



MONITORING YEAR 2 ANNUAL REPORT

Final

BIG HARRIS CREEK MITIGATION SITE

Cleveland County, NC
DMS Project No. 739
DEQ Contract 006256
DWR 401 Project No. 10-0811
USACE Action ID No. SAW-2009-0475
Broad River Basin
HUC 03050105

Data Collection Period: March – October 2019
Final Submission Date: January 30, 2020

PREPARED FOR:

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

PREPARED BY:

WILDLANDS
ENGINEERING

1430 South Mint Street, Suite 104
Charlotte, NC 28203

Phone: 704.332.7754
Fax: 704.332.3306

January 31, 2020

Mr. Paul Wiesner
NC Department of Environmental Quality
Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

RE: Big Harris Creek Mitigation Site – Monitoring Year 2 Report
Final Submittal for DMS
Contract Number 006256, RFP Number 16-006119, DMS# 739
Broad River Basin – CU# 03050105; Cleveland County, NC

Dear Mr. Wiesner:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments and observations from the Big Harris Creek Mitigation Site Draft Monitoring Year 2 Report. The following are Wildlands' responses to your comments from the report noted in *italic lettering*.

DMS Comment; General – Janet Whisnant Property: Please provide a brief update in the response letter (not the MY2 report). DMS undertstands that Wildlands has made numerous attempts to have Janet Whisnant sign a revised conservation easement and plat, so the current driveway stream crossing is not located within the existing conservation easement. The draft MY2 report shows the revised CE plat and reports the mitigation assets based on finalizing the Whisnant property transaction. DMS recommends finalizing the MY2 report as presented and continued pursuit of a revised conservation easement and plat on the Whisnant property. If Mrs. Whisnant is unwilling to sign the revised conservation easement and associated plat prior to project closeout, mitigation assets and the associated contract invoices will need to be revised accordingly.

Wildlands Response; Wildlands will continue to reach out to Ms. Whisnant and understands that the mitigation assets and associated contract invoices will need to be revised prior to closeout if an updated conservation easement and plat isn't signed.

DMS Comment; Section 1.2.5 – Vegetation Areas of Concern/ Adaptive Management: The report notes that invasive species are present over approximately eight percent or 12 acres of the total easement acreage of 145 acres. DMS recommends continued yearly invasive treatments through project closeout.

Wildlands Response; Wildlands will continue treatments to address invasives.

DMS Comment; Appendix 5 – In-Stream Flow Gage Graphs: Please add a start and finish callout/ arrow for the maximum days on each graph.

Wildlands Response; Arrows have been added to the In-Stream Gage Graphs to denote the start and finish for the period of maximum days on each graph.

DMS Comment; Digital Support Files – Some spatial features do not match the creditable footage reported in the asset table. Please provide DMS with the representative features for the following:

- **Cornwell Creek R1**
- **Cornwell Creek R2**
- **Lower Fletcher Creek R1**
- **Royster Creek R2**
- **Scott Creek**
- **Upper Stick Elliot Creek R2A**
- **Upper Stick Elliot Creek R2B**
- **Upper Stick Elliot Creek R1**

Wildlands Response; The project stream shapefile has been revised. GIS stream lengths vary slightly from the creditable footage do to minor discrepancies in stationing reported in Table 1.

DMS Comment; Digital Support Files – In CVS tool, Plot 42 MYO-2; Stem Y coordinates should be between 0-5 if the plots are 20x5. Please correct this information in the entry tool.

Wildlands Response; Plot 42 dimensions were incorrected stated as 20x5 in MY0-2. The dimensions have been corrected to 5x20 to match stem coordinates in the CVS database.

Enclosed please find two (2) hard copies of the Final Monitoring Year 2 Report and one (1) CD with the final corrected electronic files for DMS distribution. Please contact me at 704-332-7754 x110 if you have any questions.

Sincerely,

Kristi Suggs
Senior Environmental Scientist
ksuggs@wildlandseng.com

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a design-build project for the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS) to restore 10,071 linear feet (LF) of streams, enhance 23,421 LF of streams, preserve 669 LF of streams, and provide water quality treatment for 171 acres of drainage area in Cleveland County, NC. The streams proposed for mitigation credit include Big Harris Creek and 25 tributaries. Buffer restoration also occurred but is not proposed for buffer mitigation credit. The project is expected to provide 25,329.916 stream mitigation units (SMUs) in the Broad River Basin. An additional 507.000 SMU's are proposed for statistical improvement in water quality parameters per revised post-construction water quality sampling approved by the Interagency Review Team (IRT) in 2019.

The Big Harris Creek Mitigation Site (Site) is located within the DMS targeted watershed for the Broad River Basin Hydrologic Unit Code (HUC) 03050105080060 and the North Carolina Division of Water Resources (NCDWR) Subbasin 03-08-04. The Big Harris Creek and Magness Creek HUC 03050105080060 was identified as a Targeted Local Watershed (TLW) in DMS's 2009 Broad River Basin Restoration Priority (RBRP) Plan (DMS, 2009). The Cleveland County Natural Resources Conservation Service has also identified this watershed as a priority area.

The watershed has a long history of agricultural activity and most of the stressors to stream functions are related to historic and current land use practices. Prior to restoration, the major stream stressors for the Site were cattle access, erosion from lateral instability, and gully headcutting in the headwater ephemeral reaches. The effects of these stressors resulted in degraded water quality and habitat throughout the watershed when compared to reference conditions. The design approach for the Site focused on evaluating the Site's existing functional condition and evaluating its potential for recovery and need for intervention.

The major goals established for the project; which align with the overall goals of the Broad River Basin RBRP, are to reduce sediment and nutrient inputs, reduce fecal coliform inputs through cattle exclusion, and reestablish native riparian corridors while preserving existing headwater aquatic habitats and riparian corridors.

The following specific project goals were established in the mitigation plan (Wildlands, 2016).

- Improve stream stability and reduce stream bed and bank erosion;
- Restore hydrologic connection between bankfull channels and floodplains, wetlands, and vernal pools;
- Improve instream habitat and instream habitat connectivity;
- Reduce agricultural pollutant loading to project streams; and
- Create and improve forested riparian buffers.

The Site construction and as-built surveys were completed between April 2017 and May 2018. Post-construction monitoring will be conducted for five years to evaluate project success. Planting and baseline vegetation data collection occurred between March and May 2018. Monitoring Year (MY) 1 assessments were completed between September and December 2018.

MY2 assessments and site visits were completed between March and October of 2019. The Site has met the required stream, vegetation, and hydrology success criteria for MY2. Overall, restored streams are stable and functioning as designed with fluctuation in channel dimension related to bed/bank scour and/or deposition documented in some of the MY2 cross-sections. Additional isolated pockets of bank scour were observed across the Site during visual assessments. Stream repairs were completed in August 2019 to areas of bank erosion noted during MY1. The average planted stem density for the Site is

449 stems per acre and is on track to meet the MY3 interim requirement of 320 stems per acre; however, six of the 56 vegetation plots individually do not meet MY3 or final stem density success criteria. Bankfull events were recorded on a majority of gages (12 of 14 gages) along restoration and EI reaches during MY2.

TABLE OF CONTENTS

APPENDICES

Section 1: PROJECT OVERVIEW

The Site is located in western Cleveland County, approximately 2.5 miles west of the Town of Lawndale in the Broad River Basin HUC 03050105080060 and NCDWR Subbasin 03-08-04 and is being submitted for mitigation credit in the Broad River Basin HUC 03050105. (Figure 1). Located in the Inner Piedmont geologic belt within the Piedmont physiographic province (NCGS, 1985), the project watershed is dominated by agricultural and forested land. Big Harris Creek drains 3.9 square miles of rural land.

The development of the mitigation project for this Site has a long history. The Site was first identified in 2008 by DMS staff as a watershed-scale mitigation opportunity. The Site is located in a HUC that was designated as a high priority agricultural TLW and as a "focus area" for DMS in the 2009 Broad River Basin Restoration Priority (RBRP) Plan. The initial Environmental Resources Technical Report (ERTR) for the Site was completed in March 2009. Easement acquisition on 12 parcels, totaling 144.7 acres, was completed on the project area by the end of 2009. The IRT originally walked the Site in 2010 and requested a "light touch" approach to much of the Site. Water quality, benthic, fish, and storm water sampling has been collected for the project by multiple agencies and organizations between 2009 and 2013.

The availability of the pre-construction monitoring led to more precise management recommendations for the Site. The project approach incorporated previous and recent IRT feedback and minimized construction phase impacts to existing channels and riparian areas while providing the targeted uplifts to the system. Project components include intermittent and perennial stream restoration, enhancement, and preservation, as well as water quality treatment on ephemeral drainages. Stream restoration, enhancement, and preservation components include Big Harris Creek and 25 unnamed tributaries.

The watershed has a long history of agricultural activity and most of the stressors to stream functions are related to this historic and current land use. Prior to restoration, the major stream stressors for the project were cattle access, erosion from lateral instability, and gully headcutting in the headwater ephemeral reaches. The effects of these stressors resulted in degraded water quality and habitat throughout the watershed when compared to reference conditions.

Table 4 in Appendix 1 and Tables 6 in Appendix 2 present the pre-restoration conditions in more detail.

1.1 Project Goals and Objectives

The Site was identified by DMS to address major agricultural stressors within the watershed with specific focus on gully erosion, streambank erosion, and livestock access to streams. Restoration and enhancement of streams and buffers on the Site will address those identified stressors and thereby improve water quality in the Big Harris Creek watershed.

The major goals of this stream mitigation project are to reduce sediment and nutrient sources, reduce fecal coliform sources through cattle exclusion, and reestablish healthy riparian corridors while preserving existing, high quality headwater aquatic habitats. These goals will primarily be achieved by creating functional and stable stream channels by: 1) increasing and improving the interaction of stream hydrology with the riparian zone, 2) improving in-stream habitat and bed form diversity, 3) introducing large woody debris, and beginning the establishment of a native, forested riparian corridor along the stream reaches. These activities are known to support higher order functions like the processing of organic matter, nutrient cycling, and temperature regulation.

The project includes the majority of the headwater tributaries to Big Harris Creek and 35% of the 11-square mile Big Harris Creek watershed before it flows into the First Broad River. Within the project limits, approximately 34,161 LF of stream channel were restored, enhanced or preserved. Water quality BMPs were also implemented to stabilize eroding ephemeral channels and provide water quality treatment on 171 acres of headwater drainage systems during the period after construction until the riparian buffer vegetation becomes established. A total of 5,536 LF of ephemeral drainages were buffered and conserved, enhancing the overall watershed water quality and function.

The following specific goals and objectives established in the mitigation plan address the identified stressors in the Big Harris Creek and Magness Creek TLW.

Goals	Objectives
Improve stream stability and reduce stream bed and bank erosion.	Grade back eroding stream and headwater gully slopes and/or install bioengineering. Add bank revetments and in-stream structures to protect enhanced streams.
	Construct new 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.
Restore hydrologic connection between bankfull channels and floodplains, wetlands, and vernal pools.	Construct new stream channels with appropriate dimension and depth relative to their functioning floodplain elevation.
Improve instream habitat and instream habitat connectivity.	Install habitat features such as constructed riffles and brush toes into restored/enhanced streams, adding woody materials to channel beds and constructing pools of varying depth.
	Replace existing culverts with bottomless arch culverts, partially buried culverts, or ford crossings and enhance profile by removing vertical steps at culvert outlets.
Reduce agricultural pollutant loading to project streams.	Install BMPs at concentrated flow locations in the watershed headwaters to treat agricultural runoff until riparian buffer vegetation becomes established and reduce gully erosion. Plant riparian buffers that will uptake runoff and reduce pollutants once established.
	Construct new stream channels with floodplain connectivity, allowing flood flows to filter through a vegetated floodplain.
	Install fencing around conservation easements adjacent to cattle pastures to exclude cattle from the easement.
Create and improve forested riparian buffers.	Plant native tree and understory species in riparian zone.

1.2 Monitoring Year 2 Data Assessment

Annual monitoring and quarterly site visits were conducted during MY2 to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Big Harris Creek Mitigation Plan (Wildlands, 2016).

1.2.1 Stream Assessment

In general, project streams appear stable with a majority of cross-sections showing minimal change in bankfull width, maximum depth ratio, and width-to-depth ratio. Cross-section dimensions generally fell within the parameters defined for channels of the designed stream type (Rosgen, 1994 & 1996). During the fall of MY1, significant adjustments in channel dimension related to bed and/or bank scour were documented at cross-sections 3, 4, and 43 as a result of multiple large storm events (precipitation greater than two inches per event) that included the remnants of Hurricanes Florence and Michael. During MY2, cross-section 3 was stabilized in place. The bed and right bank were repaired at cross-section 4. Cross-section 43 remained stable with no repair work.

In MY2, the majority of cross-sections showed small fluctuations in channel dimension related to minor scour or deposition which are normal and not indicative of instability. During MY2, larger dimension adjustments occurred at cross-sections 9, 11, 19, 29, and 44. The adjustments at cross-sections 9, 19, 29, and 44 are the result of aggradation or bar formation. The aggradation at these cross-sections did not appear to be causing instability during MY2 visual assessments. The source of in-stream sediment may be offsite since minimal erosion was noted along project reaches in MY2. Bed and bank erosion were observed at cross-section 11 on Scott Creek, resulting in a wider and deeper channel. The degradation on Scott Creek is isolated to the area immediately around cross-section 11. The degradation may be the result of non-cohesive bed and bank material in that area and a lack of established streambank vegetation. At cross-section 44, left bank erosion was also documented. Adjustments in cross-section dimension will continue to be monitored in subsequent monitoring years.

Pebble counts conducted in the restoration and EI reaches indicate maintenance of coarser materials in the riffle features and finer particles in the pool features. Smaller tributaries including Elliot Creek UT1 as well as UT2 and UT3 to Upper Stick Elliot Creek, showed an increase in the proportion of fine particles, but the downstream reach-wide counts (Elliot Creek and Upper Stick Elliot Reaches 5 and 6) showed evidence of reach-wide stability. Cross-section 4 was repaired, and shows little change in bed structure since MY1, although there are significantly more fine particles than immediately after construction. Despite the significant erosion that occurred along Scott Creek, the substrate closely matches the substrate at construction, with more coarse particles than in MY1. Refer to Appendix 2 for the visual stability assessment table, Current Condition Plan View (CCPV) map, and reference photographs. Refer to Appendix 4 for the morphological data and plots.

1.2.2 Stream Areas of Concern

Significant areas of erosion documented in MY1 along Upper Big Harris Creek (Reaches 2B, 3, and 6), Upper Stick Elliot Creek (Reaches 2 and 3), and Lower Stick Elliott Creek were stabilized and repaired in the summer of 2019. Additional bioengineering measures including installation of coir fiber matting on banks and live stakes were completed on isolated spots along Upper Big Harris Creek Reach 6 and Lower Big Harris Creek Reach 2 including cross-section 44 in November 2019. In addition to repairs, the continued establishment of bank vegetation has improved overall bank stability. Areas of minor, isolated erosion are documented across the site and one boulder sill structure at Station 806+75 of Royster Creek failed during MY2. Wildlands will review these areas and implement repairs as necessary. Refer to the CCPV maps in Appendix 2 for the locations of stream areas of concern.

1.2.3 Stream Hydrology Assessment

At the end of the five-year monitoring period, two or more bankfull events and geomorphically significant (60%+ of bankfull flow) events must have occurred in separate years within the restoration and EI reaches. According to the stream gages, 12 of the 14 automated stream gages across the Site documented at least one bankfull event in MY2. The two exceptions occurred on Scott Creek and Bridges Creek however these reaches did record geomorphically significant events during MY2. At the end of MY2, 11 of the 14 stream gages have already met the MY5 success criteria, recording two bankfull events in separate years. Refer to Table 14 in Appendix 5 for specific reaches.

In addition to monitoring bankfull events, the presence of baseflow must be documented along Royster Creek Reach 1, Scott Creek, and Bridges Creek constructed with a Priority 1 Restoration approach. Flow must be present for at least 30 days (most likely in the winter/early spring) of the year with normal rainfall conditions. Royster Creek Reach 1, Scott Creek, and Bridges Creek stream gages recorded 26, 40, and 155 days of consecutive flow, respectively. Royster Creek Reach 1 fell just short of 30 days of flow; it is expected that the groundwater table will continue to rise in the coming years of post-construction monitoring. Refer to Appendix 5 for hydrology summary data and plots.

1.2.4 Vegetative Assessment

A total of 56 vegetation plots were established during the baseline monitoring within the project easement area. The vegetation plots were installed using a 100 square meter quadrant (10m x 10m or 5m x 20m). The final vegetative success criteria will be the survival of 260 planted stems per acre in the planted riparian corridor at the end of the required monitoring period (MY5). The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of the third monitoring year (MY3).

The MY2 vegetation monitoring resulted in an average stem density of 449 planted stems per acre, which is greater than the interim requirement of 320 planted stems per acre required at MY3. Planted stem densities within individual monitoring plots range from 81 to 688 planted stems per acre. Planted stem counts within individual plots ranging from 2 to 17 stems with an average of 11 planted stems per plot. Most plots (50 of 56 plots) are on track to meet the stem density success criteria required for MY5; however, seven plots (2, 12, 25, 29, 31, 50, 51) do not meet the interim (MY3) or final stem density success criteria required. One plot (31) does not meet the interim stem density success however is still on track to exceed the final MY5 requirement. With the inclusion of volunteers, Plots 2 and 51 do meet interim and final success criteria. Mowing within the easement occurred in the vicinity of Plots 1 and 2 prior to MY2 vegetation assessment. Several stems in these plots were broken or missing during the MY2 assessment. In addition, poor soil nutrients, suffocation due to dense herbaceous coverage, and dry soil conditions are impacting stem survival. However, a majority of woody stems (70%) had a vigor rating of 3 or more indicating that the stem is healthy and likely to survive to MY5. Refer to Appendix 2 for vegetation plot photographs and the vegetation condition assessment table and Appendix 3 for vegetation data tables.

1.2.5 Vegetation Areas of Concern/Adaptive Management Plan

Vegetation plots not meeting stem density success criteria will be evaluated for inclusion of volunteer species and supplemental planting may be implemented in the vicinity of these plots if necessary. Scattered areas of invasive species including Chinese privet (*Ligustrum sinense*), hardy orange (*Poncirus trifolata*), Japanese honeysuckle (*Lonicera japonica*), kudzu (*Pueraria lobata*), multiflora rose (*Rosa multiflora*), and tree-of-heaven (*Ailanthus altissima*) were observed during MY2. Invasive species are present over approximately eight percent or 12 acres of the total easement acreage of 145 acres. Pockets of kudzu were treated in October of 2019 with additional invasive treatments scheduled for

December 2019. Future treatments will be performed as needed. The easement encroachment (mowing) in the vicinity of Plots 1 and 2 along Upper Big Harris Reach 1 has been addressed with the landowner. Refer to Appendix 2 for the vegetation condition assessment table and the CCPV map.

1.2.6 Additional Monitoring

A post-construction water quality monitoring plan was approved by the IRT during MY2. Components of the plan include water quality sampling in MY3 – MY5 with benthic macroinvertebrate assessments and fisheries data during MY4 – MY5. Refer to Appendix 6 for the Revised Water Quality Monitoring Technical Memo and associated IRT correspondence.

1.3 Monitoring Year 2 Summary

Overall, streams within the Site appear to be stable and functioning as designed with the exception of minor areas of erosion and aggradation. Bankfull events were documented on a majority of project streams with 11 of the 14 stream gages already meeting the MY5 success criteria, recording two bankfull events in separate years. The average stem density for the Site at 449 stems per acre is on track to meeting the MY5 success criteria; however, six individual plots (2, 12, 25, 29, 50, and 51) currently do not meet the MY5 success criteria as noted in the CCPV. The plots will be evaluated for the inclusion of volunteers and the potential for supplemental planting. Adaptive management will be implemented as necessary to address areas of stream and vegetation areas of concern.

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 documents 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 were collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using either a Trimble or Topcon handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Crest gages were installed in surveyed riffle cross sections and monitored quarterly. Hydrologic monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers (USACE, 2003) standards. 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., 2006).

Section 3: REFERENCES

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

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

Lee, Michael T., Peet, Robert K., Steven D., Wentworth, Thomas R. 2006. CVS-EEP Protocol for Recording Vegetation Version 4.0. Retrieved from http://deq.nc.gov/document/cvs-eep-protocol-v42-lev1-2

North Carolina Division of Water Resources (NCDWR), 2015. Surface Water Classifications. http://portal.ncdenr.org/web/wq/ps/csu/classifications

North Carolina Division of Mitigation Services (DMS), 2009. Broad River Basin Restoration Priorities. https://files.nc.gov/ncdeq/Mitigation%20Services/Watershed_Planning/Broad_River_Basin/Broad_RBRP_2009_final.pdf

North Carolina Division of Mitigation Services (DMS), February 2014. DMS Annual Monitoring and Closeout Reporting Template.

North Carolina Geological Survey (NCGS), 1985. Geologic Map of North Carolina: North Carolina Survey, General Geologic Map, scale 1:500,000. https://deq.nc.gov/about/divisions/energy-mineral-land-resources/north-carolina-geological-survey/ncgs-maps/1985-geologic-map-of-nc4

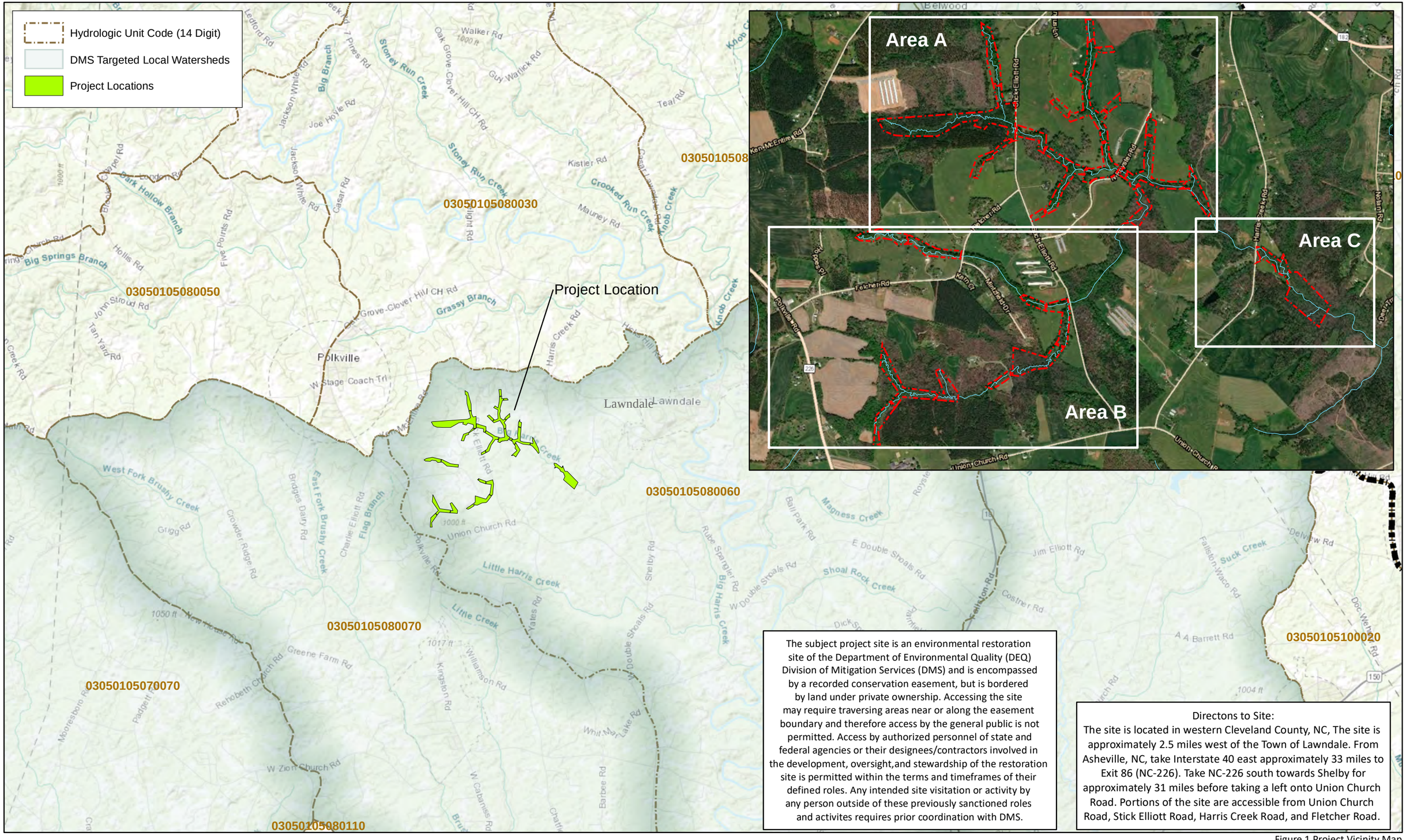
Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.

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

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

Wildlands Engineering, Inc (Wildlands), 2016. Big Harris Creek Mitigation Site Mitigation Plan. DMS, Raleigh, NC.

APPENDIX 1. General Figures and Tables



The subject project site is an environmental restoration site of the Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight,and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activites requires prior coordination with DMS.

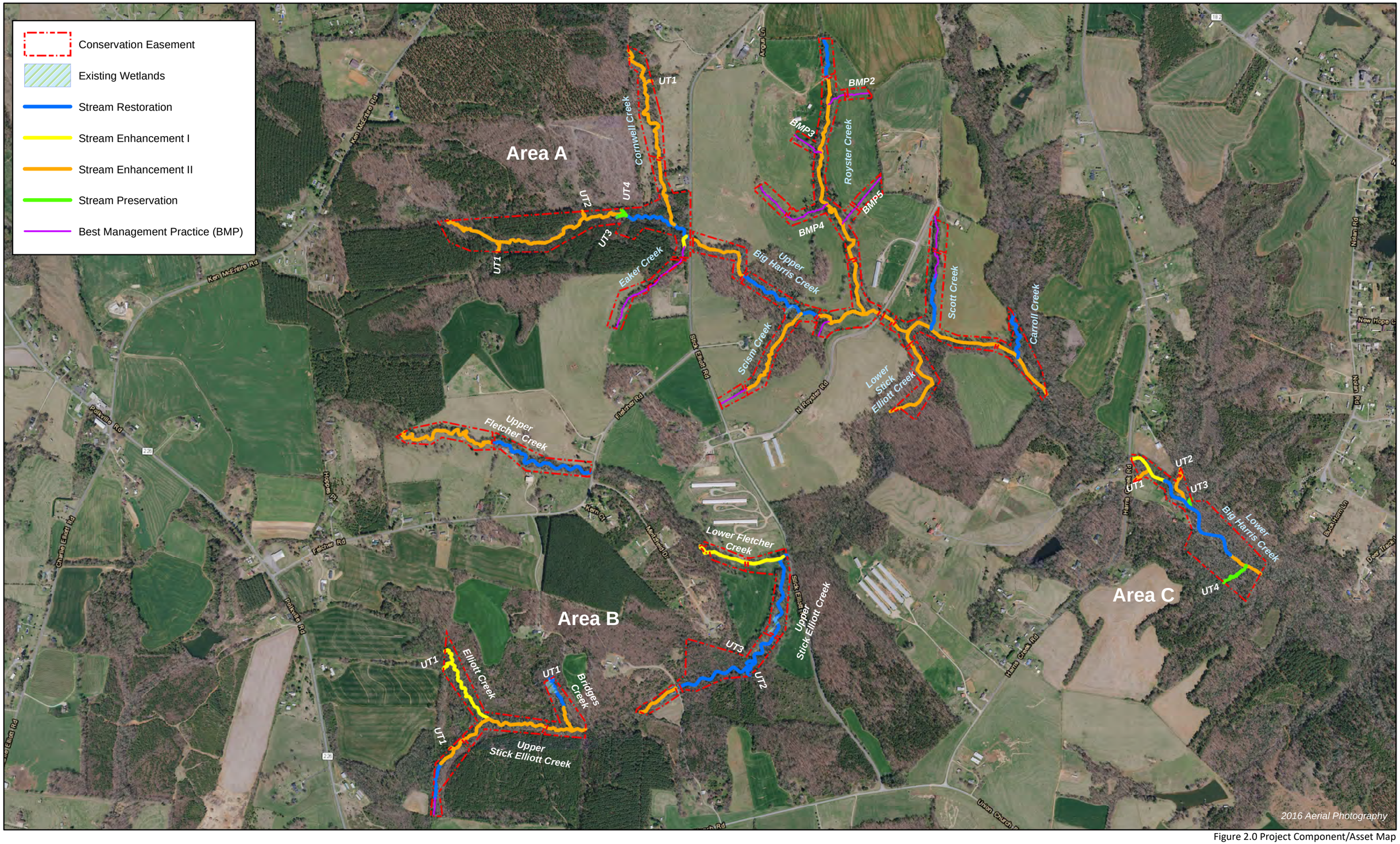
Directons to Site:
The site is located in western Cleveland County, NC, The site is approximately 2.5 miles west of the Town of Lawndale. From Asheville, NC, take Interstate 40 east approximately 33 miles to Exit 86 (NC-226). Take NC-226 south towards Shelby for approximately 31 miles before taking a left onto Union Church Road. Portions of the site are accessible from Union Church Road, Stick Elliott Road, Harris Creek Road, and Fletcher Road.

WILDLANDS ENGINEERING

0 1 2 Miles

N

Figure 1 Project Vicinity Map
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC

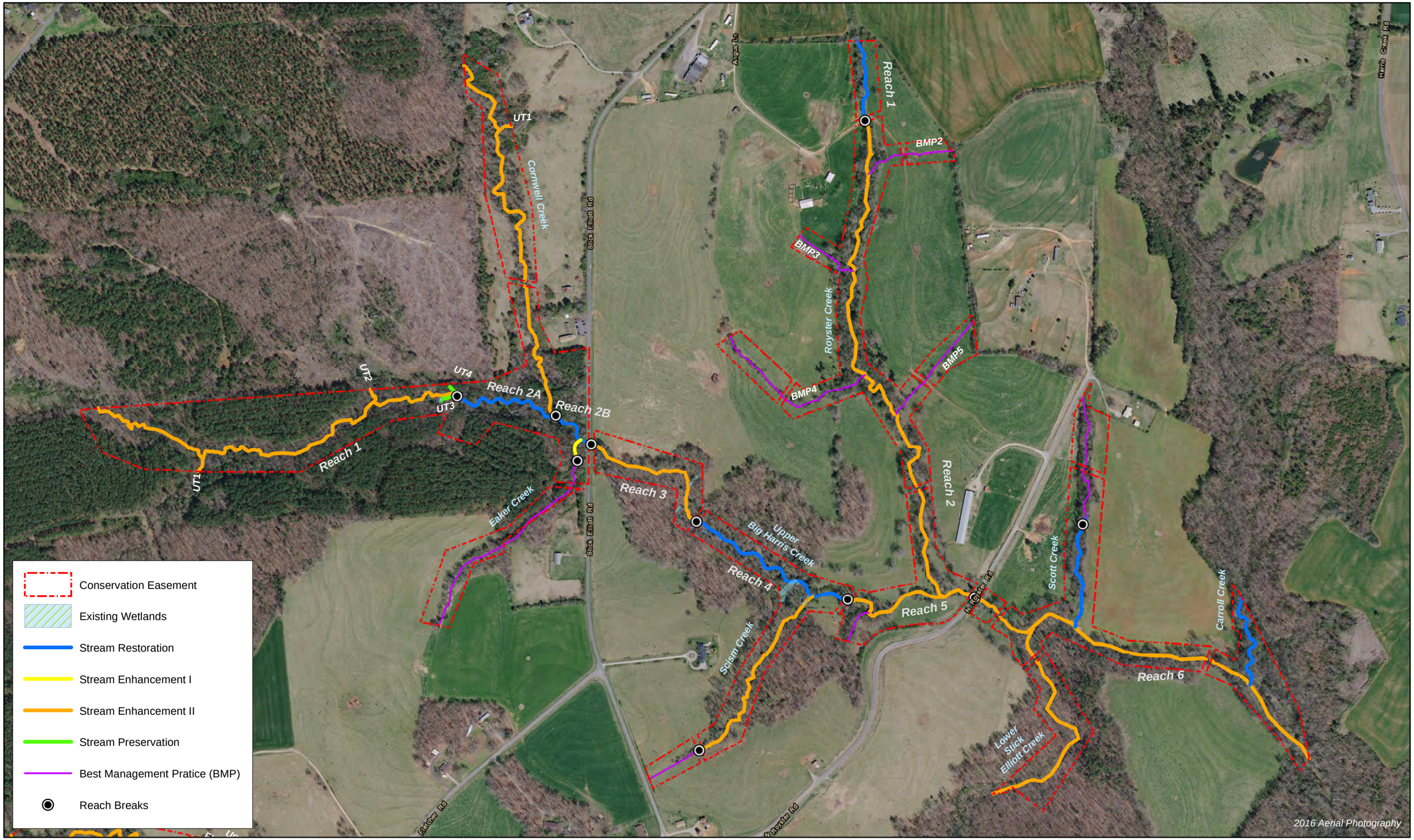


0 500 1,000 Feet

N

WILDLANDS ENGINEERING

Figure 2.0 Project Component/Asset Map
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC

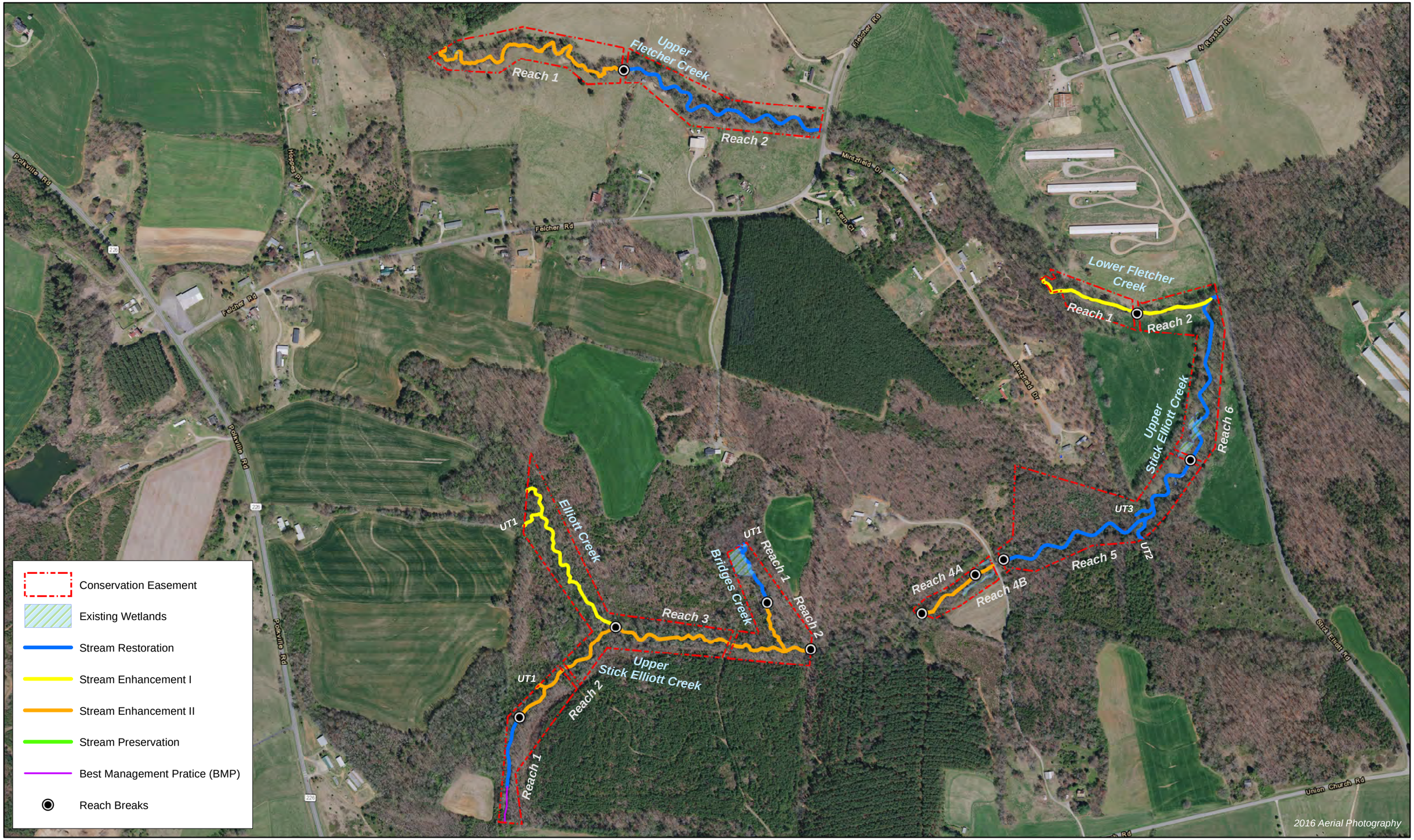


WILDLANDS ENGINEERING

0 500 1,000 Feet

N

Figure 2.1 Project Component/Asset Map
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC



WILDLANDS ENGINEERING

Figure 2.2 Project Component/Asset Map
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC

WILDLANDS ENGINEERING

0 150 300 Feet

Figure 2.3 Project Component/Asset Map
Big Harris Creek Mitigation Site - Area C
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC

Table 1. Project Components and Mitigation Credits

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Mitigation Credits										
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset	
Type	R	RE	R	RE	R	RE				
Totals	25,228.121	101.795	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Project Components										
Project Area	Project Reach	Existing Footage (LF) [1]	Stationing/Location		Approach (P1, P2, etc.)	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage (LF) [1]	Mitigation Ratio	Total Buffer Width Adjustments	Proposed Credit [2, 3, 4]
A	Cornwell Creek R1	2,144	403+44	425+20	cattle fencing; buffer planting	EII	2,144	2.5	25	883.000
	Cornwell Creek R2	286	425+20	428+27	Full restoration with structures	EII	307	2.5	0	123.000
	UT1 to Cornwell Creek	78	430+27	431+05	cattle fencing; buffer planting	EII	78	2.5	0	31.000
	Eaker Creek	135	513+11	514+45	cattle fencing, bank grading and in-stream structures	EI	134	1	0	134.000
	Eaker Creek SPSC BMP	N/A	N/A	N/A	headwater BMP	N/A	1309	N/A	N/A	N/A
	Scism Creek	1,189	606+92	618+81	BMP, bank grading and in-stream structures	EII	1,189	1.5	12	805.000
	Scism Creek EC	N/A	N/A	N/A	headwater BMP	N/A	358	N/A	N/A	N/A
	Royster Creek R1	438	802+54	807+13	Priority 2 Restoration	R	459	1	-5	454.000
	Royster Creek R2	3,185	807+40	839+40	cattle fencing; buffer planting	EII	3,170	2	21	1606.000
	Royster BMP2	N/A	N/A	N/A	headwater BMP	N/A	539	N/A	N/A	N/A
	Royster BMP3	N/A	N/A	N/A	headwater BMP	N/A	399	N/A	N/A	N/A
	Royster BMP4	N/A	N/A	N/A	headwater BMP	N/A	1022	N/A	N/A	N/A
	Royster BMP5	N/A	N/A	N/A	headwater BMP	N/A	669	N/A	N/A	N/A
	Lower Stick Elliott Creek	1,422	1101+13	1115+34	cattle fencing; buffer planting	EII	1,389	2.5	-29	527.000
	Scott Creek	630	1210+12	1216+74	Priority 1 Restoration	R	662	1	19	681.000
	Scott Creek SPSC BMP	N/A	N/A	N/A	headwater BMP	N/A	734	N/A	N/A	N/A
	Carroll Creek	553	1301+68	1307+63	Priority 2 Restoration	R	595	1	-56	539.000
	Upper Big Harris Creek R1	2,615	104+25	129+81	bank grading and in-stream structures; pine removal and buffer planting	EII	2,556	2.5	119	1141.000
	Upper Big Harris Creek R2	990	129+81	139+15	Priority 2 Restoration	R	934	1	126	1060.000

Table 1. Project Components and Mitigation Credits

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Mitigation Credits										
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset	
Type	R	RE	R	RE	R	RE				
Totals	25,228.121	101.795	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Project Components										
Project Area	Project Reach	Existing Footage (LF) [1]	Stationing/Location		Approach (P1, P2, etc.)	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage (LF) [1]	Mitigation Ratio	Total Buffer Width Adjustments	Proposed Credit [2, 3, 4]
A	Upper Big Harris Creek R3	880	139+75	148+45	cattle fencing; bank grading and in-stream structures	EII	870	2	75	510.000
	Upper Big Harris Creek R4	1,203	148+76	159+15	Priority 2 Restoration	R	1,039	1	11	1050.000
	Upper Big Harris Creek R5	845	159+58	168+03	cattle fencing; bank grading and in-stream structures	EII	845	1.5	41	604.000
	Upper Big Harris Creek R6A	824	168+63	177+50	cattle fencing; benching; bank grading and in-stream structures	EII	855	1.5	1	571.000
	Upper Big Harris Creek R6B	1,434	177+50	191+84	cattle fencing; benching; bank grading and bank structures	EII	1,403	1.5	-10	925.000
	Upper Big Harris BMP	N/A	N/A	N/A	headwater BMP into Upper Big Harris Reach 5	N/A	166	N/A	N/A	N/A
	UT1 to Upper Big Harris Creek	84	197+13	197+97	bank grading and in-stream structures; pine removal and buffer planting	EII	84	2.5	-8	26.000
	UT2 to Upper Big Harris Creek	97	200+42	201+39	bank grading and in-stream structures; pine removal and buffer planting	EII	97	2.5	-4	35.000
	UT3 to Upper Big Harris Creek	105	202+00	203+05	preservation	P	105	10	0	11.000
	UT4 to Upper Big Harris Creek	84	204+00	204+84	preservation	P	84	10	-1	7.000
B	Elliott Creek	1,389	1400+85	1412+06	bank grading, segments of profile and bench restoration, in-stream structures	EI	1,121	1	42	1163.000
	UT1 to Elliott Creek	141	1415+87	1417+28	bank grading, segments of profile and bench restoration, in-stream structures	EI	141	1	-19	122.000
	Bridges Creek R1	445	1500+91	1504+67	Priority 1 Restoration	R	376	1	15	391.000
	Bridges Creek R2	366	1504+67	1507+84	bank grading and in-stream structures	EII	317	2	9	168.000
	UT1 to Bridges Creek	58	1510+46	1511+01	Priority 1 Restoration	R	55	1	-28	27.000
	Upper Stick Elliott Creek SPSC BMP	N/A	N/A	N/A	headwater BMP into USEC	N/A	206	N/A	N/A	N/A
	Upper Stick Elliott Creek R1	352	1002+89	1006+98	Priority 1 Restoration	R	409	1	-55	354.000
	Upper Stick Elliott Creek R2A	535	1006+98	1012+00	bank grading and in-stream structures	EII	471	2	4	240.000
	Upper Stick Elliott Creek R2B	334	1012+00	1015+10	bank grading and in-stream structures	EII	310	2	0	155.000
	Upper Stick Elliott Creek R3A	209	1015+10	1018+25	bank grading and benching	EII	315	2	17	175.000
	Upper Stick Elliott Creek R3B	1,336	1018+25	1027+44	bank grading, benching, and in-stream structures	EII	889	2	21	465.000

Table 1. Project Components and Mitigation Credits

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

Mitigation Credits										
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset	
Type	R	RE	R	RE	R	RE				
Totals	25,228.121	101.795	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Project Components										
Project Area	Project Reach	Existing Footage (LF) [1]	Stationing/Location		Approach (P1, P2, etc.)	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage (LF) [1]	Mitigation Ratio	Total Buffer Width Adjustments	Proposed Credit [2, 3, 4]
B	Upper Stick Elliott Creek R4A	428	1038+11	1042+08	attle fencing, bank grading and in-stream structure	EII	397	2	-17	182.000
	Upper Stick Elliott Creek R4B	113	1042+28	1043+21	in-stream structures	EII	113	1.5	-6	69.000
	Upper Stick Elliott Creek R5	1,909	1043+77	1058+84	Priority 2 -> Priority 1 Restoration	R	1,507	1	89	1596.000
	Upper Stick Elliott Creek R6	1,036	1059+14	1069+83	Priority 1 -> Priority 2 Restoration	R	1,069	1	0	1069.000
	UT1 to Upper Stick Elliott Creek	50	1078+08	1078+80	bank grading and in-stream structures	EII	72	1.5	-9	39.000
	UT2 to Upper Stick Elliott Creek	56	1080+00	1081+54	reconnection; Priority 1 Restoration	R	154	1	-10	144.000
	UT3 to Upper Stick Elliott Creek	107	1082+00	1083+18	reconnection; Priority 1 Restoration	R	118	1	0	118.000
	Upper Fletcher Creek R1	1,493	1600+00	1615+71	isolated bank grading and in-stream structures, livestock fencing, invasives treatment	EII	1,571	2.5	16	644.000
	Upper Fletcher Creek R2	1,465	1616+02	1630+09	Priority 2 Restoration	R	1,407	1	33	1440.000
	Lower Fletcher Creek R1	574	1641+28	1647+02	bank grading, benching, and in-stream structures	EI	574	1	-81	493.000
	Lower Fletcher Creek R2	467	1647+33	1651+60	bank grading, benching, and in-stream structures	EI	427	1	37	464.000

Table 1. Project Components and Mitigation Credits

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	25,228.121	101.795	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Project Components										
Project Area	Project Reach	Existing Footage (LF) [1]	Stationing/Location		Approach (P1, P2, etc.)	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage (LF) [1]	Mitigation Ratio	Total Buffer Width Adjustments	Proposed Credit [2, 3, 4]
C	Lower Big Harris Creek R1A	509	300+13	305+13	bank grading, segments of profile and bench restoration, in-stream structures	EI	500	1.5	-29	304.000
	Lower Big Harris Creek R1B	385	305+13	308+33	Priority 2 Restoration	R	320	1	13	333.000
	Lower Big Harris Creek R2	987	308+33	318+00	Priority 2 Restoration	R	967	1	125	1092.000
	Lower Big Harris Creek R3	414	318+00	322+14	isolated bank grading and in-stream structures, invasives treatment	EII	414	2.5	32	198.000
	UT1 to Lower Big Harris Creek	229	330+68	332+96	isolated bank grading and in-stream structures, invasives treatment	EII	228	2.5	-39	53.000
	UT2 to Lower Big Harris Creek	511	334+20	338+60	heavy enhancement with in-stream structures, invasives treatment	EII	440	2	-37	183.000
	UT3 to Lower Big Harris Creek	99	341+69	342+87	preservation	P	118	10	-1	11.000
	UT4 to Lower Big Harris Creek	362	343+12	346+74	preservation	P	362	10	0	36.000
						Total Intermittent/Perennial (I/P) Streams	39,563			23,451.000
						Additional 4% Credit Based on I/P Stream Length for Extra Project Monitoring				1,366.000
						Additional 1.5% Credit Based on I/P Stream Length for Watershed Nature of Project				512.000
						Additional 2% Credit Based on Total SMUs for Statistical Improvement in Water Quality[5]				507.000
						Potential Total Credits[5]				25,329.916

Component Summation					
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)	Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
Restoration	10,071				
Enhancement	N/A				
Enhancement I	2,897				
Enhancement II	20,524				
Creation	N/A				
Wetland Rehabilitation	N/A				
Wetland Re-Establishment	N/A				
Preservation	669				
High Quality Preservation	N/A				

Notes:

1. Existing and proposed lengths include only reach length located within the conservation easement. No direct credit for BMPs. BMP lengths not included in proposed footage.
2. Credits reported have been adjusted based on buffer width deviations from standard 50-foot buffer width. Detailed calculations included in Appendix I of the Mitigation Plan (Wildlands, 2016).
3. The lengths of Royster Reach 2 and Scott Creek that are located underneath the existing overhead electric power line corridor have credits reduced by 100%.
4. The SMUs reported in this table were determined in the mitigation plan utilizing the design center line.
5. The potential SMU total does not inlclude the 2% increase for statistical improvement in water quality. If revised monitoring plan is approved, an addendum will be prepared and submitted.

Table 2. Project Activity and Reporting History
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Activity or Report		Data Collection Complete	Completion or Scheduled Delivery
Mitigation Plan		February - July 2015	November 2016
Final Design - Construction Plans		May 2018	June 2018
Construction		April 2017 - May 2018	April 2017 - May 2018
Temporary S&E mix applied to entire project area[1]		April 2017 - May 2018	April 2017 - May 2018
Permanent seed mix applied to reach/segments		April 2017 - May 2018	April 2017 - May 2018
Bare root and live stake plantings for reach/segments		February 2018 - March 2018	February 2018 - March 2018
Baseline Monitoring Document (Year 0)	Stream Assessment	April 2018	June 2018
	Vegetation Assessment	May 2018	
	Invasive Treatment	N/A	Summer 2018
Year 1 Monitoring	Stream Assessment	November 2018	December 2018
	Vegetation Assessment	November 2018	
Year 2 Monitoring	Stream Assessment	June - September 2019	December 2019
	Vegetation Assessment	August 2019	
Stream Repairs (UBHC R2B & R6, USEC R2 & R3, and LSEC)		N/A	August 2019
Isolated bank rematting & live stakes (UBHC R6 and LBHC R2)		N/A	November 2019
Invasive Treatments		N/A	October & December 2019
Year 3 Monitoring		2020	December 2020
Year 4 Monitoring		2021	December 2021
Year 5 Monitoring		2022	December 2022

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

Table 3. Project Contact Table
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Designers Emily Reinicker, PE, CFM Angela Allen, PE - Area A Jake McLean, PE, CFM - Area C	**Wildlands Engineering, Inc.** 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
Kevin Tweedy, PE - Area B	**Ecosystem Planning & Restoration** 559 Jones Franklin Road, Suite 150 Raleigh, NC 27606
Construction Contractors	**Land Mechanics Designs Incorporated** 780 Landmark Road Willow Springs, NC 27611
	Fluvial Solutions Incorporated P.O. Box 28749 Raleigh, NC 27611
Planting Contractor	**Bruton Natural Systems, Inc.** 150 Old Black Creek Rd Freemont, NC 27830
Seeding Contractor	**Land Mechanics Designs Incorporated**
	Fluvial Solutions Incorporated
Seed Mix Sources	**Green Resource, LLC** 5204 Highgreen Court Colfax, NC 27235
	ACF Environmental 3313 Durham Drive Raleigh, NC 27603
Nursery Stock Suppliers **Bare Roots**	**Dykes & Son Nursery** 825 Maude Etter Rd. McMinnville, TN 37110
Live Stakes	**Foggy Mountain Nursery** 797 Helton Creek Road Lansing, NC 28643
	Bruton Natural Systems, Inc.
Herbaceous Plugs	**Wetland Plants Incorporated** 812 Drummonds Point Road Edenton, NC 27932
Monitoring Performers	**Wildlands Engineering, Inc.**
Monitoring, POC	Kristi Suggs 704.332.7754, ext. 110

Table 4a. Project Information and Attributes
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

AREA A

Project Information	
Project Name	Big Harris Creek Mitigation Site
County	Cleveland County
Project Area (acres)	145
Project Coordinates (latitude and longitude)	34° 24' 32.70"N, 81° 36' 41.55"W
Project Watershed Summary Information	
Physiographic Province	Piedmont Physiographic Province
River Basin	Broad
Temperature Regime	Warm
USGS Hydrologic Unit 8-digit	03050105
USGS Hydrologic Unit 14-digit	03050105080060
DWR Sub-basin	03-08-04
Project Drainage Area (acres)	2,509
Project Drainage Area Percentage of Impervious Area	<10%
CGIA Land Use Classification	Pasture (46%); Deciduous Forest (22%); Evergreen Forest (14%); Developed (10%); Herbaceous (2%); Shrub/Scrub (2%); Cultivated Crops (2%); Mixed Forest (1%); and Woody Wetlands (1%)

Reach Summary Information

Parameters	Area A																			
	Carroll Creek	Cornwell Creek	Cornwell Creek UT1	Eaker Creek	LSEC	Royster Creek		Scism Creek	Scott Creek	UBHC							UBHC UT1	UBHC UT2	UBHC UT3	UBHC UT4
		R 1 & 2		R1	R1	R1	R2			R1	R2a	R2b	R3	R4	R5	R6				
Length of reach (linear feet) - Post-Restoration	595	2,451	78	134	1,389	459	3,170	1,189	662	2,556	934		870	1,039	845	2,258	84	97	105	84
Drainage area (acres)	203	211		27	943	149		40	42	1,969										
NCDWR stream identification score	38	-	30	31.5/20.5	-	22.5	32	34/22.5	28.5	25 (I only)	-	-	-	-	-	-	-	-	-	24
NCDWR Water Quality Classification	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV
Morphological Description (stream type)	P	P	P	P/I	P	I	P	P/I	I	P/I	P	P	P	P	P	P	P	I	I	P
Evolutionary trend (Simon's Model) - Pre- Restoration	IV/V	VI		IIIa	V	III/IV	V/VI	III, IV, V	III	III	III		IV	IV	III	III	III	III	III	III
Underlying mapped soils	Pacolet-Saw complex (PtD)	Chewacla loam (ChA)		Pacolet-Bethlehem complex (PbC2)	Toccoa loam (ToA)	Chewacla loam (ChA)		Pacolet-Saw complex (PtD)		Chewacla loam (ChA)										
Drainage class	Well drained	Somewhat poorly drained		Well drained	Well drained and moderately well drained	Somewhat poorly drained		Well drained		Somewhat poorly drained										
Soil hydric status	No	Yes		No	No	Yes		No		Yes										
Slope	15-25%	0-2%		8-15%	0-2%	0-2%		15-25%		0-2%										
FEMA classification	LBHC Reaches 1a, 1b, and 2 are a mapped Zone AE floodplain with defined base flood elevations.																			
Native vegetation community	Piedmont Alluvial Forest, Mesic Mixed Hardwood Forest, and Timber Forest (applies to UBHC - Reach 1, Reach 2, UT1, UT2, UT3 only)																			
Percent composition exotic invasive vegetation -Post-Restoration	0%																			

Table 4b. Project Information and Attributes
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

AREA A

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. 4087. USACE Action ID #SAW-2009-0045
Waters of the United States - Section 401	Yes	Yes	
Division of Land Quality (Erosion and Sediment Control	Yes	Yes	NPDES Construction Stormwater General Permit NCG010000
Endangered Species Act	Yes	Yes	Big Harris Creek Mitigation Plan; Wildlands determined "no effect" on Cleveland County listed endangered species. USFWS indicates project will have no impact on possible endangered plants and the possibility of incidental take of the northern long-eared bat is exempt under the 4(d) rule at this location (email correspondence from 12/18/2008 and 05/09/2016).
Historic Preservation Act	Yes	Yes	No historic resources were found to be impacted (letter from SHPO dated 6/25/2008).
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	LBHC Reaches 1a, 1b, and 2 are a mapped Zone AE floodplain with defined base flood elevations. (FEMA Zone AE, FIRM panels 2620 and 2621). Cleveland County Floodplain Development Permit #153715.
Essential Fisheries Habitat	No	N/A	N/A

Table 4c. Project Information and Attributes
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

AREA B

Project Information	
Project Name	Big Harris Creek Mitigation Site
County	Cleveland County
Project Area (acres)	145.00
Project Coordinates (latitude and longitude)	34° 24' 32.70"N, 81° 36' 41.55"W
Project Watershed Summary Information	
Physiographic Province	Piedmont Physiographic Province
River Basin	Broad
Temperature Regime	Warm
USGS Hydrologic Unit 8-digit	03050105
USGS Hydrologic Unit 14-digit	03050105080060
DWR Sub-basin	03-08-04
Project Drainage Area (acres)	2509
Project Drainage Area Percentage of Impervious Area	<10%
CGIA Land Use Classification	Pasture (46%); Deciduous Forest (22%); Evergreen Forest (14%); Developed (10%); Herbaceous (2%); Shrub/Scrub (2%); Cultivated Crops (2%); Mixed Forest (1%); and Woody Wetlands (1%)

Reach Summary Information

Parameters	Area B																		
	Elliott Creek	Elliott Creek UT1	Bridges Creek		Bridges Creek UT1	LFC		USEC							USEC UT1	USEC UT2	USEC UT3	UFC	
	R1		R1	R2		R1	R2	R1	R2	R3	R4a	R4b	R5	R6				R1	R2
Length of reach (linear feet) - Post-Restoration	1,121	141	376	317	55	574	427	409	781	1,204	397	113	1,507	1,069	72	154	118	1,571	1,407
Drainage area (acres)	82		38			266		487										185	
NCDWR stream identification score	33.5	33.5	33/25.5	-	24	38	-	33.5	-	-	-	-	-	-	25.5	33	25.5	-	-
NCDWR Water Quality Classification	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV
Morphological Description (stream type)	P	P	P/I	P	I	P	P	P	P	P	P	P	P	P	I	P	I	P	P
Evolutionary trend (Simon's Model) - Pre- Restoration	IV/V	III	III/IV/V/VI			IV/V	III/IV	III/IV	IV/V	V	III/V/VI		IV	IV/V	-	-	-	VI	
Underlying mapped soils	Chewacla loam (ChA)		Pacolet sandy clay loam (PaC2)			Chewacla loam (ChA)													
Drainage class	Somewhat poorly drained		Well drained			Somewhat poorly drained													
Soil hydric status	Yes		No			Yes													
Slope	0-2%		8-15%			0-2%													
FEMA classification	no regulated floodplain																		
Native vegetation community	Piedmont Alluvial Forest and Mesic Mixed Hardwood Forest																		
Percent composition exotic invasive vegetation -Post-Restoration	0%																		

Table 4d. Project Information and Attributes
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

AREA B

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. 4087. USACE Action ID #SAW-2009-0045
Waters of the United States - Section 401	Yes	Yes	
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	NPDES Construction Stormwater General Permit NCG010000
Endangered Species Act	Yes	Yes	Big Harris Creek Mitigation Plan; Wildlands determined "no effect" on Cleveland County listed endangered species. USFWS indicates project will have no impact on possible endangered plants and the possibility of incidental take of the northern long-eared bat is exempt under the 4(d) rule at this location (email correspondence from 12/18/2008 and 05/09/2016).
Historic Preservation Act	Yes	Yes	No historic resources were found to be impacted (letter from SHPO dated 6/25/2008).
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	LBHC Reaches 1a, 1b, and 2 are a mapped Zone AE floodplain with defined base flood elevations. (FEMA Zone AE, FIRM panels 2620 and 2621). Cleveland County Floodplain Development Permit #153715.
Essential Fisheries Habitat	No	N/A	N/A

Table 4e. Project Information and Attributes
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

AREA C

Project Information	
Project Name	Big Harris Creek Mitigation Site
County	Cleveland County
Project Area (acres)	145.00
Project Coordinates (latitude and longitude)	34° 24' 32.70"N, 81° 36' 41.55"W
Project Watershed Summary Information	
Physiographic Province	Piedmont Physiographic Province
River Basin	Broad
Temperature Regime	Warm
USGS Hydrologic Unit 8-digit	03050105
USGS Hydrologic Unit 14-digit	03050105080060
DWR Sub-basin	03-08-04
Project Drainage Area (acres)	2509
Project Drainage Area Percentage of Impervious Area	<10%
CGIA Land Use Classification	Pasture (46%); Deciduous Forest (22%); Evergreen Forest (14%); Developed (10%); Herbaceous (2%); Shrub/Scrub (2%); Cultivated Crops (2%); Mixed Forest

Reach Summary Information

Parameters	Area C							
	LBHC				LBHC UT1	LBHC UT2	LBHC UT3	LBHC UT4
	R1a	R1b	R2	R3				
Length of reach (linear feet) - Post-Restoration	500	320	967	414	228	440	118	362
Drainage area (acres)	2,509							
NCDWR stream identification score	-	-	-	-	-	35.5	32	35.5
NCDWR Water Quality Classification	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV	WS-IV
Morphological Description (stream type)	P	P	P	P	P	P	P	P
Evolutionary trend (Simon's Model) - Pre- Restoration	IV/V							VI
Underlying mapped soils	Toccoa loam (ToA)							
Drainage class	Well drained and moderately well drained							
Soil hydric status	No							
Slope	0-2%							
FEMA classification	Zone AE				no regulated floodplain			
Native vegetation community	Piedmont Alluvial Forest and Mesic Mixed Hardwood Forest							
Percent composition exotic invasive vegetation -Post-Restoration	0%							

Table 4f. Project Information and Attributes
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

AREA C

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. 4087. USACE Action ID #SAW-2009-0045.
Waters of the United States - Section 401	Yes	Yes	
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	NPDES Construction Stormwater General Permit NCG010000
Endangered Species Act	Yes	Yes	Big Harris Creek Mitigation Plan; Wildlands determined "no effect" on Cleveland County listed endangered species. USFWS indicates project will have no impact on possible endangered plants and the possibility of incidental take of the northern long-eared bat is exempt under the 4(d) rule at this location (email correspondence from 12/18/2008 and 05/09/2016).
Historic Preservation Act	Yes	Yes	No historic resources were found to be impacted (letter from SHPO dated 6/25/2008).
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	LBHC Reaches 1a, 1b, and 2 are a mapped Zone AE floodplain with defined base flood elevations. (FEMA Zone AE, FIRM panels 2620 and 2621). Cleveland County Floodplain Development Permit #153715.
Essential Fisheries Habitat	No	N/A	N/A

Table 5a. Monitoring Component Summary
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area A - Restoration and Enhancement I Reaches

Parameter	Monitoring Feature	Quantity / Length by Reach						Frequency	Notes
		Carroll Creek	Royster Creek R1	Scott Creek	UBHC R2	UBHC R4	Eaker Creek		
Dimension	Riffle Cross-Section	1	1	1	2	2	N/A	Annual	
	Pool Cross-Section	1	1	1	2	2	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Substrate	Reach Wide (RW) / Riffle (RF) 100 Pebble Count	1 RW, 1 RF	1 RW, 1 RF	1 RW, 1 RF	1 RW, 2RF	1 RW, 2RF	N/A	Annual	
Hydrology	Crest Gage/Transducer	1	1	1	1		N/A	Quarterly	2
Vegetation	CVS Level 2	16					N/A	Annual	3
Water Quality	4 baseflow, 4 stormflow grab samples	up to 10 locations throughout project areas A, B, & C and 1 reference location					N/A	Years 3, 4, and 5	
Benthic Macroinvertebrates	NCDWR Qual 4						N/A	Years 3, 4, and 5	
Fisheries	NCDWR SOP						N/A	Year 5	
Exotic and Nuisance Vegetation								Semi-Annual	4
Project Boundary								Semi-Annual	5
Reference Photos	Photographs	18						Annual	

Notes:

1. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile will be collected during as-built baseline monitoring only, unless observations indicate a lack of stability and a profile survey is warranted in additional years.
2. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers will be set to record stage once every hour. Devices will be inspected and downloaded semi-annually. In addition, Scott Creek and Royster Creek Reach 1 will be monitored for the presence of baseflow (minimun of 30 consecutives days).
3. The total number of vegetation monitoring plots represents 2% of the open planted area. This is a reduction from the number of vegetation plots proposed in the Mitigation Plan, which was based on 2% of the entire conservation easement. IRT and DMS approved the change in January 2018.
4. Locations of exotic and nuisance vegetation will be mapped.
5. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

Table 5b. Monitoring Component Summary
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area A - Enhancement II Reaches

Parameter	Monitoring Feature	Quantity / Length by Reach										Frequency	Notes
		Cornwell Creek	Cornwell Creek UT1	LSEC	Royster Creek R2	Scism Creek	UBHC R1	UBHC R3	UBHC R5	UBHC R6	UBHC UT1 & UT2		
Dimension	Riffle Cross-Section	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Annual	
	Pool Cross-Section	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Annual	
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Annual	
Substrate	Reach Wide (RW) / Riffle (RF) 100 Pebble Count	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Annual	
Hydrology	Crest Gage/Transducer	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Quarterly	
Vegetation	CVS Level 2	18										Annual	1
Exotic and Nuisance Vegetation												Semi-Annual	2
Project Boundary												Semi-Annual	3
Reference Photos	Photographs	38										Annual	4

Notes:

1. The total number of vegetation monitoring plots represents 2% of the open planted area. This is a reduction from the number of vegetation plots proposed in the Mitigation Plan, which was based on 2% of the entire conservation easement. IRT and DMS approved this change in January 2018.
2. Locations of exotic and nuisance vegetation will be mapped.
3. Locations of vegetation damage, boundary encroachments, etc. will be mapped.
4. Photographs will be taken along preservation reaches not noted above (3 photographs total).

Table 5c. Monitoring Component Summary
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area B - Restoration and Enhancement I Reaches

Parameter	Monitoring Feature	Quantity / Length by Reach												Frequency	Notes
		Elliott Creek	Elliott Creek UT1	Bridges Creek R1	Bridges Creek UT1	LFC R1	LFC R2	Upper Stick Elliott Creek R1	USEC R5	USEC R6	USEC UT2	USEC UT3	UFC R2		
Dimension	Riffle Cross-Section	2	1	1	N/A	1	1	1	3	2	1	1	3	Annual	
	Pool Cross-Section	1	0	0	N/A	1	1	0	2	1	0	0	3		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Annual	1
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Annual	
Substrate	Reach Wide (RW) / Riffle (RF) 100 Pebble Count	1 RW, 2 RF	1 RW, 1 RF	1 RW, 1 RF	N/A	1 RW, 1 RF	1 RW, 1 RF	1 RW, 1 RF	1 RW, 3 RF	1 RW, 2 RF	1 RW, 1 RF	1 RW, 1 RF	1 RW, 3RF	Annual	
Hydrology	Crest Gage/Transducer	1	1	1	N/A	1		1	1		1	1	1	Quarterly	2
Vegetation	CVS Level 2	13												Annual	3
Water Quality	4 baseflow, 4 stormflow grab samples	up to 10 locations throughout project areas A, B, & C and 1 reference location												Years 3, 4, and 5	
Benthic Macroinvertebrates	NCDWR Qual 4													Years 3, 4, and 5	
Fisheries	NCDWR SOP													Year 5	
Exotic and Nuisance Vegetation														Semi-Annual	4
Project Boundary														Semi-Annual	5
Reference Photos	Photographs	27												Annual	

Notes:

1. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile will be collected during as-built baseline monitoring survey only, unless observations indicate a lack of stability and a profile survey is warranted in additional years.
2. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers will be set to record stage once every hour. Device will be inspected and downloaded semi-annually. In addition, Bridges Creek will be monitored for the presence of baseflow (minimun of 30 consecutives days).
3. The total number of vegetation monitoring plots represents 2% of the open planted area. This is a reduction from the number of vegetation plots proposed in the Mitigation Plan, which was based on 2% of the entire conservation easement. IRT and DMS approved this change in January 2018.
4. Locations of exotic and nuisance vegetation will be mapped.
5. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

Table 5d. Monitoring Component Summary
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area B - Enhancement II Reaches

Parameter	Monitoring Feature	Quantity / Length by Reach						Frequency	Notes
		Bridges Creek R2	USEC R2	USEC R3	USEC R4a/4b	USEC UT1	UFC R1		
Dimension	Riffle Cross-Section	N/A	N/A	N/A	N/A	N/A	N/A	Annual	
	Pool Cross-Section	N/A	N/A	N/A	N/A	N/A	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	Annual	
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	Annual	
Substrate	Reach Wide (RW) / Riffle (RF) 100 Pebble Count	N/A	N/A	N/A	N/A	N/A	N/A	Annual	
Hydrology	Crest Gage/Transducer	N/A	N/A	N/A	N/A	N/A	N/A	Quarterly	
Vegetation	CVS Level 2	5						Annual	1
Exotic and Nuisance Vegetation								Semi-Annual	2
Project Boundary								Semi-Annual	3
Reference Photos	Photographs	12						Annual	

Notes:
1. The total number of vegetation monitoring plots represents 2% of the open planted area. This is a reduction from the number of vegetation plots proposed in the Mitigation Plan, which was based on 2% of the entire conservation easement that included supplemental planting areas. IRT and DMS approved this change in January 2018.
2. Locations of exotic and nuisance vegetation will be mapped.
3. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

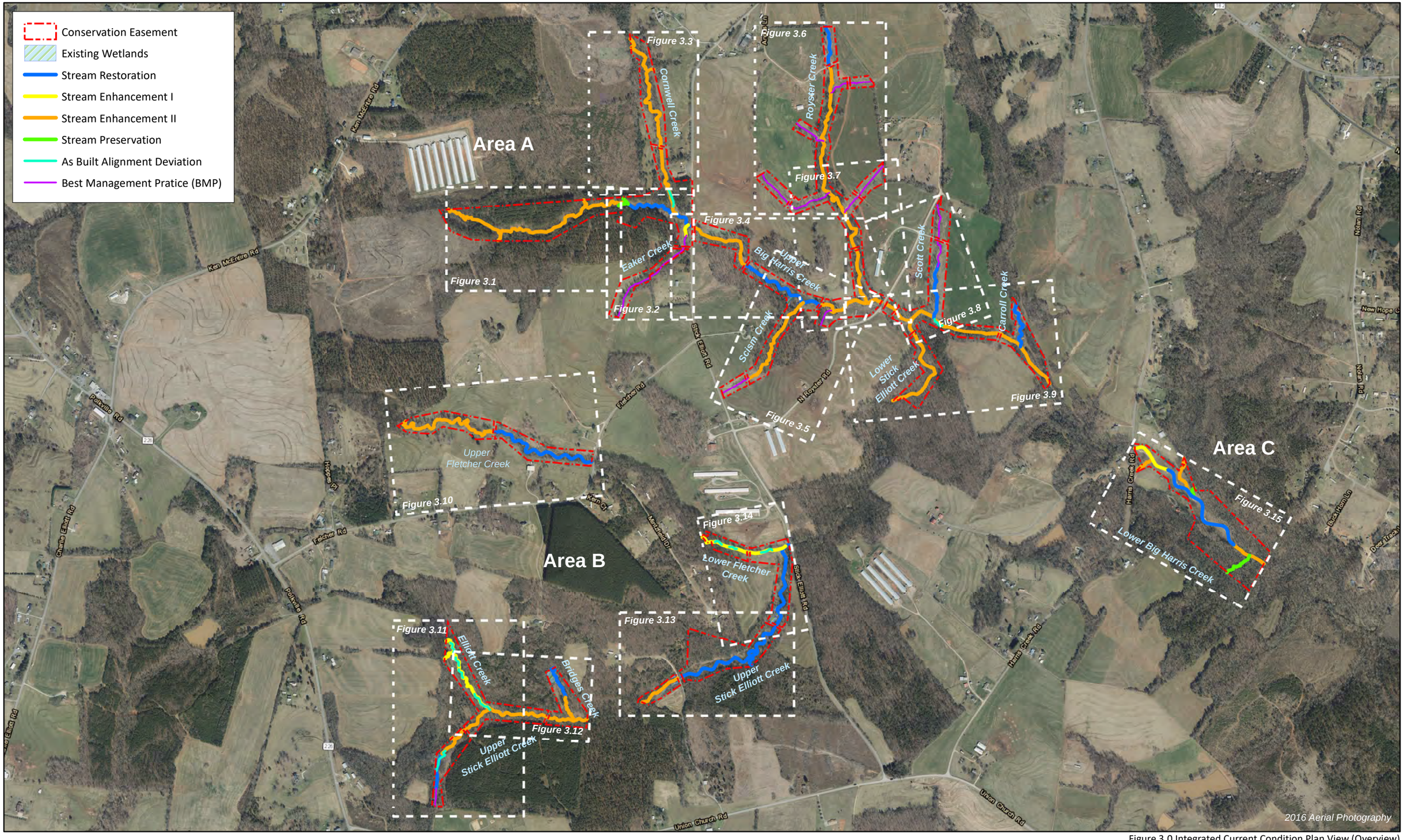
Table 5e. Monitoring Component Summary
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area C - Restoration, Enhancement I, and II Reaches

Parameter	Monitoring Feature	Quantity / Length by Reach				Frequency	Notes
		LBHC Reach 1a	LBHC Reaches 1b & 2	LBHC UT1	LBHC UT2		
Dimension	Riffle Cross-Section	1	1	N/A	N/A	Annual	
	Pool Cross-Section	1	1	N/A	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	Annual	1
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	Annual	
Substrate	Reach Wide (RW) / Riffle (RF) 100 Pebble Count	1 RW, 1 RF	1 RW, 1 RF	N/A	N/A	Annual	
Hydrology	Crest Gage/Transducer	1	1	N/A	N/A	Quarterly	2
Vegetation	CVS Level 2	4				Annual	3
Water Quality	4 baseflow, 4 stormflow grab samples	up to 10 locations throughout project areas A, B, & C and 1 reference location				Years 3, 4, and 5	
Benthic Macroinvertebrates	NCDWR Qual 4					Years 3, 4, and 5	
Fisheries	NCDWR SOP					Year 5	
Exotic and Nuisance Vegetation						Semi-Annual	4
Project Boundary						Semi-Annual	5
Reference Photos	Photographs	12				Annual	6

Notes:
1. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile will be collected during as-built baseline monitoring survey only, unless observations indicate a lack of stability and a profile survey is warranted in additional years.
2. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers will be set to record stage once every hour. Device will be inspected and downloaded semi-annually.
3. The total number of vegetation monitoring plots represents 2% of the open planted area. This is a reduction from the number of vegetation plots proposed in the Mitigation Plan, which was based on 2% of the entire conservation easement. IRT and DMS approved this change in January 2018.
4. Locations of exotic and nuisance vegetation will be mapped.
5. Locations of vegetation damage, boundary encroachments, etc. will be mapped.
6. Photographs will be taken along preservation reaches not noted above (2 photographs total).

APPENDIX 2. Visual Assessment Data

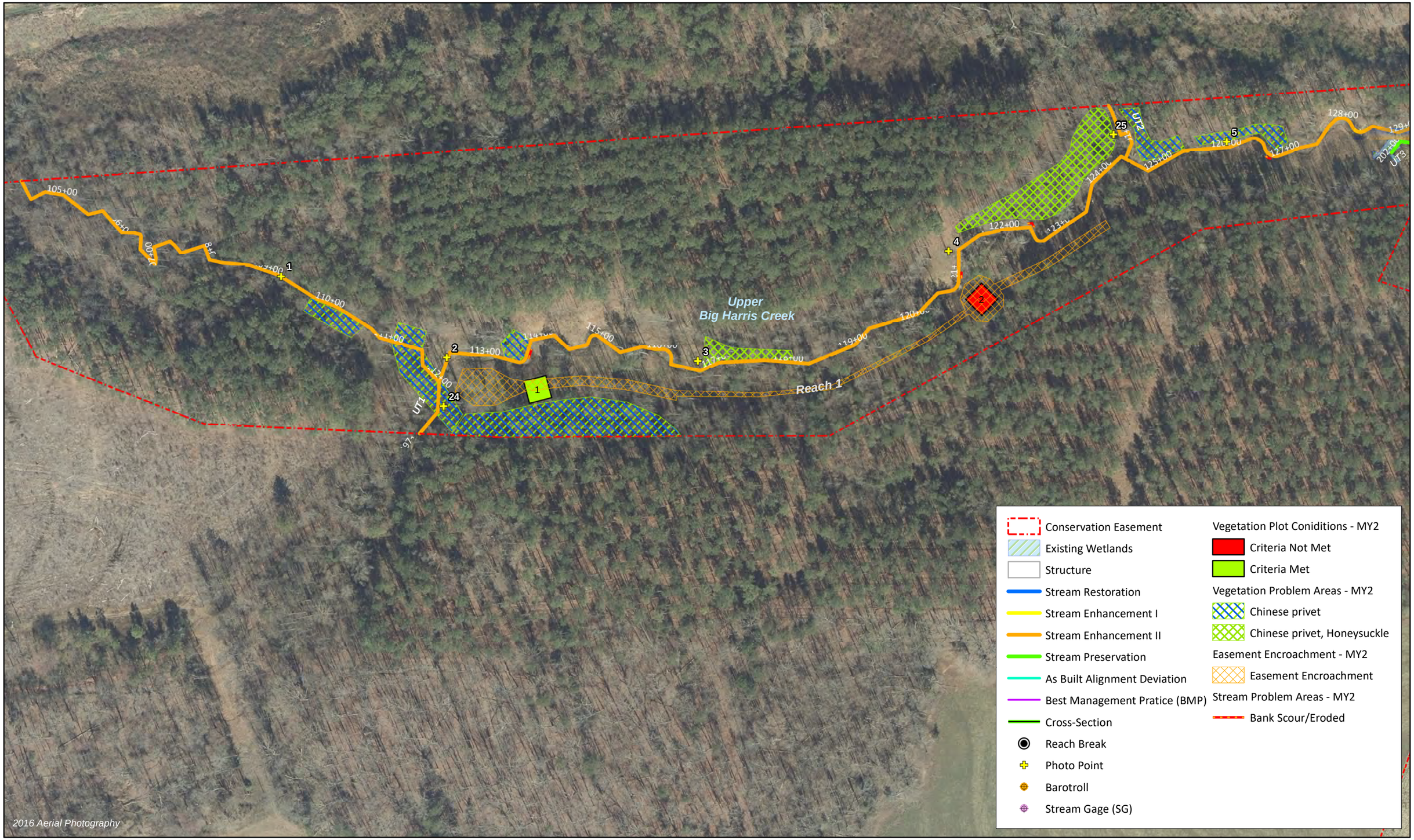


0 500 1,000 Feet

N

WILDLANDS ENGINEERING

Figure 3.0 Integrated Current Condition Plan View (Overview)
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC

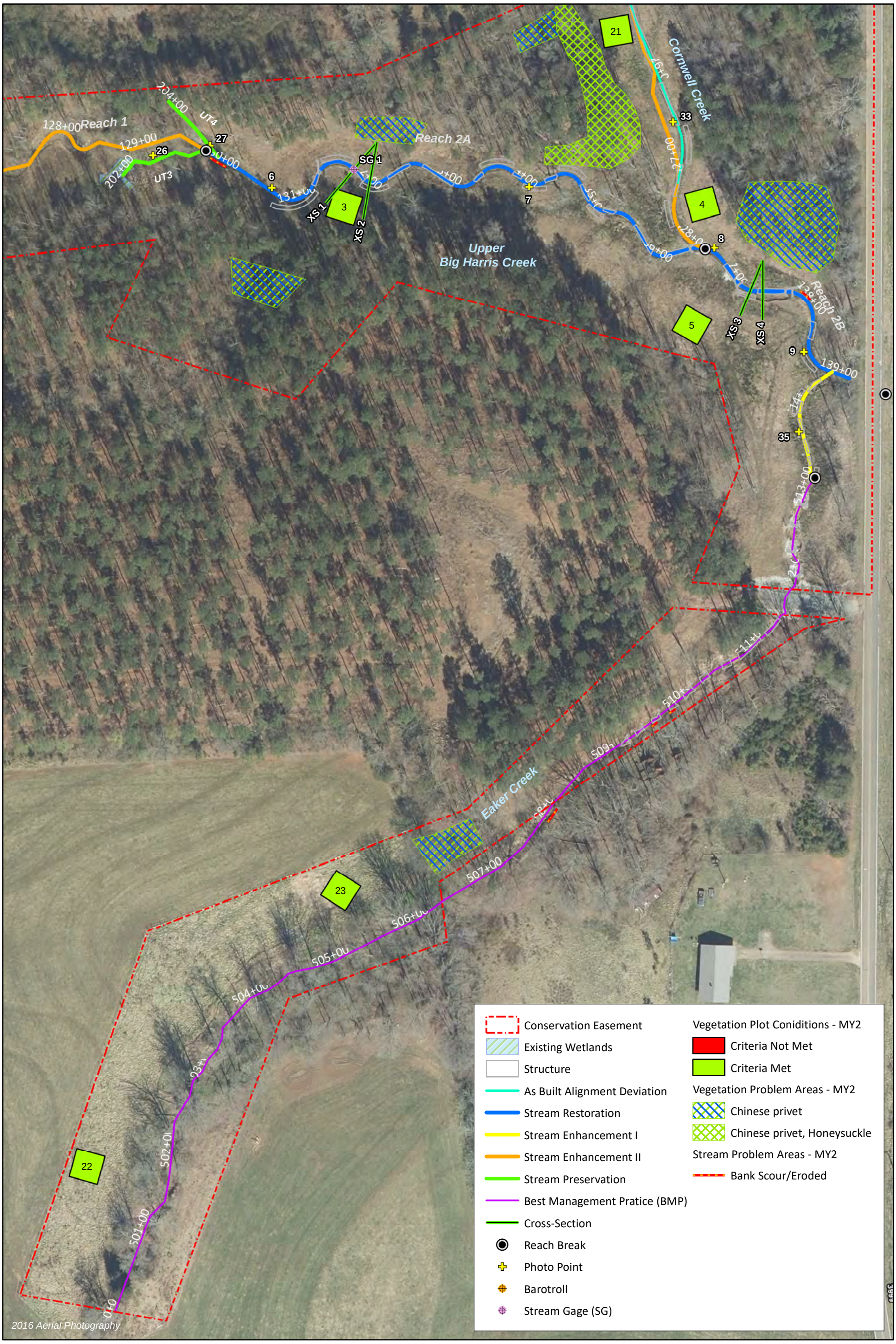


WILDLANDS ENGINEERING

0 125 250 Feet

N

Figure 3.1 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC



WILDLANDS ENGINEERING

Figure 3.2 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

Cleveland County, NC

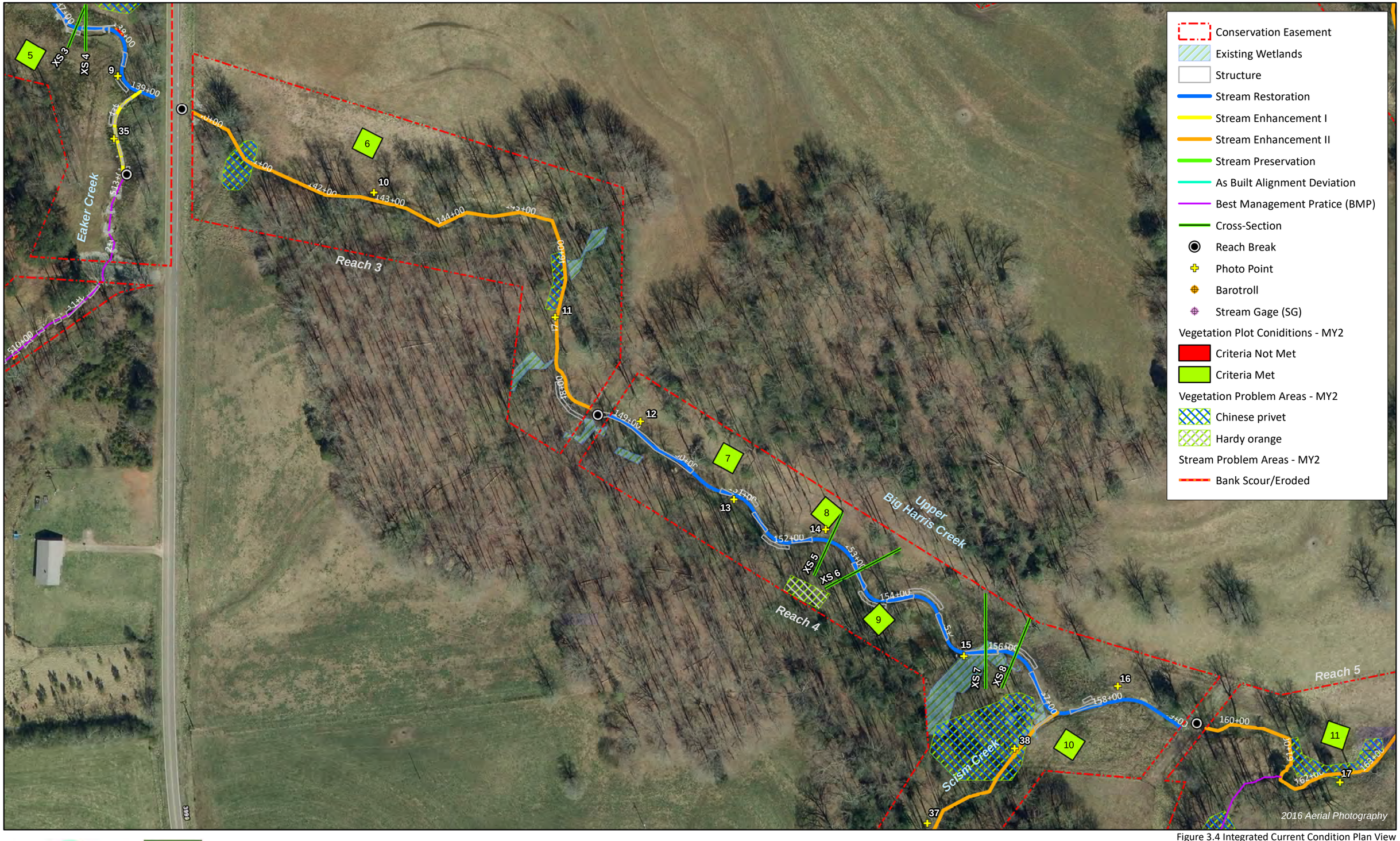
WILDLANDS ENGINEERING

0 125 250 Feet

N

Figure 3.3 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

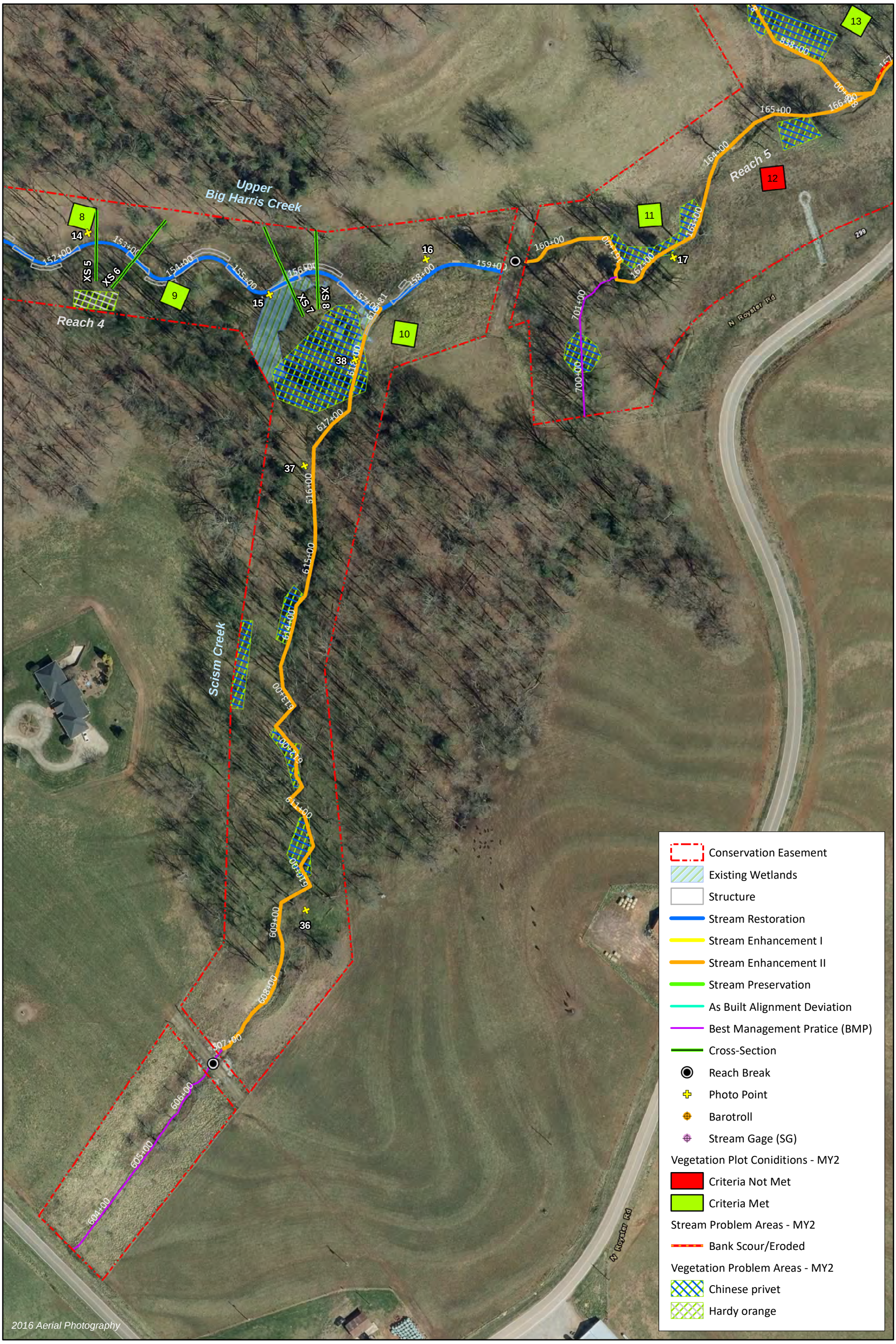
Cleveland County, NC



WILDLANDS ENGINEERING

0 125 250 Feet

Figure 3.4 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC



WILDLANDS ENGINEERING

0 125 250 Feet

Figure 3.5 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site -- Area A
DMS Project No. 739
Monitoring Year 2 - 2019

Cleveland County, NC

Conservation Easement
Existing Wetlands
Structure
Stream Restoration
Stream Enhancement I
Stream Enhancement II
Stream Preservation
As Built Alignment Deviation
Best Management Pratice (BMP)
Cross-Section
Reach Break
Photo Point
Barotroll
Stream Gage (SG)

Vegetation Plot Coniditions - MY2
Criteria Not Met
Criteria Met

Vegetation Problem Areas - MY2
Chinese privet
Tree of Heaven

Stream Problem Areas - MY2
Aggradation
Bank Scour/Eroded
Failed Structure

24
39
SG 2
XS 9
40
XS 10
Reach 1
25
41
42
BMP2
26
43
BMP3
27
Reach 2
44
Royster Creek
45
BMP4
28
BMP5
29

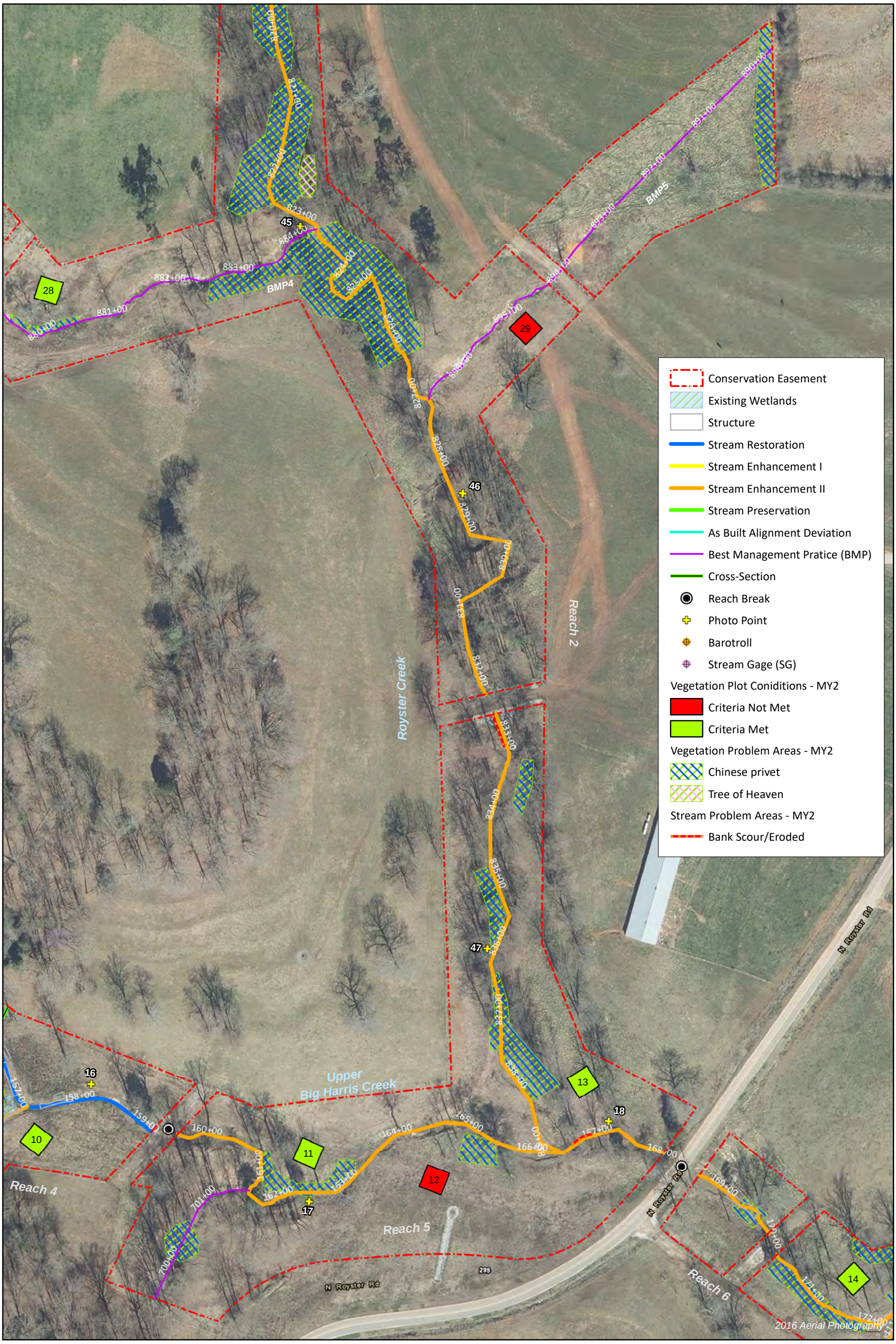
2016 Aerial Photography

WILDLANDS ENGINEERING

0 150 300 Feet

Figure 3.6 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

Cleveland County, NC

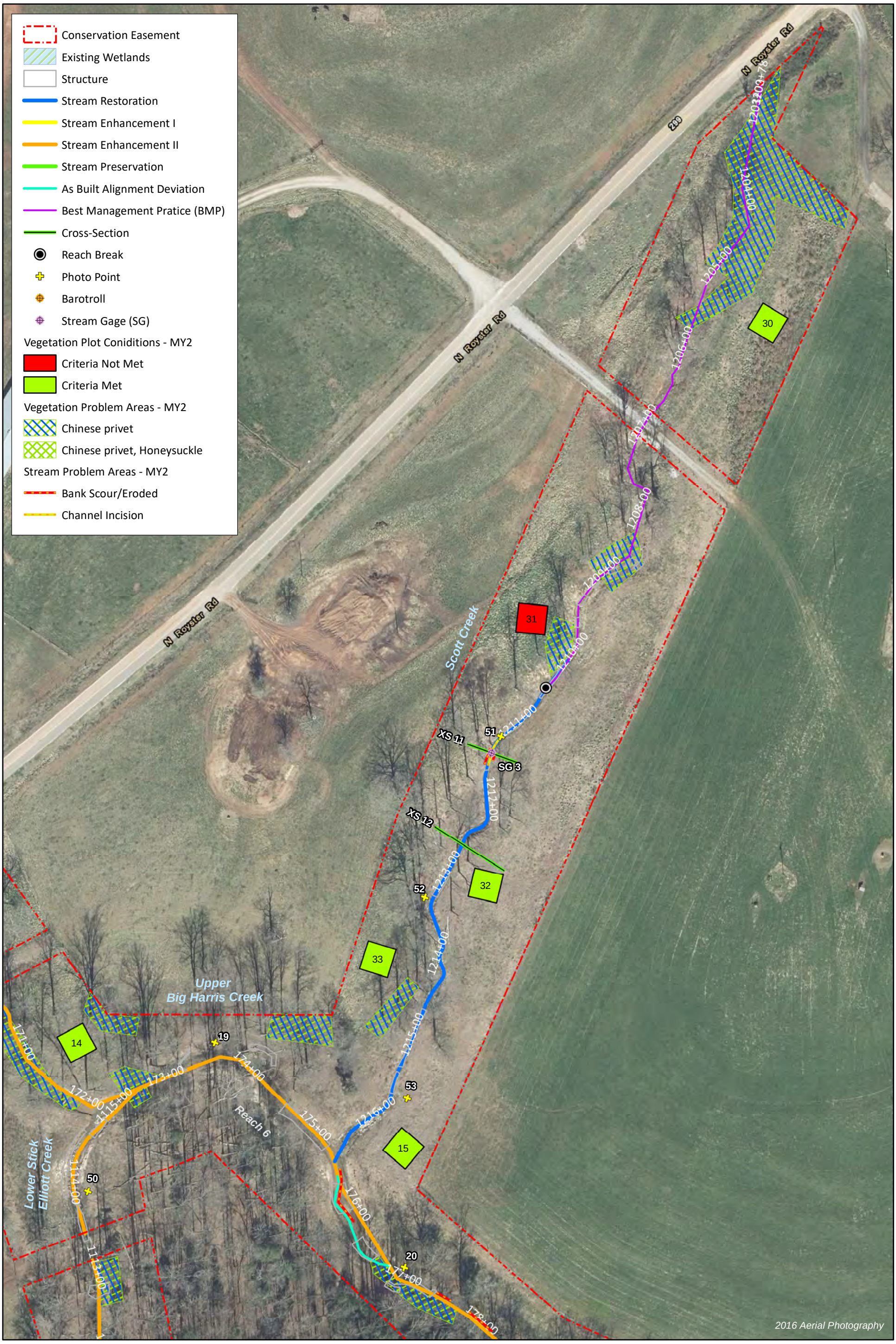


WILDLANDS ENGINEERING

0 125 250 Feet

Figure 3.7 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

Cleveland County, NC

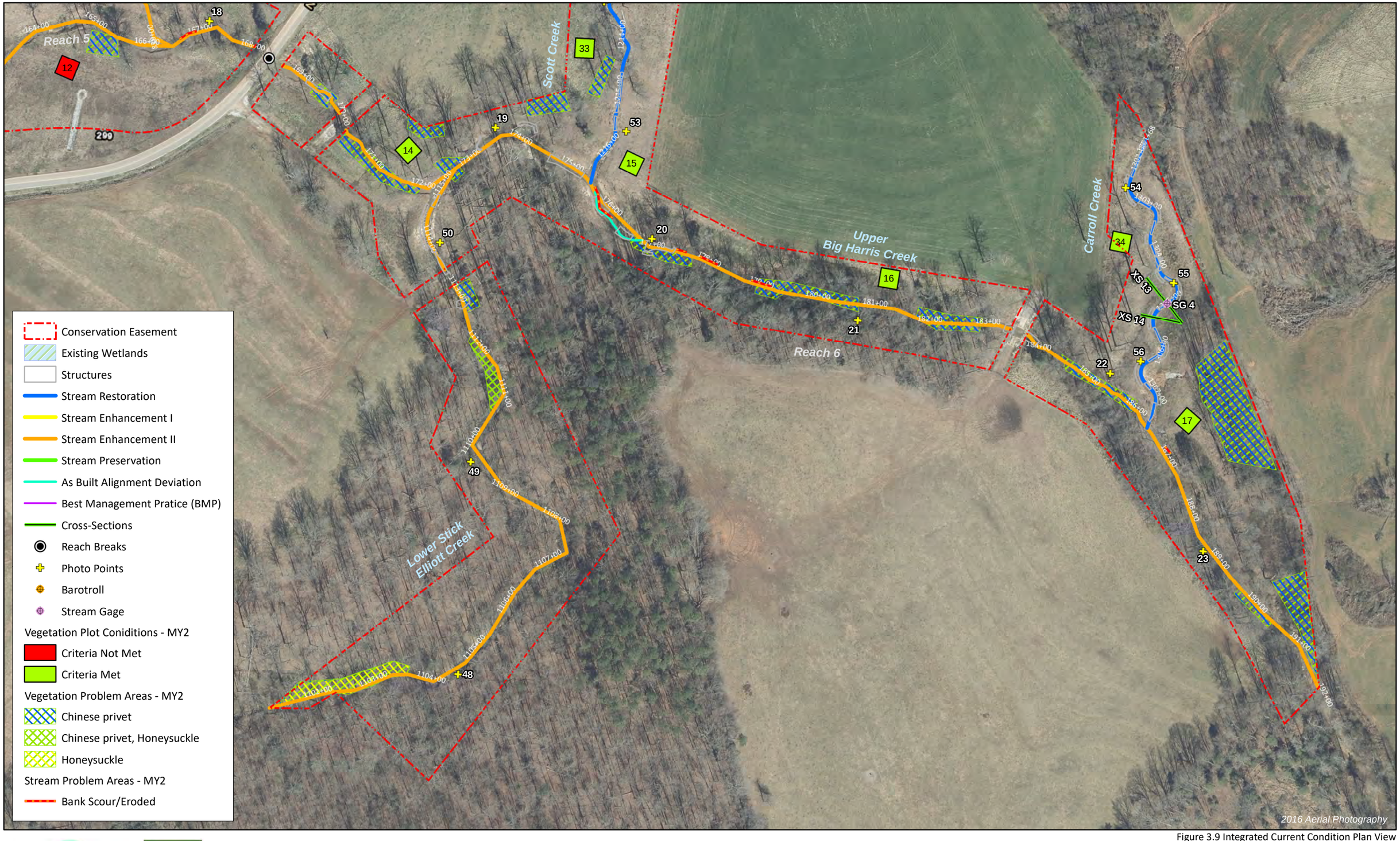


WILDLANDS ENGINEERING

0 100 200 Feet

Figure 3.8 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

Cleveland County, NC

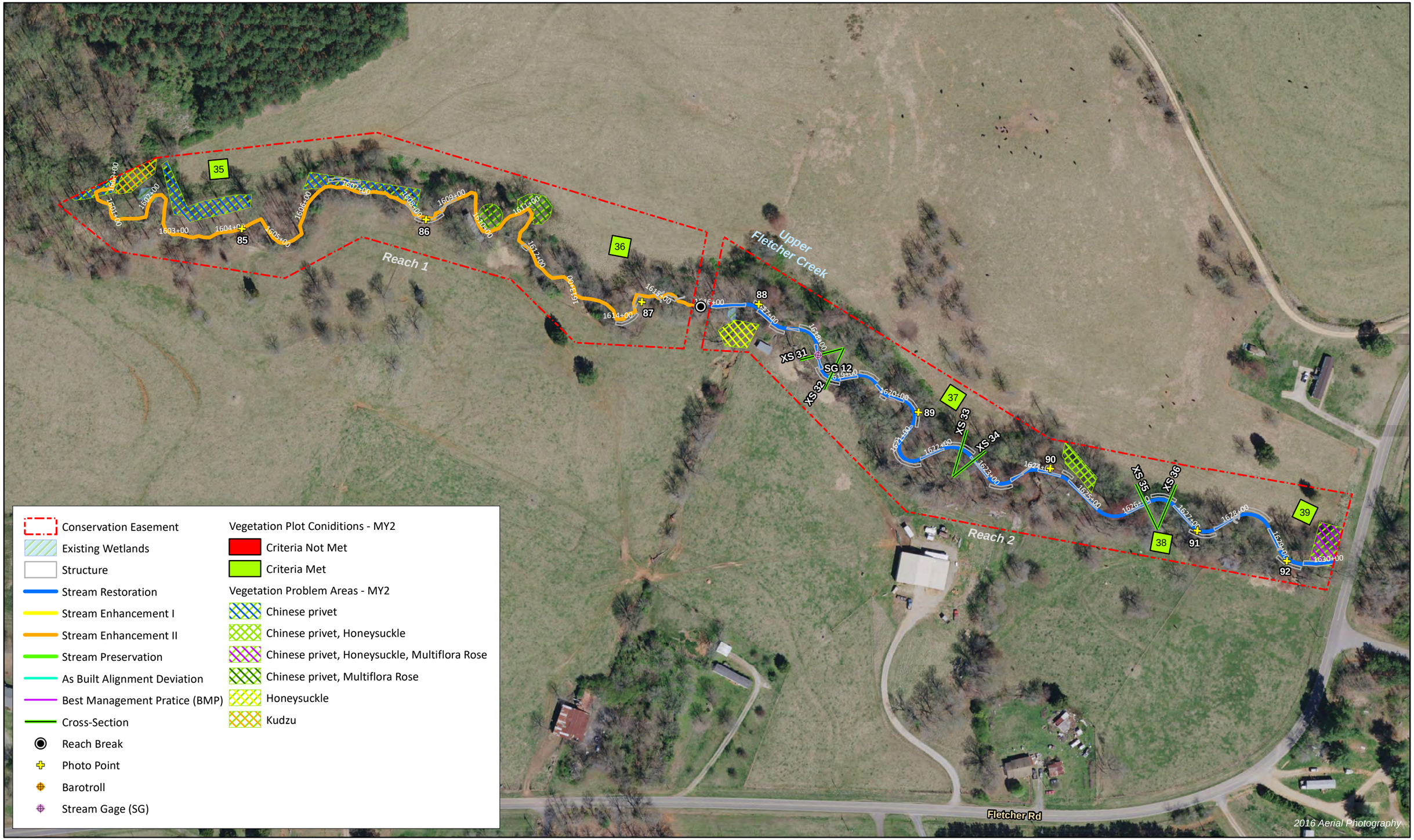


WILDLANDS ENGINEERING

0 150 300 Feet

N

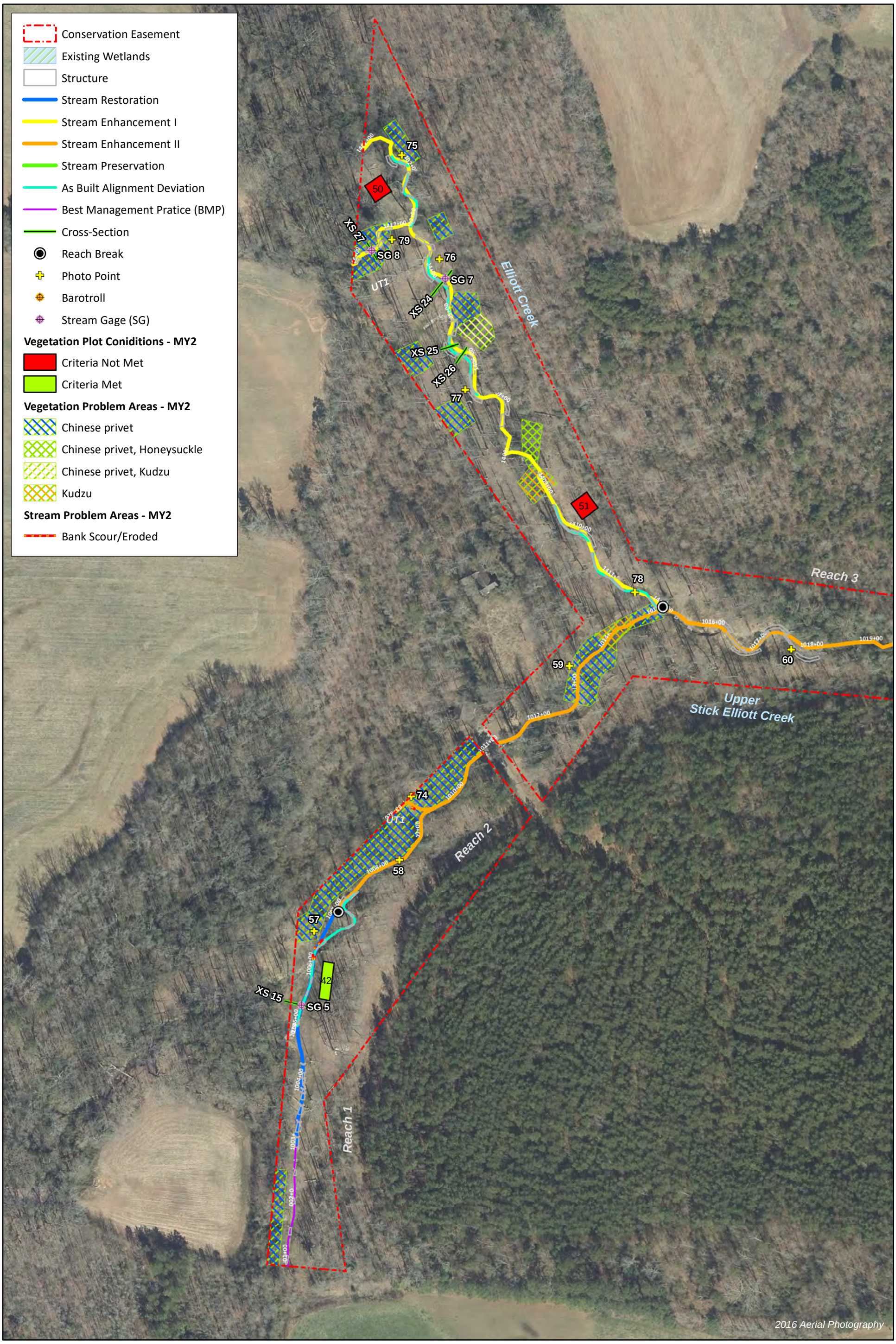
Figure 3.9 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC



WILDLANDS ENGINEERING

0 150 300 Feet

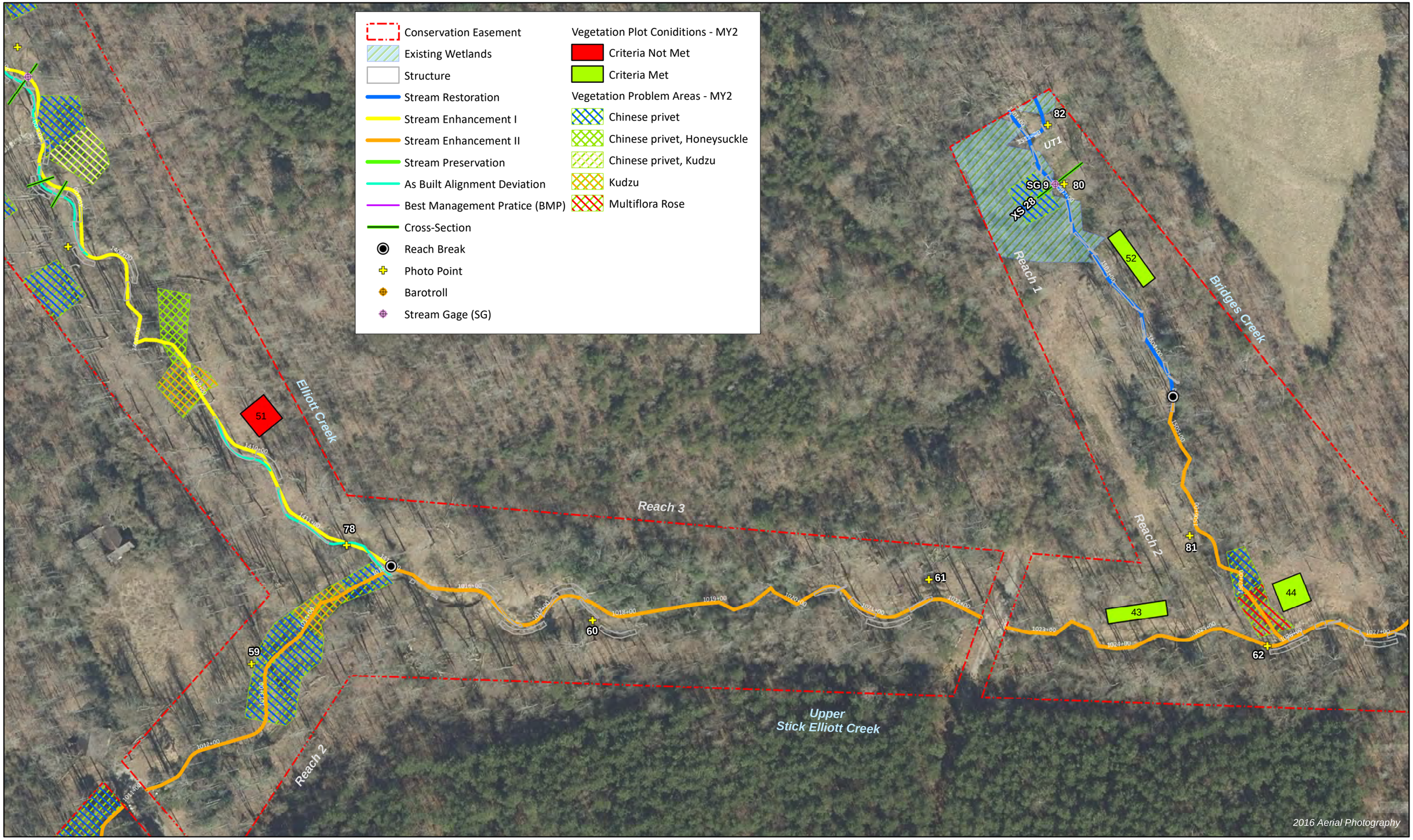
Figure 3.10 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC



WILDLANDS ENGINEERING

0 150 300 Feet

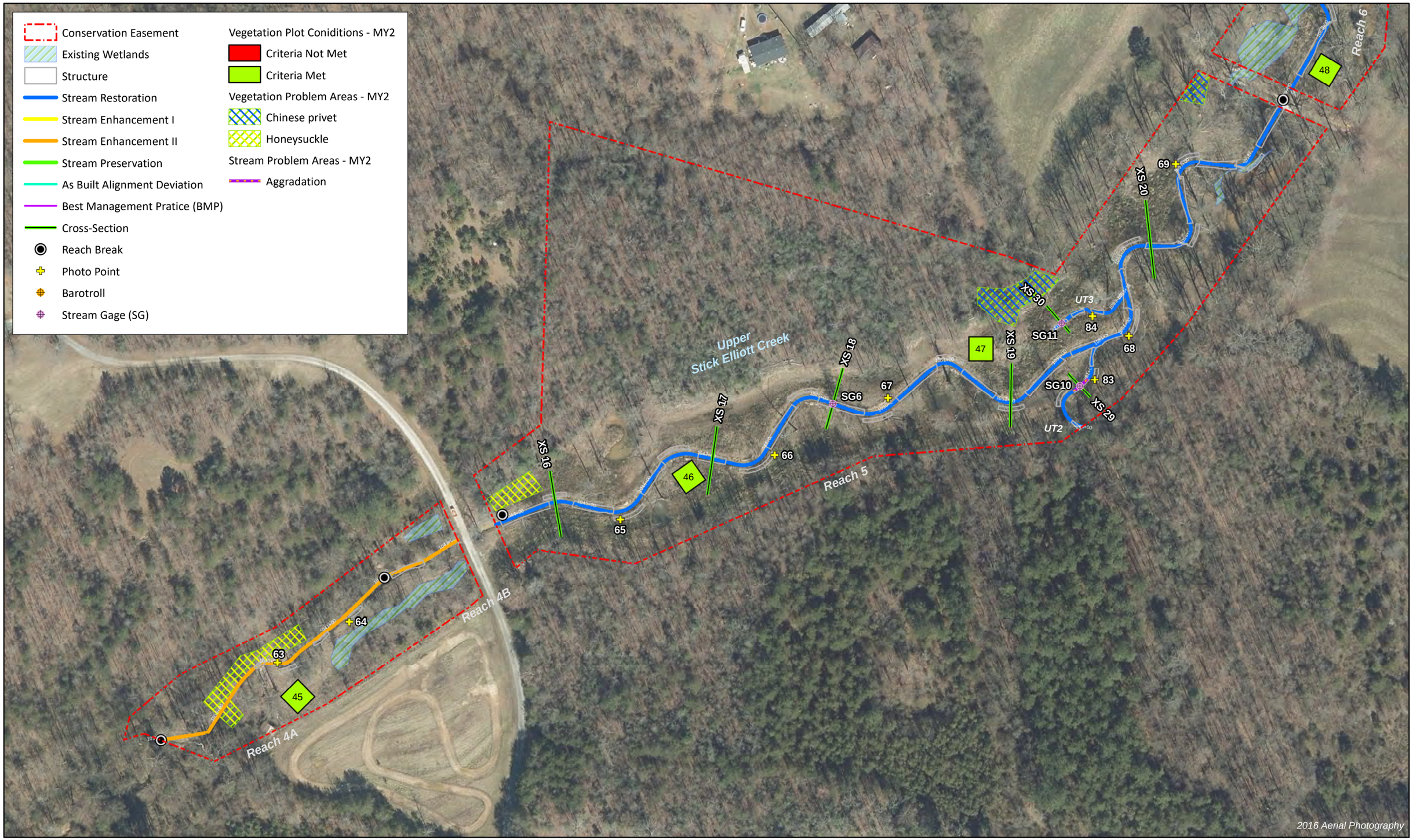
Figure 3.11 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

Figure 3.12 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC

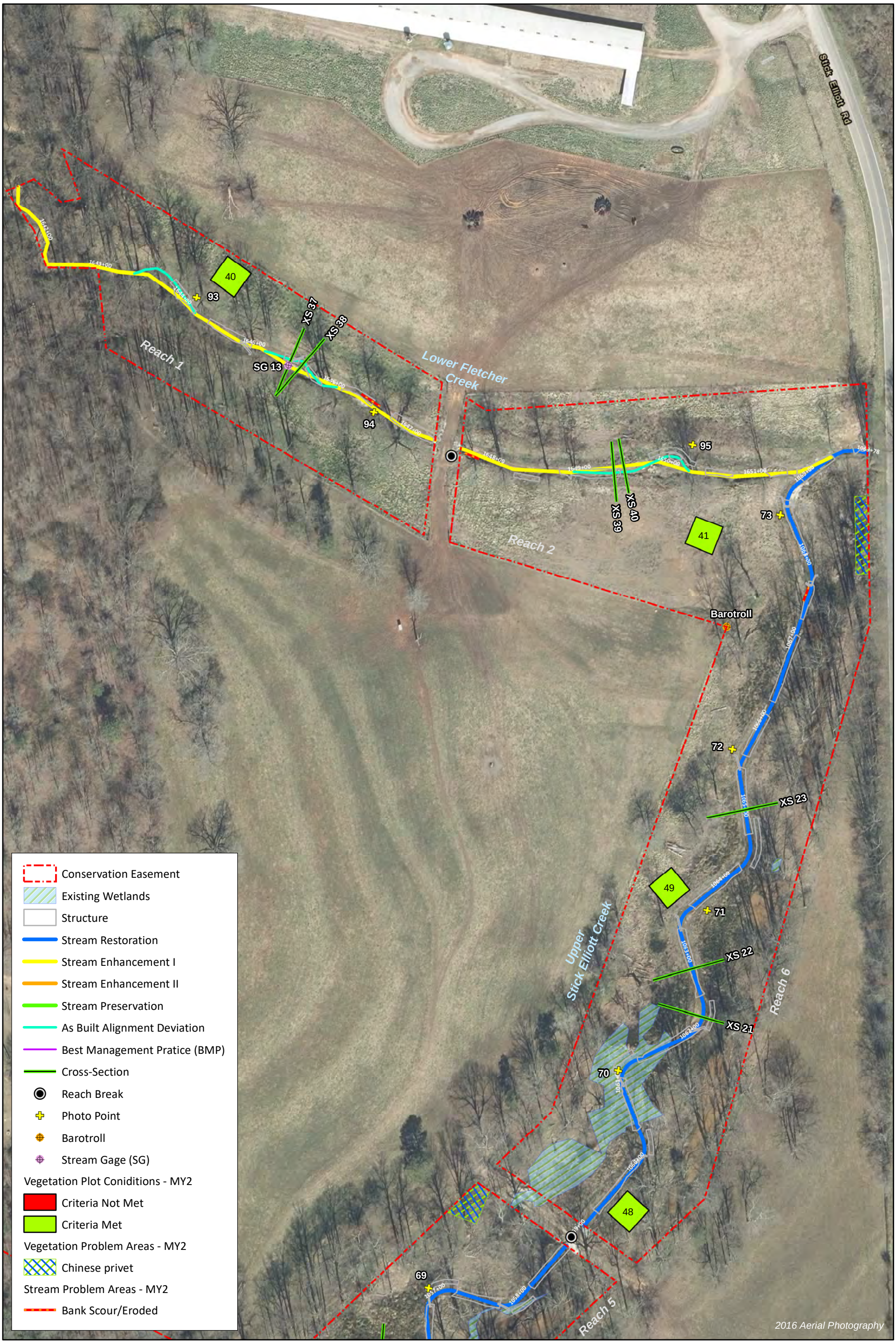


WILDLANDS ENGINEERING

0 125 250 Feet

N

Figure 3.13 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC

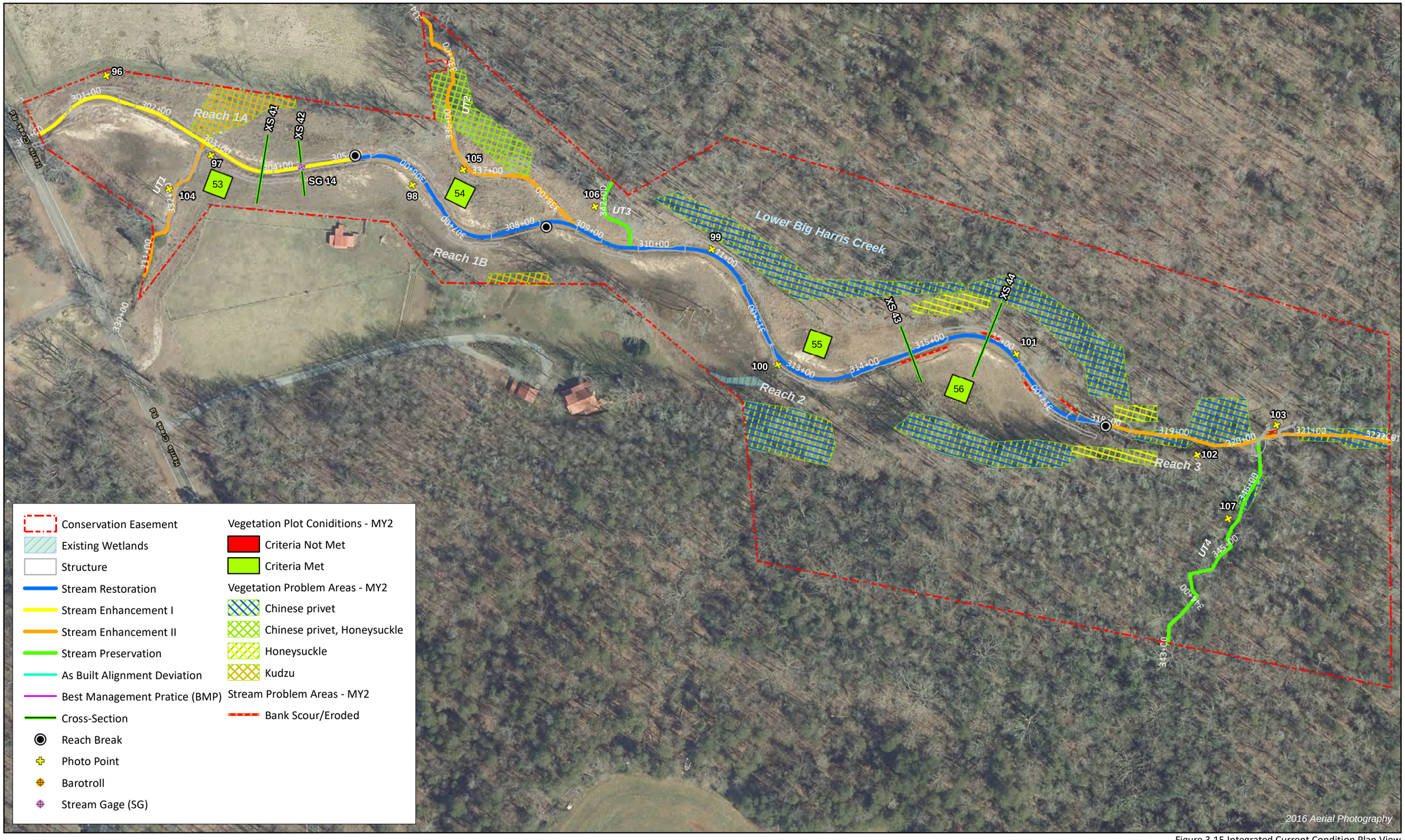


WILDLANDS ENGINEERING

0 100 200 Feet

Figure 3.14 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

Cleveland County, NC



WILDLANDS ENGINEERING

0 125 250 Feet

Figure 3.15 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area C
DMS Project No. 739
Monitoring Year 2 - 2019
Cleveland County, NC

Table 6a. Visual Stream Morphology Stability Assessment Table

Big Harris Creek Stream Mitigation Site

DMS Project No. 95739

Monitoring Year 2 - 2019

Area A- Eaker Creek - 134 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	1	1			100%			
	3. Meander Pool Condition	Depth Sufficient	1	1			100%			
		Length Appropriate	1	1			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	1	1			100%			
		Thalweg centering at downstream of meander bend (Glide)	1	1			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	n/a	n/a			n/a			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	n/a	n/a			n/a			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	n/a	n/a			n/a			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

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

Table 6b. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area A- Royster Creek R1 - 459 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			1	43	91%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	9	9			100%			
	3. Meander Pool Condition	Depth Sufficient	7	7			100%			
		Length Appropriate	7	7			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	7	7			100%			
		Thalweg centering at downstream of meander bend (Glide)	7	7			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	13	14			93%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	11	12			92%			
	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%.	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	12	12			100%			

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

Table 6c. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95 739
Monitoring Year 2 - 2019

Area A- Scott Creek - 662 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			1	38	94%			
	2. Riffle Condition	Texture/Substrate	9	10			90%			
	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%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			2	29	98%	0	0	98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	2	29	98%	0	0	98%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	19	19			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	19	19			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	19	19			100%			

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

Table 6d. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95 739
Monitoring Year 2 - 2019

Area A- Carroll Creek - 595 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	9	9			100%			
		Length Appropriate	9	9			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	9	9			100%			
		Thalweg centering at downstream of meander bend (Glide)	9	9			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	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%			

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

Table 6e. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95 739
Monitoring Year 2 - 2019

Area A- UBHC R2 - 934 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	16	17			94%			
	3. Meander Pool Condition	Depth Sufficient	15	15			100%			
		Length Appropriate	15	15			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	15	15			100%			
		Thalweg centering at downstream of meander bend (Glide)	15	15			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			2	36	98%	0	0	98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	2	36	98%	0	0	98%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	7	7			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	7	7			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	7			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	7	7			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	9	9			100%			

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

Table 6f. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95 739
Monitoring Year 2 - 2019

Area A- UBHC R4 - 1,039 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	10	10			100%			
		Length Appropriate	10	10			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%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	n/a	n/a			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%			

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

Table 6g. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- Elliot Creek - 1,121 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	19	19			100%			
	3. Meander Pool Condition	Depth Sufficient	17	17			100%			
		Length Appropriate	17	17			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	17	17			100%			
		Thalweg centering at downstream of meander bend (Glide)	17	17			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	4	4			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	4			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	4			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	11	11			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	11	11			100%			

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

Table 6h. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- UT1 to Elliot Creek - 141 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	4	4			100%			
		Length Appropriate	4	4			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	4	4			100%			
		Thalweg centering at downstream of meander bend (Glide)	4	4			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	n/a	n/a			n/a			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

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

Table 6i. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- Bridges Creek R1 - 376 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	10	10			100%			
		Length Appropriate	10	10			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%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	7	7			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	7			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	7	7			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	7	7			100%			

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

Table 6j. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- UT1 to Bridges Creek - 55 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	2	2			100%			
	3. Meander Pool Condition	Depth Sufficient	1	1			100%			
		Length Appropriate	1	1			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	1	1			100%			
		Thalweg centering at downstream of meander bend (Glide)	1	1			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

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

Table 6k. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- USEC R1 - 409 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	15	15			100%			
	3. Meander Pool Condition	Depth Sufficient	2	2			100%			
		Length Appropriate	2	2			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	2	2			100%			
		Thalweg centering at downstream of meander bend (Glide)	2	2			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			4	34	96%	0	0	96%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	4	34	96%	0	0	96%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	n/a	n/a			n/a			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

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

Table 6l. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- USEC R5 - 1,507 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	15	15			100%			
	3. Meander Pool Condition	Depth Sufficient	13	13			100%			
		Length Appropriate	13	13			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		Thalweg centering at downstream of meander bend (Glide)	13	13			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	19	19			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%.	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	3	3			100%			

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

Table 6m. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- USEC R6 - 1,069 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			1	20	98%			
	2. Riffle Condition	Texture/Substrate	12	12			100%			
	3. Meander Pool Condition	Depth Sufficient	9	9			100%			
		Length Appropriate	9	9			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	9	9			100%			
		Thalweg centering at downstream of meander bend (Glide)	9	9			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	18	99%	0	0	98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	1	18	98%	0	0	98%
3. Engineered Structures[1]	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	2	2			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%.	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	7	7			100%			

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

Table 6n. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- UT2 to USEC - 154 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			1	27	82%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	3	3			100%			
	3. Meander Pool Condition	Depth Sufficient	2	2			100%			
		Length Appropriate	2	2			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	2	2			100%			
		Thalweg centering at downstream of meander bend (Glide)	2	2			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	n/a	n/a			n/a			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	n/a	n/a			n/a			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	n/a	n/a			n/a			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

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

Table 6o. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- UT3 to USEC - 118 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	4	4			100%			
	3. Meander Pool Condition	Depth Sufficient	2	2			100%			
		Length Appropriate	2	2			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	2	2			100%			
		Thalweg centering at downstream of meander bend (Glide)	2	2			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	n/a	n/a			n/a			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	n/a	n/a			n/a			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	n/a	n/a			n/a			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

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

Table 6p. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- UFC R2 - 1,407 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	18	18			100%			
	3. Meander Pool Condition	Depth Sufficient	16	16			100%			
		Length Appropriate	16	16			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	16	16			100%			
		Thalweg centering at downstream of meander bend (Glide)	16	16			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	99%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	2	2			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	19	19			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%		0	

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

Table 6q. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- LFC R1 - 574 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	6	6			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%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	25	98%	0	0	98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	1	25	98%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	5	5			100%			

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

Table 6r. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area B- LFC R2 - 427 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	3	3			100%			
	3. Meander Pool Condition	Depth Sufficient	2	2			100%			
		Length Appropriate	2	2			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	2	2			100%			
		Thalweg centering at downstream of meander bend (Glide)	2	2			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	17	98%	0	0	98%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	1	17	98%	0	0	98%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	n/a	n/a			n/a			

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

Table 6s. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area C- LBHC R1A - 500 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	4	4			100%			
	3. Meander Pool Condition	Depth Sufficient	4	4			100%			
		Length Appropriate	4	4			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	4	4			100%			
		Thalweg centering at downstream of meander bend (Glide)	4	4			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	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%			

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

Table 6t. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area C- LBHC R1B - 320 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	3	3			100%			
	3. Meander Pool Condition	Depth Sufficient	2	2			100%			
		Length Appropriate	2	2			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	2	2			100%			
		Thalweg centering at downstream of meander bend (Glide)	2	2			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	n/a	n/a			n/a			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	2			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

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

Table 6u. Visual Stream Morphology Stability Assessment Table
Big Harris Creek Stream Mitigation Site
DMS Project No. 95739
Monitoring Year 2 - 2019

Area C- LBHC R2 - 967 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	6	6			100%			
	3. Meander Pool Condition	Depth Sufficient	6	6			100%			
		Length Appropriate	6	6			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	6	6			100%			
		Thalweg centering at downstream of meander bend (Glide)	6	6			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			4	159	92%	0	0	92%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	4	159	92%	0	0	92%
3. Engineered Structures[1]	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	1	1			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%.	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			100%			

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

Table 7. Vegetation Condition Assessment Table

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

Planted Acreage **61.5**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	0	0.0	0%
Low Stem Density Areas[1]	Woody stem densities clearly below target levels based on MY3, 4, 5, or 7 stem count criteria.	0.1	7	0.2	0%
		Total	**7**	**0.2**	**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	0	0.0	0%
		Cumulative Total	**7**	**0.2**	**0%**

Easement Acreage **144.7**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	111	12.0	8%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	1	0.3	0%

[1]Acreage calculated from vegetation plots monitored for site.

STREAM PHOTOGRAPHS

Big Harris Creek - Area A
Monitoring Year 2

	
UBHC R1 Photo Point 1 – view upstream *(5/13/2019)*	**UBHC R1 Photo Point 1** – view downstream *(5/13/2019)*
	
UBHC R1 Photo Point 2 – view upstream *(5/13/2019)*	**UBHC R1 Photo Point 2** – view downstream *(5/13/2019)*
	
UBHC R1 Photo Point 3 – view upstream *(5/13/2019)*	**UBHC R1 Photo Point 3** – view downstream *(5/13/2019)*

	
UBHC R1 Photo Point 4 – view upstream *(5/13/2019)*	**UBHC R1 Photo Point 4** – view downstream *(5/13/2019)*
	
UBHC R1 Photo Point 5 – view upstream *(5/13/2019)*	**UBHC R1 Photo Point 5** – view downstream *(5/13/2019)*
	
UBHC R2A Photo Point 6 – view upstream *(5/13/2019)*	**UBHC R2A Photo Point 6** – view downstream *(5/13/2019)*

UBHC R2A Photo Point 7 – view upstream *(5/13/2019)*

UBHC R2A Photo Point 7 – view downstream *(5/13/2019)*

UBHC R2B Photo Point 8 – view upstream *(5/13/2019)*

UBHC R2B Photo Point 8 – view downstream *(5/13/2019)*

UBHC R2B Photo Point 9 – view upstream *(5/13/2019)*

UBHC R2B Photo Point 9 – view downstream *(5/13/2019)*

	
UBHC R3 Photo Point 10 – view upstream *(5/8/2019)*	**UBHC R3 Photo Point 10** – view downstream *(5/8/2019)*
	
UBHC R3 Photo Point 11 – view upstream *(5/8/2019)*	**UBHC R3 Photo Point 11** – view downstream *(5/8/2019)*
	
UBHC R4 Photo Point 12 – view upstream *(5/8/2019)*	**UBHC R4 Photo Point 12** – view downstream *(5/8/2019)*

UBHC R4 Photo Point 13 – view upstream *(5/8/2019)*

UBHC R4 Photo Point 13 – view downstream *(5/8/2019)*

UBHC R4 Photo Point 14 – view upstream *(5/8/2019)*

UBHC R4 Photo Point 14 – view downstream *(5/8/2019)*

UBHC R4 Photo Point 15 – view upstream *(5/8/2019)*

UBHC R4 Photo Point 15 – view downstream *(5/8/2019)*

UBHC R4 Photo Point 16 – view upstream (*5/8/2019)*

UBHC R4 Photo Point 16 – view downstream *(5/8/2019)*

UBHC R5 Photo Point 17 – view upstream *(5/8/2019)*

UBHC R5 Photo Point 17 – view downstream *(5/8/2019)*

UBHC R5 Photo Point 18 – view upstream *(05/08/2019)*

UBHC R5 Photo Point 18 – view downstream *(05/08/2019)*

	
UBHC R6 Photo Point 19 – view upstream *(5/8/2019)*	**UBHC R6 Photo Point 19** – view downstream *(5/8/2019)*
	
UBHC R6 Photo Point 20 – view upstream *(05/08/2019)*	**UBHC R6 Photo Point 20** – view downstream *(05/08/2019)*
	
UBHC R6 Photo Point 21 – view upstream *(05/08/2019)*	**UBHC R6 Photo Point 21** – view downstream *(05/08/2019)*

UBHC R6 Photo Point 22 – view upstream *(05/08/2019)*

UBHC R6 Photo Point 22 – view downstream *(05/08/2019)*

UBHC R6 Photo Point 23 – view upstream *(05/08/2019)*

UBHC R6 Photo Point 23 – view downstream *(05/08/2019)*

UBHC UT1 Photo Point 24 – view upstream *(5/13/2019)*

UBHC UT1 Photo Point 24 – view downstream *(5/13/2019)*

	
UBHC UT2 Photo Point 25 – view upstream *(5/13/2019)*	**UBHC UT2 Photo Point 25** – view downstream *(5/13/2019)*
	
UBHC UT3 Photo Point 26 – view upstream *(5/13/2019)*	**UBHC UT3 Photo Point 26** – view downstream *(5/13/2019)*
	
UBHC UT4 Photo Point 27 – view upstream *(5/13/2019)*	**UBHC UT4 Photo Point 27** – view downstream *(5/13/2019)*

Cornwell Creek Photo Point 28 – view upstream *(5/13/2019)*

Cornwell Creek Photo Point 28 – view downstream *(5/13/2019)*

Cornwell Creek Photo Point 29 – view upstream *(5/13/2019)*

Cornwell Creek Photo Point 29 – view downstream *(5/13/2019)*

Cornwell Creek Photo Point 30 – view upstream *(5/13/2019)*

Cornwell Creek Photo Point 30 – view downstream *(5/13/2019)*

Cornwell Creek Photo Point 31 – view upstream *(5/13/2019)*

Cornwell Creek Photo Point 31 – view downstream *(5/13/2019)*

Cornwell Creek Photo Point 32 – view upstream *(5/13/2019)*

Cornwell Creek Photo Point 32 – view downstream *(5/13/2019)*

Cornwell Creek Photo Point 33 – view upstream *(5/13/2019)*

Cornwell Creek Photo Point 33 – view downstream *(5/13/2019)*

Cornwell Creek UT1 Photo Point 34 – view upstream *(5/13/2019)*

Cornwell Creek UT1 Photo Point 34 – view downstream*(5/13/2019)*

Eaker Creek Photo Point 35 – view upstream *(5/13/2019)*

Eaker Creek Photo Point 35 – view downstream *(5/13/2019)*

Scism Creek Photo Point 36 – view upstream *(5/8/2019)*

Scism Creek Photo Point 36 – view downstream *(5/8/2019)*

Scism Creek Photo Point 37 – view upstream *(5/8/2019)*

Scism Creek Photo Point 37 – view downstream *(5/8/2019)*

Scism Creek Photo Point 38 – view upstream *(5/8/2019)*

Scism Creek Photo Point 38 – view downstream *(5/8/2019)*

Royster Creek Photo Point 39 – view upstream *(05/08/2019)*

Royster Creek Photo Point 39 – view downstream *(05/08/2019)*

Royster Creek Photo Point 40 – view upstream *(05/08/2019)*

Royster Creek Photo Point 40 – view downstream *(05/08/2019)*

Royster Creek Photo Point 41 – view upstream *(05/08/2019)*

Royster Creek Photo Point 41 – view downstream *(05/08/2019)*

Royster Creek Photo Point 42 – view upstream *(05/08/2019)*

Royster Creek Photo Point 42 – view downstream *(05/08/2019)*

Royster Creek Photo Point 43 – view upstream *(05/08/2019)*

Royster Creek Photo Point 43 – view downstream *(05/08/2019)*

Royster Creek Photo Point 44 – view upstream *(05/08/2019)*

Royster Creek Photo Point 44 – view downstream *(05/08/2019)*

Royster Creek Photo Point 45 – view upstream *(05/08/2019)*

Royster Creek Photo Point 45 – view downstream *(05/08/2019)*

	
Royster Creek Photo Point 46 – view upstream *(05/08/2019)*	**Royster Creek Photo Point 46** – view downstream *(05/08/2019)*
	
Royster Creek Photo Point 47 – view upstream *(05/08/2019)*	**Royster Creek Photo Point 47** – view downstream *(05/08/2019)*
	
LSEC Photo Point 48 – view upstream *(5/8/2019)*	**LSEC Photo Point 48** – view downstream *(5/8/2019)*

LSEC Photo Point 49 – view upstream *(5/8/2019)*

LSEC Photo Point 49 – view downstream *(5/8/2019)*

LSEC Photo Point 50 – view upstream *(5/8/2019)*

LSEC Photo Point 50 – view downstream *(5/8/2019)*

Scott Creek Photo Point 51 – view upstream *(5/8/2019)*

Scott Creek Photo Point 51 – view downstream *(5/8/2019)*

Scott Creek Photo Point 52 – view upstream *(5/8/2019)*

Scott Creek Photo Point 52 – view downstream *(5/8/2019)*

Scott Creek Photo Point 53 – view upstream *(5/8/2019)*

Scott Creek Photo Point 53 – view downstream *(5/8/2019)*

Carroll Creek Photo Point 54 – view upstream *(05/08/2019)*

Carroll Creek Photo Point 54 – view downstream *(05/08/2019)*

	
Carroll Creek Photo Point 55 – view upstream *(05/08/2019)*	**Carroll Creek Photo Point 55** – view downstream *(05/08/2019)*
	
Carroll Creek Photo Point 56 – view upstream *(05/08/2019)*	**Carroll Creek Photo Point 56** – view downstream *(05/08/2019)*

STREAM PHOTOGRAPHS

Big Harris Creek - Area B
Monitoring Year 2

	
USEC R1 Photo Point 57 – view upstream *(5/15/2019)*	**USEC R1 Photo Point 57** – view downstream *(5/15/2019)*
	
USEC R2 Photo Point 58 – view upstream *(5/15/2019)*	**USEC R2 Photo Point 58** – view downstream *(5/15/2019)*
	
USEC R2 Photo Point 59 – view upstream *(5/15/2019)*	**USEC R2 Photo Point 59** – view downstream *(5/15/2019)*

USEC R3 Photo Point 60 – view upstream *(5/15/2019)*

USEC R3 Photo Point 60 – view downstream *(5/15/2019)*

USEC R3 Photo Point 61 – view upstream *(5/15/2019)*

USEC R3 Photo Point 61 – view downstream *(5/15/2019)*

USEC R3 Photo Point 62 – view upstream *(5/15/2019)*

USEC R3 Photo Point 62 – view downstream *(5/15/2019)*

	
USEC R4A Photo Point 63 – view upstream *(05/08/2019)*	**USEC R4A Photo Point 63** – view downstream *(05/08/2019)*
	
USEC R4B Photo Point 64 – view upstream *(05/08/2019)*	**USEC R4B Photo Point 64** – view downstream *(05/08/2019)*
	
USEC R5 Photo Point 65 – view upstream *(05/08/2019)*	**USEC R5 Photo Point 65** – view downstream *(05/08/2019)*

USEC R5 Photo Point 66 – view upstream *(05/08/2019)*

USEC R5 Photo Point 66 – view downstream *(05/08/2019)*

USEC R5 Photo Point 67 – view upstream *(05/08/2019)*

USEC R5 Photo Point 67 – view downstream *(05/08/2019)*

USEC R5 Photo Point 68 – view upstream *(05/08/2019)*

USEC R5 Photo Point 68 – view downstream *(05/08/2019)*

USEC R5 Photo Point 69 – view upstream *(05/08/2019)*

USEC R5 Photo Point 69 – view downstream *(05/08/2019)*

USEC R6 Photo Point 70 – view upstream *(5/8/2019)*

USEC R6 Photo Point 70 – view downstream *(5/8/2019)*

USEC R6 Photo Point 71 – view upstream *(5/8/2019)*

USEC R6 Photo Point 71 – view downstream *(5/8/2019)*

	
USEC R6 Photo Point 72 – view upstream *(5/8/2019)*	**USEC R6 Photo Point 72** – view downstream *(5/8/2019)*
	
USEC R6 Photo Point 73 – view upstream *(5/8/2019)*	**USEC R6 Photo Point 73** – view downstream *(5/8/2019)*
	
USEC UT1 Photo Point 74 – view upstream *(5/15/2019)*	**USEC UT1 Photo Point 74** – view downstream *(5/15/2019)*

Elliott Creek Photo Point 75 – view upstream *(5/15/2019)*

Elliott Creek Photo Point 75 – view downstream *(5/15/2019)*

Elliott Creek Photo Point 76 – view upstream *(5/15/2019)*

Elliott Creek Photo Point 76 – view downstream *(5/15/2019)*

Elliott Creek Photo Point 77 – view upstream *(5/15/2019)*

Elliott Creek Photo Point 77 – view downstream *(5/15/2019)*

Elliott Creek Photo Point 78 – view upstream *(5/15/2019)*

Elliott Creek Photo Point 78 – view downstream *(5/15/2019)*

Elliott Creek UT1 Photo Point 79 – view upstream *(5/15/2019)*

Elliott Creek UT1 Photo Point 79 – view downstream *(5/15/2019)*

Bridges Creek R1 Photo Point 80 – view upstream *(5/15/2019)*

Bridges Creek R1 Photo Point 80 – view downstream *(5/15/2019)*

Bridges Creek R2 Photo Point 81 – view upstream *(5/15/2019)*

Bridges Crk R2 Photo Point 81 – view downstream *(5/15/2019)*

Bridges Creek UT1 Photo Point 82 – view upstream *(5/15/2019)*

Bridges Crk UT1 Photo Point 82 – view downstream *(5/15/2019)*

USEC UT2 Photo Point 83 – view upstream *(05/08/2019)*

USEC UT2 Photo Point 83 – view downstream *(05/08/2019)*

USEC UT3 Photo Point 84 – view upstream *(05/08/2019)*

USEC UT3 Photo Point 84 – view downstream *(05/08/2019)*

UFC R1 Photo Point 85 – view upstream *(5/15/2019)*

UFC R1 Photo Point 85 – view downstream *(5/15/2019)*

UFC R1 Photo Point 86 – view upstream *(5/15/2019)*

UFC R1 Photo Point 86 – view downstream *(5/15/2019)*

UFC R1 Photo Point 87 – view upstream *(5/15/2019)*

UFC R1 Photo Point 87 – view downstream *(5/15/2019)*

UFC R2 Photo Point 88 – view upstream *(5/15/2019)*

UFC R2 Photo Point 88 – view downstream *(5/15/2019)*

UFC R2 Photo Point 89 – view upstream *(5/15/2019)*

UFC R2 Photo Point 89 – view downstream *(5/15/2019)*

UFC R2 Photo Point 90 – view upstream *(5/15/2019)*

UFC R2 Photo Point 90 – view downstream *(5/15/2019)*

UFC R2 Photo Point 91 – view upstream *(5/15/2019)*

UFC R2 Photo Point 91 – view downstream *(5/15/2019)*

UFC R2 Photo Point 92 – view upstream *(5/15/2019)*

UFC R2 Photo Point 92 – view downstream *(5/15/2019)*

LFC R1 Photo Point 93 – view upstream *(5/8/2019)*

LFC R1 Photo Point 93 – view downstream *(5/8/2019)*

LFC R1 Photo Point 94 – view upstream *(5/8/2019)*

LFC R1 Photo Point 94 – view downstream *(5/8/2019)*

LFC R2 Photo Point 95 – view upstream *(5/8/2019)*

LFC R2 Photo Point 95 – view downstream *(5/8/2019)*

STREAM PHOTOGRAPHS

Big Harris Creek - Area C
Monitoring Year 2

	
LBHC R1A Photo Point 96 – view upstream *(05/08/2019)*	**LBHC R1A Photo Point 96** – view downstream *(05/08/2019)*
	
LBHC R1A Photo Point 97 – view upstream *(05/08/2019)*	**LBHC R1A Photo Point 97** – view downstream *(05/08/2019)*
	
LBHC R1B Photo Point 98 – view upstream *(05/08/2019)*	**LBHC R1B Photo Point 98** – view downstream *(05/08/2019)*

LBHC R2 Photo Point 99 – view upstream *(05/08/2019)*

LBHC R2 Photo Point 99 – view downstream *(05/08/2019)*

LBHC R2 Photo Point 100 – view upstream *(05/08/2019)*

LBHC R2 Photo Point 100 – view downstream *(05/08/2019)*

LBHC R2 Photo Point 101 – view upstream *(05/08/2019)*

LBHC R2 Photo Point 101 – view downstream *(05/08/2019)*

	
LBHC R3 Photo Point 102 – view upstream *(05/08/2019)*	**LBHC R3 Photo Point 102** – view downstream *(05/08/2019)*
	
LBHC R3 Photo Point 103 – view upstream *(05/08/2019)*	**LBHC R3 Photo Point 103** – view downstream *(05/08/2019)*
	
LBHC UT1 Photo Point 104 – view upstream *(05/08/2019)*	**LBHC UT1 Photo Point 104** – view downstream *(05/08/2019)*

LBHC UT2 Photo Point 105 – view upstream *(05/08/2019)*

LBHC UT2 Photo Point 105 – view downstream *(05/08/2019)*

LBHC UT3 Photo Point 106 – view upstream *(05/08/2019)*

LBHC UT3 Photo Point 106 – view downstream *(05/08/2019)*

LBHC UT4 Photo Point 107 – view upstream *(05/08/2019)*

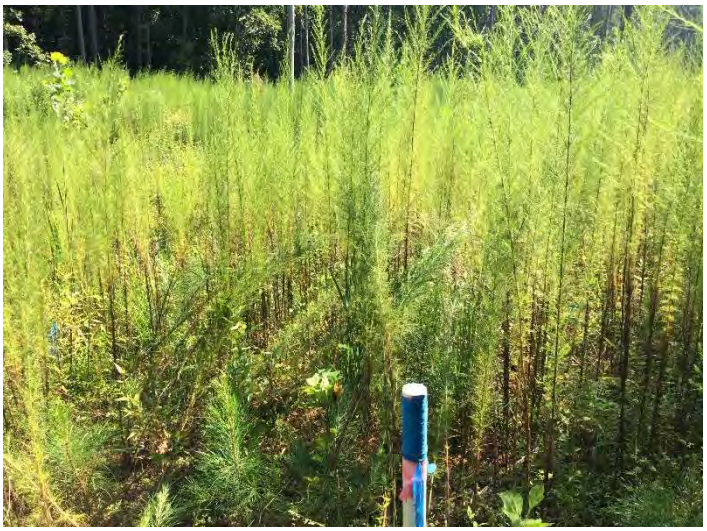
LBHC UT4 Photo Point 107 – view downstream *(05/08/2019)*

VEGETATION PHOTOGRAPHS

Monitoring Year 2

Vegetation Plot 1 *(08/13/2019)*

Vegetation Plot 2 *(08/13/2019)*



Vegetation Plot 3 *(08/13/2019)*

Vegetation Plot 4 *(08/13/2019)*

Vegetation Plot 5 *(08/13/2019)*

Vegetation Plot 6 *(08/13/2019)*

Vegetation Plot 7 *(08/13/2019)*

Vegetation Plot 8 *(08/13/2019)*

Vegetation Plot 9 *(08/13/2019)*

Vegetation Plot 10 *(08/15/2019)*

Vegetation Plot 11 *(08/15/2019)*

Vegetation Plot 12 *(08/15/2019)*

Vegetation Plot 13 *(08/20/2019)*

Vegetation Plot 14 *(08/20/2019)*

Vegetation Plot 15 *(08/20/2019)*

Vegetation Plot 16 *(08/21/2019)*

Vegetation Plot 17 *(08/21/2019)*

Vegetation Plot 18 *(08/13/2019)*

Vegetation Plot 19 *(08/13/2019)*

Vegetation Plot 20 *(08/13/2019)*

Vegetation Plot 21 *(08/13/2019)*

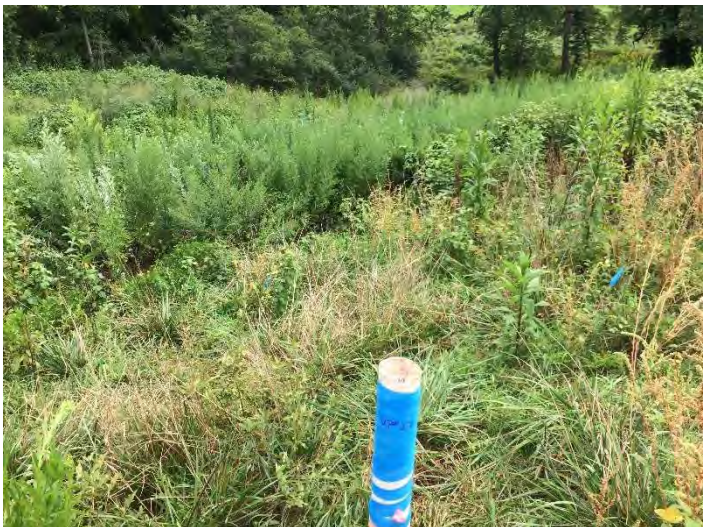
Vegetation Plot 22 *(08/13/2019)*

Vegetation Plot 23 *(08/13/2019)*

Vegetation Plot 24 *(08/20/2019)*

Vegetation Plot 25 *(08/20/2019)*

Vegetation Plot 26 *(08/20/2019)*



Vegetation Plot 27 *(08/20/2019)*

Vegetation Plot 28 *(08/20/2019)*

Vegetation Plot 29 *(08/20/2019)*

Vegetation Plot 30 *(08/20/2019)*

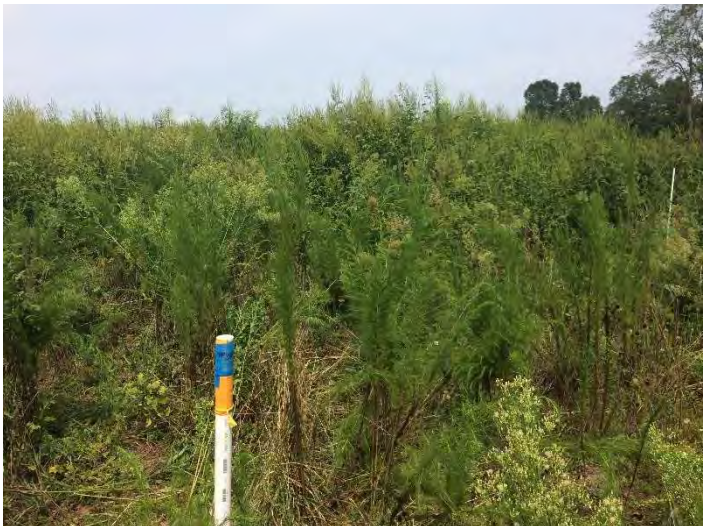
Vegetation Plot 31 *(08/21/2019)*

Vegetation Plot 32 *(08/20/2019)*

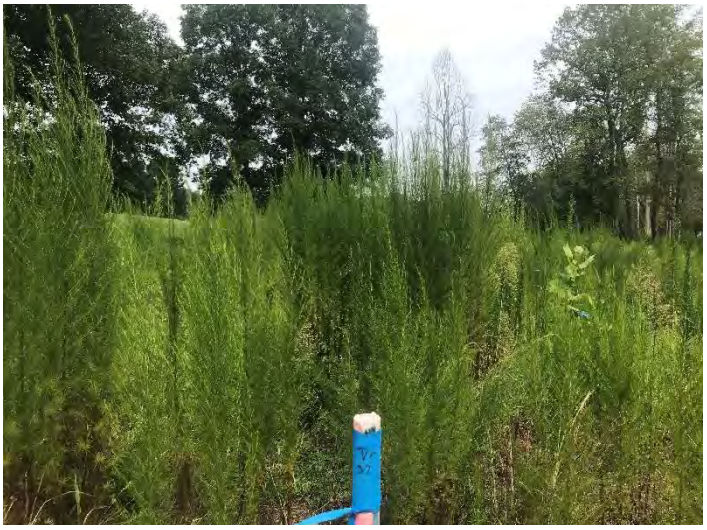
Vegetation Plot 33 *(08/20/2019)*

Vegetation Plot 34 *(08/21/2019)*

Vegetation Plot 35 *(08/12/2019)*



Vegetation Plot 36 *(08/12/2019)*



Vegetation Plot 37 *(08/12/2019)*

Vegetation Plot 38 *(08/12/2019)*

Vegetation Plot 39 *(08/12/2019)*

Vegetation Plot 40 *(08/15/2019)*

Vegetation Plot 41 *(08/15/2019)*

Vegetation Plot 42 *(08/12/2019)*

Vegetation Plot 43 *(08/12/2019)*

Vegetation Plot 44 *(08/12/2019)*

Vegetation Plot 45 *(08/15/2019)*

Vegetation Plot 46 *(08/15/2019)*

Vegetation Plot 47 *(08/15/2019)*

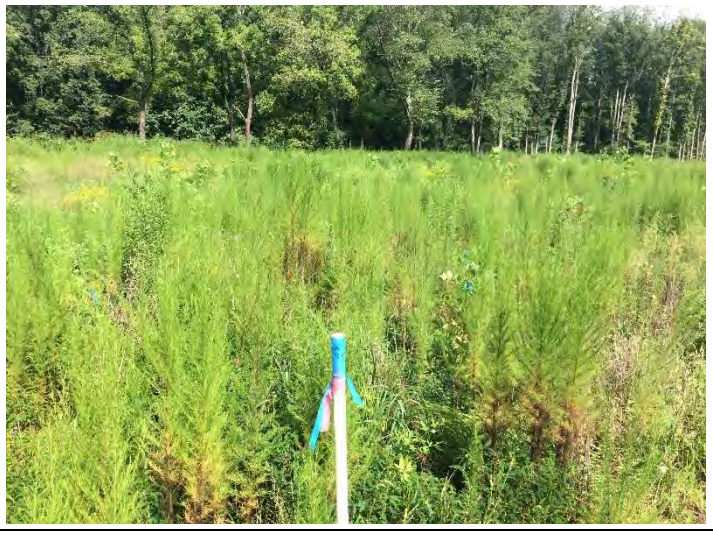
Vegetation Plot 48 *(08/15/2019)*

Vegetation Plot 49 *(08/15/2019)*

Vegetation Plot 50 *(08/12/2019)*

Vegetation Plot 51 *(08/12/2019)*

Vegetation Plot 52 *(08/12/2019)*



Vegetation Plot 53 *(08/21/2019)*

Vegetation Plot 54 *(08/21/2019)*

	
Vegetation Plot 55 *(08/21/2019)*	**Vegetation Plot 56** *(08/21/2019)*

AREAS OF CONCERN PHOTOGRAPHS

Monitoring Year 2

	
UBHC R1 Mowing Encroachment – view upstream *(8/13/2019)*	**UBHC R6 Bank Scour (Station 176+00)** – view downstream *(10/8/2019)*
	
LBHC R2 Bank Scour (Station 316+00) – view downstream *(10/8/2019)*	**Royster Creek R1 Boulder Sill Failure (Station 806+75)** – view upstream *(10/8/2019)*

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment Table
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Plot	Success Criteria Met (Y/N)	Tract Mean
1	Y	88%
2	N	
3	Y	
4	Y	
5	Y	
6	Y	
7	Y	
8	Y	
9	Y	
10	Y	
11	Y	
12	N	
13	Y	
14	Y	
15	Y	
16	Y	
17	Y	
18	Y	
19	Y	
20	Y	
21	Y	
22	Y	
23	Y	
24	Y	
25	N	
26	Y	
27	Y	
28	Y	
29	N	
30	Y	
31	N	
32	Y	
33	Y	
34	Y	
35	Y	
36	Y	
37	Y	
38	Y	
39	Y	
40	Y	
41	Y	
42	Y	
43	Y	
44	Y	
45	Y	
46	Y	
47	Y	
48	Y	
49	Y	
50	N	
51	N	
52	Y	
53	Y	
54	Y	
55	Y	
56	Y	

Table 9. CVS Vegetation Tables - Metadata
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Report Prepared By	Kristi Suggs
Date Prepared	9/26/2019 10:16
Database Name	BHC MY2 cvs-eep-entrytool-v2.5.0.mdb
Database Location	Q:\ActiveProjects\005-02149 Big Harris Creek\Monitoring\Monitoring Year 2 (2019)\Vegetation Assessment
Computer Name	ELLA-PC
File Size	96366592
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	739
Project Name	Big Harris Creek Mitigation Site
Sampled Plots	56

Table 10a. Planted and Total Stems
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

			Current Plot Data (MY2 2019) - Area A																				
			Vegetation Plot 1			Vegetation Plot 2			Vegetation Plot 3			Vegetation Plot 4			Vegetation Plot 5			Vegetation Plot 6			Vegetation Plot 7		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Boxelder maple	Tree																					
Acer rubrum	Red maple	Tree	3	3	7			2	3	3	5	3	3	3	4	4	4	2	2	2	3	3	3
Betula nigra	River birch	Tree							1	1	1	1	1	1	2	2	2	1	1	1	1	1	1
Diospyros virginiana	American Persimmon	Tree												1			1			2			
Fagus	Beech	Tree																					
Fraxinus pennsylvanica	Green ash	Tree	2	2	2	1	1	1	4	4	4	2	2	2	3	3	3	4	4	4	1	1	1
Ilex opaca	American Holly	Shrub Tree																					
Juglans nigra	Black Walnut	Tree																					
Liquidambar styraiflua	Sweet Gum	Tree			67			17			24			89			26			35			15
Liriodendron tulipifera	Tulip Poplar	Tree			24			1			5			1			10						2
Nyssa sylvatica	Blackgum	Tree	1	1	1				2	2	2	2	2	2				1	1	1	2	2	8
Pinus Virginiana	Virginia Pine	Tree						1			2			6			14						
Platanus occidentalis	American sycamore	Tree	4	4	4	5	5	5	1	1	1	2	2	2	5	5	5				4	4	4
Quercus sp.	Oak	Tree																					
Quercus alba	White Oak	Tree																					
Quercus falcata	Spanish Oak	Tree																					
Quercus nigra	Water Oak	Tree																					
Quercus pagoda	Cherrybark oak	Tree							1	1	1	1	1	1				1	1	1	1	1	1
Quercus phellos	Willow oak	Tree							1	1	1												
Quercus rubra	Red oak	Tree	1	1	1				2	2	2												
Rhus copallinum	Shining sumac	Shrub Tree																					
Rhus typhina	Staghorn Sumac	Shrub															2						
Sambucus Canadensis	Common Elderberry	Shrub Tree																					
		Stem count	11	11	106	6	6	27	15	15	48	11	11	108	14	14	67	9	9	46	12	12	35
		Size (ares)		1			1			1			1			1		1			1	
		Size (ACRES)		0.025			0.025			0.025			0.025			0.025		0.025			0.025	
		Species count	5	5	7	2	2	6	8	8	11	6	6	10	4	4	8	5	5	7	6	6	8
		Stems per ACRE	445	445	4290	243	243	1,093	607	607	1,942	445	445	4,371	567	567	2,711	364	364	1,862	486	486	1,416

			Current Plot Data (MY2 2019) - Area A																				
			Vegetation Plot 8			Vegetation Plot 9			Vegetation Plot 10			Vegetation Plot 11			Vegetation Plot 12			Vegetation Plot 13			Vegetation Plot 14		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Boxelder maple	Tree																					
Acer rubrum	Red maple	Tree	3	3	9	3	3	5	5	5	5	3	3	3	1	1	1	5	5	5	2	2	2
Betula nigra	River birch	Tree	1	1	1																1	1	1
Diospyros virginiana	American Persimmon	Tree									6												
Fagus	Beech	Tree																					
Fraxinus pennsylvanica	Green ash	Tree	5	5	5	4	4	4	3	3	3	4	4	4	1	1	1	2	2	2	3	3	3
Ilex opaca	American Holly	Shrub Tree																					
Juglans nigra	Black Walnut	Tree																					
Liquidambar styraiflua	Sweet Gum	Tree			19																		50
Liriodendron tulipifera	Tulip Poplar	Tree			57			5			1									3			75
Nyssa sylvatica	Blackgum	Tree				1	1	1										1	1	1	1	1	1
Pinus Virginiana	Virginia Pine	Tree																					
Platanus occidentalis	American sycamore	Tree	4	4	4	7	7	7	6	6	6	5	5	5	1	1	1	1	1	1	6	6	6
Quercus sp.	Oak	Tree																					
Quercus alba	White Oak	Tree																					
Quercus falcata	Spanish Oak	Tree																					
Quercus nigra	Water Oak	Tree																					
Quercus pagoda	Cherrybark oak	Tree	1	1	1				1	1	1										1	1	1
Quercus phellos	Willow oak	Tree	1	1	1													1	1	1	1	1	1
Quercus rubra	Red oak	Tree										1	1	1				2	2	2			
Rhus copallinum	Shining sumac	Shrub Tree																					
Rhus typhina	Staghorn Sumac	Shrub																					
Sambucus Canadensis	Common Elderberry	Shrub Tree																					
		Stem count	15	15	97	15	15	22	15	15	22	13	13	13	3	3	3	12	12	15	15	15	140
		Size (ares)		1			1			1			1			1			1		1	
		Size (ACRES)		0.025			0.025			0.025			0.025			0.025			0.025		0.025	
		Species count	6	6	8	4	4	5	4	4	6	4	4	4	3	3	3	6	6	7	7	7	9
		Stems per ACRE	607	607	3,925	607	607	890	607	607	890	526	526	526	121	121	121	486	486	607	607	607	5,666

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%
Volunteers included

PnoLS: Number of planted stems excluding live stakes
P-All: Number of planted stems including live stakes
T: Total stems

Table 10b. Planted and Total Stems
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

			Current Plot Data (MY2 2019) - Area A																				
			Vegetation Plot 15			Vegetation Plot 16			Vegetation Plot 17			Vegetation Plot 18			Vegetation Plot 19			Vegetation Plot 20			Vegetation Plot 21		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	Boxelder maple	Tree									2									2			
Acer rubrum	Red maple	Tree	1	1	1	1	1	1	3	3	13				3	3	3				1	1	21
Betula nigra	River birch	Tree	2	2	2				1	1	36	2	2	2				1	1	1	2	2	2
Diospyros virginiana	American Persimmon	Tree												2			5						
Fagus	Beech	Tree																					
Fraxinus pennsylvanica	Green ash	Tree	2	2	2	4	4	4	3	3	3	5	5	6	1	1	1	1	1	26	1	1	1
Ilex opaca	American Holly	Shrub Tree																					
Juglans nigra	Black Walnut	Tree																					
Liquidambar styraiflua	Sweet Gum	Tree						1			16									7			45
Liriodendron tulipifera	Tulip Poplar	Tree			2			2			23			87						3			10
Nyssa sylvatica	Blackgum	Tree							1	1	1	1	1	1	1	1	1				1	1	1
Pinus Virginiana	Virginia Pine	Tree																					
Platanus occidentalis	American sycamore	Tree	2	2	2	4	4	4	3	3	3				3	3	3	5	5	5	2	2	2
Quercus sp.	Oak	Tree				1	1	1															
Quercus alba	White Oak	Tree																					
Quercus falcata	Spanish Oak	Tree									1												
Quercus nigra	Water Oak	Tree																					
Quercus pagoda	Cherrybark oak	Tree	2	2	2							2	2	2									
Quercus phellos	Willow oak	Tree										1	1	1							1	1	1
Quercus rubra	Red oak	Tree							1	1	1	1	1	1				1	1	1			
Rhus copallinum	Shining sumac	Shrub Tree																					1
Rhus typhina	Staghorn Sumac	Shrub																					
Sambucus Canadensis	Common Elderberry	Shrub Tree									1												
Stem count			9	9	11	10	10	13	12	12	100	12	12	102	8	8	13	8	8	45	8	8	84
Size (ares)			1			1			1			1			1			1			1		
Size (ACRES)			0.025			0.025			0.025			0.025			0.025			0.025			0.025		
Species count			5	5	6	4	4	6	6	6	11	6	6	8	4	4	5	4	4	7	6	6	9
Stems per ACRE			364	364	445	405	405	526	486	486	4047	486	486	4128	324	324	526	324	324	1,821	324	324	3399

			Current Plot Data (MY2 2019) - Area A																				
			Vegetation Plot 22			Vegetation Plot 23			Vegetation Plot 24			Vegetation Plot 25			Vegetation Plot 26			Vegetation Plot 27			Vegetation Plot 28		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	Boxelder maple	Tree																					1
Acer rubrum	Red maple	Tree	3	3	3	5	5	5	3	3	3				1	1	1				1	1	1
Betula nigra	River birch	Tree				2	2	2	1	1	1							2	2	2	1	1	1
Diospyros virginiana	American Persimmon	Tree									7						16						
Fagus	Beech	Tree																					
Fraxinus pennsylvanica	Green ash	Tree	3	3	3	2	2	2	1	1	1	1	1	1	4	4	4	2	2	2	3	3	3
Ilex opaca	American Holly	Shrub Tree																					
Juglans nigra	Black Walnut	Tree																					
Liquidambar styraiflua	Sweet Gum	Tree															2						
Liriodendron tulipifera	Tulip Poplar	Tree															1						1
Nyssa sylvatica	Blackgum	Tree							2	2	2							1	1	1			
Pinus Virginiana	Virginia Pine	Tree																					
Platanus occidentalis	American sycamore	Tree	4	4	4	2	2	2				1	1	1	6	6	6				3	3	3
Quercus sp.	Oak	Tree																					
Quercus alba	White Oak	Tree																					
Quercus falcata	Spanish Oak	Tree																					
Quercus nigra	Water Oak	Tree																					
Quercus pagoda	Cherrybark oak	Tree				1	1	1	1	1	1	1	1	1				1	1	1			
Quercus phellos	Willow oak	Tree													1	1	1						
Quercus rubra	Red oak	Tree				1	1	1				1	1	1	1	1	1	2	2	2			
Rhus copallinum	Shining sumac	Shrub Tree																					
Rhus typhina	Staghorn Sumac	Shrub																					
Sambucus Canadensis	Common Elderberry	Shrub Tree																					
Stem count			10	10	10	13	13	13	8	8	15	4	4	4	13	13	32	8	8	8	8	8	10
Size (ares)			1			1			1			1			1			1			1		
Size (ACRES)			0.025			0.025			0.025			0.025			0.025			0.025			0.025		
Species count			3	3	3	6	6	6	5	5	6	4	4	4	5	5	8	5	5	5	4	4	6
Stems per ACRE			405	405	405	526	526	526	324	324	607	162	162	162	526	526	1,295	324	324	324	324	324	405

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%
Volunteers included

PnoLS: Number of planted stems excluding live stakes
P-All: Number of planted stems including live stakes
T: Total stems

Table 10c. Planted and Total Stems
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

			Current Plot Data (MY2 2019) - Area A																	
			Vegetation Plot 29			Vegetation Plot 30			Vegetation Plot 31			Vegetation Plot 32			Vegetation Plot 33			Vegetation Plot 34		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Boxelder maple	Tree																		
Acer rubrum	Red maple	Tree				3	3	3				1	1	1	3	3	3	1	1	7
Betula nigra	River birch	Tree							1	1	1	2	2	2						
Diospyros virginiana	American Persimmon	Tree																		
Fagus	Beech	Tree																		
Fraxinus pennsylvanica	Green ash	Tree				3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
Ilex opaca	American Holly	Shrub Tree																		
Juglans nigra	Black Walnut	Tree																		
Liquidambar styraiflua	Sweet Gum	Tree												11			300			
Liriodendron tulipifera	Tulip Poplar	Tree												1			40			12
Nyssa sylvatica	Blackgum	Tree										2	2	2				4	4	4
Pinus Virginiana	Virginia Pine	Tree																		
Platanus occidentalis	American sycamore	Tree	3	3	3	5	5	5	1	1	1	3	3	3	2	2	2	1	1	5
Quercus sp.	Oak	Tree																		
Quercus alba	White Oak	Tree																		
Quercus falcata	Spanish Oak	Tree																		
Quercus nigra	Water Oak	Tree																		
Quercus pagoda	Cherrybark oak	Tree				1	1	1							1	1	1	1	1	1
Quercus phellos	Willow oak	Tree										1	1	1						
Quercus rubra	Red oak	Tree	1	1	1				2	2	2	2	2	2	1	1	1	2	2	2
Rhus copallinum	Shining sumac	Shrub Tree																		
Rhus typhina	Staghorn Sumac	Shrub																		
Sambucus Canadensis	Common Elderberry	Shrub Tree																		
		Stem count	4	4	4	12	12	12	7	7	7	13	13	25	10	10	350	11	11	33
		Size (ares)		1			1			1			1			1			1	
		Size (ACRES)		0.025			0.025			0.025			0.025			0.025			0.025	
		Species count	2	2	2	4	4	4	4	4	4	7	7	9	5	5	7	6	6	7
		Stems per ACRE	162	162	162	486	486	486	283	283	283	526	526	1012	405	405	14164	445	445	1,335

			Current Plot Data (MY2 2019) - Area B																			
			Vegetation Plot 35			Vegetation Plot 36			Vegetation Plot 37			Vegetation Plot 38			Vegetation Plot 39			Vegetation Plot 40			Vegetation Plot 41		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Boxelder maple	Tree																		1			
Acer rubrum	Red maple	Tree	1	1	1	2	2	2	1	1	1	2	2	8	2	2	4	1	1	1	4	4	4
Betula nigra	River birch	Tree	2	2	2				1	1	1												
Diospyros virginiana	American Persimmon	Tree																					
Fagus	Beech	Tree																					
Fraxinus pennsylvanica	Green ash	Tree	1	1	1	3	3	3	3	3	3	5	5	7	3	3	3	2	2	2	4	4	4
Ilex opaca	American Holly	Shrub Tree																					
Juglans nigra	Black Walnut	Tree						1															
Liquidambar styraiflua	Sweet Gum	Tree																					300
Liriodendron tulipifera	Tulip Poplar	Tree									3			7			7						5
Nyssa sylvatica	Blackgum	Tree	3	3	3													1	1	1	2	2	2
Pinus Virginiana	Virginia Pine	Tree																					
Platanus occidentalis	American sycamore	Tree	3	3	3	5	5	5	3	3	5	5	5	7	5	5	9	6	6	6	1	1	1
Quercus sp.	Oak	Tree																					
Quercus alba	White Oak	Tree																					
Quercus falcata	Spanish Oak	Tree																					
Quercus nigra	Water Oak	Tree																					
Quercus pagoda	Cherrybark oak	Tree							1	1	1				2	2	2	2	2	2			
Quercus phellos	Willow oak	Tree										1	1	1							2	2	2
Quercus rubra	Red oak	Tree	3	3	3										1	1	1				1	1	1
Rhus copallinum	Shining sumac	Shrub Tree																					
Rhus typhina	Staghorn Sumac	Shrub																					
Sambucus Canadensis	Common Elderberry	Shrub Tree																					
		Stem count	13	13	13	10	10	11	9	9	14	13	13	30	13	13	26	12	12	13	14	14	319
		Size (ares)		1			1			1			1			1			1		1	
		Size (ACRES)		0.025			0.025			0.025			0.025			0.025			0.025		0.025	
		Species count	6	6	6	3	3	4	5	5	6	4	4	5	5	5	6	5	5	6	6	6	8
		Stems per ACRE	526	526	526	405	405	445	364	364	567	526	526	1214	526	526	1052	486	486	526	567	567	12909

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%
Volunteers included

PnoLS: Number of planted stems excluding live stakes
P-All: Number of planted stems including live stakes
T: Total stems

Table 10d. Planted and Total Stems
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

			Current Plot Data (MY2 2019) - Area B																			
			Vegetation Plot 42			Vegetation Plot 43			Vegetation Plot 44			Vegetation Plot 45			Vegetation Plot 46			Vegetation Plot 47			Vegetation Plot 48		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Boxelder maple	Tree																				
Acer rubrum	Red maple	Tree	1	1	85	2	2	2	2	2	52	2	2	2	2	2	2	3	3	3	3	3	3
Betula nigra	River birch	Tree				4	4	4	2	2	2	2	2	2	2	2	2	1	1	1	1	1	2
Diospyros virginiana	American Persimmon	Tree						1						7						1			
Fagus	Beech	Tree																					
Fraxinus pennsylvanica	Green ash	Tree	5	5	8	4	4	4	2	2	2	2	2	2	6	6	6	3	3	3	3	3	3
Ilex opaca	American Holly	Shrub Tree																					
Juglans nigra	Black Walnut	Tree																					
Liquidambar styraiflua	Sweet Gum	Tree			4			39			68			2			3			1			3
Liriodendron tulipifera	Tulip Poplar	Tree			85			21			46			13						5			47
Nyssa sylvatica	Blackgum	Tree	1	1	4				1	1	1	1	1	1	1	1	1				1	1	1
Pinus Virginiana	Virginia Pine	Tree																					
Platanus occidentalis	American sycamore	Tree	3	3	66	2	2	8	4	4	33	5	5	5	4	4	4	6	6	6	3	3	3
Quercus sp.	Oak	Tree																					
Quercus alba	White Oak	Tree																					
Quercus falcata	Spanish Oak	Tree																					
Quercus nigra	Water Oak	Tree																					
Quercus pagoda	Cherrybark oak	Tree							1	1	1	1	1	1	1	1	1				2	2	2
Quercus phellos	Willow oak	Tree										1	1	1	1	1	1						
Quercus rubra	Red oak	Tree				1	1	1	3	3	3			4							2	2	2
Rhus copallinum	Shining sumac	Shrub Tree																					
Rhus typhina	Staghorn Sumac	Shrub																					
Sambucus Canadensis	Common Elderberry	Shrub Tree																					
		Stem count	10	10	252	13	13	80	15	15	208	14	14	40	17	17	20	13	13	20	15	15	66
		Size (ares)		1			1			1			1			1			1			1	
		Size (ACRES)		0.025			0.025			0.025			0.025			0.025			0.025			0.025	
		Species count	4	4	6	5	5	8	7	7	9	7	7	11	7	7	8	4	4	7	7	7	9
		Stems per ACRE	405	405	10198	526	526	3,237	607	607	8,417	567	567	1,619	688	688	809	526	526	809	607	607	2,671

			Current Plot Data (MY2 2019) - Area B											
			Vegetation Plot 49			Vegetation Plot 50			Vegetation Plot 51			Vegetation Plot 52		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Boxelder maple	Tree												
Acer rubrum	Red maple	Tree	2	2	2									4
Betula nigra	River birch	Tree	3	3	3							2	2	2
Diospyros virginiana	American Persimmon	Tree						1						
Fagus	Beech	Tree												
Fraxinus pennsylvanica	Green ash	Tree	2	2	3	3	3	4	1	1	1	5	5	5
Ilex opaca	American Holly	Shrub Tree												
Juglans nigra	Black Walnut	Tree												
Liquidambar styraiflua	Sweet Gum	Tree			2						19			30
Liriodendron tulipifera	Tulip Poplar	Tree			7			20						12
Nyssa sylvatica	Blackgum	Tree	1	1	1									2
Pinus Virginiana	Virginia Pine	Tree												
Platanus occidentalis	American sycamore	Tree	2	2	2						12	4	4	4
Quercus sp.	Oak	Tree												
Quercus alba	White Oak	Tree												
Quercus falcata	Spanish Oak	Tree												
Quercus nigra	Water Oak	Tree												
Quercus pagoda	Cherrybark oak	Tree	1	1	1	2	2	2				1	1	1
Quercus phellos	Willow oak	Tree												
Quercus rubra	Red oak	Tree	1	1	1				1	1	1	1	1	3
Rhus copallinum	Shining sumac	Shrub Tree									1			
Rhus typhina	Staghorn Sumac	Shrub												
Sambucus Canadensis	Common Elderberry	Shrub Tree												
		Stem count	12	12	22	5	5	27	2	2	34	13	13	63
		Size (ares)		1			1			1			1	
		Size (ACRES)		0.025			0.025			0.025			0.025	
		Species count	7	7	9	2	2	4	2	2	5	5	5	9
		Stems per ACRE	486	486	890	202	202	1,093	81	81	1,376	526	526	2550

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%
Volunteers included

PnoLS: Number of planted stems excluding live stakes
P-All: Number of planted stems including live stakes
T: Total stems

Table 10e. Planted and Total Stems
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

			Current Plot Data (MY2 2019) - Area C												Annual Summaries								
			Vegetation Plot 53			Vegetation Plot 54			Vegetation Plot 55			Vegetation Plot 56			MY2 (2019)			MY1 (9/2018 thru 11/2018)			MY0 (3/2018 thru 5/2018)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	Boxelder maple	Tree															6						
Acer rubrum	Red maple	Tree	1	1	1	1	1	1	3	3	3	3	3	4	108	108	307	143	143	432	171	171	171
Betula nigra	River birch	Tree	2	2	2	1	1	1	4	4	4			1	52	52	89	61	61	62	99	99	99
Diospyros virginiana	American Persimmon	Tree															50			11			
Fagus	Beech	Tree																		1			
Fraxinus pennsylvanica	Green ash	Tree	5	5	5	1	1	1	3	3	3	2	2	2	153	153	186	159	159	160	167	167	167
Ilex opaca	American Holly	Shrub Tree																		1			
Juglans nigra	Black Walnut	Tree															1						
Liquidambar styraiflua	Sweet Gum	Tree						400			150			300			2045			456			
Liriodendron tulipifera	Tulip Poplar	Tree			116									2			762			366			
Nyssa sylvatica	Blackgum	Tree				1	1	1				1	1	1	38	38	49	48	48	48	59	59	60
Pinus Virginiana	Virginia Pine	Tree															23						
Platanus occidentalis	American sycamore	Tree	4	4	5	4	4	19	3	3	103	2	2	300	175	175	716	186	186	265	212	212	212
Quercus sp.	Oak	Tree	1	1	1										2	2	2	4	4	4	3	3	3
Quercus alba	White Oak	Tree																		2			
Quercus falcata	Spanish Oak	Tree															1						
Quercus nigra	Water Oak	Tree																					
Quercus pagoda	Cherrybark oak	Tree	3	3	3	1	1	1	2	2	2	1	1	1	39	39	39	49	49	49	55	55	55
Quercus phellos	Willow oak	Tree				4	4	4							17	17	17	25	25	28	46	46	46
Quercus rubra	Red oak	Tree										1	1	1	37	37	43	51	51	51	57	57	57
Rhus copallinum	Shining sumac	Shrub Tree															2						
Rhus typhina	Staghorn Sumac	Shrub						1									3						
Sambucus Canadensis	Common Elderberry	Shrub Tree															1						
		Stem count	16	16	133	13	13	429	15	15	265	10	10	612	621	621	4342	726	726	1936	869	869	870
		Size (ares)		1			1			1			1			56			56			56	
		Size (ACRES)		0.025			0.025			0.025			0.025			1.38			1.38			1.38	
		Species count	6	6	7	7	7	9	5	5	6	6	6	9	9	9	19	9	9	15	9	9	9
		Stems per ACRE	647	647	5382	526	526	17361	607	607	10724	405	405	24767	449	449	3138	525	525	1399	628	628	629

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%
Volunteers included

PnoLS: Number of planted stems excluding live stakes
P-All: Number of planted stems including live stakes
T: Total stems

APPENDIX 4. Morphological Summary Data and Plots

Table 11a. Baseline Stream Data Summary
Area A
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area A

		Pre-Restoration Condition																																	
Parameter	**Gage**	**Carroll Creek Reach 1**		**Eaker Creek Reach 1**		**Royster Creek Reach 1**		**Scott Creek**		**UBHC Reach 2A**		**UBHC Reach 2B**		**UBHC Reach 4**		**Carroll Creek Reach 1**		**Royster Creek Reach 1**		**Scott Creek**		**UBHC Reach 2A**		**UBHC Reach 2B**		**UBHC Reach 4**		**Carroll Creek Reach 1**		**Eaker Creek Reach 1**		**Royster Creek Reach 1**		**Scott Creek**		**UBHC Reach 2A**		**UBHC Reach 2B**		**UBHC Reach 4**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																																							
Bankfull Width (ft)	N/A	9.4	10.8	3.5	3.6	3.6	6.1	4.4	10.3	7.0	8.2	11.3	12.0	18.7	26.8	10.40		8.30		6.50		10.20		12.80		13.80		11.4		N/A		10.0		6.8		16.0		11.3		15.5	16.0
Floodprone Width (ft)		13.1	14.2	6.7	7.1	6.0	7.0	5.2	12.4	9.5	10.0	15.5	16.5	22.0	34.6	---		---		---		---		---		---		82.0		N/A		46.7		67.1		108.7		170.3		118.0	190.0
Bankfull Mean Depth		0.9	1.4	0.5	0.5	0.6		0.3	0.6	0.7	0.8	0.9	1.0	0.8	1.1	0.8		0.6		0.5		0.8		1.0		1.0		0.7		N/A		0.4		0.5		0.7		1.6		0.8	1.1
Bankfull Max Depth		1.0	1.8	1.0	1.1	0.8	1.4	0.8	0.9	0.8	1.0	1.3	1.7	1.3	1.7	1.2		1.0		0.7		1.2		1.5		1.6		1.3		N/A		0.8		0.9		1.5		3.0		1.4	2.0
Bankfull Cross-sectional Area (ft^2)		11.4		1.9		3.7		2.9		5.6		11.3		20.4		8.2		5.3		3.1		7.9		12.5		14.4		7.9		N/A		3.6		3.6		11.6		17.7		13.1	17.6
Width/Depth Ratio		6.6	12.5	6.6	6.9	6.1	10.2	7.4	30.8	9.1	11.5	11.4	12.7	17.6	30.3	13.2		13.0		13.6		13.2		13.1		13.2		16.4		N/A		27.6		12.7		22.0		7.3		14.5	18.3
Entrenchment Ratio		1.2	1.5	1.9	2.0	1.2	1.5	1.2	1.4	1.2	1.4	1.3	1.5	1.1	1.8	2.2+		2.2+		1.4	2.2	2.2+		2.2+		2.2+		7.2		N/A		4.7		9.9		6.8		15.0		7.6	11.9
Bank Height Ratio		3.4	5.0	3.1	3.5	6.6	7.3	3.8	10.6	3.1	4.6	3.4	4.4	1.6	2.9	1.0	1.2	1.0	1.2	1.0	1.2	1.0	1.2	1.0	1.2	1.0	1.2	1.0		N/A		1.0		1.0		1.0		1.0		1.0	1.0
D_{50} (mm)		---		---		---		---		---		---		---		N/A		N/A		N/A		N/A		N/A		N/A		51.00		N/A		43.50		51.60		44.20		83.80		46.20	85.60
Profile																																							
Riffle Length (ft)	N/A															---		---		---		---		---		---		14	65	10	19	7	42	22	47	11	40	8	39	19	56
Riffle Slope (ft/ft)																0.016	0.0500	0.033	0.0500	0.045	0.0530	0.016	0.0490	0.017	0.0500	0.017	0.0470	0.0084	0.0359	0.0093	0.0406	0.0068	0.0569	0.0164	0.0416	0.0006	0.0515	0.0215	0.0627	0.0119	0.0521
Pool Length (ft)																---		---		---		---		---		---		18	50	4	13	7	71	6	138	10	59	10	47	33	73
Pool Max Depth (ft)		---		---	---			0.9	1.2	2.2	2.2	1.9	1.9	2.9	3.2	1.3	2.4	1.1	2.0	1.0	1.7	1.2	2.3	1.5	2.9	1.6	3.1	1.9	2.8	1.3	2.1	1.6	2.5	1.9	5.2	1.9	3.3	2.6	3.4	2.4	3.8
Pool Spacing (ft)																17	73	13	58	8	42	23	66	29	83	30	110	45	67	20	22	38	70	17	69	29	75	21	79	62	125
Pool Volume (ft^3)																																							
Pattern																																							
Channel Beltwidth (ft)	N/A	---		---		---		---		---		---		---		31	47	25	37	7	26	26	51	28	64	41	69	26	45	N/A		9	18	25	45	13	31	20	35	19	67
Radius of Curvature (ft)		---		---		---		---		---		---		---		19	47	15	37	16	29	18	41	23	51	25	62	15	29	46	62	21	41	11	28	18	26	30	34	27	60
Rc:Bankfull Width (ft/ft)		---		---		---		---		---		---		---		1.8	4.5	1.8	4.5	2.5	4.5	1.8	4.0	1.8	4.0	1.8	4.5	1.3	2.5	N/A		2.1	4.1	1.6	4.1	1.1	1.6	2.7	3.0	1.7	3.8
Meander Length (ft)		---		---		---		---		---		---		---		31	104	25	83	20	52	36	97	45	122	48	193	89	139	N/A		95	125	30	59	74	102	108	125	122	178
Meander Width Ratio		---		---		---		---		---		---		---		3.0	4.5	3.0	4.5	3.0	8.0	3.5	9.5	3.5	9.5	3.5	14.0	2.2	3.9	N/A		0.9	1.8	3.7	6.6	0.8	1.9	1.8	3.1	1.2	4.2
Ri%/Ru%/P%/G%/S%	N/A																																						
SC%/Sa%/G%/C%/B%/Be%																																							
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$		0.16/0.39/ 4.0/98.3/2		---		---		SC/0.19/2. 0/90.0/19		5.2/9.5/17/		---		SC/0.36/1. 0/129.8/61														0.28/2/10.2/5 9.6/		N/A		SC/2/11/71.7/ 98.3/256		0.21/24.23/39 .8/		0.66/2.37/16.6/79.2/146.7/362				0.3/6.69/29.8/ 87/ 202.4/512	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		---		---		---		0.94		---		1.37		0.61		1.30		1.39		0.75		N/A		---		1.19		0.64		1.18		0.63	0.86
Max part size (mm) mobilized at bankfull																																							
Stream Power (Capacity) W/m^2																																							
Additional Reach Parameters																																							
Drainage Area (SM)	N/A	0.32		0.04		0.23		0.07		0.36		0.74		0.83		0.32		0.23		0.07		0.36		0.74		0.83		0.32		0.04		0.23		0.07		0.36		0.74		0.83	
Watershed Impervious Cover Estimate (%)		<10%														<10%												<10%													
Rosgen Classification		E4-G4c		A4		B4		A4		G4c		F4		F4		C4		B4		B4a		C4		C4		C4		C4		N/A		B/C4		B/C4		C4		C4		C4	
Bankfull Velocity (fps)		5.4		4.9		3.8		4.5		4.1		4.4		3.7		3.9		4.4		3.9		4.2		4.2		3.8		3.8		N/A		4.0		4.6		3.5		5.4		3.6	4.5
Bankfull Discharge (cfs)		30		9.5		14		9		32		47		53		32		23		12		33		53		55		30.3		N/A		14.5		16.5		41.2		94.9		47.2	78.4
Q-NFF regression (2-yr)		---		---		---		---		---		---		---																											
Q-USGS extrapolation (1.2-yr)		18.0		---		26.0		6.6		24.8		44.0		51.0																											
Q-Mannings		---		---		---	---	12	13	22	23	49	51	68																											
Valley Slope (ft/ft)		0.0150		N/A		0.0325		0.0444		0.0152		0.0163		0.0129		0.0150		0.0325		0.0444		0.0152		0.0163		0.0129		0.0150		N/A		0.0325		0.0444		0.0152		0.0163		0.0129	
Channel Thalweg Length (ft)		553		135		438		630		990				1,203		595		459		662		934				1,039		590		135		459		644		930				1,296	
Sinuosity		1.16		1.01		1.01		1.08		1.22		1.22		1.28		1.15		1.10		1.05	1.10	1.18		1.15		1.10		1.2		N/A		1.1		1.1		1.1				1.4	
Bankfull/Channel Slope (ft/ft)		0.0180		0.0482		0.0153		0.0405		0.0163		0.0186		0.0118		0.0131		0.0295		0.0411		0.0130		0.0140		0.0105		0.0171		0.0555		0.0395		0.0382		0.0146				0.0126	

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11b. Baseline Stream Data Summary
Area B - Pre-Restoration Condition
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area B

		Pre-Restoration Condition																					
Parameter	**Gage**	**Elliott Creek Reach 1**		**Elliott Creek UT1**		**Bridges Creek Reach 1**		**UT1 to Bridges Creek**		**Lower Fletcher Creek Reach 1**		**Lower Fletcher Creek Reach 2**		**Upper Stick Elliot Creek Reach 1**		**Upper Stick Elliott Creek Reach 5**		**Upper Stick Elliott Creek Reach 6**		**Upper Stick Elliott Creek UT2**		**Upper Stick Elliott Creek UT3**		**Upper Fletcher Creek Reach 2**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Shallow																									
Bankfull Width (ft)		7.7		3.4		2.9	5.3	3.4		16.4		9.2		4.9		15.2		15.7	24.7	4.4		4.2		9.2	
Floodprone Width (ft)		18.0		6.0		6.0	17.0	4.0		21.0		11.0		6.0		14.0		19.0	58.0	7.0		5.0		19.0	
Bankfull Mean Depth		0.5		0.4		0.4	1.0	0.2		0.8		1.0		0.4		1.2		0.7	1.2	0.7		0.8		1.1	
Bankfull Max Depth		0.9		0.2		0.7	1.2	0.3		1.1		1.3		0.6		1.7		1.5	1.7	0.9		1.1		1.7	
Bankfull Cross-sectional Area (ft^2)	N/A	4.0		3.9		3.8		0.6		12.4		9.1		1.9		18.4		18.4		2.9		3.6		10.3	
Width/Depth Ratio		14.9		26.3		3.0	9.8	18.6		21.6		9.2		12.3		12.6		13.5	34.4	6.8		5.0		8.3	
Entrenchment Ratio		2.3		1.1		2.2	4.7	1.2		1.3		1.2		1.3		1.5		1.2	2.3	1.6		1.3		2.0	
Bank Height Ratio		1.9		17.3		1.9	2.3	6.2		5.1		2.3		20.7		1.7		1.4	3.5	4.0		4.1		3.2	
D_{50} (mm)		---		---		---		---		---		---		---		---		---		---		---		---	
Profile																									
Riffle Length (ft)																									
Riffle Slope (ft/ft)		0.0179		0.0250		0.0208		0.0812		0.0204		0.0198		0.0320		0.0150		0.0175		0.0200		---		0.0270	0.0458
Pool Length (ft)	N/A																								
Pool Max Depth (ft)		1.0	1.4	0.5	0.5	1.2	1.5	0.5	0.5	1.1	1.4	1.3	1.7	1.3	2.0	1.7	2.1	0.8	1.0	1.0	1.2	1.3	1.4	2.2	
Pool Spacing (ft)		15.0	100.0	22.5	27.9	22.1	51.2	3.8	4.1	65.0	80.0	6.0	80.0	14.1	68.1	15.0	90.0	15.0	90.0	29.5	49.3	21.5	21.5	77.0	259.0
Pool Volume (ft^3)																									
Pattern																									
Channel Beltwidth (ft)		3	40	4	20	11	26	9	13	21	43	39	43	4	37	21	97	20	49	7	38	17	17	48	143
Radius of Curvature (ft)		7	74	5	23	6	25	6	25	53	98	100	130	2	23	11	76	15	69	12	26	21	33	10	90
Rc:Bankfull Width (ft/ft)	N/A	0.9	9.6	1.4	6.9	2.0	4.8	1.7	7.5	3.2	6.0	10.9	14.1	0.5	4.6	0.8	5.0	0.9	2.8	2.8	6.0	5.0	7.9	1.1	9.8
Meander Length (ft)		54	166	45	56	44	102	44	102	249	336	318	336	28	136	72	134	142	304	59	99	43	43	200	295
Meander Width Ratio		0.3	5.1	0.7	3.6	3.8	8.9	3.8	8.9	4.2	4.7	4.2	4.7	5.8	27.8	1.4	6.4	0.8	2.0	1.5	8.7	4.0	4.0	5.2	15.5
Substrate, Bed and Transport Parameters																									
Ri%/Ru%/P%/G%/S%																									
SC%/Sa%/G%/C%/B%/Be%																									
d16/d35/d50/d84/d95/d100	N/A	---		---		---		---		---		---		---		---		---		---		---		---	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		---		---		---		---		---		---		---		---	
Max part size (mm) mobilized at bankfull																									
Stream Power (Capacity) W/m^2																									
Additional Reach Parameters																									
Drainage Area (SM)		0.13		0.02		0.07		0..01		0.41		0.42		0.05		0.72		0.76		0.07		0.10		0.42	
Watershed Impervious Cover Estimate (%)		<10%																							
Rosgen Classification		Incised C5		F4		Incised E4		F5b		F4		F4		F4		B4c		Incised C4 / F4		G4		G4		F4	
Bankfull Velocity (fps)		4.2		5.2		3.8		3.9		4.8		4.1		4.8		2.8		2.9		4.2		4.2		3.6	
Bankfull Discharge (cfs)		17		3		12		3		35		37		9		52		54		12		15		21	
Q-NFF regression (2-yr)	N/A	---		---		---		---		---		---		---		---		---		---		---		---	
Q-USGS extrapolation (1.2-yr)		11		2		7		1		144		162		---		43		45		7		9		21	
Q-Mannings		15		9		12		2.4		46		44		---		73		53		11		20		40	60
Valley Slope (ft/ft)		0.0179		0.0135		0.0208		0.0812		0.0125		0.0198		0.0638		0.0143		0.0087		0.0208		0.0353		0.0160	
Channel Thalweg Length (ft)		1,389		141		445		58		574		467		352		1,909		1,036		56		107		1,465	
Sinuosity		1.30		1.17		1.06		1.16		1.10		1.03		1.04		1.53		1.09		1.22		1.22		1.23	
Bankfull/Channel Slope (ft/ft)		0.0138		0.0113		0.0196		0.0700		0.0113		0.0192		0.0613		0.0093		0.0080		0.0200		0.0289		0.0130	

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11c. Baseline Stream Data Summary
Area B - Design Parameters
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area B

Parameter	Design																					
	Elliott Creek Reach 1		Elliott Creek UT1		Bridges Creek Reach 1		UT1 to Bridges Creek		Lower Fletcher Creek Reach 1		Lower Fletcher Creek Reach 2		Upper Stick Elliott Creek Reach 5		Upper Stick Elliott Creek Reach 6		Upper Stick Elliott Creek UT2		Upper Stick Elliott Creek UT3		Upper Fletcher Creek Reach 2	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Shallow																						
Bankfull Width (ft)	7.5		4.9		6.9		4.9		11.8		12.4		16.0		16.0		6.7		7.2		10.5	
Floodprone Width (ft)	16.5	---	10.8	---	9.7	15.3	10.8	---	26.0	---	27.3	---	22.5	35.3	35.3	---	14.8	---	15.9	---	50.0	100.0
Bankfull Mean Depth	0.5		0.4		0.5		0.4		0.8		0.9		1.1		1.1		0.5		0.6		0.9	
Bankfull Max Depth	1.1	1.9	0.8	1.4	1.1	1.9	0.8	1.4	1.7	3.0	1.8	3.1	2.3	4.0	2.3	4.0	1.0	1.8	1.1	1.9	2.2+	
Bankfull Cross-sectional Area (ft^2)	4.0		2.0		3.7		2.0		10.0		11.0		18.4		18.4		3.5		4.0		9.0	
Width/Depth Ratio	14.0		12.0		13.0		12.0		14.0		14.0		14.0		14.0		13.0		13.0		12.2	
Entrenchment Ratio	2.2+		2.2+		1.4	2.2	2.2+		2.2+		2.2+		1.4	2.2	2.2+		2.2+		2.2+		4.8	9.5
Bank Height Ratio	1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D_{50} (mm)	---		---		---		---		---		---		---		---		---		---		---	
Profile																						
Riffle Length (ft)	---		---		---		---		---		---		---		---		---		---		---	
Riffle Slope (ft/ft)	0.020	0.030	0.030	0.050	0.025	0.047	0.074	0.098	0.013	0.018	0.022	0.029	0.009	0.014	0.015	0.020	0.005	0.007	0.020	0.026	0.021	0.032
Pool Length (ft)	---		---		---		---		---		---		---		---		---		---		---	
Pool Max Depth (ft)	1.1	1.9	0.8	1.4	1.1	1.9	0.8	1.4	1.7	3.0	1.8	3.1	2.3	4.0	2.3	4.0	1.0	1.8	1.1	1.9	2.2+	
Pool Spacing (ft)	26	45	17	29	24	55	17	29	41	71	43	74	88	119	63	109	24	45	25	43	40	100
Pool Volume (ft^3)																						
Pattern																						
Channel Beltwidth (ft)	19	60	17	39	---	---	17	39	41	95	43	99	61	81	62	78	24	54	25	58	25	95
Radius of Curvature (ft)	15	26	10	17	---	---	10	17	24	41	25	43	33	56	32	43	13	24	14	25	23	50
Rc:Bankfull Width (ft/ft)	2.0	3.5	2.0	3.5	---	---	2.0	3.5	2.0	3.5	2.0	3.5	2.1	3.5	2.0	2.7	1.9	3.6	1.9	3.5	2.2	4.8
Meander Length (ft)	52	90	34	59	---	---	34	59	83	142	87	149	139	192	166	191	47	81	50	87	100	200
Meander Width Ratio	2.5	8.0	3.5	8.0	---	---	3.5	8.0	3.5	8.0	3.5	8.0	3.8	5.0	3.8	4.8	3.5	8.0	3.5	8.0	2.4	9.0
Substrate, Bed and Transport Parameters																						
Ri%/Ru%/P%/G%/S%																						
SC%/Sa%/G%/C%/B%/Be%																						
d16/d35/d50/d84/d95/d100																						
Reach Shear Stress (Competency) lb/ft^2	0.47		---		0.65		---		0.73		0.45		0.55		0.69		---		---		---	
Max part size (mm) mobilized at bankfull																						
Stream Power (Capacity) W/m^2																						
Additional Reach Parameters																						
Drainage Area (SM)	0.13		0.02		0.07		0.01		0.41		0.42		0.72		0.76		0.07		0.10		0.29	
Watershed Impervious Cover Estimate (%)	<10%																					
Rosgen Classification	C5		C4		B4		C4		C4		C4		C4		C4		C4		C4		C	
Bankfull Velocity (fps)	4.3		3		3.2		1.5		3.5		3.4		2.8		2.9		3.4		3.8		3.3	
Bankfull Discharge (cfs)	17		6		12		3		35		37		52		54		12		15		30	
Q-NFF regression (2-yr)																						
Q-USGS extrapolation (1.2-yr)																						
Q-Mannings																						
Valley Slope (ft/ft)	0.0174		0.0302		0.0290		0.0580		0.0089		0.0150		0.0110		0.0115		0.0045		0.0150		0.0158	
Channel Thalweg Length (ft)	1,121		141		376		55		574		427		1,507		1,069		154		118		1,407	
Sinuosity	1.19		1.19		1.03		1.20		1.02		1.03		1.34		1.13		1.27		1.09		1.21	
Bankfull/Channel Slope (ft/ft)	0.0149		0.0255		0.028		0.049		0.0088		0.0088		0.0080		0.0101		0.0035		0.0130		0.0128	0.0263

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11d. Baseline Stream Data Summary
Area B - As-Built/Baseline Parameters
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area B

Parameter	As-Built/Baseline																							
	Elliott Creek Reach 1		Elliott Creek UT1		Bridges Creek Reach 1		UT1 to Bridges Creek		Lower Fletcher Creek Reach 1		Lower Fletcher Creek Reach 2		Upper Stick Elliot Creek Reach 1		Upper Stick Elliott Creek Reach 5		Upper Stick Elliott Creek Reach 6		Upper Stick Elliott Creek UT2		Upper Stick Elliott Creek UT3		Upper Fletcher Creek Reach 2	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Shallow																								
Bankfull Width (ft)	6.4	8.2	5.2		9.3		N/A		12.3		9.9		6.7		15.9	18.4	16.7	18.3	7.9		7.2		11.5	12.0
Floodprone Width (ft)	19.0	19.6	14.0		23.6		N/A		26.4		28.4		37.2		169.2	178.4	148.5	192.7	25.0		63.8		72.0	99.5
Bankfull Mean Depth	0.6	0.7	0.5		0.4		N/A		0.8		0.6		0.7		1.0	1.2	1.1	1.2	0.5		0.5		0.8	0.8
Bankfull Max Depth	0.9	0.9	0.8		0.7		N/A		1.1		0.8		0.9		1.7	1.8	2.0	2.2	0.9		0.8		1.4	1.4
Bankfull Cross-sectional Area (ft^2)	4.1	5.6	2.5		3.3		N/A		9.7		6.3		4.7		18.9	19.2	19.1	22.4	3.8		3.7		9.2	9.5
Width/Depth Ratio	10.1	11.9	10.7		26.5		N/A		15.7		15.4		9.6		13.3	17.8	14.6	14.9	16.5		14.0		14.0	15.6
Entrenchment Ratio	2.4	2.9	2.7		2.5		N/A		2.1		2.9		5.5		9.2	10.9	8.9	10.5	3.2		8.8		6.0	8.6
Bank Height Ratio	1.0	1.0	1.0		1.0		N/A		1.0		1.0		1.0		1.0	1.0	1.0	1.0	1.0		1.0		1.0	1.0
D_{50} (mm)	32	42	31		53.7		N/A		35.3		11.0		32.0		35.0	39.8	41.1	46.1	14.9		14.4		39.1	54.8
Profile																								
Riffle Length (ft)	7	64	11	21	11	32	6	6	11	55	14	36	6	18	39	74	13	80	14	37	18	19	16	69
Riffle Slope (ft/ft)	0.0076	0.0712	0.0018	0.0429	0.0129	0.0576	0.0686	0.0862	0.0008	0.0466	0.0050	0.0396	0.0028	0.1323	0.0068	0.0218	0.0038	0.0653	0.0065	0.0167	0.0092	0.0257	0.0078	0.0631
Pool Length (ft)	10.98	73.26	12.42	18.46	6.36	34.19	8.56	8.56	10.61	44	17.92	53.39	3.72	55.52	14.68	66.89	14.35	79.03	18.84	51.34	8.77	14.02	13.89	63.47
Pool Max Depth (ft)	1.1	2.3	1.1	1.4	1.6	2.4	1.0	2.0	1.4	1.6	1.8	2.2	1.7	2.2	1.9	4.1	2.0	4.6	1.0	1.7	1.5	1.7	2.5	4.5
Pool Spacing (ft)	20	132	18	45	29	49	11	11	36	92	42	90	22	102	48	128	43	127	62	62	26	34	45	162
Pool Volume (ft^3)																								
Pattern																								
Channel Beltwidth (ft)	14	38	8	17	9	15	23	23	20	73	44		N/A	N/A	37	64	27	57	24	24	16	16	8	71
Radius of Curvature (ft)	8	42	15	20	10	19	19	19	12	50	53	79	N/A	N/A	25	48	24	39	20	17	9	12	23	50
Rc:Bankfull Width (ft/ft)	1.3	5.1	2.9	3.8	1.1	2.0	N/A		1.0	4.1	5.4	8.0	N/A	N/A	1.6	2.6	1.4	2.2	2.5	2.2	1.3	1.7	2.0	4.2
Meander Length (ft)	46	156	48	69	68	80	51	51	73	138	201	201	N/A	N/A	128	200	160	193	54	54	32	32	92	195
Meander Width Ratio	2.2	4.6	1.4	3.3	1.0	1.6	N/A		1.6	5.9	4.4	0.0	N/A	N/A	2.3	3.5	1.6	3.1	3.1	3.1	2.2	2.2	0.7	5.9
Substrate, Bed and Transport Parameters																								
Ri%/Ru%/P%/G%/S%																								
SC%/Sa%/G%/C%/B%/Be%																								
d16/d35/d50/d84/d95/d100	0.59/1.78/6/101.2/ 151.8/180		SC/1/5.9/47/101.2/180		SC/0.16/1/90/135.5/180		N/A		0.36/0.69/1.8/57.9/ 110.1/180		0.27/0.69/4.4/40.5/ 128.7/362		SC/3.15/20.7/68.5/ 137/256		0.15/2.18/23.6/64/ 103.6/10		SC/0.61/3.3/60.4/ 113.8/180		SC/0.14/0.2/26.1/48/64		SC/SC/0.2/20.5/35.9/ 180		SC/0.63/10.4/55.9/ 104/180	
Reach Shear Stress (Competency) lb/ft^2	0.66		1.08		1.35		N/A		0.40		0.71		3.66		0.35		0.41		0.44		0.46		0.55	
Max part size (mm) mobilized at bankfull																								
Stream Power (Capacity) W/m^2																								
Additional Reach Parameters																								
Drainage Area (SM)	0.13		0.02		0.07		0.01		0.41		0.42		0.05		0.72		0.76		0.07		0.10		0.29	
Watershed Impervious Cover Estimate (%)	<10%																							
Rosgen Classification	C/E4		C/E4		C5		N/A		C5		C4		E4		C4		C4		C5		C5		C4	
Bankfull Velocity (fps)	3.2		3.7		2.9		N/A		3.1		3.4		8.5		3.4	3.8	3.8	4.1	2.4		2.1		3.3	3.6
Bankfull Discharge (cfs)	13.3		9.2		9.7		N/A		29.9		21.3		39.9		63.4	72.8	73.1	90.9	9.0		7.7		30.2	34.1
Q-NFF regression (2-yr)																								
Q-USGS extrapolation (1.2-yr)																								
Q-Mannings																								
Valley Slope (ft/ft)	0.0174		0.0302		0.0290		0.0580		0.0089		0.0150		N/A		0.0110		0.0115		0.0045		0.0150		N/A	
Channel Thalweg Length (ft)	1,121		141		376		55		574		427		409		1,228		1,070		154		118		1,407	
Sinuosity	1.1		1.1		1.0		1.0		1.1		1.0		1.0		1.2		1.1		1.4		1.3		1.2	
Bankfull/Channel Slope (ft/ft)	0.0150		0.0247		0.0308		0.0598		0.0092		0.0162		0.0837		0.0081		0.0093		0.0101		0.0105		0.0125	

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11e. Baseline Stream Data Summary
Area C
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Area C

		Pre-Restoration Condition				Design				As-Built/Baseline			
Parameter	**Gage**	**Lower Big Harris Creek Reach 1a/1b**		**Lower Big Harris Creek Reach 2**		**Lower Big Harris Creek Reach 1a/1b**		**Lower Big Harris Creek Reach 2**		**Lower Big Harris Creek Reach 1a/1b**		**Lower Big Harris Creek Reach 2**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Shallow													
Bankfull Width (ft)	N/A	25.2		25.2		26.0		27.0		26.20		26.70	
Floodprone Width (ft)		120.0		120.0		75.0	115.0	100.0	200.0	158		300	
Bankfull Mean Depth		2.4		2.4		2.1		2.2		1.9		1.7	
Bankfull Max Depth		3.6		3.6		2.9		3.0		3.0		2.8	
Bankfull Cross-sectional Area (ft^2)		60.5		60.5		54.4		58.5		49.4		46.0	
Width/Depth Ratio		10.5		10.5		12.4		12.5		13.9		15.5	
Entrenchment Ratio		4.8		4.8		2.9	4.4	3.7	7.4	6.0		11.2	
Bank Height Ratio		2.0		2.0		1.0		1.0		1.0		1.0	
D_{50} (mm)		---		---		---		---		32.0		87.4	
Profile													
Riffle Length (ft)	N/A					---		---		15	142	21	146
Riffle Slope (ft/ft)		0.0133	0.0512	0.0063	0.0177	---	0.0054	0.0054	0.0086	0.0055	0.0792	0.0019	0.0651
Pool Length (ft)						---		---		54.2	94.3	14.2	134.9
Pool Max Depth (ft)		4.1		3.2		6.0		6.2		3.9	6.2	4.6	6.0
Pool Spacing (ft)		200.0	250.0	410.0	480.0	185	240	150	250	116	218	37	291
Pool Volume (ft^3)													
Pattern													
Channel Beltwidth (ft)	N/A	75	120	85	125	53	112	110	145	58	105	80	117
Radius of Curvature (ft)		70	165	120	190	60	80	75	90	60	80	65	90
Rc:Bankfull Width (ft/ft)		2.8	6.5	4.8	7.5	2.3	3.1	2.8	3.3	2.3	3.1	2.4	3.4
Meander Length (ft)		350	450	250	300	290	440	344	420	157	419	236	396
Meander Width Ratio		3.0	4.8	3.4	5.0	2.0	4.3	4.1	5.4	2.2	4.0	3.0	4.4
Substrate, Bed and Transport Parameters													
Ri%/Ru%/P%/G%/S%	N/A												
SC%/Sa%/G%/C%/B%/Be%													
d16/d35/d50/d84/d95/d100		1.9/16/29/83/130/2048		1.9/16/29/83/130/2048						0.4/0.8/1.7/94/256/2048		0.2/0.3/5.6/94/256/2048	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		---		---	
Max part size (mm) mobilized at bankfull													
Stream Power (Capacity) W/m^2													
Additional Reach Parameters													
Drainage Area (SM)	N/A	3.19	3.36	3.50	3.88	3.36		3.88		3.36		3.88	
Watershed Impervious Cover Estimate (%)		<10%											
Rosgen Classification		E4	G4c	E4	G4c	C		C		C5		C4	
Bankfull Velocity (fps)		2.9		3.2		3.3		3.4		3.6		3.0	
Bankfull Discharge (cfs)		176		194		176		194		176		137	
Q-NFF regression (2-yr)		---		---									
Q-USGS extrapolation (1.2-yr)		190		211									
Q-Mannings		182	255	205	350								
Valley Slope (ft/ft)		0.0053		0.0053		0.0053		0.0053		0.0053		0.0053	
Channel Thalweg Length (ft)		894		987		820		967		820		967	
Sinuosity		1.0		1.0		1.1		1.1		1.1		1.1	
Bankfull/Channel Slope (ft/ft)		0.0050		0.0050		0.0048		0.0048		0.0039		0.0032	

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11f. Baseline Stream Data Summary
Big Harris Creek Mitigation Site
DMS Project No.739
Monitoring Year 2 - 2019

Parameter	Gage	Reference Reach Data																							
		Group Camp Tributary		UT to South Crowders		UT to Cane Creek		Boyd Branch		Spencer Creek		Box Creek		Hall Creek		Meadow Fork		UT to Gap Branch		UT to Kelly Branch		UT to Sandy Run		UT to Little Pine Trib 1	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Shallow																									
Bankfull Width (ft)	N/A	4.2	4.4	6.1	8.4	11.5	12.3	13.5		10.7	11.2	23.5		20.7	27.0	21.4		6.2		7.9		7.3	7.8	12.2	
Floodprone Width (ft)		8.6	10.6	26.0	31.0	31.0		37.0		60.0	114.0	76.0		34.0	39.0	---		20.9		9.1		12.2	15.6	72.0	
Bankfull Mean Depth		0.8	0.8	1.0	1.1	0.8	1.0	1.1		1.6	1.8	1.2		1.4	1.8	2.1		0.6		0.7		0.7	0.8	1.3	
Bankfull Max Depth		1.0	1.2	1.4		1.2	1.6	1.9		2.1	2.6	1.9		3.1		3.1		1.0		1.1		1.1	1.4	1.8	
Bankfull Cross-sectional Area (ft^2)		3.4	3.6	6.4	8.7	8.9	12.2	15.4		17.8	19.7	28.9		36.9		44.0		3.8		5.7		5.7	6.2	16.3	
Width/Depth Ratio		5.2	55.0	5.8	8.0	12.3	14.4	11.8		5.8	7.1	19.1		11.6	19.7	10.4		10.1		10.9		6.6	9.8	9.1	
Entrenchment Ratio		1.9	2.5	3.7	4.3	2.5	2.7	2.8		5.5	10.2+	3.3		1.4	1.6	>2.2		3.4		1.2		1.6	2.1	6.0	
Bank Height Ratio		1.0	1.0	1.4	2.1	---	---	1.0		1.0		1.5		2.1	2.2	1.1		1.0		2.5		1.7	2.6	1.0	
D50 (mm)																									
Riffle Length (ft)	N/A	---		---		---		---		---		---		---		---		---		---		---		---	
Riffle Slope (ft/ft)		0.0105	0.1218	0.0202	0.0664	0.0188	0.0704	0.015	0.028	0.013		0.0100	0.0770	0.008	0.02	0.2390		0.01	0.14	---		0.004	0.04	0.0600	0.0892
Pool Length (ft)		---		---		---		---		---		---		---		---		---		---		---		---	
Pool Max Depth (ft)		1.8	2.8	1.3	3	1.8	2.3	2.6		3.3		4.4		2.7	3.5	---		15.0		---		1.3	1.5	2.2	
Pool Spacing (ft)		9	58	28	63	27	73	260	345	71		29	88	35	108	---		3	4	---		9	55	26	81
Pool Volume (ft^3)																									
Pattern																									
Channel Beltwidth (ft)	N/A	16	17	81		102		230.0		38	41	62	88	35	41	---		---		18	34	24	60	---	
Radius of Curvature (ft)		8	12	9	20	23	38	50	180	1.3	1.4	1	2	1	4	---		---		8	26	14	29	---	
Rc:Bankfull Width (ft/ft)		---		---		---		---		---		---		---		---		---		---		---		---	
Meander Length (ft)		31	34	45	72	45	81	600	623	46	48	39	76	78	200	---		---		27	94	63	72	---	
Meander Width Ratio		3.6	3.8	9.6	13.3	8.3	8.9	17.0		3.4	3.6	2.6	3.7	1.5	1.7	---		---		2.3	4.3	3.3	7.6	---	
Substrate, Bed and Transport Parameters																									
Ri%/Ru%/P%/G%/S%	N/A																								
SC%/Sa%/G%/C%/B%/Be%																									
d16/d35/d50/d84/d95/d100		0.1/0.3/16/55.6/---		0.8/12.1/19.7/49.5/75.9/---		0.6/12.2/27.8/74.5/128/---		---		<0.063/3/8.8/42/90/---		41/11/22/50/78/--		<0.063/1/13/70/110/---		69/16/31/120/230/ ---		0.4/8/19/102.3/256/---		---		0.062/1/19/76/150/---		<0.063/2.4/22.6/120/256	
Reach Shear Stress (Competency) lb/ft^2																									
Max part size (mm) mobilized at bankfull																									
Stream Power (Capacity) W/m^2																									
Additional Reach Parameters																									
Drainage Area (SM)	N/A	0.10		0.22		0.29		0.90		0.96		2.13		4.09		4.37		0.04		0.08		0.15		1.10	
Watershed Impervious Cover Estimate (%)		---		---		---		---		---		---		---		---		---		---		---		---	
Rosgen Classification		E5b		E4		E4		E4		E4		C4		B4c		E4		B4a		A4		E4		E4b	
Bankfull Velocity (fps)		3.4	3.6	4		3.8		3.2		4.9	5.4	3.3		4.3		5.1		5		6.2		3.2		5.5	
Bankfull Discharge (cfs)		12		30		40		51		97		94.9		159		224		18.7		23.2		19		85	
Q-NFF regression (2-yr)		---				---				---				---				---				---			
Q-USGS extrapolation (1.2-yr)		---				---				---				---				---				---			
Q-Mannings		---				---				---				---				---				---			
Valley Length (ft)		---		---		---		---		---		---		---		---		---		---		---		---	
Channel Thalweg Length (ft)		---		---		---		---		---		---		---		---		---		---		---		---	
Sinuosity		1.60		2.20		1.40		1.40		1.30		1.30		1.04		---		1.12		1.19		1.60		1.10	
Water Surface Slope $(ft/ft)^2$		---		---		---		---		---		---		---		---		---		---		---		---	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		---		---		---		---		---	

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 12a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

AREA A

	Cross-Section 1, UBHC R2A (Riffle)						Cross-Section 2, UBHC R2a (Pool)						Cross-Section 3, UBHC R2B (Pool)						Cross-Section 4, UBHC R2B (Riffle)						Cross-Section 5, UBHC R4 (Pool)[2]					
Dimension[1] and Substrate	Base (3/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (11/2018)	MY2 (09/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (11/2018)	MY2 (09/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3	MY4	MY5
Bankfull Elevation (ft)	929.2	929.0	929.2				928.7	928.7	928.7				921.0	921.2	921.1				920.8	921.0	920.5				900.1	900.2	899.9			
Low Bank Elevation (ft)	929.2	929.0	929.2				928.7	928.7	928.7				921.0	921.2	921.1				920.8	921.0	920.5				900.1	900.2	899.9			
Bankfull Width (ft)	16.0	10.4	13.4				13.5	12.2	13.3				12.0	16.1	15.2				11.3	18.2	13.8				17.0	19.2	11.9			
Floodprone Width (ft)	108.7	104.1	89.3				N/A	N/A	N/A				N/A	N/A	N/A				170.3	118.6	63.4				N/A	N/A	N/A			
Bankfull Mean Depth (ft)	0.7	0.6	0.6				1.4	0.9	1.2				1.2	1.7	1.8				1.6	2.4	1.3				1.4	1.1	1.4			
Bankfull Max Depth (ft)	1.5	1.4	1.9				3.1	1.7	2.8				1.9	4.0	3.7				3.0	4.2	2.4				2.7	2.7	2.7			
Bankfull Cross-Sectional Area (ft)	11.6	6.6	8.2				19.3	11.0	16.5				14.0	27.0	27.2				17.7	44.1	18.4				23.5	20.6	17.2			
Bankfull Width/Depth Ratio	22.0	16.5	21.7				N/A	N/A	N/A				N/A	N/A	N/A				7.3	7.5	10.4				N/A	N/A	N/A			
Bankfull Entrenchment Ratio[3]	6.8	10.0	6.7				N/A	N/A	N/A				N/A	N/A	N/A				15.0	6.5	4.6				N/A	N/A	N/A			
Bankfull Bank Height Ratio	1.0	0.8	0.9				N/A	N/A	N/A				N/A	N/A	N/A				1.0	1.8	1.0				N/A	N/A	N/A			

	Cross-Section 6, UBHC R4 (Riffle)						Cross-Section 7, UBHC R4 (Riffle)						Cross-Section 8, UBHC R4 (Pool)						Cross-Section 9, Royster Cr R1 (Riffle)						Cross-Section 10, Royster Cr R1 (Pool)					
Dimension[1] and Substrate	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5
Bankfull Elevation (ft)	899.7	899.7	899.7				896.5	896.5	896.6				896.0	895.9	895.8				965.0	965.0	965.0				961.5	961.4	961.3			
Low Bank Elevation (ft)	899.7	899.7	899.7				896.5	896.5	896.6				896.0	895.9	895.8				965.0	965.0	965.0				961.5	961.4	961.3			
Bankfull Width (ft)	15.5	16.2	14.9				16.0	15.7	15.4				20.9	16.9	15.6				10.0	9.4	8.3				12.3	11.2	8.8			
Floodprone Width (ft)	118.0	110.8	119.2				190.0	167.4	137.2				N/A	N/A	N/A				46.7	46.1	39.5				N/A	N/A	N/A			
Bankfull Mean Depth (ft)	0.8	0.6	0.8				1.1	0.9	1.1				1.5	1.8	1.5				0.4	0.4	0.2				0.9	0.9	0.8			
Bankfull Max Depth (ft)	1.4	1.3	1.5				2.0	2.0	2.0				3.3	3.7	3.0				0.8	0.8	0.4				1.9	1.8	1.7			
Bankfull Cross-Sectional Area (ft)	13.1	10.5	12.0				17.6	14.7	17.7				31.6	31.0	22.8				3.6	3.7	1.8				11.0	9.7	7.4			
Bankfull Width/Depth Ratio	18.3	25.1	18.4				14.5	16.6	13.4				N/A	N/A	N/A				27.6	24.1	39.0				N/A	N/A	N/A			
Bankfull Entrenchment Ratio[3]	7.6	6.8	8.0				11.9	10.7	8.9				N/A	N/A	N/A				4.7	4.9	4.8				N/A	N/A	N/A			
Bankfull Bank Height Ratio	1.0	0.9	1.0				1.0	0.9	1.0				N/A	N/A	N/A				1.0	1.0	0.7				N/A	N/A	N/A			

	Cross-Section 11, Scott Cr (Riffle)						Cross-Section 12, Scott Cr (Pool)						Cross-Section 13, Carroll Cr R1 (Riffle)						Cross-Section 14, Carroll Cr R1 (Pool)					
Dimension[1] and Substrate	Base (4/2018)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3	MY4	MY5
Bankfull Elevation (ft)	894.8	894.7	894.8				890.1	890.2	890.0				862.2	862.2	862.2				861.6	861.4	861.9			
Low Bank Elevation (ft)	894.8	894.7	894.8				890.1	890.2	890.0				862.2	862.2	862.2				861.6	861.4	861.9			
Bankfull Width (ft)	6.8	8.7	13.6				13.7	13.9	12.5				11.4	11.3	8.6				12.7	10.2	11.5			
Floodprone Width (ft)	67.1	44.8	45.2				N/A	N/A	N/A				82.0	82.1	71.2				N/A	N/A	N/A			
Bankfull Mean Depth (ft)	0.5	0.6	1.3				1.1	0.9	1.1				0.7	0.6	0.6				1.1	0.9	0.8			
Bankfull Max Depth (ft)	0.9	1.2	2.2				2.1	1.7	2.1				1.3	1.2	1.1				2.0	1.8	1.9			
Bankfull Cross-Sectional Area (ft)	3.6	5.1	18.1				14.9	12.2	13.4				7.9	7.0	4.9				13.4	9.4	9.4			
Bankfull Width/Depth Ratio	12.7	15.0	10.2				N/A	N/A	N/A				16.4	18.2	15.0				N/A	N/A	N/A			
Bankfull Entrenchment Ratio[3]	9.9	5.1	3.3				N/A	N/A	N/A				7.2	7.3	8.3				N/A	N/A	N/A			
Bankfull Bank Height Ratio	1.0	1.2	2.6				N/A	N/A	N/A				1.0	0.9	0.8				N/A	N/A	N/A			

[1] MY0 bankfull dimensions were calculated using a fixed bankfull elevation. Beginning in MY1 Bank Height Ratios are calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by NCIRT and NCDMS (2018).

[2] The bankfull elevation at cross-section 5 was set too high in the baseline report. The baseline bankfull elevation was updated in MY1.

[3] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins

Table 12b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

AREA B

	Cross-Section 15, USEC R1 (Riffle)						Cross-Section 16, USEC R5 (Pool)						Cross-Section 17, USEC R5 (Riffle)						Cross-Section 18, USEC R5 (Riffle)						Cross-Section 19, USEC R5 (Pool)						Cross-Section 20, USEC R5 (Riffle)					
Dimension[1] and Substrate	Base (4/2018)	MY1 (11/2018)[1]	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5
Bankfull Elevation (ft)	979.1	979.1	979.1				934.0	934.0	933.9				932.1	932.1	932.0				930.9	930.7	931.0				928.9	928.7	928.8				925.7	925.6	925.5			
Low Bank Elevation (ft)	979.1	979.1	979.1				934.0	934.0	933.9				932.1	932.1	932.0				930.9	930.7	931.0				928.9	928.7	928.8				925.7	925.6	925.5			
Bankfull Width (ft)	6.7	7.7	7.8				17.4	18.0	17.2				18.4	18.3	15.6				18.1	16.4	17.2				20.8	20.9	20.1				15.9	16.6	14.6			
Floodprone Width (ft)	37.2	37.0	35.8				N/A	N/A	N/A				169.2	167.8	93.6				172.1	166.3	86.0				N/A	N/A	N/A				173.2	191.0	108.0			
Bankfull Mean Depth (ft)	0.7	0.6	0.6				1.5	1.2	1.1				1.0	1.0	0.9				1.1	1.0	1.0				1.9	1.6	1.1				1.2	1.1	1.0			
Bankfull Max Depth (ft)	0.9	0.9	1.0				2.3	2.1	1.7				1.7	1.7	1.6				1.7	1.5	1.8				3.5	3.9	2.4				1.8	1.8	1.8			
Bankfull Cross-Sectional Area (ft)	4.7	4.8	4.7				26.3	22.0	18.5				19.2	18.4	14.0				19.1	16.1	17.5				39.3	34.3	21.5				18.9	18.2	13.9			
Bankfull Width/Depth Ratio	9.6	12.3	12.7				N/A	N/A	N/A				17.8	18.1	17.5				17.2	16.7	17.0				N/A	N/A	N/A				13.3	15.1	15.2			
Bankfull Entrenchment Ratio[2]	5.5	4.8	4.6				N/A	N/A	N/A				9.2	9.2	6.0				9.5	10.2	5.0				N/A	N/A	N/A				10.9	11.5	7.4			
Bankfull Bank Height Ratio	1.0	1.0	1.0				N/A	N/A	N/A				1.0	1.0	0.8				1.0	0.9	0.9				N/A	N/A	N/A				1.0	1.0	0.8			

	Cross-Section 21, USEC R6 (Pool)						Cross-Section 22, USEC R6 (Riffle)						Cross-Section 23, USEC R6 (Riffle)						Cross-Section 24, Elliott Cr (Riffle)						Cross-Section 25, Elliott Cr (Pool)						Cross-Section 26, Elliott Cr (Riffle)					
Dimension[1] and Substrate	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3	MY4	MY5
Bankfull Elevation (ft)	919.8	919.8	919.9				919.4	919.3	919.4				917.5	917.6	917.5				972.1	972.2	972.2				970.5	970.5	970.6				970.1	970.1	970.1			
Low Bank Elevation (ft)	919.8	919.8	919.9				919.4	919.3	919.4				917.5	917.6	917.5				972.1	972.2	972.2				970.5	970.5	970.6				970.1	970.1	970.1			
Bankfull Width (ft)	21.8	22.3	21.9				18.3	16.3	19.8				16.7	16.2	16.3				6.4	7.1	7.9				7.6	8.9	10.6				8.2	8.6	8.8			
Floodprone Width (ft)	N/A	N/A	N/A				192.7	221.2	83.2				148.5	130.5	81.6				19.0	21.6	19.8				N/A	N/A	N/A				19.6	18.3	18.2			
Bankfull Mean Depth (ft)	2.1	1.7	1.9				1.2	1.2	1.2				1.1	1.2	1.2				0.6	0.6	0.5				1.5	0.9	1.2				0.7	0.6	0.6			
Bankfull Max Depth (ft)	5.2	3.8	4.2				2.2	2.6	2.5				2.0	2.2	2.5				0.9	1.0	0.9				1.9	1.5	2.0				0.9	0.9	1.1			
Bankfull Cross-Sectional Area (ft)	45.1	38.4	42.1				22.4	19.4	22.9				19.1	20.0	18.8				4.1	4.1	4.2				11.2	8.0	12.2				5.6	5.1	5.0			
Bankfull Width/Depth Ratio	N/A	N/A	N/A				14.9	13.7	17.1				14.6	13.1	14.1				10.1	12.3	14.9				N/A	N/A	N/A				11.9	14.5	15.6			
Bankfull Entrenchment Ratio[2]	N/A	N/A	N/A				10.5	13.6	4.2				8.9	8.1	5.0				2.9	3.0	2.5				N/A	N/A	N/A				2.4	2.1	2.1			
Bankfull Bank Height Ratio	N/A	N/A	N/A				1.0	0.9	1.0				1.0	1.0	1.0				1.0	1.0	1.0				N/A	N/A	N/A				1.0	1.0	0.9			

[1] MY0 bankfull dimensions were calculated using a fixed bankfull elevation. Beginning in MY1 Bank Height Ratios are calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by NCIRT and NCDMS (2018).

[2] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins

Table 12c. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

AREA B

	Cross-Section 27, UT to Elliott Cr (Riffle)						Cross-Section 28, Bridges Cr (Riffle)						Cross-Section 29, USEC UT2 (Riffle)						Cross-Section 30, USEC UT3 (Riffle)[3]						Cross-Section 31, UFC R2 (Riffle)						Cross-Section 32, UFC R2 (Pool)					
Dimension[1] and Substrate	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (10/2017)	MY1	MY2 (08/2019)	MY3	MY4	MY5
Bankfull Elevation (ft)	976.8	976.7	976.7				966.8	966.7	966.7				926.9	926.9	927.1				926.9	926.9	926.9				969.5	969.5	969.6				969.1	969.2	969.0			
Low Bank Elevation (ft)	976.8	976.7	976.7				966.8	966.7	966.7				926.9	926.9	927.1				926.9	926.9	926.9				969.5	969.5	969.6				969.1	969.2	969.0			
Bankfull Width (ft)	5.2	4.9	5.5				9.3	6.4	6.5				7.9	8.1	6.7				7.2	7.4	7.9				11.4	11.2	11.5				12.3	13.6	11.8			
Floodprone Width (ft)	14.0	14.2	13.3				23.6	21.1	20.4				25.0	26.0	23.0				63.8	62.8	45.3				91.8	91.7	77.7				N/A	N/A	N/A			
Bankfull Mean Depth (ft)	0.5	0.5	0.4				0.4	0.4	0.3				0.5	0.4	0.3				0.5	0.5	0.4				0.7	0.7	0.7				1.4	1.3	1.0			
Bankfull Max Depth (ft)	0.8	0.9	0.8				0.7	0.6	0.6				0.9	0.9	0.6				0.8	0.8	0.7				1.1	1.1	1.1				2.6	2.7	1.8			
Bankfull Cross-Sectional Area (ft^2)	2.5	2.5	2.5				3.3	2.4	2.2				3.8	3.5	2.0				3.7	3.6	3.3				8.2	7.8	7.9				17.1	18.0	11.8			
Bankfull Width/Depth Ratio	10.7	9.7	12.4				26.5	17.2	19.3				16.5	18.6	22.5				14.0	15.5	18.6				15.7	16.0	16.8				N/A	N/A	N/A			
Bankfull Entrenchment Ratio[5]	2.7	2.9	2.4				2.5	3.3	3.1				3.2	3.2	3.4				8.8	8.4	5.8				8.1	8.2	6.7				N/A	N/A	N/A			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	0.8	0.8				1.0	1.0	0.7				1.0	1.0	0.9				1.0	1.0	1.0				N/A	N/A	N/A			

	Cross-Section 33, UFC R2 (Pool)						Cross-Section 34, UFC R2 (Riffle)						Cross-Section 35, UFC R2 (Riffle)[3]						Cross-Section 36, UFC R2 (Pool)						Cross-Section 37, LFC R1 (Riffle)[2]						Cross-Section 38, LFC R1 (Pool)[3]					
Dimension[1] and Substrate	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1	MY2 (06/2019)	MY3	MY4	MY5
Bankfull Elevation (ft)	965.9	966.0	965.9				965.5	965.5	965.5				960.5	960.4	960.5				960.1	960.1	960.1				919.4	919.3	919.5				918.9	918.8	919.3			
Low Bank Elevation (ft)	965.9	966.0	965.9				965.5	965.5	965.5				960.5	960.4	960.5				960.1	960.1	960.1				919.4	919.3	919.5				918.9	918.8	919.3			
Bankfull Width (ft)	13.2	13.4	13.2				12.0	12.3	12.5				11.5	11.7	12.6				14.7	14.2	14.2				12.3	12.8	13.3				11.2	10.5	12.4			
Floodprone Width (ft)	N/A	N/A	N/A				72.0	69.1	70.6				99.5	96.4	85.5				N/A	N/A	N/A				26.4	25.3	27.3				N/A	N/A	N/A			
Bankfull Mean Depth (ft)	1.2	1.2	1.0				0.8	0.7	0.7				0.8	0.8	0.7				1.5	1.3	1.3				0.8	0.7	1.0				0.7	0.6	1.0			
Bankfull Max Depth (ft)	2.3	2.3	1.9				1.4	1.2	1.4				1.4	1.4	1.4				2.8	2.8	2.7				1.1	1.0	1.3				1.1	1.0	1.5			
Bankfull Cross-Sectional Area (ft^2)	16.1	15.7	13.2				9.2	8.1	8.3				9.5	9.4	9.1				21.5	18.5	17.7				9.7	9.6	12.8				7.7	6.5	12.4			
Bankfull Width/Depth Ratio	N/A	N/A	N/A				15.6	18.7	18.9				14.0	14.7	17.3				N/A	N/A	N/A				15.7	17.1	13.8				N/A	N/A	N/A			
Bankfull Entrenchment Ratio[5]	N/A	N/A	N/A				6.0	5.6	5.6				8.6	8.2	6.8				N/A	N/A	N/A				2.1	2.0	2.1				N/A	N/A	N/A			
Bankfull Bank Height Ratio	N/A	N/A	N/A				1.0	0.9	1.0				1.0	1.0	1.0				N/A	N/A	N/A				1.0	1.0	1.2				N/A	N/A	N/A			

	Cross-Section 39, LFC R2 (Riffle)[4]						Cross-Section 40, LFC R2 (Pool)					
Dimension[1] and Substrate	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3	MY4	MY5
Bankfull Elevation (ft)	915.9	915.9	915.9				916.0	915.9	915.9			
Low Bank Elevation (ft)	915.9	915.9	915.9				916.0	915.9	915.9			
Bankfull Width (ft)	9.9	9.8	9.1				11.5	10.9	10.4			
Floodprone Width (ft)	28.4	28.6	29.6				N/A	N/A	N/A			
Bankfull Mean Depth (ft)	0.6	0.5	0.6				1.0	0.9	1.2			
Bankfull Max Depth (ft)	0.8	0.9	1.2				1.5	1.3	1.8			
Bankfull Cross-Sectional Area (ft^2)	6.3	4.6	5.9				11.8	9.6	12.1			
Bankfull Width/Depth Ratio	15.4	20.5	14.2				N/A	N/A	N/A			
Bankfull Entrenchment Ratio[5]	2.9	2.9	3.2				N/A	N/A	N/A			
Bankfull Bank Height Ratio	1.0	0.8	1.0				N/A	N/A	N/A			

AREA C

	Cross-Section 41, LBHC R1A (Pool)						Cross-Section 42, LBHC R1A (Riffle)[3]						Cross-Section 43, LBHC R1B/2 (Riffle)[2]						Cross-Section 44, LBHC R1B/2 (Pool)					
Dimension[1] and Substrate	Base (9/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (9/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (9/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5	Base (9/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3	MY4	MY5
Bankfull Elevation (ft)	848.0	847.5	847.9				847.6	847.5	847.8				844.2	844.2	844.2				843.5	843.7	843.5			
Low Bank Elevation (ft)	848.0	847.5	847.9				847.6	847.5	847.8				844.2	844.2	844.2				843.5	843.7	843.5			
Bankfull Width (ft)	41.6	24.0	24.7				26.2	25.7	28.3				26.7	27.2	29.4				26.8	27.2	30.8			
Floodprone Width (ft)	N/A	N/A	N/A				158.0	155.7	77.9				299.6	171.0	84.9				N/A	N/A	N/A			
Bankfull Mean Depth (ft)	2.5	1.4	1.7				1.9	1.5	1.7				1.7	1.9	2.1				2.8	3.3	2.4			
Bankfull Max Depth (ft)	5.8	2.6	3.2				3.0	2.9	3.3				2.8	3.3	3.6				5.5	7.8	4.2			
Bankfull Cross-Sectional Area (ft^2)	104.7	33.5	42.8				49.4	38.7	49.3				46.0	51.5	60.8				75.4	91.0	75.2			
Bankfull Width/Depth Ratio	N/A	N/A	N/A				13.9	17.1	16.2				15.5	14.3	14.2				N/A	N/A	N/A			
Bankfull Entrenchment Ratio[5]	N/A	N/A	N/A				6.0	6.1	2.8				11.2	6.3	2.9				N/A	N/A	N/A			
Bankfull Bank Height Ratio	N/A	N/A	N/A				1.0	0.9	1.0				1.0	1.1	1.2				N/A	N/A	N/A			

[1] MY0 bankfull dimensions were calculated using a fixed bankfull elevation. Beginning in MY1 Bank Height Ratios are calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by NCIRT and NCDMS (2018).

[2] The floodprone width and entrenchment ratio at cross-section 37 and 43 were miscalculated during MY0. Both measurements were updated in MY1.

[3] The bankfull (low bank) elevations were recorded incorrectly at cross-section 30, 35, 38, and 42 during MY0; therefore, subsequent cross-sectional data calculations were incorrect. MY0 data was updated in MY1

[4] The Floodprone width for Cross-section 39 was incorrectly recorded MY0 and was updated in MY1.

[5] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pin

Table 13a. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

UBHC R2A (STA. 129+81 - 136+66)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	16.0		10.4		13.4							
Floodprone Width (ft)	108.7		104.1		89.3							
Bankfull Mean Depth	0.7		0.6		0.6							
Bankfull Max Depth	1.5		1.4		1.9							
Bankfull Cross-Sectional Area (ft2)	11.6		6.6		8.2							
Width/Depth Ratio	22.0		16.5		21.7							
Entrenchment Ratio[1]	6.8		10		6.7							
Bank Height Ratio[2]	1.0		0.8		0.9							
D50 (mm)	44.2		30.6		52.4							
Profile												
Riffle Length (ft)	11	40										
Riffle Slope (ft/ft)	0.001	0.052										
Pool Length (ft)	10	59										
Pool Max Depth (ft)	1.9	3.3										
Pool Spacing (ft)	29	75										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	13	31										
Radius of Curvature (ft)	18	26										
Rc:Bankfull Width (ft/ft)	1.1	1.6										
Meander Wave Length (ft)	74	102										
Meander Width Ratio	0.8	1.9										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	685											
Sinuosity (ft)	1.14											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.015											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.66/2.37/16.6/79.2/146.7/362											
% of Reach with Eroding Banks	0%		3%		1%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13b. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

UBHC R2B (STA. 136+66 - 139+15)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	11.3		18.2		13.8							
Floodprone Width (ft)	170.3		118.6		63.4							
Bankfull Mean Depth	1.6		2.4		1.3							
Bankfull Max Depth	3.0		4.2		2.4							
Bankfull Cross-Sectional Area (ft2)	17.7		44.1		18.4							
Width/Depth Ratio	7.3		7.5		10.4							
Entrenchment Ratio[1]	15.0		6.5		4.6							
Bank Height Ratio[2]	1.0		1.8		1.0							
D50 (mm)	83.8		1.4		0.8							
Profile												
Riffle Length (ft)	8	39										
Riffle Slope (ft/ft)	0.022	0.063										
Pool Length (ft)	10	47										
Pool Max Depth (ft)	2.6	3.4										
Pool Spacing (ft)	21	79										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	20	35										
Radius of Curvature (ft)	30	34										
Rc:Bankfull Width (ft/ft)	2.7	3.0										
Meander Wave Length (ft)	108	125										
Meander Width Ratio	1.8	3.1										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	249											
Sinuosity (ft)	1.14											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.015											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.66/2.37/16.6/79.2/146.7/362											
% of Reach with Eroding Banks	0%		14%		3%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13c. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

UBHC R4 (STA. 148+76 - 159+15)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	15.5	16.0	15.7	16.2	14.9	15.4						
Floodprone Width (ft)	118.0	190.0	110.8	167.4	119.2	137.2						
Bankfull Mean Depth	0.8	1.1	0.6	0.9	0.8	1.1						
Bankfull Max Depth	1.4	2.0	1.3	2.0	1.5	2.0						
Bankfull Cross-Sectional Area (ft2)	13.1	17.6	10.5	14.7	12.0	17.7						
Width/Depth Ratio	14.5	18.3	16.6	25.1	13.4	18.4						
Entrenchment Ratio[1]	7.6	11.9	6.8	10.7	8.0	8.9						
Bank Height Ratio[2]	1.0	1.0	0.9	0.9	1.0	1.0						
D50 (mm)	46.2	85.6	26.9	32	50.6	69.7						
Profile												
Riffle Length (ft)	19	56										
Riffle Slope (ft/ft)	0.012	0.052										
Pool Length (ft)	33	73										
Pool Max Depth (ft)	2.4	3.8										
Pool Spacing (ft)	62	125										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	19	67										
Radius of Curvature (ft)	27	60										
Rc:Bankfull Width (ft/ft)	1.7	3.8										
Meander Wave Length (ft)	122	178										
Meander Width Ratio	1.2	4.2										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	1,296											
Sinuosity (ft)	1.36											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.013											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.3/6.69/29.8/87/ 202.4/512											
% of Reach with Eroding Banks	0%		5%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13d. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

Royster Creek R1 (STA. 802+54 - 807+13)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	10.0		9.4		8.3							
Floodprone Width (ft)	46.7		46.1		39.5							
Bankfull Mean Depth	0.4		0.4		0.2							
Bankfull Max Depth	0.8		0.8		0.4							
Bankfull Cross-Sectional Area (ft2)	3.6		3.7		1.8							
Width/Depth Ratio	27.6		24.1		39.0							
Entrenchment Ratio[1]	4.7		4.9		4.8							
Bank Height Ratio[2]	1.0		1.0		0.7							
D50 (mm)	43.5		35.4		44.4							
Profile												
Riffle Length (ft)	7	42										
Riffle Slope (ft/ft)	0.007	0.057										
Pool Length (ft)	7	71										
Pool Max Depth (ft)	1.6	2.5										
Pool Spacing (ft)	38	70										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	9	18										
Radius of Curvature (ft)	21	41										
Rc:Bankfull Width (ft/ft)	2.1	4.1										
Meander Wave Length (ft)	95	125										
Meander Width Ratio	0.9	1.8										
Additional Reach Parameters												
Rosgen Classification	B/C4											
Channel Thalweg Length (ft)	459											
Sinuosity (ft)	1.05											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.040											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	SC/2/11/71.7/98.3/256											
% of Reach with Eroding Banks	0%		0%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13e. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Scott Creek (STA. 1210+12 - 1216+74)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	6.8		8.7		13.6							
Floodprone Width (ft)	67.1		44.8		45.2							
Bankfull Mean Depth	0.5		0.6		1.3							
Bankfull Max Depth	0.9		1.2		2.2							
Bankfull Cross-Sectional Area (ft2)	3.6		5.1		18.1							
Width/Depth Ratio	12.7		15.0		10.2							
Entrenchment Ratio[1]	9.9		5.1		3.3							
Bank Height Ratio[2]	1.0		1.2		2.6							
D50 (mm)	51.6		33.3		49.5							
Profile												
Riffle Length (ft)	22	47										
Riffle Slope (ft/ft)	0.016	0.042										
Pool Length (ft)	6	138										
Pool Max Depth (ft)	1.9	5.2										
Pool Spacing (ft)	17	69										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	25	45										
Radius of Curvature (ft)	11	28										
Rc:Bankfull Width (ft/ft)	1.6	4.1										
Meander Wave Length (ft)	30	59										
Meander Width Ratio	3.7	6.6										
Additional Reach Parameters												
Rosgen Classification	B/C4											
Channel Thalweg Length (ft)	644											
Sinuosity (ft)	1.10											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.038											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.21/24.23/39.8/ 99.5/160.7/512											
% of Reach with Eroding Banks	0%		4%		2%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13f. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

Carroll Creek (STA. 1301+68 - 1307+63)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	11.4		11.3		8.6							
Floodprone Width (ft)	82.0		82.1		71.2							
Bankfull Mean Depth	0.7		0.6		0.6							
Bankfull Max Depth	1.3		1.2		1.1							
Bankfull Cross-Sectional Area (ft2)	7.9		7.0		4.9							
Width/Depth Ratio	16.4		18.2		15.0							
Entrenchment Ratio[1]	7.2		7.3		8.3							
Bank Height Ratio[2]	1.0		0.9		0.8							
D50 (mm)	51		41.3		42.6							
Profile												
Riffle Length (ft)	14	65										
Riffle Slope (ft/ft)	0.008	0.036										
Pool Length (ft)	18	50										
Pool Max Depth (ft)	1.9	2.8										
Pool Spacing (ft)	45	67										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	26	45										
Radius of Curvature (ft)	15	29										
Rc:Bankfull Width (ft/ft)	1.3	2.5										
Meander Wave Length (ft)	89	139										
Meander Width Ratio	2.2	3.9										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	590											
Sinuosity (ft)	1.15											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.017											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.28/2/10.2/59.6/ 101.2/180											
% of Reach with Eroding Banks	0%		0%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13g. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

USEC R1 (STA. 1002+89 - 1006+98)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	6.7		7.7		7.8							
Floodprone Width (ft)	37.2		37.0		35.8							
Bankfull Mean Depth	0.7		0.6		0.6							
Bankfull Max Depth	0.9		0.9		1.0							
Bankfull Cross-Sectional Area (ft2)	4.7		4.8		4.7							
Width/Depth Ratio	9.6		12.3		12.7							
Entrenchment Ratio[1]	5.5		4.8		4.6							
Bank Height Ratio[2]	1.0		1.0		1.0							
D50 (mm)	32.0		36.5		33.6							
Profile												
Riffle Length (ft)	6	18										
Riffle Slope (ft/ft)	0.003	0.132										
Pool Length (ft)	4	56										
Pool Max Depth (ft)	1.7	2.2										
Pool Spacing (ft)	22	102										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	---	---										
Radius of Curvature (ft)	---	---										
Rc:Bankfull Width (ft/ft)	---	---										
Meander Wave Length (ft)	---	---										
Meander Width Ratio	---	---										
Additional Reach Parameters												
Rosgen Classification	E4											
Channel Thalweg Length (ft)	409											
Sinuosity (ft)	1.00											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.084											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	SC/3.15/20.7/68.5/ 137/256											
% of Reach with Eroding Banks	0%		8%		4%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13h. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

USEC R5 (STA. 1043+77 - 1058+84)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	15.9	18.4	16.4	18.3	14.6	17.2						
Floodprone Width (ft)	169.2	173.2	166.3	191.0	86.0	108.0						
Bankfull Mean Depth	1.0	1.2	1.0	1.1	0.9	1.0						
Bankfull Max Depth	1.7	1.8	1.5	1.8	1.6	1.8						
Bankfull Cross-Sectional Area (ft2)	18.9	19.2	16.1	18.4	13.9	17.5						
Width/Depth Ratio	13.3	17.8	15.1	18.1	15.2	17.5						
Entrenchment Ratio[1]	9.2	10.9	9.2	11.5	5.0	7.4						
Bank Height Ratio[2]	1.0	1.0	0.8	1.0	0.8	0.9						
D50 (mm)	35.0	39.8	32.0	35.3	30.4	43.1						
Profile												
Riffle Length (ft)	39	74										
Riffle Slope (ft/ft)	0.007	0.022										
Pool Length (ft)	15	67										
Pool Max Depth (ft)	1.9	4.1										
Pool Spacing (ft)	48	128										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	37	64										
Radius of Curvature (ft)	25	48										
Rc:Bankfull Width (ft/ft)	1.6	2.6										
Meander Wave Length (ft)	128	200										
Meander Width Ratio	2.3	3.5										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	1,228											
Sinuosity (ft)	1.23											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.008											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.15/2.18/23.6/64/ 103.6/10											
% of Reach with Eroding Banks	0%		1%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13i. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

USEC R6 (STA. 1059+14 - 1069+83)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	16.7	18.3	16.2	16.3	16.3	19.8						
Floodprone Width (ft)	148.5	192.7	130.5	221.2	81.6	83.2						
Bankfull Mean Depth	1.1	1.2	1.2	1.2	1.2	1.2						
Bankfull Max Depth	2.0	2.2	2.2	2.6	2.5	2.5						
Bankfull Cross-Sectional Area (ft)	19.1	22.4	19.4	20.0	18.8	22.9						
Width/Depth Ratio	14.6	14.9	13.1	13.7	14.1	17.1						
Entrenchment Ratio[1]	8.9	10.5	8.1	13.6	4.2	5.0						
Bank Height Ratio[2]	1.0	1.0	0.9	1.0	1.0	1.0						
D50 (mm)	41.1	46.1	26.9	34	27.3	50.9						
Profile												
Riffle Length (ft)	13	80										
Riffle Slope (ft/ft)	0.004	0.065										
Pool Length (ft)	14	79										
Pool Max Depth (ft)	2.0	4.6										
Pool Spacing (ft)	43	127										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	27	57										
Radius of Curvature (ft)	24	39										
Rc:Bankfull Width (ft/ft)	1.4	2.2										
Meander Wave Length (ft)	160	193										
Meander Width Ratio	1.6	3.1										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	1,070											
Sinuosity (ft)	1.13											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.009											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	SC/0.61/3.3/60.4/ 113.8/180											
% of Reach with Eroding Banks	0%		4%		1%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13j. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

Elliott Creek (STA. 1400+85 - 1412+06)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	6.4	8.2	7.1	8.6	7.9	8.8						
Floodprone Width (ft)	19.0	19.6	18.3	21.6	18.2	19.8						
Bankfull Mean Depth	0.6	0.7	0.6	0.6	0.5	0.6						
Bankfull Max Depth	0.9	0.9	0.9	1.0	0.9	1.1						
Bankfull Cross-Sectional Area (ft)	4.1	5.6	4.1	5.1	4.2	5.0						
Width/Depth Ratio	10.1	11.9	12.3	14.5	14.9	15.6						
Entrenchment Ratio[1]	2.4	2.9	2.1	3.0	2.1	2.5						
Bank Height Ratio[2]	1.0	1.0	1.0	1.0	0.9	1.0						
D50 (mm)	32.0	41.7	23.9	49.1	46.9	75.9						
Profile												
Riffle Length (ft)	7	64										
Riffle Slope (ft/ft)	0.008	0.071										
Pool Length (ft)	11	73										
Pool Max Depth (ft)	1.1	2.3										
Pool Spacing (ft)	20	132										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	14	38										
Radius of Curvature (ft)	8	42										
Rc:Bankfull Width (ft/ft)	1.3	5.1										
Meander Wave Length (ft)	46	156										
Meander Width Ratio	2.2	4.6										
Additional Reach Parameters												
Rosgen Classification	C/E4											
Channel Thalweg Length (ft)	1,121											
Sinuosity (ft)	1.13											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.015											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.59/1.78/6/101.2/ 151.8/180											
% of Reach with Eroding Banks	0%		2%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13k. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Elliott Creek UT1 (STA. 1415+87 - 1417+28)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	5.2		4.9		5.5							
Floodprone Width (ft)	14.0		14.2		13.3							
Bankfull Mean Depth	0.5		0.5		0.4							
Bankfull Max Depth	0.8		0.9		0.8							
Bankfull Cross-Sectional Area (ft)	2.5		2.5		2.5							
Width/Depth Ratio	10.7		9.7		12.4							
Entrenchment Ratio[1]	2.7		2.9		2.4							
Bank Height Ratio[2]	1.0		1.0		1.0							
D50 (mm)	31.0		36.8		26.4							
Profile												
Riffle Length (ft)	11	21										
Riffle Slope (ft/ft)	0.002	0.043										
Pool Length (ft)	12	18										
Pool Max Depth (ft)	1.1	1.4										
Pool Spacing (ft)	18	45										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	8	17										
Radius of Curvature (ft)	15	20										
Rc:Bankfull Width (ft/ft)	2.9	3.8										
Meander Wave Length (ft)	48	69										
Meander Width Ratio	1.4	3.3										
Additional Reach Parameters												
Rosgen Classification	C/E4											
Channel Thalweg Length (ft)	141											
Sinuosity (ft)	1.07											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.025											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	SC/1/5.9/47/101.2/180											
% of Reach with Eroding Banks	0%		0%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13l. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Bridges Creek R1 (STA. 1500+91 - 1504+67)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	9.3		6.4		6.5							
Floodprone Width (ft)	23.6		21.1		20.4							
Bankfull Mean Depth	0.4		0.4		0.3							
Bankfull Max Depth	0.7		0.6		0.6							
Bankfull Cross-Sectional Area (ft)	3.3		2.4		2.2							
Width/Depth Ratio	26.5		17.2		19.3							
Entrenchment Ratio[1]	2.5		3.3		3.1							
Bank Height Ratio[2]	1.0		0.8		0.8							
D50 (mm)	53.7		29.0		44.2							
Profile												
Riffle Length (ft)	11	32										
Riffle Slope (ft/ft)	0.013	0.058										
Pool Length (ft)	6	34										
Pool Max Depth (ft)	1.6	2.4										
Pool Spacing (ft)	29	49										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	9	15										
Radius of Curvature (ft)	10	19										
Rc:Bankfull Width (ft/ft)	1.1	2.0										
Meander Wave Length (ft)	68	80										
Meander Width Ratio	1.0	1.6										
Additional Reach Parameters												
Rosgen Classification	C5											
Channel Thalweg Length (ft)	376											
Sinuosity (ft)	1.00											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.031											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	SC/0.16/1/90/135.5/180											
% of Reach with Eroding Banks	0%		0%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13m. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

USEC UT2 (STA. 1080+00 - 1081+54)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	7.9		8.1		6.7							
Floodprone Width (ft)	25.0		26.0		23.0							
Bankfull Mean Depth	0.5		0.4		0.3							
Bankfull Max Depth	0.9		0.9		0.6							
Bankfull Cross-Sectional Area (ft)	3.8		3.5		2.0							
Width/Depth Ratio	16.5		18.6		22.5							
Entrenchment Ratio[1]	3.2		3.2		3.4							
Bank Height Ratio[2]	1.0		1.0		0.7							
D50 (mm)	14.9		0.5		1.3							
Profile												
Riffle Length (ft)	14	37										
Riffle Slope (ft/ft)	0.007	0.017										
Pool Length (ft)	19	51										
Pool Max Depth (ft)	1.0	1.7										
Pool Spacing (ft)	62	62										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	24	24										
Radius of Curvature (ft)	20	17										
Rc:Bankfull Width (ft/ft)	2.5	2.2										
Meander Wave Length (ft)	54	54										
Meander Width Ratio	3.1	3.1										
Additional Reach Parameters												
Rosgen Classification	C5											
Channel Thalweg Length (ft)	154											
Sinuosity (ft)	1.41											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.010											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	SC/0.14/0.2/26.1/48/64											
% of Reach with Eroding Banks	0%		0%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13n. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

USEC UT3 (STA. 1082+00 - 1083+18)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	7.2		7.4		7.9							
Floodprone Width (ft)	63.8		62.8		45.3							
Bankfull Mean Depth	0.5		0.5		0.4							
Bankfull Max Depth	0.8		0.8		0.7							
Bankfull Cross-Sectional Area (ft)	3.7		3.6		3.3							
Width/Depth Ratio	14.0		15.5		18.6							
Entrenchment Ratio[1]	8.8		8.4		5.8							
Bank Height Ratio[2]	1.0		1.0		0.9							
D50 (mm)	14.4		18.9		S/C							
Profile												
Riffle Length (ft)	18	19										
Riffle Slope (ft/ft)	0.009	0.026										
Pool Length (ft)	9	14										
Pool Max Depth (ft)	1.5	1.7										
Pool Spacing (ft)	26	34										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	16	16										
Radius of Curvature (ft)	9	12										
Rc:Bankfull Width (ft/ft)	0.7	1.0										
Meander Wave Length (ft)	32	32										
Meander Width Ratio	1.3	1.3										
Additional Reach Parameters												
Rosgen Classification	C5											
Channel Thalweg Length (ft)	118											
Sinuosity (ft)	1.28											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.011											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	SC/SC/0.2/20.5/35.9/ 180											
% of Reach with Eroding Banks	0%		0%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13o. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

UFC R2 (STA. 1616+02 - 1630+09)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	11.4	12.0	11.2	12.3	11.5	12.6						
Floodprone Width (ft)	72.0	99.5	69.1	96.4	70.2	85.5						
Bankfull Mean Depth	0.7	0.8	0.7	0.8	0.7	0.7						
Bankfull Max Depth	1.1	1.4	1.1	1.4	1.1	1.4						
Bankfull Cross-Sectional Area (ft)	8.2	9.5	7.8	9.4	7.9	9.1						
Width/Depth Ratio	14.0	15.7	14.7	18.7	16.8	18.9						
Entrenchment Ratio[1]	6.0	8.6	5.6	8.2	5.6	6.8						
Bank Height Ratio[2]	1.0	1.0	0.9	1.0	1.0	1.0						
D50 (mm)	39.1	54.8	33.4	39.5	39.5	58.3						
Profile												
Riffle Length (ft)	16	69										
Riffle Slope (ft/ft)	0.008	0.063										
Pool Length (ft)	14	63										
Pool Max Depth (ft)	2.5	4.5										
Pool Spacing (ft)	45	162										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	8	71										
Radius of Curvature (ft)	23	50										
Rc:Bankfull Width (ft/ft)	2.0	3.8										
Meander Wave Length (ft)	92	195										
Meander Width Ratio	0.7	5.4										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	1,407											
Sinuosity (ft)	1.20											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.013											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	SC/0.63/10.4/55.9/ 104/180											
% of Reach with Eroding Banks	0%		1%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13p. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

LFC R1 (STA. 1641+28 - 1647+02)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	12.3		12.8		13.3							
Floodprone Width (ft)	26.4		25.3		27.3							
Bankfull Mean Depth	0.8		0.7		1.0							
Bankfull Max Depth	1.1		1.0		1.3							
Bankfull Cross-Sectional Area (ft)	9.7		9.6		12.8							
Width/Depth Ratio	15.7		17.1		13.8							
Entrenchment Ratio[1]	2.1		2.0		2.1							
Bank Height Ratio[2]	1.0		1.0		1.2							
D50 (mm)	35.3		10.4		50.6							
Profile												
Riffle Length (ft)	11	55										
Riffle Slope (ft/ft)	0.001	0.047										
Pool Length (ft)	11	44										
Pool Max Depth (ft)	1.4	1.6										
Pool Spacing (ft)	36	92										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	20	73										
Radius of Curvature (ft)	12	50										
Rc:Bankfull Width (ft/ft)	1.0	4.1										
Meander Wave Length (ft)	73	138										
Meander Width Ratio	1.6	5.9										
Additional Reach Parameters												
Rosgen Classification	C5											
Channel Thalweg Length (ft)	574											
Sinuosity (ft)	1.07											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.009											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.36/0.69/1.8/57.9/ 110.1/180											
% of Reach with Eroding Banks	0%		0%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13q. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

LFC R2 (STA. 1647+33 - 1651+60)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	9.9		9.8		9.1							
Floodprone Width (ft)	28.4		28.6		29.6							
Bankfull Mean Depth	0.6		0.5		0.6							
Bankfull Max Depth	0.8		0.9		1.2							
Bankfull Cross-Sectional Area (ft)	6.3		4.6		5.9							
Width/Depth Ratio	15.4		20.5		14.2							
Entrenchment Ratio[1]	2.9		2.9		3.2							
Bank Height Ratio[2]	1.0		0.8		1.0							
D50 (mm)	11.0		8.4		43.9							
Profile												
Riffle Length (ft)	14	36										
Riffle Slope (ft/ft)	0.005	0.040										
Pool Length (ft)	18	53										
Pool Max Depth (ft)	1.8	2.2										
Pool Spacing (ft)	42	90										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	44											
Radius of Curvature (ft)	53	79										
Rc:Bankfull Width (ft/ft)	5.4	8.0										
Meander Wave Length (ft)	201	201										
Meander Width Ratio	4.4	0.0										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	427											
Sinuosity (ft)	1.00											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.016											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.27/0.69/4.4/40.5/ 128.7/362											
% of Reach with Eroding Banks	0%		4%		2%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13r. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

LBHC R1a (STA. 300+13 - 305+13)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	26.2		25.7		28.3							
Floodprone Width (ft)	158.0		155.7		77.9							
Bankfull Mean Depth	1.9		1.5		1.7							
Bankfull Max Depth	3.0		2.9		3.3							
Bankfull Cross-Sectional Area (ft)	49.4		38.7		49.3							
Width/Depth Ratio	13.9		17.1		16.2							
Entrenchment Ratio[1]	6.0		6.1		2.8							
Bank Height Ratio[2]	1.0		0.9		1.0							
D50 (mm)	32.0		20.3		51.2							
Profile												
Riffle Length (ft)	15	142										
Riffle Slope (ft/ft)	0.005	0.079										
Pool Length (ft)	54	94										
Pool Max Depth (ft)	3.9	6.2										
Pool Spacing (ft)	116	218										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	58	105										
Radius of Curvature (ft)	60	80										
Rc:Bankfull Width (ft/ft)	2.0	2.6										
Meander Wave Length (ft)	157	419										
Meander Width Ratio	1.9	3.5										
Additional Reach Parameters												
Rosgen Classification	C5											
Channel Thalweg Length (ft)	500											
Sinuosity (ft)	1.10											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.004											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.4/0.8/1.7/94/256/2048											
% of Reach with Eroding Banks	0%		0%		0%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Table 13s. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

LBHC R1b/2 (STA. 305+13 - 318+00)

Parameter	As-Built/Baseline 2018		MY1 2018		MY2 2019		MY3 2020		MY4 2021		MY5 2022	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate[3]												
Bankfull Width (ft)	26.7		27.2		29.4							
Floodprone Width (ft)	299.6		171.0		84.9							
Bankfull Mean Depth	1.7		1.9		2.1							
Bankfull Max Depth	2.8		3.3		3.6							
Bankfull Cross-Sectional Area (ft)	46.0		51.5		60.8							
Width/Depth Ratio	15.5		14.3		14.2							
Entrenchment Ratio[1]	11.2		6.3		2.9							
Bank Height Ratio[2]	1.0		1.1		1.2							
D50 (mm)	87.4		47.7		61.5							
Profile												
Riffle Length (ft)	21	146										
Riffle Slope (ft/ft)	0.002	0.065										
Pool Length (ft)	14	135										
Pool Max Depth (ft)	4.6	6.0										
Pool Spacing (ft)	37	291										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	80	117										
Radius of Curvature (ft)	65	90										
Rc:Bankfull Width (ft/ft)	2.4	3.4										
Meander Wave Length (ft)	236	396										
Meander Width Ratio	3.0	4.4										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	1,287											
Sinuosity (ft)	1.09											
Water Surface Slope (ft/ft)	---											
Bankfull Slope (ft/ft)	0.003											
Ri%/Ru%/P%/G%/S%	---											
SC%/Sa%/G%/C%/B%/Be%	---											
d16/d35/d50/d84/d95/d100	0.2/0.3/5.6/94/256/2048											
% of Reach with Eroding Banks	0%		11%		6%							

(---): Data was not provided

[1] Entrenchment Ratio (ER) is the flood prone width divided by the bankfull width. ER in MY2 and forward will be based on the width between monumented cross-section pins. ER in MY0 and MY1 are based on surveyed widths beyond cross-section pins.

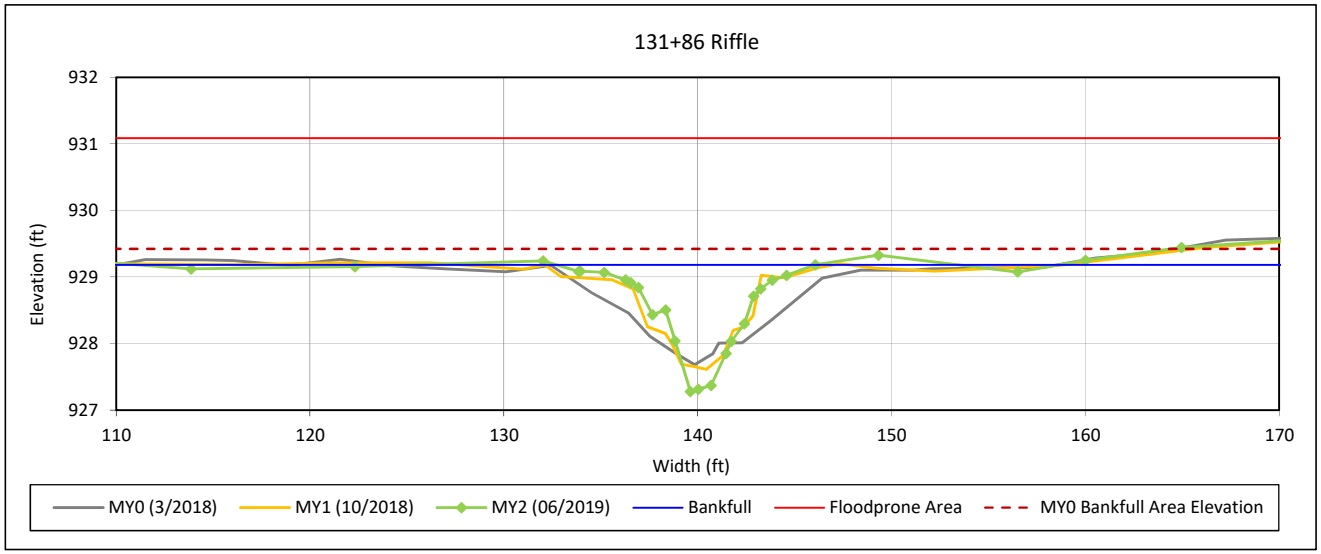
[2] Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

[3] Starting in MY2, bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (2018).

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 2A: Cross-Section 1



Bankfull Dimensions	
8.2	x-section area (ft.sq.)
13.4	width (ft)
0.6	mean depth (ft)
1.9	max depth (ft)
14.4	wetted perimeter (ft)
0.6	hydraulic radius (ft)
21.7	width-depth ratio
89.3	W flood prone area (ft)
6.7	entrenchment ratio
0.9	low bank height ratio

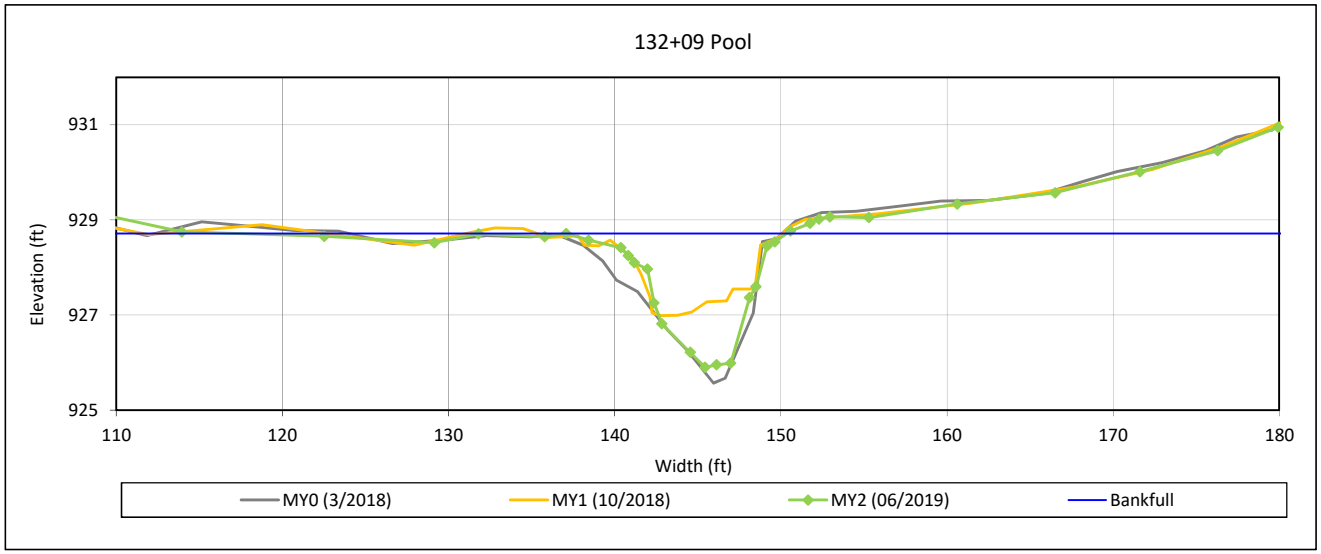
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 2A: Cross-Section 2



Bankfull Dimensions	
16.5	x-section area (ft.sq.)
13.3	width (ft)
1.2	mean depth (ft)
2.8	max depth (ft)
15.3	wetted perimeter (ft)
1.1	hydraulic radius (ft)
10.7	width-depth ratio

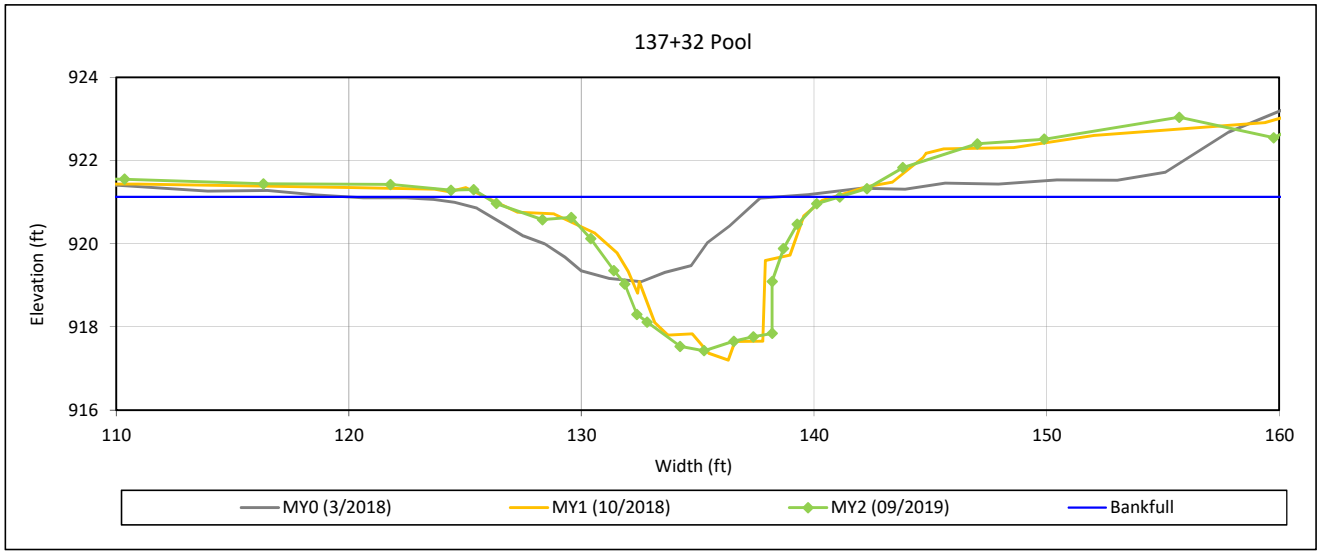
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 2B: Cross-Section 3



Bankfull Dimensions	
27.2	x-section area (ft.sq.)
15.2	width (ft)
1.8	mean depth (ft)
3.7	max depth (ft)
18.4	wetted perimeter (ft)
1.5	hydraulic radius (ft)
8.5	width-depth ratio

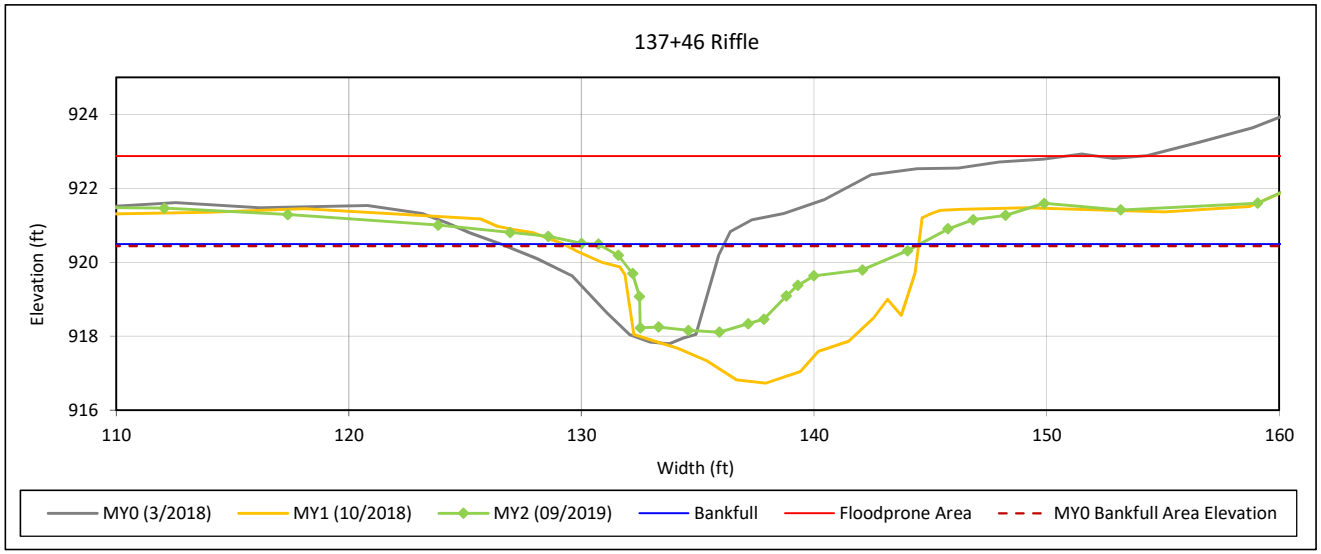
Survey Date: 09/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 2B: Cross-Section 4



Bankfull Dimensions	
18.4	x-section area (ft.sq.)
13.8	width (ft)
1.3	mean depth (ft)
2.4	max depth (ft)
15.7	wetted perimeter (ft)
1.2	hydraulic radius (ft)
10.4	width-depth ratio
63.4	W flood prone area (ft)
4.6	entrenchment ratio
1.0	low bank height ratio

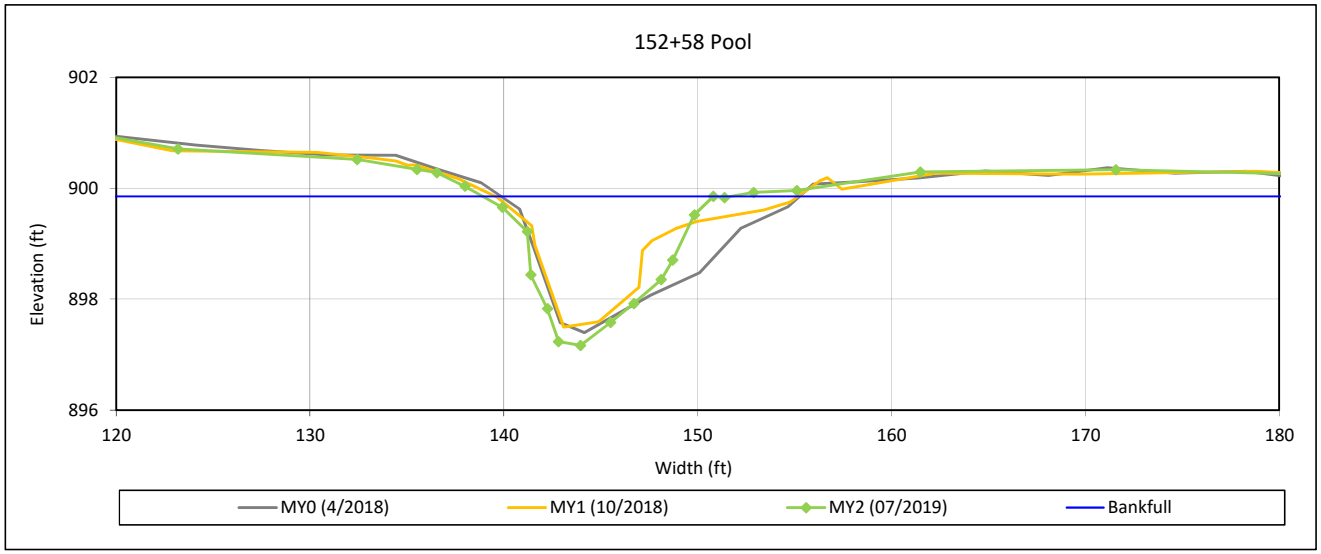
Survey Date: 09/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 4: Cross-Section 5



Bankfull Dimensions	
17.2	x-section area (ft.sq.)
11.9	width (ft)
1.4	mean depth (ft)
2.7	max depth (ft)
13.6	wetted perimeter (ft)
1.3	hydraulic radius (ft)
8.2	width-depth ratio

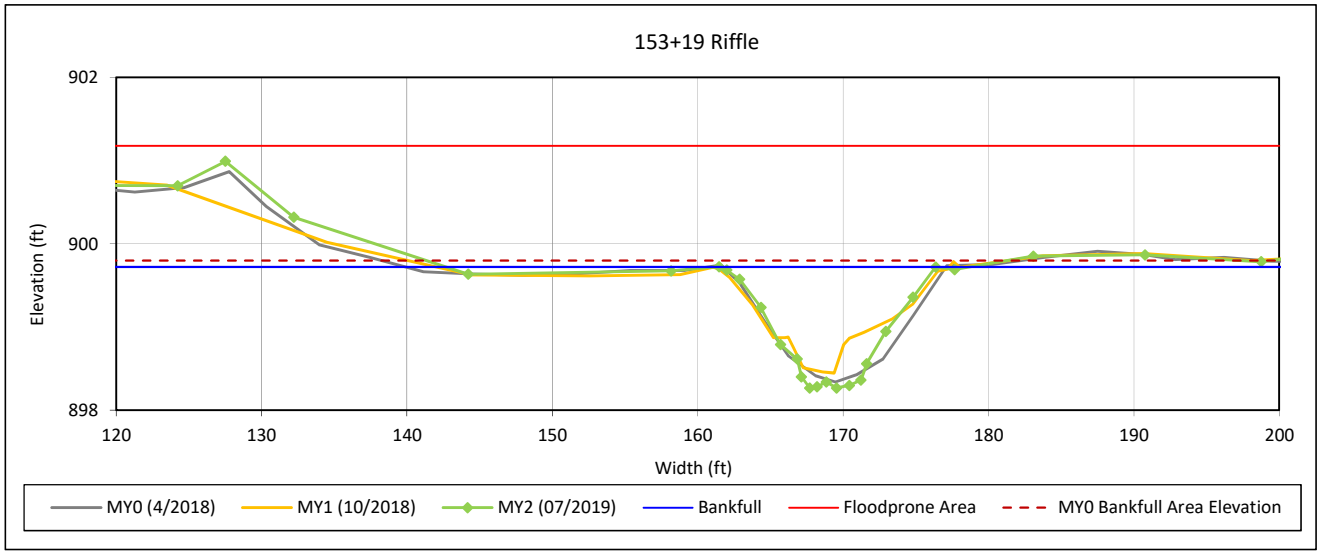
Survey Date: 07/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 4: Cross-Section 6



Bankfull Dimensions	
12.0	x-section area (ft.sq.)
14.9	width (ft)
0.8	mean depth (ft)
1.5	max depth (ft)
15.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
18.4	width-depth ratio
119.2	W flood prone area (ft)
8.0	entrenchment ratio
1.0	low bank height ratio

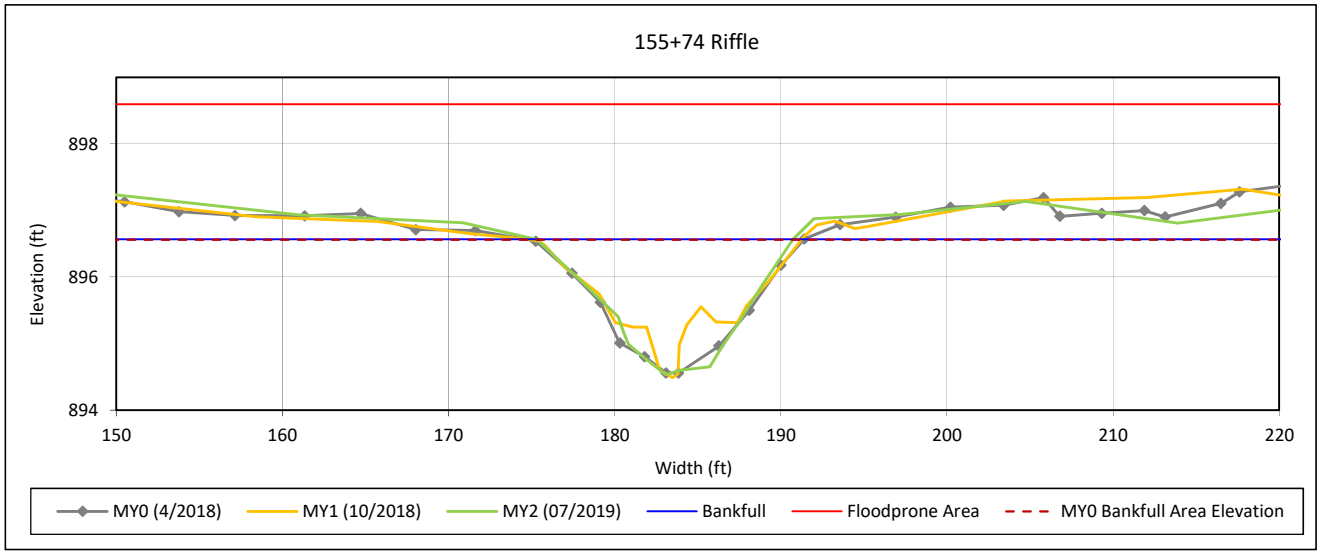
Survey Date: 07/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 4: Cross-Section 7



Bankfull Dimensions	
17.7	x-section area (ft.sq.)
15.4	width (ft)
1.1	mean depth (ft)
2.0	max depth (ft)
16.1	wetted perimeter (ft)
1.1	hydraulic radius (ft)
13.4	width-depth ratio
137.2	W flood prone area (ft)
8.9	entrenchment ratio
1.0	low bank height ratio

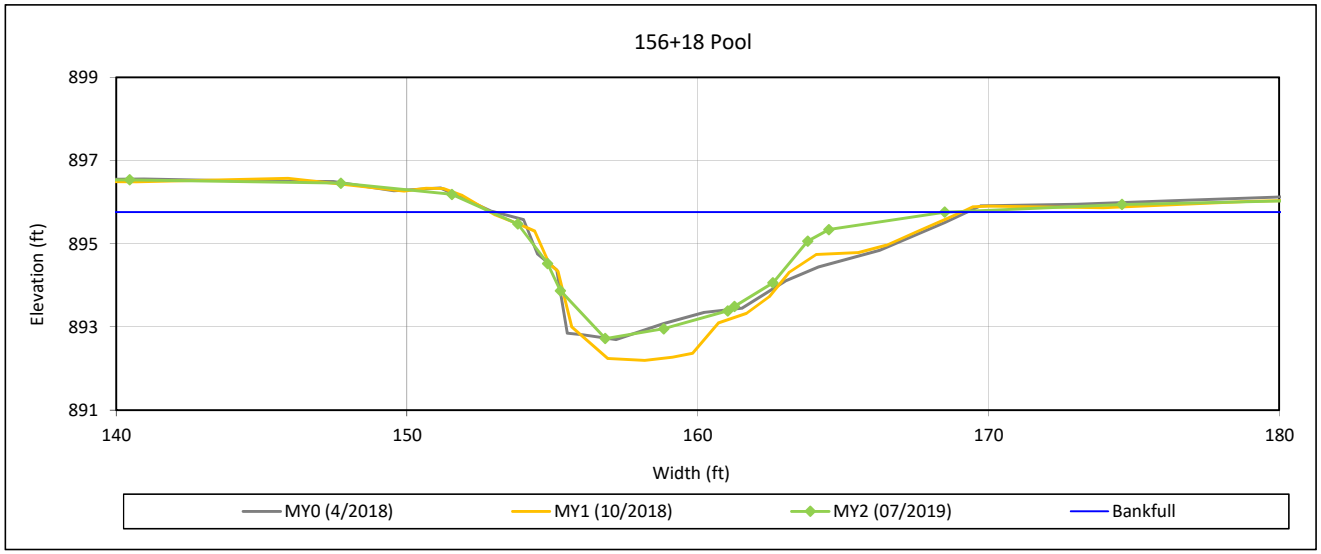
Survey Date: 07/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 4: Cross-Section 8



Bankfull Dimensions	
22.8	x-section area (ft.sq.)
15.6	width (ft)
1.5	mean depth (ft)
3.0	max depth (ft)
17.4	wetted perimeter (ft)
1.3	hydraulic radius (ft)
10.7	width-depth ratio

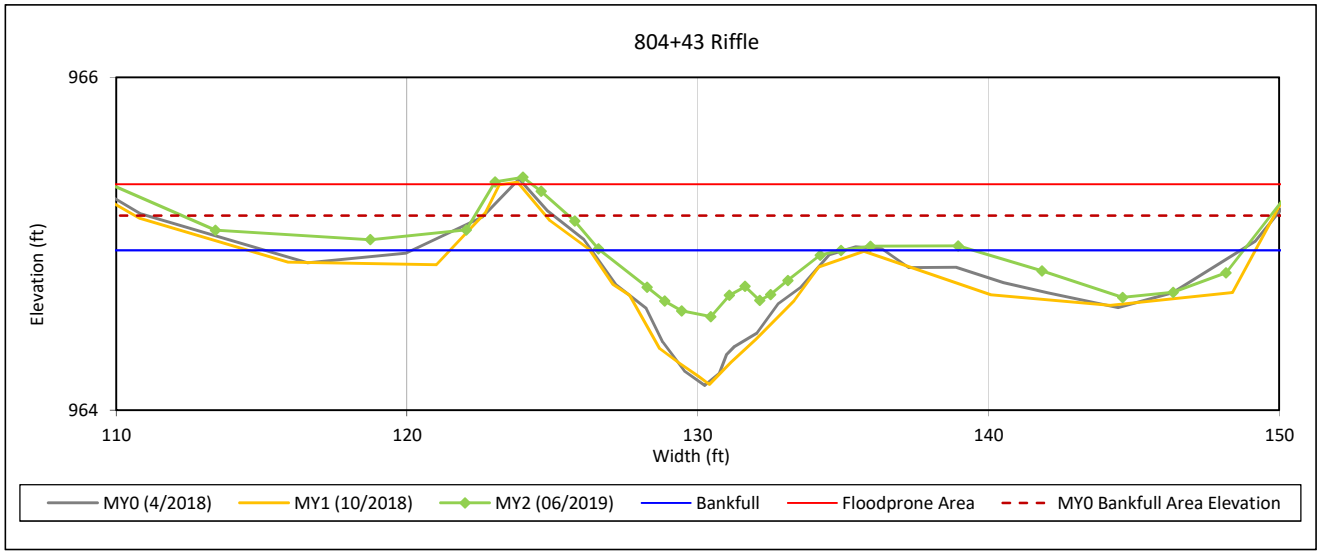
Survey Date: 07/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

Royster Creek Reach 1: Cross-Section 9



Bankfull Dimensions	
1.8	x-section area (ft.sq.)
8.3	width (ft)
0.2	mean depth (ft)
0.4	max depth (ft)
8.3	wetted perimeter (ft)
0.2	hydraulic radius (ft)
39.0	width-depth ratio
39.5	W flood prone area (ft)
4.8	entrenchment ratio
0.7	low bank height ratio

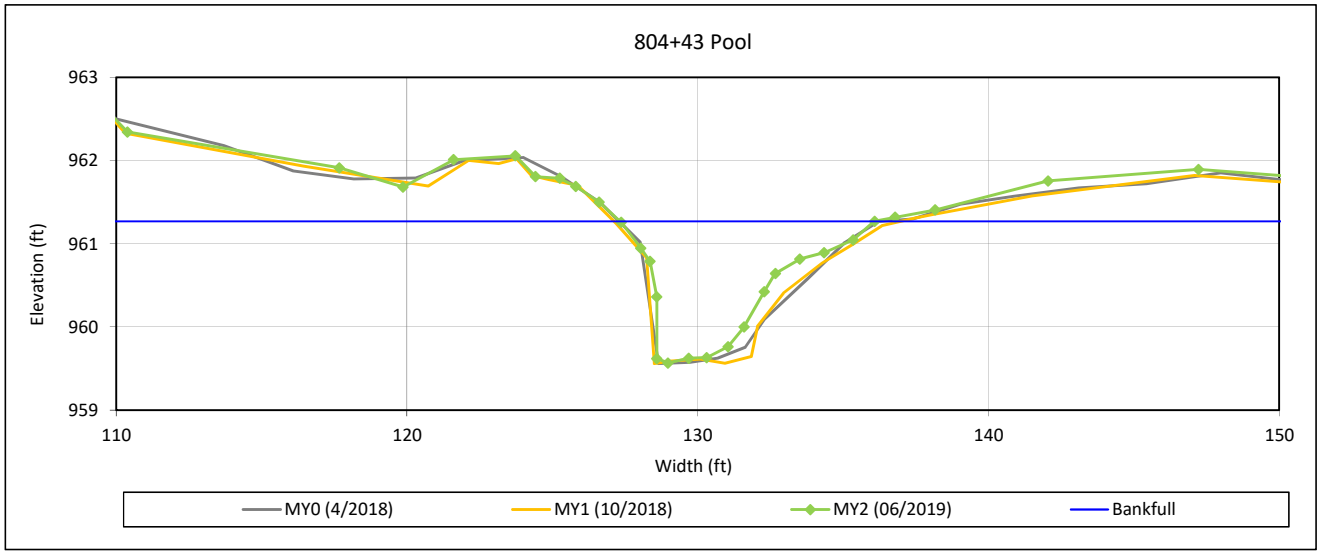
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

Royster Creek Reach 1: Cross-Section 10



Bankfull Dimensions	
7.4	x-section area (ft.sq.)
8.8	width (ft)
0.8	mean depth (ft)
1.7	max depth (ft)
10.2	wetted perimeter (ft)
0.7	hydraulic radius (ft)
10.4	width-depth ratio

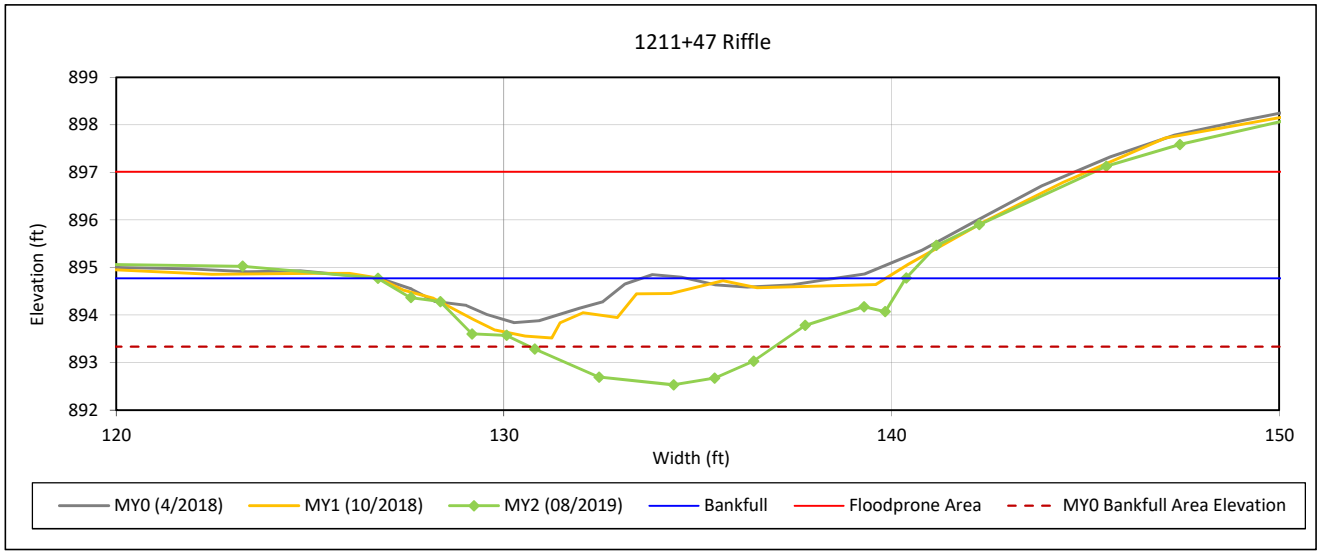
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

Scott Creek: Cross-Section 11



Bankfull Dimensions	
18.1	x-section area (ft.sq.)
13.6	width (ft)
1.3	mean depth (ft)
2.2	max depth (ft)
14.8	wetted perimeter (ft)
1.2	hydraulic radius (ft)
10.2	width-depth ratio
45.2	W flood prone area (ft)
3.3	entrenchment ratio
2.6	low bank height ratio

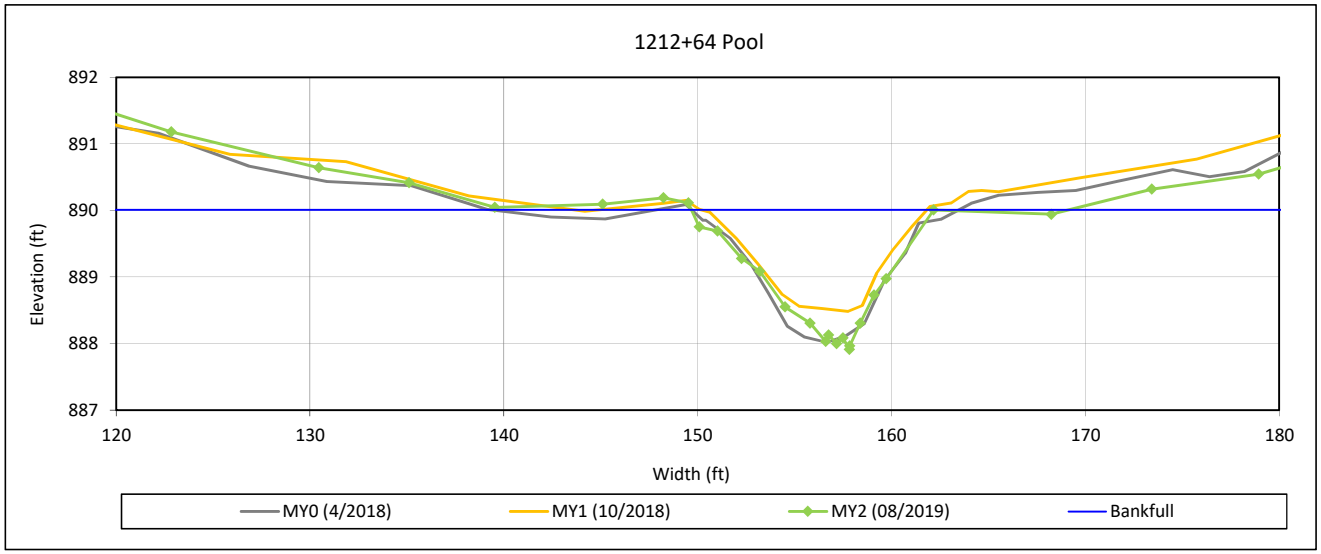
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

Scott Creek: Cross-Section 12



Bankfull Dimensions	
13.4	x-section area (ft.sq.)
12.5	width (ft)
1.1	mean depth (ft)
2.1	max depth (ft)
13.4	wetted perimeter (ft)
1.0	hydraulic radius (ft)
11.7	width-depth ratio

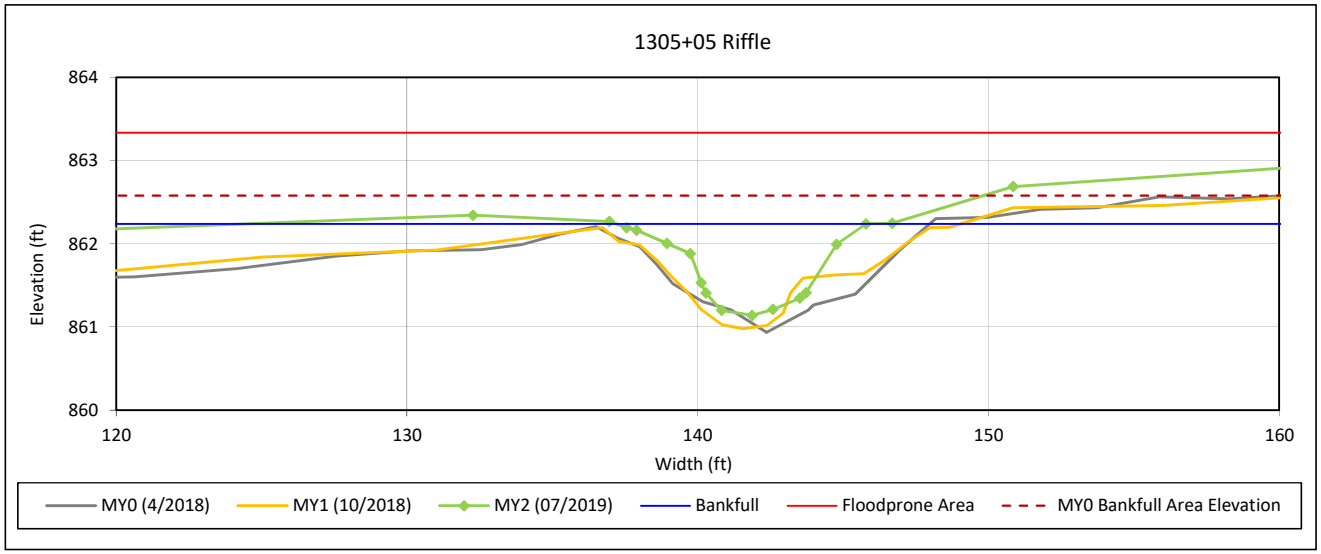
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

Carroll Creek Reach 1: Cross-Section 13



Bankfull Dimensions	
4.9	x-section area (ft.sq.)
8.6	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
9.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
15.0	width-depth ratio
71.2	W flood prone area (ft)
8.3	entrenchment ratio
0.8	low bank height ratio

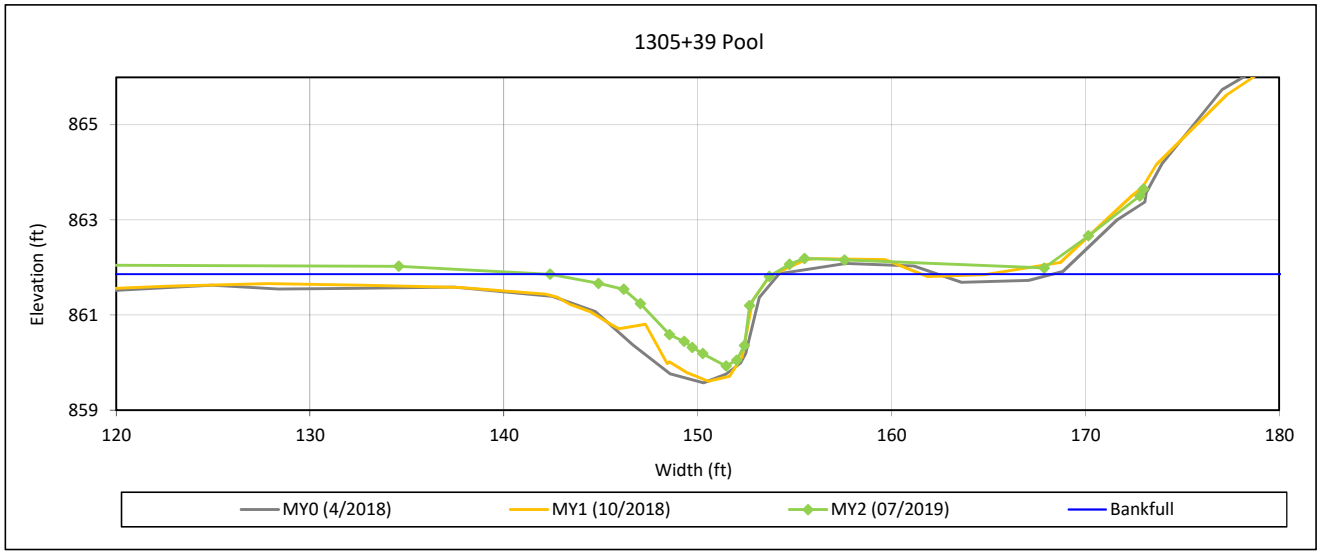
Survey Date: 07/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area A
NCDMS Project No. 739
Monitoring Year 2 - 2019

Carroll Creek Reach 1: Cross-Section 14



Bankfull Dimensions	
9.4	x-section area (ft.sq.)
11.5	width (ft)
0.8	mean depth (ft)
1.9	max depth (ft)
12.7	wetted perimeter (ft)
0.7	hydraulic radius (ft)
14.1	width-depth ratio

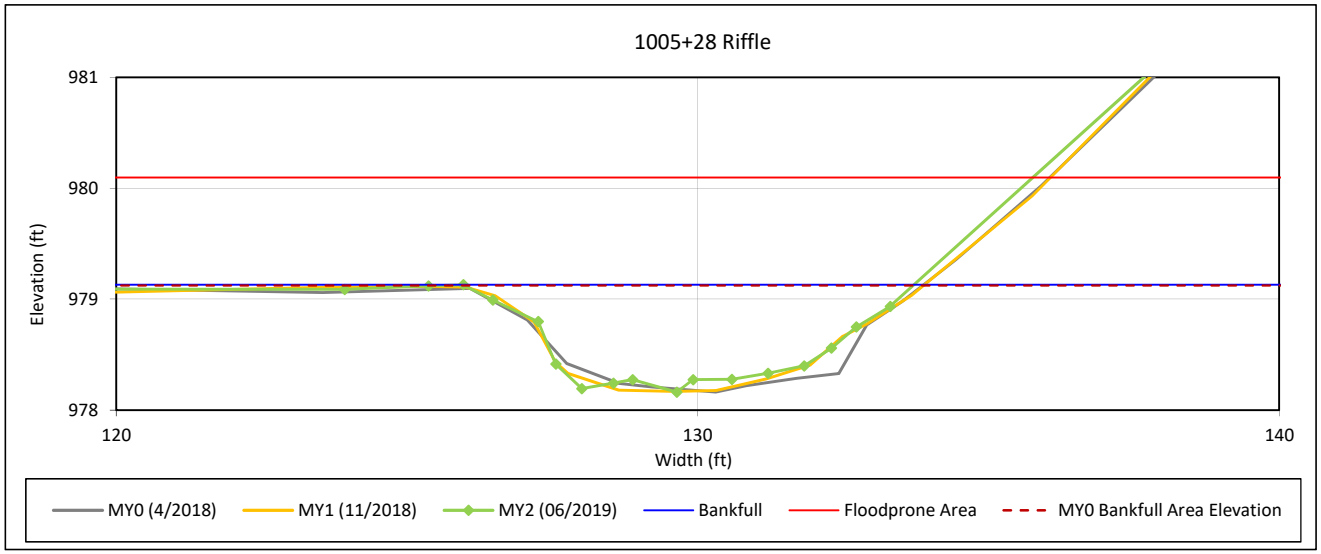
Survey Date: 07/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 1: Cross-Section 15



Bankfull Dimensions	
4.7	x-section area (ft.sq.)
7.8	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
8.2	wetted perimeter (ft)
0.6	hydraulic radius (ft)
12.7	width-depth ratio
35.8	W flood prone area (ft)
4.6	entrenchment ratio
1.0	low bank height ratio

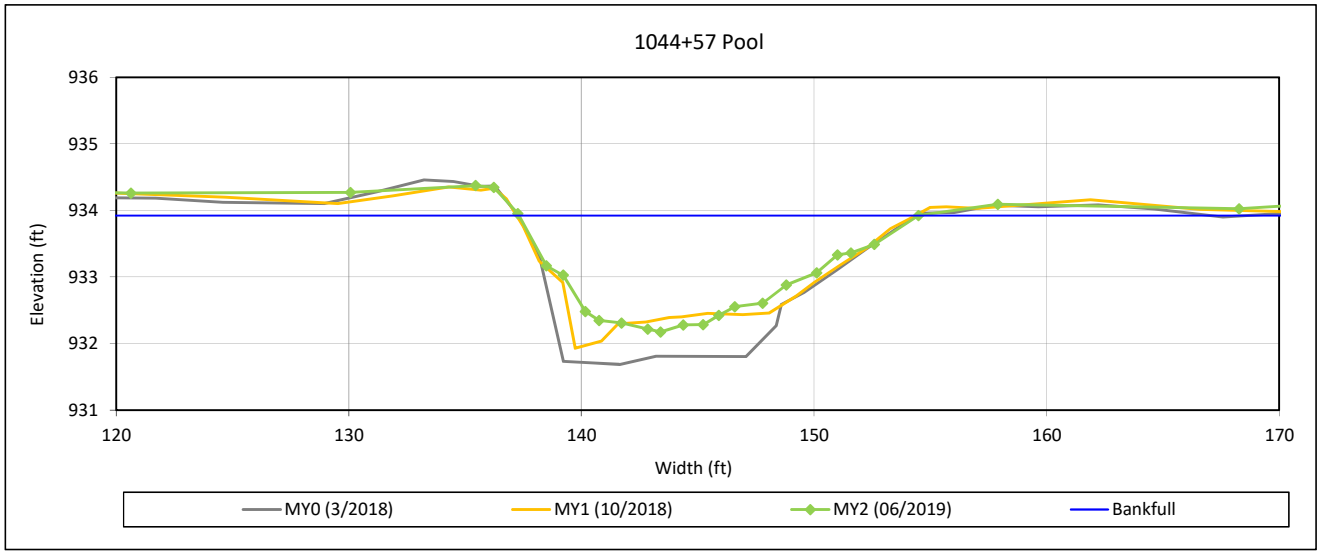
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 5: Cross-Section 16



Bankfull Dimensions	
18.5	x-section area (ft.sq.)
17.2	width (ft)
1.1	mean depth (ft)
1.7	max depth (ft)
17.8	wetted perimeter (ft)
1.0	hydraulic radius (ft)
16.0	width-depth ratio

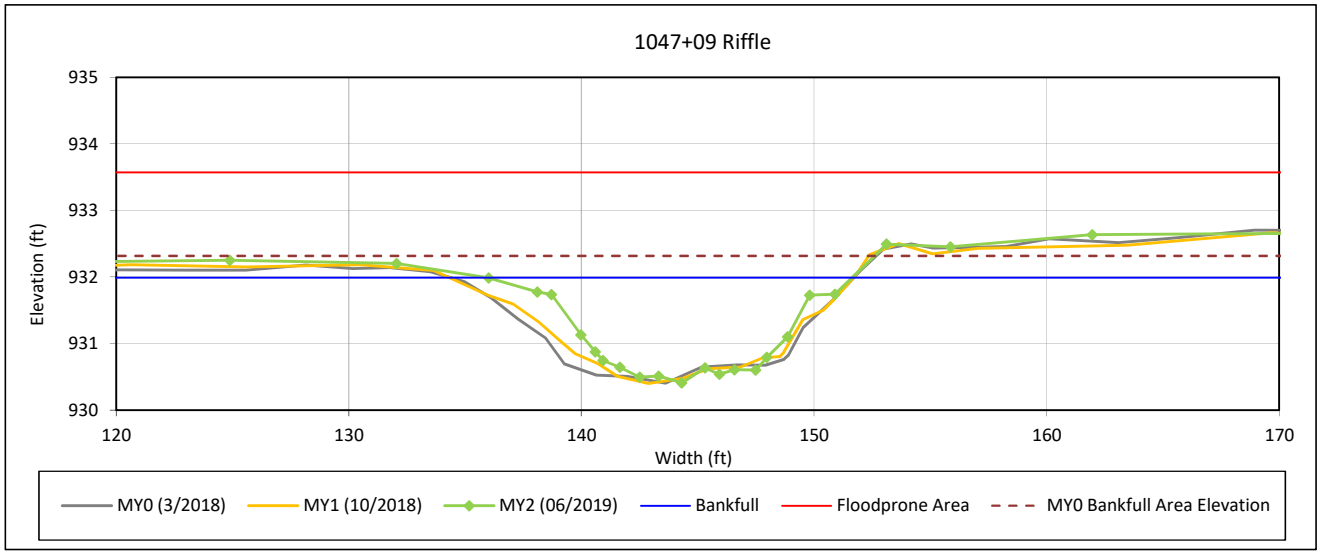
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 5: Cross-Section 17



Bankfull Dimensions	
14.0	x-section area (ft.sq.)
15.6	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
16.2	wetted perimeter (ft)
0.9	hydraulic radius (ft)
17.5	width-depth ratio
93.6	W flood prone area (ft)
6.0	entrenchment ratio
0.8	low bank height ratio

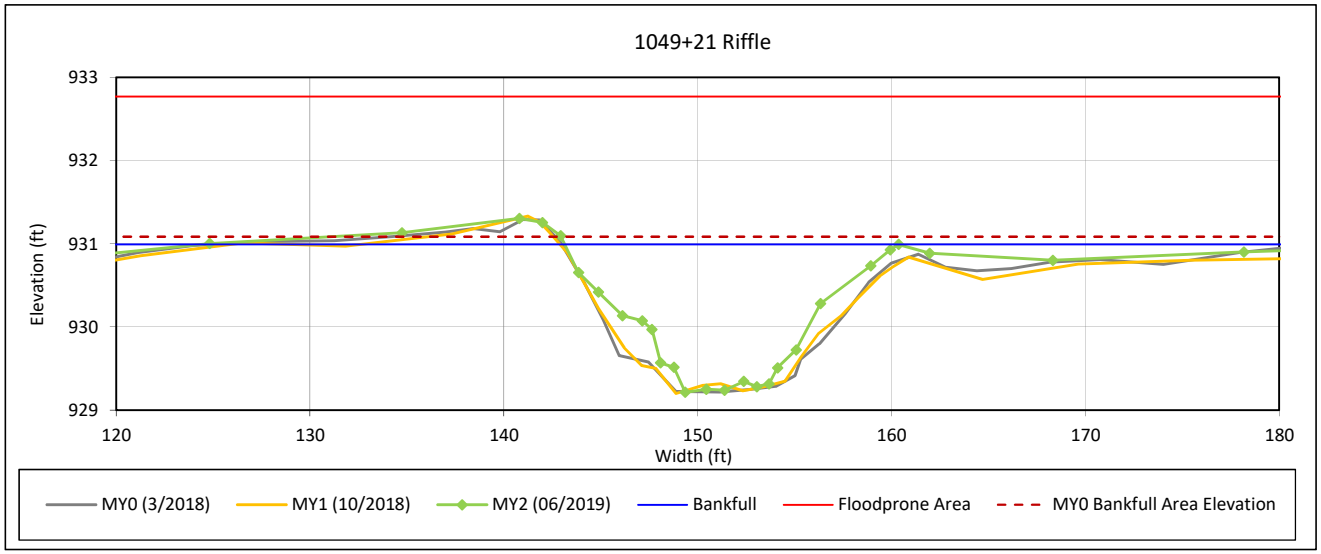
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 5: Cross-Section 18



Bankfull Dimensions	
17.5	x-section area (ft.sq.)
17.2	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
17.8	wetted perimeter (ft)
1.0	hydraulic radius (ft)
17.0	width-depth ratio
86.0	W flood prone area (ft)
5.0	entrenchment ratio
0.9	low bank height ratio

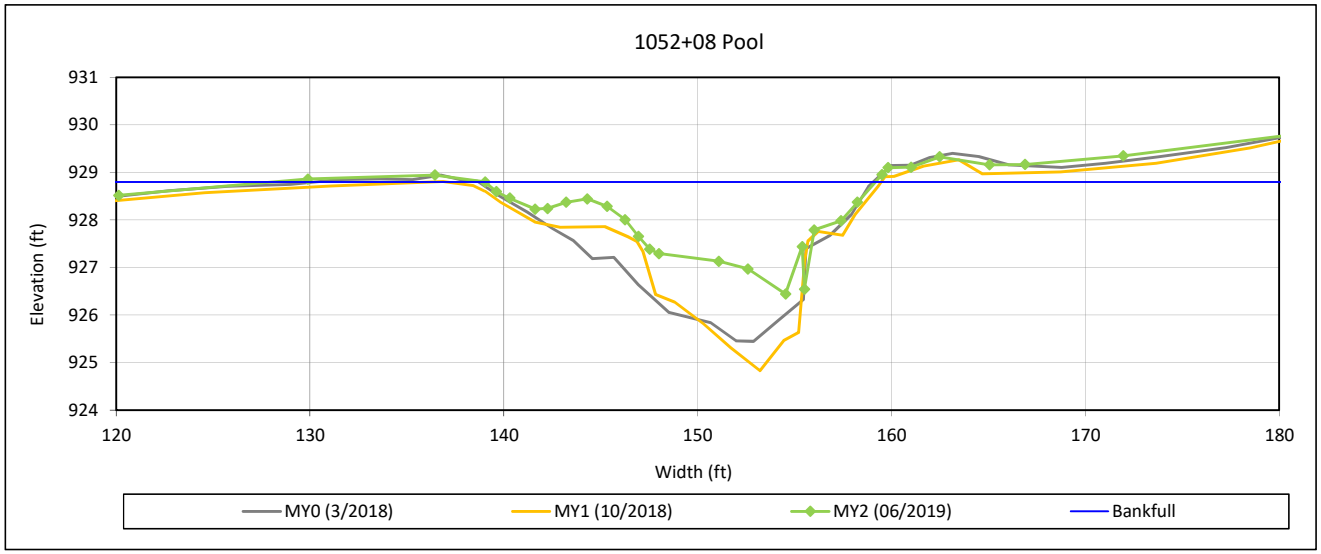
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 5: Cross-Section 19



Bankfull Dimensions	
21.5	x-section area (ft.sq.)
20.1	width (ft)
1.1	mean depth (ft)
2.4	max depth (ft)
22.8	wetted perimeter (ft)
0.9	hydraulic radius (ft)
18.9	width-depth ratio

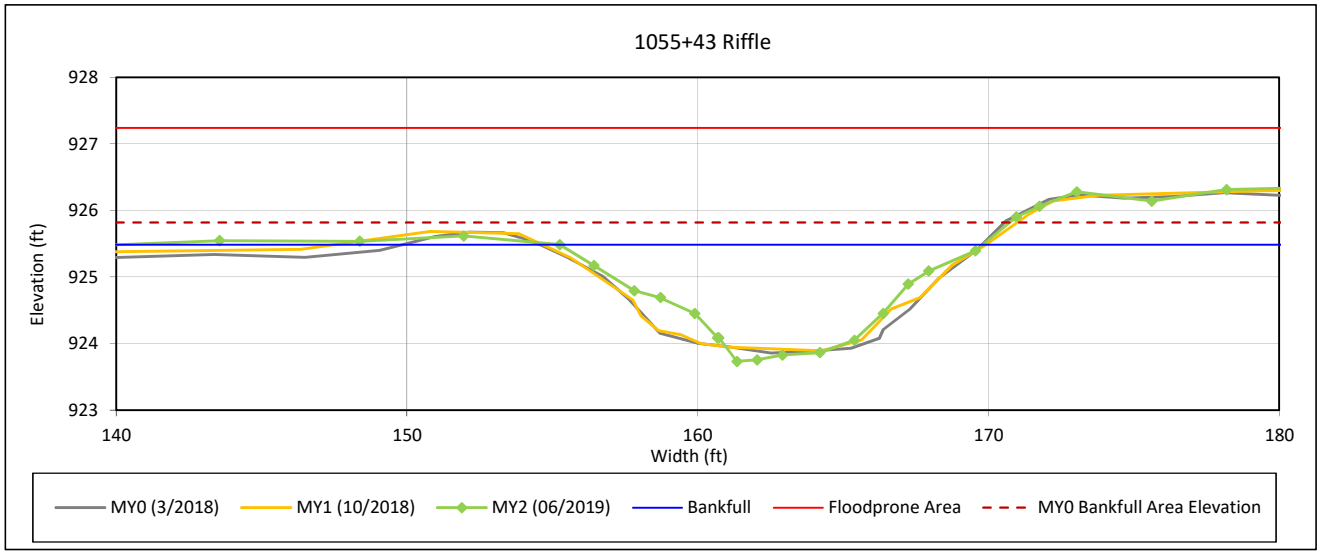
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 5: Cross-Section 20



Bankfull Dimensions	
13.9	x-section area (ft.sq.)
14.6	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
15.1	wetted perimeter (ft)
0.9	hydraulic radius (ft)
15.2	width-depth ratio
108.0	W flood prone area (ft)
7.4	entrenchment ratio
0.8	low bank height ratio

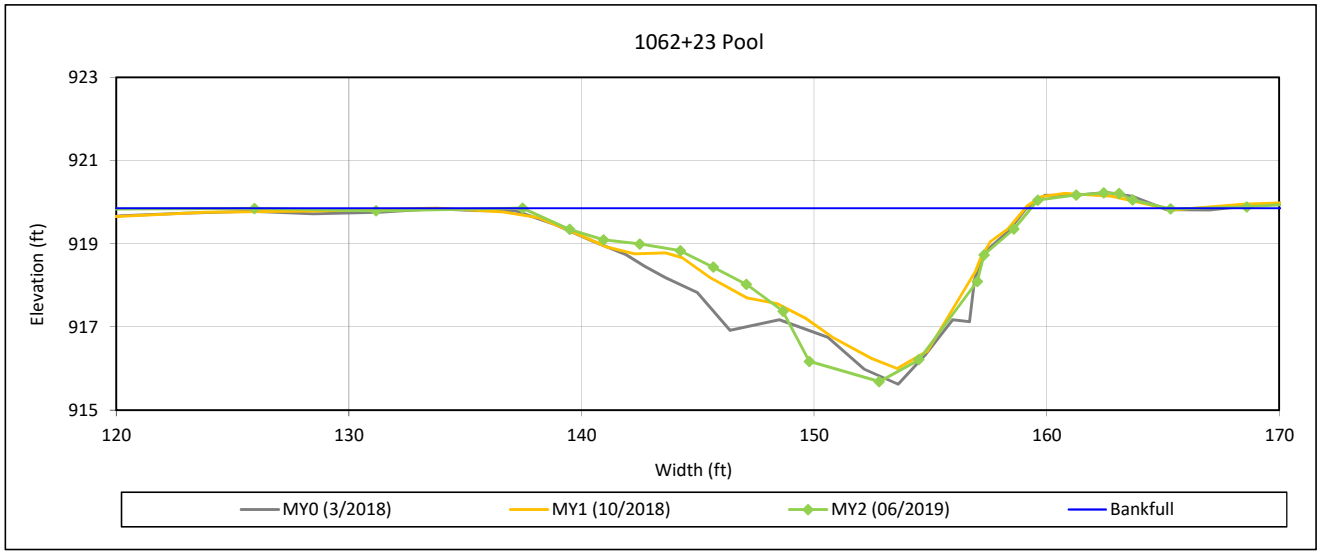
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 6: Cross-Section 21



Bankfull Dimensions	
42.1	x-section area (ft.sq.)
21.9	width (ft)
1.9	mean depth (ft)
4.2	max depth (ft)
24.2	wetted perimeter (ft)
1.7	hydraulic radius (ft)
11.4	width-depth ratio

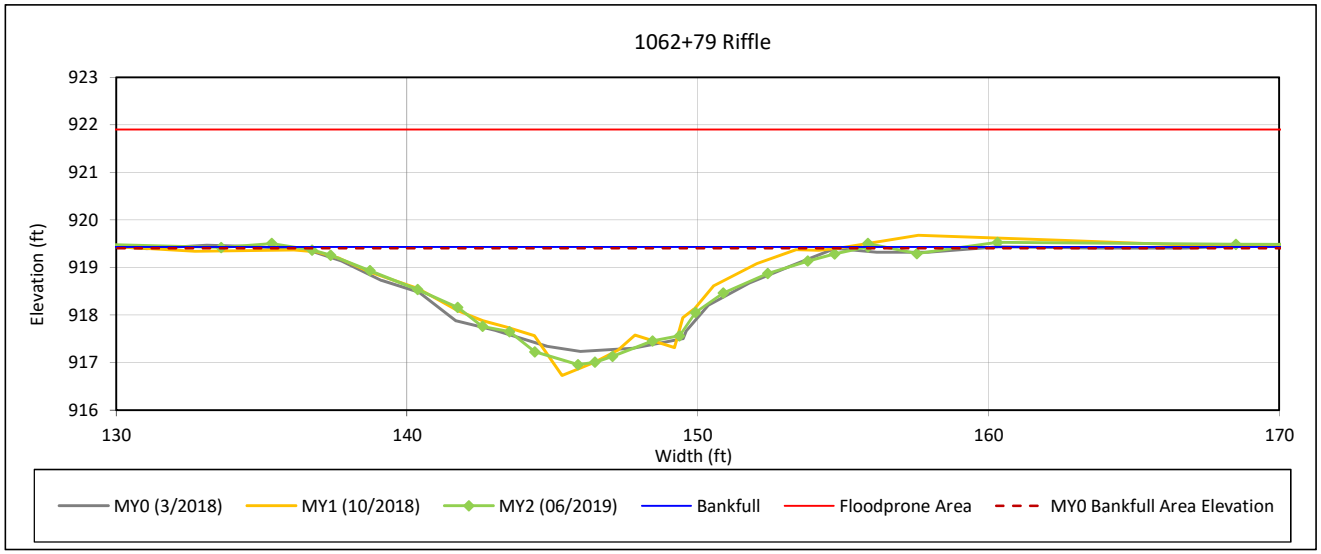
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 6: Cross-Section 22



Bankfull Dimensions	
22.9	x-section area (ft.sq.)
19.8	width (ft)
1.2	mean depth (ft)
2.5	max depth (ft)
20.6	wetted perimeter (ft)
1.1	hydraulic radius (ft)
17.1	width-depth ratio
83.2	W flood prone area (ft)
4.2	entrenchment ratio
1.0	low bank height ratio

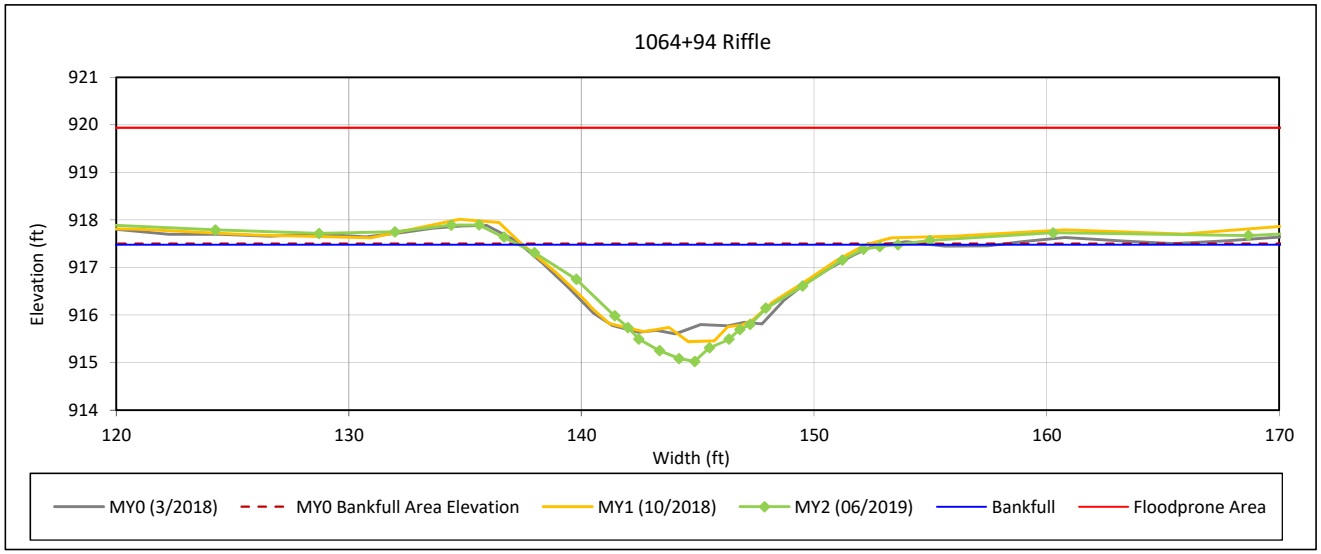
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 6: Cross-Section 23



Bankfull Dimensions	
18.8	x-section area (ft.sq.)
16.3	width (ft)
1.2	mean depth (ft)
2.5	max depth (ft)
17.2	wetted perimeter (ft)
1.1	hydraulic radius (ft)
14.1	width-depth ratio
81.6	W flood prone area (ft)
5.0	entrenchment ratio
1.0	low bank height ratio

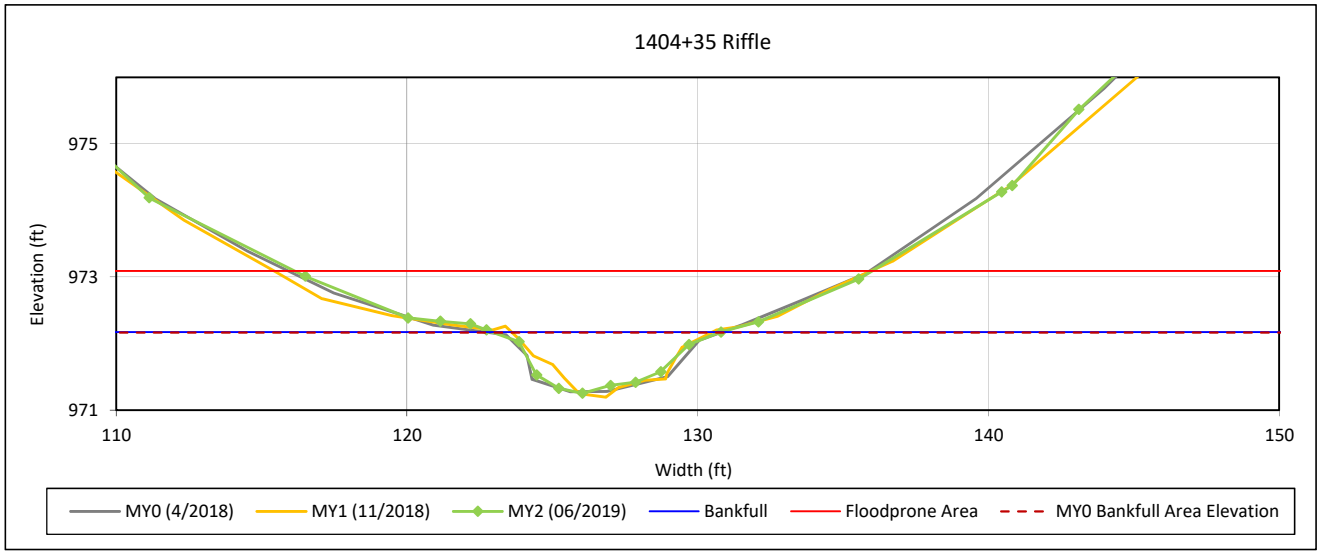
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

Elliott Creek: Cross-Section 24



Bankfull Dimensions	
4.2	x-section area (ft.sq.)
7.9	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
8.2	wetted perimeter (ft)
0.5	hydraulic radius (ft)
14.9	width-depth ratio
19.8	W flood prone area (ft)
2.5	entrenchment ratio
1.0	low bank height ratio

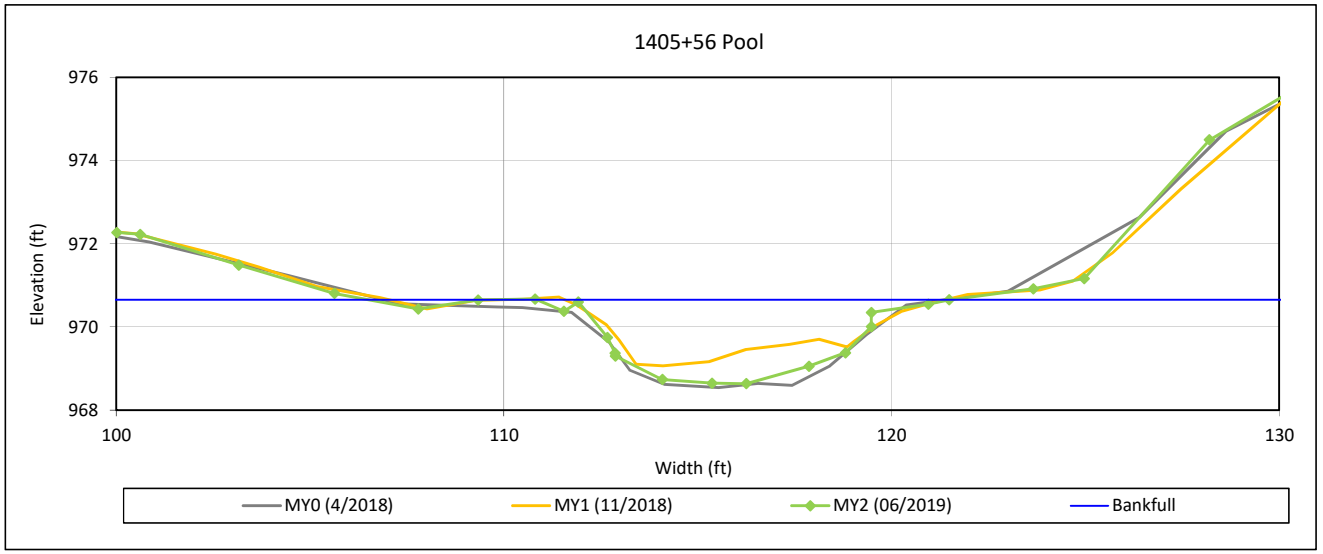
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

Elliott Creek: Cross-Section 25



Bankfull Dimensions	
12.2	x-section area (ft.sq.)
10.6	width (ft)
1.2	mean depth (ft)
2.0	max depth (ft)
12.3	wetted perimeter (ft)
1.0	hydraulic radius (ft)
9.2	width-depth ratio

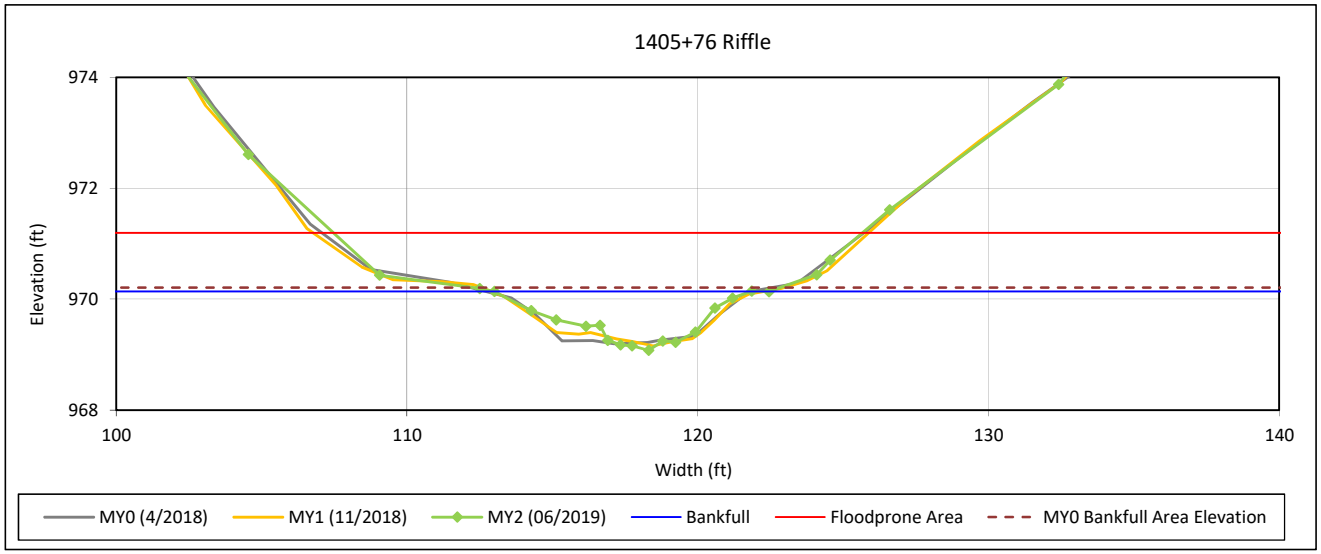
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

Elliott Creek: Cross-Section 26



Bankfull Dimensions	
5.0	x-section area (ft.sq.)
8.8	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
9.2	wetted perimeter (ft)
0.5	hydraulic radius (ft)
15.6	width-depth ratio
18.2	W flood prone area (ft)
2.1	entrenchment ratio
0.9	low bank height ratio

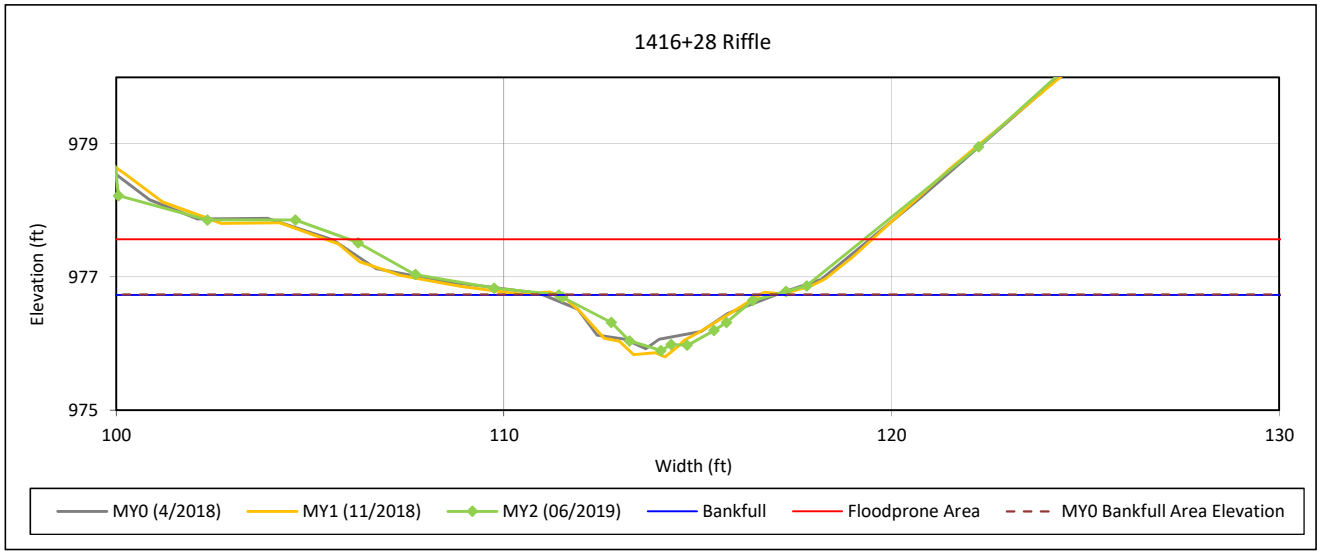
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

UT1 to Elliott Creek: Cross-Section 27



Bankfull Dimensions	
2.5	x-section area (ft.sq.)
5.5	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
5.8	wetted perimeter (ft)
0.4	hydraulic radius (ft)
12.4	width-depth ratio
13.3	W flood prone area (ft)
2.4	entrenchment ratio
1.0	low bank height ratio

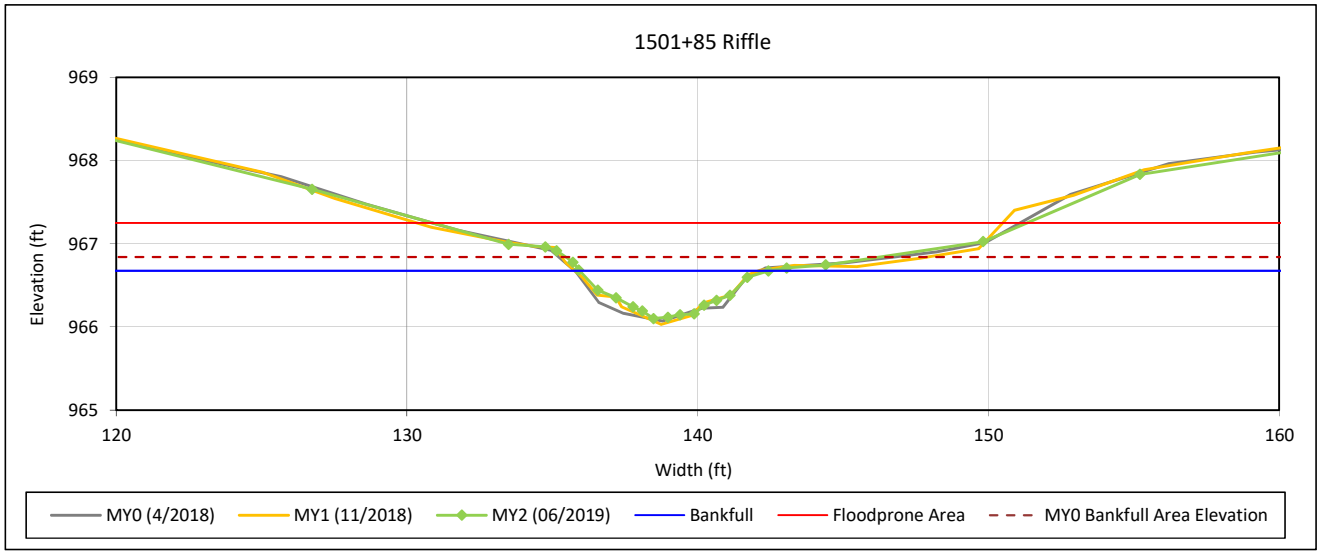
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

Bridges Creek: Cross-Section 28



Bankfull Dimensions	
2.2	x-section area (ft.sq.)
6.5	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
6.6	wetted perimeter (ft)
0.3	hydraulic radius (ft)
19.3	width-depth ratio
20.4	W flood prone area (ft)
3.1	entrenchment ratio
0.8	low bank height ratio

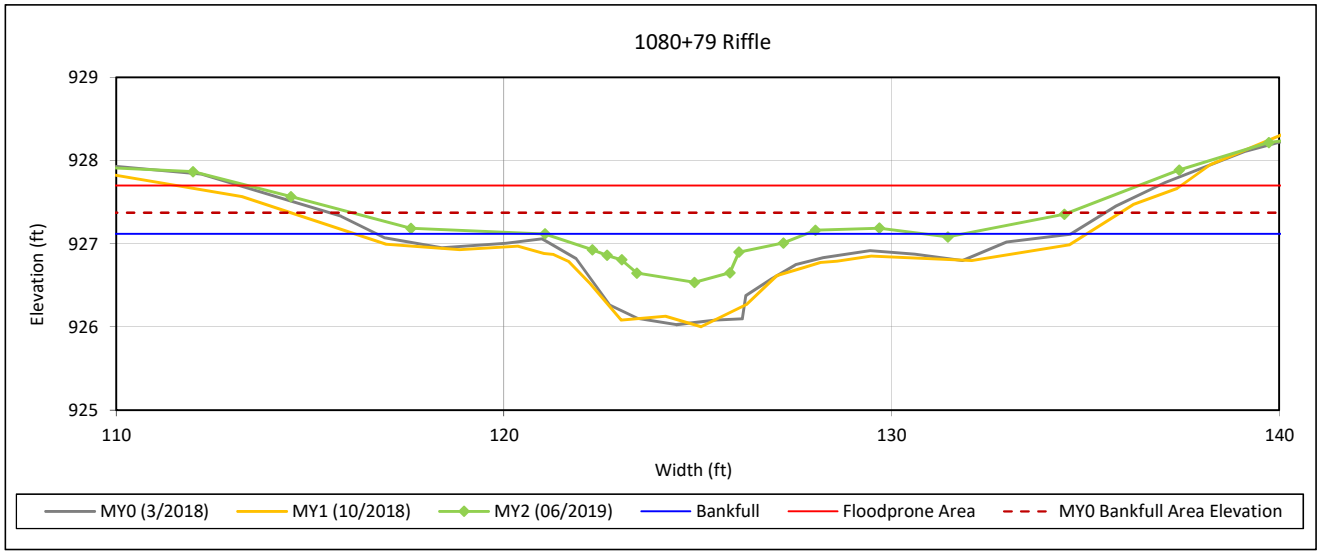
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC UT2: Cross-Section 29



Bankfull Dimensions	
2.0	x-section area (ft.sq.)
6.7	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
6.9	wetted perimeter (ft)
0.3	hydraulic radius (ft)
22.5	width-depth ratio
23.0	W flood prone area (ft)
3.4	entrenchment ratio
0.7	low bank height ratio

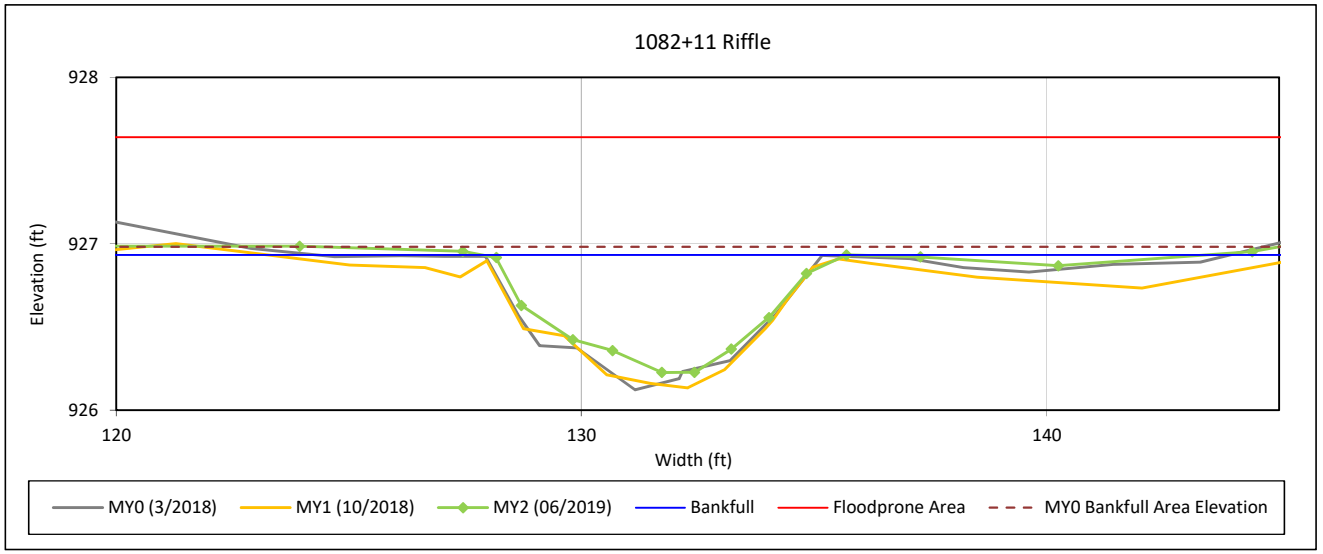
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach UT3: Cross-Section 30



Bankfull Dimensions	
3.3	x-section area (ft.sq.)
7.9	width (ft)
0.4	mean depth (ft)
0.7	max depth (ft)
8.0	wetted perimeter (ft)
0.4	hydraulic radius (ft)
18.6	width-depth ratio
45.3	W flood prone area (ft)
5.8	entrenchment ratio
0.9	low bank height ratio

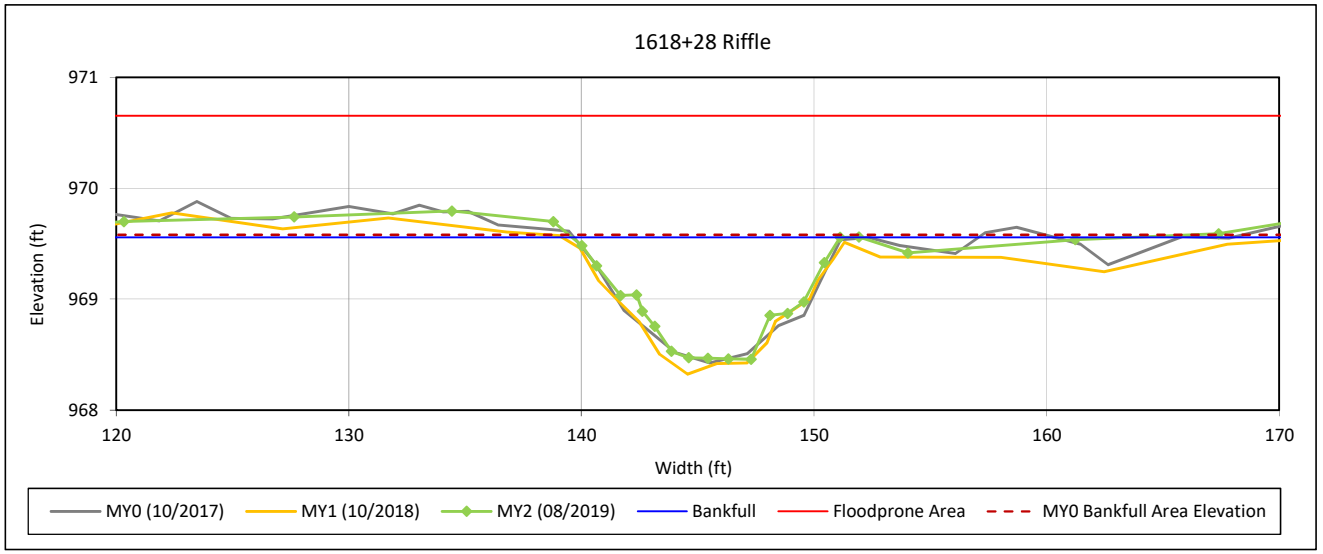
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

UFC Reach 2: Cross-Section 31



Bankfull Dimensions	
7.9	x-section area (ft.sq.)
11.5	width (ft)
0.7	mean depth (ft)
1.1	max depth (ft)
11.9	wetted perimeter (ft)
0.7	hydraulic radius (ft)
16.8	width-depth ratio
77.7	W flood prone area (ft)
6.7	entrenchment ratio
1.0	low bank height ratio

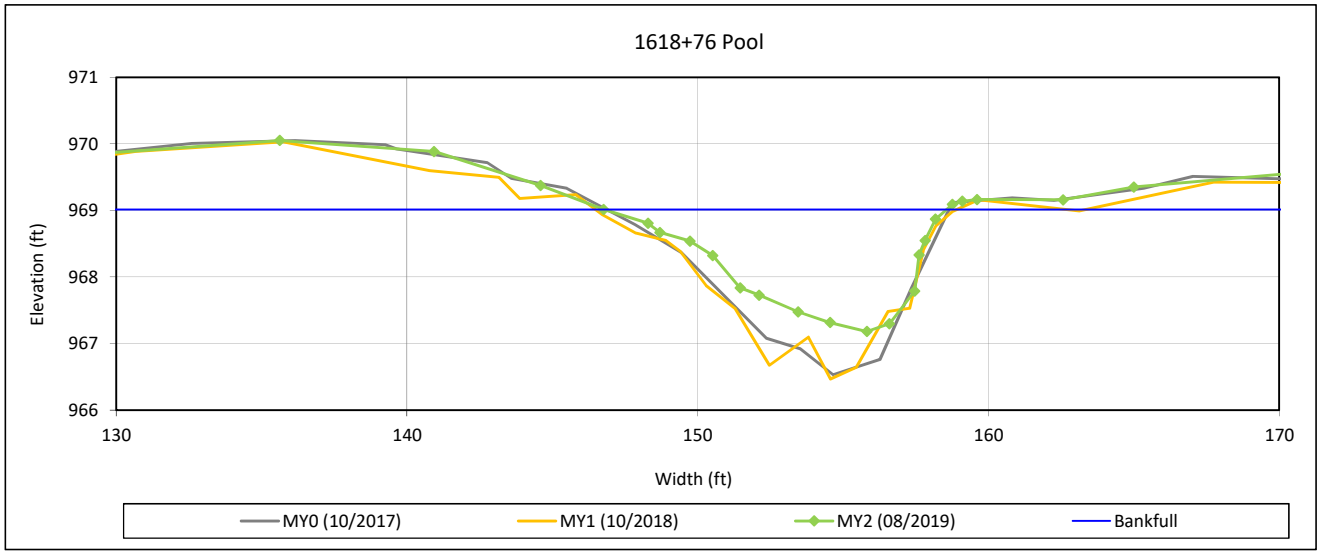
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

UFC Reach 2: Cross-Section 32



Bankfull Dimensions	
11.8	x-section area (ft.sq.)
11.8	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
12.8	wetted perimeter (ft)
0.9	hydraulic radius (ft)
11.8	width-depth ratio

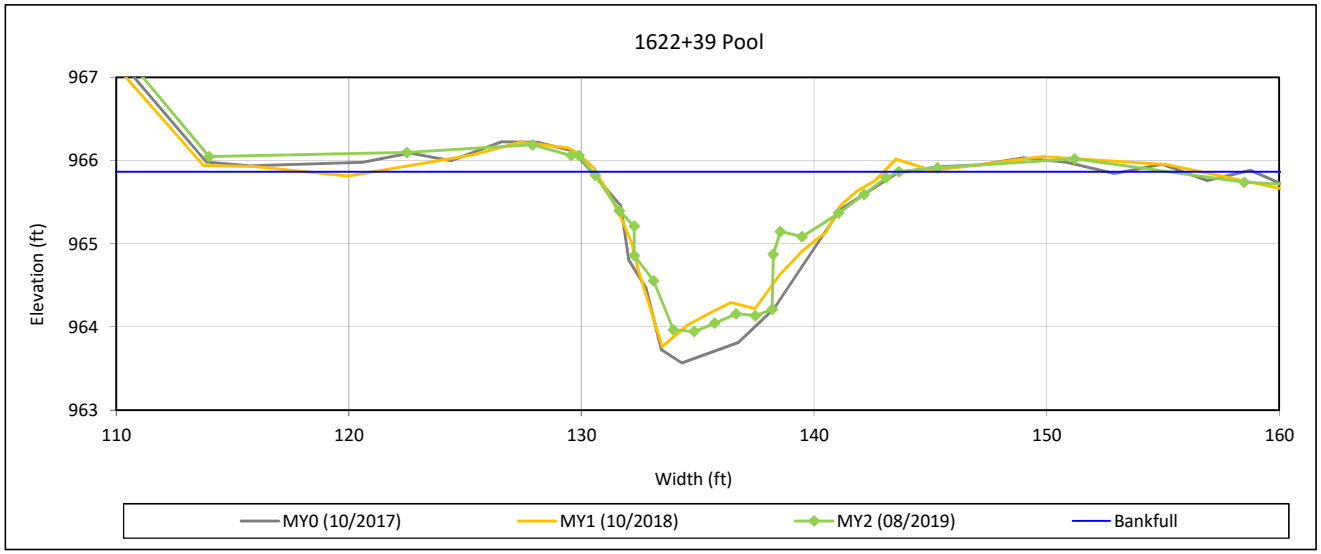
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

UFC Reach 2: Cross-Section 33



Bankfull Dimensions	
13.2	x-section area (ft.sq.)
13.2	width (ft)
1.0	mean depth (ft)
1.9	max depth (ft)
14.7	wetted perimeter (ft)
0.9	hydraulic radius (ft)
13.1	width-depth ratio

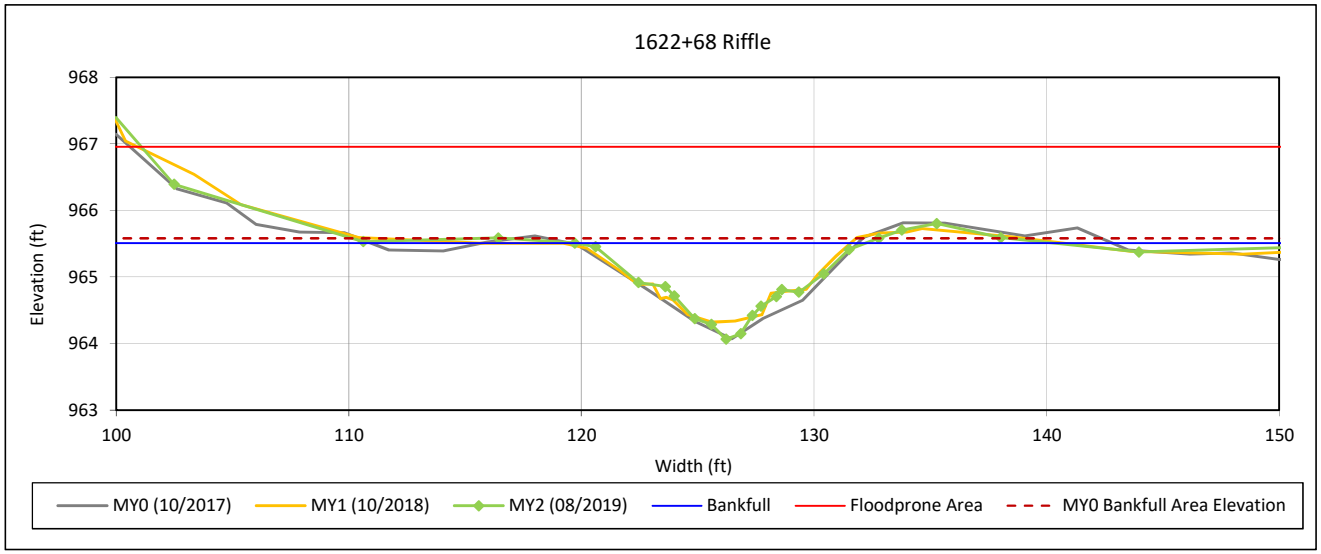
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

UFC Reach 2: Cross-Section 34



Bankfull Dimensions	
8.3	x-section area (ft.sq.)
12.5	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
13.0	wetted perimeter (ft)
0.6	hydraulic radius (ft)
18.9	width-depth ratio
70.2	W flood prone area (ft)
5.6	entrenchment ratio
1.0	low bank height ratio

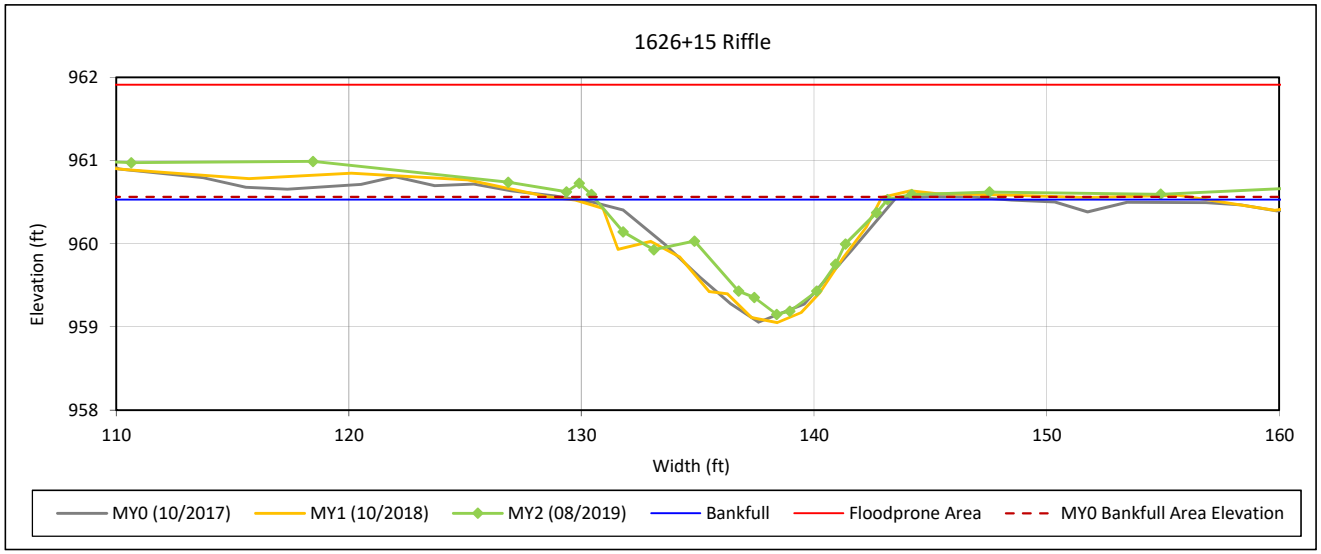
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

UFC Reach 2: Cross-Section 35



Bankfull Dimensions	
9.1	x-section area (ft.sq.)
12.6	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
13.0	wetted perimeter (ft)
0.7	hydraulic radius (ft)
17.3	width-depth ratio
85.5	W flood prone area (ft)
6.8	entrenchment ratio
1.0	low bank height ratio

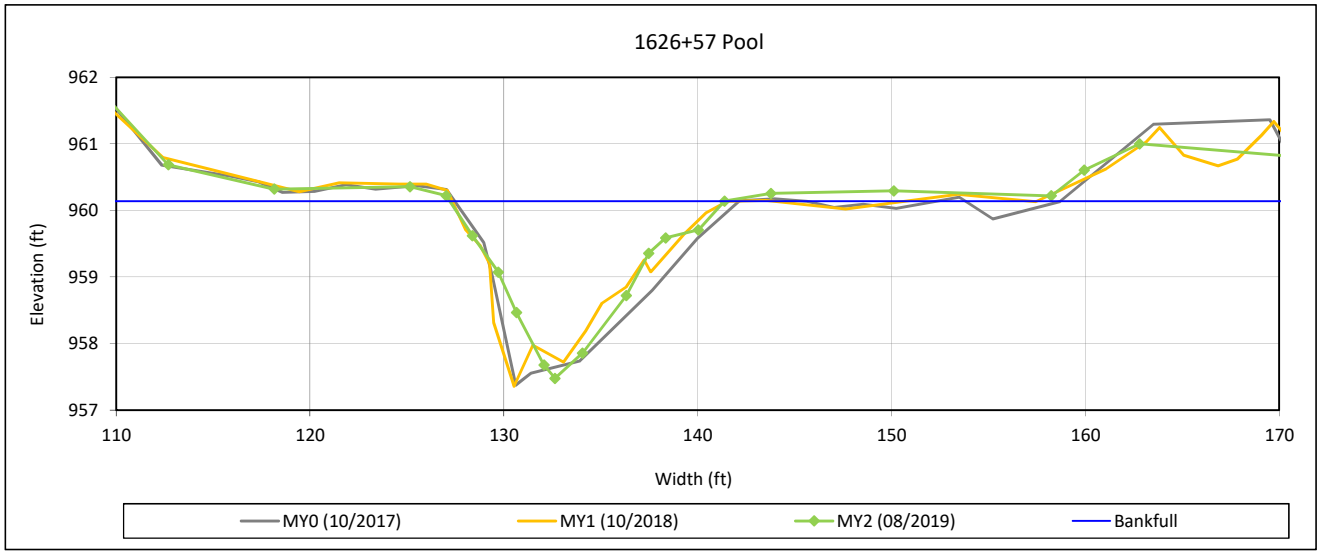
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

UFC Reach 2: Cross-Section 36



Bankfull Dimensions	
17.7	x-section area (ft.sq.)
14.2	width (ft)
1.3	mean depth (ft)
2.7	max depth (ft)
15.3	wetted perimeter (ft)
1.2	hydraulic radius (ft)
11.3	width-depth ratio

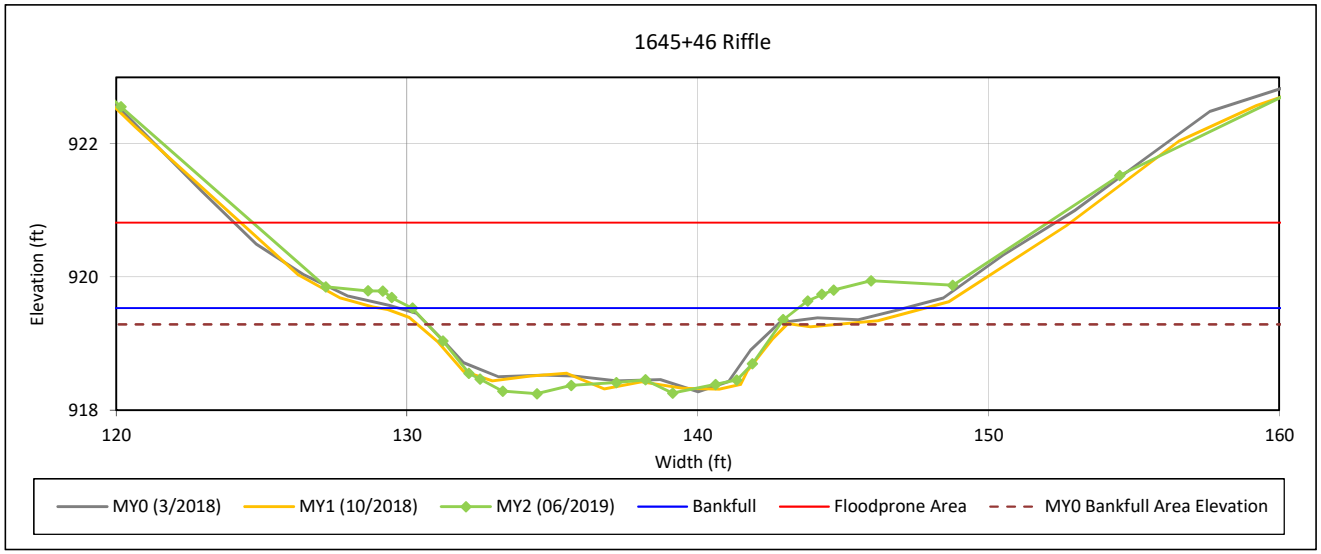
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

LFC Reach 1: Cross-Section 37



Bankfull Dimensions	
12.8	x-section area (ft.sq.)
13.3	width (ft)
1.0	mean depth (ft)
1.3	max depth (ft)
13.8	wetted perimeter (ft)
0.9	hydraulic radius (ft)
13.8	width-depth ratio
27.3	W flood prone area (ft)
2.1	entrenchment ratio
1.2	low bank height ratio

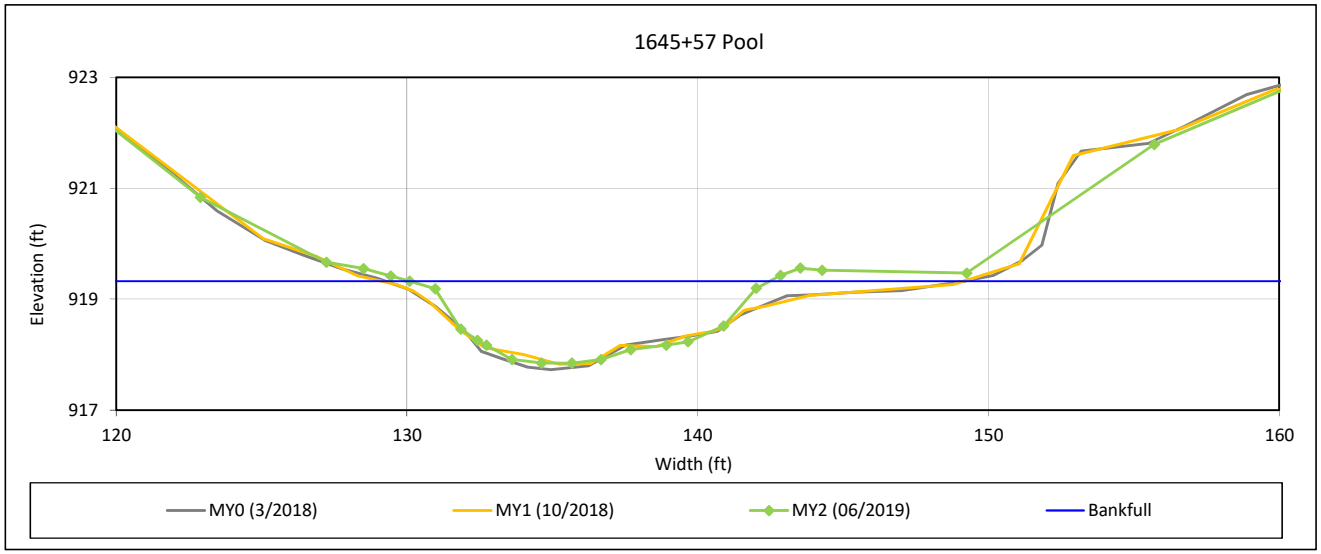
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

LFC Reach 1: Cross-Section 38



Bankfull Dimensions	
12.4	x-section area (ft.sq.)
12.4	width (ft)
1.0	mean depth (ft)
1.5	max depth (ft)
13.0	wetted perimeter (ft)
0.9	hydraulic radius (ft)
12.4	width-depth ratio

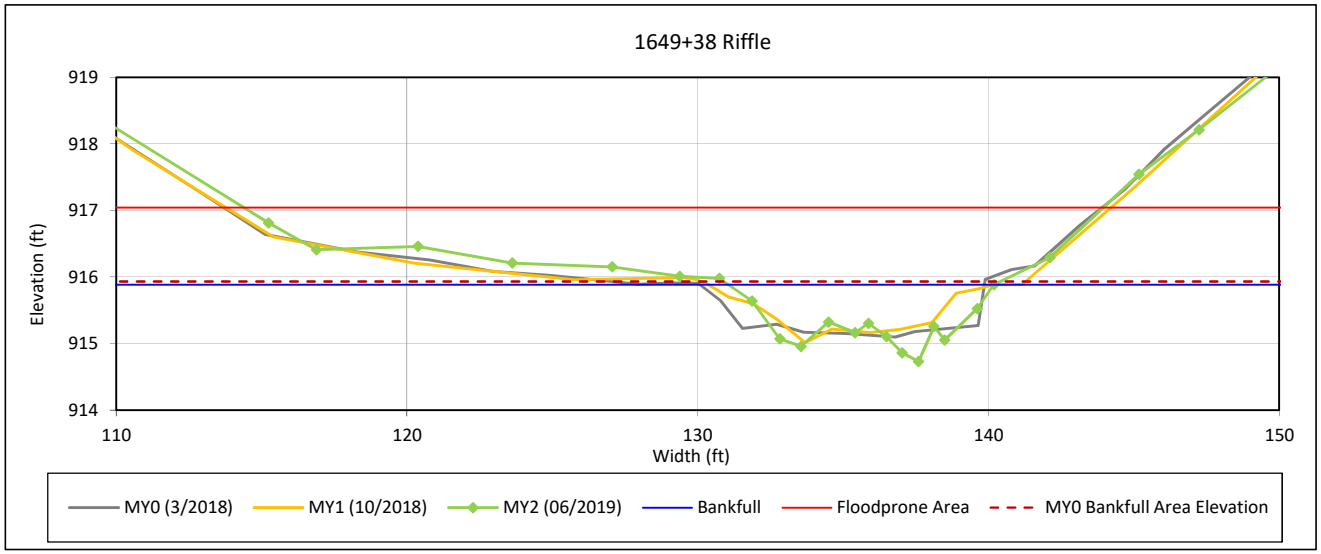
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

LFC Reach 2: Cross-Section 39



Bankfull Dimensions	
5.9	x-section area (ft.sq.)
9.1	width (ft)
0.6	mean depth (ft)
1.2	max depth (ft)
10.0	wetted perimeter (ft)
0.6	hydraulic radius (ft)
14.2	width-depth ratio
29.6	W flood prone area (ft)
3.2	entrenchment ratio
1.0	low bank height ratio

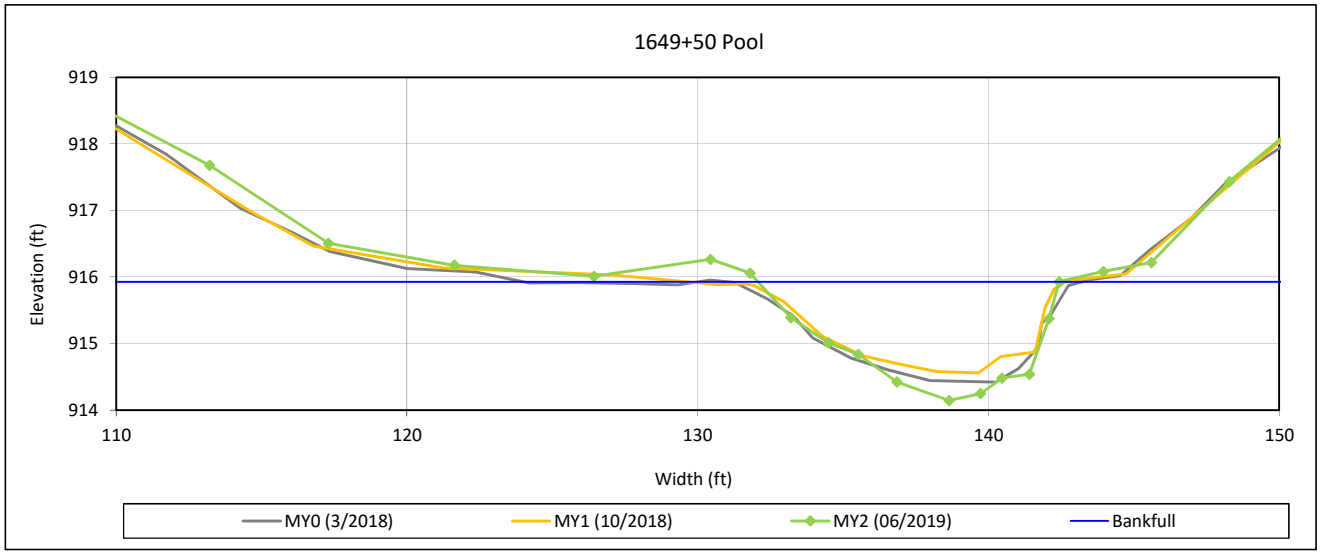
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area B
NCDMS Project No. 739
Monitoring Year 2 - 2019

LFC Reach 2: Cross-Section 40



Bankfull Dimensions	
12.1	x-section area (ft.sq.)
10.4	width (ft)
1.2	mean depth (ft)
1.8	max depth (ft)
11.4	wetted perimeter (ft)
1.1	hydraulic radius (ft)
8.9	width-depth ratio

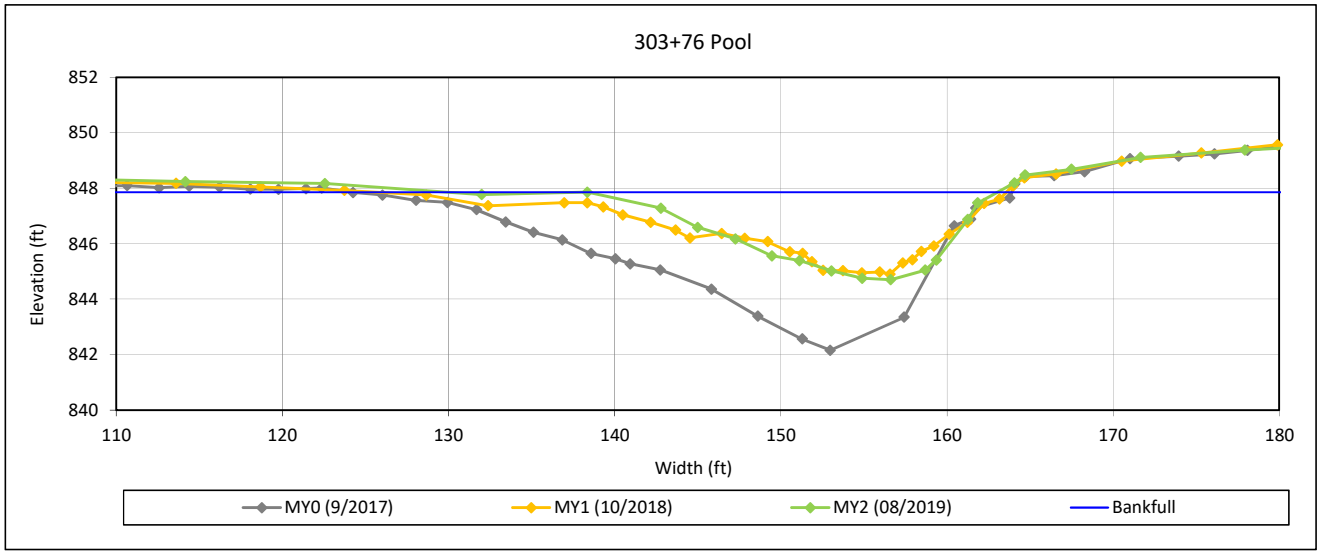
Survey Date: 06/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area C
NCDMS Project No. 739
Monitoring Year 2 - 2019

LBHC Reach 1A: Cross-Section 41



Bankfull Dimensions	
42.8	x-section area (ft.sq.)
24.7	width (ft)
1.7	mean depth (ft)
3.2	max depth (ft)
25.9	wetted perimeter (ft)
1.7	hydraulic radius (ft)
14.2	width-depth ratio

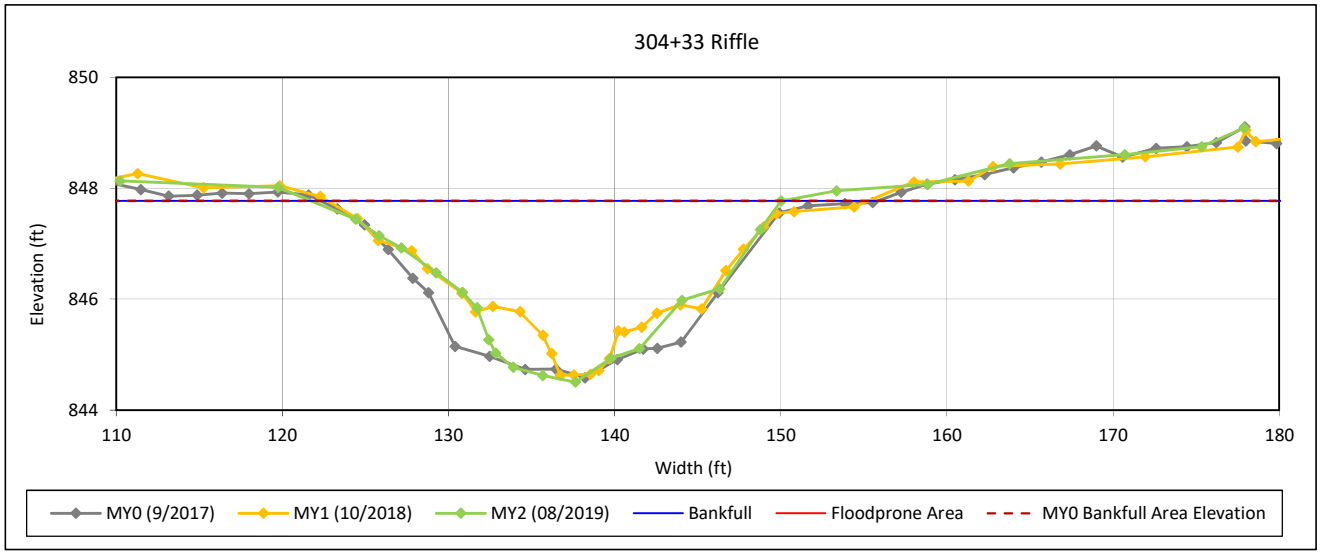
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area C
NCDMS Project No. 739
Monitoring Year 2 - 2019

LBHC Reach 1A: Cross-Section 42



Bankfull Dimensions	
49.3	x-section area (ft.sq.)
28.3	width (ft)
1.7	mean depth (ft)
3.3	max depth (ft)
29.3	wetted perimeter (ft)
1.7	hydraulic radius (ft)
16.2	width-depth ratio
77.9	W flood prone area (ft)
2.8	entrenchment ratio
1.0	low bank height ratio

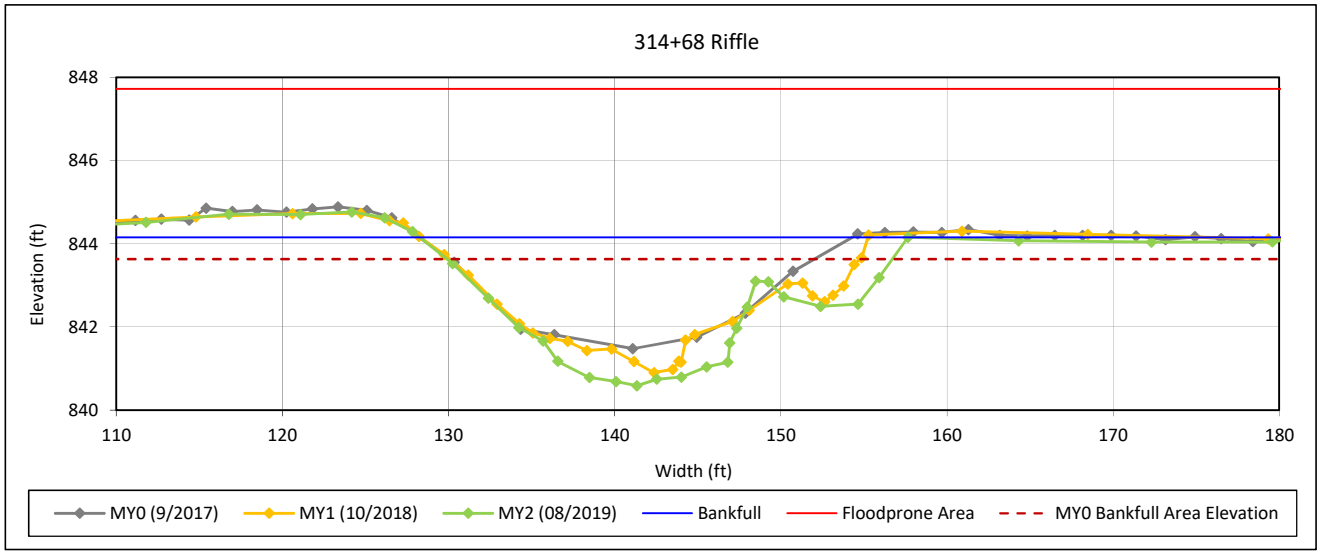
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area C
NCDMS Project No. 739
Monitoring Year 2 - 2019

LBHC Reach 1B/2: Cross-Section 43



Bankfull Dimensions	
60.8	x-section area (ft.sq.)
29.4	width (ft)
2.1	mean depth (ft)
3.6	max depth (ft)
31.5	wetted perimeter (ft)
1.9	hydraulic radius (ft)
14.2	width-depth ratio
84.9	W flood prone area (ft)
2.9	entrenchment ratio
1.2	low bank height ratio

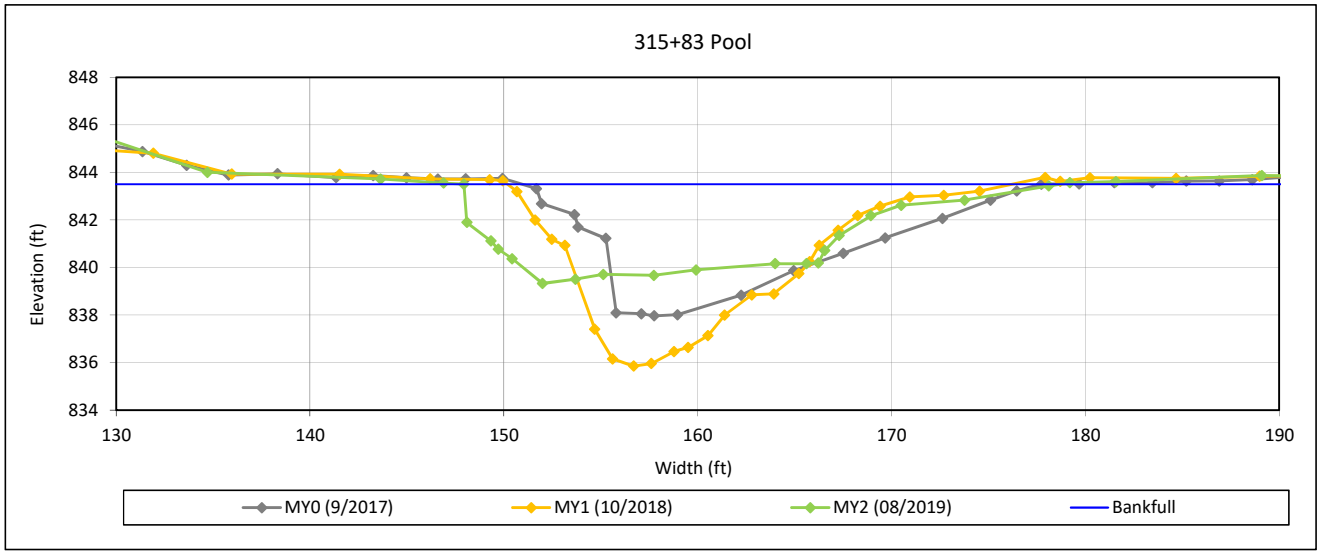
Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Big Harris Creek Mitigation Site - Area C
NCDMS Project No. 739
Monitoring Year 2 - 2019

LBHC Reach 1B/2: Cross-Section 44



Bankfull Dimensions	
75.2	x-section area (ft.sq.)
30.8	width (ft)
2.4	mean depth (ft)
4.2	max depth (ft)
33.9	wetted perimeter (ft)
2.2	hydraulic radius (ft)
12.6	width-depth ratio

Survey Date: 08/2019
Field Crew: Wildlands Engineering

View Downstream

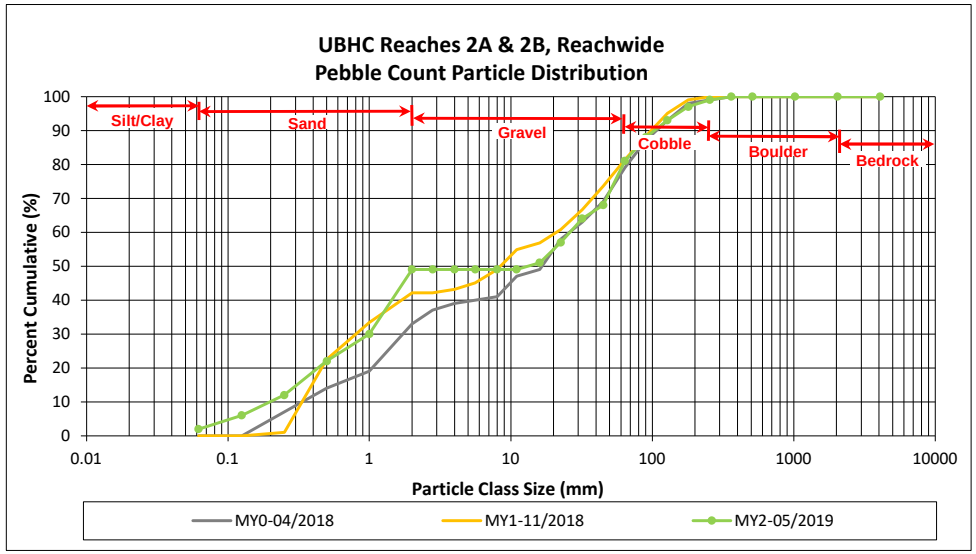
Reachwide and Cross-Section Pebble Count Plots

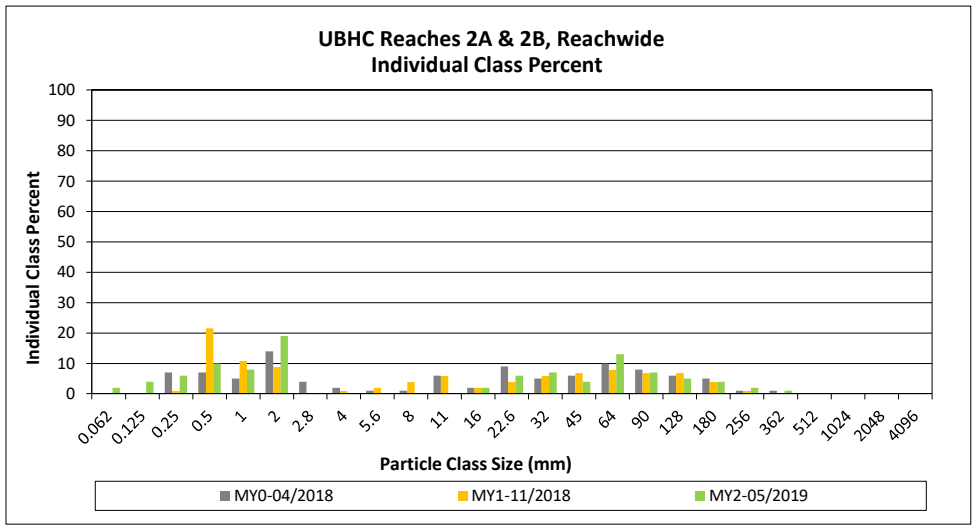
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reaches 2A & 2B, 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	1	2	2	2
SAND	Very fine	0.062	0.125		4	4	4	6
	Fine	0.125	0.250		6	6	6	12
	Medium	0.25	0.50		10	10	10	22
	Coarse	0.5	1.0	1	7	8	8	30
	Very Coarse	1.0	2.0	7	12	19	19	49
GRAVEL	Very Fine	2.0	2.8					49
	Very Fine	2.8	4.0					49
	Fine	4.0	5.6					49
	Fine	5.6	8.0					49
	Medium	8.0	11.0					49
	Medium	11.0	16.0	2		2	2	51
	Coarse	16.0	22.6	4	2	6	6	57
	Coarse	22.6	32	4	3	7	7	64
	Very Coarse	32	45	4		4	4	68
	Very Coarse	45	64	11	2	13	13	81
COBBLE	Small	64	90	7		7	7	88
	Small	90	128	4	1	5	5	93
	Large	128	180	3	1	4	4	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} =	0.3
D_{35} =	1.2
D_{50} =	13.3
D_{84} =	74.1
D_{95} =	151.8
D_{100} =	362.0





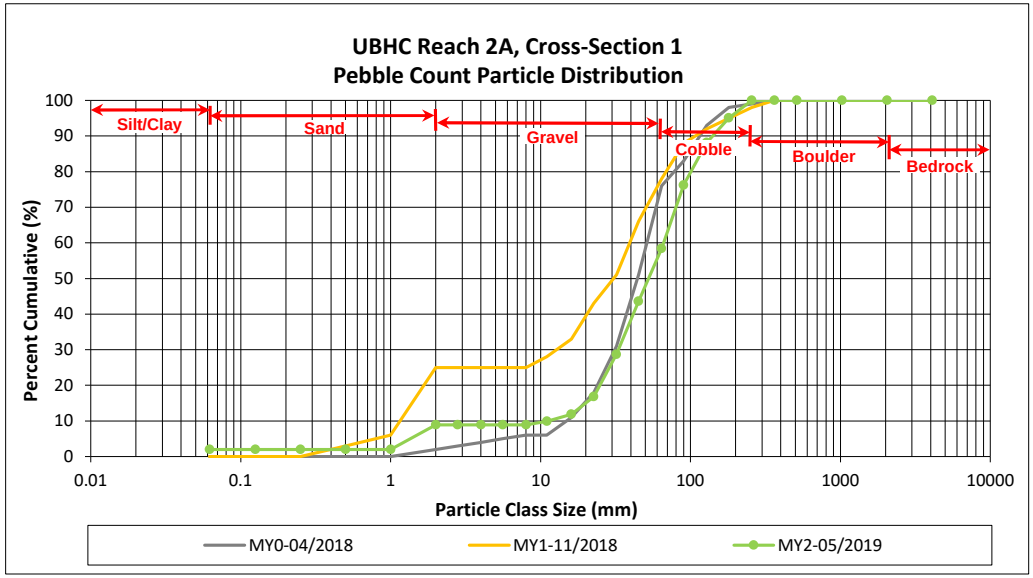
Reachwide and Cross-Section Pebble Count Plots

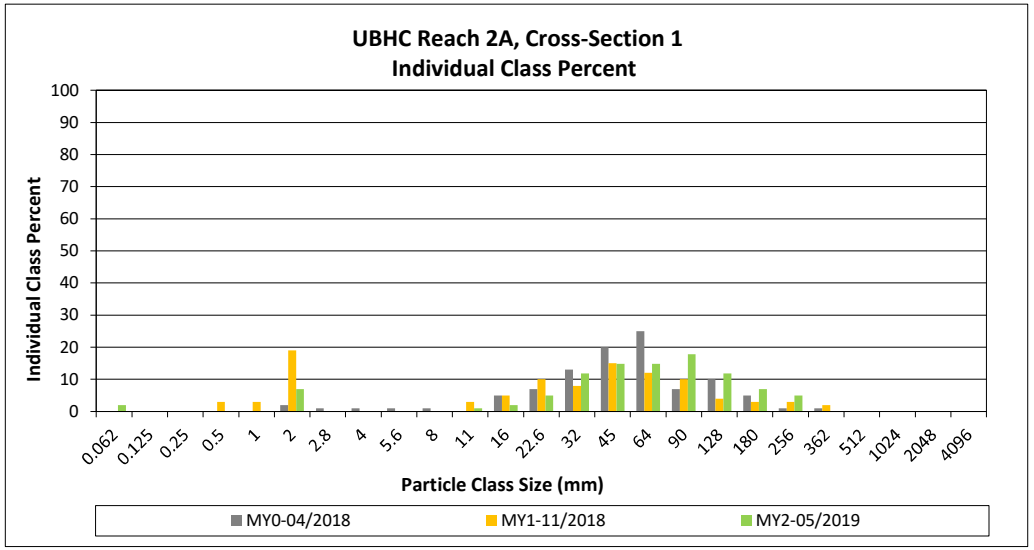
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 2A, Cross-Section 1

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	2	2
SAND	Very fine	0.062	0.125			2
	Fine	0.125	0.250			2
	Medium	0.25	0.50			2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0	7	7	9
GRAVEL	Very Fine	2.0	2.8			9
	Very Fine	2.8	4.0			9
	Fine	4.0	5.6			9
	Fine	5.6	8.0			9
	Medium	8.0	11.0	1	1	10
	Medium	11.0	16.0	2	2	12
	Coarse	16.0	22.6	5	5	17
	Coarse	22.6	32	12	12	29
	Very Coarse	32	45	15	15	44
	Very Coarse	45	64	15	15	58
COBBLE	Small	64	90	18	18	76
	Small	90	128	12	12	88
	Large	128	180	7	7	95
	Large	180	256	5	5	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	**101**	**100**	**100**

Cross-Section 1	
Channel materials (mm)	
D_{16} =	21.3
D_{35} =	37.0
D_{50} =	52.4
D_{84} =	113.3
D_{95} =	179.6
D_{100} =	256.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

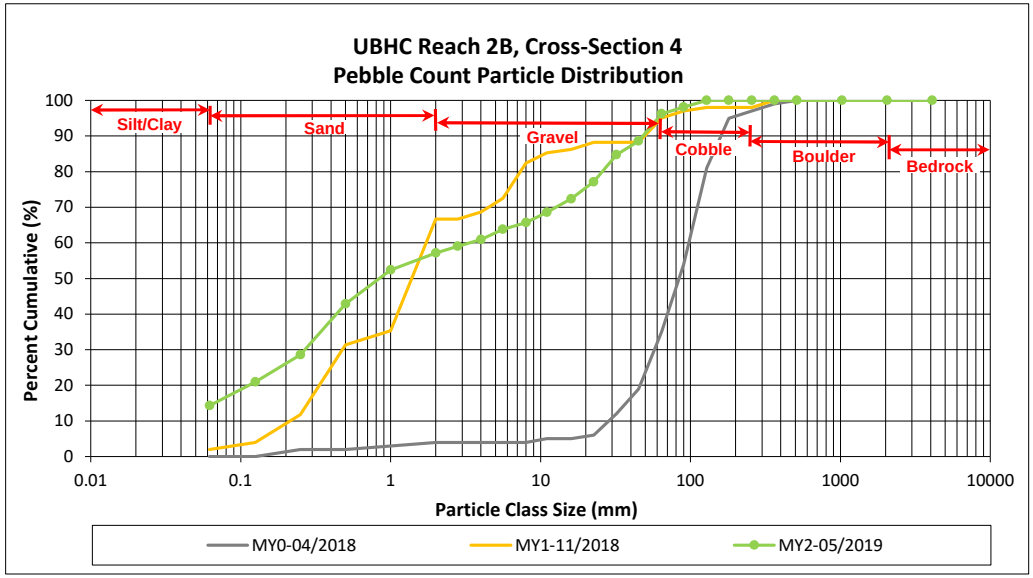
DMS Project No. 739

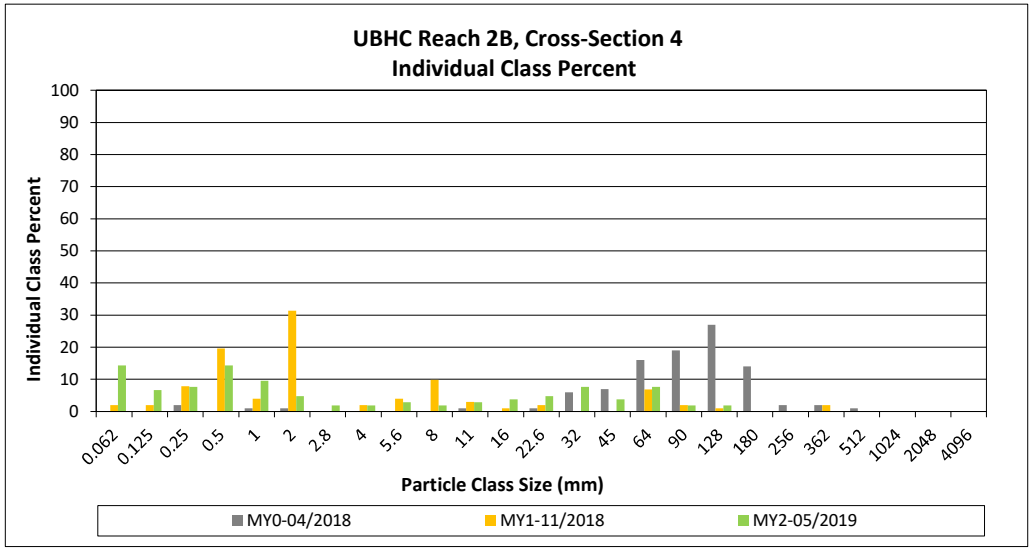
Monitoring Year 2 - 2019

UBHC Reach 2B, Cross-Section 4

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	15	14	14
SAND	Very fine	0.062	0.125	7	7	21
	Fine	0.125	0.250	8	8	29
	Medium	0.25	0.50	15	14	43
	Coarse	0.5	1.0	10	10	52
	Very Coarse	1.0	2.0	5	5	57
GRAVEL	Very Fine	2.0	2.8	2	2	59
	Very Fine	2.8	4.0	2	2	61
	Fine	4.0	5.6	3	3	64
	Fine	5.6	8.0	2	2	66
	Medium	8.0	11.0	3	3	69
	Medium	11.0	16.0	4	4	72
	Coarse	16.0	22.6	5	5	77
	Coarse	22.6	32	8	8	85
	Very Coarse	32	45	4	4	89
	Very Coarse	45	64	8	8	96
COBBLE	Small	64	90	2	2	98
	Small	90	128	2	2	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	**105**	**100**	**100**

Cross-Section 4	
Channel materials (mm)	
D_{16} =	0.1
D_{35} =	0.3
D_{50} =	0.8
D_{84} =	30.9
D_{95} =	60.6
D_{100} =	128.0





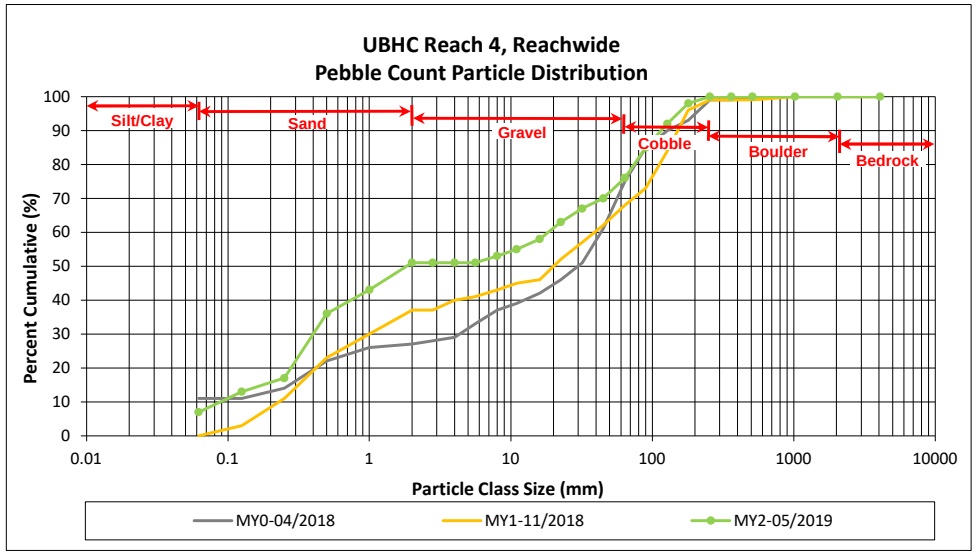
Reachwide and Cross-Section Pebble Count Plots

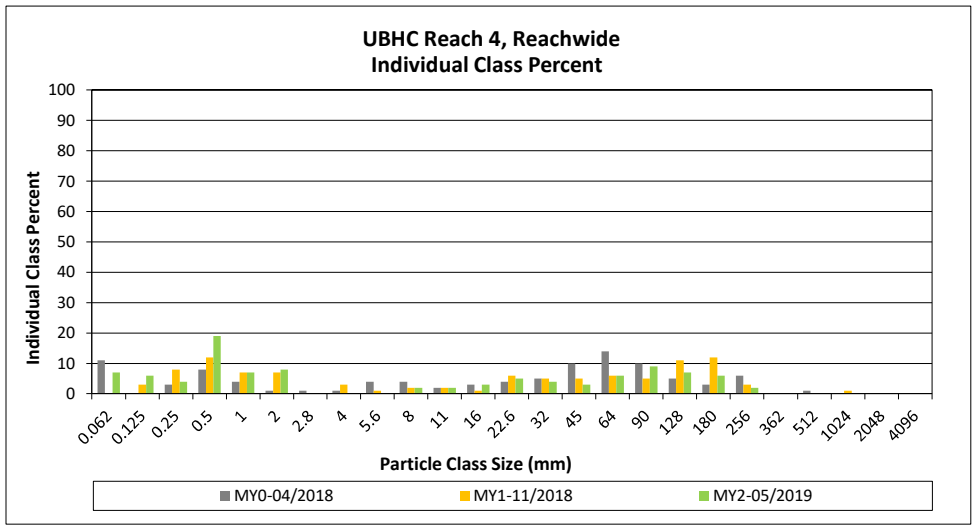
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 4, 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		6	6	6	13
	Fine	0.125	0.250	1	3	4	4	17
	Medium	0.25	0.50		19	19	19	36
	Coarse	0.5	1.0	2	5	7	7	43
	Very Coarse	1.0	2.0	4	4	8	8	51
GRAVEL	Very Fine	2.0	2.8					51
	Very Fine	2.8	4.0					51
	Fine	4.0	5.6					51
	Fine	5.6	8.0	1	1	2	2	53
	Medium	8.0	11.0	2		2	2	55
	Medium	11.0	16.0	2	1	3	3	58
	Coarse	16.0	22.6	3	2	5	5	63
	Coarse	22.6	32	3	1	4	4	67
	Very Coarse	32	45	3		3	3	70
	Very Coarse	45	64	5	1	6	6	76
COBBLE	Small	64	90	9		9	9	85
	Small	90	128	7		7	7	92
	Large	128	180	6		6	6	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} =	0.2
D_{35} =	0.5
D_{50} =	1.8
D_{84} =	86.7
D_{95} =	151.8
D_{100} =	256.0





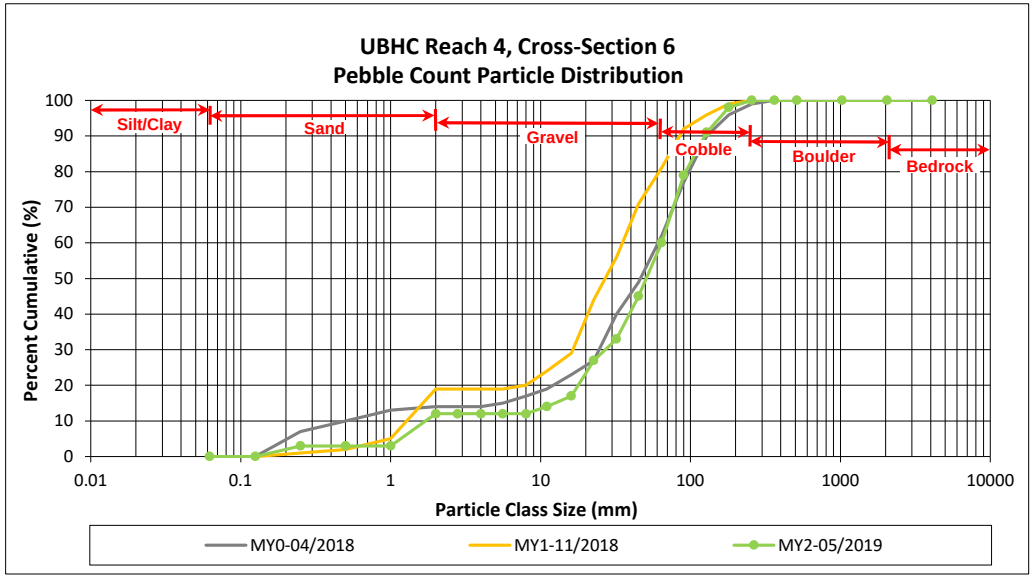
Reachwide and Cross-Section Pebble Count Plots

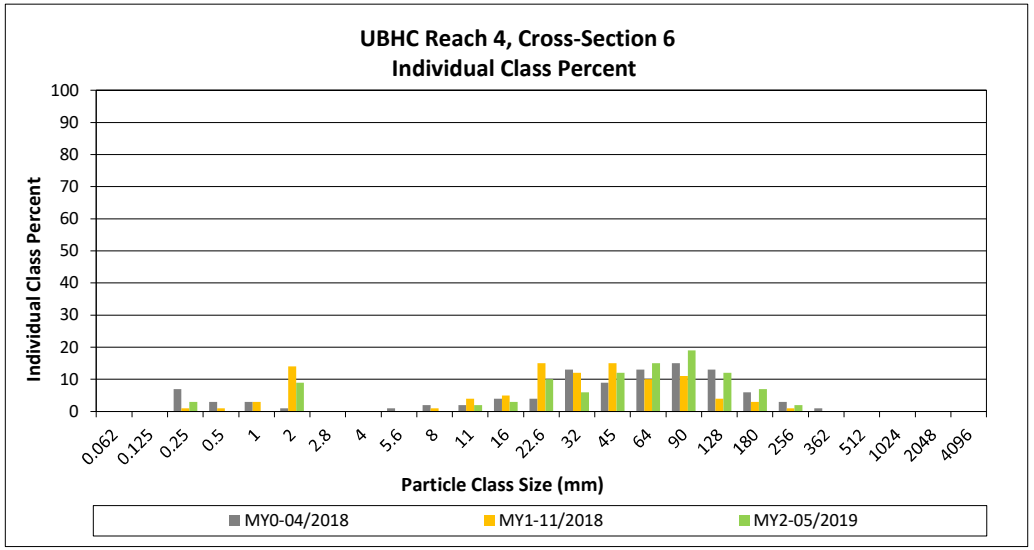
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

UBHC Reach 4, Cross-Section 6

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	3	3	3
	Medium	0.25	0.50			3
	Coarse	0.5	1.0			3
	Very Coarse	1.0	2.0	9	9	12
GRAVEL	Very Fine	2.0	2.8			12
	Very Fine	2.8	4.0			12
	Fine	4.0	5.6			12
	Fine	5.6	8.0			12
	Medium	8.0	11.0	2	2	14
	Medium	11.0	16.0	3	3	17
	Coarse	16.0	22.6	10	10	27
	Coarse	22.6	32	6	6	33
	Very Coarse	32	45	12	12	45
	Very Coarse	45	64	15	15	60
COBBLE	Small	64	90	19	19	79
	Small	90	128	12	12	91
	Large	128	180	7	7	98
	Large	180	256	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	**100**	**100**	**100**

Cross-Section 6	
Channel materials (mm)	
D_{16} =	14.1
D_{35} =	33.9
D_{50} =	50.6
D_{84} =	104.2
D_{95} =	155.5
D_{100} =	256.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

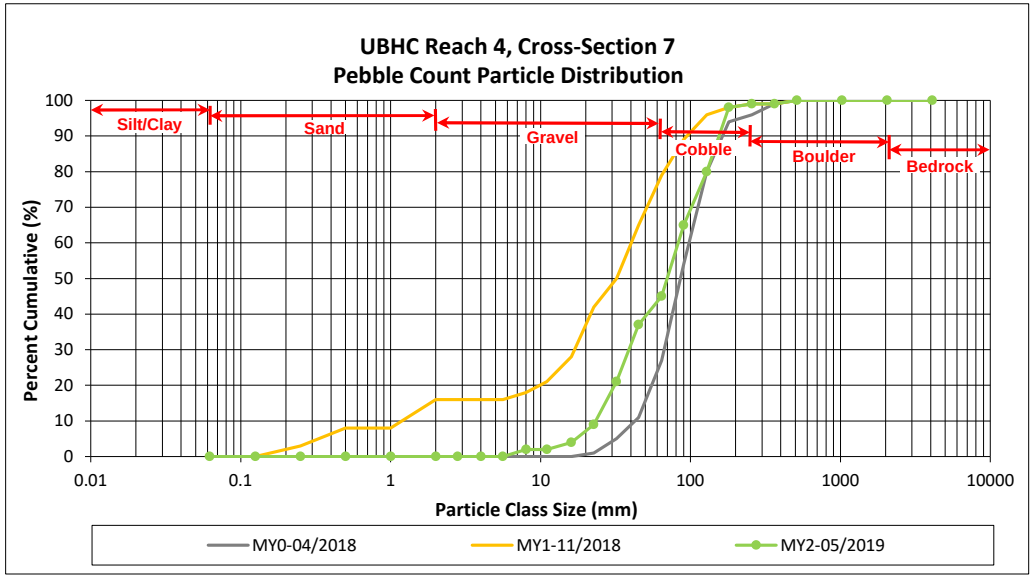
DMS Project No. 739

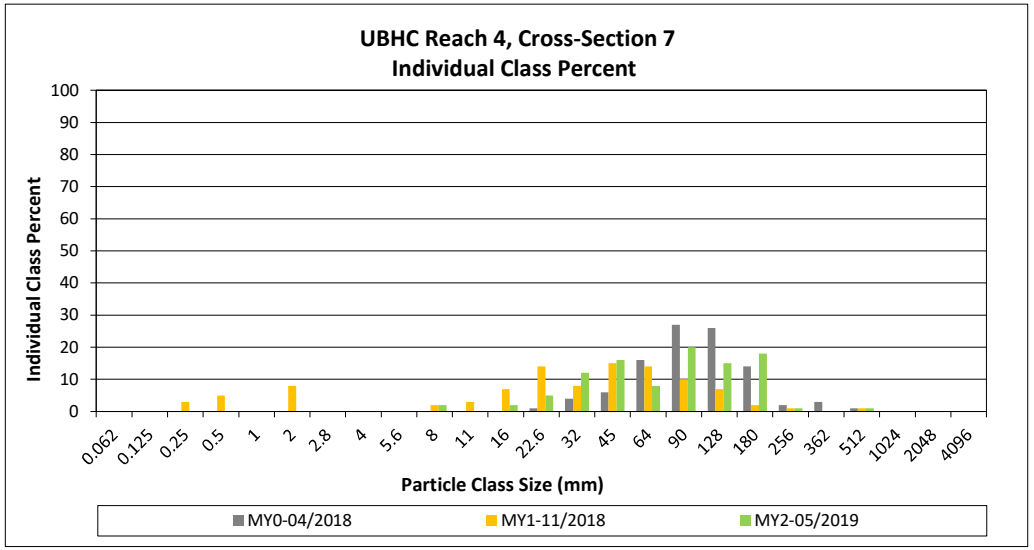
Monitoring Year 2 - 2019

UBHC Reach 4, Cross-Section 7

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0	2	2	2
	Medium	8.0	11.0			2
	Medium	11.0	16.0	2	2	4
	Coarse	16.0	22.6	5	5	9
	Coarse	22.6	32	12	12	21
	Very Coarse	32	45	16	16	37
	Very Coarse	45	64	8	8	45
COBBLE	Small	64	90	20	20	65
	Small	90	128	15	15	80
	Large	128	180	18	18	98
	Large	180	256	1	1	99
BOULDER	Small	256	362			99
	Small	362	512	1	1	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 7	
Channel materials (mm)	
D_{16} =	27.7
D_{35} =	43.1
D_{50} =	69.7
D_{84} =	138.1
D_{95} =	170.1
D_{100} =	512.0





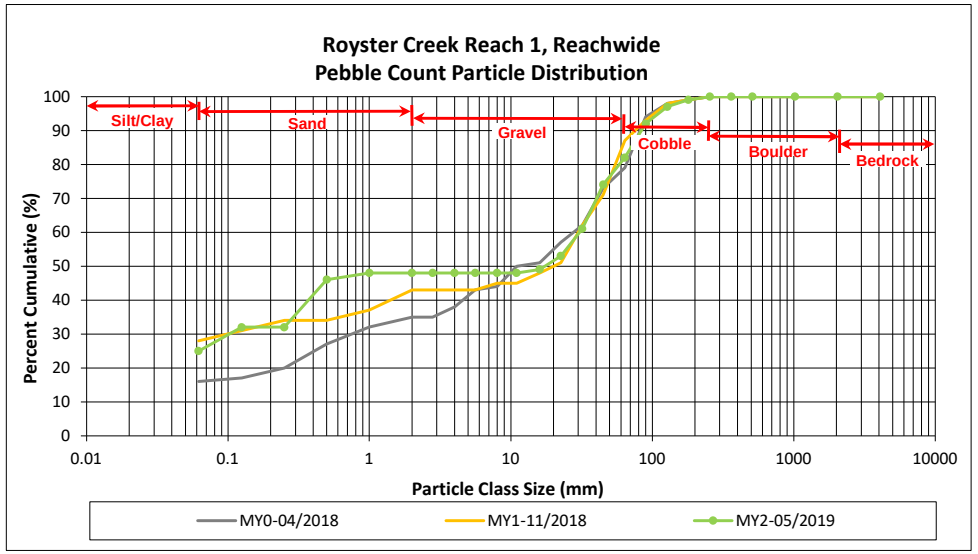
Reachwide and Cross-Section Pebble Count Plots

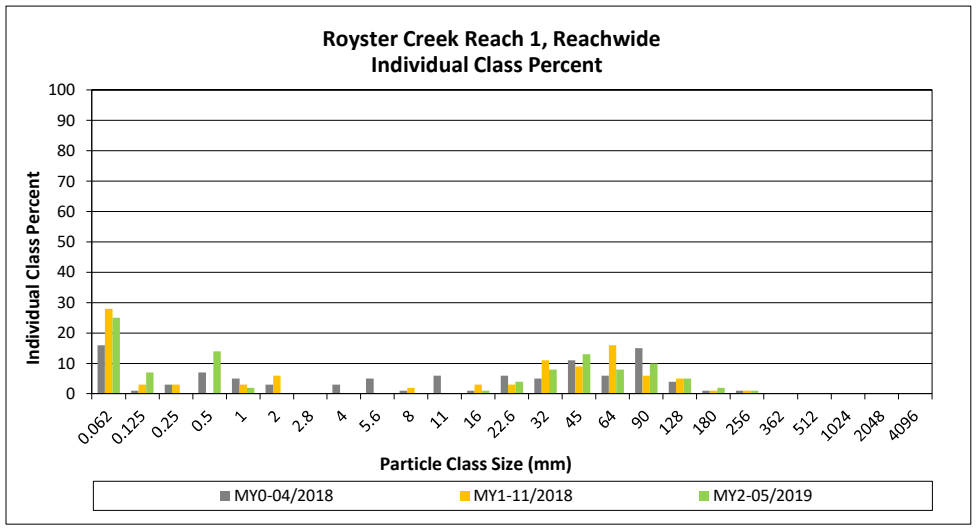
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

Royster Creek Reach 1, 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		25	25	25	25
SAND	Very fine	0.062	0.125		7	7	7	32
	Fine	0.125	0.250					32
	Medium	0.25	0.50	3	11	14	14	46
	Coarse	0.5	1.0		2	2	2	48
	Very Coarse	1.0	2.0					48
GRAVEL	Very Fine	2.0	2.8					48
	Very Fine	2.8	4.0					48
	Fine	4.0	5.6					48
	Fine	5.6	8.0					48
	Medium	8.0	11.0					48
	Medium	11.0	16.0	1		1	1	49
	Coarse	16.0	22.6	3	1	4	4	53
	Coarse	22.6	32	8		8	8	61
	Very Coarse	32	45	12	1	13	13	74
	Very Coarse	45	64	8		8	8	82
COBBLE	Small	64	90	8	2	10	10	92
	Small	90	128	5		5	5	97
	Large	128	180	2		2	2	99
	Large	180	256		1	1	1	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} =	0.3
D_{50} =	17.4
D_{84} =	68.5
D_{95} =	111.2
D_{100} =	256.0





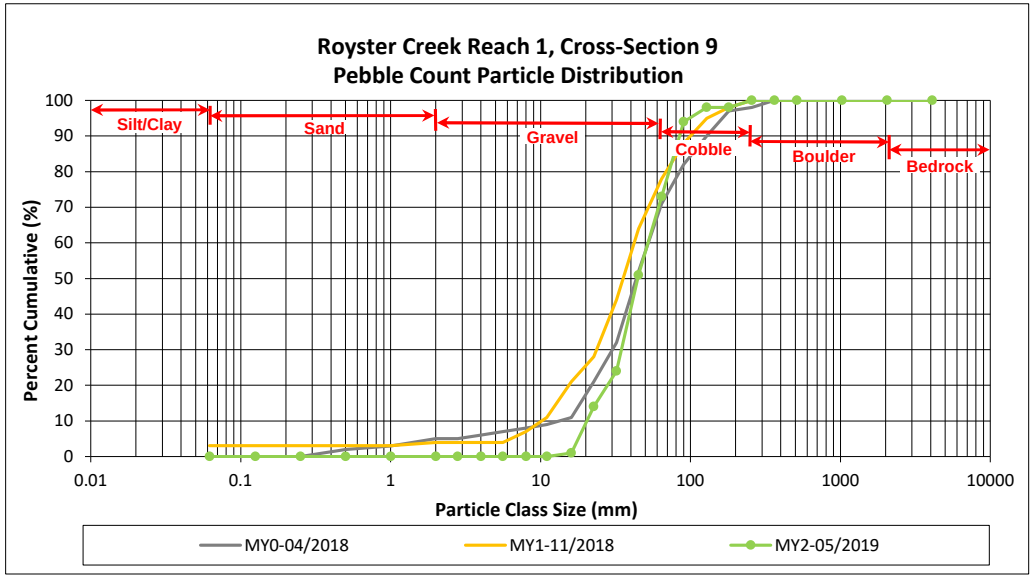
Reachwide and Cross-Section Pebble Count Plots

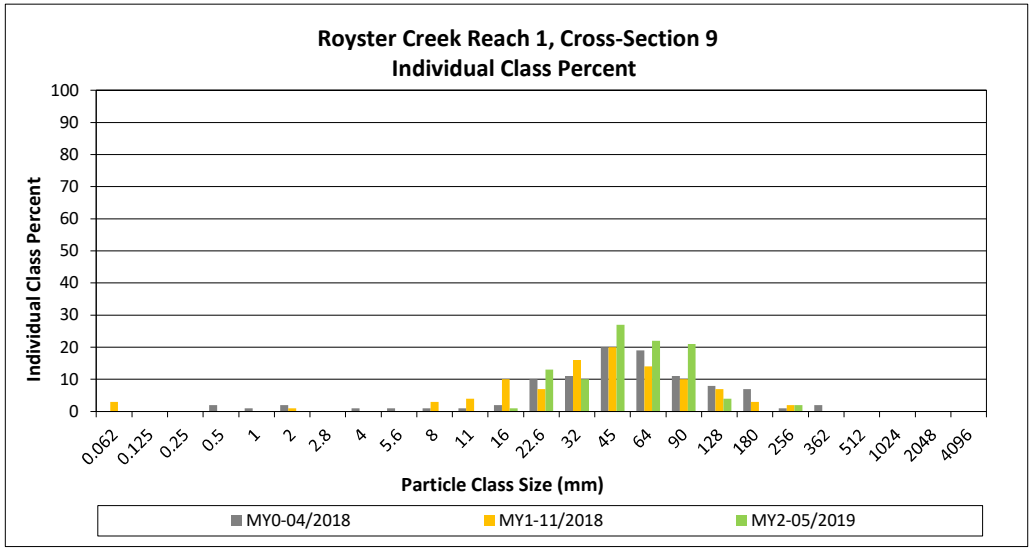
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

Royster Creek Reach 1, Cross-Section 9

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0			0
	Medium	8.0	11.0			0
	Medium	11.0	16.0	1	1	1
	Coarse	16.0	22.6	13	13	14
	Coarse	22.6	32	10	10	24
	Very Coarse	32	45	27	27	51
	Very Coarse	45	64	22	22	73
COBBLE	Small	64	90	21	21	94
	Small	90	128	4	4	98
	Large	128	180			98
	Large	180	256	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	**100**	**100**	**100**

Cross-Section 9	
Channel materials (mm)	
D_{16} =	24.2
D_{35} =	36.8
D_{50} =	44.4
D_{84} =	76.5
D_{95} =	98.3
D_{100} =	256.0





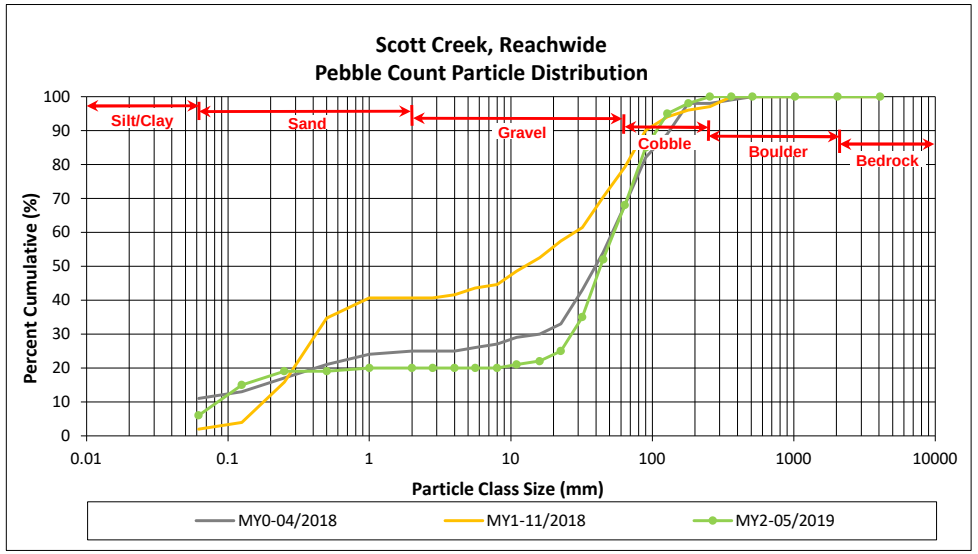
Reachwide and Cross-Section Pebble Count Plots

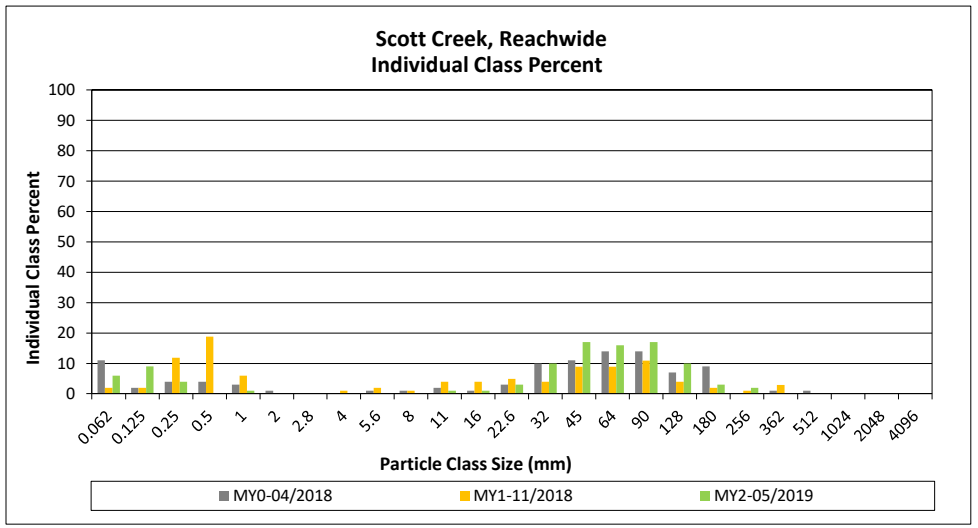
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

Scott Creek, 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	6	6	6
SAND	Very fine	0.062	0.125	1	8	9	9	15
	Fine	0.125	0.250	1	3	4	4	19
	Medium	0.25	0.50					19
	Coarse	0.5	1.0		1	1	1	20
	Very Coarse	1.0	2.0					20
GRAVEL	Very Fine	2.0	2.8					20
	Very Fine	2.8	4.0					20
	Fine	4.0	5.6					20
	Fine	5.6	8.0					20
	Medium	8.0	11.0		1	1	1	21
	Medium	11.0	16.0		1	1	1	22
	Coarse	16.0	22.6	2	1	3	3	25
	Coarse	22.6	32	5	5	10	10	35
	Very Coarse	32	45	12	5	17	17	52
	Very Coarse	45	64	10	6	16	16	68
COBBLE	Small	64	90	12	5	17	17	85
	Small	90	128	4	6	10	10	95
	Large	128	180	2	1	3	3	98
	Large	180	256	1	1	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} =	0.1
D_{35} =	32.0
D_{50} =	43.2
D_{84} =	88.2
D_{95} =	128.0
D_{100} =	256.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

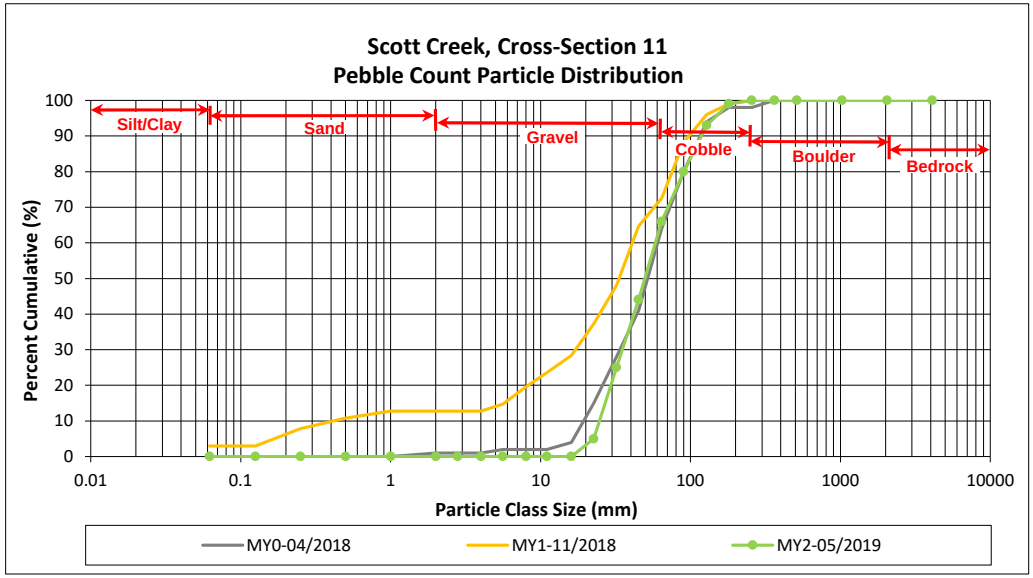
DMS Project No. 739

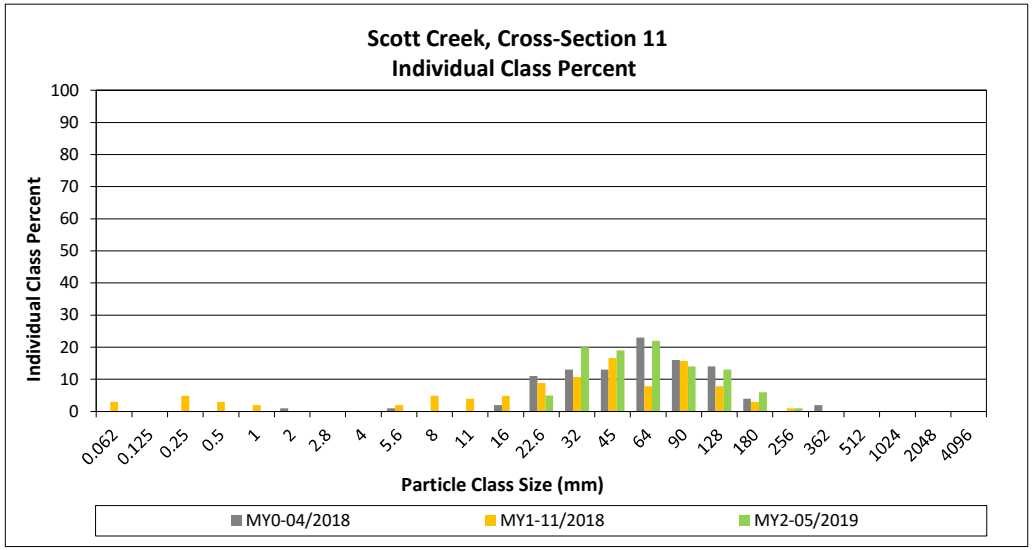
Monitoring Year 2 - 2019

Scott Creek, Cross-Section 11

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0			0
	Medium	8.0	11.0			0
	Medium	11.0	16.0			0
	Coarse	16.0	22.6	5	5	5
	Coarse	22.6	32	20	20	25
	Very Coarse	32	45	19	19	44
	Very Coarse	45	64	22	22	66
COBBLE	Small	64	90	14	14	80
	Small	90	128	13	13	93
	Large	128	180	6	6	99
	Large	180	256	1	1	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	**100**	**100**	**100**

Cross-Section 11	
Channel materials (mm)	
D_{16} =	27.4
D_{35} =	38.3
D_{50} =	49.5
D_{84} =	100.3
D_{95} =	143.4
D_{100} =	256.0





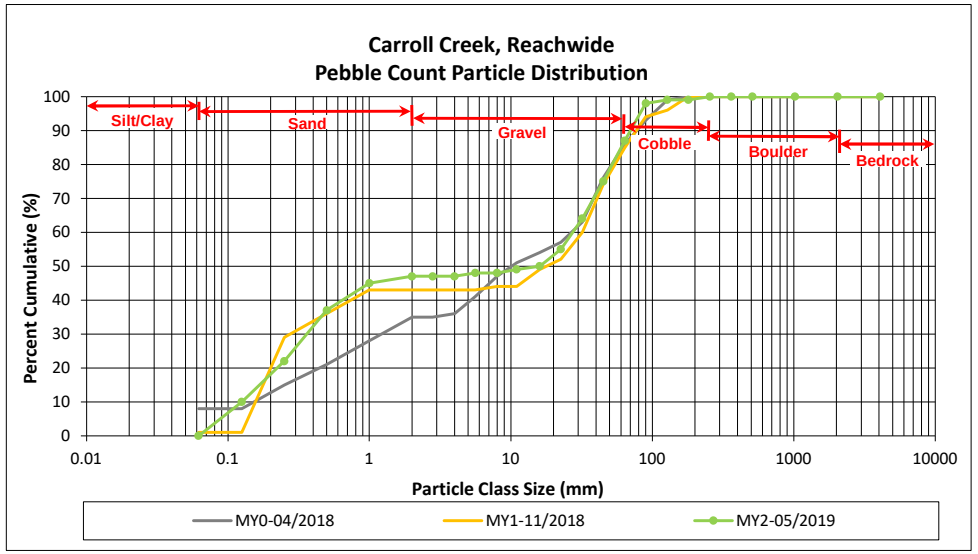
Reachwide and Cross-Section Pebble Count Plots

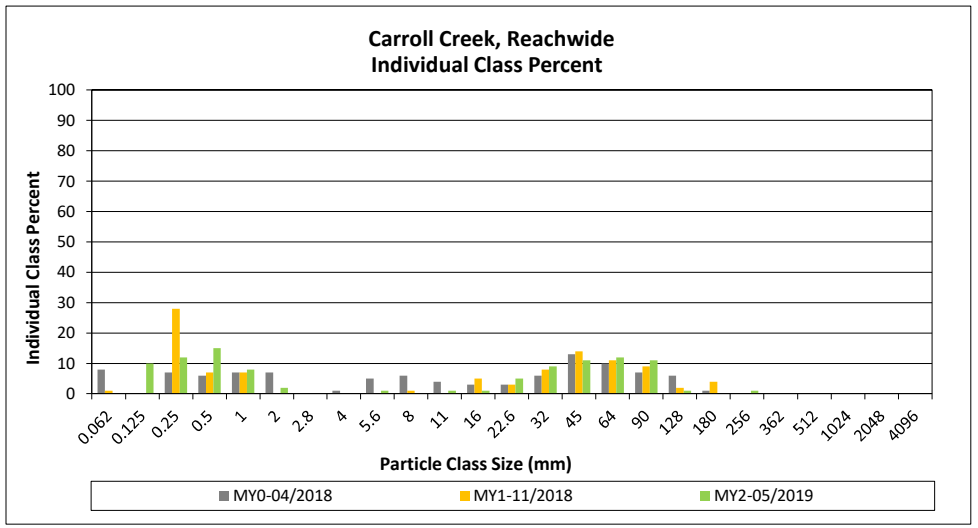
Big Harris Creek Mitigation Site - Area A
DMS Project No. 739
Monitoring Year 2 - 2019

Carroll Creek, 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					0
SAND	Very fine	0.062	0.125		10	10	10	10
	Fine	0.125	0.250		12	12	12	22
	Medium	0.25	0.50	1	14	15	15	37
	Coarse	0.5	1.0		8	8	8	45
	Very Coarse	1.0	2.0		2	2	2	47
GRAVEL	Very Fine	2.0	2.8					47
	Very Fine	2.8	4.0					47
	Fine	4.0	5.6		1	1	1	48
	Fine	5.6	8.0					48
	Medium	8.0	11.0	1		1	1	49
	Medium	11.0	16.0	1		1	1	50
	Coarse	16.0	22.6	4	1	5	5	55
	Coarse	22.6	32	9		9	9	64
	Very Coarse	32	45	9	2	11	11	75
	Very Coarse	45	64	12		12	12	87
COBBLE	Small	64	90	11		11	11	98
	Small	90	128	1		1	1	99
	Large	128	180					99
	Large	180	256	1		1	1	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} =	0.2
D_{35} =	0.5
D_{50} =	16.0
D_{84} =	58.6
D_{95} =	82.0
D_{100} =	256.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

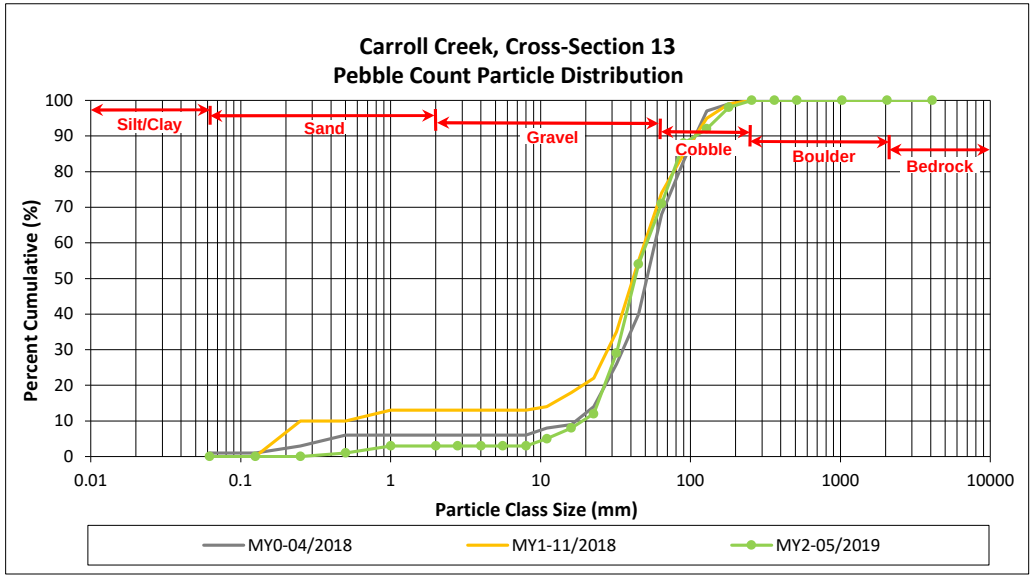
DMS Project No. 739

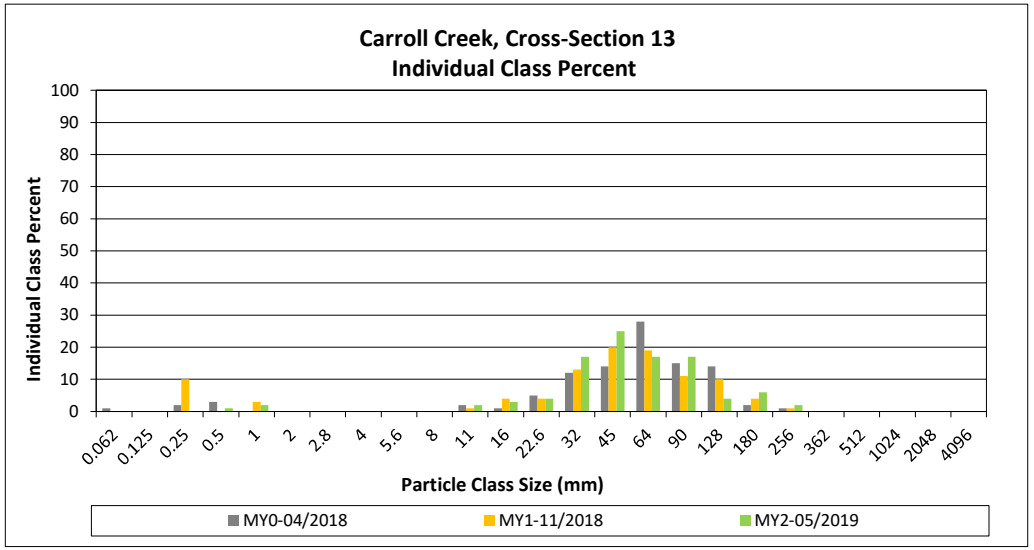
Monitoring Year 2 - 2019

Carroll Creek, Cross-Section 13

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	1	1	1
	Coarse	0.5	1.0	2	2	3
	Very Coarse	1.0	2.0			3
GRAVEL	Very Fine	2.0	2.8			3
	Very Fine	2.8	4.0			3
	Fine	4.0	5.6			3
	Fine	5.6	8.0			3
	Medium	8.0	11.0	2	2	5
	Medium	11.0	16.0	3	3	8
	Coarse	16.0	22.6	4	4	12
	Coarse	22.6	32	17	17	29
	Very Coarse	32	45	25	25	54
	Very Coarse	45	64	17	17	71
COBBLE	Small	64	90	17	17	88
	Small	90	128	4	4	92
	Large	128	180	6	6	98
	Large	180	256	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	**100**	**100**	**100**

Cross-Section 13	
Channel materials (mm)	
D_{16} =	24.5
D_{35} =	34.7
D_{50} =	42.6
D_{84} =	83.1
D_{95} =	151.8
D_{100} =	256.0





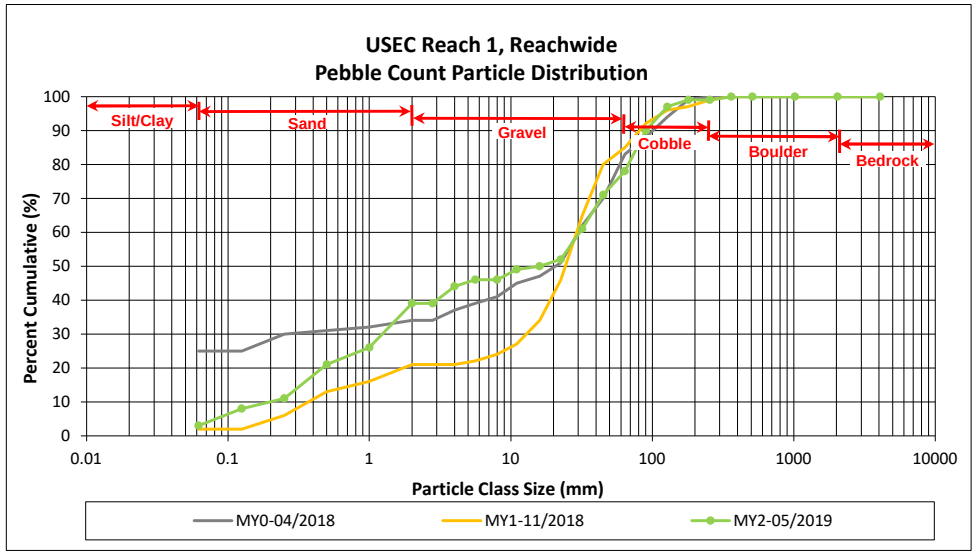
Reachwide and Cross-Section Pebble Count Plots

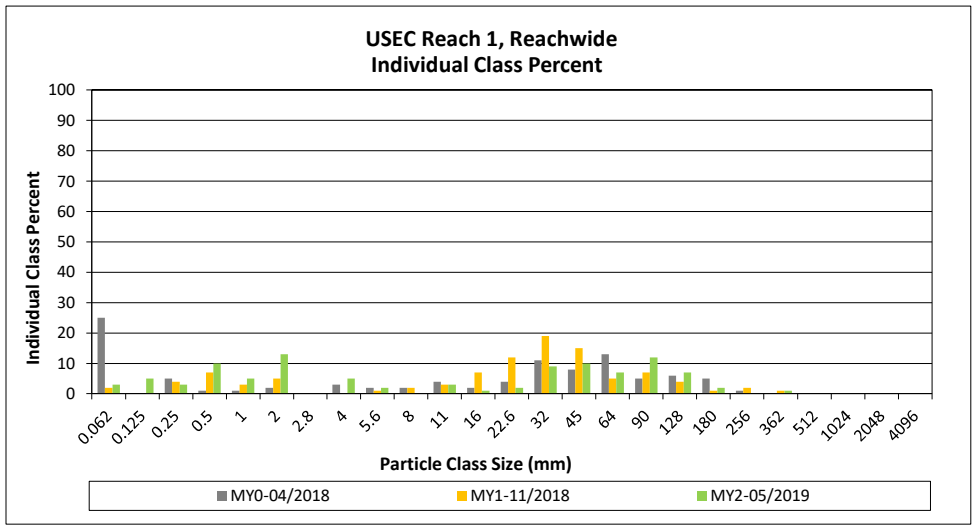
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 1, 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	3	3	3
SAND	Very fine	0.062	0.125		5	5	5	8
	Fine	0.125	0.250		3	3	3	11
	Medium	0.25	0.50		10	10	10	21
	Coarse	0.5	1.0		5	5	5	26
	Very Coarse	1.0	2.0	1	12	13	13	39
GRAVEL	Very Fine	2.0	2.8					39
	Very Fine	2.8	4.0	1	4	5	5	44
	Fine	4.0	5.6		2	2	2	46
	Fine	5.6	8.0					46
	Medium	8.0	11.0	2	1	3	3	49
	Medium	11.0	16.0		1	1	1	50
	Coarse	16.0	22.6	1	1	2	2	52
	Coarse	22.6	32	8	1	9	9	61
	Very Coarse	32	45	10		10	10	71
	Very Coarse	45	64	7		7	7	78
COBBLE	Small	64	90	12		12	12	90
	Small	90	128	6	1	7	7	97
	Large	128	180	2		2	2	99
	Large	180	256					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} =	0.4
D_{35} =	1.6
D_{50} =	16.0
D_{84} =	75.9
D_{95} =	115.7
D_{100} =	362.0





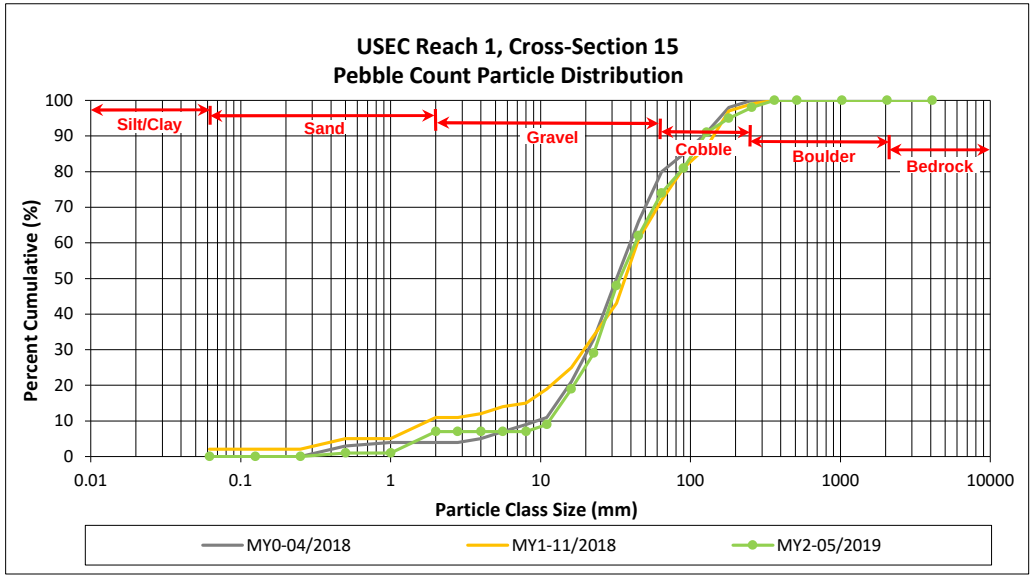
Reachwide and Cross-Section Pebble Count Plots

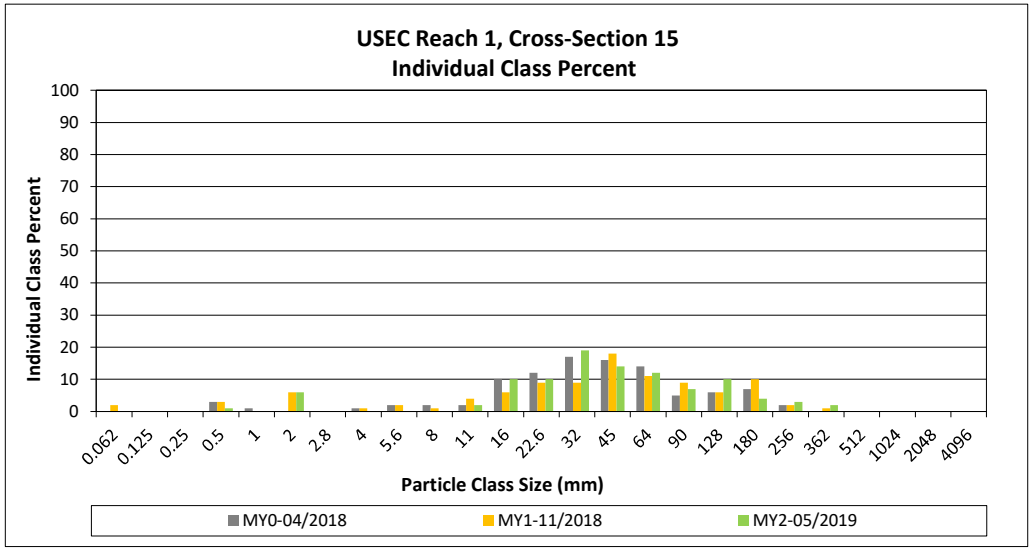
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 1, Cross-Section 15

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	1	1	1
	Coarse	0.5	1.0			1
	Very Coarse	1.0	2.0	6	6	7
GRAVEL	Very Fine	2.0	2.8			7
	Very Fine	2.8	4.0			7
	Fine	4.0	5.6			7
	Fine	5.6	8.0			7
	Medium	8.0	11.0	2	2	9
	Medium	11.0	16.0	10	10	19
	Coarse	16.0	22.6	10	10	29
	Coarse	22.6	32	19	19	48
	Very Coarse	32	45	14	14	62
	Very Coarse	45	64	12	12	74
COBBLE	Small	64	90	7	7	81
	Small	90	128	10	10	91
	Large	128	180	4	4	95
	Large	180	256	3	3	98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 15	
Channel materials (mm)	
D_{16} =	14.3
D_{35} =	25.2
D_{50} =	33.6
D_{84} =	100.0
D_{95} =	180.0
D_{100} =	362.0





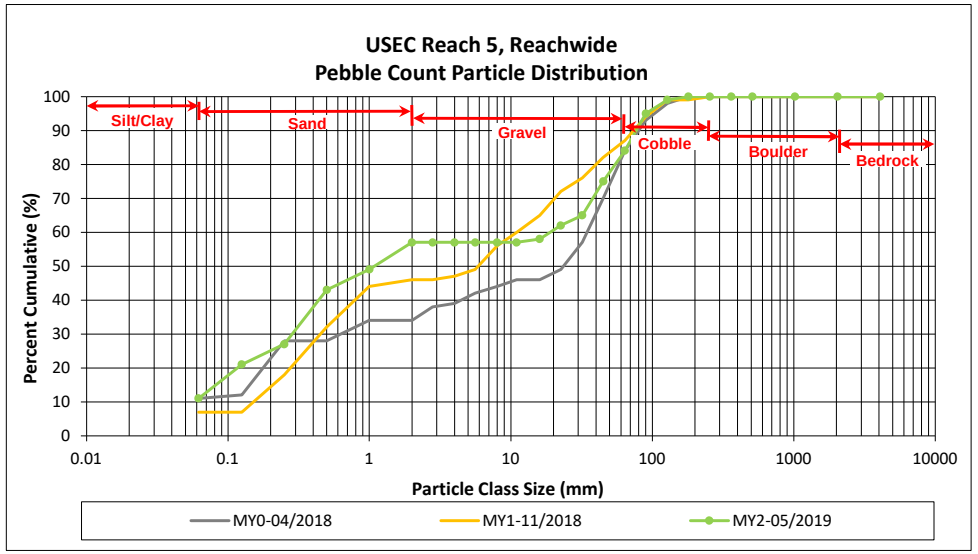
Reachwide and Cross-Section Pebble Count Plots

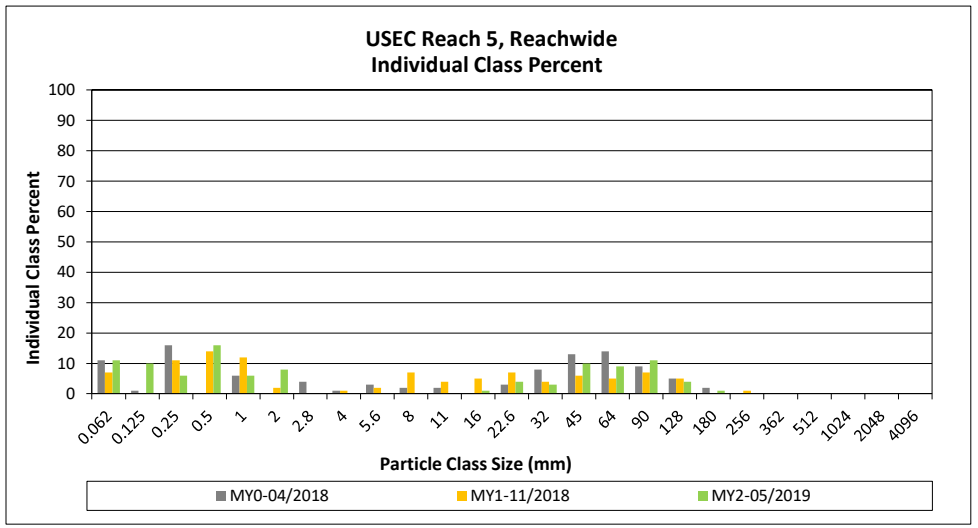
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 5, 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		11	11	11	11
SAND	Very fine	0.062	0.125		10	10	10	21
	Fine	0.125	0.250	1	5	6	6	27
	Medium	0.25	0.50	2	14	16	16	43
	Coarse	0.5	1.0		6	6	6	49
	Very Coarse	1.0	2.0	4	4	8	8	57
GRAVEL	Very Fine	2.0	2.8					57
	Very Fine	2.8	4.0					57
	Fine	4.0	5.6					57
	Fine	5.6	8.0					57
	Medium	8.0	11.0					57
	Medium	11.0	16.0	1		1	1	58
	Coarse	16.0	22.6	4		4	4	62
	Coarse	22.6	32	3		3	3	65
	Very Coarse	32	45	10		10	10	75
	Very Coarse	45	64	9		9	9	84
COBBLE	Small	64	90	11		11	11	95
	Small	90	128	4		4	4	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} =	0.1
D_{35} =	0.4
D_{50} =	1.1
D_{84} =	64.0
D_{95} =	90.0
D_{100} =	180.0





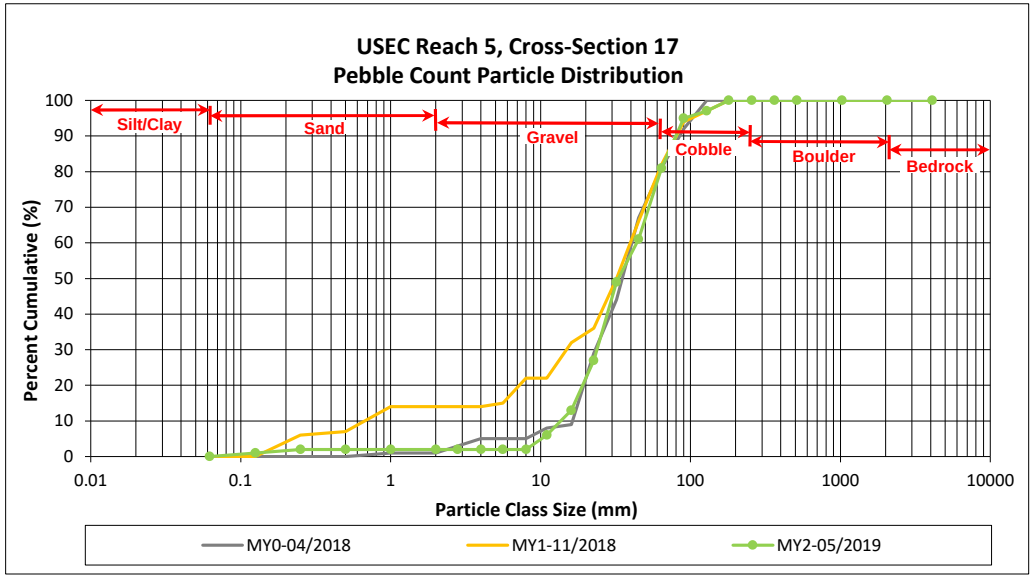
Reachwide and Cross-Section Pebble Count Plots

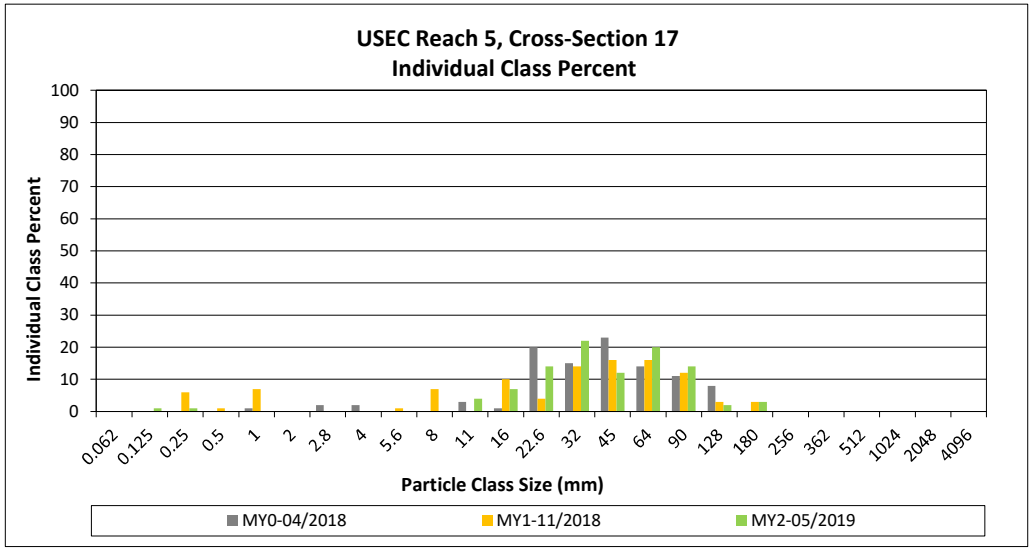
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 5, Cross-Section 17

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125	1	1	1
	Fine	0.125	0.250	1	1	2
	Medium	0.25	0.50			2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0			2
GRAVEL	Very Fine	2.0	2.8			2
	Very Fine	2.8	4.0			2
	Fine	4.0	5.6			2
	Fine	5.6	8.0			2
	Medium	8.0	11.0	4	4	6
	Medium	11.0	16.0	7	7	13
	Coarse	16.0	22.6	14	14	27
	Coarse	22.6	32	22	22	49
	Very Coarse	32	45	12	12	61
	Very Coarse	45	64	20	20	81
COBBLE	Small	64	90	14	14	95
	Small	90	128	2	2	97
	Large	128	180	3	3	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	**100**	**100**	**100**

Cross-Section 17	
Channel materials (mm)	
D_{16} =	17.2
D_{35} =	25.6
D_{50} =	32.9
D_{84} =	68.9
D_{95} =	90.0
D_{100} =	180.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

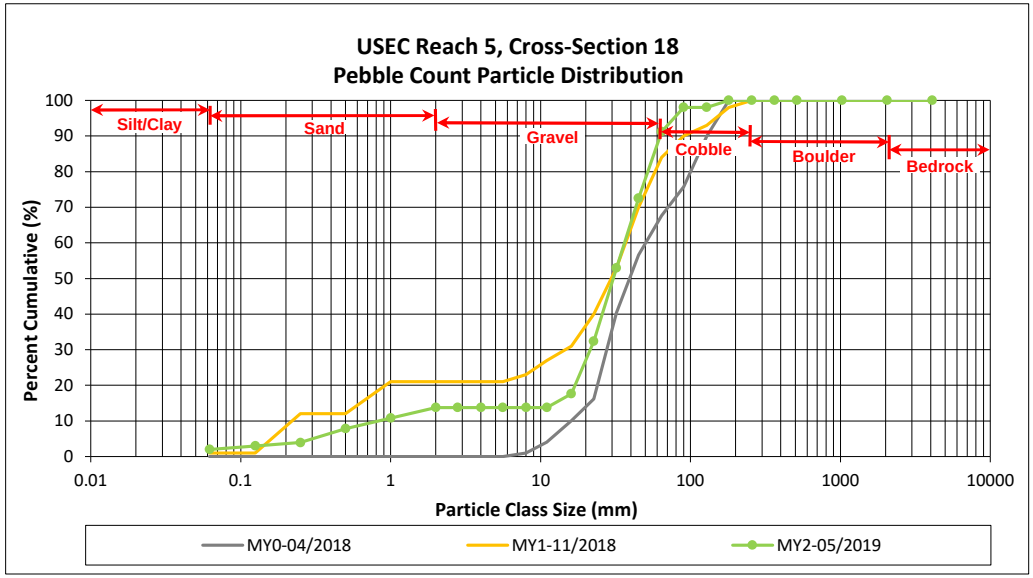
DMS Project No. 739

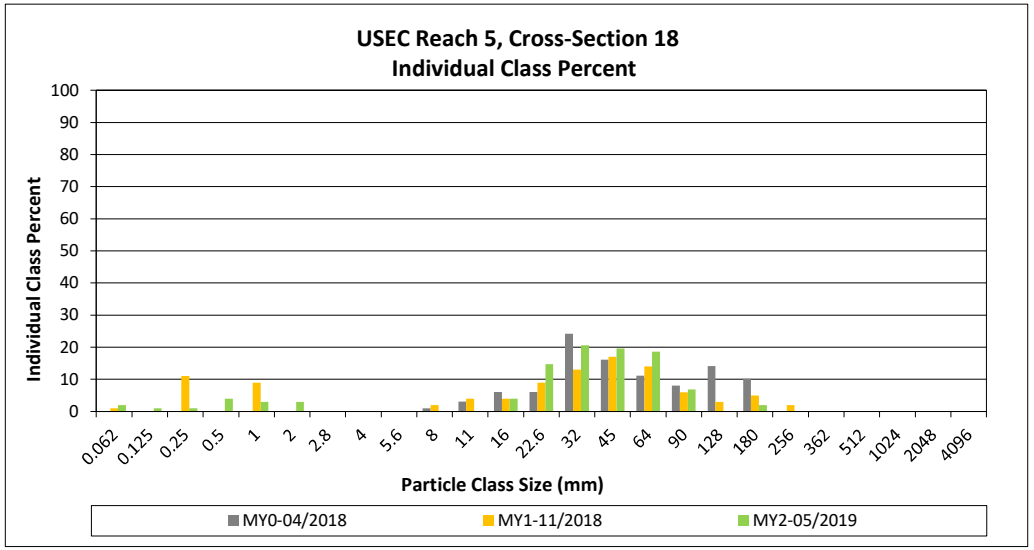
Monitoring Year 2 - 2019

USEC Reach 5, Cross-Section 18

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	2	2
SAND	Very fine	0.062	0.125	1	1	3
	Fine	0.125	0.250	1	1	4
	Medium	0.25	0.50	4	4	8
	Coarse	0.5	1.0	3	3	11
	Very Coarse	1.0	2.0	3	3	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			14
	Medium	8.0	11.0			14
	Medium	11.0	16.0	4	4	18
	Coarse	16.0	22.6	15	15	32
	Coarse	22.6	32	21	21	53
	Very Coarse	32	45	20	20	73
	Very Coarse	45	64	19	19	91
COBBLE	Small	64	90	7	7	98
	Small	90	128			98
	Large	128	180	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	**102**	**100**	**100**

Cross-Section 18	
Channel materials (mm)	
D_{16} =	13.7
D_{35} =	23.6
D_{50} =	30.4
D_{84} =	55.9
D_{95} =	77.4
D_{100} =	180.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

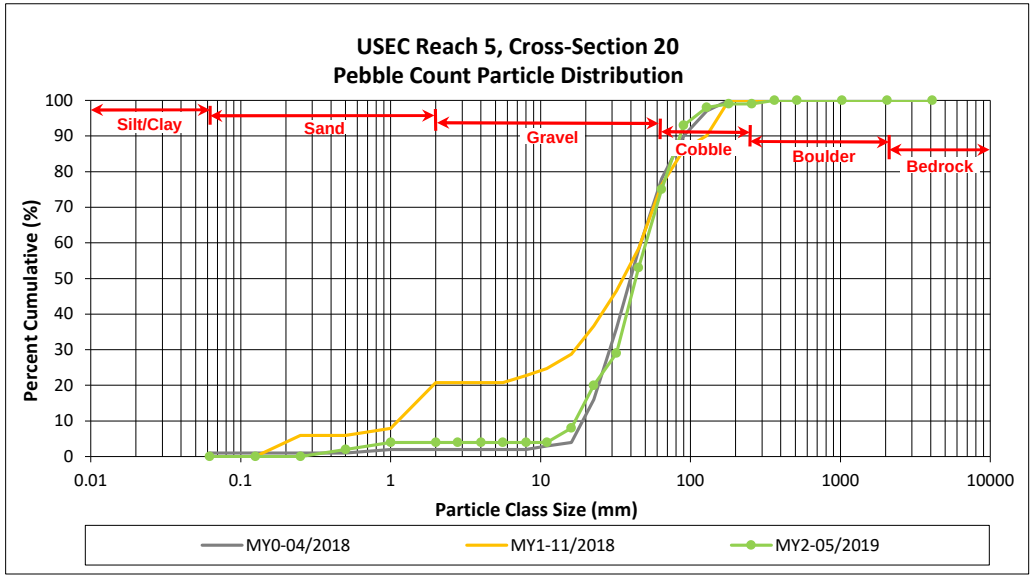
DMS Project No. 739

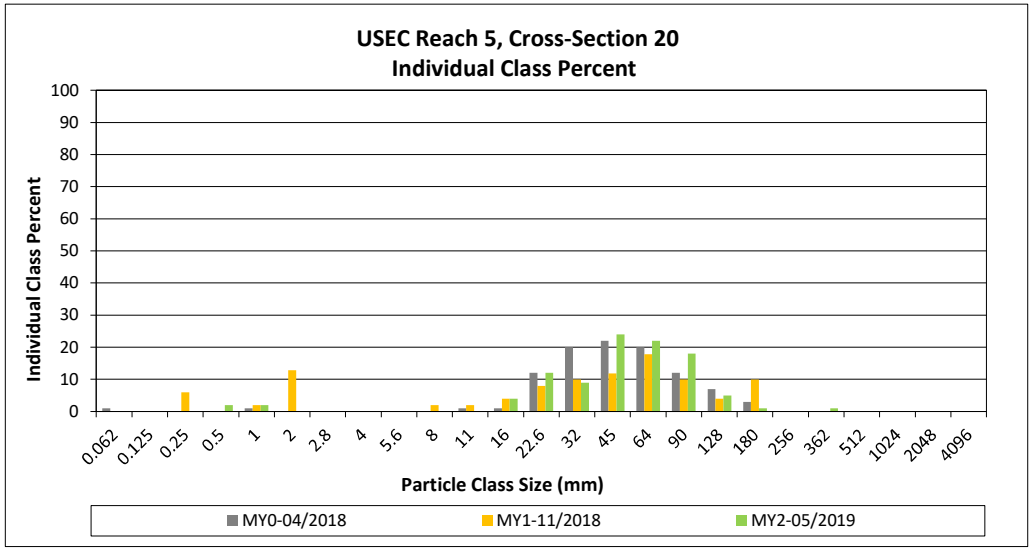
Monitoring Year 2 - 2019

USEC Reach 5, Cross-Section 20

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	2	2	2
	Coarse	0.5	1.0	2	2	4
	Very Coarse	1.0	2.0			4
GRAVEL	Very Fine	2.0	2.8			4
	Very Fine	2.8	4.0			4
	Fine	4.0	5.6			4
	Fine	5.6	8.0			4
	Medium	8.0	11.0			4
	Medium	11.0	16.0	4	4	8
	Coarse	16.0	22.6	12	12	20
	Coarse	22.6	32	9	9	29
	Very Coarse	32	45	24	24	53
	Very Coarse	45	64	22	22	75
COBBLE	Small	64	90	18	18	93
	Small	90	128	5	5	98
	Large	128	180	1	1	99
	Large	180	256			99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 20	
Channel materials (mm)	
D_{16} =	20.1
D_{35} =	34.8
D_{50} =	43.1
D_{84} =	75.9
D_{95} =	103.6
D_{100} =	362.0





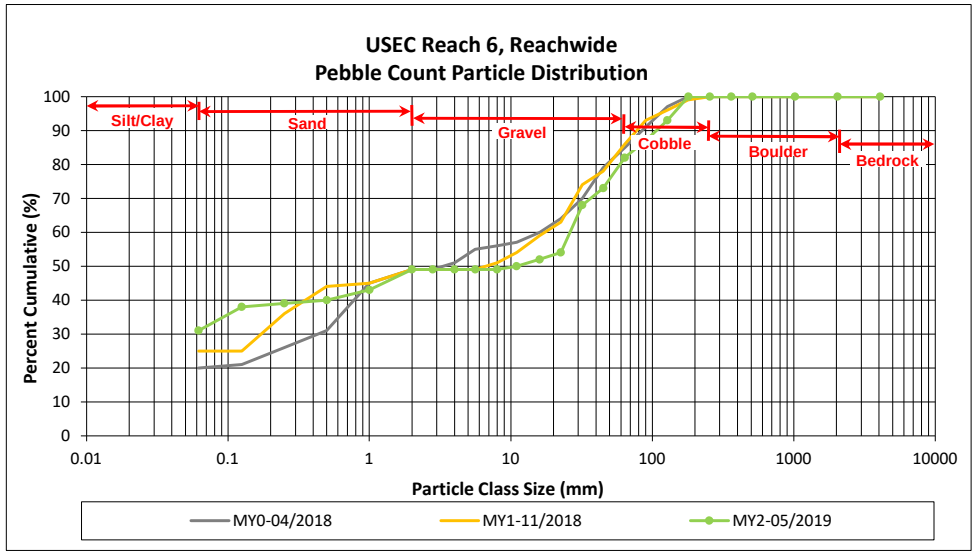
Reachwide and Cross-Section Pebble Count Plots

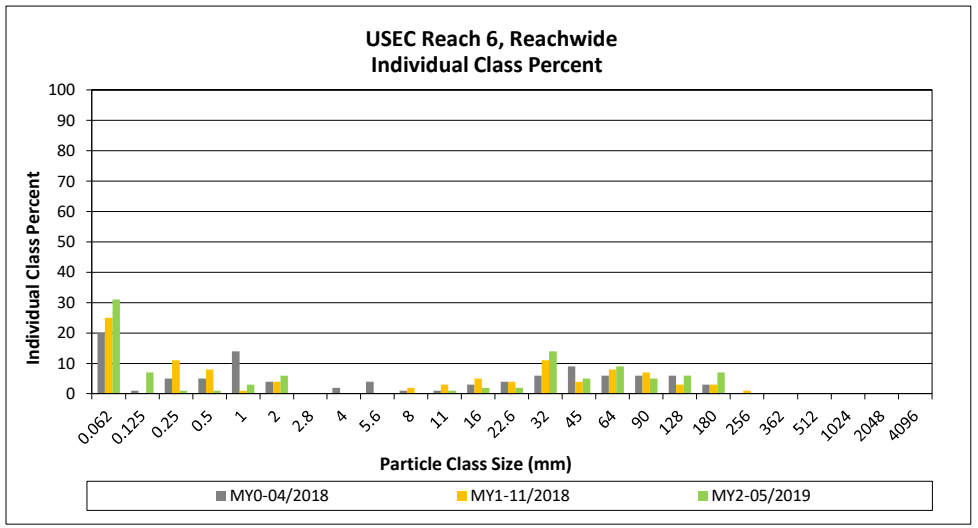
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

USEC Reach 6, 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	5	26	31	31	31
SAND	Very fine	0.062	0.125		7	7	7	38
	Fine	0.125	0.250		1	1	1	39
	Medium	0.25	0.50		1	1	1	40
	Coarse	0.5	1.0		3	3	3	43
	Very Coarse	1.0	2.0	3	3	6	6	49
GRAVEL	Very Fine	2.0	2.8					49
	Very Fine	2.8	4.0					49
	Fine	4.0	5.6					49
	Fine	5.6	8.0					49
	Medium	8.0	11.0		1	1	1	50
	Medium	11.0	16.0	1	1	2	2	52
	Coarse	16.0	22.6	2		2	2	54
	Coarse	22.6	32	10	4	14	14	68
	Very Coarse	32	45	5		5	5	73
	Very Coarse	45	64	7	2	9	9	82
COBBLE	Small	64	90	5		5	5	87
	Small	90	128	6		6	6	93
	Large	128	180	6	1	7	7	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} =	0.1
D_{50} =	11.0
D_{84} =	73.4
D_{95} =	141.1
D_{100} =	180.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

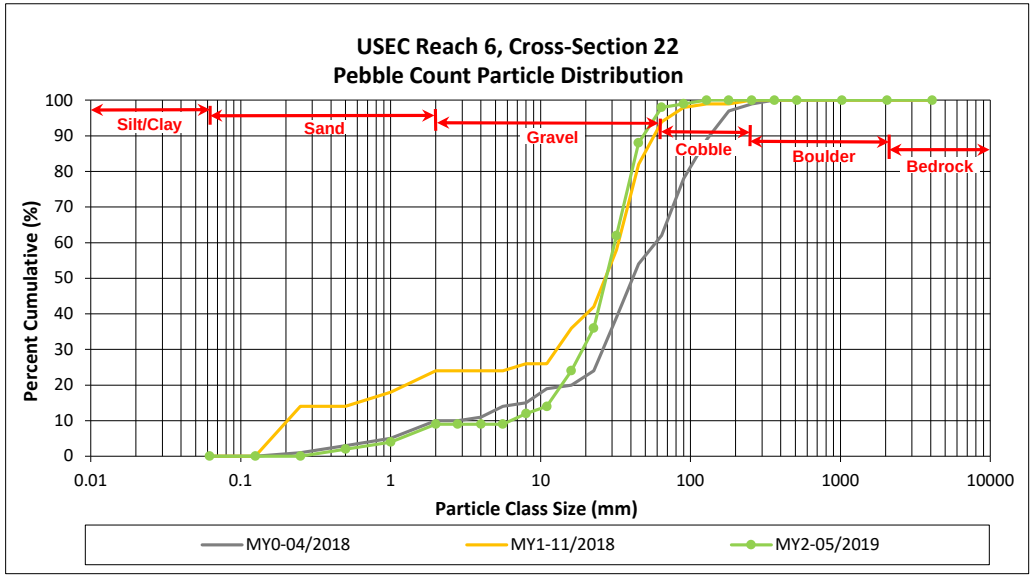
DMS Project No. 739

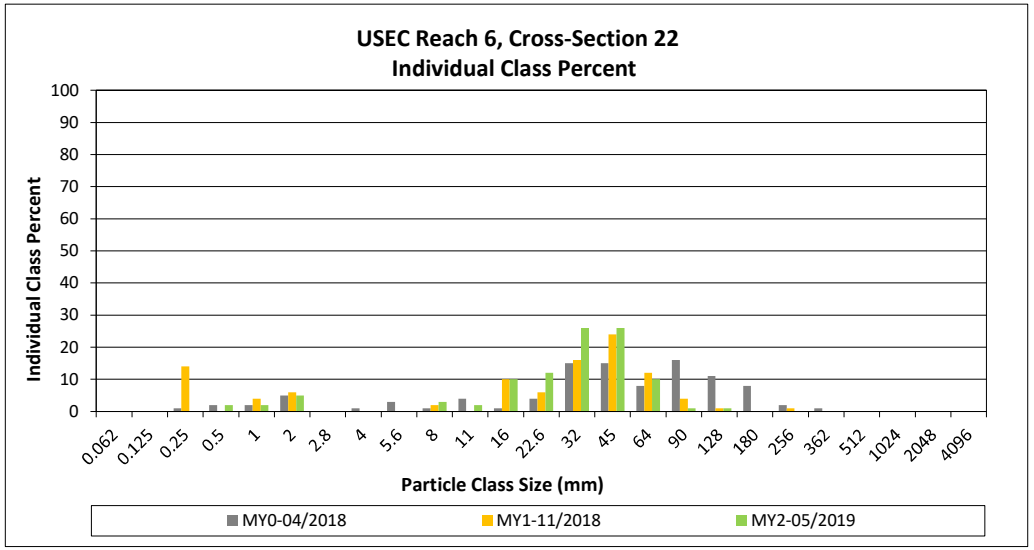
Monitoring Year 2 - 2019

USEC Reach 6, Cross-Section 22

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	2	2	2
	Coarse	0.5	1.0	2	2	4
	Very Coarse	1.0	2.0	5	5	9
GRAVEL	Very Fine	2.0	2.8			9
	Very Fine	2.8	4.0			9
	Fine	4.0	5.6			9
	Fine	5.6	8.0	3	3	12
	Medium	8.0	11.0	2	2	14
	Medium	11.0	16.0	10	10	24
	Coarse	16.0	22.6	12	12	36
	Coarse	22.6	32	26	26	62
	Very Coarse	32	45	26	26	88
	Very Coarse	45	64	10	10	98
COBBLE	Small	64	90	1	1	99
	Small	90	128	1	1	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	**100**	**100**	**100**

Cross-Section 22	
Channel materials (mm)	
D_{16} =	11.9
D_{35} =	22.0
D_{50} =	27.3
D_{84} =	42.7
D_{95} =	57.6
D_{100} =	128.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

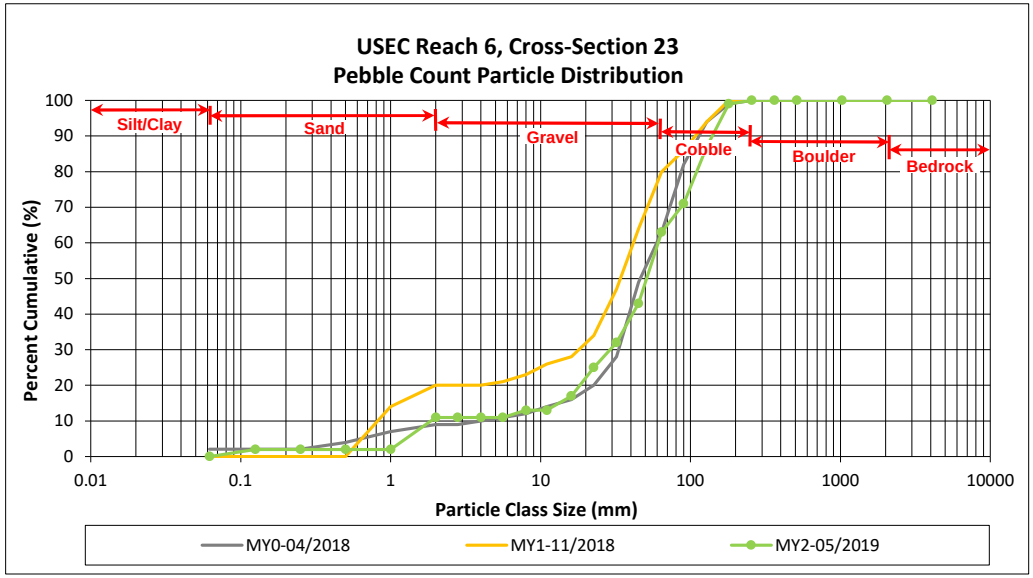
DMS Project No. 739

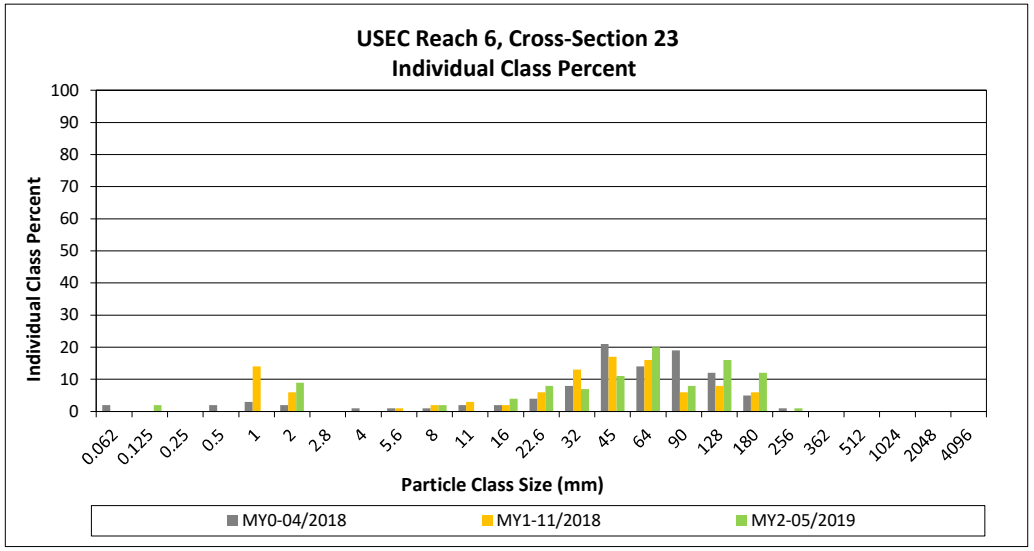
Monitoring Year 2 - 2019

USEC Reach 6, Cross-Section 23

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125	2	2	2
	Fine	0.125	0.250			2
	Medium	0.25	0.50			2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0	9	9	11
GRAVEL	Very Fine	2.0	2.8			11
	Very Fine	2.8	4.0			11
	Fine	4.0	5.6			11
	Fine	5.6	8.0	2	2	13
	Medium	8.0	11.0			13
	Medium	11.0	16.0	4	4	17
	Coarse	16.0	22.6	8	8	25
	Coarse	22.6	32	7	7	32
	Very Coarse	32	45	11	11	43
	Very Coarse	45	64	20	20	63
COBBLE	Small	64	90	8	8	71
	Small	90	128	16	16	87
	Large	128	180	12	12	99
	Large	180	256	1	1	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	**100**	**100**	**100**

Cross-Section 23	
Channel materials (mm)	
D_{16} =	14.6
D_{35} =	35.1
D_{50} =	50.9
D_{84} =	119.8
D_{95} =	160.7
D_{100} =	256.0





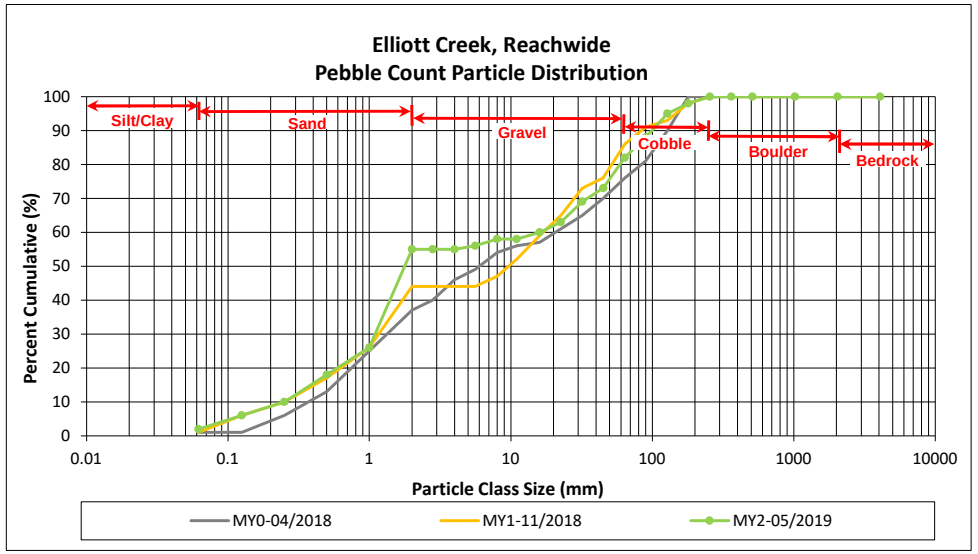
Reachwide and Cross-Section Pebble Count Plots

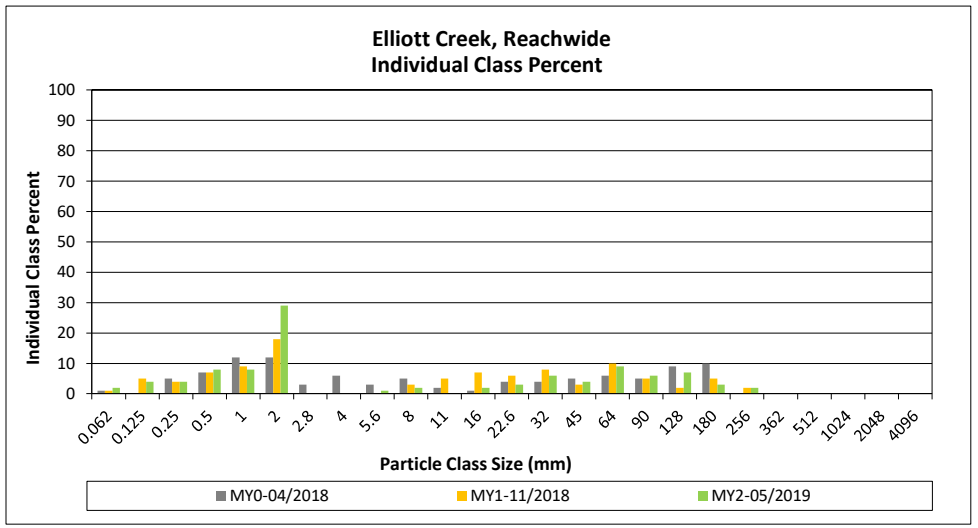
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

Elliott Creek, 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	2	2	2
SAND	Very fine	0.062	0.125		4	4	4	6
	Fine	0.125	0.250		4	4	4	10
	Medium	0.25	0.50		8	8	8	18
	Coarse	0.5	1.0		8	8	8	26
	Very Coarse	1.0	2.0	6	23	29	29	55
GRAVEL	Very Fine	2.0	2.8					55
	Very Fine	2.8	4.0					55
	Fine	4.0	5.6	1		1	1	56
	Fine	5.6	8.0	2		2	2	58
	Medium	8.0	11.0					58
	Medium	11.0	16.0	2		2	2	60
	Coarse	16.0	22.6	3		3	3	63
	Coarse	22.6	32	6		6	6	69
	Very Coarse	32	45	4		4	4	73
	Very Coarse	45	64	9		9	9	82
COBBLE	Small	64	90	6		6	6	88
	Small	90	128	7		7	7	95
	Large	128	180	3		3	3	98
	Large	180	256	1	1	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} =	0.4
D_{35} =	1.2
D_{50} =	1.8
D_{84} =	71.7
D_{95} =	128.0
D_{100} =	256.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

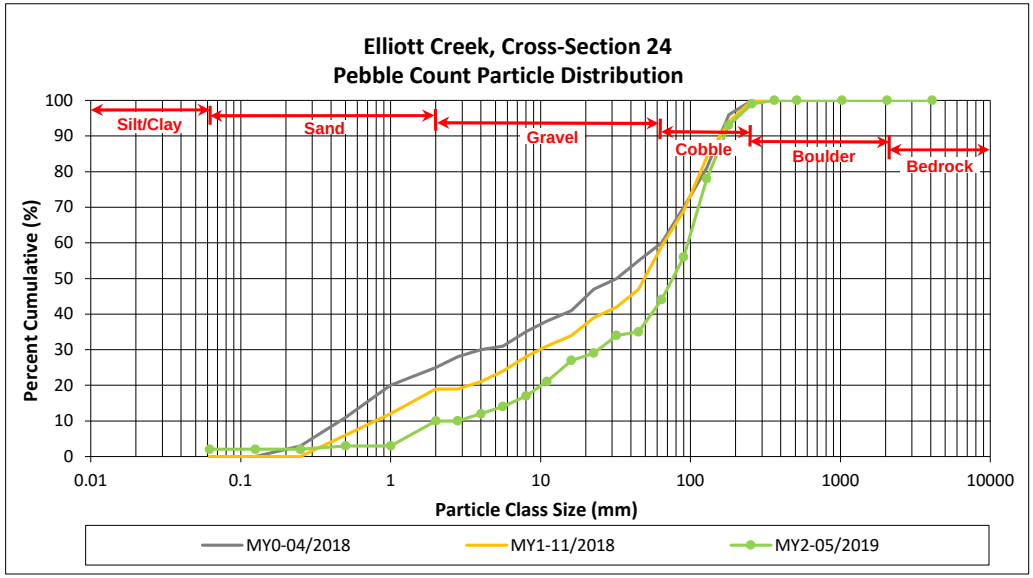
DMS Project No. 739

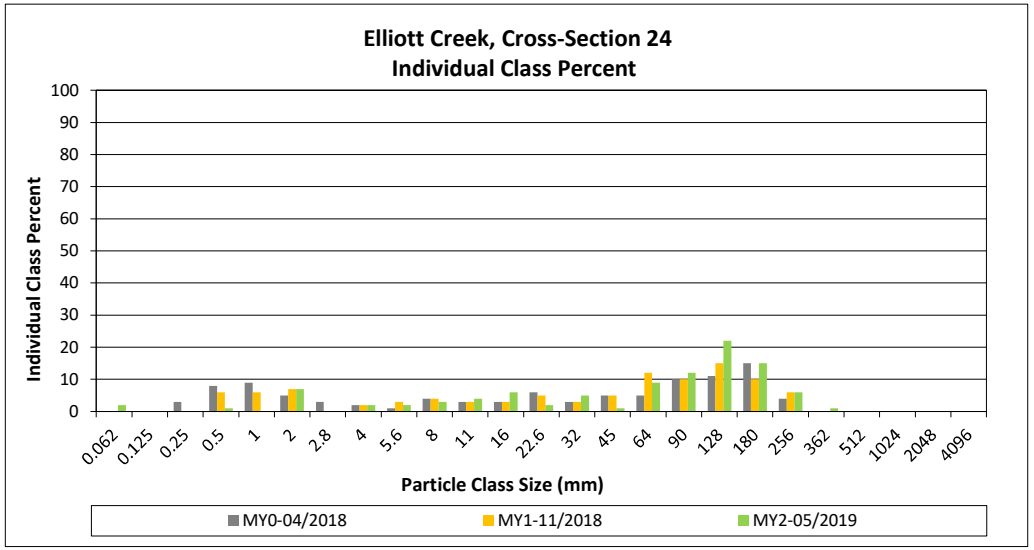
Monitoring Year 2 - 2019

Elliott Creek, Cross-Section 24

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	2	2
SAND	Very fine	0.062	0.125			2
	Fine	0.125	0.250			2
	Medium	0.25	0.50	1	1	3
	Coarse	0.5	1.0			3
	Very Coarse	1.0	2.0	7	7	10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0	2	2	12
	Fine	4.0	5.6	2	2	14
	Fine	5.6	8.0	3	3	17
	Medium	8.0	11.0	4	4	21
	Medium	11.0	16.0	6	6	27
	Coarse	16.0	22.6	2	2	29
	Coarse	22.6	32	5	5	34
	Very Coarse	32	45	1	1	35
	Very Coarse	45	64	9	9	44
COBBLE	Small	64	90	12	12	56
	Small	90	128	22	22	78
	Large	128	180	15	15	93
	Large	180	256	6	6	99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 24	
Channel materials (mm)	
D_{16} =	7.1
D_{35} =	45.0
D_{50} =	75.9
D_{84} =	146.7
D_{95} =	202.4
D_{100} =	362.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

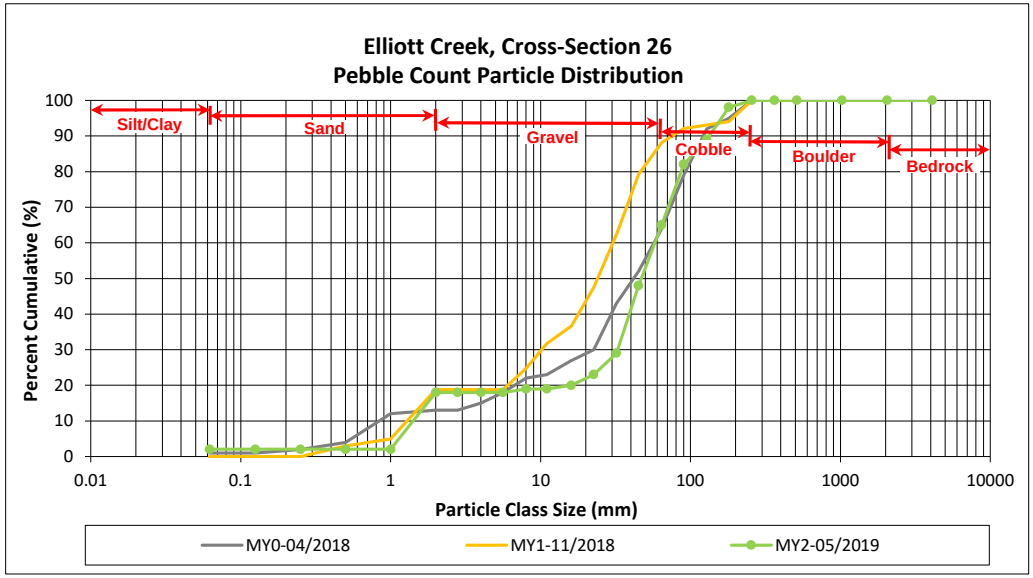
DMS Project No. 739

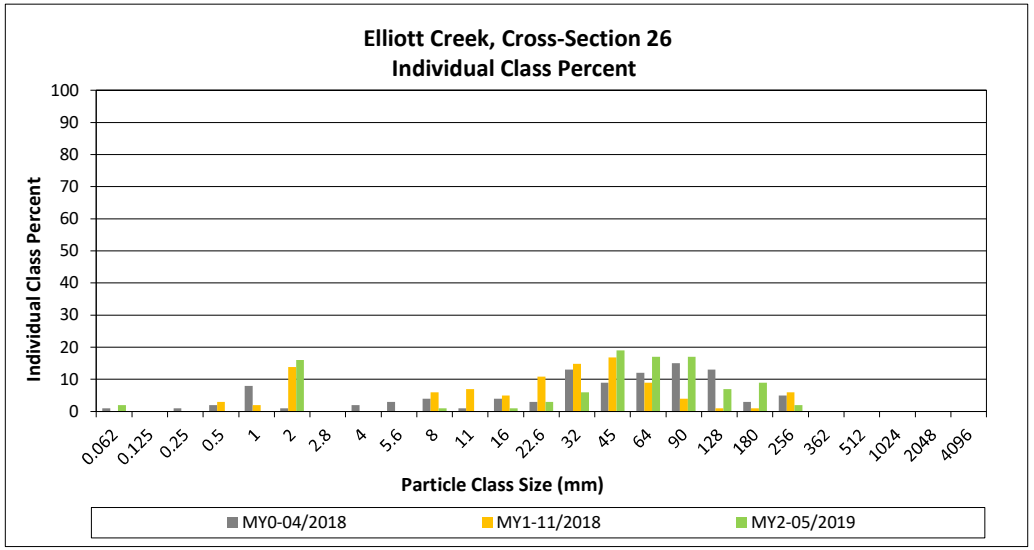
Monitoring Year 2 - 2019

Elliott Creek, Cross-Section 26

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	2	2
SAND	Very fine	0.062	0.125			2
	Fine	0.125	0.250			2
	Medium	0.25	0.50			2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0	16	16	18
GRAVEL	Very Fine	2.0	2.8			18
	Very Fine	2.8	4.0			18
	Fine	4.0	5.6			18
	Fine	5.6	8.0	1	1	19
	Medium	8.0	11.0			19
	Medium	11.0	16.0	1	1	20
	Coarse	16.0	22.6	3	3	23
	Coarse	22.6	32	6	6	29
	Very Coarse	32	45	19	19	48
	Very Coarse	45	64	17	17	65
COBBLE	Small	64	90	17	17	82
	Small	90	128	7	7	89
	Large	128	180	9	9	98
	Large	180	256	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	**100**	**100**	**100**

Cross-Section 26	
Channel materials (mm)	
D_{16} =	1.8
D_{35} =	35.6
D_{50} =	46.9
D_{84} =	99.5
D_{95} =	160.7
D_{100} =	256.0





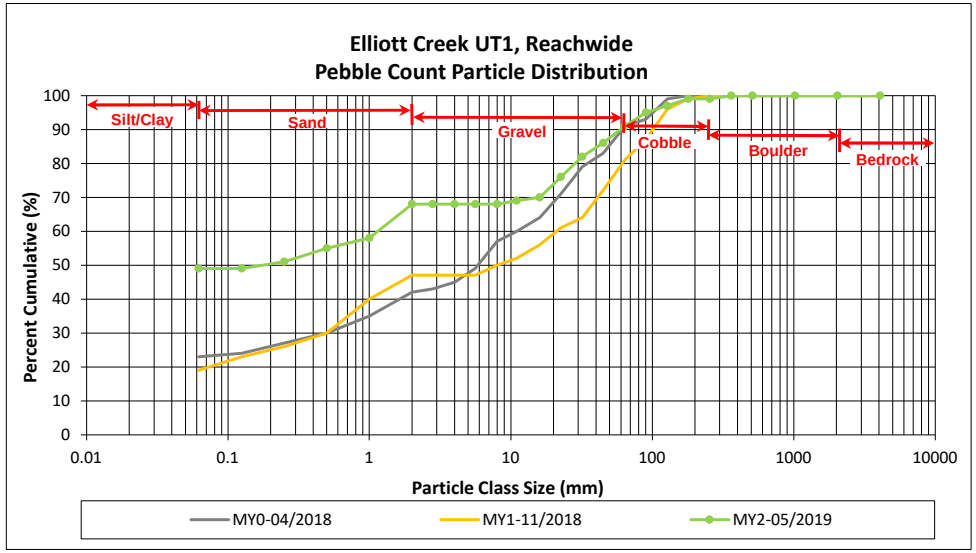
Reachwide and Cross-Section Pebble Count Plots

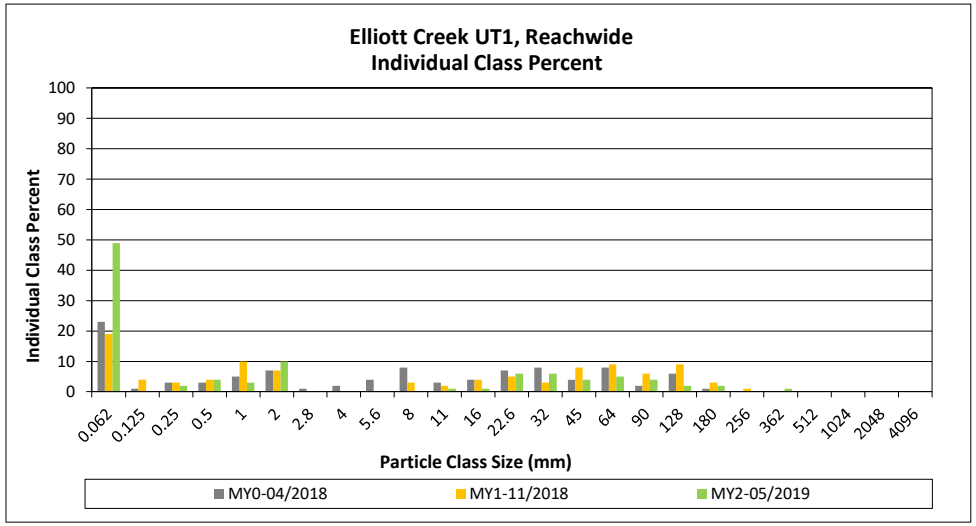
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

Elliott Creek UT1, 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	10	39	49	49	49
SAND	Very fine	0.062	0.125					49
	Fine	0.125	0.250		2	2	2	51
	Medium	0.25	0.50	2	2	4	4	55
	Coarse	0.5	1.0	2	1	3	3	58
	Very Coarse	1.0	2.0	7	3	10	10	68
GRAVEL	Very Fine	2.0	2.8					68
	Very Fine	2.8	4.0					68
	Fine	4.0	5.6					68
	Fine	5.6	8.0					68
	Medium	8.0	11.0		1	1	1	69
	Medium	11.0	16.0	1		1	1	70
	Coarse	16.0	22.6	6		6	6	76
	Coarse	22.6	32	5	1	6	6	82
	Very Coarse	32	45	4		4	4	86
	Very Coarse	45	64	5		5	5	91
COBBLE	Small	64	90	3	1	4	4	95
	Small	90	128	2		2	2	97
	Large	128	180	2		2	2	99
	Large	180	256					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} =	Silt/Clay
D_{50} =	0.2
D_{84} =	37.9
D_{95} =	90.0
D_{100} =	362.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

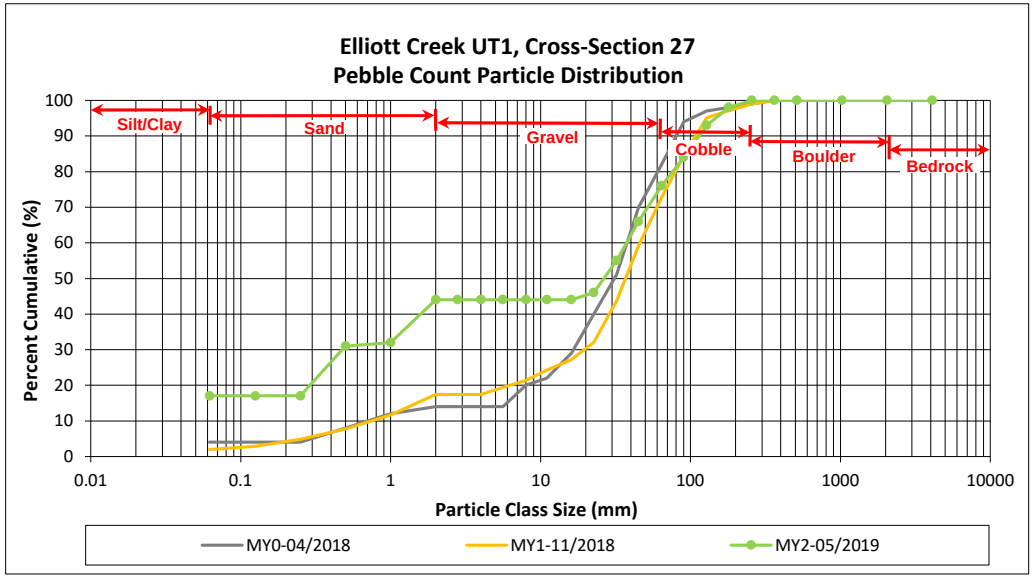
DMS Project No. 739

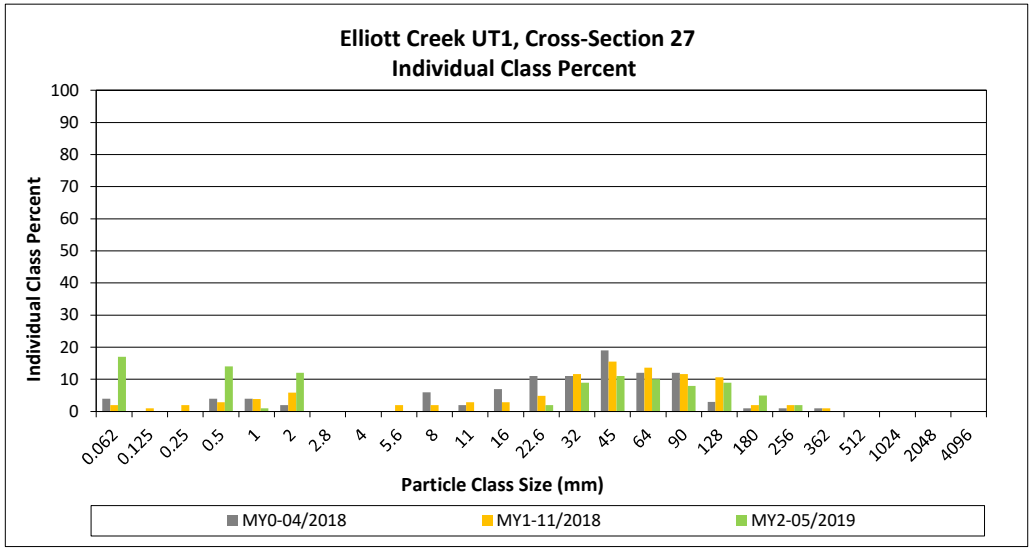
Monitoring Year 2 - 2019

Elliott Creek UT1, Cross-Section 27

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	17	17	17
SAND	Very fine	0.062	0.125			17
	Fine	0.125	0.250			17
	Medium	0.25	0.50	14	14	31
	Coarse	0.5	1.0	1	1	32
	Very Coarse	1.0	2.0	12	12	44
GRAVEL	Very Fine	2.0	2.8			44
	Very Fine	2.8	4.0			44
	Fine	4.0	5.6			44
	Fine	5.6	8.0			44
	Medium	8.0	11.0			44
	Medium	11.0	16.0			44
	Coarse	16.0	22.6	2	2	46
	Coarse	22.6	32	9	9	55
	Very Coarse	32	45	11	11	66
	Very Coarse	45	64	10	10	76
COBBLE	Small	64	90	8	8	84
	Small	90	128	9	9	93
	Large	128	180	5	5	98
	Large	180	256	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	**100**	**100**	**100**

Cross-Section 27	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	1.2
D_{50} =	26.4
D_{84} =	90.0
D_{95} =	146.7
D_{100} =	256.0





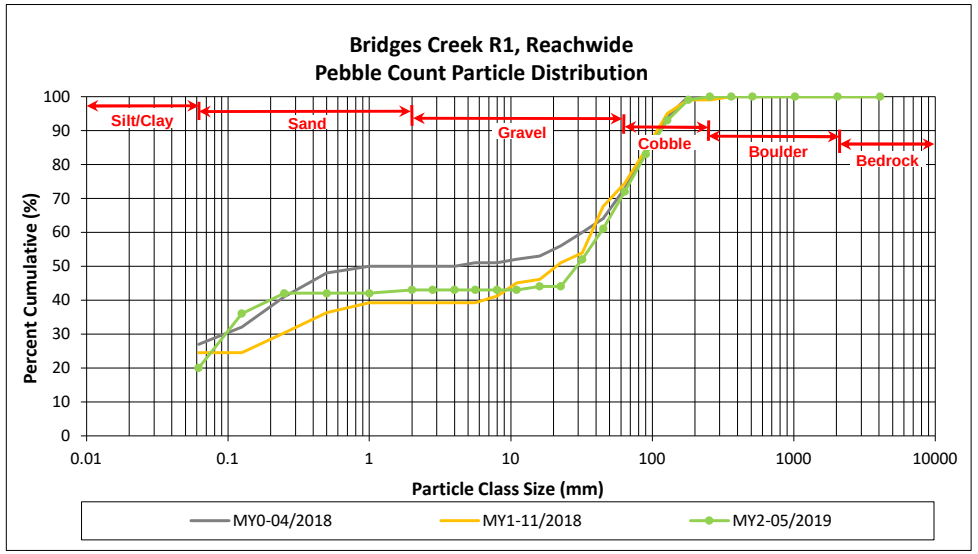
Reachwide and Cross-Section Pebble Count Plots

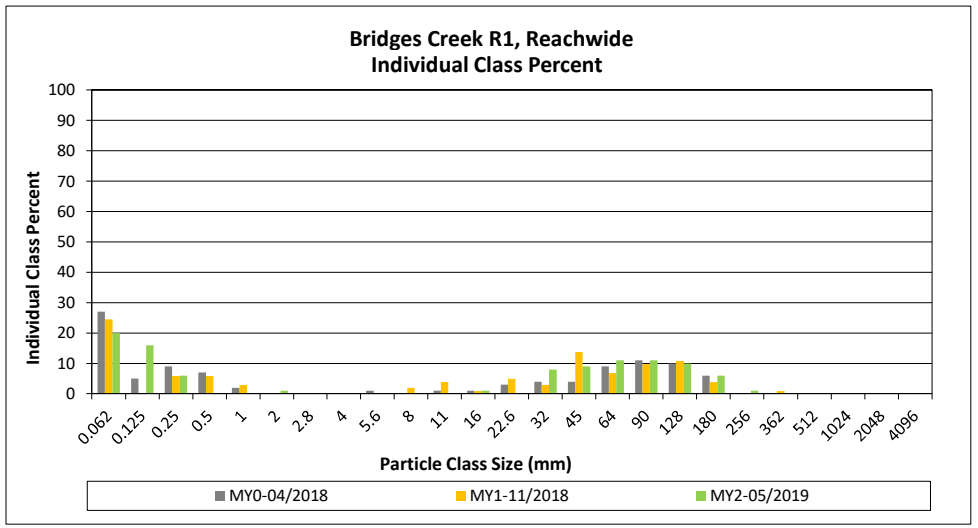
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

Bridges 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	19	20	20	20
SAND	Very fine	0.062	0.125		16	16	16	36
	Fine	0.125	0.250		6	6	6	42
	Medium	0.25	0.50					42
	Coarse	0.5	1.0					42
	Very Coarse	1.0	2.0	1		1	1	43
GRAVEL	Very Fine	2.0	2.8					43
	Very Fine	2.8	4.0					43
	Fine	4.0	5.6					43
	Fine	5.6	8.0					43
	Medium	8.0	11.0					43
	Medium	11.0	16.0	1		1	1	44
	Coarse	16.0	22.6					44
	Coarse	22.6	32	8		8	8	52
	Very Coarse	32	45	8	1	9	9	61
	Very Coarse	45	64	11		11	11	72
COBBLE	Small	64	90	8	3	11	11	83
	Small	90	128	8	2	10	10	93
	Large	128	180	3	3	6	6	99
	Large	180	256	1		1	1	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} =	0.1
D_{50} =	29.3
D_{84} =	93.2
D_{95} =	143.4
D_{100} =	256.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

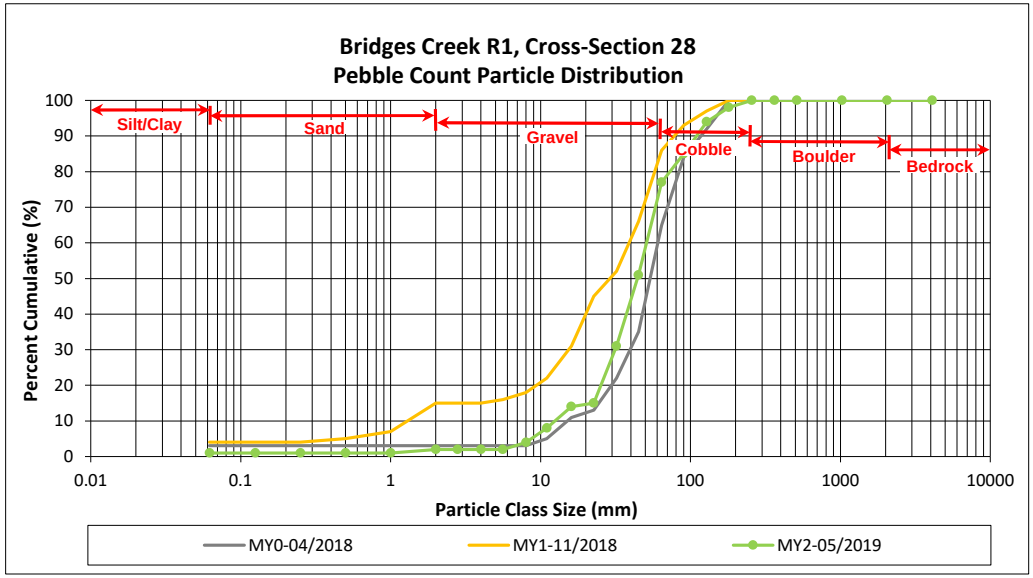
DMS Project No. 739

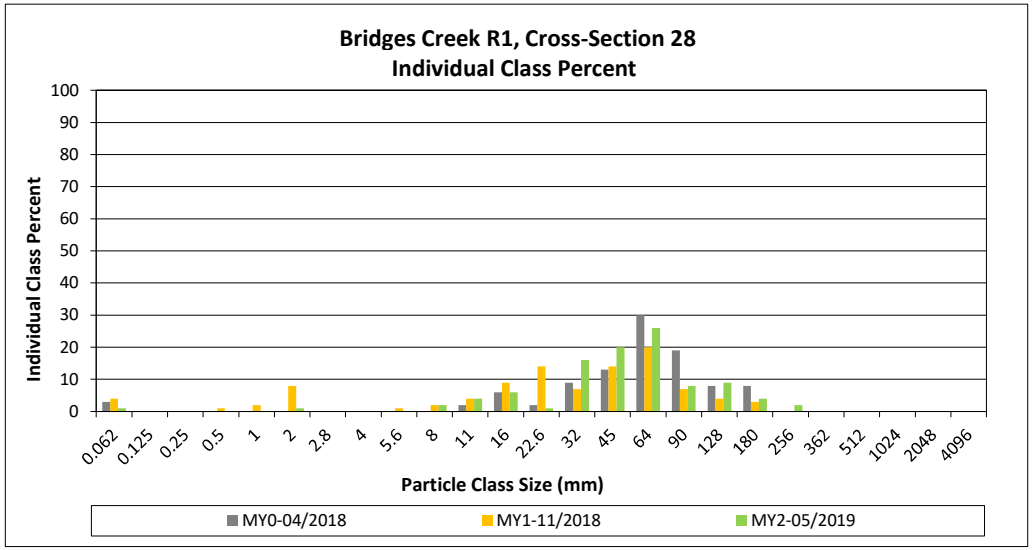
Monitoring Year 2 - 2019

Bridges Creek R1, Cross-Section 28

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	1	1
SAND	Very fine	0.062	0.125			1
	Fine	0.125	0.250			1
	Medium	0.25	0.50			1
	Coarse	0.5	1.0			1
	Very Coarse	1.0	2.0	1	1	2
GRAVEL	Very Fine	2.0	2.8			2
	Very Fine	2.8	4.0			2
	Fine	4.0	5.6			2
	Fine	5.6	8.0	2	2	4
	Medium	8.0	11.0	4	4	8
	Medium	11.0	16.0	6	6	14
	Coarse	16.0	22.6	1	1	15
	Coarse	22.6	32	16	16	31
	Very Coarse	32	45	20	20	51
	Very Coarse	45	64	26	26	77
COBBLE	Small	64	90	8	8	85
	Small	90	128	9	9	94
	Large	128	180	4	4	98
	Large	180	256	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	**100**	**100**	**100**

Cross-Section 28	
Channel materials (mm)	
D_{16} =	23.1
D_{35} =	34.3
D_{50} =	44.2
D_{84} =	86.2
D_{95} =	139.4
D_{100} =	256.0





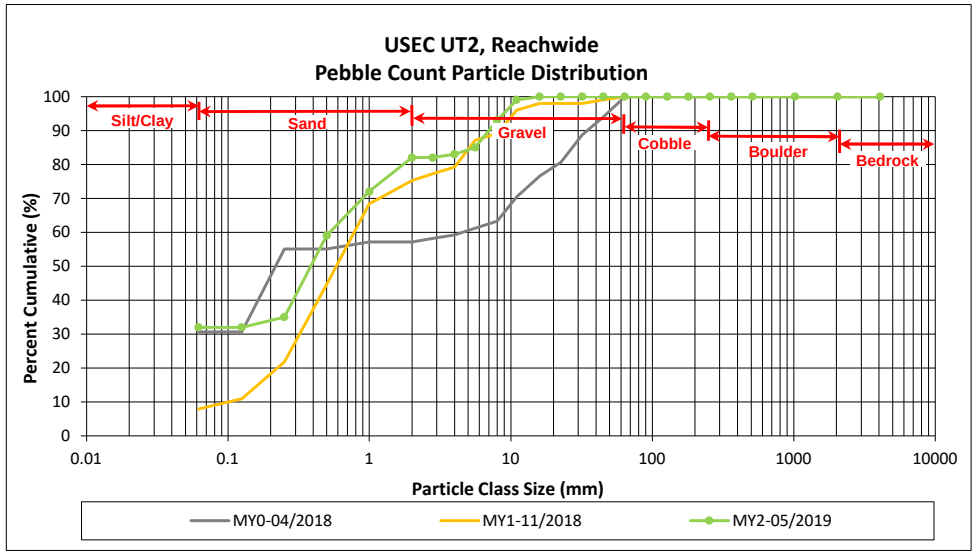
Reachwide and Cross-Section Pebble Count Plots

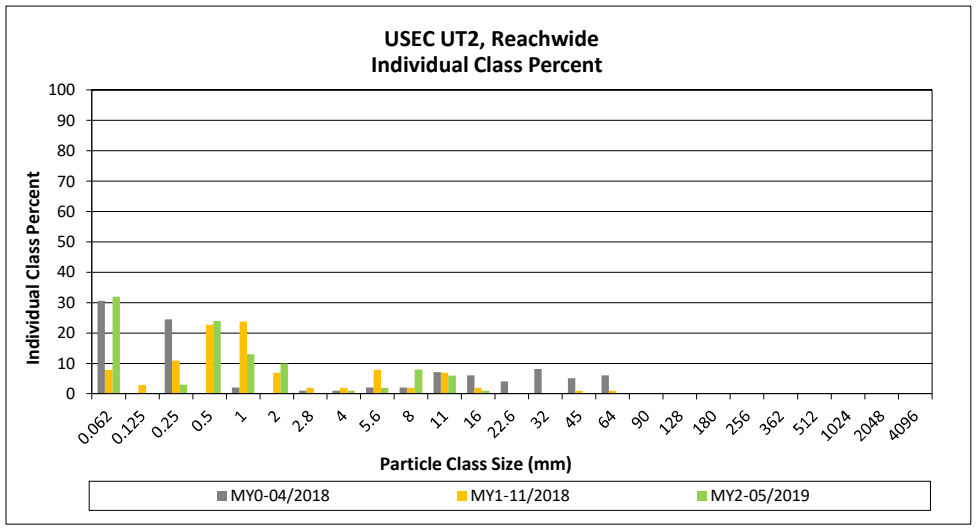
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

USEC UT2, 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	26	32	32	32
SAND	Very fine	0.062	0.125					32
	Fine	0.125	0.250		3	3	3	35
	Medium	0.25	0.50	15	9	24	24	59
	Coarse	0.5	1.0	7	6	13	13	72
	Very Coarse	1.0	2.0	9	1	10	10	82
GRAVEL	Very Fine	2.0	2.8					82
	Very Fine	2.8	4.0	1		1	1	83
	Fine	4.0	5.6	1	1	2	2	85
	Fine	5.6	8.0	5	3	8	8	93
	Medium	8.0	11.0	5	1	6	6	99
	Medium	11.0	16.0	1		1	1	100
	Coarse	16.0	22.6					100
	Coarse	22.6	32					100
	Very Coarse	32	45					100
	Very Coarse	45	64					100
COBBLE	Small	64	90					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} =	0.3
D_{50} =	0.4
D_{84} =	4.7
D_{95} =	8.9
D_{100} =	16.0





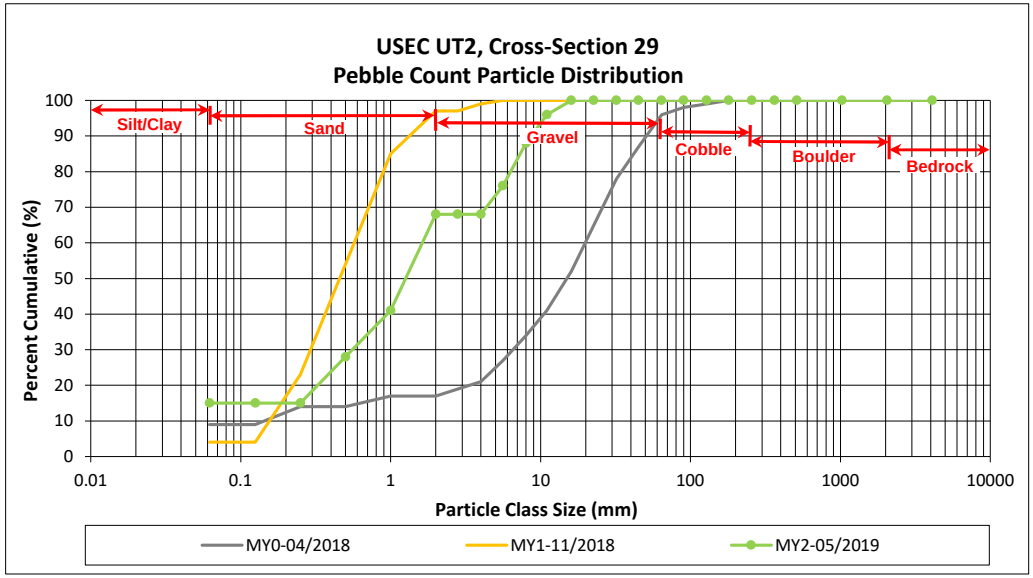
Reachwide and Cross-Section Pebble Count Plots

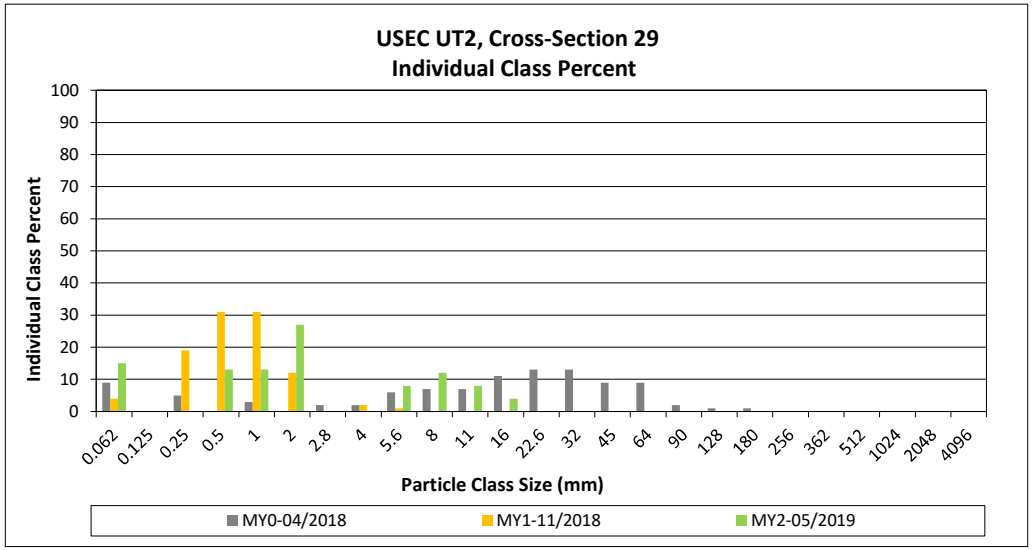
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

USEC UT2, Cross-Section 29

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	15	15	15
SAND	Very fine	0.062	0.125			15
	Fine	0.125	0.250			15
	Medium	0.25	0.50	13	13	28
	Coarse	0.5	1.0	13	13	41
	Very Coarse	1.0	2.0	27	27	68
GRAVEL	Very Fine	2.0	2.8			68
	Very Fine	2.8	4.0			68
	Fine	4.0	5.6	8	8	76
	Fine	5.6	8.0	12	12	88
	Medium	8.0	11.0	8	8	96
	Medium	11.0	16.0	4	4	100
	Coarse	16.0	22.6			100
	Coarse	22.6	32			100
	Very Coarse	32	45			100
	Very Coarse	45	64			100
COBBLE	Small	64	90			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	**100**	**100**	**100**

Cross-Section 29	
Channel materials (mm)	
D_{16} =	0.3
D_{35} =	0.7
D_{50} =	1.3
D_{84} =	7.1
D_{95} =	10.6
D_{100} =	16.0





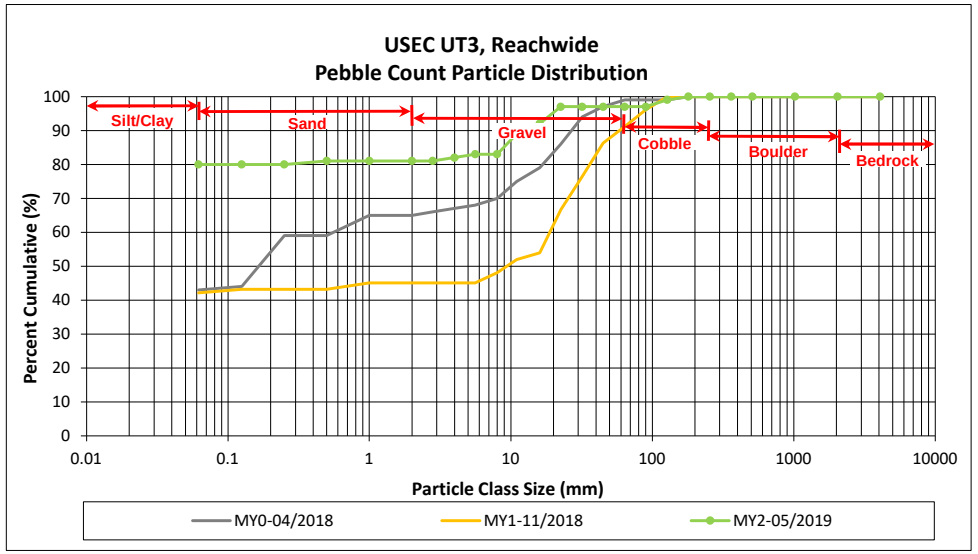
Reachwide and Cross-Section Pebble Count Plots

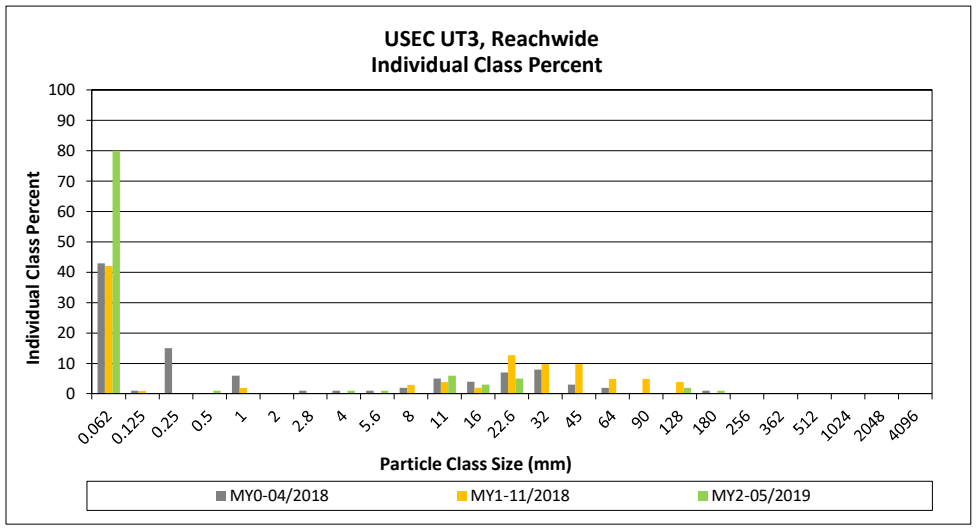
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

USEC UT3, 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	32	48	80	80	80
SAND	Very fine	0.062	0.125					80
	Fine	0.125	0.250					80
	Medium	0.25	0.50	1		1	1	81
	Coarse	0.5	1.0					81
	Very Coarse	1.0	2.0					81
GRAVEL	Very Fine	2.0	2.8					81
	Very Fine	2.8	4.0	1		1	1	82
	Fine	4.0	5.6	1		1	1	83
	Fine	5.6	8.0					83
	Medium	8.0	11.0	5	1	6	6	89
	Medium	11.0	16.0	3		3	3	92
	Coarse	16.0	22.6	5		5	5	97
	Coarse	22.6	32					97
	Very Coarse	32	45					97
	Very Coarse	45	64					97
COBBLE	Small	64	90					97
	Small	90	128	2		2	2	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} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	Silt/Clay
D_{84} =	8.4
D_{95} =	19.7
D_{100} =	180.0





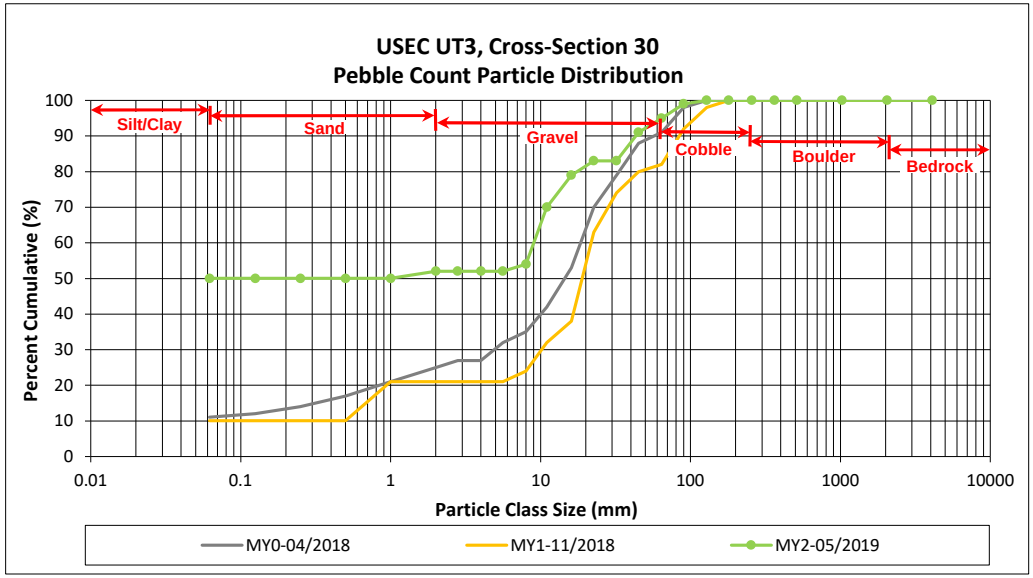
Reachwide and Cross-Section Pebble Count Plots

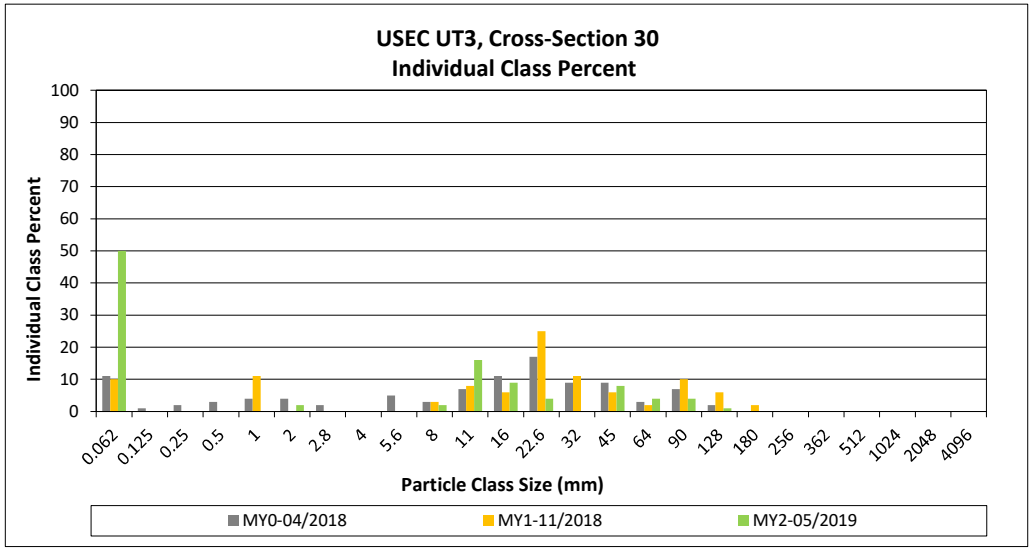
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

USEC UT3, Cross-Section 30

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	50	50	50
SAND	Very fine	0.062	0.125			50
	Fine	0.125	0.250			50
	Medium	0.25	0.50			50
	Coarse	0.5	1.0			50
	Very Coarse	1.0	2.0	2	2	52
GRAVEL	Very Fine	2.0	2.8			52
	Very Fine	2.8	4.0			52
	Fine	4.0	5.6			52
	Fine	5.6	8.0	2	2	54
	Medium	8.0	11.0	16	16	70
	Medium	11.0	16.0	9	9	79
	Coarse	16.0	22.6	4	4	83
	Coarse	22.6	32			83
	Very Coarse	32	45	8	8	91
	Very Coarse	45	64	4	4	95
COBBLE	Small	64	90	4	4	99
	Small	90	128	1	1	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	**100**	**100**	**100**

Cross-Section 30	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	Silt/Clay
D_{84} =	33.4
D_{95} =	64.0
D_{100} =	128.0





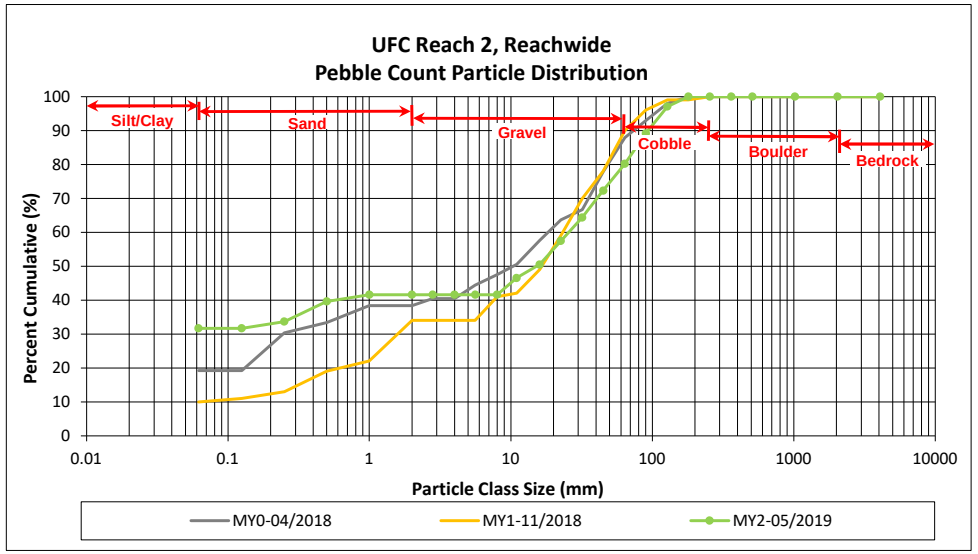
Reachwide and Cross-Section Pebble Count Plots

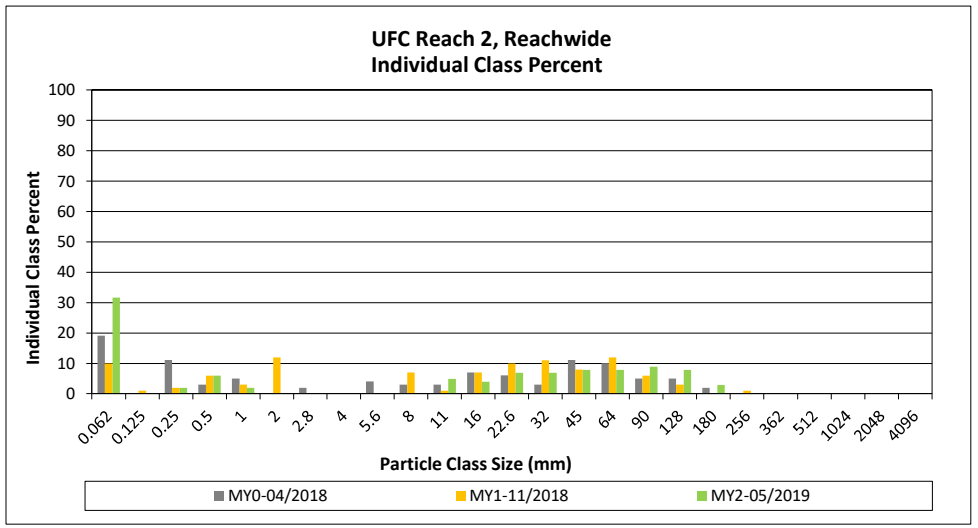
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

UFC Reach 2, 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	30	32	32	32
SAND	Very fine	0.062	0.125					32
	Fine	0.125	0.250		2	2	2	34
	Medium	0.25	0.50		6	6	6	40
	Coarse	0.5	1.0		2	2	2	42
	Very Coarse	1.0	2.0					42
GRAVEL	Very Fine	2.0	2.8					42
	Very Fine	2.8	4.0					42
	Fine	4.0	5.6					42
	Fine	5.6	8.0					42
	Medium	8.0	11.0	2	3	5	5	47
	Medium	11.0	16.0	3	1	4	4	50
	Coarse	16.0	22.6	4	3	7	7	57
	Coarse	22.6	32	6	1	7	7	64
	Very Coarse	32	45	6	2	8	8	72
	Very Coarse	45	64	8		8	8	80
COBBLE	Small	64	90	9		9	9	89
	Small	90	128	8		8	8	97
	Large	128	180	3		3	3	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	**51**	**50**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.3
D_{50} =	15.3
D_{84} =	74.0
D_{95} =	117.0
D_{100} =	180.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

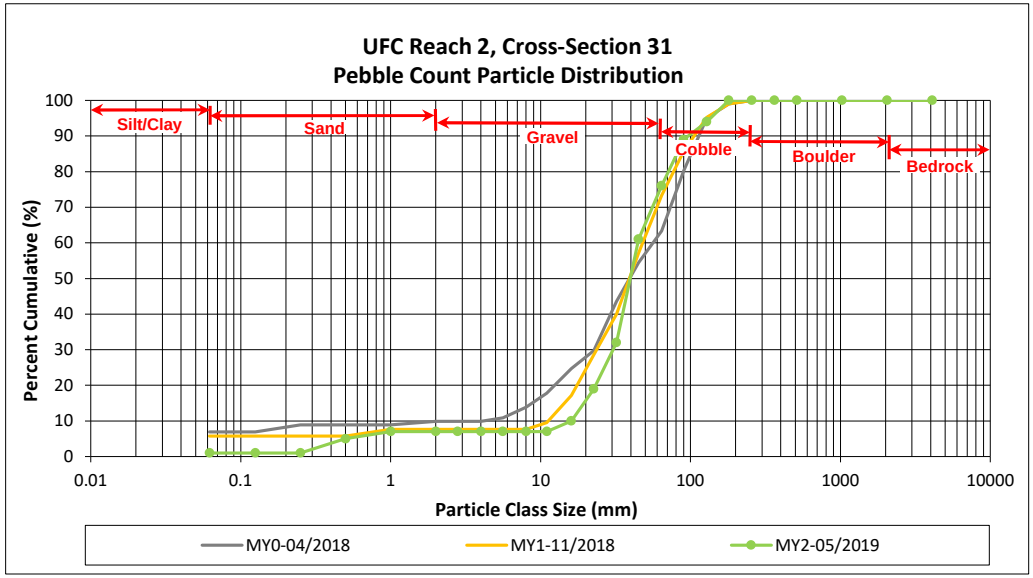
DMS Project No. 739

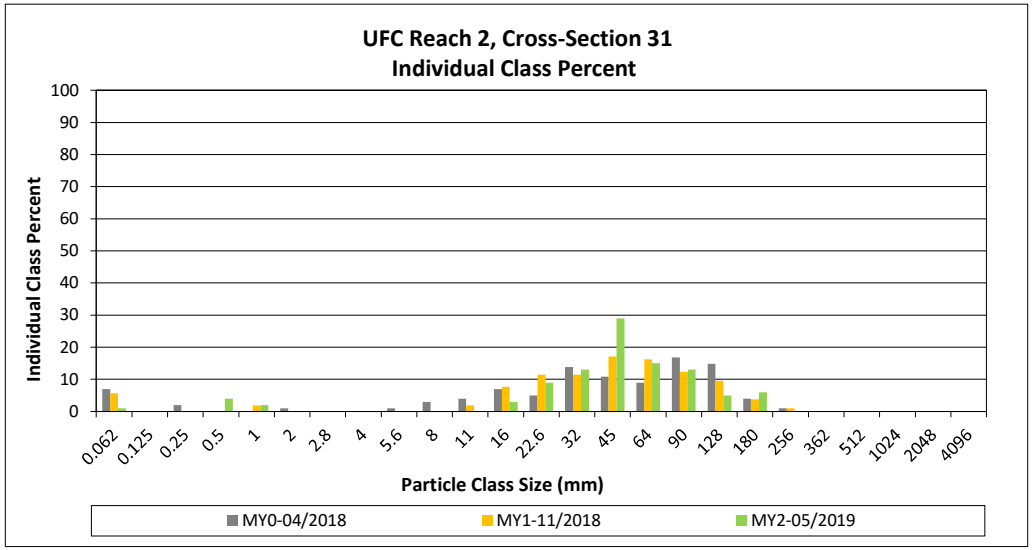
Monitoring Year 2 - 2019

UFC Reach 2, Cross-Section 31

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	1	1
SAND	Very fine	0.062	0.125			1
	Fine	0.125	0.250			1
	Medium	0.25	0.50	4	4	5
	Coarse	0.5	1.0	2	2	7
	Very Coarse	1.0	2.0			7
GRAVEL	Very Fine	2.0	2.8			7
	Very Fine	2.8	4.0			7
	Fine	4.0	5.6			7
	Fine	5.6	8.0			7
	Medium	8.0	11.0			7
	Medium	11.0	16.0	3	3	10
	Coarse	16.0	22.6	9	9	19
	Coarse	22.6	32	13	13	32
	Very Coarse	32	45	29	29	61
	Very Coarse	45	64	15	15	76
COBBLE	Small	64	90	13	13	89
	Small	90	128	5	5	94
	Large	128	180	6	6	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	**100**	**100**	**100**

Cross-Section 31	
Channel materials (mm)	
D_{16} =	20.1
D_{35} =	33.1
D_{50} =	39.5
D_{84} =	78.9
D_{95} =	135.5
D_{100} =	180.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

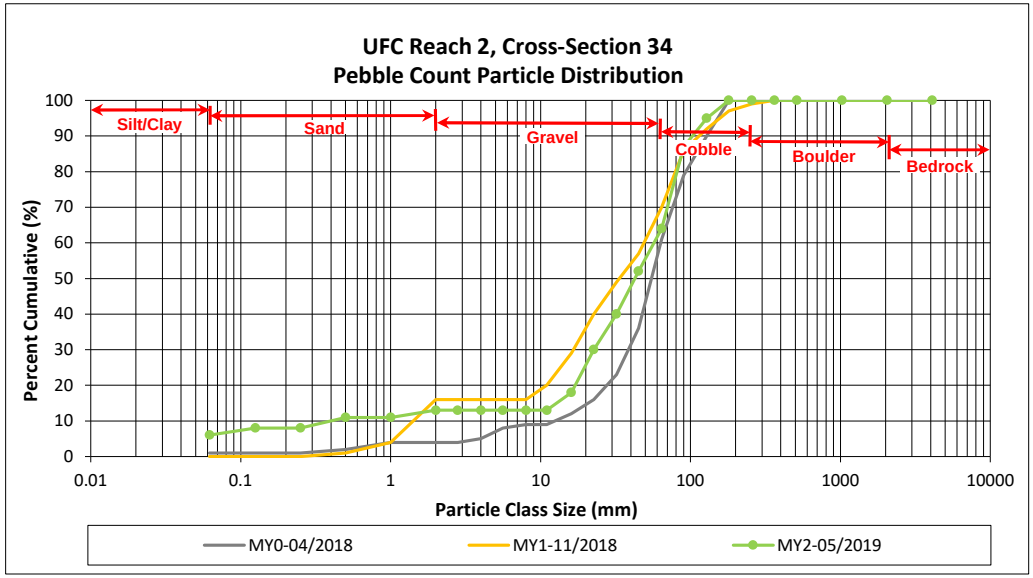
DMS Project No. 739

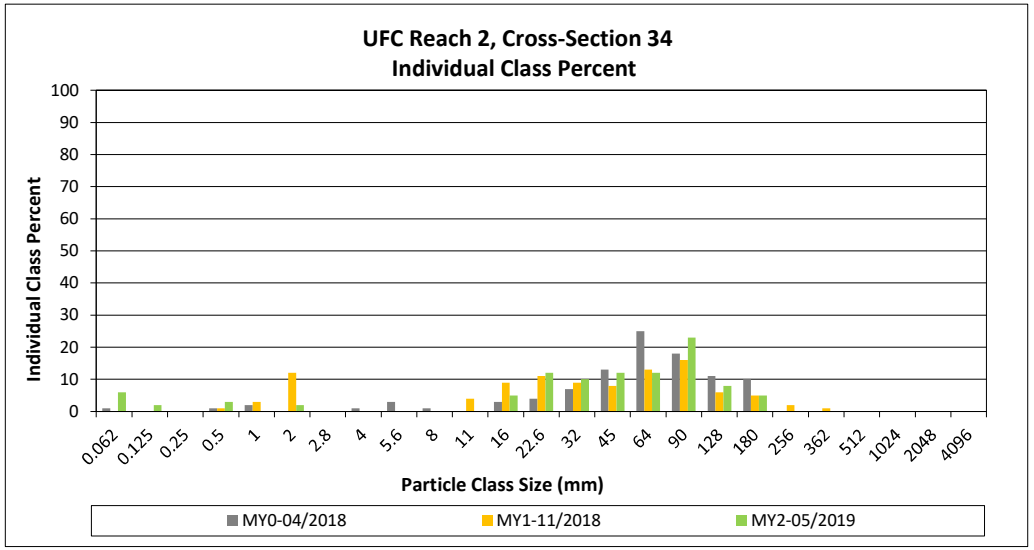
Monitoring Year 2 - 2019

UFC Reach 2, Cross-Section 34

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	6	6
SAND	Very fine	0.062	0.125	2	2	8
	Fine	0.125	0.250			8
	Medium	0.25	0.50	3	3	11
	Coarse	0.5	1.0			11
	Very Coarse	1.0	2.0	2	2	13
GRAVEL	Very Fine	2.0	2.8			13
	Very Fine	2.8	4.0			13
	Fine	4.0	5.6			13
	Fine	5.6	8.0			13
	Medium	8.0	11.0			13
	Medium	11.0	16.0	5	5	18
	Coarse	16.0	22.6	12	12	30
	Coarse	22.6	32	10	10	40
	Very Coarse	32	45	12	12	52
	Very Coarse	45	64	12	12	64
COBBLE	Small	64	90	23	23	87
	Small	90	128	8	8	95
	Large	128	180	5	5	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	**100**	**100**	**100**

Cross-Section 34	
Channel materials (mm)	
D_{16} =	13.8
D_{35} =	26.9
D_{50} =	42.5
D_{84} =	86.1
D_{95} =	128.0
D_{100} =	180.0





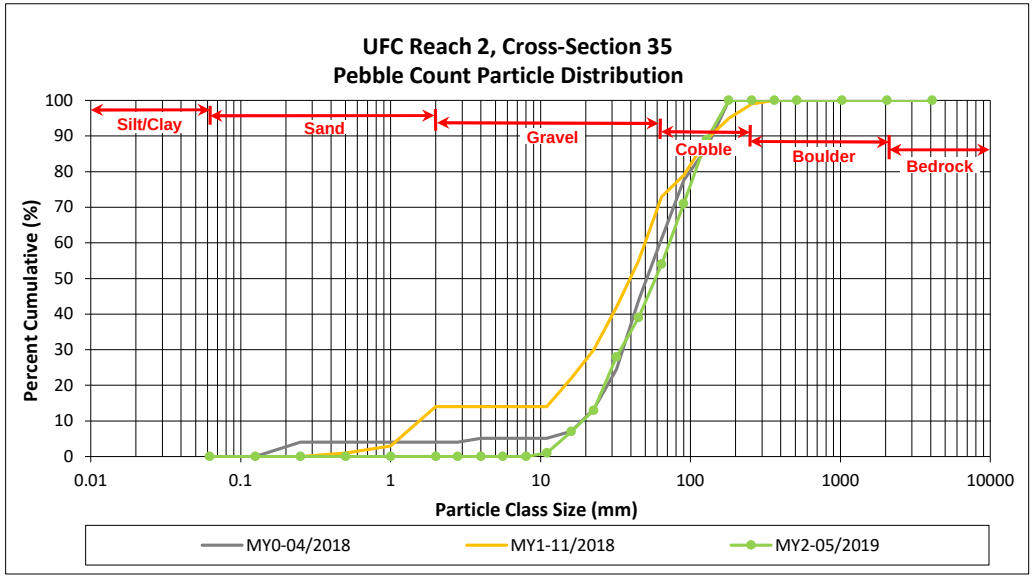
Reachwide and Cross-Section Pebble Count Plots

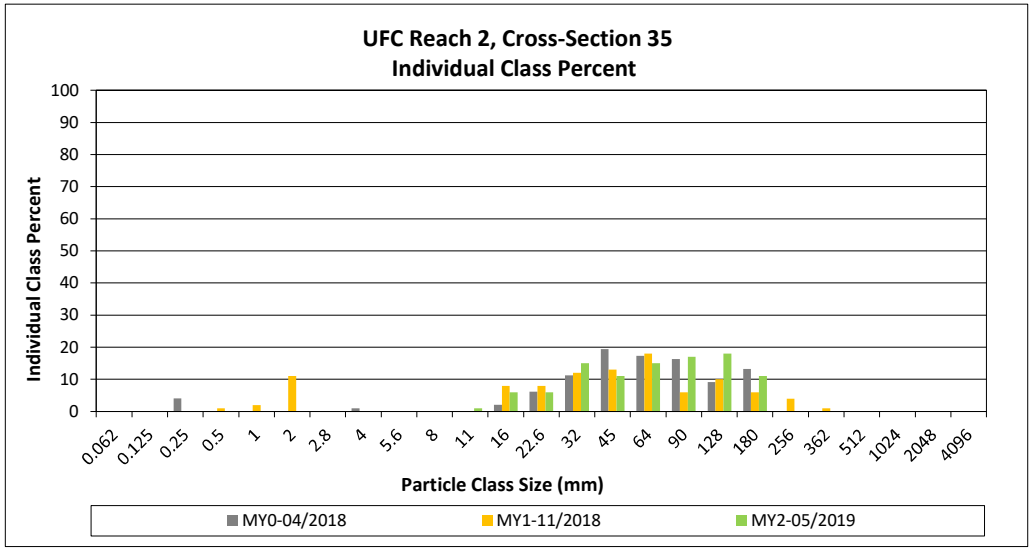
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

UFC Reach 2, Cross-Section 35

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0			0
	Medium	8.0	11.0	1	1	1
	Medium	11.0	16.0	6	6	7
	Coarse	16.0	22.6	6	6	13
	Coarse	22.6	32	15	15	28
	Very Coarse	32	45	11	11	39
	Very Coarse	45	64	15	15	54
COBBLE	Small	64	90	17	17	71
	Small	90	128	18	18	89
	Large	128	180	11	11	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	**100**	**100**	**100**

Cross-Section 35	
Channel materials (mm)	
D_{16} =	24.2
D_{35} =	39.8
D_{50} =	58.3
D_{84} =	116.1
D_{95} =	154.2
D_{100} =	180.0





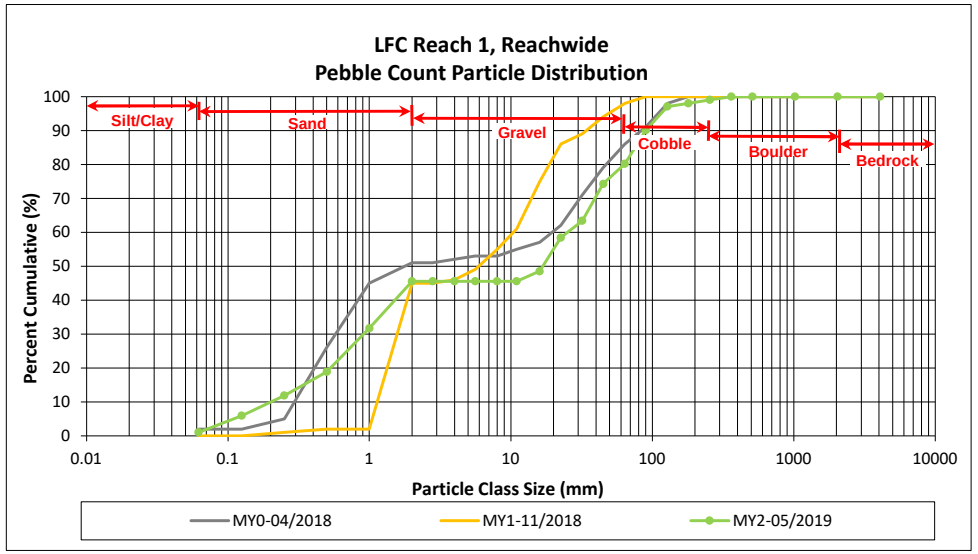
Reachwide and Cross-Section Pebble Count Plots

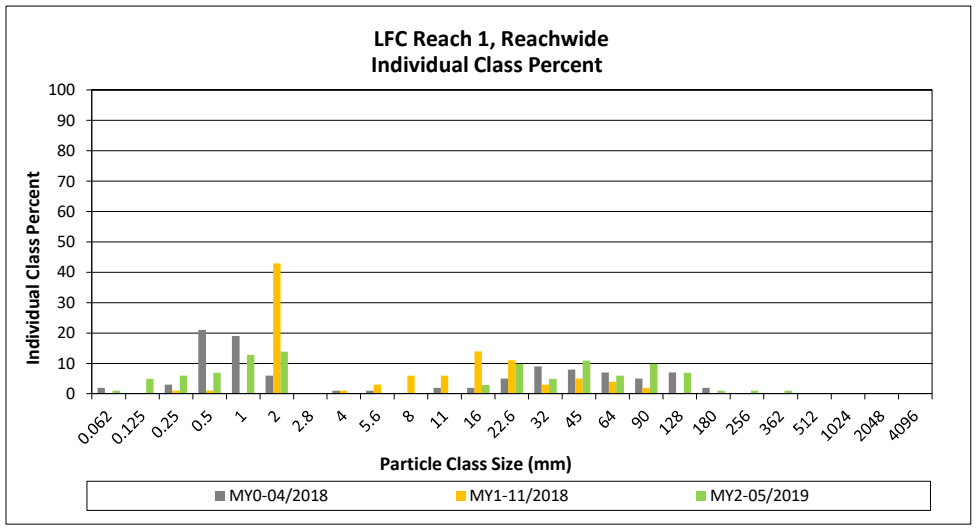
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

LFC Reach 1, 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	1	1	1
SAND	Very fine	0.062	0.125		5	5	5	6
	Fine	0.125	0.250		6	6	6	12
	Medium	0.25	0.50		7	7	7	19
	Coarse	0.5	1.0		13	13	13	32
	Very Coarse	1.0	2.0	6	8	14	14	46
GRAVEL	Very Fine	2.0	2.8					46
	Very Fine	2.8	4.0					46
	Fine	4.0	5.6					46
	Fine	5.6	8.0					46
	Medium	8.0	11.0					46
	Medium	11.0	16.0	3		3	3	49
	Coarse	16.0	22.6	5	5	10	10	58
	Coarse	22.6	32	4	1	5	5	63
	Very Coarse	32	45	9	2	11	11	74
	Very Coarse	45	64	3	3	6	6	80
COBBLE	Small	64	90	10		10	10	90
	Small	90	128	7		7	7	97
	Large	128	180	1		1	1	98
	Large	180	256	1		1	1	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**	**51**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.4
D_{35} =	1.2
D_{50} =	16.9
D_{84} =	73.0
D_{95} =	115.5
D_{100} =	362.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

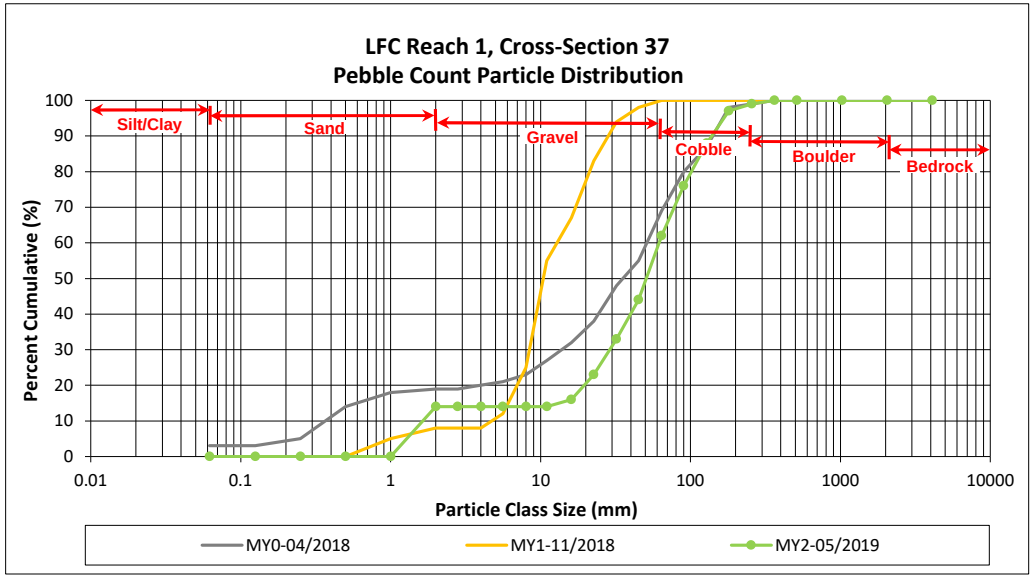
DMS Project No. 739

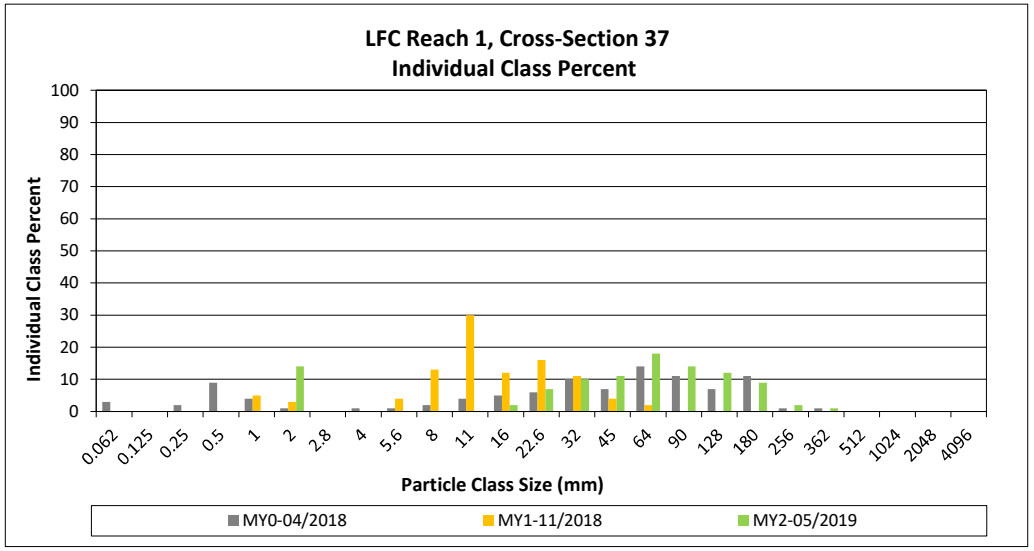
Monitoring Year 2 - 2019

LFC Reach 1, Cross-Section 37

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0	14	14	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			14
	Medium	8.0	11.0			14
	Medium	11.0	16.0	2	2	16
	Coarse	16.0	22.6	7	7	23
	Coarse	22.6	32	10	10	33
	Very Coarse	32	45	11	11	44
	Very Coarse	45	64	18	18	62
COBBLE	Small	64	90	14	14	76
	Small	90	128	12	12	88
	Large	128	180	9	9	97
	Large	180	256	2	2	99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 37	
Channel materials (mm)	
D_{16} =	16.0
D_{35} =	34.0
D_{50} =	50.6
D_{84} =	113.8
D_{95} =	166.9
D_{100} =	362.0





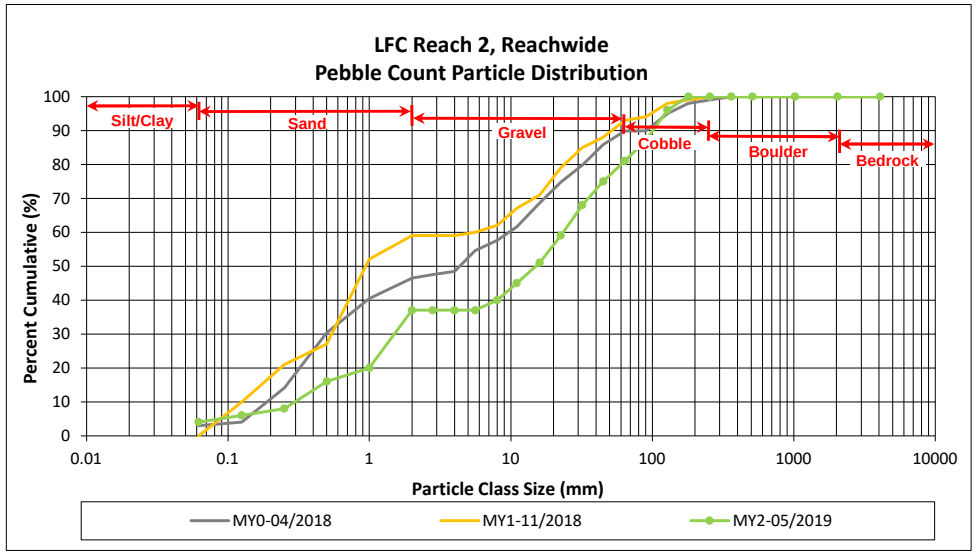
Reachwide and Cross-Section Pebble Count Plots

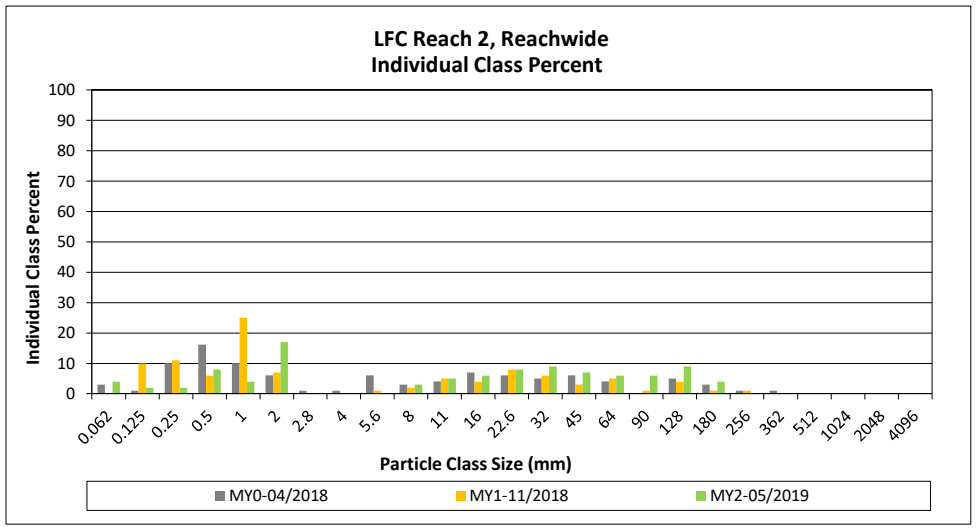
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 2 - 2019

LFC Reach 2, 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		4	4	4	4
SAND	Very fine	0.062	0.125		2	2	2	6
	Fine	0.125	0.250		2	2	2	8
	Medium	0.25	0.50	2	6	8	8	16
	Coarse	0.5	1.0		4	4	4	20
	Very Coarse	1.0	2.0	2	15	17	17	37
GRAVEL	Very Fine	2.0	2.8					37
	Very Fine	2.8	4.0					37
	Fine	4.0	5.6					37
	Fine	5.6	8.0		3	3	3	40
	Medium	8.0	11.0	1	4	5	5	45
	Medium	11.0	16.0	2	4	6	6	51
	Coarse	16.0	22.6	6	2	8	8	59
	Coarse	22.6	32	9		9	9	68
	Very Coarse	32	45	7		7	7	75
	Very Coarse	45	64	6		6	6	81
COBBLE	Small	64	90	4	2	6	6	87
	Small	90	128	8	1	9	9	96
	Large	128	180	3	1	4	4	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} =	0.5
D_{35} =	1.8
D_{50} =	15.0
D_{84} =	75.9
D_{95} =	123.1
D_{100} =	180.0





Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

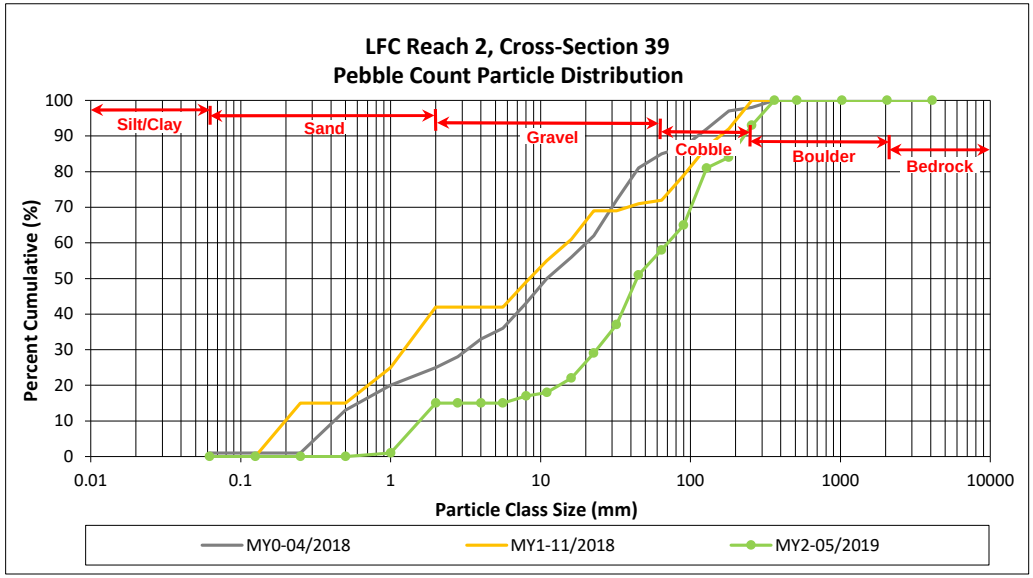
DMS Project No. 739

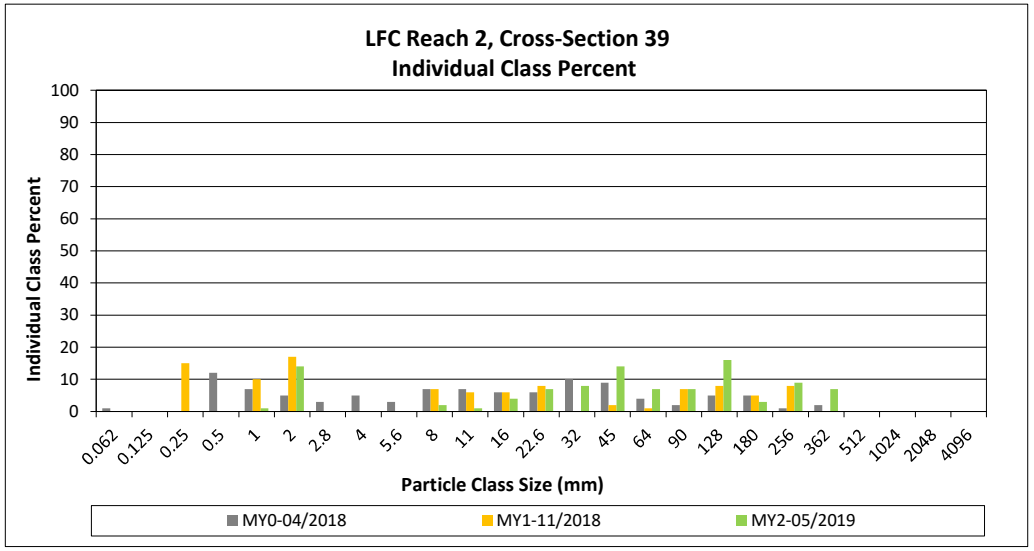
Monitoring Year 2 - 2019

LFC Reach 2, Cross-Section 39

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0	1	1	1
	Very Coarse	1.0	2.0	14	14	15
GRAVEL	Very Fine	2.0	2.8			15
	Very Fine	2.8	4.0			15
	Fine	4.0	5.6			15
	Fine	5.6	8.0	2	2	17
	Medium	8.0	11.0	1	1	18
	Medium	11.0	16.0	4	4	22
	Coarse	16.0	22.6	7	7	29
	Coarse	22.6	32	8	8	37
	Very Coarse	32	45	14	14	51
	Very Coarse	45	64	7	7	58
COBBLE	Small	64	90	7	7	65
	Small	90	128	16	16	81
	Large	128	180	3	3	84
	Large	180	256	9	9	93
BOULDER	Small	256	362	7	7	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 39	
Channel materials (mm)	
D_{16} =	6.7
D_{35} =	29.3
D_{50} =	43.9
D_{84} =	180.0
D_{95} =	282.6
D_{100} =	362.0





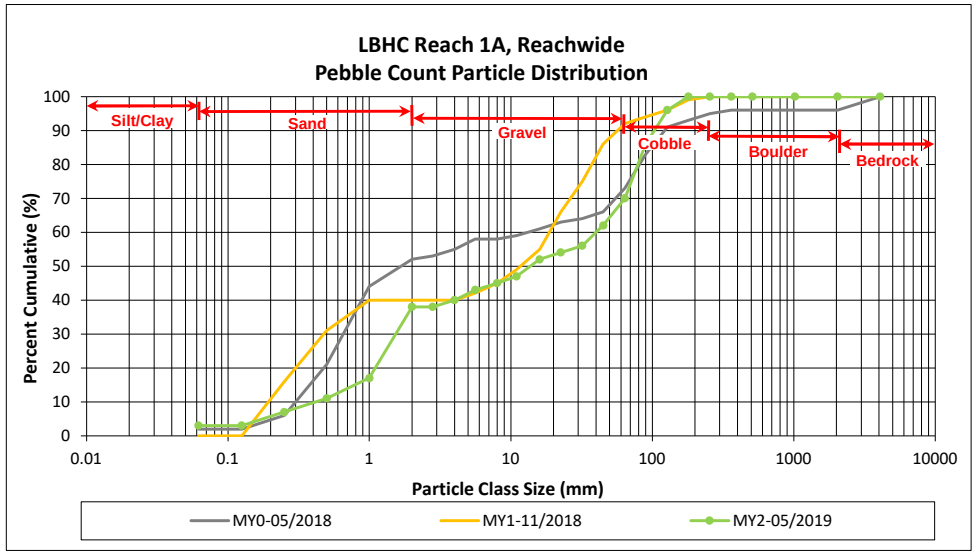
Reachwide and Cross-Section Pebble Count Plots

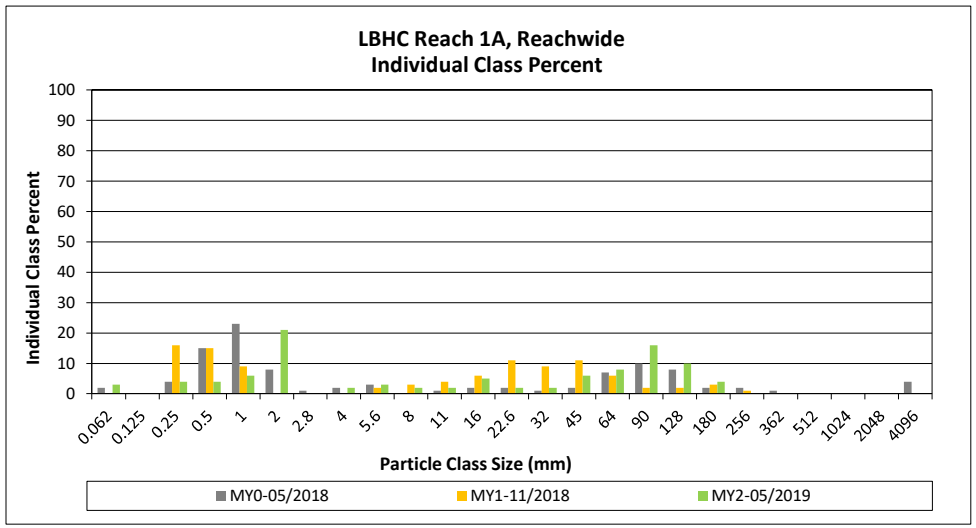
Big Harris Creek Mitigation Site - Area C
DMS Project No. 739
Monitoring Year 2 - 2019

LBHC Reach 1A, 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	3	3	3
SAND	Very fine	0.062	0.125					3
	Fine	0.125	0.250		4	4	4	7
	Medium	0.25	0.50		4	4	4	11
	Coarse	0.5	1.0		6	6	6	17
	Very Coarse	1.0	2.0	4	17	21	21	38
GRAVEL	Very Fine	2.0	2.8					38
	Very Fine	2.8	4.0		2	2	2	40
	Fine	4.0	5.6		3	3	3	43
	Fine	5.6	8.0		2	2	2	45
	Medium	8.0	11.0		2	2	2	47
	Medium	11.0	16.0	2	3	5	5	52
	Coarse	16.0	22.6	1	1	2	2	54
	Coarse	22.6	32	1	1	2	2	56
	Very Coarse	32	45	5	1	6	6	62
	Very Coarse	45	64	8		8	8	70
COBBLE	Small	64	90	15	1	16	16	86
	Small	90	128	10		10	10	96
	Large	128	180	4		4	4	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} =	0.9
D_{35} =	1.8
D_{50} =	13.8
D_{84} =	86.2
D_{95} =	123.6
D_{100} =	180.0





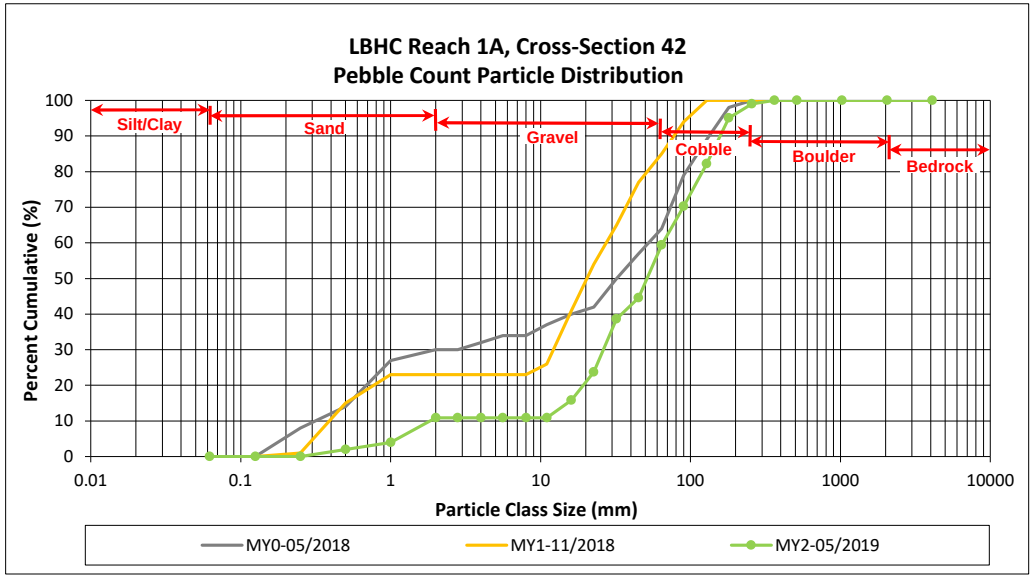
Reachwide and Cross-Section Pebble Count Plots

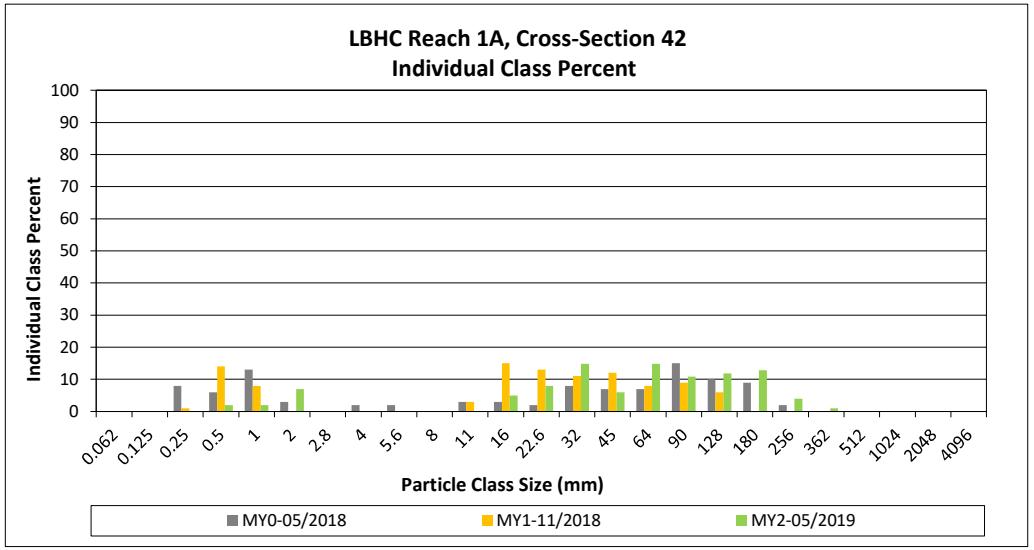
Big Harris Creek Mitigation Site - Area C
DMS Project No. 739
Monitoring Year 2 - 2019

LBHC Reach 1A, Cross-Section 42

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	2	2	2
	Coarse	0.5	1.0	2	2	4
	Very Coarse	1.0	2.0	7	7	11
GRAVEL	Very Fine	2.0	2.8			11
	Very Fine	2.8	4.0			11
	Fine	4.0	5.6			11
	Fine	5.6	8.0			11
	Medium	8.0	11.0			11
	Medium	11.0	16.0	5	5	16
	Coarse	16.0	22.6	8	8	24
	Coarse	22.6	32	15	15	39
	Very Coarse	32	45	6	6	45
	Very Coarse	45	64	15	15	59
COBBLE	Small	64	90	11	11	70
	Small	90	128	12	12	82
	Large	128	180	13	13	95
	Large	180	256	4	4	99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**101**	**100**	**100**

Cross-Section 42	
Channel materials (mm)	
D_{16} =	16.1
D_{35} =	29.4
D_{50} =	51.2
D_{84} =	134.3
D_{95} =	179.8
D_{100} =	362.0





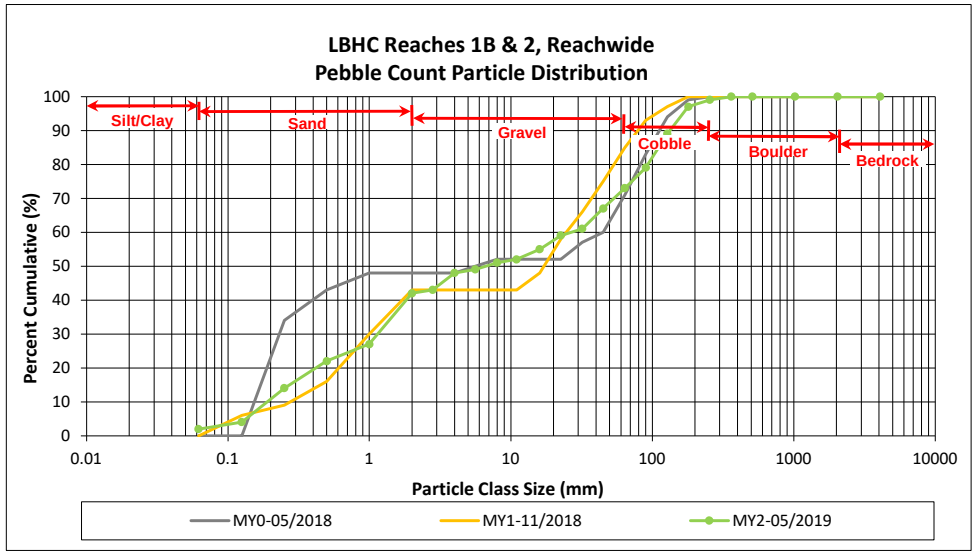
Reachwide and Cross-Section Pebble Count Plots

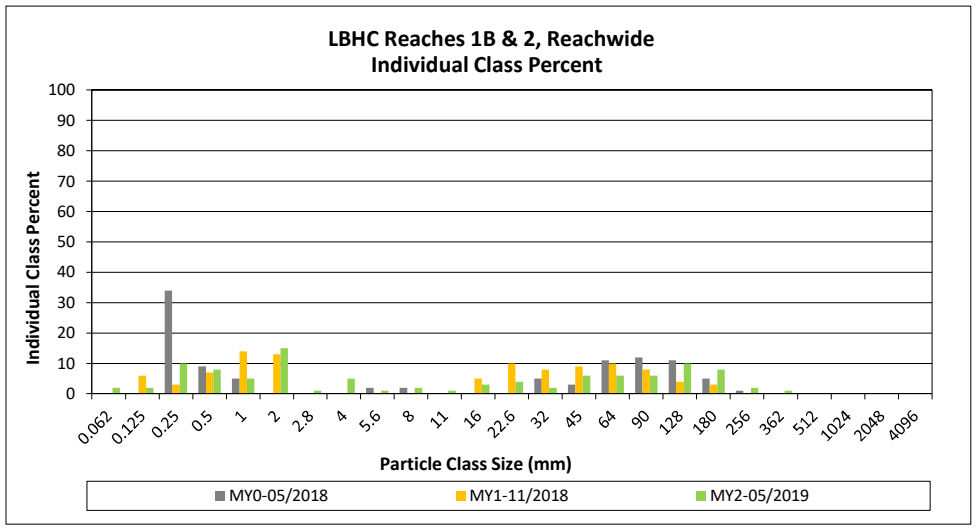
Big Harris Creek Mitigation Site - Area C
DMS Project No. 739
Monitoring Year 2 - 2019

LBHC Reaches 1B & 2, 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	1	2	2	2
SAND	Very fine	0.062	0.125		2	2	2	4
	Fine	0.125	0.250		10	10	10	14
	Medium	0.25	0.50		8	8	8	22
	Coarse	0.5	1.0	1	4	5	5	27
	Very Coarse	1.0	2.0	2	13	15	15	42
GRAVEL	Very Fine	2.0	2.8		1	1	1	43
	Very Fine	2.8	4.0		5	5	5	48
	Fine	4.0	5.6		1	1	1	49
	Fine	5.6	8.0	1	1	2	2	51
	Medium	8.0	11.0	1		1	1	52
	Medium	11.0	16.0	2	1	3	3	55
	Coarse	16.0	22.6	4		4	4	59
	Coarse	22.6	32	2		2	2	61
	Very Coarse	32	45	5	1	6	6	67
	Very Coarse	45	64	5	1	6	6	73
COBBLE	Small	64	90	6		6	6	79
	Small	90	128	9	1	10	10	89
	Large	128	180	8		8	8	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} =	0.3
D_{35} =	1.4
D_{50} =	6.7
D_{84} =	107.3
D_{95} =	165.3
D_{100} =	362.0





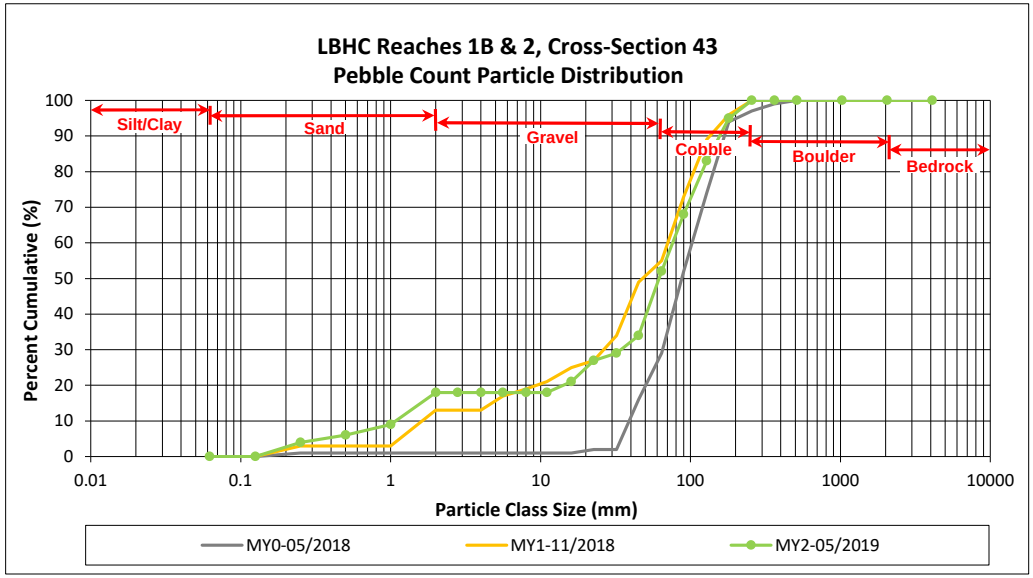
Reachwide and Cross-Section Pebble Count Plots

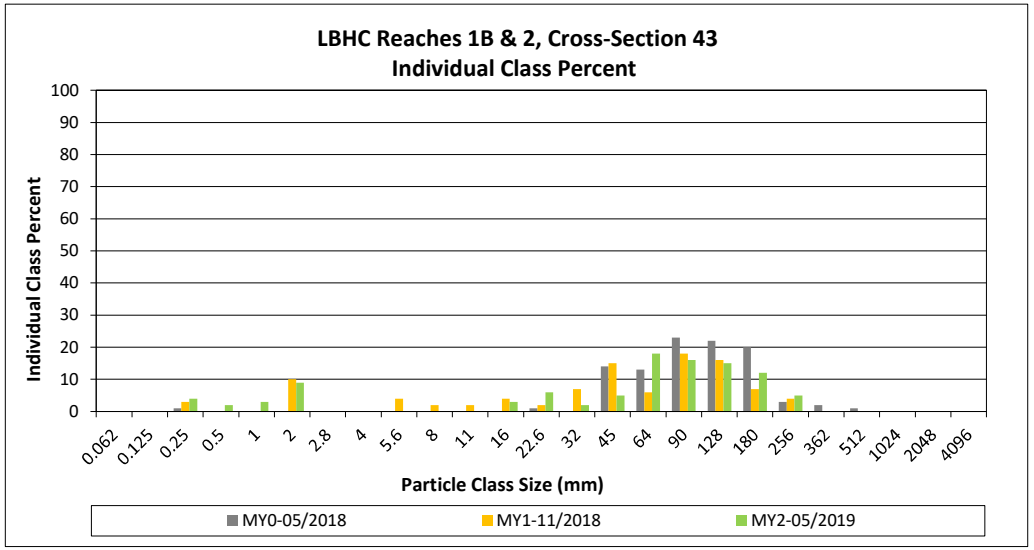
Big Harris Creek Mitigation Site - Area C
DMS Project No. 739
Monitoring Year 2 - 2019

LBHC Reaches 1B & 2, Cross-Section 43

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	4	4	4
	Medium	0.25	0.50	2	2	6
	Coarse	0.5	1.0	3	3	9
	Very Coarse	1.0	2.0	9	9	18
GRAVEL	Very Fine	2.0	2.8			18
	Very Fine	2.8	4.0			18
	Fine	4.0	5.6			18
	Fine	5.6	8.0			18
	Medium	8.0	11.0			18
	Medium	11.0	16.0	3	3	21
	Coarse	16.0	22.6	6	6	27
	Coarse	22.6	32	2	2	29
	Very Coarse	32	45	5	5	34
	Very Coarse	45	64	18	18	52
COBBLE	Small	64	90	16	16	68
	Small	90	128	15	15	83
	Large	128	180	12	12	95
	Large	180	256	5	5	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	**100**	**100**	**100**

Cross-Section 43	
Channel materials (mm)	
D_{16} =	1.7
D_{35} =	45.9
D_{50} =	61.5
D_{84} =	131.7
D_{95} =	180.0
D_{100} =	256.0





APPENDIX 5. Hydrology Summary Data and Plots

Table 14. Verification of Bankfull Events
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Reach	Monitoring Year	Date of Occurrence	Method
Upper Big Harris Creek Reach 2A	MY1	10/11/2018	Stream Gage
	MY2	6/7/2019	
		6/8/2019	
		8/4/2019	
Royster Creek Reach 1	MY1	5/30/2018	
		7/24/2018	
		10/11/2018	
		11/12/2018[1]	
		11/15/2018	
	MY2	1/22/2019	
		1/26/2019	
		1/30/2019[1]	
		1/31/2019	
		2/11/2019	
		6/7/2019	
		6/8/2019	
		6/9/2019	
Scott Creek	MY1	---	
	MY2	---	
Carroll Creek	MY1	10/11/2018	
		11/15/2018	
	MY2	6/7/2019	
		6/8/2019[1]	
		6/9/2019	
		8/4/2019	
Upper Stick Elliott Creek Reach 1	MY1	10/11/2018	
	MY2	6/7/2019[1]	
		6/8/2019	
		8/4/2019	
Upper Stick Elliott Creek Reach 5	MY1	10/11/2018[1]	
		11/12/2018	
		11/15/2018	
	MY2	6/8/2019	
		8/4/2019	

[1] Multiple bankfull events recorded on occurrence date.

--- No bankfull events reported.

Table 14. Verification of Bankfull Events
Big Harris Creek Mitigation Site
DMS Project No. 739
Monitoring Year 2 - 2019

Reach	Monitoring Year	Date of Occurrence	Method
Elliott Creek	MY1	10/11/2018	Stream Gage
	MY2	6/7/2019	
		6/8/2019	
UT1 to Elliott Creek	MY1	---	
	MY2	6/8/2019	
Bridges Creek	MY1	---	
	MY2	---	
UT2 to Upper Stick Elliott Creek	MY1	7/19/2018	
		8/2/2018	
		10/11/2018	
		11/12/2018	
		11/15/2018	
	MY2	1/4/2019	
		2/18/2019	
		2/21/2019	
		6/7/2019[1]	
		6/8/2019	
		8/2/2019	
		8/4/2019	
		8/14/2019	
UT3 to Upper Stick Elliott Creek	MY1	10/11/2018	
	MY2	8/4/2019	
Upper Fletcher Creek Reach 2	MY1	7/24/2018	
		8/2/2018	
		10/11/2018	
		10/26/2018	
		11/12/2018	
		11/15/2018	
	MY2	6/7/2019	
		6/8/2019	
Lower Fletcher Creek Reach 1	MY1	8/2/2018	
		10/11/2018	
		10/26/2018	
		11/12/2018	
		11/15/2018	
	MY2	1/30/2019	
		1/31/2019	
Lower Big Harris Creek Reach 1A	MY1	10/11/2018	
		10/26/2018	
		11/12/2018	
	MY2	6/7/2019	
		6/8/2019	
		6/9/2019	

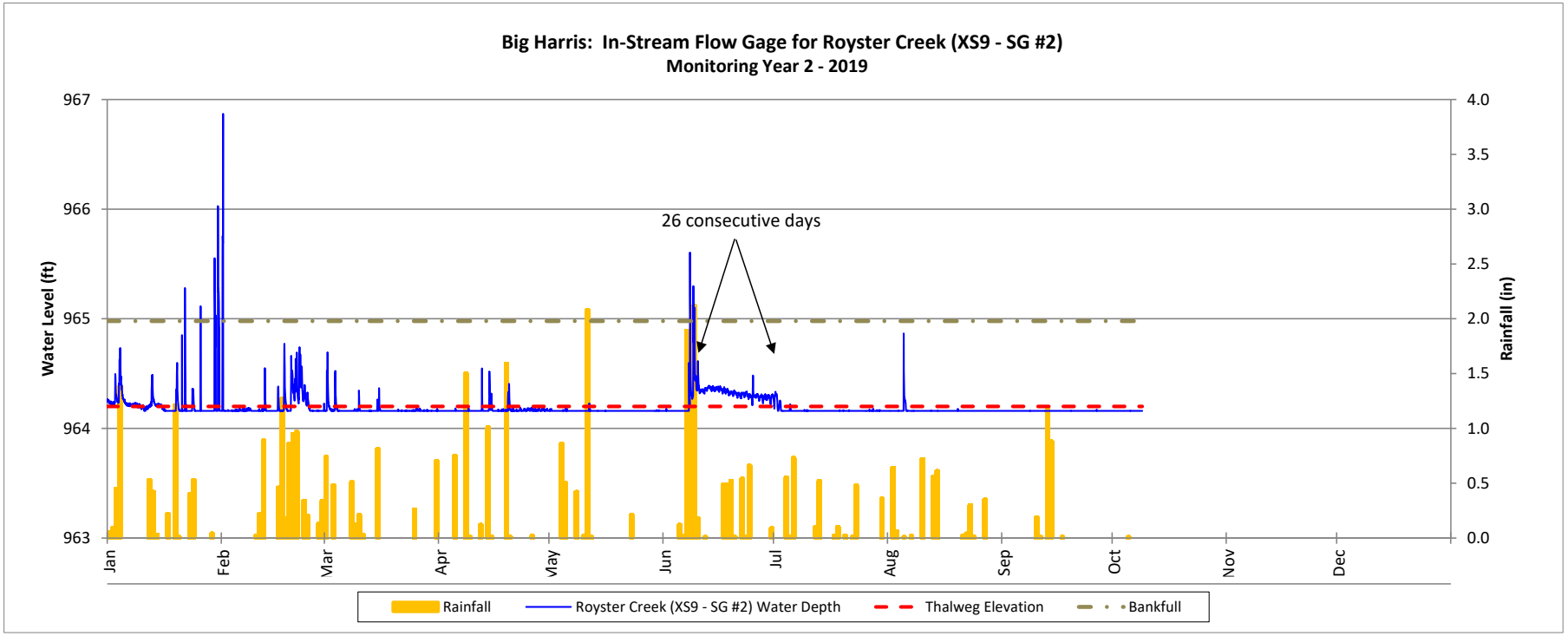
[1] Multiple bankfull events recorded on occurrence date.
--- No bankfull events reported.

Recorded In-stream Flow Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

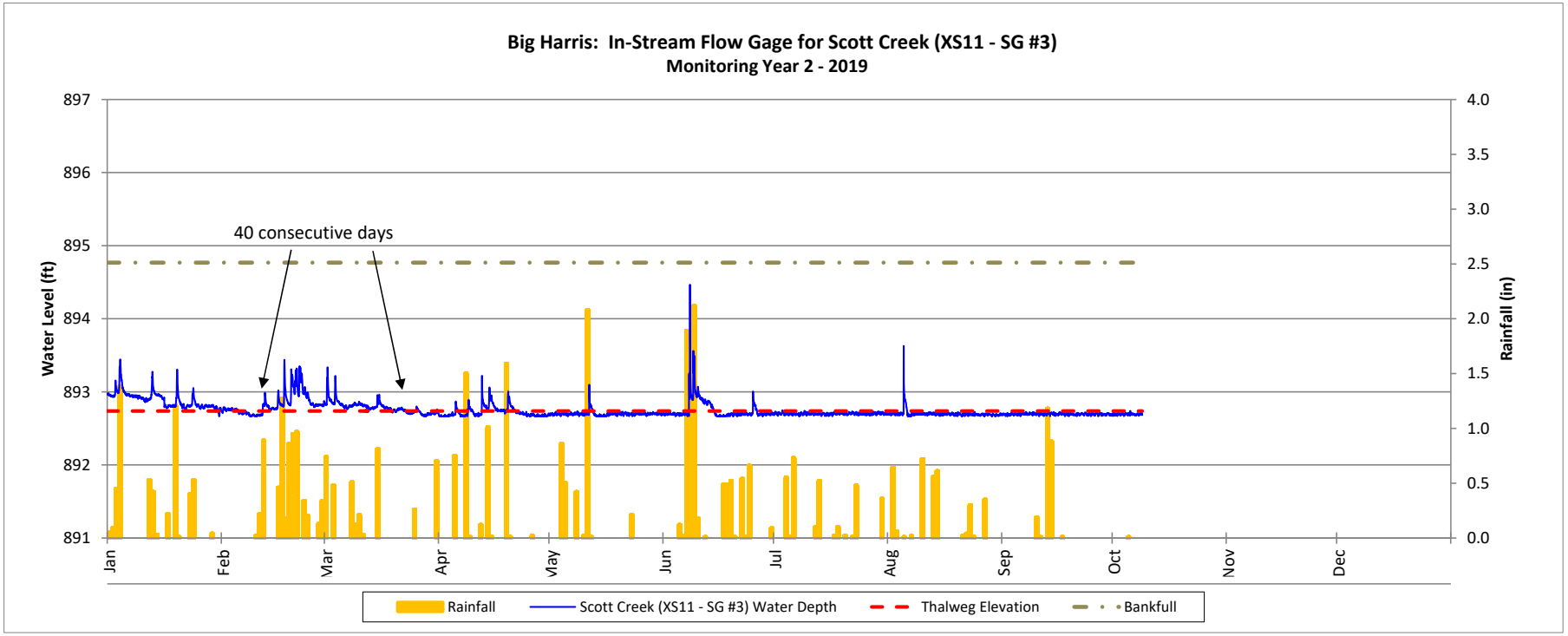


Recorded In-stream Flow Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019

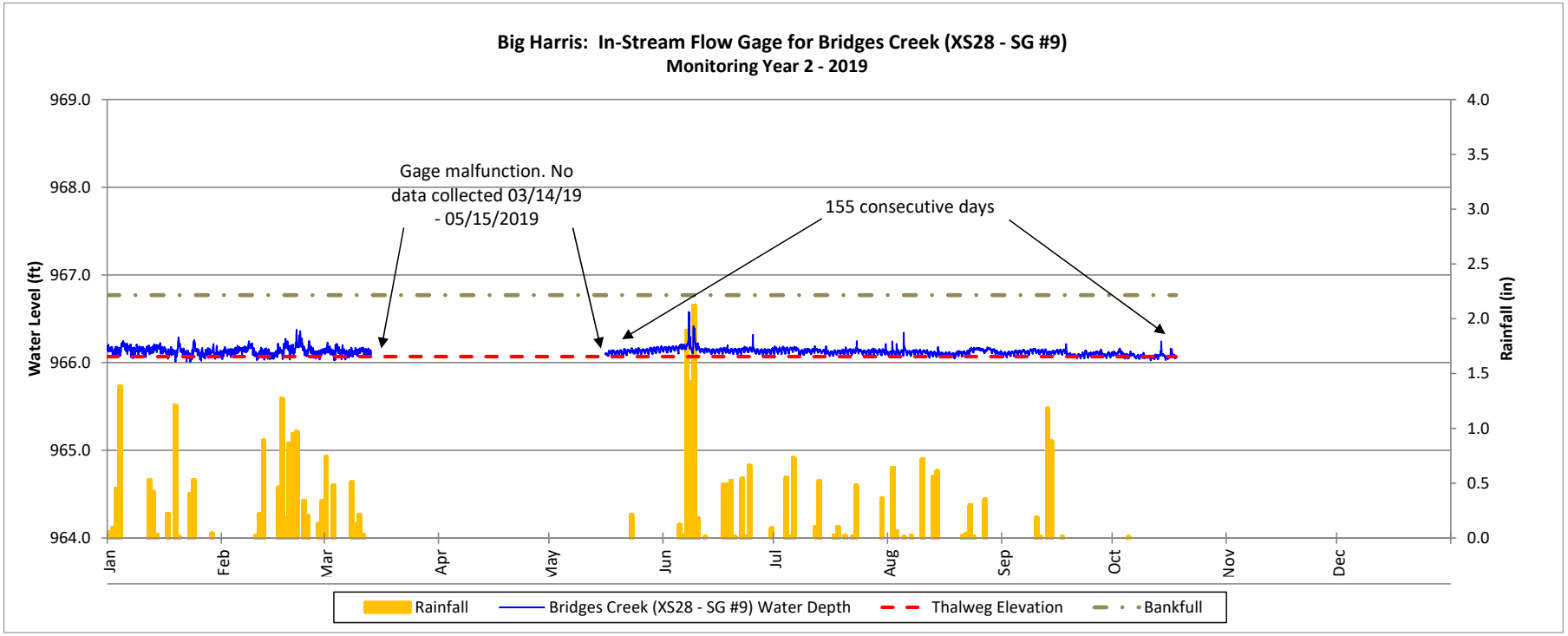


Recorded In-stream Flow Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 2 - 2019



APPENDIX 6. Revised Water Quality Monitoring Correspondence and Technical Memo

From:	Tugwell, Todd J CIV USARMY CESAW (US)
To:	Melia, Gregory; Wiesner, Paul; Kim Browning; Haupt, Mac; Davis, Erin B
Cc:	Jeff Keaton; Shawn Wilkerson
Subject:	[External] RE: Big Harris_DMS# 739_Technical Memo WQ Monitoring_6-6-2019
Date:	Thursday, August 22, 2019 11:55:46 AM

Greg,
We discussed the latest plan with the IRT yesterday, and we are fine with the responses. Please proceed and let me know if you have any other questions. I'm sure Mac will jump at the chance to go back out to Big Harris once we get some results.

Todd

-----Original Message-----
From: Melia, Gregory [mailto:gregory.melia@ncdenr.gov]
Sent: Tuesday, August 13, 2019 5:00 PM
To: Wiesner, Paul <paul.wiesner@ncdenr.gov>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Browning, Kimberly D CIV USARMY CESAW (US) <Kimberly.D.Browning@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>; Davis, Erin B <erin.davis@ncdenr.gov>
Cc: Jeff Keaton <jkeaton@wildlandseng.com>; Shawn Wilkerson <swilkerson@wildlandseng.com>
Subject: [Non-DoD Source] RE: Big Harris_DMS# 739_Technical Memo WQ Monitoring_6-6-2019

All,

Attached is the document I had brought to the meeting today. The first 3 pages include the e-mail that was sent by the IRT with questions about the memo as well as the responses I sent back (in blue). The rest of the pages are the final memo revised to address the questions. Paul sent that out on 6/12/19 (see below).

My responses (blue text) in the attached and the final memo have yellow highlighted sections that identify the salient part of my response and shows where in the memo document that we addressed the question/concern.

So, if you focus on those yellow highlighted part of the attached it should expedite things.

If there were other questions, just let us know.

WEI and Western Carolina are trying to complete their contracting for this.

Thanks,

Greg

From: Wiesner, Paul <paul.wiesner@ncdenr.gov>
Sent: Wednesday, June 12, 2019 4:35 PM
To: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Kim Browning <Kimberly.D.Browning@usace.army.mil>; Haupt, Mac <mac.haupt@ncdenr.gov>; Davis, Erin B <erin.davis@ncdenr.gov>
Cc: Melia, Gregory <gregory.melia@ncdenr.gov>; Jeff Keaton <jkeaton@wildlandseng.com>; Shawn Wilkerson <swilkerson@wildlandseng.com>
Subject: Big Harris_DMS# 739_Technical Memo WQ Monitoring_6-6-2019

Erin, Kim, Mac and Todd;

Please find attached the final Big Harris water quality monitoring proposal. It incorporates all and the changes and updates we have discussed to date.

Let us know how you would like to proceed. The potential 507 credits was established in the mitigation plan so there is no increase in project credits. If possible, we would like to move forward with an email approval of the proposal rather than a full mitigation plan addendum.

Thanks

Paul Wiesner

Western Regional Supervisor

North Carolina Department of Environmental Quality

Division of Mitigation Services

828-273-1673 Mobile

paul.wiesner@ncdenr.gov <mailto:paul.wiesner@ncdenr.gov>

Western DMS Field Office

5 Ravenscroft Drive

Suite 102

Asheville, N.C. 28801

From:	Melia, Gregory
To:	Tugwell, Todd J CIV USARMY CESAW (US); Wiesner, Paul; Shawn Wilkerson; Haupt, Mac; Jeff Keaton; Kim Browning; Russell, Periann
Subject:	RE: [External] RE: Big Harris Creek - DMS# 739 - Revised Water Quality Monitoring Proposal Memo
Date:	Thursday, April 25, 2019 10:49:00 AM

Todd et al.,

Sorry everybody. I've been playing catchup from being out last week. See my responses to your comments below in Blue

-----Original Message-----

From: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>

Sent: Tuesday, April 16, 2019 4:24 PM

To: Melia, Gregory <gregory.melia@ncdenr.gov>; Wiesner, Paul <paul.wiesner@ncdenr.gov>; Shawn Wilkerson <swilkerson@wildlandseng.com>; Haupt, Mac <mac.haupt@ncdenr.gov>; Jeff Keaton <jkeaton@wildlandseng.com>; Kim Browning <Kimberly.D.Browning@usace.army.mil>

Subject: RE: [External] RE: Big Harris Creek - DMS# 739 - Revised Water Quality Monitoring Proposal Memo

Greg,

I have had a chance to review the Big Harris WQ Monitoring proposal as discussed during our meeting last week. After looking over the mitigation plan and comments, I have the following comments and a few more questions:

1. With regard to credits, the IRT comments on the draft plan confirm your accounting of the credits with one minor error. I believe the total credit from the mitigation plan (not including the 507 credits from the additional 2%) was 25,330 (rounded up), not 25,331. While it is not clear to me if the additional 2% should have been based on the total credit before or after adding in the 1.5% watershed bonus and the initial 4% water quality bonus, I will agree to the 507 credits because Wildlands response to our comments makes reference to the 507 credits, and it is attached to our approval letter. Understood.

2. In the biological monitoring section, the memo indicates three macro-benthic sites will

be monitored on Upper Fletcher above station 1. I didn't see these stations on the map - are they in the restoration reach or the E2 reach? Also, why concentrate three sites on this reach? That is an error we didn't catch in the narrative. The only benthos stations on fletcher are stations 0 and 1. Station 0 is serving as a watershed control station and was assessed for Benthos and Conductivity pre-con. See note A on page 4.

3. In the success criteria, the physiochemical parameters are determined successful with a 15% reduction in the mean distribution, and the biological parameters are determined successful with an increase of at least one bio-classification, correct? And then all parameters (both physiochemical and biological) are used to determine the % of credit for that station? For the biological parameters, sampling will be done in year 3 and 5 - does success assume an increase in bio-classification in both year 3 and 5, or only once? Also does it matter if there is an improvement in year 3 but a loss of a bio-classification in year 5? Yes, I remember at one point that Wildlands and I were discussing this uncertainty and apparently we never circled back. As is evident there are a lot of moving parts here. We had 3 options we were discussing at the time as I recall (see below). I had meant to speak with Eric Fleek at the DWR lab to see if B is something they ever do or whether it is advisable. I will contact him about that. The rationale for C was that if the we relied on a single year we could have drought in post-con as compared to the pre-con for example. Let me circle back with Eric Fleek and/or Larry on their thoughts on that and I will get back to you. In addition, some of the habitat development might take longer to indicate a change related to the restoration efforts (e.g. LWD, Leaf Pack etc.). It may be advisable for us to have it for years 4 and 5 instead of 3 and 5 if we maintain 2 years of benthos sampling. If anyone has a compelling argument for one approach or another then chime in, but I would actually lean towards a pooled data set from year 4 and 5 if Eric and Larry bless that approach.

a. Simply measure in Year 5 and base the entire success/failure on that.

b. Pool the raw data from Year 3 and 5 to generate a single BI to represent the post-con condition for comparison to pre-con.

c. Sample both years and choose the year that is the closest in terms of the hydrologic condition (water year) that the site was exposed to in the pre-con sampling.

4. In the success criteria, there is a provision for "time series analysis" that I'd like to understand better. This seems to imply that if you don't meet the 15% reduction at the end of monitoring (year 5), but the trend indicates you will meet the 15% at the end of 10 years, you still consider this to be successful, correct? So does this mean you could meet success with as little as a 7.5% reduction at the end of monitoring? Am I reading this right? If so, I'm not sure I agree that such a low percentage is an appropriate standard for success.

Point taken. The intent here was to incorporate standard statistical practices used in assessment of change WQ , which are discussed in the Spooner paper and other literature to include parametric, non-parametric hypothesis testing (referred to as Step change in Spooner's paper) and time series in a tiered approach to investigate change, but I see the problem that the time series presents written as it is. I would say that we need to proceed and revise as follows:

a. If statistical assumptions of normality and homogeneity of variance are met we rely on parametric hypothesis testing or ANOVA ($P<0.05$)

b. If assumptions are not met we utilize non-parametric hypothesis testing ($P<0.05$) as per standard practice

c. If the variability of a particular parameter at a particular station does permit detection of significance at 0.05 in either hypothesis testing scheme (a or b) then we attempt to run the data as a time series trend. The variability in a pooled hypothesis test may present differently when subjected to multiple regression techniques plotted against time (time series) and you can may be able tease out changes you could not through a and b. The slope of the time series regression line would have to be significantly different from zero at ($P<0.05$).

Now, even though we would employ this tiered approach, the one basic minimum threshold that will apply in all cases (a,b,c) is that the difference in the means pre-post must be a minimum of 15%. If that minimum threshold of 15% is not met it doesn't matter if any of the three above are deemed significant, that parameter at that station will be deemed a failure for the purpose of attaining mitigation credit.

5. I haven't seen the as-built yet for this project - do you know if it's available and if there are projected changes to credit?

The As-built is posted on our documents spreadsheet and was sent to DWR and USACE in the Bulk transfer on 12/18/2018. It is my understanding that the credits from the Mit Plan are what WEI used in that report and are being used as the agreed upon credits for the duration. If I have this wrong anybody, just chime in.

I appreciate your bearing with me as I work through this. I know I am asking questions that may seem like I'm getting into the weeds, but the details really matter in this case and we all need to make sure to understand and agree on these points up front so we don't have disagreements on credit at closeout. I've had to learn that lesson the hard way. Understood and thanks for your review.

Thanks,

Technical Memorandum

Prepared for:	Interagency Review Team
Project Title:	Big Harris Creek Mitigation Site
Subject:	Revised Water Quality Monitoring Proposal
Date:	June 6, 2019
From:	Jeff Keaton

INTRODUCTION

The purpose of this Technical Memorandum is to provide the North Carolina Interagency Review Team (IRT) a summary of the proposed post-construction water quality and biological monitoring program for the Big Harris Creek Mitigation Site. As stated in the final mitigation plan (section 12.7), a 4% credit allowance based on the entire linear footage of the project will be granted for the inclusion of these parameters for a pre/post construction comparison. Also based on the mitigation plan, an additional 2% (507 SMUs) credit allowance will be granted if post-construction water quality monitoring demonstrates improvement as per the plan detailed below.

This memo describes a revised version of the water quality, benthic, and fish monitoring program that has been refined based on an analysis of the pre-construction data and a set of criteria to support statistically reliable detection of change. **This revised monitoring program will supersede the program described in the final mitigation plan.** The memo will also describe the proposed success criteria for the monitoring program.

ANALTICAL BASIS FOR POST-CON SAMPLING PLAN

Pre-con sampling was completed at 16 stations within the Big Harris watershed and at 4 reference stations in the Little Harris watershed by the Division of Water Resources Watershed Assessments Team (WAT) for nutrient and biological parameters using state certified procedures. Western Carolina University performed automated stormflow monitoring of suspended sediments and discharge at 4 key drainage locations. Selected reaches were also monitored for groundwater hydrology. These monitoring activities were funded by the Division of Mitigation Services (DMS). The pre-construction (baseline) data were analyzed and several criteria were used to determine whether post-construction monitoring of a parameter was warranted at a given station. The statistical analysis was performed by DMS staff member, Greg Melia, with consultation and review by Wildlands Engineering staff. The hierarchy of the criteria used to select post-construction monitoring parameters and stations are as follows:

1. The levels of the pre-con data for a given parameter at a given station had to demonstrate that they were elevated compared to regulatory standards, the Little Harris reference sites, or relevant regional data sets/literature. The main consideration here is whether there is meaningful room for improvement at a given station.

2. There exists a reasonable likelihood for improvement in the given parameter at the given location because the direct stressors can be largely addressed. Examples of where stressors might not be addressed include cases where land owner easement grants do not permit capture of the major lateral inputs.
3. The pre-construction data indicates that a given station can be adequately represented by one of the pre-construction sampling stations (to include consolidation, where sensible).
4. Statistical analysis of the pre-construction distributions using minimal detectable change (MDC) analysis (Spooner et al., 2011) was performed by DMS for each parameter at each station. Using the variance of the pre-construction distribution, the MDC provides an estimate of the minimum percent change in a pollutant concentration that will be required to support statistically reliable detection of that change (assuming and alpha of 0.05). The more variability in the distribution of the data, the greater the MDC must be for reliable change detection. MDC results $\geq$ 50% were generally considered too variable and resulted in exclusion of that parameter at that station for post-construction monitoring. However, in some case best professional judgement was applied. MDCs that were slightly over 50% may have been included if outliers in the raw data could be identified or the parameter distributions and/or site characteristics exhibited other qualities that made it sensible to override a slightly elevated MDC.
5. Statistical Assumptions – The use of the MDC in item 4 assumes the approximation of a normal distribution, however in many cases the MDC analysis is robust against the violation of this assumption after pooling the post-con data with the pre-data. Therefore, this criterion was used to assist in decision making, but was a lesser factor than the other criteria.

Wildlands Engineering will contract Western Carolina University (WCU) to collect the post-construction water quality data which will include both baseflow and stormflow monitoring. Table 1 provides the matrix of parameters to be collected at a given station based on the analysis and criteria described above. The locations of the monitoring stations are shown on the attached map (Figure 1). The station numbers in the matrix correspond to the stations listed on the map. The samples will be collected using protocols utilized by the NC Department of Environmental Quality (DEQ), which are consistent with the methods used to collect pre-construction water samples. All samples will be analyzed at the NC DEQ labs in Swannanoa and/or Raleigh.

The four water quality monitoring locations are the four previously monitored sites (Sites 2, 8, 9, 14). ISCO automated samplers will be used to collect the samples at each of these four sites. Samples at the automated ISCO stations listed in will be collected as flow-proportional composites. Samples at the non-automated sites will be collected as grab samples. Fecal coliform will be collected exclusively as grab samples in all cases. Conductivity will be measured directly in-situ with a water quality meter. Baseflow samples will be collected at the frequencies described below. Fifteen to twenty storm events will be targeted between years 2 and 5 to cover storm water samples.

Table 1. Parameter Matrix

Type	**NA**	**NA**	**A**	**NA**	**NA**	**NA**	**A**	**A**	**NA**	**A**	Baseflow	
Station	0	1	2	4	5a	6	8	9	13	14	Stormflow	
Fecal											Base and Storm	
Cond											ISCO Station	**A**
TSS											Not Automated	**NA**

NH3											Watershed Control	
TKN												
NO2-NO3												
TP												
Macrobenthos												
Fish												

Baseflow Monitoring

The base flow monitoring program proposed is as follows:

a. Fecal coliform – Once per month during years 3, 4, and 5 at Stations 2, 4 ,8, and 9.
b. Conductivity – Once per month during years 2, 3, and 5 at Stations 0, 1, 2, 8, 9, and 13, and 14 and at stations when benthos or fish are to be sampled.
c. TSS baseflow solids – Once per month during years 3, 4, 5 at Stations 2, 9, and 14.
d. Ammonia (NH_3) – Once per month during years 4 and 5 at Stations 8 and 9.
e. Total Kjeldahl nitrogen (TKN) – Once per month during years 4 and 5 at Station 9.
f. Nitrite (NO_2)-nitrate (NO_3) nitrogen – Once per month during years 4 and 5 at Stations 2, 8, 9, and 14.
g. Total phosphorous (TP) – Once per month during years 4 and 5 at Stations 2, 8, 9, and 14.

Stormflow Monitoring

The proposed stormflow monitoring program is as follows:

a. Fecal coliform – Sites 2 and 9.
b. Conductivity – Site 1
c. Ammonia (NH_3) –Sites 2, 8, 9, and 14.
d. Total Kjeldahl nitrogen (TKN) – Sites 2, 9, and 14.
e. Nitrite (NO_2)-nitrate (NO_3) nitrogen – Sites 2, 8, 9, and 14.
f. Total phosphorous (TP) – Sites 2, 8, 9, and 14.

Biological Monitoring

The proposed fish community and benthic macroinvertebrate monitoring program is as follows:

a. Fish community sampling will be conducted with a backpack electrofisher once per year during years 4 and 5 at stations 4, 5a, 9, and 13.
b. Benthic macroinvertebrate sampling will be conducted once per year during years 4 and 5 at stations 0, 1, 4, 6, 8, and 14. Two macro-benthic sites (stations 0 and 1) will be sampled on Upper Fletcher Creek. This is being done to demonstrate the extent of post-construction habitat improvement on this reach as compared to the pre-construction data. The increase in habitat brought about by the restoration treatments should demonstrate a greater extent and improved recruitment of the benthic community. The water quality results for Upper Fletcher Creek will be the result of the synthesis of the benthos data from these stations.

Biological sampling will be performed directly by Wildlands personnel. Approved Qual 4 DEQ Standard Operating Procedures will be followed for all biological sampling. The classification criteria for benthos will follow the NCBI thresholds - for small streams (NC DEQ, 2016).

Notes on Monitoring Plan

a. Site 0 will be used as watershed control point using conductivity and benthos as an indicator of incoming water quality. The drainage above this location indicated relatively high pollutant inputs possibly due to hay fields at the drainage headwaters on some very steep slopes. Monitoring station 0 for conductivity as a surrogate for overall water quality will provide comparison to pre-construction levels for any post-construction results below this point.
b. Site 13 will also serve as a watershed control. It had good water quality pre-construction, but during the design phase an upstream landowner created a large disturbance in this drainage and conductivity will be measured at this point to see how it compares to the pre-con conductivity distribution.
c. Sites 8 and 9 were only sampled at baseflow pre-construction, but site 7, which was immediately downstream of the confluence of sites 8 and 9 will serve as the stormflow baseline for sites 8 and 9. This was deemed appropriate because when pooled, the baseflow data at sites 8 and 9 closely represented the pre-con baseflow at site 7. The storm data for sites 8 and 9 will be synthesized to provide the post-construction stormflow comparison to Site 7 pre-construction stormflow baseline.
d. Site 14 was only sampled for baseflow pre-construction, but the distributions for the pre-construction water quality parameters were very similar for sites 10 and 14. Therefore, the storm data from site 10 will serve as the pre-construction storm baseline for the storm data collected at site 14 post-construction.
e. For all other sites, post-construction baseflow and stormflow data will be compared to pre-construction baseflow and stormflow data respectively for the same sites.

SUCCESS CRITERIA

Each year when sampling is complete, data will be evaluated for any changes or trends that may be developing. Any observations will be reported in annual monitoring reports. However, ultimate success or failure for each monitoring station will be determined after the final dataset is collected prior to close out. At this time, each parameter in the overall post-construction data set (years 3-5) will be compared to the same parameter in the pre-construction data set using hypothesis testing. Improvement for any given physicochemical parameter will require a minimum of a 15% reduction in the mean of the distribution and demonstrate statistical significance (alpha 0.05). If parametric tests of assumption are not met, non-parametric methods may be employed. If a particular physicochemical parameter at a given station does not demonstrate a 15% improvement while meeting these criteria using hypothesis testing, time series analysis will be applied to demonstrate whether a significant negative trend exists. That is, the trend line will have to demonstrate a negative slope that is significantly different than 0 at an alpha of 0.05. In all cases the reduction between the means of the pre- and post-distributions must meet the minimum threshold of 15% for that parameter to be successful for the purpose of obtaining credit. For biological parameters, success will be determined based on whether there is an improvement of at least one bio-classification level (i.e. fair to good). Data from years 4 and 5 will be pooled to generate one bio-classification outcome to represent the post-construction condition.

The number of parameters that demonstrate success as described above will determine the proportion of credit that would be generated. For example, if there are 4 parameters at a station then each parameter represents 25% of the total available station credits credit. The number of parameters at

station that will contribute to success will include both baseflow and stormflow samples. The following equation will be used to quantify the additional credits:

# of parameters meeting success criteria at station/total # of parameters at station x total available station credits = additional credit

Total available station credits refers to the total possible additional credit that would be given for the reaches of the project that are at or upstream of that station either to the project limits or to another station. The total available station credits to be assigned if complete success is demonstrated at each station are summarized in Table 2 below. Total available station credits for stations 2 and 4 and stations 10 and 14 have been combined to balance out the effort/cost of collecting data with the credit amounts that would be generated by showing success at these stations.

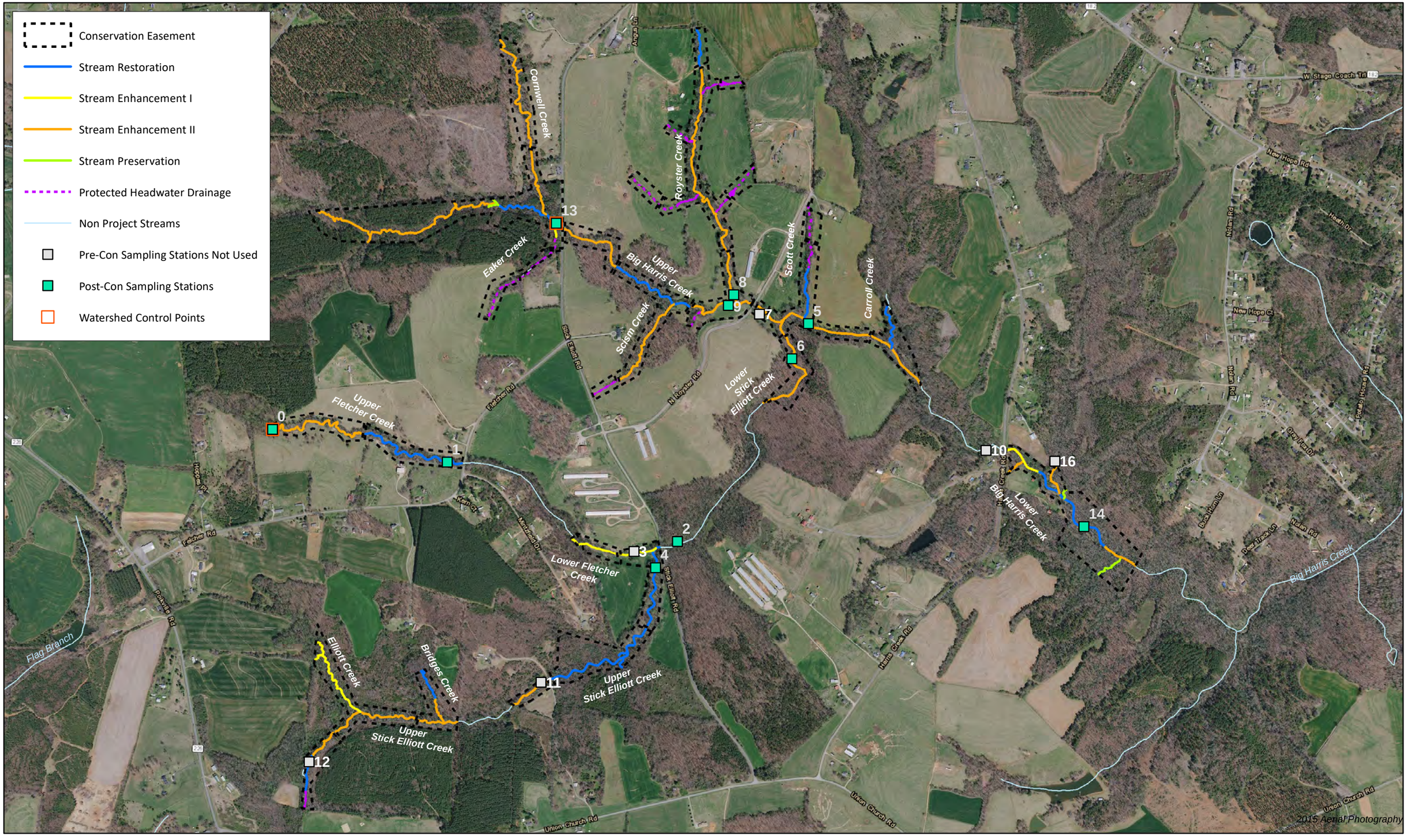
REFERENCES:

NC Department of Environmental Quality. 2016. Standard Operating Procedures for the Collection and Analysis of Benthic Macroinvertebrates. Division of Water Resources. Raleigh, North Carolina. February 2016

Spooner, Jean; Dressing, Stephen A.; and Meals, Donald W. 2011. Minimum Detectable Change Analysis. Tech Notes 7, December 2011. Developed for U.S. Environmental Protection Agency by Tetra Tech, Inc., Fairfax, VA, 21 p.

Table 2. Total Available Station Credits Assigned by Station

Station	Parameters	Reaches Represented	Credits for Reaches (from MP)	Credits * Multiplier	2% of Credits	2% of Credits * Multiplier
1	Cond, MB	Upper Fletcher Creek R1-R2	2084	2251	42	45
2 & 4	Site 2: FC, Cond, TSS, NH3, TKN, NO2-NO3, TP Site 4:MB, Fish	Lower Fletcher Creek R1-R2	7434	8030	149	161
5a	Fish, Cond	Scott Creek Upper Big Harris R6A	1252	1352	25	27
6	MB	Lower Stick Elliot Creek	527	569	11	11
8	MB, FC, Cond, NH3,NO2-NO3, TP	Royster Creek R1-R2	2060	2225	41	45
9	Fish, FC, Cond, TSS, NH3, TKN, NO2-NO3, TP	Upper Big Harris Creek R3-R5, Scism Creek	2969	3207	59	64
10 & 14	Site 10: Fish Site 14:MB, Cond, TSS, NH3, TKN, NO2-NO3, TP	Upper Big Harris R6B, Carrol Creek	3674	3969	73	79
13	Fish	Upper Big Harris Creek R1-R2, Cornwell Creek R1-R2, UT1 to Cornwell Creek, Eaker Creek	3451	3728	69	75
Total			23451	25331	469	507
TotalCredits from MP including additional credit for monitoring and watershed approach			25331			
Multiplier to get credits per reach (=25331/23451)			1.080167157050870			



WILDLANDS ENGINEERING

0 500 1,000 2,000 3,000 4,000 Feet

N

Proposed Water Quality Monitoring Locations
Big Harris Creek Mitigation Site
Broad River Basin (03050105)
Cleveland County, NC