



MONITORING YEAR 3 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: February – November 2020
Final Submission Date: February 15, 2021

PREPARED FOR:



**NC Department of Environmental Quality
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February 15, 2021

Mr. Paul Wiesner
NC Department of Environmental Quality
Division of Mitigation Services
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RE: Big Harris Creek Mitigation Site – Monitoring Year 3 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 3 Report and included them below in **bold**. Wildlands' responses to your comments from the report noted in *italics*.

DMS' Comment: General – The MY3 (2020) report indicates that invasive areas of concern were observed in 9% of the easement acreage (12.9 acres). The MY2 (2019) report noted that invasive areas of concern were observed in 8% of the easement acreage (12.0 acres). Please continue to treat invasive species on a regular basis through the monitoring term to reduce invasive coverage as much as possible on the project site. The IRT may require additional invasive treatments and monitoring if the invasive areas of concern on the project are not reduced a significant amount prior to project closeout.

Wildlands' Response: Wildlands will continue invasive treatments across the site.

DMS' Comment: General – Janet Whisnant Property: Please provide a brief update in the response letter (not the MY3 report). 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 is not signed.

DMS' Comment: Section 1.2.2 – Stream Areas of Concern & Section 1.2.5 Vegetation Areas of Concern/ Adaptive Management Plan: DMS understands that WEI will review stream and vegetation areas of concern documented in the MY3 (2020) report and will implement stream repairs, structure repairs and supplemental planting as necessary. DMS recommends implementing any necessary repairs and/or supplemental planting early in MY4 (2021) to allow 1.5 to 2 full growing seasons before the proposed IRT project closeout in 2023. The IRT has historically required 1.5 to 2 years post repair/supplemental planting before allowing formal regulatory closure.

Wildlands' Response: Wildlands will implement repairs in the first half of MY4 (2021) to allow as much time as possible before the proposed regulatory closure in 2023.

DMS' Comment: Digital Support Files – During MY2 (2019) DMS noted that certain features did not match reported assets. Shapefiles were resubmitted, and all features were accurate except for Lower



Fletcher Creek R1, which was off by 21 feet relative to the asset table. Additionally, in the resubmittal Upper Stick Elliot Creek R4A and R4B were merged, which is not how they are presented in the asset table. Please attempt to resolve the issue with Lower Fletcher Creek R1 and ensure that Upper Stick Elliot Creek R4A and R4B are segmented so that each feature represents an entry in the asset table.

Wildlands' Response: Based on further discussions with DMS the shapefile comment on Lower Fletcher Creek R1 has been resolved. Upper Stick Elliot R4A and R4B have been segmented and now reflect linear footage reported in the asset table.

DMS' Comment: Digital Support Files – The stream gage data Excel sheets are not able to be opened, and Excel suggest they are corrupted. Please ensure these files can be opened and resubmit with the final digital submittal.

Wildlands' Response: The Excel spreadsheets have been reviewed and re-copied into the folder for the final digital submittal. Please let us know if they continue to be an issue.

DMS' Comment: Digital Support Files – Please include figures displaying gage data for all gages in the report.

Wildlands' Response: Figures with gage data for all stream gages have been added to Appendix 5.

DMS' Comment: Technical Memo Reporting/Water Quality Data Comments – Western Carolina University (WCU) monthly baseflow grab sampling for conductivity, TSS, and fecal designated in the technical memo/monitoring plan were originally expected to begin in January 2020. Due to equipment issues and issues related to COVID, sampling was not initiated by WCU until June 2020. Monthly grab samples for these parameters have a scheduled duration of 36 months and will currently finish up in approximately June 2023 (post MY5). DMS anticipates that project closeout will be in mid-2023. WEI should discuss this directly with both DMS and WCU in early 2021 to make certain all parties understand that WQ monitoring will not terminate until mid-2023.

Wildlands' Response: Wildlands has communicated with DMS and WCU to make certain all parties understand WQ monitoring will terminate in June 2023. Text was added in Section 1.2.6 to acknowledge the updated sampling schedule. Email correspondence including WEI, WCU, and DMS was added to Appendix 7.

DMS' Comment: Technical Memo Reporting/Water Quality Data Comments – Conductivity data was not included in the report as documented in the technical memo. Please include conductivity data in the revised MY3 report.

Wildlands' Response: Conductivity data has been added in the final MY3 report.

DMS' Comment: Technical Memo Reporting/Water Quality Data Comments – The report is using WCU's station numbers. WEI should provide data with the station numbers from the technical memo (Tables and Graphs).

Wildlands' Response: Stations numbers have been updated to match the technical memo.

DMS' Comment: Technical Memo Reporting/Water Quality Data Comments – The report includes the SSC data that is being collected with WCU. That is a separate effort and not part of the technical memo. The SSC data should be removed from the final MY3 report.

Wildlands' Response: The SSC data has been removed from the final MY3 report.



DMS' Comment: Technical Memo Reporting/Water Quality Data Comments – Actual analysis (as per the memo) is not slated until the end of the project monitoring. DMS recommends the data be presented by Station similar to the table below. Not all of the parameters will be populated. For example, baseflow nutrient samples don't start until MY4, but something similar to this is more useful than what is currently presented in the draft report.

Station 2									
Date	Flow Type	Cond (Units)	TSS (mg/L)	Fecal (CFU/100)	NOx	NH3-4	TKN	TN	TP
06/XX/XX	Base								
07/XX/XX	Base								
	Base								
11/XX/XX	Storm								

Wildlands' Response: The WQ data presentation has been revised into a format that is similar to the template provided above.

DMS' Comment: Technical Memo Reporting/Water Quality Data Comments – Please include all unreported baseflow and stormwater results collected in 2020. All of the 2020 samples are analyzed and should be included in the tables.

Wildlands' Response: All available data collected in 2020 have been included in Table 15. Results from several stormwater samples collected between September and December 2020 have not yet been reported by the lab.

DMS' Comment: Technical Memo Reporting/Water Quality Data Comments – Please indicate the approximate storm sampling events in the hydrographs.

Wildlands' Response: The storm sampling event on 10/13/20 has been called out on the hydrograph of the corresponding station. Additional storming events between September and December 2020 are not called out on the hydrographs because no data is currently available.

Enclosed please find two (2) hard copies of the Final Monitoring Year 3 Report and one (1) USB 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.

MY3 assessments and site visits were completed between February and November of 2020. The Site has met the required stream, vegetation, and hydrology success criteria for MY3. Overall, restored streams are stable and functioning as designed with minor fluctuation in channel dimension related to bed/bank scour and/or deposition documented in some of the annual cross-sections. Isolated pockets of instability were observed across the Site during visual assessment. Stream repairs were completed in April 2020 to areas of bank erosion noted during MY2 and early MY3 on Upper Big Harris Reaches 5 and 6 and Lower



Stick Elliott Creek. The average planted stem density for the Site is 427 stems per acre; which meets the MY3 interim requirement of 320 stems per acre; however, 11 of the 56 vegetation plots individually do not meet MY3 stem density criteria. Seven of these 11 vegetation plots do not meet final stem density success criteria (260 stems per acre). Bankfull and geomorphically significant events were recorded on all restoration and EI reaches during MY3.



BIG HARRIS CREEK MITIGATION SITE
Monitoring Year 3 Annual Report

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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 addressed those identified stressors and thereby improving water quality in the Big Harris Creek watershed.

The major goals of this stream mitigation project were 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 were primarily 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 4.) 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 (Wildlands, 2016) 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 3 Data Assessment

Annual monitoring and quarterly site visits were conducted during MY3 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 most 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, 43 and 44 as a result of multiple large storm events (precipitation greater than two inches per event) that included the remnants of Hurricanes Florence and Michael. Cross-section 3 has stabilized since MY1; however, during MY3 the cross-section exhibited minor adjustments commonly associated with meander pools. Cross-section 4 was repaired during MY2 but experienced significant bed and right bank scour during MY3 similar to MY1. Cross-section 43 has remained stable since MY1 with no repair work. Cross-section 44 has stabilized in MY3 after bed and bank scour were documented MY1 and MY2. During MY2, bed and bank erosion were documented at cross-section 11 on Scott Creek, resulting in a wider and deeper channel. In MY3, cross-section 11 has stabilized with little to no change in channel dimension.

The majority of the cross-sections showed small fluctuations in channel dimension related to minor scour or deposition, which are normal and not indicative of instability. Cross-sections 9, 13, 18, 29, and 37 exhibited channel narrowing likely the result of deposition coupled with the establishment of streambank vegetation. Aggradation was also documented at cross-section 32 and 33 on Upper Fletcher Creek Reach 2. The source of in-stream sediment may be offsite since no erosion was noted along Upper Fletcher Reaches 1 or 2.

Pebble counts conducted in the restoration and EI reaches indicate maintenance of coarser substrate in the riffle features and finer particles in the pool features. Minor shifts in particle size distribution during MY3 included coarser particles on Elliott and UT1 to Elliott, Bridges, and Upper Stick Elliott Creek UT3. Cross-section 9 near the upstream end of Royster Creek exhibited a significant increase in finer particles than in previous monitoring years. The increase coincides with mapped aggradation noted on the CCPV maps. The source of in-stream sediment appears to be offsite because no erosion is documented along this portion of Royster Creek. 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.

In addition to annual geomorphic cross-section, at least three sets of hydraulic geometry measurements (water surface slopes) are to be collected within distinct restoration and enhancement I design reaches following a geomorphically significant discharge (Qgs) event as described in the DMS Stream and Wetland Mitigation Monitoring Guidelines (February 2014). During MY3 water surface slopes were collected on representative wavelengths within Upper Big Harris Reach 2A, Scott Creek, Upper Stick Elliott Creek Reach 1, Elliott Creek, UT1 Elliott Creek, Bridges Creek, and Lower Big Harris Creek. Refer to Tables 13a-13s in Appendix 4 for water slope data.

1.2.2 Stream Areas of Concern

Previously documented areas of erosion along Upper Big Harris Creek (Reaches 5 and 6) were repaired in April 2020. In addition to repairs, the continued establishment of bank vegetation has improved overall bank stability. Areas of minor, isolated erosion were documented across the Site. Three failed structures including one log vane at Station 145+40 of Upper Big Harris Creek, one boulder sill at Station 806+75 of Royster Creek, and one log sill at Station 317+50 of Lower Big Harris Creek were documented. Wildlands will review these areas and implement repairs, as necessary. A total of three small beaver dams were documented on-site in November 2020: Lower Big Harris Reaches 1B and 2 and UT2 to Lower Big Harris. Wildlands will coordinate with trappers with the U.S. Department of Agriculture (USDA) Animal and Plant Health Inspection Services (APHIS) to remove beaver in these locations.

Reach 2 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 ($\geq 60\%$ of bankfull flow) events must have occurred in separate years within the restoration and EI reaches. All 14 automated stream gages across the Site documented at least one bankfull event and an additional geomorphically significant event in MY3. At the end of MY3, all 14 stream gages have recorded two geomorphically significant events in separate years and 12 of the 14 stream gages have recorded two bankfull events in separate years. The two exceptions are Scott Creek and Bridges Creek. Refer to Table 14 in Appendix 5 for specific reaches.

In addition to monitoring bankfull events, the presence of baseflow must be documented along intermittent reaches (Royster Creek Reach 1, Scott Creek, and Bridges Creek) constructed with a Priority 1 Restoration approach. Flow must be present for at least 30 consecutive days of the year with normal rainfall conditions. All three reaches exceeded the 30 days of baseflow. Royster Creek Reach 1, Scott Creek, and Bridges Creek stream flow gages recorded 79, 33, and 165 days of consecutive flow, respectively. 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 MY3 vegetation monitoring planted stem densities among the vegetation plots ranged from 81 stems/acre to 647 stems/acre with an overall average stem density of 427 planted stems per acre, which is greater than the interim requirement of 320 planted stems per acre required at MY3. Planted stem counts within individual plots ranged from 2 to 16 stems with an average of 11 planted stems per plot. Most of the plots (45 of 56 plots) met the interim stem density success criteria for planted stems in MY3; however, seven plots (12, 25, 27, 29, 31, 50, 51) did not meet the interim or final stem density success criteria. During MY3, individual volunteers in plots 25, 29, 50, and 51 were identified for possible inclusion in future planted stem density. Vegetation plots not meeting stem density success criteria will continue to be evaluated for inclusion of volunteer species. A majority of planted woody stems (67%) 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

Scattered areas of invasive species including Asian spiderwort (*Murdannia keisak*), Chinaberry (*Melia azedarach*), 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 MY3. Areas of heavy fescue (*Festuca* sp.) were documented within designed BMPs on Eaker and Royster Creeks. Portions of the mapped invasives occurring within existing forested areas of the easement pose less of a threat to established vegetation. Invasive species are only present on approximately nine percent or 13 acres of the total easement acreage of 145 acres. Areas of Chinese privet and hardy orange were treated in January 2020. Asian spiderwort, kudzu, and



tree-of-heaven were treated in October 2020. Areas of effective treatment are not shown on CCPV maps in Appendix 2. Future treatments will be performed as needed.

During MY3, minor easement encroachment (mowing) impacted approximately 0.2 acres in the vicinity of vegetation plot 53 along Lower Big Harris Reach 1A. The encroachment has been addressed with the landowner.

Refer to Appendix 2 for the vegetation condition assessment table and the CCPV maps.

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 and fishery assessments to be conducted during MY4 – MY5. Water quality sampling was originally scheduled to begin in January 2020 and last for three years; however, due to unforeseen issues was not initiated until June 2020. Based on the adjusted start date, water quality sampling is now anticipated to run through June 2023. Refer to Appendices 6 and 7 for the Revised Water Quality Monitoring Technical Memo, associated IRT correspondence, MY3 water quality data provided by Western Carolina University (WCU), and updated sampling schedule correspondence with WCU.

1.3 Monitoring Year 3 Summary

Overall, streams within the Site appear to be stable and functioning as designed except for minor areas of erosion and aggradation. In MY3, bankfull events and additional geomorphically significant events were documented on all 14 gaged streams, with 12 of the 14 stream gages already meeting the MY5 success criteria of two bankfull and two additional geomorphically significant events occurring in separate years. With an average planted stem density of 427 stems per acre for the Site, the project is on track to meet the MY5 success criteria. However, eleven plots did not meet the interim MY3 success criteria and seven of those plots (12, 25, 27, 29, 31, 50, and 51) currently do not meet the MY5 success criteria. Volunteers in plots 25, 29, 50, and 51 were identified in MY3 for possible inclusion in future planted stem density. 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 of the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Mitigation Plan (Wildlands, 2016) documents available on the DMS' website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 2: METHODOLOGY

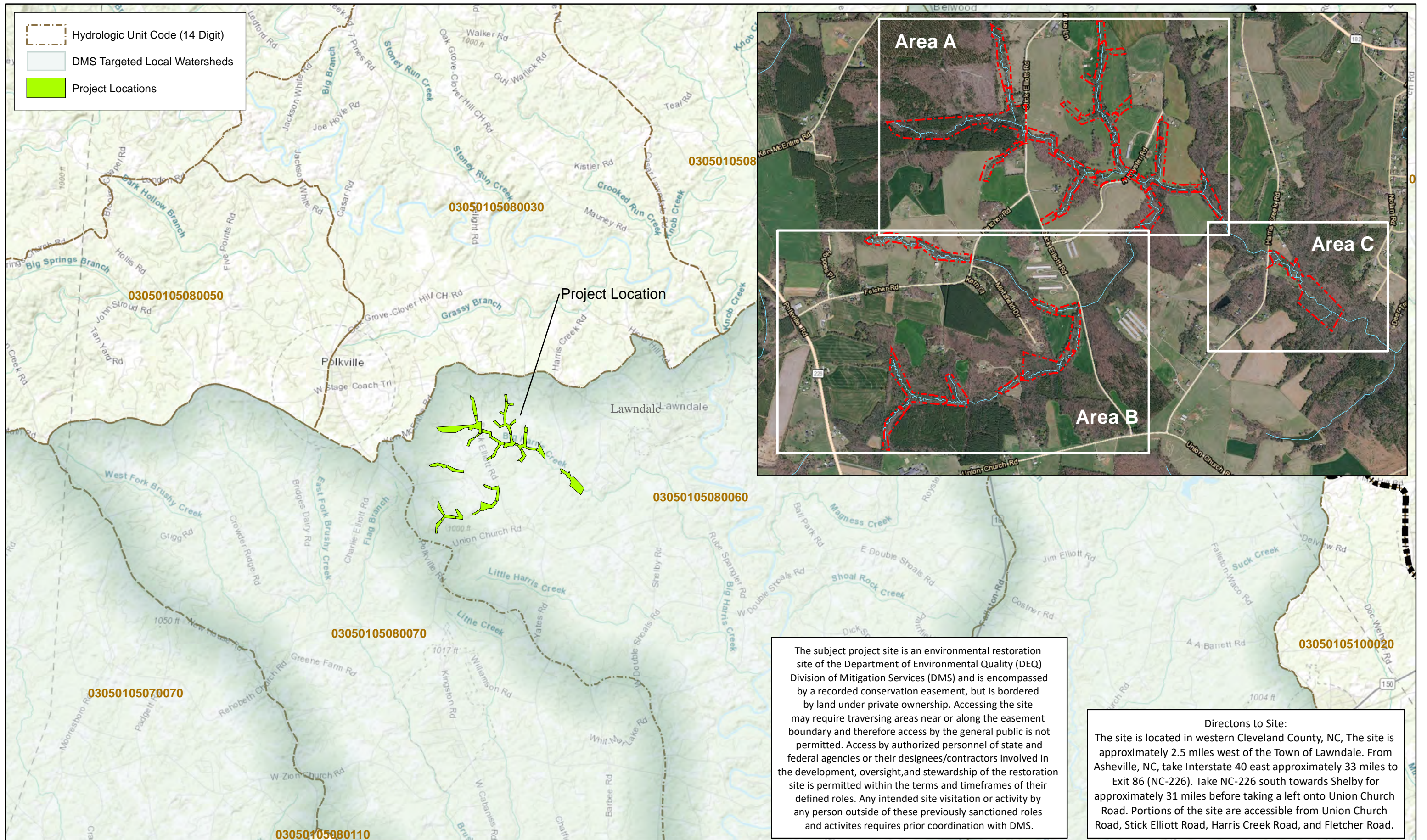
Geomorphic data were collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded 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

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- North Carolina Division of Mitigation Services (DMS), February 2014. DMS Annual Monitoring and Closeout Reporting Template.
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- Wildlands Engineering, Inc (Wildlands), 2018. Big Harris Creek Mitigation Site Baseline Monitoring Document and As-Built Baseline Report, DMS, Raleigh, NC.

APPENDIX 1. General Figures and Tables



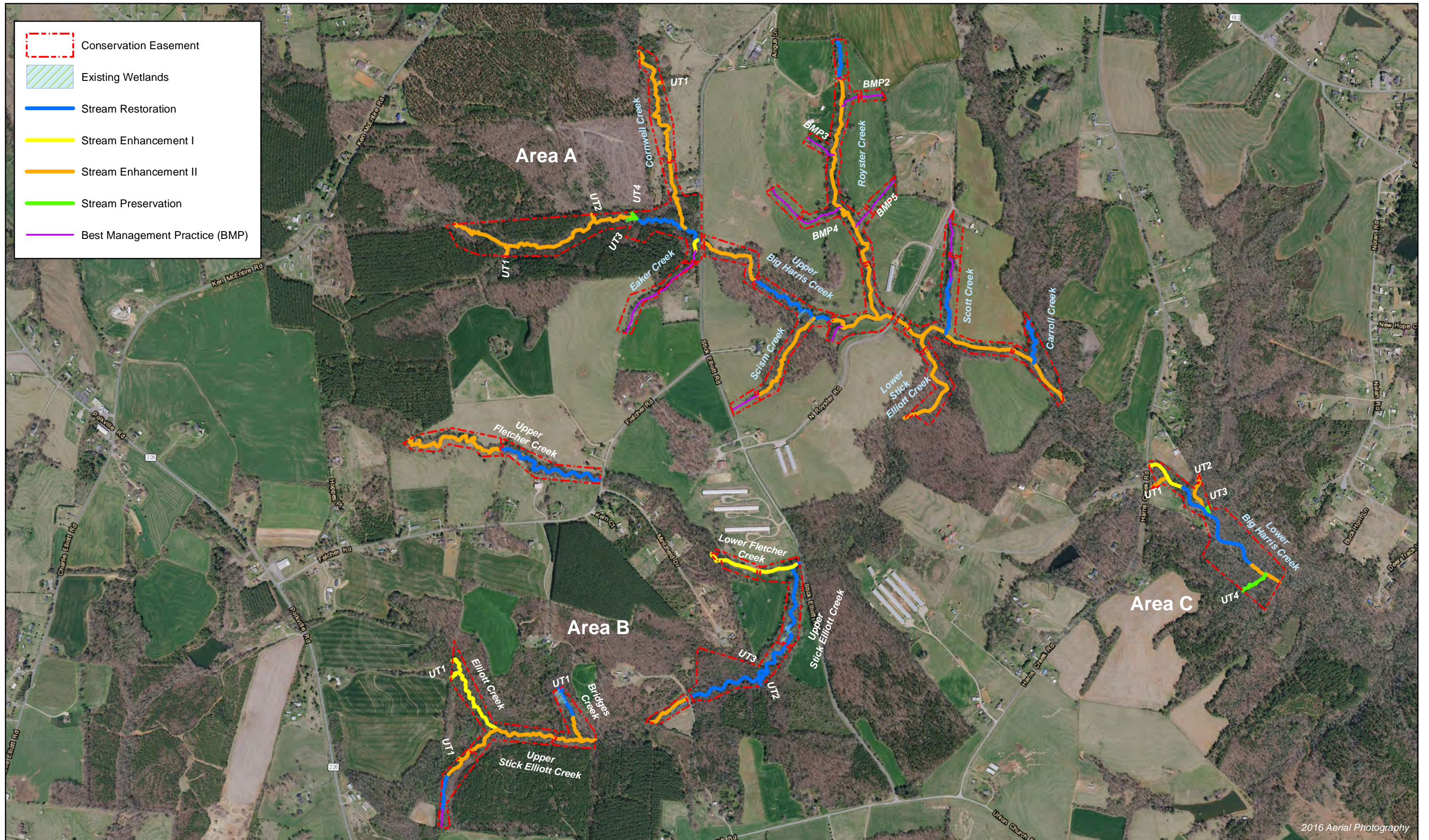
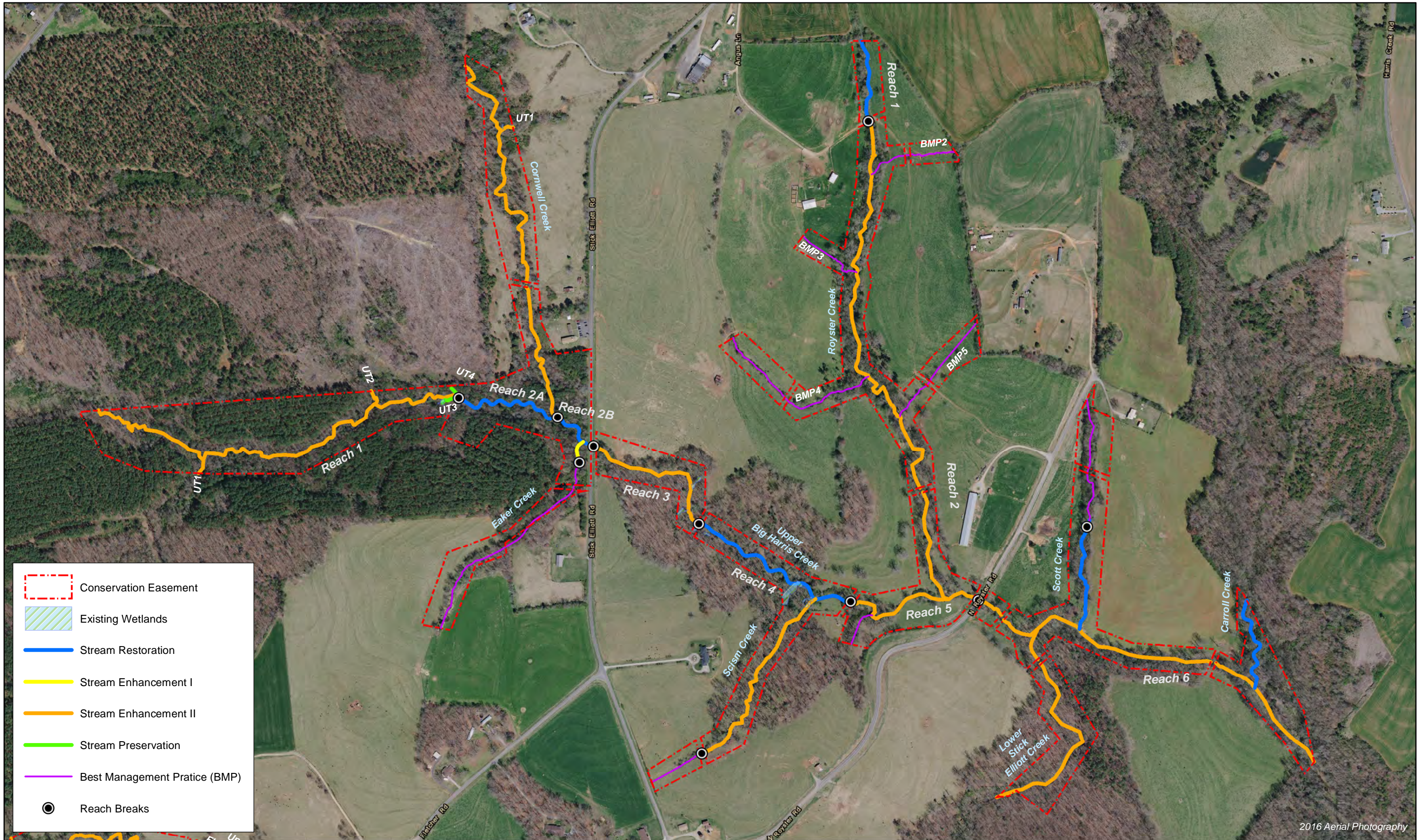


Figure 2.0 Project Component/Asset Map
 Big Harris Creek Mitigation Site
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC



2016 Aerial Photography

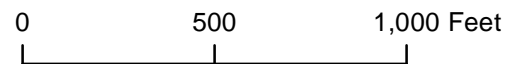
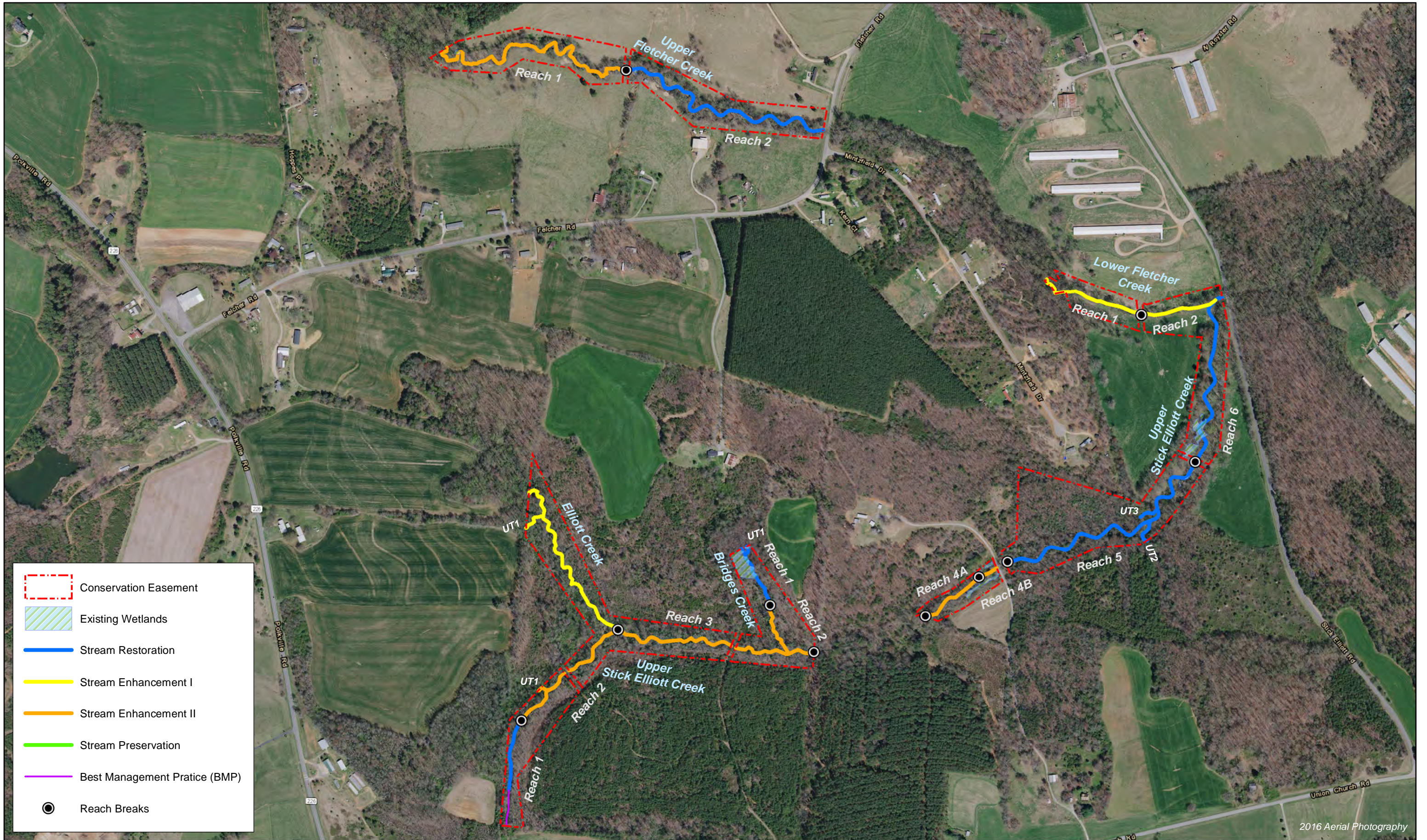
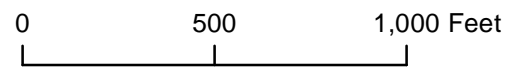


Figure 2.1 Project Component/Asset Map
 Big Harris Creek Mitigation Site - Area A
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC



- Conservation Easement
- Existing Wetlands
- Stream Restoration
- Stream Enhancement I
- Stream Enhancement II
- Stream Preservation
- Best Management Practice (BMP)
- Reach Breaks



2016 Aerial Photography



Figure 2.2 Project Component/Asset Map
 Big Harris Creek Mitigation Site - Area B
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC



2016 Aerial Photography

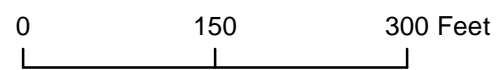


Figure 2.3 Project Component/Asset Map
 Big Harris Creek Mitigation Site - Area C
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC

Table 1. Project Components and Mitigation Credits

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

Mitigation Credits										
Type	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset	
	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	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage (LF) ¹	Mitigation Ratio	Total Buffer Width Adjustments	Proposed Credit ^{2,3,4}
					(P1, P2, etc.)					
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 3 - 2020

Mitigation Credits										
Type	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset	
	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	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage (LF) ¹	Mitigation Ratio	Total Buffer Width Adjustments	Proposed Credit ^{2,3,4}
					(P1, P2, etc.)					
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 3 - 2020

Mitigation Credits										
Type	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset	
	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	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage (LF) ¹	Mitigation Ratio	Total Buffer Width Adjustments	Proposed Credit ^{2,3,4}
					(P1, P2, etc.)					
B	Upper Stick Elliott Creek R4A	428	1038+11	1042+08	cattle fencing, bank grading and in-stream structures	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 3 - 2020

Mitigation Credits										
Type	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorus Nutrient Offset	
	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	Restoration (R) or Restoration Equivalent (RE)	Restoration Footage (LF) ¹	Mitigation Ratio	Total Buffer Width Adjustments	Proposed Credit ^{2,3,4}
					(P1, P2, etc.)					
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 include 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 3 - 2020

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
	Vegetation Assessment	May 2018
	Invasive Treatment	N/A
Year 1 Monitoring	Stream Assessment	November 2018
	Vegetation Assessment	November 2018
Year 2 Monitoring	Stream Assessment	March - October 2019
	Vegetation Assessment	August 2019
Stream Repairs (UBHC R2B & R6, USEC R2 & R3, and LSEC)	August 2019	August 2019
Invasive Treatments	October & December 2019	October & December 2019
Isolated bank rematting & live stakes (UBHC R6 and LBHC R2)	November 2019	November 2019
Invasive Treatments	January & September 2020	January & September 2020
Stream Repairs (UBHC R5 & R6, and LSEC)	April 2020	April 2020
Year 3 Monitoring	Stream Assessment	February - November 2020
	Vegetation Assessment	July - August 2020
Year 4 Monitoring	2021	December 2021
Year 5 Monitoring	2022	December 2022

¹Seed 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 3 - 2020

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
Herbaceous Plugs	Bruton Natural Systems, Inc. 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 3 - 2020

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	Cornewell Creek	Cornewell 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 3 - 2020

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 3 - 2020

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 3 - 2020

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 3 - 2020

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 3 - 2020

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 3 - 2020

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	1	
	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		
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 (minimum of 30 consecutive 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 3 - 2020

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 3 - 2020

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	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 (minimum of 30 consecutive 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 3 - 2020









Area C - Restoration, Enhancement I, and II Reaches

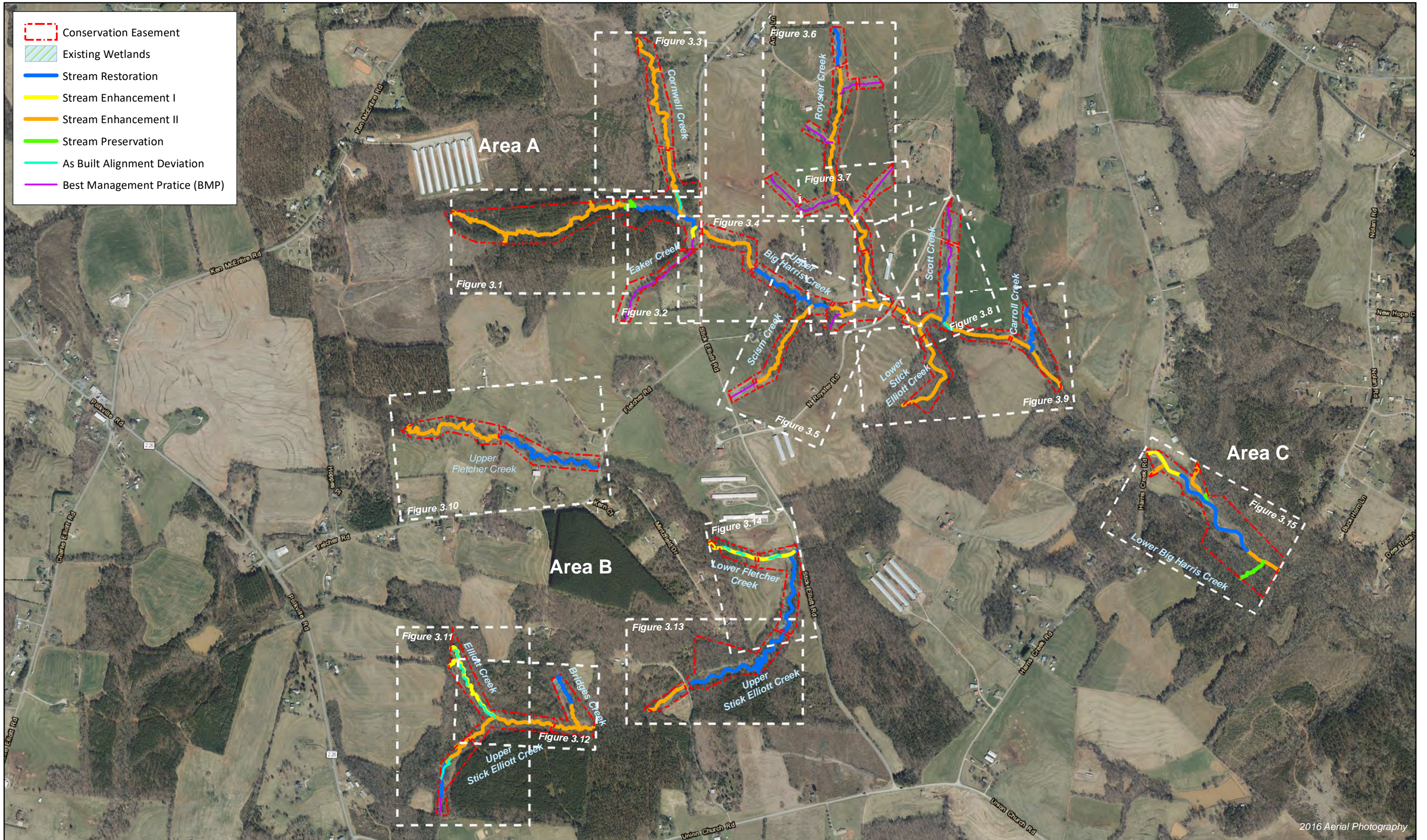
Parameter	Monitoring Feature	Quantity / Length by Reach				Frequency	Notes
		LBHC Reach 1a	LBHC Reaches 1b & 2	LBHC UT1	LBHC UT2		
Dimension	Riffle Cross-Section	1	1	N/A	N/A	Annual	
	Pool Cross-Section	1	1	N/A	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	Annual	1
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	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

-  Conservation Easement
-  Existing Wetlands
-  Stream Restoration
-  Stream Enhancement I
-  Stream Enhancement II
-  Stream Preservation
-  As Built Alignment Deviation
-  Best Management Practice (BMP)



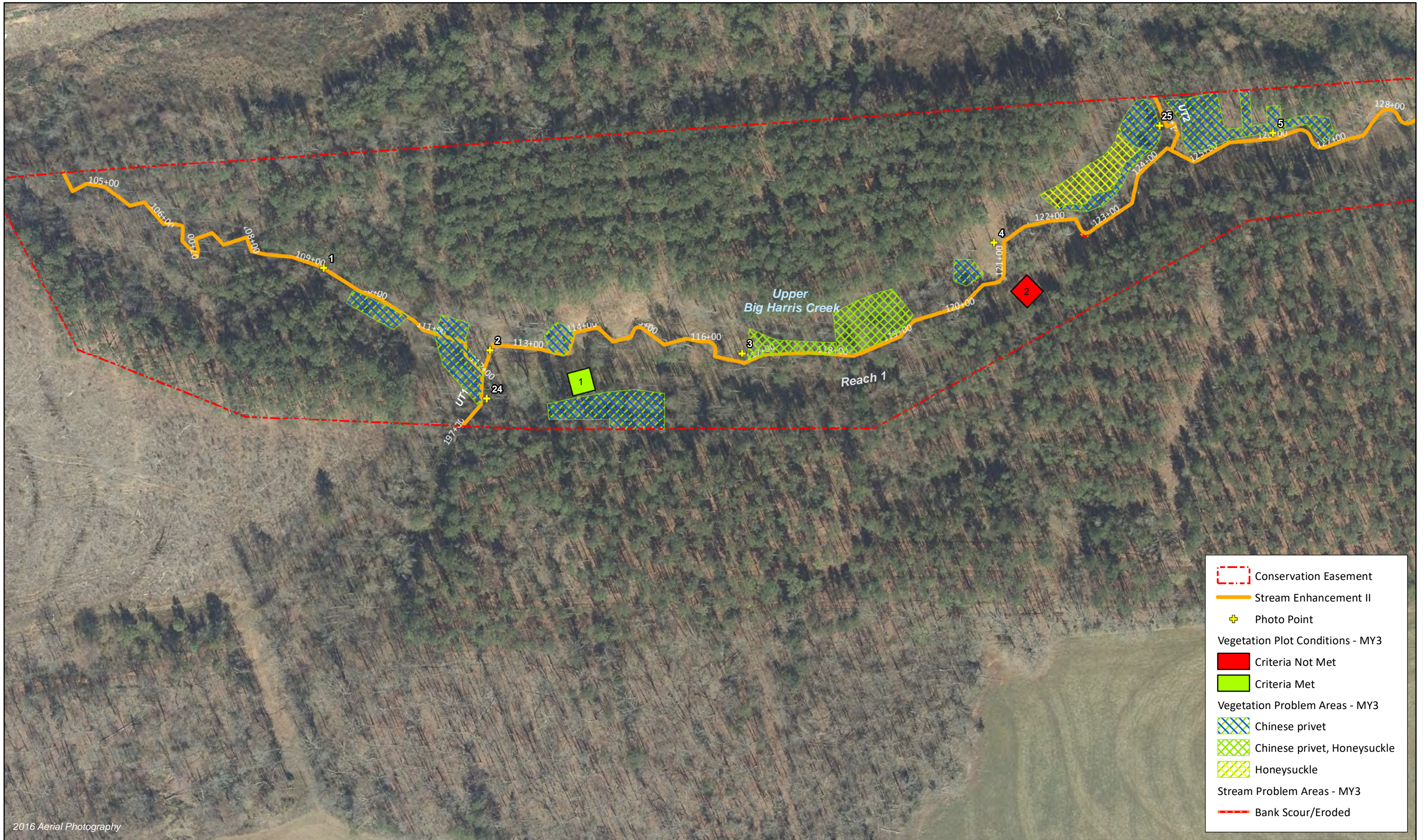
2016 Aerial Photography

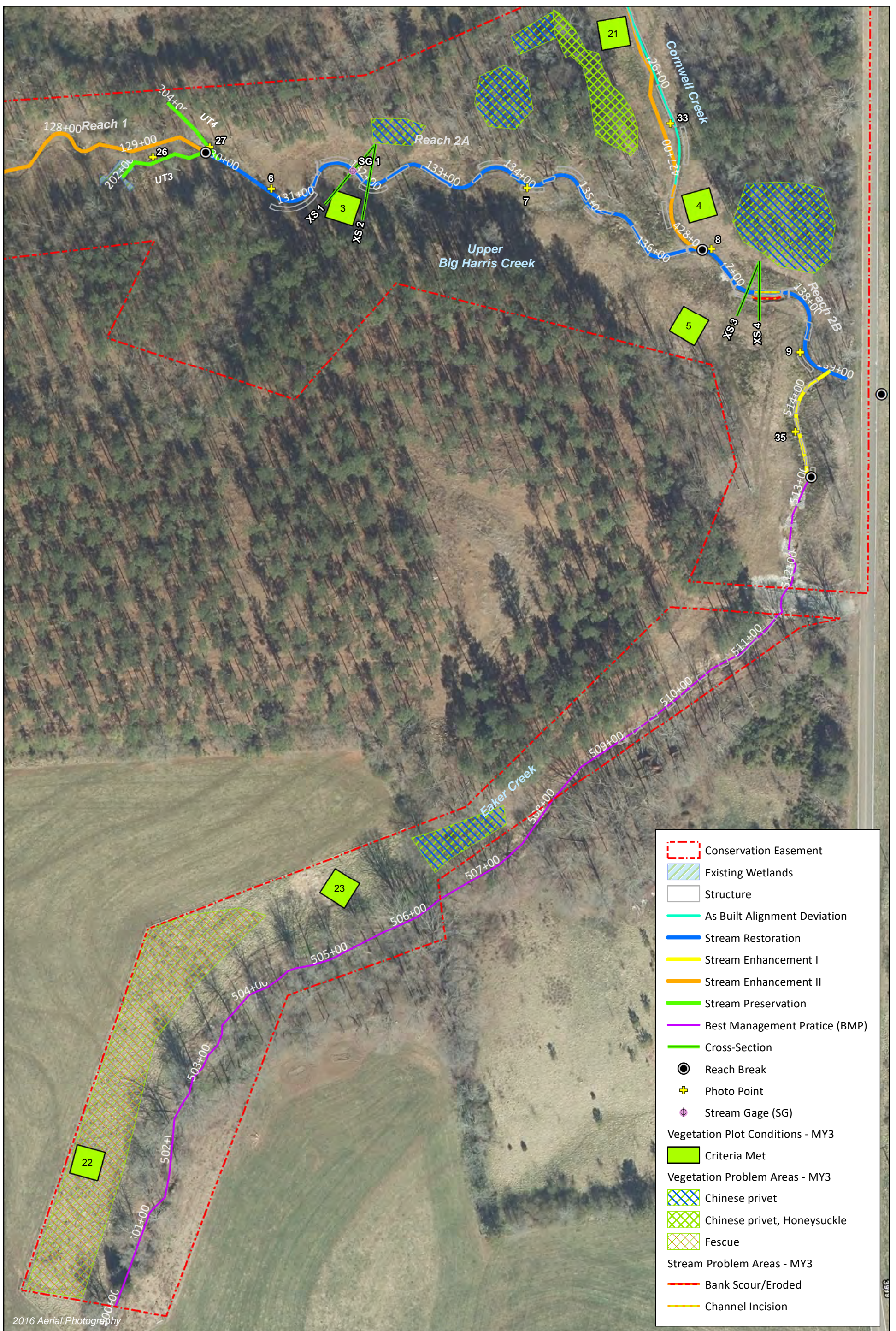
Figure 3.0 Integrated Current Condition Plan View (Overview)
 Big Harris Creek Mitigation Site
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC

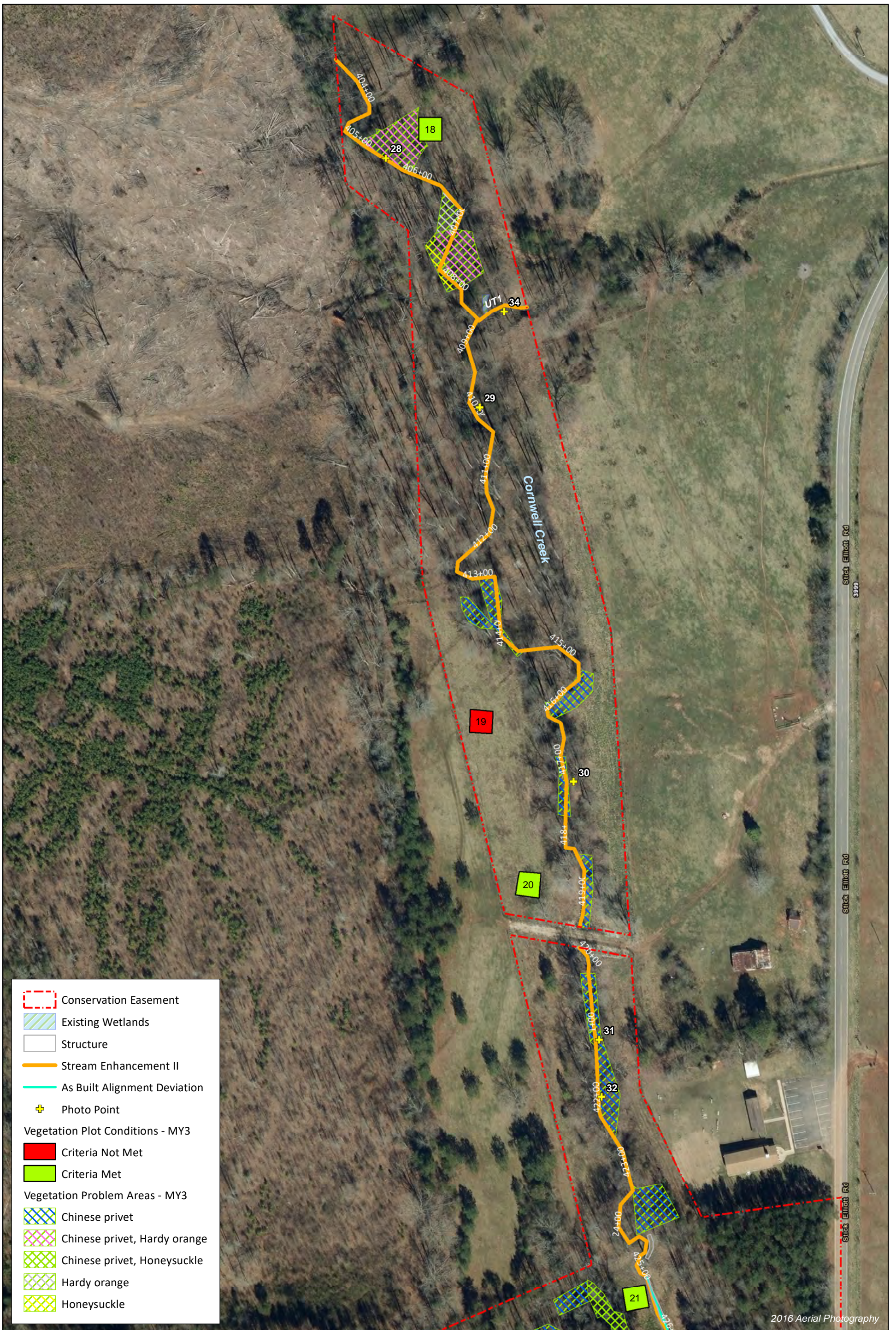


0 500 1,000 Feet









2016 Aerial Photography

Conservation Easement
 Existing Wetlands
 Structure
 Stream Enhancement II
 As Built Alignment Deviation
+ Photo Point
Vegetation Plot Conditions - MY3
 Criteria Not Met
 Criteria Met
Vegetation Problem Areas - MY3
 Chinese privet
 Chinese privet, Hardy orange
 Chinese privet, Honeysuckle
 Hardy orange
 Honeysuckle

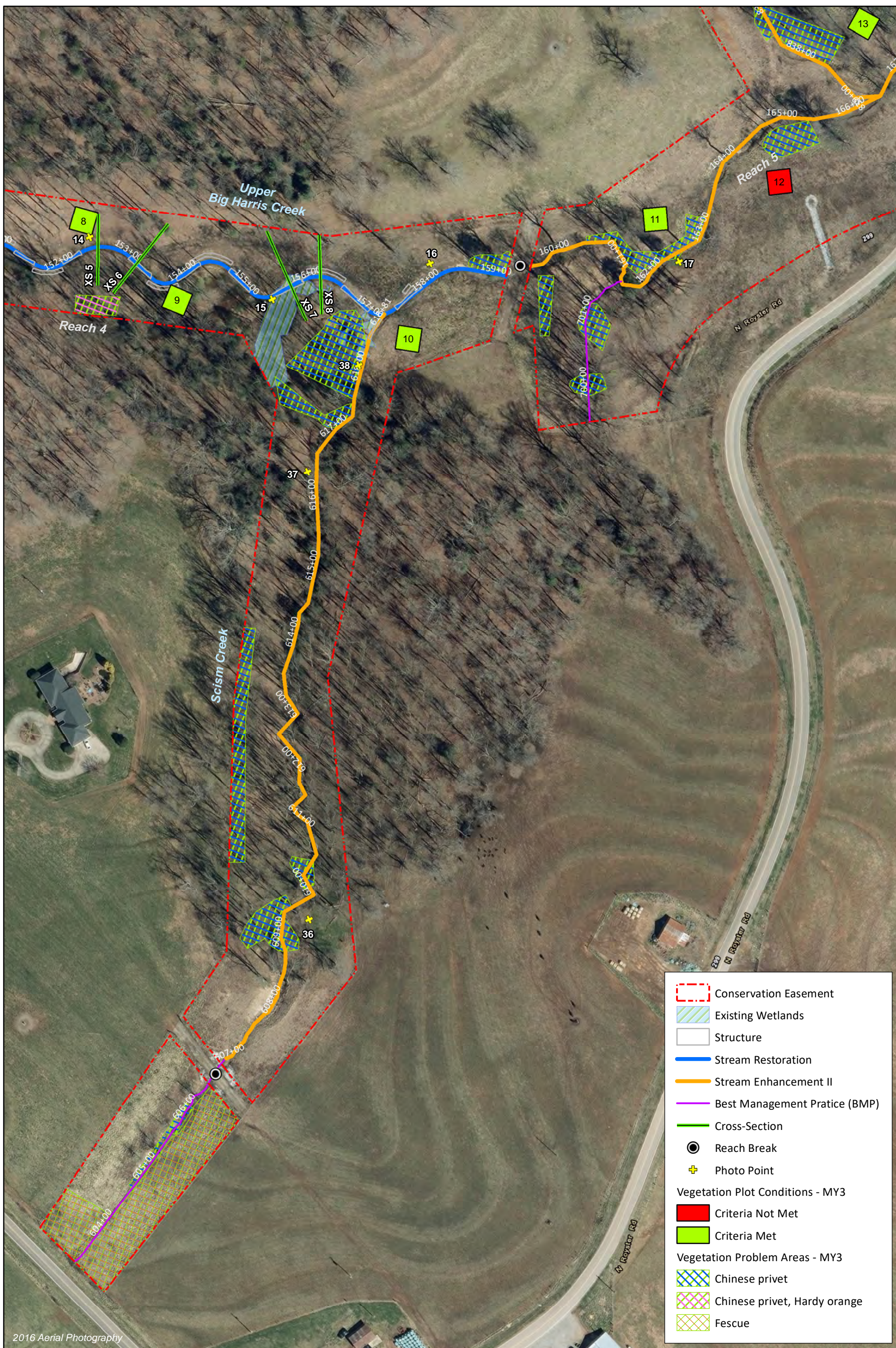


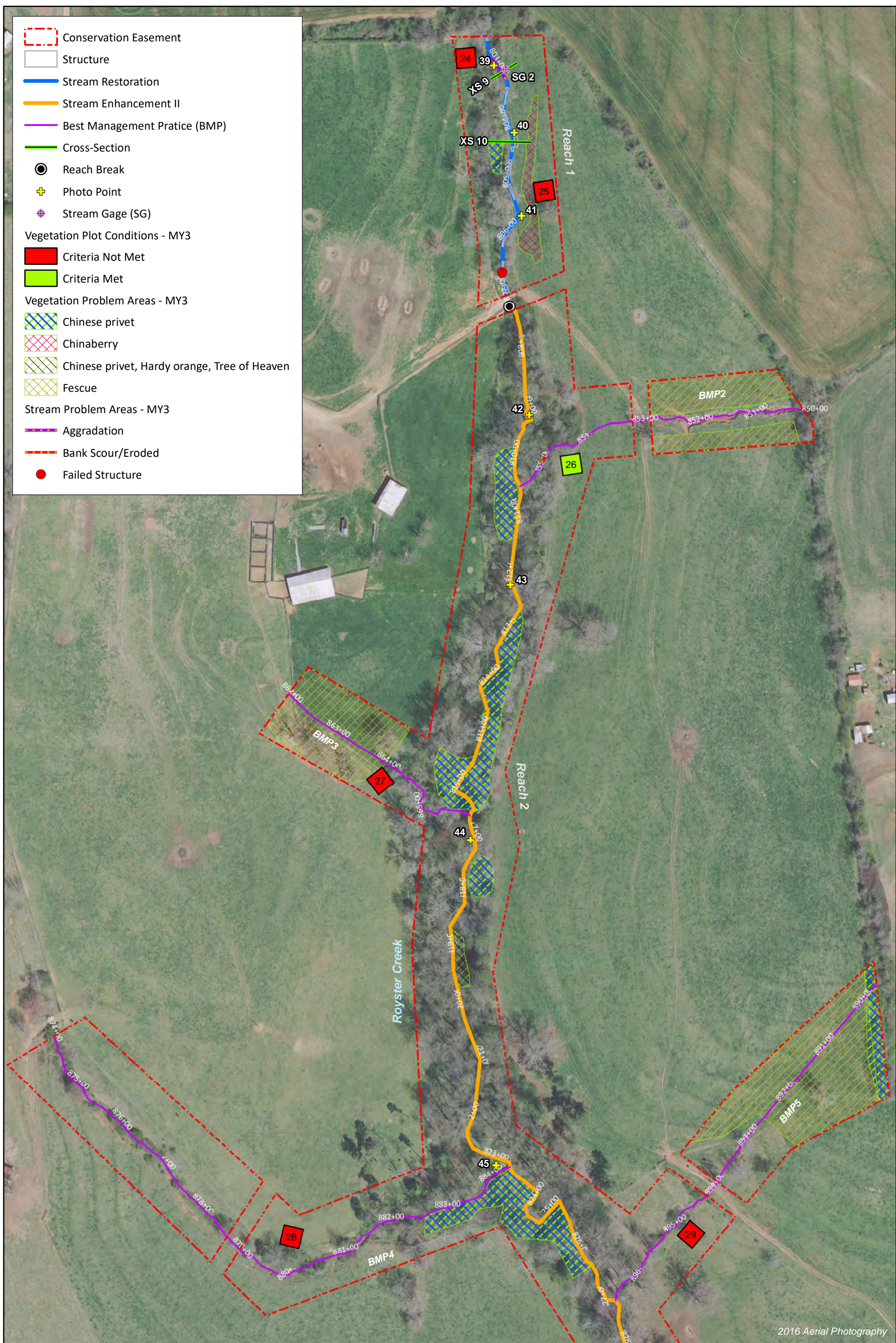
0 125 250 Feet



Figure 3.3 Integrated Current Condition Plan View
 Big Harris Creek Mitigation Site - Area A
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC



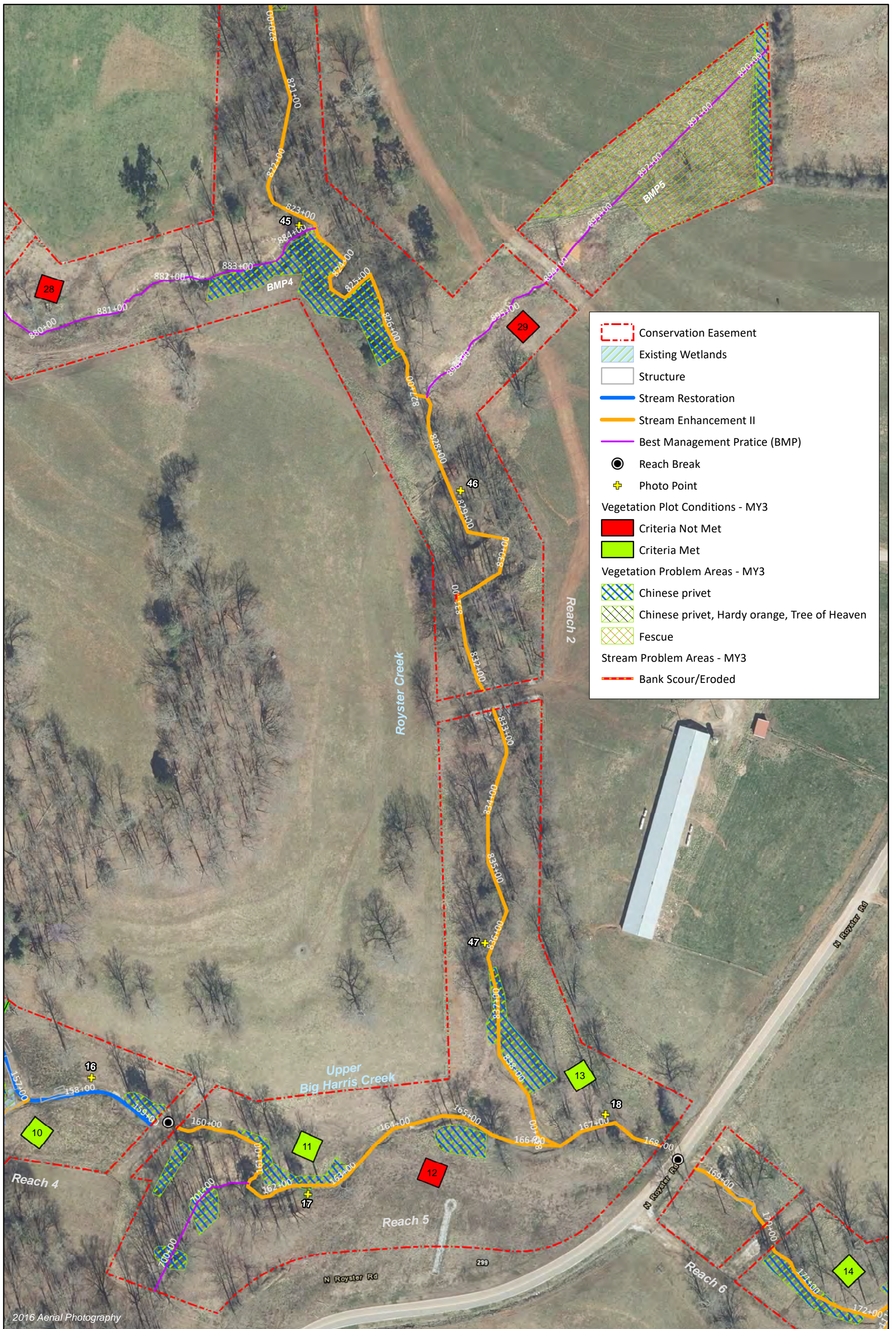




0 150 300 Feet



Figure 3.6 Integrated Current Condition Plan View
 Big Harris Creek Mitigation Site - Area A
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC



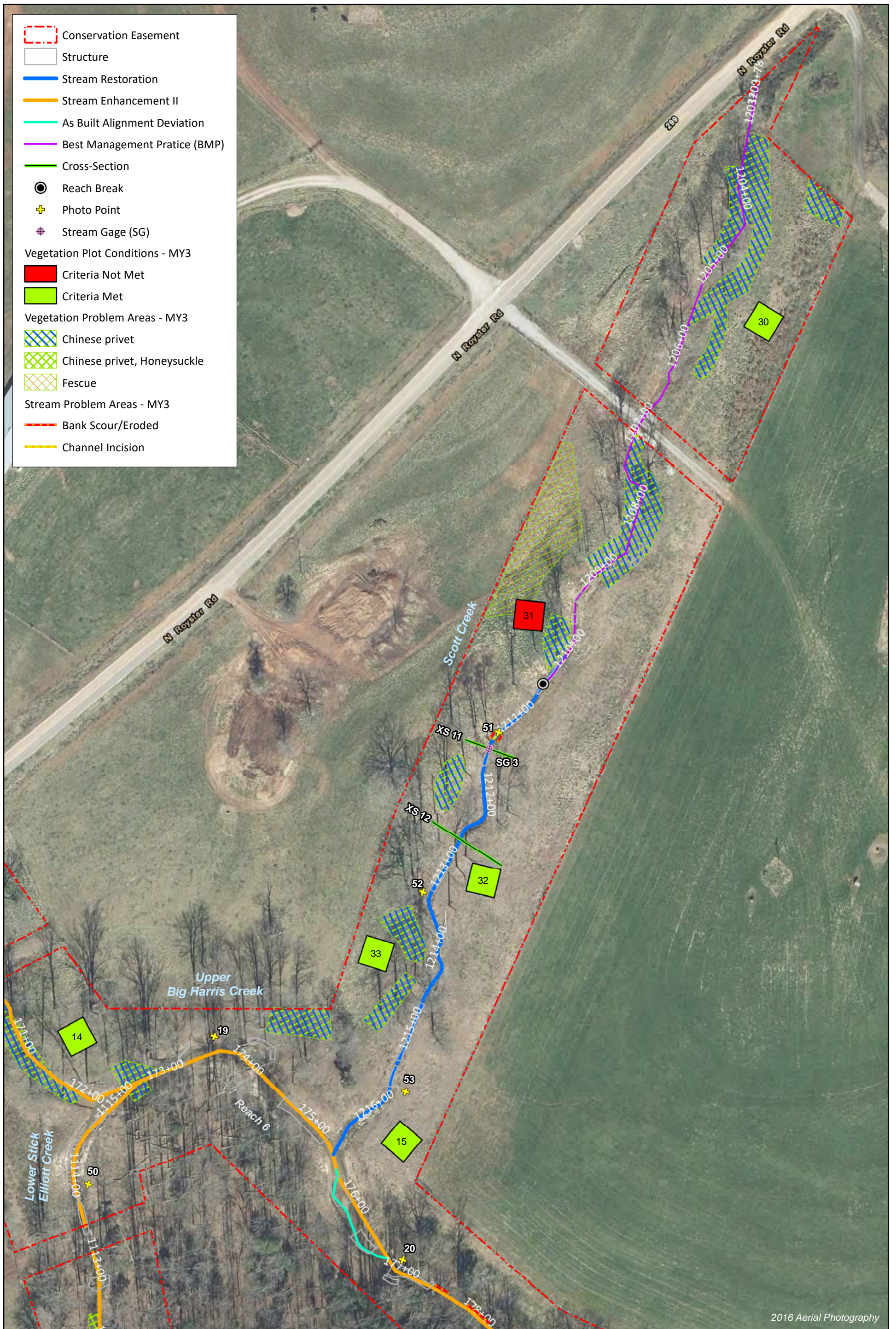
	Conservation Easement
	Existing Wetlands
	Structure
	Stream Restoration
	Stream Enhancement II
	Best Management Practice (BMP)
	Reach Break
	Photo Point
Vegetation Plot Conditions - MY3	
	Criteria Not Met
	Criteria Met
Vegetation Problem Areas - MY3	
	Chinese privet
	Chinese privet, Hardy orange, Tree of Heaven
	Fescue
Stream Problem Areas - MY3	
	Bank Scour/Eroded



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 3 - 2020
 Cleveland County, NC



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 3 - 2020

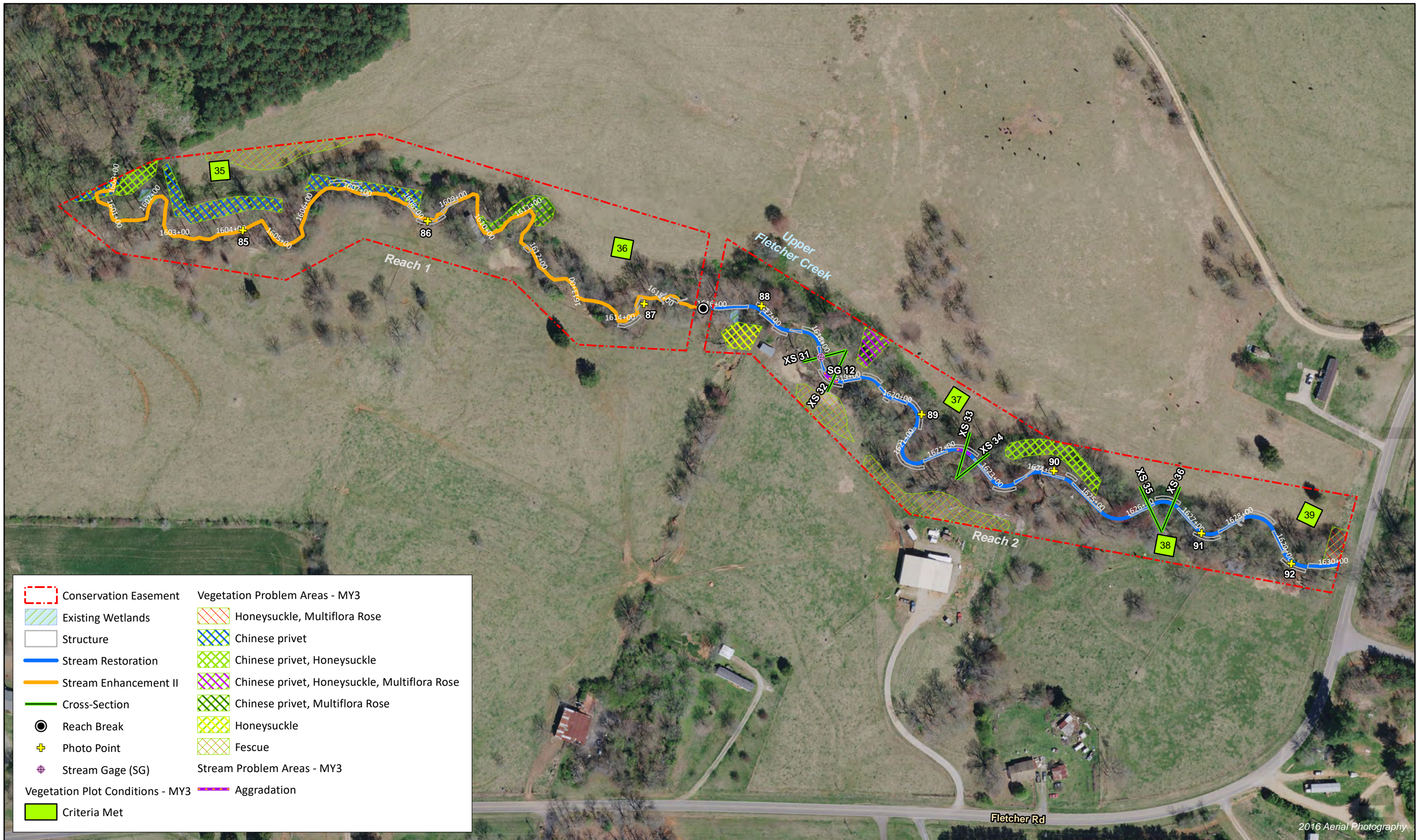
Cleveland County, NC



2016 Aerial Photography

Figure 3.9 Integrated Current Condition Plan View
 Big Harris Creek Mitigation Site - Area A
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC





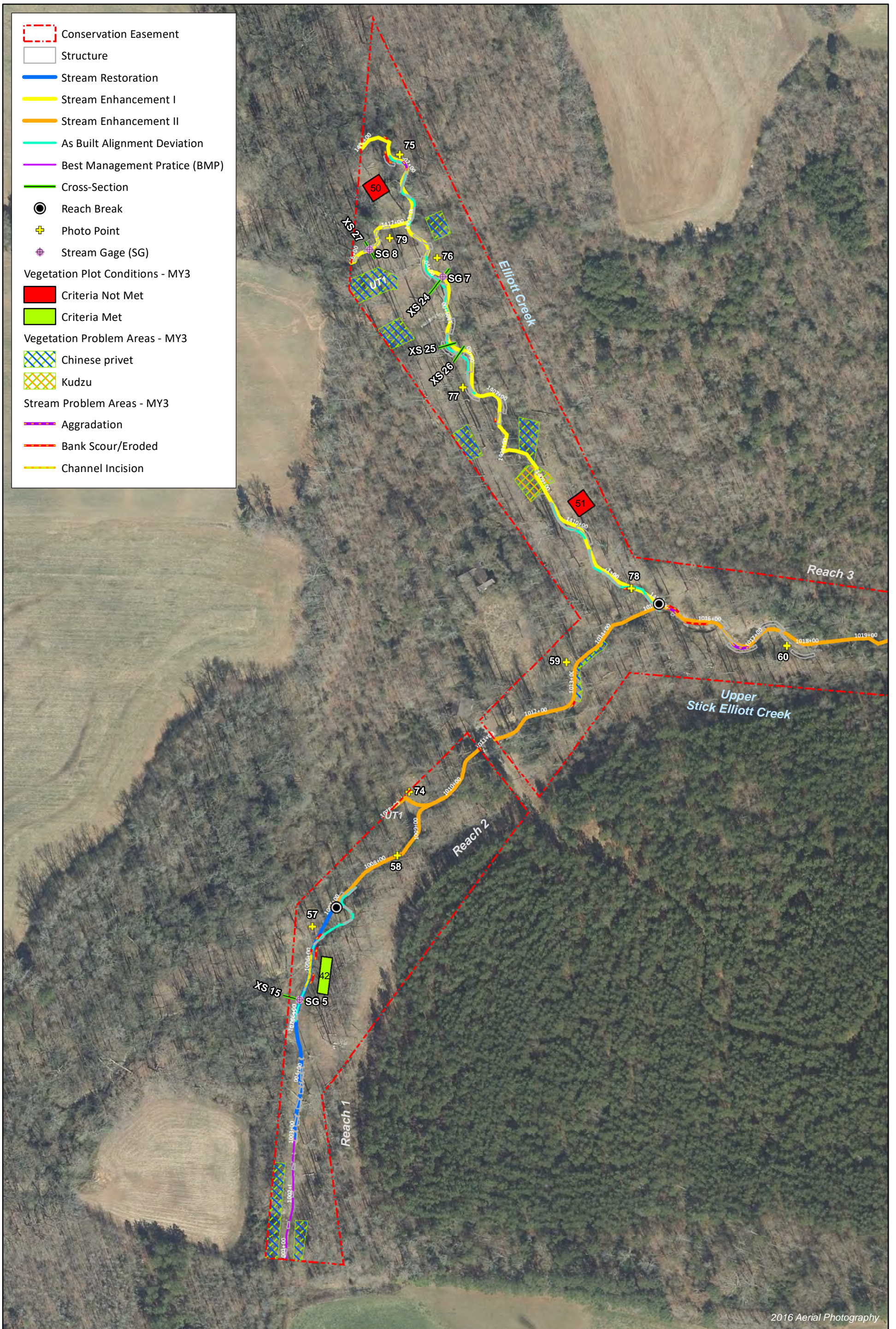
2016 Aerial Photography

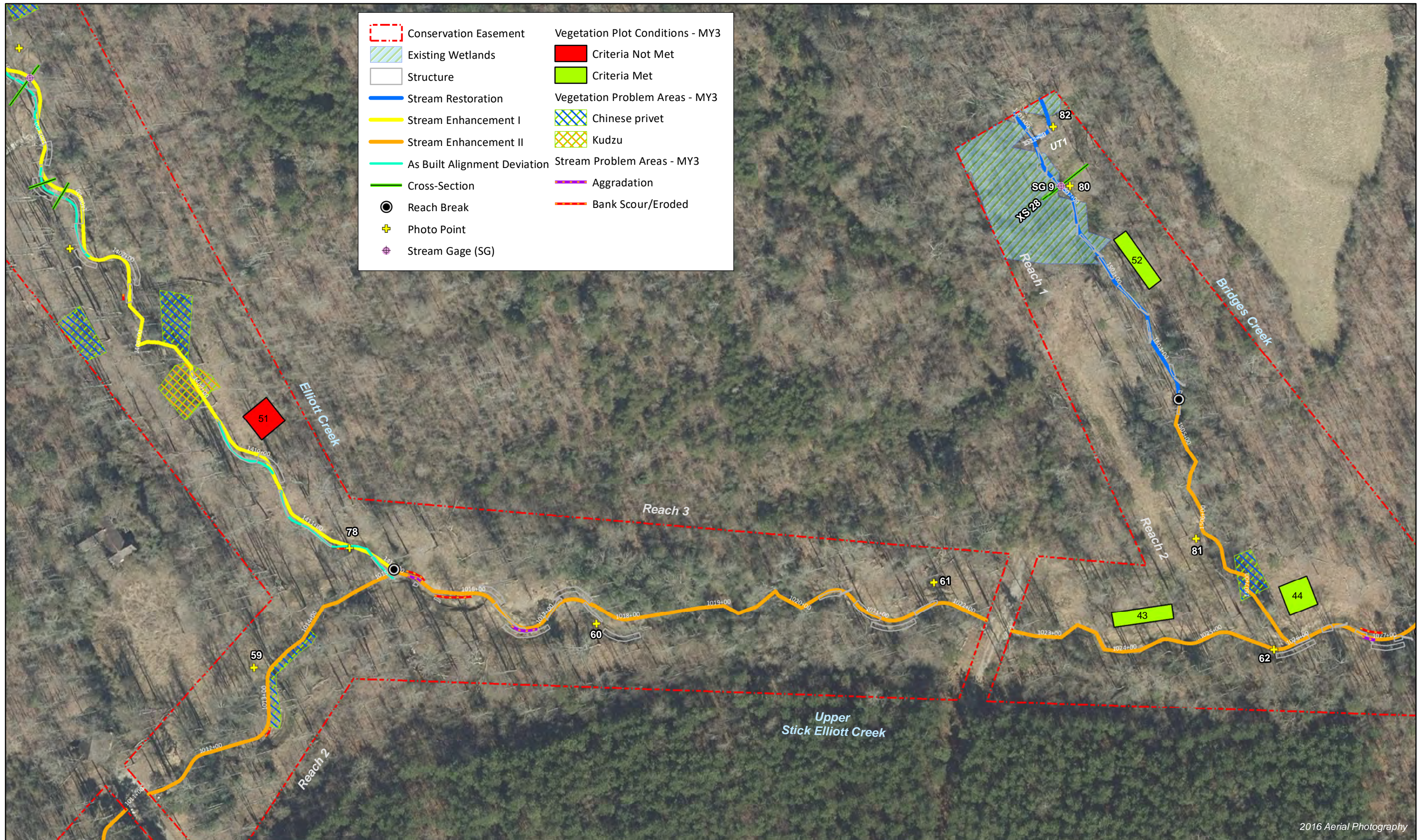


0 150 300 Feet



Figure 3.10 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 3 - 2020
Cleveland County, NC





	Conservation Easement		Existing Wetlands		Criteria Not Met
	Structure		Criteria Met		Chinese privet
	Stream Restoration		Kudzu		Aggradation
	Stream Enhancement I		Bank Scour/Eroded		Reach Break
	Stream Enhancement II		Photo Point		Stream Gage (SG)
	As Built Alignment Deviation				
	Cross-Section				

2016 Aerial Photography

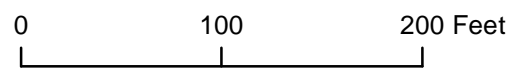
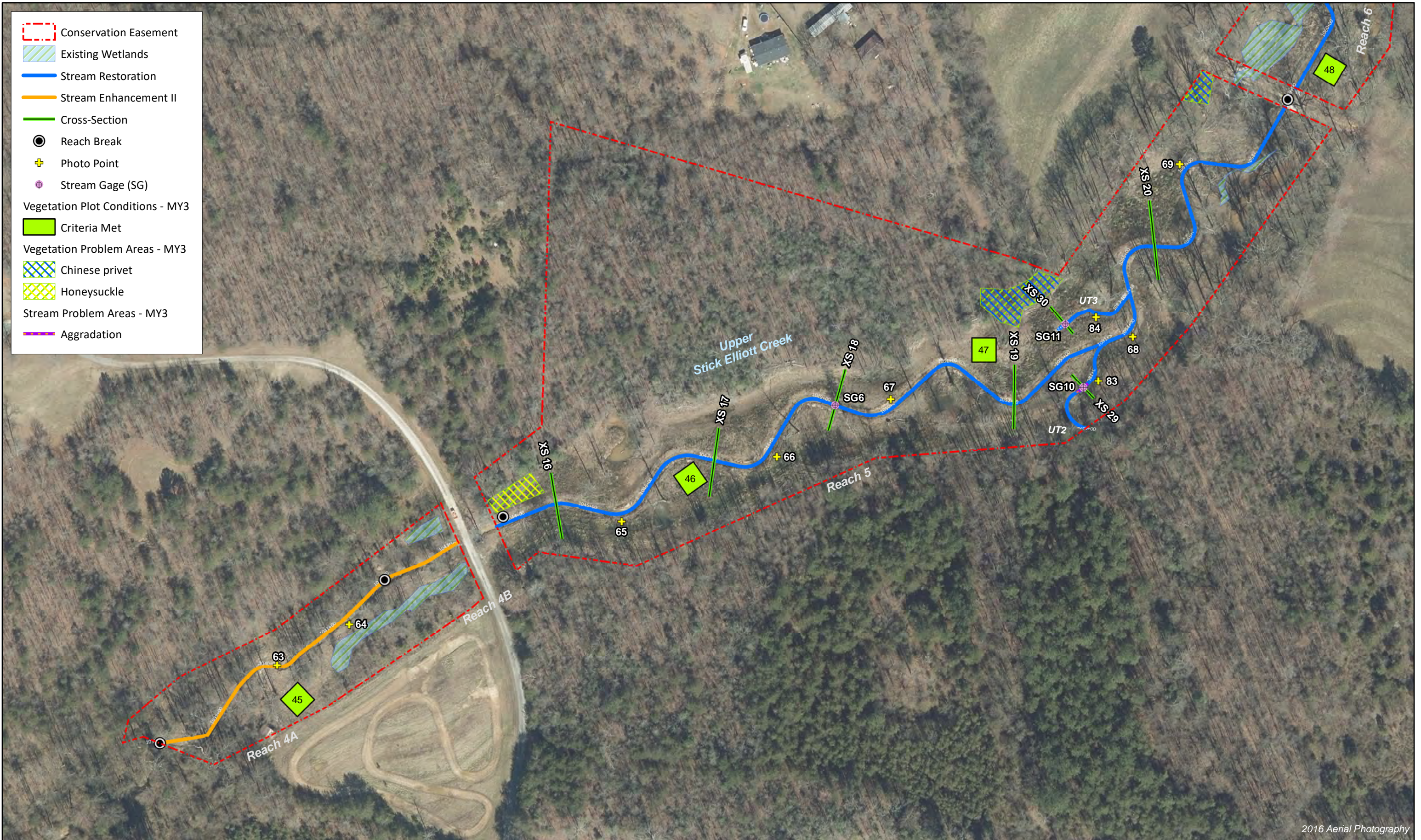
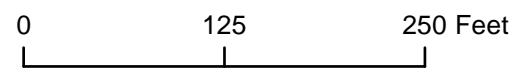


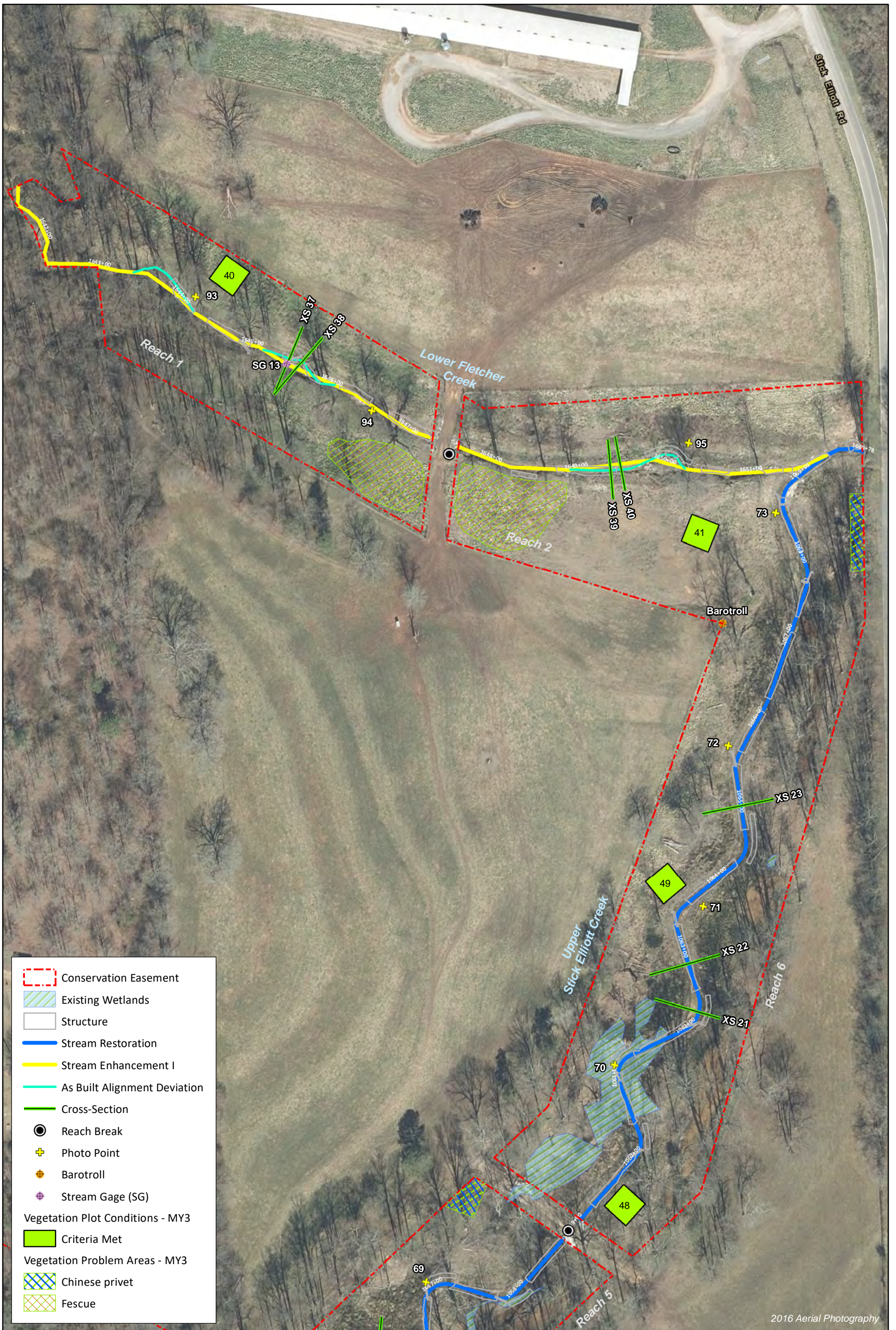
Figure 3.12 Integrated Current Condition Plan View
 Big Harris Creek Mitigation Site - Area B
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC



2016 Aerial Photography

Figure 3.13 Integrated Current Condition Plan View
Big Harris Creek Mitigation Site - Area B
DMS Project No. 739
Monitoring Year 3 - 2020
Cleveland County, NC





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

Vegetation Plot Conditions - MY3
 Criteria Met
 Vegetation Problem Areas - MY3
 Chinese privet
 Fescue

2016 Aerial Photography

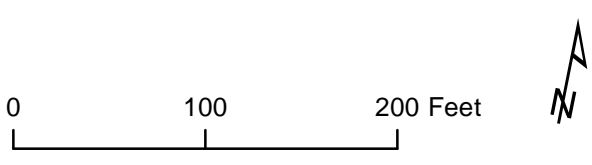
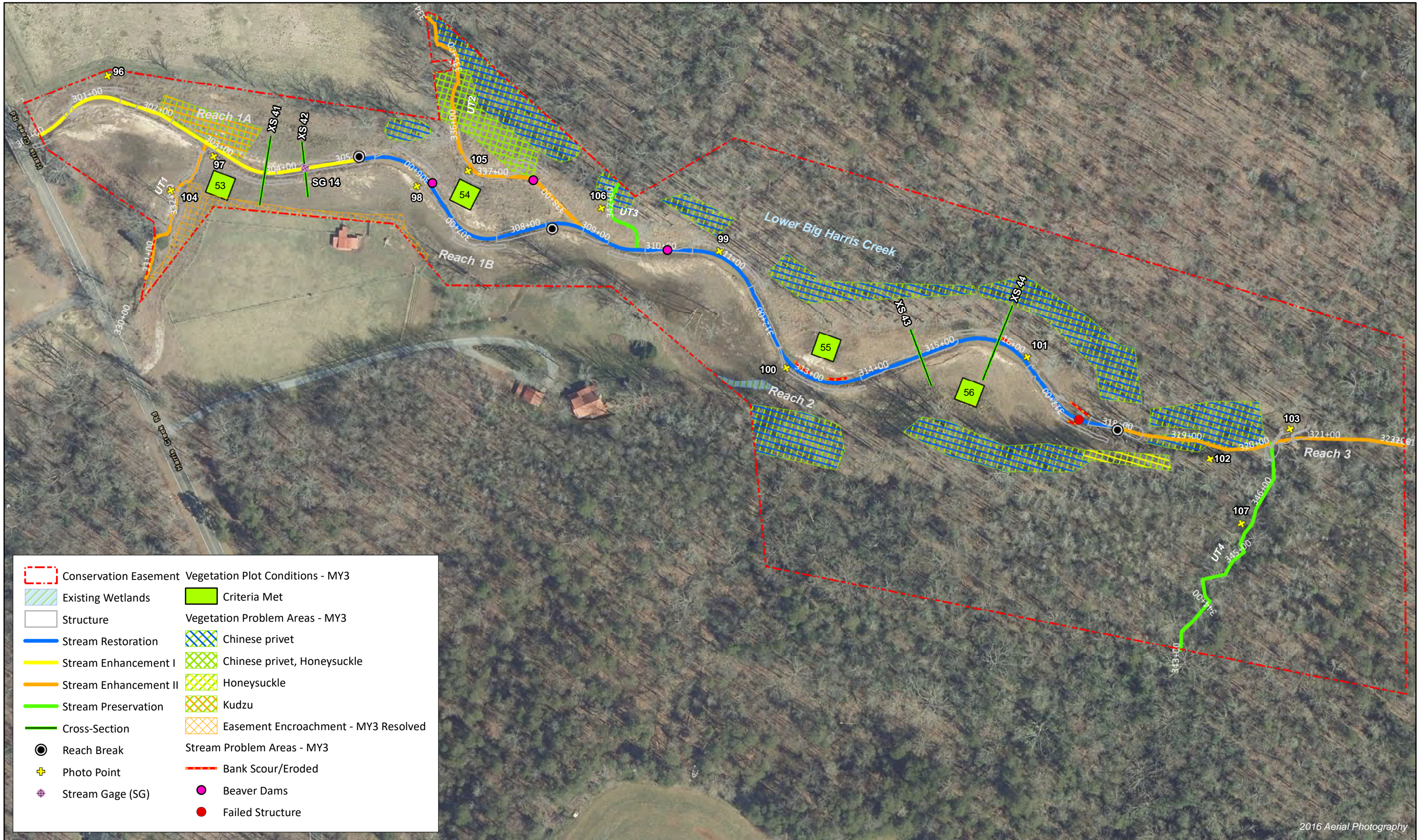


Figure 3.14 Integrated Current Condition Plan View
 Big Harris Creek Mitigation Site - Area B
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC



2016 Aerial Photography

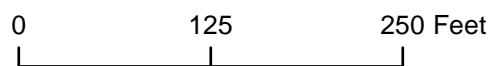


Figure 3.15 Integrated Current Condition Plan View
 Big Harris Creek Mitigation Site - Area C
 DMS Project No. 739
 Monitoring Year 3 - 2020
 Cleveland County, NC

Table 6a. Visual Stream Morphology Stability Assessment Table

Big Harris Creek Stream Mitigation Site

DMS Project No. 95 739

Monitoring Year 3 - 2020

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%						
Totals					0	0	100%	0	0	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			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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	8	9		89%				
	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%			

¹Excludes 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 3 - 2020

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	11	98%			
	2. Riffle Condition	Texture/Substrate	10	10		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	11	99%	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					1	11	99%	0	0	99%
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%			

¹Excludes 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 3 - 2020

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%			

¹Excludes 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 3 - 2020

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			1	28	97%			
	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			1	34	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	34	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%			

¹Excludes 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 3 - 2020

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			1	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					1	36	98%	0	0	98%
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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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			1	17	98%			
		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			4	50	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					4	50	98%	0	0	98%
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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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			1	58	86%			
	2. Riffle Condition	Texture/Substrate	11	15		73%				
	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	60	93%	0	0	93%
	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	60	93%	0	0	93%
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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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			0	0	100%			
	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			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.	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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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	20	87%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	2	3		67%				
	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			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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			2	56	96%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	18	18		100%				
	3. Meander Pool Condition	Depth Sufficient	14	16		88%				
		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	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	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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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			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.	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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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			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.	n/a	n/a			n/a			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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%			

¹Excludes 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. 95 739

Monitoring Year 3 - 2020

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			5	121	94%	0	0	94%
	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					5	121	94%	0	0	94%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	3			67%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	0	1			0%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	2	3			67%			
	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%			

¹Excludes 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 3 - 2020

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 Areas¹	Woody stem densities clearly below target levels based on MY3, 4, 5, or 7 stem count criteria.	0.1	11	0.3	0%
Total			11	0.3	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			11	0.3	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	117	12.9	9%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	1	0.2	0%

¹Acreage calculated from vegetation plots monitored for site.

STREAM PHOTOGRAPHS

Big Harris Creek - Area A
Monitoring Year 3



UBHC R1 Photo Point 1 – view upstream (6/11/2020)



UBHC R1 Photo Point 1 – view downstream (6/11/2020)



UBHC R1 Photo Point 2 – view upstream (6/11/2020)



UBHC R1 Photo Point 2 – view downstream (6/11/2020)



UBHC R1 Photo Point 3 – view upstream (6/11/2020)



UBHC R1 Photo Point 3 – view downstream (6/11/2020)



UBHC R1 Photo Point 4 – view upstream (6/11/2020)



UBHC R1 Photo Point 4 – view downstream (6/11/2020)



UBHC R1 Photo Point 5 – view upstream (6/11/2020)



UBHC R1 Photo Point 5 – view downstream (6/11/2020)



UBHC R2A Photo Point 6 – view upstream (6/11/2020)



UBHC R2A Photo Point 6 – view downstream (6/11/2020)



UBHC R2A Photo Point 7 – view upstream (6/11/2020)



UBHC R2A Photo Point 7 – view downstream (6/11/2020)



UBHC R2B Photo Point 8 – view upstream (6/11/2020)



UBHC R2B Photo Point 8 – view downstream (6/11/2020)



UBHC R2B Photo Point 9 – view upstream (6/11/2020)



UBHC R2B Photo Point 9 – view downstream (6/11/2020)



UBHC R3 Photo Point 10 – view upstream (5/5/2020)



UBHC R3 Photo Point 10 – view downstream (5/5/2020)



UBHC R3 Photo Point 11 – view upstream (5/5/2020)



UBHC R3 Photo Point 11 – view downstream (5/5/2020)



UBHC R4 Photo Point 12 – view upstream (5/5/2020)



UBHC R4 Photo Point 12 – view downstream (5/5/2020)



UBHC R4 Photo Point 13 – view upstream (5/5/2020)



UBHC R4 Photo Point 13 – view downstream (5/5/2020)



UBHC R4 Photo Point 14 – view upstream (5/5/2020)



UBHC R4 Photo Point 14 – view downstream (5/5/2020)



UBHC R4 Photo Point 15 – view upstream (5/5/2020)



UBHC R4 Photo Point 15 – view downstream (5/5/2020)



UBHC R4 Photo Point 16 – view upstream (5/5/2020)



UBHC R4 Photo Point 16 – view downstream (5/5/2020)



UBHC R5 Photo Point 17 – view upstream (5/5/2020)



UBHC R5 Photo Point 17 – view downstream (5/5/2020)



UBHC R5 Photo Point 18 – view upstream (5/5/2020)



UBHC R5 Photo Point 18 – view downstream (5/5/2020)



UBHC R6 Photo Point 19 – view upstream (5/5/2020)



UBHC R6 Photo Point 19 – view downstream (5/5/2020)



UBHC R6 Photo Point 20 – view upstream (5/5/2020)



UBHC R6 Photo Point 20 – view downstream (5/5/2020)



UBHC R6 Photo Point 21 – view upstream (5/5/2020)



UBHC R6 Photo Point 21 – view downstream (5/5/2020)



UBHC R6 Photo Point 22 – view upstream (5/5/2020)



UBHC R6 Photo Point 22 – view downstream (5/5/2020)



UBHC R6 Photo Point 23 – view upstream (5/5/2020)



UBHC R6 Photo Point 23 – view downstream (5/5/2020)



UBHC UT1 Photo Point 24 – view upstream (6/11/2020)



UBHC UT1 Photo Point 24 – view downstream (6/11/2020)



UBHC UT2 Photo Point 25 – view upstream (6/11/2020)



UBHC UT2 Photo Point 25 – view downstream (6/11/2020)



UBHC UT3 Photo Point 26 – view upstream (6/11/2020)



UBHC UT3 Photo Point 26 – view downstream (6/11/2020)



UBHC UT4 Photo Point 27 – view upstream (6/11/2020)



UBHC UT4 Photo Point 27 – view downstream (6/11/2020)



Cornwell Creek Photo Point 28 – view upstream (6/11/2020)



Cornwell Creek Photo Point 28 – view downstream (6/11/2020)



Cornwell Creek Photo Point 29 – view upstream (6/11/2020)



Cornwell Creek Photo Point 29 – view downstream (6/11/2020)



Cornwell Creek Photo Point 30 – view upstream (6/11/2020)



Cornwell Creek Photo Point 30 – view downstream (6/11/2020)



Cornwell Creek Photo Point 31 – view upstream (6/11/2020)



Cornwell Creek Photo Point 31 – view downstream (6/11/2020)



Cornwell Creek Photo Point 32 – view upstream (6/11/2020)



Cornwell Creek Photo Point 32 – view downstream (6/11/2020)



Cornwell Creek Photo Point 33 – view upstream (6/11/2020)



Cornwell Creek Photo Point 33 – view downstream (6/11/2020)



Cornwell Creek UT1 Photo Point 34 – view upstream (6/11/2020)



Cornwell Creek UT1 Photo Point 34 – view downstream (6/11/2020)



Eaker Creek Photo Point 35 – view upstream (6/11/2020)



Eaker Creek Photo Point 35 – view downstream (6/11/2020)



Scism Creek Photo Point 36 – view upstream (5/5/2020)



Scism Creek Photo Point 36 – view downstream (5/5/2020)



Scism Creek Photo Point 37 – view upstream (5/5/2020)



Scism Creek Photo Point 37 – view downstream 5/5/2020)



Scism Creek Photo Point 38 – view upstream (5/5/2020)



Scism Creek Photo Point 38 – view downstream (5/5/2020)



Royster Creek Photo Point 39 – view upstream (4/2/2020)



Royster Creek Photo Point 39 – view downstream (4/2/2020)



Royster Creek Photo Point 40 – view upstream (4/2/2020)



Royster Creek Photo Point 40 – view downstream (4/2/2020)



Royster Creek Photo Point 41 – view upstream (4/2/2020)



Royster Creek Photo Point 41 – view downstream (4/2/2020)



Royster Creek Photo Point 42 – view upstream (5/5/2020)



Royster Creek Photo Point 42 – view downstream (5/5/2020)



Royster Creek Photo Point 43 – view upstream (5/5/2020)



Royster Creek Photo Point 43 – view downstream (5/5/2020)



Royster Creek Photo Point 44 – view upstream (5/5/2020)



Royster Creek Photo Point 44 – view downstream (5/5/2020)



Royster Creek Photo Point 45 – view upstream (5/5/2020)



Royster Creek Photo Point 45 – view downstream (5/5/2020)



Royster Creek Photo Point 46 – view upstream (5/5/2020)



Royster Creek Photo Point 46 – view downstream (5/5/2020)



Royster Creek Photo Point 47 – view upstream (5/5/2020)



Royster Creek Photo Point 47 – view downstream (5/5/2020)



LSEC Photo Point 48 – view upstream (5/5/2020)



LSEC Photo Point 48 – view downstream (5/5/2020)



LSEC Photo Point 49 – view upstream (5/5/2020)



LSEC Photo Point 49 – view downstream (5/5/2020)



LSEC Photo Point 50 – view upstream (5/5/2020)



LSEC Photo Point 50 – view downstream (5/5/2020)



Scott Creek Photo Point 51 – view upstream (4/2/2020)



Scott Creek Photo Point 51 – view downstream (4/2/2020)



Scott Creek Photo Point 52 – view upstream (4/2/2020)



Scott Creek Photo Point 52 – view downstream (4/2/2020)



Scott Creek Photo Point 53 – view upstream (4/2/2020)



Scott Creek Photo Point 53 – view downstream (4/2/2020)



Carroll Creek Photo Point 54 – view upstream (5/5/2020)



Carroll Creek Photo Point 54 – view downstream (5/5/2020)



Carroll Creek Photo Point 55 – view upstream (5/5/2020)



Carroll Creek Photo Point 55 – view downstream (5/5/2020)



Carroll Creek Photo Point 56 – view upstream (5/5/2020)



Carroll Creek Photo Point 56 – view downstream (5/5/2020)

STREAM PHOTOGRAPHS

Big Harris Creek - Area B
Monitoring Year 3



USEC R1 Photo Point 57 – view upstream (6/11/2020)



USEC R1 Photo Point 57 – view downstream (6/11/2020)



USEC R2 Photo Point 58 – view upstream (6/13/2020)



USEC R2 Photo Point 58 – view downstream (6/13/2020)



USEC R2 Photo Point 59 – view upstream (6/13/2020)



USEC R2 Photo Point 59 – view downstream (6/13/2020)



USEC R3 Photo Point 60 – view upstream (6/13/2020)



USEC R3 Photo Point 60 – view downstream (6/13/2020)



USEC R3 Photo Point 61 – view upstream (6/11/2020)



USEC R3 Photo Point 61 – view downstream (6/11/2020)



USEC R3 Photo Point 62 – view upstream (6/11/2020)



USEC R3 Photo Point 62 – view downstream (6/11/2020)



USEC R4A Photo Point 63 – view upstream (5/6/2020)



USEC R4A Photo Point 63 – view downstream (5/6/2020)



USEC R4B Photo Point 64 – view upstream (5/6/2020)



USEC R4B Photo Point 64 – view downstream (5/6/2020)



USEC R5 Photo Point 65 – view upstream (5/6/2020)



USEC R5 Photo Point 65 – view downstream (5/6/2020)



USEC R5 Photo Point 66 – view upstream (5/6/2020)



USEC R5 Photo Point 66 – view downstream (5/6/2020)



USEC R5 Photo Point 67 – view upstream (5/6/2020)



USEC R5 Photo Point 67 – view downstream (5/6/2020)



USEC R5 Photo Point 68 – view upstream (5/6/2020)



USEC R5 Photo Point 68 – view downstream (5/6/2020)



USEC R5 Photo Point 69 – view upstream (5/6/2020)



USEC R5 Photo Point 69 – view downstream (5/6/2020)



USEC R6 Photo Point 70 – view upstream (5/6/2020)



USEC R6 Photo Point 70 – view downstream (5/6/2020)



USEC R6 Photo Point 71 – view upstream (5/6/2020)



USEC R6 Photo Point 71 – view downstream (5/6/2020)



USEC R6 Photo Point 72 – view upstream (5/6/2020)



USEC R6 Photo Point 72 – view downstream (5/6/2020)



USEC R6 Photo Point 73 – view upstream (5/6/2020)



USEC R6 Photo Point 73 – view downstream (5/6/2020)



USEC UT1 Photo Point 74 – view upstream (6/13/2020)



USEC UT1 Photo Point 74 – view downstream (6/13/2020)



Elliott Creek Photo Point 75 – view upstream (6/11/2020)



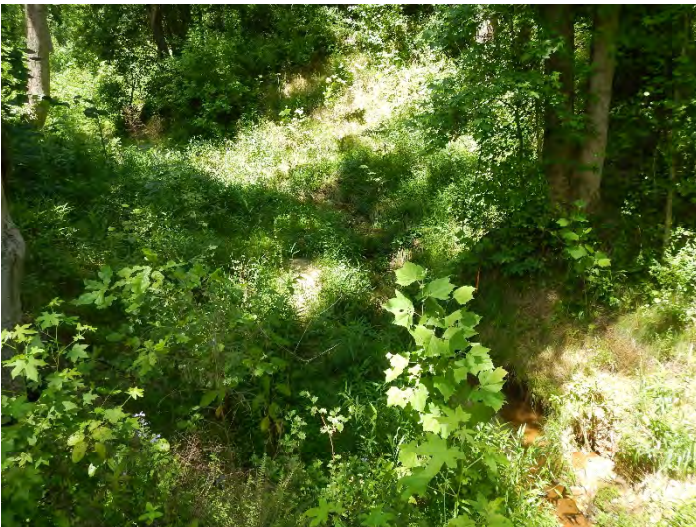
Elliott Creek Photo Point 75 – view downstream (6/11/2020)



Elliott Creek Photo Point 76 – view upstream (6/11/2020)



Elliott Creek Photo Point 76 – view downstream (6/11/2020)



Elliott Creek Photo Point 77 – view upstream (6/13/2020)



Elliott Creek Photo Point 77 – view downstream (6/13/2020)



Elliott Creek Photo Point 78 – view upstream (6/13/2020)



Elliott Creek Photo Point 78 – view downstream (6/13/2020)



Elliott Creek UT1 Photo Point 79 – view upstream (6/11/2020)



Elliott Creek UT1 Photo Point 79 – view downstream (6/11/2020)



Bridges Creek R1 Photo Point 80 – view upstream (6/11/2020)



Bridges Creek R1 Photo Point 80 – view downstream (6/11/2020)



Bridges Creek R2 Photo Point 81 – view upstream (6/11/2020)



Bridges Creek R2 Photo Point 81 – view downstream (6/11/2020)



Bridges Creek UT1 Photo Point 82 – view upstream (6/11/2020)



Bridges Crk UT1 Photo Point 82 – view downstream (6/11/2020)



USEC UT2 Photo Point 83 – view upstream (5/6/2020)



USEC UT2 Photo Point 83 – view downstream (5/6/2020)



USEC UT3 Photo Point 84 – view upstream (5/6/2020)



USEC UT3 Photo Point 84 – view downstream (5/6/2020)



UFC R1 Photo Point 85 – view upstream (5/5/2020)



UFC R1 Photo Point 85 – view downstream (5/5/2020)



UFC R1 Photo Point 86 – view upstream (5/5/2020)



UFC R1 Photo Point 86 – view downstream (5/5/2020)



UFC R1 Photo Point 87 – view upstream (5/5/2020)



UFC R1 Photo Point 87 – view downstream (5/5/2020)



UFC R2 Photo Point 88 – view upstream (5/5/2020)



UFC R2 Photo Point 88 – view downstream (5/5/2020)



UFC R2 Photo Point 89 – view upstream (5/5/2020)



UFC R2 Photo Point 89 – view downstream (5/5/2020)



UFC R2 Photo Point 90 – view upstream (5/5/2020)



UFC R2 Photo Point 90 – view downstream (5/5/2020)



UFC R2 Photo Point 91 – view upstream (5/5/2020)



UFC R2 Photo Point 91 – view downstream (5/5/2020)



UFC R2 Photo Point 92 – view upstream (5/5/2020)



UFC R2 Photo Point 92 – view downstream (5/5/2020)



LFC R1 Photo Point 93 – view upstream (5/5/2020)



LFC R1 Photo Point 93 – view downstream (5/5/2020)



LFC R1 Photo Point 94 – view upstream (5/5/2020)



LFC R1 Photo Point 94 – view downstream (5/5/2020)



LFC R2 Photo Point 95 – view upstream (5/5/2020)



LFC R2 Photo Point 95 – view downstream (5/5/2020)

STREAM PHOTOGRAPHS

Big Harris Creek - Area C
Monitoring Year 3



LBHC R1A Photo Point 96 – view upstream (5/6/2020)



LBHC R1A Photo Point 96 – view downstream (5/6/2020)



LBHC R1A Photo Point 97 – view upstream (5/6/2020)



LBHC R1A Photo Point 97 – view downstream (5/6/2020)



LBHC R1B Photo Point 98 – view upstream (5/6/2020)



LBHC R1B Photo Point 98 – view downstream (5/6/2020)



LBHC R2 Photo Point 99 – view upstream (5/6/2020)



LBHC R2 Photo Point 99 – view downstream (5/6/2020)



LBHC R2 Photo Point 100 – view upstream (5/6/2020)



LBHC R2 Photo Point 100 – view downstream (5/6/2020)



LBHC R2 Photo Point 101 – view upstream (5/6/2020)



LBHC R2 Photo Point 101 – view downstream (5/6/2020)



LBHC R3 Photo Point 102 – view upstream (5/6/2020)



LBHC R3 Photo Point 102 – view downstream (5/6/2020)



LBHC R3 Photo Point 103 – view upstream (5/6/2020)



LBHC R3 Photo Point 103 – view downstream (5/6/2020)



LBHC UT1 Photo Point 104 – view upstream (5/6/2020)



LBHC UT1 Photo Point 104 – view downstream (5/6/2020)



LBHC UT2 Photo Point 105 – view upstream (5/6/2020)



LBHC UT2 Photo Point 105 – view downstream (5/6/2020)



LBHC UT3 Photo Point 106 – view upstream (5/6/2020)



LBHC UT3 Photo Point 106 – view downstream (5/6/2020)



LBHC UT4 Photo Point 107 – view upstream (5/6/2020)



LBHC UT4 Photo Point 107 – view downstream (5/6/2020)

VEGETATION PHOTOGRAPHS

Monitoring Year 3



Vegetation Plot 1 (08/02/2020)



Vegetation Plot 2 (08/02/2020)



Vegetation Plot 3 (08/02/2020)



Vegetation Plot 4 (08/02/2020)



Vegetation Plot 5 (08/02/2020)



Vegetation Plot 6 (08/01/2020)



Vegetation Plot 7 (08/01/2020)



Vegetation Plot 8 (08/01/2020)



Vegetation Plot 9 (08/01/2020)



Vegetation Plot 10 (08/06/2020)



Vegetation Plot 11 (08/06/2020)



Vegetation Plot 12 (08/06/2020)



Vegetation Plot 13 (08/06/2020)



Vegetation Plot 14 (08/02/2020)



Vegetation Plot 15 (08/02/2020)



Vegetation Plot 16 (08/02/2020)



Vegetation Plot 17 (10/20/2020)



Vegetation Plot 18 (08/02/2020)



Vegetation Plot 19 (08/02/2020)



Vegetation Plot 20 (08/02/2020)



Vegetation Plot 21 (08/02/2020)



Vegetation Plot 22 (08/02/2020)



Vegetation Plot 23 (08/02/2020)



Vegetation Plot 24 (08/06/2020)



Vegetation Plot 25 (08/10/2020)



Vegetation Plot 26 (08/06/2020)



Vegetation Plot 27 (08/06/2020)



Vegetation Plot 28 (08/06/2020)



Vegetation Plot 29 (08/06/2020)



Vegetation Plot 30 (08/02/2020)



Vegetation Plot 31 (10/20/2020)



Vegetation Plot 32 (08/02/2020)



Vegetation Plot 33 (08/02/2020)



Vegetation Plot 34 (08/02/2020)



Vegetation Plot 35 (08/01/2020)



Vegetation Plot 36 (08/01/2020)



Vegetation Plot 37 (08/01/2020)



Vegetation Plot 38 (08/01/2020)



Vegetation Plot 39 (08/01/2020)



Vegetation Plot 40 (10/20/2020)



Vegetation Plot 41 (08/10/2020)



Vegetation Plot 42 (08/10/2020)



Vegetation Plot 43 (08/10/2020)



Vegetation Plot 44 (08/10/2020)



Vegetation Plot 45 (08/01/2020)



Vegetation Plot 46 (08/01/2020)



Vegetation Plot 47 (08/01/2020)



Vegetation Plot 48 (08/01/2020)



Vegetation Plot 49 (10/27/2020)



Vegetation Plot 50 (10/20/2020)



Vegetation Plot 51 (08/10/2020)



Vegetation Plot 52 (08/10/2020)



Vegetation Plot 53 (08/02/2020)



Vegetation Plot 54 (08/02/2020)



Vegetation Plot 55 (08/02/2020)



Vegetation Plot 56 (08/02/2020)

AREAS OF CONCERN PHOTOGRAPHS

Monitoring Year 3



UBHC R2B Bank Scour (STA 137+33 – 137+67) – view downstream
(10/22/2020)



USEC R1 Bank Scour (STA 1005+57 – 1005+75) – view downstream
(10/20/2020)



USEC R3 Aggradation (STA 1026+74 – 1026+89) – view downstream
(10/20/2020)



Scott Creek Incision (STA 1211+25 – 1211+36) – view upstream
(11/2/2020)



LBHC R1A Kudzu – view downstream *(10/27/2020)*



LBHC R2 Chinese Privet – view downstream *(10/27/2020)*



UBHC R3 Log Dislodged (STA 145+48) – view upstream
(10/27/2020)



LBHC R2 Log Sill Bypassed (STA 317+45) – view upstream
(10/27/2020)



Royster Creek R1 Rock Sill Failed (STA 806+74) – view upstream
(10/27/2020)



LBHC R2 Beaver Dam (STA 310+10) – view upstream
(10/27/2020)

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment Table

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

Plot	Success Criteria Met (Y/N)	Tract Mean
1	Y	80%
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	N	
20	Y	
21	Y	
22	Y	
23	Y	
24	N	
25	N	
26	Y	
27	N	
28	N	
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 3 - 2020

Report Prepared By	Ian Eckardt
Date Prepared	11/19/2020 12:23
Database Name	BHC MY3 cvs-eep-entrytool-v2.5.0.mdb
Database Location	Q:\ActiveProjects\005-02149 Big Harris Creek\Monitoring\Monitoring Year 3 (2020)\Vegetation Assessment
Computer Name	IAN
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 3 - 2020

		Current Plot Data (MY3 2020) - Area A																					
Scientific Name	Common Name	Species Type	Vegetation Plot 1			Vegetation Plot 2			Vegetation Plot 3			Vegetation Plot 4			Vegetation Plot 5			Vegetation Plot 6			Vegetation Plot 7		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder maple	Tree																					
<i>Acer rubrum</i>	Red maple	Tree	3	3	3	1	1	1	3	3	3	2	2	2	4	4	4	2	2	2	3	3	3
<i>Betula nigra</i>	River birch	Tree							1	1	1				2	2	2	1	1	1	1	1	1
<i>Diospyros virginiana</i>	American Persimmon	Tree																		1			
<i>Fagus</i>	Beech	Tree																					
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	2	2	2	1	1	1	4	4	4	2	2	2	3	3	3	5	5	5	1	1	1
<i>Ilex opaca</i>	American Holly	Shrub Tree																					
<i>Juglans nigra</i>	Black Walnut	Tree																					
<i>Liquidambar styraciflua</i>	Sweet Gum	Tree			65			81			55						40			20			25
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree			70						25						4						
<i>Nyssa sylvatica</i>	Blackgum	Tree	1	1	1				2	2	2	1	1	1				1	1	1	2	2	2
<i>Pinus rigida</i>	Pitch pine	Tree									25						40						
<i>Pinus virginiana</i>	Virginia Pine	Tree																					
<i>Platanus occidentalis</i>	American sycamore	Tree	4	4	4	5	5	5	1	1	1	2	2	2	5	5	5				4	4	4
<i>Quercus sp.</i>	Oak	Tree																					
<i>Quercus alba</i>	White Oak	Tree																					
<i>Quercus falcata</i>	Spanish Oak	Tree																					
<i>Quercus nigra</i>	Water Oak	Tree																					
<i>Quercus pagoda</i>	Cherrybark oak	Tree	1	1	1							1	1	1				1	1	1	1	1	1
<i>Quercus phellos</i>	Willow oak	Tree							1	1	1												
<i>Quercus rubra</i>	Red oak	Tree	1	1	1				2	2	2												
<i>Rhus copallinum</i>	Shining sumac	Shrub Tree																					
<i>Rhus typhina</i>	Staghorn Sumac	Shrub																					
<i>Salix nigra</i>	Black willow	Tree																					
<i>Sambucus Canadensis</i>	Common Elderberry	Shrub Tree																					
	Stem count		12	12	147	7	7	88	14	14	119	8	8	8	14	14	98	10	10	31	12	12	37
	Size (ares)			1			1			1			1			1			1			1	
	Size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247	
	Species count		6	6	8	3	3	4	7	7	10	5	5	5	4	4	7	5	5	7	6	6	7
	Stems per ACRE		486	486	5951	283	283	3,563	567	567	4,818	324	324	324	567	567	3,968	405	405	1,255	486	486	1,498

		Current Plot Data (MY3 2020) - Area A																					
Scientific Name	Common Name	Species Type	Vegetation Plot 8			Vegetation Plot 9			Vegetation Plot 10			Vegetation Plot 11			Vegetation Plot 12			Vegetation Plot 13			Vegetation Plot 14		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder maple	Tree																					
<i>Acer rubrum</i>	Red maple	Tree	3	3	13	3	3	3	5	5	5	3	3	3	1	1	1	4	4	4	2	2	2
<i>Betula nigra</i>	River birch	Tree	1	1	1															1	1	1	
<i>Diospyros virginiana</i>	American Persimmon	Tree												2									
<i>Fagus</i>	Beech	Tree												2									
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	5	5	5	4	4	4	3	3	4	4	4	4	1	1	1	2	2	2	3	3	3
<i>Ilex opaca</i>	American Holly	Shrub Tree																					
<i>Juglans nigra</i>	Black Walnut	Tree																					
<i>Liquidambar styraciflua</i>	Sweet Gum	Tree			75			35															47
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree			160			23			2			3					2				75
<i>Nyssa sylvatica</i>	Blackgum	Tree				1	1	1									1	1	1	1	1	1	1
<i>Pinus rigida</i>	Pitch pine	Tree																					
<i>Pinus virginiana</i>	Virginia Pine	Tree																					
<i>Platanus occidentalis</i>	American sycamore	Tree	4	4	4	7	7	7	5	5	5	5	5	6	1	1	1	1	1	1	5	5	5
<i>Quercus sp.</i>	Oak	Tree																					
<i>Quercus alba</i>	White Oak	Tree																					
<i>Quercus falcata</i>	Spanish Oak	Tree																					
<i>Quercus nigra</i>	Water Oak	Tree																					
<i>Quercus pagoda</i>	Cherrybark oak	Tree	1	1	1				1	1	1										1	1	1
<i>Quercus phellos</i>	Willow oak	Tree	1	1	1												1	1	1	1	1	1	1
<i>Quercus rubra</i>	Red oak	Tree										1	1	1			2	2	2				
<i>Rhus copallinum</i>	Shining sumac	Shrub Tree																					
<i>Rhus typhina</i>	Staghorn Sumac	Shrub																					
<i>Salix nigra</i>	Black willow	Tree																					
<i>Sambucus Canadensis</i>	Common Elderberry	Shrub Tree																					
	Stem count		15	15	260	15	15	73	14	14	19	13	13	19	3	3	3	11	11	13	14	14	136
	Size (ares)			1			1			1			1			1			1			1	
	Size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247	
	Species count		6	6	8	4	4	6	4	4	6	4	4	6	3	3	3	6	6	7	7	7	9
	Stems per ACRE		607	607	10,526	607	607	2,955	567	567	769	526	526	769	121	121	121	445	445	526	567	567	5,506

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 3 - 2020

			Current Plot Data (MY3 2020) - Area A																				
Scientific Name	Common Name	Species Type	Vegetation Plot 15			Vegetation Plot 16			Vegetation Plot 17			Vegetation Plot 18			Vegetation Plot 19			Vegetation Plot 20			Vegetation Plot 21		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder maple	Tree																					
<i>Acer rubrum</i>	Red maple	Tree	1	1	1	1	1	1	2	2	42				2	2	2			1	1	1	
<i>Betula nigra</i>	River birch	Tree	2	2	2				1	1	36	2	2	2				1	1	1	2	2	2
<i>Diospyros virginiana</i>	American Persimmon	Tree																					
<i>Fagus</i>	Beech	Tree																					
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	2	2	2	4	4	4	3	3	3	5	5	5	1	1	1	1	1	57	1	1	1
<i>Ilex opaca</i>	American Holly	Shrub Tree																					
<i>Juglans nigra</i>	Black Walnut	Tree																					
<i>Liquidambar styraciflua</i>	Sweet Gum	Tree						3			60								10				190
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree						3			55			45									
<i>Nyssa sylvatica</i>	Blackgum	Tree							1	1	1				1	1	2				1	1	1
<i>Pinus rigida</i>	Pitch pine	Tree																					
<i>Pinus virginiana</i>	Virginia Pine	Tree																					
<i>Platanus occidentalis</i>	American sycamore	Tree	1	1	1	4	4	4	3	3	28				3	3	3	5	5	5	2	2	2
<i>Quercus sp.</i>	Oak	Tree				1	1	1															
<i>Quercus alba</i>	White Oak	Tree																					
<i>Quercus falcata</i>	Spanish Oak	Tree																					
<i>Quercus nigra</i>	Water Oak	Tree																					
<i>Quercus pagoda</i>	Cherrybark oak	Tree	2	2	2							2	2	2									
<i>Quercus phellos</i>	Willow oak	Tree										1	1	1							1	1	1
<i>Quercus rubra</i>	Red oak	Tree							1	1	1	1	1	1				1	1	1			
<i>Rhus copallinum</i>	Shining sumac	Shrub Tree																					
<i>Rhus typhina</i>	Staghorn Sumac	Shrub																					
<i>Salix nigra</i>	Black willow	Tree																					
<i>Sambucus Canadensis</i>	Common Elderberry	Shrub Tree																					
	Stem count		8	8	8	10	10	16	11	11	226	11	11	56	7	7	8	8	8	75	8	8	198
	Size (ares)			1			1			1			1			1			1			1	
	Size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247	
	Species count		5	5	5	4	4	6	6	6	8	5	5	6	4	4	4	4	4	6	6	6	7
	Stems per ACRE		324	324	324	405	405	648	445	445	9150	445	445	2267	283	283	324	324	3,036	324	324	8016	

			Current Plot Data (MY3 2020) - Area A																				
Scientific Name	Common Name	Species Type	Vegetation Plot 22			Vegetation Plot 23			Vegetation Plot 24			Vegetation Plot 25			Vegetation Plot 26			Vegetation Plot 27			Vegetation Plot 28		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder maple	Tree																					
<i>Acer rubrum</i>	Red maple	Tree	3	3	3	5	5	5	3	3	3			1	1	1							
<i>Betula nigra</i>	River birch	Tree				2	2	2										1	1	1	1	1	1
<i>Diospyros virginiana</i>	American Persimmon	Tree																					
<i>Fagus</i>	Beech	Tree																					
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	3	3	3	2	2	2	1	1	1	1	1	1	4	4	4	2	2	2	3	3	3
<i>Ilex opaca</i>	American Holly	Shrub Tree																					
<i>Juglans nigra</i>	Black Walnut	Tree																					
<i>Liquidambar styraciflua</i>	Sweet Gum	Tree																					
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree																					1
<i>Nyssa sylvatica</i>	Blackgum	Tree							2	2	2												
<i>Pinus rigida</i>	Pitch pine	Tree																					
<i>Pinus virginiana</i>	Virginia Pine	Tree																					
<i>Platanus occidentalis</i>	American sycamore	Tree	4	4	4	2	2	2				1	1	1	7	7	7				3	3	3
<i>Quercus sp.</i>	Oak	Tree																					
<i>Quercus alba</i>	White Oak	Tree																					
<i>Quercus falcata</i>	Spanish Oak	Tree																					
<i>Quercus nigra</i>	Water Oak	Tree																					
<i>Quercus pagoda</i>	Cherrybark oak	Tree				1	1	1	1	1	1	1	1	1			1	1	1				
<i>Quercus phellos</i>	Willow oak	Tree													1	1	1						
<i>Quercus rubra</i>	Red oak	Tree				1	1	1				1	1	1	1	1	1	2	2	2			
<i>Rhus copallinum</i>	Shining sumac	Shrub Tree																					
<i>Rhus typhina</i>	Staghorn Sumac	Shrub																					
<i>Salix nigra</i>	Black willow	Tree																					
<i>Sambucus Canadensis</i>	Common Elderberry	Shrub Tree																					
	Stem count		10	10	10	13	13	13	7	7	13	4	4	5	14	14	41	6	6	6	7	7	8
	Size (ares)			1			1			1			1			1			1			1	
	Size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247	
	Species count		3	3	3	6	6	6	4	4	6	4	4	5	5	5	7	4	4	4	3	3	4
	Stems per ACRE		405	405	405	526	526	526	283	283	526	162	162	202	567	567	1,660	243	243	243	283	283	324

- 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 3 - 2020

			Current Plot Data (MY3 2020) - Area A																	
Scientific Name	Common Name	Species Type	Vegetation Plot 29			Vegetation Plot 30			Vegetation Plot 31			Vegetation Plot 32			Vegetation Plot 33			Vegetation Plot 34		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder maple	Tree																		
<i>Acer rubrum</i>	Red maple	Tree				2	2	3				1	1	1	3	3	3	1	1	1
<i>Betula nigra</i>	River birch	Tree									1	1	1							
<i>Diospyros virginiana</i>	American Persimmon	Tree																		
<i>Fagus</i>	Beech	Tree																		
<i>Fraxinus pennsylvanica</i>	Green ash	Tree				3	3	3	3	3	3	2	2	2	3	3	3	2	2	2
<i>Ilex opaca</i>	American Holly	Shrub Tree																		
<i>Juglans nigra</i>	Black Walnut	Tree																		
<i>Liquidambar styraciflua</i>	Sweet Gum	Tree												30		90				
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree												5		30				
<i>Nyssa sylvatica</i>	Blackgum	Tree										2	2	2				1	1	1
<i>Pinus rigida</i>	Pitch pine	Tree																		
<i>Pinus virginiana</i>	Virginia Pine	Tree																		
<i>Platanus occidentalis</i>	American sycamore	Tree	1	1	2	5	5	5				3	3	3	2	2	2	1	1	2
<i>Quercus sp.</i>	Oak	Tree																		
<i>Quercus alba</i>	White Oak	Tree																		
<i>Quercus falcata</i>	Spanish Oak	Tree																		
<i>Quercus nigra</i>	Water Oak	Tree																		
<i>Quercus pagoda</i>	Cherrybark oak	Tree				1	1	1				1	1	1	1	1	1	1	1	1
<i>Quercus phellos</i>	Willow oak	Tree	1	1	1							1	1	1						
<i>Quercus rubra</i>	Red oak	Tree	1	1	1							1	1	1	1	1	1	2	2	2
<i>Rhus copallinum</i>	Shining sumac	Shrub Tree																		
<i>Rhus typhina</i>	Staghorn Sumac	Shrub																		
<i>Salix nigra</i>	Black willow	Tree																		
<i>Sambucus Canadensis</i>	Common Elderberry	Shrub Tree																		
Stem count			3	3	4	11	11	12	5	5	5	12	12	47	10	10	130	8	8	9
Size (ares)			1			1			1			1			1			1		
Size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247		
Species count			3	3	3	4	4	4	3	3	3	8	8	10	5	5	7	6	6	6
Stems per ACRE			121	121	162	445	445	486	202	202	202	486	486	1903	405	405	5263	324	324	364

			Current Plot Data (MY3 2020) - Area B																				
Scientific Name	Common Name	Species Type	Vegetation Plot 35			Vegetation Plot 36			Vegetation Plot 37			Vegetation Plot 38			Vegetation Plot 39			Vegetation Plot 40			Vegetation Plot 41		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder maple	Tree																					
<i>Acer rubrum</i>	Red maple	Tree	1	1	2	1	1	1	1	1	1	2	2	2	3	3	8	1	1	1	4	4	4
<i>Betula nigra</i>	River birch	Tree	2	2	2									1									
<i>Diospyros virginiana</i>	American Persimmon	Tree																					
<i>Fagus</i>	Beech	Tree																					
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	1	1	1	3	3	3	3	3	3	5	5	7	3	3	3	2	2	2	4	4	4
<i>Ilex opaca</i>	American Holly	Shrub Tree																					
<i>Juglans nigra</i>	Black Walnut	Tree																					
<i>Liquidambar styraciflua</i>	Sweet Gum	Tree																				300	
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree			16									14								22	
<i>Nyssa sylvatica</i>	Blackgum	Tree	3	3	3													1	1	1	2	2	2
<i>Pinus rigida</i>	Pitch pine	Tree																					
<i>Pinus virginiana</i>	Virginia Pine	Tree																					
<i>Platanus occidentalis</i>	American sycamore	Tree	3	3	3	4	4	4	3	3	3	5	5	5	5	5	5	6	6	6	1	1	1
<i>Quercus sp.</i>	Oak	Tree																					
<i>Quercus alba</i>	White Oak	Tree																					
<i>Quercus falcata</i>	Spanish Oak	Tree																					
<i>Quercus nigra</i>	Water Oak	Tree																					
<i>Quercus pagoda</i>	Cherrybark oak	Tree							1	1	1				2	2	2	2	2	2			
<i>Quercus phellos</i>	Willow oak	Tree										1	1	1							2	2	2
<i>Quercus rubra</i>	Red oak	Tree	3	3	3										1	1	1				1	1	1
<i>Rhus copallinum</i>	Shining sumac	Shrub Tree																					
<i>Rhus typhina</i>	Staghorn Sumac	Shrub																					
<i>Salix nigra</i>	Black willow	Tree																					
<i>Sambucus Canadensis</i>	Common Elderberry	Shrub Tree																					
Stem count			13	13	30	8	8	8	9	9	9	13	13	30	14	14	19	12	12	12	14	14	336
Size (ares)			1			1			1			1			1			1			1		
Size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247		
Species count			6	6	7	3	3	3	5	5	5	4	4	6	5	5	5	5	5	5	6	6	8
Stems per ACRE			526	526	1215	324	324	324	364	364	364	526	526	1215	567	567	769	486	486	486	567	567	13603

- 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 3 - 2020

			Current Plot Data (MY3 2020) - Area B																				
Scientific Name	Common Name	Species Type	Vegetation Plot 42			Vegetation Plot 43			Vegetation Plot 44			Vegetation Plot 45			Vegetation Plot 46			Vegetation Plot 47			Vegetation Plot 48		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder maple	Tree																					
<i>Acer rubrum</i>	Red maple	Tree			9	1	1	21	2	2	7	1	1	1	2	2	2	2	2	2	2	2	
<i>Betula nigra</i>	River birch	Tree				4	4	4	2	2	2	2	2	2	1	1	1	1	1	1	1	1	
<i>Diospyros virginiana</i>	American Persimmon	Tree												3									
<i>Fagus</i>	Beech	Tree																					
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	5	5	5	4	4	4	2	2	2	2	2	2	6	6	6	3	3	3	3	3	
<i>Ilex opaca</i>	American Holly	Shrub Tree																					
<i>Juglans nigra</i>	Black Walnut	Tree																					
<i>Liquidambar styraciflua</i>	Sweet Gum	Tree			28			90			90			10			10			23			
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree			37			90			90			6					10			50	
<i>Nyssa sylvatica</i>	Blackgum	Tree							1	1	1	1	1	1	1	1	1				1	1	
<i>Pinus rigida</i>	Pitch pine	Tree																					
<i>Pinus virginiana</i>	Virginia Pine	Tree																					
<i>Platanus occidentalis</i>	American sycamore	Tree	3	3	3	2	2	2	4	4	24	5	5	5	4	4	4	6	6	6	3	3	
<i>Quercus sp.</i>	Oak	Tree																					
<i>Quercus alba</i>	White Oak	Tree																					
<i>Quercus falcata</i>	Spanish Oak	Tree																					
<i>Quercus nigra</i>	Water Oak	Tree																					
<i>Quercus pagoda</i>	Cherrybark oak	Tree			4				1	1	1	1	1	1	1	1				2	2	2	
<i>Quercus phellos</i>	Willow oak	Tree										1	1	1	1	1	1						
<i>Quercus rubra</i>	Red oak	Tree				1	1	1	3	3	3									2	2	2	
<i>Rhus copallinum</i>	Shining sumac	Shrub Tree																					
<i>Rhus typhina</i>	Staghorn Sumac	Shrub																					
<i>Salix nigra</i>	Black willow	Tree													2								
<i>Sambucus Canadensis</i>	Common Elderberry	Shrub Tree																					
Stem count			8	8	86	12	12	212	15	15	220	13	13	32	16	16	28	12	12	45	14	14	64
Size (ares)			1			1			1			1			1			1			1		
Size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247		
Species count			2	2	6	5	5	7	7	7	9	7	7	10	7	7	9	4	4	6	7	7	8
Stems per ACRE			324	324	3482	486	486	8,583	607	607	8,907	526	526	1,296	648	648	1,134	486	486	1,822	567	567	2,591

			Current Plot Data (MY3 2020) - Area B											
Scientific Name	Common Name	Species Type	Vegetation Plot 49			Vegetation Plot 50			Vegetation Plot 51			Vegetation Plot 52		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder maple	Tree												
<i>Acer rubrum</i>	Red maple	Tree	2	2	2						1			10
<i>Betula nigra</i>	River birch	Tree	3	3	3							2	2	2
<i>Diospyros virginiana</i>	American Persimmon	Tree						1	1	1				
<i>Fagus</i>	Beech	Tree												
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	2	2	2	3	3	4	1	1	1	5	5	5
<i>Ilex opaca</i>	American Holly	Shrub Tree												
<i>Juglans nigra</i>	Black Walnut	Tree												
<i>Liquidambar styraciflua</i>	Sweet Gum	Tree									27			13
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree						11			10			10
<i>Nyssa sylvatica</i>	Blackgum	Tree	1	1	1									
<i>Pinus rigida</i>	Pitch pine	Tree												
<i>Pinus virginiana</i>	Virginia Pine	Tree												
<i>Platanus occidentalis</i>	American sycamore	Tree	2	2	2							4	4	4
<i>Quercus sp.</i>	Oak	Tree												
<i>Quercus alba</i>	White Oak	Tree												
<i>Quercus falcata</i>	Spanish Oak	Tree												
<i>Quercus nigra</i>	Water Oak	Tree												
<i>Quercus pagoda</i>	Cherrybark oak	Tree	1	1	1	2	2	2				1	1	1
<i>Quercus phellos</i>	Willow oak	Tree												
<i>Quercus rubra</i>	Red oak	Tree	1	1	1							1	1	1
<i>Rhus copallinum</i>	Shining sumac	Shrub Tree												
<i>Rhus typhina</i>	Staghorn Sumac	Shrub												
<i>Salix nigra</i>	Black willow	Tree												
<i>Sambucus Canadensis</i>	Common Elderberry	Shrub Tree												
Stem count			12	12	12	5	5	18	2	2	40	13	13	46
Size (ares)			1			1			1			1		
Size (ACRES)			0.0247			0.0247			0.0247			0.0247		
Species count			7	7	7	2	2	4	2	2	5	5	5	8
Stems per ACRE			486	486	486	202	202	729	81	81	1,619	526	526	1862

- 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 3 - 2020

Scientific Name	Common Name	Species Type	Current Plot Data (MY3 2020) - Area C												Annual Summaries											
			Vegetation Plot 53			Vegetation Plot 54			Vegetation Plot 55			Vegetation Plot 56			MY3 (2020)			MY2 (2019)			MY1 (9/2018 thru 11/2018)			MY0 (3/2018 thru 5/2018)		
			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	PnoLS	P-all	T
<i>Acer negundo</i>	Boxelder maple	Tree																								
<i>Acer rubrum</i>	Red maple	Tree						1	3	3	3	2	2	2	95	95	200	108	108	307	143	143	432	171	171	171
<i>Betula nigra</i>	River birch	Tree	2	2	2	1	1	1	4	4	4				47	47	83	52	52	89	61	61	62	99	99	99
<i>Diospyros virginiana</i>	American Persimmon	Tree													1	1	38			50			11			
<i>Fagus</i>	Beech	Tree																					1			
<i>Fraxinus pennsylvanica</i>	Green ash	Tree	4	4	4	1	1	1	3	3	3	2	2	2	153	153	213	153	153	186	159	159	160	167	167	167
<i>Ilex opaca</i>	American Holly	Shrub Tree																					1			
<i>Juglans nigra</i>	Black Walnut	Tree																		1						
<i>Liquidambar styraciflua</i>	Sweet Gum	Tree						180			85			50			2332			2045			456			
<i>Liriodendron tulipifera</i>	Tulip Poplar	Tree			8								20			899			762			366				
<i>Nyssa sylvatica</i>	Blackgum	Tree				1	1	1				1	1	1	31	31	32	38	38	49	48	48	48	59	59	60
<i>Pinus rigida</i>	Pitch pine	Tree															65									
<i>Pinus Virginiana</i>	Virginia Pine	Tree																		23						
<i>Platanus occidentalis</i>	American sycamore	Tree	4	4	139	4	4	5	3	3	18	2	2	52	169	169	418	175	175	716	186	186	265	212	212	212
<i>Quercus sp.</i>	Oak	Tree	1	1	1										2	2	2	2	2	2	4	4	4	3	3	3
<i>Quercus alba</i>	White Oak	Tree																					2			
<i>Quercus falcata</i>	Spanish Oak	Tree																		1						
<i>Quercus nigra</i>	Water Oak	Tree																								
<i>Quercus pagoda</i>	Cherrybark oak	Tree	2	2	2	1	1	1	2	2	2	1	1	1	39	39	43	39	39	39	49	49	49	55	55	55
<i>Quercus phellos</i>	Willow oak	Tree				3	3	3				1	1	2	18	18	19	17	17	17	25	25	28	46	46	46
<i>Quercus rubra</i>	Red oak	Tree				1	1	1				1	1	1	35	35	35	37	37	43	51	51	51	57	57	57
<i>Rhus copallinum</i>	Shining sumac	Shrub Tree																		2						
<i>Rhus typhina</i>	Staghorn Sumac	Shrub																		3						
<i>Salix nigra</i>	Black willow	Tree															2									
<i>Sambucus Canadensis</i>	Common Elderberry	Shrub Tree																		1						
Stem count			13	13	156	12	12	194	15	15	115	10	10	131	590	590	4384	621	621	4342	726	726	1936	869	869	870
Size (ares)			1			1			1			1			56			56			56			56		
Size (ACRES)			0.0247			0.0247			0.0247			0.0247			1.38			1.38			1.38			1.38		
Species count			5	5	6	7	7	9	5	5	6	7	7	9	10	10	15	9	9	19	9	9	15	9	9	9
Stems per ACRE			526	526	6316	486	486	7854	607	607	4656	405	405	5304	427	427	3169	449	449	3139	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 11b. Baseline Stream Data Summary

Area B - Pre-Restoration Condition

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

Area B

Parameter	Gage	Pre-Restoration Condition																											
		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 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)	N/A	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)		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)	N/A	0.0179		0.0250		0.0208		0.0812		0.0204		0.0198		0.0320		0.0150		0.0175		0.0200		---		0.0270		0.0458			
Riffle Slope (ft/ft)																													
Pool Length (ft)																													
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	
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	
Pool Volume (ft ³)																													
Pattern																													
Channel Beltwidth (ft)	N/A	3		40		4		20		11		26		9		13		21		43		39		43		4		37	
Radius of Curvature (ft)		7		74		5		23		6		25		6		25		53		98		100		130		2		23	
Rc:Bankfull Width (ft/ft)		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	
Meander Length (ft)		54		166		45		56		44		102		44		102		249		336		318		336		28		136	
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	
Substrate, Bed and Transport Parameters																													
Ri%/Ru%/P%/G%/S%	N/A																												
SC%/Sa%/G%/C%/B%/Be%																													
d16/d35/d50/d84/d95/d100		---		---		---		---		---		---		---		---		---		---		---		---		---			
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	0.13		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		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)		---		---		---		---		---		---		---		---		---		---		---		---					
Q-USGS extrapolation (1.2-yr)		11		2		7		1		144		162		---		43		45		7		9		21					
Q-Mannings		15		9		12		2.4		9		46		44		---		73		53		11		20		40			
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 3 - 2020

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 3 - 2020

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 Elliott 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	Min
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 (%)																									
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 3 - 2020

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	
Riffle Slope (ft/ft)		0.0133 0.0512		0.0063 0.0177		---		0.0054 0.0086		0.0055 0.0792		0.0019 0.0651	
Pool Length (ft)						---		---		54.2		94.3	
Pool Max Depth (ft)		4.1		3.2		6.0		6.2		3.9		6.2	
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 3 - 2020

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)	N/A	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	N/A	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	N/A	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)	N/A	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	N/A	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	N/A	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	N/A	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)	N/A																								
Riffle Length (ft)	N/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---						
Riffle Slope (ft/ft)	N/A	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)	N/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---						
Pool Max Depth (ft)	N/A	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)	N/A	9	58	28	63	27	73	260	345	71	29	88	35	108	---	3	4	---	9	55	26	81			
Pool Volume (ft ³)	N/A																								
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)	N/A	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)	N/A	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---						
Meander Length (ft)	N/A	31	34	45	72	45	81	600	623	46	48	39	76	78	200	---	---	27	94	63	72	---			
Meander Width Ratio	N/A	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%	N/A																								
d16/d35/d50/d84/d95/d100	N/A	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	N/A																								
Max part size (mm) mobilized at bankfull	N/A																								
Stream Power (Capacity) W/m ²	N/A																								
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 (%)	N/A	---	---	---	---	---	---	---	---	---	---	---	---												
Rosgen Classification	N/A	E5b	E4	E4	E4	E4	C4	B4c	E4	B4a	A4	E4	E4b												
Bankfull Velocity (fps)	N/A	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)	N/A	12	30	40	51	97	94.9	159	224	18.7	23.2	19	85												
Q-NFF regression (2-yr)	N/A	---	---	---	---	---	---	---	---	---	---	---	---												
Q-USGS extrapolation (1.2-yr)	N/A	---	---	---	---	---	---	---	---	---	---	---	---												
Q-Mannings	N/A	---	---	---	---	---	---	---	---	---	---	---	---												
Valley Length (ft)	N/A	---	---	---	---	---	---	---	---	---	---	---	---												
Channel Thalweg Length (ft)	N/A	---	---	---	---	---	---	---	---	---	---	---	---												
Sinuosity	N/A	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	N/A	---	---	---	---	---	---	---	---	---	---	---	---												
Bankfull Slope (ft/ft)	N/A	---	---	---	---	---	---	---	---	---	---	---	---												

SC: Silt/Clay <0.062 mm diameter particles
 (---): Data 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 3 - 2020

AREA A

Dimension ¹ and Substrate	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					
	Base (3/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5	Base (3/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5	Base (3/2018)	MY1 (11/2018)	MY2 (09/2019)	MY3 (10/2020)	MY4	MY5	Base (3/2018)	MY1 (11/2018)	MY2 (09/2019)	MY3 (10/2020)	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3 (06/2020)	MY4	MY5
Bankfull Elevation (ft)	929.2	929.0	929.2	929.5			928.7	928.7	928.7	928.9			921.0	921.2	921.1	921.1			920.8	921.0	920.5	919.1			900.1	900.2	899.9	899.8		
Low Bank Elevation (ft)	929.2	929.0	929.2	929.2			928.7	928.7	928.7	928.9			921.0	921.2	921.1	921.1			920.8	921.0	920.5	920.9			900.1	900.2	899.9	899.8		
Bankfull Width (ft)	16.0	10.4	13.4	10.4			13.5	12.2	13.3	11.4			12.0	16.1	15.2	15.4			11.3	18.2	13.8	18.9			17.0	19.2	11.9	10.9		
Floodprone Width (ft)	108.7	104.1	89.3	89.2			N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A			170.3	118.6	63.4	67.5			N/A	N/A	N/A	N/A		
Bankfull Mean Depth (ft)	0.7	0.6	0.6	0.8			1.4	0.9	1.2	1.5			1.2	1.7	1.8	2.1			1.6	2.4	1.3	2.3			1.4	1.1	1.4	1.2		
Bankfull Max Depth (ft)	1.5	1.4	1.9	2.0			3.1	1.7	2.8	2.9			1.9	4.0	3.7	4.3			3.0	4.2	2.4	4.0			2.7	2.7	2.7	2.3		
Bankfull Cross-Sectional Area (ft)	11.6	6.6	8.2	8.3			19.3	11.0	16.5	16.5			14.0	27.0	27.2	33.1			17.7	44.1	18.4	44.0			23.5	20.6	17.2	12.9		
Bankfull Width/Depth Ratio	22.0	16.5	21.7	13.1			N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A			7.3	7.5	10.4	8.1			N/A	N/A	N/A	N/A		
Bankfull Entrenchment Ratio ³	6.8	10.0	6.7	8.6			N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A			15.0	6.5	4.6	3.6			N/A	N/A	N/A	N/A		
Bankfull Bank Height Ratio	1.0	0.8	0.9	0.9			N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A			1.0	1.8	1.0	1.8			N/A	N/A	N/A	N/A		
Dimension ¹ and Substrate	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)					
	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5
Bankfull Elevation (ft)	899.7	899.7	899.7	899.8			896.5	896.5	896.6	896.6			896.0	895.9	895.8	896.0			965.0	965.0	965.0	965.3			961.5	961.4	961.3	961.4		
Low Bank Elevation (ft)	899.7	899.7	899.7	899.7			896.5	896.5	896.6	896.6			896.0	895.9	895.8	896.0			965.0	965.0	965.0	964.9			961.5	961.4	961.3	961.4		
Bankfull Width (ft)	15.5	16.2	14.9	14.9			16.0	15.7	15.4	16.2			20.9	16.9	15.6	18.2			10.0	9.4	8.3	4.1			12.3	11.2	8.8	11.0		
Floodprone Width (ft)	118.0	110.8	119.2	121.7			190.0	167.4	137.2	137.3			N/A	N/A	N/A	N/A			46.7	46.1	39.5	39.6			N/A	N/A	N/A	N/A		
Bankfull Mean Depth (ft)	0.8	0.6	0.8	0.8			1.1	0.9	1.1	1.1			1.5	1.8	1.5	1.7			0.4	0.4	0.2	0.2			0.9	0.9	0.8	0.9		
Bankfull Max Depth (ft)	1.4	1.3	1.5	1.6			2.0	2.0	2.0	2.3			3.3	3.7	3.0	3.8			0.8	0.8	0.4	0.4			1.9	1.8	1.7	1.9		
Bankfull Cross-Sectional Area (ft)	13.1	10.5	12.0	12.1			17.6	14.7	17.7	17.1			31.6	31.0	22.8	30.9			3.6	3.7	1.8	1.0			11.0	9.7	7.4	9.5		
Bankfull Width/Depth Ratio	18.3	25.1	18.4	18.5			14.5	16.6	13.4	15.3			N/A	N/A	N/A	N/A			27.6	24.1	39.0	16.7			N/A	N/A	N/A	N/A		
Bankfull Entrenchment Ratio ³	7.6	6.8	8.0	8.1			11.9	10.7	8.9	8.5			N/A	N/A	N/A	N/A			4.7	4.9	4.8	9.6			N/A	N/A	N/A	N/A		
Bankfull Bank Height Ratio	1.0	0.9	1.0	1.0			1.0	0.9	1.0	1.0			N/A	N/A	N/A	N/A			1.0	1.0	0.7	0.5			N/A	N/A	N/A	N/A		
Dimension ¹ and Substrate	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)											
	Base (4/2018)	MY1 (10/2018)	MY2 (08/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (08/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (10/2018)	MY2 (07/2019)	MY3 (06/2020)	MY4	MY5
Bankfull Elevation (ft)	894.8	894.7	894.8	893.5			890.1	890.2	890.0	889.8			862.2	862.2	862.2	862.7			861.6	861.4	861.9	861.9			861.6	861.4	861.9	861.9		
Low Bank Elevation (ft)	894.8	894.7	894.8	894.8			890.1	890.2	890.0	889.8			862.2	862.2	862.2	862.3			861.6	861.4	861.9	861.9			861.6	861.4	861.9	861.9		
Bankfull Width (ft)	6.8	8.7	13.6	13.6			13.7	13.9	12.5	11.4			11.4	11.3	8.6	7.0			12.7	10.2	11.5	8.7			12.7	10.2	11.5	8.7		
Floodprone Width (ft)	67.1	44.8	45.2	44.5			N/A	N/A	N/A	N/A			82.0	82.1	71.2	79.2			N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A		
Bankfull Mean Depth (ft)	0.5	0.6	1.3	1.2			1.1	0.9	1.1	1.0			0.7	0.6	0.6	0.7			1.1	0.9	0.8	1.0			1.1	0.9	0.8	1.0		
Bankfull Max Depth (ft)	0.9	1.2	2.2	2.1			2.1	1.7	2.1	1.9			1.3	1.2	1.1	1.2			2.0	1.8	1.9	2.0			2.0	1.8	1.9	2.0		
Bankfull Cross-Sectional Area (ft)	3.6	5.1	18.1	16.2			14.9	12.2	13.4	10.9			7.9	7.0	4.9	4.7			13.4	9.4	9.4	8.5			13.4	9.4	9.4	8.5		
Bankfull Width/Depth Ratio	12.7	15.0	10.2	11.4			N/A	N/A	N/A	N/A			16.4	18.2	15.0	10.3			N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A		
Bankfull Entrenchment Ratio ³	9.9	5.1	3.3	3.3			N/A	N/A	N/A	N/A			7.2	7.3	8.3	11.3			N/A	N/A	N/A	N/A			N/A	N/A	N/A	N/A		
Bankfull Bank Height Ratio	1.0	1.2	2.6	2.5			N/A	N/A	N/A	N/A			1.0	0.9	0.8	0.7			N/A	N/A	N/A	N/A			N/A	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 3 - 2020

AREA B

Dimension ¹ and Substrate	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)					
	Base (4/2018)	MY1 (11/2018) ¹	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (04/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (04/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (04/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5
Bankfull Elevation (ft)	979.1	979.1	979.1	979.2			934.0	934.0	933.9	934.1			932.1	932.1	932.0	932.3			930.9	930.7	931.0	931.3			928.9	928.7	928.8	928.9			925.7	925.6	925.5	925.9		
Low Bank Elevation (ft)	979.1	979.1	979.1	979.0			934.0	934.0	933.9	934.1			932.1	932.1	932.0	932.2			930.9	930.7	931.0	931.0			928.9	928.7	928.8	928.9			925.7	925.6	925.5	925.6		
Bankfull Width (ft)	6.7	7.7	7.8	6.3			17.4	18.0	17.2	17.6			18.4	18.3	15.6	18.6			18.1	16.4	17.2	17.7			20.8	20.9	20.1	21.4			15.9	16.6	14.6	15.4		
Floodprone Width (ft)	37.2	37.0	35.8	35.8			N/A	N/A	N/A	N/A			169.2	167.8	93.6	93.6			172.1	166.3	86.0	86.0			N/A	N/A	N/A	N/A			173.2	191.0	108.0	108.1		
Bankfull Mean Depth (ft)	0.7	0.6	0.6	0.6			1.5	1.2	1.1	1.0			1.0	1.0	0.9	0.9			1.1	1.0	1.0	0.8			1.9	1.6	1.1	1.0			1.2	1.1	1.0	0.9		
Bankfull Max Depth (ft)	0.9	0.9	1.0	1.0			2.3	2.1	1.7	1.7			1.7	1.7	1.6	1.7			1.7	1.5	1.8	1.9			3.5	3.9	2.4	2.6			1.8	1.8	1.8	1.7		
Bankfull Cross-Sectional Area (ft)	4.7	4.8	4.7	3.6			26.3	22.0	18.5	17.6			19.2	18.4	14.0	17.5			19.1	16.1	17.5	14.8			39.3	34.3	21.5	21.8			18.9	18.2	13.9	14.5		
Bankfull Width/Depth Ratio	9.6	12.3	12.7	11.2			N/A	N/A	N/A	N/A			17.8	18.1	17.5	19.9			17.2	16.7	17.0	21.2			N/A	N/A	N/A	N/A			13.3	15.1	15.2	16.4		
Bankfull Entrenchment Ratio ²	5.5	4.8	4.6	5.7			N/A	N/A	N/A	N/A			9.2	9.2	6.0	5.0			9.5	10.2	5.0	4.9			N/A	N/A	N/A	N/A			10.9	11.5	7.4	7.0		
Bankfull Bank Height Ratio	1.0	1.0	1.0	0.9			N/A	N/A	N/A	N/A			1.0	1.0	0.8	0.9			1.0	0.9	0.9	0.9			N/A	N/A	N/A	N/A			1.0	1.0	0.8	0.9		
Dimension ¹ and Substrate	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)					
	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5
Bankfull Elevation (ft)	919.8	919.8	919.9	919.8			919.4	919.3	919.4	919.4			917.5	917.6	917.5	917.3			972.1	972.2	972.2	972.2			970.5	970.5	970.6	970.7			970.1	970.1	970.1	970.2		
Low Bank Elevation (ft)	919.8	919.8	919.9	919.8			919.4	919.3	919.4	919.3			917.5	917.6	917.5	917.6			972.1	972.2	972.2	972.3			970.5	970.5	970.6	970.7			970.1	970.1	970.1	970.3		
Bankfull Width (ft)	21.8	22.3	21.9	21.6			18.3	16.3	19.8	18.2			16.7	16.2	16.3	17.1			6.4	7.1	7.9	7.3			7.6	8.9	10.6	9.7			8.2	8.6	8.8	8.5		
Floodprone Width (ft)	N/A	N/A	N/A	N/A			192.7	221.2	83.2	83.2			148.5	130.5	81.6	81.8			19.0	21.6	19.8	17.6			N/A	N/A	N/A	N/A			19.6	18.3	18.2	20.5		
Bankfull Mean Depth (ft)	2.1	1.7	1.9	1.7			1.2	1.2	1.2	1.2			1.1	1.2	1.2	1.3			0.6	0.6	0.5	0.6			1.5	0.9	1.2	1.0			0.7	0.6	0.6	0.8		
Bankfull Max Depth (ft)	5.2	3.8	4.2	3.7			2.2	2.6	2.5	2.7			2.0	2.2	2.5	2.9			0.9	1.0	0.9	1.1			1.9	1.5	2.0	1.5			0.9	0.9	1.1	1.3		
Bankfull Cross-Sectional Area (ft)	45.1	38.4	42.1	36.8			22.4	19.4	22.9	21.5			19.1	20.0	18.8	22.9			4.1	4.1	4.2	4.7			11.2	8.0	12.2	9.4			5.6	5.1	5.0	6.8		
Bankfull Width/Depth Ratio	N/A	N/A	N/A	N/A			14.9	13.7	17.1	15.4			14.6	13.1	14.1	12.7			10.1	12.3	14.9	11.3			N/A	N/A	N/A	N/A			11.9	14.5	15.6	10.6		
Bankfull Entrenchment Ratio ²	N/A	N/A	N/A	N/A			10.5	13.6	4.2	4.6			8.9	8.1	5.0	4.8			2.9	3.0	2.5	2.4			N/A	N/A	N/A	N/A			2.4	2.1	2.1	2.4		
Bankfull Bank Height Ratio	N/A	N/A	N/A	N/A			1.0	0.9	1.0	1.0			1.0	1.0	1.0	1.1			1.0	1.0	1.0	1.2			N/A	N/A	N/A	N/A			1.0	1.0	0.9	1.1		

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 3 - 2020

AREA B

Dimension ¹ and Substrate	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)					
	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5	Base (4/2018)	MY1 (11/2018)	MY2 (06/2019)	MY3 (06/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (03/2020)	MY4	MY5	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (03/2020)	MY4	MY5
Bankfull Elevation (ft)	976.8	976.7	976.7	976.8			966.8	966.7	966.7	966.9			926.9	926.9	927.1	927.5			926.9	926.9	926.9	927.0			969.5	969.5	969.6	969.6			969.1	969.2	969.0	969.0		
Low Bank Elevation (ft)	976.8	976.7	976.7	976.7			966.8	966.7	966.7	966.7			926.9	926.9	927.1	927.4			926.9	926.9	926.9	926.9			969.5	969.5	969.6	969.6			969.1	969.2	969.0	969.0		
Bankfull Width (ft)	5.2	4.9	5.5	5.4			9.3	6.4	6.5	6.6			7.9	8.1	6.7	5.5			7.2	7.4	7.9	7.6			11.4	11.2	11.5	11.6			12.3	13.6	11.8	9.2		
Floodprone Width (ft)	14.0	14.2	13.3	14.3			23.6	21.1	20.4	20.1			25.0	26.0	23.0	43.5			63.8	62.8	45.3	45.2			91.8	91.7	77.7	77.8			N/A	N/A	N/A	N/A		
Bankfull Mean Depth (ft)	0.5	0.5	0.4	0.4			0.4	0.4	0.3	0.3			0.5	0.4	0.3	0.6			0.5	0.5	0.4	0.4			0.7	0.7	0.7	0.7			1.4	1.3	1.0	0.9		
Bankfull Max Depth (ft)	0.8	0.9	0.8	0.9			0.7	0.6	0.6	0.6			0.9	0.9	0.6	1.1			0.8	0.8	0.7	0.8			1.1	1.1	1.1	1.2			2.6	2.7	1.8	1.1		
Bankfull Cross-Sectional Area (ft ²)	2.5	2.5	2.5	2.2			3.3	2.4	2.2	2.2			3.8	3.5	2.0	3.0			3.7	3.6	3.3	2.9			8.2	7.8	7.9	7.8			17.1	18.0	11.8	7.9		
Bankfull Width/Depth Ratio	10.7	9.7	12.4	13.2			26.5	17.2	19.3	19.8			16.5	18.6	22.5	9.9			14.0	15.5	18.6	19.4			15.7	16.0	16.8	17.2			N/A	N/A	N/A	N/A		
Bankfull Entrenchment Ratio ⁵	2.7	2.9	2.4	2.6			2.5	3.3	3.1	3.0			3.2	3.2	3.4	8.0			8.8	8.4	5.8	6.0			8.1	8.2	6.7	6.7			N/A	N/A	N/A	N/A		
Bankfull Bank Height Ratio	1.0	1.0	1.0	0.9			1.0	0.8	0.8	0.8			1.0	1.0	0.7	1.0			1.0	1.0	0.9	0.9			1.0	1.0	1.0	1.0			N/A	N/A	N/A	N/A		
Dimension ¹ and Substrate	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					
	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (03/2020)	MY4	MY5	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (03/2020)	MY4	MY5	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (03/2020)	MY4	MY5	Base (10/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (03/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5	Base (3/2018)	MY1 (06/2019)	MY2 (03/2020)	MY3 (03/2020)	MY4	MY5
Bankfull Elevation (ft)	965.9	966.0	965.9	966.1			965.5	965.5	965.5	965.6			960.5	960.4	960.5	960.5			960.1	960.1	960.1	960.4			919.4	919.3	919.5	919.5			918.9	918.8	919.3	919.4		
Low Bank Elevation (ft)	965.9	966.0	965.9	966.1			965.5	965.5	965.5	965.6			960.5	960.4	960.5	960.5			960.1	960.1	960.1	960.4			919.4	919.3	919.5	919.4			918.9	918.8	919.3	919.4		
Bankfull Width (ft)	13.2	13.4	13.2	14.0			12.0	12.3	12.5	12.1			11.5	11.7	12.6	12.1			14.7	14.2	14.2	15.5			12.3	12.8	13.3	10.4			11.2	10.5	12.4	11.5		
Floodprone Width (ft)	N/A	N/A	N/A	N/A			72.0	69.1	70.6	69.8			99.5	96.4	85.5	85.7			N/A	N/A	N/A	N/A			26.4	25.3	27.3	26.9			N/A	N/A	N/A	N/A		
Bankfull Mean Depth (ft)	1.2	1.2	1.0	1.0			0.8	0.7	0.7	0.7			0.8	0.8	0.7	0.7			1.5	1.3	1.3	1.5			0.8	0.7	1.0	0.9			0.7	0.6	1.0	1.0		
Bankfull Max Depth (ft)	2.3	2.3	1.9	1.8			1.4	1.2	1.4	1.4			1.4	1.4	1.4	1.5			2.8	2.8	2.7	3.1			1.1	1.0	1.3	1.2			1.1	1.0	1.5	1.5		
Bankfull Cross-Sectional Area (ft ²)	16.1	15.7	13.2	13.3			9.2	8.1	8.3	8.5			9.5	9.4	9.1	8.8			21.5	18.5	17.7	22.7			9.7	9.6	12.8	9.3			7.7	6.5	12.4	11.3		
Bankfull Width/Depth Ratio	N/A	N/A	N/A	N/A			15.6	18.7	18.9	17.1			14.0	14.7	17.3	16.7			N/A	N/A	N/A	N/A			15.7	17.1	13.8	11.7			N/A	N/A	N/A	N/A		
Bankfull Entrenchment Ratio ⁵	N/A	N/A	N/A	N/A			6.0	5.6	5.6	5.8			8.6	8.2	6.8	7.1			N/A	N/A	N/A	N/A			2.1	2.0	2.1	2.6			N/A	N/A	N/A	N/A		
Bankfull Bank Height Ratio	N/A	N/A	N/A	N/A			1.0	0.9	1.0	1.0			1.0	1.0	1.0	1.0			N/A	N/A	N/A	N/A			1.0	1.0	1.2	1.0			N/A	N/A	N/A	N/A		
Dimension ¹ and Substrate	Cross-Section 39, LFC R2 (Riffle) ⁴						Cross-Section 40, LFC R2 (Pool)																													
	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5	Base (3/2018)	MY1 (10/2018)	MY2 (06/2019)	MY3 (03/2020)	MY4	MY5																								
Bankfull Elevation (ft)	915.9	915.9	915.9	916.0			916.0	915.9	915.9	915.9																										
Low Bank Elevation (ft)	915.9	915.9	915.9	916.1			916.0	915.9	915.9	915.9																										
Bankfull Width (ft)	9.9	9.8	9.1	10.1			11.5	10.9	10.4	10.0																										
Floodprone Width (ft)	28.4	28.6	29.6	30.5			N/A	N/A	N/A	N/A																										
Bankfull Mean Depth (ft)	0.6	0.5	0.6	0.8			1.0	0.9	1.2	1.2																										
Bankfull Max Depth (ft)	0.8	0.9	1.2	1.1			1.5	1.3	1.8	1.6																										
Bankfull Cross-Sectional Area (ft ²)	6.3	4.6	5.9	7.6			11.8	9.6	12.1	11.9																										
Bankfull Width/Depth Ratio	15.4	20.5	14.2	13.4			N/A	N/A	N/A	N/A																										
Bankfull Entrenchment Ratio ⁵	2.9	2.9	3.2	3.0			N/A	N/A	N/A	N/A																										
Bankfull Bank Height Ratio	1.0	0.8	1.0	1.1			N/A	N/A	N/A	N/A																										

AREA C

Dimension ¹ and Substrate	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)					
	Base (9/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (05/2020)	MY4	MY5	Base (9/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (05/2020)	MY4	MY5	Base (9/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (05/2020)	MY4	MY5	Base (9/2017)	MY1 (10/2018)	MY2 (08/2019)	MY3 (05/2020)	MY4	MY5
Bankfull Elevation (ft)	848.0	847.5	847.9	848.2			847.6	847.5	847.8	848.0			844.2	844.2	844.2	843.6			843.5	843.7	843.5	842.9		
Low Bank Elevation (ft)	848.0	847.5	847.9	848.2			847.6	847.5	847.8	848.3			844.2	844.2	844.2	844.2			843.5	843.7	843.5	842.9		
Bankfull Width (ft)	41.6	24.0	24.7	24.6			26.2	25.7	28.3	30.7			26.7	27.2	29.4	30.4			26.8	27.2	30.8	22.8		
Floodprone Width (ft)	N/A	N/A	N/A	N/A			158.0	155.7	77.9	78.0			299.6	171.0	84.9	84.9			N/A	N/A	N/A	N/A		
Bankfull Mean Depth (ft)	2.5	1.4	1.7	2.0			1.9	1.5	1.7	1.8			1.7	1.9	2.1	2.0			2.8	3.3	2.4	2.5		
Bankfull Max Depth (ft)	5.8	2.6	3.2	3.7			3.0	2.9	3.3	3.6			2.8	3.3	3.6	3.5			5.5	7.8	4.2	3.7		
Bankfull Cross-Sectional Area (ft ²)	104.7	33.5	42.8	50.2			49.4	38.7	49.3	55.6			46.0	51.5	60.8	62.1			75.4	91.0	75.2	57.7		
Bankfull Width/Depth Ratio	N/A	N/A	N/A	N/A			13.9	17.1	16.2	16.9			15.5	14.3	14.2	14.9			N/A	N/A	N/A	N/A		
Bankfull Entrenchment Ratio ⁵	N/A	N/A	N/A	N/A			6.0	6.1	2.8	2.5			11.2	6.3	2.9	2.8			N/A	N/A	N/A	N/A		
Bankfull Bank Height Ratio	N/A	N/A	N/A	N/A			1.0	0.9	1.0	1.1			1.0	1.1	1.2	1.2			N/A	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 pins

Table 13a. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	16.0		10.4		13.4		10.4					
Floodprone Width (ft)	108.7		104.1		89.3		89.2					
Bankfull Mean Depth	0.7		0.6		0.6		0.8					
Bankfull Max Depth	1.5		1.4		1.9		2.0					
Bankfull Cross-Sectional Area (ft ²)	11.6		6.6		8.2		8.3					
Width/Depth Ratio	22.0		16.5		21.7		13.1					
Entrenchment Ratio ¹	6.8		10		6.7		8.6					
Bank Height Ratio ²	1.0		0.8		0.9		0.9					
D50 (mm)	44.2		30.6		52.4		9.9					
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) ⁴	---						0.011					
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%		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).

⁴Water surface slopes are based on abbreviated longitudinal profiles of one meander length collected during MY3 after geomorphically significant events.

Table 13b. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	11.3		18.2		13.8		18.9					
Floodprone Width (ft)	170.3		118.6		63.4		67.5					
Bankfull Mean Depth	1.6		2.4		1.3		2.3					
Bankfull Max Depth	3.0		4.2		2.4		4.0					
Bankfull Cross-Sectional Area (ft ²)	17.7		44.1		18.4		44.0					
Width/Depth Ratio	7.3		7.5		10.4		8.1					
Entrenchment Ratio ¹	15.0		6.5		4.6		3.6					
Bank Height Ratio ²	1.0		1.8		1.0		1.8					
D50 (mm)	83.8		1.4		0.8		1.6					
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%		7%					

(---): 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 3 - 2020

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 Substrate³												
Bankfull Width (ft)	15.5	16.0	15.7	16.2	14.9	15.4	14.9	16.2				
Floodprone Width (ft)	118.0	190.0	110.8	167.4	119.2	137.2	121.7	137.3				
Bankfull Mean Depth	0.8	1.1	0.6	0.9	0.8	1.1	0.8	1.1				
Bankfull Max Depth	1.4	2.0	1.3	2.0	1.5	2.0	1.6	2.3				
Bankfull Cross-Sectional Area (ft ²)	13.1	17.6	10.5	14.7	12.0	17.7	12.1	17.1				
Width/Depth Ratio	14.5	18.3	16.6	25.1	13.4	18.4	15.3	18.5				
Entrenchment Ratio ¹	7.6	11.9	6.8	10.7	8.0	8.9	8.1	8.5				
Bank Height Ratio ²	1.0	1.0	0.9	0.9	1.0	1.0	1.0	1.0				
D50 (mm)	46.2	85.6	26.9	32	50.6	69.7	43.6	75.2				
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%		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 13d. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	10.0		9.4		8.3		4.1					
Floodprone Width (ft)	46.7		46.1		39.5		39.6					
Bankfull Mean Depth	0.4		0.4		0.2		0.2					
Bankfull Max Depth	0.8		0.8		0.4		0.4					
Bankfull Cross-Sectional Area (ft ²)	3.6		3.7		1.8		1.0					
Width/Depth Ratio	27.6		24.1		39.0		16.7					
Entrenchment Ratio ¹	4.7		4.9		4.8		9.6					
Bank Height Ratio ²	1.0		1.0		0.7		0.5					
D50 (mm)	43.5		35.4		44.4		1.0					
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%		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 3 - 2020

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 Substrate³												
Bankfull Width (ft)	6.8		8.7		13.6		13.6					
Floodprone Width (ft)	67.1		44.8		45.2		44.5					
Bankfull Mean Depth	0.5		0.6		1.3		1.2					
Bankfull Max Depth	0.9		1.2		2.2		2.1					
Bankfull Cross-Sectional Area (ft ²)	3.6		5.1		18.1		16.2					
Width/Depth Ratio	12.7		15.0		10.2		11.4					
Entrenchment Ratio ¹	9.9		5.1		3.3		3.3					
Bank Height Ratio ²	1.0		1.2		2.6		2.5					
D50 (mm)	51.6		33.3		49.5		38.7					
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) ⁴	---						0.041					
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%		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).

⁴Water surface slopes are based on abbreviated longitudinal profiles of one meander length collected during MY3 after geomorphically significant events.

Table 13f. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	11.4		11.3		8.6		7.0					
Floodprone Width (ft)	82.0		82.1		71.2		79.2					
Bankfull Mean Depth	0.7		0.6		0.6		0.7					
Bankfull Max Depth	1.3		1.2		1.1		1.2					
Bankfull Cross-Sectional Area (ft ²)	7.9		7.0		4.9		4.7					
Width/Depth Ratio	16.4		18.2		15.0		10.3					
Entrenchment Ratio ¹	7.2		7.3		8.3		11.3					
Bank Height Ratio ²	1.0		0.9		0.8		0.7					
D50 (mm)	51		41.3		42.6		36.0					
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%		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 3 - 2020

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 Substrate³												
Bankfull Width (ft)	6.7		7.7		7.8		6.3					
Floodprone Width (ft)	37.2		37.0		35.8		35.8					
Bankfull Mean Depth	0.7		0.6		0.6		0.6					
Bankfull Max Depth	0.9		0.9		1.0		1.0					
Bankfull Cross-Sectional Area (ft ²)	4.7		4.8		4.7		3.6					
Width/Depth Ratio	9.6		12.3		12.7		11.2					
Entrenchment Ratio ¹	5.5		4.8		4.6		5.7					
Bank Height Ratio ²	1.0		1.0		1.0		0.9					
D50 (mm)	32.0		36.5		33.6		64.0					
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) ⁴	---						0.015					
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%		7%					

(---): 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).

⁴Water surface slopes are based on abbreviated longitudinal profiles of one meander length collected during MY3 after geomorphically significant events.

Table 13h. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	15.9	18.4	16.4	18.3	14.6	17.2	15.4	18.6				
Floodprone Width (ft)	169.2	173.2	166.3	191.0	86.0	108.0	86.0	108.1				
Bankfull Mean Depth	1.0	1.2	1.0	1.1	0.9	1.0	0.8	0.9				
Bankfull Max Depth	1.7	1.8	1.5	1.8	1.6	1.8	1.7	1.9				
Bankfull Cross-Sectional Area (ft ²)	18.9	19.2	16.1	18.4	13.9	17.5	14.5	17.5				
Width/Depth Ratio	13.3	17.8	15.1	18.1	15.2	17.5	16.4	21.2				
Entrenchment Ratio ¹	9.2	10.9	9.2	11.5	5.0	7.4	4.9	7.0				
Bank Height Ratio ²	1.0	1.0	0.8	1.0	0.8	0.9	0.9	0.9				
D50 (mm)	35.0	39.8	32.0	35.3	30.4	43.1	24.7	56.9				
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%		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 3 - 2020

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 Substrate³												
Bankfull Width (ft)	16.7	18.3	16.2	16.3	16.3	19.8	17.1	18.2				
Floodprone Width (ft)	148.5	192.7	130.5	221.2	81.6	83.2	81.8	83.2				
Bankfull Mean Depth	1.1	1.2	1.2	1.2	1.2	1.2	1.2	1.3				
Bankfull Max Depth	2.0	2.2	2.2	2.6	2.5	2.5	2.7	2.9				
Bankfull Cross-Sectional Area (ft)	19.1	22.4	19.4	20.0	18.8	22.9	21.5	22.9				
Width/Depth Ratio	14.6	14.9	13.1	13.7	14.1	17.1	12.7	15.4				
Entrenchment Ratio ¹	8.9	10.5	8.1	13.6	4.2	5.0	4.6	4.8				
Bank Height Ratio ²	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.1				
D50 (mm)	41.1	46.1	26.9	34	27.3	50.9	42.9	44.2				
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%		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 13j. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	6.4	8.2	7.1	8.6	7.9	8.8	7.3	8.5				
Floodprone Width (ft)	19.0	19.6	18.3	21.6	18.2	19.8	17.6	20.5				
Bankfull Mean Depth	0.6	0.7	0.6	0.6	0.5	0.6	0.6	0.8				
Bankfull Max Depth	0.9	0.9	0.9	1.0	0.9	1.1	1.1	1.3				
Bankfull Cross-Sectional Area (ft)	4.1	5.6	4.1	5.1	4.2	5.0	4.7	6.8				
Width/Depth Ratio	10.1	11.9	12.3	14.5	14.9	15.6	10.6	11.3				
Entrenchment Ratio ¹	2.4	2.9	2.1	3.0	2.1	2.5	2.4	2.4				
Bank Height Ratio ²	1.0	1.0	1.0	1.0	0.9	1.0	1.1	1.2				
D50 (mm)	32.0	41.7	23.9	49.1	46.9	75.9	11.0	14.1				
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) ⁴	---						0.007					
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%		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).

⁴Water surface slopes are based on abbreviated longitudinal profiles of one meander length collected during MY3 after geomorphically significant events.

Table 13k. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	5.2		4.9		5.5		5.4					
Floodprone Width (ft)	14.0		14.2		13.3		14.3					
Bankfull Mean Depth	0.5		0.5		0.4		0.4					
Bankfull Max Depth	0.8		0.9		0.8		0.9					
Bankfull Cross-Sectional Area (ft)	2.5		2.5		2.5		2.2					
Width/Depth Ratio	10.7		9.7		12.4		13.2					
Entrenchment Ratio ¹	2.7		2.9		2.4		2.6					
Bank Height Ratio ²	1.0		1.0		1.0		0.9					
D50 (mm)	31.0		36.8		26.4		3.1					
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) ⁴	---						0.025					
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%		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).

⁴Water surface slopes are based on abbreviated longitudinal profiles of one meander length collected during MY3 after geomorphically significant events.

Table 13I. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	9.3		6.4		6.5		6.6					
Floodprone Width (ft)	23.6		21.1		20.4		20.1					
Bankfull Mean Depth	0.4		0.4		0.3		0.3					
Bankfull Max Depth	0.7		0.6		0.6		0.6					
Bankfull Cross-Sectional Area (ft)	3.3		2.4		2.2		2.2					
Width/Depth Ratio	26.5		17.2		19.3		19.8					
Entrenchment Ratio ¹	2.5		3.3		3.1		3.0					
Bank Height Ratio ²	1.0		0.8		0.8		0.8					
D50 (mm)	53.7		29.0		44.2		13.9					
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) ⁴	---						0.023					
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%		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).

⁴Water surface slopes are based on abbreviated longitudinal profiles of one meander length collected during MY3 after geomorphically significant events.

Table 13m. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	7.9		8.1		6.7		5.5					
Floodprone Width (ft)	25.0		26.0		23.0		43.5					
Bankfull Mean Depth	0.5		0.4		0.3		0.6					
Bankfull Max Depth	0.9		0.9		0.6		1.1					
Bankfull Cross-Sectional Area (ft)	3.8		3.5		2.0		3.0					
Width/Depth Ratio	16.5		18.6		22.5		9.9					
Entrenchment Ratio ¹	3.2		3.2		3.4		8.0					
Bank Height Ratio ²	1.0		1.0		0.7		1					
D50 (mm)	14.9		0.5		1.3		0.7					
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%		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 3 - 2020

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 Substrate³												
Bankfull Width (ft)	7.2		7.4		7.9		7.6					
Floodprone Width (ft)	63.8		62.8		45.3		45.2					
Bankfull Mean Depth	0.5		0.5		0.4		0.4					
Bankfull Max Depth	0.8		0.8		0.7		0.8					
Bankfull Cross-Sectional Area (ft)	3.7		3.6		3.3		2.9					
Width/Depth Ratio	14.0		15.5		18.6		19.4					
Entrenchment Ratio ¹	8.8		8.4		5.8		6.0					
Bank Height Ratio ²	1.0		1.0		0.9		0.9					
D50 (mm)	14.4		18.9		S/C		19.6					
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%		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 3 - 2020

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 Substrate³												
Bankfull Width (ft)	11.4	12.0	11.2	12.3	11.5	12.6	11.6	12.1				
Floodprone Width (ft)	72.0	99.5	69.1	96.4	70.2	85.5	69.8	85.7				
Bankfull Mean Depth	0.7	0.8	0.7	0.8	0.7	0.7	0.7	0.7				
Bankfull Max Depth	1.1	1.4	1.1	1.4	1.1	1.4	1.2	1.5				
Bankfull Cross-Sectional Area (ft)	8.2	9.5	7.8	9.4	7.9	9.1	7.8	8.8				
Width/Depth Ratio	14.0	15.7	14.7	18.7	16.8	18.9	16.7	17.2				
Entrenchment Ratio ¹	6.0	8.6	5.6	8.2	5.6	6.8	5.8	7.1				
Bank Height Ratio ²	1.0	1.0	0.9	1.0	1.0	1.0	1.0	1.0				
D50 (mm)	39.1	54.8	33.4	39.5	39.5	58.3	37.1	67.0				
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%		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 3 - 2020

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 Substrate³												
Bankfull Width (ft)	12.3		12.8		13.3		10.4					
Floodprone Width (ft)	26.4		25.3		27.3		26.9					
Bankfull Mean Depth	0.8		0.7		1.0		0.9					
Bankfull Max Depth	1.1		1.0		1.3		1.2					
Bankfull Cross-Sectional Area (ft)	9.7		9.6		12.8		9.3					
Width/Depth Ratio	15.7		17.1		13.8		11.7					
Entrenchment Ratio ¹	2.1		2.0		2.1		2.6					
Bank Height Ratio ²	1.0		1.0		1.2		1					
D50 (mm)	35.3		10.4		50.6		32.7					
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%		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 3 - 2020

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 Substrate³												
Bankfull Width (ft)	9.9		9.8		9.1		10.1					
Floodprone Width (ft)	28.4		28.6		29.6		30.5					
Bankfull Mean Depth	0.6		0.5		0.6		0.8					
Bankfull Max Depth	0.8		0.9		1.2		1.1					
Bankfull Cross-Sectional Area (ft)	6.3		4.6		5.9		7.6					
Width/Depth Ratio	15.4		20.5		14.2		13.4					
Entrenchment Ratio ¹	2.9		2.9		3.2		3.0					
Bank Height Ratio ²	1.0		0.8		1.0		1.1					
D50 (mm)	11.0		8.4		43.9		40.2					
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%		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 13r. Monitoring Data - Stream Reach Data Summary

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

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 Substrate³												
Bankfull Width (ft)	26.2		25.7		28.3		30.7					
Floodprone Width (ft)	158.0		155.7		77.9		78.0					
Bankfull Mean Depth	1.9		1.5		1.7		1.8					
Bankfull Max Depth	3.0		2.9		3.3		3.6					
Bankfull Cross-Sectional Area (ft)	49.4		38.7		49.3		55.6					
Width/Depth Ratio	13.9		17.1		16.2		16.9					
Entrenchment Ratio ¹	6.0		6.1		2.8		2.5					
Bank Height Ratio ²	1.0		0.9		1.0		1.1					
D50 (mm)	32.0		20.3		51.2		39.6					
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%		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 3 - 2020

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 Substrate³												
Bankfull Width (ft)	26.7		27.2		29.4		30.4					
Floodprone Width (ft)	299.6		171.0		84.9		84.9					
Bankfull Mean Depth	1.7		1.9		2.1		2.0					
Bankfull Max Depth	2.8		3.3		3.6		3.5					
Bankfull Cross-Sectional Area (ft)	46.0		51.5		60.8		62.1					
Width/Depth Ratio	15.5		14.3		14.2		14.9					
Entrenchment Ratio ¹	11.2		6.3		2.9		2.8					
Bank Height Ratio ²	1.0		1.1		1.2		1.2					
D50 (mm)	87.4		47.7		61.5		85.4					
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) ⁴	---						0.007					
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%		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).

⁴ Water surface slopes are based on abbreviated longitudinal profiles of one meander length collected during MY3 after geomorphically significant events.

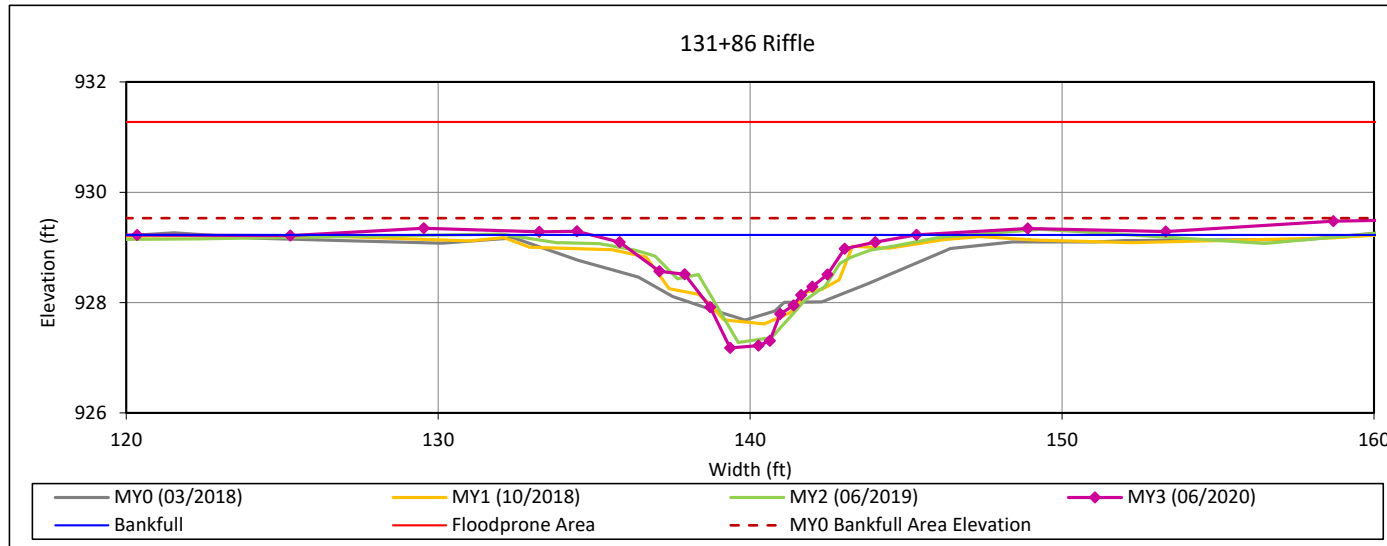
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

UBHC Reach 2A: Cross-Section 1



Bankfull Dimensions

8.3	x-section area (ft.sq.)
10.4	width (ft)
0.8	mean depth (ft)
2.0	max depth (ft)
11.7	wetted perimeter (ft)
0.7	hydraulic radius (ft)
13.1	width-depth ratio
89.2	W flood prone area (ft)
8.6	entrenchment ratio
0.9	low bank height ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

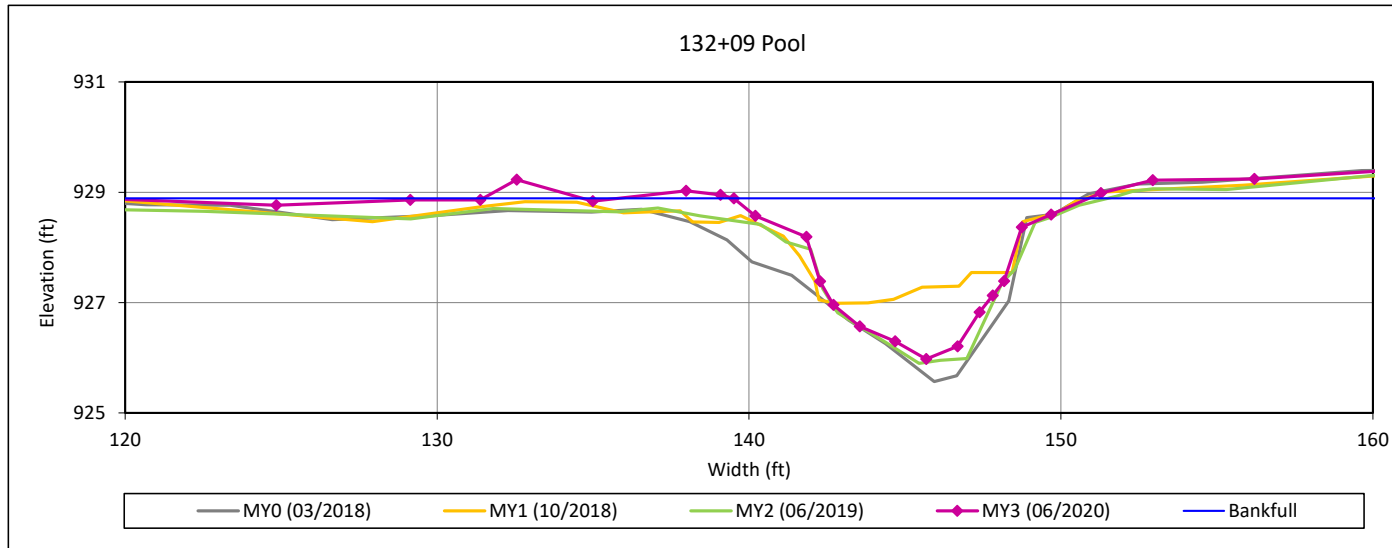
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

UBHC Reach 2A: Cross-Section 2



Bankfull Dimensions

16.5	x-section area (ft.sq.)
11.4	width (ft)
1.5	mean depth (ft)
2.9	max depth (ft)
13.4	wetted perimeter (ft)
1.2	hydraulic radius (ft)
7.9	width-depth ratio



View Downstream

Survey Date: 06/2020
Field Crew: Wildlands Engineering

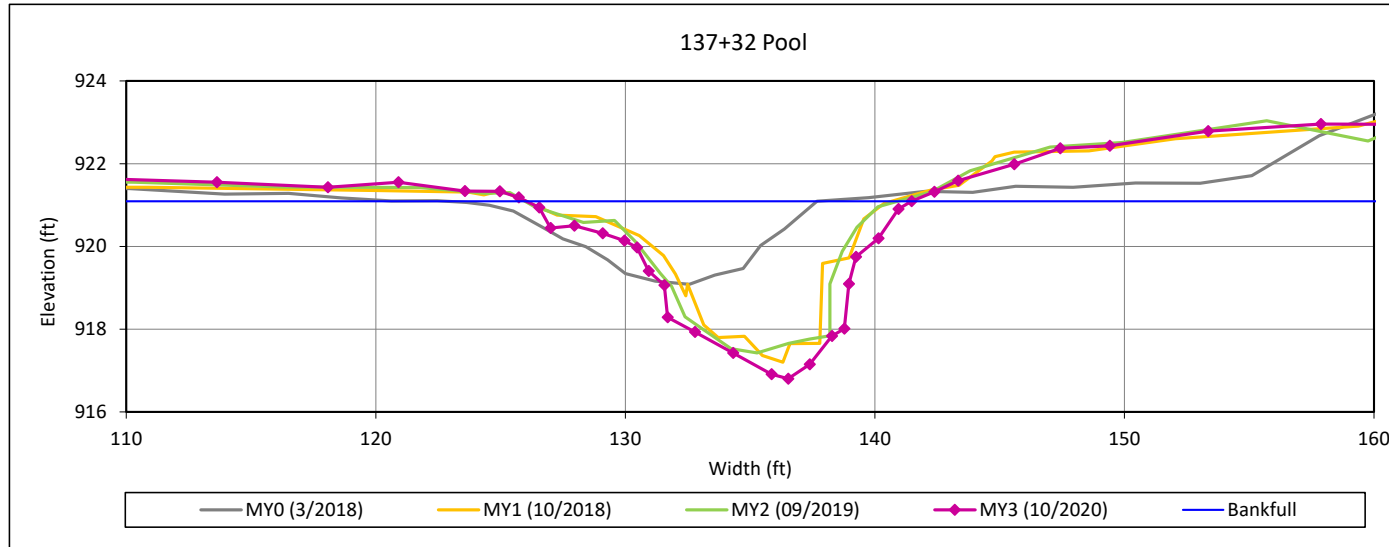
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

UBHC Reach 2B: Cross-Section 3



Bankfull Dimensions

33.1	x-section area (ft.sq.)
15.4	width (ft)
2.1	mean depth (ft)
4.3	max depth (ft)
19.0	wetted perimeter (ft)
1.7	hydraulic radius (ft)
7.2	width-depth ratio



View Downstream

Survey Date: 10/2020
Field Crew: Wildlands Engineering

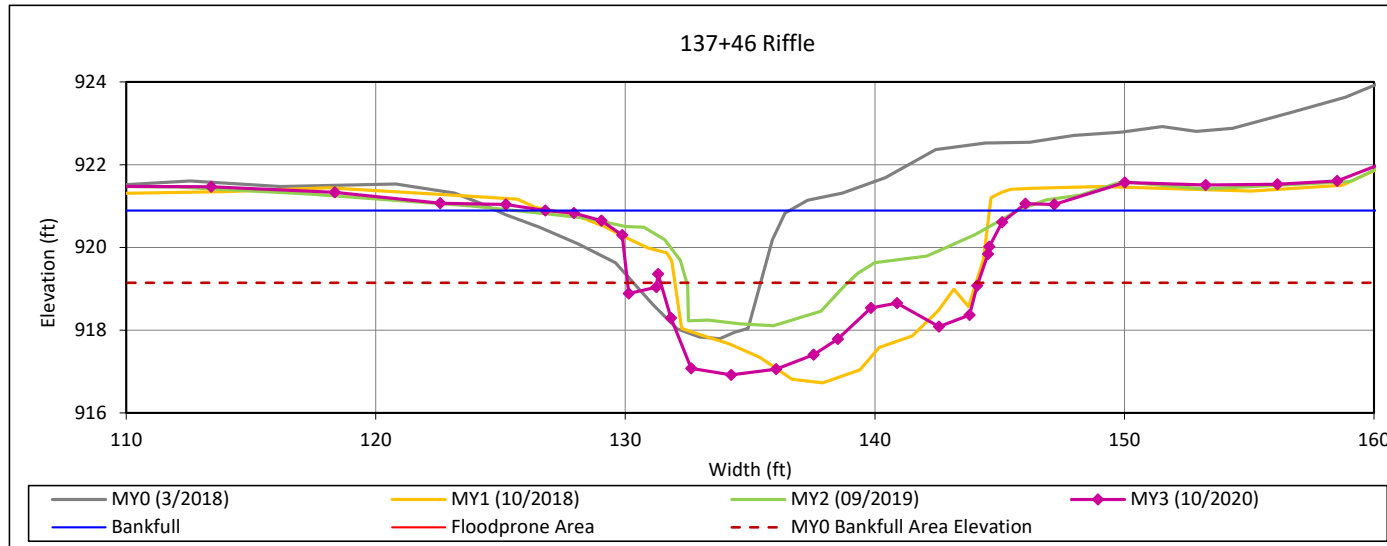
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

UBHC Reach 2B: Cross-Section 4



Bankfull Dimensions

44.0	x-section area (ft.sq.)
18.9	width (ft)
2.3	mean depth (ft)
4.0	max depth (ft)
23.6	wetted perimeter (ft)
1.9	hydraulic radius (ft)
8.1	width-depth ratio
67.5	W flood prone area (ft)
3.6	entrenchment ratio
1.8	low bank height ratio

Survey Date: 10/2020

Field Crew: Wildlands Engineering



View Downstream

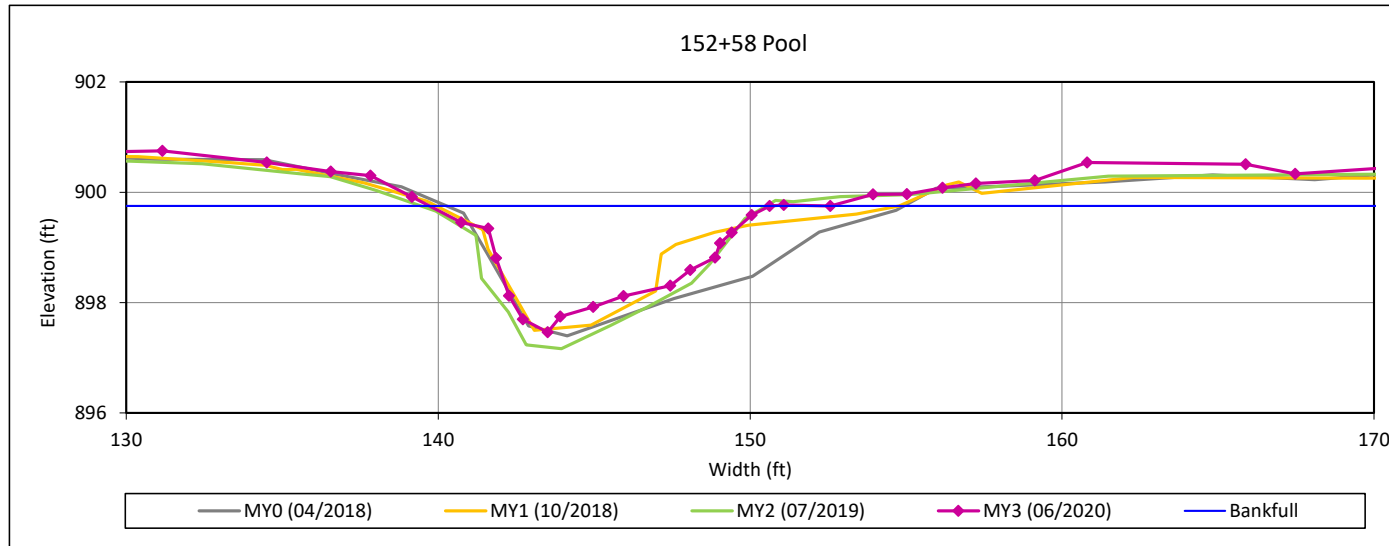
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

UBHC Reach 4: Cross-Section 5



Bankfull Dimensions

12.9	x-section area (ft.sq.)
10.9	width (ft)
1.2	mean depth (ft)
2.3	max depth (ft)
12.4	wetted perimeter (ft)
1.0	hydraulic radius (ft)
9.3	width-depth ratio



Survey Date: 06/2020
Field Crew: Wildlands Engineering

View Downstream

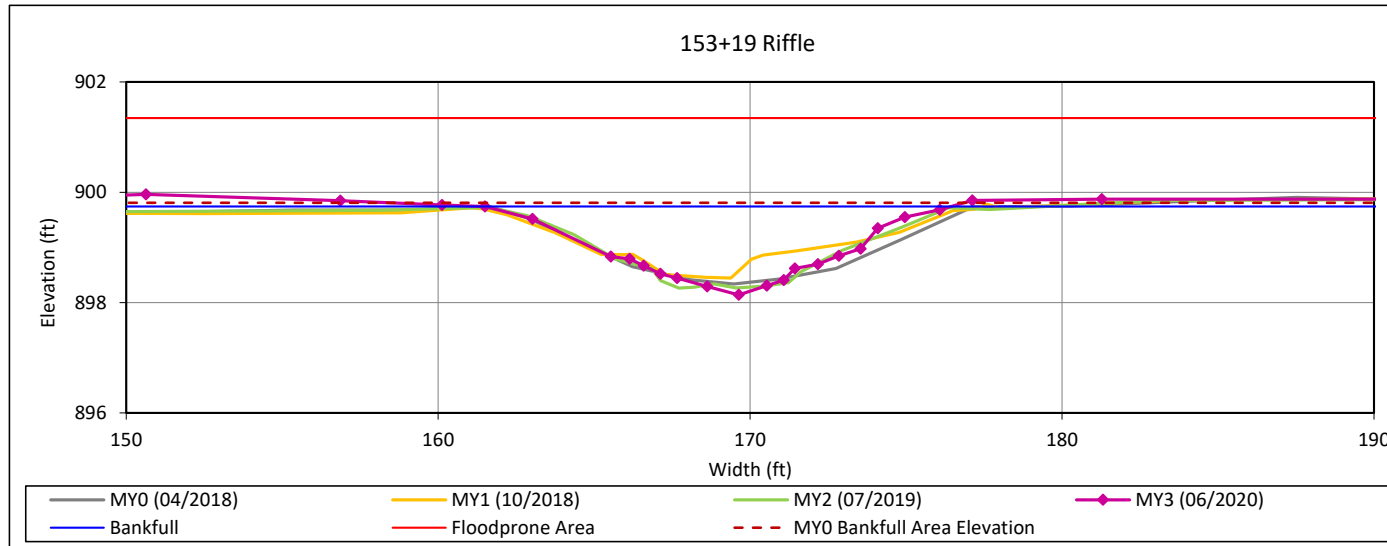
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

UBHC Reach 4: Cross-Section 6



Bankfull Dimensions

12.1	x-section area (ft.sq.)
14.9	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
15.4	wetted perimeter (ft)
0.8	hydraulic radius (ft)
18.5	width-depth ratio
121.7	W flood prone area (ft)
8.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

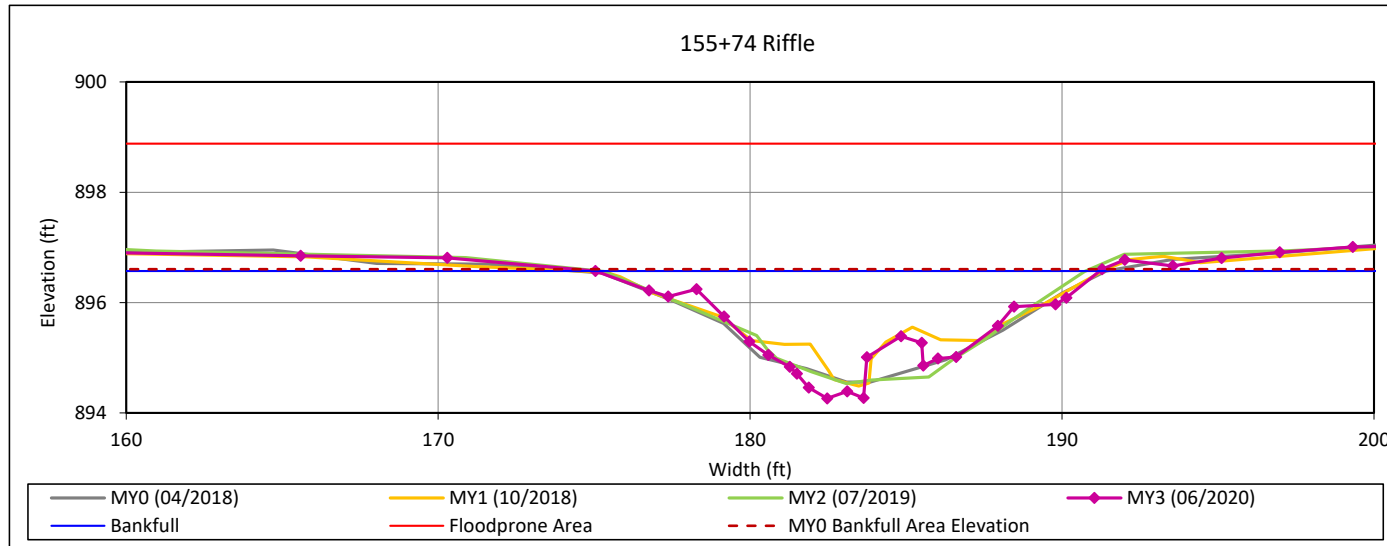
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

UBHC Reach 4: Cross-Section 7



Bankfull Dimensions

17.1	x-section area (ft.sq.)
16.2	width (ft)
1.1	mean depth (ft)
2.3	max depth (ft)
18.2	wetted perimeter (ft)
0.9	hydraulic radius (ft)
15.3	width-depth ratio
137.3	W flood prone area (ft)
8.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

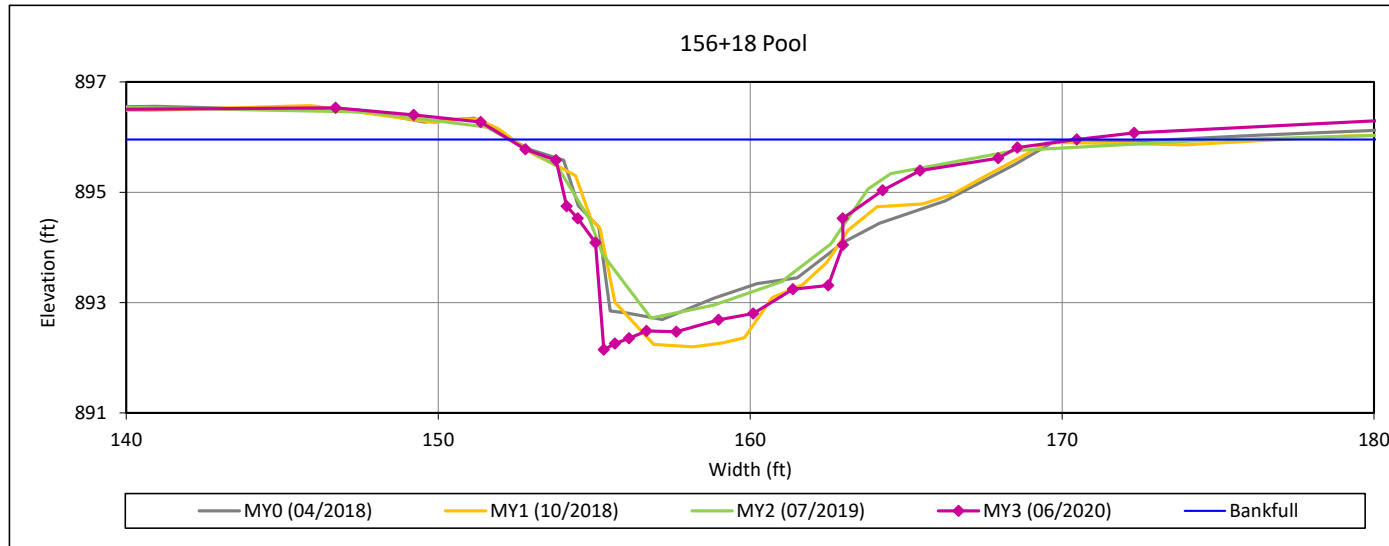
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

UBHC Reach 4: Cross-Section 8



Bankfull Dimensions

30.9	x-section area (ft.sq.)
18.2	width (ft)
1.7	mean depth (ft)
3.8	max depth (ft)
21.9	wetted perimeter (ft)
1.4	hydraulic radius (ft)
10.7	width-depth ratio



Survey Date: 06/2020
Field Crew: Wildlands Engineering

View Downstream

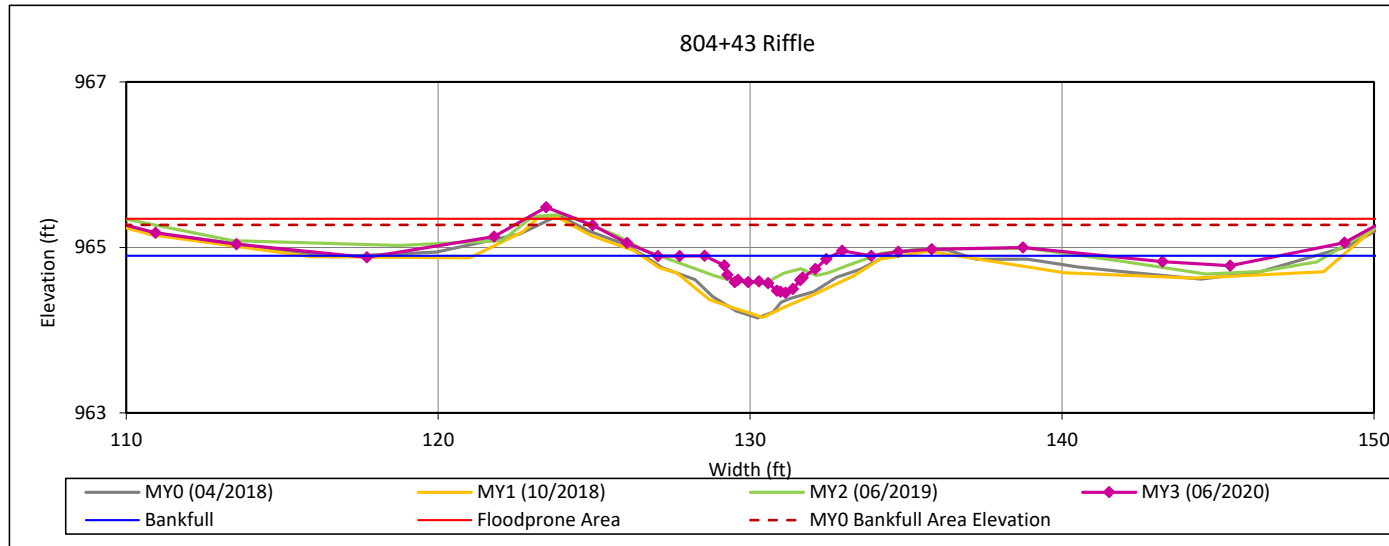
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

Royster Creek Reach 1: Cross-Section 9



Bankfull Dimensions

1.0	x-section area (ft.sq.)
4.1	width (ft)
0.2	mean depth (ft)
0.4	max depth (ft)
4.3	wetted perimeter (ft)
0.2	hydraulic radius (ft)
16.7	width-depth ratio
39.6	W flood prone area (ft)
9.6	entrenchment ratio
0.5	low bank height ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

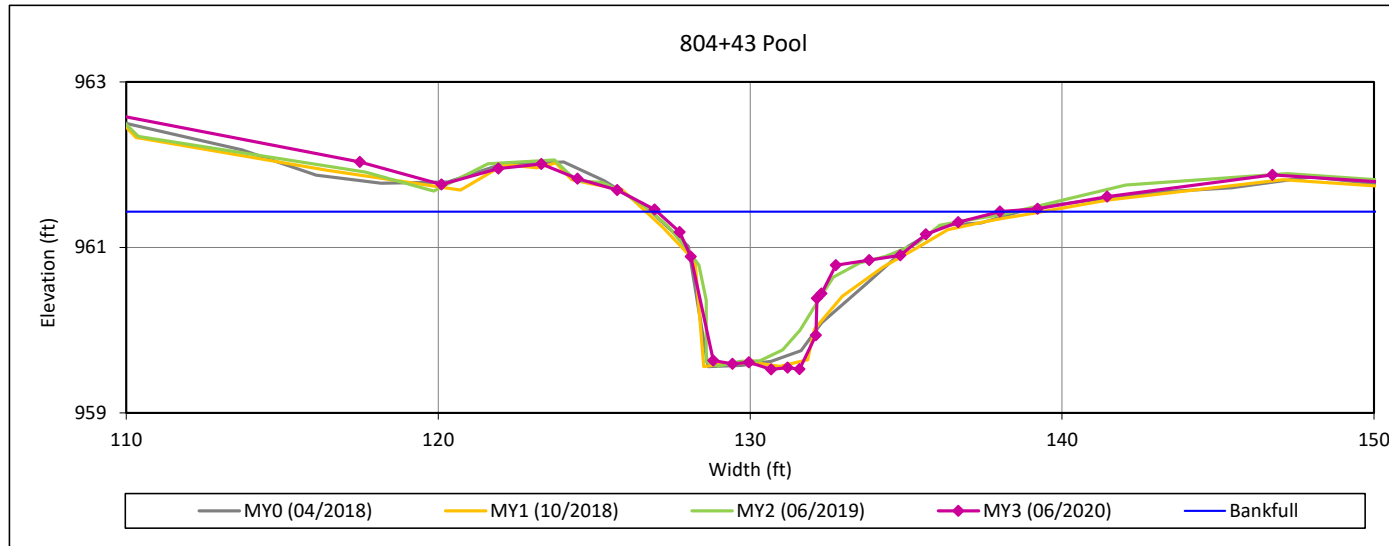
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

Royster Creek Reach 1: Cross-Section 10



Bankfull Dimensions

9.5	x-section area (ft.sq.)
11.0	width (ft)
0.9	mean depth (ft)
1.9	max depth (ft)
12.6	wetted perimeter (ft)
0.8	hydraulic radius (ft)
12.7	width-depth ratio



View Downstream

Survey Date: 06/2020
Field Crew: Wildlands Engineering

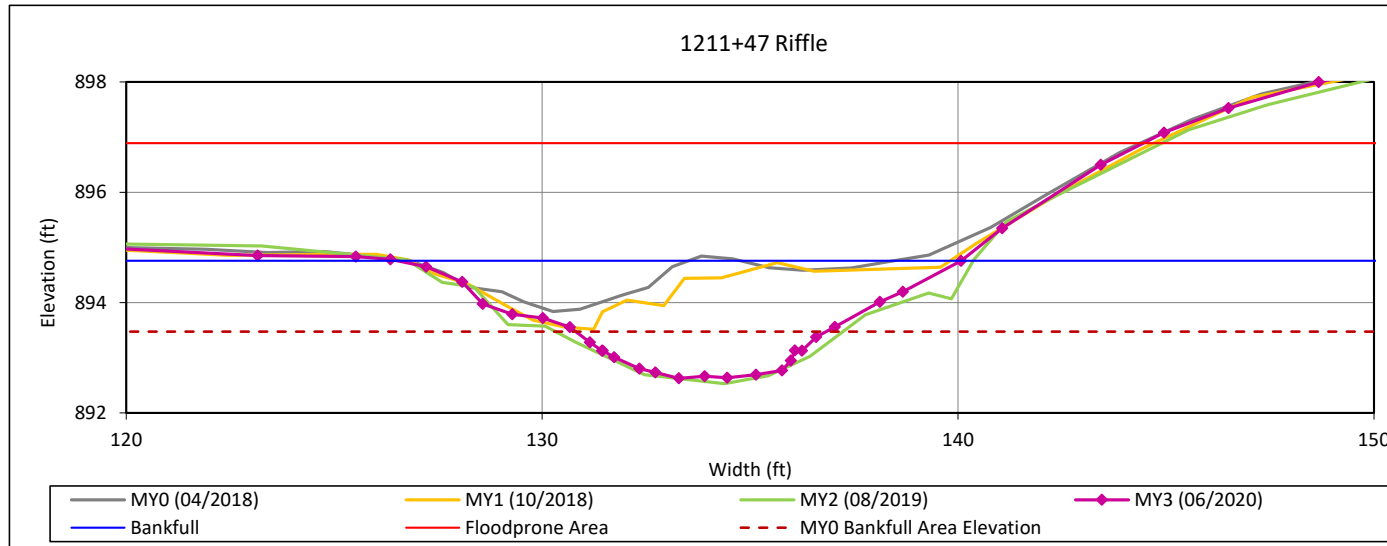
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

Scott Creek: Cross-Section 11



Bankfull Dimensions

16.2	x-section area (ft.sq.)
13.6	width (ft)
1.2	mean depth (ft)
2.1	max depth (ft)
14.5	wetted perimeter (ft)
1.1	hydraulic radius (ft)
11.4	width-depth ratio
44.5	W flood prone area (ft)
3.3	entrenchment ratio
2.5	low bank height ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

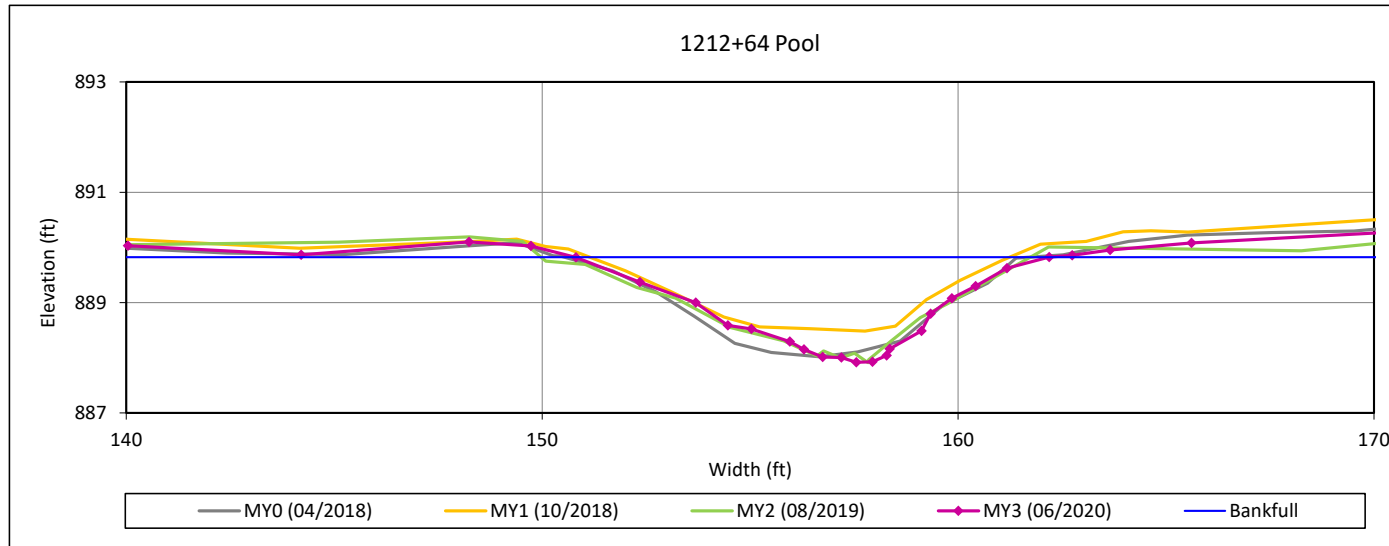
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

Scott Creek: Cross-Section 12



Bankfull Dimensions

10.9	x-section area (ft.sq.)
11.4	width (ft)
1.0	mean depth (ft)
1.9	max depth (ft)
12.2	wetted perimeter (ft)
0.9	hydraulic radius (ft)
11.9	width-depth ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

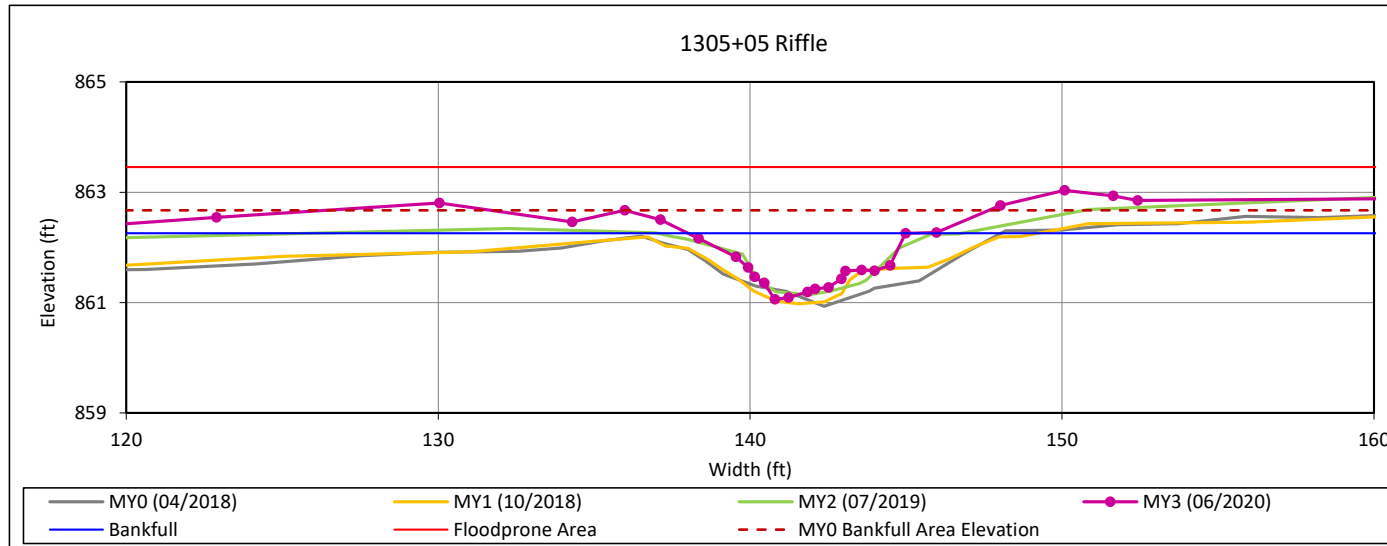
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

Carroll Creek Reach 1: Cross-Section 13



Bankfull Dimensions

4.7	x-section area (ft.sq.)
7.0	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
7.7	wetted perimeter (ft)
0.6	hydraulic radius (ft)
10.3	width-depth ratio
79.2	W flood prone area (ft)
11.3	entrenchment ratio
0.7	low bank height ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

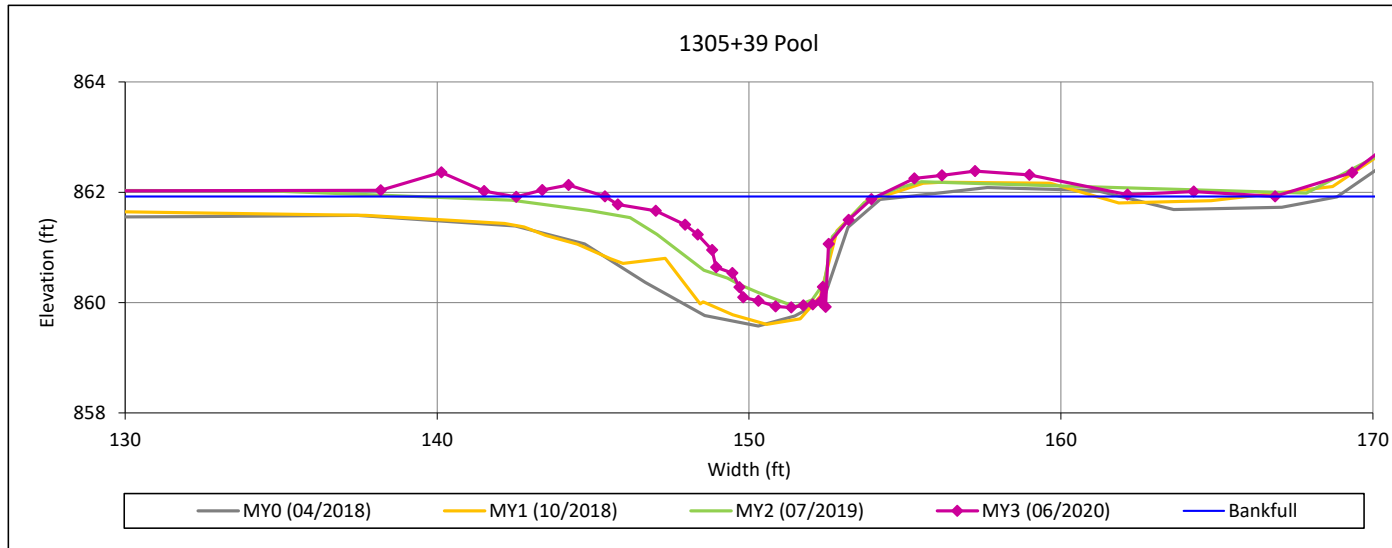
Cross-Section Plots

Big Harris Creek Mitigation Site - Area A

NCDMS Project No. 739

Monitoring Year 3 - 2020

Carroll Creek Reach 1: Cross-Section 14



Bankfull Dimensions

8.5	x-section area (ft.sq.)
8.7	width (ft)
1.0	mean depth (ft)
2.0	max depth (ft)
11.1	wetted perimeter (ft)
0.8	hydraulic radius (ft)
8.9	width-depth ratio



View Downstream

Survey Date: 06/2020
Field Crew: Wildlands Engineering

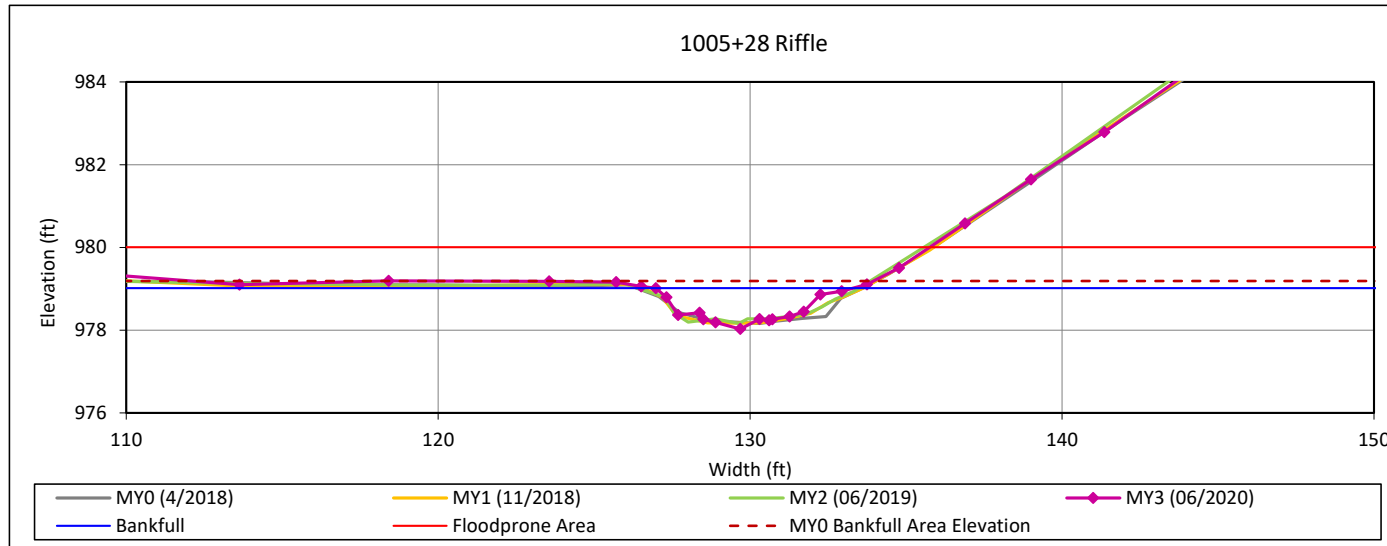
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 1: Cross-Section 15



Bankfull Dimensions

3.6	x-section area (ft.sq.)
6.3	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
6.9	wetted perimeter (ft)
0.5	hydraulic radius (ft)
11.2	width-depth ratio
35.8	W flood prone area (ft)
5.7	entrenchment ratio
0.9	low bank height ratio

Survey Date: 06/2020

Field Crew: Wildlands Engineering



View Downstream

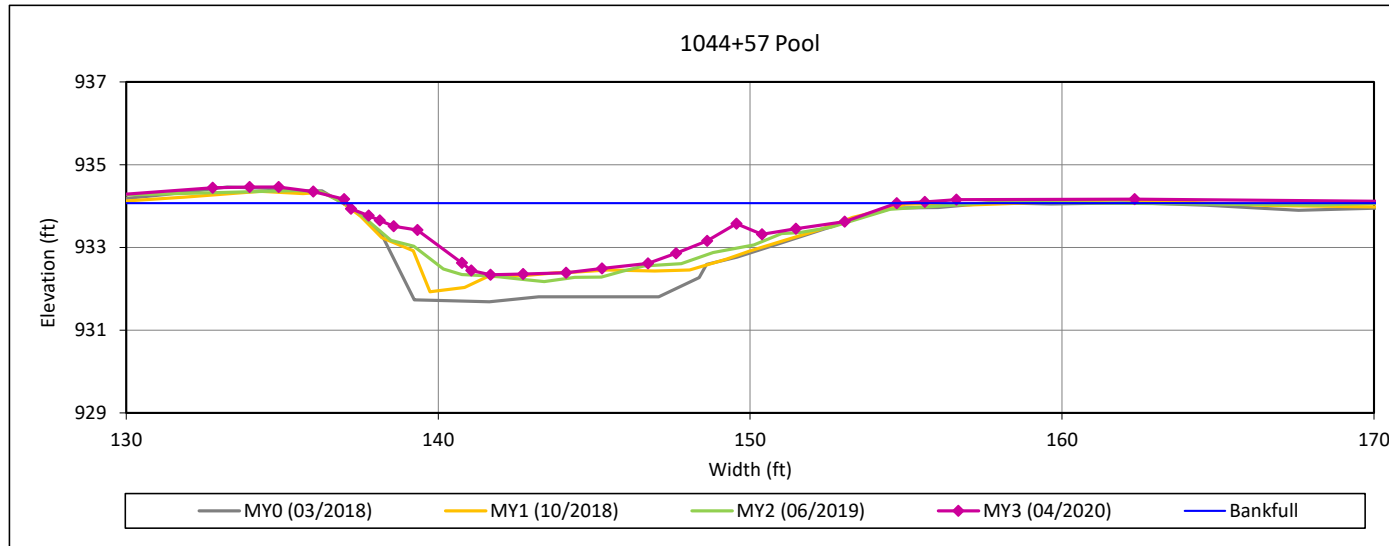
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 5: Cross-Section 16



Bankfull Dimensions

17.6	x-section area (ft.sq.)
17.6	width (ft)
1.0	mean depth (ft)
1.7	max depth (ft)
18.3	wetted perimeter (ft)
1.0	hydraulic radius (ft)
17.7	width-depth ratio

Survey Date: 04/2020
Field Crew: Wildlands Engineering



View Downstream

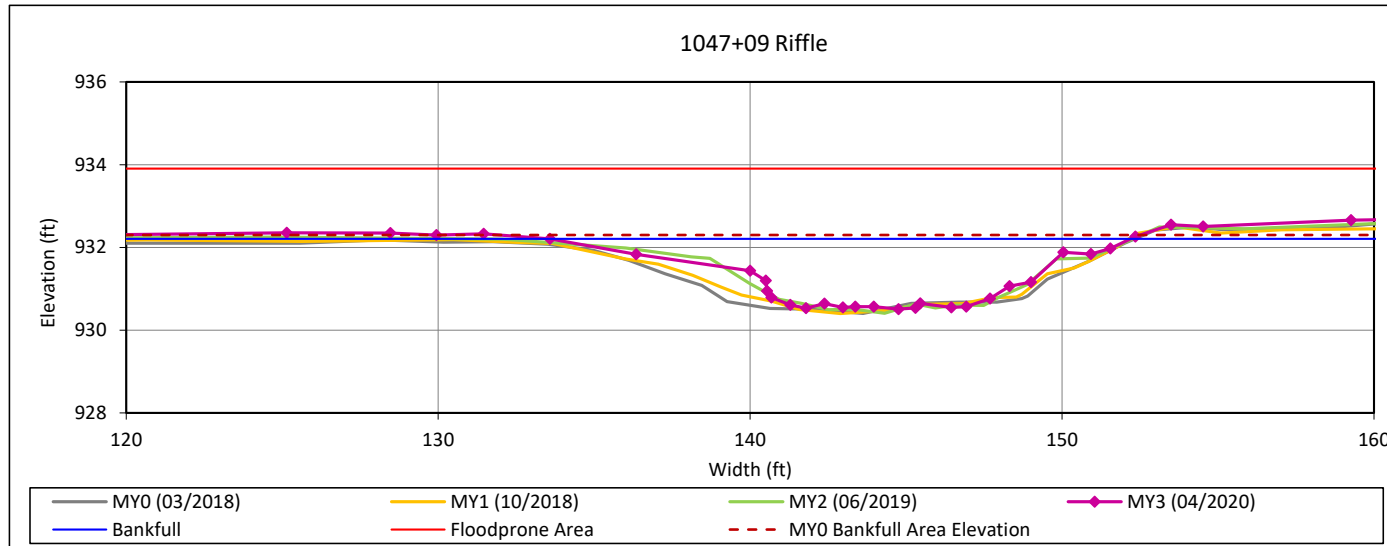
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 5: Cross-Section 17



Bankfull Dimensions

17.5	x-section area (ft.sq.)
18.6	width (ft)
0.9	mean depth (ft)
1.7	max depth (ft)
19.5	wetted perimeter (ft)
0.9	hydraulic radius (ft)
19.9	width-depth ratio
93.6	W flood prone area (ft)
5.0	entrenchment ratio
0.9	low bank height ratio

Survey Date: 04/2020
Field Crew: Wildlands Engineering



View Downstream

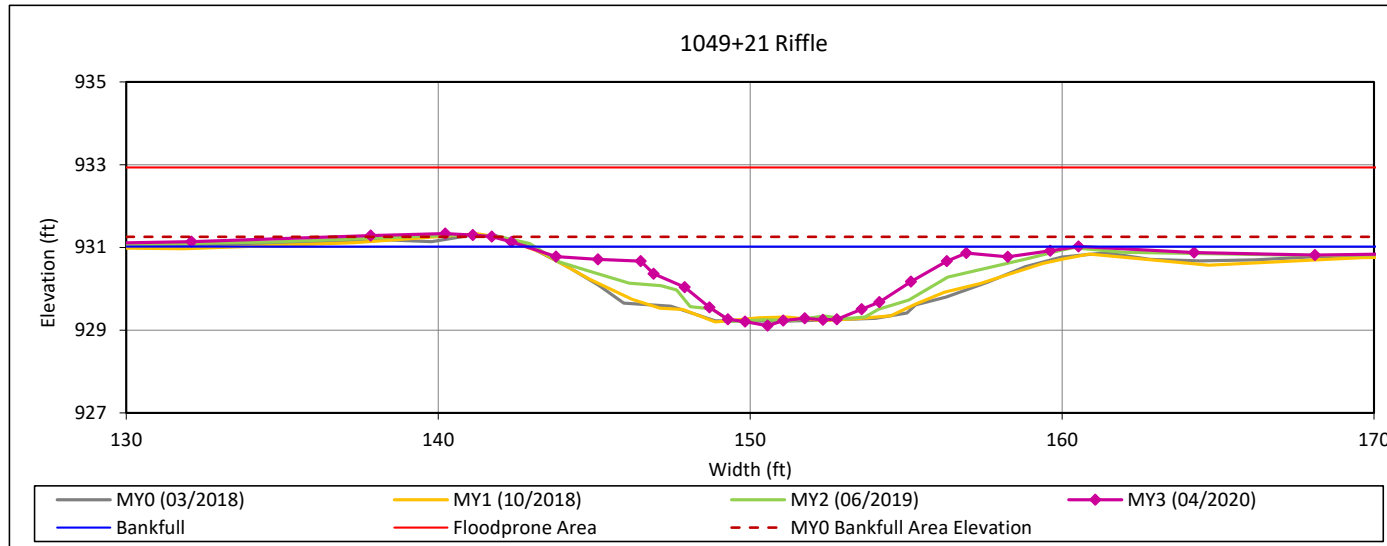
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 5: Cross-Section 18



Bankfull Dimensions

14.8	x-section area (ft.sq.)
17.7	width (ft)
0.8	mean depth (ft)
1.9	max depth (ft)
18.5	wetted perimeter (ft)
0.8	hydraulic radius (ft)
21.2	width-depth ratio
86.0	W flood prone area (ft)
4.9	entrenchment ratio
0.9	low bank height ratio

Survey Date: 04/2020
Field Crew: Wildlands Engineering



View Downstream

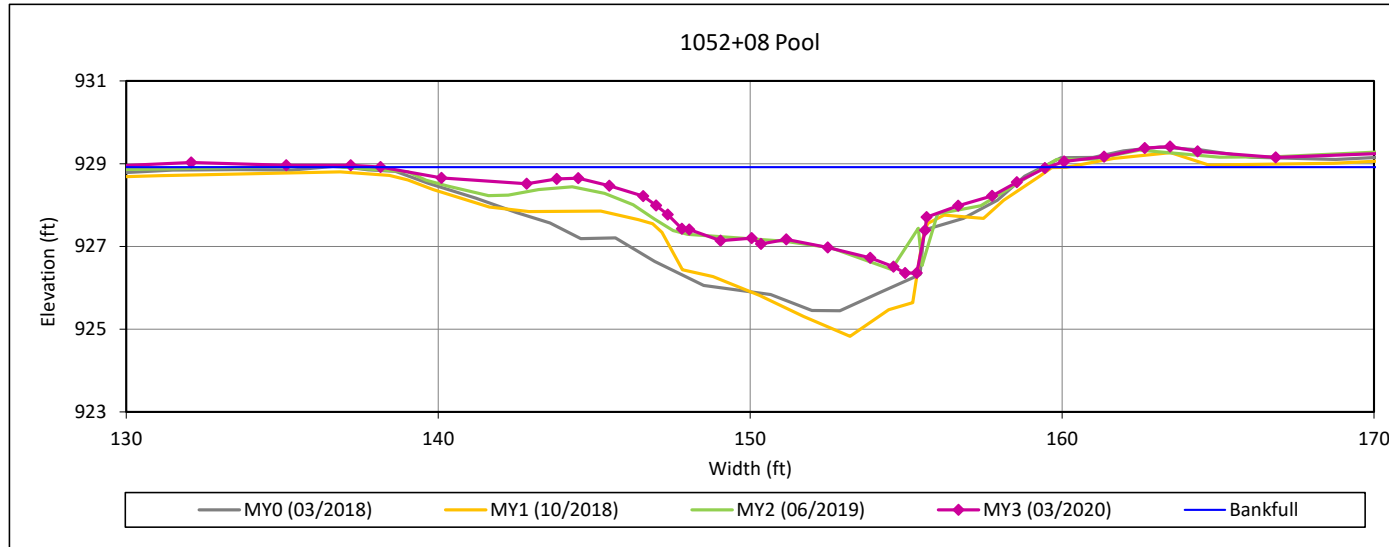
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 5: Cross-Section 19



Bankfull Dimensions

21.8	x-section area (ft.sq.)
21.4	width (ft)
1.0	mean depth (ft)
2.6	max depth (ft)
23.1	wetted perimeter (ft)
0.9	hydraulic radius (ft)
21.0	width-depth ratio



View Downstream

Survey Date: 03/2020
Field Crew: Wildlands Engineering

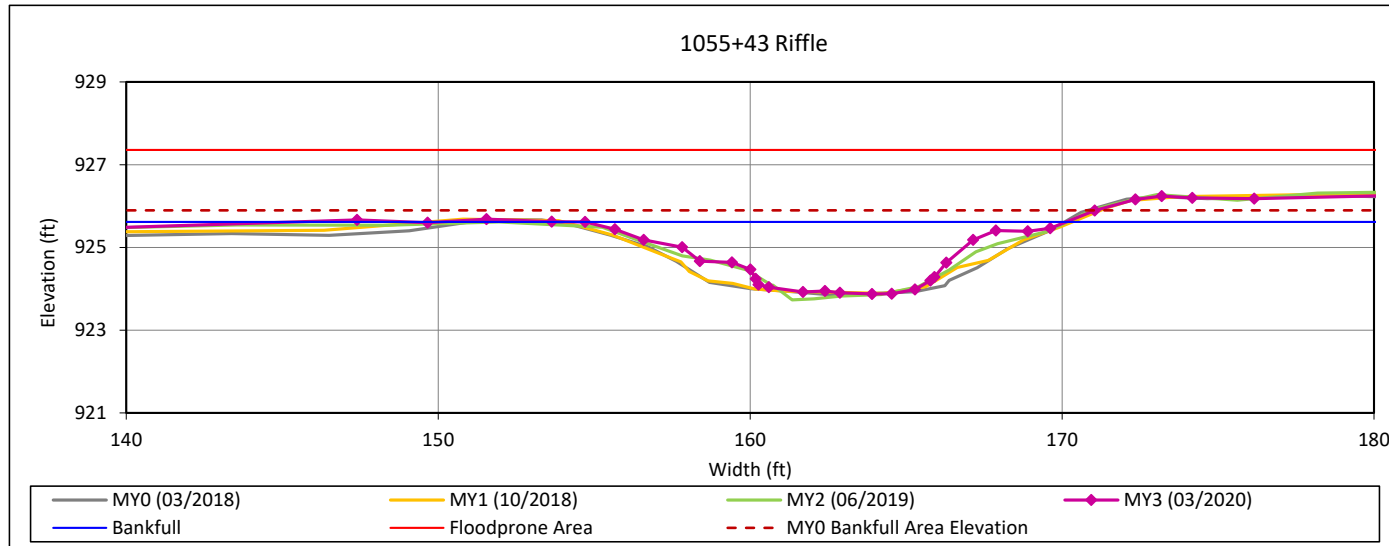
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 5: Cross-Section 20



Bankfull Dimensions

14.5	x-section area (ft.sq.)
15.4	width (ft)
0.9	mean depth (ft)
1.7	max depth (ft)
16.2	wetted perimeter (ft)
0.9	hydraulic radius (ft)
16.4	width-depth ratio
108.1	W flood prone area (ft)
7.0	entrenchment ratio
0.9	low bank height ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

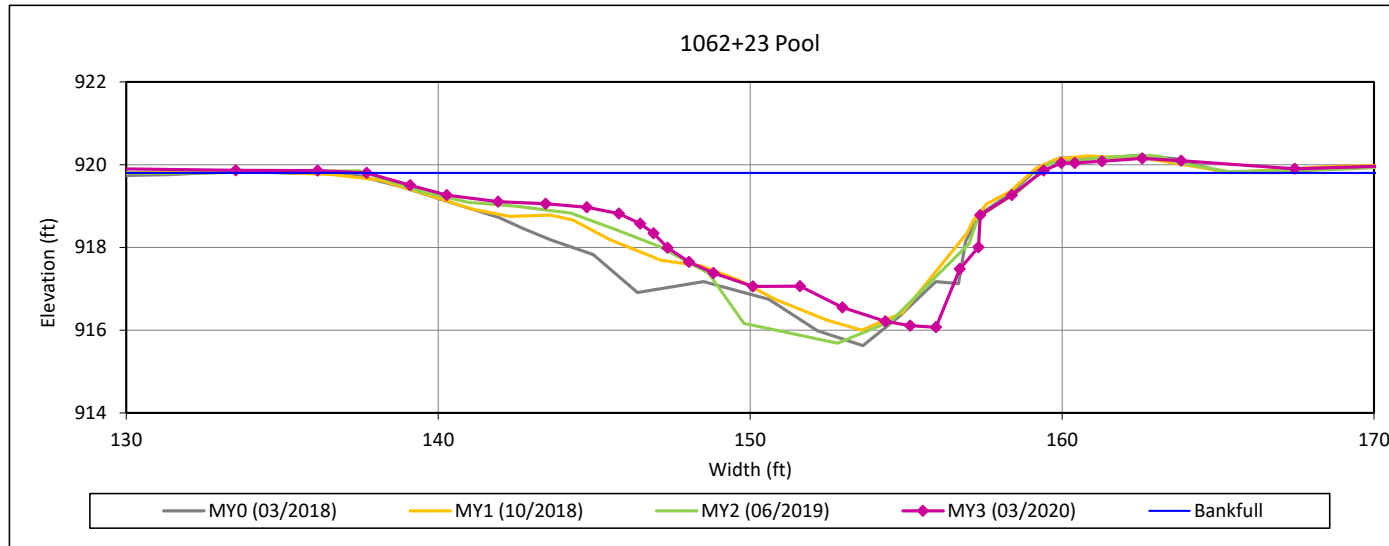
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 6: Cross-Section 21



Bankfull Dimensions

36.8	x-section area (ft.sq.)
21.6	width (ft)
1.7	mean depth (ft)
3.7	max depth (ft)
24.2	wetted perimeter (ft)
1.5	hydraulic radius (ft)
12.7	width-depth ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

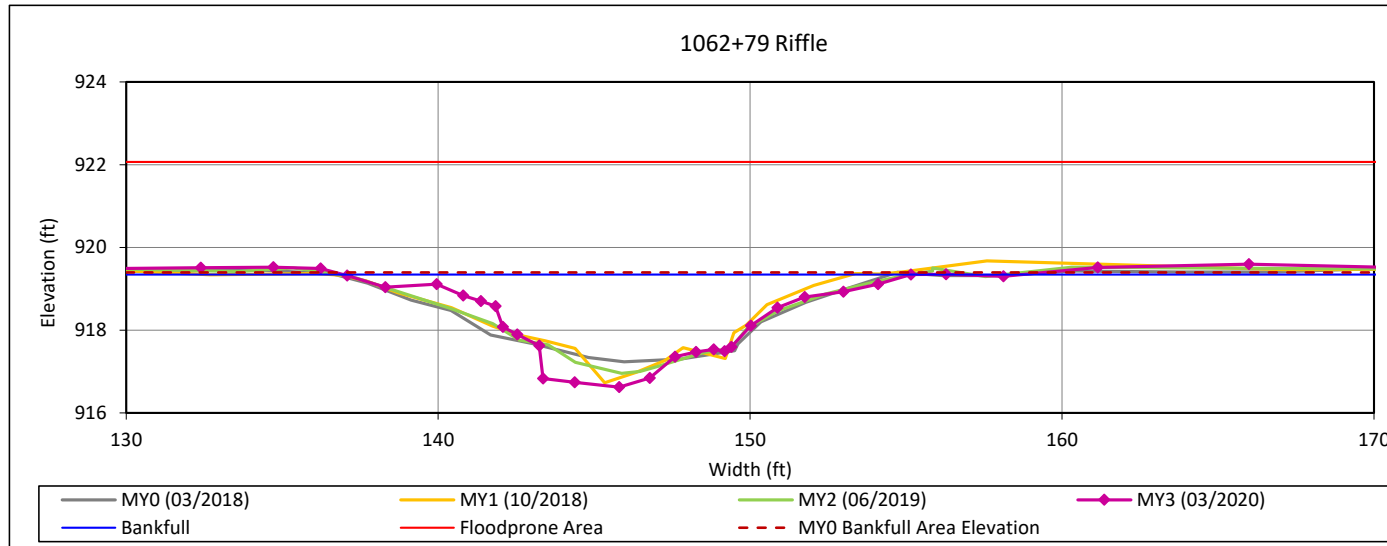
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 6: Cross-Section 22



Bankfull Dimensions

21.5	x-section area (ft.sq.)
18.2	width (ft)
1.2	mean depth (ft)
2.7	max depth (ft)
20.0	wetted perimeter (ft)
1.1	hydraulic radius (ft)
15.4	width-depth ratio
83.2	W flood prone area (ft)
4.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

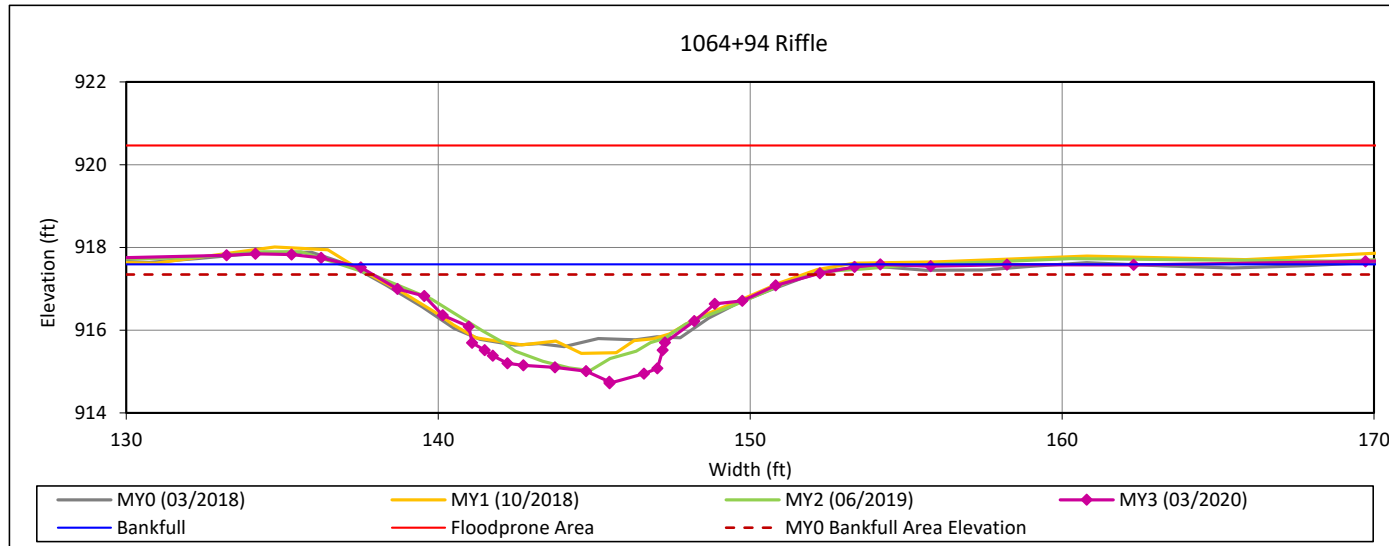
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 6: Cross-Section 23



Bankfull Dimensions

22.9	x-section area (ft.sq.)
17.1	width (ft)
1.3	mean depth (ft)
2.9	max depth (ft)
18.7	wetted perimeter (ft)
1.2	hydraulic radius (ft)
12.7	width-depth ratio
81.8	W flood prone area (ft)
4.8	entrenchment ratio
1.1	low bank height ratio

Survey Date: 03/2020

Field Crew: Wildlands Engineering



View Downstream

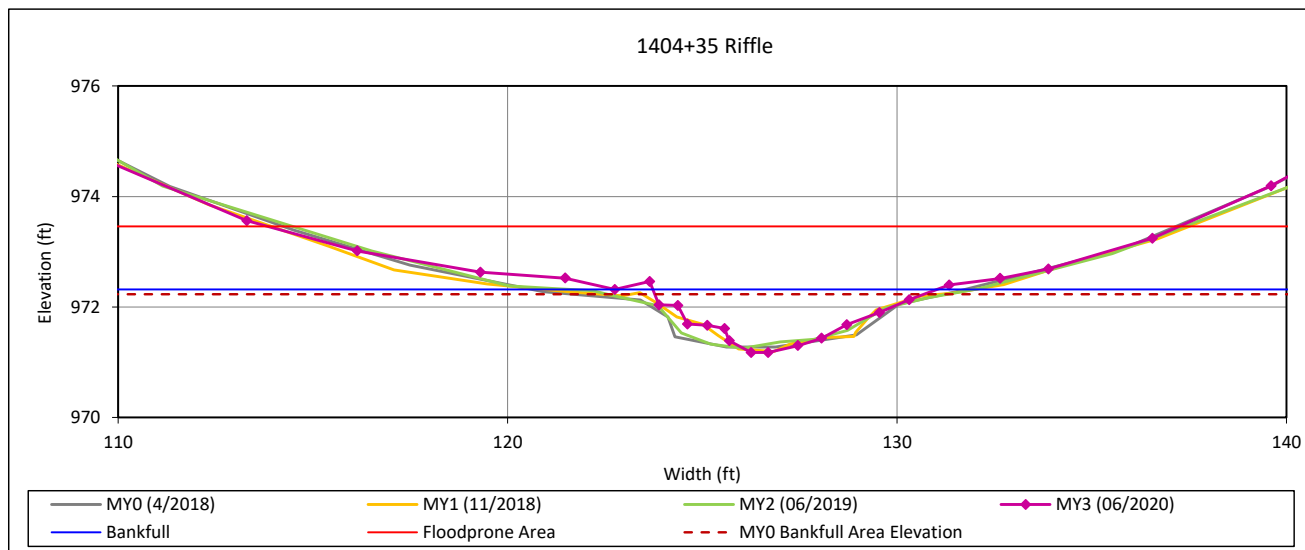
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

Elliott Creek: Cross-Section 24



Bankfull Dimensions

4.7	x-section area (ft.sq.)
7.3	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
7.9	wetted perimeter (ft)
0.6	hydraulic radius (ft)
11.3	width-depth ratio
17.6	W flood prone area (ft)
2.4	entrenchment ratio
1.2	low bank height ratio

Survey Date: 06/2020

Field Crew: Wildlands Engineering



View Downstream

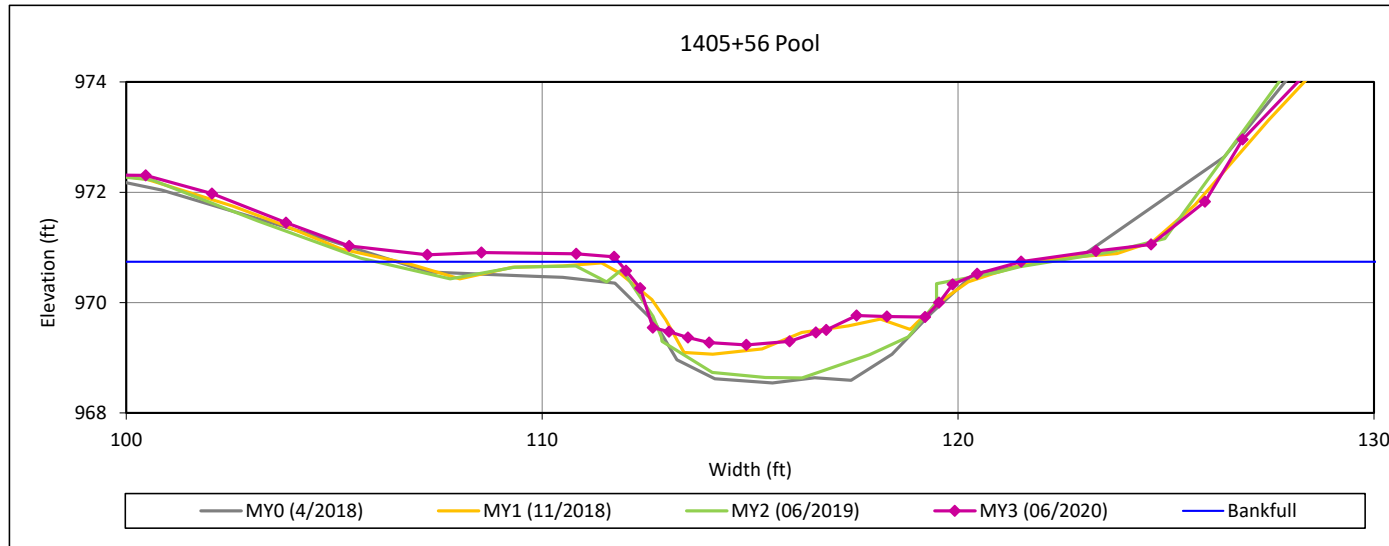
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

Elliott Creek: Cross-Section 25



Bankfull Dimensions

9.4	x-section area (ft.sq.)
9.7	width (ft)
1.0	mean depth (ft)
1.5	max depth (ft)
10.7	wetted perimeter (ft)
0.9	hydraulic radius (ft)
9.9	width-depth ratio



View Downstream

Survey Date: 06/2020
Field Crew: Wildlands Engineering

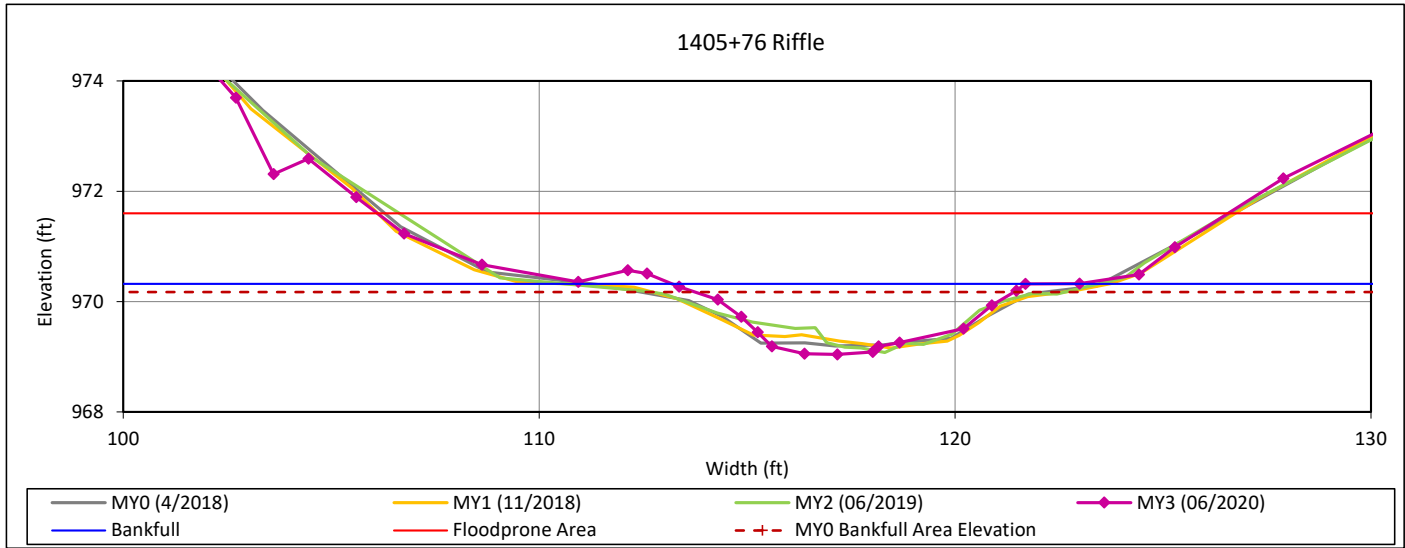
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

Elliott Creek: Cross-Section 26



Bankfull Dimensions

6.8	x-section area (ft.sq.)
8.5	width (ft)
0.8	mean depth (ft)
1.3	max depth (ft)
9.1	wetted perimeter (ft)
0.7	hydraulic radius (ft)
10.6	width-depth ratio
20.5	W flood prone area (ft)
2.4	entrenchment ratio
1.1	low bank height ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

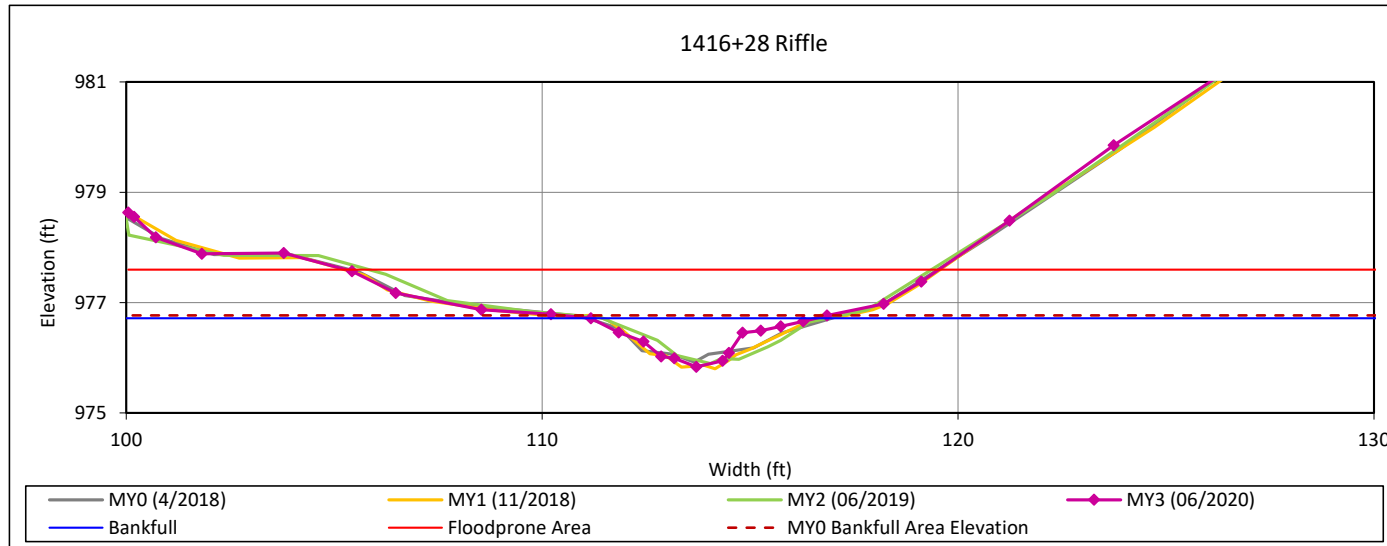
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

UT1 to Elliott Creek: Cross-Section 27



Bankfull Dimensions

2.2	x-section area (ft.sq.)
5.4	width (ft)
0.4	mean depth (ft)
0.9	max depth (ft)
5.8	wetted perimeter (ft)
0.4	hydraulic radius (ft)
13.2	width-depth ratio
14.3	W flood prone area (ft)
2.6	entrenchment ratio
0.9	low bank height ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

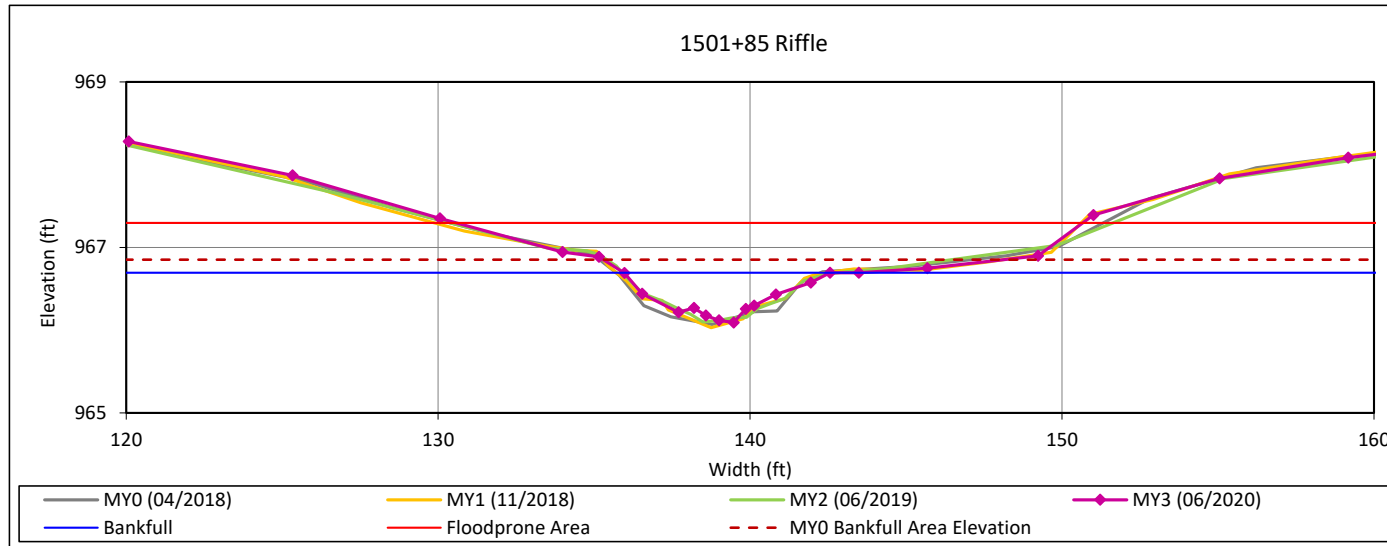
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

Bridges Creek: Cross-Section 28



Bankfull Dimensions

2.2	x-section area (ft.sq.)
6.6	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
6.8	wetted perimeter (ft)
0.3	hydraulic radius (ft)
19.8	width-depth ratio
20.1	W flood prone area (ft)
3.0	entrenchment ratio
0.8	low bank height ratio

Survey Date: 06/2020
Field Crew: Wildlands Engineering



View Downstream

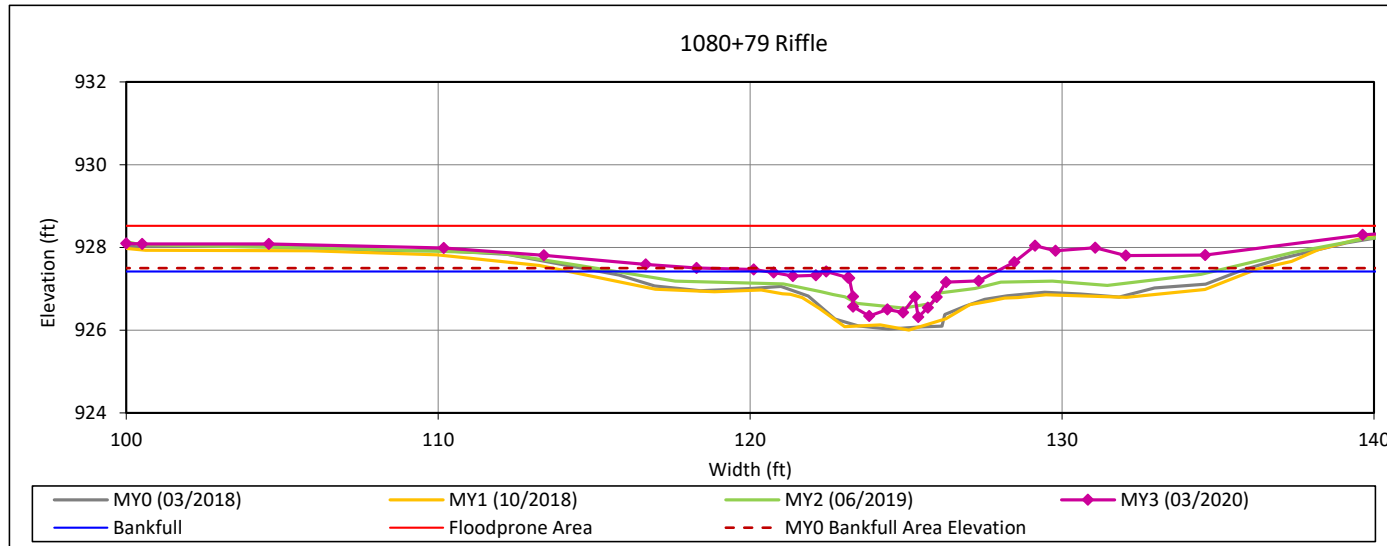
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC UT2: Cross-Section 29



Bankfull Dimensions

3.0	x-section area (ft.sq.)
5.5	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
7.1	wetted perimeter (ft)
0.4	hydraulic radius (ft)
9.9	width-depth ratio
43.5	W flood prone area (ft)
8.0	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2020

Field Crew: Wildlands Engineering



View Downstream

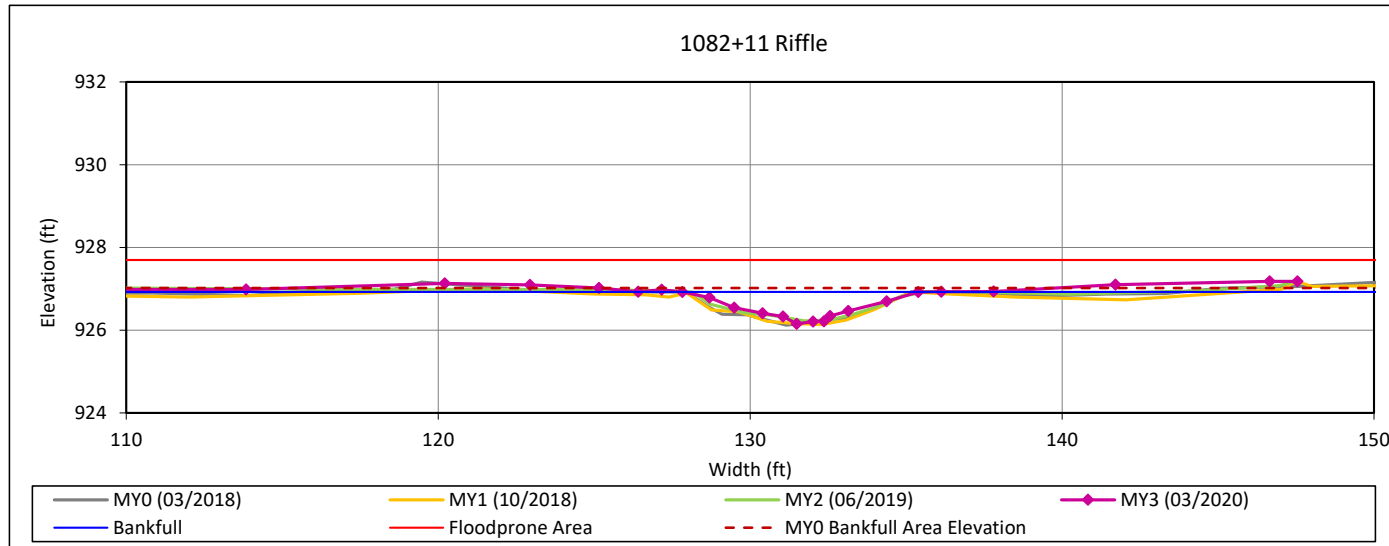
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach UT3: Cross-Section 30



Bankfull Dimensions

2.9	x-section area (ft.sq.)
7.6	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
7.8	wetted perimeter (ft)
0.4	hydraulic radius (ft)
19.4	width-depth ratio
45.2	W flood prone area (ft)
6.0	entrenchment ratio
0.9	low bank height ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

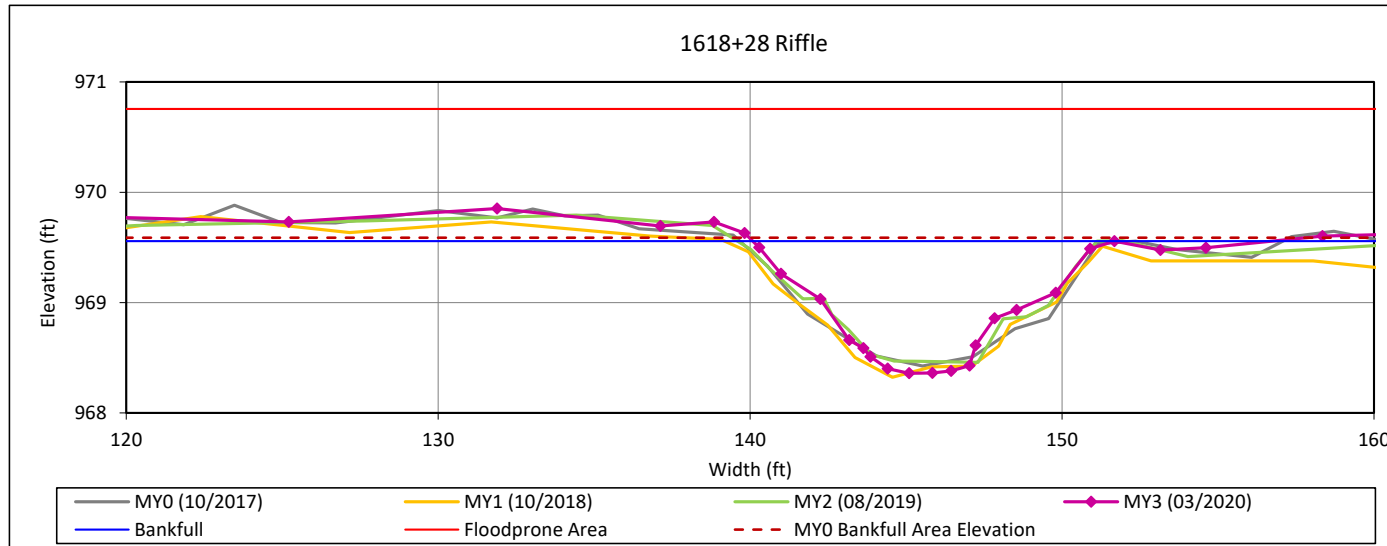
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

UFC Reach 2: Cross-Section 31



Bankfull Dimensions

7.8	x-section area (ft.sq.)
11.6	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
12.0	wetted perimeter (ft)
0.7	hydraulic radius (ft)
17.2	width-depth ratio
77.8	W flood prone area (ft)
6.7	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

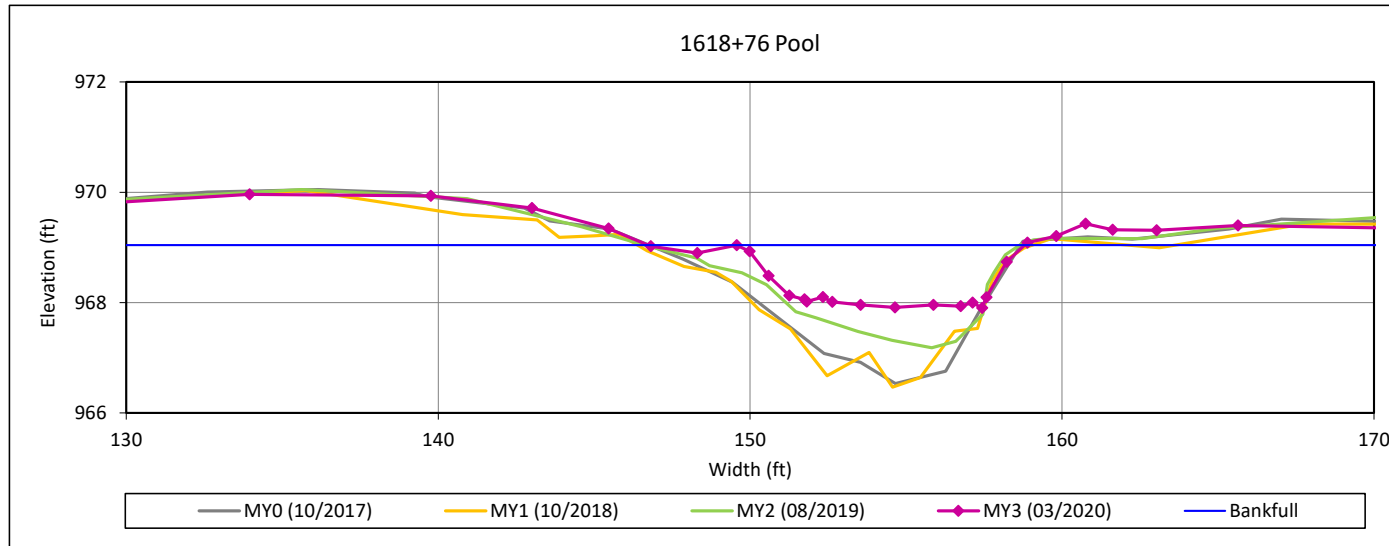
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

UFC Reach 2: Cross-Section 32



Bankfull Dimensions

7.9	x-section area (ft.sq.)
9.2	width (ft)
0.9	mean depth (ft)
1.1	max depth (ft)
10.0	wetted perimeter (ft)
0.8	hydraulic radius (ft)
10.7	width-depth ratio



View Downstream

Survey Date: 03/2020
Field Crew: Wildlands Engineering

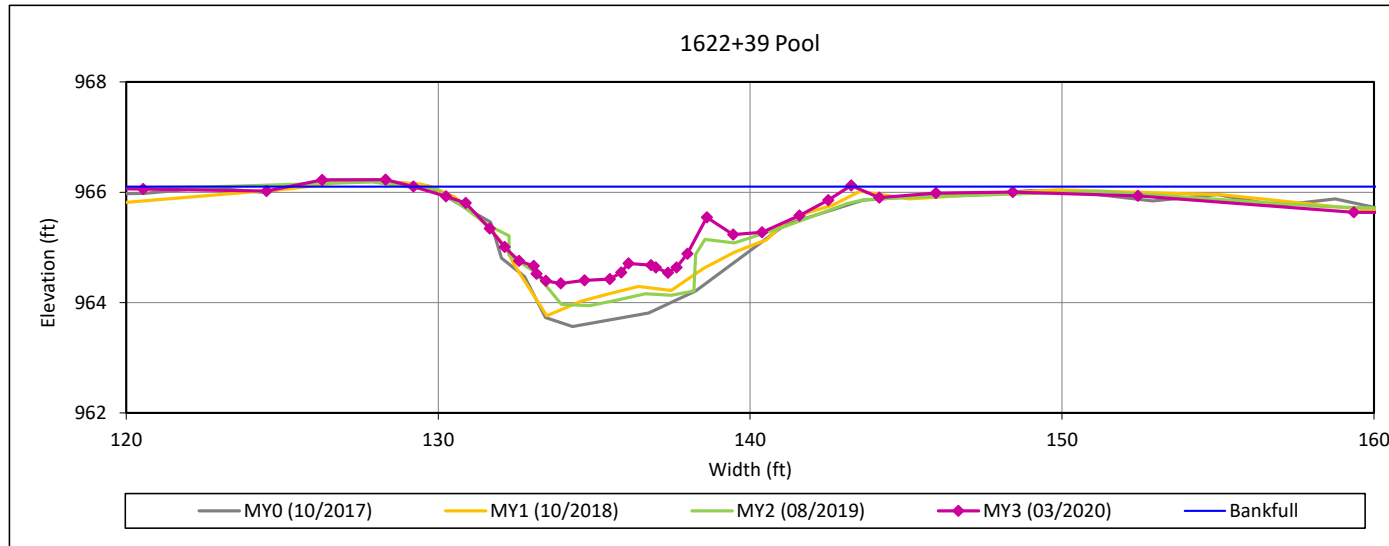
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

UFC Reach 2: Cross-Section 33



Bankfull Dimensions

13.3	x-section area (ft.sq.)
14.0	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
15.1	wetted perimeter (ft)
0.9	hydraulic radius (ft)
14.7	width-depth ratio



View Downstream

Survey Date: 03/2020
Field Crew: Wildlands Engineering

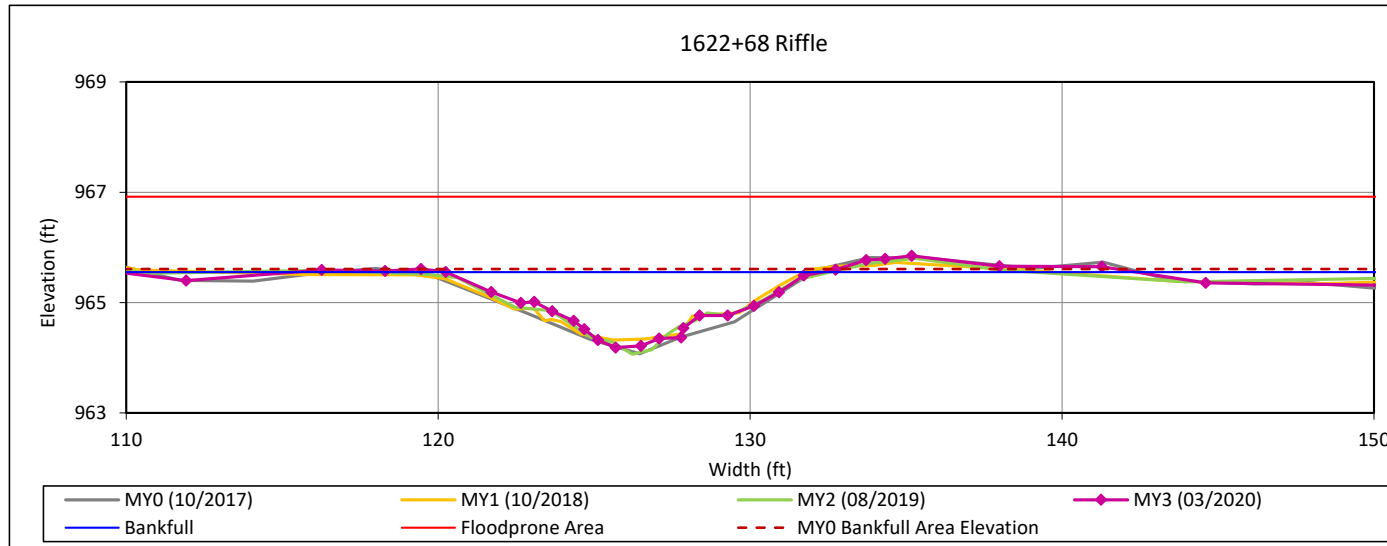
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

UFC Reach 2: Cross-Section 34



Bankfull Dimensions

8.5	x-section area (ft.sq.)
12.1	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
12.6	wetted perimeter (ft)
0.7	hydraulic radius (ft)
17.1	width-depth ratio
69.8	W flood prone area (ft)
5.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

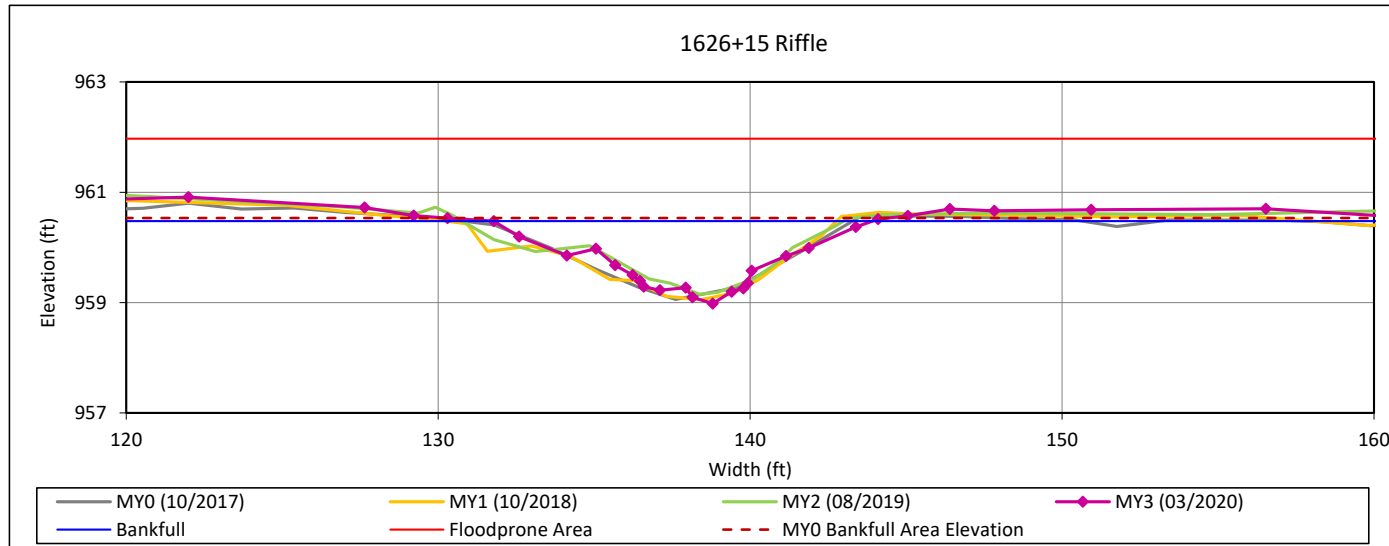
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

UFC Reach 2: Cross-Section 35



Bankfull Dimensions

8.8	x-section area (ft.sq.)
12.1	width (ft)
0.7	mean depth (ft)
1.5	max depth (ft)
12.8	wetted perimeter (ft)
0.7	hydraulic radius (ft)
16.7	width-depth ratio
85.7	W flood prone area (ft)
7.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

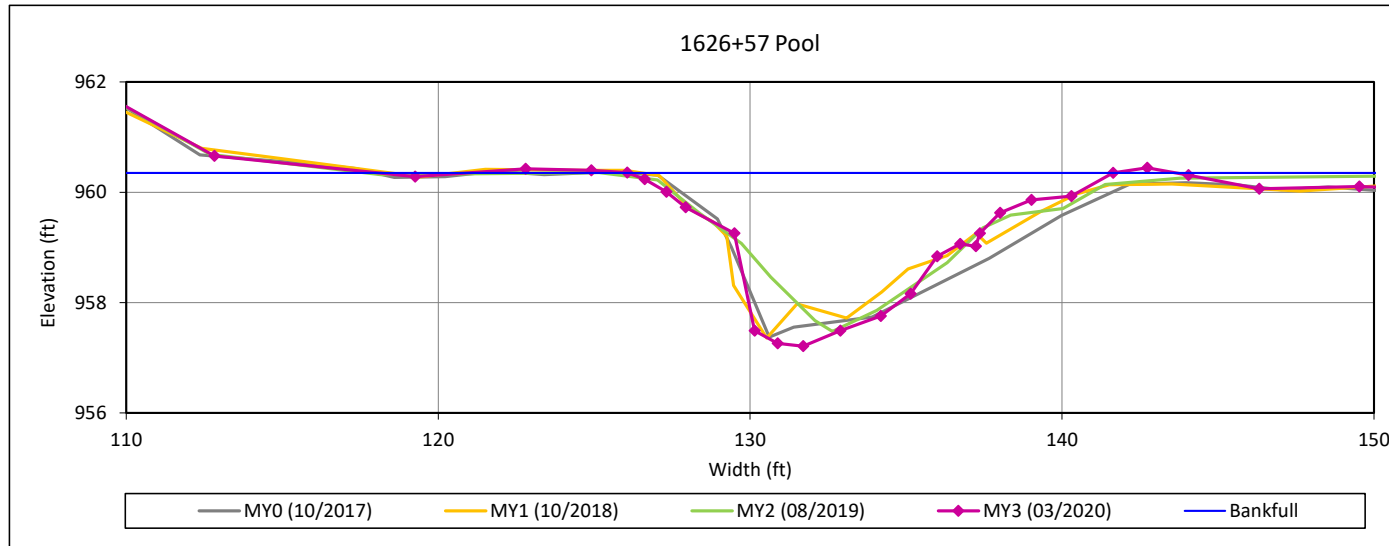
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

UFC Reach 2: Cross-Section 36



Bankfull Dimensions

22.7	x-section area (ft.sq.)
15.5	width (ft)
1.5	mean depth (ft)
3.1	max depth (ft)
17.7	wetted perimeter (ft)
1.3	hydraulic radius (ft)
10.6	width-depth ratio



View Downstream

Survey Date: 03/2020
Field Crew: Wildlands Engineering

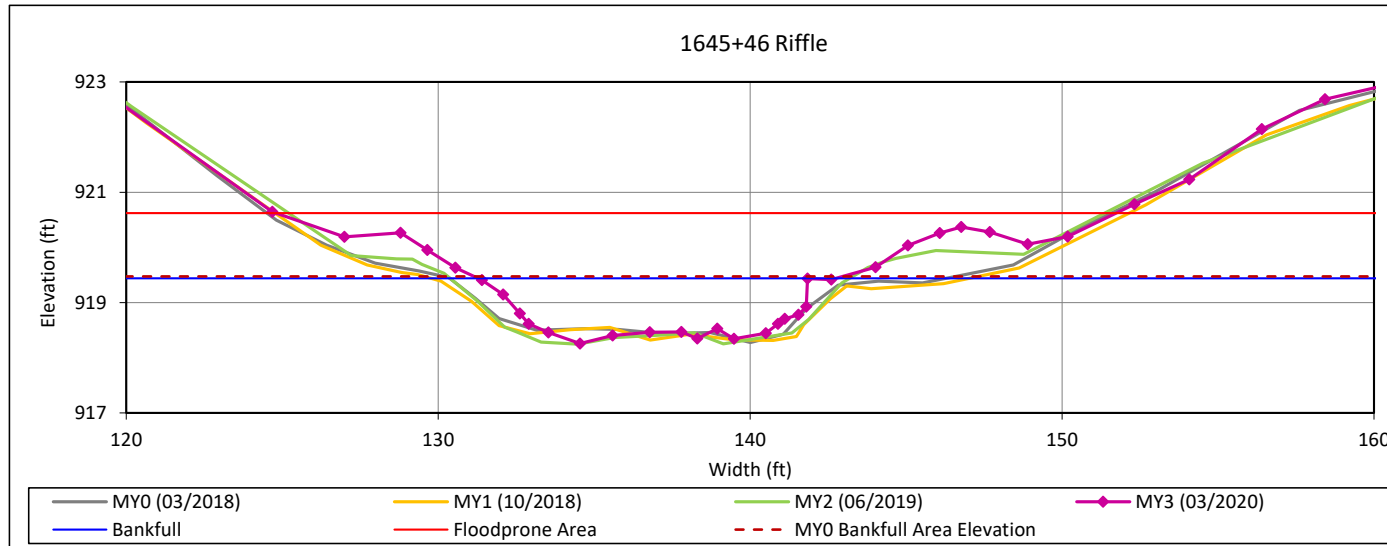
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

LFC Reach 1: Cross-Section 37



Bankfull Dimensions

9.3	x-section area (ft.sq.)
10.4	width (ft)
0.9	mean depth (ft)
1.2	max depth (ft)
11.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
11.7	width-depth ratio
26.9	W flood prone area (ft)
2.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

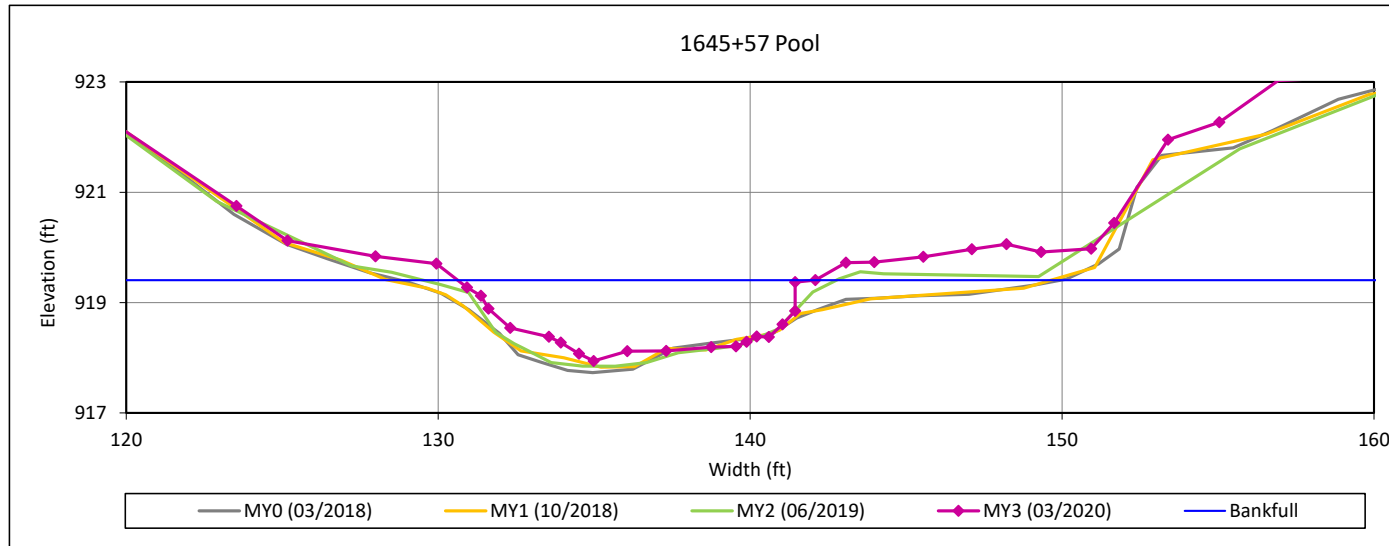
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

LFC Reach 1: Cross-Section 38



Bankfull Dimensions

11.3	x-section area (ft.sq.)
11.5	width (ft)
1.0	mean depth (ft)
1.5	max depth (ft)
12.5	wetted perimeter (ft)
0.9	hydraulic radius (ft)
11.6	width-depth ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

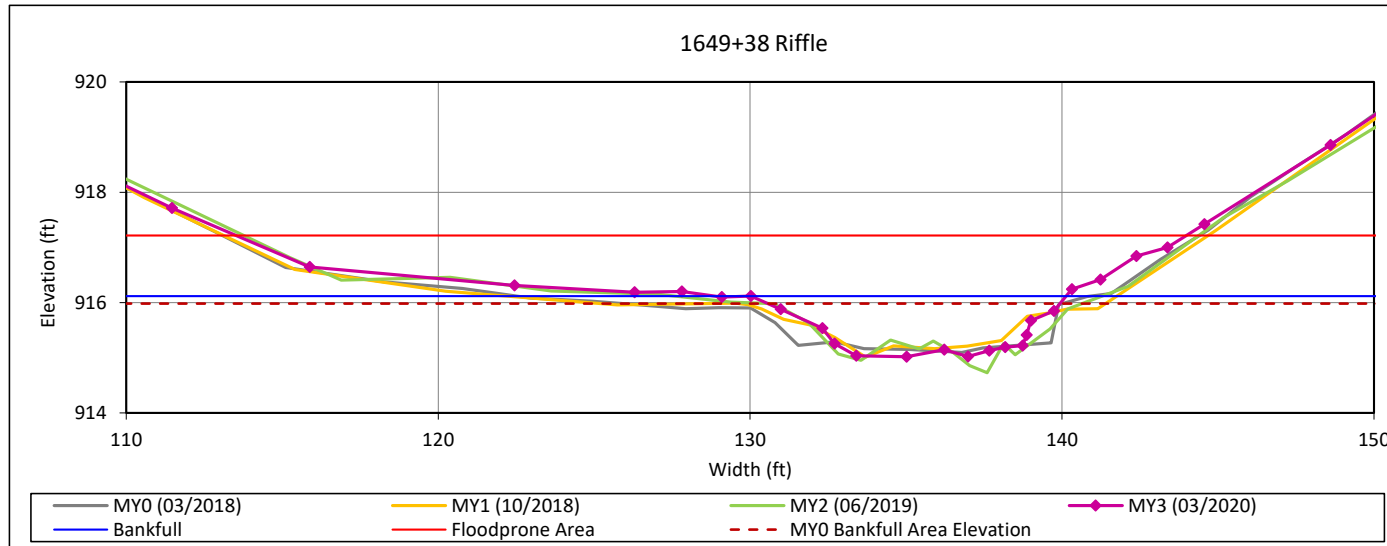
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

LFC Reach 2: Cross-Section 39



Bankfull Dimensions

7.6	x-section area (ft.sq.)
10.1	width (ft)
0.8	mean depth (ft)
1.1	max depth (ft)
10.7	wetted perimeter (ft)
0.7	hydraulic radius (ft)
13.4	width-depth ratio
30.5	W flood prone area (ft)
3.0	entrenchment ratio
1.1	low bank height ratio

Survey Date: 03/2020
Field Crew: Wildlands Engineering



View Downstream

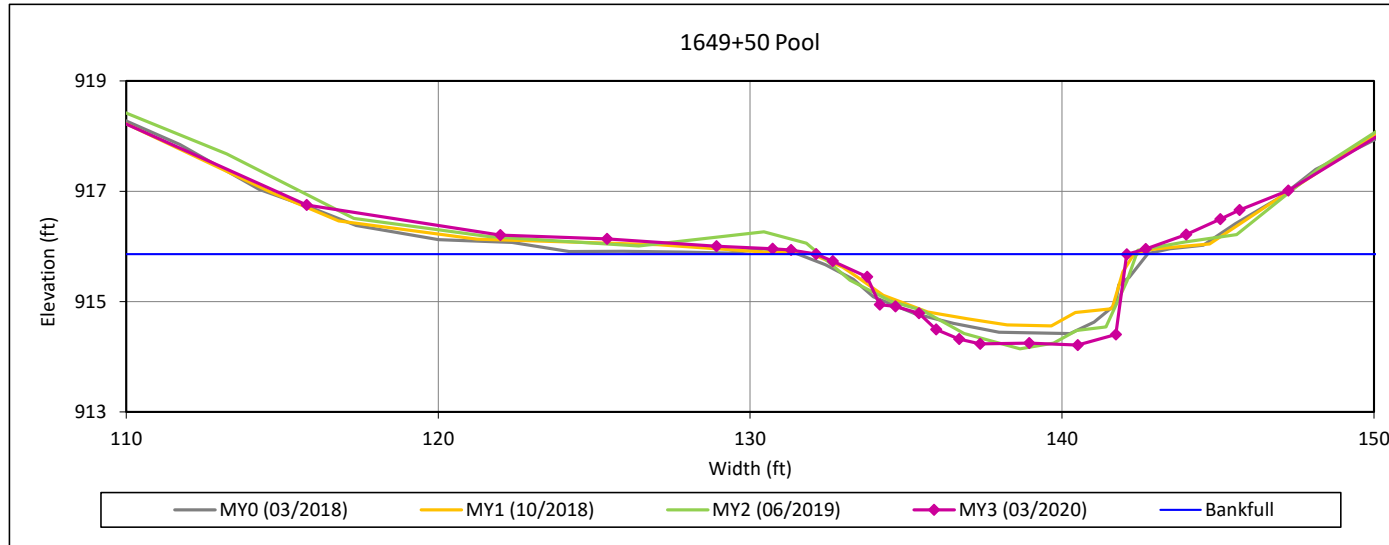
Cross-Section Plots

Big Harris Creek Mitigation Site - Area B

NCDMS Project No. 739

Monitoring Year 3 - 2020

LFC Reach 2: Cross-Section 40



Bankfull Dimensions

11.9	x-section area (ft.sq.)
10.0	width (ft)
1.2	mean depth (ft)
1.6	max depth (ft)
11.5	wetted perimeter (ft)
1.0	hydraulic radius (ft)
8.4	width-depth ratio



View Downstream

Survey Date: 03/2020
Field Crew: Wildlands Engineering

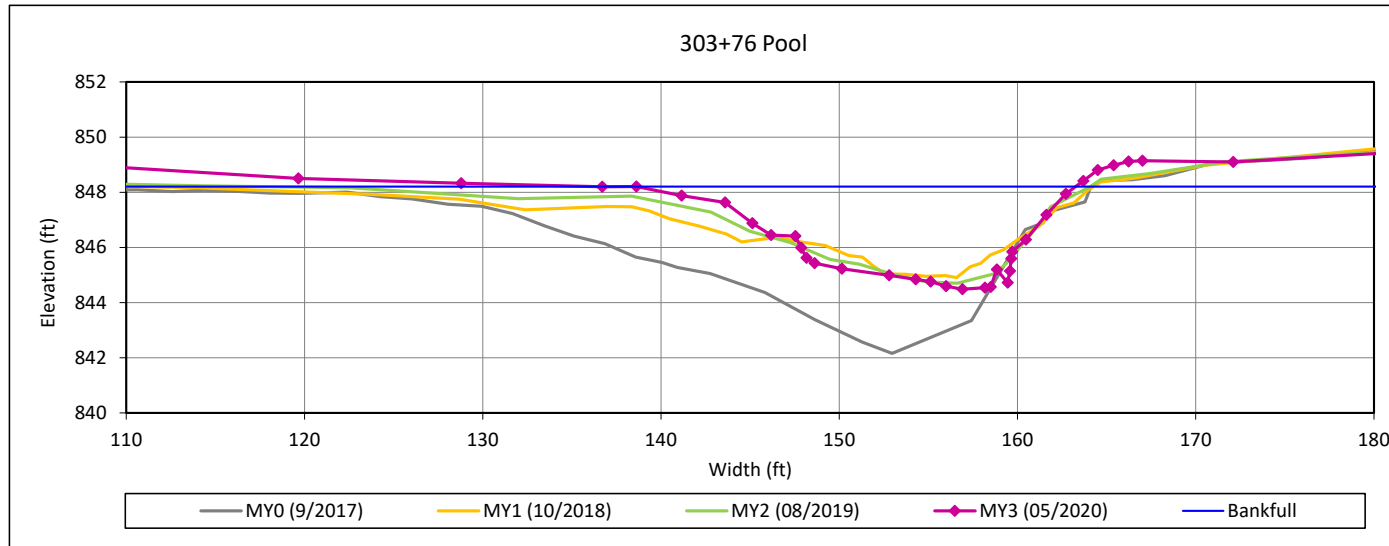
Cross-Section Plots

Big Harris Creek Mitigation Site - Area C

NCDMS Project No. 739

Monitoring Year 3 - 2020

LBHC Reach 1A: Cross-Section 41



Bankfull Dimensions

50.2	x-section area (ft.sq.)
24.6	width (ft)
2.0	mean depth (ft)
3.7	max depth (ft)
27.6	wetted perimeter (ft)
1.8	hydraulic radius (ft)
12.1	width-depth ratio

Survey Date: 05/2020
Field Crew: Wildlands Engineering



View Downstream

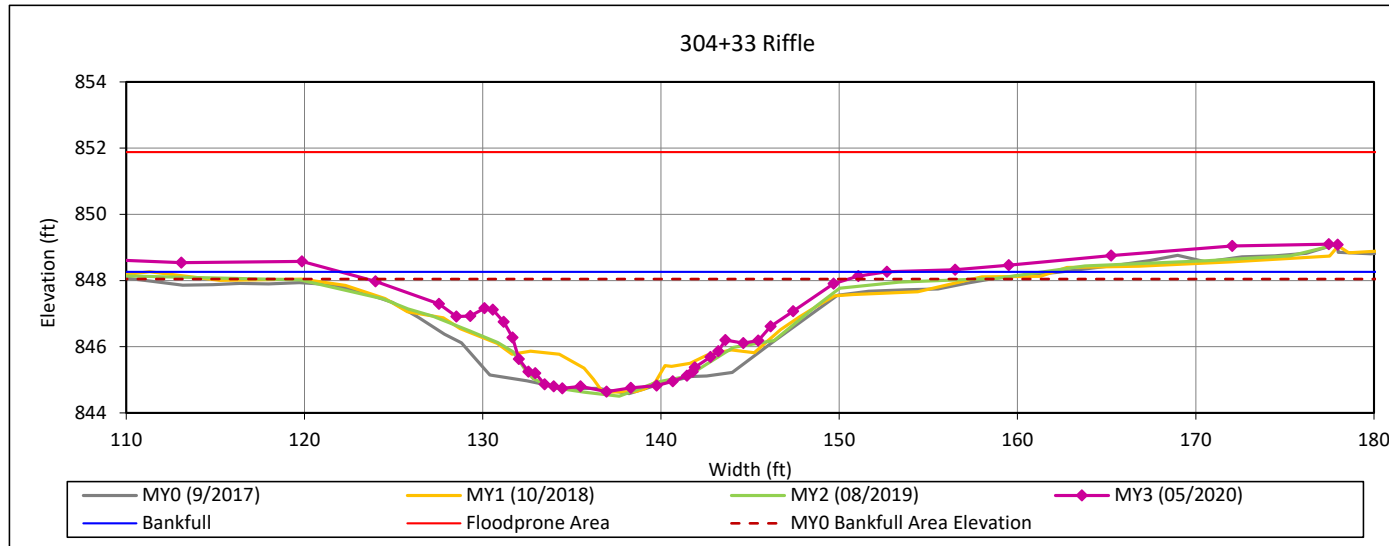
Cross-Section Plots

Big Harris Creek Mitigation Site - Area C

NCDMS Project No. 739

Monitoring Year 3 - 2020

LBHC Reach 1A: Cross-Section 42



Bankfull Dimensions

55.6	x-section area (ft.sq.)
30.7	width (ft)
1.8	mean depth (ft)
3.6	max depth (ft)
32.5	wetted perimeter (ft)
1.7	hydraulic radius (ft)
16.9	width-depth ratio
78.0	W flood prone area (ft)
2.5	entrenchment ratio
1.1	low bank height ratio

Survey Date: 05/2020
Field Crew: Wildlands Engineering



View Downstream

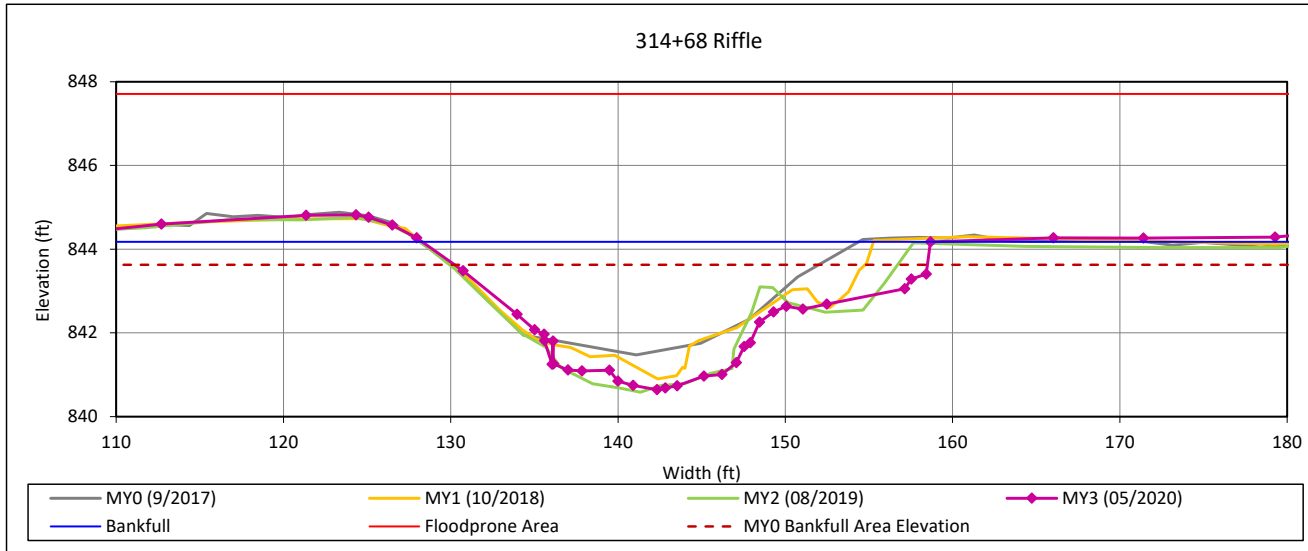
Cross-Section Plots

Big Harris Creek Mitigation Site - Area C

NCDMS Project No. 739

Monitoring Year 3 - 2020

LBHC Reach 1B/2: Cross-Section 43



Bankfull Dimensions

62.1	x-section area (ft.sq.)
30.4	width (ft)
2.0	mean depth (ft)
3.5	max depth (ft)
33.3	wetted perimeter (ft)
1.9	hydraulic radius (ft)
14.9	width-depth ratio
84.9	W flood prone area (ft)
2.8	entrenchment ratio
1.2	low bank height ratio

Survey Date: 05/2020

Field Crew: Wildlands Engineering



View Downstream

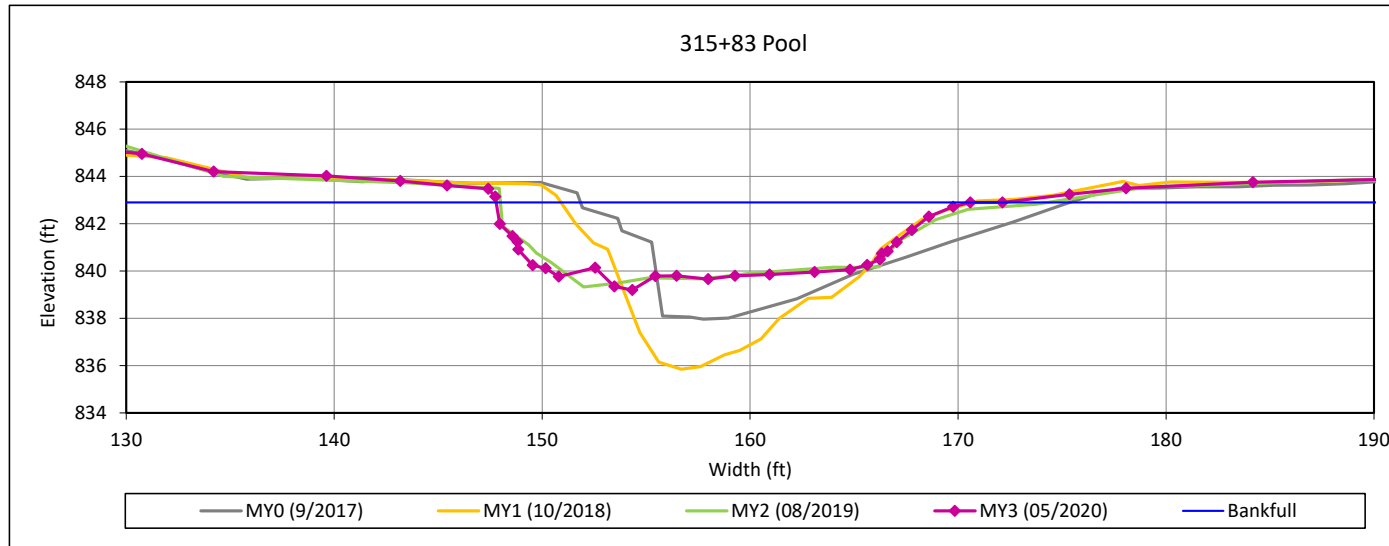
Cross-Section Plots

Big Harris Creek Mitigation Site - Area C

NCDMS Project No. 739

Monitoring Year 3 - 2020

LBHC Reach 1B/2: Cross-Section 44



Bankfull Dimensions

57.7	x-section area (ft.sq.)
22.8	width (ft)
2.5	mean depth (ft)
3.7	max depth (ft)
25.8	wetted perimeter (ft)
2.2	hydraulic radius (ft)
9.0	width-depth ratio



View Downstream

Survey Date: 05/2020
Field Crew: Wildlands Engineering

Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

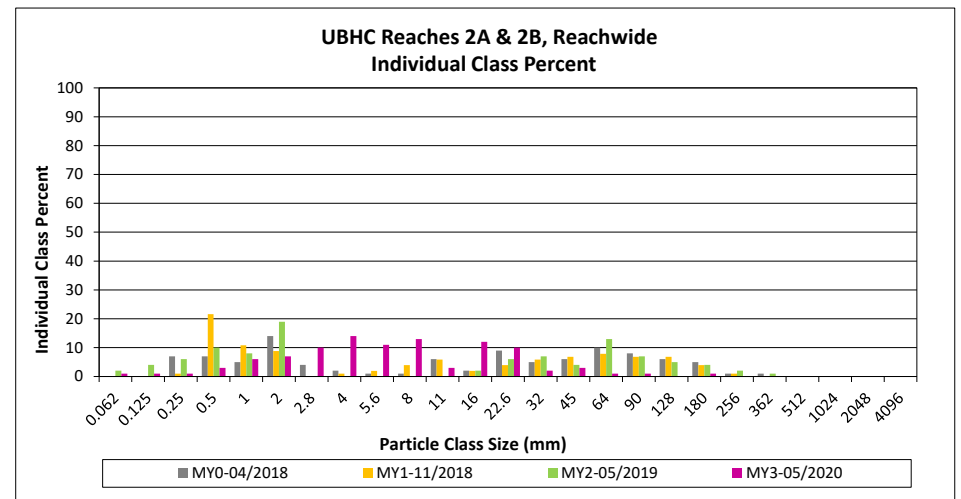
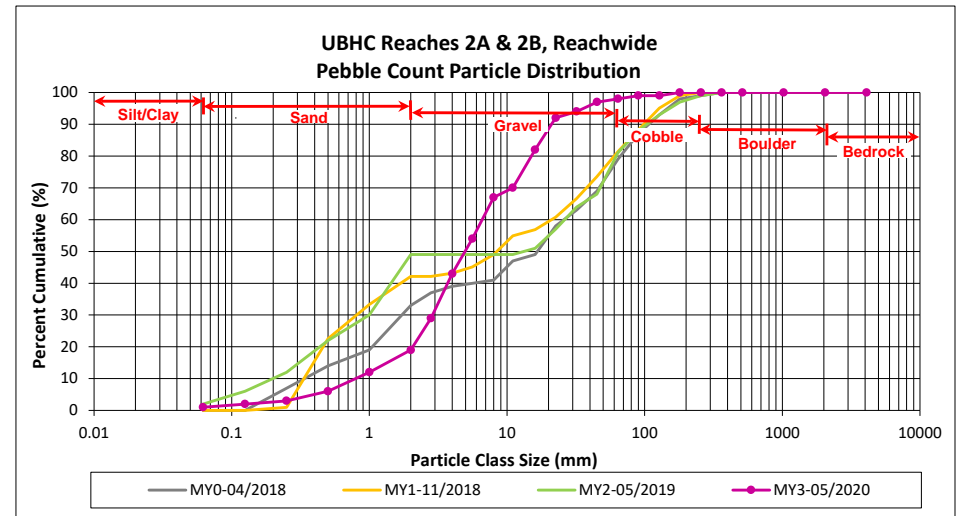
DMS Project No. 739

Monitoring Year 3 - 2020

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	1	1
SAND	Very fine	0.062	0.125		1	1	1	2
	Fine	0.125	0.250		1	1	1	3
	Medium	0.25	0.50		3	3	3	6
	Coarse	0.5	1.0		6	6	6	12
	Very Coarse	1.0	2.0		7	7	7	19
GRAVEL	Very Fine	2.0	2.8	3	7	10	10	29
	Very Fine	2.8	4.0	6	8	14	14	43
	Fine	4.0	5.6	8	3	11	11	54
	Fine	5.6	8.0	9	4	13	13	67
	Medium	8.0	11.0	3		3	3	70
	Medium	11.0	16.0	7	5	12	12	82
	Coarse	16.0	22.6	9	1	10	10	92
	Coarse	22.6	32	1	1	2	2	94
	Very Coarse	32	45	1	2	3	3	97
	Very Coarse	45	64	1		1	1	98
COBBLE	Small	64	90		1	1	1	99
	Small	90	128					99
	Large	128	180	1		1	1	100
BOULDER	Large	180	256					100
	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	1.5
D ₃₅ =	3.3
D ₅₀ =	5.0
D ₈₄ =	17.1
D ₉₅ =	35.9
D ₁₀₀ =	180.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

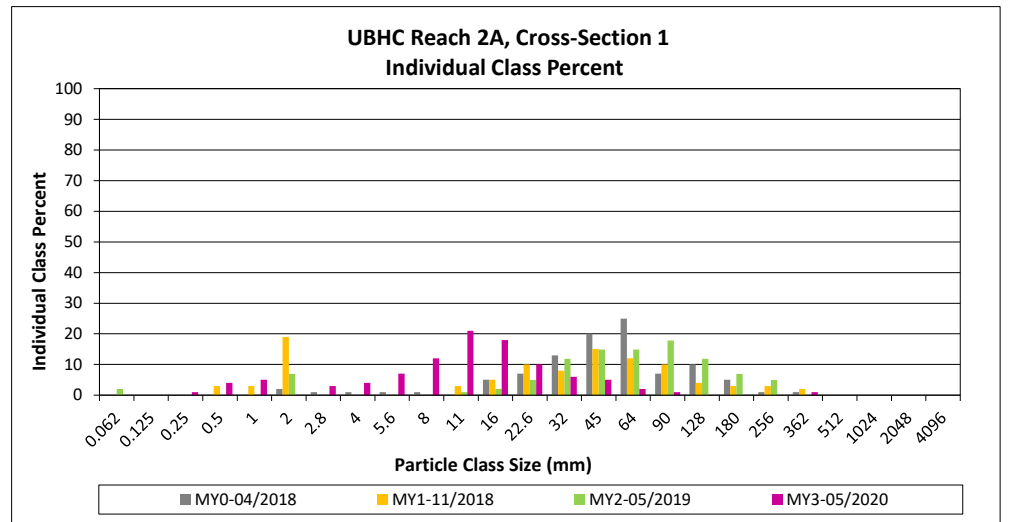
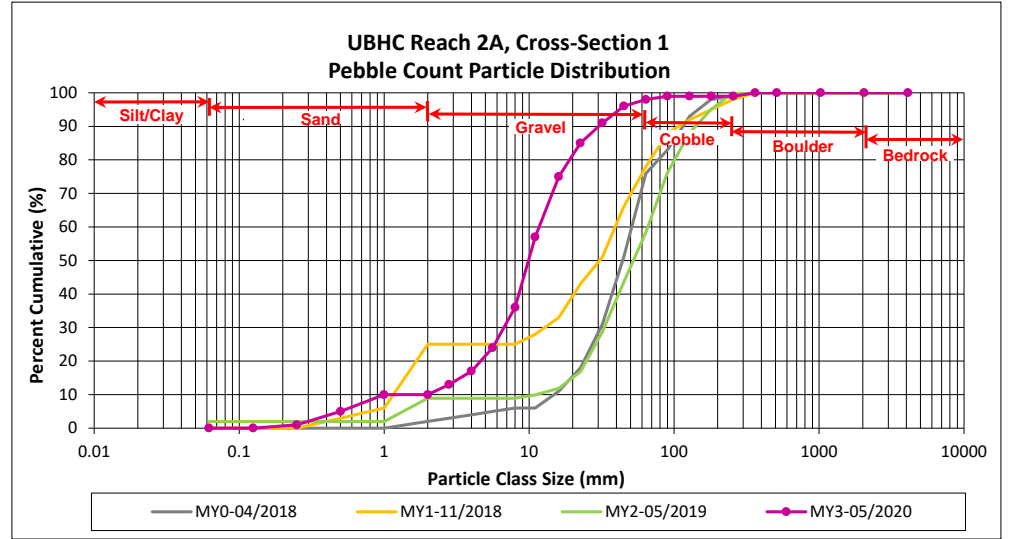
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	1	1	1
	Medium	0.25	0.50	4	4	5
	Coarse	0.5	1.0	5	5	10
	Very Coarse	1.0	2.0			10
GRAVEL	Very Fine	2.0	2.8	3	3	13
	Very Fine	2.8	4.0	4	4	17
	Fine	4.0	5.6	7	7	24
	Fine	5.6	8.0	12	12	36
	Medium	8.0	11.0	21	21	57
	Medium	11.0	16.0	18	18	75
	Coarse	16.0	22.6	10	10	85
	Coarse	22.6	32	6	6	91
	Very Coarse	32	45	5	5	96
	Very Coarse	45	64	2	2	98
COBBLE	Small	64	90	1	1	99
	Small	90	128			99
	Large	128	180			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 1	
Channel materials (mm)	
D ₁₆ =	3.7
D ₃₅ =	7.8
D ₅₀ =	9.9
D ₈₄ =	21.8
D ₉₅ =	42.0
D ₁₀₀ =	362.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

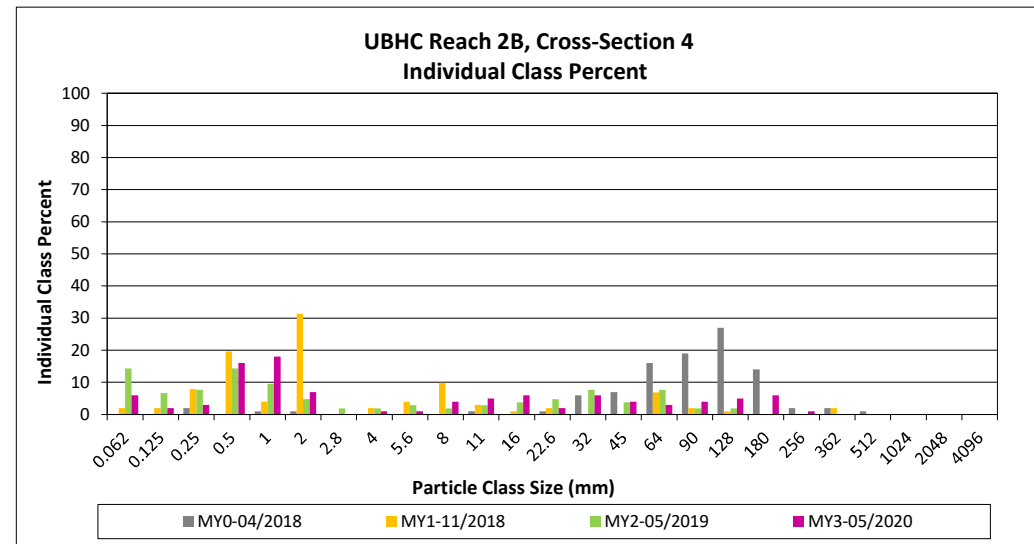
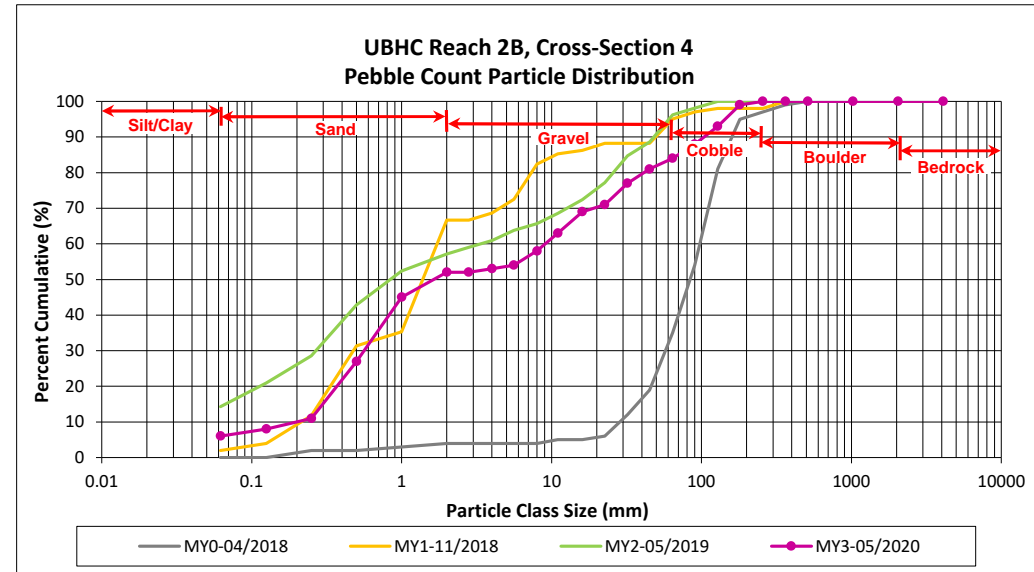
DMS Project No. 739

Monitoring Year 3 - 2020

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	6	6	6
SAND	Very fine	0.062	0.125	2	2	8
	Fine	0.125	0.250	3	3	11
	Medium	0.25	0.50	16	16	27
	Coarse	0.5	1.0	18	18	45
	Very Coarse	1.0	2.0	7	7	52
GRAVEL	Very Fine	2.0	2.8			52
	Very Fine	2.8	4.0	1	1	53
	Fine	4.0	5.6	1	1	54
	Fine	5.6	8.0	4	4	58
	Medium	8.0	11.0	5	5	63
	Medium	11.0	16.0	6	6	69
	Coarse	16.0	22.6	2	2	71
	Coarse	22.6	32	6	6	77
	Very Coarse	32	45	4	4	81
	Very Coarse	45	64	3	3	84
COBBLE	Small	64	90	4	4	88
	Small	90	128	5	5	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 4 Channel materials (mm)	
D ₁₆ =	0.3
D ₃₅ =	0.7
D ₅₀ =	1.6
D ₈₄ =	64.0
D ₉₅ =	143.4
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

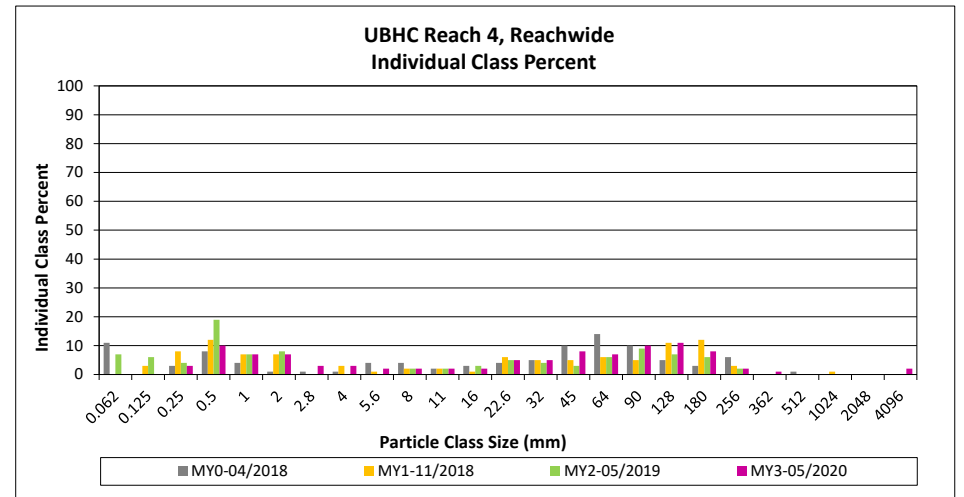
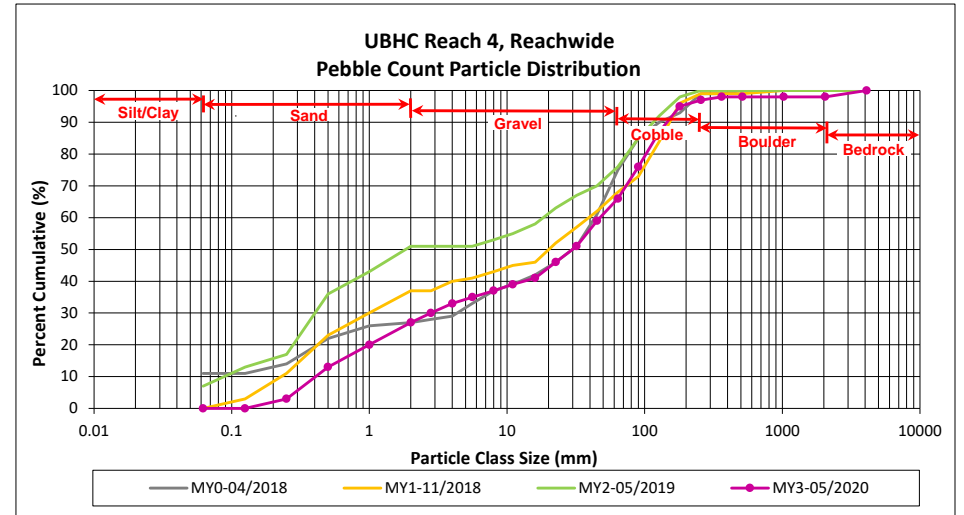
DMS Project No. 739

Monitoring Year 3 - 2020

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					0
SAND	Very fine	0.062	0.125					0
	Fine	0.125	0.250	1	2	3	3	3
	Medium	0.25	0.50		10	10	10	13
	Coarse	0.5	1.0	1	6	7	7	20
	Very Coarse	1.0	2.0		7	7	7	27
GRAVEL	Very Fine	2.0	2.8	1	2	3	3	30
	Very Fine	2.8	4.0		3	3	3	33
	Fine	4.0	5.6		2	2	2	35
	Fine	5.6	8.0		2	2	2	37
	Medium	8.0	11.0		2	2	2	39
	Medium	11.0	16.0	2		2	2	41
	Coarse	16.0	22.6	3	2	5	5	46
	Coarse	22.6	32	3	2	5	5	51
	Very Coarse	32	45	6	2	8	8	59
	Very Coarse	45	64	5	2	7	7	66
COBBLE	Small	64	90	8	2	10	10	76
	Small	90	128	7	4	11	11	87
	Large	128	180	8		8	8	95
	Large	180	256	2		2	2	97
BOULDER	Small	256	362	1		1	1	98
	Small	362	512					98
	Medium	512	1024					98
	Large/Very Large	1024	2048					98
BEDROCK	Bedrock	2048	>2048	2		2	2	100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.7
D ₃₅ =	5.6
D ₅₀ =	29.8
D ₈₄ =	116.3
D ₉₅ =	180.0
D ₁₀₀ =	>2048



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

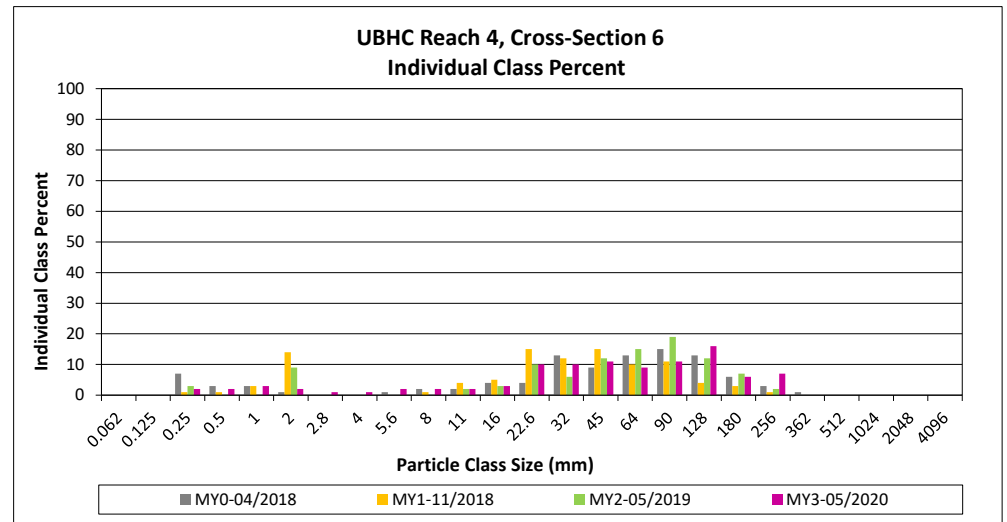
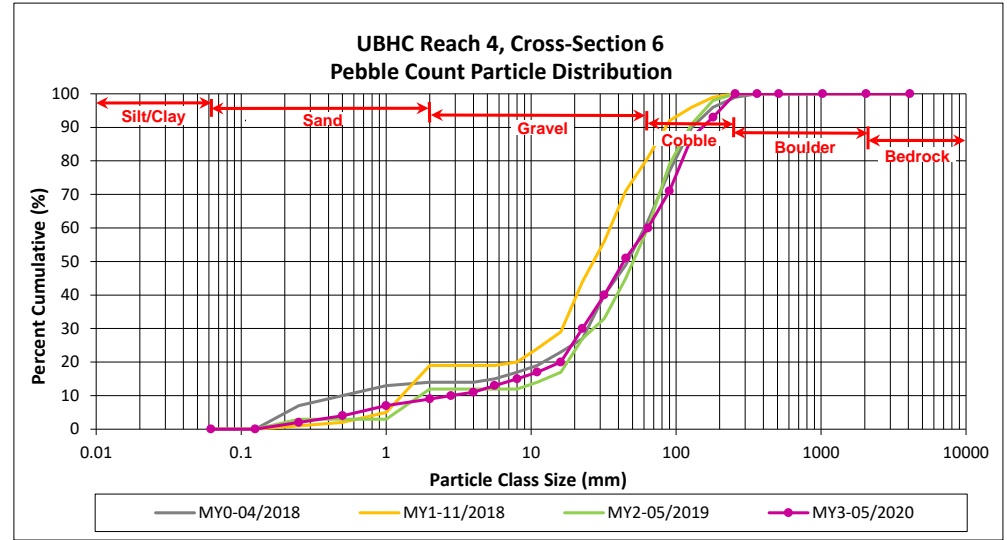
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	2	2	2
	Medium	0.25	0.50	2	2	4
	Coarse	0.5	1.0	3	3	7
	Very Coarse	1.0	2.0	2	2	9
GRAVEL	Very Fine	2.0	2.8	1	1	10
	Very Fine	2.8	4.0	1	1	11
	Fine	4.0	5.6	2	2	13
	Fine	5.6	8.0	2	2	15
	Medium	8.0	11.0	2	2	17
	Medium	11.0	16.0	3	3	20
	Coarse	16.0	22.6	10	10	30
	Coarse	22.6	32	10	10	40
	Very Coarse	32	45	11	11	51
	Very Coarse	45	64	9	9	60
COBBLE	Small	64	90	11	11	71
	Small	90	128	16	16	87
	Large	128	180	6	6	93
	Large	180	256	7	7	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 =	9.4
D ₃₅ =	26.9
D ₅₀ =	43.6
D ₈₄ =	119.8
D ₉₅ =	199.1
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

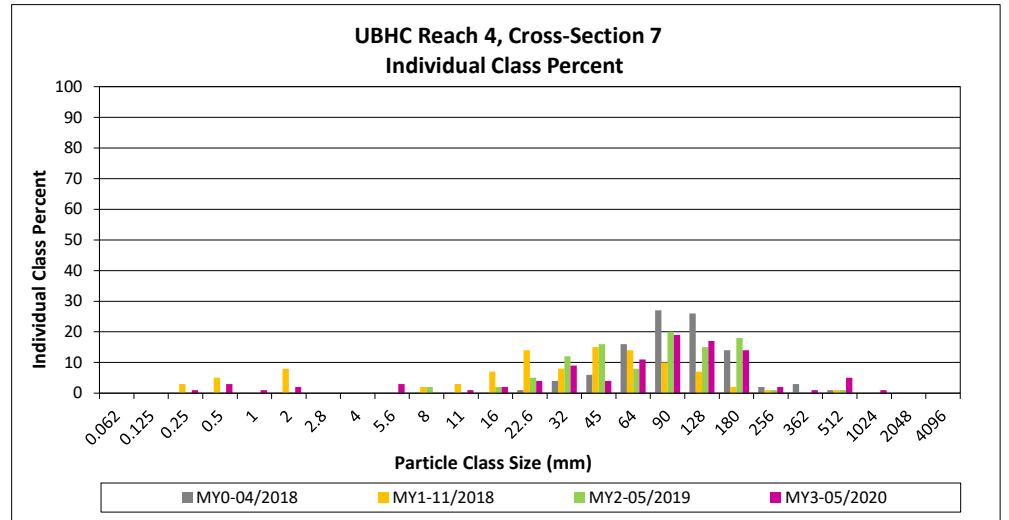
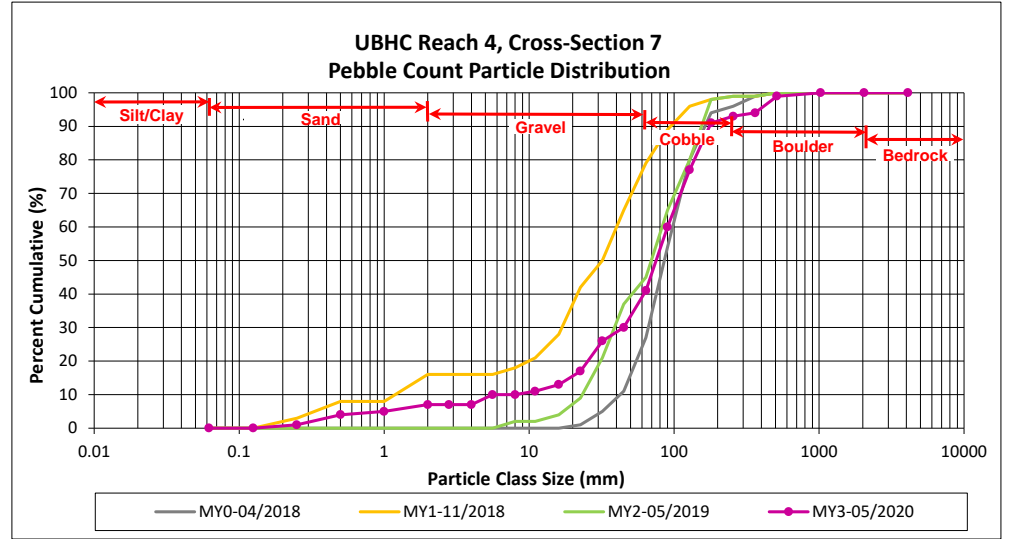
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	1	1	1
	Medium	0.25	0.50	3	3	4
	Coarse	0.5	1.0	1	1	5
	Very Coarse	1.0	2.0	2	2	7
GRAVEL	Very Fine	2.0	2.8			7
	Very Fine	2.8	4.0			7
	Fine	4.0	5.6	3	3	10
	Fine	5.6	8.0			10
	Medium	8.0	11.0	1	1	11
	Medium	11.0	16.0	2	2	13
	Coarse	16.0	22.6	4	4	17
	Coarse	22.6	32	9	9	26
	Very Coarse	32	45	4	4	30
	Very Coarse	45	64	11	11	41
COBBLE	Small	64	90	19	19	60
	Small	90	128	17	17	77
	Large	128	180	14	14	91
	Large	180	256	2	2	93
BOULDER	Small	256	362	1	1	94
	Small	362	512	5	5	99
	Medium	512	1024	1	1	100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
		Total		100	100	100

Cross-Section 7	
Channel materials (mm)	
D ₁₆ =	20.7
D ₃₅ =	52.8
D ₅₀ =	75.2
D ₆₄ =	151.8
D ₉₅ =	388.0
D ₁₀₀ =	1024.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

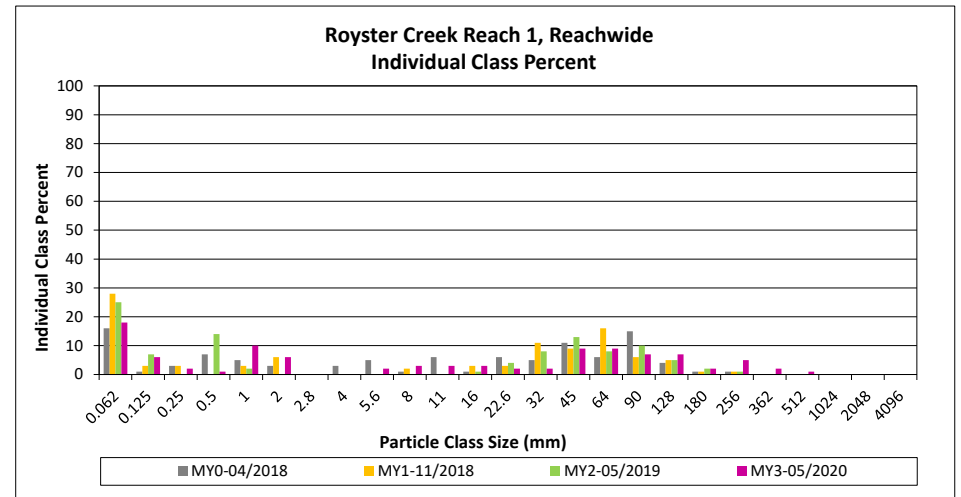
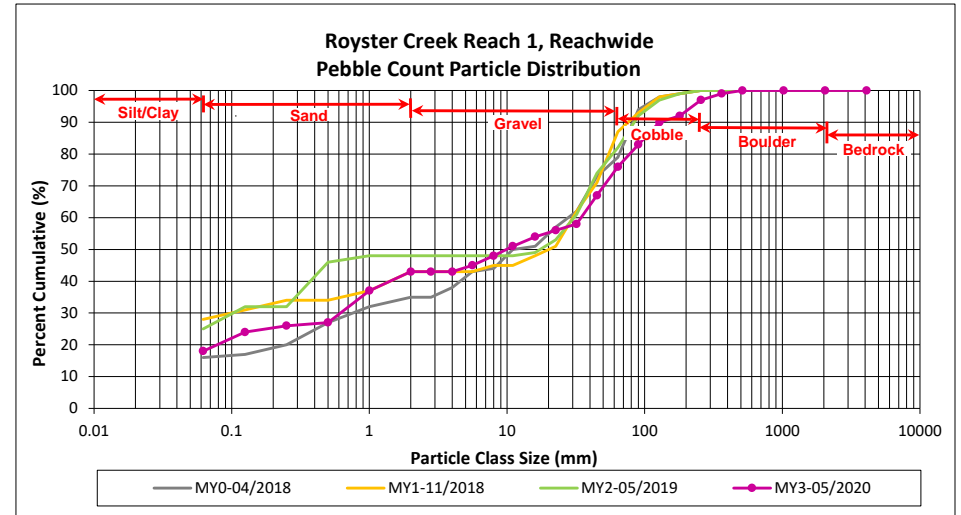
DMS Project No. 739

Monitoring Year 3 - 2020

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	4	14	18	18	18
SAND	Very fine	0.062	0.125	4	2	6	6	24
	Fine	0.125	0.250	1	1	2	2	26
	Medium	0.25	0.50		1	1	1	27
	Coarse	0.5	1.0	2	8	10	10	37
	Very Coarse	1.0	2.0		6	6	6	43
GRAVEL	Very Fine	2.0	2.8					43
	Very Fine	2.8	4.0					43
	Fine	4.0	5.6		2	2	2	45
	Fine	5.6	8.0		3	3	3	48
	Medium	8.0	11.0	2	1	3	3	51
	Medium	11.0	16.0	2	1	3	3	54
	Coarse	16.0	22.6	1	1	2	2	56
	Coarse	22.6	32	2		2	2	58
	Very Coarse	32	45	7	2	9	9	67
	Very Coarse	45	64	7	2	9	9	76
COBBLE	Small	64	90	6	1	7	7	83
	Small	90	128	3	4	7	7	90
	Large	128	180	2		2	2	92
BOULDER	Large	180	256	4	1	5	5	97
	Small	256	362	2		2	2	99
BOULDER	Small	362	512	1		1	1	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 =	0.9
D ₅₀ =	9.9
D ₈₄ =	94.6
D ₉₅ =	222.4
D ₁₀₀ =	512.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

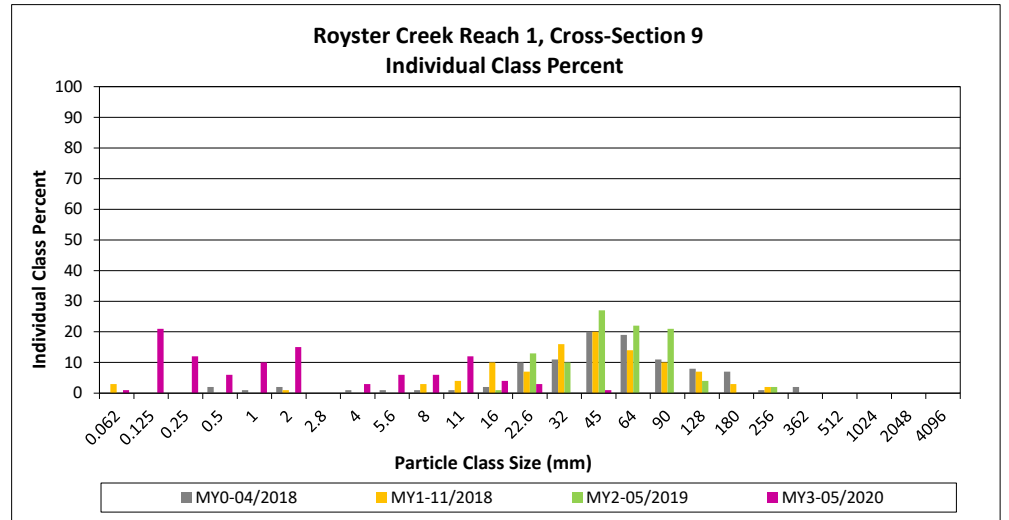
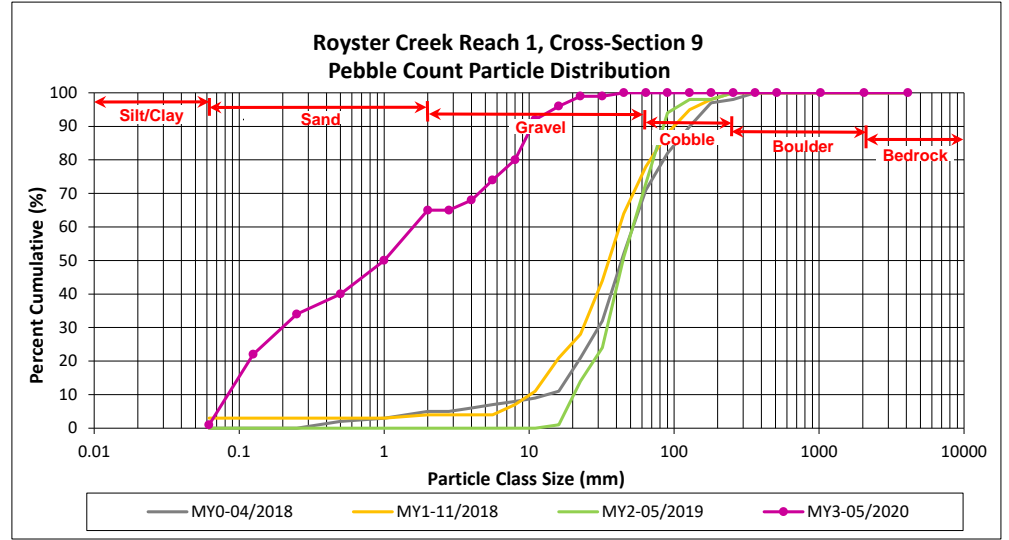
DMS Project No. 739

Monitoring Year 3 - 2020

Royster Creek Reach 1, Cross-Section 9

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
<i>SILT/CLAY</i>	Silt/Clay	0.000	0.062	1	1	1
<i>SAND</i>	Very fine	0.062	0.125	21	21	22
	Fine	0.125	0.250	12	12	34
	Medium	0.25	0.50	6	6	40
	Coarse	0.5	1.0	10	10	50
	Very Coarse	1.0	2.0	15	15	65
<i>GRAVEL</i>	Very Fine	2.0	2.8			65
	Very Fine	2.8	4.0	3	3	68
	Fine	4.0	5.6	6	6	74
	Fine	5.6	8.0	6	6	80
	Medium	8.0	11.0	12	12	92
	Medium	11.0	16.0	4	4	96
	Coarse	16.0	22.6	3	3	99
	Coarse	22.6	32			99
	Very Coarse	32	45	1	1	100
	Very Coarse	45	64			100
<i>COBBLE</i>	Small	64	90			100
	Small	90	128			100
	Large	128	180			100
	Large	180	256			100
<i>BOULDER</i>	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
<i>BEDROCK</i>	Bedrock	2048	>2048			100
		Total		100	100	100

Cross-Section 9	
Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	0.3
D ₅₀ =	1.0
D ₈₄ =	8.9
D ₉₅ =	14.6
D ₁₀₀ =	45.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

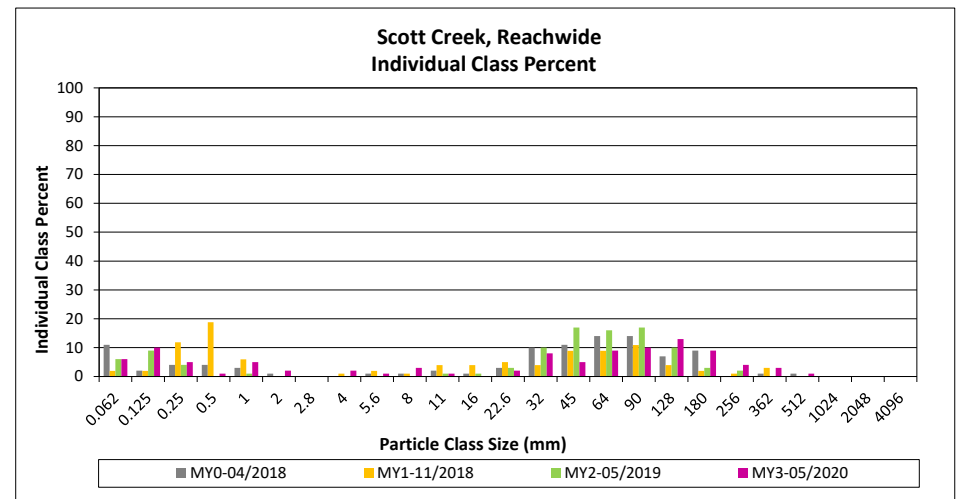
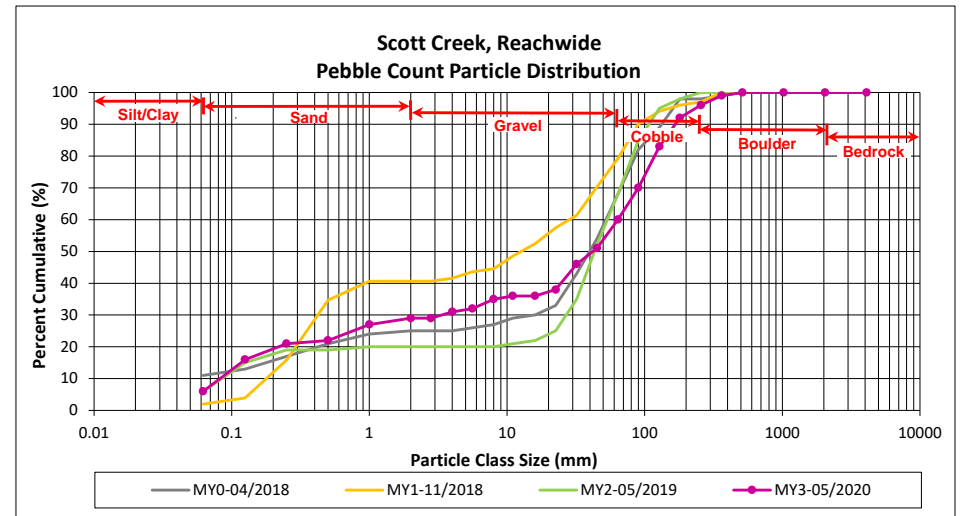
DMS Project No. 739

Monitoring Year 3 - 2020

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	2	4	6	6	6
SAND	Very fine	0.062	0.125	1	9	10	10	16
	Fine	0.125	0.250	2	3	5	5	21
	Medium	0.25	0.50		1	1	1	22
	Coarse	0.5	1.0	1	4	5	5	27
	Very Coarse	1.0	2.0		2	2	2	29
GRAVEL	Very Fine	2.0	2.8					29
	Very Fine	2.8	4.0	1	1	2	2	31
	Fine	4.0	5.6		1	1	1	32
	Fine	5.6	8.0	1	2	3	3	35
	Medium	8.0	11.0	1		1	1	36
	Medium	11.0	16.0					36
	Coarse	16.0	22.6	1	1	2	2	38
	Coarse	22.6	32	5	3	8	8	46
	Very Coarse	32	45	3	2	5	5	51
	Very Coarse	45	64	7	2	9	9	60
COBBLE	Small	64	90	7	3	10	10	70
	Small	90	128	9	4	13	13	83
	Large	128	180	4	5	9	9	92
	Large	180	256	2	2	4	4	96
BOULDER	Small	256	362	2	1	3	3	99
	Small	362	512			1	1	100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	8.0
D ₅₀ =	42.0
D ₈₄ =	132.9
D ₉₅ =	234.4
D ₁₀₀ =	512.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

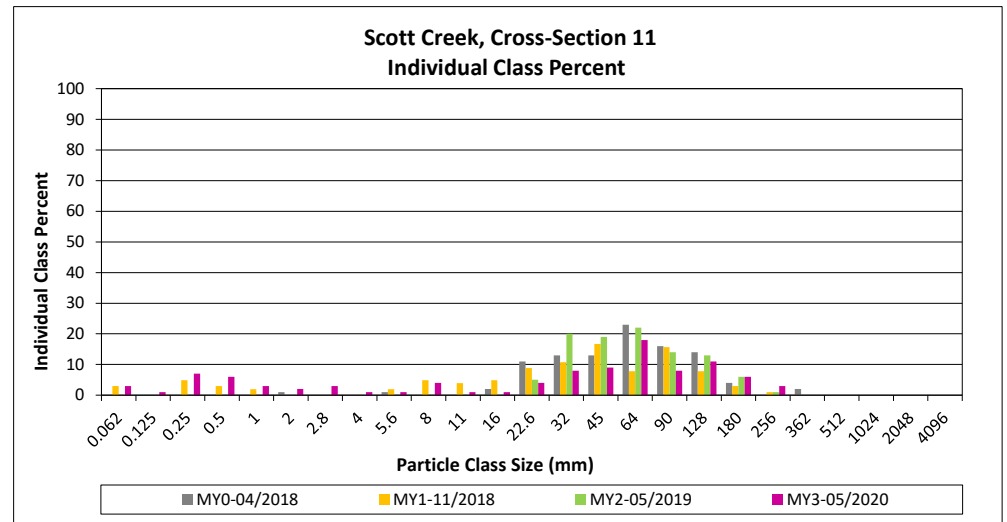
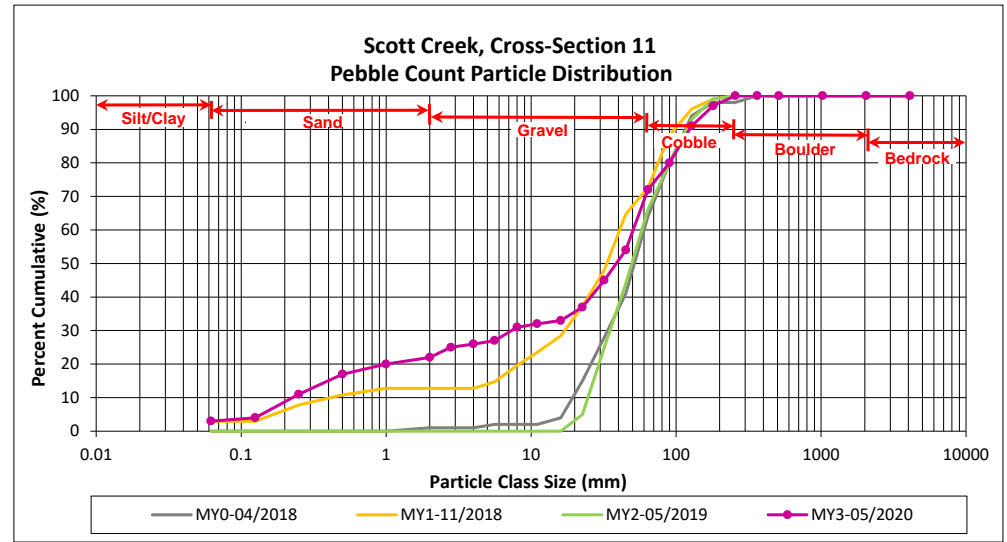
DMS Project No. 739

Monitoring Year 3 - 2020

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	3	3	3
SAND	Very fine	0.062	0.125	1	1	4
	Fine	0.125	0.250	7	7	11
	Medium	0.25	0.50	6	6	17
	Coarse	0.5	1.0	3	3	20
	Very Coarse	1.0	2.0	2	2	22
GRAVEL	Very Fine	2.0	2.8	3	3	25
	Very Fine	2.8	4.0	1	1	26
	Fine	4.0	5.6	1	1	27
	Fine	5.6	8.0	4	4	31
	Medium	8.0	11.0	1	1	32
	Medium	11.0	16.0	1	1	33
	Coarse	16.0	22.6	4	4	37
	Coarse	22.6	32	8	8	45
	Very Coarse	32	45	9	9	54
	Very Coarse	45	64	18	18	72
COBBLE	Small	64	90	8	8	80
	Small	90	128	11	11	91
	Large	128	180	6	6	97
	Large	180	256	3	3	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 =	0.4
D ₃₅ =	19.0
D ₅₀ =	38.7
D ₈₄ =	102.3
D ₉₅ =	160.7
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

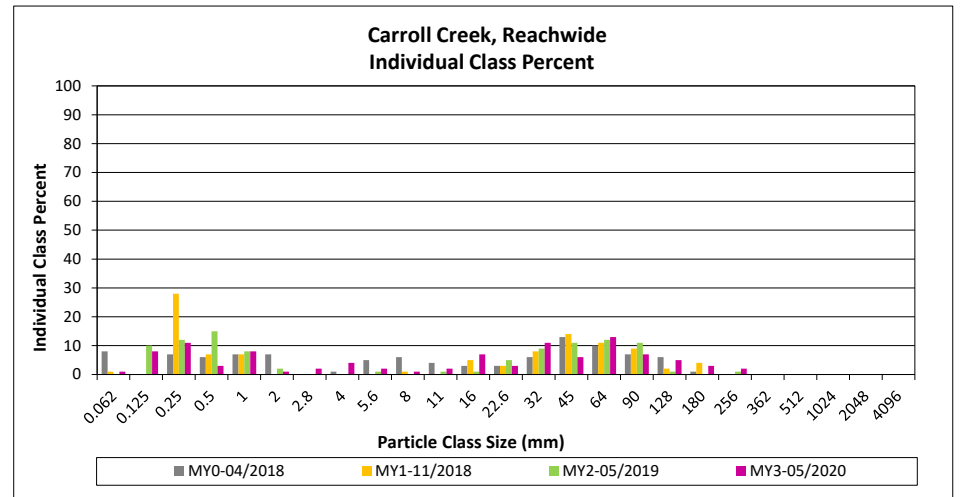
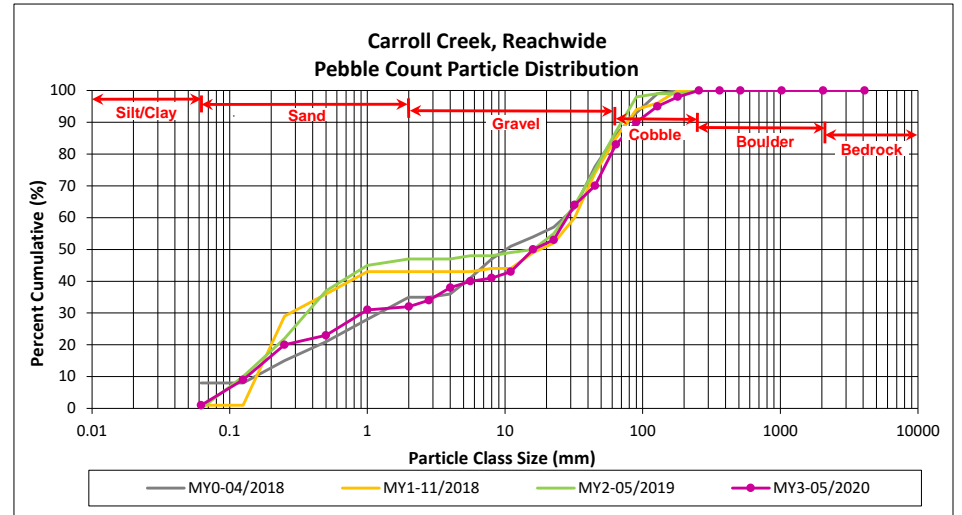
DMS Project No. 739

Monitoring Year 3 - 2020

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		1	1	1	1
SAND	Very fine	0.062	0.125		8	8	8	9
	Fine	0.125	0.250		11	11	11	20
	Medium	0.25	0.50		3	3	3	23
	Coarse	0.5	1.0	2	6	8	8	31
	Very Coarse	1.0	2.0		1	1	1	32
GRAVEL	Very Fine	2.0	2.8	1	1	2	2	34
	Very Fine	2.8	4.0	1	3	4	4	38
	Fine	4.0	5.6	1	1	2	2	40
	Fine	5.6	8.0	1		1	1	41
	Medium	8.0	11.0	2		2	2	43
	Medium	11.0	16.0	6	1	7	7	50
	Coarse	16.0	22.6	2	1	3	3	53
	Coarse	22.6	32	6	5	11	11	64
	Very Coarse	32	45	2	4	6	6	70
	Very Coarse	45	64	11	2	13	13	83
COBBLE	Small	64	90	6	1	7	7	90
	Small	90	128	4	1	5	5	95
	Large	128	180	3		3	3	98
	Large	180	256	2		2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.2
D ₃₅ =	3.1
D ₅₀ =	16.0
D ₈₄ =	67.2
D ₉₅ =	128.0
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area A

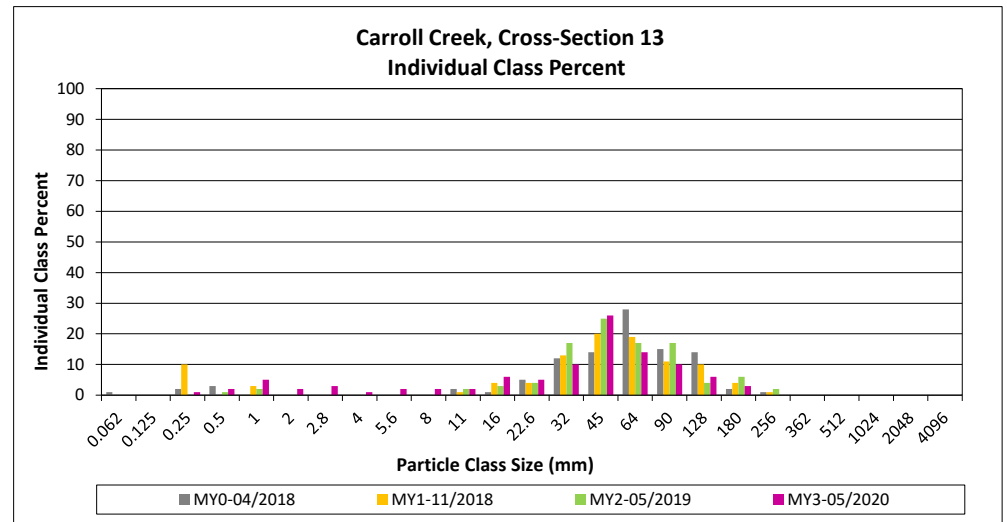
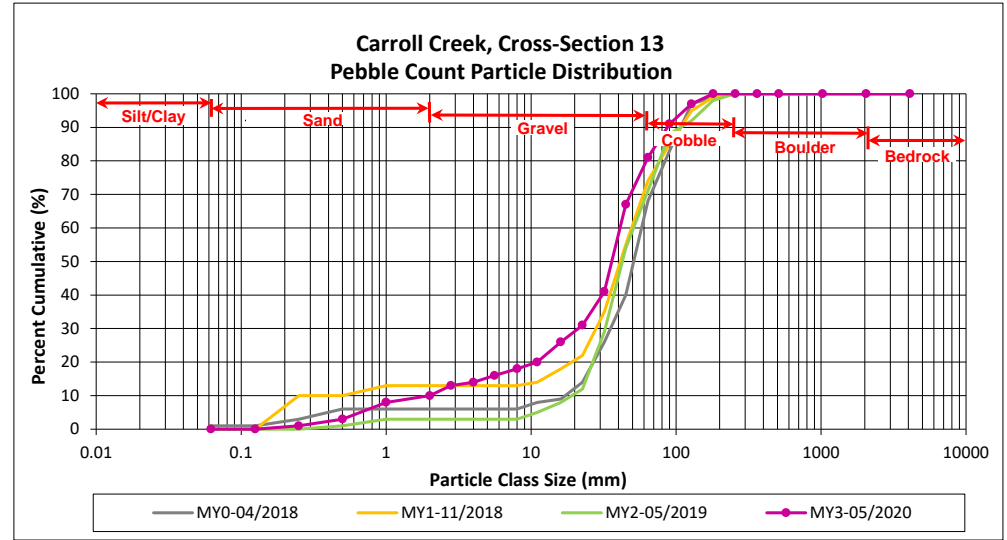
DMS Project No. 739

Monitoring Year 3 - 2020

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	1	1	1
	Medium	0.25	0.50	2	2	3
	Coarse	0.5	1.0	5	5	8
	Very Coarse	1.0	2.0	2	2	10
GRAVEL	Very Fine	2.0	2.8	3	3	13
	Very Fine	2.8	4.0	1	1	14
	Fine	4.0	5.6	2	2	16
	Fine	5.6	8.0	2	2	18
	Medium	8.0	11.0	2	2	20
	Medium	11.0	16.0	6	6	26
	Coarse	16.0	22.6	5	5	31
	Coarse	22.6	32	10	10	41
	Very Coarse	32	45	26	26	67
	Very Coarse	45	64	14	14	81
COBBLE	Small	64	90	10	10	91
	Small	90	128	6	6	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 13 Channel materials (mm)	
D ₁₆ =	5.6
D ₃₅ =	26.0
D ₅₀ =	36.0
D ₈₄ =	70.9
D ₉₅ =	113.8
D ₁₀₀ =	180.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

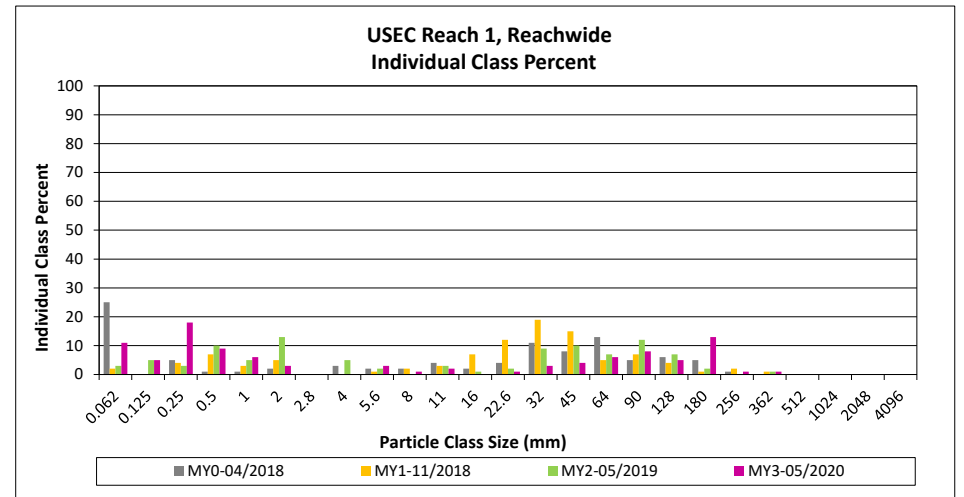
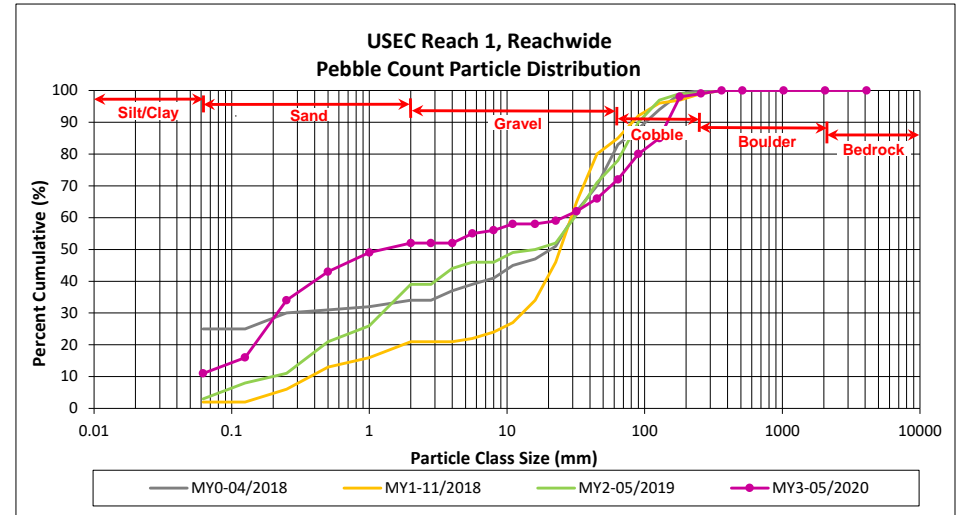
DMS Project No. 739

Monitoring Year 3 - 2020

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	8	11	11	11
SAND	Very fine	0.062	0.125		5	5	5	16
	Fine	0.125	0.250	4	14	18	18	34
	Medium	0.25	0.50	2	7	9	9	43
	Coarse	0.5	1.0	2	4	6	6	49
	Very Coarse	1.0	2.0	1	2	3	3	52
GRAVEL	Very Fine	2.0	2.8					52
	Very Fine	2.8	4.0					52
	Fine	4.0	5.6	2	1	3	3	55
	Fine	5.6	8.0	1		1	1	56
	Medium	8.0	11.0	2		2	2	58
	Medium	11.0	16.0					58
	Coarse	16.0	22.6	1		1	1	59
	Coarse	22.6	32	2	1	3	3	62
	Very Coarse	32	45	3	1	4	4	66
Very Coarse	45	64	4	2	6	6	72	
COBBLE	Small	64	90	7	1	8	8	80
	Small	90	128	2	3	5	5	85
	Large	128	180	12	1	13	13	98
BOULDER	Large	180	256	1		1	1	99
	Small	256	362	1		1	1	100
BOULDER	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 =	0.3
D ₅₀ =	1.3
D ₈₄ =	119.3
D ₉₅ =	166.4
D ₁₀₀ =	362.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

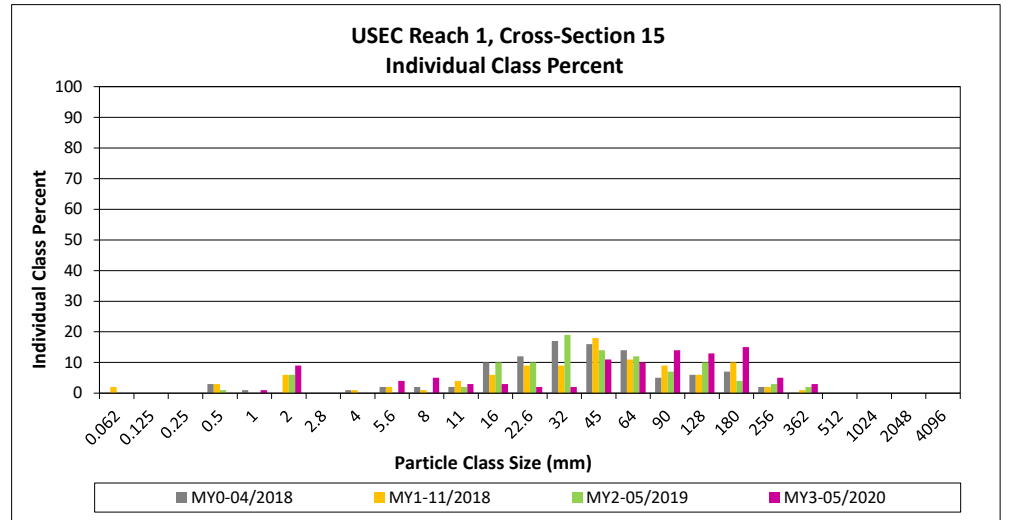
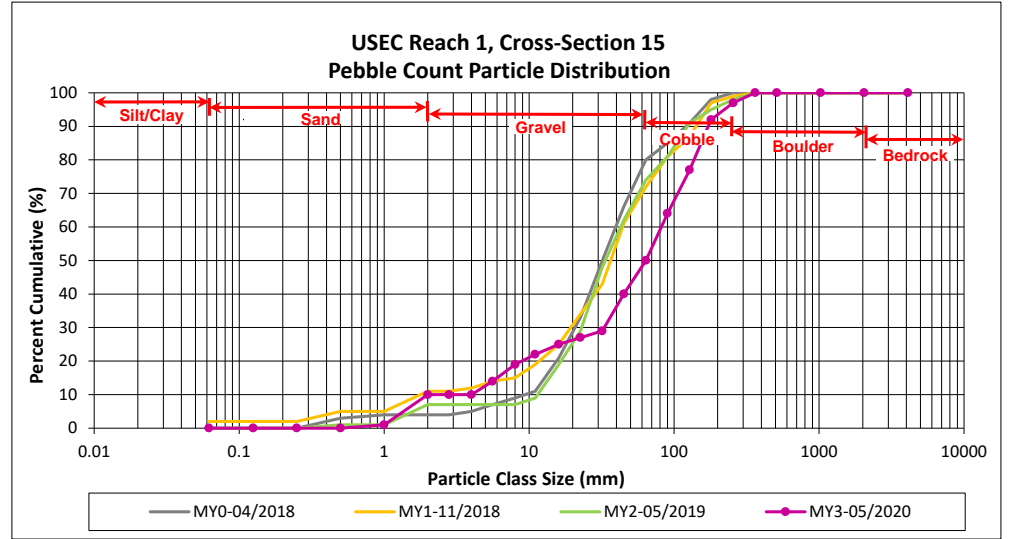
DMS Project No. 739

Monitoring Year 3 - 2020

USEC Reach 1, Cross-Section 15

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
<i>SILT/CLAY</i>	Silt/Clay	0.000	0.062			0
<i>SAND</i>	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	9	9	10
<i>GRAVEL</i>	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0			10
	Fine	4.0	5.6	4	4	14
	Fine	5.6	8.0	5	5	19
	Medium	8.0	11.0	3	3	22
	Medium	11.0	16.0	3	3	25
	Coarse	16.0	22.6	2	2	27
	Coarse	22.6	32	2	2	29
	Very Coarse	32	45	11	11	40
	Very Coarse	45	64	10	10	50
<i>COBBLE</i>	Small	64	90	14	14	64
	Small	90	128	13	13	77
	Large	128	180	15	15	92
	Large	180	256	5	5	97
<i>BOULDER</i>	Small	256	362	3	3	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
<i>BEDROCK</i>	Bedrock	2048	>2048			100
Total				100	100	100

Cross-Section 15 Channel materials (mm)	
D ₁₆ =	6.5
D ₃₅ =	38.5
D ₅₀ =	64.0
D ₈₄ =	150.1
D ₉₅ =	222.4
D ₁₀₀ =	362.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

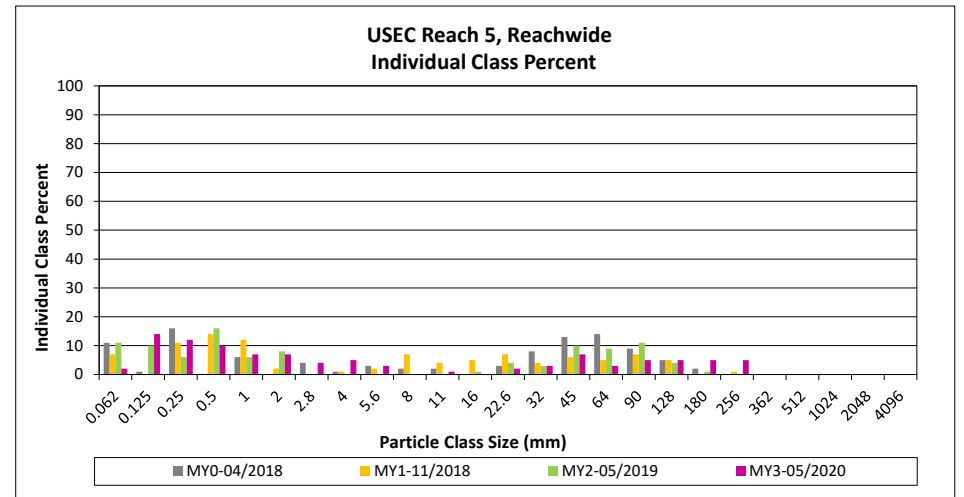
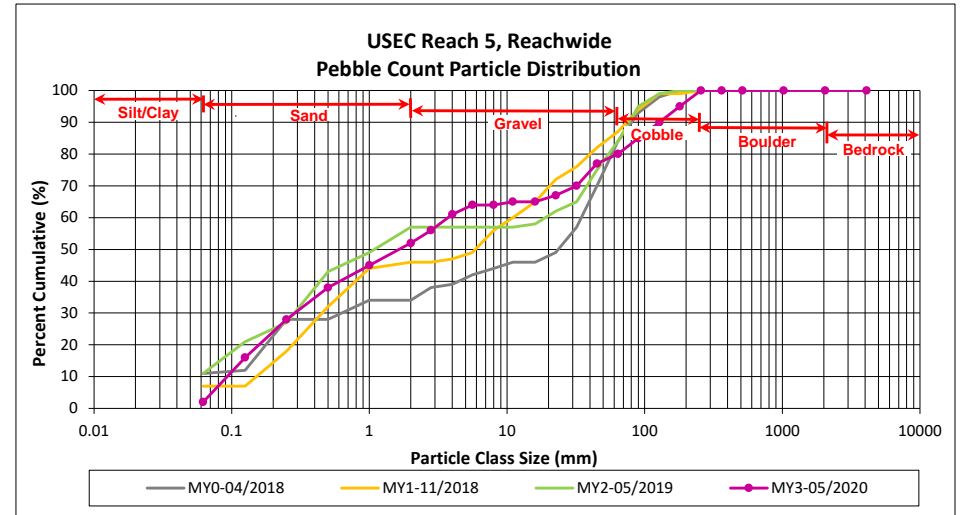
DMS Project No. 739

Monitoring Year 3 - 2020

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		2	2	2	2
SAND	Very fine	0.062	0.125	1	13	14	14	16
	Fine	0.125	0.250	1	11	12	12	28
	Medium	0.25	0.50	1	9	10	10	38
	Coarse	0.5	1.0	2	5	7	7	45
	Very Coarse	1.0	2.0	3	4	7	7	52
GRAVEL	Very Fine	2.0	2.8	3	1	4	4	56
	Very Fine	2.8	4.0	3	2	5	5	61
	Fine	4.0	5.6		3	3	3	64
	Fine	5.6	8.0					64
	Medium	8.0	11.0	1		1	1	65
	Medium	11.0	16.0					65
	Coarse	16.0	22.6	2		2	2	67
	Coarse	22.6	32	3		3	3	70
	Very Coarse	32	45	7		7	7	77
	Very Coarse	45	64	3		3	3	80
COBBLE	Small	64	90	5		5	5	85
	Small	90	128	5		5	5	90
	Large	128	180	5		5	5	95
	Large	180	256	5		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				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	0.4
D ₅₀ =	1.6
D ₈₄ =	84.1
D ₉₅ =	180.0
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

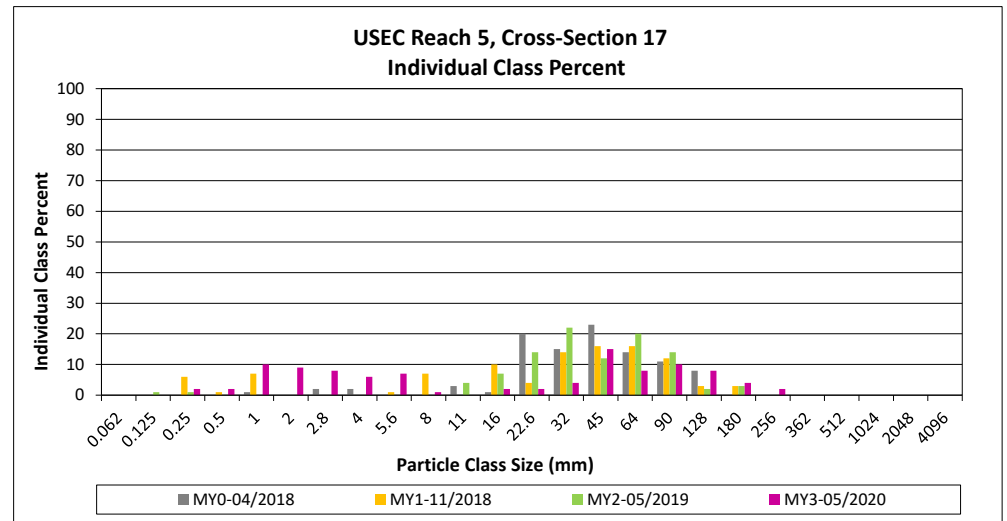
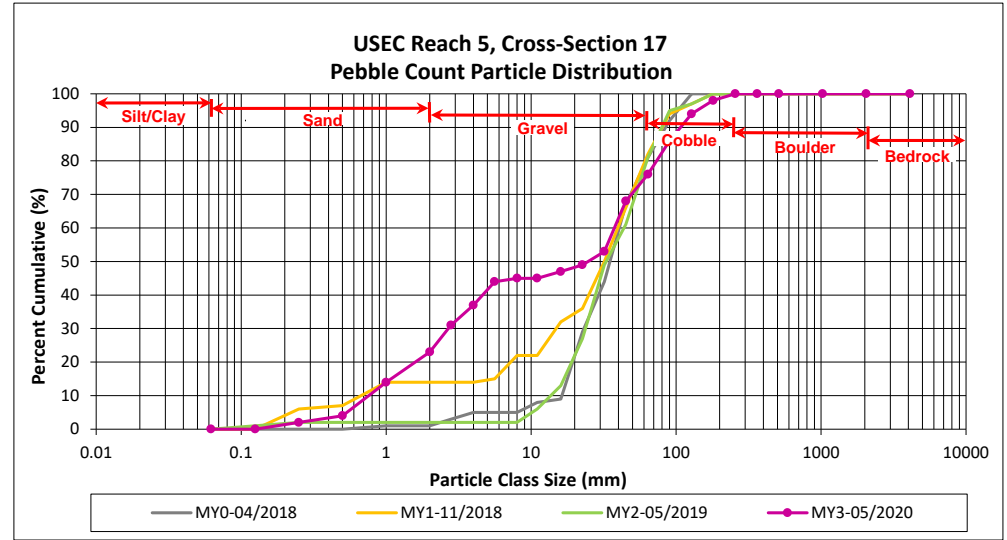
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	2	2	2
	Medium	0.25	0.50	2	2	4
	Coarse	0.5	1.0	10	10	14
	Very Coarse	1.0	2.0	9	9	23
GRAVEL	Very Fine	2.0	2.8	8	8	31
	Very Fine	2.8	4.0	6	6	37
	Fine	4.0	5.6	7	7	44
	Fine	5.6	8.0	1	1	45
	Medium	8.0	11.0			45
	Medium	11.0	16.0	2	2	47
	Coarse	16.0	22.6	2	2	49
	Coarse	22.6	32	4	4	53
	Very Coarse	32	45	15	15	68
	Very Coarse	45	64	8	8	76
COBBLE	Small	64	90	10	10	86
	Small	90	128	8	8	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 17 Channel materials (mm)	
D ₁₆ =	1.2
D ₃₅ =	3.6
D ₅₀ =	24.7
D ₈₄ =	84.1
D ₉₅ =	139.4
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

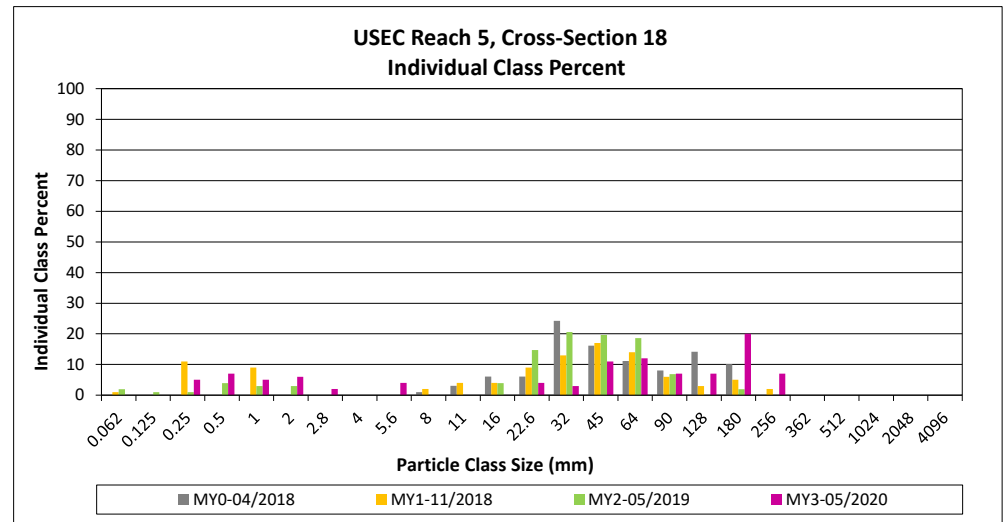
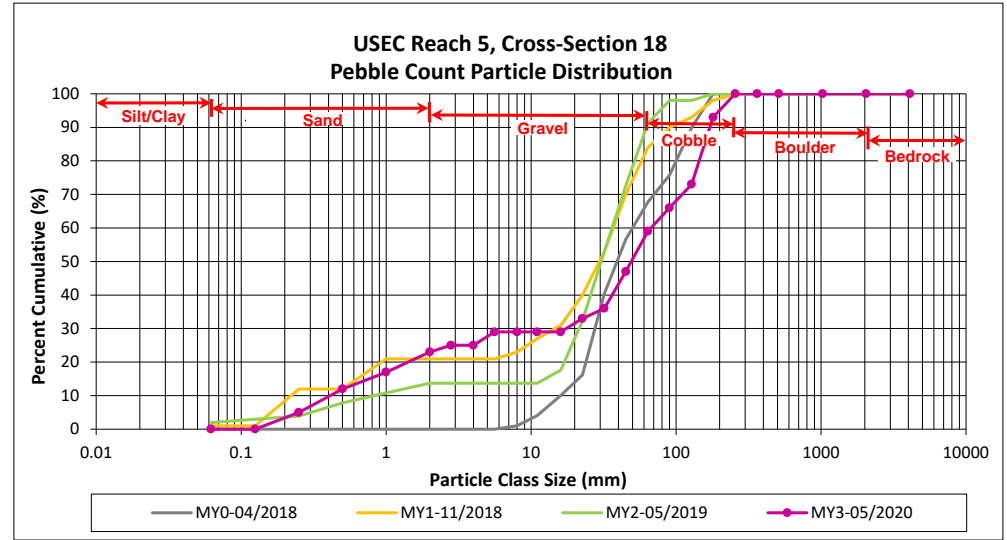
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	5	5	5
	Medium	0.25	0.50	7	7	12
	Coarse	0.5	1.0	5	5	17
	Very Coarse	1.0	2.0	6	6	23
GRAVEL	Very Fine	2.0	2.8	2	2	25
	Very Fine	2.8	4.0			25
	Fine	4.0	5.6	4	4	29
	Fine	5.6	8.0			29
	Medium	8.0	11.0			29
	Medium	11.0	16.0			29
	Coarse	16.0	22.6	4	4	33
	Coarse	22.6	32	3	3	36
	Very Coarse	32	45	11	11	47
	Very Coarse	45	64	12	12	59
	COBBLE	Small	64	90	7	7
Small		90	128	7	7	73
Large		128	180	20	20	93
Large		180	256	7	7	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 18	
Channel materials (mm)	
D ₁₆ =	0.9
D ₃₅ =	28.5
D ₅₀ =	49.1
D ₈₄ =	154.4
D ₉₅ =	199.1
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

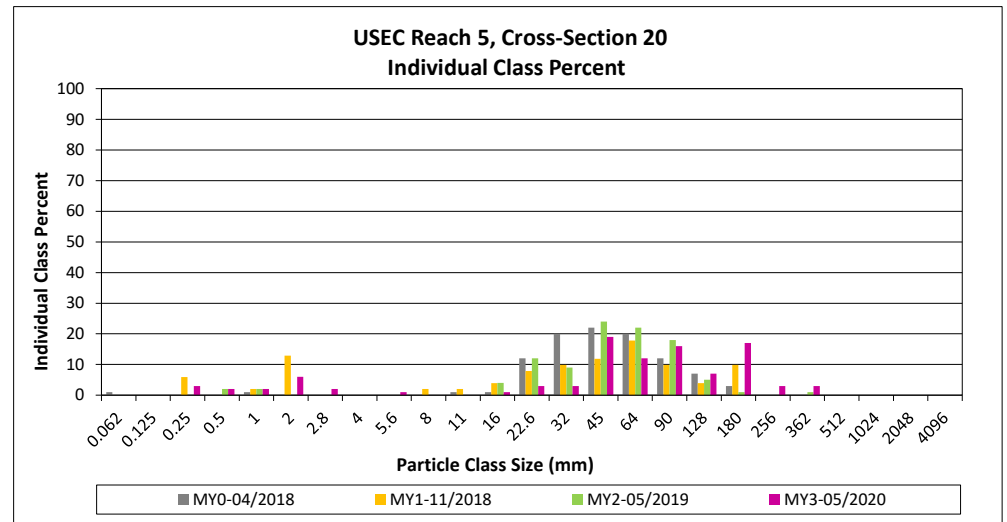
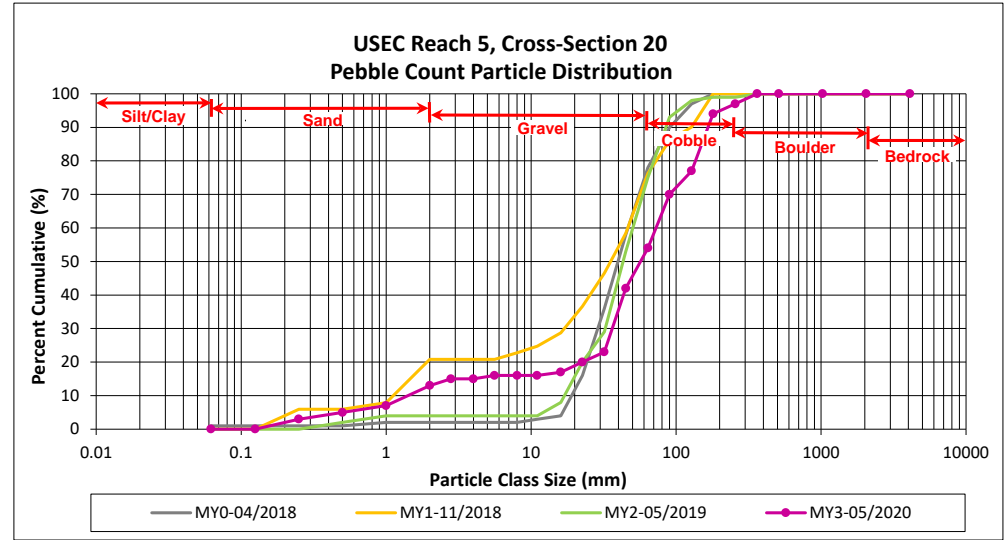
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	3	3	3
	Medium	0.25	0.50	2	2	5
	Coarse	0.5	1.0	2	2	7
	Very Coarse	1.0	2.0	6	6	13
GRAVEL	Very Fine	2.0	2.8	2	2	15
	Very Fine	2.8	4.0			15
	Fine	4.0	5.6	1	1	16
	Fine	5.6	8.0			16
	Medium	8.0	11.0			16
	Medium	11.0	16.0	1	1	17
	Coarse	16.0	22.6	3	3	20
	Coarse	22.6	32	3	3	23
	Very Coarse	32	45	19	19	42
	Very Coarse	45	64	12	12	54
COBBLE	Small	64	90	16	16	70
	Small	90	128	7	7	77
	Large	128	180	17	17	94
	Large	180	256	3	3	97
BOULDER	Small	256	362	3	3	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 =	5.6
D ₃₅ =	39.7
D ₅₀ =	56.9
D ₈₄ =	147.3
D ₉₅ =	202.4
D ₁₀₀ =	362.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

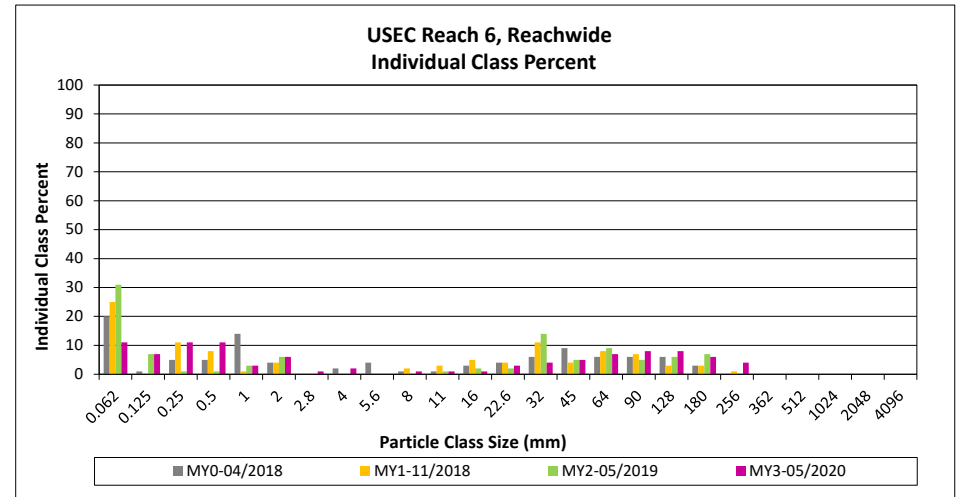
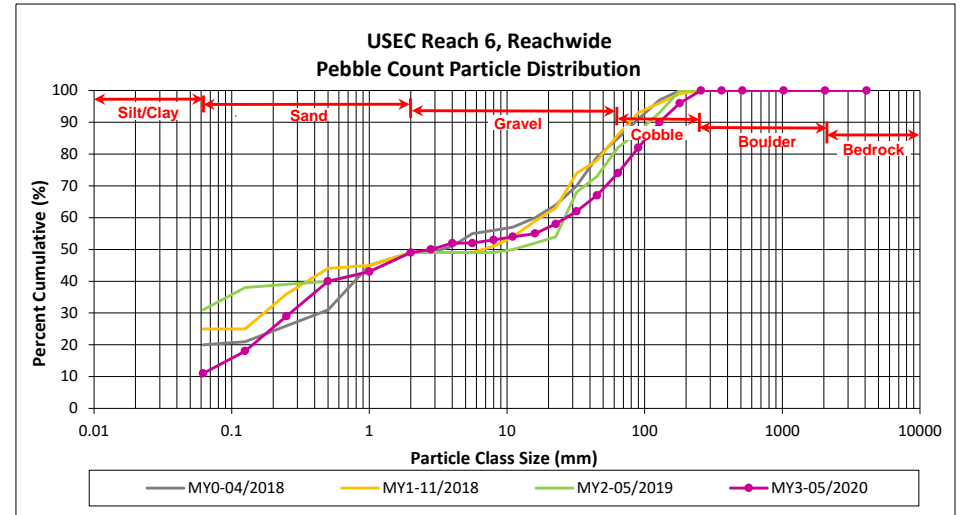
DMS Project No. 739

Monitoring Year 3 - 2020

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	1	10	11	11	11
SAND	Very fine	0.062	0.125		7	7	7	18
	Fine	0.125	0.250	1	10	11	11	29
	Medium	0.25	0.50	1	10	11	11	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	1		1	1	50
	Very Fine	2.8	4.0	1	1	2	2	52
	Fine	4.0	5.6					52
	Fine	5.6	8.0	1		1	1	53
	Medium	8.0	11.0	1		1	1	54
	Medium	11.0	16.0	1		1	1	55
	Coarse	16.0	22.6	1	2	3	3	58
	Coarse	22.6	32	3	1	4	4	62
	Very Coarse	32	45	4	1	5	5	67
	Very Coarse	45	64	6	1	7	7	74
COBBLE	Small	64	90	7	1	8	8	82
	Small	90	128	8		8	8	90
	Large	128	180	6		6	6	96
	Large	180	256	4		4	4	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	0.4
D ₅₀ =	2.8
D ₈₄ =	98.3
D ₉₅ =	170.1
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

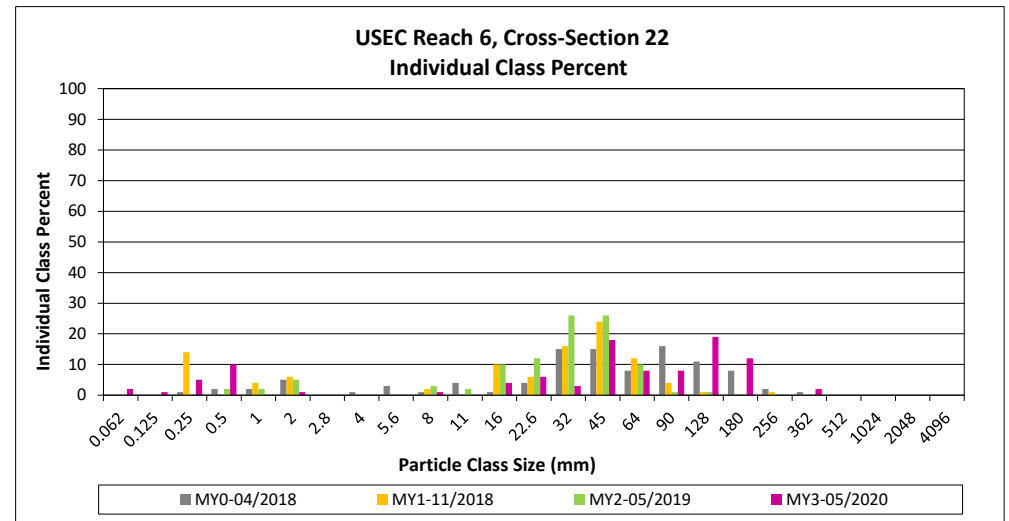
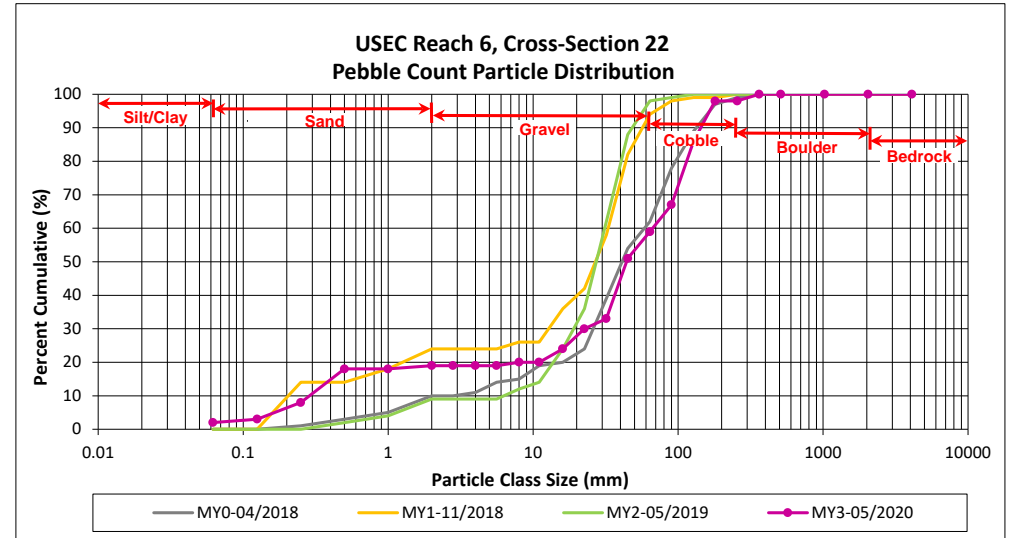
DMS Project No. 739

Monitoring Year 3 - 2020

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	2	2	2
SAND	Very fine	0.062	0.125	1	1	3
	Fine	0.125	0.250	5	5	8
	Medium	0.25	0.50	10	10	18
	Coarse	0.5	1.0			18
	Very Coarse	1.0	2.0	1	1	19
GRAVEL	Very Fine	2.0	2.8			19
	Very Fine	2.8	4.0			19
	Fine	4.0	5.6			19
	Fine	5.6	8.0	1	1	20
	Medium	8.0	11.0			20
	Medium	11.0	16.0	4	4	24
	Coarse	16.0	22.6	6	6	30
	Coarse	22.6	32	3	3	33
	Very Coarse	32	45	18	18	51
	Very Coarse	45	64	8	8	59
COBBLE	Small	64	90	8	8	67
	Small	90	128	19	19	86
	Large	128	180	12	12	98
	Large	180	256			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 22	
Channel materials (mm)	
D ₁₆ =	0.4
D ₃₅ =	33.2
D ₅₀ =	44.2
D ₈₄ =	123.3
D ₉₅ =	165.3
D ₁₀₀ =	362.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

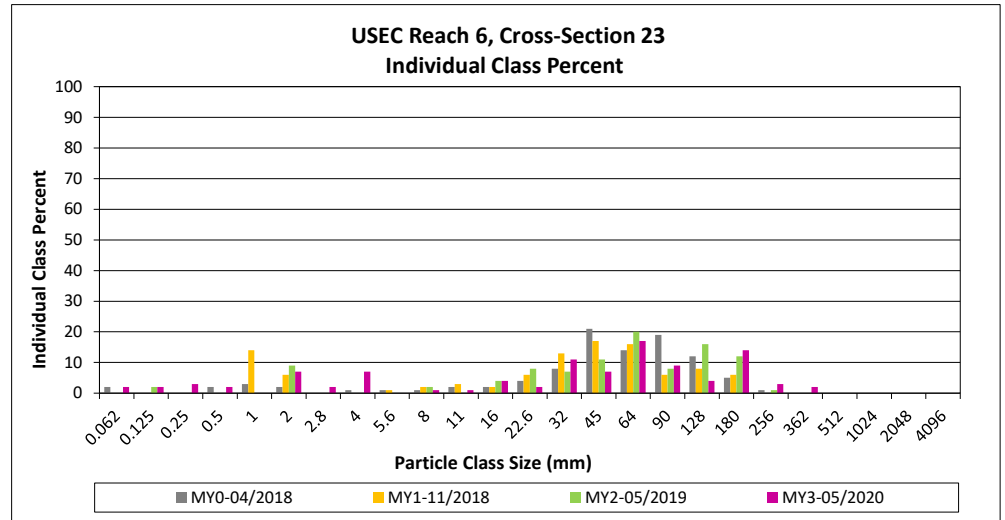
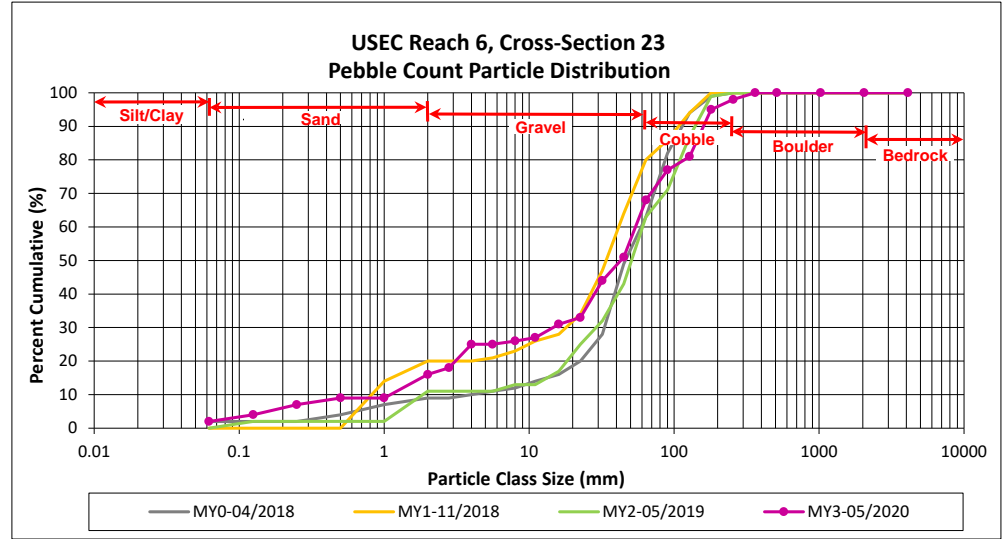
DMS Project No. 739

Monitoring Year 3 - 2020

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	2	2	2
SAND	Very fine	0.062	0.125	2	2	4
	Fine	0.125	0.250	3	3	7
	Medium	0.25	0.50	2	2	9
	Coarse	0.5	1.0			9
	Very Coarse	1.0	2.0	7	7	16
GRAVEL	Very Fine	2.0	2.8	2	2	18
	Very Fine	2.8	4.0	7	7	25
	Fine	4.0	5.6			25
	Fine	5.6	8.0	1	1	26
	Medium	8.0	11.0	1	1	27
	Medium	11.0	16.0	4	4	31
	Coarse	16.0	22.6	2	2	33
	Coarse	22.6	32	11	11	44
	Very Coarse	32	45	7	7	51
	Very Coarse	45	64	17	17	68
	COBBLE	Small	64	90	9	9
Small		90	128	4	4	81
Large		128	180	14	14	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 23	
Channel materials (mm)	
D ₁₆ =	2.0
D ₃₅ =	24.1
D ₅₀ =	42.9
D ₈₄ =	137.7
D ₉₅ =	180.0
D ₁₀₀ =	362.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

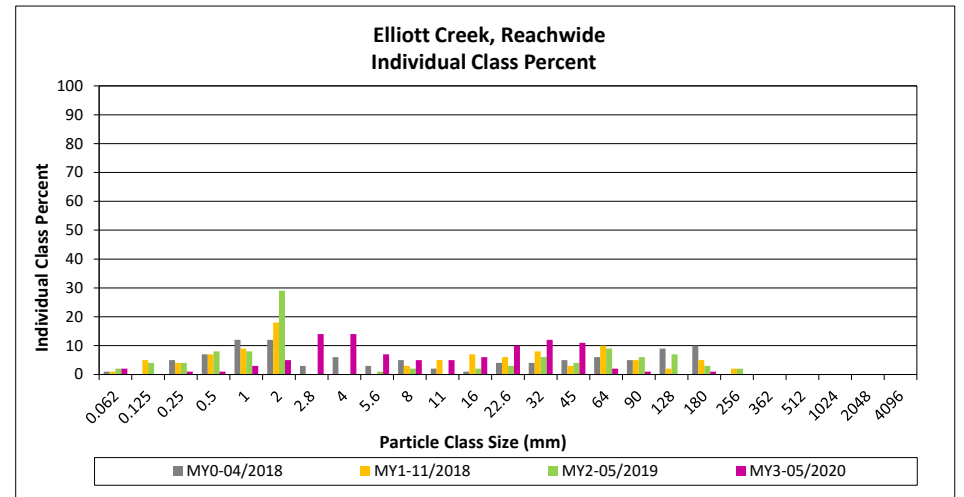
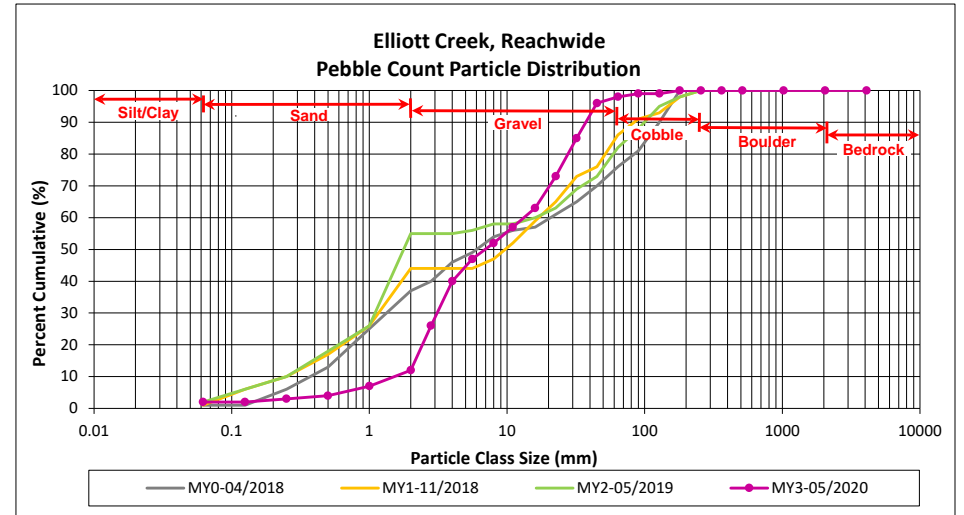
DMS Project No. 739

Monitoring Year 3 - 2020

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					2
	Fine	0.125	0.250		1	1	1	3
	Medium	0.25	0.50		1	1	1	4
	Coarse	0.5	1.0		3	3	3	7
	Very Coarse	1.0	2.0	1	4	5	5	12
GRAVEL	Very Fine	2.0	2.8	3	11	14	14	26
	Very Fine	2.8	4.0	1	13	14	14	40
	Fine	4.0	5.6	4	3	7	7	47
	Fine	5.6	8.0	3	2	5	5	52
	Medium	8.0	11.0	5		5	5	57
	Medium	11.0	16.0	5	1	6	6	63
	Coarse	16.0	22.6	8	2	10	10	73
	Coarse	22.6	32	9	3	12	12	85
	Very Coarse	32	45	8	3	11	11	96
	Very Coarse	45	64	2		2	2	98
COBBLE	Small	64	90	1		1	1	99
	Small	90	128					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 =	2.2
D ₃₅ =	3.5
D ₅₀ =	6.9
D ₈₄ =	31.1
D ₉₅ =	43.6
D ₁₀₀ =	180.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

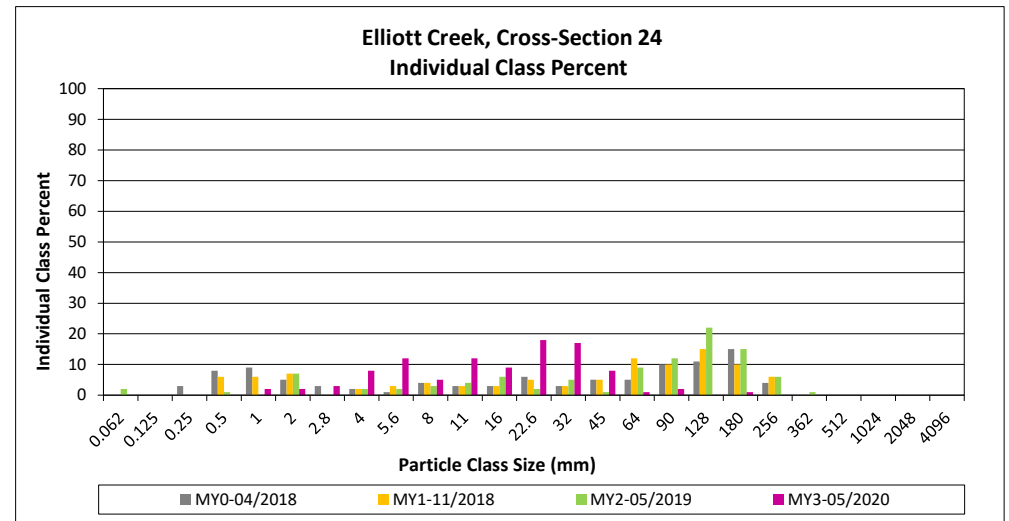
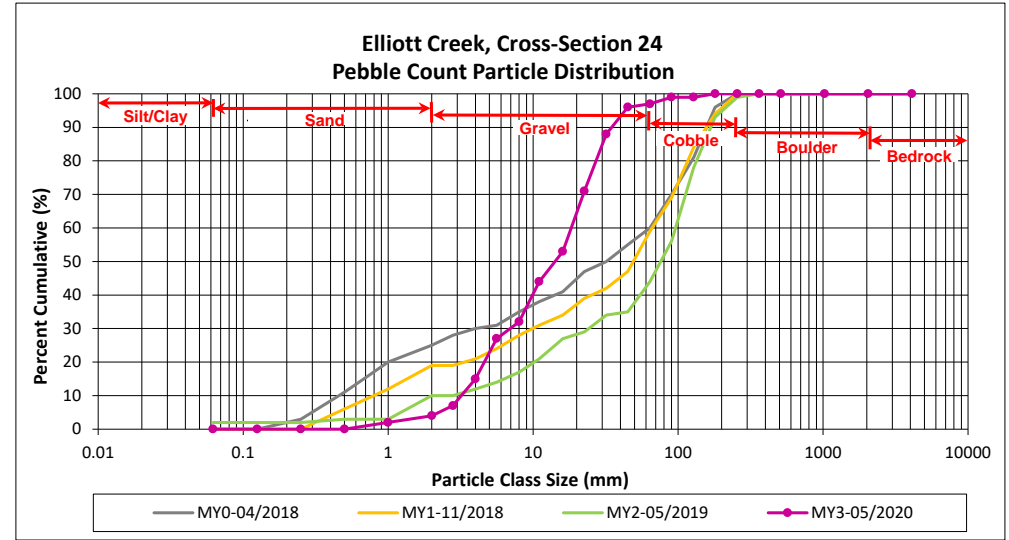
DMS Project No. 739

Monitoring Year 3 - 2020

Elliott Creek, Cross-Section 24

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY		Silt/Clay				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	2	2	2
	Very Coarse	1.0	2.0	2	2	4
GRAVEL	Very Fine	2.0	2.8	3	3	7
	Very Fine	2.8	4.0	8	8	15
	Fine	4.0	5.6	12	12	27
	Fine	5.6	8.0	5	5	32
	Medium	8.0	11.0	12	12	44
	Medium	11.0	16.0	9	9	53
	Coarse	16.0	22.6	18	18	71
	Coarse	22.6	32	17	17	88
	Very Coarse	32	45	8	8	96
	Very Coarse	45	64	1	1	97
COBBLE	Small	64	90	2	2	99
	Small	90	128			99
	Large	128	180	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		100	100	100

Cross-Section 24	
Channel materials (mm)	
D ₁₆ =	4.1
D ₃₅ =	8.7
D ₅₀ =	14.1
D ₈₄ =	29.5
D ₉₅ =	43.1
D ₁₀₀ =	180.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

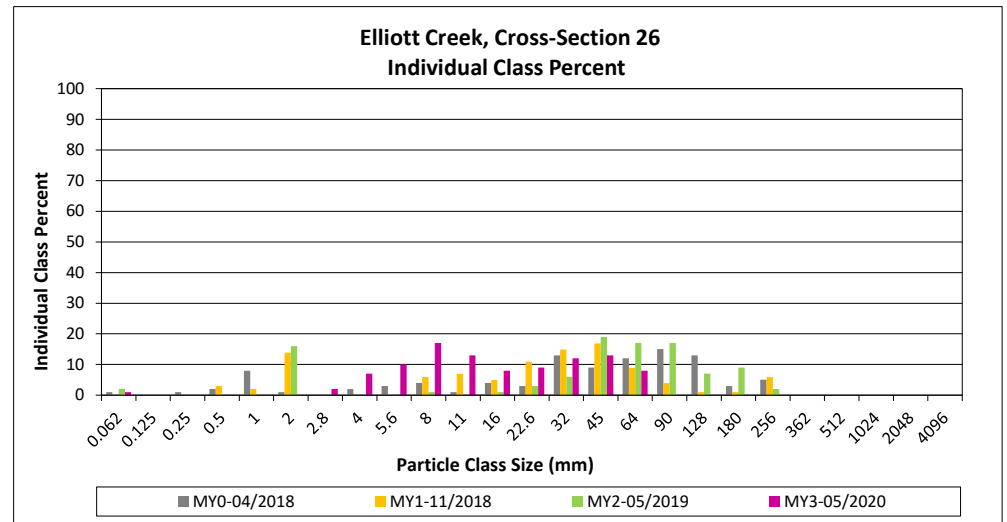
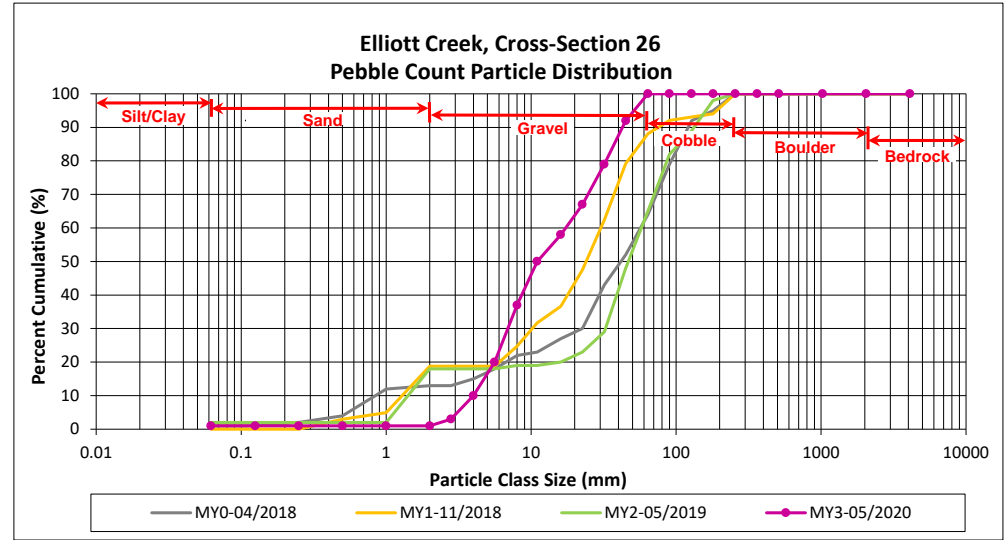
DMS Project No. 739

Monitoring Year 3 - 2020

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	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	
GRAVEL	Very Fine	2.0	2.8	2		2	3	
	Very Fine	2.8	4.0	7		7	10	
	Fine	4.0	5.6	10		10	20	
	Fine	5.6	8.0	17		17	37	
	Medium	8.0	11.0	13		13	50	
	Medium	11.0	16.0	8		8	58	
	Coarse	16.0	22.6	9		9	67	
	Coarse	22.6	32	12		12	79	
	Very Coarse	32	45	13		13	92	
	Very Coarse	45	64	8		8	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 26	
Channel materials (mm)	
D ₁₆ =	4.9
D ₃₅ =	7.7
D ₅₀ =	11.0
D ₈₄ =	36.5
D ₉₅ =	51.4
D ₁₀₀ =	64.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

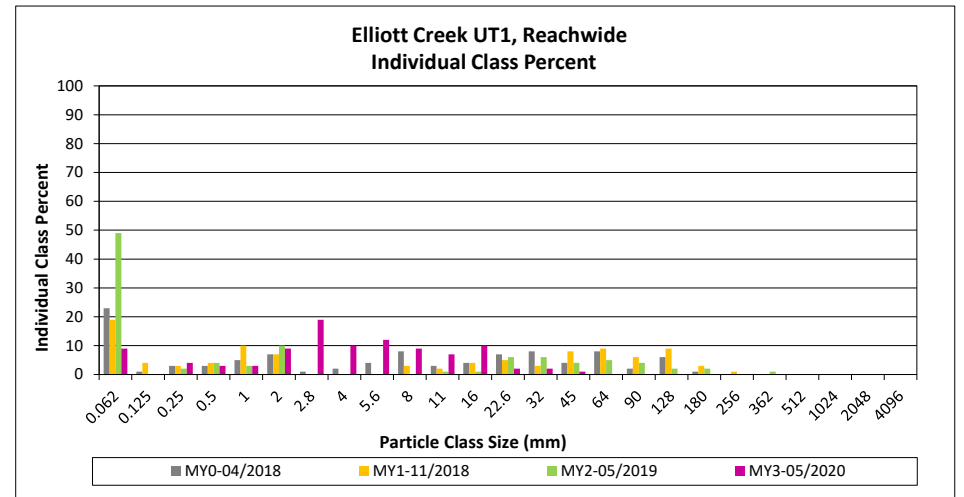
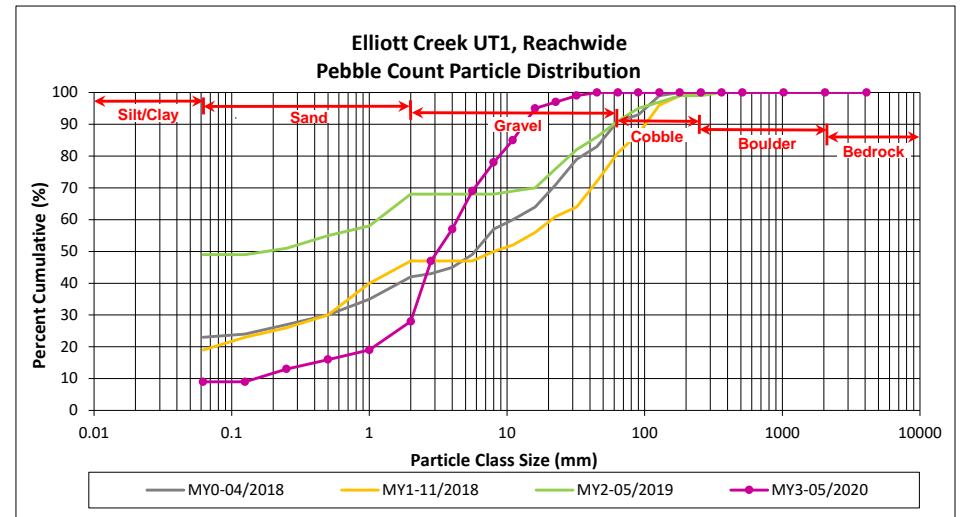
DMS Project No. 739

Monitoring Year 3 - 2020

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	3	6	9	9	9
SAND	Very fine	0.062	0.125					9
	Fine	0.125	0.250	1	3	4	4	13
	Medium	0.25	0.50	2	1	3	3	16
	Coarse	0.5	1.0	1	2	3	3	19
	Very Coarse	1.0	2.0	4	5	9	9	28
GRAVEL	Very Fine	2.0	2.8	7	12	19	19	47
	Very Fine	2.8	4.0	5	5	10	10	57
	Fine	4.0	5.6	9	3	12	12	69
	Fine	5.6	8.0	5	4	9	9	78
	Medium	8.0	11.0	6	1	7	7	85
	Medium	11.0	16.0	4	6	10	10	95
	Coarse	16.0	22.6	1	1	2	2	97
	Coarse	22.6	32	1	1	2	2	99
	Very Coarse	32	45	1		1	1	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 =	0.50
D ₃₅ =	2.26
D ₅₀ =	3.1
D ₈₄ =	10.5
D ₉₅ =	16.0
D ₁₀₀ =	45.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

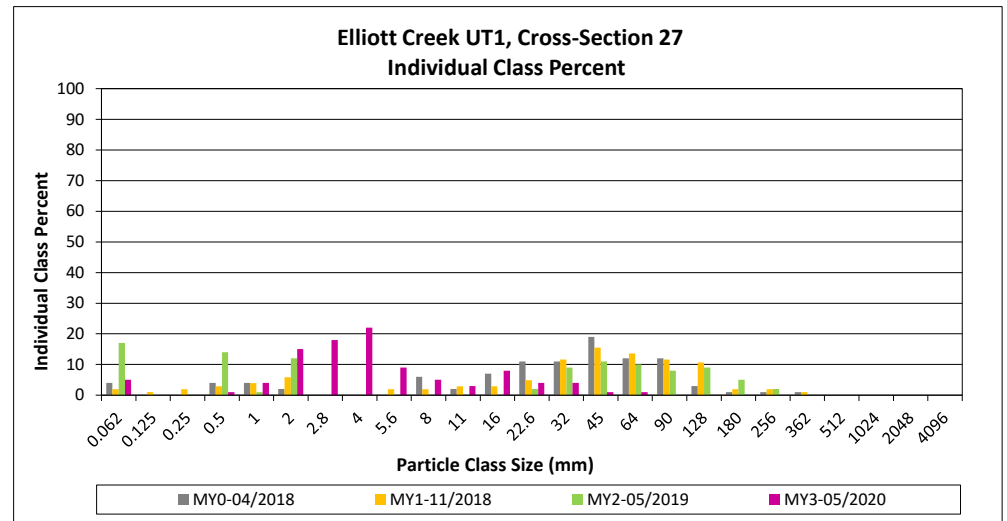
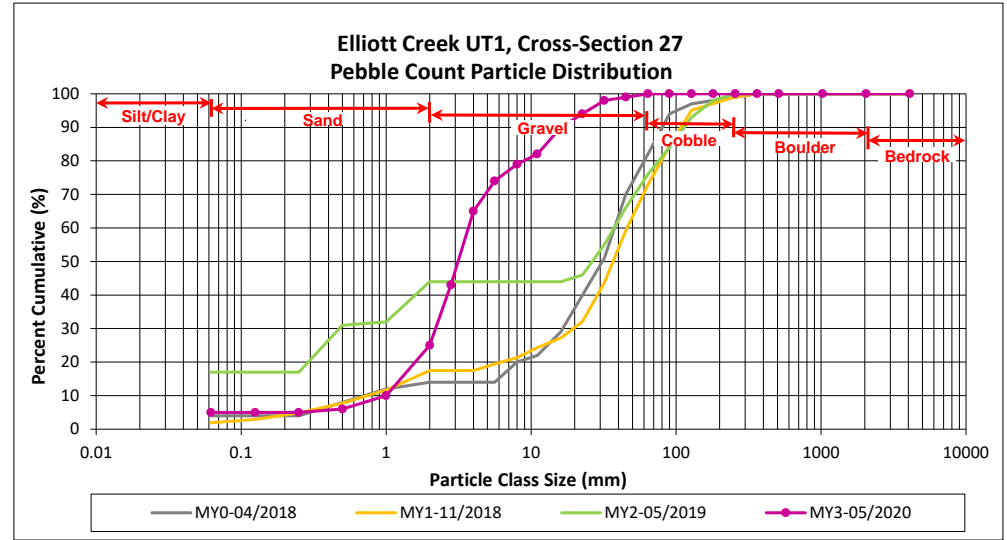
DMS Project No. 739

Monitoring Year 3 - 2020

Elliott Creek UT1, Cross-Section 27

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY		Silt/Clay		5	5	5
SAND	Very fine	0.062	0.125			5
	Fine	0.125	0.250			5
	Medium	0.25	0.50	1	1	6
	Coarse	0.5	1.0	4	4	10
	Very Coarse	1.0	2.0	15	15	25
GRAVEL	Very Fine	2.0	2.8	18	18	43
	Very Fine	2.8	4.0	22	22	65
	Fine	4.0	5.6	9	9	74
	Fine	5.6	8.0	5	5	79
	Medium	8.0	11.0	3	3	82
	Medium	11.0	16.0	8	8	90
	Coarse	16.0	22.6	4	4	94
	Coarse	22.6	32	4	4	98
	Very Coarse	32	45	1	1	99
	Very Coarse	45	64	1	1	100
	COBBLE	Small	64	90		
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 27	
Channel materials (mm)	
D ₁₆ =	1.32
D ₃₅ =	2.4
D ₅₀ =	3.1
D ₈₄ =	12.1
D ₉₅ =	24.7
D ₁₀₀ =	64.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

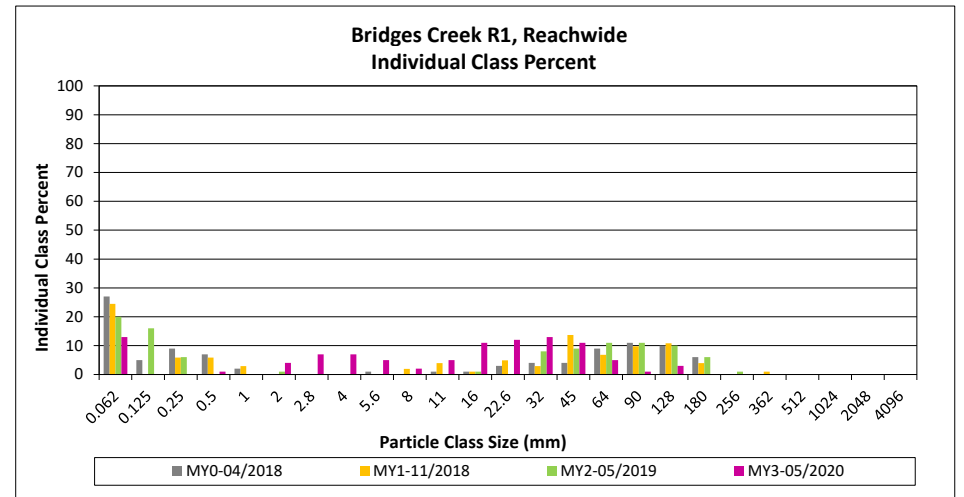
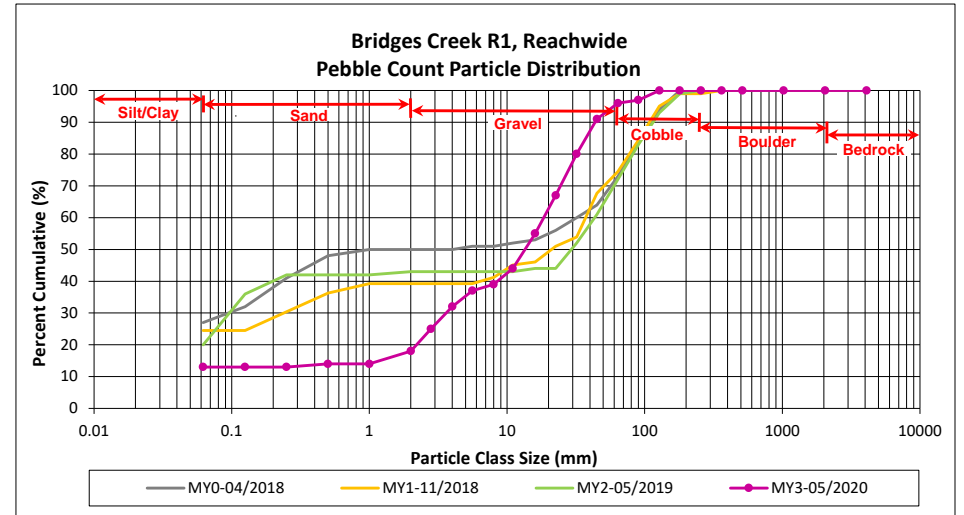
DMS Project No. 739

Monitoring Year 3 - 2020

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	12	13	13	13
SAND	Very fine	0.062	0.125					13
	Fine	0.125	0.250					13
	Medium	0.25	0.50		1	1	1	14
	Coarse	0.5	1.0					14
GRAVEL	Very Coarse	1.0	2.0	2	2	4	4	18
	Very Fine	2.0	2.8	4	3	7	7	25
	Very Fine	2.8	4.0	4	3	7	7	32
	Fine	4.0	5.6	1	4	5	5	37
	Fine	5.6	8.0	1	1	2	2	39
	Medium	8.0	11.0	3	2	5	5	44
	Medium	11.0	16.0	7	4	11	11	55
	Coarse	16.0	22.6	6	6	12	12	67
	Coarse	22.6	32	10	3	13	13	80
	Very Coarse	32	45	7	4	11	11	91
COBBLE	Very Coarse	45	64	3	2	5	5	96
	Small	64	90		1	1	1	97
	Small	90	128	1	2	3	3	100
BOULDER	Large	128	180					100
	Large	180	256					100
	Small	256	362					100
	Small	362	512					100
BEDROCK	Medium	512	1024					100
	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	1.41
D ₃₅ =	4.9
D ₅₀ =	13.5
D ₈₄ =	36.2
D ₉₅ =	59.6
D ₁₀₀ =	128.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

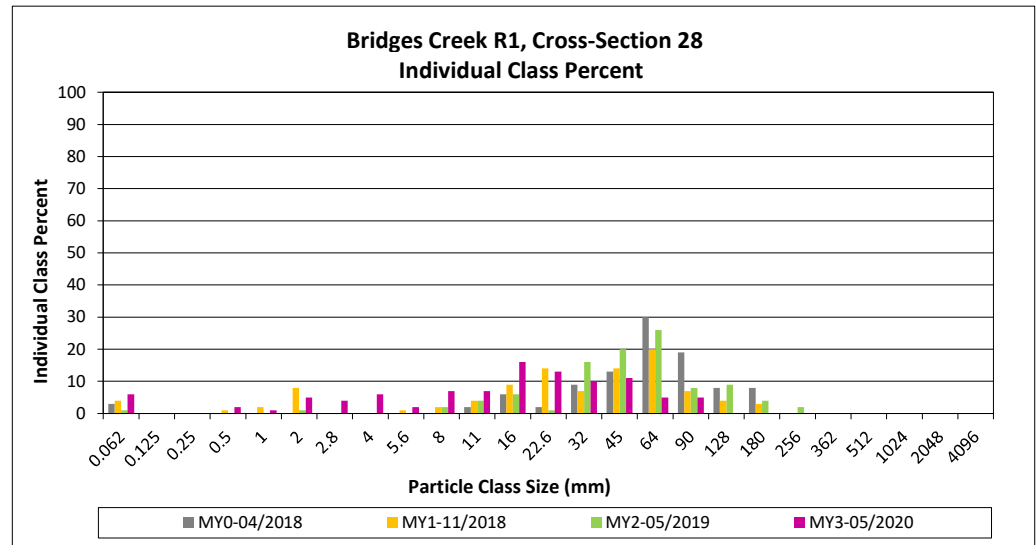
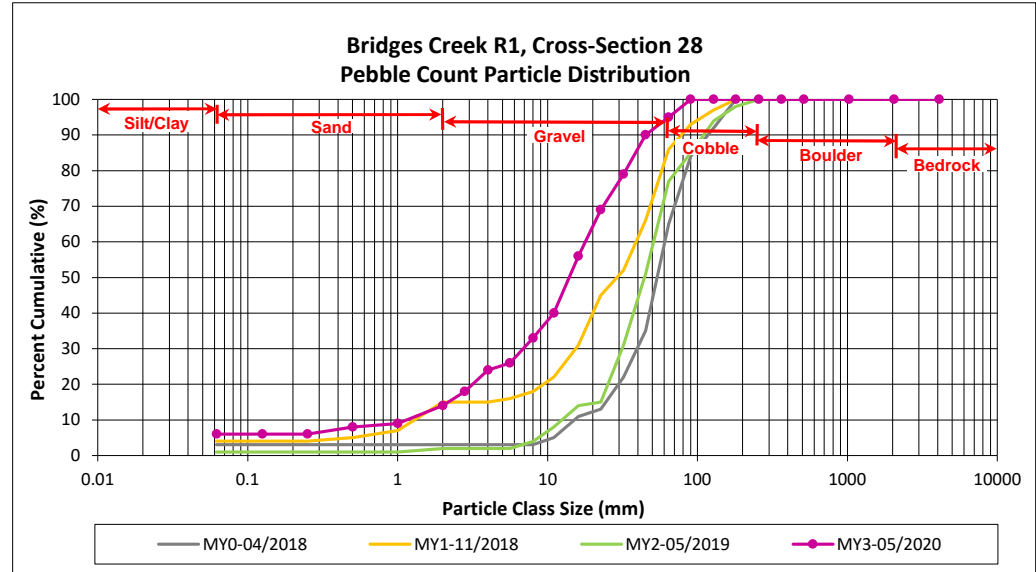
DMS Project No. 739

Monitoring Year 3 - 2020

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	6	6	6
SAND	Very fine	0.062	0.125			6
	Fine	0.125	0.250			6
	Medium	0.25	0.50	2	2	8
	Coarse	0.5	1.0	1	1	9
	Very Coarse	1.0	2.0	5	5	14
GRAVEL	Very Fine	2.0	2.8	4	4	18
	Very Fine	2.8	4.0	6	6	24
	Fine	4.0	5.6	2	2	26
	Fine	5.6	8.0	7	7	33
	Medium	8.0	11.0	7	7	40
	Medium	11.0	16.0	16	16	56
	Coarse	16.0	22.6	13	13	69
	Coarse	22.6	32	10	10	79
	Very Coarse	32	45	11	11	90
	Very Coarse	45	64	5	5	95
COBBLE	Small	64	90	5	5	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 28	
Channel materials (mm)	
D ₁₆ =	2.4
D ₃₅ =	8.8
D ₅₀ =	13.9
D ₈₄ =	37.4
D ₉₅ =	64.0
D ₁₀₀ =	90.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

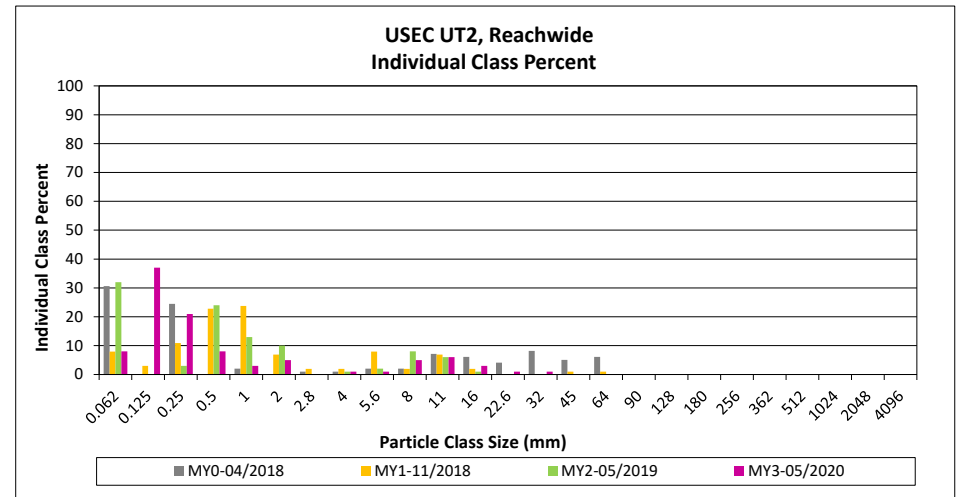
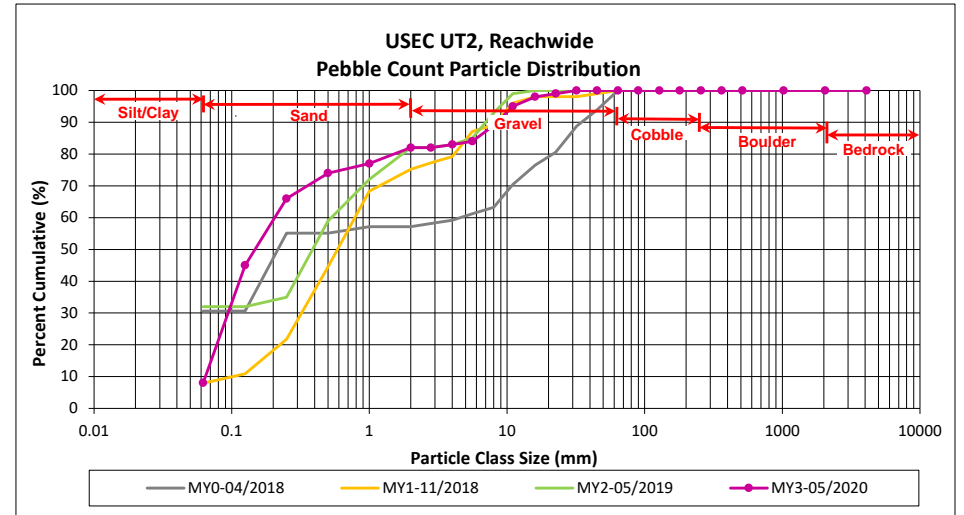
DMS Project No. 739

Monitoring Year 3 - 2020

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	2	6	8	8	8
SAND	Very fine	0.062	0.125	18	19	37	37	45
	Fine	0.125	0.250	7	14	21	21	66
	Medium	0.25	0.50	1	7	8	8	74
	Coarse	0.5	1.0	1	2	3	3	77
	Very Coarse	1.0	2.0	4	1	5	5	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	1	84
	Fine	5.6	8.0	5		5	5	89
	Medium	8.0	11.0	5	1	6	6	95
	Medium	11.0	16.0	3		3	3	98
	Coarse	16.0	22.6	1		1	1	99
	Coarse	22.6	32	1		1	1	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 =	0.1
D ₃₅ =	0.1
D ₅₀ =	0.1
D ₈₄ =	5.6
D ₉₅ =	11.0
D ₁₀₀ =	32.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

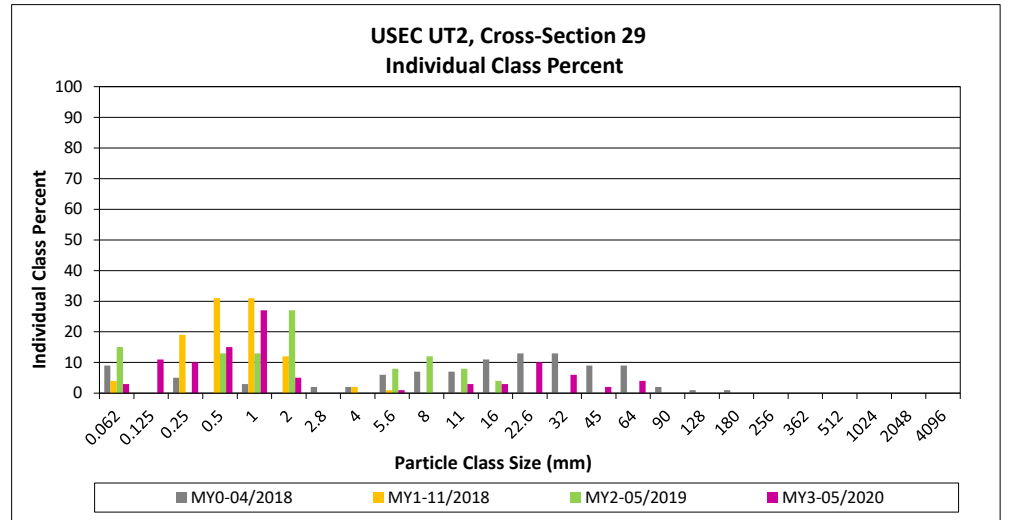
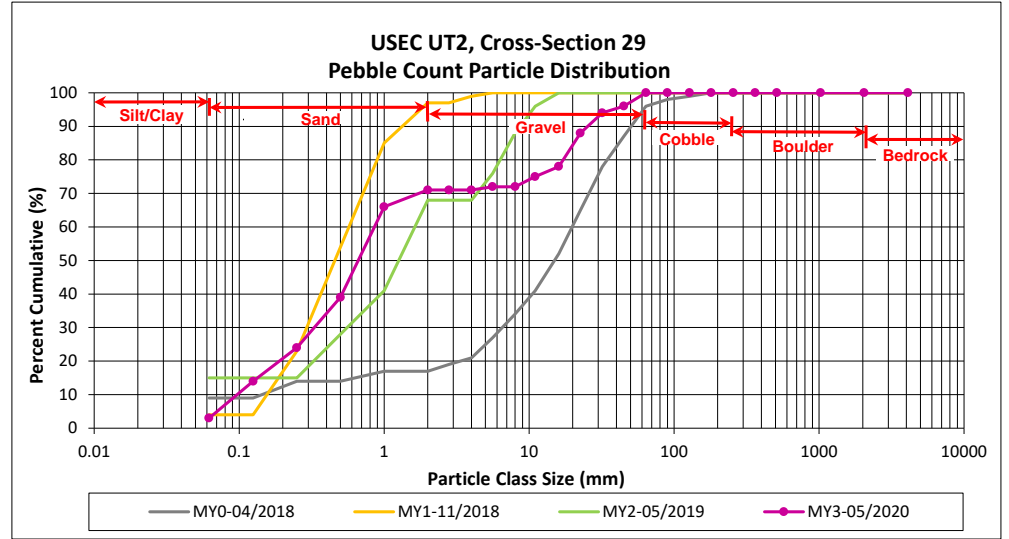
DMS Project No. 739

Monitoring Year 3 - 2020

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	3	3	3
SAND	Very fine	0.062	0.125	11	11	14
	Fine	0.125	0.250	10	10	24
	Medium	0.25	0.50	15	15	39
	Coarse	0.5	1.0	27	27	66
	Very Coarse	1.0	2.0	5	5	71
GRAVEL	Very Fine	2.0	2.8			71
	Very Fine	2.8	4.0			71
	Fine	4.0	5.6	1	1	72
	Fine	5.6	8.0			72
	Medium	8.0	11.0	3	3	75
	Medium	11.0	16.0	3	3	78
	Coarse	16.0	22.6	10	10	88
	Coarse	22.6	32	6	6	94
	Very Coarse	32	45	2	2	96
	Very Coarse	45	64	4	4	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 =	0.1
D ₃₅ =	0.4
D ₅₀ =	0.7
D ₈₄ =	19.7
D ₉₅ =	37.9
D ₁₀₀ =	64.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

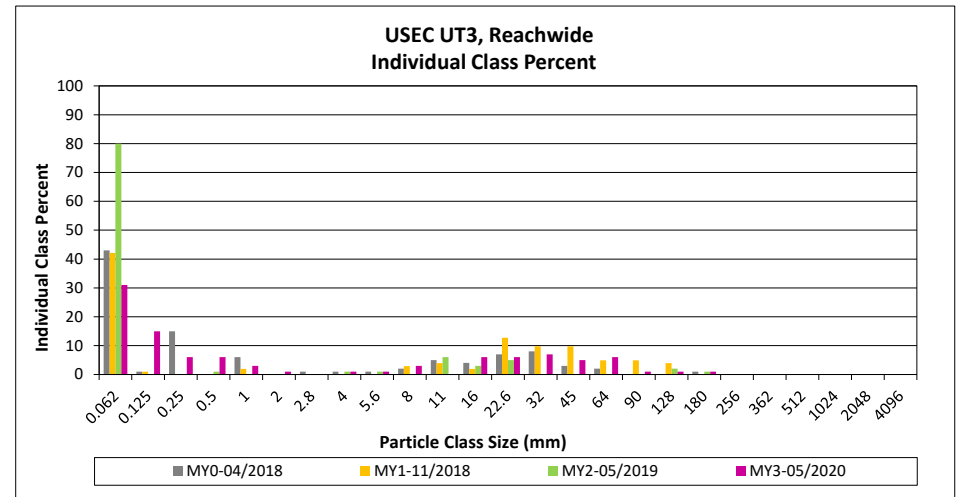
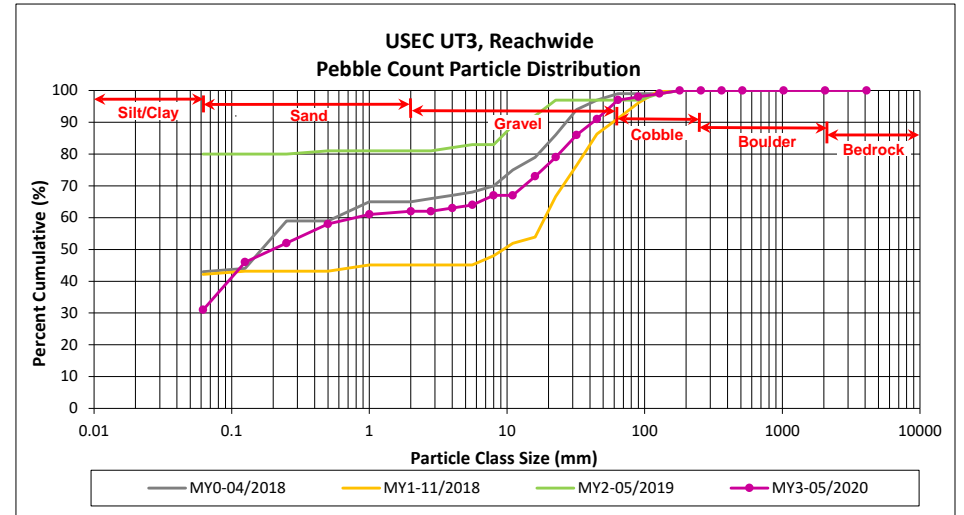
DMS Project No. 739

Monitoring Year 3 - 2020

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	3	28	31	31	31
SAND	Very fine	0.062	0.125	2	13	15	15	46
	Fine	0.125	0.250	3	3	6	6	52
	Medium	0.25	0.50	3	3	6	6	58
	Coarse	0.5	1.0	3		3	3	61
	Very Coarse	1.0	2.0		1	1	1	62
GRAVEL	Very Fine	2.0	2.8					62
	Very Fine	2.8	4.0	1		1	1	63
	Fine	4.0	5.6	1		1	1	64
	Fine	5.6	8.0	3		3	3	67
	Medium	8.0	11.0					67
	Medium	11.0	16.0	5	1	6	6	73
	Coarse	16.0	22.6	6		6	6	79
	Coarse	22.6	32	6	1	7	7	86
	Very Coarse	32	45	5		5	5	91
Very Coarse	45	64	6		6	6	97	
COBBLE	Small	64	90	1		1	1	98
	Small	90	128	1		1	1	99
	Large	128	180	1		1	1	100
BOULDER	Large	180	256					100
	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	0.1
D ₅₀ =	0.2
D ₈₄ =	29.0
D ₉₅ =	56.9
D ₁₀₀ =	180.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

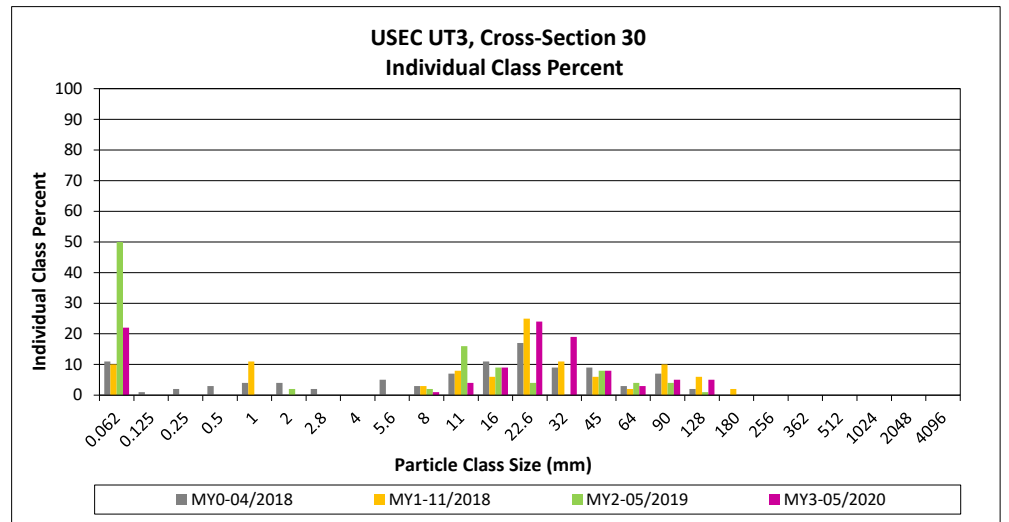
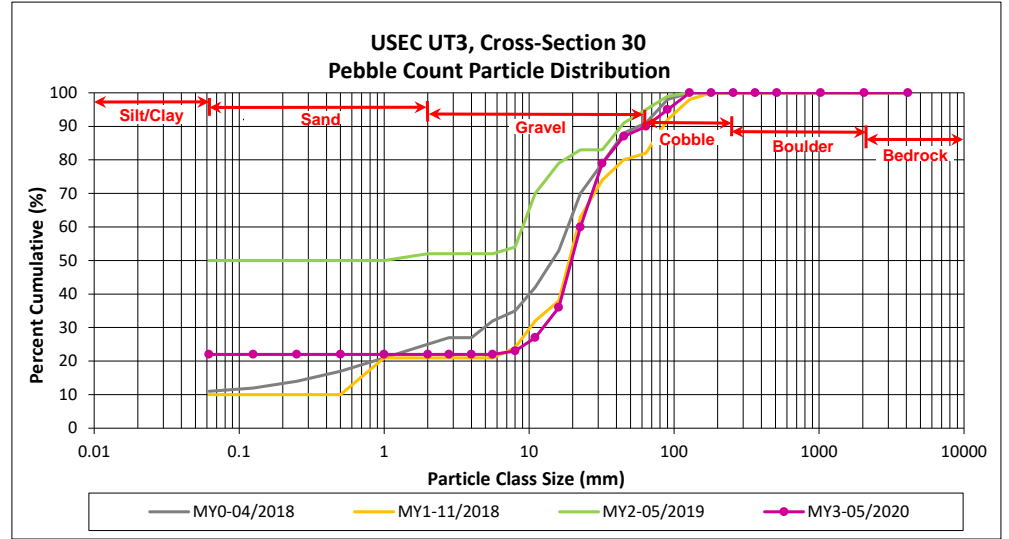
DMS Project No. 739

Monitoring Year 3 - 2020

USEC UT3, Cross-Section 30

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
<i>SILT/CLAY</i>	Silt/Clay	0.000	0.062	22	22	22
<i>SAND</i>	Very fine	0.062	0.125			22
	Fine	0.125	0.250			22
	Medium	0.25	0.50			22
	Coarse	0.5	1.0			22
	Very Coarse	1.0	2.0			22
<i>GRAVEL</i>	Very Fine	2.0	2.8			22
	Very Fine	2.8	4.0			22
	Fine	4.0	5.6			22
	Fine	5.6	8.0	1	1	23
	Medium	8.0	11.0	4	4	27
	Medium	11.0	16.0	9	9	36
	Coarse	16.0	22.6	24	24	60
	Coarse	22.6	32	19	19	79
	Very Coarse	32	45	8	8	87
	Very Coarse	45	64	3	3	90
<i>COBBLE</i>	Small	64	90	5	5	95
	Small	90	128	5	5	100
	Large	128	180			100
	Large	180	256			100
<i>BOULDER</i>	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
<i>BEDROCK</i>	Bedrock	2048	>2048			100
Total				100	100	100

Cross-Section 30	
Channel materials (mm)	
D ₁₆ =	Silt/Clay
D ₃₅ =	15.3
D ₅₀ =	19.6
D ₈₄ =	39.6
D ₉₅ =	90.0
D ₁₀₀ =	128.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

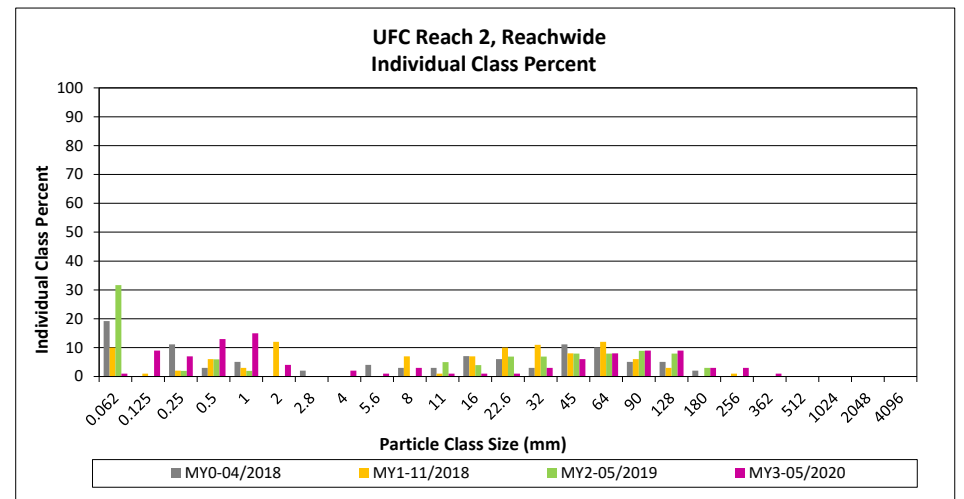
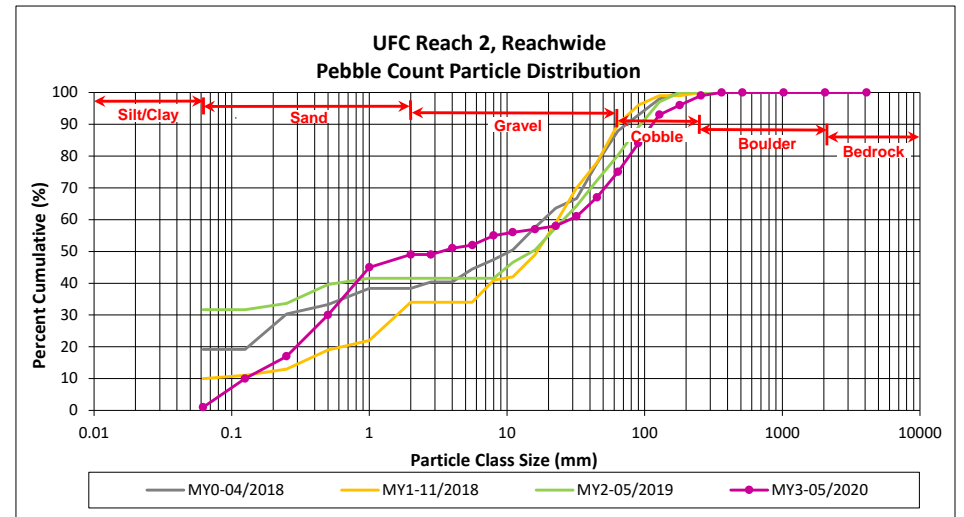
DMS Project No. 739

Monitoring Year 3 - 2020

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		1	1	1	1
SAND	Very fine	0.062	0.125		9	9	9	10
	Fine	0.125	0.250	1	6	7	7	17
	Medium	0.25	0.50		13	13	13	30
	Coarse	0.5	1.0	5	10	15	15	45
	Very Coarse	1.0	2.0		4	4	4	49
GRAVEL	Very Fine	2.0	2.8					49
	Very Fine	2.8	4.0	1	1	2	2	51
	Fine	4.0	5.6		1	1	1	52
	Fine	5.6	8.0	2	1	3	3	55
	Medium	8.0	11.0	1		1	1	56
	Medium	11.0	16.0		1	1	1	57
	Coarse	16.0	22.6	1		1	1	58
	Coarse	22.6	32	3		3	3	61
	Very Coarse	32	45	6		6	6	67
	Very Coarse	45	64	6	2	8	8	75
COBBLE	Small	64	90	9		9	9	84
	Small	90	128	8	1	9	9	93
	Large	128	180	3		3	3	96
	Large	180	256	3		3	3	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 =	0.2
D ₃₅ =	0.6
D ₅₀ =	3.3
D ₈₄ =	90.0
D ₉₅ =	160.7
D ₁₀₀ =	362.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

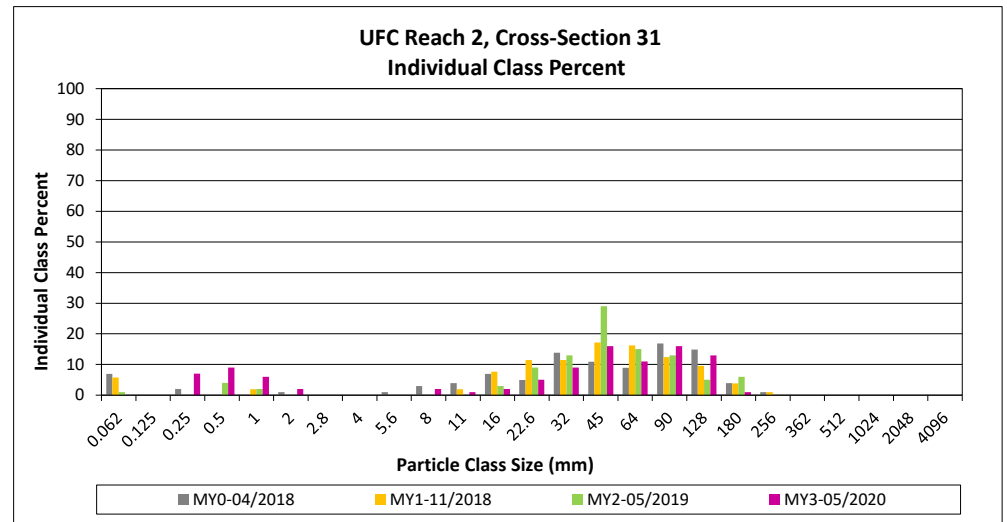
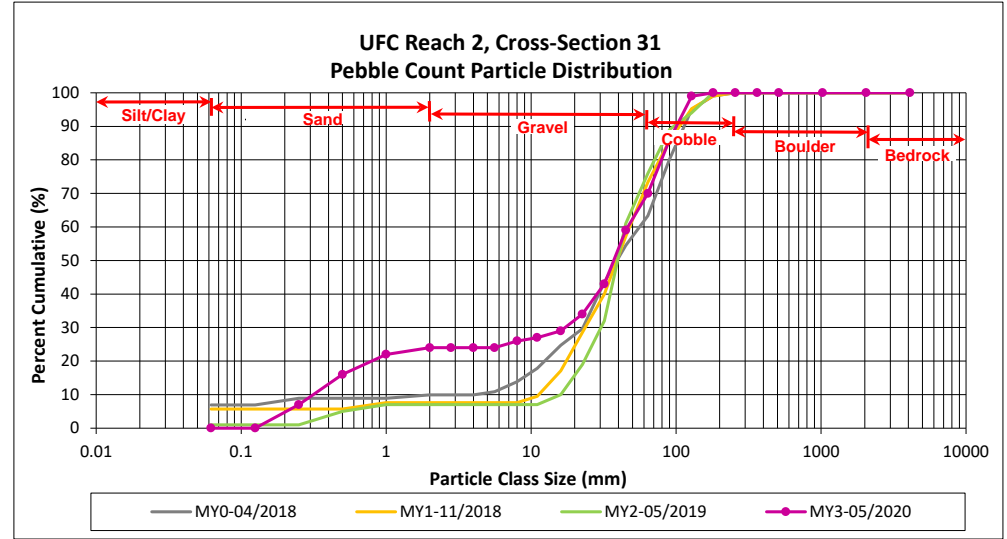
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	7	7	7
	Medium	0.25	0.50	9	9	16
	Coarse	0.5	1.0	6	6	22
	Very Coarse	1.0	2.0	2	2	24
GRAVEL	Very Fine	2.0	2.8			24
	Very Fine	2.8	4.0			24
	Fine	4.0	5.6			24
	Fine	5.6	8.0	2	2	26
	Medium	8.0	11.0	1	1	27
	Medium	11.0	16.0	2	2	29
	Coarse	16.0	22.6	5	5	34
	Coarse	22.6	32	9	9	43
	Very Coarse	32	45	16	16	59
	Very Coarse	45	64	11	11	70
COBBLE	Small	64	90	16	16	86
	Small	90	128	13	13	99
	Large	128	180	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		100	100	100

Cross-Section 31	
Channel materials (mm)	
D ₁₆ =	0.5
D ₃₅ =	23.5
D ₅₀ =	37.1
D ₈₄ =	86.2
D ₉₅ =	114.9
D ₁₀₀ =	180.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

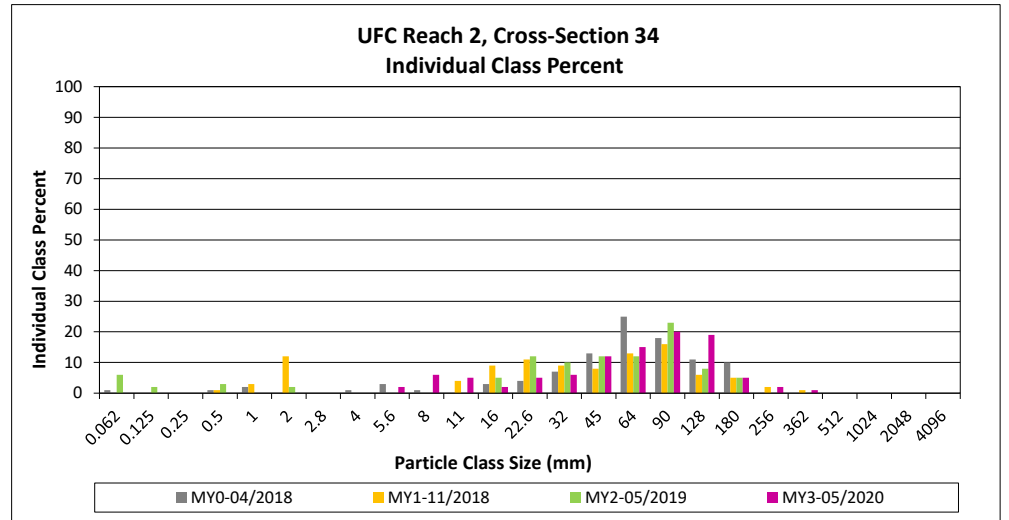
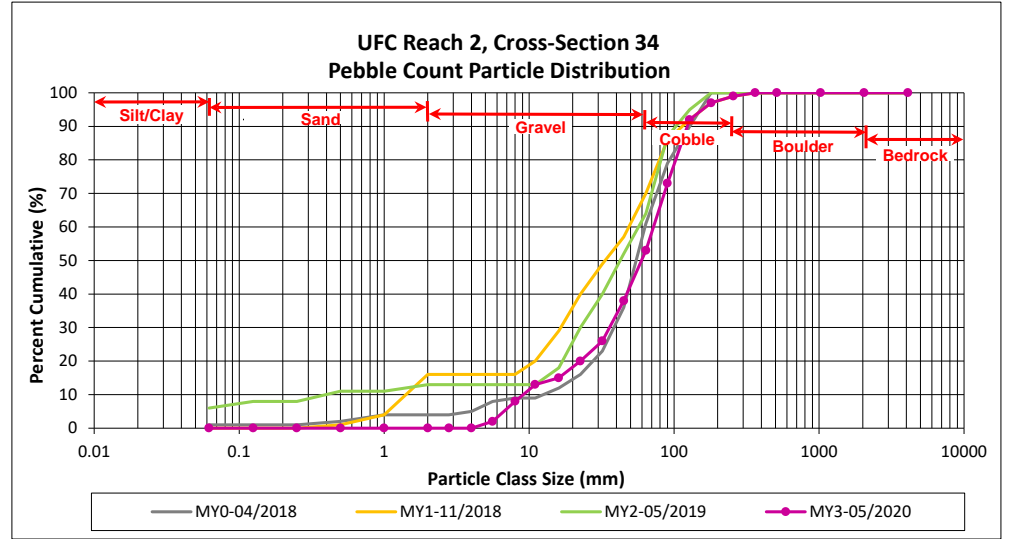
DMS Project No. 739

Monitoring Year 3 - 2020

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			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	2	2	2
	Fine	5.6	8.0	6	6	8
	Medium	8.0	11.0	5	5	13
	Medium	11.0	16.0	2	2	15
	Coarse	16.0	22.6	5	5	20
	Coarse	22.6	32	6	6	26
	Very Coarse	32	45	12	12	38
	Very Coarse	45	64	15	15	53
COBBLE	Small	64	90	20	20	73
	Small	90	128	19	19	92
	Large	128	180	5	5	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 34	
Channel materials (mm)	
D ₁₆ =	17.1
D ₃₅ =	41.3
D ₅₀ =	59.6
D ₈₄ =	110.4
D ₉₅ =	157.1
D ₁₀₀ =	362.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

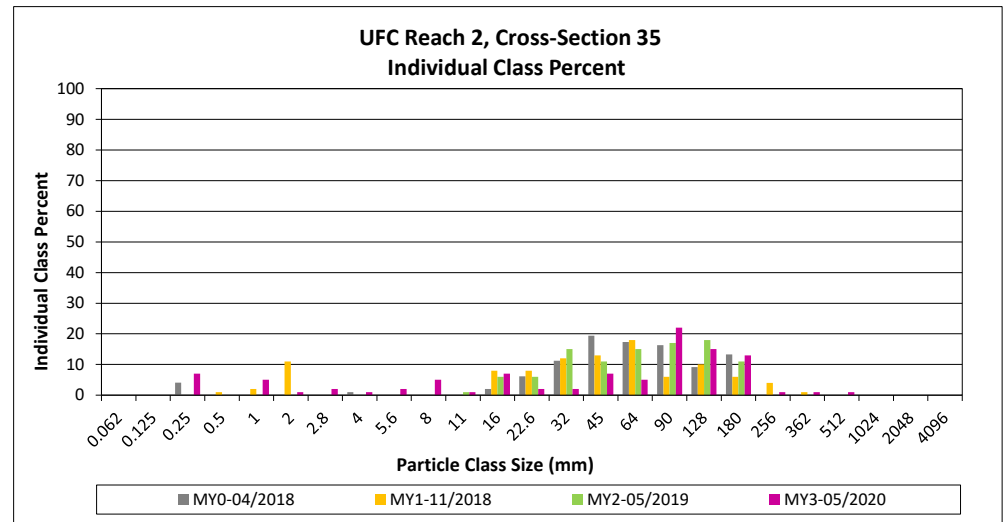
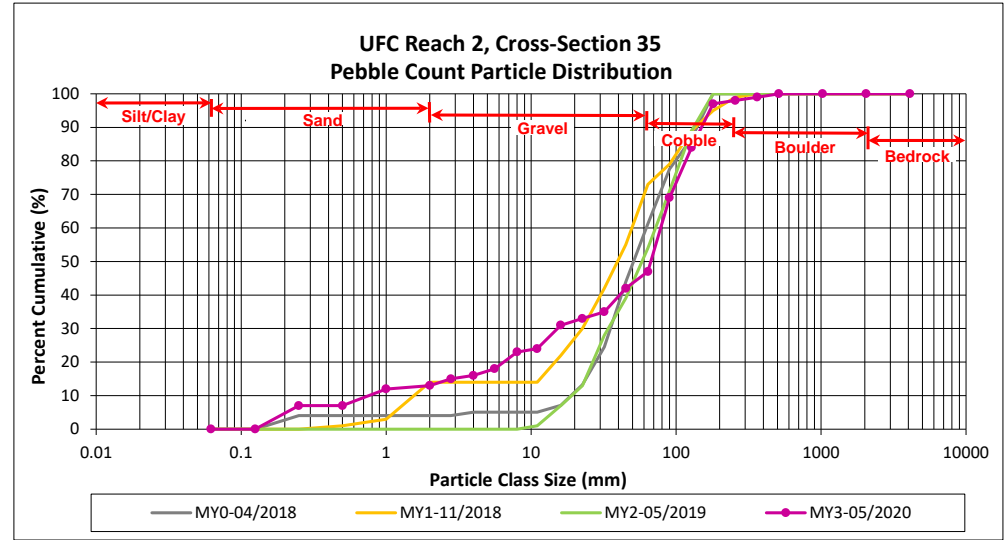
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	7	7	7
	Medium	0.25	0.50			7
	Coarse	0.5	1.0	5	5	12
	Very Coarse	1.0	2.0	1	1	13
GRAVEL	Very Fine	2.0	2.8	2	2	15
	Very Fine	2.8	4.0	1	1	16
	Fine	4.0	5.6	2	2	18
	Fine	5.6	8.0	5	5	23
	Medium	8.0	11.0	1	1	24
	Medium	11.0	16.0	7	7	31
	Coarse	16.0	22.6	2	2	33
	Coarse	22.6	32	2	2	35
	Very Coarse	32	45	7	7	42
	Very Coarse	45	64	5	5	47
COBBLE	Small	64	90	22	22	69
	Small	90	128	15	15	84
	Large	128	180	13	13	97
	Large	180	256	1	1	98
BOULDER	Small	256	362	1	1	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 35	
Channel materials (mm)	
D ₁₆ =	4.0
D ₃₅ =	32.0
D ₅₀ =	67.0
D ₈₄ =	128.0
D ₉₅ =	170.8
D ₁₀₀ =	512.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

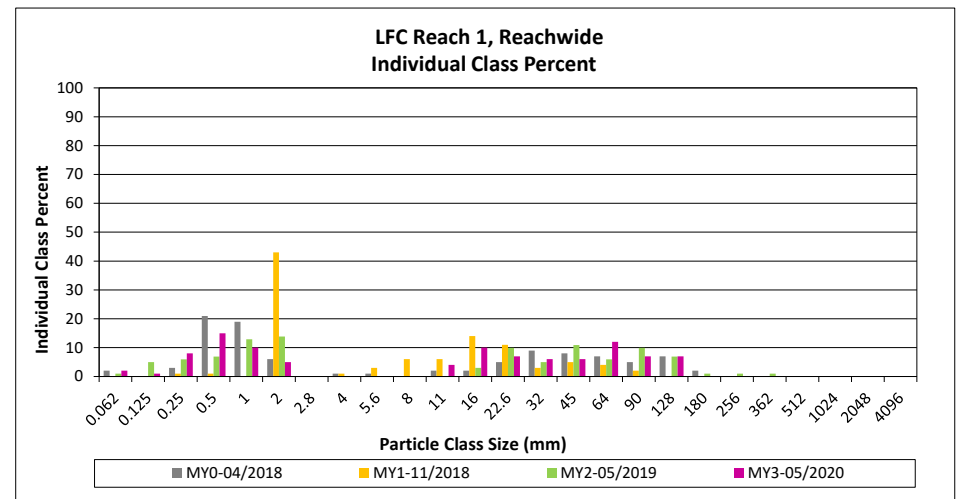
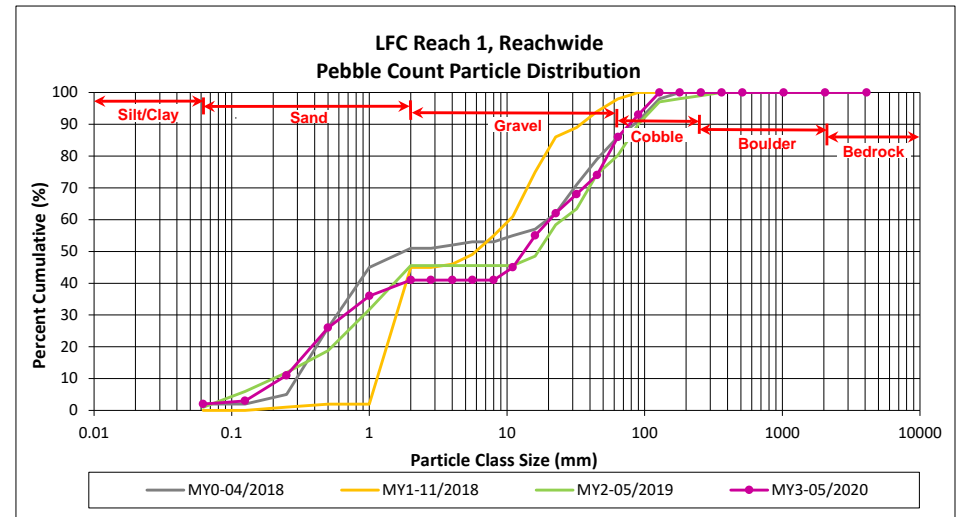
DMS Project No. 739

Monitoring Year 3 - 2020

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	2	2	2
SAND	Very fine	0.062	0.125		1	1	1	3
	Fine	0.125	0.250	1	7	8	8	11
	Medium	0.25	0.50	2	13	15	15	26
	Coarse	0.5	1.0		10	10	10	36
	Very Coarse	1.0	2.0		5	5	5	41
GRAVEL	Very Fine	2.0	2.8					41
	Very Fine	2.8	4.0					41
	Fine	4.0	5.6					41
	Fine	5.6	8.0					41
	Medium	8.0	11.0	3	1	4	4	45
	Medium	11.0	16.0	5	5	10	10	55
	Coarse	16.0	22.6	5	2	7	7	62
	Coarse	22.6	32	5	1	6	6	68
	Very Coarse	32	45	6		6	6	74
	Very Coarse	45	64	12		12	12	86
COBBLE	Small	64	90	6	1	7	7	93
	Small	90	128	4	3	7	7	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 =	0.3
D ₃₅ =	0.9
D ₅₀ =	13.3
D ₈₄ =	60.4
D ₉₅ =	99.5
D ₁₀₀ =	128.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

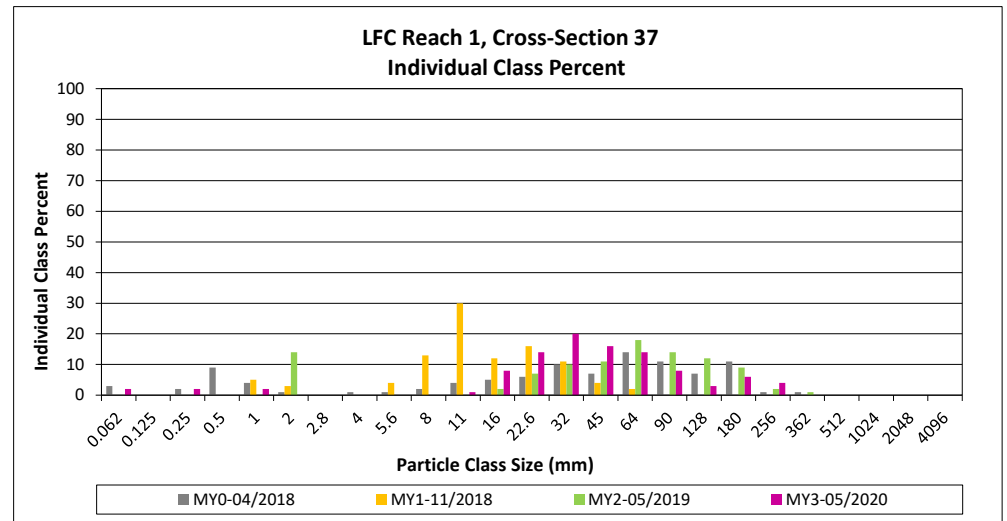
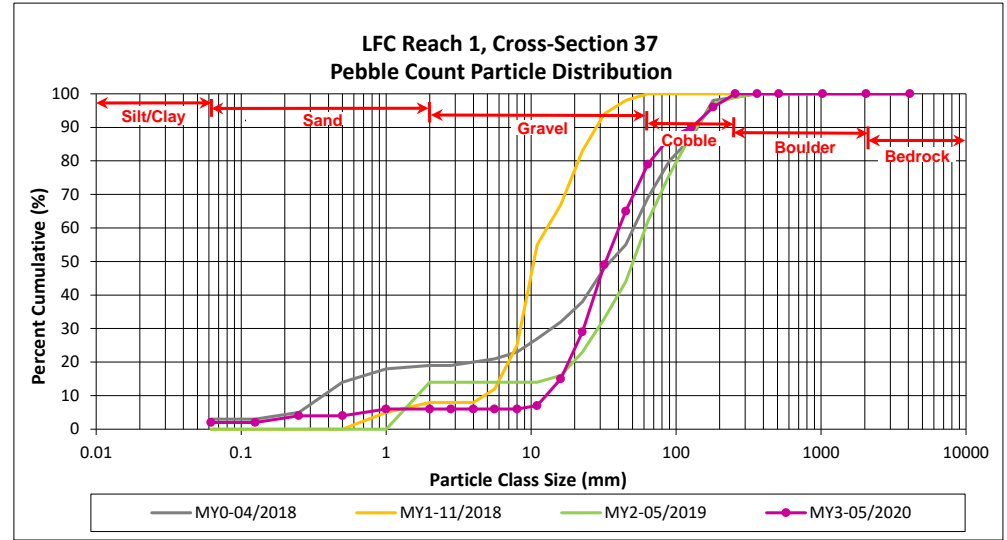
DMS Project No. 739

Monitoring Year 3 - 2020

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	2	2	2
SAND	Very fine	0.062	0.125			2
	Fine	0.125	0.250	2	2	4
	Medium	0.25	0.50			4
	Coarse	0.5	1.0	2	2	6
	Very Coarse	1.0	2.0			6
GRAVEL	Very Fine	2.0	2.8			6
	Very Fine	2.8	4.0			6
	Fine	4.0	5.6			6
	Fine	5.6	8.0			6
	Medium	8.0	11.0	1	1	7
	Medium	11.0	16.0	8	8	15
	Coarse	16.0	22.6	14	14	29
	Coarse	22.6	32	20	20	49
	Very Coarse	32	45	16	16	65
	Very Coarse	45	64	14	14	79
COBBLE	Small	64	90	8	8	87
	Small	90	128	3	3	90
	Large	128	180	6	6	96
	Large	180	256	4	4	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
Total				100	100	100

Cross-Section 37	
Channel materials (mm)	
D ₁₆ =	16.4
D ₃₅ =	25.1
D ₅₀ =	32.7
D ₈₄ =	79.2
D ₉₅ =	170.1
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

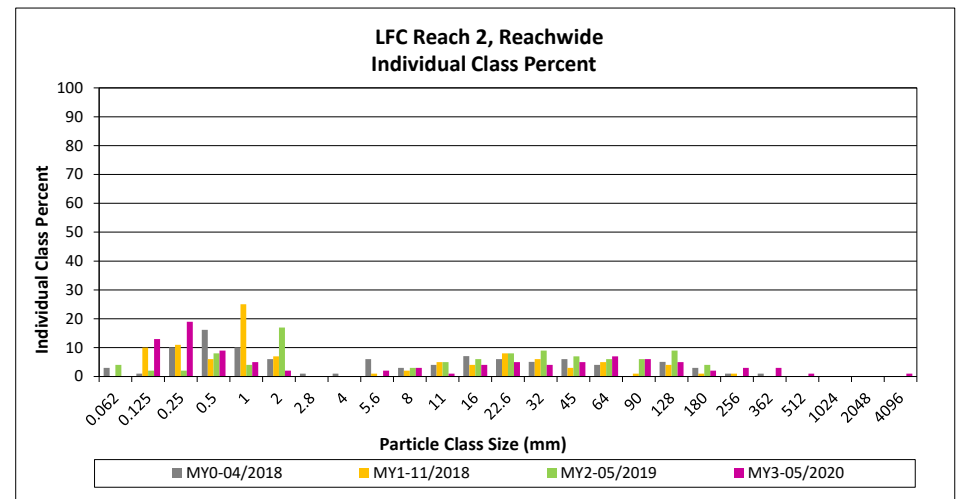
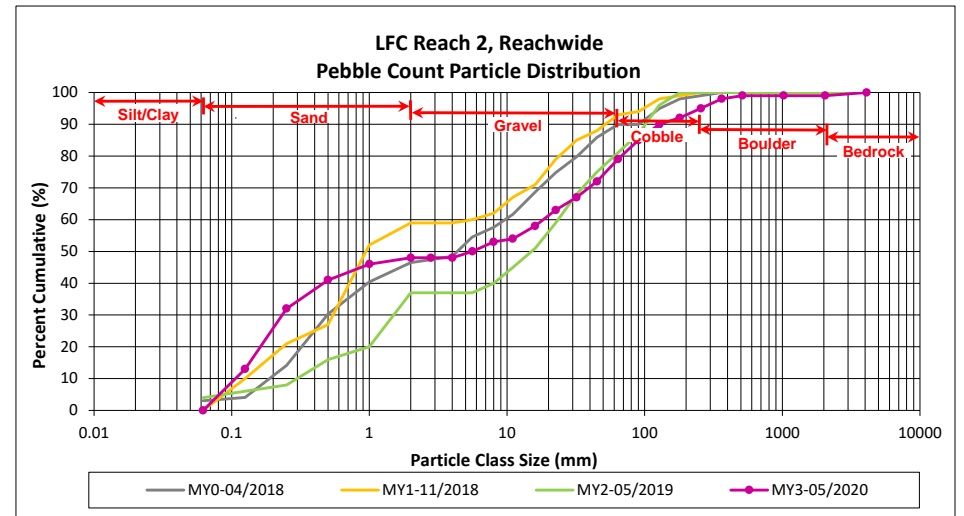
DMS Project No. 739

Monitoring Year 3 - 2020

LFC Reach 2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Rifle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062					0
SAND	Very fine	0.062	0.125	4	9	13	13	13
	Fine	0.125	0.250	2	17	19	19	32
	Medium	0.25	0.50	2	7	9	9	41
	Coarse	0.5	1.0	3	2	5	5	46
	Very Coarse	1.0	2.0		2	2	2	48
GRAVEL	Very Fine	2.0	2.8					48
	Very Fine	2.8	4.0					48
	Fine	4.0	5.6	2		2	2	50
	Fine	5.6	8.0	1	2	3	3	53
	Medium	8.0	11.0		1	1	1	54
	Medium	11.0	16.0	3	1	4	4	58
	Coarse	16.0	22.6	4	1	5	5	63
	Coarse	22.6	32	3	1	4	4	67
	Very Coarse	32	45	4	1	5	5	72
	Very Coarse	45	64	6	1	7	7	79
COBBLE	Small	64	90	4	2	6	6	85
	Small	90	128	4	1	5	5	90
	Large	128	180	2		2	2	92
BOULDER	Large	180	256	3		3	3	95
	Small	256	362	2	1	3	3	98
	Small	362	512	1		1	1	99
	Medium	512	1024					99
BEDROCK	Large/Very Large	1024	2048					99
	Bedrock	2048	>2048		1	1	1	100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.1
D ₃₅ =	0.3
D ₅₀ =	5.6
D ₈₄ =	85.0
D ₉₅ =	256.0
D ₁₀₀ =	>2048



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area B

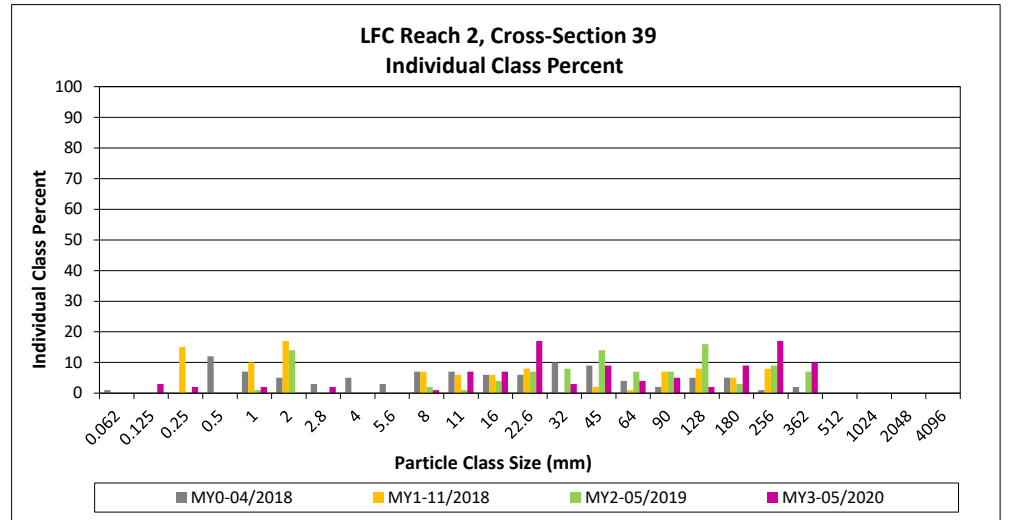
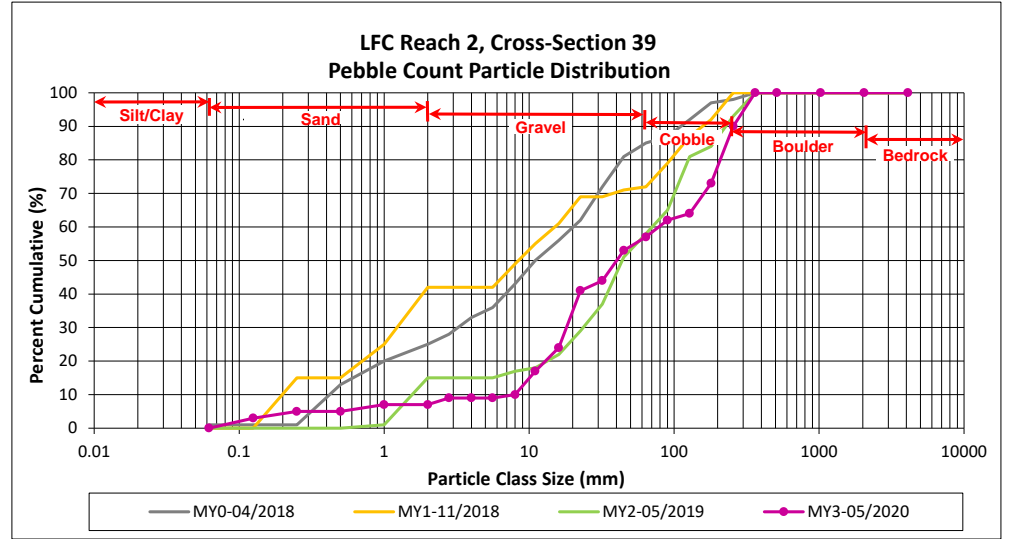
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125	3	3	3
	Fine	0.125	0.250	2	2	5
	Medium	0.25	0.50			5
	Coarse	0.5	1.0	2	2	7
	Very Coarse	1.0	2.0			7
GRAVEL	Very Fine	2.0	2.8	2	2	9
	Very Fine	2.8	4.0			9
	Fine	4.0	5.6			9
	Fine	5.6	8.0	1	1	10
	Medium	8.0	11.0	7	7	17
	Medium	11.0	16.0	7	7	24
	Coarse	16.0	22.6	17	17	41
	Coarse	22.6	32	3	3	44
	Very Coarse	32	45	9	9	53
	Very Coarse	45	64	4	4	57
COBBLE	Small	64	90	5	5	62
	Small	90	128	2	2	64
	Large	128	180	9	9	73
	Large	180	256	17	17	90
BOULDER	Small	256	362	10	10	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 =	10.5
D ₃₅ =	20.0
D ₅₀ =	40.2
D ₈₄ =	226.1
D ₉₅ =	304.4
D ₁₀₀ =	362.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area C

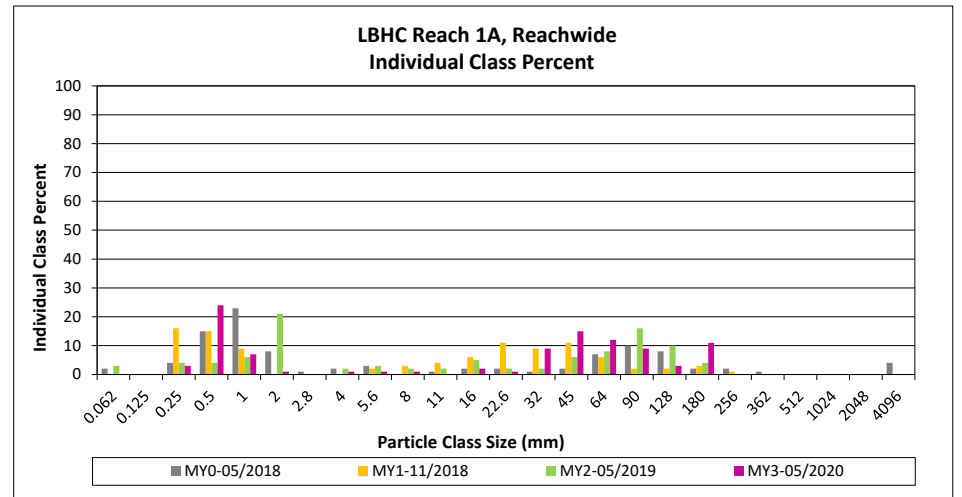
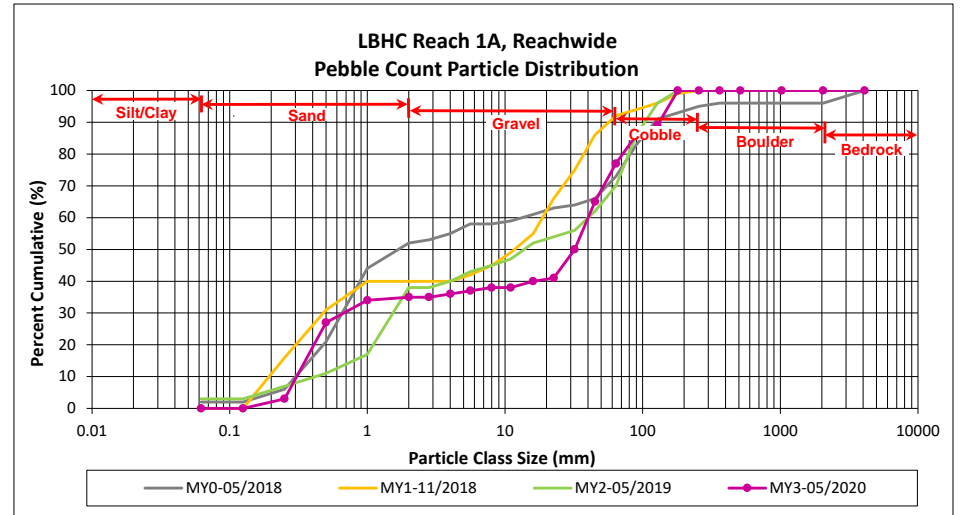
DMS Project No. 739

Monitoring Year 3 - 2020

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					0
SAND	Very fine	0.062	0.125					0
	Fine	0.125	0.250	2	1	3	3	3
	Medium	0.25	0.50		24	24	24	27
	Coarse	0.5	1.0	7	7	7	7	34
	Very Coarse	1.0	2.0		1	1	1	35
GRAVEL	Very Fine	2.0	2.8					35
	Very Fine	2.8	4.0		1	1	1	36
	Fine	4.0	5.6		1	1	1	37
	Fine	5.6	8.0		1	1	1	38
	Medium	8.0	11.0					38
	Medium	11.0	16.0	1	1	2	2	40
	Coarse	16.0	22.6		1	1	1	41
	Coarse	22.6	32	5	4	9	9	50
	Very Coarse	32	45	10	5	15	15	65
	Very Coarse	45	64	9	3	12	12	77
COBBLE	Small	64	90	9		9	9	86
	Small	90	128	3		3	3	89
	Large	128	180	11		11	11	100
BOULDER	Large	180	256					100
	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.4
D ₃₅ =	2.0
D ₅₀ =	32.0
D ₈₄ =	83.4
D ₉₅ =	154.2
D ₁₀₀ =	180.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area C

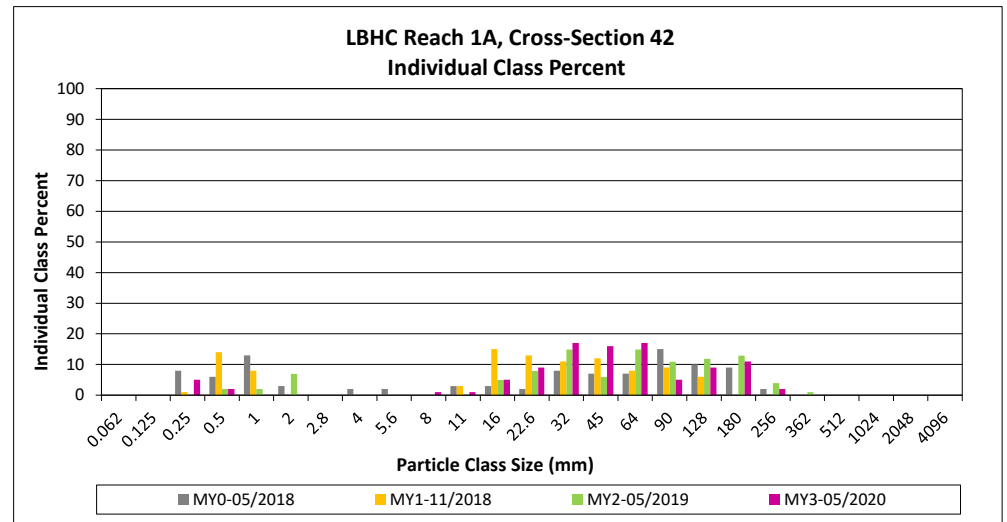
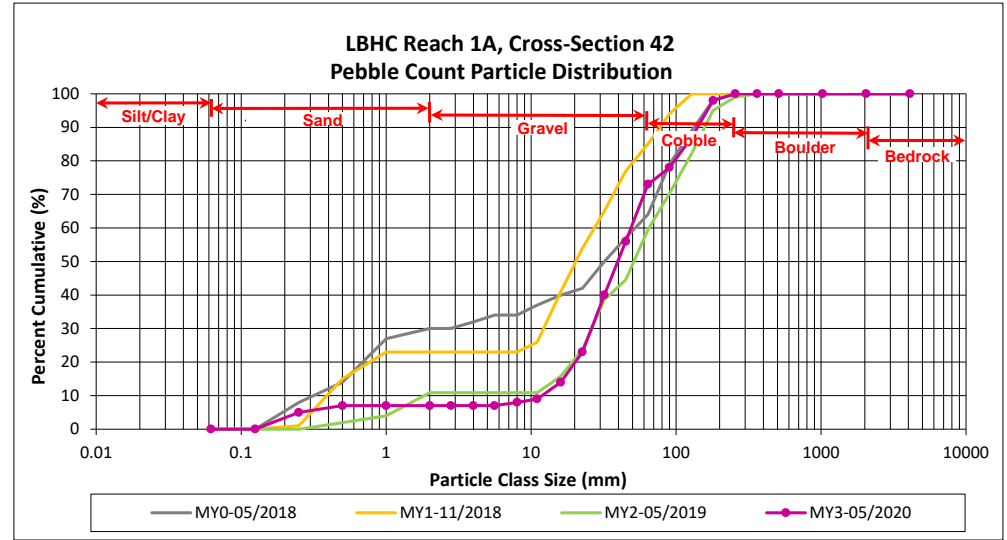
DMS Project No. 739

Monitoring Year 3 - 2020

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
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	5	5	5
	Medium	0.25	0.50	2	2	7
	Coarse	0.5	1.0			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	1	1	8
	Medium	8.0	11.0	1	1	9
	Medium	11.0	16.0	5	5	14
	Coarse	16.0	22.6	9	9	23
	Coarse	22.6	32	17	17	40
	Very Coarse	32	45	16	16	56
	Very Coarse	45	64	17	17	73
COBBLE	Small	64	90	5	5	78
	Small	90	128	9	9	87
	Large	128	180	11	11	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 42	
Channel materials (mm)	
D ₁₆ =	17.3
D ₃₅ =	28.9
D ₅₀ =	39.6
D ₈₄ =	113.8
D ₉₅ =	164.0
D ₁₀₀ =	256.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area C

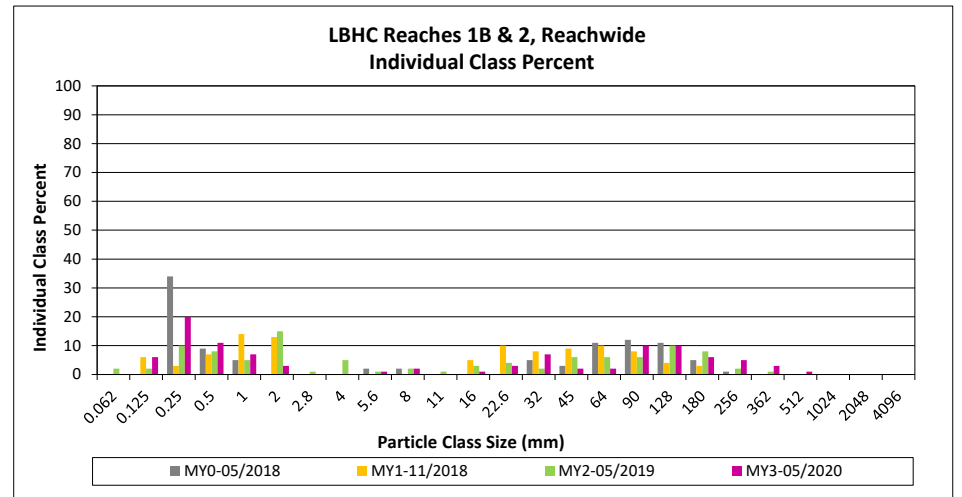
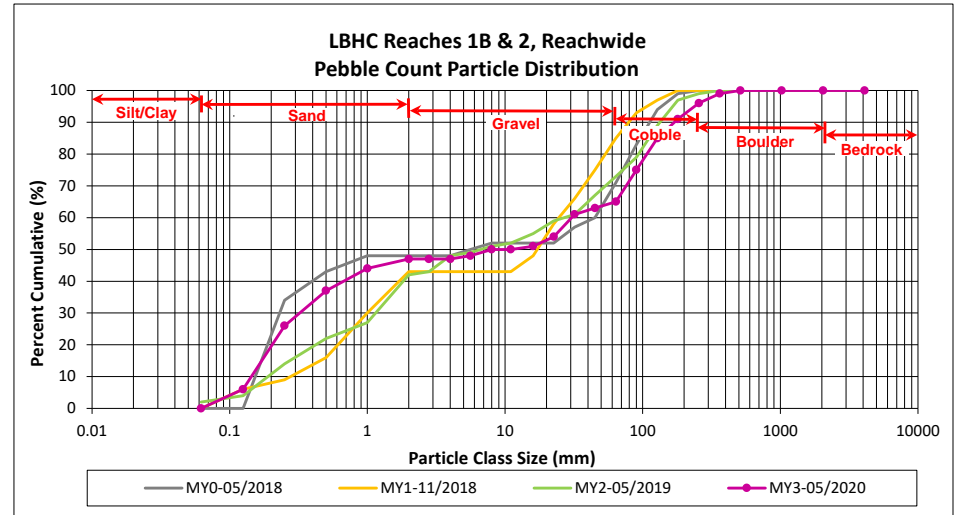
DMS Project No. 739

Monitoring Year 3 - 2020

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					0
SAND	Very fine	0.062	0.125		6	6	6	6
	Fine	0.125	0.250	2	18	20	20	26
	Medium	0.25	0.50		11	11	11	37
	Coarse	0.5	1.0	7	7	7	7	44
	Very Coarse	1.0	2.0	1	2	3	3	47
GRAVEL	Very Fine	2.0	2.8					47
	Very Fine	2.8	4.0					47
	Fine	4.0	5.6	1	1	1	1	48
	Fine	5.6	8.0	2	2	2	2	50
	Medium	8.0	11.0					50
	Medium	11.0	16.0	1	1	1	1	51
	Coarse	16.0	22.6	2	1	3	3	54
	Coarse	22.6	32	5	2	7	7	61
	Very Coarse	32	45	2		2	2	63
Very Coarse	45	64	2		2	2	65	
COBBLE	Small	64	90	10		10	10	75
	Small	90	128	10		10	10	85
	Large	128	180	6		6	6	91
BOULDER	Large	180	256	5		5	5	96
	Small	256	362	3		3	3	99
	Small	362	512	1		1	1	100
BEDROCK	Medium	512	1024					100
	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.2
D ₃₅ =	0.4
D ₅₀ =	8.0
D ₈₄ =	123.6
D ₉₅ =	238.6
D ₁₀₀ =	512.0



Reachwide and Cross-Section Pebble Count Plots

Big Harris Creek Mitigation Site - Area C

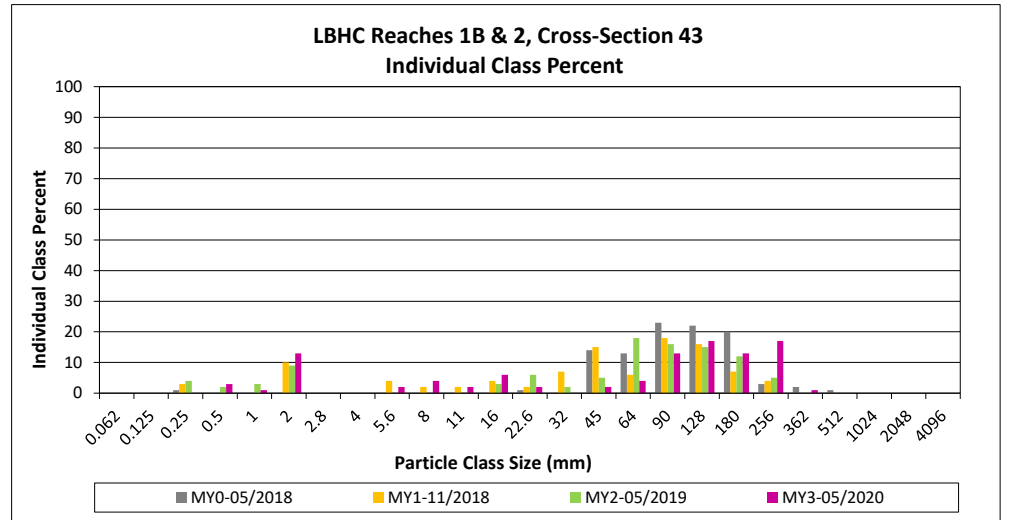
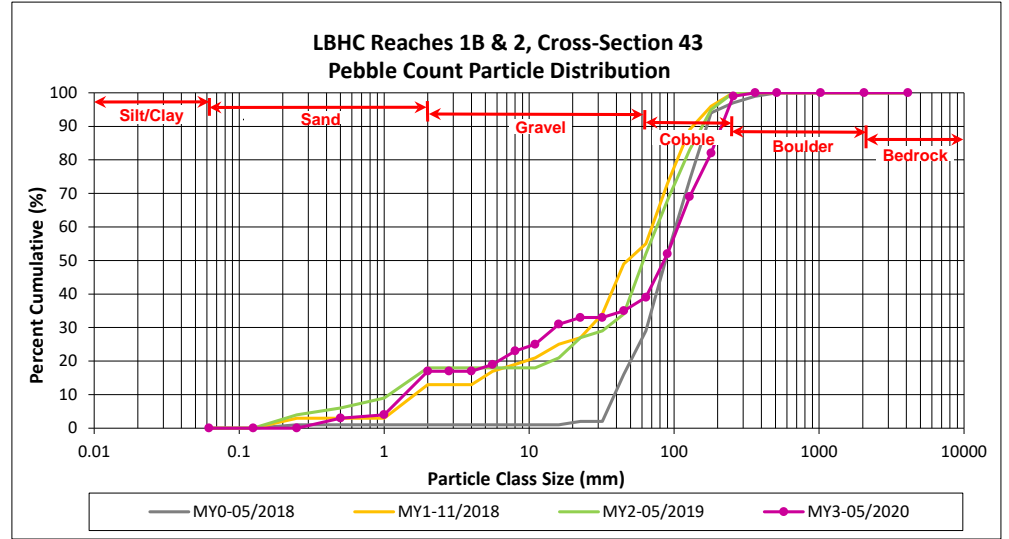
DMS Project No. 739

Monitoring Year 3 - 2020

LBHC Reaches 1B & 2, Cross-Section 43

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY		Silt/Clay				0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	3	3	3
	Coarse	0.5	1.0	1	1	4
	Very Coarse	1.0	2.0	13	13	17
GRAVEL	Very Fine	2.0	2.8			17
	Very Fine	2.8	4.0			17
	Fine	4.0	5.6	2	2	19
	Fine	5.6	8.0	4	4	23
	Medium	8.0	11.0	2	2	25
	Medium	11.0	16.0	6	6	31
	Coarse	16.0	22.6	2	2	33
	Coarse	22.6	32			33
	Very Coarse	32	45	2	2	35
	Very Coarse	45	64	4	4	39
COBBLE	Small	64	90	13	13	52
	Small	90	128	17	17	69
	Large	128	180	13	13	82
	Large	180	256	17	17	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 43	
Channel materials (mm)	
D ₁₆ =	1.9
D ₃₅ =	45.0
D ₅₀ =	85.4
D ₈₄ =	187.6
D ₉₅ =	235.6
D ₁₀₀ =	362.0



APPENDIX 5. Hydrology Summary Data and Plots

Table 14. Verification of Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

Reach	Monitoring Year	Date of Occurrence	Method
Upper Big Harris Creek Reach 2A (SG #1)	MY1	10/11/2018	Stream Gage
		6/7/2019	
	MY2	6/8/2019	
		8/4/2019	
	MY3	2/6/2020	
		4/30/2020	
10/11/2020			
5/30/2018			
Royster Creek Reach 1 (SG #2)	MY1	7/24/2018	
		10/11/2018	
		11/12/2018 ¹	
		11/15/2018	
		1/22/2019	
	MY2	1/26/2019	
		1/30/2019 ¹	
		1/31/2019	
		2/11/2019	
		6/7/2019	
		6/8/2019	
	MY3	6/9/2019	
		1/11/2020	
		2/6/2020	
		2/13/2020	
		3/25/2020	
		4/13/2020	
		4/29/2020 - 4/30/2020	
5/19/2020			
5/21/2020			
8/15/2020			
9/25/2020			
10/11/2020			
Scott Creek (SG #3)	MY1	---	
	MY2	---	
	MY3	2/6/2020	
Carroll Creek (SG #4)	MY1	3/8/2020	
		10/11/2018	
	MY2	11/15/2018	
		6/7/2019	
		6/8/2019 ¹	
	MY3	6/9/2019	
		8/4/2019	
		2/6/2020	
		2/13/2020	
4/30/2020			
5/19/2020			
8/15/2020			
10/11/2020			
Upper Stick Elliott Creek Reach 1 (SG #5)	MY1	10/11/2018	
	MY2	6/7/2019 ¹	
		6/8/2019	
	MY3	8/4/2019	
		2/6/2020	
2/13/2020			
5/19/2020			
Upper Stick Elliott Creek Reach 5 (SG #6)	MY1	10/11/2018 ¹	
		11/12/2018	
		11/15/2018	
	MY2	6/8/2019	
		8/4/2019	
	MY3	2/6/2020	
		4/30/2020	
5/19/2020			
10/11/2020			

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 3 - 2020

Reach	Monitoring Year	Date of Occurrence	Method
Elliott Creek (SG #7)	MY1	10/11/2018	Stream Gage
		6/7/2019	
	MY2	6/8/2019	
		2/6/2020	
	MY3	4/30/2020	
		5/19/2020	
10/11/2020			
UT1 to Elliott Creek (SG #8)	MY1	---	
	MY2	6/8/2019	
		2/6/2020	
	MY3	3/25/2020	
		4/30/2020	
		5/19/2020	
Bridges Creek (SG #9)	MY1	---	
	MY2	---	
	MY3	2/6/2020	
UT2 to Upper Stick Elliott Creek (SG #10)	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		
	MY3	1/13/2020 - 1/14/2020	
		2/6/2020 - 2/7/2020	
		2/11/2020	
		2/13/2020	
		3/25/2020	
		4/30/2020	
		5/19/2020	
5/21/2020			
8/3/2020			
8/7/2020			
8/15/2020			
9/17/2020			
UT3 to Upper Stick Elliott Creek (SG #11)	MY1	10/11/2018	
	MY2	8/4/2019	
	MY3	2/6/2020	
Upper Fletcher Creek Reach 2 (SG #12)	MY1	7/24/2018	
		8/2/2018	
		10/11/2018	
		10/26/2018	
		11/12/2018	
	MY2	11/15/2018	
		6/7/2019	
	MY3	6/8/2019	
		2/6/2020	
		4/30/2020	
Lower Fletcher Creek Reach 1 (SG #13)	MY1	5/19/2020	
		8/15/2020	
		10/11/2020	
		8/2/2018	
		10/11/2018	
	MY2	10/26/2018	
		11/12/2018	
	MY3	11/15/2018	
		1/30/2019	
		1/31/2019	
Lower Big Harris Creek Reach 1A (SG #14)	MY1	2/6/2020 - 2/7/2020	
		2/11/2020	
		2/13/2020	
	MY2	10/11/2020 - 10/12/2020	
		10/11/2018	
MY3	10/26/2018		
	11/12/2018		
	6/7/2019		
	6/8/2019		
	6/9/2019		
	2/6/2020		
2/13/2020			
4/30/2020			
5/19/2020			
10/11/2020			

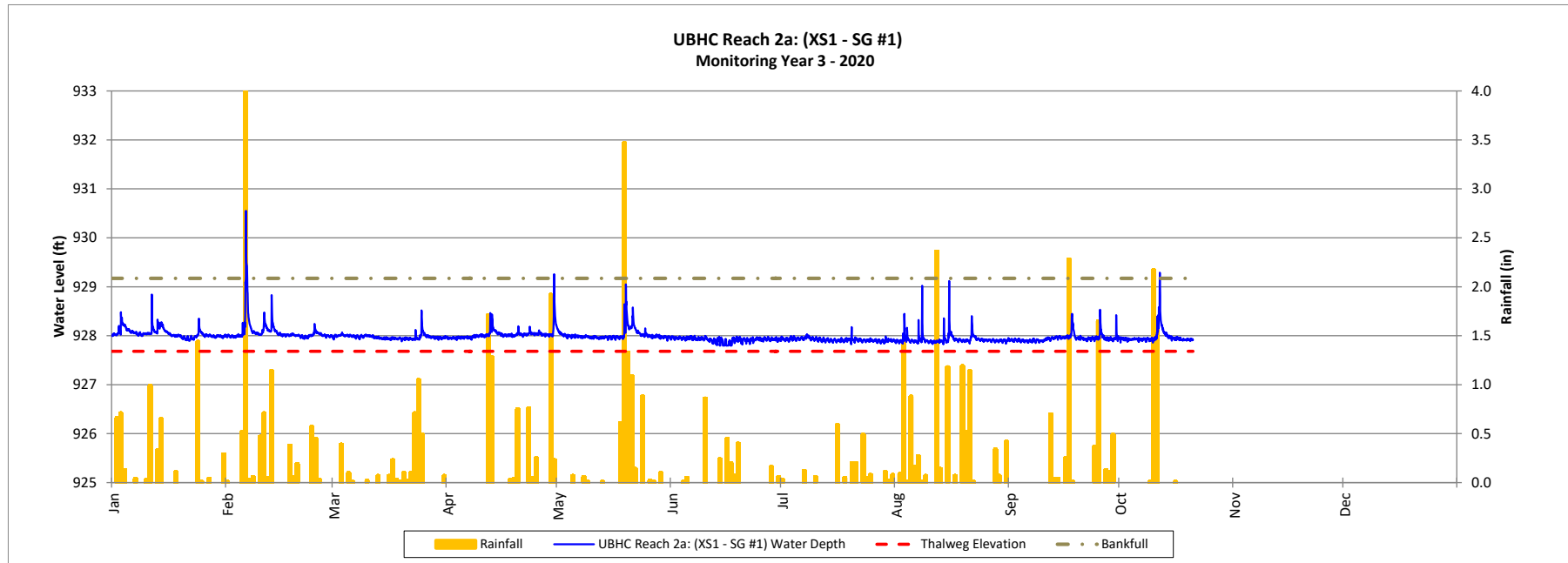
¹ Multiple bankfull events recorded on occurrence date.
 --- No bankfull events reported.

Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

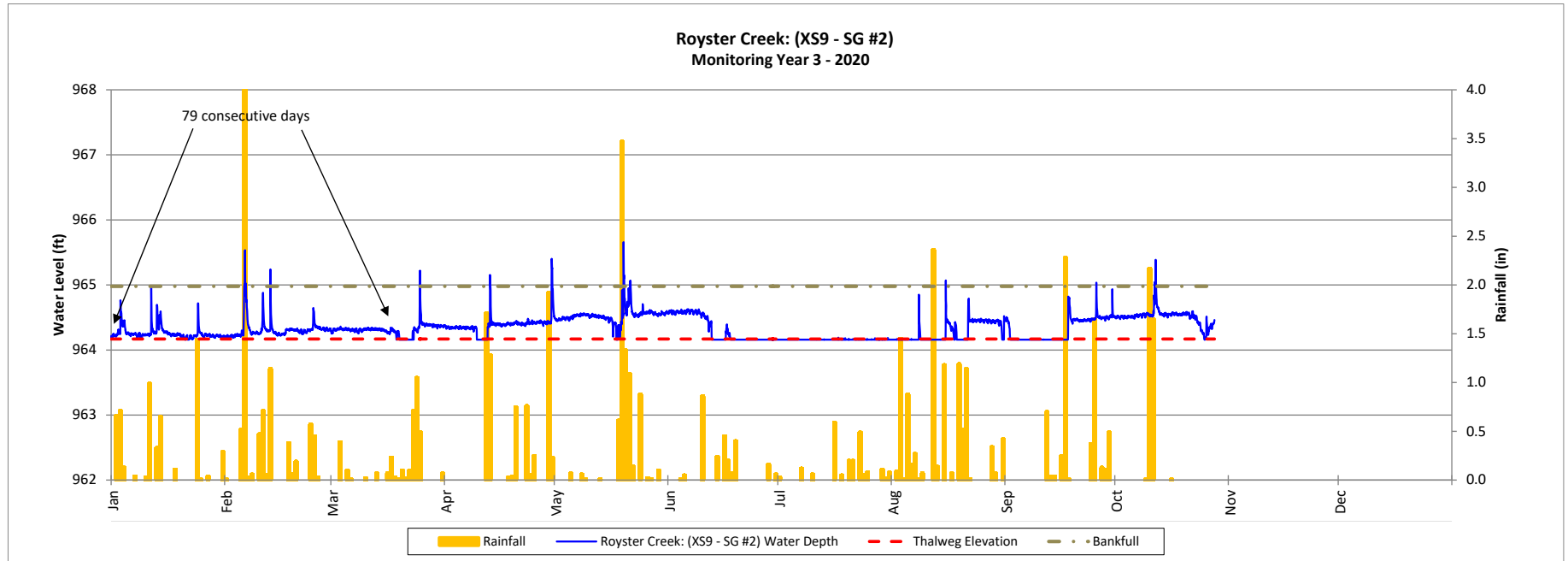


Recorded In-stream Flow Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

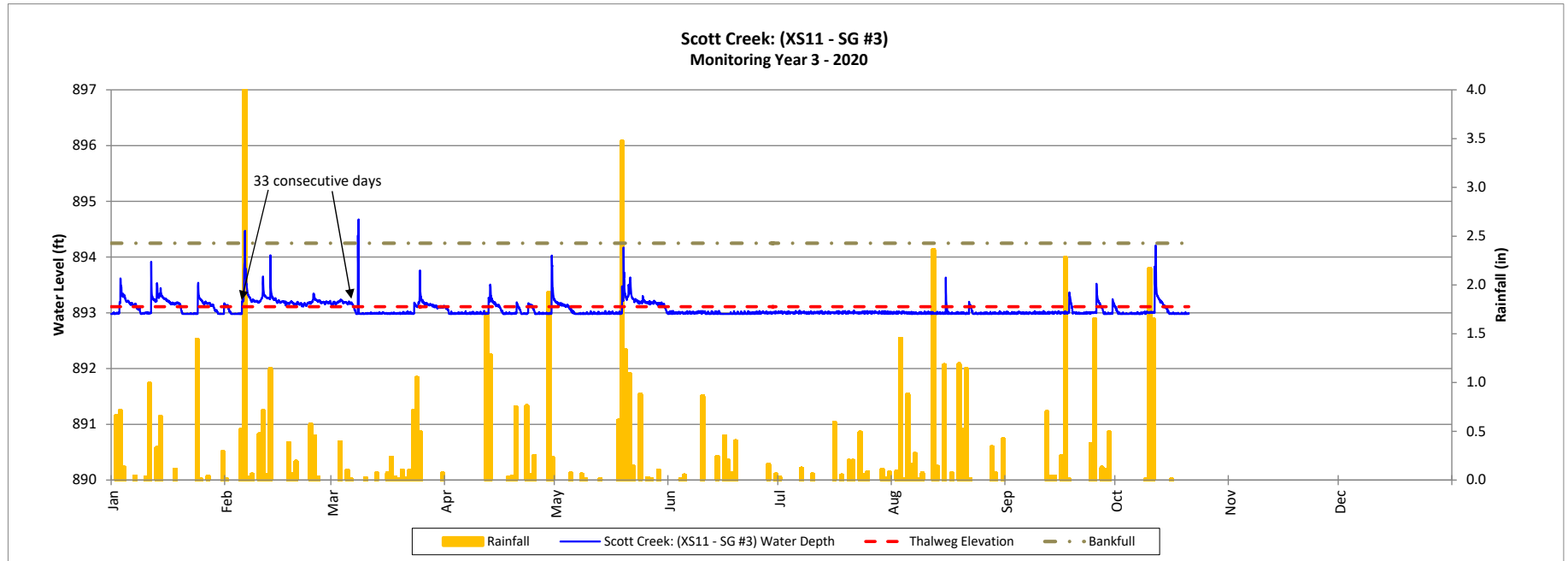


Recorded In-stream Flow Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

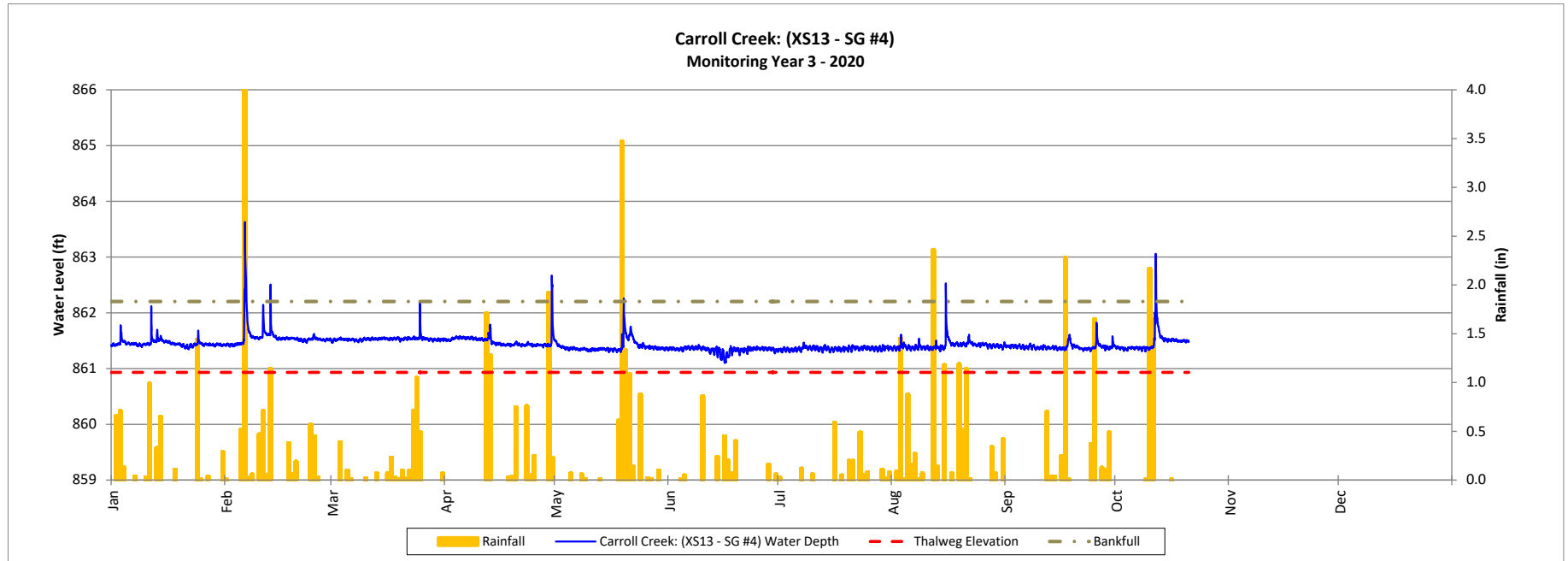


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

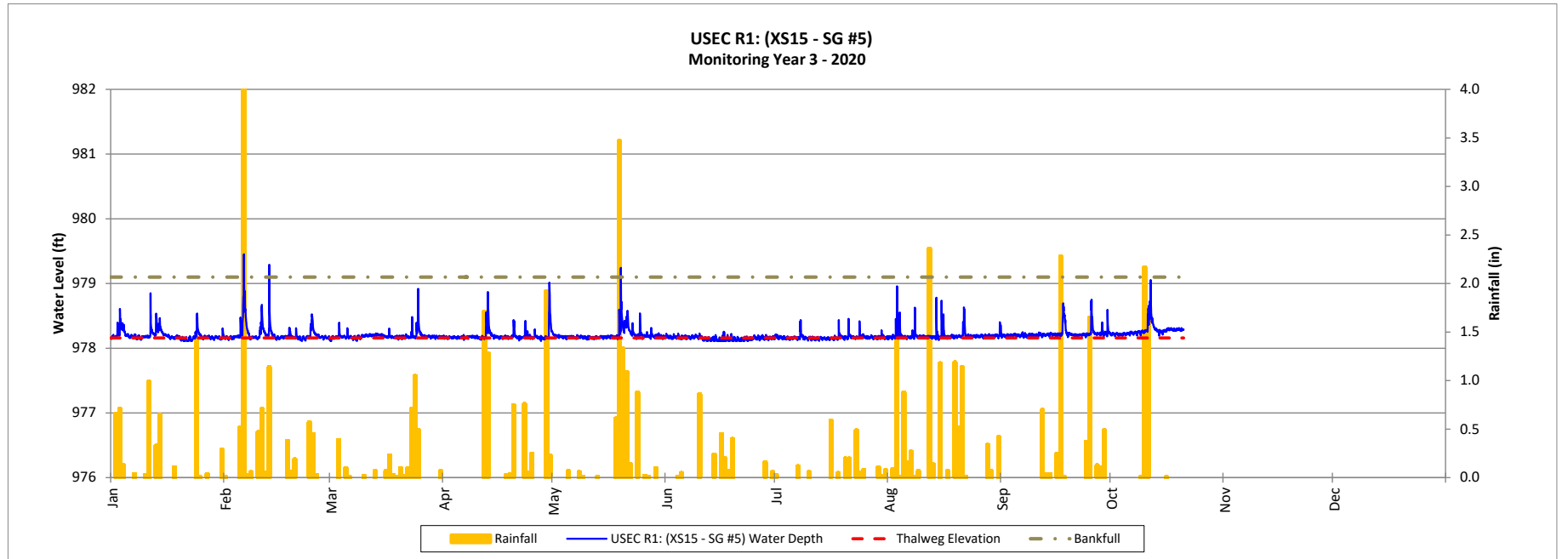


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

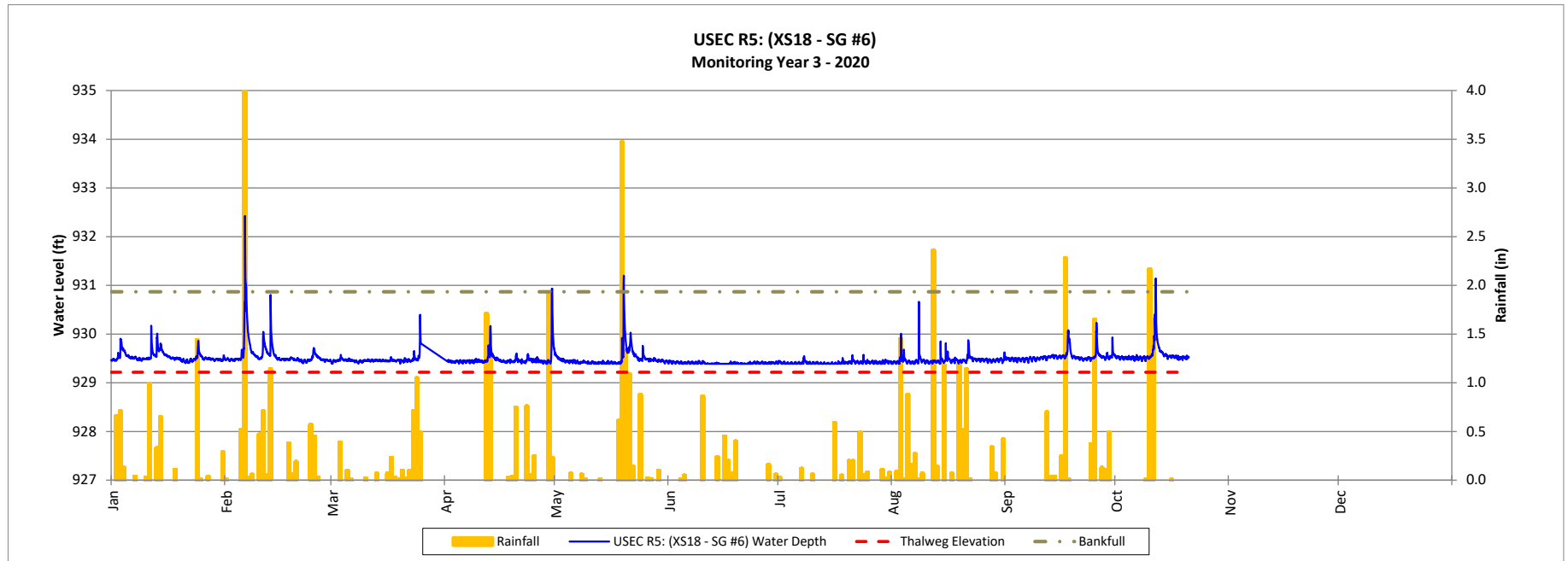


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

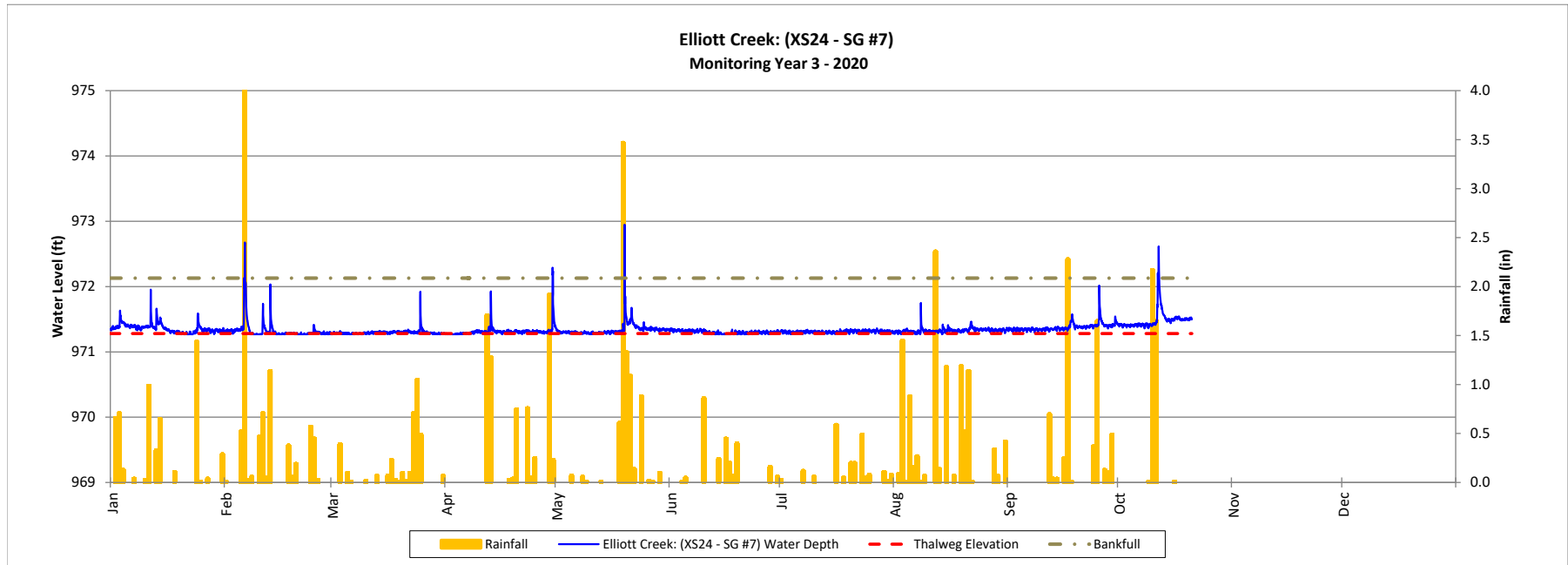


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

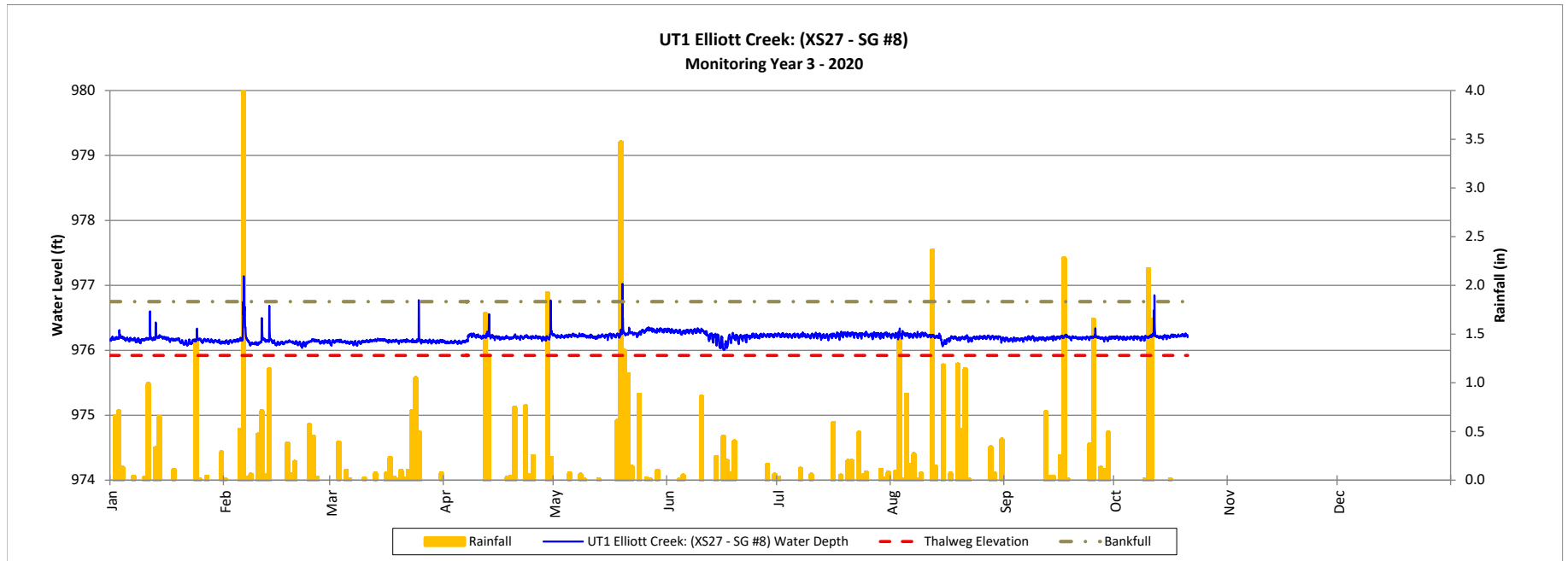


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

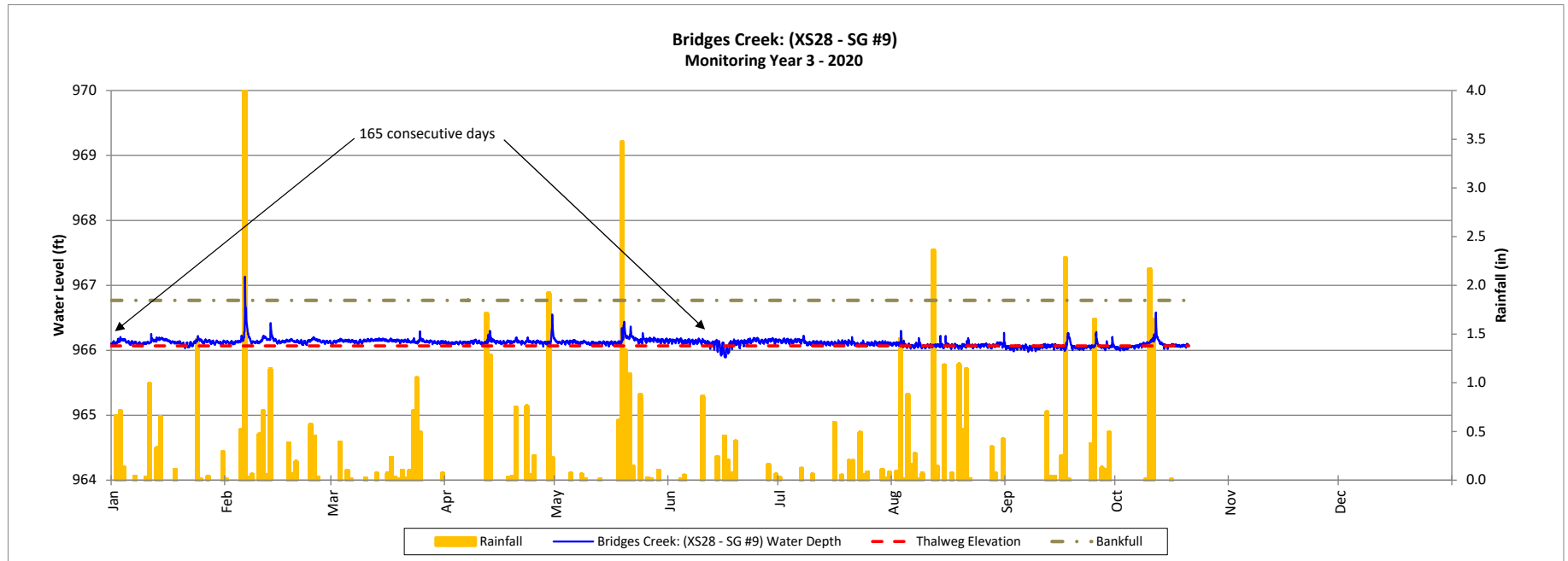


Recorded In-stream Flow Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

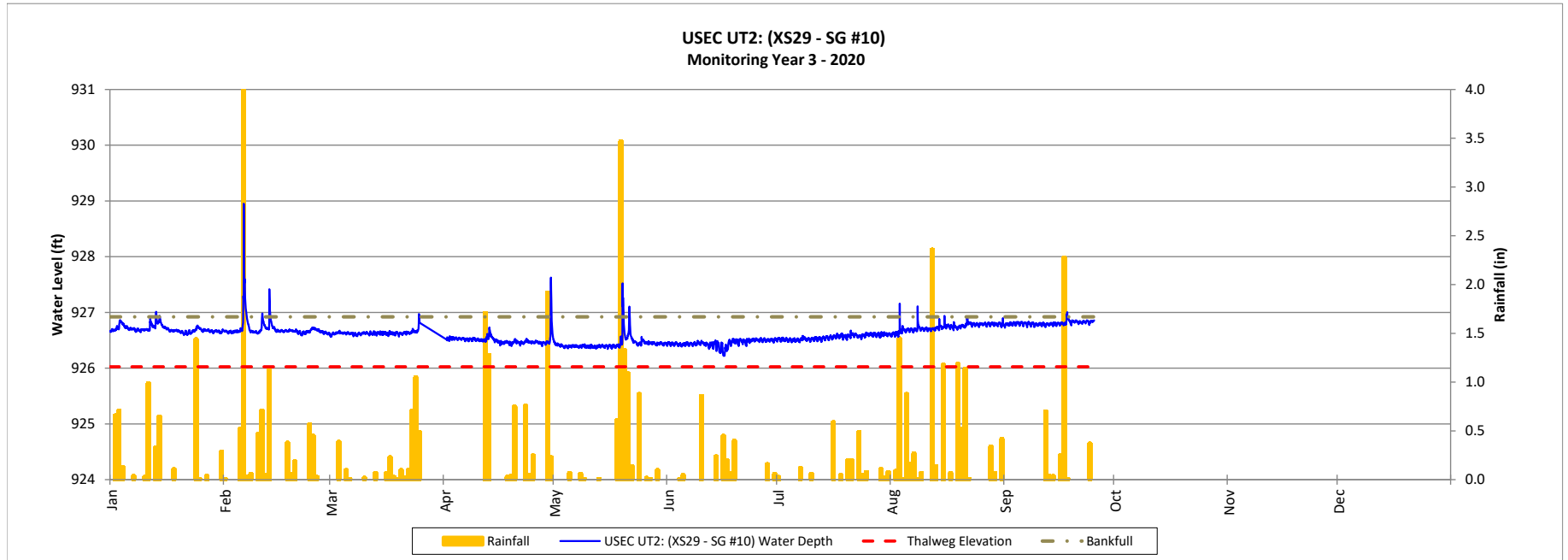


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

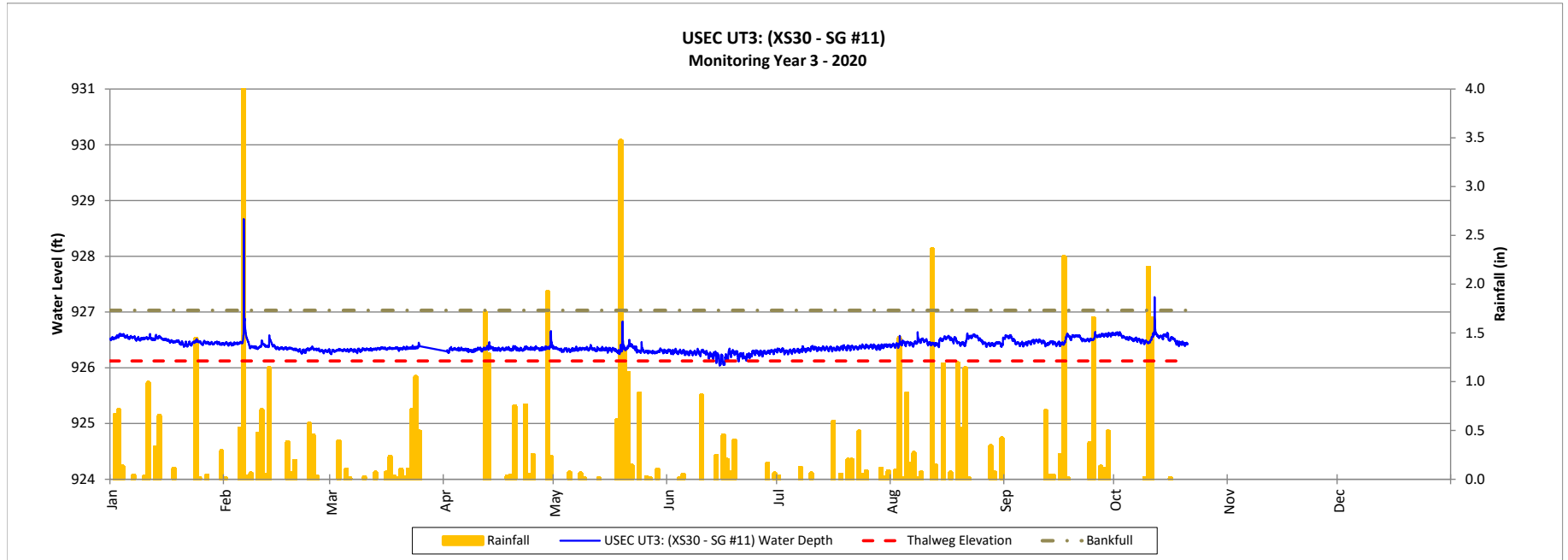


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

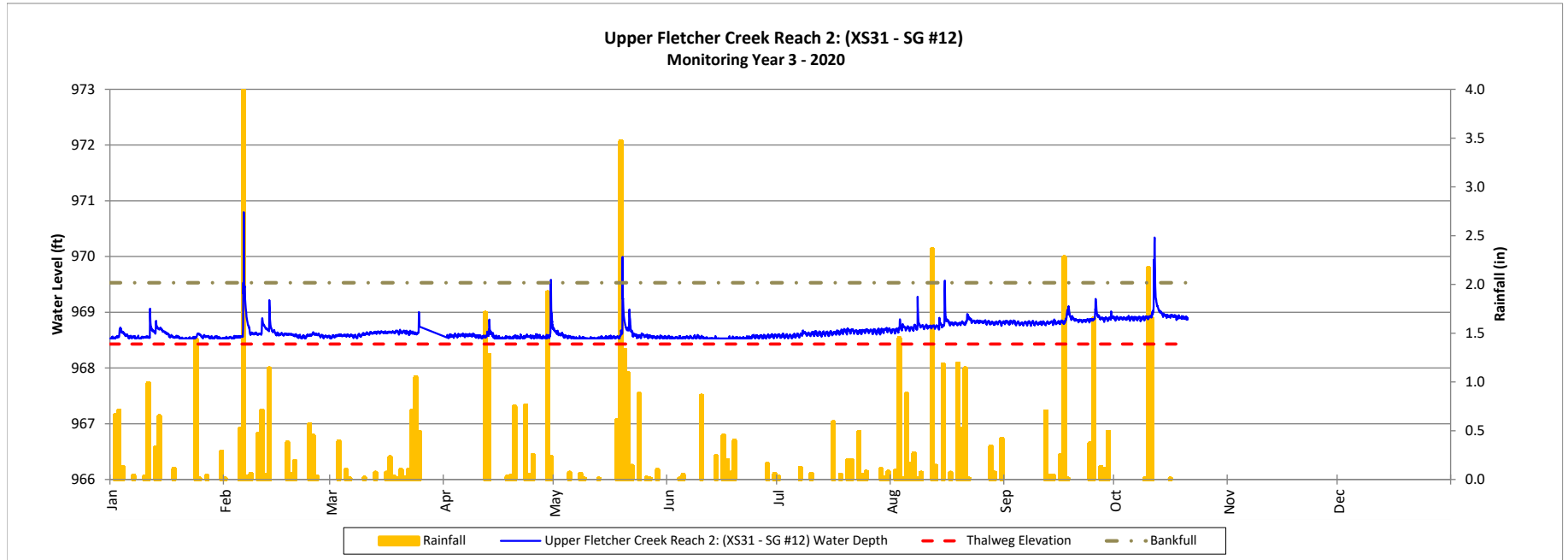


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

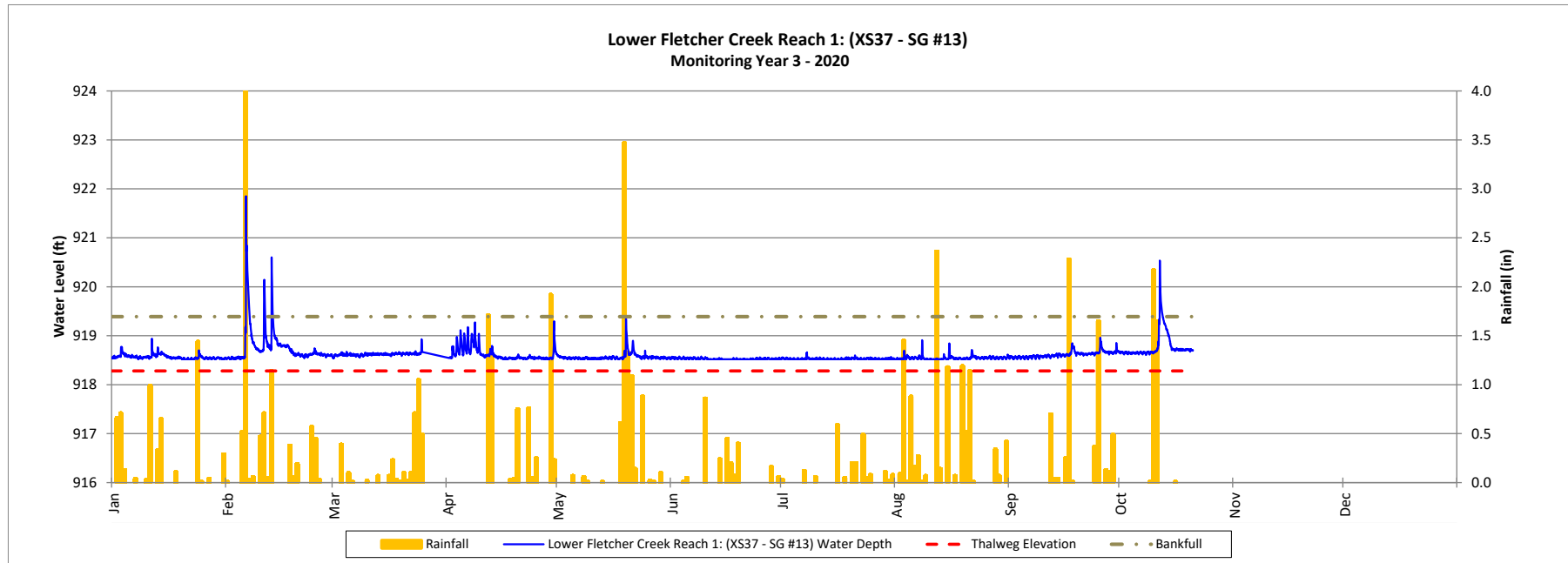


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

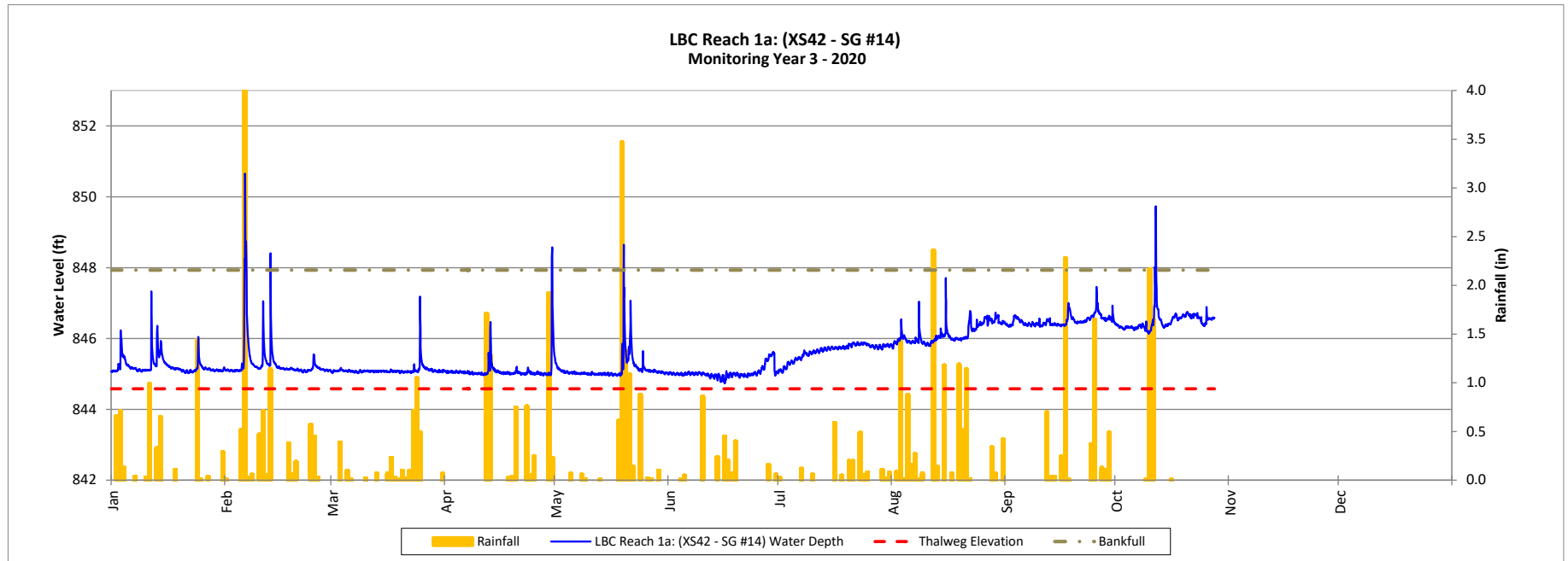


Recorded Bankfull Events

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020



**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

CAUTION: External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to report.spam@nc.gov<<mailto:report.spam@nc.gov>>

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

Email correspondence to and from this address is subject to the

North Carolina Public Records Law and may be disclosed to third parties.

From: [Melia, Gregory](#)
To: [Tugwell, Todd J CIV USARMY CESAW \(US\)](#); [Wiesner, Paul](#); [Shawn Wilkerson](#); [Haupt, Mac](#); [Jeff Keaton](#); [Kim Browning](#); [Russell, Perian](#)
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

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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 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.

ANALYTICAL 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 (NH₃) – 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 (NO₂)-nitrate (NO₃) 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 (NH₃) – Sites 2, 8, 9, and 14.
- d. Total Kjeldahl nitrogen (TKN) – Sites 2, 9, and 14.
- e. Nitrite (NO₂)-nitrate (NO₃) 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:

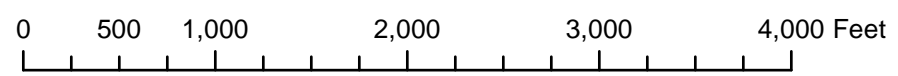
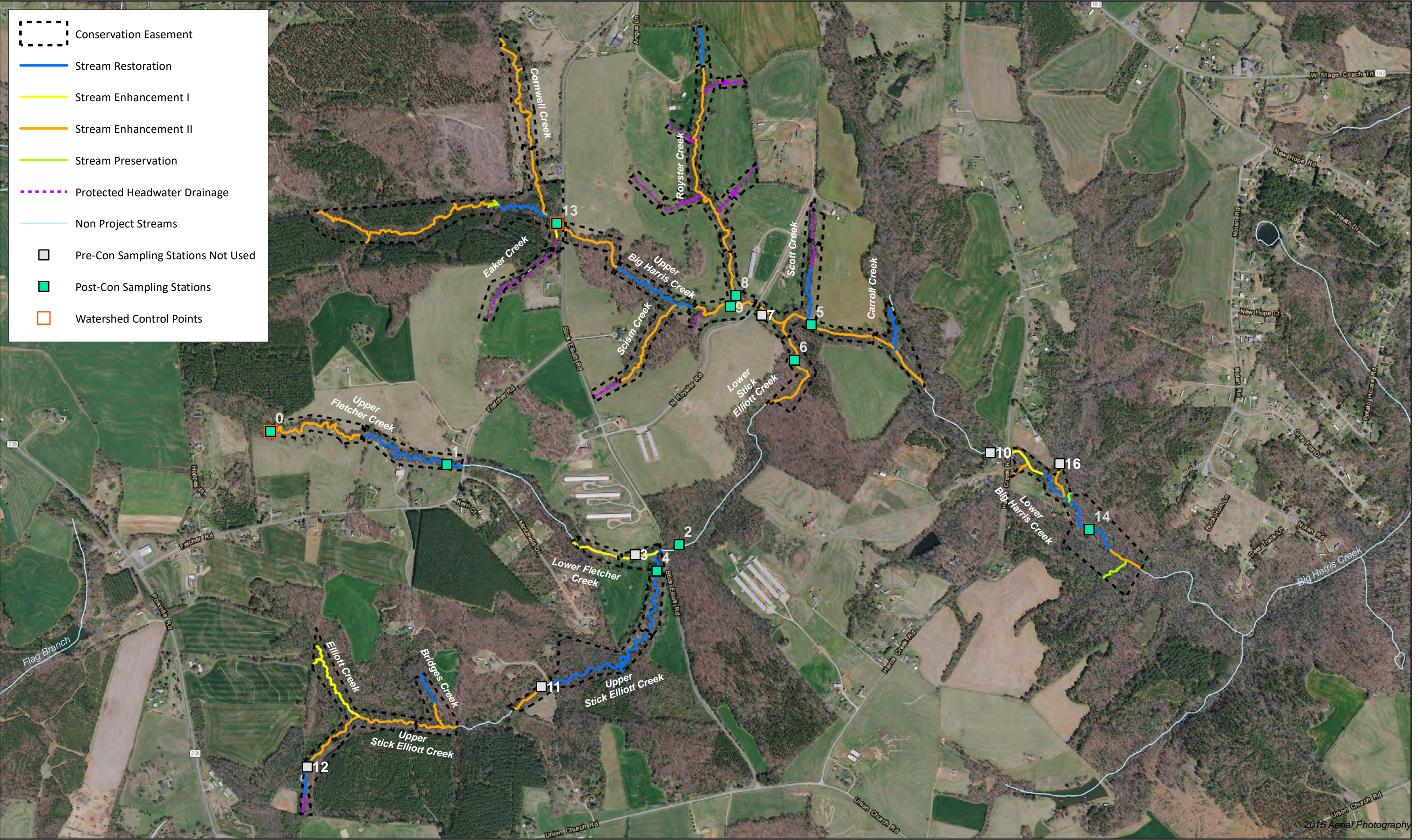
NC Department of Environmental Quality. 2016. Standard Operating Procedures for the Collection and Analysis of Benthic Macroinvertebrates. Division of Water Resources. Raleigh, North Carolina. February 2016

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			



Proposed Water Quality Monitoring Locations
 Big Harris Creek Mitigation Site
 Broad River Basin (03050105)
 Cleveland County, NC

2015 Aerial Photography

**APPENDIX 7. Water Quality Monitoring Data (MY3) & Updated Water Quality
Monitoring Sampling Schedule Correspondence**

Table 15. WCU Fecal & TSS Water Quality Data

Big Harris Creek Mitigation Site
 DMS Project No. 739
 Monitoring Year 3 - 2020

Station 0 - Upper Fletcher Creek Reach 1								
Date Sampled	Flow Type	Conductivity (µS/cm)	Fecal (CFU/100mL)	TSS (mg/L)	NOx (mg/L)	NH3-4 (mg/L)	TKN (mg/L)	TP (mg/L)
6/11/2020	Base	65.5						
7/15/2020	Base	68.6						
8/11/2020	Base	67.8						
9/16/2020	Base	64.5						
10/20/2020	Base	61.9						
11/17/2020	Base	63.6						
12/8/2020	Base	N/A						
No other parameters collected at this station.								
Station 1 - Upper Fletcher Creek Reach 2								
Date Sampled	Flow Type	Conductivity (µS/cm)	Fecal (CFU/100mL)	TSS (mg/L)	NOx (mg/L)	NH3-4 (mg/L)	TKN (mg/L)	TP (mg/L)
6/11/2020	Base	64.4						
7/15/2020	Base	63.6						
8/11/2020	Base	62.8						
9/16/2020	Base	59.1						
10/20/2020	Base	55.4						
11/17/2020	Base	54.7						
12/8/2020	Base	N/A						
No other parameters collected at this station.								
Station 2 - Lower Stick Elliot Creek (downstream of Stick Elliot Rd.)								
Date Sampled	Flow Type	Conductivity (µS/cm)	Fecal (CFU/100mL)	TSS (mg/L)	NOx (mg/L)	NH3-4 (mg/L)	TKN (mg/L)	TP (mg/L)
6/11/2020	Base	98.9	---	6.2				
7/15/2020	Base	101.8	---	6.2				
8/11/2020	Base	100.1	180	6.2				
9/16/2020	Base	93.6	170	6.2				
10/20/2020	Base	89.5	TBD	TBD				
11/17/2020	Base	89.1	TBD	TBD				
12/8/2020	Base	N/A	TBD	TBD				
Baseflow nutrient sampling to be collected in MY4 - MY5								
10/13/2020	Storm	---	---	---	---	---	---	---
Station 4 - Lower Stick Elliott Creek Reach 6								
Date Sampled	Flow Type	Conductivity (µS/cm)	Fecal (CFU/100mL)	TSS (mg/L)	NOx (mg/L)	NH3-4 (mg/L)	TKN (mg/L)	TP (mg/L)
6/11/2020	Base	52.6	140					
7/15/2020	Base	57.3	220					
8/11/2020	Base	60.2	120					
9/16/2020	Base	51.2	100					
10/20/2020	Base	50.5	TBD					
11/17/2020	Base	50.0	TBD					
12/8/2020	Base	N/A	TBD					
No other parameters collected at this station.								

N/A, No data recorded due to equipment malfunction.

---, No data collected.

TBD, Data results are pending. Currently waiting on data result from the lab.

Table 15. WCU Fecal & TSS Water Quality Data

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

Station 8 - Royster Creek Reach 2								
Date Sampled	Flow Type	Conductivity (µS/cm)	Fecal (CFU/100mL)	TSS (mg/L)	NOx (mg/L)	NH3-4 (mg/L)	TKN (mg/L)	TP (mg/L)
6/11/2020	Base	61.4	---	7.5	Baseflow nutrient sampling to be collected in MY4 - MY5			
7/15/2020	Base	66.8	---	6.2				
8/11/2020	Base	67.3	140	6.2				
9/16/2020	Base	59.2	67	6.2				
10/20/2020	Base	57.8	TBD	TBD				
11/17/2020	Base	57.2	TBD	TBD				
12/8/2020	Base	N/A	TBD	TBD				
10/13/2020	Storm	---	---	---				
Station 9 - Upper Big Harris Creek Reach 5								
Date Sampled	Flow Type	Conductivity (µS/cm)	Fecal (CFU/100mL)	TSS (mg/L)	NOx (mg/L)	NH3-4 (mg/L)	TKN (mg/L)	TP (mg/L)
6/11/2020	Base	50.0	---	6.2	Baseflow nutrient sampling to be collected in MY4 - MY5			
7/15/2020	Base	57.4	---	6.2				
8/11/2020	Base	51.2	150	6.2				
9/16/2020	Base	47.2	530	6.2				
10/20/2020	Base	45.2	TBD	TBD				
11/17/2020	Base	45.0	TBD	TBD				
12/8/2020	Base	N/A	TBD	TBD				
10/13/2020	Storm	---	---	---				
Station 13 - Upper Big Harris Creek Reach 2b								
Date Sampled	Flow Type	Conductivity (µS/cm)	Fecal (CFU/100)	TSS (mg/L)	NOx (mg/L)	NH3-4 (mg/L)	TKN (mg/L)	TP (mg/L)
6/11/2020	Base	37.6	No other parameters collected at this station.					
7/15/2020	Base	38.9						
8/11/2020	Base	39.5						
9/16/2020	Base	36.8						
10/20/2020	Base	36.1						
11/17/2020	Base	36.3						
12/8/2020	Base	N/A						
Station 14 - Lower Big Harris Creek Reach 2								
Date Sampled	Flow Type	Conductivity (µS/cm)	Fecal (CFU/100)	TSS (mg/L)	NOx (mg/L)	NH3-4 (mg/L)	TKN (mg/L)	TP (mg/L)
6/11/2020	Base	61.2	---	6.2	Baseflow nutrient sampling to be collected in MY4 - MY5			
7/15/2020	Base	64.8	---	6.2				
8/11/2020	Base	66.7	---	6.2				
9/16/2020	Base	60	---	6.2				
10/20/2020	Base	56.1	---	TBD				
11/17/2020	Base	57.1	---	TBD				
12/8/2020	Base	N/A	---	TBD				
10/13/2020	Storm	---	---	---				

N/A, No data recorded due to equipment malfunction.

---, No data collected.

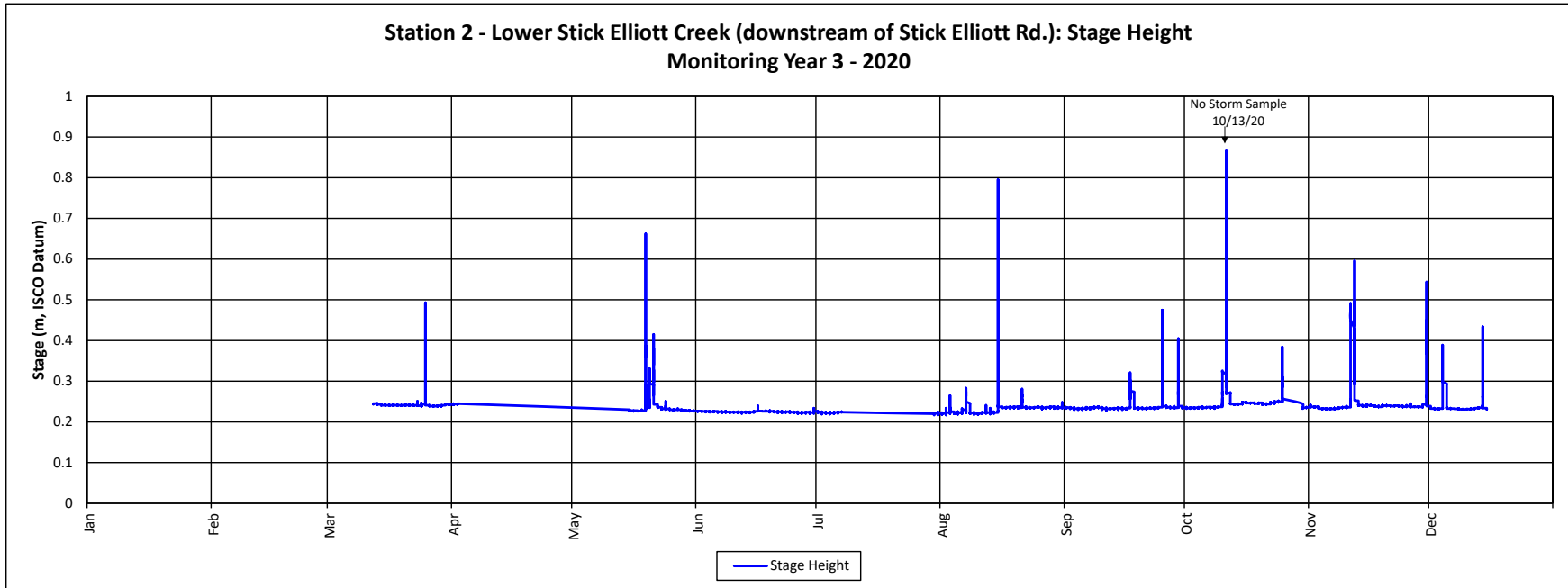
TBD, Data results are pending. Currently waiting on data result from the lab.

WCU Stage Gage Data

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

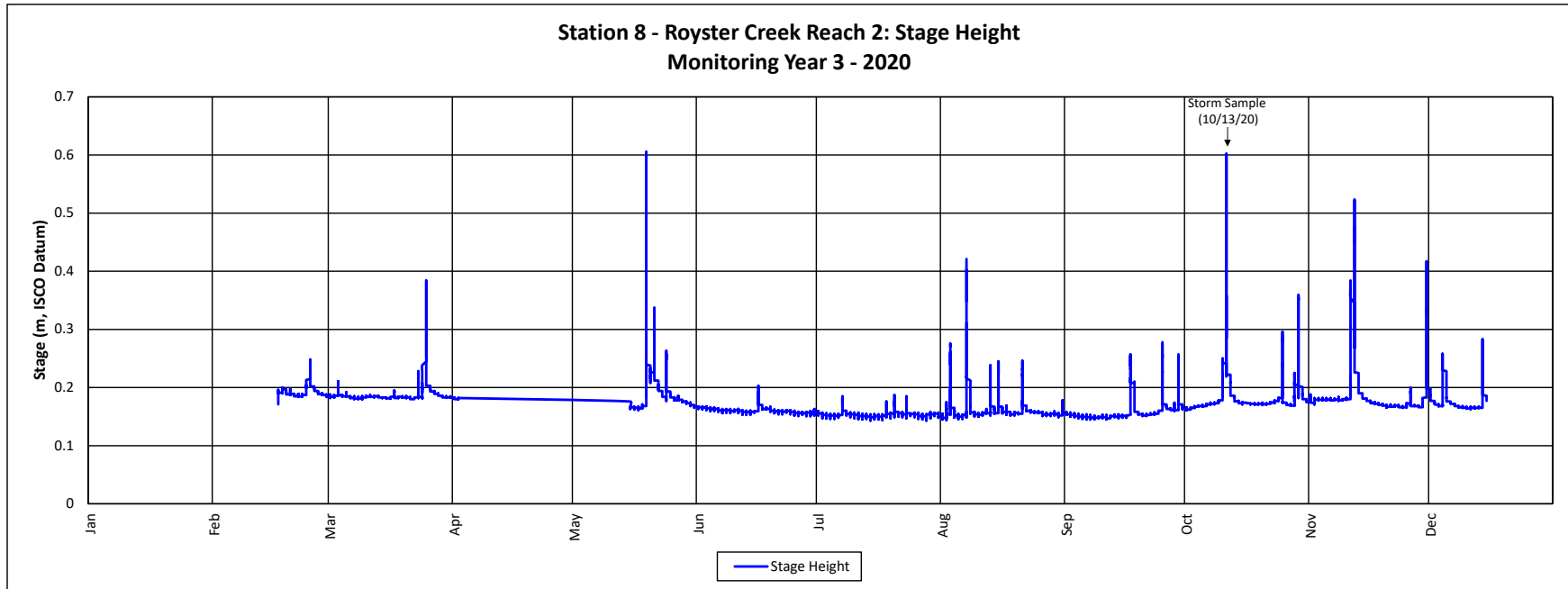


WCU Stage Gage Data

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

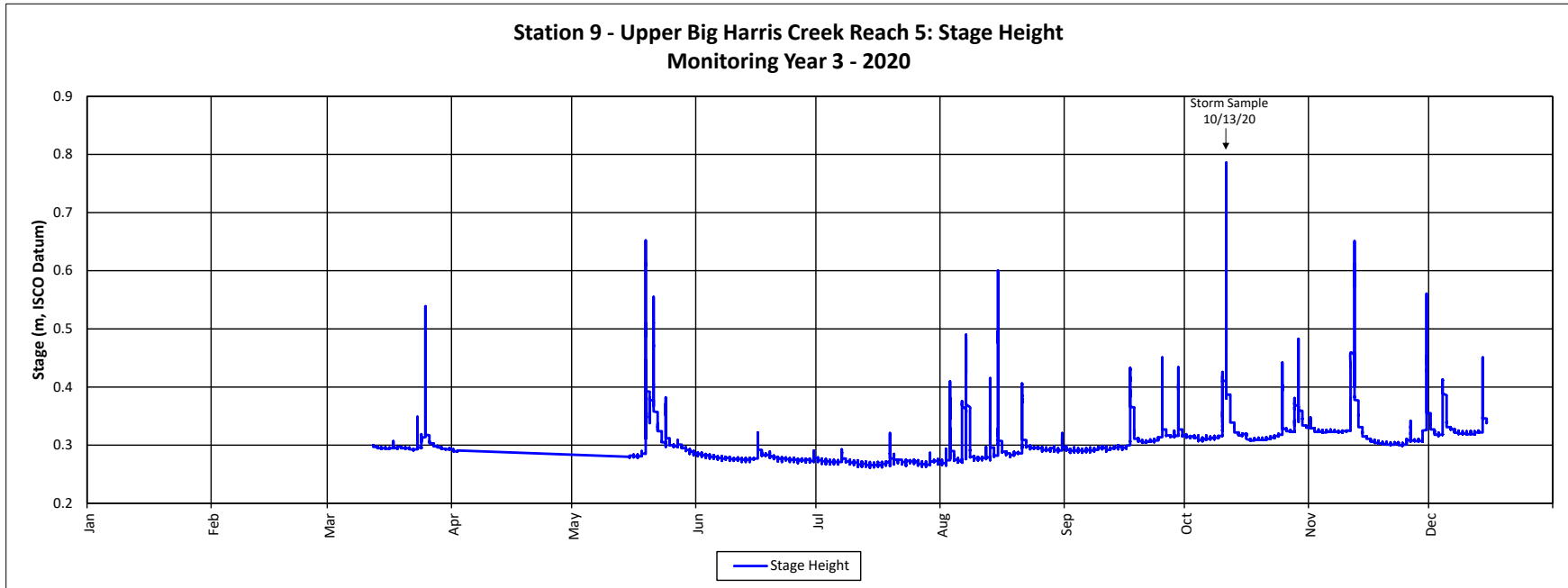


WCU Stage Gage Data

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020

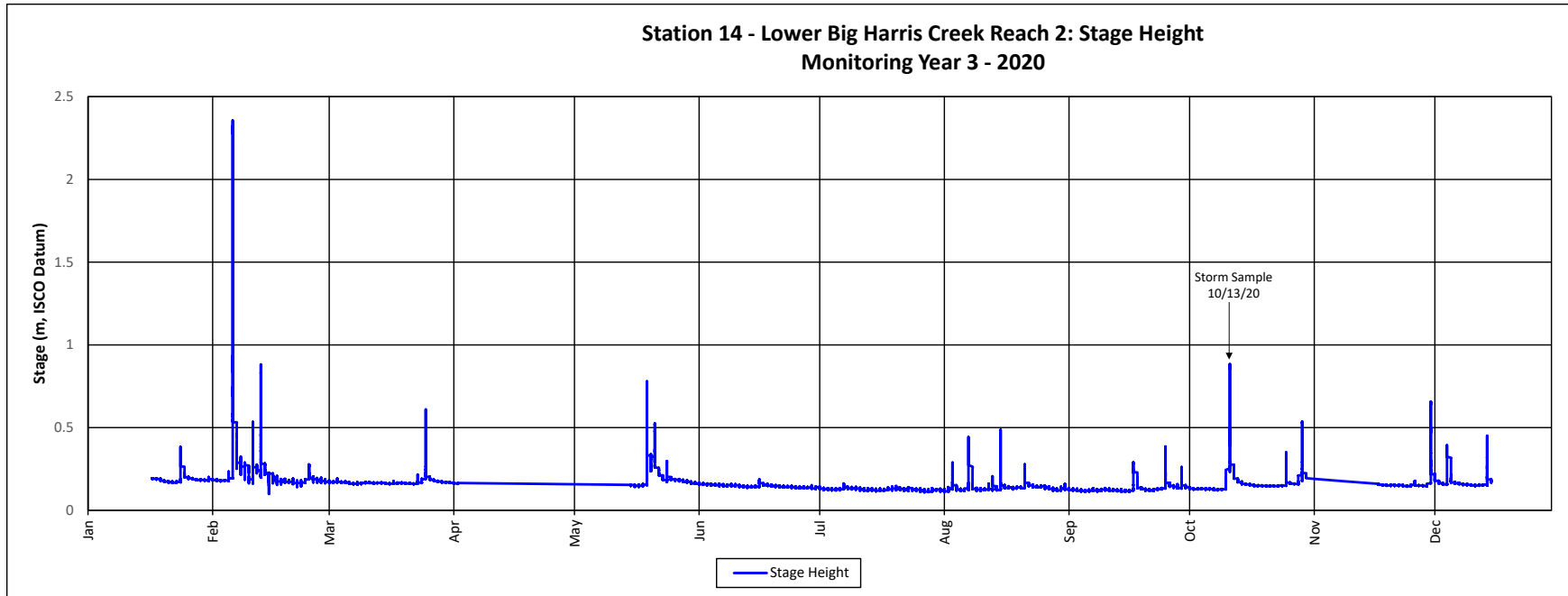


WCU Stage Gage Plot

Big Harris Creek Mitigation Site

DMS Project No. 739

Monitoring Year 3 - 2020



From: Ian Eckardt [<mailto:ieckardt@wildlandseng.com>]
Sent: Friday, February 12, 2021 1:20 PM
To: Jerry Miller <jmiller@email.wcu.edu>
Cc: Kristi Suggs <ksuggs@wildlandseng.com>; Melia, Gregory <gregory.melia@ncdenr.gov>; Wiesner, Paul <paul.wiesner@ncdenr.gov>
Subject: [External] RE: Big Harris Water Quality Monitoring Schedule

CAUTION: External email. Do not click links or open attachments unless you verify. Send all suspicious email as an attachment to [Report Spam](#).

Jerry,

Thanks for the prompt response. I'll update the final annual monitoring report (MY3) with the adjusted water quality sampling schedule which will extend to June 2023. I'm copying Greg, Paul, and Kristi so that everyone's on the same page.

Ian Eckardt, PWS | *Environmental Scientist*
O: 704.332.7754 x108 **M:** 704.517-4988

[Wildlands Engineering, Inc.](#)

1430 S. Mint St, Suite 104
Charlotte, NC 28203

From: Jerry Miller <jmiller@email.wcu.edu>
Sent: Friday, February 12, 2021 11:03 AM
To: Ian Eckardt <ieckardt@wildlandseng.com>
Subject: Re: Big Harris Water Quality Monitoring Schedule

Hi Ian,

Yes, I agree. I think that continuing the sampling through June 2023 would be best.

Jerry

From: Ian Eckardt <ieckardt@wildlandseng.com>
Sent: Friday, February 12, 2021 10:32 AM
To: Jerry Miller <jmiller@email.wcu.edu>
Subject: Big Harris Water Quality Monitoring Schedule

WARNING: This email originated from a non-WCU email account. Do not click links or open attachments unless you are confident the content is safe.

Jerry,

I wanted to touch base about the end date for the water quality sampling Western Carolina is performing at Big Harris Creek Mitigation Site. Grab samples were originally expected to begin in January 2020 and last for three years; however, due to equipment issues and issues related to COVID,

the WCU sampling wasn't initiated until June 2020. Based on the adjusted start date, water quality sampling is now anticipated to run through June 2023. Please let me know if you concur or need to discuss further.

Thanks,

Ian Eckardt, PWS | *Environmental Scientist*
O: 704.332.7754 x108 **M:** 704.517-4988

[Wildlands Engineering, Inc.](#)

1430 S. Mint St, Suite 104
Charlotte, NC 28203