MONITORING YEAR 4 of 5 ANNUAL REPORT

Final

BYRDS CREEK MITIGATION SITE
Person County, NC
NCDEQ Contract 003987
DMS Project Number 95020
USACE Action ID Number 2012-00230
NCDWR Project Number 2012-0102

Data Collection Period: January 2017 - October 2017
Draft Submission Date: November 22, 2017
Final Submission Date: January 3, 2018

PREPARED FOR:

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

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January 3, 2018

Jeff Schaffer
N.C. Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699-1652

RE: Monitoring Year 4 Report for Byrd's Creek Mitigation Site (95020)
Neuse River Basin – CU# 03020201
Person County, North Carolina
Contract No. 003987

Dear Mr. Schaffer,

We have reviewed the comments on the Monitoring Year 4 Report for the above referenced project dated December 22, 2017 and have revised the report based on these comments. The revised documents are submitted with this letter. Below are responses to each of your comments. For your convenience, the comments are reprinted with our response in italics.

1) The digital data and drawings have been reviewed and determined to meet DMS requirements.

2) Add the USACE Action ID number (2012-00230) and NCDWR Project number (2012-0102) to the cover page.

The USACE Action ID number and NCDWR Project number have been added to the cover page.

3) As per our discussion during the December 20, 2017 site visit, DMS recommends that Wildlands plant larger, more age appropriate trees in the encroachment area along Byrd's Creek Reach 4. Also, please show this on the CCPV and discuss in the report narrative.

Wildlands will plant larger more age appropriate trees in the area of easement encroachment along Byrd's Creek Reach 4. Also, this area is discussed in the report in section 1.2.2.

4) Section 1.2.3: In this section, you state that all the beaver dams were on Byrd's Creek Reach 4. According to the CCPV they are all on Byrd's Creek Reach 3.

Section 1.2.3 was updated to state all the beaver dams are on Byrd's Creek Reach 3.

5) Appendix 4: For any morphological tables, provide a footnote with the tables that describes the method by which Wildlands is calculating Bank Height Ratio and Entrenchment Ratio. In addition, please provide context to any observed changes in these calculated ratios in the report narrative. DMS has proposed a method for these calculations that can be found in the As-Built Baseline template guidance As-Built Baseline Monitoring Report – June 2017 Page22, specifically the paragraphs 8 and 9.

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A footnote was added to morphological tables in Appendix 4 describing the method used to calculate Bank Height Ratio, and Entrenchment Ratio.

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

Sincerely,

Jason Lorch, *Monitoring Coordinator*

PREPARED BY:

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

Jason Lorch
jlorch@wildlandseng.com
Phone: 919.851.9986

EXECUTIVE SUMMARY

Wildlands Engineering (Wildlands) completed a full delivery project for the North Carolina Division of Mitigation Services (DMS) to restore and enhance a total of 7,328 linear feet of stream in Person County, North Carolina. The project streams consist of Byrds Creek, a third order stream, as well as three unnamed first and second order tributaries to Byrds Creek (South Branch, Southeast Branch, and West Branch). The project provides 5,371 stream mitigation units (SMU's). At the downstream limits of the project, the drainage area is 2,957 acres (4.62 square miles).

The Byrds Creek Mitigation Site, hereafter referred to as the Site, is approximately 1.8 miles south of Hurdle Mills, NC off of Wolfe Road in southwestern Person County (Figure 1). The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The Site is within the South Flat River watershed, North Carolina Division of Water Resources (NCDWR) Subbasin 03-04-01 of the Neuse River Basin and United States Geological Survey (USGS) Hydrologic Unit Code (HUC) 03020201010020. Land use within the watershed is rural and is dominated by forestry, agriculture, and livestock operations; with approximately 60% of the watershed used for agriculture and 40% forested. The Site is located in an active cattle pasture surrounded by wooded lots, small agricultural operations, and rural residential areas. Prior to construction activities, the streams on the Site were heavily impacted by cattle, which led to stream bank erosion and instability.

The following project goals were established to address the effects from watershed and project site stressors:

- Reduce nutrient loads within the watershed and to downstream waters;
- Stabilize eroding stream banks greatly reducing sediment loads;
- Restore riffle/pool sequencing resulting in decreased water temperatures and increased dissolved oxygen concentrations;
- Establish in-stream structures to improve habitat diversity and trap detritus;
- Restore native vegetation and riparian buffers; and
- Protect the restored land in perpetuity through a conservation easement.

These goals were achieved by restoring 3,096 LF of perennial and intermittent stream channel and enhancing 4,232 LF of perennial stream channel. Restoration and enhancement construction and planting efforts were completed in December 2013. A conservation easement is in place on 24.4 acres of riparian corridor and stream resources to protect them in perpetuity.

Monitoring Year 4 (MY-4) monitoring and site visits were completed between the months of January and October 2017 to assess the conditions of the Site. All streams within the Site are stable and functioning as designed. Repair work was performed on sections of Byrds Creek Reach 3 during the spring of 2017. Overall, these isolated sections totaled approximately 200 liner feet in length. The Site's overall average planted stem density of 520 stems per acre is greater than the success criteria of 260 stems per acre density required for MY-5. Hydrologic monitoring gages documented bankfull events for all streams on the Site. All streams have met the MY-5 hydrology success criteria.

BYRDS CREEK MITIGATION SITE

Monitoring Year 4 Annual Report

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Section 1: PROJECT OVERVIEW

The Byrds Creek Mitigation Site, hereafter referred to as the Site, is located in southwestern Person County within the Neuse River Basin (USGS Hydrologic Unit 03020201). The project site is located south of Hurdle Mills off of Wolfe Road and is in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The Multi-Resolution Land Characteristics Consortium (MRLC, 2001) classified approximately 57% of the land in the project watershed as managed herbaceous cover or agricultural, 42% is classified as forested/scrubland, and the remaining 1% is open water. The drainage area for the Byrds Creek Site is 2,957 acres (4.62 square miles).

The project stream reaches consist of Byrds Creek reach 2 (BC2), Byrds Creek reach 3 (BC3), South branch (SB1), Southeast branch reach 1 (SE1), and Southeast branch reach 2 (SE2) which are stream restoration and/or enhancement level I approach. The project also consists of Byrds Creek reach 1 (BC1), Byrds Creek reach 4 (BC4), and West branch (WB1) which are enhancement level II approach. Mitigation work within the Site included restoring and enhancing 7,328 linear feet of perennial and intermittent stream channel. The stream areas were also planted with native vegetation to improve habitat and protect water quality. The project provides 5,371 stream mitigation units (SMU's). The final mitigation plan was submitted and accepted by DMS in January 2013. Construction activities were completed by North State Environmental in September 2013 and planting and seeding activities were completed by Bruton Natural Systems, Inc. in December 2013. Baseline monitoring (MY-0) was conducted between September 2013 and January 2014. Annual monitoring will be conducted for five years with the close-out anticipated to commence in 2019 given the success criteria are met. Appendix 1 provides more detailed project activity, history, contact information, and watershed/site background information for this project. Three separate conservation easements have been recorded and are in place along the riparian corridors and stream resources to protect them in perpetuity. Directions and a map of the Site are provided in Figure 1 and project components are illustrated for the Site in Figure 2.

1.1 Project Goals and Objectives

Prior to construction activities, the streams on the Byrds Creek Site were heavily impacted by cattle, which led to stream bank erosion and instability. Related degradation included declining aquatic habitat, loss of forest, degraded riparian buffers, and water quality problems related to increased sediment and nutrient loadings. Tables 10a-c in Appendix 4 present the pre-restoration conditions in detail.

The Site was designed to meet the over-arching goals as described in the mitigation plan (Wildlands, 2013). The project is intended to provide numerous ecological benefits within the Neuse River Basin. While many of these benefits are limited to the Site, others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects. The following project specific goals established in the mitigation plan included:

- Reduce nutrient loads within the watershed and to downstream waters;
- Stabilize eroding stream banks greatly reducing sediment loads;
- Restore riffle/pool sequencing resulting in decreased water temperatures and increased dissolved oxygen concentrations;
- Establish in-stream structures to improve habitat diversity and trap detritus;
- Restore native vegetation and riparian buffers; and
- Protect the restored land in perpetuity through a conservation easement.

The design features of this project were developed to achieve multiple project objectives. The stream restoration reaches were designed to frequently flood the reconnected floodplain. This design approach provides more frequent dissipation of energy from higher flows (bankfull and above) to improve channel

stability; provide water quality treatment through detention, settling, and biological removal of pollutants; and restore a more natural hydrologic regime. The project objectives defined in the mitigation plan (Wildlands, 2013) are as follows:

- On-site nutrient inputs will be decreased by removing cattle from streams and filtering on-site runoff through buffer zones. Off-site nutrient input will be absorbed on-site by filtering flood flows through restored floodplain areas, where flood flow will spread through native vegetation. Vegetation is expected to uptake excess nutrients.
- Stream bank erosion which contributes sediment load to the creek will be greatly reduced in the project area. Eroding stream banks will be stabilized using bioengineering, natural channel design techniques, and grading to reduce bank angles and bank height. Storm flow containing grit and fine sediment will be filtered through restored floodplain areas, where flow will spread through native vegetation. Spreading flood flows will also reduce velocity and allow sediment to settle out. Sediment transport capacity of restored reaches will be improved so that capacity balances more closely to load. Sediment load reduction will be monitored through assessing bank stability with cross section and profile surveys and visual assessment through photo documentation which serves as an accepted surrogate for direct turbidity measurements.
- Restored riffle/pool sequences will promote aeration of water and create deep water zones, helping to lower water temperature. Establishment and maintenance of riparian buffers will create long-term shading of the channel flow to minimize thermal heating. Lower water temperatures will help maintain dissolved oxygen concentrations.
- In-stream structures will be constructed to improve habitat diversity and trap detritus. Wood habitat structures will be included in the stream as part of the restoration design. Such structures may include log drops and rock structures that incorporate woody debris.
- Adjacent buffer and riparian habitats will be restored with native vegetation as part of the project. Native vegetation will provide cover and food for terrestrial creatures. Native plant species will be planted and invasive species will be treated. Eroding and unstable areas will also be stabilized with vegetation as part of this project.
- The restored land will be protected in perpetuity through a conservation easement.

The design streams were restored to the appropriate type based on the surrounding landscape, climate, and natural vegetation communities but also with strong consideration to existing watershed conditions and trajectory. The designs were developed to correct incision and lack of pattern caused by channelization, bank instability caused by erosion and livestock access, lack of vegetation in riparian zones, and lack of riparian and aquatic habitat.

1.2 Monitoring Year 4 Data Assessment

Annual monitoring and site visits were conducted during MY-4 to assess the condition of the project. The stream success criteria for the Site follows the approved success criteria presented in the Byrds Creek Mitigation Plan (Wildlands, 2013).

1.2.1 Vegetative Assessment

A total of 14 vegetation plots were established within the project easement area during the baseline monitoring. Thirteen of the plots were established as standard 10 meter by 10 meter plots with one plot established as a 5 meter by 20 meter plot. The final vegetative success criteria will be the survival of 260 planted stems per acre in the riparian corridor along restored and enhanced reaches at the end of MY-5.

The MY-4 vegetative survey was completed in August 2017. The 2017 annual vegetation monitoring resulted in an average planted stem density of 520 stems per acre, which is greater than the

requirement of 260 stems per acre. All 14 vegetation plots met success criteria during MY-4. The MY-4 planted stem density is approximately 30% less than the baseline density recorded (734 stems per acre) in January 2014. There is an average of 12 stems per plot and all plots are on track to meet the success criteria required for MY-5. Refer to Appendix 2 for vegetation plot photographs and the vegetation condition assessment table and Appendix 3 for vegetation data tables.

1.2.2 Vegetation Areas of Concern

During a site visit in December 2017 it was discovered that an area of the easement, approximately 0.46 acres, along Byrds Creek Reach 4 had been mowed. After a discussion with the landowner it was determined that he had allowed a family member to hunt his property. This family member mowed shooting lanes into the easement. The landowner has talked to this family member and assured Wildlands this will not happen again. The property owner is working with Wildlands to fix this issue. Wildlands will replant this area with trees of a similar age and size to the ones that were mowed. Refer to the CCPV Map in Appendix 2 for the areas of easement encroachment and Table 6 for acreages.

1.2.3 Stream Assessment

Morphological surveys for MY-4 were conducted in May 2017. All streams within the Site are stable with little to no erosion and have met the success criteria for MY-4. Refer to Appendix 2 for the visual assessment table, integrated current condition plan view (CCPV) map (Figure 3), and reference photographs. Refer to Appendix 4 for the morphological data and plots.

While there have been some minor post-construction adjustments within the restored channels; the cross sections show little to no change in the bankfull area, maximum depth ratio, or width-to-depth ratio. Surveyed riffle cross sections fell within the parameters defined for channels of the appropriate Rosgen stream type. The surveyed longitudinal profile data for BC2, BC3, SB1, SE1, SE2a and SE2b illustrates that the bedform features are maintaining lateral and vertical stability. The riffles are remaining steeper and shallower than the pools, while the pools are remaining deeper than the riffles and maintaining flat water surface slopes. The longitudinal profiles show that the bank height ratios remain at or very near to 1.0 for the restoration reaches. Entrenchment ratios vary slightly from year to year due to minor changes in bankfull widths. Small adjustments in width occur due to vegetation, sediment deposition, and many other factors. These minor changes do not indicate channel instability.

Pattern data will be collected in MY-5 only if there are indicators from the profile or dimensions that indicate significant geomorphic adjustments have occurred. No changes were observed during MY-4 that indicate a change in the radius of curvature or channel belt width.

Several beaver dams and a lodge were discovered in January 2017 (MY-4). All dams were on Byrds Creek reach three, with the largest dam at approximately station 42+50. This beaver dam extended onto the floodplain which caused water to flow out of the channel and onto the floodplain. Water was impounded up to the culverts at the easement break near station 35+00. The USDA was contracted in February 2017 to trap beaver and breach the dams at the Site. By the end of February 2017 seven beaver had been trapped and all beaver dams were breached. Once water levels were back to baseflow, Land Mechanics Designs, Inc. was hired to repair the damage associated with the beaver impoundments. During repair work one large beaver dam, and three smaller dams (stations 36+00, 38+50, and 46+50) were removed. Stream banks damaged as a result of the dams were graded, seeded, and matted. Near station 42+75 rilling and minor bank erosion had occurred from overland flow as a result of the large beaver dam. Sod mats were added to this area to stabilize stream banks. The left stream bank near station 46+50 had eroded around a small beaver dam. This area was stabilized using

brush, cobble, and soil, then the bank was seeded and matted. Live stakes were planted along stream banks as needed to stabilize any repair areas and to replace vegetation removed by beaver activity.

1.2.4 Stream Areas of Concern

As of October 2017, beaver activity has not been observed on the Site since the removal in February 2017. Beaver presence and the areas of repair will continue to be monitored in subsequent years.

1.2.5 Hydrology Assessment

At the end of the five year monitoring period, two or more bankfull events must have occurred in separate years within the restoration reaches. Bankfull events were recorded on all three gaged streams during the MY-4 data collection. Byrds Creek and South Branch have each had bankfull events during MY-1, MY-2, MY-3, and MY-4. Therefore, they have met the hydrology success criteria for the Site. Southeast Branch recorded bankfull events during MY-2, MY-3, and MY-4, also meeting hydrology success criteria. Refer to Appendix 5 for hydrologic data.

1.2.6 Maintenance Plan

No maintenance is required at this time.

1.3 Monitoring Year 4 Summary

All streams within the Site are stable and functioning as designed. The average planted stem density for the Site is 520 stems per acre and is on track to meet the MY-5 success criteria. Bankfull events were documented with gages located on all three streams during MY-4. The MY-5 stream hydrology success criteria has been met on Byrds Creek, South Branch, and Southeast Branch. Beaver activity was observed at the beginning of MY-4, but no activity has been detected since repairs were completed in the spring of MY-4.

Summary information and data related to the performance of the project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Mitigation Plan documents available on DMS's website. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

Section 2: METHODOLOGY

Geomorphic data was 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). Longitudinal and cross-sectional data were collected using a total station and were georeferenced. All CCPV mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcView. Crest gages were installed in surveyed riffle cross sections and monitored quarterly. Hydrology attainment installation and monitoring methods are in accordance with the USACE (2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-DMS Level 2 Protocol (Lee et al., 2008). Reporting follows the DMS Monitoring Report Template and Guidance Version 1.3 (DMS, 2010).

Section 3: REFERENCES

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

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

Lee, M.T., Peet, R.K., S.D., Wentworth, T.R. 2008. CVS-DMS Protocol for Recording Vegetation Version 4.2. Retrieved from http://cvs.bio.unc.edu/protocol/cvs-eep-protocol-v4.2-lev1-5.pdf.

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

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

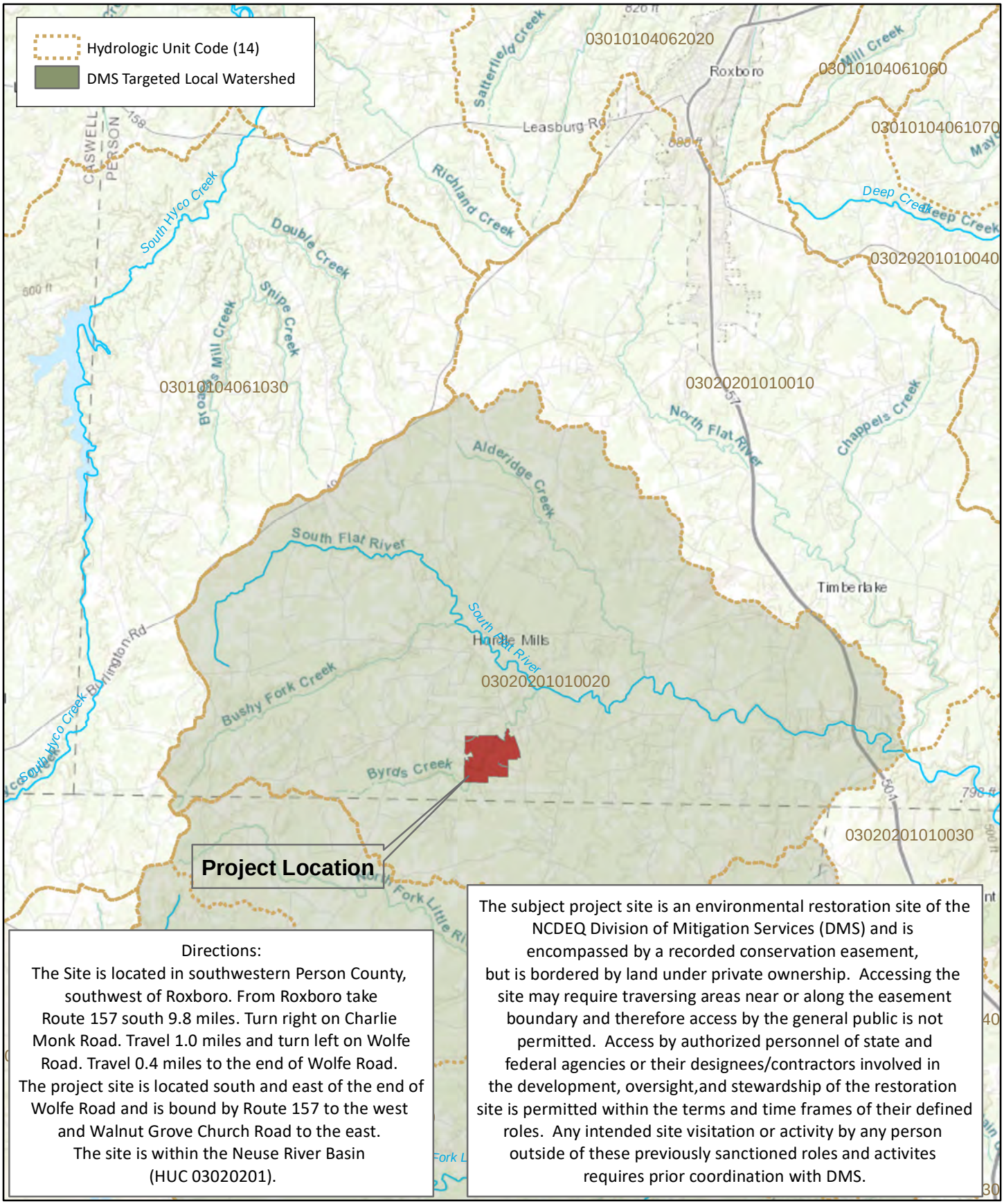
United States Army Corps of Engineers (USACE). 2003. Stream Mitigation Guidelines. USACE, NCDEQ-DWR, USEPA, NCWRC.

United States Geological Survey (USGS). 1998. North Carolina Geology. http://www.geology.enr.state.nc.us/usgs/carolina.htm.

Wildlands Engineering, Inc. 2013. Byrds Creek Mitigation Site Mitigation Plan. DMS, Raleigh, NC.

Wildlands Engineering, Inc. 2014. Byrds Creek Mitigation Site Baseline Monitoring Document and As-Built Baseline Report. DMS, Raleigh, NC.

APPENDIX 1. General Tables and Figures



Directions:
The Site is located in southwestern Person County, southwest of Roxboro. From Roxboro take Route 157 south 9.8 miles. Turn right on Charlie Monk Road. Travel 1.0 miles and turn left on Wolfe Road. Travel 0.4 miles to the end of Wolfe Road. The project site is located south and east of the end of Wolfe Road and is bound by Route 157 to the west and Walnut Grove Church Road to the east. The site is within the Neuse River Basin (HUC 03020201).

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

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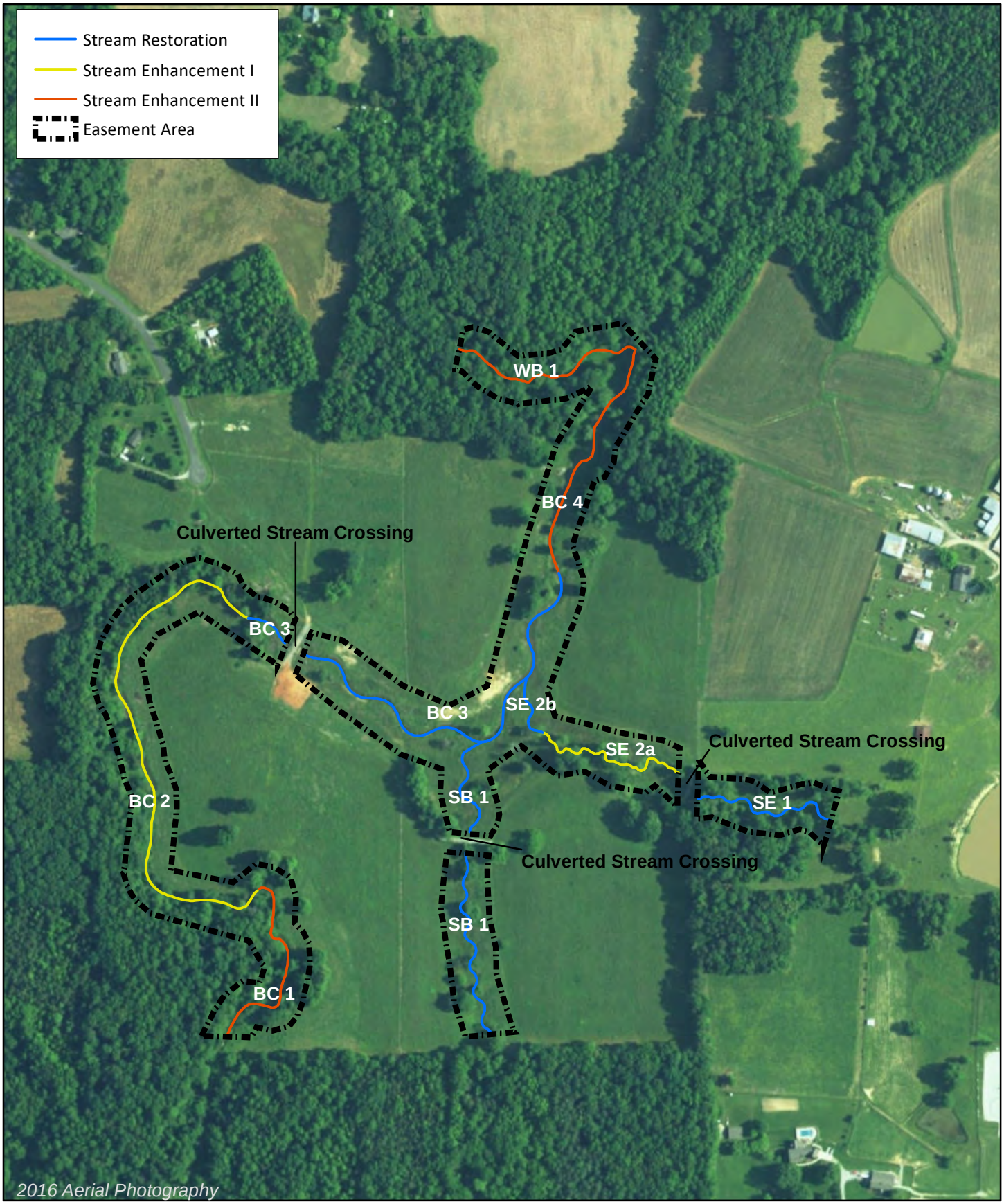
0 1 2 Miles

Figure 1 Project Vicinity Map
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Person County, NC



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0 250 500 Feet

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Figure 2 Project Component/ Asset Map
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Person County, NC

Table 1. Project Components and Mitigation Credits
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Mitigation Credits										
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset	
Type	R	RE	R	RE	R	RE				
Totals	5,371	0	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

Project Components							
Reach ID	As-Built Stationing / Location (LF)	Existing Footage (LF) / Acreage (Ac)	Approach	Restoration or Restoration Equivalent	Restoration Footage (LF) / Acreage (Ac)	Mitigation Ratio	Credits (SMU / WMU)
Streams							
BC1	10+00-16+43	643	N/A	Enhancement Level II	643	2.5:1	257
BC2	16+43-32+89	1,630	N/A	Enhancement Level I	1,646	1.5:1	1,097
BC3	32+89-34+05 34+64-47+55	1,368	Priority 1	Restoration	1,407	1:1	1,407
BC4	47+55-55+51	796	N/A	Enhancement Level II	796	2.5:1	318
SB1	60+00-66+48 67+08-70+69	976	Priority 1	Restoration	1,009	1:1	1,009
SE1	80+00-84+85	916	Priority 1	Restoration	485	1:1	485
SE2a	85+88-91+24	524	N/A	Enhancement Level I	536	1.5:1	357
SE2b	91+24-93+19	50	Priority 1	Restoration	195	1:1	195
WB1	100+00-106+11	611	N/A	Enhancement Level II	611	2.5:1	244

Component Summation						
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	3,096	-	-	-	-	-
Enhancement		-	-	-	-	-
Enhancement I	2,182					
Enhancement II	2,050					
Creation		-	-	-		
Preservation	-	-	-	-		-
High Quality Preservation	-	-	-	-		-

Table 2. Project Activity and Reporting History
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Activity or Report		Date Collection Complete	Completion or Scheduled Delivery
Mitigation Plan		January 2013	January 2013
Final Design - Construction Plans		June 2013	June 2013
Construction		September 2013	September 2013
Temporary S&E mix applied to entire project area[1]		September 2013	September 2013
Permanent seed mix applied to reach/segments		September 2013	September 2013
Bare root and live stake plantings for reach/segments		December 2013	December 2013
Baseline Monitoring Document (Year 0)	Stream Survey	September 2013	January 2014
	Vegetation Survey	January 2014	
Year 1 Monitoring	Stream Survey	March 2014	December 2014
	Vegetation Survey	September 2014	
Tree of Heaven Treatment			August 2014
Additional Live Stake Planting			February 2015
Year 2 Monitoring	Stream Survey	March 2015	December 2015
	Vegetation Survey	June 2015	
Tree of Heaven Treatment			July 2015
Stream Repair Work			January 2016
Year 3 Monitoring	Stream Survey	March 2016	December 2016
	Vegetation Survey	June 2016	
Stream Repair Work			March 2017
Year 4 Monitoring	Stream Survey	May 2017	December 2017
	Vegetation Survey	August 2017	
Year 5 Monitoring	Stream Survey	2018	December 2018
	Vegetation Survey	2018	

[1]Seed and mulch is added as each section of construction is completed.
*Byrds Creek Mitigation Site is a 5 year credit release project.

Table 3. Project Contact Table
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Designer Jeff Keaton, PE	**Wildlands Engineering, Inc.** 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	**North State Environmental** 2889 Lowery Street Winston Salem, NC 27101
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**North State Environmental** 2889 Lowery Street Winston Salem, NC 27101
Seed Mix Sources	**Green Resource, LLC**
Nursery Stock Suppliers **Bare Roots** **Live Stakes**	 **ArborGlen, Inc** **Foggy Mountain Nursery**
Monitoring Performers Stream and Vegetation Monitoring, POC	**Wildlands Engineering, Inc.** Jason Lorch 919.851.9986, ext. 107

Table 4. Project Information and Attributes

Byrds Creek Mitigation Site

DMS Project No. 95020

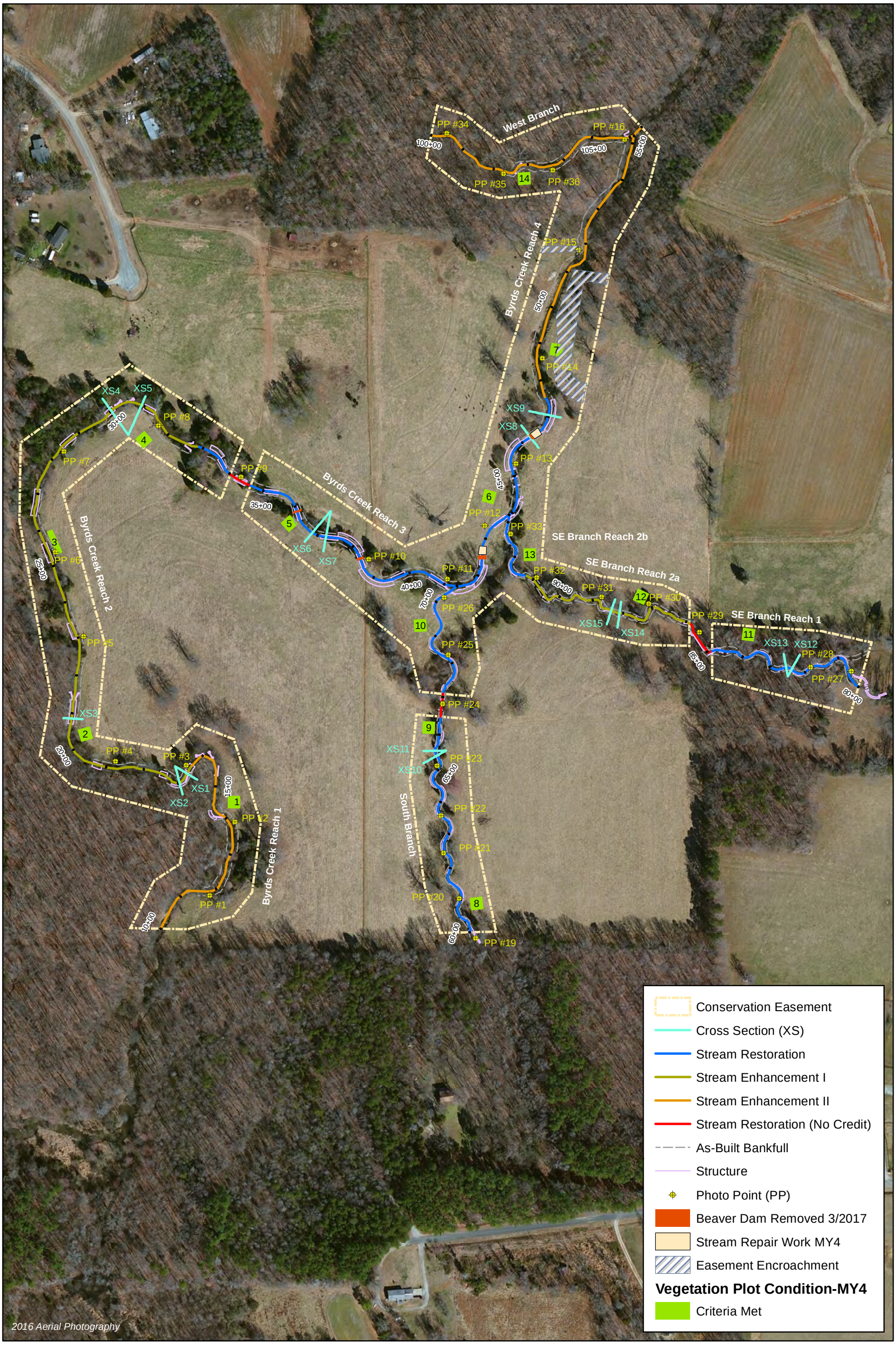
Monitoring Year 4 - 2017

Project Information	
Project Name	Byrds Creek Mitigation Site
County	Person County
Project Area (acres)	24.4
Project Coordinates (latitude and longitude)	36° 14.744' N, 79° 79° 2.636' W
Project Watershed Summary Information	
Physiographic Province	Carolina Slate Belt of the Piedmont Physiographic Province
River Basin	Neuse
USGS Hydrologic Unit 8-digit	03020201
USGS Hydrologic Unit 14-digit	03020201010020
DWQ Sub-basin	03-04-01
Project Drainiage Area (acres)	2,957 ac
Project Drainage Area Percentage of Impervious Area	<1%
CGIA Land Use Classification	57% managed herbaceous cover/agricultural, 42% forested/scrubland, 1% open water

Reach Summary Information									
Parameters	**BC1**	**BC2**	**BC3**	**BC4**	**SB1**	**SE1**	**SE2a**	**SE2b**	**WB1**
Length of reach (linear feet) - Post-Restoration	643	1,646	1,407	796	1,009	485	536	195	611
Drainage area (acres)	2,635	2,637	2,703	2,957	164	56	62	62	255
NCDWQ stream identification score	51.75				25.75	46.25			46.75
NCDWQ Water Quality Classification	WS-III, NSW								
Morphological Desription (stream type)	P	P	P	P	I	P	P	P	P
Evolutionary trend (Simon's Model) - Pre- Restoration	IV/V	IV	IV/V	IV	III	IV/V	III/IV	III/IV	IV/V
Underlying mapped soils	Chewacla / Georgeville Loam								
Drainage class	---	---	---	---	---	---	---	---	---
Soil Hydric status	---	---	---	---	---	---	---	---	---
Slope	---	---	---	---	---	---	---	---	---
FEMA classification	---	---	---	---	---	---	---	---	---
Native vegetation community	Piedmont bottomland forest								
Percent composition exotic invasive vegetation -Post-Restoration	0.8%								

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	X	X	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885
Waters of the United States - Section 401	X	X	
Division of Land Quality (Dam Safety)	N/A	N/A	N/A
Endangered Species Act	X	X	Byrds Creek Mitigation Plan; no critical habitat for listed species exists within the project area (Pedestrian Survey)
Historic Preservation Act	X	X	No historic resources were found to be impacted (letter from SHPO)
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	N/A	N/A	N/A
FEMA Floodplain Compliance	N/A	N/A	N/A
Essential Fisheries Habitat	N/A	N/A	N/A

APPENDIX 2. Visual Assessment Data



WILDLANDS ENGINEERING

0 125 250 375 500 Feet

N

Figure 3 Integrated Current Condition Plan View
Byrds Creek Stream Restoration Site
DMS Project No. 95020
Monitoring Year 4 - 2017
Person County, NC

Table 5a. Visual Stream Morphology Stability Assessment Table

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

Byrds Creek Reach 1 (643 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	n/a	n/a			n/a			
	3. Meander Pool Condition	Depth Sufficient	n/a	n/a			n/a			
		Length Appropriate	n/a	n/a			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	n/a	n/a			n/a			
		Thalweg centering at downstream of meander bend (Glide)	n/a	n/a			n/a			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. 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			

Table 5b. Visual Stream Morphology Stability Assessment Table

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

Byrds Creek Reach 2 (1,646 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%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	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	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%	2	2			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	1	1			100%			

Table 5c. Visual Stream Morphology Stability Assessment Table

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

Byrds Creek Reach 3 (1,407 LF)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	11	11			100%			
	3. Meander Pool Condition	Depth Sufficient	11	11			100%			
		Length Appropriate	11	11			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	11	11			100%			
		Thalweg centering at downstream of meander bend (Glide)	11	11			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. 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	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%	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	1	1			100%			

Table 5d. Visual Stream Morphology Stability Assessment Table

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

Byrds Creek Reach 4 (796 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	n/a	n/a			n/a			
	3. Meander Pool Condition	Depth Sufficient	n/a	n/a			n/a			
		Length Appropriate	n/a	n/a			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	n/a	n/a			n/a			
		Thalweg centering at downstream of meander bend (Glide)	n/a	n/a			n/a			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. 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			

Table 5e. Visual Stream Morphology Stability Assessment Table

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

South Branch Reach 1 (1,009 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	17	17			100%			
	3. Meander Pool Condition	Depth Sufficient	14	14			100%			
		Length Appropriate	14	14			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	14	14			100%			
		Thalweg centering at downstream of meander bend (Glide)	14	14			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. 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			

Table 5f. Visual Stream Morphology Stability Assessment Table

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

Southeast Reach 1 (485 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			n/a			
	3. Meander Pool Condition	Depth Sufficient	7	7			n/a			
		Length Appropriate	7	7			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	7	7			n/a			
		Thalweg centering at downstream of meander bend (Glide)	7	7			n/a			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	11	11			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	11	11			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	11	11			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	n/a	n/a			n/a			

Table 5g. Visual Stream Morphology Stability Assessment Table

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

Southeast Reach 2a (536 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	8	8			100%			
		Length Appropriate	8	8			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	8	8			100%			
		Thalweg centering at downstream of meander bend (Glide)	8	8			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	9	9			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	9	9			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	3	3			100%			

Table 5h. Visual Stream Morphology Stability Assessment Table

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

Southeast Reach 2b (195 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	3	3			100%			
		Length Appropriate	3	3			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	3	3			100%			
		Thalweg centering at downstream of meander bend (Glide)	3	3			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	3	3			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			

Table 5i. Visual Stream Morphology Stability Assessment Table

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

West Branch Reach 1 (611 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	n/a	n/a			n/a			
	3. Meander Pool Condition	Depth Sufficient	n/a	n/a			n/a			
		Length Appropriate	n/a	n/a			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	n/a	n/a			n/a			
		Thalweg centering at downstream of meander bend (Glide)	n/a	n/a			n/a			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. 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			

Table 6. Vegetation Condition Assessment Table
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Planted Acreage **38**

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

Easement Acreage **38**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Planted Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1,000	0	0	0.0%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	2	0.46	1.2%

Stream Photographs

	
PHOTO POINT 1 – looking upstream *(05/18/2017)*	**PHOTO POINT 1 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 2 – looking upstream *(05/18/2017)*	**PHOTO POINT 2 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 3 – looking upstream *(05/18/2017)*	**PHOTO POINT 3 –** looking downstream *(05/18/2017)*

	
PHOTO POINT 4 – looking upstream *(05/18/2017)*	**PHOTO POINT 4 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 5 – looking upstream *(05/18/2017)*	**PHOTO POINT 5 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 6 – looking upstream *(05/18/2017)*	**PHOTO POINT 6 –** looking downstream *(05/18/2017)*

	
PHOTO POINT 7 – looking upstream *(05/18/2017)*	**PHOTO POINT 7 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 8 – looking upstream *(05/18/2017)*	**PHOTO POINT 8 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 9 – looking upstream *(05/18/2017)*	**PHOTO POINT 9 –** looking downstream *(05/18/2017)*

	
PHOTO POINT 10 – looking upstream *(05/18/2017)*	**PHOTO POINT 10 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 11 – looking upstream *(05/18/2017)*	**PHOTO POINT 11 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 12 – looking upstream *(05/18/2017)*	**PHOTO POINT 12 –** looking downstream *(05/18/2017)*

PHOTO POINT 13 – looking upstream *(05/18/2017)*

PHOTO POINT 13 – looking downstream *(05/18/2017)*

PHOTO POINT 14 – looking upstream *(05/18/2017)*

PHOTO POINT 14 – looking downstream *(05/18/2017)*

PHOTO POINT 15 – looking upstream *(05/18/2017)*

PHOTO POINT 15 – looking downstream *(05/18/2017)*

	
PHOTO POINT 16 – looking upstream *(08/21/2017)*	**PHOTO POINT 16 –** looking downstream *(08/21/2017)*
	
PHOTO POINT 19 – looking upstream *(05/18/2017)*	**PHOTO POINT 19 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 20 – looking upstream *(05/18/2017)*	**PHOTO POINT 20 –** looking downstream *(05/18/2017)*

	
PHOTO POINT 21 – looking upstream *(05/18/2017)*	**PHOTO POINT 21 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 22 – looking upstream *(05/18/2017)*	**PHOTO POINT 22 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 23 – looking upstream *(05/18/2017)*	**PHOTO POINT 23 –** looking downstream *(05/18/2017)*

PHOTO POINT 24 – looking upstream *(05/18/2017)*

PHOTO POINT 24 – looking downstream *(05/18/2017)*

PHOTO POINT 25 – looking upstream *(05/18/2017)*

PHOTO POINT 25 – looking downstream *(05/18/2017)*

PHOTO POINT 26 – looking upstream *(05/18/2017)*

PHOTO POINT 26 – looking downstream *(05/18/2017)*

	
PHOTO POINT 27 – looking upstream *(05/18/2017)*	**PHOTO POINT 27 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 28 – looking upstream *(05/18/2017)*	**PHOTO POINT 28 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 29 – looking upstream *(05/18/2017)*	**PHOTO POINT 29 –** looking downstream *(05/18/2017)*

	
PHOTO POINT 30 – looking upstream *(05/18/2017)*	**PHOTO POINT 30 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 31 – looking upstream *(05/18/2017)*	**PHOTO POINT 31 –** looking downstream *(05/18/2017)*
	
PHOTO POINT 32 – looking upstream *(05/18/2017)*	**PHOTO POINT 32 –** looking downstream *(05/18/2017)*

PHOTO POINT 33 – looking upstream *(05/18/2017)*

PHOTO POINT 33 – looking downstream *(05/18/2017)*

PHOTO POINT 34 – looking upstream *(05/18/2017)*

PHOTO POINT 34 – looking downstream *(05/18/2017)*

PHOTO POINT 35 – looking upstream *(05/18/2017)*

PHOTO POINT 35 – looking downstream *(05/18/2017)*

	
PHOTO POINT 36 – looking upstream *(05/18/2017)*	**PHOTO POINT 36 –** looking downstream *(05/18/2017)*

Vegetation Photographs

VEG PLOT 1 *(08/21/2017)*

VEG PLOT 2 *(08/21/2017)*

VEG PLOT 3 *(08/21/2017)*

VEG PLOT 4 *(08/21/2017)*

VEG PLOT 5 *(08/21/2017)*

VEG PLOT 6 *(08/21/2017)*

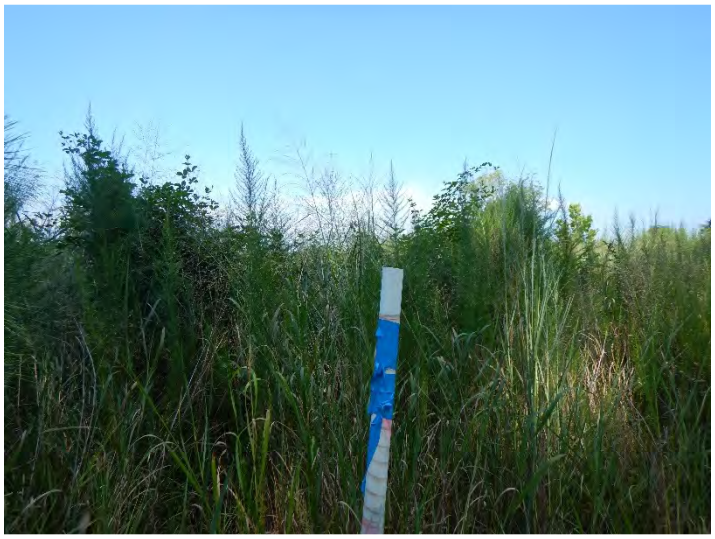
VEG PLOT 7 *(08/21/2017)*

VEG PLOT 8 *(08/21/2017)*

VEG PLOT 9 *(08/21/2017)*

VEG PLOT 10 *(08/21/2017)*

VEG PLOT 11 *(08/21/2017)*



VEG PLOT 12 *(08/21/2017)*

	
VEG PLOT 13 *(08/21/2017)*	**VEG PLOT 14** *(08/21/2017)*

APPENDIX 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Plot	MY4 Success Criteria Met (Y/N)	Tract Mean
1	Y	100%
2	Y	
3	Y	
4	Y	
5	Y	
6	Y	
7	Y	
8	Y	
9	Y	
10	Y	
11	Y	
12	Y	
13	Y	
14	Y	

Table 8. CVS Vegetation Table - Metadata

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Database name	Byrds Creek MY4 cvs-eep-entrytool-v2.3.1.mdb
Database location	F:\Projects\005-02128 Byrds Creek\Monitoring\Year 4\Vegetation Assessment
Computer name	CAROLYN
File size	55648256
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, 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	95020
project Name	Byrds Creek Mitigation Site
Description	Stream Mitigation Site
River Basin	Neuse
Sampled Plots	14

Table 9. Planted and Total Stem Counts
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

			Current Plot Data (MY4 2017)														
			95020-01-0001			95020-01-0002			95020-01-0003			95020-01-0004			95020-01-0005		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree						1									
Acer rubrum	red maple	Tree															
Baccharis halimifolia	eastern baccharis	Shrub															5
Betula nigra	river birch	Tree			1	1	1	6			1				1	1	1
Carpinus caroliniana	American hornbeam	Tree															
Carya	hickory	Tree			1												
Cephalanthus occidentalis	common buttonbush	Shrub												2			
Cercis canadensis	eastern redbud	Tree															
Cornus amomum	silky dogwood	Shrub															
Fagus grandifolia	American beech	Tree															
Fraxinus pennsylvanica	green ash	Tree	2	2	3	8	8	8	7	7	12	13	13	13	1	1	1
Juglans nigra	black walnut	Tree									2			1			
Juniperus virginiana	eastern redcedar	Tree															
Liquidambar styraciflua	sweetgum	Tree			5			4			3			20			8
Liriodendron tulipifera	tuliptree	Tree	1	1	8	4	4	24	1	1	8			2	3	3	3
Platanus occidentalis	American sycamore	Tree	2	2	2	1	1	1	1	1	3			2	6	6	26
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	1	1	1							1	1	1
Quercus phellos	willow oak	Tree	1	1	2	2	2	2	1	1	2	1	1	2	1	1	2
Quercus rubra	northern red oak	Tree	1	1	1	1	1	1			1						
Rhus copallinum	flameleaf sumac	shrub															
		Stem count	8	8	24	18	18	48	10	10	32	14	14	42	13	13	47
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	6	6	9	7	7	9	4	4	8	2	2	7	6	6	8
		Stems per ACRE	323.7	323.7	971.2	728.4	728.4	1942	404.7	404.7	1295	566.6	566.6	1700	526.1	526.1	1902

Color Coding for Table

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

PnoLS: Number of Planted stems excluding live stakes

P-all: Number of planted stems including live stakes,

T: Total Stems

Table 9. Planted and Total Stem Counts
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

			Current Plot Data (MY4 2017)														
			95020-01-0006			95020-01-0007			95020-01-0008			95020-01-0009			95020-01-0010		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree															
Acer rubrum	red maple	Tree															
Baccharis halimifolia	eastern baccharis	Shrub															
Betula nigra	river birch	Tree	2	2	2	1	1	1	2	2	2	1	1	1	2	2	2
Carpinus caroliniana	American hornbeam	Tree	1	1	1												
Carya	hickory	Tree															
Cephalanthus occidentalis	common buttonbush	Shrub															
Cercis canadensis	eastern redbud	Tree				1	1	1	1	1	1	2	2	2			
Cornus amomum	silky dogwood	Shrub												1			
Fagus grandifolia	American beech	Tree															
Fraxinus pennsylvanica	green ash	Tree	4	4	4	1	1	1	1	1	4	5	5	5	12	12	12
Juglans nigra	black walnut	Tree															
Juniperus virginiana	eastern redcedar	Tree			1									1			
Liquidambar styraciflua	sweetgum	Tree			18						12			12			3
Liriodendron tulipifera	tuliptree	Tree	1	1	1	2	2	2	1	1	9	4	4	6	2	2	2
Platanus occidentalis	American sycamore	Tree	4	4	4	1	1	1	3	3	3				1	1	1
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	1	1	1	1	1	1						
Quercus phellos	willow oak	Tree							2	2	2	2	2	2			
Quercus rubra	northern red oak	Tree	1	1	1				2	2	2						
Rhus copallinum	flameleaf sumac	shrub						1									
		Stem count	14	14	33	7	7	8	13	13	36	14	14	30	17	17	20
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	7	7	9	6	6	7	8	8	9	5	5	8	4	4	5
		Stems per ACRE	566.6	566.6	1335	283.3	283.3	323.7	526.1	526.1	1457	566.6	566.6	1214	688	688	809.4

Color Coding for Table

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

PnoLS: Number of Planted stems excluding live stakes

P-all: Number of planted stems including live stakes,

T: Total Stems

Table 9. Planted and Total Stem Counts
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

			Current Plot Data (MY4 2017)											
			95020-01-0011			95020-01-0012			95020-01-0013			95020-01-0014		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree												
Acer rubrum	red maple	Tree									8			
Baccharis halimifolia	eastern baccharis	Shrub												
Betula nigra	river birch	Tree	2	2	2	1	1	1	4	4	4	2	2	2
Carpinus caroliniana	American hornbeam	Tree												
Carya	hickory	Tree												
Cephalanthus occidentalis	common buttonbush	Shrub												
Cercis canadensis	eastern redbud	Tree				1	1	1						
Cornus amomum	silky dogwood	Shrub												
Fagus grandifolia	American beech	Tree												5
Fraxinus pennsylvanica	green ash	Tree	5	5	5	2	2	2	4	4	4	6	6	6
Juglans nigra	black walnut	Tree												
Juniperus virginiana	eastern redcedar	Tree												
Liquidambar styraciflua	sweetgum	Tree						5			10			14
Liriodendron tulipifera	tuliptree	Tree	1	1	6							3	3	53
Platanus occidentalis	American sycamore	Tree				4	4	4	4	4	4			
Quercus michauxii	swamp chestnut oak	Tree	2	2	2	1	1	1	1	1	1	1	1	1
Quercus phellos	willow oak	Tree	1	1	1	2	2	2	3	3	3	1	1	1
Quercus rubra	northern red oak	Tree				1	1	1						
Rhus copallinum	flameleaf sumac	shrub						1						
		Stem count	11	11	16	12	12	18	16	16	34	13	13	82
		size (ares)	1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02		
		Species count	5	5	5	7	7	9	5	5	7	5	5	7
		Stems per ACRE	445.2	445.2	647.5	485.6	485.6	728.4	647.5	647.5	1376	526.1	526.1	3318

Color Coding for Table

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

PnoLS: Number of Planted stems excluding live stakes

P-all: Number of planted stems including live stakes,

T: Total Stems

Table 9. Planted and Total Stem Counts
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

			Annual Means														
			MY4 (2017)			MY3 (2016)			MY2 (2015)			MY1 (2014)			MY0 (2014)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree			1												
Acer rubrum	red maple	Tree			8			4									
Baccharis halimifolia	eastern baccharis	Shrub			5												
Betula nigra	river birch	Tree	19	19	26	18	18	18	24	24	24	29	29	29	41	41	41
Carpinus caroliniana	American hornbeam	Tree	1	1	1	1	1	1	1	1	1	3	3	3	12	12	12
Carya	hickory	Tree			1												
Cephalanthus occidentalis	common buttonbush	Shrub			2						11						
Cercis canadensis	eastern redbud	Tree	5	5	5	7	7	7	8	8	8	8	8	8			
Cornus amomum	silky dogwood	Shrub			1												
Fagus grandifolia	American beech	Tree			5												
Fraxinus pennsylvanica	green ash	Tree	71	71	80	69	69	73	75	75	83	73	73	73	72	72	72
Juglans nigra	black walnut	Tree			3												
Juniperus virginiana	eastern redcedar	Tree			2												
Liquidambar styraciflua	sweetgum	Tree			114			32			102						
Liriodendron tulipifera	tuliptree	Tree	23	23	124	23	23	63	25	25	81	40	40	40	49	49	49
Platanus occidentalis	American sycamore	Tree	27	27	51	27	27	27	30	30	70	31	31	31	32	32	32
Quercus michauxii	swamp chestnut oak	Tree	11	11	11	11	11	11	11	11	11	13	13	13	19	19	19
Quercus phellos	willow oak	Tree	17	17	21	17	17	17	22	22	26	20	20	20	13	13	13
Quercus rubra	northern red oak	Tree	6	6	7	7	7	7	8	8	14	9	9	9	16	16	16
Rhus copallinum	flameleaf sumac	shrub			2												
		Stem count	180	180	470	180	180	260	204	204	431	226	226	226	254	254	254
		size (ares)	14			14			14			14			14		
		size (ACRES)	0.35			0.35			0.35			0.35			0.35		
		Species count	9	9	20	9	9	11	9	9	11	9	9	9	8	8	8
		Stems per ACRE	520.3	520.3	1359	520.3	520.3	751.6	589.7	589.7	1246	653.3	653.3	653.3	734.2	734.2	734.2

Color Coding for Table

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

PnoLS: Number of Planted stems excluding live stakes

P-all: Number of planted stems including live stakes,

T: Total Stems

APPENDIX 4. Morphological Summary Data and Plots

Table 10a. Baseline Stream Data Summary
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Byrds Creek

		Pre-Restoration Condition				Reference Reach Data								Design				As-Built/Baseline			
Parameter	**Gage**	**Byrds Creek Reach 2**		**Byrds Creek Reach 3**		**Spencer Creek Downstream**		**UT Cane Creek[1]**		**UT Richland Creek Upstream[2]**		**UT Rocky Branch[2]**		**Byrds Creek Reach 2**		**Byrds Creek Reach 3**		**Byrds Creek Reach 2**		**Byrds Creek Reach 3**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																					
Bankfull Width (ft)	N/A	19.0	26.1	27.4	35.9	10.7	11.2	11.5	12.3	8.8	10.4	12.2		33.2	38.3	25.0		28.9	42.7	20.4	36.9
Floodprone Width (ft)		145	231	116	124	60.0	114+	31.0		27.6	31.4	72.0		156	160	95	350	150+	150+	150+	150+
Bankfull Mean Depth		2.2	3.4	1.9	2.3	1.6	1.8	0.8	1.0	0.8	0.9	1.3		1.6	1.9	1.8		1.6	2.1	1.0	1.4
Bankfull Max Depth		3.8	4.4	2.6	3.4	2.1	2.6	1.2	1.6	1.1	1.3	1.8		2.8	3.2	2.8		2.9	3.4	2.1	3.0
Bankfull Cross Sectional Area (ft^2)		58.4	64.5	62.5	66.7	17.8	19.7	8.9	12.2	7.8	8.5	16.3		59.8	61.5	45.3		56.2	88.7	28.8	37.4
Width/Depth Ratio		5.6	11.7	9.3	19.3	5.8	7.1	12.3	14.4	10.0	12.8	9.1		18.0	24.5	13.8		14.8	22.2	14.5	36.5
Entrenchment Ratio[4]		5.5	12.1	3.2	5.5	5.5	10.2	>2.5		2.5	4.0	6.0		4.1	4.8	3.8	14.0	3.5+	5.2+	4.7+	7.4+
Bank Height Ratio[5]		1.0	1.0	1.0	1.3	1.0		---		1.4	2.1	1.0		1.0		1.0		1.0	1.0	1.0	1.0
D50 (mm)		0.41		22.6		---		---		---		---		---		---		12.5	26.4	29.3	45.0
Profile																					
Riffle Length (ft)	N/A	---		---		---		---		---		---		---		---		13	59	12	57
Riffle Slope (ft/ft)		0.0074	0.0075	0.0043	0.0133	0.0130		0.0188	0.0704	0.0210	0.0450	0.0606	0.0892	0.0029	0.0052	0.0076	0.0134	0.0036	0.0097	0.0022	0.0190
Pool Length (ft)		---		---		---		---		---		---		---		---		34	179	46	129
Pool Max Depth (ft)		---	---	---	---	---		---		---		---		---		---		1.21	2.58	0.97	2.43
Pool Spacing (ft)		54	103	70	124	71		27	73	N/A		26	81	102	211	60	141	84	278	73	129
Pool Volume (ft^3)		---		---		---		---		---		---		---		---		---		---	
Pattern																					
Channel Beltwidth (ft)	N/A	N/A		N/A		38	41	102		N/A		N/A		---		52	116	26	57	31	62
Radius of Curvature (ft)		N/A		N/A		11	15	23	38	N/A		N/A		---		50	80	19	79	44	84
Rc:Bankfull Width (ft/ft)		---		---		1.0	1.3	2.0	3.1	N/A		N/A		---		2.0	3.2	0.7	1.9	2.2	2.3
Meander Length (ft)		N/A		N/A		46	48	45	81	N/A		N/A		---		177	263	279	603	190	255
Meander Width Ratio		---		---		3.6	3.7	3.9	6.6	N/A		N/A		---		2.1	4.6	0.9	1.3	1.5	1.7
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%	N/A	---		---		---		---		---		---		---		---		---		---	
SC%/Sa%/G%/C%/B%/Be%		---		---		---		---		---		---		---		---		---		---	
d16/d35/d50/d84/d95/d100		SC/0.19/0.41/116/232/>2048		SC/0.41/22.6/143.4/2048/>2048		---		---		---		---		---		---		SC/SC/SC/55/128/362		SC/SC/SC/107.3/362/>2048	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		---		---		---		0.69	1.71	N/A		0.23	0.31
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m^2		---		---		---		---		---		---		---		---		---		---	
Additional Reach Parameters																					
Drainage Area (SM)	N/A	4.12		4.22		0.96		0.29		0.28		1.10		4.12		4.22		4.12		4.22	
Watershed Impervious Cover Estimate (%)		1%		<1%		---		---		---		---		1%		<1%		1%		<1%	
Rosgen Classification		C5/E5		C4/E4		E4		C4/E4		C4/E4		E4b		C4		C4		C4		C4	
Bankfull Velocity (fps)		2.7	3.0	2.5	2.5	4.9	5.4	3.8		3.5	4.1	5.5		3.0	3.3	4.6		3.6		7.3	
Bankfull Discharge (cfs)		---		---		97		40		29.1	32.0	85.0		200		210		200		210	
Q-NFF regression		---		---		---		---		---		---		---		---		---		---	
Q-USGS extrapolation		---		---		---		---		---		---		---		---		---		---	
Q-Mannings		---		---		---		---		---		---		---		---		---		---	
Valley Length (ft)		---		---		---		---		---		---		---		---		---		---	
Channel Thalweg Length (ft)		1,630		1,368		---		---		---		---		1,630		1,402		1,646		1,407	
Sinuosity		1.18		1.01		1.30		1.40		1.00		1.10		---		1.11		1.18		1.06	
Water Surface Slope ($ft/ft)^2$		---		---		---		---		---		---		---		0.0039		0.0016		0.0043	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		0.0046		0.0013		0.0042	

(---): Data was not provided
N/A: Not Applicable
[1]UT Cane Creek reference reach data only utilized for pattern and a reference point in the project specific regional curve.
[2]Data only utilized as a reference point on the the project-specific drainage area-discharge curve.
[3]Existing condition sinuosity based on valley length/channel length given no flow and therefore no water sureface shots at time of survey.
[4]Entrenchment Ratio is the flood prone width divided by the bankfull width.
[5]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 10b. Baseline Stream Data Summary
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

South Branch and Southeast Branch

		Pre-Restoration Condition				Reference Reach Data										Design				As-Built/Baseline			
Parameter	Gage	South Branch Reach 1		Southeast Branch Reach 1		Spencer Creek Upstream		UT Richland Creek Downstream		UT Cane Creek[1]		UT Richland Creek Upstream[2]		UT Rocky Branch[2]		South Branch Reach 1		Southeast Branch Reach 1		South Branch Reach 1		Southeast Branch Reach 1	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																							
Bankfull Width (ft)		7.4	7.9	7.7		8.7		13.3	15.2	11.5	12.3	8.8	10.4	12.2		10.0		8.0		9.3		19.0	
Floodprone Width (ft)		96.0	98.0	9.5		229.0		>50		31.0		27.6	31.4	72.0		70.0	375.0	30	100	>100		>75	
Bankfull Mean Depth		1.0	1.2	0.8		1.2		1.1	1.3	0.8	1.0	0.8	0.9	1.3		1.0		0.7		0.7		0.5	
Bankfull Max Depth		2.3	2.4	1.0		1.9		1.8	2.1	1.2	1.6	1.1	1.3	1.8		1.3		1.0		1.4		1.5	
Bankfull Cross Sectional Area (ft^2)	N/A	8.0	8.7	6.2		10.6		16.5	17.5	8.9	12.2	7.8	8.5	16.3		9.6		5.7		6.5		9.6	
Width/Depth Ratio		6.2	7.8	9.6		7.3		10.1	13.9	12.3	14.4	10.0	12.8	9.1		10.4		11.2		13.4		37.7	
Entrenchment Ratio[4]		12.4	13.1	1.2		26.3		>2.5		>2.5		2.5	4.0	6.0		7.0	37.5	3.8	12.5	>2.2		>2.2	
Bank Height Ratio[5]		1.0		3.7		1.0		1.4	2.1	---		1.4	2.1	1.0		1.0		1.0		1.0		1.0	
D50 (mm)		1.0		0.09		---		---		---		---		---		---		---		56.1		28.5	
Profile																							
Riffle Length (ft)		---		---		---		---		---		---		---		---		---		8	46	10	28
Riffle Slope (ft/ft)		0.0176	0.0349	0.0247	0.049	0.0188	0.0704	0.0183	0.0355	0.0188	0.0704	0.0210	0.0450	0.0606	0.0892	0.0052	0.0199	0.0220	0.0410	0.0021	0.0178	0.0023	0.0527
Pool Length (ft)	N/A	---		---		---		---		---		---		---		---		---		20	64	7	45
Pool Max Depth (ft)		---	---	---	---	---		---		---		---		---		---		---		0.4	2.2	0.9	2.3
Pool Spacing (ft)		30	62	35	90	13	47	33	93	27	73	N/A		26	81	34	85	21	53	36	116	26	58
Pool Volume (ft^3)		---		---		---		---		---		---		---		---		---		---		---	
Pattern																							
Channel Beltwidth (ft)		N/A		N/A		24	52	NA		102		N/A		N/A		25	48	16	39	14	35	10	27
Radius of Curvature (ft)		N/A		N/A		5.4	22.1	NA		23	38	N/A		N/A		20	35	18	26	17	32	14	30
Rc:Bankfull Width (ft/ft)	N/A	---		---		0.6	2.5	NA		2.0	3.1	N/A		N/A		2.0	3.5	2.3	3.3	1.8	3.4	1.3	2.9
Meander Length (ft)		N/A		N/A		54	196	NA		45	81	N/A		N/A		76	120	47	93	78	127	65	74
Meander Width Ratio		---		---		2.8	6	NA		3.9	6.6	N/A		N/A		7.6	12.0	5.9	11.6	8.4	13.6	6.3	7.1
Substrate, Bed and Transport Parameters																							
Ri%/Ru%/P%/G%/S%		---		---		---		---		---		---		---		---		---		---		---	
SC%/Sa%/G%/C%/B%/Be%		---		---		---		---		---		---		---		---		---		---		---	
d16/d35/d50/d84/d95/d100	N/A	SC/SC/1.0/45/ 107.33/180		SC/SC/0.09/26.23 /50.61/180		---		---		---		---		---		---		---		SC/SC/SC/103.6/ 256/362		SC/SC/SC/68.1/ 180/362	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		---		---		---		0.28	0.98	0.94	1.34	0.23		0.43	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m^2		---		---		---		---		---		---		---		---		---		---		---	
Additional Reach Parameters																							
Drainage Area (SM)		0.25		0.09		0.50		0.97		0.29		0.28		1.10		0.25		0.09		0.25		0.09	
Watershed Impervious Cover Estimate (%)		<1%		1%		---		---		---		---		---		<1%		1%		<1%		1%	
Rosgen Classification		E5		E6/G6		E4		C4/E4		C4/E4		C4/E4		E4b		E4		E4		C3		C4	
Bankfull Velocity (fps)		3.7		2.8		---		4.2	4.5	3.8		3.5	4.1	5.5		3.1		3.5		4.6		2.1	
Bankfull Discharge (cfs)		---		---		---		68.9	78.6	40		29.1	32.0	85.0		30		20		30		20	
Q-NFF regression		---		---		---		---		---		---		---		---		---		---		---	
Q-USGS extrapolation	N/A	---		---		---		---		---		---		---		---		---		---		---	
Q-Mannings		---		---		---		---		---		---		---		---		---		---		---	
Valley Length (ft)		---		---		---		---		---		---		---		---		---		---		---	
Channel Thalweg Length (ft)		976		916		---		---		---		---		---		971		792		1,009		485	
Sinuosity		1.03		1.31		1.40		1.10		1.40		1.00		1.10		---		1.13		1.06		1.18	
Water Surface Slope ($ft/ft)^2$		---		---		---		---		---		---		---		0.0068		0.0161		0.0070		0.0138	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		0.0075		0.0182		0.0068		0.0136	

(---): Data was not provided
N/A: Not Applicable
[1]UT Cane Creek reference reach data only utilized for pattern and a reference point in the project specific regional curve.
[2]Data only utilized as a reference point on the the project-specific drainage area-discharge curve.
[3]Existing condition sinuosity based on valley length/channel length given no flow and therefore no water sureface shots at time of survey.
[4]Entrenchment Ratio is the flood prone width divided by the bankfull width.
[5]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 10c. Baseline Stream Data Summary
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Southeast Branch

		Pre-Restoration Condition		Reference Reach Data										Design				As-Built/Baseline			
Parameter	**Gage**	**Southeast Branch Reach 2**		**Spencer Creek Upstream**		**UT Richland Creek Downstream**		**UT Cane Creek[1]**		**UT Richland Creek Upstream[2]**		**UT Rocky Branch[2]**		**Southeast Branch Reach 2a**		**Southeast Branch Reach 2b**		**Southeast Branch Reach 2a**		**Southeast Branch Reach 2b**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																					
Bankfull Width (ft)	N/A	7.2	7.4	8.7		13.3	15.2	11.5	12.3	8.8	10.4	12.2		11.7	15.0	9.0		10.6			
Floodprone Width (ft)		8.0	9.8	229.0		>50		31.0		27.6	31.4	72.0		114.7	120.1	140.0	310.0	>100			
Bankfull Mean Depth		1.3	1.4	1.2		1.1	1.3	0.8	1.0	0.8	0.9	1.3		0.7	0.9	0.7		0.6			
Bankfull Max Depth		1.6	1.9	1.9		1.8	2.1	1.2	1.6	1.1	1.3	1.8		0.9	1.0	1.0		1.2			
Bankfull Cross Sectional Area (ft^2)		8.9	9.4	10.6		16.5	17.5	8.9	12.2	7.8	8.5	16.3		10.2	10.5	6.5		6.8			
Width/Depth Ratio		5.8	7.3	7.3		10.1	13.9	12.3	14.4	10.0	12.8	9.1		13.5	21.3	12.5		16.5			
Entrenchment Ratio[4]		1.6	6.2	26.3		>2.5		>2.5		2.5	4.0	6.0		7.7	10.3	15.6	34.4	>2.2			
Bank Height Ratio[5]		1.5	2.1	1.0		1.4	2.1	---		1.4	2.1	1.0		1.0		1.0		1.0			
D50 (mm)		0.04		---		---		---		---		---		---		---		37.2			
Profile																					
Riffle Length (ft)	N/A	---		---		---		---		---		---		---		---		4	20	11	36
Riffle Slope (ft/ft)		0.0047	0.0147	0.0188	0.0704	0.0183	0.0355	0.0188	0.0704	0.0210	0.0450	0.0606	0.0892	0.0122	0.0367	0.0202		0.0145	0.0454	0.0119	0.0606
Pool Length (ft)		---		---		---		---		---		---		---		---		21	53	27	45
Pool Max Depth (ft)		---	---	---		---		---		---		---		---		---		1.3	2.6	0.89	2.23
Pool Spacing (ft)		17	122	13	47	33	93	27	73	N/A		26	81	27	55	43	49	25	54	34	73
Pool Volume (ft^3)		---		---		---		---		---		---		---		---		---		---	
Pattern																					
Channel Beltwidth (ft)	N/A	N/A		24	52	NA		102		N/A		N/A		N/A		27		3	22	12	22
Radius of Curvature (ft)		N/A		5.4	22.1	NA		23	38	N/A		N/A		N/A		22	30	7	58	21	25
Rc:Bankfull Width (ft/ft)		---		0.6	2.5	NA		2.0	3.1	N/A		N/A		N/A		2.4	3.3	0.7	5.5	N/A	
Meander Length (ft)		N/A		54	196	NA		45	81	N/A		N/A		N/A		82.0		43	80	88	88
Meander Width Ratio		---		2.8	6	NA		3.9	6.6	N/A		N/A		N/A		3.0		4.1	7.5	N/A	
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%	N/A	---		---		---		---		---		---		---		---		---		---	
SC%/Sa%/G%/C%/B%/Be%		---		---		---		---		---		---		---		---		---		---	
d16/d35/d50/d84/d95/d100		SC/0.02/0.04/0.05/33.2/79.6		---		---		---		---		---		---		---		SC/SC/SC/70.9/256/362		SC/SC/SC/70.9/256/362	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		---		---		0.93	1.14	0.93	1.14	0.47		N/A	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m^2		---		---		---		---		---		---		---		---		---		---	
Additional Reach Parameters																					
Drainage Area (SM)	N/A	0.09		0.50		0.97		0.29		0.28		1.10		0.09		0.10		0.09		0.10	
Watershed Impervious Cover Estimate (%)		1%		---		---		---		---		---		1%		1%		1%		1%	
Rosgen Classification		E6/G6		E4		C4/E4		C4/E4		C4/E4		E4b		C4		C4		C4		C4	
Bankfull Velocity (fps)		2.9	3.4	---		4.2	4.5	3.8		3.5	4.1	5.5		3.0	3.3	3.1		4.4		N/A	
Bankfull Discharge (cfs)		---		---		68.9	78.6	40		29.1	32.0	85.0		30		20		30		N/A	
Q-NFF regression		---		---		---		---		---		---		---		---		---		---	
Q-USGS extrapolation		---		---		---		---		---		---		---		---		---		---	
Q-Mannings		---		---		---		---		---		---		---		---		---		---	
Valley Length (ft)		---		---		---		---		---		---		---		---		---		---	
Channel Thalweg Length (ft)		524		---		---		---		---		---		533		180		536		195	
Sinuosity		1.17		1.40		1.10		1.40		1.00		1.10		---		1.21		1.11		1.23	
Water Surface Slope ($ft/ft)^2$		---		---		---		---		---		---		---		0.0101		0.0144		0.0160	
Bankfull Slope (ft/ft)		---		---		---		---		---		---		---		0.0122		0.0146		0.0168	

(---): Data was not provided
N/A: Not Applicable
[1]UT Cane Creek reference reach data only utilized for pattern and a reference point in the project specific regional curve.
[2]Data only utilized as a reference point on the the project-specific drainage area-discharge curve.
[3]Existing condition sinuosity based on valley length/channel length given no flow and therefore no water sureface shots at time of survey.
[4]Entrenchment Ratio is the flood prone width divided by the bankfull width.
[5]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 11. Morphology and Hydraulic Summary (Dimensional Parameters - Cross Section)
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

	Byrds Creek - Reach 2																							
	Cross Section 1 (Riffle)						Cross Section 2 (Pool)						Cross Section 3 (Riffle)						Cross Section 4 (Riffle)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	574.4						574.6						574.2						572.6					
Bankfull Width (ft)	36.4	36.6	35.3	35.6	35.9		42.2	42.1	42.6	40.3	40.3		28.9	24.7	22.9	22.1	20.8		42.7	36.0	36.9	32.8	33.6	
Floodprone Width (ft)	>150	>150	>150	>150	>150		N/A	N/A	N/A	N/A	N/A		>150	>150	>150	>150	>150		>150	>150	>150	>150	>150	
Bankfull Mean Depth (ft)	1.6	1.4	1.4	1.4	1.5		1.9	1.9	1.9	2.0	2.0		1.9	2.1	2.0	2.1	2.2		2.1	2.2	2.3	2.2	2.3	
Bankfull Max Depth (ft)	2.9	2.7	2.7	2.7	3.1		4.6	4.5	4.3	4.3	4.4		3.4	3.2	3.2	3.1	3.2		3.2	3.2	3.3	3.1	3.2	
Bankfull Cross Sectional Area (ft^2)	59.8	51.1	50.6	50.6	53.4		80.3	79.9	79.6	79.3	80.8		56.2	51.6	46.5	45.9	45.7		88.7	78.3	83.9	73.4	76.7	
Bankfull Width/Depth Ratio	22.2	26.2	24.6	25.0	24.1		22.1	22.2	22.8	20.5	20.1		14.8	11.8	11.3	10.6	9.5		20.6	16.6	16.2	14.6	14.7	
Entrenchment Ratio[1]	4.5+	4.1+	4.2+	4.2+	4.2+		N/A	N/A	N/A	N/A	N/A		5.2+	6.1+	6.6+	6.8+	7.2+		3.4+	4.2+	4.1+	4.6+	4.5+	
Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
d50 (mm)	12.5	28.7	18.0	19.0	24.2		N/A	N/A	N/A	N/A	N/A		26.4	42.9	28.1	37.9	25.0		22.6	32.0	36.4	29.8	49.1	
	Byrds Creek - Reach 2						Byrds Creek - Reach 3																	
	Cross Section 5 (Pool)						Cross Section 6 (Pool)						Cross Section 7 (Riffle)						Cross Section 8 (Riffle)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	572.0						569.0						568.7						565.0					
Bankfull Width (ft)	34.8	34.3	35.3	32.2	32.4		26.2	25.4	25.9	29.6	25.9		20.4	22.6	23.4	21.2	22.5		17.6	17.6	18.3	19.5	20.2	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		>150	>150	>150	>150	>150		>150	>150	>150	>150	>150	
Bankfull Mean Depth (ft)	2.4	2.3	2.5	2.2	2.3		1.8	1.8	1.8	1.4	1.7		1.4	1.4	1.3	1.3	1.3		1.2	1.3	1.4	1.2	1.3	
Bankfull Max Depth (ft)	3.7	4.3	4.5	4.1	4.0		3.2	3.0	3.1	2.9	3.0		2.1	2.2	2.4	2.1	2.3		2.3	2.1	2.2	2.1	2.3	
Bankfull Cross Sectional Area (ft^2)	84.3	80.2	86.7	71.4	73.2		47.5	45.8	47.8	40.3	43.6		28.8	31.0	31.0	26.6	29.2		20.5	23.4	24.9	23.2	25.8	
Bankfull Width/Depth Ratio	14.3	14.7	14.4	14.5	14.4		14.4	14.1	14.1	21.7	15.4		14.4	16.5	17.7	16.8	17.3		15.1	13.3	13.4	16.3	15.8	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		7.4+	6.6+	6.4+	7.1+	6.7+		8.5+	8.5+	8.2+	7.7	7.4+	
Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
d50 (mm)	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		29.3	41.3	37.2	52.1	16.0		45.0	49.1	66.2	70.2	11.6	
	Byrds Creek - Reach 3						South Branch - Reach 1												Southeast Branch - Reach 1					
	Cross Section 9 (Pool)						Cross Section 10 (Riffle)						Cross Section 11 (Pool)						Cross Section 12 (Riffle)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	565.5						571.4						571.3						580.3					
Bankfull Width (ft)	34.2	33.6	33.7	32.6	33.9		9.3	8.8	9.0	9.0	7.8		10.2	9.7	9.2	8.8	8.9		10.4	9.1	8.2	8.5	8.6	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A		>100	>100	>100	>100	>100		N/A	N/A	N/A	N/A	N/A		>75	>75	>75	>75	>75	
Bankfull Mean Depth (ft)	2.0	2.0	2.1	2.0	2.1		0.7	0.7	0.6	0.6	0.7		1.1	1.0	1.0	1.1	1.1		0.6	0.5	0.7	0.7	0.7	
Bankfull Max Depth (ft)	3.9	3.8	3.7	3.7	3.8		1.4	1.3	1.3	1.3	1.7		2.0	1.9	1.8	1.9	2.0		1.5	0.9	1.3	1.3	1.5	
Bankfull Cross Sectional Area (ft^2)	69.6	66.5	69.3	66.5	69.6		6.5	6.4	5.5	5.5	5.4		11.6	10.1	9.1	9.3	9.5		6.7	4.7	5.6	6.0	5.7	
Bankfull Width/Depth Ratio	16.8	17.0	16.3	16.0	16.5		13.4	12.2	14.8	14.8	11.3		8.9	9.2	9.4	8.3	8.4		16.3	17.6	12.0	12.0	12.9	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A		10.7+	11.4+	11.1+	11.1+	12.9+		N/A	N/A	N/A	N/A	N/A		7.2+	8.3+	9.1+	8.8+	8.0+	
Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
d50 (mm)	N/A	N/A	N/A	N/A	N/A		56.1	9.4	30.9	29.3	9.5		N/A	N/A	N/A	N/A	N/A		28.5	37.0	68.0	52.3	51.4	
	Southeast Branch - Reach 1						Southeast Branch - Reach 2																	
	Cross Section 13 (Pool)						Cross Section 14 (Pool)						Cross Section 15 (Riffle)											
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**						
based on fixed bankfull elevation	579.5						572.7						572.6											
Bankfull Width (ft)	12.5	8.6	8.7	9.5	8.5		16.7	14.8	13.0	12.2	13.2		10.6	9.7	9.3	9.0	9.1							
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		>100	>100	>100	>100	>100							
Bankfull Mean Depth (ft)	1.2	1.1	1.1	1.1	1.0		1.7	1.5	1.8	1.7	1.6		0.6	0.6	0.5	0.7	0.8							
Bankfull Max Depth (ft)	2.5	2.3	2.0	2.0	2.1		3.5	3.2	3.1	3.0	3.0		1.2	1.0	1.0	1.3	1.3							
Bankfull Cross Sectional Area (ft^2)	15.3	9.4	9.5	10.3	8.9		28.0	22.0	23.1	20.5	21.2		6.8	5.8	4.9	5.9	7.7							
Entrenchment Ratio[1]	10.1	7.9	8.0	8.8	8.1		10.0	10.0	7.3	7.2	8.3		16.5	16.4	17.6	13.8	10.8							
Bank Height Ratio[2]	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		9.4+	10.3+	10.8+	11.1+	11.0+							
Bankfull 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	1.0	1.0	1.0	1.0							
d50 (mm)	N/A	N/A	N/A	N/A	N/A		N/A	N/A	N/A	N/A	N/A		37.2	13.5	45.0	43.8	30.8							

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.
[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.
* Data for cross sections 6, 8, & 12 were updated during MY2 for previous monitoring years. Cross sections 6 and 12 had an error in the spreadsheet that was corrected. The spreadsheet was not calculating bankfull width correctly which affected cross-sectional area, and width to depth ratio. Bankfull elevation was corrected on cross section 8 after careful evaluation. It was determined that during the baseline survey, bankfull was called at a higher elevation than it should have been.

Table 12a. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Byrds Creek - Reach 2

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	28.9	42.7	24.7	36.6	22.9	36.9	22.1	35.6	20.8	35.9		
Floodprone Width (ft)	>150	>150	>150	>150	>150	>150	>150	>150	>150	>150		
Bankfull Mean Depth	1.6	2.1	1.4	2.2	1.4	2.3	1.4	2.2	1.5	2.3		
Bankfull Max Depth	2.9	3.4	2.7	3.2	2.7	3.3	2.7	3.1	3.1	3.2		
Bankfull Cross-sectional Area (ft^2)	56.2	88.7	51.1	78.3	46.5	83.9	45.9	73.4	45.7	76.7		
Width/Depth Ratio	14.8	22.2	11.8	26.2	11.3	24.6	10.6	25.0	9.5	24.1		
Entrenchment Ratio[1]	3.4+	5.2+	4.1+	6.1+	4.1+	6.6+	4.2+	6.8+	4.2+	7.2+		
Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
D50 (mm)	12.5	26.4	28.7	42.9	18.0	36.4	19.0	37.9	24.2	49.1		
Profile												
Riffle Length (ft)	13	59	12	59	18	59	12	59	14	59		
Riffle Slope (ft/ft)	0.0036	0.0097	0.0019	0.0147	0.0003	0.0110	0.0009	0.0138	0.0025	0.0147		
Pool Length (ft)	34	179	34	182	59	183	70	185	30	165		
Pool Max Depth (ft)	3.7	4.6	4.3	4.5	4.2	5.8	3.6	4.8	3.1	5.0		
Pool Spacing (ft)	84	278	80	214	81	225	85	211	107	219		
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	26	57										
Radius of Curvature (ft)	19	79										
Rc:Bankfull Width (ft/ft)	0.7	1.9										
Meander Wave Length (ft)	279	603										
Meander Width Ratio	0.9	1.3										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4		C4			
Channel Thalweg Length (ft)	1,646		1,646		1,646		1,646		1,646			
Sinuosity (ft)	1.2		1.2		1.2		1.2		1.2			
Water Surface Slope (ft/ft)	0.0016		0.0018		0.0019		0.0017		0.0017			
Bankfull Slope (ft/ft)	0.0013		0.0018		0.0020		0.0016		0.0017			
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.2/0.6/5.6/55/128/362		0.3/1.2/2.9/75.9/122.5/256		0.21/1.0/3.7/80.3/168.1/362		0.34/1.24/2.4/85.0/163.3/362.0		0.55/0.99/4.0/92.1/175.7/512.0			
% of Reach with Eroding Banks			0%		0%		0%		0%			

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

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

Table 12b. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Byrds Creek - Reach 3

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	17.6	20.4	17.6	22.6	18.3	23.4	19.5	21.2	20.2	22.5		
Floodprone Width (ft)	>150	>150	>150	>150	>150	>150	>150	>150	>150	>150		
Bankfull Mean Depth	1.2	1.4	1.3	1.4	1.3	1.4	1.2	1.3	1.3	1.3		
Bankfull Max Depth	2.1	2.3	2.1	2.2	2.2	2.4	2.1	2.1	2.3	2.3		
Bankfull Cross-sectional Area (ft^2)	20.5	28.8	23.4	31.0	24.9	31.0	23.2	26.6	25.8	29.2		
Width/Depth Ratio	14.4	15.1	13.3	16.5	13.4	17.7	16.3	16.8	15.8	17.3		
Entrenchment Ratio[1]	7.4+	8.5+	6.6+	8.5+	6.4+	8.2+	7.1+	7.7+	6.7+	7.4+		
Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
D50 (mm)	29.3	45.0	41.3	49.1	37.2	66.2	52.1	70.2	42.7	68.3		
Profile												
Riffle Length (ft)	12	57	26	43	18	44	28	44	24	45		
Riffle Slope (ft/ft)	0.0022	0.0190	0.0065	0.0311	0.0018	0.0304	0.0054	0.0304	0.0067	0.0263		
Pool Length (ft)	46	129	33	134	32	132	31	134	31	128		
Pool Max Depth (ft)	3.2	3.9	3.0	3.8	2.9	4.3	3.4	4.6	3.1	4.7		
Pool Spacing (ft)	73	129	82	190	92	199	60	180	60	189		
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	31	62										
Radius of Curvature (ft)	44	84										
Rc:Bankfull Width (ft/ft)	2.2	2.3										
Meander Wave Length (ft)	190	255										
Meander Width Ratio	1.5	1.7										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4		C4			
Channel Thalweg Length (ft)	1,407		1,407		1,407		1,407		1,407			
Sinuosity (ft)	1.1		1.1		1.1		1.1		1.1			
Water Surface Slope (ft/ft)	0.0043		0.0045		0.0052		0.0047		0.0046			
Bankfull Slope (ft/ft)	0.0042		0.0047		0.0047		0.0044		0.0047			
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.1/0.6/16/107.3/362/>2048		0.2/9.1/29/82.6/180/362		0.2/1.68/32.0/112.6/430.5/2048		0.5/4.73/23.4/105.6/256.0/2048		0.34/1.47/5.8/54.6/89.8/180.0			
% of Reach with Eroding Banks			0%		20%		4%		0%			

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

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

Table 12c. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

South Branch - Reach 1

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	9.3		8.8		9.0		9.0		7.8			
Floodprone Width (ft)	>100		>100		>100		>100		>100			
Bankfull Mean Depth	0.7		0.7		0.6		0.6		0.7			
Bankfull Max Depth	1.4		1.3		1.3		1.3		1.7			
Bankfull Cross-sectional Area (ft^2)	6.5		6.4		5.5		5.5		5.4			
Width/Depth Ratio	13.4		12.2		14.8		14.8		11.3			
Entrenchment Ratio[1]	10.7+		11.4+		11.1+		11.1+		12.9+			
Bank Height Ratio[2]	1.0		1.0		1.0		1.0		1.0			
D50 (mm)	56.1		9.4		30.9		29.3		9.5			
Profile												
Riffle Length (ft)	8	46	10	39	13	37	10	38	12	38		
Riffle Slope (ft/ft)	0.0021	0.0178	0.0022	0.0431	0.0029	0.0298	0.0023	0.0409	0.0030	0.0573		
Pool Length (ft)	20	64	22	65	21	67	21	69	20	62		
Pool Max Depth (ft)	2.0		1.9		2.8		2.5		3.2			
Pool Spacing (ft)	36	116	22	87	32	117	35	133	38	118		
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	14	35										
Radius of Curvature (ft)	17	32										
Rc:Bankfull Width (ft/ft)	1.8	3.4										
Meander Wave Length (ft)	78	127										
Meander Width Ratio	8.4	13.6										
Additional Reach Parameters												
Rosgen Classification	C3		C3		C3		C3		C3			
Channel Thalweg Length (ft)	1,009		1,009		1,009		1,009		1,009			
Sinuosity (ft)	1.1		1.1		1.1		1.1		1.1			
Water Surface Slope (ft/ft)	0.0070		0.0065		0.0078		0.0092		0.0079			
Bankfull Slope (ft/ft)	0.0068		0.0062		0.0070		0.0072		0.0061			
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/SC/103.6/256/362		SC/0.2/5.3/71.7/141.1/180		SC/0.09/0.3/75.9/143.4/256		SC/SC/0.6/99.5/180/512		0.27/2.0/4.8/37.9/180.0/362.0			
% of Reach with Eroding Banks			0%		0%		0%		0%			

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

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

Table 12d. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Southeast Branch - Reach 1

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	10.4		9.1		8.2		8.5		8.6			
Floodprone Width (ft)	>75		>75		>75		>75		>75			
Bankfull Mean Depth	0.6		0.5		0.7		0.7		0.7			
Bankfull Max Depth	1.5		0.9		1.3		1.3		1.5			
Bankfull Cross-sectional Area (ft^2)	6.7		4.7		5.6		6.0		5.7			
Width/Depth Ratio	16.3		17.6		12.0		12.0		12.9			
Entrenchment Ratio[1]	7.2+		8.3+		9.1+		8.8+		8.0+			
Bank Height Ratio[2]	1.0		1.0		1.0		1.0		1.0			
D50 (mm)	28.5		37.0		68.0		52.3		51.4			
Profile												
Riffle Length (ft)	10	28	10	28	11	29	12	32	9	28		
Riffle Slope (ft/ft)	0.0023	0.0527	0.0100	0.0390	0.0039	0.0630	0.0035	0.0612	0.0019	0.0290		
Pool Length (ft)	7	45	10	54	19	48	19	47	18	41		
Pool Max Depth (ft)	2.5		2.3		2.6		2.8		2.6			
Pool Spacing (ft)	26	58	18	78	22	56	21	72	24	64		
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	10	27										
Radius of Curvature (ft)	14	30										
Rc:Bankfull Width (ft/ft)	1.3	2.9										
Meander Wave Length (ft)	65	74										
Meander Width Ratio	6.3	7.1										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4		C4			
Channel Thalweg Length (ft)	485		485		485		485		484			
Sinuosity (ft)	1.2		1.2		1.2		1.2		1.2			
Water Surface Slope (ft/ft)	0.0138		0.0140		0.0133		0.0143		0.0141			
Bankfull Slope (ft/ft)	0.0136		0.0141		0.0126		0.0161		0.0171			
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/0.2/8/68.1/180/362		SC/0.1/4/67.2/151.8/362		SC/SC/0.3/86.7/180.0/512.0		SC/SC/4/101.2/170.1/256		SC/SC/0.3/84.6/151.8/256.0			
% of Reach with Eroding Banks			0%		0%		0%		0%			

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

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

Table 12e. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Southeast Branch - Reach 2a

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	10.6		9.7		9.3		9.0		9.1			
Floodprone Width (ft)	>100		>100		>100		>100		>100			
Bankfull Mean Depth	0.6		0.6		0.5		0.7		0.8			
Bankfull Max Depth	1.2		1.0		1.0		1.3		1.3			
Bankfull Cross-sectional Area (ft^2)	6.8		5.8		4.9		5.9		7.7			
Width/Depth Ratio	16.5		16.4		17.6		13.8		10.8			
Entrenchment Ratio[1]	9.4+		10.3+		10.8+		11.1+		11.0+			
Bank Height Ratio[2]	1.0		1.0		1.0		1.0		1.0			
D50 (mm)	37.2		13.5		45.0		43.8		30.8			
Profile												
Riffle Length (ft)	4	20	4	26	3	28	4	27	3	28		
Riffle Slope (ft/ft)	0.0145	0.0454	0.0017	0.0845	0.0026	0.0750	0.0010	0.0834	0.0049	0.0758		
Pool Length (ft)	21	53	9	44	16	49	10	48	12	47		
Pool Max Depth (ft)	3.5		3.2		3.4		2.9		3.1			
Pool Spacing (ft)	25	54	16	88	21	66	17	55	16	67		
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	3	22										
Radius of Curvature (ft)	7	58										
Rc:Bankfull Width (ft/ft)	0.7	5.5										
Meander Wave Length (ft)	43	80										
Meander Width Ratio	4.1	7.5										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4		C4			
Channel Thalweg Length (ft)	536		536		536		536		536			
Sinuosity (ft)	1.1		1.1		1.1		1.1		1.1			
Water Surface Slope (ft/ft)	0.0144		0.0134		0.0137		0.0137		0.0125			
Bankfull Slope (ft/ft)	0.0146		0.0135		0.0148		0.0122		0.0136			
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/0.1/17.1/70.9/256/362		SC/0.1/18/78.1/143.4/362		SC/0.13/24.7/128.0/214.7/256		SC/0.16/6.3/82.6/180/512		SC/3.82/15.0/98.37/192.5/362.0			
% of Reach with Eroding Banks			0%		0%		0%		0%			

[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

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

Table 12f. Monitoring Data - Stream Reach Data Summary
Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Southeast Branch - Reach 2b

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	10.6		9.7		9.3		9.0		9.1			
Floodprone Width (ft)	>100		>100		>100		>100		>100			
Bankfull Mean Depth	0.6		0.6		0.5		0.7		0.8			
Bankfull Max Depth	1.2		1.0		1.0		1.3		1.3			
Bankfull Cross-sectional Area (ft^2)	6.8		5.8		4.9		5.9		7.7			
Width/Depth Ratio	16.5		16.4		17.6		13.8		10.8			
Entrenchment Ratio[1]	9.4+		10.3+		10.8+		11.1+		11.0+			
Bank Height Ratio[2]	1.0		1.0		1.0		1.0		1.0			
D50 (mm)	37.2		13.5		45.0		43.8		30.8			
Profile												
Riffle Length (ft)	11	36	14	36	12	31	12	41	13	37		
Riffle Slope (ft/ft)	0.0119	0.0606	0.0017	0.0520	0.0073	0.0580	0.0021	0.0494	0.0164	0.0866		
Pool Length (ft)	27	45	27	44	28	45	28	46	30	55		
Pool Max Depth (ft)	3.5		3.2		2.7		2.7		3.1			
Pool Spacing (ft)	34	73	33	60	29	55	43	58	41	57		
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	12	22										
Radius of Curvature (ft)	21	25										
Rc:Bankfull Width (ft/ft)	N/A											
Meander Wave Length (ft)	88	88										
Meander Width Ratio	N/A											
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4		C4			
Channel Thalweg Length (ft)	195		195		195		195		195			
Sinuosity (ft)	1.2		1.2		1.2		1.2		1.2			
Water Surface Slope (ft/ft)	0.0160		0.0085		0.0092		0.0124		0.0086			
Bankfull Slope (ft/ft)	0.0168		0.0092		0.0081		0.0122		0.0055			
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/0.1/17.1/70.9/256/362		SC/0.1/18/78.1/143.4/362		SC/0.13/24.7/128.0/214.7/256		SC/0.16/6.3/82.6/180/512		SC/3.82/15.0/98.37/192.5/362.0			
% of Reach with Eroding Banks			0%		0%		0%		0%			

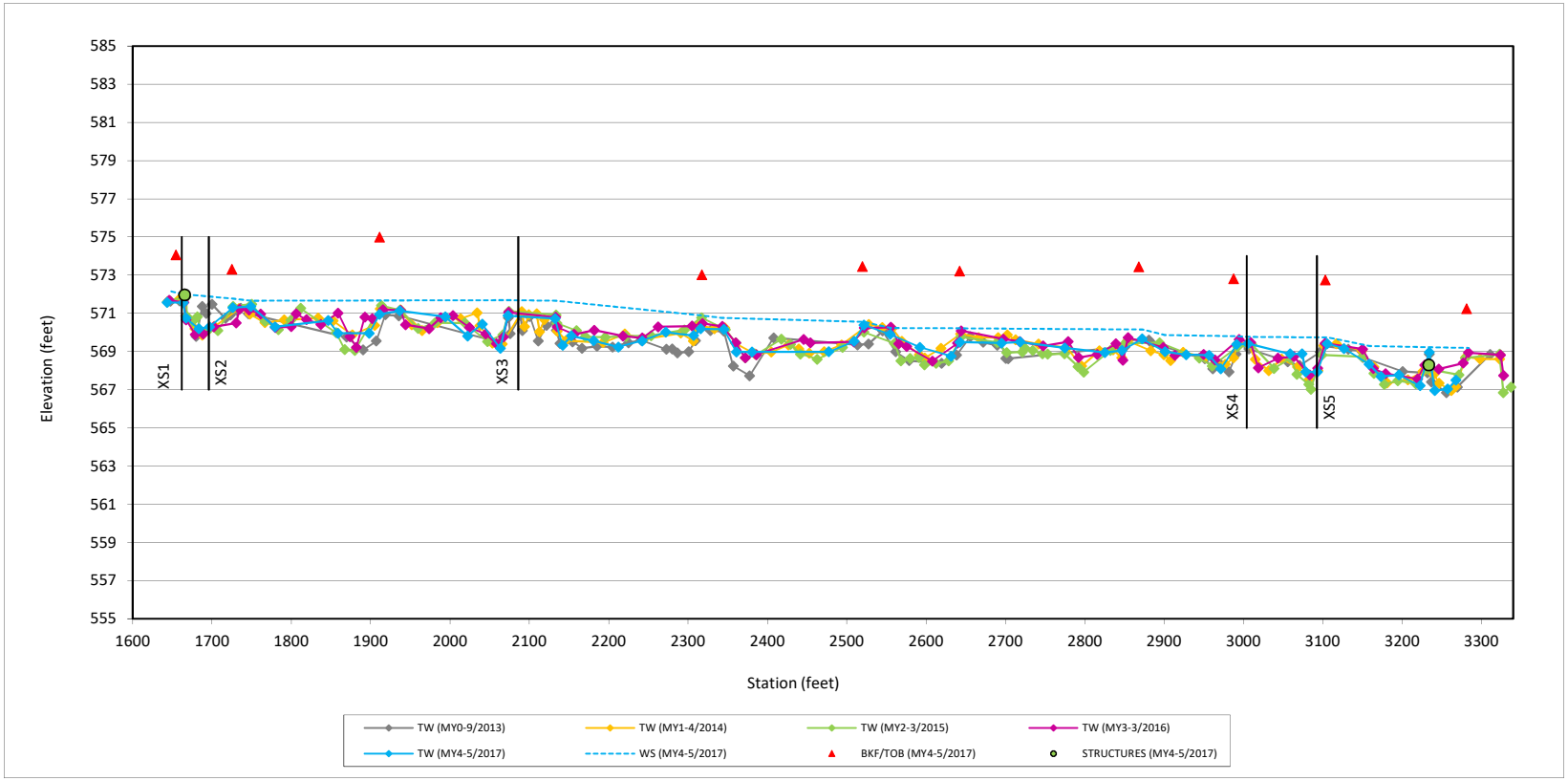
[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.

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

Longitudinal Profile Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

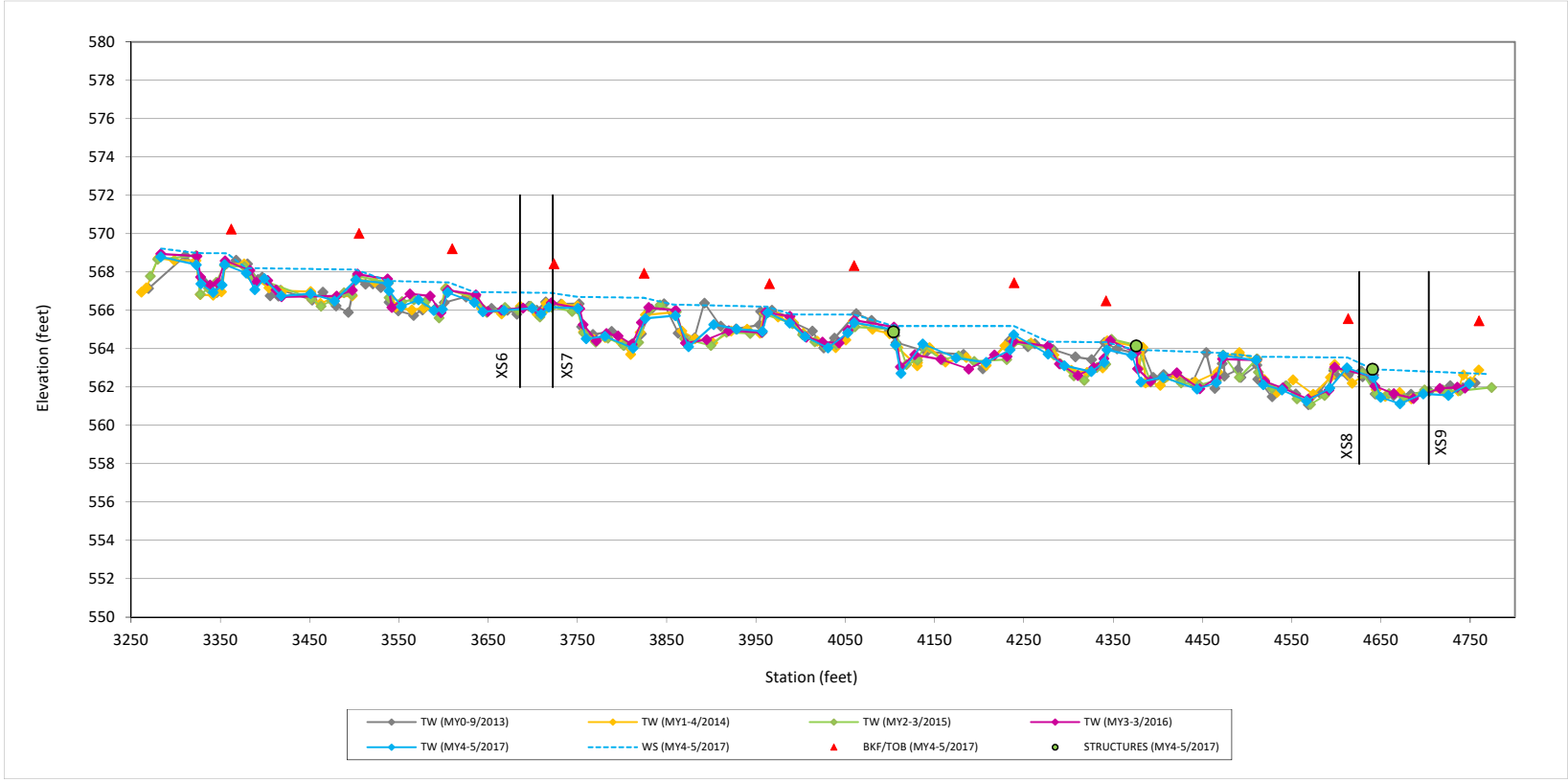
Byrds Creek Reach 2



Longitudinal Profile Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Byrds Creek Reach 3



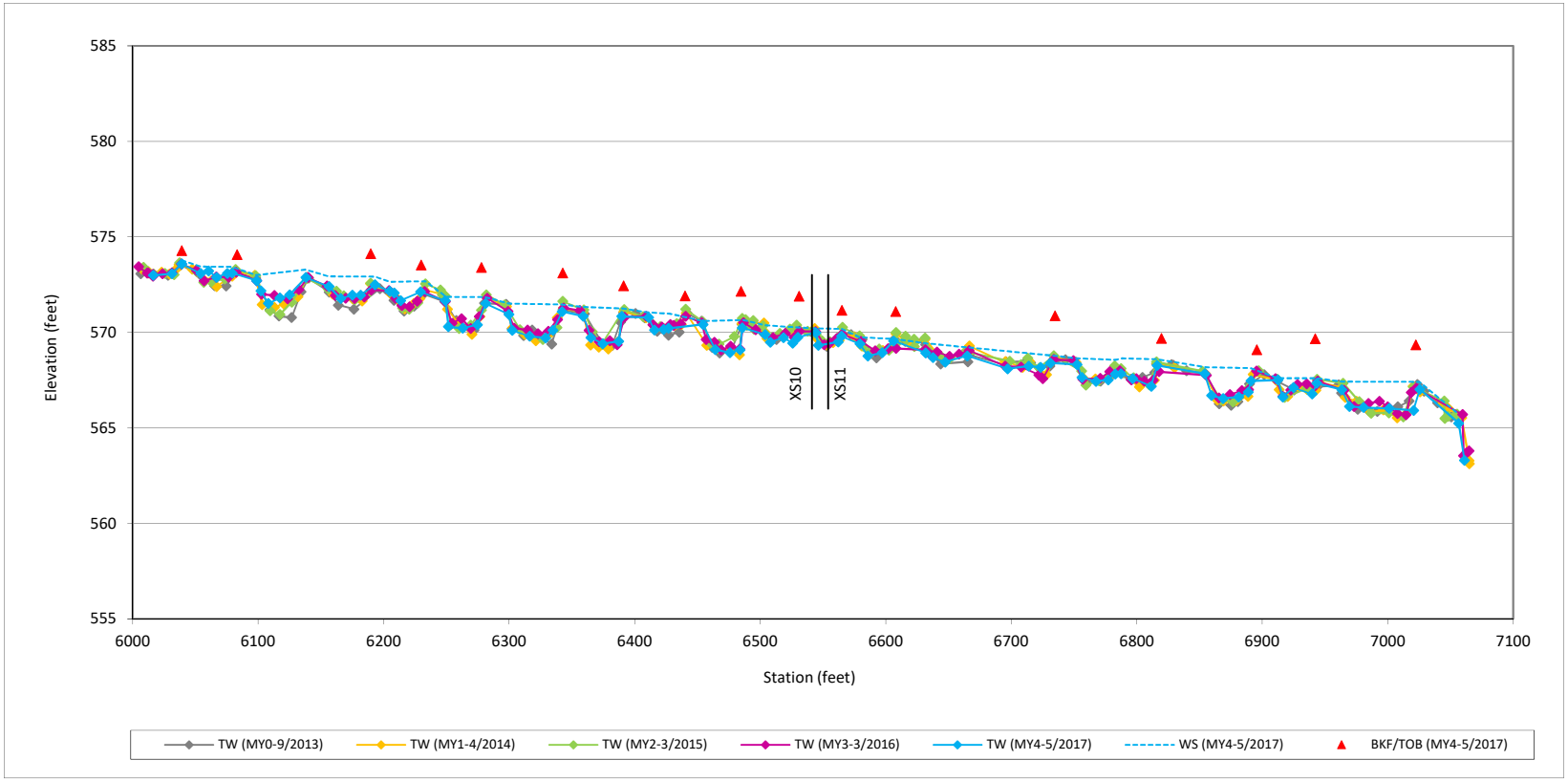
Longitudinal Profile Plots

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

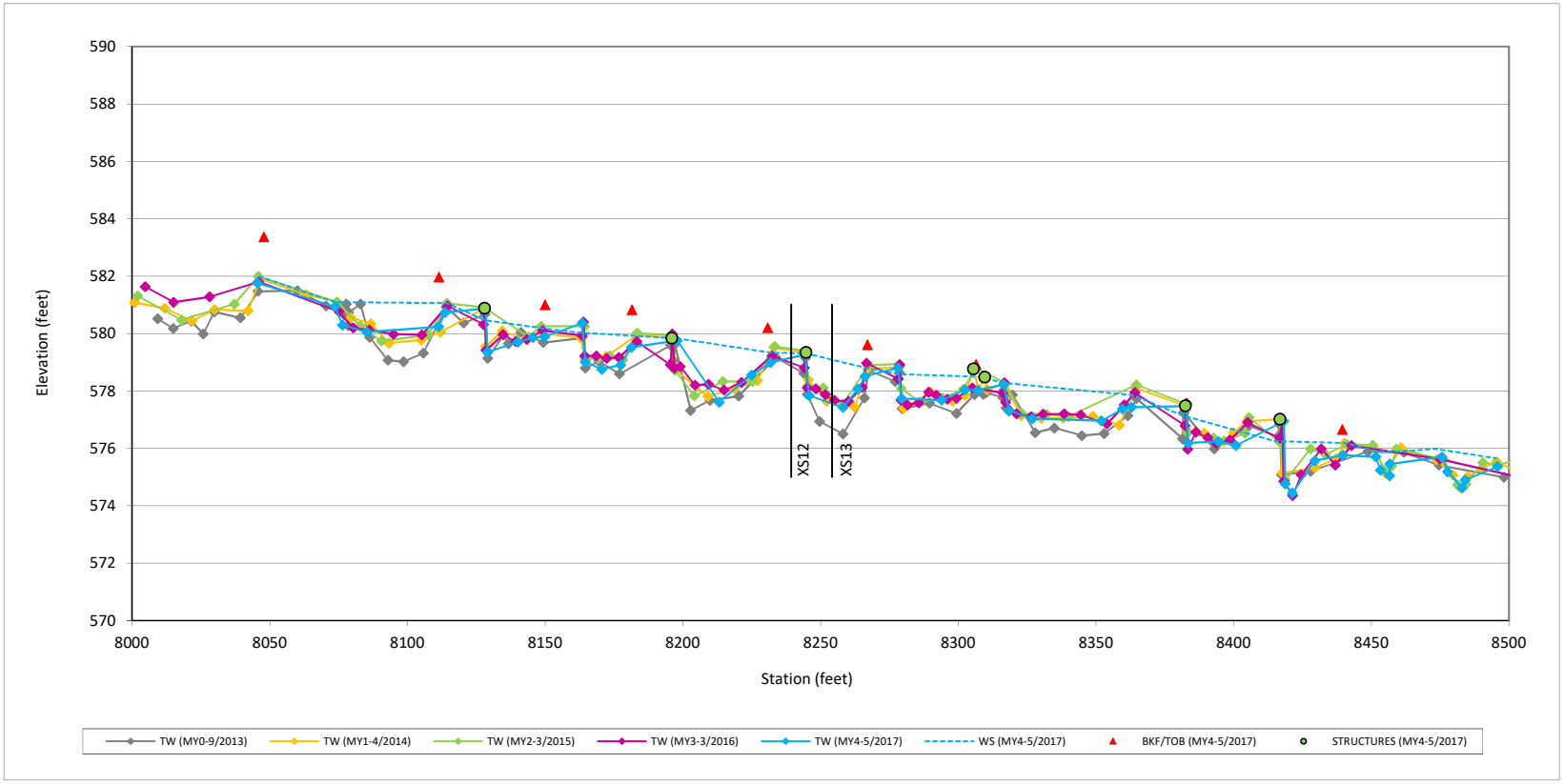
South Branch Reach 1



Longitudinal Profile Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Southeast Reach 1



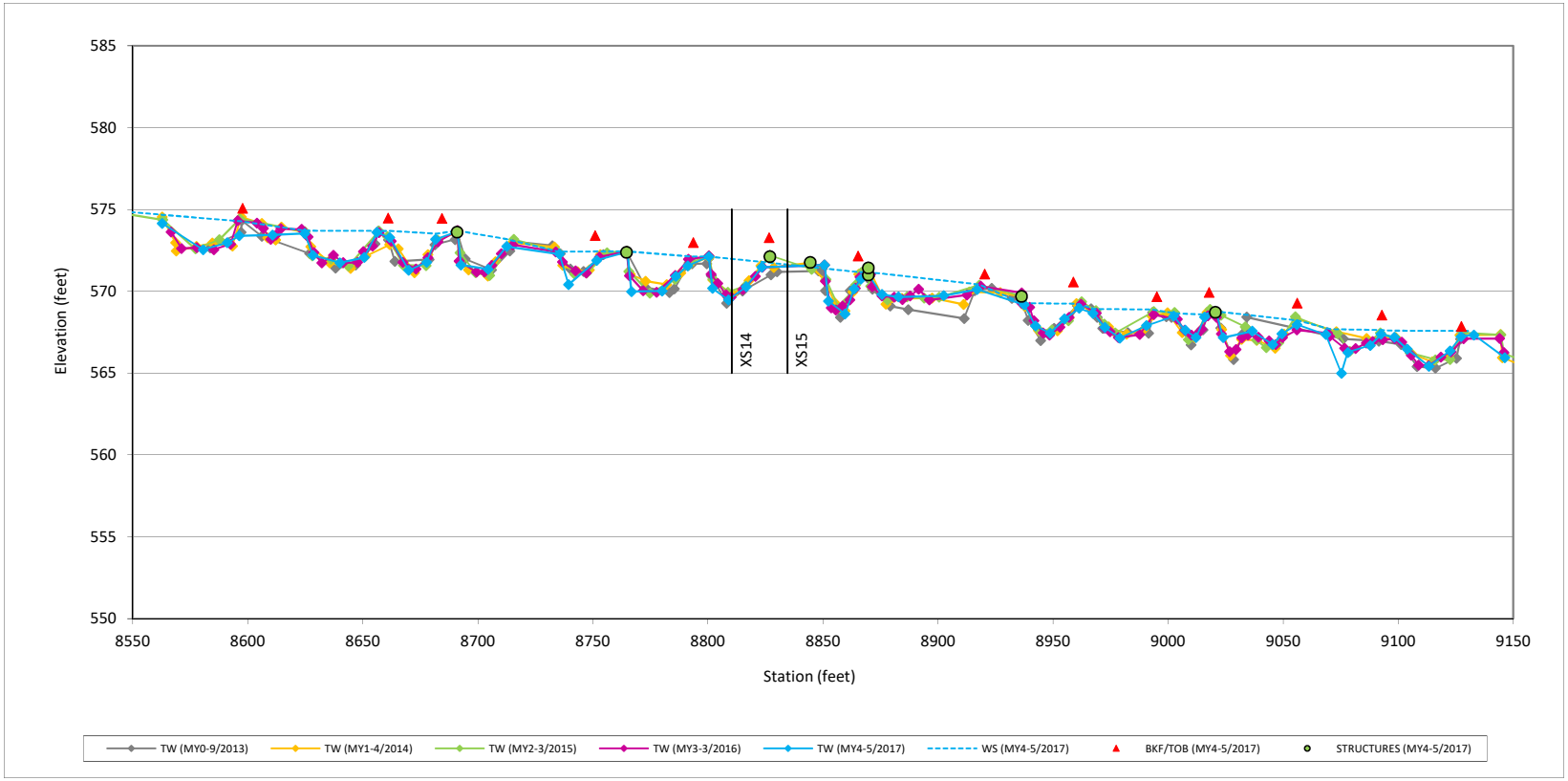
Longitudinal Profile Plots

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

Southeast Reach 2a



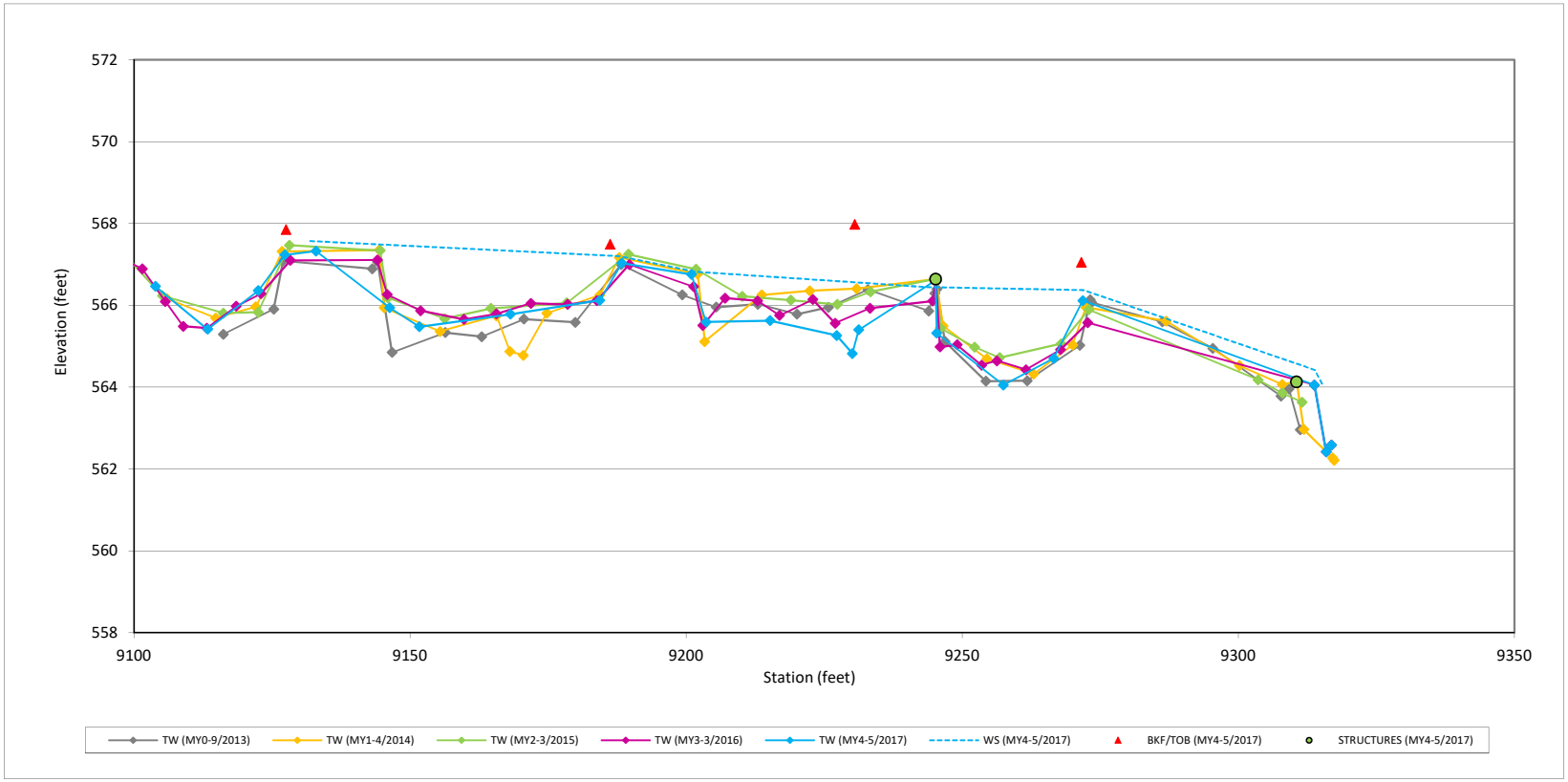
Longitudinal Profile Plots

Byrds Creek Mitigation Site

DMS Project No. 95020

Monitoring Year 4 - 2017

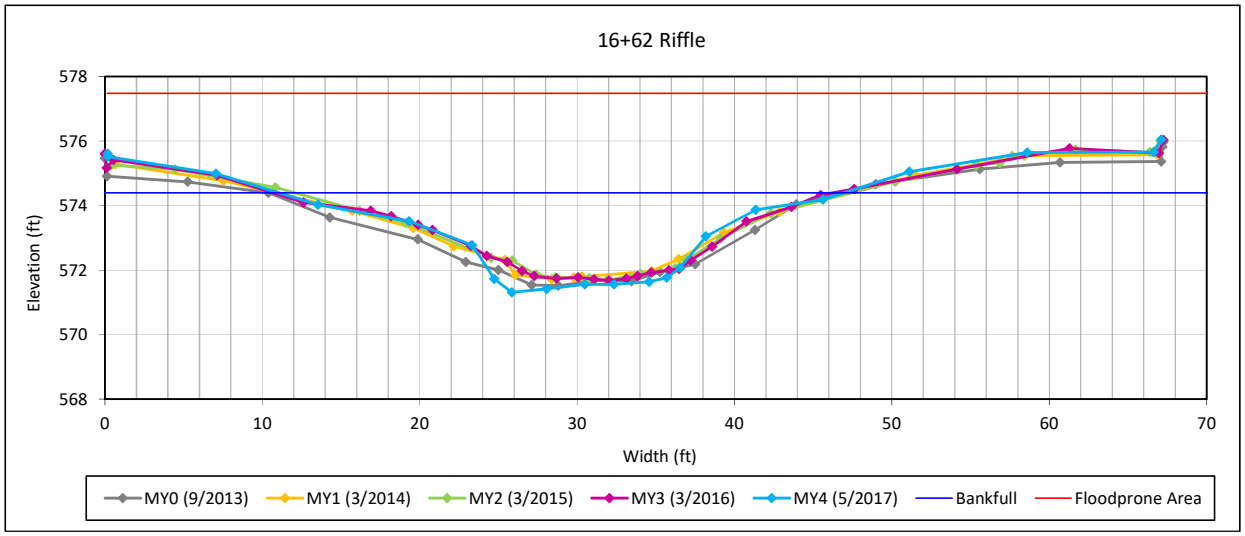
Southeast Reach 2b



Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 1-Byrds Creek Reach 2



Bankfull Dimensions	
53.4	x-section area (ft.sq.)
35.9	width (ft)
1.5	mean depth (ft)
3.1	max depth (ft)
36.9	wetted parimeter (ft)
1.4	hyd radi (ft)
24.1	width-depth ratio
150.0	W flood prone area (ft)
4.2	entrenchment ratio
1.0	low bank height ratio

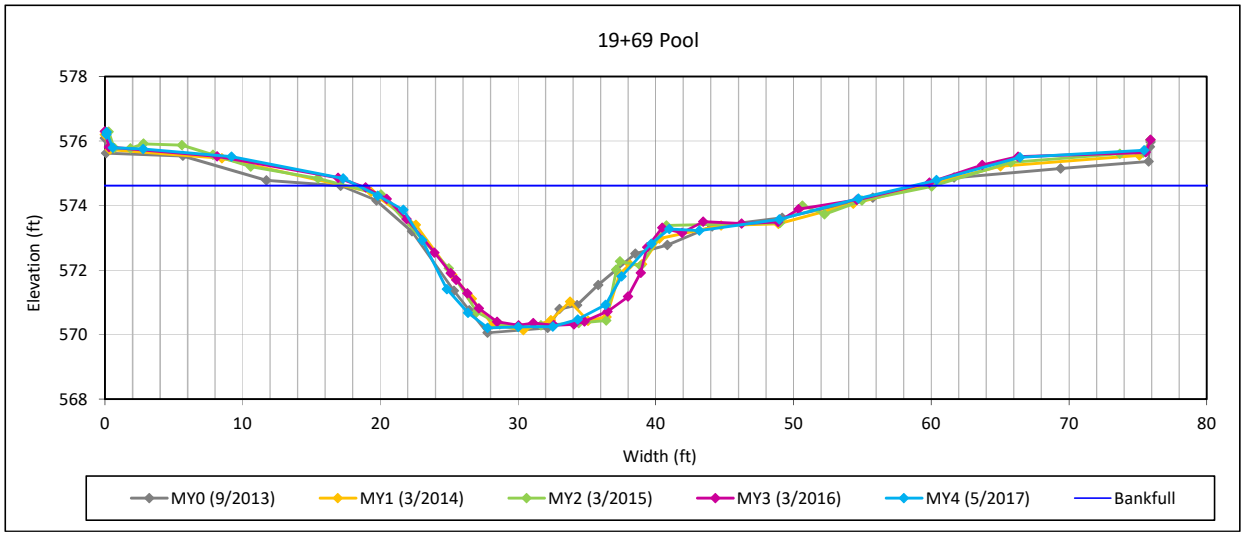
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 2-Byrds Creek Reach 2



Bankfull Dimensions	
80.8	x-section area (ft.sq.)
40.3	width (ft)
2.0	mean depth (ft)
4.4	max depth (ft)
42.2	wetted parimeter (ft)
1.9	hyd radi (ft)
20.1	width-depth ratio

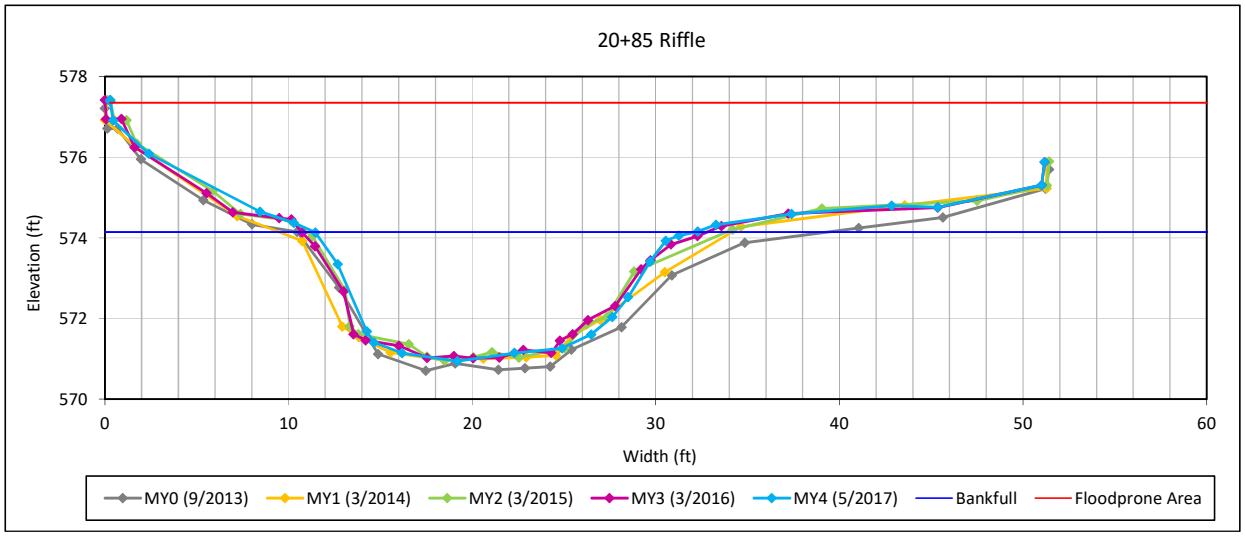
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 3-Byrds Creek Reach 2



Bankfull Dimensions	
45.7	x-section area (ft.sq.)
20.8	width (ft)
2.2	mean depth (ft)
3.2	max depth (ft)
22.6	wetted parimeter (ft)
2.0	hyd radi (ft)
9.5	width-depth ratio
150.0	W flood prone area (ft)
7.2	entrenchment ratio
1.0	low bank height ratio

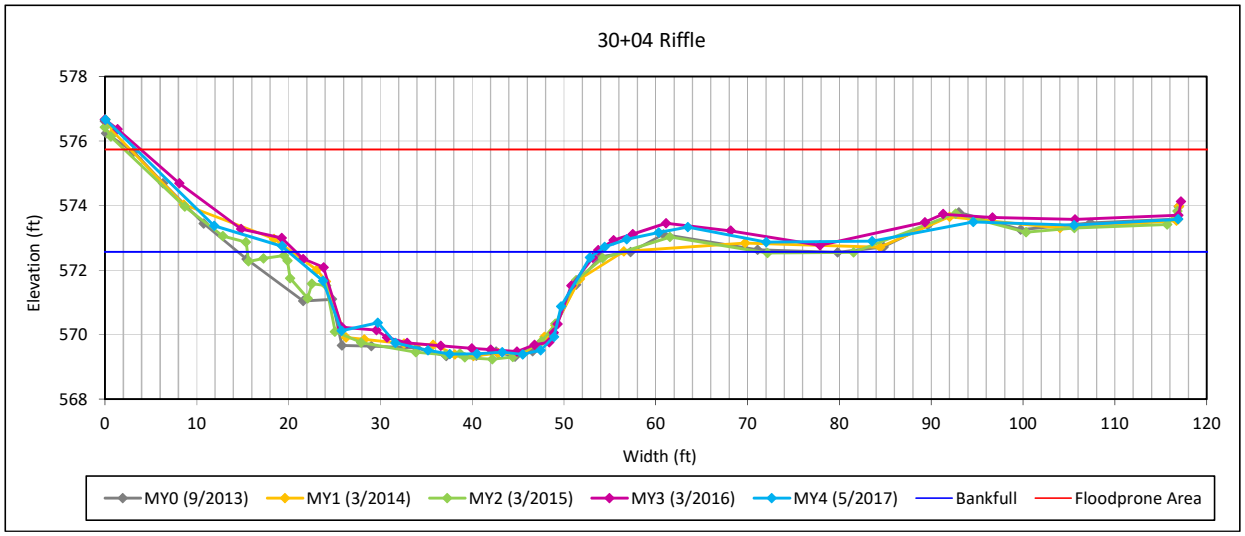
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 4-Byrds Creek Reach 2



Bankfull Dimensions	
76.7	x-section area (ft.sq.)
33.6	width (ft)
2.3	mean depth (ft)
3.2	max depth (ft)
35.2	wetted parimeter (ft)
2.2	hyd radi (ft)
14.7	width-depth ratio
150.0	W flood prone area (ft)
4.5	entrenchment ratio
1.0	low bank height ratio

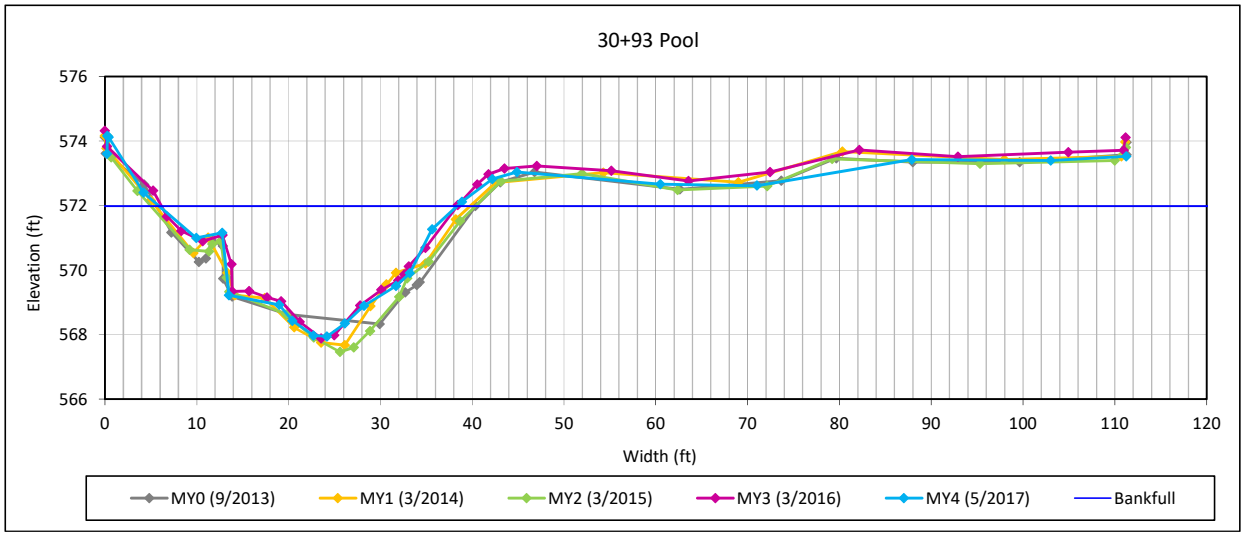
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 5-Byrds Creek Reach 2



Bankfull Dimensions	
73.2	x-section area (ft.sq.)
32.4	width (ft)
2.3	mean depth (ft)
4.0	max depth (ft)
34.7	wetted parimeter (ft)
2.1	hyd radi (ft)
14.4	width-depth ratio

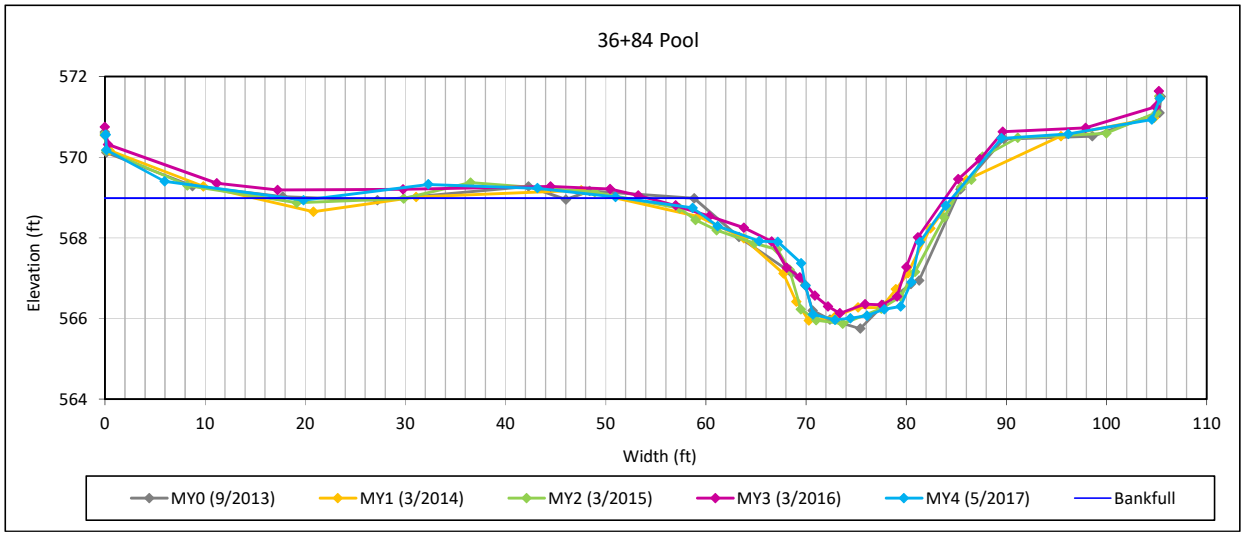
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 6-Byrds Creek Reach 3



Bankfull Dimensions	
43.6	x-section area (ft.sq.)
25.9	width (ft)
1.7	mean depth (ft)
3.0	max depth (ft)
27.4	wetted parimeter (ft)
1.6	hyd radi (ft)
15.4	width-depth ratio

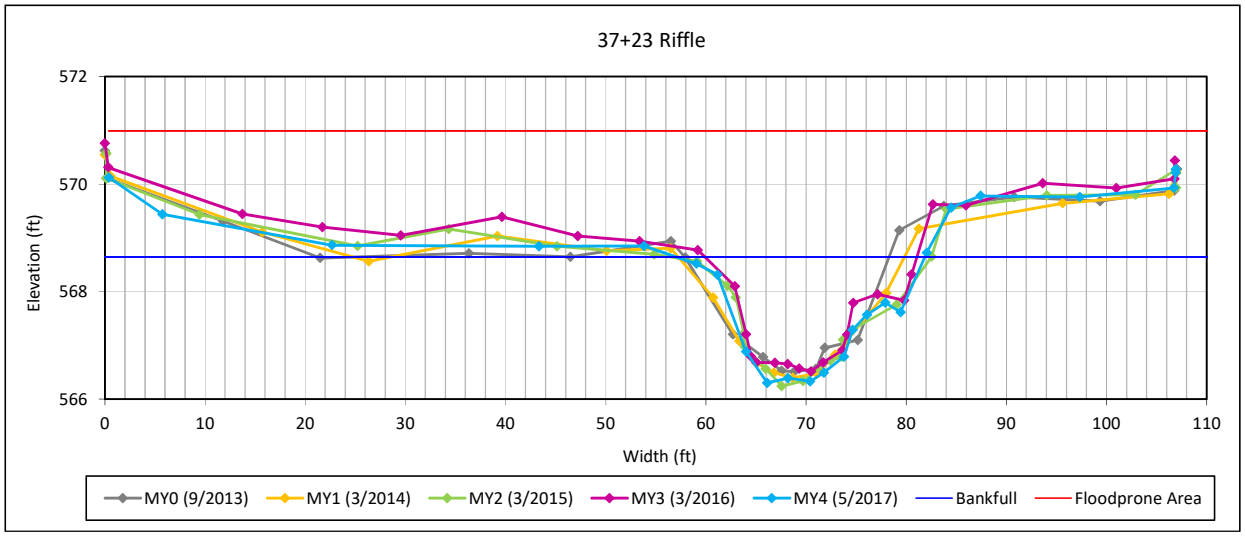
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 7- Byrds Creek Reach 3



Bankfull Dimensions	
29.2	x-section area (ft.sq.)
22.5	width (ft)
1.3	mean depth (ft)
2.3	max depth (ft)
23.2	wetted parimeter (ft)
1.3	hyd radi (ft)
17.3	width-depth ratio
150.0	W flood prone area (ft)
6.7	entrenchment ratio
1.0	low bank height ratio

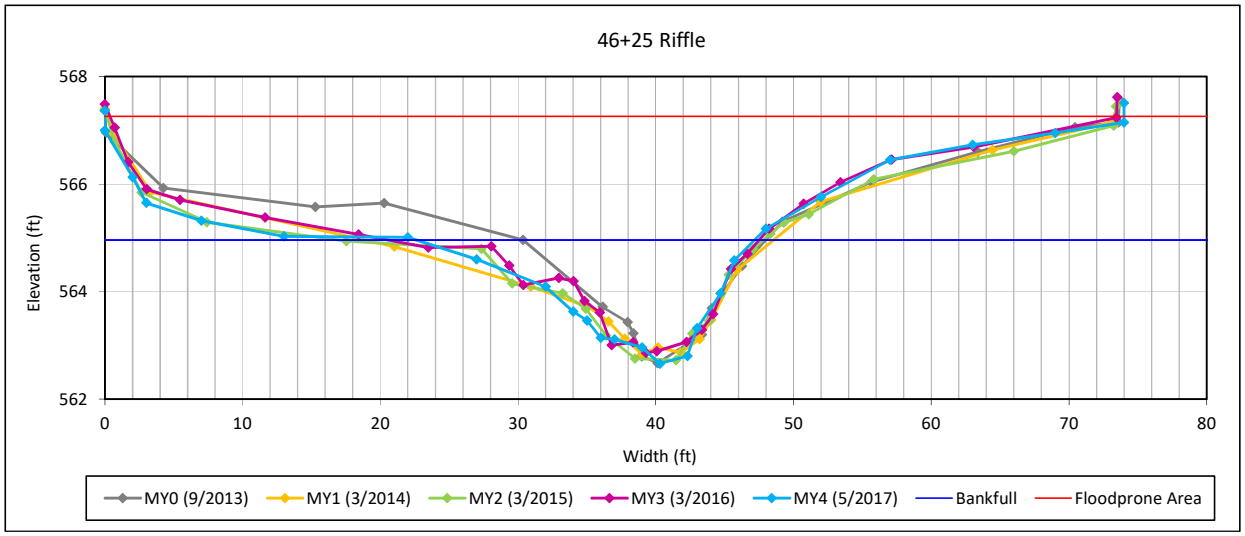
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 8- Byrds Creek Reach 3



Bankfull Dimensions	
25.8	x-section area (ft.sq.)
20.2	width (ft)
1.3	mean depth (ft)
2.3	max depth (ft)
20.9	wetted parimeter (ft)
1.2	hyd radi (ft)
15.8	width-depth ratio
150.0	W flood prone area (ft)
7.4	entrenchment ratio
1.3	low bank height ratio

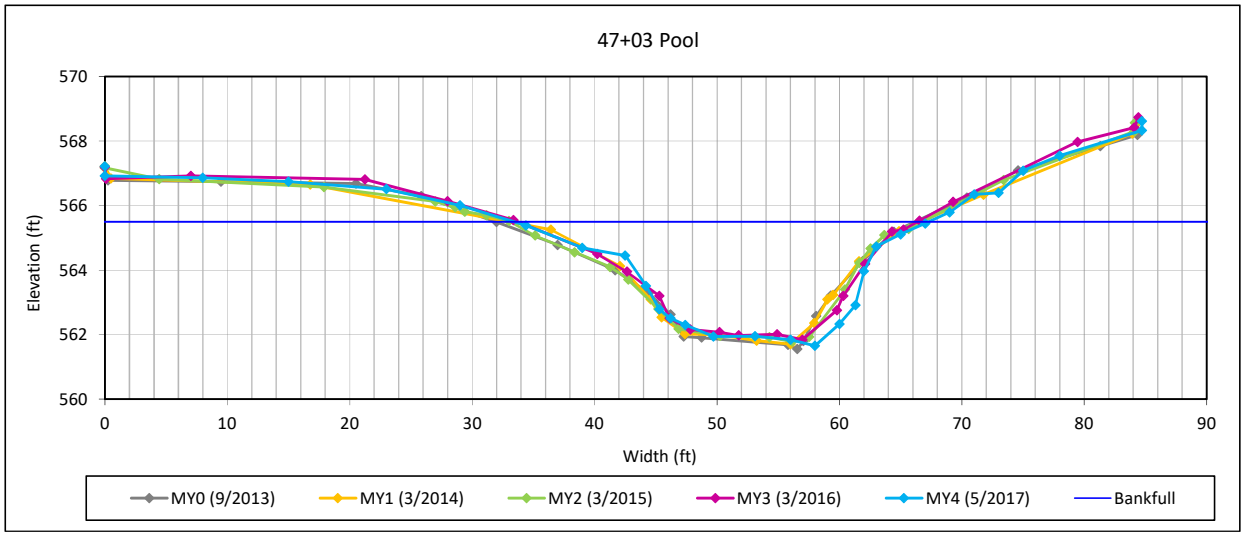
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 9- Byrds Creek Reach 3



Bankfull Dimensions	
69.6	x-section area (ft.sq.)
33.9	width (ft)
2.1	mean depth (ft)
3.8	max depth (ft)
35.7	wetted parimeter (ft)
2.0	hyd radi (ft)
16.5	width-depth ratio

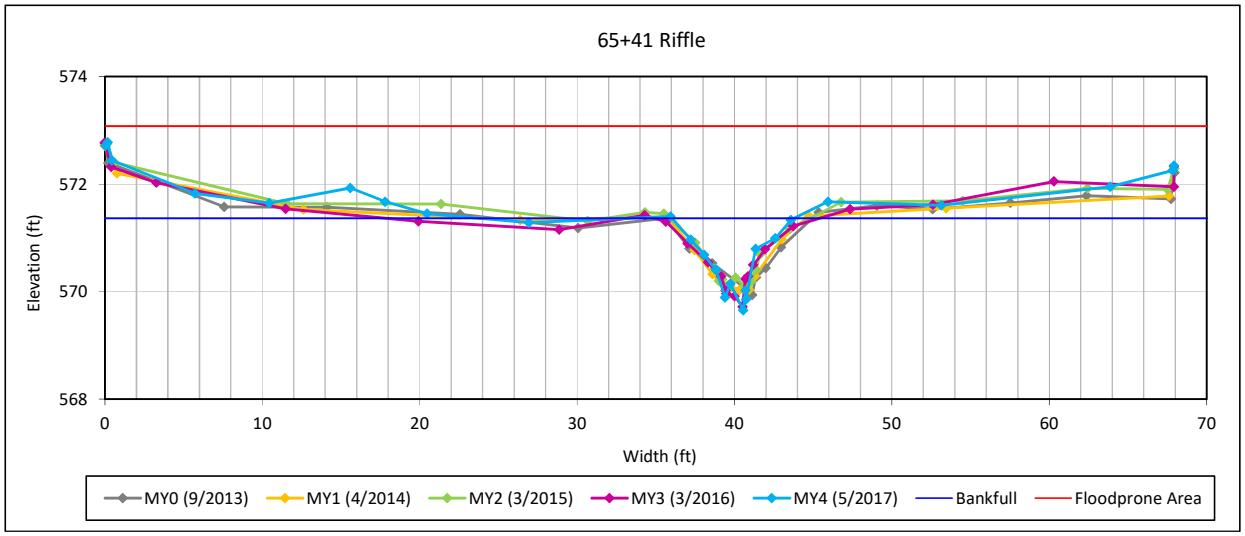
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 10-South Branch Reach 1



Bankfull Dimensions	
5.4	x-section area (ft.sq.)
7.8	width (ft)
0.7	mean depth (ft)
1.7	max depth (ft)
9.3	wetted parimeter (ft)
0.6	hyd radi (ft)
11.3	width-depth ratio
100.0	W flood prone area (ft)
12.9	entrenchment ratio
1.0	low bank height ratio

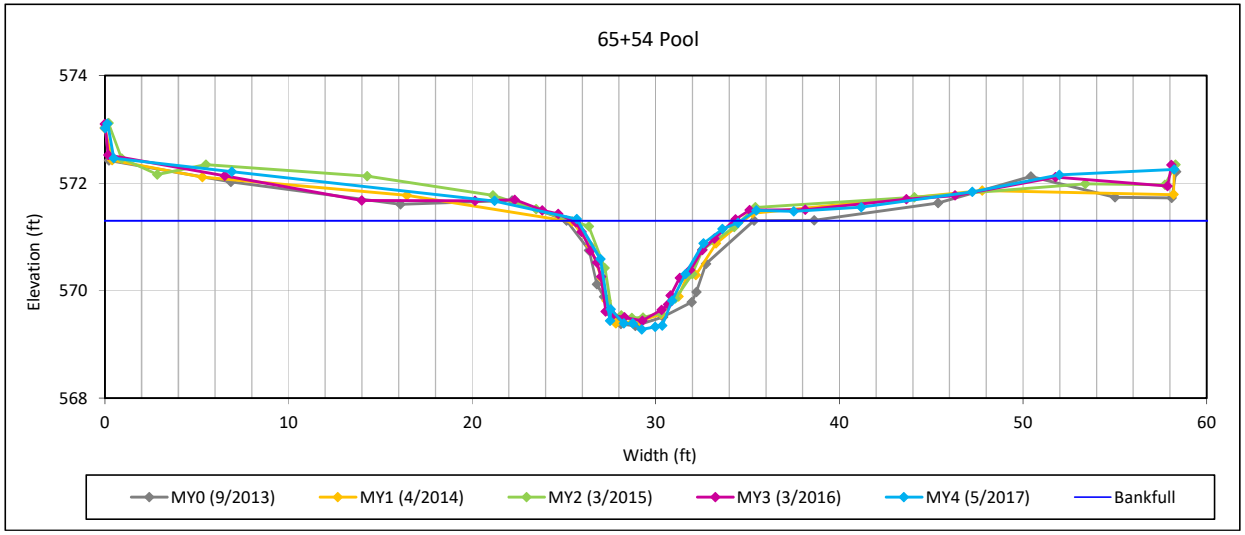
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 11- South Branch Reach 1



Bankfull Dimensions	
9.5	x-section area (ft.sq.)
8.9	width (ft)
1.1	mean depth (ft)
2.0	max depth (ft)
10.6	wetted parimeter (ft)
0.9	hyd radi (ft)
8.4	width-depth ratio

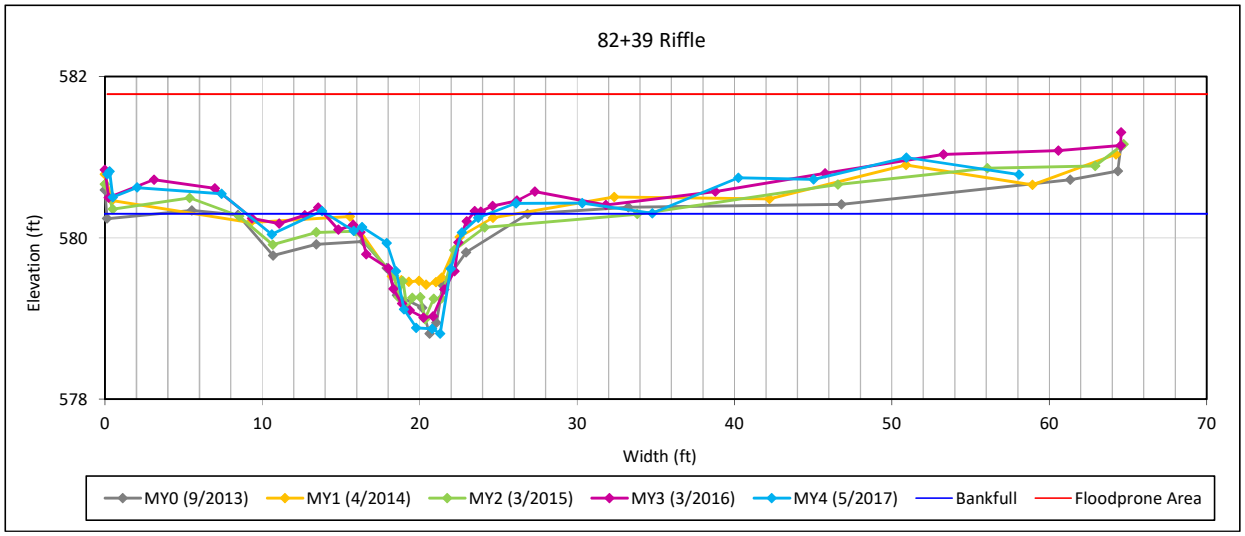
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 12 - Southeast Reach 1



Bankfull Dimensions	
5.7	x-section area (ft.sq.)
8.6	width (ft)
0.7	mean depth (ft)
1.5	max depth (ft)
9.4	wetted parimeter (ft)
0.6	hyd radi (ft)
12.9	width-depth ratio
75.0	W flood prone area (ft)
8.8	entrenchment ratio
1.0	low bank height ratio

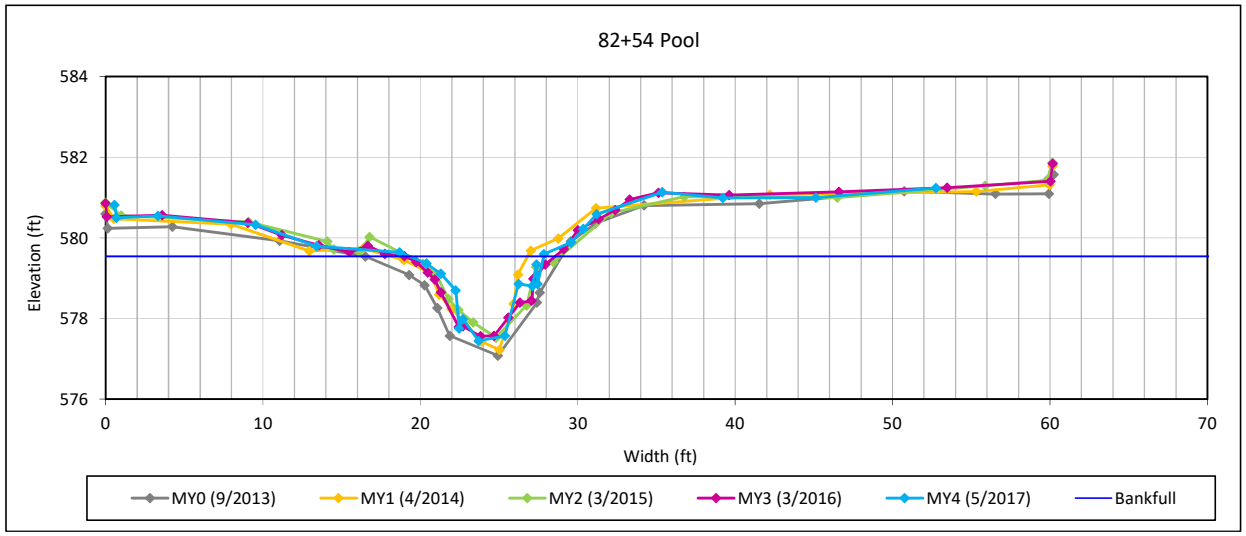
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 13 - Southeast Reach 1



Bankfull Dimensions	
8.9	x-section area (ft.sq.)
8.5	width (ft)
1.0	mean depth (ft)
2.1	max depth (ft)
11.5	wetted parimeter (ft)
0.8	hyd radi (ft)
8.1	width-depth ratio

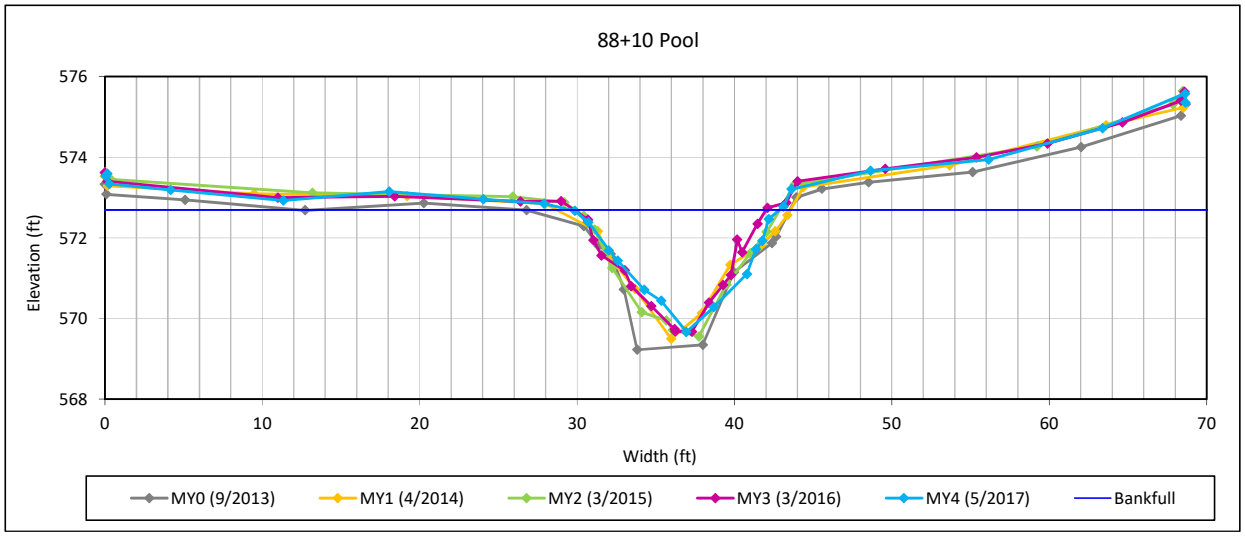
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 14 - Southeast Reach 2



Bankfull Dimensions	
21.2	x-section area (ft.sq.)
13.2	width (ft)
1.6	mean depth (ft)
3.0	max depth (ft)
14.8	wetted parimeter (ft)
1.4	hyd radi (ft)
8.3	width-depth ratio

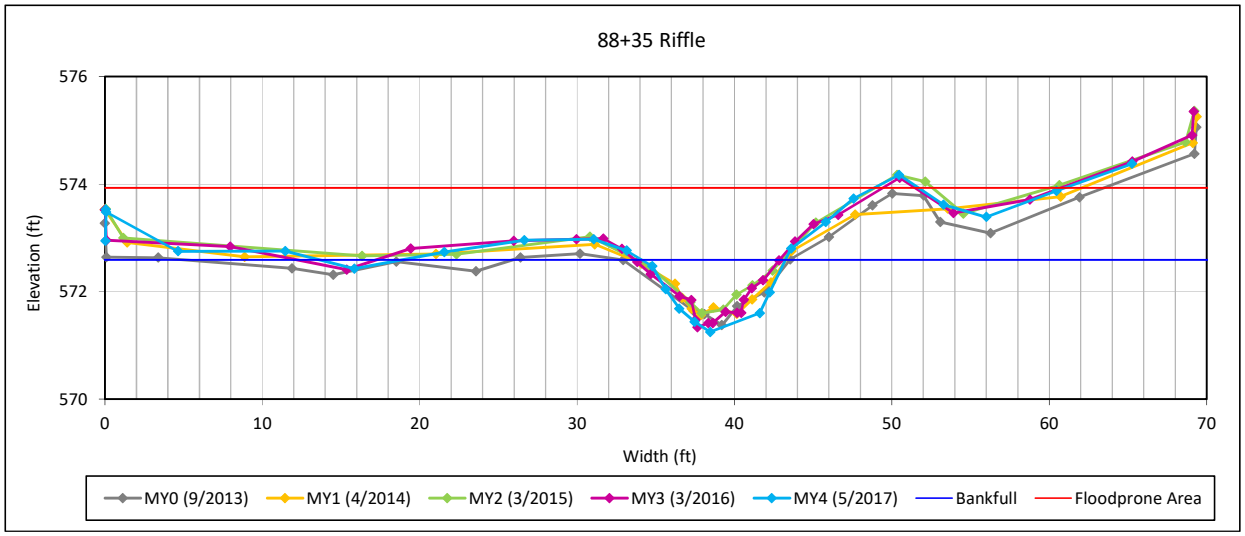
Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Cross Section Plots

Byrds Creek Mitigation Site
DMS Project No. 95020
Monitoring Year 4 - 2017

Cross Section 15 - Southeast Reach 2



Bankfull Dimensions	
7.7	x-section area (ft.sq.)
9.1	width (ft)
0.8	mean depth (ft)
1.3	max depth (ft)
9.6	wetted parimeter (ft)
0.8	hyd radi (ft)
10.8	width-depth ratio
100.0	W flood prone area (ft)
11.0	entrenchment ratio
1.0	low bank height ratio

Survey Date: 5/2017
Field Crew: Wildlands Engineering

View Downstream

Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

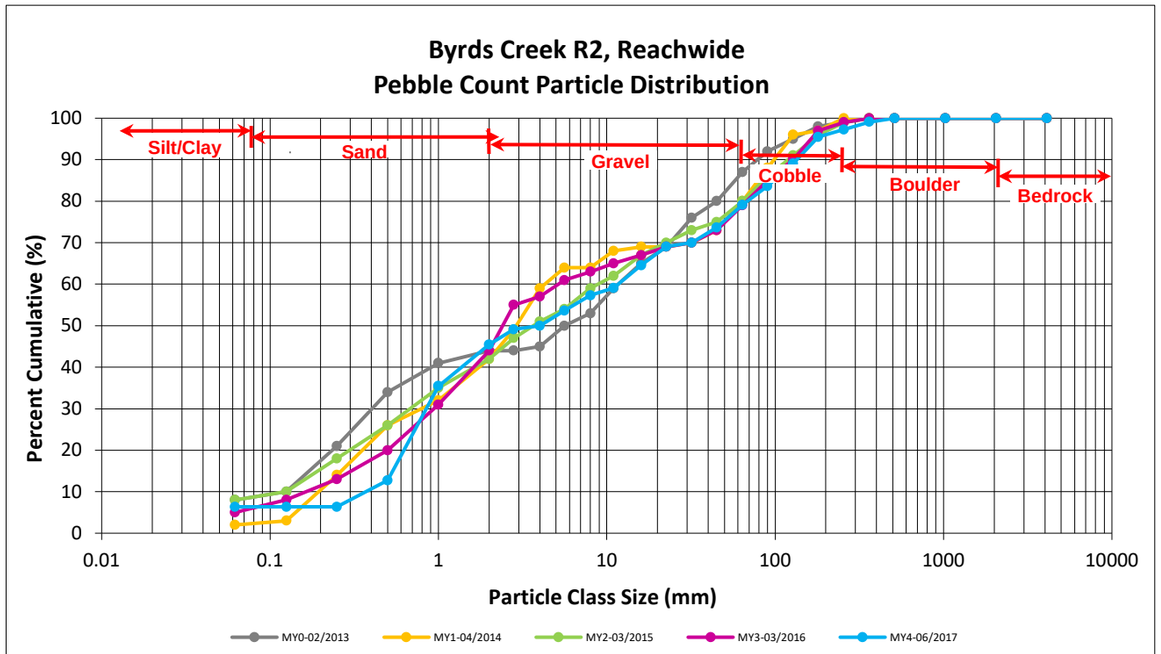
DMS Project No. 95020

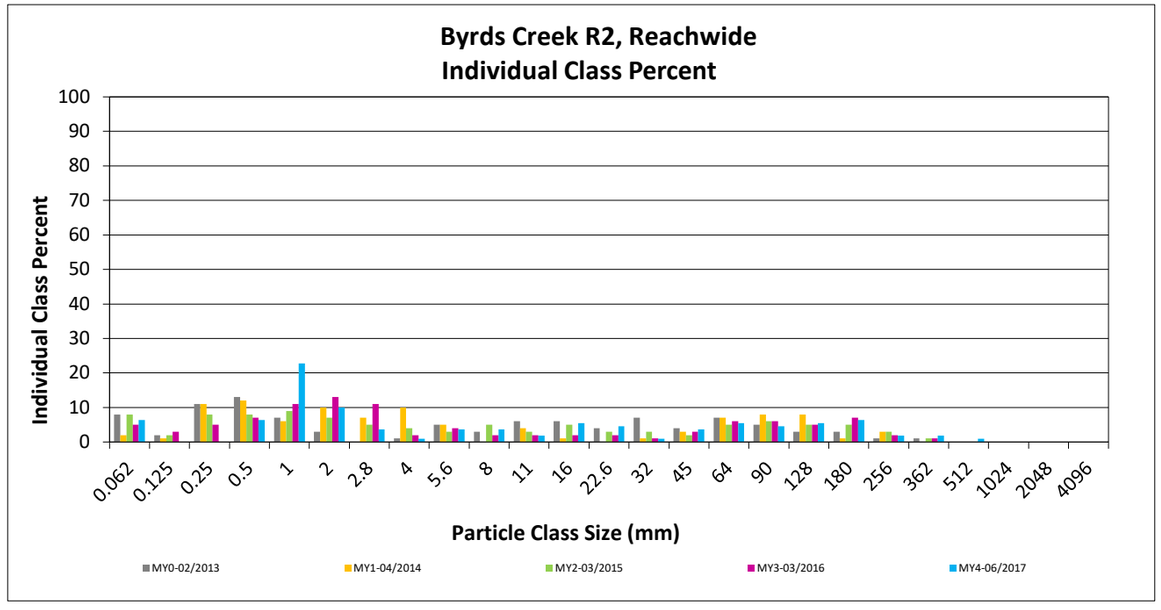
Monitoring Year 4 - 2017

Byrds Creek R2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		7	7	6	6
SAND	Very fine	0.062	0.125					6
	Fine	0.125	0.250					6
	Medium	0.25	0.50		7	7	6	13
	Coarse	0.5	1.0	5	20	25	23	35
	Very Coarse	1.0	2.0	1	10	11	10	45
GRAVEL	Very Fine	2.0	2.8		4	4	4	49
	Very Fine	2.8	4.0		1	1	1	50
	Fine	4.0	5.6		4	4	4	54
	Fine	5.6	8.0	1	3	4	4	57
	Medium	8.0	11.0	2		2	2	59
	Medium	11.0	16.0	3	3	6	5	65
	Coarse	16.0	22.6	4	1	5	5	69
	Coarse	22.6	32	1		1	1	70
	Very Coarse	32	45	4		4	4	74
	Very Coarse	45	64	6		6	5	79
COBBLE	Small	64	90	5		5	5	84
	Small	90	128	6		6	5	89
	Large	128	180	7		7	6	95
	Large	180	256	2		2	2	97
BOULDER	Small	256	362	2		2	2	99
	Small	362	512	1		1	1	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**60**	**110**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.55
D_{35} =	0.99
D_{50} =	4.0
D_{84} =	92.1
D_{95} =	175.7
D_{100} =	512.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

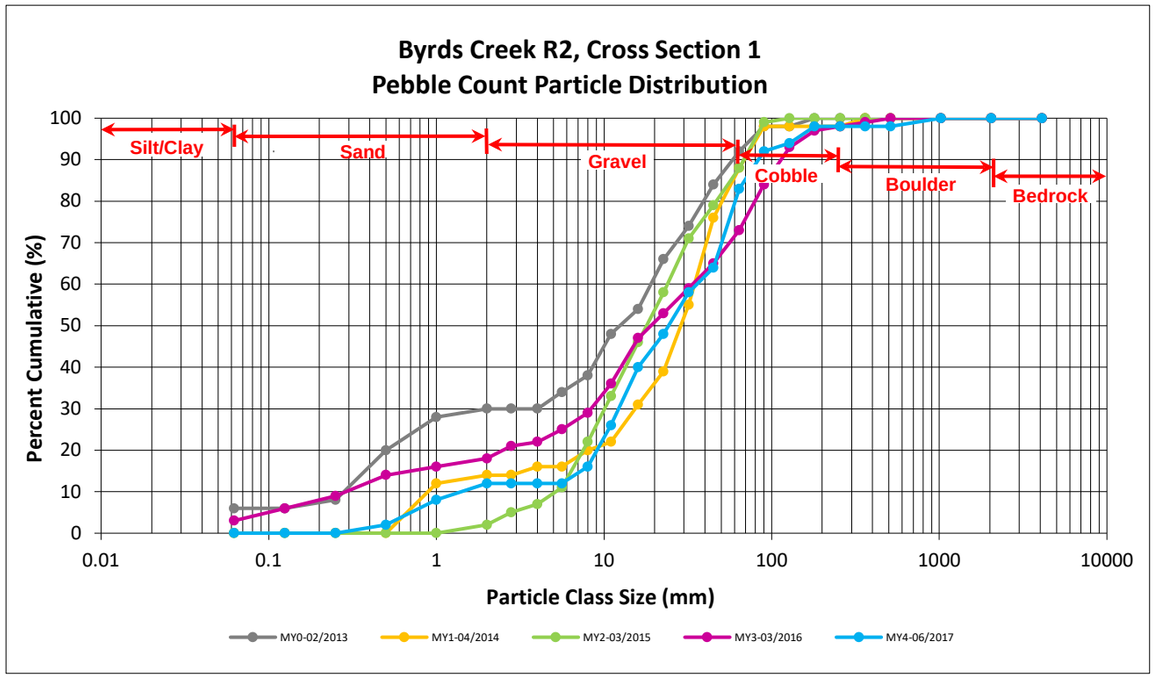
DMS Project No. 95020

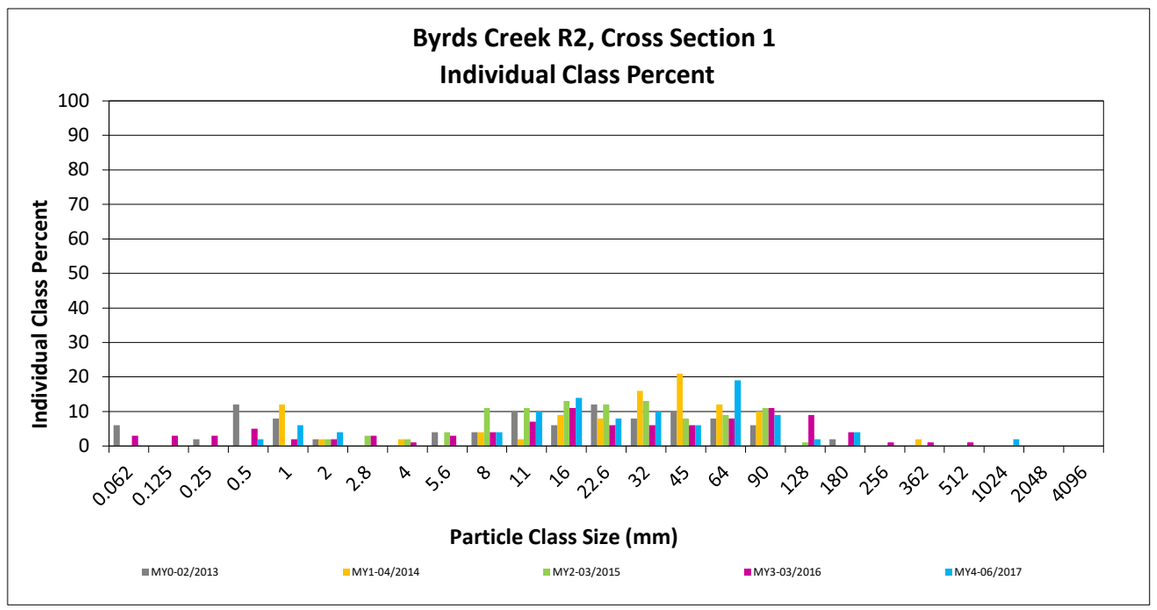
Monitoring Year 4 - 2017

Byrds Creek R2, Cross Section 1

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	2	2	2
	Coarse	0.5	1.0	6	6	8
	Very Coarse	1.0	2.0	4	4	12
GRAVEL	Very Fine	2.0	2.8			12
	Very Fine	2.8	4.0			12
	Fine	4.0	5.6			12
	Fine	5.6	8.0	4	4	16
	Medium	8.0	11.0	10	10	26
	Medium	11.0	16.0	14	14	40
	Coarse	16.0	22.6	8	8	48
	Coarse	22.6	32	10	10	58
	Very Coarse	32	45	6	6	64
	Very Coarse	45	64	19	19	83
COBBLE	Small	64	90	9	9	92
	Small	90	128	2	2	94
	Large	128	180	4	4	98
	Large	180	256			98
BOULDER	Small	256	362			98
	Small	362	512			98
	Medium	512	1024	2	2	100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 1	
Channel materials (mm)	
D_{16} =	8.00
D_{35} =	14.00
D_{50} =	24.2
D_{84} =	66.5
D_{95} =	139.4
D_{100} =	1024.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

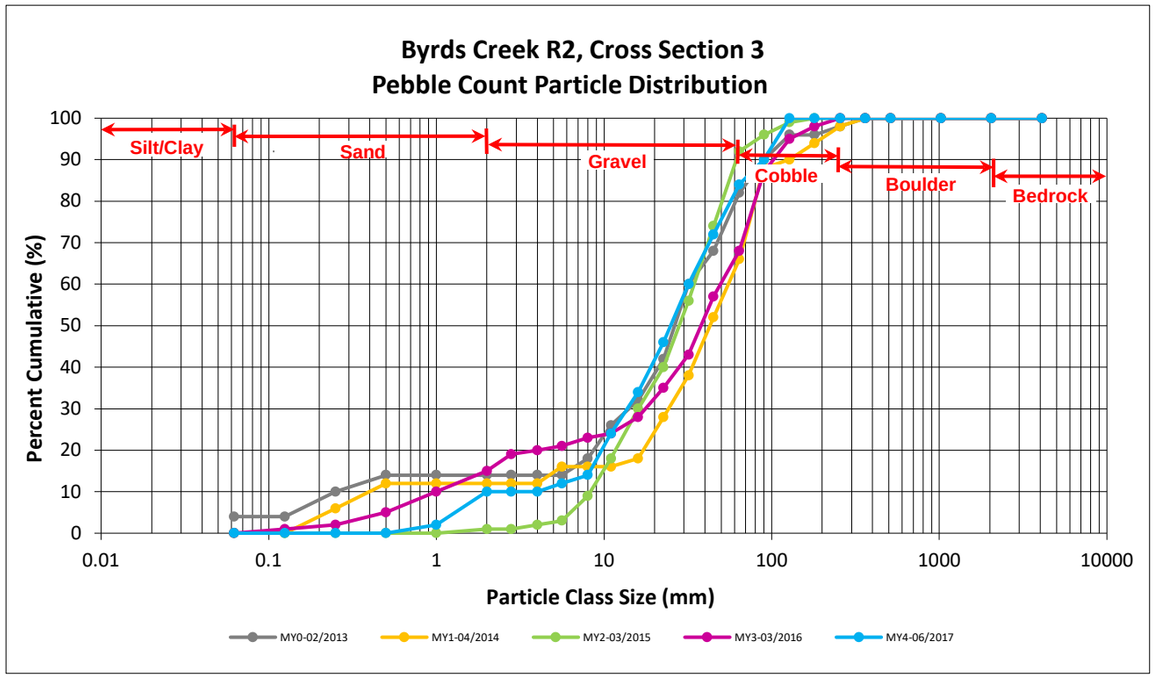
DMS Project No. 95020

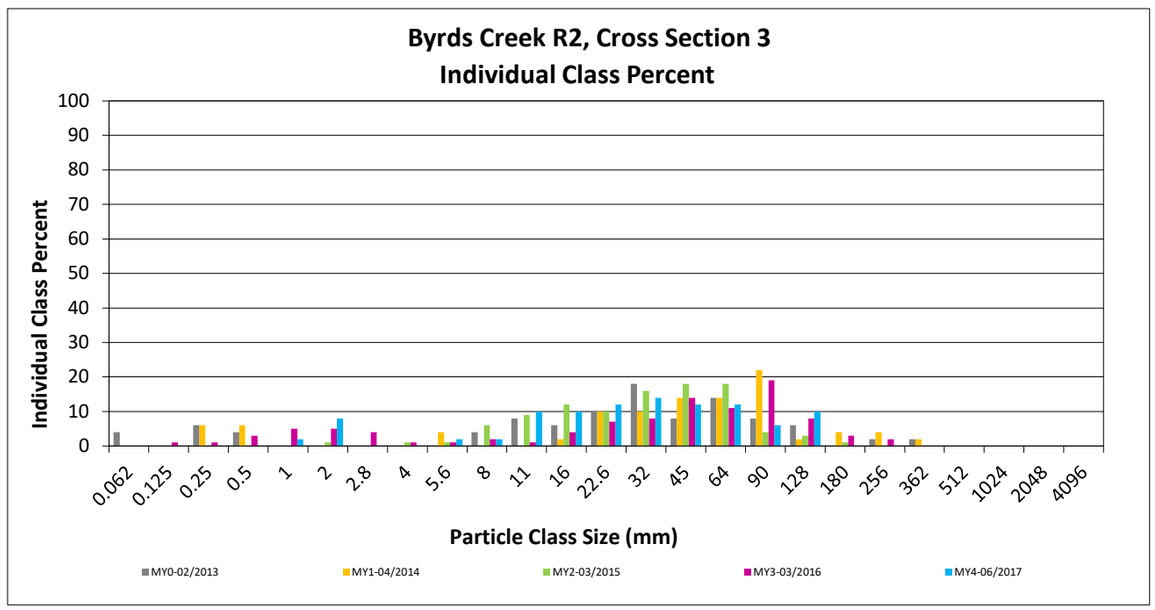
Monitoring Year 4 - 2017

Byrds Creek R2, Cross Section 3

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	2	2	2
	Very Coarse	1.0	2.0	8	8	10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0			10
	Fine	4.0	5.6	2	2	12
	Fine	5.6	8.0	2	2	14
	Medium	8.0	11.0	10	10	24
	Medium	11.0	16.0	10	10	34
	Coarse	16.0	22.6	12	12	46
	Coarse	22.6	32	14	14	60
	Very Coarse	32	45	12	12	72
	Very Coarse	45	64	12	12	84
COBBLE	Small	64	90	6	6	90
	Small	90	128	10	10	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 3	
Channel materials (mm)	
D_{16} =	8.53
D_{35} =	16.47
D_{50} =	25.0
D_{84} =	64.0
D_{95} =	107.3
D_{100} =	128.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

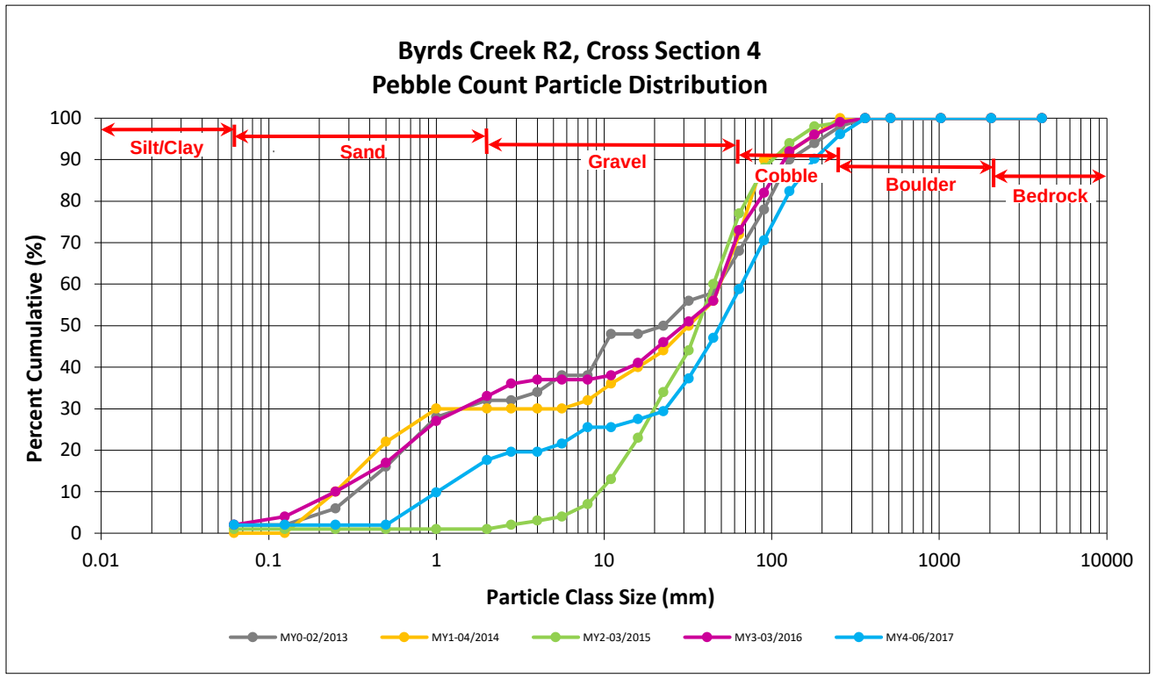
DMS Project No. 95020

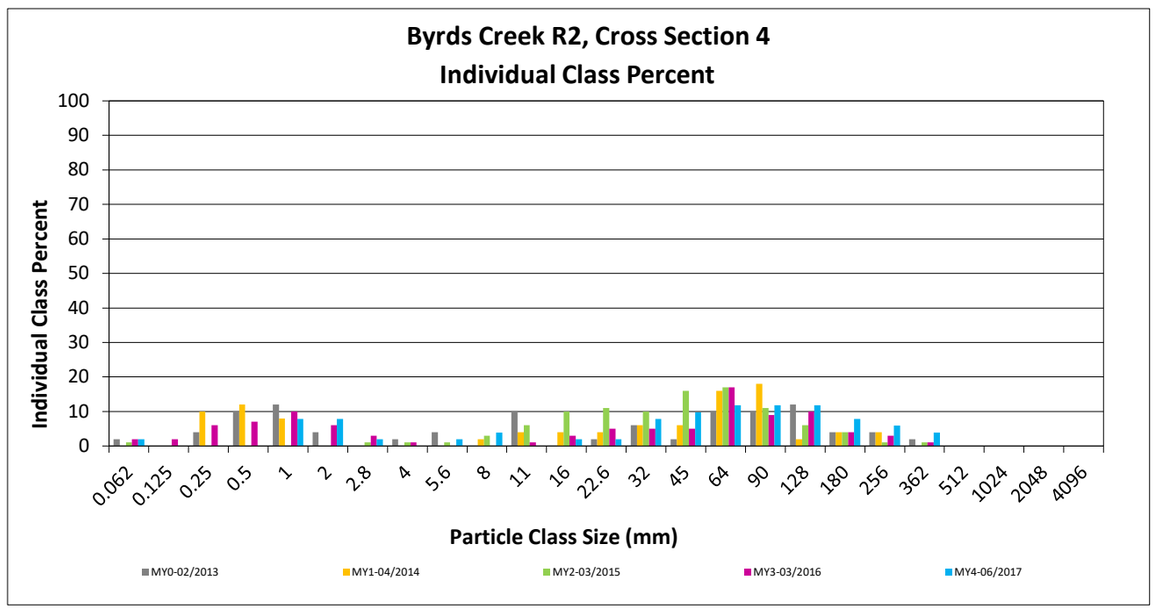
Monitoring Year 4 - 2017

Byrds Creek R2, 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	2	2	2
SAND	Very fine	0.062	0.125			2
	Fine	0.125	0.250			2
	Medium	0.25	0.50			2
	Coarse	0.5	1.0	8	8	10
	Very Coarse	1.0	2.0	8	8	18
GRAVEL	Very Fine	2.0	2.8	2	2	20
	Very Fine	2.8	4.0			20
	Fine	4.0	5.6	2	2	22
	Fine	5.6	8.0	4	4	25
	Medium	8.0	11.0			25
	Medium	11.0	16.0	2	2	27
	Coarse	16.0	22.6	2	2	29
	Coarse	22.6	32	8	8	37
	Very Coarse	32	45	10	10	47
	Very Coarse	45	64	12	12	59
COBBLE	Small	64	90	12	12	71
	Small	90	128	12	12	82
	Large	128	180	8	8	90
	Large	180	256	6	6	96
BOULDER	Small	256	362	4	4	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**102**	**100**	**100**

Cross Section 4	
Channel materials (mm)	
D_{16} =	1.73
D_{35} =	28.96
D_{50} =	49.1
D_{84} =	137.5
D_{95} =	240.0
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

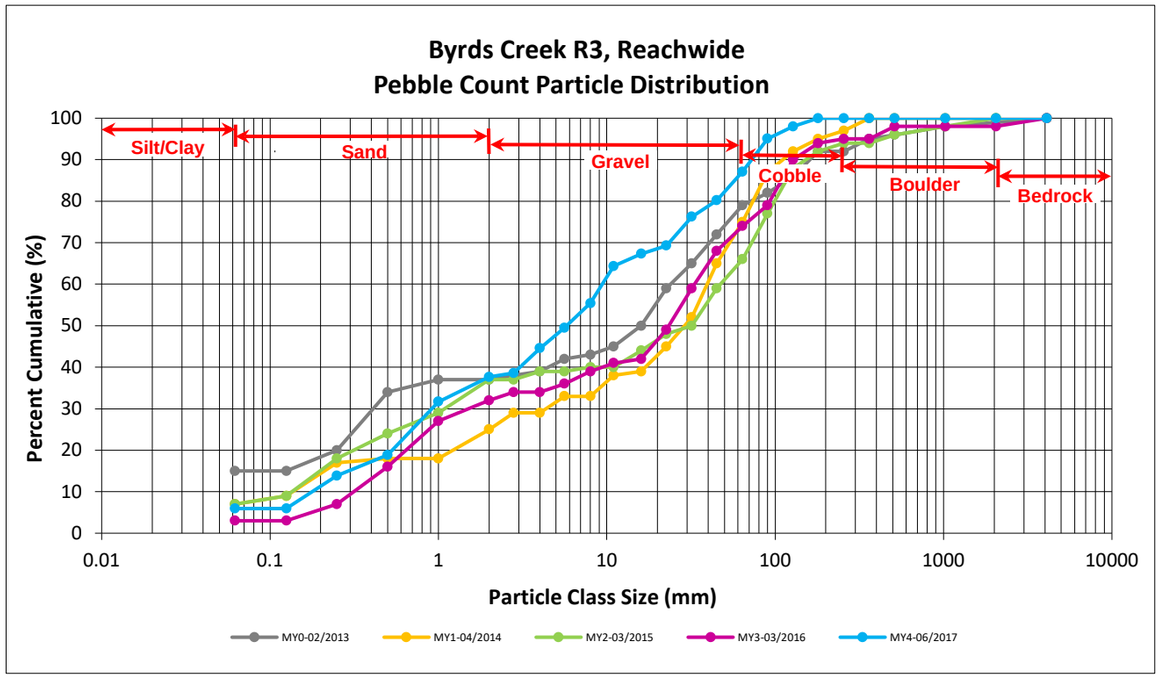
DMS Project No. 95020

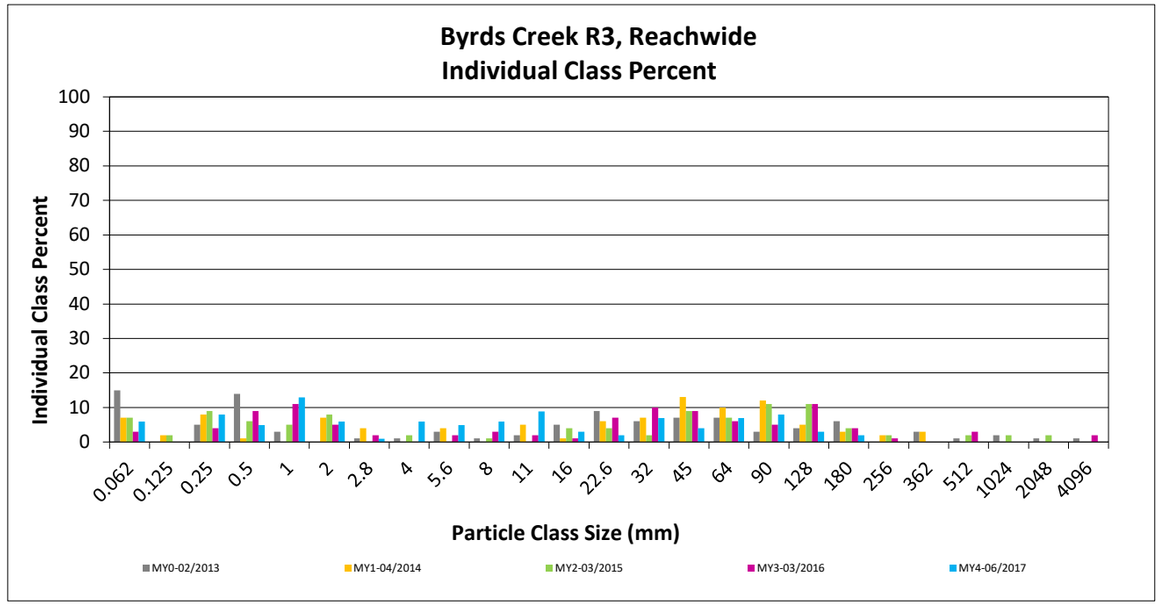
Monitoring Year 4 - 2017

Byrds Creek R3, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	4	6	6	6
SAND	Very fine	0.062	0.125					6
	Fine	0.125	0.250	2	6	8	8	14
	Medium	0.25	0.50	1	4	5	5	19
	Coarse	0.5	1.0	5	8	13	13	32
	Very Coarse	1.0	2.0	2	4	6	6	38
GRAVEL	Very Fine	2.0	2.8		1	1	1	39
	Very Fine	2.8	4.0	2	4	6	6	45
	Fine	4.0	5.6	3	2	5	5	50
	Fine	5.6	8.0	4	2	6	6	55
	Medium	8.0	11.0	6	3	9	9	64
	Medium	11.0	16.0	1	2	3	3	67
	Coarse	16.0	22.6	1	1	2	2	69
	Coarse	22.6	32	6	1	7	7	76
	Very Coarse	32	45	2	2	4	4	80
	Very Coarse	45	64	3	4	7	7	87
COBBLE	Small	64	90	5	3	8	8	95
	Small	90	128	3		3	3	98
	Large	128	180	2		2	2	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**51**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.34
D_{35} =	1.47
D_{50} =	5.8
D_{84} =	54.6
D_{95} =	89.8
D_{100} =	180.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

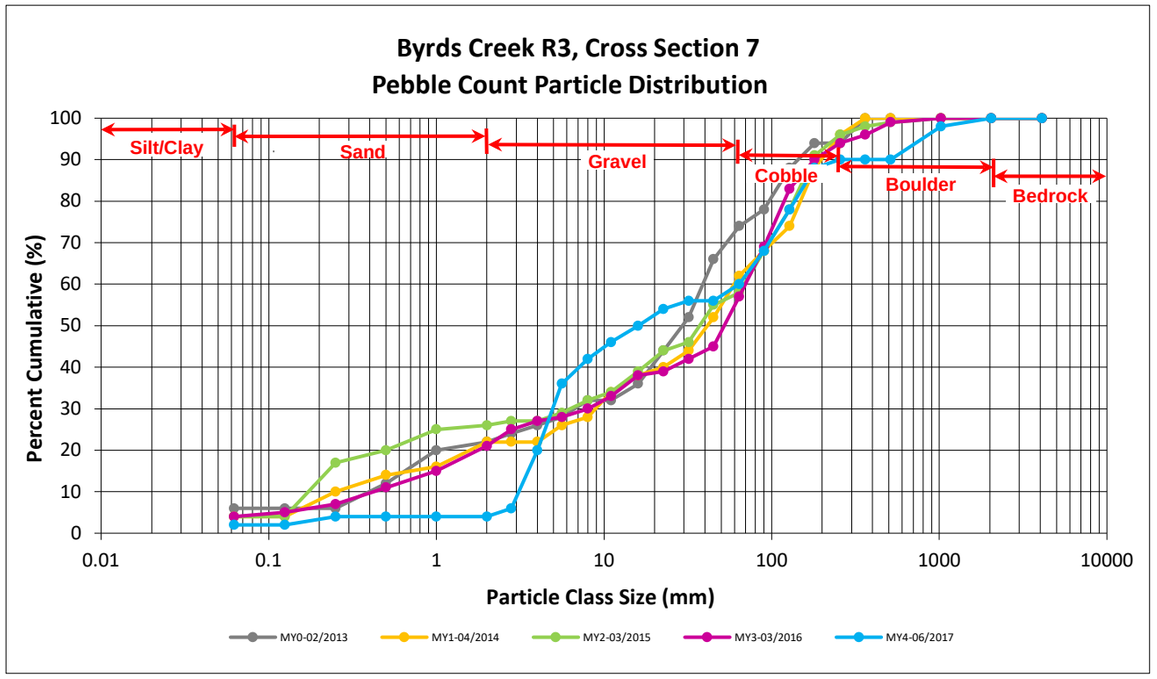
DMS Project No. 95020

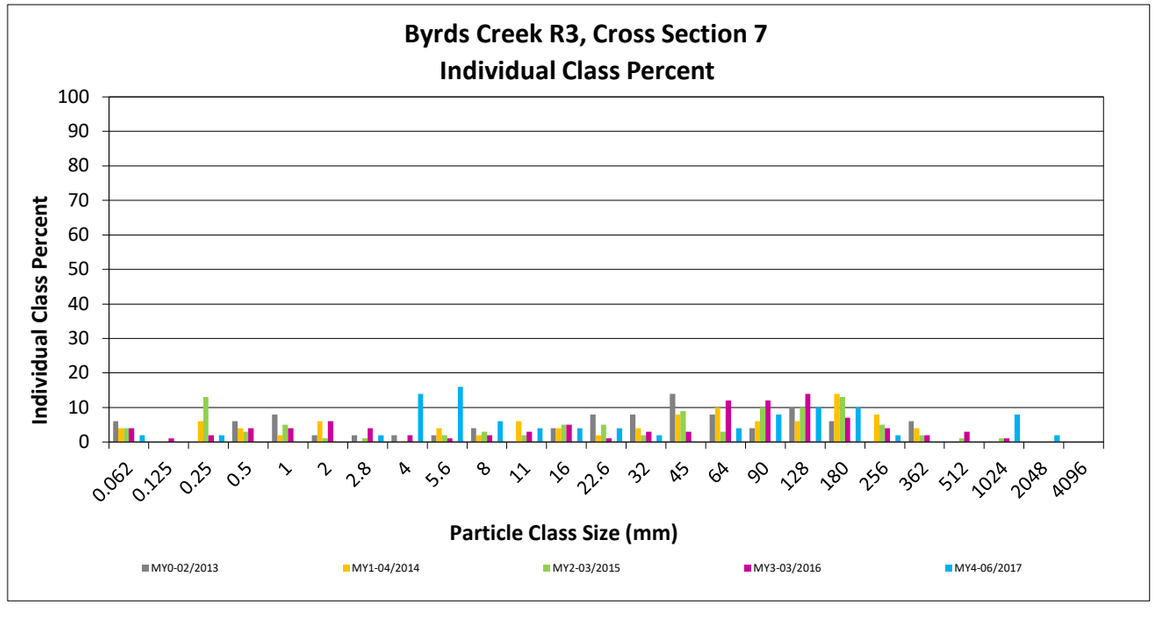
Monitoring Year 4 - 2017

Byrds Creek R3, Cross Section 7

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	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			4
	Very Coarse	1.0	2.0			4
GRAVEL	Very Fine	2.0	2.8	2	2	6
	Very Fine	2.8	4.0	14	14	20
	Fine	4.0	5.6	16	16	36
	Fine	5.6	8.0	6	6	42
	Medium	8.0	11.0	4	4	46
	Medium	11.0	16.0	4	4	50
	Coarse	16.0	22.6	4	4	54
	Coarse	22.6	32	2	2	56
	Very Coarse	32	45			56
	Very Coarse	45	64	4	4	60
COBBLE	Small	64	90	8	8	68
	Small	90	128	10	10	78
	Large	128	180	10	10	88
	Large	180	256	2	2	90
BOULDER	Small	256	362			90
	Small	362	512			90
	Medium	512	1024	8	8	98
	Large/Very Large	1024	2048	2	2	100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 7	
Channel materials (mm)	
D_{16} =	3.61
D_{35} =	5.48
D_{50} =	16.0
D_{84} =	157.1
D_{95} =	789.6
D_{100} =	2048.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

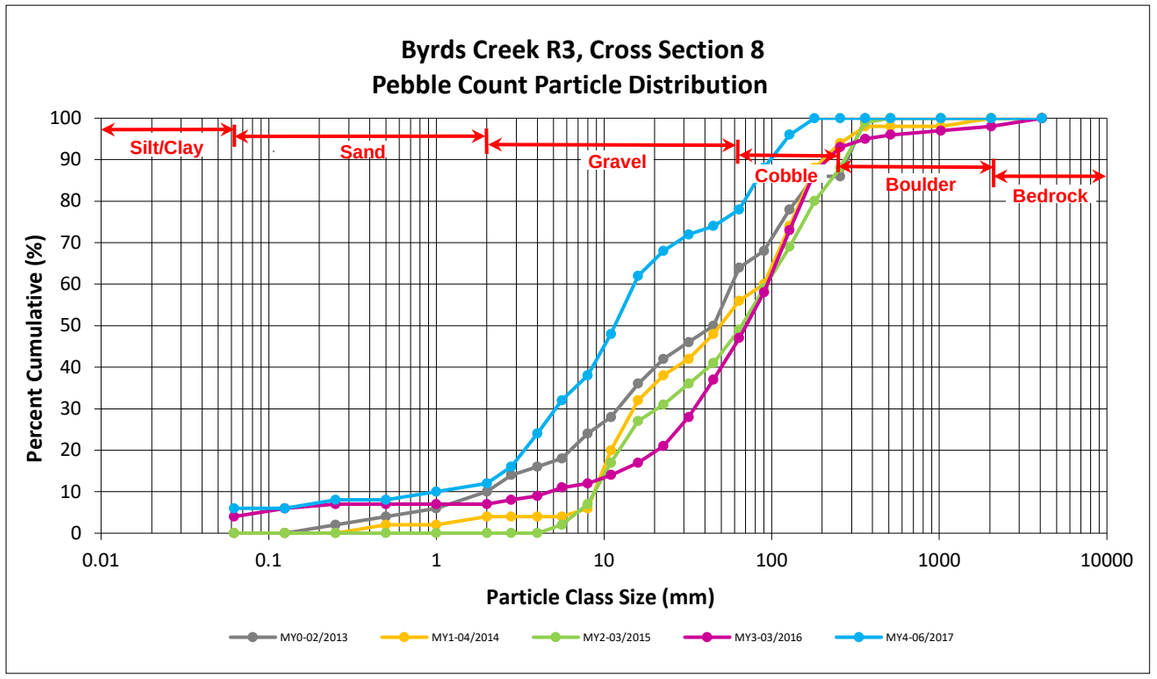
DMS Project No. 95020

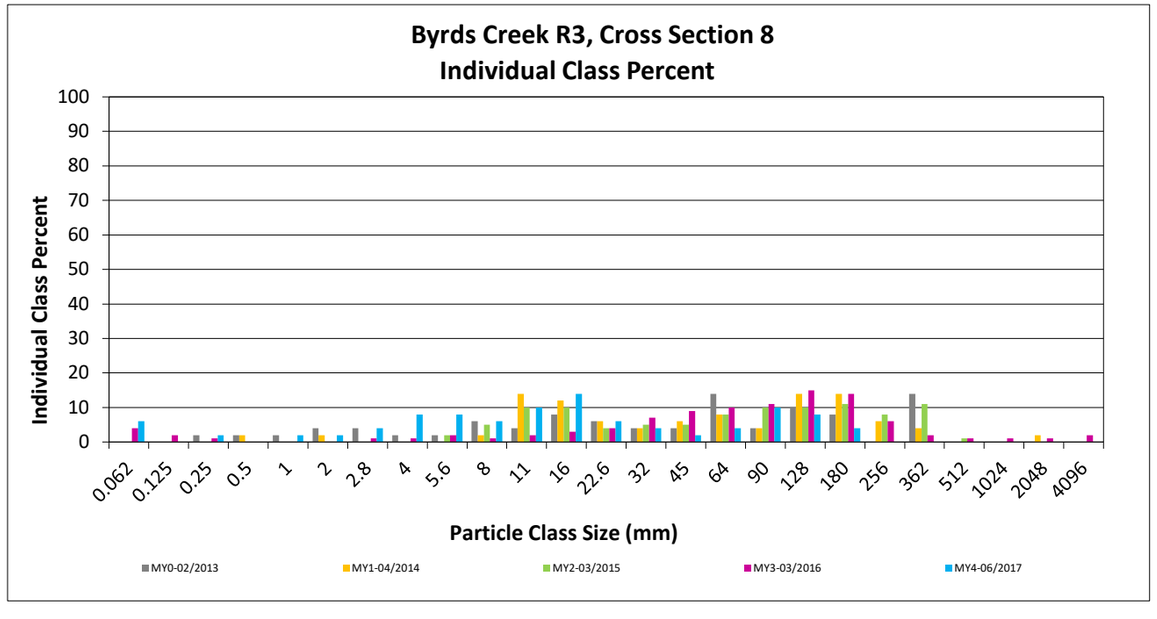
Monitoring Year 4 - 2017

Byrds Creek R3, Cross Section 8

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	2	2	8
	Medium	0.25	0.50			8
	Coarse	0.5	1.0	2	2	10
	Very Coarse	1.0	2.0	2	2	12
GRAVEL	Very Fine	2.0	2.8	4	4	16
	Very Fine	2.8	4.0	8	8	24
	Fine	4.0	5.6	8	8	32
	Fine	5.6	8.0	6	6	38
	Medium	8.0	11.0	10	10	48
	Medium	11.0	16.0	14	14	62
	Coarse	16.0	22.6	6	6	68
	Coarse	22.6	32	4	4	72
	Very Coarse	32	45	2	2	74
	Very Coarse	45	64	4	4	78
COBBLE	Small	64	90	10	10	88
	Small	90	128	8	8	96
	Large	128	180	4	4	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 8	
Channel materials (mm)	
D_{16} =	2.80
D_{35} =	6.69
D_{50} =	11.6
D_{84} =	78.5
D_{95} =	122.5
D_{100} =	180.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

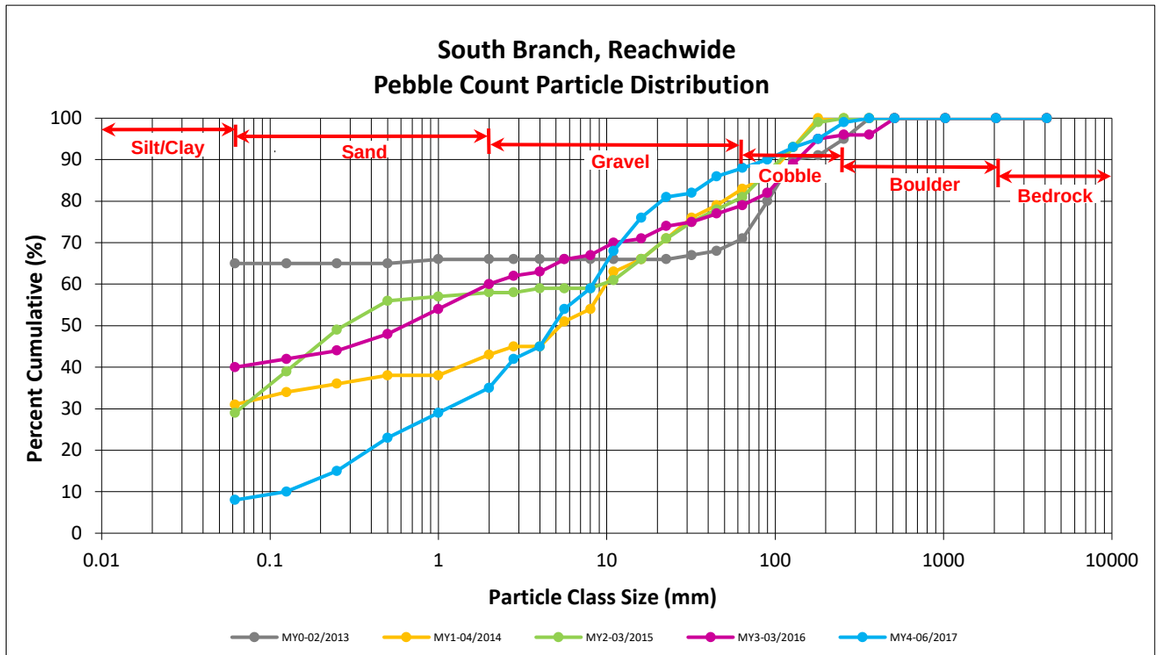
DMS Project No. 95020

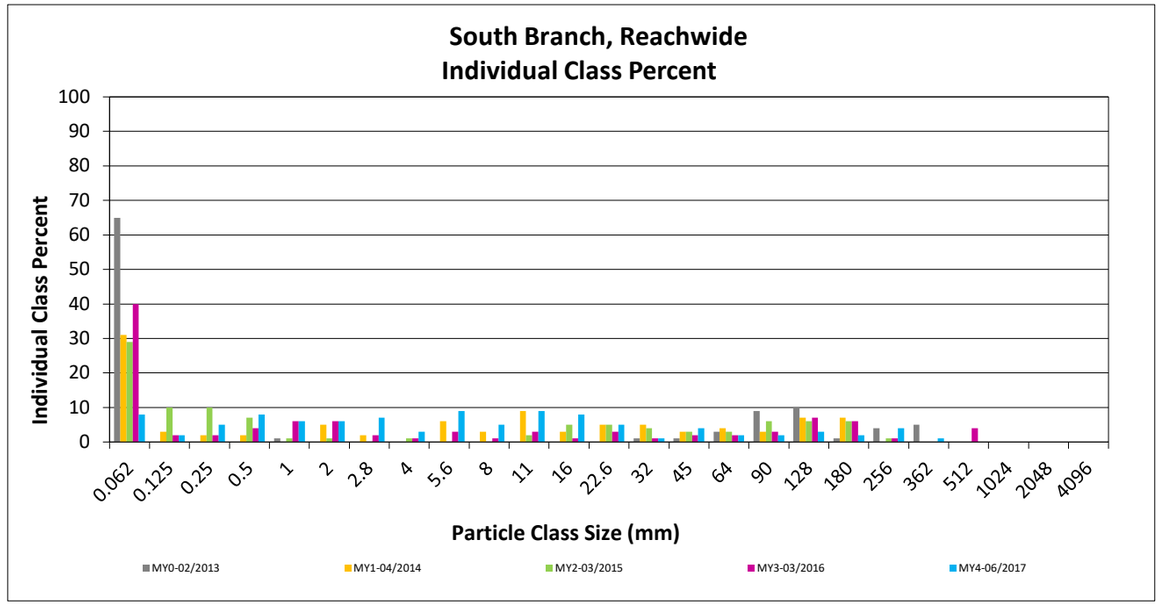
Monitoring Year 4 - 2017

South Branch, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		8	8	8	8
SAND	Very fine	0.062	0.125		2	2	2	10
	Fine	0.125	0.250	1	4	5	5	15
	Medium	0.25	0.50	2	6	8	8	23
	Coarse	0.5	1.0	2	4	6	6	29
	Very Coarse	1.0	2.0	1	5	6	6	35
GRAVEL	Very Fine	2.0	2.8	2	5	7	7	42
	Very Fine	2.8	4.0	2	1	3	3	45
	Fine	4.0	5.6	7	2	9	9	54
	Fine	5.6	8.0	4	1	5	5	59
	Medium	8.0	11.0	6	3	9	9	68
	Medium	11.0	16.0	5	3	8	8	76
	Coarse	16.0	22.6	2	3	5	5	81
	Coarse	22.6	32	1		1	1	82
	Very Coarse	32	45	2	2	4	4	86
	Very Coarse	45	64	2		2	2	88
COBBLE	Small	64	90	2		2	2	90
	Small	90	128	2	1	3	3	93
	Large	128	180	2		2	2	95
	Large	180	256	4		4	4	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} =	0.27
D_{35} =	2.00
D_{50} =	4.8
D_{84} =	37.9
D_{95} =	180.0
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

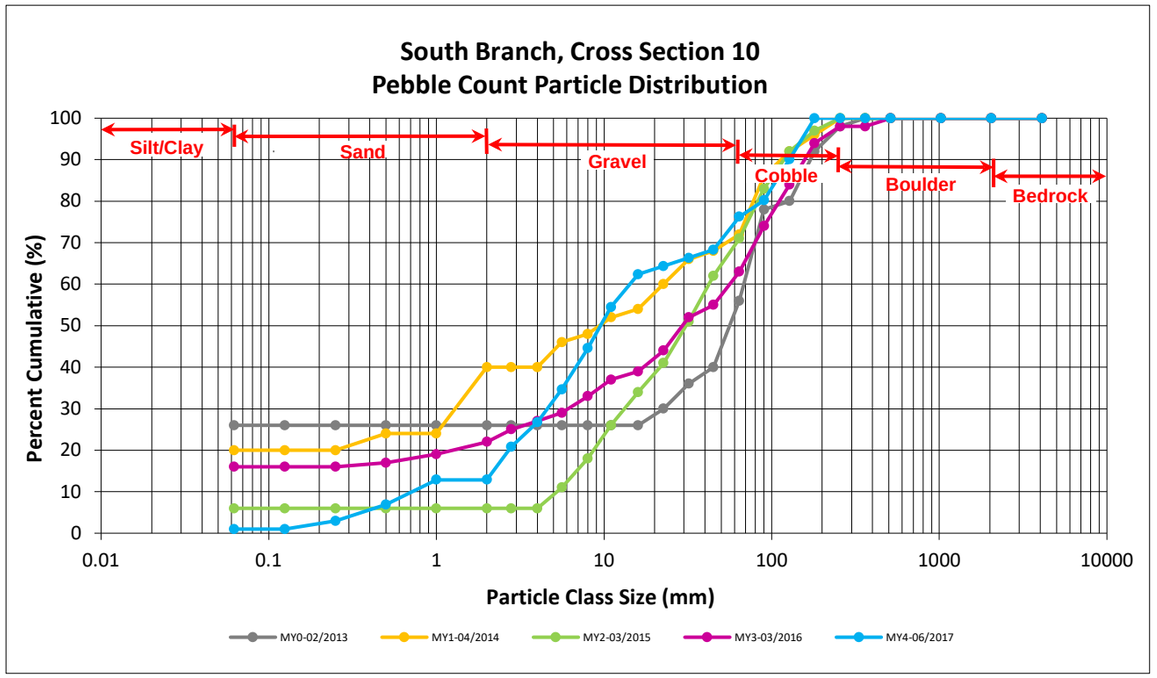
DMS Project No. 95020

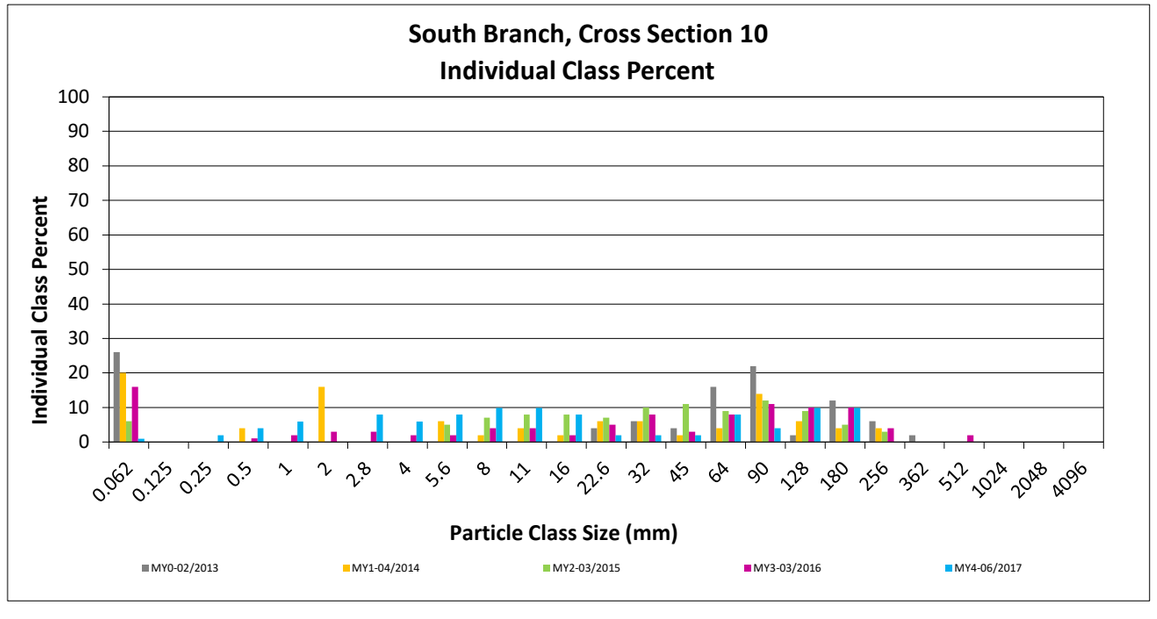
Monitoring Year 4 - 2017

South Branch, Cross Section 10

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	2	2	3
	Medium	0.25	0.50	4	4	7
	Coarse	0.5	1.0	6	6	13
	Very Coarse	1.0	2.0			13
GRAVEL	Very Fine	2.0	2.8	8	8	21
	Very Fine	2.8	4.0	6	6	27
	Fine	4.0	5.6	8	8	35
	Fine	5.6	8.0	10	10	45
	Medium	8.0	11.0	10	10	54
	Medium	11.0	16.0	8	8	62
	Coarse	16.0	22.6	2	2	64
	Coarse	22.6	32	2	2	66
	Very Coarse	32	45	2	2	68
	Very Coarse	45	64	8	8	76
COBBLE	Small	64	90	4	4	80
	Small	90	128	10	10	90
	Large	128	180	10	10	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	**101**	**100**	**100**

Cross Section 10	
Channel materials (mm)	
D_{16} =	2.28
D_{35} =	5.67
D_{50} =	9.5
D_{84} =	103.0
D_{95} =	151.5
D_{100} =	180.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

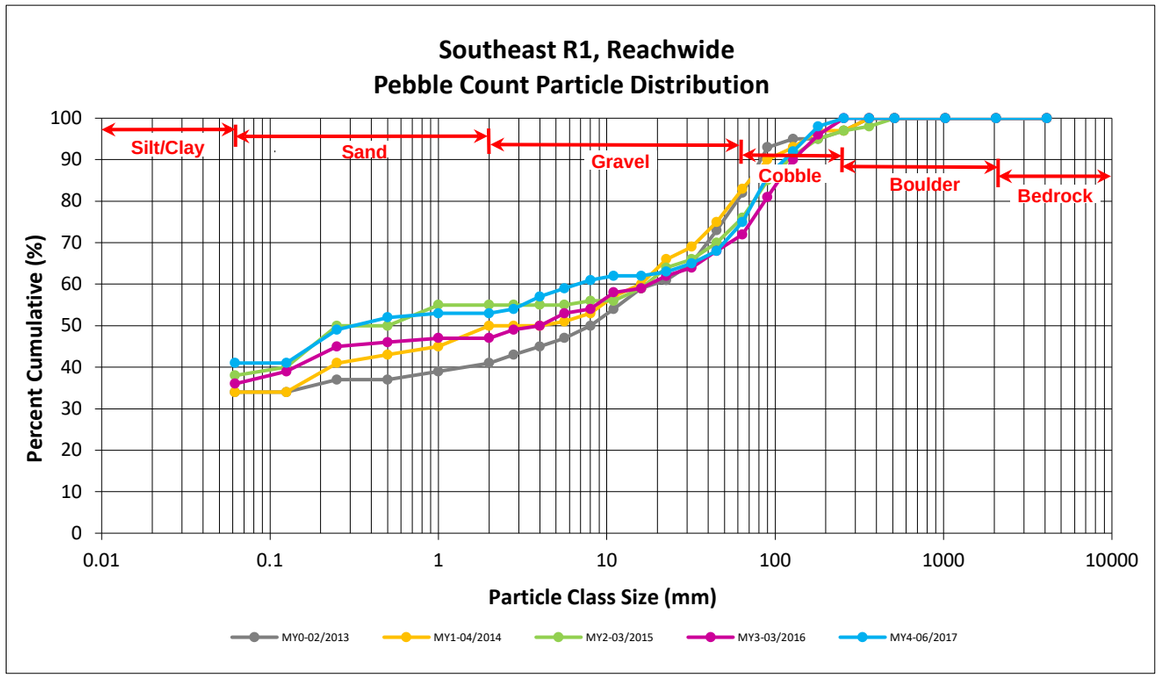
DMS Project No. 95020

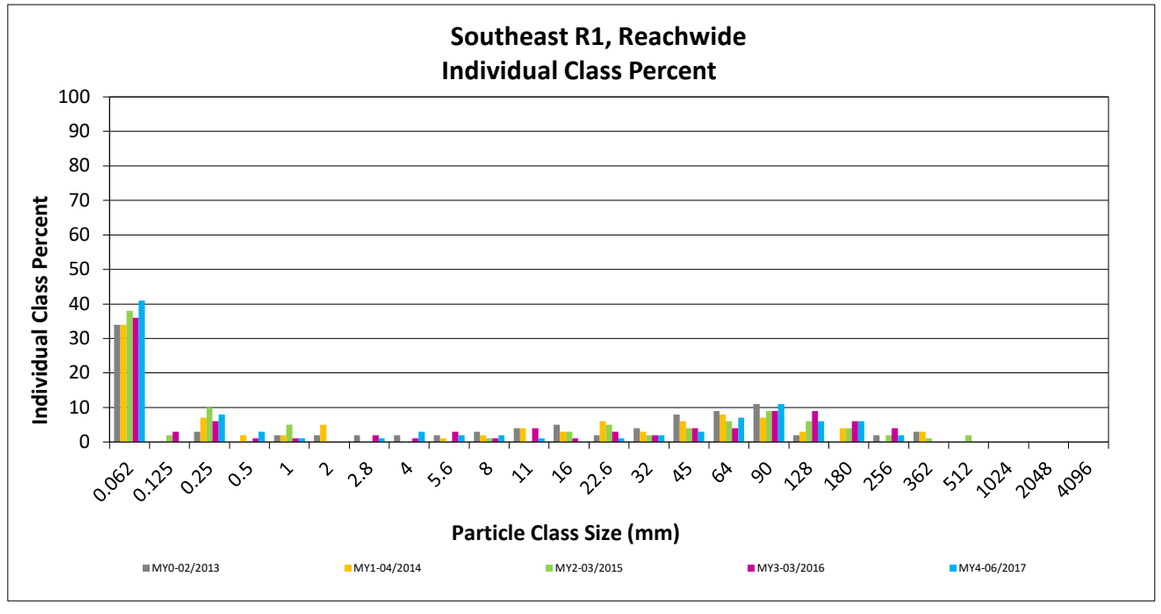
Monitoring Year 4 - 2017

Southeast R1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	35	41	41	41
SAND	Very fine	0.062	0.125					41
	Fine	0.125	0.250	2	6	8	8	49
	Medium	0.25	0.50		3	3	3	52
	Coarse	0.5	1.0	1		1	1	53
	Very Coarse	1.0	2.0					53
GRAVEL	Very Fine	2.0	2.8		1	1	1	54
	Very Fine	2.8	4.0	2	1	3	3	57
	Fine	4.0	5.6	1	1	2	2	59
	Fine	5.6	8.0	1	1	2	2	61
	Medium	8.0	11.0		1	1	1	62
	Medium	11.0	16.0					62
	Coarse	16.0	22.6	1		1	1	63
	Coarse	22.6	32	2		2	2	65
	Very Coarse	32	45	3		3	3	68
	Very Coarse	45	64	7		7	7	75
COBBLE	Small	64	90	11		11	11	86
	Small	90	128	6		6	6	92
	Large	128	180	5	1	6	6	98
	Large	180	256	2		2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	0.3
D_{84} =	84.6
D_{95} =	151.8
D_{100} =	256.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

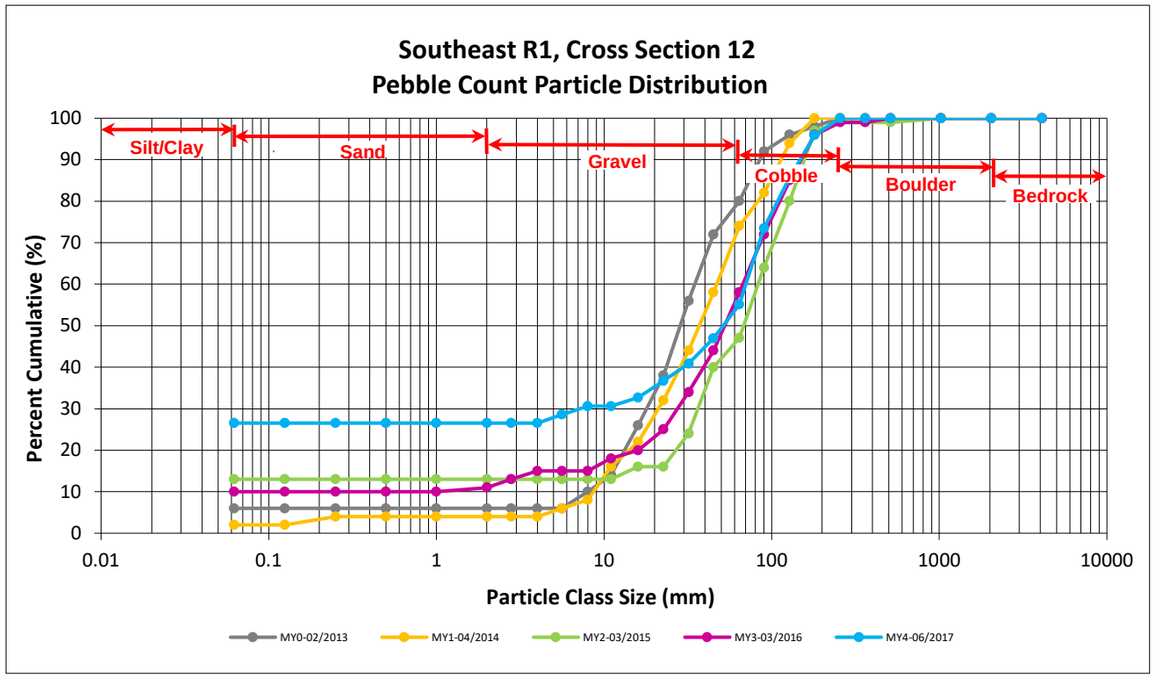
DMS Project No. 95020

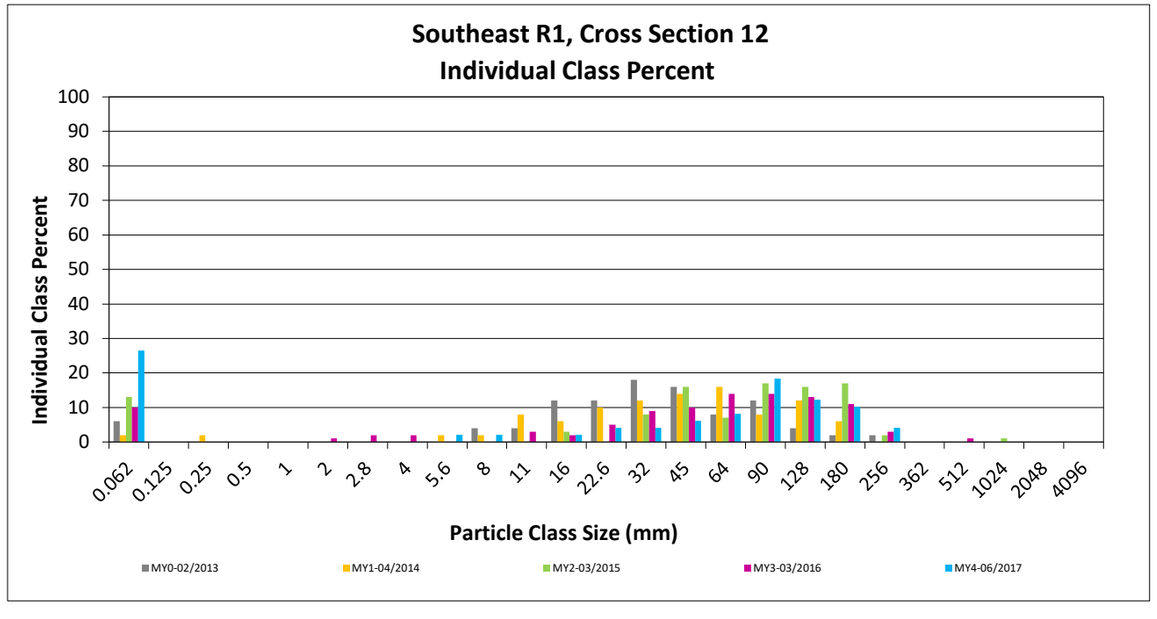
Monitoring Year 4 - 2017

Southeast R1, Cross Section 12

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	26	27	27
SAND	Very fine	0.062	0.125			27
	Fine	0.125	0.250			27
	Medium	0.25	0.50			27
	Coarse	0.5	1.0			27
	Very Coarse	1.0	2.0			27
GRAVEL	Very Fine	2.0	2.8			27
	Very Fine	2.8	4.0			27
	Fine	4.0	5.6	2	2	29
	Fine	5.6	8.0	2	2	31
	Medium	8.0	11.0			31
	Medium	11.0	16.0	2	2	33
	Coarse	16.0	22.6	4	4	37
	Coarse	22.6	32	4	4	41
	Very Coarse	32	45	6	6	47
	Very Coarse	45	64	8	8	55
COBBLE	Small	64	90	18	18	73
	Small	90	128	12	12	86
	Large	128	180	10	10	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	**98**	**100**	**100**

Cross Section 12	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	19.51
D_{50} =	51.4
D_{84} =	121.8
D_{95} =	174.6
D_{100} =	256.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

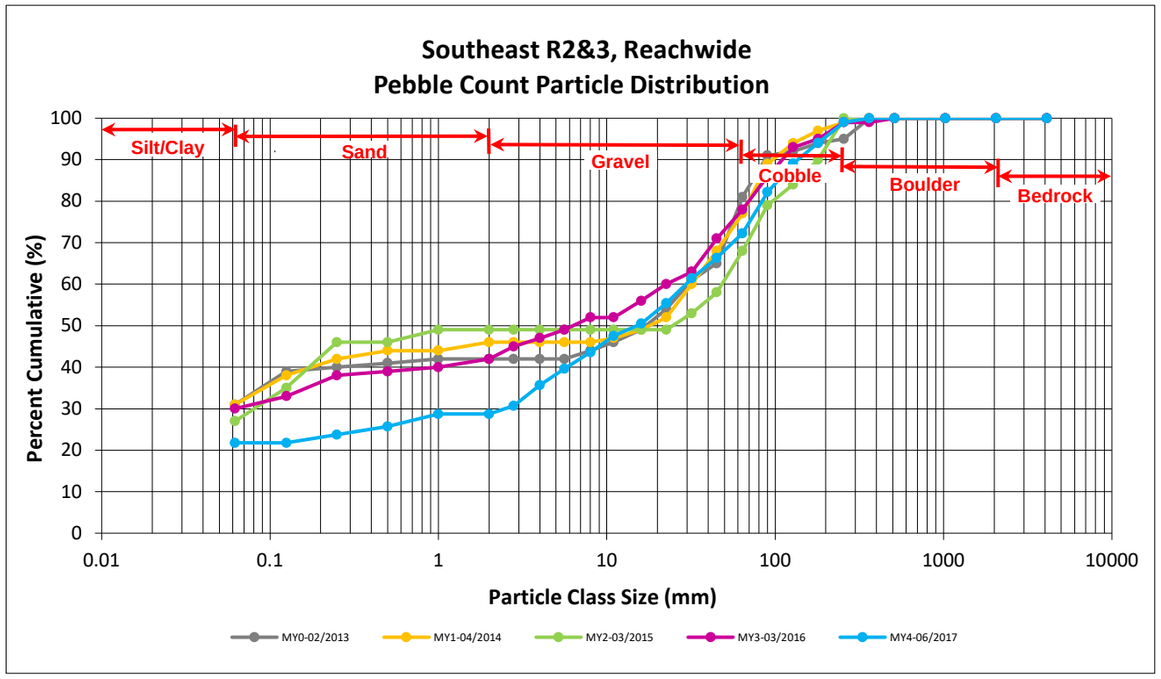
DMS Project No. 95020

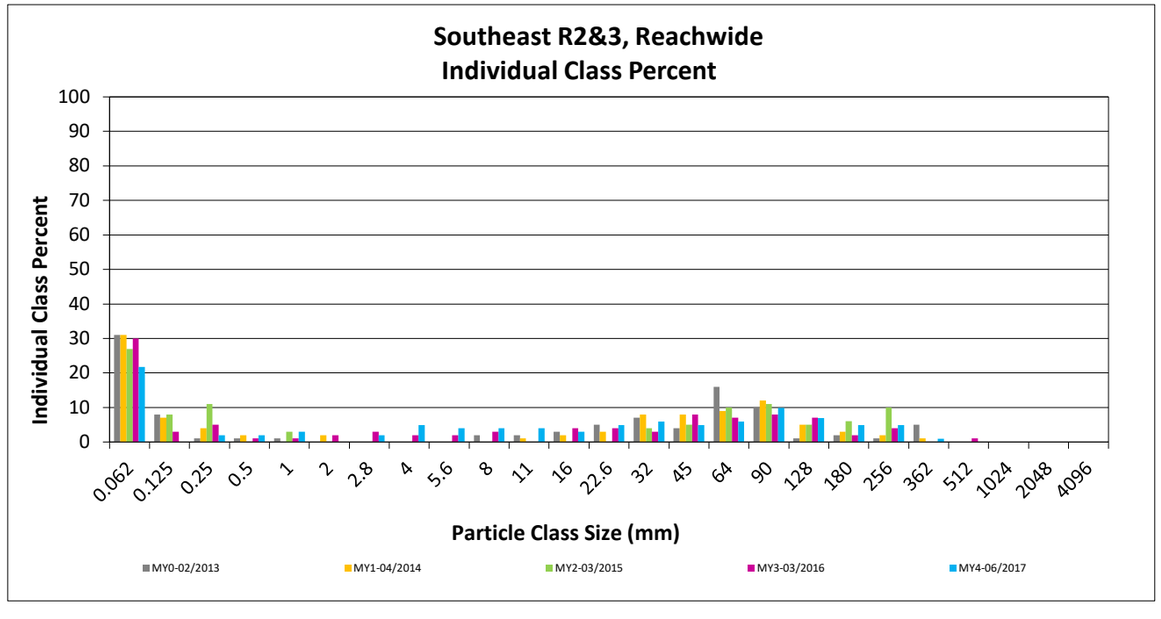
Monitoring Year 4 - 2017

Southeast R2&3, 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	19	22	22	22
SAND	Very fine	0.062	0.125					22
	Fine	0.125	0.250	2		2	2	24
	Medium	0.25	0.50		2	2	2	26
	Coarse	0.5	1.0	1	2	3	3	29
	Very Coarse	1.0	2.0					29
GRAVEL	Very Fine	2.0	2.8	1	1	2	2	31
	Very Fine	2.8	4.0	3	2	5	5	36
	Fine	4.0	5.6	2	2	4	4	40
	Fine	5.6	8.0		4	4	4	44
	Medium	8.0	11.0	2	2	4	4	48
	Medium	11.0	16.0	1	2	3	3	50
	Coarse	16.0	22.6	2	3	5	5	55
	Coarse	22.6	32	5	1	6	6	61
	Very Coarse	32	45	4	1	5	5	66
	Very Coarse	45	64	4	2	6	6	72
COBBLE	Small	64	90	8	2	10	10	82
	Small	90	128	7		7	7	89
	Large	128	180	3	2	5	5	94
	Large	180	256	4	1	5	5	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	**53**	**48**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	3.82
D_{50} =	15.0
D_{84} =	98.7
D_{95} =	192.5
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

Byrds Creek Mitigation Project

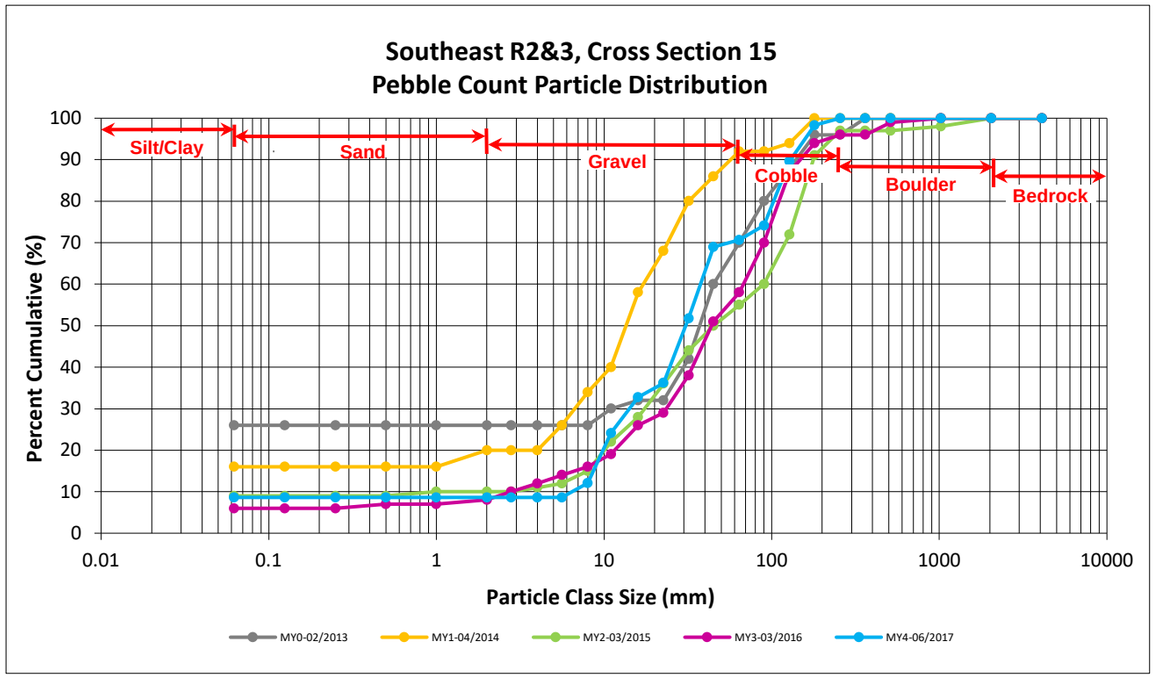
DMS Project No. 95020

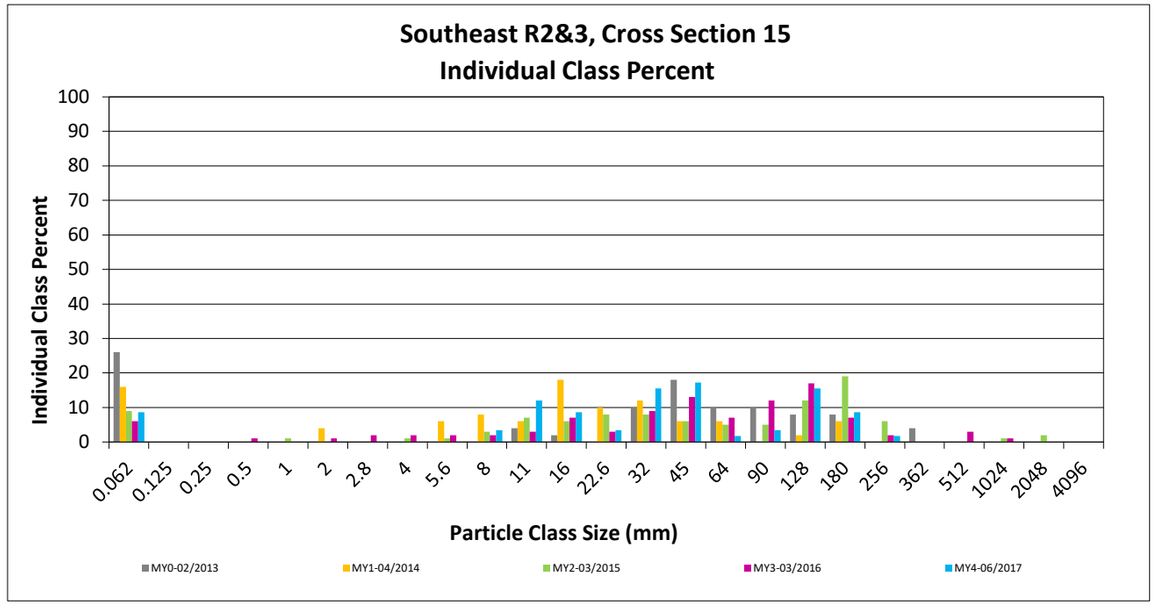
Monitoring Year 4 - 2017

Southeast R2&3, Cross Section 15

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	10	9	9
SAND	Very fine	0.062	0.125			9
	Fine	0.125	0.250			9
	Medium	0.25	0.50			9
	Coarse	0.5	1.0			9
	Very Coarse	1.0	2.0			9
GRAVEL	Very Fine	2.0	2.8			9
	Very Fine	2.8	4.0			9
	Fine	4.0	5.6			9
	Fine	5.6	8.0	4	3	12
	Medium	8.0	11.0	14	12	24
	Medium	11.0	16.0	10	9	33
	Coarse	16.0	22.6	4	3	36
	Coarse	22.6	32	18	16	52
	Very Coarse	32	45	20	17	69
	Very Coarse	45	64	2	2	71
COBBLE	Small	64	90	4	3	74
	Small	90	128	18	16	90
	Large	128	180	10	9	98
	Large	180	256	2	2	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**116**	**100**	**100**

Cross Section 15	
Channel materials (mm)	
D_{16} =	8.87
D_{35} =	20.03
D_{50} =	30.8
D_{84} =	112.6
D_{95} =	158.1
D_{100} =	256.0





APPENDIX 5. Hydrology Summary Data

Table 13. Verification of Bankfull Events

Byrds Creek Mitigation Site (DMS Project No. 95020)

Monitoring Year 4 - 2017

Reach	Date of Data Collection	Date of Occurrence	Method
Byrds Creek	10/24/2017	4/25/2017	Crest Gage/ Pressure Transducer
	10/24/2017	5/25/2017	
	10/24/2017	6/20/2017	
South Branch	4/3/2017	1/23/2017	
	10/24/2017	4/25/2017	
Southeast Branch	4/3/2017	1/10/2017	
	4/3/2017	3/15/2017	
	4/3/2017	3/17/2017	