MONITORING YEAR 1 ANNUAL REPORT

Final

VILE CREEK MITIGATION SITE

Alleghany County, NC
DEQ Contract No. 5999
DMS Project No. 96582

DWR No. 14-0869
USACE Action ID 2014-01585

Data Collection Period: May - October 2017
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PREPARED FOR:

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EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) completed a full-delivery stream and wetland mitigation project at the Vile Creek Mitigation Site (Site) for the North Carolina Division of Mitigation Services (DMS) to restore and enhance a total of 8,056 linear feet (LF) of perennial and intermittent stream and to restore 6.40 acres of riparian wetlands in Alleghany County, NC. The Site is expected to generate 5,053 stream mitigation units (SMUs), and 5.70 riparian wetland mitigation units (WMUs) for the New River Basin (Table 1). The Site is located approximately one mile east of the Town of Sparta, NC in the New River Basin; eight-digit Cataloging Unit (CU) 05050001 and the 14-digit Hydrologic Unit Code (HUC) 05050001030020 (Figure 1). The Site streams consist of Vile Creek and five unnamed tributaries (UT) to Vile Creek including UT1, UT1b, UT1c, UT2, UT3, and a portion of the Little River (Figure 2). Vile Creek flows into the Little River near the downstream site boundary. The land adjacent to the streams and wetlands is primarily maintained cattle pasture and forest.

The Site is within a Targeted Local Watershed (TLW) identified in the New River Basin Restoration Priority (RBRP) plan (NCDENR, 2009). The Site is also located within the planning area for the Little River & Brush Creek Local Watershed Plan (LWP). The LWP identified the following stressors to watershed function: deforested buffers that are heavily grazed, livestock access to the streams, heavily eroded stream banks, land-disturbing activities on steep slopes, non-point source pollution from the Town of Sparta and surrounding areas, and drained and deforested wetland areas (NCDENR, 2007).

The project goals defined in the mitigation plan (Wildlands, 2016) were established with careful consideration of goals and objectives that were described in the RBRP and to meet DMS mitigation needs while maximizing the ecological and water quality uplift with the watershed. The project goals established in the mitigation plan focused on permanent protection for the site, re-establishing natural hydrology and vegetation, reducing water quality stressors, and enhancing terrestrial and aquatic habitat.

The Site construction and as-built survey were completed in February 2017. Monitoring Year (MY) 1 assessments and site visits were completed between April and October 2017 to assess the conditions of the project.

Overall, the Site has met the required stream, vegetation, and hydrology success criteria for MY1. All restored and enhanced streams are stable and functioning as designed. Three bankfull events have occurred on Vile Creek Reach 2 and two bankfull events have occurred on UT1 Reach 2 since construction completion. The overall average stem density for the Site is 595 stems per acre and is therefore on track to meet the MY3 requirement of 320 stems per acre for trees and 160 plants per acres for shrubs. The average bog coverage is 79% which is a 68% improvement from as-built. All ten gages in the wetland re-establishment and rehabilitation areas are meeting or exceeding hydrology success criteria.

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Section 1: PROJECT OVERVIEW

The Site is located approximately one mile east of the Town Sparta in eastern Alleghany County, NC. The project is within the New River Basin; eight-digit Cataloging Unit (CU) 05050001 and the 14-digit Hydrologic Unit Code (HUC) 05050001030020 (Figure 1). Located in the Blue Ridge Belt of the Blue Ridge Province (USGS, 1998), the project watershed primarily includes managed herbaceous, mixed upland hardwoods, and other forested land. The drainage area for the project streams range from 0.01 square miles to 2.69 square miles.

The project streams consist of Vile Creek and five unnamed tributaries (UT) to Vile Creek including UT1, UT1b, UT1c, UT2, UT3, and a portion of the Little River. Stream restoration reaches include Vile Creek (Reaches 1 and 2) and UT1 Reach 2, which together comprising 3,047 linear feet (LF) of perennial stream channel. Stream enhancements reaches include UT1 Reach 1, UT1b, UT1c, UT2, UT3, and a portion of Little River, totaling 5,009 LF. Wetland components include 3.02 acres of wetland rehabilitation and 3.38 acres of wetland re-establishment.

Construction activities were completed by Land Mechanic Designs, Inc. in February 2017. Planting and seeding activities were completed by Bruton Natural Systems, Inc. in February 2017. The land required for construction, management, and stewardship of the mitigation project included portions of five parcels resulting in 25.04 acres of the conservation easement. The project is expected to generate 5,053 stream mitigation units (SMUs) and 5.70 riparian wetland mitigation units (WMUs). Annual monitoring will be conducted for seven years with close-out anticipated to commence in 2024 given the success criteria are met.

1.1 Project Goals and Objectives

The Site is intended to provide numerous ecological benefits within the New River Basin. While many of these benefits are limited to the Vile Creek project area; others, such as pollutant removal, reduced sediment loading, and improved aquatic and terrestrial habitat, have farther-reaching effects. Expected improvements to water quality and ecological processes are outlined below as project goals and objectives. These project goals were established with careful consideration of goals and objectives that were described in the RBRP and to address stressors identified in the LWP.

The following project specific goals established in the mitigation plan (Wildlands, 2016) include:

- Reduce pollutant inputs to streams including fecal coliform, nitrogen, and phosphorous;
- Reduce inputs of sediment into streams from eroding stream banks;
- Return a network of streams to a stable form that is capable of supporting hydrologic, biologic, and water quality functions;
- Improve aquatic communities in project streams and provide improved habitat for trout migrating from Little River into Vile Creek. Note: Presence of aquatic organisms and trout will not be tied to project success criteria;
- Raise local groundwater elevations and allow for more frequent overbank flows to provide a source of hydration for floodplain wetlands. Reduce shear stress on channels during larger flow events;
- Restore wetland hydrology, soils, and plant communities;
- Improve and expand Southern Appalachian bog habitat to support bog species such as bog turtles. Note: Presence of bog turtles will not be tied to project success criteria;
- Create and improve riparian and wetland habitats by planting native vegetation. Provide a canopy to shade streams and reduce thermal loadings. Create a source of woody inputs for

streams. Reduce flood flow velocities on floodplain and improve long-term lateral stability of streams. Improve bog habitat by planting herbaceous wetland plants; and

- Ensure that development and agricultural uses that would damage the site or reduce the benefits of project are prevented.

1.2 Monitoring Year 1 Data Assessment

Annual monitoring and quarterly site visits were conducted during MY1 to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Vile Creek Mitigation Plan (Wildlands, 2016).

1.2.1 Stream Assessment

Morphological surveys for the MY1 were conducted in September 2017. All streams within the site appear stable with some areas exhibiting minor scour.

In general, the cross-sections show little change in the bankfull area, maximum depth ratio, and width-to-depth ratio. All cross-sections fell within the parameters defined for channels of the appropriate stream type (Rosgen, 1994 & 1996). However, cross-section seven had an increase in the cross-section area and bankfull depth. This is not considered a concern since minor fluctuations are expected after newly completed construction. Furthermore, there is no evidence of any headcuts creating this change but rather a micro-habitat that has developed within the chunky riffle structure. Wildlands will continue watch this matter in upcoming monitoring years.

Pebble counts in Vile Creek and UT1 indicate maintenance of coarser materials in the riffle features and finer particles in the pool features. Refer to Appendix 2 for the visual stability assessment table, Current Condition Plan View (CCPV) map, and reference photographs. Refer to Appendix 4 for the morphological data and plots.

1.2.2 Stream Areas of Concern

On July 18, 2017, Wildlands, along with the Inter-Agency Review Team (IRT) and DMS observed some erosion beginning on the outside of a meander bend located at the downstream end of Vile Creek Reach 2. The agencies agreed that the area does not need remedial action at this point, as some fluctuations are expected following construction. Wildlands will continue to monitor this area and take necessary action to stabilize the bank, if the bank erosion advances.

1.2.3 Stream Hydrology Assessment

At the end of the seven-year monitoring period, two or more bankfull events and geomorphically significant (60%+ of bankfull flow) events must have occurred in separate years within the restoration and enhancement reaches. Automated stream gages documented three bankfull events on Vile Creek Reach 2 and two bankfull events on UT1 Reach 2; however, no geomorphically significant events were recorded during the monitoring year 1 period. Refer to Appendix 5 for hydrology summary data and plots.

1.2.4 Vegetative Assessment

A total of 17 woody vegetation plots were established during the baseline monitoring within the project easement area. The woody vegetation plots were installed using a 100 square meter quadrant (10m x 10m or 5m x 20m). The final woody vegetative success criteria will be the survival of 210 planted stems per acre in the planted riparian and wetland corridor at the end of the required monitoring period (MY7). The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of the third monitoring year (MY3) and at least 260 stems per acre at the end

of the fifth monitoring year (MY5). Planted trees must average 10 feet in height in each plot at the end of the seventh year of monitoring. The success criteria for shrubs will be 160 surviving plants per acre at year 3, 130 at year 5, and 105 at year 7. There are no height criteria for shrubs. In addition, eight herbaceous vegetation bog plots were installed using a 20 square meter (5m x 4m) quadrant. The bog plots are assessed by visually estimating the percent coverage within each plot and must have 80% coverage for success criteria.

The MY1 vegetative survey was completed in September 2017. The 2017 vegetation monitoring resulted in an average stem density of 595 stems per acre, which is greater than the interim requirement of 320 stems/acre required at MY3; however, the stem vigor for the woody vegetation was low throughout the Site. The average stem height is 1.9 feet and 69% of the stems have a vigor of 2 or greater. Poor soil nutrients, suffocation due to dense herbaceous coverage or dry soil conditions could all be factors impacting stem vigor. Low vigor can occur following construction; however, rejuvenation is common and typically occurs by MY2 or MY3 once the Site has been able to acclimate to the recent ground disturbance. Despite the low vigor, all 17 of the plots are on track to meet the success criteria required for MY7 (Table 9a, Appendix 3). The bog herbaceous coverage has become well established since project construction (Table 9b, Appendix 3). Refer to Appendix 2 for vegetation plot photographs and the vegetation condition assessment table and Appendix 3 for vegetation data tables.

1.2.5 Vegetation Areas of Concern

Invasive species including Japanese barberry (*Berberis thunbergii*), Oriental bittersweet (*Celastrus orbiculatus*), and multiflora rose (*Rosa multiflora*) are present within and around the Site. These species are not impacting survival rates of planted stems at this time; however, the volume of invasive plants warranted treatment to prevent any future impact. The treatment included cutting the plants and applying glyphosate the stumps or stems. Refer to Appendix 2 for the vegetation condition assessment table and the CCPV map.

1.2.6 Wetland Assessment

A total of ten groundwater hydrology gages (GWGs) were established during the baseline monitoring within the wetland rehabilitation, wetland re-establishment, and bog areas. A barotroll logger (to measure barometric pressure used in the calculations of groundwater levels with gage transducer data) and a rain gage were also installed on Site. All monitoring gages are downloaded on a quarterly basis and maintained as needed. The final performance standard for wetland hydrology will be a free groundwater surface within 12 inches of the ground surface for 14 consecutive days (8.5%) of the defined 169-day growing season which is measured under typical precipitation conditions. The final performance standard for bog areas will be a free groundwater surface within 12 inches of the ground surface for 20 consecutive days (12%) of the growing season.

All ten GWGs met the success criteria for MY1. The measured hydroperiod ranged from 23% to 100% of the growing season. Refer to Appendix 2 for the groundwater gage locations and Appendix 5 for groundwater hydrology summary data and plots.

1.2.7 Wetland Areas of Concern

During a site visit with Wildlands, along with the IRT and DMS, the agencies observed a few areas that required minor adjustments. The middle bog area on the left floodplain along Vile Creek Reach 1 contained concentrated flow paths that conveyed water through the bog. To prevent a potential headcut, the flow was dispersed by placing three coir logs across the concentrated flow paths. This placement is intended to be a temporary measure to prevent erosion until the vegetation is established. At the time of the last site visit, the vegetation growth had improved in this area.

In addition, the most downstream bog berm was constructed too high and backed up 6-10 inches of water behind the berm. To alleviate this excess water, Wildlands manually lowered the spillway elevation by approximately six inches to reduce the water level.

The third area of concern was at the upstream end of Vile Creek Reach 2, where there was a floodplain outlet not functioning properly; therefore, required Wildlands to relocate the outlet to allow the drainage to enter the channel through the natural flow. None of these adjustments affected the GWGs.

1.3 Monitoring Year 1 Summary

The streams within the Site appear to be stable and functioning as designed. Multiple bankfull events were documented on both Vile Creek and UT1; therefore, the Site has partially met the stream hydrological success criteria. The average stem density for the Site is 595 stems per acres and is on track to meeting the MY7 success criteria and all individual vegetation plots meet the MY3 success criteria as noted in the CCPV. Each groundwater gage met the success criteria for MY1. Planned management and maintenance will continue to address any areas of concerns that should advance or arise.

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

Section 2: METHODOLOGY

Geomorphic data were collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using either a Trimble or Topcon handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Crest gages were installed in surveyed riffle cross sections and monitored quarterly. Hydrologic monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers (USACE, 2003) standards. Planted woody vegetation is being monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2006).

Section 3: REFERENCES

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

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

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

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North Carolina Department of Environment and Natural Resources. 2009. New River Basin Restoration Priorities. Retrieved from http://deq.nc.gov/about/divisions/mitigation-services/dms-planning/watershed-planning-documents/new-river-basin

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

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

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

United States Geological Survey (USGS). 1998. North Carolina Geology. https://deq.nc.gov/about/divisions/energy-mineral-land-resources/north-carolina-geological-survey/

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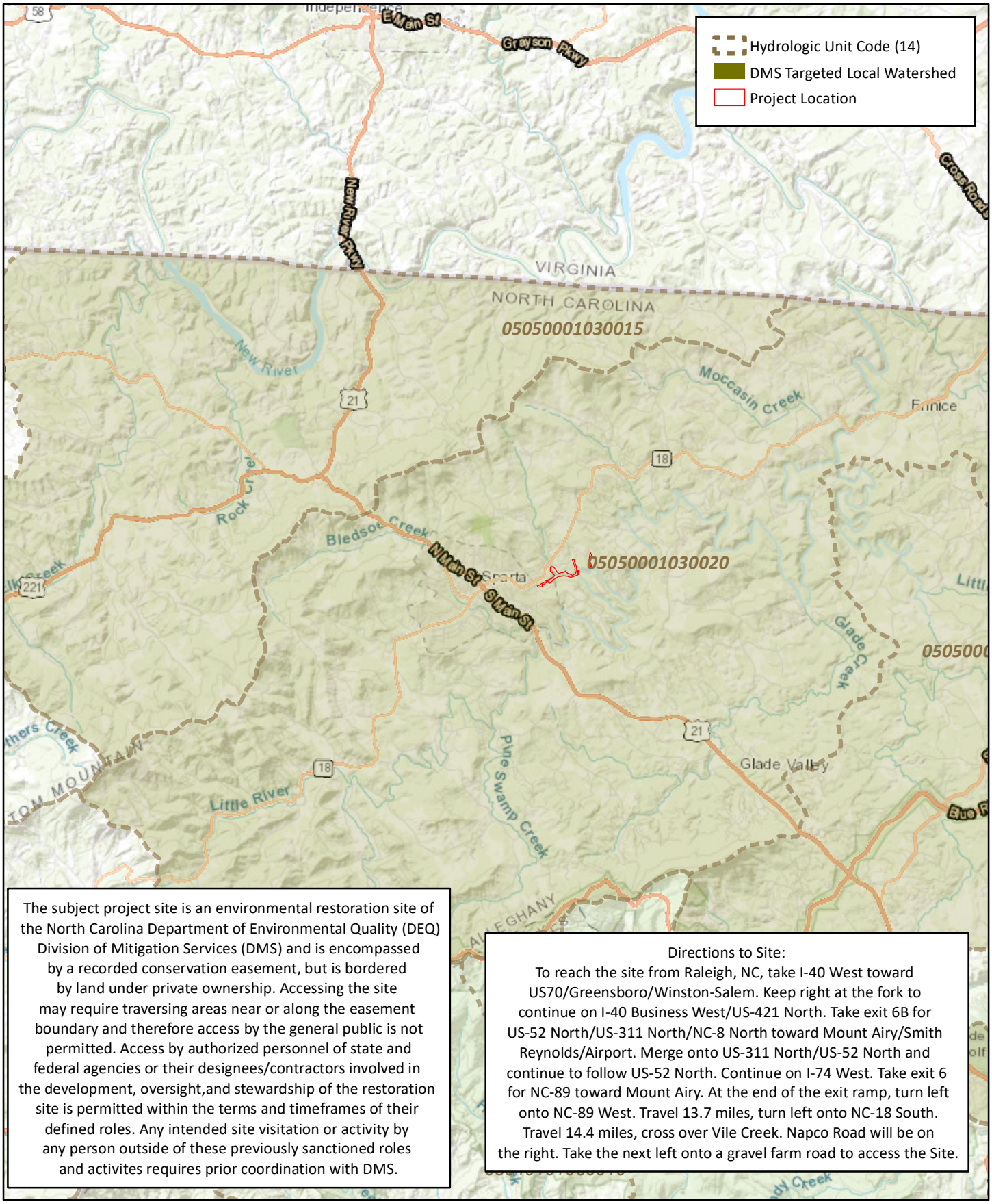
APPENDIX 1. Figures and Tables



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

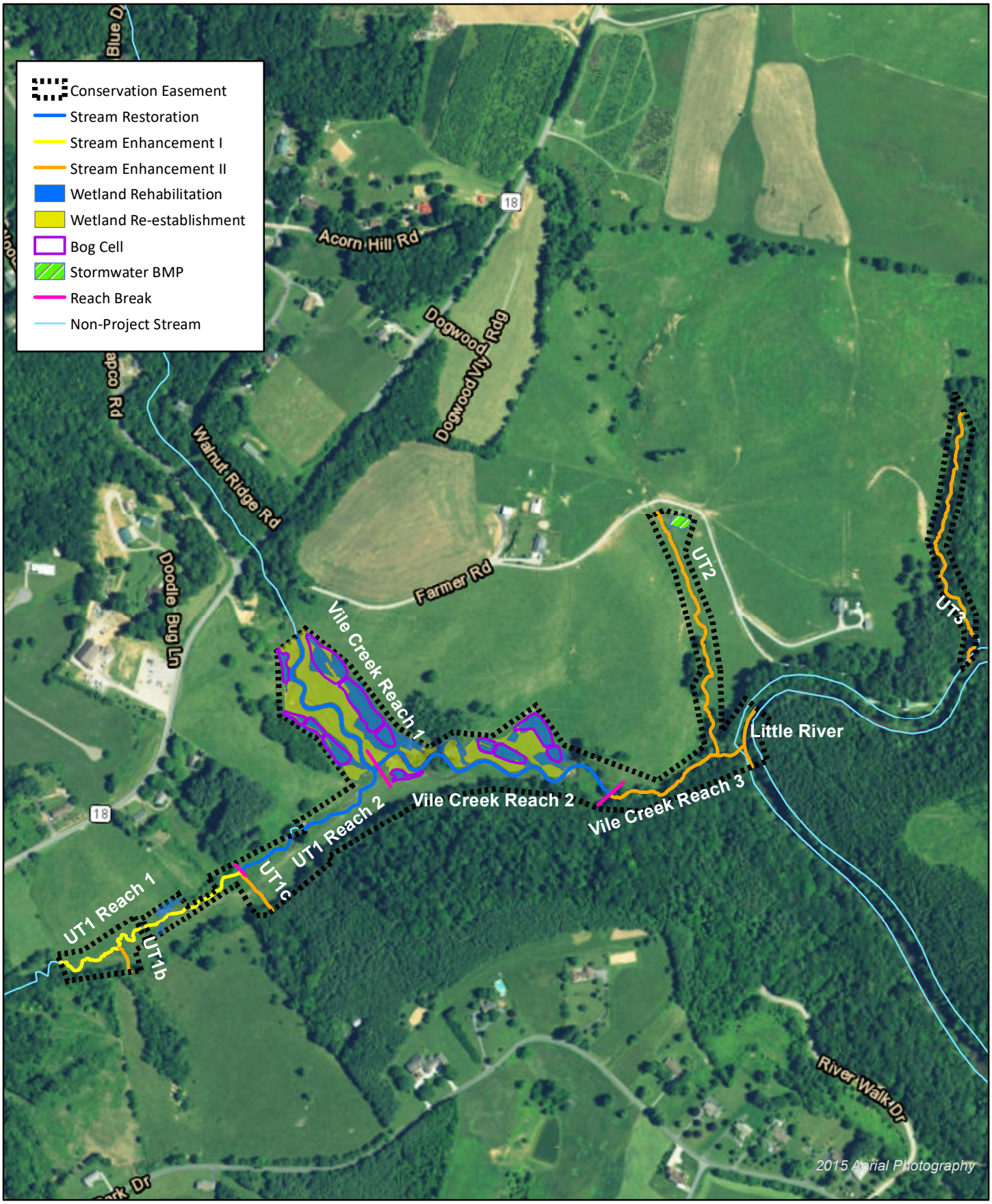
Directions to Site:
To reach the site from Raleigh, NC, take I-40 West toward US70/Greensboro/Winston-Salem. Keep right at the fork to continue on I-40 Business West/US-421 North. Take exit 6B for US-52 North/US-311 North/NC-8 North toward Mount Airy/Smith Reynolds/Airport. Merge onto US-311 North/US-52 North and continue to follow US-52 North. Continue on I-74 West. Take exit 6 for NC-89 toward Mount Airy. At the end of the exit ramp, turn left onto NC-89 West. Travel 13.7 miles, turn left onto NC-18 South. Travel 14.4 miles, cross over Vile Creek. Napco Road will be on the right. Take the next left onto a gravel farm road to access the Site.

WILDLANDS ENGINEERING

0 0.5 1 Mile

Figure 1 Project Vicinity Map
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Alleghany County, NC



WILDLANDS ENGINEERING

0 700 Feet

Figure 2 Project Component Map
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Alleghany County, NC

Table 1. Project Components and Mitigation Credits
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

MITIGATION CREDITS									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient
Type	R	RE	R	RE	R	RE			
Totals	5,053	N/A	5.70	N/A	N/A	N/A	N/A	N/A	N/A

PROJECT COMPONENTS											
Reach ID	Existing Footage/ Acreage	Design Footage/ Acreage	Approach	Restoration (R) or Restoration Equivalent (RE)	As-Built Stationing/ Location[3]	As Built Footage/ Acreage[3]	Creditable As Built Footage/ Acreage[1,3]	Mitigation Ratio	Buffer Width Credit Reduction[2]	As-Built Credits (SMU/WMU)[2,3]	Notes
STREAMS											
Vile Creek Reach 1	962	920	P1	Restoration (R)	101+81 - 110+63	882	882	1:1	N/A	882	Alignment changed from mitigation plan/final design due to bedrock obstruction.
Vile Creek Reach 2	1,247	1,260	P1	Restoration (R)	110+63 -123+74	1,311	1,311	1:1	N/A	1,311	Alignment changed from mitigation plan/final design due to bedrock obstruction.
Vile Creek Reach 3	714	714	Bank Grading/ Fencing/Planting	Enhancement II (R)	123+74 - 130+87	713	713	2.5:1	6	279	As-Built credits were reduced for areas where easement is restricted and the full buffer width is not possible.
UT1 Reach 1	1,143	1,107	Reconstructing channel to correct profile & cross section	Enhancement I (R)	201+60 - 207+16 & 207+42 - 212+74	1,114	1,088	1.5:1	95	630	Excludes one 25 foot easement crossing break from 207+13 - 207+38. As-Built credits were reduced for areas where easement is restricted and the full buffer width is not possible.
UT1 Reach 2	989	825	P1	Restoration (R)	212+74 - 215+68 & 216+45 - 221+28	854	777	1:1	27	750	Excludes 77 feet of stream outside of conservation easement from 215+68 - 216+45. Alignment changed from design due to bedrock obstruction. As-Built credits were reduced for areas where easement is restricted and the full buffer width is not possible.
UT1B	128	128	Fencing/Planting	Enhancement II (R)	250+36 - 251+64	128	128	2.5:1	3	48	As-Built credits were reduced for areas where easement is restricted and the full buffer width is not possible.
UT1C	234	228	Fencing/Planting	Enhancement II (R)	270+53 - 272+81	228	228	2.5:1	2	89	As-Built credits were reduced for areas where easement is restricted and the full buffer width is not possible.
UT2	1,226	1,226	Fencing/Planting	Enhancement II (R)	300+36 - 312+62	1,226	1,226	2.5:1	N/A	490	
UT3	1,316	1,236	Fencing/Planting	Enhancement II (R)	401+10 - 412+94 & 413+29 - 414+26	1,316	1,236	2.5:1	33	461	Creditable length reduced by 45 LF to account for 45 LF of alignment that does not have the full bankfull width within the CE.
Little River	284	284	Fencing/Planting	Enhancement II (R)	502+33 - 505+17	284	284	2.5:1	N/A	114	
WETLANDS											
Wetland Rehabilitation	3.02	3.02	Planting / Minor grading	Restoration (R)	N/A	3.02	3.02	1.3:1	N/A	2.32	
Wetland Re-establishment	0	3.50	Grading / Planting	Restoration (R)	N/A	3.38	3.38	1:1	N/A	3.38	The reduction in wetland re-establishment acreage from design to as-built stages was mainly due to Vile Creek Reaches 1 and 2 having wider top widths in the as-built survey than in the design wetland area calculations. Thus, Vile Creek cut more into the wetland area in the as-built plans than it did in the design calculations, resulting in lower as-built wetland acreage.

[1] Creditable As-Built footage excludes conservation easement breaks and a section along UT3 that exists outside of conservation easement.
[2] As-Built credits (SMUs) have been adjusted where the easement is restricted and the full buffer width and/or bankfull width is not fully contained within the conservation easement. The reductions are greater in the as-built compared to the mitigation plan. The as-built credit reductions follows the updated 2016 USACE Wilmington District Stream and Wetland Compensatory Mitigation update.
[3] Stream mitigation credits and stationg noted above are based on the as-built stream centerline.

COMPONENT SUMMATION					
Restoration Level	Stream (LF)	Riparian Wetland (acres)	Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
Restoration	3,047				
Enhancement I	1,114				
Enhancement II	3,895				
Wetland Rehabilitation		3.02			
Wetland Re-establishment		3.38			

Table 2. Project Activity and Reporting History

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Activity or Report		Data Collection Complete	Completion or Scheduled Delivery
Mitigation Plan		N/A	June 2016
Final Design - Construction Plans		N/A	June 2016
Construction		N/A	February 2017
Temporary S&E mix applied to entire project area[1]		N/A	February 2017
Permanent seed mix applied to reach/segments[1]		N/A	February 2017
Bare root and live stake plantings for reach/segments		N/A	February 2017
Baseline Monitoring Document (Year 0)	Stream Survey	March 2017	April 2017
	Vegetation Survey	April 2017	April 2017
Year 1 Monitoring	Stream Survey	September 2017	December 2017
	Vegetation Survey	September 2017	December 2017
Year 2 Monitoring	Stream Survey	2018	December 2018
	Vegetation Survey	2018	December 2018
Year 3 Monitoring	Stream Survey	2019	December 2019
	Vegetation Survey	2019	December 2019
Year 4 Monitoring	Stream Survey	2020	December 2020
	Vegetation Survey	2020	December 2020
Year 5 Monitoring	Stream Survey	2021	December 2021
	Vegetation Survey	2021	December 2021
Year 6 Monitoring	Stream Survey	2022	December 2022
	Vegetation Survey	2022	December 2022
Year 7 Monitoring	Stream Survey	2023	December 2023
	Vegetation Survey	2023	December 2023

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

Table 3. Project Contact Table

Vile Creek Mitigation Site
DMS Project No.96582
Monitoring Year 1 - 2017

Designer Jeff Keaton, PE	**Wildlands Engineering, Inc.** 1430 South Mint Street, Ste 104 Charlotte, NC 28205 704.332.7754
Construction Contractor	**Land Mechanics Design, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**Land Mechanics Design, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Seed Mix Sources	**Green Resource, LLC**
Nursery Stock Suppliers **Bare Roots** **Live Stakes** **Plugs**	 **Dykes and Son Nursery** **Bruton Natural Systems, Inc.; Foggy Mountain Nursery, LLC** **Wetland Plants Inc.**
Monitoring Performers	**Wildlands Engineering, Inc.**
Monitoring, POC	Kirsten Gimbert 704.332.7754, ext. 110

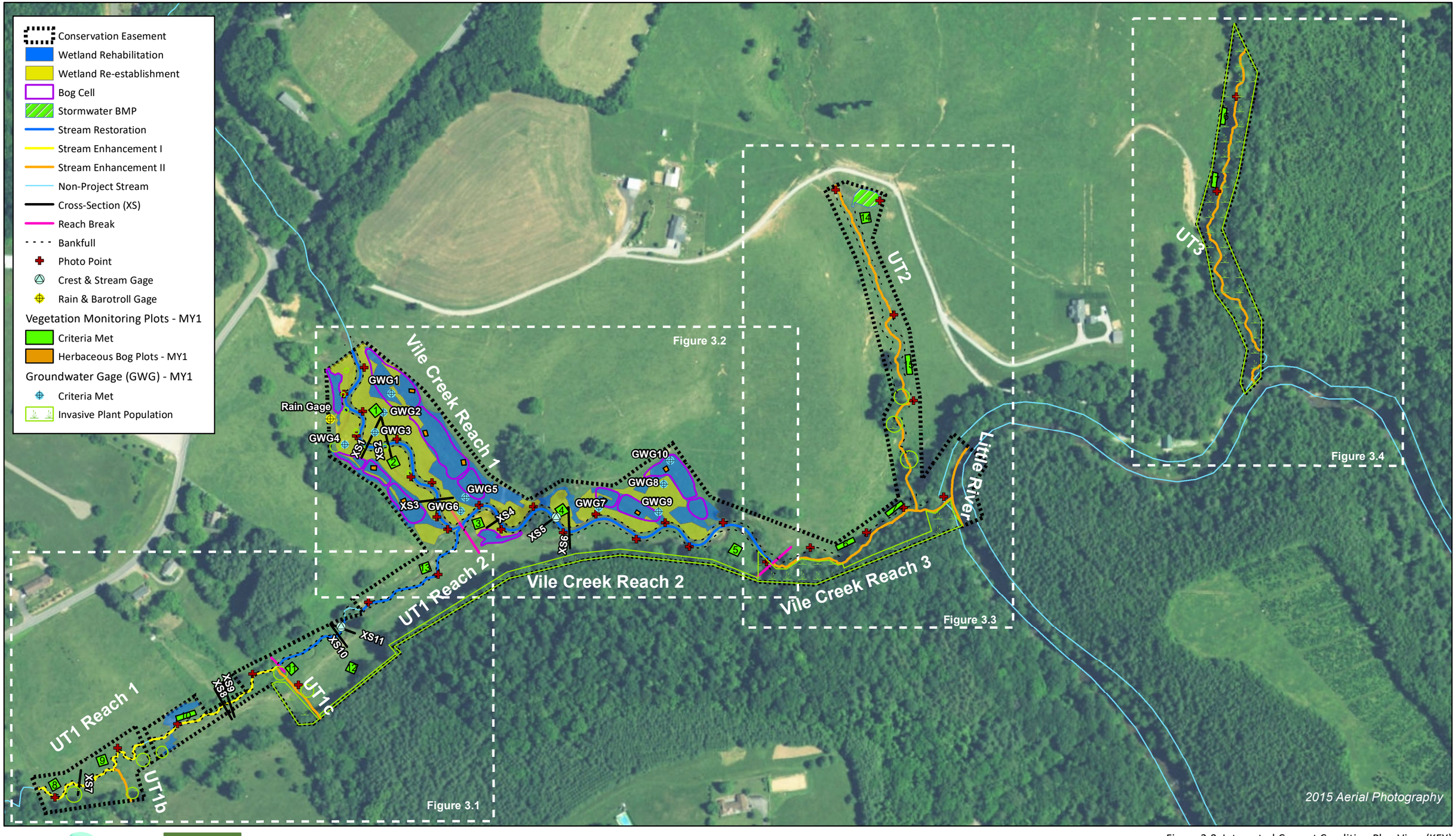
Table 4. Project Information and Attributes
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

PROJECT INFORMATION	
Project Name	Vile Creek Mitigation Site
County	Alleghany County
Project Area (acres)	25.04
Project Coordinates (latitude and longitude)	36.510530° N, -80.104092° W
PROJECT WATERSHED SUMMARY INFORMATION	
Physiographic Province	Blue Ridge Belt of the Blue Ridge Province
River Basin	New
USGS Hydrologic Unit 8-digit	05050001
USGS Hydrologic Unit 14-digit	05050001030020
DWR Sub-basin	05-07-03
Project Drainiage Area (acres)	22,912
Project Drainage Area Percentage of Impervious Area	2%
CGIA Land Use Classification	Managed Herbaceous (50%), Forested (45%), Mountain Conifers (3%), Impervious (2%)

REACH SUMMARY INFORMATION										
Parameters	**Vile Creek Reach 1**	**Vile Creek Reach 2**	**Vile Creek Reach 3**	**UT1 Reach 1**	**UT1 Reach 2**	**UT1B**	**UT1C**	**UT2**	**Little River**	**UT3**
Length of Reach (linear feet) - Post-Restoration	882	1,311	713	1,114	854	128	228	1,226	284	1,316
Drainage Area (acres)	1,375	1,639	1,720	190	218	8	8	80	22,912	38
NCDWR Stream Identification Score - Pre-Restoration	45.5	45.5	45.5	43	43	28.25	26	27, 42.5	49.5	33.5
NCDWR Water Quality Classification	C									
Morphological Desription (stream type) - Pre-Restoration	C3	C4	C4	E4b	F4b	E4b	E4b	B4	C4	B4a
Evolutionary Trend (Simon's Model) - Pre-Restoration	IV	IV	IV	III	IV	III	III	II	I	III
Underlying Mapped Soils	Alluvial land, wet (Nikwasi); Chandler silt loam; Chandler stony silt loam; Chester loam; Chester stony loam; Clifton loam; Fannin silt loam; Stony Steep Land; Tate loam; Tusquitee loam; Watauga loam									
Drainage Class	Very poorly drained (Alluvial land, wet (Nikwasi); Well Drained (Chester loam, Chester stony loam, Clifton loam, Fannin silt loam, Tate loam, Tusquitee loam, Watauga loam); Somewhat excessively drained (Chandler silt loam, Chandlery stony silt loam); Excessively drained (Stony steep land).									
Soil Hydric Status	A/D (Nikwasi); A (Chandler silt loam, Chandler stony silt loam, Tusquitee loam, Stony steep land); B (Chester silt loam, Chester stony loam, Clifton loam, Fannin silt loam, Tate loam, Watauga loam)									
Valley Slope - Pre-Restoration	0.017	0.016	0.015	0.032	0.033	0.071	0.067	0.048	N/A	0.070
FEMA Classification	AE									
Native Vegetation Community	Montane Alluvial Forest, Southern Appalachian Bog									
Percent Composition Exotic Invasive Vegetation -Post-	<1%									

REGULATORY CONSIDERATIONS			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3885. Action ID# SAW-2014-01585
Waters of the United States - Section 401	Yes	Yes	
Division of Land Quality (Dam Safety)	N/A	N/A	N/A
Endangered Species Act	Yes	Yes	Vile Creek Mitigation Site Categorical Exclusion (CE) Approved 9/15/2014
Historic Preservation Act	Yes	Yes	No historic resources were found to be impacted (letter from SHPO dated 7/25/2014)
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	No impact application was prepared for local review. No post-project activities required.	Vile Creek Final Mitigation Plan (June 2016) and Vile Creek Categorical Exclusion (CE) Approved 9/15/2014
Essential Fisheries Habitat	No	No	Vile Creek Final Mitigation Plan (June 2016) and Vile Creek Categorical Exclusion (CE) Approved 9/15/2014

APPENDIX 2. Visual Assessment Data



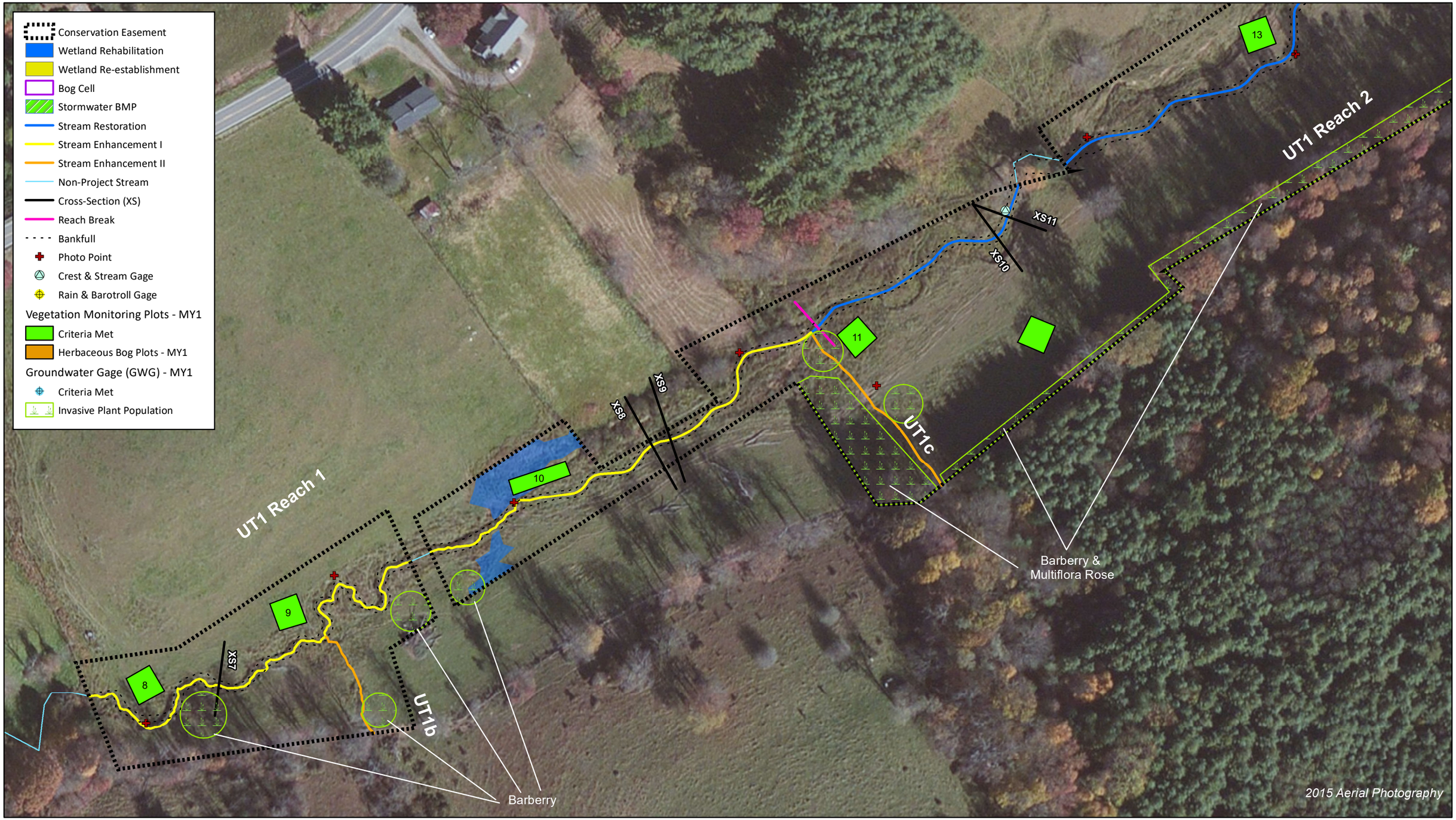
WILDLANDS ENGINEERING

0 300 600 Feet

N

Figure 3.0 Integrated Current Condition Plan View (KEY)
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Alleghany County, NC



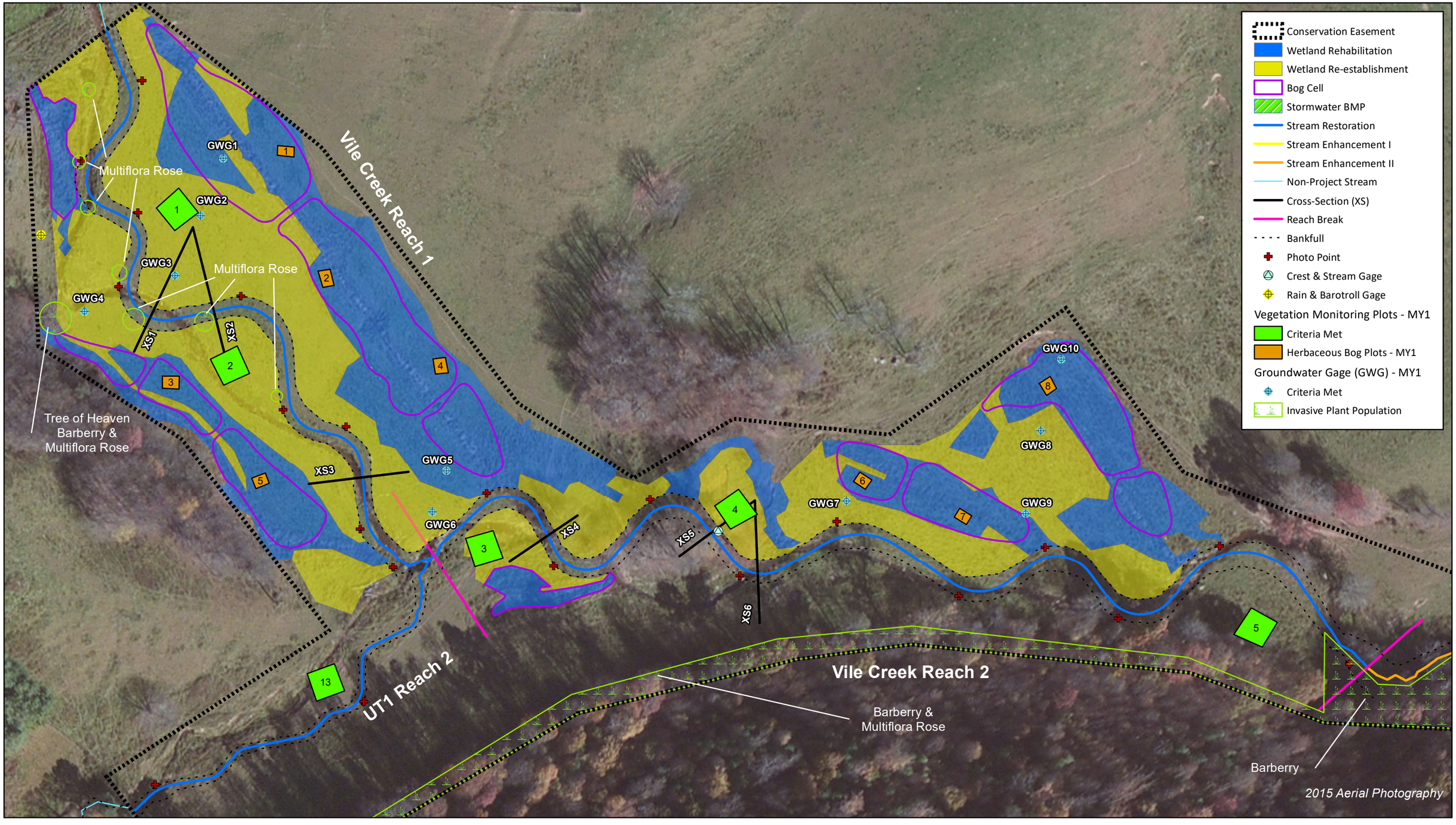
WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 3.1 Integrated Current Condition Plan View (Sheet 1)
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Alleghany County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 3.2 Integrated Current Condition Plan View (Sheet 2)
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Alleghany County, NC

Little River

UT2

Vile Creek Reach 3

15

14

7

6

Multiflora Rose &
Bittersweet

Barberry &
Multiflora Rose

Barberry &
Multiflora Rose

2015 Aerial Photography

- Conservation Easement
- Wetland Rehabilitation
- Wetland Re-establishment
- Bog Cell
- Stormwater BMP
- Stream Restoration
- Stream Enhancement I
- Stream Enhancement II
- Non-Project Stream
- Cross-Section (XS)
- Reach Break
- Bankfull
- Photo Point
- Crest & Stream Gage
- Rain & Barotroll Gage

Vegetation Monitoring Plots - MY1

- Criteria Met
- Herbaceous Bog Plots - MY1

Groundwater Gage (GWG) - MY1

- Criteria Met
- Invasive Plant Population

WILDLANDS ENGINEERING

0 100 200 Feet

Figure 3.3 Integrated Current Condition Plan View (Sheet 3)
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Alleghany County, NC

WILDLANDS ENGINEERING

0 100 200 Feet

Figure 3.4 Integrated Current Condition Plan View (Sheet 4)
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Alleghany County, NC

Table 5a. Visual Stream Morphology Stability Assessment Table
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

UT1 Reach 1 (1,114 LF)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	22	22			100%			
	3. Meander Pool Condition	Depth Sufficient	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, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	N/A	N/A			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	N/A	N/A			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	N/A	N/A			N/A			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	N/A	N/A			N/A			

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

Table 5b. Visual Stream Morphology Stability Assessment Table
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

UT1 Reach 2 (854 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, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	N/A	N/A			N/A			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	N/A	N/A			N/A			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	N/A	N/A			N/A			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	N/A	N/A			N/A			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	N/A	N/A			N/A			

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

Table 5c. Visual Stream Morphology Stability Assessment Table
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 1 (882 LF)

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

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

Table 5d. Visual Stream Morphology Stability Assessment Table
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 2 (1,311 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	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, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	6	6			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%.	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	6	6			100%			

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

Table 5e. Visual Stream Morphology Stability Assessment Table
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 3 (713 LF)

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

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

Table 6. Vegetation Condition Assessment Table
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Planted Acreage **17**

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	0.0%
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	0.0%
		Cumulative Total	**0**	**0.0**	**0.0%**

Easement Acreage **25**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	1,000	19	4.3	17.2%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0	0	0.0%

Stream Photographs

	
Photo Point 1 – view upstream Vile Creek R1 *(9/27/2017)*	**Photo Point 1** – view downstream Vile Creek R1 *(9/27/2017)*
	
Photo Point 2 – view upstream Vile Creek R1 *(9/27/2017)*	**Photo Point 2** – view downstream Vile Creek R1 *(9/27/2017)*
	
Photo Point 3 – view upstream Vile Creek R1 *(9/27/2017)*	**Photo Point 3** – view downstream Vile Creek R1 (*9/27/2017)*

	
Photo Point 4 – view upstream Vile Creek R1 *(9/27/2017)*	**Photo Point 4** – view downstream Vile Creek R1 *(9/27/2017)*
	
Photo Point 5 – view upstream Vile Creek R1 *(9/27/2017)*	**Photo Point 5** – view downstream Vile Creek R1 *(9/27/2017)*
	
Photo Point 6 – view upstream Vile Creek R1 *(9/27/2017)*	**Photo Point 6** – view downstream Vile Creek R1 *(9/27/2017)*

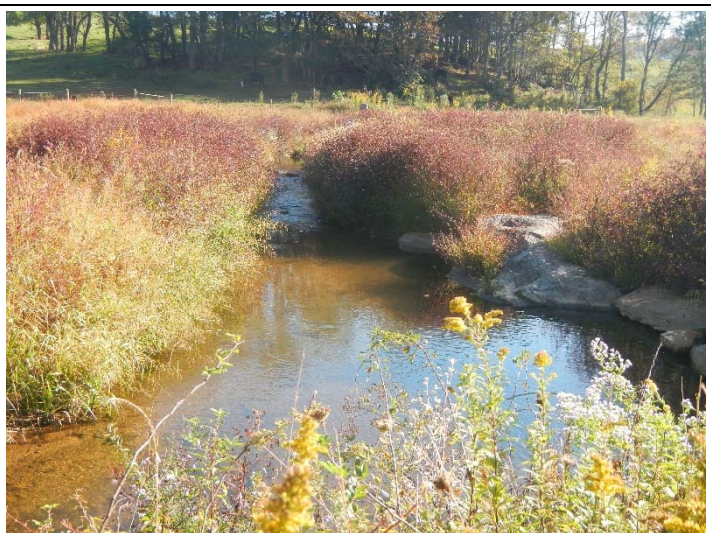
	
Photo Point 7 – view upstream Vile Creek R1 *(9/27/2017)*	**Photo Point 7** – view downstream Vile Creek R1 *(9/27/2017)*
	
Photo Point 8 – view upstream Vile Creek R1 *(9/27/2017)*	**Photo Point 8** – view downstream Vile Creek R1 *(9/27/2017)*
	
Photo Point 9 – view upstream Vile Creek R1 *(9/27/2017)*	**Photo Point 9** – view downstream Vile Creek R1 *(9/27/2017)*

	
Photo Point 10 – view upstream Vile Creek R2 *(9/27/2017)*	**Photo Point 10** – view downstream Vile Creek R2 *(9/27/2017)*
	
Photo Point 11 – view upstream Vile Creek R2 *(9/27/2017)*	**Photo Point 11** – view downstream Vile Creek R2 *(9/27/2017)*
	
Photo Point 12 – view upstream Vile Creek R2 *(9/27/2017)*	**Photo Point 12** – view downstream Vile Creek R2 *(9/27/2017)*

	
Photo Point 13 – view upstream Vile Creek R2 *(9/27/2017)*	**Photo Point 13** – view downstream Vile Creek R2 *(9/27/2017)*
	
Photo Point 14 – view upstream Vile Creek R2 *(9/27/2017)*	**Photo Point 14** – view downstream Vile Creek R2 *(9/26/2017)*
	
Photo Point 15 – view upstream Vile Creek R2 *(9/26/2017)*	**Photo Point 15** – view downstream Vile Creek R2 *(9/26/2017)*

	
Photo Point 16 – view upstream Vile Creek R2 *(9/26/2017)*	**Photo Point 16** – view downstream Vile Creek R2 *(9/26/2017)*
	
Photo Point 17 – view upstream Vile Creek R2 *(9/26/2017)*	**Photo Point 17** – view downstream Vile Creek R2 *(9/26/2017)*

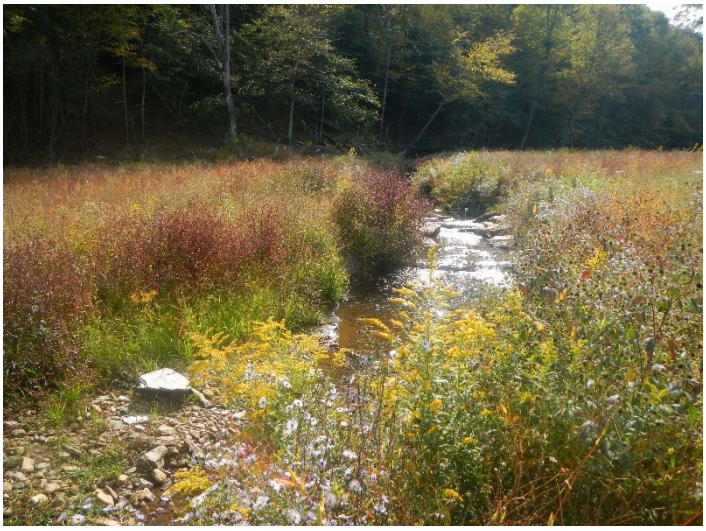



Photo Point 18 – view upstream Vile Creek R2 *(9/26/2017)*	**Photo Point 18** – view downstream Vile Creek R2 *(9/26/2017)*

	
Photo Point 19 – view upstream Vile Creek R3 *(9/26/2017)*	**Photo Point 19** – view downstream Vile Creek R3 *(9/26/2017)*
	
Photo Point 20 – view upstream Vile Creek R3 *(9/26/2017)*	**Photo Point 20** – view downstream Vile Creek R3 *(9/26/2017)*
	
Photo Point 21 – view upstream Vile Creek R3 *(9/26/2017)*	**Photo Point 21** – view downstream Vile Creek R3 *(9/26/2017)*

	
Photo Point 22 – view upstream Vile Creek R3 *(9/26/2017)*	**Photo Point 22** – view downstream Vile Creek R3 *(9/26/2017)*
	
Photo Point 23 – view upstream Little River *(9/26/2017)*	**Photo Point 23** – view downstream Little River *(9/26/2017)*
	
Photo Point 24 – view upstream UT1 R1 *(9/27/2017)*	**Photo Point 24** – view downstream UT1 R1 *(9/27/2017)*

	
Photo Point 25 – view upstream UT1 R1 (9/27/2017)	**Photo Point 25** – view downstream UT1 R1 (9/27/2017)
	
Photo Point 26 – view upstream UT1 R1 (9/27/2017)	**Photo Point 26** – view downstream UT1 R1 (9/27/2017)
	
Photo Point 27 – view upstream UT1 R1 (9/27/2017)	**Photo Point 27** – view downstream UT1 R1 (9/27/2017)

	
Photo Point 28 – view upstream UT1 R2 *(9/27/2017)*	**Photo Point 28** – view downstream UT1 R2 *(9/27/2017)*
	
Photo Point 29 – view upstream UT1 R2 *(9/27/2017)*	**Photo Point 29** – view downstream UT1 R2 *(9/27/2017)*
	
Photo Point 30 – view upstream UT1 R2 *(9/27/2017)*	**Photo Point 30** – view downstream UT1 R2 *(9/27/2017)*

Photo Point 31 – view upstream UT2 *(9/26/2017)*

Photo Point 31 – view downstream UT2 *(9/26/2017)*

Photo Point 31 – view of UT2 BMP *(9/26/2017)*

Photo Point 32 – view upstream UT2 *(9/26/2017)*

Photo Point 32 – view downstream UT2 *(9/26/2017)*

	
Photo Point 33 – view upstream UT2 *(9/26/2017)*	**Photo Point 33** – view downstream UT2 *(9/26/2017)*
	
Photo Point 34 – view upstream UT3 *(9/26/2017)*	**Photo Point 34** – view downstream UT3 *(9/26/2017)*
	
Photo Point 35 – view upstream UT3 *(9/26/2017)*	**Photo Point 35** – view downstream UT3 *(9/26/2017)*

Photo Point 36 –stormwater wetland *(9/26/2017)*

Vegetation Photographs

Vegetation Plot 1 - *(9/25/2017)*

Vegetation Plot 2 - *(9/25/2017)*

Vegetation Plot 3 - *(9/26/2017)*

Vegetation Plot 4 - *(9/26/2017)*

Vegetation Plot 5 - *(9/26/2017)*

Vegetation Plot 6 - *(9/26/2017)*

Vegetation Plot 7 - *(9/26/2017)*

Vegetation Plot 8 - *(9/25/2017)*

Vegetation Plot 9 - *(9/25/2017)*

Vegetation Plot 10 - *(9/25/2017)*

Vegetation Plot 11 - *(9/25/2017)*

Vegetation Plot 12 - *(9/25/2017)*

Vegetation Plot 13 - *(9/25/2017)*

Vegetation Plot 14 - *(9/26/2017)*

Vegetation Plot 15 - *(9/26/2017)*

Vegetation Plot 16 – (9/26/2017)

Vegetation Plot 17 - *(9/26/2017)*

Bog Vegetation Photographs

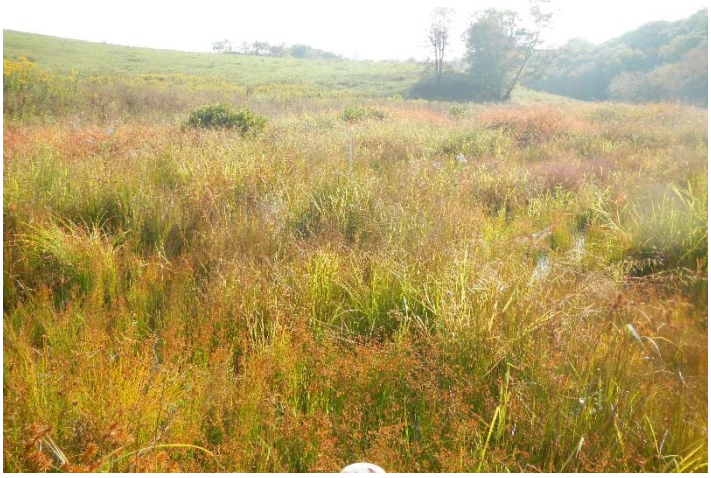
Bog Vegetation Plot 1 - *(9/25/2017)*

Bog Vegetation Plot 2 - *(9/25/2017)*

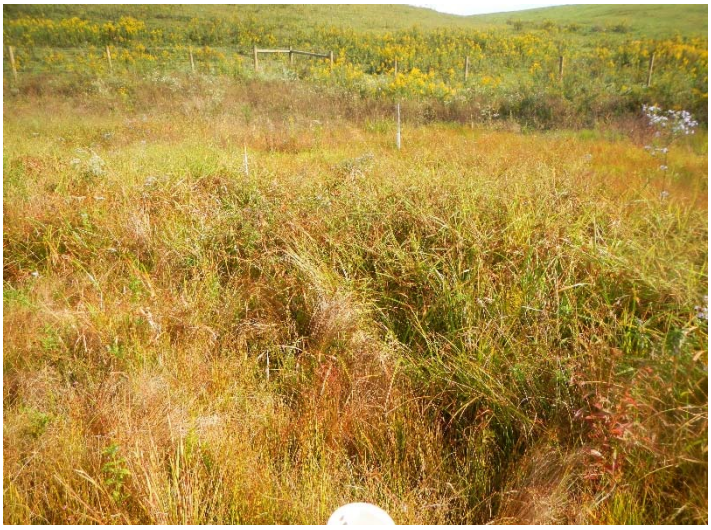
Bog Vegetation Plot 3 - *(9/25/2017)*

Bog Vegetation Plot 4 - *(9/25/2017)*

Bog Vegetation Plot 5 - *(9/25/2017)*



Bog Vegetation Plot 6 - *(9/25/2017)*

	
Bog Vegetation Plot 7 - *(9/25/2017)*	**Bog Vegetation Plot 8** - *(9/25/2017)*

APPENDIX 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 1 - 2017

Plot	MY1 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	
15	Y	
16	Y	
17	Y	

Table 8. CVS Vegetation Plot Metadata
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Report Prepared By	Ruby Davis
Date Prepared	10/4/2017 14:18
Database Name	cvs-eep-entrytool-v2.5.0 Vile MY1.mdb
Database Location	Q:\ActiveProjects\005-02147 Vile Creek\Monitoring\Monitoring Year 1\Vegetation Assessment
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Project Planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Project Total Stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	96582
project Name	Vile Creek Restoration Project
Description	Stream and Wetland Mitigation
Required Plots (calculated)	17
Sampled Plots	17

Table 9a. Planted and Total Stem Counts

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

			Current Plot Data (MY1 2017)																				
			Vegetation Plot 1			Vegetation Plot 2			Vegetation Plot 3			Vegetation Plot 4			Vegetation Plot 5			Vegetation Plot 6			Vegetation Plot 7		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	Red Maple	Tree							1	1	1												
Aronia arbutifolia	Red Chokeberry	Shrub																					
Betula nigra	River Birch	Tree										3	3	3	1	1	1	4	4	4			
Carpinus caroliniana	Ironwood	Shrub Tree										1	1	1	1	1	1	2	2	2	1	1	1
Cephalanthus occidentalis	Buttonbush	Shrub Tree	5	5	5	7	7	7															
Cornus amomum	Silky Dogwood	Shrub Tree	1	1	1	3	3	3	12	12	12												
Diospyros virginiana	American Persimmon	Tree													1	1	1				2	2	2
Fraxinus pennsylvanica	Green Ash	Tree										3	3	3	4	4	4	2	2	2	7	7	7
Lindera benzoin	Northern Spicebush	Shrub Tree	7	7	7	4	4	4															
Liriodendron tulipifera	Tulip Poplar	Tree										1	1	1				4	4	4			
Platanus occidentalis	Sycamore	Tree										4	4	4	2	2	2	3	3	3	2	2	2
Quercus pagoda	Cherrybark Oak	Tree										2	2	2	3	3	3	3	3	3	2	2	2
		Stem count	13	13	13	14	14	14	13	13	13	14	14	14	12	12	12	18	18	18	14	14	14
		size (ares)		1			1			1			1			1			1			1	
		size (ACRES)		0.02			0.02			0.02			0.02			0.02			0.02			0.02	
		Species count	3	3	3	3	3	3	2	2	2	6	6	6	6	6	6	6	6	6	5	5	5
		Stems per ACRE	526	526	526	567	567	567	526	526	526	567	567	567	486	486	486	728	728	728	567	567	567

			Current Plot Data (MY1 2017)																				
			Vegetation Plot 8			Vegetation Plot 9			Vegetation Plot 10			Vegetation Plot 11			Vegetation Plot 12			Vegetation Plot 13			Vegetation Plot 14		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	Red Maple	Tree																					
Aronia arbutifolia	Red Chokeberry	Shrub																					
Betula nigra	River Birch	Tree				2	2	2	3	3	3	4	4	4	2	2	2	2	2	2	4	4	4
Carpinus caroliniana	Ironwood	Shrub Tree				3	3	3				3	3	3	1	1	1				1	1	1
Cephalanthus occidentalis	Buttonbush	Shrub Tree																					
Cornus amomum	Silky Dogwood	Shrub Tree																					
Diospyros virginiana	American Persimmon	Tree	1	1	1										2	2	2	3	3	3			
Fraxinus pennsylvanica	Green Ash	Tree	6	6	6	1	1	1	7	7	7	1	1	1	3	3	3	1	1	1			
Lindera benzoin	Northern Spicebush	Shrub Tree																					
Liriodendron tulipifera	Tulip Poplar	Tree	2	2	2	1	1	1	3	3	3	3	3	3	1	1	1	2	2	2	1	1	1
Platanus occidentalis	Sycamore	Tree	2	2	2	3	3	3	5	5	5	2	2	2	1	1	1	4	4	4	2	2	2
Quercus pagoda	Cherrybark Oak	Tree	4	4	4				3	3	3	1	1	1	4	4	4	3	3	3	2	2	2
		Stem count	15	15	15	10	10	10	21	21	21	14	14	14	14	14	14	15	15	15	10	10	10
		size (ares)		0.02			0.02			0.02			0.02			0.02			0.02			0.02	
		size (ACRES)		1			1			1			1			1			1			1	
		size (ACRES)	5	5	5	5	5	5	5	5	5	6	6	6	7	7	7	6	6	6	5	5	5
		Species count	607	607	607	405	405	405	850	850	850	567	567	567	567	567	567	607	607	607	405	405	405

			Current Plot Data (MY1 2017)									Annual Summary					
			Vegetation Plot 15			Vegetation Plot 16			Vegetation Plot 17			MY1 (2017)			MY0 (2017)		
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 rubrum	Red Maple	Tree										1	1	1			
Aronia arbutifolia	Red Chokeberry	Shrub													1	1	1
Betula nigra	River Birch	Tree	5	5	5	11	11	11	2	2	2	43	43	43	55	55	55
Carpinus caroliniana	Ironwood	Shrub Tree	5	5	5				3	3	3	21	21	21	21	21	21
Cephalanthus occidentalis	Buttonbush	Shrub Tree										12	12	12	14	14	14
Cornus amomum	Silky Dogwood	Shrub Tree										16	16	16	19	19	19
Diospyros virginiana	American Persimmon	Tree	1	1	1				1	1	1	11	11	11	12	12	12
Fraxinus pennsylvanica	Green Ash	Tree							1	1	1	36	36	36	35	35	35
Lindera benzoin	Northern Spicebush	Shrub Tree										11	11	11	14	14	14
Liriodendron tulipifera	Tulip Poplar	Tree	2	2	2				4	4	4	24	24	24	38	38	38
Platanus occidentalis	Sycamore	Tree	7	7	7				3	3	3	40	40	40	40	40	40
Quercus pagoda	Cherrybark Oak	Tree	1	1	1	4	4	4	3	3	3	35	35	35	39	39	39
		Stem count	21	21	21	15	15	15	17	17	17	250	250	250	288	288	288
		size (ares)		1			1			1			17			17	
		size (ACRES)		0.02			0.02			0.02			0.42			0.42	
		Species count	6	6	6	2	2	2	7	7	7	11	11	11	11	11	11
		Stems per ACRE	850	850	850	607	607	607	688	688	688	595	595	595	686	686	686

Color For Density

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

PnoLS: Number of Planted stems excluding live stakes
P-all: Number of planted stems including live stakes
T: Total Stems

Table 9b. Planted Herbaceous Cover (Bog Cells)

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

	Percent Cover %							
Plot ID	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
1	<5	30						
2	10	75						
3	<5	75						
4	<5	90						
5	<5	80						
6	<5	85						
7	<5	100						
8	50	95						

APPENDIX 4. Morphological Summary Data and Plots

Table 10a. Baseline Stream Data Summary
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 1, Reach 2

	PRE-RESTORATION CONDITION				REFERENCE REACH DATA								DESIGN				AS-BUILT/BASELINE			
Parameter	**Vile Creek Reach 1**		**Vile Creek Reach 2**		**Meadow Creek**		**West Fork of Chestnut Creek**		**Brush Creek**		**Little Glade Creek**		**Vile Creek Reach 1**		**Vile Creek Reach 2**		**Vile Creek Reach 1**		**Vile Creek Reach 2**	
	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)	19.3		22.4		26.0		18.3	20.3	22.8		34.7		17.0		19.0		17.1	18.8	18.7	19.2
Floodprone Width (ft)	333		119		52.0		---		---		---		37	85	42	95	>200		156	188
Bankfull Mean Depth	1.6		0.9		2.4		1.8	2.2	1.7		2.2		1.2		1.2		1.1	1.2	1.2	1.5
Bankfull Max Depth	2.7		1.6		3.3		2.2	2.8	2.3		2.4		1.4	1.7	1.5	1.9	1.9	2.1	2.0	2.3
Bankfull Cross-sectional Area (ft^2)	30.4	31.7	20.1	48.0	62.2		35.8	40.0	37.9		76.5		19.6		23.7		19.8	21.2	22.5	28.6
Width/Depth Ratio	12.2		25.1		10.9		8.3	11.5	13.4		15.8		14.7		15.2		13.7	17.8	12.9	15.5
Entrenchment Ratio	17.2		5.3		>2.2		>2.2		>2.2		>2.2		2.2	5.0	2.2	5.0	>2.2		>2.2	
Bank Height Ratio	1.4		1.8		---		1.3	1.4	1.1		1.5		1.0		1.0		1.0	1.1	1.0	
D50 (mm)	112.0		56.3		---		---		---		---		---		---		60.4	69.3	58.6	61.5
Riffle Length (ft)	---		---		---		---		---		---		---		---		19.7	74.1	18.3	94.1
Riffle Slope (ft/ft)	0.021	0.050	0.0190	0.063	---		0.0110	0.0280	0.0040		0.0140		0.0148	0.0333	0.016	0.0360	0.0164	0.0420	0.0187	0.0385
Pool Length (ft)	---		---		---		---		---		---		---		---		38.8	149.3	47.1	123.7
Pool Max Depth (ft)	2.9		3.1		---		3.8	4.1	---		---		1.4	2.9	1.5	3.1	3.1	4.4	3.4	5.5
Pool Spacing (ft)	36	69	33	88	---		31	124	---		---		34	119	38	133	55	161	87	172
Pool Volume (ft^3)	---		---		---		---		---		---		---		---		---		---	
Pattern																				
Channel Beltwidth (ft)	38	90	42	93	---		64	71	---		---		51	119	57	133	34	127	48	88
Radius of Curvature (ft)	22	80	55	125	---		26	40	---		---		34	68	38	76	34	50	38	76
Rc:Bankfull Width (ft/ft)	1.1	4.1	2.4	5.6	---		1.3	2.0	---		---		2.0	4.0	2.0	4.0	1.8	2.9	2.0	4.1
Meander Wavelength (ft)	160	190	100	330	---		---		---		---		119	238	133	266	125	214	177	235
Meander Width Ratio	2.0	4.7	1.9	4.2	---		---		---		---		3	7	3	7	2	7	3	5
Substrate, Bed and Transport Parameters																				
Ri%/Ru%/P%/G%/S%																				
SC%/Sa%/G%/C%/B%/Be%																				
d16/d35/d50/d84/d95/d100	8.7/30.2/99.4/180/243/>2048		0.16/6.1/38/95/139/>2048		---		---		---		---		---		---		0.15/0.39/25.7/90.0/163.3/362.0		0.19/0.53/9.6/69.2/120.3/362.0	
Reach Shear Stress (Competency) lb/ft^2	1.20		0.80		---		---		---		---		1.1		1.2		0.86	1.09	0.69	0.74
Max part size (mm) mobilized at bankfull	175		130		---		---		---		---		165		175		42	54	43	53
Stream Power (Capacity) W/m^2																	3.8	5.9	4.1	5.8
Additional Reach Parameters																				
Drainage Area (SM)	2.2		2.6		2.70		1.60		1.67		3.30		2.2		2.6		2.2		2.6	
Watershed Impervious Cover Estimate (%)	3%				---		---		---		---		3%				3%			
Rosgen Classification	C3		C4		C		E4		C4		C4		C		C		C		C	
Bankfull Velocity (fps)	3.3	3.2	6.0	2.5	---		4.6	5.3	4.4		5.5		4.7		5.0		4.4	5.2	5.5	5.2
Design Bankfull Discharge (cfs)	100		120		---		164	210	168		424		100		120		87	133	103	144
Q- Little River LWP Regional 1.25-yr(cfs)	107		124																	
Q- Little River LWP Regional 1.5-yr (cfs)	122		141																	
Q- Rural Mountain Regional Curve (cfs)	180		206																	
Q-Revised Piedmont/Mountain Regional Curve (cfs)	102		117																	
Q- Basin Ration Method 1.1-yr (cfs)	101		121																	
Q- Basin Ration Method 1.25-yr (cfs)	122		146																	
Valley Length (ft)	---		---		---		---		---		---		---		---		729		1042	
Channel Thalweg Length (ft)	962		1,247		---		---		---		---		920		1260		882		1,311	
Sinuosity	1.3		1.3		---		---		---		---		1.20	1.30	1.20	1.30	1.21		1.26	
Water Surface Slope (ft/ft)	0.014		0.011		---		0.010		0.012		0.010		0.0123	0.0133	0.0131	0.0142	0.014		0.012	
Bankfull Slope (ft/ft)	0.017		0.016		---		---		---		---		0.016		0.017		0.015		0.012	

(---): Data was not provided

Table 10b. Baseline Stream Data Summary
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

UT1 Reach 1, UT1 Reach 2

	PRE-RESTORATION CONDITION				REFERENCE REACH DATA								DESIGN				AS-BUILT/BASELINE			
Parameter	UT1 Reach 1		UT1 Reach 2		Little Pine III UT2A		Henry Fork UT Upstream		UT to Gap Branch		Group Camp Tributary		UT1 Reach 1		UT1 Reach 2		UT1 Reach 1		UT1 Reach 2	
	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)	7.9		19.2		12.6		3.2	7.7	6.2		4.2	4.4	8.0		9.0		7.7	8.6	9.0	
Floodprone Width (ft)	203.0		28.0		31.0		6	13	21		9	11	14	18	15	20	63	91	96	
Bankfull Mean Depth	0.9		0.4		1.4		0.5	0.6	0.6		0.8		0.5		0.6		0.5	0.7	0.8	
Bankfull Max Depth	1.7		0.9		2.0		0.7	0.8	1.0		1.0	1.2	0.7	0.8	0.7	0.9	1.1	1.1	1.3	
Bankfull Cross-sectional Area (ft^2)	7.3	10.3	8.4	11.8	18.1		1.9	3.6	3.8		3.4	3.6	4.3		5.2		4.1	5.9	7.8	
Width/Depth Ratio	8.6		43.9		8.7		5.2	16.4	10.1		5.2	5.5	14.9		15.6		12.4	14.7	11.4	
Entrenchment Ratio	25.6		1.5		2.4		1.7	2.0	3.4		1.9	2.5	1.8	2.3	1.7	2.2	>2.2		>2.2	
Bank Height Ratio	1.3		3.8		1.0		1.0	1.3	1.0		1.0		1.0		1.0		1.0	1.0	1.0	
D50 (mm)	32		28.5		---		---		---		---		---		---		22.6	34.3	28.1	
Profile																				
Riffle Length (ft)	---		---		---		---		---		---		---		---		11.0	53.1	13.5	60.7
Riffle Slope (ft/ft)	0.022	0.11	0.0280	0.071	0.0404	0.0517	0.0500	0.0700	0.0110	0.1400	0.0110	0.1220	0.0291	0.0640	0.0282	0.6200	0.0149	0.0410	0.0176	0.0897
Pool Length (ft)	---		---		---		---		---		---		---		---		13.0	36.9	8.6	42.5
Pool Max Depth (ft)	2.3		1.6		2.2	2.5	---		6.1		1.8	2.8	1.1	1.9	1.2	2	0.8	2.6	1.1	2.5
Pool Spacing (ft)	15	39	14	58	78		14	25	18	27	5	58	16	48	162	486	7	59	38	88
Pool Volume (ft^3)	---		---		---		---		---		---		---		---		---		---	
Pattern																				
Channel Beltwidth (ft)	40	55	60	80	---		---		---		16	17	N/A[1]		13	32	N/A[1]		6	66
Radius of Curvature (ft)	12	40	15	65	---		---		---		8	11.8	N/A[1]		20	59	N/A[1]		18	59
Rc:Bankfull Width (ft/ft)	1.5	5.1	0.8	3.4	---		---		---		1.9	2.7	N/A[1]		2.2	6.6	N/A[1]		2.0	6.5
Meander Length (ft)	57	100	115	140	---		---		---		31	34	N/A[1]		64	110	N/A[1]		56	152
Meander Width Ratio	5.1	7.0	3.1	4.2	---		---		---		3.6	3.8	N/A[1]		1.5	3.6	N/A[1]		1	7
Substrate, Bed and Transport Parameters																				
Ri%/Ru%/P%/G%/S%																				
SC%/Sa%/G%/C%/B%/Be%																				
d16/d35/d50/d84/d95/d100	0.4/1.7/25.9/137/203/256		0.17/0.55/26.9/133/205/256		---		---		---		---						0.21/0.79/8.6/51.0/126.9/256.0		0.25/4.47/12.1/70.5/101.2/180.0	
Reach Shear Stress (Competency) lb/ft^2	0.7		0.4		---		---		---		---		0.5		0.6		0.53	0.84	1.39	
Max part size (mm) mobilized at bankfull	115		75		---		---		---		---		95		100		26	41	68	
Stream Power (Capacity) W/m^2																	1.54	3.4	8.2	
Additional Reach Parameters																				
Drainage Area (SM)	0.30		0.34		0.12		0.20		0.04		0.10		0.30		0.34		0.30		0.34	
Watershed Impervious Cover Estimate (%)	1%				---		---		---		---		1%				1%			
Rosgen Classification	E4b		F4b		A/B		B4a		B4a/A4		E5b		B		B		B		B	
Bankfull Velocity (fps)	1.7	2.3	1.7	2.4	0.5		3.8	5.4	5.0		3.4	3.6	3.8		3.9		2.8	3.9	5.3	
Design Bankfull Discharge (cfs)	17		20		9		12		19		12		17		20		8	16	42	
Q- Little River LWP Regional 1.25-yr(cfs)	21		23																	
Q- Little River LWP Regional 1.5-yr (cfs)	24		26																	
Q- Rural Mountain Regional Curve (cfs)	40		44																	
Q-Revised Piedmont/Mountain Regional Curve (cfs)	21		24																	
Q- Basin Ration Method 1.1-yr (cfs)	16		16																	
Q- Basin Ration Method 1.25-yr (cfs)	17		19										---		---					
Valley Length (ft)	---		---		---		---		---		---		---		---		903		755	
Channel Thalweg Length (ft)	1,143		989		---		---		---		---		1,132		863		1,114		854	
Sinuosity	1.26		1.3		---		1.1		---		1.6		1.0 - 1.1		1.0 - 1.1		1.2		1.1	
Water Surface Slope ($ft/ft)^2$	0.022		0.028		0.0433		0.0420		0.0680		0.0167		0.0291	0.0320	0.0282	0.0310	0.0264		0.0288	
Bankfull Slope (ft/ft)	0.032		0.033		---		0.0460		---		0.0229		0.0320		0.0310		0.0261		0.0284	

(---): Data was not provided

[1] Design parameters for pattern features are not reported for UT1 Reach 1 because the channel was designed as Enhancement I.

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

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 1 - 2017

	Cross-Section 1, Vile Creek Reach 1 (Pool)						Cross-Section 2, Vile Creek Reach 1 (Riffle)						Cross-Section 3, Vile Creek Reach 1 (Riffle)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**
based on fixed bankfull elevation	2700.8	2700.7					2700.0	2700.0					2695.7	2695.7				
Bankfull Width (ft)	25.1	24.6					17.1	17.6					18.8	17.9				
Floodprone Width (ft)	---	---					>200	>200					>200	>200				
Bankfull Mean Depth (ft)	1.2	1.1					1.2	1.3					1.1	1.2				
Bankfull Max Depth (ft)	3.0	2.8					2.1	2.3					1.9	2.2				
Bankfull Cross-Sectional Area (ft^2)	29.2	25.8					21.2	22.7					19.8	20.9				
Bankfull Width/Depth Ratio	---	---					13.7	13.7					17.8	15.3				
Bankfull Entrenchment Ratio	---	---					>10.6	11.4					>10.7	>11.2				
Bankfull Bank Height Ratio	---	---					1.1	1.1					1.0	1.0				
	Cross-Section 4, Vile Creek Reach 2 (Riffle)						**Cross-Section 5, Vile Creek Reach 2 (Riffle)**						**Cross-Section 6, Vile Creek Reach 2 (Pool)**					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**
based on fixed bankfull elevation	2691.7	2691.7					2688.9	2688.9					2687.9	2687.9				
Bankfull Width (ft)	18.7	19.4					19.2	19.8					24.1	24.0				
Floodprone Width (ft)	188.0	188.0					156.0	156.0					---	---				
Bankfull Mean Depth (ft)	1.2	1.2					1.5	1.5					1.8	1.6				
Bankfull Max Depth (ft)	2.0	2.3					2.3	2.5					3.6	4.0				
Bankfull Cross-Sectional Area (ft^2)	22.5	23.1					28.6	29.7					44.3	39.6				
Bankfull Width/Depth Ratio	15.5	16.3					12.9	13.2					---	---				
Bankfull Entrenchment Ratio	10.1	9.7					8.1	7.9					---	---				
Bankfull Bank Height Ratio	1.0	1.0					1.0	1.0					---	---				
	Cross-Section 7, UT1 Reach 1 (Riffle)						**Cross-Section 8, UT1 Reach 1 (Pool)**						**Cross-Section 9, UT1 Reach 1 (Riffle)**					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**
based on fixed bankfull elevation	2743.9	2743.9					2725.7	2725.7					2725.3	2725.3				
Bankfull Width (ft)	8.6	8.1					11.3	8.2					7.7	6.5				
Floodprone Width (ft)	63.0	63.0					---	---					97.0	97.0				
Bankfull Mean Depth (ft)	0.7	1.2					0.6	0.5					0.5	0.7				
Bankfull Max Depth (ft)	1.1	2.2					1.4	0.8					1.1	1.1				
Bankfull Cross-Sectional Area (ft^2)	5.9	9.4					7.1	4.4					4.1	4.2				
Bankfull Width/Depth Ratio	12.4	7.0					---	---					14.7	9.9				
Bankfull Entrenchment Ratio	7.3	7.8					---	---					12.5	15.0				
Bankfull Bank Height Ratio	1.0	1.0					---	---					1.0	1.0				
	Cross-Section 10, UT1 Reach 2 (Pool)						**Cross-Section 11, UT1 Reach 2 (Riffle)**											
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**						
based on fixed bankfull elevation	2713.5	2713.5					2712.9	2712.9										
Bankfull Width (ft)	13.3	12.6					9.0	12.6										
Floodprone Width (ft)	---	---					96.0	96.0										
Bankfull Mean Depth (ft)	0.9	0.7					0.8	0.5										
Bankfull Max Depth (ft)	1.9	1.8					1.3	1.4										
Bankfull Cross-Sectional Area (ft^2)	12.6	9.0					7.8	6.5										
Bankfull Width/Depth Ratio	---	---					11.4	24.5										
Bankfull Entrenchment Ratio	---	---					10.7	7.6										
Bankfull Bank Height Ratio	---	---					1.0	1.0										

Table 12a. Monitoring - Stream Reach Data Summary
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek, Reach 1 and Reach 2

Parameter	As-Built/Baseline				MY1			
	Vile Reach 1		Vile Reach 2		Vile Reach 1		Vile Reach 2	
	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle								
Bankfull Width (ft)	17.1	18.8	18.7	19.2	17.6	17.9	19.4	19.8
Floodprone Width (ft)	>200		156	188	>200		156.0	188.0
Bankfull Mean Depth	1.1	1.2	1.2	1.5	1.2	1.3	1.2	1.5
Bankfull Max Depth	1.9	2.1	2.0	2.3	2.2	2.3	2.3	2.5
Bankfull Cross Sectional Area (ft^2)	19.8	21.2	22.5	28.6	20.9	22.7	23.1	29.7
Width/Depth Ratio	13.7	17.8	12.9	15.5	13.7	15.3	13.2	16.3
Entrenchment Ratio	>2.2		>2.2		>2.2		>2.2	
Bank Height Ratio	1.0	1.1	1.0		1.0		1.0	
D50 (mm)	60.4	69.3	58.6	61.5	82.0	101.2	70.9	78.5
Profile								
Riffle Length (ft)	19.7	74.1	18.3	94.1				
Riffle Slope (ft/ft)	0.0164	0.0420	0.0187	0.0385				
Pool Length (ft)	38.8	149.3	47.1	123.7				
Pool Max Depth (ft)	3.1	4.4	3.4	5.5				
Pool Spacing (ft)	55	161	87	172				
Pool Volume (ft^3)	---		---					
Pattern								
Channel Beltwidth (ft)	34	127	48	88				
Radius of Curvature (ft)	34	50	38	76				
Rc:Bankfull Width (ft/ft)	1.8	2.9	2.0	4.1				
Meander Wave Length (ft)	125	214	177	235				
Meander Width Ratio	2	7	3	5				
Additional Reach Parameters								
Rosgen Classification	C		C					
Channel Thalweg Length (ft)	882		1,311					
Sinuosity (ft)	1.21		1.26					
Water Surface Slope (ft/ft)	0.0135		0.0122					
Bankfull Slope (ft/ft)	0.0145		0.0122					
Ri%/Ru%/P%/G%/S%								
SC%/Sa%/G%/C%/B%/Be%								
d16/d35/d50/d84/d95/d100								
% of Reach with Eroding Banks					0%		0%	

Table 12b. Monitoring - Stream Reach Data Summary
Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

UT1 Reach 1 and Reach 2

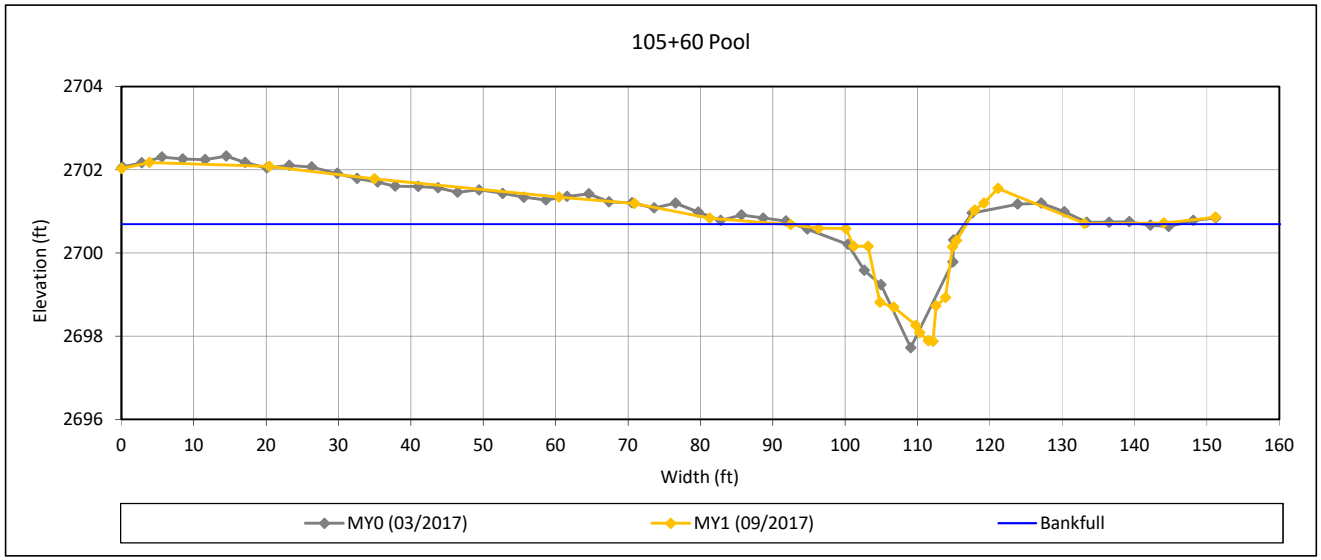
Parameter	As-Built/Baseline				MY1			
	UT1 Reach 1		UT1 Reach 2		UT1 Reach 1		UT1 Reach 2	
	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle								
Bankfull Width (ft)	7.7	8.6	9.0		6.5	8.1	12.6	
Floodprone Width (ft)	63	91	96		63.0	82.4	96.0	
Bankfull Mean Depth	0.5	0.7	0.8		0.7	1.2	0.5	
Bankfull Max Depth	1.1	1.1	1.3		1.1	2.2	1.4	
Bankfull Cross Sectional Area (ft^2)	4.1	5.9	7.8		4.2	9.4	6.5	
Width/Depth Ratio	12.4	14.7	11.4		7.0	9.9	24.5	
Entrenchment Ratio	>2.2		>2.2		>2.2		>2.2	
Bank Height Ratio	1.0	1.0	1.0		1.0		1.0	
D50 (mm)	22.6	34.3	28.1		29.8	48.3	58.6	
Profile								
Shallow Length (ft)	11.0	53.1	13.5	60.7				
Shallow Slope (ft/ft)	0.0149	0.0410	0.0176	0.0897				
Pool Length (ft)	13.0	36.9	8.6	42.5				
Pool Max Depth (ft)	0.8	2.6	1.1	2.5				
Pool Spacing (ft)	7	59	38	88				
Pool Volume (ft^3)	---		---					
Pattern								
Channel Beltwidth (ft)	N/A[1]		6	66				
Radius of Curvature (ft)	N/A[1]		18	59				
Rc:Bankfull Width (ft/ft)	N/A[1]		2.0	6.5				
Meander Wave Length (ft)	N/A[1]		56	152				
Meander Width Ratio	N/A[1]		1	7				
Additional Reach Parameters								
Rosgen Classification	B		B					
Channel Thalweg Length (ft)	1,114		854					
Sinuosity (ft)	1.2		1.1					
Water Surface Slope (ft/ft)	0.0264		0.0288					
Bankfull Slope (ft/ft)	0.0261		0.0284					
Ri%/Ru%/P%/G%/S%								
SC%/Sa%/G%/C%/B%/Be%								
d16/d35/d50/d84/d95/d100								
% of Reach with Eroding Banks					0%		0%	

N/A: Not Applicable

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 1 - Vile Creek Reach 1



Bankfull Dimensions	
25.8	x-section area (ft.sq.)
24.6	width (ft)
1.1	mean depth (ft)
2.8	max depth (ft)
26.4	wetted perimeter (ft)
1.0	hydraulic radius (ft)
23.4	width-depth ratio

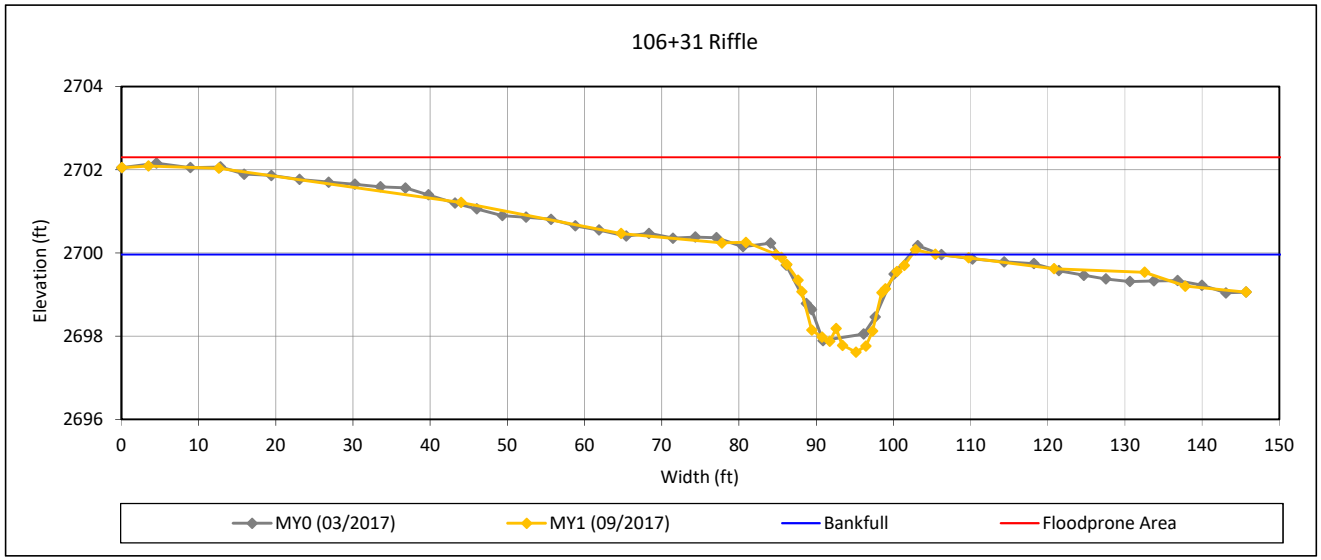
Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 2 - Vile Creek Reach 1



Bankfull Dimensions	
22.7	x-section area (ft.sq.)
17.6	width (ft)
1.3	mean depth (ft)
2.3	max depth (ft)
18.7	wetted perimeter (ft)
1.2	hydraulic radius (ft)
13.7	width-depth ratio
200.0	W flood prone area (ft)
11.4	entrenchment ratio
1.1	low bank height ratio

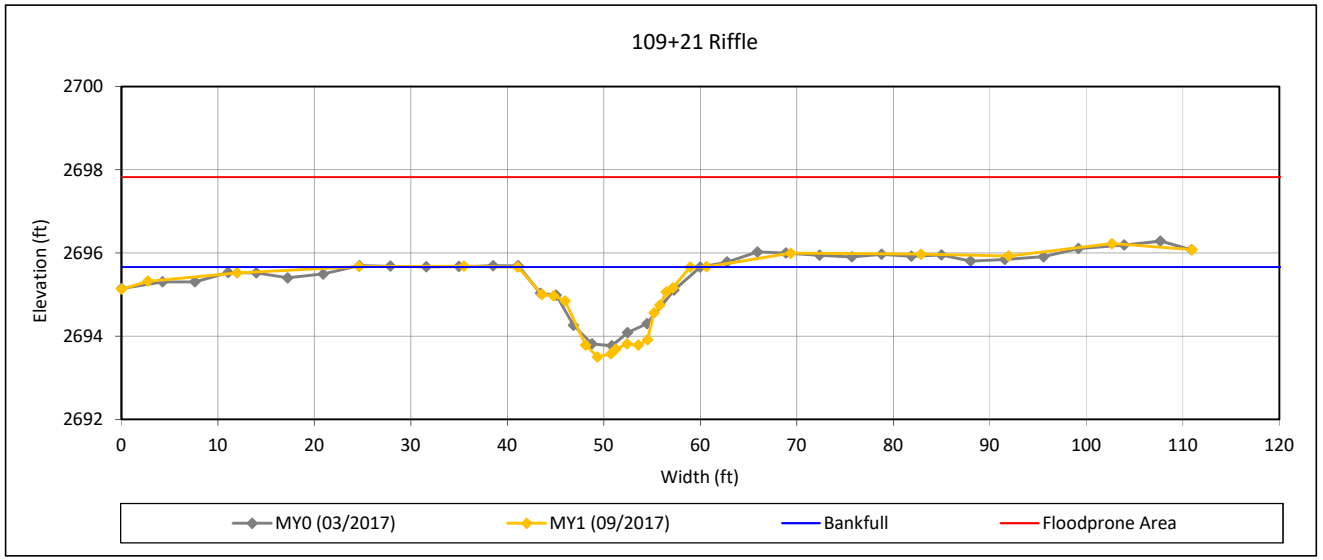
Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 3 - Vile Creek Reach 1



Bankfull Dimensions	
20.9	x-section area (ft.sq.)
17.9	width (ft)
1.2	mean depth (ft)
2.2	max depth (ft)
18.7	wetted perimeter (ft)
1.1	hydraulic radius (ft)
15.3	width-depth ratio
200.0	W flood prone area (ft)
11.2	entrenchment ratio
1.0	low bank height ratio

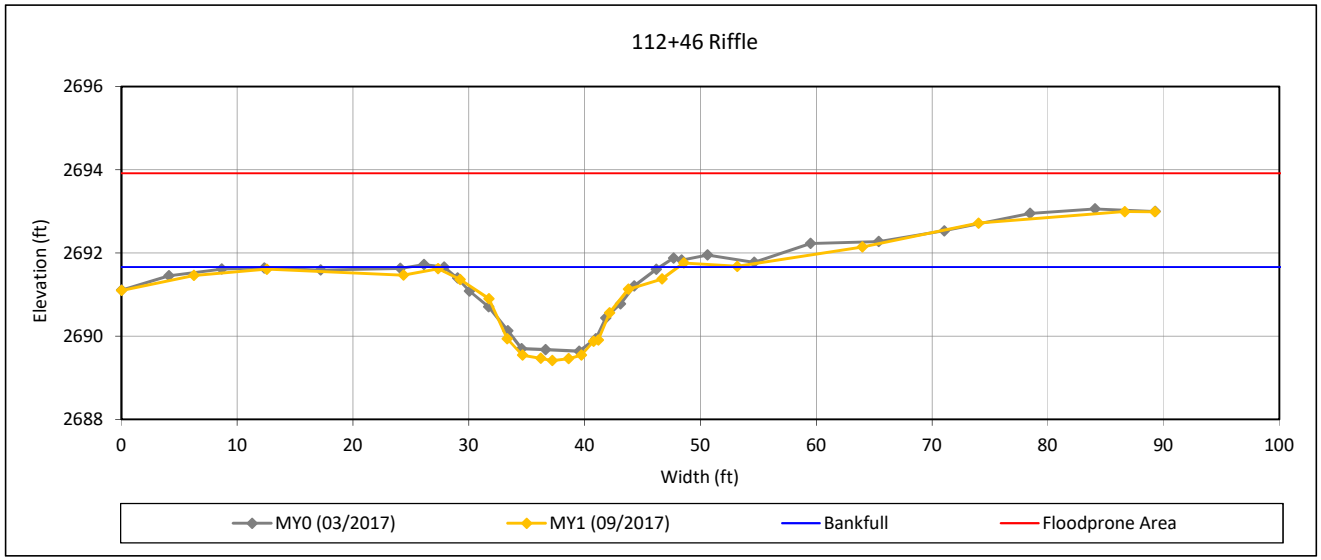
Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 4 - Vile Creek Reach 2



Bankfull Dimensions	
23.1	x-section area (ft.sq.)
19.4	width (ft)
1.2	mean depth (ft)
2.3	max depth (ft)
20.2	wetted perimeter (ft)
1.1	hydraulic radius (ft)
16.3	width-depth ratio
188.0	W flood prone area (ft)
9.7	entrenchment ratio
1.0	low bank height ratio

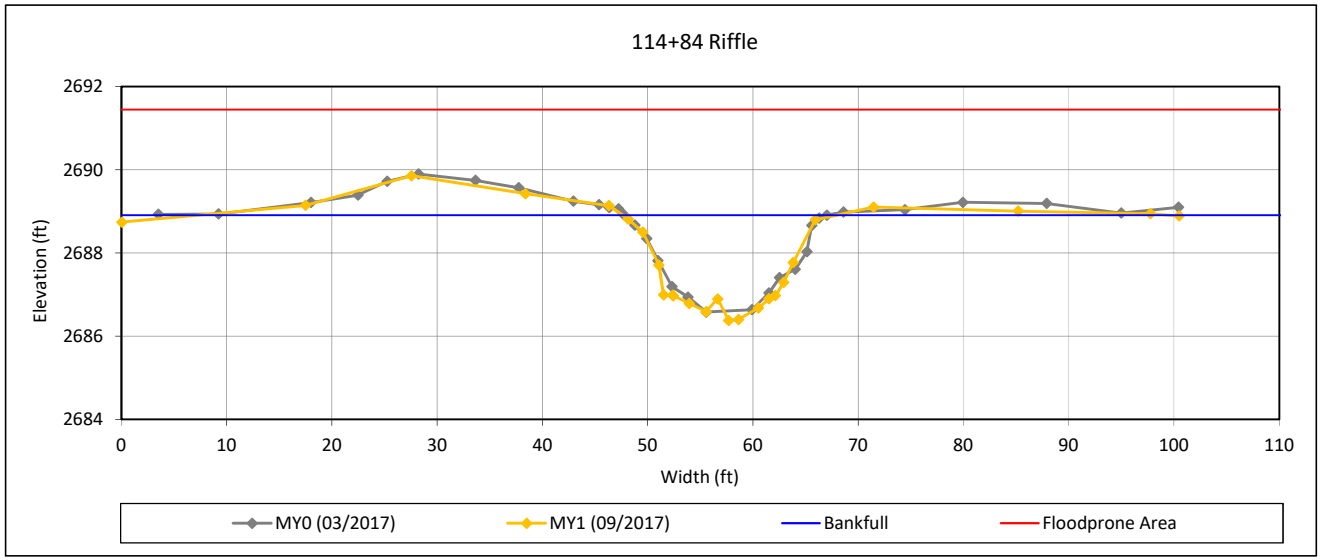
Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 5 - Vile Creek Reach 2



Bankfull Dimensions	
29.7	x-section area (ft.sq.)
19.8	width (ft)
1.5	mean depth (ft)
2.5	max depth (ft)
21.1	wetted perimeter (ft)
1.4	hydraulic radius (ft)
13.2	width-depth ratio
156.0	W flood prone area (ft)
7.9	entrenchment ratio
1.0	low bank height ratio

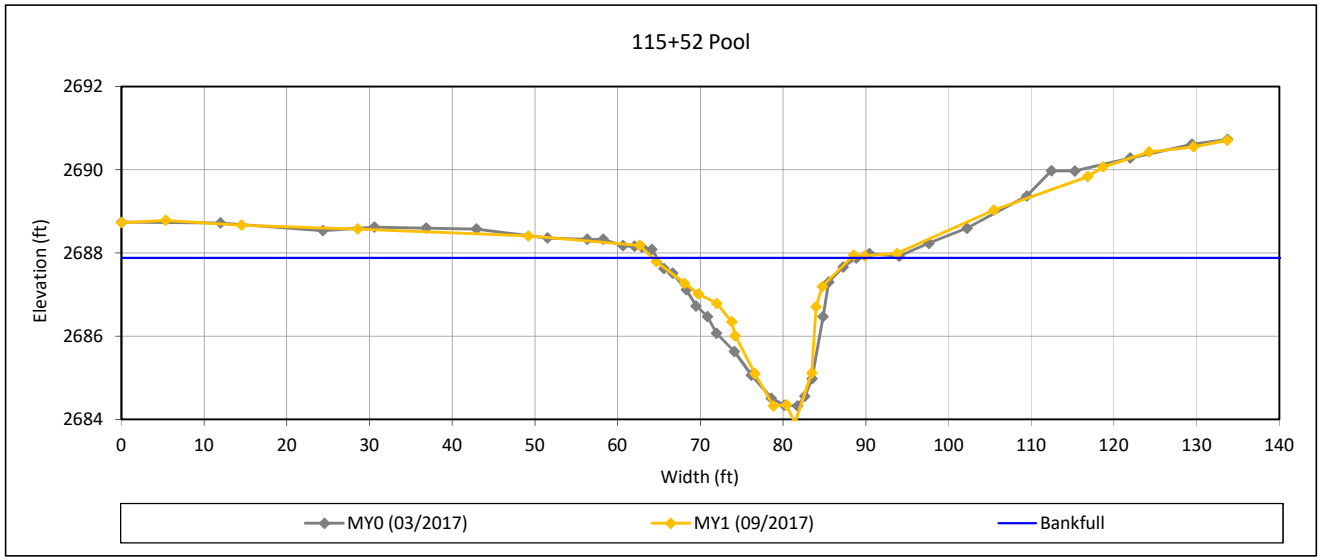
Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 6 - Vile Creek Reach 2



Bankfull Dimensions	
39.6	x-section area (ft.sq.)
24.0	width (ft)
1.6	mean depth (ft)
4.0	max depth (ft)
26.4	wetted perimeter (ft)
1.5	hydraulic radius (ft)
14.6	width-depth ratio

Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

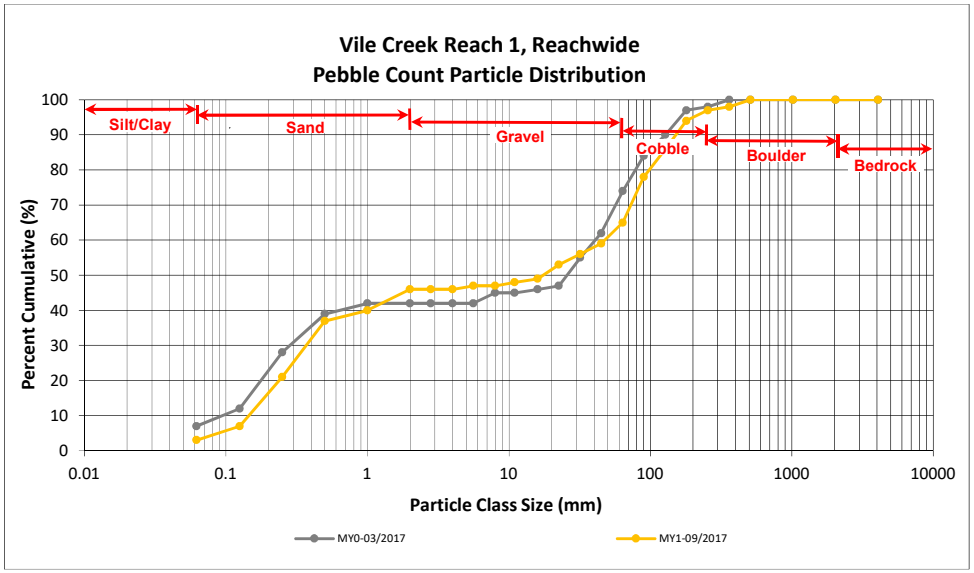
Reachwide and Cross-section Pebble Count Plots

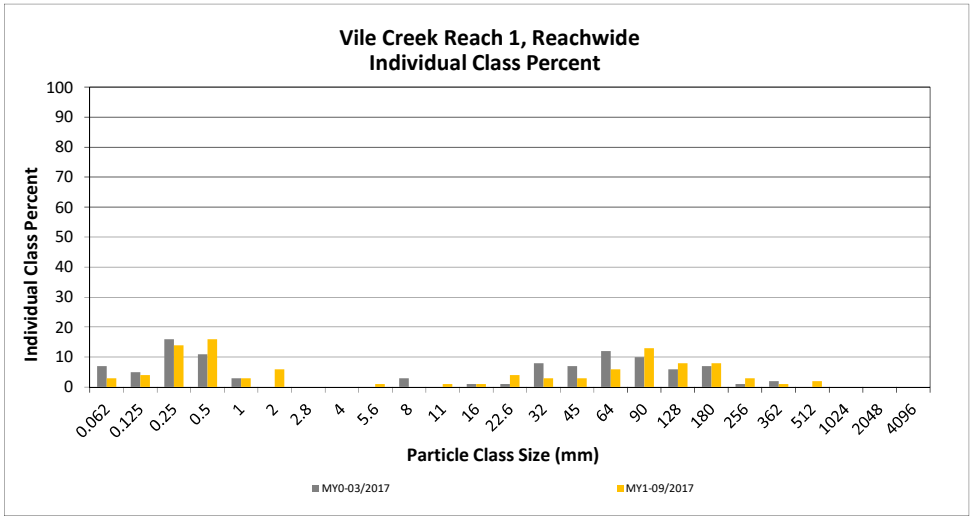
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	2	3	3	3
SAND	Very fine	0.062	0.125	1	3	4	4	7
	Fine	0.125	0.250	1	13	14	14	21
	Medium	0.25	0.50	1	15	16	16	37
	Coarse	0.5	1.0	2	1	3	3	40
	Very Coarse	1.0	2.0	3	3	6	6	46
GRAVEL	Very Fine	2.0	2.8					46
	Very Fine	2.8	4.0					46
	Fine	4.0	5.6	1		1	1	47
	Fine	5.6	8.0					47
	Medium	8.0	11.0		1	1	1	48
	Medium	11.0	16.0	1		1	1	49
	Coarse	16.0	22.6	2	2	4	4	53
	Coarse	22.6	32	2	1	3	3	56
	Very Coarse	32	45	2	1	3	3	59
	Very Coarse	45	64	5	1	6	6	65
COBBLE	Small	64	90	9	4	13	13	78
	Small	90	128	6	2	8	8	86
	Large	128	180	7	1	8	8	94
	Large	180	256	3		3	3	97
BOULDER	Small	256	362	1		1	1	98
	Small	362	512	2		2	2	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} =	0.20
D_{35} =	0.46
D_{50} =	17.4
D_{84} =	117.2
D_{95} =	202.4
D_{100} =	512.0





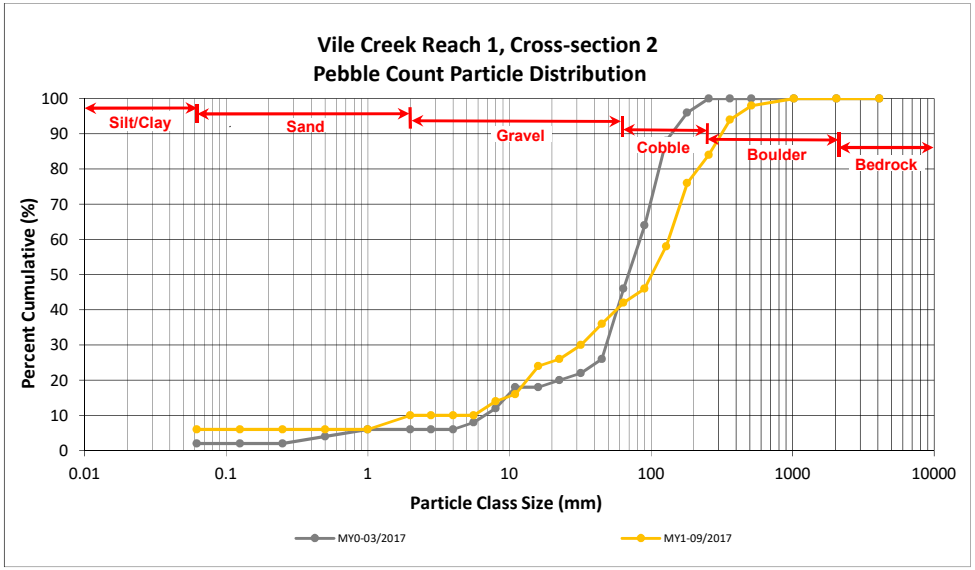
Reachwide and Cross-section Pebble Count Plots

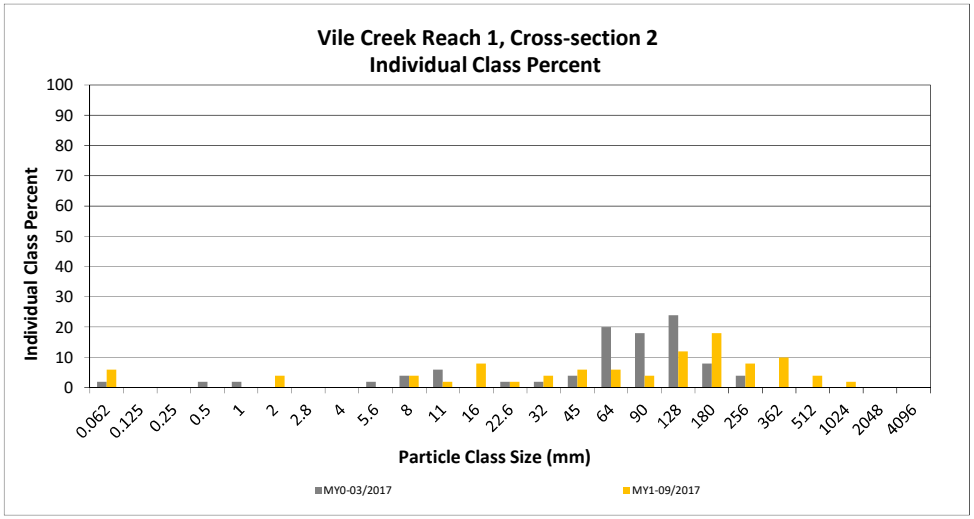
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 1, Cross-section 2

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	6	6
SAND	Very fine	0.062	0.125			6
	Fine	0.125	0.250			6
	Medium	0.25	0.50			6
	Coarse	0.5	1.0			6
	Very Coarse	1.0	2.0	4	4	10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0			10
	Fine	4.0	5.6			10
	Fine	5.6	8.0	4	4	14
	Medium	8.0	11.0	2	2	16
	Medium	11.0	16.0	8	8	24
	Coarse	16.0	22.6	2	2	26
	Coarse	22.6	32	4	4	30
	Very Coarse	32	45	6	6	36
	Very Coarse	45	64	6	6	42
COBBLE	Small	64	90	4	4	46
	Small	90	128	12	12	58
	Large	128	180	18	18	76
	Large	180	256	8	8	84
BOULDER	Small	256	362	10	10	94
	Small	362	512	4	4	98
	Medium	512	1024	2	2	100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-section 2	
Channel materials (mm)	
D_{16} =	11.00
D_{35} =	42.51
D_{50} =	101.2
D_{84} =	256.0
D_{95} =	394.8
D_{100} =	1024.0





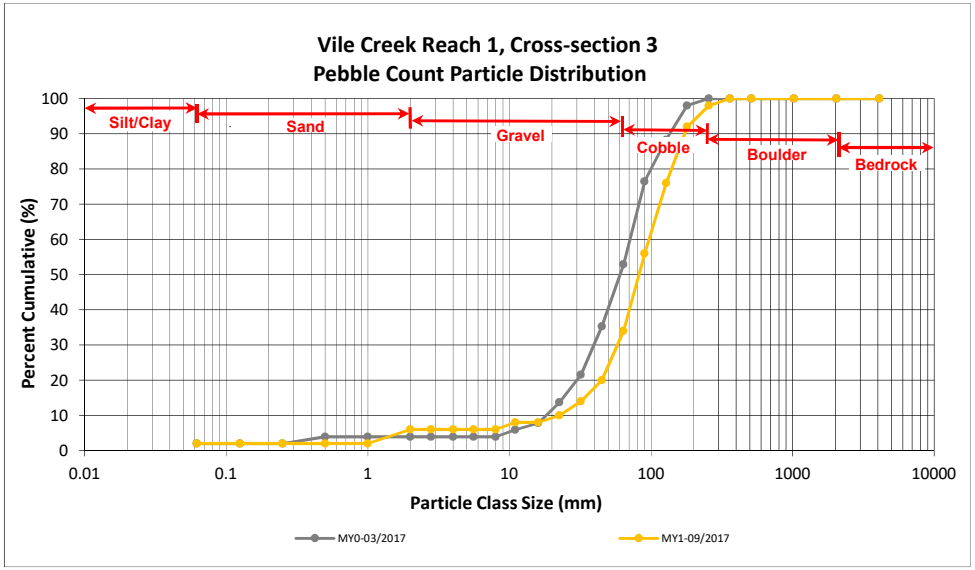
Reachwide and Cross-section Pebble Count Plots

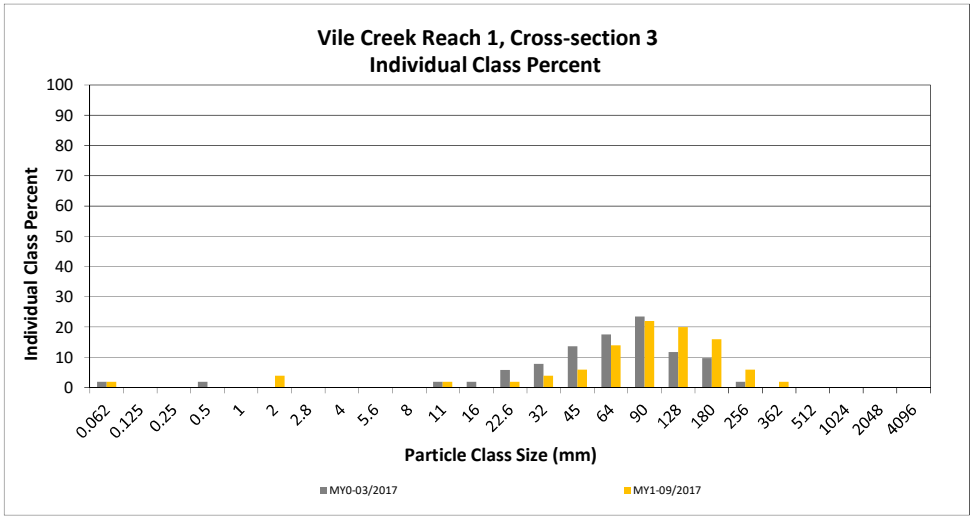
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 1, 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	2	2	2
SAND	Very fine	0.062	0.125			2
	Fine	0.125	0.250			2
	Medium	0.25	0.50			2
	Coarse	0.5	1.0			2
	Very Coarse	1.0	2.0	4	4	6
GRAVEL	Very Fine	2.0	2.8			6
	Very Fine	2.8	4.0			6
	Fine	4.0	5.6			6
	Fine	5.6	8.0			6
	Medium	8.0	11.0	2	2	8
	Medium	11.0	16.0			8
	Coarse	16.0	22.6	2	2	10
	Coarse	22.6	32	4	4	14
	Very Coarse	32	45	6	6	20
	Very Coarse	45	64	14	14	34
COBBLE	Small	64	90	22	22	56
	Small	90	128	20	20	76
	Large	128	180	16	16	92
	Large	180	256	6	6	98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-section 3	
Channel materials (mm)	
D_{16} =	35.85
D_{35} =	65.00
D_{50} =	82.0
D_{84} =	151.8
D_{95} =	214.7
D_{100} =	362.0





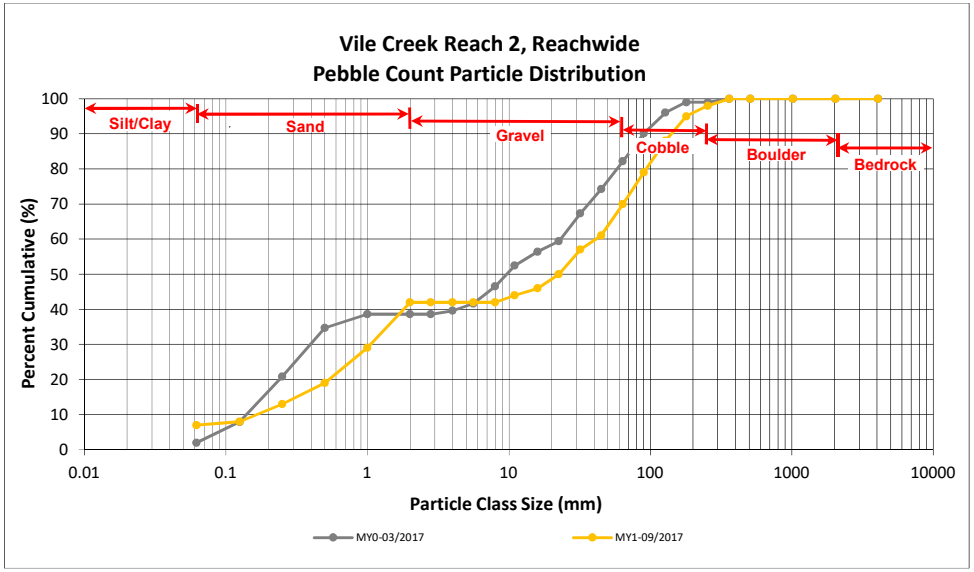
Reachwide and Cross-section Pebble Count Plots

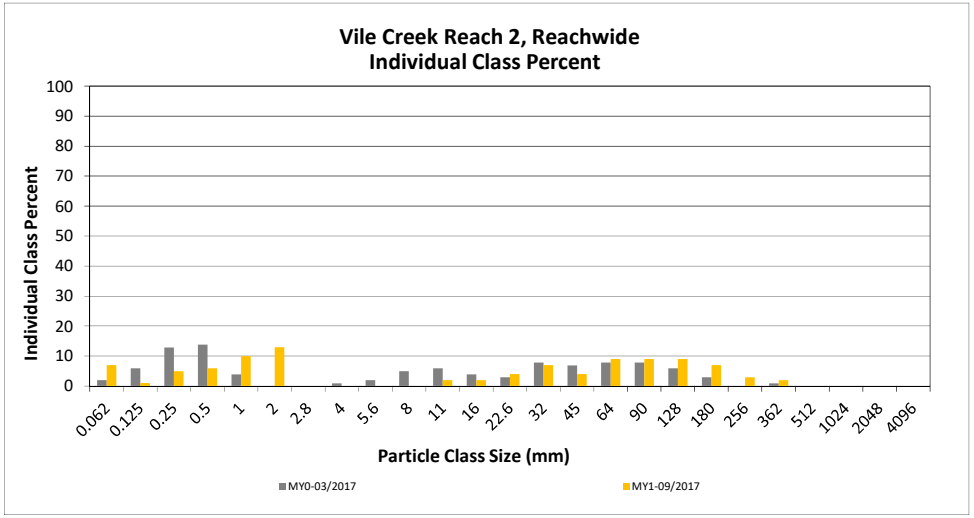
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	6	7	7	7
SAND	Very fine	0.062	0.125		1	1	1	8
	Fine	0.125	0.250		5	5	5	13
	Medium	0.25	0.50		6	6	6	19
	Coarse	0.5	1.0		10	10	10	29
	Very Coarse	1.0	2.0	3	10	13	13	42
GRAVEL	Very Fine	2.0	2.8					42
	Very Fine	2.8	4.0					42
	Fine	4.0	5.6					42
	Fine	5.6	8.0					42
	Medium	8.0	11.0	1	1	2	2	44
	Medium	11.0	16.0	1	1	2	2	46
	Coarse	16.0	22.6	2	2	4	4	50
	Coarse	22.6	32	4	3	7	7	57
	Very Coarse	32	45	3	1	4	4	61
	Very Coarse	45	64	6	3	9	9	70
COBBLE	Small	64	90	8	1	9	9	79
	Small	90	128	9		9	9	88
	Large	128	180	7		7	7	95
	Large	180	256	3		3	3	98
BOULDER	Small	256	362	2		2	2	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.35
D_{35} =	1.38
D_{50} =	22.6
D_{84} =	109.5
D_{95} =	180.0
D_{100} =	362.0





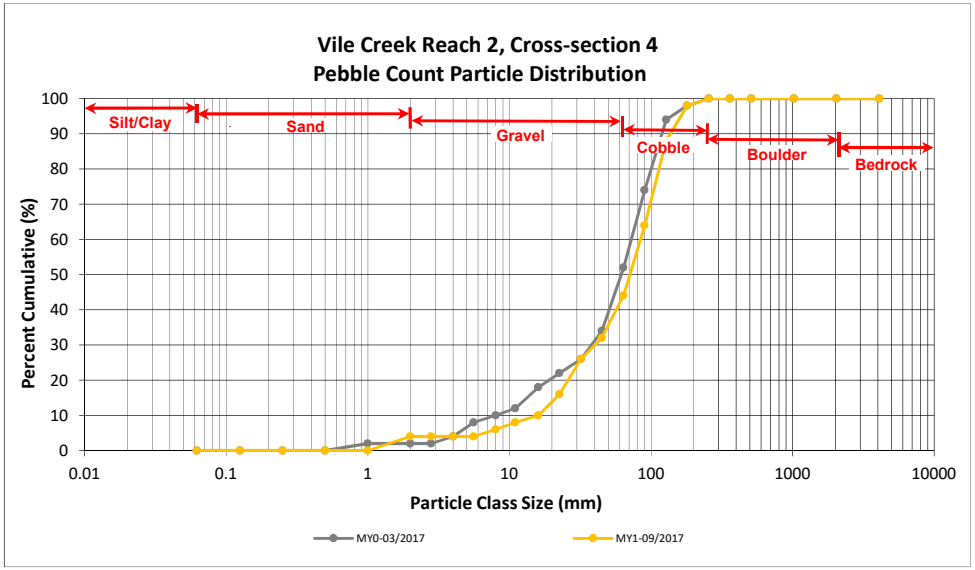
Reachwide and Cross-section Pebble Count Plots

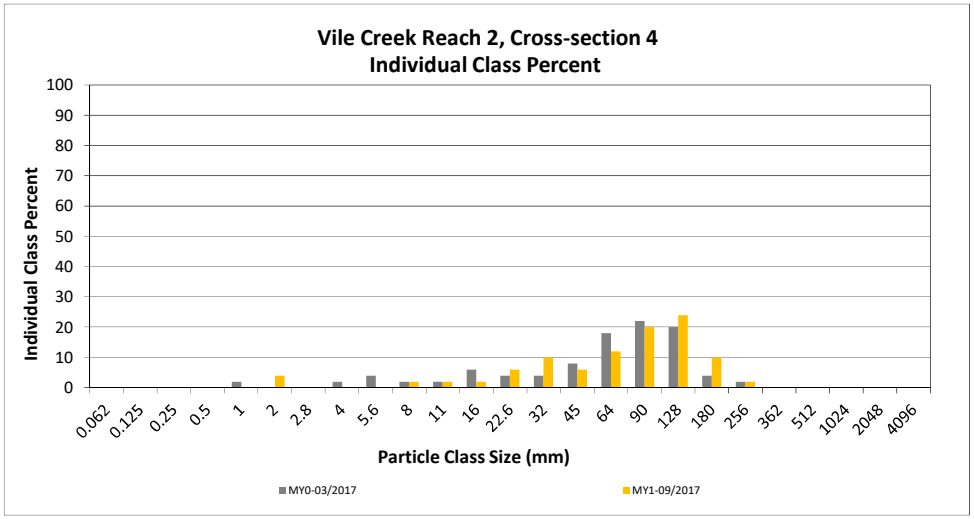
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 2, 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			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0	4	4	4
GRAVEL	Very Fine	2.0	2.8			4
	Very Fine	2.8	4.0			4
	Fine	4.0	5.6			4
	Fine	5.6	8.0	2	2	6
	Medium	8.0	11.0	2	2	8
	Medium	11.0	16.0	2	2	10
	Coarse	16.0	22.6	6	6	16
	Coarse	22.6	32	10	10	26
	Very Coarse	32	45	6	6	32
	Very Coarse	45	64	12	12	44
COBBLE	Small	64	90	20	20	64
	Small	90	128	24	24	88
	Large	128	180	10	10	98
	Large	180	256	2	2	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-section 4	
Channel materials (mm)	
D_{16} =	22.60
D_{35} =	49.14
D_{50} =	70.9
D_{84} =	120.7
D_{95} =	162.5
D_{100} =	256.0





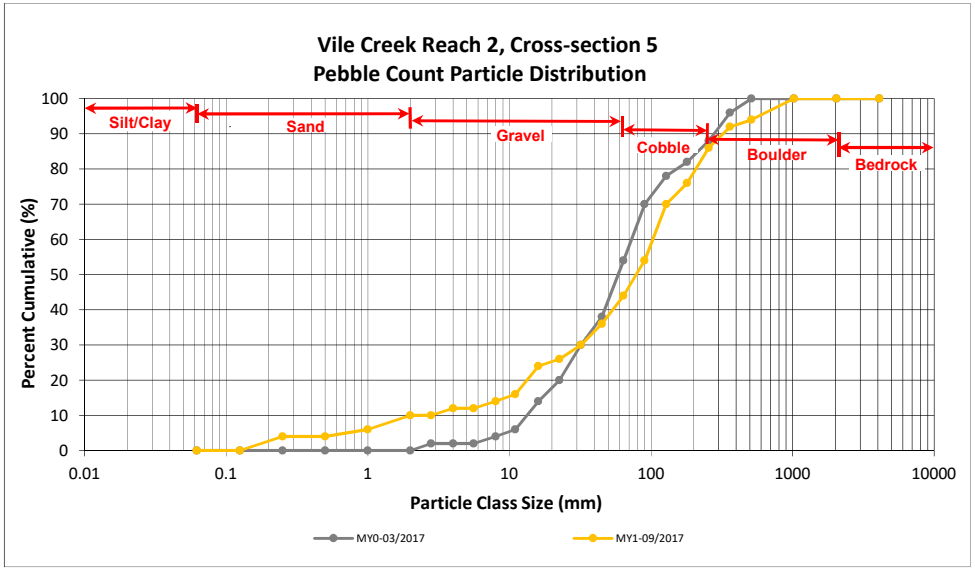
Reachwide and Cross-section Pebble Count Plots

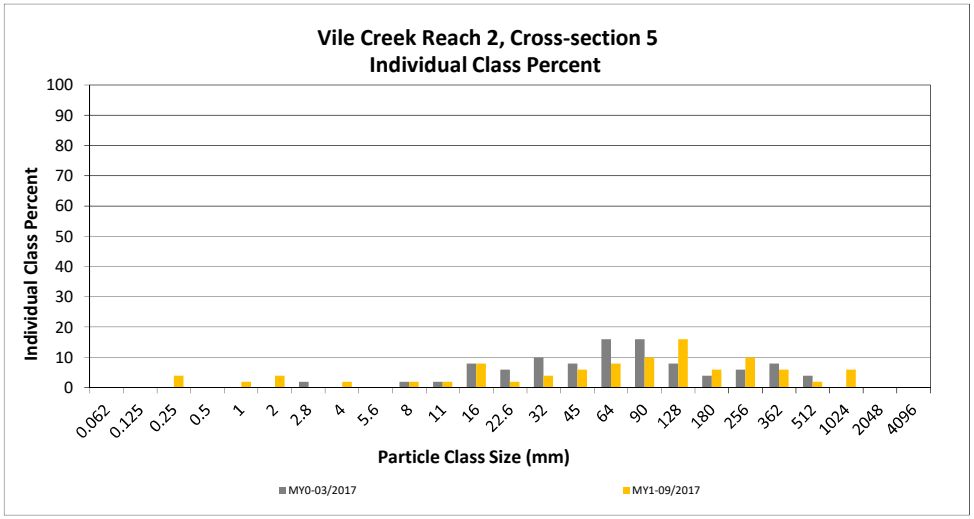
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Vile Creek Reach 2, Cross-section 5

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	4	4	4
	Medium	0.25	0.50			4
	Coarse	0.5	1.0	2	2	6
	Very Coarse	1.0	2.0	4	4	10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0	2	2	12
	Fine	4.0	5.6			12
	Fine	5.6	8.0	2	2	14
	Medium	8.0	11.0	2	2	16
	Medium	11.0	16.0	8	8	24
	Coarse	16.0	22.6	2	2	26
	Coarse	22.6	32	4	4	30
	Very Coarse	32	45	6	6	36
	Very Coarse	45	64	8	8	44
COBBLE	Small	64	90	10	10	54
	Small	90	128	16	16	70
	Large	128	180	6	6	76
	Large	180	256	10	10	86
BOULDER	Small	256	362	6	6	92
	Small	362	512	2	2	94
	Medium	512	1024	6	6	100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-section 5	
Channel materials (mm)	
D_{16} =	11.00
D_{35} =	42.51
D_{50} =	78.5
D_{84} =	238.6
D_{95} =	574.7
D_{100} =	1024.0

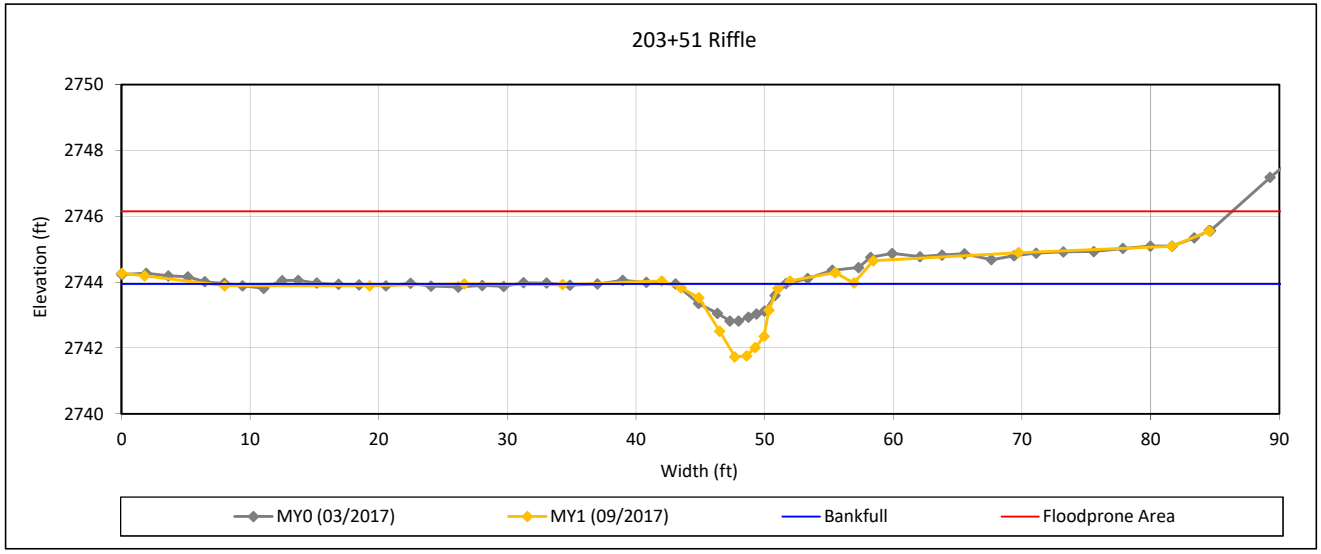




Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 7 - UT1 Reach 1



Bankfull Dimensions	
9.4	x-section area (ft.sq.)
8.1	width (ft)
1.2	mean depth (ft)
2.2	max depth (ft)
9.6	wetted perimeter (ft)
1.0	hydraulic radius (ft)
7.0	width-depth ratio
63.0	W flood prone area (ft)
7.8	entrenchment ratio
1.0	low bank height ratio

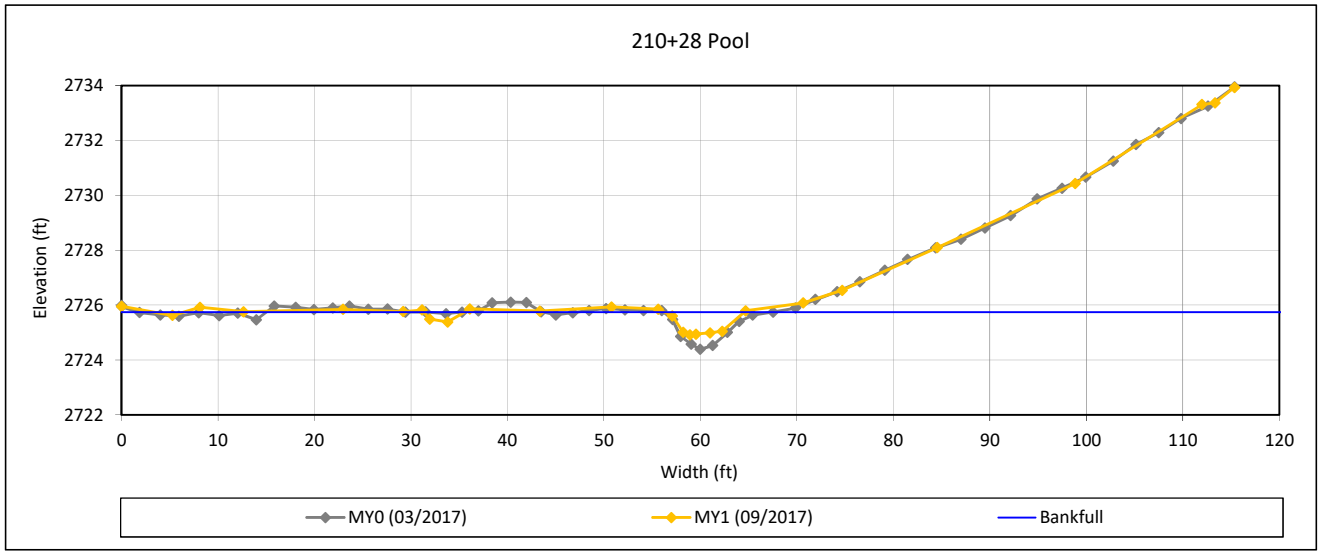
Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 8 - UT1 Reach 1



Bankfull Dimensions	
4.4	x-section area (ft.sq.)
8.2	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
8.5	wetted perimeter (ft)
0.5	hydraulic radius (ft)
15.3	width-depth ratio

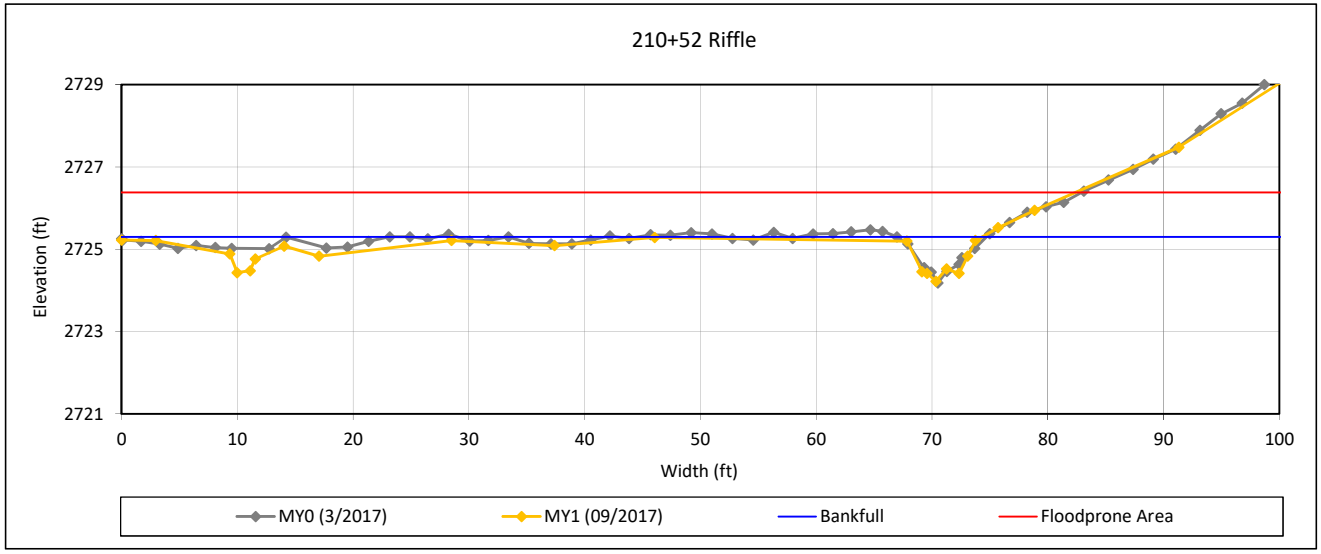
Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 9 - UT1 Reach 1



Bankfull Dimensions	
4.2	x-section area (ft.sq.)
6.5	width (ft)
0.7	mean depth (ft)
1.1	max depth (ft)
7.0	wetted perimeter (ft)
0.6	hydraulic radius (ft)
9.9	width-depth ratio
82.4	W flood prone area (ft)
12.7	entrenchment ratio
1.0	low bank height ratio

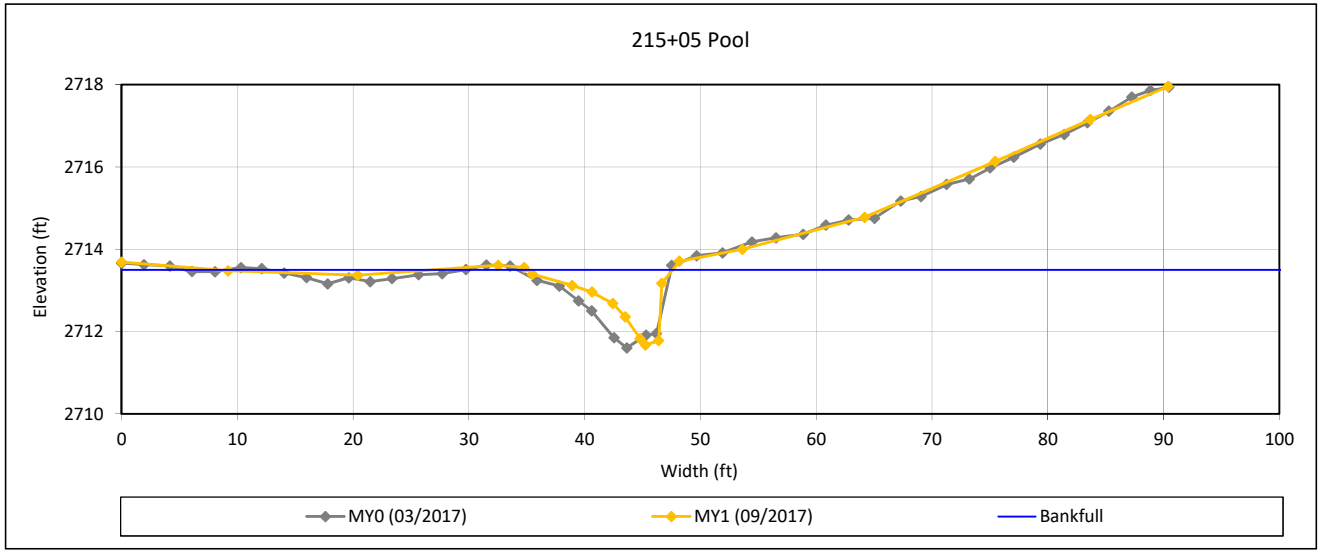
Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 10 - UT1 Reach 2



Bankfull Dimensions	
9.0	x-section area (ft.sq.)
12.6	width (ft)
0.7	mean depth (ft)
1.8	max depth (ft)
14.0	wetted perimeter (ft)
0.6	hydraulic radius (ft)
17.6	width-depth ratio

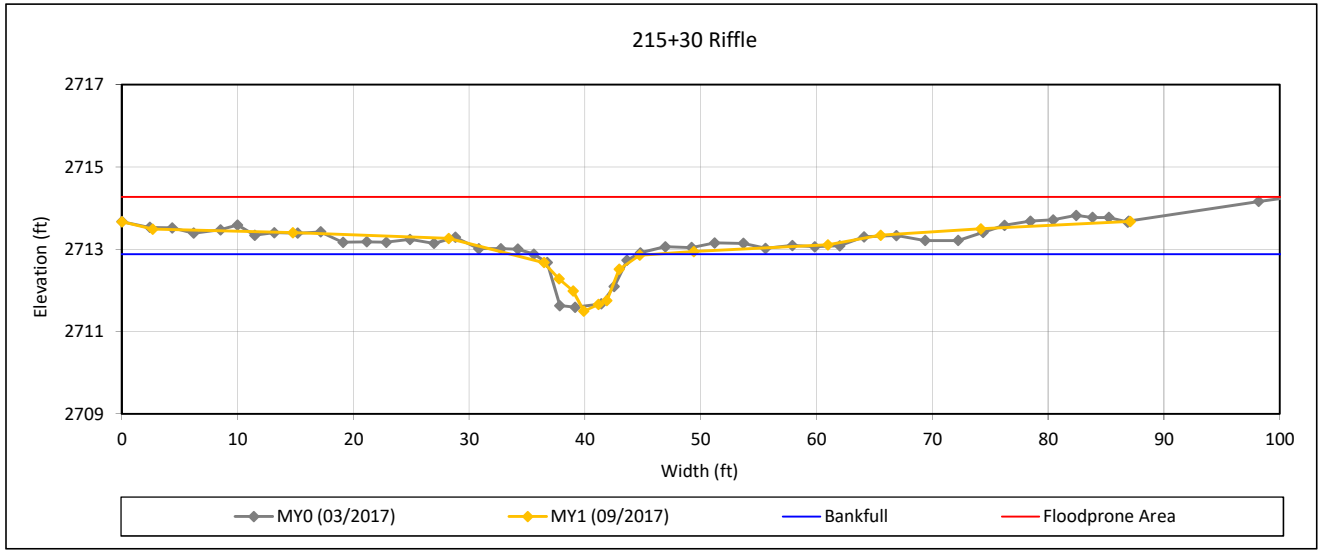
Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

Cross-section Plots

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Cross-section 11 - UT1 Reach 2



Bankfull Dimensions	
6.5	x-section area (ft.sq.)
12.6	width (ft)
0.5	mean depth (ft)
1.4	max depth (ft)
13.1	wetted perimeter (ft)
0.5	hydraulic radius (ft)
24.5	width-depth ratio
96.0	W flood prone area (ft)
7.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 09/2017
Field Crew: Wildlands Engineering

View Downstream

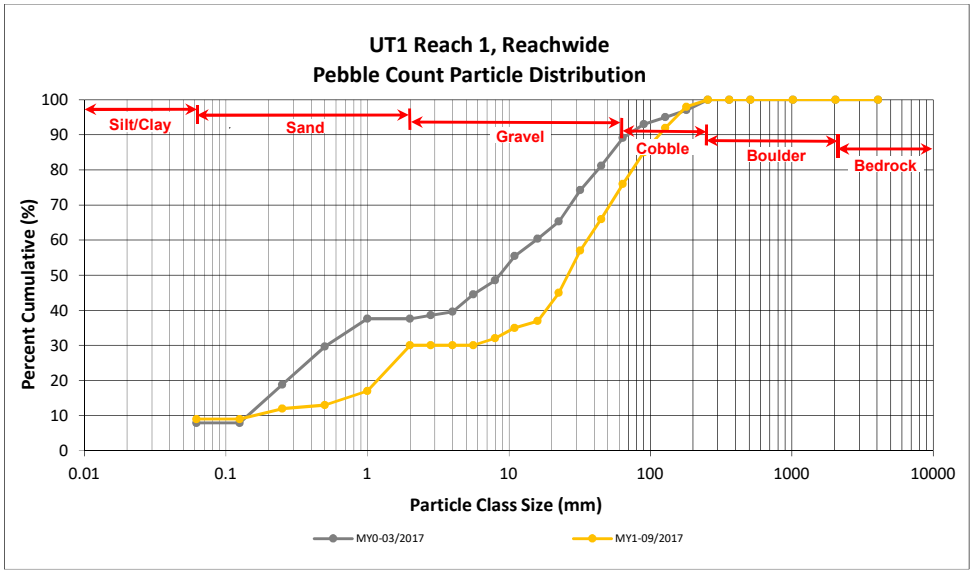
Reachwide and Cross-section Pebble Count Plots

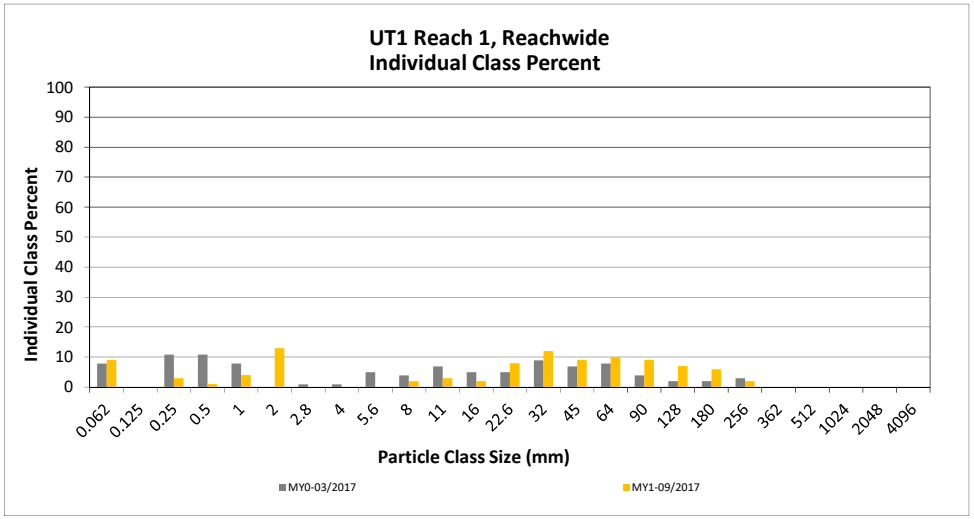
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

UT1 Reach 1, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	3	6	9	9	9
SAND	Very fine	0.062	0.125					9
	Fine	0.125	0.250	1	2	3	3	12
	Medium	0.25	0.50	1		1	1	13
	Coarse	0.5	1.0		4	4	4	17
	Very Coarse	1.0	2.0	2	11	13	13	30
GRAVEL	Very Fine	2.0	2.8					30
	Very Fine	2.8	4.0					30
	Fine	4.0	5.6					30
	Fine	5.6	8.0	1	1	2	2	32
	Medium	8.0	11.0	1	2	3	3	35
	Medium	11.0	16.0	1	1	2	2	37
	Coarse	16.0	22.6	2	6	8	8	45
	Coarse	22.6	32	7	5	12	12	57
	Very Coarse	32	45	5	4	9	9	66
	Very Coarse	45	64	6	4	10	10	76
COBBLE	Small	64	90	8	1	9	9	85
	Small	90	128	7		7	7	92
	Large	128	180	4	2	6	6	98
	Large	180	256	1	1	2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.84
D_{35} =	11.00
D_{50} =	26.1
D_{84} =	86.7
D_{95} =	151.8
D_{100} =	256.0





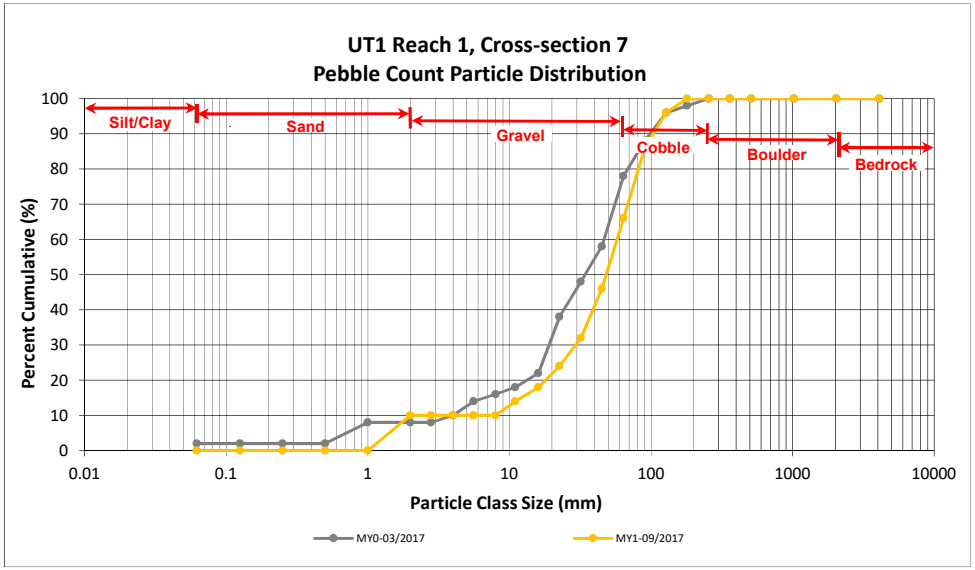
Reachwide and Cross-section Pebble Count Plots

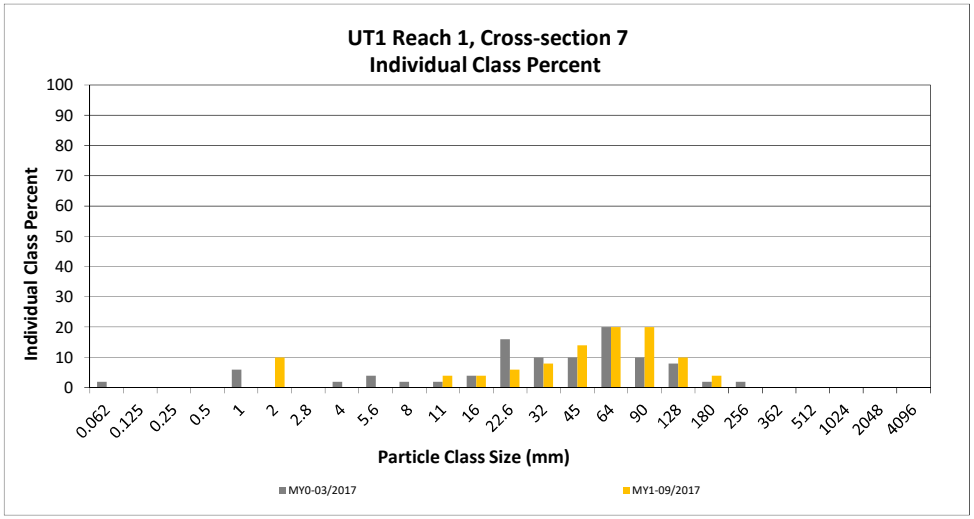
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

UT1 Reach 1, Cross-section 7

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0	10	10	10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0			10
	Fine	4.0	5.6			10
	Fine	5.6	8.0			10
	Medium	8.0	11.0	4	4	14
	Medium	11.0	16.0	4	4	18
	Coarse	16.0	22.6	6	6	24
	Coarse	22.6	32	8	8	32
	Very Coarse	32	45	14	14	46
	Very Coarse	45	64	20	20	66
COBBLE	Small	64	90	20	20	86
	Small	90	128	10	10	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 7	
Channel materials (mm)	
D_{16} =	13.27
D_{35} =	34.43
D_{50} =	48.3
D_{84} =	87.0
D_{95} =	123.6
D_{100} =	180.0





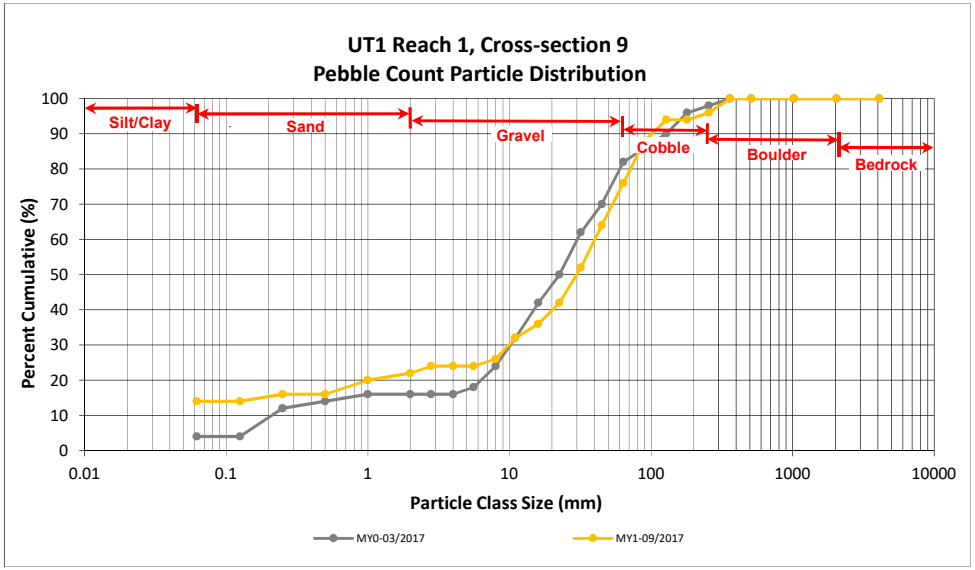
Reachwide and Cross-section Pebble Count Plots

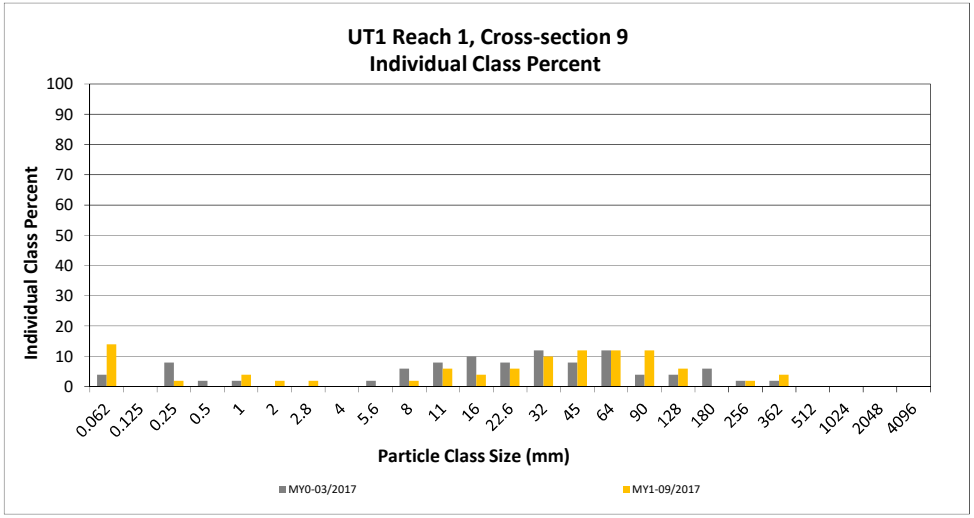
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

UT1 Reach 1, Cross-section 9

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	14	14	14
SAND	Very fine	0.062	0.125			14
	Fine	0.125	0.250	2	2	16
	Medium	0.25	0.50			16
	Coarse	0.5	1.0	4	4	20
	Very Coarse	1.0	2.0	2	2	22
GRAVEL	Very Fine	2.0	2.8	2	2	24
	Very Fine	2.8	4.0			24
	Fine	4.0	5.6			24
	Fine	5.6	8.0	2	2	26
	Medium	8.0	11.0	6	6	32
	Medium	11.0	16.0	4	4	36
	Coarse	16.0	22.6	6	6	42
	Coarse	22.6	32	10	10	52
	Very Coarse	32	45	12	12	64
	Very Coarse	45	64	12	12	76
COBBLE	Small	64	90	12	12	88
	Small	90	128	6	6	94
	Large	128	180			94
	Large	180	256	2	2	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	**100**	**100**	**100**

Cross-section 9	
Channel materials (mm)	
D_{16} =	0.25
D_{35} =	14.57
D_{50} =	29.8
D_{84} =	80.3
D_{95} =	214.7
D_{100} =	362.0





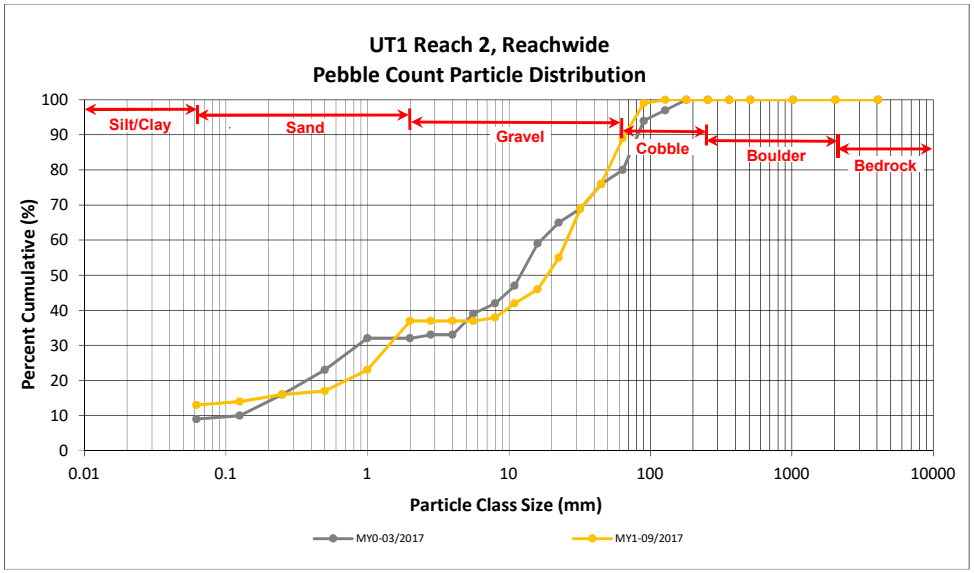
Reachwide and Cross-section Pebble Count Plots

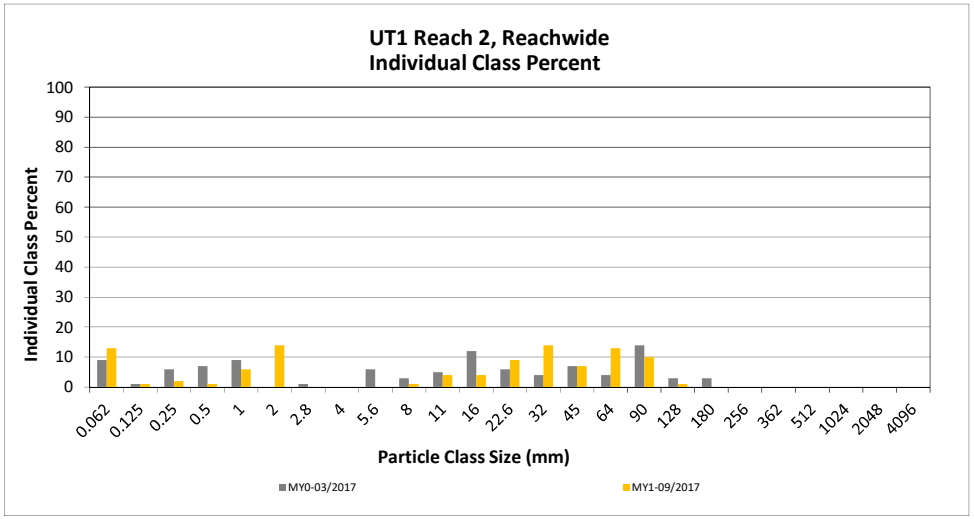
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

UT1 Reach 2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	5	8	13	13	13
SAND	Very fine	0.062	0.125		1	1	1	14
	Fine	0.125	0.250		2	2	2	16
	Medium	0.25	0.50		1	1	1	17
	Coarse	0.5	1.0		6	6	6	23
	Very Coarse	1.0	2.0	3	11	14	14	37
GRAVEL	Very Fine	2.0	2.8					37
	Very Fine	2.8	4.0					37
	Fine	4.0	5.6					37
	Fine	5.6	8.0		1	1	1	38
	Medium	8.0	11.0	2	2	4	4	42
	Medium	11.0	16.0	2	2	4	4	46
	Coarse	16.0	22.6	3	6	9	9	55
	Coarse	22.6	32	10	4	14	14	69
	Very Coarse	32	45	5	2	7	7	76
	Very Coarse	45	64	11	2	13	13	89
COBBLE	Small	64	90	8	2	10	10	99
	Small	90	128	1		1	1	100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.25
D_{35} =	1.81
D_{50} =	18.7
D_{84} =	55.9
D_{95} =	78.5
D_{100} =	128.0





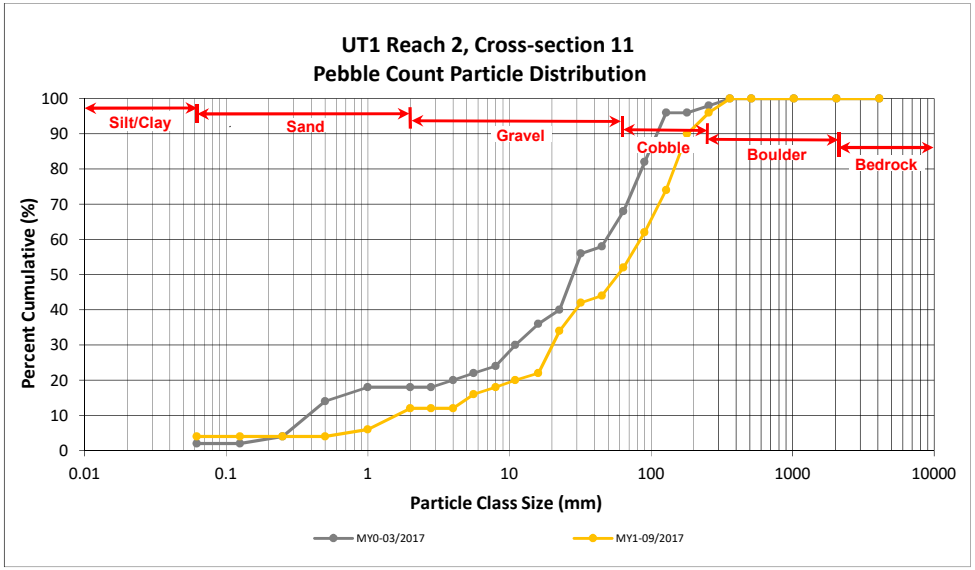
Reachwide and Cross-section Pebble Count Plots

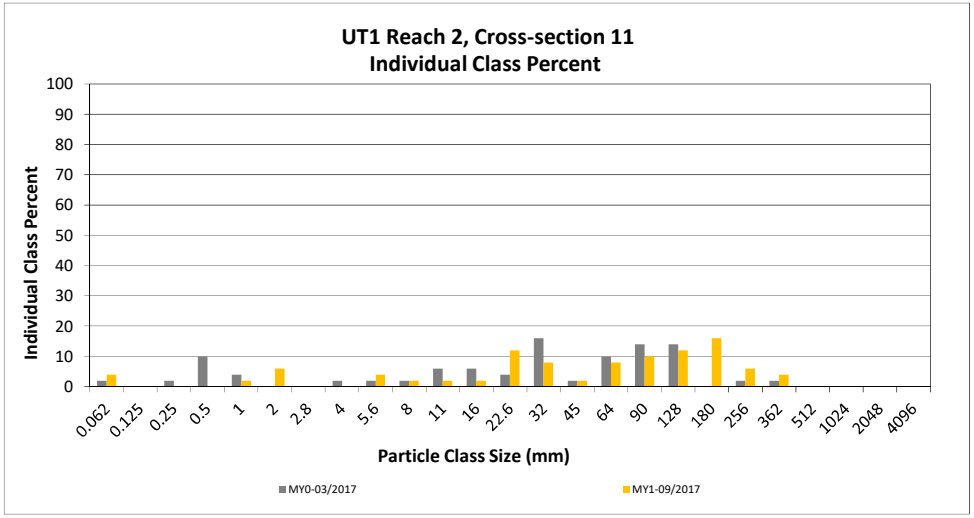
Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 1 - 2017

UT1 Reach 2, Cross-section 11

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4	4	4
SAND	Very fine	0.062	0.125			4
	Fine	0.125	0.250			4
	Medium	0.25	0.50			4
	Coarse	0.5	1.0	2	2	6
	Very Coarse	1.0	2.0	6	6	12
GRAVEL	Very Fine	2.0	2.8			12
	Very Fine	2.8	4.0			12
	Fine	4.0	5.6	4	4	16
	Fine	5.6	8.0	2	2	18
	Medium	8.0	11.0	2	2	20
	Medium	11.0	16.0	2	2	22
	Coarse	16.0	22.6	12	12	34
	Coarse	22.6	32	8	8	42
	Very Coarse	32	45	2	2	44
	Very Coarse	45	64	8	8	52
COBBLE	Small	64	90	10	10	62
	Small	90	128	12	12	74
	Large	128	180	16	16	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	**100**	**100**	**100**

Cross-section 11	
Channel materials (mm)	
D_{16} =	5.60
D_{35} =	23.60
D_{50} =	58.6
D_{84} =	158.4
D_{95} =	241.4
D_{100} =	362.0





APPENDIX 5. Hydrology Summary Data and Plots

Table 13. Verification of Bankfull Events

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Reach	Date of MY1 Data Collection	Date of Occurrence	Method
Vile Reach 2	5/24/2017	3/31/2017	Stream Gage
	6/7/2017	4/24/2017	
	10/19/2017	10/8/2017	
UT1 Reach 2	6/7/2017	5/5/2017	
	10/19/2017	10/8/2017	

Table 14. Wetland Gage Attainment Summary

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017

Summary of Groundwater Gage Results for Monitoring Years 1 through 7							
Gage	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	Year 1 (2017)	Year 2 (2018)	Year 3 (2019)	Year 4 (2020)	Year 5 (2021)	Year 6 (2022)	Year 7 (2023)
1*	Yes/169 Days (100%)						
2	Yes/ 129 Days (77%)						
3	Yes/169 Days (100%)						
4	Yes/169 Days (100%)						
5	Yes/169 Days (100%)						
6	Yes/169 Days (100%)						
7	Yes/ 129 Days (77%)						
8	Yes/125 Days (74%)						
9	Yes/40 Days (24%)						
10*	Yes/169 Days (100%)						

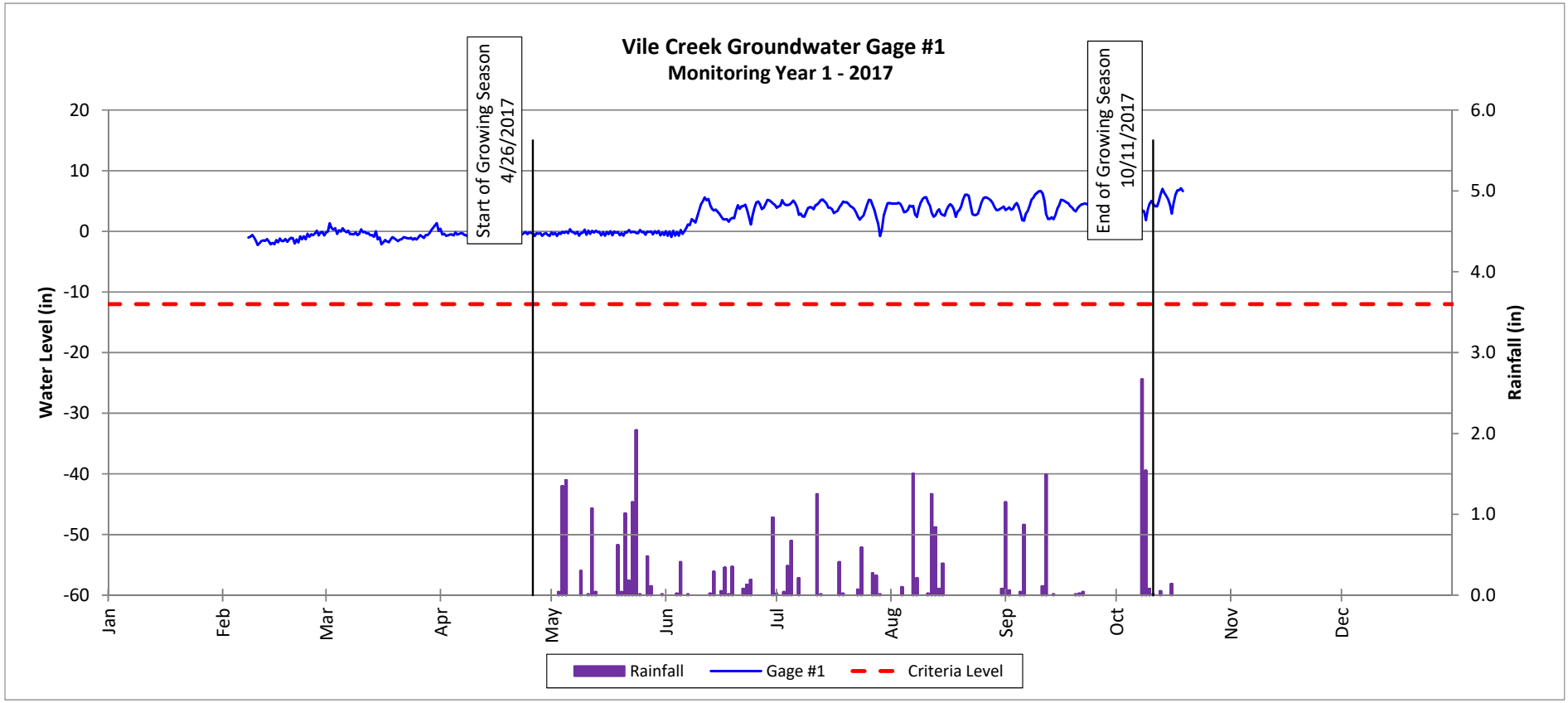
*Gages are located in bog habitat.
*Growing season is April 26th -October 11th.

Groundwater Gage Plots

Vile Creek Mitigation Site - DMS Project No. 96582

Monitoring Year 1 - 2017

Wetland Bog Rehabilitation

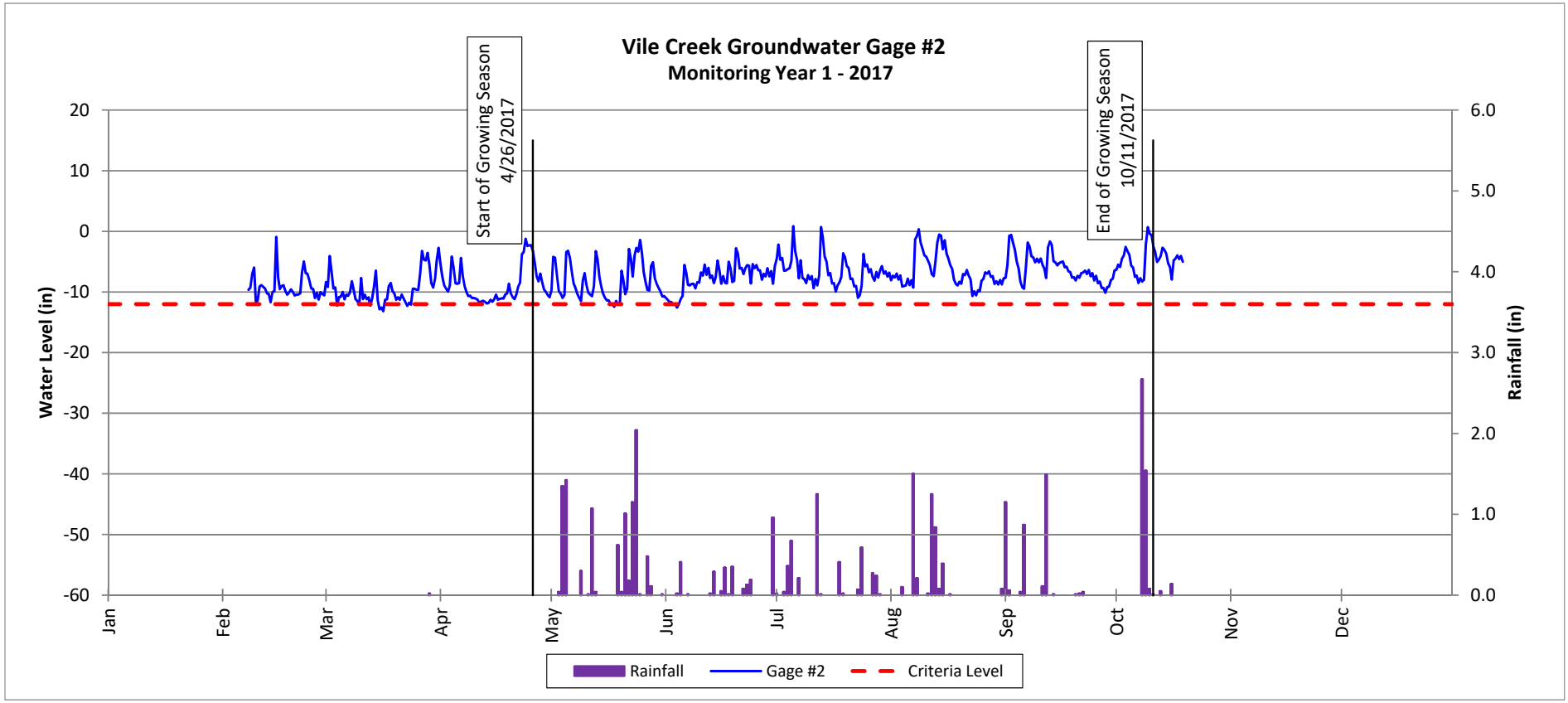


Groundwater Gage Plots

Vile Creek Mitigation SiteDMS Project No. 96582

Monitoring Year 1 - 2017

Wetland Re-establishment

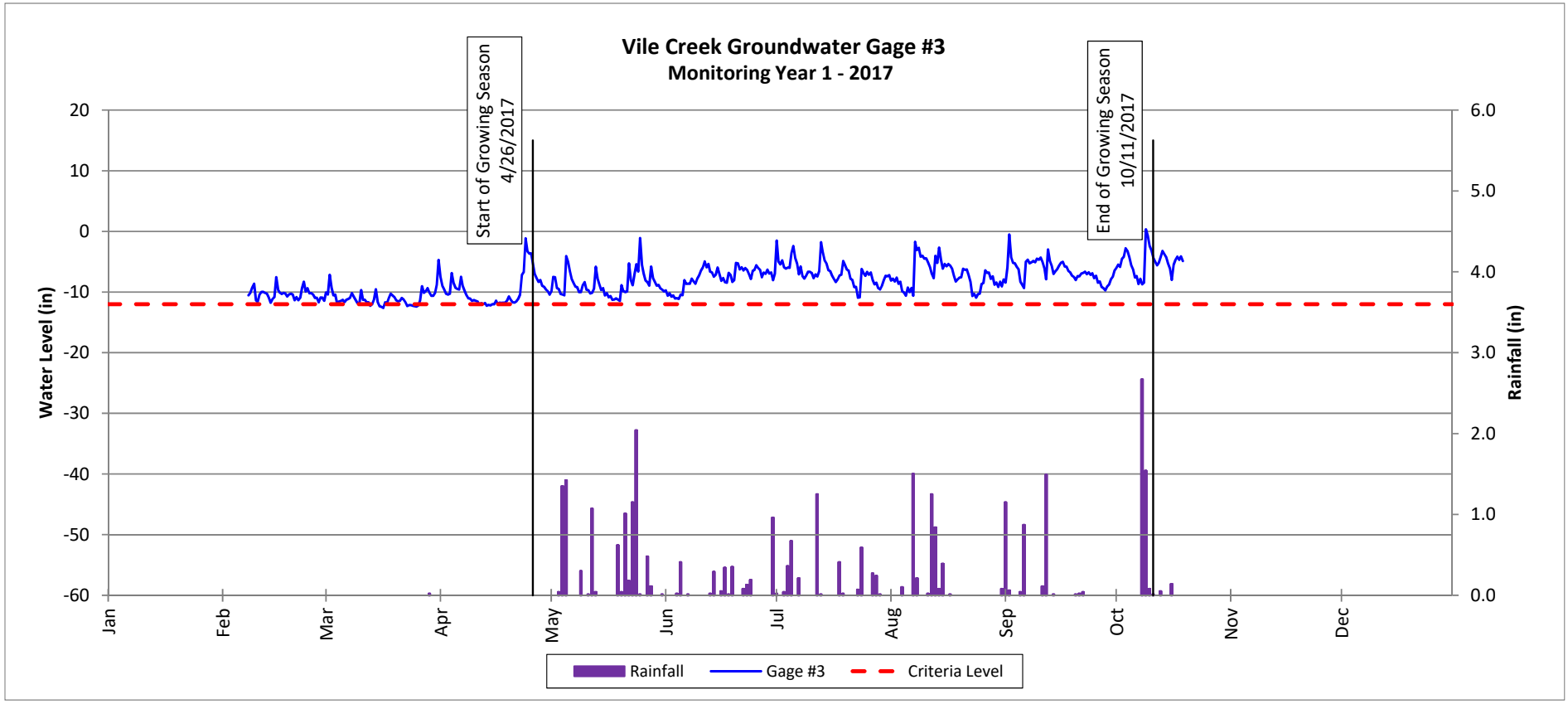


Groundwater Gage Plots

Vile Creek Mitigation SiteDMS Project No. 96582

Monitoring Year 1 - 2017

Wetland Re-establishment

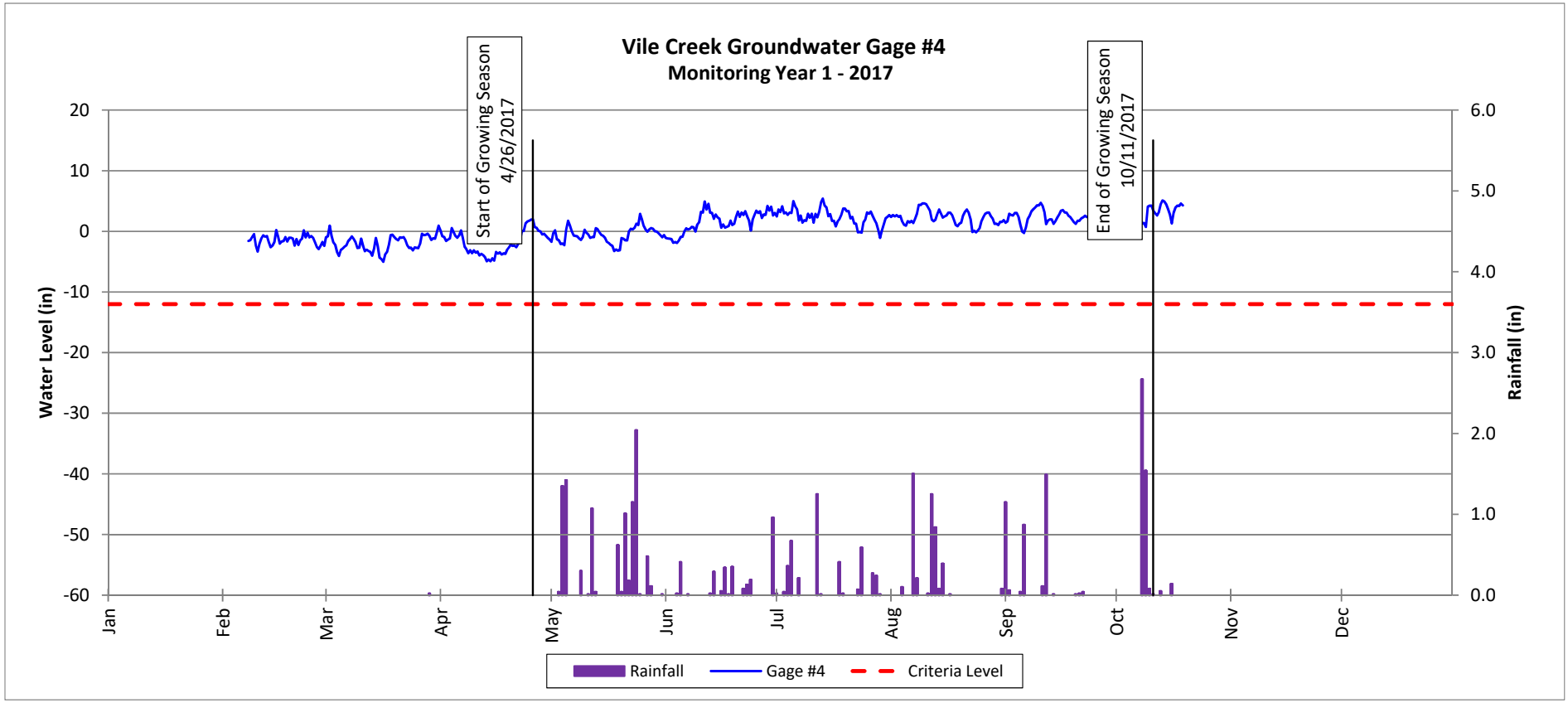


Groundwater Gage Plots

Vile Creek Mitigation SiteDMS Project No. 96582

Monitoring Year 1 - 2017

Wetland Re-establishment

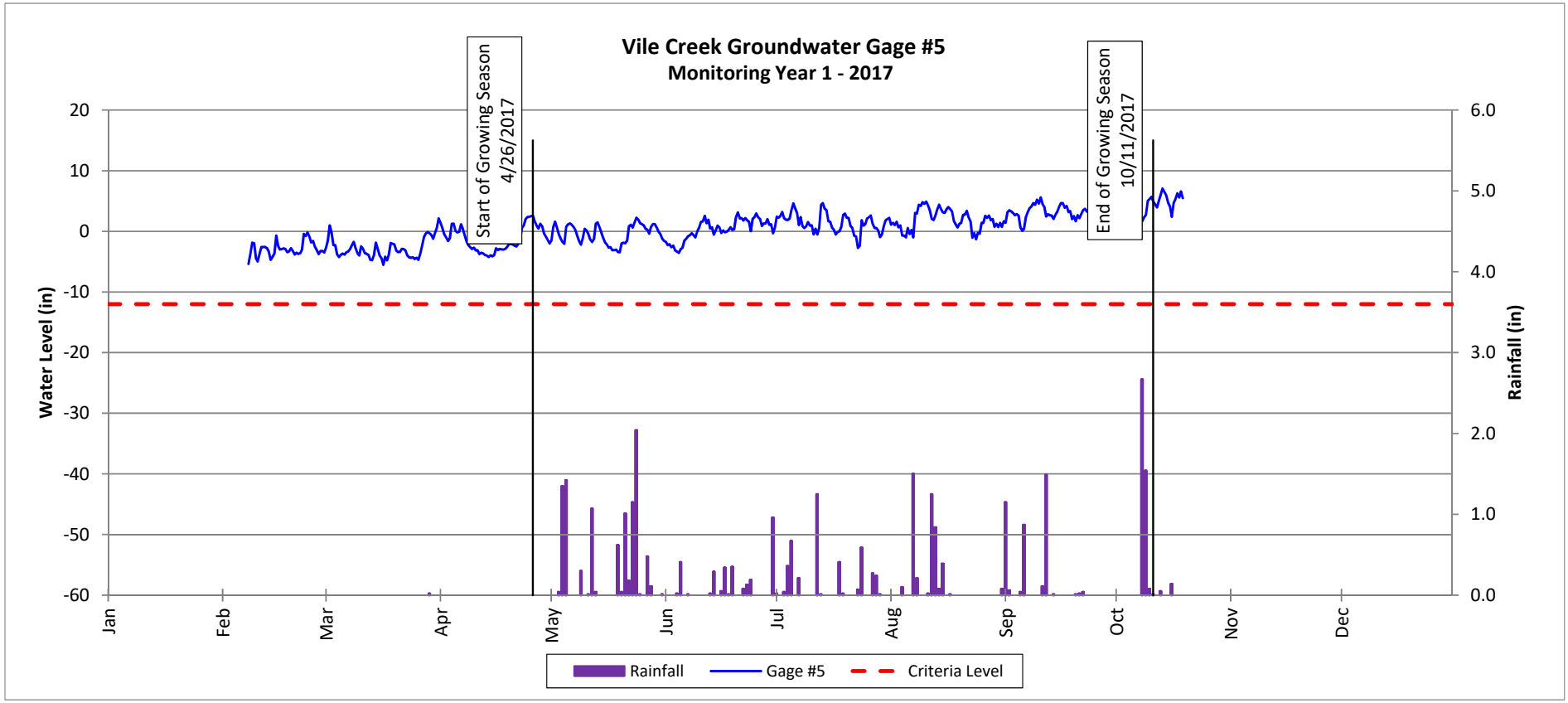


Groundwater Gage Plots

Vile Creek Mitigation SiteDMS Project No. 96582

Monitoring Year 1 - 2017

Wetland Rehabilitation

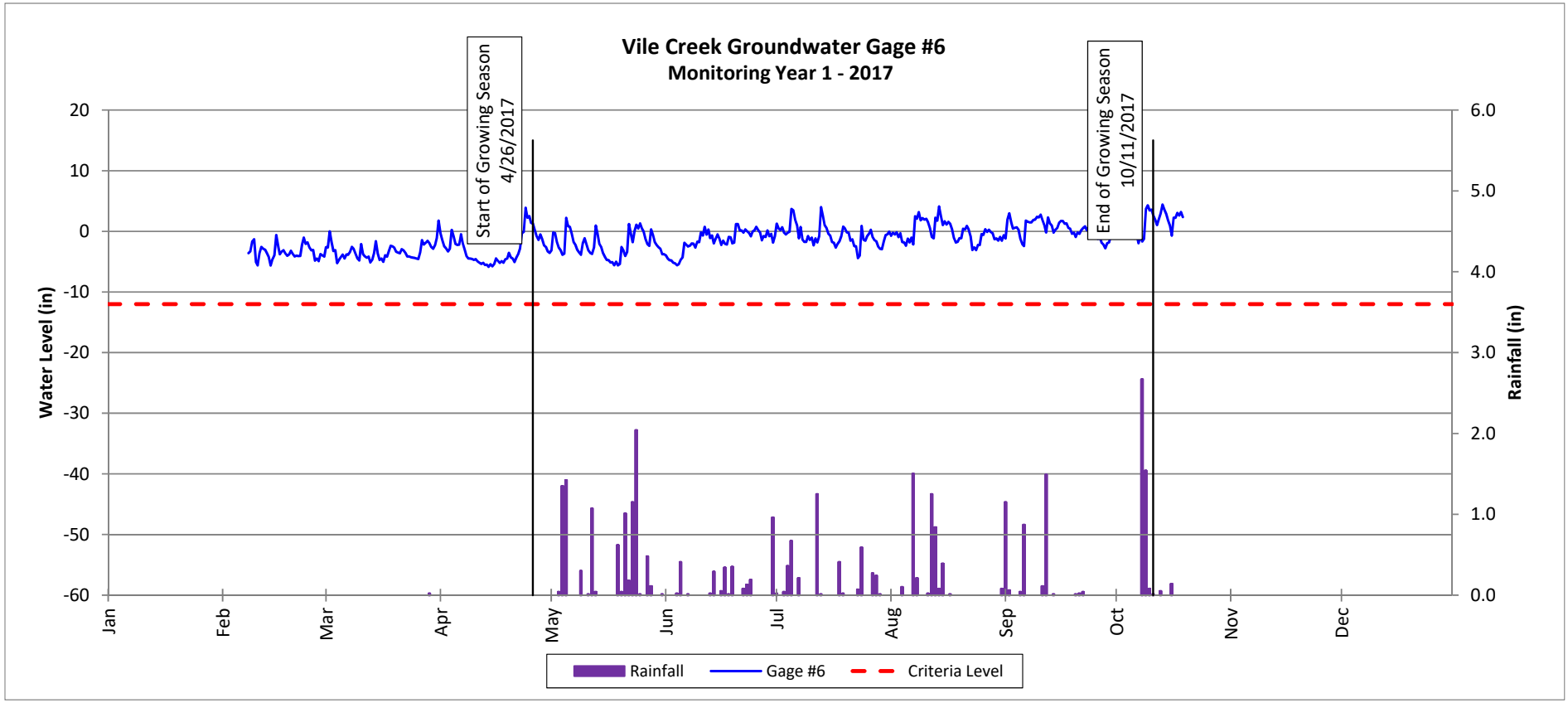


Groundwater Gage Plots

Vile Creek Mitigation SiteDMS Project No. 96582

Monitoring Year 1 - 2017

Wetland Re-establishment

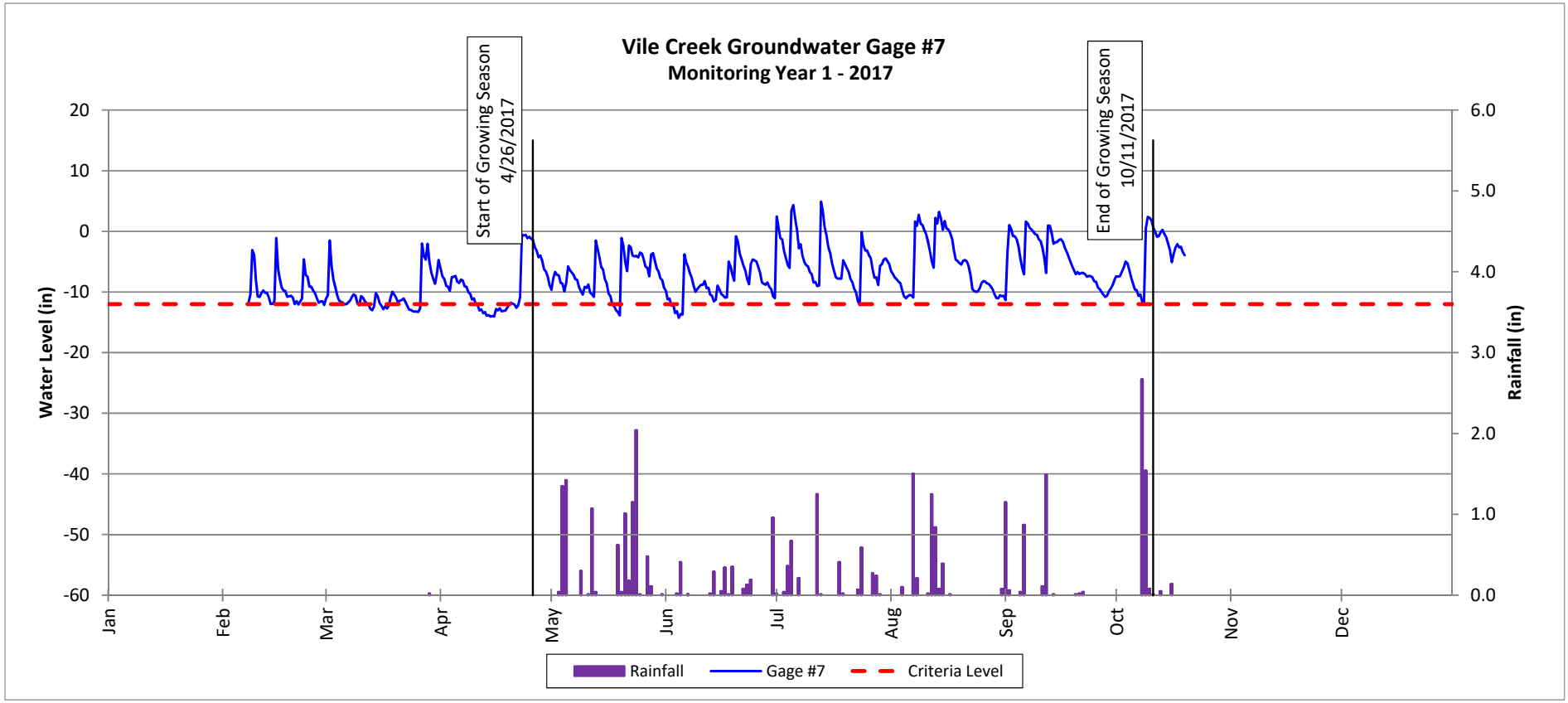


Groundwater Gage Plots

Vile Creek Mitigation SiteDMS Project No. 96582

Monitoring Year 1 - 2017

Wetland Re-establishment

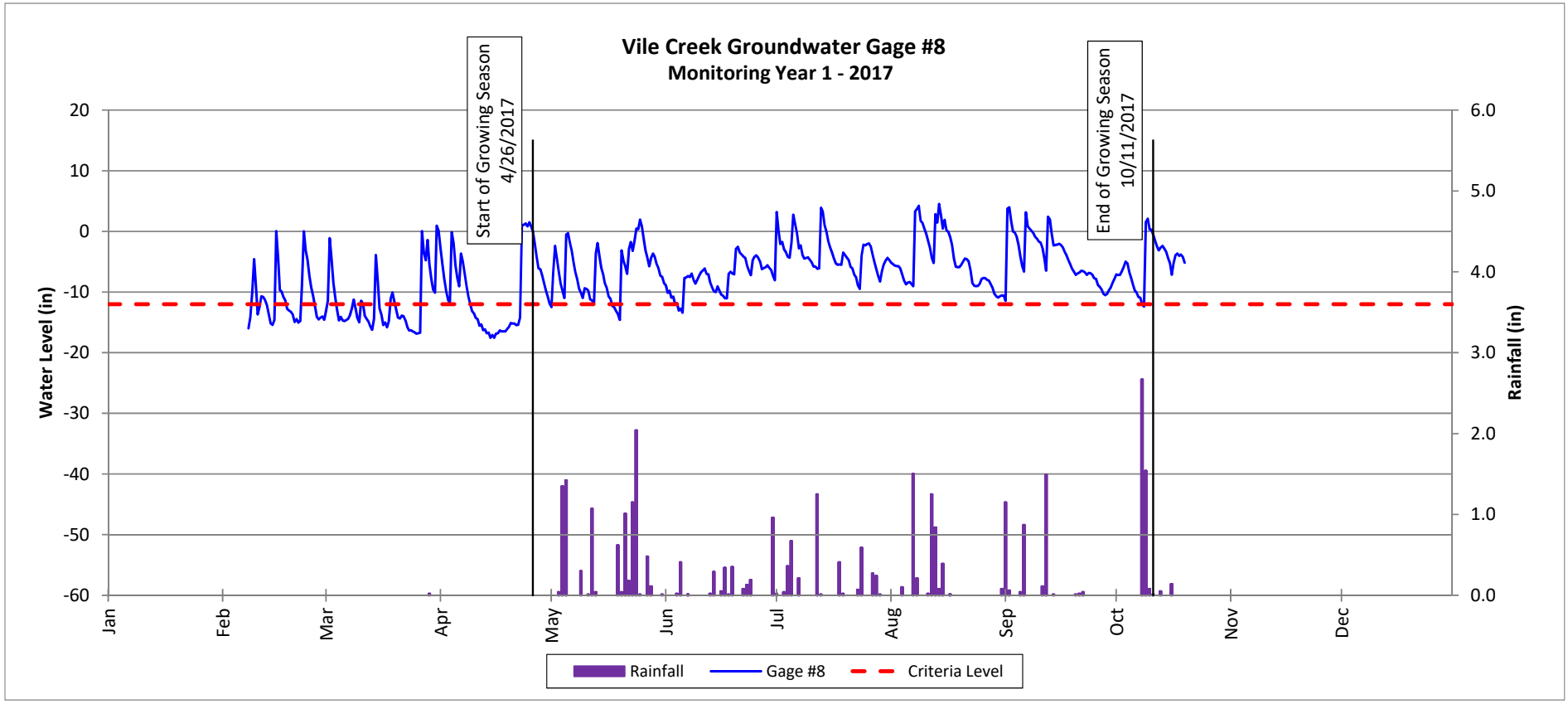


Groundwater Gage Plots

Vile Creek Mitigation SiteDMS Project No. 96582

Monitoring Year 1 - 2017

Wetland Re-establishment

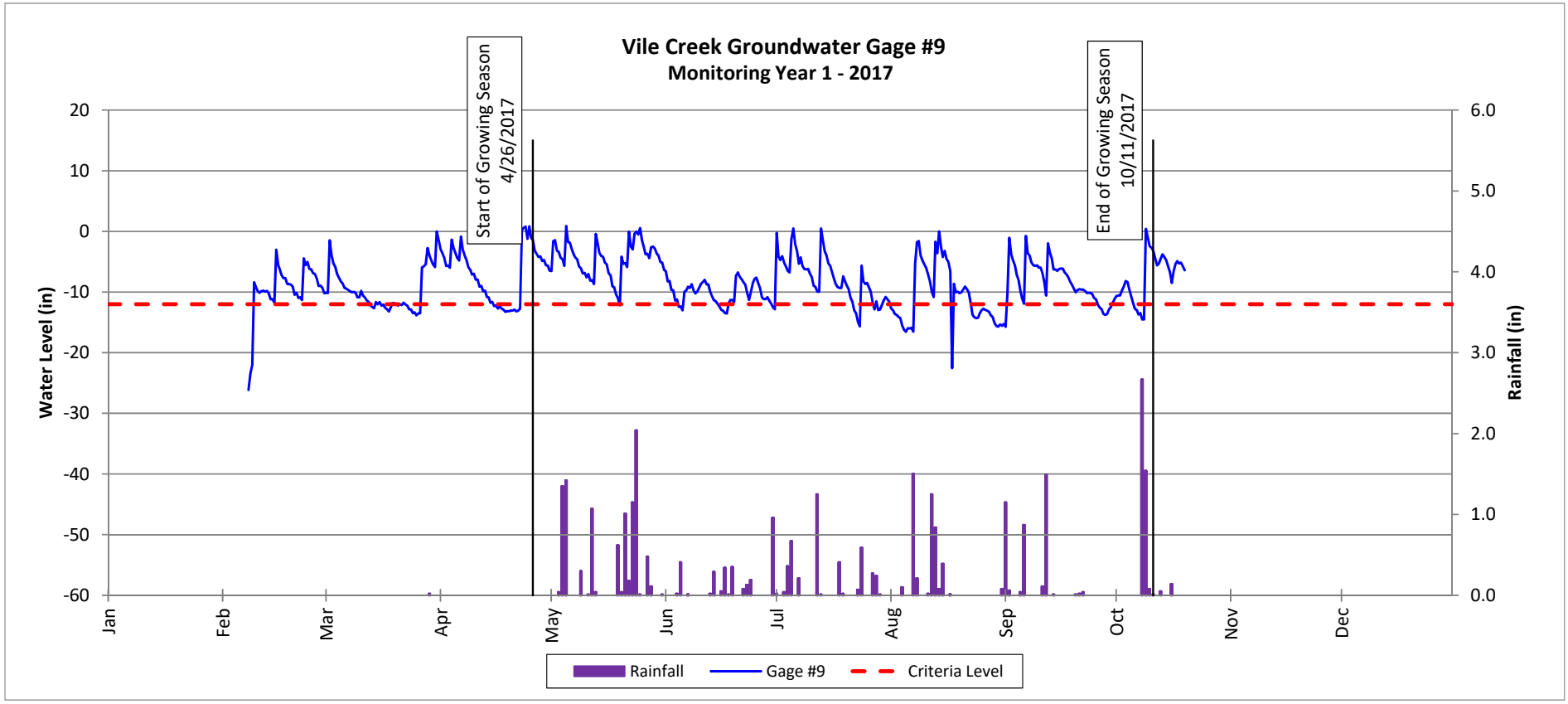


Groundwater Gage Plots

Vile Creek Mitigation SiteDMS Project No. 96582

Monitoring Year 1 - 2017

Wetland Re-establishment

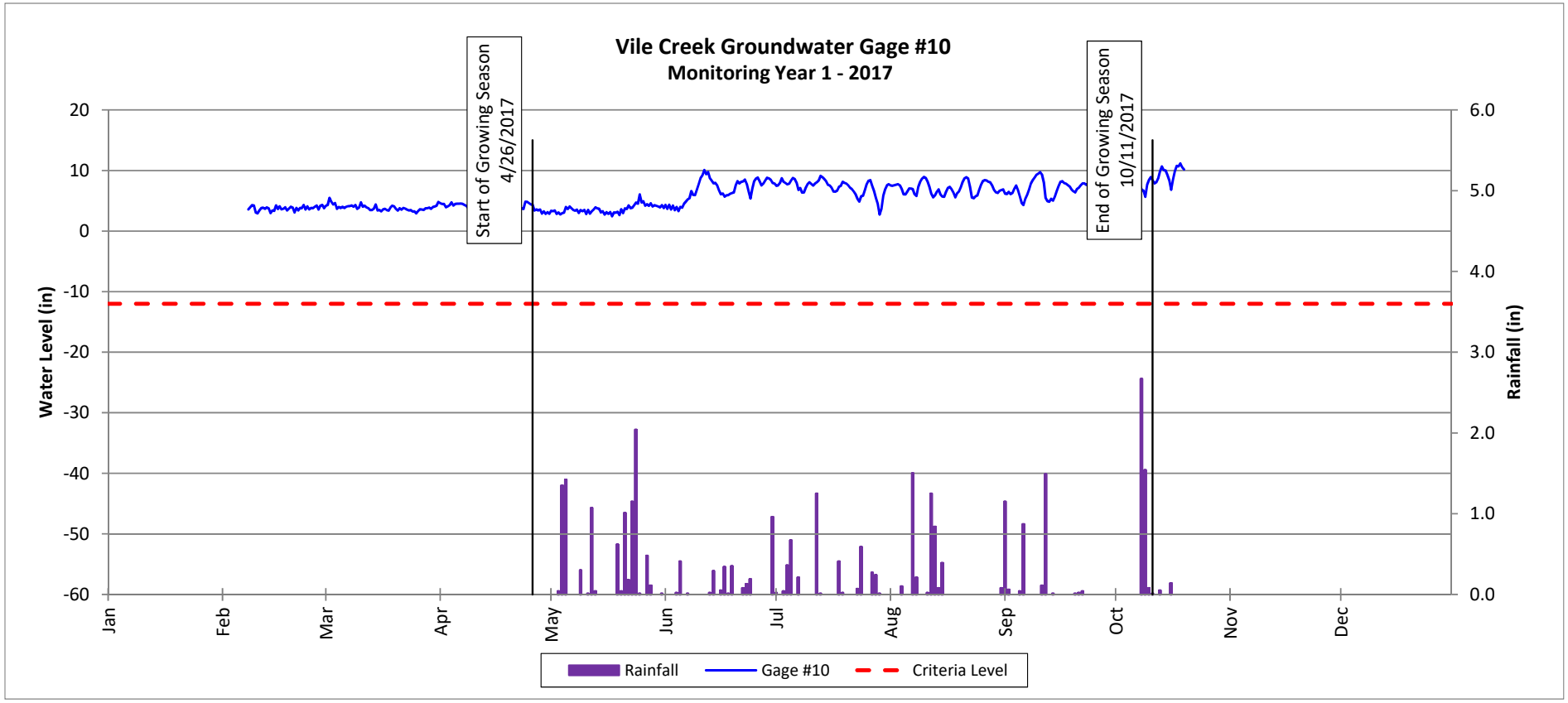


Groundwater Gage Plots

Vile Creek Mitigation Site - DMS Project No. 96582

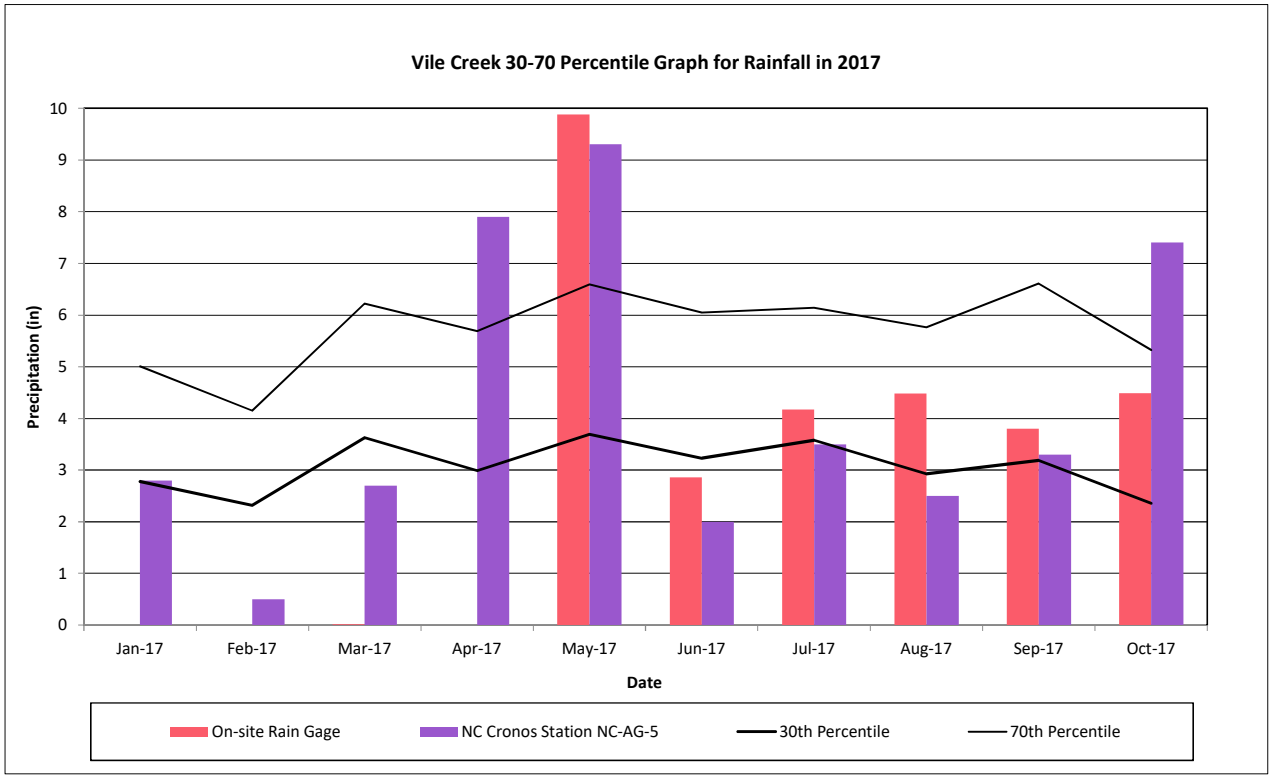
Monitoring Year 1 - 2017

Wetland Bog Rehabilitation



Monthly Rainfall Data

Vile Creek Mitigation Site
DMS Project No. 96582
Monitoring Year 1 - 2017



[1] 2017 rainfall collected by on-site rainfall gage and NC Cronos Station NC-AG-5

[2] 30th and 70th percentile rainfall data collected from WETS station Transou, Ashe County, NC

[3] On-site rainfall gage malfunctioned Jan-April 2017.