



MONITORING YEAR 4 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: April – November 2020
Submission Date: January 19, 2021

PREPARED FOR:



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

Mitigation Project Name	Vile Creek Mitigation Site	USACE Action ID	2014-01585
DMS ID	96582	DWR Permit	2014-0869
River Basin	New	Date Project Instituted	6/24/2014
Cataloging Unit	05050001	Date Prepared	4/20/2020
County	Alleghany	Stream/Wet. Service Area	New 05050001

Todd J. [Signature] 9/21/2020

Signature & Date of Official Approving Credit Release

1 - For NCDMS, no credits are released during the first milestone
 2 - For NCDMS projects, the initial credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the IRT by posting it to the DMS portal, provided the following have been met:

- 1) Approved of Final Mitigation Plan
 - 2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property.
 - 3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan.
 - 4) Receipt of necessary DA permit authorization or written DA approval for projects where DA permit issuance is not required.
- 3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met.

Credit Release Milestone	Cold Stream Credits						
	Scheduled Releases %	Proposed Releases %	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	1,515.904	0.000	1,515.904	2017	7/25/2017
3 - Year 1 Monitoring	10.00%	10.00%	505.301	0.000	505.301	2018	4/25/2018
4 - Year 2 Monitoring	10.00%	10.00%	505.301	0.000	505.301	2019	4/26/2019
5 - Year 3 Monitoring	10.00%	10.00%	505.301	0.000	505.301	2020	4/20/2020
6 - Year 4 Monitoring	5.00%					2021	
7 - Year 5 Monitoring	10.00%					2022	
8 - Year 6 Monitoring	5.00%					2023	
9 - Year 7 Monitoring	10.00%					2024	
Stream Bankfull Standard	10.00%	10.00%	505.301	0.000	505.301	2019	4/26/2019
			Totals		3,537.108		

Total Gross Credits	5,053.014
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	3,537.108
Total Percentage Released	70.00%
Remaining Unreleased Credits	1,515.906

Credit Release Milestone	Riparian Credits						
	Scheduled Releases %	Proposed Releases %	Proposed Released #	Not Approved # Releases	Approved Credits	Anticipated Release Year	Actual Release Date
1 - Site Establishment	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2 - Year 0 / As-Built	30.00%	30.00%	1.711	0.000	1.711	2017	7/25/2017
3 - Year 1 Monitoring	10.00%	10.00%	0.570	0.000	0.570	2018	4/25/2018
4 - Year 2 Monitoring	10.00%	10.00%	0.570	0.000	0.570	2019	4/26/2019
5 - Year 3 Monitoring	15.00%	15.00%	0.855	0.000	0.855	2020	4/20/2020
6 - Year 4 Monitoring	5.00%					2021	
7 - Year 5 Monitoring	15.00%					2022	
8 - Year 6 Monitoring	5.00%					2023	
9 - Year 7 Monitoring	10.00%					2024	
Stream Bankfull Standard	N/A	N/A	N/A	N/A	N/A	N/A	N/A
			Totals		3.706		

Total Gross Credits	5.703
Total Unrealized Credits to Date	0.000
Total Released Credits to Date	3.706
Total Percentage Released	64.83%
Remaining Unreleased Credits	1.997

Mitigation Project Name	Vile Creek Mitigation Site	USACE Action ID	2014-01585
DMS ID	96582	DWR Permit	2014-0869
River Basin	New	Date Project Instituted	6/24/2014
Cataloging Unit	05050001	Date Prepared	4/20/2020
County	Alleghany	Stream/Wet. Service Area	New 05050001

Notes**Contingencies (if any)****Project Quantities**

Mitigation Type	Restoration Type	Physical Quantity
Cold Stream	Restoration	2,970.000
Cold Stream	Enhancement I	1,088.000
Cold Stream	Enhancement II	3,815.000
Riparian	Restoration	6.400

Debits

							Stream Restoration Credits	Riparian Restoration
Beginning Balance (mitigation credits)							5,053.014	5.703
Released Credits							3,537.108	3.706
Unrealized Credits							0.000	0.000
Owning Program	Req. Id	TIP #	Project Name	USACE Permit #	DWR Permit #	DCM Permit #		
NCDOT Stream & Wetland ILF Program	REQ-005451	R-0529BA R-0529BB R-0529DB	US 421 Widening	1997-07161	1997-0616		119.000	
NCDOT Stream & Wetland ILF Program	REQ-005451	R-0529BA R-0529BB R-0529DB	US 421 Widening	1997-07161	1997-0616		1,010.602	
NCDOT Stream & Wetland ILF Program	REQ-005946	R-3101	US 21 Improvements	2012-01963	2013-0777		188.501	
NCDOT Stream & Wetland ILF Program	REQ-006194	R-2915A	US 221 Widening	2012-00882	2014-0762		204.663	
NCDOT Stream & Wetland ILF Program	REQ-006194	R-2915A	US 221 Widening	2012-00882	2014-0762		60.077	
NCDOT Stream & Wetland ILF Program	REQ-006196	R-2915B	US 221 Widening	2012-00882	2014-0762		489.739	
NCDOT Stream & Wetland ILF Program	REQ-006196	R-2915B	US 221 Widening	2012-00882	2014-0762		188.700	
NCDOT Stream & Wetland ILF Program	REQ-006196	R-2915B	US 221 Widening	2012-00882	2014-0762		387.561	
NCDOT Stream & Wetland ILF Program	REQ-006198	R-2915D	US 221 Widening	2012-00882	2014-0762		294.301	
NCDOT Stream & Wetland ILF Program	REQ-006198	R-2915D	US 221 Widening	2012-00882	2014-0762		62.900	
NCDOT Stream & Wetland ILF Program	REQ-006198	R-2915D	US 221 Widening	2012-00882	2014-0762		25.760	

Mitigation Project Name Vile Creek Mitigation Site
DMS ID 96582
River Basin New
Cataloging Unit 05050001
County Alleghany

USACE Action ID 2014-01585
DWR Permit 2014-0869
Date Project Instituted 6/24/2014
Date Prepared 4/20/2020
Stream/Wet. Service Area New 05050001

Debits

							Stream Restoration Credits	Riparian Restoration
Beginning Balance (mitigation credits)							5,053.014	5.703
Released Credits							3,537.108	3.706
Unrealized Credits							0.000	0.000
NCDOT Stream & Wetland ILF Program	REQ-006195	R-2915A	US 221 Widening	2012-00882	2014-0762		0.588	
NCDOT Stream & Wetland ILF Program	REQ-006197	R-2915B	US 221 Widening	2012-00882	2014-0762		0.860	
NCDOT Stream & Wetland ILF Program	REQ-006199	R-2915D	US 221 Widening	2012-00882	2014-0762		0.570	
NCDOT Stream & Wetland ILF Program	REQ-006199	R-2915D	US 221 Widening	2012-00882	2014-0762		0.262	
NCDOT Stream & Wetland ILF Program	REQ-006199	R-2915D	US 221 Widening	2012-00882	2014-0762		0.571	
Total Credits Debited							3,031.804	2.851
Remaining Available balance (Released credits)							505.304	0.855
Remaining balance (Unreleased credits)							1,515.906	1.997



January 19, 2021

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

RE: **Response to MY4 Draft Report Comments
Vile Creek Mitigation Project**
DMS Project # 96582
Contract Number 5999
New River Basin - HUC# 05050001 - Alleghany County, North Carolina

Dear Mr. Tsomides:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services, (DMS) comments from the Draft Monitoring Year 4 report for the Vile Creek Mitigation Project. DMS comments are noted below in bold, Wildlands responses to DMS report comments are noted in *italics*.

DMS Comment: Please update the asset tables to reflect the current reporting format (Project Components, Length and Area Summations, and Overall Assets Summary).

Wildlands, response: The project components and mitigation credits table were revised to reflect the current reporting format (Table 1).

DMS Comment: Wildlands notes up to 12 bankfull events and up to 16 geomorphically significant events for 2020 across the site. While it was a wetter than normal year, is there an explanation of why such an unexpected number of apparent bankfull/geomorphic events occurred in 2020? Please consider confirming bankfull elevations in the field in MY5 due to so many recorded events.

Wildlands, response: The top of banks and eye bolt elevation were surveyed at each stream's crest gage during MY4. The crest gages were also resurveyed during the MY4 so a shift in elevation that effected the whole project during the monitoring year is unlikely. During the stream survey in MY5 and corresponding data will be adjusted if necessary, Wildlands will confirm bankfull elevations in the field. The only current explanation for the abundance of bankfull/geomorphic events that occurred in 2020 is the wetter than normal year. Wildlands' noted similar occurrences of above average bankfull/geomorphic events throughout most, if not all, of our NC monitoring projects during 2020.

DMS Comment: Please double-side the final hard copy pages.

Wildlands, response: Wildlands has double-sided the final 8 ½" x 11" hard copy pages.



Digital Support File Comments

DMS Comment: Last year DMS requested updated spatial features. The digital submittal addressed all reaches and wetlands, except for UT1 Reach 1. The feature for UT1 Reach 1 does have a length that matches the “As Built Footage/Acreage” column (1114 ft), but not the “Creditable As Built Footage/Acreage” column (1088 ft). The notes state that the 25 ft differences between these 2 columns is due to the easement break, which is excluded in the digital submittal, but the feature is still 1114 ft. Please update the feature to address this difference, or indicate why the feature is different from the Creditable As Built Footage/Acreage column.

Wildlands, response: The current lengths for UT1 Reach 1 in the digital submittal shapefile are correct. The issue is that the “As Built Footage/Acreage” and the “Creditable As Built Footage/Acreage” for UT1 Reach 1 in the Baseline Report were incorrectly reported in Table 1 and were subsequently carried forward and reported incorrectly in MY1 – MY4’s draft report. The correct lengths should have been reported in the baseline reports as 1,139 for the “As Built Footage/Acreage” and 1,114 for the Creditable AS Built Footage/Acreage”, which excludes the 25 foot easement crossing break. Since the Project Components and Mitigation Credits Table in the Final MY4 Report has been reformatted, the listed lengths of 1,114 in the AS Built Footage/Acreage column is correct.

DMS Comment: If available, please include features that connect the creditable stream reaches (e.g. stream segments in easement breaks). DMS wants to be able to have segmented, but continuous stream shapes within a project’s footprint.

Wildlands, response: Wildlands updated the shape file to include the stream segments in easement breaks. The updated shape file is provided with the digital submittal data.

Enclosed please find two (2) hard copies and one (1) electronic copy on CD of the Final Monitoring Report. Please contact me at 704-332-7754 x101 if you have any questions.

Sincerely,

Kristi Suggs,
Senior Environmental Scientist
ksuggs@wildlandseng.com

PREPARED BY:



1430 South Mint Street, Suite 104
Charlotte, NC 28203

Phone: 704.332.7754
Fax: 704.332.3306

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 5,053.000 stream mitigation units (SMUs) and 5.703 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 Hydrologic Unit Code (HUC) 05050001 and the 14-digit 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 Little River (Figure 2). Vile Creek flows into Little River near the downstream project 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: Heavily grazed deforested buffer, 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) 4 assessments and Site visits were completed between April and November 2020 to assess the conditions of the project.

Overall, the Site has partially met the required stream, vegetation, and hydrology success criteria for MY5 and is on track to meet MY7 performance standards/success criteria. All restored and enhancement I streams are geomorphically stable and functioning as designed. During MY4, 9 bankfull events were recorded on Vile Creek Reach 2 and 7 bankfull events were recorded on UT1 Reach 2. However, bankfull event criteria was already met in MY2. Multiple geomorphically significant events were recorded on Vile Creek Reach 2 and UT1 Reach 2. Pebble counts reflect no significant change in restoration and enhancement I stream substrate material. All ten gages in the wetland re-establishment and rehabilitation areas are either meeting or exceeding hydrology success criteria.

Invasive species continue to be present within and around the site. Currently, 11.6 % of the conservation easement contains an invasive species population. Treatments performed in September MY4 will be evaluated in MY5.



VILE CREEK MITIGATION SITE
Monitoring Year 3 Annual Report

TABLE OF CONTENTS

Section 1: PROJECT OVERVIEW 1-1

- 1.1 Project Goals and Objectives 1-1
- 1.2 Monitoring Year 4 Data Assessment..... 1-3
 - 1.2.1 Stream Assessment 1-3
 - 1.2.2 Stream Hydrology Assessment 1-3
 - 1.2.3 Vegetative Assessment 1-4
 - 1.2.4 Wetland Assessment..... 1-4
 - 1.2.5 Areas of Concern/Adaptive Management Plan 1-4
- 1.3 Monitoring Year 4 Summary 1-6

Section 2: METHODOLOGY 2-1

Section 3: REFERENCES 3-1



APPENDICES

Appendix 1

Figures and Tables

Figure 1	Project Vicinity Map
Figure 2	Project Component Map
Table 1	Project Components and Mitigation Credits
Table 2	Project Activity and Reporting History
Table 3	Project Contact Table
Table 4	Project Information and Attributes Meeting Summary - Vile Creek Mitigation Site IRT Meeting

Appendix 2

Visual Assessment Data

Figure 3.0-3.4	Integrated Current Condition Plan View
Table 5a-f	Visual Stream Morphology Stability Assessment Table
Table 6	Vegetation Condition Assessment Table Stream Photographs Vegetation Photographs Bog Vegetation Photographs Photos – Stream Areas of Concern

Appendix 3*

Vegetation Plot Data

Table 7	Vegetation Plot Criteria Attainment
Table 8	CVS Vegetation Plot Metadata
Table 9a	Planted and Total Stem Counts
Table 9b	Planted Herbaceous Cover (Bog Cells)

Appendix 4

Morphological Summary Data and Plots

Table 10a-b	Baseline Stream Data Summary*
Table 11	Morphology and Hydraulic Summary (Dimensional Parameters – Cross Section)*
Table 12a-b	Monitoring Data – Cross-section Plots* Reachwide and Cross-section Pebble Count Plots

Appendix 5

Hydrology Summary Data and Plots

Table 13a-b	Verification of Bankfull and Geomorphically Significant Events
Table 14	Wetland Gage Attainment Summary Groundwater Gage Plots Recorded Geomorphic Significant and Bankfull Event Plots Monthly Rainfall Data

*Content not required for monitoring year 4 report



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 HUC 05050001 and the 14-digit 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 Little River. Stream restoration reaches include Vile Creek (Reaches 1 and 2) and UT1 Reach 2, which together comprise 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 5,053.000 stream mitigation units (SMUs) and 5.703 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 and objectives 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:



Goals	Objectives
<p>Reduce pollutant inputs to streams including fecal coliform, nitrogen, and phosphorous.</p>	<p>Exclude cattle from streams and buffers by installing fencing around conservation easements adjacent to cattle pastures. Install wells and drinkers to provide alternative water sources for cattle.</p>
<p>Reduce inputs of sediment into streams from eroding stream banks.</p>	<p>Reconstruct stream channels with stable dimensions. Add bank revetments and in-stream structures to protect restored/enhanced streams.</p>
<p>Return a network of streams to a stable form that is capable of supporting hydrologic, biologic, and water quality functions.</p>	<p>Construct stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions.</p>
<p>Improve aquatic communities in project streams and provide improved habitat for trout migrating from Little River into Vile Creek. <i>Note: Presence of aquatic organisms and trout will not be tied to project success criteria.</i></p>	<p>Install habitat features such as constructed riffles, cover logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.</p>

Goals	Objectives
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.	Reconstruct stream channels with appropriate bankfull dimensions and depth relative to the existing floodplain.
Restore wetland hydrology, soils, and plant communities.	Restore riparian wetlands by raising stream beds, plugging existing ditches, removing fill material over relict hydric soils, and planting native wetland species.
Improve and expand Southern Appalachian bog habitat to support bog species such as bog turtles. <i>Note: Presence of bog turtles will not be tied to project success criteria.</i>	Widen low lying ditched areas that represent bog conditions.
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.	Plant native tree and shrub species in riparian zone and wetland areas other than bog areas. Bog areas will be planted with herbaceous species.
Ensure that development and agricultural uses that would damage the site or reduce the benefits of project are prevented.	Establish conservation easements on the site.

1.2 Monitoring Year 4 Data Assessment

Annual monitoring and quarterly Site visits were conducted during MY4 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

MY4 is a reduced monitoring year that does not require morphological surveys; therefore, no cross-sectional survey was performed this year. Pebble counts were conducted in MY4 and found no significant change in stream bed material throughout the site.

1.2.2 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.

During MY4, Twelve bankfull events and sixteen geomorphically significant events were documented on UT1 Reach 2, while nine bankfull events and fourteen geomorphically significant events were documented on Vile Creek Reach 2. With at least three bankfull events occurring in separate years documented on UT1 Reach 2 and at least two bankfull events occurring in separate years documented on Vile Creek, the success criteria for bankfull and geomorphically significant events has been met on all monitored reaches.

Refer to Appendix 5 for hydrology summary data and plots.

1.2.3 Vegetative Assessment

MY4 is a reduced monitoring year that does not require detailed vegetation inventory and analysis; therefore, no vegetation plot monitoring was performed this year. Visual assessments in MY4 indicate isolated areas on-site are exhibiting low stem heights and vigor. See the Adaptive Management Section below for more detail.

Refer to Appendix 2 for vegetation plot photographs.

1.2.4 Wetland Assessment

A total of ten groundwater hydrology gages (GWG) and two soil temperature gages were established during baseline monitoring within the wetland rehabilitation, wetland re-establishment, and bog areas. A barotroll logger, used to measure barometric pressure and aid in the calculation of groundwater levels, was also installed on-site. Groundwater monitoring gages are downloaded on a quarterly basis and maintained as needed. Under typical precipitation conditions, the final performance success criteria for groundwater hydrology is the documentation of free groundwater within 12 inches of the ground surface for 14 consecutive days (8.5%) of the defined 169-day growing season (April 26 – October 11) for wetlands and 20 consecutive days (12%) of the defined 169-day growing season (April 26 – October 11) for bog areas.

All the Site's GWGs met the success criteria for MY4, with the measured hydroperiod ranging from 26% to 100% of the growing season. The attainment criteria for hydrologic success for all the wells increased or remained the same in comparison to previous years. A manual measurement of each GWG water elevation was taken during MY4. GWGS 5 and 9 show inconsistencies with the manual measurement and the barotroll gage data. Multiple manual measurements will be conducted at each GWG in MY5 to further evaluate any inconsistencies in data.

Rainfall data collected from the NC-AG-1-Sparta 3.5 SSW(NCCRONOS) rain gage, showed average to above average rainfall for a majority of the growing season. Refer to the CCPV Maps in Appendix 2 for the groundwater gage locations and Appendix 5 for groundwater hydrology and average rainfall summary data and plots.

1.2.5 Areas of Concern/Adaptive Management Plan

Overall, the streams are geomorphically stable and riparian and wetland vegetation is performing well. However, isolated stream and vegetation problem areas do exist on-site. The following areas are experiencing localized bank instability and include: Vile Creek Reach 1 station 103+90-104+20, Vile Creek Reach 2 stations 118+50-118+80, 120+70-121+00, and 122+80-123+00, UT1 Reach 1 station 206+40-206+60, UT2 stations 305+00-305+50, 306+30-306+70, and 310+00-310+15. Localized areas of aggradation along enhancement II reaches, UT2 (Stations 309+70 (32'), UT1b (station 251+20 (51')), and UT1c (Station 271+50 (115')), have resulted in sheet flow onto the floodplain rather than maintaining flow within a single thread channel. The stormwater best management practice (BMP) at the top of UT2 has formed a headcut at the intake from a natural crenulation flowing into the BMP. An area of instability along UT1 Reach 1 (Station 205+10-205+60) that was previously mention in the MY3 report, naturally realigned itself (Approximately 21-feet) in MY4; thereby, abandoning an existing meander bend and creating an ox bow. The newly created channel appears to be stable and will be closely monitored for instability. If necessary, soil amendments and live stakes will be added to the abandoned oxbow channel, see areas of concern photos 7 & 8. Stream structures currently failing include: Log sill UT1 Reach 1 station 204+90, Rock Sill UT1 Reach 2 station 220+98, and Log sill Vile Creek Reach 1 station 104+10. Wildlands plans to address areas of localized bank instability across the Site and further evaluate headcut/s, structure failures, and aggradational areas of concern during winter 2020/2021. All completed repairs will be included in MY5 monitoring report.



The headcut at the intake of the BMP located at the top of UT2 was repaired with hand tools and live stakes in March of 2020. The live stakes have started taking root; however, further repairs will be needed to fix the headcut. In addition, a large undercut bank was repaired with live brush on UT2 at station 306+30. These repairs will be further evaluated during MY5 site walks.

Though invasive species, including Japanese barberry (*Berberis thunbergii*), Oriental bittersweet (*Celastrus orbiculatus*), and multiflora rose (*Rosa multiflora*) continue to be present within and around the Site, previous invasive species treatments of cutting the plants and applying glyphosate to the stumps or stems have reduced their populations from 13.2% in MY3 to 11.6% in MY4. Invasive treatments were also conducted in September of MY4 and included spraying all fence lines and UT3 for barberry. Although the presence of invasive species are not impacting survival rates of planted stems at this time, these areas will likely warrant additional treatment to prevent any advancement within the conservation easement and future impacts to the Site. Wildlands will continue to monitor the areas of concern and take action as necessary.

Less than 1% of the easement contains areas of poor herbaceous cover. These areas are located between GWGs 8 and 9, along the right bank of UT2 near station 305+00, and along the left bank boulder toe on Vile Creek Reach 3 between stations 124+00 and 124+50. Although, these areas were reseeded in June of MY3 and are starting to establish herbaceous vegetation, these areas were still included MY4 as exhibiting poor herbaceous cover.

During winter MY3 and MY4 areas of low stem density and height were documented on site and amount to 18.2% of the planted conservation easement. These areas include: A portion of the left floodplain on UT1 Reach 1, an area along the right floodplain of UT1C, which continues downstream to Vile Creek Reach 2, and along the left floodplain of UT2 just below the BMP. Supplemental planting of 300 1-gallon trees were completed in the spring of 2020 on the right bank UT1 R2 starting at UT1C and continuing down to Vile Creek Reach 2. Elderberry plugs were also planted along UT1 as streamside plantings to further shade out the stream. All of the 1-gallon plantings were considered unsuccessful because the deer population located on-site are grazing the tops off newly planted stems; therefore, causing a mortality rate of greater than 50% of the supplementally planted stems. A second supplemental planting in this area, as well as along the left floodplain of UT1 Reach 1 is proposed. Installation will be planned when nursery stocks of deer resistance plant material becomes available.

Easement encroachment from mowing on the left floodplain of UT1 Reach 1 continues to be an issue. In MY4, Wildlands further delineated the easement boundary in this area with additional signs. The additional signs installed along the boundary helped reduce the mowing encroachment but did not eliminate it. Wildlands will add additional signage between existing posts to help continue reduce mowing within the easement.

Refer to Appendix 2 for the vegetation condition assessment table, the CCPV maps, and area of concern photos.



1.3 Monitoring Year 4 Summary

The streams within the Site appear to be stable and functioning as designed. Multiple bankfull and geomorphically significant events were documented for UT1 and Vile Creek; therefore, the site has met the stream hydrological success criteria. All ten groundwater gages met the success criteria for MY4. 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, 2016) 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-eeep-protocol-v42-lev1-2>.
- 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>.
- North Carolina Department of Environment and Natural Resources. 2007. Little River & Brush Creek Local Watershed Plan (LWP) Project Atlas. Retrieved from <http://deq.nc.gov/about/divisions/mitigation-services/dms-planning/watershed-planning-documents/new-river-basin>.
- North Carolina Division of Mitigation Services and Interagency Review Team Technical Workgroup. 2018. Standard Measurement of the BHR Monitoring Parameter. Raleigh, NC.
- North Carolina Climate Retrieval and Observations Network of the Southeast Database (NCCRONOS). 2020. State Climate Office of North Carolina. Version 2.7.2. Station ID NC-AG-1-Sparta 3.5 SSW. Accessed October and November 2020.
- 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). 2016. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.
- United States Department of Agriculture (USDA). 2019. WETS Station: SPARA 3.5 SSW, NC. NRCS. 1971 – 2020. https://www.wcc.nrcs.usda.gov/climate/navigate_wets.html
- United States Geological Survey (USGS). 1998. North Carolina Geology. <https://deq.nc.gov/about/divisions/energy-mineral-land-resources/north-carolina-geological-survey/>.
- Wildlands Engineering, Inc. 2016. Vile Creek Mitigation Site Final Mitigation Plan. NCDMS, Raleigh, NC.
- Wildlands Engineering, Inc. 2017. Vile Creek Stream Mitigation Site Baseline Monitoring Document and As-Built Baseline Report. DMS, Raleigh, NC.



APPENDIX 1. General Figures and Tables

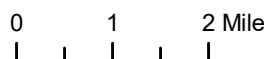
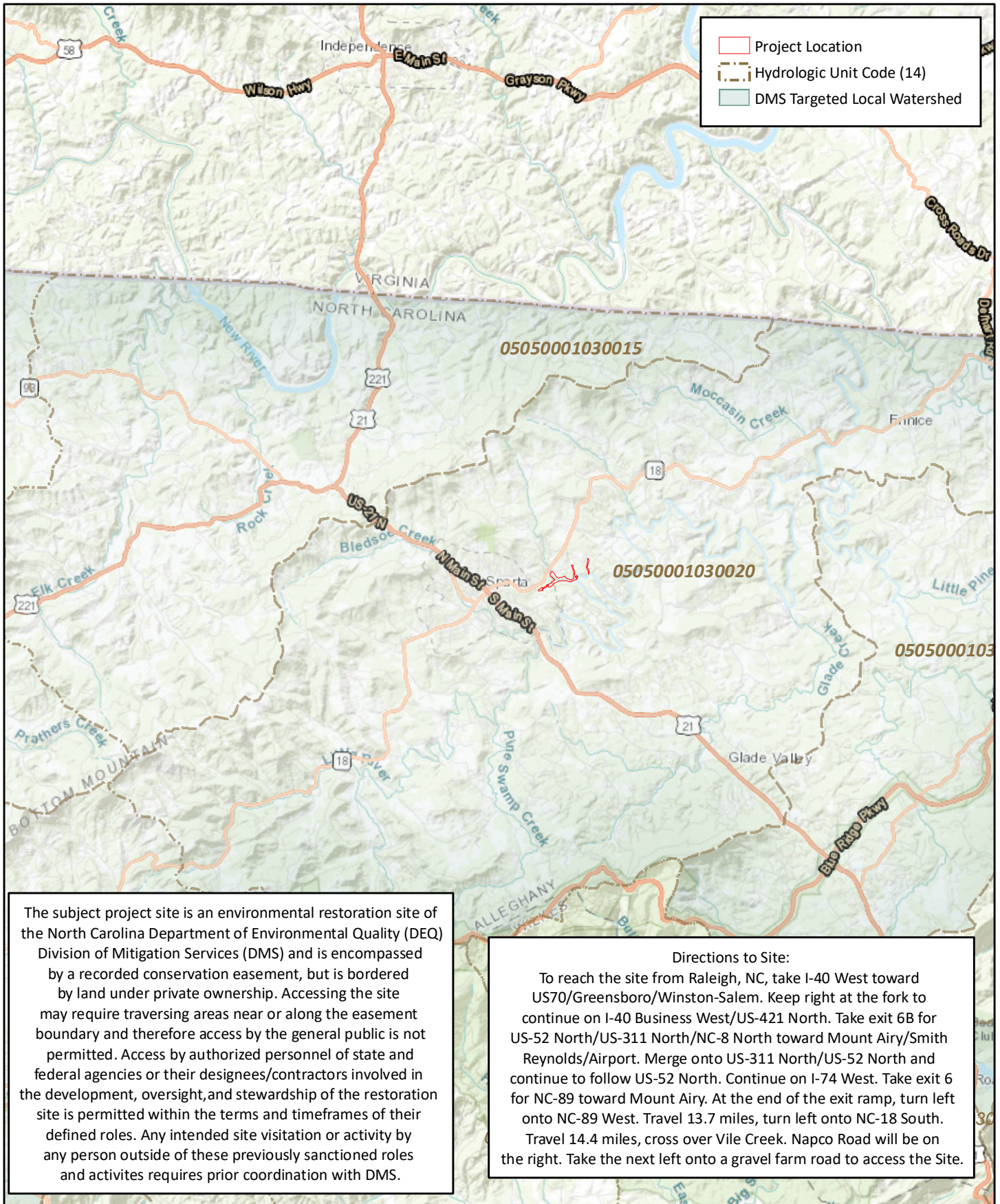


Figure 1 Project Vicinity Map
 Vile Creek Mitigation Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

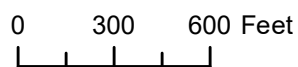
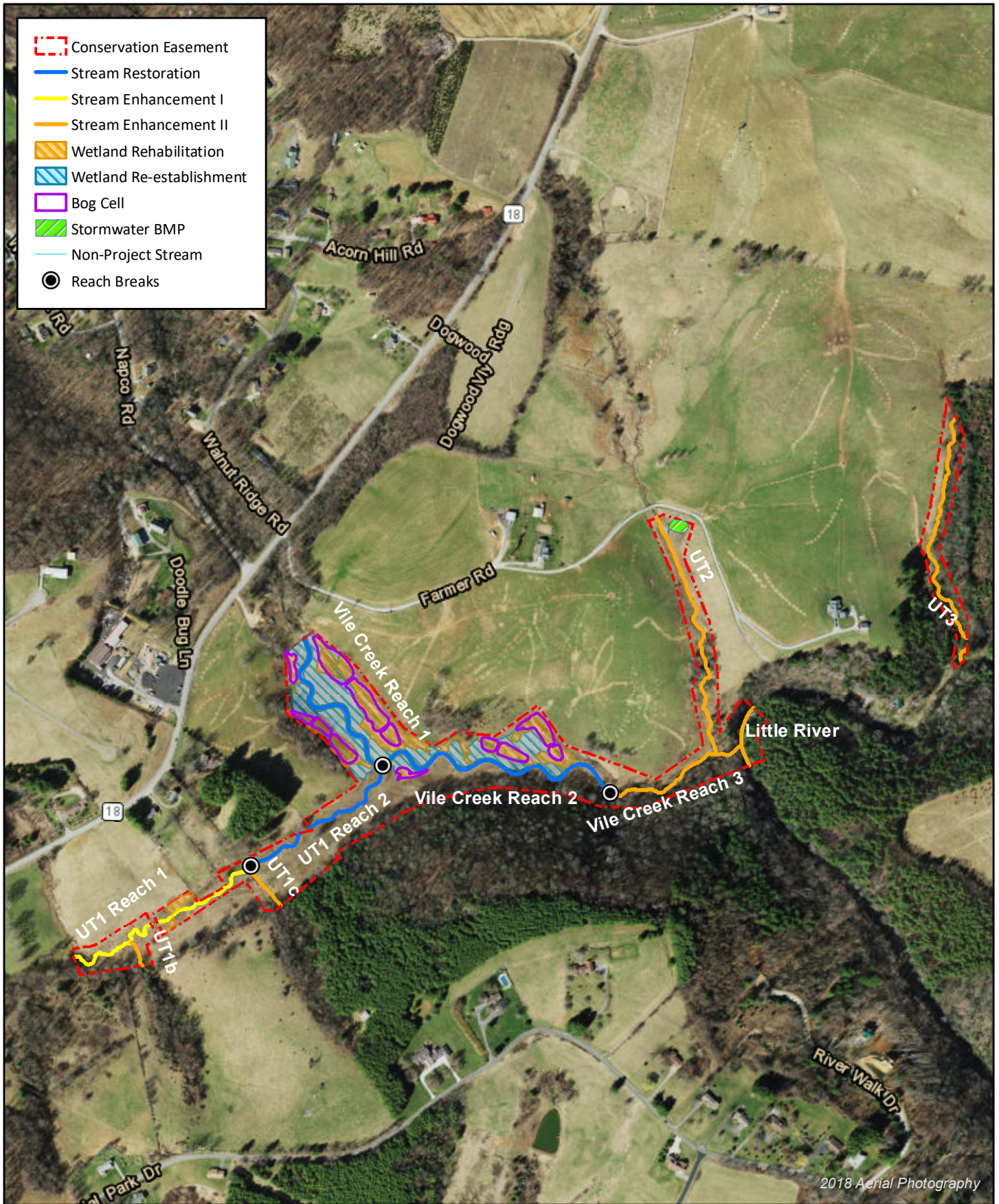


Figure 2 Project Component Map
 Vile Creek Mitigation Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

Table 1. Project Components and Mitigation Credits

Vile Creek Mitigation Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

PROJECT COMPONENTS									
Project Area/Reach	Existing Footage (LF) or Acreage	Mitigation Plan Footage (LF)/Acreage	Mitigation Category	Restoration Level	Priority Level	Mitigation Ratio (X:1)	As Built Footage/Acreage ²	Project Credit (SMU/WMU) ^{1,2}	Notes
Vile Creek Reach 1	962	920	Warm	Restoration	P1	1:1	882	882.000	Alignment changed from mitigation plan/final design due to bedrock obstruction.
Vile Creek Reach 2	1,247	1,260	Warm	Restoration	P1	1:1	1,311	1,311.000	Alignment changed from mitigation plan/final design due to bedrock obstruction.
Vile Creek Reach 3	714	714	Warm	Enhancement II	N/A	2.5:1	713	279.000	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	Warm	Enhancement I	N/A	1.5:1	1,114	630.000	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	Warm	Restoration	P1	1:1	777	750.000	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	Warm	Enhancement II	N/A	2.5:1	128	48.000	As-Built credits were reduced for areas where easement is restricted and the full buffer width is not possible.
UT1C	234	228	Warm	Enhancement II	N/A	2.5:1	228	89.000	As-Built credits were reduced for areas where easement is restricted and the full buffer width is not possible.
UT2	1,226	1,226	Warm	Enhancement II	N/A	2.5:1	1,226	490.000	
UT3	1,316	1,236	Warm	Enhancement II	N/A	2.5:1	1,236	461.000	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	Warm	Enhancement II	N/A	2.5:1	284	114.000	
Wetland Rehabilitation	3.02	3.02	Warm	Rehabilitation		1.3:1	3.02	2.323	
Wetland Re-establishment	0	3.50	Warm	Re-establishment		1:1	3.38	3.380	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.

¹As-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.

²Stream mitigation credits and stationing noted above are based on the as-built stream centerline.

Project Credits							
Restoration Level	Stream			Riparian Wetland		Non-Riparian Wetland	Coastal Marsh
	Warm	Cool	Cold	Riverine	Non-Riv		
Restoration	2,943.000	N/A	N/A	N/A	N/A	N/A	N/A
Re-establishment				3.380	N/A	N/A	N/A
Rehabilitation				2.323	N/A	N/A	N/A
Enhancement							
Enhancement I	630.000	N/A	N/A				
Enhancement II	1,481.000	N/A	N/A				
Creation							
Preservation							
Total	5,053.000	N/A	N/A	5.703	N/A	N/A	N/A

Table 2. Project Activity and Reporting History

Vile Creek Mitigation Site
 DMS Project No. 96582
Monitoring Year 4 - 2020

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	
Year 1 Monitoring	Stream Survey	September 2017	December 2017
	Vegetation Survey	September 2017	
Year 2 Monitoring	Stream Survey	April 2018	November 2018
	Vegetation Survey	September 2018	
Year 3 Monitoring	Stream Survey	April 2019	December 2019
	Shrub Planting	June 2019	
	Invasive Treatment	June 2019	
	Vegetation Survey	September 2019	
Year 4 Monitoring	Supplimental Planting	March 2020	November 2020
	Stream Repairs	March 2020	
	Invasive Treatment	September 2020	
Year 5 Monitoring	Stream Survey	2021	November 2021
	Vegetation Survey	2021	November 2021
Year 6 Monitoring	Stream Survey	2022	November 2022
	Vegetation Survey	2022	November 2022
Year 7 Monitoring	Stream Survey	2023	November 2023
	Vegetation Survey	2023	November 2023

¹Seed 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 4 - 2020

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	Dykes and Son Nursery Bruton Natural Systems, Inc.; Foggy Mountain Nursery, LLC Wetland Plants Inc.
Monitoring Performers	Wildlands Engineering, Inc.
Monitoring, POC	Kristi Suggs 704.332.7754, ext. 110

Table 4. Project Information and Attributes

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4- 2020

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 Drainage 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 Description (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-Restoration	<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							



MEETING SUMMARY

Vile Creek Mitigation Site IRT Meeting

Meeting Date: July 18, 2017

Meeting Attendees
Todd Tugwell/USACE
Andrea Hughes/USACE
Kim Browning/USACE
Mac Haupt/NCDWR
Marella Buncick/USFWS
Sue Cameron/USFWS
Gabrielle Graeter/NCWRC
Paul Wisener/NCDMS
Harry Tsomides/NCDMS
Shawn Wilkerson/Wildlands
Jeff Keaton/Wildlands

On July 18, representatives from Wildlands Engineering met with several members of the Inter-Agency Review Team and NC Division of Mitigation Services on site to observe and discuss the construction and performance of the bog habitat built on site. The key topics of the discussion are described below.

1. Break up flow paths in bog area

The middle bog area on the left floodplain along Vile Creek Reach 1 has some concentrated flow paths that seem to consistently convey water through the bog. These are a risk for headcutting. The flow will be dispersed by placing three coir logs across the concentrated flow paths. They will be staked in place. The coir logs are only intended to be a temporary measure to prevent erosion until the vegetation becomes fully established. The approximate location for the coir logs is shown on the attached map.

2. Lowering of bog area berm

The most downstream bog area has approximately 6 to 10 inches of water backed up behind the berm (see attached map). This particular berm was constructed slightly too high. Wildlands has agreed to lower the spillway elevation on this berm by about six inches to reduce the depth of water ponded behind the berm. This will be done with manual labor in order to minimize the impacts on the surrounding wetlands and vegetation.

3. Transplant Gray's Lily

Because one or two specimens of Gray's Lily identified on site were graded over during construction, Wildlands located a source for the flowers to transplant on the site. During the site visit, a Gray's Lily was found adjacent to a bog area on the left floodplain of Vile Creek Reach 2. U.S. Fish and Wildlife Service representatives asked Wildlands to install the transplants in the same area as the existing plant. On Thursday, July 20 Wildlands planted three Gray's Lily bulbs in this location (see attached map).

4. Remove trees from shrub planting zones and replant with shrubs

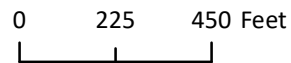
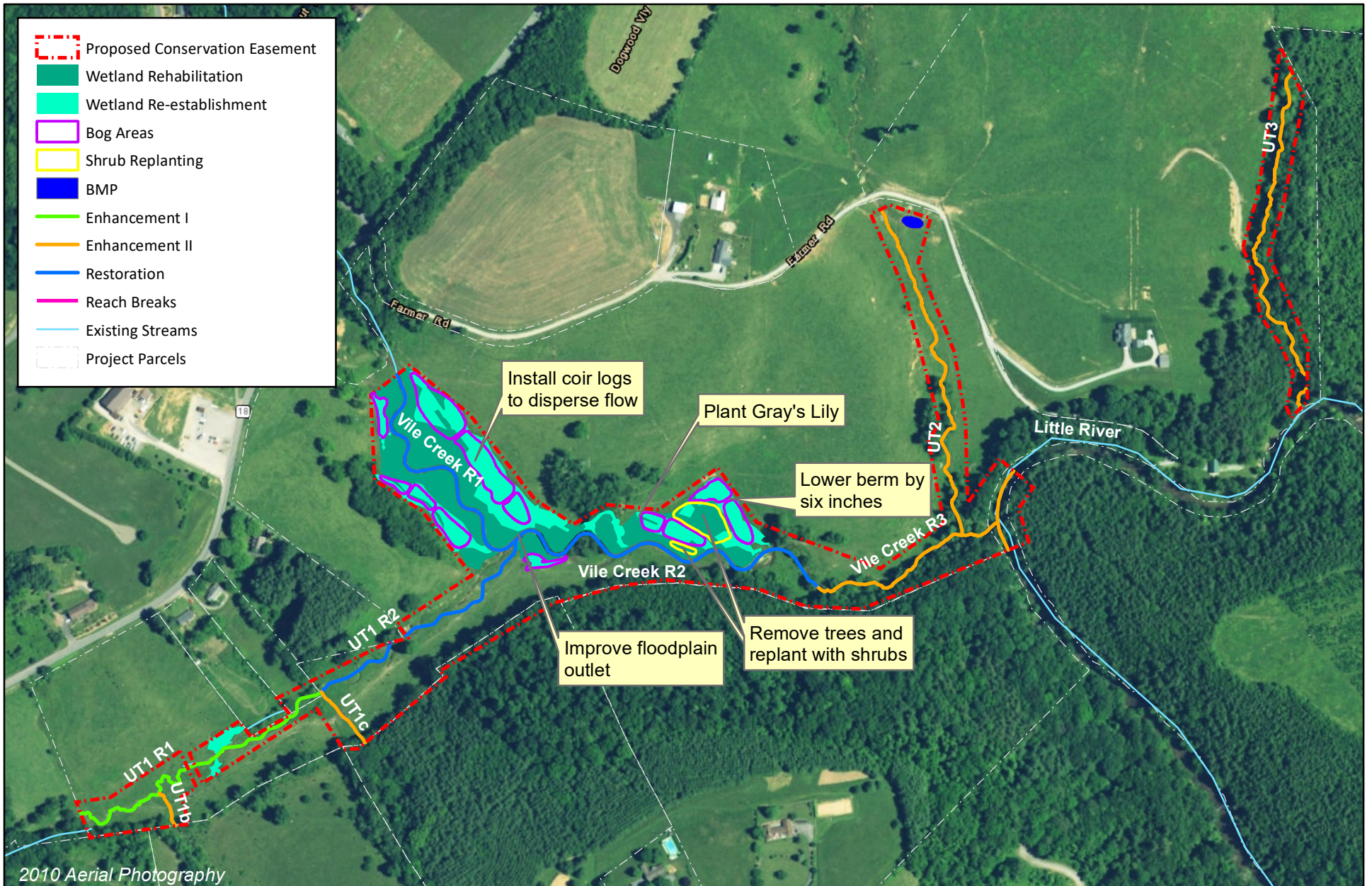
In a couple of areas along Vile Creek, at least some trees were planted in shrub zones. This is a problem because the shrub zones were planned to minimize shade on the bog areas. Trees will create undesirable shade on the bogs. Wildlands will remove the trees from these areas and replant with shrubs. The primary areas where trees are planted in shrub zones are shown on the attached map. **Action Item: Please review the attached map and coordinate with Jeff Keaton if there are other areas where trees are planted in a shrub zone. Please also review the approved planting plan map submitted with the final mitigation plan (also included) to make sure the any additional areas are within planned shrub zones.**

5. Improve floodplain outlet

At the upstream end of Vile Creek Reach 2, there is a floodplain outlet that is not functioning properly (see attached map). Most of the water draining out of a nearby bog area is not entering the channel through the constructed outlet but is draining over a brush toe where the brush overlaps with the riffle. After some discussion, it seems like the best solution is to relocate the outlet to the location where the water wants to flow. Wildlands will relocate the outlet.

6. Meander bend erosion

At the downstream end of Vile Creek Reach 2 there is some erosion beginning on the outside of a meander bend. The group agreed that this area does not need remedial action at this point but Wildlands agreed to continue to watch this area going forward. If remedial action becomes necessary, Wildlands will stabilize the bank and correct the problem.



Vile Creek Mitigation Site
New River Basin 05050001

Allegheny County, NC

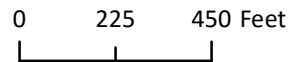
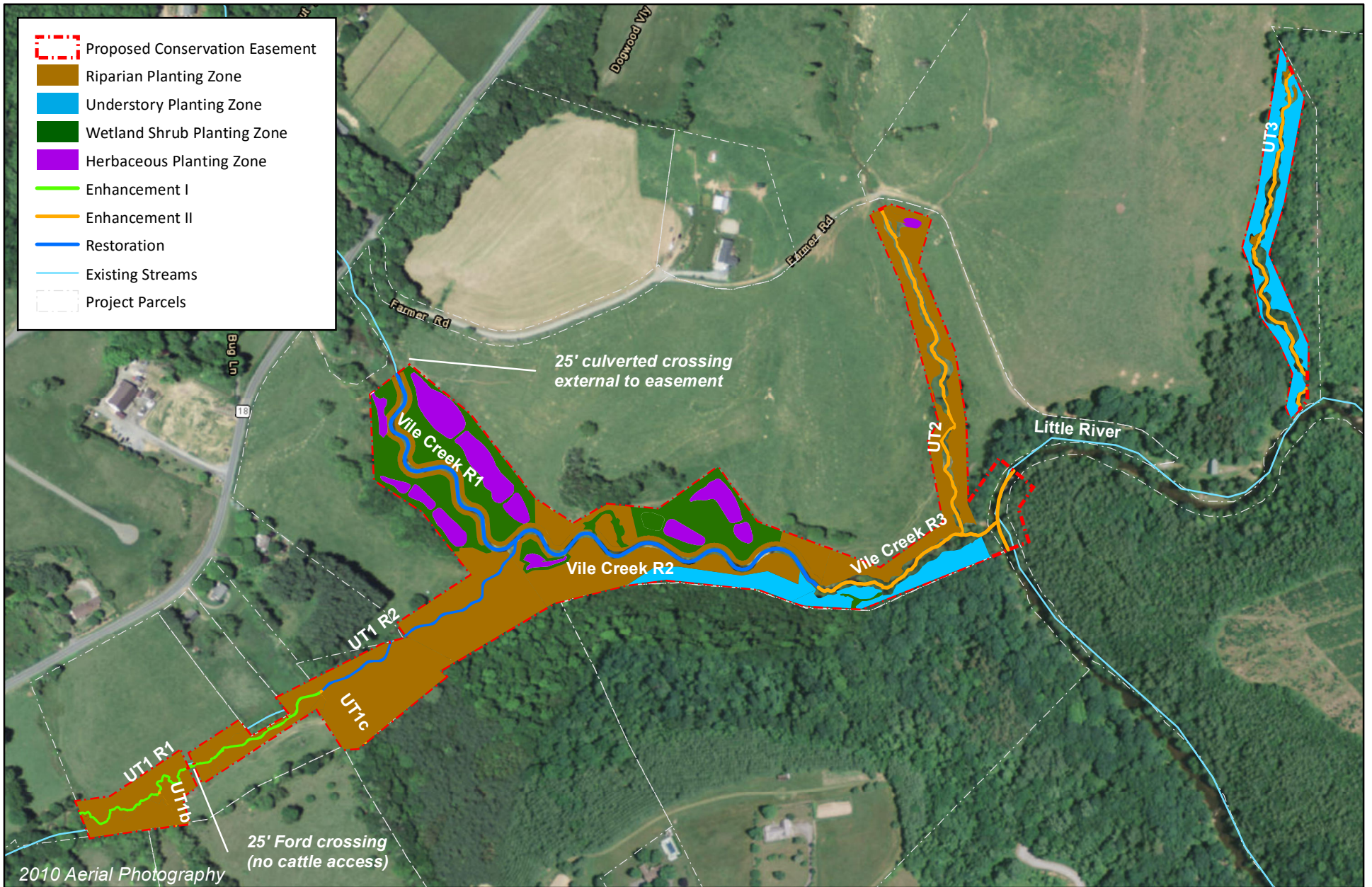
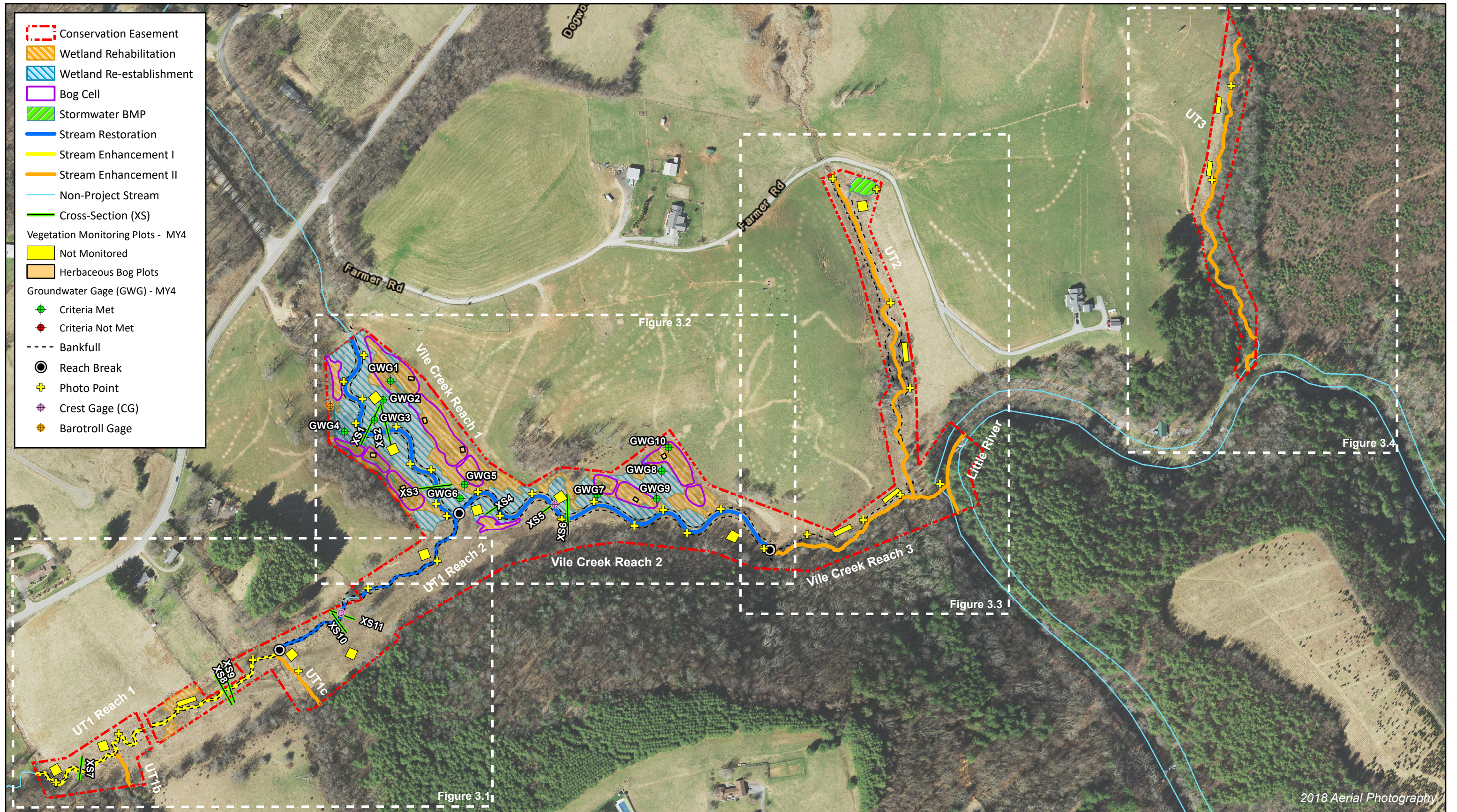
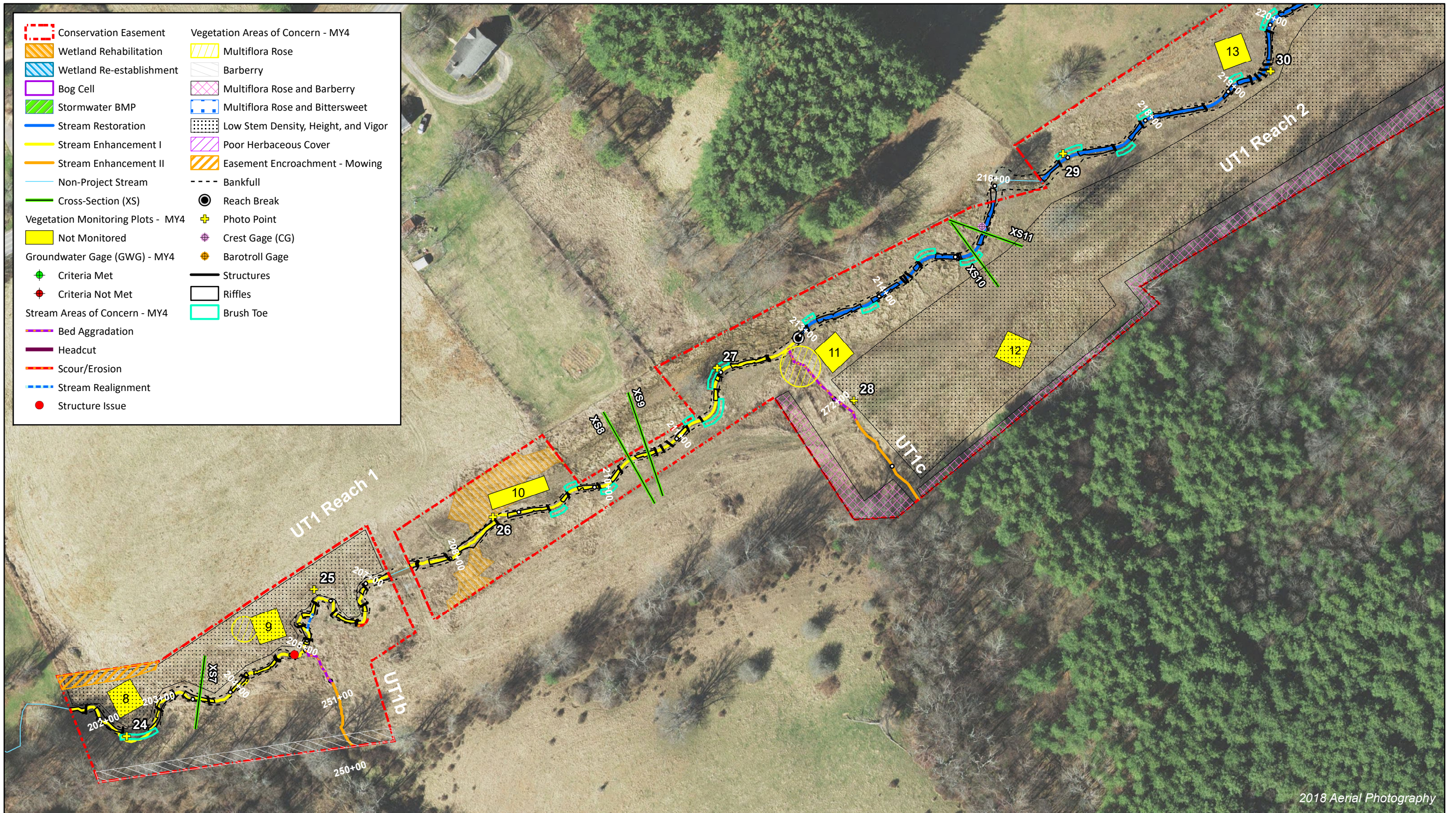


Figure 12 Proposed Planting Overview
 Vile Creek Mitigation Site
 New River Basin 05050001

APPENDIX 2. Visual Assessment Data





2018 Aerial Photography

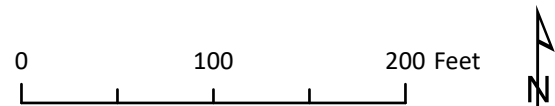
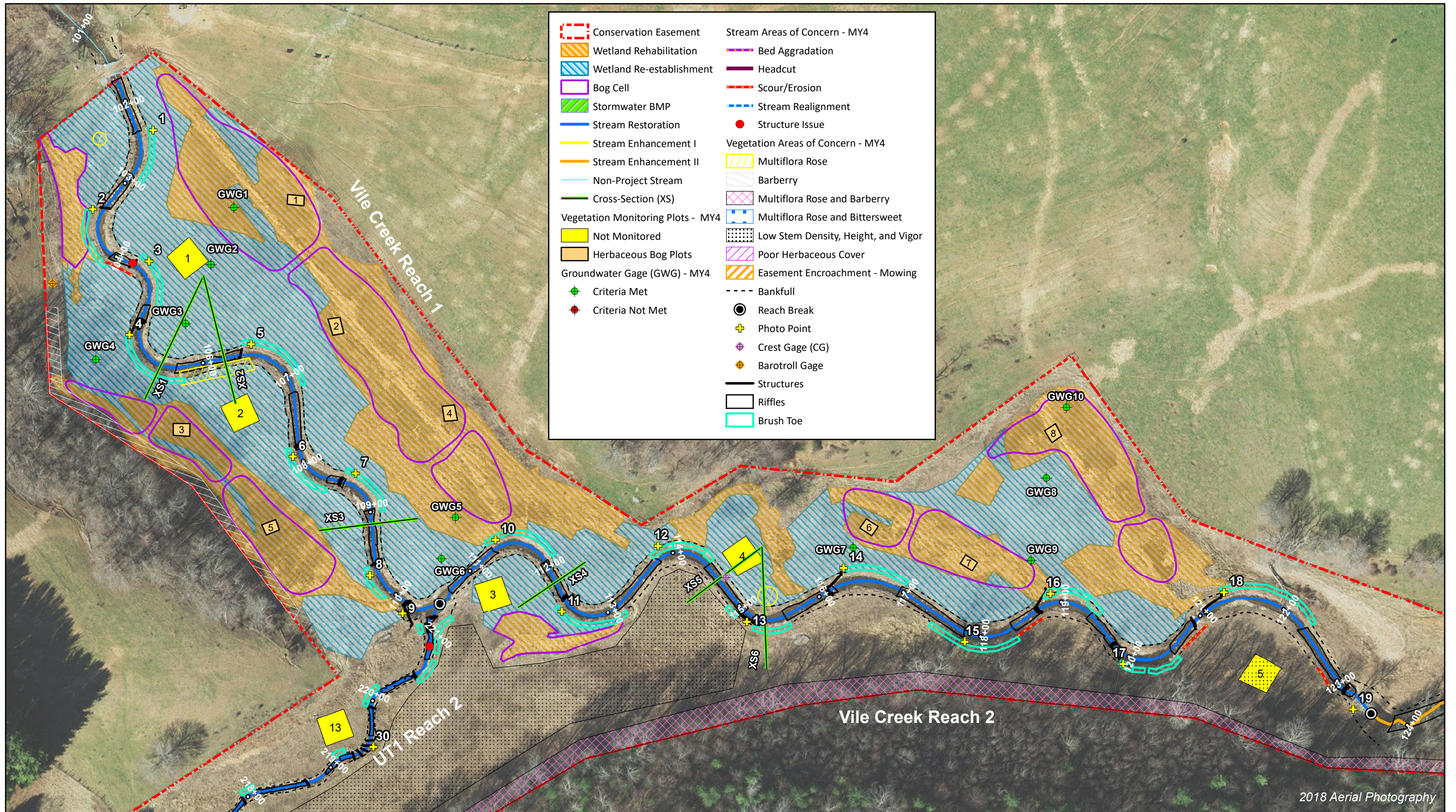


Figure 3.1 Integrated Current Condition Plan View
 Vile Creek Mitigation Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020



2018 Aerial Photography

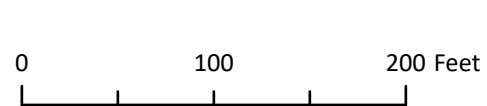
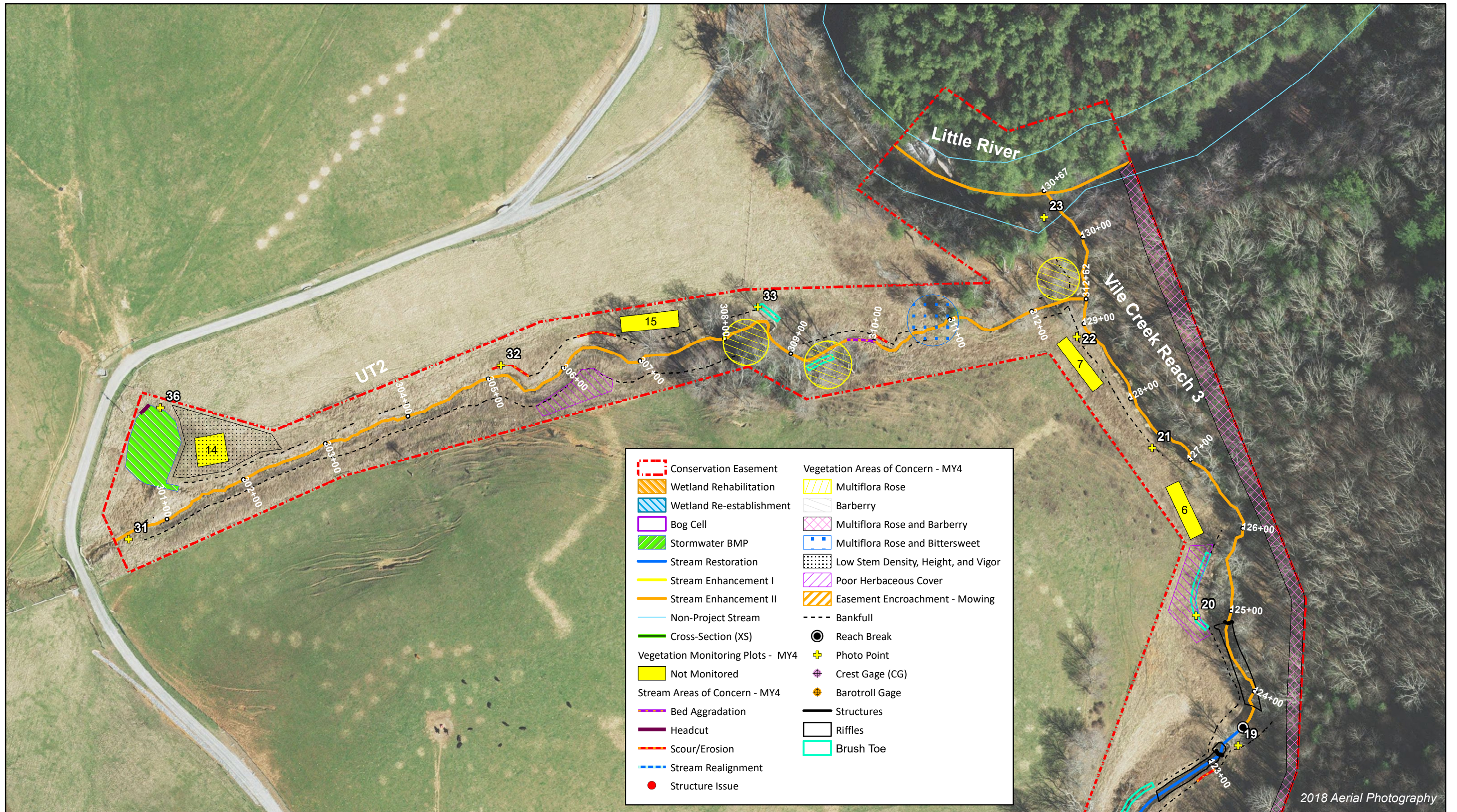
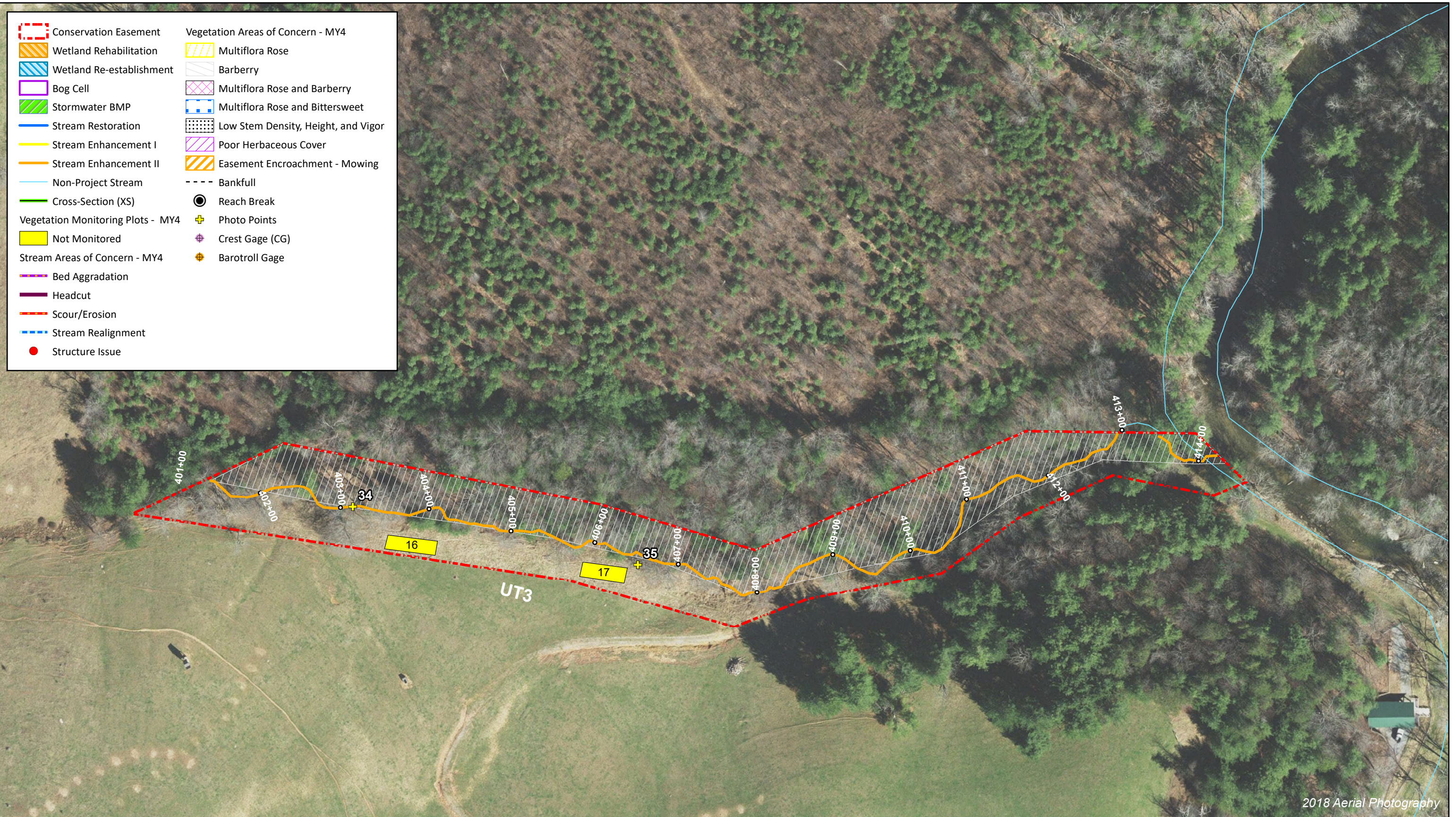


Figure 3.2 Integrated Current Condition Plan View
 Vile Creek Mitigation Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020



2018 Aerial Photography



- | | |
|--|-------------------------------------|
| Conservation Easement | Multiflora Rose |
| Wetland Rehabilitation | Barberry |
| Wetland Re-establishment | Multiflora Rose and Barberry |
| Bog Cell | Multiflora Rose and Bittersweet |
| Stormwater BMP | Low Stem Density, Height, and Vigor |
| Stream Restoration | Poor Herbaceous Cover |
| Stream Enhancement I | Easement Encroachment - Mowing |
| Stream Enhancement II | Bankfull |
| Non-Project Stream | Reach Break |
| Cross-Section (XS) | Photo Points |
| Vegetation Monitoring Plots - MY4 | Crest Gage (CG) |
| Not Monitored | Barotroll Gage |
| Stream Areas of Concern - MY4 | |
| Bed Aggradation | |
| Headcut | |
| Scour/Erosion | |
| Stream Realignment | |
| Structure Issue | |

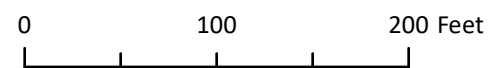


Figure 3.4 Integrated Current Condition Plan View
 Vile Creek Mitigation Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

Table 5a. Visual Stream Morphology Stability Assessment Table

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

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.			1	16	99%	0	0	99%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					1	16	99%	0	0	99%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	36	37			97%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	29	30			97%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	29	30			97%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	36	37			97%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	36	37			97%			

¹Excludes constructed riffles 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 4 - 2020

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%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					0	0	100%	0	0	100%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	32	33			97%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	21	22			95%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	21	22			95%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	32	33			97%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	32	33			97%			

¹Excludes constructed riffles 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 4 - 2020

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	8	8			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.			1	35	99%	0	0	99%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					1	35	99%	0	0	99%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	15	16			94%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	7	8			88%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	8			88%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	15	16			94%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	15	16			94%			

¹Excludes constructed riffles 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 4 - 2020

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	10	10			100%			
	3. Meander Pool Condition	Depth Sufficient	9	9			100%			
		Length Appropriate	9	9			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	9	9			100%			
Thalweg centering at downstream of meander bend (Glide)		9	9	100%						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			3	99	96%	0	0	96%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					3	99	96%	0	0	96%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	16	16			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	7	7			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	7			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	16	16			100%			
4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	16	16	100%						

¹Excludes constructed riffles 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 4 - 2020

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

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

Table 5f. Visual Stream Morphology Stability Assessment Table

Vile Creek Mitigation Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

UT2: Stations (763 LF)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			1	32	96%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	N/A	N/A			n/a			
	3. Meander Pool Condition	Depth Sufficient	N/A	N/A			n/a			
		Length Appropriate	N/A	N/A			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	N/A	N/A			n/a			
Thalweg centering at downstream of meander bend (Glide)		N/A	N/A	n/a						
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			3	97	94%	0	0	94%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
Totals					3	97	94%	0	0	94%
3. Engineered Structures ¹	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	2	2			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%.	2	2			N/A			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	2	2			N/A			

¹Excludes constructed riffles since they are evaluated in section 1.
 N/A - Not applicable: No Engineered Structures applies to UT2

Table 6. Vegetation Condition Assessment Table

Vile Creek Mitigation Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

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	2	0.1	0.6%
Low Stem Density Areas*	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	4	3.1	18.2%
			Total	6	18.8%
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	4	3.1	18.2%
			Cumulative Total	6	18.8%

*Low stem density areas and poor growth areas are the same areas on-site.

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	13	2.9	11.6%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	1	0.03	0.1%

Stream Photographs

Monitoring Year 4



Photo Point 1 – view upstream Vile Creek R1 (4/13/2020)



Photo Point 1 – view downstream Vile Creek R1 (4/13/2020)



Photo Point 2 – view upstream Vile Creek R1 (4/13/2020)



Photo Point 2 – view downstream Vile Creek R1 (4/13/2020)



Photo Point 3 – view upstream Vile Creek R1 (4/13/2020)



Photo Point 3 – view downstream Vile Creek R1 (4/13/2020)



Photo Point 4 – view upstream Vile Creek R1 (4/13/2020)



Photo Point 4 – view downstream Vile Creek R1 (4/13/2020)



Photo Point 5 – view upstream Vile Creek R1 (4/13/2020)



Photo Point 5 – view downstream Vile Creek R1 (4/13/2020)



Photo Point 6 – view upstream Vile Creek R1 (4/13/2021)



Photo Point 6 – view downstream Vile Creek R1 (4/13/2020)



Photo Point 7 – view upstream Vile Creek R1 (4/13/2020)



Photo Point 7 – view downstream Vile Creek R1 (4/13/2020)



Photo Point 8 – view upstream Vile Creek R1 (4/13/2020)



Photo Point 8 – view downstream Vile Creek R1 (4/13/2020)



Photo Point 9 – view upstream Vile Creek R1 (4/13/2020)



Photo Point 9 – view downstream Vile Creek R1 (4/13/2020)



Photo Point 10 – view upstream Vile Creek R2 (4/13/2020)



Photo Point 10 – view downstream Vile Creek R2 (4/13/2020)



Photo Point 11 – view upstream Vile Creek R2 (4/13/2020)



Photo Point 11 – view downstream Vile Creek R2 (4/13/2020)



Photo Point 12 – view upstream Vile Creek R2 (4/13/2020)



Photo Point 12 – view downstream Vile Creek R2 (4/13/2020)



Photo Point 13 – view upstream Vile Creek R2 (4/13/2020)



Photo Point 13 – view downstream Vile Creek R2 (4/13/2020)



Photo Point 14 – view upstream Vile Creek R2 (4/13/2020)



Photo Point 14 – view downstream Vile Creek R2 (4/13/2020)



Photo Point 15 – view upstream Vile Creek R2 (4/13/2020)



Photo Point 15 – view downstream Vile Creek R2 (4/13/2020)



Photo Point 16 – view upstream Vile Creek R2 (4/13/2020)



Photo Point 16 – view downstream Vile Creek R2 (4/13/2020)



Photo Point 17 – view upstream Vile Creek R2 (4/13/2020)



Photo Point 17 – view downstream Vile Creek R2 (4/13/2020)



Photo Point 18 – view upstream Vile Creek R2 (4/13/2020)



Photo Point 18 – view downstream Vile Creek R2 (4/13/2020)



Photo Point 19 – view upstream Vile Creek R3 (4/13/2020)



Photo Point 19 – view downstream Vile Creek R3 (4/13/2020)



Photo Point 20 – view upstream Vile Creek R3 (4/13/2020)



Photo Point 20 – view downstream Vile Creek R3 (4/13/2020)



Photo Point 21 – view upstream Vile Creek R3 (4/13/2020)



Photo Point 21 – view downstream Vile Creek R3 (4/13/2020)



Photo Point 22 – view upstream Vile Creek R3 (4/13/2020)



Photo Point 22 – view downstream Vile Creek R3 (4/13/2020)



Photo Point 23 – view upstream Little River (4/13/2020)



Photo Point 23 – view downstream Little River (4/13/2020)



Photo Point 24 – view upstream UT1 R1 (4/13/2020)



Photo Point 24 – view downstream UT1 R1 (4/13/2020)



Photo Point 25 – view upstream UT1 R1 (4/13/2020)



Photo Point 25 – view downstream UT1 R1 (4/13/2020)



Photo Point 26 – view upstream UT1 R1 (4/13/2020)



Photo Point 26 – view downstream UT1 R1 (4/13/2020)



Photo Point 27 – view upstream UT1 R1 (4/13/2020)



Photo Point 27 – view downstream UT1 R1 (4/13/2020)



Photo Point 28 – view upstream UT1C (4/13/2020)



Photo Point 28 – view downstream UT1B (4/13/2020)



Photo Point 29 – view upstream UT1 R2 (4/13/2020)



Photo Point 29 – view downstream UT1 R2 (4/13/2020)



Photo Point 30 – view upstream UT1 R2 (4/13/2020)



Photo Point 30 – view downstream UT1 R2 (4/13/2020)



Photo Point 31 – view upstream UT2 (4/13/2020)



Photo Point 31 – view downstream UT2 (4/13/2020)



Photo Point 31 – view of UT2 BMP (8/13/2020)



Photo Point 32 – view upstream UT2 (4/13/2020)



Photo Point 32 – view downstream UT2 (4/13/2020)



Photo Point 33 – view upstream UT2 (4/13/2020)



Photo Point 33 – view downstream UT2 (4/13/2020)



Photo Point 34 – view upstream UT3 (4/13/2020)



Photo Point 34 – view downstream UT3 (4/13/2020)



Photo Point 35 – view upstream UT3 (4/13/2020)



Photo Point 35 – view downstream UT3 (4/13/2020)



Photo Point 36 –stormwater wetland (4/13/2020)

Vegetation Photographs

Monitoring Year 4



Vegetation Plot 1 - (8/13/2020)



Vegetation Plot 2 - (8/13/2020)



Vegetation Plot 3 - (8/13/2020)



Vegetation Plot 4 - (8/13/2020)



Vegetation Plot 5 - (8/13/2020)



Vegetation Plot 6 - (8/13/2020)



Vegetation Plot 7 - (8/13/2020)



Vegetation Plot 8 - (8/13/2020)



Vegetation Plot 9 - (8/13/2020)



Vegetation Plot 10 - (8/13/2020)



Vegetation Plot 11 - (8/13/2020)



Vegetation Plot 12 - (8/13/2020)



Vegetation Plot 13 - (8/13/2020)



Vegetation Plot 14 - (8/13/2020)



Vegetation Plot 15 - (8/13/2020)



Vegetation Plot 16 - (8/13/2020)



Vegetation Plot 17 - (9/16/2019)

Bog Vegetation Photographs

Monitoring Year 4



Bog Vegetation Plot 1 - (8/13/2020)



Bog Vegetation Plot 2 - (8/13/2020)



Bog Vegetation Plot 3 - (8/13/2020)



Bog Vegetation Plot 4 - (8/13/2020)



Bog Vegetation Plot 5 - (8/13/2020)



Bog Vegetation Plot 6 - (8/13/2020)



Bog Vegetation Plot 7 - (8/13/2020)



Bog Vegetation Plot 8 - (8/13/2020)

Photos – Stream Areas of Concern

Monitoring Year 4



Photo 1 – Vile Creek R1: Station 103+90 – Right bank piping and scour around log sill. 4-14-2020



Photo 2 – Vile Creek R1: Station 103+90-104+20 – Right bank scour and piping around structures in constructed riffle. 4-14-2020



Photo 3 – Vile Creek R2: Station 118+50 – 118+80 – Bank scour. 11-6-2020



Photo 4 – Vile Creek R2: Station 120+70-121+00 – Bank scour. 11-6-2020



Photo 5 – Vile Creek R2: Station 122+80-123+00 – Bank scour. 11-6-2020



Photo 6 – UT1 R1: Station 204+90 – Structure missing. 11-6-2020





Photo 7 – UT1 R1: Station 205+10-205+50- Stream realignment. 11-6-2020



Photo 8– UT1 R1: Station 205+40-205+60 – Abandoned Ox Bow. 11-6-2020



Photo 9 – UT1 R1: Station 206+40 – 206+60 – Bank Scour 11-6-2020



Photo 10 – UT1 R2: Station 220+98 – Piping around structure 11-6-2020



Photo 11 – UT2: Station 305+00 – 305+50 – Bank scour. 11-6-2020



Photo 12 – UT2: Station 306+30 – 306+70 – Bank scour. 11-6-2020



Photo 13 – UT2 Station 309+70: Stream aggradation. 4-14-2020



Photo 14– UT2 BMP: Headcut at intake. 11-6-2020



Photo 15 – UT1B: Stream aggradation. 11-6-2020



Photo 16 – UT1C: Stream aggradation. 11-6-2020



Photo 17 – UT1 R1: Easement encroachment. 11-6-2020





APPENDIX 3. Vegetation Plot Data

Vegetation assessment and analysis not required in Monitoring Year 4

APPENDIX 4. Morphological Summary Data and Plots

Cross-sectional morphological surveys and analysis not required in Monitoring Year 4

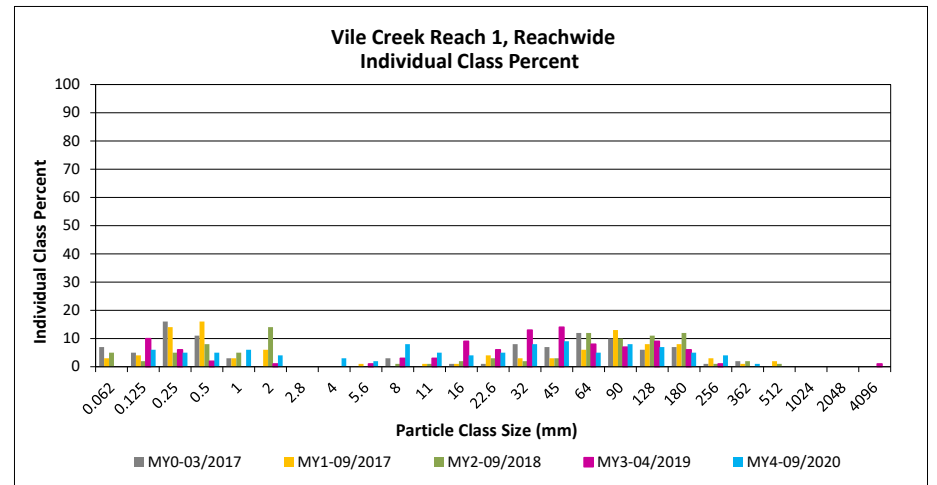
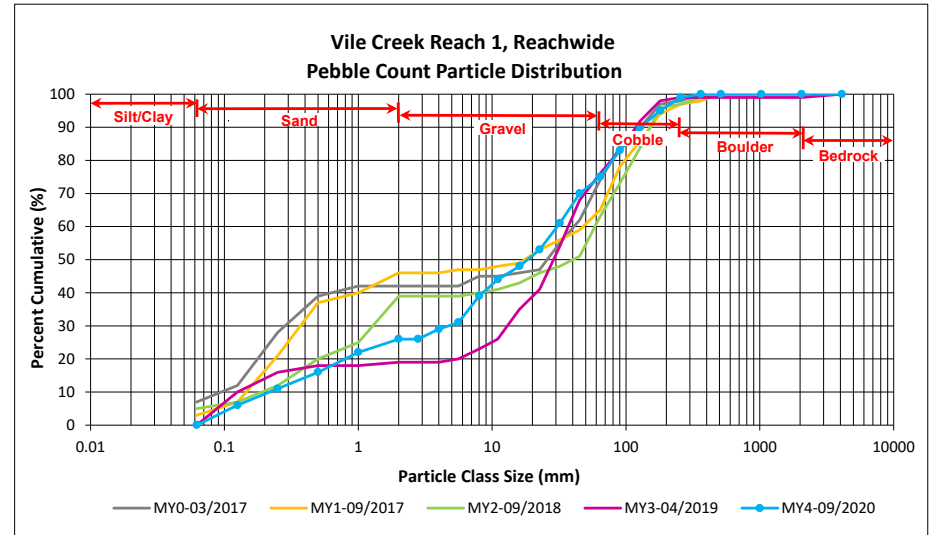
Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

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				0
SAND	Very fine	0.062	0.125		6	6	6	6
	Fine	0.125	0.250		5	5	5	11
	Medium	0.25	0.50	1	4	5	5	16
	Coarse	0.5	1.0	3	3	6	6	22
	Very Coarse	1.0	2.0		4	4	4	26
GRAVEL	Very Fine	2.0	2.8					26
	Very Fine	2.8	4.0		3	3	3	29
	Fine	4.0	5.6		2	2	2	31
	Fine	5.6	8.0	1	7	8	8	39
	Medium	8.0	11.0	3	2	5	5	44
	Medium	11.0	16.0		4	4	4	48
	Coarse	16.0	22.6	3	2	5	5	53
	Coarse	22.6	32	5	3	8	8	61
	Very Coarse	32	45	7	2	9	9	70
	Very Coarse	45	64	4	1	5	5	75
COBBLE	Small	64	90	6	2	8	8	83
	Small	90	128	7		7	7	90
	Large	128	180	5		5	5	95
	Large	180	256	4		4	4	99
BOULDER	Small	256	362	1		1	1	100
	Small	362	512					100
	Medium	512	1024					100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.5
D ₃₅ =	6.7
D ₅₀ =	18.4
D ₈₄ =	94.6
D ₉₅ =	180.0
D ₁₀₀ =	362.0



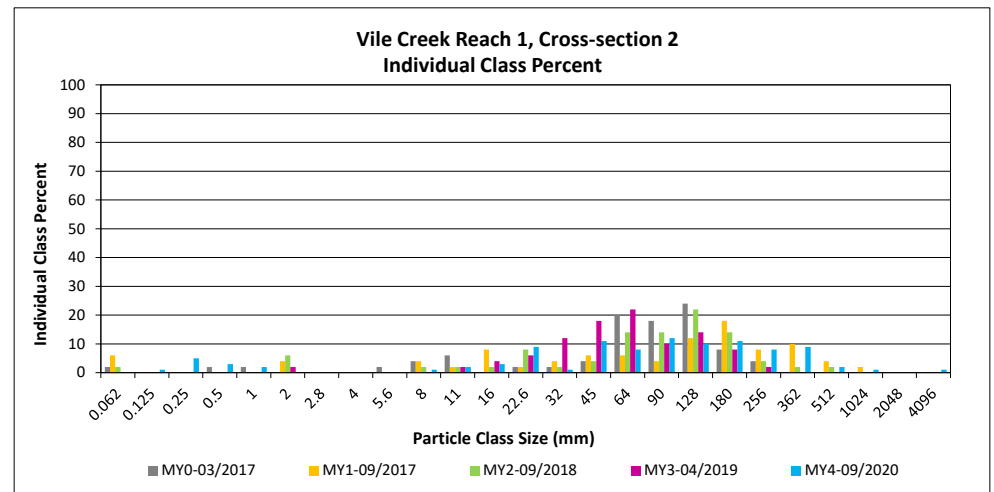
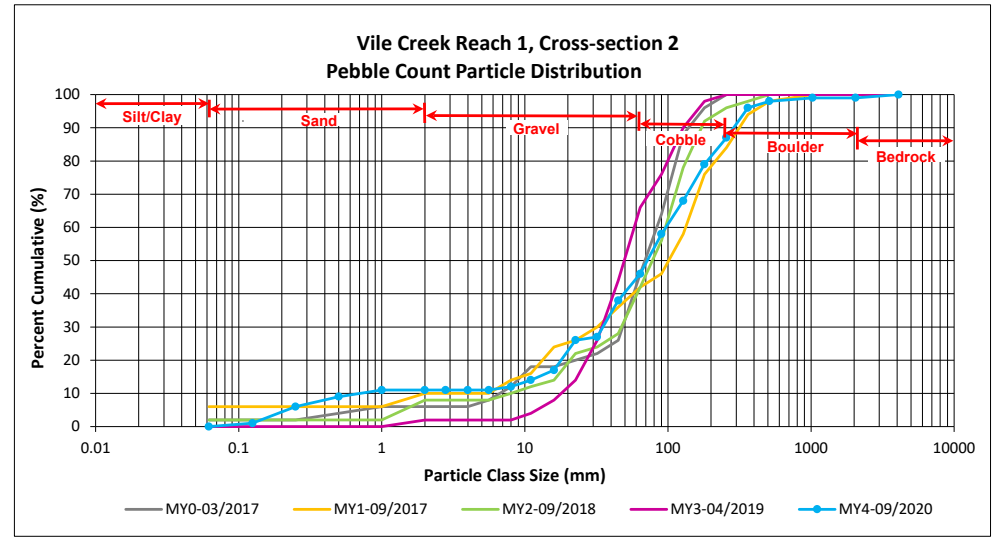
Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

Vile Creek Reach 1, Cross-section 2

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
<i>SILT/CLAY</i>		Silt/Clay	0.000 - 0.062			0
<i>SAND</i>	Very fine	0.062 - 0.125	1	1	1	
	Fine	0.125 - 0.250	5	5	6	
	Medium	0.25 - 0.50	3	3	9	
	Coarse	0.5 - 1.0	2	2	11	
	Very Coarse	1.0 - 2.0			11	
<i>GRAVEL</i>	Very Fine	2.0 - 2.8			11	
	Very Fine	2.8 - 4.0			11	
	Fine	4.0 - 5.6	1	1	12	
	Fine	5.6 - 8.0	2	2	14	
	Medium	8.0 - 11.0	2	2	16	
	Medium	11.0 - 16.0	3	3	19	
	Coarse	16.0 - 22.6	10	10	29	
	Coarse	22.6 - 32	1	1	30	
	Very Coarse	32 - 45	11	11	41	
	Very Coarse	45 - 64	8	8	49	
<i>COBBLE</i>	Small	64 - 90	12	12	61	
	Small	90 - 128	10	10	71	
	Large	128 - 180	11	11	82	
	Large	180 - 256	8	8	90	
<i>BEDROCK</i>	Small	256 - 362	9	9	99	
	Small	362 - 512			99	
	Medium	512 - 1024			99	
		Large/Very Large	1024 - 2048		99	
<i>BEDROCK</i>		Bedrock	2048 - >2048	1	1	100
Total				100	100	100

Cross-section 2	
Channel materials (mm)	
D ₁₆ =	11.0
D ₃₅ =	37.4
D ₅₀ =	65.8
D ₈₄ =	196.6
D ₉₅ =	310.3
D ₁₀₀ =	>2048



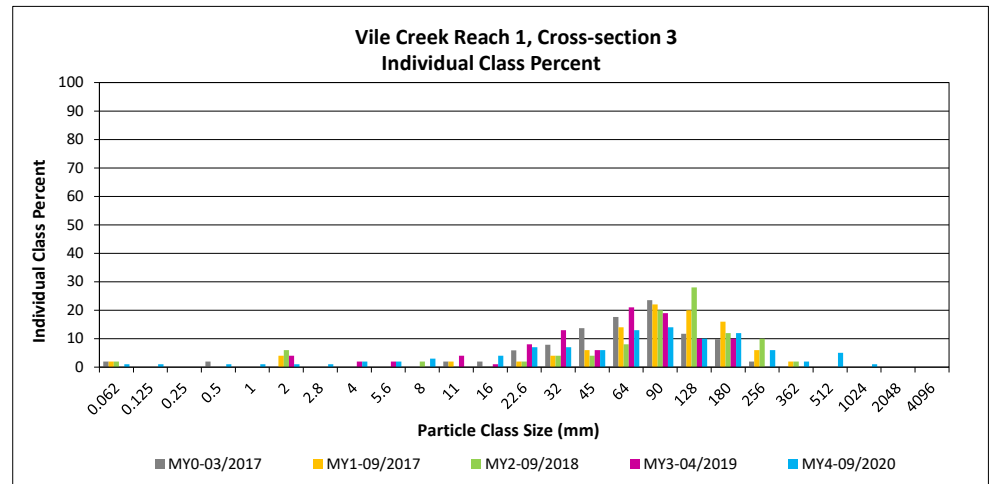
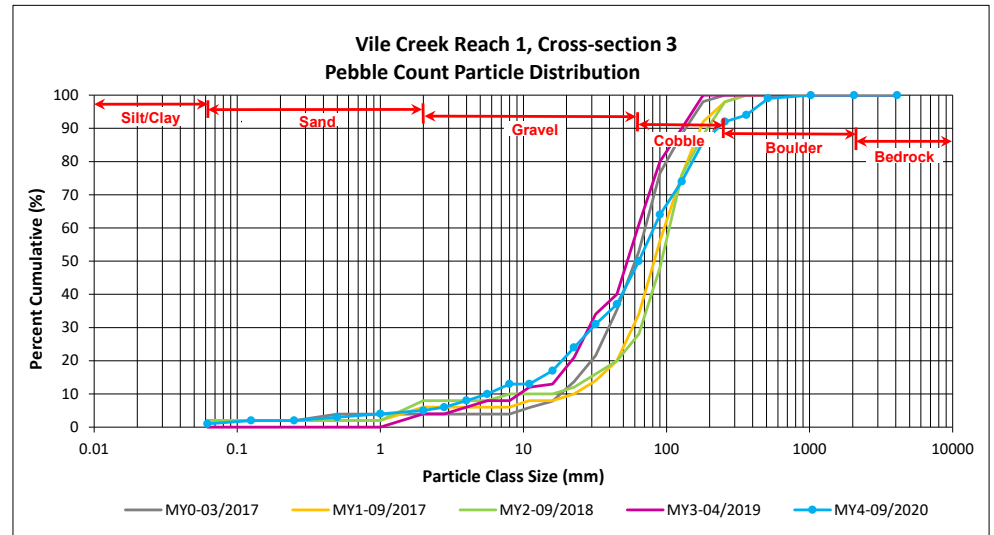
Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

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	1	1	1
SAND	Very fine	0.062	0.125	1	1	2
	Fine	0.125	0.250			2
	Medium	0.25	0.50	1	1	3
	Coarse	0.5	1.0	1	1	4
	Very Coarse	1.0	2.0	1	1	5
GRAVEL	Very Fine	2.0	2.8	1	1	6
	Very Fine	2.8	4.0	2	2	8
	Fine	4.0	5.6	2	2	10
	Fine	5.6	8.0	3	3	13
	Medium	8.0	11.0			13
	Medium	11.0	16.0	4	4	17
	Coarse	16.0	22.6	7	7	24
	Coarse	22.6	32	7	7	31
	Very Coarse	32	45	6	6	37
	Very Coarse	45	64	13	13	50
COBBLE	Small	64	90	14	14	64
	Small	90	128	10	10	74
	Large	128	180	12	12	86
	Large	180	256	6	6	92
BOULDER	Small	256	362	2	2	94
	Small	362	512	5	5	99
	Medium	512	1024	1	1	100
BEDROCK	Large/Very Large	1024	2048			100
	Bedrock	2048	>2048			100
Total				100	100	100

Cross-section 3 Channel materials (mm)	
D ₁₆ =	14.6
D ₃₅ =	40.2
D ₅₀ =	64.0
D ₈₄ =	170.1
D ₉₅ =	388.0
D ₁₀₀ =	1024.0



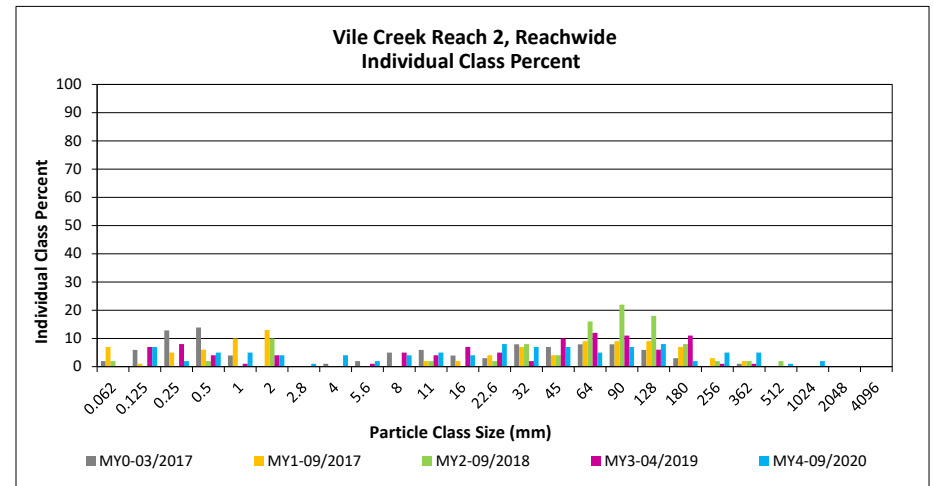
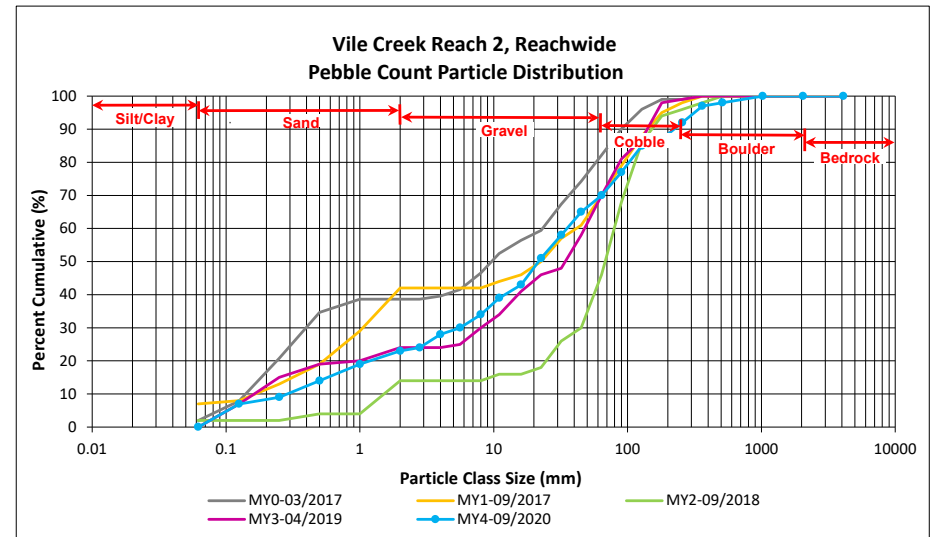
Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

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					0
SAND	Very fine	0.062	0.125		7	7	7	7
	Fine	0.125	0.250	1	1	2	2	9
	Medium	0.25	0.50	1	4	5	5	14
	Coarse	0.5	1.0		5	5	5	19
	Very Coarse	1.0	2.0	1	3	4	4	23
GRAVEL	Very Fine	2.0	2.8		1	1	1	24
	Very Fine	2.8	4.0	1	3	4	4	28
	Fine	4.0	5.6		2	2	2	30
	Fine	5.6	8.0		4	4	4	34
	Medium	8.0	11.0	2	3	5	5	39
	Medium	11.0	16.0	1	3	4	4	43
	Coarse	16.0	22.6	4	4	8	8	51
	Coarse	22.6	32	4	3	7	7	58
	Very Coarse	32	45	4	3	7	7	65
	Very Coarse	45	64	4	1	5	5	70
COBBLE	Small	64	90	5	2	7	7	77
	Small	90	128	8		8	8	85
	Large	128	180	2		2	2	87
	Large	180	256	5		5	5	92
BOULDER	Small	256	362	5		5	5	97
	Small	362	512		1	1	1	98
	Medium	512	1024	2		2	2	100
BEDROCK	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				50	50	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	0.7
D ₃₅ =	8.5
D ₅₀ =	21.6
D ₈₄ =	122.5
D ₉₅ =	315.2
D ₁₀₀ =	1024.0



Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site

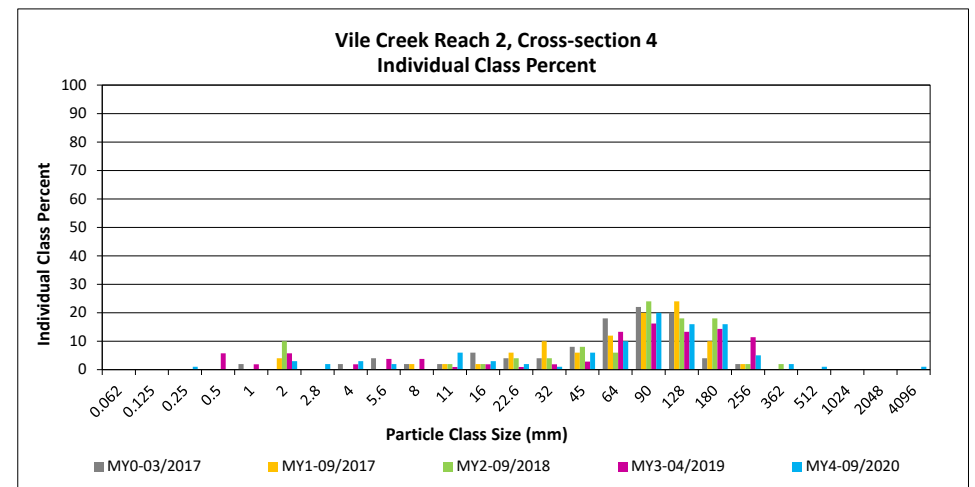
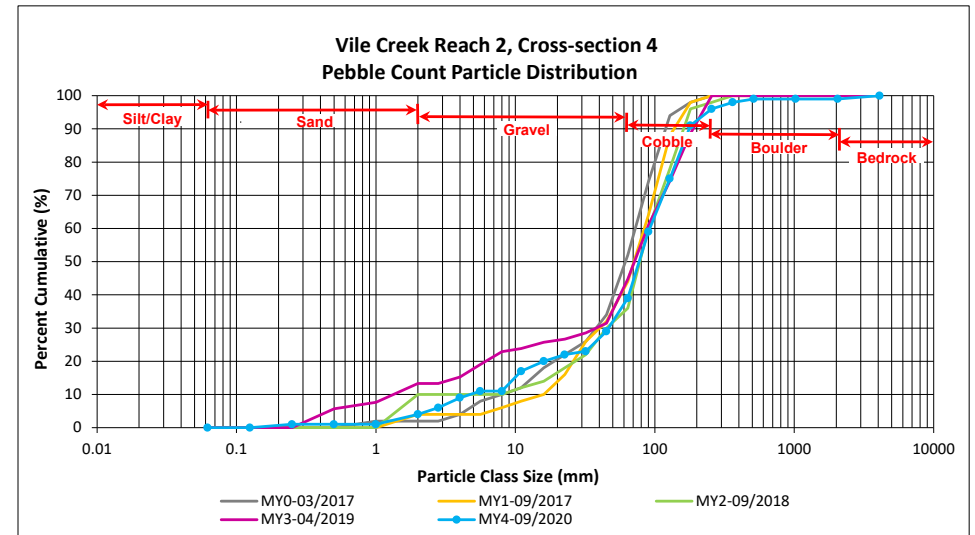
DMS Project No. 96582

Monitoring Year 4 - 2020

Vile Creek Reach 2, Cross-section 4

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
<i>SILT/CLAY</i>		Silt/Clay	0.000	0.062		0
<i>SAND</i>	Very fine	0.062	0.125			0
	Fine	0.125	0.250	2	2	2
	Medium	0.25	0.50	4	4	6
	Coarse	0.5	1.0	7	7	13
	Very Coarse	1.0	2.0			13
<i>GRAVEL</i>	Very Fine	2.0	2.8	1	1	14
	Very Fine	2.8	4.0			14
	Fine	4.0	5.6	1	1	15
	Fine	5.6	8.0	1	1	16
	Medium	8.0	11.0			16
	Medium	11.0	16.0	3	3	19
	Coarse	16.0	22.6	4	4	23
	Coarse	22.6	32	7	7	30
	Very Coarse	32	45	8	8	38
<i>COBBLE</i>	Very Coarse	45	64	8	8	46
	Small	64	90	11	11	57
	Small	90	128	12	12	69
	Large	128	180	10	10	79
	Large	180	256	9	9	88
<i>BOULDER</i>	Small	256	362	3	3	91
	Small	362	512	3	3	94
	Medium	512	1024	4	4	98
	Large/Very Large	1024	2048	1	1	99
<i>BEDROCK</i>	Bedrock	2048	>2048	1	1	100
Total				100	100	100

Cross-section 4	
Channel materials (mm)	
D ₁₆ =	8.0
D ₃₅ =	39.6
D ₅₀ =	72.4
D ₈₄ =	218.9
D ₉₅ =	608.9
D ₁₀₀ =	>2048



Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site

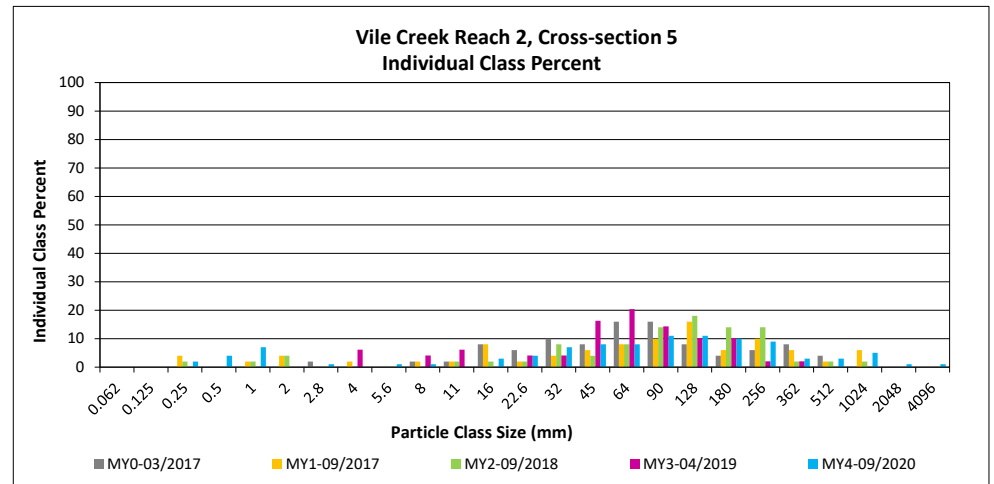
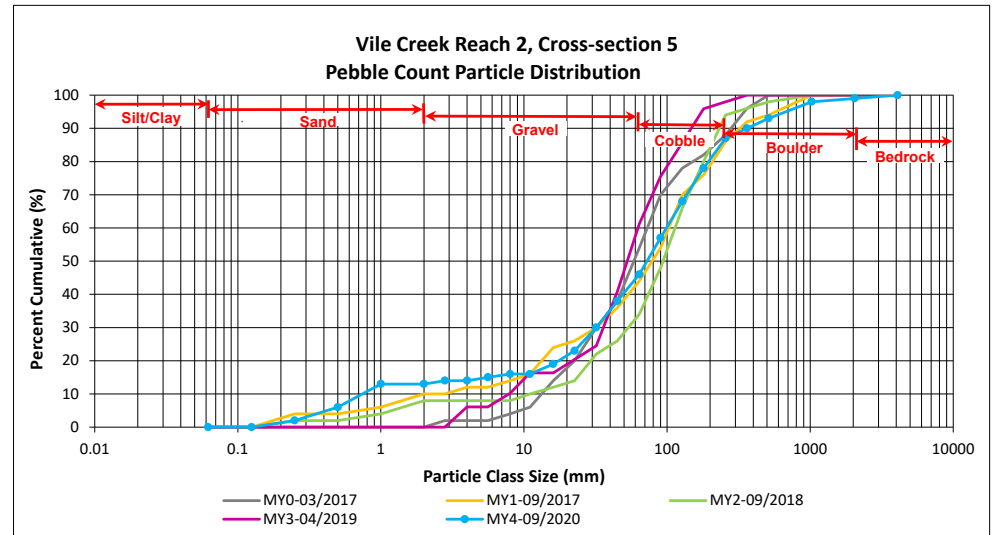
DMS Project No. 96582

Monitoring Year 4 - 2020

Vile Creek Reach 2, Cross-section 5

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
	Very fine	0.062	0.125			0
SAND	Fine	0.125	0.250	2	2	2
	Medium	0.25	0.50	4	4	6
	Coarse	0.5	1.0	7	7	13
	Very Coarse	1.0	2.0			13
	Very Fine	2.0	2.8	1	1	14
GRAVEL	Very Fine	2.8	4.0			14
	Fine	4.0	5.6	1	1	15
	Fine	5.6	8.0	1	1	16
	Medium	8.0	11.0			16
	Medium	11.0	16.0	3	3	19
	Coarse	16.0	22.6	4	4	23
	Coarse	22.6	32	7	7	30
	Very Coarse	32	45	8	8	38
	Very Coarse	45	64	8	8	46
	Very Coarse	64	90	11	11	57
COBBLE	Small	90	128	11	11	68
	Large	128	180	10	10	78
	Large	180	256	9	9	87
	Small	256	362	3	3	90
BOULDER	Small	362	512	3	3	93
	Medium	512	1024	5	5	98
	Large/Very Large	1024	2048	1	1	99
BEDROCK	Bedrock	2048	>2048	1	1	100
Total				100	100	100

Cross-section 5	
Channel materials (mm)	
D ₁₆ =	8.0
D ₃₅ =	39.6
D ₅₀ =	72.4
D ₈₄ =	227.6
D ₉₅ =	675.6
D ₁₀₀ =	>2048



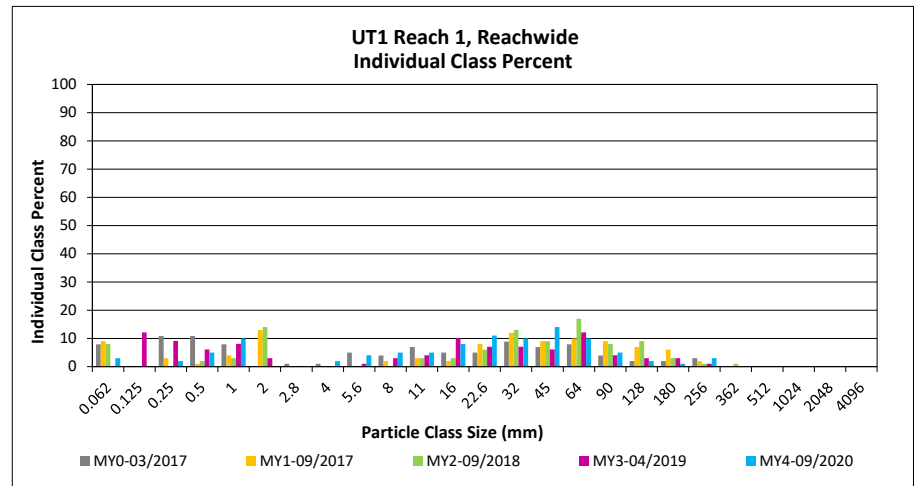
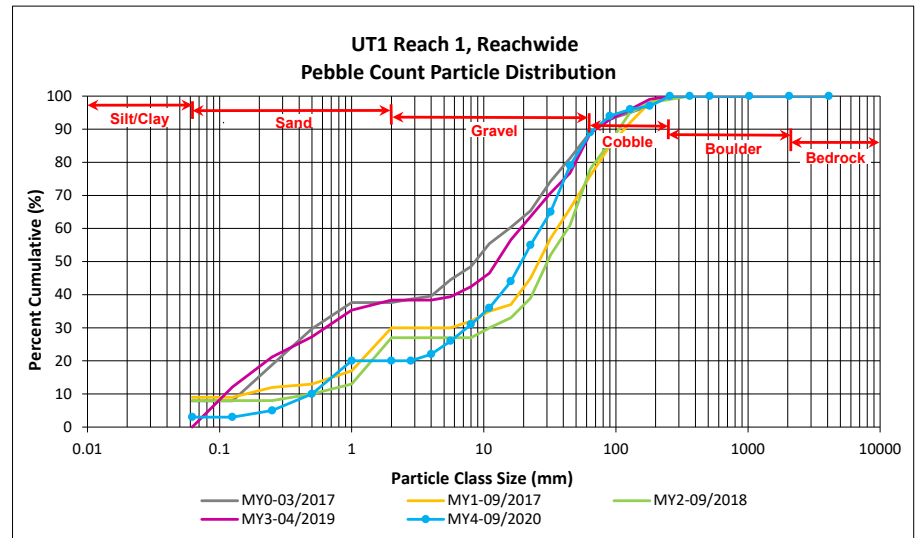
Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site
 DMS Project No. 96582
 Monitoring Year 4 - 2020

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	3	3	3
SAND	Very fine	0.062	0.125					3
	Fine	0.125	0.250		2	2	2	5
	Medium	0.25	0.50		5	5	5	10
	Coarse	0.5	1.0	1	9	10	10	20
	Very Coarse	1.0	2.0					20
GRAVEL	Very Fine	2.0	2.8					20
	Fine	2.8	4.0		2	2	2	22
	Fine	4.0	5.6		4	4	4	26
	Fine	5.6	8.0		5	5	5	31
	Medium	8.0	11.0	2	3	5	5	36
	Medium	11.0	16.0	3	5	8	8	44
	Coarse	16.0	22.6	8	3	11	11	55
	Coarse	22.6	32	7	3	10	10	65
	Very Coarse	32	45	11	3	14	14	79
	Very Coarse	45	64	10		10	10	89
COBBLE	Small	64	90	4	1	5	5	94
	Small	90	128	1	1	2	2	96
	Large	128	180		1	1	1	97
	Large	180	256	3		3	3	100
BEDROCK	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 =	0.8
D ₃₅ =	10.3
D ₅₀ =	19.3
D ₈₄ =	53.7
D ₉₅ =	107.3
D ₁₀₀ =	256.0



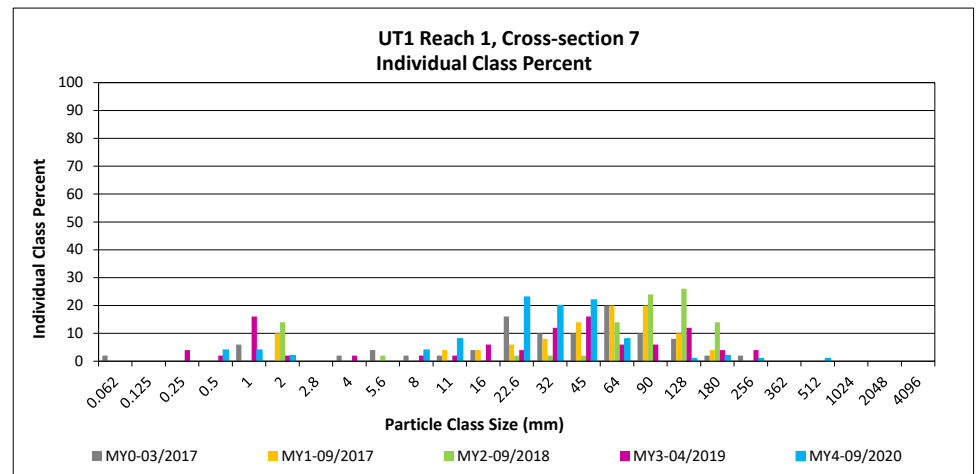
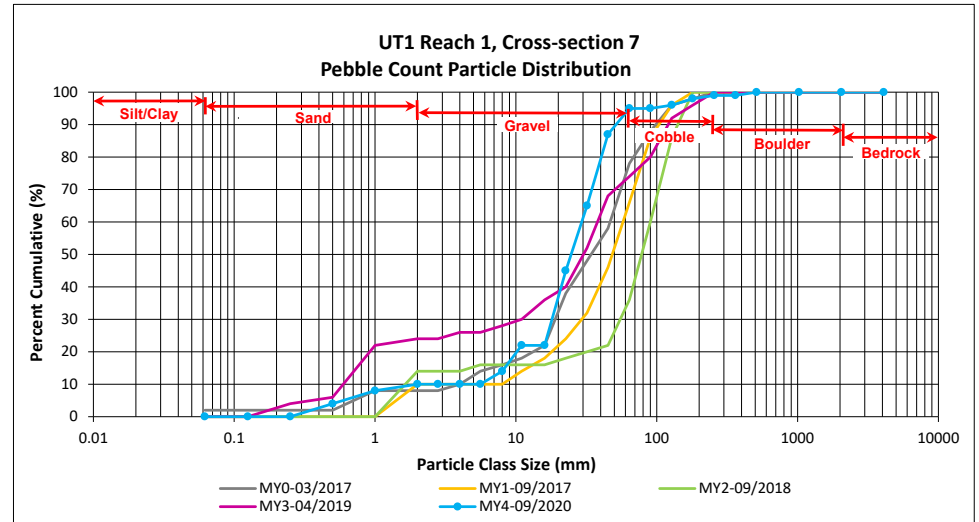
Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site
DMS Project No. 96582
Monitoring Year 4 - 2020

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	4		4			4
	Coarse	0.5	1.0	4		4			8
	Very Coarse	1.0	2.0	2		2			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	8		8			22
	Medium	11.0	16.0						22
	Coarse	16.0	22.6	23		23			45
	Coarse	22.6	32	20		20			65
	Very Coarse	32	45	22		22			87
	Very Coarse	45	64	8		8			95
COBBLE	Small	64	90						95
	Small	90	128	1		1			96
	Large	128	180	2		2			98
	Large	180	256	1		1			99
BOULDER	Small	256	362						99
	Small	362	512	1		1			100
	Medium	512	1024						100
	Large/Very Large	1024	2048						100
BEDROCK	Bedrock	2048	>2048						100
Total				100		100			100

Cross-section 7	
Channel materials (mm)	
D ₁₆ =	8.7
D ₃₅ =	19.4
D ₅₀ =	24.7
D ₈₄ =	43.0
D ₉₅ =	64.0
D ₁₀₀ =	512.0



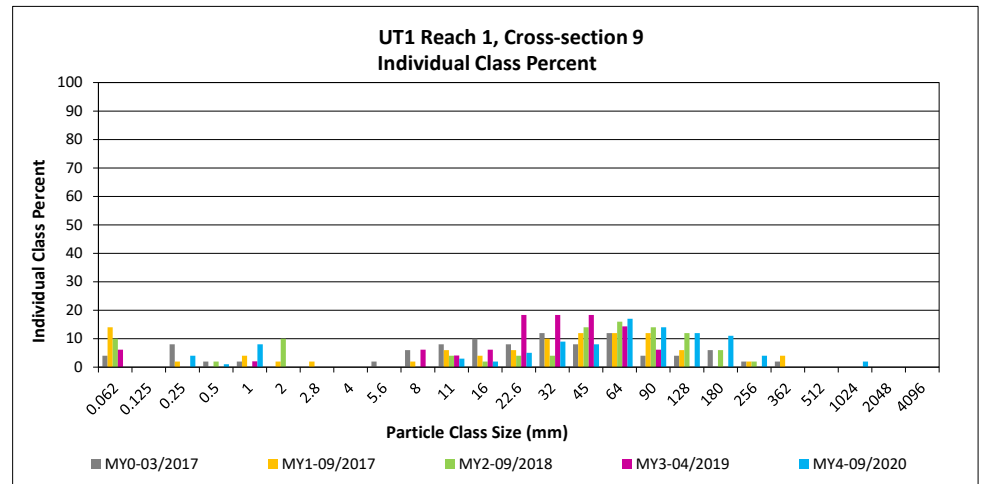
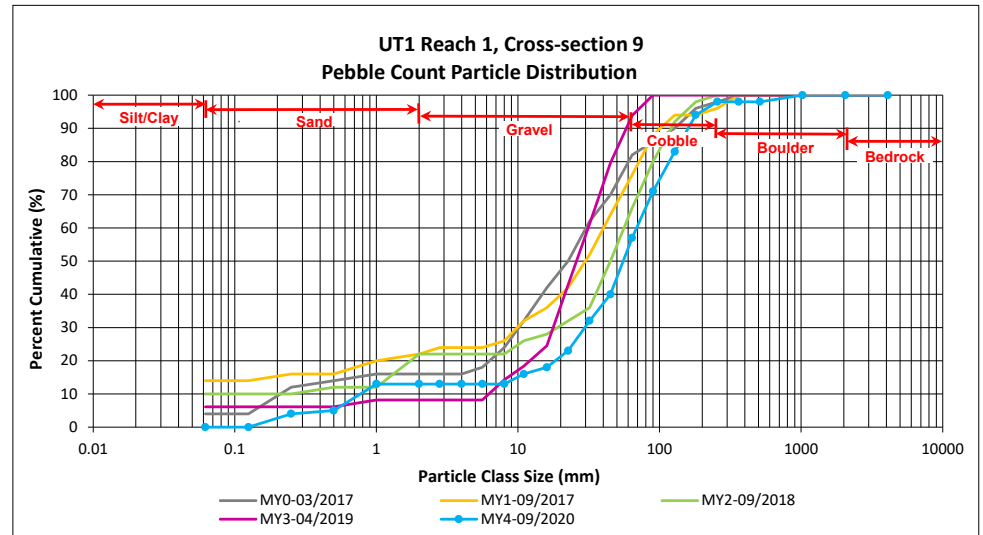
Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site
 DMS Project No. 96582
Monitoring Year 4 - 2020

UT1 Reach 1, Cross-section 9

Particle Class		Diameter (mm)		Riffle 100- Count	Summary	
		min	max		Class Percentage	Percent Cumulative
<i>SILT/CLAY</i>	Silt/Clay	0.000	0.062		0	0
<i>SAND</i>	Very fine	0.062	0.125		0	0
	Fine	0.125	0.250		0	0
	Medium	0.25	0.50	4	4	4
	Coarse	0.5	1.0	4	4	8
	Very Coarse	1.0	2.0	2	2	10
<i>GRAVEL</i>	Very Fine	2.0	2.8		0	10
	Very Fine	2.8	4.0		0	10
	Fine	4.0	5.6		0	10
	Fine	5.6	8.0	4	4	14
	Medium	8.0	11.0	8	8	22
	Medium	11.0	16.0		0	22
	Coarse	16.0	22.6	23	23	45
	Coarse	22.6	32	20	20	65
	Very Coarse	32	45	22	22	87
	Very Coarse	45	64	8	8	95
<i>COBBLE</i>	Small	64	90		0	95
	Small	90	128	1	1	96
	Large	128	180	2	2	98
	Large	180	256	1	1	99
<i>BOULDER</i>	Small	256	362		0	99
	Small	362	512	1	1	100
	Medium	512	1024		0	100
	Large/Very Large	1024	2048		0	100
<i>BEDROCK</i>	Bedrock	2048	>2048		0	100
Total				100	100	100

Cross-section 9	
Channel materials (mm)	
D ₁₆ =	8.7
D ₃₅ =	19.4
D ₅₀ =	24.7
D ₈₄ =	43.0
D ₉₅ =	64.0
D ₁₀₀ =	>2048



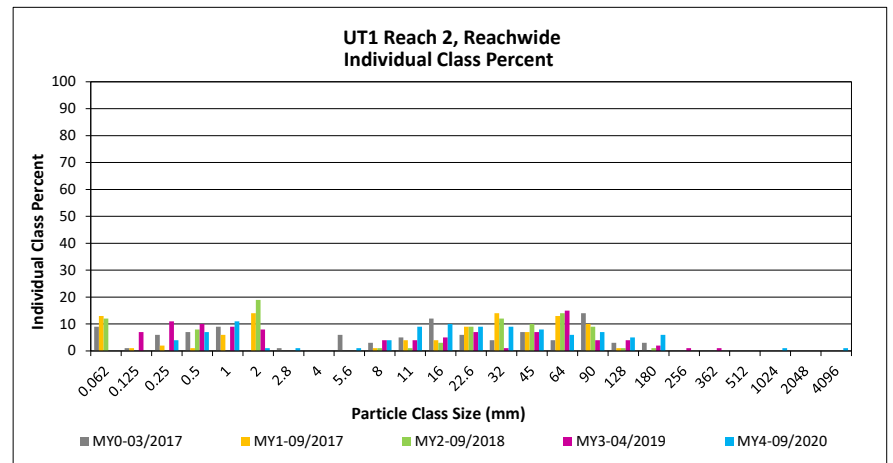
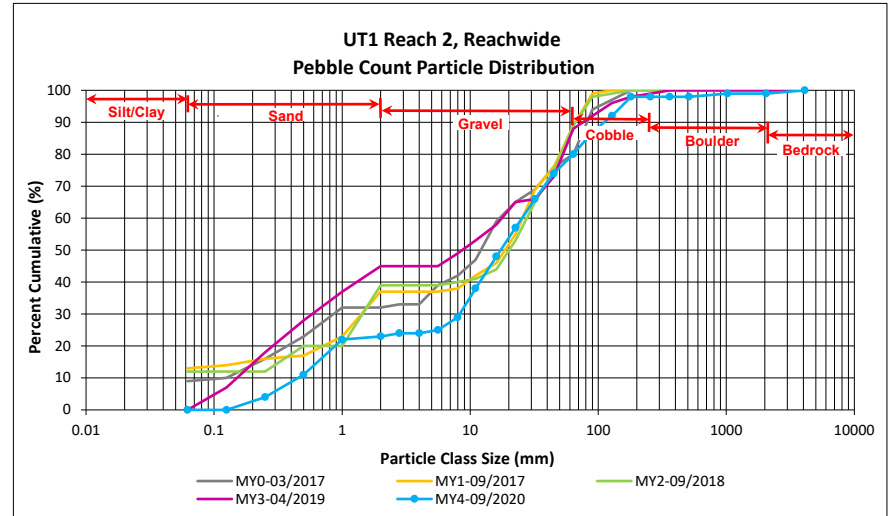
Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site
 DMS Project No. 96582
Monitoring Year 4 - 2020

UT1 Reach 2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
<i>SILT/CLAY</i>		Silt/Clay	0.000	0.062				0
<i>SAND</i>	Very fine	0.062	0.125					0
	Fine	0.125	0.250	4		4	4	4
	Medium	0.25	0.50	1		1	1	5
	Coarse	0.5	1.0	8		8	8	13
	Very Coarse	1.0	2.0					13
<i>GRAVEL</i>	Very Fine	2.0	2.8					13
	Very Fine	2.8	4.0					13
	Fine	4.0	5.6					13
	Fine	5.6	8.0					13
	Medium	8.0	11.0	3		3	3	16
	Medium	11.0	16.0	2		2	2	18
	Coarse	16.0	22.6	5		5	5	23
	Coarse	22.6	32	9		9	9	32
	Very Coarse	32	45	8		8	8	40
	Very Coarse	45	64	17		17	17	57
<i>COBBLE</i>	Small	64	90	14		14	14	71
	Small	90	128	12		12	12	83
	Large	128	180	11		11	11	94
	Large	180	256	4		4	4	98
<i>BOULDER</i>	Small	256	362					98
	Small	362	512					98
	Medium	512	1024	2		2	2	100
<i>BEDROCK</i>	Large/Very Large	1024	2048					100
	Bedrock	2048	>2048					100
Total				100	0	100	100	100

Reachwide Channel materials (mm)	
D ₁₆ =	11.0
D ₃₅ =	36.4
D ₅₀ =	55.4
D ₈₄ =	132.0
D ₉₅ =	196.6
D ₁₀₀ =	1024.0



Reachwide and Cross-section Pebble Count Plots

Vile Creek Restoration Site

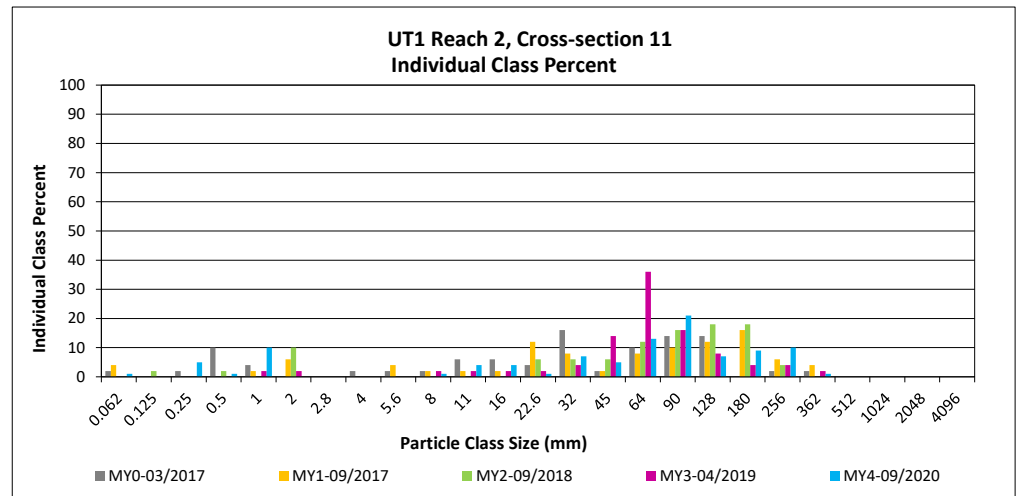
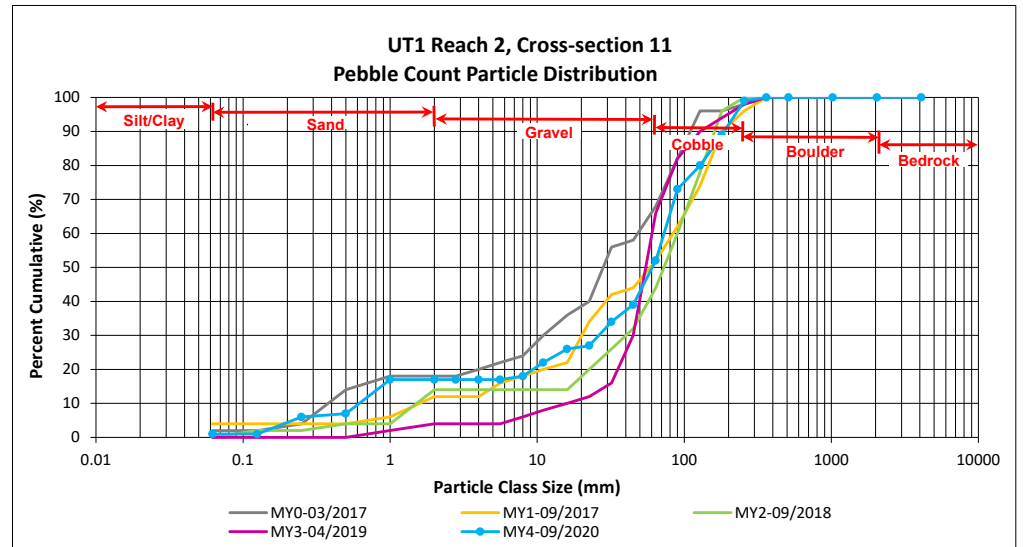
DMS Project No. 96582

Monitoring Year 4 - 2020

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	1	1	1
SAND	Very fine	0.062	0.125			1
	Fine	0.125	0.250	5	5	6
	Medium	0.25	0.50	1	1	7
	Coarse	0.5	1.0	10	10	17
	Very Coarse	1.0	2.0			17
GRAVEL	Very Fine	2.0	2.8			17
	Very Fine	2.8	4.0			17
	Fine	4.0	5.6			17
	Fine	5.6	8.0	1	1	18
	Medium	8.0	11.0	4	4	22
	Medium	11.0	16.0	4	4	26
	Coarse	16.0	22.6	1	1	27
	Coarse	22.6	32	7	7	34
	Very Coarse	32	45	5	5	39
	Very Coarse	45	64	13	13	52
COBBLE	Small	64	90	21	21	73
	Small	90	128	7	7	80
	Large	128	180	9	9	89
	Large	180	256	10	10	99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
Total				100	100	100

Cross-section 11 Channel materials (mm)	
D ₁₆ =	0.9
D ₃₅ =	34.3
D ₅₀ =	60.6
D ₈₄ =	148.9
D ₉₅ =	222.4
D ₁₀₀ =	362.0



APPENDIX 5. Hydrology Summary Data and Plots

Table 13a. Verification of Bankfull Events

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4- 2020

Reach	Monitoring Year	Date of Occurrence	Method
Vile Reach 2	MY1	3/31/2017	Crest Gage
		4/24/2017	
		10/8/2017	
	MY2	9/16/2018	
		10/11/2018	
	MY4	1/11/2020	
		1/22/2020	
		2/7/2020	
		4/13/2020	
		5/20/2020	
		5/27/2020	
		8/15/2020	
		9/29/2020	
10/29/2020			
UT1 Reach 2	MY1	5/5/2017	
		10/8/2017	
	MY2	10/11/2018	
	MY3	6/17/2019	
		8/1/2019	
		9/30/2019	
	MY4	1/11/2020	
		1/24/2020	
		2/6/2020	
		4/13/2020	
		4/29/2020	
		5/20/2020	
		5/27/2020	
		7/23/2020	
		8/15/2020	
9/12/2020			
9/29/2020			
10/29/2020			

Table 13b. Verification of Geomorphically Significant Events

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4- 2020

Reach	Monitoring Year	Date of Occurrence	Method
Vile Reach 2	MY3	2/23/2019	Crest Gage
		4/14/2019	
		4/19/2019	
		6/17/2019	
		7/5/2019	
		8/1/2019	
		9/30/2019	
	MY4	1/11/2020	
		1/21/2020	
		1/24/2020	
		2/6/2020	
		4/13/2020	
		4/29/2020	
		5/20/2020	
		5/27/2020	
		8/3/2020	
		8/15/2020	
		9/12/2020	
		9/29/2020	
		10/11/2020	
10/29/2020			
UT1 Reach 2	MY3	2/23/2019	
		4/14/2019	
		4/19/2019	
		6/17/2019	
		7/30/2019	
		8/1/2019	
		9/30/2019	
	MY4	1/11/2020	
		1/21/2020	
		1/24/2020	
		2/6/2020	
		4/13/2020	
		4/29/2020	
		5/20/2020	
		5/27/2020	
		7/19/2020	
		7/23/2020	
		8/15/2020	
		8/20/2020	
		9/12/2020	
9/29/2020			
10/11/2020			
10/29/2020			

Table 14. Wetland Gage Attainment Summary

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

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%)	Yes/169 Days (100%)	Yes/169 Days (100%)	Yes/169 Days (100%)			
2	Yes/ 129 Days (77%)	Yes/33 Days (20%)	Yes/15 Days (9%)	Yes/70 Days (41%)			
3	Yes/169 Days (100%)	Yes/73 Days (43%)	Yes/14 Days (8.5%)	Yes/85 Days (50%)			
4	Yes/169 Days (100%)	Yes/169 Days (100%)	Yes/169 Days (100%)	Yes/169 Days (100%)			
5	Yes/169 Days (100%)	Yes/169 Days (100%)	Yes/169 Days (100%)	Yes/169 Days (100%)			
6	Yes/169 Days (100%)	Yes/169 Days (100%)	Yes/169 Days (100%)	Yes/169 Days (100%)			
7	Yes/ 129 Days (77%)	Yes/33 Days (20%)	Yes/24 Days (14%)	Yes/85 Days (50%)			
8	Yes/125 Days (74%)	Yes/14 Days (8%)	No/4 Days (2%)	Yes/44 Days (26%)			
9	Yes/40 Days (24%)	Yes/33 Days (20%)	Yes/106 Days (63%)	Yes/169 Days (100%)			
10*	Yes/169 Days (100%)	Yes/169 Days (100%)	Yes/169 Days (100%)	Yes/169 Days (100%)			

*Gages are located in bog habitat.

Growing season is April 26th -October 11th.

Success criteria for wetlands is 14 consecutive days (8.5%) and 20 consecutive days (12%) for bogs.

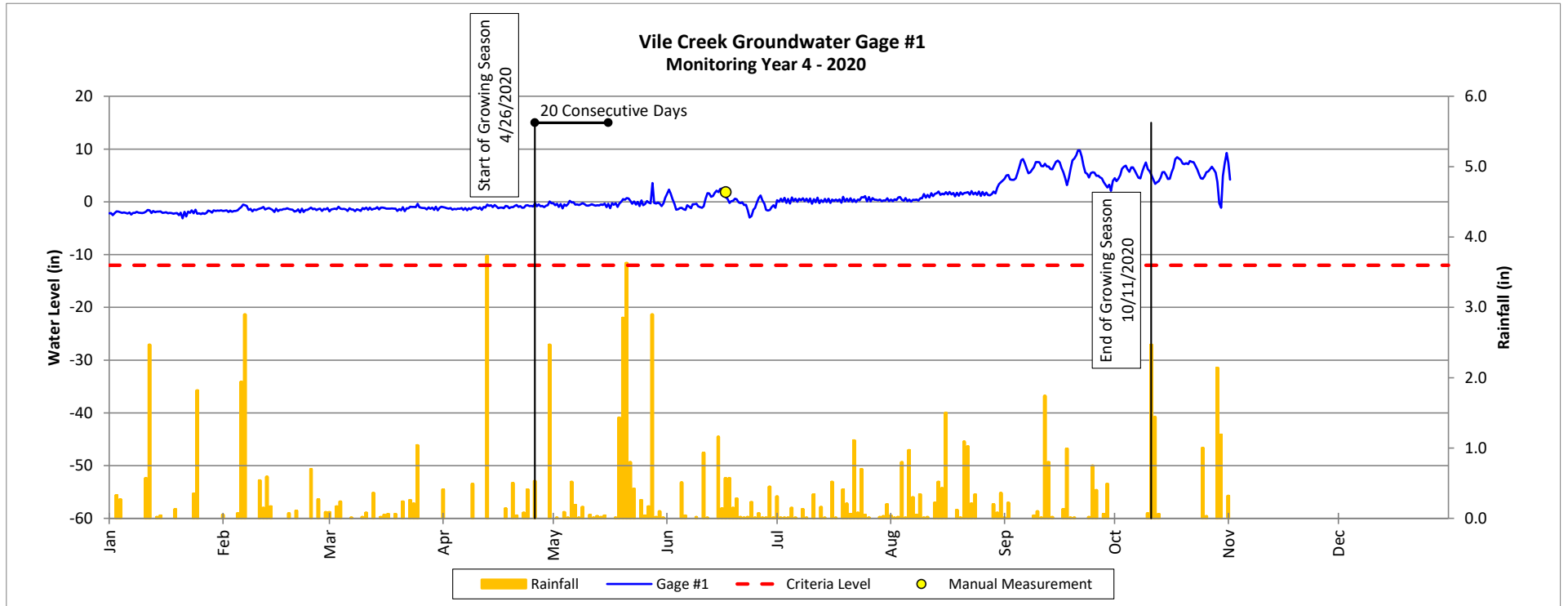
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Bog Rehabilitation



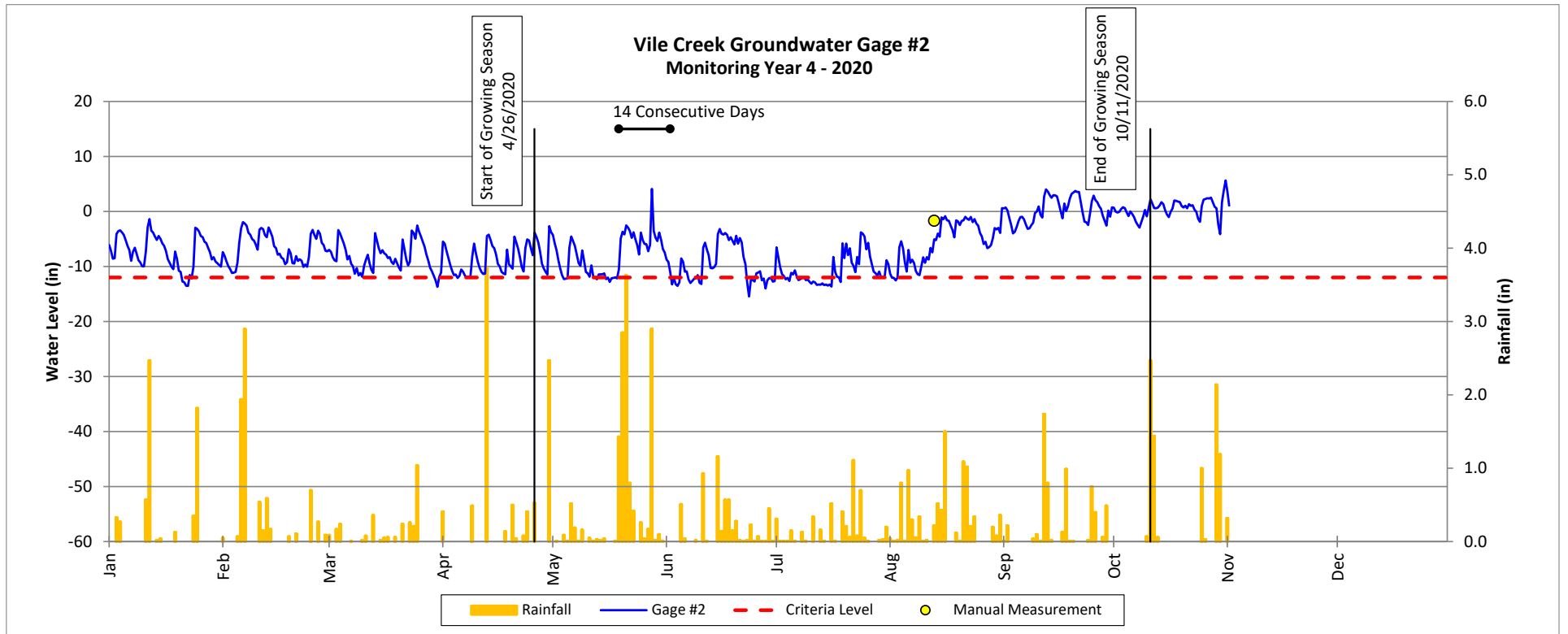
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Re-establishment



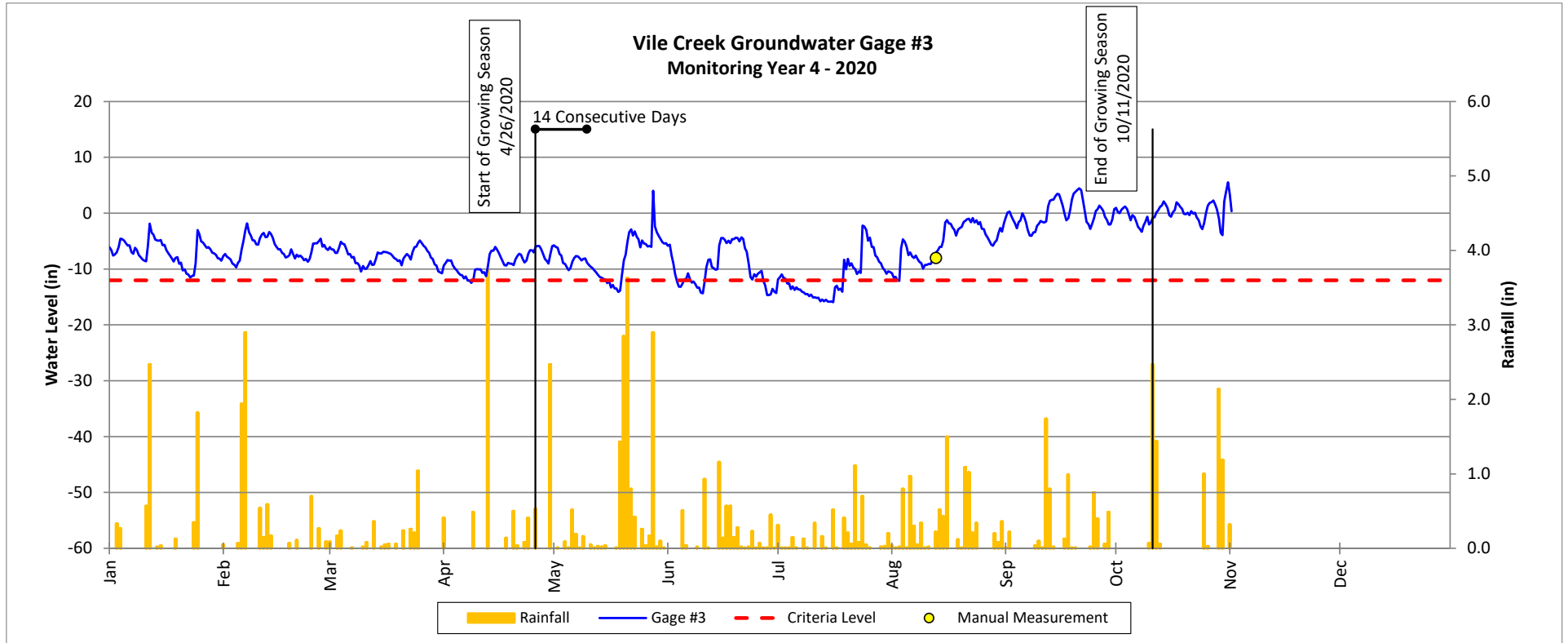
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Re-establishment



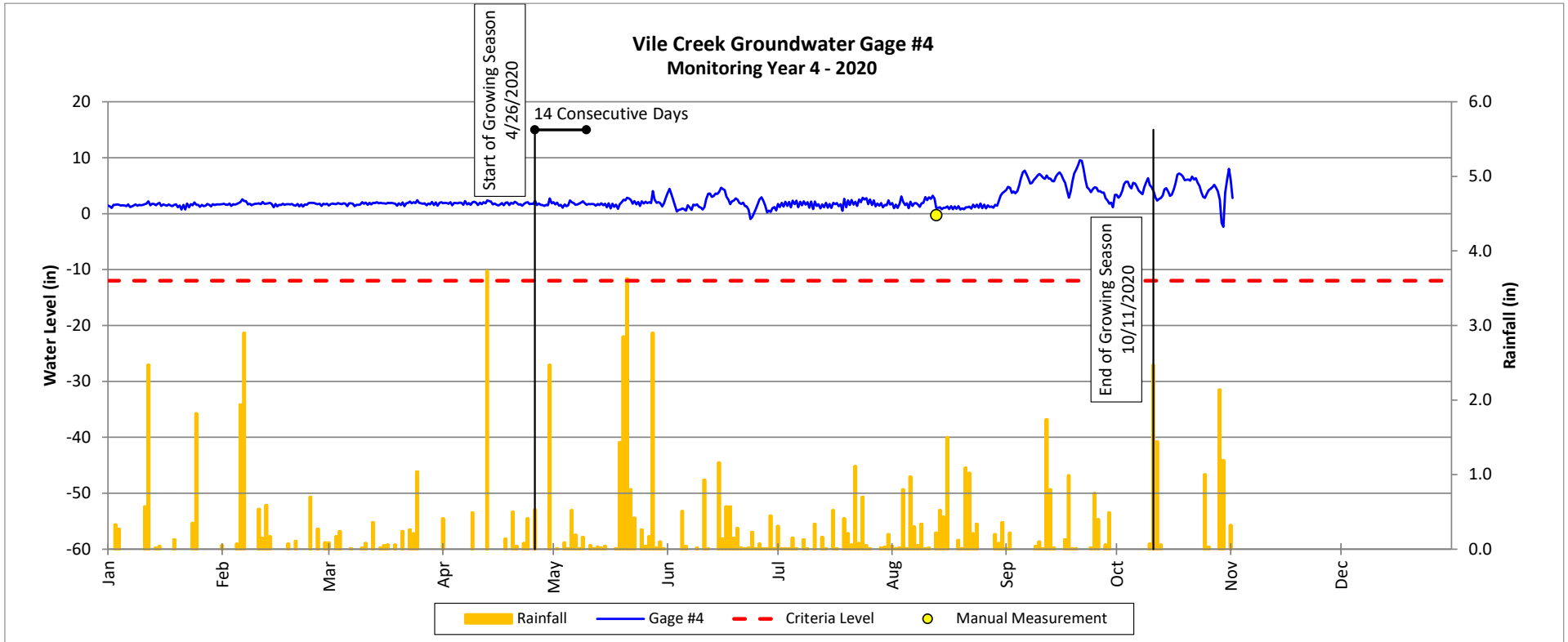
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Re-establishment



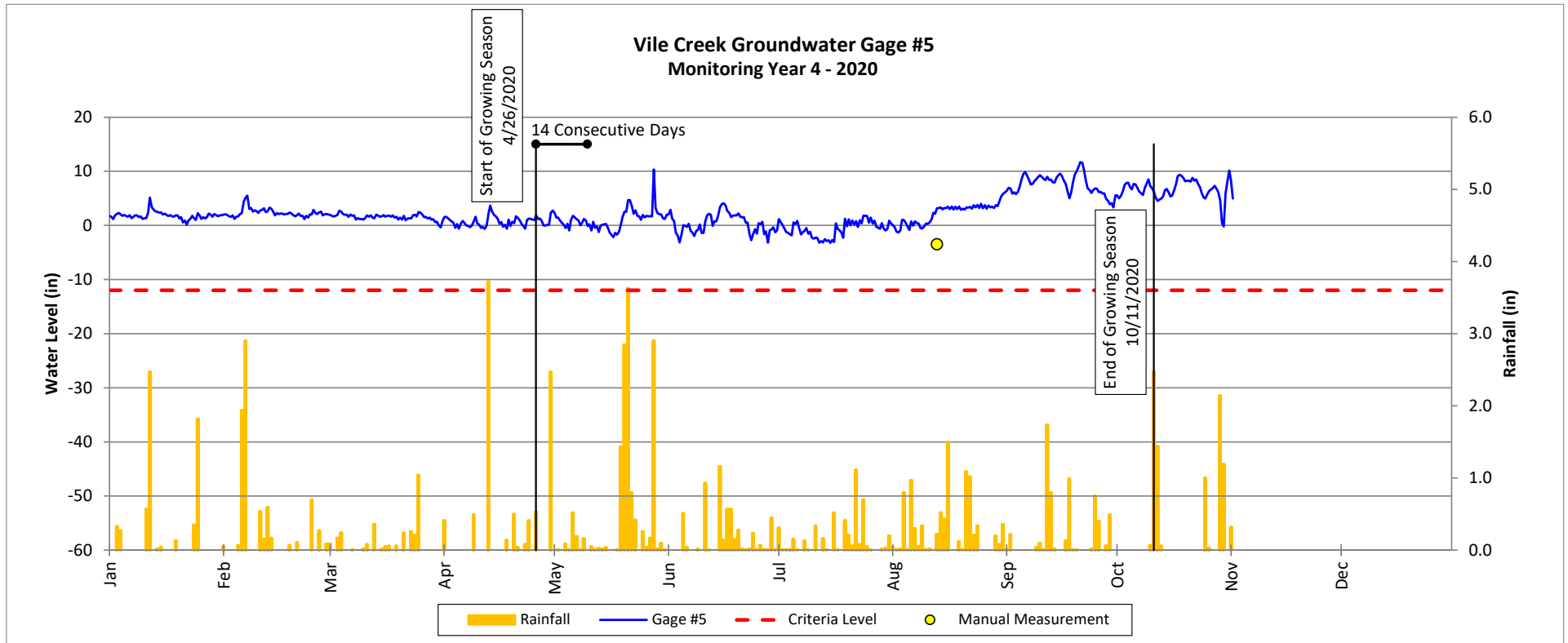
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Rehabilitation



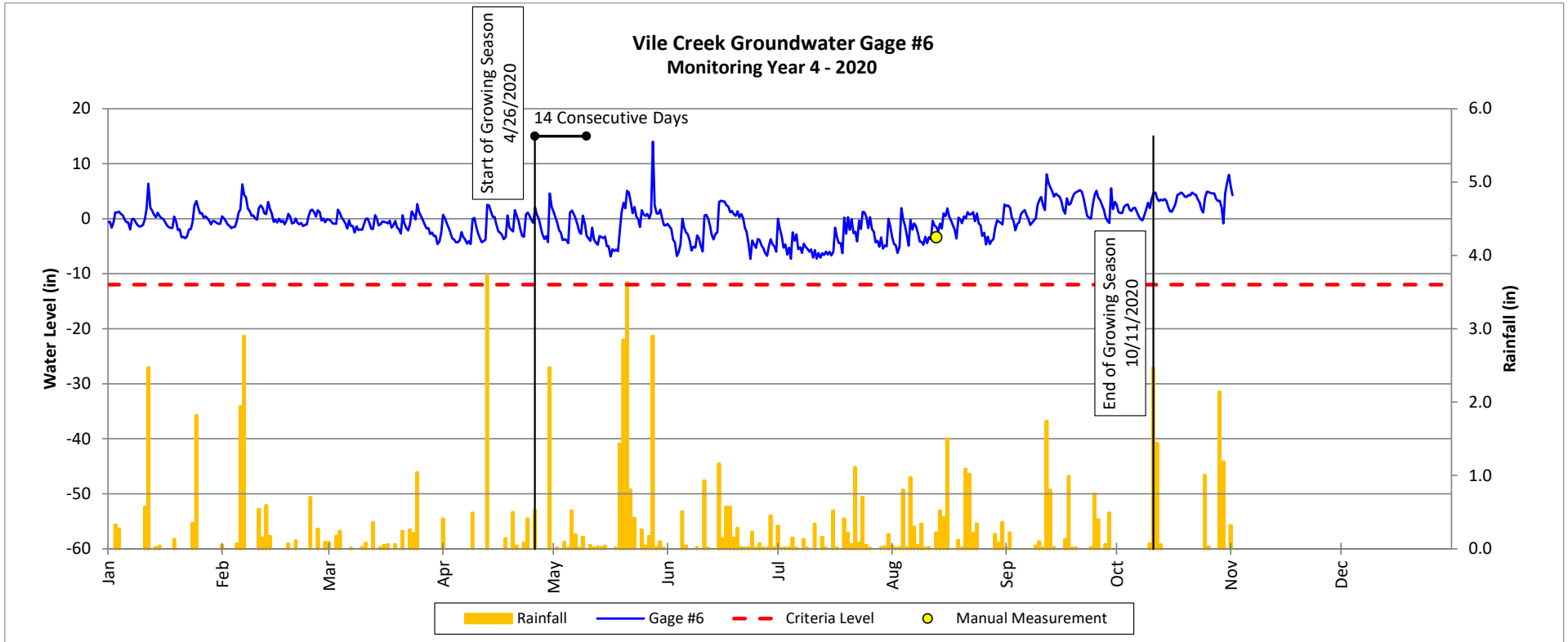
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Re-establishment



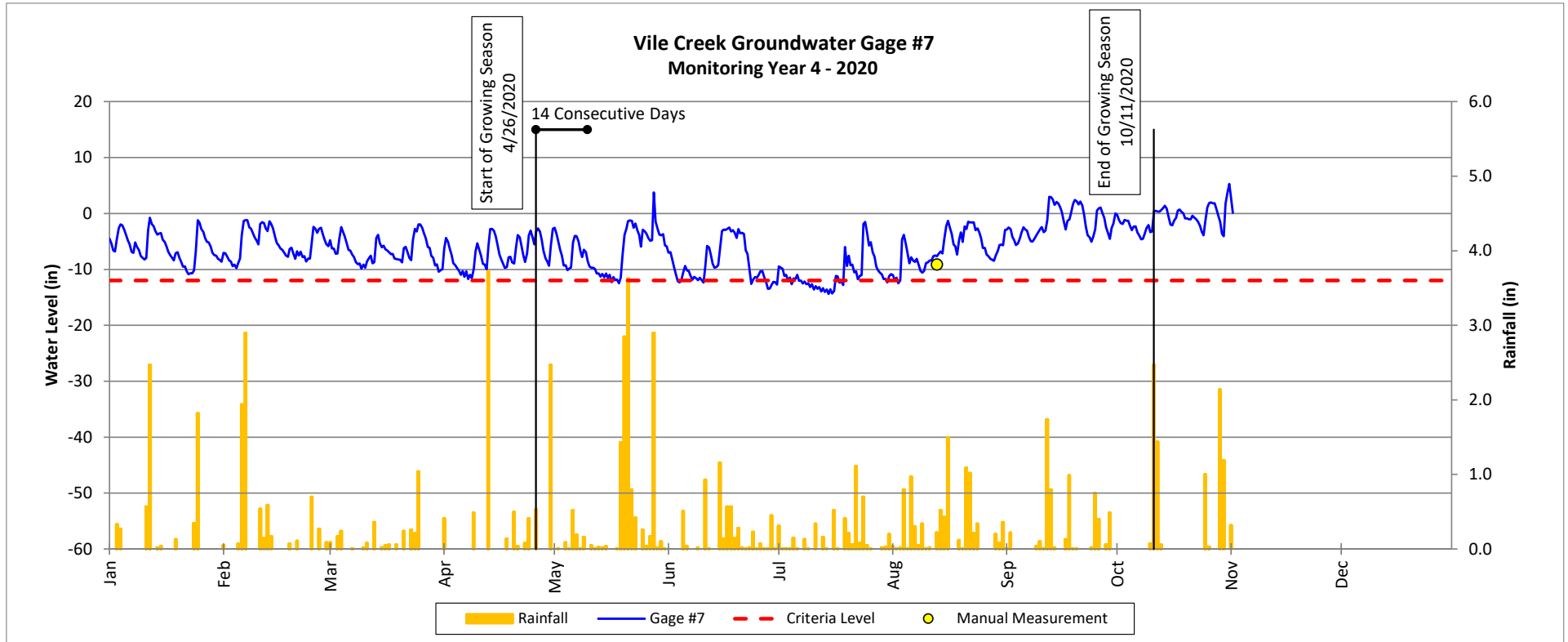
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Re-establishment



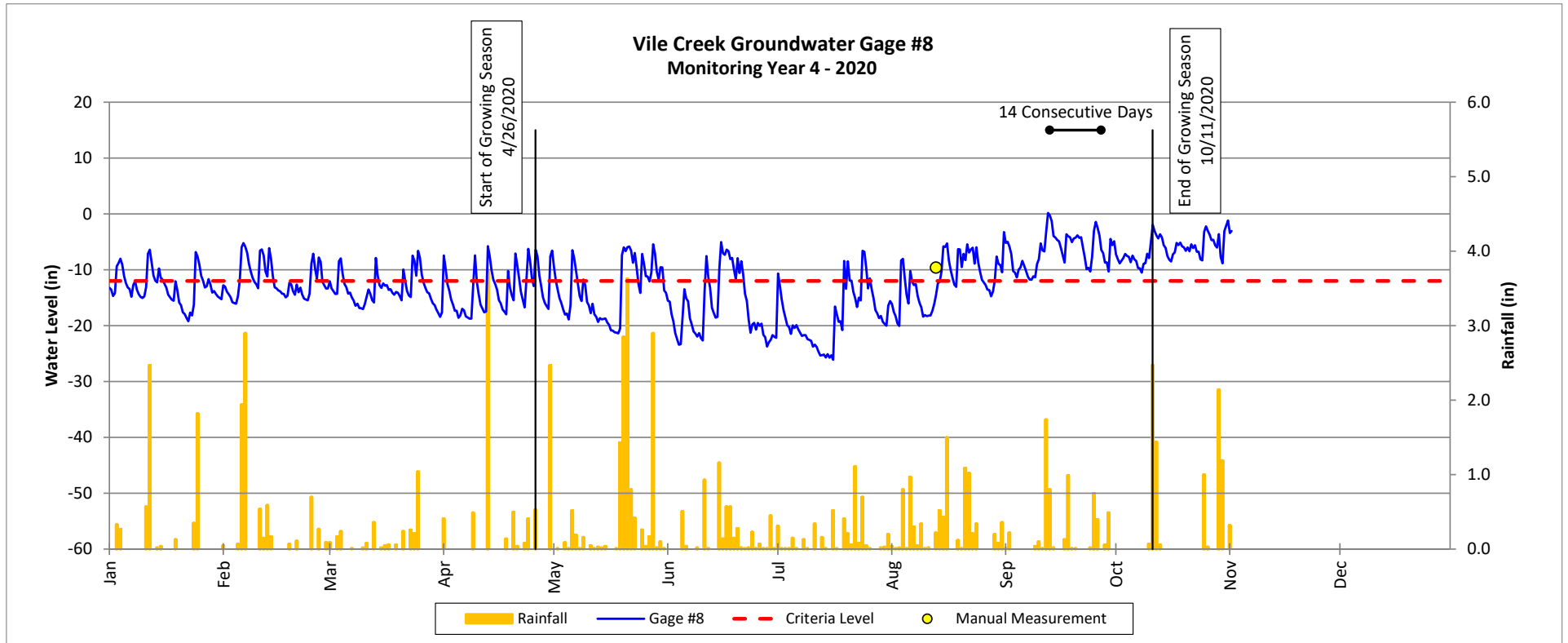
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Re-establishment



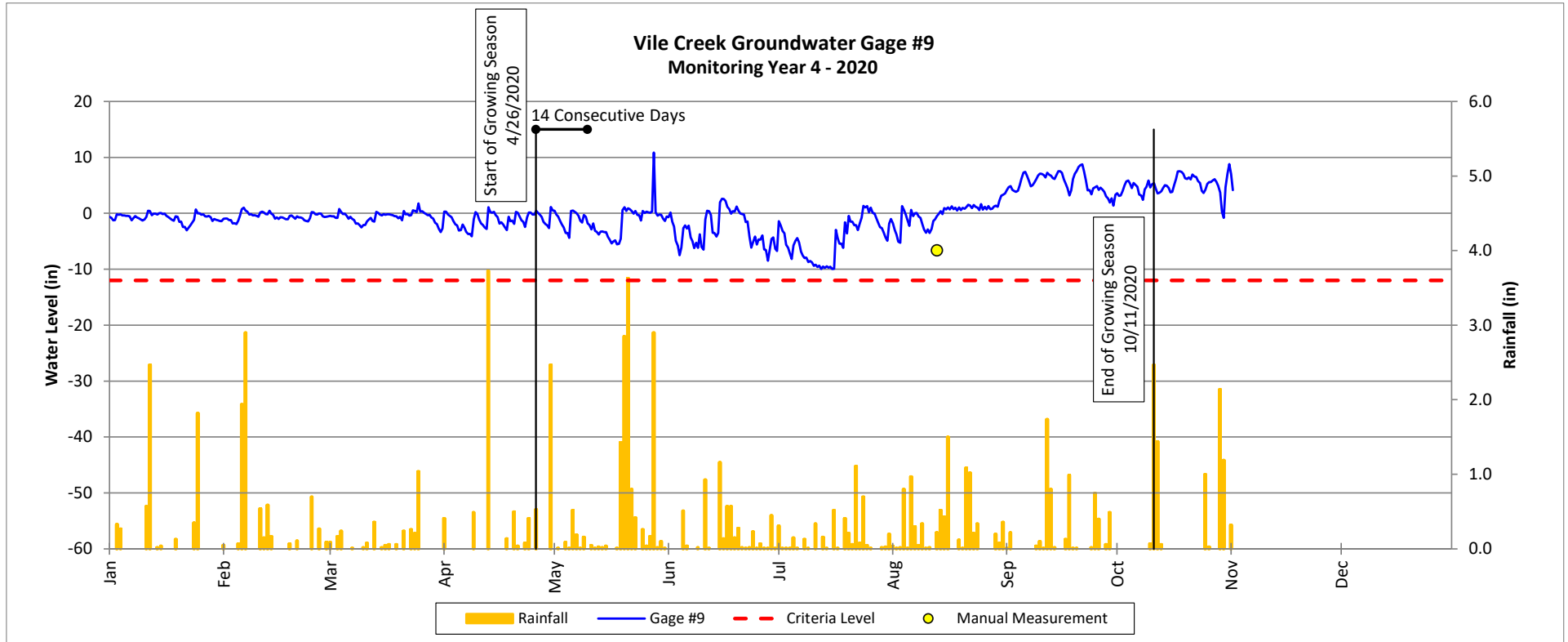
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Re-establishment



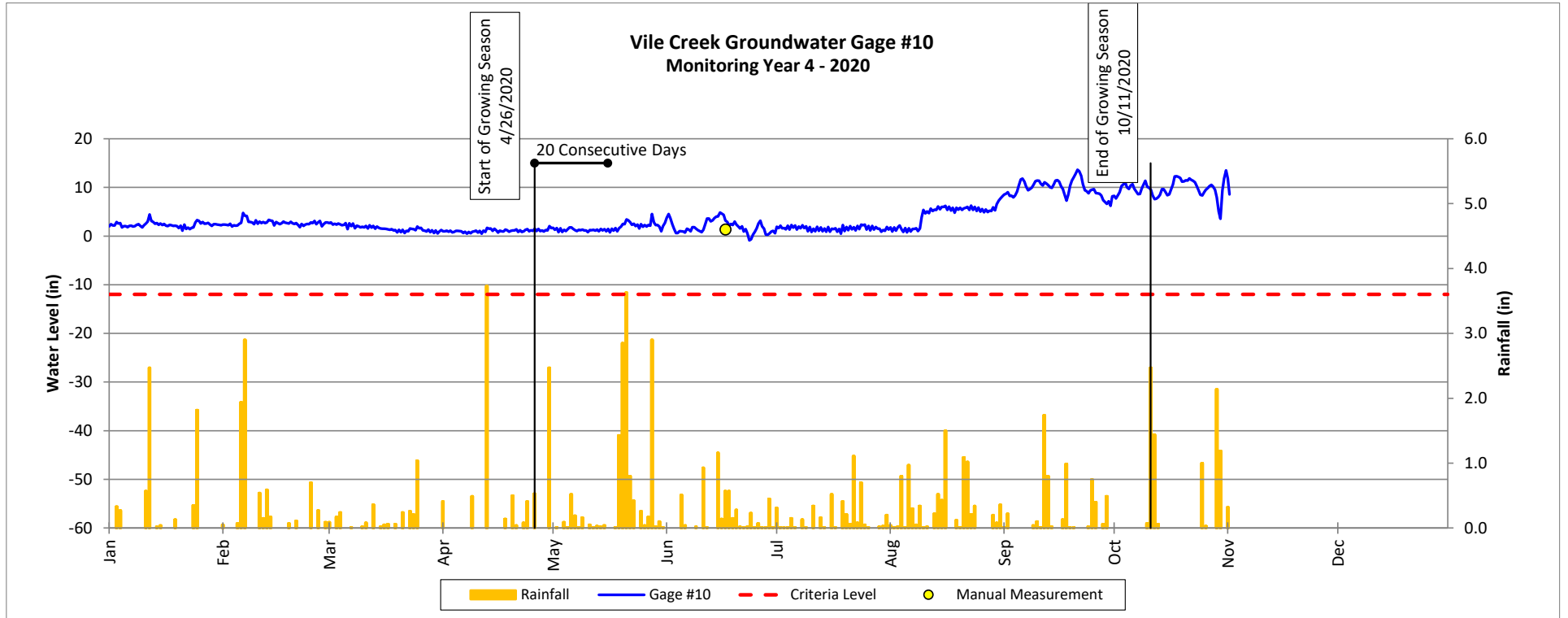
Groundwater Gage Plots

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

Wetland Bog Rehabilitation

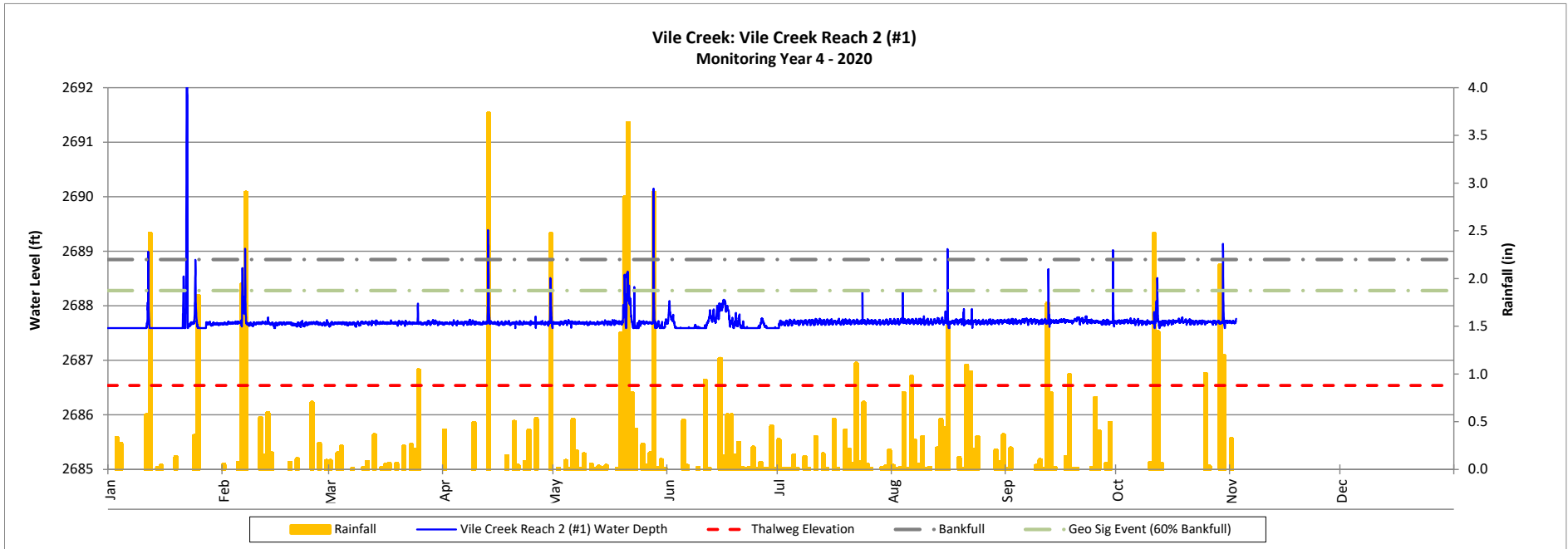


Recorded Geomorphic Significant Flow and Bankfull Events

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

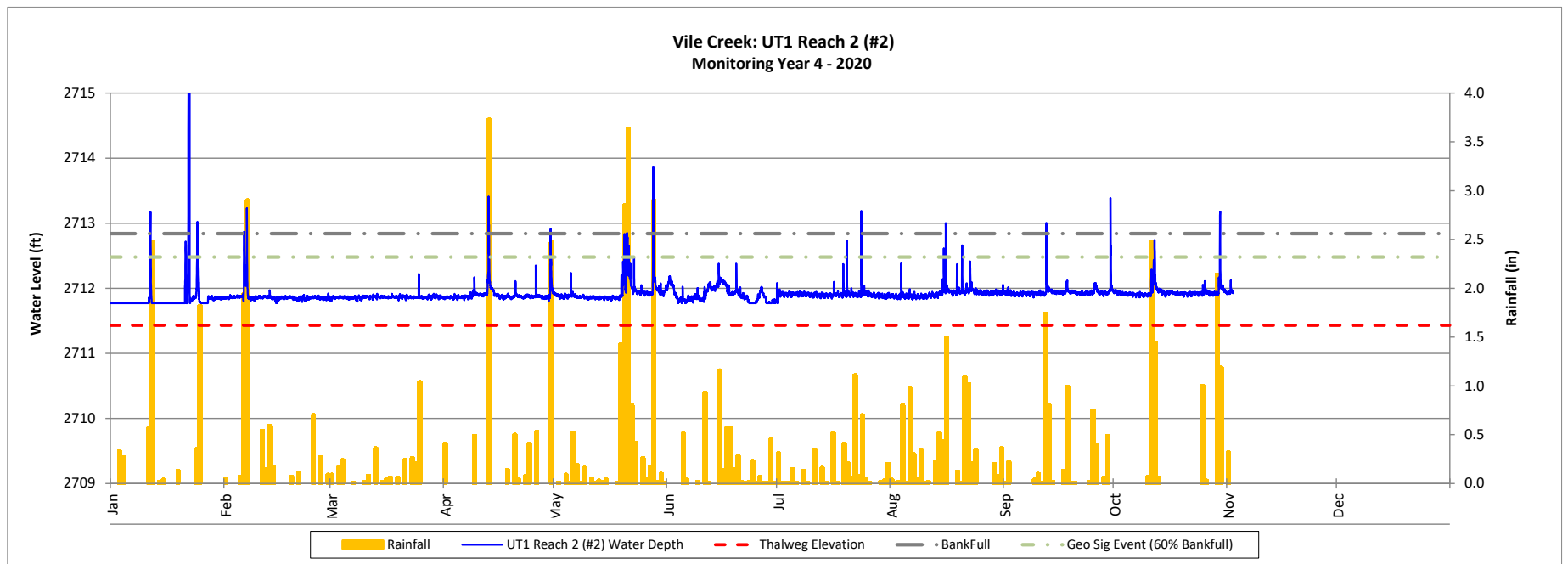


Recorded Geomorphic Significant Flow and Bankfull Events

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020

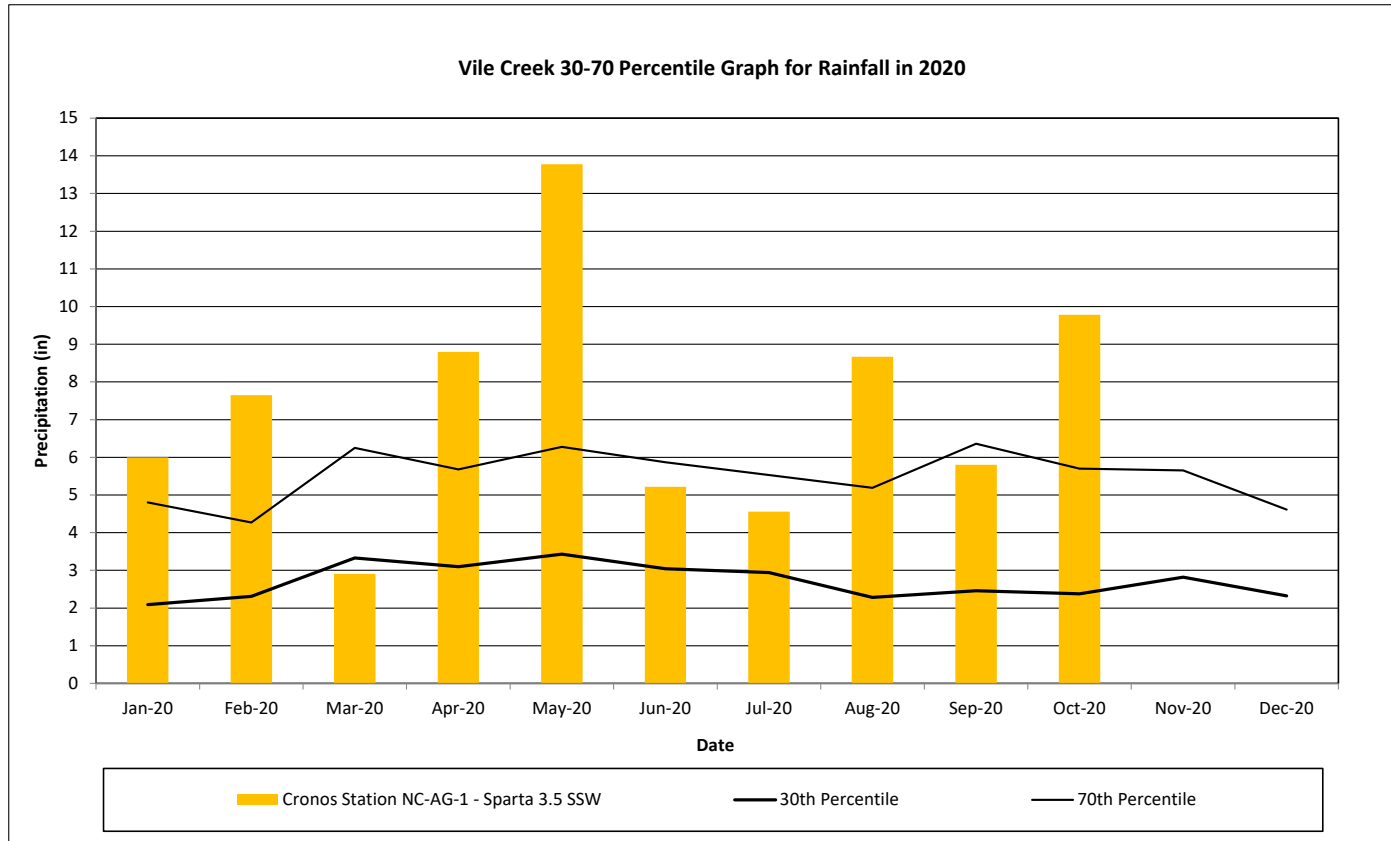


Monthly Rainfall Data

Vile Creek Mitigation Site

DMS Project No. 96582

Monitoring Year 4 - 2020



2020 rainfall collected by Cronos Station NC-AG-1 - Sparta 3.5 SSW

30th and 70th percentile rainfall data collected from Wets Station Sparta 3.5 SSW, NC (Years 1971 - 2020)