Mitigation Project Name	**Little Pine Creek III Stream and Wetland Restoration Site**	**County**	**Alleghany**	**USACE Action ID**	**2012-01299**
DMS ID	**94903**	**Date Project Instituted**	**5/30/2011**	**NCDWR Permit No**	**2014-0041**
River Basin	**New**	**Date Prepared**	**7/12/2018**		
Cataloging Unit	**05050001**				

Credit Release Milestone	Stream Credits						Wetland Credits							
	Scheduled Releases (Stream)	Warm	Cool	Cold	Anticipated Release Year (Stream)	Actual Release Date (Stream)	Scheduled Releases (Forested)	Riparian Riverine	Riparian Non-riverine	Non-riparian	Scheduled Releases (Coastal)	Coastal	Anticipated Release Year (Wetland)	Actual Release Date (Wetland)
Potential Credits (Mitigation Plan)				**7,016.700**					**1.390**					
Potential Credits (As-Built Survey)				**6,973.400**					**1.393**					
1 (Site Establishment)	**N/A**				N/A	N/A	**N/A**				**N/A**		N/A	N/A
2 (Year 0 / As-Built)	**30%**			2,092.020	2016	9/22/2016	**30%**		0.418		**30%**		2016	9/22/2016
3 (Year 1 Monitoring)	**10%**			697.340	2017	4/3/2017	**10%**		0.139		**10%**		2017	4/3/2017
4 (Year 2 Monitoring)	**8.90%**			620.540	2018	7/12/2018	**10%**		0.139		**15%**		2018	7/12/2018
4 (Year 2 Monitoring) - NOT RELEASED (Enh II)	**1.10%**			76.800	2018	Not Released								
5 (Year 3 Monitoring)	**10%**				2019		**10%**				**20%**		2019	
6 (Year 4 Monitoring)	**10%**				2020		**10%**				**10%**		2020	
7 (Year 5 Monitoring)	**15%**				2021		**10%**				**15%**		2021	
8 (Year 6 Monitoring)	**n/a**						**10%**				**N/A**		2022	
9 (Year 7 Monitoring)	**n/a**						**10%**				**N/A**		2023	
Stream Bankfull Standard	**15%**			1,046.010	2018	7/12/2018	**N/A**				**N/A**			
Total Credits Released to Date				**4,455.910**					**0.697**					

DEBITS (released credits only)

			Ratios	1	**2**	**2.51895**	5	1	3	2	5	1	3	2	5	1	3	2	5
				Stream Restoration	Stream Enhancement I	Stream Enhancement II	Stream Preservation	Riparian Restoration	Riparian Creation	Riparian Enhancement	Riparian Preservation	Nonriparian Restoration	Nonriparian Creation	Nonriparian Enhancement	Nonriparian Preservation	Coastal Marsh Restoration	Coastal Marsh Creation	Coastal Marsh Enhancement	Coastal Marsh Preservation
As-Built Amounts (feet and acres)				**3,221.000**	**4,474.000**	**2,193.000**	**3,224.000**			**2.710**	**0.190**								
As-Built Amounts (mitigation credits)				**3,221.000**	**2,237.000**	**870.600**	**644.800**			**1.355**	**0.038**								
Percentage Released (approximately)				**65.00%**	**65.00%**	**56.18%**	**65.00%**			**50.00%**	**50.00%**								
Released Amounts (feet / acres)				**2,093.650**	**2,908.100**	**1,232.027**	**2,095.600**			**1.355**	**0.095**								
Released Amounts (credits)				**2,093.650**	**1,454.050**	**489.090**	**419.120**			**0.678**	**0.019**								
NCDWR Permit	USACE Action ID	Project Name																	
1997-0616	1997-07161	NCDOT TIP R-0529BA / BB / BD		159.000															
	2014-00636	SR 1595 - Bridge 129 - Division 11		31.000															
	2014-00886	SR 1187 Improvements - Division 11		25.000															
	2014-01188	SR 1393 Improvements - Division 11		260.000															
2014-1204	2014-02340	SR 1331B Improvements - Division 11		98.000															
	2014-02058	SR 1339 Improvements - Division 11		250.000															
2014-0762	2012-00882	NCDOT TIP R-2915A - US 221 Widening		143.300	1,342.200	657.900	967.200			0.810	0.050								
2014-0762	2012-00882	NCDOT TIP R-2915A - US 221 Widening		322.100	447.400	219.300	322.400			0.274									
Remaining Amounts (feet / acres)				**805.250**	**1,118.500**	**354.827**	**806.000**			**0.271**	**0.045**								
Remaining Amounts (credits)				**805.250**	**559.250**	**140.863**	**161.200**			**0.136**	**0.009**								

Contingencies (if any): None

Signature of Wilmington District Official Approving Credit Release

9/20/18

Date

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

1) Approval of the 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) Reciept of necessary DA permit authorization or written DA approval for porjects where DA permit issuance is not required

3 - A 15% reserve of credits is to be held back until the bankfull event performance standard has been met

MONITORING YEAR 3 ANNUAL REPORT

Final

LITTLE PINE III STREAM AND WETLAND RESTORATION PROJECT

Alleghany County, NC
DEQ Contract 6844
DMS Project Number 94903
DWR # 14-0041
USACE Action ID 2012-01299

Data Collection Period: April - November 2018
Submission Date: December 12, 2018

PREPARED FOR:

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

PREPARED BY:

Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203
Phone: 704.332.7754
Fax: 704.332.3306

December 12, 2018

Mr. Harry Tsomides
Project Manager
Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

RE: Monitoring Year 3 (MY3) Report – Draft Submittal
Little Pine Creek III Mitigation Site
DMS ID 94903
DEQ Contract Number 6844
New River Basin - #CU# 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 3 report for the Little Pine Creek III Mitigation Project. The following Wildlands responses to DMS's report comments are noted in italics lettering.

DMS comment; Section 1.2.1 – It is indicated that a large storm event (Florence) occurred in the middle of the MY03 vegetation assessment. Can you clarify if and which of the veg plot counts were done before versus after the storm.

Wildlands response; The counts for the following nine veg plots (VP) were completed before the large storm event (Florence): VP 1 - 4, VP 11, and VP 15 - 18. The remaining twelve veg plot counts occurred after the storm: VP 5 - 10, VP 12 - 14, and VP 19 - 21. To clarify this, text was added in Section 1.2.1 of the report.

DMS comment; Section 1.2.2 – Please note that two more repeat treatments will occur into 2019 to address remaining site invasive vegetation.

Wildlands response; Text was added to Section 1.2.2 to indicate that two more repeat treatments will occur in 2019 to address the remaining site invasive vegetation.

DMS comment; Section 1.2.4 – Please indicate the 192 linear footage you provided on 6/8/18 for the severely aggraded section of UT1, from the lower end of the culvert (200+36) to the sill of the A-vane to be (202+28).

Wildlands response; In Section 1.2.4, the stationing and linear footage details were added to describe the severely aggraded section of UT1.

DMS comment; Section 1.2.4 – Please indicate that the UT2/2A repairs are expected to occur in Spring 2019.

Wildlands response; In Section 1.2.4, the expected date of the UT2/2A repairs were added to the report text.

DMS comment; Table 1 – Wetland credits should calculate out to 1.393, not 1.400. Stream credits should only be reported to the nearest tenth, not thousandth of an SMU.

Wildlands response; In Table 1, the wetland credits were corrected to a total of 1.393 WMUs. Stream credits were corrected to be reported to the nearest tenth of an SMU.

DMS comment; Table 2 – Correct typos "Vegetaion".

Wildlands response; These typos were corrected in Table 2.

DMS comment; Table 6 - Please indicate if the visual assessment tables were updated to include the Fall 2018 storm events, or were completed prior.

Wildlands response; Yes, the visual assessment tables (Tables 6a-g) were updated to include the Fall 2018 storm events.

Four (4) hard copies of the Final Monitoring Report and a full electronic submittal has been mailed to the DMS western field office. Please contact me at 704-332-7754 x110 if you have any questions.

Sincerely,

Kirsten Y. Gimbert

Kirsten Y. Gimbert
Project Manager
kgimbert@wildlandseng.com

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) completed design and construction management for the North Carolina Division of Mitigation Services (DMS) as part of a design-bid-build contract at the Little Pine III Stream and Wetland Restoration Project (Site). The Site is in Alleghany County approximately eight miles east of the Town of Sparta, NC and approximately four miles south of the Virginia border. The Site lies within the New River Basin; eight-digit Cataloging Unit (CU) 05050001 and the 14-digit Hydrologic Unit Code (HUC) 05050001030030 (Figure 1). Site streams consist of Little Pine Creek, a third order stream, as well as an unnamed second order tributary to Little Pine Creek (UT2), an unnamed first order tributary to Little Pine Creek (UT2a), four unnamed zero order tributaries to Little Pine Creek (UT1, UT2b, UT3, and UT4), and 2.9 acres of wetlands (Figure 2). The project design and construction restored, enhanced, and preserved a total of 13,112 linear feet (LF) of perennial and intermittent stream, and enhanced and preserved 2.9 acres of wetlands. The Site is expected to generate 6,973 stream mitigation units (SMUs), and 1.40 wetland mitigation units (WMUs) for the New River Basin (Table 1).

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 Little River & Brush Creek Local Watershed Plan (LWP). The project goals from the mitigation plan (Wildlands, 2014) were established with careful consideration of RBRP goals and objectives to address stressors identified in the LWP. The established project goals include:

- Restore unforested buffers;
- Remove livestock from buffers;
- Remove livestock from streams;
- Repair heavily eroded stream banks and improve stream bank stability;
- Reforest steep landscape around streams; and
- Enhance wetland vegetation.

Site construction and as-built survey were completed in 2016 with planting and baseline monitoring activities occurring between December 2015 and May 2016. The monitoring year (MY) 1 monitoring activities were completed in October 2016. The monitoring year 2 activities occurred in April through December 2017. The monitoring year 3 activities occurred in April through November 2018.

Overall, the Site is on track to meet the MY5 monitoring success criteria for vegetation, geomorphology, and hydrology performance standards. A repair design is underway to address areas of stream instability along UT2a and UT2, including the formation of head-cuts, lateral stream migration, and excessive streambank erosion that were amplified by the large storm events in September and October 2018. The vegetation survey resulted in an average of 486 planted stems per acre, which meets the interim MY3 monitoring requirement of 320 stems per acre with 20 of the 21 plots (95%) individually meeting this requirement. The observed vegetation areas of invasive plant populations in the upstream riparian portions of UT2 Reach 1 and Reach 2 have been significantly reduced by supplemental treatment that occurred in summer 2018. Morphological surveys and visual assessment indicate that the channel dimensions are stable and functioning as designed, except for isolated areas on UT2, UT2a and Little Pine Creek Reach 2b. At least one bankfull event occurred during MY3 data collection which was recorded by crest gages and by visual indicators. The performance standard of two recorded bankfull events in separate monitoring years has been met for Little Pine Creek, UT2, and UT2b. No target performance standard was established for wetland hydrology success; however, the groundwater gage in Wetland FF recorded 169 consecutive days of the groundwater levels at or within 12 inches of the ground surface, consisting of 100% of the growing season.

LITTLE PINE III STREAM AND WETLAND RESTORATION PROJECT

Monitoring Year 3 Report

TABLE OF CONTENTS

APPENDICES

Section 1: PROJECT OVERVIEW

The Site is a DMS design-bid-build project in Alleghany County, NC, located in the New River Basin; eight-digit Cataloging Unit (CU) 05050001 and the 14-digit Hydrologic Unit Code (HUC) 05050001030030 (Figure 1). Located in the Blue Ridge belt of the Blue Ridge province (USGS, 1998), the project watershed includes primarily managed herbaceous, mixed upland hardwoods, and other forested land. The drainage area for the Site is 2,784 acres. Little Pine Creek flows into Brush Creek several hundred feet downstream of the Site boundary. The land adjacent to the streams and wetlands is primarily maintained cattle pasture and forest.

The project streams consist of Little Pine Creek, a third order stream, as well as an unnamed second order tributary to Little Pine Creek (UT2), an unnamed first order tributary to Little Pine Creek (UT2a) and four unnamed zero order tributaries to Little Pine Creek (UT1, UT2b, UT3, and UT4) (Figure 2). Mitigation work within the Site included restoring and enhancing 9,888 linear feet (LF) and preserving 3,224 LF of perennial stream, enhancing 2.71 acres of wetlands and preserving a 0.19 acres existing wetland. The Site is expected to provide 6,973 SMUs, and 1.40 WMUs.

A conservation easement protecting 57.3 acres in perpetuity was purchased by the State of North Carolina and recorded with Alleghany County Register of Deeds in 2012. The final mitigation plan was submitted and accepted by DMS in March 2014. Construction activities were completed in September 2015 by North State Environmental, Inc. Planting was completed in December 2015 by Bruton Environmental, Inc. Kee Surveying, Inc. completed the as-built survey in April 2016. Wildlands completed the baseline monitoring activities in May 2016, and MY1 activities in October 2016. Repairs were completed in March and December 2016. Appendix 1 includes detailed project activity, history, contact information, and background information. Directions and a map of the Site are provided in Figure 1. Site components are discussed in Table 1 and illustrated in Figure 2.

1.1 Project Goals and Objectives

Prior to construction activities, livestock had full access to most of the Site streams and used them as a water source. The riparian buffers in areas proposed for restoration were primarily herbaceous with a few sparse trees. Deposition of fine sediment, severe bank erosion, and trampling of banks impacted the in-stream habitat. Channel widening and incision indicated instability. Table 4 in Appendix 1 and Table 11 in Appendix 4 provide pre-restoration condition details.

The Site is intended to provide numerous ecological benefits within the New River Basin. While many of these benefits are limited to the Site 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 secondary goals and objectives. These project goals were established with careful consideration of goals and objectives that were described in the RBRP and to address stressors identified in the LWP.

The project specific goals of the Site address stressors identified in the LWP and include the following:

- Restore unforested buffers;
- Remove livestock from buffers;
- Remove livestock from streams;
- Repair heavily eroded stream banks and improve stream bank stability;
- Reforest steep landscape around streams; and
- Enhance wetland vegetation.

Secondary goals include the following:

- Remove harmful nutrients from creek flow;
- Reduce pollution of creek by excess sediment;
- Improve in-stream habitat; and
- Improve aesthetics.

The project objectives have been defined as follows:

- Restore 26.3 acres of forested riparian buffer;
- Fence off livestock from 57.3 acres of buffer and 14,736 LF of existing streams;
- Stream bank erosion which contributes sediment load to the creek will be greatly reduced, if not eliminated, in the project area. Eroding stream banks will be stabilized by increased woody root mass in banks, reducing channel incision, and by using natural channel design techniques, grading, and planting to reduce bank angles and bank height;
- Steep, unforested landscape within the conservation easement will be reforested;
- Eight of the nine onsite wetlands will be enhanced with supplemental plantings;
- Flood flows will be filtered through restored floodplain areas, where flood flow will spread through native vegetation. Vegetation takes up excess nutrients;
- Storm flow containing grit and fine sediment will be filtered through restored floodplain areas, where flow will spread through native vegetation. The spreading of flood flows will reduce velocity allowing sediment to settle out;
- In-stream structures will promote aeration of water;
- In-stream structures will be constructed to improve habitat diversity and trap detritus. Wood structures will be incorporated into the stream as part of the restoration design. Such structures may include log drops and rock structures that incorporate woody debris; and
- Site aesthetics will be enhanced by planting native plant species, treating invasive species, and stabilizing eroding and unstable areas throughout the project.

1.2 Monitoring Year 3 Data Assessment

Annual monitoring was conducted during MY3 (April to October 2018) to assess the condition of the project. The stream restoration success criteria for the Site follows the approved performance standards presented in the Little Pine III Stream & Wetland Restoration Project Final Mitigation Plan (Wildlands, 2014).

1.2.1 Vegetation Assessment

A total of 21 vegetation monitoring plots were established during baseline monitoring within the project easement areas using a standard 10 by 10 meter plot. Please refer to Figures 3.0-3.2 in Appendix 2 for the vegetation monitoring locations. The final vegetation success criterion is the survival of 260 planted stems per acre in the riparian corridor along restored and enhanced reaches at the end of year five of the monitoring period. The interim measure of vegetation success for the Site is the survival of at least 320 planted stems per acre at the end of year three of the monitoring period.

The MY3 vegetation survey was completed in September 2018, resulting in an average planted stem density of 486 stems per acre. The Site has met the MY3 interim requirement of 320 stems per acre, with 20 of the 21 plots (95%) individually meeting this requirement. The planted stem mortality was approximately 1% of the MY2 stem count (493 stems per acre). There is an average of 12 planted stems per plot.

In the middle of the MY3 vegetation assessment a large storm event occurred in September 2018. The counts for the following nine vegetation plots (VP) were completed before the large storm event: VP 1 - 4, VP 11, and VP 15 - 18. The remaining twelve vegetation plot counts occurred after the storm event:

VP 5 - 10, VP 12 - 14, and VP 19 - 21. Sediment accumulation was observed on much of the floodplain of Little Pine Creek along with debris rack lines bending over many planted stems. Other sources of low vigor include competition with dense herbaceous vegetation and animal herbivory. Approximately 11% of the remaining planted stems scored a vigor of 1, indicating that they are unlikely to survive. In addition, approximately 34% of the remaining planted stems scored a vigor of 2, indicating more than minor damage to leaf material and/or bark tissue exists. Please refer to Appendix 2 for vegetation plot photographs and Appendix 3 for vegetation data tables.

1.2.2 Vegetation Areas of Concern

Some invasive plant populations were identified within the Site boundary in MY3 with predominant species including: European barberry (*Berberis vulgaris*), multiflora rose (*Rosa multiflora*), Chinese privet (*Ligustrum sinense*), and oriental bittersweet (*Celastrus orbiculatus*). Areas of invasive species that had been identified in MY2/early MY3 have been reduced by supplementary treatment that occurred in Summer 2018. Two more repeat treatments will occur in 2019 to address the Site's remaining invasive species.

Two large storm events occurred in September and October 2018. Visual assessment after these storm events revealed significant areas of fine sediment accumulation on the floodplain of Little Pine Creek. Many planted stems were observed to be bent over and herbaceous cover buried by the sandy sediment deposited on the floodplain. These vegetation areas of concern will continue to be monitored and addressed by DMS. Please refer to Figure 3 in Appendix 2 for vegetation areas of concern.

1.2.3 Stream Assessment

Morphological surveys for MY3 were conducted in June 2018, before the significant storm events of September and October 2018. Overall, results indicate that the channel dimensions are stable and functioning as designed, with the exception of stream areas of concern identified section 1.2.4.

In general, the cross-sections on Little Pine Creek, UT2, and UT2b show little to no change in the bankfull width, maximum depth ratio, or width-to-depth ratio compared to baseline. Surveyed riffle cross-sections fell within the parameters defined for channels of the appropriate Rosgen stream type (Rosgen, 1996). While cross-section 10 on UT2b and cross-sections 15 and 16 on UT2 vary significantly from baseline conditions, their dimensions remain stable in MY3. In MY1, pool cross-section 10 deepened considerably however this is not considered detrimental to either the stability of the channel or the project goals. Cross-section 10 plots show little change between MY2 and MY3, indicating that the deepening displayed in MY1 has stabilized. In MY1, pool cross-section 15 filled in partially with sediment causing a decreased depth and cross-sectional area, however dimensions remain stable between MY2 and MY3. Between MY0 and MY1, the channel thalweg shifted laterally due to channel erosion within the vicinity of riffle cross-section 16. In December 2016, repairs to the Site included bank repairs and installing new riffle materials at riffle cross-section 16. At the time of survey (June 2018), the channel appeared to be stable and in good condition with cross-section 16 dimensions similar to the baseline.

The surveyed longitudinal profile data for the project streams illustrates that bedform features are maintaining lateral and vertical stability between MY2 and MY3, except for isolated areas on UT2 discussed below. The longitudinal profile parameters on Little Pine Creek, UT2, and UT2b showed little change from baseline in slope (riffle, water surface, bankfull) with minor differences in pool-to-pool spacing and pool length. Max pool depths increased in most reaches due to scour from log structures, which enhances aquatic habitat. The overall pattern of all project streams remained the same compared to the baseline data. Several instances of structure piping and sediment deposition were noted during the MY3 survey and are discussed in section 1.2.4.

In general, substrate counts in the restoration reaches indicated maintenance of coarser materials in the riffle reaches and finer particles in the pools. The particle size distributions for MY3 are similar to the as-built data in coarseness and distribution. Refer to Appendix 2 for the visual stability assessment table, Current Condition Plan View (CCPV) maps, and reference photographs. Refer to Appendix 4 for the morphological summary data and plots.

1.2.4 Stream Areas of Concern

Stream areas of concern included instances of structure piping, bank scour, sediment deposition, and clogged culverts at internal easement crossings. On Little Pine Creek, stream areas of concern noted in MY2 persist into MY3 with new or expanded isolated areas of bank scour (STA 100+80, 121+50, 131+20, 131+60, and 132+50) observed after the storm events of fall 2018. Large established trees are undermined by bank scour along the enhancement II section of Little Pine Creek Reach 2b.

Along UT1, several headcuts have formed as the channel slope increases above the culvert crossing. In MY2, sediment aggradation was observed on approximately 192 linear feet of UT1 downstream of the culvert crossing (STA 200+36) and beyond the two installed boulder sills (STA 202+28). Adaptive management was performed in March 2018 along UT1 to improve stream function. In future years, as woody vegetation becomes more established and shades out the herbaceous cover, the baseflow is expected to become stronger and transport the accumulated fine sediment in the reach. Currently, a defined baseflow channel is still present and this area will continue to be monitored for additional sediment aggradation in future years.

Structure piping that was noted on UT2 Reach 1 Upper in MY2 persists into MY3 with an additional structure failure at approximately STA 309+60. Furthermore, sediment deposition is noted above both of the culvert crossings on UT2 Reach 1 (Upper and Lower). On UT2 Reach 2, new areas of bank instability (STA 334+50, 335+50, 336+00) and additional headcuts (STA 331+90 and 336+30) were observed in MY3 after the significant rainfall events of fall 2018. These rainfall events also caused significant aggradation at the bottom of UT2 Reach 2, thus directing sheet flow through the left floodplain above the culvert crossing.

Localized bank erosion is still apparent along UT2a (STA 427+80, 431+00) along the right outer bends of the channel. Just upstream of the confluence with UT2, UT2a continues to exhibit an area of high instability with vertical eroding right bank at the channel bend (STA 431+50). The sections of eroding banks on UT2a and UT2 are in enhancement I and enhancement II reaches, in areas where no bank work was performed. DMS has a repair design underway to address areas of stream instability along UT2a and UT2, including the formation of head-cuts, lateral stream migration, and excessive streambank erosion and are expected to occur in Spring 2019. These stream areas of concern are indicated in Table 6 and on Figure 3 in Appendix 2.

1.2.5 Hydrology Assessment

At least one bankfull event occurred on Little Pine, UT2, and UT2b reaches during the MY3 data collection, which was recorded by crest gages and by visual indicators. Two bankfull flow events occurring in separate years must be documented on the restoration reaches within the five year monitoring period. Therefore, the performance standard has been met in MY3 for all project reaches. Refer to Appendix 5 for hydrologic data and graphs.

1.2.6 Wetland Assessment

One groundwater monitoring gage (GWG 1) was established during the baseline monitoring within the Wetland FF area using logging hydrology pressure transducers. The gage was installed at an appropriate location so that the data collected will provide an indication of groundwater levels throughout the wetland enhancement area. No target performance standard for wetland hydrology success was

established within the mitigation plan (2014). Wetland hydrology attainment typically consists of recorded groundwater levels within 12 inches of the ground surface for a consecutive period consisting of a pre-defined percentage of the growing season. Under typical precipitation conditions, Alleghany County's growing season extends 169 days from April 26th to October 11th. No onsite rainfall data is available; however, daily precipitation data for MY3 was collected from closest NC CRONOS Station, Sparta 3.5 SSW. GWG 1 recorded 169 consecutive days of the groundwater levels at or within 12 inches of the ground surface, consisting of 100% of the growing season. The climate data from nearby NC CRONOS station suggests that the Site received more than typical amounts of rain in 2018. The monthly rainfall in April, May, August, September, and October exceeded the 70th percentile for the area (USDA, 2018). The rainfall totals were approximately 14 inches in September and 11 inches in October which is over double the 70th percentile for those respective months. Please refer to Appendix 2 for the groundwater gage location and Appendix 5 for groundwater hydrology data and plots.

1.3 Monitoring Year 3 Summary

Overall, the Site is on track to meet the MY5 monitoring success criteria for vegetation, geomorphology, and hydrology performance standards. A repair design is underway to address areas of stream instability along UT2a and UT2, including the formation of head-cuts, lateral stream migration, and excessive streambank erosion that were amplified by the large storm events in September and October 2018. The vegetation survey resulted in an average of 486 planted stems per acre, which meets the interim MY3 monitoring requirement of 320 stems per acre with 20 of the 21 plots (95%) individually meeting this requirement. The observed vegetation areas of invasive plant populations in the upstream riparian portions of UT2 Reach 1 and Reach 2 have been significantly reduced by supplemental treatment that occurred in summer 2018. Morphological surveys and visual assessment indicate that the channel dimensions are stable and functioning as designed, except for isolated areas on UT2, UT2a and Little Pine Creek Reach 2b. At least one bankfull event occurred during MY3 data collection which was recorded by crest gages and by visual indicators. The performance standard of two recorded bankfull events in separate monitoring years has been met for Little Pine Creek, UT2, and UT2b. No target performance standard was established for wetland hydrology success; however, the groundwater gage in Wetland FF recorded 169 consecutive days of the groundwater levels at or within 12 inches of the ground surface, consisting of 100% of the growing season.

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 annual monitoring reports can be found in the mitigation plan documents available on DMS's website. All raw data supporting the tables and figures in the Appendices are available from DMS upon request.

Section 2: METHODOLOGY

Geomorphic data was collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). Longitudinal and cross-sectional data were collected using a total station and were georeferenced. All Current Condition Plan View mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using was Pathfinder and ArcView. Crest gages were installed in surveyed riffle cross-sections and monitored annually. Hydrology attainment installation and monitoring methods are in accordance with the standards published in the United States Army Corps of Engineers Stream Mitigation Guidelines (2003). Vegetation monitoring protocols followed the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2008).

Section 3: REFERENCES

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Lee, Michael T., Peet, Robert K., Steven D., Wentworth, Thomas R. 2008. CVS-EEP Protocol for Recording Vegetation Version 4.2. Retrieved from: http://cvs.bio.unc.edu/protocol/cvs-eep-protocol-v4.2-lev1-2.pdf

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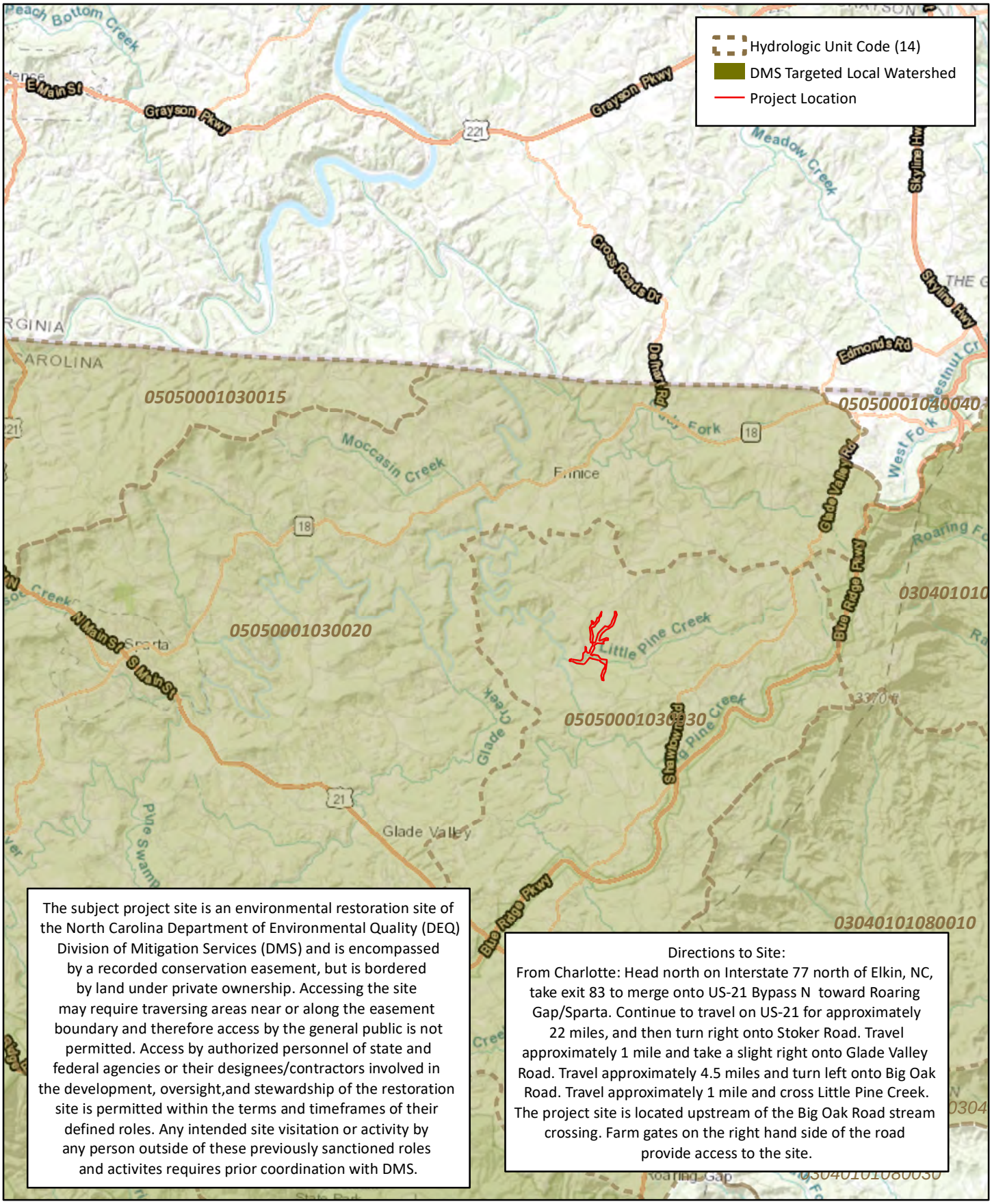
APPENDIX 1. General Tables and Figures

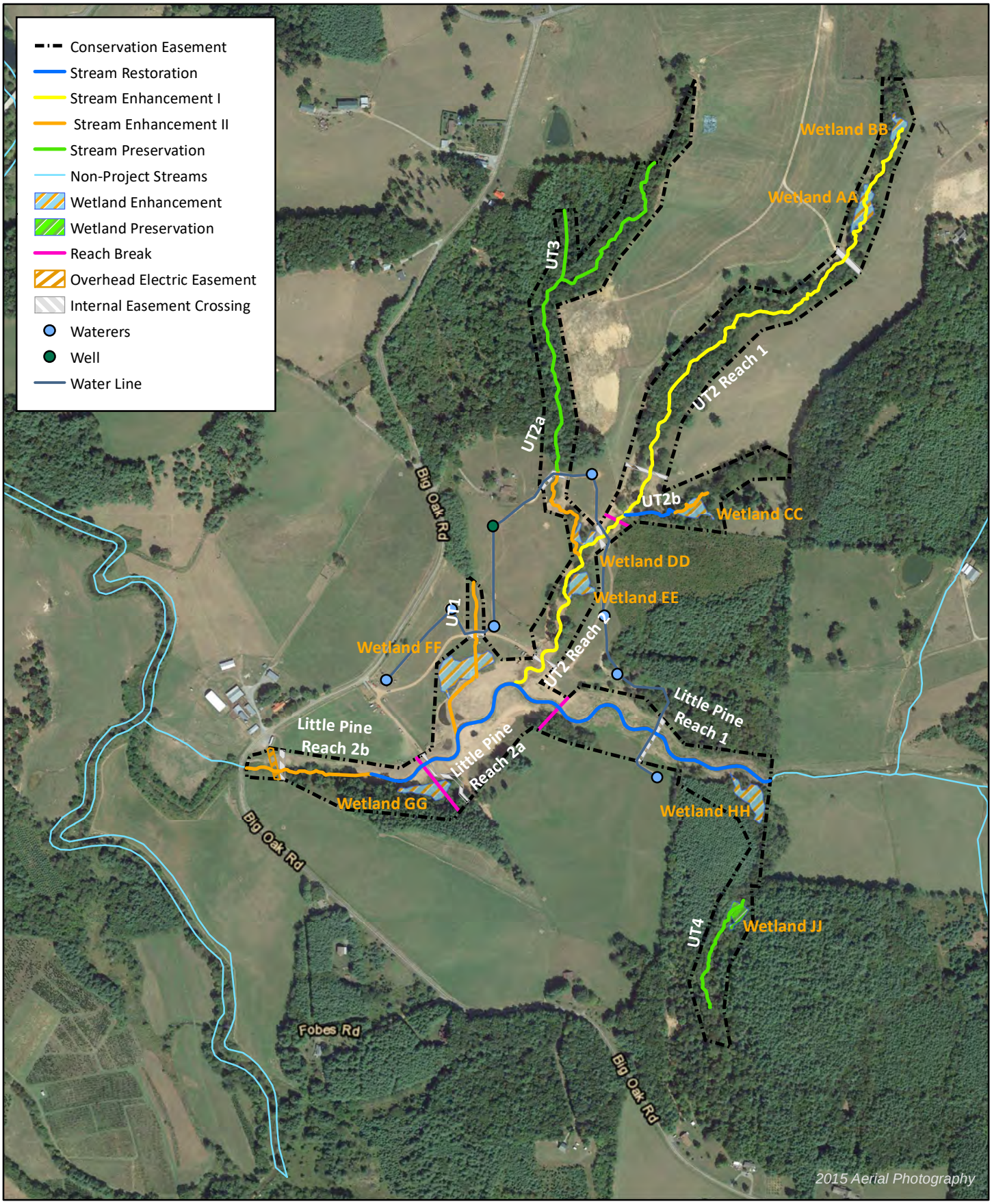


WILDLANDS ENGINEERING

0 0.5 1 Mile

Figure 1 Project Vicinity Map
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Alleghany County, NC



WILDLANDS ENGINEERING

0 700 Feet

N

Figure 2 Project Component/Asset Map
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Alleghany County, NC

Table 1. Project Components and Mitigation Credits
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Mitigation Credits									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	6,328.6	644.8	N/A	1.393	N/A	N/A	N/A	N/A	N/A

Project Components									
Reach ID	Existing Footage/ Acreage	Approach	Restoration (R) or Restoration Equivalent (RE)	As-Built Stationing/ Location	As-Built Footage/ Acreage	Restoration Footage/ Acreage[1]	Mitigation Ratio[2]	Credits[1] (SMU/WMU)	Notes[1]
STREAMS									
Little Pine Reach 1	4,016	P1/P2	Restoration (R)	100+00 to 114+44	1,444	1,417	1:1	1,417.0	Excludes one 27 foot wide ford crossing.
Little Pine Reach 2a		P1	Restoration (R)	114+44 to 125+27	1,083	1,058	1:1	1,058.0	Excludes one 25 foot wide ford crossing.
Little Pine Reach 2b		P1/P2	Restoration (R)	125+27 to 130+20	493	493	1:1	493.0	
		Planting, fencing	Enhancement II (R)	130+20 to 135+60	540	509	2.5:1	197.0	Excludes one 31 foot wide ford crossing, Includes 50% reduction for 33 ft overhead electric easement crossing.
UT1	540	Planting, fencing	Enhancement II (R)	197+26 to 202+24	498	463	2.5:1	185.2	Excludes one 35 foot wide culvert crossing.
		Planting, fencing, channel creation	Enhancement II (R)	202+24 to 206+26	402	402	2.5:1	160.8	
UT2 Reach 1	5,270	P1/P2/P4, preservation	Enhancement I (R)	297+18-343+18	4,600	4,474	2:1	2,237.0	Excludes four constructed culvert crossings; 32, 24, 32, and 38 feet wide respectively.
UT2 Reach 2									
UT2a	2,921	Planting, fencing	Enhancement II (R)[3]	401+78 to 403+34 & 403+75 to 404+34	215[3]	215[3]	n/a	n/a	Easement Break 403+34 - 403+75
		Preservation	Preservation (RE)	405+15 to 426+58	2,143	2,143	5:1	428.6	
		Planting, fencing	Enhancement II (R)	426+58 to 432+09	551	519	2.5:1	207.6	Excludes one 32 foot wide constructed culvert crossing.
UT2b	553	Planting, fencing	Enhancement II (R)	500+00 to 503+00	300	300	2.5:1	120.0	
		P2	Restoration (R)	503+00 to 505+53	253	253	1:1	253.0	
UT3	400	Preservation	Preservation (RE)	602+44 to 606+44	400	384	5:1	76.8	Excludes one 16 foot wide constructed ford crossing.
UT4	1,036	Preservation	Preservation (RE)	701+26 to 708+23	697	697	5:1	139.4	
WETLANDS									
Wetland AA	0.38	Planting, fencing	Enhancement (RE)	UT2 floodplain	0.38		2:1	0.190	
Wetland BB	0.16	Planting, fencing	Enhancement (RE)	UT2 floodplain	0.16		2:1	0.080	
Wetland CC	0.26	Grade control, planting, fencing	Enhancement (RE)	UT2b headwaters	0.26		2:1	0.130	
Wetland DD	0.12	Planting, fencing	Enhancement (RE)	North of UT2/UT2a	0.12		2:1	0.060	
Wetland EE	0.28	Planting fencing	Enhancement (RE)	UT2 floodplain	0.28		2:1	0.140	
Wetland FF	0.76	Outlet stabilization, planting, fencing	Enhancement (RE)	North of UT1/Little Pine	0.76		2:1	0.380	
Wetland GG	0.33	Planting fencing	Enhancement (RE)	Little Pine	0.33		2:1	0.165	
Wetland HH	0.42	Planting, grade control	Enhancement (RE)	South of UT4/ Little Pine	0.42		2:1	0.210	
Wetland JJ	0.19	Preservation	Preservation (RE)	UT4 floodplain	0.19		5:1	0.038	

Component Summation					
Restoration Level	Stream (LF)	Riparian Wetland (acres)	Non-Riparian Wetland	Buffer (square feet)	Upland (acres)
Restoration	3221				
Enhancement I	4474				
Enhancement II	2193				
Enhancement		2.71			
Preservation	3224	0.19			

[1]Restoration footage based off of the surveyed as-built thalweg alignment is greater than design centerline alignment, resulting in credited length greater than that reported in the Mitigation Plan.

[2]Unique ratio for UT2 was discussed in field with IRT members and recorded 8/15/2012 in meeting notes.

[3] Length not included in component summation since no credit is sought

Table 2. Project Activity and Reporting History

Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Activity or Report		Data Collection Complete	Completion or Scheduled Delivery
Mitigation Plan		March 2013	March 2014
Final Design - Construction Plans		N/A	September 2014
Construction		N/A	September 2015
Temporary S&E mix applied to entire project area[1]		N/A	July - September 2015
Permanent seed mix applied to reach/segments[1]		N/A	July - September 2015
Bare root and live stake plantings for reach/segments		N/A	December 2015
Repair Work		N/A	March 2016 / December 2016
Baseline Monitoring Document (Year 0)	Vegetation Survey	May 2016	July 2016
	Stream Survey	April 2016	
Year 1 Monitoring	Vegetation Survey	October 2016	December 2016
	Stream Survey	October 2016	
Year 2 Monitoring	Vegetation Survey	September 2017	November 2017
	Stream Survey	May 2017	
Year 3 Monitoring	Invasive Treatment	N/A	July 2018
	Vegetation Survey	September 2018	November 2018
	Stream Survey	June 2018	
Year 4 Monitoring	Vegetation Survey	2019	November 2019
	Stream Survey	2019	
Year 5 Monitoring	Vegetation Survey	2020	November 2020
	Stream Survey	2020	

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

Table 3. Project Contact Table

Little Pine III Stream & Wetland Restoration Project
DMS Project No.94903
Monitoring Year 3 - 2018

Designer Aaron Early, PE, CFM	**Wildlands Engineering, Inc.** 1430 South Mint Street, Ste 104 Charlotte, NC 28205 704.332.7754
Construction Contractor	**North State Environmental, Inc.** 2889 Lowery Street Winston-Salem, NC 27101
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**North State Environmental, Inc.** 2889 Lowery Street Winston-Salem, NC 27101
Seed Mix Sources	**Green Resource, LLC**
Nursery Stock Suppliers **Bare Roots** **Live Stakes** **Plugs**	 **Bruton Natural Systems, Inc** **Foggy Mountain Nursery** **Mellow Marsh Farms**
Monitoring Performers	**Wildlands Engineering, Inc.**
Monitoring, POC	Kirsten Gimbert 704.332.7754, ext. 110

Table 4. Project Information and Attributes
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Project Information	
Project Name	Little Pine Creek III Stream & Wetland Restoration
County	Alleghany County
Project Area (acres)	57.32
Project Coordinates (latitude and longitude)	36° 30′ 29.16′′ N, 81° 0′ 6.12′′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	05050001030030
DWR Sub-basin	05-07-03
Project Drainiage Area (acres)	2,784
Project Drainage Area Percentage of Impervious Area	<1%
CGIA Land Use Classification	Managed Herbaceous (74%), Mixed Upland Hardwoods (20%), Mixed Hardwoods/Conifers (5%), Southern Yellow Pine (<1%), Mountain Conifers (<1%)

Reach Summary Information

Parameters	LP Reach 1	LP Reach 2a	LP2 Reach b	UT1	UT2 Reach 1	UT2 Reach 2	UT2 Reach 3	UT2a	UT2b	UT3	UT4
Length of Reach (linear feet) - Post-Restoration[1]	1,444	1,083	1,033	900	4,600			2,909	553	400	697
Drainage Area (acres)	2,496	2,752	2,784	28	75	185	196	89	19	23	33
NCDWR Stream Identification Score - Pre-Restoration	45.5	45.5	45.5	22.25	36	36	41.5	42	28/37.5	38.5	31.5
NCDWR Water Quality Classification	C, Tr										
Morphological Desription (stream type) - Pre-Restoration	C4	C/E4	C4	N/A	A4	E4b	E4	C4b	F4b	N/A	N/A
Evolutionary Trend (Simon's Model) - Pre-Restoration	IV/V	III/IV	IV/V	N/A[2]	N/A[4]	N/A[4]	N/A[4]	V	N/A[4]	N/A[2]	N/A[2]
Underlying Mapped Soils	Alluvial land, wet (Nikwasi); Ashe stony fine sandy loam (25-45% slopes); Chester loam (10-25% slopes); Chester clay loam (25-45% slopes), eroded (Evard); Codorus complex (Arkaqua); Tate loam (6-10% slopes); Watauga loam (6-45% slopes).										
Drainage Class	Well-drained										
Soil Hydric Status	A/D (Nikwasi); B (Ashe stony fine sandy loam, Chester loam, Tate loam, Watauga loam); B/D (Codorus complex);										
Slope - Pre-Restoration	0.0043	0.0059	0.0087	N/A[2]	0.047	0.036	0.028	0.044	0.064	N/A[2]	N/A[2]
FEMA Classification	AE[3]										
Native Vegetation Community	Piedmont/Mountain Bottomland Forest, Rich Cove										
Percent Composition Exotic Invasive Vegetation -Post-Restoration	0%										

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# 14-0041
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	LPIII Categorical Exclusion (CE) Approved 7/6/2012
Historic Preservation Act	Yes	Yes	No historic resources were found to be impacted (letter from SHPO dated 5/3/2012)
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes[3]	No impact application was prepared for local review. No post-project activities required.	LPIII Final Mitigation Plan (3/4/2014) and LPIII CE Approved 7/6/2012
Essential Fisheries Habitat	Yes	Yes	LPIII Final Mitigation Plan (3/4/2014) and LPIII CE Approved 7/6/2012

1: Length includes internal easment crossings.
2: UT1 is enhancement II only, and UT3 and UT4 are preservation only. Geomorphic surveys were not performed for these streams in existing conditions.
3: The downstream 400 LF of Little Pine Creek near Big Oak Road is within a FEMA Zone AE floodplain on Firm panel 4010. The Zone AE floodplain is due to the backwater of Brush Creek; Little Pine Creek is not a FEMA studied stream.
4: Streams do not fit into Simon Evolutionary Sequence.

Table 5. Monitoring Component Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Parameter	Monitoring Feature	Quantity/ Length by Reach										Frequency
		Little Pine Reach 1	Little Pine Reach 2a	Little Pine Reach 2b	UT1	UT2	UT2a	UT2b	UT3	UT4	Wetlands	
	Riffle Cross Section	2	2	2	N/A	4	N/A	1	N/A	N/A	N/A	Annual
	Pool Cross Section	1	1.000	1	N/A	3	N/A	1	N/A	N/A	N/A	
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Profile	Longitudinal Profile	Y			N/A	Y	N/A	Y	N/A	N/A	N/A	N/A
Substrate	Reach Wide (RW) / Riffle (RF) 100 Pebble Count	RW-1, RF-1	RW-1, RF-1	RW-1, RF-1	N/A	RW-1, RF-3	N/A	RW-1, RF-1	N/A	N/A	N/A	N/A
Stream Hydrology	Crest Gage	1			N/A	1	N/A	1	N/A	N/A	N/A	Annual
Wetland Hydrology	Groundwater Gages	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1	Annual
Vegetation[1]	CVS Level 2	21										Annual
Visual Assessment	All Streams	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y	Annual
Exotic and nuisance vegetation												
Project Boundary												
Reference Photos	Photographs	42										Annual

[1]A deviation from the vegetation plot quantity indicated in the Mitigation Plan is due to a smaller than expected planted area.

APPENDIX 2. Visual Assessment Data

Conservation Easement
Overhead Electric Easement
Internal Easement Crossing
Waterers
Well
Water Line
Stream Restoration
Stream Enhancement I
Stream Enhancement II
Stream Preservation
Non-Project Stream
Wetland Enhancement
Wetland Preservation
Reach Break
Barotroll
Crest Gage (CG)
Groundwater Gage (GWG)
Photo Point
Cross-Section (XS)

Vegetation Monitoring Plot - MY3

Criteria Met
Criteria Not Met

Stream Areas of Concern - MY3

Bank instability
Sediment deposition
Structure piping
Headcuts

Vegetation Areas of Concern - MY3

Bare/Poor Herbaceous Cover
Invasive Plant Population

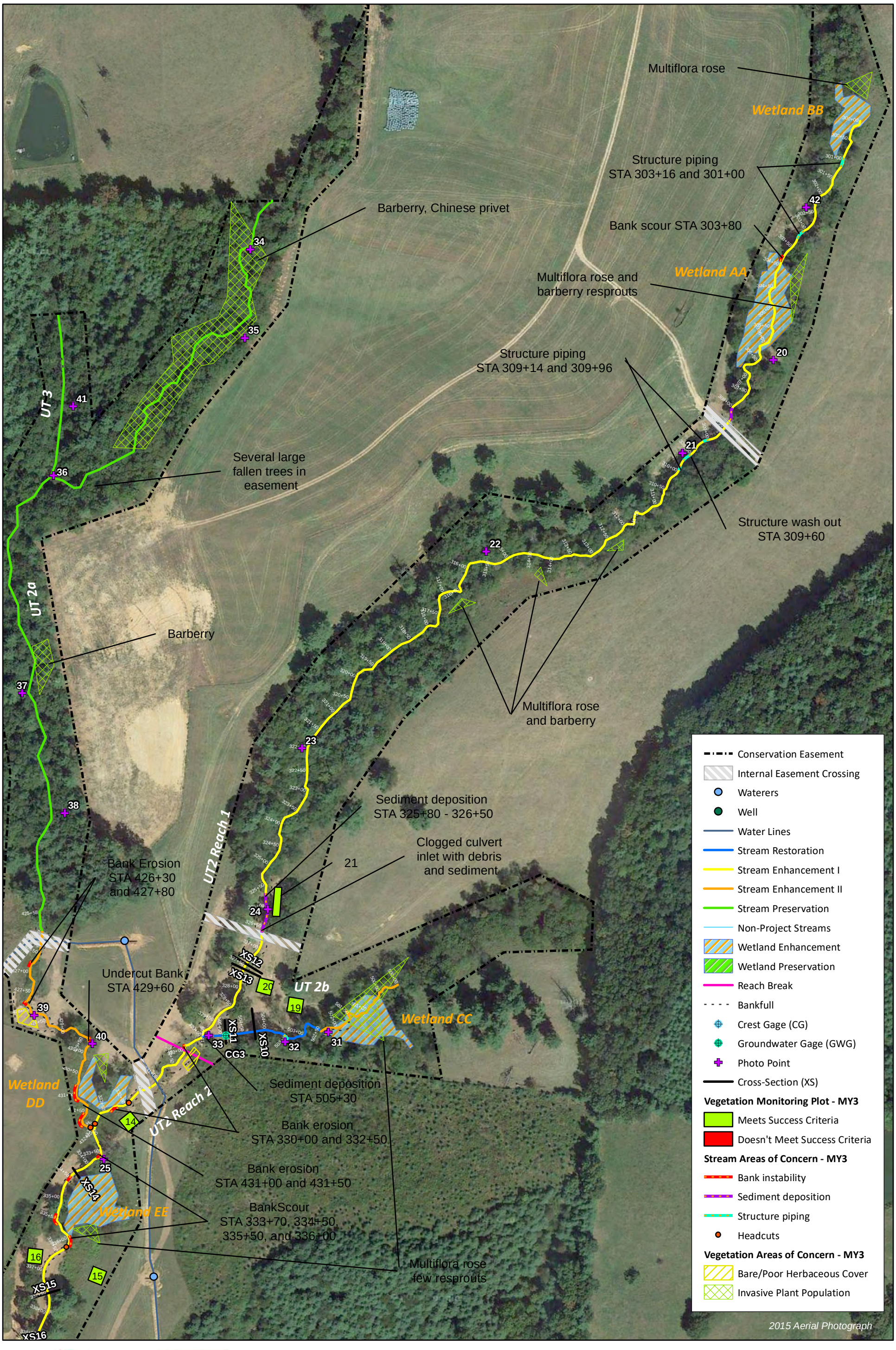
Barrett Rd
Sheet 1
Wetland BB
Wetland AA
UT 3
UT 2a
UT2 Reach 1
Big Oak Rd
Wetland DD
UT 2b
Wetland CC
Sheet 2
UT 1
UT2 Reach 2
Wetland EE
Barotroll
GWG
Wetland FF
Little Pine Creek Reach 2a
Little Pine Creek Reach 1
Little Pine Creek Reach 2b
Wetland GG
Wetland HH
UT 4
Wetland JJ
Big Oak Rd
Fobes Rd
2015 Aerial Photograph

WILDLANDS ENGINEERING

0 200 400 Feet

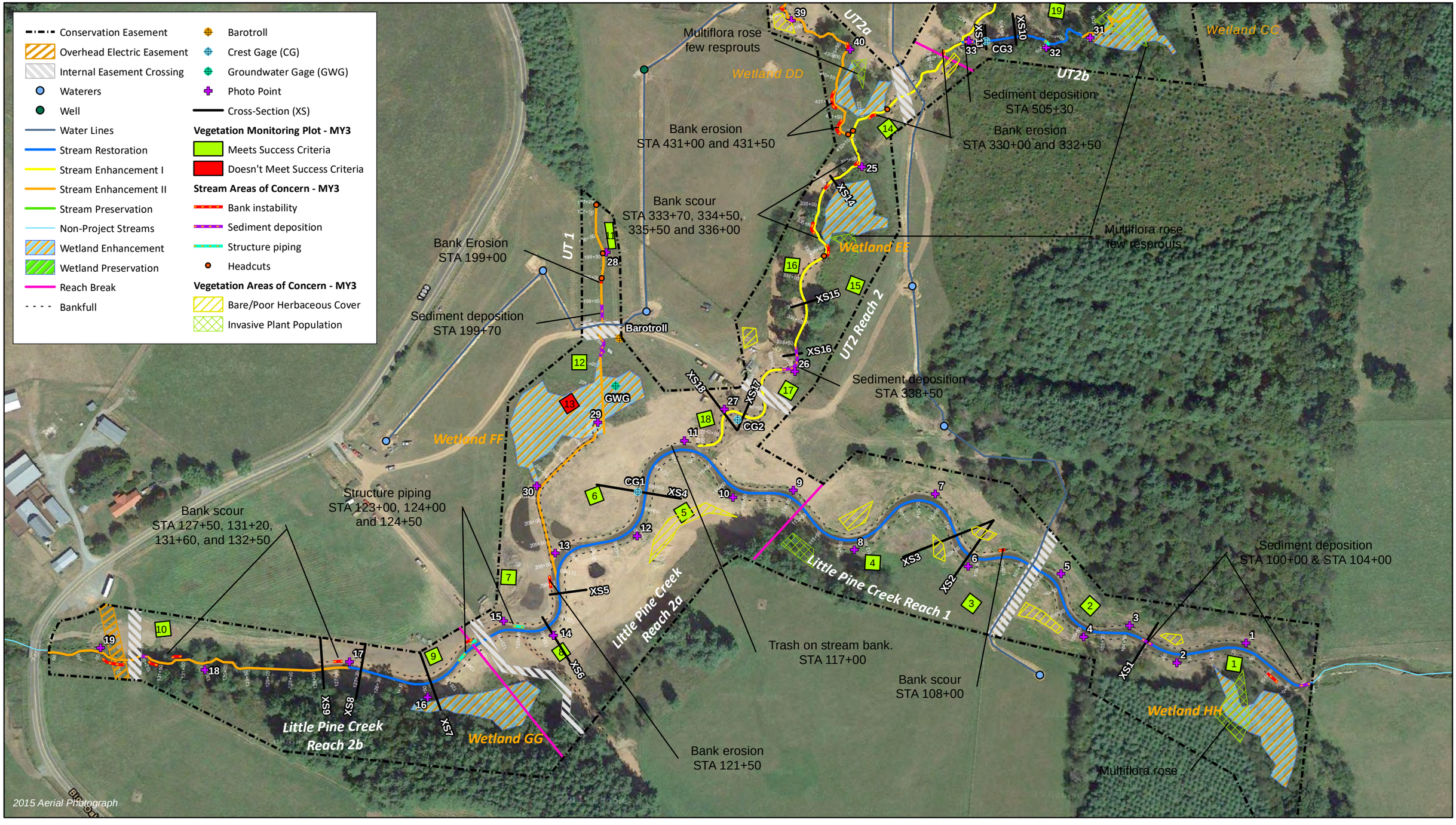
N

Figure 3.0 Current Condition Plan View Map (Key)
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018
Alleghany County, NC



WILDLANDS ENGINEERING

Figure 3.1 Current Condition Plan View Map (Sheet 1 of 2)
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018
Alleghany County, NC



WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 3.2 Current Condition Plan View Map (Sheet 2 of 2)
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018
Alleghany County, NC

Table 6a. Visual Stream Morphology Stability Assessment Table

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Little Pine Reach 1 (STA 100+00 - 114+44) 1,444 LF assessed

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			2	50	97%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	10			100%			
	3. Meander Pool Condition	Depth Sufficient	7	7			100%			
		Length Appropriate	7	7			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	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			2	45	97%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	2	45	97%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	3	3			100%			

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

Table 6b. Visual Stream Morphology Stability Assessment Table
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 2a (114+44-125+27) 1,083 LF assessed

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	7	7			100%			
	3. Meander Pool Condition	Depth Sufficient	6	6			100%			
		Length Appropriate	6	6			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	7	7			100%			
		Thalweg centering at downstream of meander bend (Glide)	7	7			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	30	97%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	1	30	97%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	4	5			80%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	4	5			80%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	5	5			100%			

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

Table 6c. Visual Stream Morphology Stability Assessment Table
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 2b (125+27-130+20) 493 LF assessed

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	4	4			100%			
	3. Meander Pool Condition	Depth Sufficient	4	4			100%			
		Length Appropriate	4	4			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	4	4			100%			
		Thalweg centering at downstream of meander bend (Glide)	4	4			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	15	97%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	1	15	97%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	3	5			60%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	3	5			60%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	3	5			60%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	5	5			100%			

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

Table 6d. Visual Stream Morphology Stability Assessment Table
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2 Reach 1 Upper (STA 297+18 - 310+50) 1,332 LF assessed

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	40	97%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	9	10			90%			
	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			1	15	99%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	1	15	99%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	20	21			95%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	16	21			76%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	16	21			76%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	21	21			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	21	21			100%			

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

Table 6e. Visual Stream Morphology Stability Assessment Table
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2 Reach 1 Lower (STA 325+67 - 330+00) 433 LF assessed

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	80	82%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	9	12			75%			
	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			1	10	99%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	1	10	99%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	15	20			75%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	15	20			75%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	20			75%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	15	20			75%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	15	20			75%			

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

Table 6f. Visual Stream Morphology Stability Assessment Table
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2 Reach 2 (STA 330+00 - 343+18) 1,318 LF assessed

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	100	92%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	12	15			80%			
	3. Meander Pool Condition	Depth Sufficient	4	5			80%			
		Length Appropriate	4	5			80%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	4	5			80%			
		Thalweg centering at downstream of meander bend (Glide)	4	5			80%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			5	90	93%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	5	90	93%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	16	19			84%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	19	19			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	19	19			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	17	19			89%			

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

Table 6g. Visual Stream Morphology Stability Assessment Table
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2b (STA 503+00 - 505+53) 253 LF assessed

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			1	20	92%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	7	9			78%			
	3. Meander Pool Condition	Depth Sufficient	n/a	n/a			n/a			
		Length Appropriate	n/a	n/a			n/a			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	n/a	n/a			n/a			
		Thalweg centering at downstream of meander bend (Glide)	n/a	n/a			n/a			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	23	23			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	21	23			91%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	21	23			91%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	23	23			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	23	23			100%			

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

Table 7. Vegetation Condition Assessment Table
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Planted Acreage **27.8**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	8	0.7	3%
Low Stem Density Areas[1]	Woody stem densities clearly below target levels based on MY3, 4, 5, or 7 stem count criteria.	0.1	3	0.1	0.3%
		Total	**11**	**0.8**	**3%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0	0	0.0	0%
		Cumulative Total	**11**	**0.8**	**3%**

Easement Acreage **57.3**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	11	2.1	4%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0	0%

[1]Acreage calculated from permanent vegetation monitoring plots and temporary vegetation monitoring plots from current year Site Assessment Report.

Stream Photographs

	
Photo Point 1 – Little Pine Reach 1, looking upstream *(11/19/2018)*	**Photo Point 1** – Little Pine Reach 1, looking downstream *(11/19/2018)*
	
Photo Point 2 – Little Pine Reach 1, looking upstream *(11/19/2018)*	**Photo Point 2** – Little Pine Reach 1, looking downstream *(11/19/2018)*
	
Photo Point 3 – Little Pine Reach 1, looking upstream *(11/19/2018)*	**Photo Point 3** – Little Pine Reach 1, looking downstream *(11/19/2018)*

	
Photo Point 4 – Little Pine Reach 1, looking upstream *(11/19/2018)*	**Photo Point 4** – Little Pine Reach 1, looking downstream *(11/19/2018)*
	
Photo Point 5 – Little Pine Reach 1, looking upstream *(11/19/2018)*	**Photo Point 5** – Little Pine Reach 1, looking downstream *(11/19/2018)*
	
Photo Point 6 – Little Pine Reach 1, looking upstream *(11/19/2018)*	**Photo Point 6** – Little Pine Reach 1, looking downstream *(11/19/2018)*

	
Photo Point 7 – Little Pine Reach 1, looking upstream *(11/19/2018)*	**Photo Point 7** – Little Pine Reach 1, looking downstream *11/19/2018)*
	
Photo Point 8 – Little Pine Reach 1, looking upstream *(11/19/2018)*	**Photo Point 8** – Little Pine Reach 1, looking downstream *(11/19/2018)*
	
Photo Point 9 – Little Pine Reach 2a, looking upstream *(11/19/2018)*	**Photo Point 9** – Little Pine Reach 2a, looking downstream *(11/19/2018)*

	
Photo Point 10 – Little Pine Reach 2a, looking upstream *(11/19/2018)*	**Photo Point 10** – Little Pine Reach 2a, looking downstream *(11/19/2018)*
	
Photo Point 11 – Little Pine Reach 2a, looking upstream *(11/19/2018)*	**Photo Point 11** – Little Pine Reach 2a, looking downstream *(11/19/2018)*
	
Photo Point 12 – Little Pine Reach 2a, looking upstream *(11/19/2018)*	**Photo Point 12** – Little Pine Reach 2a, looking downstream *(11/19/2018)*

	
Photo Point 13 – Little Pine Reach 2a, looking upstream *(11/19/2018)*	**Photo Point 13** – Little Pine Reach 2a, looking downstream *(11/19/2018)*
	
Photo Point 14 – Little Pine Reach 2a, looking upstream *(11/19/2018)*	**Photo Point 14** – Little Pine Reach 2a, looking downstream *(11/19/2018)*
	
Photo Point 15 – Little Pine Reach 2a, looking upstream *(11/19/2018)*	**Photo Point 15** – Little Pine Reach 2a, looking downstream *(11/19/2018)*

	
Photo Point 16 – Little Pine Reach 2b, looking upstream *(11/19/2018)*	**Photo Point 16** – Little Pine Reach 2b, looking downstream *(11/19/2018)*
	
Photo Point 17 – Little Pine Reach 2b, looking upstream *(11/19/2018)*	**Photo Point 17** – Little Pine Reach 2b, looking downstream *(11/19/2018)*
	
Photo Point 18 – Little Pine Reach 2b, looking upstream *(11/19/2018)*	**Photo Point 18** – Little Pine Reach 2b, looking downstream *(11/19/2018)*

Photo Point 19 – Little Pine Reach 2b, looking upstream *(11/19/2018)*

Photo Point 19 – Little Pine Reach 2b, looking downstream *(11/19/2018)*

Photo Point 20 – UT2 Reach 1, looking upstream *(7/25/2018)*

Photo Point 20 – UT2 Reach 1, looking downstream *(7/25/2018)*

Photo Point 21 – UT2 Reach 1, looking upstream *(7/25/2018)*

Photo Point 21 – UT2 Reach 1, looking downstream *(7/25/2018)*

Photo Point 22 – UT2 Reach 1, looking upstream *(7/25/2018)*

Photo Point 22 – UT2 Reach 1, looking downstream *(7/25/2018)*

Photo Point 23 – UT2 Reach 1, looking upstream *(7/25/2018)*

Photo Point 23 – UT2 Reach 1, looking downstream *(7/25/2018)*

Photo Point 24 – UT2 Reach 1, looking upstream *(7/25/2018)*

Photo Point 24 – UT2 Reach 1, looking downstream *(7/25/2018)*

	
Photo Point 25 – UT2 Reach 2, looking upstream *(7/25/2018)*	**Photo Point 25** – UT2 Reach 2, looking downstream *(7/25/2018)*
	
Photo Point 26 – UT2 Reach 2, looking upstream *(7/25/2018)*	**Photo Point 26** – UT2 Reach 2, looking downstream *(7/25/2018)*
	
Photo Point 27 – UT2 Reach 2, looking upstream *(7/25/2018)*	**Photo Point 27** – UT2 Reach 2, looking downstream *(7/25/2018)*

	
Photo Point 28 – UT1, looking upstream *(7/25/2018)*	**Photo Point 28** – UT1, looking downstream *(7/25/2018)*
	
Photo Point 29 – UT1, looking upstream *(7/25/2018)*	**Photo Point 29** – UT1, looking downstream *(7/25/2018)*
	
Photo Point 30 – UT1, looking upstream *(7/25/2018)*	**Photo Point 30** – UT1, looking downstream *(7/25/2018)*

Photo Point 31 – UT2b, looking upstream *(7/25/2018)*

Photo Point 31 – UT2b, looking downstream *(7/25/2018)*

Photo Point 32 – UT2b, looking upstream *(7/25/2018)*

Photo Point 32 – UT2b, looking downstream *(7/25/2018)*

Photo Point 33 – UT2, looking upstream *(7/25/2018)*

Photo Point 33 – UT2b, looking upstream *(7/25/2018)*

Photo Point 33 – UT2, looking downstream *(7/25/2018)*

Photo Point 34 – UT2a, looking upstream *(7/25/2018)*

Photo Point 34 – UT2a, looking downstream *(7/25/2018)*

Photo Point 35 – UT2a, looking upstream *(7/25/2018)*

Photo Point 35 – UT2a, looking downstream *(7/25/2018)*

Photo Point 36 – UT2a, looking upstream *(7/25/2018)*

Photo Point 36 – looking upstream UT3 *(7/25/2018)*

Photo Point 36 – UT2a, looking downstream *(7/25/2018)*

Photo Point 37 – UT2a, looking upstream *(7/25/2018)*

Photo Point 37 – UT2a, looking downstream *(7/25/2018)*

	
Photo Point 38 – UT2a, looking upstream *(7/25/2018)*	**Photo Point 38** – UT2a, looking downstream *(7/25/2018)*
	
Photo Point 39 – UT2a, looking upstream *(7/25/2018)*	**Photo Point 39** – UT2a, looking downstream *(7/25/2018)*
	
Photo Point 40 – UT2a, looking upstream *(7/25/2018)*	**Photo Point 40** – UT2a, looking downstream *(7/25/2018)*

	
Photo Point 41 – UT3, looking upstream *(7/25/2018)*	**Photo Point 41** – UT3, looking downstream *(7/25/2018)*
	
Photo Point 42 – UT2 Reach 1, looking upstream *(7/25/2018)*	**Photo Point 42** – UT2 Reach 1, looking downstream *(7/25/2018)*

Vegetation Photographs

Vegetation Plot 1 – *(09/11/2018)*

Vegetation Plot 2 – *(09/11/2018)*

Vegetation Plot 3 – *(09/11/2018)*

Vegetation Plot 4 – *(09/11/2018)*

Vegetation Plot 5 – *(09/18/2018)*

Vegetation Plot 6 – *(09/18/2018)*

	
Vegetation Plot 7 – *(09/18/2018)*	**Vegetation Plot 8** – *(09/18/2018)*
	
Vegetation Plot 9 – *(09/18/2018)*	**Vegetation Plot 10** – *(09/18/2018)*
	
Vegetation Plot 11 – *(09/11/2018)*	**Vegetation Plot 12** – *(09/19/2018)*

Vegetation Plot 13 – *(09/19/2018)*

Vegetation Plot 14 – *(09/19/2018)*

Vegetation Plot 15 – *(09/10/2018)*

Vegetation Plot 16 – *(09/10/2018)*

Vegetation Plot 17 – *(09/10/2018)*

Vegetation Plot 18 – *(09/11/2018)*

Vegetation Plot 19 – *(09/19/2018)*

Vegetation Plot 20 – *(09/19/2018)*

Vegetation Plot 21 – *(09/19/2018)*

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Plot	MY4 Success Criteria Met (Y/N)	Tract Mean
1	Y	
2	Y	
3	Y	
4	Y	
5	Y	
6	Y	
7	Y	
8	Y	
9	Y	
10	Y	
11	Y	95%
12	Y	
13	N	
14	Y	
15	Y	
16	Y	
17	Y	
18	Y	
19	Y	
20	Y	
21	Y	

Table 9. CVS Vegetation Plot Metadata
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Database Name	cvs-eep-entrytool-v2.5.0 LP III MY3.mdb
Database Location	Q:\ActiveProjects\005-02160 Little Pine III Monitoring\Monitoring\Monitoring Year 3\Vegetation Assessment
Computer Name	MIMI-PC
File Size	49389568
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	94903
Project Name	Little Pine Creek III Stream & Wetland Restoration Project
Description	Little Pine Creek III Stream & Wetland Restoration Project
River Basin	
Length(ft)	
Stream-to-edge Width (ft)	
Area (sq m)	
Required Plots (calculated)	
Sampled Plots	21
Required Plots (calculated)	21
Sampled Plots	21

Table 10a. Planted and Total Stem Counts
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

			Current Plot Data (MY3 2018)																				
			94903-WEI-0001			94903-WEI-0002			94903-WEI-0003			94903-WEI-0004			94903-WEI-0005			94903-WEI-0006			94903-WEI-0007		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	Red Maple	Tree			10	1	1	6	2	2	2	5	5	5	4	4	4						3
Alnus serrulata	Tag Alder	Shrub Tree						1												2			
Betula nigra	River Birch	Tree	1	1	1	3	3	3	3	3	3	2	2	2				5	5	5			
Cercis canadensis	Redbud	Shrub Tree	2	2	2							3	3	3	4	4	4				5	5	5
Cornus amomum	Silky Dogwood	Shrub Tree			5																		
Cornus florida	Flowering Dogwood	Shrub Tree						5															
Fraxinus pennsylvanica	Green Ash	Tree	1	1	1	2	2	2	2	2	2	5	5	5	2	2	2				8	8	8
Liriodendron tulipifera	Tulip Poplar	Tree																					
Platanus occidentalis	Sycamore	Tree	1	1	1	1	1	1				1	1	1	1	1	1	3	3	3	3	3	3
Ulmus americana	American Elm	Tree	8	8	8	3	3	3	8	8	8				3	3	3						
Stem count			13	13	28	10	10	21	15	15	15	16	16	16	14	14	14	8	8	10	16	16	19
size (ares)			1			1			1			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247		
Species count			5	5	7	5	5	7	4	4	4	5	5	5	5	5	5	2	2	3	3	3	4
Stems per ACRE			526	526	1133	405	405	850	607	607	607	647	647	647	567	567	567	324	324	405	647	647	769

			Current Plot Data (MY3 2018)																				
			94903-WEI-0008			94903-WEI-0009			94903-WEI-0010			94903-WEI-0011			94903-WEI-0012			94903-WEI-0013			94903-WEI-0014		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	Red Maple	Tree	7	7	7	3	3	3	2	2	2	1	1	1	1	1	1						2
Alnus serrulata	Tag Alder	Shrub Tree																					
Betula nigra	River Birch	Tree				1	1	1	1	1	1	2	2	2	4	4	4				2	2	2
Cercis canadensis	Redbud	Shrub Tree	3	3	3	1	1	1	2	2	2	1	1	1	2	2	2				1	1	1
Cornus amomum	Silky Dogwood	Shrub Tree																					
Cornus florida	Flowering Dogwood	Shrub Tree																					
Fraxinus pennsylvanica	Green Ash	Tree	4	4	4	3	3	3	4	4	5	4	4	4	5	5	5	4	4	4	2	2	2
Liriodendron tulipifera	Tulip Poplar	Tree																					2
Platanus occidentalis	Sycamore	Tree	1	1	1				2	2	2				1	1	3	1	1	1	2	2	2
Ulmus americana	American Elm	Tree				3	3	3				1	1	1	2	2	2				5	5	5
Stem count			15	15	15	11	11	11	11	11	12	9	9	9	15	15	17	5	5	5	12	12	16
size (ares)			1			1			1			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247		
Species count			4	4	4	5	5	5	5	5	5	5	5	5	6	6	6	2	2	2	5	5	7
Stems per ACRE			607	607	607	445	445	445	445	445	486	364	364	364	607	607	688	202	202	202	486	486	647

Color for Density

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

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

Table 10b. Planted and Total Stem Counts
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

			Current Plot Data (MY3)																				
			94903-WEI-0015			94903-WEI-0016			94903-WEI-0017			94903-WEI-0018			94903-WEI-0019			94903-WEI-0020			94903-WEI-0021		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	Red Maple	Tree			10	5	5	10							1	1	6			10	2	2	17
Alnus serrulata	Tag Alder	Shrub Tree																					
Betula nigra	River Birch	Tree	3	3	3				3	3	3	3	3	3	2	2	2	1	1	1	3	3	3
Cercis canadensis	Redbud	Shrub Tree										5	5	5	2	2	2	3	3	3	1	1	1
Cornus amomum	Silky Dogwood	Shrub Tree																					
Cornus florida	Flowering Dogwood	Shrub Tree																					
Fraxinus pennsylvanica	Green Ash	Tree	2	2	2	4	4	4	4	4	4	2	2	2	4	4	4	2	2	2	3	3	3
Liriodendron tulipifera	Tulip Poplar	Tree																		2			
Platanus occidentalis	Sycamore	Tree	8	8	8	1	1	1				5	5	5							2	2	2
Ulmus americana	American Elm	Tree							3	3	3	1	1	1	2	2	2	5	5	5			
Stem count			13	13	23	10	10	15	10	10	10	16	16	16	11	11	16	11	11	23	11	11	26
size (ares)			1			1			1			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247			0.0247		
Species count			3	3	4	3	3	3	3	3	3	5	5	5	5	5	5	4	4	6	5	5	5
Stems per ACRE			526	526	931	405	405	607	405	405	405	647	647	647	445	445	647	445	445	931	445	445	1052

			Annual Means											
			MY3 (9/2018)			MY2 (9/2017)			MY1 (10/2016)			MY0 (05/2016)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	Red Maple	Tree	34	34	99	41	41	45	45	45	45	50	50	50
Alnus serrulata	Tag Alder	Shrub Tree			3			1			1			
Betula nigra	River Birch	Tree	39	39	39	39	39	41	41	41	41	49	49	49
Cercis canadensis	Redbud	Shrub Tree	35	35	35	35	35	37	44	44	44	46	46	46
Cornus amomum	Silky Dogwood	Shrub Tree			5									
Cornus florida	Flowering Dogwood	Shrub Tree			5									
Fraxinus pennsylvanica	Green Ash	Tree	67	67	68	61	61	67	58	58	58	58	58	58
Liriodendron tulipifera	Tulip Poplar	Tree			4			1						
Platanus occidentalis	Sycamore	Tree	33	33	35	33	33	33	33	33	33	30	30	30
Ulmus americana	American Elm	Tree	44	44	44	47	47	47	50	50	50	52	52	52
Stem count			252	252	337	256	256	272	271	271	272	285	285	285
size (ares)			21			21			21			21		
size (ACRES)			0.52			0.52			0.52			0.52		
Species count			10	10	10	6	6	8	6	6	7	6	6	6
Stems per ACRE			486	486	649	493	493	524	522	522	524	549	549	549

Color for Density

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

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

APPENDIX 4. Morphological Summary Data and Plots

Table 11a. Baseline Stream Data Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No.94903
Monitoring Year 3 - 2018

Little Pine Reach 1, Reach 2a, Reach 2b

		Pre-Restoration Condition						Reference Reach Data		Design						As-Built/Baseline					
Parameter	Gage	Little Pine Reach 1		Little Pine Reach 2a		Little Pine Reach 2b		Meadow Fork		Little Pine Reach 1		Little Pine Reach 2a		Little Pine Reach 2b		Little Pine Reach 1		Little Pine Reach 2a		Little Pine Reach 2b[1]	
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																					
Bankfull Width (ft)	N/A	25.8	33.4	24.9		29.0		21.4		30.0		30.0		31.0		30.3	33.5	29.1	30.7	28.7	31.9
Floodprone Width (ft)		>200		>200		>200		>200		>200		>200		>200		133	>200	>200		>200	
Bankfull Mean Depth		1.7	1.8	2.1		1.8		2.1		1.8		1.8		1.8		1.6	1.8	1.6	1.9	2.0	2.1
Bankfull Max Depth		3.3	3.3	3.7		2.2		3.1		2.5		2.5		2.5		2.7	3.2	2.6	3.9	3.1	3.4
Bankfull Cross-sectional Area (ft^2)		45.5	47.5	53.3		53.3		44.0		54.5		53.0		54.9		52.2	53.5	46.6	56.9	58.8	64.2
Width/Depth Ratio		1.4	23.9	11.6		16.1		10.2		16.5		17.0		17.5		17.1	21.4	16.6	18.1	14.0	15.9
Entrenchment Ratio		>2.2		>2.2		>2.2		>2.2		>2.2		>2.2		>2.2		4.4	>6.0	>6.5	>6.9	>6.3	>7
Bank Height Ratio		1.2	1.4	1.6		1.0		1.1		1.0		1.0		1.0		0.8	1.0	1.0		1.0	
D50 (mm)		10.2		1.3		18.4		---		---		---		---		50.7		87.6		47.4	
Riffle Length (ft)	N/A							---		---		---		---		28.4	80.5	37.8	68.3	30.44	132.29
Riffle Slope (ft/ft)		0.012	0.019	0.0095	0.031	0.028	0.045	0.0239		0.007	0.0125	0.0098	0.0175	0.0155	0.0278	0.0040	0.0275	0.0101	0.0274	0.0055	0.0236
Pool Length (ft)								---		---		---		---		44.5	96.5	38.7	108.9	40.92	99.41
Pool Max Depth (ft)		---		---		---		---		---		---		---		3.5	5.8	4.7	5.8	2.6	5.4
Pool Spacing (ft)		38	85	55	227	65	229	---		75	270	75	270	78	279	71	191	132	206	88	190
Pool Volume (ft^3)								---													
Pattern																					
Channel Beltwidth (ft)	N/A	63	82	77	94	57		---		45	210	45	210	47	217	45	154	48	108	89	
Radius of Curvature (ft)		25	59	39	58	34	70	---		60	210	60	120	62	124	60	96	63	77	82	124
Rc:Bankfull Width (ft/ft)		1.0	1.8	1.6	2.3	1.3	2.4	---		2.0	4.0	2.0	4.0	2.0	4.0	2.0	2.9	2.2	2.5	2.9	3.9
Meander Length (ft)		86	140	110	186	100	134	---		210	360	210	360	217	372	207	313	288	337	334	329
Meander Width Ratio		2.4	2.5	3.1	3.8	2.0		---		1.5	7.0	1.5	7.0	1.5	7.0	1.5	4.6	1.6	3.5	3.1	
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%	N/A																				
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100		SC/4.5/10.2/61.2/143.4/>2048		SC/0.4/1.3/77.8/180.0/362		SC/0.5/18.4/79.2/143.4/256		---								0.22/0.48/2.0/88.2/146.7/362		0.22/1.0/37.9/111.8/160.7/256		0.38/21.6/47.4/122.3/208.8/362	
Reach Shear Stress (Competency) lb/ft^2		0.85		0.66		2.43				0.56		0.75		1.20		0.46	0.51	0.69	0.74	1.21	1.23
Max part size (mm) mobilized at bankfull		134		122		289				99		123		174							
Stream Power (Capacity) W/m^2																					
Additional Reach Parameters																					
Drainage Area (SM)	N/A	3.9		4.3		4.4		4.4		3.9		4.3		4.4		3.9		4.3		4.4	
Watershed Impervious Cover Estimate (%)		<1%		<1%		<1%		<1%		<1%		<1%		<1%		<1%		<1%		<1%	
Rosgen Classification		C4		E/C5		C4		E4		C4		C5		C4		C4		C4		C4	
Bankfull Velocity (fps)		4.2	4.6	4.0		4.4		5.1		3.8		4.0		4.1		3.6	3.8	4.1	4.3	3.6	3.7
Bankfull Discharge (cfs)		205		215		225		224		205		215		225		205		215		225	
Q-NFF regression (2-yr)		---		---		---															
Q- NC Mountain Regional Curve (cfs)		284		306		308															
Q-USGS extrapolation (1.2-yr)		177		191		193															
Q-Mannings		199	211	213		235				---		---		---		188	204	199	231	219	232
Valley Length (ft)		---		---		---		---		---		---		---		1,184		876		476	
Channel Thalweg Length (ft)		4,016						---		1,350[1]		1,025[1]		481[2]		1,444		1,083		493	
Sinuosity		1.2		1.7		1.1		---		1.14		1.17		1.01		1.22		1.24		1.04	
Water Surface Slope (ft/ft)		0.0048	0.0058	0.0033	0.0057	0.0049	0.0058	0.0100		0.0050		0.0070		0.0111		0.0049		0.0072		0.0118	
Bankfull Slope (ft/ft)		0.0057		0.0087		0.0089		---		0.0057		0.0082		0.0089		0.0051		0.0074		0.0101	

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable
[1] Little Pine Reach 2b: Calculations only include reaches with a P1 or P2 approach

Table 11b. Baseline Stream Data Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No.94903
Monitoring Year 3 - 2018

UT2, UT2b

		Pre-Restoration Condition						Reference Reach Data		Design						As-Built/Baseline					
Parameter	**Gage**	**UT2 Reach 1**		**UT2 Reach 2/3**		**UT2b**		**UT2a Reference**		**UT2 Reach 1 Lower**		**UT2 Reach 2**		**UT2b[2]**		**UT2 Reach 1 Lower**		**UT2 Reach 2**		**UT2b[2]**	
		Min	**Max**	**Reach 2**	**Reach 3**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																					
Bankfull Width (ft)		4.9	9.7	6.1	7.0	8.3		12.6		9.0		11.6		5.9		8.1		8.9	12.8	6.7	
Floodprone Width (ft)		5.4	29.9	49.3	41.0	10.6		31.0		98		17	195	15	30	28.4		21.5	>200	15.9	
Bankfull Mean Depth		0.9	1.2	1.4	1.2	0.4		1.4		0.49		0.65		0.35		0.6		0.5	0.9	0.5	
Bankfull Max Depth		1.4		2.3	1.9	0.6		2.0		0.7		0.95		0.55		1.0		1.10	2.10	0.9	
Bankfull Cross-sectional Area (ft^2)	N/A	5.9	8.6	8.7	8.5	3.1		18.1		4.4		7.6		2.1		5.1		4.2	12.0	3.7	
Width/Depth Ratio		4.1	11.0	4.2	5.7	22.6		8.7		18.5		17.7		16.8		13.0		13.6	20.1	12.2	
Entrenchment Ratio		1.1	3.1	8.1	5.9	1.3		2.4		10.9		1.5	16.8	2.5	5.1	3.5		2.0	>22.4	2.4	
Bank Height Ratio		2.6	3.2	1.0	1.2	5.8		1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D50 (mm)		10.7		15		16.0		---		---		---		---		56.9		44	53	43	
Profile																					
Riffle Length (ft)								---		---		---		---		10.7	25.0	16.8	29.3	4.4	23.0
Riffle Slope (ft/ft)		0.012	0.083	0.0327-0.063	0.0092-0.068	0.0178	0.081	0.0404	0.0517	0.0512	0.0681	0.026	0.046	0.0436	0.0750	0.0360	0.0853	0.0262	0.0575	0.0448	0.0659
Pool Length (ft)	N/A							---		---		---		---		5.0	22.3	13.3	46.3	3.1	14.3
Pool Max Depth (ft)		---		---		---		2.2	2.5	---		---		---		1.9	5.0	1.6	3.2	0.6	2.1
Pool Spacing (ft)		11.6	40.5	14-68	22-63	8	34	78		6.5	41.5	19	95	5	21	7	34	24	98	3	33
Pool Volume (ft^3)								---													
Pattern																					
Channel Beltwidth (ft)		---		49-52	120	N/A		---		---		45	68	---		---		61	66	---	
Radius of Curvature (ft)		---		10-48	8-27	N/A		---		---		29	39	---		---		19	63	---	
Rc:Bankfull Width (ft/ft)	N/A	---		1.6-7.9	1.1-3.9	N/A		---		---		2.5	3.4	---		---		2.1	4.9	---	
Meander Length (ft)		---		64-188	43-141	N/A		---		---		88	135	---		---		105	135	---	
Meander Width Ratio		---		8.0-8.5	17.1	N/A		---		---		3.9	5.9	---		---		7	5	---	
Substrate, Bed and Transport Parameters																					
Ri%/Ru%/P%/G%/S%																					
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100	N/A	SC/5.9/10.7/21.5/36.7/90.0		SC/8.0/15/55.6/84.6/180.0		SC/11/16/52.6/128/180		---								0.25/11.0/27.6/96.0/143.4/256.0				0.78/28.5/41.6/85.0/123.3/180.0	
Reach Shear Stress (Competency) lb/ft^2		1.53		0.73		0.75				1.49		0.96		1.38		1.95		0.83	1.69	1.98	
Max part size (mm) mobilized at bankfull		208		121		123				208		148		193							
Stream Power (Capacity) W/m^2																					
Additional Reach Parameters																					
Drainage Area (SM)		0.12		0.29	0.31	0.030		0.12		0.12		0.31		0.03		0.12		0.31		0.03	
Watershed Impervious Cover Estimate (%)		<1%		<1%		<1%		<1%		<1%		<1%		<1%		<1%		<1%		<1%	
Rosgen Classification		A4		E4b	E4	F4b		A/B4/1		B4a		C4b		B4a		B4a		C4b		B4a	
Bankfull Velocity (fps)		2.3	3.4	4.0	4.1	3.2		---		4.5		4.6		4.7		4.1		2.7	4.3	5.1	
Bankfull Discharge (cfs)		20		35		10		20		20		35		10		20		35		10	
Q-NFF regression (2-yr)		---		---		---															
Q- NC Mountain Regional Curve (cfs)	N/A	21		44		7															
Q-USGS extrapolation (1.2-yr)		10		21		3															
Q-Mannings		35		43		8				---		---		---		21		11.2	51.0	18.7	
Valley Length (ft)		---		---		---		---		---		---		---		3,988				231	
Channel Thalweg Length (ft)		5270[1]				553		---		433		1264		241		433		1318		253	
Sinuosity		1.1		1.3	2.1	1.1		---		1.05		1.20		1.04		1.05		1.2		1.1	
Water Surface Slope ($ft/ft)^2$		0.0436		0.0290	0.0136	0.0406		0.0433		0.0501		0.0239		0.0639		0.0560		0.0231		0.0616	
Bankfull Slope (ft/ft)		0.0476		0.0363	0.028	0.0667		---		0.0525		0.0280		0.0667		0.0563		0.0237		0.0536	

SC: Silt/Clay <0.062 mm diameter particles
FS: Fine Sand 0.125-0.250mm diameter particles
(---): Data was not provided
N/A: Not Applicable
[1]entire length of UT2
[2] UT2b: Calculations only include reach with a P2 approach

Table 12a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 3 - 2018

	Cross-Section 1, Little Pine Reach 1 (Riffle)						Cross-Section 2, Little Pine Reach 1 (Pool)						Cross-Section 3, Little Pine Reach 1 (Riffle)					
Dimension	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**
Bankfull Elevation (ft)	2,535.4	2,535.4	2,535.4	2,535.7			2,533.2	2,533.2	2,533.2	2,533.4			2,532.9	2,532.9	2,532.9	2,533.2		
Low Bank Elevation (ft)	2,535.4	2,535.4	2,535.5	2,535.7			2,533.2	2,533.2	2,533.1	2,533.2			2,532.4	2,532.2	2,532.5	2,533.0		
Bankfull Width (ft)	30.3	29.9	30.8	28.4			30.6	30.9	30.9	29.5			33.5	32.9	32.3	29.0		
Floodprone Width (ft)	132.9	135.1	135.1	135.1			---	---	---	---			>200	>200	>200	>200		
Bankfull Mean Depth (ft)	1.8	1.7	1.7	1.9			2.2	2.1	2.2	2.3			1.6	1.6	1.6	1.8		
Bankfull Max Depth (ft)	2.7	2.8	3.2	3.0			4.3	3.9	4.4	4.7			3.2	3.1	3.0	3.4		
Bankfull Cross Sectional Area (ft^2)	53.5	49.8	52.8	53.5			68.0	65.9	66.9	68.0			52.2	51.8	52.2	52.2		
Bankfull Width/Depth Ratio	17.1	18.0	18.0	15.1			---	---	---	---			21.4	20.9	20.0	16.1		
Bankfull Entrenchment Ratio	4.4	4.5	4.4	4.8			---	---	---	---			>6.0	>6.1	>6.2	>6.9		
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0			---	---	---	---			<1.0	<1.0	<1.0	<1.0		
	Cross-Section 4, Little Pine Reach 2a (Riffle)						**Cross-Section 5, Little Pine Reach 2a (Riffle)**						**Cross-Section 6, Little Pine Reach 2a (Pool)**					
Dimension	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**
Bankfull Elevation (ft)	2,527.4	2,527.4	2,527.4	2,527.3			2,525.4	2,525.4	2,525.4	2,525.2			2,524.8	2,524.8	2,524.8	2,525.1		
Low Bank Elevation (ft)	2,527.4	2,527.5	2,527.5	2,527.7			2,525.4	2,525.3	2,525.4	2,525.4			2,524.8	2,524.5	2,524.7	2,524.4		
Bankfull Width (ft)	29.1	29.3	28.5	26.0			30.7	31.3	31.0	28.1			35.4	35.5	35.4	39.4		
Floodprone Width (ft)	>200	>200	>200	>200			>200	>200	>200	>200			---	---	---	---		
Bankfull Mean Depth (ft)	1.6	1.6	1.8	1.8			1.9	1.8	1.9	2.0			2.6	2.4	2.4	2.4		
Bankfull Max Depth (ft)	2.6	2.6	2.9	3.5			3.9	3.6	3.5	3.4			5.7	5.1	5.3	5.4		
Bankfull Cross Sectional Area (ft^2)	46.6	46.4	49.8	46.6			56.9	56.7	58.2	56.9			93.4	83.6	86.5	93.4		
Bankfull Width/Depth Ratio	18.1	18.5	16.2	14.5			16.6	17.2	16.5	13.9			---	---	---	---		
Bankfull Entrenchment Ratio	>6.9	>6.8	>7.0	>7.7			>6.5	>6.4	>6.5	>7.1			---	---	---	---		
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.1			1.0	1.0	1.0	1.1			---	---	---	---		
	Cross-Section 7, Little Pine Reach 2b (Pool)						**Cross-Section 8, Little Pine Reach 2b (Riffle)**						**Cross-Section 9, Little Pine Reach 2b (Riffle)**					
Dimension	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**
Bankfull Elevation (ft)	2,522.0	2,522.0	2,522.0	2,522.4			2,520.1	2,520.1	2,520.1	2,520.0			2,519.5	2,519.5	2,519.5	2,519.3		
Low Bank Elevation (ft)	2,522.0	2,522.0	2,522.2	2,522.2			2,520.1	2,520.1	2,520.2	2,520.3			2,519.5	2,519.5	2,519.4	2,519.5		
Bankfull Width (ft)	35.3	35.5	35.2	40.2			28.7	29.8	29.4	26.9			31.9	30.7	29.3	29.7		
Floodprone Width (ft)	---	---	---	---			>200	>200	>200	>200			>200	>200	>200	>200		
Bankfull Mean Depth (ft)	2.9	2.8	2.8	2.6			2.1	2.1	2.0	2.2			2.0	2.0	2.1	2.2		
Bankfull Max Depth (ft)	5.4	5.6	5.4	5.6			3.4	3.6	3.4	3.9			3.1	3.2	3.0	3.5		
Bankfull Cross Sectional Area (ft^2)	103.7	100.0	97.2	103.7			58.8	61.2	59.8	58.8			64.2	62.3	60.2	64.2		
Bankfull Width/Depth Ratio	---	---	---	---			14.0	14.5	14.4	12.3			15.9	15.2	14.2	13.7		
Bankfull Entrenchment Ratio	---	---	---	---			>7.0	>6.7	>6.8	>7.4			>6.3	>6.5	>6.9	>6.7		
Bankfull Bank Height Ratio	---	---	---	---			1.0	1.0	1.0	1.1			1.0	1.0	1.0	1.0		

---: not applicable

[1]Prior to MY3, bankfull dimensions were calculated using a fixed bankfull elevation. For MY3 through MY7 bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (9/2018).

Table 12b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)

Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 3 - 2018

	Cross-Section 10, UT2b (Pool)						Cross-Section 11, UT2b (Riffle)						Cross-Section 12, UT2 Reach 1 Lower (Riffle)					
Dimension	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**
Bankfull Elevation (ft)	2,570.0	2,570.0	2,570.0	2,568.4			2,566.4	2,566.4	2,566.4	2,566.4			2,573.8	2,573.8	2,573.8	2,573.8		
Low Bank Elevation (ft)	2,570.0	2,569.7	2,570.0	2,570.1			2,566.4	2,566.4	2,566.2	2,566.3			2,573.8	2,573.7	2,573.7	2,573.9		
Bankfull Width (ft)	5.9	6.0	6.1	4.8			6.7	6.3	6.6	6.6			8.1	8.4	8.6	8.2		
Floodprone Width (ft)	---	---	---	---			15.9	17.7	17.9	16.3			28.4	30.0	30.0	30.4		
Bankfull Mean Depth (ft)	1.0	2.3	2.4	1.2			0.5	0.7	0.7	0.6			0.6	0.7	0.6	0.6		
Bankfull Max Depth (ft)	1.7	3.4	3.3	1.7			0.9	1.1	1.1	0.9			1.0	1.3	1.2	1.3		
Bankfull Cross Sectional Area (ft^2)	5.7	14.0	14.9	5.7			3.7	4.3	4.5	3.7			5.1	5.7	5.4	5.1		
Bankfull Width/Depth Ratio	---	---	---	---			12.2	9.1	9.6	11.6			13.0	12.5	13.9	13.2		
Bankfull Entrenchment Ratio	---	---	---	---			2.4	2.8	2.7	2.5			3.5	3.6	3.5	3.7		
Bankfull Bank Height Ratio	---	---	---	---			1.0	1.0	<1.0	<1.0			1.0	<1.0	<1.0	1.1		
	Cross-Section 13, UT2 Reach 1 Lower (Pool)						**Cross-Section 14, UT2 Reach 2 (Riffle)**						**Cross-Section 15, UT2 Reach 2 (Pool)**					
Dimension	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**
Bankfull Elevation (ft)	2,573.3	2,573.3	2,573.3	2,573.0			2,547.2	2,547.2	2,547.2	2,547.5			2,539.1	2,539.1	2,539.1	2,539.1		
Low Bank Elevation (ft)	2,573.3	2,573.3	2,573.3	2,573.4			2,547.2	2,547.2	2,547.1	2,547.4			2,539.1	2,539.0	2,539.2	2,539.1		
Bankfull Width (ft)	9.8	10.1	10.4	8.7			10.8	8.0	9.2	10.6			12.2	11.6	12.0	11.4		
Floodprone Width (ft)	---	---	---	---			21.5	23.2	23.5	21.0			---	---	---	---		
Bankfull Mean Depth (ft)	1.3	1.2	1.4	1.5			0.5	0.8	0.7	0.6			1.5	1.0	1.2	1.2		
Bankfull Max Depth (ft)	2.2	1.9	2.5	2.6			1.1	1.2	1.2	1.3			3.1	1.7	2.2	1.9		
Bankfull Cross Sectional Area (ft^2)	12.8	12.5	15.0	12.8			5.9	6.6	6.6	5.9			18.7	11.9	14.4	13.9		
Bankfull Width/Depth Ratio	---	---	---	---			20.1	9.7	13.0	19.2			---	---	---	---		
Bankfull Entrenchment Ratio	---	---	---	---			2.0	2.9	2.5	2.0			---	---	---	---		
Bankfull Bank Height Ratio	---	---	---	---			1.0	1.0	<1.0	<1.0			---	---	---	---		
	Cross-Section 16, UT2 Reach 2 (Riffle)						**Cross-Section 17, UT2 Reach 2 (Riffle)**						**Cross-Section 18, UT2 Reach 2 (Pool)**					
Dimension	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3[1]**	**MY4**	**MY5**
Bankfull Elevation (ft)	2,535.0	2,535.0	2,535.0	2,535.4			2,531.2	2,531.2	2,531.2	2,531.2			2,530.4	2,530.4	2,530.4	2,530.4		
Low Bank Elevation (ft)	2,535.0	2,535.0	2,535.1	2,535.5			2,531.2	2,531.2	2,531.2	2,531.2			2,530.4	2,579.7	2,530.1	2,530.0		
Bankfull Width (ft)	8.9	10.0	6.9	8.1			12.8	12.9	13.6	12.6			19.3	19.5	21.4	22.3		
Floodprone Width (ft)	>200	>200	>200	>200			>200	>200	>200	>200			---	---	---	---		
Bankfull Mean Depth (ft)	0.5	0.5	0.4	0.5			0.9	0.9	0.9	1.0			0.8	0.8	0.8	0.7		
Bankfull Max Depth (ft)	1.1	0.8	0.6	0.9			2.1	1.8	1.9	2.1			2.0	2.3	2.1	2.8		
Bankfull Cross Sectional Area (ft^2)	4.2	5.0	2.8	4.2			12.0	12.0	12.0	12.0			15.8	16.3	16.9	15.8		
Bankfull Width/Depth Ratio	19.2	19.9	17.1	15.6			13.6	13.8	15.4	13.2			---	---	---	---		
Bankfull Entrenchment Ratio	>22.4	>20.0	>28.9	>24.6			>15.7	>15.5	>14.7	>15.9			---	---	---	---		
Bankfull Bank Height Ratio	1.0	1.1	1.2	1.1			1.0	1.0	1.0	1.0			---	---	---	---		

---: not applicable

[1]Prior to MY3, bankfull dimensions were calculated using a fixed bankfull elevation. For MY3 through MY7 bankfull elevation is calculated using a fixed Abkf as described in the Standard Measurement of the BHR Monitoring Parameter provided by NCIRT and NCDMS (9/2018).

Table 13a. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 1

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	30.3	33.5	29.9	32.9	30.8	32.3	28.4	29.0				
Floodprone Width (ft)	133	>200	135	>200	135	>200	135.1	>200				
Bankfull Mean Depth	1.6	1.8	1.6	1.7	1.6	1.7	1.8	1.9				
Bankfull Max Depth	2.7	3.2	2.8	3.1	3.0	3.2	3.0	3.4				
Bankfull Cross-sectional Area (ft^2)	52.2	53.5	49.8	51.8	52.2	52.8	52.2	53.5				
Width/Depth Ratio	17.1	21.4	18	20.9	18	20	15.1	16.1				
Entrenchment Ratio	4.4	>6.0	4.5	>6.1	4.4	>6.2	4.8	>6.9				
Bank Height Ratio	0.8	1.0	0.8	1.0	0.9	1.0	0.9	1.0				
D50 (mm)	50.7		56.9		45.0		48.5					
Profile												
Riffle Length (ft)	28	81	21	47	32	76	12	50				
Riffle Slope (ft/ft)	0.0040	0.0275	0.0064	0.0283	0.0052	0.0183	0.0029	0.0191				
Pool Length (ft)	44	96	66	176	49	177	58	176				
Pool Max Depth (ft)	3.5	5.8	3.0	4.7	3.9	6.2	4.2	5.8				
Pool Spacing (ft)	71	191	77	224	94	210	81	225				
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	45	154										
Radius of Curvature (ft)	60	96										
Rc:Bankfull Width (ft/ft)	2.0	2.9										
Meander Wave Length (ft)	207	313										
Meander Width Ratio	1.5	4.6										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4					
Channel Thalweg Length (ft)	1,444		1,444		1,444		1,444					
Sinuosity (ft)	1.22											
Water Surface Slope (ft/ft)	0.0049		0.0049		0.0050		0.0049					
Bankfull Slope (ft/ft)	0.0051		0.0043		0.0045		0.0048					
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.22/0.48/2.0/88/147/362		0.22/3.4/22/81/123/362		0.13/0.38/11/789/180/1024		0.35/7.45/16/90/128/180					
% of Reach with Eroding Banks	0%		0%		1%		3%					

Table 13b. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 2a

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	29.1	30.7	29.3	31.3	28.5	31.0	26.0	28.1				
Floodprone Width (ft)	>200		>200		>200		>200					
Bankfull Mean Depth	1.6	1.9	1.6	1.8	1.8	1.9	1.8	2.0				
Bankfull Max Depth	2.6	3.9	2.6	3.6	2.9	3.5	3.4	3.5				
Bankfull Cross-sectional Area (ft^2)	46.6	56.9	46.4	56.7	49.8	58.2	46.6	56.9				
Width/Depth Ratio	16.6	18.1	17.2	18.5	16.2	16.5	13.9	14.5				
Entrenchment Ratio	>6.5	>6.9	>6.4	>6.8	>6.5	>7.0	>7.1	>7.7				
Bank Height Ratio	1.0		1.0		1.0		1.1					
D50 (mm)	87.6		72.4		75.9		85.0					
Profile												
Riffle Length (ft)	38	68	19	49	27	55	26	54				
Riffle Slope (ft/ft)	0.0101	0.0274	0.0112	0.0471	0.0143	0.0280	0.0139	0.0300				
Pool Length (ft)	39	109	39	145	66	186	84	178				
Pool Max Depth (ft)	4.7	5.8	4.3	6.6	4.0	6.7	4.3	6.0				
Pool Spacing (ft)	132	206	78	206	121	279	57	263				
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	48	108										
Radius of Curvature (ft)	63	77										
Rc:Bankfull Width (ft/ft)	2.2	2.5										
Meander Wave Length (ft)	288	337										
Meander Width Ratio	1.6	3.5										
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4					
Channel Thalweg Length (ft)	1,083		1,083		1,083		1,083					
Sinuosity (ft)	1.24											
Water Surface Slope (ft/ft)	0.0072		0.0073		0.0075		0.0074					
Bankfull Slope (ft/ft)	0.0074		0.0059		0.0067		0.0070					
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.22/1.0/38/112/161/256		0.29/11/36/90/157/1024		0.21/12.5/523/121/168/1024		0.32/6.7/49.8/136/274/512					
% of Reach with Eroding Banks	0%		0%		2%		3%					

Table 13c. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 2b

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	28.7	31.9	29.8	30.7	29.3	29.4	26.9	29.7				
Floodprone Width (ft)	>200		>200		>200		>200					
Bankfull Mean Depth	2.0	2.1	2.0	2.1	2.0	2.1	2.2					
Bankfull Max Depth	3.1	3.4	3.2	3.6	3.0	3.4	3.5	3.9				
Bankfull Cross-sectional Area (ft^2)	58.8	64.2	61.2	62.3	59.8	60.2	58.8	64.2				
Width/Depth Ratio	14.0	15.9	14.5	15.2	14.2	14.4	12.3	13.7				
Entrenchment Ratio	>6.3	>7	>6.5	>6.7	>6.8	>6.9	>6.7	>7.4				
Bank Height Ratio	1.0		1.0		1.0		1.0	1.1				
D50 (mm)	47.4		72		70.2		62.1					
Profile												
Riffle Length (ft)	30	132	26	102	26	44	35	59				
Riffle Slope (ft/ft)	0.0055	0.0236	0.0169	0.0254	0.0116	0.0177	0.0040	0.0133				
Pool Length (ft)	41	99	55	153	26	149	24	152				
Pool Max Depth (ft)	2.6	5.4	3.8	6.3	3.7	5.0	3.6	5.5				
Pool Spacing (ft)	88	190	12	129	8	175	69	162				
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	89											
Radius of Curvature (ft)	82	124										
Rc:Bankfull Width (ft/ft)	2.9	3.9										
Meander Wave Length (ft)	334	329										
Meander Width Ratio	3.1											
Additional Reach Parameters												
Rosgen Classification	C4		C4		C4		C4					
Channel Thalweg Length (ft)	493		493		493		493					
Sinuosity (ft)	1.04											
Water Surface Slope (ft/ft)	0.0118		0.0101		0.0082		0.0105					
Bankfull Slope (ft/ft)	0.0101		0.0107		0.0103		0.0102					
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.38/22/47/122/209/362		0.22/10/29/111/171/362		0.3/8.0/29.0/107.3/180/362		0.71/5.6/28/93/152/512					
% of Reach with Eroding Banks	0%		0%		0%		3%					

Table 13d. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2 Reach 1 Lower

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	8.1		8.4		8.6		8.2					
Floodprone Width (ft)	28.4		30.0		30.0		30.4					
Bankfull Mean Depth	0.6		0.7		0.6		0.6					
Bankfull Max Depth	1.0		1.3		1.2		1.3					
Bankfull Cross-sectional Area (ft^2)	5.1		5.7		5.4		5.1					
Width/Depth Ratio	13.0		12.5		13.9		13.2					
Entrenchment Ratio	3.5		3.6		3.5		3.7					
Bank Height Ratio	1.0		1.0		0.9		1.1					
D50 (mm)	56.9		39.8		38.7		43.8					
Profile												
Riffle Length (ft)	11	25	13	39	5	24	6	20				
Riffle Slope (ft/ft)	0.0360	0.0853	0.0136	0.0730	0.0253	0.0793	0.0109	0.0624				
Pool Length (ft)	5	22	2	15	4	17	5	21				
Pool Max Depth (ft)	1.9	5.0	1.0	2.9	2.0	3.8	1.1	3.5				
Pool Spacing (ft)	7	34	8	52	6	53	6	34				
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	---											
Radius of Curvature (ft)	---											
Rc:Bankfull Width (ft/ft)	---											
Meander Wave Length (ft)	---											
Meander Width Ratio	---											
Additional Reach Parameters												
Rosgen Classification	B4a		B4a		B4a		B4a					
Channel Thalweg Length (ft)	433		433		433		433					
Sinuosity (ft)	1.05											
Water Surface Slope (ft/ft)	0.0560		0.0477		0.0481		0.0475					
Bankfull Slope (ft/ft)	0.0563		0.0483		0.0485		0.0455					
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.25/11/28/96/143/256		6.1/14/23/75/153/256		0.7/11/28/76/118/256		1.2/18/37/113/180/362					
% of Reach with Eroding Banks	0%		6%		2%		1%					

Table 13e. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2 Reach 2

Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	8.9	12.8	8.0	12.9	6.9	13.6	8.1	12.6				
Floodprone Width (ft)	21.5	>200	23.2	>200	23.5	>200	21.0	>200				
Bankfull Mean Depth	0.5	0.9	0.5	0.9	0.4	0.9	0.5	1.0				
Bankfull Max Depth	1.1	2.1	0.8	1.8	0.6	1.9	0.9	2.1				
Bankfull Cross-sectional Area (ft^2)	4.2	12.0	5.0	12.0	2.8	12.0	4.2	12.0				
Width/Depth Ratio	13.6	20.1	9.7	19.9	13.0	17.1	13.2	19.2				
Entrenchment Ratio	2.0	>22.4	2.9	>20.0	2.5	>28.9	2.0	>24.6				
Bank Height Ratio	1.0		1.0		0.9	1.2	0.9	1.1				
D50 (mm)	44	53	15	90	34.5	34.8	45.0	48.2				
Profile												
Riffle Length (ft)	17	29	10	36	5	62	4	68				
Riffle Slope (ft/ft)	0.0262	0.0575	0.0141	0.0658	0.0093	0.0773	0.0122	0.1161				
Pool Length (ft)	13	46	4	40	6	35	4	39				
Pool Max Depth (ft)	1.6	3.2	1.5	3.8	1.1	4.6	1.9	4.8				
Pool Spacing (ft)	24	98	8	113	10	207	7	156				
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	61	66										
Radius of Curvature (ft)	19	63										
Rc:Bankfull Width (ft/ft)	2.1	4.9										
Meander Wave Length (ft)	105	135										
Meander Width Ratio	7	5										
Additional Reach Parameters												
Rosgen Classification	C4b		C4b		C4b		C4b					
Channel Thalweg Length (ft)	1,318		1,318		1,318		1,318					
Sinuosity (ft)	1.2											
Water Surface Slope (ft/ft)	0.0231		0.0225		0.0235		0.0237					
Bankfull Slope (ft/ft)	0.0237		0.0214		0.0245		0.0247					
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.25/11/28/96/143/256		6.1/14/23/75/153/256		0.7/11/28/76/118/256		1.2/18/37/113/180/362					
% of Reach with Eroding Banks	0%		0%		4%		7%					

Table 13f. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

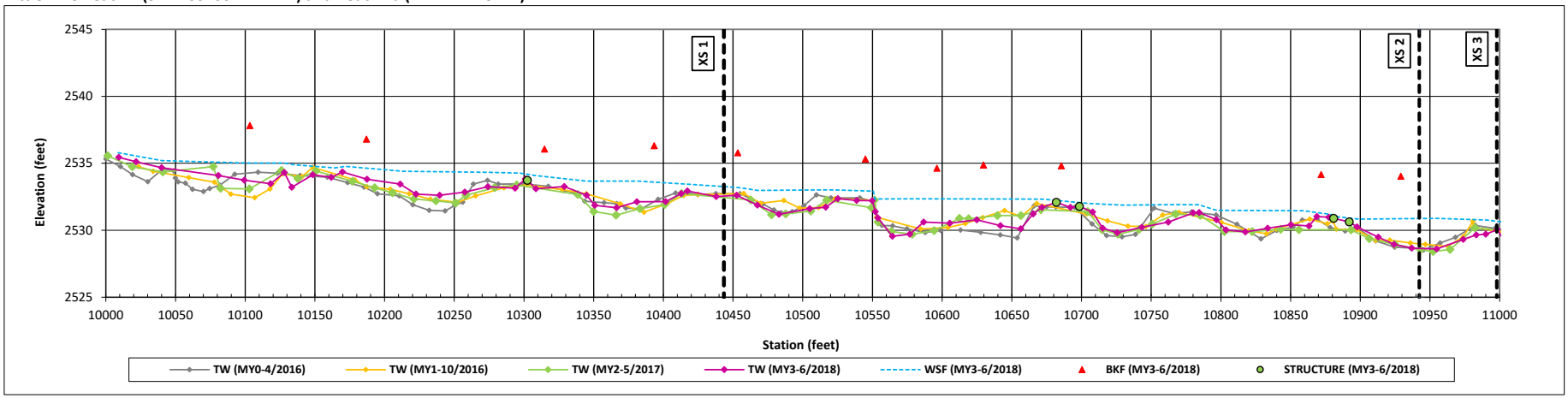
UT2b

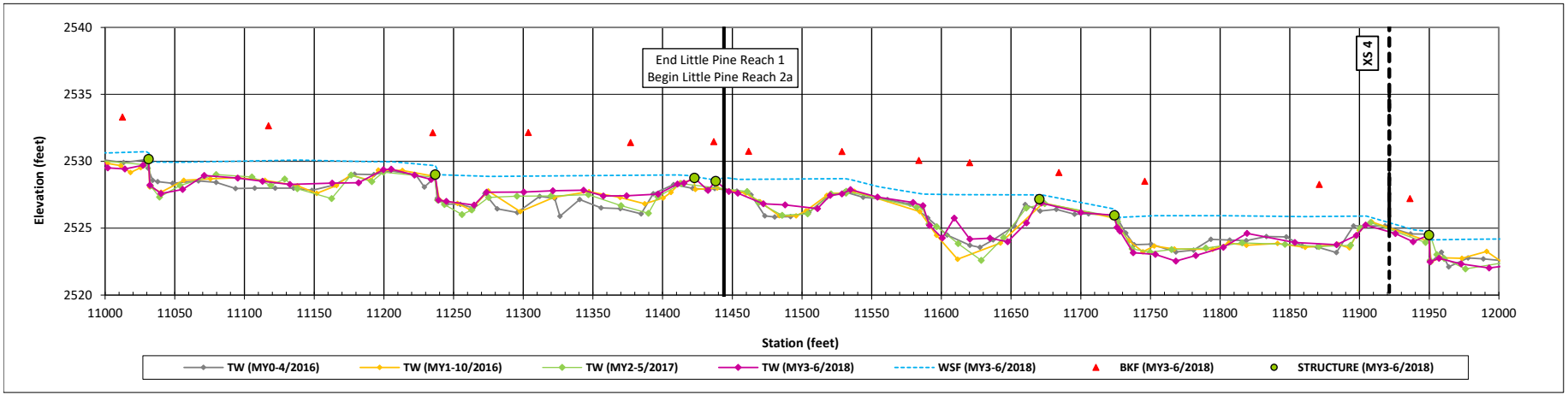
Parameter	As-Built/Baseline		MY-1		MY-2		MY-3		MY-4		MY-5	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	6.7		6.3		6.6		6.6					
Floodprone Width (ft)	15.9		17.7		17.9		16.3					
Bankfull Mean Depth	0.5		0.7		0.7		0.6					
Bankfull Max Depth	0.9		1.1		1.1		0.9					
Bankfull Cross-sectional Area (ft^2)	3.7		4.3		4.5		3.7					
Width/Depth Ratio	12.2		9.1		9.6		11.6					
Entrenchment Ratio	2.4		2.8		2.7		2.5					
Bank Height Ratio	1.0		1.0		0.9		0.9					
D50 (mm)	43		36		32		24					
Profile												
Riffle Length (ft)	4	23	7	24	7	25	6	32				
Riffle Slope (ft/ft)	0.0448	0.0659	0.0276	0.0451	0.0127	0.0702	0.0125	0.0494				
Pool Length (ft)	3	14	3	8	4	15	3	11				
Pool Max Depth (ft)	0.6	2.1	2.0	3.9	0.8	3.8	0.9	4.0				
Pool Spacing (ft)	3	33	4	30	3	30	2	32				
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	---											
Radius of Curvature (ft)	---											
Rc:Bankfull Width (ft/ft)	---											
Meander Wave Length (ft)	---											
Meander Width Ratio	---											
Additional Reach Parameters												
Rosgen Classification	B4a		B4a		B4a		B4a					
Channel Thalweg Length (ft)	253		253		253		253					
Sinuosity (ft)	1.10											
Water Surface Slope (ft/ft)	0.0616		0.0614		0.0557		0.0608					
Bankfull Slope (ft/ft)	0.0536		0.0608		0.0612		0.0612					
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	0.78/29/42/85/123/180		0.28/7.4/23/82/128/362		0.5/13/26/87/143/256		0.50/6.7/14/100/161/256					
% of Reach with Eroding Banks	0%		0%		0%		0%					

Longitudinal Profile Plots

Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 1 (STA 100+00 - 114+44) and Reach 2a (114+44-125+27)





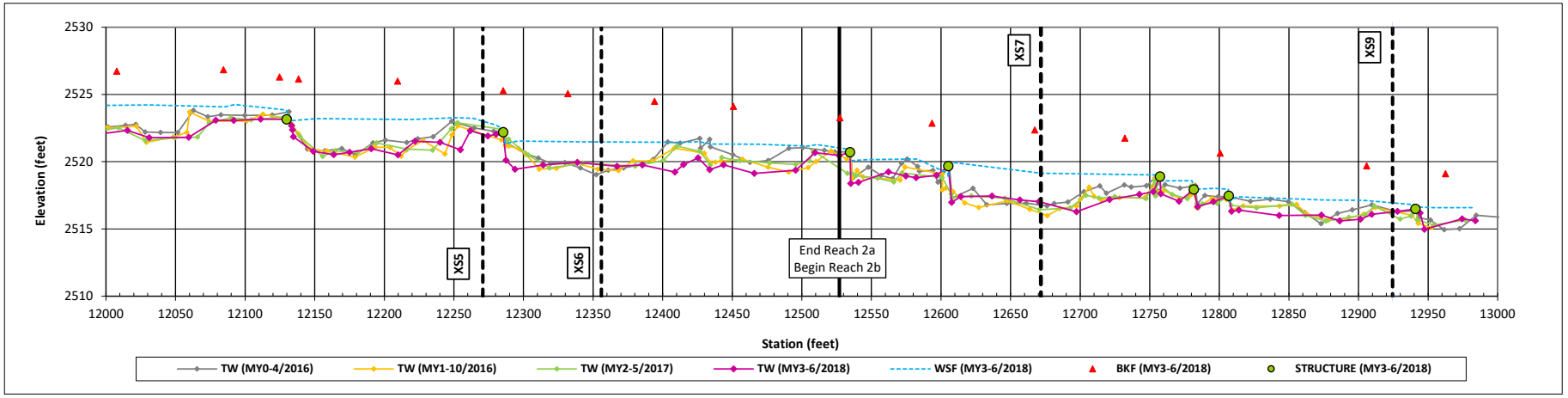
Longitudinal Profile Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Little Pine Reach 2a (114+44-125+27) and Reach 2b (125+27-130+20)



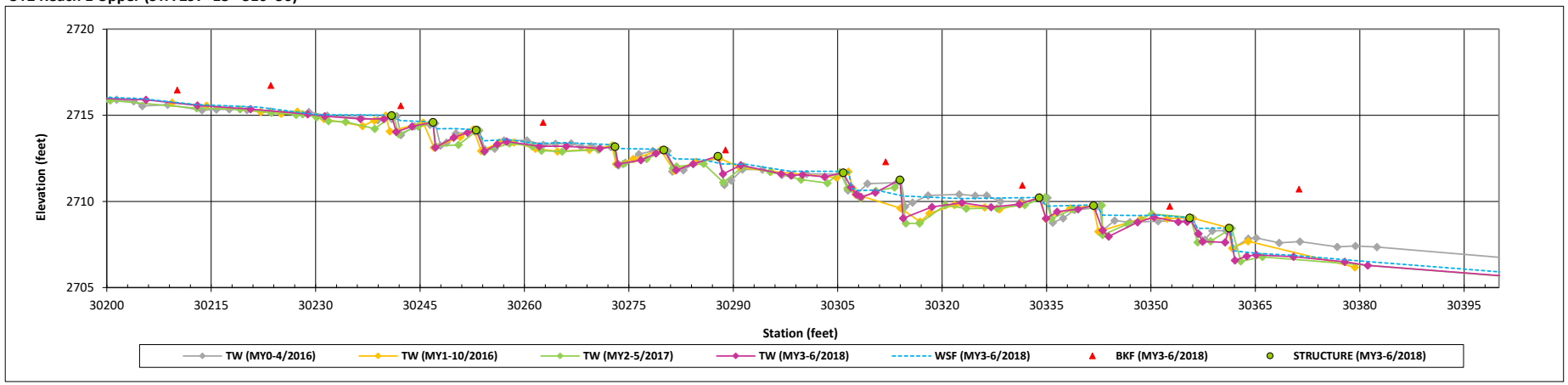
Longitudinal Profile Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 3 - 2018

UT2 Reach 1 Upper (STA 297+18 - 310+56)



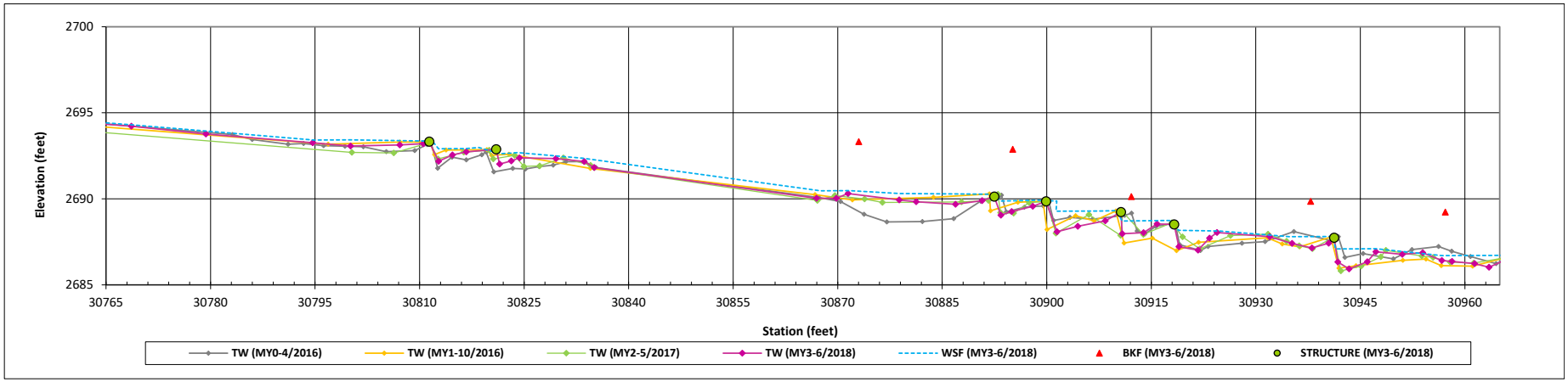
Longitudinal Profile Plots

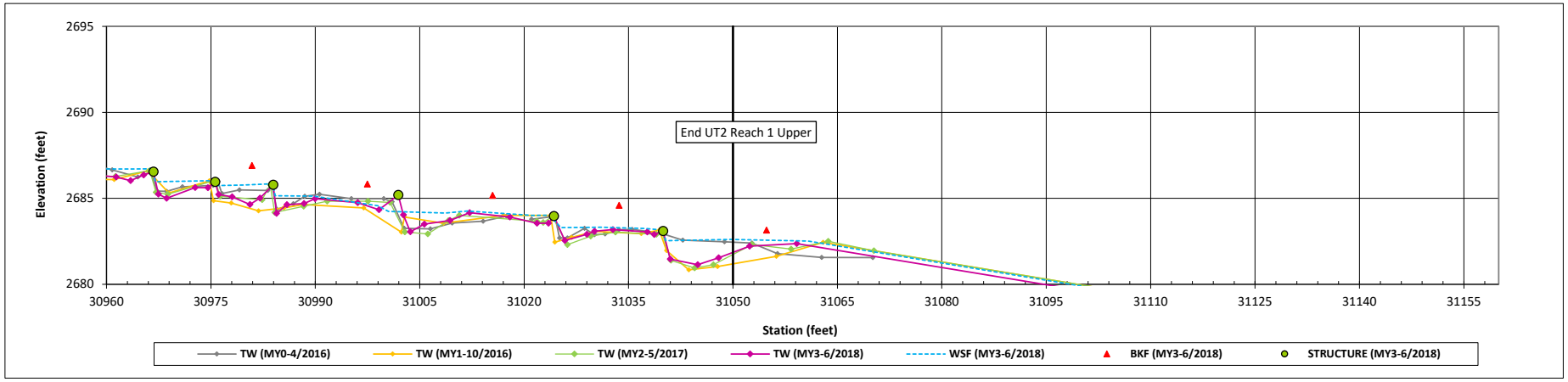
Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 3 - 2018

UT2 Reach 1 Upper (STA 297+18 - 310+56)





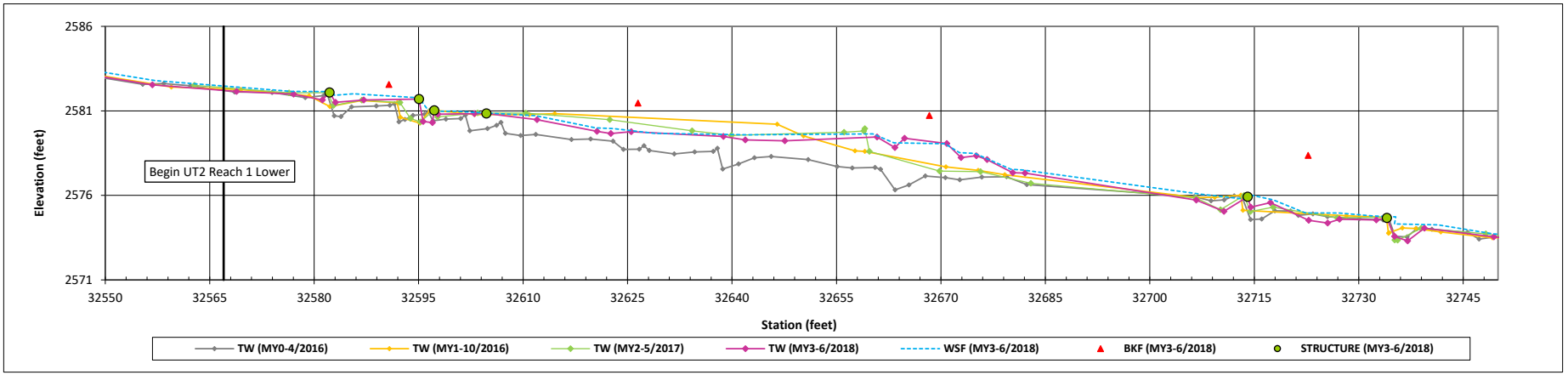
Longitudinal Profile Plots

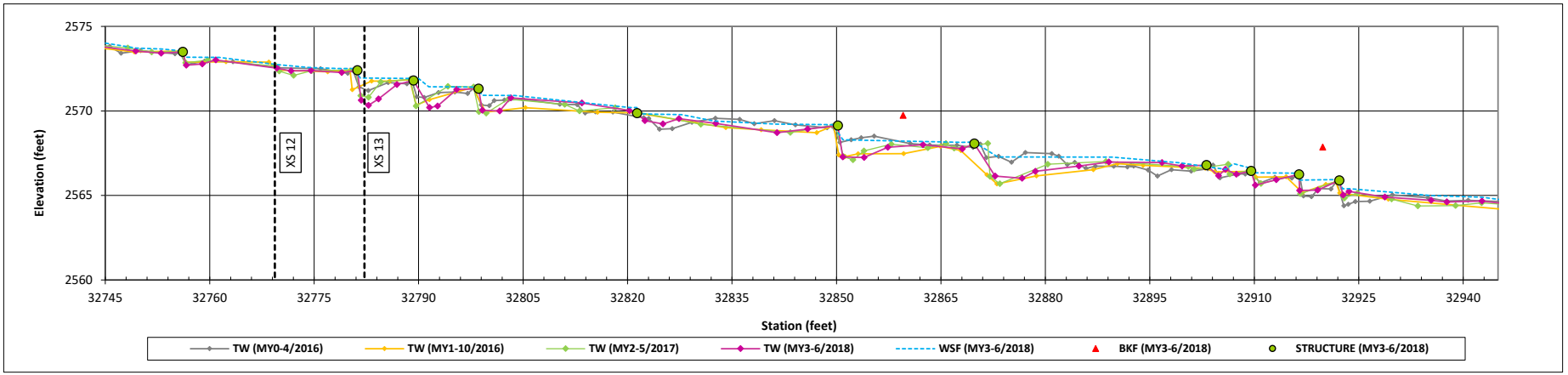
Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 3 - 2018

UT2 Reach 1 Lower (STA 325+67 - 330+00)





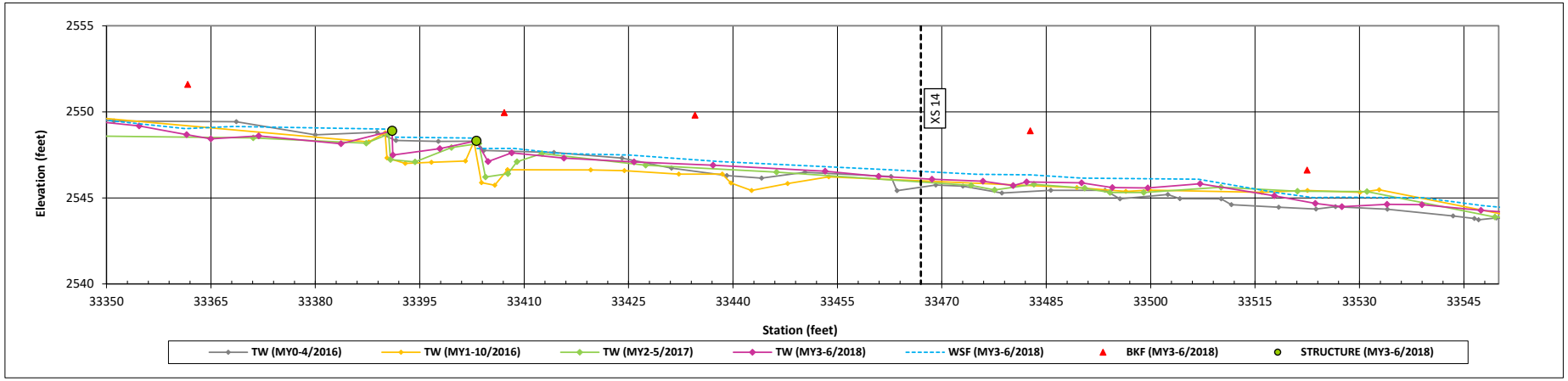
Longitudinal Profile Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 3 - 2018

UT2 Reach 2 (STA 330+00 - 343+18)



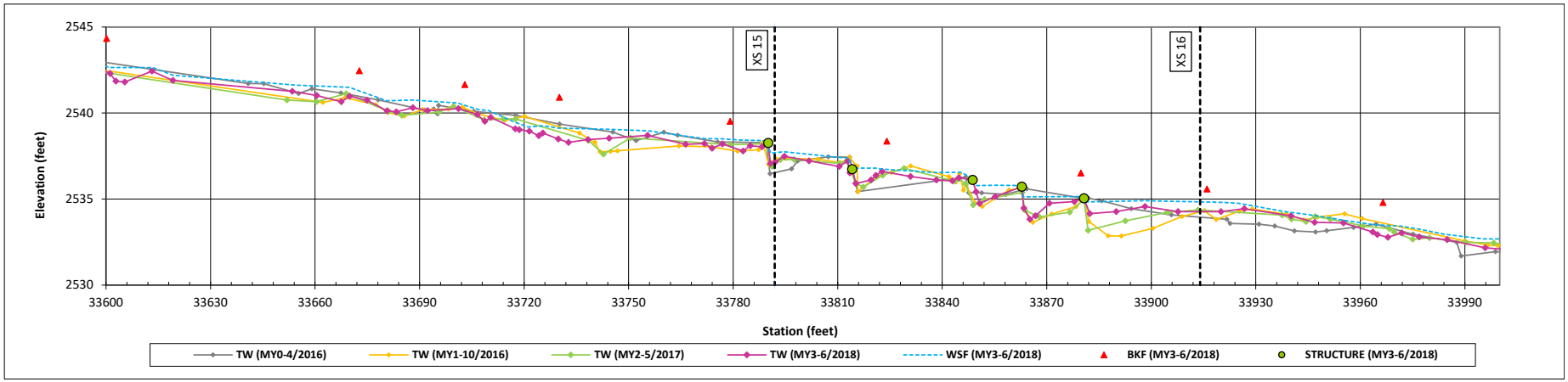
Longitudinal Profile Plots

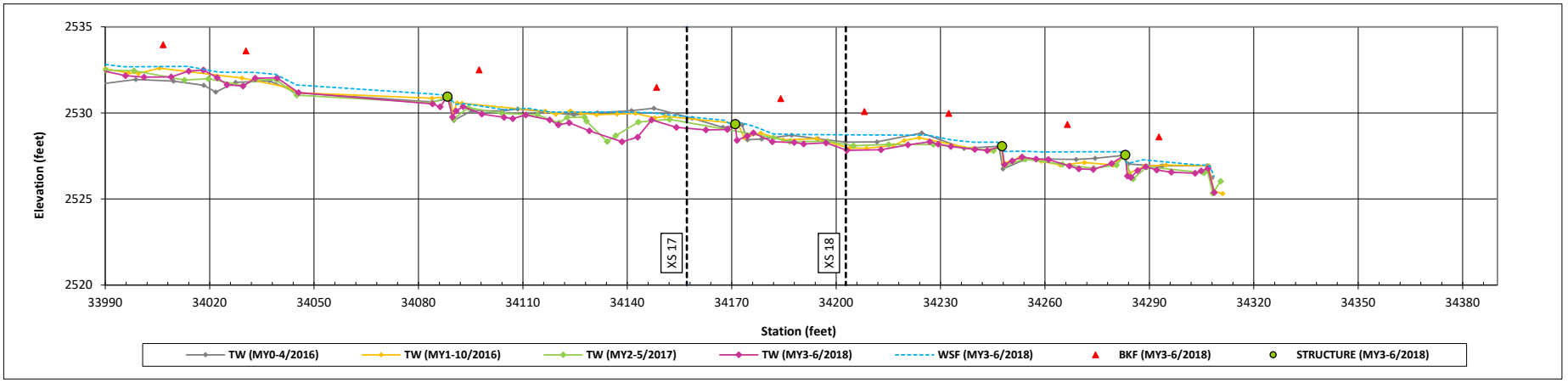
Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 3 - 2018

UT2 Reach 2 (STA 330+00 - 343+18)





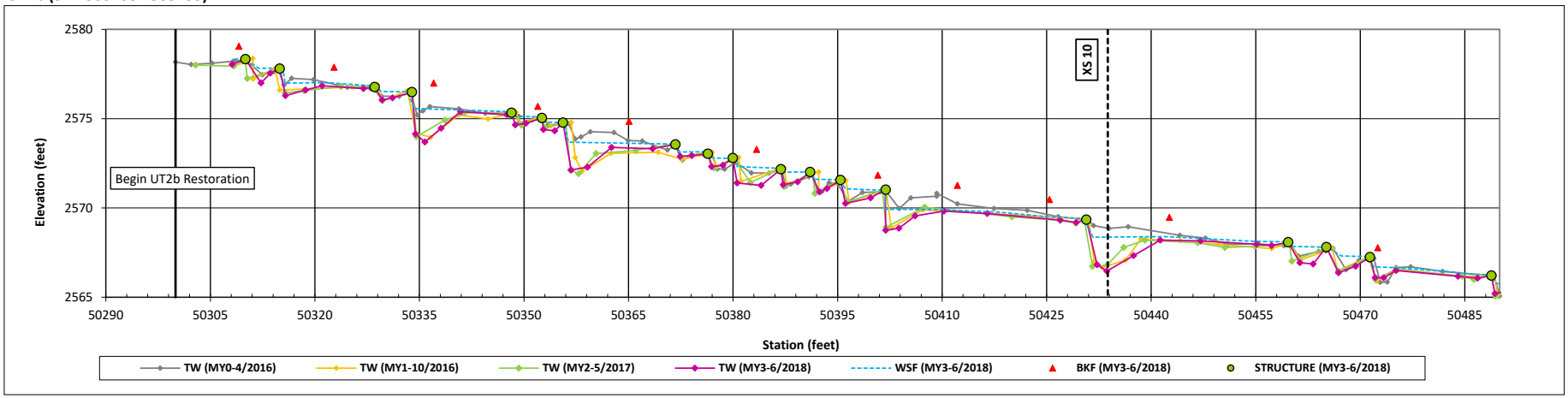
Longitudinal Profile Plots

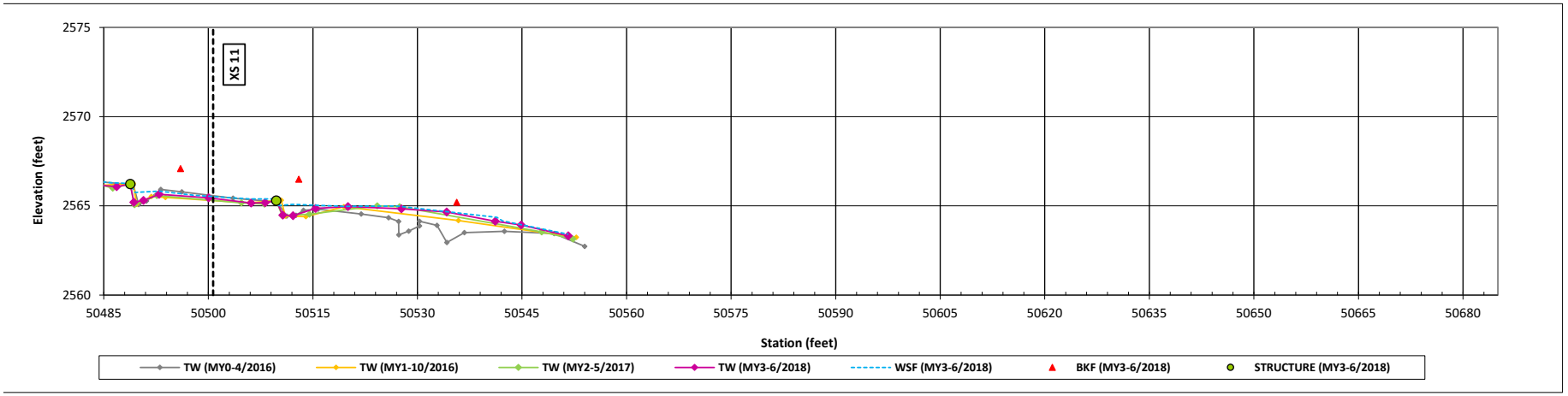
Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

UT2b (STA 503+00 - 505+53)





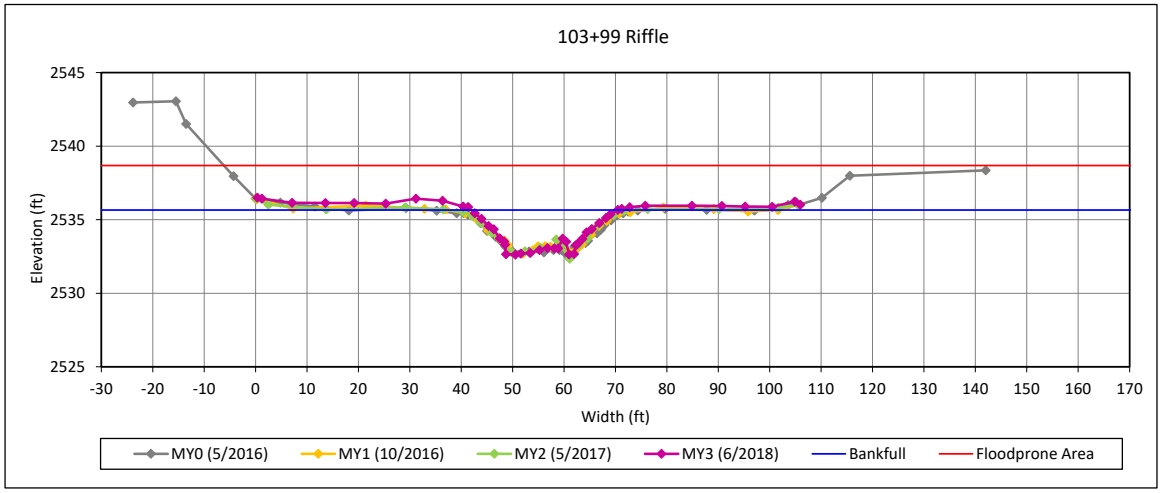
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 1- Little Pine Reach 1



Bankfull Dimensions	
53.5	x-section area (ft.sq.)
28.4	width (ft)
1.9	mean depth (ft)
3.0	max depth (ft)
30.8	wetted perimeter (ft)
1.7	hydraulic radius (ft)
15.1	width-depth ratio
135.1	W flood prone area (ft)
4.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 06/2018

Field Crew: Wildlands Engineering

View Downstream

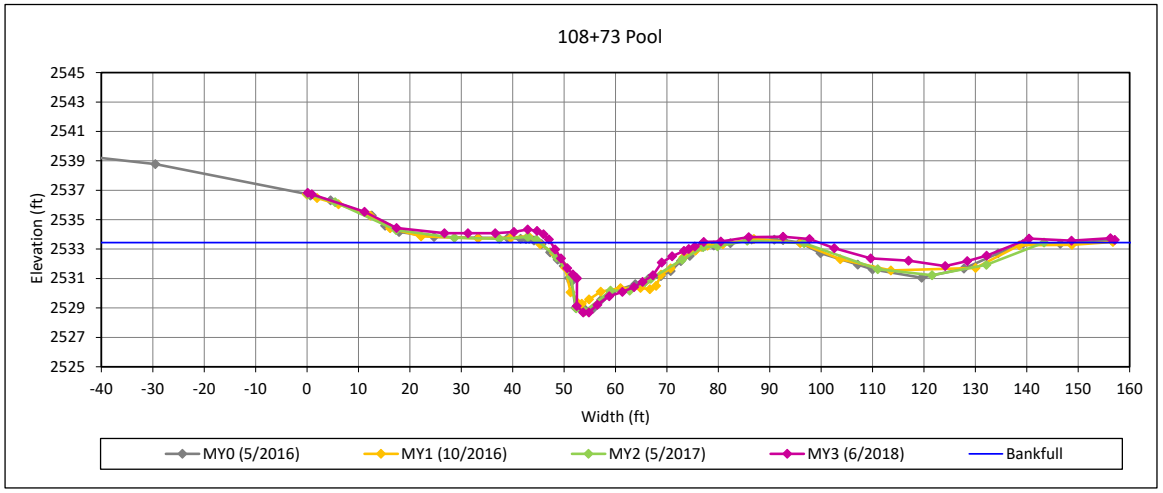
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 2- Little Pine Reach 1



Bankfull Dimensions	
68.0	x-section area (ft.sq.)
29.5	width (ft)
2.3	mean depth (ft)
4.7	max depth (ft)
32.6	wetted perimeter (ft)
2.1	hydraulic radius (ft)
12.8	width-depth ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

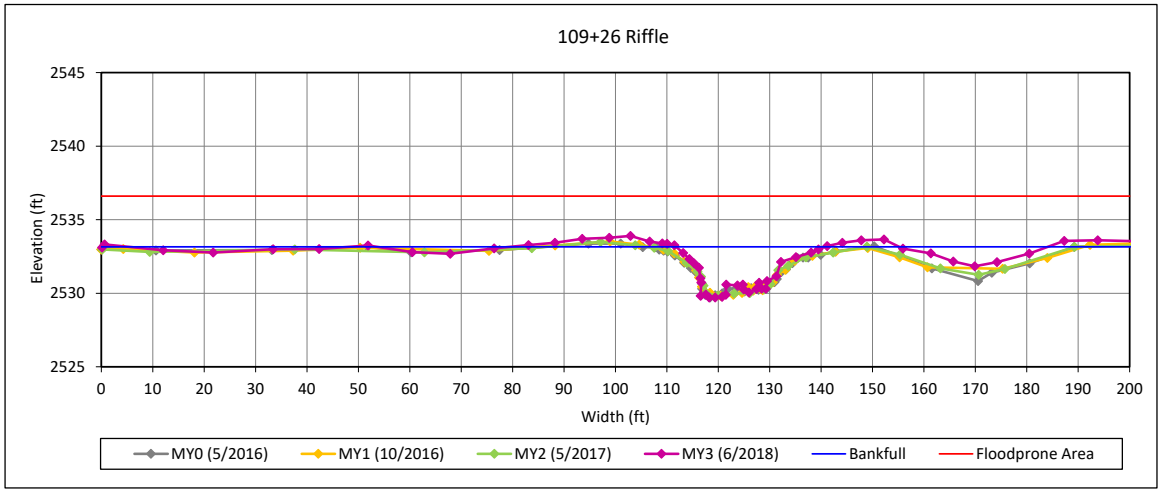
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 3- Little Pine Reach 1



Bankfull Dimensions	
52.2	x-section area (ft.sq.)
29.0	width (ft)
1.8	mean depth (ft)
3.4	max depth (ft)
33.0	wetted perimeter (ft)
1.6	hydraulic radius (ft)
16.1	width-depth ratio
200.0	W flood prone area (ft)
6.9	entrenchment ratio
0.9	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

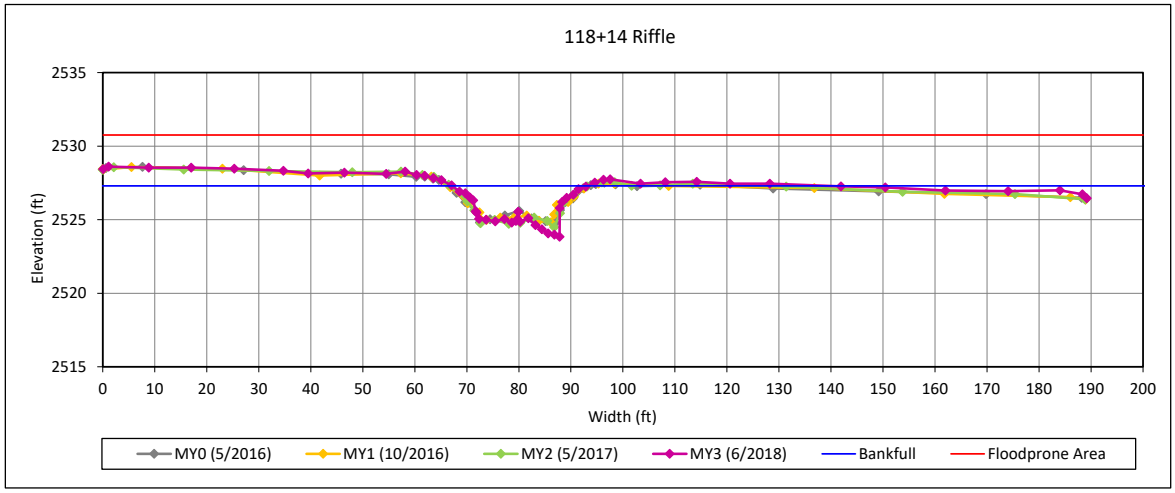
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 4 - Little Pine Reach 2a



Bankfull Dimensions	
46.6	x-section area (ft.sq.)
26.0	width (ft)
1.8	mean depth (ft)
3.5	max depth (ft)
29.9	wetted perimeter (ft)
1.6	hydraulic radius (ft)
14.5	width-depth ratio
200	W flood prone area (ft)
7.7	entrenchment ratio
1.1	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

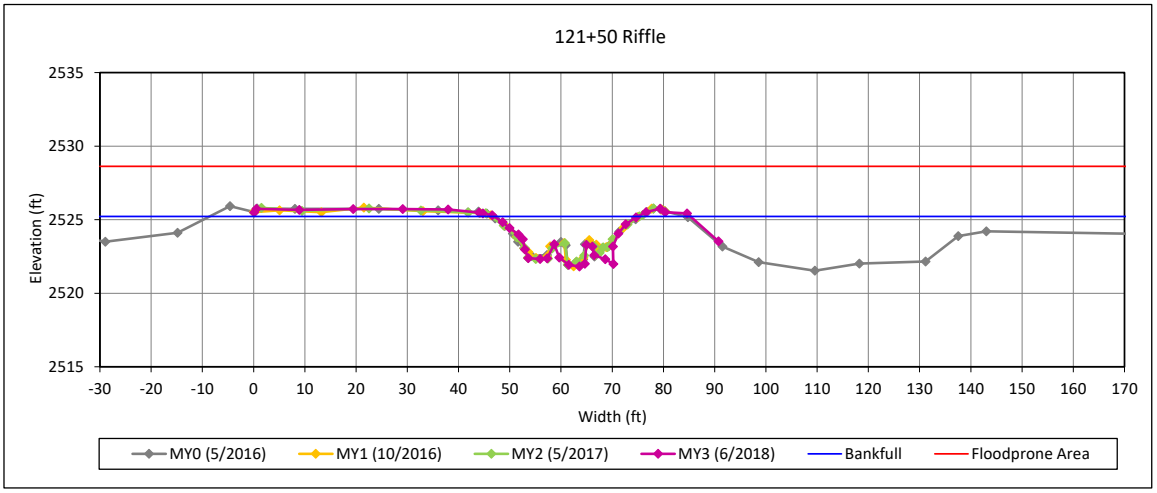
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 5- Little Pine Reach 2a



Bankfull Dimensions	
56.9	x-section area (ft.sq.)
28.1	width (ft)
2.0	mean depth (ft)
3.4	max depth (ft)
32.9	wetted perimeter (ft)
1.7	hydraulic radius (ft)
13.9	width-depth ratio
200.0	W flood prone area (ft)
7.1	entrenchment ratio
1.1	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

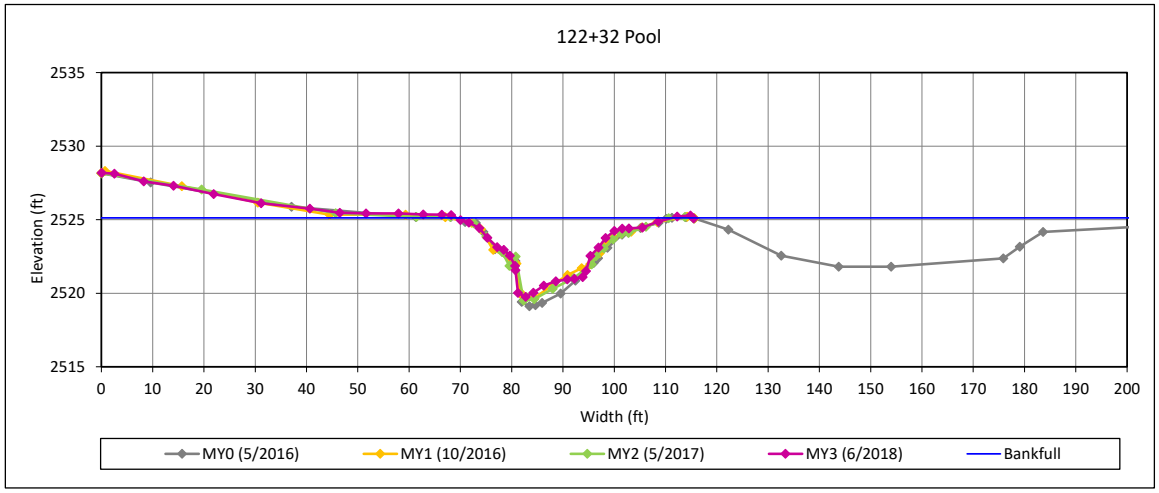
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 6- Little Pine Reach 2a



Bankfull Dimensions	
93.4	x-section area (ft.sq.)
39.4	width (ft)
2.4	mean depth (ft)
5.4	max depth (ft)
42.4	wetted perimeter (ft)
2.2	hydraulic radius (ft)
16.6	width-depth ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

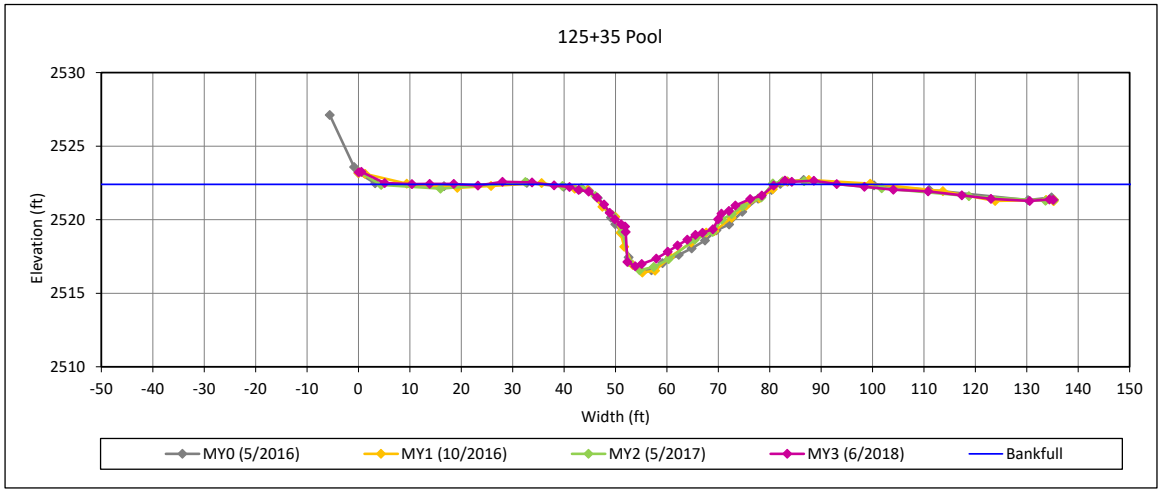
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 7 - Little Pine Reach 2b



Bankfull Dimensions	
103.7	x-section area (ft.sq.)
40.2	width (ft)
2.6	mean depth (ft)
5.6	max depth (ft)
43.4	wetted perimeter (ft)
2.4	hydraulic radius (ft)
15.6	width-depth ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

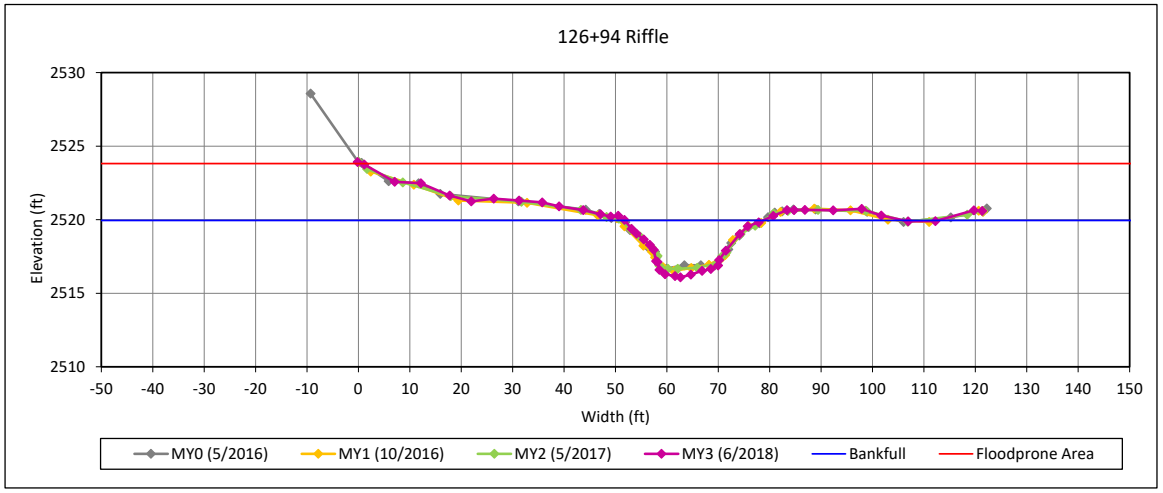
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 8 - Little Pine Reach 2b



Bankfull Dimensions	
58.8	x-section area (ft.sq.)
26.9	width (ft)
2.2	mean depth (ft)
3.9	max depth (ft)
28.8	wetted perimeter (ft)
2.0	hydraulic radius (ft)
12.3	width-depth ratio
200.0	W flood prone area (ft)
7.4	entrenchment ratio
1.1	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

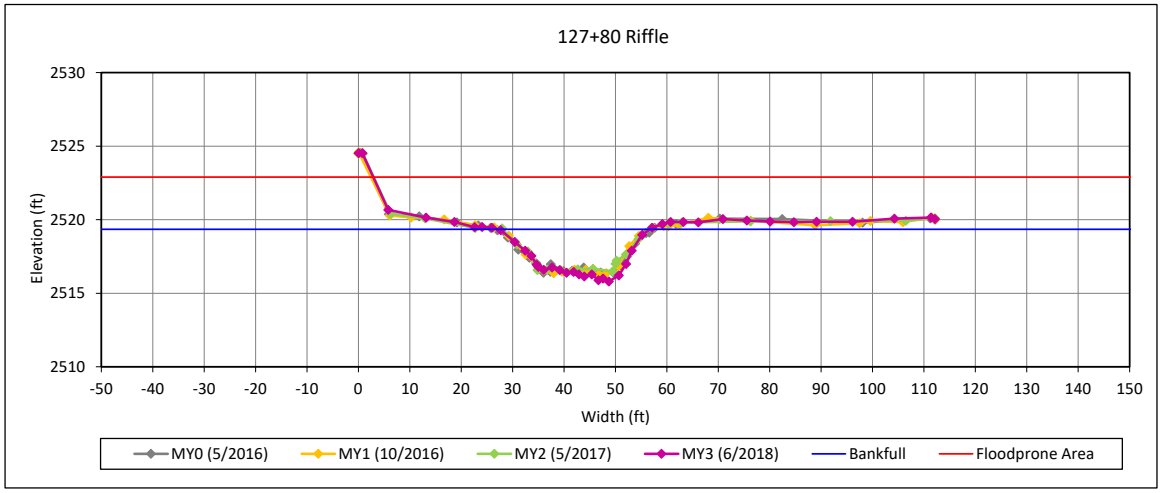
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 9 - Little Pine Reach 2b



Bankfull Dimensions	
64.2	x-section area (ft.sq.)
29.7	width (ft)
2.2	mean depth (ft)
3.5	max depth (ft)
31.2	wetted perimeter (ft)
2.1	hydraulic radius (ft)
13.7	width-depth ratio
200.0	W flood prone area (ft)
6.7	entrenchment ratio
1.0	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

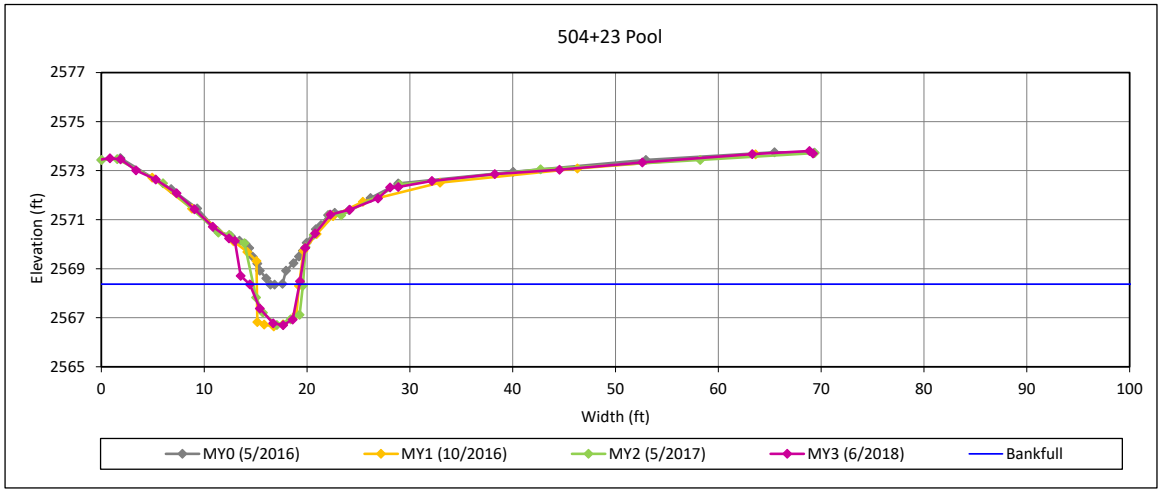
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 10 - UT2b



Bankfull Dimensions	
5.7	x-section area (ft.sq.)
4.8	width (ft)
1.2	mean depth (ft)
1.7	max depth (ft)
6.3	wetted perimeter (ft)
0.9	hydraulic radius (ft)
4.1	width-depth ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

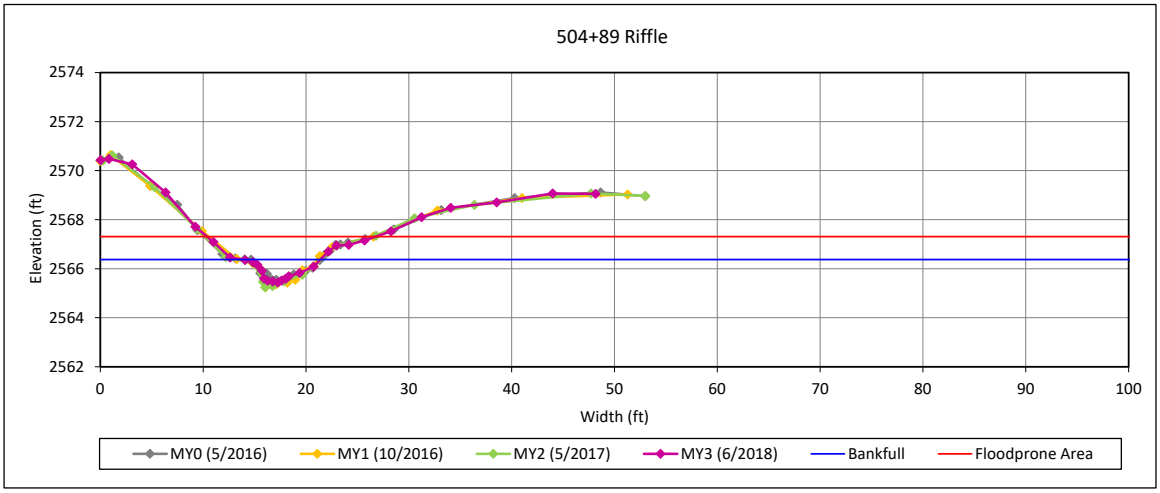
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 11 - UT2b



Bankfull Dimensions	
3.7	x-section area (ft.sq.)
6.6	width (ft)
0.6	mean depth (ft)
0.9	max depth (ft)
6.9	wetted perimeter (ft)
0.5	hydraulic radius (ft)
11.6	width-depth ratio
16.3	W flood prone area (ft)
2.5	entrenchment ratio
0.9	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

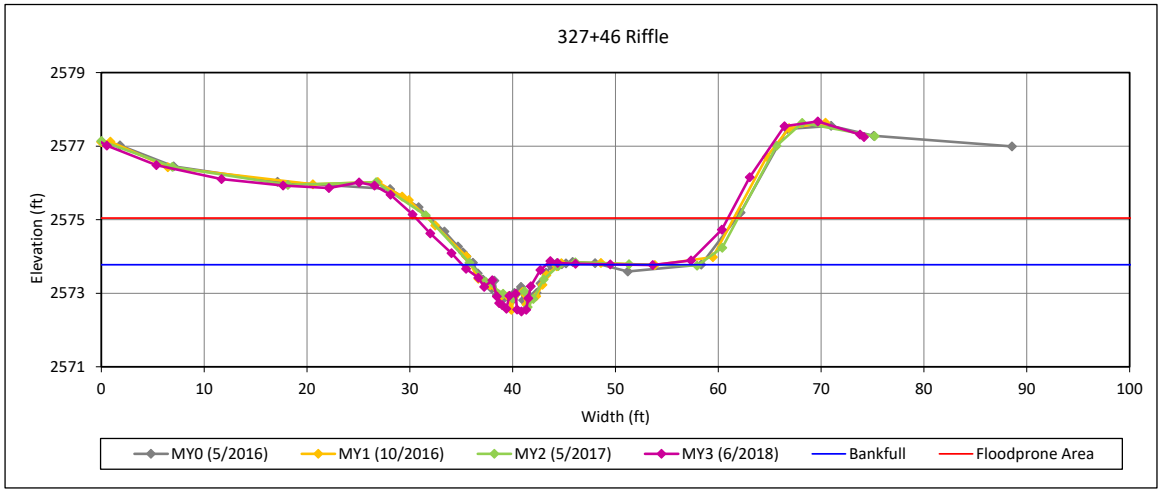
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 12 - UT2



Bankfull Dimensions	
5.1	x-section area (ft.sq.)
8.2	width (ft)
0.6	mean depth (ft)
1.3	max depth (ft)
9.5	wetted perimeter (ft)
0.5	hydraulic radius (ft)
13.2	width-depth ratio
30.4	W flood prone area (ft)
3.7	entrenchment ratio
1.1	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

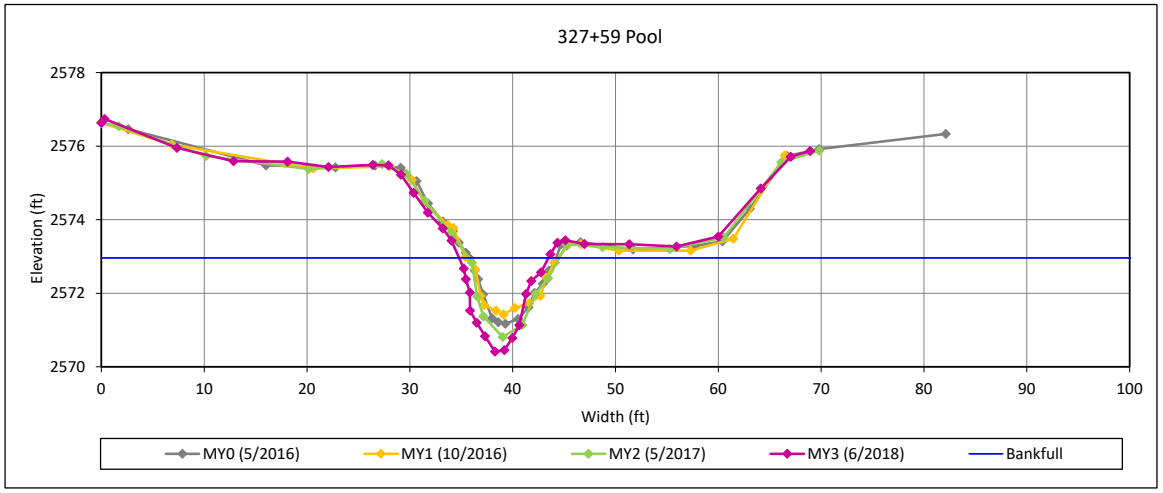
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 13 - UT2



Bankfull Dimensions	
12.8	x-section area (ft.sq.)
8.7	width (ft)
1.5	mean depth (ft)
2.6	max depth (ft)
10.6	wetted perimeter (ft)
1.2	hydraulic radius (ft)
5.9	width-depth ratio

Survey Date: 06/2018

Field Crew: Wildlands Engineering

View Downstream

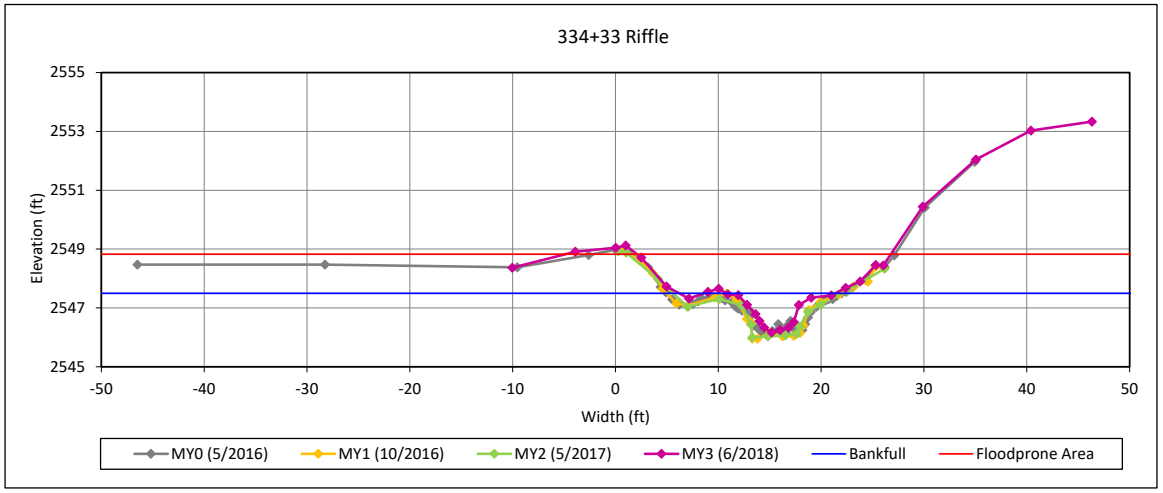
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 14 - UT2



Bankfull Dimensions	
5.9	x-section area (ft.sq.)
10.6	width (ft)
0.6	mean depth (ft)
1.3	max depth (ft)
11.3	wetted perimeter (ft)
0.5	hydraulic radius (ft)
19.2	width-depth ratio
21.0	W flood prone area (ft)
2.0	entrenchment ratio
0.9	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

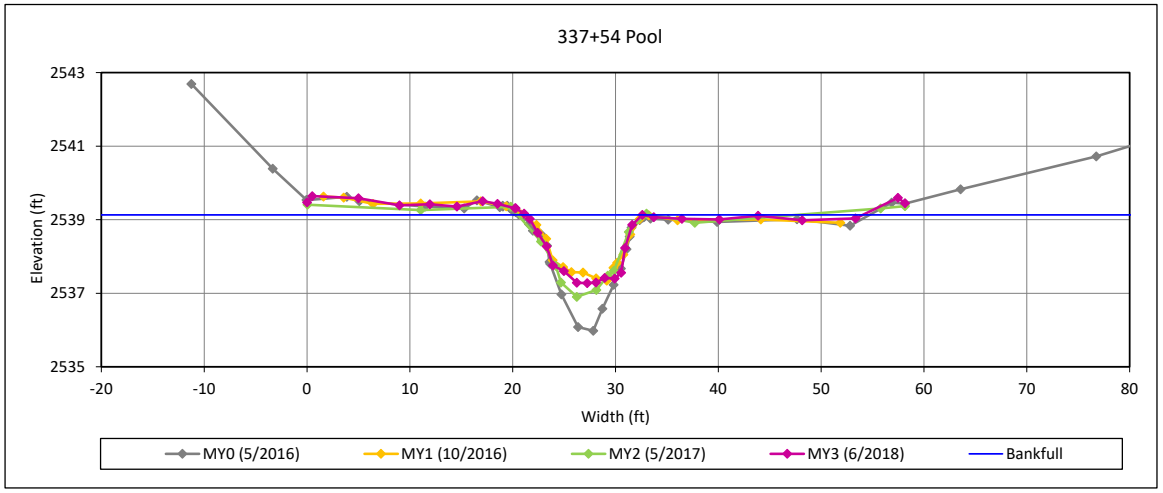
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 15 - UT2



Bankfull Dimensions	
13.9	x-section area (ft.sq.)
11.4	width (ft)
1.2	mean depth (ft)
1.9	max depth (ft)
12.5	wetted perimeter (ft)
1.1	hydraulic radius (ft)
9.3	width-depth ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

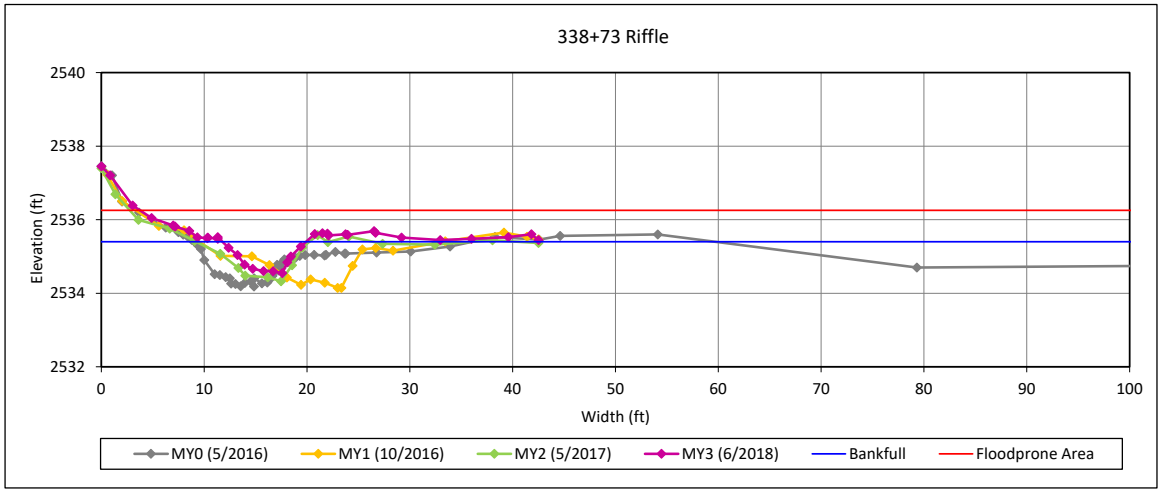
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 16 - UT2



Bankfull Dimensions	
4.2	x-section area (ft.sq.)
8.1	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
8.4	wetted perimeter (ft)
0.5	hydraulic radius (ft)
15.6	width-depth ratio
200.0	W flood prone area (ft)
24.6	entrenchment ratio
1.1	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

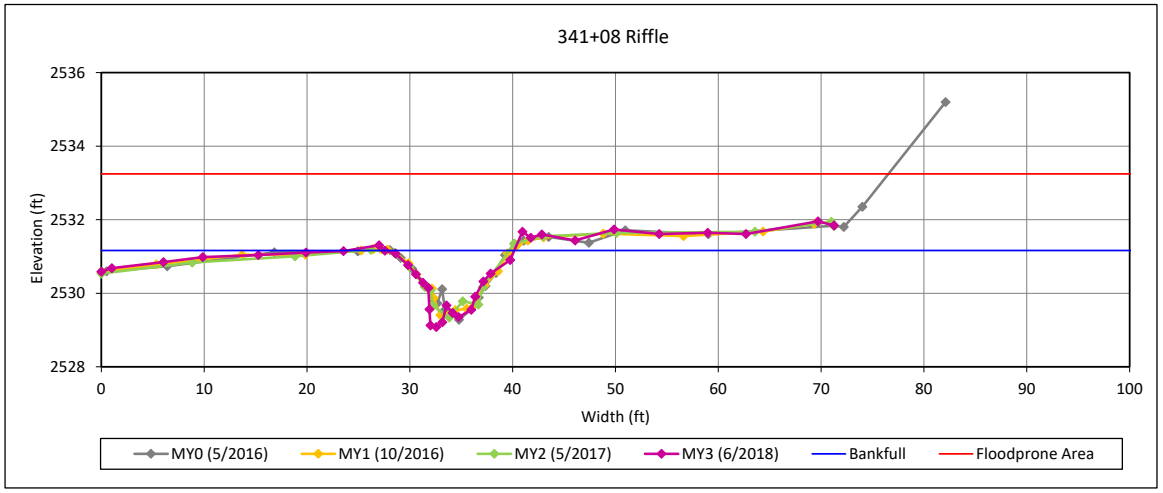
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 17 - UT2



Bankfull Dimensions	
12.0	x-section area (ft.sq.)
12.6	width (ft)
1.0	mean depth (ft)
2.1	max depth (ft)
14.2	wetted perimeter (ft)
0.8	hydraulic radius (ft)
13.2	width-depth ratio
200.0	W flood prone area (ft)
15.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

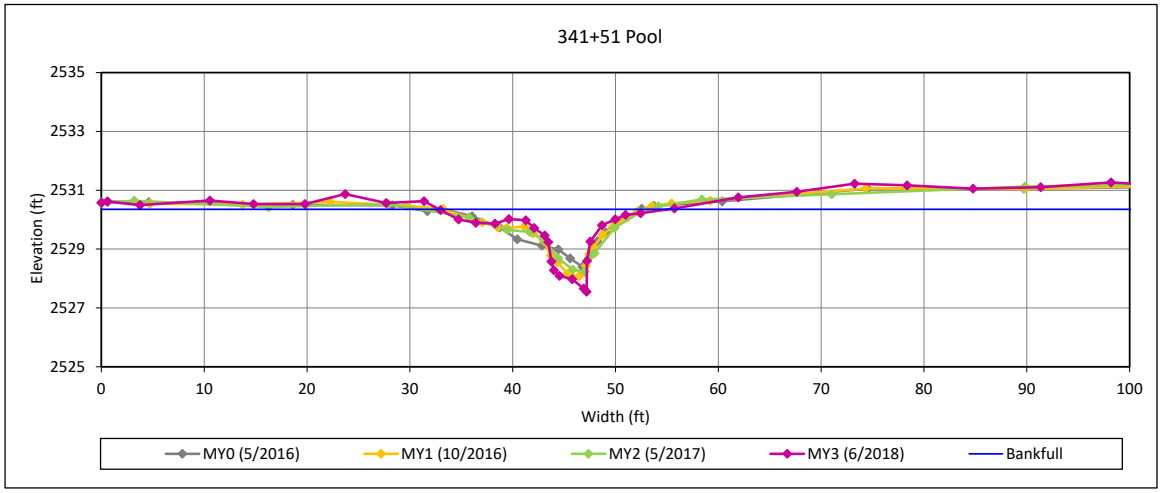
Cross-Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018

Cross-Section 18 - UT2



Bankfull Dimensions	
15.8	x-section area (ft.sq.)
22.3	width (ft)
0.7	mean depth (ft)
2.8	max depth (ft)
24.7	wetted perimeter (ft)
0.6	hydraulic radius (ft)
31.6	width-depth ratio

Survey Date: 6/2018

Field Crew: Wildlands Engineering

View Downstream

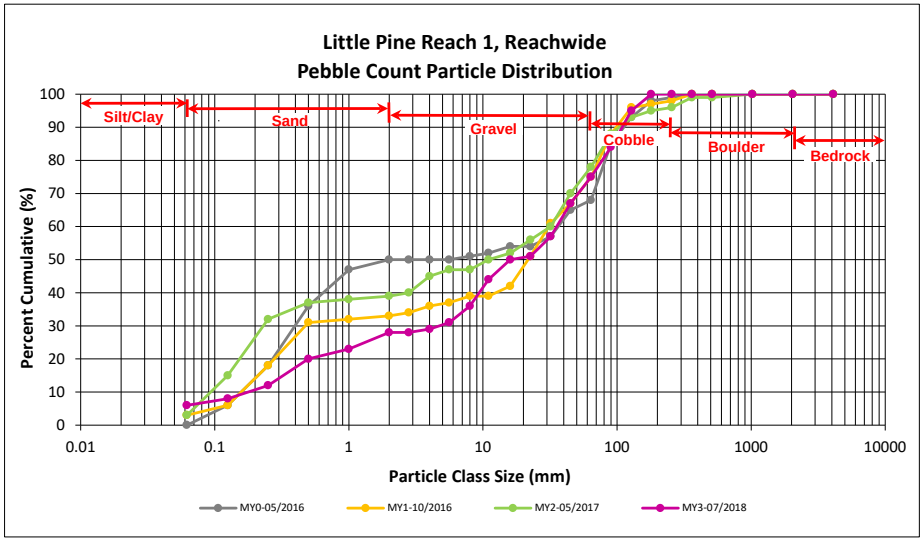
Reachwide and Cross-Section Pebble Count Plots

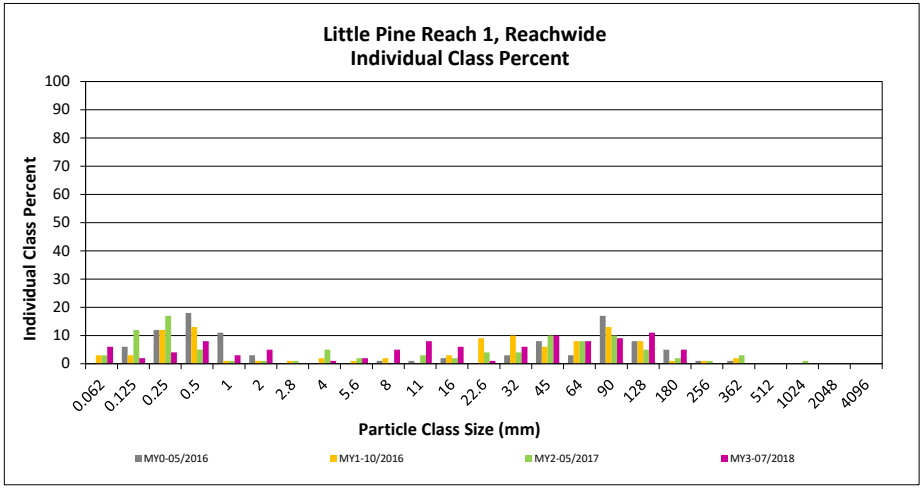
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine 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		6	6	6	6
SAND	Very fine	0.062	0.125		2	2	2	8
	Fine	0.125	0.250		4	4	4	12
	Medium	0.25	0.50		8	8	8	20
	Coarse	0.5	1.0		3	3	3	23
	Very Coarse	1.0	2.0		5	5	5	28
GRAVEL	Very Fine	2.0	2.8					28
	Very Fine	2.8	4.0	1		1	1	29
	Fine	4.0	5.6		2	2	2	31
	Fine	5.6	8.0	1	4	5	5	36
	Medium	8.0	11.0	2	6	8	8	44
	Medium	11.0	16.0	3	3	6	6	50
	Coarse	16.0	22.6	1		1	1	51
	Coarse	22.6	32	5	1	6	6	57
	Very Coarse	32	45	9	1	10	10	67
	Very Coarse	45	64	6	2	8	8	75
COBBLE	Small	64	90	7	2	9	9	84
	Small	90	128	10	1	11	11	95
	Large	128	180	5		5	5	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.35
D_{35} =	7.45
D_{50} =	16.0
D_{84} =	90.0
D_{95} =	128.0
D_{100} =	180.0





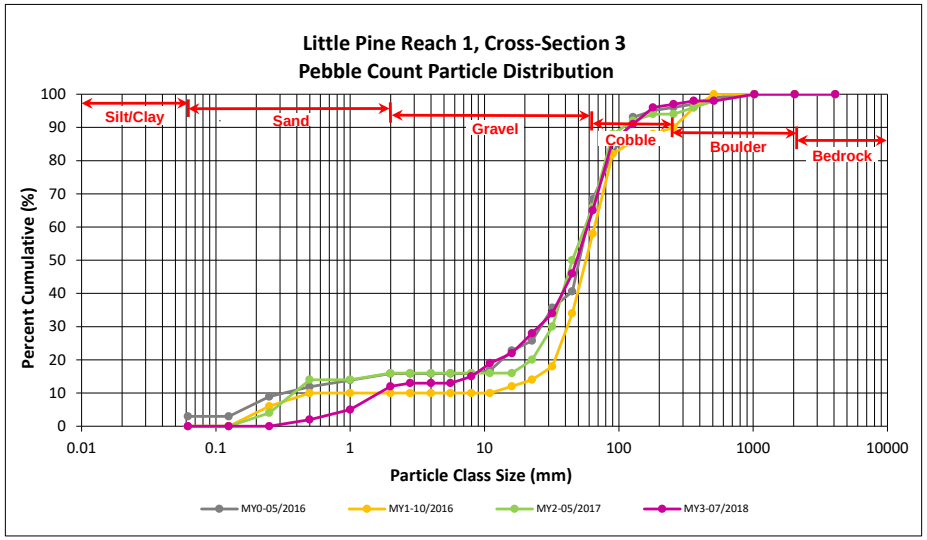
Reachwide and Cross-Section Pebble Count Plots

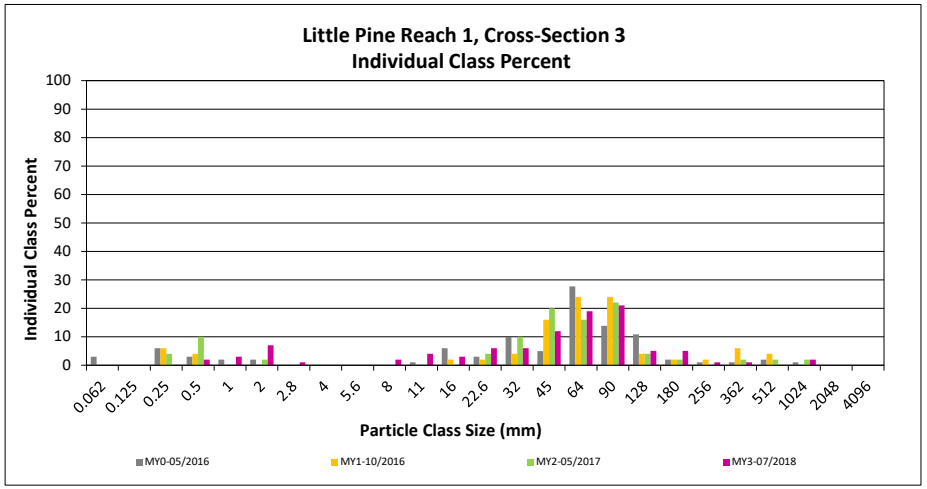
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 1, Cross-Section 3

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary Class Percentage	Summary Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	2	2	2
	Coarse	0.5	1.0	3	3	5
	Very Coarse	1.0	2.0	7	7	12
GRAVEL	Very Fine	2.0	2.8	1	1	13
	Very Fine	2.8	4.0			13
	Fine	4.0	5.6			13
	Fine	5.6	8.0	2	2	15
	Medium	8.0	11.0	4	4	19
	Medium	11.0	16.0	3	3	22
	Coarse	16.0	22.6	6	6	28
	Coarse	22.6	32	6	6	34
	Very Coarse	32	45	12	12	46
	Very Coarse	45	64	19	19	65
COBBLE	Small	64	90	21	21	86
	Small	90	128	5	5	91
	Large	128	180	5	5	96
	Large	180	256	1	1	97
BOULDER	Small	256	362	1	1	98
	Small	362	512			98
	Medium	512	1024	2	2	100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 3	
Channel materials (mm)	
D_{16} =	8.66
D_{35} =	32.92
D_{50} =	48.5
D_{84} =	87.1
D_{95} =	168.1
D_{100} =	1024.0





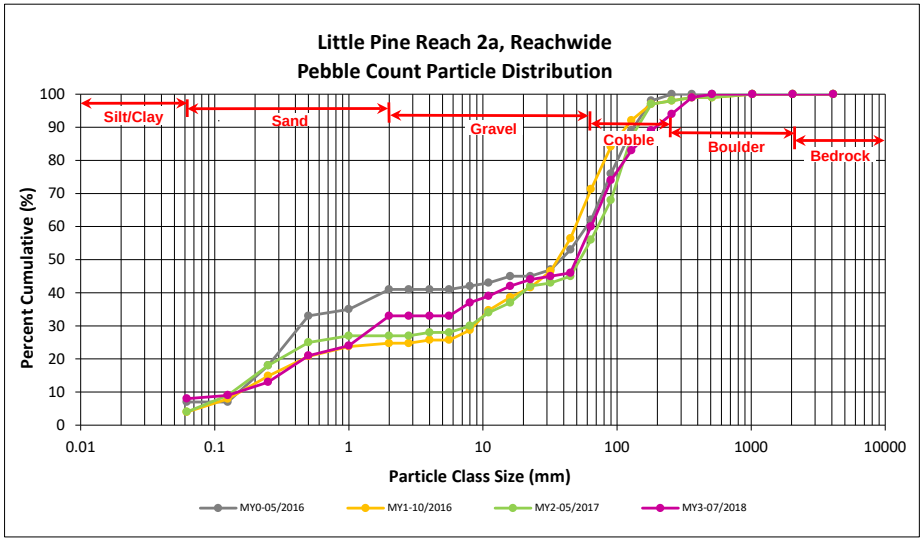
Reachwide and Cross-Section Pebble Count Plots

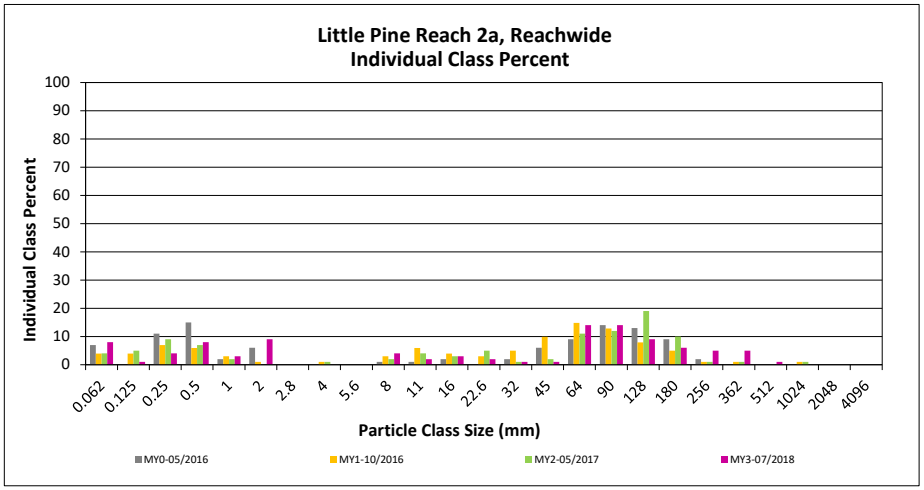
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 2a, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		8	8	8	8
SAND	Very fine	0.062	0.125		1	1	1	9
	Fine	0.125	0.250		4	4	4	13
	Medium	0.25	0.50		8	8	8	21
	Coarse	0.5	1.0		3	3	3	24
	Very Coarse	1.0	2.0	3	6	9	9	33
GRAVEL	Very Fine	2.0	2.8					33
	Very Fine	2.8	4.0					33
	Fine	4.0	5.6					33
	Fine	5.6	8.0	1	3	4	4	37
	Medium	8.0	11.0		2	2	2	39
	Medium	11.0	16.0	1	2	3	3	42
	Coarse	16.0	22.6	1	1	2	2	44
	Coarse	22.6	32	1		1	1	45
	Very Coarse	32	45	1		1	1	46
	Very Coarse	45	64	11	3	14	14	60
COBBLE	Small	64	90	9	5	14	14	74
	Small	90	128	8	1	9	9	83
	Large	128	180	6		6	6	89
	Large	180	256	4	1	5	5	94
BOULDER	Small	256	362	3	2	5	5	99
	Small	362	512	1		1	1	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.32
D_{35} =	6.69
D_{50} =	49.8
D_{84} =	135.5
D_{95} =	274.4
D_{100} =	512.0





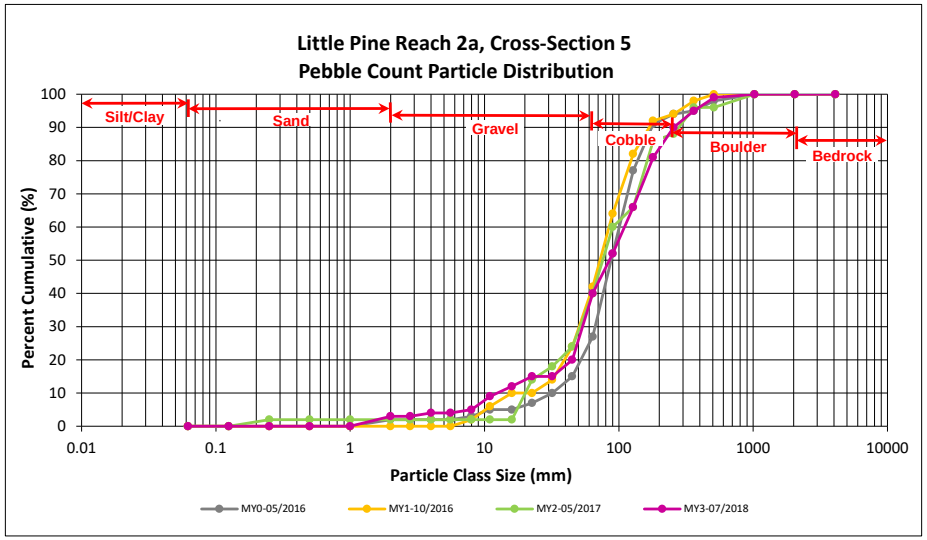
Reachwide and Cross-Section Pebble Count Plots

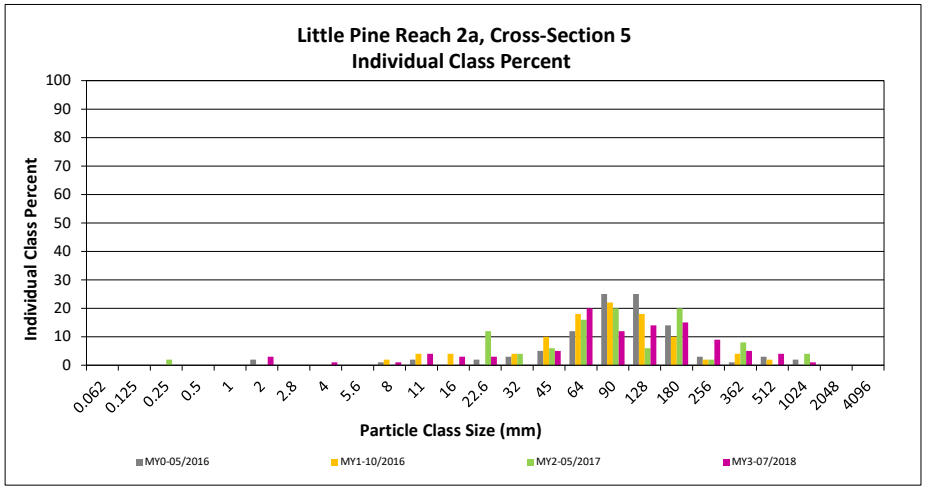
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 2a, Cross-Section 5

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary Class Percentage	Summary Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0	3	3	3
GRAVEL	Very Fine	2.0	2.8			3
	Very Fine	2.8	4.0	1	1	4
	Fine	4.0	5.6			4
	Fine	5.6	8.0	1	1	5
	Medium	8.0	11.0	4	4	9
	Medium	11.0	16.0	3	3	12
	Coarse	16.0	22.6	3	3	15
	Coarse	22.6	32			15
	Very Coarse	32	45	5	5	20
	Very Coarse	45	64	20	20	40
COBBLE	Small	64	90	12	12	52
	Small	90	128	14	14	66
	Large	128	180	15	15	81
	Large	180	256	9	9	90
BOULDER	Small	256	362	5	5	95
	Small	362	512	4	4	99
	Medium	512	1024	1	1	100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 5	
Channel materials (mm)	
D_{16} =	34.26
D_{35} =	58.61
D_{50} =	85.0
D_{84} =	202.4
D_{95} =	362.0
D_{100} =	1024.0





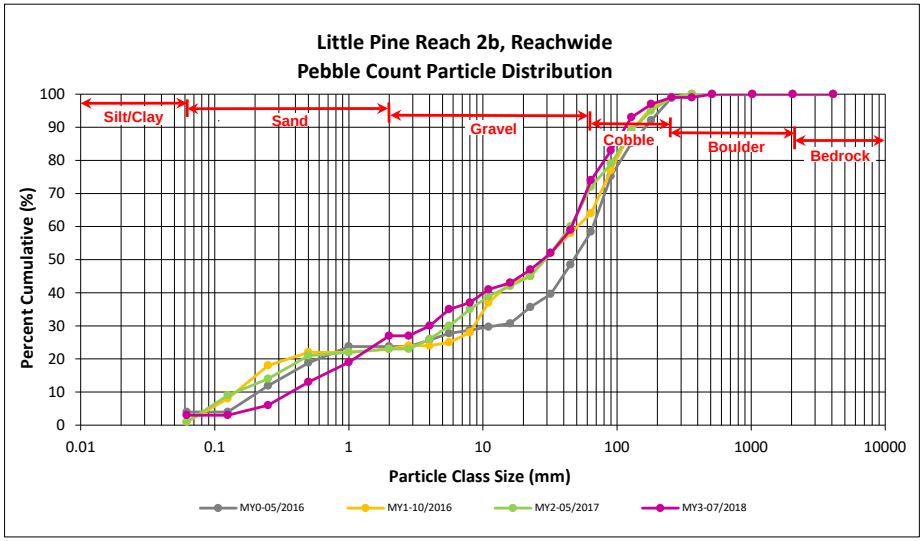
Reachwide and Cross-Section Pebble Count Plots

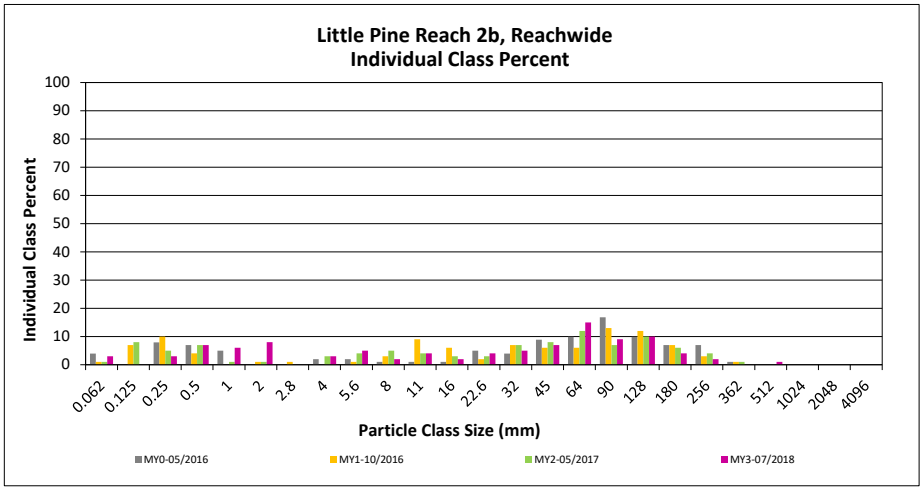
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 2b, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		3	3	3	3
SAND	Very fine	0.062	0.125					3
	Fine	0.125	0.250		3	3	3	6
	Medium	0.25	0.50		7	7	7	13
	Coarse	0.5	1.0		6	6	6	19
	Very Coarse	1.0	2.0	2	6	8	8	27
GRAVEL	Very Fine	2.0	2.8					27
	Very Fine	2.8	4.0	1	2	3	3	30
	Fine	4.0	5.6	2	3	5	5	35
	Fine	5.6	8.0		2	2	2	37
	Medium	8.0	11.0	1	3	4	4	41
	Medium	11.0	16.0		2	2	2	43
	Coarse	16.0	22.6	1	3	4	4	47
	Coarse	22.6	32	1	4	5	5	52
	Very Coarse	32	45	3	4	7	7	59
	Very Coarse	45	64	13	2	15	15	74
COBBLE	Small	64	90	5	4	9	9	83
	Small	90	128	8	2	10	10	93
	Large	128	180	2	2	4	4	97
	Large	180	256	1	1	2	2	99
BOULDER	Small	256	362					99
	Small	362	512		1	1	1	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	40	60	100	100	100

Reachwide	
Channel materials (mm)	
D_{16} =	0.71
D_{35} =	5.60
D_{50} =	27.8
D_{84} =	93.2
D_{95} =	151.8
D_{100} =	512.0





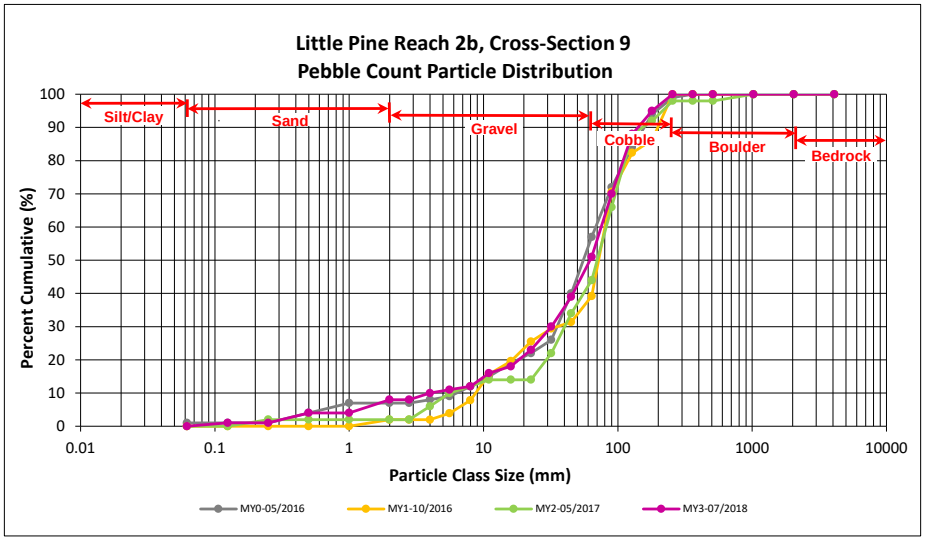
Reachwide and Cross-Section Pebble Count Plots

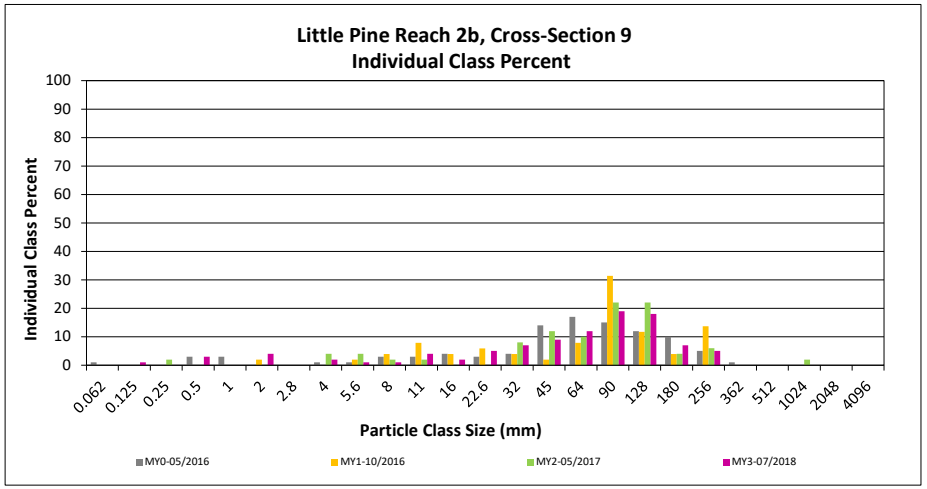
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Little Pine Reach 2b, Cross-Section 9

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125	1	1	1
	Fine	0.125	0.250			1
	Medium	0.25	0.50	3	3	4
	Coarse	0.5	1.0			4
	Very Coarse	1.0	2.0	4	4	8
GRAVEL	Very Fine	2.0	2.8			8
	Very Fine	2.8	4.0	2	2	10
	Fine	4.0	5.6	1	1	11
	Fine	5.6	8.0	1	1	12
	Medium	8.0	11.0	4	4	16
	Medium	11.0	16.0	2	2	18
	Coarse	16.0	22.6	5	5	23
	Coarse	22.6	32	7	7	30
	Very Coarse	32	45	9	9	39
	Very Coarse	45	64	12	12	51
COBBLE	Small	64	90	19	19	70
	Small	90	128	18	18	88
	Large	128	180	7	7	95
	Large	180	256	5	5	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 9	
Channel materials (mm)	
D_{16} =	11.00
D_{35} =	38.67
D_{50} =	62.1
D_{84} =	118.4
D_{95} =	180.0
D_{100} =	256.0





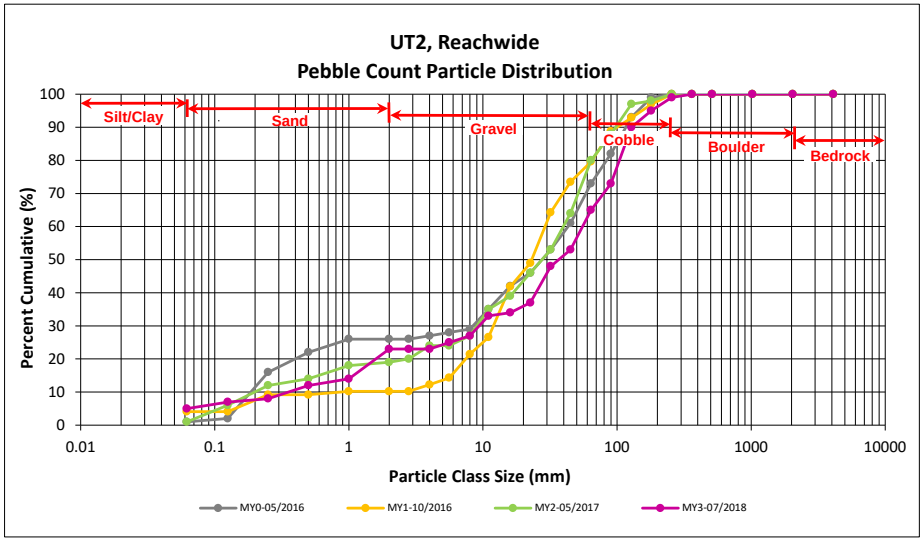
Reachwide and Cross-Section Pebble Count Plots

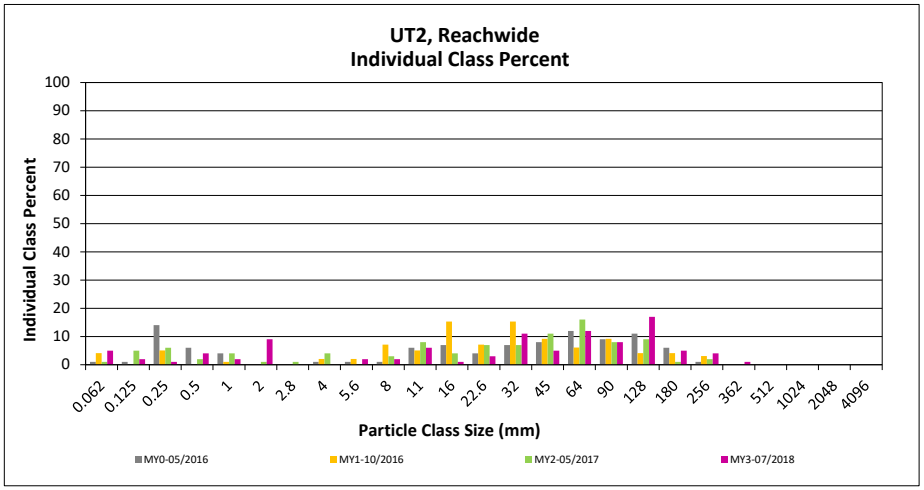
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		5	5	5	5
SAND	Very fine	0.062	0.125	1	1	2	2	7
	Fine	0.125	0.250		1	1	1	8
	Medium	0.25	0.50		4	4	4	12
	Coarse	0.5	1.0	1	1	2	2	14
	Very Coarse	1.0	2.0	5	4	9	9	23
GRAVEL	Very Fine	2.0	2.8					23
	Very Fine	2.8	4.0					23
	Fine	4.0	5.6	1	1	2	2	25
	Fine	5.6	8.0	2		2	2	27
	Medium	8.0	11.0	4	2	6	6	33
	Medium	11.0	16.0	1		1	1	34
	Coarse	16.0	22.6	2	1	3	3	37
	Coarse	22.6	32	8	3	11	11	48
	Very Coarse	32	45	3	2	5	5	53
	Very Coarse	45	64	11	1	12	12	65
COBBLE	Small	64	90	7	1	8	8	73
	Small	90	128	15	2	17	17	90
	Large	128	180	4	1	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
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**70**	**30**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	1.2
D_{35} =	18.0
D_{50} =	36.7
D_{84} =	113.0
D_{95} =	180.0
D_{100} =	362.0





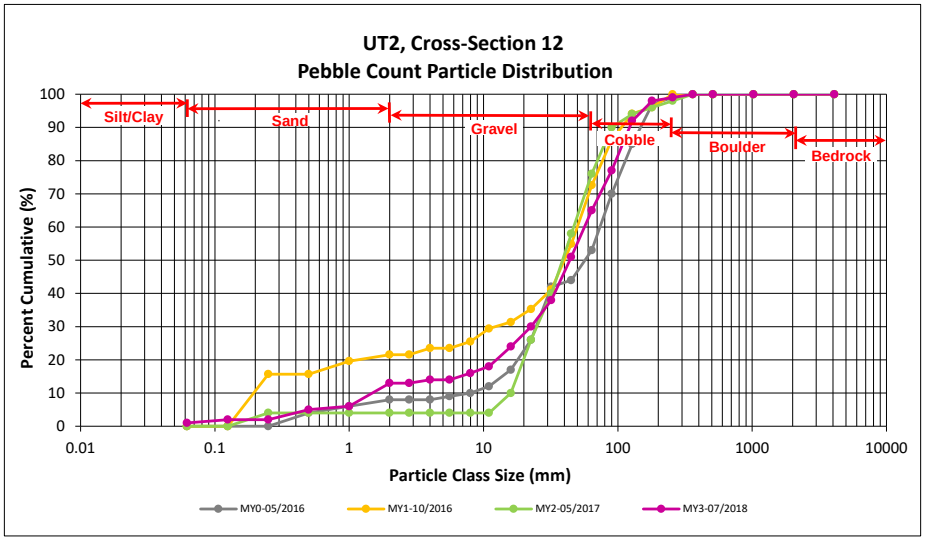
Reachwide and Cross-Section Pebble Count Plots

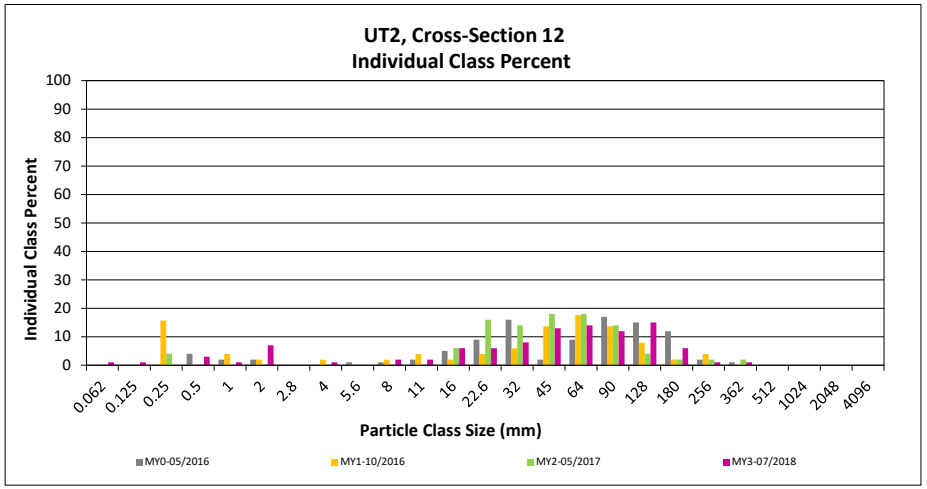
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2, Cross-Section 12

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary Class Percentage	Summary Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	1	1
SAND	Very fine	0.062	0.125	1	1	2
	Fine	0.125	0.250			2
	Medium	0.25	0.50	3	3	5
	Coarse	0.5	1.0	1	1	6
	Very Coarse	1.0	2.0	7	7	13
GRAVEL	Very Fine	2.0	2.8			13
	Very Fine	2.8	4.0	1	1	14
	Fine	4.0	5.6			14
	Fine	5.6	8.0	2	2	16
	Medium	8.0	11.0	2	2	18
	Medium	11.0	16.0	6	6	24
	Coarse	16.0	22.6	6	6	30
	Coarse	22.6	32	8	8	38
	Very Coarse	32	45	13	13	51
	Very Coarse	45	64	14	14	65
COBBLE	Small	64	90	12	12	77
	Small	90	128	15	15	92
	Large	128	180	6	6	98
	Large	180	256	1	1	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 12	
Channel materials (mm)	
D_{16} =	8.00
D_{35} =	28.09
D_{50} =	43.8
D_{84} =	106.1
D_{95} =	151.8
D_{100} =	362.0





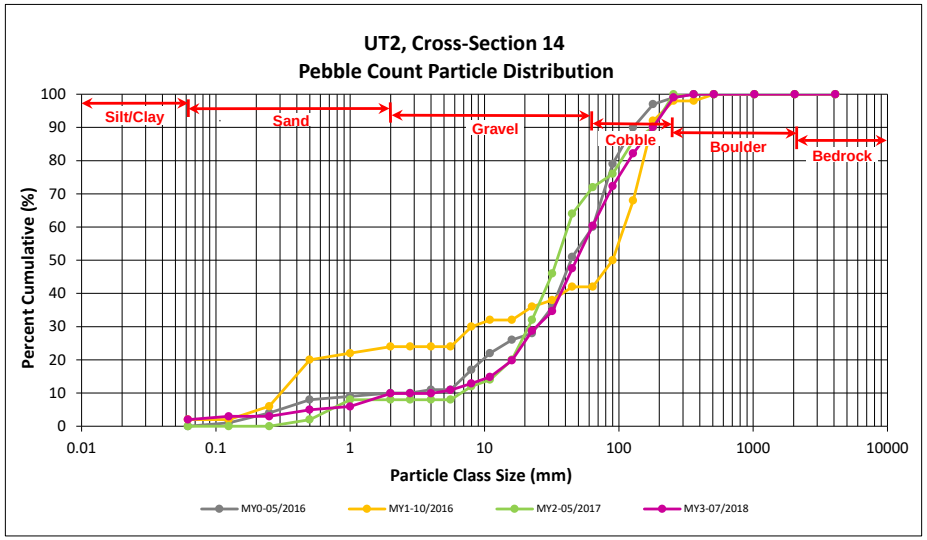
Reachwide and Cross-Section Pebble Count Plots

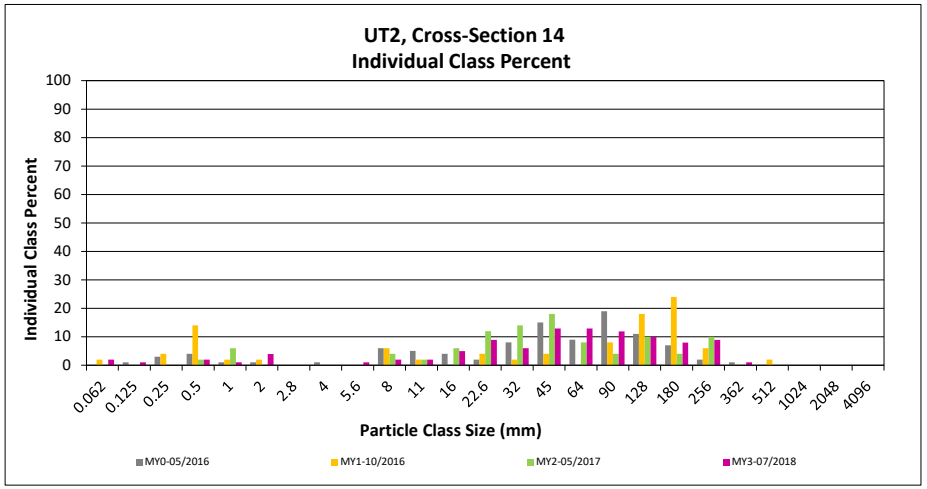
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2, Cross-Section 14

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary Class Percentage	Summary Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	2	2
SAND	Very fine	0.062	0.125	1	1	3
	Fine	0.125	0.250			3
	Medium	0.25	0.50	2	2	5
	Coarse	0.5	1.0	1	1	6
	Very Coarse	1.0	2.0	4	4	10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0			10
	Fine	4.0	5.6	1	1	11
	Fine	5.6	8.0	2	2	13
	Medium	8.0	11.0	2	2	15
	Medium	11.0	16.0	5	5	20
	Coarse	16.0	22.6	9	9	29
	Coarse	22.6	32	6	6	35
	Very Coarse	32	45	13	13	48
	Very Coarse	45	64	13	13	60
COBBLE	Small	64	90	12	12	72
	Small	90	128	10	10	82
	Large	128	180	8	8	90
	Large	180	256	9	9	99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**101**	**100**	**100**

Cross-Section 14	
Channel materials (mm)	
D_{16} =	12.00
D_{35} =	32.30
D_{50} =	48.2
D_{84} =	138.4
D_{95} =	218.5
D_{100} =	362.0





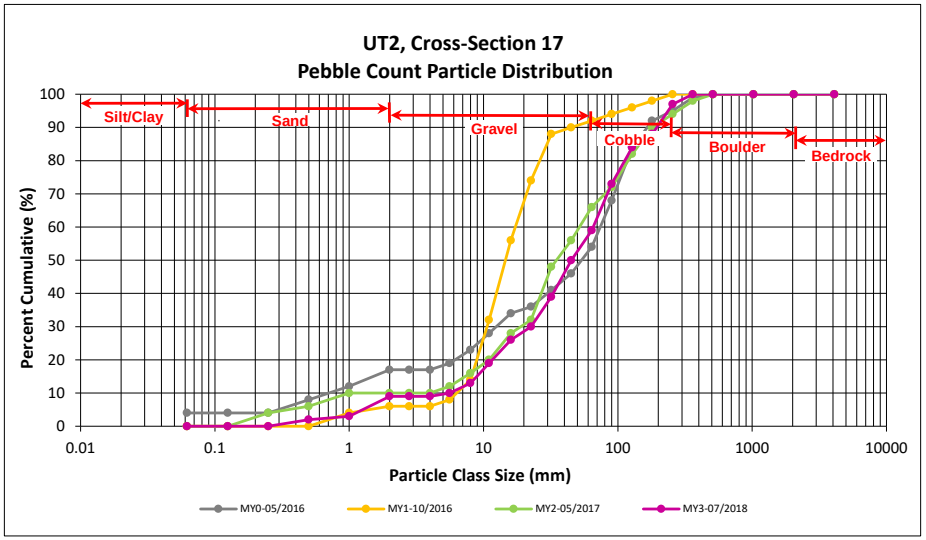
Reachwide and Cross-Section Pebble Count Plots

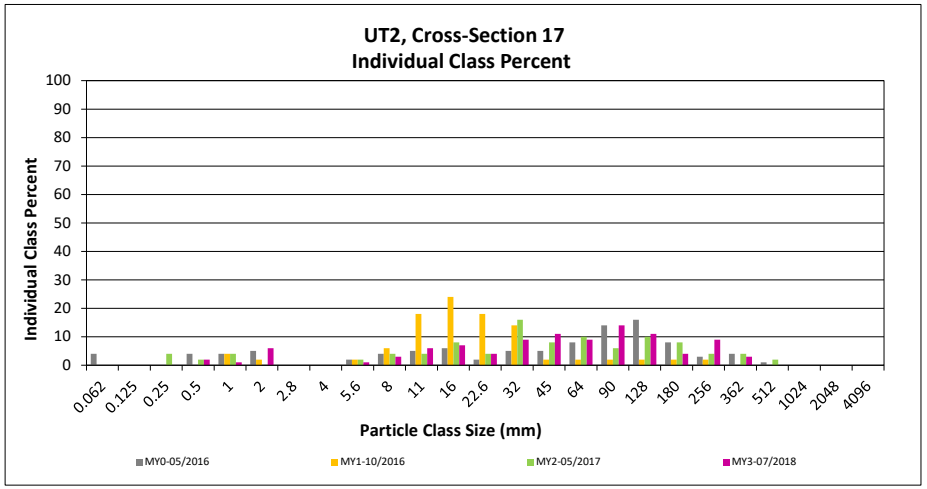
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2, Cross-Section 17

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary Class Percentage	Summary Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	2	2	2
	Coarse	0.5	1.0	1	1	3
	Very Coarse	1.0	2.0	6	6	9
GRAVEL	Very Fine	2.0	2.8			9
	Very Fine	2.8	4.0			9
	Fine	4.0	5.6	1	1	10
	Fine	5.6	8.0	3	3	13
	Medium	8.0	11.0	6	6	19
	Medium	11.0	16.0	7	7	26
	Coarse	16.0	22.6	4	4	30
	Coarse	22.6	32	9	9	39
	Very Coarse	32	45	11	11	50
	Very Coarse	45	64	9	9	59
COBBLE	Small	64	90	14	14	73
	Small	90	128	11	11	84
	Large	128	180	4	4	88
	Large	180	256	9	9	97
BOULDER	Small	256	362	3	3	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 17	
Channel materials (mm)	
D_{16} =	9.38
D_{35} =	27.42
D_{50} =	45.0
D_{84} =	128.0
D_{95} =	236.7
D_{100} =	362.0





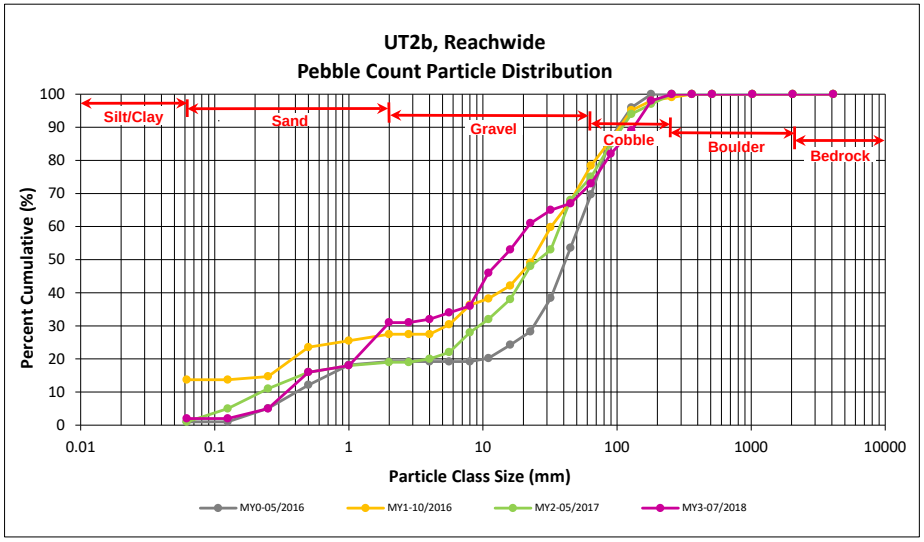
Reachwide and Cross-Section Pebble Count Plots

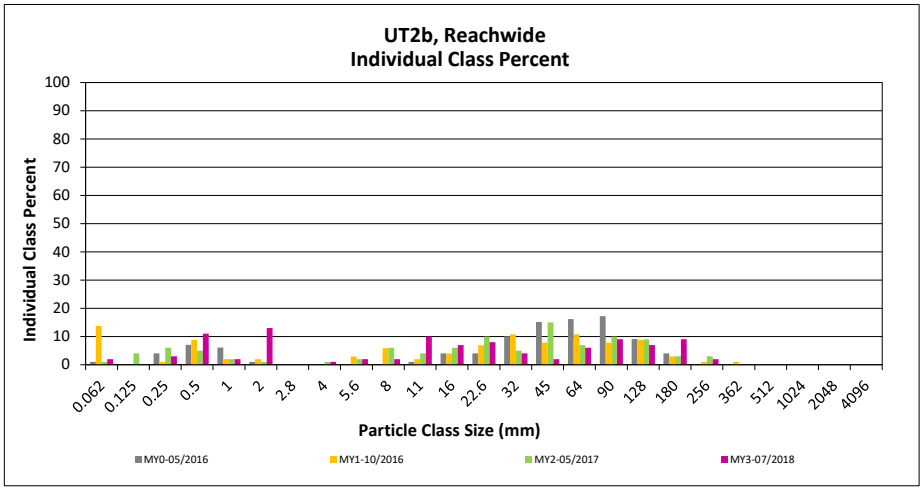
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2b, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	1	2	2	2
SAND	Very fine	0.062	0.125					2
	Fine	0.125	0.250	1	2	3	3	5
	Medium	0.25	0.50	7	4	11	11	16
	Coarse	0.5	1.0	1	1	2	2	18
	Very Coarse	1.0	2.0	7	6	13	13	31
GRAVEL	Very Fine	2.0	2.8					31
	Very Fine	2.8	4.0	1		1	1	32
	Fine	4.0	5.6	2		2	2	34
	Fine	5.6	8.0	1	1	2	2	36
	Medium	8.0	11.0	3	7	10	10	46
	Medium	11.0	16.0	5	2	7	7	53
	Coarse	16.0	22.6	7	1	8	8	61
	Coarse	22.6	32	4		4	4	65
	Very Coarse	32	45	2		2	2	67
	Very Coarse	45	64	6		6	6	73
COBBLE	Small	64	90	7	2	9	9	82
	Small	90	128	5	2	7	7	89
	Large	128	180	8	1	9	9	98
	Large	180	256	2		2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**70**	**30**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.50
D_{35} =	6.69
D_{50} =	13.6
D_{84} =	99.5
D_{95} =	160.7
D_{100} =	256.0





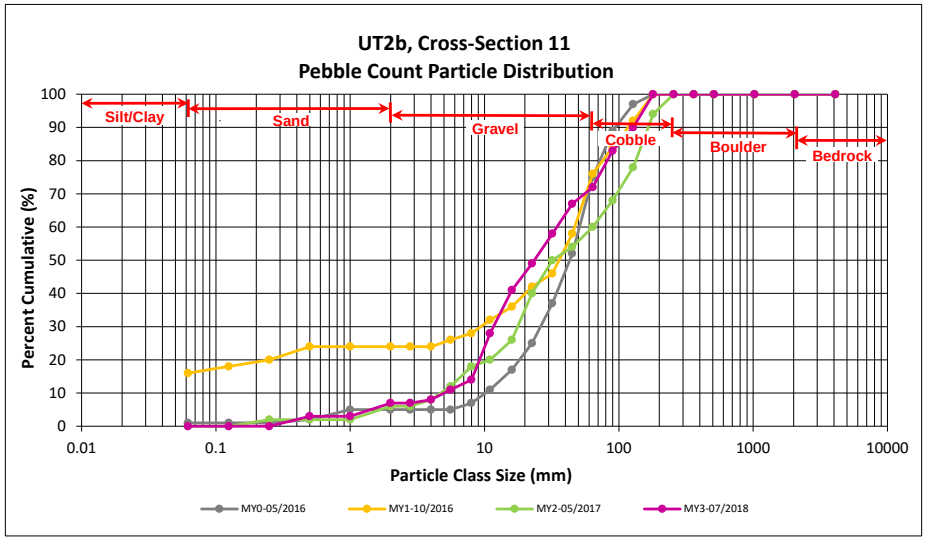
Reachwide and Cross-Section Pebble Count Plots

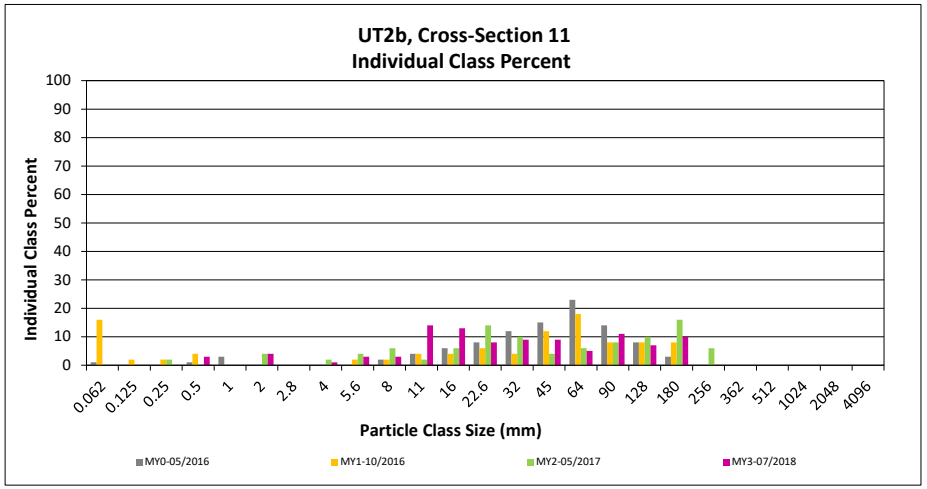
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

UT2b, Cross-Section 11

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary Class Percentage	Summary Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	3	3	3
	Coarse	0.5	1.0			3
	Very Coarse	1.0	2.0	4	4	7
GRAVEL	Very Fine	2.0	2.8			7
	Very Fine	2.8	4.0	1	1	8
	Fine	4.0	5.6	3	3	11
	Fine	5.6	8.0	3	3	14
	Medium	8.0	11.0	14	14	28
	Medium	11.0	16.0	13	13	41
	Coarse	16.0	22.6	8	8	49
	Coarse	22.6	32	9	9	58
	Very Coarse	32	45	9	9	67
	Very Coarse	45	64	5	5	72
COBBLE	Small	64	90	11	11	83
	Small	90	128	7	7	90
	Large	128	180	10	10	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	100	100	100

Cross-Section 11	
Channel materials (mm)	
D_{16} =	8.37
D_{35} =	13.46
D_{50} =	23.5
D_{84} =	94.6
D_{95} =	151.8
D_{100} =	180.0





APPENDIX 5. Hydrology Summary Data and Plots

Table 14. Verification of Bankfull Events
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Reach	Year of Occurrence	Date of Data Collection	Date of Occurrence	Method
Little Pine	MY1	9/25/2016	unknown	Crest Gage
	MY2	5/23/2017	unknown	Wrack Lines and alluvial sediment deposit
	MY3	4/2/2018	unknown	Wrack Lines and alluvial sediment deposit
UT2	MY1	10/5/2016	unknown	Crest Gage
	MY2	5/23/2017	unknown	Crest Gage
	MY3	4/2/2018	unknown	Wrack Lines and alluvial sediment deposit
UT2B	MY1	9/27/2016	unknown	Crest Gage
	MY3	4/2/2018	unknown	Wrack Lines and alluvial sediment deposit

Table 15. Wetland Gage Attainment Summary
Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 3 - 2018

Summary of Groundwater Gage Results for MY3					
Gage	Success Criteria Achieved/Max Consecutive Days During Growing Season[1] (%)				
	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)
Wetland FF	Yes/112 Days (66.6%)	Yes/169 Days (100%)	Yes/169 Days (100%)		

No wetland success criteria established

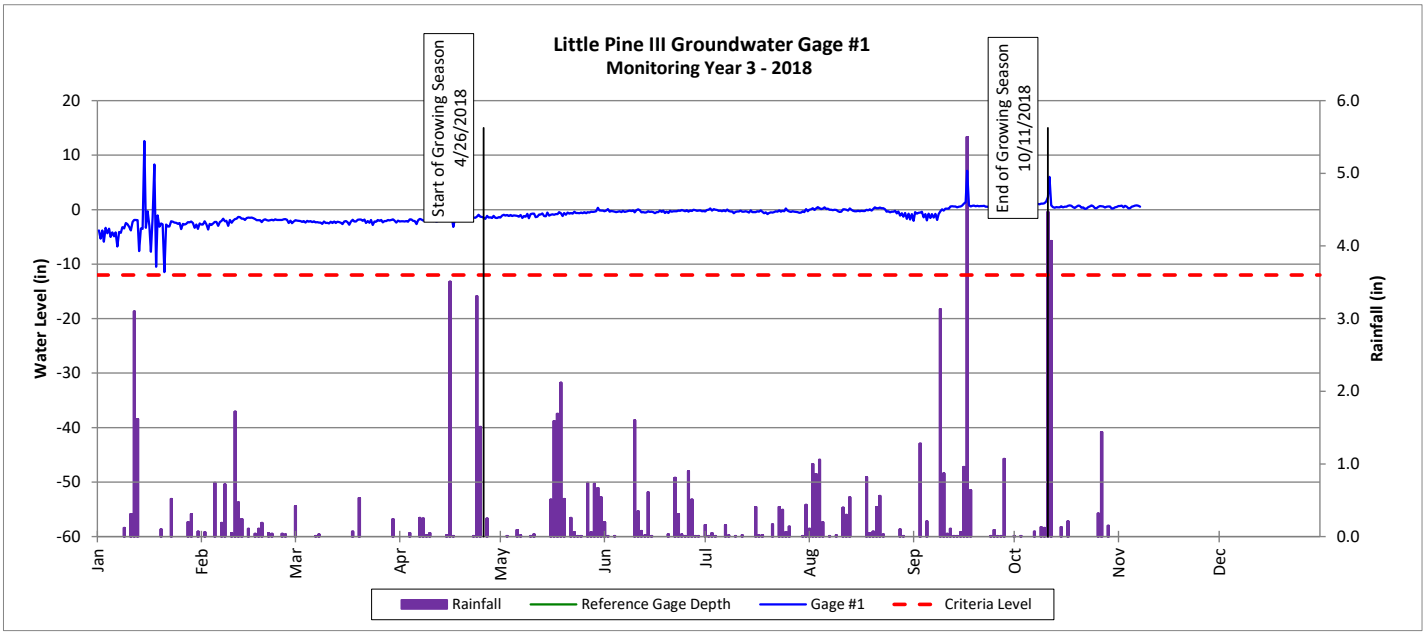
[1]Growing season starts April 26, 2018 and ends October 11, 2018.

Groundwater Gage Plots

Little Pine III Stream & Wetland Mitigation Project (DMS Project No. 94903)

Monitoring Year 3 - 2018

Wetland FF

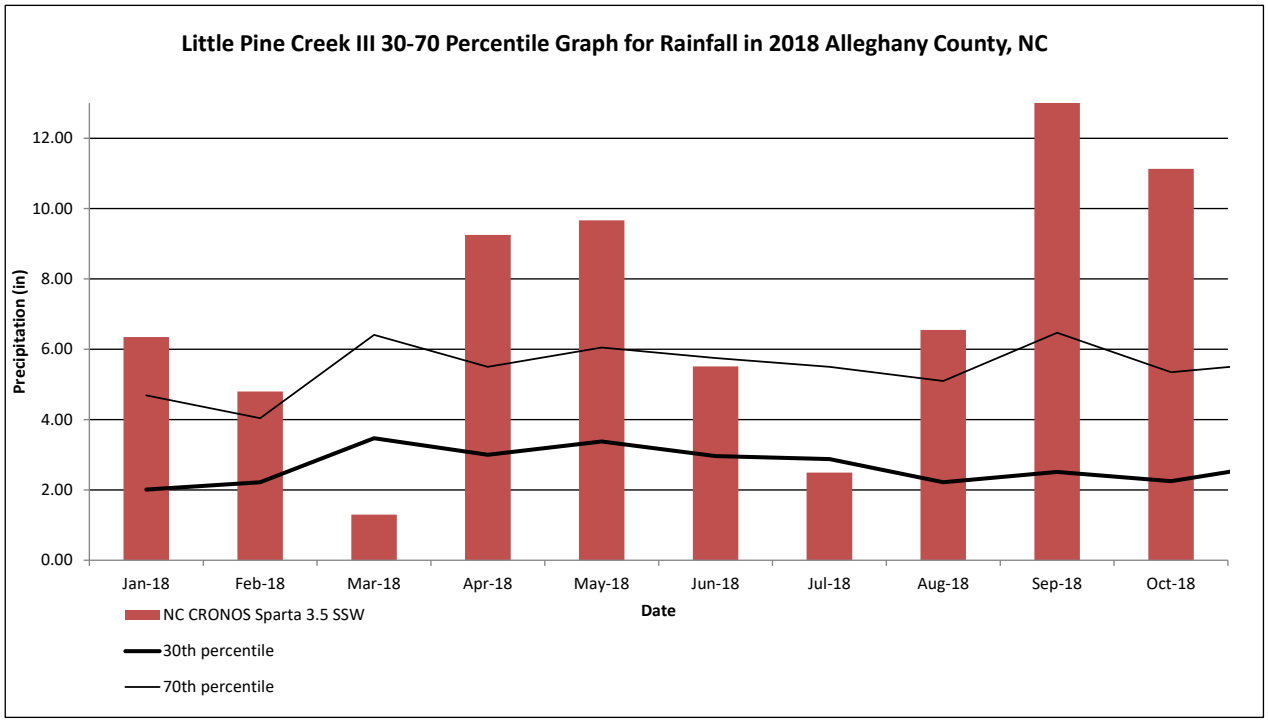


Monthly Rainfall Data

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 3 - 2018



[1] 2018 rainfall collected from NC CRONOS Station Name: Sparta 3.5 SSW (NCSU, 2018)

[2] 30th and 70th percentile rainfall data collected from weather station Sparta, NC8158 (USDA, 2018)