MONITORING YEAR 1 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: September-October 2016
Draft Submission Date: December 31, 2016
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PREPARED FOR:

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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.

Overall, the Site is on track to meet the MY5 monitoring success criteria for vegetation, geomorphology, and hydrology performance standards. The vegetation survey resulted in an average of 522 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 vegetation monitoring and visual assessment revealed few vegetation areas of concern. The observed vegetation areas of concern include an area of bare/poor herbaceous cover on the left floodplain of Little Pine Creek Reach 2a and invasive plant populations in the upstream portion of UT2a. Morphological surveys indicate that the channel dimensions are stable and functioning as designed, except for a few problem areas on UT2 and Little Pine Creek Reach 2b. The problem areas on UT2 were repaired in December 2016 after MY1 activities were conducted. At least one bankfull event occurred on all reaches during the MY1 data collection, which was recorded by crest gages and by visual indicators. This partially meets the stream hydrology performance standard of two recorded bankfull events occurring in separate monitoring years. No target performance standard was established for wetland hydrology success; however, the groundwater gage in Wetland FF recorded 122 consecutive days of the groundwater levels at or within 12 inches of the ground surface, consisting of 66.6% of the growing season.

LITTLE PINE III STREAM AND WETLAND RESTORATION PROJECT

Monitoring Year 1 Report

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APPENDICES

Section 1: PROJECT OVERVIEW

The Site is a design-bid-build contract with DMS 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.

The Site is located on portions of parcels owned by Jeffery C. Anders, Eddie and Joye G. Edwards, Frances R. Huber, and Thomas E. Rector. A conservation easement within these tracts 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 and 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 57.32 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 1 Data Assessment

Annual monitoring was conducted during MY1 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 (2014).

1.2.1 Vegetation Assessment

Planted woody vegetation is being monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2008). 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 MY1 vegetation survey was completed in October 2016, resulting in an average stem density of 522 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 5% of the baseline stem count (549 stems per acre). There is an average of 13 stems per plot as compared to 14 stems per plot in MY0. Approximately 16% of the remaining planted stems scored a vigor of 2 or less, indicating that they are unlikely to survive. This low vigor rating is due to damage from deer, insects, drought, or other unknown factors. The Site is scheduled to have supplemental planting installed prior

to MY2 during the dormant season, in order to address areas of low stem density. Please refer to Appendix 2 for vegetation plot photographs and Appendix 3 for vegetation data tables.

1.2.2 Vegetation Areas of Concern

The MY1 vegetation monitoring and visual assessment revealed few vegetation areas of concern. Small patches of bare or poor herbaceous cover in the riparian area of Little Pine Reach 2a were observed. Invasive areas of concern were observed along UT2a, where populations of European barberry (*Berberis vulgaris*) and Chinese privet (*Ligustrum sinense*) are becoming prevalent. These vegetation areas of concern are shown in Figure 3 in Appendix 2.

1.2.3 Stream Assessment

Morphological surveys for MY1 were conducted in September and October 2016. Results indicate that the channel dimensions are stable and functioning as designed, with the exception of a few problem areas discussed below.

In general, the cross sections on Little Pine Creek, UT2, and UT2b show little to no change in the bankfull area, 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). However, cross section 10 on UT2b and cross sections 15 and 16 on UT2 vary significantly from baseline conditions. Pool cross section 10 has deepened resulting in a max depth and cross sectional area roughly double that recorded at baseline. This is not considered detrimental to either the stability of the channel or project goals. Pool cross section 15 has filled in partially with sediment resulting in a decreased depth and cross sectional area. The sediment deposition within the pool is minor and is likely a temporary development, however this area will be watched in future years. Riffle cross section 16 dimensions are similar to baseline, however the channel thalweg has shifted laterally due to channel erosion in the vicinity, which is discussed in further detail in Section 1.2.4.

The surveyed longitudinal profile data for the project streams illustrates that bedform features are maintaining lateral and vertical stability, except for isolated areas of UT2 discussed below. The longitudinal profiles on Little Pine and UT2, and UT2b showed little change from MY0 in slope (riffle, water surface, bankfull) with minor differences in pool-to-pool spacing and pool length. The overall pattern of all project streams remained the same compared to the baseline data. Several instances of structure piping, sediment deposition, and streambed scour were noted during the MY1 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 MY1 resemble the as-built data; however, the reachwide count in UT2b indicates a finer distribution of particles in MY1. This may be reflective of the increase in the pool lengths and depths observed in cross section and long profile data in MY1. Refer to Appendix 2 for the visual stability assessment table, Current Condition Plan View (CCPV) map, and reference photographs. Refer to Appendix 4 for the morphological 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 streambed scour. Little Pine Reach 2b had one instance of structure piping, located at STA 124+50. UT2 Reach 1 Upper had 3 instances of structures piping (STA 303+16, 309+14, and 309+96) resulting in the degradation of one riffle at STA 303+20. UT2 Reach 1 Lower had an area of sediment deposition from STA 325+80-326+50 which buried 4 structures and 3 riffles, and an area of bank erosion from STA 333+75-334+00. The bank erosion from 333+75 to 334+00 was repaired in December 2016. UT2 Reach 2 had one instance of streambed erosion from STA 338+50-339+30 resulting in riffle degradation, shifting

of thalweg position, floodplain scour, and sediment deposition. This area was also repaired in December 2016. 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 all reaches during the MY1 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 partially met in MY1. 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 restoration 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 168 days from April 26th to October 11th. No onsite rainfall data is available; however, daily precipitation data was collected from closest NC CRONOS Station, Glade Valley 3.0 ENE. GWG 1 recorded 122 consecutive days of the groundwater levels at or within 12 inches of the ground surface, consisting of 67% of the growing season. The climate data from nearby NC CRONOS station suggests that the Site received less than typical amounts of rain in 2016. The monthly rainfall in January, March and April fell below the 30th percentile for the area (USDA, 2016). Please refer to Appendix 2 for the groundwater gage location and Appendix 5 for groundwater hydrology data and plots.

1.3 Monitoring Year 1 Summary

The Site is on track to meet monitoring success criteria for vegetation, geomorphology, and hydrology performance standards. The MY1 vegetation survey resulted in an average stem density of 522 stems per acre. The Site has met the interim requirement of 320 stems per acre, with 20 of the 21 plots (95%) individually meeting this requirement. The MY1 vegetation monitoring and visual assessment revealed few vegetation areas of concern, including an area of bare/poor herbaceous cover on the left floodplain of Little Pine Creek Reach 2a, and invasive plant populations in the upstream portion of UT2a. Morphological surveys indicate that the channel dimensions are stable and functioning as designed, with the exception of a few problem areas on UT2 and Little Pine Creek Reach 2b. At least one bankfull event occurred on all reaches during the MY1 data collection, which was recorded by crest gages and by visual indicators. This partially meets the stream hydrology performance standard of two recorded bankfull events occurring in separate monitoring years. No target performance standard was established for wetland hydrology success; however, GWG 1 in Wetland FF recorded 122 consecutive days of the groundwater levels at or within 12 inches of the ground surface, consisting of 67% 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

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

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

Lee, Michael T., Peet, Robert K., Steven D., Wentworth, Thomas R. 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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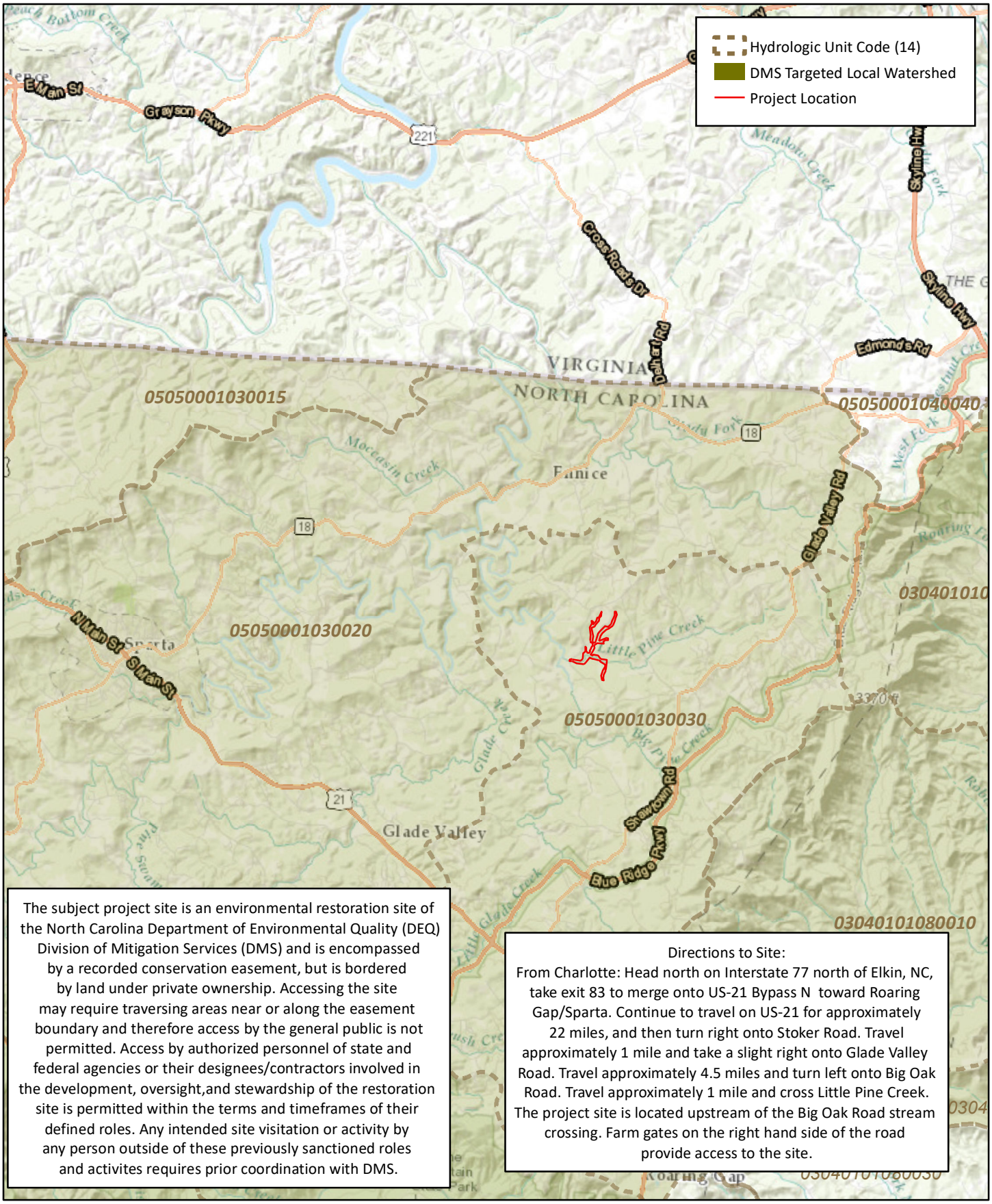
United States Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

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

Wildlands Engineering, Inc. 2014. Little Pine III Stream & Wetland Restoration Project Final Mitigation Plan. NCEEP, Raleigh, NC.

Wildlands Engineering, Inc. 2016. Little Pine III Stream & Wetland Restoration Project As-Built Baseline Monitoring Report. NCDEQ-DMS, Raleigh, NC.

APPENDIX 1. General Tables and Figures



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

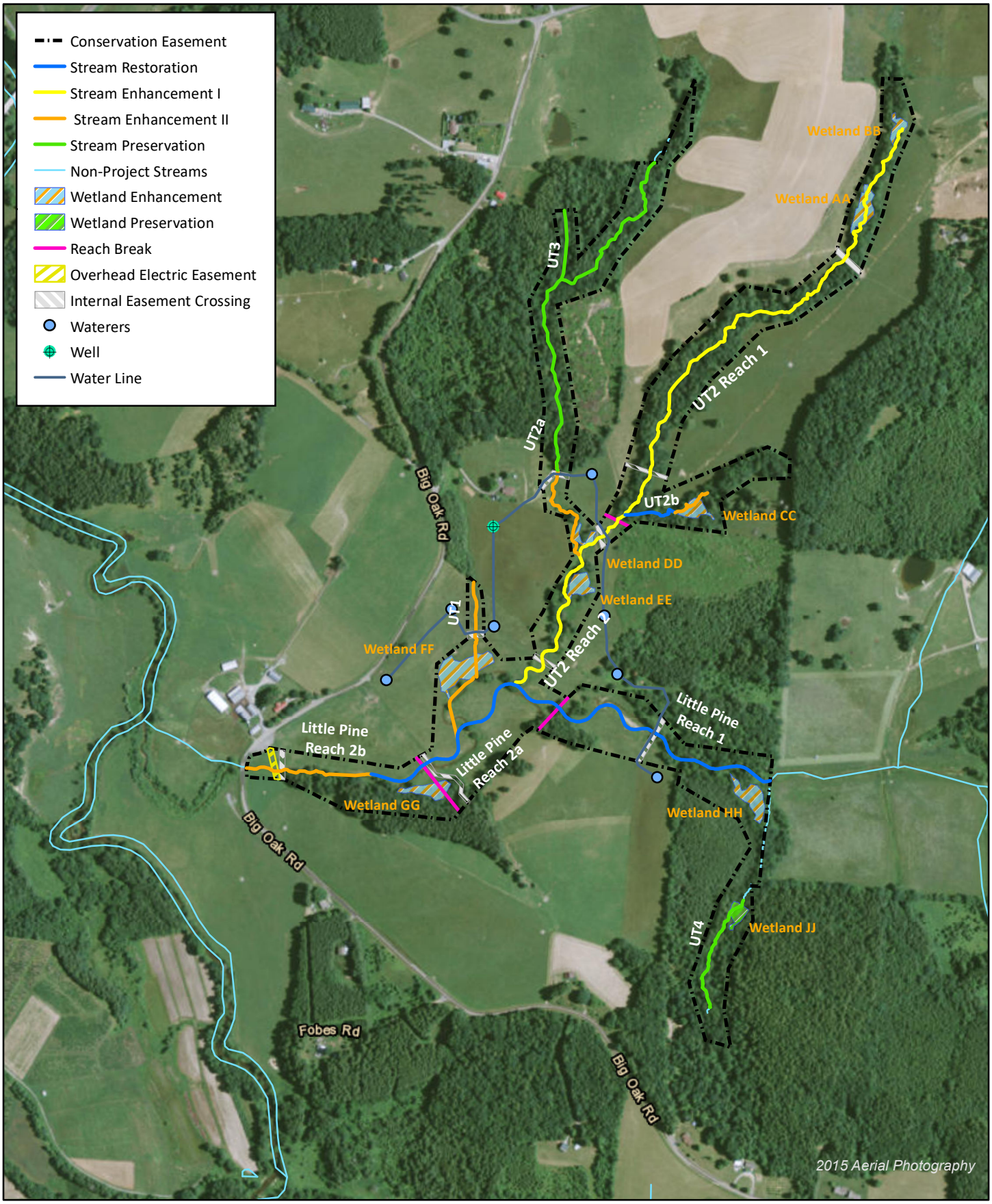
Directions to Site:
From Charlotte: Head north on Interstate 77 north of Elkin, NC, take exit 83 to merge onto US-21 Bypass N toward Roaring Gap/Sparta. Continue to travel on US-21 for approximately 22 miles, and then turn right onto Stoker Road. Travel approximately 1 mile and take a slight right onto Glade Valley Road. Travel approximately 4.5 miles and turn left onto Big Oak Road. Travel approximately 1 mile and cross Little Pine Creek. The project site is located upstream of the Big Oak Road stream crossing. Farm gates on the right hand side of the road provide access to the site.

WILDLANDS ENGINEERING

0 0.5 1 Mile

Figure 1 Project Vicinity Map
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

Alleghany County, NC



WILDLANDS ENGINEERING

0 700 Feet

N

Figure 2 Project Component/Asset Map
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

Alleghany County, NC

Table 1. Project Components and Mitigation Credits
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

Mitigation Credits									
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	6,328.60	645	N/A	1.40	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	1,417.00	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	1,058.00	Excludes one 25 foot wide ford crossing.
Little Pine Reach 2b		P1/P2	Restoration (R)	125+27 to 130+20	493	493	1:1	493.00	
		Planting, fencing	Enhancement II (R)	130+20 to 135+60	540	509	2.5:1	197.00	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	185.20	Excludes one 35 foot wide culvert crossing.
		Planting, fencing, channel creation	Enhancement II (R)	202+24 to 206+26	402	402	2.5:1	160.80	
UT2 Reach 1	5,270	P1/P2/P4, preservation	Enhancement I (R)	297+18-343+18	4,600	4,474	2:1	2,237.00	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	428.60	
		Planting, fencing	Enhancement II (R)	426+58 to 432+09	551	519	2.5:1	207.60	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	120.00	
		P2	Restoration (R)	503+00 to 505+53	253	253	1:1	253.00	
UT3	400	Preservation	Preservation (RE)	602+44 to 606+44	400	384	5:1	76.80	Excludes one 16 foot wide constructed ford crossing.
UT4	1,036	Preservation	Preservation (RE)	701+26 to 708+23	697	697	5:1	139.40	
WETLANDS									
Wetland AA	0.38	Planting, fencing	Enhancement (RE)	UT2 floodplain	0.38		2:1	0.19	
Wetland BB	0.16	Planting, fencing	Enhancement (RE)	UT2 floodplain	0.16		2:1	0.08	
Wetland CC	0.26	Grade control, planting, fencing	Enhancement (RE)	UT2b headwaters	0.26		2:1	0.13	
Wetland DD	0.12	Planting, fencing	Enhancement (RE)	North of UT2/UT2a	0.12		2:1	0.06	
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	0.38	
Wetland GG	0.33	Planting fencing	Enhancement (RE)	Little Pine	0.33		2:1	0.17	
Wetland HH	0.42	Planting, grade control	Enhancement (RE)	South of UT4/ Little Pine	0.42		2:1	0.21	
Wetland JJ	0.19	Preservation	Preservation (RE)	UT4 floodplain	0.19		5:1	0.04	

Component Summation					
Restoration Level	Stream (LF)	Riparian Wetland (acres)	Non-Riparian	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 Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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)	May 2016	July 2016
Year 1 Monitoring	Fall 2016	December 2016
Year 2 Monitoring	2017	November 2017
Year 3 Monitoring	2018	November 2018
Year 4 Monitoring	2019	November 2019
Year 5 Monitoring	2020	November 2020

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

Table 3. Project Contact Table
Little Pine III Stream & Wetland Mitigation Project
DMS Project No.94903
Monitoring Year 1 - 2016

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 Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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 Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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	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

Table 6a. Visual Stream Morphology Stability Assessment Table

Little Pine III Stream & Wetland Mitigation Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Little Pine Reach 1 (STA 100+00 - 114+44)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	10	10			100%			
	3. Meander Pool Condition	Depth Sufficient	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			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.	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 Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

Little Pine Reach 2a (114+44-125+27)

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			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.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	5	5			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	5	5			100%			

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

Table 6c. Visual Stream Morphology Stability Assessment Table
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	4	4			100%			
	3. Meander Pool Condition	Depth Sufficient	4	4			100%			
		Length Appropriate	4	4			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	4	4			100%			
		Thalweg centering at downstream of meander bend (Glide)	4	4			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	n/a	n/a	n/a
				Totals	0	0	100%	n/a	n/a	n/a
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	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 6d. Visual Stream Morphology Stability Assessment Table
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

UT2 Reach 1 Upper (STA 297+18 - 310+50)

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	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			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.	21	21			100%			
	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 Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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

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	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			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.	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 Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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

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	14	15			93%			
	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)	5	5			100%			
		Thalweg centering at downstream of meander bend (Glide)	5	5			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	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.	19	19			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	12	19			63%			
	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.	12	19			63%			

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

Table 6g. Visual Stream Morphology Stability Assessment Table
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

UT2b (STA 503+00 - 505+53)

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	5	9			56%			
	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	23	23			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	23	23			100%			
	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 Mitigation Project

DMS Project No. 94903

Monitoring Year 1 - 2016

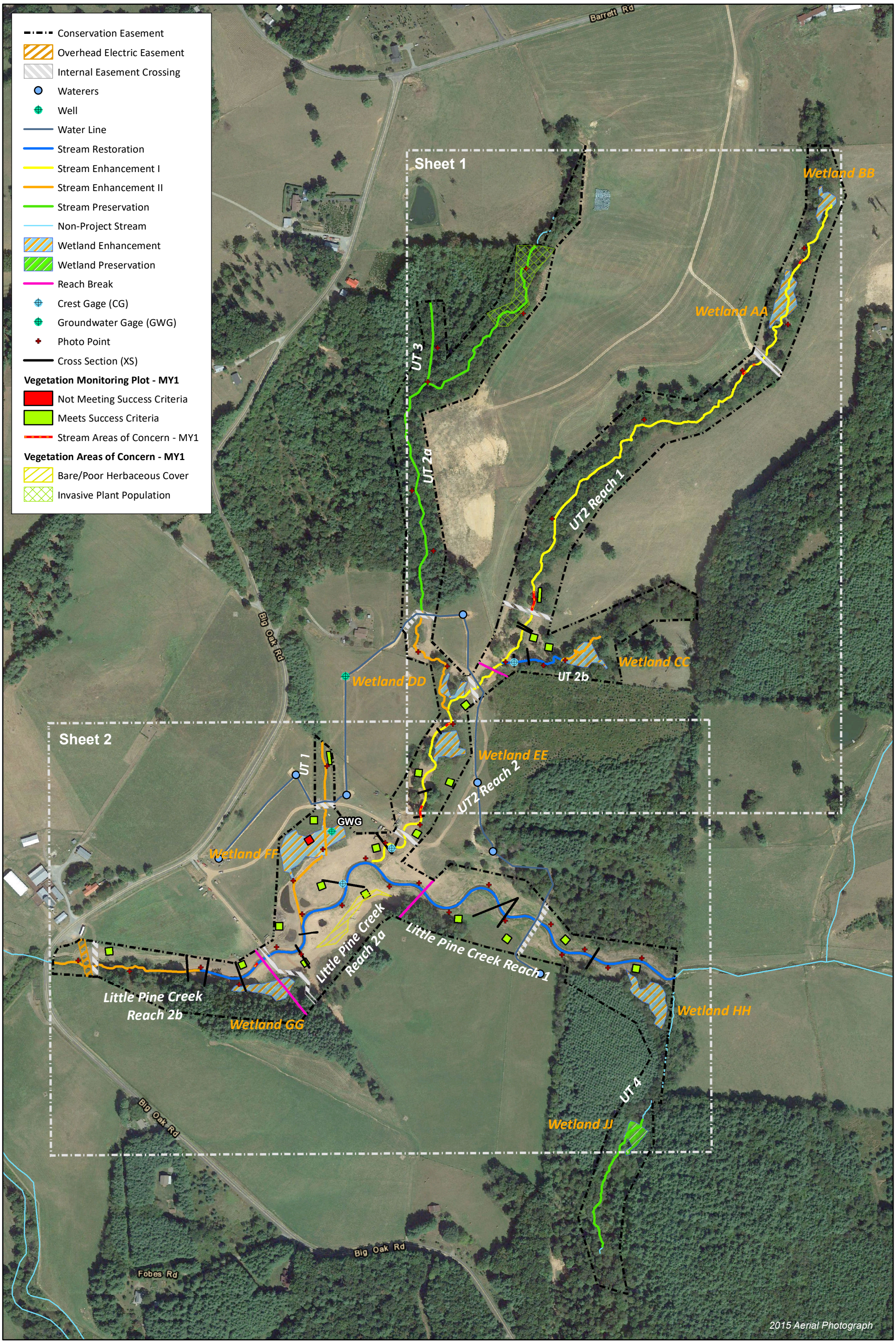
Planted Acreage **27.8**

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	1	0.3	1%
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	**4**	**0.4**	**1%**
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	**4**	**0.4**	**1%**

Easement Acreage **57.3**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Planted Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	1	0.9	3%
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.



WILDLANDS ENGINEERING

0 200 400 Feet

N

Figure 3.0 Integrated Current Condition Plan View Map (Key)
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

Alleghany County, NC

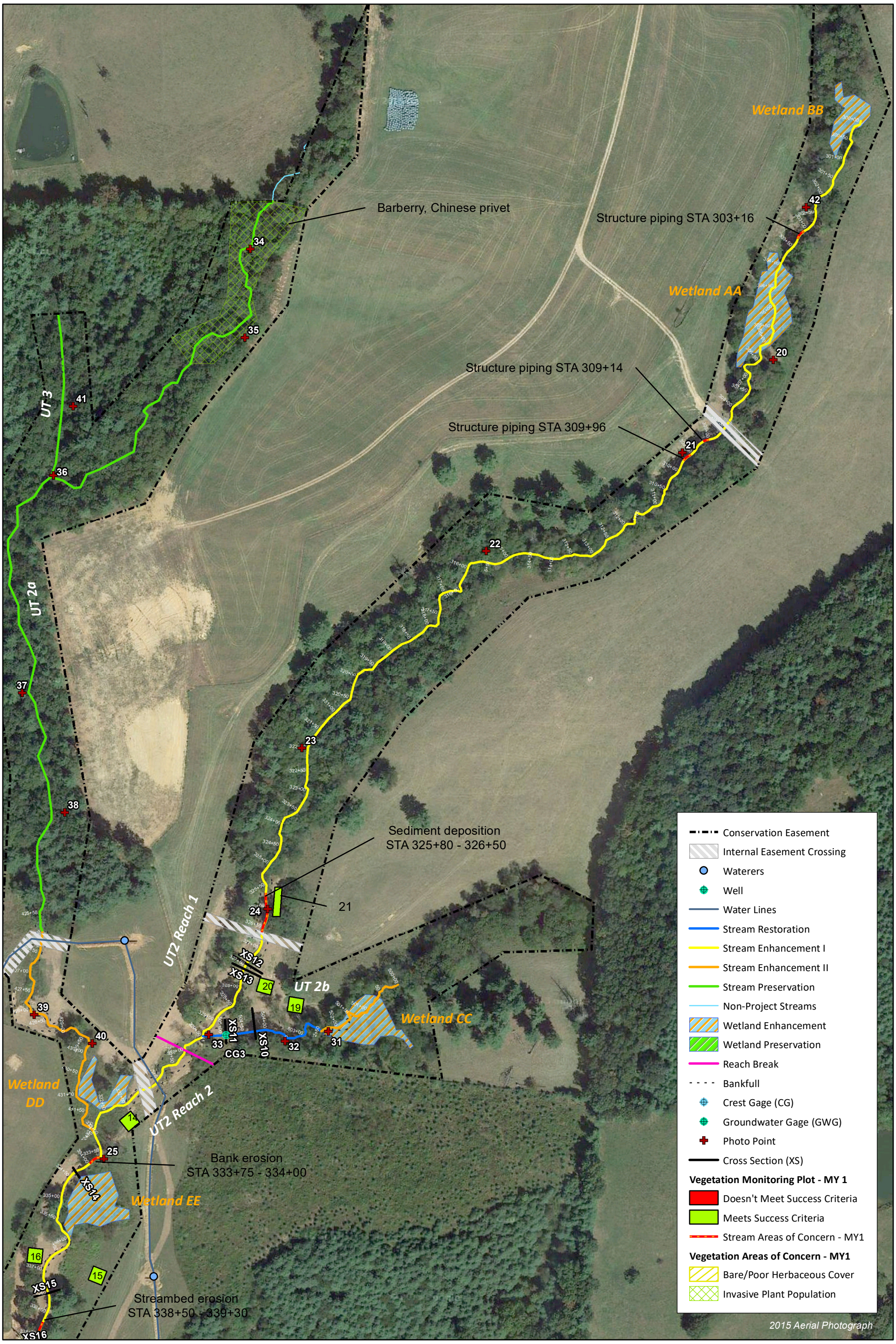
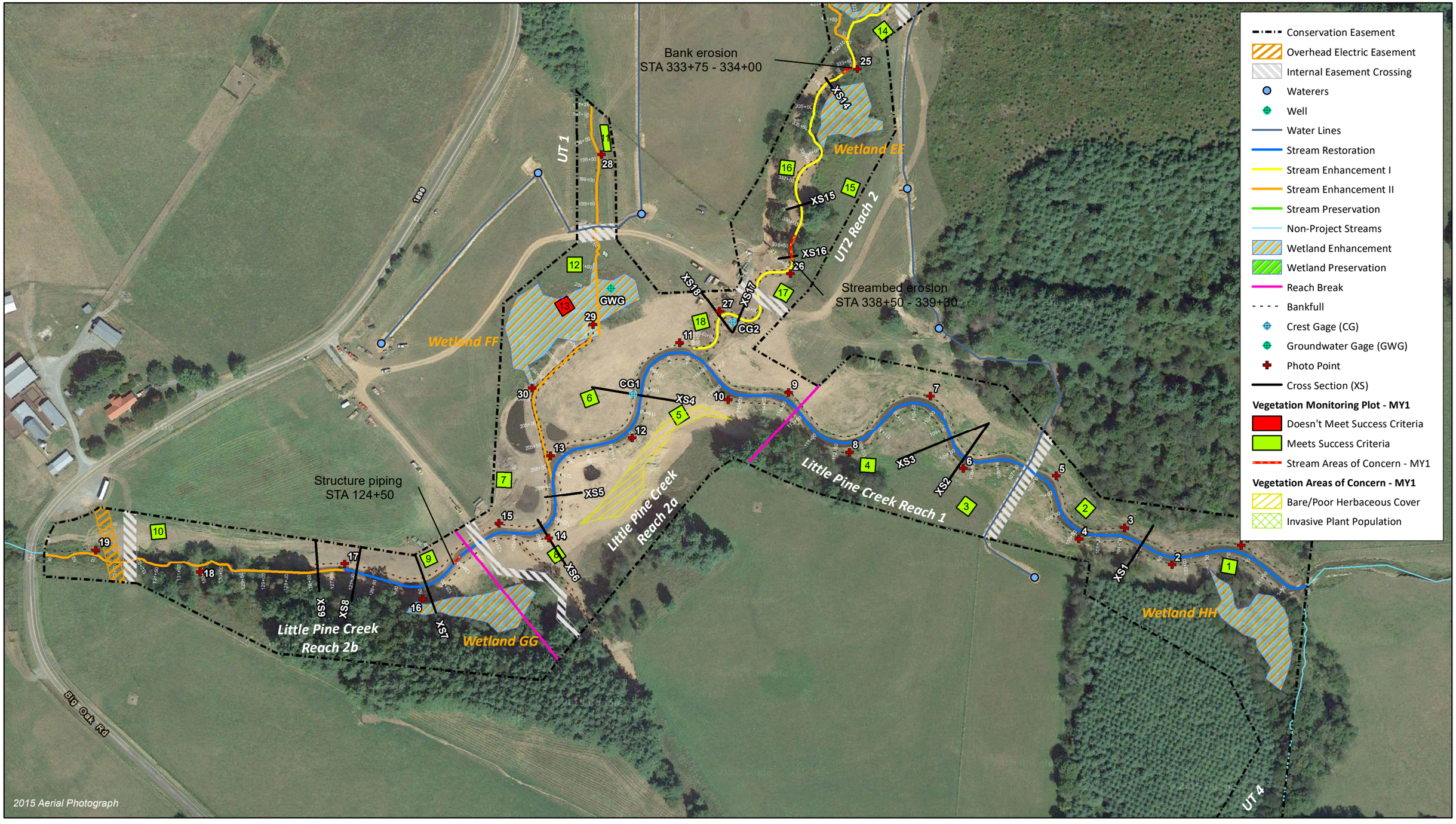


Figure 3.1 Current Condition Plan View Map (Sheet 1 of 2)
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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 1 - 2016

Alleghany County, NC

Stream Photographs

	
Photo Point 1 – looking upstream *(10/05/2016)*	**Photo Point 1** – looking downstream *(10/05/2016)*
	
Photo Point 2 – looking upstream *(10/05/2016)*	**Photo Point 2** – looking downstream *(10/05/2016)*
	
Photo Point 3 – looking upstream *(10/05/2016)*	**Photo Point 3** – looking downstream *(10/05/2016)*

	
Photo Point 4 – looking upstream *(10/05/2016)*	**Photo Point 4** – looking downstream *(10/05/2016)*
	
Photo Point 5 – looking upstream *(10/05/2016)*	**Photo Point 5** – looking downstream *(10/05/2016)*
	
Photo Point 6 – looking upstream *(10/05/2016)*	**Photo Point 6** – looking downstream *(10/05/2016)*

	
Photo Point 7 – looking upstream *(10/05/2016)*	**Photo Point 7** – looking downstream *(10/05/2016)*
	
Photo Point 8 – looking upstream *(10/05/2016)*	**Photo Point 8** – looking downstream *(10/05/2016)*
	
Photo Point 9 – looking upstream *(10/05/2016)*	**Photo Point 9** – looking downstream *(10/05/2016)*

	
Photo Point 10 – looking upstream *(10/05/2016)*	**Photo Point 10** – looking downstream *(10/05/2016)*
	
Photo Point 11 – looking upstream *(10/05/2016)*	**Photo Point 11** – looking downstream *(10/05/2016)*
	
Photo Point 12 – looking upstream *(10/05/2016)*	**Photo Point 12** – looking downstream *(10/05/2016)*

	
Photo Point 13 – looking upstream *(10/05/2016)*	**Photo Point 13** – looking downstream *(10/05/2016)*
	
Photo Point 14 – looking upstream *(10/05/2016)*	**Photo Point 14** – looking downstream *(10/05/2016)*
	
Photo Point 15 – looking upstream *(10/05/2016)*	**Photo Point 15** – looking downstream *(10/05/2016)*

	
Photo Point 16 – looking upstream *(10/05/2016)*	**Photo Point 16** – looking downstream *(10/05/2016)*
	
Photo Point 17 – looking upstream *(10/15/2016)*	**Photo Point 17** – looking downstream *(10/15/2016)*
	
Photo Point 18 – looking upstream *(10/05/2016)*	**Photo Point 18** – looking downstream *(10/05/2016)*

	
Photo Point 19 – looking upstream *(10/05/2016)*	**Photo Point 19** – looking downstream *(10/05/2016)*
	
Photo Point 20 – looking upstream *(10/05/2016)*	**Photo Point 20** – looking downstream *(10/05/2016)*
	
Photo Point 21 – looking upstream *(10/05/2016)*	**Photo Point 21** – looking downstream *(10/05/2016)*

	
Photo Point 22 – looking upstream *(10/05/2016)*	**Photo Point 22** – looking downstream *(10/05/2016)*
	
Photo Point 23 – looking upstream *(10/05/2016)*	**Photo Point 23** – looking downstream *(10/05/2016)*
	
Photo Point 24 – looking upstream *(10/05/2016)*	**Photo Point 24** – looking downstream *(10/05/2016)*

	
Photo Point 25 – looking upstream *(10/05/2016)*	**Photo Point 25** – looking downstream *(10/05/2016)*
	
Photo Point 26 – looking upstream *(10/05/2016)*	**Photo Point 26** – looking downstream *(10/05/2016)*
	
Photo Point 27 – looking upstream *(10/05/2016)*	**Photo Point 27** – looking downstream *(10/05/2016)*

	
Photo Point 28 – looking upstream *(10/15/2016)*	**Photo Point 28** – looking downstream *(10/15/2016)*
	
Photo Point 29 – looking upstream *(10/05/2016)*	**Photo Point 29** – looking downstream *(10/05/2016)*
	
Photo Point 30 – looking upstream *(10/05/2016)*	**Photo Point 30** – looking downstream *(10/05/2016)*

	
Photo Point 31 – looking upstream *(10/15/2016)*	**Photo Point 31** – looking downstream *(10/15/2016)*
	
Photo Point 32 – looking upstream *(10/15/2016)*	**Photo Point 32** – looking downstream *(10/15/2016)*
	
Photo Point 33 – looking upstream UT2 *(10/05/2016)*	**Photo Point 33** – looking upstream UT2b *(10/05/2016)*

Photo Point 33 – looking downstream UT2 *(10/05/2016)*

Photo Point 34 – looking upstream *(10/05/2016)*

Photo Point 34 – looking downstream *(10/05/2016)*

Photo Point 35 – looking upstream *(10/05/2016)*

Photo Point 35 – looking downstream *(10/05/2016)*

Photo Point 36 – looking upstream UT2a *(10/05/2016)*

Photo Point 36 – looking upstream UT3 *(10/05/2016)*

Photo Point 36 – looking downstream *(10/05/2016)*

Photo Point 37 – looking upstream *(10/05/2016)*

Photo Point 37 – looking downstream *(10/05/2016)*

	
Photo Point 38 – looking upstream *(10/05/2016)*	**Photo Point 38** – looking downstream *(10/05/2016)*
	
Photo Point 39 – looking upstream *(10/05/2016)*	**Photo Point 39** – looking downstream *(10/05/2016)*
	
Photo Point 40 – looking upstream *(10/05/2016)*	**Photo Point 40** – looking downstream *(10/05/2016)*

	
Photo Point 41 – looking upstream *(10/05/2016)*	**Photo Point 41** – looking downstream *(10/05/2016)*
	
Photo Point 42 – looking upstream *(10/05/2016)*	**Photo Point 42** – looking downstream *(10/05/2016)*

Vegetation Photographs

Vegetation Plot 1 – *(09/26/2016)*

Vegetation Plot 2 – *(09/26/2016)*

Vegetation Plot 3 – *(09/26/2016)*

Vegetation Plot 4 – *(09/26/2016)*

Vegetation Plot 5 – *(09/27/2016)*

Vegetation Plot 6 – *(10/04/2016)*

Vegetation Plot 7 – *(10/04/2016)*

Vegetation Plot 8 – *(10/04/2016)*

Vegetation Plot 9 – *(10/04/2016)*

Vegetation Plot 10 – *(10/15/2016)*

Vegetation Plot 11 – *(09/27/2016)*

Vegetation Plot 12 – *(10/04/216)*

Vegetation Plot 13 – *(10/04/2016)*

Vegetation Plot 14 – *(10/05/2016)*

Vegetation Plot 15 – *(10/05/2016)*

Vegetation Plot 16 – *(10/05/2016)*

Vegetation Plot 17 – *(10/05/2016)*

Vegetation Plot 18 – *(09/27/2016)*

Vegetation Plot 19 – *(10/05/2016)*

Vegetation Plot 20 – *(10/05/2016)*

Vegetation Plot 21 – *(10/15/2016)*

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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 Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

Database Name	cvs-eep-entrytool-v2.5.0 LP III MY1.mdb
Database Location	Q:\ActiveProjects\005-02160 Little Pine III Monitoring\Monitoring\Monitoring Year 1\Vegetation Assessment
Computer Name	ALEA
File Size	73900032
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 10. Planted and Total Stem Counts
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

			Current Plot Data (MY1 2016)																							
			94903-WEI-0001			94903-WEI-0002			94903-WEI-0003			94903-WEI-0004			94903-WEI-0005			94903-WEI-0006			94903-WEI-0007			94903-WEI-0008		
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**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree				1	1	1	3	3	3	4	4	4	4	4	4	3	3	3				7	7	7
Alnus serrulata	tag alder	Shrub Tree																		1						
Betula nigra	river birch	Tree	1	1	1	3	3	3	3	3	3	3	3	3				5	5	5						
Cercis canadensis	redbud	Shrub Tree	2	2	2	1	1	1				4	4	4	5	5	5				8	8	8	3	3	3
Fraxinus pennsylvanica	green ash	Tree	1	1	1	2	2	2	2	2	2	2	2	2	2	2	2				5	5	5	4	4	4
Platanus occidentalis	sycamore	Tree	1	1	1	1	1	1				1	1	1	1	1	1	3	3	3	3	3	3	1	1	1
Ulmus americana	American elm	Tree	10	10	10	4	4	4	8	8	8				3	3	3	1	1	1						
Stem count			15	15	15	12	12	12	16	16	16	14	14	14	15	15	15	12	12	13	16	16	16	15	15	15
size (ares)			1			1			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			5	5	5	6	6	6	4	4	4	5	5	5	5	5	5	4	4	5	3	3	3	4	4	4
Stems per ACRE			607	607	607	486	486	486	647	647	647	567	567	567	607	607	607	486	486	526	647	647	647	607	607	607

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 10. Planted and Total Stem Counts
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

			Current Plot Data (MY1 2016)																																				
			94903-WEI-0009			94903-WEI-0010			94903-WEI-0011			94903-WEI-0012			94903-WEI-0013			94903-WEI-0014			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**	**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	3	3	3	2	2	2	4	4	4	1	1	1	3	3	3							5	5	5							1	1	1				4	4	4
Alnus serrulata	tag alder	Shrub Tree																																						
Betula nigra	river birch	Tree	1	1	1	1	1	1	2	2	2	4	4	4				3	3	3	3	3	3				3	3	3	3	3	3	1	1	1	1	1	1	4	4	4
Cercis canadensis	redbud	Shrub Tree	2	2	2	2	2	2	2	2	2	2	2	2				1	1	1				1	1	1				5	5	5	2	2	2	3	3	3	1	1	1
Fraxinus pennsylvanica	green ash	Tree	3	3	3	4	4	4	5	5	5	1	1	1	1	1	1	2	2	2	2	2	2	4	4	4	4	4	4	2	2	2	4	4	4	5	5	5	3	3	3
Platanus occidentalis	sycamore	Tree				2	2	2				1	1	1	1	1	1	2	2	2	8	8	8	1	1	1				5	5	5							2	2	2
Ulmus americana	American elm	Tree	4	4	4				1	1	1	3	3	3				5	5	5							3	3	3	1	1	1	2	2	2	5	5	5			
		Stem count	13	13	13	11	11	11	14	14	14	12	12	12	5	5	5	13	13	13	13	13	13	11	11	11	10	10	10	16	16	16	10	10	10	14	14	14	14	14	14
		size (ares)	1			1			1			1			1			1			1			1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	5	5	5	5	5	5	5	6	6	6	3	3	3	5	5	5	3	3	3	4	4	4	3	3	3	5	5	5	5	5	5	4	4	4	5	5	5
		Stems per ACRE	526	526	526	445	445	445	567	567	567	486	486	486	202	202	202	526	526	526	526	526	526	445	445	445	405	405	405	647	647	647	405	405	405	567	567	567	567	567	567

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 10. Planted and Total Stem Counts
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

			Annual Summary					
			MY1 (2016)			MY0 (2016)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer rubrum	red maple	Tree	45	45	45	50	50	50
Alnus serrulata	tag alder	Shrub Tree			1			
Betula nigra	river birch	Tree	41	41	41	49	49	49
Cercis canadensis	redbud	Shrub Tree	44	44	44	46	46	46
Fraxinus pennsylvanica	green ash	Tree	58	58	58	58	58	58
Platanus occidentalis	sycamore	Tree	33	33	33	30	30	30
Ulmus americana	American elm	Tree	50	50	50	52	52	52
		Stem count	271	271	272	285	285	285
		size (ares)	21			21		
		size (ACRES)	0.52			0.52		
		Species count	6	6	7	6	6	6
		Stems per ACRE	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 1 - 2016

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)		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)	N/A	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)								---		---		---		---		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)	N/A							---		---		---		---		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)		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)	N/A	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%																					
SC%/Sa%/G%/C%/B%/Be%																					
d16/d35/d50/d84/d95/d100	N/A	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)		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)	N/A	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 1 - 2016

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)								---		---		---		---		5.0	22.3	13.3	46.3	3.1	14.3
Pool Max Depth (ft)	N/A	---		---		---		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 1 - 2016

	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**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	2,535.4	2,535.4					2,533.2	2,533.2					2,532.9	2,532.9				
Bankfull Width (ft)	30.3	29.9					30.6	30.9					33.5	32.9				
Floodprone Width (ft)	132.9	135.1					---	---					>200	>200				
Bankfull Mean Depth (ft)	1.8	1.7					2.2	2.1					1.6	1.6				
Bankfull Max Depth (ft)	2.7	2.8					4.3	3.9					3.2	3.1				
Bankfull Cross Sectional Area (ft2)	53.5	49.8					68.0	65.9					52.2	51.8				
Bankfull Width/Depth Ratio	17.1	18.0					---	---					21.4	20.9				
Bankfull Entrenchment Ratio	4.4	4.5					---	---					>6.0	>6.1				
Bankfull Bank Height Ratio	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**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	2,527.4	2,527.4					2,525.4	2,525.4					2,524.8	2,524.8				
Bankfull Width (ft)	29.1	29.3					30.7	31.3					35.4	35.5				
Floodprone Width (ft)	>200	>200					>200	>200					---	---				
Bankfull Mean Depth (ft)	1.6	1.6					1.9	1.8					2.6	2.4				
Bankfull Max Depth (ft)	2.6	2.6					3.9	3.6					5.7	5.1				
Bankfull Cross Sectional Area (ft2)	46.6	46.4					56.9	56.7					93.4	83.6				
Bankfull Width/Depth Ratio	18.1	18.5					16.6	17.2					---	---				
Bankfull Entrenchment Ratio	>6.9	>6.8					>6.5	>6.4					---	---				
Bankfull Bank Height Ratio	1.0	1.0					1.0	1.0					---	---				
	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**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	2,522.0	2,522.0					2,520.1	2,520.1					2,519.5	2,519.5				
Bankfull Width (ft)	35.3	35.5					28.7	29.8					31.9	30.7				
Floodprone Width (ft)	---	---					>200	>200					>200	>200				
Bankfull Mean Depth (ft)	2.9	2.8					2.1	2.1					2.0	2.0				
Bankfull Max Depth (ft)	5.4	5.6					3.4	3.6					3.1	3.2				
Bankfull Cross Sectional Area (ft2)	103.7	100.0					58.8	61.2					64.2	62.3				
Bankfull Width/Depth Ratio	---	---					14.0	14.5					15.9	15.2				
Bankfull Entrenchment Ratio	---	---					>7.0	>6.7					>6.3	>6.5				
Bankfull Bank Height Ratio	---	---					1.0	1.0					1.0	1.0				

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

Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 1 - 2016

	Cross Section 10, UT2b (Pool)						Cross Section 11, UT2b (Riffle)						Cross Section 12, UT2 Reach 1 Lower (Riffle)					
Dimension	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	2,570.0	2,570.0					2,566.4	2,566.4					2,573.8	2,573.8				
Bankfull Width (ft)	5.9	6.0					6.7	6.3					8.1	8.4				
Floodprone Width (ft)	---	---					15.9	17.7					28.4	30.0				
Bankfull Mean Depth (ft)	1.0	2.3					0.5	0.7					0.6	0.7				
Bankfull Max Depth (ft)	1.7	3.4					0.9	1.1					1.0	1.3				
Bankfull Cross Sectional Area (ft2)	5.7	14.0					3.7	4.3					5.1	5.7				
Bankfull Width/Depth Ratio	---	---					12.2	9.1					13.0	12.5				
Bankfull Entrenchment Ratio	---	---					2.4	2.8					3.5	3.6				
Bankfull Bank Height Ratio	---	---					1.0	1.0					1.0	1.0				
	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**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	2,573.3	2,573.3					2,547.2	2,547.2					2,539.1	2,539.1				
Bankfull Width (ft)	9.8	10.1					10.8	8.0					12.2	11.6				
Floodprone Width (ft)	---	---					21.5	23.2					---	---				
Bankfull Mean Depth (ft)	1.3	1.2					0.5	0.8					1.5	1.0				
Bankfull Max Depth (ft)	2.2	1.9					1.1	1.2					3.1	1.7				
Bankfull Cross Sectional Area (ft2)	12.8	12.5					5.9	6.6					18.7	11.9				
Bankfull Width/Depth Ratio	---	---					20.1	9.7					---	---				
Bankfull Entrenchment Ratio	---	---					2.0	2.9					---	---				
Bankfull Bank Height Ratio	---	---					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**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation	2,535.0	2,535.0					2,531.2	2,531.2					2,530.4	2,530.4				
Bankfull Width (ft)	8.9	10.0					12.8	12.9					19.3	19.5				
Floodprone Width (ft)	>200	>200					>200	>200					---	---				
Bankfull Mean Depth (ft)	0.5	0.5					0.9	0.9					0.8	0.8				
Bankfull Max Depth (ft)	1.1	0.8					2.1	1.8					2.0	2.3				
Bankfull Cross Sectional Area (ft2)	4.2	5.0					12.0	12.0					15.8	16.3				
Bankfull Width/Depth Ratio	19.2	19.9					13.6	13.8					---	---				
Bankfull Entrenchment Ratio	>22.4	>20.0					>15.7	>15.5					---	---				
Bankfull Bank Height Ratio	1.0	1.0					1.0	1.0					---	---				

Table 13a. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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								
Floodprone Width (ft)	133	>200	135	>200								
Bankfull Mean Depth	1.6	1.8	1.6	1.7								
Bankfull Max Depth	2.7	3.2	2.8	3.1								
Bankfull Cross-sectional Area (ft^2)	52.2	53.5	49.8	51.8								
Width/Depth Ratio	17.1	21.4	18	20.9								
Entrenchment Ratio	4.4	>6.0	4.5	>6.1								
Bank Height Ratio	0.8	1.0	0.8	1.0								
D50 (mm)	50.7		56.9									
Profile												
Riffle Length (ft)	28	81	21	47								
Riffle Slope (ft/ft)	0.0040	0.0275	0.0064	0.0283								
Pool Length (ft)	44	96	66	176								
Pool Max Depth (ft)	3.5	5.8	3.0	4.7								
Pool Spacing (ft)	71	191	77	224								
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									
Channel Thalweg Length (ft)	1,444		1,444									
Sinuosity (ft)	1.22											
Water Surface Slope (ft/ft)	0.0049		0.0049									
Bankfull Slope (ft/ft)	0.0051		0.0043									
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									
% of Reach with Eroding Banks	0%		0%									

Table 13b. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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								
Floodprone Width (ft)	>200		>200									
Bankfull Mean Depth	1.6	1.9	1.6	1.8								
Bankfull Max Depth	2.6	3.9	2.6	3.6								
Bankfull Cross-sectional Area (ft^2)	46.6	56.9	46.4	56.7								
Width/Depth Ratio	16.6	18.1	17.2	18.5								
Entrenchment Ratio	>6.5	>6.9	>6.4	>6.8								
Bank Height Ratio	1.0		1.0									
D50 (mm)	87.6		72.4									
Profile												
Riffle Length (ft)	38	68	19	49								
Riffle Slope (ft/ft)	0.0101	0.0274	0.0112	0.0471								
Pool Length (ft)	39	109	39	145								
Pool Max Depth (ft)	4.7	5.8	4.3	6.6								
Pool Spacing (ft)	132	206	78	206								
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									
Channel Thalweg Length (ft)	1,083		1,083									
Sinuosity (ft)	1.24											
Water Surface Slope (ft/ft)	0.0072		0.0073									
Bankfull Slope (ft/ft)	0.0074		0.0059									
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									
% of Reach with Eroding Banks	0%		0%									

Table 13c. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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								
Floodprone Width (ft)	>200		>200									
Bankfull Mean Depth	2.0	2.1	2.0	2.1								
Bankfull Max Depth	3.1	3.4	3.2	3.6								
Bankfull Cross-sectional Area (ft^2)	58.8	64.2	61.2	62.3								
Width/Depth Ratio	14.0	15.9	14.5	15.2								
Entrenchment Ratio	>6.3	>7	>6.5	>6.7								
Bank Height Ratio	1.0		1.0									
D50 (mm)	47.4		72									
Profile												
Riffle Length (ft)	30	132	26	102								
Riffle Slope (ft/ft)	0.0055	0.0236	0.0169	0.0254								
Pool Length (ft)	41	99	55	153								
Pool Max Depth (ft)	2.6	5.4	3.8	6.3								
Pool Spacing (ft)	88	190	12	129								
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									
Channel Thalweg Length (ft)	493		493									
Sinuosity (ft)	1.04											
Water Surface Slope (ft/ft)	0.0118		0.0101									
Bankfull Slope (ft/ft)	0.0101		0.0107									
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									
% of Reach with Eroding Banks	0%		0%									

Table 13d. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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									
Floodprone Width (ft)	28.4		30.0									
Bankfull Mean Depth	0.6		0.7									
Bankfull Max Depth	1.0		1.3									
Bankfull Cross-sectional Area (ft^2)	5.1		5.7									
Width/Depth Ratio	13.0		12.5									
Entrenchment Ratio	3.5		3.6									
Bank Height Ratio	1.0		1.0									
D50 (mm)	56.9		39.8									
Profile												
Riffle Length (ft)	11	25	13	39								
Riffle Slope (ft/ft)	0.0360	0.0853	0.0136	0.0730								
Pool Length (ft)	5	22	2	15								
Pool Max Depth (ft)	1.9	5.0	1.0	2.9								
Pool Spacing (ft)	7	34	8	52								
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									
Channel Thalweg Length (ft)	433		433									
Sinuosity (ft)	1.05											
Water Surface Slope (ft/ft)	0.0560		0.0477									
Bankfull Slope (ft/ft)	0.0563		0.0483									
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
[1]d16/d35/d50/d84/d95/d100	0.25/11/28/96/143/256		6.1/14/23/75/153/256									
% of Reach with Eroding Banks	0%		6%									

Table 13e. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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								
Floodprone Width (ft)	21.5	>200	23.2	>200								
Bankfull Mean Depth	0.5	0.9	0.5	0.9								
Bankfull Max Depth	1.10	2.10	0.80	1.80								
Bankfull Cross-sectional Area (ft^2)	4.2	12.0	5.0	12.0								
Width/Depth Ratio	13.6	20.1	9.7	19.9								
Entrenchment Ratio	2.0	>22.4	2.9	>20.0								
Bank Height Ratio	1.0		1.0									
D50 (mm)	44	53	15	90								
Profile												
Riffle Length (ft)	17	29	10	36								
Riffle Slope (ft/ft)	0.0262	0.0575	0.0141	0.0658								
Pool Length (ft)	13	46	4	40								
Pool Max Depth (ft)	1.6	3.2	1.5	3.8								
Pool Spacing (ft)	24	98	8	113								
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									
Channel Thalweg Length (ft)	1,318		1,318									
Sinuosity (ft)	1.2											
Water Surface Slope (ft/ft)	0.0231		0.0225									
Bankfull Slope (ft/ft)	0.0237		0.0214									
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
[1]d16/d35/d50/d84/d95/d100	0.25/11/28/96/143/256		6.1/14/23/75/153/256									
% of Reach with Eroding Banks	0%		0%									

Table 13f. Monitoring Data - Stream Reach Data Summary
Little Pine III Stream & Wetland Mitigation Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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									
Floodprone Width (ft)	15.9		17.7									
Bankfull Mean Depth	0.5		0.7									
Bankfull Max Depth	0.9		1.1									
Bankfull Cross-sectional Area (ft^2)	3.7		4.3									
Width/Depth Ratio	12.2		9.1									
Entrenchment Ratio	2.4		2.8									
Bank Height Ratio	1.0		1.0									
D50 (mm)	43		36									
Profile												
Riffle Length (ft)	4	23	7	24								
Riffle Slope (ft/ft)	0.0448	0.0659	0.0276	0.0451								
Pool Length (ft)	3	14	3	8								
Pool Max Depth (ft)	0.6	2.1	2.0	3.9								
Pool Spacing (ft)	3	33	4	30								
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									
Channel Thalweg Length (ft)	253		253									
Sinuosity (ft)	1.10											
Water Surface Slope (ft/ft)	0.0616		0.0614									
Bankfull Slope (ft/ft)	0.0536		0.0608									
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									
% of Reach with Eroding Banks	0%		0%									

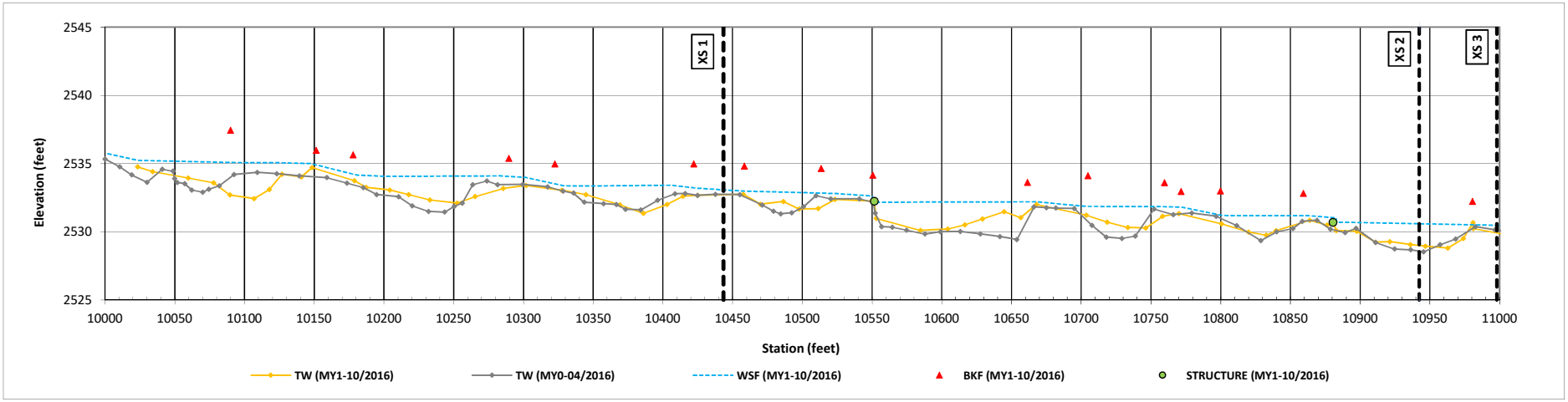
Longitudinal Profile Plots

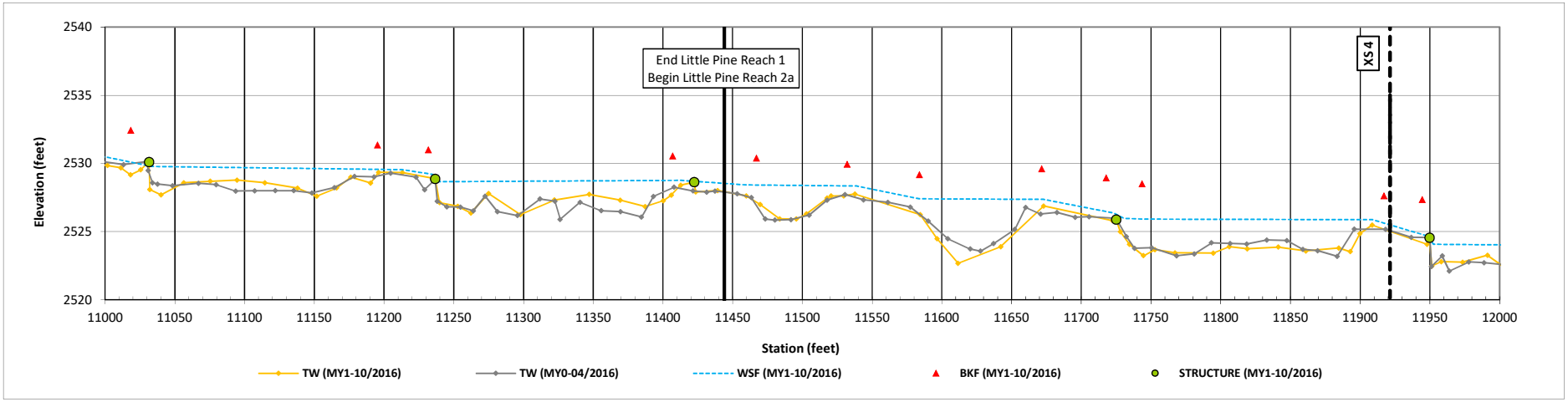
Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

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





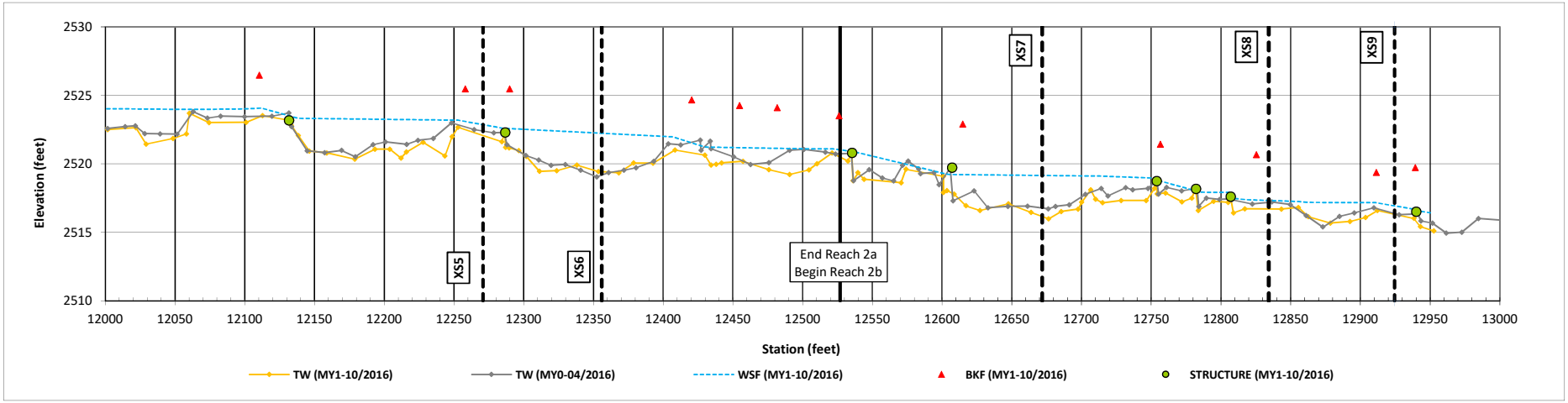
Longitudinal Profile Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

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



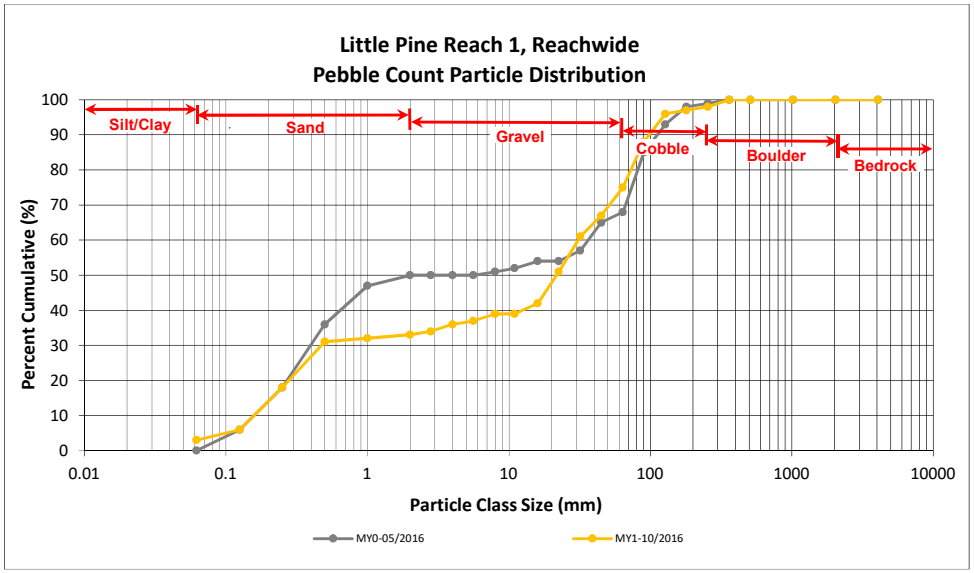
Reachwide and Cross Section Pebble Count Plots

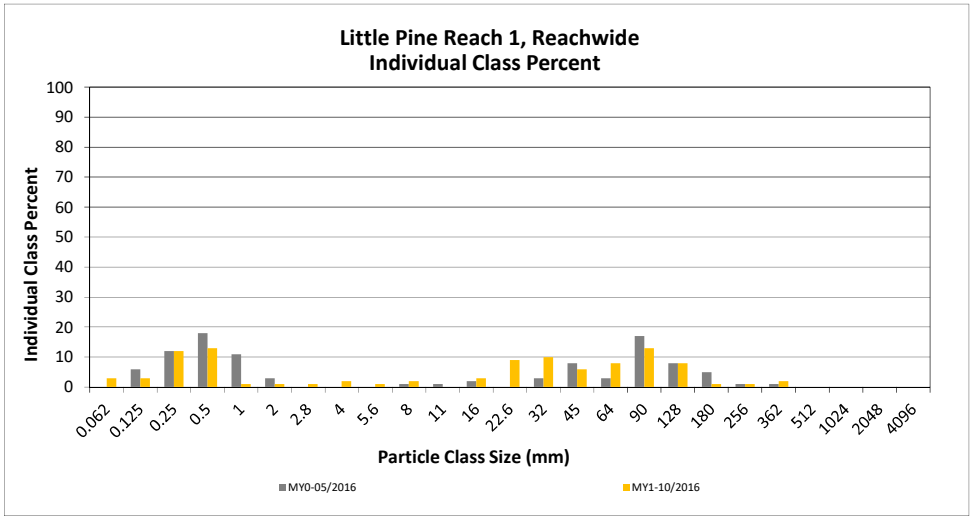
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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		3	3	3	3
SAND	Very fine	0.062	0.125		3	3	3	6
	Fine	0.125	0.250		12	12	12	18
	Medium	0.25	0.50	3	10	13	13	31
	Coarse	0.5	1.0		1	1	1	32
	Very Coarse	1.0	2.0		1	1	1	33
GRAVEL	Very Fine	2.0	2.8		1	1	1	34
	Very Fine	2.8	4.0		2	2	2	36
	Fine	4.0	5.6	1		1	1	37
	Fine	5.6	8.0	2		2	2	39
	Medium	8.0	11.0					39
	Medium	11.0	16.0	1	2	3	3	42
	Coarse	16.0	22.6	7	2	9	9	51
	Coarse	22.6	32	5	5	10	10	61
	Very Coarse	32	45	5	1	6	6	67
	Very Coarse	45	64	4	4	8	8	75
COBBLE	Small	64	90	12	1	13	13	88
	Small	90	128	7	1	8	8	96
	Large	128	180	1		1	1	97
	Large	180	256		1	1	1	98
BOULDER	Small	256	362	2		2	2	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.22
D_{35} =	3.3
D_{50} =	22
D_{84} =	81
D_{95} =	122
D_{100} =	362





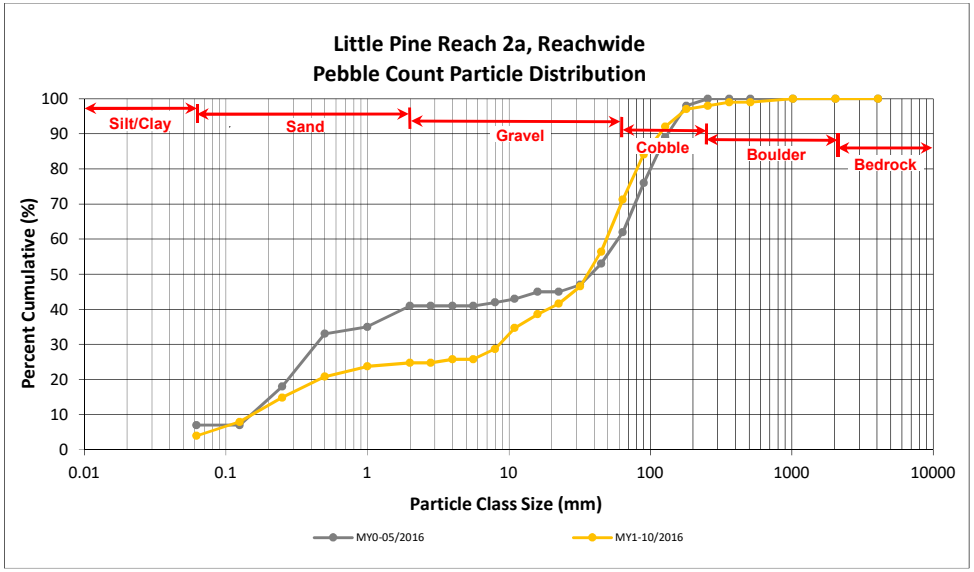
Reachwide and Cross Section Pebble Count Plots

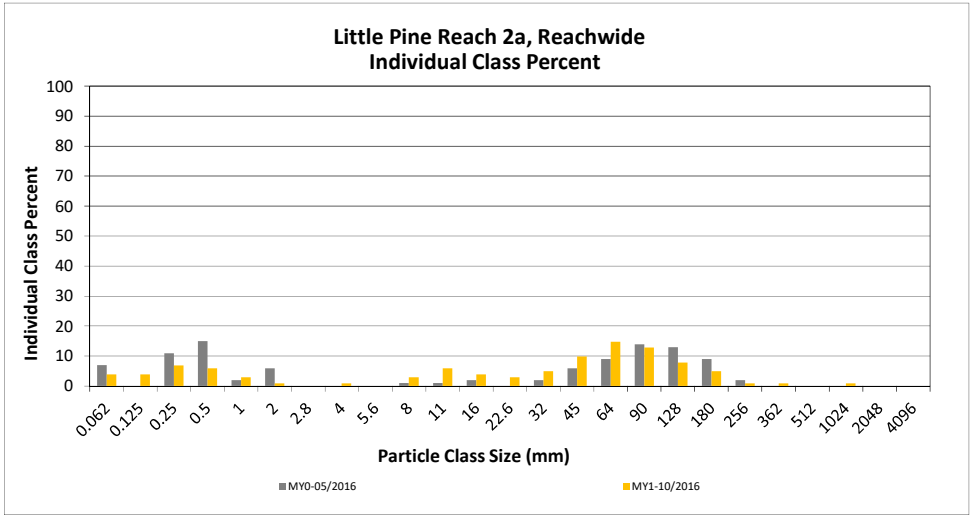
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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		4	4	4	4
SAND	Very fine	0.062	0.125		4	4	4	8
	Fine	0.125	0.250		7	7	7	15
	Medium	0.25	0.50		6	6	6	21
	Coarse	0.5	1.0		3	3	3	24
	Very Coarse	1.0	2.0		1	1	1	25
GRAVEL	Very Fine	2.0	2.8					25
	Very Fine	2.8	4.0		1	1	1	26
	Fine	4.0	5.6					26
	Fine	5.6	8.0	2	1	3	3	29
	Medium	8.0	11.0	3	3	6	6	35
	Medium	11.0	16.0	2	2	4	4	39
	Coarse	16.0	22.6		3	3	3	42
	Coarse	22.6	32	3	2	5	5	47
	Very Coarse	32	45	5	5	10	10	56
	Very Coarse	45	64	10	5	15	15	71
COBBLE	Small	64	90	12	1	13	13	84
	Small	90	128	6	2	8	8	92
	Large	128	180	4	1	5	5	97
	Large	180	256	1		1	1	98
BOULDER	Small	256	362	1		1	1	99
	Small	362	512					99
	Medium	512	1024	1		1	1	100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**51**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.29
D_{35} =	11
D_{50} =	36
D_{84} =	90
D_{95} =	157
D_{100} =	1024





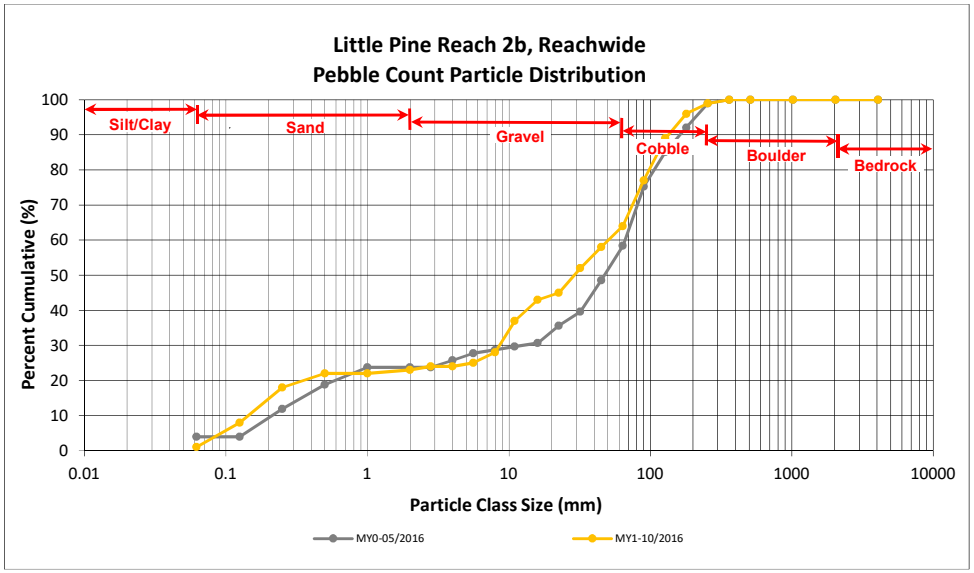
Reachwide and Cross Section Pebble Count Plots

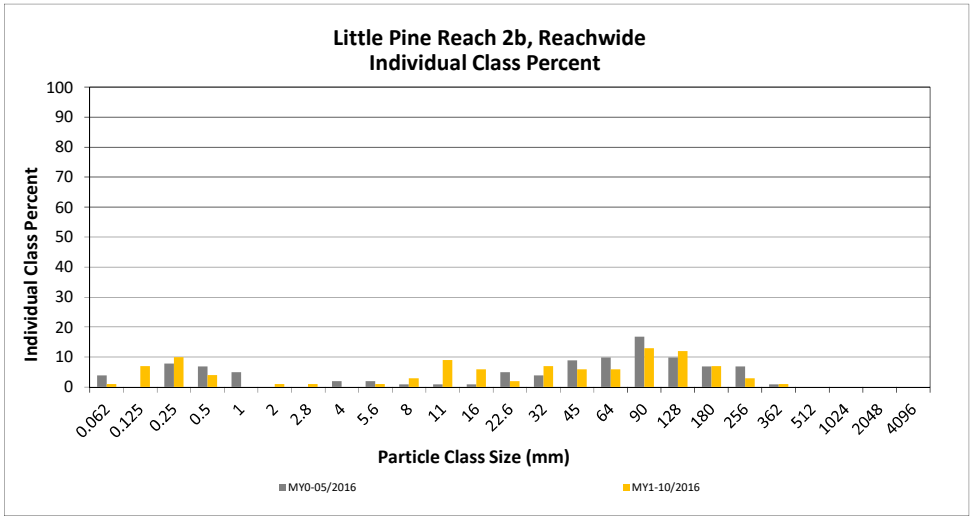
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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		1	1	1	1
SAND	Very fine	0.062	0.125	1	6	7	7	8
	Fine	0.125	0.250	1	9	10	10	18
	Medium	0.25	0.50		4	4	4	22
	Coarse	0.5	1.0					22
	Very Coarse	1.0	2.0		1	1	1	23
GRAVEL	Very Fine	2.0	2.8		1	1	1	24
	Very Fine	2.8	4.0					24
	Fine	4.0	5.6		1	1	1	25
	Fine	5.6	8.0	1	2	3	3	28
	Medium	8.0	11.0	3	6	9	9	37
	Medium	11.0	16.0	2	4	6	6	43
	Coarse	16.0	22.6		2	2	2	45
	Coarse	22.6	32	2	5	7	7	52
	Very Coarse	32	45	3	3	6	6	58
	Very Coarse	45	64	2	4	6	6	64
COBBLE	Small	64	90	8	5	13	13	77
	Small	90	128	8	4	12	12	89
	Large	128	180	5	2	7	7	96
	Large	180	256	3		3	3	99
BOULDER	Small	256	362	1		1	1	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**40**	**60**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.22
D_{35} =	10
D_{50} =	29
D_{84} =	111
D_{95} =	171
D_{100} =	362





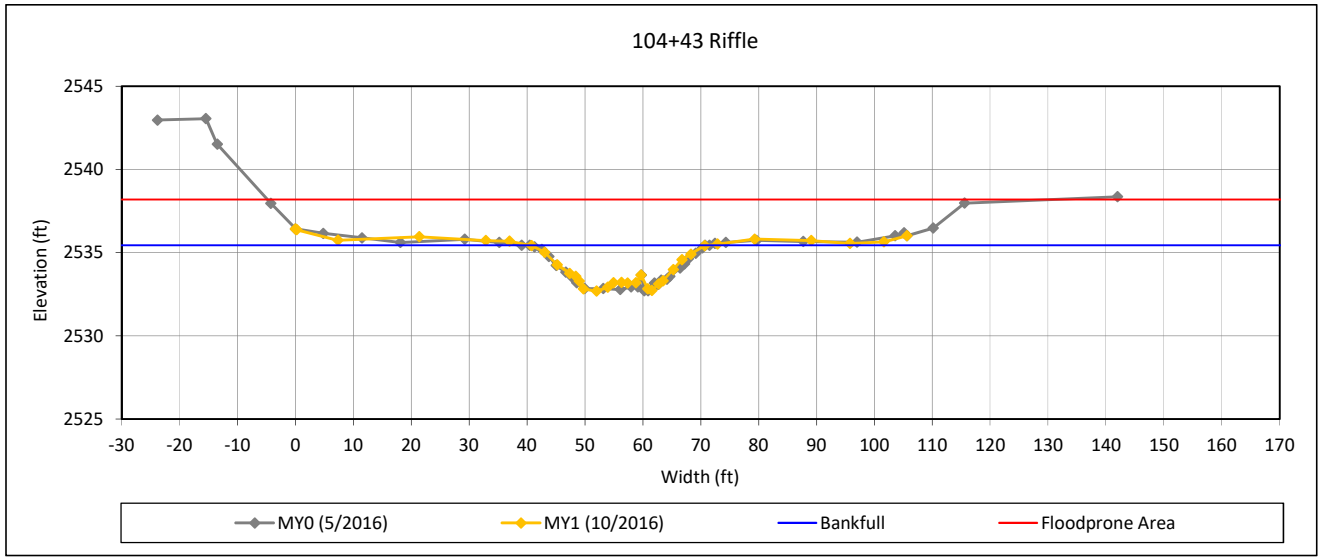
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 1 - Little Pine Reach 1



Bankfull Dimensions	
49.8	x-section area (ft.sq.)
29.9	width (ft)
1.7	mean depth (ft)
2.8	max depth (ft)
31.2	wetted perimeter (ft)
1.6	hydraulic radius (ft)
18.0	width-depth ratio
135.1	W flood prone area (ft)
4.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

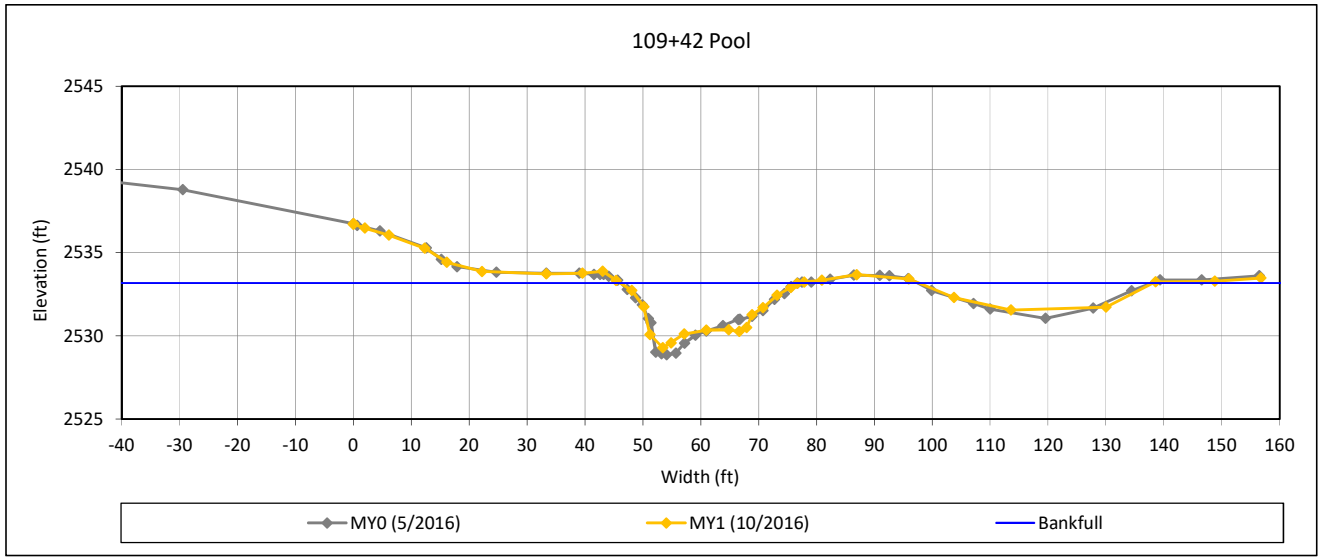
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 2 - Little Pine Reach 1



Bankfull Dimensions	
65.9	x-section area (ft.sq.)
30.9	width (ft)
2.1	mean depth (ft)
3.9	max depth (ft)
32.9	wetted perimeter (ft)
2.0	hydraulic radius (ft)
14.5	width-depth ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

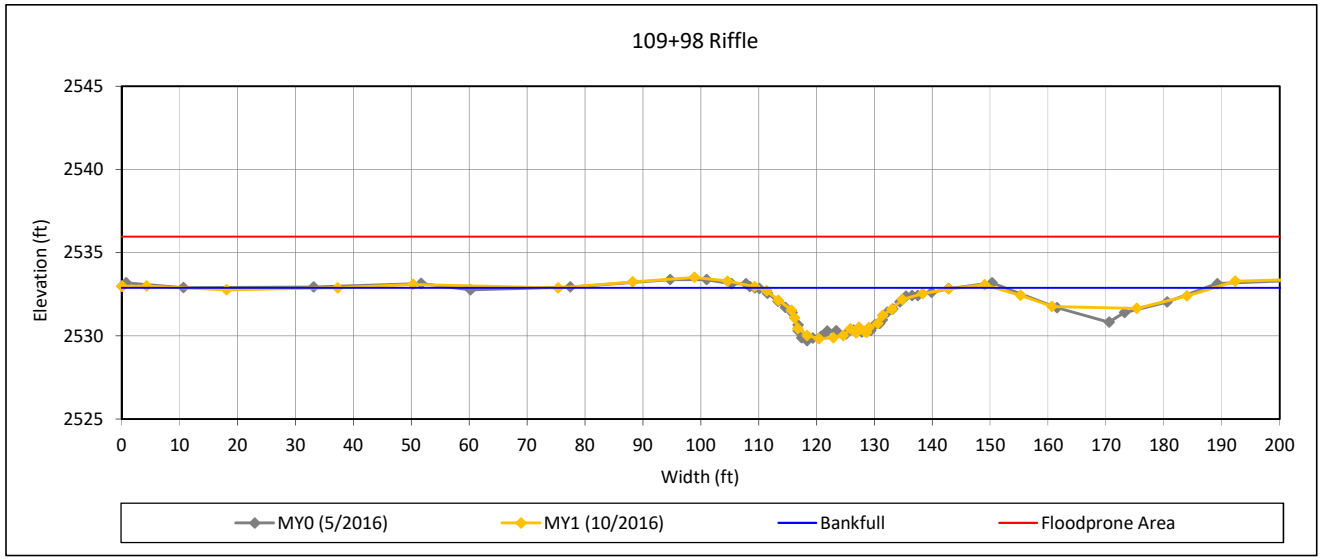
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 3 - Little Pine Reach 1



Bankfull Dimensions	
51.8	x-section area (ft.sq.)
32.9	width (ft)
1.6	mean depth (ft)
3.1	max depth (ft)
34.2	wetted perimeter (ft)
1.5	hydraulic radius (ft)
20.9	width-depth ratio
>200	W flood prone area (ft)
6.1	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

Reachwide and Cross Section Pebble Count Plots

Little Pine Creek III Stream & Wetland Restoration Project

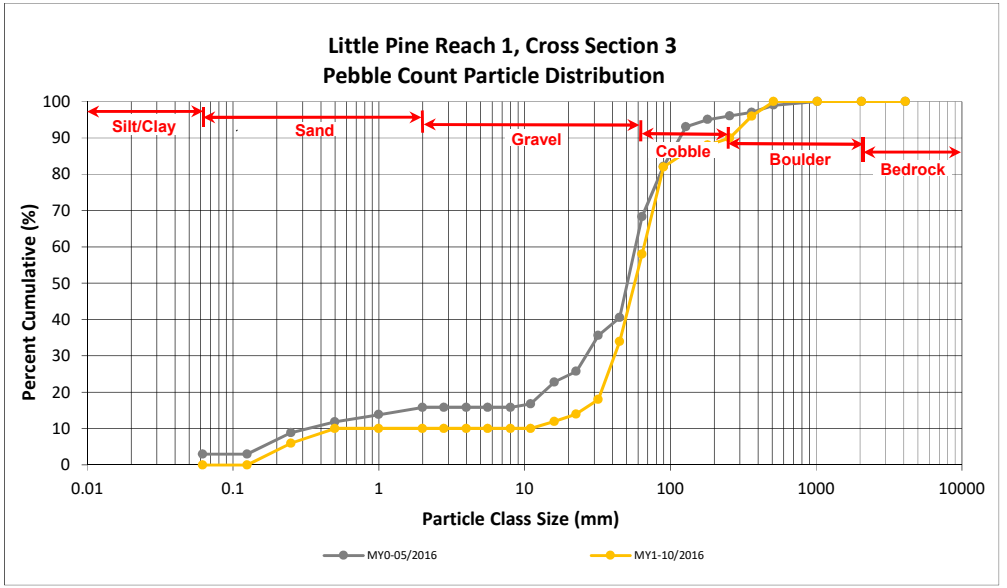
DMS Project No. 94903

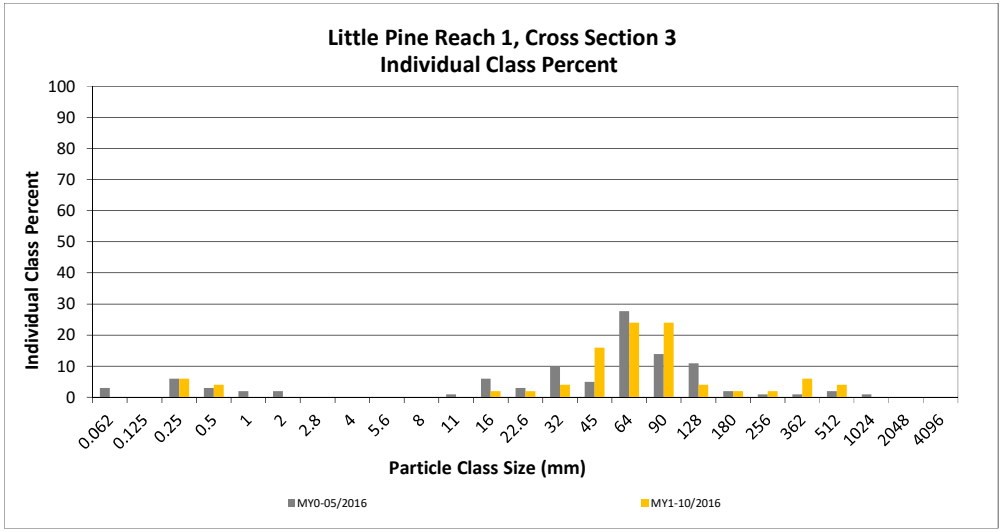
Monitoring Year 1 - 2016

Little Pine Reach 1, Cross Section 3

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	3	6	6
	Medium	0.25	0.50	2	4	10
	Coarse	0.5	1.0			10
	Very Coarse	1.0	2.0			10
GRAVEL	Very Fine	2.0	2.8			10
	Very Fine	2.8	4.0			10
	Fine	4.0	5.6			10
	Fine	5.6	8.0			10
	Medium	8.0	11.0			10
	Medium	11.0	16.0	1	2	12
	Coarse	16.0	22.6	1	2	14
	Coarse	22.6	32	2	4	18
	Very Coarse	32	45	8	16	34
	Very Coarse	45	64	12	24	58
COBBLE	Small	64	90	12	24	82
	Small	90	128	2	4	86
	Large	128	180	1	2	88
	Large	180	256	1	2	90
BOULDER	Small	256	362	3	6	96
	Small	362	512	2	4	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**50**	**100**	**100**

Cross Section 3	
Channel materials (mm)	
D_{16} =	27
D_{35} =	46
D_{50} =	57
D_{84} =	107
D_{95} =	342
D_{100} =	512





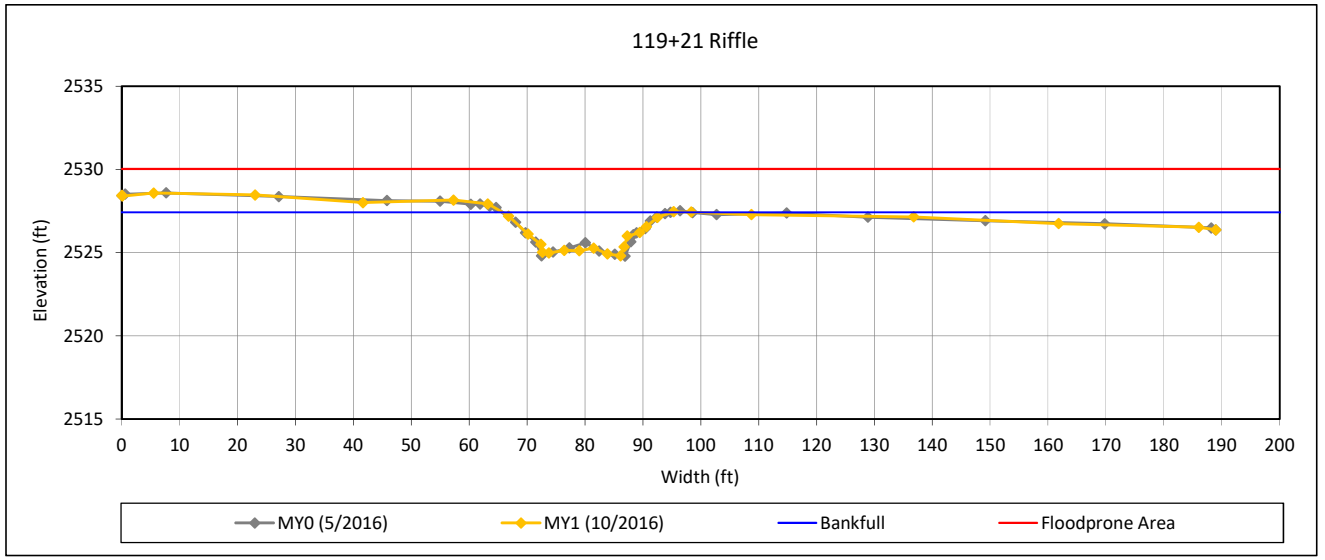
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 4 - Little Pine Reach 2a



Bankfull Dimensions	
46.4	x-section area (ft.sq.)
29.3	width (ft)
1.6	mean depth (ft)
2.6	max depth (ft)
30.6	wetted perimeter (ft)
1.5	hydraulic radius (ft)
18.5	width-depth ratio
>200	W flood prone area (ft)
6.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

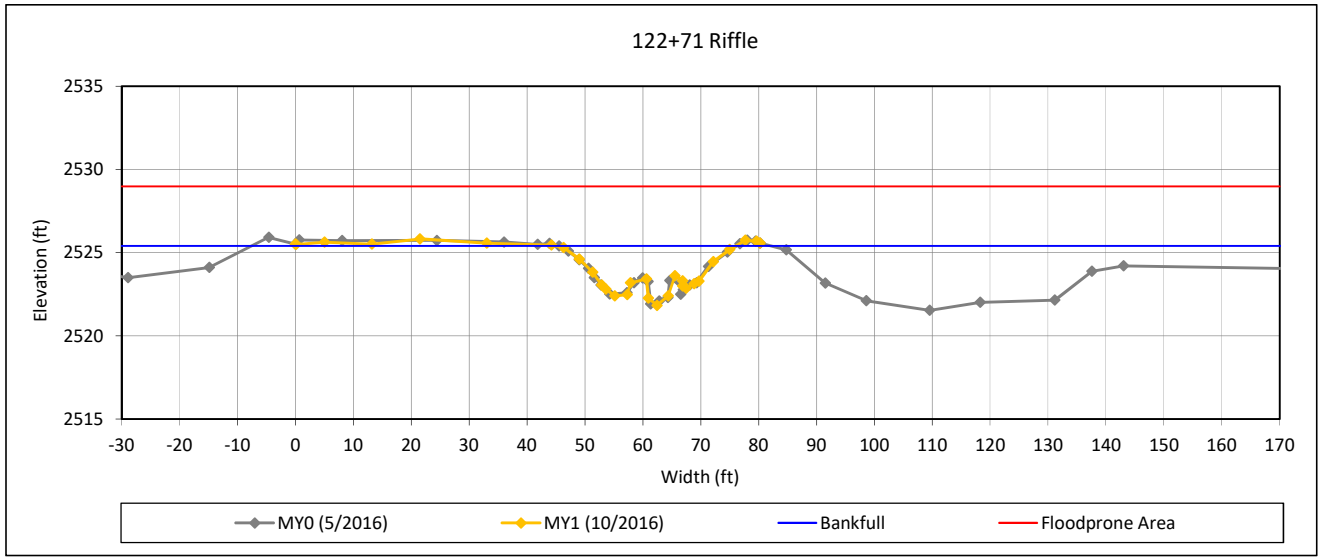
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 5 - Little Pine Reach 2a



Bankfull Dimensions	
56.7	x-section area (ft.sq.)
31.3	width (ft)
1.8	mean depth (ft)
3.6	max depth (ft)
34.4	wetted perimeter (ft)
1.6	hydraulic radius (ft)
17.2	width-depth ratio
>200	W flood prone area (ft)
6.4	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

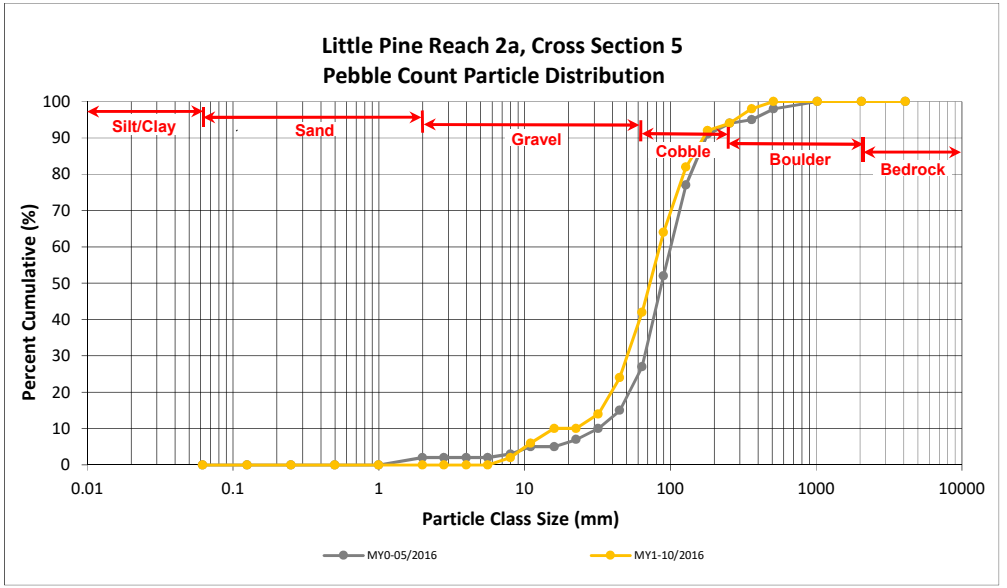
Reachwide and Cross Section Pebble Count Plots

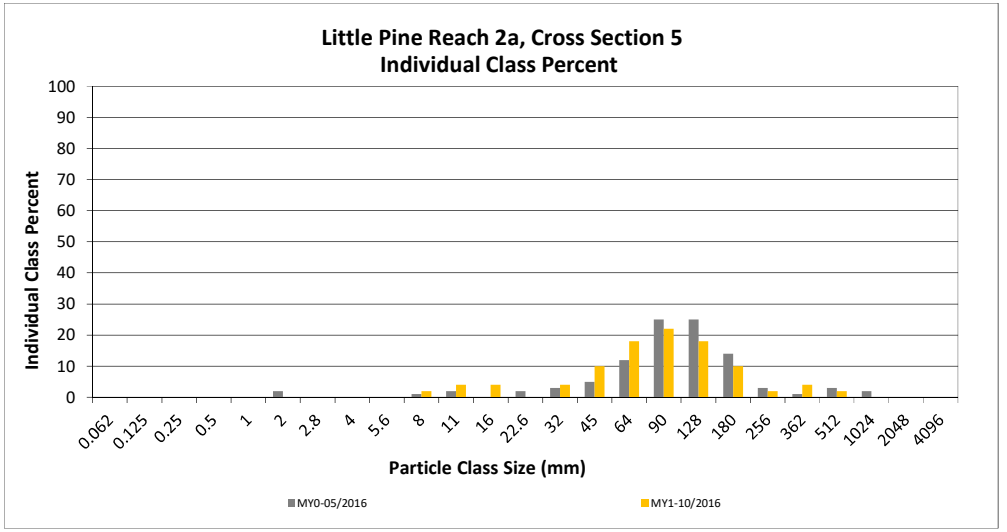
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

Little Pine Reach 2a, Cross Section 5

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.6			0
	Fine	5.6	8.0	1	2	2
	Medium	8.0	11.0	2	4	6
	Medium	11.0	16.0	2	4	10
	Coarse	16.0	22.6			10
	Coarse	22.6	32	2	4	14
	Very Coarse	32	45	5	10	24
	Very Coarse	45	64	9	18	42
COBBLE	Small	64	90	11	22	64
	Small	90	128	9	18	82
	Large	128	180	5	10	92
	Large	180	256	1	2	94
BOULDER	Small	256	362	2	4	98
	Small	362	512	1	2	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**50**	**100**	**100**

Cross Section 5	
Channel materials (mm)	
D_{16} =	34
D_{35} =	56
D_{50} =	72
D_{84} =	137
D_{95} =	279
D_{100} =	512





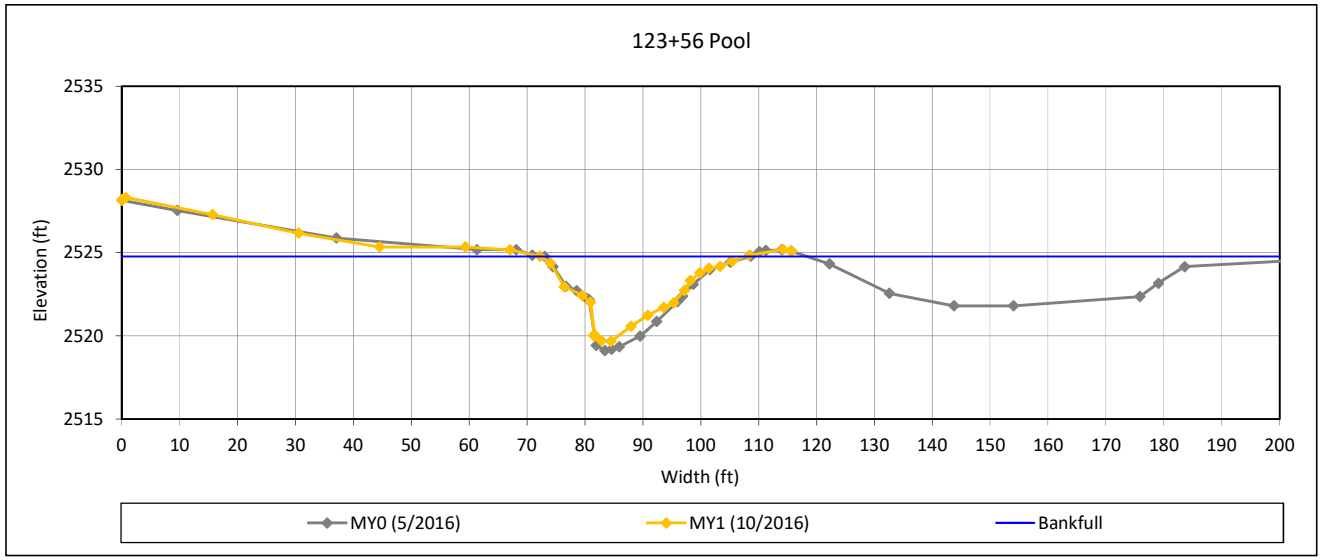
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 6 - Little Pine Reach 2a



Bankfull Dimensions	
83.6	x-section area (ft.sq.)
35.5	width (ft)
2.4	mean depth (ft)
5.1	max depth (ft)
38.3	wetted perimeter (ft)
2.2	hydraulic radius (ft)
15.1	width-depth ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

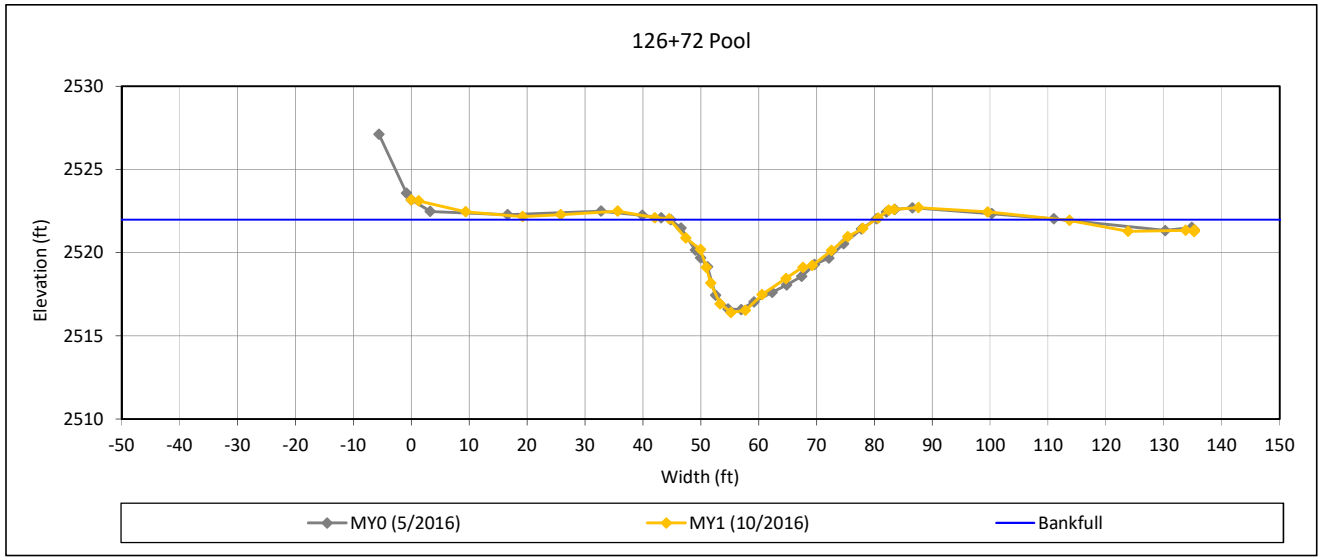
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 7 - Little Pine Reach 2b



Bankfull Dimensions	
100.0	x-section area (ft.sq.)
35.5	width (ft)
2.8	mean depth (ft)
5.6	max depth (ft)
37.9	wetted perimeter (ft)
2.6	hydraulic radius (ft)
12.6	width-depth ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

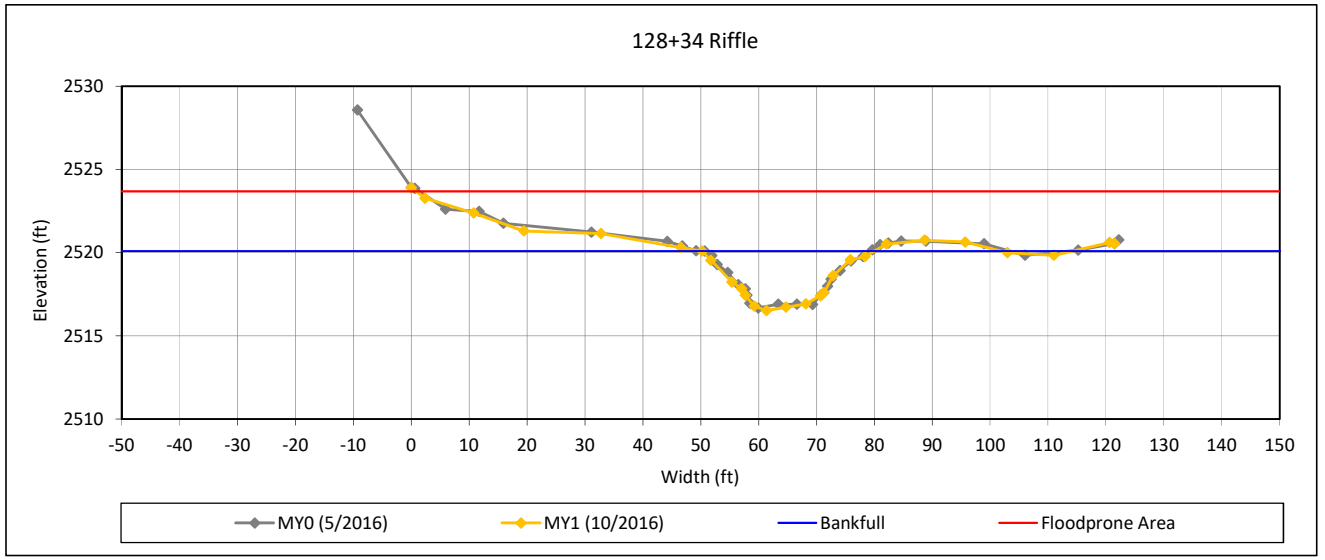
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 8 - Little Pine Reach 2b



Bankfull Dimensions	
61.2	x-section area (ft.sq.)
29.8	width (ft)
2.1	mean depth (ft)
3.6	max depth (ft)
31.0	wetted perimeter (ft)
2.0	hydraulic radius (ft)
14.5	width-depth ratio
>200	W flood prone area (ft)
6.7	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

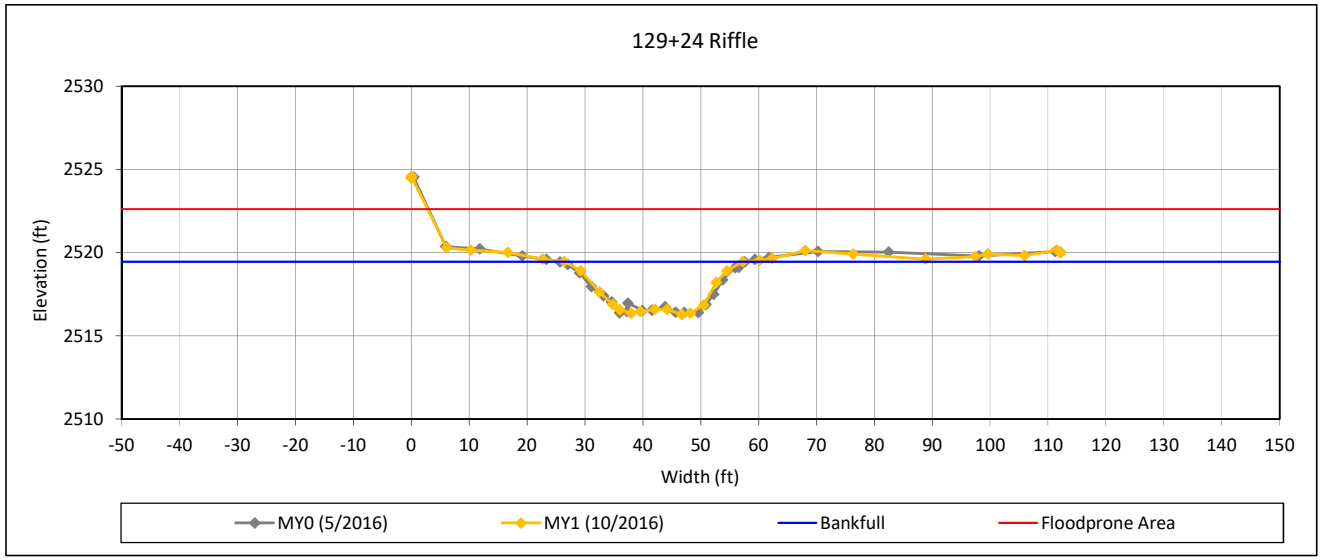
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 9 - Little Pine Reach 2b



Bankfull Dimensions	
62.3	x-section area (ft.sq.)
30.7	width (ft)
2.0	mean depth (ft)
3.2	max depth (ft)
31.9	wetted perimeter (ft)
2.0	hydraulic radius (ft)
15.2	width-depth ratio
>200	W flood prone area (ft)
6.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

Reachwide and Cross Section Pebble Count Plots

Little Pine Creek III Stream & Wetland Restoration Project

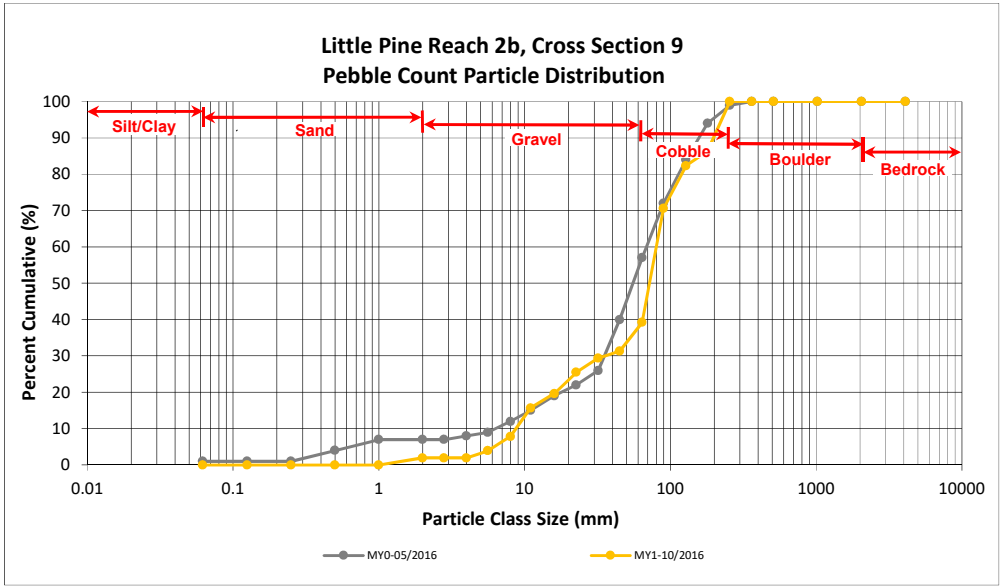
DMS Project No. 94903

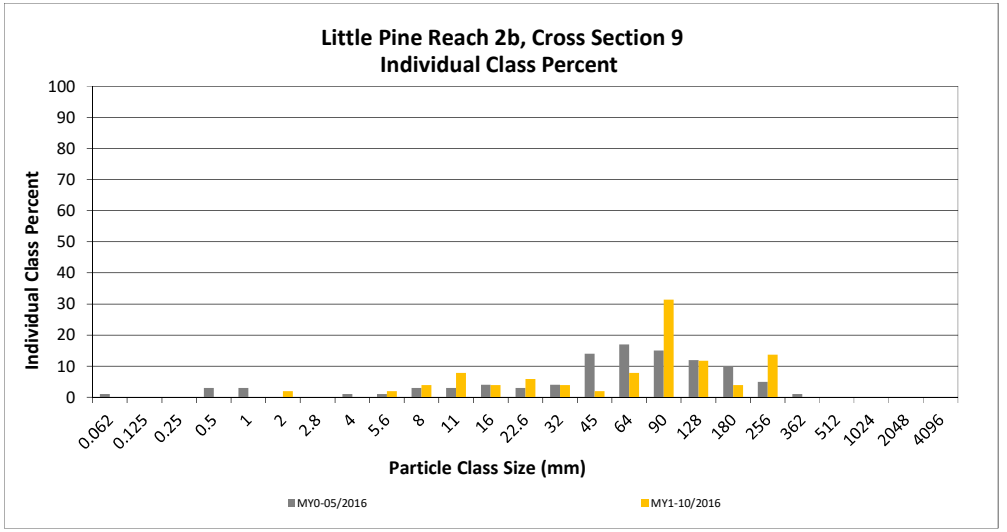
Monitoring Year 1 - 2016

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			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	1	2	2
GRAVEL	Very Fine	2.0	2.8			2
	Very Fine	2.8	4.0			2
	Fine	4.0	5.6	1	2	4
	Fine	5.6	8.0	2	4	8
	Medium	8.0	11.0	4	8	16
	Medium	11.0	16.0	2	4	20
	Coarse	16.0	22.6	3	6	25
	Coarse	22.6	32	2	4	29
	Very Coarse	32	45	1	2	31
	Very Coarse	45	64	4	8	39
COBBLE	Small	64	90	16	31	71
	Small	90	128	6	12	82
	Large	128	180	2	4	86
	Large	180	256	7	14	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	**51**	**100**	**100**

Cross Section 9	
Channel materials (mm)	
D_{16} =	11
D_{35} =	53
D_{50} =	72
D_{84} =	148
D_{95} =	225
D_{100} =	256





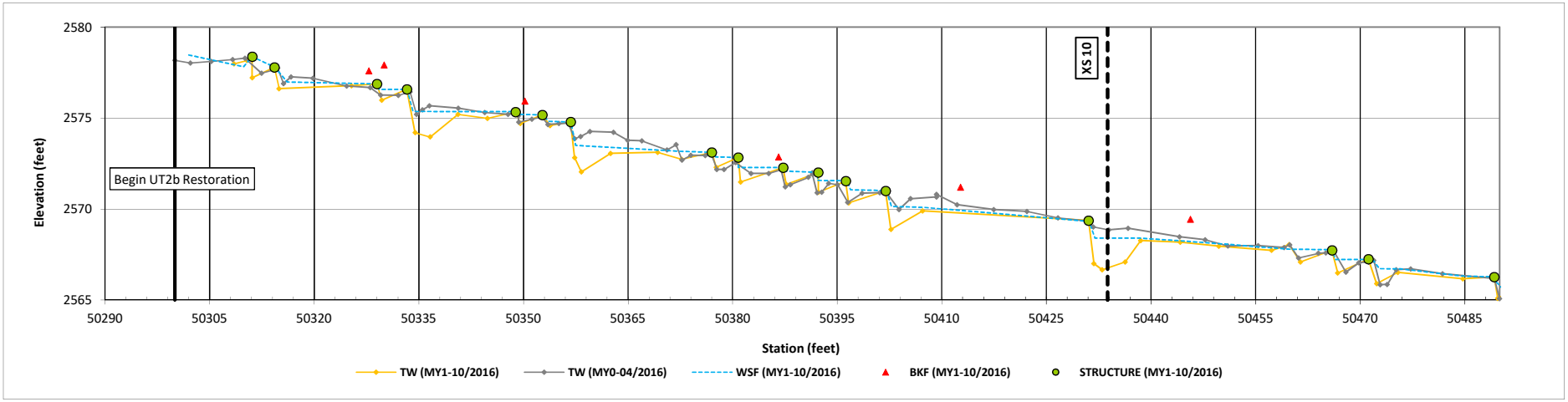
Longitudinal Profile Plots

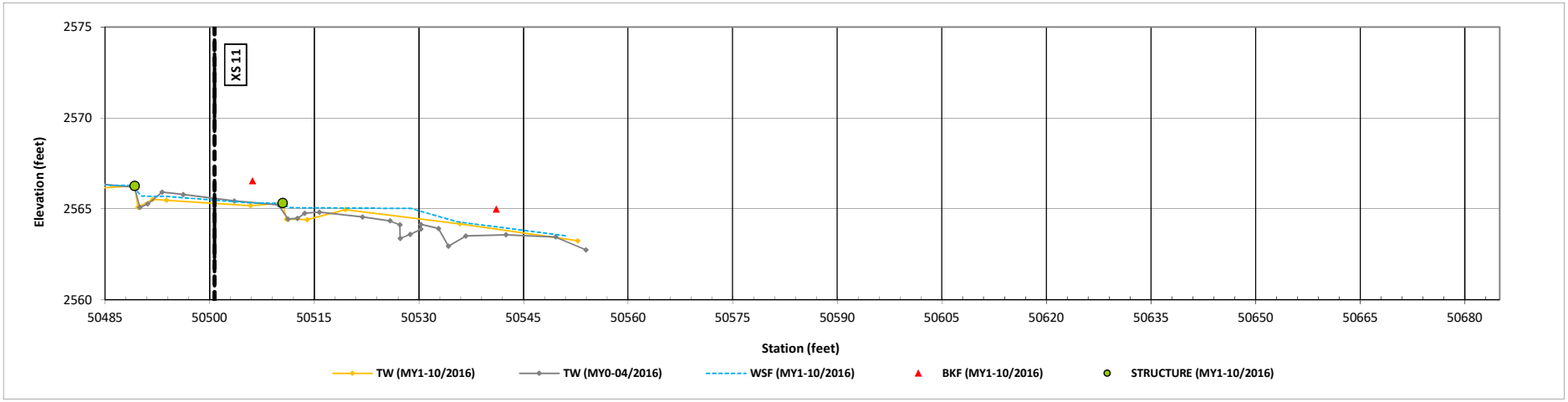
Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

UT2b (STA 503+00 - 505+53)





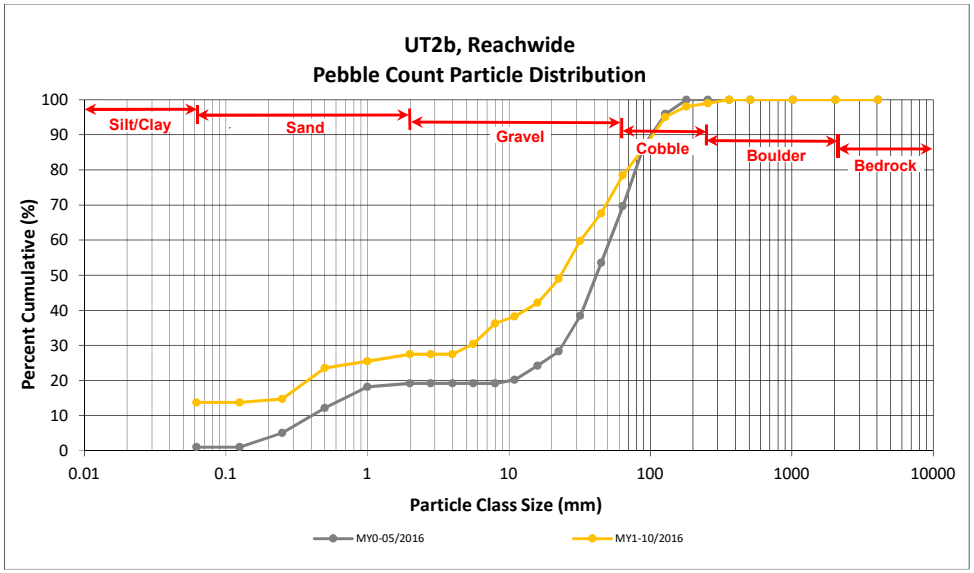
Reachwide and Cross Section Pebble Count Plots

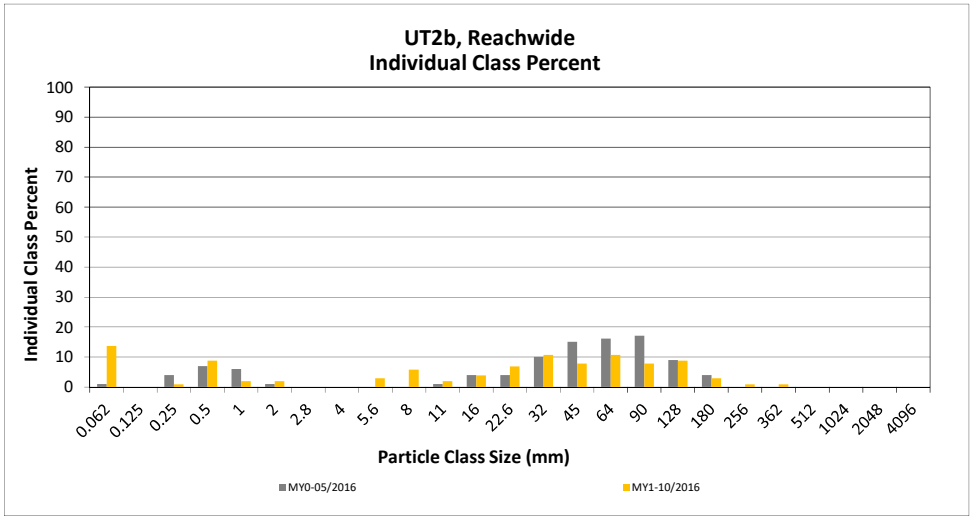
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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	13	14	14	14
SAND	Very fine	0.062	0.125					14
	Fine	0.125	0.250		1	1	1	15
	Medium	0.25	0.50	1	8	9	9	24
	Coarse	0.5	1.0	1	1	2	2	25
	Very Coarse	1.0	2.0	1	1	2	2	27
GRAVEL	Very Fine	2.0	2.8					27
	Very Fine	2.8	4.0					27
	Fine	4.0	5.6	2	1	3	3	30
	Fine	5.6	8.0	5	1	6	6	36
	Medium	8.0	11.0		2	2	2	38
	Medium	11.0	16.0	1	3	4	4	42
	Coarse	16.0	22.6	6	1	7	7	49
	Coarse	22.6	32	9	2	11	11	60
	Very Coarse	32	45	6	2	8	8	68
	Very Coarse	45	64	8	3	11	11	78
COBBLE	Small	64	90	6	2	8	8	86
	Small	90	128	8	1	9	9	95
	Large	128	180	3		3	3	98
	Large	180	256	1		1	1	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	**60**	**42**	**102**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.28
D_{35} =	7.4
D_{50} =	23
D_{84} =	82
D_{95} =	128
D_{100} =	362





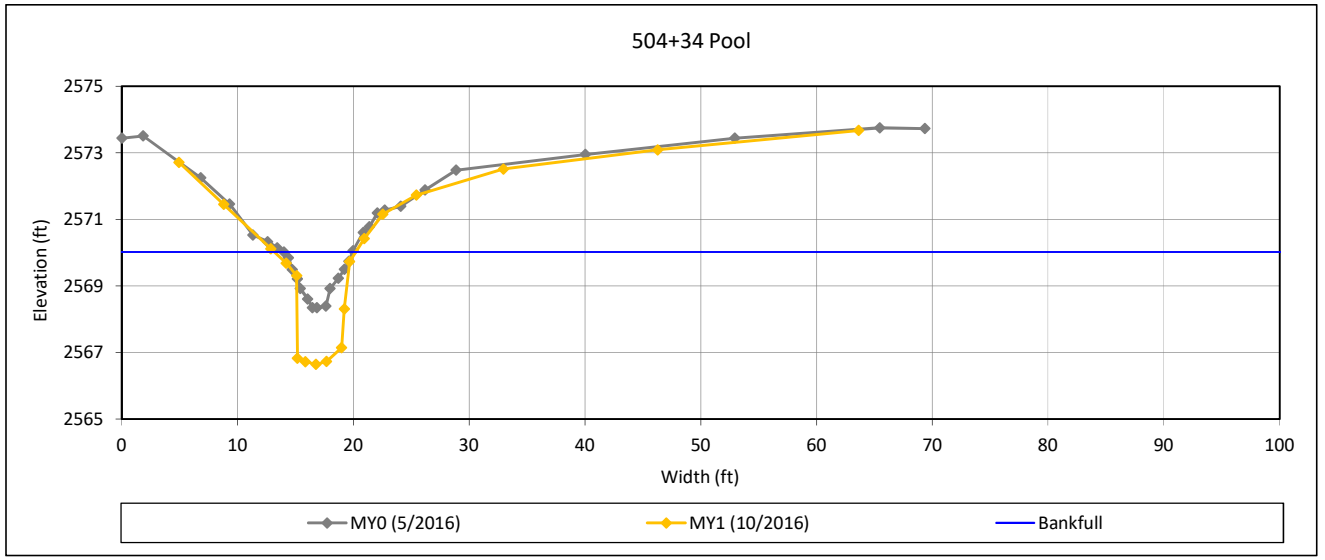
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 10 - UT2b



Bankfull Dimensions	
14.0	x-section area (ft.sq.)
6.0	width (ft)
2.3	mean depth (ft)
3.4	max depth (ft)
10.6	wetted perimeter (ft)
1.3	hydraulic radius (ft)
2.6	width-depth ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

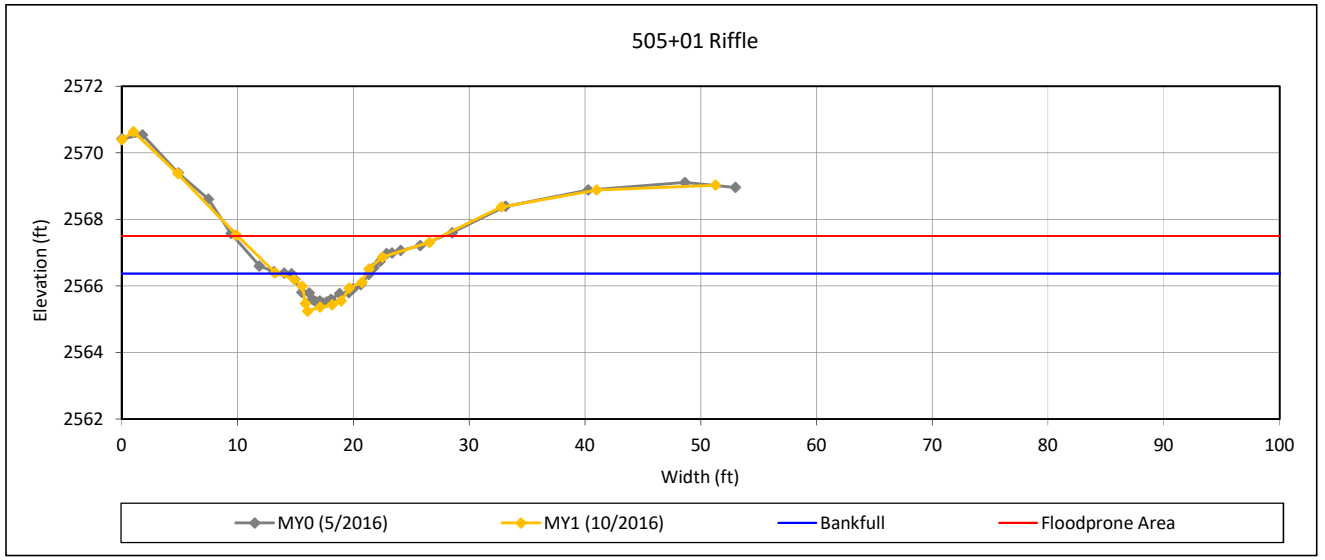
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 11 - UT2b



Bankfull Dimensions	
4.3	x-section area (ft.sq.)
6.3	width (ft)
0.7	mean depth (ft)
1.1	max depth (ft)
6.9	wetted perimeter (ft)
0.6	hydraulic radius (ft)
9.1	width-depth ratio
17.7	W flood prone area (ft)
2.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

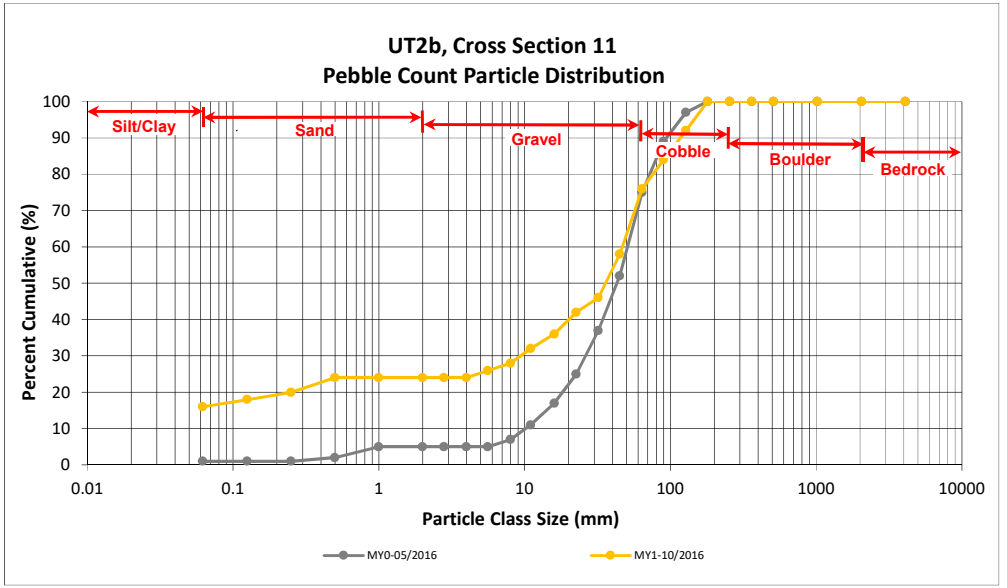
Reachwide and Cross Section Pebble Count Plots

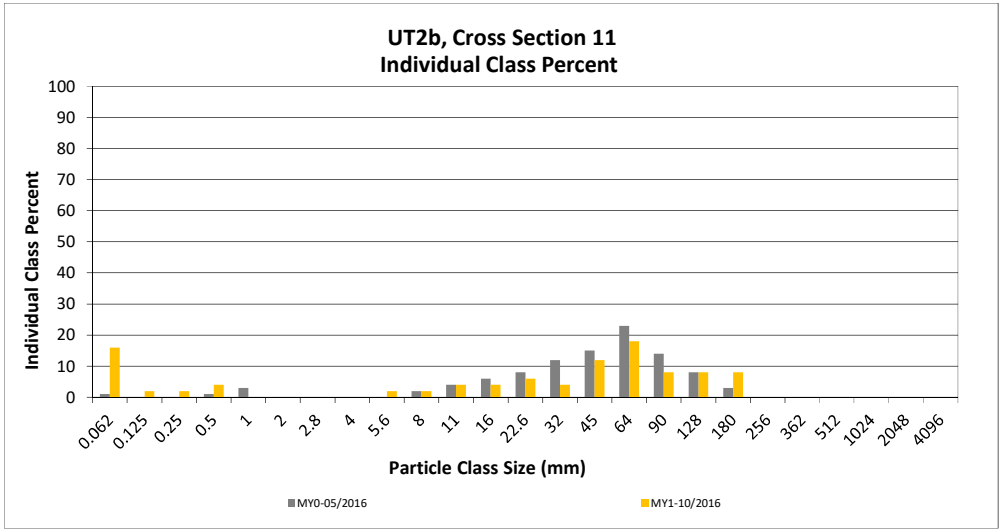
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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	8	16	16
SAND	Very fine	0.062	0.125	1	2	18
	Fine	0.125	0.250	1	2	20
	Medium	0.25	0.50	2	4	24
	Coarse	0.5	1.0			24
	Very Coarse	1.0	2.0			24
GRAVEL	Very Fine	2.0	2.8			24
	Very Fine	2.8	4.0			24
	Fine	4.0	5.6	1	2	26
	Fine	5.6	8.0	1	2	28
	Medium	8.0	11.0	2	4	32
	Medium	11.0	16.0	2	4	36
	Coarse	16.0	22.6	3	6	42
	Coarse	22.6	32	2	4	46
	Very Coarse	32	45	6	12	58
	Very Coarse	45	64	9	18	76
COBBLE	Small	64	90	4	8	84
	Small	90	128	4	8	92
	Large	128	180	4	8	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**	**100**	**100**

Cross Section 11	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	15
D_{50} =	36
D_{84} =	90
D_{95} =	145
D_{100} =	180





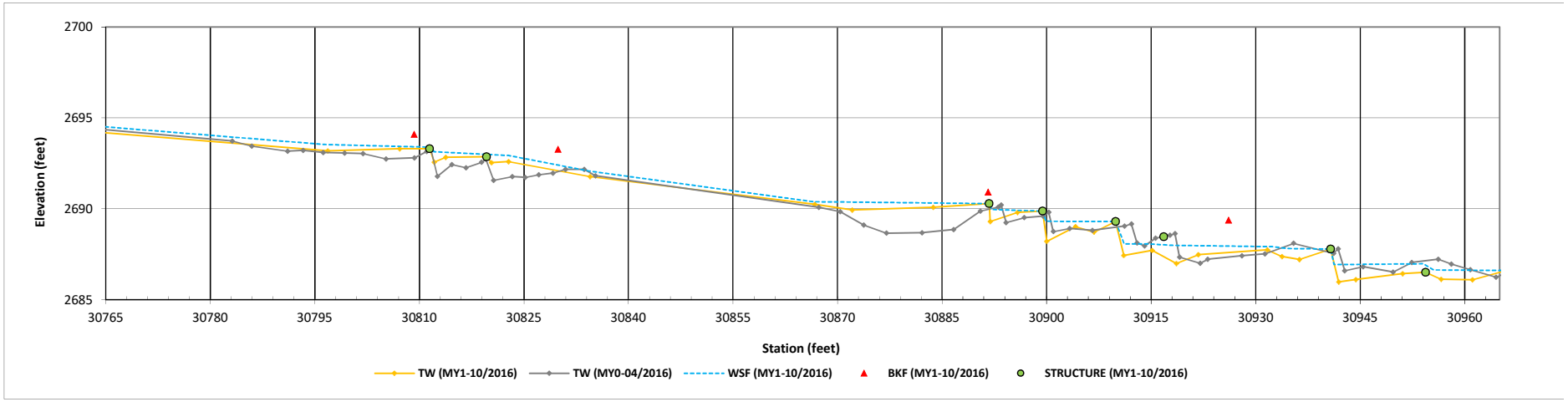
Longitudinal Profile Plots

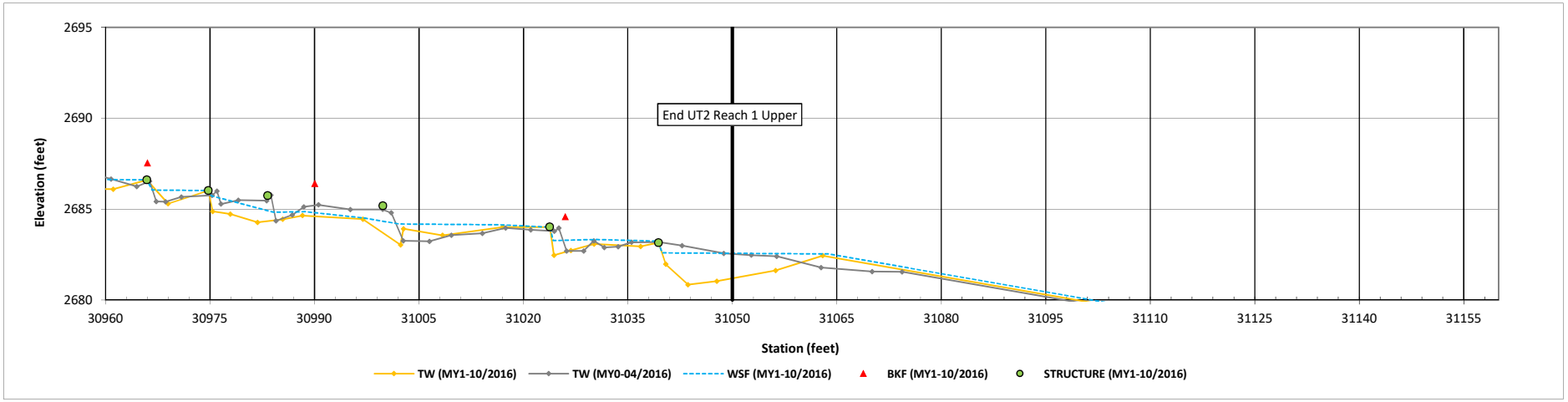
Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 1 - 2016

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





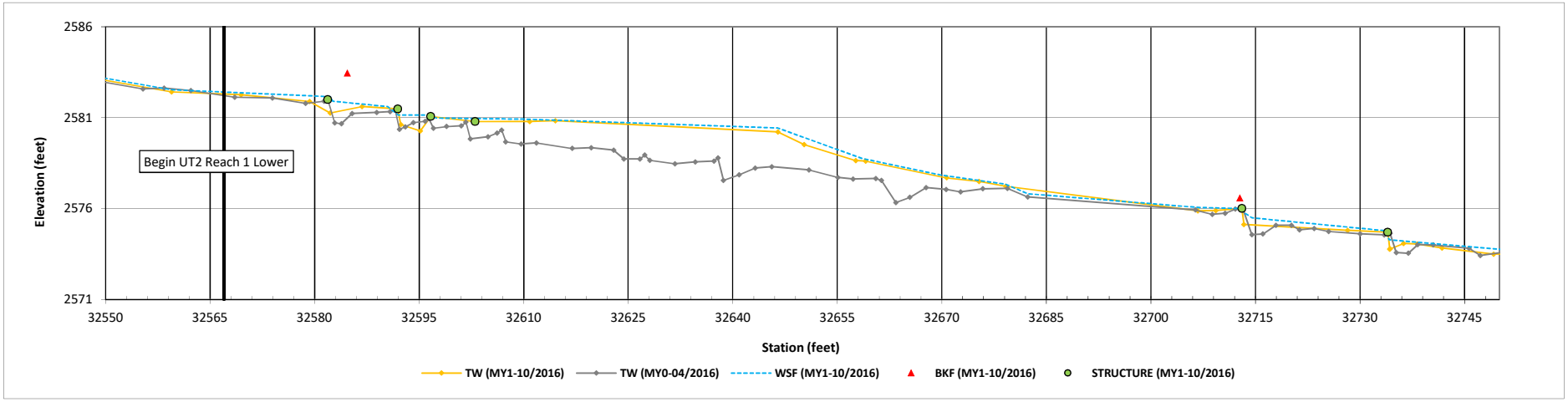
Longitudinal Profile Plots

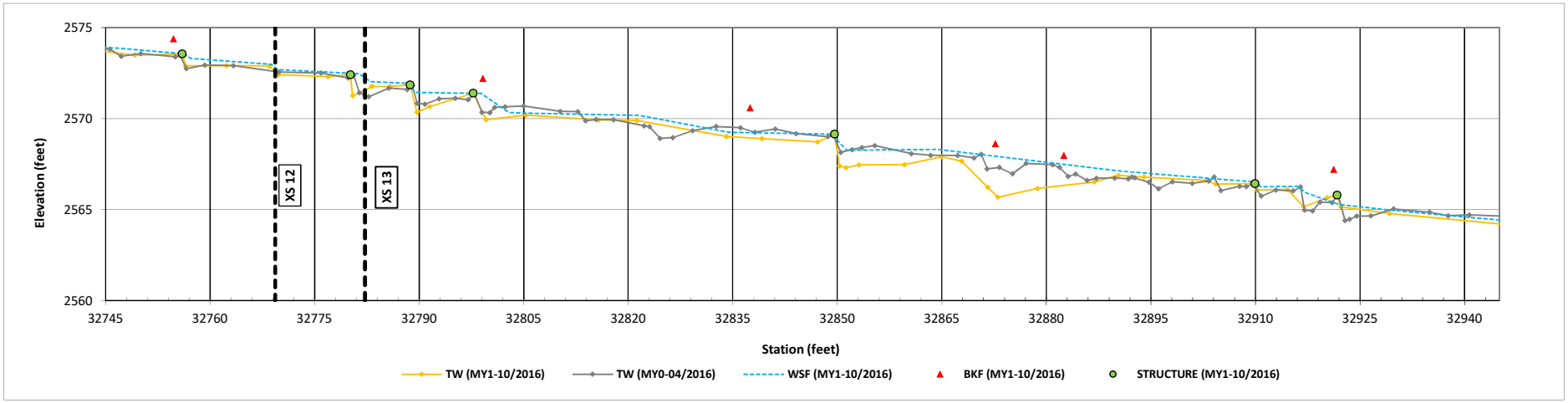
Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 1 - 2016

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





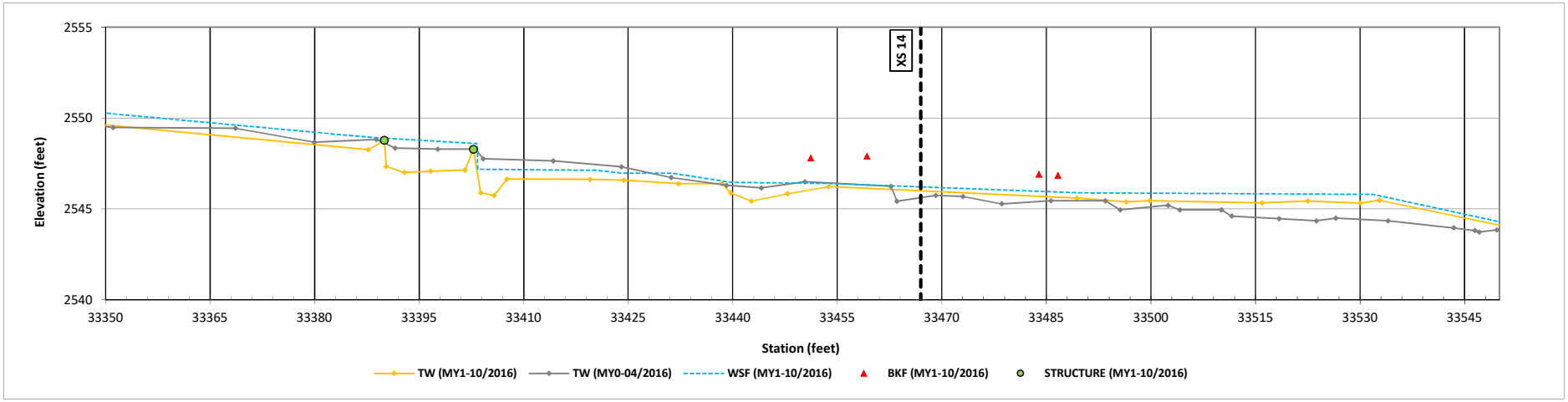
Longitudinal Profile Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 1 - 2016

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



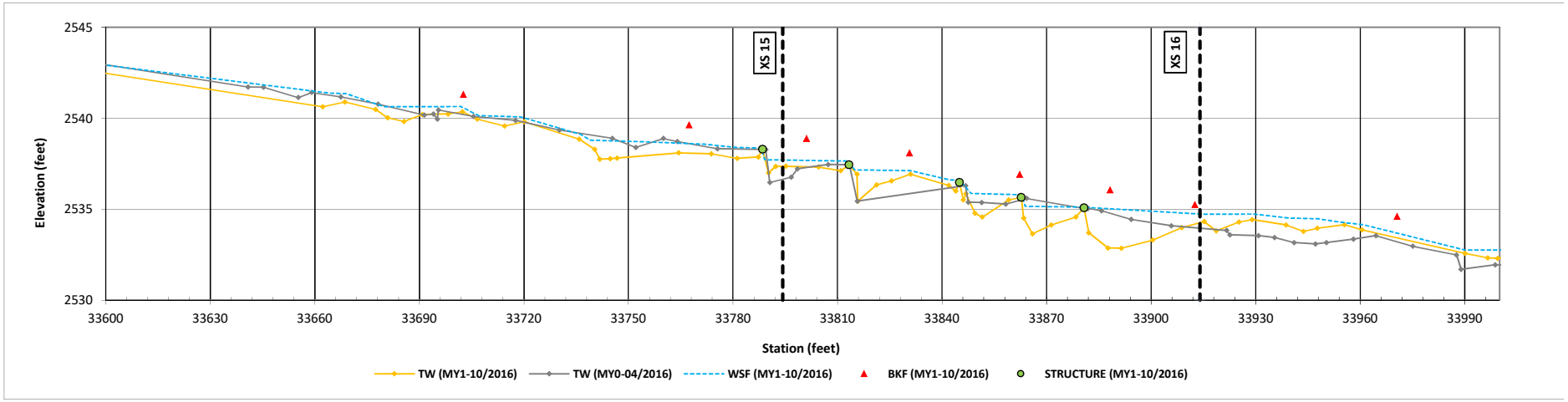
Longitudinal Profile Plots

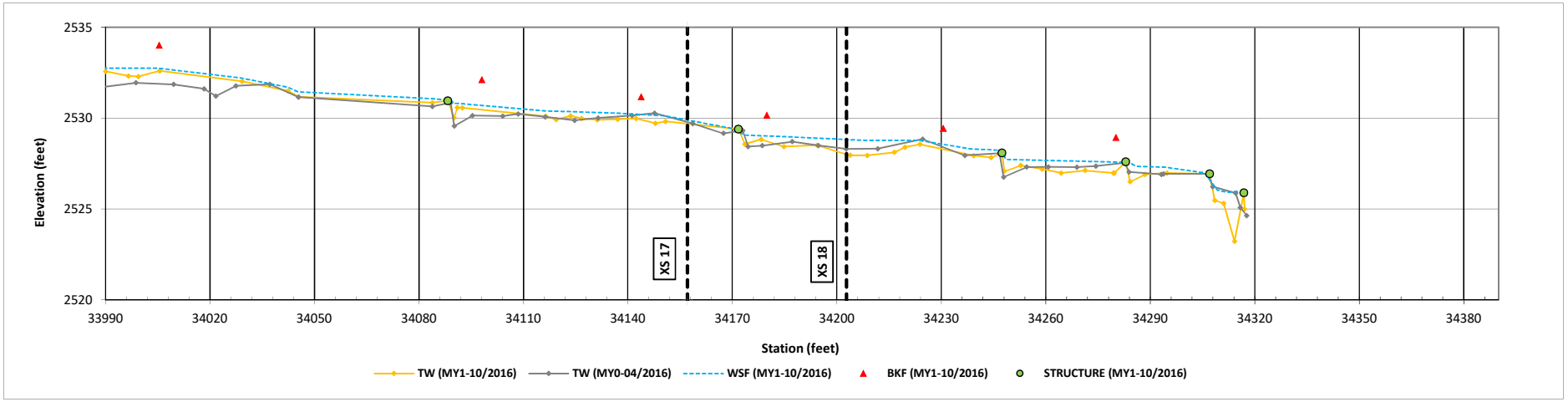
Little Pine III Stream & Wetland Restoration Project

DMS Project No.94903

Monitoring Year 1 - 2016

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





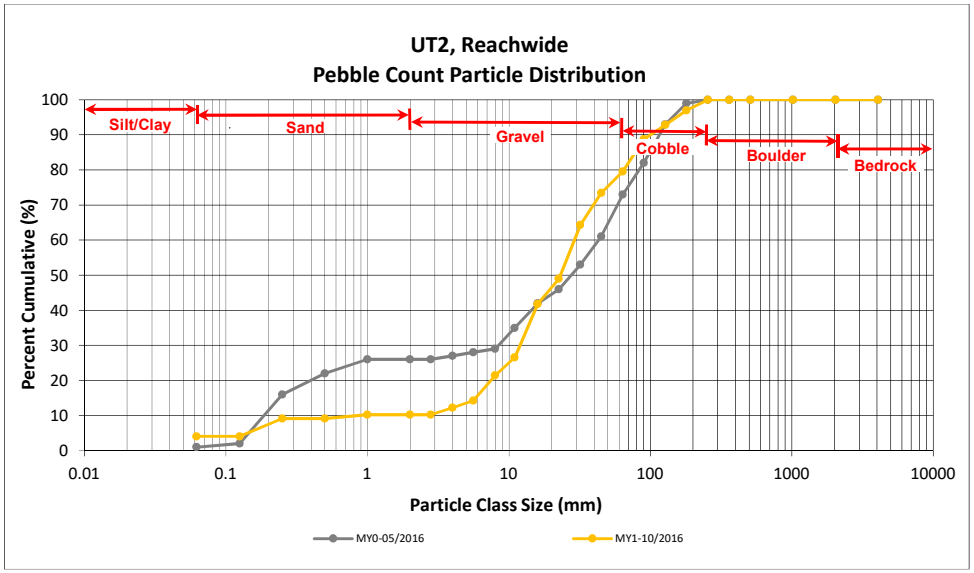
Reachwide and Cross Section Pebble Count Plots

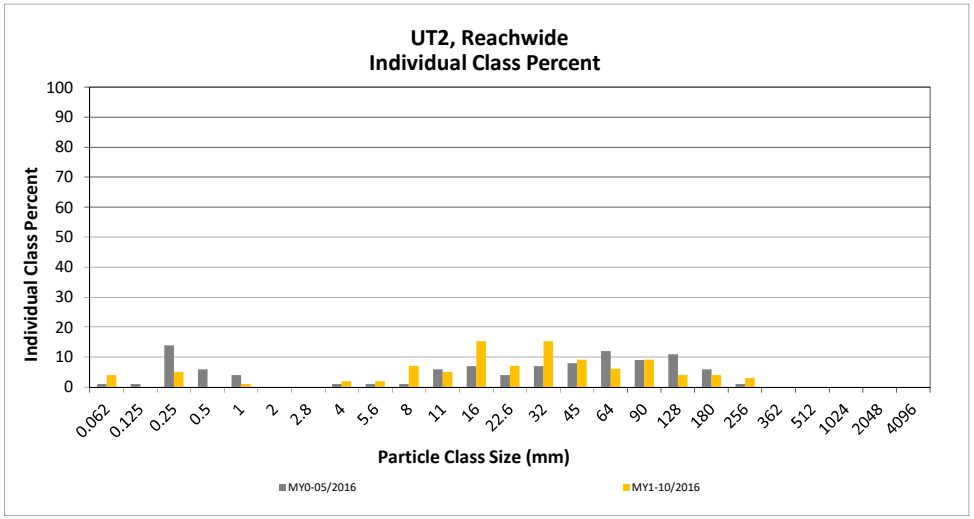
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

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		4	4	4	4
SAND	Very fine	0.062	0.125					4
	Fine	0.125	0.250		5	5	5	9
	Medium	0.25	0.50					9
	Coarse	0.5	1.0	1		1	1	10
	Very Coarse	1.0	2.0					10
GRAVEL	Very Fine	2.0	2.8					10
	Very Fine	2.8	4.0	1	1	2	2	12
	Fine	4.0	5.6	2		2	2	14
	Fine	5.6	8.0	6	1	7	7	21
	Medium	8.0	11.0	3	2	5	5	27
	Medium	11.0	16.0	8	7	15	15	42
	Coarse	16.0	22.6	5	2	7	7	49
	Coarse	22.6	32	13	2	15	15	64
	Very Coarse	32	45	7	2	9	9	73
	Very Coarse	45	64	6		6	6	80
COBBLE	Small	64	90	9		9	9	89
	Small	90	128	1	3	4	4	93
	Large	128	180	4		4	4	97
	Large	180	256	2	1	3	3	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**68**	**30**	**98**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	6.1
D_{35} =	14
D_{50} =	23
D_{84} =	75
D_{95} =	153
D_{100} =	256





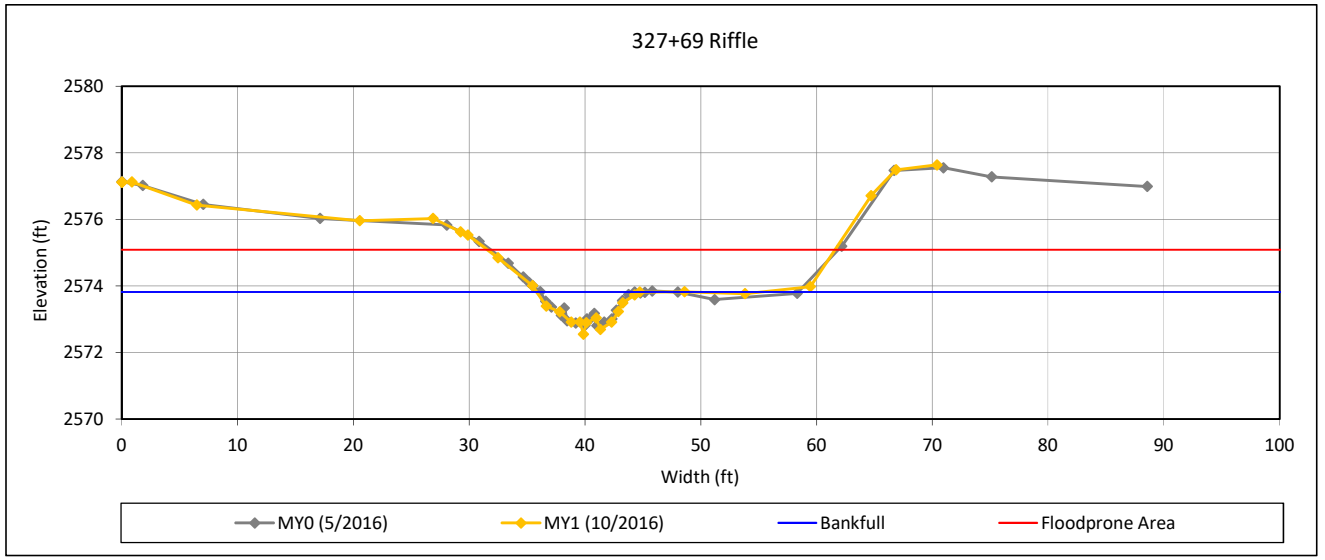
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 12 - UT2



Bankfull Dimensions	
5.7	x-section area (ft.sq.)
8.4	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
9.3	wetted perimeter (ft)
0.6	hydraulic radius (ft)
12.5	width-depth ratio
30.0	W flood prone area (ft)
3.6	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

Reachwide and Cross Section Pebble Count Plots

Little Pine Creek III Stream & Wetland Restoration Project

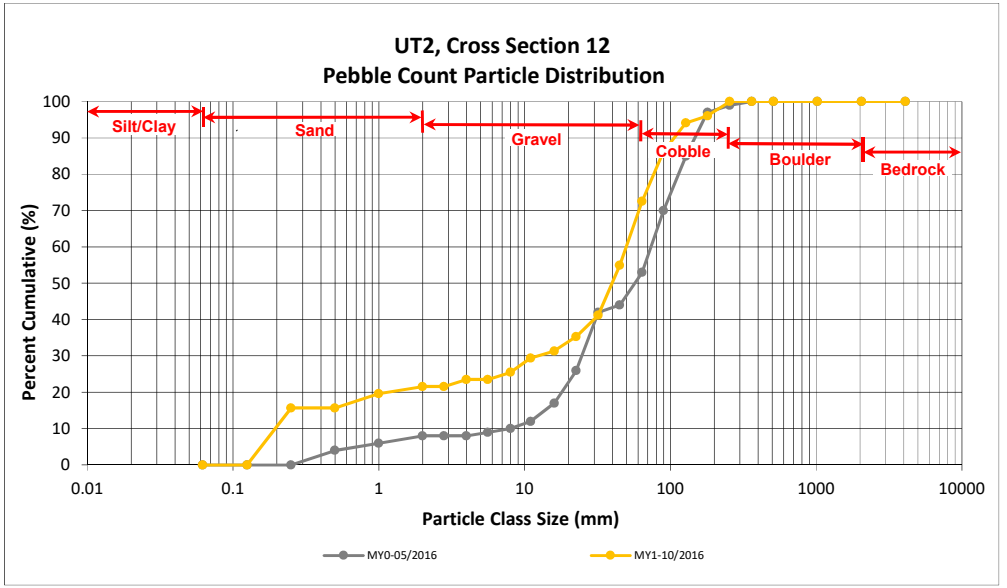
DMS Project No. 94903

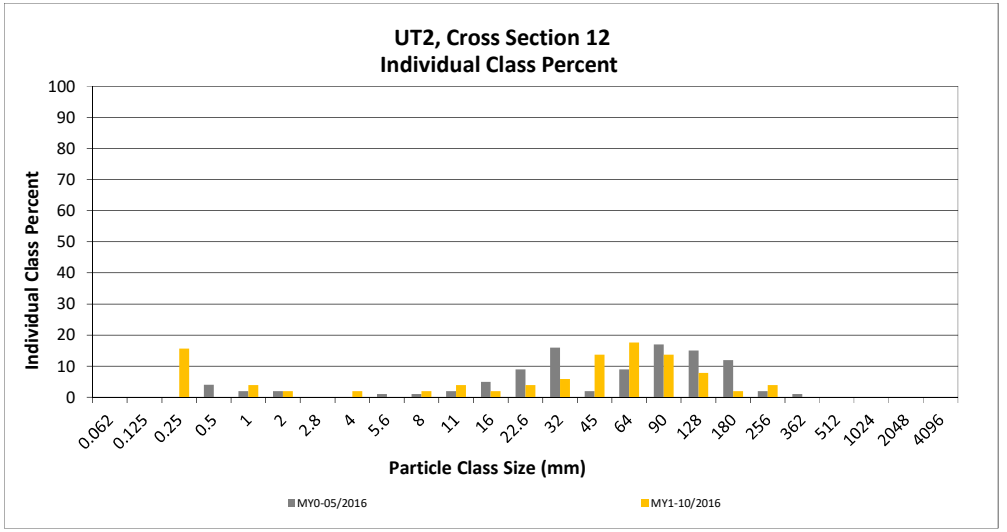
Monitoring Year 1 - 2016

UT2, Cross Section 12

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250	8	16	16
	Medium	0.25	0.50			16
	Coarse	0.5	1.0	2	4	20
	Very Coarse	1.0	2.0	1	2	22
GRAVEL	Very Fine	2.0	2.8			22
	Very Fine	2.8	4.0	1	2	24
	Fine	4.0	5.6			24
	Fine	5.6	8.0	1	2	25
	Medium	8.0	11.0	2	4	29
	Medium	11.0	16.0	1	2	31
	Coarse	16.0	22.6	2	4	35
	Coarse	22.6	32	3	6	41
	Very Coarse	32	45	7	14	55
	Very Coarse	45	64	9	18	73
COBBLE	Small	64	90	7	14	86
	Small	90	128	4	8	94
	Large	128	180	1	2	96
	Large	180	256	2	4	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**51**	**100**	**100**

Cross Section 12	
Channel materials (mm)	
D_{16} =	0.53
D_{35} =	22
D_{50} =	40
D_{84} =	85
D_{95} =	149
D_{100} =	256





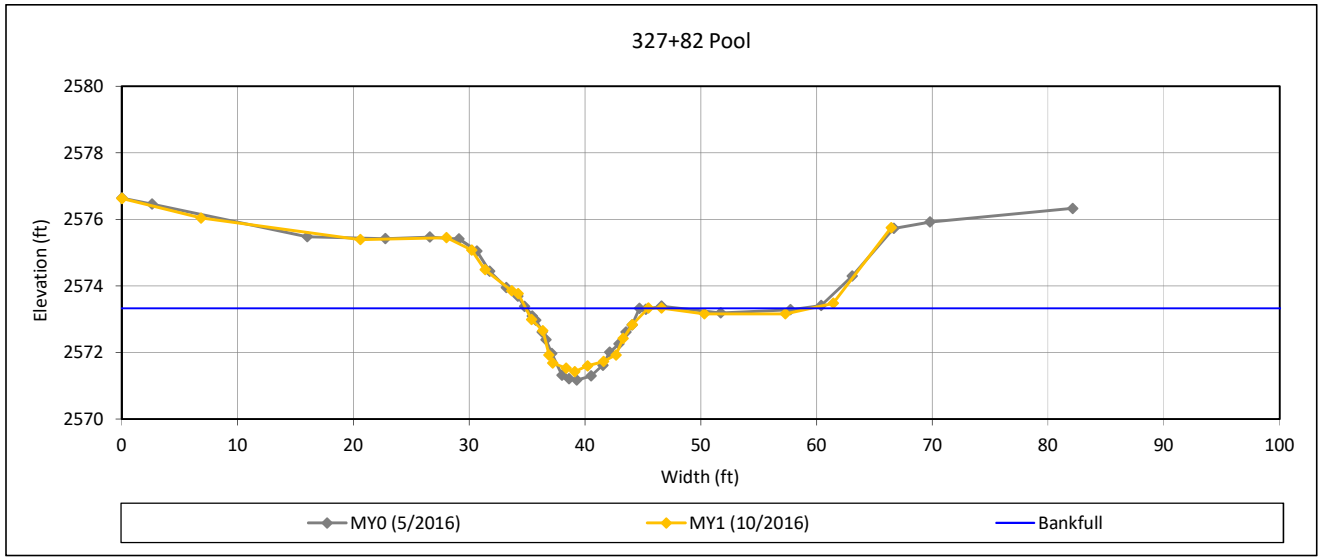
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 13 - UT2



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

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

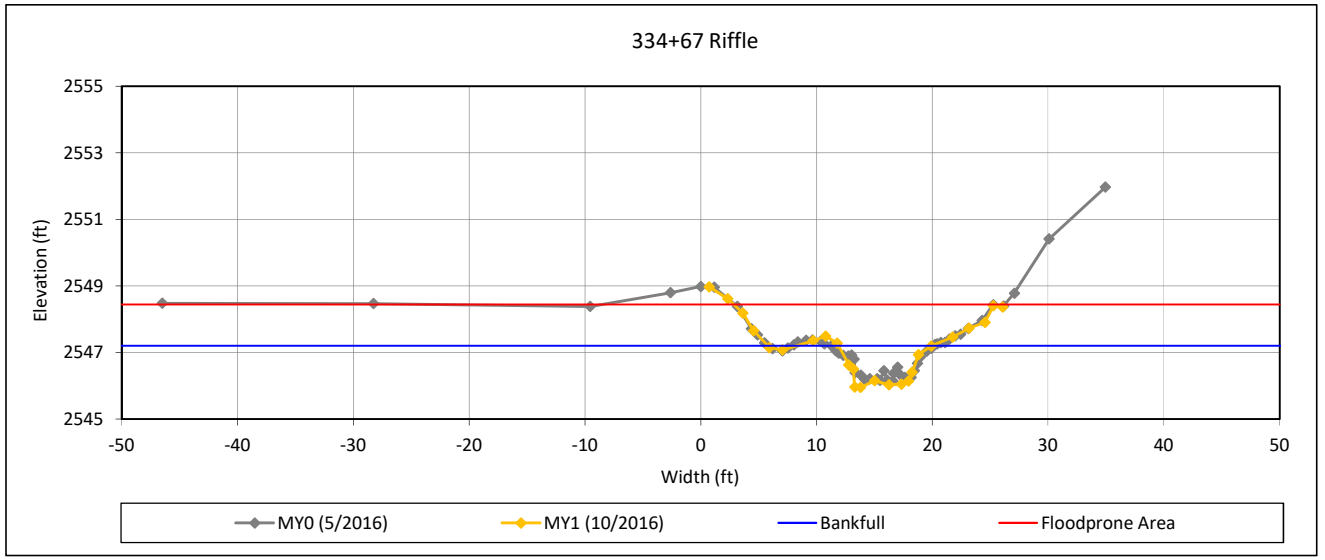
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 14 - UT2



Bankfull Dimensions	
6.6	x-section area (ft.sq.)
8.0	width (ft)
0.8	mean depth (ft)
1.2	max depth (ft)
9.0	wetted perimeter (ft)
0.7	hydraulic radius (ft)
9.7	width-depth ratio
23.2	W flood prone area (ft)
2.9	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

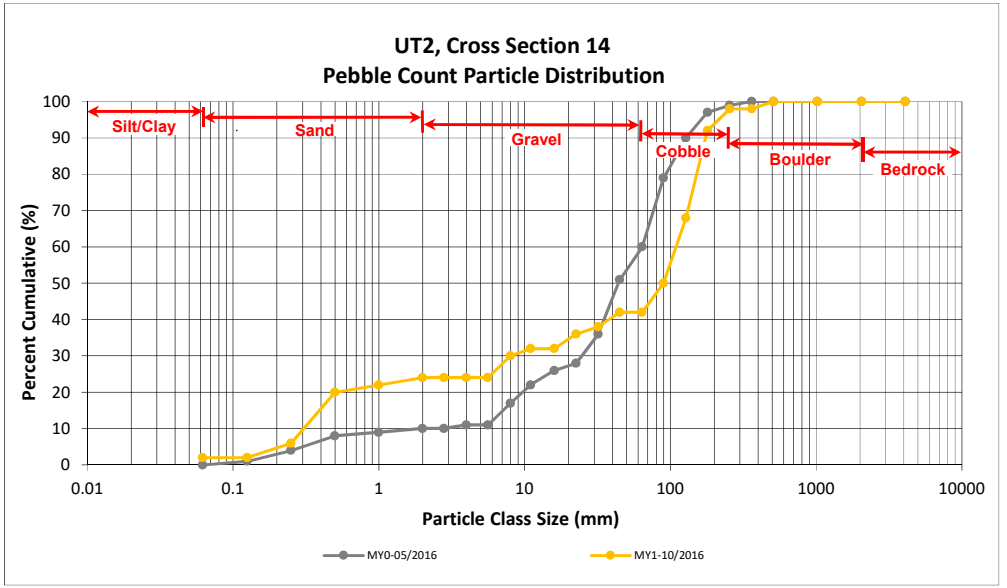
Reachwide and Cross Section Pebble Count Plots

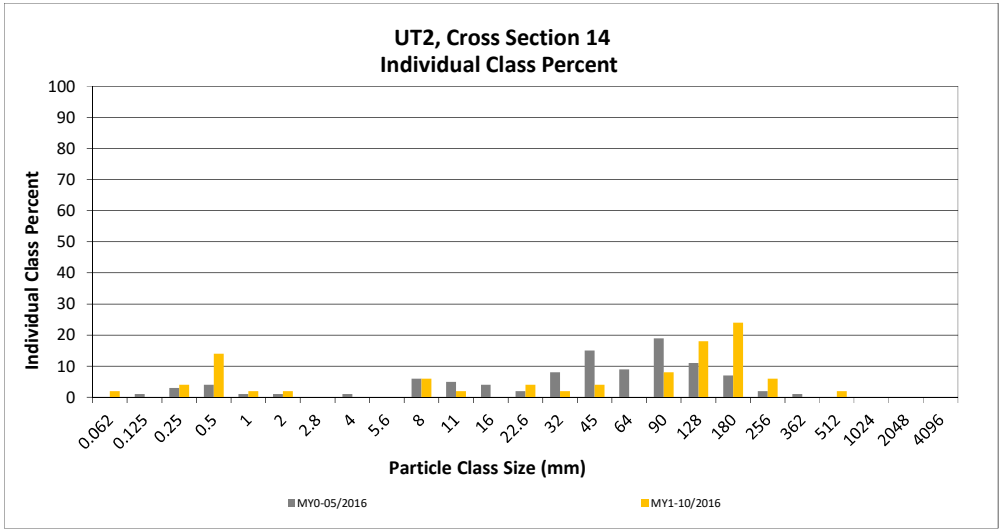
Little Pine Creek III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

UT2, Cross Section 14

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	2	2
SAND	Very fine	0.062	0.125			2
	Fine	0.125	0.250	2	4	6
	Medium	0.25	0.50	7	14	20
	Coarse	0.5	1.0	1	2	22
	Very Coarse	1.0	2.0	1	2	24
GRAVEL	Very Fine	2.0	2.8			24
	Very Fine	2.8	4.0			24
	Fine	4.0	5.6			24
	Fine	5.6	8.0	3	6	30
	Medium	8.0	11.0	1	2	32
	Medium	11.0	16.0			32
	Coarse	16.0	22.6	2	4	36
	Coarse	22.6	32	1	2	38
	Very Coarse	32	45	2	4	42
	Very Coarse	45	64			42
COBBLE	Small	64	90	4	8	50
	Small	90	128	9	18	68
	Large	128	180	12	24	92
	Large	180	256	3	6	98
BOULDER	Small	256	362			98
	Small	362	512	1	2	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**50**	**100**	**100**

Cross Section 14	
Channel materials (mm)	
D_{16} =	0.41
D_{35} =	21
D_{50} =	90
D_{84} =	161
D_{95} =	215
D_{100} =	512





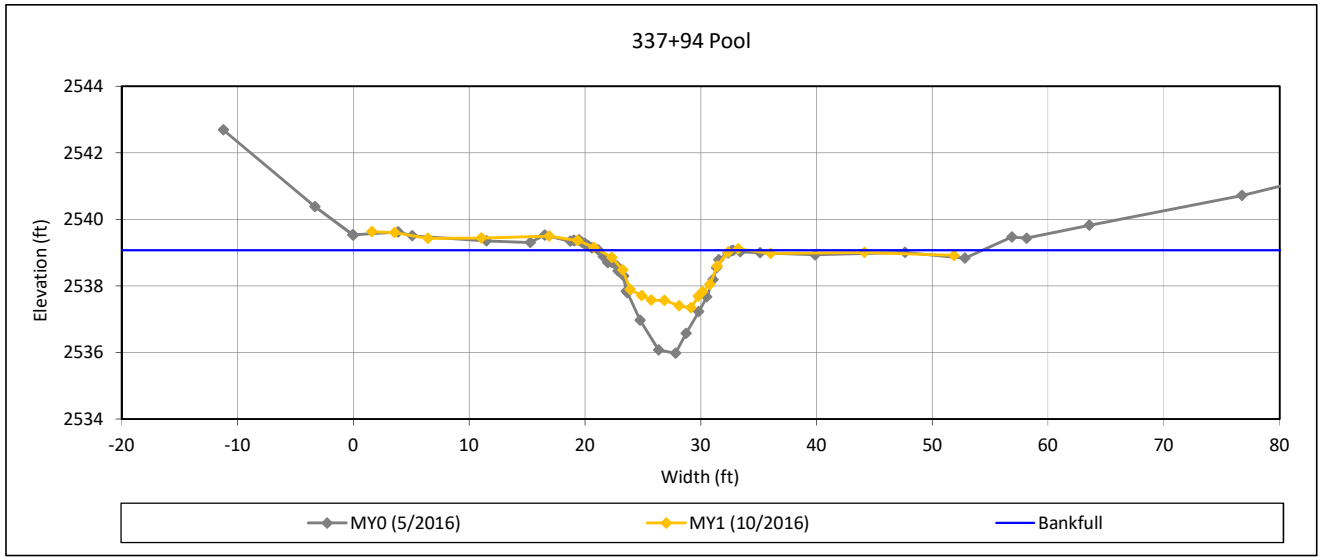
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 15 - UT2



Bankfull Dimensions	
11.9	x-section area (ft.sq.)
11.6	width (ft)
1.0	mean depth (ft)
1.7	max depth (ft)
12.5	wetted perimeter (ft)
1.0	hydraulic radius (ft)
11.4	width-depth ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

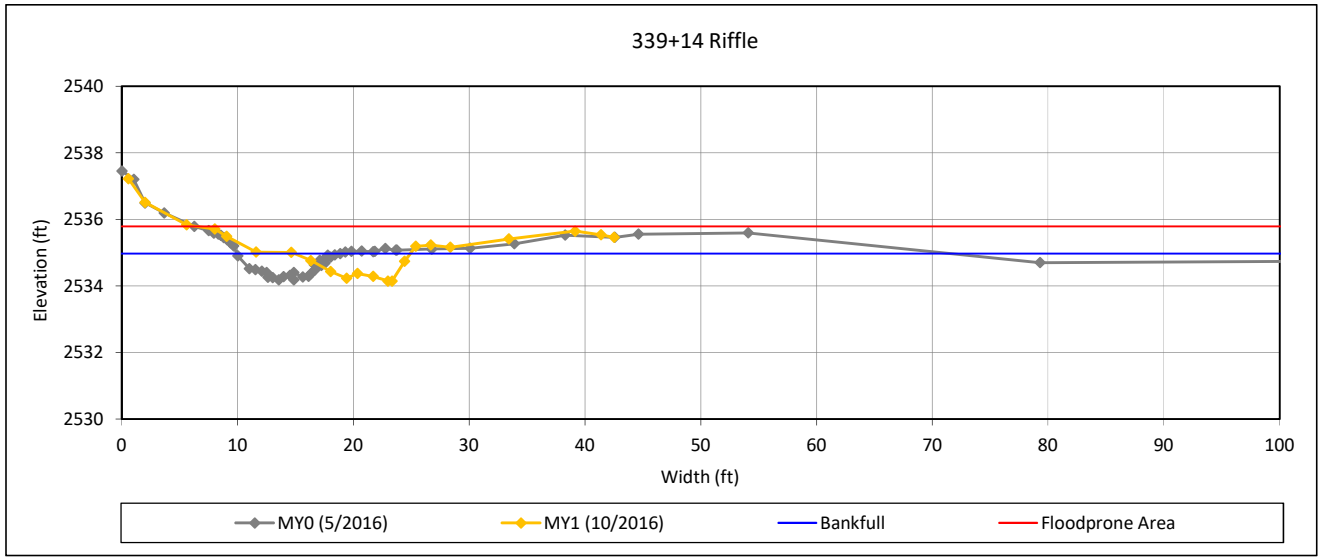
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 16 - UT2



Bankfull Dimensions	
5.0	x-section area (ft.sq.)
10.0	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
10.3	wetted perimeter (ft)
0.5	hydraulic radius (ft)
19.9	width-depth ratio
>200	W flood prone area (ft)
20.0	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

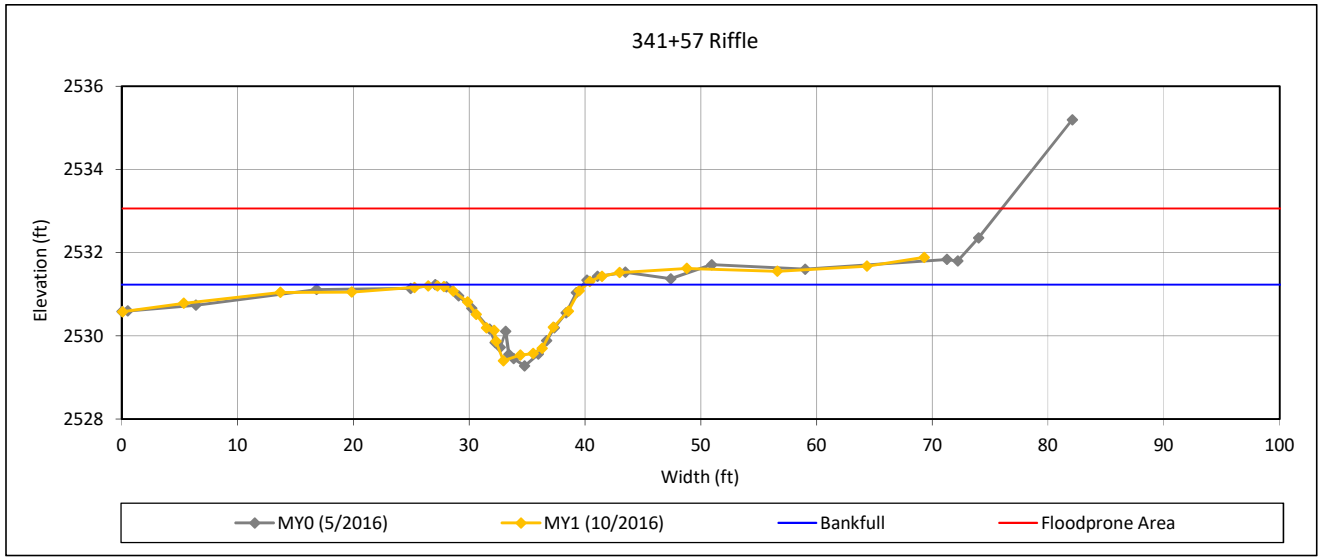
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 17 - UT2



Bankfull Dimensions	
12.0	x-section area (ft.sq.)
12.9	width (ft)
0.9	mean depth (ft)
1.8	max depth (ft)
13.6	wetted perimeter (ft)
0.9	hydraulic radius (ft)
13.8	width-depth ratio
>200	W flood prone area (ft)
15.5	entrenchment ratio
1.0	low bank height ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

Reachwide and Cross Section Pebble Count Plots

Little Pine Creek III Stream & Wetland Restoration Project

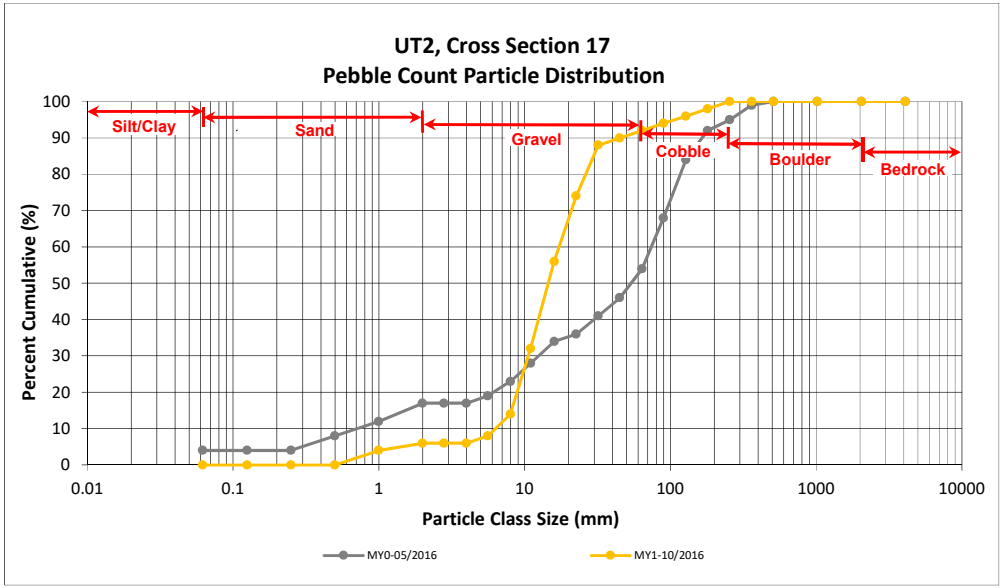
DMS Project No. 94903

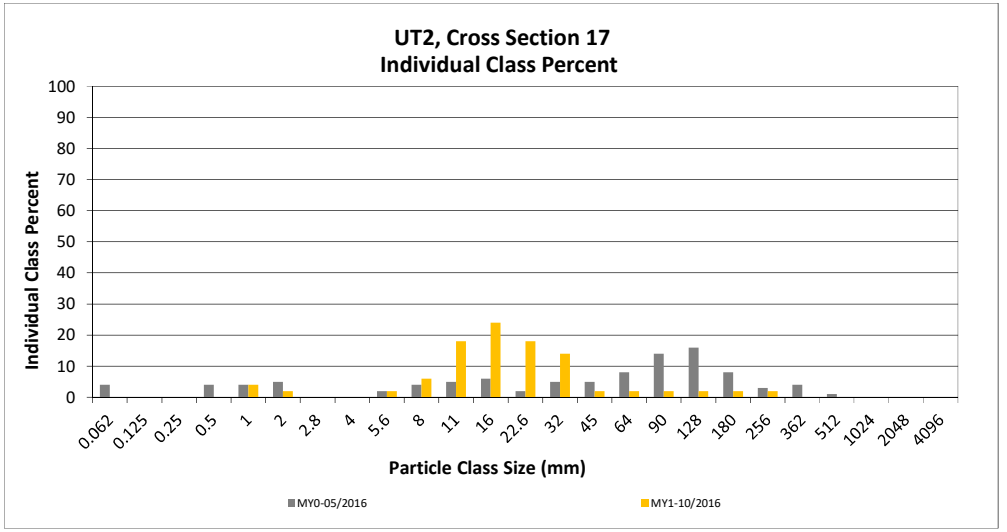
Monitoring Year 1 - 2016

UT2, Cross Section 17

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50			0
	Coarse	0.5	1.0	2	4	4
	Very Coarse	1.0	2.0	1	2	6
GRAVEL	Very Fine	2.0	2.8			6
	Very Fine	2.8	4.0			6
	Fine	4.0	5.6	1	2	8
	Fine	5.6	8.0	3	6	14
	Medium	8.0	11.0	9	18	32
	Medium	11.0	16.0	12	24	56
	Coarse	16.0	22.6	9	18	74
	Coarse	22.6	32	7	14	88
	Very Coarse	32	45	1	2	90
	Very Coarse	45	64	1	2	92
COBBLE	Small	64	90	1	2	94
	Small	90	128	1	2	96
	Large	128	180	1	2	98
	Large	180	256	1	2	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**50**	**100**	**100**

Cross Section 17	
Channel materials (mm)	
D_{16} =	8.3
D_{35} =	12
D_{50} =	15
D_{84} =	29
D_{95} =	107
D_{100} =	256





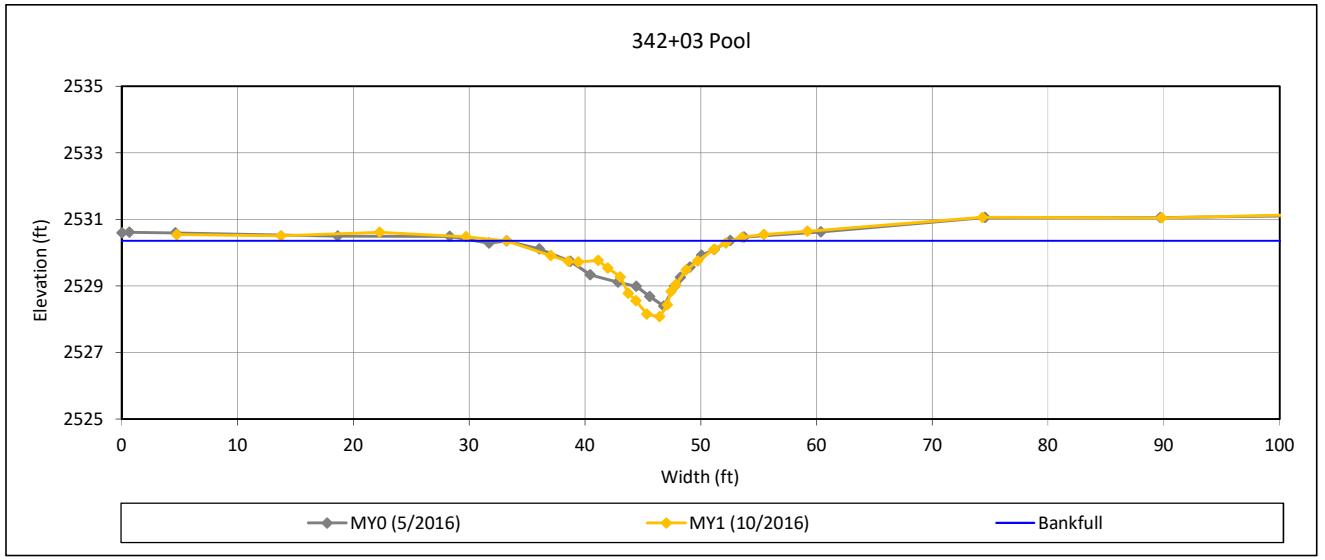
Cross Section Plots

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016

Cross Section 18 - UT2



Bankfull Dimensions	
16.3	x-section area (ft.sq.)
19.5	width (ft)
0.8	mean depth (ft)
2.3	max depth (ft)
20.4	wetted perimeter (ft)
0.8	hydraulic radius (ft)
23.3	width-depth ratio

Survey Date: 10/2016

Field Crew: Wildlands Engineering

View Downstream

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 1 - 2016

Reach	Date of Data Collection	Date of Occurrence	Year of Occurrence	Method
Little Pine	9/25/2016	unknown	Year 1	Crest Gage
UT2	10/5/2016	unknown	Year 1	Crest Gage
UT2B	9/27/2016	unknown	Year 1	Crest Gage

Table 15. Wetland Gage Attainment Summary

Little Pine III Stream & Wetland Restoration Project
DMS Project No. 94903
Monitoring Year 1 - 2016

Summary of Groundwater Gage Results for MY1					
Gage	Success Criteria Achieved/Max Consecutive Days During Growing Season (%)				
	Year 1 (2016)	Year 2 (2017)	Year 3 (2018)	Year 4 (2019)	Year 5 (2020)
Wetland FF	Yes/112 Days (66.6%)				

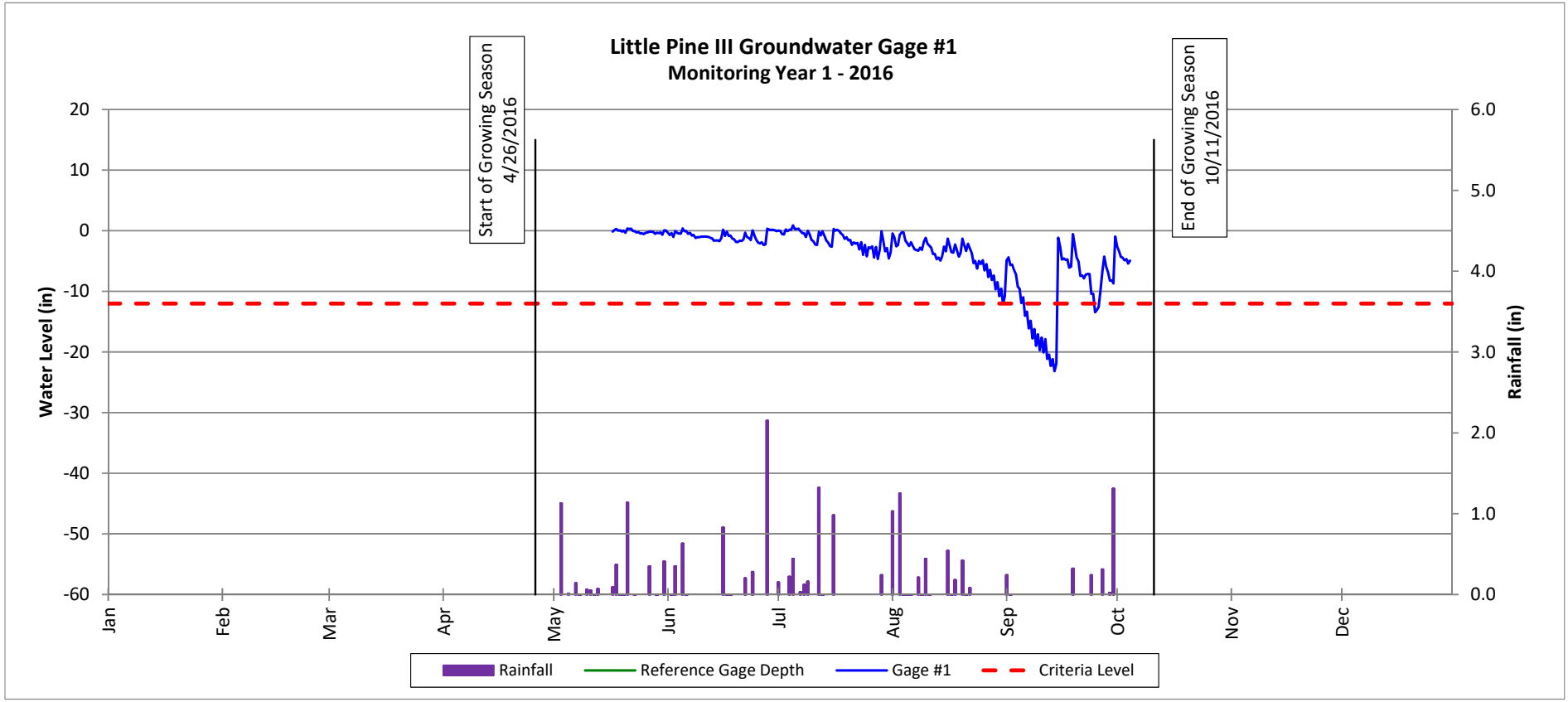
No wetland success criteria established

Groundwater Gage Plots

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

Monitoring Year 1 - 2016

Wetland FF

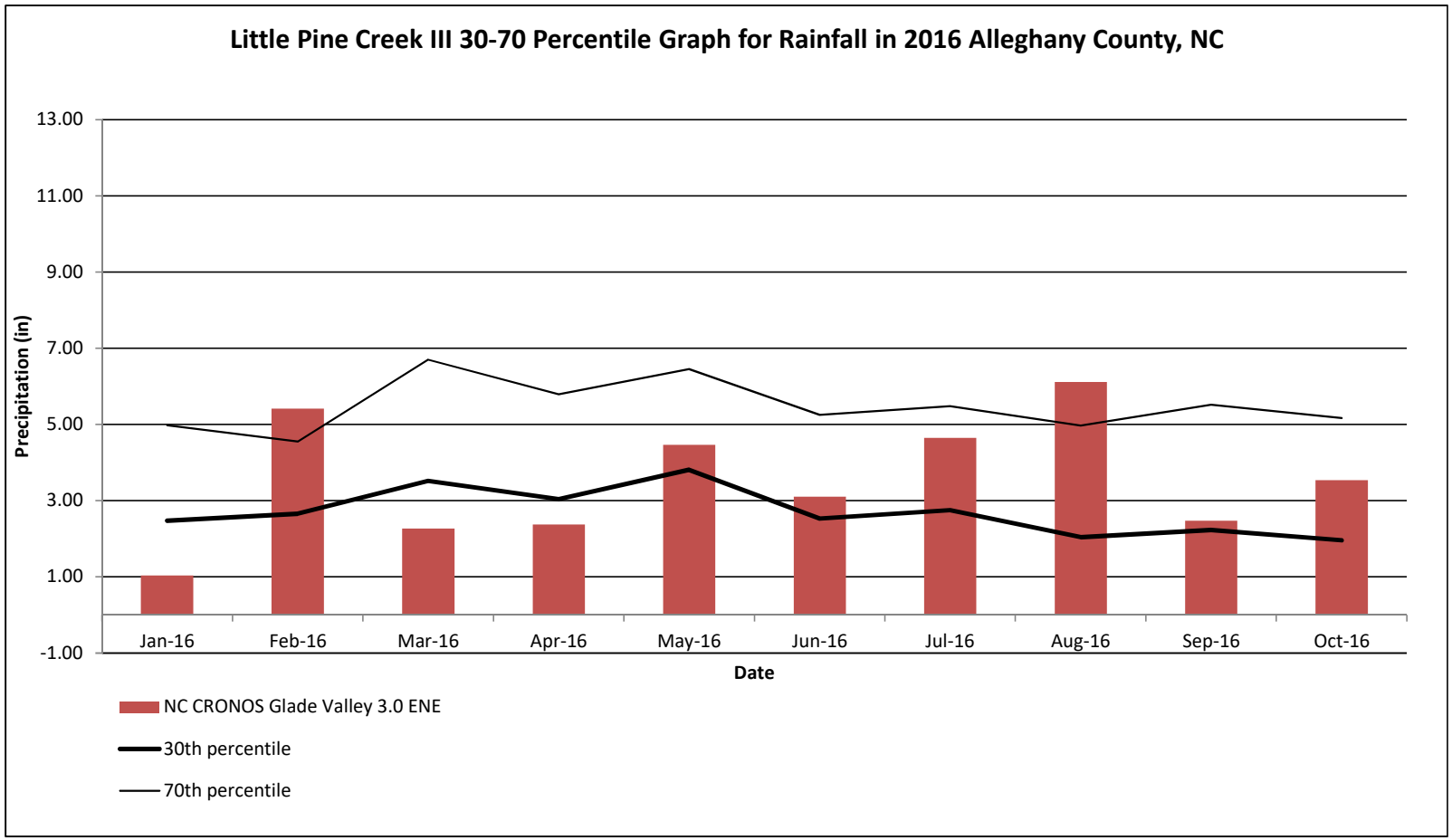


Monthly Rainfall Data

Little Pine III Stream & Wetland Restoration Project

DMS Project No. 94903

Monitoring Year 1 - 2016



[1] 2016 rainfall collected from NC CRONOS Station Name: Glade Valley 3.0 ENE (NCSU, 2016)

[2] 30th and 70th percentile rainfall data collected from weather station Sparta, NC8158 (USDA, 2016)

[3] Onsite rainfall gage malfunctioned. No onsite data available.