MONITORING YEAR 5 ANNUAL REPORT

Final

AGONY ACRES MITIGATION SITE

Guilford County, NC
NCDEQ Contract 004949
DMS Project Number 95716
USACE Action ID Number 2012-1909
NCDWR Project Number 2013-1305

Data Collection Period: March 2019 – October 2019
Draft Submission Date: November 4, 2019
Final Submission Date: November 13, 2019

PREPARED FOR:

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

November 13, 2019

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

RE: Monitoring Year 5 Report for Agony Acres Mitigation Site (95716)
Cape Fear River Basin (03030002)
Guilford County, North Carolina
Contract No. 004949

Dear Mr. Dow,

We have reviewed the comments on the Monitoring Year 5 Report for the above referenced project dated November 7, 2019 and have revised the report based on these comments. The revised documents are submitted with this letter. Below are responses to each of your comments. For your convenience, the comments are reprinted with our response in italics.

1. Section 1.2
   Per the IRT site visit on Nov. 6, please add a section detailing the fence and gate damage caused by a fallen tree at an easement break stream crossing, and briefly discuss the rationale for not repairing the damage.

   A discussion of the damage and rationale for not repairing the damage has been added.

2. Section 1.2.1
   First paragraph, page 3 – Please remove or reword the last sentence. This sentence could be interpreted as assigning a 210 stem per acre success criteria for the buffer restoration areas at MY7.

   The last sentence has been reworded to avoid misinterpretation.

3. Section 1.2.5
   Per IRT comments during the site visit on Nov. 6, please include a brief discussion of UT1A flow gauge data here.

   A discussion of the UT1A flow gauge data has been added.

4. Appendix 2
   Figure 3.2 – Please add UT1A flow gauges to CCPV.

   UT1A flow gauges have been added to the CCPV.

5. Appendix 5
   Please add flow gauge data for UT1A.

   UT1A flow gauge data has been added.

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

Sincerely,

Jason Lorch, *Monitoring Coordinator*

Mitigation Project Name	**Agony Acres**	**County**	**Guilford**	**USACE Action ID**	2012-01909
DMS IMS ID	**95716**	**Date Project Instituted**	**12/4/2012**	**NCDWR Permit No**	2013-1305
River Basin	**Cape Fear**	**Date Prepared**	**7/17/2019**		
Cataloging Unit	**03030002**				

Credit Release Milestone	Stream Credits						Wetland Credits							
	Scheduled Releases (Stream)	Warm	Cool	Cold	Anticipated Release Year (Stream)	Actual Release Date (Stream)	Scheduled Releases (Forested)	Riparian Riverine	Riparian Non-riverine	Non-riparian	Scheduled Releases (Coastal)	Coastal	Anticipated Release Year (Wetland)	Actual Release Date (Wetland)
Potential Credits (Mitigation Plan)		**6,479.133**												
Potential Credits (As-Built Survey)		**6,596.133**												
Potential Credits (IRT Approved)		**6,479.133**												
1 (Site Establishment)	**N/A**				N/A	N/A	**N/A**				**N/A**		N/A	N/A
2 (Year 0 / As-Built)	**30%**	1,978.840			2015	3/6/2015	**N/A**				**N/A**		N/A	N/A
3 (Year 1 Monitoring)	**10%**	659.613			2016	4/25/2016	**N/A**				**N/A**		N/A	N/A
4 (Year 2 Monitoring)	**10%**	647.913			2017	8/8/2017	**N/A**				**N/A**		N/A	N/A
IRT Adjustment*		-46.800				8/8/2017								
5 (Year 3 Monitoring)	**10%**	647.913			2018	4/25/2018	**N/A**				**N/A**		N/A	N/A
6 (Year 4 Monitoring)	**5%**	313.557			2019	4/26/2019	**N/A**				**N/A**		N/A	N/A
7 (Year 5 Monitoring)	**10%**				2020		**N/A**				**N/A**		N/A	N/A
8 (Year 6 Monitoring)	**5%**				2021		**N/A**				**N/A**		N/A	N/A
9 (Year 7 Monitoring)	**10%**				2022		**N/A**				**N/A**		N/A	N/A
Stream Bankfull Standard	**10%**	647.913			2017	8/8/2017	**N/A**				**N/A**			
Total Credits Released to Date		**4,848.949**												
Total Credits Unrealized (Permanent Reduction)		**10.400**												

NOTES:

8/8/2017: Adjustment required due to IRT concerns on how the as-built credits were calculated

12/21/2018: 10.40 stream credits marked as unrealized due to NCDOT bridge replacement project encroachment; removed all 10.4 SMUs from 5% Yr 4 proposed release

CONTINGENCIES:

Signature of Wilmington District Official Approving Credit Release

27 Sept 2019

Date

1 - For DMS, no credits are released during the first milestone

2 - For DMS projects, the second credit release milestone occurs automatically when the as-built report (baseline monitoring report) has been made available to the NCIRT by posting it to the NCEEP Portal, provided the following criteria have been met:

1) Approval of the final Mitigation Plan
2) Recordation of the preservation mechanism, as well as a title opinion acceptable to the USACE covering the property
3) Completion of all physical and biological improvements to the mitigation site pursuant to the mitigation plan
4) Reciept of necessary DA permit authorization or written DA approval for porjects where DA permit issuance is not required

3 - A 10% reserve of credits is to be held back until the bankfull event performance standard has been met

Mitigation Project Name	**Agony Acres**	**County**	**Guilford**	**USACE Action ID**	2012-01909
DMS IMS ID	**95716**	**Date Project Instituted**	**12/4/2012**	**NCDWR Permit No**	2013-1305
River Basin	**Cape Fear**	**Date Prepared**	**7/17/2019**		
Cataloging Unit	**03030002**				

DEBITS (released credits only)

		Ratios	1	1.5	2.5	5	1	3	2	5	1	3	2	5	1	3	2	5
			Stream Restoration	Stream Enhancment I	Stream Enhancement II	Stream Preservation	Riparian Restoration	Riparian Creation	Riparian Enhancement	Riparian Preservation	Nonriparian Restoration	Nonriparian Creation	Nonriparian Enhancement	Nonriparian Preservation	Coastal Marsh Restoration	Coastal Marsh Creation	Coastal Marsh Enhancement	Coastal Marsh Preservation
IRT Adjusted As-Built Amounts (feet and acres)			**5,192.000**	**353.000**	**1,726.000**	**1,807.000**												
IRT Adjusted As-Built Amounts (mitigation credits)			**5,192.000**	**235.333**	**690.400**	**361.400**												
Percentage Released			**75%**	**75%**	**75%**	**75%**												
Released Amounts (feet / acres)			**3,894.000**	**264.747**	**1,268.500**	**1,355.250**												
Released Amounts (credits)			**3,894.000**	**176.4990**	**507.400**	**271.050**												
Credits Unrealized (Permanent Reduction)					**10.400**													
NCDWR Permit	USACE Action ID	Project Name																
2007-1470	2007-02903	NCDOT TIP R-2635 - Western Wake Expressway				421.730												
2013-0223	2001-21125	NCDOT TIP U-2524C / D - Greensboro - Western Loop	1,254.703	105.900	517.800													
2013-0223	2001-21125	NCDOT TIP U-2524C / D - Greensboro - Western Loop	20.000															
2013-0517	2013-00557	NCDOT TIP R-2413A/B - NC 68 Connector, Guilford County	510.900															
2013-0517	2013-00557	NCDOT TIP R-2413A/B - NC 68 Connector, Guilford County		35.300														
2013-0517	2013-00557	NCDOT TIP R-2413A/B - NC 68 Connector, Guilford County			172.600													
2013-0912	2013-01990	NCDOT TIP R-2612B				301.000												
2013-0918	2005-21386	NCDOT TIP U-2525B/C - Greensboro Eastern Loop, Guilford County	991.600	70.600	345.200													
2013-0918	2005-21386	NCDOT TIP U-2525B/C - Greensboro Eastern Loop, Guilford County	519.200	35.300	172.600													
2013-0223	2001-21125	NCDOT TIP U-2524C / D - Greensboro - Western Loop	291.002			50.000												
2013-0918	2005-21386	NCDOT TIP U-2525B/C - Greensboro Eastern Loop, Guilford County	306.595		60.300													
2013-0223	2001-21125	NCDOT TIP U-2524C / D Mod 2 - Greensboro - Western Loop		17.647		180.000												
2017-1466	2009-02019	U-4734 - Division 9 - Kernersville - Macy Grove Rd Extension				402.520												
Remaining Amounts (feet / acres)			**0.000**	**0.000**	**0.000**	**0.000**												
Remaining Amounts (credits)			**0.000**	**0.000**	**0.000**	**0.000**												

PREPARED BY:

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

Jason Lorch
jlorch@wildlandseng.com
Phone: 919.851.9986

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) completed a full delivery project at the Agony Acres Mitigation Site (Site) for the North Carolina Division of Mitigation Services (DMS) to restore, enhance, and preserve a total of 9,052 linear feet (LF) of perennial and intermittent stream and restore 3.0 acres of riparian buffer in Guilford County, NC. The Site provides 6,468.3 Stream Mitigation Units (SMUs) and 3.0 Buffer Mitigation Units (BMUs). The Site is located in the Reedy Fork Watershed within Cape Fear River Basin Hydrologic Unit Code (HUC) 03030002 (Cape Fear 02) near Ossipee, NC (Figure 1). The streams are all unnamed tributaries (UT) to Reedy Fork and are referred to herein as UT1, UT1A, UT1B, and UT2. The buffer restoration component is adjacent to Reedy Fork and lower UT1.

The Site is located within the Jordan Lake Water Supply Watershed which has been designated as a Nutrient Sensitive Water. The Site's watershed is within Cape Fear local watershed HUC 03030002020070, which was not identified as a Cape Fear 02 Targeted Local Watershed (TLW) in DMS's 2009 Cape Fear River Basin Restoration Priority (RBRP) plan; however, this local watershed was later designated as a Targeted Resource Area (TRA) in the 2011 Request for Proposals (RFP) in the Cape Fear 02. The Agony Acres Mitigation Site fully supports the Cataloging Unit (CU)-wide functional objectives stated in the 2011 RFP to reduce and control nutrient inputs, reduce and control sediment inputs, and protect and augment Significant Natural Heritage Areas in the Cape Fear 02 River Basin. The Site will contribute to meeting the CU-wide Functional Improvement Objectives by establishing the following project goals:

- Reduce sediment inputs by removing cattle from streams and restoring degraded and eroding stream channels;
- Return a network of streams to a stable form that is capable of supporting biological functions;
- Reduce fecal coliform, nitrogen, and phosphorous inputs through removing cattle from streams and establishing and augmenting a forested riparian corridor;
- Protect existing high quality streams and forested buffers; and
- Improve and protect hydrologic inputs to the adjacent Reedy Fork Aquatic Habitat Significant Natural Heritage Area.

The project is helping meet the goals for the watershed outlined in the RBRP and provides numerous ecological benefits within the Cape Fear River Basin. While many of these benefits are limited to the Agony Acres project area; others, such as pollutant removal, reduced sediment loading, and improved aquatic and terrestrial habitat, have farther-reaching effects.

Stream restoration and enhancement construction efforts were completed in September 2014. Baseline as-built monitoring activities (MY0) were completed between October and December 2014. A conservation easement is in place on 30.74 acres of stream and riparian corridors to protect them in perpetuity.

Monitoring Year 5 (MY5) assessment and site visits were completed between March and October 2019 to assess the conditions of the project. Overall, the Site has met the required vegetation, stream, and hydrology success criteria for MY5. The overall stem density for the Site in MY5 is 473 stems per acre, which is greater than the interim success criterion of 260 stems per acre. All restored and enhanced streams are stable and functioning as designed and have recorded multiple bankfull events. UT1B has two pressure transducers installed to monitor stream flow. Both stream gages on UT1B met the hydrologic criteria for MY5 (Appendix 5).

AGONY ACRES MITIGATION SITE

Monitoring Year 5 Annual Report

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Section 1: PROJECT OVERVIEW

The Agony Acres Mitigation Site (Site) is located in northeastern Guilford County, north of Gibsonville (Figure 1). From Gibsonville take NC 61 north 5.5 miles. Turn right on Sockwell Road and travel 1.4 miles. The project site is located north of Sockwell Road and is bound on the north by Reedy Fork. The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province. The project watershed is classified as approximately 65% managed herbaceous cover, 30% mixed upland hardwoods, 3% cultivated, 2% southern yellow pine, and the remaining 1% is low intensity development. The drainage area for the Agony Acres Mitigation Site is 358 acres.

The Site is located in the Reedy Fork Watershed within the Jordan Lake Water Supply Watershed which has been designated a Nutrient Sensitive Water. The project streams flow directly into Reedy Fork which flows into the Haw River and eventually into the Jordan Lake Reservoir. The Site's watershed is within Hydrologic Unit Code (HUC) 03030002020070 which was not identified as a Cape Fear 02 Targeted Local Watershed (TLW) in DMS's 2009 Cape Fear River Basin Restoration Priority (RBRP) plan; however, this HUC was later designated as a Targeted Resource Area (TRA) in the 2011 Request for Proposals (RFP) in the Cape Fear 02. The Site connects to Reedy Fork and three separate but connected Significant Natural Heritage areas. Reedy Fork Aquatic Habitat, Reedy Fork Slopes at NC 61, and Altamahaw Alluvial Forest are all listed on the NC Natural Heritage GIS database and are immediately adjacent to the Site. There are also records for several state threatened, special concern, and significantly rare mussel species in Reedy Fork.

North Carolina Division of Mitigation Services (DMS) completed a Local Watershed Plan (LWP) in 2008 on the HUC immediately downstream which begins at the confluence of Reedy Fork and the Haw River and includes Travis and Tickle Creeks. The Site is located less than one mile outside of the LWP area and has a very similar land use pattern. The 2008 Little Alamance, Travis, and Tickle Creeks LWP identified nutrient inputs from agriculture and stream bank erosion in altered reaches as major stressors within this TLW. The Site was identified as a stream and buffer restoration and cattle exclusion opportunity to improve water quality and buffers within the TRA.

The Site consists of four tributaries to Reedy Fork which are located within the North Carolina Division of Water Resources (NCDWR) subbasin 03-06-02 of the Cape Fear River Basin. The project stream reaches include UT1, UT1A, UT1B, and UT2.

Mitigation work within the Site included restoration, enhancement, and preservation of 9,052 linear feet (LF) of perennial and intermittent stream channel and 3.0 acres (ac) of riparian buffer restoration. The Site provides 6,468.3 Stream Mitigation Units (SMUs) and 3.0 Buffer Mitigation Units (BMUs). The stream areas were also planted with native vegetation to improve habitat and protect water quality.

The final mitigation plan was submitted and accepted by the DMS in March 2014. Construction activities were completed by Land Mechanic Designs, Inc. in September 2014. The planting was completed by Bruton Natural Systems, Inc. in December 2014. The baseline as-built survey was completed by Kee Mapping and Surveying, in October 2014. Annual monitoring will be conducted for seven years with the close-out anticipated to occur in 2022 given the success criteria are met. Appendix 1 provides more detailed project activity, history, contact information, directions, and watershed/site background information for this project.

1.1 Project Goals and Objectives

Prior to construction activities, the stream channels exhibited varying degrees of degradation across the Site. The Site was used as agricultural and pasture land and most of the buffers had been reduced to narrow corridors. Cattle had free access to the streams, which resulted in sporadic degraded stream banks and poor bed forms.

The restored stream channels on the Site were previously incised and overwidened in many locations, likely as a result of historic channelization. The alterations of the Site to promote cattle grazing and farming resulted in elimination of many of the ecological functions of this small stream complex. Specifically, functional losses at the Site included degraded aquatic habitat, altered hydrology (related to loss of floodplain connection and lowered water table), and a reduction of the quality and quantity of riparian wetland habitats and related water quality benefits. Ongoing bank erosion was also occurring at some locations due to high, overly steep banks, and lack of bank vegetation. Table 4 in Appendix 1 and Tables 10a-d in Appendix 4 present the pre-restoration conditions in detail.

The mitigation project is intended to provide numerous ecological benefits within the Cape Fear River Basin. While many of these benefits are limited to the Agony Acres Mitigation Site project area; others, such as pollutant removal and improved aquatic and terrestrial habitat, have more far-reaching effects. Expected improvements to water quality and ecological processes are outlined below as project goals and objectives. These project goals were established and completed with careful consideration of goals and objectives that were described in the RBRP and to meet DMS's mitigation needs while maximizing the ecological and water quality uplift within the watershed.

The following project specific goals established in the Agony Acres Mitigation Plan (Wildlands, 2014) include:

- Reduce sediment inputs by removing cattle from streams and restoring degraded and eroding stream channels;
- Return a network of streams to a stable form that is capable of supporting biological functions important to sensitive species within and adjacent to the project site;
- Reduce fecal coliform, nitrogen, and phosphorous inputs through removing cattle from streams and establishing and augmenting a forested riparian corridor;
- Protect existing high quality streams and forested buffers that provide habitat important to sensitive species within and adjacent to the project site;
- Improve and protect hydrologic inputs to the adjacent Reedy Fork Aquatic Habitat Significant Natural Heritage Area; and
- Improve and protect hydrologic inputs to Reedy Fork, which is listed as impaired on the 2012 NC 303(d) list for impaired aquatic life and for elevated fecal coliform levels.

The project goals will be addressed through the following project objectives:

- On-site nutrient inputs were decreased by removing cattle from streams, re-establishing floodplain connectivity, and filtering on-site runoff through buffer zones. Off-site nutrient input will be absorbed on-site by filtering flood flows through restored floodplain areas, where flood flow will spread through native vegetation. Vegetation is expected to uptake excess nutrients.
- Stream bank erosion which contributes sediment load to the creeks was greatly reduced, if not eliminated, in the project area. Eroding stream banks were stabilized using bioengineering, natural channel design techniques, and grading to reduce bank angles and bank height. Storm flow containing grit and fine sediment is filtered through restored floodplain areas, where flow will spread through native vegetation. Spreading flood flows also reduces velocity and allows

sediment to settle out. Sediment transport capacity of restored reaches was improved so that capacity balances more closely to load. Sediment load reduction will be monitored through assessing bank stability with cross section surveys and visual assessment through photo documentation which serves as an accepted surrogate for direct turbidity measurements.

- Restored riffle/pool sequences promote aeration of water and create deep water zones, helping to lower water temperature. Establishment and maintenance of riparian buffers creates long-term shading of the channel flow to minimize thermal heating. Lower water temperatures will help maintain dissolved oxygen concentrations.
- In-stream structures were constructed to improve habitat diversity and trap detritus. Wood habitat structures were included in the stream as part of the restoration design. Such structures include log drops and rock structures that incorporate woody debris and native onsite rock.
- Adjacent buffer and riparian habitats were restored with native vegetation as part of the project. Native vegetation provides cover and food for terrestrial creatures. Native plant species were planted and invasive species treated. Eroding and unstable areas were stabilized with vegetation as part of this project.
- The restored land is protected in perpetuity through a conservation easement.

The design streams were restored to the appropriate form based on the surrounding landscape, climate, and natural vegetation communities but also with strong consideration to existing watershed conditions and trajectory. Specifically, the site design was developed to restore a small stream complex directly adjacent to Reedy Fork. Other key factors addressed in the design were to create stable habitats, improve riparian buffers, and restore the natural migration patterns for fish spawning. Figure 2 and Table 1 in Appendix 1 present the stream mitigation components for the Agony Acres Mitigation Site.

1.2 Monitoring Year 5 Data Assessment

Annual monitoring and quarterly site visits were conducted during MY5 to assess the condition of the project. The stream and buffer success criteria for the Site follow the approved success criteria presented in the Agony Acres Mitigation Plan (Wildlands, 2014). During an IRT site visit on November 6, 2019, the group observed and discussed damage to fencing and gates at the external easement crossing between UT1A Reach 3 and UT1A Reach 4. A tree had fallen perpendicularly across the crossing damaging the fence and gates on both sides. The fence was not repaired because no livestock are moved through this crossing. Attendees of the site visit agreed that it was not necessary to repair fencing at this location and elsewhere on the project site so long as livestock remained excluded from the conservation easement.

1.2.1 Vegetative Assessment

Planted woody vegetation was monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-DMS Level 2 Protocol (Lee et al., 2006). A total of 16 10 meter by 10 meter vegetation plots were established during the baseline monitoring within the project easement areas. The final vegetative success criteria for the stream restoration and enhancement areas will be the survival of 210 planted stems per acre in the riparian corridor at the end of the required monitoring period (MY7). The interim measure of vegetative success is the survival of at least 260 stems per acre at the end of the fifth year of monitoring (MY5). Planted vegetation must average 10 feet in height in each plot at the end of the seventh year of monitoring. The final vegetative success criteria for the buffer restoration areas will be the survival of 320 planted stems per acre in the riparian corridor at the end of the required monitoring period. Wildlands plans to monitor the buffer restoration area on the same schedule as the rest of the project.

The MY5 vegetation survey was completed in August 2019. The 2019 vegetation monitoring resulted in a site-wide average stem density of 473 planted stems per acre, which is greater than the interim requirement of 260 planted stems per acre at MY5, but approximately 27% less than the baseline density recorded at MY0. Fifteen out of the 16 plots exceed the MY5 stem density criterion of 260 planted stems per acre. Plot 10 represents a density of 202 planted stems per acre but represents a density of 405 stems per acre when including volunteers (Table 9, Appendix 3). Site-wide average and median values for planted stem height are 11.0 feet and 9.6 feet, respectively. With the exception of plot 10, average and median heights within individual plots have either exceeded or are approaching 10 feet (data not shown). Both the average and median value for planted stem height in plot 10 is 2.3 feet. Refer to Appendix 2 for vegetation plot photographs and the vegetation condition assessment table and Appendix 3 for vegetation data tables.

1.2.2 Vegetation Areas of Concern

During MY5, defined populations of Chinese privet (*Ligustrum sinense*), multiflora rose (*Rosa multiflora*), Japanese honeysuckle (*Lonicera japonica*), and callery pear (*Pyrus calleryana*) were identified throughout the site (Figures 3.1-3.3). Japanese hops (*Humulus japonica*) and sweet autumn virginsbower (*Clematis terniflora*) were identified within the buffer restoration area along Reedy Fork (Figure 3.3). All of these defined populations of invasive vegetation were treated during June and October of 2019. Vegetation plot 1 is within a callery pear removal area, but no surviving callery pear stems were present in the plot at the time of inventory. Additionally, the entire site was spot treated for scattered invading invasive individuals to prevent spreading. This treatment included in the tree of heaven (*Ailanthus altissima*) stems recorded in vegetation plot five. In general, the individuals targeted in this treatment were dispersed at low density.

1.2.3 Stream Assessment

Morphological surveys for MY5 were conducted in March 2019. All streams within the Site are stable with little to no erosion and have met the success criteria for MY5. While there have been some minor post-construction adjustments within the restored channels; the cross sections show little to no change in the bankfull area, maximum depth, or width-to-depth ratio. Surveyed riffle cross sections fell within the parameters defined for channels of the appropriate Rosgen stream type. Pebble counts indicated coarser materials in the riffle features and finer particles in the pool features.

Visual assessment indicated streams are laterally and vertically stable throughout the project. Refer to Appendix 2 for the visual stability assessment table, CCPV Maps, and reference photographs. Refer to Appendix 4 for the morphological data and plots.

1.2.4 Stream Areas of Concern

Beaver activity occurred on UT1 where it approaches the Reedy Fork floodplain (Figure 3.2). Beaver activity was identified in September and removal was completed in October. Minimal damage occurred to the stream channels and tree community.

1.2.5 Hydrology Assessment

Two bankfull flow events within separate years must be documented on the restoration and enhancement reaches within the seven-year monitoring period. In addition, the presence of baseflow must be documented along portions of UT1B constructed with a Priority I restoration approach. Baseflow must be present for at least some portion of the year (most likely in the winter/early spring) during years with normal rainfall conditions.

Multiple bankfull events were recorded on all streams at the Site during MY5 (Table 13). Bankfull Events on all streams have been recorded during previous monitoring years; therefore, the Site has met the bankfull stream hydrology criterion for the duration of the monitoring period.

The downstream flow gage in UT1B recorded flow above the thalweg elevation throughout MY5 with the exception of few, scattered two to eight hour periods during July, August, and September. The upstream flow gage in UT1B recorded baseflow throughout the year except for September 11th through Otober 19th which was during a drought with below normal precipitation (Appendix 5). UT1B has met the baseflow criterion for MY1 through MY5.

Stream flow was recorded at five locations in UT1A during MY5, but there is no hydrology performance standard for this stream other than the bankfull flow requirement (Figure 3.2). Flow gages 1, 3, 4, and 5 indicate that UT1A had consistent flow from the beginning of the year through June. From June through the remainder of the 2019 monitoring year, UT1A had sporadic stream flow. Flow gage 2 recorded short interruptions to baseflow during July and August and a longer interruption to baseflow during September and October. Below normal rainfall was recorded during May, July, September, and October which likely contributed to these results (Appendix 5). Stream flow on UT1A will continue to be monitored through the duration of the monitoring period.

1.2.6 Maintenance Plan

The entire site will continue to be monitored and treated for invasive species as necessary. The seed bank of the Japanese hops area along Reedy Fork has been substantially reduced but will likely require additional treatment. The Site will continue to be monitored for beaver activity.

1.3 Monitoring Year 5 Summary

Vegetation, stream, and hydrology criteria were met for MY5. Fifteen out the 16 vegetation plots attainted the interim planted stem density requirement of 260 stems per acre. Plot 10 had a planted stem density of 202 planted stems per acre but had a density of 405 stems per acre when including volunteer species. All steams at the Site are stable and functioning as designed. UT1B attained the baseflow criterion and multiple bankfull events were recorded on all streams during MY5.

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). Crest gages were installed in surveyed riffle cross sections and monitored quarterly. Hydrology attainment installation and monitoring methods are in accordance with the USACE (USACE, 2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-DMS Level 2 Protocol (Lee et al., 2006). Reporting follows the DMS Monitoring Report Template and Guidance Version 1.3 (DMS, 2010).

Section 3: REFERENCES

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

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

Lee, Michael T., Peet, Robert K., Steven D., Wentworth, Thomas R. 2006. CVS-DMS Protocol for Recording Vegetation Version 4.0. Retrieved from http://www.ncdms.net/business/monitoring/veg/datasheets.htm.

Multi-Resolution Land Characteristics Consortium (MRLC). 2001. National Land Cover Database. http://www.mrlc.gov/nlcd.php

North Carolina Division of Water Resources (NCDWR). 2011. Surface Water Classifications. http://portal.ncdeq.org/web/wq/ps/csu/classifications

North Carolina Division of Water Resources, 2005. Cape Fear River Basinwide Water Quality Plan. http://h20.enr.state.nc.us/basinwide/draftCPFApril2005.htm

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

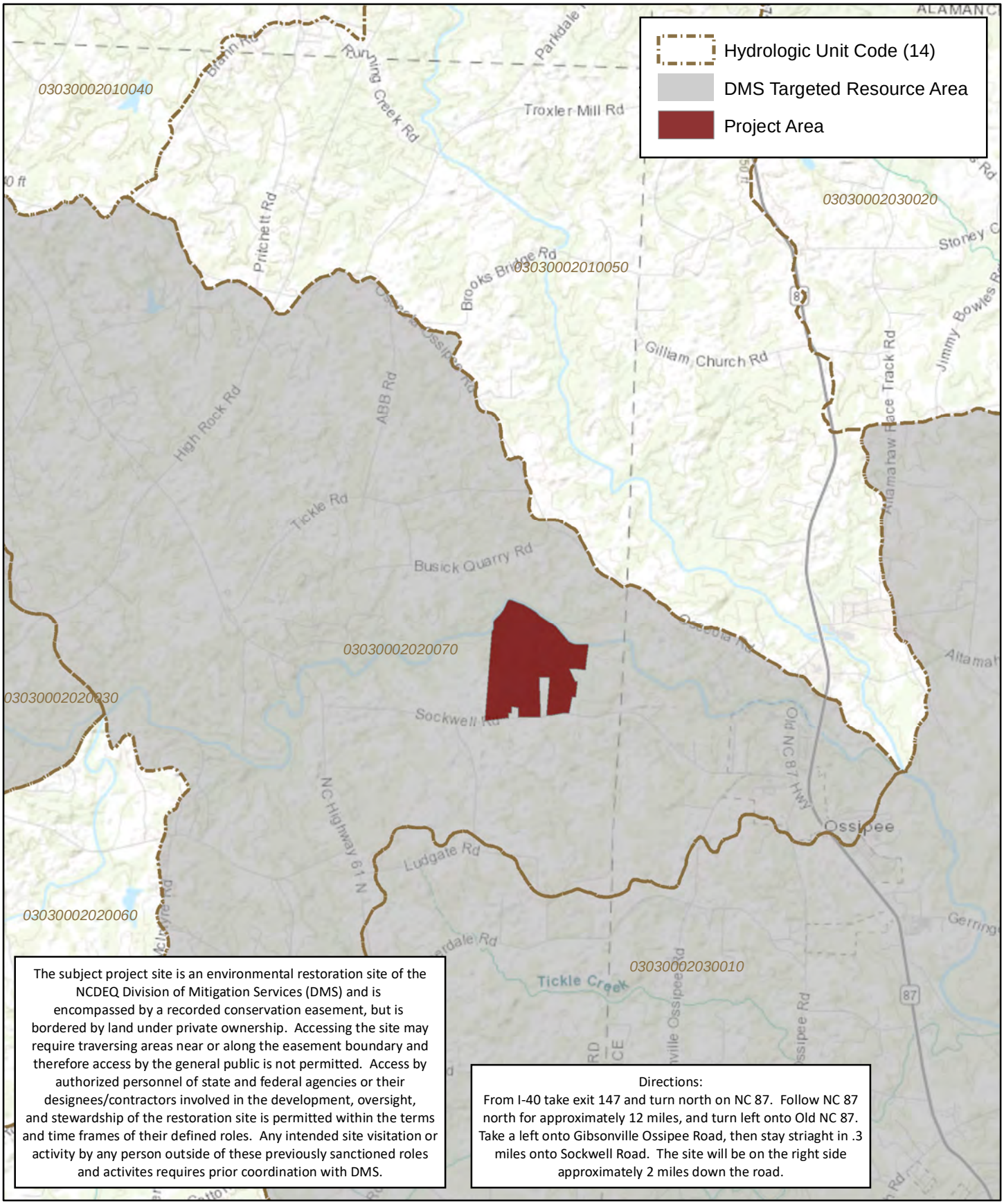
Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

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

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

Wildlands Engineering, Inc (2014). Agony Acres Mitigation Site Mitigation Plan. DMS, Raleigh, NC.

APPENDIX 1. General Tables and Figures



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

Directions:
From I-40 take exit 147 and turn north on NC 87. Follow NC 87 north for approximately 12 miles, and turn left onto Old NC 87. Take a left onto Gibsonville Ossipee Road, then stay striaght in .3 miles onto Sockwell Road. The site will be on the right side approximately 2 miles down the road.

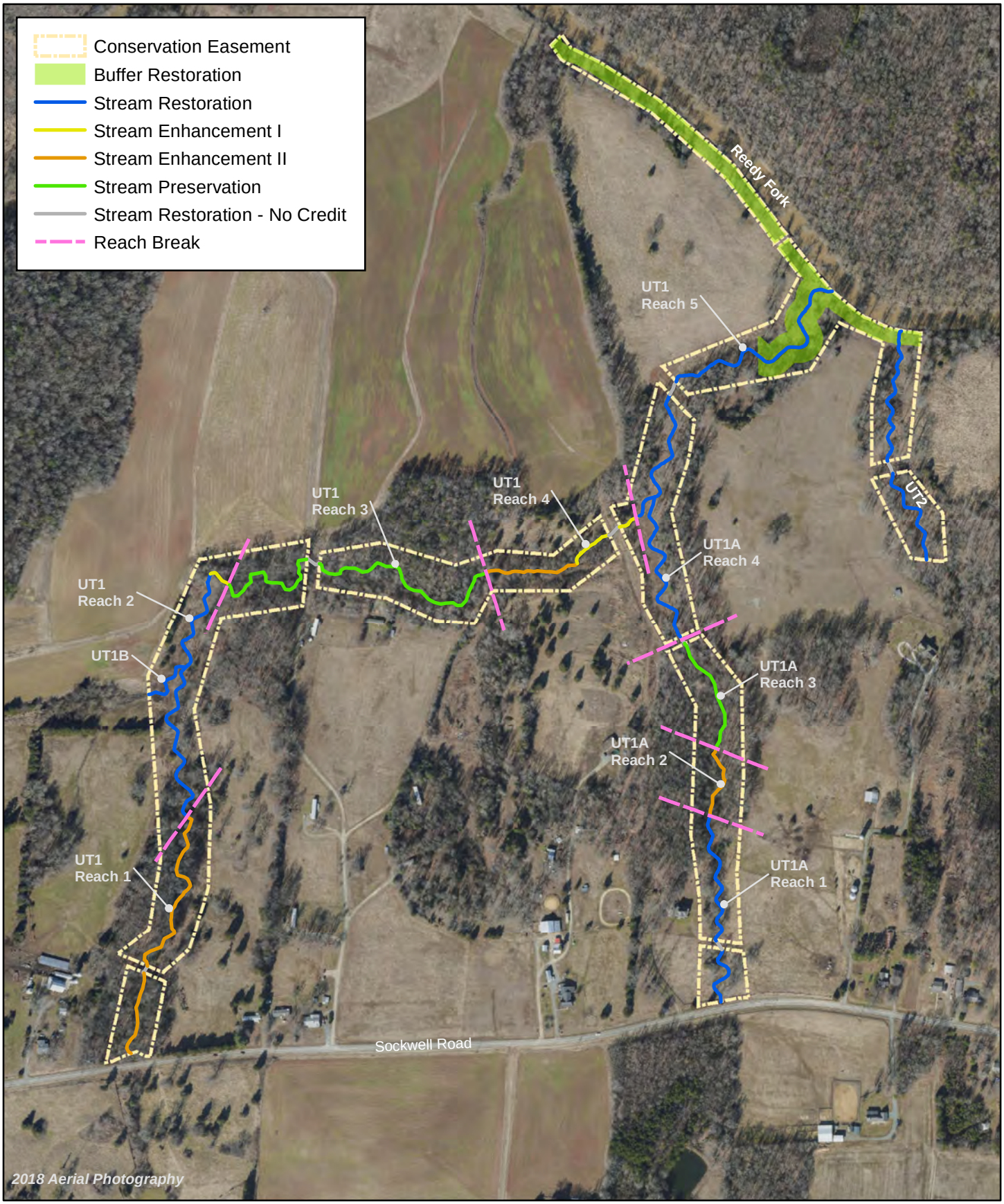
WILDLANDS ENGINEERING

0 0.5 1 Miles

N

Figure 1. Project Vicinity Map
Agony Acres Mitigation Site
DMS Project No. 95716
Monitoring Year 5 - 2019

Guilford County, NC



WILDLANDS ENGINEERING

0 250 500 Feet

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Figure 2. Project Component/Asset Map
Agony Acres Mitigation Site
DMS Project No. 95716
Monitoring Year 5 - 2019

Guilford County, NC

Table 1. Project Components and Mitigation Credits
Agony Acres Mitigation Site (DMS Project No.95716)
Monitoring Year 5 - 2019

MITIGATION CREDITS

	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Totals	6,107.3**	361	N/A	N/A	N/A	N/A	130,680	N/A	N/A

PROJECT COMPONENTS

Reach ID	As-Built Stationing/ Location	Existing Footage/ Acreage	Approach	Restoration or Restoration Equivalent	Restoration Footage/ Acreage	Mitigation Ratio	Credits (SMU/ WMU/BMU)
STREAMS							
UT1-Reach 1 (DOT ROW)	100+00 to 100+14	40**	EII	Enhancement (No Credit)	40**	---	---
UT1-Reach 1	100+14 to 103+62; 103+93 to 111+24	1,053**	EII	Enhancement	1,053**	2.5	421.2**
UT1-Reach 1 (Easement Break)	103+62 to 103+93	31	EII	Enhancement (No Credit)	31	---	---
UT1-Reach 2	111+24 to 122+38	1,039	P1	Restoration	1,114	1	1,114
UT1-Reach 2	122+38 to 123+31	93	EI	Enhancement	93	1.5	62
UT1-Reach 3	123+31 to 128+50; 129+06 to 137+37	1,350		Preservation	1,350	5	270
UT1-Reach 3 (Easement Break)	128+50 to 129+06	56		Preservation (No Credit)	56	---	---
UT1-Reach 4	137+37 to 140+92	355	EII	Enhancement	355	2.5	142
UT1-Reach 4	140+92 to 142+66; 143+20 to 144+06	260	EI	Enhancement	260	1.5	173
UT1-Reach 4 (Easement Break)	142+66 to 143+20	54	EI	Enhancement (No Credit)	54	---	---
UT1-Reach 5	144+06 to 149+65; 150+20 to 158+94	1,355	P1/2	Restoration	1,433	1	1,433
UT1-Reach 5 (Easement Break)	149+65 to 150+20	65	P1	Restoration (No Credit)	55	---	---
UT1A-Reach 1 (DOT ROW)	200+00 to 200+05	5	P1	Restoration (No Credit)	5	---	---
UT1A-Reach 1	200+05 to 202+64; 203+04 to 208+49	738	P1	Restoration	804	1	804
UT1A-Reach 1 (Easement Break)	202+64 to 203+04	32	P1	Restoration (No Credit)	40	---	---
UT1A-Reach 2	208+49 to 211+41	292	EII	Enhancement	292	2.5	117
UT1A-Reach 3	211+41 to 215+98	457		Preservation	457	5	91
UT1A-Reach 3 (Easement Break)	215+98 to 216+28	30	EII	Enhancement (No Credit)	30	---	---
UT1A-Reach 4	216+28 to 222+78	461	P1	Restoration	650	1	650
UT1B	300+00 to 302+19	243	P1	Restoration	219	1	219
UT2	400+00 to 404+16; 404+67 to 410+23	975	P1	Restoration	972	1	972
UT2 (Easement Break)	404+16 to 404+67	53	P1/2	Restoration (No Credit)	51	---	---
Riparian Buffer Area	---	---	---	Restoration	3.0 (130,680 ft^2)	1	130,680

COMPONENT SUMMATION

Restoration Level	Stream (LF)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Buffer (acres)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	5,192	-	-	-	3.0	-
Enhancement		-	-	-	-	-
Enhancement I	353					
Enhancement II	1,700**					
Creation		-	-	-		
Preservation	1,807	-	-	-		-
High Quality Preservation	-	-	-	-		-

N/A: not applicable
* Credit calculations were originally calculated along the as-built thalweg and updated to be calculated along stream centerlines as stated in the approved Mitigation Plan for Monitoring Year 3 after discusions with NC IRT.
**Values updated during MY4 to account for DOT culvert replacement project.

Table 2. Project Activity and Reporting History
Agony Acres Mitigation Site (DMS Project No.95716)
Monitoring Year 5 - 2019

Activity or Report		Date Collection Complete	Completion or Scheduled Delivery
Mitigation Plan		October 2013-March 2014	March 2014
Final Design - Construction Plans		April 2014-June 2014	June 2014
Construction		June 2014-September 2014	September 2014
Temporary S&E mix applied to entire project area [1]		September 2014	September 2014
Permanent seed mix applied to reach/segments		September 2014	September 2014
Bare root and live stake plantings for reach/segments		December 2014	December 2014
Baseline Monitoring Document (Year 0)	Stream Survey	October 2014	February 2015
	Vegetation Survey	December 2014	
Year 1 Monitoring	Stream Survey	May 2015	December 2015
	Vegetation Survey	September 2015	
Year 2 Monitoring	Stream Survey	March 2016	December 2016
	Vegetation Survey	June 2016	
Supplemental Planting			December 2016
Year 3 Monitoring	Stream Survey	April 2017	December 2017
	Vegetation Survey	August 2017	
Invasive Vegetation Treatment			September-October 2018
Year 4 Monitoring	Stream Survey	N/A	December 2018
	Vegetation Survey	N/A	
Invasive Vegetation Treatment			June 2019
Invasive Vegetation Treatment			October 2019
Beaver Removal			October 2019
Year 5 Monitoring	Stream Survey	March 2019	December 2019
	Vegetation Survey	August 2019	
Year 6 Monitoring	Stream Survey	2020	December 2020
	Vegetation Survey	2020	
Year 7 Monitoring	Stream Survey	2021	December 2021
	Vegetation Survey	2021	

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

Table 3. Project Contact Table
Agony Acres Mitigation Site (DMS Project No.95716)
Monitoring Year 5 - 2019

Designer Nicole Macaluso, PE, CFM	**Wildlands Engineering, Inc.** 312 West Millbrook Road, Suite 225 Raleigh, NC 27609 919.851.9986
Construction Contractor	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Planting Contractor	**Bruton Natural Systems, Inc** P.O. Box 1197 Fremont, NC 27830
Seeding Contractor	**Land Mechanic Designs, Inc.** 126 Circle G Lane Willow Spring, NC 27592
Seed Mix Sources	**Green Resource, LLC**
Nursery Stock Suppliers	
Bare Roots	**Dykes and Son Nursery**
Live Stakes	**Bruton Natural Systems, Inc**
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Jason Lorch 919.851.9986, ext. 107

Table 4. Project Information and Attributes
Agony Acres Mitigation Site (DMS Project No.95716)
Monitoring Year 5 - 2019

PROJECT INFORMATION	
Project Name	Agony Acres Mitigation Site
County	Guilford County
Project Area (acres)	30.74 acres
Project Coordinates (latitude and longitude)	36° 10' 40" N, 79° 33' 02" W
PROJECT WATERSHED SUMMARY INFORMATION	
Physiographic Province	Piedmont
River Basin	Cape Fear River
USGS Hydrologic Unit 8-digit	03030002
USGS Hydrologic Unit 14-digit	03030002020070
DWR Sub-basin	03-06-02
Project Drainiage Area (acres)	358 acres
Project Drainage Area Percentage of Impervious Area	<1%
CGIA Land Use Classification	65% Managed Herbaceous Cover, 30% Mixed Upland Hardwoods, 3% Cultivated, 2% Southern Yellow Pine, <1% Low Intensity Development

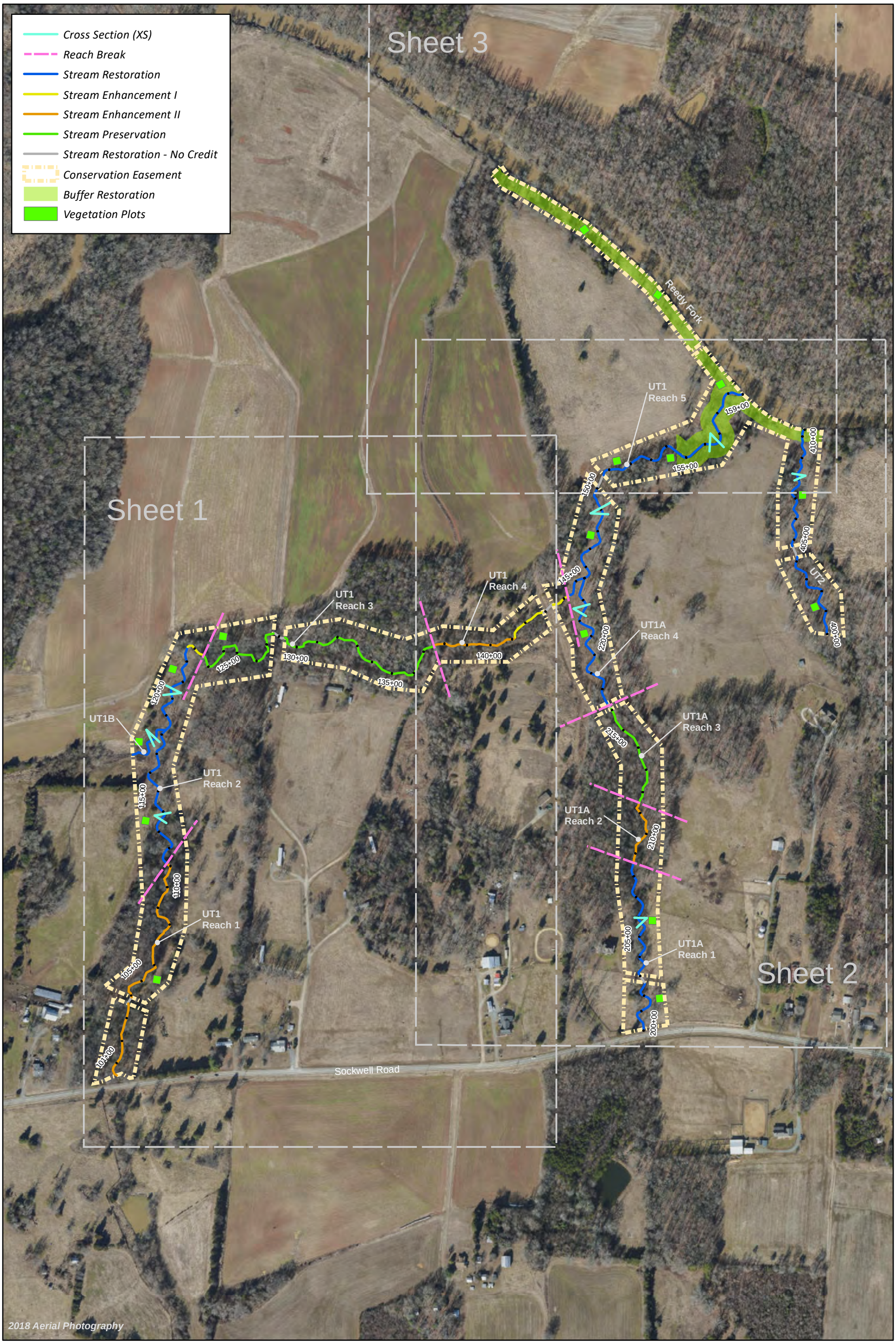
REACH SUMMARY INFORMATION

Parameters	UT1 - Reaches 1 -3	UT1 - Reaches 4 & 5	UT1A	UT1B	UT2	
Length of reach (linear feet) - Post-Restoration	3,711	2,157	2,278	219	1,023	
Drainage area (acres)	228	358	103	61	61	
NCDWR stream identification score	42.5	46.5	41	29.25	32.25	
NCDWR Water Quality Classification	WS-V					
Morphological Desription (stream type)	P	P	P/I	P	P	
Evolutionary trend (Simon's Model) - Pre- Restoration	I, III	III, IV	I, II/III	II/III	II/III	
Underlying mapped soils	Cecil sandy loam, Congaree loam, Coronaca clay loam, Enon fine sandy loam, Enon clay loam, Madison clay loam, Mecklenburg sandy clay loam, Wehadkee loam					
Drainage class	---	---	---	---	---	---
Soil Hydric status	---	---	---	---	---	---
Slope	---	---	---	---	---	---
FEMA classification	N/A					
Native vegetation community	Piedmont bottomland forest					
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.
Waters of the United States - Section 401	Yes	Yes	
Division of Land Quality (Dam Safety)	No	N/A	N/A
Endangered Species Act	Yes	Yes	Agony Acres Mitigation Plan; Wildlands determined "no effect" on Guilford County listed endangered species.
Historic Preservation Act	Yes	Yes	No historic resources were found to be impacted (letter from SHPO dated 1/15/13).
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	N/A	N/A	The project streams do not have an associated regulatory floodplain; however portions of UT1, UT1A, and UT2 are located within the floodway and flood fringe of Reedy Fork (FEMA Zone AE, FIRM panels 8838 and 8848).
Essential Fisheries Habitat	No	N/A	N/A

APPENDIX 2. Visual Assessment Data



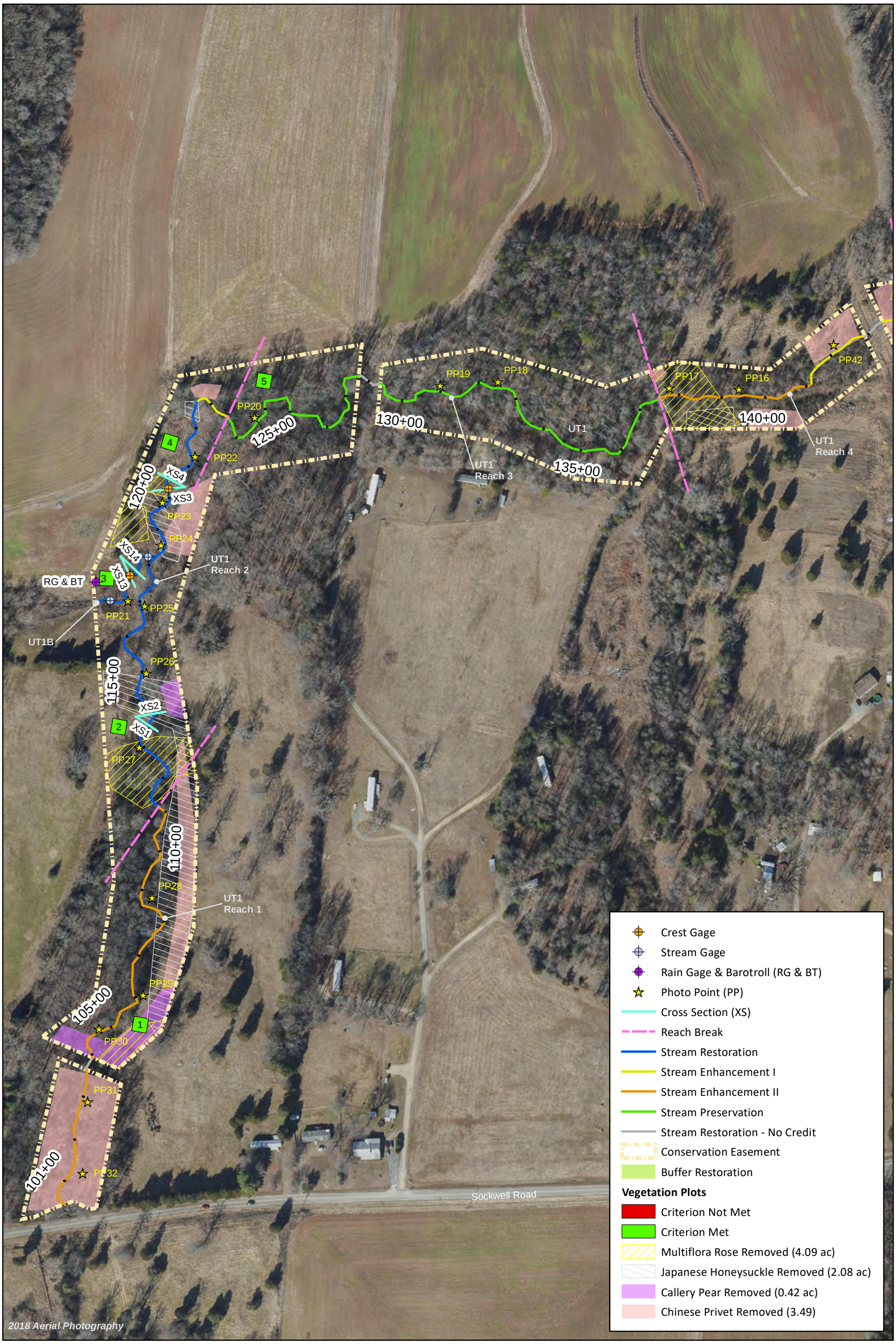
WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 3.0 Integrated Current Condition Plan View (Key)
Agony Acres Mitigation Site
DMS Project No. 95716
Monitoring Year 5 - 2019

Guilford County, NC



WILDLANDS ENGINEERING

0 250 500 Feet

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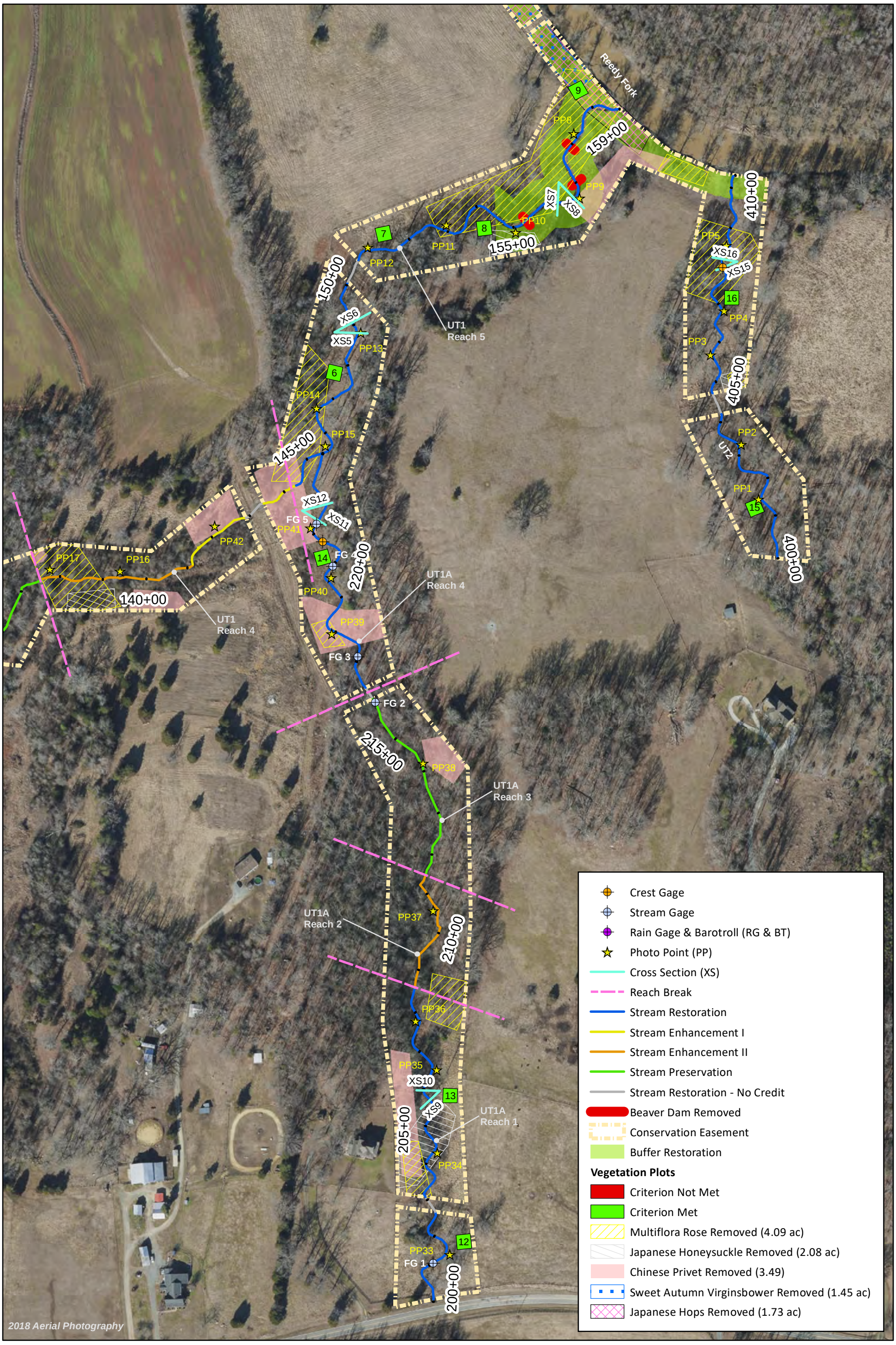
Figure 3.1. Integrated Current Condition Plan View
(Sheet 1 of 3)
Agony Acres Mitigation Site
DMS Project No. 95716
Monitoring Year 5 - 2019

Guilford County, NC



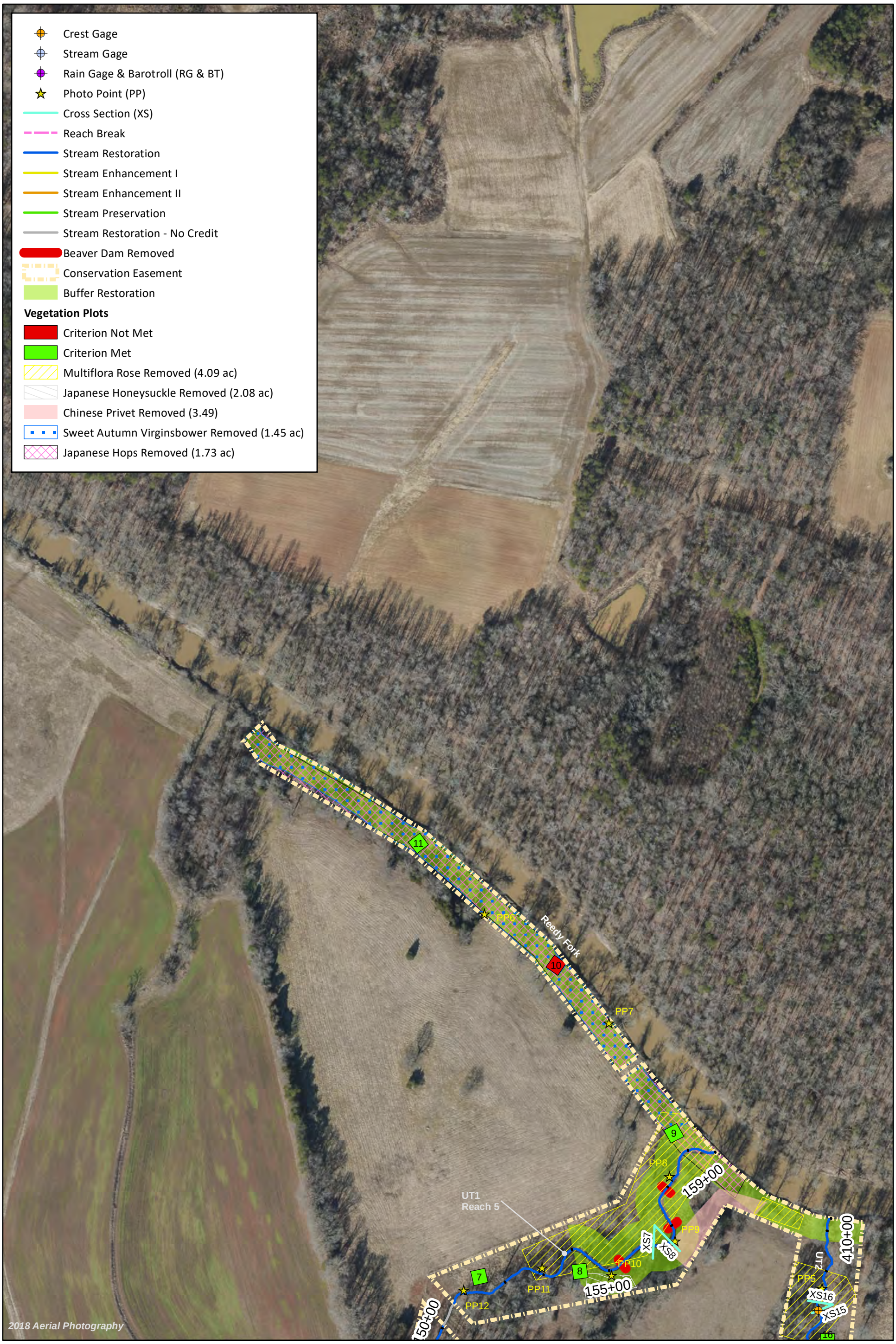
WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 3.2. Integrated Current Condition Plan View
(Sheet 2 of 3)
Agony Acres Mitigation Site
DMS Project No. 95716
Monitoring Year 5 - 2019

Guilford County, NC



WILDLANDS ENGINEERING

0 250 500 Feet

N

Figure 3.3. Integrated Current Condition Plan View
(Sheet 3 of 3)
Agony Acres Mitigation Site
DMS Project No. 95716
Monitoring Year 5 - 2019

Guilford County, NC

Table 5a. Visual Stream Morphology Stability Assessment Table

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

UT1

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	42	42			100%			
	3. Meander Pool Condition	Depth Sufficient	39	39			100%			
		Length Appropriate	39	39			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	39	39			100%			
		Thalweg centering at downstream of meander bend (Glide)	39	39			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	16	16			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	16	16			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	16	16			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	16	16			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	16	16			100%			

Table 5b. Visual Stream Morphology Stability Assessment Table

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

UT1A

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	26	26			100%			
	3. Meander Pool Condition	Depth Sufficient	26	26			100%			
		Length Appropriate	26	26			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	26	26			100%			
		Thalweg centering at downstream of meander bend (Glide)	26	26			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	3	3			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	3	3			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	3	3			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	3	3			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	3	3			100%			

Table 5c. Visual Stream Morphology Stability Assessment Table

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

UT1B

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	6	6			100%			
	3. Meander Pool Condition	Depth Sufficient	5	5			100%			
		Length Appropriate	5	5			100%			
	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, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms	1	1			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow	1	1			100%			

Table 5d. Visual Stream Morphology Stability Assessment Table

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

UT2

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	20	20			100%			
	3. Meander Pool Condition	Depth Sufficient	21	21			100%			
		Length Appropriate	21	21			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	21	21			100%			
		Thalweg centering at downstream of meander bend (Glide)	21	21			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	n/a	n/a	n/a
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	n/a	n/a	n/a
	3. Mass Wasting	Bank slumping, caving, or collapse			0	0	100%	n/a	n/a	n/a
				TOTALS	0	0	100%	n/a	n/a	n/a
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	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%			

Table 6. Vegetation Condition Assessment Table
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

Planted Acreage **18**

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

Easement Acreage **31**

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).	1,000	0	0	0.0%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0	0%

PHOTO POINT 1 UT2 – looking upstream *(03/26/2019)*	**PHOTO POINT 1 UT2** – looking downstream *(03/26/2019)*
PHOTO POINT 2 UT2 – looking upstream *(03/26/2019)*	**PHOTO POINT 2 UT2** – looking downstream *(03/26/2019)*
PHOTO POINT 3 UT2 – looking upstream *(03/26/2019)*	**PHOTO POINT 3 UT2** – looking downstream *(03/26/2019)*

PHOTO POINT 4 UT2 – looking upstream *(03/26/2019)*	**PHOTO POINT 4 UT2** – looking downstream *(03/26/2019)*
PHOTO POINT 5 UT2 – looking upstream *(03/26/2019)*	**PHOTO POINT 5 UT2** – looking downstream *(03/26/2019)*
PHOTO POINT 6 Reedy Fork – looking upstream *(03/26/2019)*	**PHOTO POINT 6 Reedy Fork** – looking downstream *(03/26/2019)*

PHOTO POINT 7 Reedy Fork – looking upstream *(03/26/2019)*	**PHOTO POINT 7 Reedy Fork** – looking downstream *(03/26/2019)*
PHOTO POINT 8 UT1 R5 – looking upstream (03/26/2019)	**PHOTO POINT 8 UT1 R5 – looking downstream (03/26/2019)**
PHOTO POINT 9 UT1 R5 – looking upstream (03/26/2019)	**PHOTO POINT 9 UT1 R5 – looking downstream (03/26/2019)**

PHOTO POINT 10 UT1 R5 – looking upstream (03/26/2019)

PHOTO POINT 10 UT1 R5 – looking downstream (03/26/2019)

PHOTO POINT 11 UT1 R5 – looking upstream (03/26/2019)

PHOTO POINT 11 UT1 R5 – looking downstream (03/26/2019)

PHOTO POINT 12 UT1 R5 – looking upstream (03/26/2019)

PHOTO POINT 12 UT1 R5 – looking downstream (03/26/2019)

PHOTO POINT 13 UT1 R5 – looking upstream (03/26/2019)	**PHOTO POINT 13 UT1 R5 – looking downstream (03/26/2019)**
PHOTO POINT 14 UT1 R5 – looking upstream (03/26/2019)	**PHOTO POINT 14 UT1 R5 – looking downstream (03/26/2019)**
PHOTO POINT 15 UT1 R5 – looking upstream (03/26/2019)	**PHOTO POINT 15 UT1 R5 – looking downstream (03/26/2019)**

PHOTO POINT 16 UT1 R4 – looking upstream *(03/27/2019)*	**PHOTO POINT 16 UT1 R4** – looking downstream *(03/27/2019)*
PHOTO POINT 17 UT1 R4 – looking upstream *(03/27/2019)*	**PHOTO POINT 17 UT1 R4** – looking downstream *(03/27/2019)*
PHOTO POINT 42 UT1 R4 – looking upstream *(03/27/2019*	**PHOTO POINT 42 UT1 R4** – looking downstream *(03/27/2019)*

PHOTO POINT 18 UT1 R3 – looking upstream *(03/28/2019)*

PHOTO POINT 18 UT1 R3 – looking downstream *(03/28/2019)*

PHOTO POINT 19 UT1 R3 – looking upstream *(03/28/2019)*

PHOTO POINT 19 UT1 R3 – looking downstream *(03/28/2019)*

PHOTO POINT 20 UT1 R3 – looking upstream *(03/28/2019)*

PHOTO POINT 20 UT1 R3 – looking downstream *(03/28/2019)*

PHOTO POINT 21 UT1B – looking upstream *(03/27/2019)*

PHOTO POINT 21 UT1B – looking downstream *(03/27/2019)*

PHOTO POINT 22 UT1 R2 – looking upstream (03/28/2019)

PHOTO POINT 22 UT1 R2 – looking downstream (03/28/2019)

PHOTO POINT 23 UT1 R2 – looking upstream (03/28/2019)

PHOTO POINT 23 UT1 R2 – looking downstream (03/28/2019)

PHOTO POINT 24 UT1 R2 – looking upstream (03/28/2019)	**PHOTO POINT 24 UT1 R2 – looking downstream (03/28/2019)**
PHOTO POINT 25 UT1 R2 – looking upstream (03/28/2019)	**PHOTO POINT 25 UT1 R2 – looking downstream (03/28/2019)**
PHOTO POINT 26 UT1 R2 – looking upstream (03/28/2019)	**PHOTO POINT 26 UT1 R2 – looking downstream (03/28/2019)**

PHOTO POINT 27 UT1 R2 – looking upstream (03/28/2019)	**PHOTO POINT 27 UT1 R2 – looking downstream (03/28/2019)**
PHOTO POINT 28 UT1 R1 – looking upstream (03/28/2019)	**PHOTO POINT 28 UT1 R1 – looking downstream (03/28/2019)**
PHOTO POINT 29 UT1 R1 – looking upstream (03/28/2019)	**PHOTO POINT 29 UT1 R1 – looking downstream (03/28/2019)**

PHOTO POINT 30 UT1 R1 – looking upstream (03/28/2019)	**PHOTO POINT 30 UT1 R1 – looking downstream (03/28/2019)**
PHOTO POINT 31 UT1 R1 – looking upstream (03/28/2019)	**PHOTO POINT 31 UT1 R1 – looking downstream (03/28/2019)**
PHOTO POINT 32 UT1 R1 – looking upstream (03/28/2019)	**PHOTO POINT 32 UT1 R1 – looking downstream (03/28/2019)**

PHOTO POINT 33 UT1A R1 – looking upstream *(03/27/2019)*

PHOTO POINT 33 UT1A R1 – looking downstream *(03/27/2019)*

PHOTO POINT 34 UT1A R1 – looking upstream *(03/27/2019)*

PHOTO POINT 34 UT1A R1 – looking downstream *(03/27/2019)*

PHOTO POINT 35 UT1A R1 – looking upstream *(03/27/2019)*

PHOTO POINT 35 UT1A R1 – looking downstream *(03/27/2019)*

PHOTO POINT 36 UT1A R1 – looking upstream *(03/27/2019)*

PHOTO POINT 36 UT1A R1 – looking downstream *(03/27/2019)*

PHOTO POINT 37 UT1A R2 – looking upstream (03/27/2019)

PHOTO POINT 37 UT1A R2 – looking downstream (03/27/2019)

PHOTO POINT 38 UT1A R3 – looking upstream (03/27/2019)

PHOTO POINT 38 UT1A R3 – looking downstream (03/27/2019)

PHOTO POINT 39 UT1A R4 – looking upstream *(03/27/2019)*

PHOTO POINT 39 UT1A R4 – looking downstream *(03/27/2019)*

PHOTO POINT 40 UT1A R4 – looking upstream *(03/27/2019)*

PHOTO POINT 40 UT1A R4 – looking downstream *(03/27/2019)*

PHOTO POINT 41 UT1A R4 – looking upstream *(03/27/2019)*

PHOTO POINT 41 UT1A R4 – looking downstream *(03/27/2019)*

VEGETATION PHOTOGRAPHS
Agony Acres
Monitoring Year 5

VEG PLOT 1 *(08/13/2019)*	**VEG PLOT 2** *(08/13/2019)*
VEG PLOT 3 *(08/8/2019)*	**VEG PLOT 4** *(08/8/2019)*

VEG PLOT 5 *(08/8/2019)*

VEG PLOT 6 *(08/8/2019)*

VEG PLOT 7 *(08/8/2019)*

VEG PLOT 8 *(08/8/2019)*

VEG PLOT 9 *(08/13/2019)*

VEG PLOT 10 *(08/13/2019)*

VEG PLOT 11 *(08/13/2019)*

VEG PLOT 12 *(08/8/2019)*

VEG PLOT 13 *(08/8/2019)*

VEG PLOT 14 *(08/8/2019)*

VEG PLOT 15 *(08/8/2019)*

VEG PLOT 16 *(08/8/2019)*

APPENDIX 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Plot	Success Criteria Met (Y/N)	Tract Mean
1	Y	94%
2	Y	
3	Y	
4	Y	
5	Y	
6	Y	
7	Y	
8	Y	
9	Y	
10	N	
11	Y	
12	Y	
13	Y	
14	Y	
15	Y	
16	Y	

Table 8. CVS Vegetation Plot Metadata

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Database name	Agony Acres- MY5- v2.3.1.mdb
Database location	F:\Projects\005-02136 Agony Acres\Monitoring\Monitoring Year 5\Vegetation Assessment
Computer name	JASON-PC
File size	68157440
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	95716
project Name	Agony Acres Mitigation Site
Description	Stream & Buffer Site
River Basin	Cape Fear
Sampled Plots	16

Table 9. Planted and Total Stem Counts

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

			Current Plot Data (MY5 2019)														
			VP 1			VP 2			VP 3			VP 4			VP 5		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree															
Acer rubrum	red maple	Tree															
Ailanthus altissima	tree of heaven	Exotic															6
Alnus serrulata	hazel alder	Shrub							1	1	1						
Betula nigra	river birch	Tree				1	1	1	2	2	2	3	3	3			
Cornus amomum	silky dogwood	Shrub															
Diospyros virginiana	common persimmon	Tree															
Fraxinus pennsylvanica	green ash	Tree	5	5	5	4	4	4	3	3	3	2	2	4	2	2	2
Gleditsia triacanthos	honeylocust	Tree															
Ilex opaca	American holly	Tree															
Juglans nigra	black walnut	Tree															
Juniperus virginiana	eastern redcedar	Tree															
Liquidambar styraciflua	sweetgum	Tree			17			2						11			
Liriodendron tulipifera	tuliptree	Tree			11									6			
Nyssa sylvatica	blackgum	Tree															
Platanus occidentalis	American sycamore	Tree	3	3	3				4	4	4	4	4	13	2	2	2
Quercus michauxii	swamp chestnut oak	Tree				1	1	1	1	1	1	1	1	1	5	5	5
Quercus pagoda	cherrybark oak	Tree	2	2	2	3	3	3	1	1	1	2	2	2			
Quercus phellos	willow oak	Tree	2	2	2	1	1	1	2	2	2	1	1	1	1	1	1
Quercus rubra	northern red oak	Tree															
Quercus velutina	black oak	Tree															
Rhus	sumac	shrub															
Rhus copallinum	flameleaf sumac	shrub															
Ulmus	elm	Tree															
		Stem count	12	12	40	10	10	12	14	14	14	13	13	41	10	10	10
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	4	4	6	5	5	6	7	7	7	6	6	8	4	4	5
		Stems per ACRE	486	486	1,619	405	405	486	567	567	567	526	526	1,659	405	405	405

Color Coding for Table

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

PnoLS: Number of Planted stems excluding live stakes

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

T: Total Stems

Table 9. Planted and Total Stem Counts

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

			Current Plot Data (MY5 2019)														
			VP 6			VP 7			VP 8			VP 9			VP 10		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree						2			2			18			4
Acer rubrum	red maple	Tree															
Ailanthus altissima	tree of heaven	Exotic															
Alnus serrulata	hazel alder	Shrub	4	4	4												
Betula nigra	river birch	Tree	3	3	3	3	3	3	1	1	1						
Cornus amomum	silky dogwood	Shrub															
Diospyros virginiana	common persimmon	Tree															
Fraxinus pennsylvanica	green ash	Tree	2	2	2	3	3	3	5	5	5	5	5	21	2	2	3
Gleditsia triacanthos	honeylocust	Tree						1									
Ilex opaca	American holly	Tree															
Juglans nigra	black walnut	Tree															
Juniperus virginiana	eastern redcedar	Tree															
Liquidambar styraciflua	sweetgum	Tree			36			9			4			4			
Liriodendron tulipifera	tuliptree	Tree			58			2									
Nyssa sylvatica	blackgum	Tree															
Platanus occidentalis	American sycamore	Tree	2	2	45	3	3	5	6	6	6	6	6	14	1	1	1
Quercus michauxii	swamp chestnut oak	Tree	2	2	2	4	4	4	1	1	1	1	1	1	1	1	1
Quercus pagoda	cherrybark oak	Tree	1	1	1										1	1	1
Quercus phellos	willow oak	Tree										1	1	1			
Quercus rubra	northern red oak	Tree															
Quercus velutina	black oak	Tree			1												
Rhus	sumac	shrub															
Rhus copallinum	flameleaf sumac	shrub						7									
Ulmus	elm	Tree															
		Stem count	14	14	152	13	13	36	13	13	19	13	13	59	5	5	10
		size (ares)	1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02		
		Species count	6	6	9	4	4	9	4	4	6	4	4	6	4	4	5
		Stems per ACRE	567	567	6,151	526	526	1,457	526	526	769	526	526	2,388	202	202	405

Color Coding for Table

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

PnoLS: Number of Planted stems excluding live stakes

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

T: Total Stems

Table 9. Planted and Total Stem Counts

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

			Current Plot Data (MY5 2019)																	
			VP 11			VP 12			VP 13			VP 14			VP 15			VP 16		
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**
Acer negundo	boxelder	Tree			9															6
Acer rubrum	red maple	Tree																		
Ailanthus altissima	tree of heaven	Exotic																		
Alnus serrulata	hazel alder	Shrub	1	1	1							1	1	1				1	1	1
Betula nigra	river birch	Tree	1	1	1				3	3	3	2	2	2						
Cornus amomum	silky dogwood	Shrub																		
Diospyros virginiana	common persimmon	Tree						3												
Fraxinus pennsylvanica	green ash	Tree	7	7	7	3	3	3	2	2	2				3	3	4	2	2	4
Gleditsia triacanthos	honeylocust	Tree																		
Ilex opaca	American holly	Tree																		
Juglans nigra	black walnut	Tree																		
Juniperus virginiana	eastern redcedar	Tree																		
Liquidambar styraciflua	sweetgum	Tree												100						2
Liriodendron tulipifera	tuliptree	Tree												50			4			70
Nyssa sylvatica	blackgum	Tree			4												3			
Platanus occidentalis	American sycamore	Tree	2	2	2	4	4	4				3	3	15	4	4	4	3	3	87
Quercus michauxii	swamp chestnut oak	Tree				1	1	1	6	6	6	4	4	4	2	2	2	1	1	1
Quercus pagoda	cherrybark oak	Tree				1	1	1	2	2	2	2	2	2	1	1	1			
Quercus phellos	willow oak	Tree	1	1	1	1	1	1				1	1	1	1	1	1	4	4	4
Quercus rubra	northern red oak	Tree																		
Quercus velutina	black oak	Tree																		
Rhus	sumac	shrub																		
Rhus copallinum	flameleaf sumac	shrub															1			15
Ulmus	elm	Tree																		
		Stem count	12	12	25	10	10	13	13	13	13	13	13	175	11	11	20	11	11	190
		size (ares)	1			1			1			1			1			1		
		size (ACRES)	0.02			0.02			0.02			0.02			0.02			0.02		
		Species count	5	5	7	5	5	6	4	4	4	6	6	8	5	5	8	5	5	9
		Stems per ACRE	486	486	1,012	405	405	526	526	526	526	526	526	7,082	445	445	809	445	445	7,689

Color Coding for Table

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

PnoLS: Number of Planted stems excluding live stakes

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

T: Total Stems

Table 9. Planted and Total Stem Counts

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

			Annual Means														
			MY5 (2019)			MY3 (2017)			MY2 (2016)			MY1 (2015)			MY0 (2015)		
Scientific Name	**Common Name**	**Species Type**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	boxelder	Tree			42			16						2			
Acer rubrum	red maple	Tree						4			30			10			
Ailanthus altissima	tree of heaven	Exotic			6												
Alnus serrulata	hazel alder	Shrub	8	8	8	10	10	11	15	15	15	26	26	26	27	27	27
Betula nigra	river birch	Tree	19	19	19	21	21	23	20	20	20	27	27	27	28	28	28
Cornus amomum	silky dogwood	Shrub									2						
Diospyros virginiana	common persimmon	Tree			3												
Fraxinus pennsylvanica	green ash	Tree	50	50	73	51	51	67	52	52	82	55	55	56	55	55	55
Gleditsia triacanthos	honeylocust	Tree			1			1									
Ilex opaca	American holly	Tree						1			3						
Juglans nigra	black walnut	Tree												1			
Juniperus virginiana	eastern redcedar	Tree						3									
Liquidambar styraciflua	sweetgum	Tree			185			129			30			10			
Liriodendron tulipifera	tuliptree	Tree			201			74			71			32			
Nyssa sylvatica	blackgum	Tree			7												
Platanus occidentalis	American sycamore	Tree	47	47	205	49	49	235	50	50	115	56	56	101	56	56	56
Quercus michauxii	swamp chestnut oak	Tree	31	31	31	34	34	34	35	35	35	36	36	36	36	36	36
Quercus pagoda	cherrybark oak	Tree	16	16	16	18	18	18	20	20	20	25	25	25	25	25	25
Quercus phellos	willow oak	Tree	16	16	16	16	16	16	18	18	18	30	30	30	30	30	30
Quercus rubra	northern red oak	Tree						6			40			10			
Quercus velutina	black oak	Tree			1												
Rhus	sumac	shrub						1									
Rhus copallinum	flameleaf sumac	shrub			23			2									
Ulmus	elm	Tree						9									
		Stem count	187	187	837	199	199	650	210	210	481	255	255	366	257	257	257
		size (ares)	16			16			16			16			16		
		size (ACRES)	0.40			0.40			0.40			0.40			0.40		
		Species count	7	7	16	7	7	18	7	7	13	7	7	13	7	7	7
		Stems per ACRE	473	473	2,117	503	503	1,644	531	531	1,217	645	645	926	650	650	650

Color Coding for Table

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

PnoLS: Number of Planted stems excluding live stakes

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

T: Total Stems

APPENDIX 4. Morphological Summary Data and Plots

Table 10a. Baseline Stream Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT1

		PRE-RESTORATION CONDITION				REFERENCE REACH DATA										DESIGN				AS-BUILT/BASELINE			
Parameter	Gage	UT1 - Reach 2		UT1 - Reach 5		Onsite Reference Reach - UT1A - Reach 3		UT to Polecat Creek		Spencer Creek 1		Spencer Creek 2		UT To Cane Creek		UT1 - Reach 2		UT1 - Reach 5		UT1 - Reach 2		UT1 - Reach 5	
				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)		6.5		13.9	16.0	11.1		5.3	10.9	10.7	11.2	6.3	9.3	11.5	12.3	10.2		12.8		10.2	10.4	11.9	13.6
Floodprone Width (ft)		10		20	>50	25		25	65	60	>114	14	125	31		22	51	28	64	60	100	200	
Bankfull Mean Depth		0.8		1.5	4.3	0.7		1.0	1.1	1.6	1.8	0.8	1.0	0.8	1.0	0.8		0.9		0.6	0.9	0.8	0.9
Bankfull Max Depth		1.4		1.9	5.2	1.0		1.4	1.7	2.1	2.6	1.0	1.2	1.2	1.6	1.0	1.2	1.2	1.5	1.1	1.4	1.3	1.6
Bankfull Cross Sectional Area (ft^2)	N/A	5.2		24.6	59.0	7.4		5.4	12.4	17.8	19.7	6.6	8.7	8.9	12.2	7.9		12.0		6.2	9.0	9.1	11.9
Width/Depth Ratio		8.2		3.3	10.4	16.6		5.2	9.6	5.8	7.1	7.9	9.3	12.3	14.4	13.1		13.6		12.0	16.8	15.5	15.7
Entrenchment Ratio[1]		1.5		1.2	>3.6	2		3.2	8.3	5.5	>10.2	1.7	4.3	>2.5		2.2	5.0	2.2	5.0	5.9	9.6	14.7	16.8
Bank Height Ratio[2]		2.3		1.0	2.0	1.0		1.0	1.1	1.0		1.0	1.0	--	--	1.0	1.0	1.0	1.0	1.0		1.0	
D50 (mm)		3.47		14.60		---		---		---		---		---		---		---		Silt/ Clay		0.11	
Profile																							
Riffle Length (ft)		---		---		---		---		---		---		---		---		---		13.9	73.2	23.7	81.3
Riffle Slope (ft/ft)		---		---		N/A		0.0040	0.0470	0.0130		0.0184	0.0343	0.0188	0.0704	0.0148	0.0453	0.0118	0.0363	0.0078	0.0317	0.0090	0.0304
Pool Length (ft)		---		---		---		---		---		---		---		---		---		17.2	42.8	17.6	76.6
Pool Max Depth (ft)	N/A	2.4		2.5		1.6		1.8		3.3		1.2	1.8	2.6		0.9	3.2	1.1	3.9	1.6	3.7	2.0	4.9
Pool Spacing (ft)		---		---		N/A		34	52	71		9	46	27	73	13	67	17	84	31	78	35	103
Pool Volume (ft^3)		---		---		---		---		---		---		---		---		---		---		---	
Pattern																							
Channel Beltwidth (ft)		12	20	48	157	N/A		28	50	38	41	10	50	102		16	74	20	93	20	68	34	72
Radius of Curvature (ft)		6	18	13	86	N/A		19	50	11	15	12	85	23	38	18	31	23	38	18	26	23	38
Rc:Bankfull Width (ft/ft)	N/A	0.8	2.3	1.6	10.9	N/A		2.0	5.3	1.3	1.4	1.9	9.1	2.0	3.1	1.8	3.0	1.8	3.0	1.8	2.5	1.9	2.8
Meander Length (ft)		27	45	176	260	N/A		--	--	--	--	53	178	--	--	31	151	38	192	70	120	97	160
Meander Width Ratio		1.5	2.5	6.1	19.9	N/A		3.0	5.3	3.4	3.6	1.6	5.4	8.3	8.9	1.6	7.3	1.6	7.3	2.0	6.5	2.9	5.3
Substrate, Bed and Transport Parameters																							
Ri%/Ru%/P%/G%/S%		---		---		---		---		---		---		---		---		---		---		---	
SC%/Sa%/G%/C%/B%/Be%		---		---		---		---		---		---		---		---		---		---		---	
d16/d35/d50/d84/d95/d100	N/A	0.33/1.88/3.47/ 45.0/117/256		0.18/3.2/14.6/ 128/234/>2048		---		---		---		---		---		---		---		SC/ SC/SC/ 41.3/79.2/128.0		SC/SC/0.11/ 45.0/104.7/180.0	
Reach Shear Stress (Competency) lb/ft^2		0.43		1.26		---		---		---		---		---		0.49		0.63		0.38		0.56	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m^2		---		---		---		---		---		---		---		---		---		---		---	
Additional Reach Parameters																							
Drainage Area (SM)		0.25		0.56		0.15		0.41		0.96		0.37		0.29		0.25		0.56		0.25		0.56	
Watershed Impervious Cover Estimate (%)		<1%		<1%		---		---		---		---		---		<1%		<1%		<1%		<1%	
Rosgen Classification		G4		E4, G4		B3		E4		E4		E4		C4/E4		C4		C4		C4		C4	
Bankfull Velocity (fps)		2.7		1.7	5.7	4.9		2.2	3.5	4.9	5.4	5.0	5.6	3.8		2.5-5		2.5-5		2.6	3.4	3.3	3.6
Bankfull Discharge (cfs)		14		129		37		20		97		35		40		25.0		46.0		17.0	30.9	30.3	42.9
Q-NFF regression		---		---				---		---		---		---		---		---		---		---	
Q-USGS extrapolation	N/A	---		---				---		---		---		---		---		---		---		---	
Q-Mannings		---		---				---		---		---		---		---		---		---		---	
Valley Length (ft)		---		---		---		---		---		---		---		907		1,232		---		---	
Channel Thalweg Length (ft)		1,132		1,417		---		---		---		---		---		1,114		1,488		1,137		1,535	
Sinuosity		1.14		1.24		1.04		1.40		2.32		1.00	1.30	1.40		1.20	1.30	1.20	1.30	1.20		1.22	
Water Surface Slope ($ft/ft)^2$		---		---		---		---		---		---		---		---		---		0.0111		0.0122	
Bankfull Slope (ft/ft)		0.0093	0.0190	0.0005	0.0130	0.0490		0.0120		0.0047		0.0190	0.0220	0.0150		0.0070	0.0150	0.0054	0.0172	0.0096		0.0104	

(---): Data was not provided
N/A: Not Applicable
[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.
[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 10b. Baseline Stream Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT1A

		PRE-RESTORATION CONDITION				REFERENCE REACH DATA								DESIGN				AS-BUILT/BASELINE			
Parameter	Gage	UT1A - Reach 1		UT1A - Reach 4		Onsite Reference Reach - UT1A - Reach 3		UT to Polecat Creek		Spencer Creek 1		Spencer Creek 2		UT To Cane Creek		UT1A - Reach 1		UT1A - Reach 4		UT1A - Reach 1		UT1A - Reach 4	
						Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																							
Bankfull Width (ft)	N/A	5.8		9.3		11.1		5.3	10.9	10.7	11.2	6.3	9.3	11.5	12.3	8.0		8.2		8.0		8.1	
Floodprone Width (ft)		15		>80		25		25	65	60	>114	14	125	31		18	40	18	41	50		200	
Bankfull Mean Depth		1.1		1.0		0.7		1.0	1.1	1.6	1.8	0.8	1.0	0.8	1.0	0.6		0.6		0.5		0.6	
Bankfull Max Depth		1.4		1.5		1.0		1.4	1.7	2.1	2.6	1	1.2	1.2	1.6	0.7	0.9	0.8	1.0	0.9		1.8	
Bankfull Cross Sectional Area (ft^2)		6.3		9.3		7.4		5.4	12.4	17.8	19.7	6.6	8.7	8.9	12.2	4.8		5.0		4.0		5.0	
Width/Depth Ratio		5.3		9.0		16.6		5.2	9.6	5.8	7.1	7.9	9.3	12.3	14.4	13.4		13.6		15.9		13.2	
Entrenchment Ratio[1]		2.6		>8.6		2		3.2	8.3	5.5	>10.2	1.7	4.3	>2.5		2.2	5.0	2.2	5.0	6.3		24.8	
Bank Height Ratio[2]		1.7		1.5		1.0		1.0	1.1	1.0		1.0	1.0	--	--	1.0	1.0	1.0	1.0	1.0		1.0	
D50 (mm)		4.31		5.06		---		---		---		---		---		---		---		1.41		0.25	
Profile																							
Riffle Length (ft)	N/A	---		---		---		---		---		---		---		---		---		15.5	42.0	20.5	51.9
Riffle Slope (ft/ft)		---		---		N/A		0.0040	0.0470	0.0130		0.0184	0.0343	0.0188	0.0704	0.0148	0.0453	0.0212	0.0652	0.0077	0.0505	0.0109	0.0449
Pool Length (ft)		---		---		---		---		---		---		---		---		---		5.4	52.2	9.1	35.5
Pool Max Depth (ft)		1.8		3.6		1.6		1.8		3.3		1.2	1.8	2.6		0.7	2.4	0.7	2.5	1.6	3.5	1.4	3.1
Pool Spacing (ft)		---		---		N/A		34	52	71		9	46	27	73	10	53	11	54	20	85	45	82
Pool Volume (ft^3)		---		---		---		---		---		---		---		---		---		---		---	
Pattern																							
Channel Beltwidth (ft)	N/A	30	35	N/A	N/A	N/A		28	50	38	41	10	50	102		13	58	13	60	24	60	35	55
Radius of Curvature (ft)		12	57	N/A	N/A	N/A		19	50	11	15	12	85	23	38	14	24	15	25	14	23	15	23
Rc:Bankfull Width (ft/ft)		1.5	7.2	N/A	N/A	N/A		2.0	5.3	1.3	1.4	1.9	9.1	2.0	3.1	1.8	3.0	1.8	3.0	1.8	2.9	1.9	2.8
Meander Length (ft)		89	104	N/A	N/A	N/A		--	--	--	--	53	178	--	--	24	120	25	123	70	112	96	117
Meander Width Ratio		3.8	4.4	N/A	N/A	N/A		3.0	5.3	3.4	3.6	1.6	5.4	8.3	8.9	1.6	7.3	1.6	7.3	3.0	7.5	4.3	6.8
Substrate, Bed and Transport Parameters																							
Ri%/Ru%/P%/G%/S%	N/A	---		---		---		---		---		---		---		---		---		---		---	
SC%/Sa%/G%/C%/B%/Be%		---		---		---		---		---		---		---		---		---		---		---	
d16/d35/d50/d84/d95/d100		0.15/2.18/4.31/ 16/139/256		0.45/2.71/5.06/ 67.7/122/362		---		---		---		---		---		---		---		SC/SC/1.41/ 33.4/64.0/128.0		SC/SC/0.25/ 26.2/75.9/180.0	
Reach Shear Stress (Competency) lb/ft^2		0.50		1.76		---		---		---		---		---		0.48		0.54		0.38		0.49	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m^2		---		---		---		---		---		---		---		---		---		---		---	
Additional Reach Parameters																							
Drainage Area (SM)	N/A	0.12		0.16		0.15		0.41		0.96		0.37		0.29		0.12		0.16		0.12		0.16	
Watershed Impervious Cover Estimate (%)		<1%		<1%		---		---		---		---		---		<1%		<1%		<1%		<1%	
Rosgen Classification		E4		E4		B3		E4		E4		E4		C4/E4		C4		C4		C4		C4	
Bankfull Velocity (fps)		3.3		5.2		4.9		2.2	3.5	4.9	5.4	5.0	5.6	3.8		2.5-5		2.5-5		2.6		3.0	
Bankfull Discharge (cfs)		21		50		37		20		97		35		40		14.0		17.0		15.9		15.0	
Q-NFF regression		---		---				---		---		---		---		---		---		---		---	
Q-USGS extrapolation		---		---				---		---		---		---		---		---		---		---	
Q-Mannings		---		---				---		---		---		---		---		---		---		---	
Valley Length (ft)		---		---		---		---		---		---		---		673		530		---		---	
Channel Thalweg Length (ft)		770		461		---		---		---		---		---		849		650		857		666	
Sinuosity		1.12		1.03		1.04		1.40		2.32		1.00	1.30	1.40		1.20	1.30	1.20	1.30	1.21		1.25	
Water Surface Slope ($ft/ft)^2$		---		---		---		---		---		---		---		---		---		0.0126		N/A	
Bankfull Slope (ft/ft)		0.0095		0.0150		0.0490		0.0120		0.0047		0.0190	0.0220	0.0150		0.0103	0.0175	0.0141	0.0153	0.0137		0.0129	

(---): Data was not provided
N/A: Not Applicable
[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.
[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 10c. Baseline Stream Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT1B

		PRE-RESTORATION		REFERENCE REACH DATA										DESIGN		AS-BUILT/ BASELINE	
Parameter	**Gage**	**UT1B**		**Onsite Reference Reach - UT1A - Reach 3**		**UT to Polecat Creek**		**Spencer Creek 1**		**Spencer Creek 2**		**UT To Cane Creek**		**UT1B**		**UT1B**	
				Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																	
Bankfull Width (ft)	N/A	4.9		11.1		5.3	10.9	10.7	11.2	6.3	9.3	11.5	12.3	7.3		7.7	
Floodprone Width (ft)	N/A	36		25		25	65	60	>114	14	125	31		16	37	70	
Bankfull Mean Depth	N/A	1.1		0.7		1.0	1.1	1.6	1.8	0.8	1.0	0.8	1.0	0.6		0.5	
Bankfull Max Depth	N/A	1.9		1.0		1.4	1.7	2.1	2.6	1.0	1.2	1.2	1.6	0.7	0.9	0.7	
Bankfull Cross Sectional Area (ft^2)	N/A	5.4		7.4		5.4	12.4	17.8	19.7	6.6	8.7	8.9	12.2	5.2		3.5	
Width/Depth Ratio	N/A	4.4		16.6		5.2	9.6	5.8	7.1	7.9	9.3	12.3	14.4	12.6		17.0	
Entrenchment Ratio[1]	N/A	7.5		2.3		3.2	8.3	5.5	>10.2	1.7	4.3	>2.5		2.2	5.0	9.1	
Bank Height Ratio[2]	N/A	1.6		1.0		1.0	1.1	1.0		1.0	1.0	--	--	1.0	1.0	1.0	
D50 (mm)	N/A	---		---		---		---		---		---		---		Silt/Clay	
Profile																	
Riffle Length (ft)	N/A	---		---		---		---		---		---		---		12.1	24.4
Riffle Slope (ft/ft)	N/A	---		N/A		0.0040	0.0470	0.0130		0.0184	0.0343	0.0188	0.0704	0.0222	0.0680	0.0219	0.0425
Pool Length (ft)	N/A	---		---		---		---		---		---		---		11.9	30.9
Pool Max Depth (ft)	N/A	2.5		1.6		1.8		3.3		1.2	1.8	2.6		0.7	2.4	1.7	2.5
Pool Spacing (ft)	N/A	---		N/A		34	52	71		9	46	27	73	9	48	30	45
Pool Volume (ft^3)	N/A	---		---		---		---		---		---		---		---	
Pattern																	
Channel Beltwidth (ft)	N/A	N/A	N/A	N/A		28	50	38	41	10	50	102		12	53	25	40
Radius of Curvature (ft)	N/A	N/A	N/A	N/A		19	50	11	15	12	85	23	38	13	22	14	20
Rc:Bankfull Width (ft/ft)	N/A	N/A	N/A	N/A		2.0	5.3	1.3	1.4	1.9	9.1	2.0	3.1	1.8	3.0	1.8	2.6
Meander Length (ft)	N/A	N/A	N/A	N/A		--	--	--	--	53	178	--	--	22	110	60	72
Meander Width Ratio	N/A	N/A	N/A	N/A		3.0	5.3	3.4	3.6	1.6	5.4	8.3	8.9	1.6	7.3	3.2	5.2
Substrate, Bed and Transport Parameters																	
Ri%/Ru%/P%/G%/S%	N/A	---		---		---		---		---		---		---		---	
SC%/Sa%/G%/C%/B%/Be%	N/A	---		---		---		---		---		---		---		---	
d16/d35/d50/d84/d95/d100	N/A	---		---		---		---		---		---		---		SC/SC/SC/ 19.5/40.2/90.0	
Reach Shear Stress (Competency) lb/ft^2	N/A	---		---		---		---		---		---		---		0.21	
Max part size (mm) mobilized at bankfull	N/A	---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m^2	N/A	---		---		---		---		---		---		---		---	
Additional Reach Parameters																	
Drainage Area (SM)	N/A	0.10		0.15		0.41		0.96		0.37		0.29		0.10		0.10	
Watershed Impervious Cover Estimate (%)	N/A	<1%		---		---		---		---		---		<1%		<1%	
Rosgen Classification	N/A	E4		B3		E4		E4		E4		C4/E4		C4		C4	
Bankfull Velocity (fps)	N/A	4.6		4.9		2.2	3.5	4.9	5.4	5.0	5.6	3.8		1.5-4		1.9	
Bankfull Discharge (cfs)	N/A	25		37		20		97		35		40		11		6.6	
Q-NFF regression	N/A	---				---		---		---		---		---		---	
Q-USGS extrapolation	N/A	---				---		---		---		---		---		---	
Q-Mannings	N/A	---				---		---		---		---		---		---	
Valley Length (ft)	N/A	---		---		---		---		---		---		199		---	
Channel Thalweg Length (ft)	N/A	243		---		---		---		---		---		219		232	
Sinuosity	N/A	1.06		1.04		1.40		2.32		1.00	1.30	1.40		1.20	1.30	1.34	
Water Surface Slope (ft/ft^2)	N/A	---		---		---		---		---		---		---		0.0095	
Bankfull Slope (ft/ft)	N/A	0.0200		0.0490		0.0120		0.0047		0.0190	0.0220	0.0150		0.0100	0.0200	0.0181	

(---): Data was not provided
N/A: Not Applicable
[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.
[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Table 10d. Baseline Stream Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT2

		PRE-RESTORATION		REFERENCE REACH DATA										DESIGN		AS-BUILT/ BASELINE	
Parameter	Gage	UT2		Onsite Reference Reach - UT1A - Reach 3		UT to Polecat Creek		Spencer Creek 1		Spencer Creek 2		UT To Cane Creek		UT2		UT2	
				Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle																	
Bankfull Width (ft)	N/A	6.2	9.6	11.1		5.3	10.9	10.7	11.2	6.3	9.3	11.5	12.3	6.6		6.7	
Floodprone Width (ft)		>20		25		25	65	60	>114	14	125	31		15	33	50	
Bankfull Mean Depth		0.6	1.1	0.7		1.0	1.1	1.6	1.8	0.8	1.0	0.8	1.0	0.5		0.5	
Bankfull Max Depth		1.0	2.0	1.0		1.4	1.7	2.1	2.6	1.0	1.2	1.2	1.6	0.6	0.8	0.7	
Bankfull Cross Sectional Area (ft^2)		5.2	7.0	7.4		5.4	12.4	17.8	19.7	6.6	8.7	8.9	12.2	3.4		3.4	
Width/Depth Ratio		5.5	15.5	16.6		5.2	9.6	5.8	7.1	7.9	9.3	12.3	14.4	12.8		12.9	
Entrenchment Ratio[1]		>2.4		2.3		3.2	8.3	5.5	>10.2	1.7	4.3	>2.5		2.2	5.0	7.5	
Bank Height Ratio[2]		1.0	2.1	1.0		1.0	1.1	1.0		1.0	1.0	--	--	1.0	1.0	1.0	
D50 (mm)		2.11		---		---		---		---		---		---		Silt/Clay	
Profile																	
Riffle Length (ft)	N/A	---		---		---		---		---		---		---		13.9	51.7
Riffle Slope (ft/ft)		---		N/A		0.0040	0.0470	0.0130		0.0184	0.0343	0.0188	0.0704	0.0179	0.0549	0.0146	0.0525
Pool Length (ft)		---		---		---		---		---		---		---		10.0	28.4
Pool Max Depth (ft)		1.4		1.6		1.8		3.3		1.2	1.8	2.6		0.6	2.1	1.0	2.4
Pool Spacing (ft)		---		N/A		34	52	71		9	46	27	73	9	44	25	66
Pool Volume (ft^3)		---		---		---		---		---		---		---		---	
Pattern																	
Channel Beltwidth (ft)	N/A	32	54	N/A		28	50	38	41	10	50	102		11	48	19	50
Radius of Curvature (ft)		12	43	N/A		19	50	11	15	12	85	23	38	12	20	12	20
Rc:Bankfull Width (ft/ft)		1.5	5.4	N/A		2.0	5.3	1.3	1.4	1.9	9.1	2.0	3.1	1.8	3.0	1.8	3.0
Meander Length (ft)		102	103	N/A		--	--	--	--	53	178	--	--	20	99	58	98
Meander Width Ratio		4.1	6.8	N/A		3.0	5.3	3.4	3.6	1.6	5.4	8.3	8.9	1.6	7.3	2.8	7.5
Substrate, Bed and Transport Parameters																	
Ri%/Ru%/P%/G%/S%	N/A	---		---		---		---		---		---		---		---	
SC%/Sa%/G%/C%/B%/Be%		---		---		---		---		---		---		---		---	
d16/d35/d50/d84/d95/d100		0.2/0.68/2.11/ 20.7/98.3/256		---		---		---		---		---		---		SC/SC/SC/ 30.2/64.0/128.0	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		---		---		---		0.64	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		---		---		---	
Stream Power (Capacity) W/m^2		---		---		---		---		---		---		---		---	
Additional Reach Parameters																	
Drainage Area (SM)	N/A	0.09		0.15		0.41		0.96		0.37		0.29		0.09		0.09	
Watershed Impervious Cover Estimate (%)		<1%		---		---		---		---		---		<1%		<1%	
Rosgen Classification		E4		B3		E4		E4		E4		C4/E4		C4		C4	
Bankfull Velocity (fps)		3.0	5.1	4.9		2.2	3.5	4.9	5.4	5.0	5.6	3.8		2.5-5		3.4	
Bankfull Discharge (cfs)		23		37		20		97		35		40		11.0		11.5	
Q-NFF regression		---				---		---		---		---		---		---	
Q-USGS extrapolation		---				---		---		---		---		---		---	
Q-Mannings		---				---		---		---		---		---		---	
Valley Length (ft)		---		---		---		---		---		---		905		---	
Channel Thalweg Length (ft)		1,028		---		---		---		---		---		1,023		1,032	
Sinuosity		1.06		1.04		1.40		2.32		1.00	1.30	1.40		1.20	1.30	1.16	
Water Surface Slope (ft/ft^2)		---		---		---		---		---		---		---		0.0207	
Bankfull Slope (ft/ft)		0.0130	0.0220	0.0490		0.0120		0.0047		0.0190	0.0220	0.0150		0.0121	0.0231	0.0195	

(---): Data was not provided
N/A: Not Applicable
[1]Entrenchment Ratio is the flood prone width divided by the bankfull width.
[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

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

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

	UT1 Reach 2																							
	Cross Section 1 (Riffle)						Cross Section 2 (Pool)						Cross Section 3 (Riffle)						Cross Section 4 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**
Bankfull Elevation *(ft)*	651.7	651.7	651.7	651.7	651.8		651.0	651.0	651.0	651.0	651.2		644.0	644.0	644.0	644.0	644.0		643.6	643.6	643.6	643.6	643.6	
Low Bank Elevation (ft)	651.7	651.7	651.7	651.7	651.8		651.0	651.0	651.0	651.0	651.2		644.0	644.0	644.0	644.0	644.0		643.6	643.6	643.6	643.6	643.6	
Bankfull Width (ft)	10.4	9.9	10.5	10.9	12.0		9.6	9.3	9.3	8.9	10.0		10.6	10.2	9.7	9.2	9.7		13.5	13.7	12.9	13.3	12.8	
Floodprone Width (ft)	100	100	100	100	100		N/A	N/A	N/A	N/A	N/A		60	60	60	60	60		N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.9	0.8	0.7	0.7	0.7		1.2	1.1	1.2	1.2	1.2		0.6	0.6	0.5	0.5	0.6		1.1	1.0	1.0	1.0	1.0	
Bankfull Max Depth (ft)	1.4	1.4	1.4	1.4	1.5		2.1	1.9	2.0	1.9	2.2		1.1	1.1	1.1	1.0	1.1		1.9	1.8	1.9	1.9	2.0	
Bankfull Cross Sectional Area (ft^2)	9.0	8.0	7.8	7.9	8.7		11.6	10.4	11.2	10.3	11.9		6.2	6.2	5.3	4.9	6.2		14.7	14.2	13.3	13.6	12.4	
Bankfull Width/Depth Ratio	12.0	12.2	14.2	15.1	16.5		7.9	8.3	7.7	7.6	8.3		18.2	16.7	17.7	17.5	15.1		12.4	13.2	12.5	13.1	13.2	
Entrenchment Ratio[1]	9.6	10.1	9.5	9.2	8.4		N/A	N/A	N/A	N/A	N/A		5.6	5.9	6.2	6.5	6.2		N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	<1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0	
d50 (mm)	18.0	64.0	10.4	27.2	56.1		N/A	N/A	N/A	N/A	N/A		13.3	46.6	22.6	23.0	22.6		N/A	N/A	N/A	N/A	N/A	

	UT1 Reach 5																							
	Cross Section 5 (Pool)						Cross Section 6 (Riffle)						Cross Section 7 (Riffle)						Cross Section 8 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**
Bankfull Elevation *(ft)*	610.4	610.4	610.4	610.4	610.3		610.0	610.0	610.0	610.0	610.0		600.9	600.9	600.9	600.9	600.8		600.6	600.6	600.6	600.6	600.5	
Low Bank Elevation (ft)	610.4	610.4	610.4	610.4	610.3		610.0	610.0	610.0	610.0	610.0		600.9	600.9	600.9	600.9	600.8		600.6	600.6	600.6	600.6	600.5	
Bankfull Width (ft)	15.9	16.5	16.7	17.1	14.4		15.3	15.2	16.0	15.1	15.3		11.9	11.9	11.8	12.0	10.9		15.2	15.7	16.1	16.1	14.3	
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A		200	200	200	200	200		200	200	200	200	200		N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	1.2	1.1	1.2	1.1	1.2		0.8	0.8	0.8	0.8	1.0		0.8	0.8	0.8	0.7	0.8		1.4	1.4	1.3	1.3	1.4	
Bankfull Max Depth (ft)	2.4	2.2	2.4	2.4	2.3		1.6	1.7	1.8	1.8	2.0		1.3	1.5	1.4	1.3	1.5		2.7	2.8	2.8	2.7	3.2	
Bankfull Cross Sectional Area (ft^2)	18.5	18.1	19.3	19.4	17.0		12.0	12.6	12.5	12.5	14.7		9.1	10.1	9.3	8.8	8.4		21.3	21.8	21.1	20.4	19.4	
Bankfull Width/Depth Ratio	13.6	15.1	14.4	15.1	12.2		19.5	18.4	20.5	18.2	15.9		15.7	14.0	14.9	16.3	14.1		10.9	11.3	12.3	12.7	10.5	
Entrenchment Ratio[1]	N/A	N/A	N/A	N/A	N/A		13.1	13.1	12.5	13.3	13.1		16.8	16.8	17.0	16.7	18.4		N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.1		1.0	1.0	1.0	1.0	<1.0		1.0	1.0	1.0	1.0	1.0	
d50 (mm)	N/A	N/A	N/A	N/A	N/A		15.4	30.8	57.9	29.6	33.5		16.0	52.1	70.5	40.2	31.0		N/A	N/A	N/A	N/A	N/A	

	UT1A Reach 1												UT1A Reach 4											
	Cross Section 9 (Riffle)						Cross Section 10 (Pool)						Cross Section 11 (Riffle)						Cross Section 12 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**
Bankfull Elevation *(ft)*	656.4	656.4	656.4	656.4	656.5		656.0	656.0	656.0	656.0	656.2		615.8	615.8	615.8	615.8	615.7		615.1	615.1	615.1	615.1	615.1	
Low Bank Elevation (ft)	656.4	656.4	656.4	656.4	656.5		656.0	656.0	656.0	656.0	656.2		615.8	615.8	615.8	615.8	615.7		615.1	615.1	615.1	615.1	615.1	
Bankfull Width (ft)	8.0	7.3	7.2	6.7	6.6		10.5	10.0	10.2	9.4	10.7		8.1	8.2	8.2	8.9	8.5		10.6	10.5	10.5	10.8	12.0	
Floodprone Width (ft)	50	50	50	50	50		N/A	N/A	N/A	N/A	N/A		200	200	200	200	200		N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.5	0.5	0.5	0.5	0.6		0.7	0.7	0.7	0.7	0.7		0.6	0.8	0.8	0.8	0.8		1.2	1.2	1.2	1.1	1.1	
Bankfull Max Depth (ft)	0.9	0.9	0.8	0.8	1.2		1.5	1.2	1.3	1.3	1.7		1.8	1.9	1.9	1.8	1.7		2.7	2.6	2.6	2.5	2.8	
Bankfull Cross Sectional Area (ft^2)	4.0	3.9	3.8	3.3	4.0		7.8	7.0	6.7	6.5	8.0		5.0	6.6	6.5	6.7	6.9		12.3	13.2	13.1	12.4	13.0	
Bankfull Width/Depth Ratio	15.9	13.7	13.8	13.4	10.9		14.1	14.4	15.5	13.5	14.4		13.2	10.1	10.4	11.7	10.4		9.1	8.4	8.4	9.4	1.0	
Entrenchment Ratio[1]	6.3	6.8	6.9	7.5	7.8		N/A	N/A	N/A	N/A	N/A		24.8	24.4	24.4	22.6	23.5		N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.2		1.0	1.0	1.0	1.0	1.0	
d50 (mm)	18.0	17.8	25.2	38.8	20.9		N/A	N/A	N/A	N/A	N/A		18.3	42.1	28.5	22.6	24.7		N/A	N/A	N/A	N/A	N/A	

	UT1B												UT2											
	Cross Section 13 (Riffle)						Cross Section 14 (Pool)						Cross Section 15 (Riffle)						Cross Section 16 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**	**Base**	**MY1**	**MY2**	**MY3**	**MY5**	**MY7**
Bankfull Elevation *(ft)*	647.1	647.1	647.1	647.1	647.1		646.9	646.9	646.9	646.9	646.9		602.9	602.9	602.9	602.9	603.0		602.4	602.4	602.4	602.4	602.4	
Low Bank Elevation (ft)	647.1	647.1	647.1	647.1	647.1		646.9	646.9	646.9	646.9	646.9		602.9	602.9	602.9	602.9	603.0		602.4	602.4	602.4	602.4	602.4	
Bankfull Width (ft)	7.7	7.8	7.7	7.4	8.7		9.7	10.1	9.8	10.0	9.8		7.1	7.0	6.8	6.6	6.8		9.5	9.5	9.9	9.9	9.0	
Floodprone Width (ft)	70	70	70	70	70		N/A	N/A	N/A	N/A	N/A		50	50	50	50	50		N/A	N/A	N/A	N/A	N/A	
Bankfull Mean Depth (ft)	0.5	0.5	0.4	0.4	0.5		0.8	0.7	0.7	0.7	0.7		0.5	0.5	0.5	0.5	0.6		0.6	0.6	0.6	0.6	0.6	
Bankfull Max Depth (ft)	0.7	0.9	0.8	0.8	0.9		1.4	1.3	1.4	1.3	1.4		0.7	0.9	0.9	0.8	1.1		1.3	1.3	1.3	1.3	1.4	
Bankfull Cross Sectional Area (ft^2)	3.5	3.6	3.2	2.7	4.0		7.8	7.2	7.2	6.6	7.1		3.4	3.8	3.5	3.3	3.9		5.8	5.5	5.8	5.7	5.2	
Bankfull Width/Depth Ratio	17.0	16.9	18.3	20.6	19.2		12.1	14.2	13.5	15.0	13.7		14.7	12.9	13.5	13.5	12.1		15.5	16.3	16.8	17.0	15.3	
Entrenchment Ratio[1]	9.1	9.0	9.1	9.4	8.0		N/A	N/A	N/A	N/A	N/A		7.0	7.2	7.3	7.5	7.3		N/A	N/A	N/A	N/A	N/A	
Bankfull Bank Height Ratio[2]	1.0	1.0	1.0	1.0	1.1		1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.1		1.0	1.0	1.0	1.0	1.0	
d50 (mm)	21.3	43.9	26.9	23.2	72.7		N/A	N/A	N/A	N/A	N/A		19.7	25.0	23.5	29.3	29.6		N/A	N/A	N/A	N/A	N/A	

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

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

Table 12a. Monitoring Data - Stream Reach Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT1 Reach 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY5		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	10.2	10.4	9.9	10.2	9.7	10.5	9.2	10.9	9.7	12.0		
Floodprone Width (ft)	60	100	60	100	60	100	60	100	60	100		
Bankfull Mean Depth	0.6	0.9	0.6	0.8	0.5	0.7	0.5	0.7	0.6	0.7		
Bankfull Max Depth	1.1	1.4	1.1	1.4	1.1	1.4	1.0	1.4	1.1	1.5		
Bankfull Cross Sectional Area (ft^2)	6.2	9.0	6.2	8.0	5.3	7.8	4.9	7.9	6.2	8.7		
Width/Depth Ratio	12.0	16.8	12.2	16.7	14.2	17.7	15.1	17.5	15.1	16.5		
Entrenchment Ratio[1]	5.9	9.6	5.9	10.1	6.2	9.5	6.5	9.2	6.2	8.4		
Bank Height Ratio [2]	1.0		1.0		1.0		1.0		<1.0	1.0		
D50 (mm)	13.3	18.0	46.6	64.0	10.4	22.6	23.0	27.2	22.6	56.1		
Profile												
Riffle Length (ft)	13.9	73.2										
Riffle Slope (ft/ft)	0.0078	0.0317										
Pool Length (ft)	17.2	42.8										
Pool Max Depth (ft)	1.6	3.7										
Pool Spacing (ft)	31	78										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	20	68										
Radius of Curvature (ft)	18	26										
Rc:Bankfull Width (ft/ft)	1.8	2.5										
Meander Wave Length (ft)	70	120										
Meander Width Ratio	2.0	6.5										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	1,137											
Sinuosity (ft)	1.2											
Water Surface Slope (ft/ft)	0.0111											
Bankfull Slope (ft/ft)	0.0096											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/SC/41.3/79.2/128.0		SC/0.28/9.9/93.6/145.5/180.0		0.56\2.57\4.8\64.0\117.2\512.0		0.52\2.43\4.6\34.3\102.1\180.0		SC/1.12/14.1/98.3/180.0/1024.0			
% of Reach with Eroding Banks	0%		0%		0%		0%		0%			

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

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

Table 12b. Monitoring Data - Stream Reach Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT1 Reach 5

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY5		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	11.9	13.6	11.9	15.2	11.8	16.0	12.0	15.1	10.9	15.3		
Floodprone Width (ft)	200		200		200		200		200			
Bankfull Mean Depth	0.8	0.9	0.8	0.8	0.8	0.8	0.7	0.8	0.8	1.0		
Bankfull Max Depth	1.3	1.6	1.5	1.7	1.4	1.8	1.3	1.8	1.5	2.0		
Bankfull Cross Sectional Area (ft^2)	9.1	11.9	10.1	12.6	9.3	12.5	8.8	12.5	8.4	14.7		
Width/Depth Ratio	15.5	15.7	14.0	18.4	14.9	20.5	16.3	18.2	14.1	15.9		
Entrenchment Ratio[1]	14.7	16.8	13.1	16.8	12.5	17.0	13.3	16.7	13.1	18.4		
Bank Height Ratio [2]	1.0		1.0		1.0		1.0		<1.0	1.1		
D50 (mm)	15.4	16.0	30.8	52.1	57.9	70.5	29.6	40.2	31.0	33.5		
Profile												
Riffle Length (ft)	23.7	81.3										
Riffle Slope (ft/ft)	0.0090	0.0304										
Pool Length (ft)	17.6	76.6										
Pool Max Depth (ft)	2.0	4.9										
Pool Spacing (ft)	35	103										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	34	72										
Radius of Curvature (ft)	23	38										
Rc:Bankfull Width (ft/ft)	1.9	2.8										
Meander Wave Length (ft)	97	160										
Meander Width Ratio	2.9	5.3										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	1,535											
Sinuosity (ft)	1.2											
Water Surface Slope (ft/ft)	0.0122											
Bankfull Slope (ft/ft)	0.0104											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/0.11/45.0/104.7/180.0		SC\4.47\20.1\74.9\128.0\362.0		0.18\4.00\20.7\75.9\139.4\512.0		SC\0.50\17.1\70.2\104.7\180.0		SC/0.88/14.8/97.3/168.1/362.0			
% of Reach with Eroding Banks	0%		0%		0%		0%		0%			

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

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

Table 12c. Monitoring Data - Stream Reach Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT1A Reach 1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY5		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	8.0		7.3		7.2		6.7		6.6			
Floodprone Width (ft)	50		50		50		50		50			
Bankfull Mean Depth	0.5		0.5		0.5		0.5		0.6			
Bankfull Max Depth	0.9		0.9		0.8		0.8		1.2			
Bankfull Cross Sectional Area (ft^2)	4.0		3.9		3.8		3.3		4.0			
Width/Depth Ratio	15.9		13.7		13.8		13.4		10.9			
Entrenchment Ratio[1]	6.3		6.8		6.9		7.5		7.8			
Bank Height Ratio [2]	1.0		1.0		1.0		1.0		1.0			
D50 (mm)	18.0		17.8		25.2		38.8		20.9			
Profile												
Riffle Length (ft)	15.5	41.97										
Riffle Slope (ft/ft)	0.0077	0.0505										
Pool Length (ft)	5.4	52.2										
Pool Max Depth (ft)	1.6	3.5										
Pool Spacing (ft)	20	85										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	24	60										
Radius of Curvature (ft)	14	23										
Rc:Bankfull Width (ft/ft)	1.8	2.9										
Meander Wave Length (ft)	70	112										
Meander Width Ratio	3.0	7.5										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	857											
Sinuosity (ft)	1.2											
Water Surface Slope (ft/ft)	0.0126											
Bankfull Slope (ft/ft)	0.0137											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/1.41/33.4/64.0/128.0		0.16\2.24\11.0\42.0\73.4\180.0		0.50\6.01\15.2\52.1\75.9\512.0		SC\0.95\17.3\56.3\83.4\180.0		SC/SC/2.4/39.3/85.0/256.0			
% of Reach with Eroding Banks	0%		0%		0%		0%		0%			

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

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

Table 12d. Monitoring Data - Stream Reach Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT1A Reach 4

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY5		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	8.1		8.2		8.2		8.9		8.5			
Floodprone Width (ft)	200		200		200		200		200			
Bankfull Mean Depth	0.6		0.8		0.8		0.8		0.8			
Bankfull Max Depth	1.8		1.9		1.9		1.8		1.7			
Bankfull Cross Sectional Area (ft^2)	5.0		6.6		6.5		6.7		6.9			
Width/Depth Ratio	13.2		10.1		10.4		11.7		10.4			
Entrenchment Ratio[1]	24.8		24.4		24.4		22.6		23.5			
Bank Height Ratio [2]	1.0		1.0		1.0		1.0		1.0			
D50 (mm)	18.3		42.1		28.5		22.6		24.7			
Profile												
Riffle Length (ft)	20.5	51.9										
Riffle Slope (ft/ft)	0.0109	0.0449										
Pool Length (ft)	9.1	35.5										
Pool Max Depth (ft)	1.4	3.1										
Pool Spacing (ft)	45	82										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	35	55										
Radius of Curvature (ft)	15	23										
Rc:Bankfull Width (ft/ft)	1.9	2.8										
Meander Wave Length (ft)	96	117										
Meander Width Ratio	4.3	6.8										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	666											
Sinuosity (ft)	1.2											
Water Surface Slope (ft/ft)	N/A											
Bankfull Slope (ft/ft)	0.0129											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/0.25/26.2/75.9/180.0		SC\4.00\23.4\77.8\119.3\180.0		0.50\7.10\27.6\93.2\143.4\256.0		0.14\0.63\11.4\53.2\106.9\180.0		0.30/1.05/9.89/80.3/151.8/512.0			
% of Reach with Eroding Banks	0%		0%		0%		0%		0%			

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

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

Table 12e. Monitoring Data - Stream Reach Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT1B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY5		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	7.7		7.8		7.7		7.4		8.7			
Floodprone Width (ft)	70		70		70		70		70			
Bankfull Mean Depth	0.5		0.5		0.4		0.4		0.5			
Bankfull Max Depth	0.7		0.9		0.8		0.8		0.9			
Bankfull Cross Sectional Area (ft^2)	3.5		3.6		3.2		2.7		4.0			
Width/Depth Ratio	17.0		16.9		18.3		20.6		19.2			
Entrenchment Ratio[1]	9.1		9.0		9.1		9.4		8.0			
Bank Height Ratio [2]	1.0		1.0		1.0		1.0		1.1			
D50 (mm)	21.3		43.9		26.9		23.2		72.7			
Profile												
Riffle Length (ft)	12.1	24.4										
Riffle Slope (ft/ft)	0.0219	0.0425										
Pool Length (ft)	11.9	30.9										
Pool Max Depth (ft)	1.7	2.5										
Pool Spacing (ft)	30	45										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	25	40										
Radius of Curvature (ft)	14	20										
Rc:Bankfull Width (ft/ft)	1.8	2.6										
Meander Wave Length (ft)	60	72										
Meander Width Ratio	3.2	5.2										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	232											
Sinuosity (ft)	1.3											
Water Surface Slope (ft/ft)	0.0095											
Bankfull Slope (ft/ft)	0.0181											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/SC/19.5/40.2/90.0		SC\0.71\5.6\64.0\107.3\180.0		SC\0.40\3.3\40.2\95.4\128.0		SC\0.62\2.5\62.2\144.6\180.0		SC/2.00/14.8/102.7/139.4/256.0			
% of Reach with Eroding Banks	0%		0%		0%		0%		0%			

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

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

Table 12f. Monitoring Data - Stream Reach Data Summary
Agony Acres Mitigation Site (DMS Project No. 95716)
Monitoring Year 5 - 2019

UT2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY5		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle												
Bankfull Width (ft)	7.1		7.0		6.8		6.6		6.8			
Floodprone Width (ft)	50		50		50		50		50			
Bankfull Mean Depth	0.5		0.5		0.5		0.5		0.6			
Bankfull Max Depth	0.7		0.9		0.9		0.8		1.1			
Bankfull Cross Sectional Area (ft^2)	3.4		3.8		3.5		3.3		3.9			
Width/Depth Ratio	14.7		12.9		13.5		13.5		12.1			
Entrenchment Ratio[1]	7.0		7.2		7.3		7.5		7.3			
Bank Height Ratio [2]	1.0		1.0		1.0		1.0		1.0			
D50 (mm)	19.7		25.0		23.5		29.3		29.6			
Profile												
Riffle Length (ft)	13.9	51.7										
Riffle Slope (ft/ft)	0.0146	0.0525										
Pool Length (ft)	10.0	28.4										
Pool Max Depth (ft)	1.0	2.4										
Pool Spacing (ft)	25	66										
Pool Volume (ft^3)												
Pattern												
Channel Beltwidth (ft)	19	50										
Radius of Curvature (ft)	12	20										
Rc:Bankfull Width (ft/ft)	1.8	3.0										
Meander Wave Length (ft)	58	98										
Meander Width Ratio	2.8	7.5										
Additional Reach Parameters												
Rosgen Classification	C4											
Channel Thalweg Length (ft)	1,032											
Sinuosity (ft)	1.2											
Water Surface Slope (ft/ft)	0.0207											
Bankfull Slope (ft/ft)	0.0195											
Ri%/Ru%/P%/G%/S%												
SC%/Sa%/G%/C%/B%/Be%												
d16/d35/d50/d84/d95/d100	SC/SC/SC/30.2/64.0/128.0		SC\2.80\10.7\35.9\75.9\180.0		SC\3.23\12.9\43.6\80.3\180.0		SC\SC\1.3\26.9\64.0\180.0		SC/0.5/8.0/57.6/95.4/128.0			
% of Reach with Eroding Banks	0%		0%		0%		0%		0%			

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

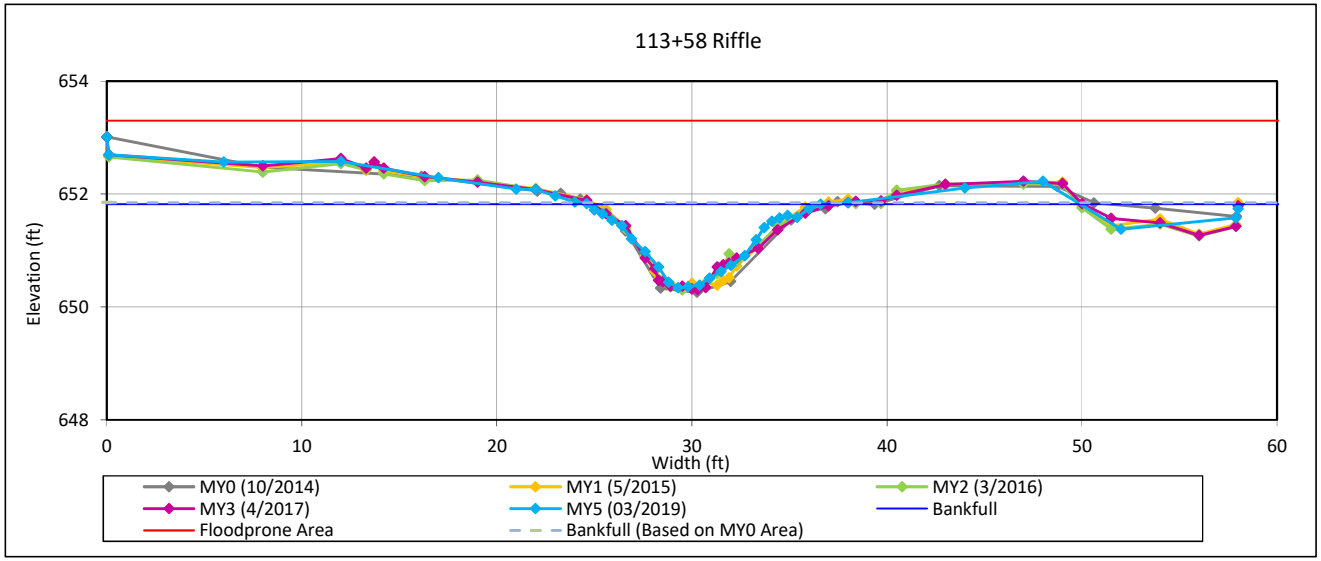
[2]Bank Height Ratio is the bank height divided by the max depth of the bankfull channel.

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 1-UT1 Reach 2



Bankfull Dimensions	
8.7	x-section area (ft.sq.)
12.0	width (ft)
0.7	mean depth (ft)
1.5	max depth (ft)
12.4	wetted parimeter (ft)
0.7	hyd radi (ft)
16.5	width-depth ratio
100.0	W flood prone area (ft)
8.4	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 03/2019

Field Crew: Wildlands Engineering

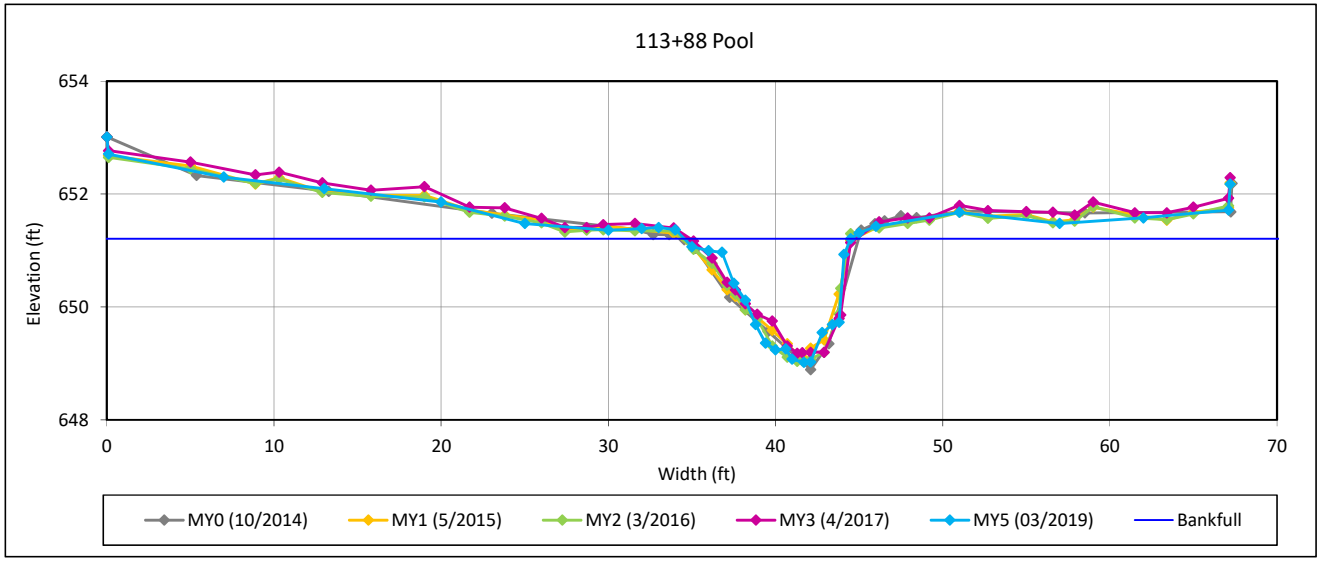
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 2-UT1 Reach 2



Bankfull Dimensions	
11.9	x-section area (ft.sq.)
10.0	width (ft)
1.2	mean depth (ft)
2.2	max depth (ft)
11.7	wetted parimeter (ft)
1.0	hyd radi (ft)
8.3	width-depth ratio

Survey Date: 03/2019
Field Crew: Wildlands Engineering

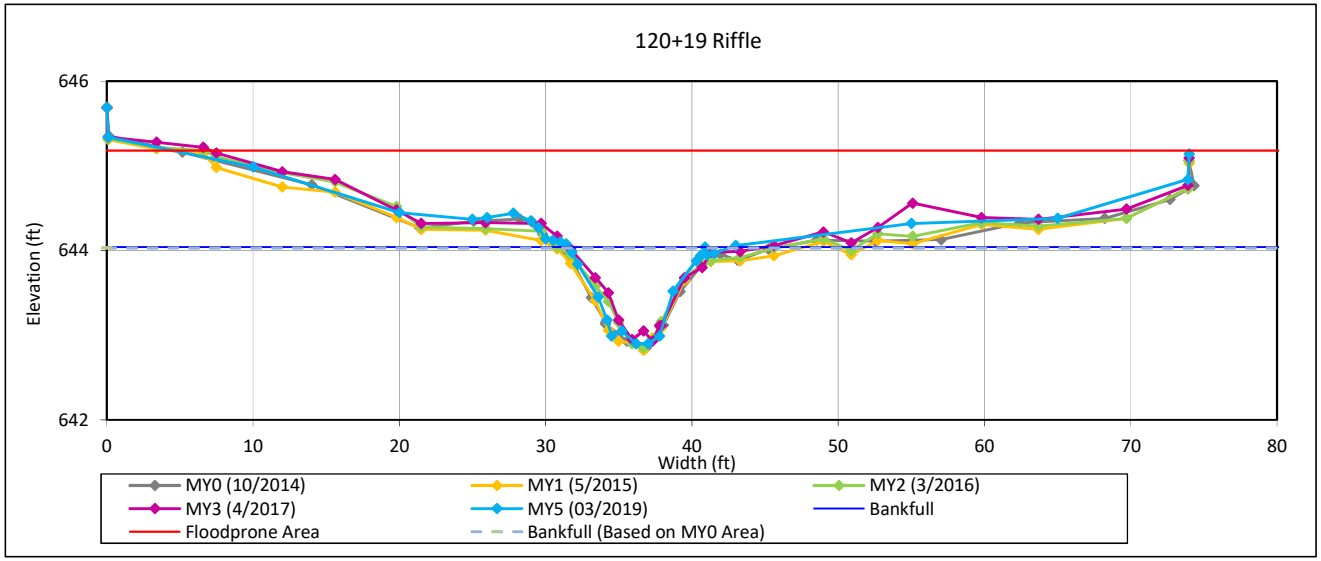
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 3-UT1 Reach 2



Bankfull Dimensions	
6.2	x-section area (ft.sq.)
9.7	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
10.2	wetted parimeter (ft)
0.6	hyd radi (ft)
15.1	width-depth ratio
60.0	W flood prone area (ft)
6.2	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2019

Field Crew: Wildlands Engineering

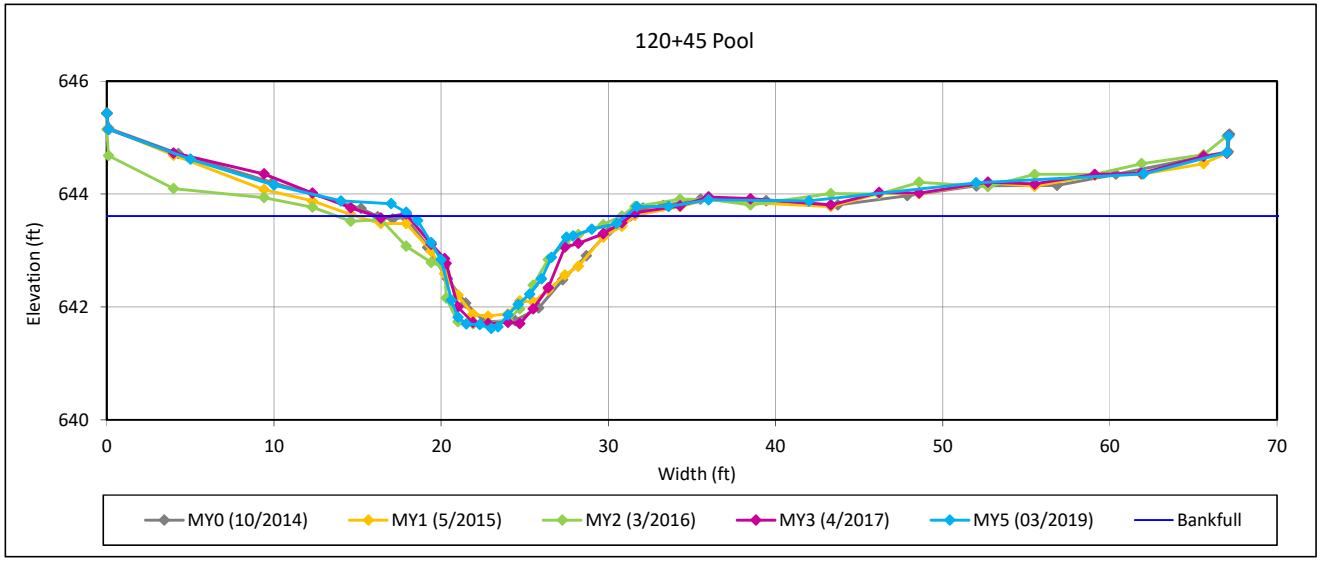
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 4-UT1 Reach 2



Bankfull Dimensions	
12.4	x-section area (ft.sq.)
12.8	width (ft)
1.0	mean depth (ft)
2.0	max depth (ft)
13.8	wetted parimeter (ft)
0.9	hyd radi (ft)
13.2	width-depth ratio

Survey Date: 03/2019
Field Crew: Wildlands Engineering

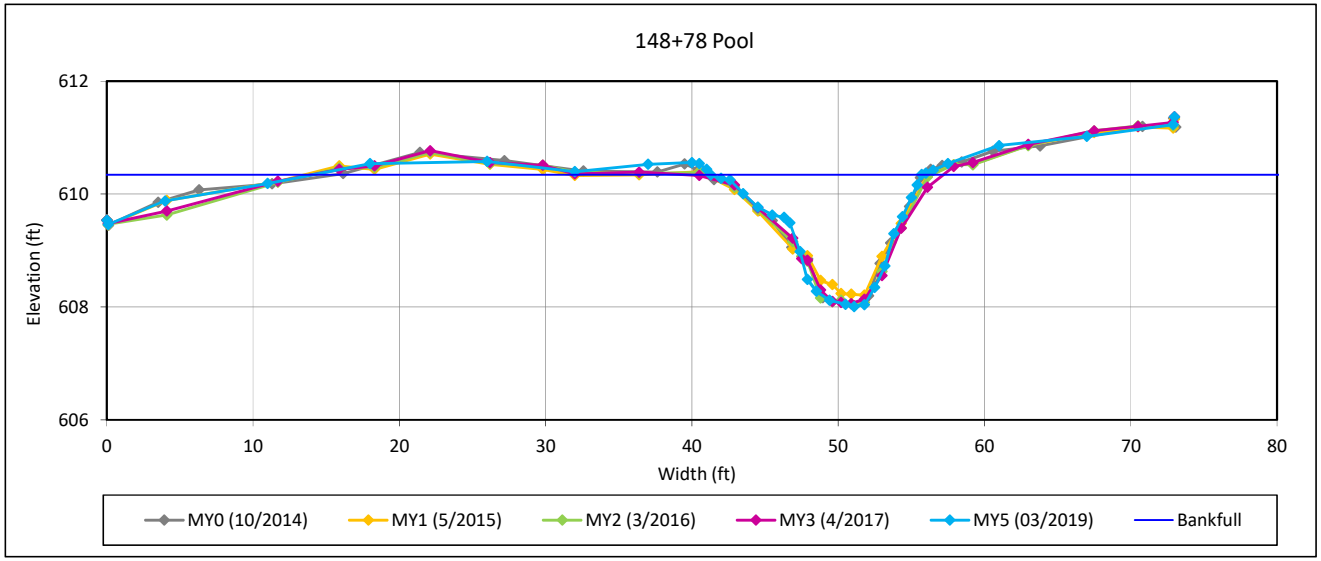
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 5-UT1 Reach 5



Bankfull Dimensions	
17.0	x-section area (ft.sq.)
14.4	width (ft)
1.2	mean depth (ft)
2.3	max depth (ft)
15.5	wetted parimeter (ft)
1.1	hyd radi (ft)
12.2	width-depth ratio

Survey Date: 03/2019
Field Crew: Wildlands Engineering

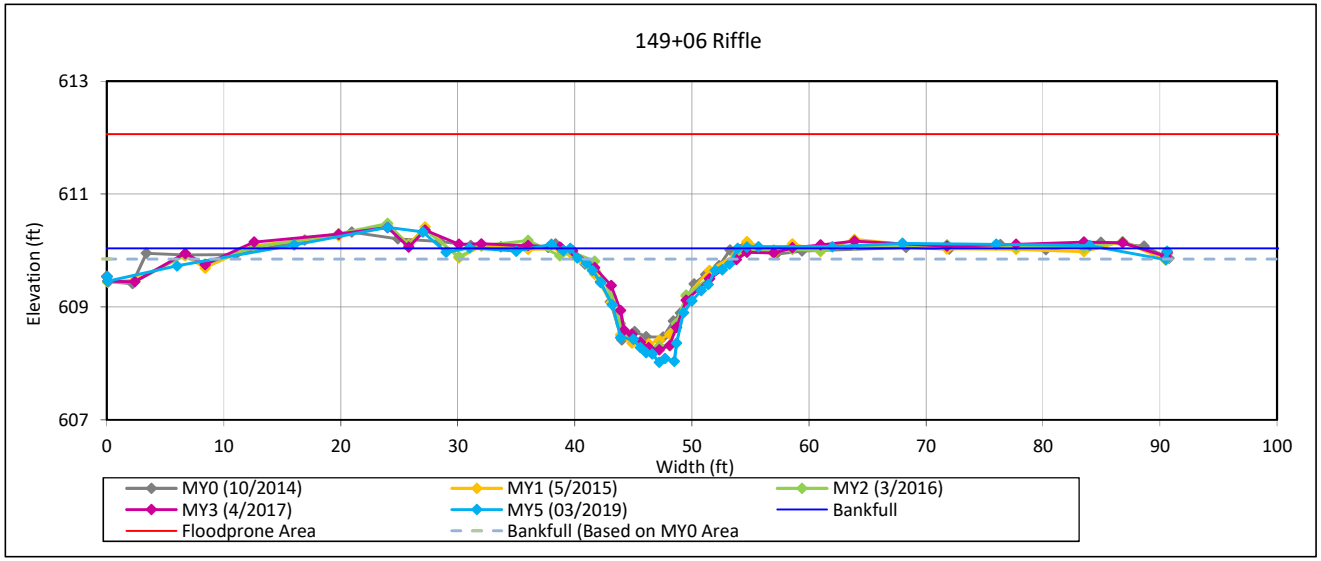
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 6-UT1 Reach 5



Bankfull Dimensions	
14.7	x-section area (ft.sq.)
15.3	width (ft)
1.0	mean depth (ft)
2.0	max depth (ft)
16.2	wetted parimeter (ft)
0.9	hyd radi (ft)
15.9	width-depth ratio
200.0	W flood prone area (ft)
13.1	entrenchment ratio
1.1	low bank height ratio

Survey Date: 03/2019

Field Crew: Wildlands Engineering

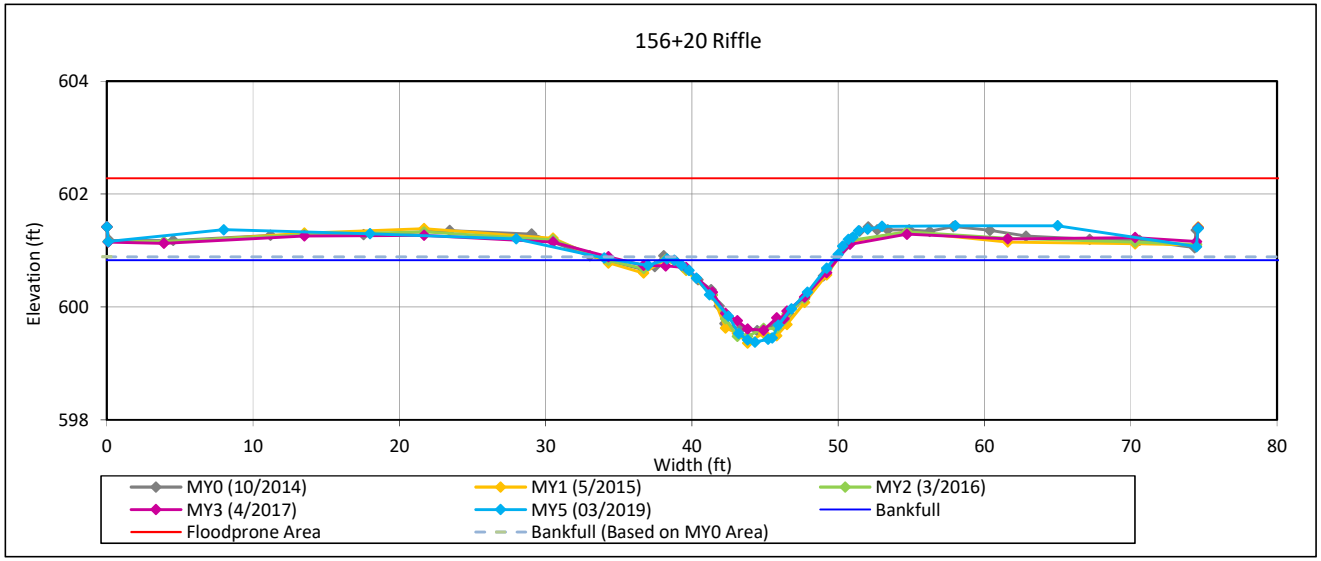
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 7-UT1 Reach 5



Bankfull Dimensions	
8.4	x-section area (ft.sq.)
10.9	width (ft)
0.8	mean depth (ft)
1.5	max depth (ft)
11.3	wetted parimeter (ft)
0.7	hyd radi (ft)
14.1	width-depth ratio
200.0	W flood prone area (ft)
18.4	entrenchment ratio
< 1.0	low bank height ratio

Survey Date: 03/2019

Field Crew: Wildlands Engineering

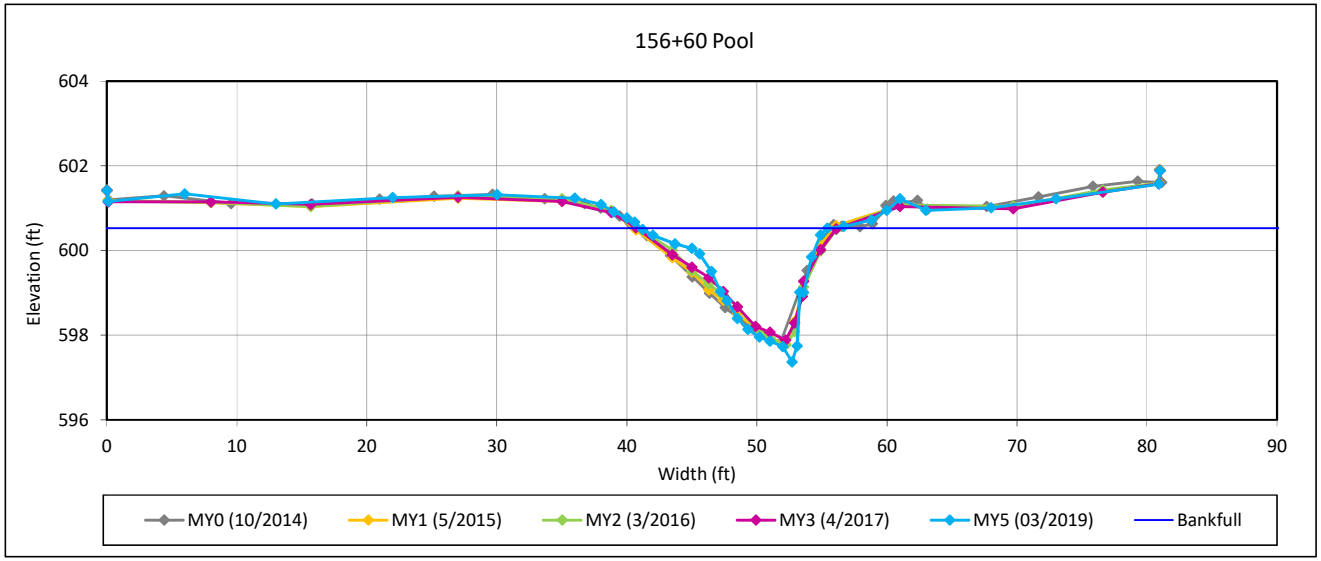
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 8-UT1 Reach 5



Bankfull Dimensions	
19.4	x-section area (ft.sq.)
14.3	width (ft)
1.4	mean depth (ft)
3.2	max depth (ft)
16.8	wetted parimeter (ft)
1.2	hyd radi (ft)
10.5	width-depth ratio

Survey Date: 03/2019
Field Crew: Wildlands Engineering

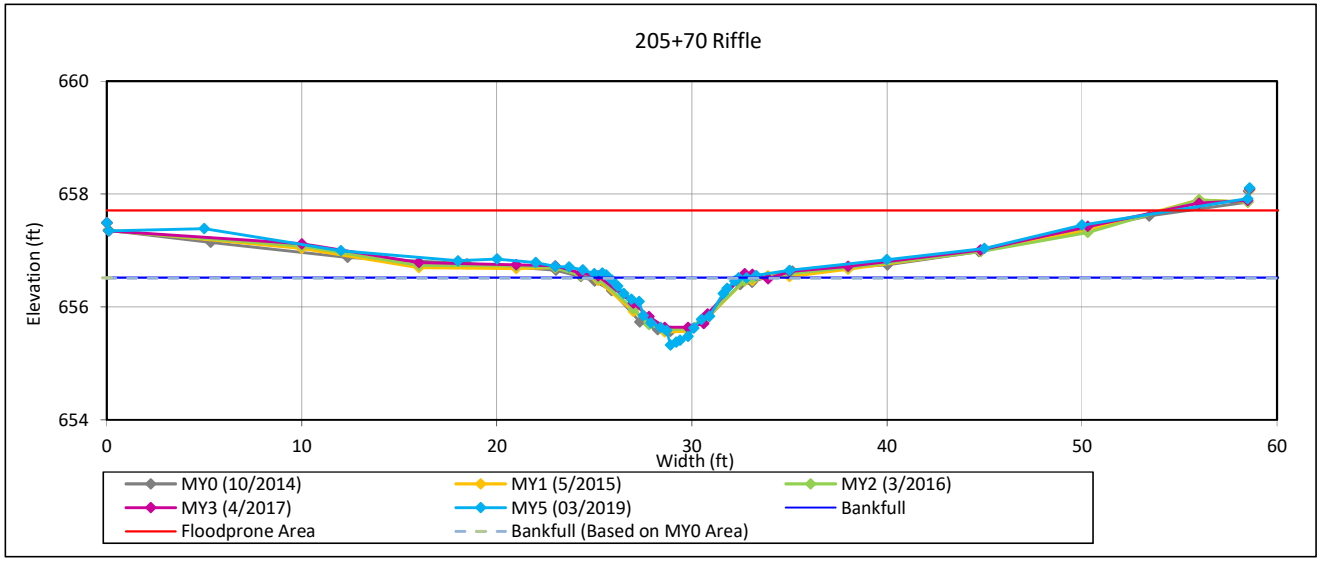
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 9-UT1A Reach 1



Bankfull Dimensions	
4.0	x-section area (ft.sq.)
6.6	width (ft)
0.6	mean depth (ft)
1.2	max depth (ft)
7.2	wetted parimeter (ft)
0.6	hyd radi (ft)
10.9	width-depth ratio
51.8	W flood prone area (ft)
7.8	entrenchment ratio
1.0	low bank height ratio

Survey Date: 03/2019

Field Crew: Wildlands Engineering

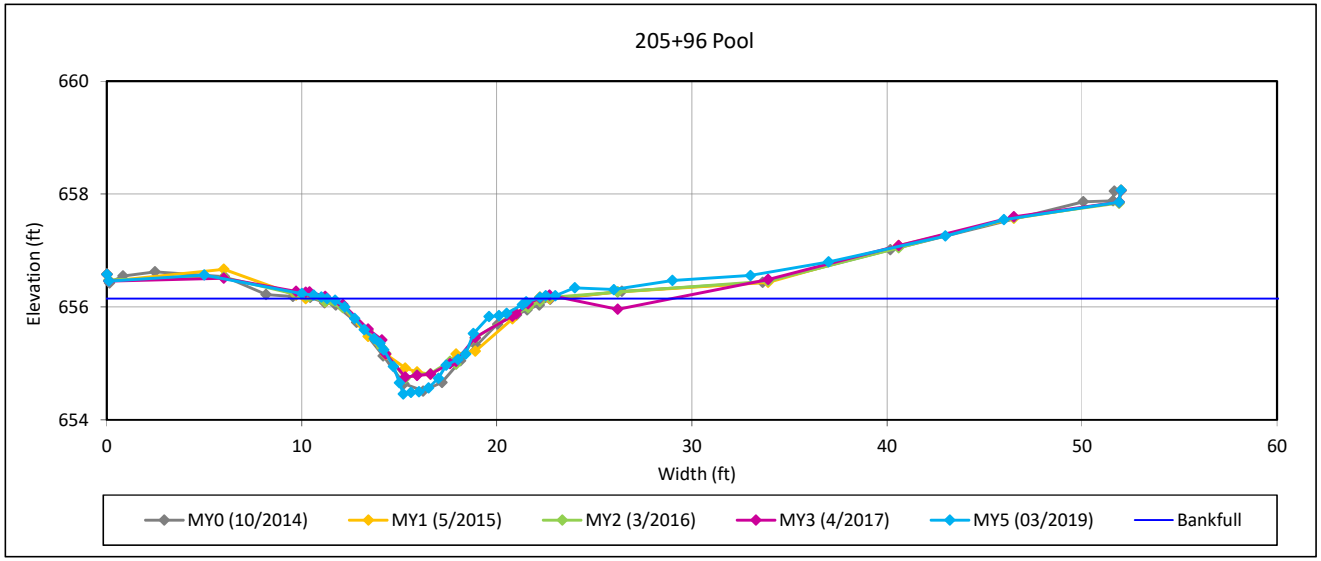
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 10-UT1A Reach 1



Bankfull Dimensions	
8.0	x-section area (ft.sq.)
10.7	width (ft)
0.7	mean depth (ft)
1.7	max depth (ft)
11.5	wetted parimeter (ft)
0.7	hyd radi (ft)
14.4	width-depth ratio

Survey Date: 03/2019
Field Crew: Wildlands Engineering

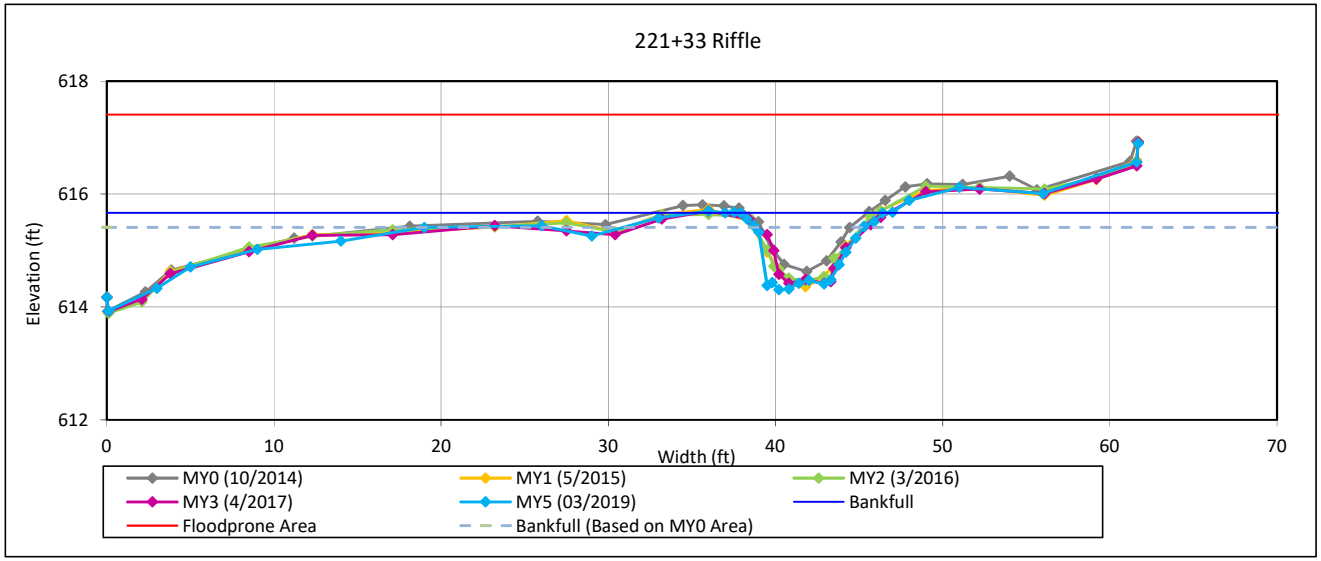
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 11-UT1A Reach 4



Bankfull Dimensions	
6.9	x-section area (ft.sq.)
8.5	width (ft)
0.8	mean depth (ft)
1.7	max depth (ft)
9.4	wetted parimeter (ft)
0.7	hyd radi (ft)
10.4	width-depth ratio
200.0	W flood prone area (ft)
23.5	entrenchment ratio
1.2	low bank height ratio

Survey Date: 03/2019

Field Crew: Wildlands Engineering

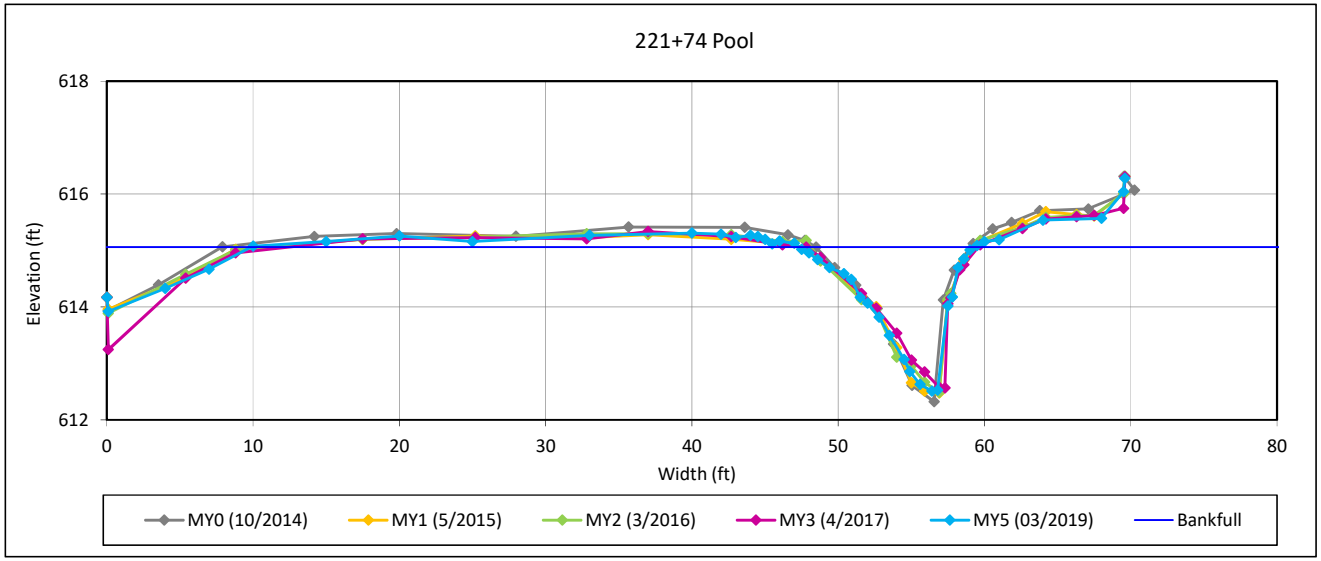
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 12-UT1A Reach 4



Bankfull Dimensions	
13.0	x-section area (ft.sq.)
12.0	width (ft)
1.1	mean depth (ft)
2.5	max depth (ft)
13.7	wetted parimeter (ft)
0.9	hyd radi (ft)
11.0	width-depth ratio

Survey Date: 03/2019
Field Crew: Wildlands Engineering

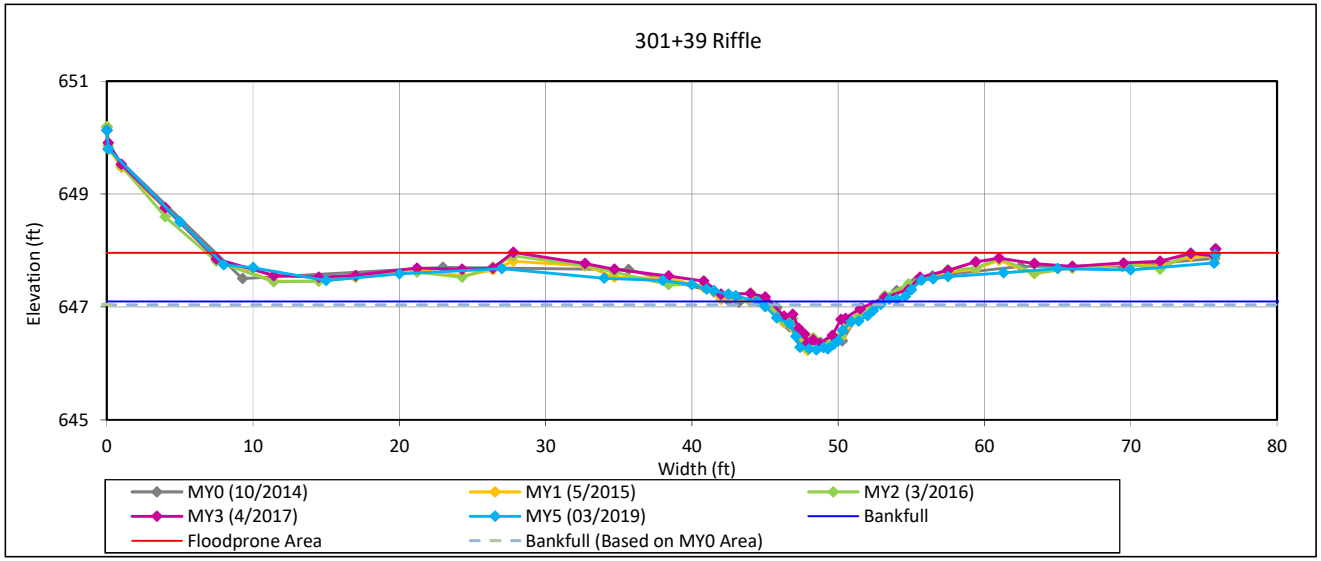
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 13-UT1B



Bankfull Dimensions	
4.0	x-section area (ft.sq.)
8.7	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
9.0	wetted parimeter (ft)
0.4	hyd radi (ft)
19.2	width-depth ratio
70.0	W flood prone area (ft)
8.0	entrenchment ratio
1.1	low bank height ratio

Survey Date: 03/2019

Field Crew: Wildlands Engineering

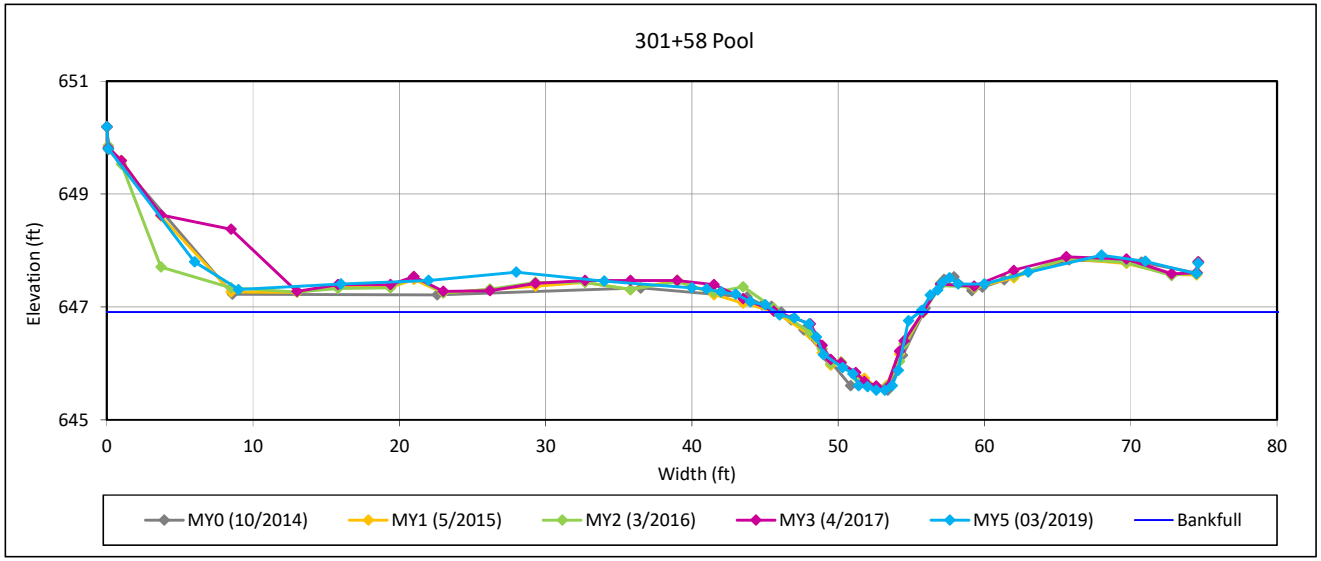
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 14-UT1B



Bankfull Dimensions	
7.1	x-section area (ft.sq.)
9.8	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
10.6	wetted parimeter (ft)
0.7	hyd radi (ft)
13.7	width-depth ratio

Survey Date: 03/2019
Field Crew: Wildlands Engineering

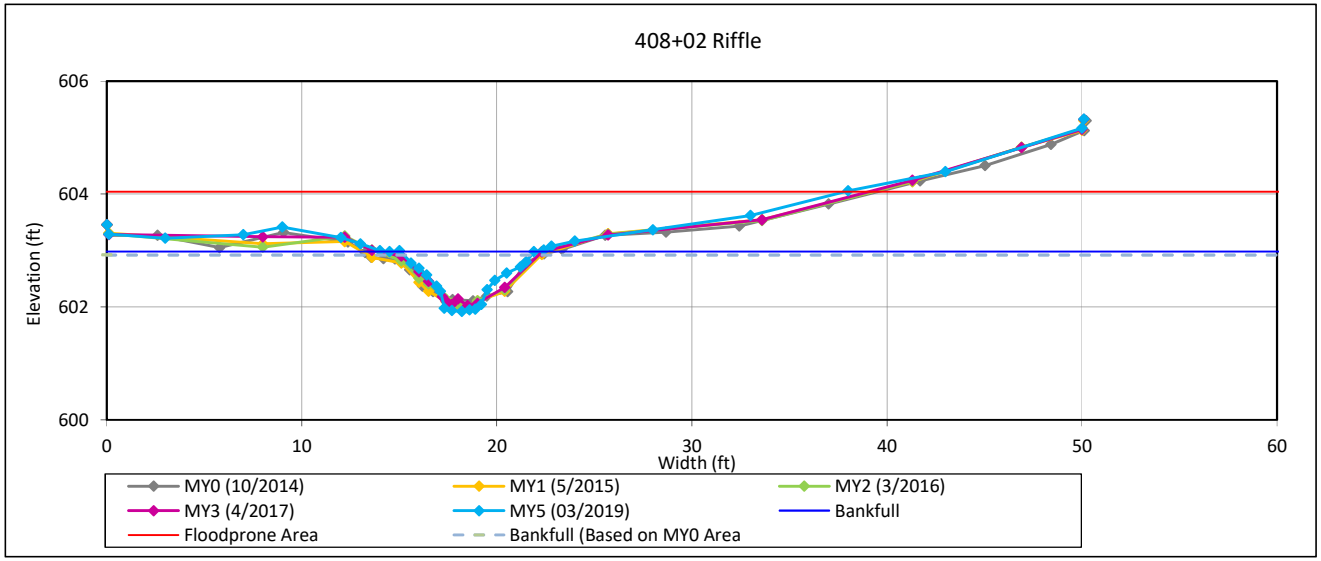
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 15-UT2



Bankfull Dimensions	
3.9	x-section area (ft.sq.)
6.8	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
7.3	wetted parimeter (ft)
0.5	hyd radi (ft)
12.1	width-depth ratio
50.0	W flood prone area (ft)
7.3	entrenchment ratio
1.1	low bank height ratio

Survey Date: 03/2019

Field Crew: Wildlands Engineering

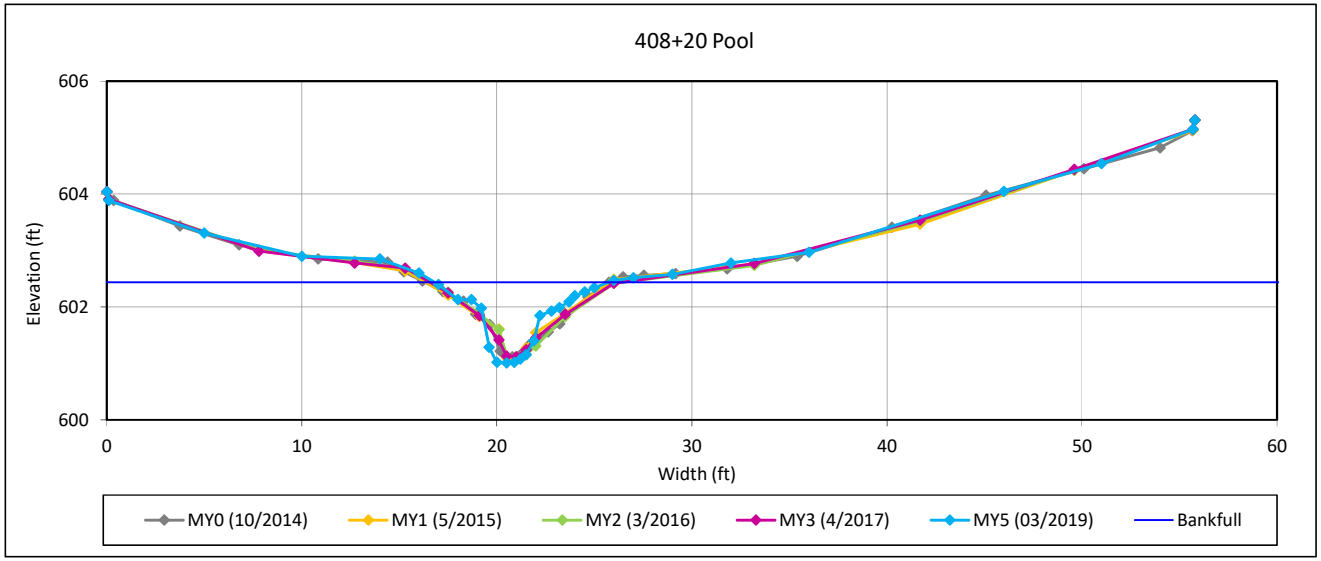
View Downstream

Cross Section Plots

Agony Acres Mitigtion Site (DMS Project No. 95716)

Monitoring Year 5 - 2019

Cross Section 16-UT2



Bankfull Dimensions	
5.2	x-section area (ft.sq.)
9.0	width (ft)
0.6	mean depth (ft)
1.4	max depth (ft)
9.9	wetted parimeter (ft)
0.5	hyd radi (ft)
15.3	width-depth ratio

Survey Date: 03/2019
Field Crew: Wildlands Engineering

View Downstream

Reachwide and Cross Section Pebble Count Plots

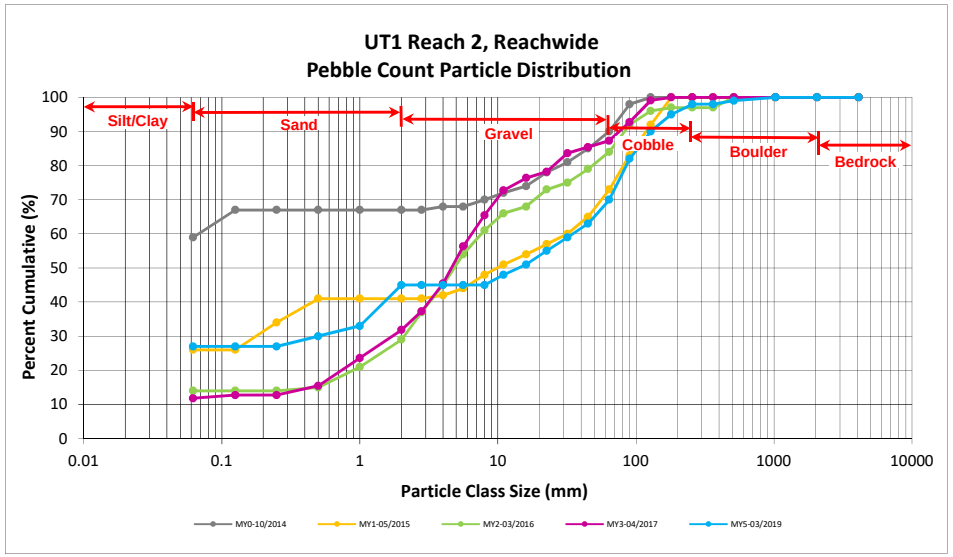
Agony Acres Mitigation Site (DMS Project No. 95716)

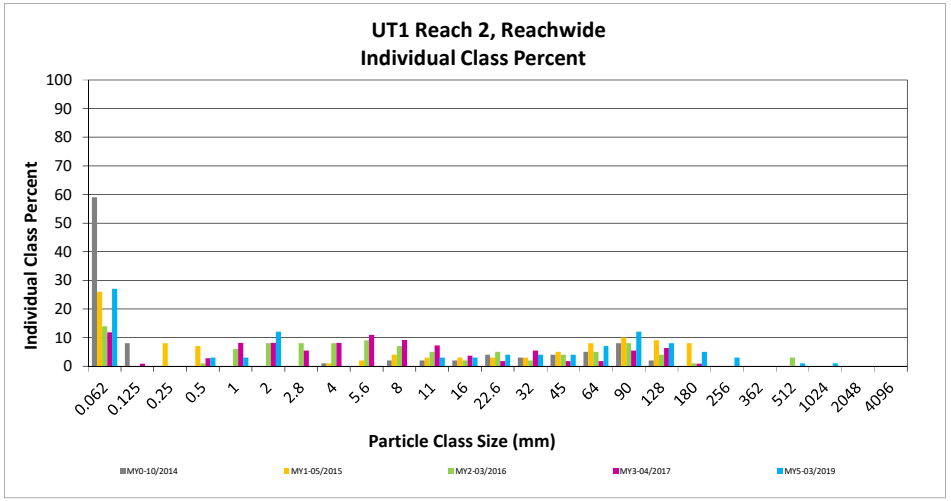
Monitoring Year 5 - 2019

UT1 Reach 2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	3	24	27	27	27
SAND	Very fine	0.062	0.125					27
	Fine	0.125	0.250					27
	Medium	0.25	0.50	1	2	3	3	30
	Coarse	0.5	1.0		3	3	3	33
	Very Coarse	1.0	2.0	8	4	12	12	45
GRAVEL	Very Fine	2.0	2.8					45
	Very Fine	2.8	4.0					45
	Fine	4.0	5.6					45
	Fine	5.6	8.0					45
	Medium	8.0	11.0	2	1	3	3	48
	Medium	11.0	16.0	2	1	3	3	51
	Coarse	16.0	22.6	1	3	4	4	55
	Coarse	22.6	32	4		4	4	59
	Very Coarse	32	45	4		4	4	63
	Very Coarse	45	64	6	1	7	7	70
COBBLE	Small	64	90	12		12	12	82
	Small	90	128	8		8	8	90
	Large	128	180	5		5	5	95
	Large	180	256	2	1	3	3	98
BOULDER	Small	256	362					98
	Small	362	512	1		1	1	99
	Medium	512	1024	1		1	1	100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**60**	**40**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	1.12
D_{50} =	14.1
D_{84} =	98.3
D_{95} =	180.0
D_{100} =	1024.0





Reachwide and Cross Section Pebble Count Plots

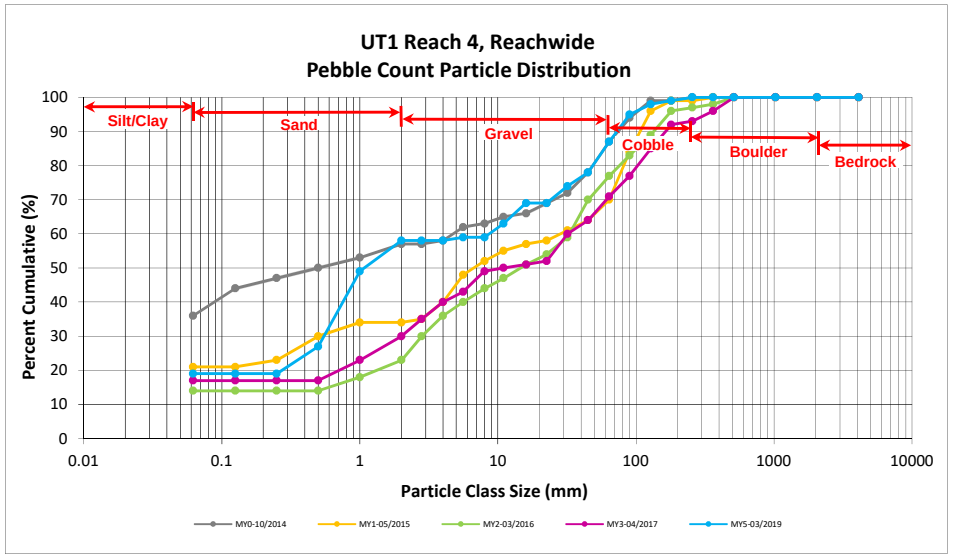
Agony Acres Mitigation Site (DMS Project No. 95716)

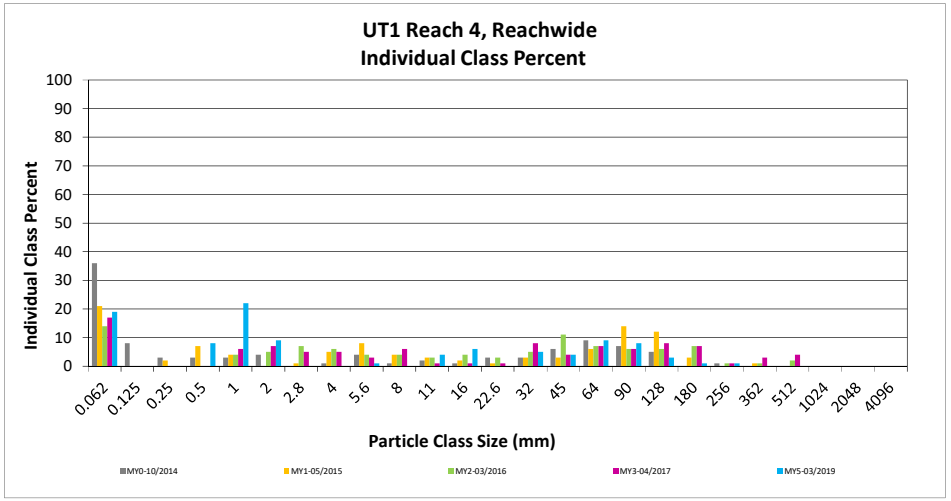
Monitoring Year 5 - 2019

UT1 Reach 4, 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	10	9	19	19	19
SAND	Very fine	0.062	0.125					19
	Fine	0.125	0.250					19
	Medium	0.25	0.50	2	6	8	8	27
	Coarse	0.5	1.0	7	15	22	22	49
	Very Coarse	1.0	2.0	2	7	9	9	58
GRAVEL	Very Fine	2.0	2.8					58
	Very Fine	2.8	4.0					58
	Fine	4.0	5.6	1		1	1	59
	Fine	5.6	8.0					59
	Medium	8.0	11.0	3	1	4	4	63
	Medium	11.0	16.0	6		6	6	69
	Coarse	16.0	22.6					69
	Coarse	22.6	32	4	1	5	5	74
	Very Coarse	32	45	3	1	4	4	78
	Very Coarse	45	64	9		9	9	87
COBBLE	Small	64	90	8		8	8	95
	Small	90	128	3		3	3	98
	Large	128	180	1		1	1	99
	Large	180	256	1		1	1	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	**60**	**40**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.64
D_{50} =	1.1
D_{84} =	56.9
D_{95} =	90.0
D_{100} =	256.0





Reachwide and Cross Section Pebble Count Plots

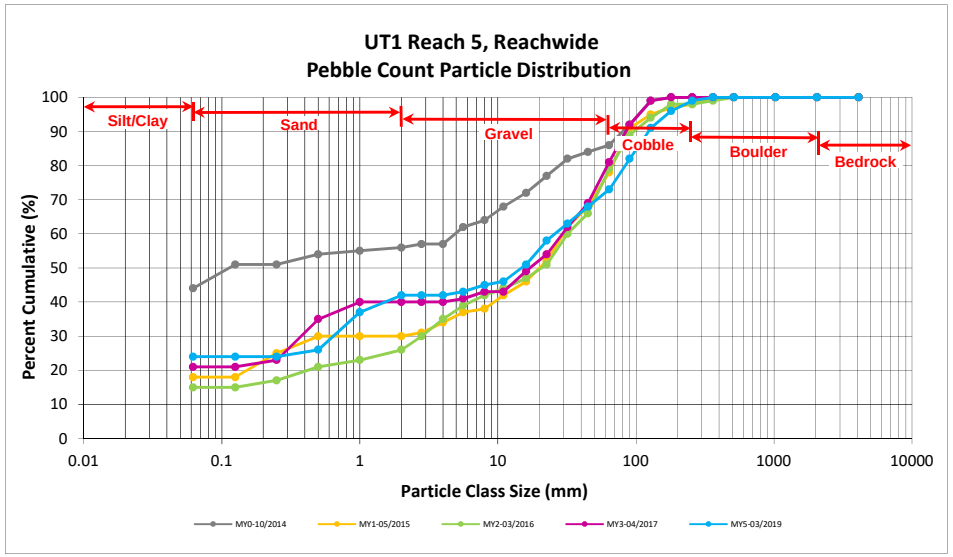
Agony Acres Mitigation Site (DMS Project No. 95716)

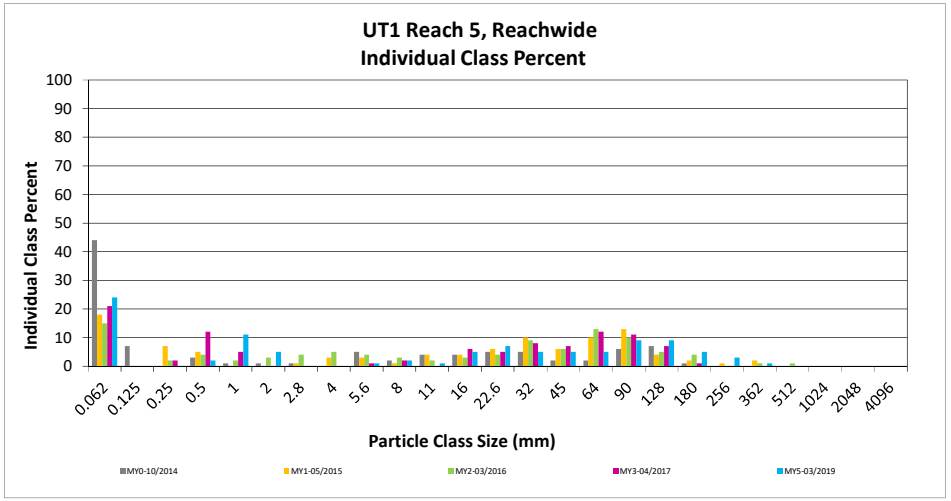
Monitoring Year 5 - 2019

UT1 Reach 5, 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	23	24	24	24
SAND	Very fine	0.062	0.125					24
	Fine	0.125	0.250					24
	Medium	0.25	0.50		2	2	2	26
	Coarse	0.5	1.0	2	9	11	11	37
	Very Coarse	1.0	2.0	4	1	5	5	42
GRAVEL	Very Fine	2.0	2.8					42
	Very Fine	2.8	4.0					42
	Fine	4.0	5.6	1		1	1	43
	Fine	5.6	8.0	2		2	2	45
	Medium	8.0	11.0		1	1	1	46
	Medium	11.0	16.0	5		5	5	51
	Coarse	16.0	22.6	5	2	7	7	58
	Coarse	22.6	32	4	1	5	5	63
	Very Coarse	32	45	5		5	5	68
	Very Coarse	45	64	5		5	5	73
COBBLE	Small	64	90	9		9	9	82
	Small	90	128	9		9	9	91
	Large	128	180	5		5	5	96
	Large	180	256	2	1	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	**60**	**40**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.88
D_{50} =	14.8
D_{84} =	97.3
D_{95} =	168.1
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

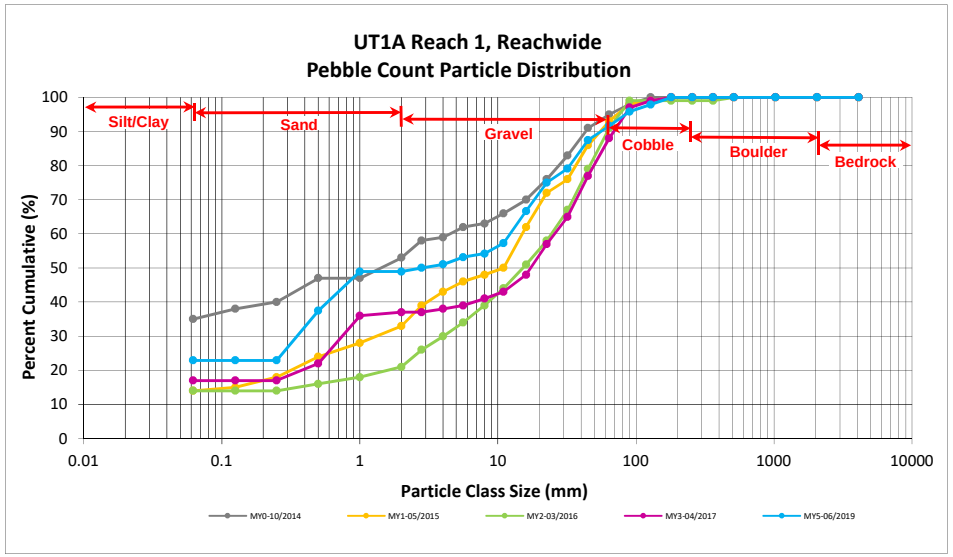
Agony Acres Mitigation Site (DMS Project No. 95716)

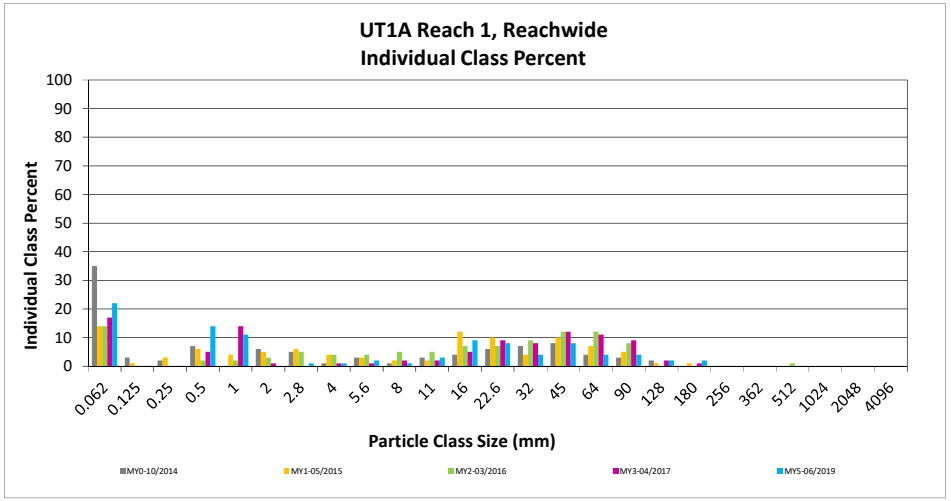
Monitoring Year 5 - 2019

UT1A 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		17	17	17	17
SAND	Very fine	0.062	0.125					17
	Fine	0.125	0.250					17
	Medium	0.25	0.50		5	5	5	22
	Coarse	0.5	1.0		14	14	14	36
	Very Coarse	1.0	2.0		1	1	1	37
GRAVEL	Very Fine	2.0	2.8					37
	Very Fine	2.8	4.0		1	1	1	38
	Fine	4.0	5.6		1	1	1	39
	Fine	5.6	8.0	1	1	2	2	41
	Medium	8.0	11.0	2		2	2	43
	Medium	11.0	16.0	5		5	5	48
	Coarse	16.0	22.6	9		9	9	57
	Coarse	22.6	32	8		8	8	65
	Very Coarse	32	45	12		12	12	77
	Very Coarse	45	64	11		11	11	88
COBBLE	Small	64	90	9		9	9	97
	Small	90	128	2		2	2	99
	Large	128	180	1		1	1	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	**60**	**40**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.95
D_{50} =	17.3
D_{84} =	56.3
D_{95} =	83.4
D_{100} =	180.0





Reachwide and Cross Section Pebble Count Plots

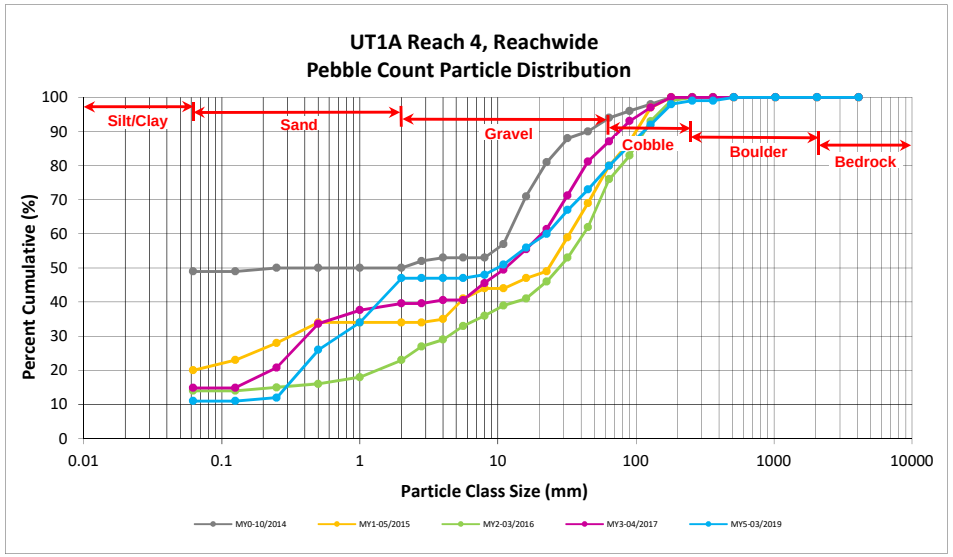
Agony Acres Mitigation Site (DMS Project No. 95716)

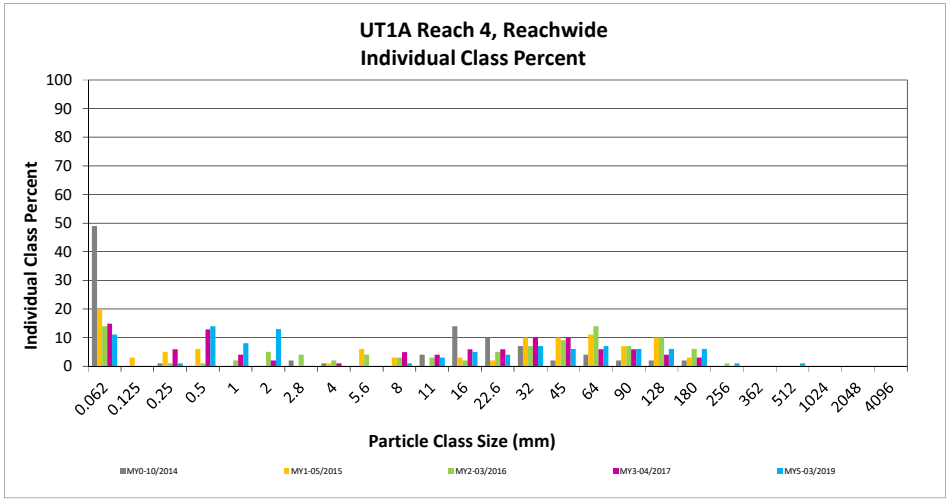
Monitoring Year 5 - 2019

UT1A Reach 4, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	5	11	11	11
SAND	Very fine	0.062	0.125					11
	Fine	0.125	0.250		1	1	1	12
	Medium	0.25	0.50		14	14	14	26
	Coarse	0.5	1.0	2	6	8	8	34
	Very Coarse	1.0	2.0	8	5	13	13	47
GRAVEL	Very Fine	2.0	2.8					47
	Very Fine	2.8	4.0					47
	Fine	4.0	5.6					47
	Fine	5.6	8.0		1	1	1	48
	Medium	8.0	11.0		3	3	3	51
	Medium	11.0	16.0	1	4	5	5	56
	Coarse	16.0	22.6	3	1	4	4	60
	Coarse	22.6	32	7		7	7	67
	Very Coarse	32	45	6		6	6	73
	Very Coarse	45	64	7		7	7	80
COBBLE	Small	64	90	6		6	6	86
	Small	90	128	6		6	6	92
	Large	128	180	6		6	6	98
	Large	180	256	1		1	1	99
BOULDER	Small	256	362					99
	Small	362	512	1		1	1	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**60**	**40**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.30
D_{35} =	1.05
D_{50} =	9.89
D_{84} =	80.3
D_{95} =	151.8
D_{100} =	512.0





Reachwide and Cross Section Pebble Count Plots

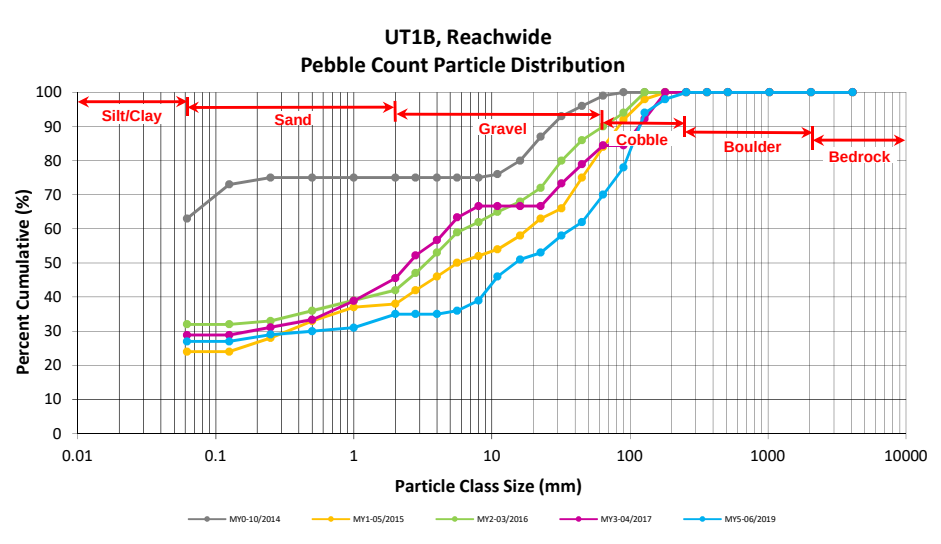
Agony Acres Mitigation Site (DMS Project No. 95716)

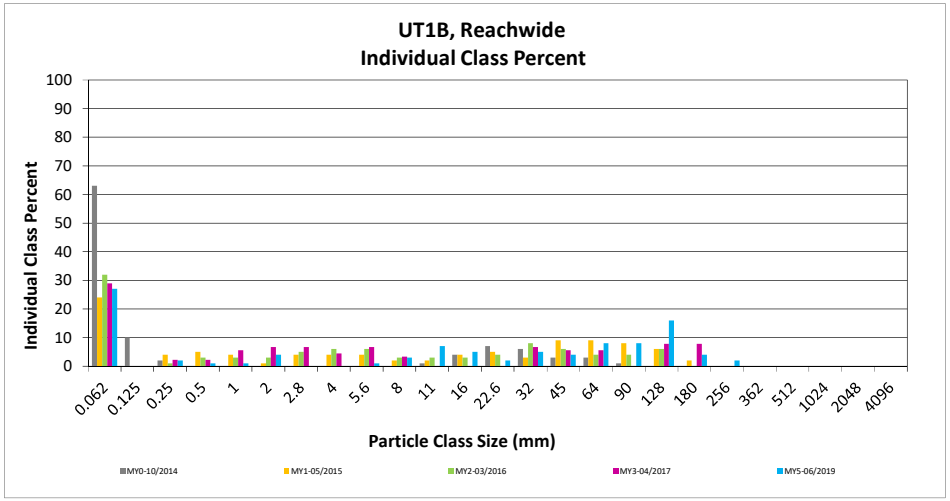
Monitoring Year 5 - 2019

UT1B, 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	24	27	27	27
SAND	Very fine	0.062	0.125					27
	Fine	0.125	0.250		2	2	2	29
	Medium	0.25	0.50		1	1	1	30
	Coarse	0.5	1.0		1	1	1	31
	Very Coarse	1.0	2.0	2	2	4	4	35
GRAVEL	Very Fine	2.0	2.8					35
	Very Fine	2.8	4.0					35
	Fine	4.0	5.6		1	1	1	36
	Fine	5.6	8.0	1	2	3	3	39
	Medium	8.0	11.0	5	2	7	7	46
	Medium	11.0	16.0	3	2	5	5	51
	Coarse	16.0	22.6	2		2	2	53
	Coarse	22.6	32	4	1	5	5	58
	Very Coarse	32	45	4		4	4	62
	Very Coarse	45	64	7	1	8	8	70
COBBLE	Small	64	90	8		8	8	78
	Small	90	128	15	1	16	16	94
	Large	128	180	4		4	4	98
	Large	180	256	2		2	2	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**60**	**40**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	2.00
D_{50} =	14.8
D_{84} =	102.7
D_{95} =	139.4
D_{100} =	256.0





Reachwide and Cross Section Pebble Count Plots

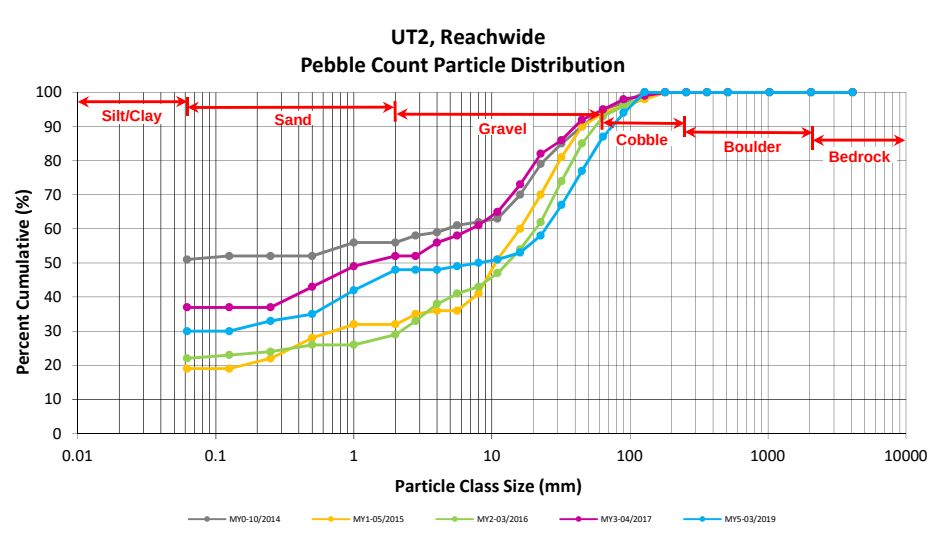
Agony Acres Mitigation Site (DMS Project No. 95716)

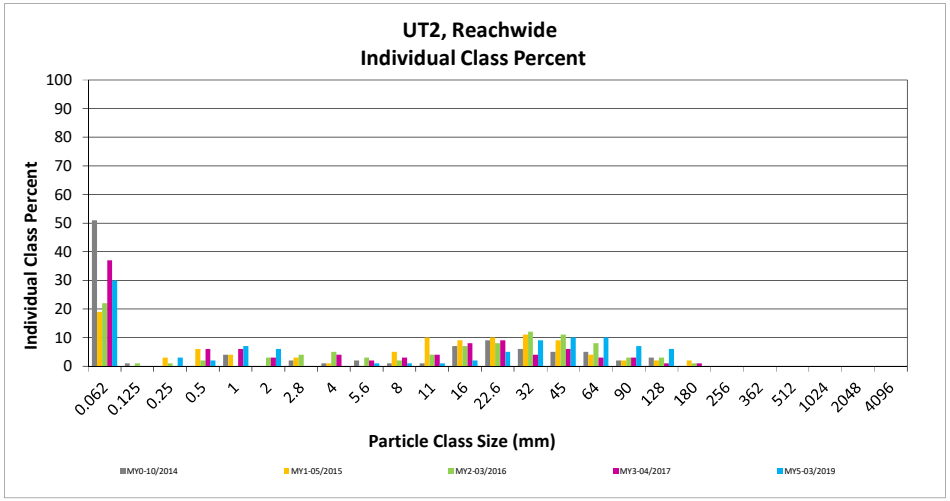
Monitoring Year 5 - 2019

UT2, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	5	25	30	30	30
SAND	Very fine	0.062	0.125					30
	Fine	0.125	0.250		3	3	3	33
	Medium	0.25	0.50		2	2	2	35
	Coarse	0.5	1.0	5	2	7	7	42
	Very Coarse	1.0	2.0	5	1	6	6	48
GRAVEL	Very Fine	2.0	2.8					48
	Very Fine	2.8	4.0					48
	Fine	4.0	5.6		1	1	1	49
	Fine	5.6	8.0		1	1	1	50
	Medium	8.0	11.0	1		1	1	51
	Medium	11.0	16.0	2		2	2	53
	Coarse	16.0	22.6	4	1	5	5	58
	Coarse	22.6	32	8	1	9	9	67
	Very Coarse	32	45	9	1	10	10	77
	Very Coarse	45	64	8	2	10	10	87
COBBLE	Small	64	90	7		7	7	94
	Small	90	128	6		6	6	100
	Large	128	180					100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**60**	**40**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.50
D_{50} =	8.0
D_{84} =	57.6
D_{95} =	95.4
D_{100} =	128.0





Reachwide and Cross Section Pebble Count Plots

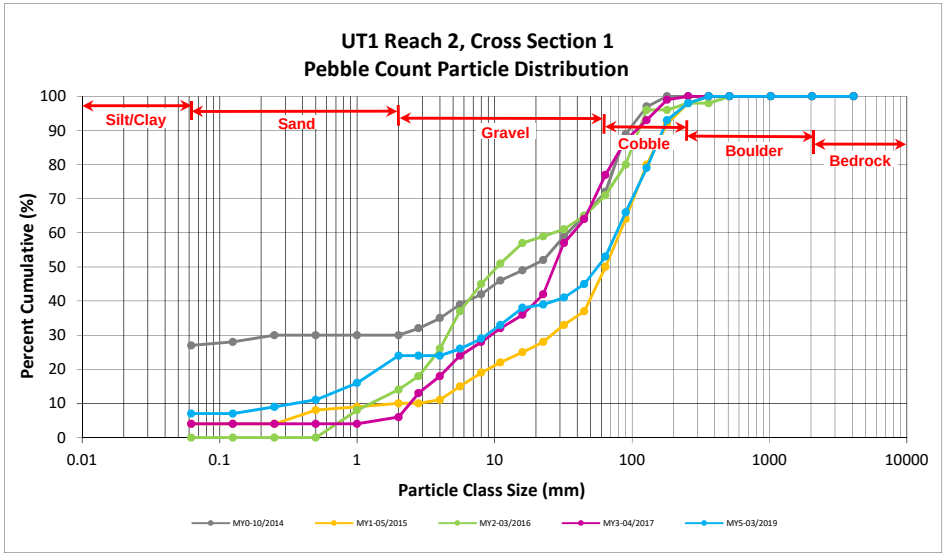
Agony Acres Mitigation Site (DMS Project No. 95716)

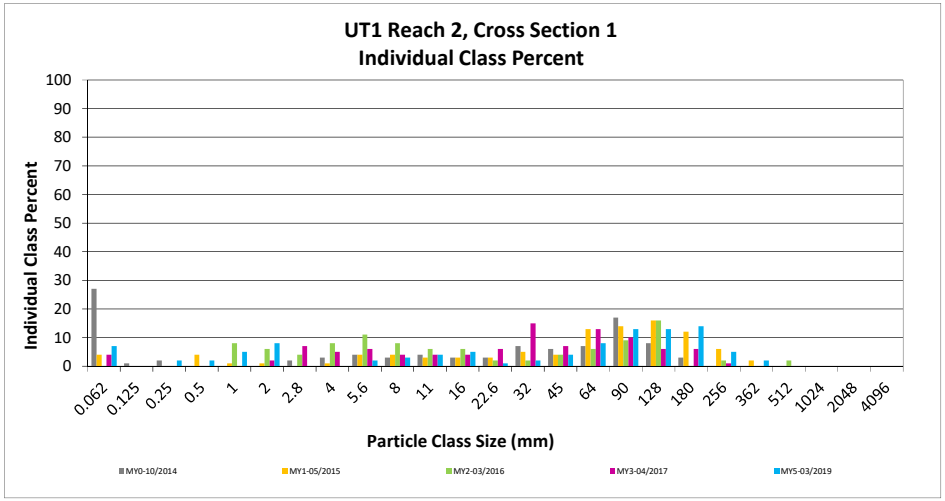
Monitoring Year 5 - 2019

UT1 Reach 2, Cross Section 1

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	7	7	7
SAND	Very fine	0.062	0.125			7
	Fine	0.125	0.250	2	2	9
	Medium	0.25	0.50	2	2	11
	Coarse	0.5	1.0	5	5	16
	Very Coarse	1.0	2.0	8	8	24
GRAVEL	Very Fine	2.0	2.8			24
	Very Fine	2.8	4.0			24
	Fine	4.0	5.6	2	2	26
	Fine	5.6	8.0	3	3	29
	Medium	8.0	11.0	4	4	33
	Medium	11.0	16.0	5	5	38
	Coarse	16.0	22.6	1	1	39
	Coarse	22.6	32	2	2	41
	Very Coarse	32	45	4	4	45
	Very Coarse	45	64	8	8	53
COBBLE	Small	64	90	13	13	66
	Small	90	128	13	13	79
	Large	128	180	14	14	93
	Large	180	256	5	5	98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 1	
Channel materials (mm)	
D_{16} =	1.00
D_{35} =	12.78
D_{50} =	56.1
D_{84} =	144.6
D_{95} =	207.2
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

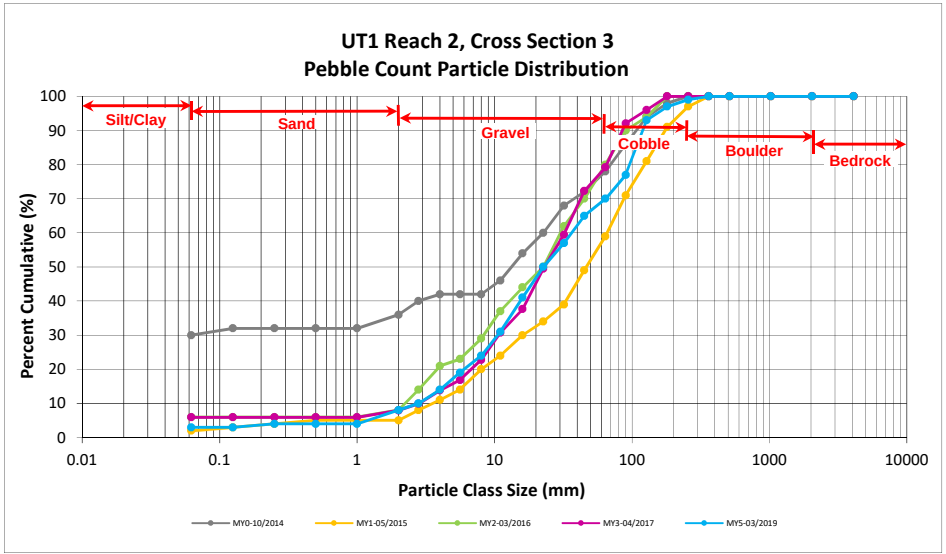
Agony Acres Mitigation Site (DMS Project No. 95716)

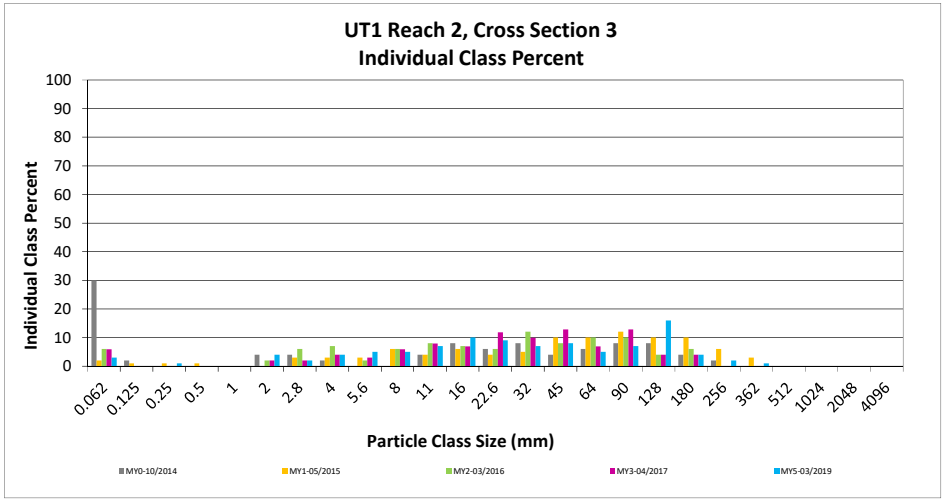
Monitoring Year 5 - 2019

UT1 Reach 2, Cross Section 3

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	3	3	3
SAND	Very fine	0.062	0.125			3
	Fine	0.125	0.250	1	1	4
	Medium	0.25	0.50			4
	Coarse	0.5	1.0			4
	Very Coarse	1.0	2.0	4	4	8
GRAVEL	Very Fine	2.0	2.8	2	2	10
	Very Fine	2.8	4.0	4	4	14
	Fine	4.0	5.6	5	5	19
	Fine	5.6	8.0	5	5	24
	Medium	8.0	11.0	7	7	31
	Medium	11.0	16.0	10	10	41
	Coarse	16.0	22.6	9	9	50
	Coarse	22.6	32	7	7	57
	Very Coarse	32	45	8	8	65
	Very Coarse	45	64	5	5	70
COBBLE	Small	64	90	7	7	77
	Small	90	128	16	16	93
	Large	128	180	4	4	97
	Large	180	256	2	2	99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 3	
Channel materials (mm)	
D_{16} =	4.58
D_{35} =	12.78
D_{50} =	22.6
D_{84} =	105.0
D_{95} =	151.8
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

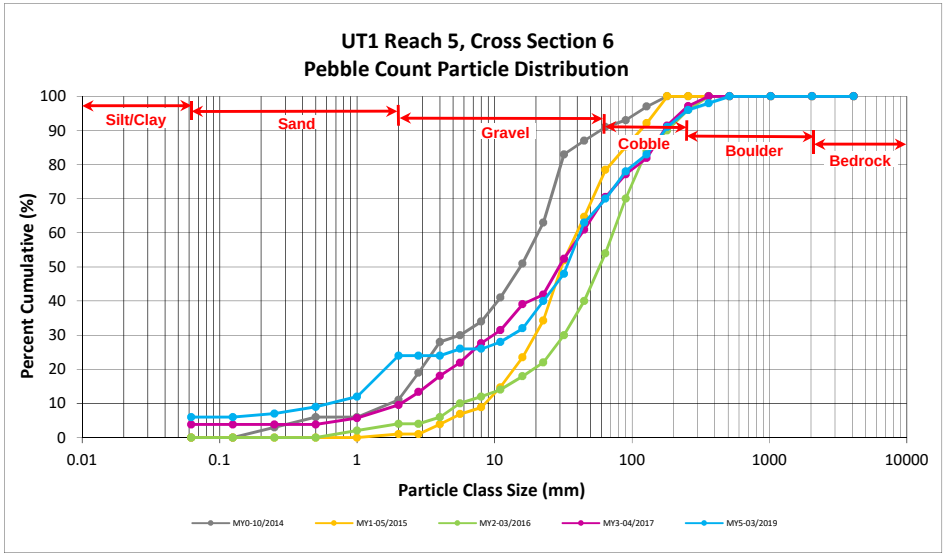
Agony Acres Mitigation Site (DMS Project No. 95716)

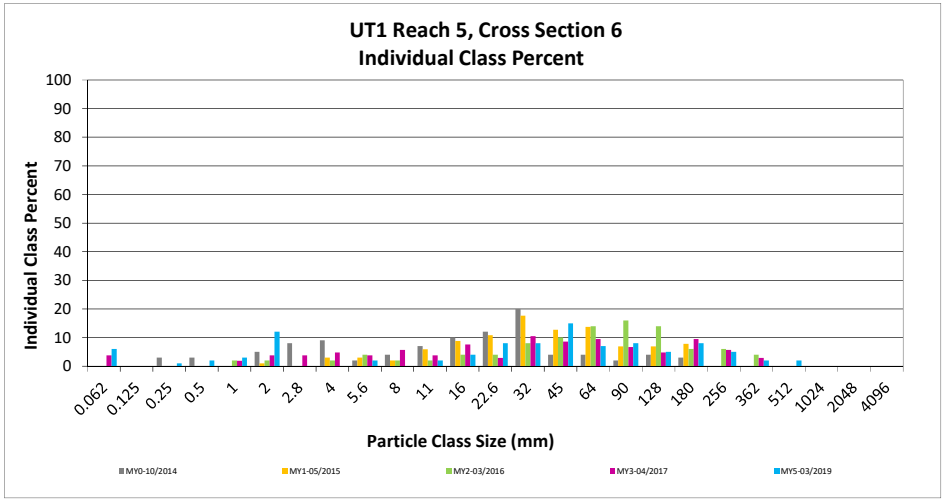
Monitoring Year 5 - 2019

UT1 Reach 5, Cross Section 6

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	6	6
SAND	Very fine	0.062	0.125			6
	Fine	0.125	0.250	1	1	7
	Medium	0.25	0.50	2	2	9
	Coarse	0.5	1.0	3	3	12
	Very Coarse	1.0	2.0	12	12	24
GRAVEL	Very Fine	2.0	2.8			24
	Very Fine	2.8	4.0			24
	Fine	4.0	5.6	2	2	26
	Fine	5.6	8.0			26
	Medium	8.0	11.0	2	2	28
	Medium	11.0	16.0	4	4	32
	Coarse	16.0	22.6	8	8	40
	Coarse	22.6	32	8	8	48
	Very Coarse	32	45	15	15	63
	Very Coarse	45	64	7	7	70
COBBLE	Small	64	90	8	8	78
	Small	90	128	5	5	83
	Large	128	180	8	8	91
	Large	180	256	5	5	96
BOULDER	Small	256	362	2	2	98
	Small	362	512	2	2	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 6	
Channel materials (mm)	
D_{16} =	1.26
D_{35} =	18.21
D_{50} =	33.5
D_{84} =	133.6
D_{95} =	238.6
D_{100} =	512.0





Reachwide and Cross Section Pebble Count Plots

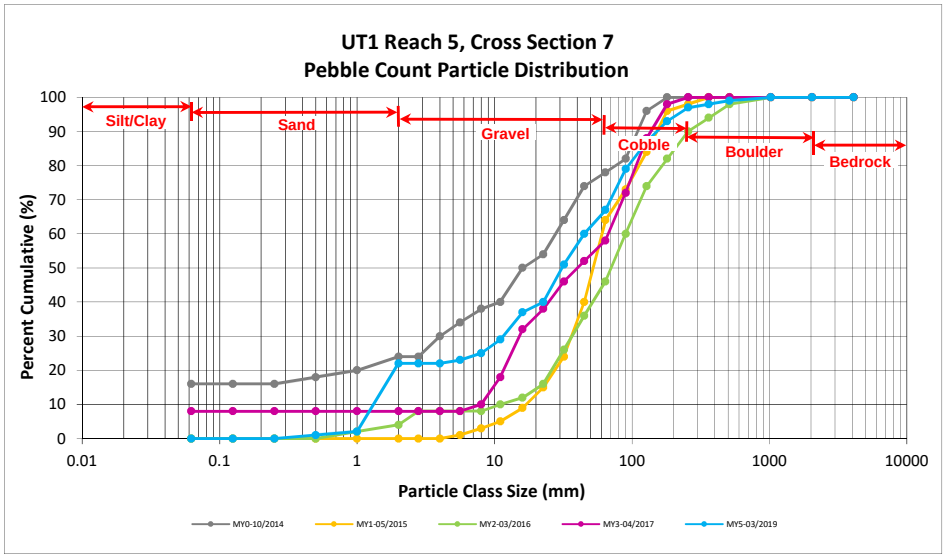
Agony Acres Mitigation Site (DMS Project No. 95716)

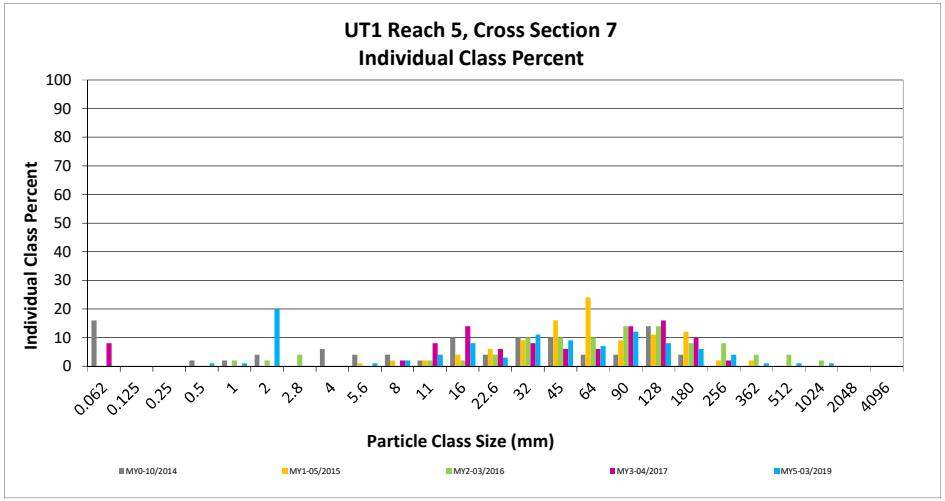
Monitoring Year 5 - 2019

UT1 Reach 5, Cross Section 7

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.25	0.50	1	1	1
	Coarse	0.5	1.0	1	1	2
	Very Coarse	1.0	2.0	20	20	22
GRAVEL	Very Fine	2.0	2.8			22
	Very Fine	2.8	4.0			22
	Fine	4.0	5.6	1	1	23
	Fine	5.6	8.0	2	2	25
	Medium	8.0	11.0	4	4	29
	Medium	11.0	16.0	8	8	37
	Coarse	16.0	22.6	3	3	40
	Coarse	22.6	32	11	11	51
	Very Coarse	32	45	9	9	60
	Very Coarse	45	64	7	7	67
COBBLE	Small	64	90	12	12	79
	Small	90	128	8	8	87
	Large	128	180	6	6	93
	Large	180	256	4	4	97
BOULDER	Small	256	362	1	1	98
	Small	362	512	1	1	99
	Medium	512	1024	1	1	100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 7	
Channel materials (mm)	
D_{16} =	1.62
D_{35} =	14.57
D_{50} =	31.0
D_{84} =	112.2
D_{95} =	214.7
D_{100} =	1024.0





Reachwide and Cross Section Pebble Count Plots

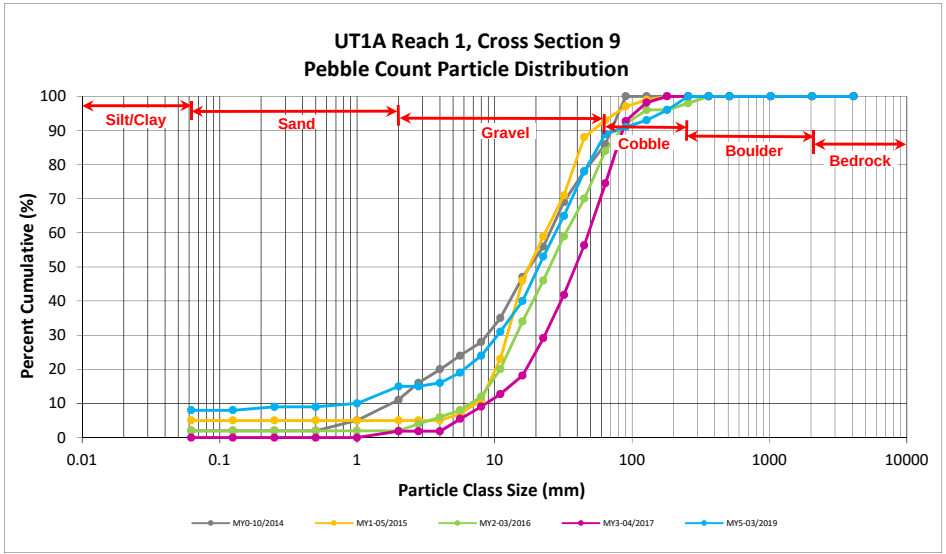
Agony Acres Mitigation Site (DMS Project No. 95716)

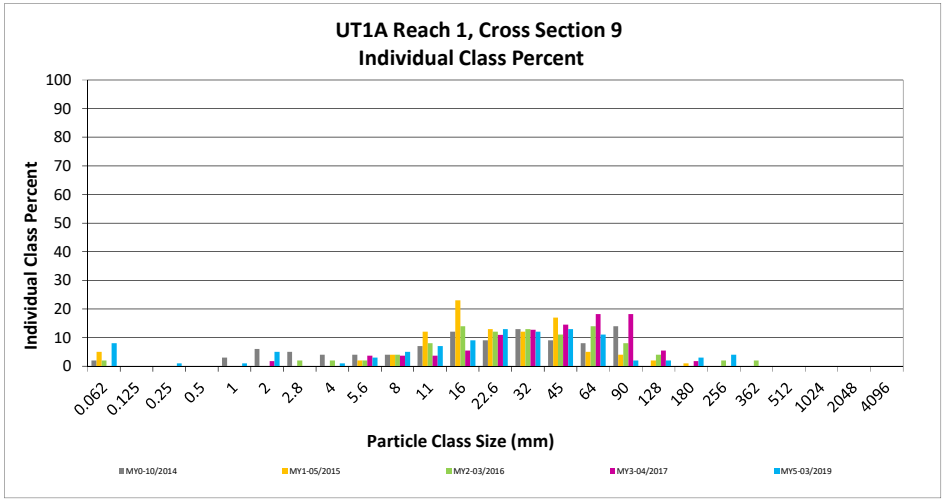
Monitoring Year 5 - 2019

UT1A Reach 1, Cross Section 9

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	8	8	8
SAND	Very fine	0.062	0.125			8
	Fine	0.125	0.250	1	1	9
	Medium	0.25	0.50			9
	Coarse	0.5	1.0	1	1	10
	Very Coarse	1.0	2.0	5	5	15
GRAVEL	Very Fine	2.0	2.8			15
	Very Fine	2.8	4.0	1	1	16
	Fine	4.0	5.6	3	3	19
	Fine	5.6	8.0	5	5	24
	Medium	8.0	11.0	7	7	31
	Medium	11.0	16.0	9	9	40
	Coarse	16.0	22.6	13	13	53
	Coarse	22.6	32	12	12	65
	Very Coarse	32	45	13	13	78
	Very Coarse	45	64	11	11	89
COBBLE	Small	64	90	2	2	91
	Small	90	128	2	2	93
	Large	128	180	3	3	96
	Large	180	256	4	4	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 9	
Channel materials (mm)	
D_{16} =	4.00
D_{35} =	12.99
D_{50} =	20.9
D_{84} =	54.5
D_{95} =	160.7
D_{100} =	256.0





Reachwide and Cross Section Pebble Count Plots

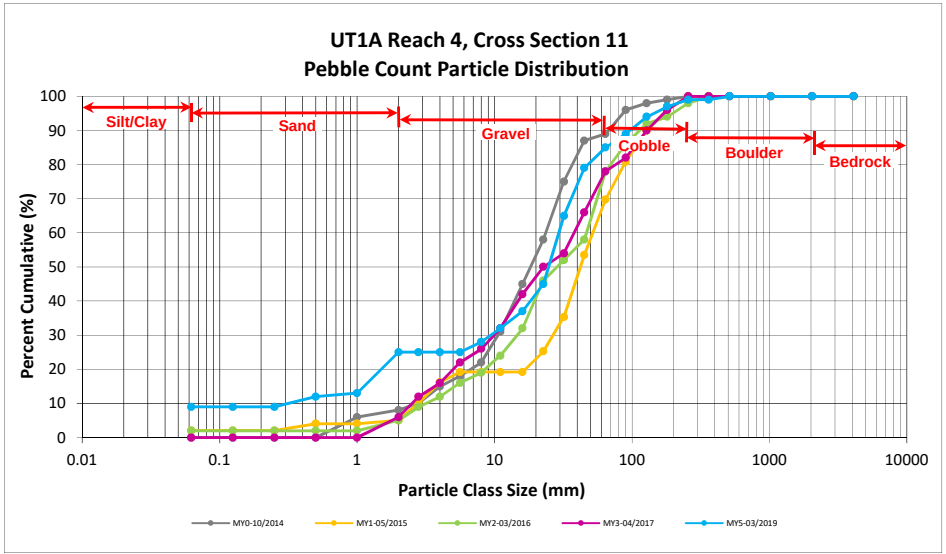
Agony Acres Mitigation Site (DMS Project No. 95716)

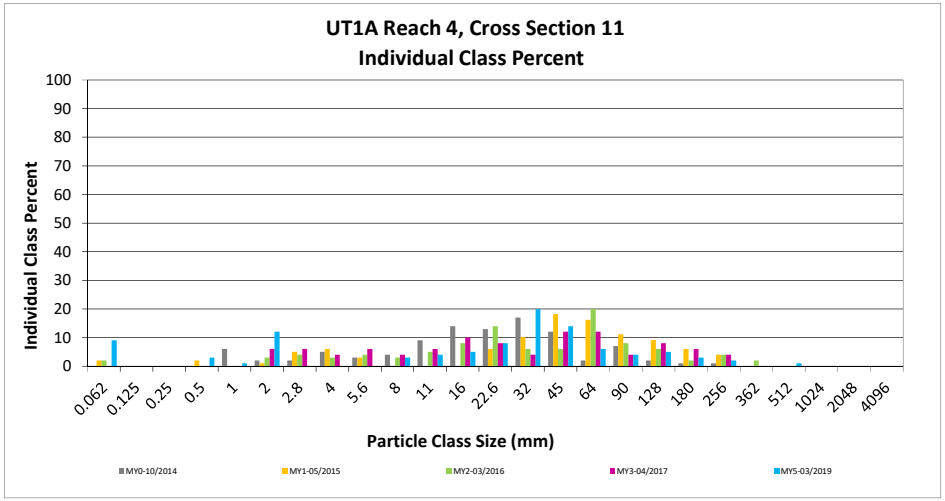
Monitoring Year 5 - 2019

UT1A Reach 4, Cross Section 11

Particle Class		Diameter (mm)		Riffle 100-Count	Summary	
		min	max		Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	9	9	9
SAND	Very fine	0.062	0.125			9
	Fine	0.125	0.250			9
	Medium	0.25	0.50	3	3	12
	Coarse	0.5	1.0	1	1	13
	Very Coarse	1.0	2.0	12	12	25
GRAVEL	Very Fine	2.0	2.8			25
	Very Fine	2.8	4.0			25
	Fine	4.0	5.6			25
	Fine	5.6	8.0	3	3	28
	Medium	8.0	11.0	4	4	32
	Medium	11.0	16.0	5	5	37
	Coarse	16.0	22.6	8	8	45
	Coarse	22.6	32	20	20	65
	Very Coarse	32	45	14	14	79
	Very Coarse	45	64	6	6	85
COBBLE	Small	64	90	4	4	89
	Small	90	128	5	5	94
	Large	128	180	3	3	97
	Large	180	256	2	2	99
BOULDER	Small	256	362			99
	Small	362	512	1	1	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 11	
Channel materials (mm)	
D_{16} =	1.19
D_{35} =	13.77
D_{50} =	24.7
D_{84} =	60.4
D_{95} =	143.4
D_{100} =	512.0





Reachwide and Cross Section Pebble Count Plots

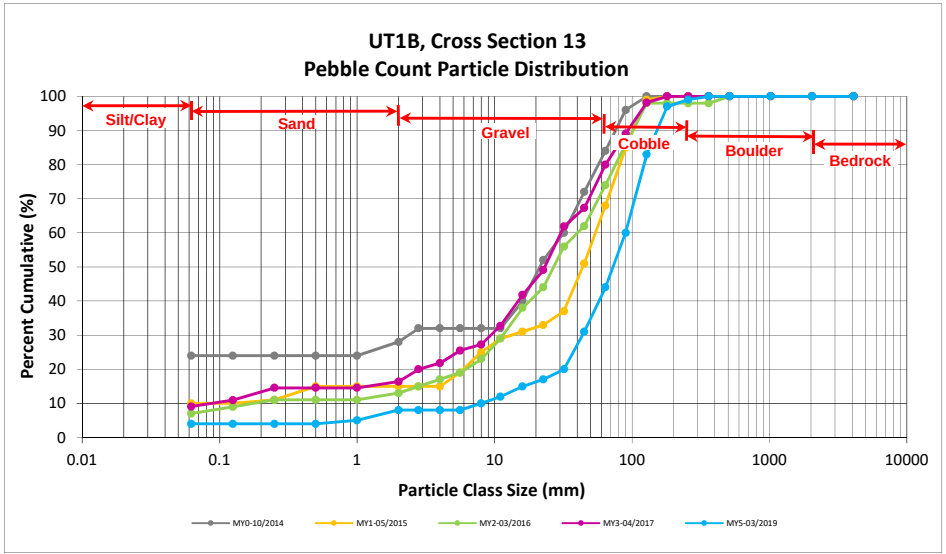
Agony Acres Mitigation Site (DMS Project No. 95716)

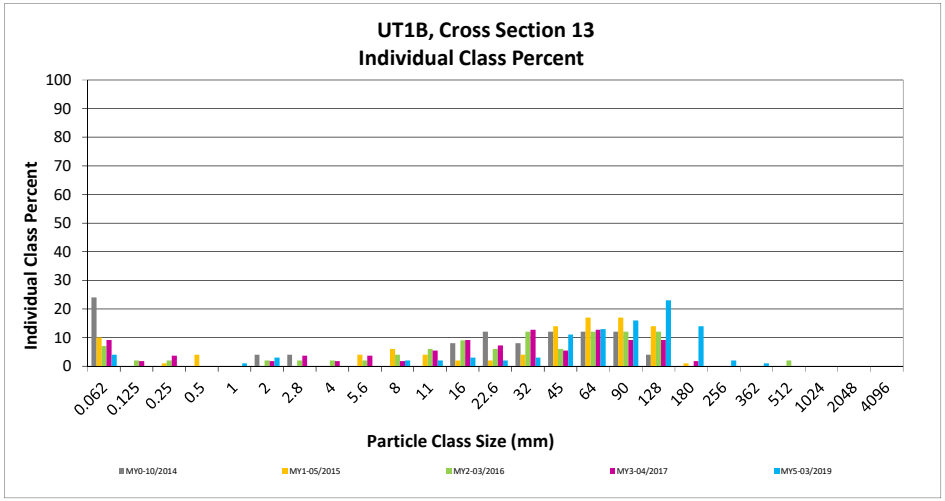
Monitoring Year 5 - 2019

UT1B, Cross Section 13

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	4	4	4
SAND	Very fine	0.062	0.125			4
	Fine	0.125	0.250			4
	Medium	0.25	0.50			4
	Coarse	0.5	1.0	1	1	5
	Very Coarse	1.0	2.0	3	3	8
GRAVEL	Very Fine	2.0	2.8			8
	Very Fine	2.8	4.0			8
	Fine	4.0	5.6			8
	Fine	5.6	8.0	2	2	10
	Medium	8.0	11.0	2	2	12
	Medium	11.0	16.0	3	3	15
	Coarse	16.0	22.6	2	2	17
	Coarse	22.6	32	3	3	20
	Very Coarse	32	45	11	11	31
	Very Coarse	45	64	13	13	44
COBBLE	Small	64	90	16	16	60
	Small	90	128	23	23	83
	Large	128	180	14	14	97
	Large	180	256	2	2	99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 13	
Channel materials (mm)	
D_{16} =	19.02
D_{35} =	50.15
D_{50} =	72.7
D_{84} =	131.2
D_{95} =	171.4
D_{100} =	362.0





Reachwide and Cross Section Pebble Count Plots

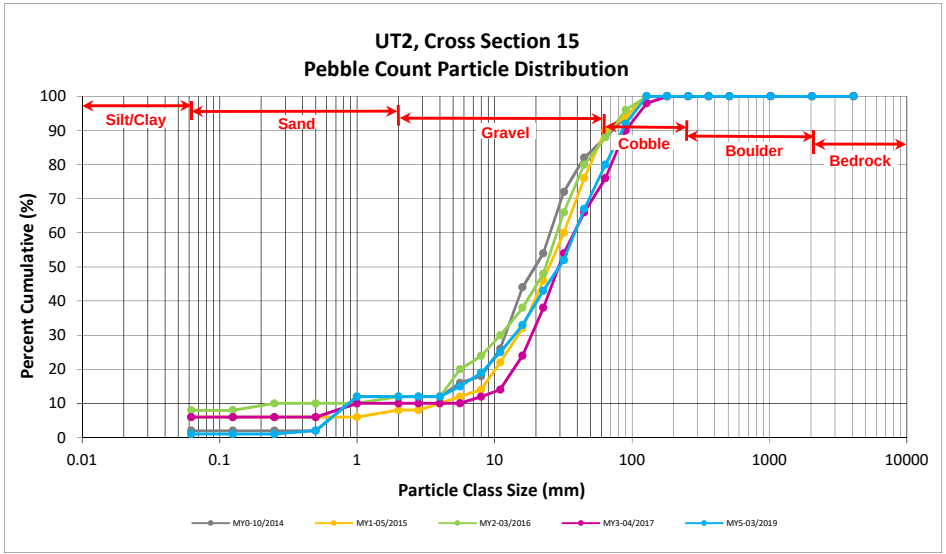
Agony Acres Mitigation Site (DMS Project No. 95716)

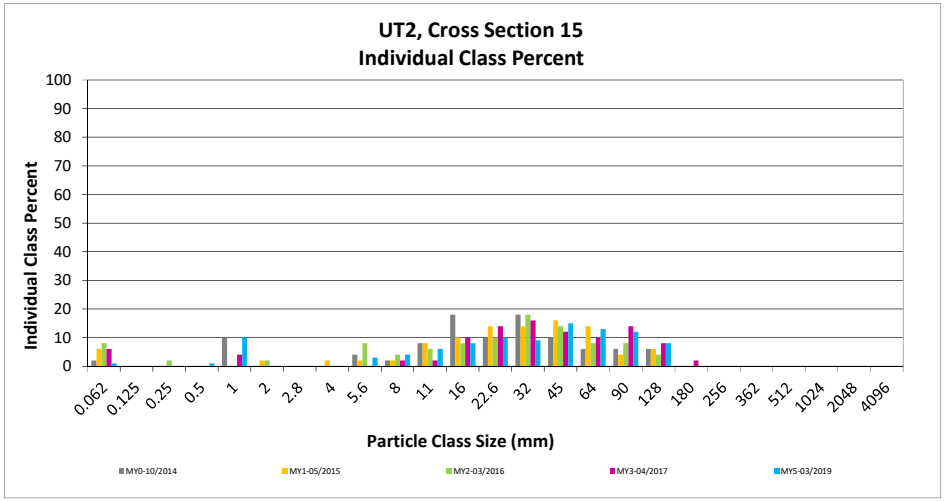
Monitoring Year 5 - 2019

UT2, Cross Section 15

Particle Class		Diameter (mm) min	Diameter (mm) max	Riffle 100-Count	Summary: Class Percentage	Summary: Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	1	1
SAND	Very fine	0.062	0.125			1
	Fine	0.125	0.250			1
	Medium	0.25	0.50	1	1	2
	Coarse	0.5	1.0	10	10	12
	Very Coarse	1.0	2.0			12
GRAVEL	Very Fine	2.0	2.8			12
	Very Fine	2.8	4.0			12
	Fine	4.0	5.6	3	3	15
	Fine	5.6	8.0	4	4	19
	Medium	8.0	11.0	6	6	25
	Medium	11.0	16.0	8	8	33
	Coarse	16.0	22.6	10	10	43
	Coarse	22.6	32	9	9	52
	Very Coarse	32	45	15	15	67
	Very Coarse	45	64	13	13	80
COBBLE	Small	64	90	12	12	92
	Small	90	128	8	8	100
	Large	128	180			100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross Section 15	
Channel materials (mm)	
D_{16} =	6.12
D_{35} =	17.14
D_{50} =	29.6
D_{84} =	71.7
D_{95} =	102.7
D_{100} =	128.0





APPENDIX 5. Hydrology Summary Data and Plots

Table 13. Verification of Bankfull Events

Agony Acres Mitigation Site (DMS Project No. 95716)

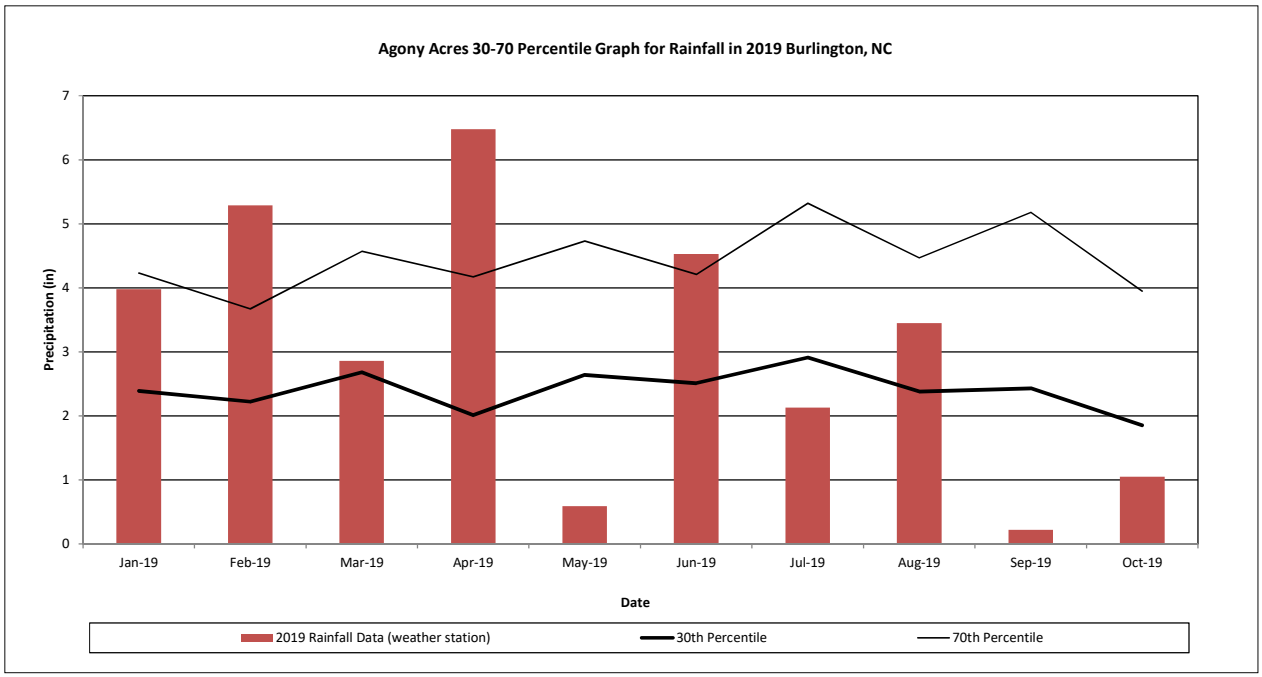
Monitoring Year 5 - 2019

Reach	Date of Data Collection	Date of Occurrence	Method
UT1	2/6/2019	1/21/2019	Crest Gage/ Pressure Transducer
		1/24/2019	
		2/1/2019	
	6/27/2019	2/18/2019	
		2/23/2019	
		3/1/2019	
		3/7/2019	
		3/21/2019	
		4/19/2019	
UT1A	2/6/2019	1/21/2019	
		1/24/2019	
	6/27/2019	2/18/2019	
		2/23/2019	
		3/1/2019	
		3/21/2019	
		4/19/2019	
UT1B	2/6/2019	1/4/2019	
		1/13/2019	
		1/20/2019	
		1/24/2019	
	6/27/2019	2/18/2019	
		2/23/2019	
		3/1/2019	
		3/21/2019	
		4/19/2019	
UT2	2/6/2019	1/21/2019	
		1/24/2019	
	6/27/2019	2/18/2019	
		2/23/2019	
		6/8/2019	
	10/29/2019	8/1/2019	

Monthly Rainfall Data

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019



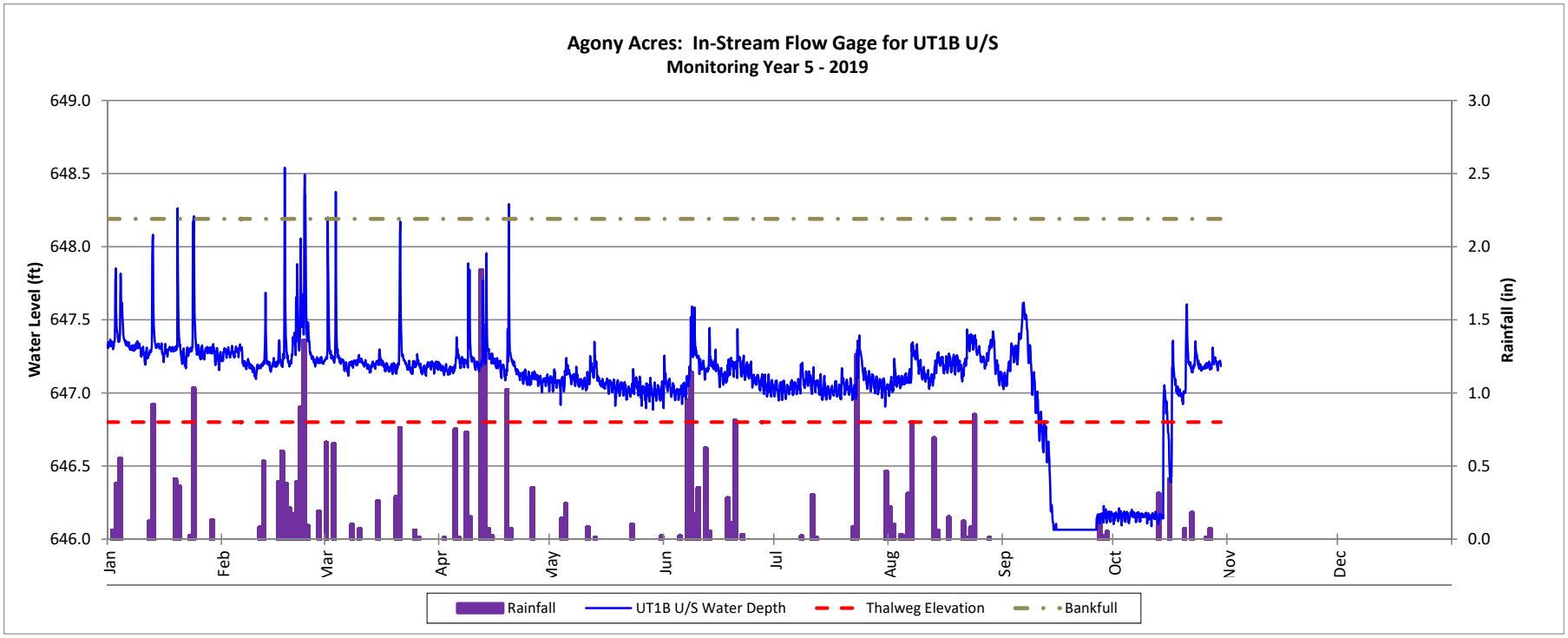
[1] 2019 monthly rainfall collected from weather station 93783, at Burlington Alamance Regional AP, NC (USDA, 2002).

[2] 30th and 70th percentile rainfall data collected from weather station NC723, at Pedimont Tiad Intl AP, NC (USDA, 2002).

Recorded In-Stream Flow Events

Agony Acres Mitigation Site (DMS Project No. 95716)

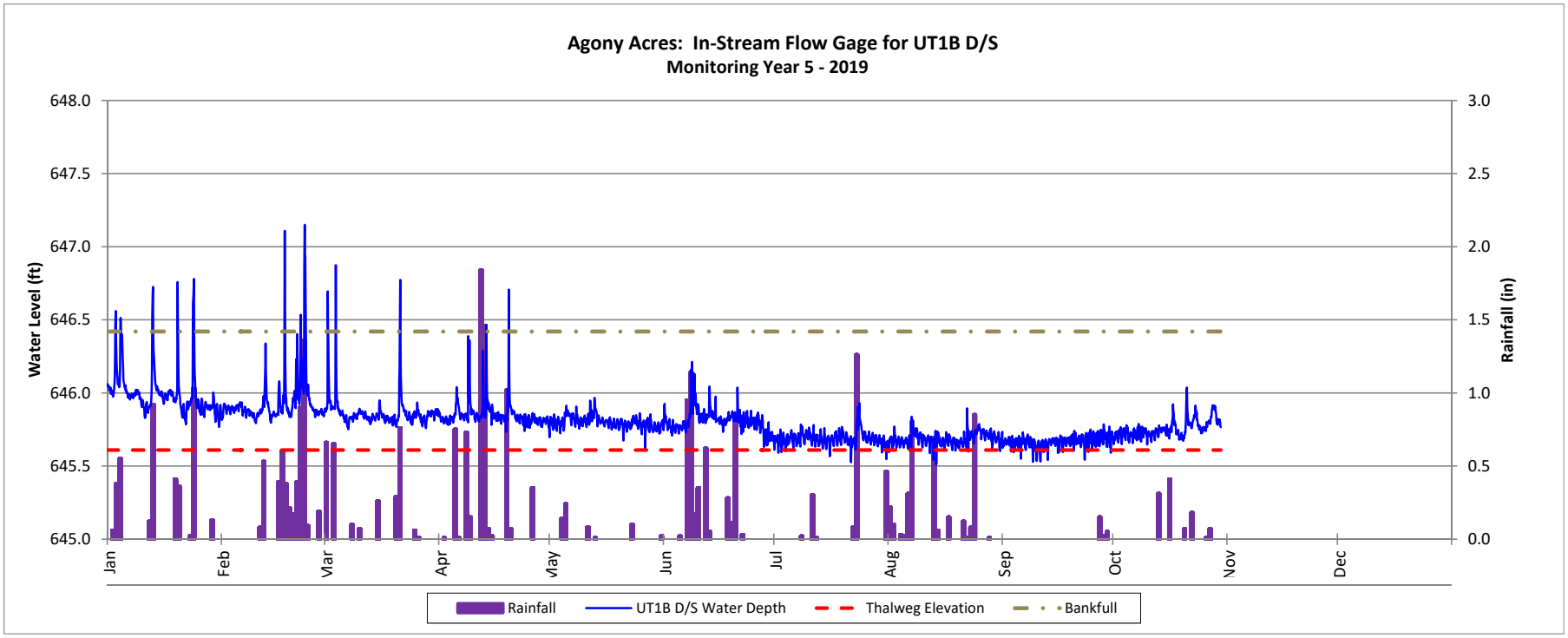
Monitoring Year 5 - 2019



Recorded In-Stream Flow Events

Agony Acres Mitigation Site (DMS Project No. 95716)

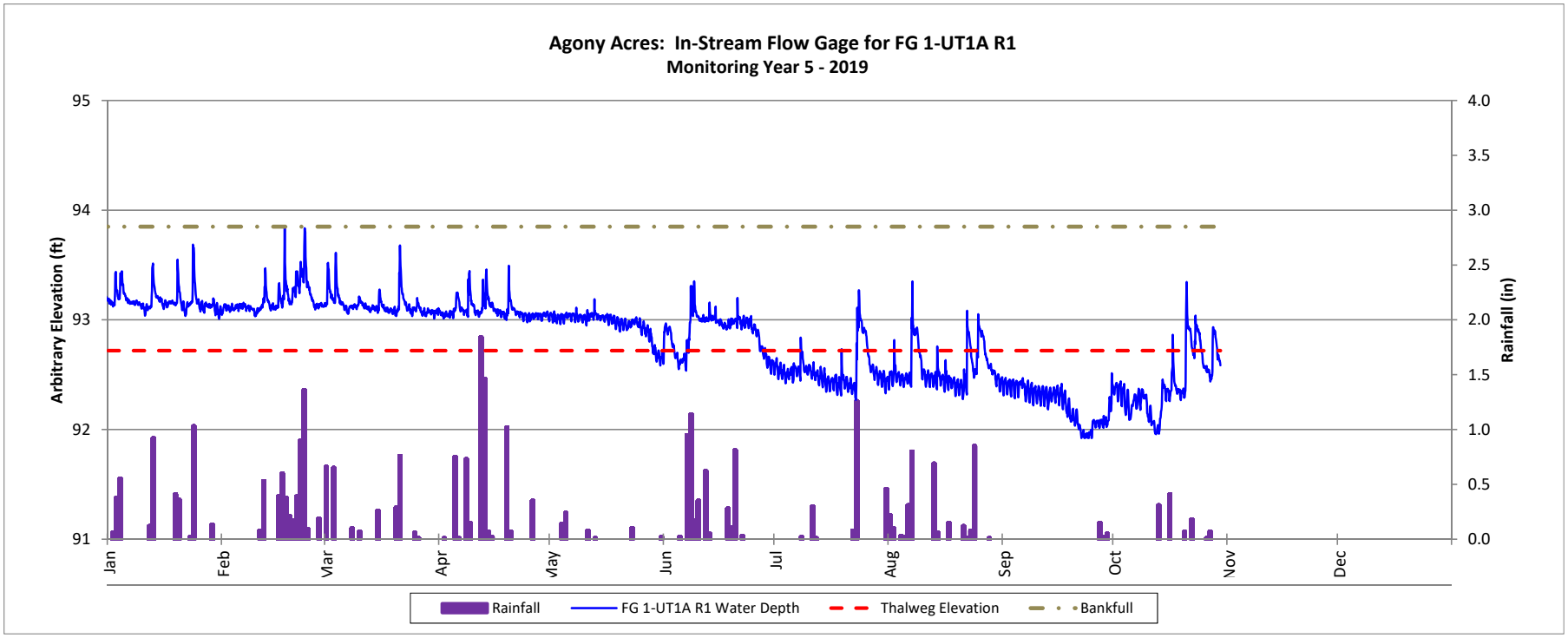
Monitoring Year 5 - 2019



Recorded In-Stream Flow Events

Agony Acres Mitigation Site (DMS Project No. 95716)

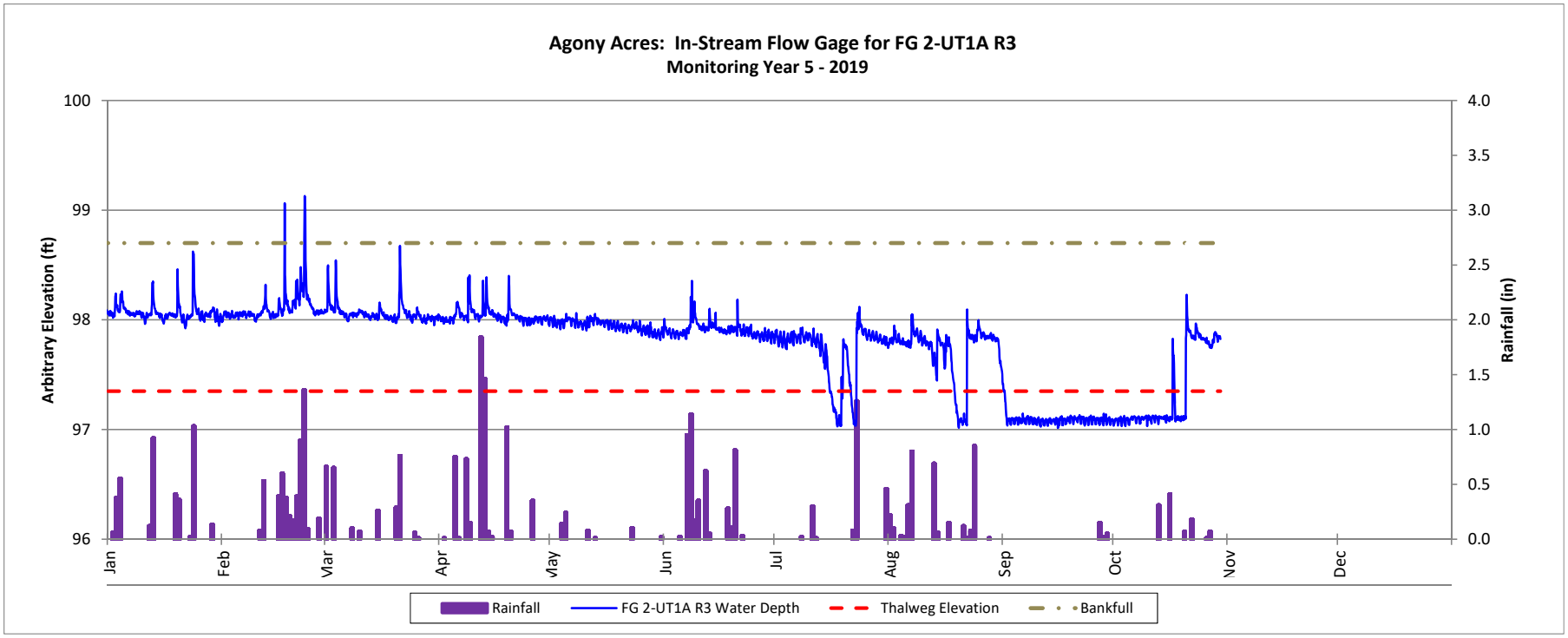
Monitoring Year 5 - 2019



Recorded In-Stream Flow Events

Agony Acres Mitigation Site (DMS Project No. 95716)

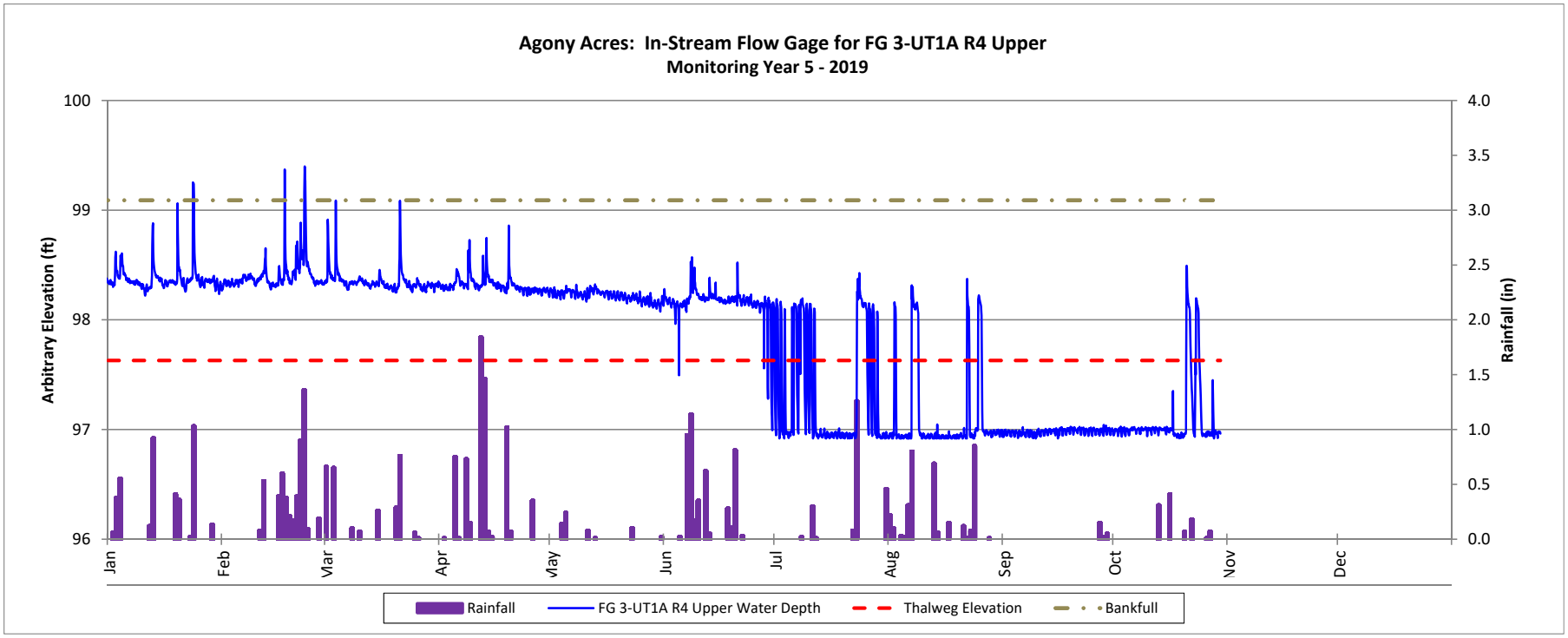
Monitoring Year 5 - 2019



Recorded In-Stream Flow Events

Agony Acres Mitigation Site (DMS Project No. 95716)

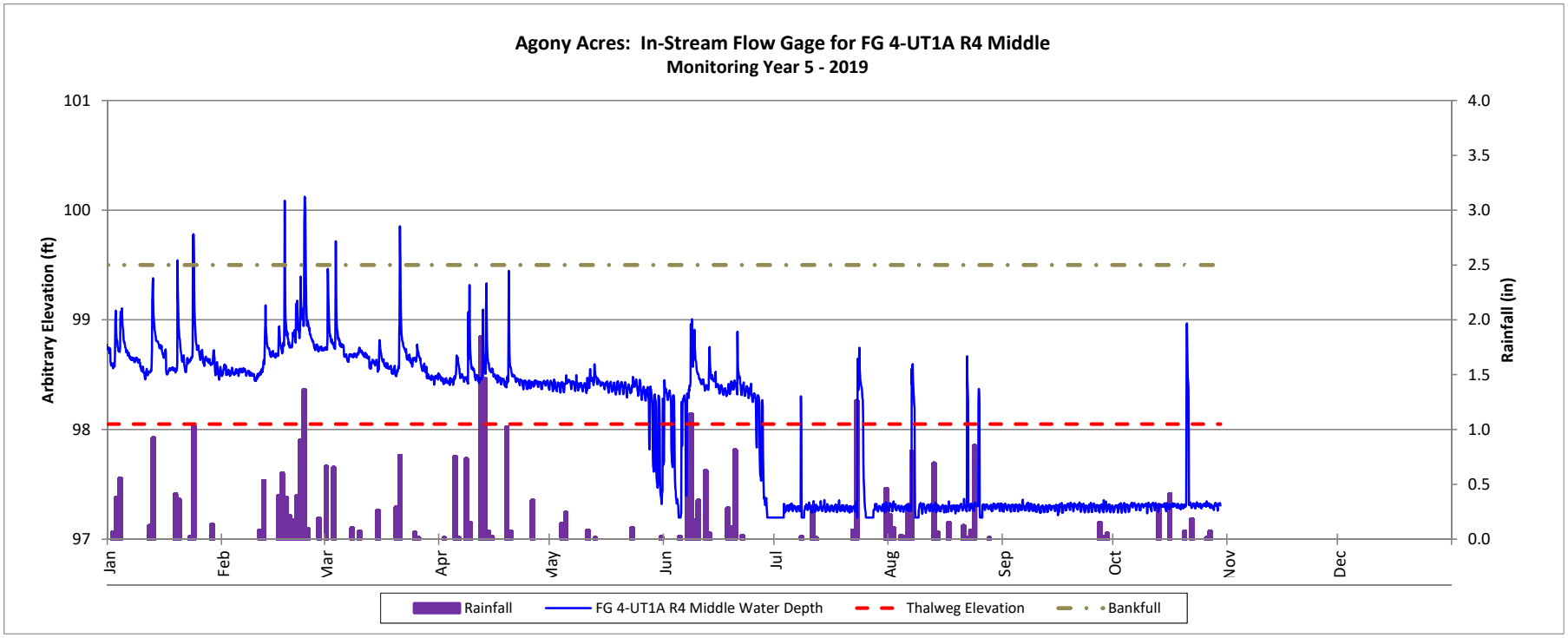
Monitoring Year 5 - 2019



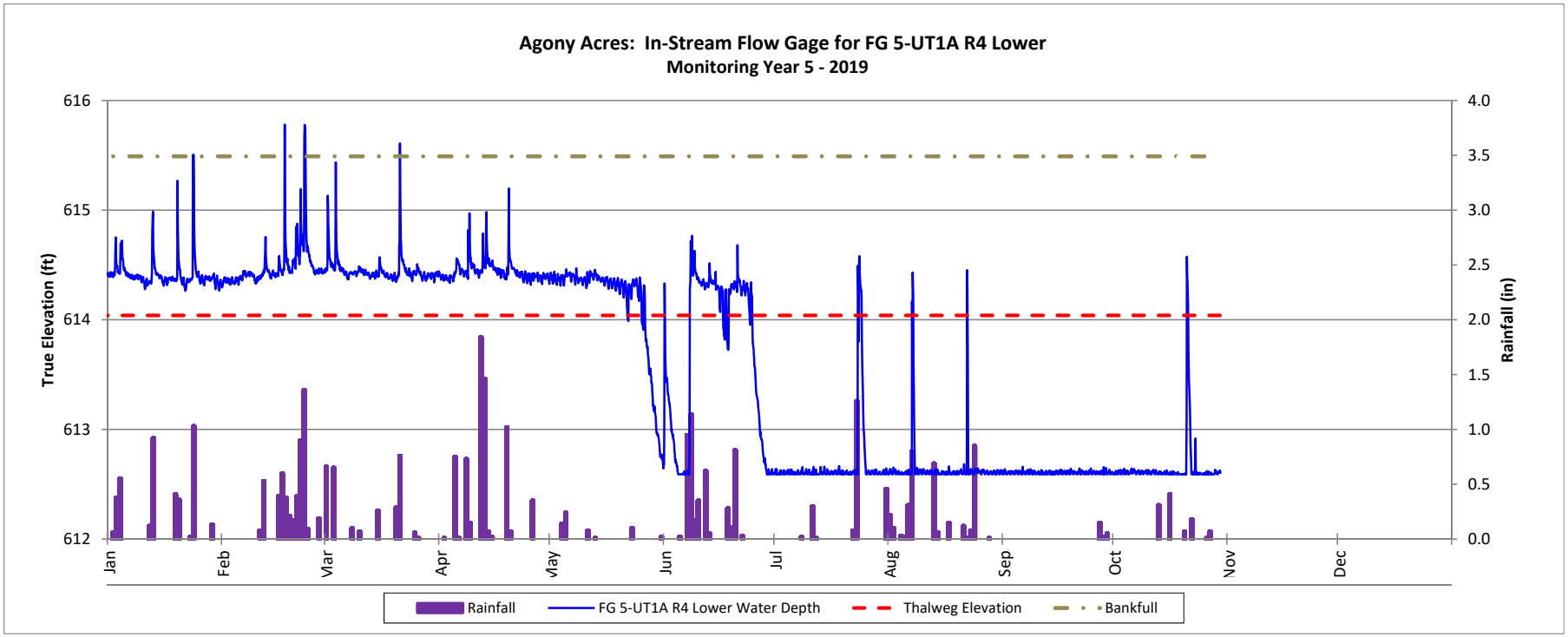
Recorded In-Stream Flow Events

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019



Recorded In-Stream Flow Events

Agony Acres Mitigation Site (DMS Project No. 95716)

Monitoring Year 5 - 2019