MONITORING YEAR 1 ANNUAL REPORT

Final

LONE HICKORY MITIGATION SITE

Yadkin County, NC
DEQ Contract No. 6897
DMS Project No. 97135
DWR No. 20161044
USACE Action ID No. SAW-2017-00100
Yadkin River Basin
HUC 03040101

Data Collection Period: May 2019 – November 2019
Final Submission Date: January 14, 2020

PREPARED FOR:

NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
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PREPARED BY:

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January 14, 2020

Mr. Paul Wiesner
Western Regional Supervisor
NCDEQ – Division of Mitigation Services
5 Ravenscroft Dr., Suite 102
Asheville, NC 28801

RE: Lone Hickory Mitigation Site – Monitoring Year 1 Report Final
Yadkin River Basin – CU# 03040101 – Yadkin County
DMS Project ID No. 97135
Contract # 006897

Dear Mr. Wiesner:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services (DMS) comments from the Draft Monitoring Year (MY) 1 report for the Lone Hickory Mitigation Site. Wildlands' responses to DMS' report comments are noted below in *italics*.

DMS comment; Cover Page: Please update the DWR # to 20161044 to be consistent with the DWR website and document upload page. This is just a minor formatting update.

Wildlands response; The cover page has been updated.

DMS comment; Executive Summary: The summary notes that the project restored and/or preserved a total of 12,630 linear feet of stream. Table 1 notes 12,621 linear feet. Please update.

Wildlands response; The length has been updated to 12,621 linear feet in the Executive Summary.

DMS comment; Report text & IRT Site Visit Meeting Minutes 8/19/2019: During the August 2019 IRT site visit, the IRT noted a grass that was similar to Johnson grass adjacent to UT1. Please address/discuss in the report text.

Wildlands response; The Johnson grass-like specimen noted during the August 2019 IRT site visit was later identified by Wildlands to be barnyard grass (Echinochloa sp.). We expect this grass will be shaded out over time but will continue to monitor its density and coverage at the Site and treat if it seems to be crowding out floodplain vegetation diversity. Text has been added to section 1.2.2.

DMS comment; During the August 2019 site visit, DMS and the IRT observed that the BMP overflow channel from BMP4 had been eroded by recent storm flow. Based on WEI's assessment, DMS understands that this damaged area is noncredit generating. The meeting minutes indicate that WEI planned to repair this area by the end of September 2019. Please address and update the report text accordingly.

Wildlands response; Wildlands completed a repair to the overflow channel from BMP4 in September 2019. Text has been added to section 1.2.5.

DMS comment; Section 1.2 – Monitoring Year 1 Data Assessment: The report notes that annual monitoring for MY1 was conducted from March 2019-November 2019. Based on Table 2, site planting was not completed until April 2019. DMS recommends updating this to May 2019-November 2019 report wide.

Wildlands response; Wildlands had originally noted the MY1 assessment beginning in March 2019 since that is when the hydrologic gage data collection began. For consistency, the MY1 assessment dates have been updated to May 2019 – November 2019 throughout the report.

DMS comment; Section 1.2.4 – Stream Hydrology Assessment & CCPV Maps: Do the CCPV maps show the October 2019 relocated stream gages on UT2A and UT2B or the MY0-MY1 gage locations? Since these gages were not relocated until October 2019, DMS recommends showing the previous MY0 locations in the MY1 report and updating the mapped locations (and digital support files) in the 2020 - MY2 report. Please address and update the report text accordingly.

Wildlands response; The CCPV maps submitted with the MY1 draft report showed the relocated stream gage locations on UT2A and UT2B. The CCPV maps and digital support files have been updated to show the previous MY0-MY1 stream gage locations on UT2A and UT2B and text has been added to section 1.2.4. Going forward, the MY2 report will show the relocated stream gage locations.

DMS comment; Section 1.2.6 – Wetland Assessment: In the report text, please confirm that the groundwater gage maintenance (GWG 6) and gage calibration was completed as requested/noted in the August 19, 2019 IRT site visit meeting minutes.

Wildlands response; Text has been added to section 1.2.6 to confirm that groundwater gage maintenance and calibration was completed in MY1. The manual water level measurement data points have been added to groundwater gage plots in Appendix 5.

DMS comment; Table 1: In the Project Credits section, the 9.5 WMUs should be placed in the Re-establishment row.

Wildlands response; Table 1 has been updated.

DMS comment; Groundwater gage plots: For clarity, consider adding the consecutive day number for each gage on the groundwater gage plots instead of using the currently shown 19-day bar. The 19-day bar adds some confusion to the plots without a description of what it corresponds too (9.2% of the growing season).

Wildlands response; For clarity, the maximum number of consecutive days achieved by each gage has been added to all groundwater gage plots instead of the 19-day bar.

DMS comment; In-Stream flow gage plots: For clarity, consider reporting the maximum consecutive days achieved for each gage on the individual graph. It would also be helpful to show a start and end line that corresponds with the consecutive days reported. Note that gage #1 has a "30 days" line but the other graphs do not. All gage graphs should be consistent in format.

Wildlands response; For clarity, the maximum number of consecutive days achieved by each gage has been added to all stream gage plots.

DMS comment; Digital Support File Comments: Please provide all required digital support files as specified in the applicable DMS monitoring template. The GIS stream and wetland features for this project were not included in the digital support files. Please provide DMS with GIS features segmented based on the asset table for which linear feet/ acres of the features match the linear feet/ acres reported in the asset table.

Wildlands response; All CCPV GIS data has been added to the support files in the electronic submittal. The stream and wetland GIS features that match the linear feet/acres reported in the asset table are found in the "LH_ALIGNS_CL" and "LH_Wetland_Reest" shapefiles.

Two (2) hard copies of the Final Monitoring Report and a full electronic submittal has been mailed to the DMS western field office. Please contact me at 704-332-7754 x106 if you have any questions.

Sincerely,

Emily Reinicker, PE, CFM
Project Manager

EXECUTIVE SUMMARY

Wildlands Engineering, Inc. (Wildlands) implemented a full-delivery stream and wetland mitigation project at the Lone Hickory Mitigation Site (Site) for the North Carolina Department of Environmental Quality (DEQ) Division of Mitigation Services (DMS). The project restored and preserved a total of 12,621 linear feet (LF) of perennial and intermittent stream and restored 9.5 acres of riparian wetland in Yadkin County, NC. The Site is located within the DMS targeted watershed for the Yadkin River Basin HUC 03040101130020 and the NC Division of Water Resources (NCDWR) Subbasin 03-07-02. The project is providing 13,164.000 stream mitigation units (SMUs) and 9.500 wetland mitigation units (WMUs) for the Yadkin River Basin Hydrologic Unit Code (HUC) 03040101 (Yadkin 01).

The watershed has a long history of agricultural activity and most of the stressors to stream functions are related to this historic and current land use practices. The major stream stressors for the Site were concentrated agricultural runoff inputs, active stream incision and head cutting, lack of stabilizing streamside vegetation, extensive agricultural manipulation through ditching, and the lack of bedform diversity. The effects of these stressors resulted in degraded water quality and habitat throughout the Site's watershed when compared to reference conditions. The project approach for the Site focused on evaluating the Site's existing functional condition and evaluating its potential for recovery and need for intervention.

The project goals defined in the mitigation plan (Wildlands, 2017) were established with careful consideration of 2009 Upper Yadkin Pee Dee River Basin Restoration Priorities (RBRP) goals and objectives to address stressors identified in the watershed. The established project goals include:

- Improve stream channel stability;
- Reconnect channels with historic floodplains and re-establish wetland hydrology and function in relic wetland areas;
- Improve instream habitat;
- Reduce sediment and nutrient input from adjacent farm fields;
- Restore and enhance native floodplain and wetland vegetation; and
- Permanently protect the project site from harmful uses.

The Site construction and as-built surveys were completed in April 2019. Monitoring Year (MY) 1 assessments and site visits were completed between April and November 2019 to assess the conditions of the project.

Overall, the Site has met the required stream, vegetation, and hydrology success criteria for MY1. The overall average planted stem density for the Site is 491 stems per acre and is on track to meet the MY3 requirement of 320 stems per acre. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring, and streams are functioning as intended. At least one bankfull event was documented on UT3 Reach 3 and UT2B since the completion of construction. All nine gages that were initially installed at baseline in the wetland re-establishment area are meeting or exceeding hydrology success criteria. The MY1 visual assessment identified a few areas of concern including populations of invasive plant species and an isolated area of bed and bank scour. Wildlands will continue to monitor these areas, and an adaptive management plan will be implemented as necessary throughout the seven-year monitoring period to benefit the ecological health of the Site.

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APPENDICES

Section 1: PROJECT OVERVIEW

The Lone Hickory Mitigation Site (Site) is located in Yadkin County approximately 3.5 miles south of the town of Yadkinville, NC in the Yadkin River Basin HUC 03040101130020 and NCDWR Subbasin 03-07-02 (Figure 1). Located in the Inner Piedmont lithotectonic belt within the Piedmont physiographic province (NCGS, 1985), the project watershed is dominated by agricultural and forested land.

The Site contains two valleys, separated by a ridge that runs north to south through the project limits. South Deep Creek flows along the northern boundary of the project. On the east side of the ridge (herein referenced as the East Side), UT1 flows through a steep, narrow valley that gradually widens and flattens in slope as it flows downstream to the South Deep Creek floodplain. UT1 is joined by UT1A and UT1B within the Site limits before flowing offsite to join South Deep Creek. On the west side of the ridge (herein referenced as the West Side), UT2 and UT3 flow out of steep, narrow valleys into the broad, flat floodplain of South Deep Creek. UT2A and UT2B join UT2 before the stream's confluence with South Deep Creek. The East Side of the Site drains 0.44 square miles and the West Side of the Site drains 0.87 square miles of rural land.

Prior to construction activities, the Site has a history of use for both crop production and as a dairy farm resulting in degraded in-stream habitat and sediment erosion. Within the East Side of the Site, the streams were manipulated through ditching, impoundments, and land use changes. The West Side streams were ditched and re-routed with the adjacent floodplain previously altered for agricultural uses. The riparian buffers on both sides exhibited a lack of stabilizing streamside vegetation due to agricultural practices. Tables 11a – 11d in Appendix 4 present the pre-restoration conditions in detail.

Construction activities were completed in April 2019 by KBS Earthworks, Inc. Turner Land Surveying, PLLC. completed the as-built survey in April 2019. Planting was completed following construction in the spring of 2019 by Bruton Natural Systems, Inc. A conservation easement has been recorded and is in place on 103 acres. The project is providing 13,164.000 SMUs and 9.500 WMUs for the Yadkin River Basin 03040101 HUC (Yadkin 01). Annual monitoring will be conducted for seven years with close-out anticipated to commence in 2026 given the success criteria are met.

Directions and a map of the Site are provided in Figure 1 and project components are illustrated for the Site in Figure 2.

1.1 Project Goals and Objectives

The Site is providing numerous ecological benefits within the Yadkin Valley Basin. The project goals were established with careful consideration to address stressors that were identified in the NCDWR 2008 Yadkin River Basinwide Plan (NCDWR, 2008) and the RBRP (EEP, 2009).

The following project specific goals and objectives outlined in the mitigation plan (Wildlands, 2017) include:

Goals	Objectives
Improve stream channel stability.	Restore stream channels that will maintain a stable pattern and profile considering the hydrologic and sediment inputs to the system, the landscape setting, and the watershed conditions. Create stable tie-ins for tributaries joining restored channels. Add bank revetments and in-stream structures to protect restored streams.
Reconnect channels with historic floodplains and re-establish wetland hydrology and function in relic wetland areas.	Remove man-made impoundments, remove culvert crossings, and restore historic valley profile. Remove historic overburden from farm fields. Reconstruct stream channels with bankfull dimensions relative to the floodplain. Restore stream plan form to promote development of mutually beneficial stream/wetland complex.
Improve instream habitat.	Remove man-made impoundments and culvert crossings within easement. Install habitat features such as constructed riffles, cover logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth.
Reduce sediment and nutrient input from adjacent farm fields.	Construct two step pool stormwater conveyance and three dry detention BMPs to slow and treat runoff from farm fields before entering Site streams.
Restore and enhance native floodplain and wetland vegetation.	Plant native tree and understory species in riparian zone where currently insufficient.
Permanently protect the project site from harmful uses.	Establish a conservation easement on the Site.

1.2 Monitoring Year 1 Data Assessment

Annual monitoring was conducted during MY1 (May to November 2019) to assess the condition of the project. The stream, vegetation, and hydrologic success criteria for the Site follows the approved success criteria presented in the Lone Hickory Mitigation Plan (Wildlands, 2017).

1.2.1 Vegetation Assessment

Vegetation plot monitoring is being conducted in post-construction monitoring years 1, 2, 3, 5, and 7. Permanent plots are monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008) and the 2016 USACE Stream and Wetland Mitigation Guidance to assess the vegetation success. A total of 25 permanent vegetation plots were established within the project easement area. All of the permanent plots were established as a

standard 10 meter by 10 meter square plot. In addition, 15 mobile vegetation plots were established in monitoring year 1 throughout the planted conservation easement to evaluate the random vegetation performance for the Site. These plots will be subsequently reestablished in different random locations in monitoring years 2, 3, 5 and 7. Mobile vegetation monitoring plot assessments will document stems, species, and height using a circular or 100 meter square/rectangular plot. The final vegetative performance standard will be the survival of 210 planted stems per acre in the planted riparian areas at the end of the required seven-year monitoring period. The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of MY3 and at least 260 stems per acre at the end of MY5.

The MY1 vegetation survey was completed in October 2019, resulting in an average planted stem density of 491 stems per acre for all monitored permanent and mobile vegetation plots. The Site is on track to meet the MY3 density requirement of 320 planted stems per acre with all (25) of the permanent plots individually on track to meet this requirement. For the mobile vegetation plots, 11 of the 15 plots are individually on track to meet the interim MY3 density requirement. Three of the four mobile plots not meeting the MY3 density requirement were located within the west side of the Site in areas where dense herbaceous cover is competing with planted stems.

Approximately 74% of the planted stems in permanent plots are thriving with a health score (vigor) of 3 or greater. However, about 10% of the stems have a vigor of 2 or less indicating that some may not survive next year and 3% of the stems were missing. The poor tree health is a result of suffocation from dense herbaceous cover, insects, deer, or other unknown factors. This leaves a mortality rate of about 13% of the baseline planted stem count in permanent vegetation plots. Furthermore, tulip poplars (*Liriodendron tulipifera*) and swamp chestnut oaks (*Quercus michauxii*) were the planted tree species with the highest mortality rates in MY1. Please refer to Appendix 2 for permanent vegetation plot photographs, Figures 3.0-3.5 for vegetation plot locations, and Appendix 3 for vegetation data tables.

1.2.2 Vegetation Areas of Concern and Management Activity

MY1 visual assessments indicate that some invasive plant populations are present within the conservation easement. These species include: kudzu (*Pueraria montana*), Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), tree of heaven (*Ailanthus altissima*), and Asian spiderwort (*Murdannia keisak*). In MY1, adaptive management occurred in September and October of 2019 by Wildlands staff. Primary focus areas for treatment included populations of kudzu re-sprouts within the Site near UT2, UT3, and UT3A that were previously treated prior to construction. In addition, aquatic invasive plant species including Asian spiderwort were treated within UT1. During the August 2019 IRT site visit, a grass noted to be similar to Johnson grass adjacent to UT1 was later identified by Wildlands to be barnyard grass (*Echinochloa sp.*). It is expected that this grass will be shaded out over time. Along UT3, small areas of the floodplain were re-seeded to promote stronger herbaceous cover. These vegetation areas of concern will continue to be monitored and addressed by Wildlands throughout the monitoring period. Current vegetation areas of concern are shown in Current Condition Plan View (CCPV) Figures 3.0-3.5 in Appendix 2.

1.2.3 Stream Assessment

Riffle cross-sections on the restoration and enhancement I reaches should be stable and show little change in bankfull area, maximum depth ratio, and width-to-depth ratio. Per the Interagency Review Team (IRT) guidance, bank height ratios shall not exceed 1.2 and entrenchment ratios shall be at least 1.4 for restored B channels and 2.2 for restored C channels to be considered stable. All riffle cross-sections should fall within the parameters defined for channels of the appropriate stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing

signs of instability. Indicators of instability include trends in vertical incision or bank erosion. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability. Please note that the downstream extent of UT3 Reach 3 was designed to deepen relative to its floodplain as it transitions to meet the invert of South Deep Creek, and this reach is expected to have a bank height ratio greater than 1.0 and an entrenchment ratio less than 2.2.

Morphological surveys for MY1 were conducted during October 2019. Cross-section survey results indicate that channel dimensions are stable and functioning as designed on all restoration reaches with minimal adjustments. Some in-stream vegetation is visible within the channel along UT1, UT2, UT2A, and UT2B but has not adversely affected stream form or function with little change in bankfull dimensions in comparison to the baseline survey. In future years, as woody stems become more established in-stream vegetation is expected to be shaded out and diminish.

Reachwide pebble counts along all restoration reaches indicate maintenance of coarser materials in riffle features and finer particles in the pool features. Refer to Appendix 2 for the visual stability assessment tables, CCPV maps, and reference photographs. Refer to Appendix 4 for the morphological tables and plots.

1.2.4 Stream Hydrology Assessment

At the end of the seven-year monitoring period, four or more bankfull flow events must have occurred in separate years within the restoration reaches. In MY1, at least one bankfull event was recorded on two of the stream restoration reaches (UT3 Reach 3, and UT2B).

Consistent flow must be documented in the restored intermittent channels (UT1 Reach 1, UT2A, and UT2B) at the Site. Under periods of normal rainfall, stream flow must be documented to occur every year for at least 30 consecutive days during the seven-year monitoring period. On UT1 Reach 1 and UT2A, 209 and 64 consecutive days were documented respectively in MY1 indicating that these two reaches exceeded success criteria for intermittent channels. UT2B did not meet the success criteria for this initial monitoring year with 23 consecutive days of stream flow documented in MY1. Per the IRT recommendations following the site walk on August 19, 2019, the stream gages on UT2A and UT2B were relocated upstream above mid-reach on these intermittent channels on October 25, 2019. The CCPV maps in Appendix 2 show the original locations of the stream gages on UT2A and UT2B. Please refer to Appendix 5 for hydrology summary data and plots.

1.2.5 Stream Areas of Concern

MY1 visual assessments indicate that very few stream areas of concern exist on the Site, and project streams are functioning as designed. Along UT3 Reach 1, one isolated area of bank scour and bed degradation was observed along the riffle at station 304+20. After construction, storm flow caused scour along the outflow channel from BMP4. A repair was completed in September 2019 to stabilize the outflow channel from BMP4 above the start of UT2B. Wildlands will continue to monitor stream areas of concern for accelerated instability and will be addressed as needed throughout the monitoring period. Please refer to Appendix 2 for current CCPV Figures 3.0-3.5 and stream stability tables.

1.2.6 Wetland Assessment

Nine groundwater monitoring gages (GWGs) were initially installed during baseline monitoring within the wetland re-establishment area using In-situ Level TROLL® 100 pressure transducers. Following recommendations from the August 19, 2019 IRT site walk, an additional gage (GWG 10) was installed adjacent to GWG 4 but outside of the former ditch location at the end of October 2019. A reference

gage was established in a nearby reference wetland and will be utilized to compare the hydrologic response within the restored wetland areas at the Site. All monitoring gages are downloaded on a quarterly basis and maintained as needed. As requested during the August 19, 2019 IRT site walk, the filter sock on GWG 6 was trimmed and bentonite was added to gages as needed. Calibration was completed by manually measuring water levels on all gages which confirmed the downloaded data. The final performance standard for wetland hydrology is the presence of groundwater within 12 inches of the ground surface for 19 consecutive days (9.2%) of the defined growing season for Yadkin County (April 4 through October 27) under typical precipitation conditions. The Site does not contain a rainfall gage; therefore, the daily precipitation data was collected from closest NC Climate Retrieval and Observations Network of the Southeast Database (NC CRONOS) Station, Yadkinville 0.2 E, NC.

Of the nine GWGs that were installed during baseline monitoring, all met or exceeded the success criteria for MY1 and ranged from 11.1% to 52.7% of the growing season. Monthly rainfall data in 2019 indicated higher than normal rainfall amounts occurred during the months of February, June, and October and lower than normal rainfall amounts occurred during March, July, and September 2019. Please refer to Figures 3.0-3.5 in Appendix 2 for the groundwater gage locations and Appendix 5 for hydrology data and plots.

As discussed at the beginning of this section, GWG 10 was installed at the end of the growing season in 2019. The reporting of monitoring data for GWG 10 will begin in MY2 and GWG 4 will be omitted in future monitoring reports.

1.3 Monitoring Year 1 Summary

Overall, the Site has met the required stream, vegetation, and hydrology success criteria for MY1. The overall average planted stem density for the Site is 491 stems per acre and is on track to meet the MY3 requirement of 320 stems per acre. Geomorphic surveys indicate that cross-section bankfull dimensions closely match the baseline monitoring, and streams are functioning as intended. At least one bankfull event was documented on UT3 Reach 3 and UT2B since the completion of construction. All nine gages that were initially installed at baseline in the wetland re-establishment area are meeting or exceeding hydrology success criteria. The MY1 visual assessment identified a few areas of concern including populations of invasive plant species and an isolated area of bed and bank scour. Wildlands will continue to monitor these areas, and an adaptive management plan will be implemented as necessary throughout the seven-year monitoring period to benefit the ecological health of the Site.

Section 2: METHODOLOGY

Geomorphic data were collected following the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). All Integrated Current Condition Mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using Pathfinder and ArcGIS. Stream gages were installed in riffles and monitored quarterly. Hydrologic monitoring instrument installation and monitoring methods are in accordance with the United States Army Corps of Engineers (USACE, 2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

Section 3: REFERENCES

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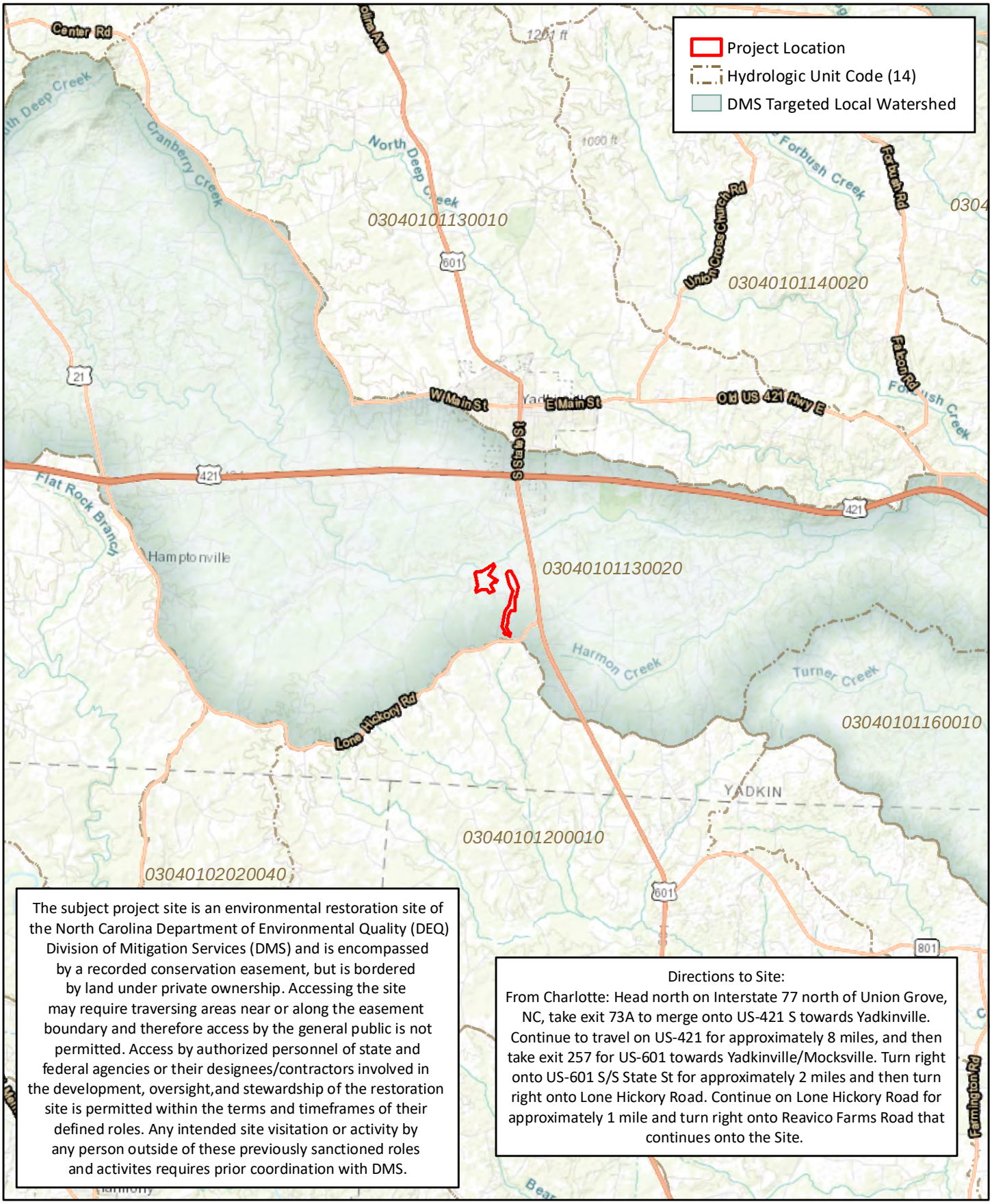
APPENDIX 1. General Figures and Tables



WILDLANDS ENGINEERING

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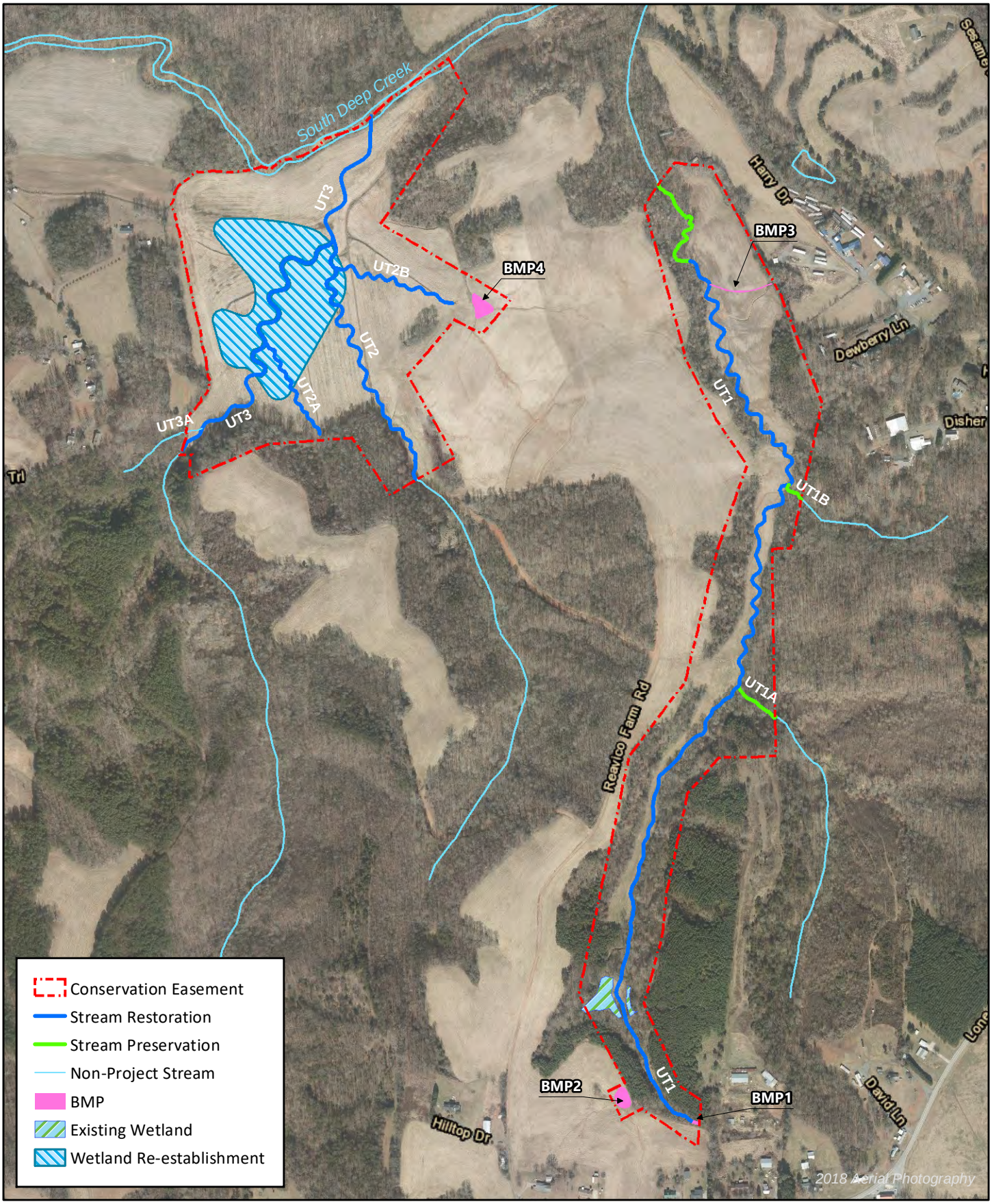
Figure 1 Project Vicinity Map
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Yadkin County, NC



WILDLANDS ENGINEERING

0 350 700 Feet

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Figure 2 Project Component/Asset Map
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Yadkin County, NC

Table 1. Mitigation Assets and Components

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Project Components								
Project Area/Reach	**Existing Footage (LF) or Acreage**	**Mitigation Plan Footage/ Acreage**	**Mitigation Category**	**Restoration Level**	**Priority Level**	**Mitigation Ratio (X:1)**	**As-Built Footage/ Acreage**	**Project Credit [1 2]**
UT1, R1, R2a, R2b, R3	6,015	5,721	Warm	Restoration	P1, P2	1.000	5,721	6,698.000
UT1 R4	659	659	Warm	Preservation	P4	10.000	659	66.000
UT1A	230	282	Warm	Preservation	N/A	10.000	282	28.000
UT1B	48	124	Warm	Preservation	N/A	10.000	123	12.000
UT2 R1, R2	2,527	1,703	Warm	Restoration	P1, P2	1.000	1,703	1,933.000
UT2A	1,184	655	Warm	Restoration	P1	1.000	655	699.000
UT2B	699	784	Warm	Restoration	P1, P2	1.000	776	893.000
UT3 R1, R2, R3	2,008	2,702	Warm	Restoration	P1, P2	1.000	2,702	2,835.000
West Side Wetlands	N/A	9.5	Warm	Re-establishment		1.000	9.5	9.500

Project Credits							
Restoration Level	**Stream**			**Riparian Wetland**		**Non-Riparian Wetland**	**Coastal Marsh**
	Warm	**Cool**	**Cold**	**Riverine**	**Non-Riv**		
Restoration	13,058.000	N/A	N/A	N/A	N/A	N/A	N/A
Re-establishment				9.500	N/A	N/A	N/A
Rehabilitation				N/A	N/A	N/A	N/A
Enhancement				N/A	N/A	N/A	N/A
Enhancement I	N/A	N/A	N/A				
Enhancement II	N/A	N/A	N/A				
Creation				N/A	N/A	N/A	N/A
Preservation	106.000	N/A	N/A	N/A	N/A	N/A	
Totals	**13,164.000**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**

Notes:

1. No direct credit for BMPs.

2. Credits reported have been adjusted based on buffer width deviations from standard 50-foot buffer width.

Table 2. Project Activity and Reporting History

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Activity or Report		Data Collection Complete	Completion or Delivery
404 Permit		April 2018	April 2018
Mitigation Plan		July - December 2016	December 2017
Final Design - Construction Plans		June 2018	June 2018
Construction		Oct 2018 - April 2019	Oct 2018 - April 2019
Temporary S&E mix applied to entire project area[1]		Oct 2018 - April 2019	Oct 2018 - April 2019
Permanent seed mix applied to reach/segments		Oct 2018 - April 2019	Oct 2018 - April 2019
Bare root and live stake plantings for reach/segments		February 2019 - April 2019	April 2019
Baseline Monitoring Document (Year 0)		February 2019 - May 2019	June 2019
Invasive Species Treatment		September 2019 - October 2019	October 2019
Supplemental seeding applied to UT3 floodplain		September 2019 - October 2019	October 2019
Year 1 Monitoring	Stream Survey	October 2019	November 2019
	Vegetation Survey	October 2019	
Year 2 Monitoring	Stream Survey	2020	November 2020
	Vegetation Survey	2020	
Year 3 Monitoring	Stream Survey	2021	November 2021
	Vegetation Survey	2021	
Year 4 Monitoring	Stream Survey	2022	November 2022
	Vegetation Survey	2022	
Year 5 Monitoring	Stream Survey	2023	November 2023
	Vegetation Survey	2023	
Year 6 Monitoring	Stream Survey	2024	November 2024
	Vegetation Survey	2024	
Year 7 Monitoring	Stream Survey	2025	November 2025
	Vegetation Survey	2025	

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

Table 3. Project Contact Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Designers Emily Reinicker, PE, CFM	**Wildlands Engineering, Inc.** 1430 South Mint Street, Suite 104 Charlotte, NC 28203 704.332.7754
Construction Contractors	**KBS Earthworks, Inc.** 5616 Coble Church Road Julian, NC 27283
Planting Contractor	**Bruton Natural Systems, Inc.** PO Box 1197 Freemont, NC 27830
Seeding Contractor	**KBS Earthworks, Inc.**
Seed Mix Sources	**KBS Earthworks, Inc.**
Nursery Stock Suppliers **Bare Roots** **Live Stakes** **Herbaceous Plugs**	**Bruton Natural Systems, Inc.**
Monitoring Performers	**Wildlands Engineering, Inc.** Kristi Suggs 704.332.7754

Table 4. Project Information and Attributes

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Project Information	
Project Name	Lone Hickory Mitigation Site
	Yadkin County
Project Area (acres)	103.000
Project Coordinates (latitude and longitude)	36° 5' 39.16"N 80° 40' 2.14"W
Planted Acreage (Acre of Woody Stems Planted)	99.000
Project Watershed Summary Information	
Physiographic Province	Piedmont Physiographic Province
River Basin	Yadkin River
USGS Hydrologic Unit 8-digit	03040101
USGS Hydrologic Unit 14-digit	03040101130020
DWR Sub-basin	03-07-02
Project Drainage Area (acres)	286 (East Side), 170 (UT2 - West Side), 392 (UT3 – West Side)
Project Drainage Area Percentage of Impervious Area	3% (UT1 - East Side), 1% (UT2 – West Side), 2% (UT3 – West Side)
2011 NLCD Land Use Classification	UT1 - East Side: Forest (39%), Cultivated (42%), Grassland (4%), Shrubland (7%), Urban (8%), Open Water (0%) UT2 - West Side: Forest (31%), Cultivated (40%), Grassland (9%), Shrubland (10%), Urban (0%), Open Water (10%) UT3 - West Side: Forest (57%), Cultivated (22%), Grassland (5%), Shrubland (10%), Urban (3%), Open Water (3%)

Reach Summary Information

Parameters	UT1				UT1A	UT1B	UT2		UT2A	UT2B	UT3		
	R1	R2A/R2B	R3	R4			R1	R2			R1	R2	R3
Length of reach (linear feet) - Post-Restoration	966	3,114	1,641	659	282	123	623	1,080	655	776	779	1,159	764
Valley confinement (Confined, moderately confined, unconfined)	Confined	Confined to moderately confined			Confined	Confined	Moderately confined to unconfined		Unconfined	Unconfined	Moderately confined to unconfined		
Drainage area (acres)	286				92	31	170		27	6	392		
Perennial, Intermittent, Ephemeral	I/P	P	P	P	P	P	P		I/P	P	P		
NCDWR Water Quality Classification	WS-III				WS-III	WS-III	WS-III		WS-III	WS-III	WS-III		
Morphological Description (stream type) - Pre-Restoration	G, Straigthened E/G				-	-	G	G	G	G	G	G	G
Morphological Description (stream type) - Post-Restoration	A	B	C	-	-	-	B	C	C	C/Cb	Bc	C	C
Evolutionary trend (Simon's Model) - Pre- Restoration	III/IV/V				VI	VI	III/IV/V		III/IV/V	IV/V	IV/V		
FEMA classification	Last 400LF in Zone AE backwater from South Deep				None	None	Zone AE backwater from South Deep Creek						

Wetland Summary Information

Parameters	West Side Wetlands
Size of Wetland (acres)	9.5
Wetland Type	Riparian Riverine
Mapped Soil Series	Codorus loam/Dan River and Comus soils
Drainage class	Somewhat poorly drainage/well drained
Soil Hydric Status	Yes/No
Source of Hydrology	Groundwater
Restoration or enhancement method (hydrologic, vegetative etc.)	Re-establishment

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. 4134.
Waters of the United States - Section 401	Yes	Yes	USACE Action ID #SAW-2017-00100
Division of Land Quality (Erosion and Sediment Control)	Yes	Yes	NPDES Construction Stormwater General Permit NCG010000
Endangered Species Act	Yes	Yes	Categorical Exclusion Document in Mitigation Plan
Historic Preservation Act	Yes	Yes	Categorical Exclusion Document in Mitigation Plan
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	N/A	N/A
FEMA Floodplain Compliance	Yes	Yes	Yadkin County Floodplain Development Permit #2017-4.
Essential Fisheries Habitat	No	N/A	N/A

Table 5a. Monitoring Component Summary

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

East Side

Parameter	Monitoring Feature	Quantity / Length by Reach						Frequency	Notes
		UT1 Reach 1	UT1 Reach 2	UT1 Reach 3	UT1 Reach 4	UT1A	UT1B		
Dimension	Riffle Cross-Section	1	4	2	N/A	N/A	N/A	Year 1, 2, 3, 5, and 7	1
	Pool Cross-Section	1	3	2	N/A	N/A	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Substrate	Reach Wide (RW) Pebble Count	1 RW	1 RW	1 RW	N/A	N/A	N/A	Year 1, 2, 3, 5, and 7	3
Hydrology	Crest Gage (CG) and or/Transducer (SG)	1 SG	1 CG & SG					Semi-Annual	4
Vegetation	CVS Level 2/Mobile plots	15 (10 permanent, 5 mobile)						Year 1, 2, 3, 5, and 7	5
Visual Assessment		Yes						Semi-Annual	
Exotic and Nuisance Vegetation								Semi-Annual	6
Project Boundary								Semi-Annual	7
Reference Photos	Photographs	22						Annual	

Notes:

1. Cross-sections were permanently marked with rebar to establish location. Surveys include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.

2. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile was collected during as-built baseline monitoring survey only, unless observations indicate widespread lack of vertical stability (greater than 10% of reach is affected) and profile survey is warranted in additional years to monitor adjustments or survey repair work.

3. Riffle 100-count substrate sampling were collected during the baseline monitoring only.

4. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers, if used, will be set to record stage once every 2 hours. The transducer will be inspected and downloaded semi-annually. A transducer was installed on the intermittent portion of UT1 Reach 1 to document 30 days of continuous flow.

5. Permanent vegetation monitoring plot assessments will follow CVS Level 2 protocols. Mobile vegetation monitoring plot assessments will document number of planted stems, height, and species using a circular or 100 m2 square/rectangular plot. 2% of the non-shaded planted acreage will be monitored with permanent plots within the 50' stream buffer, and 1% of the non-shaded planted acreage will be monitored with mobile plots beyond the 50' stream buffer. Planted shaded areas will be visually assessed.

6. Locations of exotic and nuisance vegetation will be mapped.

7. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

Table 5b. Monitoring Component Summary

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

West Side

Parameter	Monitoring Feature	Quantity / Length by Reach								Frequency	Notes
		UT2 Reach 1	UT2 Reach 2	UT2A	UT2B	UT3 Reach 1	UT3 Reach 2	UT3 Reach 3	Wetland Re-establishment		
Dimension	Riffle Cross-Section	1	2	2	2.000	1	1	1	N/A	Year 1, 2, 3, 5, and 7	1
	Pool Cross-Section	1	1	2	2.000	1	1	1	N/A		
Pattern	Pattern	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	2
Profile	Longitudinal Profile	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Substrate	Reach Wide (RW) Pebble Count	1 RW	1 RW	1 RW	1 RW	1 RW	1 RW	1 RW	N/A	Year 1, 2, 3, 5, and 7	3
Stream Hydrology	Crest Gage (CG) and/or Transducer (SG)	1 CG & SG		1 CG & SG	1 CG & SG	1 CG & SG			N/A	Semi-Annual	4
Wetland Hydrology	Groundwater Gages								9	Quarterly	
Vegetation	CVS Level 2/Mobile Plots	25 (15 permanent, 10 mobile)								Year 1, 2, 3, 5, and 7	5
Visual Assessment		Yes								Semi-Annual	
Exotic and Nuisance Vegetation										Semi-Annual	6
Project Boundary										Semi-Annual	7
Reference Photos	Photographs	22								Annual	

Notes:

1. Cross-sections were permanently marked with rebar to establish location. Surveys include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.

2. Pattern and profile will be assessed visually during semi-annual site visits. Longitudinal profile was collected during as-built baseline monitoring survey only, unless observations indicate widespread lack of vertical stability (greater than 10% of reach is affected) and profile survey is warranted in additional years to monitor adjustments or survey repair work.

3. Riffle 100-count substrate sampling was collected during the baseline monitoring only.

4. Crest gages and/or transducers will be inspected quarterly or semi-annually, evidence of bankfull events will be documented with a photo when possible. Transducers, if used, will be set to record stage once every 2 hours. The transducer will be inspected and downloaded semi-annually. A transducer was installed on the intermittent portion of UT2A and UT2B to document 30 days of continuous flow.

5. Permanent vegetation monitoring plot assessments will follow CVS Level 2 protocols. Mobile vegetation monitoring plot assessments will document number of planted stems, height, and species using a circular or 100 m2 square/rectangular plot. 2% of the non-shaded planted acreage will be monitored with permanent plots within the 50' stream buffer, and 1% of the non-shaded planted acreage will be monitored with mobile plots beyond the 50' stream buffer. Planted shaded areas will be visually assessed.

6. Locations of exotic and nuisance vegetation will be mapped.

7. Locations of vegetation damage, boundary encroachments, etc. will be mapped.

PROJECT: Lone Hickory, Yadkin County, NC
DATE: August, 19 2019; 10:30 AM
LOCATION: Lone Hickory, Yadkinville, NC

Sign In

Company	Name
Wildlands	Shawn Wilkerson
Wildlands	Ben McGuire
NCDMS	Paul Wiesner
NCDMS	Kelly Phillips
DWR	Mac Haupt
USACE	Todd Tugwell

1. Livestakes used onsite: Silky Dogwood 40%, Silky Willow 50%, Black Willow 10%
2. Wildlands Land Management team to identify and address:
    a. Vegetation in UT1 stream channel 112+50 – 117+00.
    b. Along UT1 from 113+00-160+00 a grass that looks similar to Johnson Grass is growing throughout..
    c. A couple of kudzu sprouts were noted on a point bar of the West Side of UT3 around station 305+00.
3. UT2B Stream jurisdiction begins at the end of the overflow channel from BMP4. A short portion of this overflow channel (upstream of stream resource) has been eroded by BMP outlflow. The area with damage is not receiving credits.
    a. The outlet area and overflow channel will be repaired by the end of September.
4. Ground water gauges:
    a. GWG4 is loose. It is also installed over the filled ditch line. Add an additional ground water gauge adjacent to GWG4 but outside of the ditch.
    b. The sediment sock on GWG6 is above the ground level.
    c. Make sure the monitoring team is calibrating the gauges, provide manual measure-down to compare to data download.

General IRT notes for the future:

-Remove Green Ash from future planting plans.

-Stream gauges are to be installed no farther than midway down reaches.

Emily Reinicker

From: Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>
Sent: Wednesday, September 4, 2019 9:45 AM
To: Haupt, Mac; Wiesner, Paul; Browning, Kimberly D CIV USARMY CESAW (US)
Cc: Phillips, Kelly D; Ben McGuire; Shawn Wilkerson; Emily Reinicker; Kristi Suggs
Subject: RE: Lone Hickory_DMS# 97135: As-Built/ MY0 IRT Site Visit (8-19-19) Meeting Minutes

Follow Up Flag: Follow up
Flag Status: Flagged

Paul, I agree with Mac. I did note that both UT2A&B were both dry. UT2A did have water in the pools on the steeper section, but it had vegetation growing within the bed in the wetland area.

Todd

-----Original Message-----
From: Haupt, Mac [mailto:mac.haupt@ncdenr.gov]
Sent: Friday, August 30, 2019 2:23 PM
To: Wiesner, Paul <paul.wiesner@ncdenr.gov>; Tugwell, Todd J CIV USARMY CESAW (US) <Todd.J.Tugwell@usace.army.mil>; Browning, Kimberly D CIV USARMY CESAW (US) <Kimberly.D.Browning@usace.army.mil>
Cc: Phillips, Kelly D <Kelly.Phillips@ncdenr.gov>; Ben McGuire <bmcguire@wildlandseng.com>; Shawn Wilkerson <swilkerson@wildlandseng.com>; Emily Reinicker <ereinicker@wildlandseng.com>; Kristi Suggs <ksuggs@wildlandseng.com>
Subject: [Non-DoD Source] RE: Lone Hickory_DMS# 97135: As-Built/ MY0 IRT Site Visit (8-19-19) Meeting Minutes

Paul,

I would add two items:

I was concerned with the placement of both stream gauges on reaches UT2B and UT2A (as you recall, one of my comments on the draft mit plan was that stream gauges were to be placed no farther than midway down the reach). I would either like the gauges moved or add a camera at the recommended locations:

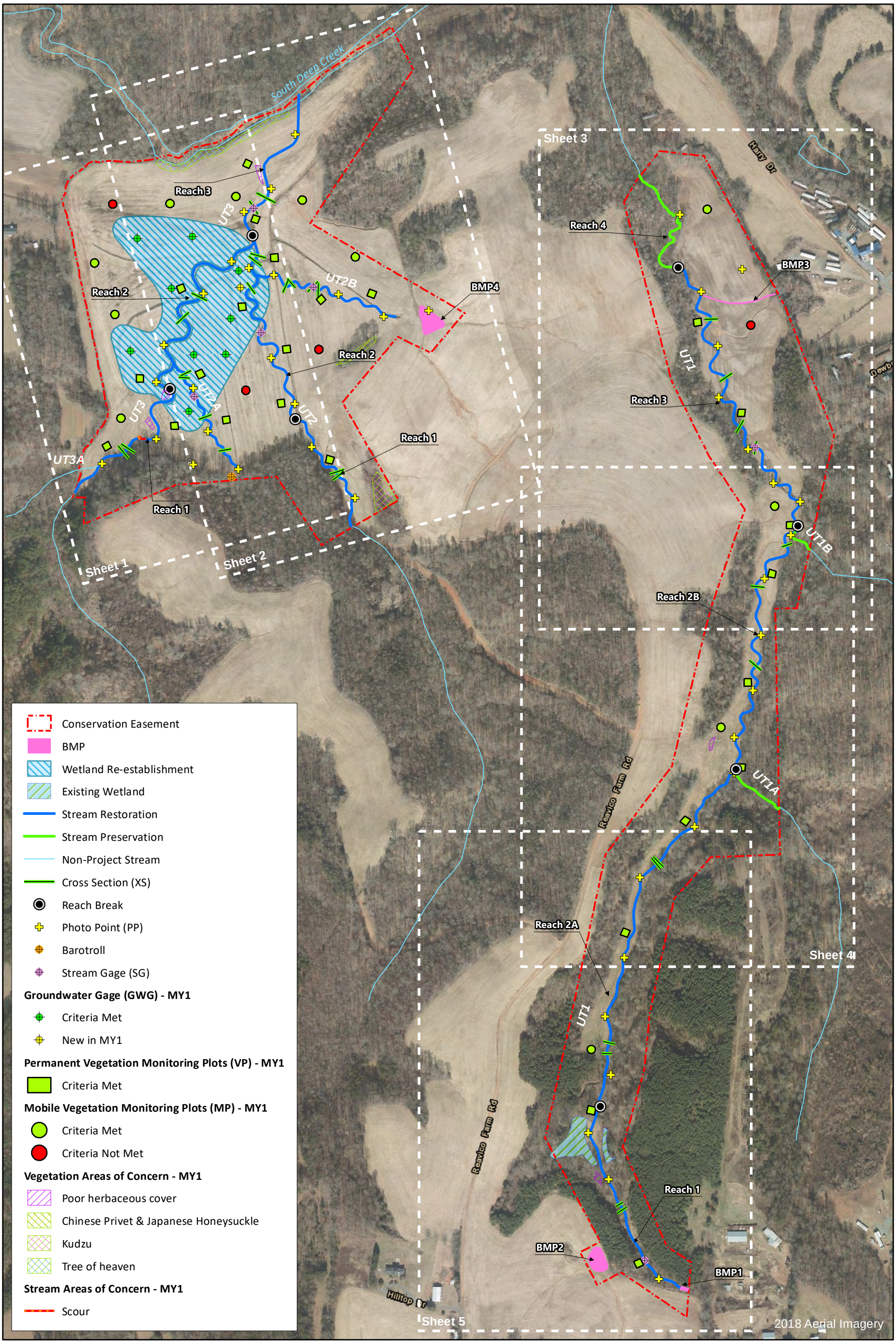
1. For reach UT2B- as seen on record drawings sheet 1.23, on the riffle between topo elevation lines 764 and 763, and

2. For reach UT2A, as seen on record drawings sheet 1.20, on the riffle just above station 402+00.

Thanks,

Mac

APPENDIX 2. Visual Assessment Data

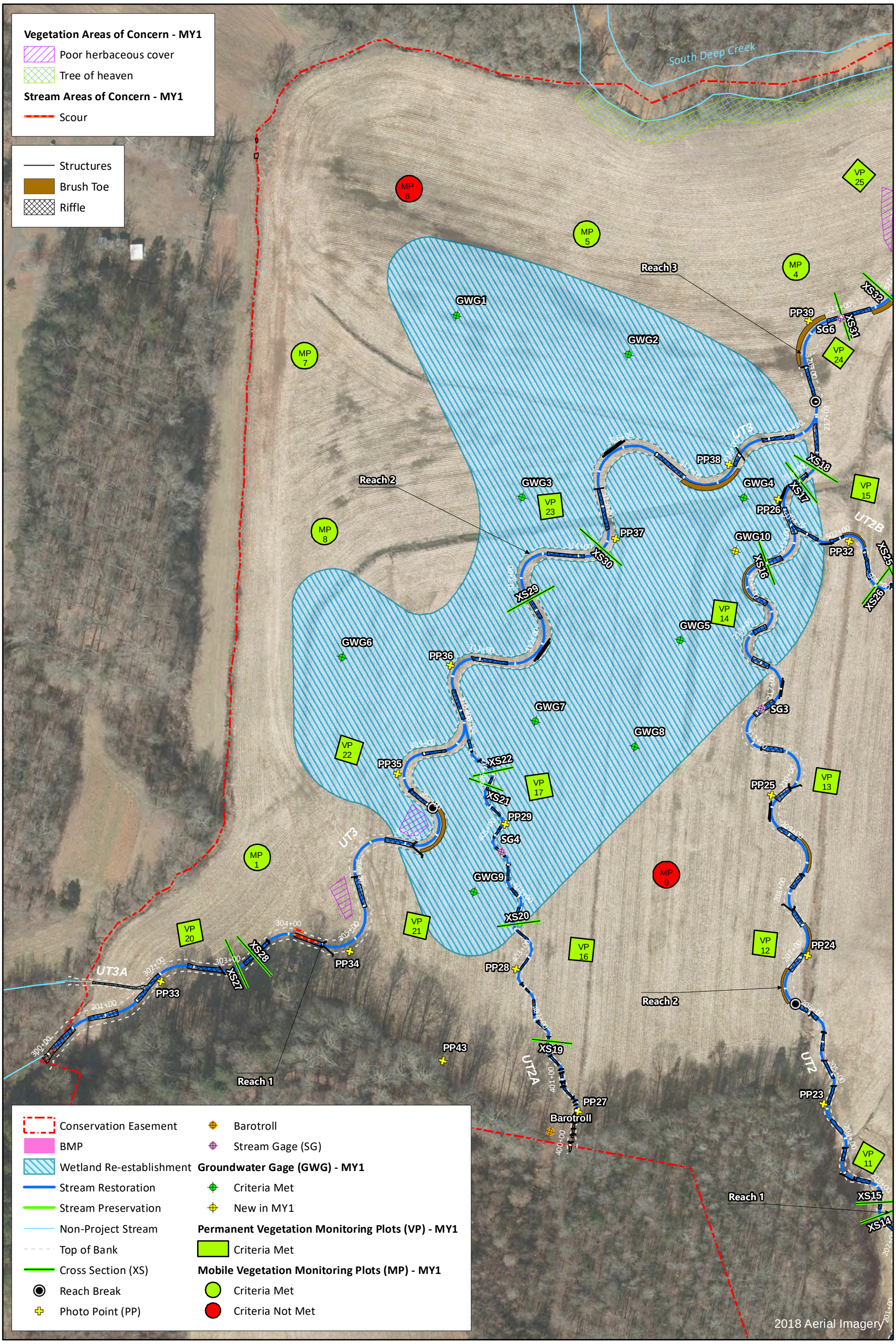


WILDLANDS ENGINEERING

0 400 800 Feet

Figure 3.0 Integrated Current Condition Plan View Map (Key)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Yadkin County, NC

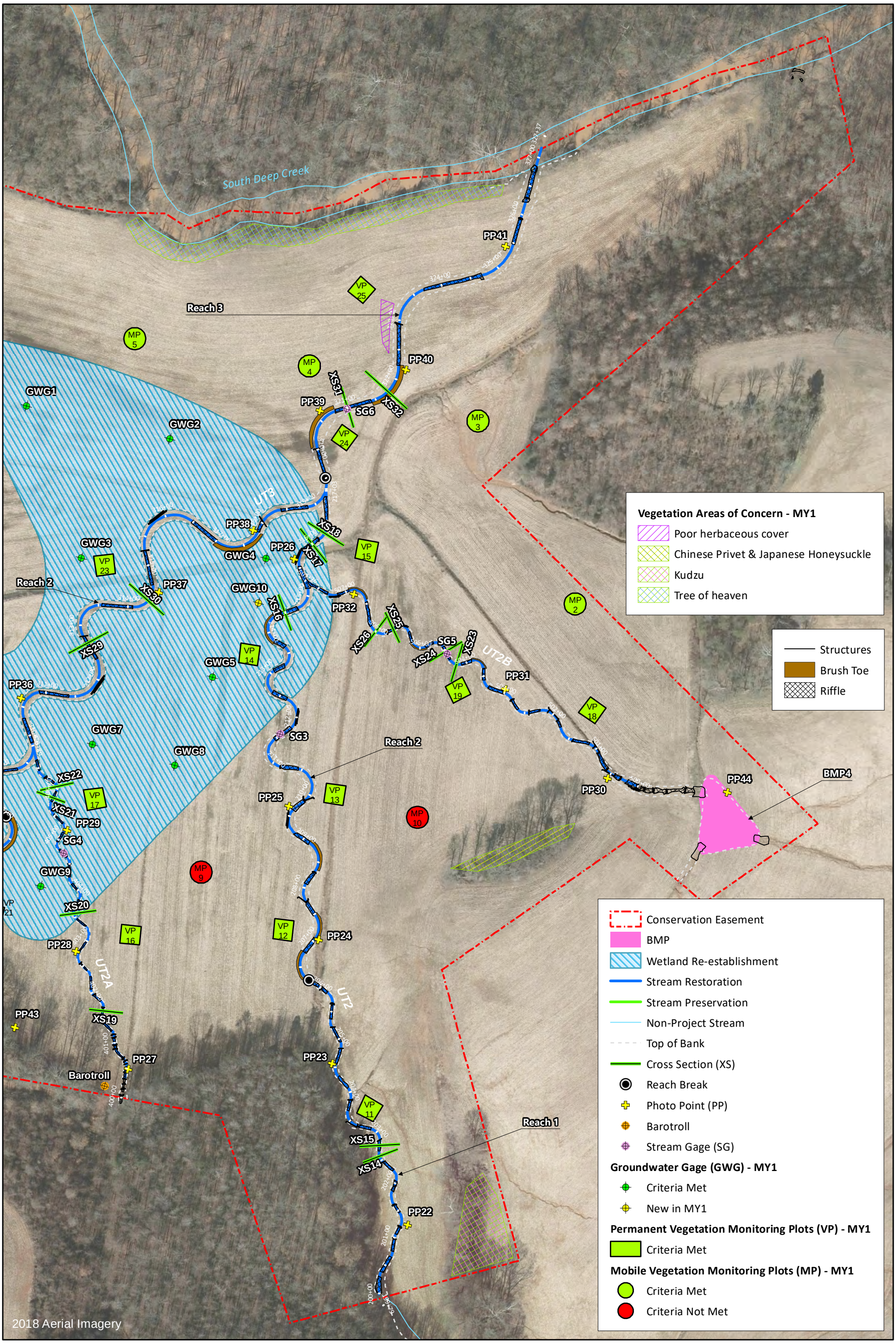


WILDLANDS ENGINEERING

0 125 250 Feet

Figure 3.1 Integrated Current Condition Plan View Map (Sheet 1)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Yadkin County, NC

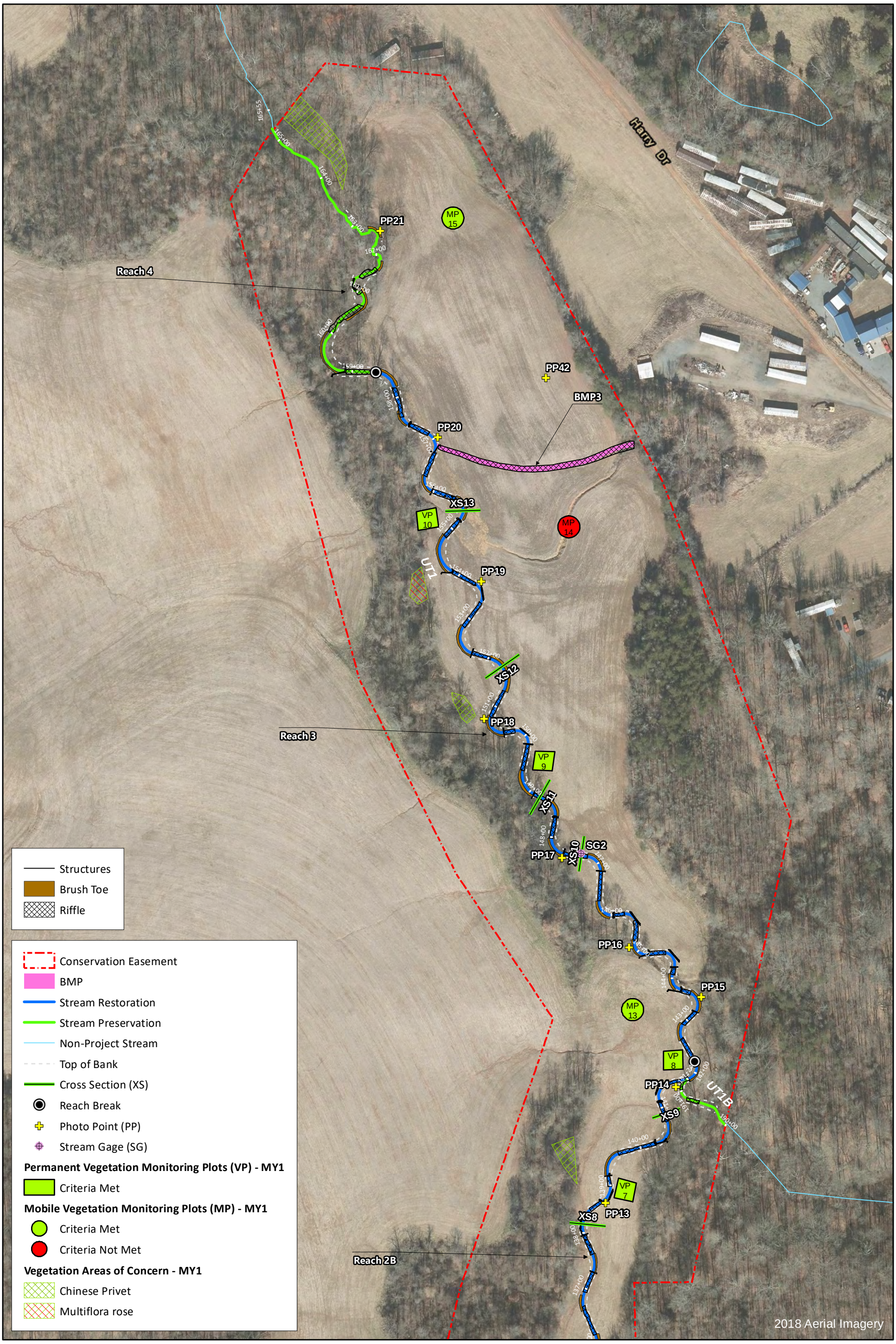


WILDLANDS ENGINEERING

0 150 300 Feet

Figure 3.2 Integrated Current Condition Plan View Map (Sheet 2)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Yadkin County, NC



WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3.3 Integrated Current Condition Plan View Map (Sheet 3)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Yadkin County, NC

Conservation Easement
BMP
Stream Restoration
Stream Preservation
Non-Project Stream
Top of Bank
Cross Section (XS)
Reach Break
Photo Point (PP)
Stream Gage (SG)

Permanent Vegetation Monitoring Plots (VP) - MY1

Criteria Met

Mobile Vegetation Monitoring Plots (MP) - MY1

Criteria Met
Criteria Not Met

Vegetation Areas of Concern - MY1

Poor herbaceous cover
Chinese Privet

Structures
Brush Toe
Riffle

PP16
PP15
PP14
PP13
PP12
PP11
PP10
PP9
PP8
PP7
PP6
XS9
XS8
XS7
XS6
XS5
MP 13
MP 12
VP 8
VP 7
VP 6
VP 5
VP 4
VP 3
UT1B
UT1A
UT1
Reach 3
Reach 2B
Reach 2A
Reavico Farm Rd
2018 Aerial Imagery

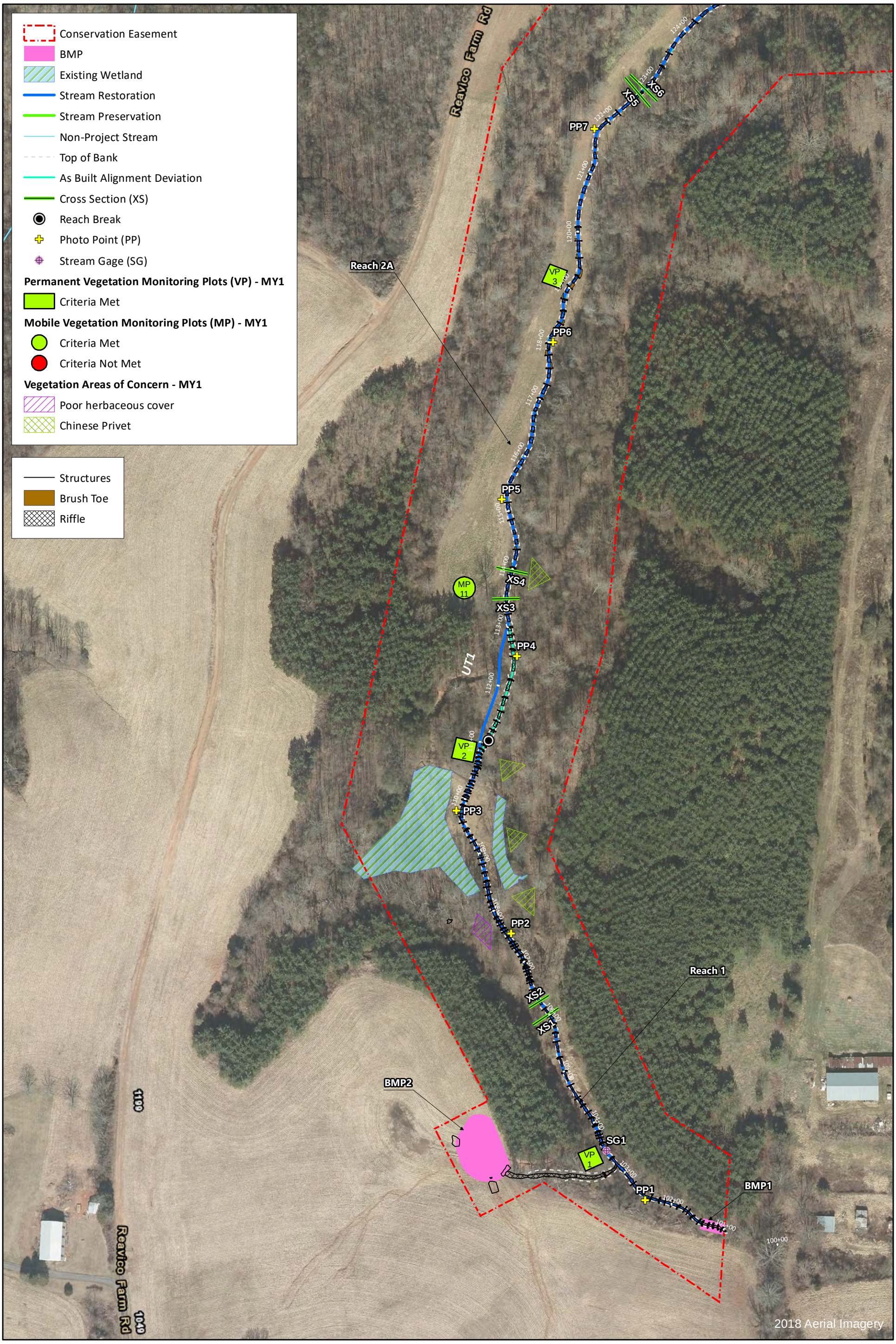
WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3.4 Integrated Current Condition Plan View Map (Sheet 4)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Yadkin County, NC



WILDLANDS ENGINEERING

0 150 300 Feet

N

Figure 3.5 Integrated Current Condition Plan View Map (Sheet 5)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Yadkin County, NC

Table 6a. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT1 Reach 1 (STA 101+39 to 111+05)
Assessed Length: 966

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

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

Table 6b. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT1 Reach 2A (STA 111+05 to 128+51)
Assessed Length: 1,746

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	35	35			100%			
	3. Step Pool Condition	Depth Sufficient	35	35			100%			
		Length Appropriate	N/A	N/A			N/A			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	N/A	N/A			N/A			
		Thalweg centering at downstream of meander bend (Glide)	N/A	N/A			N/A			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	36	36			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	35	35			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	35	35			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	36	36			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	36	36			100%			

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

Table 6c. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT1 Reach 2B (STA 128+51 to 142+19)
Assessed Length: 1,368

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	20	20			100%			
		Length Appropriate	20	20			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	20	20			100%			
		Thalweg centering at downstream of meander bend (Glide)	20	20			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	33	33			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	19	19			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	19	19			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	33	33			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	33	33			100%			

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

Table 6d. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT1 Reach 3 (STA 142+19 to 158+60)
Assessed Length: 1,641

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	22	22			100%			
	3. Meander Pool Condition	Depth Sufficient	22	22			100%			
		Length Appropriate	22	22			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	22	22			100%			
		Thalweg centering at downstream of meander bend (Glide)	22	22			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	38	38			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	17	17			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	17	17			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	38	38			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	38	38			100%			

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

Table 6e. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT2 Reach 1 (STA 200+00 to 206+23)
Assessed Length: 623

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	15	15			100%			
	3. Meander Pool Condition	Depth Sufficient	14	14			100%			
		Length Appropriate	14	14			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	15	15			100%			
		Thalweg centering at downstream of meander bend (Glide)	15	15			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	11	11			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	11	11			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	12	12			100%			

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

Table 6f. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT2 Reach 2 (STA 206+23 to 217+03)
Assessed Length: 1,080

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-Built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjust % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	Aggradation			0	0	100%			
		Degradation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	14	14			100%			
	3. Meander Pool Condition	Depth Sufficient	14	14			100%			
		Length Appropriate	14	14			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	14	14			100%			
		Thalweg centering at downstream of meander bend (Glide)	14	14			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	6	6			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	6	6			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	12	12			100%			

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

Table 6g. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT2A (STA 400+34 to 406+89)
Assessed Length: 655

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	19	19			100%			
	3. Meander Pool Condition	Depth Sufficient	17	17			100%			
		Length Appropriate	17	17			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	17	17			100%			
		Thalweg centering at downstream of meander bend (Glide)	17	17			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	16	16			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	13	13			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	13	13			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%			

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

Table 6h. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT2B (STA 500+00 to 507+76)
Assessed Length: 776

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	17	17			100%			
	3. Meander Pool Condition	Depth Sufficient	15	15			100%			
		Length Appropriate	15	15			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	15	15			100%			
		Thalweg centering at downstream of meander bend (Glide)	15	15			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	12	12			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	7	7			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	7			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	12	12			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	12	12			100%			

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

Table 6i. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT3 Reach 1 (STA 300+13 to 307+92)
Assessed Length: 779

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			1	35	98%			
	2. Riffle Condition	Texture/Substrate	8	8			100%			
	3. Meander Pool Condition	Depth Sufficient	8	8			100%			
		Length Appropriate	8	8			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	8	8			100%			
		Thalweg centering at downstream of meander bend (Glide)	8	8			100%			
2. Bank	1. Scoured/Eroded	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	15	99%	0	0	99%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	1	15	99%	0	0	99%
3. Engineered Structures[1]	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	6	6			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	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%.	6	6			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	6	6			100%			

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

Table 6j. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT3 Reach 2 (STA 307+92 to 319+51)
Assessed Length: 1,159

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

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

Table 6k. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach: UT3 Reach 3 (STA 319+51 to STA 327+15)
Assessed Length: 764

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

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

Table 7. Vegetation Condition Assessment Table

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Planted Acreage **68.3**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	5	0.1	0.2%
Low Stem Density Areas[1&2]	Woody stem densities clearly below target levels based on MY3, 4, 5, or 7 stem count criteria.	0.1	4	0.1	0.1%
		Total	**9**	**0.2**	**0.3%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0	0	0.0	0.0%
		Cumulative Total	**9**	**0.2**	**0.3%**

Easement Acreage **103.2**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	12	1.1	1.1%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0.0	0.0%

[1]Acreage calculated from vegetation plots monitored for site.

[2]Area with low stem density is less than 0.1 acres.

Stream Photographs

	
Photo Point 1 – UT1 Reach 1, view upstream *(10/22/2019)*	**Photo Point 1** – UT1 Reach 1, view downstream *(10/22/2019)*
	
Photo Point 2 – UT1 Reach 1, view upstream *(10/22/2019)*	**Photo Point 2** – UT1 Reach 1, view downstream *(10/22/2019)*
	
Photo Point 3 – UT1 Reach 1, view upstream *(10/22/2019)*	**Photo Point 3** – UT1 Reach 1, view downstream *(10/22/2019)*

	
Photo Point 4 – UT1 Reach 2A, view upstream *(10/22/2019)*	**Photo Point 4** – UT1 Reach 2A, view downstream *(10/22/2019)*
	
Photo Point 5 – UT1 Reach 2A, view upstream *(10/22/2019)*	**Photo Point 5** – UT1 Reach 2A, view downstream *(10/22/2019)*
	
Photo Point 6 – UT1 Reach 2A, view upstream *(10/22/2019)*	**Photo Point 6** – UT1 Reach 2A, view downstream *(10/22/2019)*

	
Photo Point 7 – UT1 Reach 2A, view upstream *(10/22/2019)*	**Photo Point 7** – UT1 Reach 2A, view downstream *(10/22/2019)*
	
Photo Point 8 – UT1 Reach 2A, view upstream *(10/22/2019)*	**Photo Point 8** – UT1 Reach 2A, view downstream *(10/22/2019)*
	
Photo Point 9 – UT1 Reach 2A, view upstream *(10/22/2019)*	**Photo Point 9** – UT1 Reach 2A, view downstream *(10/22/2019)*

Photo Point 9 – UT1A, view upstream *(10/22/2019)*

Photo Point 10 – UT1 Reach 2B, view upstream *(10/22/2019)*

Photo Point 10 – UT1 Reach 2B, view downstream *(10/22/2019)*

Photo Point 11 – UT1 Reach 2B, view upstream *(10/22/2019)*

Photo Point 11 – UT1 Reach 2B, view downstream *(10/22/2019)*

	
Photo Point 12 – UT1 Reach 2B, view upstream *(10/22/2019)*	**Photo Point 12** – UT1 Reach 2B, view downstream *(10/22/2019)*
	
Photo Point 13 – UT1 Reach 2B, view upstream *(10/22/2019)*	**Photo Point 13** – UT1 Reach 2B, view downstream *(10/22/2019)*
	
Photo Point 14 – UT1 Reach 2B, view upstream *(10/22/2019)*	**Photo Point 14** – UT1 Reach 2B, view downstream *(10/22/2019)*

Photo Point 14 – UT1B, view upstream *(10/22/2019)*

Photo Point 15 – UT1 Reach 3, view upstream *(10/22/2019)*

Photo Point 15 – UT1 Reach 3, view downstream *(10/22/2019)*

Photo Point 16 – UT1 Reach 3, view upstream *(10/22/2019)*

Photo Point 16 – UT1 Reach 3, view downstream *(10/22/2019)*

	
Photo Point 17 – UT1 Reach 3, view upstream *(10/22/2019)*	**Photo Point 17** – UT1 Reach 3, view downstream *(10/22/2019)*
	
Photo Point 18 – UT1 Reach 3, view upstream *(10/22/2019)*	**Photo Point 18** – UT1 Reach 3, view downstream *(10/22/2019)*
	
Photo Point 19 – UT1 Reach 3, view upstream *(10/22/2019)*	**Photo Point 19** – UT1 Reach 3, view downstream *(10/22/2019)*

Photo Point 20 – UT1 Reach 3, view upstream *(11/12/2019)*

Photo Point 20 – UT1 Reach 3, view downstream *(10/22/2019)*

Photo Point 20 – UT1 Reach 3 BMP 3, view upstream *(10/22/2019)*

Photo Point 21 – UT1 Reach 4, view upstream *(10/22/2019)*

Photo Point 21 – UT1 Reach 4, view downstream *(10/22/2019)*

	
Photo Point 22 – UT2 Reach 1, view upstream *(10/22/2019)*	**Photo Point 22** – UT2 Reach 1, view downstream *(10/22/2019)*
	
Photo Point 23 – UT2 Reach 1, view upstream *(10/22/2019)*	**Photo Point 23** – UT2 Reach 1, view downstream *(10/22/2019)*
	
Photo Point 24 – UT2 Reach 2, view upstream *(10/22/2019)*	**Photo Point 24** – UT2 Reach 2, view downstream *(10/22/2019)*

	
Photo Point 25 – UT2 Reach 2, view upstream *(10/22/2019)*	**Photo Point 25** – UT2 Reach 2, view downstream *(10/22/2019)*
	
Photo Point 26 – UT2 Reach 2, view upstream *(10/22/2019)*	**Photo Point 26** – UT2 Reach 2, view downstream *(10/22/2019)*
	
Photo Point 27 – UT2A, view upstream *(10/22/2019)*	**Photo Point 27** – UT2A, view downstream (10*/22/2019)*

	
Photo Point 28 – UT2A, view upstream *(10/22/2019)*	**Photo Point 28** – UT2A, view downstream *(10/22/2019)*
	
Photo Point 29 – UT2A, view upstream *(10/22/2019)*	**Photo Point 29** – UT2A, view downstream *(10/22/2019)*
	
Photo Point 30 – UT2B, view upstream *(10/22/2019)*	**Photo Point 30** – UT2B, view downstream *(10/22/2019)*

	
Photo Point 31 – UT2B, view upstream *(10/22/2019)*	**Photo Point 31** – UT2B, view downstream *(10/22/2019)*
	
Photo Point 32 – UT2B, view upstream *(10/22/2019)*	**Photo Point 32** – UT2B, view downstream *(10/22/2019)*
	
Photo Point 33 – UT3 Reach 1, view upstream *(10/22/2019)*	**Photo Point 33** – UT3 Reach 1, view downstream *(10/22/2019)*

	
Photo Point 34 – UT3 Reach 1, view upstream *(10/22/2019)*	**Photo Point 34** – UT3 Reach 1, view downstream *(10/22/2019)*
	
Photo Point 35 – UT3 Reach 1, view upstream *(10/22/2019)*	**Photo Point 35** – UT3 Reach 1, view downstream *(10/22/2019)*
	
Photo Point 36 – UT3 Reach 2, view upstream *(10/22/2019)*	**Photo Point 36** – UT3 Reach 2, view downstream *(10/22/2019)*

Photo Point 37 – UT3 Reach 2, view upstream *(10/22/2019)*

Photo Point 37 – UT3 Reach 2, view downstream *(10/22/2019)*

Photo Point 38 – UT3 Reach 2, view upstream *(10/22/2019)*

Photo Point 38 – UT3 Reach 2, view downstream *(10/22/2019)*

Photo Point 39 – UT3 Reach 3, view upstream *(10/22/2019)*

Photo Point 39 – UT3 Reach 3, view downstream *(10/22/2019)*

	
Photo Point 40 – UT3 Reach 3, view upstream *(10/22/2019)*	**Photo Point 40** – UT3 Reach 3, view downstream *(10/22/2019)*
	
Photo Point 41 – UT3 Reach 3, view upstream *(10/22/2019)*	**Photo Point 41** – UT3 Reach 3, view downstream *(10/22/2019)*
	
Photo Point 42 – UT1 Reach 3, up valley *(10/22/2019)*	**Photo Point 42** – UT1 Reach 4, down valley *(10/22/2019)*

Photo Point 43 – UT2A, northeast view *(10/22/2019)*

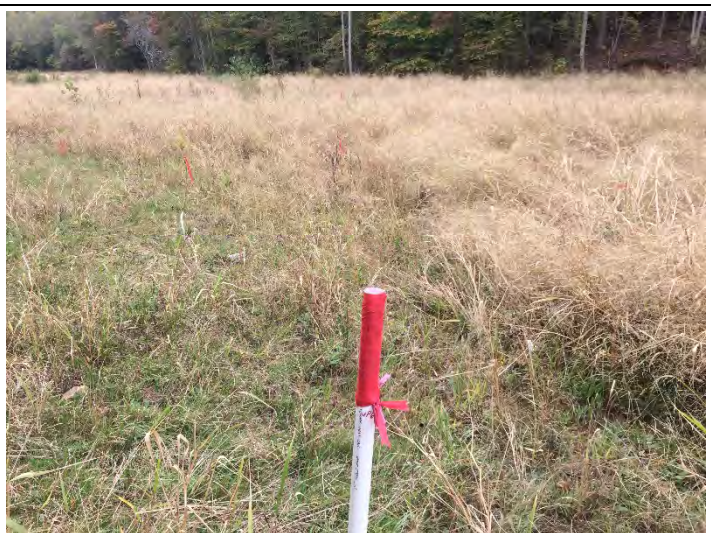
Photo Point 43 – UT2A, north view *(10/22/2019)*

Photo Point 43 – UT3 Reach 3, northwest view *(10/22/2019)*

Photo Point 44 – BMP 4 above UT2B, inlet view *(10/22/2019)*

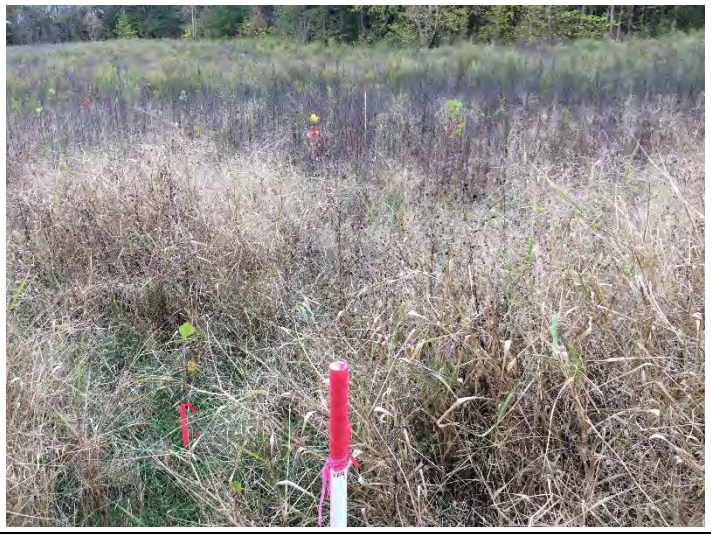
Photo Point 44 – BMP 4 above UT2B, outlet view *(10/22/2019)*

Vegetation Photographs

	
Vegetation Plot 1 – *(10/21/2019)*	**Vegetation Plot 2** – *(10/21/2019)*
	
Vegetation Plot 3 – *(10/21/2019)*	**Vegetation Plot 4** – *(10/21/2019)*
	
Vegetation Plot 5 – *(10/21/2019)*	**Vegetation Plot 6** – *(10/21/2019)*

Vegetation Plot 7 – *(10/21/2019)*

Vegetation Plot 8 – *(10/21/2019)*



Vegetation Plot 9 – *(10/21/2019)*

Vegetation Plot 10 – *(10/21/2019)*

Vegetation Plot 11 – *(10/21/2019)*

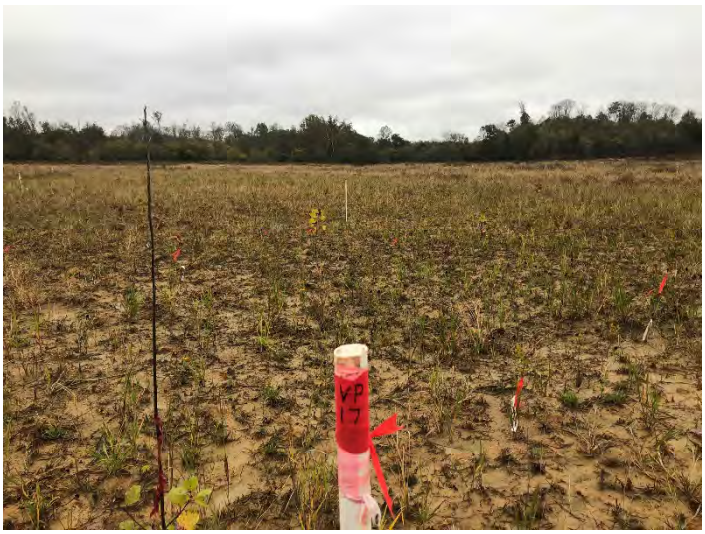
Vegetation Plot 12 – *(10/21/2019)*

Vegetation Plot 13 – *(10/21/2019)*

Vegetation Plot 14 – *(10/21/2019)*

Vegetation Plot 15 – *(10/21/2019)*

Vegetation Plot 16 – *(10/21/2019)*



Vegetation Plot 17 – *(10/22/2019)*

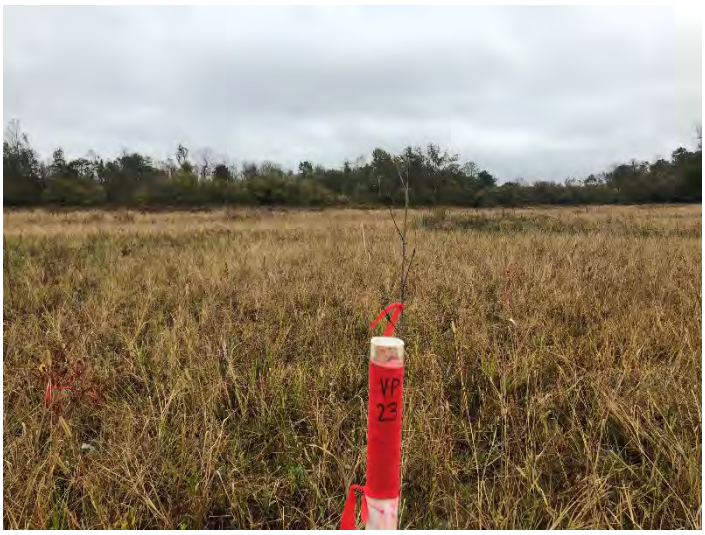
Vegetation Plot 18 – *(10/21/2019)*

Vegetation Plot 19 – *(10/21/2019)*

Vegetation Plot 20 – *(10/22/2019)*

Vegetation Plot 21 – *(10/22/2019)*

Vegetation Plot 22 – *(10/21/2019)*



Vegetation Plot 23 – *(10/22/2019)*

Vegetation Plot 24 – *(10/21/2019)*

Vegetation Plot 25 – *(11/12/2019)*

APPENDIX 3. Vegetation Plot Data

Table 8a. Vegetation Plot Criteria Attainment

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Permanent Vegetation Plot	MY1 Success Criteria Met (Y/N)	Tract Mean
1	Y	100%
2	Y	
3	Y	
4	Y	
5	Y	
6	Y	
7	Y	
8	Y	
9	Y	
10	Y	
11	Y	
12	Y	
13	Y	
14	Y	
15	Y	
16	Y	
17	Y	
18	Y	
19	Y	
20	Y	
21	Y	
22	Y	
23	Y	
24	Y	
25	Y	

Table 8b. Vegetation Plot Criteria Attainment

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Mobile Vegetation Plot	MY1 Success Criteria Met (Y/N)	Tract Mean
1	Y	73%
2	Y	
3	Y	
4	Y	
5	Y	
6	N	
7	Y	
8	Y	
9	N	
10	N	
11	Y	
12	Y	
13	Y	
14	N	
15	Y	

Table 9. CVS Permanent Vegetation Plot Metadata

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Database Name	cvs-eep-entrytool-v2.5.0 Lone Hickory MY1.mdb
Database Location	L:\Active Projects\005-02163 Lone Hickory FDP\Monitoring\Monitoring Year 1\Vegetation Assessment
Computer Name	MIMI-PC
File Size	74551296
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	97135
Project Name	Lone Hickory Mitigation Site
Description	Stream and wetland mitigation project in Yadkin County, NC.
River Basin	
Length(ft)	
Stream-to-edge Width (ft)	
Area (sq m)	
Required Plots (calculated)	
Sampled Plots	25
Required Plots (calculated)	25
Sampled Plots	25

Table 10a. Planted and Total Stem Counts
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Current Permanent Vegetation Plot Data (MY1 2019)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 1**			**Permanent Plot 2**			**Permanent Plot 3**			**Permanent Plot 4**			**Permanent Plot 5**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree															
Acer rubrum	Red Maple	Tree															
Betula nigra	River Birch	Tree	3	3	3				1	1	1	3	3	3	3	3	3
Diospyros virginiana	American Persimmon	Tree															
Fraxinus pennsylvanica	Green Ash	Tree													3	3	3
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree	2	2	2	4	4	4				1	1	1	2	2	2
Platanus occidentalis	Sycamore	Tree	3	3	3	4	4	4	3	3	3	4	4	4	3	3	3
Populus deltoides	Eastern Cottonwood	Tree															
Quercus lyrata	Overcup Oak	Tree															
Quercus michauxii	Swamp Chestnut Oak	Tree	2	2	2	1	1	1	5	5	5	2	2	2	1	1	1
Quercus pagoda	Cherrybark Oak	Tree	4	4	4	2	2	2	3	3	3	1	1	1			
Quercus phellos	Willow Oak	Tree				2	2	2	2	2	2	1	1	1	1	1	1
Salix sericea	Silky Willow	Shrub Tree															
		Stem count	14	14	14	13	13	13	14	14	14	12	12	12	13	13	13
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.02			0.02			0.02			0.02			0.02	
		Species count	5	5	5	5	5	5	5	5	5	6	6	6	6	6	6
		Stems per ACRE	567	567	567	526	526	526	567	567	567	486	486	486	526	526	526

Current Permanent Vegetation Plot Data (MY1 2019)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 6**			**Permanent Plot 7**			**Permanent Plot 8**			**Permanent Plot 9**			**Permanent Plot 10**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree															
Acer rubrum	Red Maple	Tree															
Betula nigra	River Birch	Tree	3	3	3	3	3	3	3	3	7	2	2	2	2	2	2
Diospyros virginiana	American Persimmon	Tree															
Fraxinus pennsylvanica	Green Ash	Tree													2	2	2
Liquidambar styraciflua	Sweet Gum	Tree						2			4						
Liriodendron tulipifera	Tulip Poplar	Tree				1	1	1	2	2	2	2	2	2	1	1	1
Platanus occidentalis	Sycamore	Tree	3	3	3	5	5	6	2	2	88	5	5	5			
Populus deltoides	Eastern Cottonwood	Tree															
Quercus lyrata	Overcup Oak	Tree															
Quercus michauxii	Swamp Chestnut Oak	Tree	1	1	1	2	2	2	1	1	1				3	3	3
Quercus pagoda	Cherrybark Oak	Tree							5	5	5	1	1	1	2	2	2
Quercus phellos	Willow Oak	Tree	2	2	2				1	1	1	2	2	2	3	3	3
Salix sericea	Silky Willow	Shrub Tree															
		Stem count	9	9	9	11	11	14	14	14	108	12	12	12	13	13	13
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.02			0.02			0.02			0.02			0.02	
		Species count	4	4	4	4	4	5	6	6	7	5	5	5	6	6	6
		Stems per ACRE	364	364	364	445	445	567	567	567	4371	486	486	486	526	526	526

Color for Density

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

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

Table 10b. Planted and Total Stem Counts
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Current Permanent Vegetation Plot Data (MY1 2019)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 11**			**Permanent Plot 12**			**Permanent Plot 13**			**Permanent Plot 14**			**Permanent Plot 15**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree															
Acer rubrum	Red Maple	Tree															
Betula nigra	River Birch	Tree	2	2	2	3	3	5	2	2	2	3	3	5			
Diospyros virginiana	American Persimmon	Tree															
Fraxinus pennsylvanica	Green Ash	Tree	1	1	1				1	1	1	1	1	1	1	1	1
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree	1	1	1	4	4	4	1	1	1						
Platanus occidentalis	Sycamore	Tree	2	2	2	1	1	1	3	3	3	4	4	4	3	3	3
Populus deltoides	Eastern Cottonwood	Tree										3	3	3			
Quercus lyrata	Overcup Oak	Tree	2	2	2	1	1	1	2	2	2	2	2	2	2	2	2
Quercus michauxii	Swamp Chestnut Oak	Tree															
Quercus pagoda	Cherrybark Oak	Tree	2	2	2	2	2	2	3	3	3				2	2	2
Quercus phellos	Willow Oak	Tree	1	1	1				1	1	1	2	2	2			
Salix sericea	Silky Willow	Shrub Tree															2
Stem count			11	11	11	11	11	13	13	13	13	15	15	17	8	8	10
size (ares)				1			1			1			1			1	
size (ACRES)				0.02			0.02			0.02			0.02			0.02	
Species count			7	7	7	5	5	5	7	7	7	6	6	6	4	4	5
Stems per ACRE			445	445	445	445	445	526	526	526	526	607	607	688	324	324	405

Current Permanent Vegetation Plot Data (MY1 2019)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 16**			**Permanent Plot 17**			**Permanent Plot 18**			**Permanent Plot 19**			**Permanent Plot 20**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree															2
Acer rubrum	Red Maple	Tree				1	1	1									
Betula nigra	River Birch	Tree				1	1	1				1	1	1	3	3	3
Diospyros virginiana	American Persimmon	Tree				1	1	1									
Fraxinus pennsylvanica	Green Ash	Tree	1	1	1	2	2	2	1	1	1	1	1	1	3	3	3
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree										2	2	2	3	3	3
Platanus occidentalis	Sycamore	Tree	5	5	5	5	5	10	6	6	6	3	3	3	3	3	7
Populus deltoides	Eastern Cottonwood	Tree				2	2	2									
Quercus lyrata	Overcup Oak	Tree	2	2	2	3	3	3	5	5	5	1	1	1	1	1	1
Quercus michauxii	Swamp Chestnut Oak	Tree															
Quercus pagoda	Cherrybark Oak	Tree							1	1	1						
Quercus phellos	Willow Oak	Tree	5	5	5							2	2	2	2	2	2
Salix sericea	Silky Willow	Shrub Tree															
Stem count			13	13	13	15	15	20	13	13	13	10	10	10	15	15	21
size (ares)				1			1			1			1			1	
size (ACRES)				0.02			0.02			0.02			0.02			0.02	
Species count			4	4	4	7	7	7	4	4	4	6	6	6	6	6	7
Stems per ACRE			526	526	526	607	607	809	526	526	526	405	405	405	607	607	850

Color for Density

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

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

Table 10c. Planted and Total Stem Counts
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Current Permanent Vegetation Plot Data (MY1 2019)																	
Scientific Name	**Common Name**	**Species Type**	**Permanent Plot 21**			**Permanent Plot 22**			**Permanent Plot 23**			**Permanent Plot 24**			**Permanent Plot 25**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree															30
Acer rubrum	Red Maple	Tree				1	1	1	1	1	1						1
Betula nigra	River Birch	Tree	1	1	1	2	2	2	2	2	2			10			
Diospyros virginiana	American Persimmon	Tree				2	2	2	3	3	3						
Fraxinus pennsylvanica	Green Ash	Tree				2	2	2	2	2	2	1	1	1			1
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree	2	2	2							1	1	1	3	3	5
Platanus occidentalis	Sycamore	Tree	3	3	13	3	3	8				1	1	1	1	1	3
Populus deltoides	Eastern Cottonwood	Tree				2	2	2	1	1	1						
Quercus lyrata	Overcup Oak	Tree	3	3	3	1	1	1	2	2	2	3	3	3	2	2	2
Quercus michauxii	Swamp Chestnut Oak	Tree															
Quercus pagoda	Cherrybark Oak	Tree	2	2	2							2	2	2	4	4	4
Quercus phellos	Willow Oak	Tree	3	3	3	1	1	1	3	3	3	2	2	2	3	3	3
Salix sericea	Silky Willow	Shrub Tree															
		Stem count	14	14	24	14	14	19	14	14	14	10	10	20	13	13	49
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.02			0.02			0.02			0.02			0.02	
		Species count	6	6	6	8	8	8	7	7	7	6	6	7	5	5	8
		Stems per ACRE	567	567	971	567	567	769	567	567	567	405	405	809	526	526	1983

Annual Mean								
Scientific Name	**Common Name**	**Species Type**	**MY1 (2019)**			**MY0 (2019)**		
			PnoLS	**P-all**	**T**	**PnoLS**	**P-all**	**T**
Acer negundo	Box Elder	Tree			32			
Acer rubrum	Red Maple	Tree	3	3	4	3	3	3
Betula nigra	River Birch	Tree	43	43	61	55	55	55
Diospyros virginiana	American Persimmon	Tree	6	6	6	6	6	6
Fraxinus pennsylvanica	Green Ash	Tree	22	22	23	23	23	23
Liquidambar styraciflua	Sweet Gum	Tree			6			
Liriodendron tulipifera	Tulip Poplar	Tree	32	32	34	58	58	58
Platanus occidentalis	Sycamore	Tree	75	75	188	77	77	77
Populus deltoides	Eastern Cottonwood	Tree	8	8	8	8	8	8
Quercus lyrata	Overcup Oak	Tree	32	32	32	33	33	33
Quercus michauxii	Swamp Chestnut Oak	Tree	18	18	18	23	23	23
Quercus pagoda	Cherrybark Oak	Tree	36	36	36	42	42	42
Quercus phellos	Willow Oak	Tree	39	39	39	46	46	46
Salix sericea	Silky Willow	Shrub Tree			2			
		Stem count	314	314	489	374	374	374
		size (ares)		25			25	
		size (ACRES)		0.62			0.62	
		Species count	11	11	14	11	11	11
		Stems per ACRE	508	508	792	605	605	605

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

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

Table 10d. Planted and Total Stem Counts
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Current Mobile Vegetation Plot (MP) Data (MY1 2019)											
Scientific Name	**Common Name**	**Species Type**	**MP1**	**MP2**	**MP3**	**MP4**	**MP5**	**MP6**	**MP7**	**MP8**	**MP9**	**MP10**
			PnoLS	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**
Acer negundo	Box Elder	Tree										
Acer rubrum	Red Maple	Tree			1		2					
Betula nigra	River Birch	Tree	4	2	1	1	1	1	2	3		1
Diospyros virginiana	American Persimmon	Tree										
Fraxinus pennsylvanica	Green Ash	Tree	1					1	1			1
Liquidambar styraciflua	Sweet Gum	Tree										
Liriodendron tulipifera	Tulip Poplar	Tree		2	1		1					
Platanus occidentalis	Sycamore	Tree	1	7	1	5	1	4	5	5	3	2
Populus deltoides	Eastern Cottonwood	Tree										
Quercus lyrata	Overcup Oak	Tree	1		4	5	4		3	3	4	2
Quercus michauxii	Swamp Chestnut Oak	Tree										
Quercus pagoda	Cherrybark Oak	Tree						1				1
Quercus phellos	Willow Oak	Tree	2	1						1		
Salix sericea	Silky Willow	Shrub Tree										
		Stem count	9	12	8	11	9	7	11	12	7	7
		size (ares)	1	1	1	1	1	1	1	1	1	1
		size (ACRES)	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
		Species count	5	4	5	3	5	4	4	4	2	5
		Stems per ACRE	364	486	324	445	364	283	445	486	283	283

Current Mobile Vegetation Plot (MP) Data (MY1 2019)								Annual Mean		Overall Site Annual Mean	
Scientific Name	**Common Name**	**Species Type**	**MP11**	**MP12**	**MP13**	**MP14**	**MP15**	**MY1 (2019)**	**MY0 (2019)**	**MY1 (2019)**	**MY0 (2019)**
			PnoLS	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**
Acer negundo	Box Elder	Tree									
Acer rubrum	Red Maple	Tree						16		19	3
Betula nigra	River Birch	Tree	3	7	1		1	28	27	71	82
Diospyros virginiana	American Persimmon	Tree								6	6
Fraxinus pennsylvanica	Green Ash	Tree		2	1		1	8	18	30	41
Liquidambar styraciflua	Sweet Gum	Tree									
Liriodendron tulipifera	Tulip Poplar	Tree	3	3			2	12	47	44	105
Platanus occidentalis	Sycamore	Tree	4	3	6	2	11	60	43	135	120
Populus deltoides	Eastern Cottonwood	Tree								8	8
Quercus lyrata	Overcup Oak	Tree						26	7	58	40
Quercus michauxii	Swamp Chestnut Oak	Tree							5	18	28
Quercus pagoda	Cherrybark Oak	Tree	5	4	4	3	1	19	56	55	98
Quercus phellos	Willow Oak	Tree						2	13	41	59
Salix sericea	Silky Willow	Shrub Tree									
		Stem count	15	19	12	5	16	171	216	485	590
		size (ares)	1	1	1	1	1	15	15	40	40
		size (ACRES)	0.02	0.02	0.02	0.02	0.02	0.37	0.37	0.99	0.99
		Species count	4	5	4	2	5	8	8	11	11
		Stems per ACRE	607	769	486	202	647	461	583	491	597

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

PnoLS: Number of planted stems excluding live stakes

APPENDIX 4. Morphological Summary Data and Plots

Table 11a. Baseline Stream Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 0 - 2019

East Side

		Pre-Restoration Condition						Design								As-Built/Baseline							
Parameter	**Gage**	**UT1 Reach 1**		**UT1 Reach 2**		**UT1 Reach 3**		**UT1 Reach 1**		**UT1 Reach 2A**		**UT1 Reach 2B**		**UT1 Reach 3**		**UT1 Reach 1**		**UT1 Reach 2A**		**UT1 Reach 2B**		**UT1 Reach 3**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																							
Bankfull Width (ft)	N/A	4.8		8.9		10.0		6.5		7.8		10.7		11.8		6.9		7.3		10.3	10.5	11.3	12.5
Floodprone Width (ft)		13.1		13.2		31.1		15	50	15	50	25	100	25	100	29		46	65+	49+	68+	60+	68+
Bankfull Mean Depth (ft)		0.8		0.8		1.3		0.5		0.5		0.8		0.8		0.6		0.6		0.8		0.7	
Bankfull Max Depth (ft)		1.4		1.3		1.9		0.6		0.7		1.0		1.0		1.0		0.9	1.0	1.2	1.3	1.1	
Bankfull Cross-sectional Area (ft^2)		3.8		7.2		13.4		3.0		4.2		8.1		9.5		4.2		4.5	4.6	7.9	8.5	8.3	8.7
Width/Depth Ratio		6.2		11.0		7.5		14.2		14.6		14.3		14.6		11.5		11.5	11.8	12.9	13.3	15.5	18.0
Entrenchment Ratio		2.7		1.5		3.1		2.2+		2.2+		2.2+		2.2+		4.2		6.3	9.0+	4.7+	6.6+	5.3+	5.4+
Bank Height Ratio		3.8		2.6		1.7		1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D_{50} (mm)		15.1		41.0		19.6		---		---		---		---		59.6		37.0	37.9	35.6	45.0	41.6	47.4
Profile																							
Riffle Length (ft)	N/A																						
Riffle Slope (ft/ft)								0.020	0.041	0.011	0.055	0.018	0.045	0.016	0.048	N/A[1]	N/A[1]	0.003	0.068	0.013	0.072	0.013	0.055
Pool Length (ft)																							
Pool Max Depth (ft)		1.4		1.4		1.7		1.7		1.8		3.2		2.9		1.1	3.0	1.3	2.8	1.8	3.1	1.8	3.7
Pool Spacing (ft)		5	20	29	42	18	32	14	26	16	39	34	109	48	113	5	76	6	51	18	145	41	129
Pool Volume (ft^3)																							
Pattern																							
Channel Beltwidth (ft)	N/A	6	12	---		12	14	N/A[2]		N/A[2]		31	67	35	71	N/A[2]		N/A[2]		31	67	35	71
Radius of Curvature (ft)		3	8	---		5	12	N/A[2]		N/A[2]		20	38	19	38	N/A[2]		N/A[2]		20	38	19	38
Rc/Bankfull Width (ft/ft)		0.6	1.7	---		5	12	N/A[2]		N/A[2]		1.9	3.6	1.6	3.2	N/A[2]		N/A[2]		1.9	3.6	1.7	3.0
Meander Length (ft)		9	19	---		14	43	N/A[2]		N/A[2]		102	190	102	196	N/A[2]		N/A[2]		102	190	102	196
Meander Width Ratio		1.3	2.5	---		1.2	1.4	N/A[2]		N/A[2]		2.9	6.3	3.0	6.0	N/A[2]		N/A[2]		3.0	6.4	3.1	5.7
Substrate, Bed and Transport Parameters																							
Ri%/Ru%/P%/G%/S%	N/A																						
SC%/Sa%/G%/C%/B%/Be%																							
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$		SC/0.37/3.7/54.2/75.9/128		1.35/11.0/38/90/193.1/2048		0.19/0.39/0.73/26.3/52.5/90										0.4/1.8/33.9/108/156.5/256		0.3/14.1/21.6/67.2/137/362		0.3/0.4/22.6/59.2/104.7/362		0.3/16/25.6/62.4/113.8/180	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		1.74		0.95		0.75		0.76		1.97		1.06	1.08	0.85	0.88	0.65	0.68
Max part size (mm) mobilized at bankfull								228		146		123		125		97		52	53	42	43	32	33
Stream Power (Capacity) W/m^2																							
Additional Reach Parameters																							
Drainage Area (SM)	N/A	0.07		0.37		0.45		0.07		0.12		0.32		0.44		0.07		0.12		0.32		0.44	
Watershed Impervious Cover Estimate (%)		3%						3%								3%							
Rosgen Classification		E5b		G4		E4		A4		B4		C4		C4		A4		B4		C4		C4	
Bankfull Velocity (fps)		2.9		4.8		4.1		4.1		3.7		3.8		4.0		4.8		3.9	4.0	4.1	4.2	3.7	3.8
Bankfull Discharge (cfs)		11		35		55		11		15		30		38		20.2		17.7	18.3	32.7	36.2	30.4	31.0
Q-NFF regression (2-yr)		---		---		---																	
Q-USGS extrapolation (1.2-yr)		---		---		---		11		16		34		42									
Max Q-Mannings		---		---		---		601		304		304		218									
Valley Slope (ft/ft)		0.0411		0.0454		0.0049		0.0648		0.0313		0.0225		0.0203		---		---		---		---	
Channel Thalweg Length (ft)		6,015						966		1,746		1,368		1,641		966		1,746		1,368		1,641	
Sinuosity		1.08		1.04		1.13						1.25		1.30						1.25		1.30	
Bankfull/Channel Slope (ft/ft)		0.0295		0.0256		0.0101		0.0622		0.0290		0.0180		0.0156		0.0555		0.0292		0.0182		0.0153	

1. UT1 Reach 1 riffle slopes were not calculated because this reach is comprised of a series of rock steps and cascades.

2. Pattern data is not applicable for A-type and B-type channels

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11b. Baseline Stream Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

West Side - UT2, UT2A, UT2B

		Pre-Restoration Condition										Design								As-built/Baseline							
Parameter	**Gage**	**UT2 Reach 1**		**UT2 Reach 2**		**UT2 Reach 3**		**UT2A**		**UT2B**		**UT2 Reach 1**		**UT2 Reach 2**		**UT2A**		**UT2B**		**UT2 Reach 1**		**UT2 Reach 2**		**UT2A**		**UT2B**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																											
Bankfull Width (ft)	N/A	8.7		7.7		8.4		3.4	4.7	3.9	4.1	6.5		11.0		5.5		7.5		8.3		11.8	11.9	5.4	5.7	7.2	9.6
Floodprone Width (ft)		12.3		10.7		13.0		5.4	11.4	5.1	6.4	130+		250+		100+		100+		69+		65+	72+	51+	57+	56+	66+
Bankfull Mean Depth (ft)		0.7		0.8		0.7		0.5	0.7	0.3		0.5		0.7		0.4		0.5		0.7		0.8	0.9	0.4	0.4	0.5	0.5
Bankfull Max Depth (ft)		0.9		1.2		1.1		0.9		0.5	0.6	0.8		1.0		0.6		0.9		1.2		1.2	1.3	0.5	0.7	0.8	0.8
Bankfull Cross-sectional Area (ft^2)		5.7		6.1		5.7		2.2	2.3	1.3	1.4	3.9		7.8		2.1		4.1		6.1		9.1	10.2	1.9	2.4	3.9	4.3
Width/Depth Ratio		13.1		9.8		12.3		5.1	9.5	11.4	13.0	14.0		16.0		14.0		14.0		11.3		13.6	15.6	13.6	15.2	13.4	21.1
Entrenchment Ratio		1.4		1.1		1.5		1.6	2.4	1.2	1.6	2.2+		2.2+		2.2+		1.4	2.2+	8.3+		5.5+	6.1+	9.0+	10.5+	6.9+	7.8+
Bank Height Ratio		4.4		2.3		3.1		2.7	3.1	6.5	7.2	1.0		1.0		1.0		1.0		1.0		1.0		1.0		1.0	
D_{50} (mm)		34.4		11.4		---		---		---		---		---		---		---		26.9		25.4	33.4	21.0	28.1	25.1	30.6
Profile																											
Riffle Length (ft)	N/A																										
Riffle Slope (ft/ft)												0.020	0.034	0.003	0.025	0.006	0.045	0.004	0.056	0.006	0.034	0.004	0.035	0.001	0.046	0.001	0.037
Pool Length (ft)																											
Pool Max Depth (ft)		1.2		1.5		1.5		---		---		1.1	1.8	1.1	2.5	0.6	1.4	0.8	1.9	1.2	2.5	2.1	3.2	0.9	1.3	1.5	2.7
Pool Spacing (ft)		24	30	22	44	23	68	---		---		8	45	39	77	19	39	26	53	15	78	45	127	18	58	7	58
Pool Volume (ft^3)																											
Pattern																											
Channel Beltwidth (ft)	N/A	---		---		---		---		---		N/A[1]		39	88	19	44	26	60	N/A[1]		39	88	19	44	26	60
Radius of Curvature (ft)		---		---		---		---		---		N/A[1]		20	39	10	19	14	23	N/A[1]		20	39	10	19	14	23
Rc/Bankfull Width (ft/ft)		---		---		---		---		---		N/A[1]		1.8	3.5	1.8	3.5	1.8	3.0	N/A[1]		1.7	3.3	1.9	3.3	1.9	2.4
Meander Length (ft)		---		---		---		---		---		N/A[1]		72	154	36	77	49	105	N/A[1]		72	154	36	77	49	105
Meander Width Ratio		---		---		---		---		---		N/A[1]		3.5	8.0	3.5	8.0	3.5	8.0	N/A[1]		3.3	7.4	3.5	7.7	3.6	6.3
Substrate, Bed and Transport Parameters																											
Ri%/Ru%/P%/G%/S%	N/A																										
SC%/Sa%/G%/C%/B%/Be%																											
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$		0.37/1.38/7.1/ 49.5/75.9/128		0.25/0.59/1.1/17.9/35.9/90				---		---		---		---		---		---		SC/SC/0.5/47.3/ 90/128		SC/SC/SC/42/ 71.7/180		SC/SC/0.5/42.5/ 90/180		SC/SC/0.4/43.3/ 82.6/256	
Reach Shear Stress (Competency) lb/ft^2		---		---		---		---		---		0.66		1.66		---		---		0.79		0.33	0.38	---		---	
Max part size (mm) mobilized at bankfull		---		---		---		---		---		112		221		---		---		39		16	19	---		---	
Stream Power (Capacity) W/m^2																											
Additional Reach Parameters																											
Drainage Area (SM)	N/A	0.14		0.26		0.27		0.02		0.04		0.14		0.26		0.02		0.05		0.14		0.26		0.02		0.05	
Watershed Impervious Cover Estimate (%)		1%						---		---		1%				---		---		1%				---		---	
Rosgen Classification		G4		G5		G5		G5		G5		B4		C4		C4		C/Cb4		B4		C4		C4		C4	
Bankfull Velocity (fps)		3.4		2.3		1.8		1.6	1.8	1.7	1.8	3.4		2.6		1.9		2.0		3.9		2.6	2.8	1.9	2.1	2.3	2.6
Bankfull Discharge (cfs)		19		14		10		4		2	3	14		20		4		8		24.0		23.6	28.9	3.7	5.1	10.1	10.1
Q-NFF regression (2-yr)		---		---		---		---		---																	
Q-USGS extrapolation (1.2-yr)		---		---		---		---		---		18		29		4		9									
Max Q-Mannings		---		---		---		---		---		331		75		52		124									
Valley Slope (ft/ft)		0.0205		0.0123		0.0086		0.0028		0.0027		0.0280		0.0045	0.0130	0.0057	0.0170	0.0060	0.0400	---		---		---		---	
Channel Thalweg Length (ft)		2,527						1,184		699		623		1080		655		776		623		1,080		655		776	
Sinuosity		1.01		1.02		1.05		1.00		1.00		1.10		1.30		1.20		1.20		1.10		1.30		1.20		1.20	
Bankfull/Channel Slope (ft/ft)		0.0154		0.0062		0.0043		0.0052		0.0107		0.0200		0.0030	0.0120	0.0050	0.0140	0.0040	0.0280	0.0180		0.0072		0.0110		0.0115	

1. Pattern data is not applicable for B-type channels
SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11c. Baseline Stream Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

West Side - UT3

		Pre- Restoration				Design						As-Built/Baseline					
Parameter	**Gage**	**UT3 Reach 1**		**UT3 Reach 2**		**UT3 Reach 1**		**UT3 Reach 2**		**UT3 Reach 3**		**UT3 Reach 1**		**UT3 Reach 2**		**UT3 Reach 3**	
		Min	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**	**Min**	**Max**
Dimension and Substrate - Riffle																	
Bankfull Width (ft)	N/A	11.2		10.0		13.0		16.2		19.0		13.7		16.7		19.2	
Floodprone Width (ft)		17.4		150+		75		100+		42	219	73+		76+		71+	
Bankfull Mean Depth (ft)		1.2		1.0		0.9		1.0		1.1		0.9		1.0		1.0	
Bankfull Max Depth (ft)		1.8		2.1		1.4		1.7		2.0		1.5		1.9		1.9	
Bankfull Cross-sectional Area (ft^2)		13.7		10.2		12.1		16.2		21.1		12.8		16.5		19.5	
Width/Depth Ratio		9.1		9.9		14.4		16.2		17.1		14.7		17.0		19.0	
Entrenchment Ratio		1.3		14.9+		1.4	2.2+	2.2+		2.2+		5.3+		4.5+		3.7+	
Bank Height Ratio		2.6		1.4		1.0		1.0		1.0		1.0		1.0		1.0	
D_{50} (mm)		12.5		0.9		---		---		---		50.0		31.2		47.0	
Profile																	
Riffle Length (ft)	N/A																
Riffle Slope (ft/ft)						0.012	0.017	0.002	0.022	0.002	0.008	0.001	0.023	0.002	0.012	0.0002	0.005
Pool Length (ft)																	
Pool Max Depth (ft)		1.9		2.7		1.9	3.3	1.5	3.5	1.7	3.9	2.8	3.9	2.5	4.1	3.3	3.9
Pool Spacing (ft)		12	87	48	185	169	1014	57	113	67	133	64	163	53	186	83	180
Pool Volume (ft^3)																	
Pattern																	
Channel Beltwidth (ft)	N/A	4	10	---		N/A[1]		57	130	67	152	N/A[1]		57	130	67	152
Radius of Curvature (ft)		4	8	---		N/A[1]		29	57	34	67	N/A[1]		29	57	34	67
Rc/Bankfull Width (ft/ft)		0.4	0.7	---		N/A[1]		1.8	3.5	1.8	3.5	N/A[1]		1.7	3.4	1.8	3.5
Meander Length (ft)		15	28	---		N/A[1]		105	227	124	266	N/A[1]		105	227	124	266
Meander Width Ratio		0.4	0.9	---		N/A[1]		3.5	8.0	3.5	8.0	N/A[1]		3.4	7.8	3.5	7.9
Substrate, Bed and Transport Parameters																	
Ri%/Ru%/P%/G%/S%	N/A																
SC%/Sa%/G%/C%/B%/Be%																	
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$		0.22/0.87/2.5/ 22.6/47.7/64		SC/0.12/0.24/ 4.63/7.7/16		---		---		---		SC/0.2/0.4/ 59.2/107.3/180		SC/SC/0.2/41.6/ 61.5/180		SC/SC/SC/64/ 151.8/362	
Reach Shear Stress (Competency) lb/ft^2		---		---		0.61		---		---		0.42		---		---	
Max part size (mm) mobilized at bankfull		---		---		106		---		---		21		---		---	
Stream Power (Capacity) W/m^2																	
Additional Reach Parameters																	
Drainage Area (SM)	N/A	0.59		0.65		0.63		0.63		0.88		0.63		0.63		0.88	
Watershed Impervious Cover Estimate (%)		2%				2%						2%					
Rosgen Classification		G4		G5		B4c		C4		C4		B4c		C4		C4	
Bankfull Velocity (fps)		4.0		2.0		3.6		2.7		1.8		3.0		1.9		0.8	
Bankfull Discharge (cfs)		54.8		20.4		45		45		55		38.6		31.1		16.0	
Q-NFF regression (2-yr)		---		---		---		---		---							
Q-USGS extrapolation (1.2-yr)		---		---		53		56		71							
Max Q-Mannings		---		---		370		39		N/A[2]							
Valley Slope (ft/ft)		0.0145		0.0050		0.0120		0.0030	0.0140	0.0022		---		---		---	
Channel Thalweg Length (ft)		2,008				779		1159		764		779		1,159		764	
Sinuosity		1.06		1.01		1.10		1.40		1.20		1.10		1.40		1.20	
Bankfull/Channel Slope (ft/ft)		0.0107		0.0034		0.0110		0.0020	0.0110	0.0020		0.0075		0.0027		0.0005	

1. Pattern data is not applicable for B-type channels
2. UT3 Reach 3 post-restoration combines flow from the existing conditions UT2 Reach 3 and UT3.
SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 11d. Reference Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Parameter	Gage	Reference Reach Data															
		UT to Kelly Branch		Pilot Mountain Trib		Lone Hickory UT3 - Onsite Reference		UT to South Crowders		UT to S. Fork Catawba - Vile Preserve		UT to Lyle Creek		Deep Creek Mitigation		Cooleemee Plantation	
		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	6.4		8.6		6.7		6.1	8.4	6.1	6.2	7.0	8.6	12.9		14.7	18.1
Floodprone Width (ft)		9.1		13.3		20.0		26.0	31.0	200+		45.0	49.0	135.0		140+	
Bankfull Mean Depth		0.7		0.7		0.5		1.0	1.1	0.7	0.8	0.5		1.4		0.8	1.0
Bankfull Max Depth		0.9		1.0		0.8		1.4		1.3	1.4	1.0	1.1	2.3		1.6	
Bankfull Cross-sectional Area (ft^2)		4.5		6.0		3.6		6.4	8.7	4.5	5.3	3.5	4.1	17.1		13.6	14.9
Width/Depth Ratio		9.2		12.5		13.4		5.8	8.0	7.4	8.3	14.9	18.3	9.6		14.6	24.1
Entrenchment Ratio		1.4		1.5		3.0		3.7	4.3	30+		5.7	6.4	10.5		8.8+	
Bank Height Ratio		1.0		1.0		1.0		1.4	2.1	1.0		1.0		1.0		1.0	
D50 (mm)		9.4		---		---		---		---		---		---		---	
Profile																	
Riffle Length (ft)	N/A	---		---		---		---		---		---		---		---	
Riffle Slope (ft/ft)		---		0.0150	0.1200	0.0229	0.0615	0.0202	0.0664	0.0260		0.0055	0.0597	0.0019	0.009	0.0027	0.0130
Pool Length (ft)		---		---		---		---		---		---		---		---	
Pool Max Depth (ft)		---		1.6		2.0		1.3	3	1.4		1.3		3.2		2.0	
Pool Spacing (ft)		---		7	52	13	77	28	63	45		15	28	29	103	19	35
Pool Volume (ft^3)																	
Pattern																	
Channel Beltwidth (ft)	N/A	18	34	---		12	31	81		---		21		45	71	22	30
Radius of Curvature (ft)		8	26	---		---		9	20	---		19	32	18	33	14	38
Rc/Bankfull Width (ft/ft)		1.2	4.1	---		---		1.5	2.4	---		2.7	3.7	1.4	2.6	0.9	2.3
Meander Length (ft)		27	94	---		55		45	72	---		39	44	95	130	58	70
Meander Width Ratio		2.8	5.3	---		1.8	4.6	9.6	13.3	---		2.4	3.0	3.5	5.5	1.3	1.8
Substrate, Bed and Transport Parameters																	
Ri%/Ru%/P%/G%/S%	N/A																
SC%/Sa%/G%/C%/B%/Be%																	
d16/d35/d50/d84/d95/d100		0.25/3.2/9.4/45/ 140/---		SC/5.6/20.1/128/ 322.5/>2048		0.2/1.5/16.8/69.7/ 115.7/180		0.8/12.1/19.7/49.5/ 75.9/180		---		NA/0.07/0.17/0.54/ 4.0/8.0		SC/0.2/0.2/1.1/ 8.9/22.6		---	
Reach Shear Stress (Competency) lb/ft^2																	
Max part size (mm) mobilized at bankfull																	
Stream Power (Capacity) W/m^2																	
Additional Reach Parameters																	
Drainage Area (SM)	N/A	0.08		0.27		0.17		0.22		0.94		0.25		0.67		0.68	
Watershed Impervious Cover Estimate (%)		---		---		---		---		---		---		---		---	
Rosgen Classification		A4		B4		C4		E4		E5		C5		C5		C5	
Bankfull Velocity (fps)		4.4		5.3		3.2		2.9		11		4.7		2.4		1.8	
Bankfull Discharge (cfs)		19		32		12		22		54		18		41		26	
Q-NFF regression (2-yr)																	
Q-USGS extrapolation (1.2-yr)																	
Q-Mannings																	
Valley Length (ft)		---		---		---		---		---		---		---		---	
Channel Thalweg Length (ft)		---		---		---		---		---		---		---		---	
Sinuosity		1.2		1.05		1.32		2.20		1.03		1.10		1.60		1.10	
Water Surface Slope (ft/ft)		---		---		---		---		---		---		---		---	
Bankfull/Channel Slope (ft/ft)		0.03 - 0.065		0.0378		0.0185		0.0091		0.0068		0.0057		0.0028		0.0027	

SC: Silt/Clay <0.062 mm diameter particles
(---): Data was not provided
N/A: Not Applicable

Table 12a. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

East Side (UT1)

	UT1 Reach 1 Cross-Section 1, Pool								UT1 Reach 1 Cross-Section 2, Riffle								UT1 Reach 2A Cross-Section 3, Pool								UT1 Reach 2A Cross-Section 4, Riffle							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	918.84	918.82							918.21	918.21							870.19	870.39							868.46	868.68						
low bank height elevation	918.84	918.82							918.21	918.21							870.19	870.39							868.46	868.68						
Bankfull Width (ft)	8.2	8.5							6.9	7.0							9.2	9.9							7.3	9.2						
Floodprone Width (ft)	---	---							29	27							---	---							46	46						
Bankfull Mean Depth (ft)	1.0	0.9							0.6	0.5							1.2	1.2							0.6	0.6						
Bankfull Max Depth (ft)	1.8	1.6							1.0	0.9							2.1	2.5							0.9	1.1						
Bankfull Cross-Sectional Area (ft^2)	8.5	7.3							4.2	3.5							11.4	12.1							4.5	5.1						
Bankfull Width/Depth Ratio	7.8	9.9							11.5	13.9							7.4	8.0							11.8	16.4						
Bankfull Entrenchment Ratio	---	---							4.2	3.8							---	---							6.3	5.0						
Bankfull Bank Height Ratio	---	---							1.0	0.9							---	---							1.0	1.1						

	UT1 Reach 2A Cross-Section 5, Riffle								UT1 Reach 2A Cross-Section 6, Pool								UT1 Reach 2B Cross-Section 7, Riffle								UT1 Reach 2B Cross-Section 8, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	844.23	844.26							843.72	843.72							817.28	817.14							809.31	809.23						
low bank height elevation	844.23	844.26							843.72	843.72							817.28	817.14							809.31	809.23						
Bankfull Width (ft)	7.3	8.1							9.1	9.5							10.3	10.1							12.6	13.0						
Floodprone Width (ft)	65+	65+							---	---							68+	68+							---	---						
Bankfull Mean Depth (ft)	0.6	0.7							1.2	1.4							0.8	0.7							1.2	1.0						
Bankfull Max Depth (ft)	1.0	1.2							1.9	2.5							1.2	1.3							2.6	2.1						
Bankfull Cross-Sectional Area (ft^2)	4.6	5.3							10.5	13.6							7.9	7.5							15.4	12.8						
Bankfull Width/Depth Ratio	11.5	12.4							7.9	6.6							13.3	13.7							10.3	13.2						
Bankfull Entrenchment Ratio	9.0+	8.1+							---	---							6.6+	6.7+							---	---						
Bankfull Bank Height Ratio	1.0	1.1							---	---							1.0	1.0							---	---						

	UT1 Reach 2B Cross-Section 9, Riffle								UT1 Reach 3 Cross-Section 10, Riffle								UT1 Reach 3 Cross-Section 11, Riffle								UT1 Reach 3 Cross-Section 12, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	804.58	804.64							794.10	793.96							791.15	791.06							787.94	787.82						
low bank height elevation	804.58	804.64							794.10	793.96							791.15	791.06							787.94	787.82						
Bankfull Width (ft)	10.5	11.5							11.3	10.8							12.5	11.6							16.7	16.2						
Floodprone Width (ft)	49+	49+							60+	60+							68+	68+							---	---						
Bankfull Mean Depth (ft)	0.8	0.8							0.7	0.8							0.7	0.7							1.1	1.1						
Bankfull Max Depth (ft)	1.3	1.4							1.1	1.3							1.1	1.1							2.4	2.4						
Bankfull Cross-Sectional Area (ft^2)	8.5	8.9							8.3	8.3							8.7	7.7							18.7	17.8						
Bankfull Width/Depth Ratio	12.9	15.0							15.5	14.1							18.0	17.4							14.8	14.7						
Bankfull Entrenchment Ratio	4.7+	4.3+							5.3+	5.5+							5.4+	5.8+							---	---						
Bankfull Bank Height Ratio	1.0	1.0							1.0	1.0							1.0	0.9							---	---						

	UT1 Reach 3 Cross-Section 13, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	783.88	783.76						
low bank height elevation	783.88	783.76						
Bankfull Width (ft)	15.6	16.3						
Floodprone Width (ft)	---	---						
Bankfull Mean Depth (ft)	1.4	1.4						
Bankfull Max Depth (ft)	2.6	3.0						
Bankfull Cross-Sectional Area (ft^2)	22.4	22.4						
Bankfull Width/Depth Ratio	10.9	11.9						
Bankfull Entrenchment Ratio	---	---						
Bankfull Bank Height Ratio	---	---						

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

Table 12b. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

West Side (UT2 & UT2A)

	UT2 Reach 1 Cross-Section 14, Pool								UT2 Reach 1 Cross-Section 15, Riffle								UT2 Reach 2 Cross-Section 16, Riffle								UT2 Reach 2 Cross-Section 17, Riffle							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	772.71	772.82							772.61	772.56							759.49	759.31							758.87	758.82						
low bank height elevation	772.71	772.82							772.61	772.56							759.49	759.31							758.87	758.82						
Bankfull Width (ft)	9.3	10.4							8.3	8.3							11.8	12.2							11.9	13.2						
Floodprone Width (ft)	---	---							69+	69+							65+	65+							72+	72+						
Bankfull Mean Depth (ft)	0.8	0.9							0.7	0.7							0.9	0.7							0.8	0.7						
Bankfull Max Depth (ft)	1.5	1.8							1.2	1.3							1.3	1.3							1.2	1.4						
Bankfull Cross-Sectional Area (ft^2)	7.6	8.9							6.1	6.1							10.2	9.0							9.1	9.5						
Bankfull Width/Depth Ratio	11.4	12.0							11.3	11.5							13.6	16.4							15.6	18.2						
Bankfull Entrenchment Ratio	---	---							8.3+	8.2+							5.5+	5.3+							6.1+	5.5+						
Bankfull Bank Height Ratio	---	---							1.0	1.0							1.0	0.9							1.0	1.0						

	UT2 Reach 2 Cross-Section 18, Pool								UT2A Cross-Section 19, Riffle								UT2A Cross-Section 20, Pool								UT2A Cross-Section 21, Riffle							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	758.62	758.70							763.99	763.94							761.60	761.65							760.53	760.46						
low bank height elevation	758.62	758.70							763.99	763.94							761.60	761.65							760.53	760.46						
Bankfull Width (ft)	15.2	16.3							5.4	5.5							6.9	6.6							5.7	5.8						
Floodprone Width (ft)	---	---							57+	57+							---	---							51+	51+						
Bankfull Mean Depth (ft)	1.4	1.5							0.4	0.4							0.6	0.6							0.4	0.3						
Bankfull Max Depth (ft)	2.5	2.6							0.5	0.6							1.2	1.2							0.7	0.6						
Bankfull Cross-Sectional Area (ft^2)	21.8	24.0							1.9	2.0							4.1	3.7							2.4	2.0						
Bankfull Width/Depth Ratio	10.6	11.1							15.2	15.0							11.6	11.7							13.6	17.2						
Bankfull Entrenchment Ratio	---	---							10.5+	10.4+							---	---							9.0+	8.8+						
Bankfull Bank Height Ratio	---	---							1.0	1.0							---	---							1.0	0.8						

	UT2A Cross-Section 22, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	760.53	760.60						
low bank height elevation	760.53	760.60						
Bankfull Width (ft)	7.2	9.3						
Floodprone Width (ft)	---	---						
Bankfull Mean Depth (ft)	0.6	0.5						
Bankfull Max Depth (ft)	1.1	1.1						
Bankfull Cross-Sectional Area (ft^2)	4.3	4.8						
Bankfull Width/Depth Ratio	12.1	18.1						
Bankfull Entrenchment Ratio	---	---						
Bankfull Bank Height Ratio	---	---						

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

Table 12c. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

West Side (UT2B & UT3)

	UT2B Cross-Section 23, Pool								UT2B Cross-Section 24, Riffle								UT2B Cross-Section 25, Riffle								UT2B Cross-Section 26, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	761.34	761.26							761.16	761.07							760.67	760.61							760.71	760.69						
low bank height elevation	761.34	761.26							761.16	761.07							760.67	760.61							760.71	760.69						
Bankfull Width (ft)	9.9	10.1							9.6	7.9							7.2	6.9							12.2	12.0						
Floodprone Width (ft)	---	---							66+	66+							56+	56+							---	---						
Bankfull Mean Depth (ft)	0.9	0.8							0.5	0.5							0.5	0.5							1.3	1.2						
Bankfull Max Depth (ft)	1.6	1.6							0.8	0.7							0.8	0.8							2.6	2.2						
Bankfull Cross-Sectional Area (ft^2)	8.8	8.4							4.3	3.6							3.9	3.7							15.8	14.0						
Bankfull Width/Depth Ratio	11.2	12.1							21.1	17.4							13.4	12.9							9.4	10.3						
Bankfull Entrenchment Ratio	---	---							6.9+	8.3+							7.8+	8.2+							---	---						
Bankfull Bank Height Ratio	---	---							1.0	0.9							1.0	1.0							---	---						
	UT3 Reach 1 Cross-Section 27, Pool								**UT3 Reach 1 Cross-Section 28, Riffle**								**UT3 Reach 2 Cross-Section 29, Riffle**								**UT3 Reach 2 Cross-Section 30, Pool**							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	766.07	766.11							765.76	765.79							759.75	759.84							759.40	759.49						
low bank height elevation	766.07	766.11							765.76	765.79							759.75	759.84							759.40	759.49						
Bankfull Width (ft)	16.0	16.7							13.7	13.3							16.7	17.0							18.7	19.0						
Floodprone Width (ft)	---	---							73+	73+							76+	76+							---	---						
Bankfull Mean Depth (ft)	1.4	1.4							0.9	0.9							1.0	1.0							1.4	1.4						
Bankfull Max Depth (ft)	2.6	2.7							1.5	1.5							1.9	1.8							2.6	2.9						
Bankfull Cross-Sectional Area (ft^2)	21.7	23.0							12.8	12.3							16.5	16.7							26.3	26.6						
Bankfull Width/Depth Ratio	11.9	12.1							14.7	14.3							17.0	17.2							13.3	13.6						
Bankfull Entrenchment Ratio	---	---							5.3+	5.5+							4.5+	4.5+							---	---						
Bankfull Bank Height Ratio	---	---							1.0	1.0							1.0	1.0							---	---						
	UT3 Reach 3 Cross-Section 31, Riffle								**UT3 Reach 3 Cross-Section 32, Pool**																									
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**																		
bankfull elevation	758.39	758.19							758.36	758.21																						
low bank height elevation	758.39	758.19							758.36	758.21																						
Bankfull Width (ft)	19.2	19.1							25.8	26.9																						
Floodprone Width (ft)	71+	71+							---	---																						
Bankfull Mean Depth (ft)	1.0	0.9							1.8	1.7																						
Bankfull Max Depth (ft)	1.9	1.9							3.8	3.7																						
Bankfull Cross-Sectional Area (ft^2)	19.5	17.8							45.8	46.1																						
Bankfull Width/Depth Ratio	19.0	20.5							14.5	15.8																						
Bankfull Entrenchment Ratio	3.7+	3.7+							---	---																						
Bankfull Bank Height Ratio	1.0	1.0							---	---																						

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

Table 13a. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT1 Reach 1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[3]																
Bankfull Width (ft)	6.9		7.0													
Floodprone Width (ft)	29		27													
Bankfull Mean Depth (ft)	0.6		0.5													
Bankfull Max Depth (ft)	1.0		0.9													
Bankfull Cross-sectional Area (ft^2)	4.2		3.5													
Width/Depth Ratio	11.5		13.9													
Entrenchment Ratio	4.2		3.8													
Bank Height Ratio	1.0		0.9													
D_{50} (mm)	59.6															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	N/A[1]	N/A[1]														
Pool Length (ft)																
Pool Max Depth (ft)	1.1	3.0														
Pool Spacing (ft)	5	76														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A[2]															
Radius of Curvature (ft)	N/A[2]															
Rc/Bankfull Width (ft/ft)	N/A[2]															
Meander Length (ft)	N/A[2]															
Meander Width Ratio	N/A[2]															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	0.4/1.8/33.9/108/ 156.5/256		0.6/9.4/21.3/84.1/ 137.0/256													
Reach Shear Stress (Competency) lb/ft^2	1.97															
Max part size (mm) mobilized at bankfull	97															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.07															
Watershed Impervious Cover Estimate (%)	3%															
Rosgen Classification	A4															
Bankfull Velocity (fps)	4.8															
Bankfull Discharge (cfs)	20.2															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	966															
Sinuosity																
Bankfull/Channel Slope (ft/ft)	0.0555															

[1]UT1 Reach 1 riffle slopes were not calculated because this reach is comprised of a series of rock steps and cascades.

[2]Pattern data is not applicable for A-type and B-type channels

[3]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13b. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT1 Reach 2A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[2]																
Bankfull Width (ft)	7.3		8.1	9.2												
Floodprone Width (ft)	46	65+	46	65+												
Bankfull Mean Depth (ft)	0.6		0.6	0.7												
Bankfull Max Depth (ft)	0.9	1.0	1.1	1.2												
Bankfull Cross-sectional Area (ft^2)	4.5	4.6	5.1	5.3												
Width/Depth Ratio	11.5	11.8	12.4	16.4												
Entrenchment Ratio	6.3	9.0+	5.0	8.1+												
Bank Height Ratio	1.0		1.1													
D_{50} (mm)	37.0	37.9														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.003	0.068														
Pool Length (ft)																
Pool Max Depth (ft)	1.3	2.8														
Pool Spacing (ft)	6	51														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A[1]															
Radius of Curvature (ft)	N/A[1]															
Rc/Bankfull Width (ft/ft)	N/A[1]															
Meander Length (ft)	N/A[1]															
Meander Width Ratio	N/A[1]															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	0.3/14.1/21.6/67.2/ 137/362		0.3/6.7/19.9/75.9/ 128/256													
Reach Shear Stress (Competency) lb/ft^2	1.06	1.08														
Max part size (mm) mobilized at bankfull	52	53														
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.12															
Watershed Impervious Cover Estimate (%)	3%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	3.9	4.0														
Bankfull Discharge (cfs)	17.7	18.3														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,746															
Sinuosity																
Bankfull/Channel Slope (ft/ft)	0.0292															

[1]Pattern data is not applicable for A-type and B-type channels

[2]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13c. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT1 Reach 2B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	10.3	10.5	10.1	11.5												
Floodprone Width (ft)	49+	68+	49+	68+												
Bankfull Mean Depth (ft)	0.8		0.7	0.8												
Bankfull Max Depth (ft)	1.2	1.3	1.3	1.4												
Bankfull Cross-sectional Area (ft^2)	7.9	8.5	7.5	8.9												
Width/Depth Ratio	12.9	13.3	13.7	15.0												
Entrenchment Ratio	4.7+	6.6+	4.3+	6.7+												
Bank Height Ratio	1.0		1.0													
D_{50} (mm)	35.6	45.0														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.013	0.072														
Pool Length (ft)																
Pool Max Depth (ft)	1.8	3.1														
Pool Spacing (ft)	18	145														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	31	67														
Radius of Curvature (ft)	20	38														
Rc/Bankfull Width (ft/ft)	1.9	3.6														
Meander Length (ft)	102	190														
Meander Width Ratio	3.0	6.4														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	0.3/0.4/22.6/59.2/ 104.7/362		0.3/1.8/15.2/87/ 190.9/256													
Reach Shear Stress (Competency) lb/ft^2	0.85	0.88														
Max part size (mm) mobilized at bankfull	42	43														
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.32															
Watershed Impervious Cover Estimate (%)	3%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	4.1	4.2														
Bankfull Discharge (cfs)	32.7	36.2														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,368															
Sinuosity	1.25															
Bankfull/Channel Slope (ft/ft)	0.0182															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13d. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT1 Reach 3

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	11.3	12.5	10.8	11.6												
Floodprone Width (ft)	60+	68+	60+	68+												
Bankfull Mean Depth (ft)	0.7		0.7	0.8												
Bankfull Max Depth (ft)	1.1		1.1	1.3												
Bankfull Cross-sectional Area (ft^2)	8.3	8.7	7.7	8.3												
Width/Depth Ratio	15.5	18.0	14.1	17.4												
Entrenchment Ratio	5.3+	5.4+	5.5+	5.8+												
Bank Height Ratio	1.0		0.9	1.0												
D_{50} (mm)	41.6	47.4														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.013	0.055														
Pool Length (ft)																
Pool Max Depth (ft)	1.8	3.7														
Pool Spacing (ft)	41	129														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	35	71														
Radius of Curvature (ft)	19	38														
Rc/Bankfull Width (ft/ft)	1.7	3.0														
Meander Length (ft)	102	196														
Meander Width Ratio	3.1	5.7														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	0.3/16/25.6/62.4/ 113.8/180		3.2/18.3/28.2/62.7/ 101.2/256													
Reach Shear Stress (Competency) lb/ft^2	0.65	0.68														
Max part size (mm) mobilized at bankfull	32	33														
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.44															
Watershed Impervious Cover Estimate (%)	3%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	3.7	3.8														
Bankfull Discharge (cfs)	30.4	31.0														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,641															
Sinuosity	1.30															
Bankfull/Channel Slope (ft/ft)	0.0153															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13e. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT2 Reach 1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[2]																
Bankfull Width (ft)	8.3		8.3													
Floodprone Width (ft)	69+		69+													
Bankfull Mean Depth (ft)	0.7		0.7													
Bankfull Max Depth (ft)	1.2		1.3													
Bankfull Cross-sectional Area (ft^2)	6.1		6.1													
Width/Depth Ratio	11.3		11.5													
Entrenchment Ratio	8.3+		8.2+													
Bank Height Ratio	1.0		1.0													
D_{50} (mm)	26.9															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.006	0.034														
Pool Length (ft)																
Pool Max Depth (ft)	1.2	2.5														
Pool Spacing (ft)	15	78														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A[1]															
Radius of Curvature (ft)	N/A[1]															
Rc/Bankfull Width (ft/ft)	N/A[1]															
Meander Length (ft)	N/A[1]															
Meander Width Ratio	N/A[1]															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/0.5/47.3/ 90/128		3.2/18.3/28.2/62.7/ 101.2/256													
Reach Shear Stress (Competency) lb/ft^2	0.79															
Max part size (mm) mobilized at bankfull	39															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.14															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	B4															
Bankfull Velocity (fps)	3.9															
Bankfull Discharge (cfs)	24.0															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	623															
Sinuosity	1.10															
Bankfull/Channel Slope (ft/ft)	0.0180															

[1]Pattern data is not applicable for B-type channels

[2]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13f. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT2 Reach 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	11.8	11.9	12.2	13.2												
Floodprone Width (ft)	65+	72+	65+	72+												
Bankfull Mean Depth (ft)	0.8	0.9	0.7													
Bankfull Max Depth (ft)	1.2	1.3	1.3	1.4												
Bankfull Cross-sectional Area (ft^2)	9.1	10.2	9.0	9.5												
Width/Depth Ratio	13.6	15.6	16.4	18.2												
Entrenchment Ratio	5.5+	6.1+	5.3+	5.5+												
Bank Height Ratio	1.0		0.9	1.0												
D_{50} (mm)	25.4	33.4														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.004	0.035														
Pool Length (ft)																
Pool Max Depth (ft)	2.1	3.2														
Pool Spacing (ft)	45	127														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	39	88														
Radius of Curvature (ft)	20	39														
Rc/Bankfull Width (ft/ft)	1.7	3.3														
Meander Length (ft)	72	154														
Meander Width Ratio	3.3	7.4														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/SC/42/ 71.7/180		SC/0.16/9.4/52.7/ 86.3/>2048													
Reach Shear Stress (Competency) lb/ft^2	0.33	0.38														
Max part size (mm) mobilized at bankfull	16	19														
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.26															
Watershed Impervious Cover Estimate (%)	1%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	2.6	2.8														
Bankfull Discharge (cfs)	23.6	28.9														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,080															
Sinuosity	1.30															
Bankfull/Channel Slope (ft/ft)	0.0072															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13g. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT2A

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	5.4	5.7	5.5	5.8												
Floodprone Width (ft)	51+	57+	51+	57+												
Bankfull Mean Depth (ft)	0.4	0.4	0.3	0.4												
Bankfull Max Depth (ft)	0.5	0.7	0.6													
Bankfull Cross-sectional Area (ft^2)	1.9	2.4	2.0													
Width/Depth Ratio	13.6	15.2	15.0	17.2												
Entrenchment Ratio	9.0+	10.5+	8.8+	10.4+												
Bank Height Ratio	1.0		0.8	1.0												
D_{50} (mm)	21.0	28.1														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.001	0.046														
Pool Length (ft)																
Pool Max Depth (ft)	0.9	1.3														
Pool Spacing (ft)	18	58														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	19	44														
Radius of Curvature (ft)	10	19														
Rc/Bankfull Width (ft/ft)	1.9	3.3														
Meander Length (ft)	36	77														
Meander Width Ratio	3.5	7.7														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/0.5/42.5/ 90/180		SC/0.09/5.6/75.9/ 139.4/256													
Reach Shear Stress (Competency) lb/ft^2	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.02															
Watershed Impervious Cover Estimate (%)	---															
Rosgen Classification	C4															
Bankfull Velocity (fps)	1.9	2.1														
Bankfull Discharge (cfs)	3.7	5.1														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	655															
Sinuosity	1.20															
Bankfull/Channel Slope (ft/ft)	0.0110															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13h. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT2B

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	7.2	9.6	6.9	7.9												
Floodprone Width (ft)	56+	66+	56+	66+												
Bankfull Mean Depth (ft)	0.5	0.5	0.5													
Bankfull Max Depth (ft)	0.8	0.8	0.7	0.8												
Bankfull Cross-sectional Area (ft^2)	3.9	4.3	3.6	3.7												
Width/Depth Ratio	13.4	21.1	12.9	17.4												
Entrenchment Ratio	6.9+	7.8+	8.2+	8.3+												
Bank Height Ratio	1.0		0.9	1.0												
D_{50} (mm)	25.1	30.6														
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.001	0.037														
Pool Length (ft)																
Pool Max Depth (ft)	1.5	2.7														
Pool Spacing (ft)	7	58														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	26	60														
Radius of Curvature (ft)	14	23														
Rc/Bankfull Width (ft/ft)	1.9	2.4														
Meander Length (ft)	49	105														
Meander Width Ratio	3.6	6.3														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/0.4/43.3/ 82.6/256		0.17/17.58/26.1/59.0/ 86.7/180													
Reach Shear Stress (Competency) lb/ft^2	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.05															
Watershed Impervious Cover Estimate (%)	---															
Rosgen Classification	C4															
Bankfull Velocity (fps)	2.3	2.6														
Bankfull Discharge (cfs)	10.1	10.1														
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	776															
Sinuosity	1.20															
Bankfull/Channel Slope (ft/ft)	0.0115															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13i. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT3 Reach 1

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[2]																
Bankfull Width (ft)	13.7		13.3													
Floodprone Width (ft)	73+		73+													
Bankfull Mean Depth (ft)	0.9		0.9													
Bankfull Max Depth (ft)	1.5		1.5													
Bankfull Cross-sectional Area (ft^2)	12.8		12.3													
Width/Depth Ratio	14.7		14.3													
Entrenchment Ratio	5.3+		5.5+													
Bank Height Ratio	1.0		1.0													
D_{50} (mm)	50.0															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.001	0.023														
Pool Length (ft)																
Pool Max Depth (ft)	2.8	3.9														
Pool Spacing (ft)	64	163														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	N/A[1]															
Radius of Curvature (ft)	N/A[1]															
Rc/Bankfull Width (ft/ft)	N/A[1]															
Meander Length (ft)	N/A[1]															
Meander Width Ratio	N/A[1]															
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/0.2/0.4/59.2/ 107.3/180		SC/2.8/17.1/74.5/ 117.2/180													
Reach Shear Stress (Competency) lb/ft^2	0.42															
Max part size (mm) mobilized at bankfull	21															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.63															
Watershed Impervious Cover Estimate (%)	2%															
Rosgen Classification	B4c															
Bankfull Velocity (fps)	3.0															
Bankfull Discharge (cfs)	38.6															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	779															
Sinuosity	1.10															
Bankfull/Channel Slope (ft/ft)	0.0075															

[1]Pattern data is not applicable for B-type channels

[2]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13j. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT3 Reach 2

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	16.7		17.0													
Floodprone Width (ft)	76+		76+													
Bankfull Mean Depth (ft)	1.0		1.0													
Bankfull Max Depth (ft)	1.9		1.8													
Bankfull Cross-sectional Area (ft^2)	16.5		16.7													
Width/Depth Ratio	17.0		17.2													
Entrenchment Ratio	4.5+		4.5+													
Bank Height Ratio[1]	1.0		1.0													
D_{50} (mm)	31.2															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.002	0.012														
Pool Length (ft)																
Pool Max Depth (ft)	2.5	4.1														
Pool Spacing (ft)	53	186														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	57	130														
Radius of Curvature (ft)	29	57														
Rc/Bankfull Width (ft/ft)	1.7	3.4														
Meander Length (ft)	105	227														
Meander Width Ratio	3.4	7.8														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/0.2/41.6/ 61.5/180		SC/SC/0.2/60.4/ 113.8/256													
Reach Shear Stress (Competency) lb/ft^2	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.63															
Watershed Impervious Cover Estimate (%)	2%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	1.9															
Bankfull Discharge (cfs)	31.1															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	1,159															
Sinuosity	1.40															
Bankfull/Channel Slope (ft/ft)	0.0027															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

(---): Data was not provided

N/A: Not Applicable

Table 13k. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT3 Reach 3

Parameter	As-Built/Baseline		MY1		MY2		MY3		MY4		MY5		MY6		MY7	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Dimension and Substrate - Riffle[1]																
Bankfull Width (ft)	19.2		19.1													
Floodprone Width (ft)	71+		71+													
Bankfull Mean Depth (ft)	1.0		0.9													
Bankfull Max Depth (ft)	1.9		1.9													
Bankfull Cross-sectional Area (ft^2)	19.5		17.8													
Width/Depth Ratio	19.0		20.5													
Entrenchment Ratio	3.7+		3.7+													
Bank Height Ratio[1]	1.0		1.0													
D_{50} (mm)	47.0															
Profile																
Riffle Length (ft)																
Riffle Slope (ft/ft)	0.0002	0.005														
Pool Length (ft)																
Pool Max Depth (ft)	3.3	3.9														
Pool Spacing (ft)	83	180														
Pool Volume (ft^3)																
Pattern																
Channel Beltwidth (ft)	67	152														
Radius of Curvature (ft)	34	67														
Rc/Bankfull Width (ft/ft)	1.8	3.5														
Meander Length (ft)	124	266														
Meander Width Ratio	3.5	7.9														
Substrate, Bed and Transport Parameters																
Ri%/Ru%/P%/G%/S%																
SC%/Sa%/G%/C%/B%/Be%																
$D_{16}/D_{35}/D_{50}/D_{84}/D_{95}/D_{100}$	SC/SC/SC/64/ 151.8/362		SC/SC/SC/32.0/ 151.8/362													
Reach Shear Stress (Competency) lb/ft^2	---															
Max part size (mm) mobilized at bankfull	---															
Stream Power (Capacity) W/m^2																
Additional Reach Parameters																
Drainage Area (SM)	0.88															
Watershed Impervious Cover Estimate (%)	2%															
Rosgen Classification	C4															
Bankfull Velocity (fps)	0.8															
Bankfull Discharge (cfs)	16.0															
Q-NFF regression (2-yr)																
Q-USGS extrapolation (1.2-yr)																
Max Q-Mannings																
Valley Slope (ft/ft)	---															
Channel Thalweg Length (ft)	764															
Sinuosity	1.20															
Bankfull/Channel Slope (ft/ft)	0.0005															

[1]MY1-MY7 Bank Height Ratio is calculated based on the As-built (MY0) cross-sectional area as described in the Standard Measurement of the BHR Monitoring Parameter document provided by the NCIRT and NCDMS (9/2018). The remainder of the cross-section dimension parameters were calculated based on the current low bank height.

SC: Silt/Clay <0.062 mm diameter particles

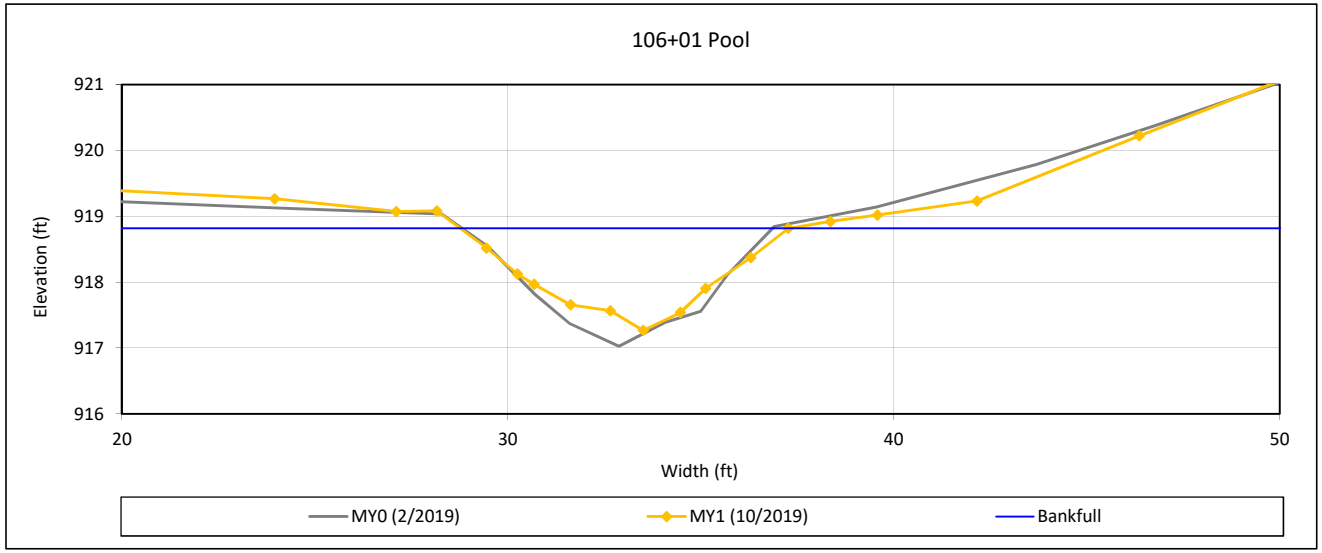
(---): Data was not provided

N/A: Not Applicable

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 1 - UT1 Reach 1



Bankfull Dimensions	
7.3	x-section area (ft.sq.)
8.5	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
9.1	wetted perimeter (ft)
0.8	hydraulic radius (ft)
9.9	width-depth ratio

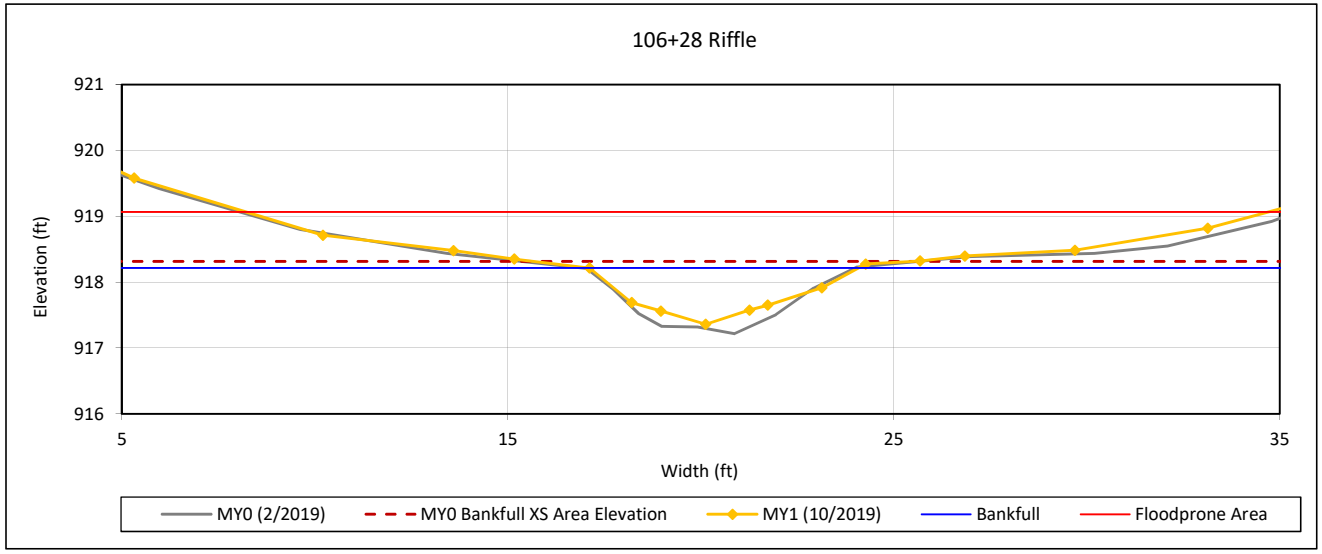
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 2 - UT1 Reach 1



Bankfull Dimensions	
3.5	x-section area (ft.sq.)
7.0	width (ft)
0.5	mean depth (ft)
0.9	max depth (ft)
7.2	wetted perimeter (ft)
0.5	hydraulic radius (ft)
13.9	width-depth ratio
26.5	W flood prone area (ft)
3.8	entrenchment ratio
0.9	low bank height ratio

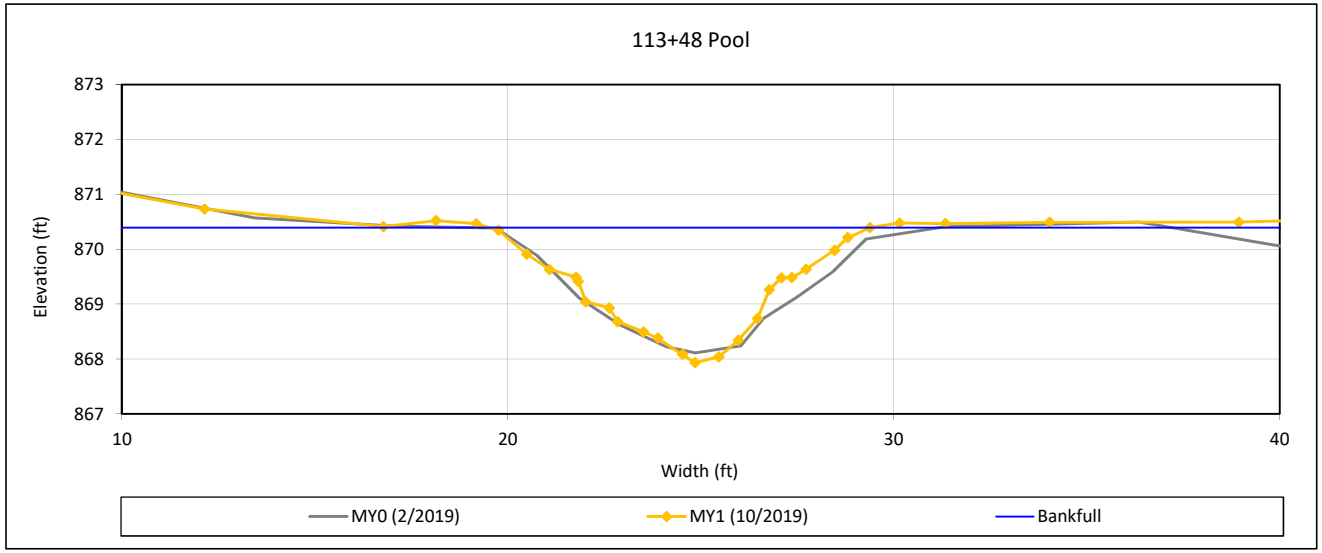
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 3 - UT1 Reach 2A



Bankfull Dimensions	
12.1	x-section area (ft.sq.)
9.9	width (ft)
1.2	mean depth (ft)
2.5	max depth (ft)
11.4	wetted perimeter (ft)
1.1	hydraulic radius (ft)
8.0	width-depth ratio

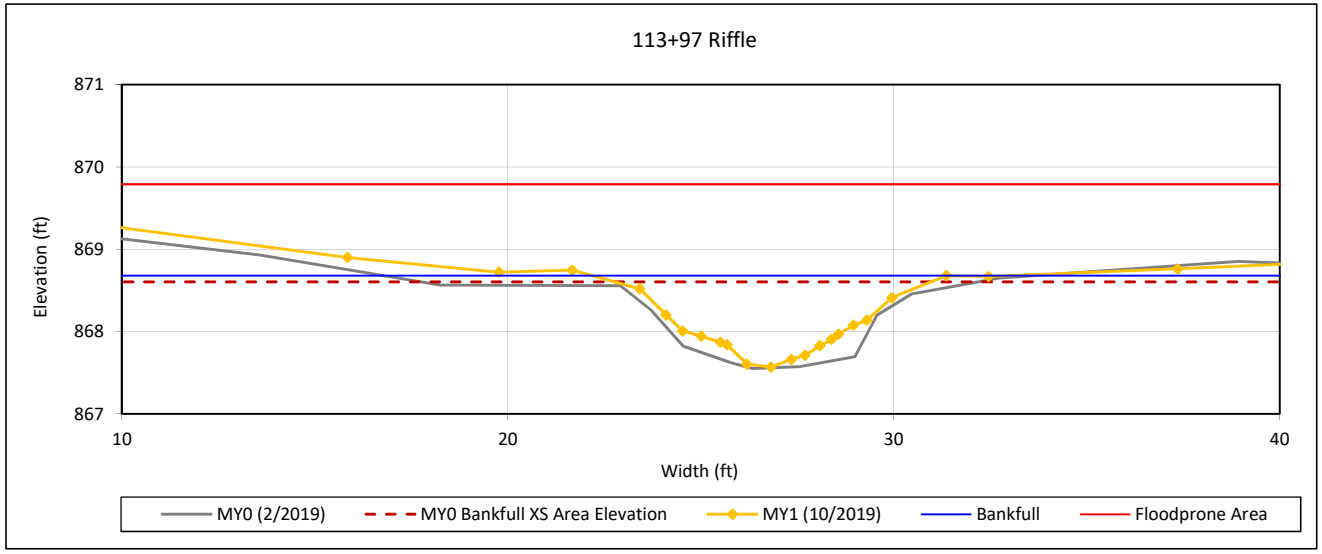
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 4 - UT1 Reach 2A



Bankfull Dimensions	
5.1	x-section area (ft.sq.)
9.2	width (ft)
0.6	mean depth (ft)
1.1	max depth (ft)
9.5	wetted perimeter (ft)
0.5	hydraulic radius (ft)
16.4	width-depth ratio
45.6	W flood prone area (ft)
5.0	entrenchment ratio
1.1	low bank height ratio

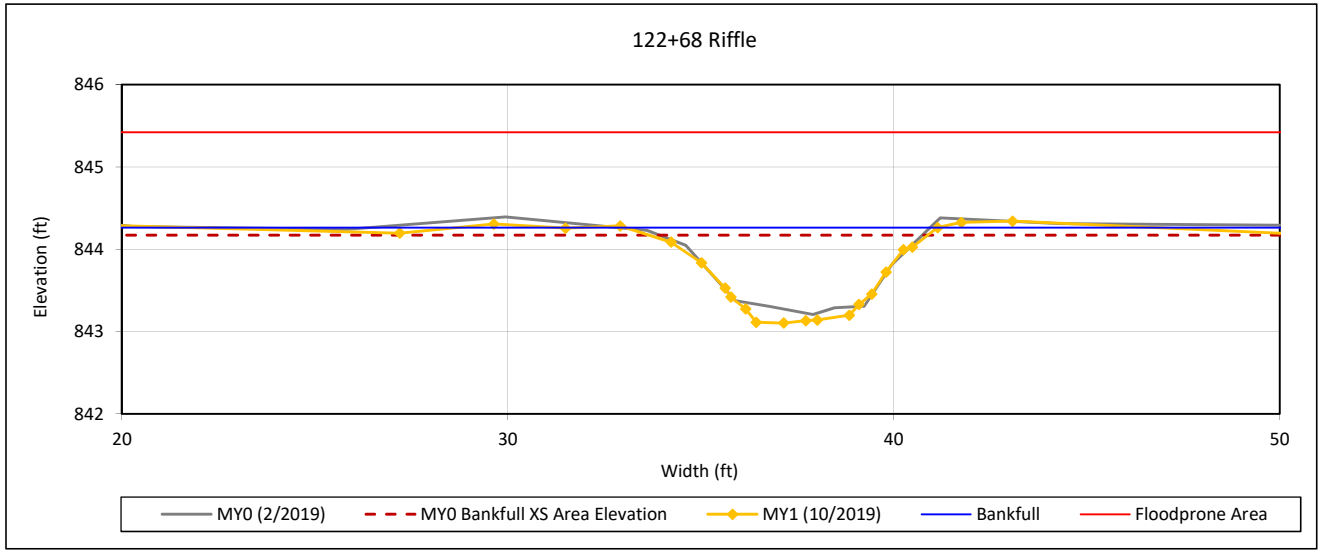
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 5 - UT1 Reach 2A



Bankfull Dimensions	
5.3	x-section area (ft.sq.)
8.1	width (ft)
0.7	mean depth (ft)
1.2	max depth (ft)
8.6	wetted perimeter (ft)
0.6	hydraulic radius (ft)
12.4	width-depth ratio
65.4	W flood prone area (ft)
8.1	entrenchment ratio
1.1	low bank height ratio

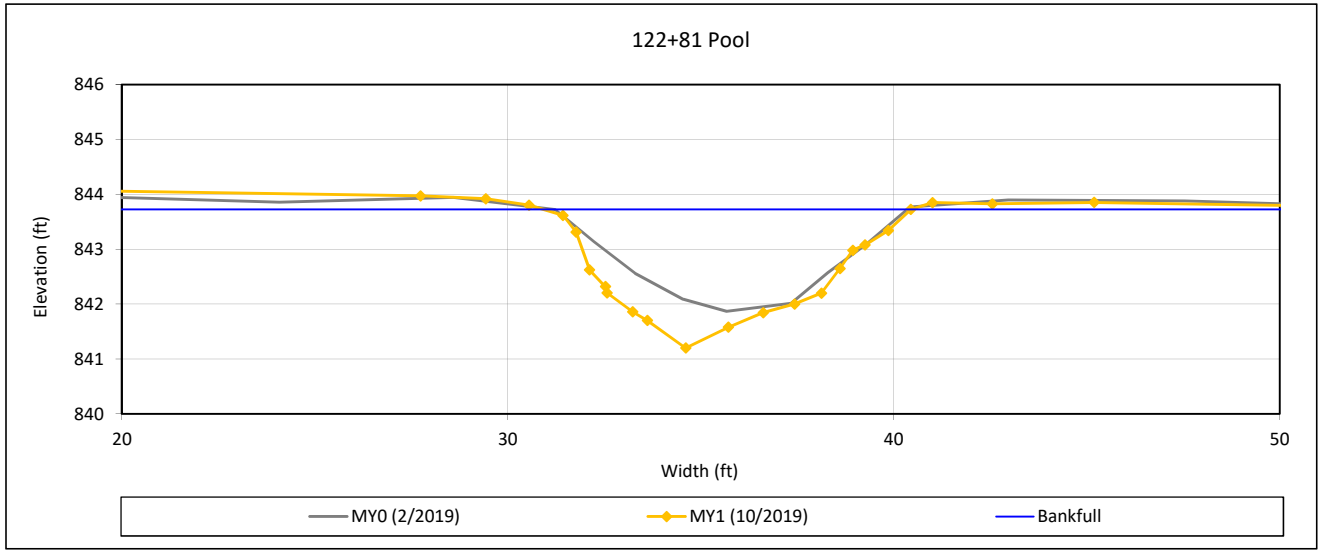
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 6 - UT1 Reach 2A



Bankfull Dimensions	
13.6	x-section area (ft.sq.)
9.5	width (ft)
1.4	mean depth (ft)
2.5	max depth (ft)
11.1	wetted perimeter (ft)
1.2	hydraulic radius (ft)
6.6	width-depth ratio

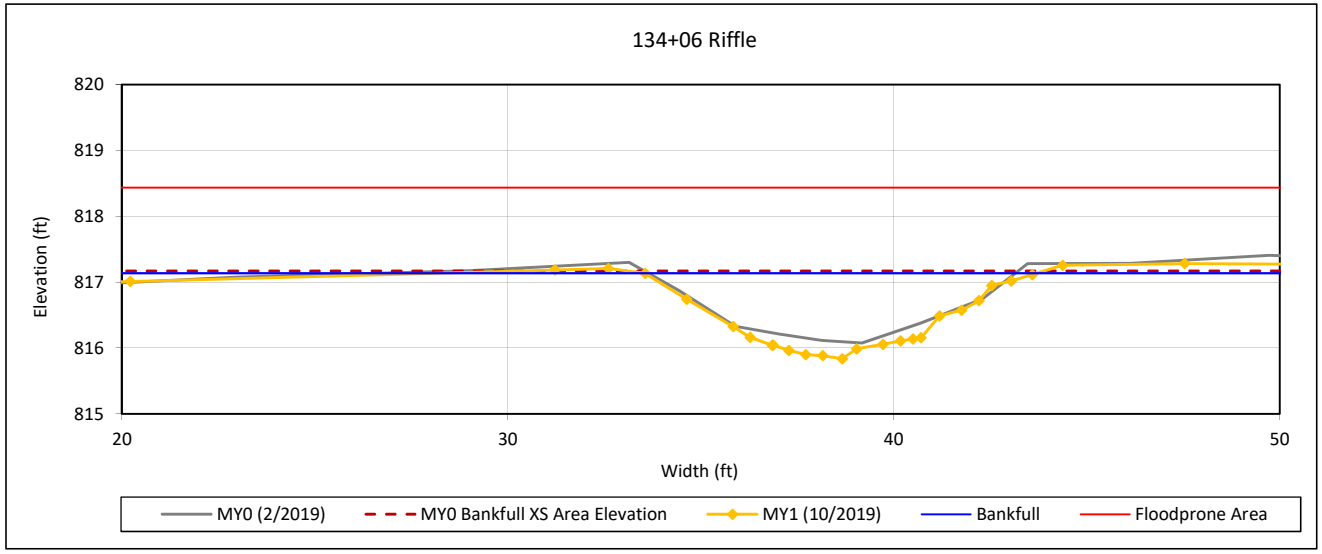
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 7 - UT1 Reach 2B



Bankfull Dimensions	
7.5	x-section area (ft.sq.)
10.1	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
10.6	wetted perimeter (ft)
0.7	hydraulic radius (ft)
13.7	width-depth ratio
68.0	W flood prone area (ft)
6.7	entrenchment ratio
1.0	low bank height ratio

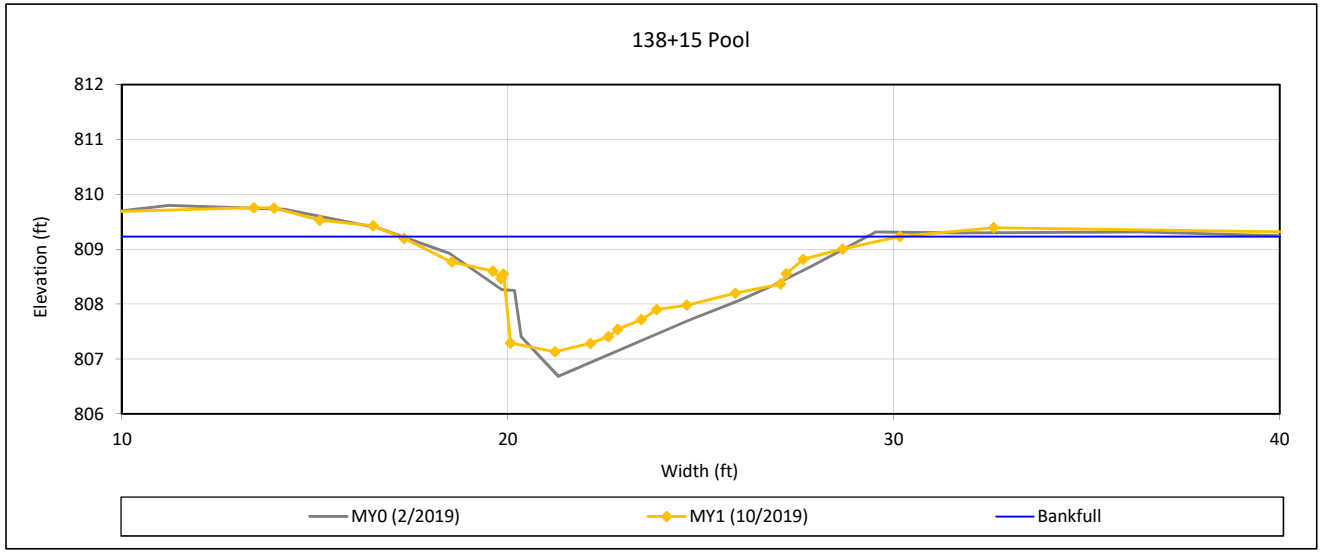
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 8 - UT1 Reach 2B



Bankfull Dimensions	
12.8	x-section area (ft.sq.)
13.0	width (ft)
1.0	mean depth (ft)
2.1	max depth (ft)
14.6	wetted perimeter (ft)
0.9	hydraulic radius (ft)
13.2	width-depth ratio

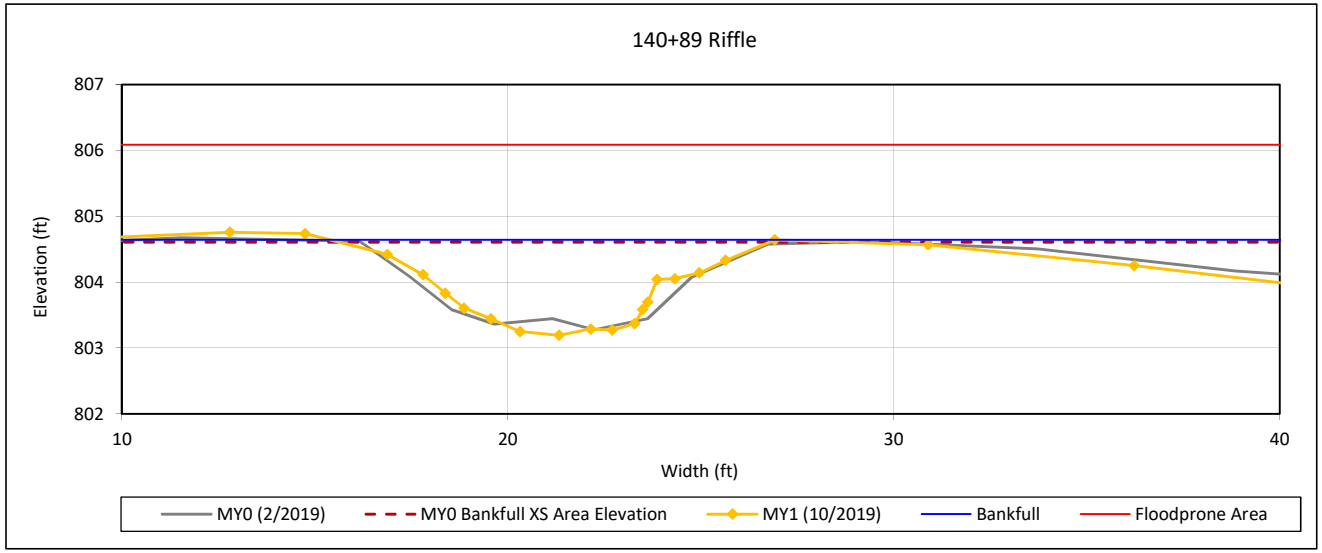
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 9 - UT1 Reach 2B



Bankfull Dimensions	
8.9	x-section area (ft.sq.)
11.5	width (ft)
0.8	mean depth (ft)
1.4	max depth (ft)
12.1	wetted perimeter (ft)
0.7	hydraulic radius (ft)
15.0	width-depth ratio
49.1	W flood prone area (ft)
4.3	entrenchment ratio
1.0	low bank height ratio

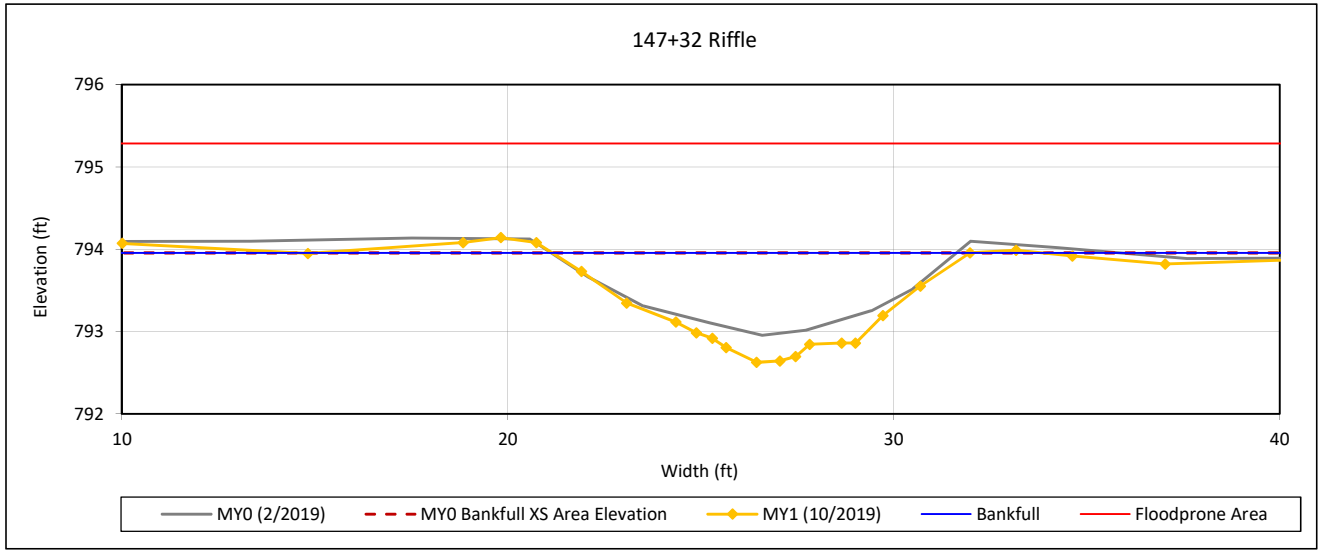
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 10 - UT1 Reach 3



Bankfull Dimensions	
8.3	x-section area (ft.sq.)
10.8	width (ft)
0.8	mean depth (ft)
1.3	max depth (ft)
11.2	wetted perimeter (ft)
0.7	hydraulic radius (ft)
14.1	width-depth ratio
59.9	W flood prone area (ft)
5.5	entrenchment ratio
1.0	low bank height ratio

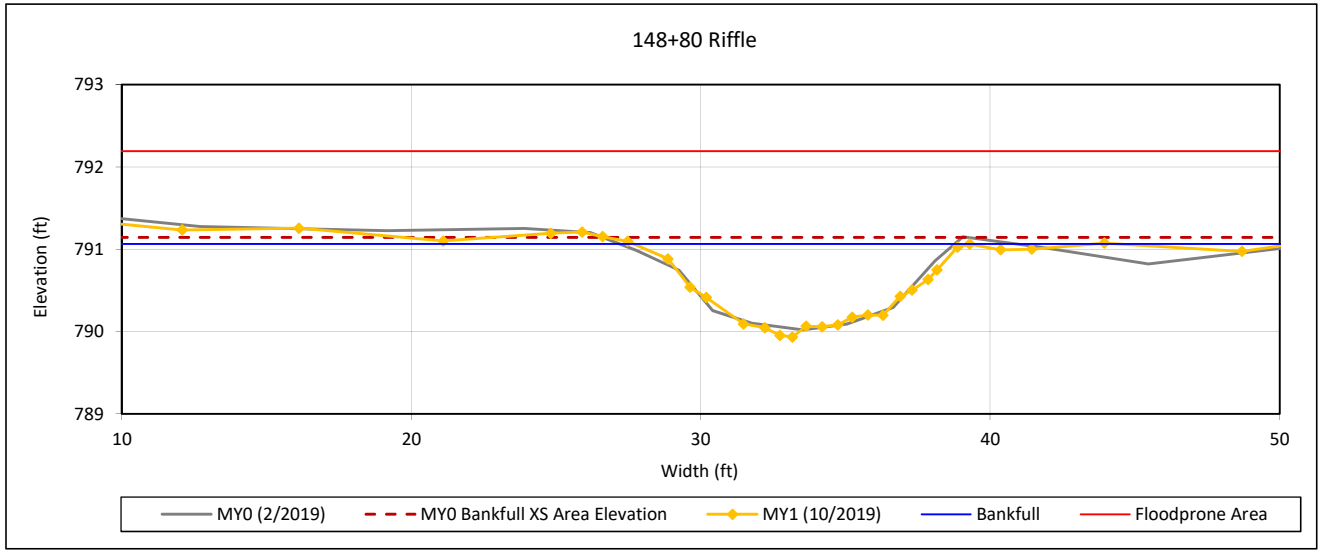
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 11 - UT1 Reach 3



Bankfull Dimensions	
7.7	x-section area (ft.sq.)
11.6	width (ft)
0.7	mean depth (ft)
1.1	max depth (ft)
11.9	wetted perimeter (ft)
0.6	hydraulic radius (ft)
17.4	width-depth ratio
67.7	W flood prone area (ft)
5.8	entrenchment ratio
0.9	low bank height ratio

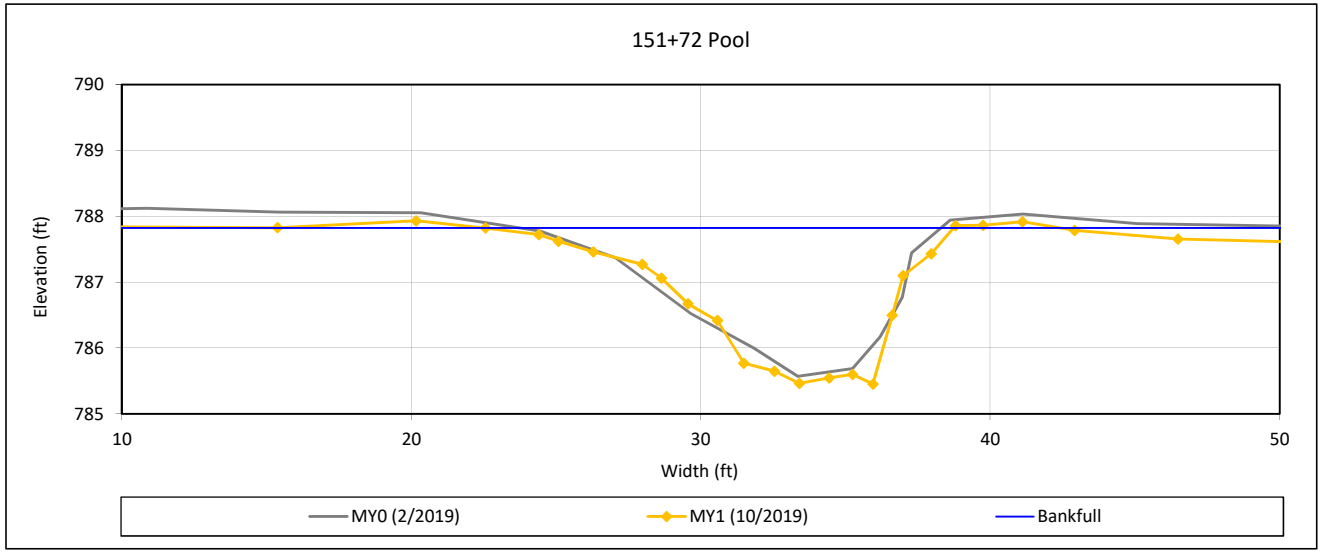
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 12 - UT1 Reach 3



Bankfull Dimensions	
17.8	x-section area (ft.sq.)
16.2	width (ft)
1.1	mean depth (ft)
2.4	max depth (ft)
17.7	wetted perimeter (ft)
1.0	hydraulic radius (ft)
14.7	width-depth ratio

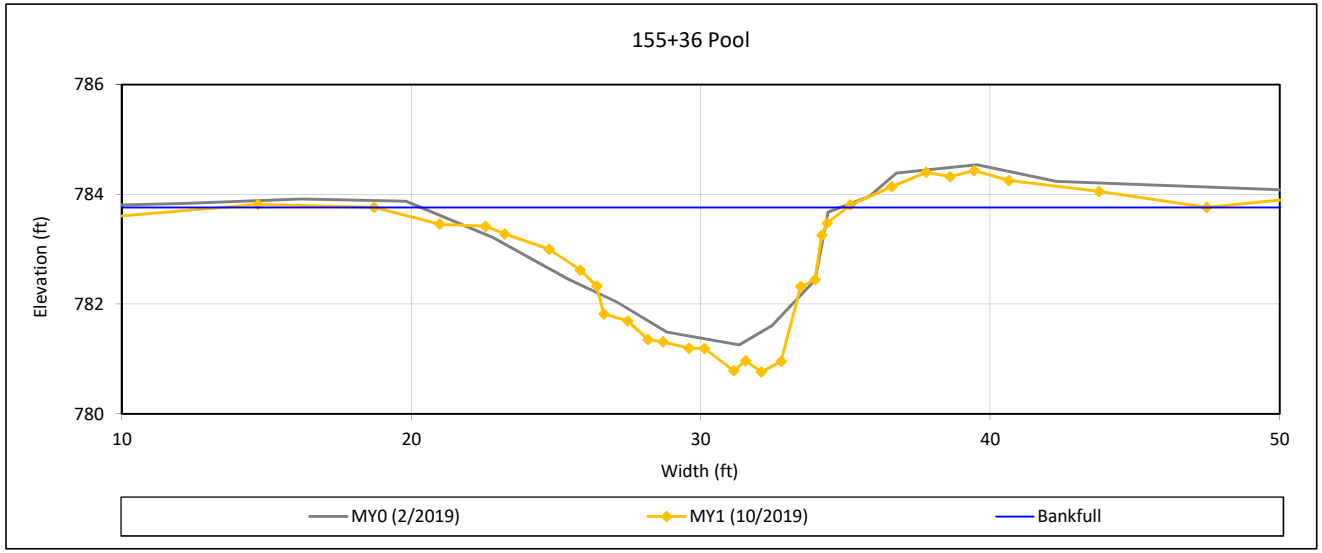
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 13 - UT1 Reach 3



Bankfull Dimensions	
22.4	x-section area (ft.sq.)
16.3	width (ft)
1.4	mean depth (ft)
3.0	max depth (ft)
18.8	wetted perimeter (ft)
1.2	hydraulic radius (ft)
11.9	width-depth ratio

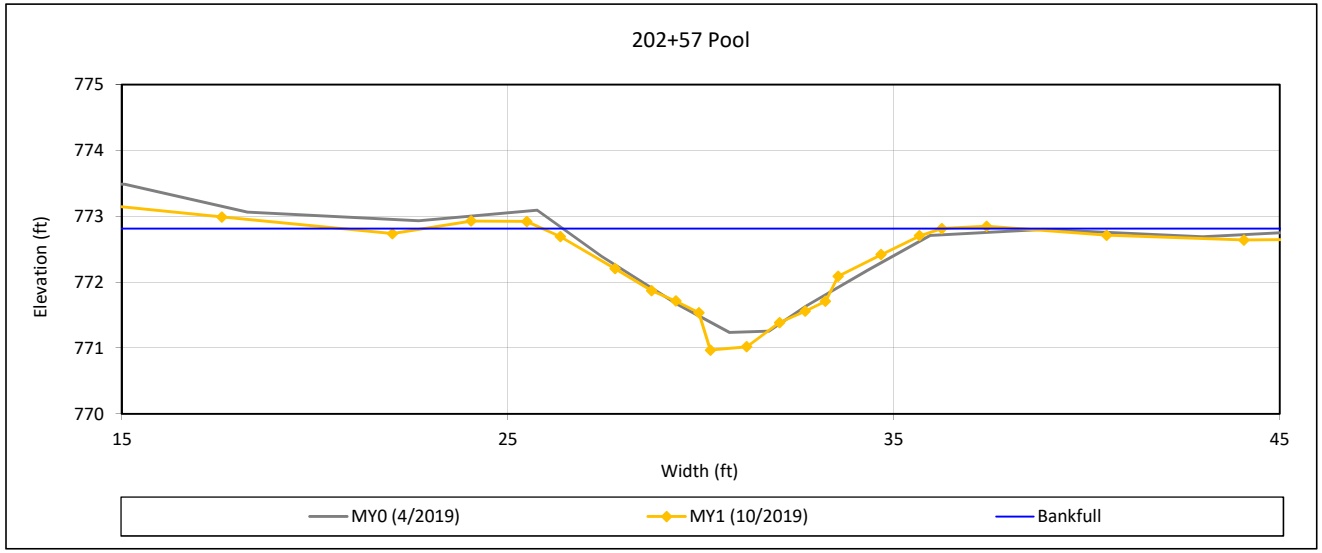
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 14 - UT2 Reach 1



Bankfull Dimensions	
8.9	x-section area (ft.sq.)
10.4	width (ft)
0.9	mean depth (ft)
1.8	max depth (ft)
11.3	wetted perimeter (ft)
0.8	hydraulic radius (ft)
12.0	width-depth ratio

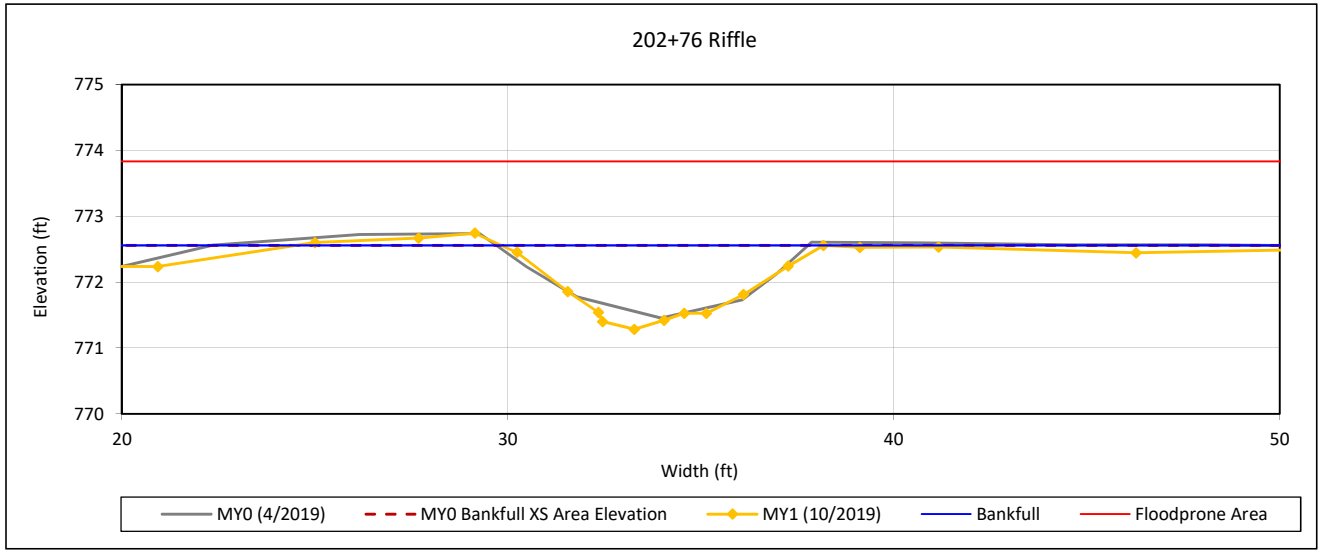
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 15 - UT2 Reach 1



Bankfull Dimensions	
6.1	x-section area (ft.sq.)
8.3	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
8.8	wetted perimeter (ft)
0.7	hydraulic radius (ft)
11.5	width-depth ratio
68.7	W flood prone area (ft)
8.2	entrenchment ratio
1.0	low bank height ratio

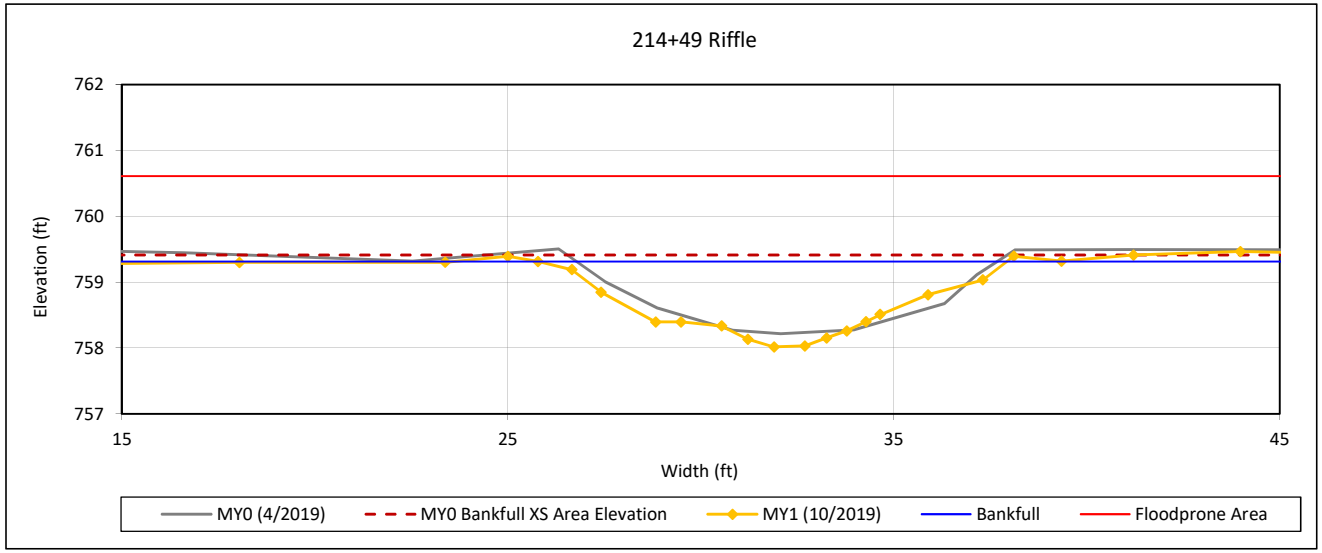
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 16 - UT2 Reach 2



Bankfull Dimensions	
9.0	x-section area (ft.sq.)
12.2	width (ft)
0.7	mean depth (ft)
1.3	max depth (ft)
12.5	wetted perimeter (ft)
0.7	hydraulic radius (ft)
16.4	width-depth ratio
64.7	W flood prone area (ft)
5.3	entrenchment ratio
0.9	low bank height ratio

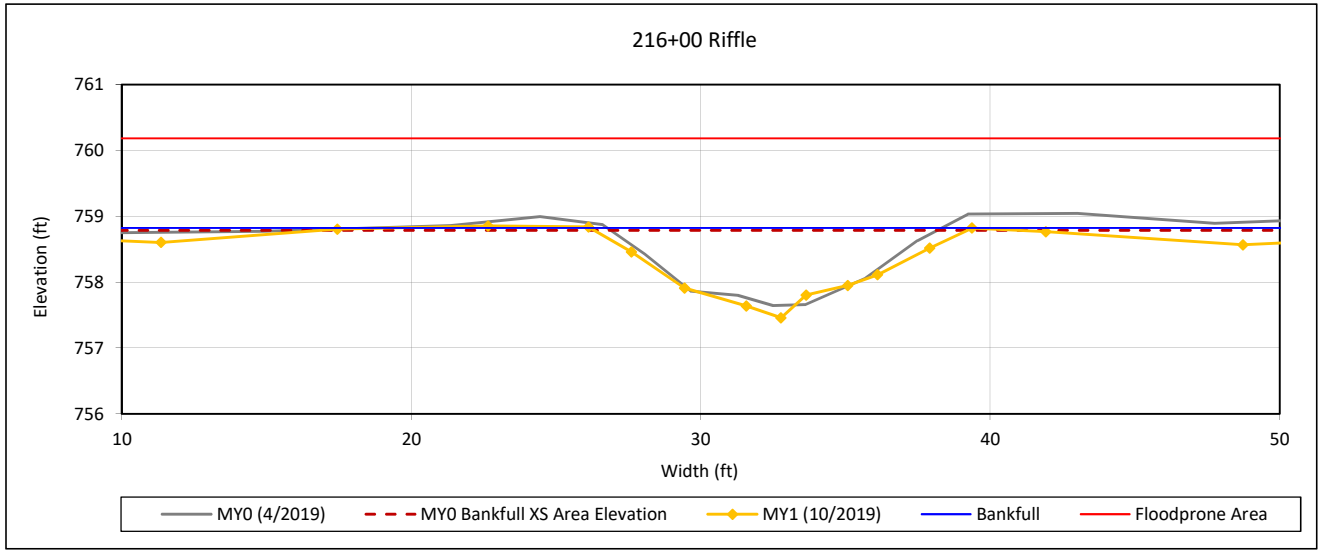
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 17 - UT2 Reach 2



Bankfull Dimensions	
9.5	x-section area (ft.sq.)
13.2	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
13.5	wetted perimeter (ft)
0.7	hydraulic radius (ft)
18.2	width-depth ratio
72.2	W flood prone area (ft)
5.5	entrenchment ratio
1.0	low bank height ratio

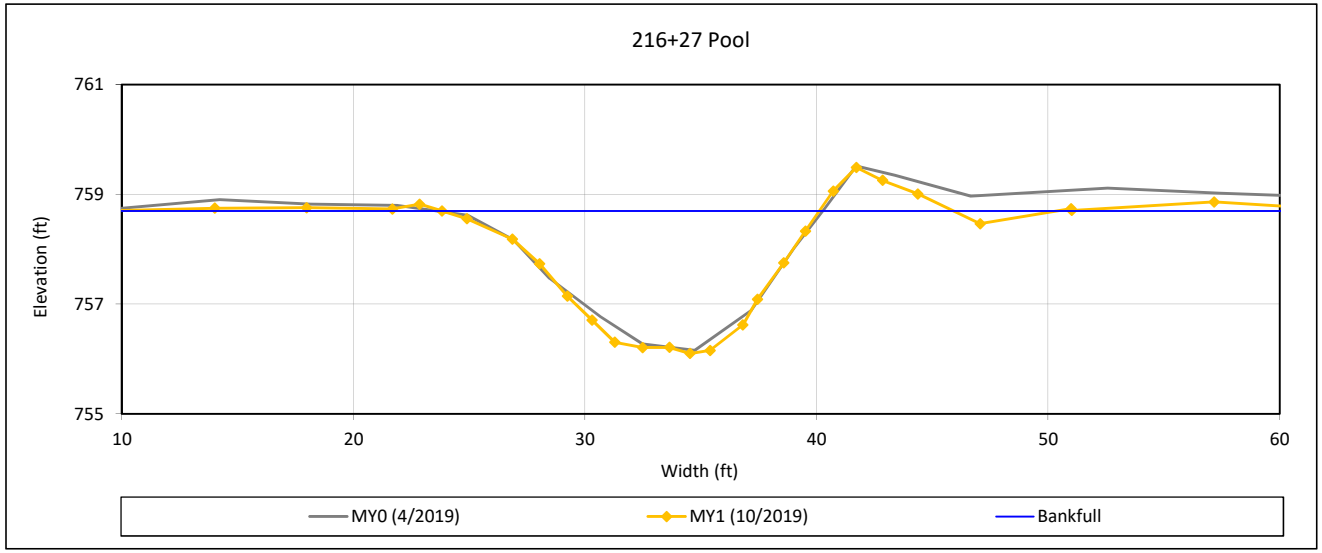
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 18 - UT2 Reach 2



Bankfull Dimensions	
24.0	x-section area (ft.sq.)
16.3	width (ft)
1.5	mean depth (ft)
2.6	max depth (ft)
17.4	wetted perimeter (ft)
1.4	hydraulic radius (ft)
11.1	width-depth ratio

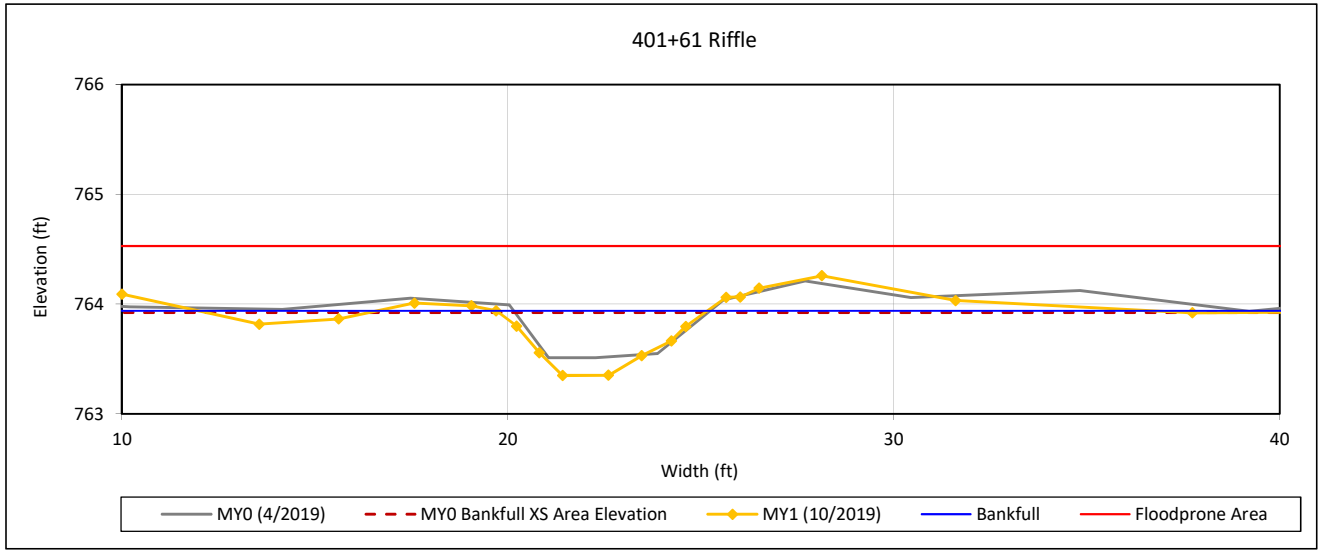
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 19 - UT2A



Bankfull Dimensions	
2.0	x-section area (ft.sq.)
5.5	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
5.6	wetted perimeter (ft)
0.4	hydraulic radius (ft)
15.0	width-depth ratio
56.9	W flood prone area (ft)
10.4	entrenchment ratio
1.0	low bank height ratio

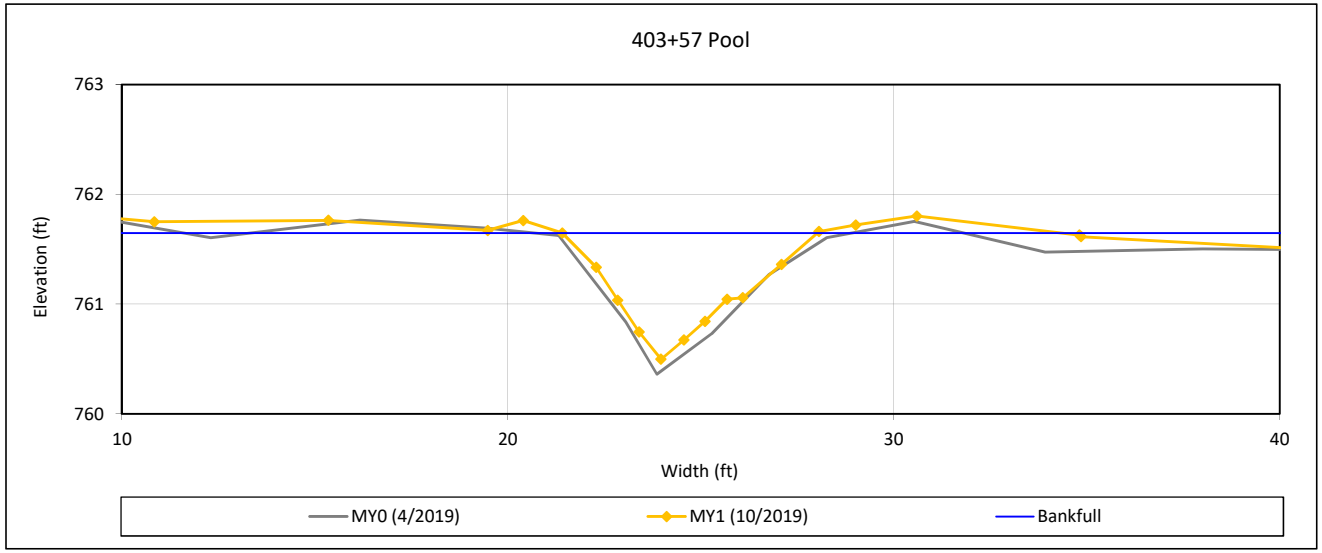
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 20 - UT2A



Bankfull Dimensions	
3.7	x-section area (ft.sq.)
6.6	width (ft)
0.6	mean depth (ft)
1.2	max depth (ft)
7.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
11.7	width-depth ratio

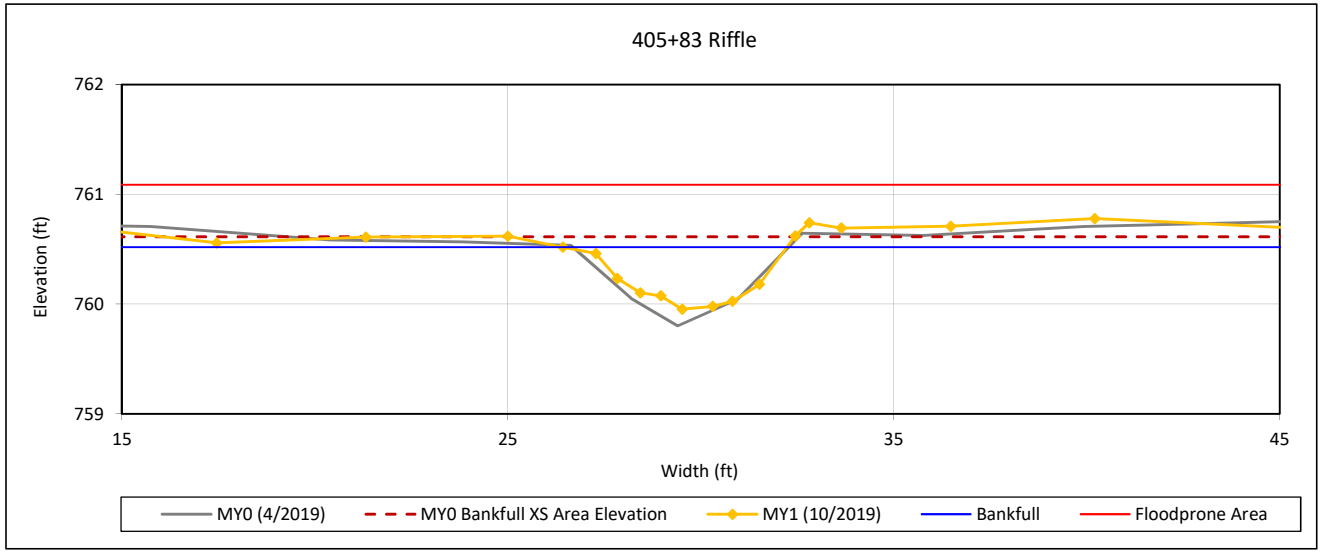
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 21 - UT2A



Bankfull Dimensions	
2.0	x-section area (ft.sq.)
5.8	width (ft)
0.3	mean depth (ft)
0.6	max depth (ft)
6.0	wetted perimeter (ft)
0.3	hydraulic radius (ft)
17.2	width-depth ratio
51.4	W flood prone area (ft)
8.8	entrenchment ratio
0.8	low bank height ratio

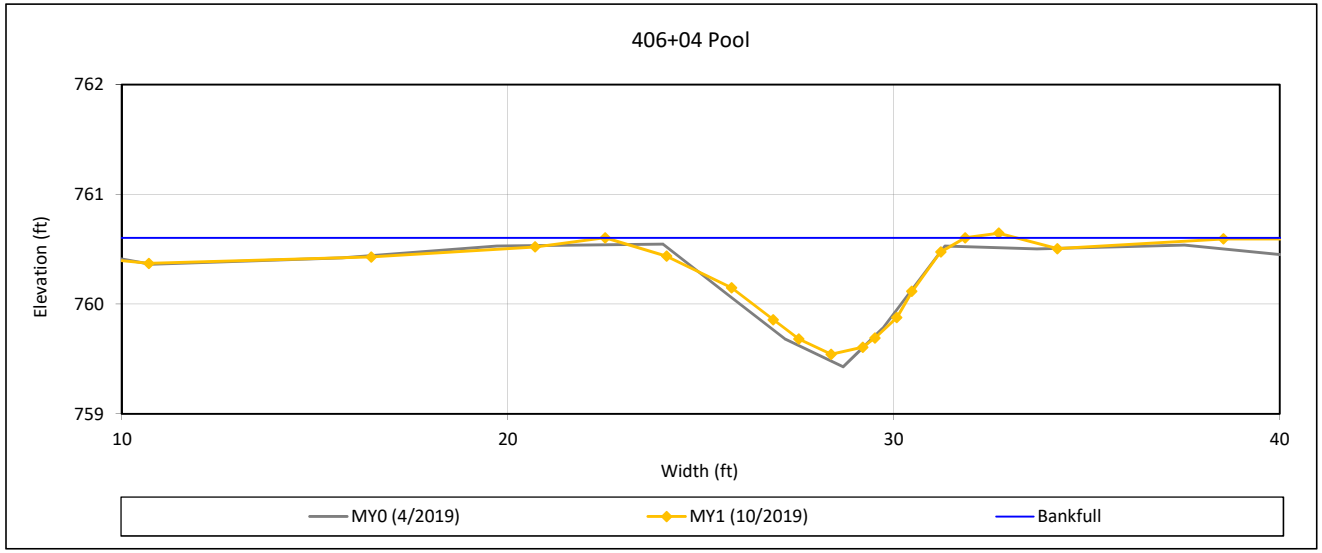
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 22 - UT2A



Bankfull Dimensions	
4.8	x-section area (ft.sq.)
9.3	width (ft)
0.5	mean depth (ft)
1.1	max depth (ft)
9.6	wetted perimeter (ft)
0.5	hydraulic radius (ft)
18.1	width-depth ratio

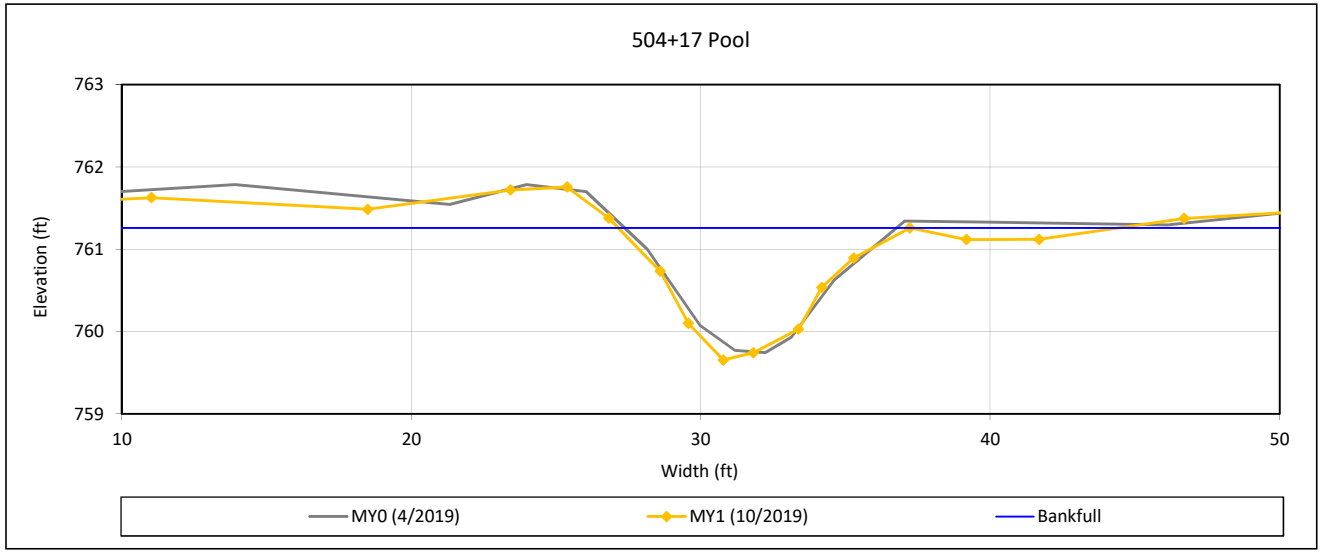
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 23 - UT2B



Bankfull Dimensions	
8.4	x-section area (ft.sq.)
10.1	width (ft)
0.8	mean depth (ft)
1.6	max depth (ft)
10.7	wetted perimeter (ft)
0.8	hydraulic radius (ft)
12.1	width-depth ratio

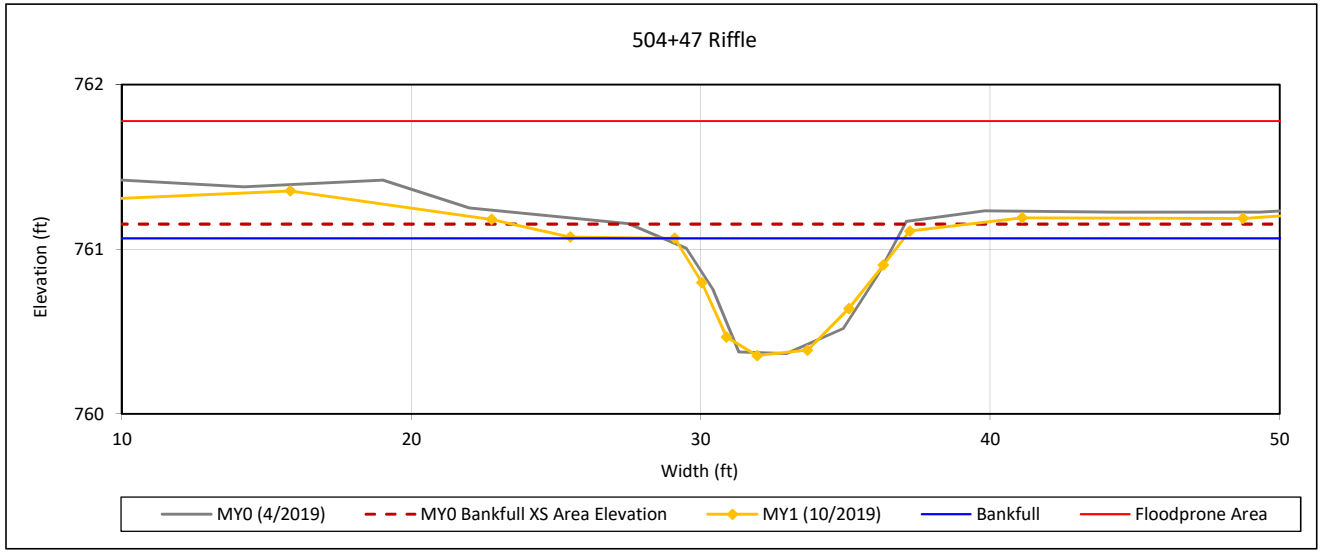
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 24 - UT2B



Bankfull Dimensions	
3.6	x-section area (ft.sq.)
7.9	width (ft)
0.5	mean depth (ft)
0.7	max depth (ft)
8.1	wetted perimeter (ft)
0.4	hydraulic radius (ft)
17.4	width-depth ratio
65.9	W flood prone area (ft)
8.3	entrenchment ratio
0.9	low bank height ratio

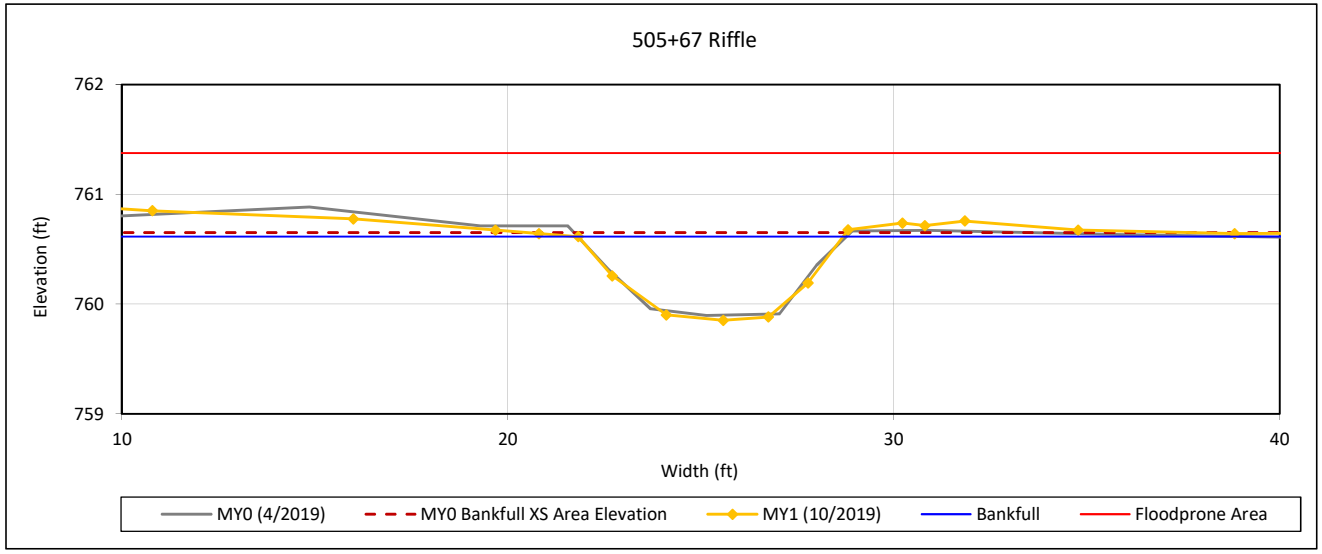
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 25 - UT2B



Bankfull Dimensions	
3.7	x-section area (ft.sq.)
6.9	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
7.1	wetted perimeter (ft)
0.5	hydraulic radius (ft)
12.9	width-depth ratio
56.4	W flood prone area (ft)
8.2	entrenchment ratio
1.0	low bank height ratio

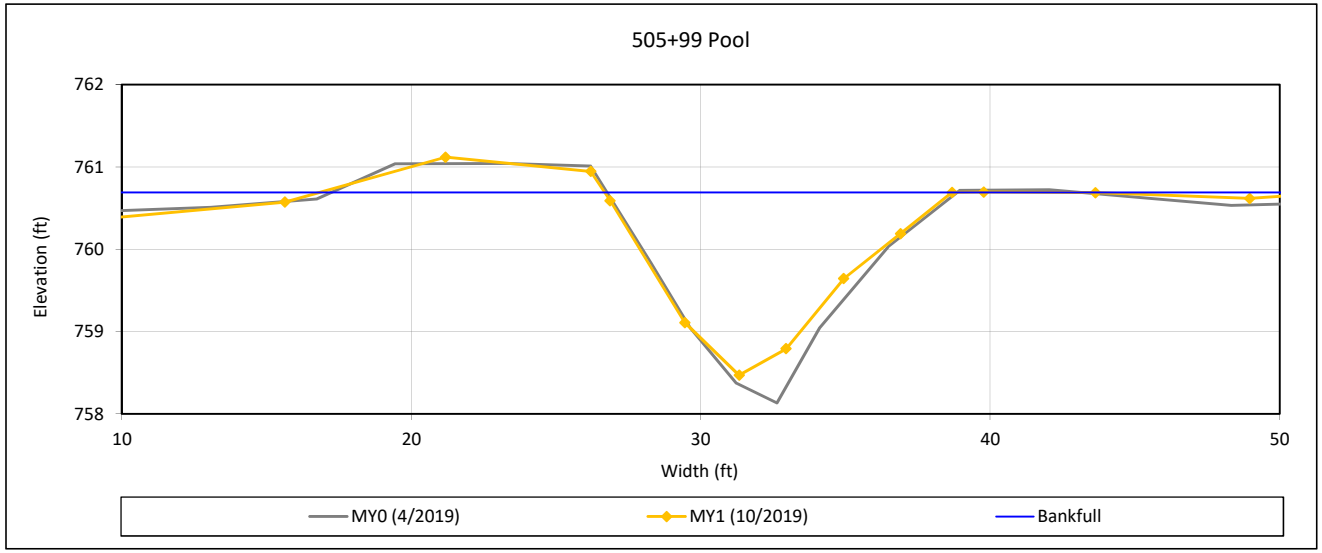
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 26 - UT2B



Bankfull Dimensions	
14.0	x-section area (ft.sq.)
12.0	width (ft)
1.2	mean depth (ft)
2.2	max depth (ft)
12.9	wetted perimeter (ft)
1.1	hydraulic radius (ft)
10.3	width-depth ratio

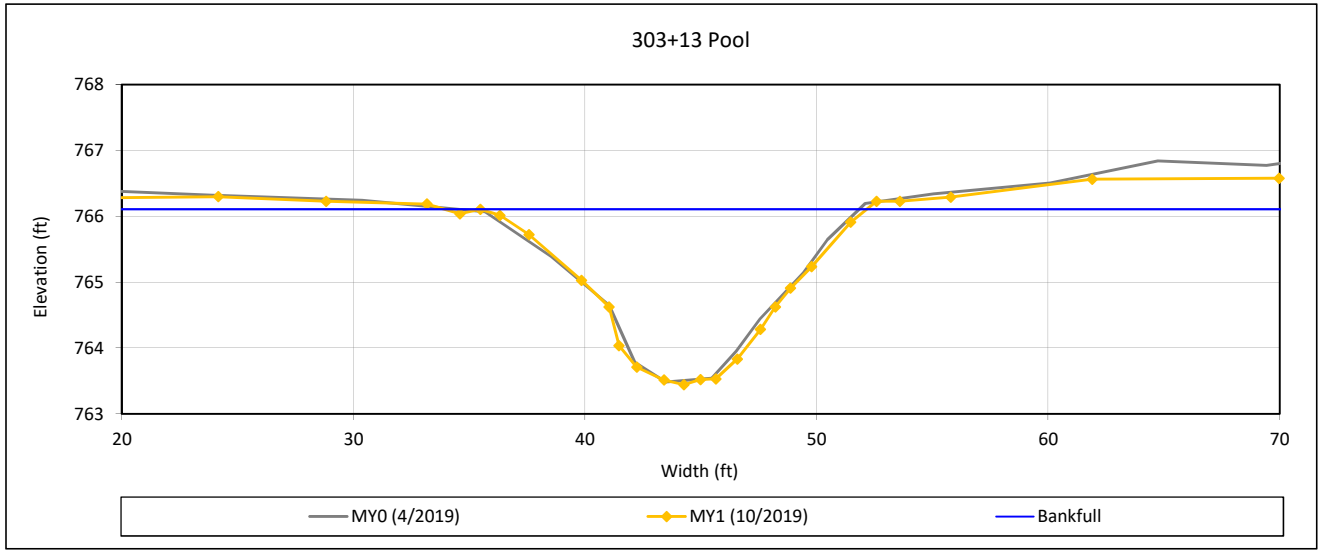
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 27 - UT3 Reach 1



Bankfull Dimensions	
23.0	x-section area (ft.sq.)
16.7	width (ft)
1.4	mean depth (ft)
2.7	max depth (ft)
17.8	wetted perimeter (ft)
1.3	hydraulic radius (ft)
12.1	width-depth ratio

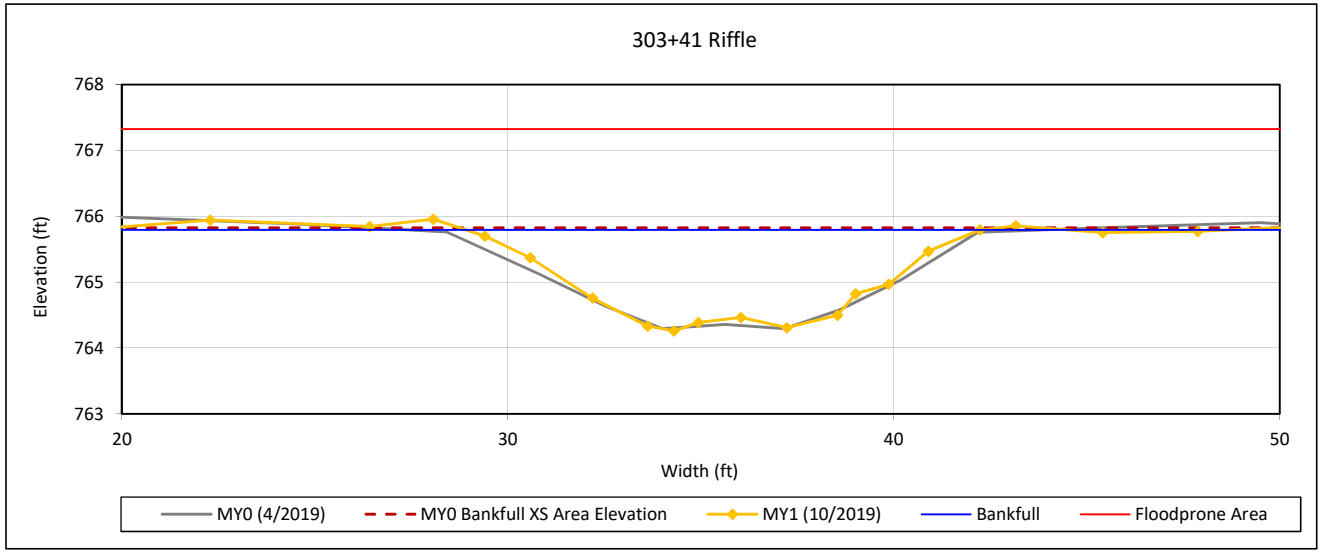
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 28 - UT3 Reach 1



Bankfull Dimensions	
12.3	x-section area (ft.sq.)
13.3	width (ft)
0.9	mean depth (ft)
1.5	max depth (ft)
13.8	wetted perimeter (ft)
0.9	hydraulic radius (ft)
14.3	width-depth ratio
72.9	W flood prone area (ft)
5.5	entrenchment ratio
1.0	low bank height ratio

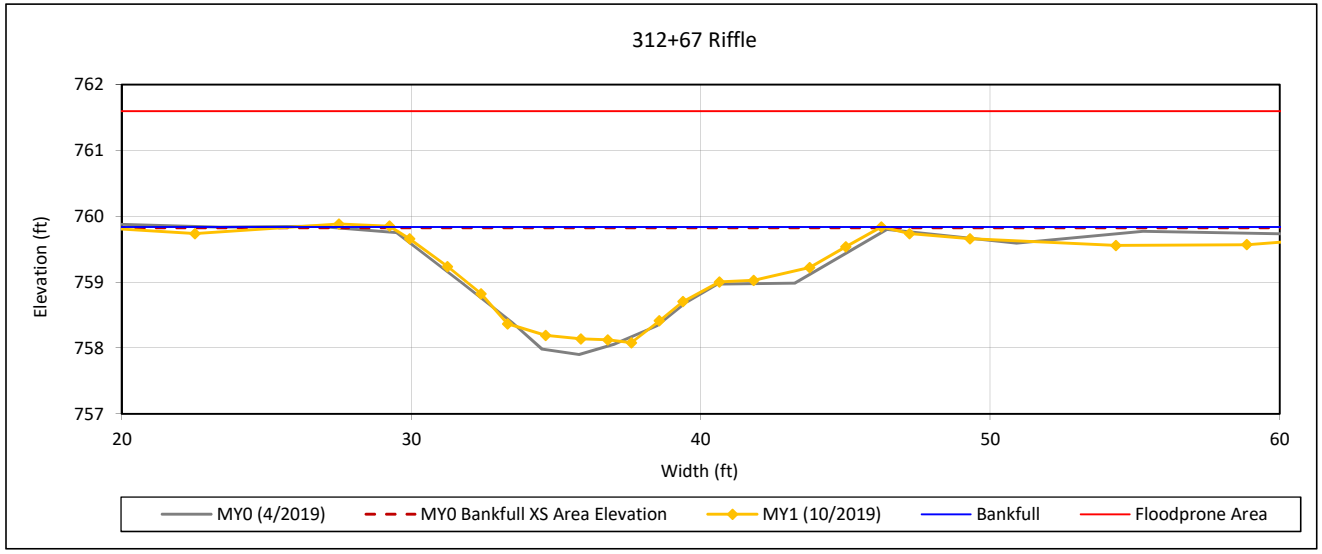
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 29 - UT3 Reach 2



Bankfull Dimensions	
16.7	x-section area (ft.sq.)
17.0	width (ft)
1.0	mean depth (ft)
1.8	max depth (ft)
17.5	wetted perimeter (ft)
1.0	hydraulic radius (ft)
17.2	width-depth ratio
75.6	W flood prone area (ft)
4.5	entrenchment ratio
1.0	low bank height ratio

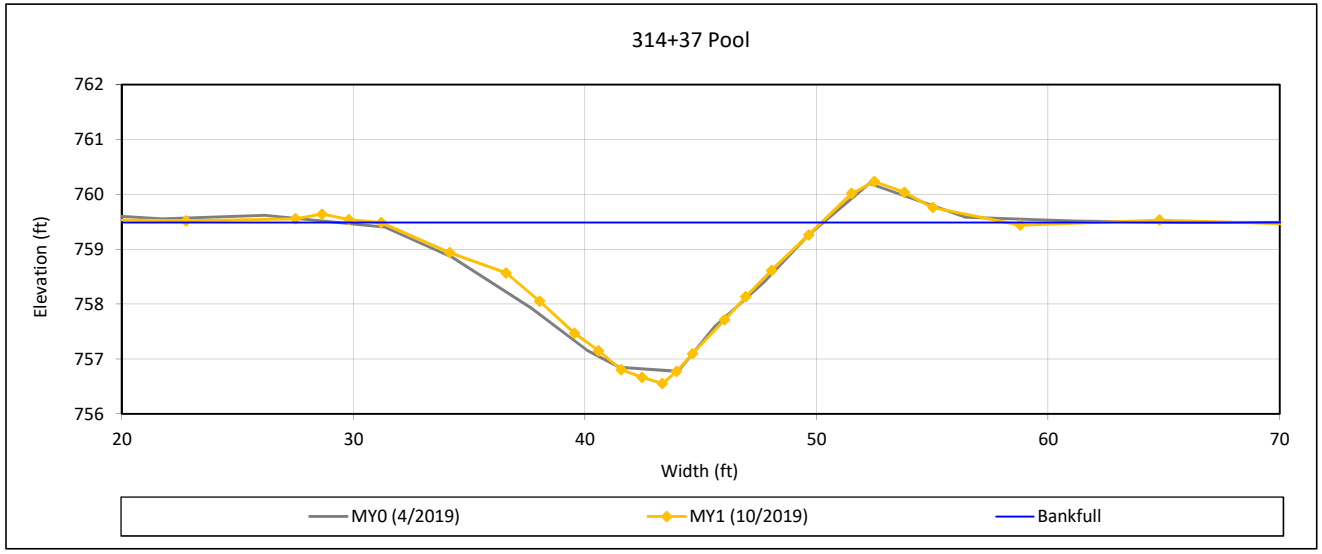
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 30 - UT3 Reach 2



Bankfull Dimensions	
26.6	x-section area (ft.sq.)
19.0	width (ft)
1.4	mean depth (ft)
2.9	max depth (ft)
20.0	wetted perimeter (ft)
1.3	hydraulic radius (ft)
13.6	width-depth ratio

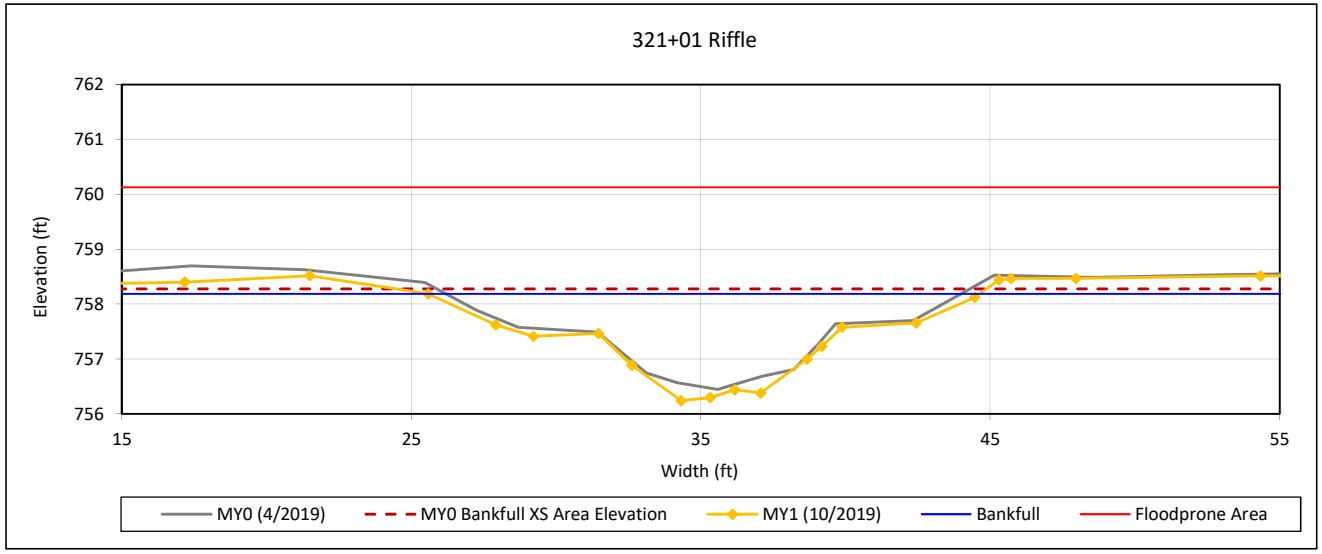
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 31 - UT3 Reach 3



Bankfull Dimensions	
17.8	x-section area (ft.sq.)
19.1	width (ft)
0.9	mean depth (ft)
1.9	max depth (ft)
19.7	wetted perimeter (ft)
0.9	hydraulic radius (ft)
20.5	width-depth ratio
70.8	W flood prone area (ft)
3.7	entrenchment ratio
1.0	low bank height ratio

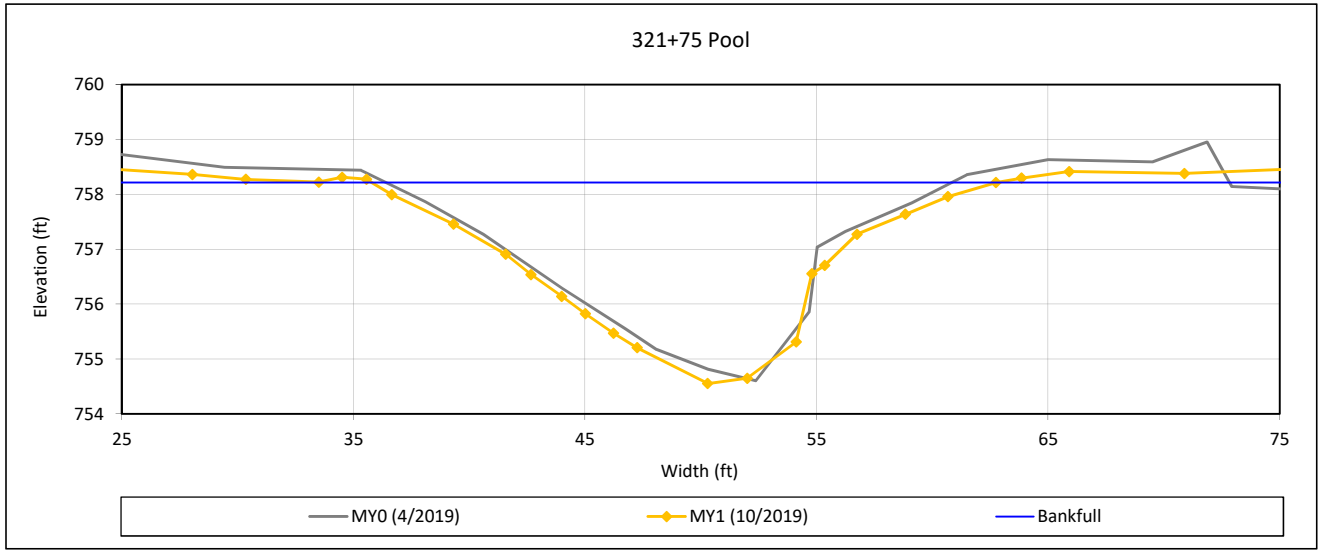
Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 1 - 2019

Cross-Section 32 - UT3 Reach 3



Bankfull Dimensions	
46.1	x-section area (ft.sq.)
26.9	width (ft)
1.7	mean depth (ft)
3.7	max depth (ft)
28.5	wetted perimeter (ft)
1.6	hydraulic radius (ft)
15.8	width-depth ratio

Survey Date: 10/2019
Field Crew: Wildlands Engineering

View Downstream

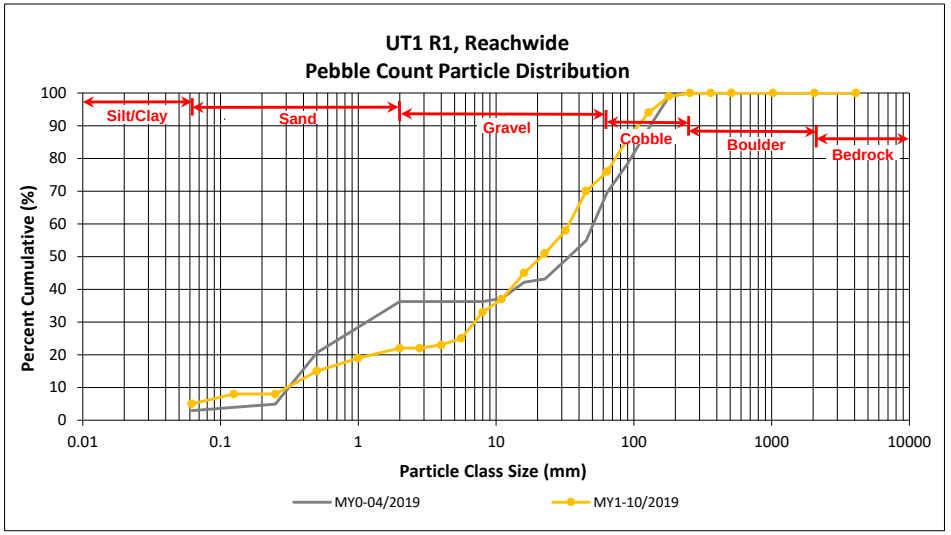
Reachwide Pebble Count Plots

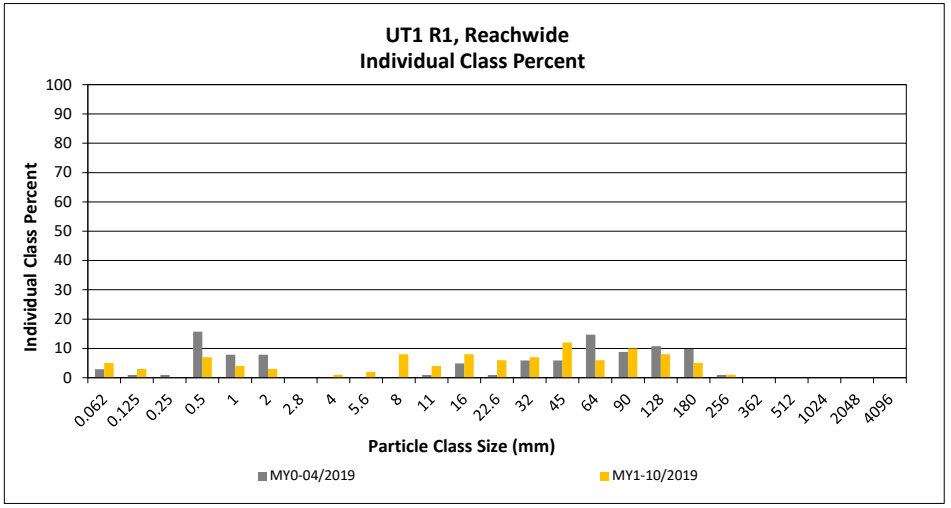
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT1 R1, 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	4	5	5	5
SAND	Very fine	0.062	0.125	1	2	3	3	8
	Fine	0.125	0.250					8
	Medium	0.25	0.50	2	5	7	7	15
	Coarse	0.5	1.0	1	3	4	4	19
	Very Coarse	1.0	2.0		3	3	3	22
GRAVEL	Very Fine	2.0	2.8					22
	Very Fine	2.8	4.0	1		1	1	23
	Fine	4.0	5.6		2	2	2	25
	Fine	5.6	8.0	1	7	8	8	33
	Medium	8.0	11.0	3	1	4	4	37
	Medium	11.0	16.0	4	4	8	8	45
	Coarse	16.0	22.6	2	4	6	6	51
	Coarse	22.6	32	2	5	7	7	58
	Very Coarse	32	45	6	6	12	12	70
	Very Coarse	45	64	4	2	6	6	76
COBBLE	Small	64	90	10		10	10	86
	Small	90	128	7	1	8	8	94
	Large	128	180	4	1	5	5	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	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.6
D_{35} =	9.4
D_{50} =	21.3
D_{84} =	84.1
D_{95} =	137.0
D_{100} =	256.0





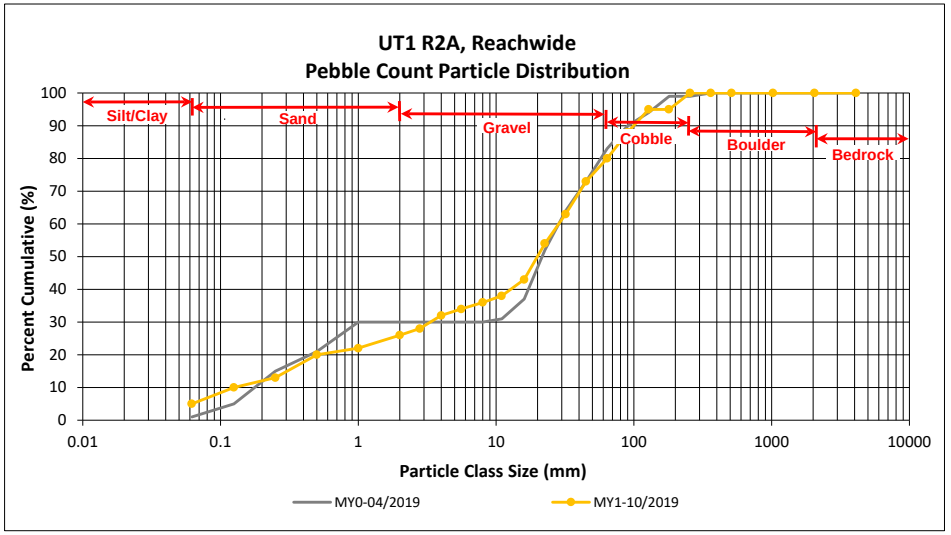
Reachwide Pebble Count Plots

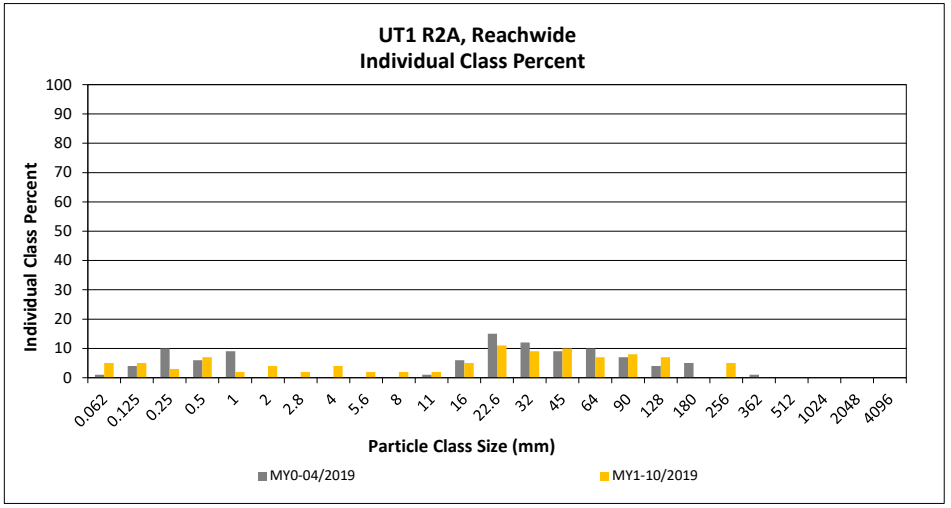
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT1 R2A, 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	4	5	5	5
SAND	Very fine	0.062	0.125		5	5	5	10
	Fine	0.125	0.250	2	1	3	3	13
	Medium	0.25	0.50	3	4	7	7	20
	Coarse	0.5	1.0	1	1	2	2	22
	Very Coarse	1.0	2.0	1	3	4	4	26
GRAVEL	Very Fine	2.0	2.8	1	1	2	2	28
	Very Fine	2.8	4.0		4	4	4	32
	Fine	4.0	5.6		2	2	2	34
	Fine	5.6	8.0		2	2	2	36
	Medium	8.0	11.0	1	1	2	2	38
	Medium	11.0	16.0	2	3	5	5	43
	Coarse	16.0	22.6	7	4	11	11	54
	Coarse	22.6	32	4	5	9	9	63
	Very Coarse	32	45	5	5	10	10	73
	Very Coarse	45	64	6	1	7	7	80
COBBLE	Small	64	90	6	2	8	8	88
	Small	90	128	6	1	7	7	95
	Large	128	180					95
	Large	180	256	4	1	5	5	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.3
D_{35} =	6.7
D_{50} =	19.9
D_{84} =	75.9
D_{95} =	128.0
D_{100} =	256.0





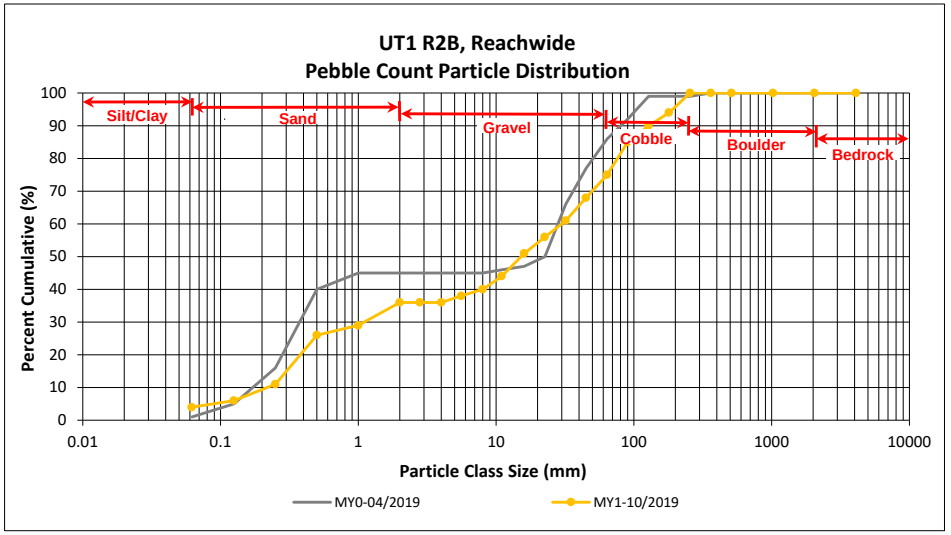
Reachwide Pebble Count Plots

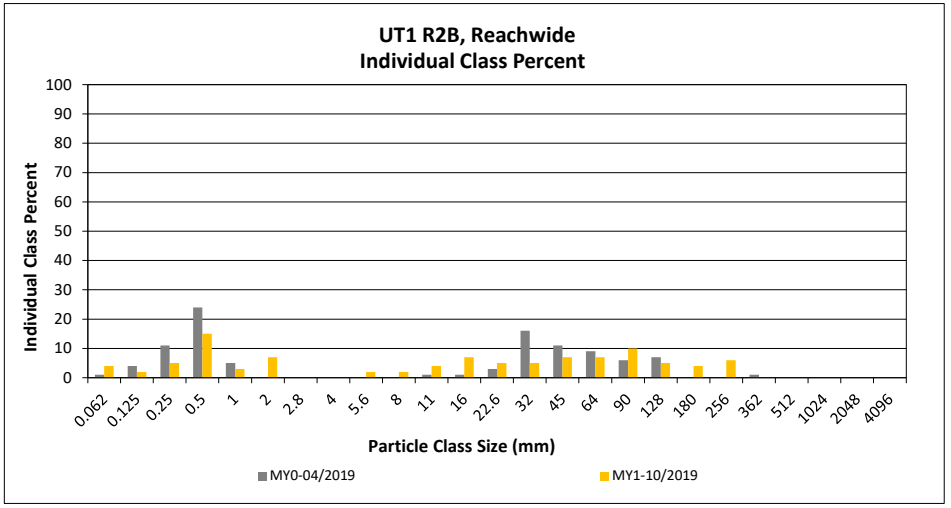
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT1 R2B, 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	3	4	4	4
SAND	Very fine	0.062	0.125		2	2	2	6
	Fine	0.125	0.250		5	5	5	11
	Medium	0.25	0.50	2	13	15	15	26
	Coarse	0.5	1.0		3	3	3	29
	Very Coarse	1.0	2.0	4	3	7	7	36
GRAVEL	Very Fine	2.0	2.8					36
	Very Fine	2.8	4.0					36
	Fine	4.0	5.6	1	1	2	2	38
	Fine	5.6	8.0	1	1	2	2	40
	Medium	8.0	11.0	1	3	4	4	44
	Medium	11.0	16.0	5	2	7	7	51
	Coarse	16.0	22.6	2	3	5	5	56
	Coarse	22.6	32	2	3	5	5	61
	Very Coarse	32	45	5	2	7	7	68
	Very Coarse	45	64	4	3	7	7	75
COBBLE	Small	64	90	9	1	10	10	85
	Small	90	128	4	1	5	5	90
	Large	128	180	3	1	4	4	94
	Large	180	256	6		6	6	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.3
D_{35} =	1.8
D_{50} =	15.2
D_{84} =	87.0
D_{95} =	190.9
D_{100} =	256.0





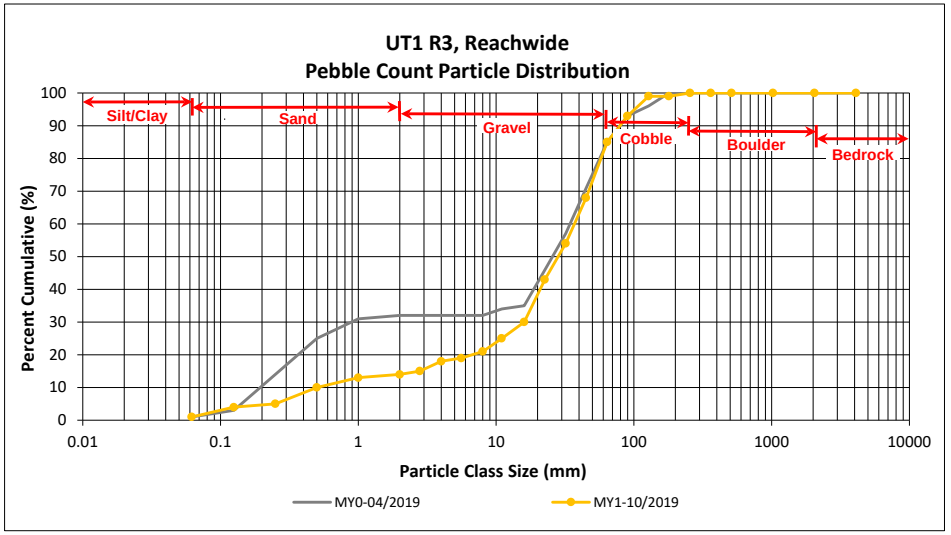
Reachwide Pebble Count Plots

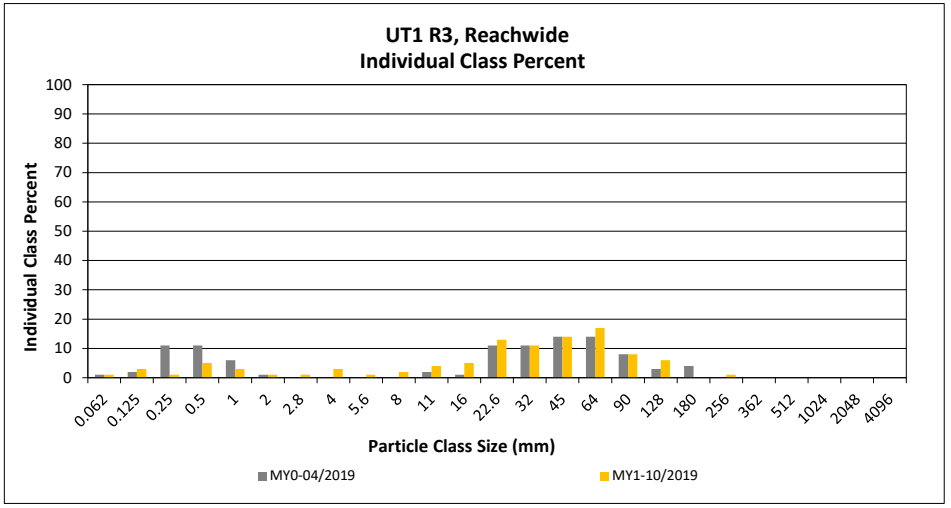
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT1 R3, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		1	1	1	1
SAND	Very fine	0.062	0.125		3	3	3	4
	Fine	0.125	0.250		1	1	1	5
	Medium	0.25	0.50		5	5	5	10
	Coarse	0.5	1.0		3	3	3	13
	Very Coarse	1.0	2.0		1	1	1	14
GRAVEL	Very Fine	2.0	2.8		1	1	1	15
	Very Fine	2.8	4.0		3	3	3	18
	Fine	4.0	5.6		1	1	1	19
	Fine	5.6	8.0		2	2	2	21
	Medium	8.0	11.0	2	2	4	4	25
	Medium	11.0	16.0	1	4	5	5	30
	Coarse	16.0	22.6	7	6	13	13	43
	Coarse	22.6	32	4	7	11	11	54
	Very Coarse	32	45	10	4	14	14	68
	Very Coarse	45	64	12	5	17	17	85
COBBLE	Small	64	90	7	1	8	8	93
	Small	90	128	6		6	6	99
	Large	128	180					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	50	50	100	100	100

Reachwide	
Channel materials (mm)	
D_{16} =	3.2
D_{35} =	18.3
D_{50} =	28.2
D_{84} =	62.7
D_{95} =	101.2
D_{100} =	256.0





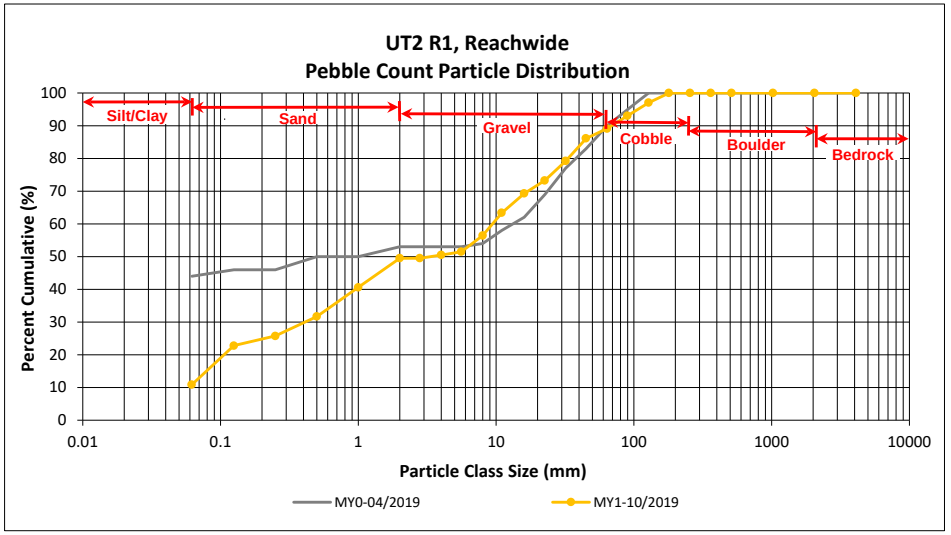
Reachwide Pebble Count Plots

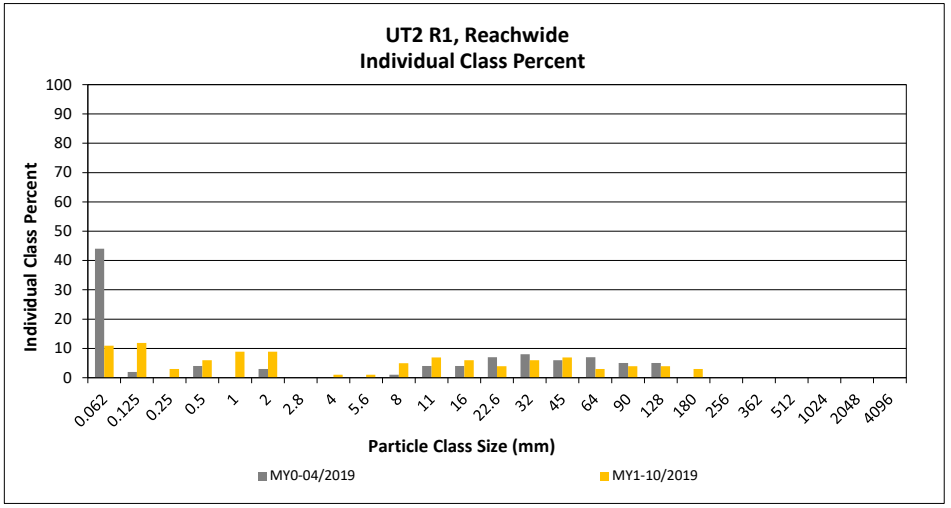
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT2 R1, 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	2	9	11	11	11
SAND	Very fine	0.062	0.125		12	12	12	23
	Fine	0.125	0.250		3	3	3	26
	Medium	0.25	0.50	2	4	6	6	32
	Coarse	0.5	1.0	1	8	9	9	41
	Very Coarse	1.0	2.0	6	3	9	9	50
GRAVEL	Very Fine	2.0	2.8					50
	Very Fine	2.8	4.0	1		1	1	50
	Fine	4.0	5.6	1		1	1	51
	Fine	5.6	8.0	2	3	5	5	56
	Medium	8.0	11.0	4	3	7	7	63
	Medium	11.0	16.0	4	2	6	6	69
	Coarse	16.0	22.6	3	1	4	4	73
	Coarse	22.6	32	5	1	6	6	79
	Very Coarse	32	45	6	1	7	7	86
	Very Coarse	45	64	3		3	3	89
COBBLE	Small	64	90	4		4	4	93
	Small	90	128	4		4	4	97
	Large	128	180	3		3	3	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	**51**	**50**	**101**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.1
D_{35} =	0.6
D_{50} =	3.3
D_{84} =	40.5
D_{95} =	106.9
D_{100} =	180.0





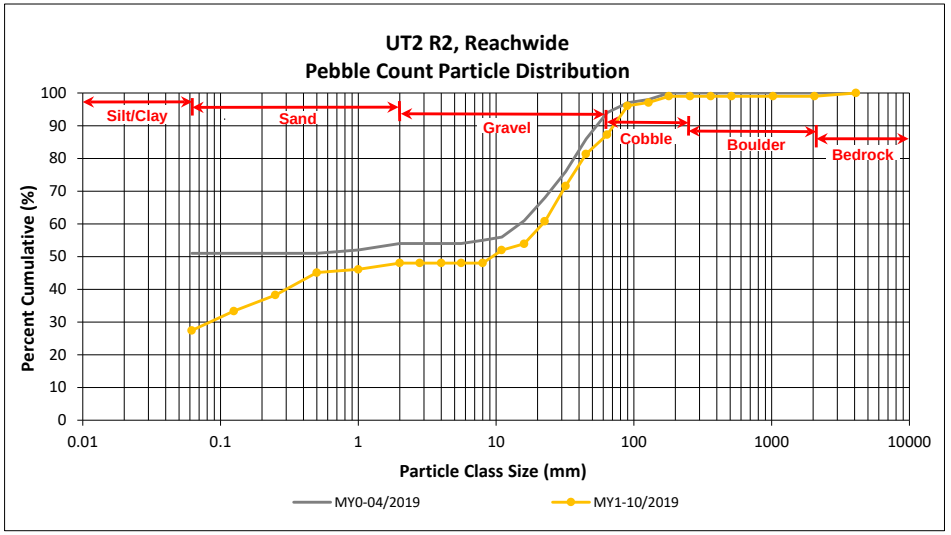
Reachwide Pebble Count Plots

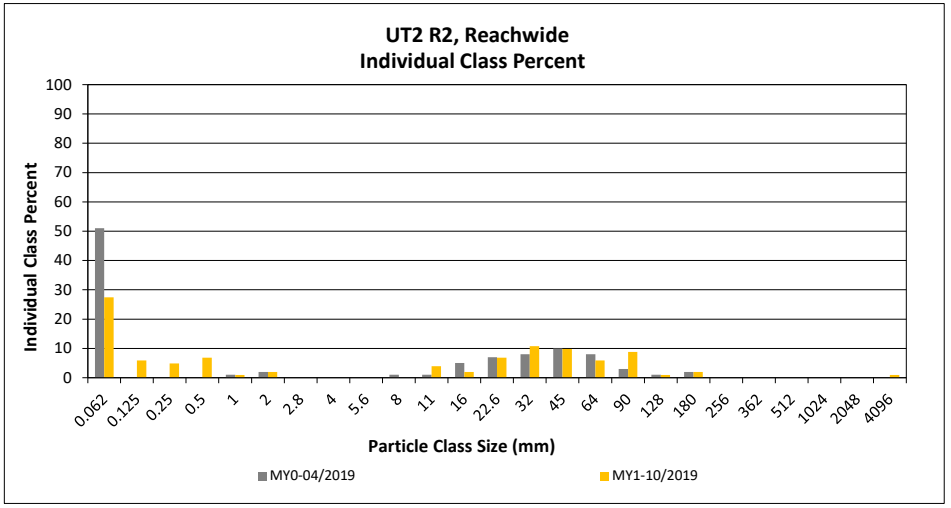
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT2 R2, 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		28	28	27	27
SAND	Very fine	0.062	0.125		6	6	6	33
	Fine	0.125	0.250		5	5	5	38
	Medium	0.25	0.50		7	7	7	45
	Coarse	0.5	1.0		1	1	1	46
	Very Coarse	1.0	2.0	1	1	2	2	48
GRAVEL	Very Fine	2.0	2.8					48
	Very Fine	2.8	4.0					48
	Fine	4.0	5.6					48
	Fine	5.6	8.0					48
	Medium	8.0	11.0	4		4	4	52
	Medium	11.0	16.0	1	1	2	2	54
	Coarse	16.0	22.6	6	1	7	7	61
	Coarse	22.6	32	10	1	11	11	72
	Very Coarse	32	45	10		10	10	81
	Very Coarse	45	64	6		6	6	87
COBBLE	Small	64	90	9		9	9	96
	Small	90	128	1		1	1	97
	Large	128	180	2		2	2	99
	Large	180	256					99
BOULDER	Small	256	362					99
	Small	362	512					99
	Medium	512	1024					99
	Large/Very Large	1024	2048					99
BEDROCK	Bedrock	2048	>2048	1		1	1	100
			Total	**51**	**51**	**102**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.2
D_{50} =	9.4
D_{84} =	52.7
D_{95} =	86.3
D_{100} =	>2048





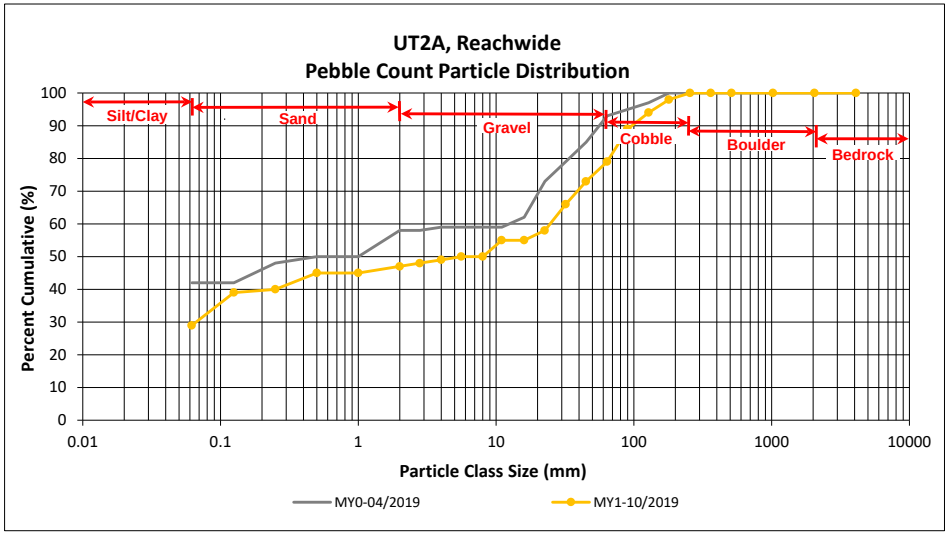
Reachwide Pebble Count Plots

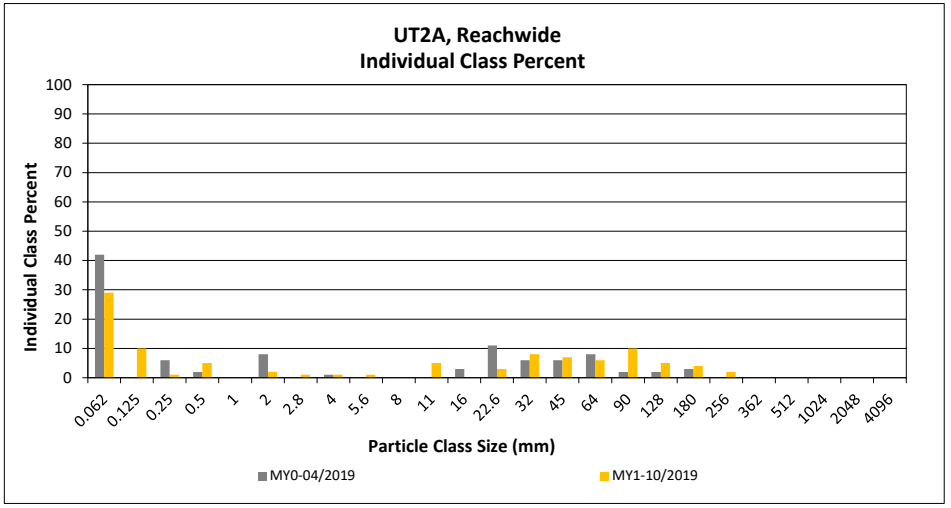
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT2A, 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	2	27	29	29	29
SAND	Very fine	0.062	0.125		10	10	10	39
	Fine	0.125	0.250		1	1	1	40
	Medium	0.25	0.50		5	5	5	45
	Coarse	0.5	1.0					45
	Very Coarse	1.0	2.0		2	2	2	47
GRAVEL	Very Fine	2.0	2.8	1		1	1	48
	Very Fine	2.8	4.0	1		1	1	49
	Fine	4.0	5.6		1	1	1	50
	Fine	5.6	8.0					50
	Medium	8.0	11.0	2	3	5	5	55
	Medium	11.0	16.0					55
	Coarse	16.0	22.6	3		3	3	58
	Coarse	22.6	32	7	1	8	8	66
	Very Coarse	32	45	7		7	7	73
	Very Coarse	45	64	6		6	6	79
COBBLE	Small	64	90	10		10	10	89
	Small	90	128	5		5	5	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	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	0.1
D_{50} =	5.6
D_{84} =	75.9
D_{95} =	139.4
D_{100} =	256.0





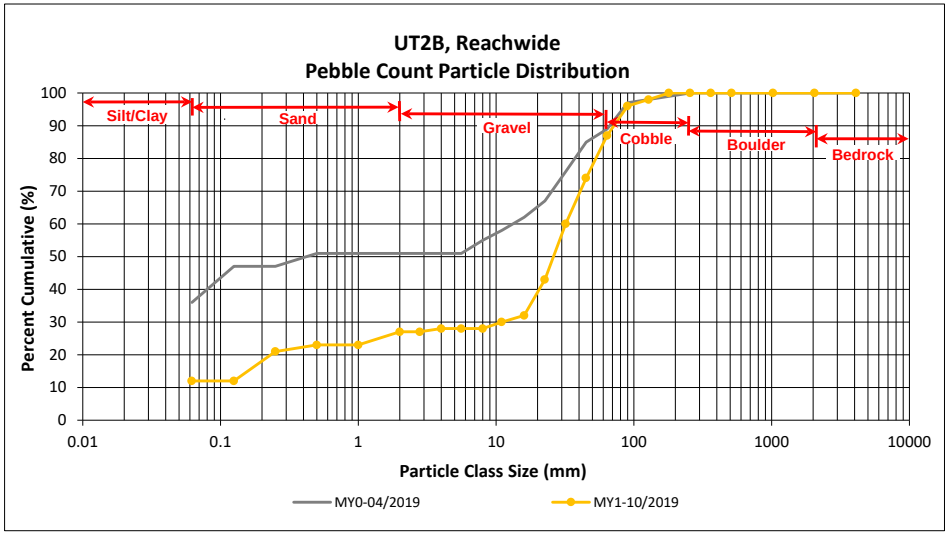
Reachwide Pebble Count Plots

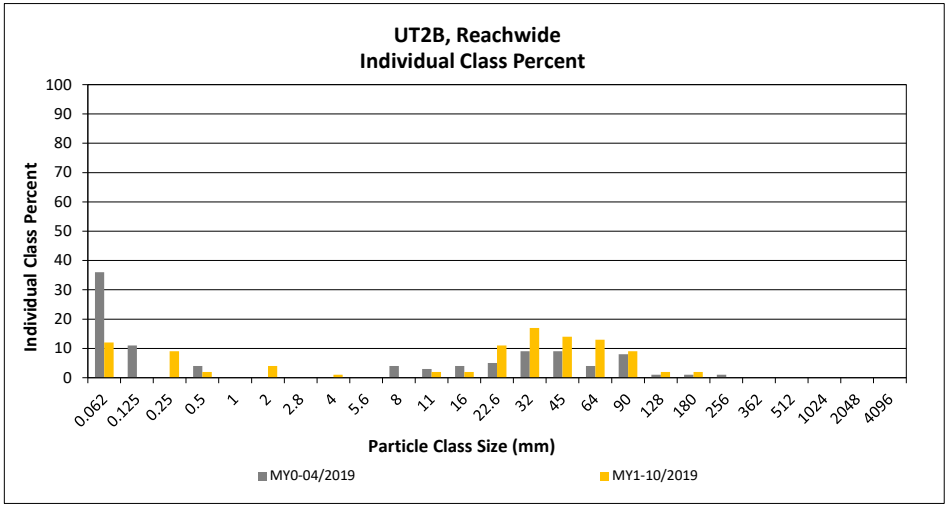
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT2B, Reachwide

Particle Class		Diameter (mm)		Particle Count			Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	11	12	12	12
SAND	Very fine	0.062	0.125					12
	Fine	0.125	0.250		9	9	9	21
	Medium	0.25	0.50		2	2	2	23
	Coarse	0.5	1.0					23
	Very Coarse	1.0	2.0		4	4	4	27
GRAVEL	Very Fine	2.0	2.8					27
	Very Fine	2.8	4.0	1		1	1	28
	Fine	4.0	5.6					28
	Fine	5.6	8.0					28
	Medium	8.0	11.0		2	2	2	30
	Medium	11.0	16.0		2	2	2	32
	Coarse	16.0	22.6	5	6	11	11	43
	Coarse	22.6	32	13	4	17	17	60
	Very Coarse	32	45	10	4	14	14	74
	Very Coarse	45	64	11	2	13	13	87
COBBLE	Small	64	90	6	3	9	9	96
	Small	90	128	1	1	2	2	98
	Large	128	180	2		2	2	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	0.2
D_{35} =	17.6
D_{50} =	26.1
D_{84} =	59.0
D_{95} =	86.7
D_{100} =	180.0





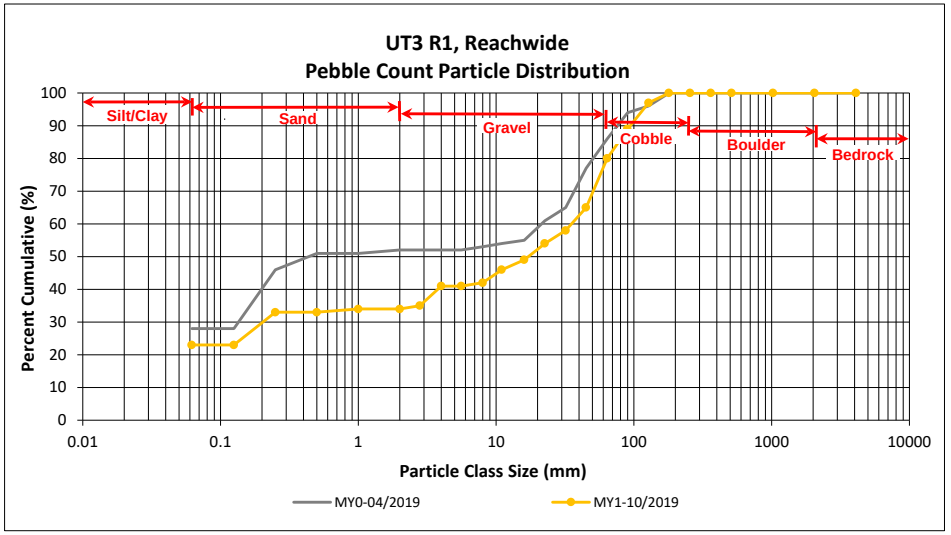
Reachwide Pebble Count Plots

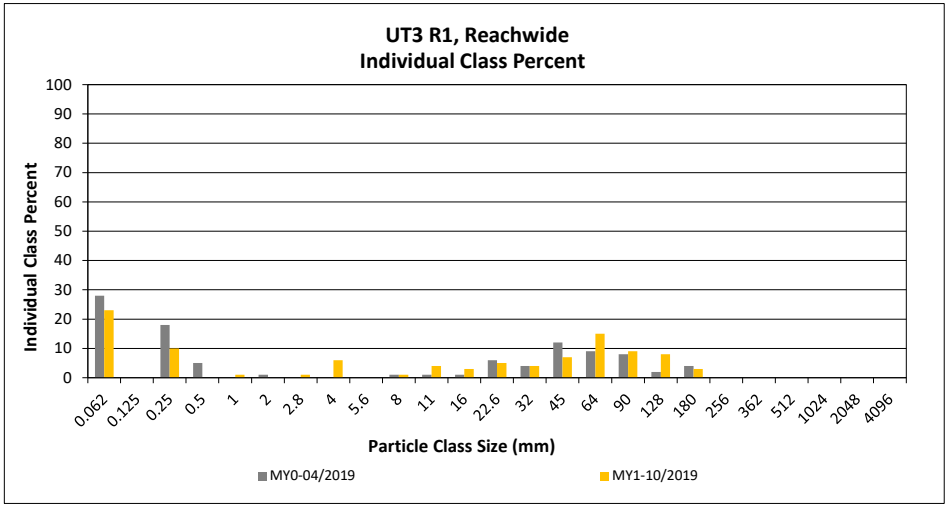
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT3 R1, 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	22	23	23	23
SAND	Very fine	0.062	0.125					23
	Fine	0.125	0.250		10	10	10	33
	Medium	0.25	0.50					33
	Coarse	0.5	1.0	1		1	1	34
	Very Coarse	1.0	2.0					34
GRAVEL	Very Fine	2.0	2.8		1	1	1	35
	Very Fine	2.8	4.0	1	5	6	6	41
	Fine	4.0	5.6					41
	Fine	5.6	8.0		1	1	1	42
	Medium	8.0	11.0		4	4	4	46
	Medium	11.0	16.0	3		3	3	49
	Coarse	16.0	22.6	3	2	5	5	54
	Coarse	22.6	32	3	1	4	4	58
	Very Coarse	32	45	7		7	7	65
	Very Coarse	45	64	13	2	15	15	80
COBBLE	Small	64	90	7	2	9	9	89
	Small	90	128	8		8	8	97
	Large	128	180	3		3	3	100
	Large	180	256					100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	2.8
D_{50} =	17.1
D_{84} =	74.5
D_{95} =	117.2
D_{100} =	180.0





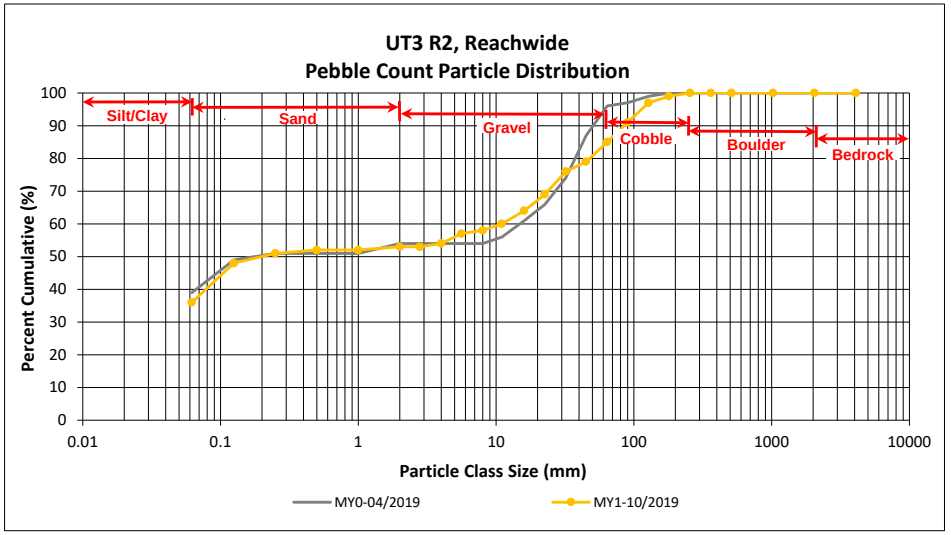
Reachwide Pebble Count Plots

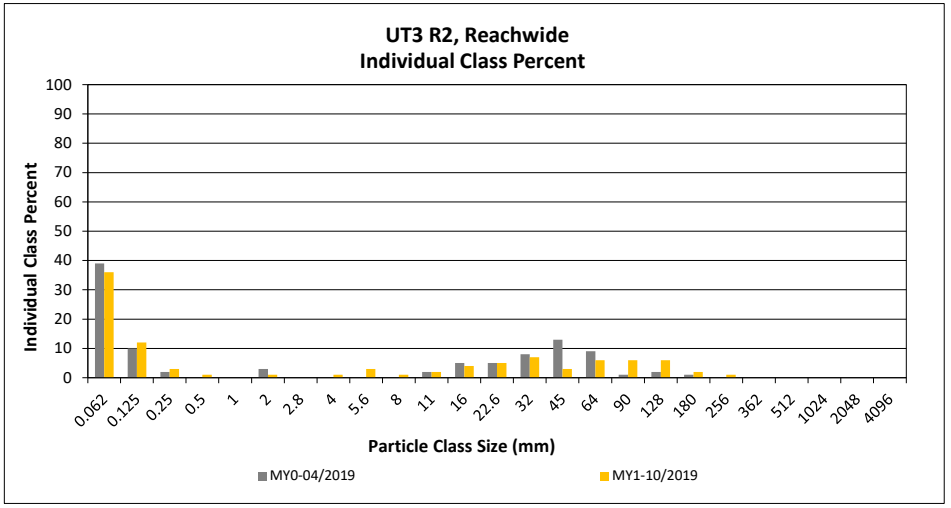
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT3 R2, 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	31	36	36	36
SAND	Very fine	0.062	0.125		12	12	12	48
	Fine	0.125	0.250		3	3	3	51
	Medium	0.25	0.50		1	1	1	52
	Coarse	0.5	1.0					52
	Very Coarse	1.0	2.0	1		1	1	53
GRAVEL	Very Fine	2.0	2.8					53
	Very Fine	2.8	4.0	1		1	1	54
	Fine	4.0	5.6	2	1	3	3	57
	Fine	5.6	8.0		1	1	1	58
	Medium	8.0	11.0	2		2	2	60
	Medium	11.0	16.0	3	1	4	4	64
	Coarse	16.0	22.6	5		5	5	69
	Coarse	22.6	32	7		7	7	76
	Very Coarse	32	45	3		3	3	79
	Very Coarse	45	64	6		6	6	85
COBBLE	Small	64	90	6		6	6	91
	Small	90	128	6		6	6	97
	Large	128	180	2		2	2	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	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	0.2
D_{84} =	60.4
D_{95} =	113.8
D_{100} =	256.0





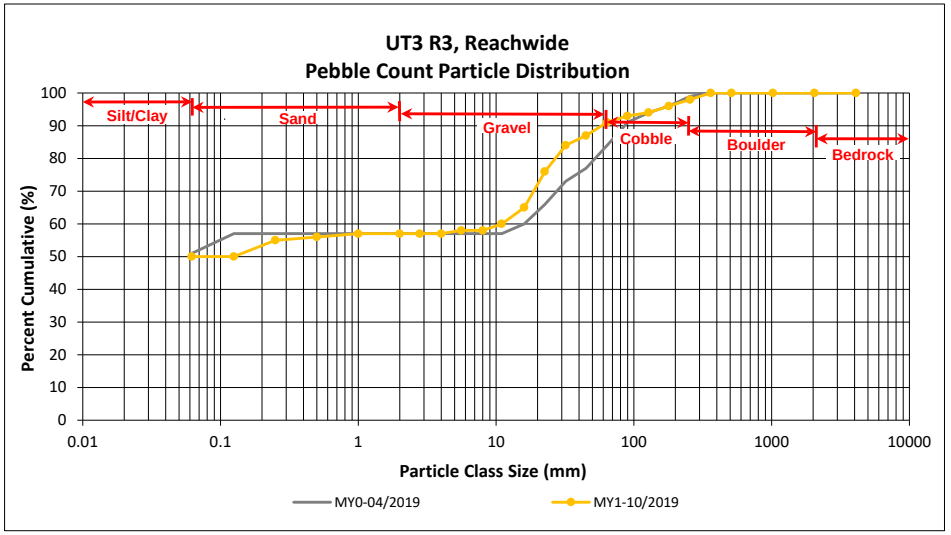
Reachwide Pebble Count Plots

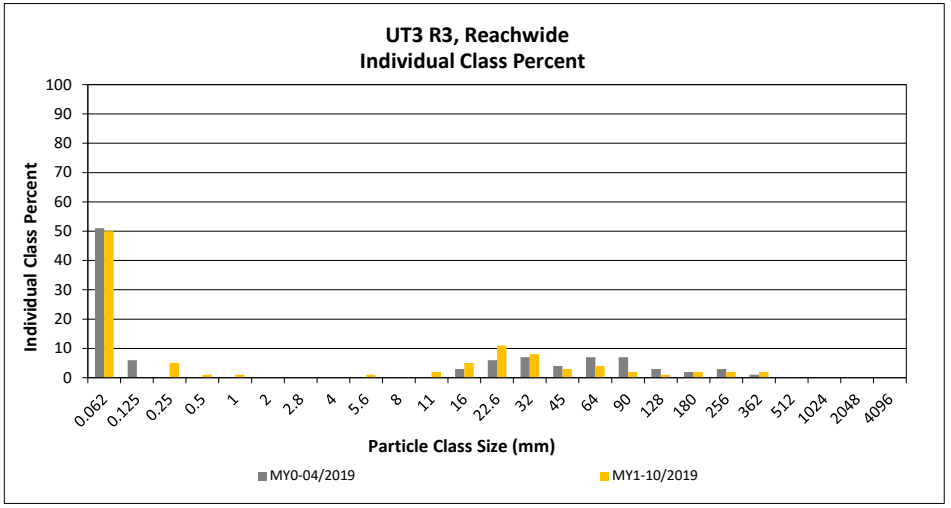
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

UT3 R3, 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	45	50	50	50
SAND	Very fine	0.062	0.125					50
	Fine	0.125	0.250		5	5	5	55
	Medium	0.25	0.50	1		1	1	56
	Coarse	0.5	1.0	1		1	1	57
	Very Coarse	1.0	2.0					57
GRAVEL	Very Fine	2.0	2.8					57
	Very Fine	2.8	4.0					57
	Fine	4.0	5.6	1		1	1	58
	Fine	5.6	8.0					58
	Medium	8.0	11.0	2		2	2	60
	Medium	11.0	16.0	5		5	5	65
	Coarse	16.0	22.6	11		11	11	76
	Coarse	22.6	32	8		8	8	84
	Very Coarse	32	45	3		3	3	87
	Very Coarse	45	64	4		4	4	91
COBBLE	Small	64	90	2		2	2	93
	Small	90	128	1		1	1	94
	Large	128	180	2		2	2	96
	Large	180	256	2		2	2	98
BOULDER	Small	256	362	2		2	2	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	Silt/Clay
D_{84} =	32.0
D_{95} =	151.8
D_{100} =	362.0





APPENDIX 5. Hydrology Summary Data and Plots

Table 14. Verification of Bankfull Events
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

Reach	MY	Date of Occurrence	Date of Data Collection	Method
UT2B	MY1	6/8/2019	6/8/2019	Stream Gage
UT3 Reach 3		6/8/2019 - 6/9/2019	6/8/2019 - 6/9/2019	Stream Gage
		6/23/2019	6/23/2019	Stream Gage

Table 15. Wetland Gage Attainment Summary

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Summary of Groundwater Gage Results for Monitoring Years 1 through 7							
Gage	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)						
	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Reference	Yes/25 days (12.1%)						
1	Yes/25 days (12.1%)						
2	Yes/23 days (11.1%)						
3	Yes/24 days (11.6%)						
4	Yes/109 days (52.7%)						
5	Yes/48 days (23.2%)						
6	Yes/23 days (11.1%)						
7	Yes/24 days (11.6%)						
8	Yes/48 days (23.2%)						
9	Yes/26 days (12.6%)						
10 [1]	N/A						

[1] Groundwater gage 10 was installed at the end of the MY1 growing season. Success criteria not applicable in MY1.

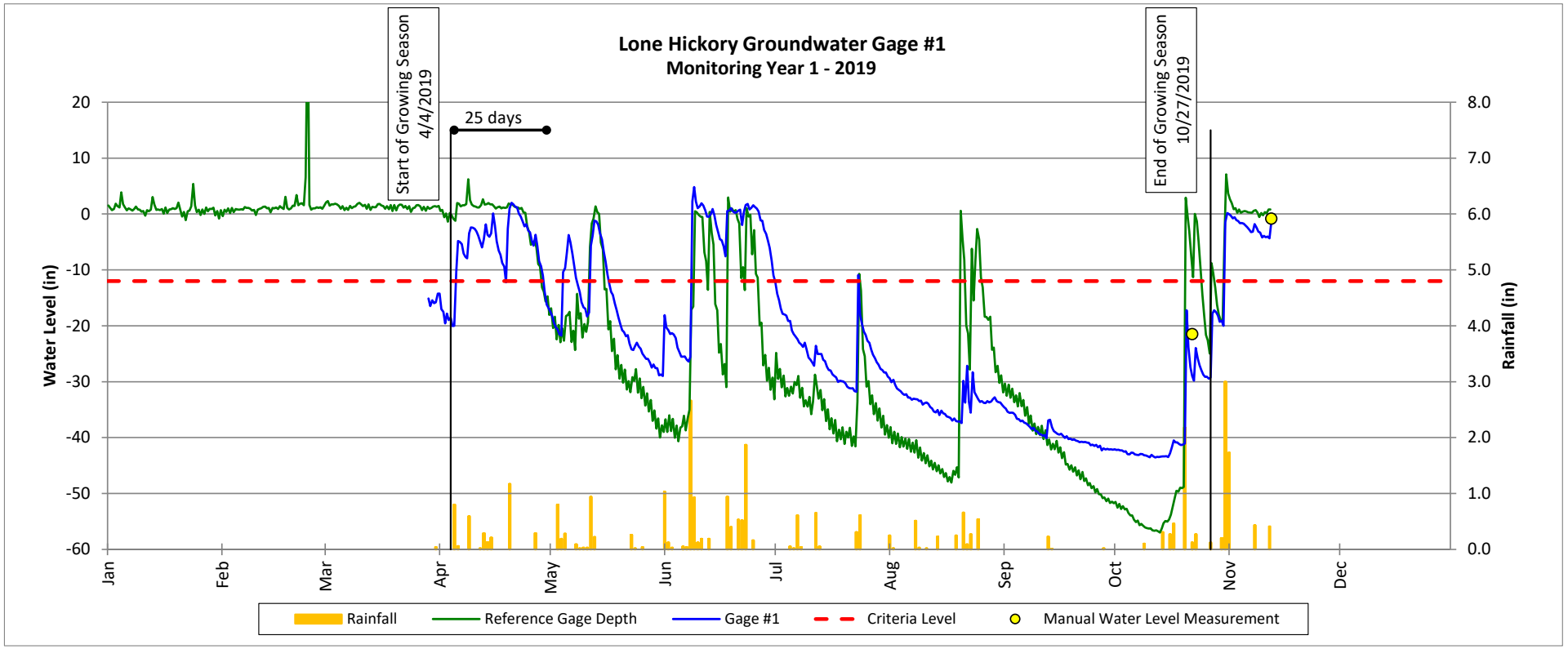
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Wetland Re-establishment



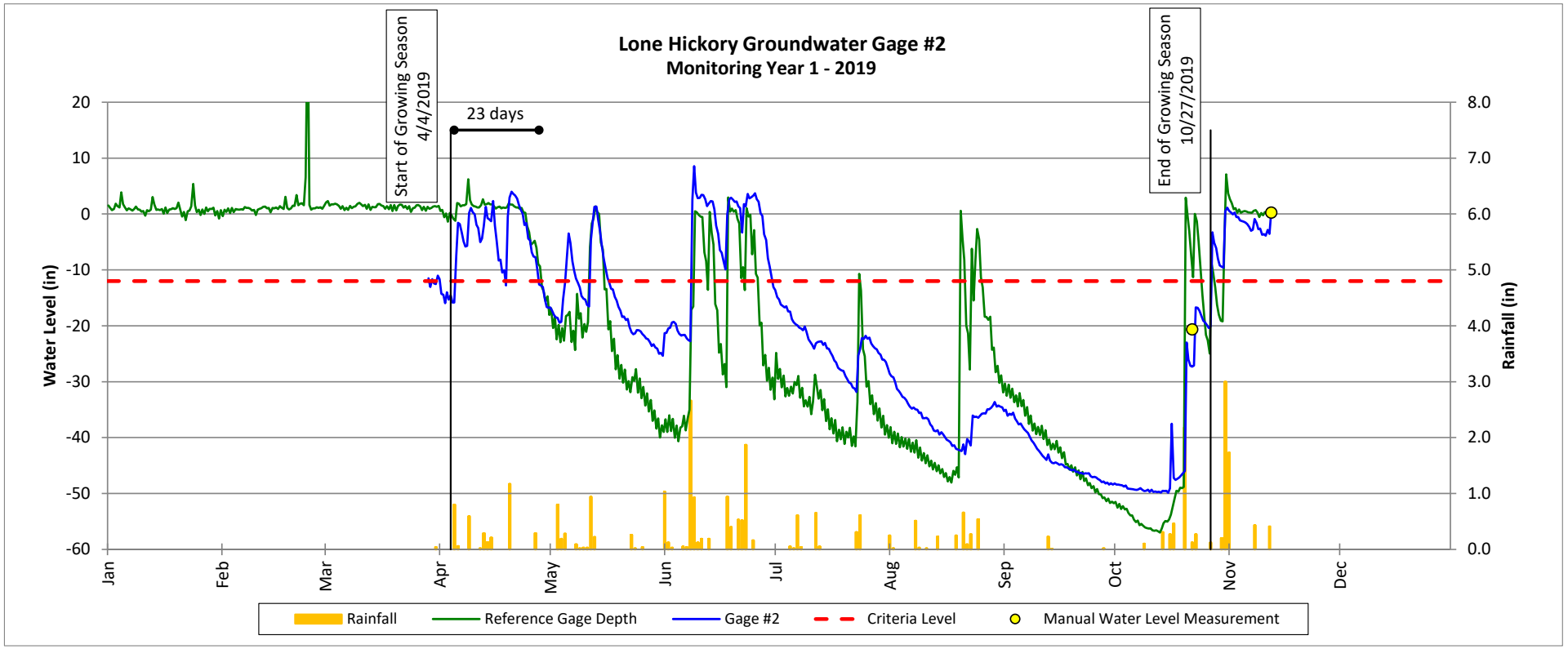
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Wetland Re-establishment



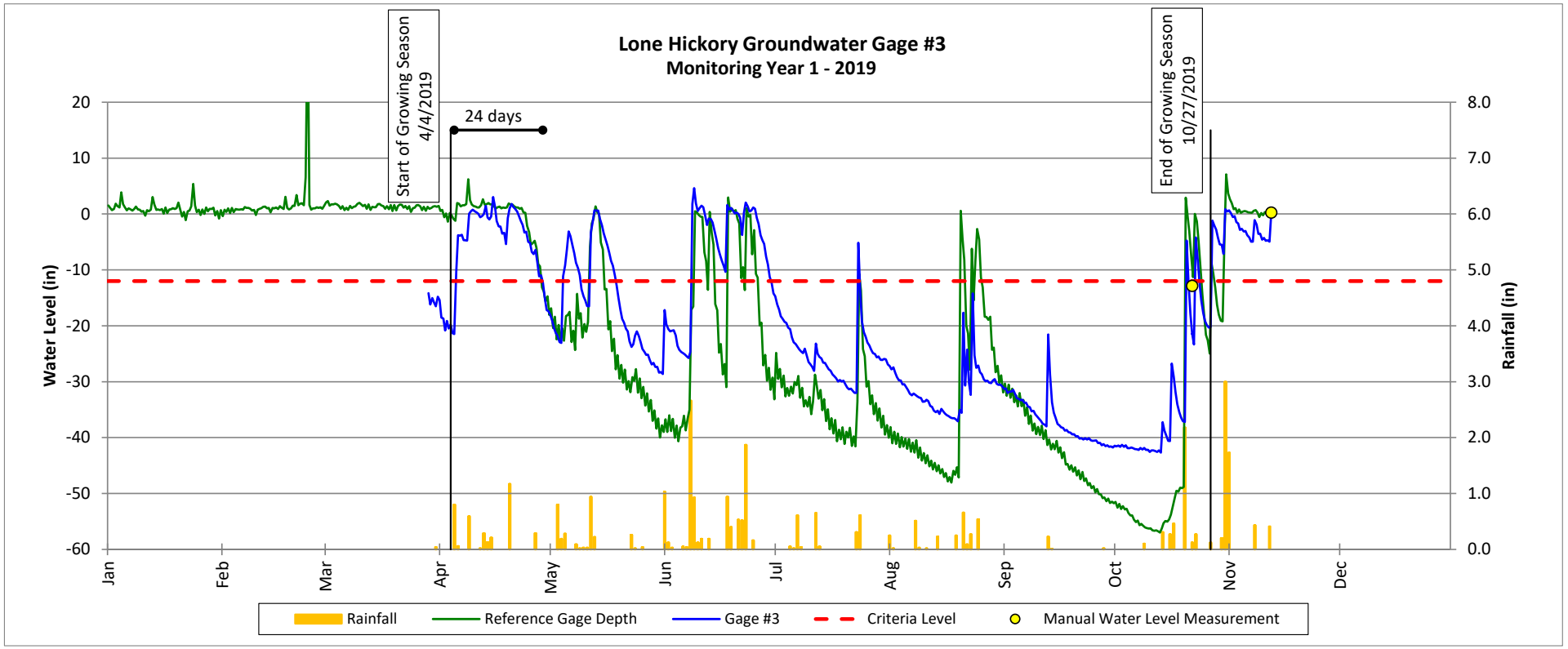
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Wetland Re-establishment



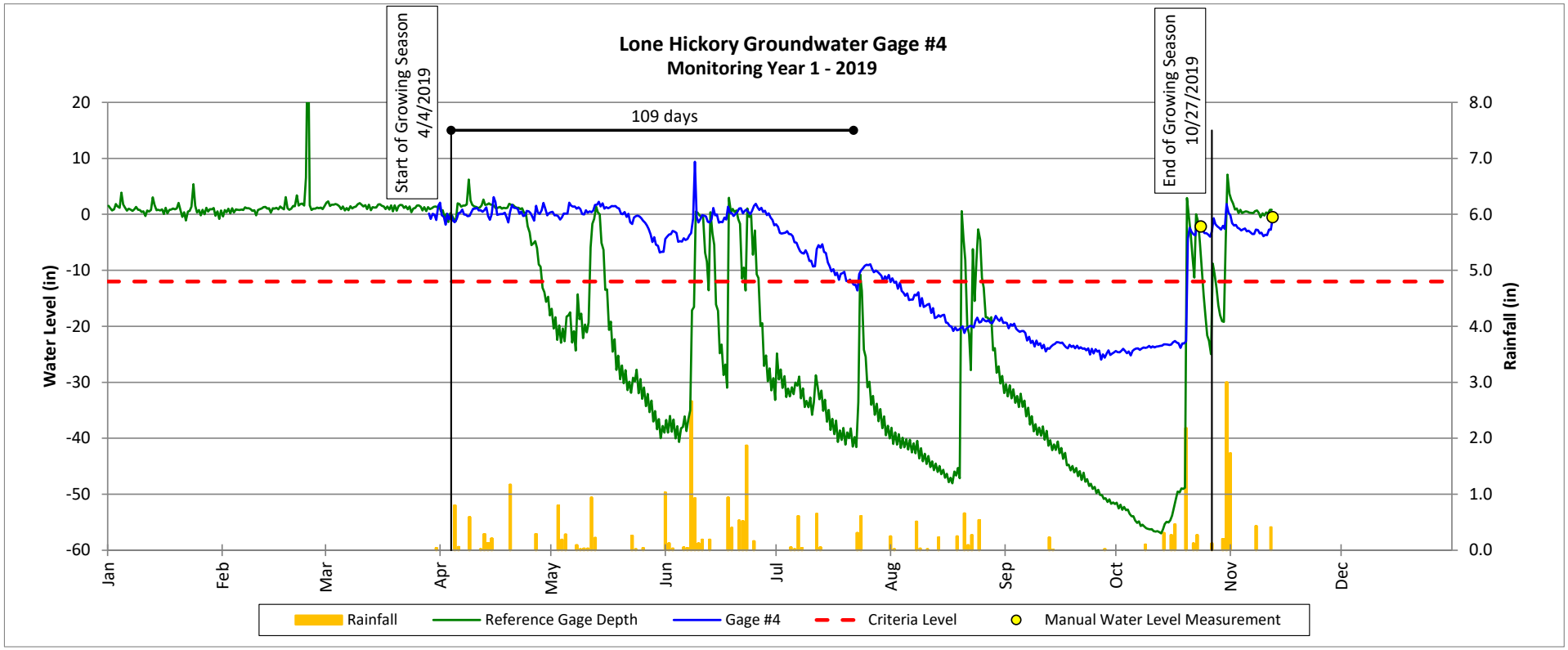
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Wetland Re-establishment



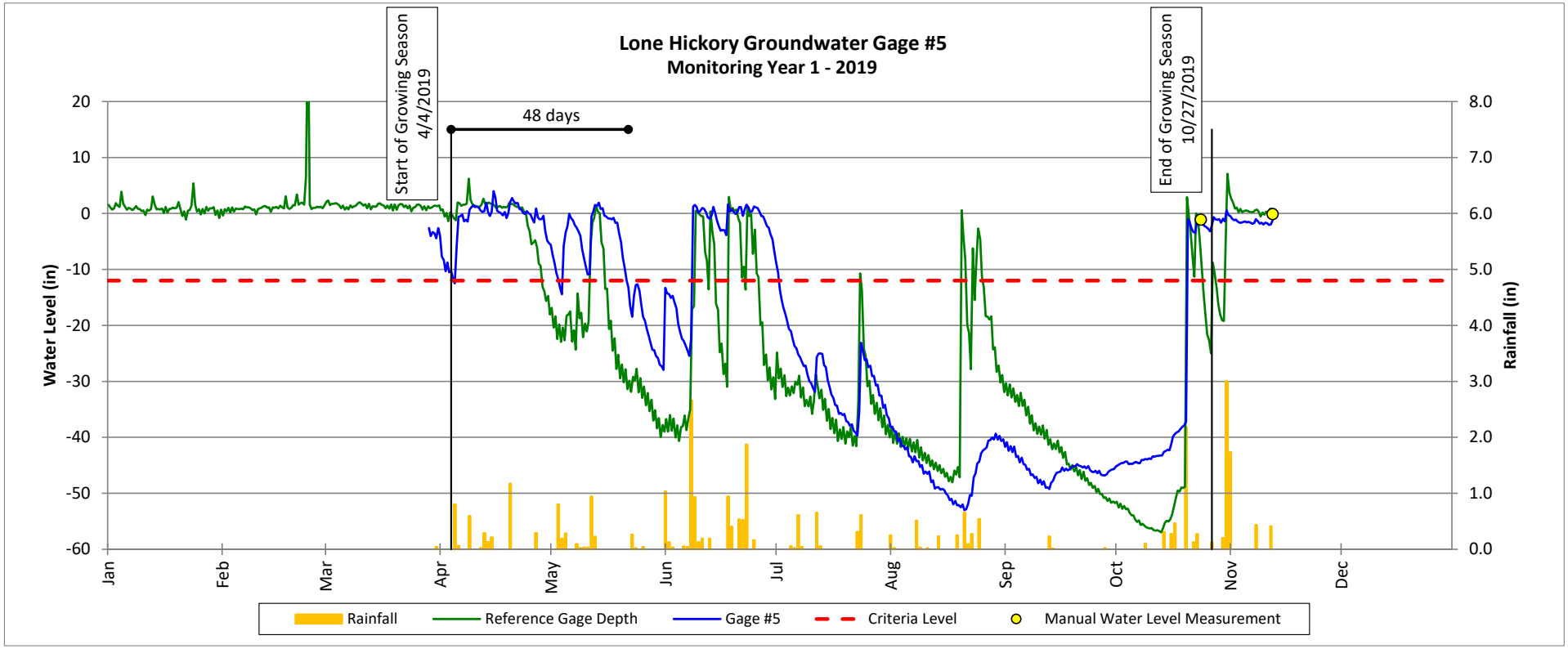
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Wetland Re-establishment



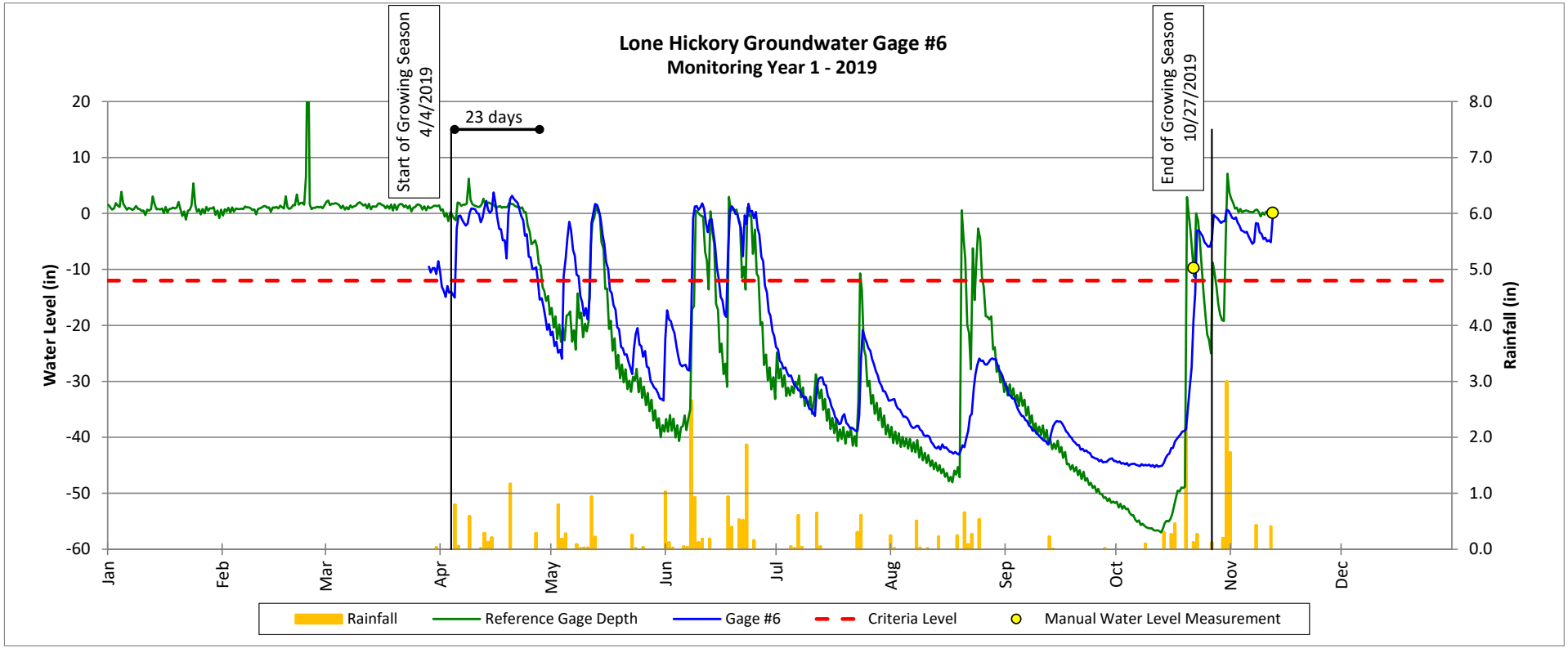
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Wetland Re-establishment



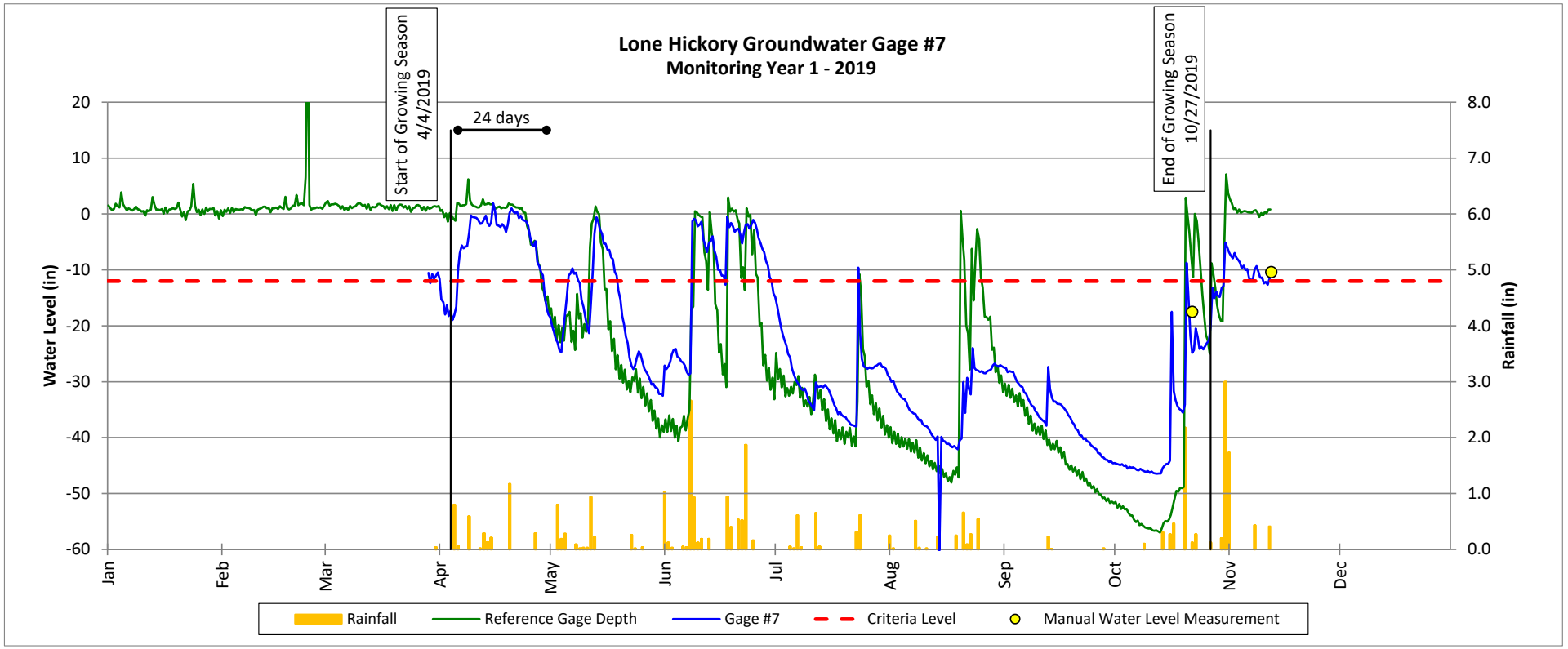
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Wetland Re-establishment



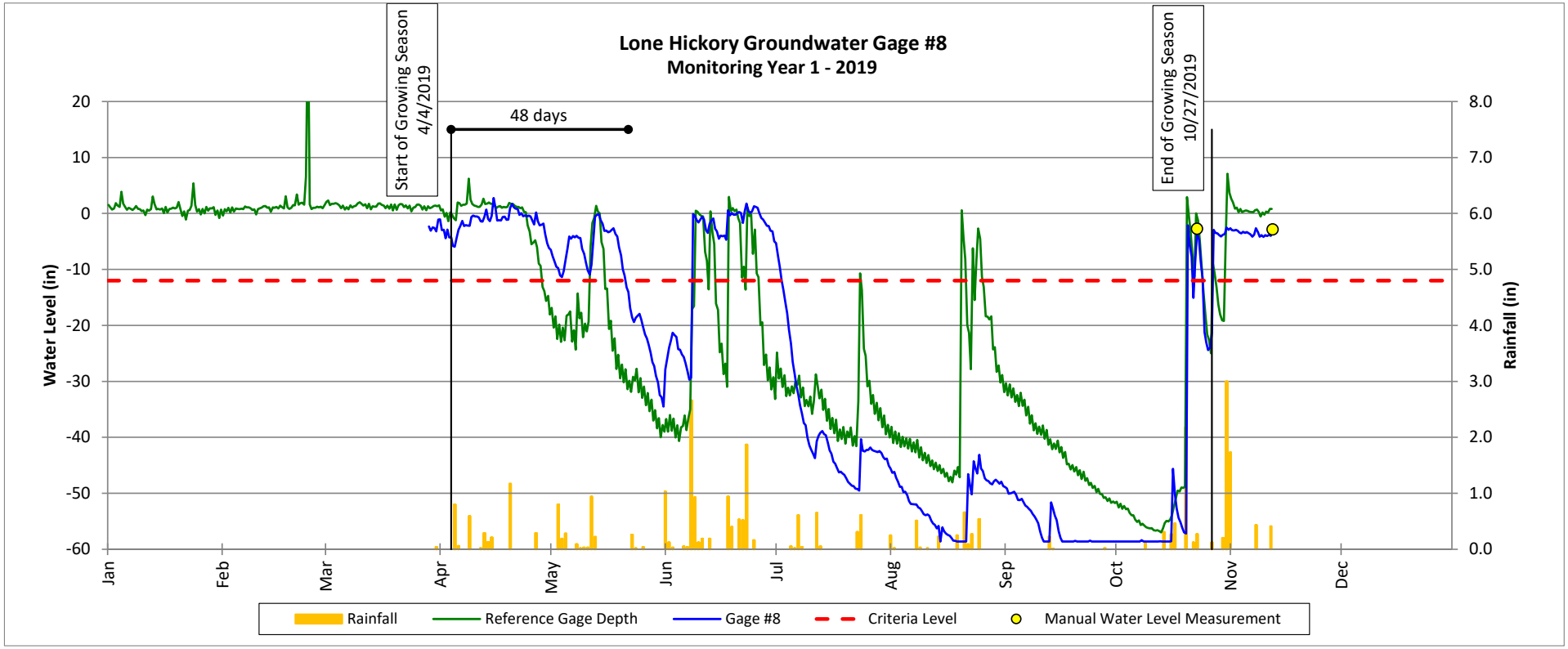
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019

Wetland Re-establishment



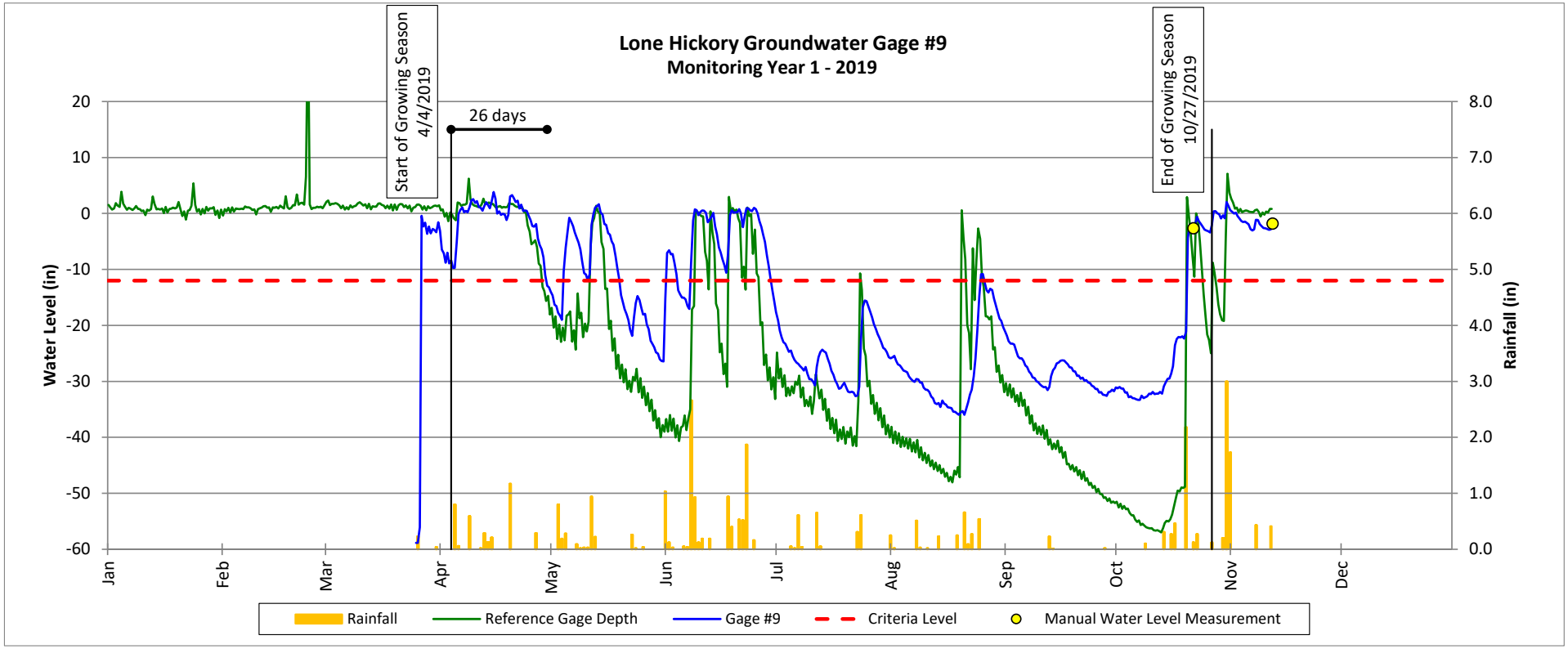
Groundwater Gage Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

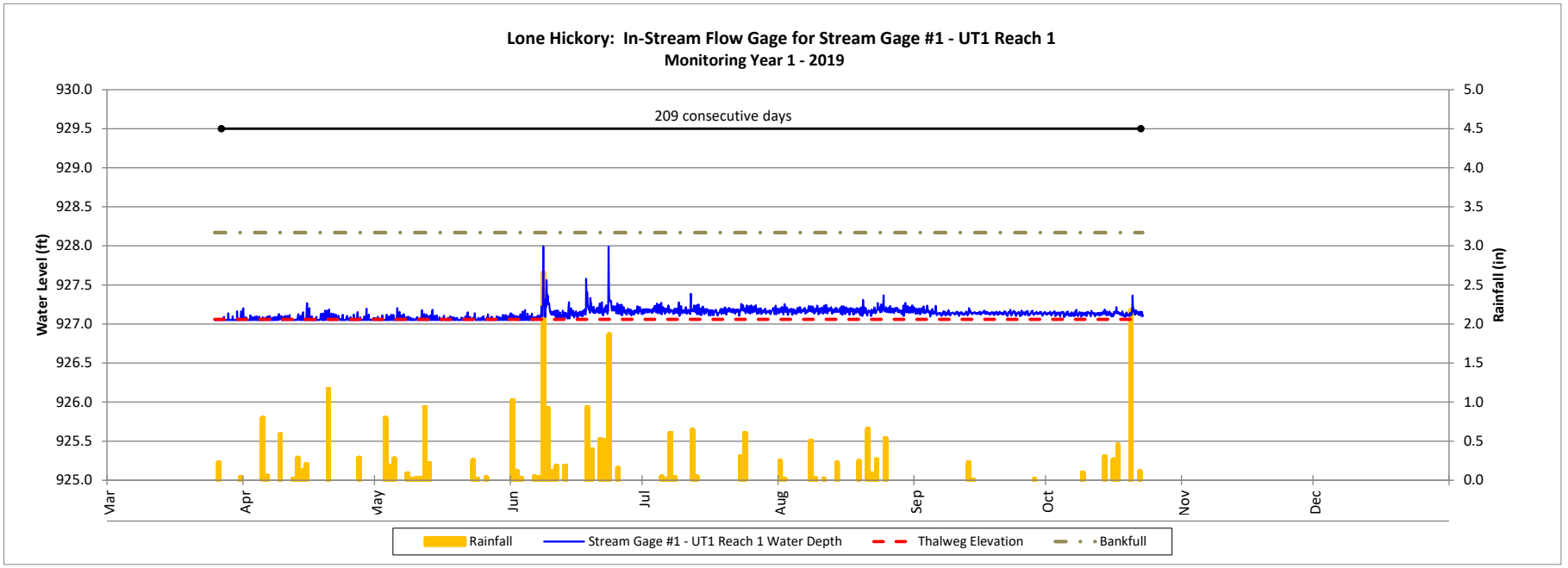
Monitoring Year 1 - 2019

Wetland Re-establishment



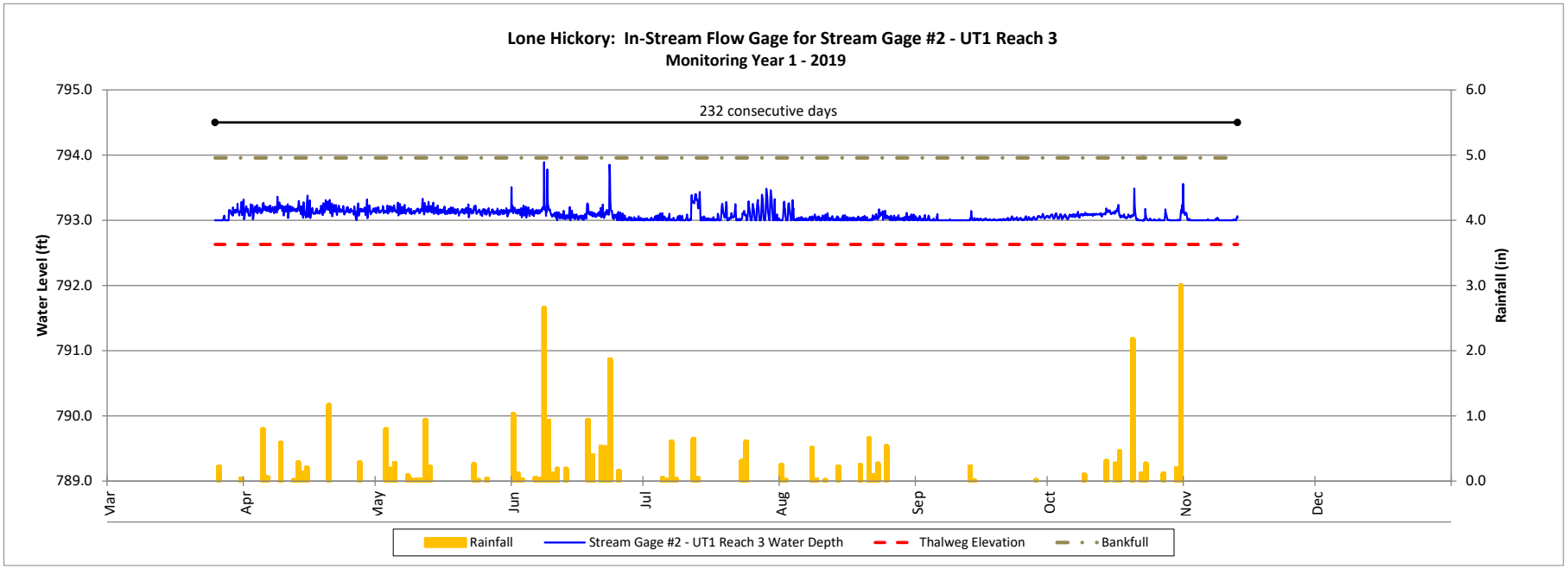
Recorded In-stream Flow Events

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019



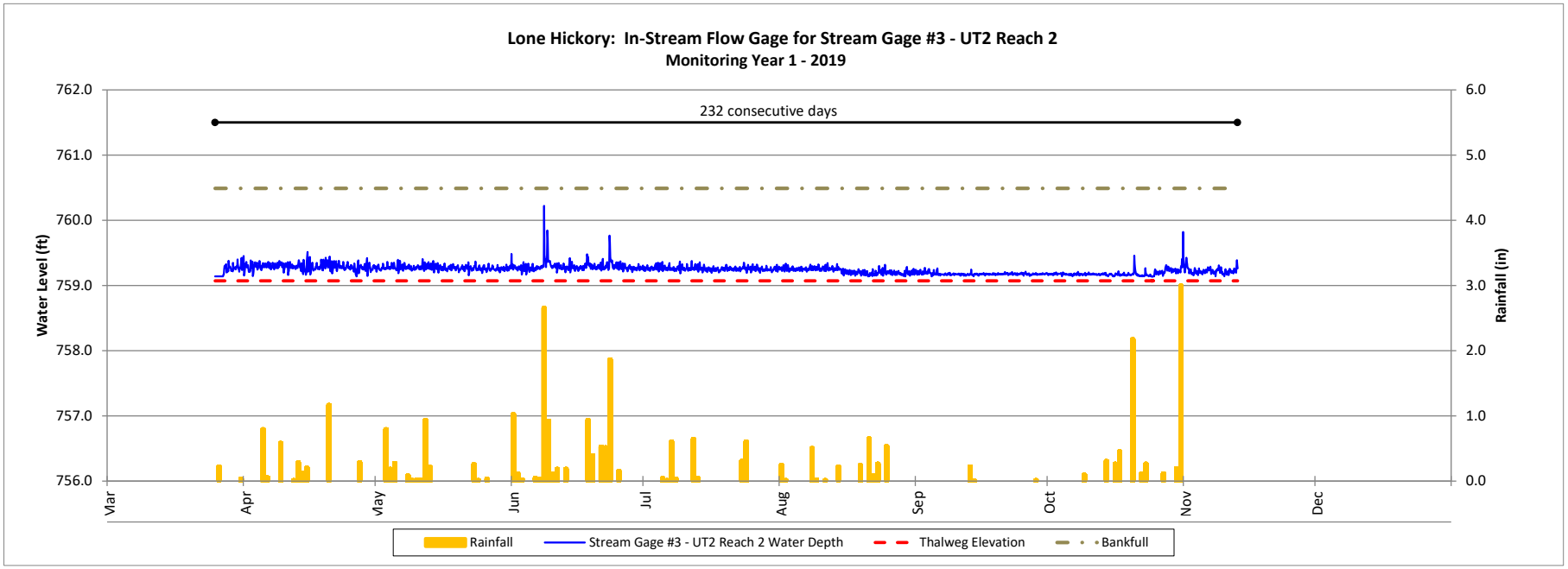
Recorded In-stream Flow Events

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019



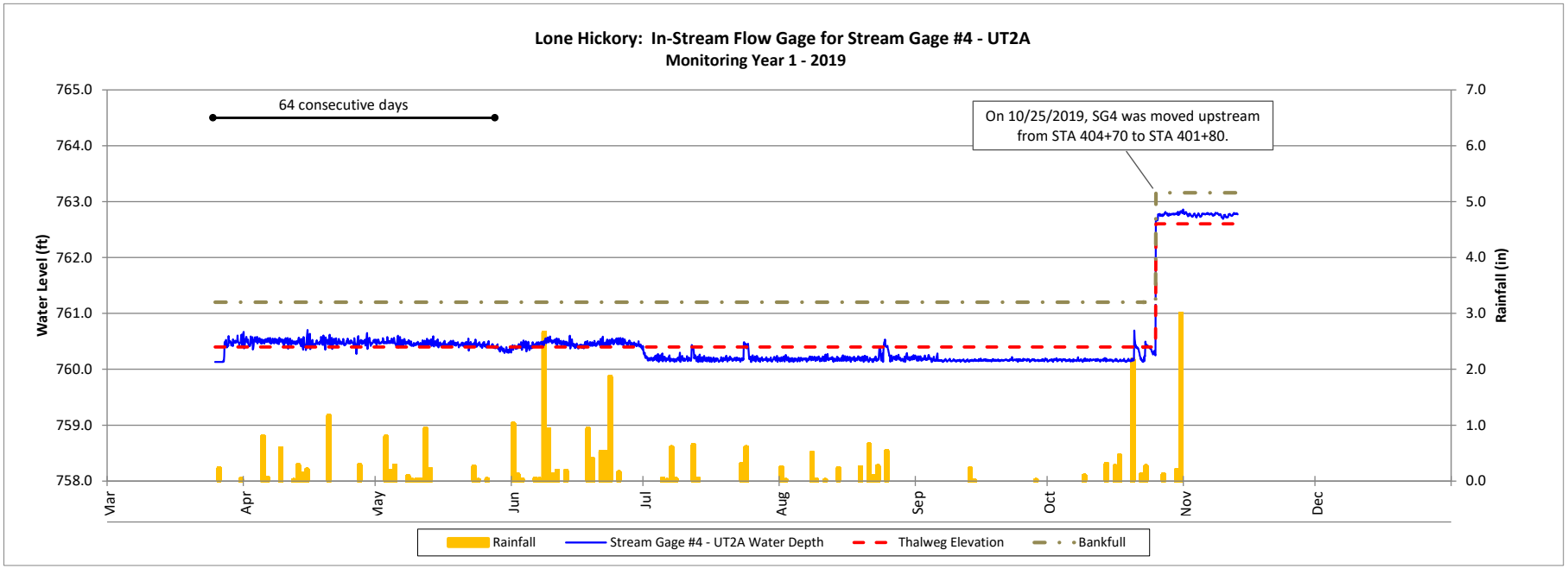
Recorded In-stream Flow Events

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019



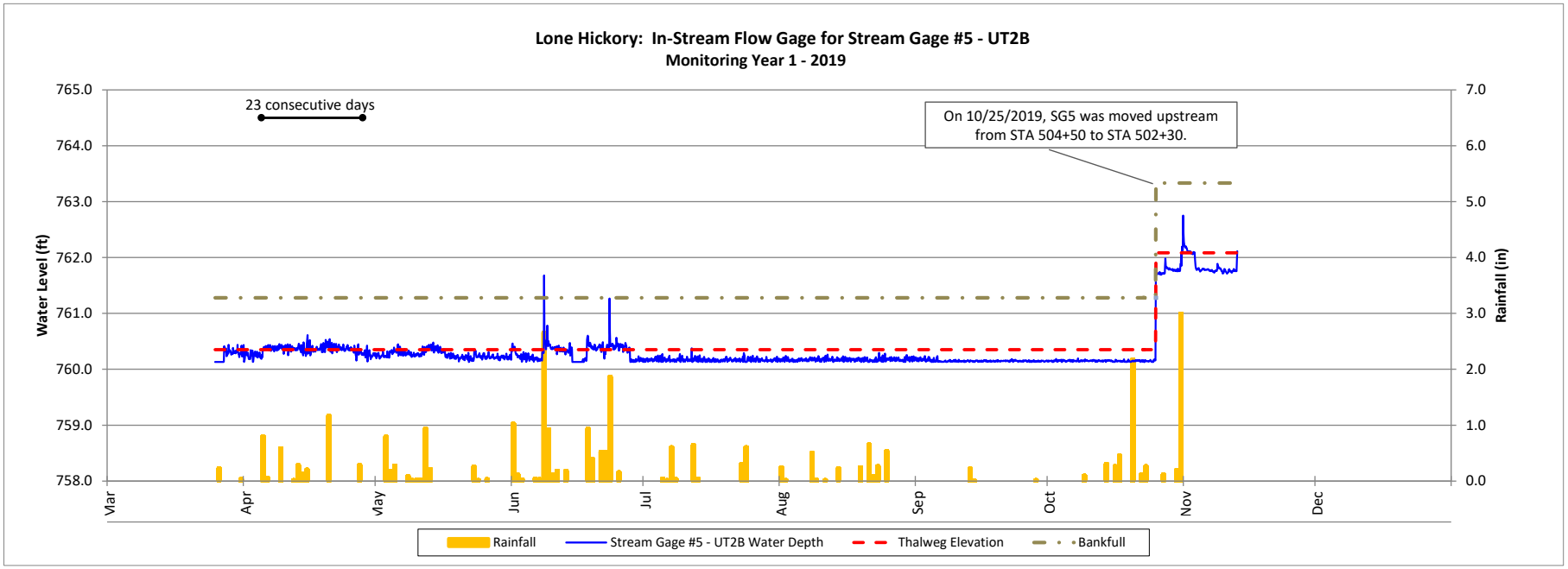
Recorded In-stream Flow Events

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019



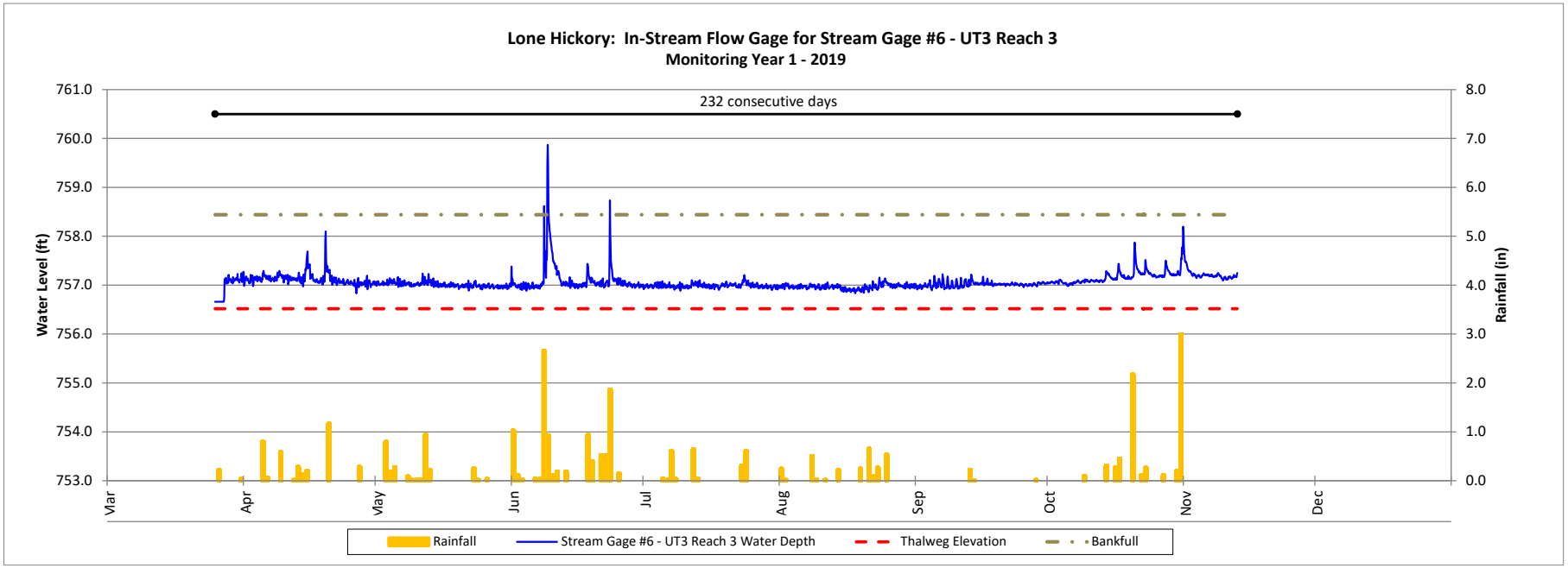
Recorded In-stream Flow Events

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019



Recorded In-stream Flow Events

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 1 - 2019

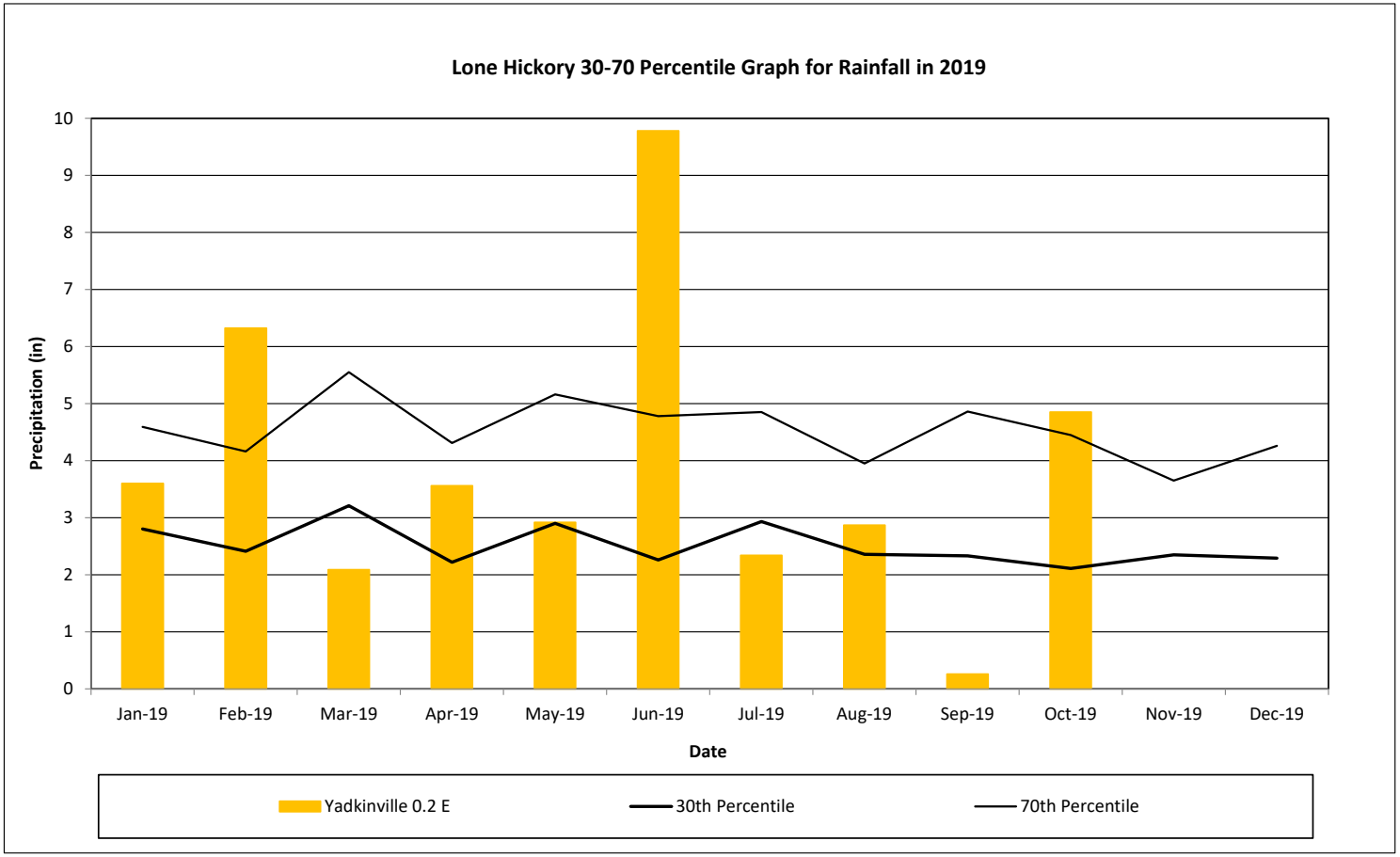


Monthly Rainfall Data

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 1 - 2019



2019 rainfall collected by NC CRONOS Station, Yadkinville 0.2 E, NC

30th and 70th percentile rainfall data collected from WETS station Yadkinville 6E