

MONITORING YEAR 5 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

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PREPARED FOR:

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

PREPARED BY:

Wildlands Engineering, Inc.
1430 South Mint Street, Suite 104
Charlotte, NC 28203

Phone: 704.332.7754
Fax: 704.332.3306

January 4, 2024

Mr. Paul Wiesner
Western Regional Supervisor
NCDEQ – Division of Mitigation Services
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, N.C. 28778-8211

RE: Lone Hickory Mitigation Site - Monitoring Year 5 (MY5) Report
Yadkin River Basin – CU# 03040101 – Yadkin County
DMS Project ID No. 97135
Contract # 6897

Dear Mr. Wiesner:

Wildlands Engineering, Inc. (Wildlands) has reviewed the Division of Mitigation Services' (DMS) comments from the Draft Monitoring Year (MY) 5 report for the Lone Hickory Mitigation Site. DMS' comments are noted below in **bold**. Wildlands' responses to those comments are noted in *italics*.

General: Per the 12/8/2017 IRT approved mitigation plan; "*If a gage does not meet the performance standard for a given monitoring year, rainfall patterns will be analyzed and the hydrograph will be compared to that of the reference wetlands to assess whether atypical weather conditions occurred during the monitoring period.*" Reference wetland gauge data for the site has not been collected since November 2020 (MY2). DMS recommends continued attempts to re-establish a functional reference wetland gauge for the site. If successful, the re-establishment and location of the wetland reference gauge should be documented in the MY6 (2024) report.

Wildlands' response: Wildlands will continue to investigate additional options to reestablish a functional reference wetland gage. If successful, this will be documented in the MY6 (2024) report.

Section 1.2.2 Stream Assessment – "*As woody vegetation has become more established, the minor deposition originally noted in MY2 within cross-sections 19 and 21 along UT2A and cross-sections 29 and 30 along UT3 Reach 2 appears to have reached an equilibrium.*" Can Wildlands please clarify this statement; is adequate sediment transport occurring on this reach? Is there a source of erosion upstream and have there been any changes to the project site or its watershed affecting sediment input, or has the reach simply been shaded out more effectively? If in-stream vegetation has been present, how has this been trending? Similarly, it is stated "*On the West Side, riffle cross-section 15 along UT2 Reach 1 initially experienced some bed scour in MY3 but has since stabilized in MY5 and is no longer an area of concern.*" Has the scoured area filled in with bed material of some type? Please clarify why this is no longer an area of concern or if/ how it has healed over.

Wildlands' response: Regarding the statement describing cross-sections 19, 21, 29, and 30, these reaches have been shaded out more effectively with in-stream vegetation becoming less of an issue. Both watersheds for UT2A and UT3 are predominantly forested and have not seen a noticeable change in land

cover in the past 5 years, according to visual observations and recent aerial imagery. Therefore, there do not appear to be any new sources of sediment.

Along UT2, the riffle cross-section 15 that initially displayed some bed scour in MY3 has improved in MY5 with a bank height ratio of 1.1. Some material has been deposited on the bed and along the banks forming small inner benches, as demonstrated in the cross-section plot. In addition, the downstream log structure is holding grade and functioning as designed. Thus, Wildlands no longer considers this riffle to be an area of concern.

Text describing the above cross-sections has been added to section 1.2.2.

Section 1.2.5 Areas of Concern and Management Activities– During the April 17, 2023, IRT Credit Release meeting (based on a review of the MY4 (2022) report and photos), the IRT asked about the vegetation adjacent to the UT2 & UTA areas.

Some areas around VP16, VP17, VP21, VP23, & MP6 have been called out in the MY5 (2023) report text, Areas of Concern Photographs, and mapped as areas with low stem height. Almost half of all the vegetation plots are not meeting the MY5 height requirement (Table 10e). For the entire project, does Wildlands feel that additional plantings will be warranted anywhere on the site prior to proposed project closeout, and if so, when would the planting occur?

Soil amendments and "compost tea" in some of the low stem height areas is mentioned; can Wildlands describe what/ how much was done during MY5 (2023) in more detail and what is planned in MY6 (2024)?

Wildlands' response: Though 19 of the 40 vegetation plots did not meet the MY5 height criteria, 12 of those plots are within 2 feet of an average heigh of 7 feet. It is expected that the growth rates in all plots should increase between MY5 and MY7, as this has been the trend in other mitigation sites Wildlands has monitored. Additional plantings are not warranted since stem density is not an issue and the areas of low stem height are being addressed through other adaptive management measures, described below.

In MY5, one application of soil amendments was completed along with two applications of "compost tea". The amendments added to the areas of low stem height along UT2 and UT2A consisted of humified carbon, humic acid, fertilizer, and azomite. The "compost tea" was applied to these areas to increase microorganism populations impacting root growth. These amendments combined should increase organic matter, nutrient load, and microbial activity in the soil to help improve stem growth. Additional applications of these amendments are planned for MY6.

Additional discussion has been added to section 1.2.5.

General: Cross-Section 10 (UT1 Reach 3) shows that the riffle has down cut almost 2 feet since 2019. Wildlands has called out XS 10 and XS 28 in the report text as scoured. While cross sections are technically not required during MY6, please consider collecting cross section data for these two cross sections in MY6 (2024), or in the absence of that, please visually monitor these closely in MY6 (2024) to assess their trend.

Wildlands' response: Wildlands plans to collect cross section data for these two cross sections in MY6 to closely monitor their trend.

Digital Support File Comments:

None

Wildlands' response: Noted

Two (2) hard copies of the Final Year 5 Monitoring Report and a full electronic submittal on a USB drive have been mailed to the DMS Western Field Office. Please contact me at 828-774-5547 x107 if you have any questions.

Sincerely,

Mimi Caddell
Environmental Scientist

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 Hydrologic Unit Code (HUC) 03040101130020 and the NC Division of Water Resources (NCDWR) Subbasin 03-07-02. The project is providing 13,164.574 stream mitigation units (SMUs) and 9.500 wetland mitigation units (WMUs) for the Yadkin River Basin 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 recent 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 a lack of bedform diversity. The effects of these stressors resulted in degraded water quality and habitat throughout the watershed of the Site when compared to reference conditions. The project approach for the Site focused on evaluating the existing functional condition, 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) 5 assessments and site visits were completed between February and November 2023 to evaluate the current conditions of the project.

The Site is meeting most of the required stream, vegetation, and hydrology success criteria for MY5. The average planted stem density for the Site is 500 stems per acre with all vegetation plots meeting the MY5 density criteria, and the average height is approximately 7.8 feet. At least one bankfull event was documented along UT2 Reach 2, UT2A, UT2B, and UT3 Reach 3. The bankfull requirement has been met for all reaches except for UT1 Reach 3. All low flow or intermittent channels monitored for consecutive baseflow met the requirement in MY5. For wetland hydrology, all thirteen groundwater gages installed on the Site met or exceeded the hydrologic success criteria for MY5. The visual assessment identified a few areas of concern including pockets of invasive species populations and isolated areas of bed scour and structure piping. Wildlands will continue to monitor these areas and adaptive management actions will be implemented as necessary throughout the seven-year monitoring period to maintain the ecological health of the Site.

LONE HICKORY MITIGATION SITE

Monitoring Year 5 Annual Report

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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 Hydrologic Unit Code (HUC) 03040101130020 and NCDWR Subbasin 03-07-02 (Figure 1). The project watershed is dominated by agricultural and forested land and located in the Inner Piedmont lithotectonic belt within the Piedmont physiographic province (NCGS, 1985).

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. UT2B begins downstream of BMP4 and flows into UT2. UT2A and UT2 join UT3 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.

The Site was historically used for crop production and dairy farming which collectively contributed to degraded in-stream habitat and sediment erosion. On the East Side, streams were manipulated through ditching, impoundments, and land use changes. The West Side streams were ditched and re-routed within the adjacent floodplain which was previously altered for agricultural uses. The riparian buffers on both sides of the Site lacked stabilizing streamside vegetation due to agricultural practices.

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 13,164.574 Stream Mitigation Units (SMUs) and 9.500 Wetland Mitigation Units (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 5 Data Assessment

Annual monitoring was conducted between February and November 2023 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 (VPs) 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 (MPs) were established in MY1 throughout the planted conservation easement to evaluate the random vegetation performance for the Site. These plots have been and will be 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 monitoring year (MY) 3 and at least 260 stems per acre at the end of MY5. In NC piedmont counties, planted trees must average 7 feet in height at the end of MY5 and 10 feet in height at the end of MY7.

The MY5 vegetation survey was completed in August 2023, resulting in an average planted stem density of 500 stems per acre for all monitored permanent and mobile vegetation plots. The Site has met the MY5 density requirement of 260 planted stems per acre with 100% (25/25) of the permanent plots and 100% (15/15) of the mobile plots individually meeting this requirement. Supplemental planting that occurred at the beginning of MY4 (2022) was successful in improving the stem density in plots previously not meeting the standard.

The MY5 average stem height for all permanent and mobile vegetation plots is 7.8 feet. Currently of the 40 total vegetation plots, 21 plots have individually met or exceeded the MY5 height requirement of 7 feet, and 12 plots are within 2 feet of meeting the MY5 height requirement. Many of the plots with the highest average planted stem heights are in areas where many volunteer trees exist that have provided healthy competition for the planted stems. Though the remaining 7 plots are greater than 2 feet from meeting the MY5 height requirement, over 91% of the stems in these plots reported health scores (vigor) of 3 or 4, indicating that those stems are healthy and likely to survive. The plots with the lowest average heights are in and around the wetland re-establishment area where soil conditions have hindered some growth. See section 1.2.5 for discussion on areas of low stem height.

In the permanent vegetation plots, approximately 95% of the planted stems in permanent plots are thriving with a health score (vigor) of 3 or greater. Approximately 3% of monitored stems were documented with a vigor of 2, indicating that they have fair plant health with some damage present. In addition, about 2% of the monitored stems were missing. When present, the poor tree health is a result of suffocation from dense herbaceous cover, insects, deer browsing, wet or dry soil conditions, and/or other unknown factors. The numerous volunteer woody stems noted in some permanent vegetation plots are not deterring planted stem growth. Please refer to Appendix 2 for vegetation plot photographs, Current Condition Plan View (CCPV) Figures 3.0-3.5 for vegetation plot locations, and Appendix 3 for vegetation data tables, including annual average tree height per plot.

1.2.2 Stream Assessment

Riffle cross-sections (XS) 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. Deviations will be evaluated to assess possible signs of stream channel instability. Indicators most often 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 be deemed unnecessary 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; therefore, 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 MY5 were completed in June 2023. Cross-section survey results indicate that channel dimensions are stable and functioning as designed on all restoration reaches. When occurring, adjustments are minor and isolated in comparison to baseline conditions.

As woody vegetation has become more established, the minor deposition originally noted in MY2 within cross-sections 19 and 21 along UT2A and cross-sections 29 and 30 along UT3 Reach 2 appears to have reached an equilibrium. These reaches have been shaded out more effectively with in-stream vegetation becoming less of an issue. Both watersheds for UT2A and UT3 are predominantly forested and have not seen a noticeable change in land cover in the past 5 years, according to visual observations and recent aerial imagery. Therefore, there do not appear to be any new sources of sediment.

On the West Side, riffle cross-section 15 along UT2 Reach 1 initially experienced some bed scour in MY3 but has improved in MY5 with a bank height ratio of 1.1. Some material has been deposited on the bed and along the banks forming small inner benches, as demonstrated by the cross-section plot. In addition, the downstream log structure is holding grade and functioning as designed. Thus, this riffle is no longer considered an area of concern.

Along UT1 Reach 3, some bed scour is present at riffle cross-section 10 and consequently the bank height ratio has increased to 1.4. First noted in MY3, riffle cross-section 28 along UT3 Reach 1 continues to experience some incision. The incision within cross-sections 10 and 28 is isolated and not representative of most riffles within the reach. Refer to section 1.2.5 for further discussion on stream areas of concern.

Refer to Appendix 2 for the visual stability assessment tables, CCPV figures, and reference photographs.

1.2.3 Stream Hydrology Assessment

At the end of the seven-year monitoring period, four or more bankfull events must have occurred in separate years within the restoration reaches. At least one bankfull event was recorded on UT2 Reach 2, UT2A, UT2B, and UT3 Reach 3 in MY5 using stream gage pressure transducers. UT3 Reach 3 has recorded five bankfull events in separate years, while UT2 Reach 2, UT2A, and UT2B have recorded four bankfull events in separate years, and UT1 Reach 3 has recorded three bankfull events in separate years thus far. Currently, the Site is on track to meet the hydrologic success criteria for bankfull events and has been met the performance standard for all reaches except for UT1 Reach 3.

Consistent flow must be documented in the restored intermittent or low flow 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. In December 2022, an additional stream gage (SG7) was installed on UT2B, approximately 120 LF downstream to provide additional stream flow data.

In MY5, all channels monitored for consecutive flow exceeded the success criteria. UT1 Reach 1 and UT2A documented 309 and 143 consecutive days, respectively. Along UT2B, the upstream stream gage (SG5) documented 40 consecutive days and the newly installed stream gage (SG7) documented 65 consecutive days. Photos captured during site visits that took place on 2/08/2023 and 3/07/2023 verify the stream flow documented by the gages on UT2B. See stream photo points 30 – 32 and gage photos in Appendix 2 for photo documentation. Please refer to CCPV figures in Appendix 2 for the stream gage locations and Appendix 5 for hydrology summary data and plots.

1.2.4 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, outside of the former ditch location, at the end of October 2019. Reporting for GWG 10 began in MY2 to replace GWG 4. Monitoring for GWG 4 ended in MY2. On April 22, 2022, GWG 11 and GWG 12 were installed to capture groundwater hydrology data within the wetland re-establishment area, and GWG 13 and GWG 14 were installed to document potential additional wetland areas along UT2 Reach 1 that have been created by the project. All monitoring gages are downloaded on a quarterly basis and maintained as needed. Calibration was checked by manually measuring water levels on all gages to validate the recorded data from the pressure transducers. Two soil temperature probes were installed on the Site during baseline monitoring near GWGs 5 and 6. The Site does not contain a rainfall gage; instead, the daily precipitation data was collected from the nearest NC Climate Retrieval and Observations Network of the Southeast Database (NC CRONOS) Station, Yadkinville 0.2 E, NC which is located approximately 2.5 miles from the Site as the crow flies.

A reference gage was originally established in a nearby reference wetland to compare the hydrologic response within the restored wetland areas at the Site. In MY3, Wildlands made multiple attempts to contact the new landowner and obtain permission to access the gage but were unsuccessful. In MY4, Wildlands made several attempts to establish a new functional reference wetland gage within other nearby properties, but unfortunately landowners were unwilling to allow access. Wildlands will continue to make efforts to re-establish a reference wetland gage.

The original performance standard for wetland hydrology from the Mitigation Plan (Wildlands, 2017) was 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. A memo was sent to the NC IRT in September 2023 documenting soil temperature and vegetation indicators onsite for all monitoring years and which supports extending the original growing season to begin on March 28 and end on November 3. In October 2023, the NC IRT approved modifying the Site's growing season apply the change going forward and to all previous monitoring years. Therefore, the new performance standard for wetland hydrology is 21 consecutive days (9.2%) of the growing season (March 28 through November 3). Wildlands will continue to document soil temperature and vegetation indicators to verify the approved growing season for the Site. Please refer to Appendix 2 for leaf out and leaf senescence photographs, Appendix 5 for soil temperature plots, and Appendix 6 for the growing season memo and email correspondence from the NC IRT.

All thirteen GWGs (GWG 1 – 3 and 5 – 14) met or exceeded the success criteria for MY5 with the percentage of consecutive days of the growing season ranging from 11.3 to 67%. Monthly rainfall data in 2023 indicated lower than normal rainfall amounts in March, June, September, and October, while higher than normal amounts occurred in January, April, June, and August. The remaining months' (February and May) rainfall amounts fell between the 30th and 70th percentile for Yadkin County. Please refer to CCPV figures in Appendix 2 for the groundwater gage locations and Appendix 5 for hydrology plots and summary tables.

1.2.5 Areas of Concern and Management Activities

Vegetation

Invasive treatments have been successful in reducing previously noted areas of invasive species; MY5 visual assessments revealed that approximately 99% of the conservation easement is unaffected by invasive populations. However, when present, these species include kudzu (*Pueraria montana*) and Chinese privet (*Ligustrum sinense*). Multiple kudzu treatments occurred in July and September 2023 in

the buffers along UT2 and UT3. Additional invasive treatments focusing on Chinese privet, princess tree (*Paulownia tomentosa*), Japanese honeysuckle (*Lonicera japonica*), and tree of heaven (*Ailanthus altissima)* within the existing wood line along the East Side buffer occurred in May and July 2023. Asian spiderwort (*Murdannia keisak*) was also chemically treated within targeted riffles of UT2A and UT3 in the summer 2023. Additional treatments will continue as needed to help manage remaining invasive species populations on the Site.

Woody vegetation has become well established on the Site. Supplemental plantings that occurred in MY4 (2022) around VP11 and VP16 are surviving and have successfully improved the stem densities in the floodplain between UT2A and UT2. Soil amendments were added to these areas in June 2023, along with applications of compost tea. A few small areas of low stem height totaling approximately 0.91 acres (1.3% of the planted acreage) have been mapped on the West side and are represented by the average stem heights noted in VP16, VP17, VP21, VP22, VP23, and MP6. It is expected that the growth rates should increase between MY5 and MY7. Additional applications of soil amendments and compost tea are planned for 2024 to increase organic matter, nutrient load, and microbial activity in the soil to help improve planted stem growth.

Vegetation has continued to become well-established in areas throughout the Site previously identified with poor herbaceous cover, gully formation, and floodplain scour. In MY5, live stakes of species including silky dogwood (*Cornus amomum*), silky willow (*Salix sericea*), and black willow (*Salix nigra*) were installed as bio-stabilization measures in a few small areas along the banks of UT1 and UT2A.

Streams

Repairs were previously completed in MY2 and MY3 to address areas of bank and bed instability along UT3 Reach 1, isolated structure issues along UT1 Reach 1, and headcuts that had formed at the inlets/outlets of BMP3 and BMP4. Please refer to previous monitoring reports for more detailed repair plans and documentation. Visual assessments in MY5 reveal that these repair areas continue to appear stable and functioning as designed.

Beaver dams were removed in January and late summer 2023 along UT2 Reach 2 and UT3 Reach 2 and 3. The infrequent inundation caused by the beaver dams at the bottom of the Site has not appeared to have damaged floodplain vegetation or stream stability. Wildlands has contracted with USDA to manage beaver on the Site. Beaver activity will continue to be monitored and managed on the Site through closeout.

A few additional minor stream areas of concern were noted in MY5. Some piping during baseflow was observed at one structure along UT1 Reach 1 (near station 107+10); however, the majority of structures (85 out of 86 engineered structures) along this reach are functioning as designed. As noted in section 1.2.2, two constructed riffles are experiencing some bed scour/incision along UT1 Reach 3 at station 147+50 (XS10) and UT3 Reach 1 at station 303+25 (XS28). Log structures located at the end of these riffles are maintaining grade and protecting from additional degradation. These areas of concern are considered minor and will be monitored for signs of instability. Please refer to the areas of concern photolog in Appendix 2.

Conservation Easement

The conservation easement boundary was inspected in MY5, and no encroachments were discovered. Wildlands will continue to inspect the conservation easement annually to verify that there are no encroachments and ensure markings/signage are visible.

Quarterly site visits will continue to be conducted to monitor and address areas of concern. If necessary, future adaptive management will be implemented to improve herbaceous cover and woody stem

densities, treat and control invasive plants, and address stream stability issues. Please refer to Appendix 2 for CCPV figures and stream stability and vegetation assessment tables.

1.3 Monitoring Year 5 Summary

The Site is meeting most of the required stream, vegetation, and hydrology success criteria for MY5. The average planted stem density for the Site is 500 stems per acre with all vegetation plots meeting the MY5 density criteria, and the average height is approximately 7.8 feet. At least one bankfull event was documented along UT2 Reach 2, UT2A, UT2B, and UT3 Reach 3. The bankfull requirement has been met for all reaches except for UT1 Reach 3. All low flow or intermittent channels monitored for consecutive baseflow met the requirement in MY5. For wetland hydrology, all thirteen groundwater gages installed on the Site met or exceeded the hydrologic success criteria for MY5. The visual assessment identified a few areas of concern including pockets of invasive species populations and isolated areas of bed scour and structure piping. Wildlands will continue to monitor these areas and adaptive management actions will be implemented as necessary throughout the seven-year monitoring period to maintain 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. Monitoring methods are in accordance with the United States Army Corps of Engineers (USACE, 2016) standards for mitigation. Vegetation monitoring follows the Carolina Vegetation Survey-EEP Level 2 Protocol (Lee et al., 2008).

Section 3: REFERENCES

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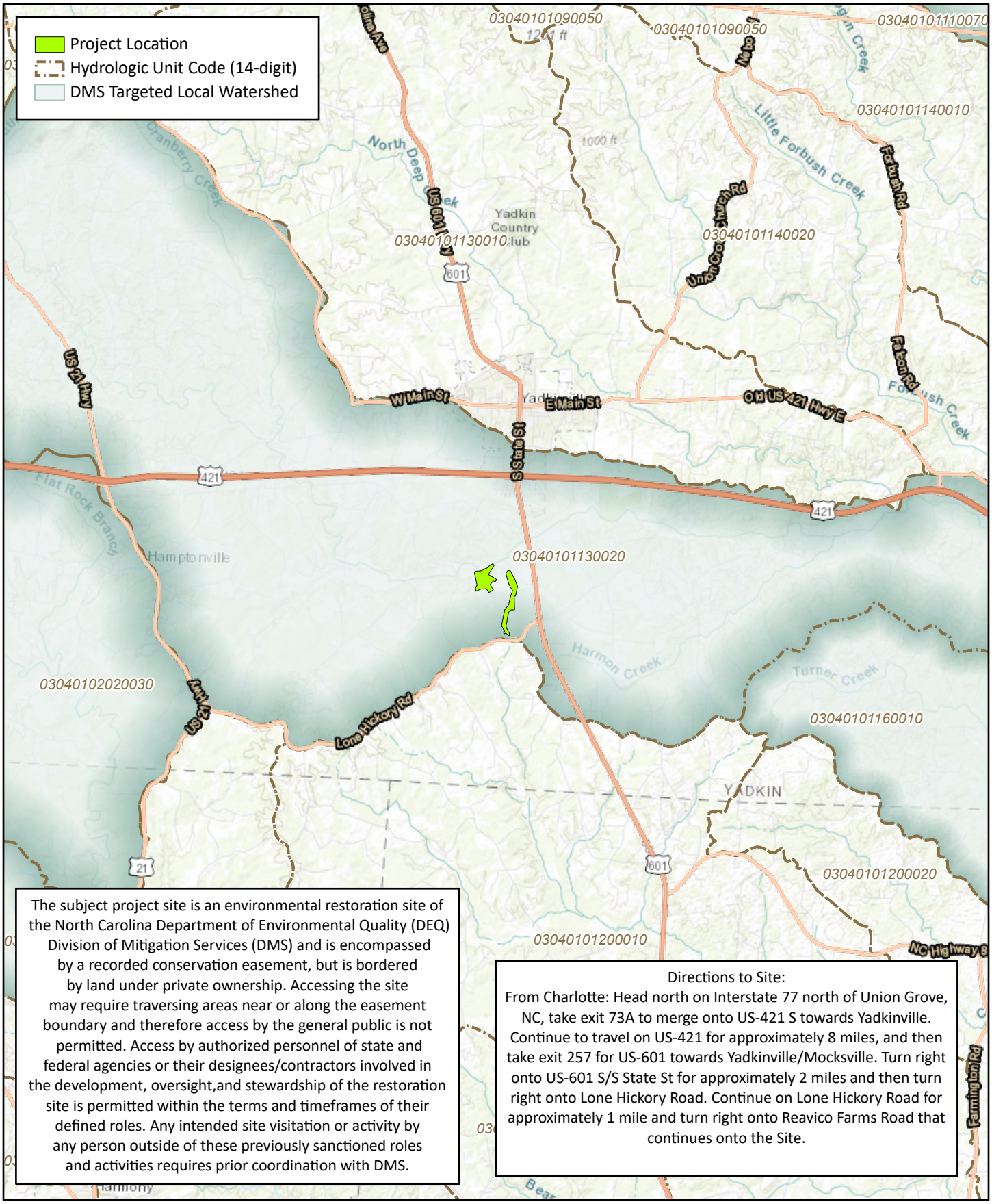
Wildlands Engineering, Inc (Wildlands), 2021. Lone Hickory Mitigation Site Monitoring Year 3 Annual Report. DMS, Raleigh, NC.

Wildlands Engineering, Inc (Wildlands), 2022. Lone Hickory Mitigation Site Monitoring Year 4 Annual Report. DMS, Raleigh, NC.

APPENDIX 1. General Figures and Tables



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

Directions to Site:
From Charlotte: Head north on Interstate 77 north of Union Grove, NC, take exit 73A to merge onto US-421 S towards Yadkinville. Continue to travel on US-421 for approximately 8 miles, and then take exit 257 for US-601 towards Yadkinville/Mocksville. Turn right onto US-601 S/S State St for approximately 2 miles and then turn right onto Lone Hickory Road. Continue on Lone Hickory Road for approximately 1 mile and turn right onto Reavico Farms Road that continues onto the Site.

WILDLANDS ENGINEERING

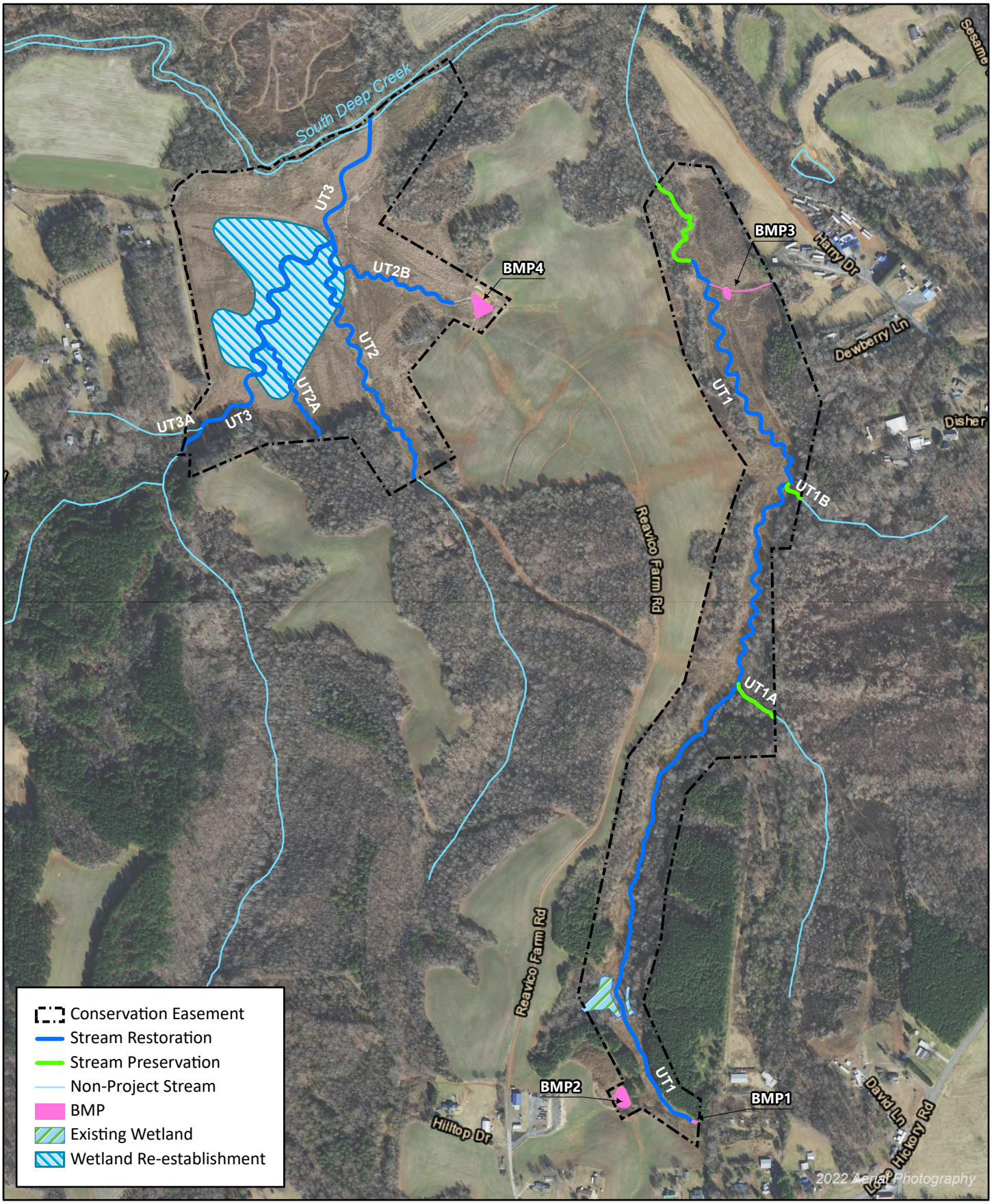
Environmental Quality

0 1 2 Mile

N

Figure 1 Project Vicinity Map
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Yadkin County, NC



WILDLANDS ENGINEERING

Environmental Quality

0 350 700 Feet

N

Figure 2 Project Component/Asset Map
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Yadkin County, NC

Table 1. Mitigation Assets and Components

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

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	6,698.044
UT1 R4	659	659	Warm	Preservation	P4	10.000	659	65.900
UT1A	230	282	Warm	Preservation	N/A	10.000	282	28.200
UT1B	48	124	Warm	Preservation	N/A	10.000	123	12.400
UT2 R1, R2	2,527	1,703	Warm	Restoration	P1, P2	1.000	1,703	1,933.009
UT2A	1,184	655	Warm	Restoration	P1	1.000	655	699.002
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	2,835.019
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	13,058.074	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	106.500	N/A	N/A	N/A	N/A	N/A	
Totals	**13,164.574**	**N/A**	**N/A**	**9.500**	**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 5 - 2023

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	
Stream Repair		April 2020	April 2020
Supplemental seeding, herbaceous plug, and live stake planting		June 2020 - August 2020	August 2020
Invasive Species Treatment		May, August, & September 2020	September 2020
Year 2 Monitoring	Stream Survey	July 2020	November 2020
	Vegetation Survey	August 2020	
Stream repair		April 2021	April 2021
Vegetation management (invasive species, soil amendments)		July 2021	July 2021
Beaver maintenance		June - August 2021	August 2021
Year 3 Monitoring	Stream Survey	July 2021	November 2021
	Vegetation Survey	October 2021	
Invasive Species Treatment		July & August 2022	August 2022
Supplemental soil amendments, seeding, and bare root planting		February 2022	Feburary 2022
Beaver maintenance		August 2022	August 2022
Year 4 Monitoring	Stream Survey	N/A	November 2022
	Vegetation Survey	N/A	
Invasive Species Treatment		May, July, & September 2023	September 2023
Soil amendments, live stake planting		January & June 2023	June 2023
Beaver maintenance		January - August 2023	August 2023
Year 5 Monitoring	Stream Survey	June 2023	November 2023
	Vegetation Survey	August 2023	
Year 6 Monitoring	Stream Survey	N/A	November 2024
	Vegetation Survey	N/A	
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 5 - 2023

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.** Mimi Caddell 828-774-5547

Table 4. Project Information and Attributes

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 5 - 2023

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 5 - 2023

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	N/A	3
Hydrology	Crest Gage (CG) and or/Transducer (SG)	1 SG	1 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. Reachwide sampling no longer required.

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 5 - 2023

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	1	1	1	N/A	Year 1, 2, 3, 5, and 7	1
	Pool Cross-Section	1	1	2	2	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	N/A	3
Stream Hydrology	Crest Gage (CG) and/or Transducer (SG)	1 SG		1 SG	1 SG	1 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.

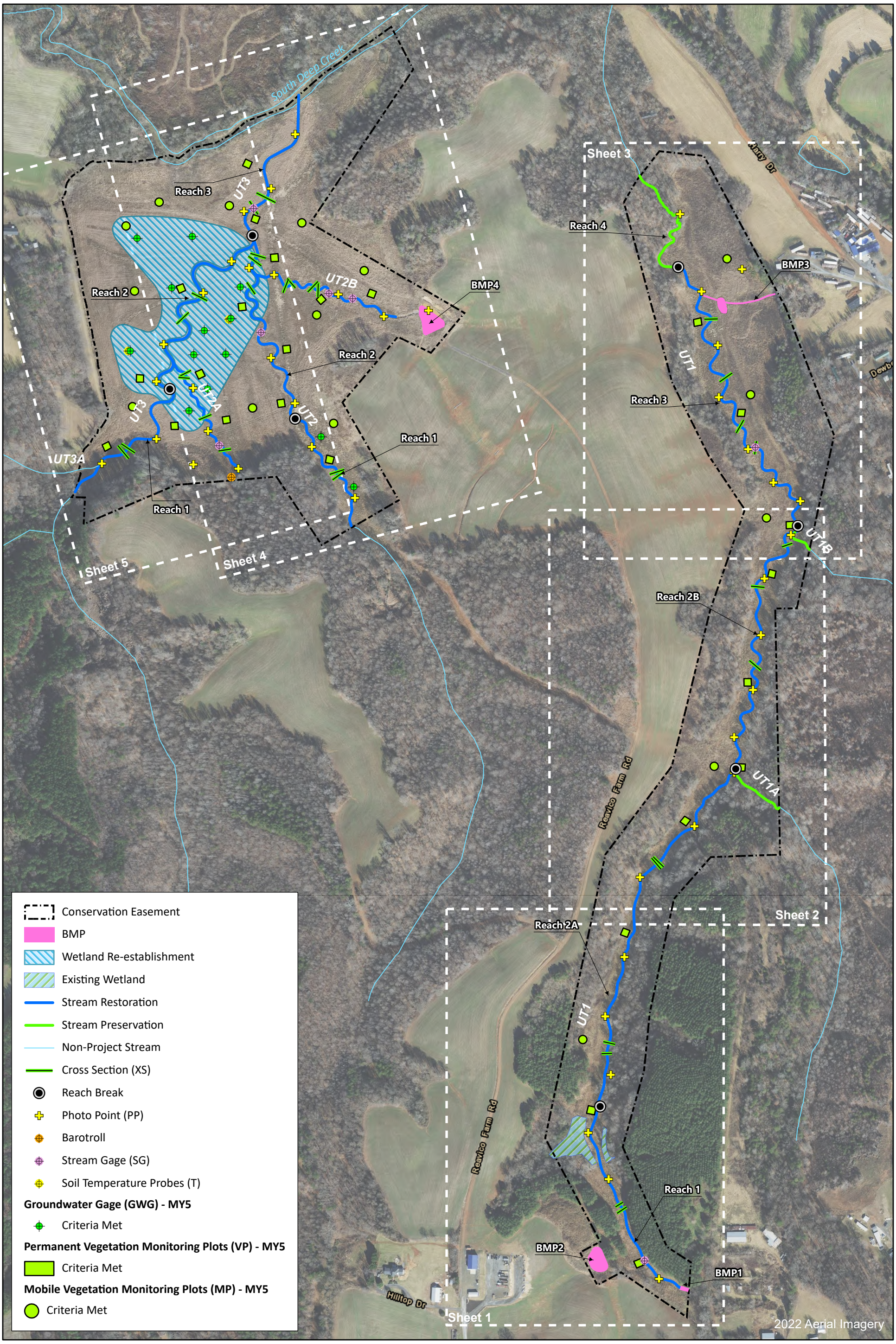
3. Riffle 100-count substrate sampling was collected during the baseline monitoring only. Reachwide sampling no longer required.

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.

APPENDIX 2. Visual Assessment Data



WILDLANDS ENGINEERING

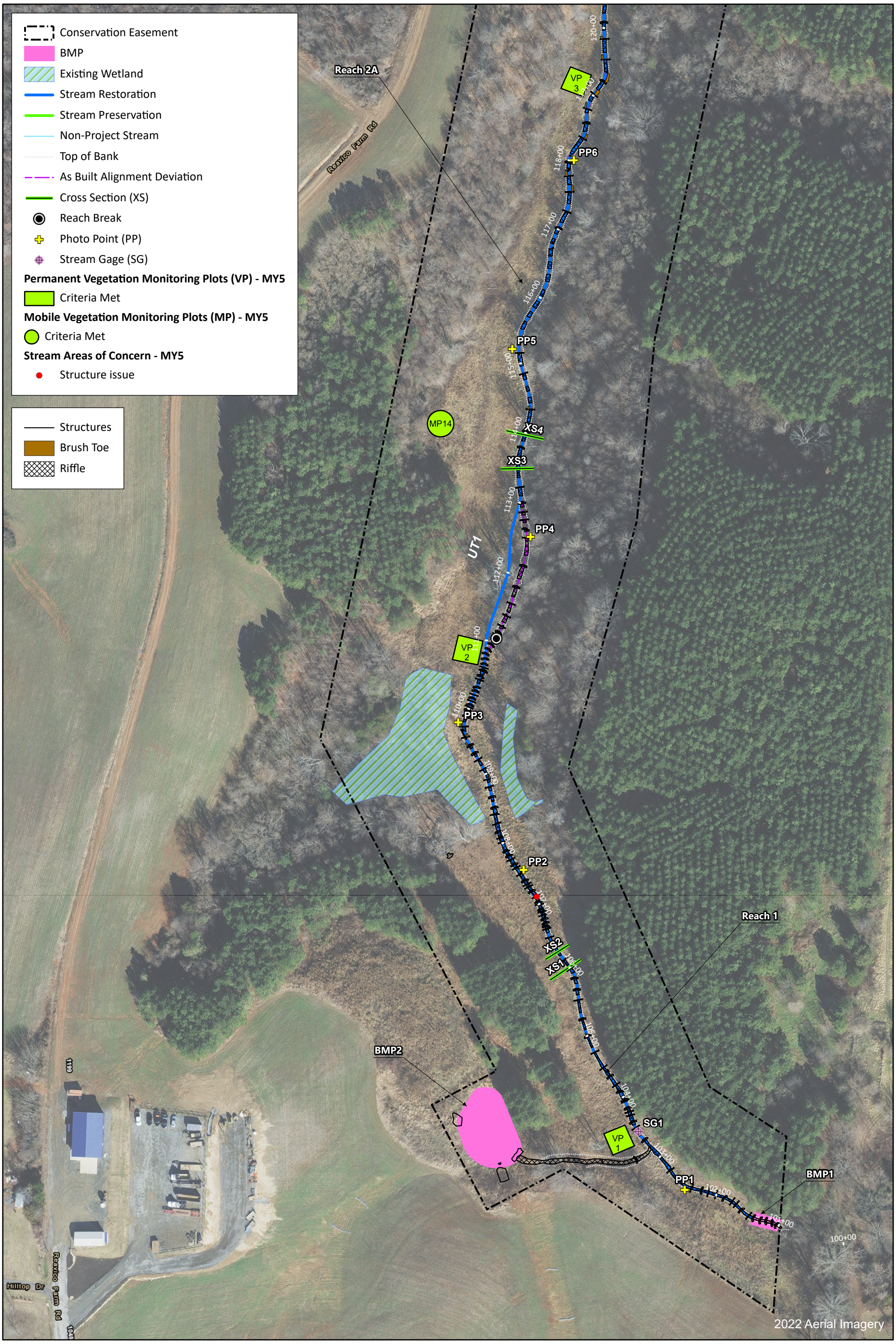
Environmental Quality

0 400 800 Feet

N

Figure 3.0 Current Condition Plan View Map (Key)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Yadkin County, NC



WILDLANDS ENGINEERING

Environmental Quality

0 125 250 Feet

N

Figure 3.1 Current Condition Plan View Map (Sheet 1)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Yadkin County, NC

Conservation Easement
Stream Restoration
Stream Preservation
Top of Bank
Cross Section (XS)
Reach Break
Photo Point (PP)

Permanent Vegetation Monitoring Plots (VP) - MY5

Criteria Met

Mobile Vegetation Monitoring Plots (MP) - MY5

Criteria Met

Structures
Brush Toe
Riffle

MP13
VP 8
VP 7
VP 6
MP15
VP 5
VP 4
XS9
XS8
XS7
XS6
XS5
PP13
PP12
PP11
PP10
PP9
PP8
PP7
UT1B
UT1A
UT1
Reach 3
Reach 2B
Reach 2A
Reavico Farm Rd
142+00
141+24
141+00
140+00
139+00
138+81
137+00
136+00
135+00
134+00
133+00
132+00
131+00
130+00
129+00
128+00
127+00
126+00
125+00
124+00
123+00
122+00
121+00
120+00
190+00
181+00
180+00
2022 Aerial Imagery

WILDLANDS ENGINEERING

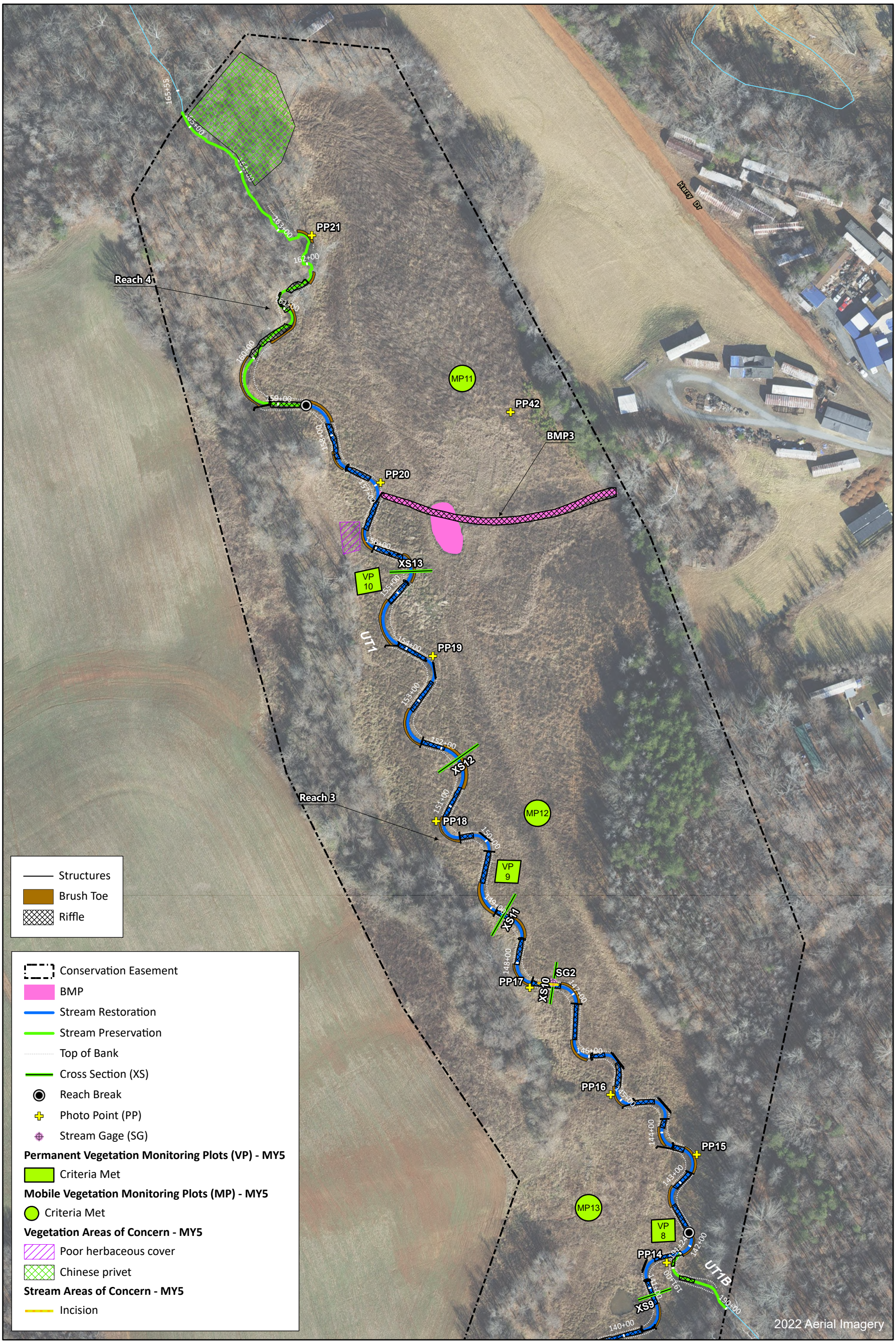
Environmental Quality

0 125 250 Feet

N

Figure 3.2 Current Condition Plan View Map (Sheet 2)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Yadkin County, NC



WILDLANDS ENGINEERING

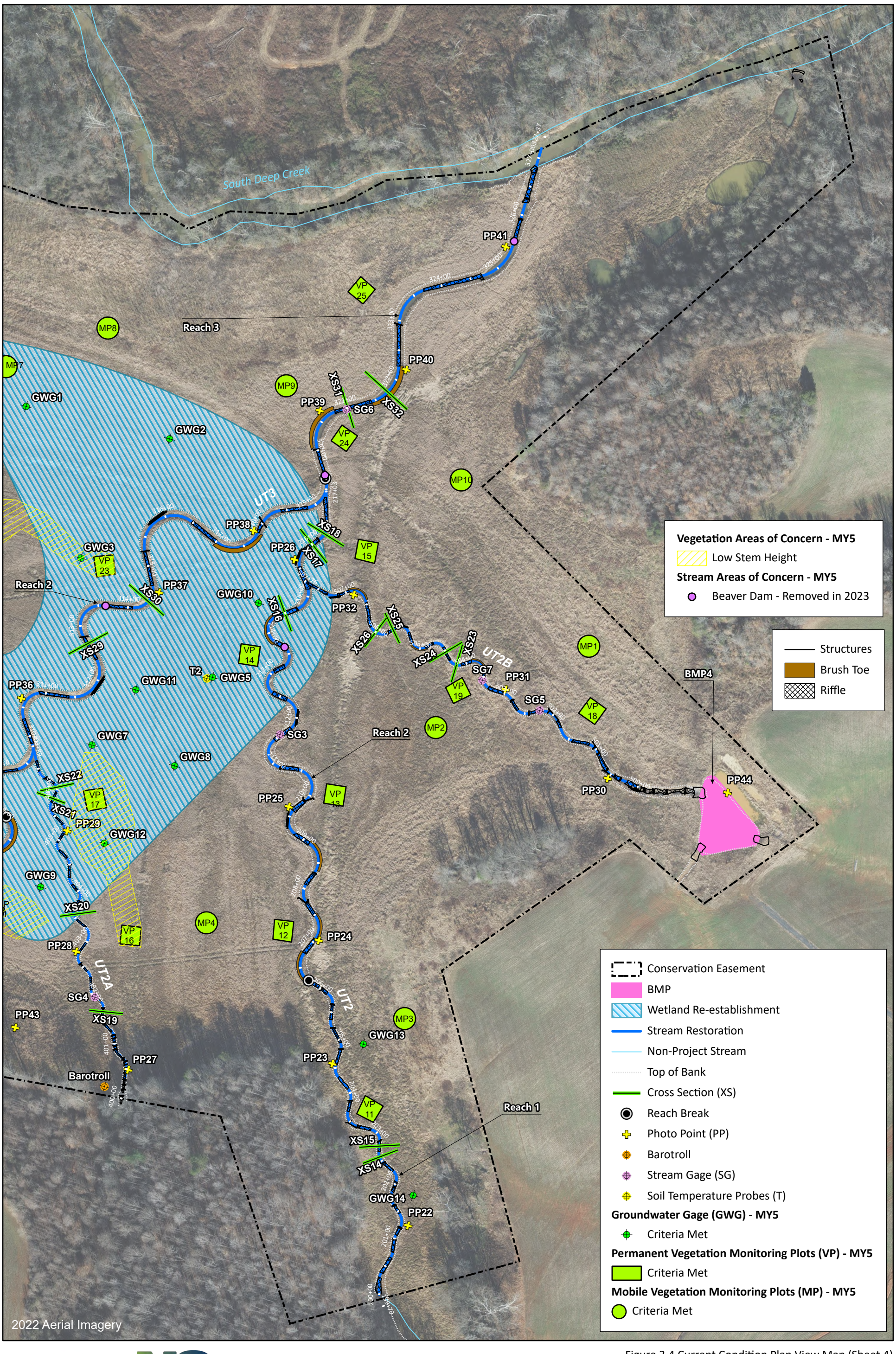
Environmental Quality

0 125 250 Feet

N

Figure 3.3 Current Condition Plan View Map (Sheet 3)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Yadkin County, NC



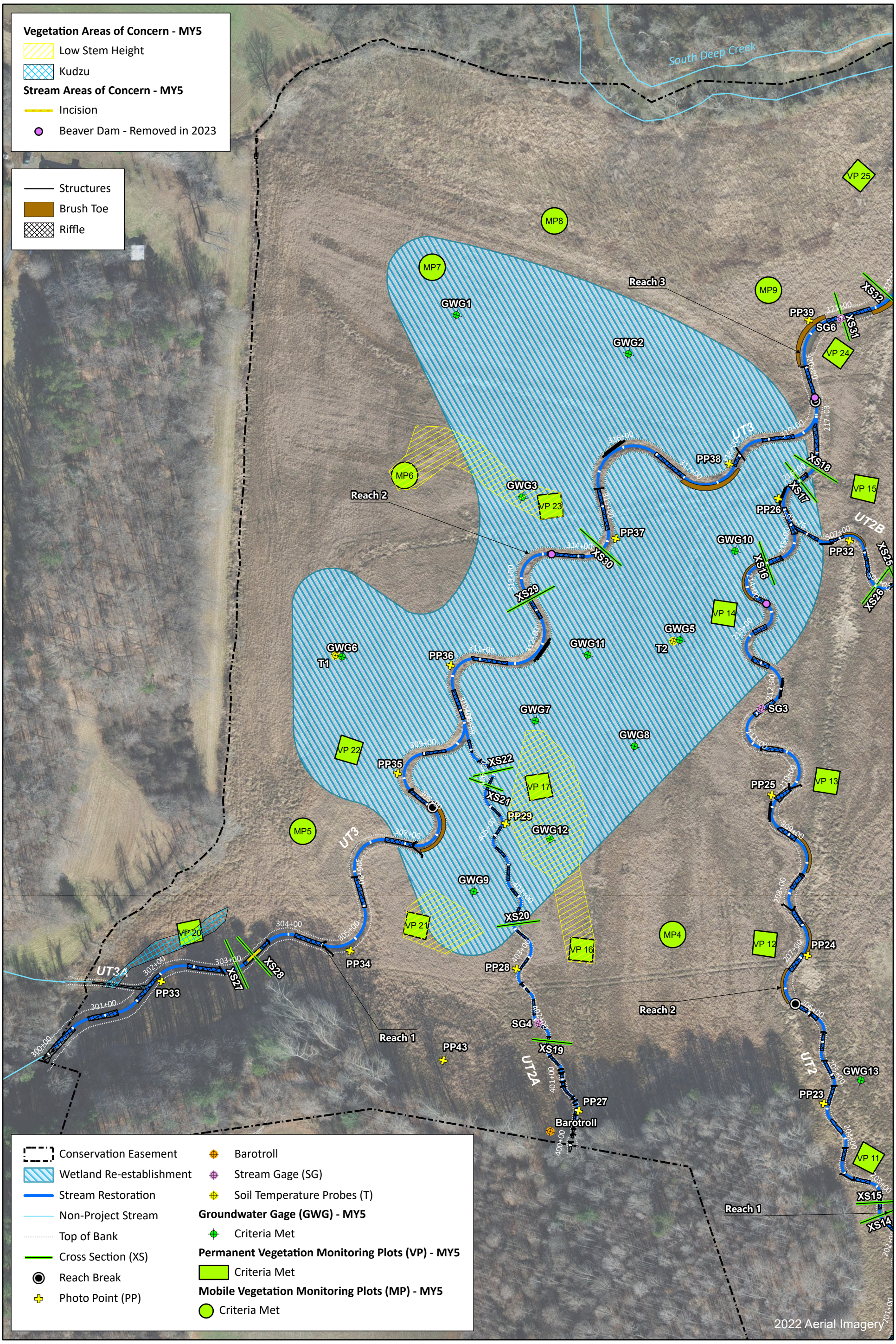
WILDLANDS ENGINEERING

Environmental Quality

0 150 300 Feet

Figure 3.4 Current Condition Plan View Map (Sheet 4)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Yadkin County, NC



WILDLANDS ENGINEERING

Environmental Quality

0 125 250 Feet

Figure 3.5 Current Condition Plan View Map (Sheet 5)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Yadkin County, NC

Table 6a. Visual Stream Morphology Stability Assessment Table

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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	25	25			100%			
	3. Step Pool Condition	Depth Sufficient	25	25			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.	85	86			99%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	85	86			99%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	85	86			99%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	85	86			99%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	85	86			99%			

[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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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.	42	42			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	41	41			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	41	41			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	41	41			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	41	41			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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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			1	30	98%			
	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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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	25	97%			
	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			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	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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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 5 - 2023

Last Date of Visual Assessment: 11/6/2023
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 5 - 2023

Last Date of Visual Assessment: 11/6/2023

Planted Acreage **68.3**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage
Bare Areas [1]	Very limited cover of both woody and herbaceous material	0.1	1	0.03	0.04%
Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, 5, or 7 stem count criteria.	0.1	0	0.00	0.00%
		Total	**1**	**0.03**	**0.04%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.1	3	0.91	1.34%
		Cumulative Total	**4**	**0.94**	**1.37%**

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	2	0.43	0.4%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0.0	0.0%

[1] Area included is less than 0.1 acres.

Stream Photographs
MY5

	
Photo Point 1 – UT1 Reach 1, view upstream *(03/07/2023)*	**Photo Point 1** – UT1 Reach 1, view downstream *(03/07/2023)*
	
Photo Point 2 – UT1 Reach 1, view upstream *(03/07/2023)*	**Photo Point 2** – UT1 Reach 1, view downstream *(03/07/2023)*
	
Photo Point 3 – UT1 Reach 1, view upstream *(03/07/2023)*	**Photo Point 3** – UT1 Reach 1, view downstream *(03/07/2023)*

	
Photo Point 4 – UT1 Reach 2A, view upstream *(03/07/2023)*	**Photo Point 4** – UT1 Reach 2A, view downstream *(03/07/2023)*
	
Photo Point 5 – UT1 Reach 2A, view upstream *(03/07/2023)*	**Photo Point 5** – UT1 Reach 2A, view downstream *(03/07/2023)*
	
Photo Point 6 – UT1 Reach 2A, view upstream *(03/07/2023)*	**Photo Point 6** – UT1 Reach 2A, view downstream *(03/07/2023)*

	
Photo Point 7 – UT1 Reach 2A, view upstream *(03/07/2023)*	**Photo Point 7** – UT1 Reach 2A, view downstream *(03/07/2023)*
	
Photo Point 8 – UT1 Reach 2A, view upstream *(03/07/2023)*	**Photo Point 8** – UT1 Reach 2A, view downstream *(03/07/2023)*
	
Photo Point 9 – UT1 Reach 2A, view upstream *(03/07/2023)*	**Photo Point 9** – UT1 Reach 2A, view downstream *(03/07/2023)*

Photo Point 9 – UT1A, view upstream *(03/07/2023)*

Photo Point 10 – UT1 Reach 2B, view upstream *(03/07/2023)*

Photo Point 10 – UT1 Reach 2B, view downstream *(03/07/2023)*

Photo Point 11 – UT1 Reach 2B, view upstream *(03/07/2023)*

Photo Point 11 – UT1 Reach 2B, view downstream *(03/07/2023)*

	
Photo Point 12 – UT1 Reach 2B, view upstream *(03/07/2023)*	**Photo Point 12** – UT1 Reach 2B, view downstream *(03/07/2023)*
	
Photo Point 13 – UT1 Reach 2B, view upstream *(03/07/2023)*	**Photo Point 13** – UT1 Reach 2B, view downstream *(03/07/2023)*
	
Photo Point 14 – UT1 Reach 2B, view upstream *(03/07/2023)*	**Photo Point 14** – UT1 Reach 2B, view downstream *(03/07/2023)*

Photo Point 14 – UT1B, view upstream *(03/07/2023)*

Photo Point 15 – UT1 Reach 3, view upstream *(03/07/2023)*

Photo Point 15 – UT1 Reach 3, view downstream *(03/07/2023)*

Photo Point 16 – UT1 Reach 3, view upstream *(03/07/2023)*

Photo Point 16 – UT1 Reach 3, view downstream *(03/07/2023)*

	
Photo Point 17 – UT1 Reach 3, view upstream *(03/07/2023)*	**Photo Point 17** – UT1 Reach 3, view downstream *(03/07/2023)*
	
Photo Point 18 – UT1 Reach 3, view upstream *(03/07/2023)*	**Photo Point 18** – UT1 Reach 3, view downstream *(03/07/2023)*
	
Photo Point 19 – UT1 Reach 3, view upstream *(03/07/2023)*	**Photo Point 19** – UT1 Reach 3, view downstream *(03/07/2023)*

Photo Point 20 – UT1 Reach 3, view upstream *(03/07/2023)*

Photo Point 20 – UT1 Reach 3, view downstream *(03/07/2023)*

Photo Point 20 – UT1 Reach 3 BMP 3, view upstream *(03/07/2023)*

Photo Point 21 – UT1 Reach 4, view upstream *(03/07/2023)*

Photo Point 21 – UT1 Reach 4, view downstream *(03/07/2023)*

	
Photo Point 22 – UT2 Reach 1, view upstream *(03/07/2023)*	**Photo Point 22** – UT2 Reach 1, view downstream *(03/07/2023)*
	
Photo Point 23 – UT2 Reach 1, view upstream *(03/07/2023)*	**Photo Point 23** – UT2 Reach 1, view downstream *(03/07/2023)*
	
Photo Point 24 – UT2 Reach 2, view upstream *(03/07/2023)*	**Photo Point 24** – UT2 Reach 2, view downstream *(03/07/2023)*

	
Photo Point 25 – UT2 Reach 2, view upstream *(03/07/2023)*	**Photo Point 25** – UT2 Reach 2, view downstream *(03/07/2023)*
	
Photo Point 26 – UT2 Reach 2, view upstream *(05/09/2023)*	**Photo Point 26** – UT2 Reach 2, view downstream *(05/09/2023)*
	
Photo Point 27 – UT2A, view upstream *(03/07/2023)*	**Photo Point 27** – UT2A, view downstream *(03/07/2023)*

	
Photo Point 28 – UT2A, view upstream *(03/07/2023)*	**Photo Point 28** – UT2A, view downstream *(03/07/2023)*
	
Photo Point 29 – UT2A, view upstream *(03/07/2023)*	**Photo Point 29** – UT2A, view downstream *(03/07/2023)*
	
Photo Point 30 – UT2B, view upstream *(03/07/2023)*	**Photo Point 30** – UT2B, view downstream *(03/07/2023)*

	
Photo Point 31 – UT2B, view upstream *(03/07/2023)*	**Photo Point 31** – UT2B, view downstream *(03/07/2023)*
	
Photo Point 32 – UT2B, view upstream *(03/07/2023)*	**Photo Point 32** – UT2B, view downstream *(03/07/2023)*
	
Photo Point 33 – UT3 Reach 1, view upstream *(03/07/2023)*	**Photo Point 33** – UT3 Reach 1, view downstream *(03/07/2023)*

	
Photo Point 34 – UT3 Reach 1, view upstream *(03/07/2023)*	**Photo Point 34** – UT3 Reach 1, view downstream *(03/07/2023)*
	
Photo Point 35 – UT3 Reach 2, view upstream *(03/07/2023)*	**Photo Point 35** – UT3 Reach 2, view downstream *(03/07/2023)*
	
Photo Point 36 – UT3 Reach 2, view upstream *(03/07/2023)*	**Photo Point 36** – UT3 Reach 2, view downstream *(03/07/2023)*

	
Photo Point 37 – UT3 Reach 2, view upstream *(03/07/2023)*	**Photo Point 37** – UT3 Reach 2, view downstream *(03/07/2023)*
	
Photo Point 38 – UT3 Reach 2, view upstream *(05/09/2023)*	**Photo Point 38** – UT3 Reach 2, view downstream *(05/09/2023)*
	
Photo Point 39 – UT3 Reach 3, view upstream *(03/07/2023)*	**Photo Point 39** – UT3 Reach 3, view downstream *(03/07/2023)*

	
Photo Point 40 – UT3 Reach 3, view upstream *(03/07/2023)*	**Photo Point 40** – UT3 Reach 3, view downstream *(03/07/2023)*
	
Photo Point 41 – UT3 Reach 3, view upstream *(03/07/2023)*	**Photo Point 41** – UT3 Reach 3, view downstream *(03/07/2023)*
	
Photo Point 42 – UT1 Reach 3, up valley *(03/07/2023)*	**Photo Point 42** – UT1 Reach 4, down valley *(03/07/2023)*

Photo Point 43 – UT2A, northeast view *(05/31/2023)*

Photo Point 43 – UT2A, north view *(05/31/2023)*

Photo Point 43 – UT3 Reach 3, northwest view *(05/31/2023)*

Photo Point 44 – BMP 4 above UT2B, inlet view *(05/31/2023)*

Photo Point 44 – BMP 4 above UT2B, outlet view *(05/31/2023)*

Groundwater and Stream Gage Photographs
MY5

Groundwater Gage 1 – *(05/09/2023)*

Groundwater Gage 2 – *(05/09/2023)*

Groundwater Gage 3 – *(05/09/2023)*

Groundwater Gage 5 – *(05/09/2023)*

Groundwater Gage 6 – *(05/09/2023)*

Groundwater Gage 7 – *(05/09/2023)*

Groundwater Gage 8 – *(05/09/2023)*

Groundwater Gage 9 – *(05/09/2023)*

Groundwater Gage 10 – *(05/09/2023)*

Groundwater Gage 11 – *(09/14/2023)*

Groundwater Gage 12 – *(05/09/2023)*

Groundwater Gage 13 – *(06/29/2023)*

Groundwater Gage 14 – *(05/09/2023)*

Stream Gage 1, UT1 Reach 1 – *(07/25/2023)*

Stream Gage 2, UT1 Reach 3 – *(05/09/2023)*

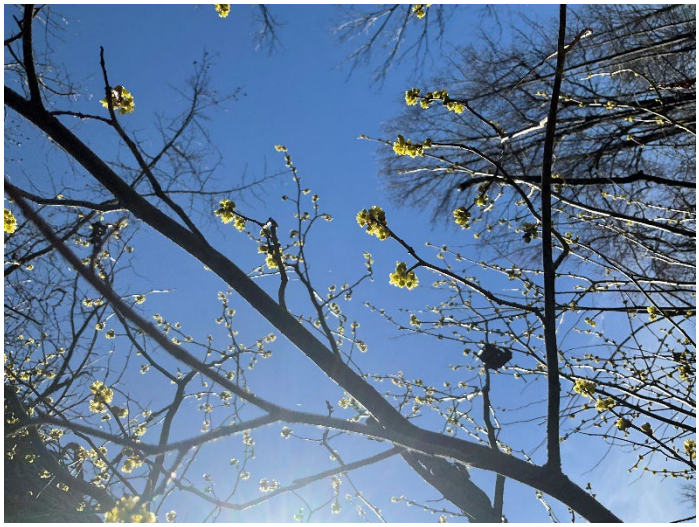
Stream Gage 3, UT2 Reach 2 – *(05/09/2023)*

Stream Gage 4, UT2A – *(02/08/2023)*

Stream Gage 5, UT2B STA 502+25 – *(02/08/2023)*

	
Stream Gage 6, UT3 Reach 3 – *(05/09/2023)*	**Stream Gage 7, UT2B STA 503+40** – *(02/08/2023)*

Vegetation Growing Season Indicators Photographs
MY5



MY5: Spice Bush Bud Burst Documentation – *(3/07/2023)*

MY5: Elderberry Leaf-out Documentation – *(3/07/2023)*

MY5: Leaf Senescence Documentation – *(11/06/2023)*

Permanent Vegetation Plot Photographs
MY5

Vegetation Plot 1 – *(8/21/2023)*

Vegetation Plot 2 – *(8/21/2023)*

Vegetation Plot 3 – *(8/21/2023)*

Vegetation Plot 4 – *(8/21/2023)*

Vegetation Plot 5 – *(8/21/2023)*

Vegetation Plot 6 – *(8/21/2023)*

Vegetation Plot 7 – *(8/21/2023)*

Vegetation Plot 8 – *(8/21/2023)*

Vegetation Plot 9 – *(8/21/2023)*

Vegetation Plot 10 – *(8/21/2023)*

Vegetation Plot 11 – *(8/08/2023)*

Vegetation Plot 12 – *(8/08/2023)*

Vegetation Plot 13 – *(8/08/2023)*

Vegetation Plot 14 – *(8/09/2023)*

Vegetation Plot 15 – *(8/21/2023)*

Vegetation Plot 16 – *(8/08/2023)*

Vegetation Plot 17 – *(8/09/2023)*

Vegetation Plot 18 – *(8/08/2023)*

Vegetation Plot 19 – *(8/08/2023)*

Vegetation Plot 20 – *(8/09/2023)*

Vegetation Plot 21 – *(8/09/2023)*

Vegetation Plot 22 – *(8/09/2023)*

Vegetation Plot 23 – *(8/09/2023)*

Vegetation Plot 24 – *(8/21/2023)*

Vegetation Plot 25 – *(8/21/2023)*

Mobile Vegetation Plot Photographs
MY5

	
Mobile Vegetation Plot 1 – *(08/08/2023)*	**Mobile Vegetation Plot 2** – *(08/08/2023)*
	
Mobile Vegetation Plot 3 – *(08/08/2023)*	**Mobile Vegetation Plot 4** – *(08/08/2023)*
	
Mobile Vegetation Plot 5 – *(08/09/2023)*	**Mobile Vegetation Plot 6** – *(08/09/2023)*

	
Mobile Vegetation Plot 7 – *(08/09/2023)*	**Vegetation Plot 8** – *(08/09/2023)*
	
Mobile Vegetation Plot 9 – *(08/09/2023)*	**Mobile Vegetation Plot 10** – *(08/21/2023)*
	
Mobile Vegetation Plot 11 – *(08/21/2023)*	**Mobile Vegetation Plot 12** – *(08/21/2023)*

Mobile Vegetation Plot 13 – *(08/21/2023)*

Mobile Vegetation Plot 14 – *(08/21/2023)*

Mobile Vegetation Plot 15 – *(08/21/2023)*

Areas of Concern Photographs
MY5

	
UT1 Reach 1, STA 107+10 – Structure piping *(07/25/2023)*	**UT1 Reach 3, XS10** – Isolated bed scour at riffle cross-section *(11/06/2023)*
	
UT1 Reach 3, XS10 – Tail of riffle structure stable and holding grade *(11/06/2023)*	**UT3 Reach 1, XS28** – Isolated bed scour at riffle cross-section *(11/06/2023)*
	
UT3 Reach 1, XS28 – Tail of riffle structure stable and holding grade *(11/06/2023)*	**West Side** – Area of low stem height represented by VP16 & VP17 *(09/14/2023)*

	
West Side – Area of low stem height represented by VP21 *(09/14/2023)*	**West Side** – Area of low stem height represented by VP23 & MP6 *(09/14/2023)*

APPENDIX 3. Vegetation Plot Data

Table 8. Vegetation Plot Criteria Attainment

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 5 - 2023

Permanent Vegetation Plot	MY5 Density Criteria Met (Y/N)	Tract Mean	Overall Mean
1	Y	100%	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		
Mobile Vegetation Plot	**MY5 Density 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		

Table 9. CVS Permanent Vegetation Plot Metadata

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 5 - 2023

Database Name	cvs-eep-entrytool-v2.5.0 Lone Hickory MY5.mdb
Database Location	X:\Active Projects\005-02163 Lone Hickory FDP\Monitoring\Monitoring Year 5\Vegetation Assessment
Computer Name	MIMI-PC
File Size	54661120
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	Yadkin River Basin
Length(ft)	12,621
Required Plots (calculated)	25
Sampled Plots	25

Table 10a. Planted and Total Stem Counts
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Current Permanent Vegetation Plot Data (MY5 2023)																	
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															
Alnus serrulata	Tag Alder	Shrub Tree															
Betula nigra	River Birch	Tree	3	3	3				2	2	2	3	3	3	3	3	8
Carpinus caroliana	Ironwood	Tree															
Cornus amomum	Silky Dogwood	Shrub Tree															
Diospyros virginiana	American Persimmon	Tree															
Fraxinus pennsylvanica	Green Ash	Tree													3	3	3
Liquidambar styraciflua	Sweet Gum	Tree															1
Liriodendron tulipifera	Tulip Poplar	Tree	2	2	4	4	4	9			1	1	1	1	1	1	1
Platanus occidentalis	Sycamore	Tree	3	3	3	4	4	22	3	3	3	4	4	14	3	3	4
Populus deltoides	Eastern Cottonwood	Tree															
Quercus lyrata	Overcup Oak	Tree															
Quercus michauxii	Swamp Chestnut Oak	Tree	2	2	2	1	1	1	4	4	4	1	1	1			
Quercus pagoda	Cherrybark Oak	Tree	4	4	4	2	2	2	2	2	2	1	1	1			
Quercus phellos	Willow Oak	Tree				2	2	2	2	2	2	1	1	1	1	1	1
Salix nigra	Black Willow	Tree						1									2
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree			3												
Stem count			14	14	19	13	13	37	13	13	14	11	11	21	11	11	20
size (ares)			1			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247		
Species count			5	5	6	5	5	6	5	5	6	6	6	6	5	5	7
Stems per ACRE			567	567	769	526	526	1497	526	526	567	445	445	850	445	445	809

Current Permanent Vegetation Plot Data (MY5 2023)																	
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						1									
Acer rubrum	Red Maple	Tree												2			
Alnus serrulata	Tag Alder	Shrub Tree															
Betula nigra	River Birch	Tree	3	3	3	3	3	9	3	3	23	2	2	2	2	2	2
Carpinus caroliana	Ironwood	Tree															
Cornus amomum	Silky Dogwood	Shrub Tree															
Diospyros virginiana	American Persimmon	Tree															
Fraxinus pennsylvanica	Green Ash	Tree													2	2	2
Liquidambar styraciflua	Sweet Gum	Tree			5			5			20			3			2
Liriodendron tulipifera	Tulip Poplar	Tree				1	1	1	2	2	7	2	2	2			1
Platanus occidentalis	Sycamore	Tree	3	3	5	5	5	6	2	2	62	5	5	7			7
Populus deltoides	Eastern Cottonwood	Tree			2												
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 nigra	Black Willow	Tree						6									
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
Stem count			9	9	18	11	11	30	14	14	119	12	12	19	12	12	22
size (ares)			1			1			1			1			1		
size (ACRES)			0.0247			0.0247			0.0247			0.0247			0.0247		
Species count			4	4	6	4	4	7	6	6	7	5	5	7	5	5	8
Stems per ACRE			364	364	728	445	445	1214	567	567	4816	486	486	769	486	486	890

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 5 - 2023

Current Permanent Vegetation Plot Data (MY5 2023)																
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									2						2
Acer rubrum	Red Maple	Tree				1	1	2									
Alnus serrulata	Tag Alder	Shrub Tree															
Betula nigra	River Birch	Tree	2	2	2	3	3	3	2	2	2	3	3	3			
Carpinus caroliana	Ironwood	Tree			1												
Cornus amomum	Silky Dogwood	Shrub Tree															
Diospyros virginiana	American Persimmon	Tree	2	2	2												
Fraxinus pennsylvanica	Green Ash	Tree							1	1	1	1	1	1	1	1	1
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree						1									
Platanus occidentalis	Sycamore	Tree	5	5	5	1	1	11	2	2	7	4	4	21	3	3	3
Populus deltoides	Eastern Cottonwood	Tree										3	3	3			
Quercus lyrata	Overcup Oak	Tree				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	1	1	1				1	1	1
Quercus phellos	Willow Oak	Tree							1	1	1						
Salix nigra	Black Willow	Tree	1	1	2										1	1	11
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
		Stem count	10	10	12	8	8	20	9	9	16	13	13	30	8	8	20
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.0247			0.0247			0.0247			0.0247			0.0247	
		Species count	4	4	5	5	5	6	6	6	7	5	5	5	5	5	6
		Stems per ACRE	405	405	486	324	324	809	364	364	647	526	526	1214	324	324	809

Current Permanent Vegetation Plot Data (MY5 2023)																
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						5			3			5
Acer rubrum	Red Maple	Tree												2			
Alnus serrulata	Tag Alder	Shrub Tree															
Betula nigra	River Birch	Tree				1	1	1				3	3	3	3	3	3
Carpinus caroliana	Ironwood	Tree															
Cornus amomum	Silky Dogwood	Shrub Tree	2	2	2												
Diospyros virginiana	American Persimmon	Tree			1	1	1	1									
Fraxinus pennsylvanica	Green Ash	Tree				2	2	2	1	1	1	1	1	1	3	3	3
Liquidambar styraciflua	Sweet Gum	Tree			1						6			3			13
Liriodendron tulipifera	Tulip Poplar	Tree													3	3	3
Platanus occidentalis	Sycamore	Tree	7	7	9	5	5	8	6	6	6	3	3	6	3	3	21
Populus deltoides	Eastern Cottonwood	Tree			1												
Quercus lyrata	Overcup Oak	Tree	2	2	2	3	3	3	5	5	5	2	2	2	1	1	1
Quercus michauxii	Swamp Chestnut Oak	Tree															
Quercus pagoda	Cherrybark Oak	Tree							1	1	1				1	1	1
Quercus phellos	Willow Oak	Tree	1	1	1							2	2	2	1	1	1
Salix nigra	Black Willow	Tree															
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
		Stem count	12	12	19	12	12	15	13	13	24	11	11	22	15	15	51
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.0247			0.0247			0.0247			0.0247			0.0247	
		Species count	4	4	8	5	5	5	4	4	6	5	5	8	7	7	9
		Stems per ACRE	486	486	769	486	486	607	526	526	971	445	445	890	607	607	2064

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 5 - 2023

Current Permanent Vegetation Plot Data (MY5 2023)																	
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									2						60
Acer rubrum	Red Maple	Tree						2	2	2	7			6			
Alnus serrulata	Tag Alder	Shrub Tree															
Betula nigra	River Birch	Tree	1	1	1	2	2	2	2	2	2						
Carpinus caroliana	Ironwood	Tree															
Cornus amomum	Silky Dogwood	Shrub Tree															
Diospyros virginiana	American Persimmon	Tree				1	1	1	2	2	2						
Fraxinus pennsylvanica	Green Ash	Tree				2	2	2	2	2	2	1	1	1			
Liquidambar styraciflua	Sweet Gum	Tree															2
Liriodendron tulipifera	Tulip Poplar	Tree	1	1	1										2	2	5
Platanus occidentalis	Sycamore	Tree	3	3	29	3	3	9			6	3	3	18	1	1	6
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										4	4	4
Quercus phellos	Willow Oak	Tree	3	3	3				2	2	2				1	1	1
Salix nigra	Black Willow	Tree															
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
		Stem count	13	13	39	11	11	19	13	13	26	7	7	28	10	10	80
		size (ares)		1			1			1			1			1	
		size (ACRES)		0.0247			0.0247			0.0247			0.0247			0.0247	
		Species count	6	6	6	6	6	7	7	7	9	3	3	4	5	5	7
		Stems per ACRE	526	526	1578	445	445	769	526	526	1052	283.3	283	1133	405	405	3237

Current Permanent Vegetation Plot Data (MY5 2023) Total Stem Counts & Annual Means																	
Scientific Name	**Common Name**	**Species Type**	**MY5 (2023)**			**MY3 (2021)**			**MY2 (2020)**			**MY1 (2019)**			**MY0 (2019)**		
			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			82			123			27			32			
Acer rubrum	Red Maple	Tree	3	3	21	2	2	4	1	1	3	3	3	4	3	3	3
Alnus serrulata	Tag Alder	Shrub Tree															
Betula nigra	River Birch	Tree	46	46	77	44	44	136	45	45	56	43	43	61	55	55	55
Carpinus caroliana	Ironwood	Tree			1												
Cornus amomum	Silky Dogwood	Shrub Tree	2	2	2												
Diospyros virginiana	American Persimmon	Tree	6	6	7	4	4	4	5	5	5	6	6	6	6	6	6
Fraxinus pennsylvanica	Green Ash	Tree	20	20	20	21	21	21	21	21	21	22	22	23	23	23	23
Liquidambar styraciflua	Sweet Gum	Tree			61			17			13			6			
Liriodendron tulipifera	Tulip Poplar	Tree	19	19	37	20	20	34	21	21	26	32	32	34	58	58	58
Platanus occidentalis	Sycamore	Tree	81	81	298	71	71	254	72	72	218	75	75	188	77	77	77
Populus deltoides	Eastern Cottonwood	Tree	6	6	9	7	7	8	7	7	8	8	8	8	8	8	8
Quercus lyrata	Overcup Oak	Tree	31	31	31	33	33	33	31	31	31	32	32	32	33	33	33
Quercus michauxii	Swamp Chestnut Oak	Tree	15	15	15	14	14	14	16	16	16	18	18	18	23	23	23
Quercus pagoda	Cherrybark Oak	Tree	29	29	29	30	30	30	31	31	31	36	36	36	42	42	42
Quercus phellos	Willow Oak	Tree	25	25	25	24	24	24	25	25	25	39	39	39	46	46	46
Salix nigra	Black Willow	Tree	2	2	22			14			5						
Salix sericea	Silky Willow	Shrub Tree									2			2			
Sambucus canadensis	Common Elderberry	Shrub Tree			3			1									
		Stem count	285	285	740	270	270	717	275	275	487	314	314	489	374	374	374
		size (ares)		25			25			25			25			25	
		size (ACRES)		0.6178			0.6178			0.6178			0.6178			0.6178	
		Species count	13	13	17	11	11	15	11	11	15	11	11	14	11	11	11
		Stems per ACRE	461	461	1198	437	437	1161	445	445	788	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 5 - 2023

Current Mobile Vegetation Plot (MP) Data (MY5 2023)																
Scientific Name	**Common Name**	**Species Type**	**MP1**	**MP2**	**MP3**	**MP4**	**MP5**	**MP6**	**MP7**	**MP8**	**MP9**	**MP10**	**MP11**	**MP12**	**MP13**	**MP14**	**MP15**
			PnoLS	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**
Acer negundo	Box Elder	Tree															
Acer rubrum	Red Maple	Tree		2			2		3								
Alnus serrulata	Tag Alder	Shrub Tree					1										
Betula nigra	River Birch	Tree	2		8	2	4	4	2	1	1	2			1	1	3
Carpinus caroliana	Ironwood	Tree															
Cornus amomum	Silky Dogwood	Shrub Tree															
Diospyros virginiana	American Persimmon	Tree	2										2				
Fraxinus pennsylvanica	Green Ash	Tree							1			1					
Liquidambar styraciflua	Sweet Gum	Tree															
Liriodendron tulipifera	Tulip Poplar	Tree								1			4	2	3	3	2
Platanus occidentalis	Sycamore	Tree	1	10	3	4	5	5	4	9	5	7	10	8	4	4	1
Populus deltoides	Eastern Cottonwood	Tree						1	2			1					
Quercus lyrata	Overcup Oak	Tree					3	2	1	2	2		1	2			
Quercus michauxii	Swamp Chestnut Oak	Tree			4					1			1			2	
Quercus pagoda	Cherrybark Oak	Tree	6	1		4	1				1			2	2	1	4
Quercus phellos	Willow Oak	Tree	1	7					2	1	4	1	2			2	
Salix nigra	Black Willow	Tree						2									
Salix sericea	Silky Willow	Shrub Tree															
Sambucus canadensis	Common Elderberry	Shrub Tree															
		Stem count	12	20	15	10	16	14	15	15	13	12	20	14	10	13	10
		size (ares)	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
		size (ACRES)	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247	0.0247
		Species count	5	4	3	3	6	5	7	6	5	5	6	4	4	6	4
		Stems per ACRE	486	809	607	405	647	567	607	607	526	486	809	567	405	526	405

Current Mobile Vegetation Plot (MP) Data (MY5 2023) Total Stem Counts & Annual Means							
Scientific Name	**Common Name**	**Species Type**	**MY5 (2023)**	**MY3 (2021)**	**MY2 (2020)**	**MY1 (2019)**	**MY0 (2019)**
			PnoLS	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**
Acer negundo	Box Elder	Tree			3		
Acer rubrum	Red Maple	Tree	7	3		16	
Alnus serrulata	Tag Alder	Shrub Tree	1				
Betula nigra	River Birch	Tree	31	23	24	28	27
Carpinus caroliana	Ironwood	Tree					
Cornus amomum	Silky Dogwood	Shrub Tree					
Diospyros virginiana	American Persimmon	Tree	4		3		
Fraxinus pennsylvanica	Green Ash	Tree	2	16	16	8	18
Liquidambar styraciflua	Sweet Gum	Tree					
Liriodendron tulipifera	Tulip Poplar	Tree	15	16	10	12	47
Platanus occidentalis	Sycamore	Tree	80	68	47	60	43
Populus deltoides	Eastern Cottonwood	Tree	4	4	5		
Quercus lyrata	Overcup Oak	Tree	13	34	31	26	7
Quercus michauxii	Swamp Chestnut Oak	Tree	8	2	9		5
Quercus pagoda	Cherrybark Oak	Tree	22	12	41	19	56
Quercus phellos	Willow Oak	Tree	20	17	19	2	13
Salix nigra	Black Willow	Tree	2				
Salix sericea	Silky Willow	Shrub Tree					
Sambucus canadensis	Common Elderberry	Shrub Tree					
		Stem count	209	195	208	171	216
		size (ares)	15	15	15	15	15
		size (ACRES)	0.3707	0.3707	0.3707	0.3707	0.3707
		Species count	13	10	11	8	8
		Stems per ACRE	564	526	561	461	583

Overall (VP & MP) Site Annual Means				
MY5 (2023)	**MY3 (2021)**	**MY2 (2020)**	**MY1 (2019)**	**MY0 (2019)**
PnoLS	**PnoLS**	**PnoLS**	**PnoLS**	**PnoLS**
		3		
10	5	1	19	3
1				
77	67	69	71	82
2				
10	4	8	6	6
22	37	37	30	41
34	36	31	44	105
161	139	119	135	120
10	11	12	8	8
44	67	62	58	40
23	16	25	18	28
51	42	72	55	98
45	41	44	41	59
4				
494	465	483	485	590
40	40	40	40	40
0.9884	0.9884	0.9884	0.9884	0.9884
14	11	12	11	11
500	470	489	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

Table 10e. Planted Stem Average Heights
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Average Stem Height (ft) by Plot					
	MY0	**MY1**	**MY2**	**MY3**	**MY5**
Permanent Plot 1	2.8	3.3	4.4	6.6	13.8
Permanent Plot 2	2.6	2.8	3.1	4.0	6.8
Permanent Plot 3	2.9	2.8	2.8	3.7	7.4
Permanent Plot 4	2.7	2.8	3.2	4.3	7.9
Permanent Plot 5	2.9	2.7	2.7	4.7	9.7
Permanent Plot 6	2.8	2.9	3.0	3.8	7.4
Permanent Plot 7	2.9	2.2	3.2	4.5	9.7
Permanent Plot 8	2.8	2.9	2.9	3.8	7.5
Permanent Plot 9	2.9	2.9	3.1	3.8	6.9
Permanent Plot 10	2.8	2.6	3.1	4.6	8.3
Permanent Plot 11	2.3	1.8	1.3	2.6	5.6
Permanent Plot 12	2.0	1.7	2.1	2.9	6.3
Permanent Plot 13	2.6	2.3	2.6	3.9	7.3
Permanent Plot 14	2.9	2.5	2.8	3.8	7.7
Permanent Plot 15	2.2	2.6	3.0	6.0	11.8
Permanent Plot 16	2.3	2.0	1.9	2.7	3.4
Permanent Plot 17	2.4	1.8	2.1	2.0	2.5
Permanent Plot 18	2.5	1.5	2.6	4.2	8.9
Permanent Plot 19	2.4	2.2	3.4	5.9	11.5
Permanent Plot 20	2.3	2.2	2.9	4.4	9.8
Permanent Plot 21	2.3	2.4	2.6	2.9	4.5
Permanent Plot 22	2.6	2.3	2.7	3.0	4.3
Permanent Plot 23	2.5	2.3	2.3	2.6	4.0
Permanent Plot 24	2.1	2.2	2.6	3.3	4.8
Permanent Plot 25	2.1	1.6	2.9	4.9	11.8
Permanent Plot Site Average	**2.5**	**2.4**	**2.8**	**3.9**	**7.6**
Mobile Plot 1	2.4	2.3	2.5	5.4	13.8
Mobile Plot 2	2.6	2.6	2.9	5.3	5.8
Mobile Plot 3	2.4	2.0	4.4	4.5	12.1
Mobile Plot 4	2.3	2.4	2.6	4.4	6.1
Mobile Plot 5	2.1	2.0	3.7	4.1	6.5
Mobile Plot 6	2.2	1.8	2.9	4.3	4.5
Mobile Plot 7	2.3	2.4	2.0	3.2	6.5
Mobile Plot 8	2.0	2.2	2.1	2.4	15.4
Mobile Plot 9	2.5	2.6	2.8	1.9	5.5
Mobile Plot 10	2.1	2.5	2.7	4.7	6.2
Mobile Plot 11	2.5	2.4	3.4	5.6	6.5
Mobile Plot 12	2.5	2.0	4.2	3.0	7.0
Mobile Plot 13	2.3	2.3	2.1	4.2	12.9
Mobile Plot 14	2.4	2.0	1.8	4.9	7.9
Mobile Plot 15	2.1	3.0	4.1	3.1	6.1
Mobile Plot Site Average	**2.3**	**2.3**	**2.9**	**4.1**	**8.2**
Overall Site Average	**2.5**	**2.3**	**2.8**	**4.0**	**7.8**

Meeting MY5 Height Criteria (Greater to or equal to 7 ft)
Not meeting MY5 Height Criteria by less than 2 ft
Not meeting MY5 Height Criteria by more than 2 ft

APPENDIX 4. Morphological Summary Data and Plots

Table 11a. Baseline Stream Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

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 5 - 2023

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 5 - 2023

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 5 - 2023

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 5 - 2023

East Side (UT1 Reach 1 and UT1 Reach 2A)

	UT1 Reach 1 Cross-Section 1, Pool								UT1 Reach 1 Cross-Section 2, Riffle								UT1 Reach 2A Cross-Section 3, 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**
bankfull elevation	918.84	918.82	918.82	918.93		918.96			918.21	918.31	918.31	918.41		918.31			870.19	870.39	870.37	870.52		870.58		
low bank height elevation	918.84	918.82	918.82	918.93		918.96			918.21	918.21	918.25	918.36		918.28			870.19	870.39	870.37	870.52		870.58		
Bankfull Width (ft)	8.2	8.5	8.3	8.2		9.3			6.9	7.0	6.9	7.1		7.9			9.2	9.9	9.4	11.1		11.2		
Floodprone Width (ft)	---	---	---	---		---			29	27	28	30		29			---	---	---	---		---		
Bankfull Mean Depth (ft)	1.0	0.9	1.0	1.0		0.9			0.6	0.5	0.5	0.5		0.5			1.2	1.2	1.2	1.4		1.2		
Bankfull Max Depth (ft)	1.8	1.6	1.6	1.7	N/A	1.8			1.0	0.9	0.9	1.0	N/A	1.0			2.1	2.5	2.4	2.6	N/A	2.4		
Bankfull Cross-Sectional Area (ft^2)	8.5	7.3	8.0	8.4		8.7			4.2	3.5	3.8	3.9		4.0			11.4	12.1	11.6	15.1		13.1		
Bankfull Width/Depth Ratio	7.8	9.9	8.6	8.0		10.0			11.5	13.9	12.6	13.0		15.6			7.4	8.0	7.5	8.1		9.5		
Bankfull Entrenchment Ratio	---	---	---	---		---			4.2	3.8	4.1	4.2		3.6			---	---	---	---		---		
Bankfull Bank Height Ratio	---	---	---	---		---			1.0	0.9	0.9	1.0		1.0			---	---	---	---		---		

	UT1 Reach 2A Cross-Section 4, Riffle								UT1 Reach 2A Cross-Section 5, Riffle								UT1 Reach 2A Cross-Section 6, 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**
bankfull elevation	868.46	868.60	868.61	868.71		868.77			844.23	844.17	844.12	844.12		844.07			843.72	843.72	843.74	843.75		843.84		
low bank height elevation	868.46	868.68	868.61	868.73		868.76			844.23	844.26	844.24	844.29		844.24			843.72	843.72	843.74	843.75		843.84		
Bankfull Width (ft)	7.3	9.2	7.5	7.3		7.4			7.3	8.1	7.9	8.0		6.3			9.1	9.5	9.4	9.6		10.2		
Floodprone Width (ft)	46	46	49	51		51			65+	65+	65+	65+		65+			---	---	---	---		---		
Bankfull Mean Depth (ft)	0.6	0.6	0.6	0.6		0.6			0.6	0.7	0.7	0.7		0.9			1.2	1.4	1.5	1.7		1.7		
Bankfull Max Depth (ft)	0.9	1.1	1.1	1.3	N/A	1.3			1.0	1.2	1.4	1.4	N/A	1.6			1.9	2.5	2.2	2.6	N/A	3.0		
Bankfull Cross-Sectional Area (ft^2)	4.5	5.1	4.5	4.6		4.4			4.6	5.3	5.6	5.8		5.6			10.5	13.6	13.9	15.9		17.3		
Bankfull Width/Depth Ratio	11.8	16.4	12.5	11.5		12.5			11.5	12.4	11.3	11.1		7.0			7.9	6.6	6.3	5.8		6.0		
Bankfull Entrenchment Ratio	6.3	5.0	6.5	7.0		6.8			9.0+	8.1+	8.2+	8.1+		10.4+			---	---	---	---		---		
Bankfull Bank Height Ratio	1.0	1.1	1.0	1.0		1.0			1.0	1.1	1.1	1.1		1.1			---	---	---	---		---		

[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 5 - 2023

East Side (UT1 Reach 2B and UT1 Reach 3)

	UT1 Reach 2B Cross-Section 7, Riffle								UT1 Reach 2B Cross-Section 8, Pool								UT1 Reach 2B Cross-Section 9, 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**
bankfull elevation	817.28	817.17	817.07	817.18		817.20			809.31	809.23	809.38	809.42		809.48			804.58	804.61	804.66	804.72		804.70		
low bank height elevation	817.28	817.14	817.13	817.27		817.22			809.31	809.23	809.38	809.42		809.48			804.58	804.64	804.71	804.66		804.67		
Bankfull Width (ft)	10.3	10.1	10.1	11.1		10.8			12.6	13.0	13.6	12.4		13.8			10.5	11.5	11.2	10.8		11.6		
Floodprone Width (ft)	68+	68+	68+	68+		68+			---	---	---	---		---			49+	49+	49+	49+		49+		
Bankfull Mean Depth (ft)	0.8	0.7	0.8	0.8		0.8			1.2	1.0	1.1	1.3		1.2			0.8	0.8	0.8	0.7		0.7		
Bankfull Max Depth (ft)	1.2	1.3	1.4	1.5	N/A	1.7			2.6	2.1	2.3	2.8	N/A	2.8			1.3	1.4	1.4	1.4	N/A	1.5		
Bankfull Cross-Sectional Area (ft^2)	7.9	7.5	8.5	8.8		8.1			15.4	12.8	14.4	16.0		16.1			8.5	8.9	9.0	7.8		8.1		
Bankfull Width/Depth Ratio	13.3	13.7	12.0	13.9		14.3			10.3	13.2	12.9	9.6		11.9			12.9	15.0	13.9	14.9		16.7		
Bankfull Entrenchment Ratio	6.6+	6.7+	6.7+	6.1+		6.3+			---	---	---	---		---			4.7+	4.3+	4.4+	4.6+		4.2+		
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.1		1.0			---	---	---	---		---			1.0	1.0	1.0	1.0		1.0		

	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**
bankfull elevation	794.10	793.96	793.89	793.59		793.27			791.15	791.14	791.33	791.49		791.38			787.94	787.82	787.89	787.73		787.77		
low bank height elevation	794.10	793.96	794.04	794.11		794.03			791.15	791.06	791.10	791.29		791.32			787.94	787.82	787.89	787.73		787.77		
Bankfull Width (ft)	11.3	10.8	10.7	11.2		10.7			12.5	11.6	10.5	11.2		12.2			16.7	16.2	15.0	12.2		12.2		
Floodprone Width (ft)	60+	60+	60+	60+		60+			68+	68+	68+	68+		68+			---	---	---	---		---		
Bankfull Mean Depth (ft)	0.7	0.8	0.9	1.2		1.4			0.7	0.7	0.6	0.6		0.7			1.1	1.1	1.0	1.0		0.9		
Bankfull Max Depth (ft)	1.1	1.3	1.7	2.5	N/A	2.7			1.1	1.1	1.1	1.2	N/A	1.6			2.4	2.4	2.2	2.0	N/A	2.2		
Bankfull Cross-Sectional Area (ft^2)	8.3	8.3	9.8	13.1		14.7			8.7	7.7	6.2	6.5		7.9			18.7	17.8	15.5	12.5		11.6		
Bankfull Width/Depth Ratio	15.5	14.1	11.6	9.6		7.8			18.0	17.4	17.9	19.3		18.6			14.8	14.7	14.5	11.9		12.9		
Bankfull Entrenchment Ratio	5.3+	5.5+	5.6+	5.3+		5.6+			5.4+	5.8+	6.4+	6.0+		5.5+			---	---	---	---		---		
Bankfull Bank Height Ratio	1.0	1.0	1.1	1.3		1.4			1.0	0.9	0.8	0.9		1.0			---	---	---	---		---		

	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	783.92	783.56		783.58		
low bank height elevation	783.88	783.76	783.92	783.56		783.58		
Bankfull Width (ft)	15.6	16.3	16.6	9.7		9.3		
Floodprone Width (ft)	---	---	---	---		---		
Bankfull Mean Depth (ft)	1.4	1.4	1.3	1.7		1.4		
Bankfull Max Depth (ft)	2.6	3.0	3.0	2.8	N/A	3.1		
Bankfull Cross-Sectional Area (ft^2)	22.4	22.4	20.9	16.7		12.9		
Bankfull Width/Depth Ratio	10.9	11.9	13.2	5.6		6.7		
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 5 - 2023

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							
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**
bankfull elevation	772.71	772.82	772.87	773.14		773.06			772.61	772.56	772.67	772.44		772.60			759.49	759.41	759.60	759.59		759.78		
low bank height elevation	772.71	772.82	772.87	773.14		773.06			772.61	772.56	772.67	772.81		772.81			759.49	759.31	759.54	759.39		759.57		
Bankfull Width (ft)	9.3	10.4	9.3	9.4		8.8			8.3	8.3	8.5	8.3		8.0			11.8	12.2	12.5	11.6		11.0		
Floodprone Width (ft)	---	---	---	---		---			69+	69+	69+	69+		69+			65+	65+	65+	65+		65+		
Bankfull Mean Depth (ft)	0.8	0.9	0.9	1.1		1.1			0.7	0.7	0.7	1.1		1.0			0.9	0.7	0.7	0.7		0.7		
Bankfull Max Depth (ft)	1.5	1.8	1.6	2.0	N/A	2.1			1.2	1.3	1.5	2.1	N/A	2.0			1.3	1.3	1.3	1.4	N/A	1.4		
Bankfull Cross-Sectional Area (ft^2)	7.6	8.9	8.3	10.2		9.3			6.1	6.1	6.1	8.8		7.6			10.2	9.0	9.3	7.8		7.9		
Bankfull Width/Depth Ratio	11.4	12.0	10.3	8.7		8.2			11.3	11.5	11.7	7.8		8.5			13.6	16.4	16.6	17.0		15.3		
Bankfull Entrenchment Ratio	---	---	---	---		---			8.3+	8.2+	8.1+	8.3+		8.6+			5.5+	5.3+	5.2+	5.6+		5.9+		
Bankfull Bank Height Ratio	---	---	---	---		---			1.0	1.0	1.0	1.2		1.1			1.0	0.9	0.9	0.9		0.9		

	UT2 Reach 2 Cross-Section 17, Riffle								UT2 Reach 2 Cross-Section 18, Pool								UT2A Cross-Section 19, 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**
bankfull elevation	758.87	758.79	758.82	758.97		759.02			758.62	758.70	758.76	758.85		758.81			763.99	763.92	764.15	764.30		764.30		
low bank height elevation	758.87	758.82	758.93	758.95		759.03			758.62	758.70	758.76	758.85		758.81			763.99	763.94	764.15	764.28		764.18		
Bankfull Width (ft)	11.9	13.2	13.0	12.7		12.2			15.2	16.3	15.2	15.2		14.0			5.4	5.5	5.3	6.1		5.7		
Floodprone Width (ft)	72+	72+	72+	72+		72+			---	---	---	---		---			57+	57+	57+	57+		57+		
Bankfull Mean Depth (ft)	0.8	0.7	0.8	0.7		0.8			1.4	1.5	1.5	1.5		1.5			0.4	0.4	0.4	0.3		0.2		
Bankfull Max Depth (ft)	1.2	1.4	1.4	1.3	N/A	1.5			2.5	2.6	2.6	2.6	N/A	2.6			0.5	0.6	0.6	0.7	N/A	0.5		
Bankfull Cross-Sectional Area (ft^2)	9.1	9.5	10.5	8.9		9.3			21.8	24.0	22.8	23.4		21.4			1.9	2.0	1.9	1.7		1.1		
Bankfull Width/Depth Ratio	15.6	18.2	16.1	18.0		16.1			10.6	11.1	10.1	9.9		9.2			15.2	15.0	15.3	21.4		29.5		
Bankfull Entrenchment Ratio	6.1+	5.5+	5.5+	5.7+		5.9+			---	---	---	---		---			10.5+	10.4+	10.6+	9.4+		9.9+		
Bankfull Bank Height Ratio	1.0	1.0	1.1	1.0		1.0			---	---	---	---		---			1.0	1.0	1.0	1.0		0.8		

	UT2A Cross-Section 20, Pool								UT2A Cross-Section 21, Riffle								UT2A Cross-Section 22, 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**
bankfull elevation	761.60	761.65	761.73	761.72		761.70			760.53	760.61	760.72	760.76		760.68			760.53	760.60	760.59	760.64		760.60		
low bank height elevation	761.60	761.65	761.73	761.72		761.70			760.53	760.52	760.61	760.71		760.64			760.53	760.60	760.59	760.64		760.60		
Bankfull Width (ft)	6.9	6.6	6.8	7.3		7.9			5.7	5.8	5.0	6.0		5.9			7.2	9.3	7.4	7.8		7.8		
Floodprone Width (ft)	---	---	---	---		---			51+	51+	51+	51+		51+			---	---	---	---		---		
Bankfull Mean Depth (ft)	0.6	0.6	0.5	0.5		0.5			0.4	0.3	0.4	0.3		0.4			0.6	0.5	0.5	0.4		0.5		
Bankfull Max Depth (ft)	1.2	1.2	1.1	1.1	N/A	1.0			0.7	0.6	0.6	0.5	N/A	0.6			1.1	1.1	0.9	0.8	N/A	0.8		
Bankfull Cross-Sectional Area (ft^2)	4.1	3.7	3.5	3.8		4.0			2.4	2.0	1.8	2.1		2.2			4.3	4.8	3.7	3.4		3.7		
Bankfull Width/Depth Ratio	11.6	11.7	12.9	14.0		15.7			13.6	17.2	13.7	17.1		15.8			12.1	18.1	14.9	17.8		16.2		
Bankfull Entrenchment Ratio	---	---	---	---		---			9.0+	8.8+	10.1+	8.6+		8.7+			---	---	---	---		---		
Bankfull Bank Height Ratio	---	---	---	---		---			1.0	0.8	0.8	0.9		0.9			---	---	---	---		---		

[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 12d. Morphology and Hydraulic Summary (Dimensional Parameters - Cross-Section)
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

West Side (UT2B & UT3)

	UT2B Cross-Section 23, Pool								UT2B Cross-Section 24, Riffle								UT2B Cross-Section 25, 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**
bankfull elevation	761.34	761.26	761.44	761.45		761.40			761.16	761.15	761.36	761.21		761.30			760.67	760.65	760.77	760.67		760.74		
low bank height elevation	761.34	761.26	761.44	761.45		761.40			761.16	761.07	761.27	761.12		761.24			760.67	760.61	760.79	760.70		760.78		
Bankfull Width (ft)	9.9	10.1	9.8	10.2		9.9			9.6	7.9	8.3	8.1		8.5			7.2	6.9	7.4	7.3		7.4		
Floodprone Width (ft)	---	---	---	---		---			66+	66+	66+	66+		66+			56+	56+	56+	56+		56+		
Bankfull Mean Depth (ft)	0.9	0.8	0.8	0.8	N/A	0.7			0.5	0.5	0.4	0.4	N/A	0.4			0.5	0.5	0.5	0.6	N/A	0.6		
Bankfull Max Depth (ft)	1.6	1.6	1.7	1.5		1.4			0.8	0.7	0.8	0.7		0.8			0.8	0.8	0.8	0.9		1.0		
Bankfull Cross-Sectional Area (ft^2)	8.8	8.4	8.2	7.8		6.8			4.3	3.6	3.6	3.5		3.6			3.9	3.7	4.0	4.1		4.2		
Bankfull Width/Depth Ratio	11.2	12.1	11.6	13.5		14.6			21.1	17.4	19.1	18.8		20.2			13.4	12.9	13.9	13.2		13.2		
Bankfull Entrenchment Ratio	---	---	---	---		---			6.9+	8.3+	8.0+	8.1+		7.7+			7.8+	8.2+	7.6+	7.7+		7.6+		
Bankfull Bank Height Ratio	---	---	---	---		---			1.0	0.9	0.9	0.9		0.9			1.0	1.0	1.0	1.0		0.8		

	UT2B Cross-Section 26, Pool								UT3 Reach 1 Cross-Section 27, Pool								UT3 Reach 1 Cross-Section 28, 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**
bankfull elevation	760.71	760.69	760.88	760.70		760.93			766.07	766.11	766.25	766.37		766.39			765.76	765.83	765.89	765.51		765.22		
low bank height elevation	760.71	760.69	760.88	760.70		760.93			766.07	766.11	766.25	766.37		766.39			765.76	765.79	765.85	765.96		765.95		
Bankfull Width (ft)	12.2	12.0	12.2	12.2		12.4			16.0	16.7	15.8	15.6		16.7			13.7	13.3	13.2	12.5		11.5		
Floodprone Width (ft)	---	---	---	---		---			---	---	---	---		---			73+	73+	73+	73+		73+		
Bankfull Mean Depth (ft)	1.3	1.2	1.2	1.1	N/A	1.2			1.4	1.4	1.4	1.4	N/A	1.3			0.9	0.9	0.9	1.4	N/A	1.8		
Bankfull Max Depth (ft)	2.6	2.2	2.3	2.1		2.2			2.6	2.7	2.7	2.8		3.0			1.5	1.5	1.6	2.9		3.1		
Bankfull Cross-Sectional Area (ft^2)	15.8	14.0	14.4	13.0		14.4			21.7	23.0	22.3	21.8		22.5			12.8	12.3	12.2	17.7		20.2		
Bankfull Width/Depth Ratio	9.4	10.3	10.4	11.4		10.6			11.9	12.1	11.2	11.1		12.5			14.7	14.3	14.4	8.8		6.5		
Bankfull Entrenchment Ratio	---	---	---	---		---			---	---	---	---		---			5.3+	5.5+	5.5+	5.9+		6.4+		
Bankfull Bank Height Ratio	---	---	---	---		---			---	---	---	---		---			1.0	1.0	1.0	1.2		1.3		

	UT3 Reach 2 Cross-Section 29, Riffle								UT3 Reach 2 Cross-Section 30, Pool								UT3 Reach 3 Cross-Section 31, 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**
bankfull elevation	759.75	759.83	759.98	760.29		760.35			759.40	759.49	759.48	759.66		759.67			758.39	758.19	758.41	758.49		758.61		
low bank height elevation	759.75	759.84	759.79	759.82		759.94			759.40	759.49	759.48	759.66		759.67			758.39	758.19	758.43	758.45		758.51		
Bankfull Width (ft)	16.7	17.0	16.9	15.3		16.3			18.7	19.0	18.8	19.9		18.6			19.2	19.1	19.5	19.4		19.2		
Floodprone Width (ft)	76+	76+	76+	76+		76+			---	---	---	---		---			71+	71+	71+	71+		71+		
Bankfull Mean Depth (ft)	1.0	1.0	0.8	0.6	N/A	0.6			1.4	1.4	1.0	0.8	N/A	0.6			1.0	0.9	1.0	1.0	N/A	0.9		
Bankfull Max Depth (ft)	1.9	1.8	1.6	1.4		1.4			2.6	2.9	1.7	1.7		1.4			1.9	1.9	2.1	2.1		2.1		
Bankfull Cross-Sectional Area (ft^2)	16.5	16.7	13.4	9.0		9.6			26.3	26.6	18.1	15.9		11.7			19.5	17.8	19.9	18.8		17.5		
Bankfull Width/Depth Ratio	17.0	17.2	21.5	26.0		27.5			13.3	13.6	19.5	25.0		29.6			19.0	20.5	19.1	20.1		21.1		
Bankfull Entrenchment Ratio	4.5+	4.5+	4.5+	4.9+		4.6+			---	---	---	---		---			3.7+	3.7+	3.6+	3.6+		3.7+		
Bankfull Bank Height Ratio	1.0	1.0	0.9	0.7		0.8			---	---	---	---		---			1.0	1.0	1.0	1.0		1.0		

	UT3 Reach 3 Cross-Section 32, Pool							
Dimension and Substrate[1]	**MY0**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**MY6**	**MY7**
bankfull elevation	758.36	758.21	758.35	758.41		758.33		
low bank height elevation	758.36	758.21	758.35	758.41		758.33		
Bankfull Width (ft)	25.8	26.9	27.2	27.3		26.1		
Floodprone Width (ft)	---	---	---	---		---		
Bankfull Mean Depth (ft)	1.8	1.7	1.7	1.7	N/A	1.7		
Bankfull Max Depth (ft)	3.8	3.7	3.8	3.9		3.7		
Bankfull Cross-Sectional Area (ft^2)	45.8	46.1	45.8	47.2		43.9		
Bankfull Width/Depth Ratio	14.5	15.8	16.1	15.8		15.5		
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 13a. Monitoring Data - Stream Reach Data Summary
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

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		6.9		7.1				7.9					
Floodprone Width (ft)	29		27		28		30				29					
Bankfull Mean Depth (ft)	0.6		0.5		0.5		0.5				0.5					
Bankfull Max Depth (ft)	1.0		0.9		0.9		1.0		N/A		1.0					
Bankfull Cross-sectional Area (ft^2)	4.2		3.5		3.8		3.9				4.0					
Width/Depth Ratio	11.5		13.9		12.6		13.0				15.6					
Entrenchment Ratio	4.2		3.8		4.1		4.2				3.6					
Bank Height Ratio	1.0		0.9		0.9		1.0				1.0					
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		0.8/28.1/48.4/107/ 140.8/180		5.3/11.9/18.5/130.1/ 170.4/256									
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 5 - 2023

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	7.5	7.9	7.3	8.0			6.3	7.4				
Floodprone Width (ft)	46	65+	46	65+	49	65+	51	65+			51	65+				
Bankfull Mean Depth (ft)	0.6		0.6	0.7	0.6	0.7	0.6	0.7			0.6	0.9				
Bankfull Max Depth (ft)	0.9	1.0	1.1	1.2	1.1	1.4	1.3	1.4			1.3	1.6				
Bankfull Cross-sectional Area (ft^2)	4.5	4.6	5.1	5.3	4.5	5.6	4.6	5.8	N/A		4.4	5.6				
Width/Depth Ratio	11.5	11.8	12.4	16.4	11.3	12.5	11.1	11.5			7.0	12.5				
Entrenchment Ratio	6.3	9.0+	5.0	8.1+	6.5	8.2+	7.0	8.1+			6.8	10.4+				
Bank Height Ratio	1.0		1.1		1.0	1.1	1.0	1.1			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		7.1/16.7/20.7/55.0/ 85.0/362		0.8/4.6/10.4/70.7/ 175.5/362									
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 5 - 2023

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	10.1	11.2	10.8	11.1			10.8	11.6				
Floodprone Width (ft)	49+	68+	49+	68+	49+	68+	49+	68+			49+	68+				
Bankfull Mean Depth (ft)	0.8		0.7	0.8	0.8		0.7	0.8			0.7	0.8				
Bankfull Max Depth (ft)	1.2	1.3	1.3	1.4	1.4		1.4	1.5	N/A		1.5	1.7				
Bankfull Cross-sectional Area (ft^2)	7.9	8.5	7.5	8.9	8.5	9.0	7.8	8.8			8.1					
Width/Depth Ratio	12.9	13.3	13.7	15.0	12.0	13.9	13.9	14.9			14.3	16.7				
Entrenchment Ratio	4.7+	6.6+	4.3+	6.7+	4.4+	6.7+	4.6+	6.1+			4.2+	6.3+				
Bank Height Ratio	1.0		1.0		1.0		1.0	1.1			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		8.0/14.6/19.8/49.1/ 75.9/180		0.4/13.1/28.6/106.3/ 192.5/362									
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 5 - 2023

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	10.5	10.7	11.2		N/A		10.7	12.2				
Floodprone Width (ft)	60+	68+	60+	68+	60+	68+	60+	68+			60+	68+				
Bankfull Mean Depth (ft)	0.7		0.7	0.8	0.6	0.9	0.6	1.2			0.7	1.4				
Bankfull Max Depth (ft)	1.1		1.1	1.3	1.1	1.7	1.2	2.5			1.6	2.7				
Bankfull Cross-sectional Area (ft^2)	8.3	8.7	7.7	8.3	6.2	9.8	6.5	13.1			7.9	14.7				
Width/Depth Ratio	15.5	18.0	14.1	17.4	11.6	17.9	9.6	19.3			7.8	18.6				
Entrenchment Ratio	5.3+	5.4+	5.5+	5.8+	5.6+	6.4+	5.3+	6.0+			5.5+	5.6+				
Bank Height Ratio	1.0		0.9	1.0	0.8	1.1	0.9	1.3			1.0	1.4				
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		13.3/26.4/39.1/90/ 128/256		1.0/10.7/16.6/60/ 90/256									
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 5 - 2023

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		8.5		8.3				8.0					
Floodprone Width (ft)	69+		69+		69+		69+				69+					
Bankfull Mean Depth (ft)	0.7		0.7		0.7		1.1				1.0					
Bankfull Max Depth (ft)	1.2		1.3		1.5		2.1		N/A		2.0					
Bankfull Cross-sectional Area (ft^2)	6.1		6.1		6.1		8.8				7.6					
Width/Depth Ratio	11.3		11.5		11.7		7.8				8.5					
Entrenchment Ratio	8.3+		8.2+		8.1+		8.3+				8.6+					
Bank Height Ratio	1.0		1.0		1.0		1.2				1.1					
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		0.2/0.3/1.0/64.0/ 146.7/256		0.5/4.2/7.5/60.9/ 107.3/2048									
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 5 - 2023

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	12.5	13.0	11.6	12.7			11.0	12.2				
Floodprone Width (ft)	65+	72+	65+	72+	65+	72+	65+	72+			65+	72+				
Bankfull Mean Depth (ft)	0.8	0.9	0.7		0.7	0.8	0.7				0.7	0.8				
Bankfull Max Depth (ft)	1.2	1.3	1.3	1.4	1.3	1.4	1.3	1.4	N/A		1.4	1.5				
Bankfull Cross-sectional Area (ft^2)	9.1	10.2	9.0	9.5	9.3	10.5	7.8	8.9			7.9	9.3				
Width/Depth Ratio	13.6	15.6	16.4	18.2	16.1	16.6	17.0	18.0			15.3	16.1				
Entrenchment Ratio	5.5+	6.1+	5.3+	5.5+	5.2+	5.5+	5.6+	5.7+			5.9+	5.9+				
Bank Height Ratio	1.0		0.9	1.0	0.9	1.1	0.9	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		SC/0.2/0.6/44.7/ 125.8/512		0.4/4.0/10.6/101.2/ 148.1/256									
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 5 - 2023

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	5.0	5.3	6.0	6.1			5.7	5.9				
Floodprone Width (ft)	51+	57+	51+	57+	51+	57+	51+	57+			51+	57+				
Bankfull Mean Depth (ft)	0.4	0.4	0.3	0.4	0.4		0.3				0.2	0.4				
Bankfull Max Depth (ft)	0.5	0.7	0.6		0.6		0.5	0.7	N/A		0.5	0.6				
Bankfull Cross-sectional Area (ft^2)	1.9	2.4	2.0		1.8	1.9	1.7	2.1			1.1	2.2				
Width/Depth Ratio	13.6	15.2	15.0	17.2	13.7	15.3	17.1	21.4			15.8	29.5				
Entrenchment Ratio	9.0+	10.5+	8.8+	10.4+	10.1+	10.6+	8.6+	9.4+			8.7+	9.9+				
Bank Height Ratio	1.0		0.8	1.0	0.8	1.0	0.9	1.0			0.8	0.9				
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		SC/SC/SC/35.4/ 64/180		SC/SC/SC/61.2/ 90/256									
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 5 - 2023

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	7.4	8.3	7.3	8.1			7.4	8.5				
Floodprone Width (ft)	56+	66+	56+	66+	56+	66+	56+	66+			56+	66+				
Bankfull Mean Depth (ft)	0.5	0.5	0.5		0.4	0.5	0.4	0.6			0.4	0.6				
Bankfull Max Depth (ft)	0.8	0.8	0.7	0.8	0.8		0.7	0.9	N/A		0.8	1.0				
Bankfull Cross-sectional Area (ft^2)	3.9	4.3	3.6	3.7	3.6	4.0	3.5	4.1			3.6	4.2				
Width/Depth Ratio	13.4	21.1	12.9	17.4	13.9	19.1	13.2	18.8			13.2	20.2				
Entrenchment Ratio	6.9+	7.8+	8.2+	8.3+	7.6+	8.0+	7.7+	8.1+			7.6+	7.7+				
Bank Height Ratio	1.0		0.9	1.0	0.9	1.0	0.9	1.0			0.8	0.9				
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		SC/8.0/21.8/51.8/ 73.4/128		0.1/13.3/31/102.3/ 160.7/362									
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)	0.05															
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 5 - 2023

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		13.2		12.5		N/A		11.5					
Floodprone Width (ft)	73+		73+		73+		73+				73+					
Bankfull Mean Depth (ft)	0.9		0.9		0.9		1.4				1.8					
Bankfull Max Depth (ft)	1.5		1.5		1.6		2.9				3.1					
Bankfull Cross-sectional Area (ft^2)	12.8		12.3		12.2		17.7				20.2					
Width/Depth Ratio	14.7		14.3		14.4		8.8				6.5					
Entrenchment Ratio	5.3+		5.5+		5.5+		5.9+				6.4+					
Bank Height Ratio	1.0		1.0		1.0		1.2				1.3					
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		0.5/13.3/21.1/80.3/ 168.1/362		0.5/1.2/6.9/37/ 90/2048									
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 5 - 2023

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		16.9		15.3				16.3					
Floodprone Width (ft)	76+		76+		76+		76+				76+					
Bankfull Mean Depth (ft)	1.0		1.0		0.8		0.6				0.6					
Bankfull Max Depth (ft)	1.9		1.8		1.6		1.4				1.4					
Bankfull Cross-sectional Area (ft^2)	16.5		16.7		13.4		9.0		N/A		9.6					
Width/Depth Ratio	17.0		17.2		21.5		26.0				27.5					
Entrenchment Ratio	4.5+		4.5+		4.5+		4.9+				4.6+					
Bank Height Ratio[1]	1.0		1.0		0.9		0.7				0.8					
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		SC/0.41/6.7/20.1/ 56.9/128		0.3/1.3/4.5/20/ 63.4/256									
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)	0.63															
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 5 - 2023

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		19.5		19.4				19.2					
Floodprone Width (ft)	71+		71+		71+		71+				71+					
Bankfull Mean Depth (ft)	1.0		0.9		1.0		1.0				0.9					
Bankfull Max Depth (ft)	1.9		1.9		2.1		2.1				2.1					
Bankfull Cross-sectional Area (ft^2)	19.5		17.8		19.9		18.8		N/A		17.5					
Width/Depth Ratio	19.0		20.5		19.1		20.1				21.1					
Entrenchment Ratio	3.7+		3.7+		3.6+		3.6+				3.7+					
Bank Height Ratio[1]	1.0		1.0		1.0		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		SC/SC/0.2/61.2/ 90/362		0.1/2.5/9.3/27.6/ 101.2/256									
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)	0.88															
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

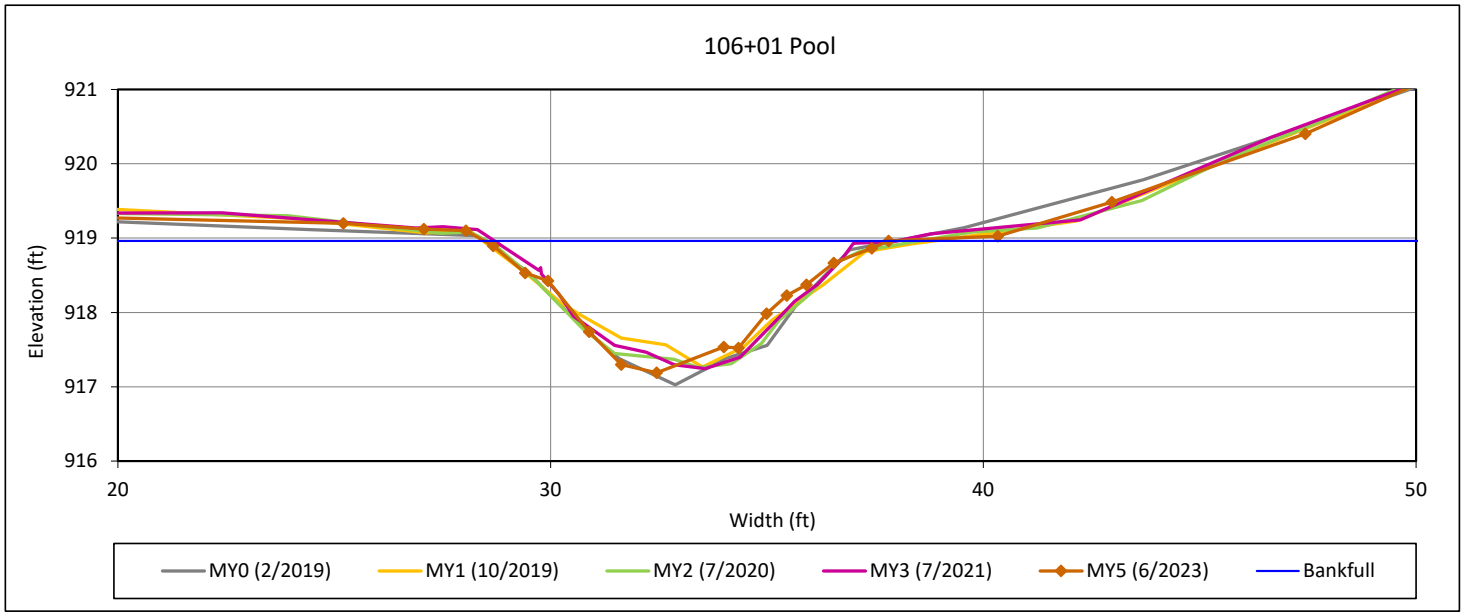
(---): Data was not provided

N/A: Not Applicable

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 1 - UT1 Reach 1



Bankfull Dimensions	
8.7	x-section area (ft.sq.)
9.3	width (ft)
0.9	mean depth (ft)
1.8	max depth (ft)
10.2	wetted perimeter (ft)
0.9	hydraulic radius (ft)
10.0	width-depth ratio

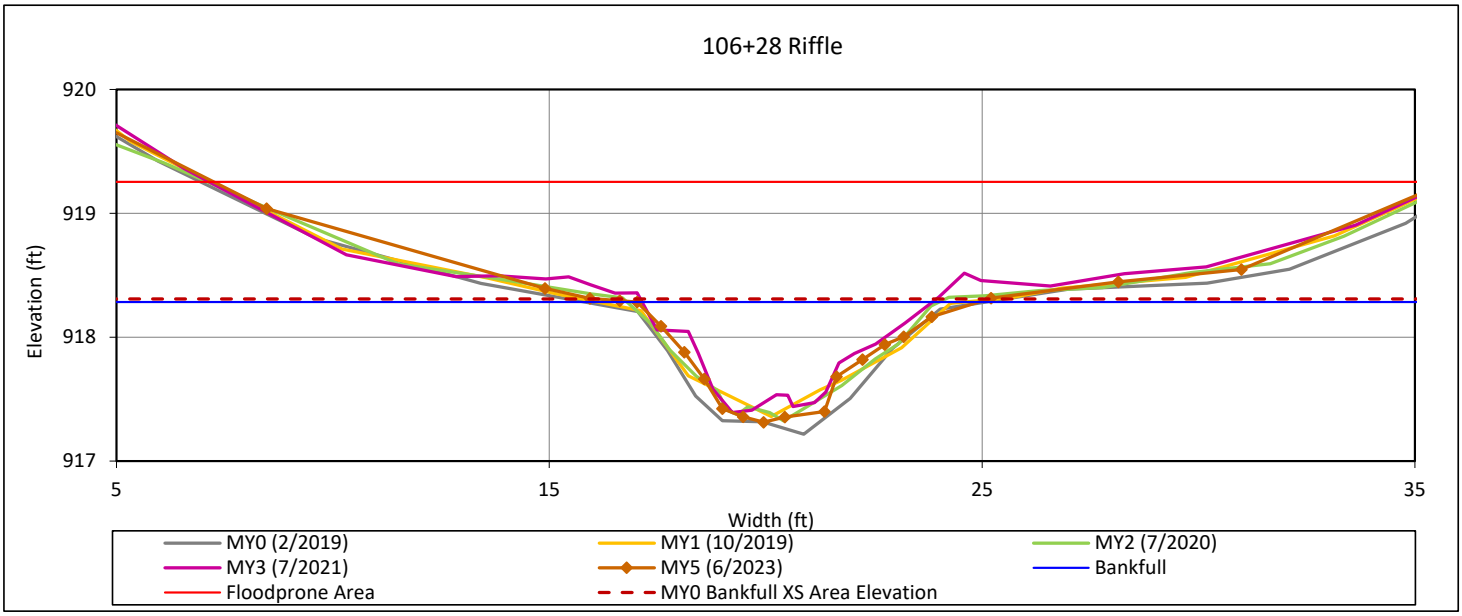
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 2 - UT1 Reach 1



Bankfull Dimensions	
4.0	x-section area (ft.sq.)
7.9	width (ft)
0.5	mean depth (ft)
1.0	max depth (ft)
8.3	wetted perimeter (ft)
0.5	hydraulic radius (ft)
15.6	width-depth ratio
28.5	W flood prone area (ft)
3.6	entrenchment ratio
1.0	low bank height ratio

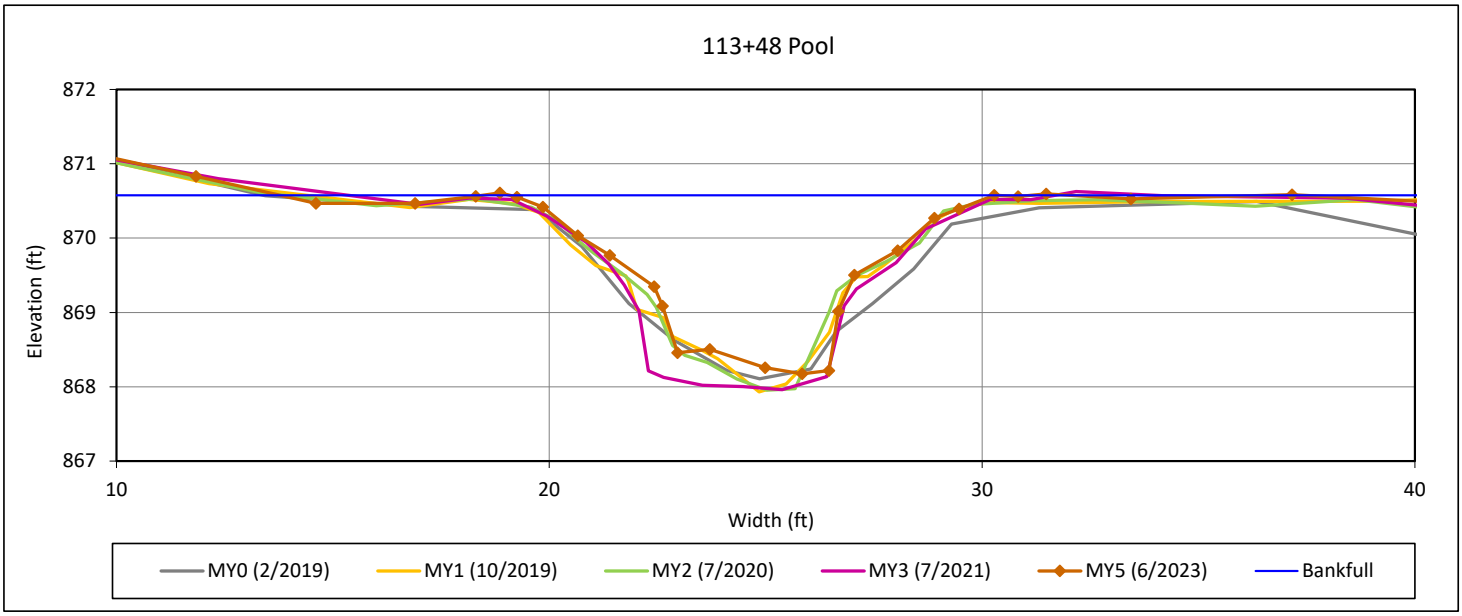
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 3 - UT1 Reach 2A



Bankfull Dimensions	
13.1	x-section area (ft.sq.)
11.2	width (ft)
1.2	mean depth (ft)
2.4	max depth (ft)
13.0	wetted perimeter (ft)
1.0	hydraulic radius (ft)
9.5	width-depth ratio

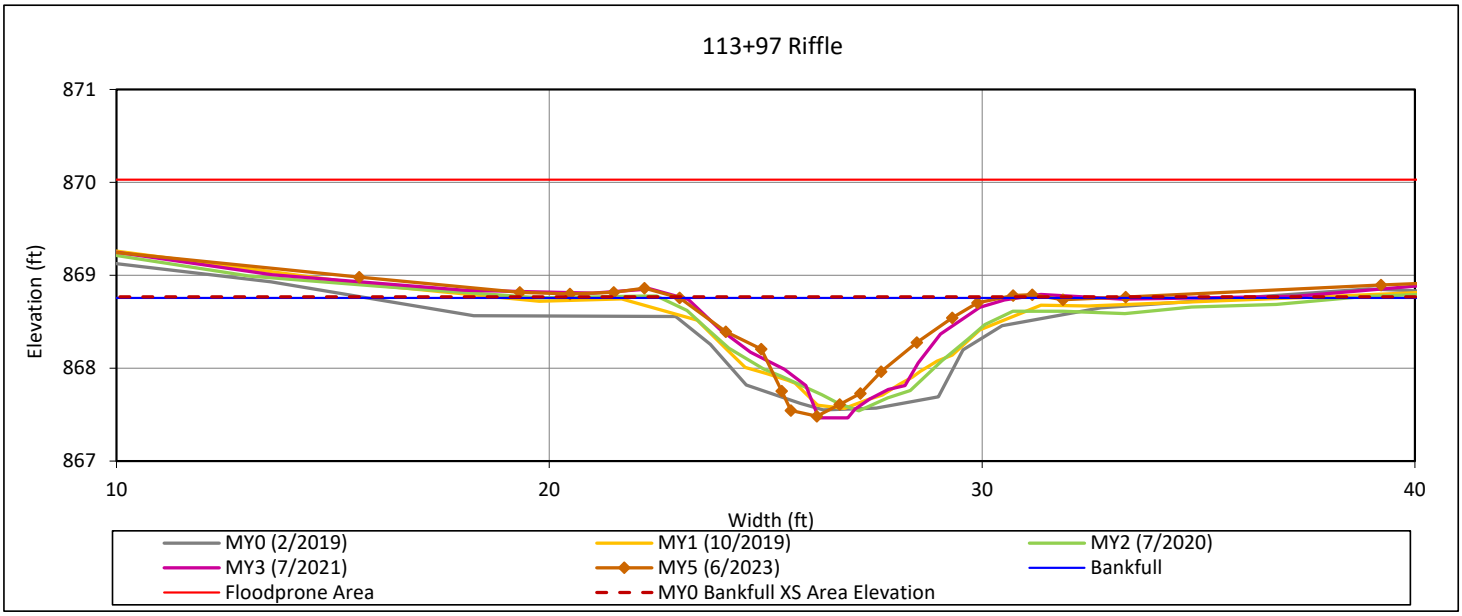
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 4 - UT1 Reach 2A



Bankfull Dimensions	
4.4	x-section area (ft.sq.)
7.4	width (ft)
0.6	mean depth (ft)
1.3	max depth (ft)
8.0	wetted perimeter (ft)
0.6	hydraulic radius (ft)
12.5	width-depth ratio
50.6	W flood prone area (ft)
6.8	entrenchment ratio
1.0	low bank height ratio

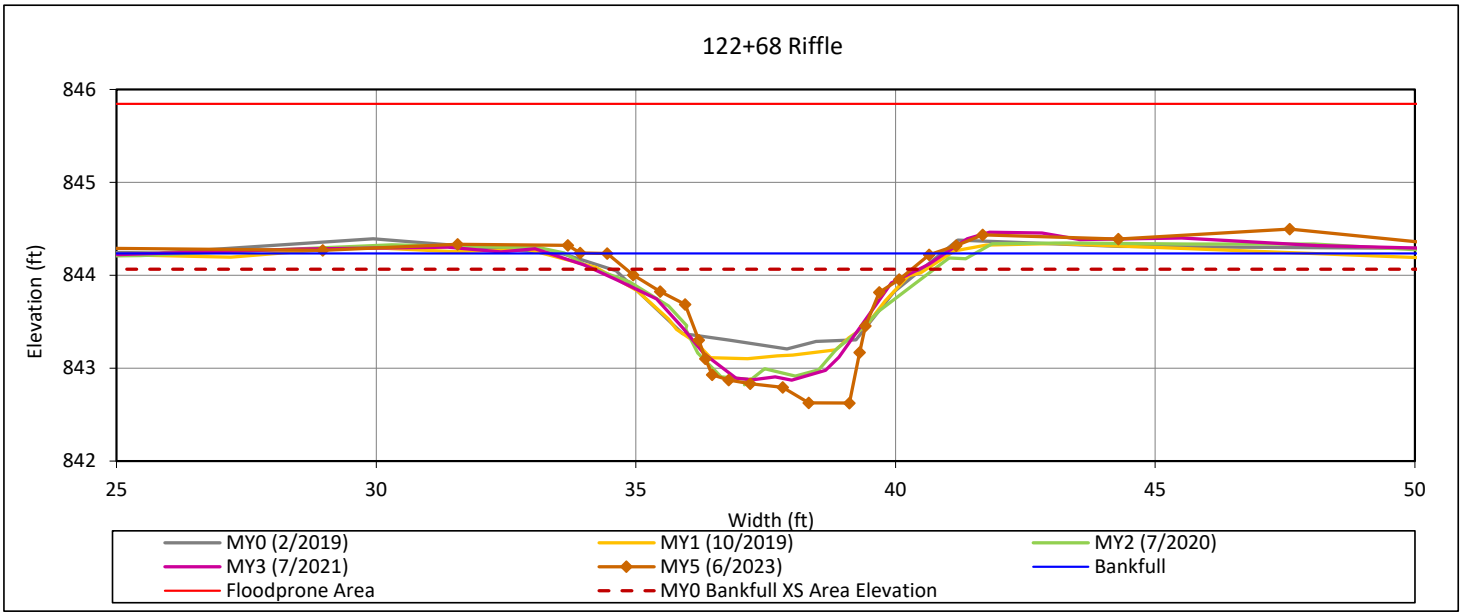
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 5 - UT1 Reach 2A



Bankfull Dimensions	
5.6	x-section area (ft.sq.)
6.3	width (ft)
0.9	mean depth (ft)
1.6	max depth (ft)
7.6	wetted perimeter (ft)
0.7	hydraulic radius (ft)
7.0	width-depth ratio
65.4	W flood prone area (ft)
10.4	entrenchment ratio
1.1	low bank height ratio

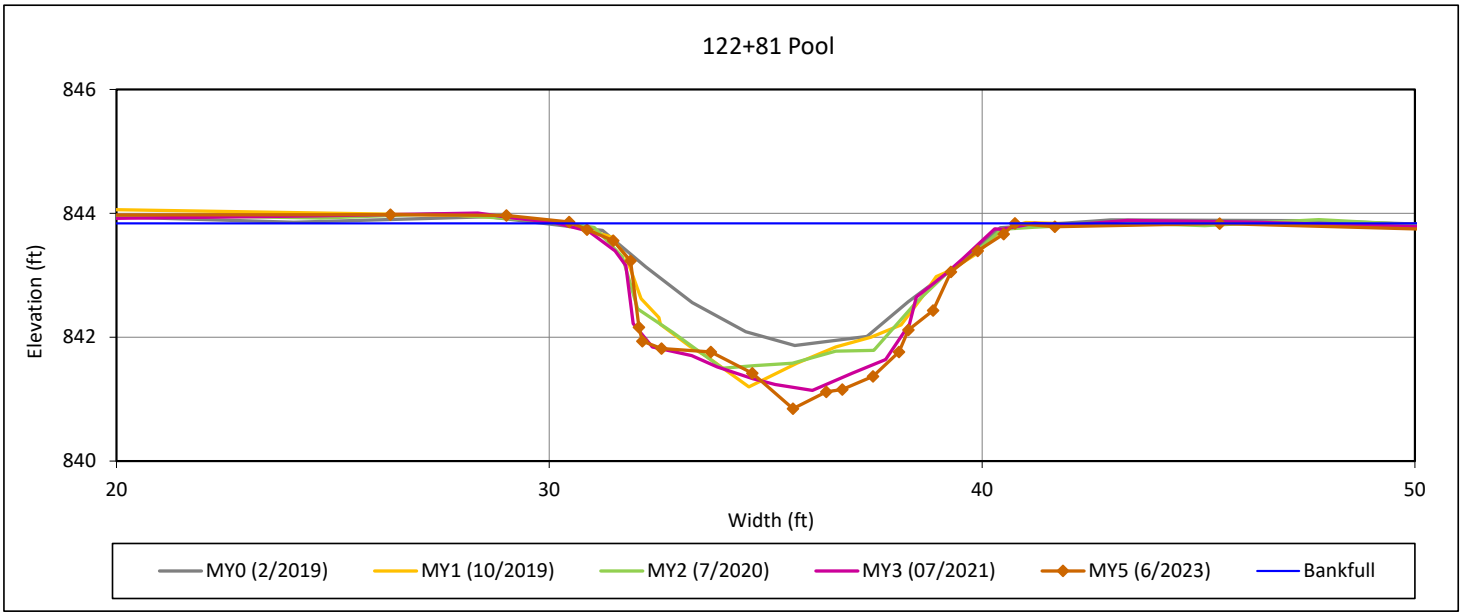
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 6 - UT1 Reach 2A



Bankfull Dimensions	
17.3	x-section area (ft.sq.)
10.2	width (ft)
1.7	mean depth (ft)
3.0	max depth (ft)
12.7	wetted perimeter (ft)
1.4	hydraulic radius (ft)
6.0	width-depth ratio

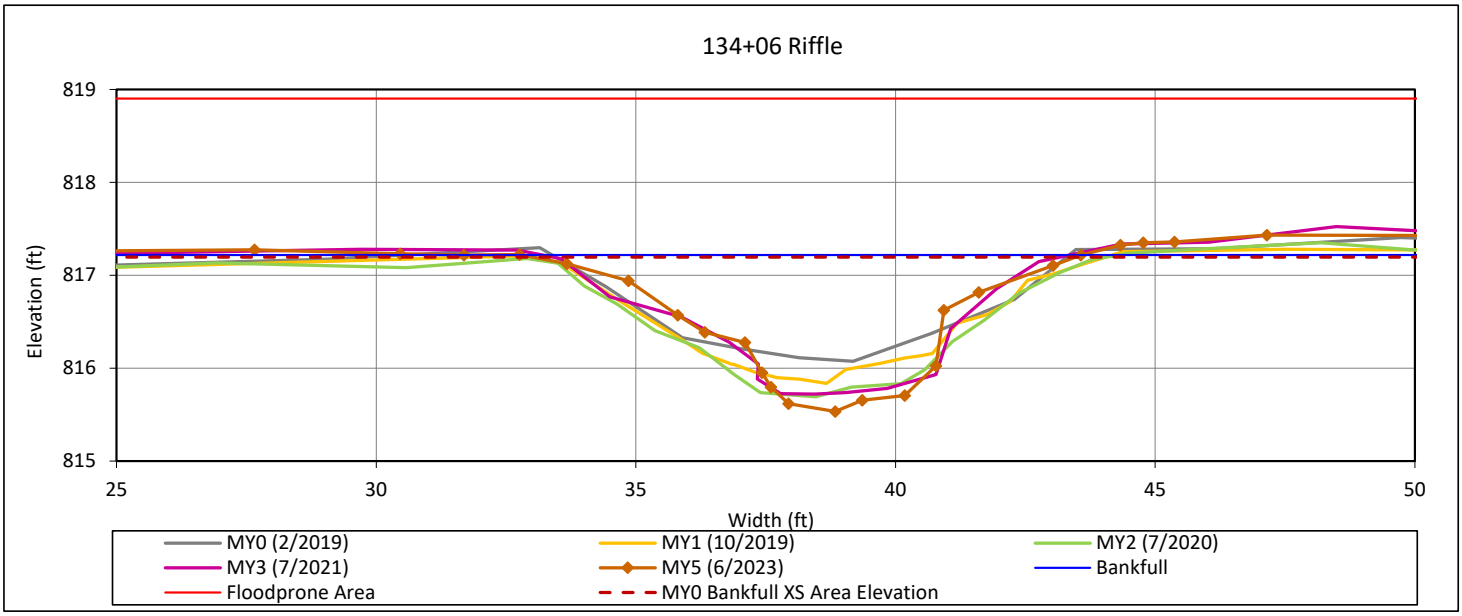
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 7 - UT1 Reach 2B



Bankfull Dimensions	
8.1	x-section area (ft.sq.)
10.8	width (ft)
0.8	mean depth (ft)
1.7	max depth (ft)
11.8	wetted perimeter (ft)
0.7	hydraulic radius (ft)
14.3	width-depth ratio
68.0	W flood prone area (ft)
6.3	entrenchment ratio
1.0	low bank height ratio

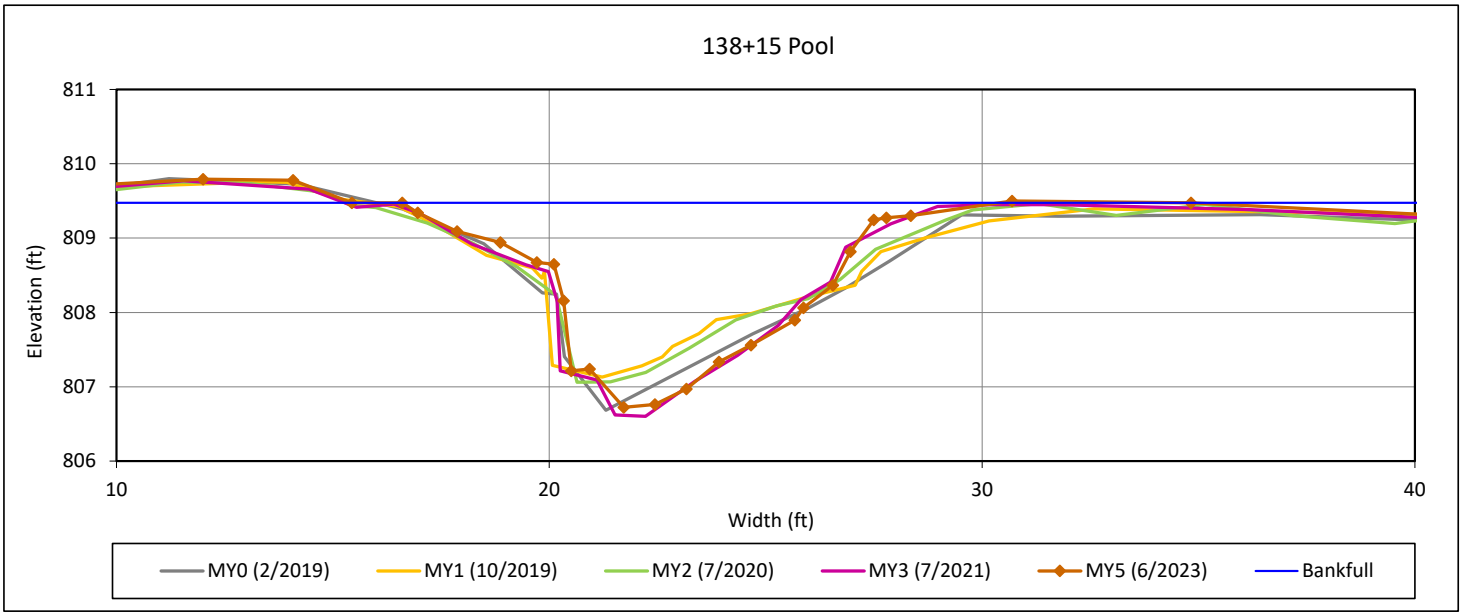
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 8 - UT1 Reach 2B



Bankfull Dimensions	
16.1	x-section area (ft.sq.)
13.8	width (ft)
1.2	mean depth (ft)
2.8	max depth (ft)
15.9	wetted perimeter (ft)
1.0	hydraulic radius (ft)
11.9	width-depth ratio

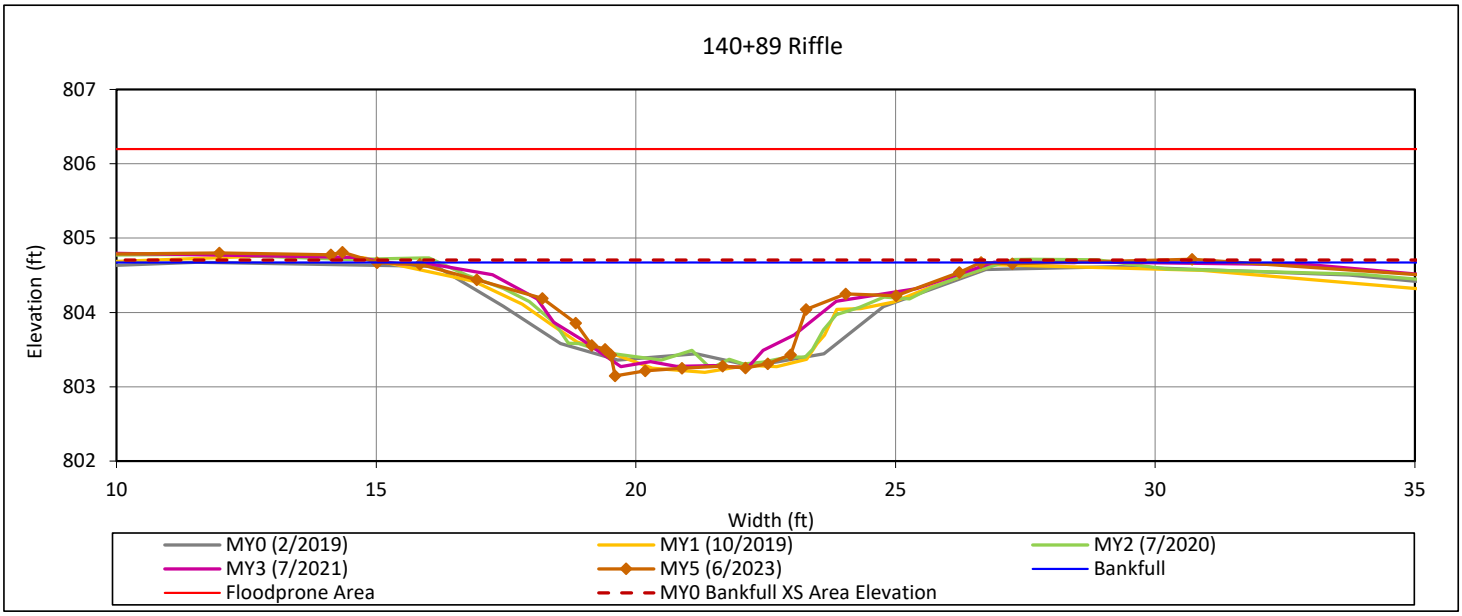
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 9 - UT1 Reach 2B



Bankfull Dimensions	
8.1	x-section area (ft.sq.)
11.6	width (ft)
0.7	mean depth (ft)
1.5	max depth (ft)
12.6	wetted perimeter (ft)
0.6	hydraulic radius (ft)
16.7	width-depth ratio
49.1	W flood prone area (ft)
4.2	entrenchment ratio
1.0	low bank height ratio

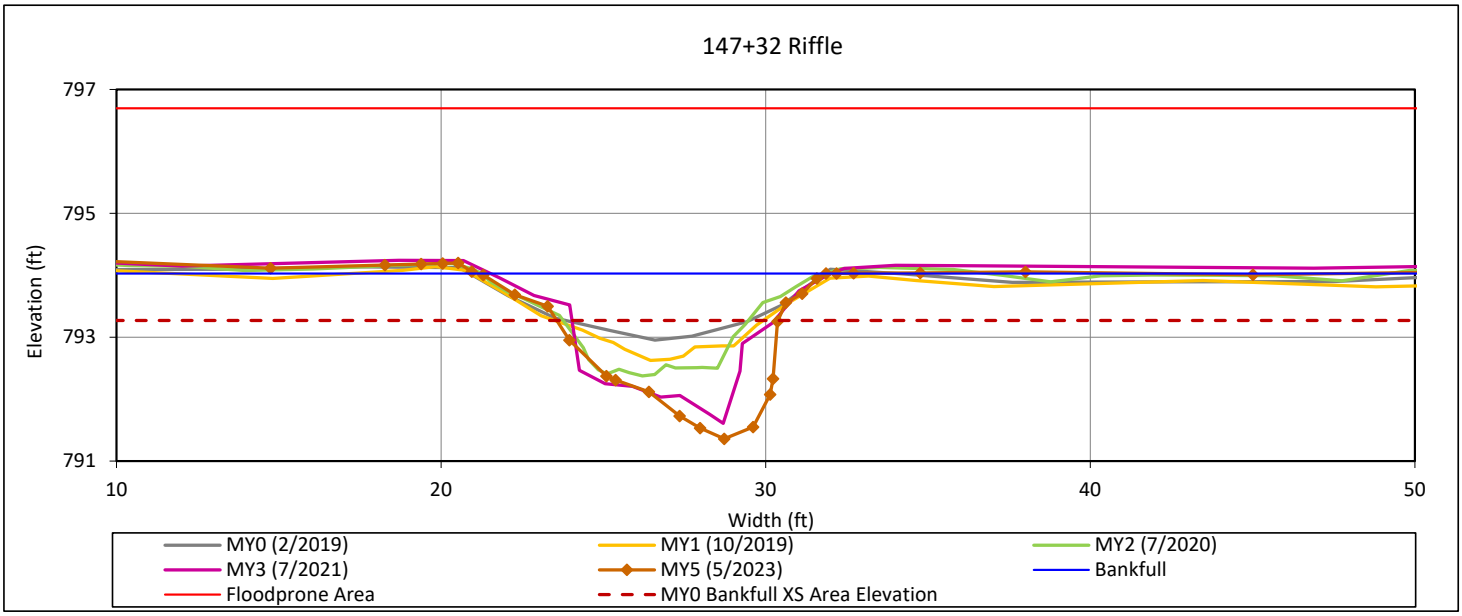
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 10 - UT1 Reach 3



Bankfull Dimensions	
14.7	x-section area (ft.sq.)
10.7	width (ft)
1.4	mean depth (ft)
2.7	max depth (ft)
12.7	wetted perimeter (ft)
1.2	hydraulic radius (ft)
7.8	width-depth ratio
59.8	W flood prone area (ft)
5.6	entrenchment ratio
1.4	low bank height ratio

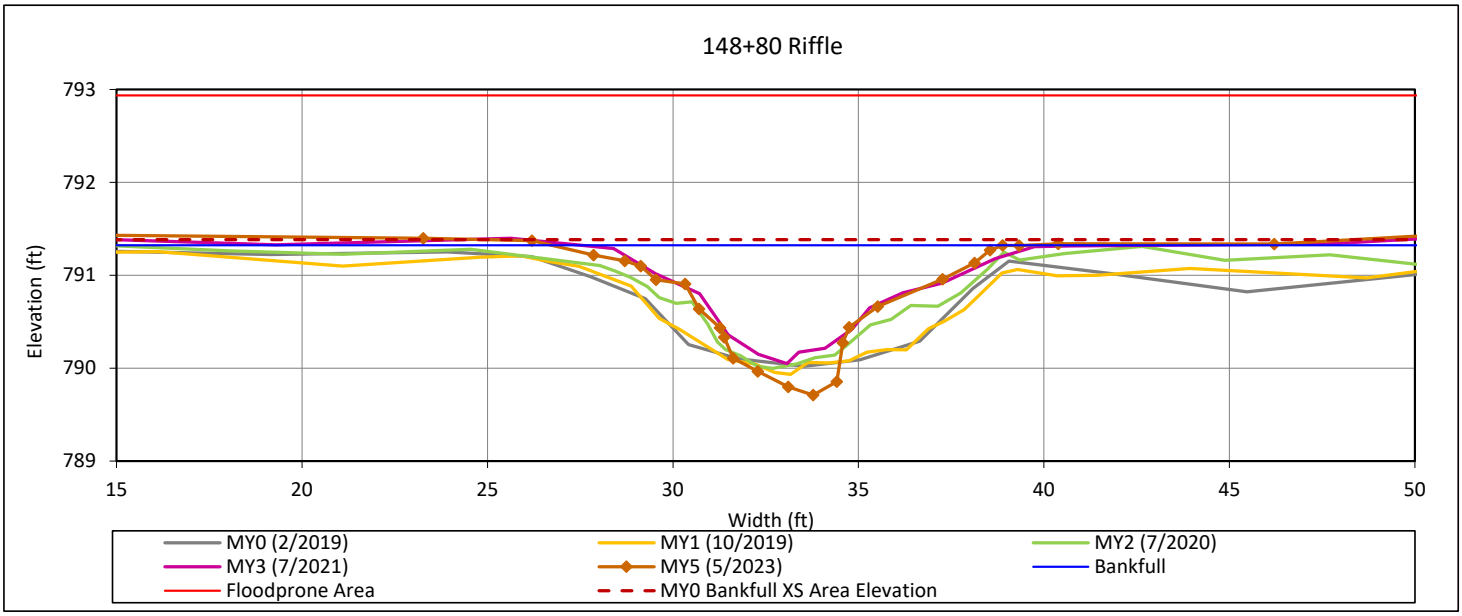
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 11 - UT1 Reach 3



Bankfull Dimensions	
7.9	x-section area (ft.sq.)
12.2	width (ft)
0.7	mean depth (ft)
1.6	max depth (ft)
13.0	wetted perimeter (ft)
0.6	hydraulic radius (ft)
18.6	width-depth ratio
67.5	W flood prone area (ft)
5.5	entrenchment ratio
1.0	low bank height ratio

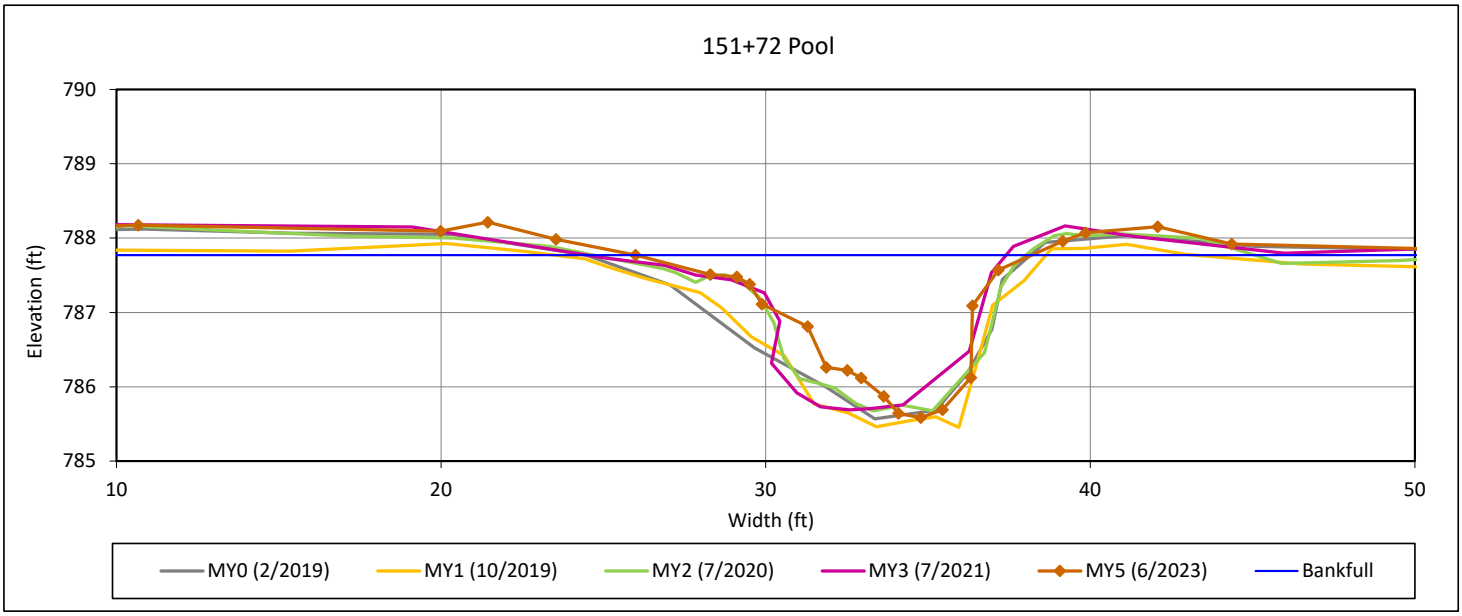
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 12 - UT1 Reach 3



Bankfull Dimensions	
11.6	x-section area (ft.sq.)
12.2	width (ft)
0.9	mean depth (ft)
2.2	max depth (ft)
13.9	wetted perimeter (ft)
0.8	hydraulic radius (ft)
12.9	width-depth ratio

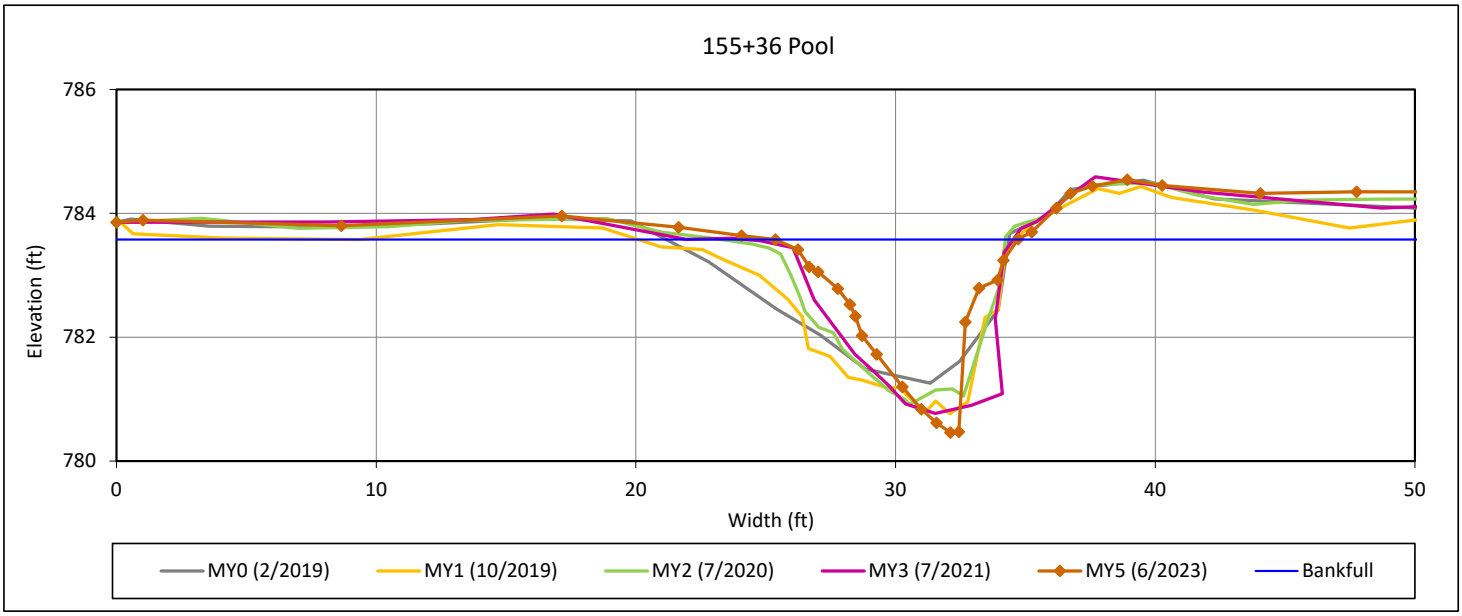
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 13 - UT1 Reach 3



Bankfull Dimensions	
12.9	x-section area (ft.sq.)
9.3	width (ft)
1.4	mean depth (ft)
3.1	max depth (ft)
12.2	wetted perimeter (ft)
1.1	hydraulic radius (ft)
6.7	width-depth ratio

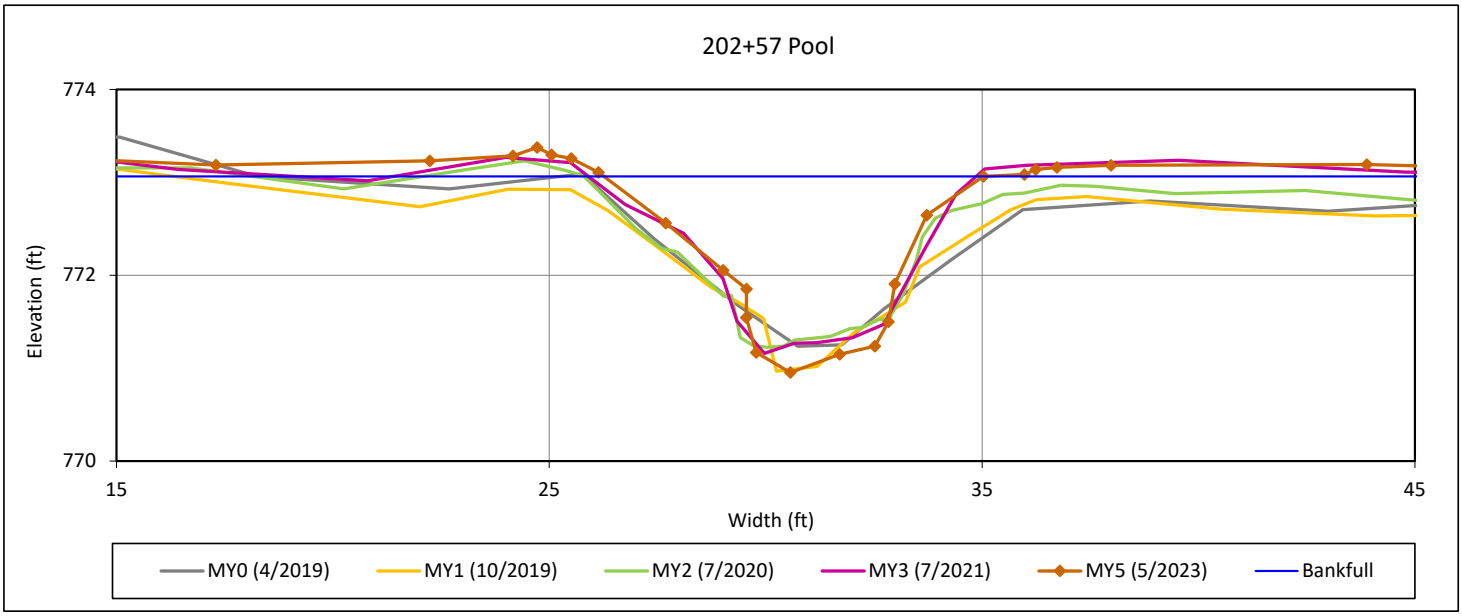
Survey Date: 6/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 14 - UT2 Reach 1



Bankfull Dimensions	
9.3	x-section area (ft.sq.)
8.8	width (ft)
1.1	mean depth (ft)
2.1	max depth (ft)
10.3	wetted perimeter (ft)
0.9	hydraulic radius (ft)
8.2	width-depth ratio

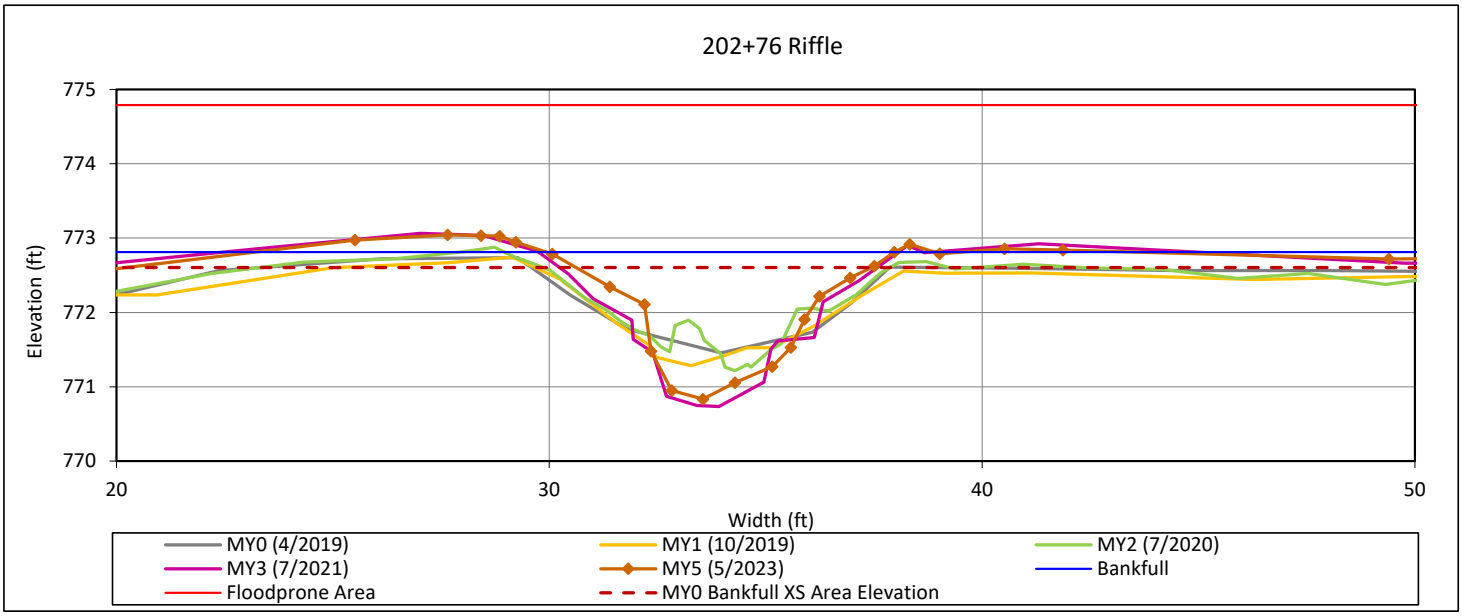
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 15 - UT2 Reach 1



Bankfull Dimensions	
7.6	x-section area (ft.sq.)
8.0	width (ft)
1.0	mean depth (ft)
2.0	max depth (ft)
9.4	wetted perimeter (ft)
0.8	hydraulic radius (ft)
8.5	width-depth ratio
68.9	W flood prone area (ft)
8.6	entrenchment ratio
1.1	low bank height ratio

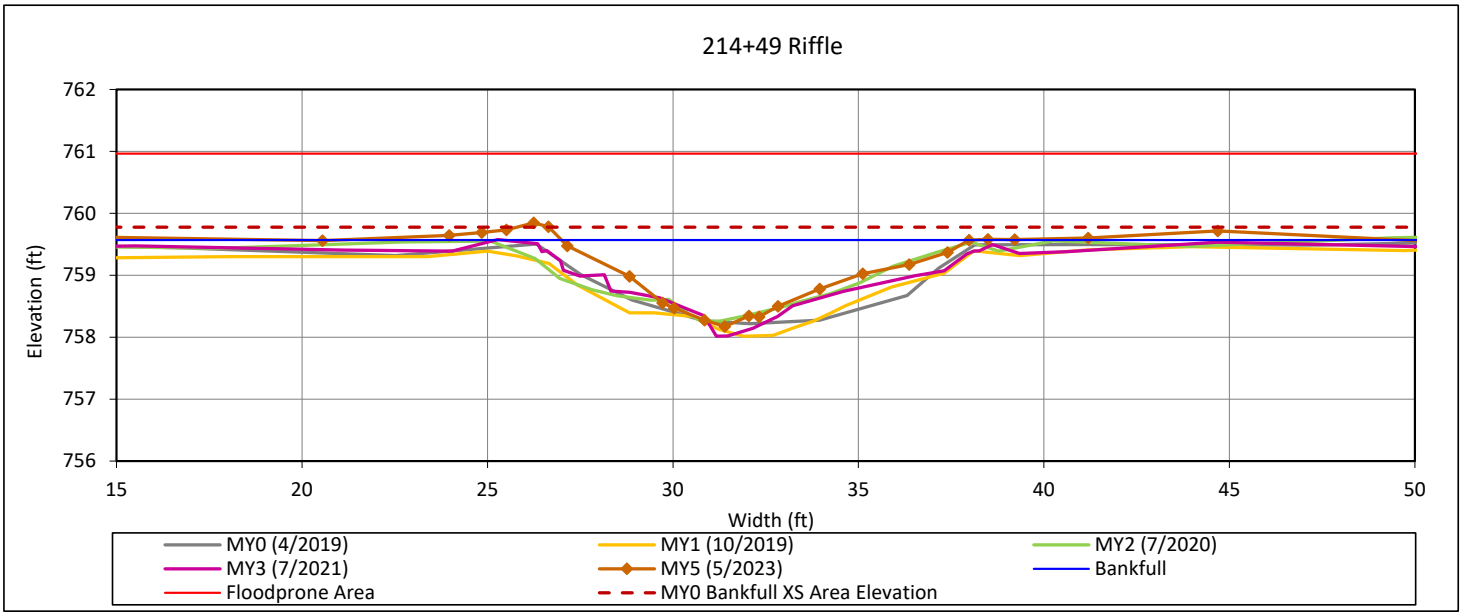
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 16 - UT2 Reach 2



Bankfull Dimensions	
7.9	x-section area (ft.sq.)
11.0	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
11.4	wetted perimeter (ft)
0.7	hydraulic radius (ft)
15.3	width-depth ratio
64.6	W flood prone area (ft)
5.9	entrenchment ratio
0.9	low bank height ratio

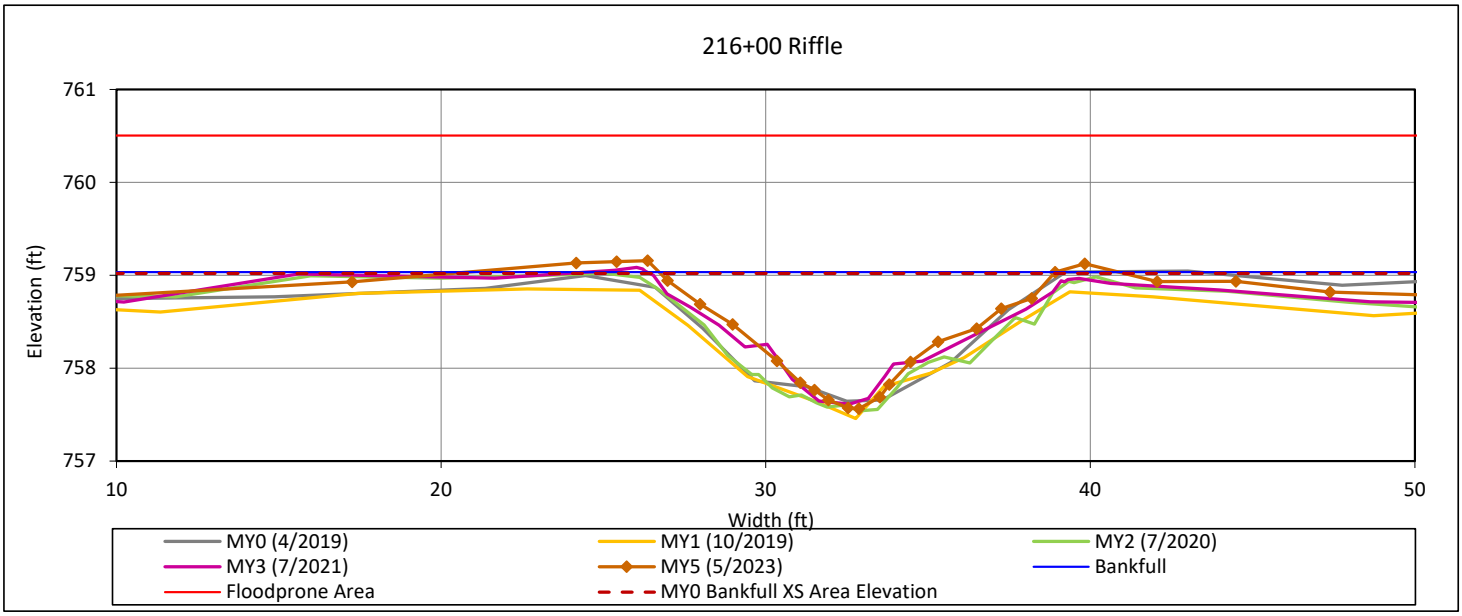
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 17 - UT2 Reach 2



Bankfull Dimensions	
9.3	x-section area (ft.sq.)
12.2	width (ft)
0.8	mean depth (ft)
1.5	max depth (ft)
12.6	wetted perimeter (ft)
0.7	hydraulic radius (ft)
16.1	width-depth ratio
72.2	W flood prone area (ft)
5.9	entrenchment ratio
1.0	low bank height ratio

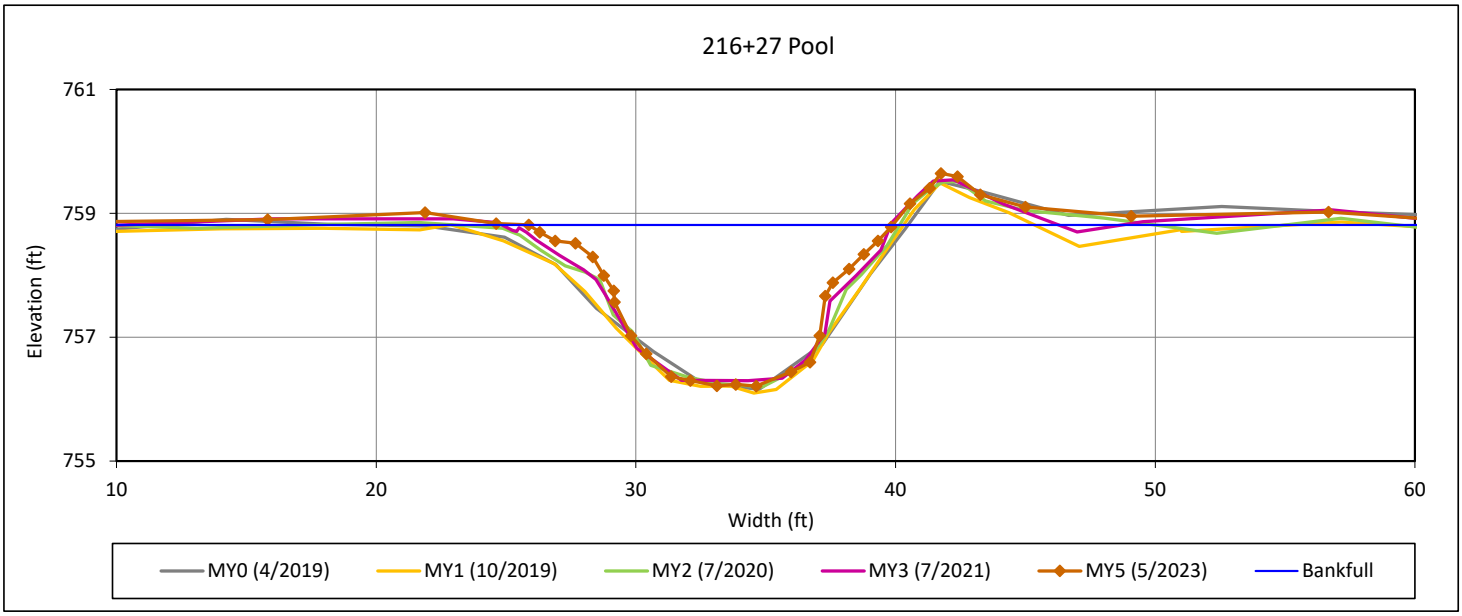
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 18 - UT2 Reach 2



Bankfull Dimensions	
21.4	x-section area (ft.sq.)
14.0	width (ft)
1.5	mean depth (ft)
2.6	max depth (ft)
15.7	wetted perimeter (ft)
1.4	hydraulic radius (ft)
9.2	width-depth ratio

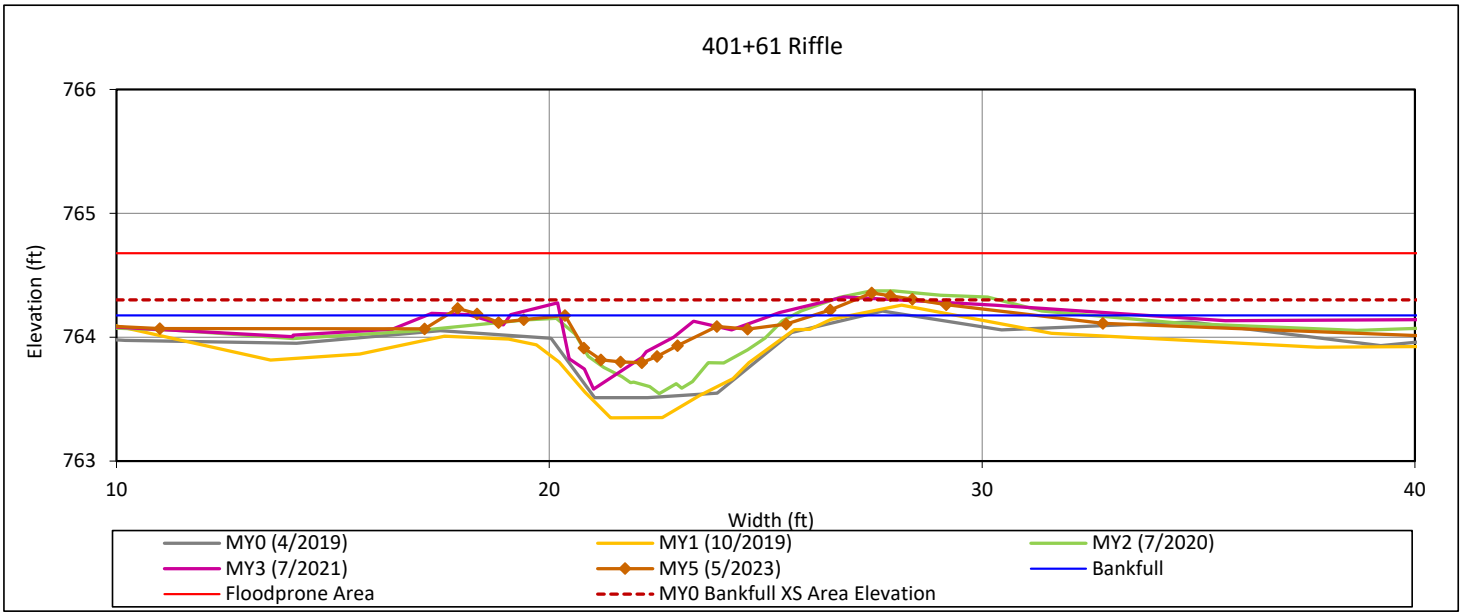
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 19 - UT2A



Bankfull Dimensions	
1.1	x-section area (ft.sq.)
5.7	width (ft)
0.2	mean depth (ft)
0.5	max depth (ft)
5.9	wetted perimeter (ft)
0.2	hydraulic radius (ft)
29.5	width-depth ratio
56.7	W flood prone area (ft)
9.9	entrenchment ratio
0.8	low bank height ratio

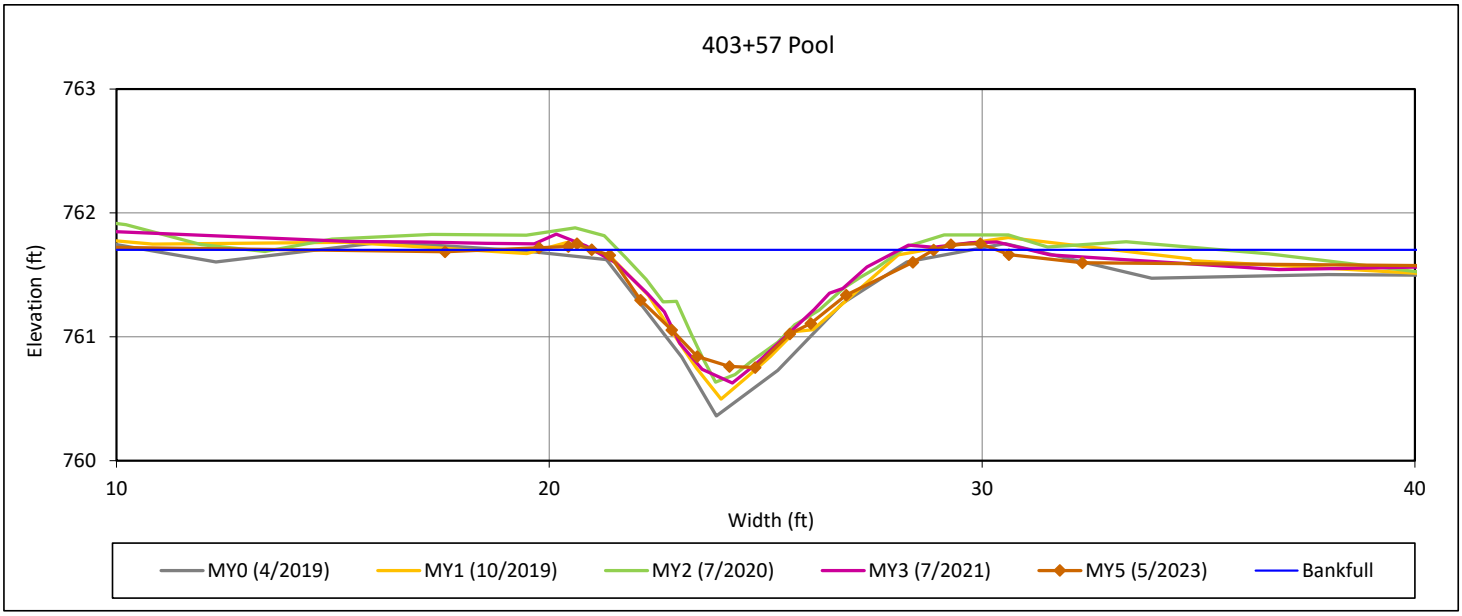
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 20 - UT2A



Bankfull Dimensions	
4.0	x-section area (ft.sq.)
7.9	width (ft)
0.5	mean depth (ft)
1.0	max depth (ft)
8.2	wetted perimeter (ft)
0.5	hydraulic radius (ft)
15.7	width-depth ratio

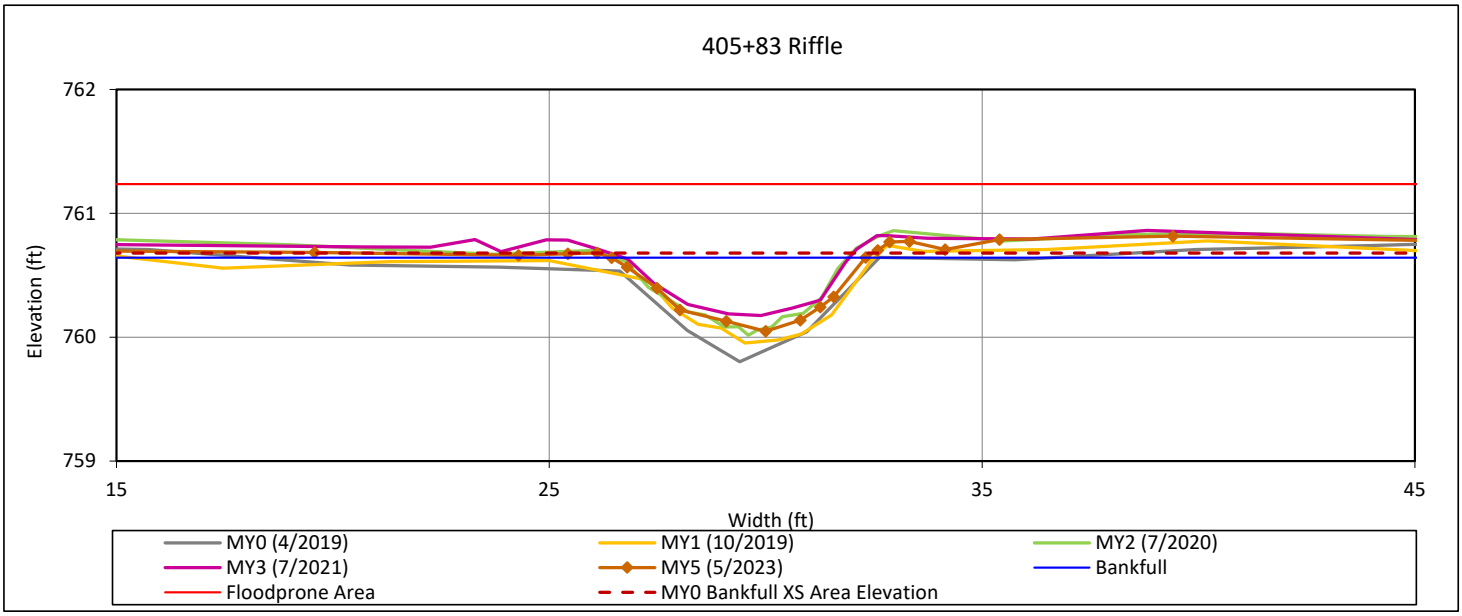
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 21 - UT2A



Bankfull Dimensions	
2.2	x-section area (ft.sq.)
5.9	width (ft)
0.4	mean depth (ft)
0.6	max depth (ft)
6.0	wetted perimeter (ft)
0.4	hydraulic radius (ft)
15.8	width-depth ratio
51.3	W flood prone area (ft)
8.7	entrenchment ratio
0.9	low bank height ratio

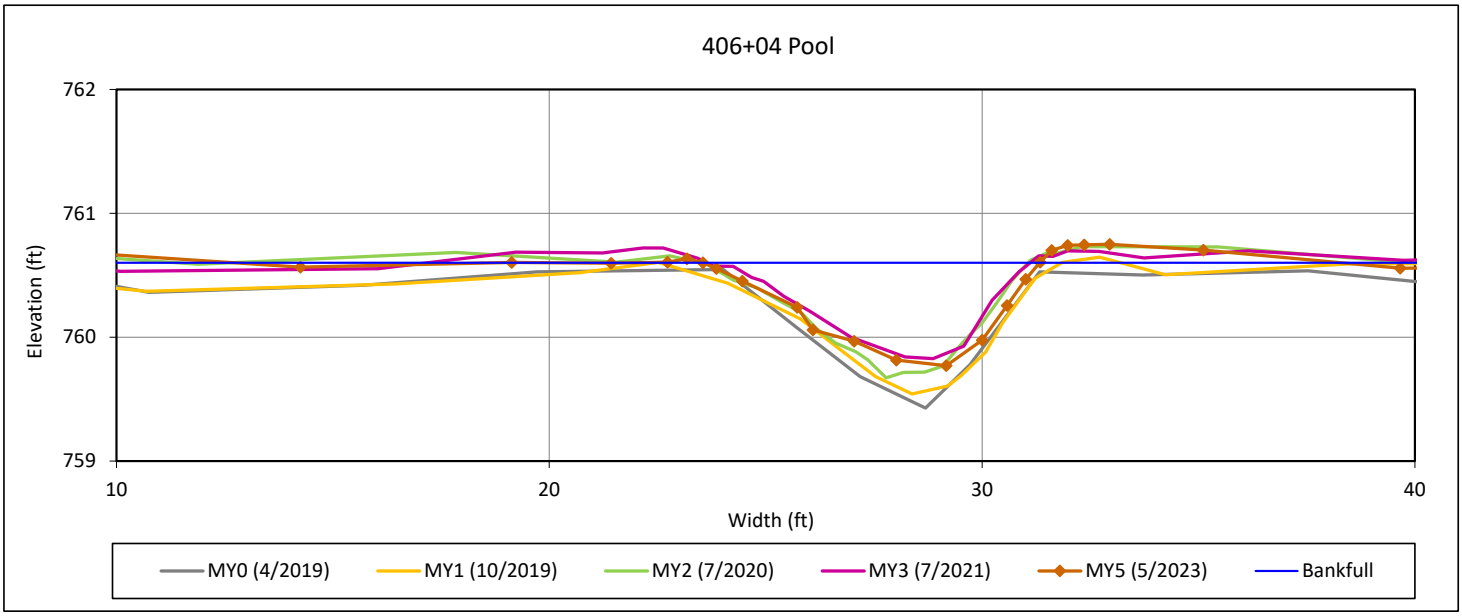
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 22 - UT2A



Bankfull Dimensions	
3.7	x-section area (ft.sq.)
7.8	width (ft)
0.5	mean depth (ft)
0.8	max depth (ft)
8.0	wetted perimeter (ft)
0.5	hydraulic radius (ft)
16.2	width-depth ratio

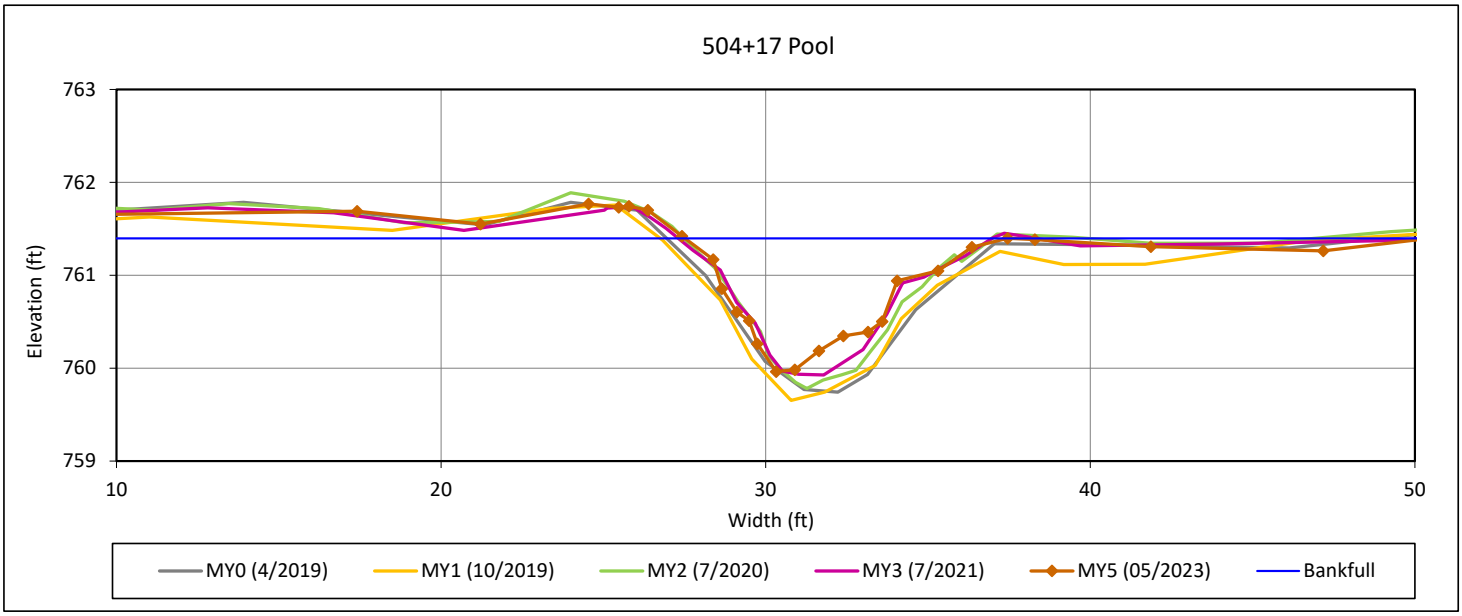
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 23 - UT2B



Bankfull Dimensions	
6.8	x-section area (ft.sq.)
9.9	width (ft)
0.7	mean depth (ft)
1.4	max depth (ft)
10.6	wetted perimeter (ft)
0.6	hydraulic radius (ft)
14.6	width-depth ratio

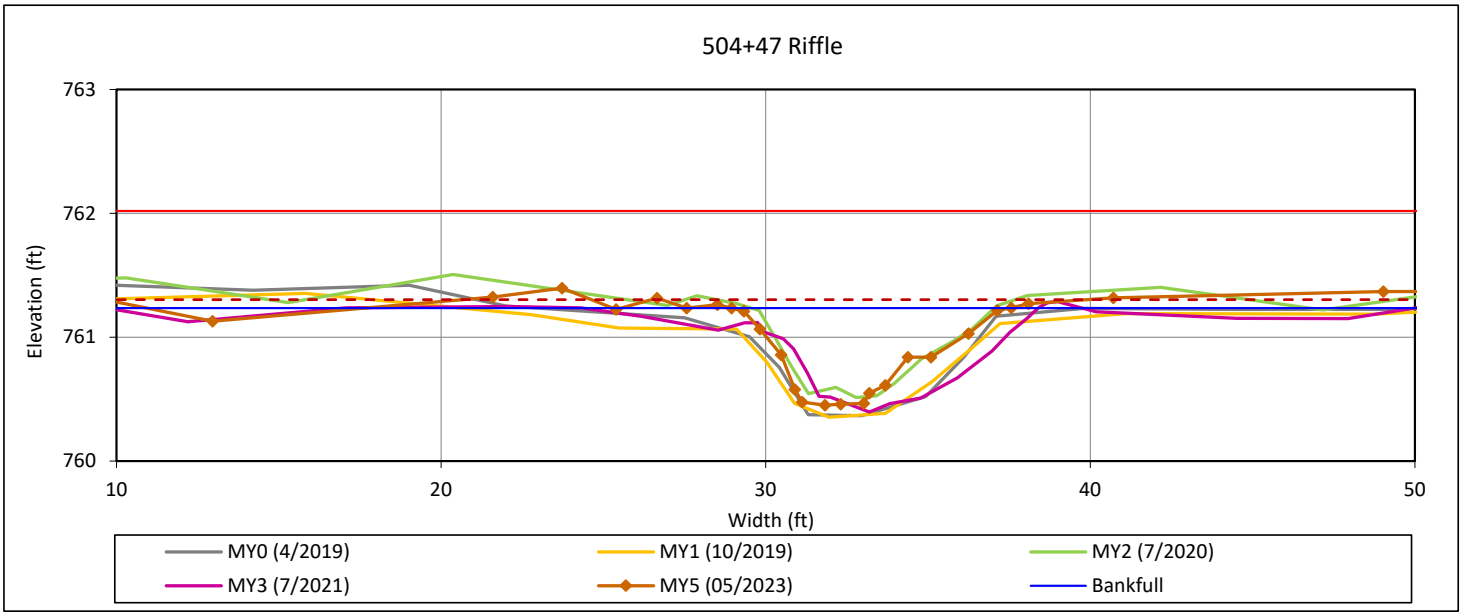
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 24 - UT2B



Bankfull Dimensions	
3.6	x-section area (ft.sq.)
8.5	width (ft)
0.4	mean depth (ft)
0.8	max depth (ft)
8.8	wetted perimeter (ft)
0.4	hydraulic radius (ft)
20.2	width-depth ratio
65.9	W flood prone area (ft)
7.7	entrenchment ratio
0.9	low bank height ratio

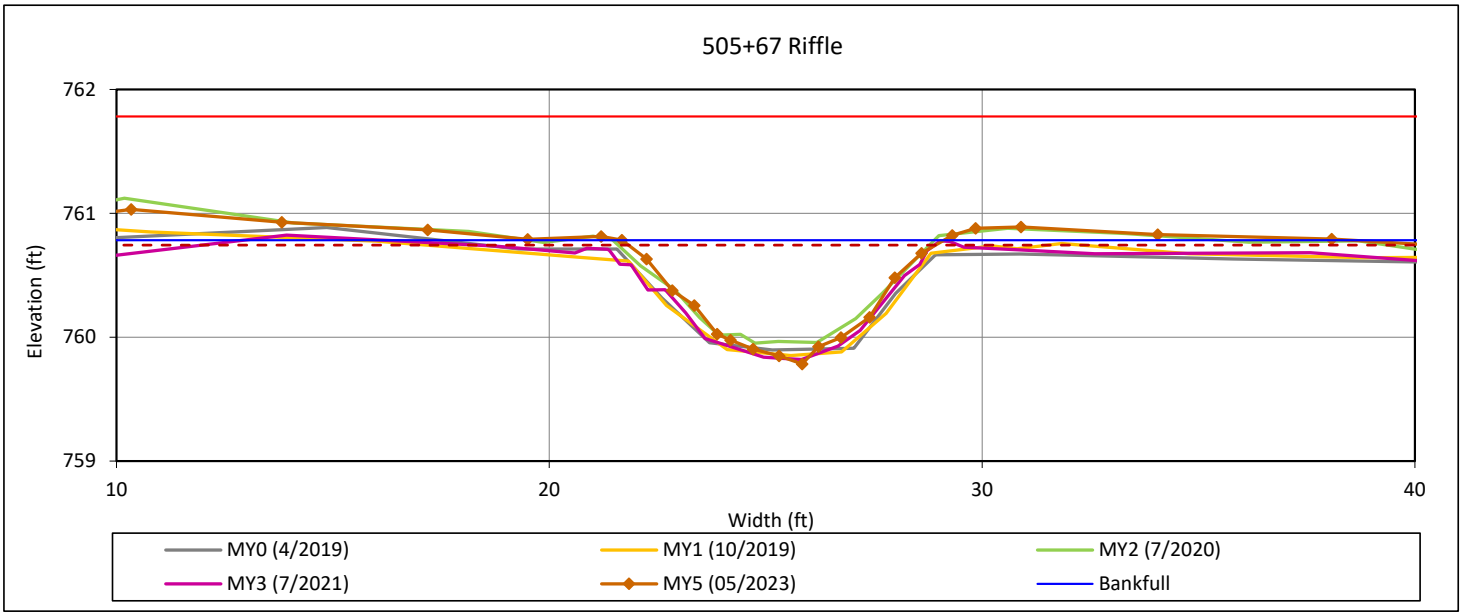
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 25 - UT2B



Bankfull Dimensions	
4.2	x-section area (ft.sq.)
7.4	width (ft)
0.6	mean depth (ft)
1.0	max depth (ft)
7.8	wetted perimeter (ft)
0.5	hydraulic radius (ft)
13.2	width-depth ratio
56.4	W flood prone area (ft)
7.6	entrenchment ratio
0.8	low bank height ratio

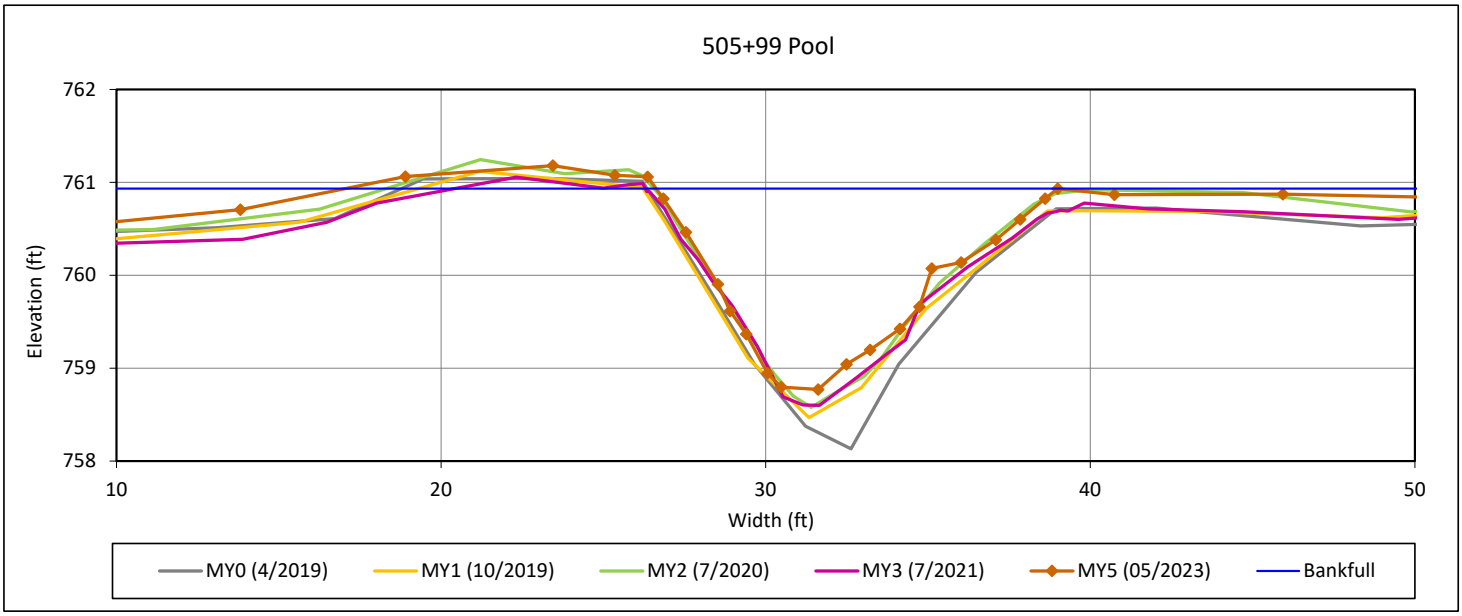
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 26 - UT2B



Bankfull Dimensions	
14.4	x-section area (ft.sq.)
12.4	width (ft)
1.2	mean depth (ft)
2.2	max depth (ft)
13.4	wetted perimeter (ft)
1.1	hydraulic radius (ft)
10.6	width-depth ratio

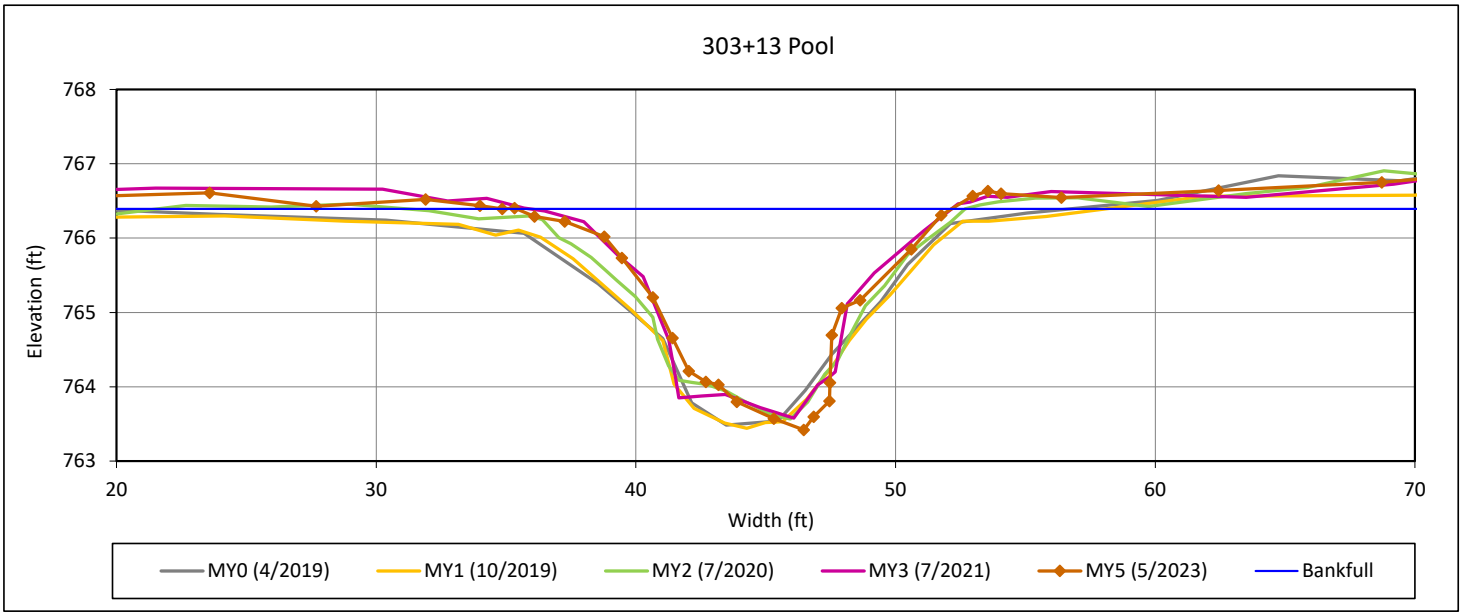
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 27 - UT3 Reach 1



Bankfull Dimensions	
22.5	x-section area (ft.sq.)
16.7	width (ft)
1.3	mean depth (ft)
3.0	max depth (ft)
18.6	wetted perimeter (ft)
1.2	hydraulic radius (ft)
12.5	width-depth ratio

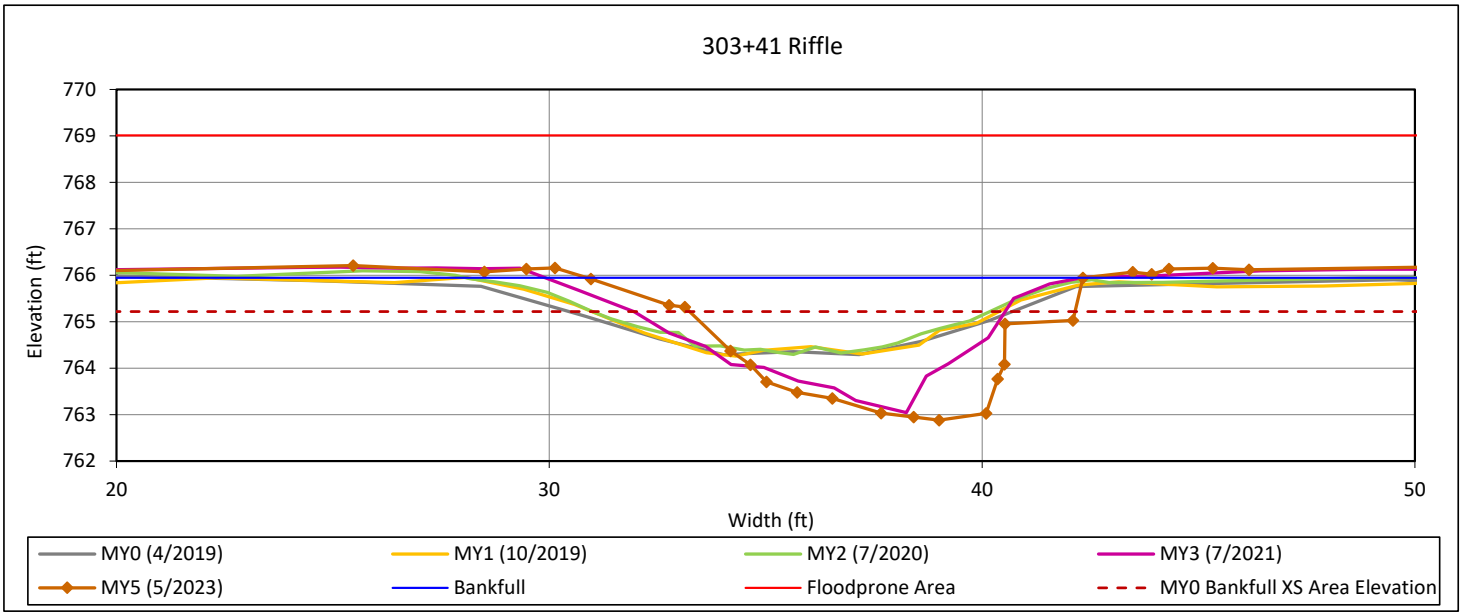
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 28 - UT3 Reach 1



Bankfull Dimensions	
20.2	x-section area (ft.sq.)
11.5	width (ft)
1.8	mean depth (ft)
3.1	max depth (ft)
14.5	wetted perimeter (ft)
1.4	hydraulic radius (ft)
6.5	width-depth ratio
73.3	W flood prone area (ft)
6.4	entrenchment ratio
1.3	low bank height ratio

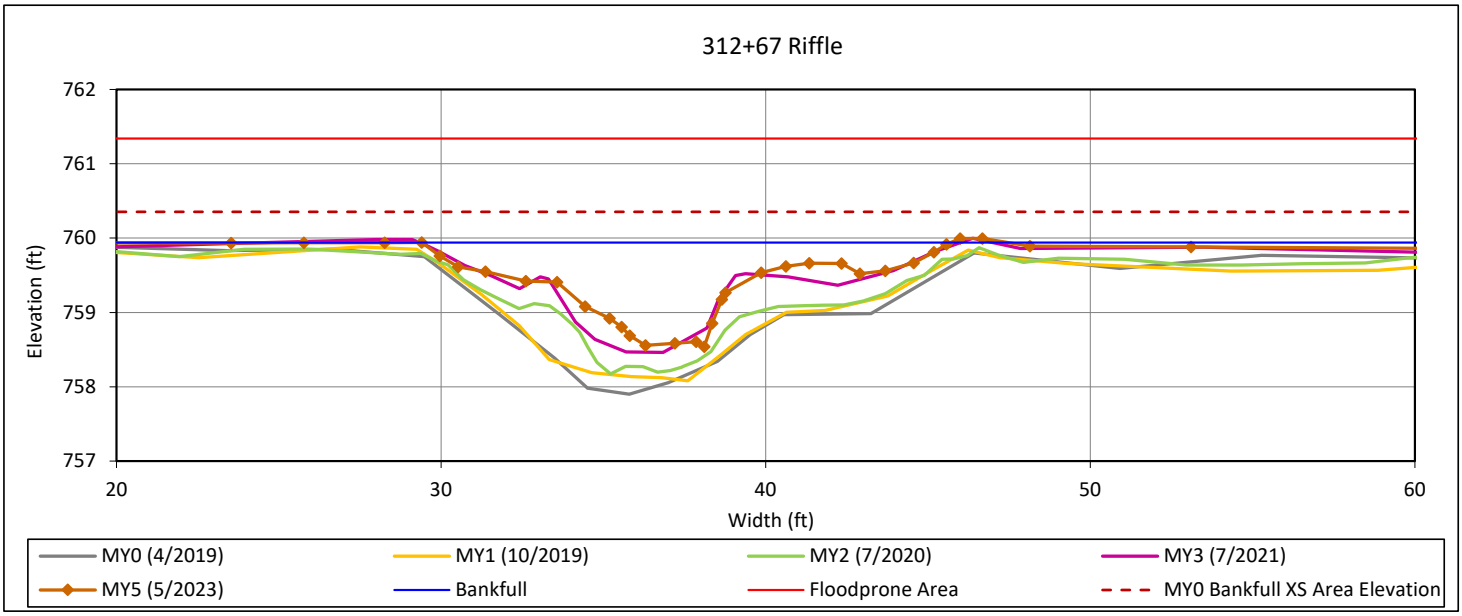
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 29 - UT3 Reach 2



Bankfull Dimensions	
9.6	x-section area (ft.sq.)
16.3	width (ft)
0.6	mean depth (ft)
1.4	max depth (ft)
16.9	wetted perimeter (ft)
0.6	hydraulic radius (ft)
27.5	width-depth ratio
75.6	W flood prone area (ft)
4.6	entrenchment ratio
0.8	low bank height ratio

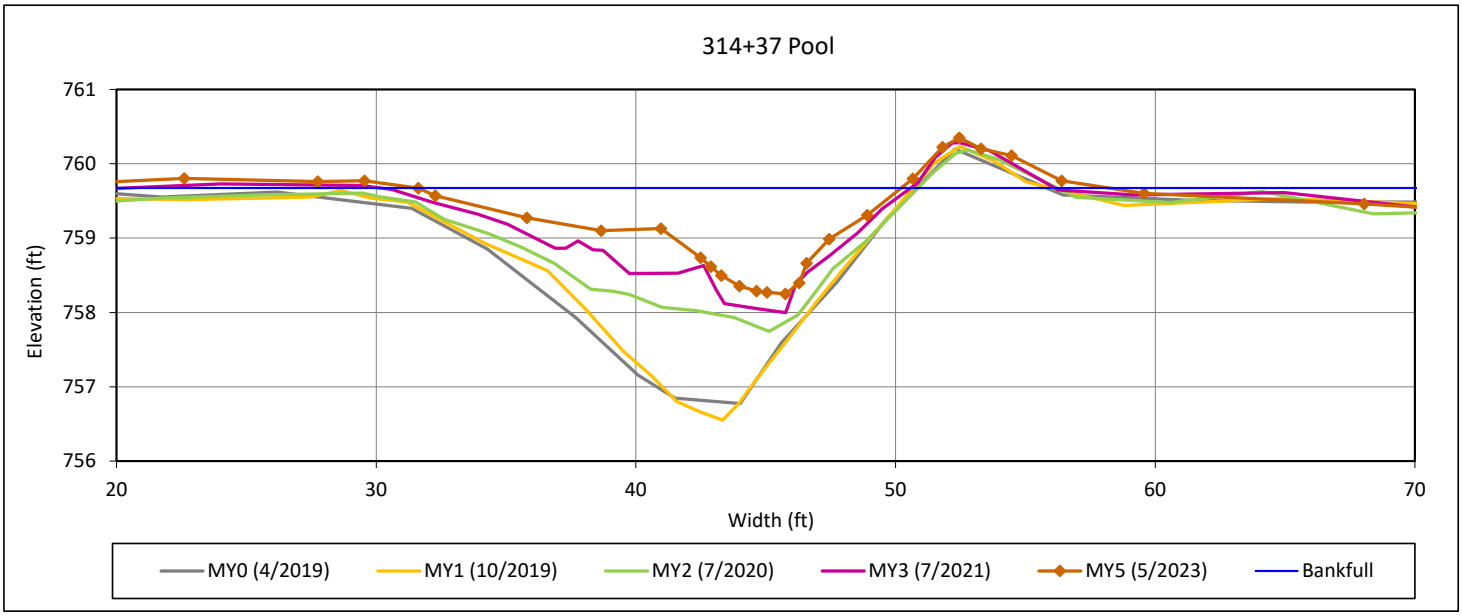
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 30 - UT3 Reach 2



Bankfull Dimensions	
11.7	x-section area (ft.sq.)
18.6	width (ft)
0.6	mean depth (ft)
1.4	max depth (ft)
19.0	wetted perimeter (ft)
0.6	hydraulic radius (ft)
29.6	width-depth ratio

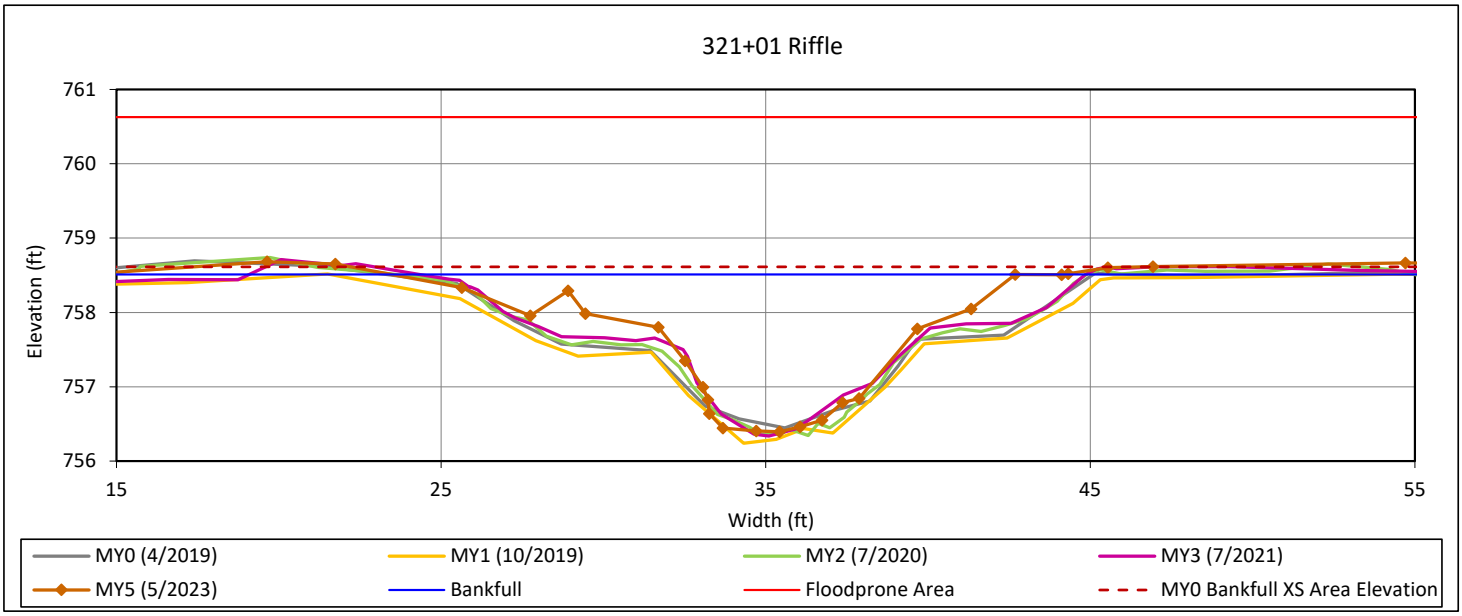
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 31 - UT3 Reach 3



Bankfull Dimensions	
17.5	x-section area (ft.sq.)
19.2	width (ft)
0.9	mean depth (ft)
2.1	max depth (ft)
20.3	wetted perimeter (ft)
0.9	hydraulic radius (ft)
21.1	width-depth ratio
70.7	W flood prone area (ft)
3.7	entrenchment ratio
1.0	low bank height ratio

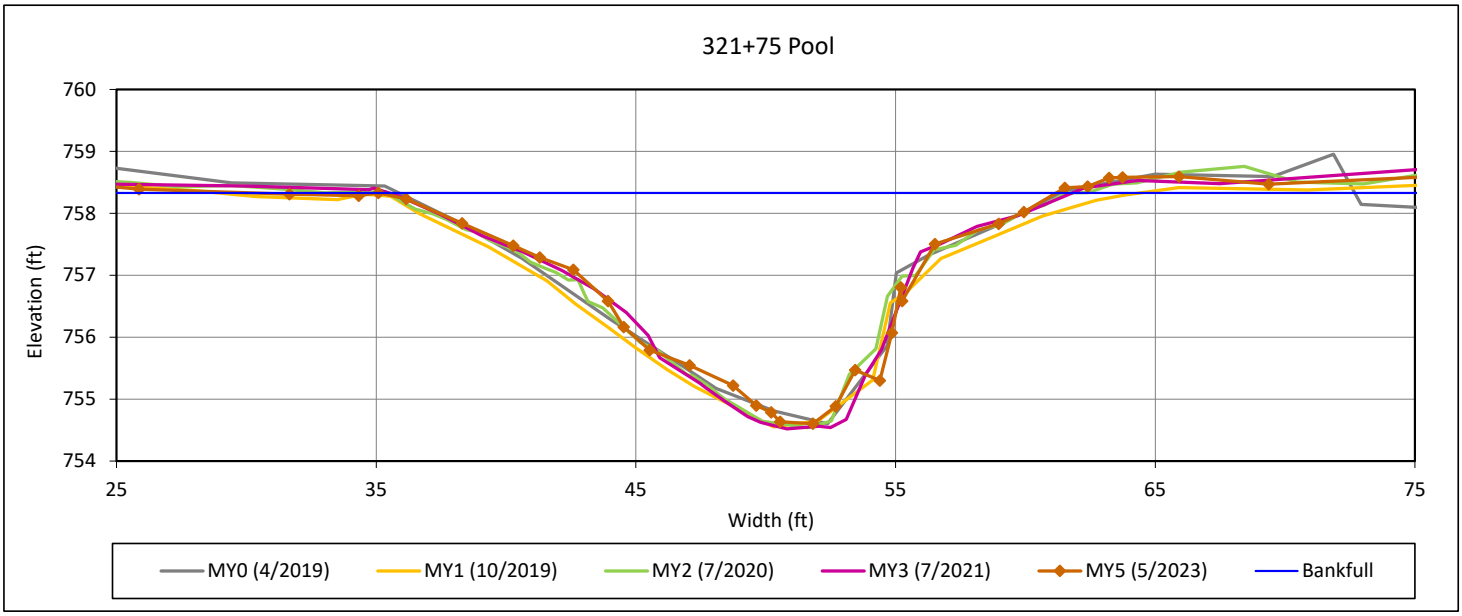
Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

Cross-Section Plots

Lone Hickory Mitigation Site
NCDMS Project No. 97135
Monitoring Year 5 - 2023

Cross-Section 32 - UT3 Reach 3



Bankfull Dimensions	
43.9	x-section area (ft.sq.)
26.1	width (ft)
1.7	mean depth (ft)
3.7	max depth (ft)
28.3	wetted perimeter (ft)
1.6	hydraulic radius (ft)
15.5	width-depth ratio

Survey Date: 5/2023
Field Crew: Wildlands Engineering

View Downstream

APPENDIX 5. Hydrology Summary Data and Plots

Table 14a. Verification of Bankfull Events
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Reach	MY	Date of Occurrence	Date of Data Collection	Method
UT1 Reach 3 (SG2)	MY2	2/6/2020	2/6/2020	Stream Gage
		5/27/2020	5/27/2020	
		8/6/2020	8/6/2020	
	MY3	1/9/2021	1/9/2021	
		2/20/2021	2/20/2021	
	MY4	1/27/2022	1/27/2022	
		1/30/2022	1/30/2022	
		5/22/2022	5/22/2022	
UT2 Reach 2 (SG3)	MY2	2/6/2020	2/6/2020	
		5/21/2020	5/21/2020	
		5/27/2020	5/27/2020	
		7/24/2020	7/24/2020	
		8/6/2020	8/6/2020	
		10/11/2020	10/11/2020	
	MY3	2/16/2021	2/16/2021	
		6/12/2021	6/12/2021	
	MY4	1/3/2022	1/3/2022	
		2/23/2022	2/23/2022	
		3/25/2022	3/25/2022	
		5/21/2022	5/21/2022	
		5/27/2022	5/27/2022	
		7/7/2022	7/7/2022	
		8/15/2022	8/15/2022	
	MY5	5/29/2023	5/29/2023	
UT2A (SG4)	MY2	2/6/2020	2/6/2020	
		5/27/2020	5/27/2020	
		8/6/2020	8/6/2020	
		10/11/2020	10/11/2020	
	MY3	3/18/2021	3/18/2021	
		6/12/2021	6/12/2021	
	MY4	5/21/2022	5/21/2022	
		5/27/2022	5/27/2022	
	MY5	3/4/2023	3/4/2023	

[1] Multiple bankfull events occurred within these date ranges.

Table 14b. Verification of Bankfull Events
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Reach	MY	Date of Occurrence	Date of Data Collection	Method
UT2B (SG5 & SG7)	MY1	6/8/2019	6/8/2019	Stream Gage
	MY2	2/6/2020	2/6/2020	
		5/27/2020	5/27/2020	
	MY3	1/24/2021	1/24/2021	
	MY5	3/4/2023	3/4/2023	
		5/28/2023	5/28/2023	
UT3 Reach 3 (SG6)	MY1	6/8/2019 - 6/9/2019	6/8/2019 - 6/9/2019	
		6/23/2019	6/23/2019	
	MY2	1/11/2020	1/11/2020	
		1/24/2020	1/24/2020	
		2/6/2020 - 2/13/2020[1]	2/6/2020 - 2/13/2020	
		4/13/2020	4/13/2020	
		4/30/2020	4/30/2020	
		5/22/2020	5/22/2020	
		5/27/2020	5/27/2020	
		7/24/2020	7/24/2020	
		8/6/2020	8/6/2020	
		8/13/2020 - 8/15/2020[1]	8/13/2020 - 8/15/2020	
		8/21/2020	8/21/2020	
		9/17/2020	9/17/2020	
		9/25/2020	9/25/2020	
		10/11/2020	10/11/2020	
		10/29/2020	10/29/2020	
	MY3	1/28/2021	1/28/2021	
		2/13/2021	2/13/2021	
		2/16/2021	2/16/2021	
		2/18/2021	2/18/2021	
		3/18/2021	3/18/2021	
		3/26/2021	3/26/2021	
		6/12/2021	6/12/2021	
	MY4	1/3/2022	1/3/2022	
		2/23/2022	2/23/2022	
		3/23/2022	3/23/2022	
	MY5	3/3/2023	3/3/2023	
		4/28/2023	4/28/2023	
		5/28/2023	5/28/2023	

[1] Multiple bankfull events occurred within these date ranges.

Table 14c. Verification of Consecutive Flow Days
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Reach	MY	Dates of Occurrence	Maximum Consecutive Days of Stream Flow	Method
UT1 Reach 1 (SG1)	MY1	3/27/2019 - 10/22/2019	209 days	Stream Gage
	MY2	3/8/2020 - 11/3/2020	241 days	
	MY3	5/18/2021 - 9/9/2021	114 days	
	MY4	1/1/2022 - 11/1/2022	304 days	
	MY5	1/1/2023 - 11/6/2023	309 days	
UT2A (SG4)	MY1	3/25/2019 - 5/28/2019	64 days	
	MY2	2/22/2020 - 7/14/2020	143 days	
	MY3	1/1/2021 - 7/29/2021	210 days	
	MY4	1/1/2022 - 5/4/2022	123 days	
	MY5	1/1/2023 - 5/24/2023	143 days	
UT2B (SG5)	MY1	4/5/2019 - 4/28/2019	23 days	
	MY2	2/5/2020 - 3/5/2020	29 days	
	MY3	1/24/2021 - 3/6/2021	42 days	
	MY4	2/3/2022 - 2/13/2022	11 days	
	MY5	1/1/2023 - 2/10/2023	40 days	
UT2B (SG7)	MY5	1/1/2023 - 3/7/2023	65 days	

Table 15. Wetland Gage Attainment Summary

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 5 - 2023

Summary of Groundwater Gage Results for Monitoring Years 1 through 7							
Gage	Success Criteria[2] Achieved/Max Consecutive Days During Growing Season (Percentage)						
	MY1	MY2	MY3	MY4	MY5	MY6	MY7
Reference	Yes/32 days (14.5%)	Yes/104 days (47.1%)	N/A	N/A	N/A		
1	Yes/25 days (11.3%)	Yes/54 days (24.4%)	Yes/23 days (10.4%)	Yes/34 days (15.4%)	Yes/48 days (21.7%)		
2	Yes/23 days (10.4%)	Yes/54 days (24.4%)	Yes/21 days (9.5%)	Yes/34 days (15.4%)	Yes/47 days (21.3%)		
3	Yes/24 days (10.9%)	Yes/54 days (24.4%)	Yes/23 days (10.4%)	Yes/39 days (17.6%)	Yes/57 days (25.8%)		
4[1]	Yes/115 days (52.0%)	N/A	N/A	N/A	N/A		
5	Yes/54 days (24.4%)	Yes/94 days (42.5%)	Yes/24 days (10.9%)	Yes/56 days (25.3%)	Yes/57 days (25.8%)		
6	Yes/23 days (10.4%)	Yes/26 days (11.8%)	No/11 days (5.0%)	Yes/22 days (10.0%)	Yes/40 days (18.1%)		
7	Yes/24 days (10.9%)	No/16 days (7.2%)	No/8 days (3.6%)	Yes/22 days (10.0%)	Yes/39 days (17.6%)		
8	Yes/54 days (24.4%)	Yes/54 days (24.4%)	No/12 days (5.4%)	Yes/22 days (10.0%)	Yes/48 days (21.7%)		
9	Yes/33 days (14.9%)	Yes/54 days (24.4%)	Yes/21 days (9.5%)	Yes/22 days (10.0%)	Yes/48 days (21.7%)		
10[1]	N/A	Yes/54 days (24.4%)	No/13 days (5.9%)	Yes/38 days (17.2%)	Yes/55 days (24.9%)		
11[3]	N/A	N/A	N/A	Yes/34 days (15.4%)	Yes/49 days (22.2%)		
12[3]	N/A	N/A	N/A	Yes/22 days (10.0%)	Yes/25 days (11.3%)		
13[3]	N/A	N/A	N/A	Yes/189 days (85.5%)	Yes/148 days (67.0%)		
14[3]	N/A	N/A	N/A	Yes/23 days (10.4%)	Yes/60 days (27.1%)		

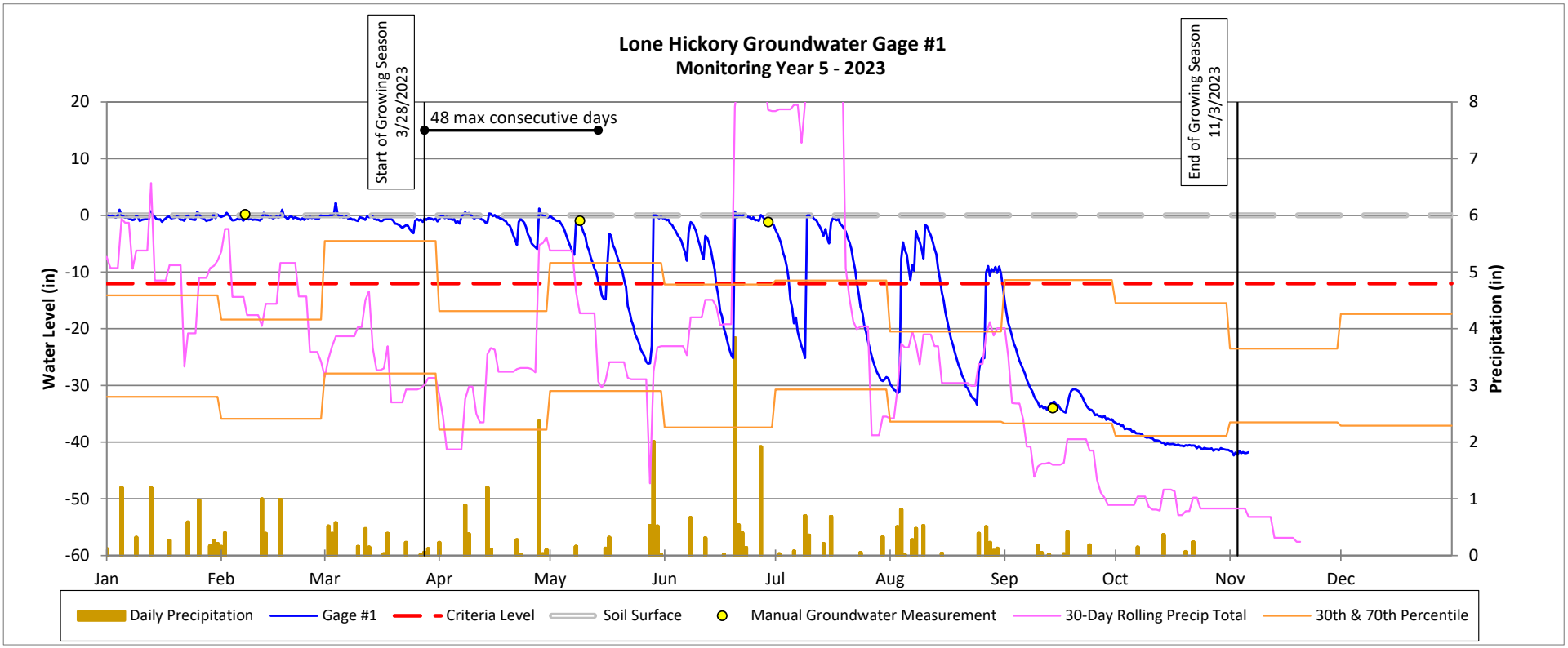
[1] GWG 10 was installed adjacent to GWG 4 but outside of the former ditch location at the end of October 2019. Reporting for GWG 10 begins in MY2 and GWG 4 will be omitted from future monitoring reports.

[2] The success criteria is 21 consecutive days, (9.2%) of the growing season (March 28 to November 3).

[3] GWG 11 - GWG 14 were installed on April 22, 2022.

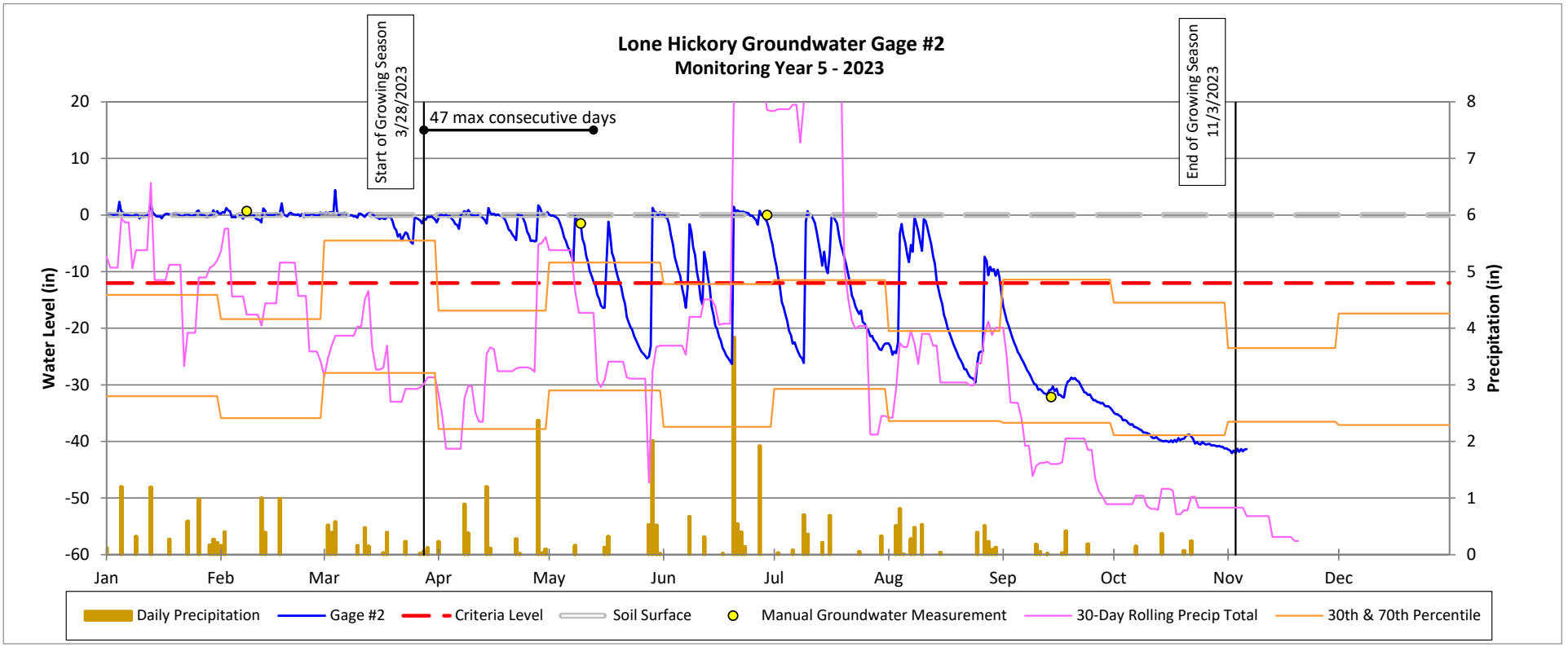
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



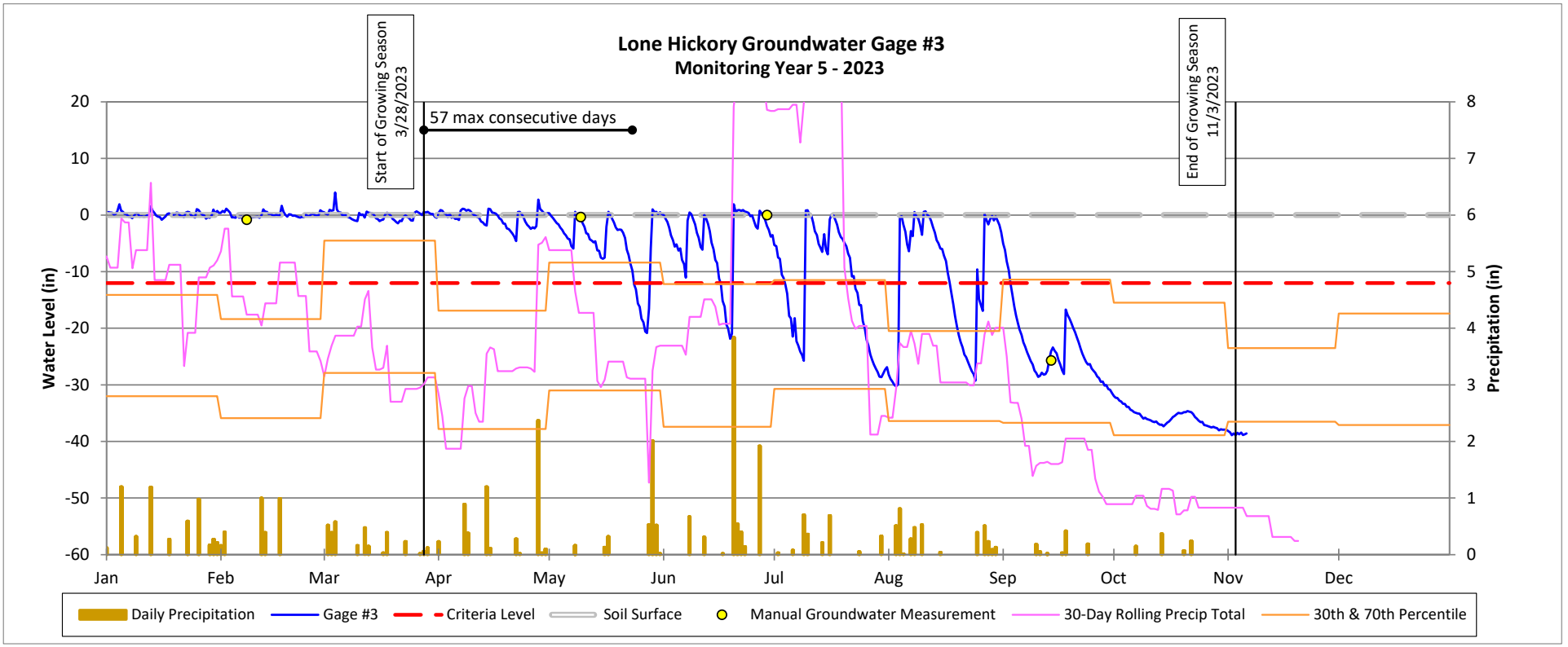
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



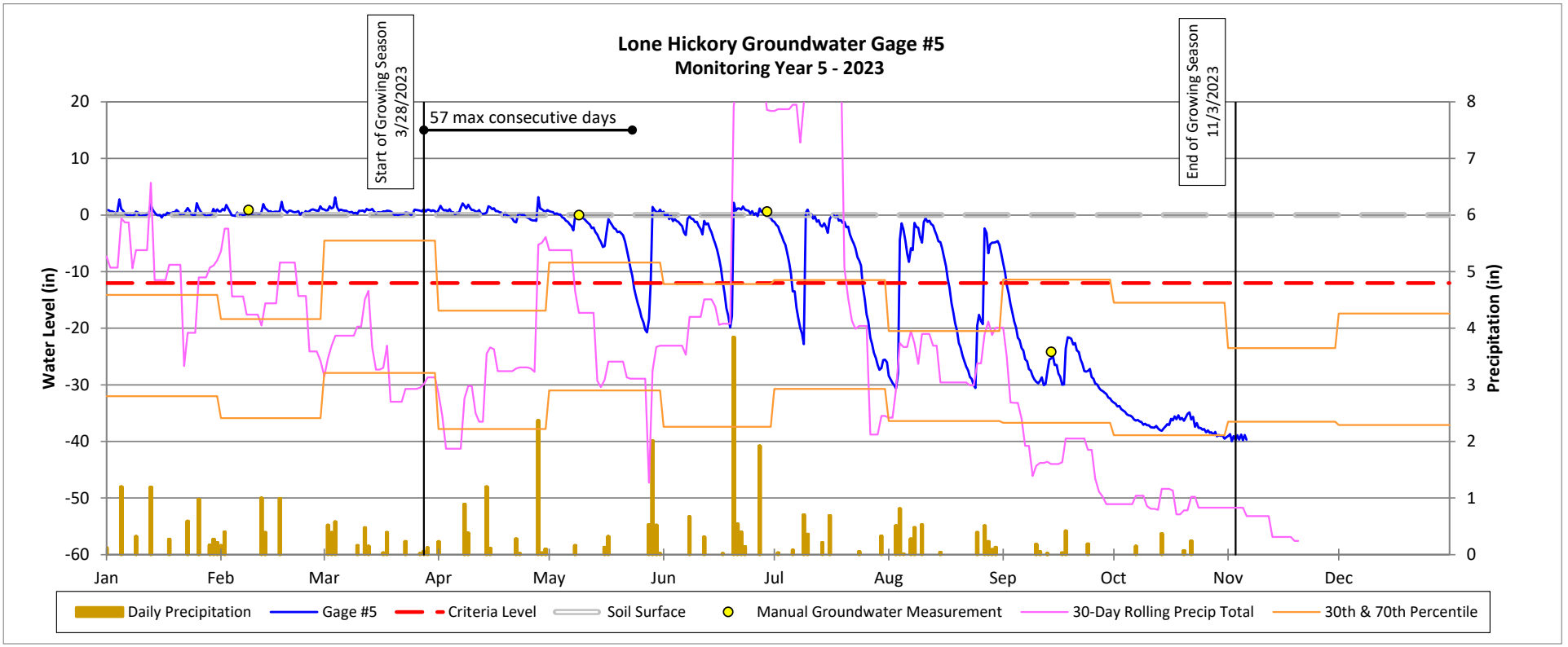
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



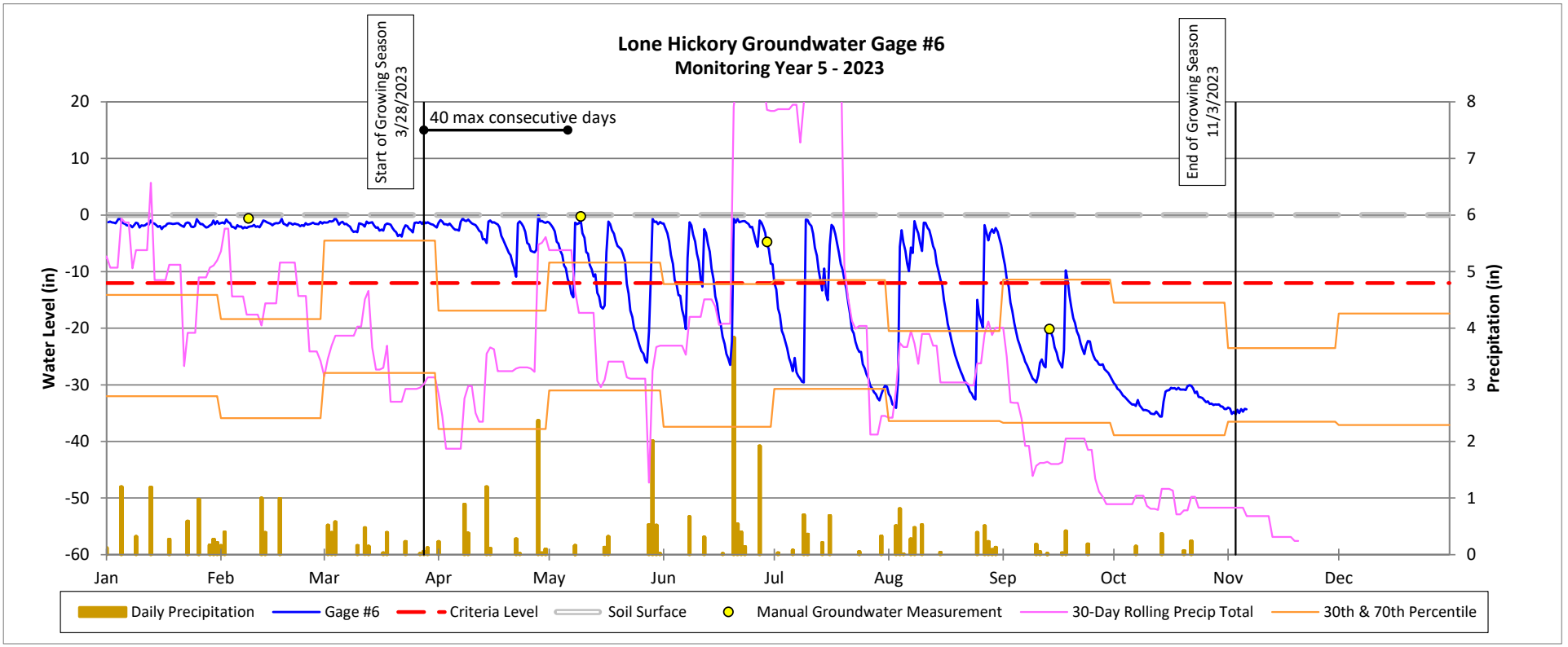
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



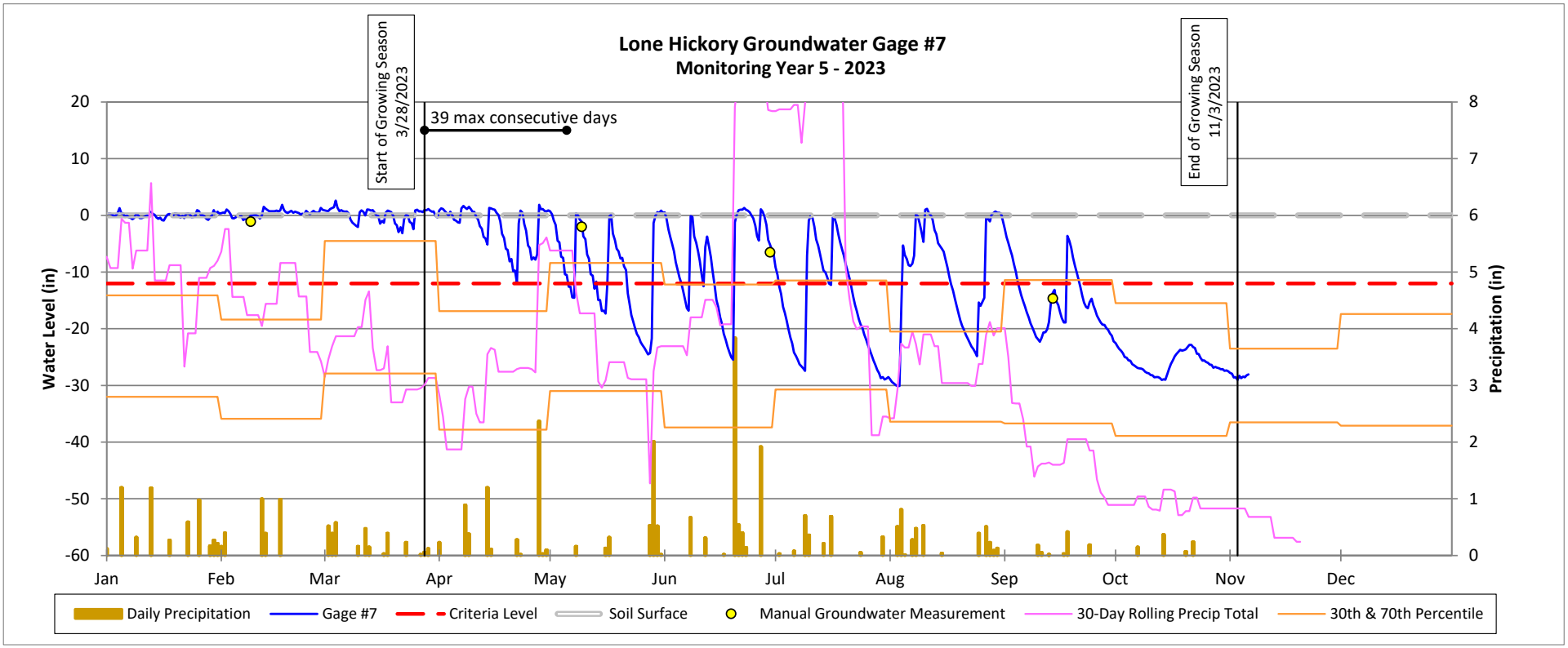
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



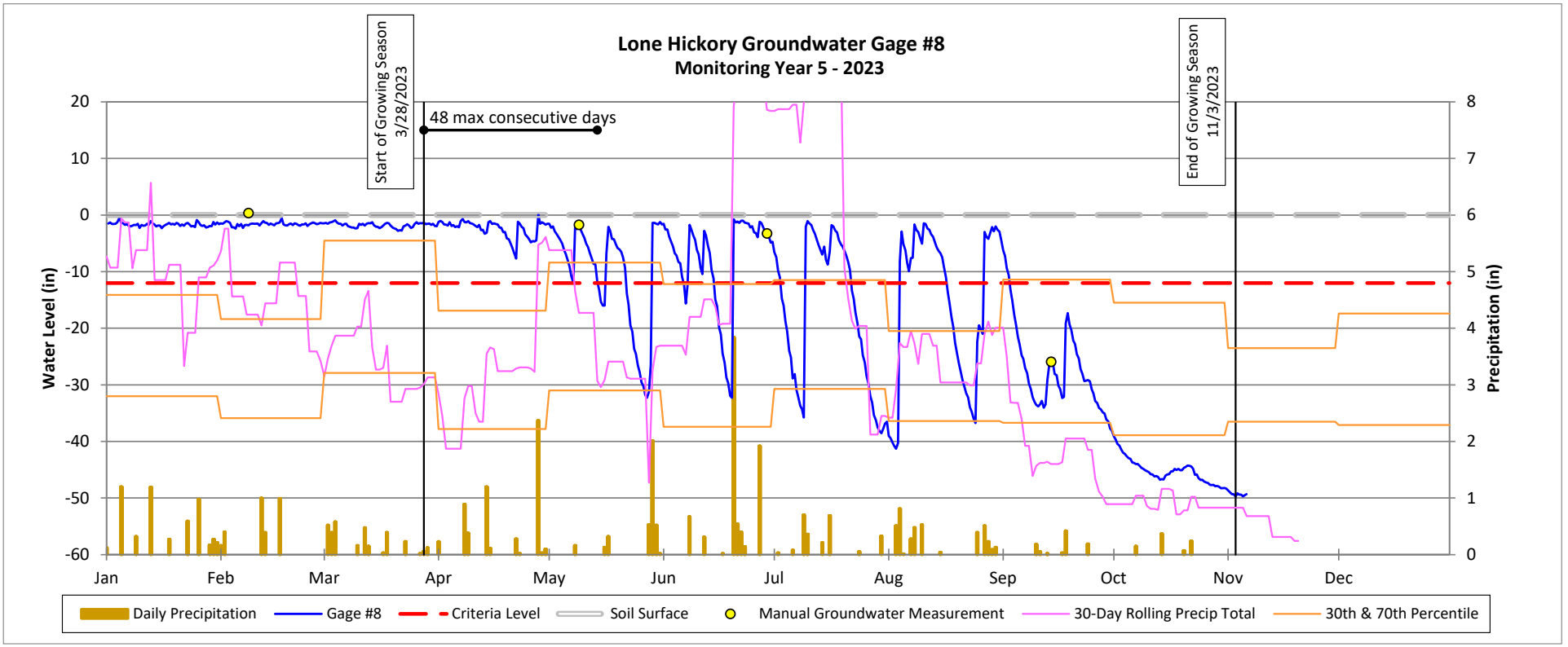
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



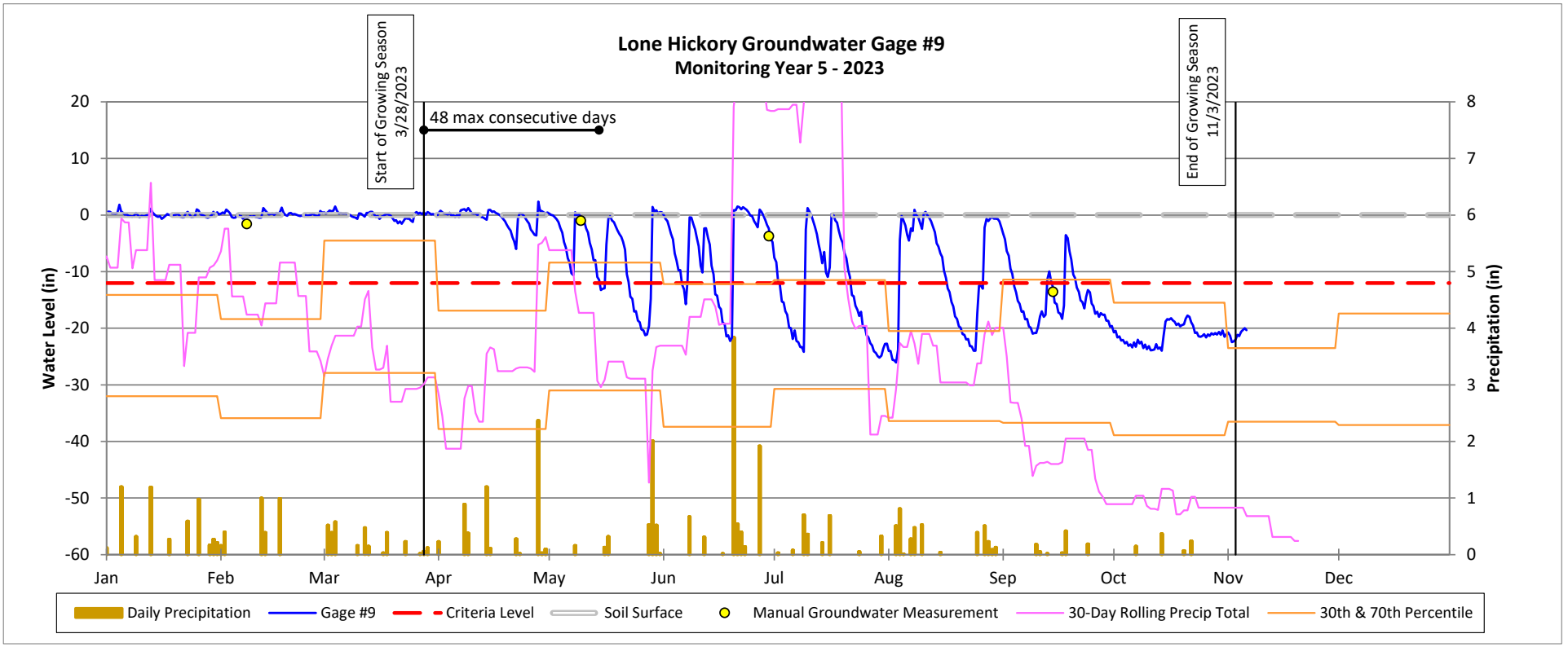
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



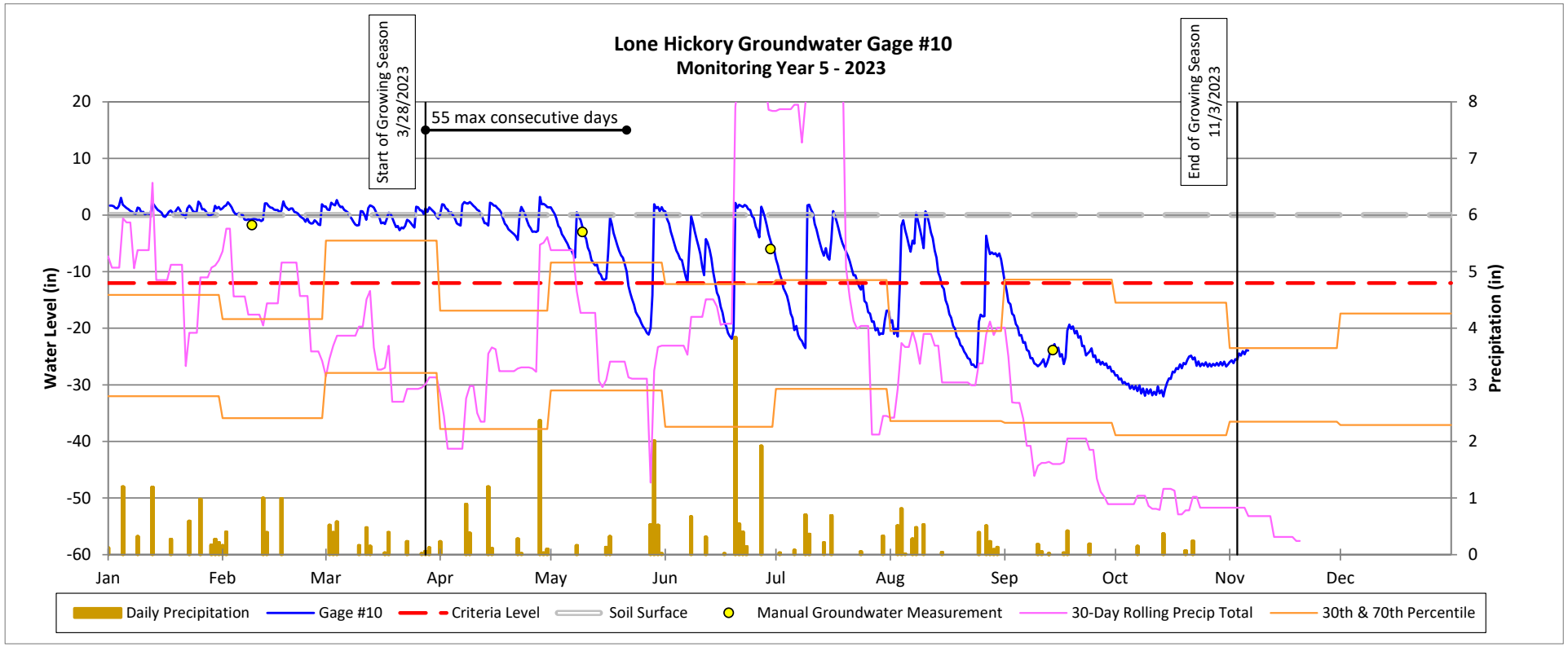
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



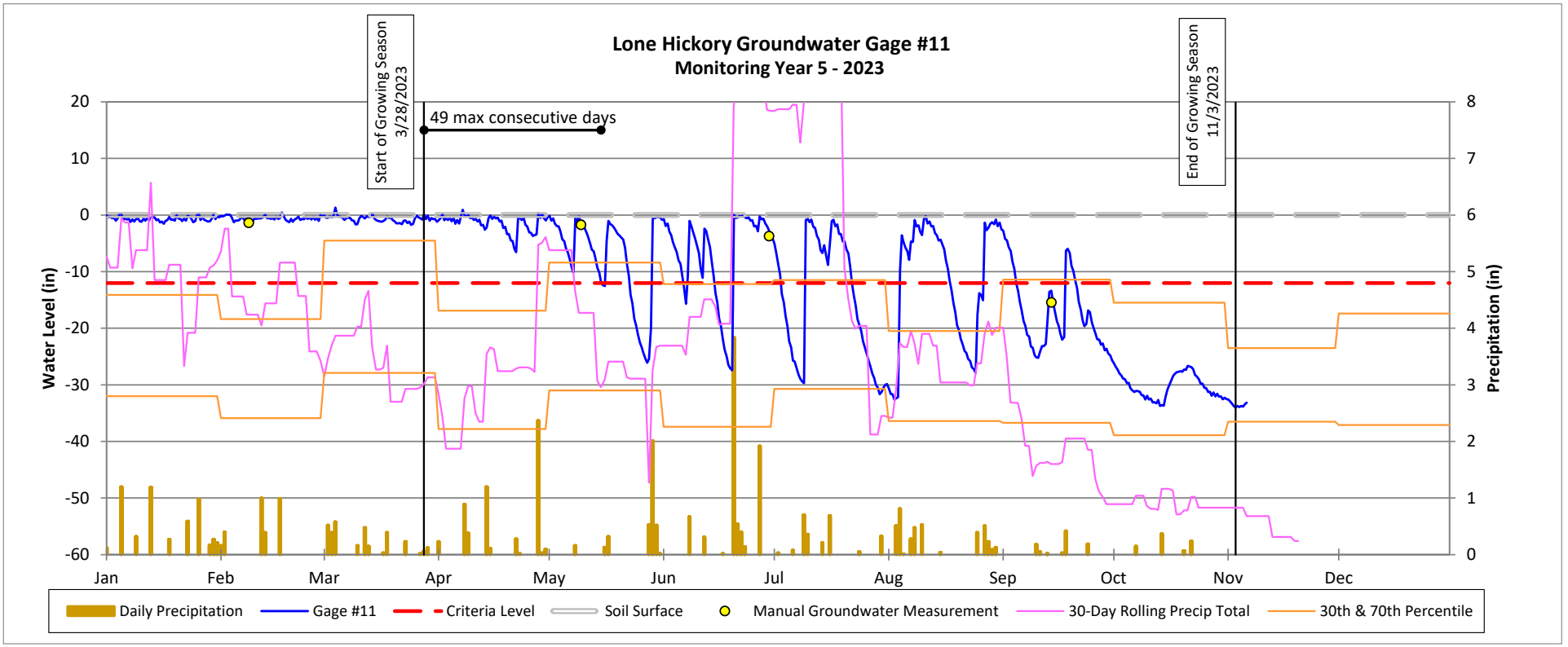
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



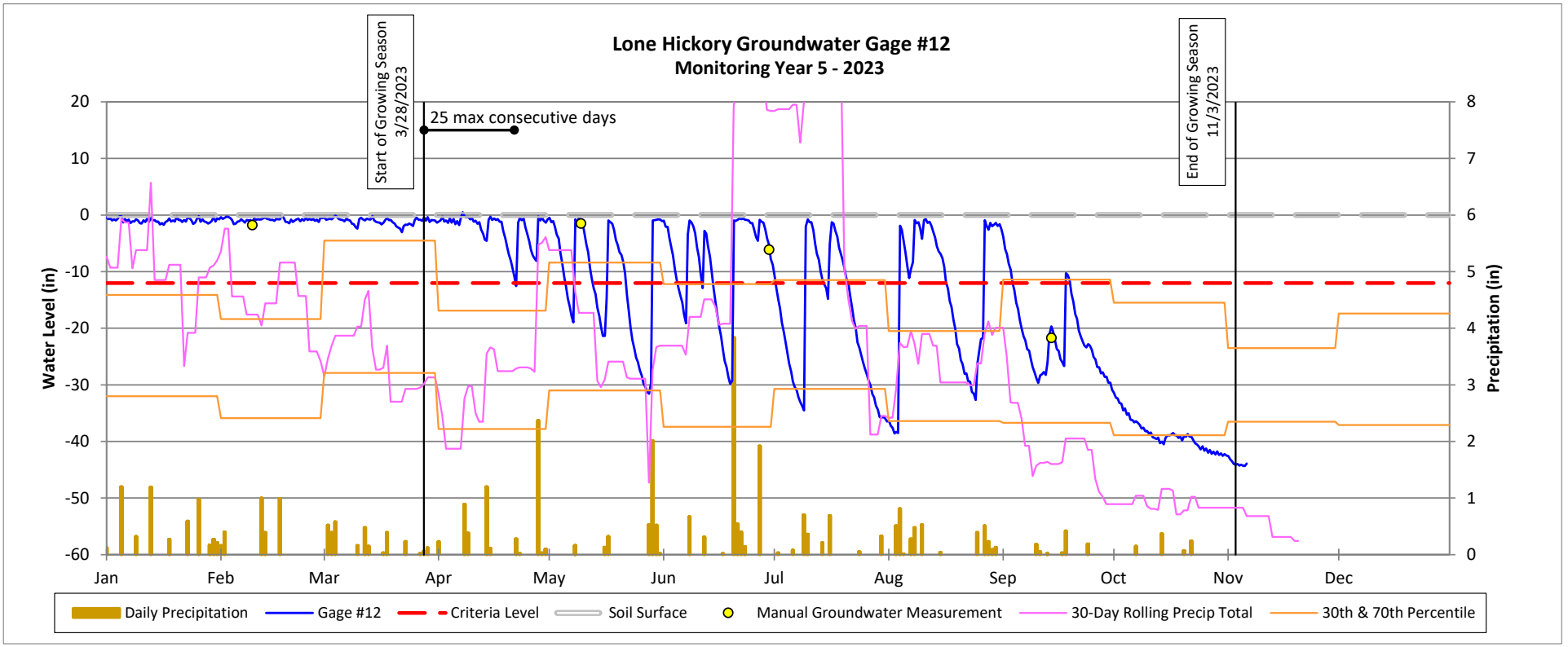
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



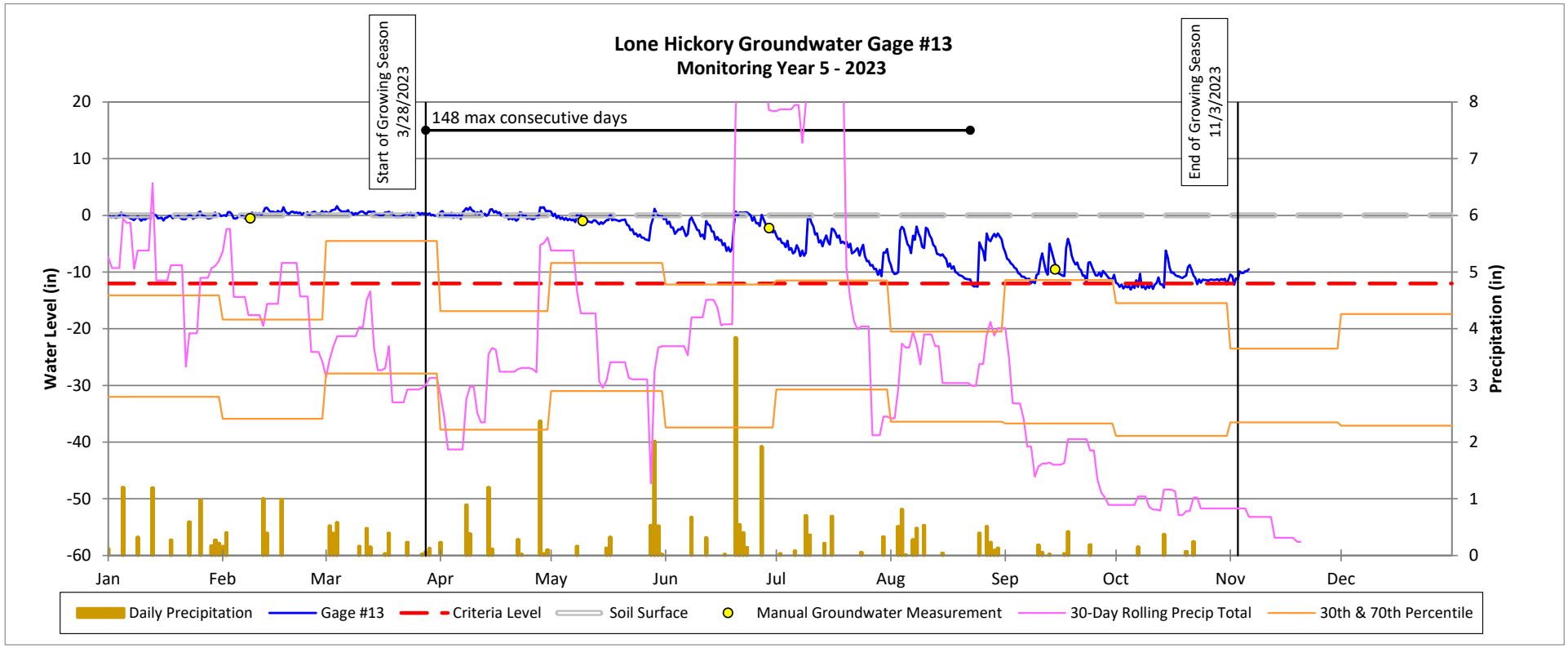
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Re-est



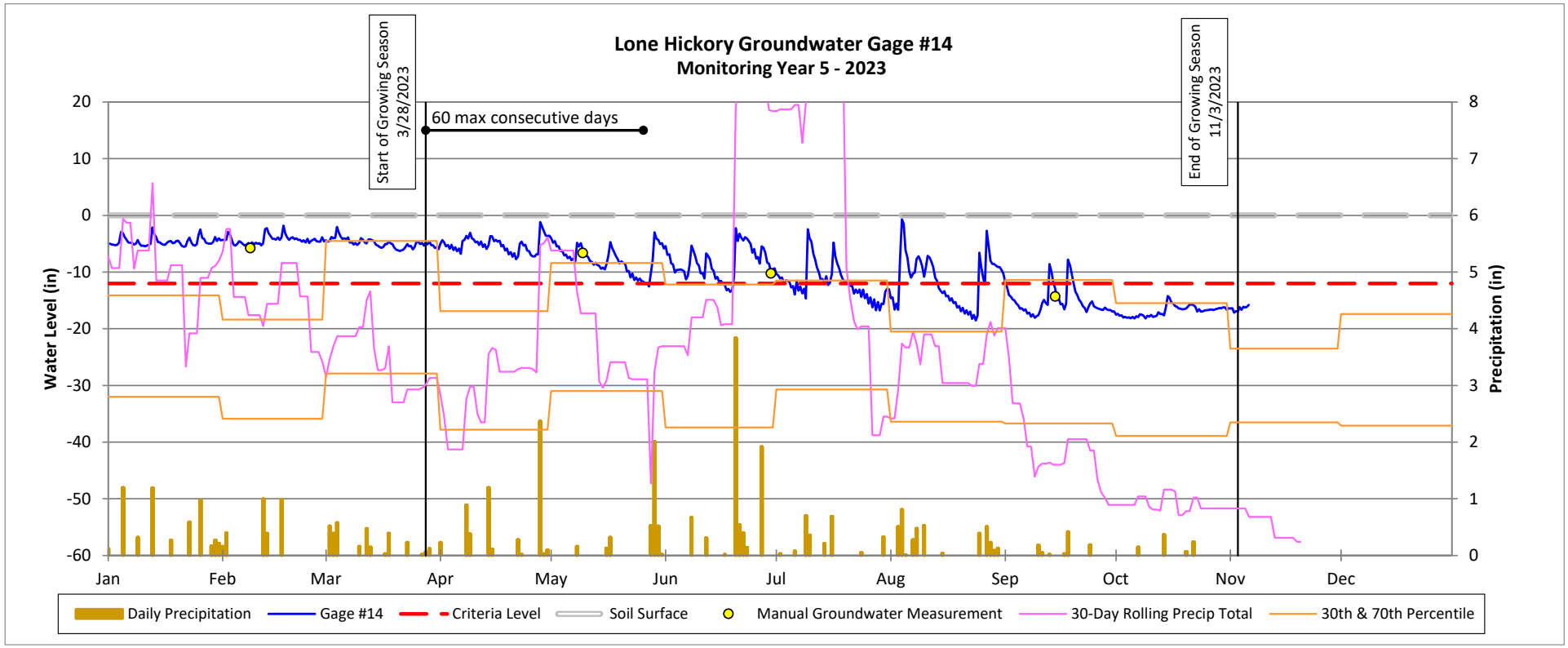
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Potential



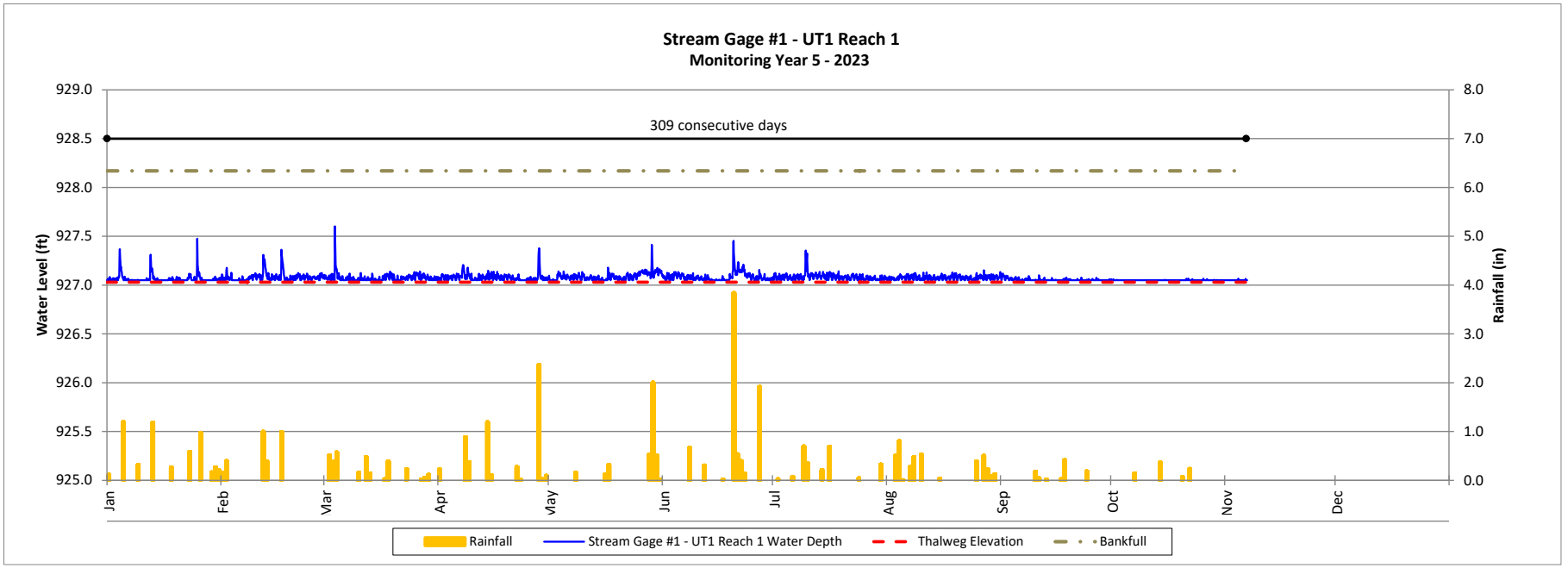
Groundwater Gage Plot

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023
Wetland Potential



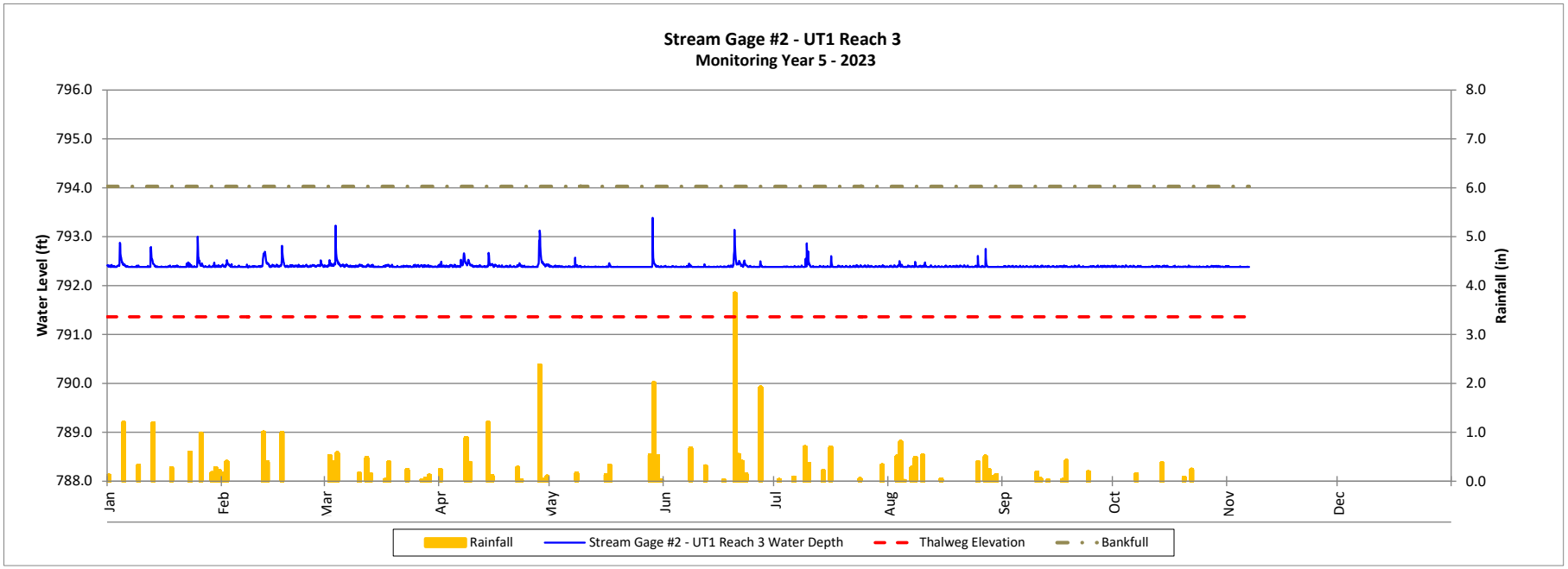
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023



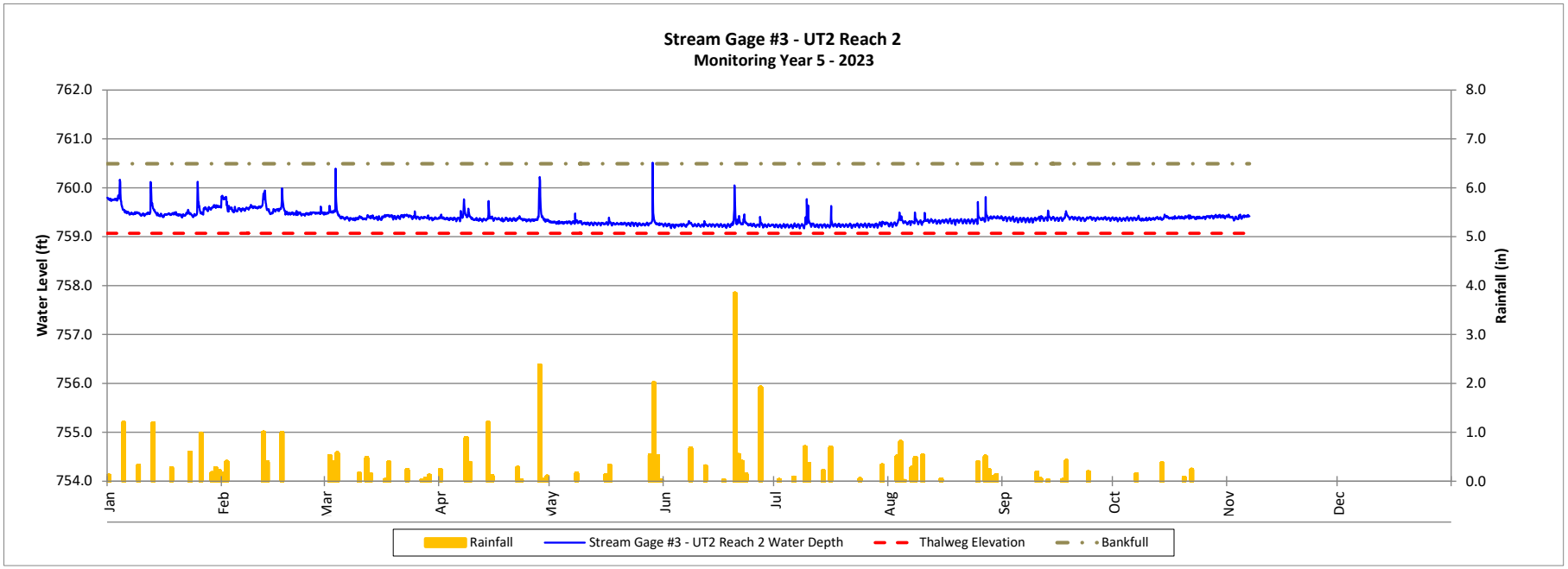
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023



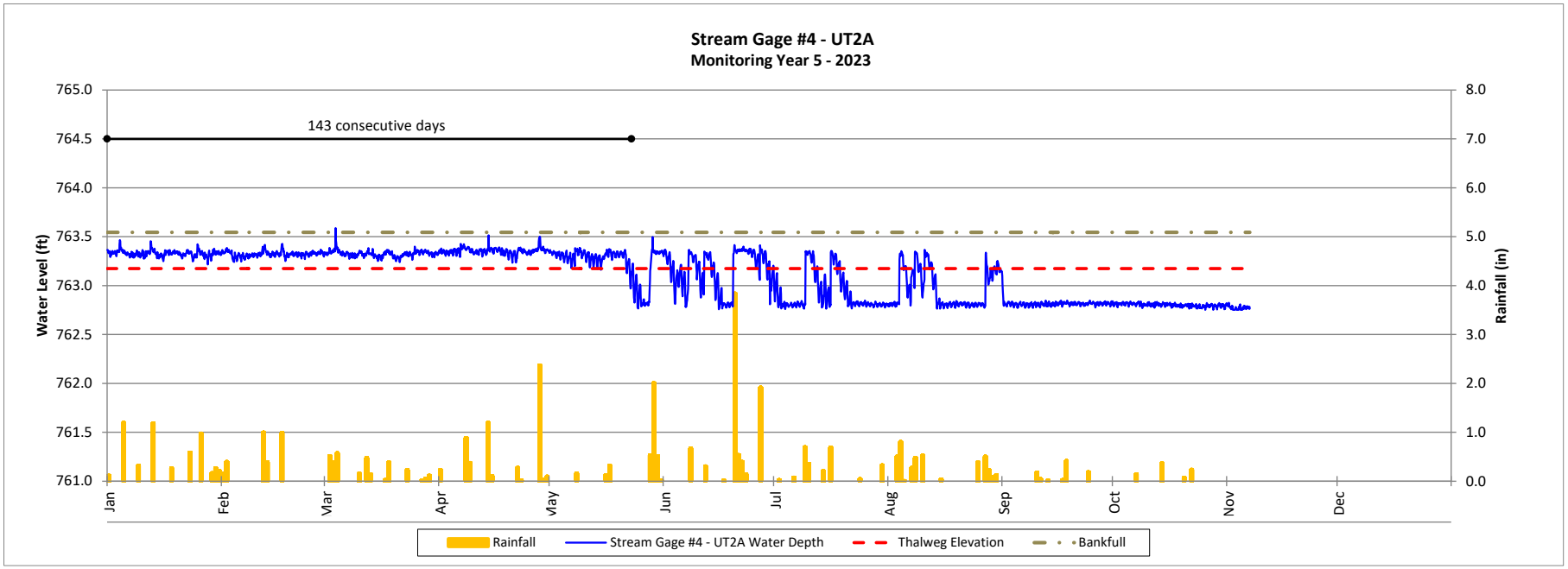
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023



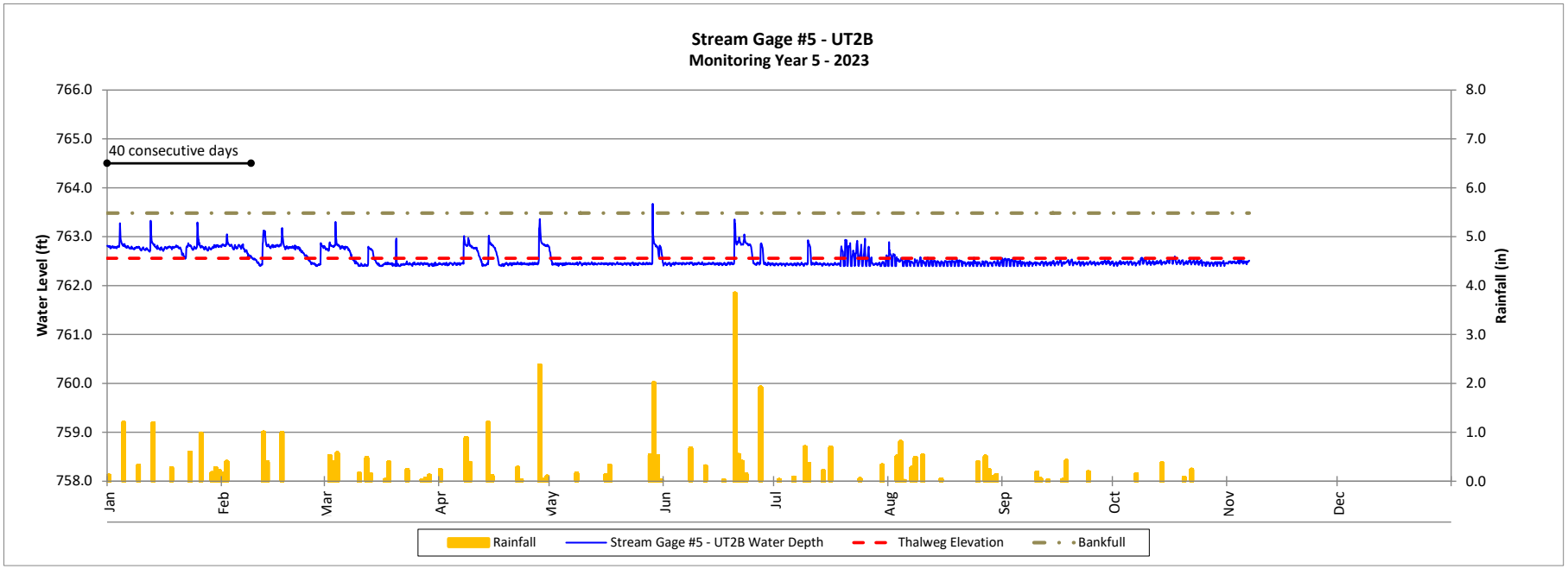
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023



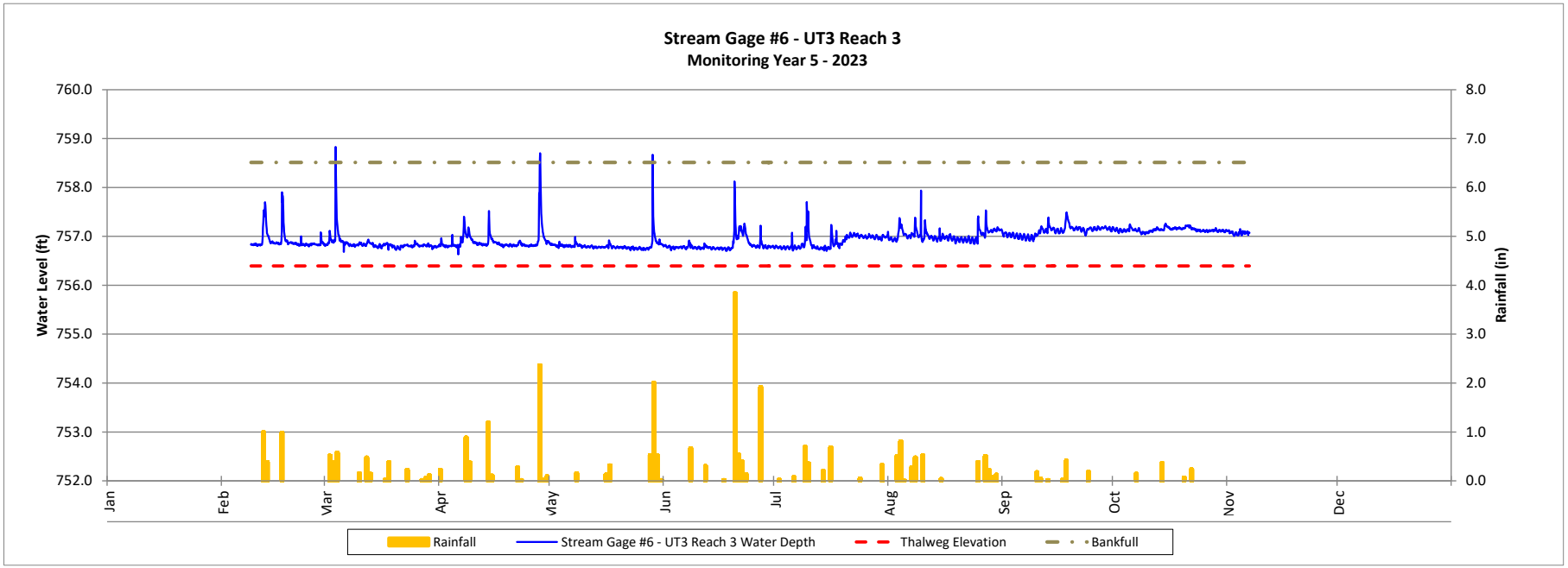
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023



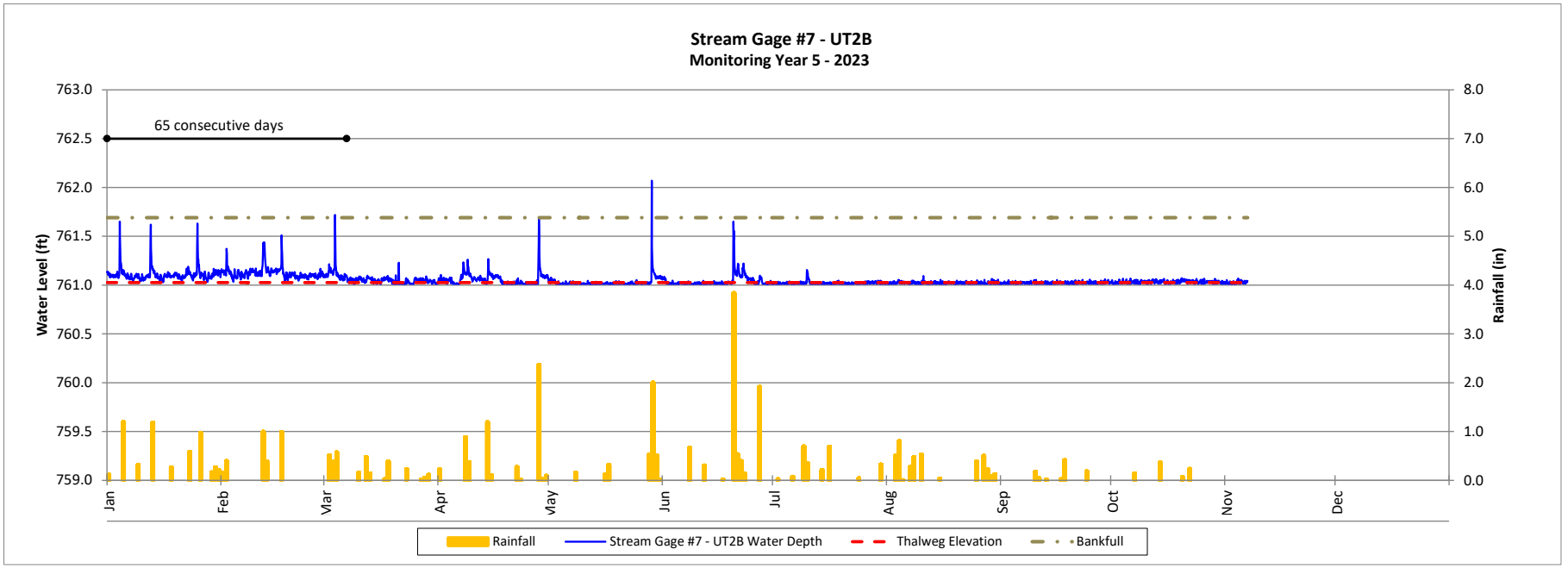
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023



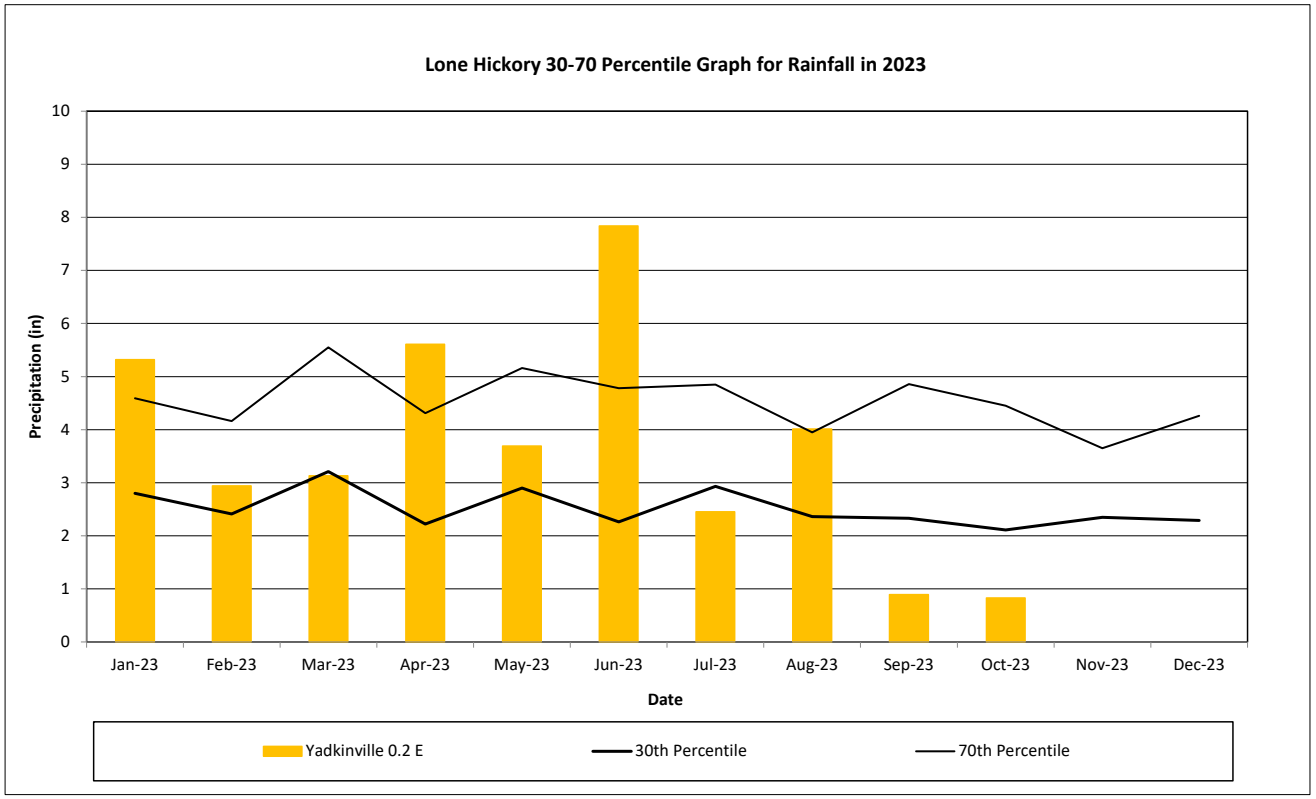
Stream Gage Plots

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023



Monthly Rainfall Data

Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023



2023 rainfall collected by NC CRONOS Station, Yadkinville 0.2 E, NC located 2.5 miles from the Site
30th and 70th percentile rainfall data collected from WETS station Yadkinville 6E

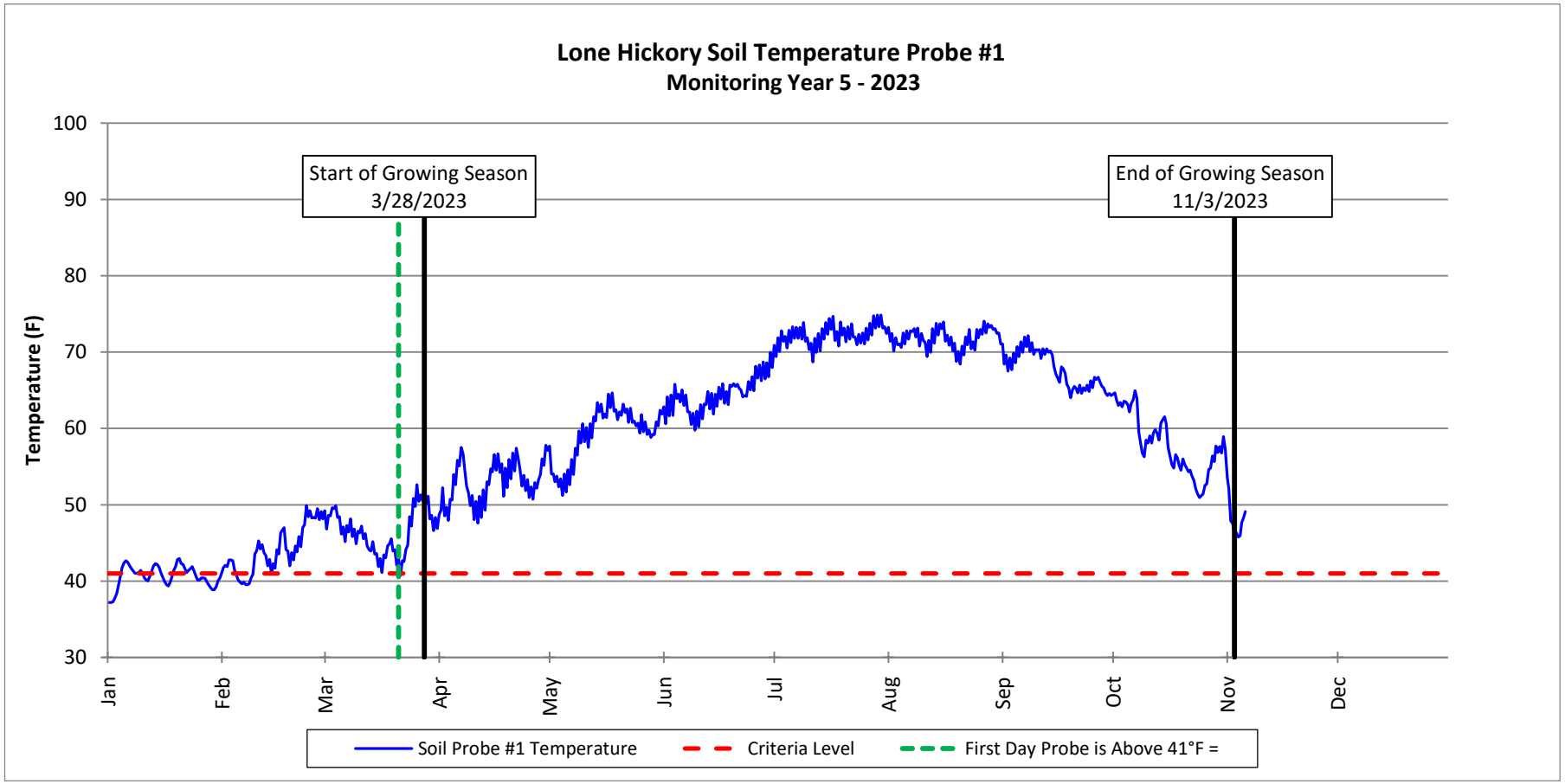
Soil Temperature Probe Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Wetland Re-est

Monitoring Year 5 - 2023



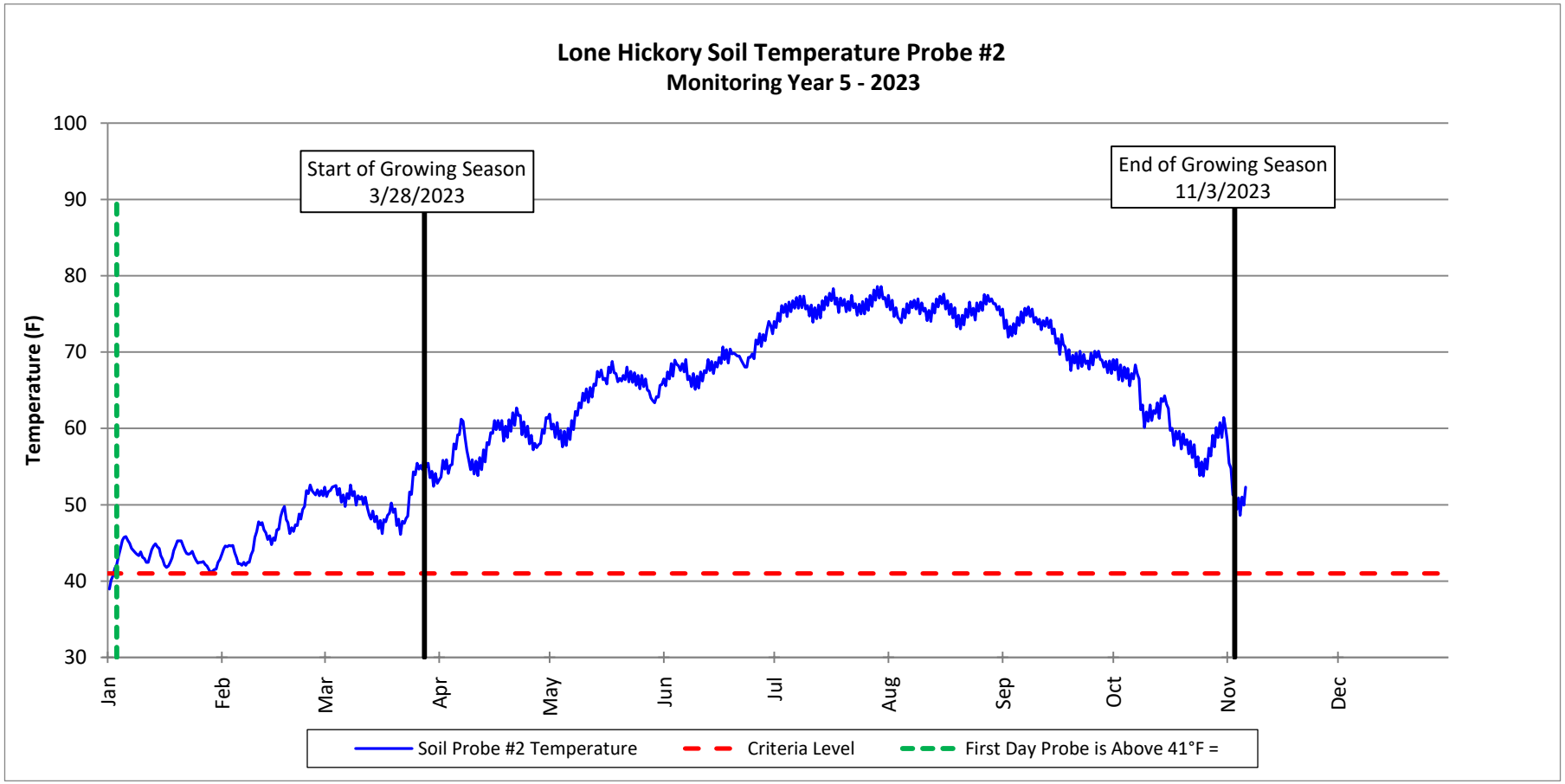
Soil Temperature Probe Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Wetland Re-est

Monitoring Year 5 - 2023



APPENDIX 6. Correspondence

From:	Haywood, Casey M CIV USARMY CESAW (USA)
To:	Wiesner, Paul
Cc:	Emily Reinicker; Mimi Caddell; Tugwell, Todd J CIV USARMY CESAW (USA); Isenhour, Kimberly T CIV USARMY CESAW (USA); Kichefski, Steven L CIV USARMY CESAW (USA); Davis, Erin B CIV USARMY CESAW (USA); Polizzi, Maria; Haupt, Mac; Youngman, Holland J; Bowers, Todd; Wilson, Travis W.; Munzer, Olivia; McHenry, David G
Subject:	RE: IRT Request to Modify (Extend) Growing Season: Lone Hickory Mitigation Site / SAW-2017-00100 / Yadkin County
Date:	Tuesday, October 3, 2023 7:42:44 AM

Good morning Paul,

The IRT is okay with Wildlands' request to change the project's growing season to March 28-Novemeber 03. Since soil temperature and vegetation indicators were documented for all monitoring years, we are also okay with the growing season being applied to all previous monitoring years as requested. We appreciate the additional documentation/data provided in the report to support the request. Please ensure these dates are used for the project moving forward as discussed during the NCDMS Credit Release meeting for consistency.

Thank you,
Casey

From: Haywood, Casey M CIV USARMY CESAW (USA) <Casey.M.Haywood@usace.army.mil>
Sent: Wednesday, September 20, 2023 9:55 AM
To: Tugwell, Todd J CIV USARMY CESAW (USA) <Todd.J.Tugwell@usace.army.mil>; Isenhour, Kimberly T CIV USARMY CESAW (USA) <Kimberly.T.Isenhour@usace.army.mil>; Kichefski, Steven L CIV USARMY CESAW (USA) <Steven.L.Kichefski@usace.army.mil>; Davis, Erin B CIV USARMY CESAW (USA) <Erin.B.Davis@usace.army.mil>; Polizzi, Maria <maria.polizzi@deq.nc.gov>; Haupt, Mac <mac.haupt@deq.nc.gov>; Youngman, Holland J <holland_youngman@fws.gov>; Bowers, Todd <bowers.todd@epa.gov>; Wilson, Travis W. <travis.wilson@ncwildlife.org>; Munzer, Olivia <olivia.munzer@ncwildlife.org>; McHenry, David G <david.mchenry@ncwildlife.org>
Subject: IRT Request to Modify (Extend) Growing Season: Lone Hickory Mitigation Site / SAW-2017-00100 / Yadkin County

Good morning IRT,

At the April 17, 2023, credit release meeting, the IRT requested that additional documentation be emailed to the IRT if a growing season change was proposed on the Lone Hickory Mitigation site. Please let me know your thoughts or concerns by **Oct 02, 2023**.

Wildlands Engineering, Inc. is requesting a change of the project's growing season as follows:

- Original growing season dates: April 4 through October 27
- Revised growing season dates: March 28 through November 3

The attached letter documents data collected over the past five monitoring years which supports Wildlands request to extend the project's growing season.

If approved, the attached request document will be included in an Appendix and the MY5 (2023) report will be updated accordingly.

Project information is as follows:
Lone Hickory Mitigation Site
DMS Project # 97135
Institution Date: 5/23/2016
RFP# 16-006706 (Issued: 10/21/2015)
Yadkin River Basin
Cataloging Unit 03040101
Yadkin County, North Carolina
USACE Action ID: SAW-2017-00100
DWR# 2016-1044v1

Proposed Mitigation Project Credits:
13,164.574 SMUs (warm)
9.5 WMUs (riparian)

Full Delivery Provider: Wildlands Engineering, Inc.
Contact: Emily Reinicker, PE, CFM, ereinicker@wildlandseng.com , O: 704.332.7754 x106 M: 704.965.7834

NCDEQ - DMS Project Manager: Paul Wiesner, paul.wiesner@deq.nc.gov, (828) 273-1673

USACE POCs: USACE Bank Manager: Steve Kichefski Steven.L.Kichefski@usace.army.mil
USACE Mitigation Specialist: Casey Haywood Casey.M.Haywood@usace.army.mil

Thank you,
Casey

Casey Haywood
Mitigation Specialist, Regulatory Division
U.S. Army Corps of Engineers, Wilmington District
(919) 750-7397 work cell

September 11, 2023

Mr. Paul Wiesner
Western Regional Supervisor
NCDEQ – Division of Mitigation Services
Asheville Regional Office
2090 U.S. 70 Highway
Swannanoa, N.C. 28778-8211

Subject: Request to modify the growing season
Lone Hickory Mitigation Site
Yadkin River Basin – CU# 03040101 – Yadkin County
DMS Project ID No. 97135
Contract # 6897

Dear Mr. Wiesner,

Wildlands Engineering, Inc. (Wildlands) has analyzed data over the past five monitoring years (MY1 – MY5) that supports modifying the start and end of the growing season for the Lone Hickory Mitigation Site (Site). Additional supplemental data including overlayed soil temperature plots, photo log of vegetation indicators, gage map figure, and summary tables have been included with this letter.

Background
In the Lone Hickory Site's Final Mitigation Plan (2017), the original growing season dates (April 4 through October 27) were defined by the Yadkinville 6E North Carolina WETS table for 50% probability of soil temperatures greater than 28 degrees Fahrenheit. The original performance standard for wetland hydrology was defined as a free groundwater surface 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.

Data Collection and Analysis
Beginning in late-March 2019 (MY0/MY1), Wildlands installed two soil temperature probes to continuously measure the soil temperature at 12 inches below the ground surface at the Site. For all monitoring years (MY) thus far, the soil temperature for both probes has been consistently above 41 degrees Fahrenheit by mid to late March, well before the original growing season start date (April 4). Please refer to attached plots for overlays of annual soil temperature data for each soil probe.

In addition, Wildlands has documented the vegetation indicators around the beginning and end of the growing season for the past monitoring years. These photos are meant to verify that the growing season has already started and were not necessarily taken at the exact start or end of the growing season. See the attached photo log of vegetation indicators and Table 1 for a summary of indicators documented in MY1 through MY5.

Conclusion

The Stream and Wetland Mitigation Guidance issued in October 2016 by the NCIRT allows for alternative methods to determine growing season based on soil temperature and vegetation indicators. As demonstrated by the monitoring data thus far, the soil temperature for the site has been consistently greater than 41 degrees Fahrenheit more than a week before the start and end of the growing season that was originally defined by the Yadkinville 6E North Carolina WETS table. The documented vegetation indicators (blooming, leaf-out, bud burst, leaf-drop, leaf senescence) have corroborated this data.

Wildlands requests the Site's growing season be extended by two weeks to begin a week earlier on March 28 and end a week later on November 3. Therefore, the success criteria would be 21 consecutive days (9.2%) of the growing season (March 28 through November 3). Since soil temperature and vegetation indicators have been documented for all monitoring years, Wildlands also requests that the change in growing season be retroactive and be applied to all previous years to keep the standard consistent for the entirety of the project. With the approval of these requests, Wildlands will carry this extended growing season forward and will continue to document soil temperature conditions and vegetation indicators through closeout.

Sincerely,

Mimi Caddell
Environmental Scientist

Attachments:

1) Soil temperature plots (MY1 – MY5)
2) Table 1. Vegetation Indicators Summary
3) Vegetation Indicators Photographs (MY1 – MY5)
4) Table 2. Wetland Gage Attainment Summary
5) Figure 1 – Gage Map

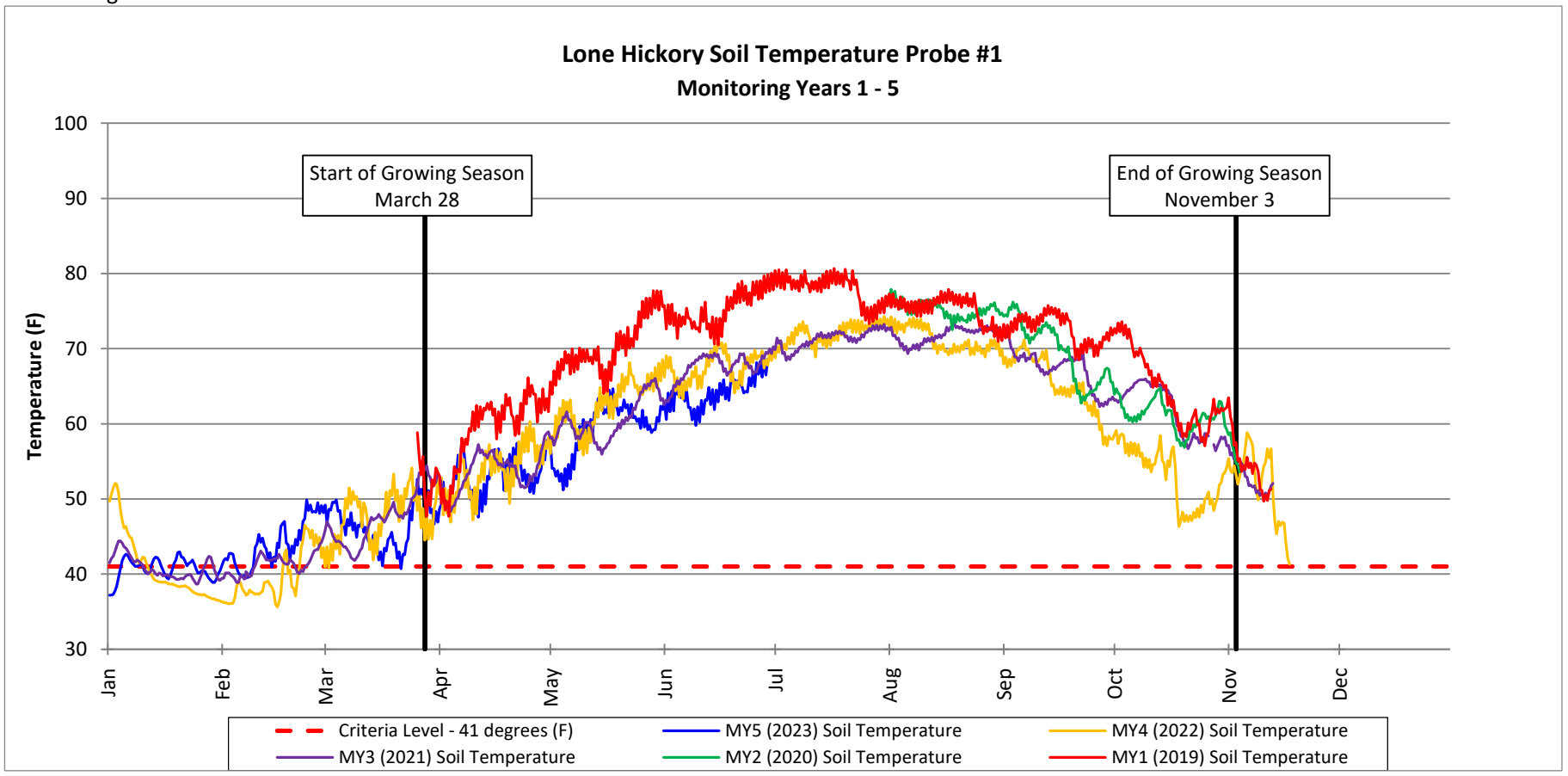
Soil Temperature Probe Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Wetland Re-est

Monitoring Year 5 - 2023



- Probe malfunction in MY2 (2020) which caused a loss of data

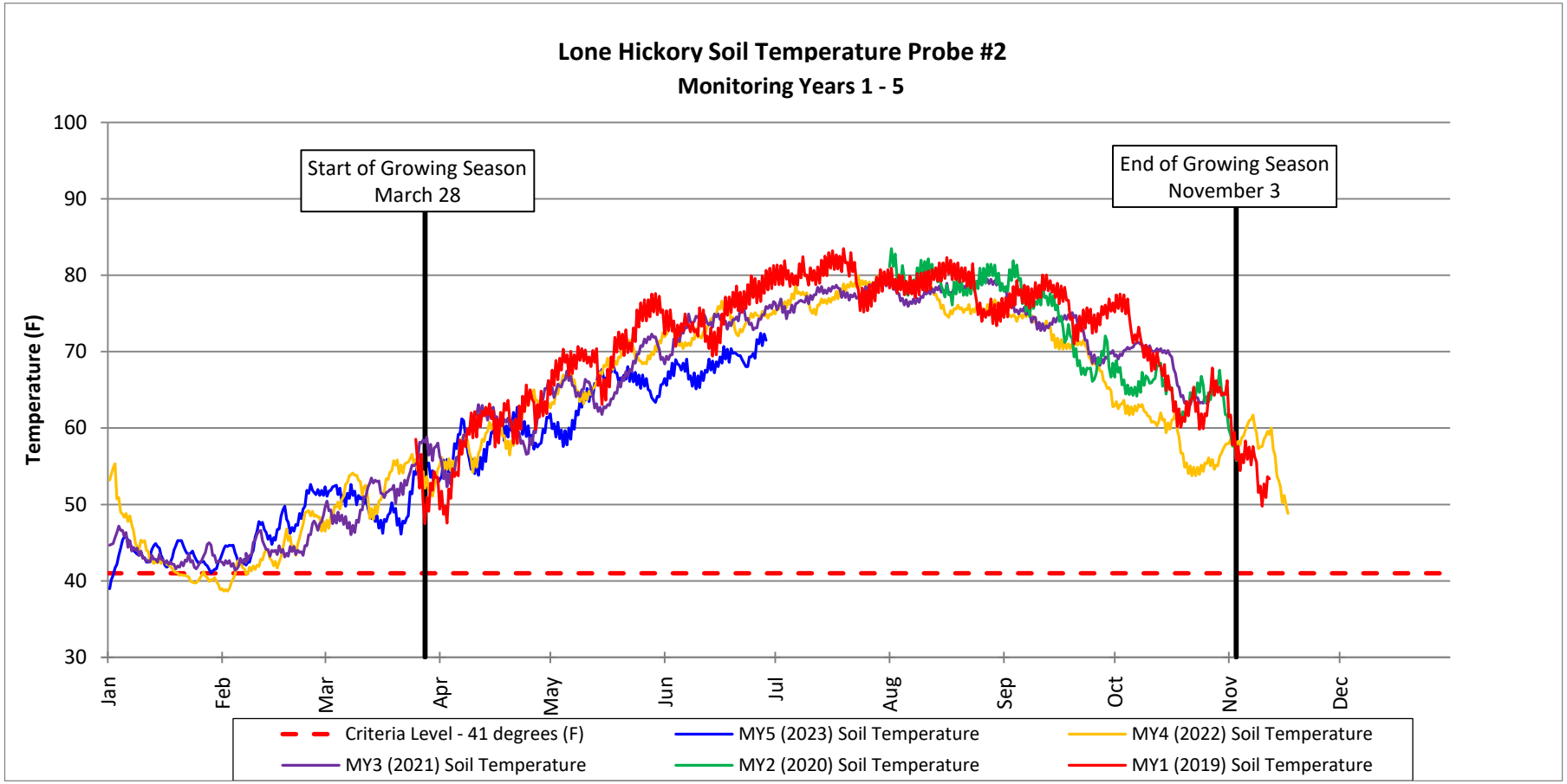
Soil Temperature Probe Plots

Lone Hickory Mitigation Site

DMS Project No. 97135

Wetland Re-est

Monitoring Year 5 - 2023



- Probe malfunction in MY2 (2020) which caused a loss of data

Table 1. Vegetation Indicators Summary

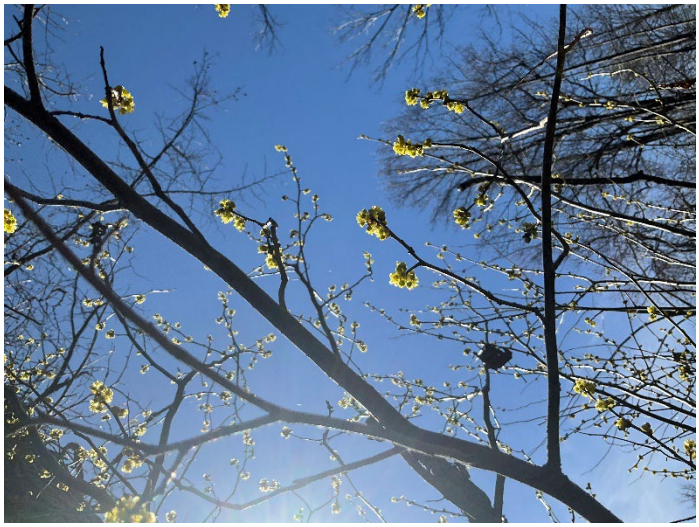
Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 5 - 2023

Monitoring Year	Type of Vegetative Indicator	Species	Date of Documentation
MY5	Bud burst/leaf-out	Spice bush (*Lindera benzoin*), Elderberry (*Sambucus canadensis*)	3/7/2023
MY4	Leaf senescence/drop	Multiple canopy and sapling tree species including sycamore (*Platanus occidentalis*), black willow (*Salix nigra*)	11/1/2022
MY4	Blooming/leaf out	River birch *(Betula nigra*), Red Bud (*Cercis canadensis*)	3/30/2022
MY3	Beginning of Leaf senescence/drop	Multiple canopy and sapling tree species including sycamore (*Platanus occidentalis*), box elder (*Acer negundo*)	10/27/2021
MY3	Bud burst/leaf-out	Black willow (*Salix nigra*), Cottonwood (Populus deltoides)	4/2/2021
MY2	Leaf senescence/drop	Multiple canopy and sapling tree species including sycamore (*Platanus occidentalis*), American beech (*Fagus grandifolia*)	11/5/2020
MY2	Beyond Leaf-out	Black willow (Salix nigra)	4/8/2020
MY1	Beyond Leaf senescence/drop	Multiple canopy species	11/12/2019
MY0/MY1	Blooming/leaf-out	Red Bud (*Cercis canadensis*)	4/5/2019

Vegetation Indicators Photographs
MY1-MY5



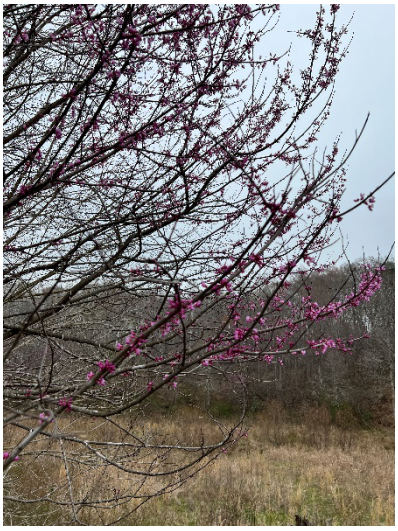
MY5: Spice Bush Bud Burst Documentation – *(3/07/2023)*

MY5: Elderberry Leaf-out Documentation – *(3/07/2023)*

MY4: Leaf Senescence Documentation – *(11/01/2022)*

MY4: Leaf Senescence Documentation – *(11/01/2022)*

MY4: River Birch Leaf Out Documentation – *(3/30/2022)*



MY4: Red Bud Blooming Documentation – *(3/30/2022)*

MY3: Begin Leaf Senescence Documentation – *(10/27/2021)*

MY3: Willow Bud Burst Documentation – *(04/02/2021)*

MY3: Cottonwood Leaf Out Documentation – *(04/02/2021)*

MY2: Leaf Senescence Documentation – *(11/05/2020)*

MY2: Leaf Senescence Documentation – *(11/05/2020)*

MY2: Willow Beyond Leaf-out Documentation – *(04/08/2020)*

	
MY1: Beyond Leaf Senescence Documentation – *(11/12/2019)*	**MY0/MY1: Red bud Blooming Documentation –** *(04/05/2019)*

Table 2. Wetland Gage Attainment Summary

Lone Hickory Mitigation Site

DMS Project No. 97135

Monitoring Year 5 - 2023

Summary of Groundwater Gage Results for Monitoring Years 1 through 7												
Gage	Success Criteria[2] Achieved/Max Consecutive Days During Growing Season (Percentage)											
	MY1		MY2		MY3		MY4		MY5 [5]		MY6	MY7
	Original	Extended[3]	Original	Extended[3]	Original	Extended[3]	Original	Extended[3]	Original	Extended[3]		
Reference	Yes/25 days (12.1%)	Yes/32 days (14.5%)	Yes/97 days (46.9%)	Yes/104 days (47.1%)	N/A	N/A	N/A	N/A	N/A	N/A		
1	Yes/25 days (12.1%)	Yes/25 days (11.3%)	Yes/46 days (22.2%)	Yes/54 days (24.4%)	No/16 days (7.7%)	Yes/23 days (10.4%)	Yes/27 days (13.0%)	Yes/34 days (15.4%)	Yes/41 days (19.8%)	Yes/48 days (21.7%)		
2	Yes/23 days (11.1%)	Yes/23 days (10.4%)	Yes/46 days (22.2%)	Yes/54 days (24.4%)	No/14 days (6.8%)	Yes/21 days (9.5%)	Yes/27 days (13.0%)	Yes/34 days (15.4%)	Yes/40 days (19.3%)	Yes/47 days (21.3%)		
3	Yes/24 days (11.6%)	Yes/24 days (10.9%)	Yes/46 days (22.2%)	Yes/54 days (24.4%)	Yes/22 days (10.6%)	Yes/23 days (10.4%)	Yes/39 days (18.8%)	Yes/39 days (17.6%)	Yes/50 days (24.2%)	Yes/57 days (25.8%)		
4 [1]	Yes/109 days (52.7%)	Yes/115 days (52.0%)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		
5	Yes/48 days (23.2%)	Yes/54 days (24.4%)	Yes/86 days (41.5%)	Yes/94 days (42.5%)	Yes/22 days (10.6%)	Yes/24 days (10.9%)	Yes/56 days (27.1%)	Yes/56 days (25.3%)	Yes/50 days (24.2%)	Yes/57 days (25.8%)		
6	Yes/23 days (11.1%)	Yes/23 days (10.4%)	Yes/26 days (12.6%)	Yes/26 days (11.8%)	No/10 days (4.8%)	No/11 days (5.0%)	No/15 days (7.3%)	Yes/22 days (10.0%)	Yes/33 days (15.9%)	Yes/40 days (18.1%)		
7	Yes/24 days (11.6%)	Yes/24 days (10.9%)	No/16 days (7.7%)	No/16 days (7.2%)	No/4 days (1.9%)	No/8 days (3.6%)	No/15 days (7.3%)	Yes/22 days (10.0%)	Yes/32 days (15.5%)	Yes/39 days (17.6%)		
8	Yes/48 days (23.2%)	Yes/54 days (24.4%)	Yes/46 days (22.2%)	Yes/54 days (24.4%)	No/11 days (5.3%)	No/12 days (5.4%)	Yes/20 days (9.7%)	Yes/22 days (10.0%)	Yes/41 days (19.8%)	Yes/48 days (21.7%)		
9	Yes/26 days (12.6%)	Yes/33 days (14.9%)	Yes/46 days (22.2%)	Yes/54 days (24.4%)	No/14 days (6.8%)	Yes/21 days (9.5%)	Yes/19 days (9.2%)	Yes/22 days (10.0%)	Yes/41 days (19.8%)	Yes/48 days (21.7%)		
10 [1]	N/A	N/A	Yes/46 days (22.2%)	Yes/54 days (24.4%)	No/11 days (5.3%)	No/13 days (5.9%)	Yes/38 days (18.4%)	Yes/38 days (17.2%)	Yes/48 days (23.2%)	Yes/55 days (24.9%)		
11 [4]	N/A	N/A	N/A	N/A	N/A	N/A	Yes/27 days (13.0%)	Yes/34 days (15.4%)	Yes/42 days (20.3%)	Yes/49 days (22.2%)		
12 [4]	N/A	N/A	N/A	N/A	N/A	N/A	Yes/19 days (9.2%)	Yes/22 days (10.0%)	No/18 days (7.3%)	Yes/25 days (11.3%)		
13 [4]	N/A	N/A	N/A	N/A	N/A	N/A	Yes/116 days (56.3%)	Yes/189 days (85.5%)	Yes/86 days (41.5%)	Yes/93 days (42.1%)		
14 [4]	N/A	N/A	N/A	N/A	N/A	N/A	Yes/20 days (9.7%)	Yes/23 days (10.4%)	Yes/53 days (25.6%)	Yes/60 days (27.1%)		

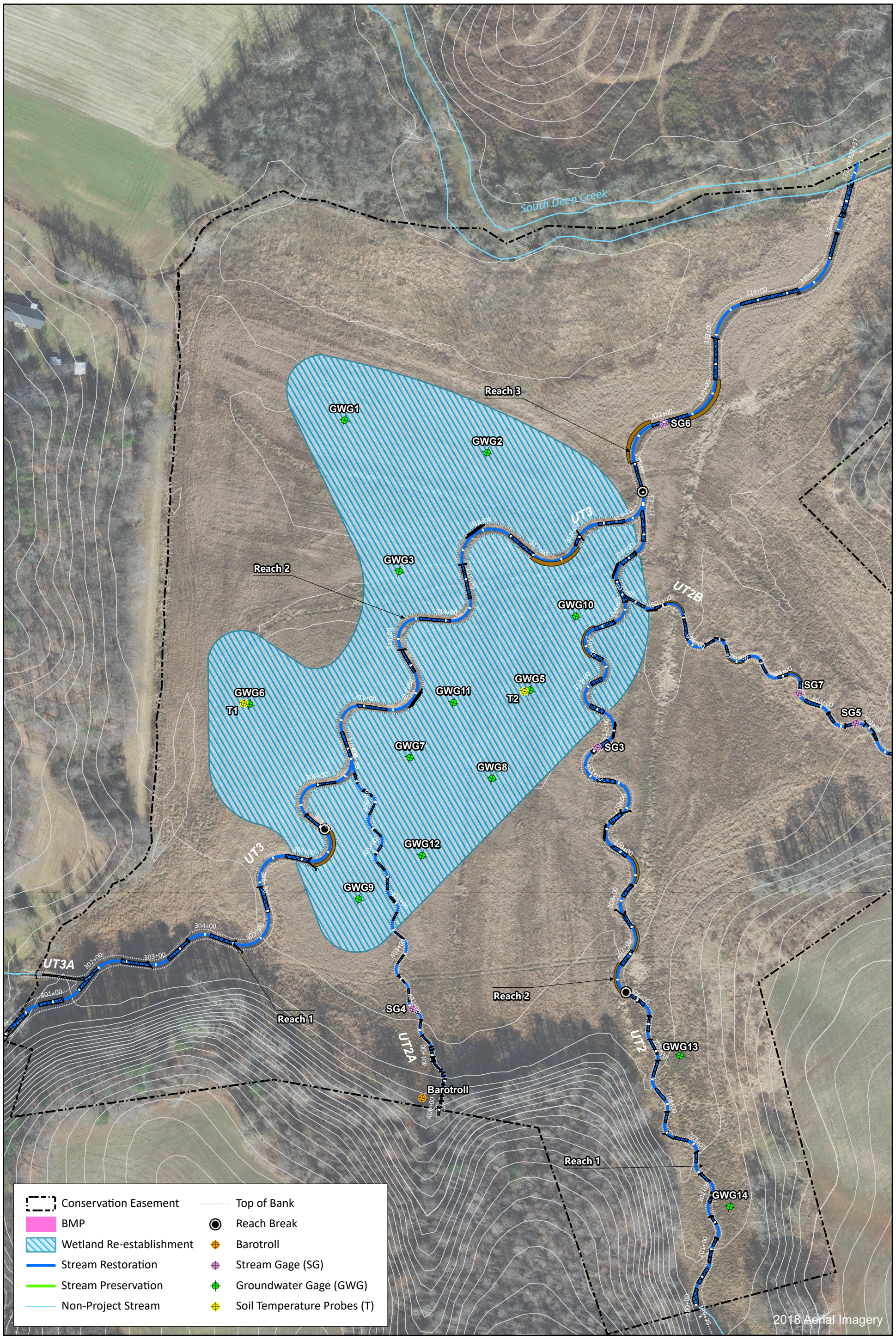
[1] GWG 10 was installed adjacent to GWG 4 but outside of the former ditch location at the end of October 2019. Reporting for GWG 10 begins in MY2 and GWG 4 will be omitted from future monitoring reports.

[2] The original success criteria is 19 consecutive days, (9.2%) of the growing season (April 4 to October 27).

[3] The success criteria of 21 consecutive days, or (9.2%) of the extended growing season (March 28 to November 3).

[4] GWG 11 - GWG 14 were installed on April 22, 2022.

[5] Data collected through 6/28/2023.



WILDLANDS ENGINEERING

0 150 300 Feet

Figure 1 - Gage Map
Lone Hickory Mitigation Site
DMS Project No. 97135
Monitoring Year 5 - 2023

Yadkin County, NC