# MONITORING YEAR 2 ANNUAL REPORT
Final

January 2023

## SASSARIXA SWAMP MITIGATION SITE
Johnston County, NC
Neuse River Basin
HUC 03020201

DMS Project No. 100040
DMS Contract No. 7425
DMS RFP No. 16-007279
USACE Action ID No. 2018-00432
DWR Project No. 2018-0198

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**SASSARIXA SWAMP MITIGATION SITE**

Monitoring Year 2 Annual Report

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# Section 1: PROJECT OVERVIEW

The Sassarixa Swamp Mitigation Site (Site) is located in Johnston County, approximately six miles southwest of Smithfield and five miles north of Four Oaks. The Site drains to Holts Lake, which drains to the Neuse River. Holts Lake is a recreational lake classified as a Nutrient Sensitive Water (NSW) and the Neuse River is a water supply for the City of Goldsboro. Table 3 presents information related to the project attributes.

## 1.1 Project Quantities and Credits

The Site is located on 10 parcels under 7 different landowners and a conservation easement was recorded on 65.06 acres. Mitigation work within the Site included restoration, enhancement II, and preservation of perennial and intermittent stream channels. Table 1 below shows stream credits by reach and the total amount of stream credits expected at closeout.

**Table 1: Project Quantities and Credits**

| PROJECT MITIGATION QUANTITIES | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Project Segment** | **Mitigation Plan Footage** | **As-Built Footage** | **Mitigation Category** | **Restoration Level** | **Mitigation Ratio (X:1)** | **Credits** | **Comments** |
| **Stream** | | | | | | | |
| Sassarixa Creek R1-R3 | 2,631 | 2,631 | Warm | EII | 2.5 | 1,052.400 | Ford Crossing, Fencing Out Livestock |
| T1 R1 | 570 | 570 | Warm | EII | 2.5 | 228.000 | Bank Stabilization, Fencing Out Livestock |
| T1 R2 | 824 | 810 | Warm | R | 1.0 | 824.000 | Full Channel Restoration, Fencing Out Livestock |
| T1 R3 | 509 | 507 | Warm | R | 1.0 | 509.000 | Full Channel Restoration, Fencing Out Livestock |
| T1 R4 | 252 | 252 | Warm | EII | 2.5 | 100.800 | Fencing Out Livestock |
| T1A | 358 | 356 | Warm | EII | 2.5 | 143.200 | Fencing Out Livestock |
| T1B | 275 | 276 | Warm | EII | 2.5 | 110.000 | Fencing Out Livestock |
| T1C | 307 | 307 | Warm | EII | 2.5 | 122.800 | Fencing Out Livestock |
| T2 | 1,010 | 1,006 | Warm | R | 1.0 | 1,010.000 | Pond Removal, Fencing Out Livestock |
| T3 R1 | 1,053 | 1,041 | Warm | R | 1.0 | 1,053.000 | Full Channel Restoration, Fencing Out Livestock |
| T3 R2 | 61 | 61 | Warm | P | 10.0 | 6.100 | Conservation Easement |
| T4 R1 | 206 | 206 | Warm | EII | 2.5 | 82.400 | Ford Crossing, Fencing Out Livestock |
| T4 R2 | 398 | 399 | Warm | EII | 2.5 | 159.200 | Bank Stabilization, Fencing Out Livestock |
| T4 R3 | 1,509 | 1,510 | Warm | P | 10.0 | 150.900 | Culvert Crossing, Conservation Easement |
| T5 R1 | 670 | 642 | Warm | EII | 2.5 | 268.000 | Bank Stabilization |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| T5 R2 | 885 | 874 | Warm | R | 1.0 | 885.000 | Full Channel Restoration, Fencing Out Livestock |
| T5 R3 | 965 | 961 | Warm | EII | 4.0 | 241.250 | Culvert Crossing, Bank Stabilization |
| T5A | 1,026 | 1,018 | Warm | EII | 2.5 | 410.400 | Bank Stabilization, Fencing Out Livestock |
| T5B | 580 | 580 | Warm | EII | 2.5 | 232.000 | Fencing Out Livestock |
| T5C[1] | 588 | 588 | Warm | EII | 2.5 | 235.200 | Fencing Out Livestock |
| T6 R1 | 381 | 383 | Warm | R | 1.0 | 381.000 | Full Channel Restoration, Fencing Out Livestock |
| T6 R2 | 1,035 | 1,037 | Warm | EII | 2.5 | 414.000 | Culvert Crossing, Bank Stabilization. Fencing Out Livestock |
| | | | | | **Total:** | **8,618.650** | |

1. T5C Credited using the Headwater Stream guidance method of the valley length.

| Restoration Level | Stream | | |
|---|---|---|---|
| | Warm | Cool | Cold |
| Restoration | 4,662.000 | | |
| Enhancement I | -- | | |
| Enhancement II | 3,799.650 | | |
| Preservation | 157.000 | | |
| **Totals** | **8,618.650** | | |
| **Total Stream Credit** | **8,618.650** | | |

## 1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 2 below describes expected outcomes to water quality and ecological processes and provides project goals and objectives.

**Table 2: Goals, Performance Criteria, and Functional Improvements**

| Goal | Objective/ Treatment | Likely Functional Uplift | Performance Criteria | Measurement | Cumulative Monitoring Results |
|---|---|---|---|---|---|
| Improve the stability of stream channels. | Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time. | Reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary. | ER stays over 2.2 and BHR below 1.2 with visual assessments showing progression towards stability. | Cross-section monitoring will be assessed during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be assessed annually. | No deviations from design. Supplemental live stakes were installed as needed throughout the Site. |

| Goal | Objective/ Treatment | Likely Functional Uplift | Performance Criteria | Measurement | Cumulative Monitoring Results |
|---|---|---|---|---|---|
| Improve instream habitat. | Install habitat features such as constructed riffles, lunker logs, and brush toes into restored/enhanced streams. Add woody materials to channel beds. Construct pools of varying depth. | Increase and diversify available habitats for macroinvertebrates, fish, and amphibians leading to colonization and increase in biodiversity over time. | There is no required performance standard for this metric. | N/A | N/A |
| Reconnect channels with floodplains to allow a natural flooding regime. | Reconstruct stream channels with designed bankfull dimensions and depth based on reference reach data. Remove pond above T2. | Allow more frequent flood flows to disperse on the floodplain. | Four bankfull events in separate years within monitoring period.<br>30 consecutive days of flow for intermittent channels. | Crest gauges and/or pressure transducers recording flow elevations. | Bankfull events documented on all reaches except T2 during MY2. Greater than 30 consecutive days of flow recorded on all intermittent streams during MY2. |
| Restore and enhance native floodplain and streambank vegetation. | Plant native tree and understory species in riparian zones and plant native shrub and herbaceous species on streambanks. | Reduce sediment inputs from bank erosion and runoff. Increase nutrient cycling and storage in floodplain. Provide riparian habitat. Add a source of LWD and organic material to stream. | Survival rate of 320 stems per acre at MY3, 260 planted stems per acre at MY5, and 210 stems per acre at MY7. Height requirement is 7 feet at MY5 and 10 feet at MY7. | One hundred square meter vegetation plots are placed on 2% of the planted area of the Site and monitored during MY1, MY2, MY3, MY5, and MY7. | 9 out of 11 vegetation plots have a planted stem density greater than 320 stems per acre. There will be a small supplemental planting in the winter of 2023. |
| Permanently protect the project Site from harmful uses. | Establish conservation easements on the Site. | Protect the Site from encroachment on the riparian corridor and direct impact to streams and wetlands. | Prevent easement encroachment. | Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring. | No cattle encroachment since July 2021. |

## 1.3 Project Attributes

The project includes several adjacent properties that have been owned and operated as a livestock farm by a single family since 1850, where livestock were continually rotated through all fields with access to the project streams. Based on aerial photos from 1950 to 2012 onsite streams have existed in their approximate locations with very little change to riparian buffer extents since 1950. Two alterations to the Site visible from historical aerial photography were the addition of the pond on T2 between 1964 and 1973, and the addition of the large pond below T5A, T5B, and T5C between 1950 and 1961. According to the landowners, in the 1960's and early 1970's a hog yard was located at the upstream end of T4 and T5, where the streams were diverted to make a hog wallow area. The hogs were moved to a hog house in the early 1970's, however goats, horses, and cattle had continuous access to this portion of the site until Hurricane Matthew struck in September 2016. The floods from the storm destroyed much

of the fencing around T4 and T5 and livestock have been rotated in other fields since that time while fencing was being repaired. Other portions of the site had not seen significant changes in land use with livestock or crop rotations from existing activities. Table 3 below and Table 9 in Appendix C present additional information on pre-restoration conditions.

**Table 3: Project Attributes**

| PROJECT INFORMATION | | | |
|---|---|---|---|
| Project Name | Sassarixa Swamp Mitigation Site | County | Johnston County |
| Project Area (acres) | 65.06 | Project Coordinates | 35.472153, -78.436000 |
| **PROJECT WATERSHED SUMMARY INFORMATION** | | | |
| Physiographic Province | Rolling Coastal Plain | River Basin | Neuse River |
| USGS HUC 8-digit | 03020201 | USGS HUC 14-digit | 03020201130030 |
| DWR Sub-basin | 03-04-04 | Land Use Classification | 66% agriculture, 27% forested, 7% developed |
| Project Drainage Area (acres) | 5,024 | Percentage of Impervious Area | 0.9% |

| RESTORATION TRIBUTARY SUMMARY INFORMATION | | | | | |
|---|---|---|---|---|---|
| **Parameters** | **T1** | **T2** | **T3** | **T5** | **T6** |
| Pre-project length (feet) | 2,202 | 348 | 1,098 | 2,544 | 1,342 |
| Post-project (feet) | 2,155 | 1,010 | 1,114 | 2,553 | 1,451 |
| Valley confinement (Confined, moderately confined, unconfined) | Unconfined | Moderately Confined to Unconfined | | | |
| Drainage area (acres) | 45 | 25 | 26 | 41.25 | 38.25 |
| Perennial, Intermittent, Ephemeral | Intermittent | | Perennial | | |
| DWR Water Quality Classification | C, NSW | | | B, NSW | |
| Dominant Stream Classification (existing) | G5 | G5 | B5/G5 | E5 | G5/E5 |
| Dominant Stream Classification (proposed) | C5b/E5b | C5b/E5b | C5b/E5b | C5/E5 | C5/E5 |
| Dominant Evolutionary class (Simon) if applicable | Stage III | Stage IV | | Stage III | Stage IV |

| REGULATORY CONSIDERATIONS | | | |
|---|---|---|---|
| **Parameters** | **Applicable?** | **Resolved?** | **Supporting Documentation** |
| Water of the United States - Section 404 | Yes | Yes | USACE Nationwide Permit No. 27 and DWQ 401 Water Quality Certification No. 4134. |
| Water of the United States - Section 401 | Yes | Yes | |
| Endangered Species Act | Yes | Yes | Categorical Exclusion in Mitigation Plan (Wildlands, 2019) |
| Historic Preservation Act | Yes | Yes | |
| Coastal Zone Management Act (CZMA or CAMA) | N/A | N/A | N/A |
| Essential Fisheries Habitat | N/A | N/A | N/A |

# Section 2: Monitoring Year 2 Data Assessment

Annual monitoring and site visits were conducted during MY2 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved success criteria presented in the Mitigation Plan (Wildlands, 2019). Performance criteria for vegetation, stream, and hydrologic assessment are located in Section 1.2 Table 2: Goals, Performance Criteria, and Functional Improvements. Methodology for annual monitoring is presented in the MY0 Annual Report (Wildlands, 2021).

## 2.1 Vegetative Assessment

The MY2 vegetative survey was completed in September 2022. Vegetation monitoring resulted in a stem density range of 162 to 567 planted stems per acre and average stem density was 441 planted stems per acre. Out of the eleven vegetation plots, nine met the interim success criteria of 320 stems per acres, while Vegetation Plot 1 and 2 have 162 and 283 stems per acres, respectively. Mortality is contributed to competition from dense herbaceous grass and a dry spring when the trees where originally planted in 2021. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

There were a significant number of mature hardwood trees that were left untouched from construction. A visual site assessment in September 2022 indicated that some mature trees are starting to decline after construction. Planted trees and volunteer species are growing throughout the Site and starting to fill in an understory that will eventually become a mature hardwood forest.

## 2.2 Vegetation Areas of Concern and Management

A supplemental planting occurred in the Sassarixa Swamp II Mitigation Bank easement along UT6 in February 2022. After planting was complete, Wildlands realized the planting overextended into the Sassarixa Swamp Mitigation Site easement by 0.22 acres. The supplementally planted species were the same from the approved Mitigation Plan.

A 0.55-acres of replanting will occur in the winter of 2022/2023 to supplement the tree mortality that was assessed along T1 (Figure 1a). This area and any new species not included in the approved Mitigation Plan (Wildlands, 2019) is currently under review by the IRT.

A follow up invasive treatment occurred in March 2022 along the 11.99 acres (Figure 1a) along the lower half of Sassasrixa Creek to treat the Chinese privet (*Ligustrum sinense*) that resprouted from the originally treatment during construction. A combination of methods included foliar and cut stump applications. The Site will continue to be monitored for invasive species and follow up treatments will occur if necessary.

Kudzu (*Pueraria montana*) has been established outside of the Site along the farm path leading up to T5a (Figure 1c). As a preventative measure to ensure Kudzu does not become established on Site, Wildlands received permission from the landowner to treat the Kudzu along the farm path in July 2022. Follow up treatments will be scheduled in the upcoming years.

## 2.3 Stream Assessment

Morphological surveys for MY2 were conducted in March 2022. All streams within the Site are stable and functioning as designed. All 10 cross-sections at the Site show little to no change in the bankfull area and width-to-depth ratio, and bank height ratios are less than 1.2. Refer to Appendix A for the Visual

Stream Morphology Stability Assessment Table and Stream Photographs. Refer to Appendix C for Stream Geomorphology Data.

## 2.4 Stream Areas of Concern and Management

Supplemental live stakes were installed in March 2022 as needed on restoration reaches throughout the Site to provide additional shade and bank protection.

## 2.5 Hydrology Assessment

By the end of MY7, four bankfull events must have occurred in separate years within the restoration reaches. At least one bankfull event was recorded on all stream restoration reaches except T2. The hydrologic success criterion for bankfull events has been partially met in MY2.

In addition, the presence of baseflow must be documented on restored intermittent reaches (T1 Reach 2, T2 and T3 Reach 1) for a minimum of 30 consecutive days during a normal precipitation year. In-stream flow gauges equipped with pressure transducers were installed to monitor continuity of baseflow. All intermittent reaches in MY2 exceeded baseflow success criteria. The maximum consecutive days ranged from 63 days to 87 days. Refer to Appendix 5 for hydrologic data.

## 2.6 Wetland Assessment

One groundwater gauge was installed and monitored within an existing wetland zone along T3 at a location requested by North Carolina Division of Water Resources. The purpose of the gauge is to assess potential effects to wetland hydrology from the construction of the restored stream channel through this area. The results of this monitoring are not tied to any success criteria. Results from the groundwater gauge, during MY2, show that the existing wetland maintained free groundwater within 12 inches of the ground surface for 36.8% of the defined growing season (March 1 to November 16).

## 2.7 Monitoring Year 2 Summary

Overall, the Site has met the success criteria for MY2. Nine out of eleven veg plots are on track to meet the MY3 interim success criteria. A supplemental planting is planned for the winter of 2022/2023 to accommodate for tree mortality along T1. The Sassarixa Swamp II easement was replanted in February 2022. While replanting, the boundary expanded beyond originally outlined and extended into the DMS portion of the easement. Some mature trees that were avoided during construction are starting to decline, however a new understory layer is coming in. A follow up treatment of the Chinese privet resprouts along Sassarixa Creek and additional live stakes were installed throughout restoration reaches in March 2022. As a preventative measure, Kudzu was treated outside the easement in July 2022. Bankfull events were documented on all stream restoration reaches except T2, partially fulfilling the final bankfull hydrologic success requirement. Greater than 30 days of consecutive flow were recorded on monitored intermittent stream reaches T1 Reach 2, T2, and T3 Reach 1 fulfilling MY2 success requirement. Overall, the Site is meeting its goals of preventing excess nutrients and sediment from entering the Neuse River tributaries and is on track to meet final success criteria.

Summary information and data related to the performance of various project and monitoring elements can be found in the tables and figures in the report appendices. All raw data supporting the tables and figures in the appendices are available from DMS upon request.

# Section 3: REFERENCES


Breeding, R. 2010. Neuse River Basin Restoration Priorities 2010. NCEEP, NC

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

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

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

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

Rosgen, D.L. 1997. A Geomorphological Approach to Restoration of Incised Rivers. Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision. Center For Computational Hydroscience and Bioengineering, Oxford Campus, University of Mississippi, Pages 12-22.

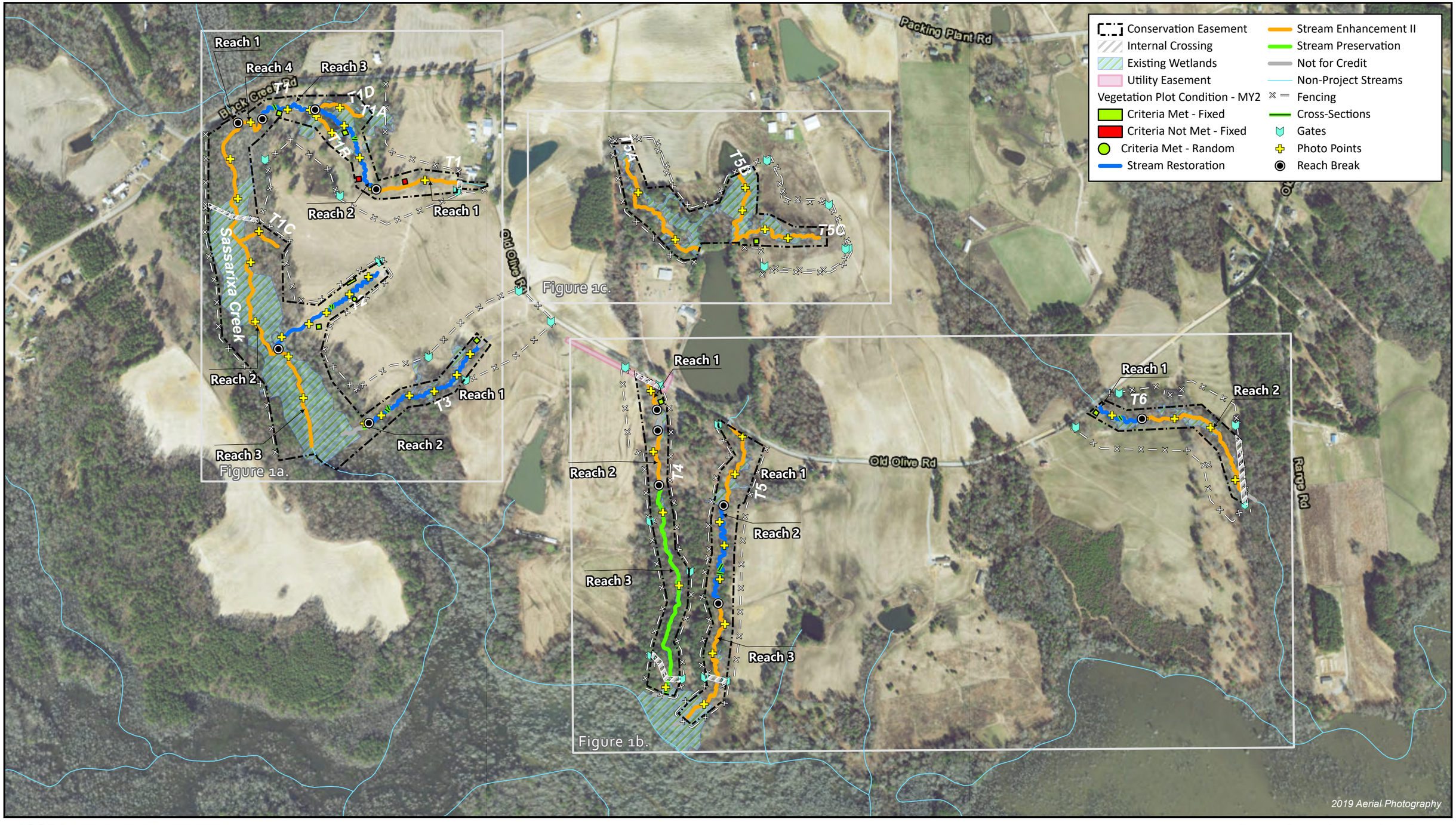
North Carolina Division of Water Resources (DWR). 2015. Neuse 01 CU Update. River Basin Restoration Priorities Transition Approach.

North Carolina Interagency Review Team (NCIRT). 2016. Wilmington District Stream and Wetland Compensatory Mitigation Update. Accessed at: https://saw-reg.usace.army.mil/PN/2016/Wilmington-District-Mitigation-Update.pdf

United States Army Corps of Engineers. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

United States Geological Survey. 1998. North Carolina Geology.

Wildlands Engineering, Inc. (2019). Sassarixa Swamp Mitigation Project Mitigation Plan. DMS, Raleigh, NC.



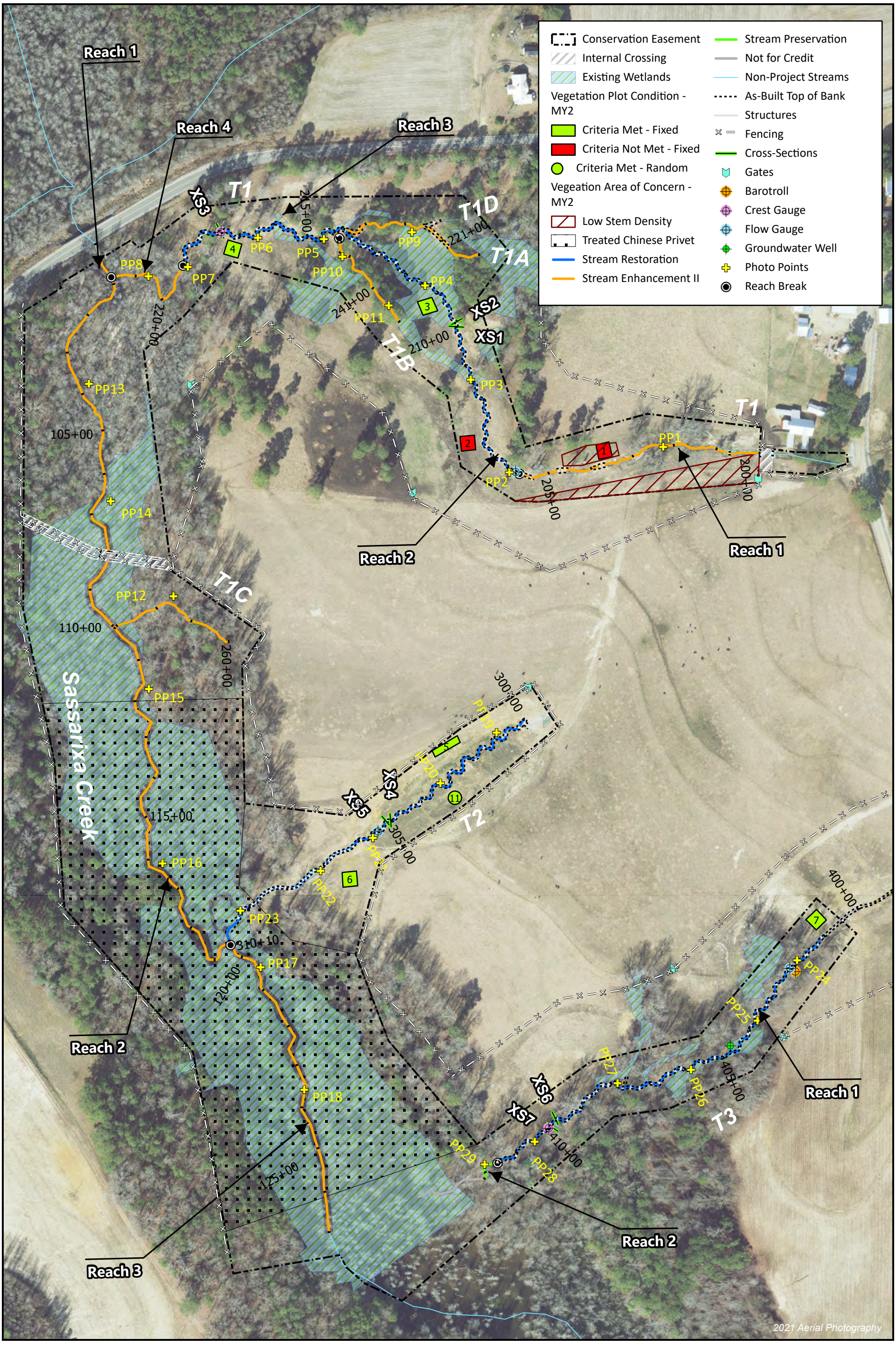

WILDLANDS ENGINEERING

0 600 1,200 Feet

N

Figure 1. Current Condition Plan View Key
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 2 - 2022

*Johnston County, NC*



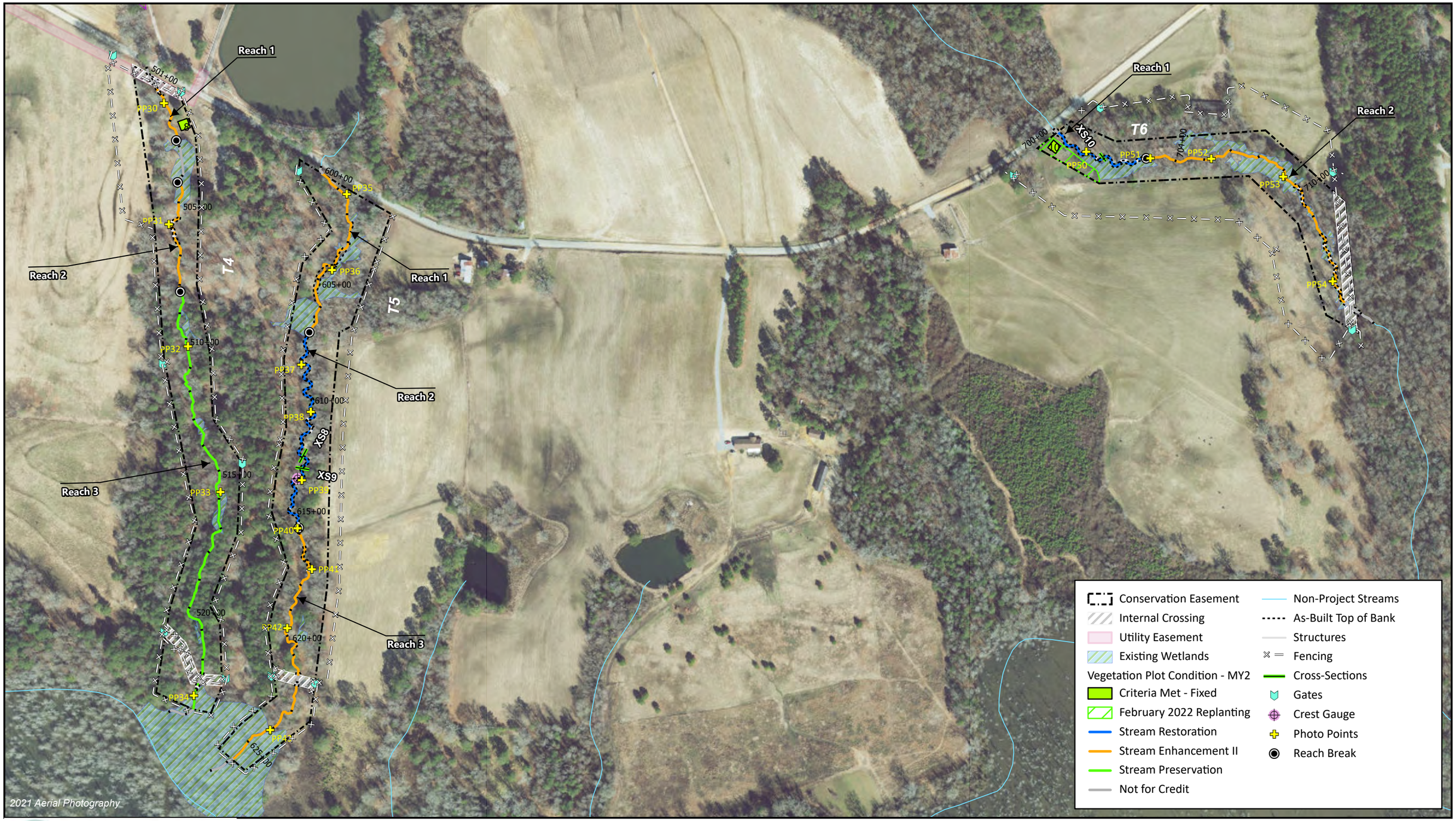

WILDLANDS ENGINEERING

0 200 400 Feet

N

Figure 1a. Current Condition Plan View
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 2 - 2022

*Johnston County, NC*



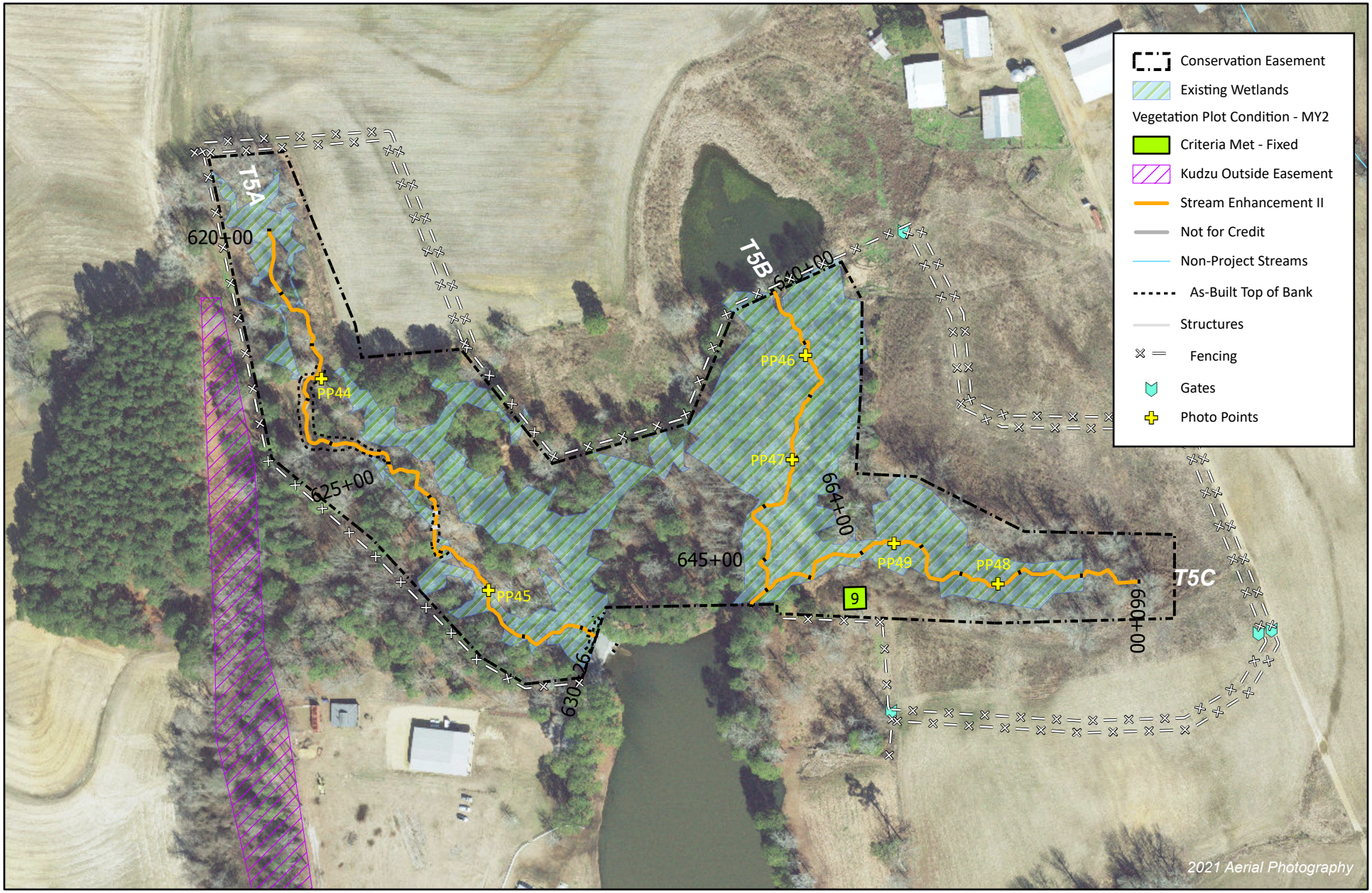

WILDLANDS ENGINEERING

0 300 600 Feet

N

**Figure 1b. Current Condition Plan View**
**Sassarixa Swamp Mitigation Site**
**DMS Project No. 100040**
**Monitoring Year 2 - 2022**

*Johnston County, NC*




WILDLANDS ENGINEERING

0 100 200 Feet

N

Figure 1c. Current Condition Plan View
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
Monitoring Year 2 - 2022

*Johnston County, NC*

# APPENDIX A. VISUAL ASSESSMENT DATA

**Table 4. Visual Stream Morphology Stability Assessment Table**

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

**T1 R2**

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | **Assessed Stream Length** | 810 |
| | | | | | **Assessed Bank Length** | 1,620 |
| **Bank** | **Surface Scour/ Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour. | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| | | | | **Totals:** | **0** | **100%** |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 0 | 0 | | N/A |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | 27 | 27 | | 100% |

**T1 R3**

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | **Assessed Stream Length** | 507 |
| | | | | | **Assessed Bank Length** | 1,014 |
| **Bank** | **Surface Scour/ Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour. | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| | | | | **Totals:** | **0** | **100%** |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 0 | 0 | | N/A |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | 14 | 14 | | 100% |

**Table 4. Visual Stream Morphology Stability Assessment Table**

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

**T2**

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | **Assessed Stream Length** | 1,006 |
| | | | | | **Assessed Bank Length** | 2,012 |
| **Bank** | **Surface Scour/ Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour. | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| | | | | **Totals:** | **0** | **100%** |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 34 | 34 | | 100% |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | 18 | 18 | | 100% |

**T3 R1**

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | **Assessed Stream Length** | 1,041 |
| | | | | | **Assessed Bank Length** | 2,082 |
| **Bank** | **Surface Scour/ Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour. | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| | | | | **Totals:** | **0** | **100%** |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 0 | 0 | | N/A |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | 30 | 30 | | 100% |

**Table 4. Visual Stream Morphology Stability Assessment Table**

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

**T5 R2**

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | **Assessed Stream Length** | 874 |
| | | | | | **Assessed Bank Length** | 1,748 |
| **Bank** | **Surface Scour/ Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour. | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| | | | | **Totals:** | **0** | **100%** |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 0 | 0 | | N/A |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | 20 | 20 | | 100% |

**T6 R1**

| Major Channel Category | | Metric | Number Stable, Performing as Intended | Total Number in As-built | Amount of Unstable Footage | % Stable, Performing as Intended |
|---|---|---|---|---|---|---|
| | | | | | **Assessed Stream Length** | 383 |
| | | | | | **Assessed Bank Length** | 766 |
| **Bank** | **Surface Scour/ Bare Bank** | Bank lacking vegetative cover resulting simply from poor growth and/or surface scour. | | | 0 | 100% |
| | **Toe Erosion** | Bank toe eroding to the extent that bank failure appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat. | | | 0 | 100% |
| | **Bank Failure** | Fluvial and geotechnical - rotational, slumping, calving, or collapse. | | | 0 | 100% |
| | | | | **Totals:** | **0** | **100%** |
| **Structure** | **Grade Control** | Grade control structures exhibiting maintenance of grade across the sill. | 0 | 0 | | N/A |
| | **Bank Protection** | Bank erosion within the structures extent of influence does not exceed 15%. | 5 | 5 | | 100% |

**Table 5. Vegetation Condition Assessment Table**
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

**Planted Acreage** **13.03**

| Vegetation Category | Definitions | Mapping Threshold (ac) | Combined Acreage | % of Planted Acreage |
|---|---|---|---|---|
| **Bare Areas** | Very limited cover of both woody and herbaceous material. | 0.10 | 0 | 0% |
| **Low Stem Density Areas** | Woody stem densities clearly below target levels based on current MY stem count criteria. | 0.10 | 0.55 | 4% |
| | | **Total** | **0.55** | **4%** |
| **Areas of Poor Growth Rates** | Planted areas where average height is not meeting current MY Performance Standard. | 0.10 | 0 | 0% |
| | | **Cumulative Total** | **0.55** | **4%** |

**Easement Acreage** **65.06**

| Vegetation Category | Definitions | Mapping Threshold (ac) | Combined Acreage | % of Easement Acreage |
|---|---|---|---|---|
| **Invasive Areas of Concern** | Invasives may occur outside of planted areas and within the easement and will therefore be calculated against the total easement acreage. Include species with the potential to directly outcompete native, young, woody stems in the short-term or community structure for existing communities. Invasive species included in summation above should be identified in report summary. | 0.10 | 11.99* | 18% |
| | | | | |
| **Easement Encroachment Areas** | Encroachment may be point, line, or polygon. Encroachment to be mapped consists of any violation of restrictions specified in the conservation easement. Common encroachments are mowing, cattle access, vehicular access. Encroachment has no threshold value as will need to be addressed regardless of impact area. | none | 0 Encroachments Noted/ 0 Ac | |

*Chinese privet (*Ligustrum sinense* ) resprouted throughout an existing mautre canopy forest along Sassarixa Creek and was treated May 2022.

**STREAM PHOTOGRAPHS**

| | |
|---|---|
|  |  |
| **PHOTO POINT 1 T1 R1 – upstream *(4/8/2022)*** | **PHOTO POINT 1 T1 R1 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 2 T1 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 2 T1 R2 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 3 T1 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 3 T1 R2 – downstream *(4/8/2022)*** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 4 T1 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 4 T1 R2 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 5 T1 R3 – upstream *(4/8/2022)*** | **PHOTO POINT 5 T1 R3 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 6 T1 R3 – upstream *(4/8/2022)*** | **PHOTO POINT 6 T1 R3 – downstream *(4/8/2022)*** |

**PHOTO POINT 7 T1 R3 – upstream *(4/8/2022)***

**PHOTO POINT 7 T1 R4 – downstream *(4/8/2022)***

**PHOTO POINT 8 T1 R4 – upstream *(4/8/2022)***

**PHOTO POINT 8 T1 R4 – downstream *(4/8/2022)***

**PHOTO POINT 9 T1A – upstream *(4/8/2022)***

**PHOTO POINT 9 T1A – downstream *(4/8/2022)***

| | |
|---|---|
|  |  |
| **PHOTO POINT 10 T1B – upstream *(4/8/2022)*** | **PHOTO POINT 10 T1B – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 11 T1B – upstream *(4/8/2022)*** | **PHOTO POINT 11 T1B – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 12 T1C – upstream *(4/8/2022)*** | **PHOTO POINT 12 T1C – downstream *(4/8/2022)*** |

**PHOTO POINT 13 Sassarixa Creek R2 – upstream *(4/8/2022)***

**PHOTO POINT 13 Sassarixa Creek R2 – downstream *(4/8/2022)***

**PHOTO POINT 14 Sassarixa Creek R2 – upstream *(4/8/2022)***

**PHOTO POINT 14 Sassarixa Creek R2 – downstream *(4/8/2022)***

**PHOTO POINT 15 Sassarixa Creek R2 – upstream *(4/8/2022)***

**PHOTO POINT 15 Sassarixa Creek R2 – downstream *(4/8/2022)***

| | |
|---|---|
|  |  |
| **PHOTO POINT 16 Sassarixa Creek R2 – upstream *(4/8/2022)*** | **PHOTO POINT 16 Sassarixa Creek R2 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 17 Sassarixa Creek R3 – upstream *(4/8/2022)*** | **PHOTO POINT 17 Sassarixa Creek R3 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 18 Sassarixa Creek R3 – upstream *(4/25/2022)*** | **PHOTO POINT 18 Sassarixa Creek R3 – downstream *(4/25/2022)*** |

**PHOTO POINT 19 T2 – upstream *(8/3/2022)***

**PHOTO POINT 19 T2 – downstream *(8/3/2022)***

**PHOTO POINT 20 T2 – upstream *(4/8/2022)***

**PHOTO POINT 20 T2 – downstream *(4/8/2022)***

**PHOTO POINT 21 T2 – upstream *(4/8/2022)***

**PHOTO POINT 21 T2 – downstream *(4/8/2022)***

**PHOTO POINT 22 T2 – upstream *(4/8/2022)***

**PHOTO POINT 22 T2 – downstream *(4/8/2022)***

**PHOTO POINT 23 T2 – upstream *(8/3/2022)***

**PHOTO POINT 23 T2 – downstream *(8/3/2022)***

**PHOTO POINT 24 T3 R1 – upstream *(4/8/2022)***

**PHOTO POINT 24 T3 R1 – downstream *(4/8/2022)***

| | |
|---|---|
|  |  |
| **PHOTO POINT 25 T3 R1 – upstream *(4/8/2022)*** | **PHOTO POINT 25 T3 R1 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 26 T3 R1 – upstream *(4/8/2022)*** | **PHOTO POINT 26 T3 R1 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 27 T3 R1 – upstream *(4/8/2022)*** | **PHOTO POINT 27 T3 R1 – downstream *(4/8/2022)*** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 28 T3 R1 – upstream *(4/8/2022)*** | **PHOTO POINT 28 T3 R1 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 29 T3 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 29 T3 R2 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 30 T4 R1 – upstream *(4/8/2022)*** | **PHOTO POINT 30 T4 R1 – downstream *(4/8/2022)*** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 31 T4 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 31 T4 R2 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 32 T4 R3 – upstream *(4/8/2022)*** | **PHOTO POINT 32 T4 R3 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 33 T4 R3 – upstream *(4/8/2022)*** | **PHOTO POINT 33 T4 R3 – downstream *(4/8/2022)*** |

**PHOTO POINT 34 T4 R3 – upstream *(4/8/2022)***

**PHOTO POINT 34 T4 R3 – downstream *(4/8/2022)***

**PHOTO POINT 35 T5 R1 – upstream *(4/8/2022)***

**PHOTO POINT 35 T5 R1 – downstream *(4/8/2022)***

**PHOTO POINT 36 T5 R1 – upstream *(4/8/2022)***

**PHOTO POINT 36 T5 R1 – downstream *(4/8/2022)***

| | |
|---|---|
|  |  |
| **PHOTO POINT 37 T5 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 37 T5 R2 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 38 T5 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 38 T5 R2 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 39 T5 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 39 T5 R2 – downstream *(4/8/2022)*** |

**PHOTO POINT 40 T5 R2 – upstream *(4/8/2022)***

**PHOTO POINT 40 T5 R3 – downstream *(4/8/2022)***

**PHOTO POINT 41 T5 R3 – upstream *(4/8/2022)***

**PHOTO POINT 41 T5 R3 – downstream *(4/8/2022)***

**PHOTO POINT 42 T5 R3 – upstream *(4/8/2022)***

**PHOTO POINT 42 T5 R3 – downstream *(4/8/2022)***

| | |
|---|---|
|  |  |
| **PHOTO POINT 43 T5 R3 – upstream *(4/8/2022)*** | **PHOTO POINT 43 T5 R3 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 44 T5A – upstream *(4/8/2022)*** | **PHOTO POINT 44 T5A – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 45 T5A – upstream *(4/8/2022)*** | **PHOTO POINT 45 T5A – downstream *(4/8/2022)*** |

**PHOTO POINT 46 T5B – upstream *(4/8/2022)***

**PHOTO POINT 46 T5B – downstream *(4/8/2022)***

**PHOTO POINT 47 T5B – upstream *(4/8/2022)***

**PHOTO POINT 47 T5B – downstream *(4/8/2022)***

**PHOTO POINT 48 T5C – upstream *(4/8/2022)***

**PHOTO POINT 48 T5C – downstream *(4/8/2022)***

| | |
|---|---|
|  |  |
| **PHOTO POINT 49 T5C – upstream *(4/8/2022)*** | **PHOTO POINT 49 T5C – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 50 T6 R1 – upstream *(4/8/2022)*** | **PHOTO POINT 50 T6 R1 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 51 T6 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 51 T6 R2 – downstream *(4/8/2022)*** |

| | |
|---|---|
|  |  |
| **PHOTO POINT 52 T6 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 52 T6 R2 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 53 T6 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 53 T6 R2 – downstream *(4/8/2022)*** |
|  |  |
| **PHOTO POINT 54 T6 R2 – upstream *(4/8/2022)*** | **PHOTO POINT 54 T6 R2 – downstream *(4/8/2022)*** |

**STREAM CROSSING PHOTOGRAPHS**

**Sassarixa Creek Reach 2 – Looking Upstream** *(9/29/2022)*

**Sassarixa Creek Reach 2 – Looking Downstream** *(9/29/2022)*

**T1 Reach 1 – Looking Upstream** *(4/7/2022)*

**T1 Reach 1 – Looking Downstream** *(4/7/2022)*

**T4 Reach 3 – Looking Upstream** *(4/7/2022)*

**T4 Reach 3 – Looking Downstream** *(4/7/2022)*

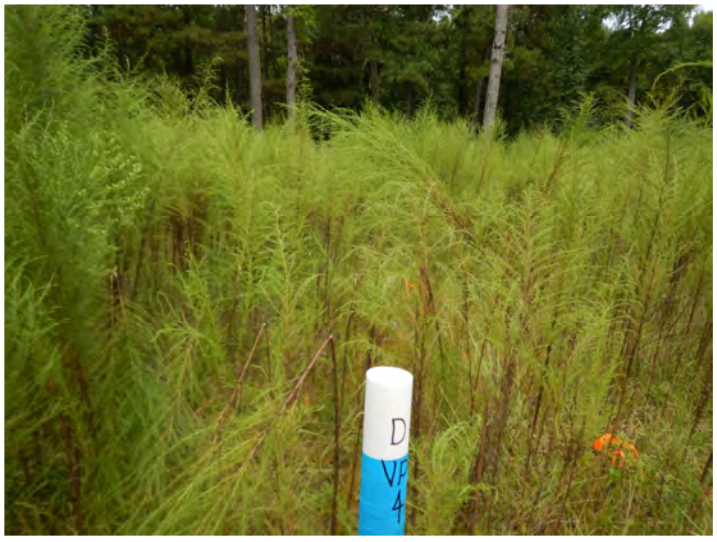
| | |
|---|---|
|  |  |
| **T5 Reach 3 – Looking Upstream** *(4/7/2022)* | **T5 Reach 3 – Looking Downstream** *(4/7/2022)* |
|  |  |
| **T6 Reach 2 – Looking Upstream** *(4/7/2022)* | **T6 Reach 2 – Looking Downstream** *(4/7/2022)* |

**VEGETATION PLOT PHOTOGRAPHS**


**FIXED VEG PLOT 1** *(9/9/2022)*

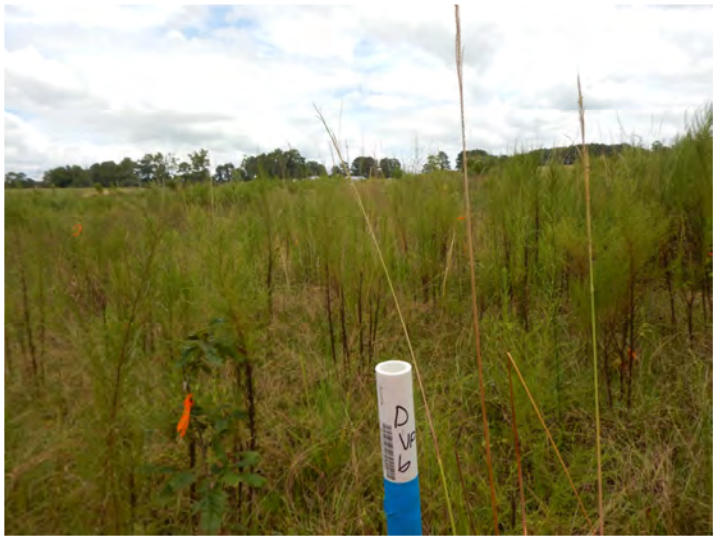

**FIXED VEG PLOT 2** *(9/9/2022)*


**FIXED VEG PLOT 3** *(9/9/2022)*

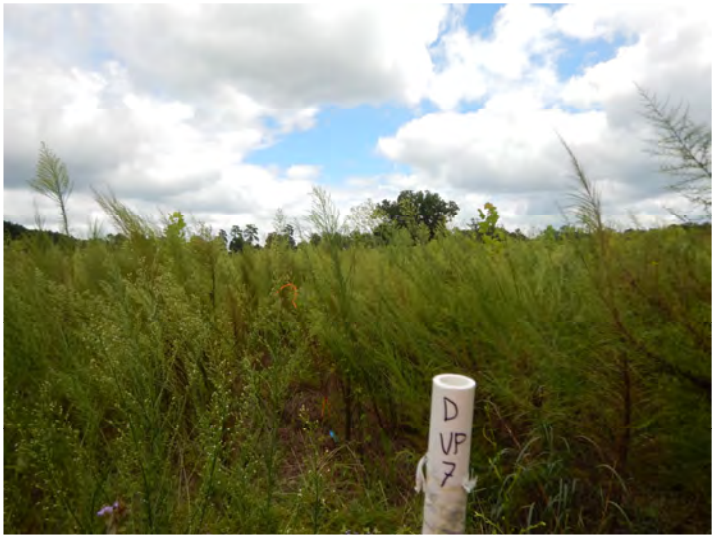



**FIXED VEG PLOT 4** *(9/9/2022)*


**FIXED VEG PLOT 5** *(9/9/2022)*




**FIXED VEG PLOT 6** *(9/9/2022)*




**FIXED VEG PLOT 7** *(9/9/2022)*


**FIXED VEG PLOT 8** *(9/9/2022)*


**FIXED VEG PLOT 9** *(9/9/2022)*

**FIXED VEG PLOT 10** *(9/9/2022)*

**RANDOM VEG PLOT 11** *(9/9/2022)*

# APPENDIX B. VEGETATION PLOT DATA

**Table 6. Vegetation Plot Data**
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

| | |
|---|---|
| Planted Acreage | 13.03 |
| Date of Initial Plant | 2021-03-05 |
| Date(s) of Supplemental Plant(s) | 2022-02-28 |
| Date of Current Survey | 2022-09-09 |
| Plot size (ACRES) | 0.0247 |

| | Scientific Name | Common Name | Tree/Shrub | Indicator Status | Veg Plot 1 F | | Veg Plot 2 F | | Veg Plot 3 F | | Veg Plot 4 F | | Veg Plot 5 F | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total |
| Species Included in Approved Mitigation Plan | Acer negundo | boxelder | Tree | FAC | 1 | 1 | | | 1 | 1 | 1 | 1 | 1 | 1 |
| | Betula nigra | river birch | Tree | FACW | 2 | 2 | | | 4 | 4 | 1 | 1 | 2 | 2 |
| | Magnolia virginiana | sweetbay | Tree | FACW | | | 1 | 1 | | | 1 | 1 | 1 | 1 |
| | Platanus occidentalis | American sycamore | Tree | FACW | | | 1 | 1 | 4 | 4 | 2 | 2 | 4 | 4 |
| | Populus deltoides | eastern cottonwood | Tree | FAC | | | 3 | 3 | | | 1 | 1 | 1 | 1 |
| | Quercus michauxii | swamp chestnut oak | Tree | FACW | 1 | 1 | | | 2 | 2 | 3 | 3 | 1 | 1 |
| | Quercus nigra | water oak | Tree | FAC | | | 1 | 1 | | | 1 | 1 | | |
| | Quercus phellos | willow oak | Tree | FACW | | | 1 | 1 | 3 | 3 | 3 | 3 | 2 | 2 |
| Sum | | | | Performance Standard | 4 | 4 | 7 | 7 | 14 | 14 | 13 | 13 | 12 | 12 |
| Post Mitigation Plan Species | *Liquidambar styraciflua* | *sweetgum* | *Tree* | *FAC* | | | | | | | | | | |
| Sum | | | | Proposed Standard | 4 | 4 | 7 | 7 | 14 | 14 | 13 | 13 | 12 | 12 |
| Mitigation Plan Performance Standard | | | | Current Year Stem Count | | 4 | | 7 | | 14 | | 13 | | 12 |
| | | | | Stems/Acre | | 162 | | 283 | | 567 | | 526 | | 486 |
| | | | | Species Count | | 3 | | 5 | | 5 | | 8 | | 7 |
| | | | | Dominant Species Composition (%) | | 50 | | 43 | | 29 | | 23 | | 33 |
| | | | | Average Plot Height (ft.) | | 5 | | 4 | | 5 | | 3 | | 5 |
| | | | | % Invasives | | 0 | | 0 | | 0 | | 0 | | 0 |
| Post Mitigation Plan Performance Standard | | | | Current Year Stem Count | | 4 | | 7 | | 14 | | 13 | | 12 |
| | | | | Stems/Acre | | 162 | | 283 | | 567 | | 526 | | 486 |
| | | | | Species Count | | 3 | | 5 | | 5 | | 8 | | 7 |
| | | | | Dominant Species Composition (%) | | 50 | | 43 | | 29 | | 23 | | 33 |
| | | | | Average Plot Height (ft.) | | 5 | | 4 | | 5 | | 3 | | 5 |
| | | | | % Invasives | | 0 | | 0 | | 0 | | 0 | | 0 |

**Table 6. Vegetation Plot Data**
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

| | |
|---|---|
| Planted Acreage | 13.03 |
| Date of Initial Plant | 2021-03-05 |
| Date(s) of Supplemental Plant(s) | 2022-02-28 |
| Date of Current Survey | 2022-09-09 |
| Plot size (ACRES) | 0.0247 |

| | Scientific Name | Common Name | Tree/Shrub | Indicator Status | Veg Plot 6 F | | Veg Plot 7 F | | Veg Plot 8 F | | Veg Plot 9 F | | Veg Plot 10 F | | Veg Plot 11 R |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Planted | Total | Total |
| Species Included in Approved Mitigation Plan | Acer negundo | boxelder | Tree | FAC | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 4 |
| | Betula nigra | river birch | Tree | FACW | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 1 |
| | Magnolia virginiana | sweetbay | Tree | FACW | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 |
| | Platanus occidentalis | American sycamore | Tree | FACW | 2 | 2 | 3 | 3 | 2 | 2 | 4 | 4 | 3 | 3 | 2 |
| | Populus deltoides | eastern cottonwood | Tree | FAC | | | 1 | 1 | | | | | | | 1 |
| | Quercus michauxii | swamp chestnut oak | Tree | FACW | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 5 | 5 | 1 |
| | Quercus nigra | water oak | Tree | FAC | | | 1 | 1 | | | | | | | 2 |
| | Quercus phellos | willow oak | Tree | FACW | 3 | 3 | 1 | 1 | 2 | 2 | | | 1 | 1 | |
| Sum | | | | Performance Standard | 13 | 13 | 13 | 13 | 9 | 9 | 9 | 9 | 14 | 14 | 12 |
| Post Mitigation Plan Species | *Liquidambar styraciflua* | *sweetgum* | *Tree* | *FAC* | | | | | | | | | | | *3* |
| Sum | | | | Proposed Standard | 13 | 13 | 13 | 13 | 9 | 9 | 9 | 9 | 14 | 14 | 12 |
| Mitigation Plan Performance Standard | | | | Current Year Stem Count | | 13 | | 13 | | 9 | | 9 | | 14 | 12 |
| | | | | Stems/Acre | | 526 | | 526 | | 364 | | 364 | | 567 | 486 |
| | | | | Species Count | | 6 | | 8 | | 6 | | 5 | | 6 | 7 |
| | | | | Dominant Species Composition (%) | | 23 | | 23 | | 22 | | 44 | | 36 | 27 |
| | | | | Average Plot Height (ft.) | | 2 | | 4 | | 4 | | 3 | | 3 | 4 |
| | | | | % Invasives | | 0 | | 0 | | 0 | | 0 | | 0 | 0 |
| Post Mitigation Plan Performance Standard | | | | Current Year Stem Count | | 13 | | 13 | | 9 | | 9 | | 14 | 12 |
| | | | | Stems/Acre | | 526 | | 526 | | 364 | | 364 | | 567 | 486 |
| | | | | Species Count | | 6 | | 8 | | 6 | | 5 | | 6 | 7 |
| | | | | Dominant Species Composition (%) | | 23 | | 23 | | 22 | | 44 | | 36 | 27 |
| | | | | Average Plot Height (ft.) | | 2 | | 4 | | 4 | | 3 | | 3 | 4 |
| | | | | % Invasives | | 0 | | 0 | | 0 | | 0 | | 0 | 0 |

**Table 7. Vegetation Performance Standards Summary Table**

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

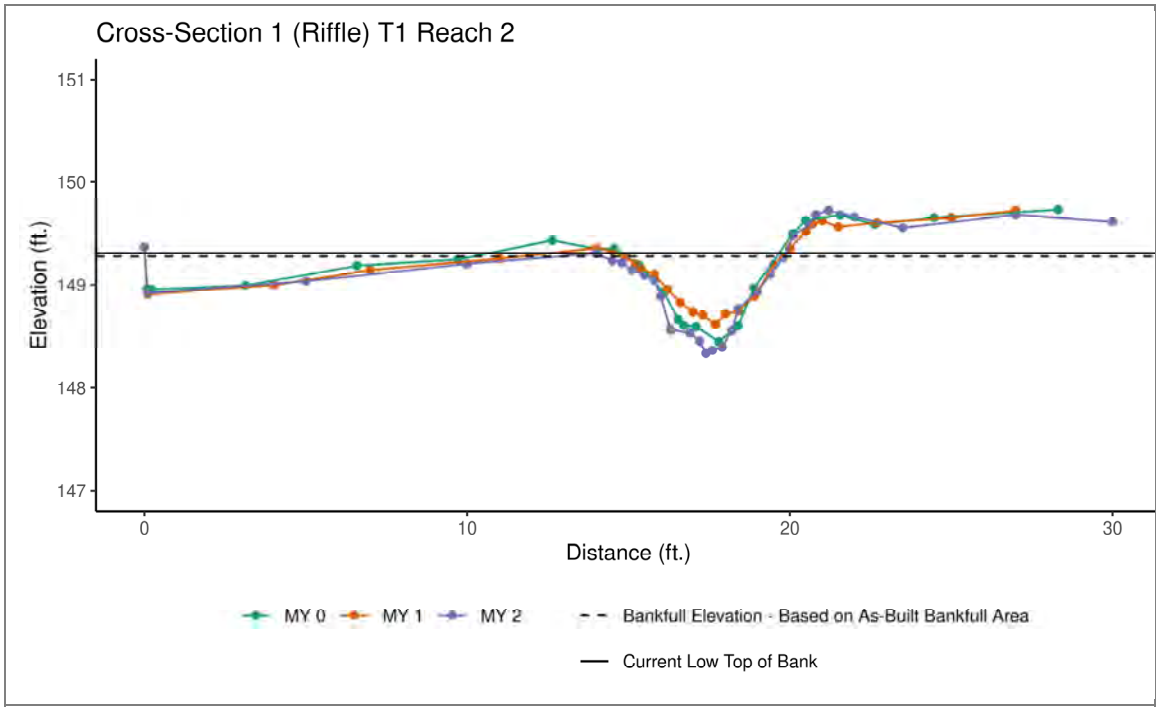
**Monitoring Year 2 - 2022**

| | Veg Plot 1 F | | | | Veg Plot 2 F | | | | Veg Plot 3 F | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | 162 | 5 | 3 | 0 | 283 | 4 | 5 | 0 | 567 | 5 | 5 | 0 |
| Monitoring Year 1 | 364 | 2 | 6 | 0 | 243 | 2 | 3 | 0 | 607 | 3 | 6 | 0 |
| Monitoring Year 0 | 567 | 3 | 8 | 0 | 445 | 2 | 5 | 0 | 607 | 2 | 6 | 0 |
| | Veg Plot 4 F | | | | Veg Plot 5 F | | | | Veg Plot 6 F | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | 526 | 3 | 8 | 0 | 486 | 5 | 7 | 0 | 526 | 2 | 6 | 0 |
| Monitoring Year 1 | 567 | 2 | 8 | 0 | 486 | 3 | 7 | 0 | 526 | 2 | 6 | 0 |
| Monitoring Year 0 | 607 | 2 | 8 | 0 | 486 | 3 | 7 | 0 | 567 | 3 | 6 | 0 |
| | Veg Plot 7 F | | | | Veg Plot 8 F | | | | Veg Plot 9 F | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | 526 | 4 | 8 | 0 | 364 | 4 | 6 | 0 | 364 | 3 | 5 | 0 |
| Monitoring Year 1 | 567 | 3 | 8 | 0 | 567 | 3 | 7 | 0 | 607 | 3 | 7 | 0 |
| Monitoring Year 0 | 567 | 2 | 8 | 0 | 567 | 3 | 7 | 0 | 648 | 2 | 7 | 0 |
| | Veg Plot 10 F | | | | Veg Plot Group 11 R | | | | | | | |
| | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | Stems/Ac. | Av. Ht. (ft) | # Species | % Invasives | | | | |
| Monitoring Year 7 | | | | | | | | | | | | |
| Monitoring Year 5 | | | | | | | | | | | | |
| Monitoring Year 3 | | | | | | | | | | | | |
| Monitoring Year 2 | 567 | 3 | 6 | 0 | 486 | 4 | 7 | 0 | | | | |
| Monitoring Year 1 | 891 | 2 | 8 | 0 | 486 | 3 | 8 | 0 | | | | |
| Monitoring Year 0 | 607 | 2 | 8 | 0 | 648 | 2 | 8 | 0 | | | | |

*Each monitoring year represents a different plot for the random vegetation plot "groups". Random plots are denoted with an R, and fixed plots with an F.

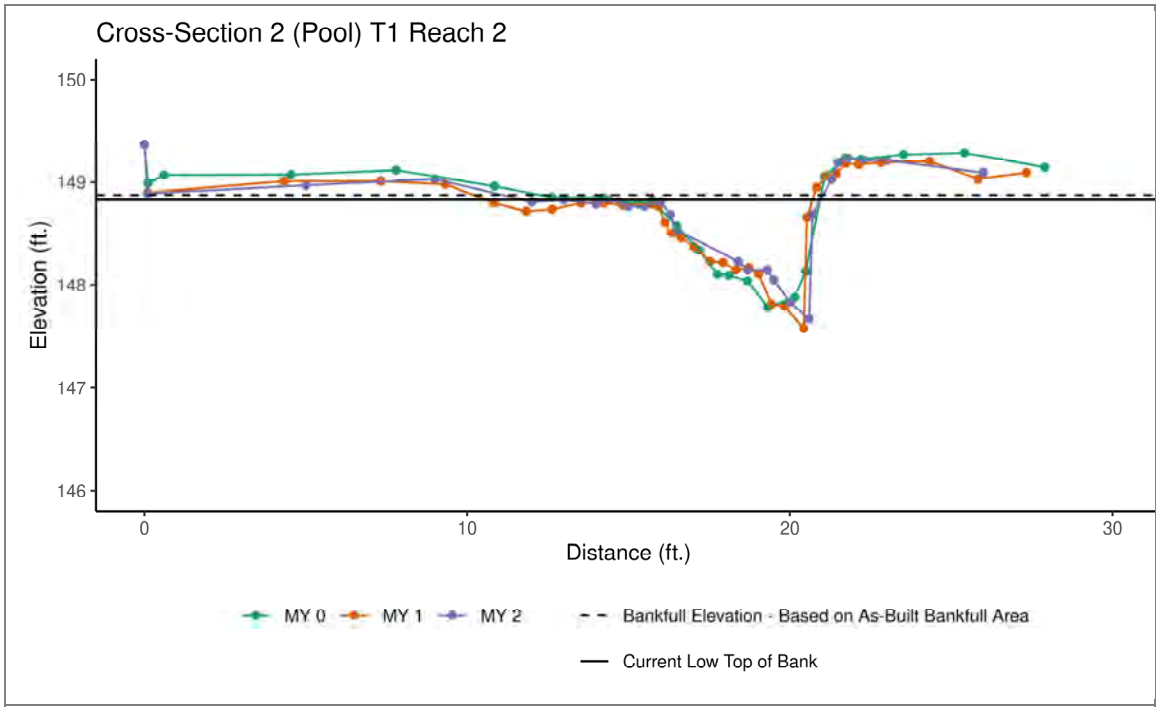
# APPENDIX C. STREAM GEOMORPHOLOGY DATA

**Cross-Section Plots**



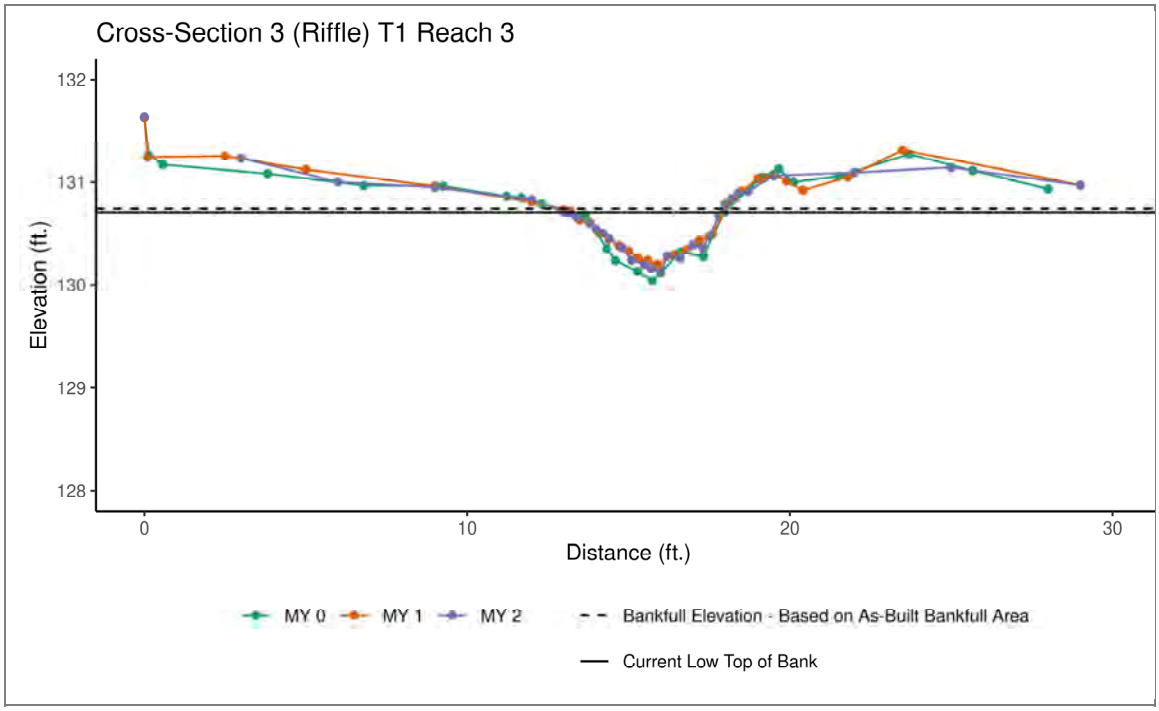

| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | 149.35 | 149.41 | 149.28 | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | 1.00 | 0.93 | 1.03 | | | |
| Thalweg Elevation | 148.45 | 148.62 | 148.34 | | | |
| LTOB Elevation | 149.35 | 149.36 | 149.31 | | | |
| LTOB Max Depth | 0.90 | 0.74 | 0.97 | | | |
| LTOB Cross-Sectional Area | 2.47 | 2.16 | 2.63 | | | |

**Downstream** *(03/04/2022)*



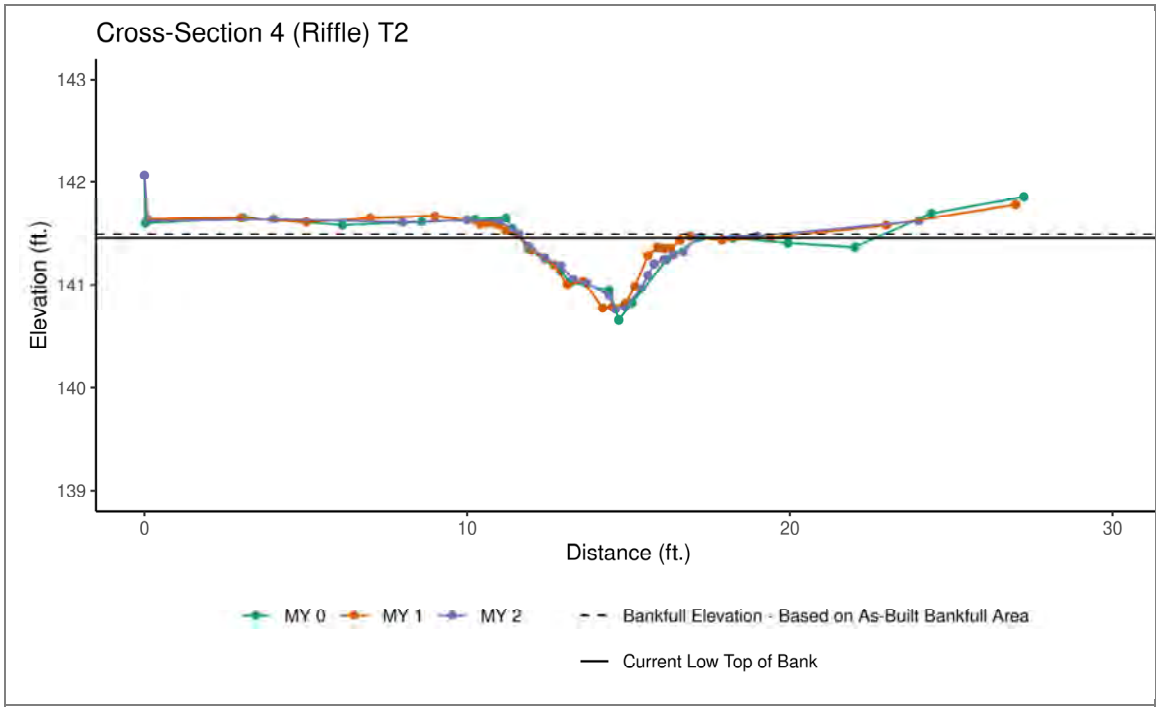

| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | N/A | N/A | N/A | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | N/A | N/A | N/A | | | |
| Thalweg Elevation | 147.78 | 147.58 | 147.67 | | | |
| LTOB Elevation | 148.82 | 148.77 | 148.83 | | | |
| LTOB Max Depth | 1.04 | 1.19 | 1.16 | | | |
| LTOB Cross-Sectional Area | 3.20 | 2.84 | 2.91 | | | |

**Downstream** *(03/04/2022)*



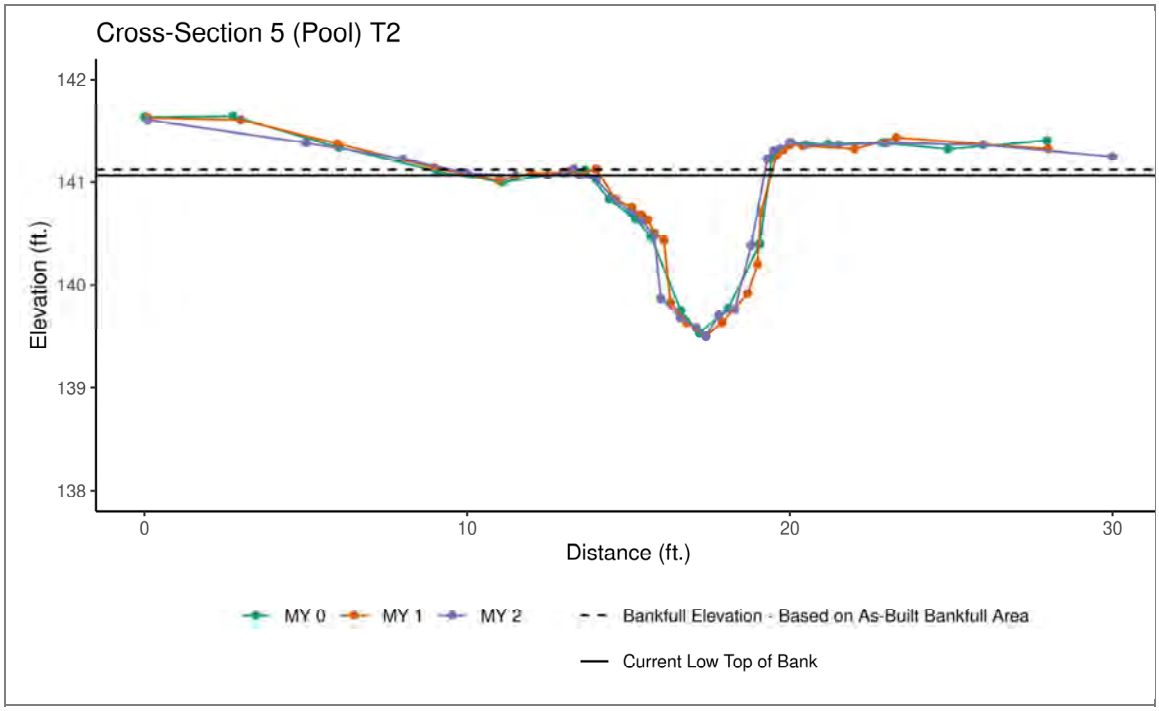

| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | 130.69 | 130.77 | 130.75 | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | 1.00 | 0.91 | 0.94 | | | |
| Thalweg Elevation | 130.04 | 130.24 | 130.12 | | | |
| LTOB Elevation | 130.69 | 130.72 | 130.71 | | | |
| LTOB Max Depth | 0.64 | 0.48 | 0.59 | | | |
| LTOB Cross-Sectional Area | 1.67 | 1.45 | 1.50 | | | |

**Downstream** *(03/04/2022)*



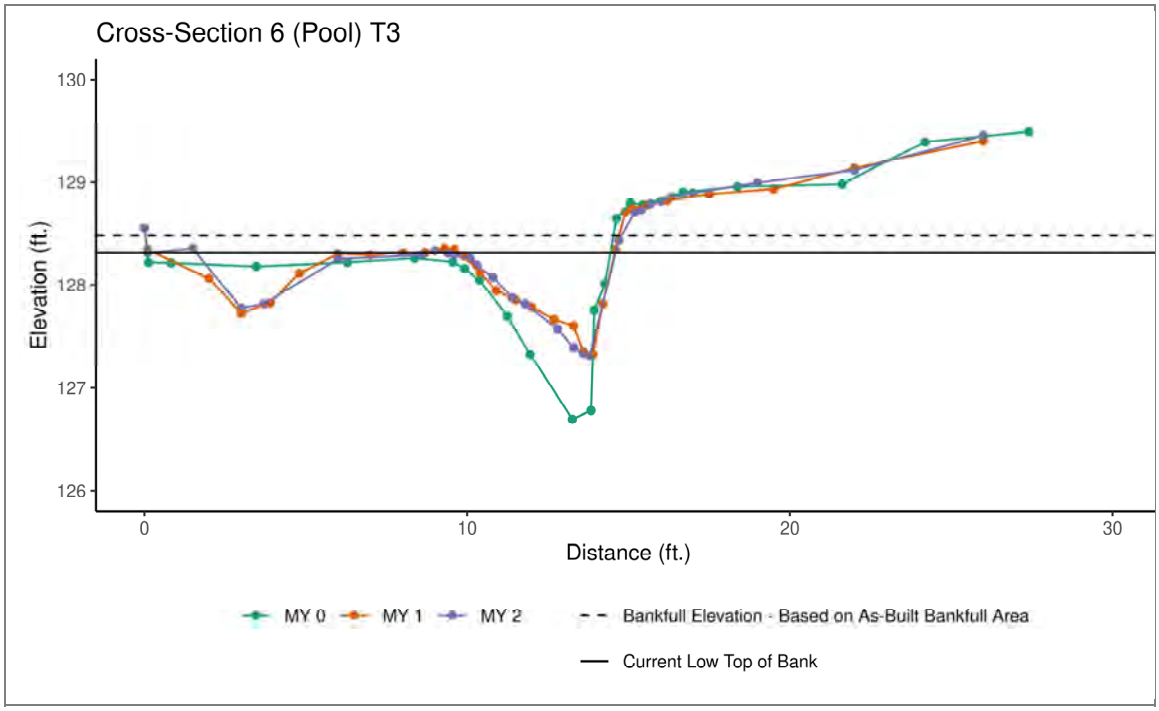

| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | 141.46 | 141.52 | 141.49 | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | 1.00 | 0.94 | 0.95 | | | |
| Thalweg Elevation | 140.66 | 140.78 | 140.77 | | | |
| LTOB Elevation | 141.46 | 141.47 | 141.46 | | | |
| LTOB Max Depth | 0.80 | 0.69 | 0.69 | | | |
| LTOB Cross-Sectional Area | 1.99 | 1.76 | 1.80 | | | |

**Downstream** *(03/04/2022)*



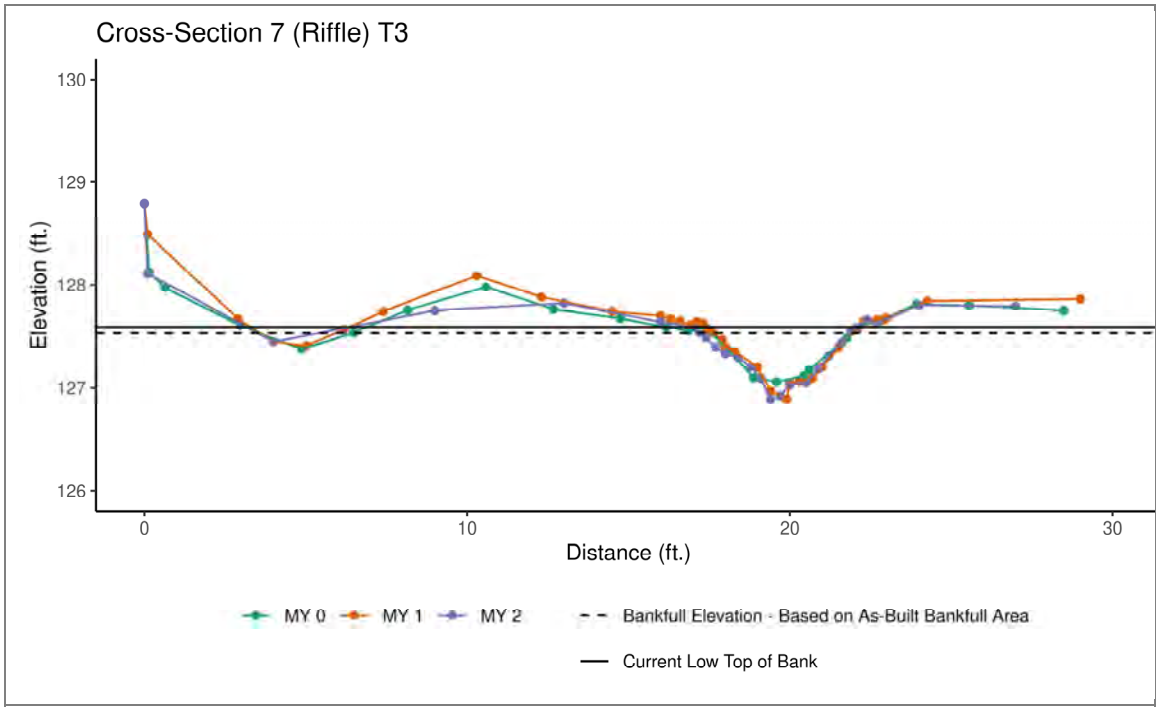

| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | N/A | N/A | N/A | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | N/A | N/A | N/A | | | |
| Thalweg Elevation | 139.53 | 139.50 | 139.51 | | | |
| LTOB Elevation | 141.12 | 141.10 | 141.07 | | | |
| LTOB Max Depth | 1.58 | 1.60 | 1.56 | | | |
| LTOB Cross-Sectional Area | 4.88 | 4.82 | 4.57 | | | |

**Downstream** *(03/04/2022)*



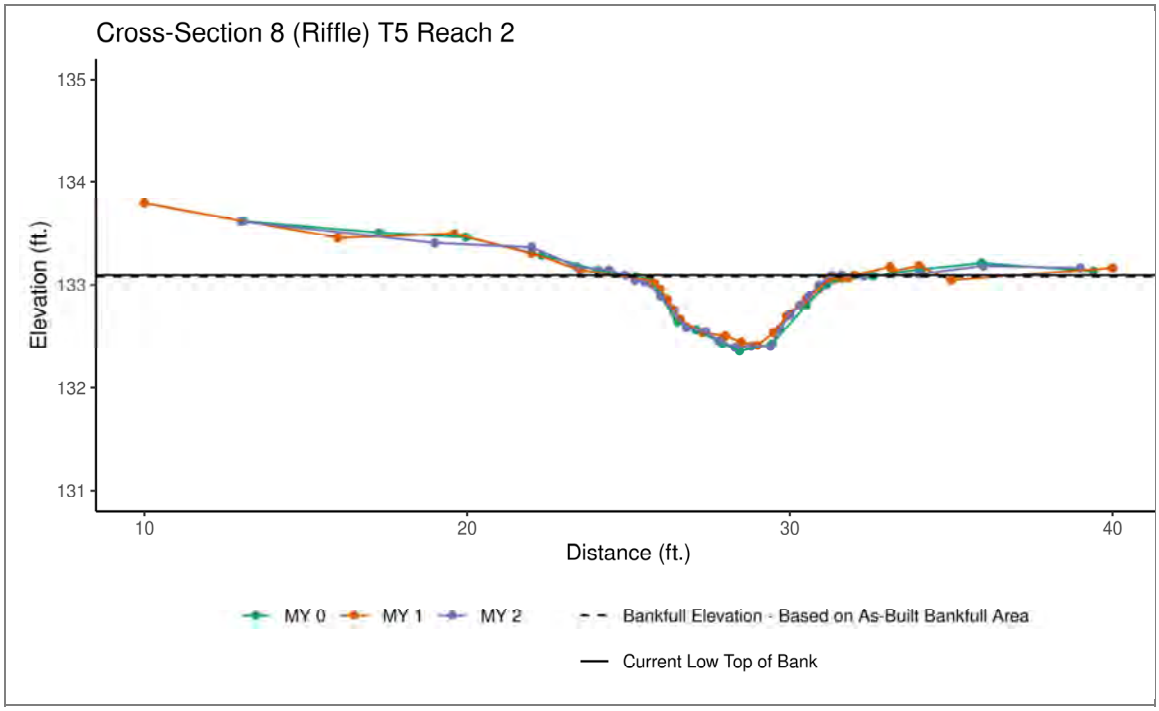

| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | N/A | N/A | N/A | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | N/A | N/A | N/A | | | |
| Thalweg Elevation | 126.70 | 127.32 | 127.31 | | | |
| LTOB Elevation | 128.16 | 128.35 | 128.31 | | | |
| LTOB Max Depth | 1.46 | 1.03 | 1.00 | | | |
| LTOB Cross-Sectional Area | 3.25 | 2.57 | 2.40 | | | |

**Downstream** *(03/04/2022)*



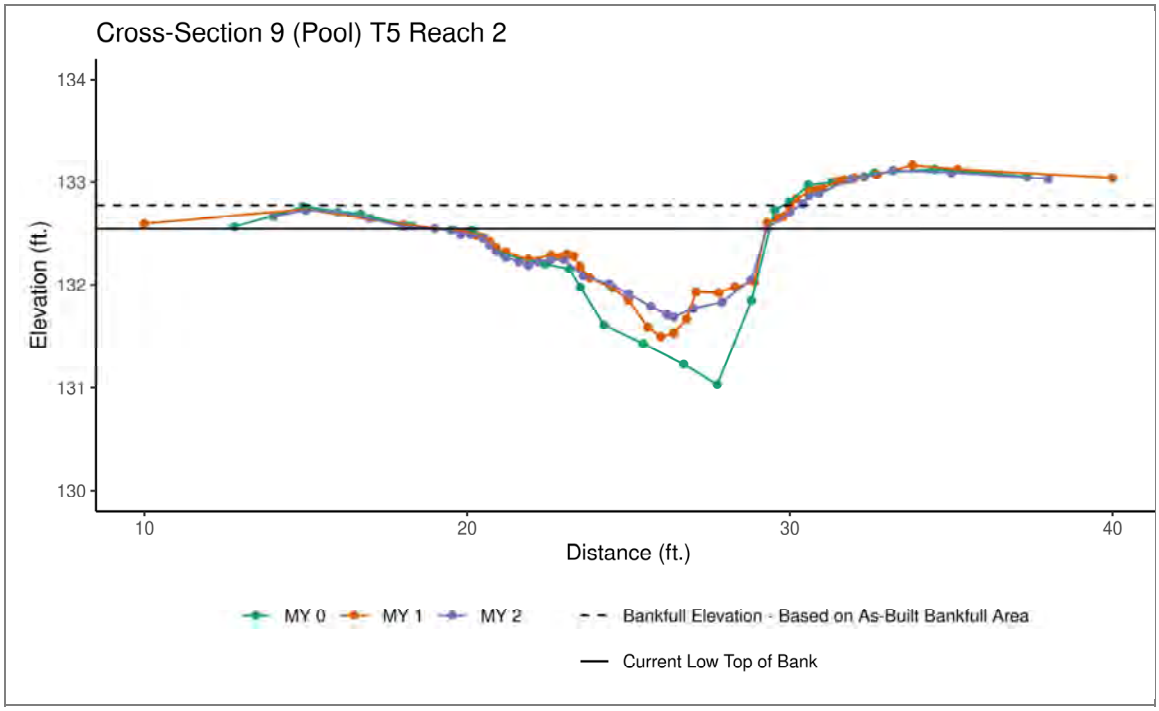

| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | 127.58 | 127.56 | 127.54 | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | 1.00 | 1.10 | 1.09 | | | |
| Thalweg Elevation | 127.06 | 126.89 | 126.89 | | | |
| LTOB Elevation | 127.58 | 127.63 | 127.59 | | | |
| LTOB Max Depth | 0.52 | 0.74 | 0.70 | | | |
| LTOB Cross-Sectional Area | 1.50 | 1.82 | 1.77 | | | |

**Downstream** *(03/04/2022)*



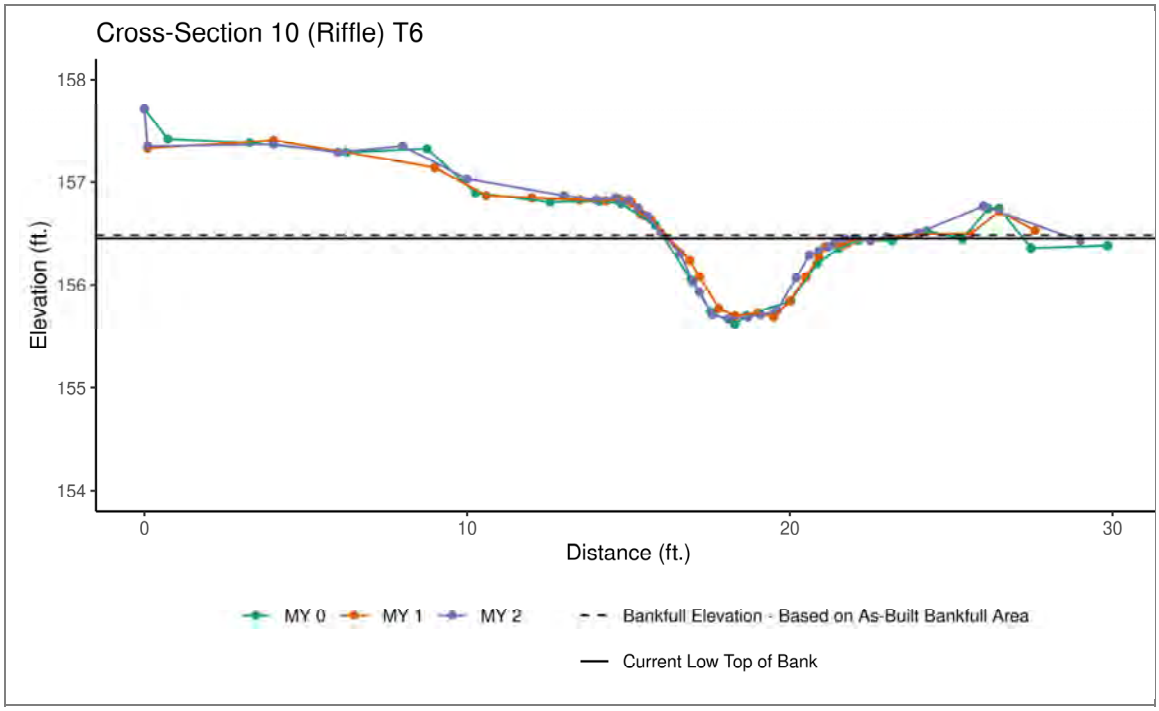

| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | 133.06 | 133.12 | 133.08 | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | 1.00 | 0.85 | 1.02 | | | |
| Thalweg Elevation | 132.36 | 132.42 | 132.40 | | | |
| LTOB Elevation | 133.06 | 133.02 | 133.10 | | | |
| LTOB Max Depth | 0.70 | 0.60 | 0.70 | | | |
| LTOB Cross-Sectional Area | 2.49 | 1.95 | 2.60 | | | |

**Downstream** *(03/04/2022)*




| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | N/A | N/A | N/A | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | N/A | N/A | N/A | | | |
| Thalweg Elevation | 131.03 | 131.50 | 131.69 | | | |
| LTOB Elevation | 132.53 | 132.46 | 132.55 | | | |
| LTOB Max Depth | 1.50 | 0.96 | 0.86 | | | |
| LTOB Cross-Sectional Area | 6.97 | 3.86 | 4.66 | | | |

**Downstream** *(03/04/2022)*




| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
|---|---|---|---|---|---|---|
| Bankfull Elevation - Based on AB-Bankfull Area | 156.43 | 156.50 | 156.48 | | | |
| Bank Height Ratio - Based on AB-Bankfull Area | 1.00 | 0.88 | 0.96 | | | |
| Thalweg Elevation | 155.62 | 155.69 | 155.67 | | | |
| LTOB Elevation | 156.43 | 156.40 | 156.45 | | | |
| LTOB Max Depth | 0.81 | 0.71 | 0.78 | | | |
| LTOB Cross-Sectional Area | 2.69 | 2.20 | 2.51 | | | |

**Downstream** *(03/04/2022)*

**Table 8. Baseline Stream Data Summary**

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

**Monitoring Year 2 - 2022**

| | PRE-EXISTING CONDITIONS | | | DESIGN | | MONITORING BASELINE (MY0) | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **T1 R2** | | | | | | | |
| **Riffle Only** | **Min** | **Max** | **n** | **Min** | **Max** | **Min** | **Max** | **n** |
| Bankfull Width (ft) | 3.4 | | 1 | 3.6 | | 5.2 | | 1 |
| Floodprone Width (ft) | 8 | | 1 | >7.9 | | 200 | | 1 |
| Bankfull Mean Depth | 1 | | 1 | 0.3 | | 0.4 | | 1 |
| Bankfull Max Depth | 0.7 | | 1 | 0.4 | 0.5 | 0.9 | | 1 |
| Bankfull Cross Sectional Area ($ft^2$) | 2.5 | | 1 | 1.2 | | 2.5 | | 1 |
| Width/Depth Ratio | 4.9 | | 1 | 11.0 | | 11.0 | | 1 |
| Entrenchment Ratio | 2.2 | | 1 | >2.2 | | 34.6 | | 1 |
| Bank Height Ratio | 3.0 | | 1 | 1.0 | 1.2 | 1.0 | | 1 |
| Max part size (mm) mobilized at bankfull | --- | | | --- | | --- | | |
| Rosgen Classification | G5 | | | C5b/E5b | | C5b/E5b | | |
| Bankfull Discharge (cfs) | 8.8 | | | 3.0 | | 9.0 | | |
| Sinuosity | 1.20 | | | 1.20 | | 1.20 | | |
| Water Surface Slope ($ft/ft)^2$ | 0.0190 | 0.0300 | 2 | 0.0250 | 0.0410 | 0.0322 | | |
| Other | --- | | | --- | | --- | | |
| **Parameter** | **T1 R3** | | | | | | | |
| **Riffle Only** | **Min** | **Max** | **n** | **Min** | **Max** | **Min** | **Max** | **n** |
| Bankfull Width (ft) | 3.4 | | 1 | 4.2 | | 4.3 | | 1 |
| Floodprone Width (ft) | 8 | | 1 | >9.2 | | 90 | | 1 |
| Bankfull Mean Depth | 1 | | 1 | 0.4 | | 0.4 | | 1 |
| Bankfull Max Depth | 0.7 | | 1 | 0.4 | 0.6 | 0.6 | | 1 |
| Bankfull Cross Sectional Area ($ft^2$) | 2.5 | | 1 | 1.5 | | 1.7 | | 1 |
| Width/Depth Ratio | 4.9 | | 1 | 12.0 | | 11.1 | | 1 |
| Entrenchment Ratio | 2.2 | | 1 | >2.2 | | 21.9 | | 1 |
| Bank Height Ratio | 3.0 | | 1 | 1.0 | 1.2 | 1.0 | | 1 |
| Max part size (mm) mobilized at bankfull | --- | | | --- | | --- | | |
| Rosgen Classification | G5 | | | C5/E5 | | C5/E5 | | |
| Bankfull Discharge (cfs) | 8.8 | | | 3.5 | | 4.3 | | |
| Sinuosity | 1.20 | | | 1.20 | | 1.20 | | |
| Water Surface Slope ($ft/ft)^2$ | 0.0190 | 0.0300 | 2 | 0.0092 | 0.0250 | 0.0181 | | |
| Other | --- | | | --- | | --- | | |

**Table 8. Baseline Stream Data Summary**

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

**Monitoring Year 2 - 2022**

| | PRE-EXISTING CONDITIONS | | | DESIGN | | MONITORING BASELINE (MY0) | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **T2** | | | | | | | |
| **Riffle Only** | **Min** | **Max** | **n** | **Min** | **Max** | **Min** | **Max** | **n** |
| Bankfull Width (ft) | 3 | | 1 | 4.2 | | 5.6 | | 1 |
| Floodprone Width (ft) | 4 | | 1 | >9.2 | | 75 | | 1 |
| Bankfull Mean Depth | 0.5 | | 1 | 0.4 | | 0.4 | | 1 |
| Bankfull Max Depth | 0.6 | | 1 | 0.5 | | 0.8 | | 1 |
| Bankfull Cross Sectional Area ($ft^2$) | 1.5 | | 1 | 1.5 | | 2.0 | | 1 |
| Width/Depth Ratio | 6 | | 1 | 12.0 | | 15.7 | | 1 |
| Entrenchment Ratio | 1.2 | | 1 | >2.2 | | 13.4 | | 1 |
| Bank Height Ratio | 6.5 | | 1 | 1.0 | 1.2 | 1.0 | | 1 |
| Max part size (mm) mobilized at bankfull | --- | | | --- | | --- | | |
| Rosgen Classification | G5 | | | C5b/E5b | | C5b/E5b | | |
| Bankfull Discharge (cfs) | 5.4 | | | 2.0 | | 4.3 | | |
| Sinuosity | 1.14 | | | 1.40 | | 1.40 | | |
| Water Surface Slope ($ft/ft)^2$ | 0.0290 | | 1 | 0.0051 | 0.0064 | 0.0147 | | |
| Other | --- | | | --- | | --- | | |
| **Parameter** | **T3 R1** | | | | | | | |
| **Riffle Only** | **Min** | **Max** | **n** | **Min** | **Max** | **Min** | **Max** | **n** |
| Bankfull Width (ft) | 3.2 | 4.2 | 2 | 3.6 | | 4.7 | | 1 |
| Floodprone Width (ft) | 5 | 24 | 2 | >7.9 | | 35 | | 1 |
| Bankfull Mean Depth | 0.42 | 0.5 | 2 | 0.3 | | 0.3 | | 1 |
| Bankfull Max Depth | 0.7 | 0.56 | 2 | 0.4 | 0.5 | 0.5 | | 1 |
| Bankfull Cross Sectional Area ($ft^2$) | 1.7 | | 2 | 1.0 | | 1.5 | | 1 |
| Width/Depth Ratio | 6.4 | 10 | 2 | 12.0 | | 14.8 | | 1 |
| Entrenchment Ratio | 1.1 | 7.1 | 2 | >2.2 | | 7.4 | | 1 |
| Bank Height Ratio | 2.7 | 7.0 | 2 | 1.0 | 1.2 | 1.0 | | 1 |
| Max part size (mm) mobilized at bankfull | --- | | | --- | | --- | | |
| Rosgen Classification | B5/G5 | | | C5/E5b | | C5/E5b | | |
| Bankfull Discharge (cfs) | 6.2 | 6.9 | 2 | 2.5 | | 4.5 | | |
| Sinuosity | 1.16 | | | 1.20 | | 1.20 | | |
| Water Surface Slope ($ft/ft)^2$ | 0.0340 | | 1 | 0.0280 | 0.0330 | 0.0312 | | |
| Other | --- | | | --- | | --- | | |

**Table 8. Baseline Stream Data Summary**

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

**Monitoring Year 2 - 2022**

| | PRE-EXISTING CONDITIONS | | | DESIGN | | MONITORING BASELINE (MY0) | | |
|---|---|---|---|---|---|---|---|---|
| **Parameter** | **T5 R2** | | | | | | | |
| **Riffle Only** | **Min** | **Max** | **n** | **Min** | **Max** | **Min** | **Max** | **n** |
| Bankfull Width (ft) | 3.1 | | 1 | 5.6 | | 5.9 | | 1 |
| Floodprone Width (ft) | 27 | | 1 | >11 | | 170 | | 1 |
| Bankfull Mean Depth | 1.1 | | 1 | 0.5 | | 0.4 | | 1 |
| Bankfull Max Depth | 1.4 | | 1 | 0.6 | 0.8 | 0.7 | | 1 |
| Bankfull Cross Sectional Area ($ft^2$) | 3.5 | | 1 | 2.7 | | 2.5 | | 1 |
| Width/Depth Ratio | 2.8 | | 1 | 12.0 | | 14.0 | | 1 |
| Entrenchment Ratio | 8.7 | | 1 | >2.2 | | 16.9 | | 1 |
| Bank Height Ratio | 1.6 | | 1 | 1.0 | 1.2 | 1.0 | | 1 |
| Max part size (mm) mobilized at bankfull | --- | | | --- | | --- | | |
| Rosgen Classification | E5 | | | C5/E5 | | C5/E5 | | |
| Bankfull Discharge (cfs) | 10.9 | | | 6.0 | | 5.4 | | |
| Sinuosity | 1.20 | | | 1.40 | | 1.40 | | |
| Water Surface Slope ($ft/ft)^2$ | 0.0120 | | 1 | 0.0086 | 0.0170 | 0.0111 | | |
| Other | --- | | | --- | | --- | | |
| **Parameter** | **T6 R1** | | | | | | | |
| **Riffle Only** | **Min** | **Max** | **n** | **Min** | **Max** | **Min** | **Max** | **n** |
| Bankfull Width (ft) | 4.1 | | 1 | 6.4 | | 6.0 | | 1 |
| Floodprone Width (ft) | 7 | | 1 | >14 | | 90 | | 1 |
| Bankfull Mean Depth | 1.1 | | 1 | 0.41 | | 0.4 | | 1 |
| Bankfull Max Depth | 1.5 | | 1 | 0.5 | 0.7 | 0.8 | | 1 |
| Bankfull Cross Sectional Area ($ft^2$) | 4.4 | | 1 | 3.3 | | 2.7 | | 1 |
| Width/Depth Ratio | 3.7 | | 1 | 12.0 | | 13.3 | | 1 |
| Entrenchment Ratio | 1.7 | | 1 | >2.2 | | 15.1 | | 1 |
| Bank Height Ratio | 2.0 | | 1 | 1.0 | 1.2 | 1.0 | | 1 |
| Max part size (mm) mobilized at bankfull | --- | | | --- | | --- | | |
| Rosgen Classification | G5 | | | C5/E5 | | C5/E5 | | |
| Bankfull Discharge (cfs) | 12.8 | | | 5.5 | | 5.9 | | |
| Sinuosity | 1.10 | | | 1.20 | | 1.20 | | |
| Water Surface Slope ($ft/ft)^2$ | 0.0086 | | 1 | 0.0049 | 0.0150 | 0.0107 | | |
| Other | --- | | | --- | | --- | | |

**Table 9. Cross-Section Morphology Monitoring Summary**

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

**Monitoring Year 2 - 2022**

| | T1 Reach 2 | | | | | | | | | | | | T1 Reach 3 | | | | | | T2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cross-Section 1 (Riffle) | | | | | | Cross-Section 2 (Pool) | | | | | | Cross-Section 3 (Riffle) | | | | | | Cross-Section 4 (Riffle) | | | | | |
| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
| Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area | 149.35 | 149.41 | 149.28 | | | | N/A | N/A | N/A | | | | 130.69 | 130.77 | 130.75 | | | | 141.46 | 141.52 | 141.49 | | | |
| Bank Height Ratio - Based on AB Bankfull[1] Area | 1.00 | 0.93 | 1.03 | | | | N/A | N/A | N/A | | | | 1.00 | 0.91 | 0.94 | | | | 1.00 | 0.94 | 0.95 | | | |
| Thalweg Elevation | 148.45 | 148.62 | 148.34 | | | | 147.78 | 147.58 | 147.67 | | | | 130.04 | 130.24 | 130.12 | | | | 140.66 | 140.79 | 140.77 | | | |
| LTOB[2] Elevation | 149.35 | 149.36 | 149.31 | | | | 148.82 | 148.77 | 148.83 | | | | 130.69 | 130.72 | 130.71 | | | | 141.46 | 141.48 | 141.46 | | | |
| LTOB[2] Max Depth (ft) | 0.90 | 0.74 | 0.97 | | | | 1.04 | 1.19 | 1.16 | | | | 0.64 | 0.48 | 0.59 | | | | 0.80 | 0.69 | 0.69 | | | |
| LTOB[2] Cross Sectional Area ($ft^2$) | 2.47 | 2.16 | 2.63 | | | | 3.20 | 2.84 | 2.91 | | | | 1.67 | 1.45 | 1.50 | | | | 1.99 | 1.76 | 1.80 | | | |

| | T2 | | | | | | T3 Reach 1 | | | | | | | | | | | | T5 Reach 2 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cross-Section 5 (Pool) | | | | | | Cross-Section 6 (Pool) | | | | | | Cross-Section 7 (Riffle) | | | | | | Cross-Section 8 (Riffle) | | | | | |
| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
| Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area | N/A | N/A | N/A | | | | N/A | N/A | N/A | | | | 127.58 | 127.56 | 127.54 | | | | 133.06 | 133.12 | 133.08 | | | |
| Bank Height Ratio - Based on AB Bankfull[1] Area | N/A | N/A | N/A | | | | N/A | N/A | N/A | | | | 1.00 | 1.10 | 1.09 | | | | 1.00 | 0.85 | 1.02 | | | |
| Thalweg Elevation | 139.53 | 139.51 | 139.51 | | | | 126.70 | 127.32 | 127.31 | | | | 127.06 | 126.89 | 126.89 | | | | 132.36 | 132.42 | 132.40 | | | |
| LTOB[2] Elevation | 141.12 | 141.11 | 141.07 | | | | 128.16 | 128.35 | 128.31 | | | | 127.58 | 127.63 | 127.59 | | | | 133.06 | 133.02 | 133.10 | | | |
| LTOB[2] Max Depth (ft) | 1.58 | 1.60 | 1.56 | | | | 1.46 | 1.03 | 1.00 | | | | 0.52 | 0.74 | 0.70 | | | | 0.70 | 0.60 | 0.70 | | | |
| LTOB[2] Cross Sectional Area ($ft^2$) | 4.88 | 4.82 | 4.57 | | | | 3.25 | 2.57 | 2.40 | | | | 1.50 | 1.82 | 1.77 | | | | 2.49 | 1.95 | 2.60 | | | |

| | T5 Reach 2 | | | | | | T6 Reach 1 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Cross-Section 9 (Pool) | | | | | | Cross-Section 10 (Riffle) | | | | | |
| | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 | MY0 | MY1 | MY2 | MY3 | MY5 | MY7 |
| Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area | N/A | N/A | N/A | | | | 156.43 | 156.50 | 156.48 | | | |
| Bank Height Ratio - Based on AB Bankfull[1] Area | N/A | N/A | N/A | | | | 1.00 | 0.88 | 0.96 | | | |
| Thalweg Elevation | 131.03 | 131.50 | 131.69 | | | | 155.62 | 155.69 | 155.67 | | | |
| LTOB[2] Elevation | 132.53 | 132.46 | 132.55 | | | | 156.43 | 156.40 | 156.45 | | | |
| LTOB[2] Max Depth (ft) | 1.50 | 0.96 | 0.86 | | | | 0.81 | 0.71 | 0.78 | | | |
| LTOB[2] Cross Sectional Area ($ft^2$) | 6.97 | 3.86 | 4.66 | | | | 2.69 | 2.20 | 2.51 | | | |

[1]Bank Height Ratio (BHR) takes the As-built bankful area as the basis for adjusting each subsequent years bankfull elevation.

[2]LTOB Area and Max depth - These are based on the LTOB elevation for each years survey (The same elevation used for the LTOB in the BHR calculation). Area below the LTOB elevation will be used and tracked for each year as above. The difference between the LTOB elevation and the thalweg elevation (same as in the BHR calculation) will be recroded and tracked above as LTOB max depth.

# APPENDIX D. HYDROLOGY DATA

### Table 10. Bankfull Events

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

| Reach | MY1 (2021) | MY2 (2022) | MY3 (2023) | MY4 (2024) | MY5 (2025) | MY6 (2026) | MY7 (2027) |
|---|---|---|---|---|---|---|---|
| **T1 Reach 3** | 2/16/2021<br>7/28/2021 | 3/12/2022<br>5/23/2022<br>9/10/2022 | | | | | |
| **T2** | 7/27/2021<br>10/9/2021 | N/A | | | | | |
| **T3 Reach 1** | 7/28/2021 | 1/18/2022 | | | | | |
| **T5 Reach 2** | 1/24/2021<br>7/28/2021 | 9/10/2022 | | | | | |

N/A: No bankfull events were recorded before 9/29/2022. Data will be updated in MY3.

### Table 11. Rainfall Summary

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

| | MY1 (2021) | MY2 (2022) | MY3 (2023) | MY4 (2024) | MY5 (2025) | MY6 (2026) | MY7 (2027) |
|---|---|---|---|---|---|---|---|
| **Annual Precip Total** | 34.14 | 20.00* | | | | | |
| **WETS 30th Percentile** | 44.35 | 33.95 | | | | | |
| **WETS 70th Percentile** | 52.31 | 58.89 | | | | | |
| **Normal** | L | * | | | | | |

*Annual precipitation total was collected up until 9/29/2022. Data will be updated in MY3.

## Table 12. Groundwater Gauge Summary

Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

| Gauge | Max. Consecutive Hydroperiod (Percentage) | | | | | | |
|---|---|---|---|---|---|---|---|
| | MY1 (2021) | MY2 (2022)* | MY3 (2023) | MY4 (2024) | MY5 (2025) | MY6 (2026) | MY7 (2027) |
| 1 | **124 Days (47.5%)** | **96 Days (36.8%)** | | | | | |

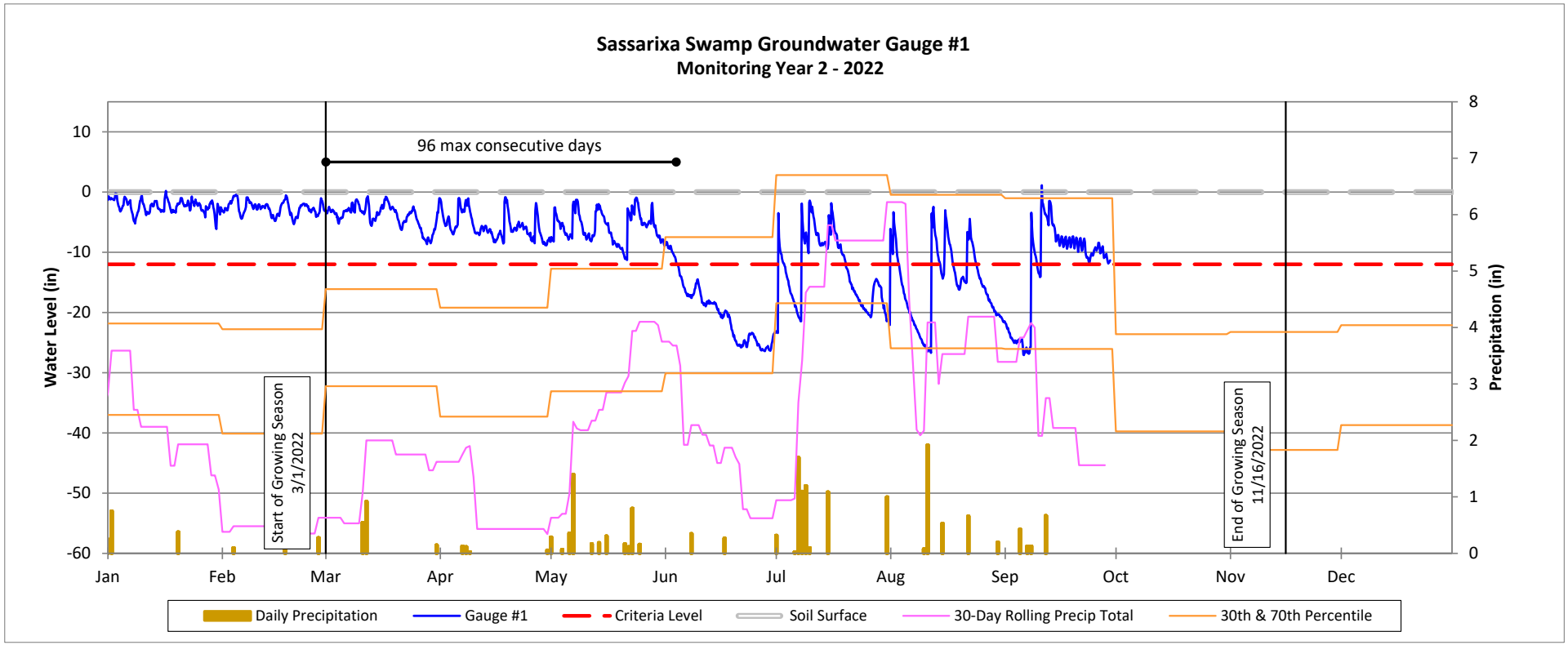
Performance Standard: **None**
WETS Station: **Smithfield 2 North**
Growing Season: **3/1/2021 to 11/16/2022 (260 Days)**
*Data was collected from 3/1/2022 to 9/29/2022 (212 Days).

## Groundwater Gauge Plot

Sassarixa Swamp Mitigation Site

DMS Project No. 100040

**Monitoring Year 2 - 2022**



## Table 13. Recorded In-Stream Flow Events Summary

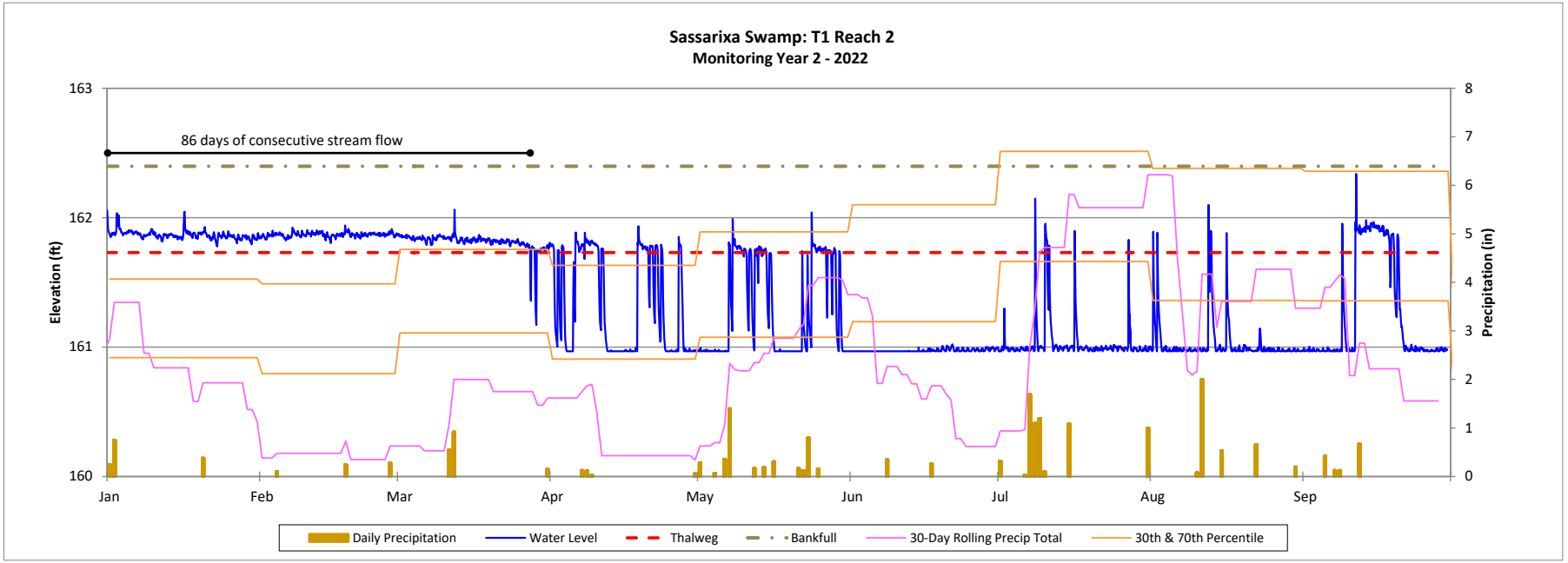
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

| Reach | Max Consecutive Days/Total Days Meeting Success Criteria* | | | | | | |
|---|---|---|---|---|---|---|---|
| | MY1 (2021) | MY2 (2022)** | MY3 (2023) | MY4 (2024) | MY5 (2025) | MY6 (2026) | MY7 (2027) |
| T1 Reach 2 | 44 Days/ 122 Days | 86 Days/ 119 Days | | | | | |
| T2 | 103 Days/ 192 Days | 87 Days/ 117 Days | | | | | |
| T3 Reach 1 | 108 Days/ 190 Days | 63 Days/ 106 Days | | | | | |

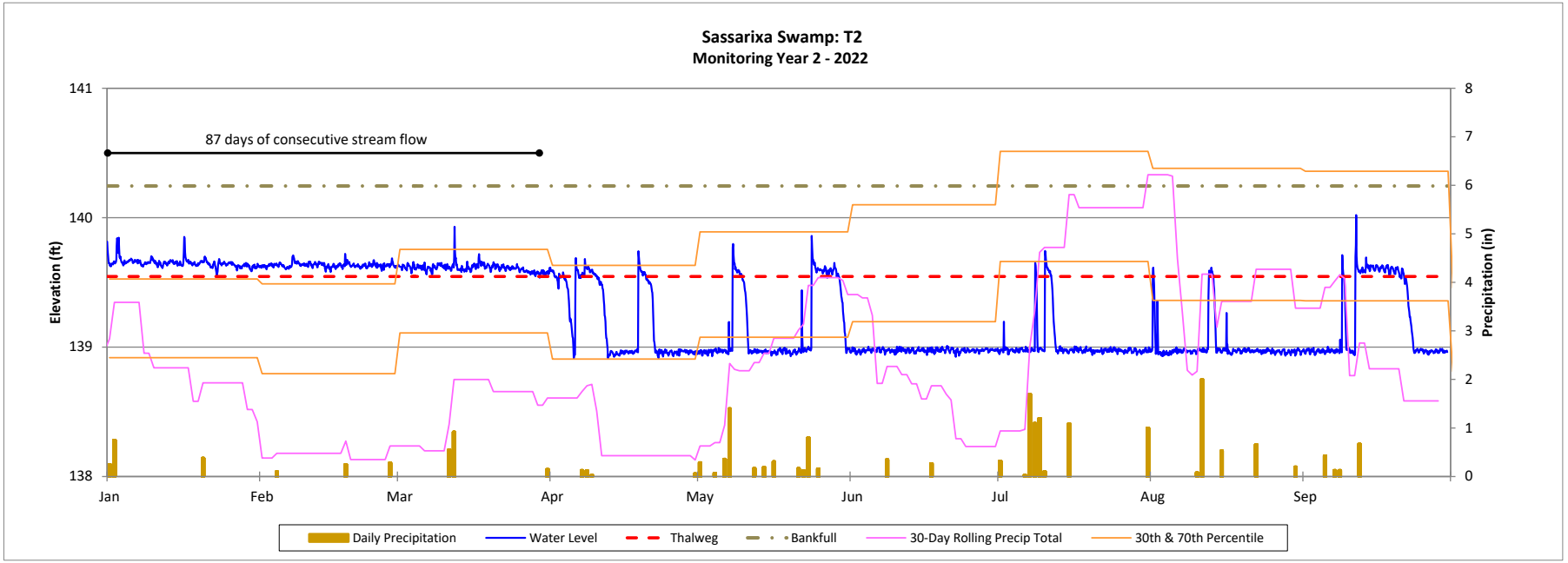
*Success criteria is 30 consecutive days of flow.

**Data was colleted through 9/29/2022. Data will be updated in MY3.

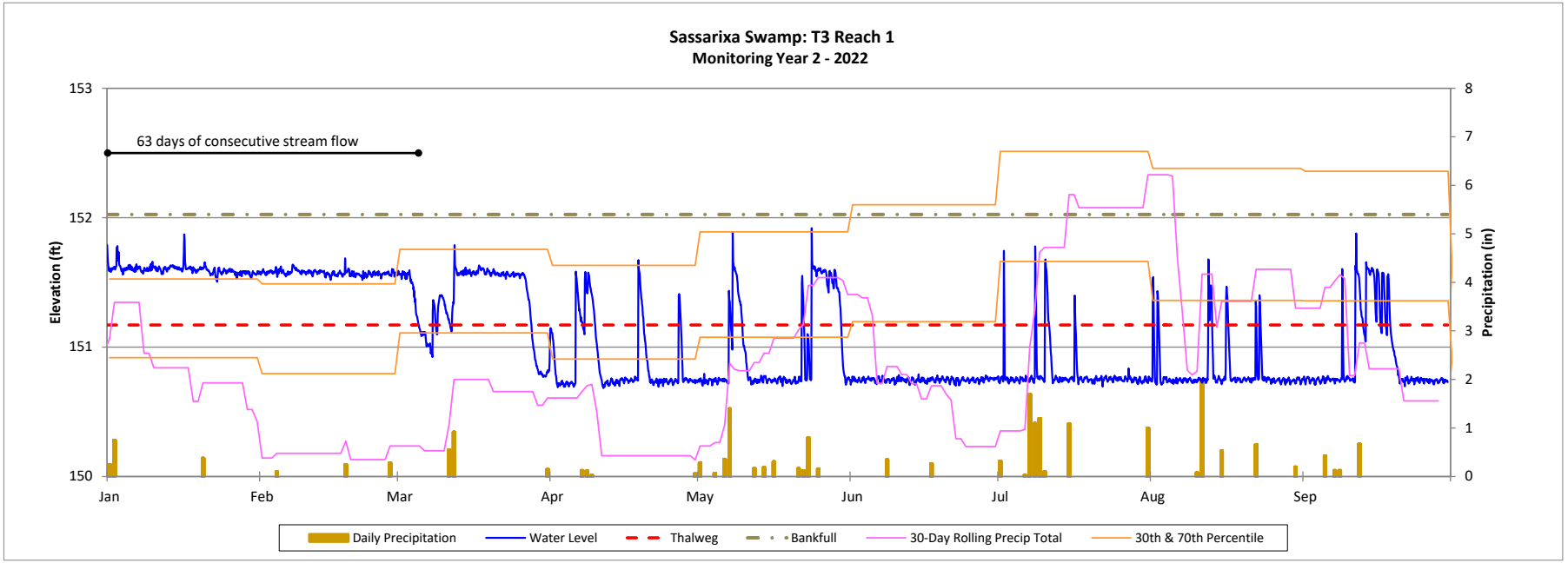
**Recorded In-Stream Flow Events Plot**
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**



**Recorded In-Stream Flow Events Plot**
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**



**Recorded In-Stream Flow Events Plot**
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**



# APPENDIX E. PROJECT TIMELINE AND CONTACT INFO

**Table 14. Project Activity and Reporting History**
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

| Activity or Deliverable | | Data Collection Complete | Task Completion or Deliverable Submission |
|---|---|---|---|
| Project Instituted | | NA | January 2018 |
| Mitigation Plan Approved | | NA | November 2019 |
| Construction (Grading) Completed | | NA | January 2021 |
| Planting Completed | | NA | March 2021 |
| As-Built Survey Completed | | NA | Febuary 2021 |
| Baseline Monitoring Document (Year 0) | Stream Survey | January 2021 | April 2021 |
| | Vegetation Survey | March 2021 | |
| | Easement Encroachment | July 2021 | |
| | In-Stream Vegetation Treatment | September 2021 | |
| Year 1 Monitoring | Stream Survey | July 2021 | December 2021 |
| | Vegetation Survey | September 2021 | |
| Year 2 Monitoring | Stream Survey | March 2022 | December 2022 |
| | Vegetation Survey | September 2022 | |
| | Replanting | February 2022 | |
| | Invasive Species Treatment | March - July 2022 | |
| Year 3 Monitoring | Stream Survey | 2023 | December 2023 |
| | Vegetation Survey | 2023 | |
| Year 4 Monitoring | | | December 2024 |
| Year 5 Monitoring | Stream Survey | 2025 | December 2025 |
| | Vegetation Survey | 2025 | |
| Year 6 Monitoring | | | December 2026 |
| Year 7 Monitoring | Stream Survey | 2027 | December 2027 |
| | Vegetation Survey | 2027 | |

**Table 15. Project Contact Table**
Sassarixa Swamp Mitigation Site
DMS Project No. 100040
**Monitoring Year 2 - 2022**

| | |
|---|---|
| **Designer**<br>Angela Allen, PE | **Wildlands Engineering, Inc.**<br>312 West Millbrook Road, Suite 225<br>Raleigh, NC 27609<br>919.851.9986 |
| **Construction Contractor** | **Land Mechanic Designs, Inc.**<br>126 Circle G Lane<br>Willow Spring, NC 27592 |
| **Monitoring Performers**<br>Monitoring, POC | **Wildlands Engineering, Inc.**<br>Jason Lorch<br>919.851.9986 |