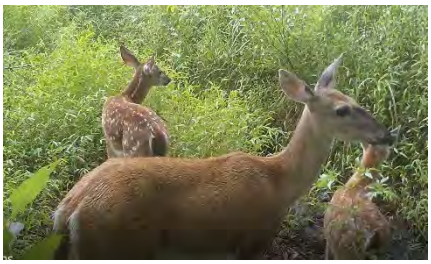

MONITORING YEAR 3 ANNUAL REPORT

FINAL

December 2022

CATFISH POND MITIGATION SITE

Durham County, NC
Neuse River Basin
HUC 03020201

DMS Project No. 100039
NCDEQ Contract No. 007424
NCDWR Project No. 2018-0196
USACE Action ID No. 2018-00424
Data Collection Dates: January - November 2022

PREPARED FOR:

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CATFISH POND MITIGATION SITE

Monitoring Year 3 Annual Report

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Section 1: PROJECT OVERVIEW

The Catfish Pond Mitigation Site (Site) is in Durham County, approximately 12 miles north of the City of Durham and approximately 3 miles east of the Orange/Durham County border. The project watershed consists primarily of agricultural and forested land. The streams drain to Mountain Creek, which flows into Little River, the Eno River, and then Falls Lake. A 20.73-acre conservation easement has been placed on the Site. Table 3 presents more information related to the project attributes.

1.1 Project Quantities and Credits

Mitigation work within the Site included restoration and enhancement II of perennial and intermittent stream channels (Figures 1-1b). Table 1 below shows stream credits by reach and credit totals expected by project 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							
Catfish Creek Reach 1	115	115	Warm	EII	2.5	46.000	Invasive Control, Conservation Easement
Catfish Creek Reach 2	323	323	Warm	EII	2.5	129.200	Invasive Control, Grade Control Structures, Planted Buffer, Livestock Exclusion
Catfish Creek Reach 3	473	474	Warm	EII	2.5	189.200	Invasive Control, Grade Control Structures, Planted Buffer, Livestock Exclusion
Catfish Creek Reach 4	374	373	Warm	R	1.0	374.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
	72	72	N/A	N/A	0.0	0.000	Culvert Crossing
Catfish Creek Reach 5	460	460	Warm	EII	2.5	184.000	Grade Control Structures, Planted Buffer, Livestock Exclusion, Conservation Easement
Catfish Creek Reach 6	454*	444	Warm	R	1.0	454.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion, Farm Pond Drained
Catfish Creek Reach 7	1,071*	1,087	Warm	EII	2.5	428.400	Invasive Control, Grade Control Structures, Planted Buffer, Livestock Exclusion

*Due to a stationing error in the Mitigation Plan, linear feet and associated credits were overestimated on Catfish Creek Reach 6 and underestimated on Reach 7 for a net overage of 10.6 credits. Stream credits were calculated using Mitigation Plan footage because the 10.6 credits represent only 0.28% of the total stream credits.

PROJECT MITIGATION QUANTITIES							
Project Segment	**Mitigation Plan Footage**	**As-Built Footage**	**Mitigation Category**	**Restoration Level**	**Mitigation Ratio (X:1)**	**Credits**	**Comments**
Stream							
UT1 Reach 1	263	263	Warm	EII	2.5	105.200	Invasive Control, Planted Buffer, Livestock Exclusion
	42	42	N/A	N/A	0.0	0.000	Culvert Crossing
	717	711	Warm	EII	2.5	286.800	Invasive Control, Planted Buffer, Livestock Exclusion
UT1 Reach 2	515	520	Warm	R	1.0	515.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
	60	61	N/A	N/A	0.0	0.000	Culvert Crossing
UT1 Reach 3	149	149	Warm	R	1.0	149.000	Full Channel Restoration, Planted Buffer, Livestock Exclusion
UT1 Reach 4	446	446	Warm	EII	2.5	178.400	Invasive Control, Planted Buffer, Livestock Exclusion
UT2	412	412	Warm	EII	2.5	164.800	Invasive Control, Grade Control Structures, Livestock Exclusion
Mountain Tributary	1,362	1,362	Warm	EII	2.5	544.800	Invasive Control, Grade Control Structures, Planted Buffer, Livestock Exclusion
					Total:	**3,748.800**	

Restoration Level	**Stream**		
	Warm	**Cool**	**Cold**
Restoration	1,492.000		
Enhancement I	--		
Enhancement II	2,256.800		
Preservation	--		
Totals	**3,748.800**		
Total Stream Credit^	**3,748.800**		

^Credits were adjusted at As-Built to include changes in stream alignment on Catfish Creek Reach 6 due to bedrock in the floodplain.

1.2 Project Goals and Objectives

The project is intended to provide numerous ecological benefits. Table 2 below describes the project goals and objectives along with the expected outcomes to water quality and ecological processes. Additionally, performance criteria for project objectives and a summary of the related monitoring data results for Monitoring Year 3 (MY3) are included.

Table 2: Goals, Performance Criteria, and Functional Improvements

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Exclude livestock from streams.	Install fencing around conservation easements adjacent to cattle pastures or remove livestock.	Reduction in sediment, nutrient, and fecal coliform bacteria inputs through livestock exclusion. Contribution to protection of or improvement of Water Supply Waterbody.	Exclusion fencing is installed and maintained. Livestock remain excluded from the project area.	Visually inspect the perimeter, as well as interior, of the Site to ensure there are no signs of livestock entering the Site.	No livestock access to the conservation easement has occurred.
Reconnect channels with floodplains and riparian wetlands to allow a natural flooding regime.	Reconstruct stream channels for bankfull dimensions and depth relative to the existing floodplain. Remove existing berms to re-connect channel with adjacent wetlands.	Raise water table and hydrate riparian wetlands. Allow more frequent flood flows to disperse on the floodplain. Support geomorphology and higher level functions.	Four bankfull events in separate years within monitoring period.	Crest gauge and/or pressure transducer recording flow elevations.	A bankfull event was documented on UT1 but not Catfish Creek.
Improve the stability of stream channels.	Construct stream channels that will maintain stable cross-sections, patterns, and profiles over time.	Significantly reduce sediment inputs from bank erosion. Reduce shear stress on channel boundary. Support all stream functions above hydrology.	Entrenchment ratio over 2.2 and bank height ratios below 1.2 with visual assessments showing stability.	Cross-section data will be collected during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be performed annually.	All cross-section entrenchment ratios are over 2.2. Bank height ratios are below 1.2, except on XS4 (Catfish Creek Reach 6) which is just over 1.2 and stable.
Improve instream habitat.	Install habitat features such as constructed riffles, cover/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. Add complexity including LWD to streams.	There is no performance standard for this metric.	N/A	N/A
Restore and enhance native floodplain and streambank vegetation.	Plant native tree and understory species in riparian zone and plant appropriate species on streambank.	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. Support all stream functions.	210 planted stems per acre at MY7. Interim survival rate of 320 planted stems per acre at MY3 and 260 at MY5. Trees in each plot must average 7 ft at MY5 and 10 ft at MY7.	One hundred square meter vegetation plots are placed on 2% of the planted area of the Site. Data will be collected during MY1, MY2, MY3, MY5, and MY7 and visual inspections will be performed annually.	All 9 vegetation plots have a planted stem density greater than 320 stems per acre.

Goal	Objective/ Treatment	Likely Functional Uplift	Performance Criteria	Measurement	Cumulative Monitoring Results
Permanently protect the project Site from harmful uses.	Establish conservation easements on the Site.	Protect site from encroachment on the riparian corridor and direct impact to streams and wetlands. Support all stream functions.	Prevent easement encroachment.	Visually inspect the perimeter of the Site to ensure no easement encroachment is occurring.	No easement encroachments have occurred.

1.3 Project Attributes

The Site area has been used for livestock grazing or maintained as managed herbaceous cover since at least 1940. Cattle were continually rotated through all fields with access to the project streams. Based on aerial photos from 1940 to 2012, there was an increase in agricultural activity between 1955 and 1972, but onsite streams have existed in their approximate locations with very little change to riparian buffer extents since 1972.

Catfish Pond was constructed sometime between 1940 and 1955, and extensive logging and farm road construction along the Site streams were prevalent during this period. Aerial photographs from 1972 show UT1 in a cleared condition. This imagery, in addition to the lack of sinuosity on UT1, suggest that the channel was straightened for agricultural purposes prior to 1972. UT1 showed no signs of riparian buffer growth until 2005, when an aerial photo shows a visible narrow corridor of trees. Catfish Creek, UT2, and Mountain Tributary do not show signs of channel manipulation.

Table 3 below and Table 8 in Appendix C present additional information on pre-restoration conditions. Project Activity and Reporting History, as well as the Project Contact Table are included in Appendix E.

Table 3: Project Attributes

PROJECT INFORMATION			
Project Name	Catfish Pond Mitigation Site	County	Durham County
Project Area (acres)	20.73	Project Coordinates	36° 9’ 48.03” N, 78° 54’ 37.66” W
PROJECT WATERSHED SUMMARY INFORMATION			
Physiographic Province	Carolina Slate Belt of Piedmont	River Basin	Neuse River
USGS HUC 8-digit	03020201	USGS HUC 14-digit	03020201020040
DWR Sub-basin	03-04-01	Land Use Classification	45.6% forested, 54.2% cultivated, 0.2% wetland
Project Drainage Area (acres)	227 (Catfish Creek - 197, Mountain Tributary - 30)	Percentage of Impervious Area	0.0%

RESTORATION TRIBUTARY SUMMARY INFORMATION				
Parameters	**Catfish Creek**		**UT1**	
	Reach 4	**Reach 6**	**Reach 2**	**Reach 3**
Pre-project length (feet)	369	466	430	154
Post-project (feet)	373	444	520	149
Valley confinement	Unconfined	Moderately Confined		
Drainage area (acres)	56	70	105	107
Perennial, Intermittent, Ephemeral	Perennial			
DWR Water Quality Classification	WS-II/HQW/NSW			
Dominant Stream Classification (existing)	Incised E6	N/A	C6	E4b
Dominant Stream Classification (proposed)	C4	B4a	C4	B4a
Dominant Evolutionary class (Simon) if applicable	Stage IV	N/A	Stage V	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 3 Data Assessment

Annual monitoring and site visits were conducted during MY3 to assess the condition of the project. The vegetation and stream success criteria for the Site follow the approved performance standards 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 Baseline Monitoring Document and As-Built Baseline Report (Wildlands, 2020).

2.1 Vegetative Assessment

The MY3 vegetative survey was completed in September 2022. Vegetation monitoring resulted in an average stem density of 494 stems per acre, which is well above the interim success criteria of 320 stems per acre required at MY3. All nine vegetation plots individually met the interim success criteria and stem densities for each plot range from 324 to 607 stems per acre. Volunteer stems including desirable species such as American persimmon (*Diospyros virginiana*) and tulip poplar (*Liriodendron tulipifera*) continue to establish themselves. Refer to Appendix A for Vegetation Plot Photographs and the Vegetation Condition Assessment Table and Appendix B for Vegetation Plot Data.

2.2 Vegetation Areas of Concern

While planted trees are growing well, pasture grasses are still thick. In April 2022, where necessary to ensure planted trees remain competitive, herbicide ring sprays were applied around the base of trees.

Invasive species at Catfish Pond have been greatly reduced by past treatments throughout the site. However, Wildlands recognizes that multiple treatments are typically needed for effective invasive plant control. Sporadic patches of multiflora rose (*Rosa multiflora*) and blackberry (*Rubus spp.*) on the upstream portion of UT1 had begun to compete with planted trees and were treated in May 2022 with a foliar spray application of triclopyr herbicide. Intermittent resprouts of multiflora rose, Chinese Privet (*Ligustrum sinense*), and tree-of-heaven (*Alianthus altissima*), were also treated along Catfish Creek with triclopyr and glyphosate using situation and plant appropriate forms of application.

In an effort to help shade out in-stream vegetation as much as possible, additional live stakes were planted in areas that seem to get the most sun on Catfish Creek Reach 4 in early April 2022. While waiting for the live stakes to grow, in-stream vegetation was treated with a foliar spray of glyphosate in June 2022.

2.3 Stream Assessment

Morphological surveys for MY3 were conducted in April 2022. All streams within the Site are stable and functioning. Cross-section 1, 2, 3, 5, and 6 graphs show slight deviations from as-built due to sediment deposition and establishment of vegetation. Some sediment deposition in pools is natural and expected.

Cross-section 4 on Catfish Creek Reach 6 has not changed noticeably since MY2, after the riffle material in the area washed downstream over the bedrock. Although the bank height ratio is just over 1.2, this is to be expected with the deeper channel. The bedrock stream channel is stable and no longer an area of concern.

Cross-section 7 on UT1 Reach 3 is now stable. After repairs, this reach is a step pool system with short riffles and longer glides. This leaves cross-section 7 in a step pool glide, rather than a typical riffle in a C type stream channel. The MY2 and MY3 “Bank Height Ratio – Based on AB-Bankfull Area” in the Cross-Section Plot table and Table 9 (Appendix C) are based on the bankfull area of the channel after repairs were completed in MY2. The repairs changed the channels dimensions, so the low top of bank elevation

and the cross-sectional area are no longer comparable to the MY0 AB-Bankfull Elevation or BHR. When the MY3 cross-section 7 graph is compared to the repaired channel in MY2, it has not changed significantly. The Bank Height Ratio is less than 1.2 and the entrenchment ratio is over 2.2.

Refer to Appendix A for the Visual Stream Morphology Stability Assessment Table and Stream Photographs. Refer to Appendix C for Stream Geomorphology Data. Pebble count data is no longer required per the September 29, 2021 Technical Work Group Meeting and is not included in this report. The IRT reserves the right to request pebble count data/particle distributions if deemed necessary during the monitoring period.

2.4 Stream Areas of Concern

The repairs around cross-section 7 on UT1 Reach 3 seem to be stable and holding up well. Cross-section 7 has deepened slightly, which is to be expected in a step pool system, but no significant changes have occurred. Wildlands will continue to observe this reach to confirm stability.

In light of the difficulties documenting bankfull events on Catfish Creek (Section 2.5 below), it was suggested at the IRT Site Walk (minutes in Appendix F) that the focus for Catfish Creek be on optimizing high frequency of streamflow. The original crest gauge is located on Reach 6, which is designed as a B channel. This valley shape, the channel shape, the loss of bed material over the bedrock in the reach, and the below normal rainfall this year (Table 11, Appendix D) may be contributing factors to lack of bankfull documentation. See Section 2.7 for future stream flow monitoring plans.

2.5 Hydrology Assessment

By the end of MY7, four or more bankfull events must have occurred in separate years within the restoration reaches. A bankfull event was recorded on UT1 Reach 2 but no bankfull events were recorded on Catfish Creek Reaches 4 or 6 in MY3.

As mentioned in the MY2 Report, Wildlands installed two additional crest gauges on Catfish Creek Reach 4 in the hopes of learning if bankfull events were occurring in other locations along the stream. No bankfull events were recorded. In order to focus on streamflow, the additional crest gauge pressure transducers were re-installed to function both as flow and crest gauges on Catfish Creek Reach 4 in September 2022. Most of the Reach 6 channel is exposed bedrock or bedrock a few inches below the channel bed, making it impossible to install flow gauges.

As was suggested at the IRT Site Walk in June 2022, trail cameras to monitor flow were installed on Reach 4 and Reach 6 on July 5, 2022. Thick summer vegetation and low water levels made clear pictures of flow difficult. Despite these difficulties, the fourth camera installed at the downstream end of Catfish Creek Reach 6 faces upstream and gives clear timelapse of stream flow during daylight hours (See Figure 1a for location). The video recording flow from July 5 to October 16, 2022 has been uploaded to YouTube: https://youtu.be/yD4c0nbjaeg

The barotroll on-site malfunctioned at the beginning of the year but the faulty readings were not noticeable until March. Data from the barotroll at a site approximately 6 miles away (Dry Creek Mitigation Site) was used to replace the faulty readings from January until the on-site gauge could be replaced in April. Refer to Appendix D for hydrology data.

2.6 Wetland Assessment

As requested by NCDWR, four groundwater wells with pressure transducers were installed and monitored within the existing wetlands zones (one along Catfish Creek Reach 4 and three along UT1 Reach 2). The purpose of these gauges is to assess potential effects to wetland hydrology from the

construction of the restored stream channels. The monitoring results are not tied to performance standards. All gauges were downloaded and maintained quarterly.

The measured hydroperiods ranged from 14.1% (36 days) to 27.7% (71 days) of the growing season. Refer to Appendix D for wetland hydrology data.

2.7 Adaptive Management Plan

Wildlands plans to re-apply herbicide in rings around planted trees in areas of thick herbaceous competition in spring of 2023. Wildlands will continue to monitor for resprouts of invasive species, and additional treatments will be applied as necessary.

Wildlands will continue to monitor the stability of UT1 Reach 3 around cross-section 7. Currently the area is functioning well, and no problems are anticipated.

Hydrology on Catfish Creek will be monitored closely with the addition of flow/crest gauges on Reach 4 and the trail cameras requested at the IRT Site Walk. The current Catfish Creek Reach 6 trail camera will remain in place and another trail camera will be adjusted for a clear view of the channel on Reach 4. Flow and crest gauge pressure transducers are recording every 30 minutes and data will be collected with each quarterly download.

2.8 Monitoring Year 3 Summary

Vegetation across the Site is exceeding the MY3 interim requirement of 320 planted stems per acre. Monitoring Year 3 data shows an average density of 494 stems per acre across vegetation plots. In addition, desirable volunteer species such as American persimmon (*Diospyros virginiana*) and tulip poplar (*Liriodendron tulipifera*) are establishing themselves. Sporadic resprouts of invasive vegetation were treated and herbicide ring sprays were applied around trees in Monitoring Year 3. Wildlands will continue to monitor and treat as necessary. Additional herbicide ring sprays will be applied as needed around the base of trees in areas of thick herbaceous competition in spring 2023. Project streams are stable and functioning. Cross-sections 1, 2, 3, 5, and 6 show limited deviations from as-built due to sediment deposition and vegetation establishment. Cross-section 4 is no longer an area of concern. Cross-section 7 is stable, and Wildlands will continue to monitor the condition of the area. A bankfull event was documented on UT1 Reach 2 during MY3. Trail cameras and flow gauges have been installed on Catfish Creek to monitor stream flow throughout the year.

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

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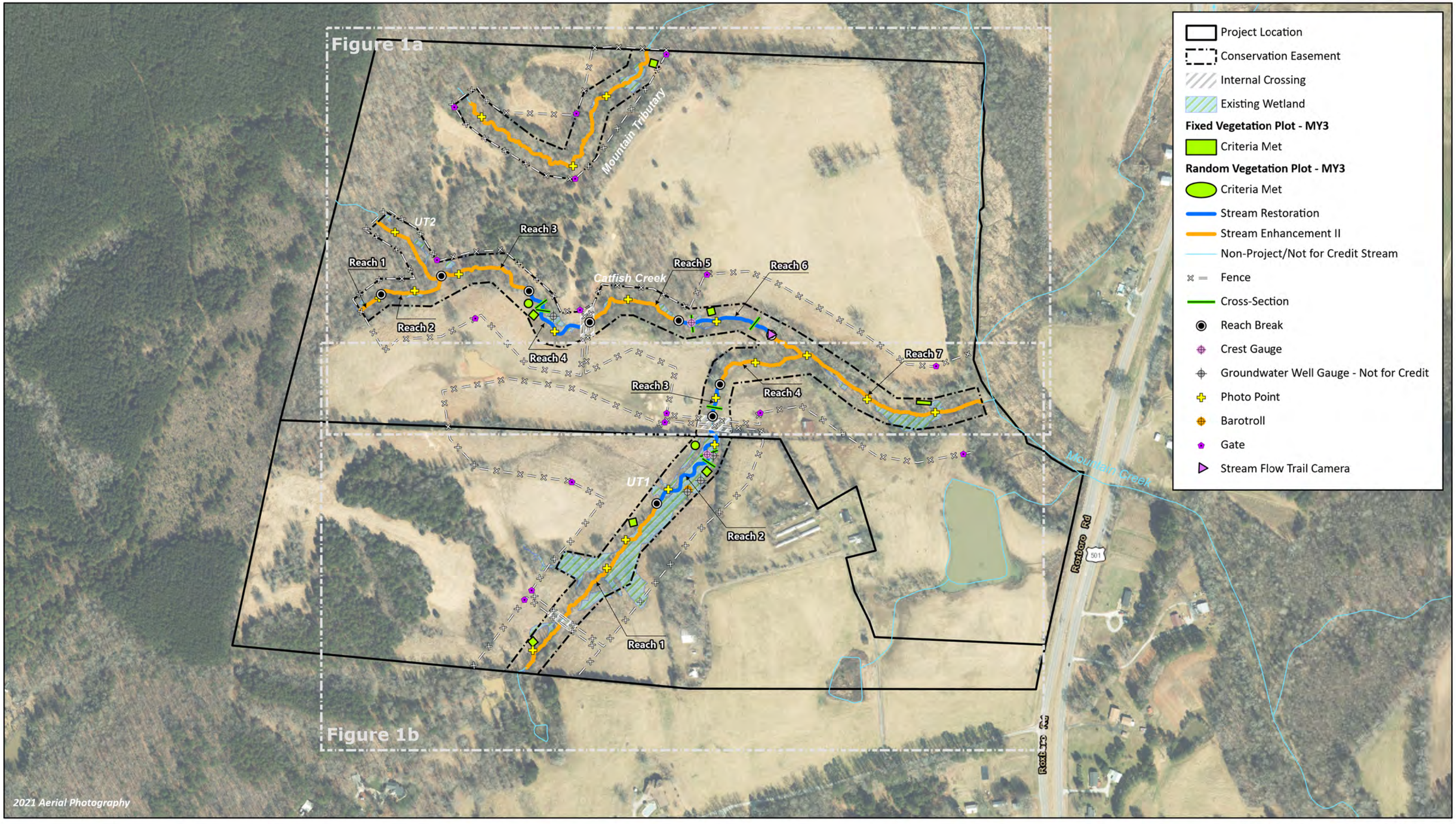

WILDLANDS ENGINEERING

0 400 800 Feet

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Figure 1. Current Condition Plan View
Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 – 2022

Durham County, NC

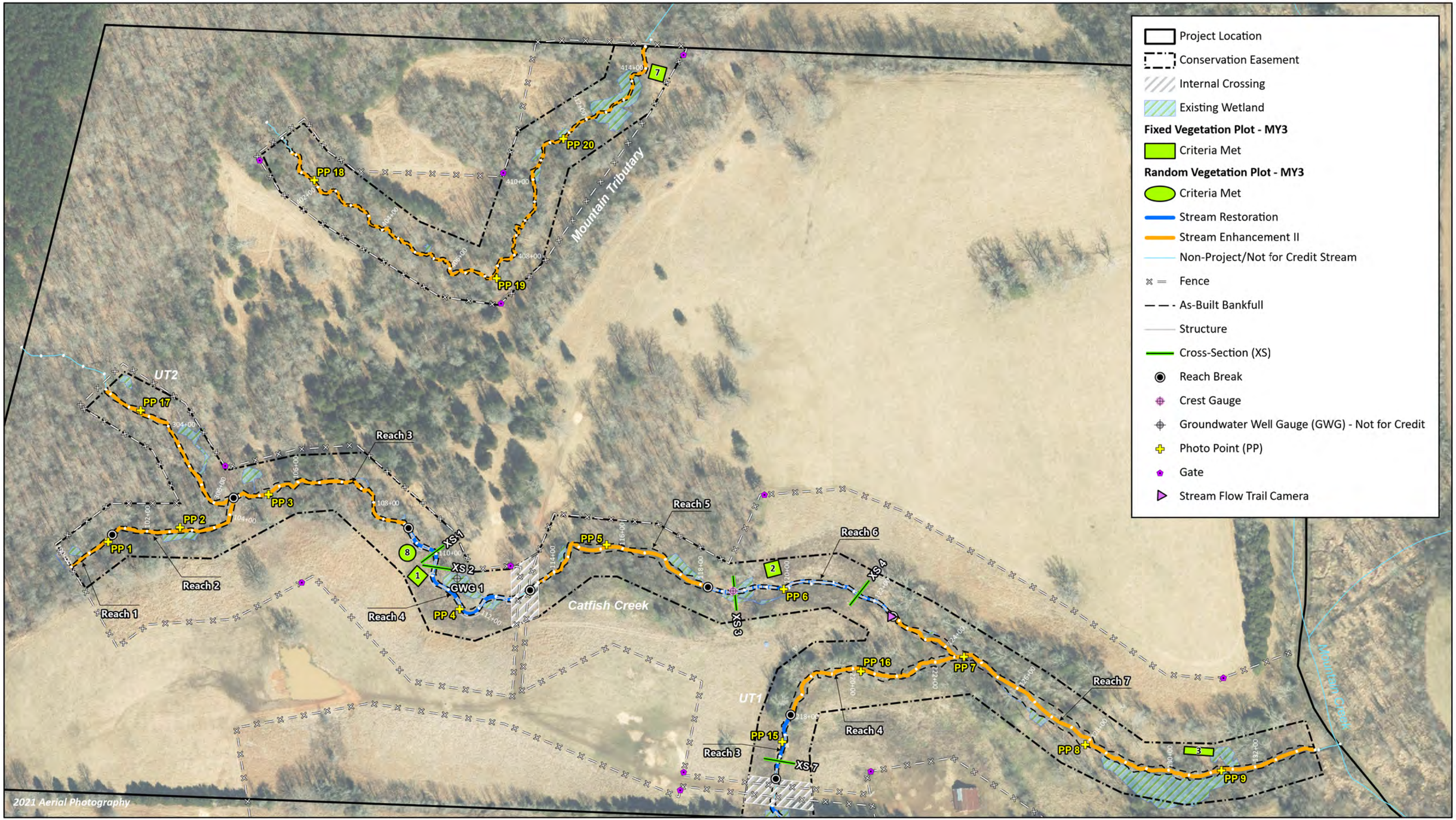
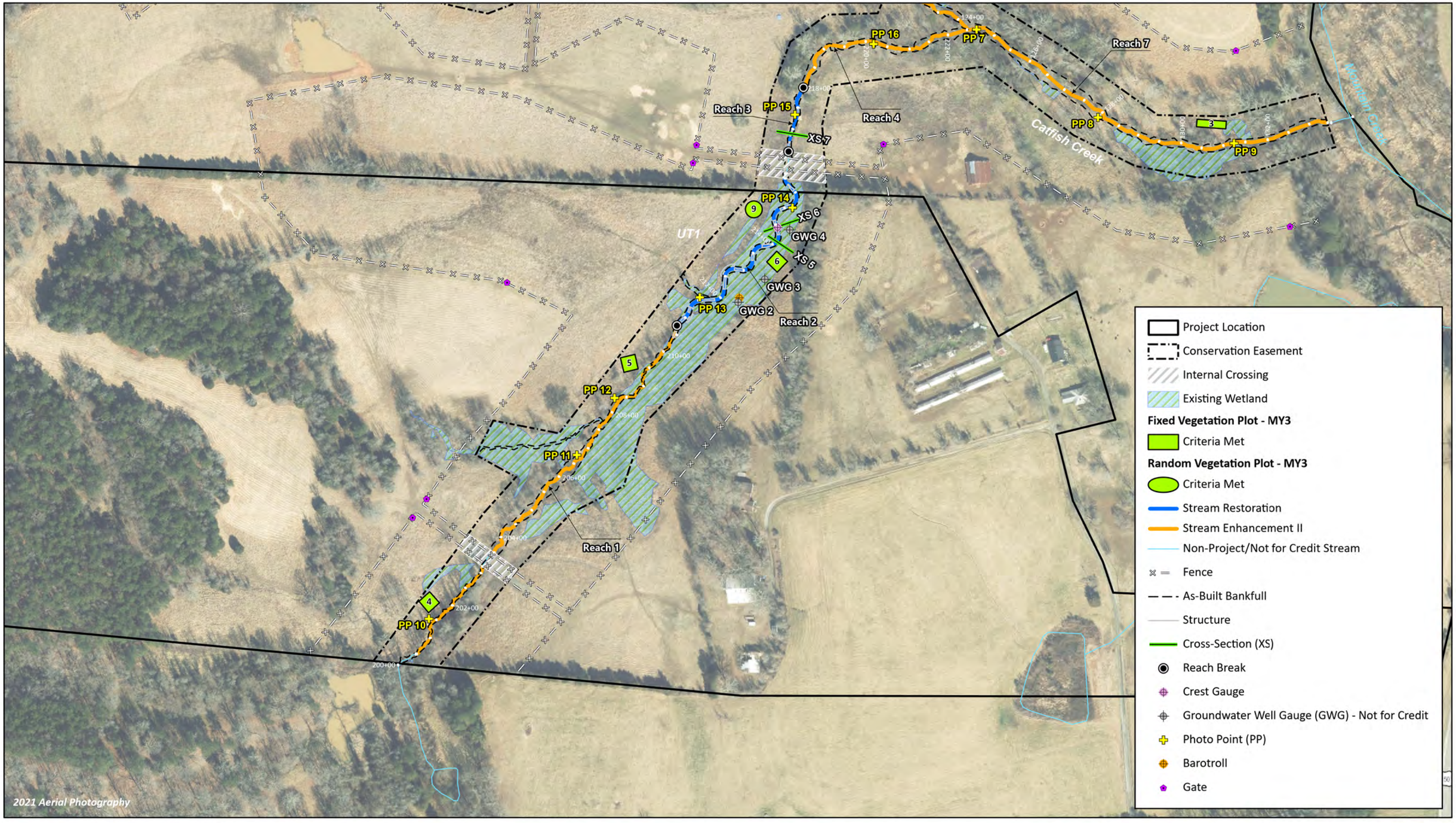


Figure 1a. Current Condition Plan View
Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 – 2022

Durham County, NC



WILDLANDS ENGINEERING

0 200 400 Feet

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Figure 1b. Current Condition Plan View
Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 – 2022

Durham County, NC

APPENDIX A. VISUAL ASSESSMENT DATA

Table 4. Visual Stream Morphology Stability Assessment Table
Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

Catfish Creek Reach 4

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	373
					Assessed Bank Length	746
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.	25	25		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	58	58		100%

Visual assessment was completed October 18, 2022.

Catfish Creek Reach 6

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	444
					Assessed Bank Length	888
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.	15	15		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	4	4		100%

Visual assessment was completed October 18, 2022.

Table 4. Visual Stream Morphology Stability Assessment Table

Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

UT1 Reach 2

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	520
					Assessed Bank Length	1,040
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.	22	22		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	30	30		100%

Visual assessment was completed October 18, 2022.

UT1 Reach 3

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	149
					Assessed Bank Length	298
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.	14	14		100%
	Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	7	7		100%

Visual assessment was completed October 18, 2022.

Table 5. Vegetation Condition Assessment Table

Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

Planted Acreage **8.00**

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 MY3, 4, or 5 stem count criteria.	0.10	0	0%
		Total	**0.00**	**0%**
Areas of Poor Growth Rates	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25	0	0%
		Cumulative Total	**0.00**	**0%**

Visual assessment was completed October 18, 2022.

Easement Acreage **20.73**

Vegetation Category	Definitions	Mapping Threshold (ac)	Combined Acreage	% of Easement Acreage
Invasive Areas of Concern	Areas of points (if too small to render as polygons at map scale).	0.10	0	0%
Easement Encroachment Areas	Areas of points (if too small to render as polygons at map scale).	none	0 Encroachments Noted / 0 ac	

Visual assessment was completed October 18, 2022.

STREAM PHOTOGRAPHS

	
PHOTO POINT 1 Catfish Creek R1 – upstream *(04/05/2022)*	**PHOTO POINT 1 Catfish Creek R1 – downstream *(04/05/2022)***
	
PHOTO POINT 2 Catfish Creek R2 – upstream *(04/05/2022)*	**PHOTO POINT 2 Catfish Creek R2 – downstream *(04/05/2022)***
	
PHOTO POINT 3 Catfish Creek R3 – upstream *(04/05/2022)*	**PHOTO POINT 3 Catfish Creek R3 – downstream *(04/05/2022)***

	
PHOTO POINT 4 Catfish Creek R4 – upstream *(04/05/2022)*	**PHOTO POINT 4 Catfish Creek R4 – downstream *(04/05/2022)***
	
PHOTO POINT 5 Catfish Creek R5 – upstream *(04/05/2022)*	**PHOTO POINT 5 Catfish Creek R5 – downstream *(04/05/2022)***
	
PHOTO POINT 6 Catfish Creek R6 – upstream *(04/05/2022)*	**PHOTO POINT 6 Catfish Creek R6 – downstream *(04/05/2022)***

PHOTO POINT 7 Catfish Creek R7 – upstream *(04/05/2022)*

PHOTO POINT 7 Catfish Creek R7 – downstream *(04/05/2022)*

PHOTO POINT 8 Catfish Creek R7 – upstream *(04/05/2022)*

PHOTO POINT 8 Catfish Creek R7 – downstream *(04/05/2022)*

PHOTO POINT 9 Catfish Creek R7 – upstream *(04/05/2022)*

PHOTO POINT 9 Catfish Creek R7 – downstream *(04/05/2022)*

	
PHOTO POINT 10 UT1 R1 – upstream *(04/05/2022)*	**PHOTO POINT 10 UT1 R1 – downstream *(04/05/2022)***
	
PHOTO POINT 11 UT1 R1 – upstream *(04/05/2022)*	**PHOTO POINT 11 UT1 R1 – downstream *(04/05/2022)***
	
PHOTO POINT 12 UT1 R1 – upstream *(04/05/2022)*	**PHOTO POINT 12 UT1 R1 – downstream *(04/05/2022)***

	
PHOTO POINT 13 UT1 R2 – upstream *(04/05/2022)*	**PHOTO POINT 13 UT1 R2 – downstream *(04/05/2022)***
	
PHOTO POINT 14 UT1 R2 – upstream *(04/05/2022)*	**PHOTO POINT 14 UT1 R2 – downstream *(04/05/2022)***
	
PHOTO POINT 15 UT1 R3 – upstream *(04/05/2022)*	**PHOTO POINT 15 UT1 R3 – downstream *(04/05/2022)***

	
PHOTO POINT 16 UT1 R4 – upstream *(04/05/2022)*	**PHOTO POINT 16 UT1 R4 – downstream *(04/05/2022)***
	
PHOTO POINT 17 UT2 – upstream *(04/05/2022)*	**PHOTO POINT 17 UT2 – downstream *(04/05/2022)***
	
PHOTO POINT 18 Mountain Trib – upstream *(04/05/2022)*	**PHOTO POINT 18 Mountain Trib – downstream *(04/05/2022)***

	
PHOTO POINT 19 Mountain Trib – upstream *(04/05/2022)*	**PHOTO POINT 19 Mountain Trib – downstream *(04/05/2022)***
	
PHOTO POINT 20 Mountain Trib – upstream *(04/05/2022)*	**PHOTO POINT 20 Mountain Trib – downstream *(04/05/2022)***

VEGETATION PLOT PHOTOGRAPHS

FIXED VEG PLOT 1 *(09/01/2022)*

FIXED VEG PLOT 2 *(09/22/2022)*

FIXED VEG PLOT 3 *(09/22/2022)*

FIXED VEG PLOT 4 *(09/22/2022)*

FIXED VEG PLOT 5 *(09/22/2022)*

FIXED VEG PLOT 6 *(09/22/2022)*

FIXED VEG PLOT 7 *(09/01/2022)*

RANDOM VEG PLOT 8 *(09/01/2022)*

RANDOM VEG PLOT 9 *(09/22/2022)*

APPENDIX B. VEGETATION PLOT DATA

Table 6. Vegetation Plot Data
Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

Planted Acreage	8.00
Date of Initial Plant	2020-03-25
Date of Current Survey	2022-09-22
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	Aesculus flava	yellow buckeye	Tree	FACU	1	1								
	Betula nigra	river birch	Tree	FACW					1	1				
	Fraxinus pennsylvanica	green ash	Tree	FACW			2	2				2	3	3
	Platanus occidentalis	American sycamore	Tree	FACW	4	7	6	6	3	3	8	8	2	2
	Quercus alba	white oak	Tree	FACU			2	2						
	Quercus michauxii	swamp chestnut oak	Tree	FACW			1	1	2	2	1	1	3	3
	Quercus pagoda	cherrybark oak	Tree	FACW										
	Quercus phellos	willow oak	Tree	FAC	4	5			2	2	1	1	3	3
	Quercus shumardii	Shumard's oak	Tree	FAC	1	1	1	1			2	2	2	3
	Salix nigra	black willow	Tree	OBL										
	Sambucus canadensis	American black elderberry	Tree			1								
Sum				Performance Standard	10	15	12	12	8	8	12	14	13	14
Post Mitigation Plan Species	**Alnus serrulata**	**hazel alder**	**Tree**	**OBL**										
	Cercis canadensis	**eastern redbud**	**Tree**	**FACU**										
	Diospyros virginiana	**common persimmon**	**Tree**	**FAC**						**5**		**1**		
	Juglans nigra	**black walnut**	**Tree**	**FACU**										
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*								*1*		*1*
	Liriodendron tulipifera	**tuliptree**	**Tree**	**FACU**										
	Nyssa biflora	**swamp tupelo**	**Tree**	**FACW**		**1**								
Sum				Proposed Standard	10	16	12	12	8	13	12	15	13	14
Mitigation Plan Performance Standard				Current Year Stem Count		15		12		8		14		14
				Stems/Acre		607		486		324		526		567
				Species Count		5		5		4		5		5
				Dominant Species Composition (%)		47		50		38		53		20
				Average Plot Height (ft.)		4		10		6		9		5
				% Invasives		0		0		0		0		0
Post Mitigation Plan Performance Standard				Current Year Stem Count		16		12		13		15		14
				Stems/Acre		648		486		526		567		567
				Species Count		6		5		5		6		5
				Dominant Species Composition (%)		47		50		38		53		20
				Average Plot Height (ft.)		4		10		5		9		5
				% Invasives		0		0		0		0		0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

Table 6. Vegetation Plot Data

Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

Planted Acreage	8.00
Date of Initial Plant	2020-03-25
Date of Current Survey	2022-09-22
Plot size (ACRES)	0.0247

	Scientific Name	Common Name	Tree/ Shrub	Indicator Status	Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 R	Veg Plot 9 R
					Planted	Total	Planted	Total	Total	Total
Species Included in Approved Mitigation Plan	Aesculus flava	yellow buckeye	Tree	FACU						
	Betula nigra	river birch	Tree	FACW			4	4	1	1
	Fraxinus pennsylvanica	green ash	Tree	FACW	1	1	1	1	3	3
	Platanus occidentalis	American sycamore	Tree	FACW	6	6	6	6	3	3
	Quercus alba	white oak	Tree	FACU						
	Quercus michauxii	swamp chestnut oak	Tree	FACW	2	2			1	2
	Quercus pagoda	cherrybark oak	Tree	FACW					1	
	Quercus phellos	willow oak	Tree	FAC	2	2			1	1
	Quercus shumardii	Shumard's oak	Tree	FAC	1	1				
	Salix nigra	black willow	Tree	OBL		3				2
	Sambucus canadensis	American black elderberry	Tree							
Sum				Performance Standard	12	15	11	11	10	12
Post Mitigation Plan Species	**Alnus serrulata**	**hazel alder**	**Tree**	**OBL**		**2**			**1**	
	Cercis canadensis	**eastern redbud**	**Tree**	**FACU**				**2**		
	Diospyros virginiana	**common persimmon**	**Tree**	**FAC**						
	Juglans nigra	**black walnut**	**Tree**	**FACU**				**1**	**1**	
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*				*2*	*8*	*6*
	Liriodendron tulipifera	**tuliptree**	**Tree**	**FACU**					**1**	
	Nyssa biflora	**swamp tupelo**	**Tree**	**FACW**					**1**	
Sum				Proposed Standard	12	17	11	14	14	12
Mitigation Plan Performance Standard				Current Year Stem Count		15		11	10	12
				Stems/Acre		607		445	405	486
				Species Count		6		3	6	6
				Dominant Species Composition (%)		40		46	44	33
				Average Plot Height (ft.)		8		5	3	8
				% Invasives		0		0	0	0
Post Mitigation Plan Performance Standard				Current Year Stem Count		17		14	14	12
				Stems/Acre		688		567	567	486
				Species Count		7		5	10	6
				Dominant Species Composition (%)		40		46	44	33
				Average Plot Height (ft.)		8		4	2	8
				% Invasives		0		0	0	0

1). Bolded species are proposed for the current monitoring year, italicized species are not approved, and a regular font indicates that the species has been approved.
2). The "Species Included in Approved Mitigation Plan" section contains only those species that were included in the original approved mitigation plan. The "Post Mitigation Plan Species" section includes species that are being proposed through a mitigation plan addendum for the current monitoring year (bolded) , species that have been approved in prior monitoring years through a mitigation plan addendum (regular font), and species that are not approved (italicized).
3). The "Mitigation Plan Performance Standard" section is derived only from stems included in the original mitigation plan, whereas the "Post Mitigation Plan Performance Standard" includes data from mitigation plan approved, post mitigation plan approved, and proposed stems.

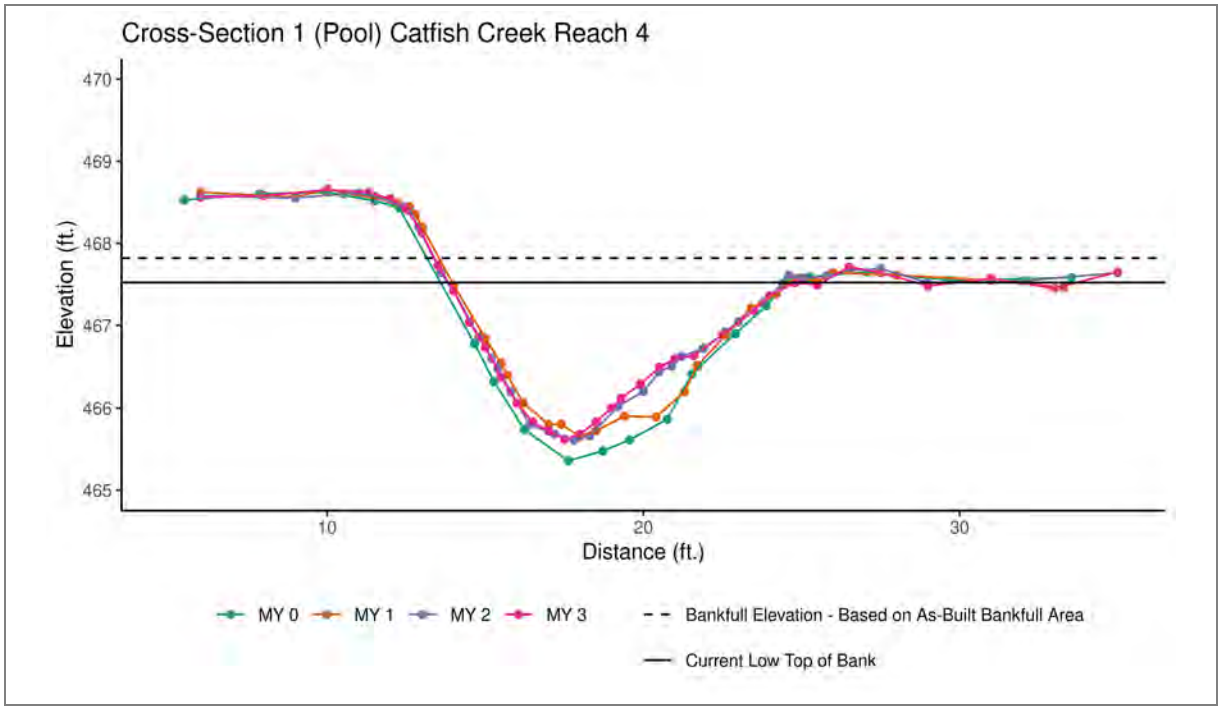
Table 7. Vegetation Performance Standards Summary Table
Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

	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	607	4	5	0	486	10	5	0	324	6	4	0
Monitoring Year 2	405	3	4	0	526	6	5	0	405	4	5	0
Monitoring Year 1	567	3	5	0	607	4	6	0	486	3	6	0
Monitoring Year 0	567	3	5	0	607	3	6	0	486	3	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	526	9	5	0	567	5	5	0	607	8	6	0
Monitoring Year 2	405	7	4	0	526	4	5	0	567	4	5	0
Monitoring Year 1	405	4	4	0	526	3	5	0	567	3	5	0
Monitoring Year 0	405	4	4	0	526	2	5	0	607	2	6	0
	Veg Plot 7 F				**Veg Plot Group 8 R**				**Veg Plot Group 9 R**			
	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	445	5	3	0	405	3	6	0	486	8	6	0
Monitoring Year 2	526	4	5	0	688	2	4	0	526	3	5	0
Monitoring Year 1	648	3	5	0	526	3	7	0	648	3	7	0
Monitoring Year 0	648	3	5	0	526	3	8	0	526	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.

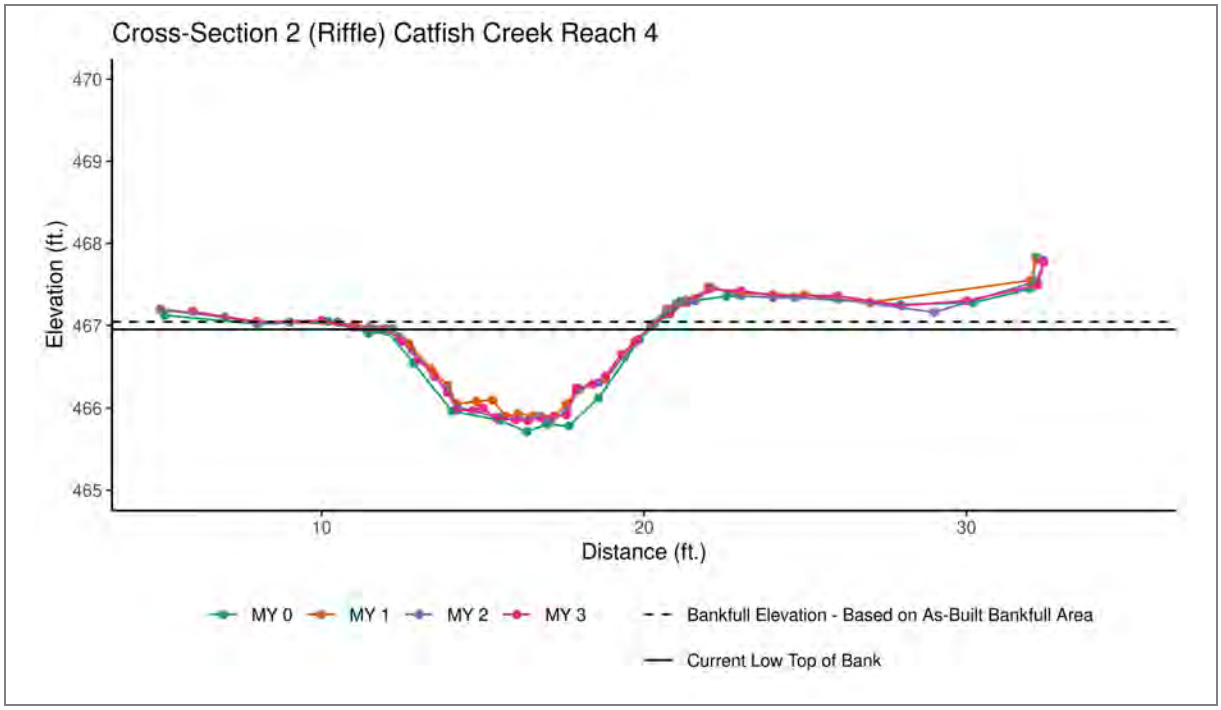
APPENDIX C. STREAM GEOMORPHOLOGY DATA

Cross-Section Plots



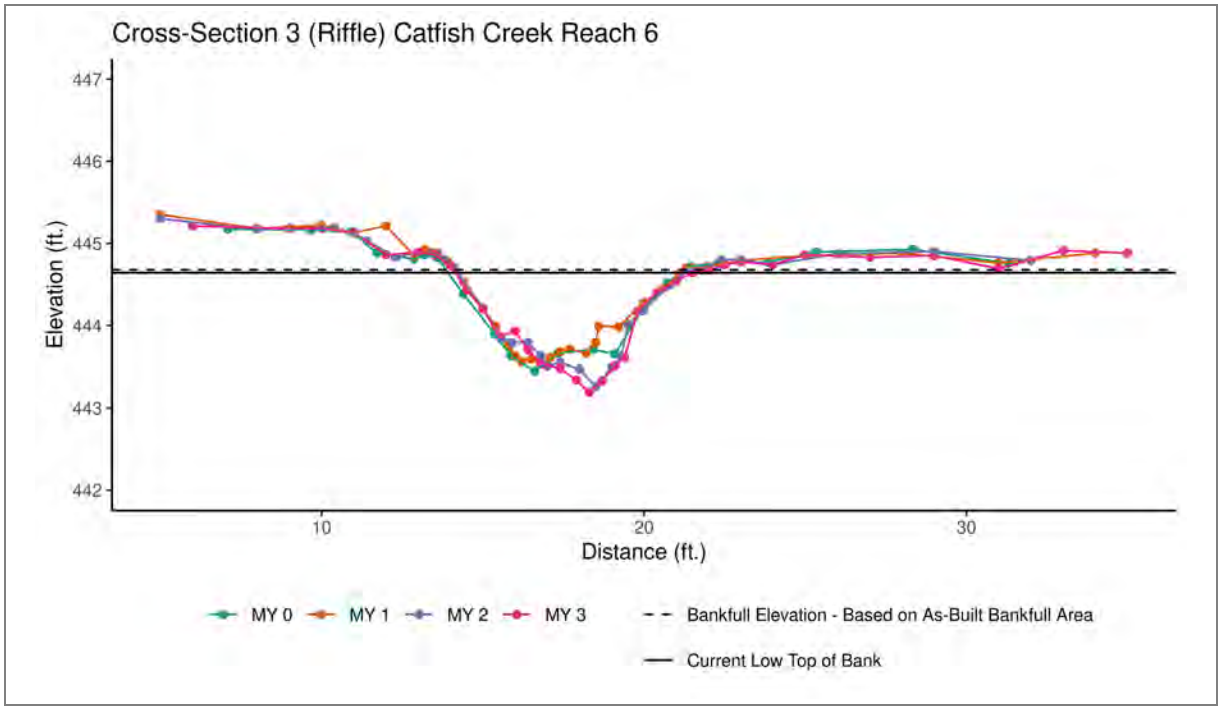
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Thalweg Elevation	465.36	465.65	465.61	465.62		
LTOB Elevation	467.55	467.56	467.61	467.52		
LTOB Max Depth	2.19	1.91	2.00	1.90		
LTOB Cross-Sectional Area	14.39	12.29	12.28	11.12		

Downstream *(4/5/2022)*



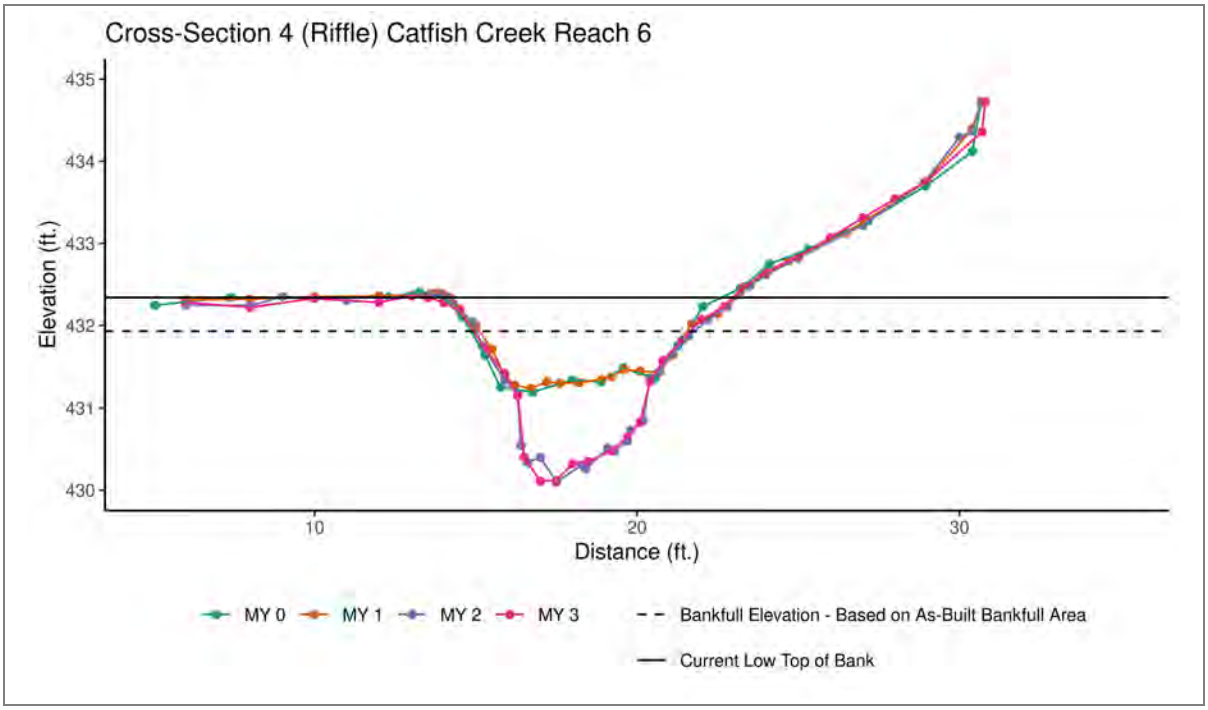
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	466.93	467.09	467.04	467.04		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.88	0.93	0.92		
Thalweg Elevation	465.71	465.90	465.83	465.85		
LTOB Elevation	466.93	466.95	466.96	466.95		
LTOB Max Depth	1.21	1.05	1.13	1.10		
LTOB Cross-Sectional Area	6.40	5.31	5.74	5.65		

Downstream *(4/5/2022)*



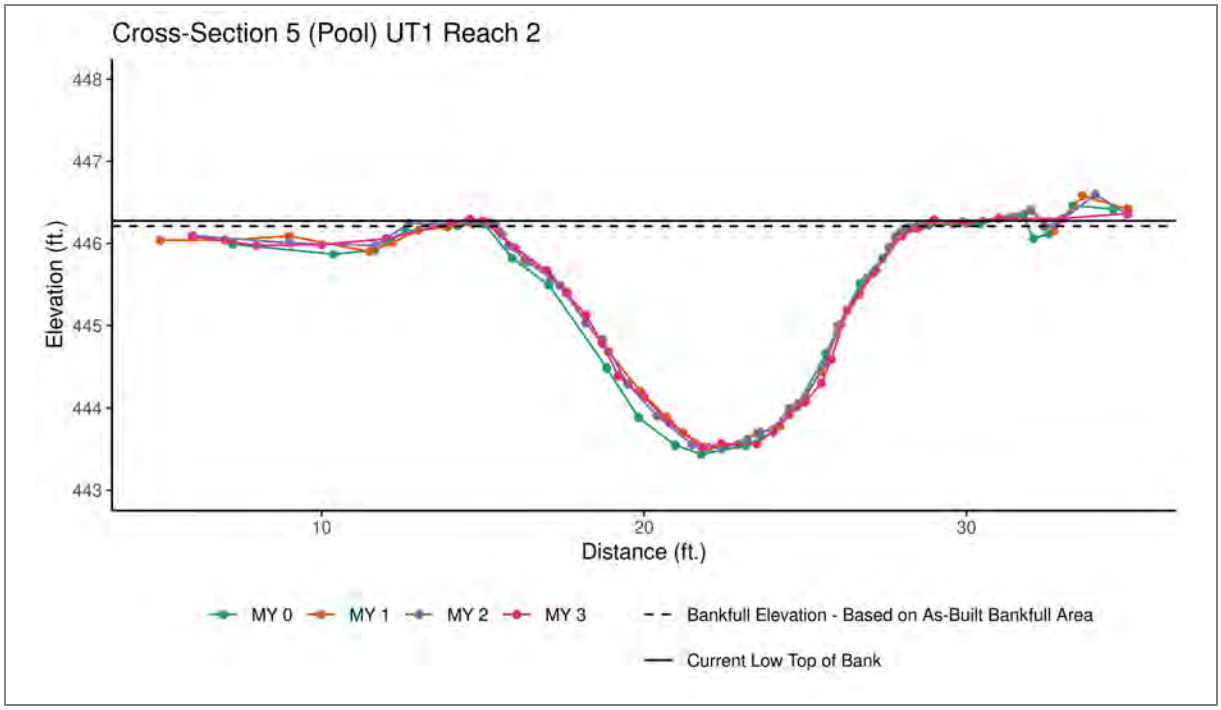
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	444.72	444.81	444.71	444.68		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.91	0.99	0.98		
Thalweg Elevation	443.45	443.53	443.26	443.19		
LTOB Elevation	444.72	444.70	444.69	444.64		
LTOB Max Depth	1.27	1.17	1.43	1.45		
LTOB Cross-Sectional Area	5.72	4.92	5.58	5.46		

Downstream *(4/5/2022)*



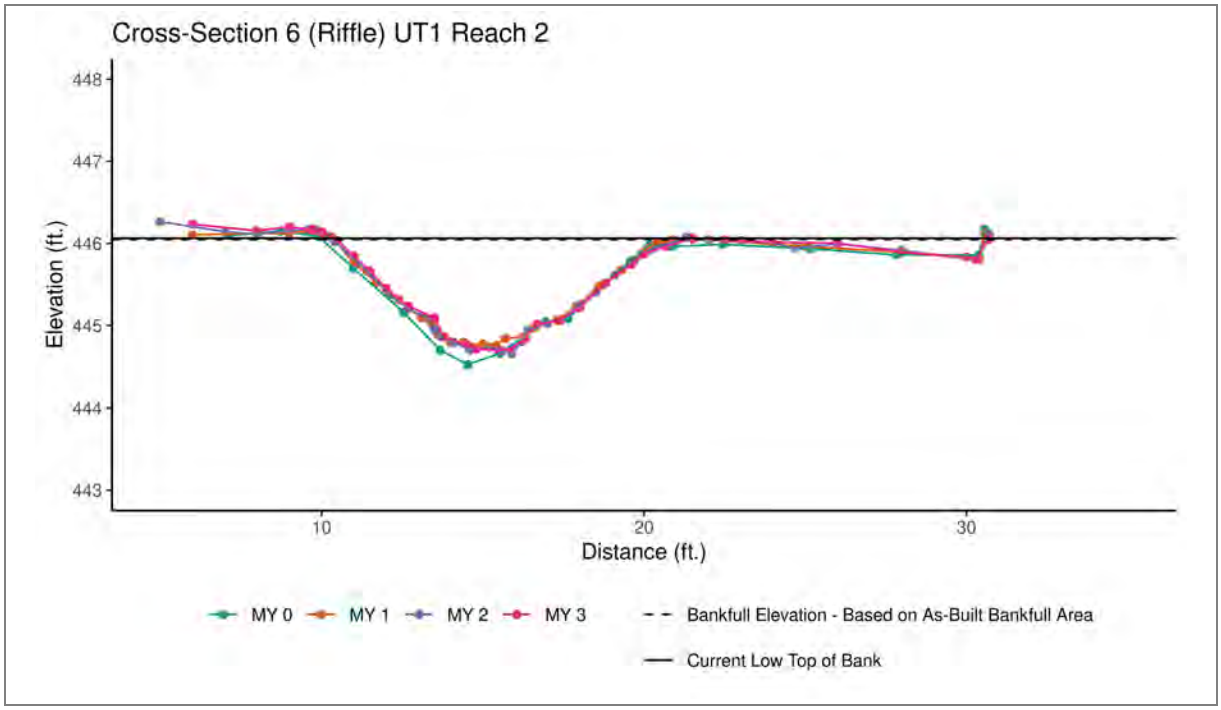
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	432.39	432.41	431.92	431.93		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.99	1.25	1.23		
Thalweg Elevation	431.20	431.24	430.10	430.11		
LTOB Elevation	432.39	432.40	432.38	432.34		
LTOB Max Depth	1.19	1.16	2.28	2.23		
LTOB Cross-Sectional Area	6.96	6.88	10.61	10.19		

Downstream *(4/5/2022)*



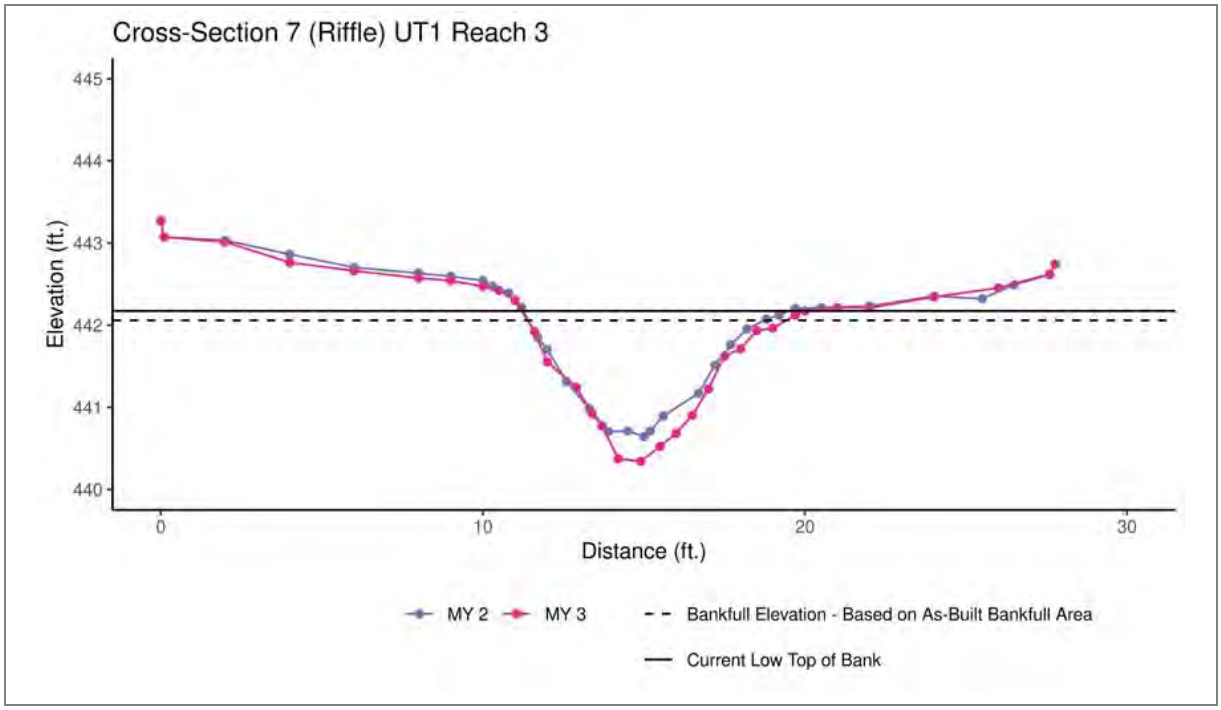
	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Bank Height Ratio - Based on AB-Bankfull Area	N/A	N/A	N/A	N/A		
Thalweg Elevation	443.44	443.52	443.50	443.52		
LTOB Elevation	446.13	446.19	446.24	446.27		
LTOB Max Depth	2.70	2.67	2.74	2.75		
LTOB Cross-Sectional Area	20.11	19.52	20.37	20.99		

Downstream *(4/5/2022)*



	MY0	MY1	MY2	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	445.98	446.06	446.04	446.05		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.97	1.03	1.01		
Thalweg Elevation	444.52	444.73	444.65	444.69		
LTOB Elevation	445.98	446.01	446.07	446.06		
LTOB Max Depth	1.45	1.28	1.42	1.37		
LTOB Cross-Sectional Area	8.01	7.57	8.41	8.18		

Downstream *(4/5/2022)*



	MY0	MY1	MY2*	MY3	MY5	MY7
Bankfull Elevation - Based on AB-Bankfull Area	442.36	442.40	442.20	442.06		
Bank Height Ratio - Based on AB-Bankfull Area	1.00	0.97	1.00	1.07		
Thalweg Elevation	440.83	440.87	440.64	440.34		
LTOB Elevation	442.36	442.34	442.20	442.17		
LTOB Max Depth	1.53	1.47	1.56	1.83		
LTOB Cross-Sectional Area	5.39	5.07	7.06	8.02		

*Repairs during MY2 changed channel dimensions along this reach. MY2-7 calculations and the graph above are based off the MY2 repaired channel because they are no longer comparable to MY0-1.

Downstream *(4/5/2022)*

Table 8. Baseline Stream Data Summary

Catfish Pond Mitigation Site

DMS Project No. 100039

Monitoring Year 3 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**Catfish Creek Reach 4**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	7.0		1	8.5		8.1		2
Floodprone Width (ft)	12.0		1	19.0		200.0		2
Bankfull Mean Depth	0.9		1	0.7		0.8		2
Bankfull Max Depth	1.3		1	0.9	1.2	1.2		2
Bankfull Cross Sectional Area (ft^2)	6.4		1	5.8		6.4		2
Width/Depth Ratio	7.7		1	12.6		10.2		2
Entrenchment Ratio	1.7		1	>2.2		24.6		2
Bank Height Ratio	2.2		1	1.0		1.0		2
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	E6			C4		C4		
Bankfull Discharge (cfs)	18.0		1	17.0		20.6		
Sinuosity	1.1			1.2		1.2		
Water Surface Slope ($ft/ft)^2$	0.016		1	0.014		0.014		
Other	---			---		---		
Parameter	**Catfish Creek Reach 6**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	N/A[1]		1	8.0		7.7	9.0	2
Floodprone Width (ft)	N/A[1]		1	11.0	20.0	30.0	100.0	2
Bankfull Mean Depth	N/A[1]		1	0.6		0.7	0.8	2
Bankfull Max Depth	N/A[1]		1	0.9	1.1	1.2	1.3	2
Bankfull Cross Sectional Area (ft^2)	N/A[1]		1	4.9		5.7	7.0	2
Width/Depth Ratio	N/A[1]		1	13.0		10.2	11.6	2
Entrenchment Ratio	N/A[1]		1	1.4	2.5	3.3	13.1	2
Bank Height Ratio	N/A[1]		1	1.0		1.0		2
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	---			B4a		B4a		
Bankfull Discharge (cfs)	---		1	20.9		28.4		
Sinuosity	---			1.04		1.05		
Water Surface Slope ($ft/ft)^2$	---		1	0.043		0.043		
Other	---			---		---		

Table 8. Baseline Stream Data Summary

Catfish Pond Mitigation Site

DMS Project No. 100039

Monitoring Year 3 - 2022

	PRE-EXISTING CONDITIONS			DESIGN		MONITORING BASELINE (MY0)		
Parameter	**UT1 Reach 2**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	16.7		1	11.5		10.0		2
Floodprone Width (ft)	22.0		1	25.0	58.0	200.0		2
Bankfull Mean Depth	0.4		1	0.9		0.8		2
Bankfull Max Depth	0.9		1	1.0	1.3	1.5		2
Bankfull Cross Sectional Area (ft^2)	7.1		1	9.9		8.0		2
Width/Depth Ratio	39.5		1	13.4		12.4		2
Entrenchment Ratio	1.3		1	2.2	5.0	20.1		2
Bank Height Ratio	2.4		1	1.0		1.0		2
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	C6			C4		C4		
Bankfull Discharge (cfs)	21.0		1	17.0		9.6		
Sinuosity	1.06		1	1.23		1.23		
Water Surface Slope ($ft/ft)^2$	0.020		1	0.005		0.005		
Other	---			---		---		
Parameter	**UT1 Reach 3**							
Riffle Only	**Min**	**Max**	**n**	**Min**	**Max**	**Min**	**Max**	**n**
Bankfull Width (ft)	6.2	8.1	1	8.0		6.5		1
Floodprone Width (ft)	22.0		1	11.0	20.0	60.0		1
Bankfull Mean Depth	0.7	0.8	1	0.6		0.8		1
Bankfull Max Depth	0.9	1.1	1	0.9	1.1	1.5		1
Bankfull Cross Sectional Area (ft^2)	4.2	6.2	1	4.9		5.4		1
Width/Depth Ratio	9.2	10.5	1	13.0		7.8		1
Entrenchment Ratio	2.8	3.6	1	1.4	2.5	9.3		1
Bank Height Ratio	1.2	1.5	1	1.0		1.0		1
Max part size (mm) mobilized at bankfull	---			---		---		
Rosgen Classification	E4b			B4a		B4a		
Bankfull Discharge (cfs)	21.0		1	21.8		20.1		
Sinuosity	1.10			1.02		1.02		
Water Surface Slope ($ft/ft)^2$	0.038		1	0.054		0.061		
Other	---			---		---		

Table 9. Cross-Section Morphology Monitoring Summary

Catfish Pond Mitigation Site

DMS Project No. 100039

Monitoring Year 3 - 2022

	Catfish Creek Reach 4												Catfish Creek Reach 6					
	Cross-Section 1 (Pool)						Cross-Section 2 (Riffle)						Cross-Section 3 (Riffle)					
	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			466.93	467.09	467.04	467.04			444.72	444.81	444.71	444.68		
Bank Height Ratio - Based on AB Bankfull[1] Area	N/A	N/A	N/A	N/A			1.00	0.88	0.93	0.92			1.00	0.91	0.99	0.98		
Thalweg Elevation	465.36	465.65	465.61	465.62			465.71	465.90	465.83	465.85			443.45	443.53	443.26	443.19		
LTOB[2] Elevation	467.55	467.56	467.61	467.52			466.93	466.95	466.96	466.95			444.72	444.70	444.69	444.64		
LTOB[2] Max Depth (ft)	2.19	1.91	2.00	1.90			1.21	1.05	1.13	1.10			1.27	1.17	1.43	1.45		
LTOB[2] Cross Sectional Area (ft^2)	14.39	12.29	12.28	11.12			6.40	5.31	5.74	5.65			5.72	4.92	5.58	5.46		
	Catfish Creek Reach 6						UT1 Reach 2											
	Cross-Section 4 (Riffle)						Cross-Section 5 (Pool)						Cross-Section 6 (Riffle)					
	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	432.39	432.41	431.92	431.93			N/A	N/A	N/A	N/A			445.98	446.06	446.04	446.05		
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	0.99	1.25	1.23			N/A	N/A	N/A	N/A			1.00	0.97	1.03	1.01		
Thalweg Elevation	431.20	431.24	430.10	430.11			443.44	443.52	443.50	443.52			444.52	444.73	444.65	444.69		
LTOB[2] Elevation	432.39	432.40	432.38	432.34			446.13	446.19	446.24	446.27			445.98	446.01	446.07	446.06		
LTOB[2] Max Depth (ft)	1.19	1.16	2.28	2.23			2.70	2.67	2.74	2.75			1.45	1.28	1.42	1.37		
LTOB[2] Cross Sectional Area (ft^2)	6.96	6.88	10.61	10.19			20.11	19.52	20.37	20.99			8.01	7.57	8.41	8.18		
	UT1 Reach 3																	
	Cross-Section 7 (Riffle)																	
	MY0	MY1	MY2	MY3	MY5	MY7												
Bankfull Elevation (ft) - Based on AB-Bankfull[1] Area	442.36	442.40	442.40	442.06														
Bank Height Ratio - Based on AB Bankfull[1] Area	1.00	0.97	1.00	1.07														
Thalweg Elevation	440.83	440.87	440.64	440.34														
LTOB[2] Elevation	442.36	442.34	442.20	442.17														
LTOB[2] Max Depth (ft)	1.53	1.47	1.56	1.83														
LTOB[2] Cross Sectional Area (ft^2)	5.39	5.07	7.06	8.02														

[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

Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

Reach	MY1 (2020)	MY2 (2021)	MY3 (2022)*	MY4 (2023)	MY5 (2024)	MY6 (2025)	MY7 (2026)
Catfish Creek Reach 6	10/11/2020	N/A	N/A				
UT1 Reach 2	12/14/2020	1/3/2021 2/15/2021 4/9/2021	5/23-24/2022				

*Data was collected 1/1/2022 to 10/17/2022. Data from the remainder of MY3 will be updated in MY4.

Table 11. Rainfall Summary

Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

	MY1 (2020)	MY2 (2021)	MY3 (2022)	MY4 (2023)	MY5 (2024)	MY6 (2025)	MY7 (2026)
Annual Precipitation Total	60.41 in	40.55 in	39.83 in*				
30 Year Average Precip WETS 30th Percentile	42.80 in	43.74 in	43.01 in				
30 Year Average Precip WETS 70th Percentile	50.25 in	51.35 in	50.84 in				
Annual Precipitation Compared to Normal	High	Low	*				

Annual Precipitation Source: **Butner Beef Cattle Laboratory (BAHA)** Station, Durham County, NC, State Climate Office

30 Year Average Precipitation Source: **Roxboro 7 ESE** Station, Person County, NC, AgACIS

*Annual precipitation was collected 1/1/2022 to 10/17/2022. Data from the remainder of MY3 will be updated in MY4.

Table 12. Groundwater Gauge Summary

Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

Gauge	Max. Consecutive Hydroperiod (Percentage)						
	MY1 (2020)	MY2 (2021)	MY3 (2022)*	MY4 (2023)	MY5 (2024)	MY6 (2025)	MY7 (2026)
1	14 Days (5.3%)	49 Days (19.1%)	45 Days (17.6%)				
2	100 Days (37.6%)	80 Days (31.3%)	59 Days (23.0%)				
3	109 Days (41.0%)	87 Days (34.0%)	71 Days (27.7%)				
4	59 Days (22.2%)	80 Days (31.3%)	36 Days (14.1%)				

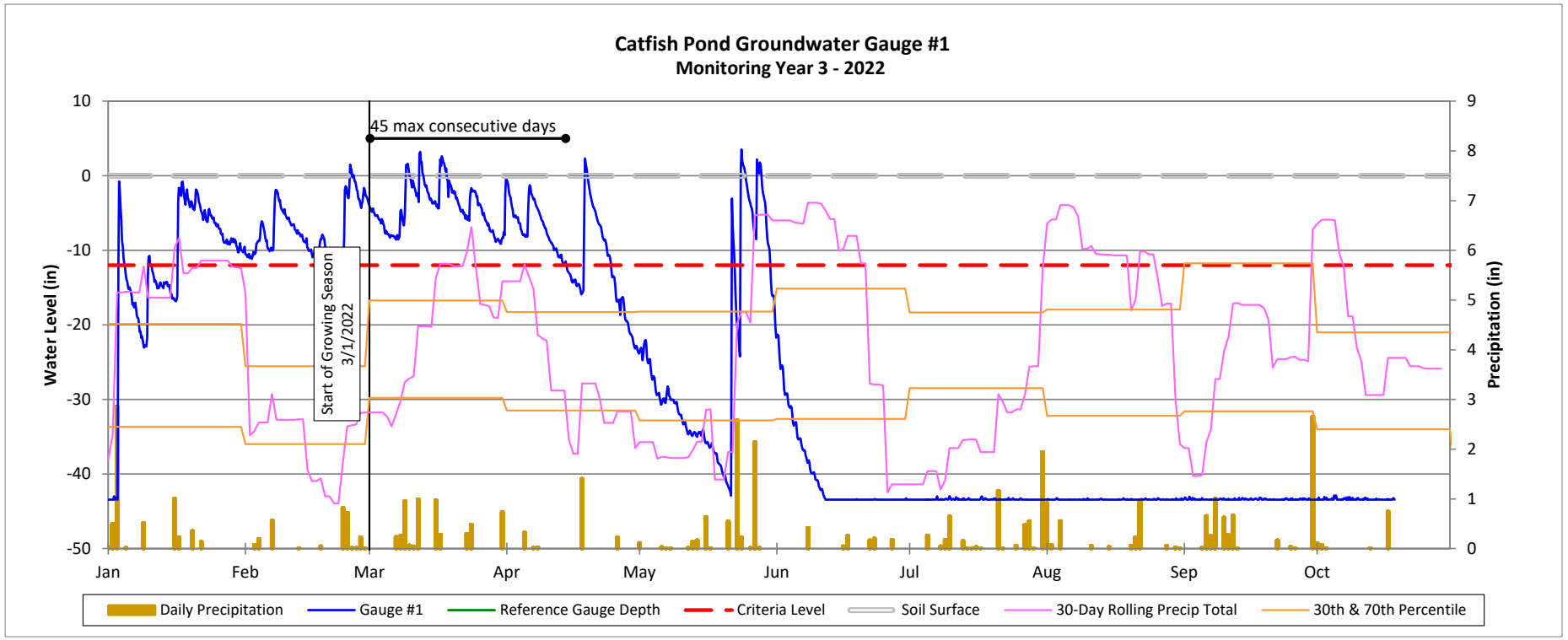
Perfomance Standard: **None**
Growing Season: **3/1/2022 to 11/11/2022 (255 Days)**
*Reflects the data collected from 3/1/2022 to 10/18/2022 (231 Days). The remainder of the MY3 growing season data will be updated in MY4.

Groundwater Gauge Plot

Catfish Pond Mitigation Site

DMS Project No. 100039

Monitoring Year 3 - 2022

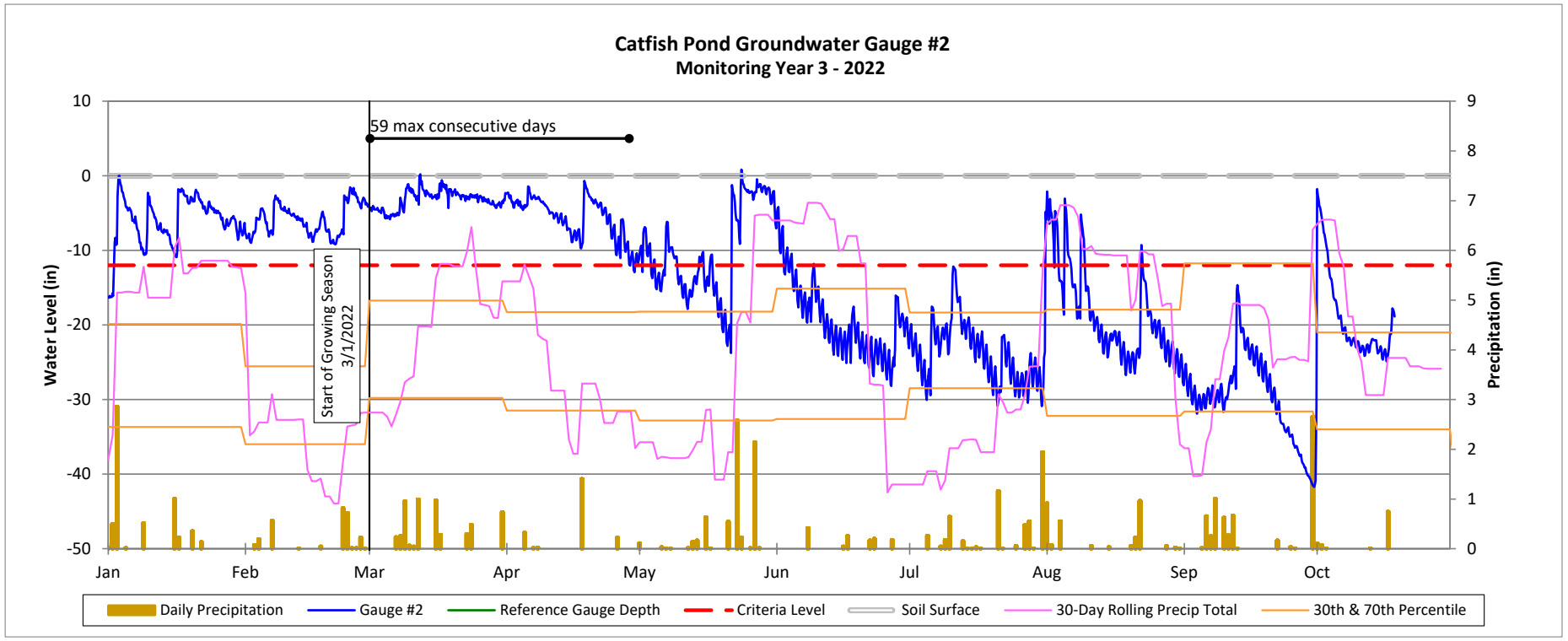


Groundwater Gauge Plot

Catfish Pond Mitigation Site

DMS Project No. 100039

Monitoring Year 3 - 2022

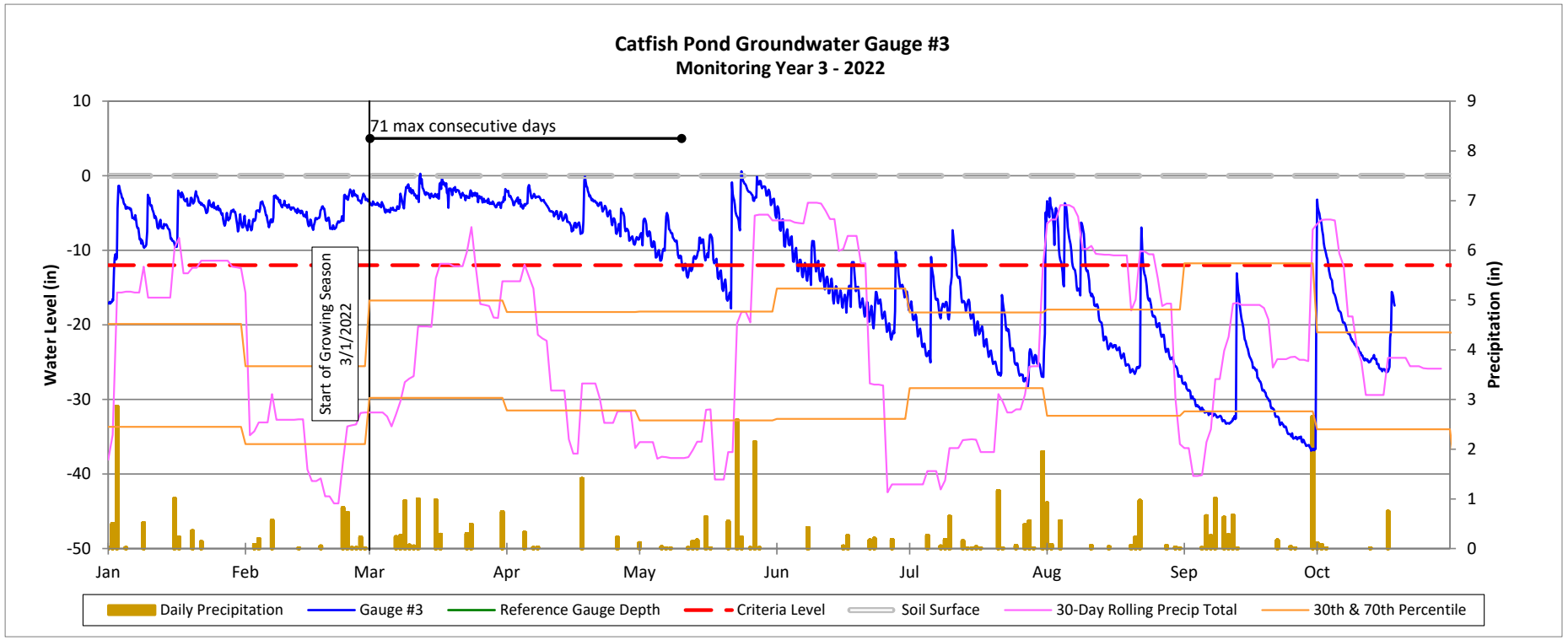


Groundwater Gauge Plot

Catfish Pond Mitigation Site

DMS Project No. 100039

Monitoring Year 3 - 2022

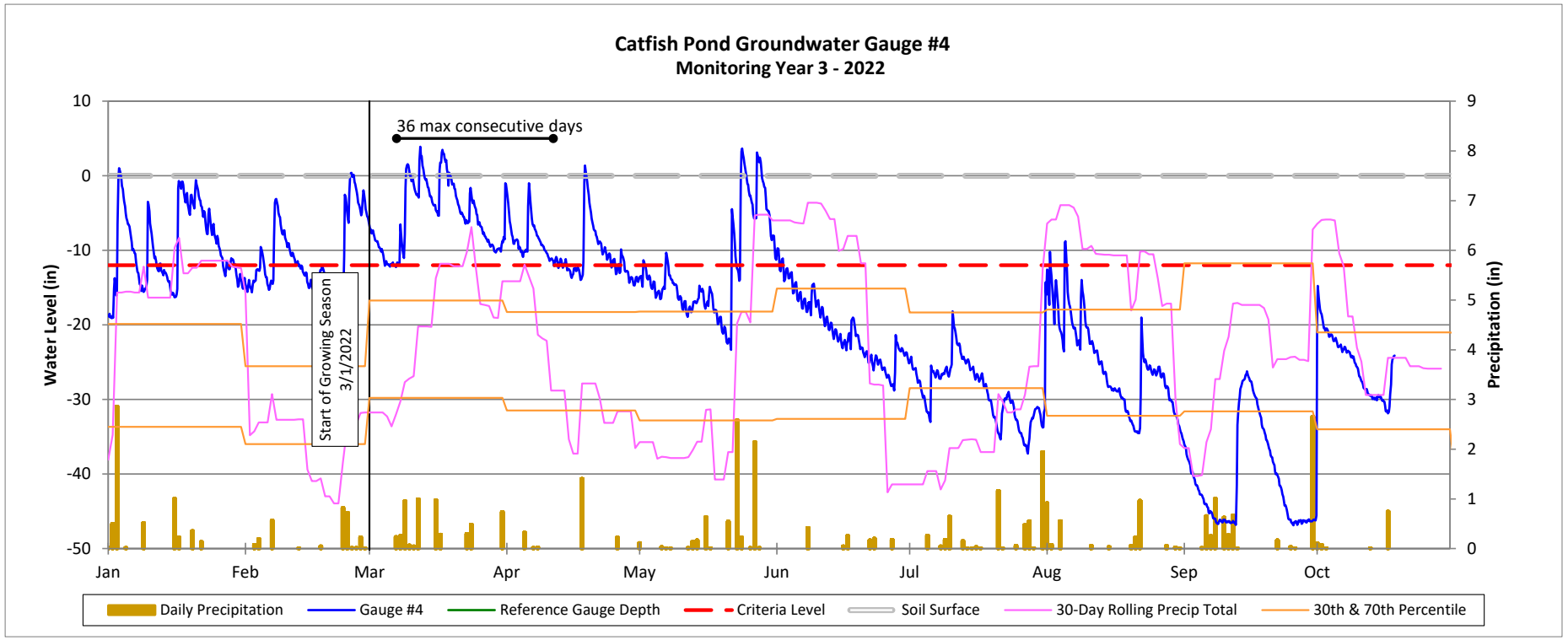


Groundwater Gauge Plot

Catfish Pond Mitigation Site

DMS Project No. 100039

Monitoring Year 3 - 2022



APPENDIX E. PROJECT TIMELINE AND CONTACT INFO

Table 13. Project Activity and Reporting History

Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

Activity or Deliverable		Data Collection Complete	Completion or Scheduled Delivery
Project Instituted		NA	January 2018
Mitigation Plan Approved		July 2019	July 2019
Construction (Grading) Completed		February-March 2020	March 2020
Planting Completed		NA	March 2020
As-Built Survey Completed		March-April 2020	April 2020
Baseline Monitoring Document (Year 0)	Stream Survey	March-April 2020	June 2020
	Vegetation Survey	March 2020	
Competitive Vegetation Treatment[1]			April-May 2020
Invasive Vegetation Treatment			May & September 2020
Year 1 Monitoring	Stream Survey	October 2020	December 2020
	Vegetation Survey	October 2020	
Stream channel repairs on UT1 Reach 3			July 2021
Invasive Vegetation Treatment			September 2021
Year 2 Monitoring	Stream Survey	April & October 2021	December 2021
	Vegetation Survey	September 2021	
Competitive Vegetation Treatment[1]			April 2022
Invasive Vegetation Treatment			May 2022
In-stream Vegetation Treatment			June 2022
Year 3 Monitoring	Stream Survey	April 2022	December 2022
	Vegetation Survey	September 2022	
Year 4 Monitoring			December 2023
Year 5 Monitoring	Stream Survey	2024	December 2024
	Vegetation Survey	2024	
Year 6 Monitoring			December 2025
Year 7 Monitoring	Stream Survey	2026	December 2026
	Vegetation Survey	2026	

[1]Herbicide ring sprays around the base of planted stems.

Table 14. Project Contact Table

Catfish Pond Mitigation Site
DMS Project No. 100039
Monitoring Year 3 - 2022

Designer Daniel Johnson, PE	**Wildlands Engineering, Inc.** 497 Bramson Ct, Suite 104 Mt. Pleasant, SC 29464 843.277.6221
Construction Contractor	**Main Stream Earthwork, Inc.** 631 Camp Dan Valley Rd Reidsville, NC 27320
Monitoring Performers Monitoring, POC	**Wildlands Engineering, Inc.** Jason Lorch 919.851.9986

APPENDIX F. ADDITIONAL DOCUMENTATION

MEETING MINUTES

MEETING: MY2 IRT Site Visit
Catfish Pond Mitigation Site
Neuse River Basin 03020201; Durham County, NC
NCDMS Project No. 100039
USACE ID: SAW-2018-00424
NCDEQ Contract No. 7424

DATE: *On-site Meeting:* Monday, June 13, 2022
Meeting Notes Distributed: Thursday, June 16, 2022

Attendees
Kim Browning, USACE
Casey Haywood, USACE
Travis Wilson, NC Wildlife Resource Commission
Lindsay Crocker, NC Division of Mitigation Services
Jeremiah Dow, NC Division of Mitigation Services
Chris Roessler, Wildlands Engineering
Jason Lorch, Wildlands Engineering
Tasha King, Wildlands Engineering
Andrew Radecki, Wildlands Engineering

Meeting Notes

- Catfish Creek Reach 4
  - Leave crest gauges on Catfish Creek but discussed focusing on flow. Install a camera on Catfish Creek Reach 4 and Reach 6 to document flow in the restored channels.
- Catfish Creek Reach 6
  - There was a long discussion about how bedrock was discovered approximately 6" below the proposed grade of the stream channel through the old pond bed which led to some construction/ installation difficulties in meeting the designed grade. In the future, the IRT would prefer grading banks in lieu of attempting to raise the bed of the channel to the design elevations. The group determined that due to the existing grade control and slope of the reach, flow was more crucial than achieving bankfull in the upper reaches of Catfish Creek.
  - All agreed the channel is good and bedrock is stable.
- UT1 Reach 2
  - GWG data is good. If GWGs are Not for Credit - if data shows wetlands are doing well after 3 or 4 years, Wildlands may request to remove the wells and stop monitoring existing wetlands.
- UT1 Reach 3
  - The IRT agreed that repairs looked fine.

- Vegetation
    - The IRT noticed some privet and multiflora rose – Wildlands confirmed they are actively working to keep on top of it. They will be treated again this year.