Pond Haven Buffer Restoration Site

Year 3 Monitoring Report
Granville County, North Carolina
Tar-Pamlico River Basin - 03020101

DMS Contract 7873
DMS Project Number 100118
DWR Project Number 20190646

Prepared for:
NC Department of Environmental Quality
Division of Mitigation Services
1652 Mail Service Center
Raleigh, NC 27699

Data Collected: 2023
Date Submitted: February 2024

Monitoring and Design Firm

Prepared by:

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KCI ASSOCIATES OF NORTH CAROLINA, PA

ENGINEERS • SCIENTISTS • SURVEYORS • CONSTRUCTION MANAGERS
4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 (919) 783-9214 (919) 783-9266 Fax

MEMORANDUM

Date: February 23, 2024

To: Danielle Mir, DMS Project Manager

From: Adam Spiller, Project Manager
KCI Associates of North Carolina, PA

Subject: Pond Haven Buffer Restoration Site
MY-03 Monitoring Report Comments
Tar-Pamlico River Basin CU 03020101
NCDMS Project # 100118
Contract # 7873

Please find below our responses in italics to the MY-03 Monitoring Report comments from NCDMS received on February 5, 2024, for the Pond Haven Buffer Restoration Site.

- Is the landscape fabric at the base of every plant tube biodegradable?
  KCI Response: The weed mats were installed by the planting contractor and we are not certain what material they are made of but KCI will reach out to them for this information.

- Tubes will need to be removed by MY5 before closeout, unless DWR says differently.
  KCI Response: The installed tree tubes are photo-degradable. Our experience has indicated that these tubes will degrade over time and will not hinder tree growth or project success. The IRT, including the DWR representative, has not required removal of tree tubes on past projects. KCI can provide evidence of these tubes degrading over time if requested by DMS or DWR.

- Mature privet was observed around T2A. Please continue treatment.
  KCI Response: KCI is planning a treatment of the scattered privet growing on site during 2024.

Please contact me if you have any questions or would like clarification concerning these responses.

Sincerely,

Adam Spiller
Project Manager

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PROJECT SUMMARY

The Pond Haven Buffer Restoration Site (PHBRS) was completed in early 2021 and restored a total of 738,372 square feet of riparian buffer along stream in the Bollens and Johnson Creeks Watershed of the Tar-Pamlico River Basin (HUC 03020101010060). The buffers at this site have been historically cleared for pasture and impacted by cattle and other anthropogenic impacts. Prior to restoration, the site was an active cattle pasture that supported approximately 150 head. Tributary 1 had some existing buffer along the stream banks, which cattle had access to. Tributaries 2 and 3 were completely devoid of buffer, while Tributary 4 had some buffer along the stream banks that the cattle were excluded from. The completed project will return a functional riparian buffer to previously unbuffered and cattle impacted streams. All project assets are based on the surveyed conservation easement and top of bank.

The PHBRS is protected by a 17.49 acre permanent conservation easement, held by the State of North Carolina. It is located in central Granville County, approximately three miles northeast of Creedmoor, North Carolina. Specifically, the site is on the west side of NC-96, just south of Cannady Road. The center of the site is at approximately 36.1591 N and -78.5954 W in the Wilton USGS Quadrangle.

The mitigation work at the PHBRS was completed on February 27, 2021. This work included chemical control of pasture grasses and other non-native or invasive species. Disking was used in areas of fescue or other allelopathic plants. Cattle exclusion fencing was erected around the entire easement boundary and 11,900 bare root seedlings were planted across the site with a 4' Tubex Treeshelter and a VisPore Weedmat fitted on every other tree. See Table 3 for a complete list of the species planted on site. A custom herbaceous seed mix composed of native species was spread across the site. Finally the site boundary was marked with visible signs conforming to DMS and DEQ Stewardship standards.

MONITORING PLAN

Monitoring will be conducted for a period of five years following project implementation or until performance standards have been achieved. Monitoring will consist of vegetation sampling and visual inspection to ensure the health and vigor of the planted restoration area and that the requirements of the conservation easement are being upheld. Vegetation sampling will consist of fifteen 10m x 10m plots. Eight of these plots were permanently installed during the baseline monitoring, while the other seven will be randomly placed during each monitoring visit. The species, height, and origin (planted vs. volunteer) of all trees within these plots will be recorded each year, and a photograph will be taken of each plot. Invasive stems will be recorded in each plot but will not count towards reaching performance standards.

SUCCESS CRITERIA

Plots must achieve an average stem density of 260 stems/acre after five years with a minimum of four native hardwood tree species or four native hardwood tree and native shrub species, where no one species is greater than 50 percent of stems. Native hardwood and native shrub volunteer species may be included to meet the final performance standard of 260 stems/acre upon DWR approval.

ANNUAL MONITORING

Monitoring Year 3 vegetation data was collected on August 24th and September 6th of 2023. 14 of the 15 vegetation monitoring plots had greater than 260 stems/acre, with only Plot 6F (243 stems/acre) below the density requirement. Plot 6F (3 species) was also the only plot with less than four native hardwood species. Overall, the site is well vegetated with extensive herbaceous coverage and many diverse volunteer woody species.

APPENDIX A

Background Tables and Site Maps

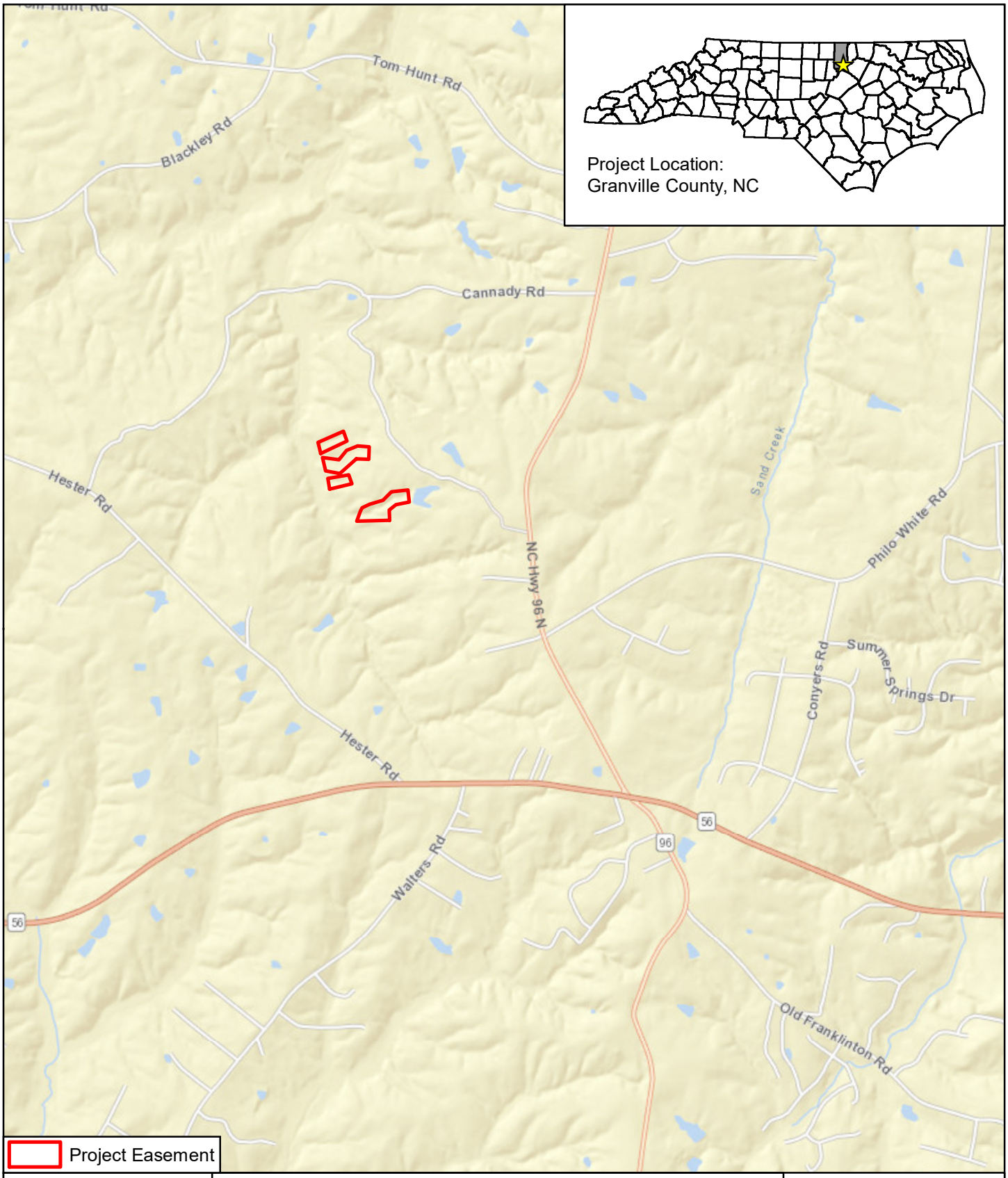
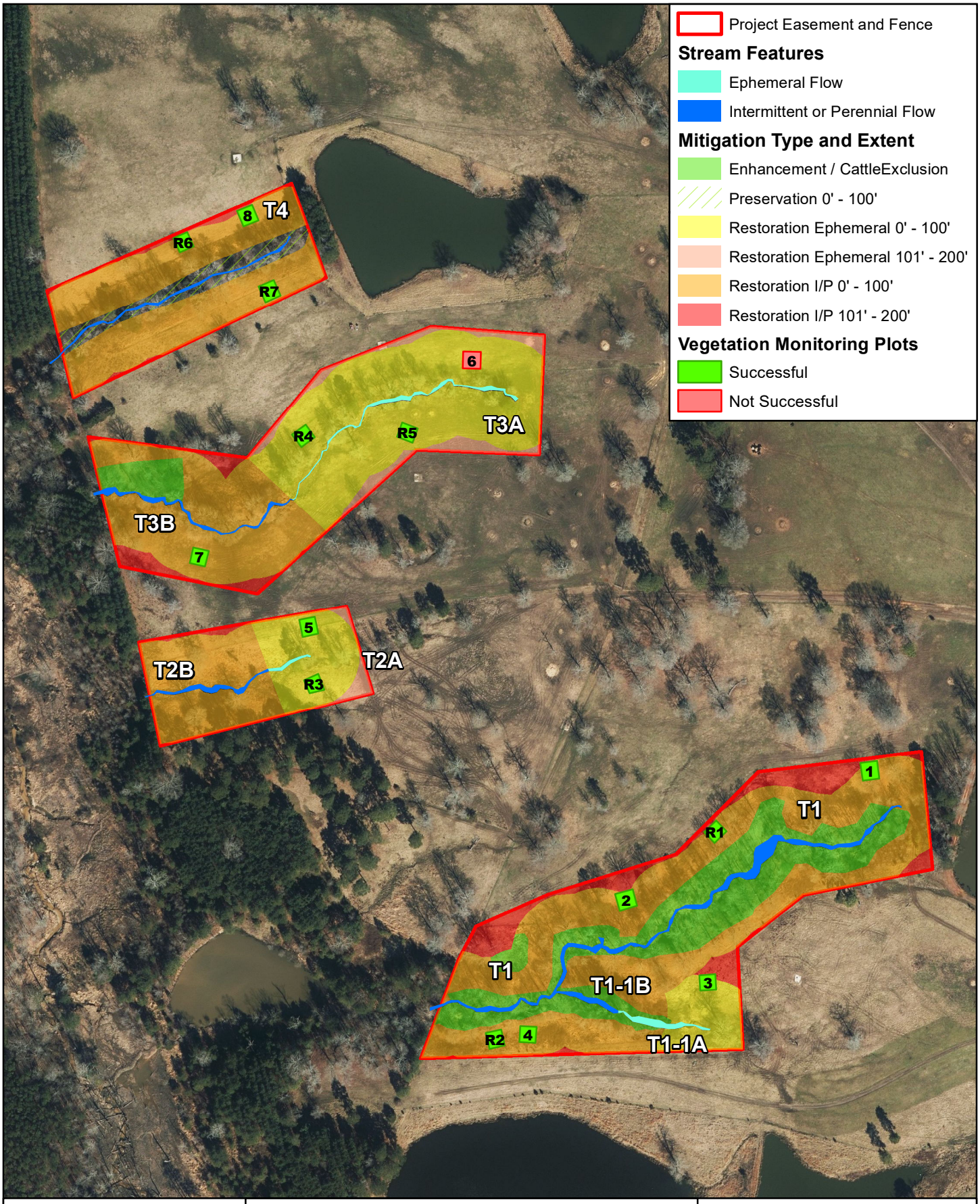


FIGURE 1. PROJECT SITE VICINITY MAP
POND HAVEN BUFFER RESTORATION SITE
GRANVILLE COUNTY, NC



0 160 320 Feet

FIGURE 2. PROJECT ASSETS and CURRENT CONDITIONS
POND HAVEN BUFFER RESTORATION SITE
GRANVILLE COUNTY, NC

N

Sources: NC Statewide Orthoimagery, 2017.

Table 1. Buffer Project Attributes	
Project Name	Pond Haven Buffer Restoration Site
Hydrologic Unit Code	03020101010060
River Basin	Tar-Pamlico
Geographic Location (Lat, Long)	36.1591 N, -78.5954 W
Site Protection Instrument (DB, PG)	DB 1773 PG 770
Total Credits (BMU)	620,880.555
Types of Credits	Buffer
Mitigation Plan Date	February 20, 2020
Initial Planting Date	February 27, 2021
Baseline Report Date	April 2021
MY1 Report Date	December 2021
MY2 Report Date	August 2022
MY3 Report Date	December 2023
MY4 Report Date	December 2024
MY5 Report Date	December 2025

Table 2. Pond Haven Buffer Restoration Site, 100118, Project Mitigation Credits

Tar-Pamlico 03020101	Project Area
19.16394	N Credit Ratio (sf/credit)
297.54099	P Credit Ratio (sf/credit)

Credit Type	Location	Subject? (enter NO if ephemeral or ditch [1])	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area of Buffer Mitigation (sf)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Convertible to Riparian Buffer?	Riparian Buffer Credits	Convertible to Nutrient Offset?	Delivered Nutrient Offset: N (lbs)	Delivered Nutrient Offset: P (lbs)
Buffer	Rural	Yes	I / P	Restoration	0-100	Restoration I/P (T1, T1-1B, T2B, T3B, T4- Orange Shaded Fig. 7)	323,101	323,101	1	100%	1.00000	Yes	323,101.000	Yes	16,859.842	1,085.904
Buffer	Rural	Yes	I / P	Restoration	101-200	Restoration I/P >101 (T1, T3B, T4-Red Shaded Fig.7)	45,113	45,113	1	33%	3.03030	Yes	14,887.305	Yes	2,354.057	151.619
Buffer	Rural	No	Ephemeral	Restoration	0-100	Restoration Eph (T1-1A, T2A, T3A-Yellow Shaded Fig. 7)	179,203	179,203	1	100%	1.00000	Yes	179,203.000	Yes	9,351.052	602.280
Buffer	Rural	No	Ephemeral	Restoration	101-200	Restoration Eph >100 (T2A, T3A-Pink Shaded Fig. 7)	17,943	1,215	1	33%	3.03030	Yes	400.950	Yes	936.290	60.304
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	0-100	Cattle Exclusion (T1, T1-1B, T3B-Green Shaded Fig 7)	104,918	104,918	2	100%	2.00000	Yes	52,459.000	No	—	—
Buffer	Rural	Yes	I / P	Restoration	0-100	Restoration I/P (T4-Orange Dotted Fig. 7)	48,911	48,911	1	100%	1.00000	Yes	48,911.000	No	—	—
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													—		—	—
						Totals:	719,189	702,461								

Enter Preservation Credits Below — **Eligible for Preservation (sf):** 234,154

Credit Type	Location	Subject?	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area for Buffer Mitigation (sf)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits
Buffer	Rural	Yes	I / P	Preservation	0-100	Pres inside fence (T4-Hatching Fig. 7)	19,183	19,183	10	100%	10.00000	1,918.300
												—
												—
												—
												—
												—
												—
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												—
												—
												—
						Preservation Area Subtotal (sf):		19,183				
						Preservation as % Total Area of Buffer Mitigation:		2.0%				
						Ephemeral Reaches as % Total Area of Buffer Mitigation:		25.0%				

TOTAL AREA OF BUFFER MITIGATION (TABM)			
Mitigation Totals		Square Feet	Credits
Restoration:		597,543	566,503.255
Enhancement:		104,918	52,459.000
Preservation:		19,183	1,918.300
Total Riparian Buffer:		721,644	620,880.555
TOTAL NUTRIENT OFFSET MITIGATION			
Mitigation Totals		Square Feet	Credits
Nutrient Offset:	Nitrogen:	0	0.000
	Phosphorus:		0.000

1. The Randleman Lake buffer rules allow some ditches to be classified as subject according to 15A NCAC 02B .0250 (5)(a).

APPENDIX B

Visual Assessment Data

Vegetation Monitoring Plot Photos

Plot 1 MY00 – 3/30/2021

Plot 1 MY03 – 8/24/23

Plot 2 MY00 – 3/30/2021

Plot 2 MY03 – 8/24/23

Plot 3 MY00 – 3/30/2021

Plot 3 MY03 – 8/24/23

Plot 4 MY00 – 3/30/2021

Plot 4 MY03 – 8/24/23

Plot 5 MY00 – 3/30/2021

Plot 5 MY03 – 8/24/23

Plot 6 MY00 – 3/30/2021

Plot 6 MY03 – 9/6/23

Plot 7 MY00 – 3/30/2021

Plot 7 MY03 – 9/6/23

Plot 8 MY00 – 3/30/2021

Plot 8 MY03 – 9/6/23

Plot R1 MY03 – 8/24/23

Plot R2 MY03 – 8/24/23

Plot R3 MY03 – 8/24/23

Plot R4 MY03 – 9/6/23

Plot R5 MY03 – 9/6/23

Plot R6 MY03 – 9/6/23

Plot R7 MY02 – 9/6/23

APPENDIX C

Vegetation Plot Data

Table 3. Species and Quantity of Planted Stems		
Common Name	Scientific Name	Quantity
Black Gum	*Nyssa sylvatica*	595
River Birch	*Betula nigra*	1190
Persimmon	*Diospyros virginiana*	1190
Silky Dogwood	*Cornus amomum*	595
Buttonbush	*Cephalanthus occidentalis*	120
Pin Oak	*Quercus palustris*	595
Tulip Poplar	*Liriodendron tulipifera*	1190
Sycamore	*Platanus occidentalis*	1190
White Oak	*Quercus alba*	1190
Swamp Chestnut Oak	*Quercus michauxii*	1190
Willow Oak	*Quercus phellos*	1665
American Elm	*Ulmus americana*	1190
Herbaceous Seed Mix		
Common Name	Scientific Name	% of mix
Autumn Bentgrass	*Agrostis perennans*	10
Big Bluestem	*Andropogon gerardii*	8
Lanceleaf Coreopsis	*Coreopsis lanceolata*	10
Virginia Wild Rye	*Elymus virginicus*	15
Soft Rush	*Juncus effusus*	3
Switchgrass	*Panicum virgatum*	10
Black-Eyed Susan	*Rudbeckia hirta*	10
Little Bluestem	*Schizachyrium scoparium*	3
Indian Grass	*Sorghastrum nutans*	3
Eastern Gamma	*Tripsacum dactyloides*	3
Rye Grain	*Secale cereal*	25

Planted Acreage	17.49
Date of Initial Plant	2021-02-27
Date(s) of Supplemental Plant(s)	NA
Date(s) Mowing	NA
Date of Current Survey	8/24/2023
Plot size (ACRES)	0.0247

Table 4. Vegetation Performance Standards Summary
Pond Haven Buffer Restoration Site, DMS #100118

	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		Veg Plot 6 F		Veg Plot 7 F		Veg Plot 8 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	Betula nigra	river birch	Tree	FACW	1	1	7	7	3	3										
	Cornus amomum	silky dogwood	Shrub	FACW	1	1	5	5	1	1	3	3	3	3						
	Diospyros virginiana	common persimmon	Tree	FAC													3	3	2	2
	Liriodendron tulipifera	tuliptree	Tree	FACU	2	2							1	1			2	2	1	1
	Nyssa sylvatica	blackgum	Tree	FAC	2	2							5	5			3	3	3	3
	other										1	1								
	Platanus occidentalis	American sycamore	Tree	FACW	1	1	8	8	2	2	1	1								
	Quercus alba	white oak	Tree	FACU	1	47		2					2	2	1	1	2	2	2	2
	Quercus michauxii	swamp chestnut oak	Tree	FACW			1	1	1	1	4	4								
	Quercus palustris	pin oak	Tree	FACW	2	2			2	2		2								
	Quercus phellos	willow oak	Tree	FAC			3	3	4	4	1	1			1	1	5	5	1	1
	Ulmus americana	American elm	Tree	FACW	2	2			1	1			1	1	6	6	3	3	4	4
Sum	Performance Standard				12	58	24	26	14	14	10	12	12	12	8	8	18	18	13	13
Post Mitigation Plan Species	*Acer negundo*	*boxelder*	*Tree*	*FAC*																
	Acer rubrum	*red maple*	*Tree*	*FAC*																
	Juglans nigra	*black walnut*	*Tree*	*UPL*		*1*						*1*								
	Juniperus virginiana	*eastern redcedar*	*Tree*	*FACU*		*1*														
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*		*35*		*13*				*9*						*6*		
	Pinus taeda	*loblolly pine*	*Tree*	*FAC*		*9*		*1*				*3*								
	Prunus serotina	*black cherry*	*Tree*	*FACU*		*1*														
	Quercus rubra	*northern red oak*	*Tree*	*FACU*								*1*								
	Ulmus alata	*winged elm*	*Tree*	*FACU*																
Sum	Proposed Standard				12	58	24	26	14	14	10	12	12	12	8	8	18	18	13	13
Mitigation Plan Performance Standard	Current Year Stem Count					58		26		14		12		12		8		18		13
	Stems/Acre					2348		1052		567		486		486		243		729		526
	Species Count					8		6		7		6		5		3		6		6
	Dominant Species Composition (%)					45		32		29		35		42		75		25		31
	Average Plot Height (ft.)					3		6		5		2		4		5		5		3
	% Invasives					0		0		0		0		0		0		0		0
Post Mitigation Plan Performance Standard	Current Year Stem Count					58		26		14		12		12		8		18		13
	Stems/Acre					2348		1052		567		486		486		243		729		526
	Species Count					8		6		7		6		5		3		6		6
	Dominant Species Composition (%)					45		32		29		35		42		75		25		31
	Average Plot Height (ft.)					3		6		5		2		4		5		5		3
	% Invasives					0		0		0		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 (bol 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.
4). Green = acheived success criteria, Red = did not acheive success criteria

Table 4. Vegetation Performance Standards Summary
Pond Haven Buffer Restoration Site, DMS #100118

	Scientific Name	Common Name	Tree/Shrub	Indicator Status	Veg Plot 1 R Total	Veg Plot 2 R Total	Veg Plot 3 R Total	Veg Plot 4 R Total	Veg Plot 5 R Total	Veg Plot 6 R Total	Veg Plot 7 R Total
Species Included in Approved Mitigation Plan	Betula nigra	river birch	Tree	FACW			1	3			1
	Cornus amomum	silky dogwood	Shrub	FACW							1
	Diospyros virginiana	common persimmon	Tree	FAC	1			2	1	3	2
	Liriodendron tulipifera	tuliptree	Tree	FACU	1		2	2	1		
	Nyssa sylvatica	blackgum	Tree	FAC	3			2	2	2	2
	other										
	Platanus occidentalis	American sycamore	Tree	FACW		1		1			
	Quercus alba	white oak	Tree	FACU	9	1	1	1	2	1	
	Quercus michauxii	swamp chestnut oak	Tree	FACW	1	4					8
	Quercus palustris	pin oak	Tree	FACW	1	4	1				
	Quercus phellos	willow oak	Tree	FACW	2	4	1	3		2	2
	Ulmus americana	American elm	Tree	FAC			3		4		
Sum	Performance Standard				18	14	9	14	10	8	16
Post Mitigation Plan Species	*Acer negundo*	*boxelder*	*Tree*	*FAC*				*1*			
	Acer rubrum	*red maple*	*Tree*	*FAC*					*1*		
	Juglans nigra	*black walnut*	*Tree*	*UPL*	*3*	*5*					
	Juniperus virginiana	*eastern redcedar*	*Tree*	*FACU*	*1*						
	Liquidambar styraciflua	*sweetgum*	*Tree*	*FAC*	*1*	*10*	*5*	*2*	*1*		
	Pinus taeda	*loblolly pine*	*Tree*	*FAC*	*1*	*6*	*2*				
	Prunus serotina	*black cherry*	*Tree*	*FACU*							
	Quercus rubra	*northern red oak*	*Tree*	*FACU*							
	Ulmus alata	*winged elm*	*Tree*	*FACU*						*2*	
Sum	*Proposed Standard*				18	14	9	14	10	8	16
Mitigation Plan Performance Standard	Current Year Stem Count				18	14	9	14	10	8	16
	Stems/Acre				729	567	364	567	405	324	648
	Species Count				7	5	6	7	5	4	6
	Dominant Species Composition (%)				38	29	31	18	33	30	50
	Average Plot Height (ft.)				2	2	6	4	4	4	4
	% Invasives				0	0	0	0	0	0	0
Post Mitigation Plan Performance Standard	Current Year Stem Count				18	14	9	14	10	8	16
	Stems/Acre				729	567	364	567	405	324	648
	Species Count				7	5	6	7	5	4	6
	Dominant Species Composition (%)				38	29	31	18	33	30	50
	Average Plot Height (ft.)				2	2	6	4	4	4	4
	% Invasives				0	0	0	0	0	0	0

	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 5												
Monitoring Year 4												
Monitoring Year 3	2307	3	8	0	1052	6	6	0	567	5	7	0
Monitoring Year 2	2226	2	9	0	1012	4	5	0	445	3	7	0
Monitoring Year 1	486	2	8	0	1093	3	5	0	607	2	7	0
Monitoring Year 0	972	2	11	0	1376	2	7	0	1133	2	9	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 5												
Monitoring Year 4												
Monitoring Year 3	445	3	5	0	486	4	5	0	243	5	3	0
Monitoring Year 2	567	2	7	0	486	3	5	0	324	4	3	0
Monitoring Year 1	486	2	6	0	607	2	6	0	324	3	4	0
Monitoring Year 0	1214	2	9	0	931	2	7	0	891	1	8	0
	Veg Plot 7 F				Veg Plot 8 F				Veg Plot Group 1 R			
	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 5												
Monitoring Year 4												
Monitoring Year 3	688	5	6	0	405	4	6	0	729	2	7	0
Monitoring Year 2	729	3	6	0	486	2	6	0	891	2	8	0
Monitoring Year 1	769	2	6	0	526	2	5	0				
Monitoring Year 0	1052	1	7	0	1052	2	8	0				
	Veg Plot Group 2 R				Veg Plot Group 3 R				Veg Plot Group 4 R			
	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 5												
Monitoring Year 4												
Monitoring Year 3	567	2	5	0	364	6	6	0	567	4	7	0
Monitoring Year 2	526	2	4	0	526	3	5	0	405	4	5	0
Monitoring Year 1												
Monitoring Year 0												
	Veg Plot Group 5 R				Veg Plot Group 6 R				Veg Plot Group 7 R			
	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives	Stems/ Ac.	Av. Ht. (ft)	# Species	% Invasives
Monitoring Year 5												
Monitoring Year 4												
Monitoring Year 3	405	4	5	0	324	4	4	0	648	4	6	0
Monitoring Year 2	607	3	6	0	567	2	4	0	607	2	5	0
Monitoring Year 1												
Monitoring Year 0												