YEAR 4 ANNUAL MONITORING REPORT
FINAL
Year 5 Post Planting
UT to Falls Lake (McDaniel Farm)
Riparian Buffer and Nutrient Offset Mitigation Project
Durham County, North Carolina
NC Division of Mitigation Services Project #: 95389

Neuse River Basin
03020201

DWR #: 2015-0634

Mitigation Services
ENVIRONMENTAL QUALITY

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

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Appendices

1.0 PROJECT SUMMARY

NC Division of Mitigation Services (DMS) implemented the **UT to Falls Lake (McDaniel Farm) Project** (Project) to fulfill riparian buffer mitigation needs in the Neuse 03020201 Catalog Unit and nutrient offset mitigation needs in the Upper Falls Lake Watershed in accordance with the NC Division of Water Resources (DWR) Temporary Buffer Mitigation Rule (15A NCAC 02B .0295) effective October 24, 2014.

This project site is located off Benny Ross Road in Durham County approximately 7.5 miles east of the City of Durham and is within the Upper Falls Lake Watershed (Appendix B, Figure 1). The site is within the Lick Creek watershed (HU 3020201050030) which is comprised of sub-watersheds draining to Lick Creek, its tributary Rocky Branch, Laurel Creek, and unnamed tributaries to Falls Lake. Falls Lake is a drinking water supply watershed with additional nutrient restrictions regulated by the North Carolina Division of Water Resources. The site is in NC DWR's 03-04-01 sub-basin.

Riparian buffer mitigation activities occur along the Project from top of bank and extending out to 200 feet, resulting in a maximum of 9.67 acres (421,385 ft^2) of riparian buffer and/or nutrient offset mitigation through planting and preservation of 10.86 acres of forested buffer easement along the main unnamed tributary to Falls Lake and several water conveyances that flow to UT to Falls Lake. Refer to Appendix A, Table 1 for project mitigation components and Appendix B, Figure 2 for the project component/asset map. Due to the site's location within the Upper Falls Lake Watershed, nutrient offset mitigation from this site can only be provided to offset impacts from development within the Falls Lake Watershed. In addition, riparian buffer mitigation from this site can be used to offset permitted impacts according to the Temporary Rule (15A NCAC 02B .0295) effective October 24, 2014.

The following goals of this riparian buffer/nutrient offset mitigation project are to address stressors identified in the Project watershed through the restoration of riparian buffers along the UT and its conveyances.

- Removing nonpoint sources of pollution associated with agricultural activities
- Reducing sedimentation onsite and downstream

The success of these goals are based on the following objectives;

- Removal of horses and goats from riparian areas;
- Reducing the application of agricultural materials into and adjacent to streams;
- Establishing a vegetative buffer adjacent to streams to treat surface runoff, which may contain pollutants such as sediment and/or agricultural pollutants from the adjacent landscape;
- Reducing bank erosion associated with a lack of vegetative cover; and
- Planting a diverse hardwood vegetative buffer adjacent to Site tributaries.

Project restoration activities were completed in March 2016. Refer to Appendix A, Tables 2, 3 and 4 for detailed project activity, reporting history, project contact information and project baseline information and attributes.

Directions to the Project from Raleigh: Take US 70 West/Glenwood Avenue toward Durham. Turn Right on NC 50 North/Creedmoor Road. Exit onto NC 98 West. Turn Right onto Southview Road and follow to T intersection. Turn Right onto Baptist Road. Turn right onto Benny Ross Road Site. Travel approximately 0.3 mile to gate on the left. Access is by foot through the gate and 50 ft. access easement See Appendix D, As-Built Sheets). Coordinates: 35.998142, -78.742794

2.0 PERFORMANCE STANDARDS

Performance standards were established for native forest development and diffuse flow through the riparian buffer in accordance with DWR's Administrative Code 15A NCAC 02B.0295 (Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers) (NCDWR 2014 Temporary Rule). Performance standards are dependent upon the density and survival of characteristic forest species. After five years of monitoring, an average density of 260 woody stems per acre must be surviving and diffuse flow maintained.

3.0 MONITORING PLAN

3.1 Reporting

Annual monitoring data will be reported following DMS's Riparian Buffer and Nutrient Offset Buffer Annual Monitoring Report Template (ver. 1.0) dated Feb. 2, 2014. The monitoring report shall provide a project data chronology and assist in decision making regarding project close-out. The following table outlines monitoring requirements and parameters for this project.

Required	Parameter	Quantity	Frequency	Notes
Yes	Vegetation	Quantity and location of vegetation plots will be determined by Division of Mitigation Services	Annual	Vegetation will be monitored for a period of five years or until success criteria are met. During years 2, 3 and 5 random plots will be used. Visual monitoring of the site will be done all five years
Yes	Project boundary		Annual	Locations of fence damage, vegetation damage, boundary encroachments, etc. will be mapped

3.2 Vegetation Monitoring

To monitor the vegetation at this site, the NC Division of Mitigation Services will use a combination of visual monitoring and random vegetation plots. Visual monitoring will be conducted during all five years of monitoring to assess vegetative cover, diffuse flow and easement integrity. DMS will monitor ten (10) rotating, random 1,500 square foot vegetation plots in years 2, 3, and 5 to assess vegetative success representative of the entire mitigation area from top of bank to 200 feet from each tributary/conveyance. These ten (10) plots will provide coverage of 3% of the site each year used. In each sample plot, monitoring parameters will include species composition and density. As it was done for the baseline data collection, the vegetation plots will be randomly selected using a grid and random number generator or similar method for each of the monitoring years 2, 3 and 5. Visual observations of the percent cover of shrub and herbaceous species, diffuse flow and easement integrity will be documented by photograph and site visits.

Monitoring of site restoration efforts will be performed for five years or until performance standards are met. The first annual monitoring assessment (MY1) was completed in the fall of 2016. The vegetation will be monitored for a total of five years, with the final monitoring activities concluding in 2021. The close-out for the Project will be conducted in 2022 given that the performance criteria has been met.

4.0 MAINTENANCE AND CONTINGENCY PLAN

DMS shall monitor the site and conduct a physical inspection of the site a minimum of once per year throughout the post-construction monitoring period until performance standards are met. These site inspections may identify site components and features that require routine maintenance. Routine maintenance should be expected most often in the first two years following site construction and may include the following:

Component/Feature	Maintenance through project close-out	Remedial Measures
Vegetation	Vegetation shall be maintained to ensure survival. Routine vegetation maintenance and repair activities may include supplemental planting. The site will also be evaluated to ensure diffuse flow is still occurring.	Any remedial activities performed will be documented in the annual monitoring reports.
Site Boundary	Site boundaries shall be identified in the field to ensure clear distinction between the mitigation site and adjacent properties. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by site conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as needed basis.	Any remedial activities performed will be documented in the annual monitoring reports.

5.0 YEAR 4 MONITORING

Based on the results of Year 2 annual monitoring, and DMS's efforts to contract with a new planting contractor to replant the Project and treat invasive vegetation, DMS did not conduct annual monitoring in 2018. The replanting of the site was completed in late February 2019. A list of species planted during the replant of the site is provided in Appendix C. Invasive treatments were last completed in June 2019. Species treated included Tree of Heaven, Lespedeza and dog fennel. Additional treatment of will be done as needed.

Year 4 annual monitoring (MY4) was conducted in August 2020. While quantitative vegetation monitoring was not proposed for MY4, due to the history of planted stems struggling at this site, and observations of low stem density and vigor, MY4 monitoring activities included stem counts using ten (10) rotating, random 1,500 square foot vegetation plots. Other monitoring activities included visual monitoring of the project verifying the presence or absence of invasive species; checking the integrity of the easement and fencing; and taking photographs at the established photo points.

Five (5) of the ten (10) transects did not meet success criteria of 260 stems per acre for planted stems. Visual monitoring and random vegetation transects conducted by DMS staff revealed most planted stems are concealed by herbaceous vegetation and areas with low stem density are likely due to low soil fertility, and to a lesser extent, competition from a dense

herbaceous layer. Furthermore, in plots that met success criteria, the vigor of many stems was poor (See Appendix B for representative photos). The fence installed along the easement boundary is functioning as intended and all installed signage is still in place.

DMS secured a new planting contractor, Terravista Landscape Management (Terravista), to treat invasive vegetation and replant approximately 3.27 acres of low stem density area within the easement. Terravista began the supplemental planting on December 16, 2020 and completed the work on January 4, 2021. To maximize survivability of stems in the poor site soils, Terravista dug 10" deep holes by hand with shovels and backfilled with 50/50 mix. Planted stems were at least 24" in height and 0.5" in caliper size. Planted species included Persimmon (*Diospyros virginiana*) and Sycamore (*Platanus occidentalis*). Terravista has been contracted to conduct independent, random vegetation transect monitoring to ensure survival of at least 300 stems per acre in the supplemental planting zones. The results of Terravista's monitoring will be included in future monitoring reports in addition to the normal yearly vegetation monitoring.

APPENDIX A

BACKGROUND TABLES

Table 1: Project Mitigation Components
UT to Falls Lake (McDaniel Farm) DMS Project #95389

Mitigation Components*										
Project Component	Existing Buffer SF	Restored Buffer SF	Creditable Buffer SF	Restortion Level	Mitigation Ratio (X:1)	Riparian Buffer Mitigation Credits (SF)		Nutrient Offset Credits Nitrogen (lbs)	Nutrient Offset Credits Phosphous (lbs)	Notes/Comments
Buffer										
Riparian Buffer TOB-50' (Reaches A1, A2 & B) Subject Rural	0	49,393	49,393	R	1	49,393	**OR**	2,577.48	166.00	Restored riparian buffer for buffer or Nutrient Offset credit
Riparian Buffer 51-100' (Reaches A1, A2 & B) Subject Rural	0	82,083	82,083	R	1	82,083	**OR**	4,283.35	275.87	Restored riparian buffer for buffer or Nutrient Offset credit
Riparian Buffer 101-200' (Reaches A1, A2 & B) Subject Rural	0	149,557	149,557	R	1			7,804.36	502.64	Restored riparian buffer for Nutrient Offset credit only
Riparian Buffer TOB-200' Non-Subject Rural	0	72,392	72,392	R	1			3,777.65	243.30	Restored riparian buffer for Nutrient Offset credit only
Riparian Buffer TOB-100' (Reaches A1, A2 & B) Subject Rural	64,826	0	64,826	P	10	6,483				Preserved Riparain Buffer for Buffer Credit only
Riparian Buffer 101-200' (Reach A2) Subject Rural	3,134	0	3,134	P	20	157				Preserved Riparian Buffer for Buffer Credit only. Area in this zone is less than 10% of total Buffer Mitigation area. 20:1 ratio = 10:1 factoring in 50% reduction for preservation on a Subject Non-Urban stream.
		Totals	**421,385**			**138,115**		**18,442.85**	**1,187.82**	
*All assets and credits generated in accordance withDWR Temporary Buffer Mitigation Rule (15A NCAC 02B .0295) effective October 24, 2014.										

Length and Area Summations by Mitigation Category					
	Stream	Riparian Wetland		Non-riparian Wetland	Creditable Buffer
Restoration Level	(linear feet)	(acres)		(acres)	(square feet)
		Riverine	Non-Riverine		
Restoration					353,425
Enhancement					
Enhancement I					
Enhancement II					
Creation					
Preservation					67,960
High Quality Pres					

Overall Assets Summary	
Asset Category	**Overall Credits**
Buffer[1]	**138,115**
Nutrient Offset Nitrogen (lbs/ac/30 yr)	**18,442.85**
Nutrient Offset Phosphorus (lbs/ac/30 yr)	**1,187.82**

[1] Pursuant to 15A NCAC 02B .0295(n)(1) (2014 Temporary Rule), buffer mitigation credit used for buffer credit will not be used for nutrient offset credit

Table 2. Project Activity and Reporting History
UT to Falls Lake (McDaniel Farm) DMS Project #95389

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Institution Date	NA	Jun-13
404 permit date	NA	NA
Restoration Plan	Jul-15	Sep-15
Final Design – Construction Plans	Jul-15	Sep-15
Construction	NA	Mar-16
Planting	Mar-16	Mar-16
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	May-16	Jun-16
Year 1 Monitoring	Oct-16	Oct-16
Year 2 Monitoring	Oct-17	Oct-17
Invasive Treatment	NA	Oct-19
Site Replant	NA	Feb-19
Invasive Treatment	NA	Jun-19
Year 3 Monitoring	Sep-19	Sep-19
Year 4 Monitoring	Aug-20	Aug-20
Year 5 Monitoring		

Table 3. Project Contacts Table
UT to Falls Lake (McDaniel Farm) DMS Project #95389

Designer	**NC Division of Mitigation Services**
	217 W Jones Street, Raleigh, NC 27603
Jeff Schaffer, DMS	(919) 707-8308
Construction Contractor	**Wright Contracting, LLC**
	PO Box 545, Siler City, NC 27344
Andrew Dimmette	(704) 219-0486
Initial Planting Contractor	**Bruton Natural Systems, Inc.**
	PO Box 1197, Fremont, NC 27830
Charlie Bruton	(919) 242-6555
Supplemental Planting & Invasive Contractor	**Terravista Landscape Management**
	7213 Becky Cir., Raleigh, NC 27615
Jennifer Barnhill	(919) 791-7840
Monitoring Performers	**NC Division of Mitigation Services**
	217 W Jones Street, Raleigh, NC 27603
Jeremiah Dow, DMS	(919) 707-8308

Table 4: Project Attributes Table

UT to Falls Lake (McDaniel Farm) DMS Project #95389

Project Information			
Project Name	UT to Falls Lake (McDaniel Farm)		
County	Durham		
Project Area (acres)	10.86		
Project Coordinates (latitude and longitude)	35.998142, -78.742794		
Planted Acreage (Acres of Woody Stems Planted)	10.86		
Project Watershed Summary Information			
Physiographic Province			
River Basin	Neuse		
USGS Hydrologic Unit 8-digit 3020201	USGS Hydrologic Unit 14-digit 03020201050030		
DWR Sub-basin	03-04-01		
Project Drainage Area (acres)	21.5		
Project Drainage Area Percentage of Impervious Area	< 5%		
CGIA Land Use Classification	Majority Forested, some pasture		
Regulatory Considerations			
Parameters	**Applicable?**	**Resolved?**	**Supporting Docs?**
Water of the United States - Section 404	No		
Water of the United States - Section 401	No		
Endangered Species Act	No		
Historic Preservation Act	No		
Coastal Zone Management Act (CZMA or CAMA)	No		
FEMA Floodplain Compliance	No		
Essential Fisheries Habitat	No		

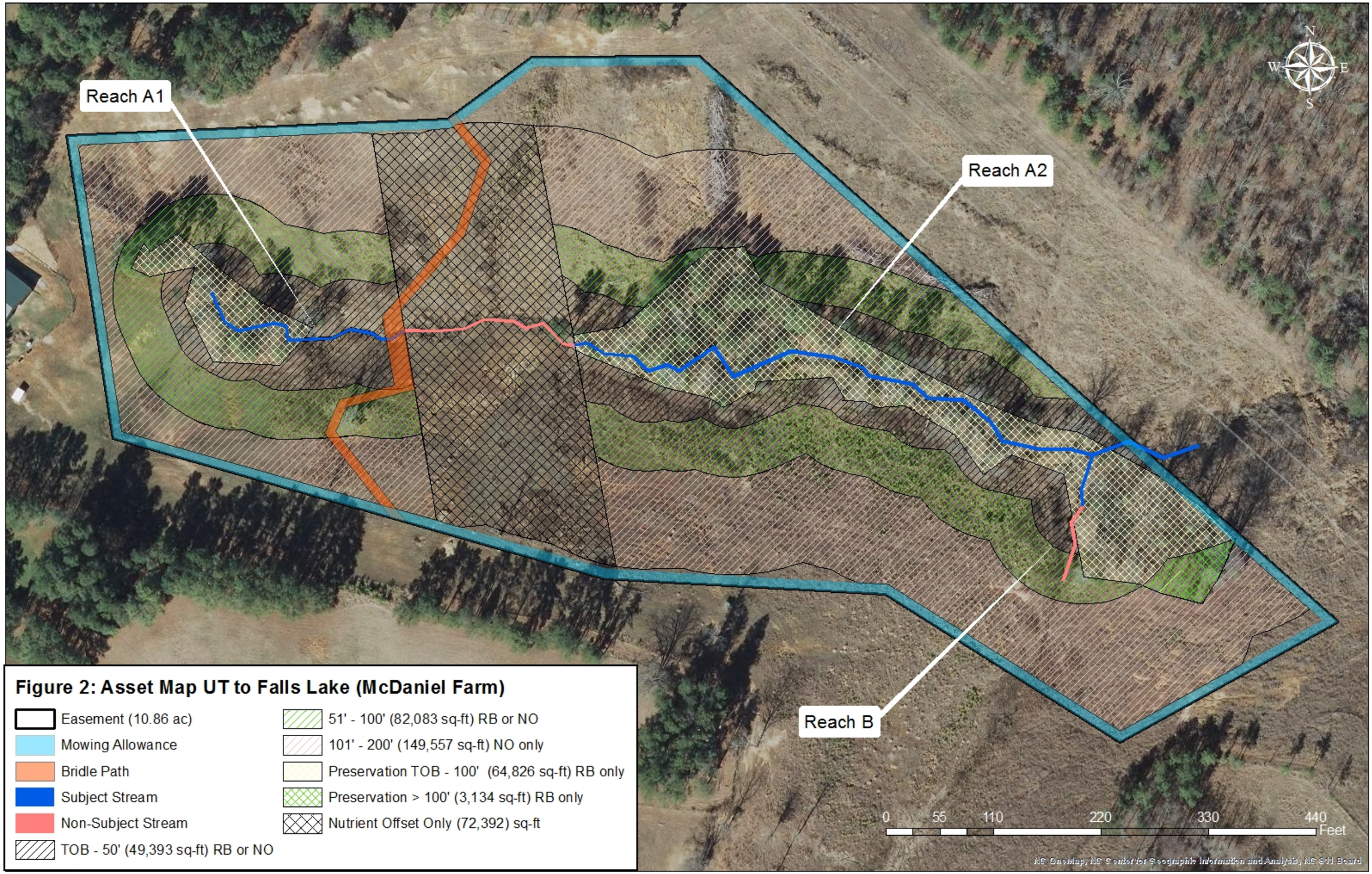
APPENDIX B

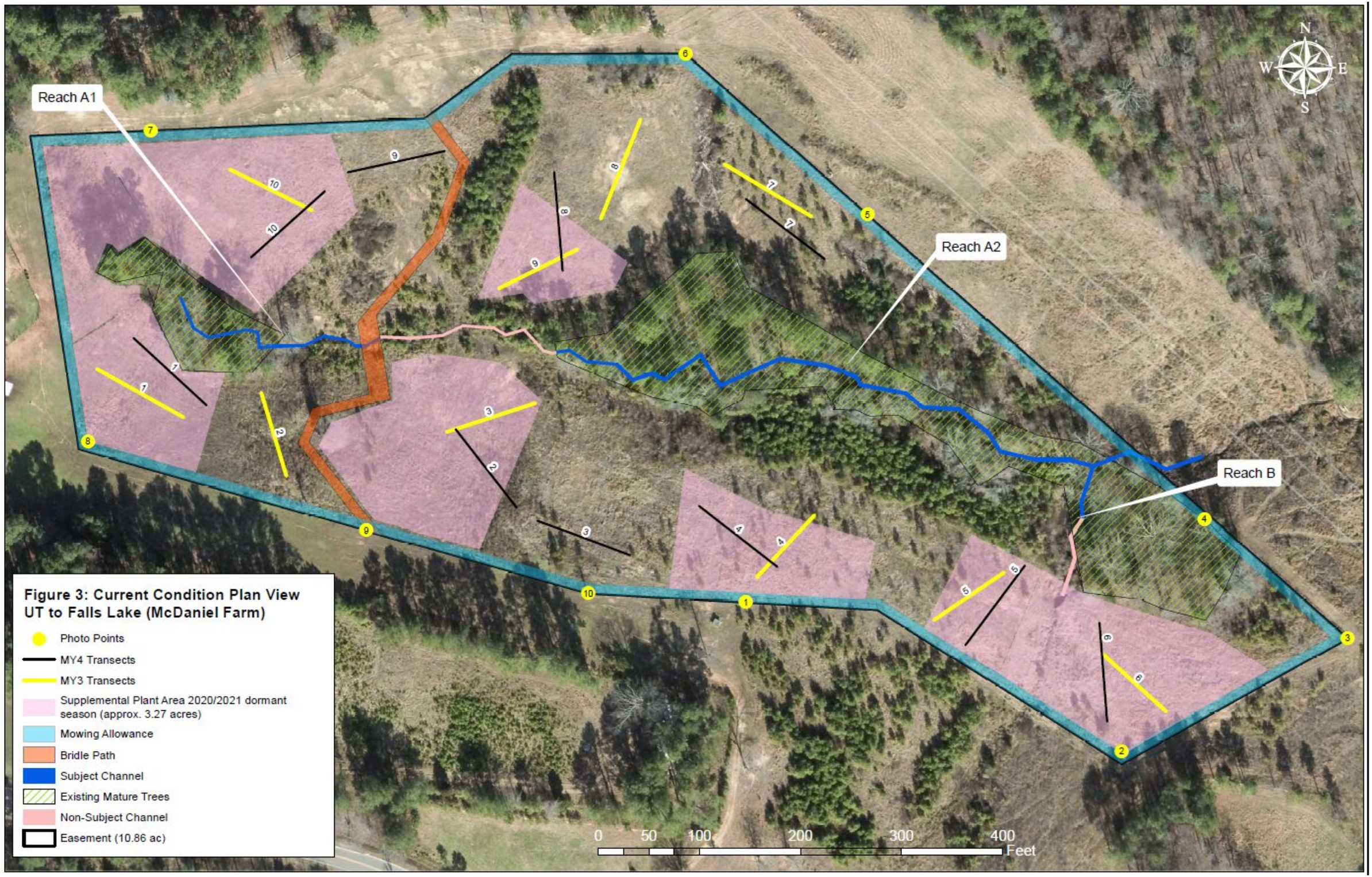
VISUAL ASSESSMENT DATA

FIGURE 1
Project Location Map
UT TO FALLS LAKE (McDANIEL FARM)
Durham County, NC

0 0.25 0.5 0.75 1 Miles

N W E S


Reach A1
Reach A2
Reach B
N
W
E
S
0
55
110
220
330
440
Feet
NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board
Figure 2: Asset Map UT to Falls Lake (McDaniel Farm)
Easement (10.86 ac)
Mowing Allowance
Bridle Path
Subject Stream
Non-Subject Stream
TOB - 50' (49,393 sq-ft) RB or NO
51' - 100' (82,083 sq-ft) RB or NO
101' - 200' (149,557 sq-ft) NO only
Preservation TOB - 100' (64,826 sq-ft) RB only
Preservation > 100' (3,134 sq-ft) RB only
Nutrient Offset Only (72,392) sq-ft


Reach A1
Reach A2
Reach B
N
W
E
S
0
50
100
200
300
400
Feet
Figure 3: Current Condition Plan View
UT to Falls Lake (McDaniel Farm)
Photo Points
MY4 Transects
MY3 Transects
Supplemental Plant Area 2020/2021 dormant season (approx. 3.27 acres)
Mowing Allowance
Bridle Path
Subject Channel
Existing Mature Trees
Non-Subject Channel
Easement (10.86 ac)

Site Photos

Photo Point 1

Photo Point 2A-NW

Photo Point 2B-NE

Photo Point 3A-SW

Photo Point 3B-NW

Photo Point 4

Photo Point 5

Photo Point 6

Photo Point 7A-SE

Photo Point 7B-E

Photo Point 8A-NW

Photo Point 8B-SE

Photo Point 9

Photo Point 10

View of Veg Transect 2

View of Veg Transect 2

Table 5: Vegetation Condition Assessment
UT to Falls Lake (McDaniel Farm) DMS Project #95389
Planted Acreage **10.86**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	Pattern and Color	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres	Transparent Pink Polygons	5	3.27	30.1%
			Total	5	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Pattern and Color	0	0.00	0.0%
			Cumulative Total	5	3.27	30.1%

Easement Acreage **10.86**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000 SF	Pattern and Color	0	0.00	0.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

APPENDIX C

Vegetation Plot Data

Table 6a: Planted Tree Species
UT to Falls Lake (McDaniel Farm) DMS Project #95389

Scientific Name	Common Name	Number Planted	% of Total
Acer rubrum	Red Maple	1,000	17.5%
Fraxinus pennsylvanica	Green Ash	1,000	17.5%
Platanus occidentalis	Sycamore	1,000	17.5%
Betula nigra	River birch	1,000	17.5%
Ulmus americana	American Elm	1,000	17.5%
Hamamelis virginiana	Witch hazel	700	12.3%
Total		**5,700**	**100%**

Table 6b: Supplemental Planted Tree Species (2018)

Scientific Name	Common Name	Number Planted	% of Total
Liriodendron tulipefera	Tulip poplar	700	15.6%
Fraxinus pennsylvanica	Green Ash	700	15.6%
Platanus occidentalis	Sycamore	600	13.3%
Betula nigra	River birch	600	13.3%
Diosypros virginiana	Persimmon	600	13.3%
Nyssa sylvatica	Black gum	600	13.3%
Cercis Canadensis	Red bud	700	15.6%
Total		**4,500**	**100.0%**

Table 7: Planted and Total Stems - MY4
UT to Falls Lake (McDaniel Farm) DMS Project #95389

			Current Year (MY4)																				Annual Means									
			VT1		VT2		VT3		VT4		VT5		VT6		VT7		VT8		VT9		VT10		MY4 (2020)		MY3 (2019)		MY2 (2017)		MY1 (2016)		MY0 (2016)	
Scientific Name	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer rubrum	Red Maple	Tree																									2	2	3	3	26	26
Fraxinus pennsylvanica	Green Ash	Tree			1	1							2	2									3	3	13	13	7	7	3	3	24	24
Platanus occidentalis	Sycamore	Tree			2	2	7	7	4	4			1	1			3	3	3	3			20	20	18	18	12	12	25	25	26	26
Betula nigra	River birch	Tree																							13	13	5	5	24	24	32	32
Ulmus americana	American Elm	Tree	1	1	3	3					1	1	1	1			2	2			1	1	9	9	9	9	6	6	17	17	35	35
Hamamelis virginiana	Witch hazel	Tree																							43	43	9	9	19	19	28	28
Liriodendron tulipefera	Tulip poplar	Tree																														
Diosypros virginiana	Persimmon	Tree			2	2	4	4	3	3	4	4	2	2	1	1	1	1	8	8	3	3	28	28	14	18						
Nyssa sylvatica	Black gum	Tree					1	1			2	2	4	4	6	6	5	5	23	23	6	6	47	47								
Cercis Canadensis	Red bud	Tree																														
Pinus taeda	Loblolly pine	Tree		10		57		26		4		2		6		15		67		21		9		217		165		81		46		29
Liquidambar styraciflua	Sweet gum	Tree						5		2		3		8		9		9						36		62		85		64		38
Salix nigra	Black Willow	Tree																												2		
Chamaecyparis thyoides	Atlantic White Cedar	Tree				1		2		1														4		2		2		1		
Quercus spp.	Oak	Tree														1								1				1		1		
	Unknown	Tree																										4		8		1
Stem count			1	11	8	66	12	45	7	14	7	12	10	24	7	32	11	87	34	55	10	19	107	365	110	343	41	214	91	213	171	239
Plot size (acres)			0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.344		0.344		0.344		0.344		0.344	
Species Count			1	2	4	6	3	6	2	5	3	5	5	7	2	5	4	6	3	4	3	4	5	9	6	9	6	11	6	12	6	9
Stems per ACRE			29	319	232	1,916	348	1,307	203	407	203	348	290	697	203	929	319	2,526	987	1,597	290	552	311	1,060	319	996	119	621	264	618	581	1016

Type = Tree, Shrub, Livestake
P = Planted
T = Total

Color for Density
Exceeds requirements by 10%
Exceeds requirements, but by less than 10%
Fails to meet requirements, by less than 10%
Fails to meet requirements by more than 10%