YEAR 3 ANNUAL MONITORING REPORT
FINAL
Year 4 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:
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1652 Mail Service Center
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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 occurred 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 3 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 completed in October 2018 and June 2019. Species treated included Tree of Heaven, Lespedeza and dog fennel. Additional treatment of will be done as needed. Year 3 annual monitoring (MY3) was conducted in September 2019. As stated in Section 3.0, year 3 monitoring activities included stem counts using ten (10) rotating, random 1,500 square foot vegetation plots, 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. Two (2) 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 the areas with low stem density are most likely due to competition from a dense herbaceous layer and low soil fertility. DMS is contacting the planting contractor to conduct a warranty replant to address the low stem density issue. See Figure 3 in Appendix B for areas of concern. The fence installed along the easement boundary is functioning as intended and all installed signage is still in place.

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		
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
Replanting & Invasive	**Carolina Wetland Services, Inc.**
Contractor	550 E Westinghouse Blvd, Charlotte, NC 28278
Gregory Antemann	(704) 408-1683
Monitoring Performers	**NC Division of Mitigation Services**
	217 W Jones Street, Raleigh, NC 27603
Jeff Schaffer, 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

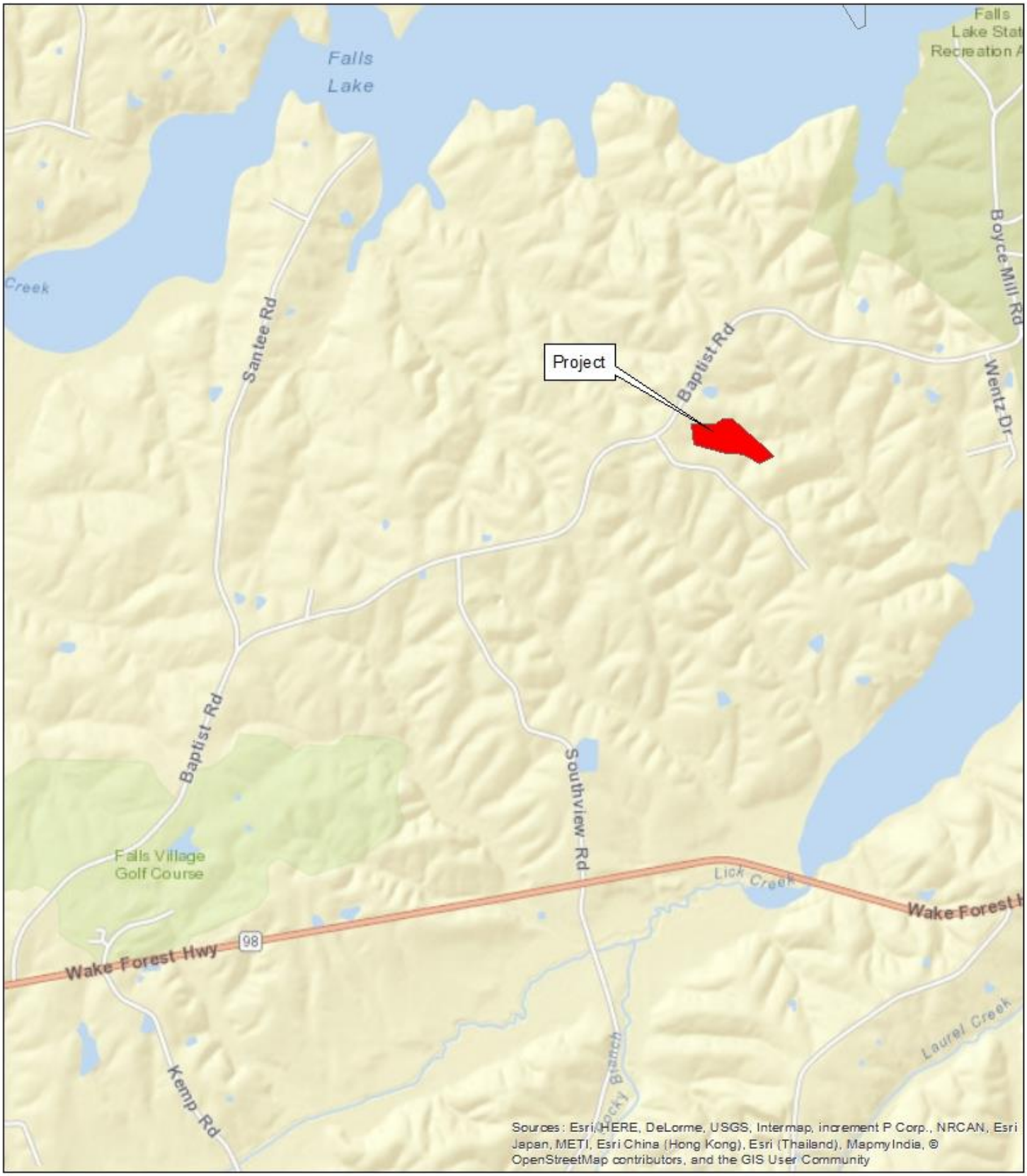
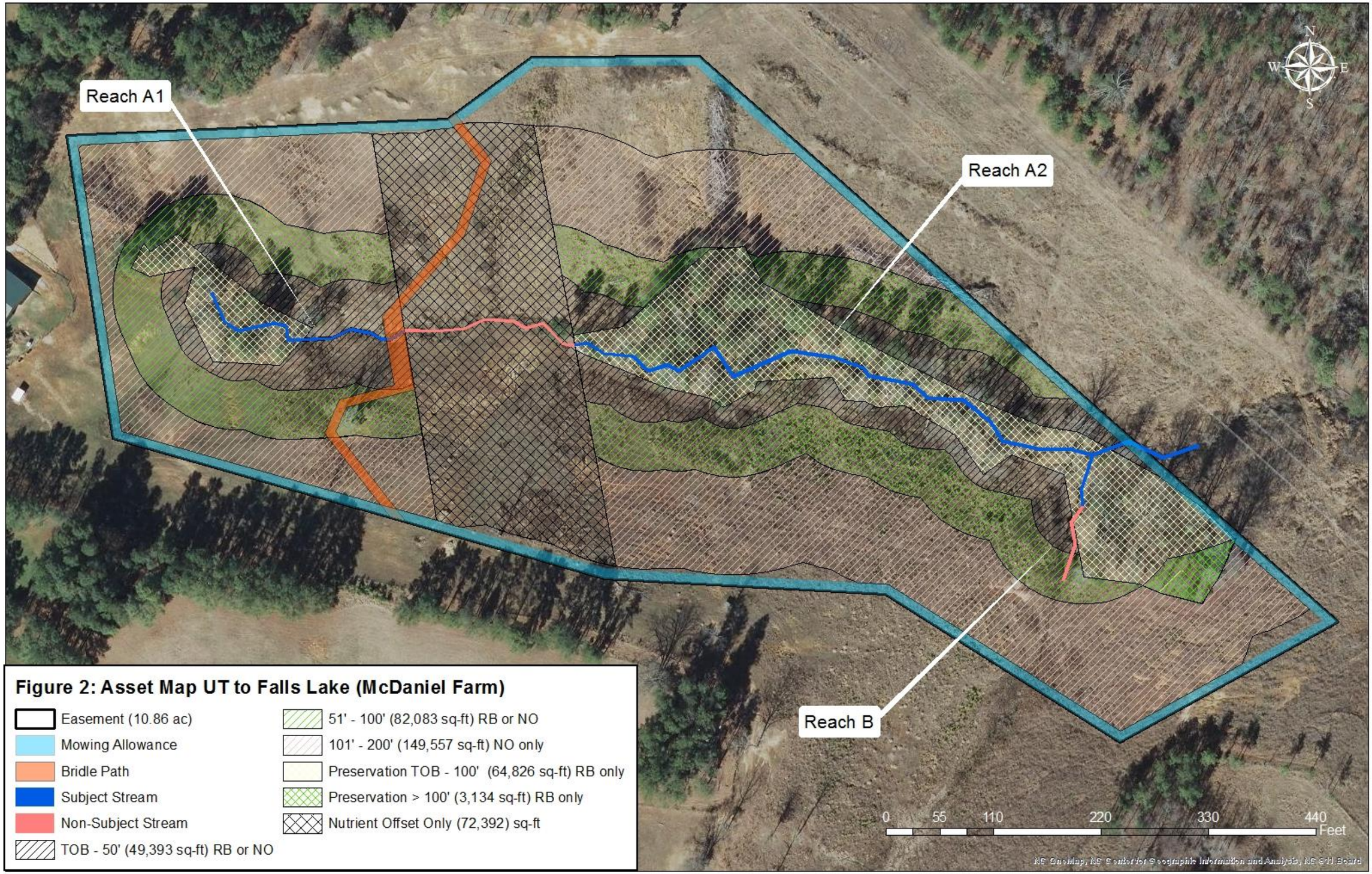
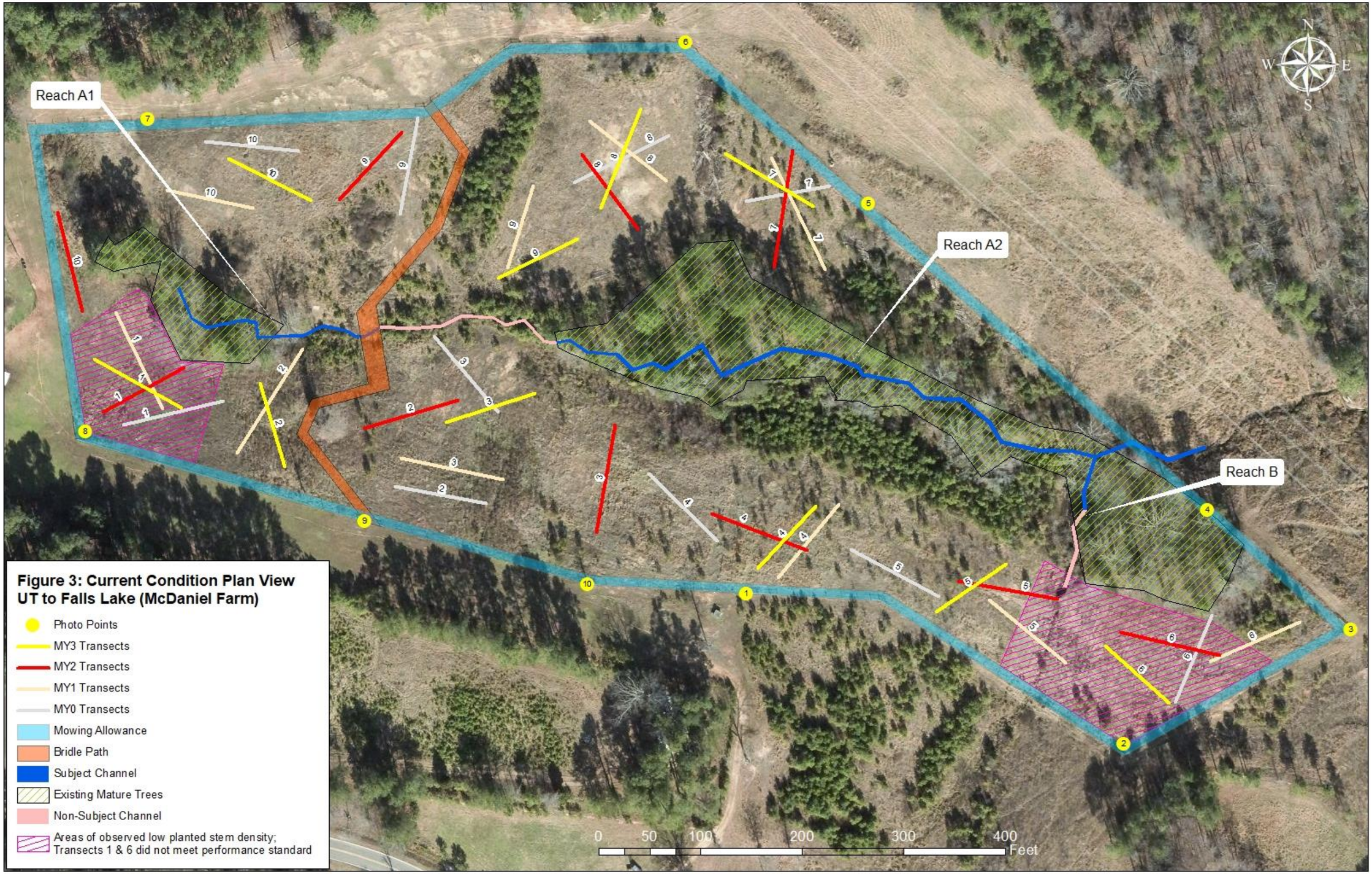


FIGURE 1
Project Location Map
UT TO FALLS LAKE (McDANIEL FARM)
Durham County, NC

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
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
MY3 Transects
MY2 Transects
MY1 Transects
MY0 Transects
Mowing Allowance
Bridle Path
Subject Channel
Existing Mature Trees
Non-Subject Channel
Areas of observed low planted stem density;
Transects 1 & 6 did not meet performance standard

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

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	Pattern and Color	2	0.93	8.6%
			Total	2	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	2	0.93	8.6%

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

Scientific Name	Common Name	Number	% of
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 - MY3
UT to Falls Lake (McDaniel Farm) DMS Project #95389

			Current Year (MY3)																				Annual Means							
			VT1		VT2		VT3		VT4		VT5		VT6		VT7		VT8		VT9		VT10		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																							1	1	3	3	3	3
Fraxinus pennsylvanica	**Green Ash**	Tree			3	3	1	1	2	2	3	3	1	1			1	1	1	1	1	1	2	2	2	2	1	1	3	3
Platanus occidentalis	**Sycamore**	Tree	1	1			9	9	1	1	2	2	1	1					1	1	3	3	3	3	2	3	3	3	3	3
Betula nigra	**River birch**	Tree			3	3	2	2	2	2	1	1	1	1	2	2			2	2			2	2	1	1	3	3	4	4
Ulmus americana	**American Elm**	Tree			2	2			3	3	1	1					1	1			2	2	2	2	3	3	2	2	4	4
Hamamelis virginiana	**Witch hazel**	Tree			1	1			2	2	12	12			8	8	13	13	5	5	2	2	6	6	3	3	2	2	3	3
Liriodendron tulipefera	Tulip poplar	Tree																												
Diosypros virginiana	Persimmon	Tree			3	7					6	6			4	4					1	1	4	5						
Nyssa sylvatica	Black gum	Tree																												
Cercis Canadensis	Red bud	Tree																												
Pinus taeda	Loblolly pine	Tree		1				4		14		7		5		32		27		67		8		18		10		9		5
Liquidambar styraciflua	Sweet gum	Tree				2				2		7		15		11		11		7		7		8		9		8		10
Salix nigra	Black Willow	Tree																										2		
	Oak	Tree				1																1		1		1		1		
	Sumac	Shrub																								2		1		
	Unknown	Tree																								2		8		1
		Stem count	1	2	12	19	12	16	10	26	25	39	3	23	14	57	15	53	9	83	9	25	17	46	12	37	14	43	20	35
		Plot size (acres)	0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034		0.034	
		Species Count	1	2	5	7	3	4	5	7	6	8	3	5	3	5	3	5	4	6	5	8	6	9	6	11	6	12	6	9
		Stems per ACRE	29	58	348	552	348	465	290	755	726	1,132	87	668	407	1,655	436	1,539	261	2,410	261	726	515	1,341	353	1,088	412	1,265	581	1,016

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%