
MY3 FINAL MONITORING REPORT
Odell's House Buffer Mitigation Project
Monitoring Year 3
Calendar Year of Data Collection: 2023

NCDEQ DMS Project Identification #100041
NCDEQ DMS Contract # 7420
Neuse River Basin (CU 03020201)
DWR Project # 2018-0200
USACE Action ID Number: SAW-2018-00431
Johnston County, NC
Data Collection Period: March and September 2023
Submission Date: December 2023



Prepared for:

NC Department of Environmental Quality
Division of Water Resources
512 N. Salisbury Street,
Raleigh, North Carolina 27620





December 29, 2023

NC Department of Environmental Quality

Division of Mitigation Services

Attn: Emily Dunnigan, Project Manager

217 W. Jones Street, Suite 3000

Raleigh, NC 27609

RE: WLS Responses to NCDEQ DMS Review Comments for Task 9 Submittal, Draft Monitoring Year 3 Report for the Odell's House Mitigation Project, DMS Full-Delivery Project ID #100041, Contract #7420, Neuse River Basin, Cataloging Unit 03020201, Johnston County, NC

Dear Ms. Dunnigan:

Water & Land Solutions, LLC (WLS) is pleased to present the Final Monitoring Year 3 Report for the Odell's House Mitigation Project to the North Carolina Department of Environmental Quality (NCDEQ) Division of Mitigation Services (DMS). Per the DMS review comments, WLS has updated the Final Monitoring Year 3 Report and associated deliverables accordingly. We are providing the electronic deliverables via cloud link. The electronic deliverables are organized under the following folder structure as required under the digital submission requirements:

1. Report PDF
2. Support Files
 - 1_ Tables
 - 2_CCPV
 - 3_Veg
 - 4_Geomorph
 - 5_Hydro
 - 6_Photos

We are providing our written responses to DMS' review comments on the Monitoring Year 3 Report below. Each of the DMS review comments is copied below in **bold** text, followed by the appropriate response from WLS in regular text:

General:

1. **Figure 1b: Add date to replanted area in legend (1/2022).** WLS Response: The date has been added to the replanted area in the Figure 1b legend.
2. **Figure 1b: Is the low stem density area the same as it was in MY2? Indicate if this is true by adding MY3 in legend.** WLS Response: The low stem density area is the same as it was in MY2 and the legend on Figure 1b and c have been updated accordingly.
3. **Appendix A, Vegetation Condition Assessment Table: Update low stem acreage to 0.33 acres.** WLS Response: The low stem acreage has been updated to the correct acreage in the Appendix A, Vegetation Condition Assessment Table.

- 4. Appendix A, Cross-Section Photos: XS-8 MY0 right bank photo glitched; please update.** WLS Response: The photo has been updated in the PDF report.
- 5. Appendix C, Headwater Photos: It's great that R5 appears to have 8/9 channel forming indicators, but only photos were provided for 1 of the indicators. Please update with additional photos and/or provide photographs for each indicator in future reports.** WLS Response: WLS will take photos of additional channel forming indicators and provide them in the MY4 report.
- 6. Appendix C, R1 Drone Photo: Please make the labels on the aerial more legible.** WLS Response: The labels on the R1 aerial photo have been updated to be easier to read.
- 7. Appendix D: DMS encourages WLS to include gauge data for the entirety of the growing season in the final submission.** WLS Response: WLS has included all gauge data that has been collected in the final report (ending 9/26/23). For future monitoring reports, efforts will be made to include data as close to the end of the growing season as feasibly possible with monitoring schedules.
- 8. Appendix D, Rainfall Data Table: Based on the data for October 2023 rainfall was not normal; please update the table/graph. Please update with rainfall through November if possible.** WLS Response: WLS updated all months' rainfall overall designation and added the rainfall total for November 2023 in the table and graph.

Riparian Buffer:

- 1. Pg. 7, Section 3.2, last paragraph: Provide a breakdown of credits/sqft at risk by buffer credit type (0-100 vs 101-200).** WLS Response: A breakdown of credits/sq. ft. at risk by buffer credit type has been added to the At-Risk Credit Table in the report narrative.
- 2. See AMP comment #1 above. Please remove the AMP and add these details to the report narrative.** WLS Response: WLS has removed the AMP and added all details into the report narrative as requested.
- 3. DWR has requested raw vegetation data (individual tree heights and species by plot) so they can get a better idea of tree conditions. The veg plot input tables used in the Shiny App easily fulfill this need. This should be included in an Appendix.** WLS Response: The Shiny App vegetation plot input tables have been added to the report in Appendix B.

Adaptive Management Plan:

- 1. An adaptive management plan is not necessary for this project as no remedial action is being proposed to fix the subsurface flow of R1. Please remove the AMP and add details of the subsurface flow, at-risk credits, and summary to the report narrative. Update the CCPV with the features called out in the AMP Figure 1 (and/or rename the AMP figure and include with the other CCPVs). Please do not include credit values at risk in the final report.** WLS Response: WLS has removed the AMP and added all details into the report narrative as requested. The credit values at risk column in the At-Risk Credit Table has been removed in the final report.
- 2. Pg. 3, Section 3: Is WLS intending to continue vegetation monitoring in the at-risk areas? Please explain in narrative.** WLS Response: WLS will continue vegetation monitoring in the at-risk area as well as stream flow and wetland hydrology.

Electronic Comments:

- 1. The report indicates the low stem density identified on reach 5 as MY 2 in the CCPV, this same shapefile has been submitted in MY 3 as low stem density and this is not depicted on the CCPV. Please verify the current state of low stem density and ensure the correct file has been submitted.** WLS Response: The low stem density labels have been updated to MY3 on the CCPV to reflect that the current low stem density shapefile is correct.

Boundary Inspection:

1. At corner #27 ensure the aluminum cap is affixed to the rebar and is stamped with corner number. WLS Response: WLS will ensure the aluminum cap is affixed to the rebar and is stamped with the corner number at the beginning of MY4.

2. Add signs where needed at witness posts. Ref KML for example locations. WLS Response: WLS will add signs at all witness posts indicated in the reference KML at the beginning of MY4.

3. Add signs online to ensure at least one sign every 200 feet. Ref. KML for example locations. WLS Response: WLS will add additional signs at locations indicated in the reference KML at the beginning of MY4.

4. Straighten or replace bent t-posts where encountered. Ref. KML for example locations. WLS Response: WLS will straighten or replace all bent t-posts identified in the reference KML at the beginning of MY4.

5. Remove tree from fence and repair. WLS Response: WLS will remove the tree from the fence and repair.

6. In multiple locations the fence extends well outside of the conservation easement. This is acceptable if the landowner agrees with this practice. Confirm the location of these signs with the landowner and if acceptable document the conversation. If not, please remove. WLS Response: The fence location was coordinated with and approved by all landowners during project construction.

7. Where the fence was broken and recent sign of livestock in the easement area was noted, fix the broken fence. Communicate this observation to the landowner and encourage them to speak with their neighbor to try and avoid future impacts to the easement area. WLS Response: WLS monitoring staff repaired the broken section of fence on 11/28/23. Photos of the repair have been included in the final report (see Appendix A). WLS has communicated to all landowners that if they notice any fence issues, they should call WLS to have field staff repair the issue as soon as possible.

8. Wooden post fasteners should be upgraded to an ACQ appropriate fastener with an appropriate length of 2.5-3" to ensure fastening strength over time. WLS Response: WLS will replace any easement signs and fasteners that are damaged/failing as needed.

Please contact me if you have any questions or comments.

Sincerely,

Alyssa Davis

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1 Project Summary

1.1 Project Location and Description

The Odell's House Mitigation Site ("Site") is a riparian buffer mitigation project in conjunction with a North Carolina Department of Environmental Quality (NCDEQ), Division of Mitigation Services (DMS) stream and wetland mitigation project. The Site was planned according to the Consolidated Buffer Mitigation Rule 15A NCAC 02B .0295, which became effective on November 1st, 2015.

The Site (35.716526 N, -78.349830 W) is located in Johnston County, North Carolina between the Town of Wendell and Archer Lodge. The Site boundary is within the 8-digit Hydrologic Unit Code (HUC) 03020201, in the NCDEQ sub-basin 03-04-06 (Warm Water Thermal Regime).

This Site provides riparian buffer mitigation credits for unavoidable impacts due to development in the Neuse River Basin, United States Geologic Survey (USGS) 8-digit HUC 03020201. Nutrient offset credits may be used for stormwater requirements for new and existing development requiring nutrient offsets. The project involves the restoration and preservation of riparian vegetation to reduce non-point source discharge of contaminants into streams and agricultural ditch channels within the Neuse River basin. The project area is comprised of two separate easement locations totaling 15.092 acres, including stream and wetland mitigation areas.

Based on the sealed survey the as-built acres are as follows: the easement area is 15.092 acres, with 10.390 acres being restored for Neuse buffer credit. In general, Neuse buffer widths extend a minimum width of 50 feet from tops of stream and ditch banks, while nutrient offset restoration area widths will extend out to a maximum of 200 feet from the top of the channel or ditch bank. The buffer restoration credit adjacent to coastal headwater stream mitigation is classified as alternative mitigation under Rule 15A NCAC 02B .0295 (o)(2). The buffer preservation credit is classified as alternative mitigation under Rule .0295 (o).

Monitoring Year 3 (MY3) activities occurred during March and September 2023. This report presents the data for MY3. The Project meets the MY3 success criteria for vegetation and headwater channel formation on R5. Headwater channel formation on R1 is being impacted by subsurface flows through the old pond bed. With the exception of a portion of R1, the Project is on trajectory to meet interim and final success criteria.

1.2 Project Success Criteria

The success criteria for the Site will follow the approved performance standards and monitoring protocols presented in the approved Mitigation Plan, developed in compliance with the DWR Rule 15A NCAC 02B 0295. Annual vegetation monitoring will occur each year for a minimum of five years and will be conducted during the fall season with the first year occurring at least five months from initial planting. Permanent vegetation monitoring plots will be installed and evaluated within the buffer restoration and nutrient offset areas to measure the survival of the planted trees. Riparian buffer vegetation monitoring will be based on the *Carolina Vegetation Survey-Ecosystem Enhancement Program Protocol for Recording Vegetation: Level 1-2 Plot Sampling Only Version 4.2*.

The measures of vegetative success for the Site will be the survival of at least four native hardwood tree species, where no one species is greater than 50 percent of the established stems, established at a density



of at least 260 planted trees per acre at the end of Year 5. Appropriate native volunteer stems of native hardwood tree species may be included to meet the performance standards with DWR approval.

1.2.1 Vegetation

Seven 100 square-meter vegetation monitoring plots were installed for DWR monitoring, covering at least two percent of the 15.092 acres of the riparian restoration area. Plots were randomly placed throughout the planted riparian areas. The location of the plots is shown on Figure 2a. Photos will be taken from all photo points annually. All planted stems will be marked with flagging tape and a wood stake. In the field, the four corners of each plot were permanently marked with PVC at the origin and rebar at the other corners. Photos of each plot will be taken from the origin each monitoring year. All seven of these plots are joint monitoring plots for 404/401, and there are an additional five 404/USACE plots for a total of 12 vegetation plots. Vegetation monitoring will occur in the fall each required monitoring year, prior to the leaf fall. Plots will be monitored for a minimum of five years. The following data are recorded for all planted trees in the plots: species, common name, height, planting date, and grid location. The total number of volunteer woody stems will also be documented and reported by species. Vegetation plot monitoring follows the CVS-EEP Level 2 Protocol for Recording Vegetation, version 4.2 (Lee et al. 2008) and includes analysis of species composition, density, and height. Data is processed using the NCDMS Shiny App data entry tool.

1.2.2 Performance Standards for Vegetation Adjacent to Single-Thread Streams

The measures of vegetative success for the Project will be the survival of at least four native hardwood tree species, where no one species is greater than 50 percent of the established stems, established at a density of at least 260 planted trees per acre at the end of Year 5. Appropriate volunteer stems of native hardwood tree species may be included to meet the performance standards upon DWR approval.

1.2.3 Performance Standards for Vegetation Adjacent to Coastal Headwater Streams

The measures of vegetative success for the Project will be the survival of at least four native hardwood tree species, where no one species is greater than 50 percent of the established stems, established at a density of at least 260 planted trees per acre at the end of Year 5 and 210 hardwood trees per acre at the end of Year 7 for riparian restoration areas adjacent to coastal headwater stream restoration. The seven years of monitoring only applies to the areas receiving credit under Rule 15A NCAC 02B .0295 (o)(2) for buffer mitigation. Appropriate volunteer stems of native hardwood tree species may be included to meet the performance standards upon DWR approval.

1.2.4 Performance Standard for Coastal Headwater Streams

The performance standards for the coastal headwater streams must be met each monitoring year for a minimum of seven years to comply with 15A NCAC 02B .0295 (o)(2) for buffer mitigation (permanent vegetation plots 1 and 6). Confirmation from the USACE that stream performance standards have been met will be provided to DWR prior to issuance of credit releases for riparian buffer credit along the coastal headwater streams. The success criteria for the coastal headwater streams include channel formation within the valley or crenulation that must be documented through identification of field indicators consistent with those listed in the mitigation plan, and continuous surface water flow within the valley or crenulation must be documented to occur every year for at least 30 consecutive days during the prescribed monitoring period.



1.2.5 Visual Assessment

Visual assessments are performed within the site semi-annually during the five-year monitoring period. Problem areas will be noted (e.g. low stem density, vegetation mortality, invasive species or encroachment). Areas of concern will be photographed, mapped, and accompanied by a written description in the annual report. Problem areas will be re-evaluated during each subsequent visual assessment. Should remedial actions be required, recommendations will be provided in the annual monitoring report.

2 Project Mitigation Components

2.1 Project Components

The Odell's House Site includes a combination of stream restoration, enhancement, and preservation activities on 4,313 linear feet of designed streams and 3.890 acres of designed wetland re-establishment, rehabilitation, enhancement, and preservation. Out of 15.09 acres that will be protected with a permanent conservation easement, 10.400 acres (453,057.200 ft²) are proposed to generate riparian buffer credits along coastal headwater restoration, enhancement, and preservation streams.

The total potential riparian buffer credits that the Site generates are summarized in Table 1 below.



Table 1. Odell's House Mitigation Site, DWR #2018-0200v1, Project Credits

Neuse 03020201 - Outside Falls Lake				Project Area													
19.16394				N Credit Conversion Ratio (ft ² /pound)													
N/A				P Credit Conversion Ratio (ft ² /pound)													
Credit Type	Location	Subject? (enter NO if ephemeral or ditch)	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (ft ²)	Total (Creditable) Area of Buffer Mitigation (ft ²)	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	Coastal Headwater	Restoration	0-100	R1	36,185	36,185	1	100%	1.00000	N/A	36,185.000	No	—	—	
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	0-100	R2 (right bank)	36,352	36,352	2	100%	2.00000	N/A	18,176.000	No	—	—	
Buffer	Rural	Yes	I / P	Enhancement	0-100	R2 (left bank)	54,325	54,325	2	100%	2.00000	N/A	27,162.500	No	—	—	
Buffer	Rural	Yes	I / P	Restoration	0-100	R3	126,221	126,221	1	100%	1.00000	N/A	126,221.000	Yes	6,586.386	—	
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	0-100	R4 (right bank)	10,360	10,360	2	100%	2.00000	N/A	5,180.000	No	—	—	
Buffer	Rural	Yes	Coastal Headwater	Restoration	0-100	R5	28,116	28,116	1	100%	1.00000	N/A	28,116.000	No	—	—	
Buffer	Rural	Yes	Coastal Headwater	Restoration	101-200	R5	8,493	8,493	1	33%	3.03030	N/A	2,802.693	No	—	—	
Buffer	Rural	Yes	I / P	Restoration	0-100	R6	31,084	31,084	1	100%	1.00000	N/A	31,084.000	Yes	1,622.014	—	
Buffer	Rural	Yes	I / P	Restoration	101-200	R3	6,320	6,320	1	33%	3.03030	N/A	2,085.602	Yes	329.779	—	
Buffer	Rural	Yes	Coastal Headwater	Restoration	101-200	R1	10,456	10,456	1	33%	3.03030	N/A	3,450.483	No	—	—	
Buffer	Rural	Yes	I / P	Restoration	101-200	R7 upper	1,922	1,922	1	33%	3.03030	N/A	634.261	Yes	100.283	—	
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						Totals:	349,835	349,835									

Enter Preservation Credits Below

Eligible for Preservation (ft ²):										116,612			
Credit Type	Location	Subject?	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Total (Creditable) Area for Buffer Mitigation (ft ²)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits	
Buffer	Rural	Yes	I / P	Preservation	0-100	R3 (left bank)	60,900	60,900	10	100%	10.00000	6,090.000	
	Rural	Yes	I / P		0-100	R7 lower	42,323	42,323	10	100%	10.00000	4,232.300	
													—
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Preservation Area Subtotal (ft²):							103,222						
Preservation as % Total Area of Buffer Mitigation:								22.1%					
Ephemeral Reaches as % Total Area of Buffer Mitigation:								0.0%					

TOTAL AREA OF BUFFER MITIGATION (TABM)		
Mitigation Totals	Square Feet	Credits
Restoration:	248,798	230,579.039
Enhancement:	101,037	50,518.500
Preservation:	103,222	10,322.300
Total Riparian Buffer:	453,057	291,419.839
TOTAL NUTRIENT OFFSET MITIGATION		
Mitigation Totals	Square Feet	Credits
Nutrient Offset:	Nitrogen:	0.000
	Phosphorus:	0.000
		0

1. The Randleman Lake buffer rules allow some ditches to be classified as subject according to 15A NCAC 02B .0250 (5)(a). last updated 11/22/2019



2.2 Design Approach

Riparian buffer mitigation adjacent to streams and ditches was approved by DWR via letter on October 30, 2020. Odell's House is also a stream and wetland mitigation site for the Division of Mitigation Services (DMS), and restoration of riparian areas will be accomplished through the goals and methods outlined by the Odell's House Mitigation Plan (SAW #2018-00431). All riparian buffer mitigation along channels begins from the top of bank and extends a minimum of 50 feet and a maximum of 200 feet perpendicular to the channel pursuant to 15A NCAC 02B .0295 and 15A NCAC 02B .0240. Land use proposed for buffer restoration was composed of pasture, fields, and woodlands. Wetland mitigation areas are excluded from riparian buffer credit areas.

A riparian headwater valley restoration approach was constructed for R1 and R5. Headwater stream restoration activities included draining the existing farm ponds & excavating a broader floodplain at or slightly above the existing bed elevation that will seek to restore groundwater hydrology and connection of surface flows. Shallow flow paths were connected to allow initial flow of water toward reach R1 and R5, which will gradually transition into a single thread channel that is more well defined. Figure 2a depicts the buffer restoration plan based on actual top of bank conditions. The riparian buffer credits located adjacent to coastal headwater valley restoration are based on the as-built survey centerline of the valley. The area of the buffer credits shall be measured perpendicular to the length of the valley being restored.

The riparian revegetation plan included permanent seeding, bare root trees, live stakes, and controlling invasive species growth. The riparian restoration efforts along the project streams are adjacent to reconstructed stream banks and extend perpendicular from tops of banks 50 feet to 200 feet.

3 Monitoring Year 3 Assessment and Results

3.1 Vegetation

Monitoring of the seven permanent vegetation plots was completed during September 2023. Vegetation data can be found in Appendix B with the associated photos located in Appendix C. The MY3 site-wide average planted density is 457 stems per acre, which exceeds the interim measure of vegetative success of at least 260 planted stems per acre at the end of the fifth monitoring year. All vegetation plots successfully meet criteria with stem counts between 324 and 607 stems per acre. No volunteer species were observed during year 3 of monitoring. Table 2 below details the average stem density per plot based on the number of years required for monitoring and associated performance criteria.

Table: 2 Stem Density Per Plot Type

Plots	Average Stem Density/Acre	Performance Criteria	Meets Criteria
Headwater (1 and 6)	506	260 stems/acre at Year 5, 210 stems/acre at Year 7, and Stream Success	Yes
Riparian Buffer (2-5 and 7)	437	260 stems/acre at Year 5	Yes



3.2 Visual Assessment

Visual assessment of vegetation outside of the monitoring plots indicates that the herbaceous vegetation is becoming well established throughout the project. One area of encroachment was noted in MY1 along R3 left bank slope (~0.12 acres). An active farm field along the easement led to farm equipment encroachment. Prior to MY2, additional t-posts, string, and flagging was added to the easement. No trees were damaged from the encroachment, only herbaceous vegetation. No further encroachment in this area was noted in MY3.

Two areas of low stem density were observed in MY1. Low stem densities in these areas (~1.07 acres) are due to low planting densities at as-built, mortality due to high hydrology, and dense herbaceous vegetation. Extremely soft and wet soil conditions during construction and planting made areas of W1 and W2 unsafe for the contractor to plant bare roots. During MY2, both wetlands (W01 & W02) were re-planted with wet tolerant species from the approved mitigation plan on January 6th, 2022 (see Table 3 below). Based on this year's data, the low-stem density area was reduced to the left floodplain of R1 within W1 (0.14 acres) and the right floodplain of R5 (0.19 acres) for a total of 0.33 acres. WLS is not proposing any supplemental planting.

Table 3: Supplemental Planting List

Species	Common Name	Total Number Planted	Total Percentage Planted
<i>Platanus occidentalis</i>	Sycamore	300	33.3%
<i>Betula nigra</i>	River Birch	300	33.3%
<i>Quercus michauxii</i>	Swamp Chestnut Oak	150	16.7%
<i>Quercus phellos</i>	Willow Oak	150	16.7%
	Total	900	100.0%

A large population of golden bamboo (*Phyllostachys aurea*) existed along the left floodplain of R2 prior to construction. Construction activities included bamboo removal in this area by ripping the roots/rhizomes, cut stump herbicide treatments, and foliar spray of re-sprouts. Herbicide treatments used 50 percent glyphosate (Rodeo) for cut/stump and 20 percent for foliar spray. Foliar spray treatments of bamboo were continued during MY3, and the treatment dates can be found in the table below. This area will continue to be monitored closely, and any treatments will be documented in future monitoring reports.



Table 4: Herbicide Treatment Table

Monitoring Year	Invasive Targeted	Invasive Treatment	Date Treatment Conducted	Herbicide Used
1	Golden Bamboo	Foliar	7/1/2021	Rodeo (5%)
	Golden Bamboo	Foliar	8/17/2021	Rodeo (20%)
2	Golden Bamboo & Cattail	Foliar	4/20/2022	Rodeo (5% and 20%)
3	Golden Bamboo & Cattail	Foliar	6/8/2023	Rodeo (5%)
	Golden Bamboo	Foliar	8/30/2023	Rodeo (5%)

Monitoring of headwater reaches R1 and R5 was conducted by visual assessment to determine if a preponderance of evidence indicated coastal headwater stream channel formation. Data collected is included in Appendix E and with the report submitted to USACE. R5 coastal headwater reach is meeting the requirements for coastal headwater channel formation and will continue to be evaluated during MY4.

3.3 R1 Subsurface Flow

During MY2 site visits, it was noted that stream flow through the lower portion of R1 from station 12+50 – 14+60 (based off the as-built surveyed stream) was flowing subsurface during drier portions of the year. WLS installed a flow gauge within this area (FG-3) prior to MY2. During MY3, FG-3 did not record any consecutive days of flow greater than 1 day. FG-1, located above the old pond bed, recorded 163 consecutive days of flow. WLS noted flow resurfacing at station 14+60 which is located at a rock riffle at the old pond dam. Flow is visible below this point within the channel from R2 down to the exit of the project area on R4. Poor soil conditions at the time of construction did not allow for sufficient excavation of pond silt and structure placement. This has caused the subsurface flow conditions that are affecting stream flow and wetland hydrology within W1.

WLS is not requesting a release on the credits within the affected area. A summary of the credits affected can be found in Table 5 below.



Table 5. At-Risk Credit Table

Project Reach Designation	Credit Type	Credits At-Risk	*Contracted Credit At-Risk
W1	Wetland Mitigation Credit	0.476	0.1
R1	Stream Mitigation Credit	182.00	N/A
R1 Buffer (0-100)	Buffer Credit	18,016.00	18,016.00
R1 Buffer (101-200)	Buffer Credit	1,253.00	1,253.00

**Contracted Credit At-Risk is the difference between the credits at risk and the approved Mitigation Plan Credits. WLS had additional Stream and Wetland length/area above the contract value with DMS.*

WLS understands these credits are at risk within the old pond bed portion of R1, all of W1, and the associated headwater Buffer credits. Stream function and buffer function above the affected reach of R1 remains functional and creditable. Stream flow is present and documented with FG-1 until station 12+50. R1 stream credit is calculated based off headwater valley length, and the associated at-risk credits are calculated within the valley crediting parameters.

WLS is not proposing any remedial action on R1 in the old pond bed. WLS will continue to monitor the area for stream flow, wetland hydrology, and vegetation.



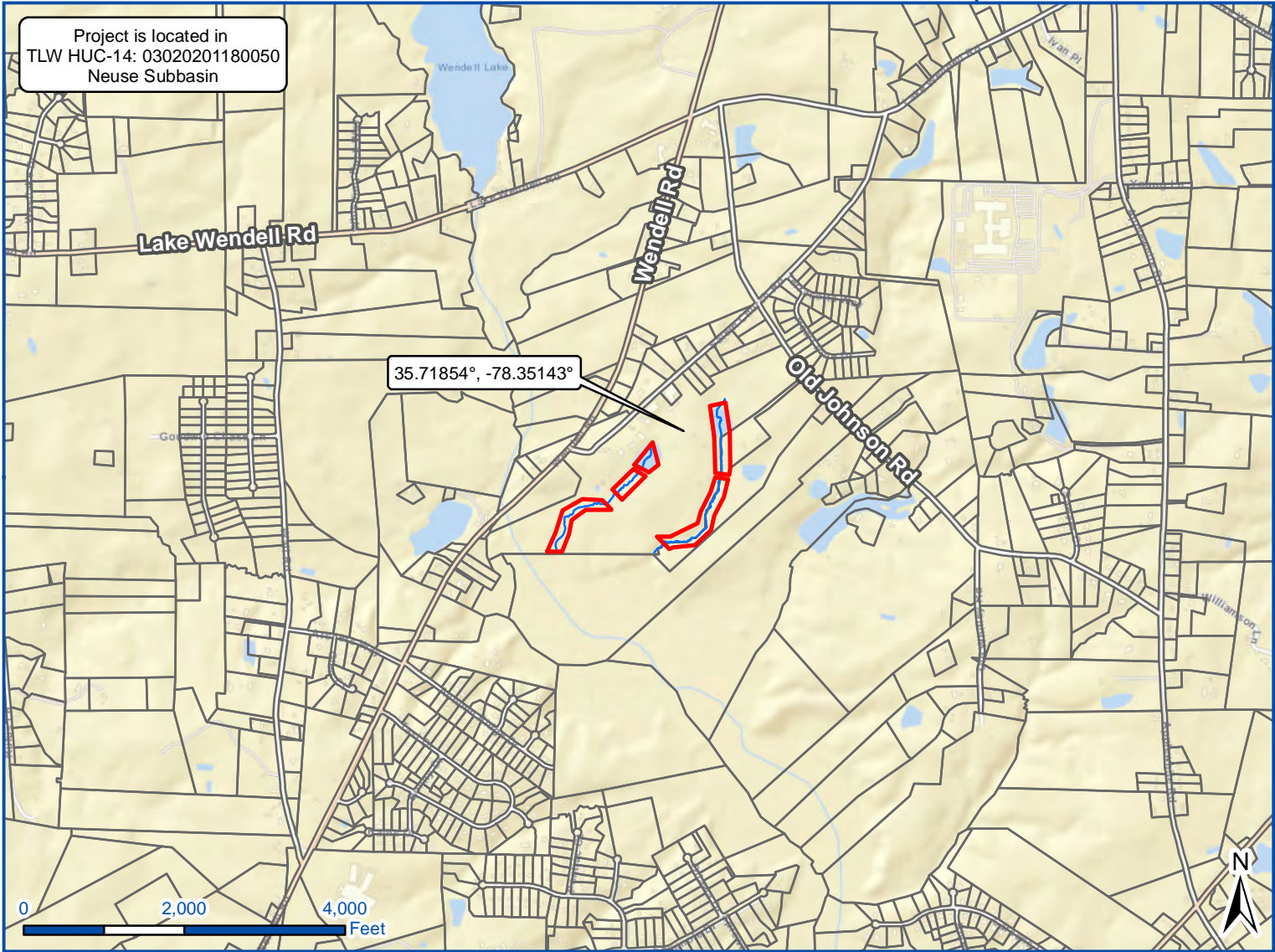
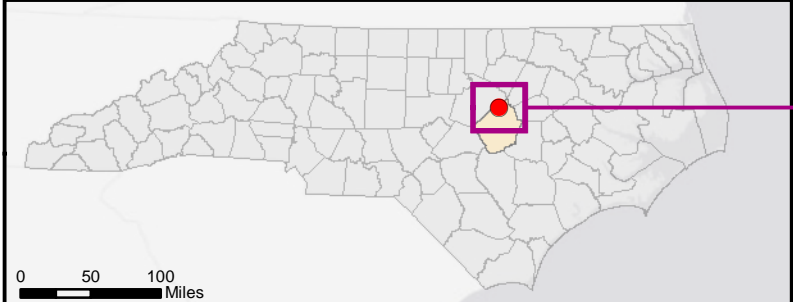
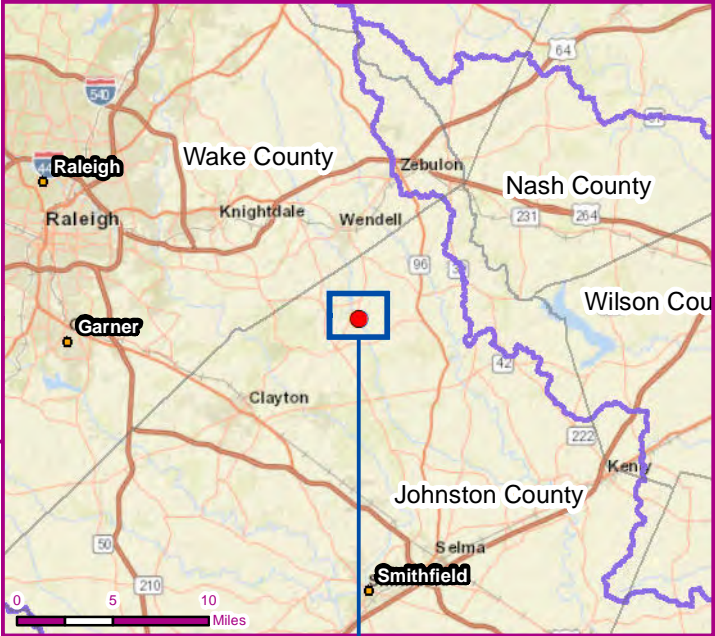
Appendix A:

Background Tables and Figures

Figure 1: Site Location Map
Figure 2a-b: Current Condition Plan View

Legend

- Conservation Easement
- Project Location
- Stream
- HUC-8
- Johnston Co Parcels
- NC Counties
- NC Cities
- Johnston County



Project is located in
TLW HUC-14: 03020201180050
Neuse Subbasin

WATER & LAND™
SOLUTIONS

Odells House Mitigation Project
Neuse 03020201
Johnston County, NC

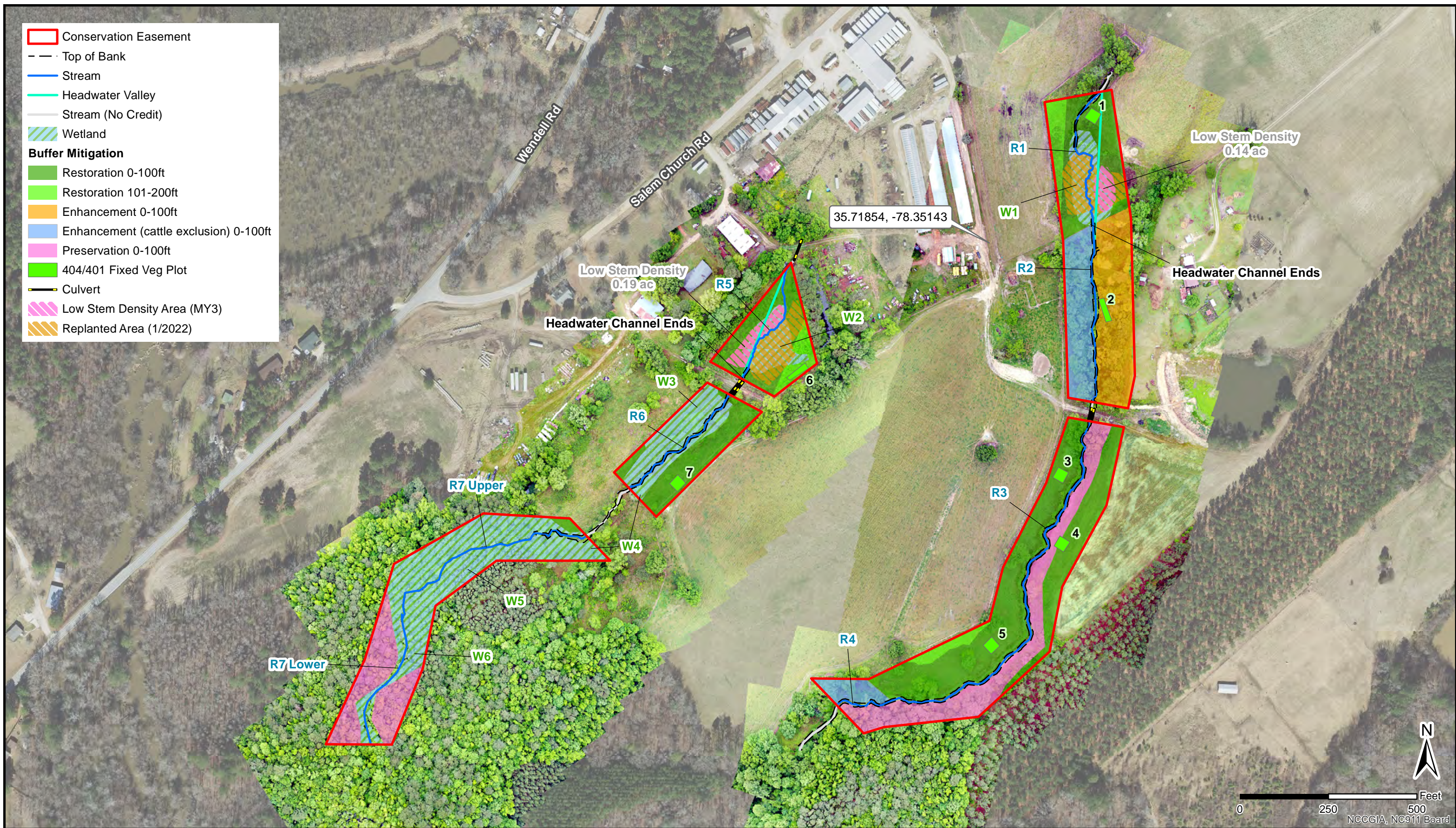
Map Projection: NAD 83 2011 State Plane North Carolina FIPS 3200 FT US

Project Location
Map

Date: 6/15/2021

Figure
1

Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community



- Conservation Easement
- Top of Bank
- Stream
- Headwater Valley
- Stream (No Credit)
- Wetland
- Buffer Mitigation**
- Restoration 0-100ft
- Restoration 101-200ft
- Enhancement 0-100ft
- Enhancement (cattle exclusion) 0-100ft
- Preservation 0-100ft
- 404/401 Fixed Veg Plot
- Culvert
- Low Stem Density Area (MY3)
- Replanted Area (1/2022)



**Odells House Nutrient Offset
and Riparian Buffer Project
Johnston County, North Carolina**

DWR Project Number: DWR-2018-0200

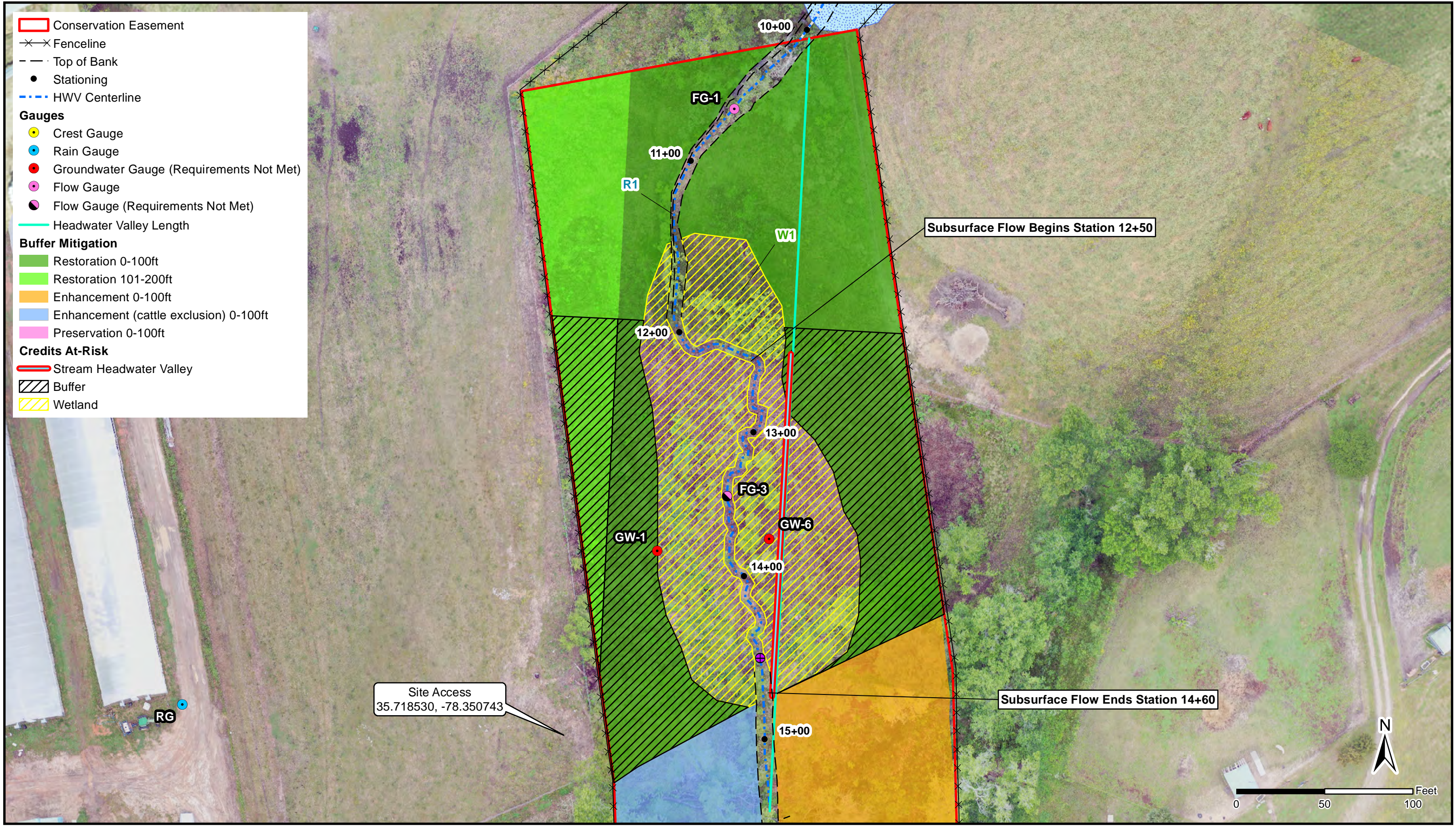
October 2023
MY3

Current Conditions Plan View
Monitoring Year 3

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
2a

- Conservation Easement
- ××× Fenceline
- - - Top of Bank
- Stationing
- · - · HWV Centerline
- Gauges**
- Crest Gauge
- Rain Gauge
- Groundwater Gauge (Requirements Not Met)
- Flow Gauge
- Flow Gauge (Requirements Not Met)
- Headwater Valley Length
- Buffer Mitigation**
- Restoration 0-100ft
- Restoration 101-200ft
- Enhancement 0-100ft
- Enhancement (cattle exclusion) 0-100ft
- Preservation 0-100ft
- Credits At-Risk**
- Stream Headwater Valley
- Buffer
- Wetland



Site Access
35.718530, -78.350743

Subsurface Flow Ends Station 14+60

Subsurface Flow Begins Station 12+50



**Odells House Mitigation Project
Johnston County, North Carolina**

USACE Action ID Number:
SAW-2018-00431
October 2023
MY3

USACE
Current Conditions Plan View
Monitoring Year 3

NAD 1983 2011 State Plane
North Carolina FIPS 3200 FT US

FIGURE
2b

Appendix B:

Vegetation Assessment Data

Table 1: Red-line Plant List

Table 2: Vegetation Performance Standards Summary Table

Table 3: Vegetation Plot Counts and Densities Table

Vegetation Plot Raw Data Tables

**Table 1: Odell's House Mitigation
Project Red-line Planting List**

Species	Common Name	Stems	% Planted	Mitigation Plan %
<i>Fraxinus pennsylvanica</i>	Green Ash	228	3.00%	3%
<i>Betula nigra</i>	River birch	608	8.00%	12%
<i>Quercus michauxii</i>	Swamp chestnut oak	608	8.00%	10%
<i>Quercus pagoda</i>	Cherrybark oak	532	7.00%	10%
<i>Platanus occidentalis</i>	American sycamore	684	9.00%	12%
<i>Quercus nigra</i>	Water Oak	532	7.00%	10%
<i>Liriodendron tulipifera</i>	Tulip Poplar	684	9.00%	12%
<i>Quercus phellos</i>	Willow Oak	532	7.00%	10%
<i>Diospyros virginiana</i>	Persimmon	456	6.00%	4%
<i>Carpinus caroliniana</i>	Ironwood	456	6.00%	3%
<i>Hamamelis virginiana</i>	Witch Hazel	456	6.00%	3%
<i>Asimina triloba</i>	Pawpaw	456	6.00%	4%
<i>Lindera benzoin</i>	Spicebush	456	6.00%	4%
<i>Alnus serulatta</i>	Tag Alder	456	6.00%	0%
<i>Corylus americana</i>	Hazelnut	456	6.00%	3%
Total		7,600	100%	

* changes from mitigation plan in red

*Tag Alder was not planted within potential Nutrient Buffer Areas

Table 2: Vegetation Performance Standards Summary Table												
	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	405	5	7	0	405	4	8	0	405	3	7	0
Monitoring Year 2	445	3	8	0	526	3	9	0	486	2	7	0
Monitoring Year 1	567	2	11	0	607	2	10	0	567	2	7	0
Monitoring Year 0	688	2	12	0	648	2	10	0	607	2	7	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	486	3	7	0	324	3	5	0	607	5	6	0
Monitoring Year 2	445	2	6	0	405	2	6	0	769	3	7	0
Monitoring Year 1	607	2	8	0	486	2	7	0	1174	2	8	0
Monitoring Year 0	769	2	9	0	607	2	8	0	1214	2	9	0
	Veg Plot 7 F											
	Stems/Ac.	Av. Ht. (ft)	# Species	% Invasives								
Monitoring Year 7												
Monitoring Year 5												
Monitoring Year 3	567	4	7	0								
Monitoring Year 2	486	3	7	0								
Monitoring Year 1	526	2	7	0								
Monitoring Year 0	850	2	10	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.

Planted Acreage	11.17
Date of Initial Plant	2021-03-03
Date(s) of Supplemental Plant(s)	2022-01-05
Date(s) Mowing	NA
Date of Current Survey	2023-09-26
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		Veg Plot 6 F		Veg Plot 7 F	
					Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total
Species Included in Approved Mitigation Plan	<i>Asimina triloba</i>	pawpaw	Tree	FAC			1	1			2	2	1	1				
	<i>Betula nigra</i>	river birch	Tree	FACW	1	1	1	1	1	1					3	3	1	1
	<i>Carpinus caroliniana</i>	American hornbeam	Tree	FAC							1	1						
	<i>Corylus americana</i>	American hazelnut	Shrub	FACU			1	1									1	1
	<i>Diospyros virginiana</i>	common persimmon	Tree	FAC	2	2			2	2	2	2					3	3
	<i>Fraxinus pennsylvanica</i>	green ash	Tree	FACW	2	2									4	4		
	<i>Hamamelis virginiana</i>	American witchhazel	Tree	FACU	1	1	1	1	1	1	1	1						
	<i>Lindera benzoin</i>	northern spicebush	Tree	FACW	1	1												
	<i>Liriodendron tulipifera</i>	tuliptree	Tree	FACU					1	1	1	1	2	3				
	<i>Platanus occidentalis</i>	American sycamore	Tree	FACW	2	2	2	2	2	2			2	2	3	3	3	3
	<i>Quercus michauxii</i>	swamp chestnut oak	Tree	FACW			2	2							3	3	1	1
	<i>Quercus nigra</i>	water oak	Tree	FAC					1	1			1	1				
<i>Quercus pagoda</i>	cherrybark oak	Tree	FACW	1	1	1	1			2	2	1	1			2	2	
<i>Quercus phellos</i>	willow oak	Tree	FACW			1	1	2	2	3	3			1	1	1	3	
Sum	Performance Standard				10	10	10	10	10	10	12	12	7	8	15	15	12	14
Post Mitigation Plan Species	<i>Salix nigra</i>	black willow	Tree	OBL												5		
Sum	Proposed Standard				10	10	10	10	10	10	12	12	7	8	15	15	12	14
Mitigation Plan Performance Standard	Current Year Stem Count				10	10	10	10	10	12	12	8	8	15	15	14	14	
	Stems/Acre				405	405	405	405	405	486	486	324	324	607	607	567		
	Species Count				7	8	7	8	7	7	7	5	5	6	6	7		
	Dominant Species Composition (%)				20	20	20	20	20	25	25	38	38	25	25	21		
	Average Plot Height (ft.)				5	4	4	4	3	3	3	3	3	5	5	4		
	% Invasives				0	0	0	0	0	0	0	0	0	0	0	0		
Post Mitigation Plan Performance Standard	Current Year Stem Count				10	10	10	10	10	12	12	8	8	15	15	14		
	Stems/Acre				405	405	405	405	405	486	486	324	324	607	607	567		
	Species Count				7	8	7	8	7	7	7	5	5	6	6	7		
	Dominant Species Composition (%)				20	20	20	20	20	25	25	38	38	25	25	21		
	Average Plot Height (ft.)				5	4	4	4	3	3	3	3	3	5	5	4		
	% Invasives				0	0	0	0	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 (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.

Vegetation Plot Raw Data Tables

Plot ID	Scientific Name	Performance Standard Approval	Planted or Volunteer?	X Coordinate (m)	Y Coordinate (m)	MY0 Height	MY1 Height	MY2 Height	MY3 Height	MY5 Height	MY7 Height	Map_ID
1	<i>Lindera benzoin</i>	Approved Mit Plan	Planted	6.6	0.8	1.8	0.5	0.5	0.8			a
1	<i>Hamamelis virginiana</i>	Approved Mit Plan	Planted	8.6	1.8	0.4	2.2	3.8	5.7			b
1	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	9.5	4.2	1.6	0.4					c
1	<i>Fraxinus pennsylvanica</i>	Approved Mit Plan	Planted	4.4	1.5	2.4	2.6	2.6	1.6			d
1	<i>Quercus nigra</i>	Approved Mit Plan	Planted	1.7	0.2	0.8	0.9	0.7				e
1	<i>Quercus phellos</i>	Approved Mit Plan	Planted	2.3	2.9	1.8						f
1	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	4.6	4.6	3	1.8	1.9	3			g
1	<i>Betula nigra</i>	Approved Mit Plan	Planted	6.4	7.4	3	3	5.4	6.5			h
1	<i>Carpinus caroliniana</i>	Approved Mit Plan	Planted	8.3	8.2	1.5	0.7					i
1	<i>Hamamelis virginiana</i>	Approved Mit Plan	Planted	4.7	7.7	1						j
1	<i>Fraxinus pennsylvanica</i>	Approved Mit Plan	Planted	3	5.6	1.3	2.4	4.6	6.2			k
1	<i>Quercus michauxii</i>	Approved Mit Plan	Planted	0	3	2.3	2.5					l
1	<i>Quercus pagoda</i>	Approved Mit Plan	Planted	0.6	5.7	2	2.1	1.6	4			m
1	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	1.8	8.4	2.4	3.2	5.5	6.7			n
1	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	0.4	8.4	2.6	2.5	3.5	5.5			o
1	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	9.8	6.9	2.7	3.2	3	6.2			p
1	<i>Carpinus caroliniana</i>	Approved Mit Plan	Planted	7.9	5.9	1.4						q

Plot ID	Scientific Name	Performance Standard Approval	Planted or Volunteer?	X Coordinate (m)	Y Coordinate (m)	MY0 Height	MY1 Height	MY2 Height	MY3 Height	MY5 Height	MY7 Height	Map_ID
2	<i>Quercus pagoda</i>	Approved Mit Plan	Planted	0.4	0.6	1.7						a
2	<i>Quercus phellos</i>	Approved Mit Plan	Planted	2.7	1.6	1.6	1.5	1.2	1.5			b
2	<i>Hamamelis virginiana</i>	Approved Mit Plan	Planted	2.7	0	0.5	1.6	2				c
2	<i>Betula nigra</i>	Approved Mit Plan	Planted	0.4	3.5	3.2	3.1					d
2	<i>Quercus michauxii</i>	Approved Mit Plan	Planted	3	4.4	1.4	1.5	2.2	3.2			e
2	<i>Betula nigra</i>	Approved Mit Plan	Planted	5.4	2.6	3.3	2.7	3.9	6.2			f
2	<i>Asimina triloba</i>	Approved Mit Plan	Planted	5.9	5	2.4	1.8	1.5	0.9			g
2	<i>Corylus americana</i>	Approved Mit Plan	Planted	7.5	2.6	1.4	1.6	1.7	1.3			h
2	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	10.7	1.3	2.8	4.6	10	18			i
2	<i>Lindera benzoin</i>	Approved Mit Plan	Planted	10.8	4.4	3.2	3.1	1.3				j
2	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	12.6	3	2.2	1.9					k
2	<i>Quercus michauxii</i>	Approved Mit Plan	Planted	14.5	3.2	2.2	2.2	2.2	0.9			l
2	<i>Hamamelis virginiana</i>	Approved Mit Plan	Planted	14.3	0.5	0.5	1.9	2.7	3			m
2	<i>Quercus pagoda</i>	Approved Mit Plan	Planted	16.6	1	2.5	2.4	1.3	1			n
2	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	19.7	0.1	2.5	3.4	7	7.5			o
2	<i>Lindera benzoin</i>	Approved Mit Plan	Planted	19.6	3.1	0.8	0.8	0.8				p

Plot ID	Scientific Name	Performance Standard Approval	Planted or Volunteer?	X Coordinate (m)	Y Coordinate (m)	MY0 Height	MY1 Height	MY2 Height	MY3 Height	MY5 Height	MY7 Height	Map_ID
3	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	0.1	0	1.8	1.2					a
3	<i>Hamamelis virginiana</i>	Approved Mit Plan	Planted	2	1.5	0.6	1.8	2.3	3			b
3	<i>Quercus phellos</i>	Approved Mit Plan	Planted	1.6	3.8	0.6						c
3	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	1.5	6.3	2.3	2.6	2.8	3.7			d
3	<i>Quercus phellos</i>	Approved Mit Plan	Planted	1.3	8.8	1.2	1.3	1.5	2.4			e
3	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	3.2	6.6	1.6	1.4					f
3	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	4.7	8.6	2.7	2.7	2.5	2.5			g
3	<i>Quercus phellos</i>	Approved Mit Plan	Planted	5.3	6.1	1.6	1.7	1.9	1.9			h
3	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	5.7	3.6	2.5	2.9	3.3	4.8			i
3	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	6.4	1	2.2	1.3	1.6				j
3	<i>Quercus phellos</i>	Approved Mit Plan	Planted	9.7	0.1	1	0.9	0.2				k
3	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	8.9	2.4	2.4	2.9	3.1	5.2			l
3	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	8.4	4.6	3.3	3.5	3.7	4.2			m
3	<i>Betula nigra</i>	Approved Mit Plan	Planted	8	7.2	2.9	3.1	3.1	3.1			n
3	<i>Quercus nigra</i>	Approved Mit Plan	Planted	7.3	9.5	2	2	2	2.1			o

Plot ID	Scientific Name	Performance Standard Approval	Planted or Volunteer?	X Coordinate (m)	Y Coordinate (m)	MY0 Height	MY1 Height	MY2 Height	MY3 Height	MY5 Height	MY7 Height	Map_ID
4	<i>Quercus phellos</i>	Approved Mit Plan	Planted	1	0.3	1.7	0.5	0.9	0.8			a
4	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	3.7	0.4	2.2	2.1	2.7	4			b
4	<i>Quercus phellos</i>	Approved Mit Plan	Planted	6.3	0.5	1.3	2	1.3	1.8			c
4	<i>Quercus pagoda</i>	Approved Mit Plan	Planted	9.3	0.7	2.5	2.8	3.2	6.7			d
4	<i>Quercus pagoda</i>	Approved Mit Plan	Planted	8.9	3.2	1.8	1.7					e
4	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	6.2	3.4	2.6	1.9					f
4	<i>Carpinus caroliniana</i>	Approved Mit Plan	Planted	3.3	3.3	2.5	1.8					g
4	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	0.8	3.2	2.9						h
4	<i>Asimina triloba</i>	Approved Mit Plan	Planted	0.5	6.4	2.6	2.6	1.1	2			i
4	<i>Asimina triloba</i>	Approved Mit Plan	Planted	3	6.5	2.3	2.5	2.3	3.2			j
4	<i>Quercus pagoda</i>	Approved Mit Plan	Planted	5.8	6.7	2.4	0.9	1.4	3.3			k
4	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	8.1	6.3	2.6						l
4	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	8.5	9.3	2.8	2.9	2.4	3.5			m
4	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	6.2	9.7	2.2	2.2	0.4	2.5			n
4	<i>Betula nigra</i>	Approved Mit Plan	Planted	5.1	8.5	1.5						o
4	<i>Carpinus caroliniana</i>	Approved Mit Plan	Planted	3.4	8.6	1.2	0.2	0.9	0.6			p
4	<i>Quercus phellos</i>	Approved Mit Plan	Planted	0.5	9.2	1.1	1.3	1.7	4.1			q
4	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	4.2	5.2	2.3						r
4	<i>Hamamelis virginiana</i>	Approved Mit Plan	Planted	7.1	1.8	1.3	0.2		2.8			s
4	<i>Liquidambar styraciflua</i>	Not Approved - Not Invasive or Exotic	Volunteer	0	0			1.5				
4	<i>Liquidambar styraciflua</i>	Not Approved - Not Invasive or Exotic	Volunteer	0	0			1.5				

Plot ID	Scientific Name	Performance Standard Approval	Planted or Volunteer?	X Coordinate (m)	Y Coordinate (m)	MY0 Height	MY1 Height	MY2 Height	MY3 Height	MY5 Height	MY7 Height	Map_ID
5	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	1.2	0.6	1.6						a
5	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	4	1.4	1.6	1.7					b
5	<i>Quercus pagoda</i>	Approved Mit Plan	Planted	6.6	0.4	2.4	1.6	3.2	4.6			c
5	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	9.4	0.8	1.8	2.4	3.6	5.6			d
5	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	7	2.5	1.7	1.8	1.7				e
5	<i>Quercus phellos</i>	Approved Mit Plan	Planted	4.2	3.3	1.3	1.1	0.7				f
5	<i>Lindera benzoin</i>	Approved Mit Plan	Planted	1.6	2.8	1.2	1.1					g
5	<i>Asimina triloba</i>	Approved Mit Plan	Planted	2.1	5.2	2.6	2.7	1.7	2.1			h
5	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	6.1	5.5	1.4	0.3	0.7	0.7			i
5	<i>Quercus nigra</i>	Approved Mit Plan	Planted	8.7	4.9	1.9	2	0.6	0.8			j
5	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	9.4	8.3	1.7	2.6	5.2	6.8			k
5	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	6.8	8.6	2.1						l
5	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	3.9	8	2.8						m
5	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	1.8	7.3	2.4	2.7	2.7	2.6			n
5	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	2	9.6	2.4	2.6	2.6				o
5	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Volunteer	0.1	0.1				1.2			p

Plot ID	Scientific Name	Performance Standard Approval	Planted or Volunteer?	X Coordinate (m)	Y Coordinate (m)	MY0 Height	MY1 Height	MY2 Height	MY3 Height	MY5 Height	MY7 Height	Map_ID
6	Quercus michauxii	Approved Mit Plan	Planted	0.4	0.1	1.4	1.5	1.7	3.2			a
6	Quercus phellos	Approved Mit Plan	Planted	0.4	2.1	2.3	1.6	1.7	1.2			b
6	Quercus phellos	Approved Mit Plan	Planted	1	4.5	2	1.5					c
6	Fraxinus pennsylvanica	Approved Mit Plan	Planted	3.1	3.6	1.5	3	3.7	6.2			d
6	Quercus michauxii	Approved Mit Plan	Planted	2.3	2.2	1.5	0.8	0.7	1.2			e
6	Platanus occidentalis	Approved Mit Plan	Planted	2.1	0.1	2	1.3					f
6	Fraxinus pennsylvanica	Approved Mit Plan	Planted	4	0	1.3	2	0.6	1			g
6	Corylus americana	Approved Mit Plan	Planted	4.4	0	1.2	0.7					h
6	Quercus phellos	Approved Mit Plan	Planted	5	4.4	1	1					i
6	Quercus nigra	Approved Mit Plan	Planted	7.4	3.7	2.9	1.2	0.7				j
6	Quercus nigra	Approved Mit Plan	Planted	6.8	2.8	1	0.9					k
6	Betula nigra	Approved Mit Plan	Planted	5.7	0.3	2.8	2.2					l
6	Asimina triloba	Approved Mit Plan	Planted	6.6	0.2	1.5	1.3	1.3	2.1			m
6	Quercus pagoda	Approved Mit Plan	Planted	8.5	2.1	0.4						n
6	Platanus occidentalis	Approved Mit Plan	Planted	9.4	3.9	2.9	1.4	2.5	2.6			o
6	Betula nigra	Approved Mit Plan	Planted	10.5	2	2.4	3	3	1.9			p
6	Betula nigra	Approved Mit Plan	Planted	10.2	0.3	3.1	0.6					q
6	Quercus phellos	Approved Mit Plan	Planted	12.2	0.1	2.4	1.4	1.6				r
6	Betula nigra	Approved Mit Plan	Planted	12.6	1.8	2.6	3					s
6	Platanus occidentalis	Approved Mit Plan	Planted	11.5	3.6	2.6	5.5	12	19.5			t
6	Platanus occidentalis	Approved Mit Plan	Planted	13.5	3.4	2.9	5	9	15.5			u
6	Quercus nigra	Approved Mit Plan	Planted	15.4	3.3	1.5	0.8					v
6	Betula nigra	Approved Mit Plan	Planted	14.7	1.8	2.1	2.3					w
6	Betula nigra	Approved Mit Plan	Planted	14.2	0.1	3.6	2.9	2.8				x
6	Fraxinus pennsylvanica	Approved Mit Plan	Planted	16.1	0.3	1.6	1.3	3.8	8			y
6	Betula nigra	Approved Mit Plan	Planted	16.4	1.6	2.1	1.6	2.4	2.4			z
6	Quercus michauxii	Approved Mit Plan	Planted	17.3	3.9	2.4	1.8	1.7	1.1			A
6	Betula nigra	Approved Mit Plan	Planted	18.2	2.5	2.7	2.6	3.1	2.7			B
6	Fraxinus pennsylvanica	Approved Mit Plan	Planted	18.2	0.5	2	2.2	1.3	2.6			C
6	Quercus michauxii	Approved Mit Plan	Planted	19.9	4.3	2	0.9	0.8				D
6	Salix nigra	Not Approved - Not Invasive or Exotic	Volunteer	0.1	0.1			4.5	5.5			E
6	Salix nigra	Not Approved - Not Invasive or Exotic	Volunteer	0.1	0.1			6	8			F
6	Salix nigra	Not Approved - Not Invasive or Exotic	Volunteer	0.1	0.1			5	7			G
6	Salix nigra	Not Approved - Not Invasive or Exotic	Volunteer	0.1	0.1			4.5	9			H
6	Salix nigra	Not Approved - Not Invasive or Exotic	Volunteer	0.1	0.1			7	12			I

Plot ID	Scientific Name	Performance Standard Approval	Planted or Volunteer?	X Coordinate (m)	Y Coordinate (m)	MY0 Height	MY1 Height	MY2 Height	MY3 Height	MY5 Height	MY7 Height	Map_ID
7	<i>Carpinus caroliniana</i>	Approved Mit Plan	Planted	0.5	0.3	1.5						a
7	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	2.9	0.6	1.9	1.7	4.8	9.5			b
7	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	6.5	0.7	3	2.7	3.3	6			c
7	<i>Betula nigra</i>	Approved Mit Plan	Planted	9	0.2	2.1	2	1.7	2.8			d
7	<i>Quercus phellos</i>	Approved Mit Plan	Planted	7.2	2.2	1.7	1.2	1.3	1.5			e
7	<i>Betula nigra</i>	Approved Mit Plan	Planted	4.9	2.4	2.4						f
7	<i>Corylus americana</i>	Approved Mit Plan	Planted	2.4	2.6	0.9	0.5	0.7	2.1			g
7	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	0.3	2.7	2.1	1.8	7	13.5			h
7	<i>Lindera benzoin</i>	Approved Mit Plan	Planted	0.9	4.9	0.9						i
7	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	3.3	4.7	3.1	3.2	3.5	4.3			j
7	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	5.7	4.9	2						k
7	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	7.6	4.3	2.4	1.3	1.4	1.8			l
7	<i>Quercus michauxii</i>	Approved Mit Plan	Planted	9.7	6.6	1.6	1.3	1.4	1.6			m
7	<i>Quercus phellos</i>	Approved Mit Plan	Planted	7.4	6.7	1.9	1.7					n
7	<i>Platanus occidentalis</i>	Approved Mit Plan	Planted	5.5	7.4	1.4						o
7	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	3.1	7.1	2.5						p
7	<i>Quercus pagoda</i>	Approved Mit Plan	Planted	0.9	7.1	1	1	1.6	2.9			q
7	<i>Quercus pagoda</i>	Approved Mit Plan	Planted	0.8	9.4	1.9	0.8	1	1.3			r
7	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	3.2	9.2	2.7						s
7	<i>Diospyros virginiana</i>	Approved Mit Plan	Planted	5.9	9.4	1.8	0.4	3.1	4.9			t
7	<i>Liriodendron tulipifera</i>	Approved Mit Plan	Planted	8	8.9	4						u
7	<i>Quercus phellos</i>	Approved Mit Plan	Volunteer	0.1	0.1				8			v
7	<i>Quercus phellos</i>	Approved Mit Plan	Volunteer	0.1	0.1				0.5			w

Appendix C:
Vegetation Monitoring
Plot Photos



3/23/21, 11:45 AM
Johnston

Fixed Veg Plot 1 (MY-00)



9/26/23, 1:13 PM
Johnston County

Fixed Veg Plot 1 (MY-03)



3/23/21, 1:12 PM
Johnston

Fixed Veg Plot 2 (MY-00)



9/26/23, 12:41 PM
Johnston County

Fixed Veg Plot 2 (MY-03)



3/23/21, 2:18 PM
Johnston

Fixed Veg Plot 3 (MY-00)



9/26/23, 12:16 PM
Johnston County

Fixed Veg Plot 3 (MY-03)



3/23/21, 2:41 PM
Johnston

Fixed Veg Plot 4 (MY-00)



9/26/23, 12:05 PM
Johnston County

Fixed Veg Plot 4 (MY-03)



3/23/21, 3:05 PM
Johnston

Fixed Veg Plot 5 (MY-00)



9/26/23 11:26 AM
Johnston County

Fixed Veg Plot 5 (MY-03)



3/23/21 9:13 AM
Johnston County

Fixed Veg Plot 6 (MY-00)



9/26/23, 10:21 AM
Johnston County

Fixed Veg Plot 6 (MY-03)



3/23/21, 9:55 AM
Johnston

Fixed Veg Plot 7 (MY-00)

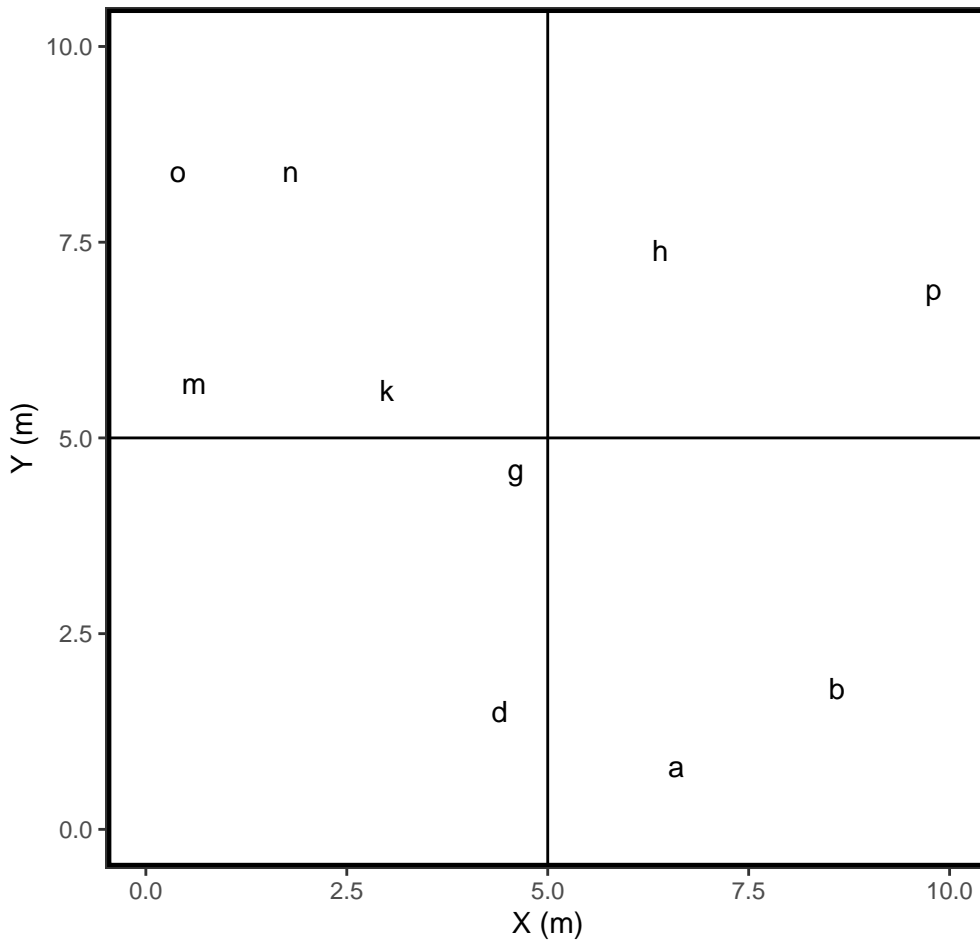


9/26/23, 10:43 AM
Johnston County

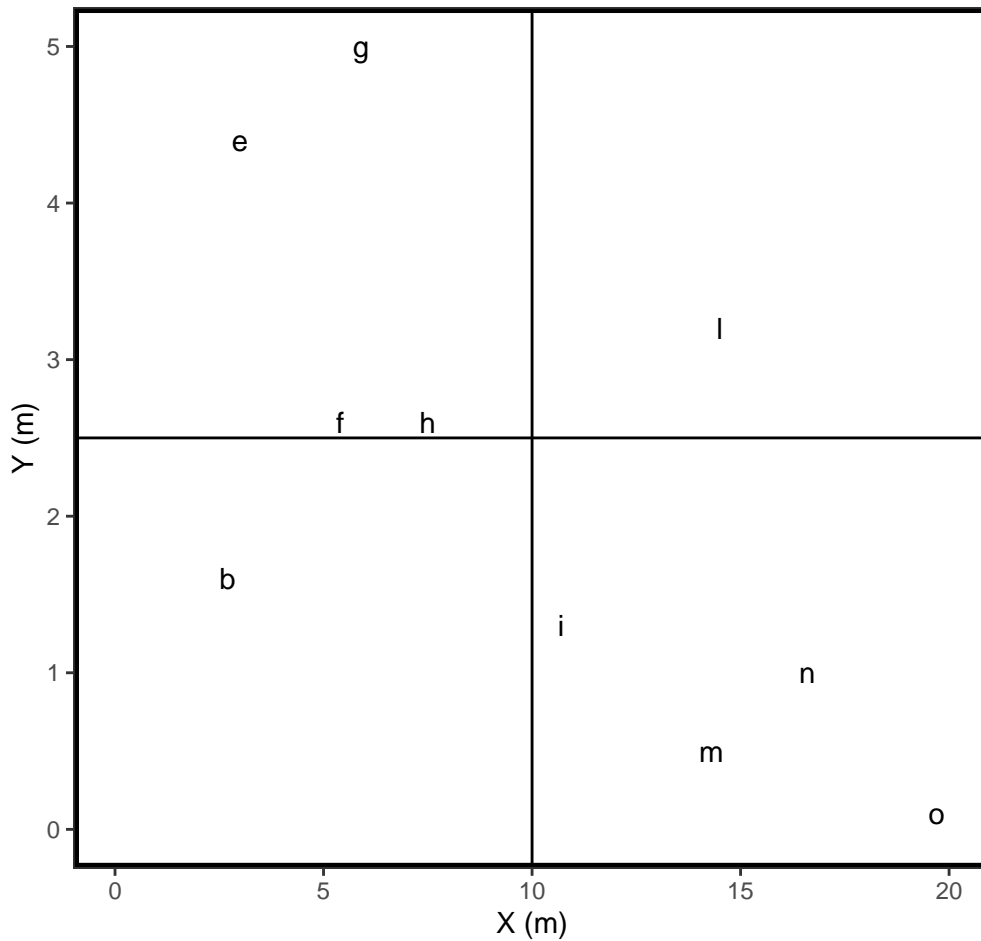
Fixed Veg Plot 7 (MY-03)

Appendix D:
Vegetation Monitoring Plot
Maps

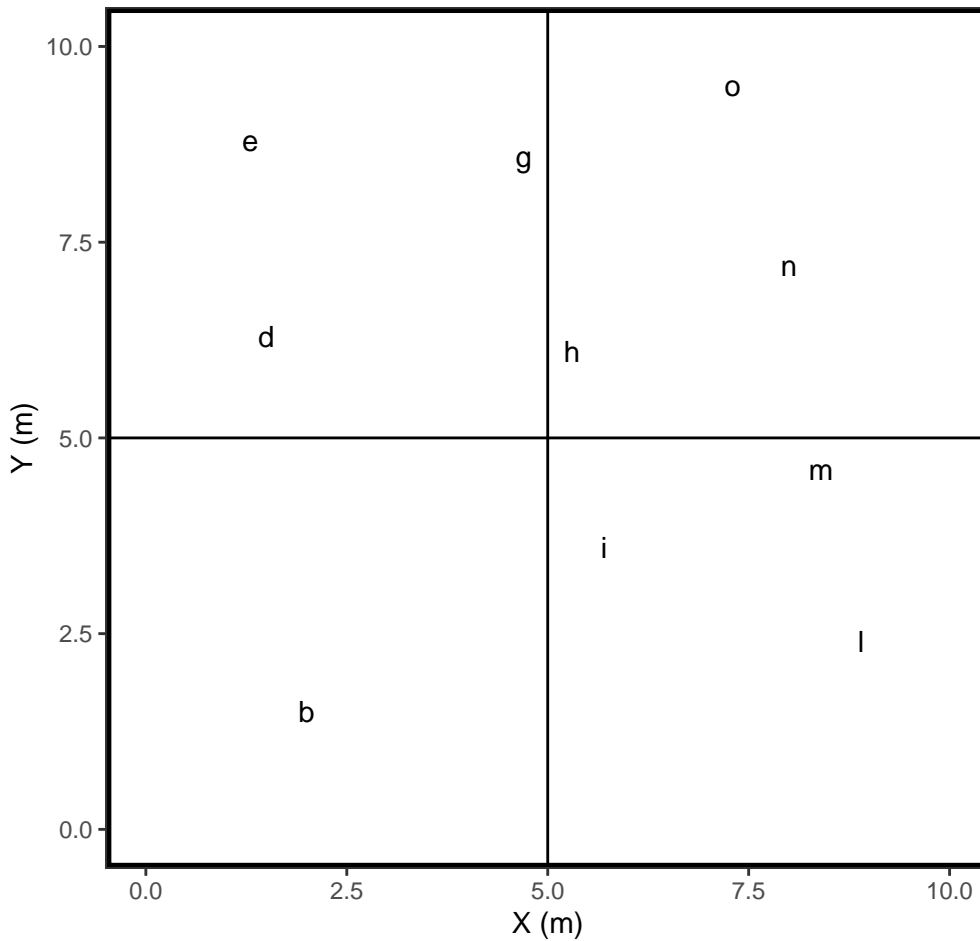
Plot 1



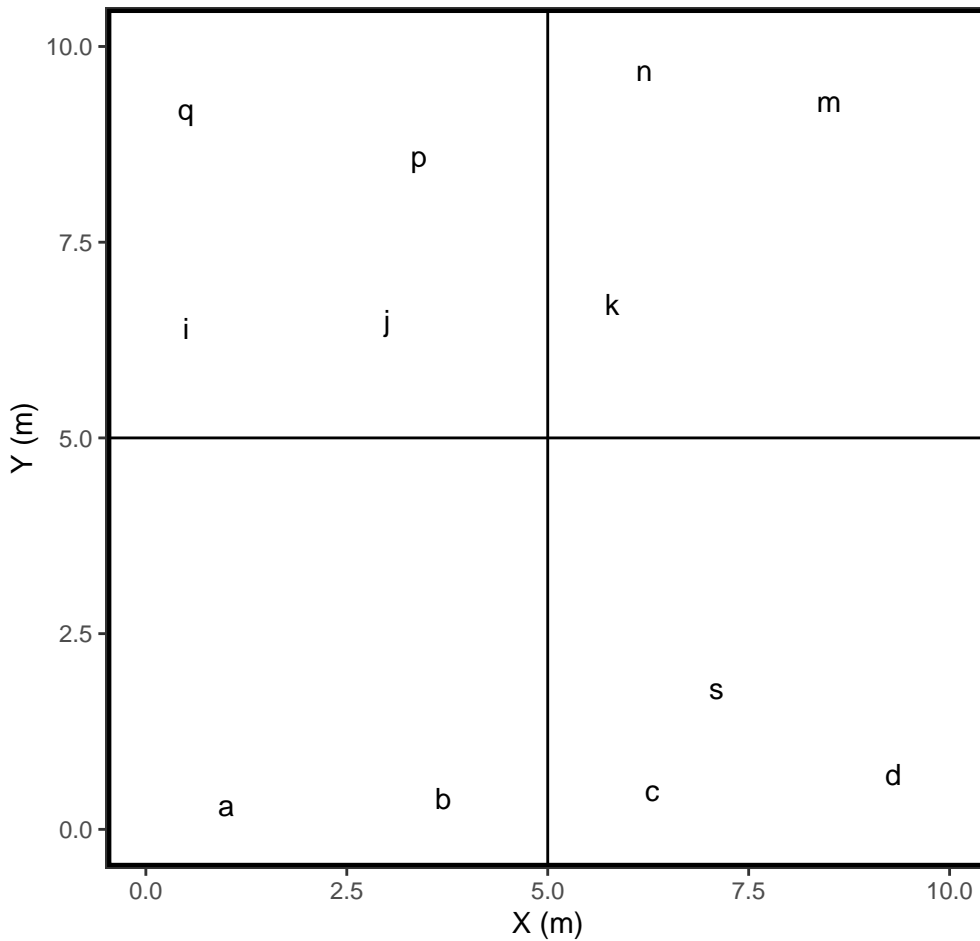
Plot 2



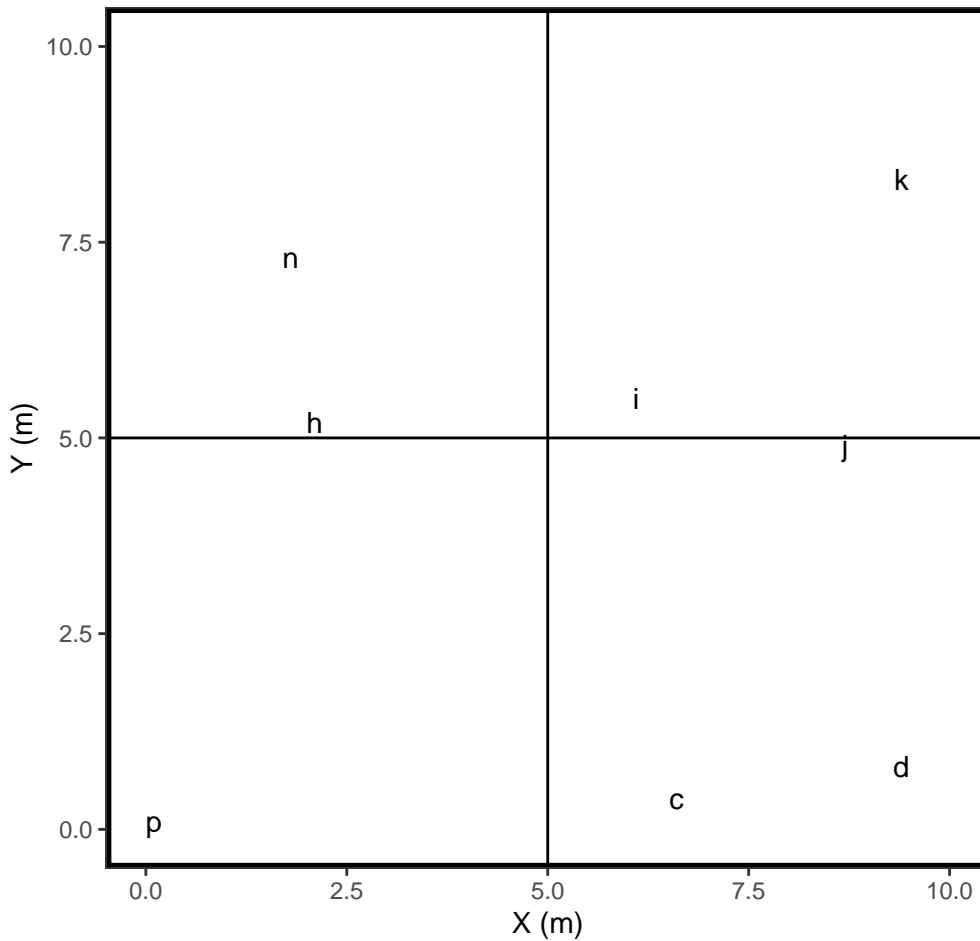
Plot 3



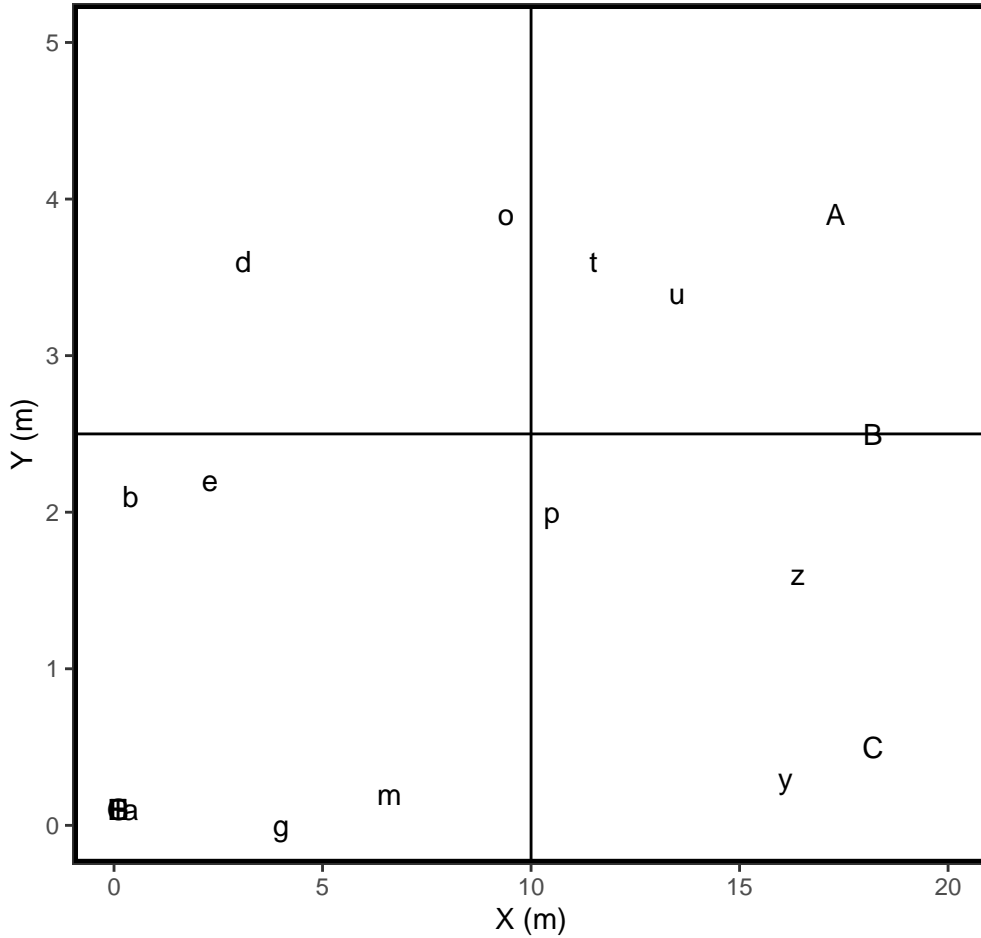
Plot 4



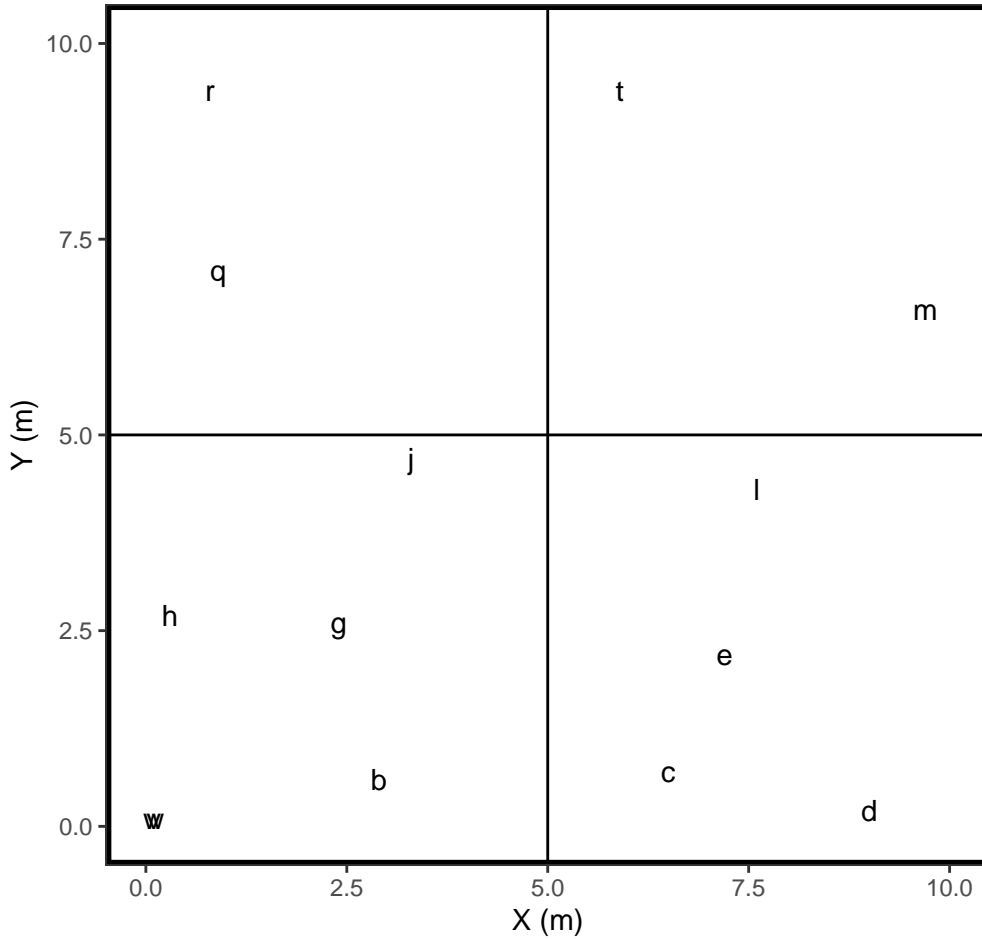
Plot 5



Plot 6



Plot 7



Appendix E:
Headwater Stream
Channel Formation Table
Headwater Photos

**Table 4: Headwater Stream Channel Formation Table
Odell's House Mitigation Project**

Channel Forming Indicators - R1	MY1	MY2	MY3	MY4
Scour (indicating sediment transport by flowing water)	No	No	No	
Sediment deposition (accumulations of sediment and/or formation of ripples)	No	No	No	
Sediment sorting (sediment sorting indicated by grain-size distribution within primary flow path)	No	No	No	
Multiple observed flow events (must be documented by gauge data and/or photographs)	Yes	Yes	No	
Destruction of terrestrial vegetation	No	No	No	
Presence of litter and debris	No	No	No	
Wracking (deposits of drift material indicating surface water flow)	No	No	No	
Vegetation matted down, bent, or absent (herbaceous or otherwise)	No	Yes	No	
Leaf litter disturbed or washed away	No	No	No	
Channel Forming Indicators - R5	MY1	MY2	MY3	MY4
Scour (indicating sediment transport by flowing water)	Yes	No	Yes	
Sediment deposition (accumulations of sediment and/or formation of ripples)	No	No	No	
Sediment sorting (sediment sorting indicated by grain-size distribution within primary flow path)	No	No	Yes	
Multiple observed flow events (must be documented by gauge data and/or photographs)	Yes	Yes	Yes	
Destruction of terrestrial vegetation	Yes	Yes	Yes	
Presence of litter and debris	No	No	Yes	
Wracking (deposits of drift material indicating surface water flow)	No	No	Yes	
Vegetation matted down, bent, or absent (herbaceous or otherwise)	Yes	Yes	Yes	
Leaf litter disturbed or washed away	No	No	Yes	



3/29/23 9:59 AM
Johnston County

R1 Documentation – XS-1 Upstream View (MY-03)



3/29/23 9:59 AM
Johnston County

R1 Looking Downstream at FG-3 04/27/2023 (MY-03)



3/29/23 12:09 PM
Johnston County

R5 Flow Documentation (MY-03)



3/29/23 12:09 PM
Johnston County

R5 Looking Downstream at FG-2 (MY-03)



End of above ground channel

Surface flow returns

R1 Drone Aerial View – 4/29/2023



33 ft

R5 Drone Aerial View – 4/29/2023