Year 4 Monitoring Report

FINAL

Rhapsody Mitigation Project

DMS Project #: 100110 | Contract #: 7864
DWR # 2019-1405 | RFP: 16-007703

Randolph County, North Carolina
Cape Fear River Basin
Randleman Lake Watershed
HUC 03030003

Prepared By:

Resource Environmental Solutions, LLC
For Environmental Banc and Exchange, LLC

Prepared For:
NC Department of Environmental Quality
Division of Mitigation Services

January 2024

3600 Glenwood Avenue, Suite 100
Raleigh, NC 27612

Corporate Headquarters
6575 W Loop S #300
Bellaire, TX 77401
Main: 713.520.5400

January 10, 2024

Jeremiah Dow
NC DEQ Division of Mitigation Services
217 West Jones Street
Raleigh, NC 27604

RE: Rhapsody, Project ID #100110, DMS Contract #7864

Listed below are comments provided by DMS on November, 2023 regarding the Rhapsody Site: Year 4 Monitoring Report and RES' responses.

Comments:
1. During the 11/16 site visit it was observed that there were no witness posts located at easement corners. While the site is fenced, it is a requirement to mark all conservation easement corners with a post inside of the fence line (typically a t-post or u-channel), and 6" to 1' inside the corner monument (rebar). Please add witness posts to all project corners. Please note that witness posts do not need conservation easement signage if the corresponding fence post has appropriate signage. This work should be completed in the first half of 2024 prior to the Stewardship Program's MY5 site visit to determine suitability for transfer into long-term management.
Based on communication on December 8th, 2023, stating "I wanted to follow up on the comments I made regarding the corner monuments. I found an old email from Jeff Horton from 2020 that says the following:

"Anytime a treated wooden round post is located within 3 ft of the corner we appreciate the clean marking by using that same post. No need to add the extra marking. The requirement is to have a physical marking devise that can be used to help locate the in the ground monumentation. If the fence were located 10 ft away then we would absolutely require the corner to receive the extra above ground witness."

I'm confident that this guidance will be changing, but for your projects, the fence posts are probably sufficient based on what we have historically allowed. You can disregard the comments discussing corner witness posts inside of fenced areas at Bohemian, Rhapsody, and Bucky's. Any comments regarding corner marking where there is no fencing will still apply." RES will disregard the above comment.

Table of Contents

1 Project Summary

1.1 Project Location and Description

The Rhapsody Project is within the Randleman Lake Watershed of the Cape Fear River Basin within the 8-digit Hydrologic Unit Code (HUC) 03030003, 14-digit HUC 03030003010060 and DWR Sub Basin Number 03-06-08.

The Rhapsody Project is located in Randolph County approximately five miles east of Archdale, North Carolina (**Figure 1**). To access the Project head East on Cedar Square Road from I-74 and turn left on Muddy Creek Road, after about a one and half miles the Project will be on the right. The coordinates are 35.897336° and -79.889849°.

Environmental Banc & Exchange, LLC (EBX), a wholly owned subsidiary of Resource Environmental Solutions (RES), is pleased to provide this Monitoring Report for the Rhapsody Riparian Buffer Mitigation Project (Project) as a full-delivery buffer mitigation project for the Division of Mitigation Services (DMS) (DMS #100110). This Project provides riparian buffer mitigation credits for unavoidable impacts due to development within the Randleman Lake Watershed of the Cape Fear River Basin, United States Geological Survey (USGS) 8-digit Hydrologic Unit Code (HUC – 03030003) (**Figure 1**). The Project is in accordance with the Consolidated Buffer Mitigation Rule 15A NCAC 02B .0295 and the Randleman Lake Water Supply Watershed Buffer Rule 15A NCAC 02B .0250.

The conservation easement of the Rhapsody Project totals approximately 7.75 acres and includes two perennial unnamed tributaries (RQ1 and RQ2) that drain south through the easement into Muddy Creek approximately one mile downstream of the Project. Reach RQ1, a 1,890 linear feet reach, is the primary feature onsite and has a drainage area of 213 acres. RQ2 flows southeast into the easement for 189 linear feet and then drains directly into RQ1 just below a large bedrock outcrop. Stream determinations were verified by the DWR on June 12, 2018. There are two easement breaks in the Project: one existing culvert along RQ1 that is maintained and another break that will allow for farm access. This farm access provides a break for future, unplanned access by the landowner and includes gates on either side of the easement break in order to exclude cattle from accessing the stream. Because this access will be used for future use and no in-stream work was conducted during construction, no permits were needed. Land use within the Project was primarily actively grazed, disturbed riparian forest, non-forested pasture, and a recently timbered area with the presence of invasive species. Grazing livestock have historically had access to all Project reaches causing bank instability and erosional rills within some riparian zones.

The goal of the Project is to restore and enhance ecological function to the existing stream and riparian buffer by establishing appropriate plant communities while minimizing temporal and land disturbing impacts and will assist DMS with achieving its mitigation goals in the Randleman Lake Watershed. Restoration and enhancement of the Randleman Lake riparian buffer (as defined in 15A NCAC 02B .0250) results in a reduction of the water quality stressors that affected the Project: livestock access and areas of minimal riparian buffer. Immediate water quality benefits and pollutant removal within the vicinity of the Project include the exclusion of livestock access

to streams and reduction in nutrient loads from agricultural land-uses. This Project is consistent with the management strategy for maintaining and protecting riparian areas in the Randleman Lake watershed. Project attributes are summarized in **Table 1.**

1.2 Monitoring Protocol and Project Success Criteria

Annual vegetation monitoring and visual assessments will be conducted. Riparian vegetation monitoring is based on the "Carolina Vegetation Survey-Ecosystem Enhancement Program Protocol for Recording Vegetation: Level 2 Plot Sampling Only Version 4.2". Monitoring plots were installed a minimum of 100 meters squared in size and cover at least two percent of the planted mitigation area. These plots were randomly placed throughout the planted riparian buffer mitigation area (4.66 acres) and are representative of the riparian restoration and enhancement areas where applicable (i.e. when enhancement credit is being generated from supplemental planting under 15A NCAC 02B .0295 (n)). As the upper section of Rhapsody was cleared after 2007, this area was planted and monitored although credit is only being generated under Enhancement for cattle exclusion. The following data is recorded for all trees in the plots: species, height, planting date (or volunteer), and grid location. All stems in plots are flagged with flagging tape. Data is processed using the CVS data entry tool. In the field, the four corners of each plot were permanently marked with PVC at the origin and metal conduit at the other corners. Photos of each plot are to be taken from the origin each monitoring year. There are four monitoring plots (two designated to restoration, two designated to enhancement via cattle exclusion with planting) (**Figure 2**).

Photos are taken at all vegetation plot origins each monitoring year and provided in the annual reports. Visual inspections and photos are taken to ensure that enhancement areas are being maintained and compliant. The measures of vegetative success for the Project are the survival of at least four native hardwood tree species, where no one species is greater than 50 percent of stems, at a density of at least 260 stems per acre at the end of Year 5. Native volunteer species may be included to meet the performance standards as determined by NC Division of Water Resources (DWR).

A visual assessment of the conservation easement is also performed each year to confirm:

- Fencing is in good condition throughout the site (if applicable);
- No cattle access within the conservation easement area;
- No encroachment has occurred;
- No invasive species in areas were invasive species were treated,
- Diffuse flow is being maintained in the conservation easement areas; and
  there has not been any cutting, clearing, filling, grading, or similar activities that would negatively affect the functioning of the buffer.

Component/ Feature	Monitoring	Maintenance through project close-out
Vegetation	Annual vegetation monitoring	Vegetation shall be maintained to ensure the health and vigor of the targeted plant community. Routine vegetation maintenance and repair activities may include supplemental planting, pruning, mulching, and fertilizing. Exotic invasive plant species shall be treated by mechanical and/or chemical methods. Any vegetation requiring herbicide application will be performed in accordance with NC Department of Agriculture (NCDA) rules and regulations. Vegetation maintenance activities will be documented and reported in annual monitoring reports. Vegetation maintenance will continue through the monitoring period.
Invasive and Nuisance Vegetation	Visual Assessment	Invasive and noxious species will be monitored and treated so that none become dominant or alter the desired community structure of the Project. Locations of invasive and nuisance vegetation will be mapped.
Project Boundary	Visual Assessment	Project boundaries shall be identified in the field to ensure clear distinction between the mitigation project and adjacent properties. Boundaries are marked with signs identifying the property as a mitigation project and will include the name of the long-term steward and a contact number. Boundaries may be identified by fence, marker, bollard, post, tree-blazing, or other means as allowed by Project conditions and/or conservation easement. Boundary markers disturbed, damaged, or destroyed will be repaired and/or replaced on an as-needed basis. Easement monitoring and staking/ signage maintenance will continue in perpetuity as a stewardship activity.
Road Crossing	Visual Assessment	Road crossings within the Project may be maintained only as allowed by conservation easement or existing easement, deed restrictions, rights of way, or corridor agreements. Crossings in easement breaks are the responsibility of the landowner to maintain.
Livestock Fencing	Visual Assessment	Livestock fencing is to be placed outside the easement limits. Maintenance of fencing is the responsibility of the landowner.

1.3 Project Components

This Project generates approximately 66,907.251 riparian buffer restoration credits on existing non-forested pasture and 123,228.305 buffer enhancement via cattle exclusion credits. The riparian buffer mitigation credits were generated to service Randleman Lake buffer impacts within the USGS 8-digit HUC 03030003 of the Cape Fear River Basin. The total mitigation credits generated from the Rhapsody Mitigation Project are summarized below and a more detailed table is located in **Appendix A**.

Mitigation Totals	Square Feet	Credits
Restoration	68,800	66,907.251
Enhancement via Cattle Exclusion	248,174	123,228.305
Total Riparian Buffer	**316,974**	**190,135.556**

1.4 Riparian Mitigation Approach

Restoration activities included planting a composition of native bare-root tree species based on reference reach data and excluding livestock from the stream and buffer area. The restoration of

plant communities within the Project not only provide stabilization and improve water quality within the easement limits, but also provide ecological benefits to the entire watershed.

Enhancement occurred in the very northern segment of the easement, along the stream in the middle segment and the complete southern segment of the easement in accordance with the Consolidated Buffer Mitigation Rule 15A NCAC 02B .0295 (o)(6) (**Figure 2**). All livestock were removed from the easement and the fence was installed to exclude access to riparian areas and their associated streams.

In the northern segment of the easement, the same activities as described in the Riparian Restoration Activities were conducted (planting a composition of native bare-root tree species). However, since this area was a riparian buffer with mature forest before and after the effective date of Rule 15A NCAC 02B .0250 and remained forested up to approximately 2007, when it was cleared, but had the presence of cattle throughout this time period, it is only viable for enhancement credit but did receive similar activities as a restoration area.

The area along the stream in the middle segment as well as the southern segment have continued to remain a fully forested area that has been grazed by cattle, therefore this area was not planted but livestock exclusion fencing was installed around these segments.

1.5 Construction and As-Built Conditions

Revegetation of the Site included treating invasive species and planting native hardwood bare root trees. Prior to planting, RES prepped the site by spraying and ripping the easement. Piedmont Alluvial Forest is the target community type for the riparian restoration areas. The community is defined by Schafale (2012). Bare root trees were planted in May 2020. Deviations from the initial planting plan were due to bare root availability. A list of the planted species can be found in **Table 5**. Additionally, a temporary and permanent seed mixture was applied where cattle caused bare areas were present. The mixture included black-eyed susan (*Rudbeckia hirta*) which is a perennial, pollinator species.

1.6 Year 4 Monitoring Performance

Monitoring of the four permanent vegetation plots was completed on November 1, 2023. Vegetation tables are in **Appendix B**, associated photos are in **Appendix C**, and individual tree heights are in **Appendix D**. Year 4 monitoring data indicates that all plots are exceeding the success criteria of 260 planted stems per acre. Planted stem densities ranged from 567 to 809 planted stems per acre with a mean of 647 planted stems per acre across all plots. Volunteer trees were found in all four of the vegetation plots. A total of 13 planted species were documented within the plots. The average tree height observed was 4.8 feet.

Visual assessment of vegetation outside of the monitoring plots indicates that the herbaceous vegetation is becoming well established throughout the project. Tree of heaven (*Ailanthus*

altissima), Chinese privet (*Ligustrum sinense*), and multiflora rose (*Rosa multiflora*) was treated within the easement on August 19, 2023. Invasives will continue to be monitored and will be treated again if necessary. A small section of the fence was repaired on March 9, 2023, from a fallen tree and now is in good condition. The fence is still maintaining cattle exclusion and there were no signs of encroachment. Additionally, there were no signs of concentrated flow in the easement area.

2 Reference

Lee Michael T., Peet Robert K., Roberts Steven D., and Wentworth Thomas R., 2008. *CVS-EEP Protocol for Recording Vegetation Level*. Version 4.2

NC Environmental Management Commission. 2010. Rule 15 A NCAC 02B .0250 – Randleman Lake Water Supply Watershed: Protection and Maintenance of Riparian Buffers.

NC Environmental Management Commission. 2014. Rule 15A NCAC 02B.0295 – Mitigation Program Requirements for Protection and Maintenance of Riparian Buffers.

Resource Environmental Solutions, LLC (2020). Rhapsody Mitigation Project – Final Mitigation Plan.

Schafale, M.P. 2012. Classification of the Natural Communities of North Carolina, Fourth Approximation. North Carolina Natural Heritage Program, Division of Parks and Recreation, NCDENR, Raleigh, NC.

Appendix A

Project Background Tables and Site Maps

Table 1. Buffer Project Areas and Assets

Credit Type	Location	Subject? (enter NO if ephemeral or ditch [1])	Feature Type	Mitigation Activity	Min-Max Buffer Width (ft)	Feature Name	Total Area (sf)	Creditable Area (sf)	Initial Credit Ratio (x:1)	% Full Credit	Final Credit Ratio (x:1)	Riparian Buffer Credits
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	20-30	RQ1	258	258	2	75%	2.66667	96.750
Buffer	Rural	Yes	I / P	Restoration	0-100	RQ1	65,975	65,975	1	100%	1	65,975.000
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	0-100	RQ1, RQ2	245,449	245,449	2	100%	2	122,724.500
Buffer	Rural	Yes	I / P	Restoration	101-200	RQ1	2,825	2,825	1	33%	3.0303	932.251
Buffer	Rural	Yes	I / P	Enhancement via Cattle Exclusion	101-200	RQ1	2,467	2,467	2	33%	6.06061	407.055
							TOTAL	**316,974**				**190,135.556**

Table 2. Project Activity and Reporting History
Rhapsody Site

Elapsed Time Since planting complete: 3 year 6 months
Number of reporting Years[1]: 4

Activity or Deliverable	Data Collection Complete	Completion or Delievery
Restoration Plan	NA	Jan-20
Final Design – Construction Plans	NA	NA
Stream Construction	NA	NA
Site Planting	NA	May-20
As-built (Year 0 Monitoring – baseline)	May-20	May-20
Year 1 Monitoring	Nov-20	Dec-20
Year 2 Monitoring	Nov-21	Nov-21
Year 3 Monitoring	Oct-22	Nov-22
Year 4 Monitoring	Nov-23	Nov-23
Year 5 Monitoring		

1 = The number of reports or data points produced excluding the baseline

Table 3. Project Contacts Table Rhapsody Site	
Planting Contractor	H&J Forestry
Planting contractor POC	Matt Hitch
Nursery Stock Suppliers	Arborgen
Monitoring Performers	RES / 3300 Glenwood Ave, Suite 100, Raleigh, NC 27612
Monitoring POC	Ryan Medric (919) 741-6268

Table 4. Project Background Information			
Project Name	Rhapsody		
County	Randolph		
Project Area (acres)	7.75		
Project Coordinates (latitude and longitude)	Latitude: 35.897336 N Longitude: -79.889849 W		
Planted Acreage (Acres of Woody Stems Planted)	4.66		
Project Watershed Summary Information			
Physiographic Province	Southern Outer Piedmont		
River Basin	Cape Fear		
USGS Hydrologic Unit 8-digit	03030003	USGS Hydrologic Unit 14-digit	03030003010060
DWR Sub-basin	03-06-08		

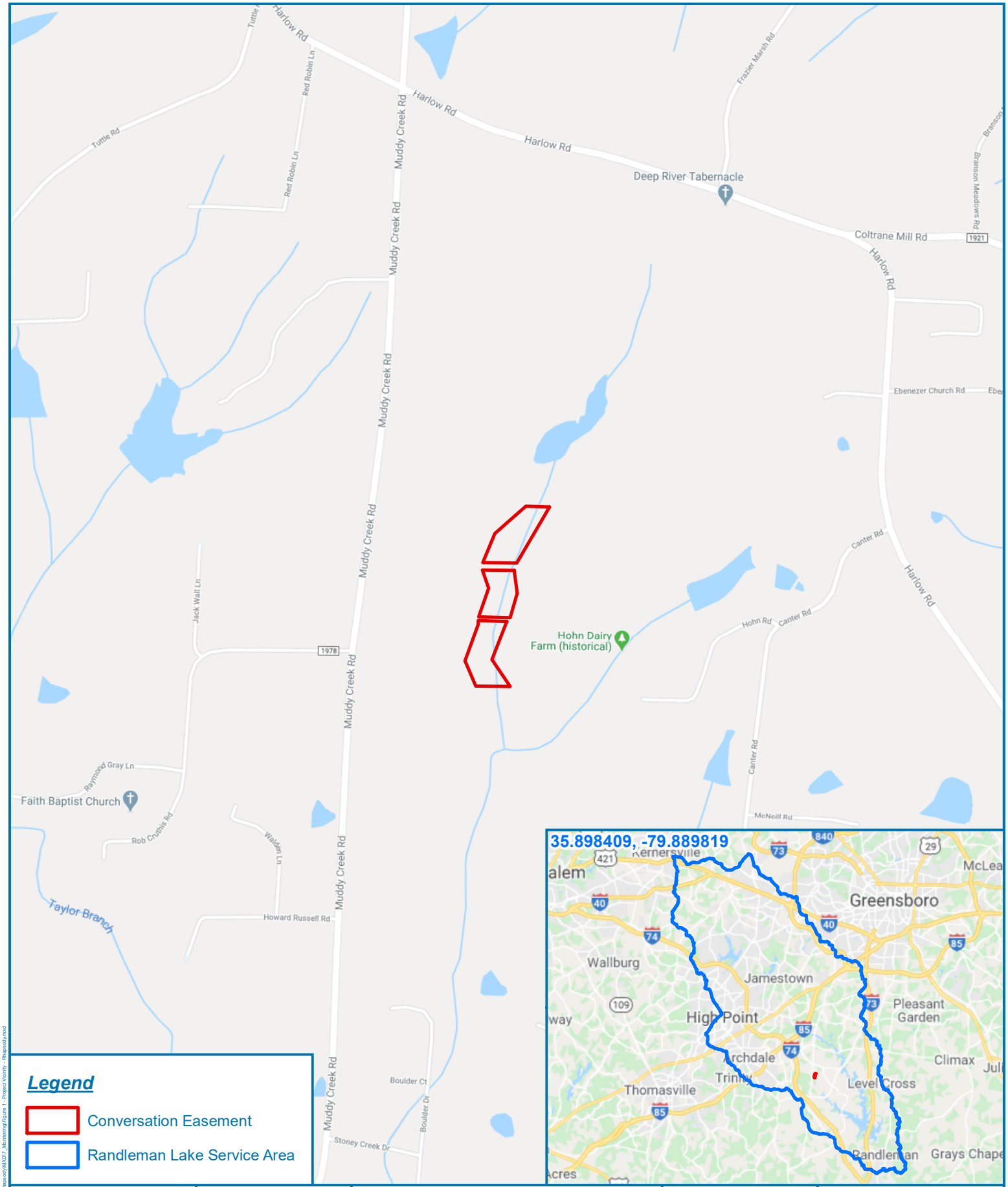


Figure 1 - Site Location Map

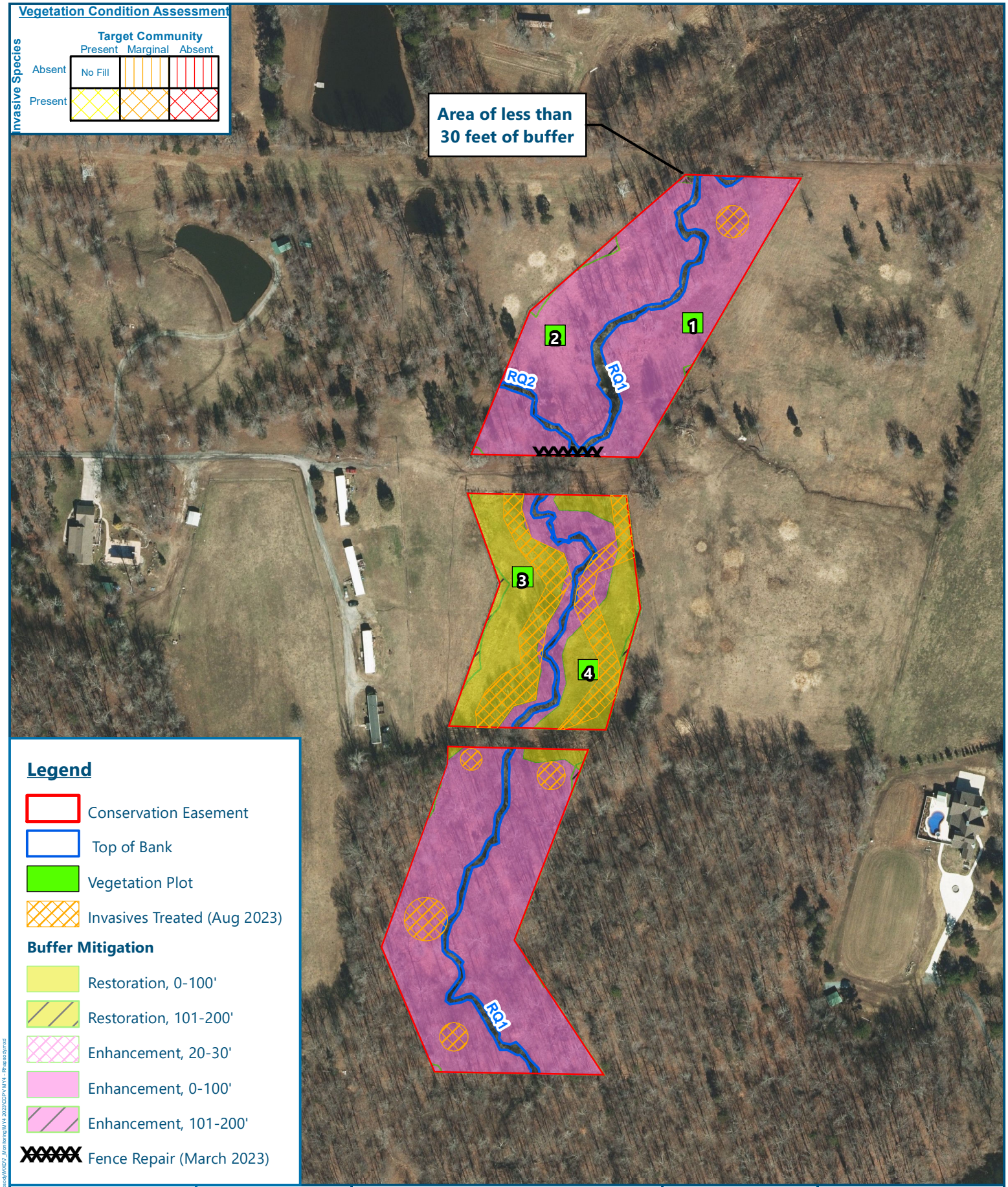
Rhapsody Mitigation Project

Randolph County, North Carolina

Date:	5/20/2020
Drawn by:	HKH
Checked by:	RTM
	1 inch = 1,000 feet

res

Document Path: R:\Regional\Projects\NC\Rhapsody\MXD\7_Monitoring\Figure 1 - Project Vicinity - Rhapsody.mxd



N
W E
S
0 100 200
Feet

Figure 2 - Current Conditions Plan View

Rhapsody
Mitigation Project

Randolph County, North Carolina

Date:	11/8/2023
Drawn by:	HG
Checked by:	JM
	1 inch = 200 feet

res

Document Path: R:\Regional\Projects\NC\10139_Rhapsody\MY07_Monitoring\MY4 2023\CCPV MY4 - Rhapsody.mxd

Appendix B

Vegetation Assessment Data

Table 5. Rhapsody Planted Species Summary

Common Name	Scientific Name	Total Stems Planted
American Sycamore	*Platanus occidentalis*	2,000
Water Oak	*Quercus nigra*	1,400
Tuliptree	*Liriodendron tulipifera*	1,400
Northern Red Oak	*Quercus rubra*	1,300
River Birch	*Betula nigra*	1,200
Silky Dogwood	*Cornus amomum*	1,000
Willow Oak	*Quercus phellos*	800
Black Walnut	*Juglans nigra*	700
Eastern Red Bud	*Cercis canadensis*	600
Pin Oak	*Quercus palustris*	500
Southern Crab Apple	*Malus angustifolia*	500
White Oak	*Quercus alba*	300
American Plum	*Prunus americana*	200
Southern Red Oak	*Quercus falcata*	200
Common Persimmon	*Diospyros virginiana*	200
Blackgum	*Nyssa sylvatica*	100
Common Elderberry	*Sambucus canadensis*	100
Total		12,500

Table 6. Rhapsody Vegetation Plot Mitigation Success Summary

Plot #	Planted Stems/Acre	Volunteer Stems/Acre	Total Stems/Acre	Success Criteria Met?	Average Planted Stem Height (ft)
1	809	1619	2428	Yes	4.6
2	647	1052	1700	Yes	8.3
3	567	202	769	Yes	3.1
4	567	567	1133	Yes	2.8
Project Avg	**647**	**860**	**1507**	**Yes**	**4.8**

Table 7. Rhapsody Stem Count Total and Planted by Plot Species

Rhapsody			Current Plot Data (MY4 2023)												Annual Means													
			100110-01-0001			100110-01-0002			100110-01-0003			100110-01-0004			MY4 (2023)			MY3 (2022)			MY2 (2021)			MY1 (2020)			MY0 (2020)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer rubrum	red maple	Tree												5			5											
Betula nigra	river birch	Tree	2	2	2	4	4	4	1	1	1	2	2	2	9	9	9	9	9	9	9	9	9	11	11	11	18	18	18
Cercis canadensis	eastern redbud	Tree				3	3	3	3	3	3	4	4	4	10	10	10	11	11	11	8	8	8	6	6	6	11	11	11
Cornus amomum	silky dogwood	Shrub	6	6	6				7	7	7				13	13	13	14	14	14	13	13	13	15	15	15	18	18	18
Diospyros virginiana	common persimmon	Tree	2	2	4	1	1	1				2	2	2	5	5	7	8	8	8	6	6	6	7	7	7	8	8	8
Juglans nigra	black walnut	Tree	5	5	5	1	1	1				1	1	1	7	7	7	8	8	8	8	8	8	10	10	10	11	11	11
Liquidambar styraciflua	sweetgum	Tree			22			20						7			49											
Liriodendron tulipifera	tuliptree	Tree	1	1	11	1	1	6	1	1	6	2	2	4	5	5	27	5	5	5	4	4	7	4	4	4	2	2	2
Malus angustifolia	southern crabapple	Tree																			1	1	1	1	1	1	3	3	3
Pinus taeda	loblolly pine	Tree																					10						
Platanus occidentalis	American sycamore	Tree	2	2	8			1							2	2	9	1	1	1	5	5	7	5	5	5	6	6	6
Prunus americana	American plum	Tree																1	1	1	1	1	1	1	1	1	4	4	4
Quercus alba	white oak	Tree							1	1	1				1	1	1	1	1	1	1	1	1				3	3	3
Quercus falcata	southern red oak	Tree										2	2	2	2	2	2	2	2	2	2	2	2	1	1	1	5	5	5
Quercus nigra	water oak	Tree				3	3	3				1	1	1	4	4	4	2	2	2	4	4	4	3	3	3	5	5	5
Quercus palustris	pin oak	Tree				2	2	2							2	2	2	2	2	2	2	2	2	2	2	2	4	4	4
Quercus phellos	willow oak	Tree	1	1	1				1	1	1				2	2	2	1	1	1	1	1	1	2	2	2	7	7	7
Quercus rubra	northern red oak	Tree	1	1	1	1	1	1							2	2	2	5	5	5	5	5	5	6	6	6	6	6	6
Sambucus canadensis	Common Elderberry	Shrub																						1	1	1	1	1	1
		Stem count	20	20	60	16	16	42	14	14	19	14	14	28	64	64	149	70	70	70	70	70	85	75	75	75	112	112	112
		size (ares)	1			1			1			1			4			4			4			4			4		
		size (ACRES)	0.02			0.02			0.02			0.02			0.10			0.10			0.10			0.10			0.10		
		Species count	8	8	9	8	8	10	6	6	6	7	7	9	13	13	15	14	14	14	15	15	16	15	15	15	16	16	16
		Stems per ACRE	809	809	2428	647	647	1700	567	567	769	567	567	1133	647	647	1507	708	708	708	708	708	860	759	759	759	1133	1133	1133

Appendix C

Monitoring Photos

Rhapsody Vegetation Monitoring Plot Photos

Vegetation Plot 1 (11/01/2023)

Vegetation Plot 2 (11/01/2023)

Vegetation Plot 3 (11/01/2023)

Vegetation Plot 4 (11/01/2023)

Rhapsody General Monitoring Photos

Easement signage (11/01/2023)

Easement Signage (7/10/2023)

Foliar treatment of Chinese privet (07/19/2023)

Appendix D

Year 4 Vegetation

Datasheets

Rhapsody

Plot (continued): 100110-01-0001

ID	Species	map char	source	X (m)	Y (m)	Oct 2022 Data ddh (mm)	Oct 2022 Data Height (cm)	Oct 2022 Data DBH (cm)	Notes*	THIS YEAR'S DATA ddh (mm)	THIS YEAR'S DATA Height (cm)	THIS YEAR'S DATA DBH (cm)	THIS YEAR'S DATA Re-sprout	THIS YEAR'S DATA Vigor*	THIS YEAR'S DATA Damage*	THIS YEAR'S DATA Notes

Vegetation Monitoring Data (VMD) Datasheet — **Please fill in any missing data and correct any errors.**

Plot 100110-01-0001

VMD Year (1-5): 4 Date: 11/1/23 - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m)

Longitude or UTM-E:

Coordinate Accuracy (m):

Datum: NAD83/W GS84

UTM Zone:

X-Axis bearing (deg): 90

Plot Dimensions: X: 10 Y: 10 ☐ Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X

Party: HG JS — Role:

Date last planted:

New planting date m/yy?

☐ Check box if plot was not sampled, specify reason below

Notes:

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Oct 2022 Data Height 1cm*	Oct 2022 Data DBH 1 cm	Notes*	THIS YEAR'S DATA Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
1	~~Diospyros virginiana~~ PLUC	v	R	9.5	2.0	50.0		☐	115		☐	3		
3	Juglans nigra	m	R	5.2	0.9	150.0	0.2	☐	190	.9	☐	1		
4	Juglans nigra	o	R	6.2	1.8	90.0		☐	155	.3	☐	1		
5	Juglans nigra	q	R	7.2	2.9	76.0		☐	85		☐	1		
6	Juglans nigra	s	R	8.1	3.7	70.0		☐	90		☐	1		
7	Juglans nigra	u	R	9.1	4.6	130.0	DBH?	☐	170	.6	☐	↓		
9	Cornus amomum	t	R	8.6	8.6	50.0		☐	60		☐			
10	Cornus amomum	r	R	7.7	7.5	65.0		☐	70		☐	3		
11	Cornus amomum	p	R	6.5	6.2	65.0		☐	42		☒	3		
13	Cornus amomum	k	R	4.1	3.8	75.0		☐	60		☒	3		
14	Cornus amomum	i	R	2.8	2.7	65.0		☐	75		☐	3		
15	Cornus amomum	f	R	1.8	1.9	70.0		☐	74		☐	3		
17	Diospyros virginiana	b	R	0.8	4.4	80.0		☐	MISS	SNG	☐			
18	Diospyros virginiana PLUC	e	R	1.6	5.4	145.0	0.1	☐	180	.3	☐	3		
19	Diospyros virginiana	h	R	2.6	6.1	190.0	0.4	☐	260	.7	☐	3		
20	Malus angustifolia	j	R	3.5	7.0	*Missing*		☐	DEA	D	☐			
21	Betula nigra	l	R	4.6	7.8	150.0	0.1	☐	210	.2	☐	3		
22	Betula nigra	n	R	5.6	8.9	170.0	0.3	☐	290	.6	☐	3		
23	Cercis canadensis	g	R	2.0	9.3	40.0		☐	MISSING		☐			
24	Quercus rubra	c	R	1.1	8.6	70.0		☐	98		☐	3		
25	Liriodendron tulipifera	a	R	0.3	7.7	110.0	DBH?	☐	143	.1	☐	3		
345	Platanus occidentalis	d	R	1.5	5.4	300.0	1.2	☐	360	1.5	☐	3		

 # stems: 22

New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes
QUPH				70				

*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.

*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Printed in the CVS-EEP Entry Tool ver. 2.3.1

Plot (continued): 100110-01-0001					Oct 2022 Data			Notes*	THIS YEAR'S DATA						
ID	Species	map char	source	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)		ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Explanation of cut-off & subsampling**:

Height Cut-Off (All stems shorter than this are ignored. If >10cm, explain why to the right.): ☐ 10cm ☐ 50cm ☐ 100cm ☐ 137cm

Species Name	☑ c	SEEDLINGS — HEIGHT CLASSES				SAPLINGS — DBH			TREES — DBH		
		Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5	2.5-	5-	=10 (write DBH)
Divi		—				—					
litU		—				—					
Ploc		—				—					
list		—	5	12	5	—					
		—				—					
		—				—					
		—				—					

**Required if cut-off >10cm or subsample ? 100%.

1 2 3 4 5 6 7 8 9 10

Form WS2, ver 9.1

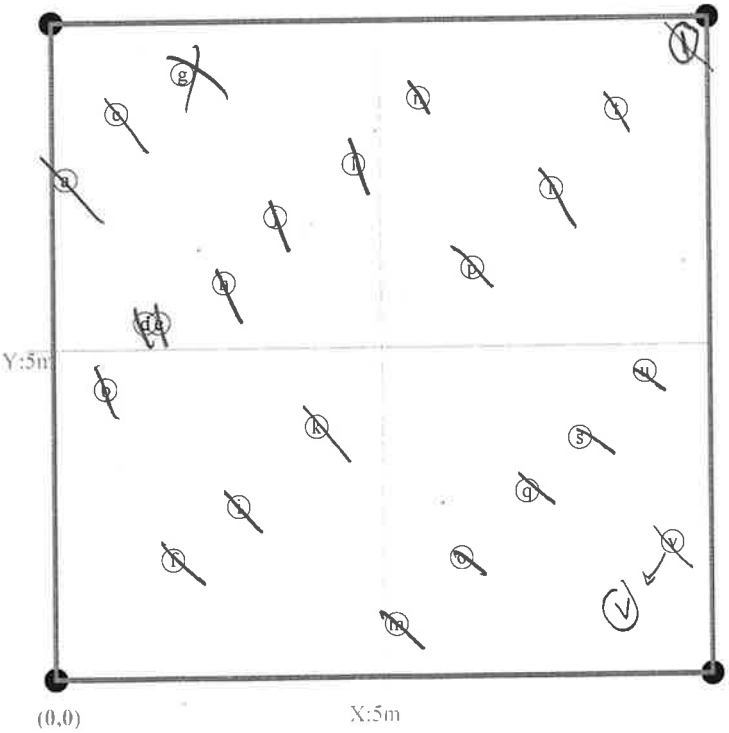
Map of stems on plot 100110-01-0001

X-axis: 90 °

N

 # stems: 22

map size: small



*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.

*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Vegetation Monitoring Data (VMD) Datasheet **Please fill in any missing data and correct any errors.**

Plot 100110-01-0002

VMD Year (1-5): 4 Date: / / - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m)

Longitude or UTM-E:

Coordinate Accuracy (m):

Datum: NAD83/W

UTM Zone:

X-Axis bearing (deg): 200

Plot Dimensions: X: 10 Y: 10 ☐ Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X

Party: Role:

Date last planted:

New planting date m/yy?

☐ Check box if plot was not sampled, specify reason below

Notes:

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Oct 2022 Data Height 1cm*	Oct 2022 Data DBH 1 cm	Notes*	THIS YEAR'S DATA Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
27	Juglans nigra	ⓑ	R	0.4	0.4	130.0	DBH? ☐		200	.8	☐	3		
30	Quercus palustris	ⓔ	R	1.2	3.0	210.0	0.5 ☐		260	.7	☐	1		
31	Diospyros virginiana	ⓐ	R	0.1	4.3	70.0	☐		80		☐			
32	Quercus ~~rubra~~ hi	ⓒ	R	0.4	8.1	180.0	0.3 ☐		260	1.0	☐			
33	Quercus rubra	ⓓ	R	1.0	7.2	90.0	☐		150	.1	☐			
36	Quercus palustris	ⓕ	R	3.5	4.2	170.0	0.3 ☐		230	.8	☐			
37	Cercis canadensis	ⓖ	R	4.3	3.4	210.0	0.8 ☐		230	1.0	☐			
39	Betula nigra	ⓘ	R	6.4	1.8	350.0	1.0 ☐		425	2	☐			
40	Cercis canadensis	ⓛ	R	7.5	1.1	80.0	☐		148	.2	☐			
42	Betula nigra	ⓟ	R	9.6	0.2	400.0	0.9 ☐		420	1.1	☐			
44	Betula nigra	ⓝ	R	8.7	4.3	420.0	1.5 ☐		450	3	☐			
45	Betula nigra	ⓙ	R	6.5	5.3	190.0	0.2 ☐		310	.9	☐			
46	Liriodendron tulipifera	ⓗ	R	5.6	6.2	180.0	0.3 ☐		300	.8	☐			
51	Cercis canadensis	ⓚ	R	6.6	9.1	95.0	☐		100		☐			
52	~~Diospyros virginiana~~ QUni	ⓜ	R	8.1	8.3	140.0	0.2 ☐		250	.9	☐			
53	Quercus nigra	ⓞ	R	9.3	7.5	136.0	DBH? ☐		230	.9	☐	V		

 # stems: 16

New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes

*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing

*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Printed in the CVS-EEP Entry Tool ver. 2.3.1

Plot (continued): 100110-01-0002

ID	Species	map char	source	X (m)	Y (m)	Oct 2022 Data ddh (mm)	Height (cm)	DBH (cm)	Notes*	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Explanation of cut-off & subsampling**:

Height Cut-Off (All stems shorter than this are ignored. If >10cm, explain why to the right.): ☐ 10cm ☐ 50cm ☐ 100cm ☐ 137cm

Species Name	☑ c	SEEDLINGS — HEIGHT CLASSES Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	SAPLINGS — DBH Sub-Sapl	0-1 cm	1-2.5	TREES — DBH 2.5-	5-	=10 (write DBH)
LIST		—	4	9	7	—					
LITU		—	2	3		—					
PLOC		—		1		—					
		—				—					
		—				—					
		—				—					
		—				—					

**Required if cut-off >10cm or subsample ? 100%.

●1 ●2 ●3 ●●4 ●●5 ●●6 ●●7 ●●8 ●●9 ●●10

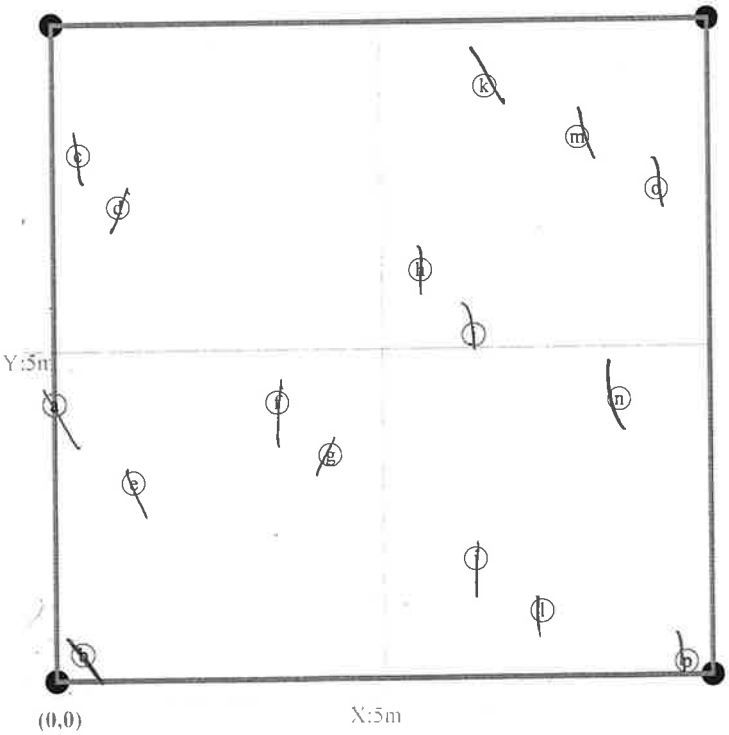
Form WS2, ver 9.1

Map of stems on plot 100110-01-0002

X-axis: 200°

N

 # stems: 16
map size: small



*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.

*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Vegetation Monitoring Data (VMD) Datasheet **Please fill in any missing data and correct any errors.**

Plot 100110-01-0003

VMD Year (1-5): 4 Date: 11/1/23 / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m)

Longitude or UTM-E:

Coordinate Accuracy (m):

Datum: NAD83/W

UTM Zone:

X-Axis bearing (deg): 124

Plot Dimensions: X: 10 Y: 10 ☐ Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X

Party: JS HG Role:

Date last planted:

New planting date m/yy?

☐ Check box if plot was not sampled, specify reason below

Notes:

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Oct 2022 Data Height 1cm*	Oct 2022 Data DBH 1 cm	Notes*	THIS YEAR'S DATA Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
55	Diospyros virginiana	b	R	0.4	0.4	50.0		☐	Missing		☐			
56	Cornus amomum	g	R	3.2	0.6	60.0		☐	75		☐	3		
58	Cornus amomum	c	R	1.1	2.8	80.0		☐	50		☒	3		
59	Cornus amomum	a	R	0.3	3.7	40.0		☐	53		☐	3		
63	Cercis canadensis	e	R	3.1	4.1	50.0		☐	92		☐	3		
66	Quercus nigra	k	R	5.5	1.5	*Missing*		☐	Dead		☐			
68	Cornus amomum	q	R	9.8	0.5	100.0		☐	70		☒	3		
70	Betula nigra	o	R	8.4	1.9	90.0		☐	100		☐	3		
72	~~Cornus amomum~~	n	R	7.0	3.6	80.0		☐	91		☐	3		
73	Cornus amomum	l	R	6.1	4.4	90.0		☐	93		☐	3		
74	Cercis canadensis	j	R	5.3	5.3	40.0		☐	110		☐	3		
75	Cornus amomum	i	R	4.5	6.2	50.0		☐	52		☐	3		
76	Cornus amomum	h	R	3.7	7.0	80.0		☐	missing		☐			
77	Cercis canadensis	f	R	3.0	8.0	110.0	*DBH?*	☐	220	.4	☐	3		
79	Quercus phellos	d	R	1.3	9.7	120.0	*DBH?*	☐	175	.1	☐	3		
85	Quercus alba	p	R	9.4	4.8	90.0		☐	30		☒	3		
437	Liriodendron tulipifera	m	R	6.5	4.0	80.0		☐	125		☐	3		

 # stems: 17

New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes

*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.

*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Plot (continued): 100110-01-0003

ID	Species	map char	source	X (m)	Y (m)	Oct 2022 Data: ddh (mm)	Height (cm)	DBH (cm)	Notes*	THIS YEAR'S DATA: ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Height Cut-Off (All stems shorter than this are ignored. If >10cm, explain why to the right.): ☐ 10cm ☐ 50cm ☐ 100cm ☐ 137cm

Explanation of cut-off & subsampling**:

Species Name	☑ c	SEEDLINGS — HEIGHT CLASSES: Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	SAPLINGS — DBH: Sub-Sapl	0-1 cm	1-2.5	TREES — DBH: 2.5-	5-	=10 (write DBH)
L+V											

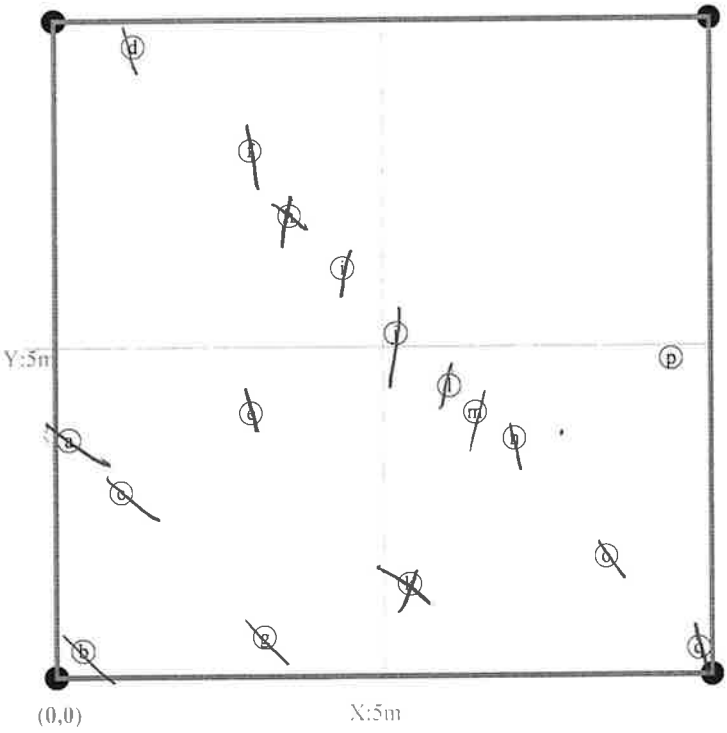
**Required if cut-off >10cm or subsample ? 100%.

Form WS2, ver 9.1

Map of stems on plot 100110-01-0003

X-axis: 124° N

 # stems: 17
map size: small



*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.

*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Vegetation Monitoring Data (VMD) Datasheet **Please fill in any missing data and correct any errors.**

Plot 100110-01-0004

VMD Year (1-5): 4 Date: / / - / /

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: (dec.deg. or m) Datum: NAD83/W

Longitude or UTM-E: UTM Zone:

Coordinate Accuracy (m): X-Axis bearing (deg): 0

Plot Dimensions: X: 10 Y: 10 ☐ Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X

Party: Role:

Date last planted:

New planting date m/yy?

☐ Check box if plot was not sampled, specify reason below

Notes:

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Oct 2022 Data Height 1cm*	Oct 2022 Data DBH 1 cm	Notes*	THIS YEAR'S DATA Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
88	Liriodendron tulipifera	a	R	0.3	3.0	50.0		☐	52		☐	3		
89	Diospyros virginiana	c	R	1.2	2.6	50.0		☐	60		☐	1		
90	Juglans nigra	g	R	2.4	2.1	40.0		☐	48		☐	1		
92	Cercis canadensis	h	R	4.9	1.1	60.0		☐	70		☑	1		
93	Cercis canadensis	k	R	5.9	0.8	35.0		☐	65		☐	1		
95	Quercus rubra	q	R	8.3	0.3	75.0		☐	MK	sing	☐			
97	Quercus nigra	r	R	8.6	3.0	40.0		☐	45		☐	3		
98	Cercis canadensis	o	R	7.4	3.1	120.0	DBH?	☐	190	.2	☐	1		
100	Liriodendron tulipifera	i	R	4.9	3.7	115.0	DBH?	☐	160	.3	☐	1		
103	Betula nigra	d	R	1.2	5.3	90.0		☐	100		☐	1		
104	Betula nigra	b	R	0.3	5.7	60.0		☐	35		☒	1		
106	Quercus falcata	e	R	1.2	8.4	100.0		☐	158	.1	☐	1		
107	~~Prunus americana~~ DiVi	f	R	2.3	7.9	70.0		☐	105		☐	1		
110	Cercis canadensis	m	R	6.4	6.5	*Missing*		☐	Dead		☐			
111	Quercus ~~rubra~~ FA	p	R	7.9	6.1	65.0		☐	90		☐	3		
112	Cercis canadensis	s	R	9.2	5.9	60.0		☐	30		☒	3		
114	Juglans nigra	n	R	7.2	9.2	75.0		☐	missing		☐			
115	Quercus falcata	l	R	6.0	9.6	*Missing*		☐	Dead		☐			
439	Quercus falcata	j	R	5.0	9.9	60.0		☐	missing		☐			

 # stems: 19

New Stems, not included last year, but are obviously planted. If more space needed, use blank PWS (Planted Woody Stems) Form:

Species Name	Source*	X (m)	Y (m)	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes

*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.

*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Plot (continued): 100110-01-0004

ID	Species	map char	source	X (m)	Y (m)	Oct 2022 Data ddh (mm)	Height (cm)	DBH (cm)	Notes*	THIS YEAR'S DATA ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes

Natural Woody Stems - tallied by species

Explanation of cut-off & subsampling**:

Height Cut-Off (All stems shorter than this are ignored. If >10cm, explain why to the right.): ☐ 10cm ☐ 50cm ☐ 100cm ☐ 137cm

Species Name	☑ c	SEEDLINGS — HEIGHT CLASSES: Sub-Seed	10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	SAPLINGS — DBH: Sub-Sapl	0-1 cm	1-2.5	TREES — DBH: 2.5-	5-	=10 (write DBH)
L;tU		___	1			___					
GCRV		___	5			___					
L;St		___	2	5		___					
		___				___					
		___				___					
		___				___					
		___				___					

**Required if cut-off >10cm or subsample ? 100%.

Form WS2, ver 9.1

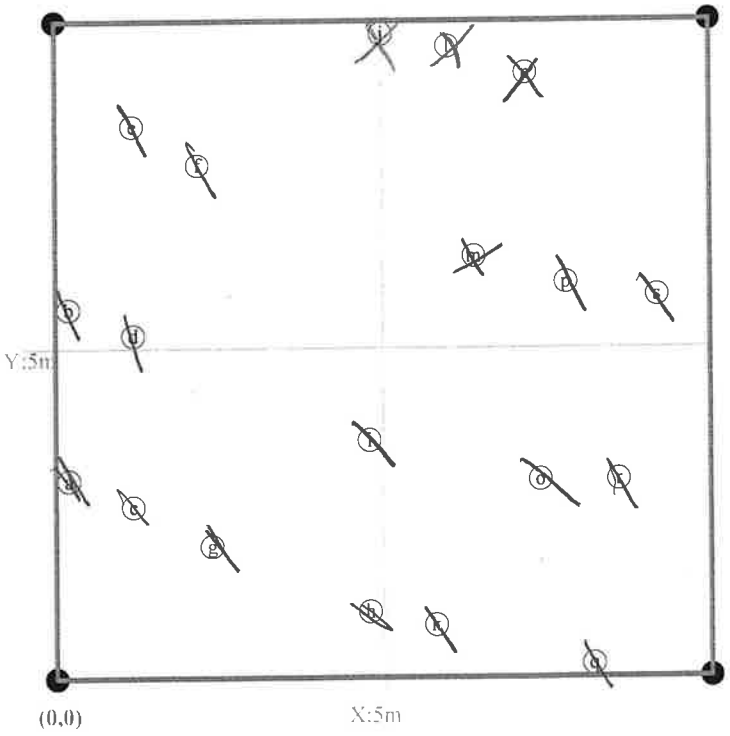
Map of stems on plot 100110-01-0004

X-axis: 0°

 # stems: 19

map size: small

N



*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown

*VIGOR: 4=excellent, 3=good, 2=fair, 1=unlikely to survive year, 0=dead, M=missing.

*DAMAGE: REMoval, CUT, MOWing, BEAVer, DEER, RODents, INSects, GAME, LIVESTock, Other/Unknown ANIMal, Human TRAMpled, Site Too WET, Site Too DRY, FLOOD, DROUght, STORM, HURRicane, DISeased, VINE Strangulation, UNKNown, specify other.

*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Printed in the CVS-EEP Entry Tool ver. 2.3.1