

WELLS CREEK #2 -- NCEEP Project #92688
2013 Monitoring Report: MY-3
Alamance County NC – CAPE FEAR 03030002

Conducted for the NC Department of Environment and Natural Resources,
North Carolina Ecosystem Enhancement Program (NC-EEP)



Final Report Submitted **November 18, 2013** to:



North Carolina Department of Environment
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Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Robert J Goldstein & Associates, Inc. --- RJG&A Environmental Consultants

WELLS CREEK #2 -- NCEEP Project #92688
2013 MONITORING REPORT – YEAR 3

CONDUCTED FOR THE NC DEPARTMENT OF ENVIRONMENT AND NATURAL
RESOURCES, ECOSYSTEM ENHANCEMENT PROGRAM

Table of Contents

1.0	Executive Summary	1
1.1.	Project Description.....	1
1.2.	Goals & Objectives	1
1.3.	Vegetation Condition.....	1
1.4.	Stream Channel Condition.....	2
1.5.	Easement Integrity	2
1.6.	Summary Data	3
2.0	Methodology	3
2.1.	Stream Methodology.....	3
2.2.	Vegetation Methodology	4
3.0	References.....	4

APPENDICES

Appendix A.	Project Vicinity Map and Background Tables
Figure 1	Project Vicinity Map and Directions
Table 1A-B	Project Restoration Components
Table 2	Project Activity and Reporting History
Table 3	Project Contacts Table
Table 4	Project Attribute Table
Appendix B.	Visual Assessment Data
Figure 2.1-2.2	Current Conditions Plan View
Table 5	Vegetation Condition Assessment Table
Figures 3.1-3.8	Permanent Photopoints
Figure 4.	Vegetation Monitoring Plot Photos
Appendix C.	Vegetation Plot Data
Table 6.	Vegetation Plot Mitigation Success Summary Table
Table 7.	Stem Count Total and Planted by Plot and Species
e-Tables	Raw CVS vegetation data sheets

1.0 Executive Summary

1.1. Project Description

Wells Creek #2 (NC Ecosystem Enhancement Program # 92688) is a stream mitigation project located near Snow Camp in southwestern Alamance County, North Carolina (Figure 1.0). Wells Creek is a tributary to Cane Creek which flows east into the Haw River in Cape Fear River Basin 14-digit HUC #03030002-050050. NCEEP identified this HUC as a Targeted Local Watershed in the 2009 Cape Fear River Basin Restoration Priority report.

Wells Creek #2 consists of two separate parcels: 1) The Northern (Enhancement) Reach is located along Wells Creek upstream and downstream of Carl Noah Road and along tributary UT3. The Southern (Preservation) Reach is located along Wells Creek tributaries UT1 and UT2 downstream of Longest Acres Road, 4000 feet southwest of the Enhancement Reach. The stream segments immediately downstream of each project reach along Wells Creek and UT1 were previously restored (NCEEP project #414, Wells Creek). Tributary UT1 flows into Wells Creek approximately 2,000 feet downstream of the Preservation Reach, just north of Beale Road.

Fencing was installed along both the Enhancement Reach and Preservation Reach to exclude hogs and cattle, and both reaches received herbicide treatments between August 2010 and May 2011 to control invasive exotic plants. The Enhancement Reach also received tree and shrub plantings in non-forested (former pasture) areas along Wells Creek south of Carl Noah Rd, and understory shrubs were planted beneath the forest canopy along UT3 where livestock had destroyed the understory. Planting was done between November 2010 and April 2011. This project does not include any direct stream channel improvement work.

1.2. Goals & Objectives

The goals of the Wells Creek #2 project are to improve water quality and restore riparian habitat. To achieve these goals, the project has the following objectives:

- Reduce direct nutrient loading and fecal coliform inputs into the streams by fencing out cattle and hogs and providing an alternative livestock water system;
- Reduce excess sedimentation into the streams by eliminating livestock impacts from hoof shear to forest floor and stream banks;
- Reestablish and enhance native forested buffers by planting native plants, removing invasive exotic vegetation, and preventing future negative impacts within the buffer;
- Increase surface runoff infiltration and non-point pollutant removal through the buffer;
- Preserve existing natural, well-established riparian plant communities.

1.3. Vegetation Condition

CVS Plots: Two vegetation monitoring plots (20m x 5m) were established in April 2011 and resampled in September 2011, September 2012 and October 2013. The two plots contained 15

and 12 live planted woody stems in 2013, with an average density of 546 planted stems per acre, a decrease of 7% from 2012. Both plots exceed the MY3 planted stem density success criterion of 320 stems per acre for stream enhancement. Native volunteer woody seedlings are abundant in both plots, and average density of planted plus native volunteer stems was 1760 stems per acre in 2013.

Enhancement Areas Beyond CVS Plots: Based on visual assessment of the former pasture areas along Wells Creek outside of the CVS plots, planted woody stem survival and native volunteer recruitment appears to be good throughout the easement area, despite dense growth of tall grasses and herbaceous weeds, including both native and exotic species. Visual assessment of the understory enhancement area along UT3 revealed good to fair survival and slow growth of the planted shrubs. Some of the shrubs reported as having stunted leaves in 2012 have died, but the survivors (mainly buckeye, pawpaw, and spicebush) now appear to be growing normally, with normal-sized leaves. Some also appeared to have deer browsing damage. Invasive *Microstegium* grass is abundant along UT3 especially near the head and near the confluence with Wells Creek (photo-points 8 to 11 and 14). Numerous green ash and sweetgum volunteer seedlings are also becoming prominent in this area.

Invasive Species: The Enhancement Reach and Preservation Reach were treated in 2010-2011 for invasive species, including multiflora rose (*Rosa multiflora*), tree of heaven (*Ailanthus altissima*), Chinese privet (*Ligustrum sinense*), and Japanese honeysuckle (*Lonicera japonica*). Most appear to have been killed or substantially reduced, but some resprouting patches noted in 2012 and spring 2013 are growing and may need further treatment. Most are under forest canopy and pose minimal threat to established trees, but some patches of rose and privet at the southern end of the Preservation Reach (adjacent to the Wells Cr #1 restoration project) and along the powerline right-of-way north of Carl Noah Rd (Enhancement Reach) are overgrowing small trees. The more prominent patches are mapped in the CCPV figures.

1.4. Stream Channel Condition

Based on the permanent photopoints and overall visual assessment in 2013, there are no new areas of channel instability in the project area. The lower portion of UT3 near its confluence with Wells Creek (near photopoint 8) remains incised with steep and sparsely wooded banks, similar to its pre-project condition. The livestock exclusion fence is close to the north (left) bank of UT3, which limits the potential for woody vegetation recovery along this bank segment.

1.5. Easement Integrity

Wells Creek Main Stem: At the two cattle crossings on the Wells Creek Enhancement Reach, south of Carl Noah Rd, the fencing wire is disengaged from the fence posts in some areas, as noted in the 2012 and spring 2013 reports. Cattle were present in the adjacent pasture, but were excluded from the conservation easement by a temporary portable electric fence. No livestock encroachment or damage inside the conservation area along the main stem of Wells Creek was evident. The segment north of Carl Noah Rd has no fencing and no adjacent pasture.

Wells Creek UT3: The September 2011 monitoring report noted livestock encroachment (hog wallows and paths) in areas along tributary UT3 (Enhancement Reach) that hogs had used prior to fencing, and which were still accessible to small hogs that could get under the fence. The hogs were subsequently removed from the adjacent pastures, which are now used for cattle only. During the spring 2013 assessment we noted cattle hoof prints and dung (apparently a few months old) just inside the fence south of UT3, but no detectable cattle damage to trees or shrubs within the easement. No break in the fence or obvious point of entry was found. Three dead calves had been left inside the fence to decay, near the lower end of UT3 about 50 feet from the stream bank. In October 2013 there was no further evidence of livestock encroachment, no new carcasses placed in the easement, and the easement fence remains intact.

Wells Creek UT1 & UT2 (Preservation Reach): Livestock exclusion fencing along the northeast and southeast boundaries of the Preservation Reach appears to be intact in October 2013, and no livestock encroachment or damage inside the conservation area was evident. A gap under the fence is present where it crosses UT-2, but the existing fence appears adequate to exclude cattle. The fence segment previously broken by a fallen tree (noted in the spring 2013 assessment) has been repaired. There is no fence along the roadside (Longest Acres Rd) or along the southwest easement boundary, which is bordered by forest.

1.6. Summary Data

Summary information, data and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 Methodology

Monitoring methodologies follow the current EEP-provided templates and guidelines (Lee *et al* 2008) including Level 2 Protocol sampling in the CVS vegetation plots. Photographs were taken digitally. A Trimble Geo XT handheld mapping-grade unit was used to collect vegetation corner, photopoint, and problem area locations. Problem areas identified in the 2012 and spring 2013 assessments were re-evaluated.

2.1. Stream Methodology

As outlined in the 2010 Existing Conditions Report, the Preservation Reach (southern reach) consists of two unnamed tributaries to Wells Creek. UT1 is a perennial stream with a rocky substrate. Channel width ranges from eight to 12 feet; overall channel morphology is stable. UT2 is a five-foot wide intermittent stream that is slightly incised. At the Enhancement Reach (northern reach), Wells Creek is an eight to 15 foot-wide perennial stream with a rocky substrate and some areas of channel instability. UT3 is an intermittent stream with eroding banks due to livestock damage. Photos in the Existing Conditions Report and Figures 3.0-3.7 in this report depict typical channel morphology.

This project does not include direct stream channel improvement work or stream geomorphology data collection. Success of stream enhancement level II reaches will rely on using fixed photopoints to evaluate stream stability and the absence of further channel degradation. Photos taken during data collection for the Existing Conditions Report will serve as baseline photos. Based on available data, no new areas of channel instability were identified during the spring or fall 2013 site visits.

2.2. Vegetation Methodology

Two representative vegetation survey plots were selected and installed along Wells Creek in April 2011. Each plots measures five meters by 20 meters and is 100 square meters in area. Pursuant to the guidelines, the four corners of each plot are marked with metal pipe.

Level 1 (planted woody stems) and Level 2 (volunteer woody stems) data collection was performed in all plots, pursuant to the most recent CVS/EEP protocol (Lee *et al* 2008). Within each plot, each planted woody stem location (x and y) was recorded, and height and live stem diameter were recorded for each stem location. All planted stems were marked with pink flagging. Vegetation was identified using Radford (1968) and Weakley (2011). Photos were taken of each vegetation plot from the 0,0 corner.

3.0 References

Lee, Michael T., Peet, Robert K., Roberts, Steven D., Wentworth, Thomas R. (2008). *CVS-EEP Protocol for Recording Vegetation Version 4.2*. Retrieved September 2011, from: <http://www.nceep.net/business/monitoring/veg/datasheets.htm>.

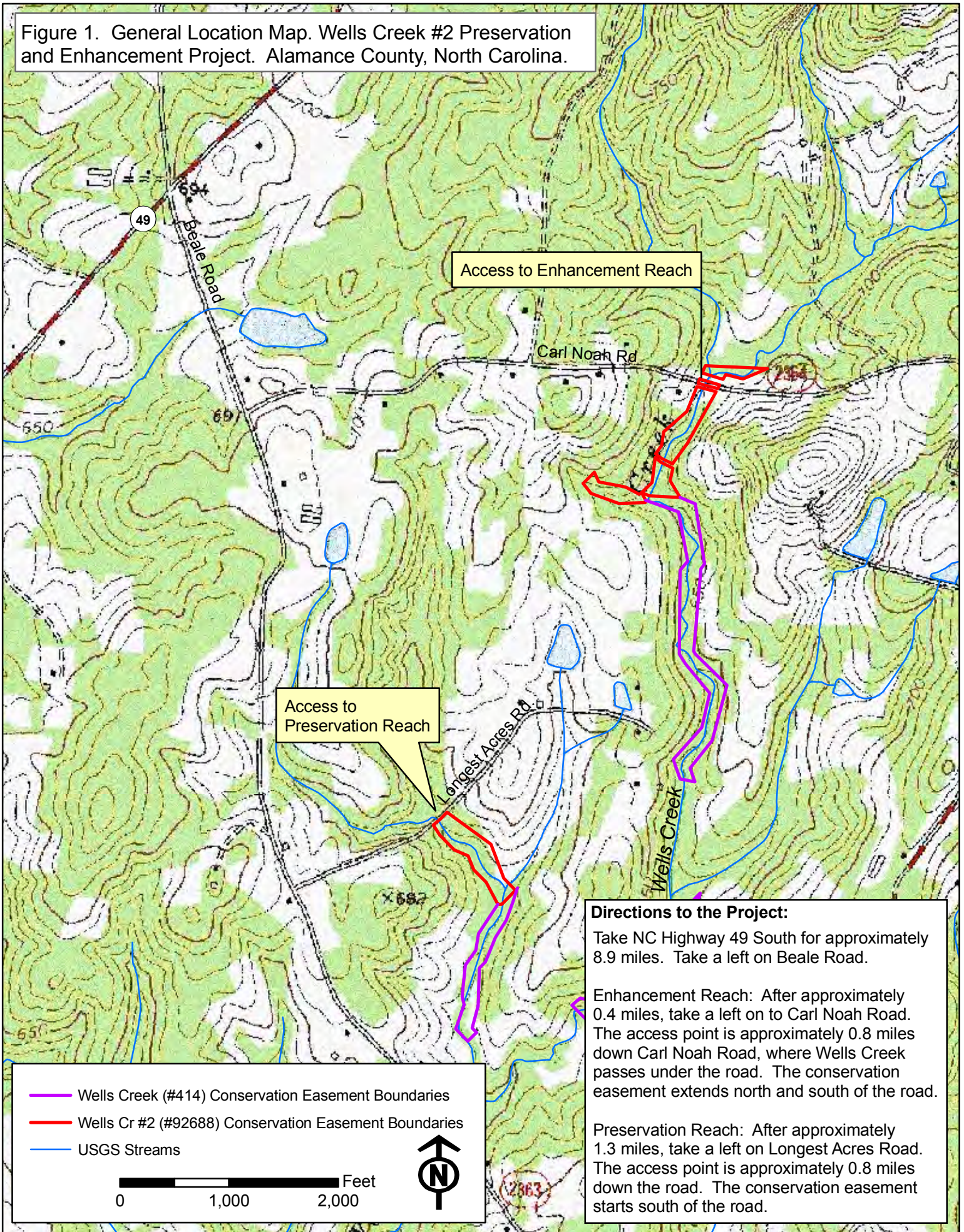
Radford, A.E., H.E. Ahles, and C.R. Bell (1968). *Manual of the Vascular Flora of the Carolinas*. University of North Carolina Press. Chapel Hill, NC.

Weakley, Alan (2011). *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas*. Downloaded in December 2011 from: <http://www.herbarium.unc.edu/flora.htm>.

Appendix A. Project Vicinity Map and Background Tables

- Figure 1. Project Vicinity Map and Directions
- Table 1A-B Project Restoration Components
- Table 2. Project Activity and Reporting History
- Table 3. Project Contacts Table
- Table 4. Project Attributes Table

Figure 1. General Location Map. Wells Creek #2 Preservation and Enhancement Project. Alamance County, North Carolina.



**Table 1A. Project Components
Wells Creek #2 (EEP #92688)**

Project Component or Reach ID	Existing Length (ft)	Restoration Level	Approach	Mitigation Length (ft)	Stationing⁺	Mitigation Ratio	Stream Mitigation Units	BMP Elements¹	Comment
Wells Creek - Preservation	438	P	n/a	438	00+00 to 04+38	5:1	87	Cattle fencing & watering	Invasive vegetation treatment, riparian buffer plantings
Wells Creek - Enhancement	1321	E2	n/a	1253*	04+98 to 18+19	2.5:1	501	Cattle fencing & watering	Invasive vegetation treatment, riparian buffer plantings
UT 3 - Enhancement	644	E2	n/a	644	00+00 to 06+44	2.5:1	258	Cattle fencing & watering	Invasive vegetation treatment, riparian buffer plantings
UT1 - Preservation	1130	P	n/a	1130	00+00 to 11+30	5:1	226	Cattle fencing	Invasive vegetation treatment
UT2 - Preservation	48	P	n/a	48	00+00 to 00+48	5:1	10	Cattle fencing	Invasive vegetation treatment

¹ = BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; Grassed Swale = S; LS = Level Spreader; NI = Natural Infiltration Area, O = Other
CF = Cattle Fencing; WS = Watering System; CH = Livestock Housing

⁺ Stationing is estimated based on stream length measurements in ArcGIS. Measured upstream to downstream for each reach.

* Wells Creek enhancement reach mitigation length does not include two cattle crossings or road crossing at Carl Noah Road.

Table 1B. Component Summations

Wells Creek #2 (EEP #92688)

Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Mitigation Length (ft) (Ac)	Stationing ⁺ (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration							
Enhancement							
Enhancement I							
Enhancement II	1897						
Creation							
Preservation	1616						
HQ Preservation							
	3513						
MU Totals	1082						

Non-Applicable

**Table 2. Project Activity and Reporting History
Wells Creek #2 (#92688) - Monitoring Year 3 (2013)**

Elapsed Time Since Grading Complete: n/a

Elapsed Time Since Planting Complete: 35 months

Number of Reporting Years¹: 3

Activity or Deliverable	Data Collection Complete	Completion or Delivery
Conservation Easement Option Signed	n/a	May 12, 2008
Conservation Easement Survey Plat Recorded	n/a	October 8, 2008
Permanent Conservation Easement Executed & Recorded	n/a	December 31, 2008
Cattle Exclusion Fencing & Livestock Watering System	n/a	December 2009
Existing Conditions Report	January 2010	March 2010
Final Design – Construction Plans	January 2010	April 2010
Containerized plant installations*	n/a	November 2010
Invasive Exotic Vegetation Treatments	January 2010	December 2010
Baseline Monitoring/As-built Baseline Report (Year 0 - baseline)	May 2011	June 2011
Monitoring Year 1 Report	September 2011	September 2011
Monitoring Year 2 Report	September 2012	March 2013
Monitoring Year 3 Report	October 2013	November 2013

* *Saururus cernuus* and *Lobelia cardinalis* planted within UT3 wetland seep in May 2011.

Table 3. Project Contacts

Wells Creek #2 (#92688) - Monitoring Year 3 (2013)

Designer	Robert J. Goldstein & Associates 1221 Corporation Parkway, suite 100 Raleigh, NC 27610 Design POC - Gerald Pottern, Sean Doig, (919) 872-1174
Farm BMPs Design	Alamance County SWCD Burlington NC POC - Phil Ross, (336) 228-1753
Planting / Invasives Contractor	Habitat Assessment and Restoration Program 301 McCullough Drive, 4 th Floor Charlotte, NC 28262 POC - Karri Blackmon, (704) 841-2841
Nursery Stock Suppliers	Cure Nursery, 919-542-6186 Parks Seed, 800-845-3369 Coastal Plain Conservation Nursery, 252-482-5707 Habitat And Restoration Plants (HARP), 704-841-2841
Monitoring Firm	Robert J. Goldstein & Associates 1221 Corporation Parkway, suite 100 Raleigh, NC 27610 Monitoring POC - Gerald Pottern, (919) 872-1174

**Table 4. Project Attributes
Wells Creek #2 -- EEP#92688**

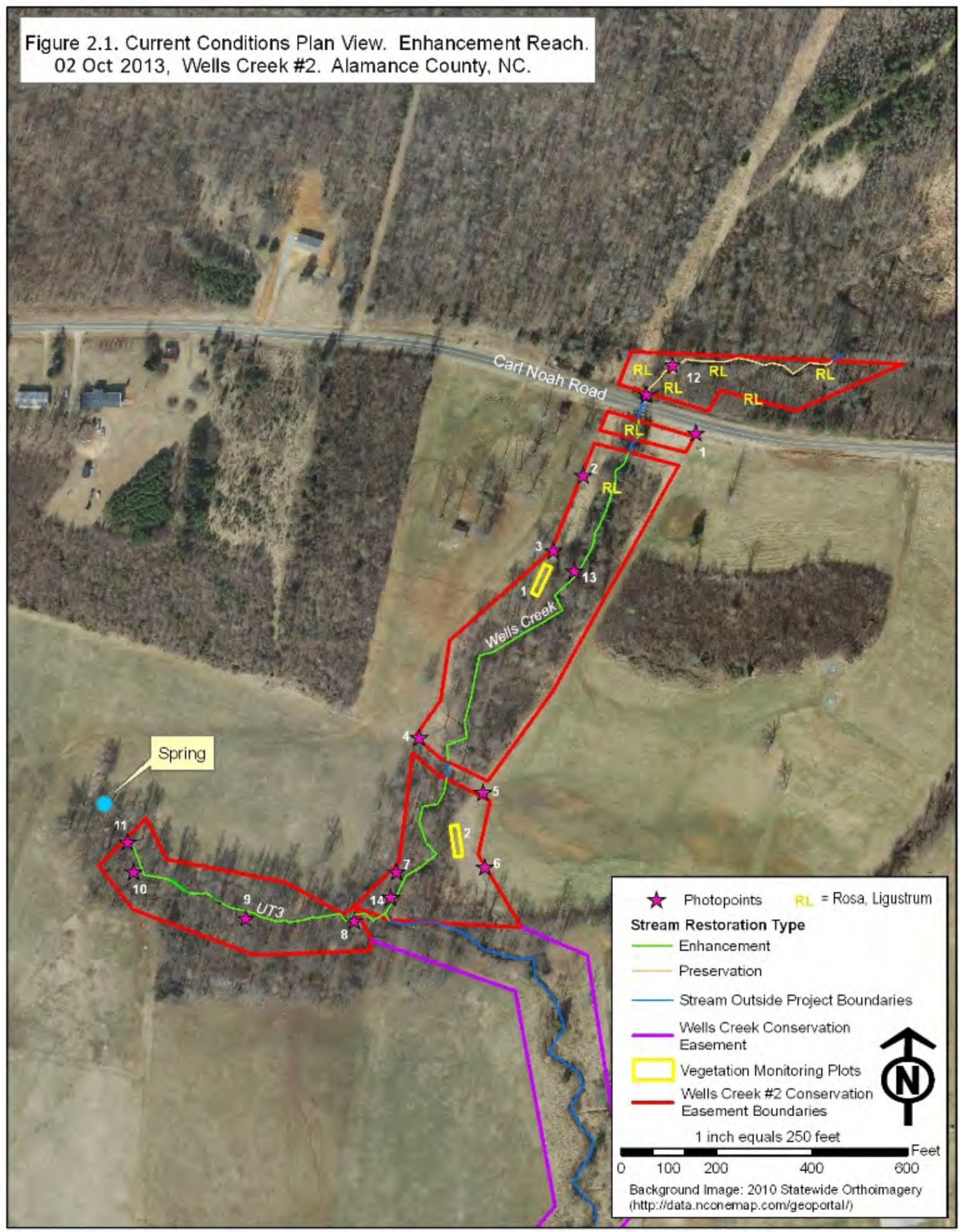
Project County	Alamance	
Physiographic Region	Piedmont	
Ecoregion	Carolina Slate Belt	
Project River Basin	Cape Fear	
USGS HUC for Project (14 digit)	3030002-050050	
NCDWQ Sub-basin for Project	Cape Fear 03-06-04	
Within extent of EEP Watershed Plan?	2009 Cape Fear River Basin Restoration Priority Report	
WRC Hab Class (Warm, Cool, Cold)	Warm	
% of project easement fenced or demarcated	100%	
Beaver activity observed during design phase?	No	
Restoration Component Attribute Table		
	Preservation	Enhancement
Drainage area	377 acres	958 acres
Stream order	1	1
Restored length (feet)	n/a	n/a
Perennial or Intermittent	Perennial	Intermittent/Perennial
Watershed type (Rural, Urban, Developing etc.)	Rural	Rural
Watershed LULC Distribution (e.g.)		
Residential	4	4
Ag-Row Crop	2	0
Ag-Livestock	57	21
Forested	28	73
Etc.	9	2
Watershed impervious cover (%)	2	2
NCDWQ AU/Index number	16-28-1	16-28-1
NCDWQ classification	C-NSW	C-NSW
303d listed?	No	No
Upstream of a 303d listed segment?	No	No
Reasons for 303d listing or stressor	n'a	n/a
Total acreage of easement	4.62	7.52
Total vegetated acreage within the easement	4.62	6.07
Total planted acreage as part of the restoration	0	2.99 (including areas with existing overstory)
Rosgen classification of pre-existing	n/a	n/a
Rosgen classification of As-built	n/a	n/a
Valley type	n/a	n/a
Valley slope	n/a	n'a
Valley side slope range (e.g. 2-3.%)	n/a	n/a
Valley toe slope range (e.g. 2-3.%)	n/a	n/a
Cowardin classification	n/a	n/a
Trout waters designation	n/a	n/a
Species of concern, endangered etc.? (Y/N)	N	N
Dominant soil series and characteristics		
Series	Colfax	Colfax
Depth	65	65
Clay%	19	19
K	0.17	0.17
T	4	4

Use N/A for items that may not apply. Use "--" for items that are unavailable and "U" for items that are unknown

Appendix B. Visual Assessment Data

Figure 2.1.-2.2	Current Conditions Plan View
Table 5.	Vegetation Condition Assessment
Figure 3.1-3.8	Permanent Stream Photopoints
Figure 4.	Vegetation Monitoring Plot Photos

Figure 2.1. Current Conditions Plan View. Enhancement Reach.
 02 Oct 2013, Wells Creek #2. Alamance County, NC.



- ★ Photopoints
- RL = Rosa, Ligustrum

Stream Restoration Type

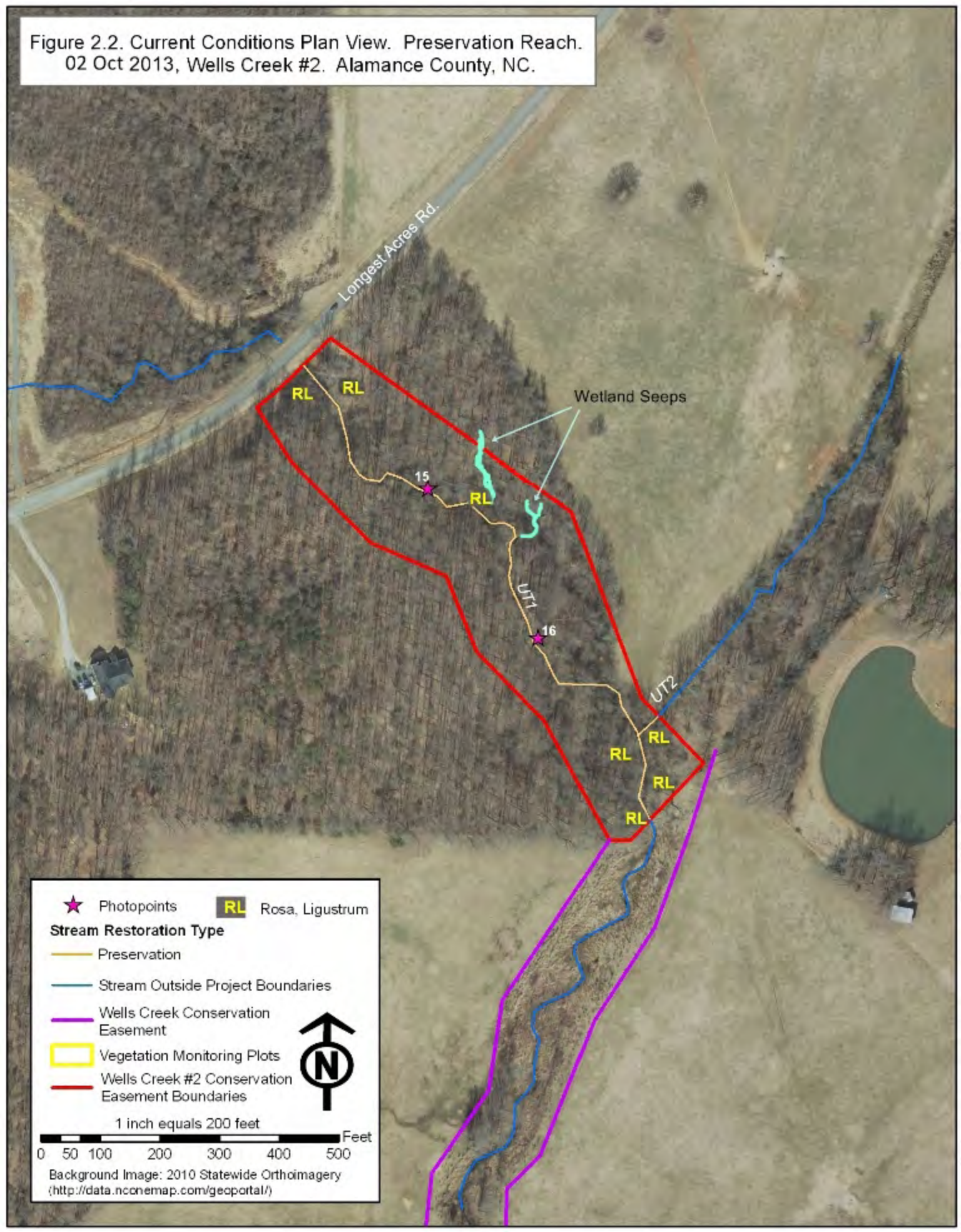
- Enhancement
- Preservation
- Stream Outside Project Boundaries
- Wells Creek Conservation Easement
- ▭ Vegetation Monitoring Plots
- Wells Creek #2 Conservation Easement Boundaries

1 inch equals 250 feet

0 100 200 400 600 Feet

Background Image: 2010 Statewide Orthoimagery
 (<http://data.nconemap.com/geoportals/>)

Figure 2.2. Current Conditions Plan View. Preservation Reach.
 02 Oct 2013, Wells Creek #2. Alamance County, NC.



★ Photopoints **RL** Rosa, Ligustrum

Stream Restoration Type

- Preservation
- Stream Outside Project Boundaries
- Wells Creek Conservation Easement
- Vegetation Monitoring Plots
- Wells Creek #2 Conservation Easement Boundaries

1 inch equals 200 feet

0 50 100 200 300 400 500 Feet

Background Image: 2010 Statewide Orthoimagery
 (<http://data.nccnemap.com/geportal/>)

Table 5. Vegetation Assessment - Wells Creek #2 (#92688) - Monitoring Year 3 (2013)

Planted Acreage¹ 3.04

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

Easement Acreage² 12.14

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern ⁴	Areas or <u>points</u> (if too small to render as polygons at map scale). "RL" on ccpv	1000 SF	Pattern and Color	~30 clumps	0.02	0.2%
5. Easement Encroachment Areas ³	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

1 = Enter the planted acreage within the easement. This number is calculated as the easement acreage minus any existing mature tree stands that were not subject to supplemental planting of the understory, the channel acreage, crossings or any other elements not directly planted as part of the project effort.

2 = The acreage within the easement boundaries.

3 = Encroachment may occur within or outside of planted areas and will therefore be calculated against the overall easement acreage. In the event a polygon is cataloged into items 1, 2 or 3 in the table and is the result of encroachment, the associated acreage should be tallied in the relevant item (i.e., item 1, 2 or 3) as well as a parallel tally in item 5.

4 = Invasives may occur in or out of planted areas, but still within the easement and will therefore be calculated against the overall easement acreage. Invasives of concern/interest are listed below. The list of high concern species are those with the potential to directly outcompete native, young, woody stems in the short-term (e.g. monitoring period or shortly thereafter) or affect the community structure for existing, more established tree/shrub stands over timeframes that are slightly longer (e.g. 1-2 decades). The low/moderate concern group are those species that generally do not have this capacity over the timeframes discussed and therefore are not expected to be mapped with regularity, but can be mapped, if in the judgement of the observer their coverage, density or distribution is suppressing the viability, density, or growth of planted woody stems. Decisions as to whether remediation will be needed are based on the integration of risk factors by EEP such as species present, their coverage, distribution relative to native biomass, and the practicality of treatment. For example, even modest amounts of Kudzu or Japanese Knotweed early in the projects history will warrant control, but potentially large coverages of Microstegium in the herb layer will not likely trigger control because of the limited capacities to impact tree/shrub layers within the timeframes discussed and the potential impacts of treating extensive amounts of ground cover. Those species with the "watch list" designation in gray shade are of interest as well, but have yet to be observed across the state with any frequency. Those in *red italics* are of particular interest given their extreme risk/threat level for mapping as points where isolated specimens are found, particularly early in a projects monitoring history. However, areas of discreet, dense patches will of course be mapped as polygons. The symbology scheme below was one that was found to be helpful for symbolizing invasives polygons, particularly for situations where the condition for an area is somewhere between isolated specimens and dense, discreet patches. In any case, the point or polygon/area feature can be symbolized to describe things like high or low concern and species can be listed as a map inset, in legend items if the number of species are limited or in the narrative section of the executive summary.

Figure 3.1. Permanent Photo Points - Wells Creek #2 - Monitoring Year 3 (2013) - Project #92688



PP #1 – Looking S from Carl Noah Rd, E of Wells Cr (09/16/09)



PP #1 – Looking S from Carl Noah Rd, E of Wells Cr (10/02/13)



PP #2 – Looking S along easement, W of Wells Cr (09/16/09)



PP #2 – Looking S along easement, W of Wells Cr (10/02/13)

Figure 3.2. Permanent Photo Points - Wells Creek #2 - Monitoring Year 3 (2013) - Project #92688



PP #3 – Looking SW along easement, W of Wells Cr (09/16/09)



PP #3 – Looking SW along easement, W of Wells Cr (10/02/13)



PP #4 – Looking East from easement toward Wells Cr (09/16/09)



PP #4 – Looking East from easement toward Wells Cr (10/02/13)

Figure 3.3. Permanent Photo Points - Wells Creek #2 - Monitoring Year 3 (2013) - Project #92688



PP #5 – Looking south along easement, E of Wells Cr (09/16/09)



PP #5 – Looking south along easement, E of Wells Cr (10/02/13)



PP #6 – Looking south from easement toward Wells Cr (09/16/09)



PP #6 – Looking south from easement toward Wells Cr (10/12/13)

Figure 3.4. Permanent Photo Points - Wells Creek #2 - Monitoring Year 3 (2013) - Project #92688



PP #7 – Looking South beside RBK Wells Cr (09/16/09)



PP #7 – Looking South beside RBK Wells Cr (10/12/13)



PP #8 – Looking up UT3 from lower end (09/16/09)



PP #8 – Looking up UT3 from lower end (10/02/13)

Figure 3.5. Permanent Photo Points - Wells Creek #2 - Monitoring Year 3 (2013) - Project #92688



PP #9 – Looking downstream (east) along UT3 (09/16/09)



PP #9 – Looking downstream (east) along UT3 (10/02/13)



PP #10 – Looking across trampled banks, upper UT3 (09/16/09)



PP #10 – Looking across trampled banks, upper UT3 (10/02/13)

Figure 3.6. Permanent Photo Points - Wells Creek #2 - Monitoring Year 3 (2013) - Project #92688



PP #11 – Looking downstream from UT3 Head (09/16/09)



PP #11 – Looking downstream from UT3 Head (10/02/13)



PP #12 – Wells Cr north of Carl Noah Rd, looking upstr (01/03/10)



PP #12 – Wells Cr north of Carl Noah Rd, looking upstr (10/02/13)

Figure 3.7. Permanent Photo Points - Wells Creek #2 - Monitoring Year 3 (2013) - Project #92688



PP #13 – Wells Creek South of Carl Noah Road (01/03/10)



PP #13 – Wells Creek South of Carl Noah Road (10/02/13)



PP #14 – Confluence of Wells Creek and UT3 (09/16/09)



PP #14 – Confluence of Wells Creek and UT3 (10/02/13)

Figure 3.8. Permanent Photo Points - Wells Creek #2 - Monitoring Year 3 (2013) - Project #92688



PP #15 – UT#1 Preservation Reach (01/03/10)



PP #15 – UT#1 Preservation Reach (10/02/13)



PP #16 – UT1 Preservation Reach (01/03/10)



PP #16 – UT1 Preservation Reach (10/02/13)

Figure 4. Vegetation Plot Photos - Wells Creek #2 - Monitoring Year 3 (2013) - Project #92688



VP 1 (April 27, 2011)



VP 1 (October 02, 2013)



VP 2 (April 27, 2011)



VP 2 (October 02, 2013)

Appendix C. Vegetation Plot Data

Table 6.	CVS Vegetation Plot Mitigation Success Summary
Table 7.	CVS Stem Counts, Total and Planted by Species, Plot and Year
e-Tables	Raw CVS Vegetation Data Sheets

Table 6. Vegetation Plot Mitigation Success Summary

Wells Creek #2 (#92688)
Year 3 (2013)
 Vegetation Plot Summary Information

Plot #	Riparian Buffer Stems ¹	Stream/Wetland Stems ²	Live Stakes	Invasives	Volunteers ³	Total ⁴	Unknown Growth Form
0001	n/a	15	0	0	25	40	0
0002	n/a	12	0	0	35	47	0

Wetland/Stream Vegetation Totals
 (per acre)

Plot #	Stream/Wetland Stems ²	Volunteers ³	Total ⁴	Success Criteria Met?
0001	607	1012	1619	Yes
0002	486	1416	1902	Yes
Project Avg	546	1214	1760	Yes

Riparian Buffer Vegetation Totals
 (per acre)

Plot #	Riparian Buffer Stems ¹	Success Criteria Met?
0001	n/a	
0002	n/a	
Project Avg	n/a	

Stem Class characteristics

¹Buffer

Stems Native planted hardwood trees. Does NOT include shrubs. No pines. No vines.

²Stream/Wetland

Stems Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines

³Volunteers Native woody stems. Not planted. No vines.

⁴Total Planted + volunteer native woody stems. Includes live stakes. Excl. exotics. Excl. vines.

Color for Density

Exceeds requirements by 10%

Exceeds requirements, but by less than 10%

Fails to meet requirements, by less than 10%

Fails to meet requirements by more than 10%

Table 7. CVS Stem Counts, Total and Planted Stems by Plot and Species
EEP Project Code 92688. Project Name: Wells Creek #2

Scientific Name	Common Name	Species Type	Current Plot Data (MY3 2013)						Annual Means											
			E92688-SD-0001			E92688-SD-0002			MY3 (2013)			MY2 (2012)			MY1 (2011)			MY0 (2011)		
			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																	1.00	
Alnus serrulata	hazel alder	Shrub	3.00	3.00	3.00				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
Baccharis halimifolia	eastern baccharis	Shrub			1.00			1.00			2.00			2.00			1.00		1.00	
Carpinus caroliniana	American hornbeam	Tree	1.00	1.00	1.00			5.00	1.00	1.00	6.00	1.00	1.00	6.00					7.00	
Carya alba	mockernut hickory	Tree						5.00			5.00			5.00						
Carya cordiformis	bitternut hickory	Tree														5.00			6.00	
Celtis laevigata	sugarberry	Tree												1.00	1.00	1.00	1.00	1.00	1.00	
Diospyros virginiana	common persimmon	Tree				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00				1.00	1.00	
Fraxinus	ash	Tree														2.00			2.00	
Fraxinus pennsylvanica	green ash	Tree			3.00	1.00	1.00	5.00	1.00	1.00	8.00	1.00	1.00	8.00	1.00	1.00	1.00	2.00	2.00	
Juglans nigra	black walnut	Tree			2.00						2.00			2.00			3.00		1.00	
Lindera benzoin	northern spicebush	Shrub	2.00	2.00	2.00	3.00	3.00	3.00	5.00	5.00	5.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	6.00	
Liquidambar styraciflua	sweetgum	Tree						12.00			12.00			12.00			4.00		2.00	
Liriodendron tulipifera	tuliptree	Tree			16.00	3.00	3.00	9.00	3.00	3.00	25.00	3.00	3.00	25.00	3.00	3.00	15.00	3.00	3.00	
Nyssa sylvatica	blackgum	Tree	3.00	3.00	3.00				3.00	3.00	3.00	3.00	3.00	3.00	4.00	4.00	4.00	3.00	3.00	
Platanus occidentalis	American sycamore	Tree	1.00	1.00	1.00				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	
Prunus serotina	black cherry	Tree			1.00						1.00			1.00					1.00	
Quercus michauxii	swamp chestnut oak	Tree	1.00	1.00	1.00	2.00	2.00	2.00	3.00	3.00	3.00	3.00	3.00	3.00	5.00	5.00	5.00	5.00	5.00	
Quercus rubra	northern red oak	Tree	1.00	1.00	1.00				1.00	1.00	1.00	2.00	2.00	2.00	1.00	1.00	1.00	2.00	2.00	
Quercus stellata	post oak	Tree				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00			
Quercus velutina	black oak	Tree				1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00						
Rhus copallinum	flameleaf sumac	shrub						2.00			2.00			2.00			1.00			
Ulmus	elm	Tree														1.00				
Ulmus americana	American elm	Tree			2.00						2.00			2.00						
Viburnum dentatum	southern arrowwood	Shrub	3.00	3.00	3.00				3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	
Stem count			15	15	40	12	12	47	27	27	87	29	29	89	29	29	58	30	30	
size (ares)			1			1			2			2			2			2		
size (ACRES)			0.02			0.02			0.05			0.05			0.05			0.05		
Species count			8	8	14	7	7	12	13	13	20	13	13	20	11	11	18	11	11	
Stems per ACRE			607	607	1618.7	485.6	486	1902	546.3	546	1760	586.8	587	1801	586.8	587	1174	607.03	607	

Vegetation Monitoring Data (VMD) Datasheet

Please fill in any missing data and correct any errors.

Plot E92688-SD-0001

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

Taxonomic Standard: _____

Taxonomic Standard DATE: _____

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

Longitude or UTM-E: UTM Zone:

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

Plot Dimensions: X: Y: 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

Notes: sampled, specify reason below

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Sep 2012 Data		Notes*	2013 THIS YEAR'S DATA					
						Height 1cm*	DBH 1 cm		Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
1	Viburnum dentatum	(a)	P	1.4	4.0	46.0			56		<input type="checkbox"/>	2		
2	Alnus serrulata	(l)	P	4.1	3.3	53.0			50		<input type="checkbox"/>	2		
3	Quercus rubra	(k)	P	3.4	0.1	60.0		<input checked="" type="checkbox"/>	47		<input type="checkbox"/>	1	UNK	lead dead
4	Nyssa sylvatica	(m)	P	7.1	1.9	99.0			100		<input type="checkbox"/>	2		
5	Nyssa sylvatica	(n)	P	7.9	0.2	80.0			73		<input type="checkbox"/>	2	UNK	lead dead
6	Platanus occidentalis	(o)	P	9.8	1.1	143.0	0.4	<input type="checkbox"/>	205	0.7	<input type="checkbox"/>	3		
7	Viburnum dentatum	(p)	P	9.9	4.3	48.0			57		<input type="checkbox"/>	2		
8	Lindera benzoin	(b)	P	12.0	2.0	82.0			100		<input type="checkbox"/>	3		
9	Alnus serrulata	(c)	P	12.8	4.3	96.0		<input checked="" type="checkbox"/>	95		<input type="checkbox"/>	3		
10	Quercus michauxii	(d)	P	14.4	2.0	135.0	DBH?	<input type="checkbox"/>	91		<input checked="" type="checkbox"/>	2	UNK	lead dead
11	Lindera benzoin	(f)	P	15.6	0.5	77.0			94		<input type="checkbox"/>	3		
12	Quercus rubra	(e)	P	15.3	4.2	110.0	DBH?	<input type="checkbox"/>	—		<input type="checkbox"/>	0	UNK	DEAD
13	Alnus serrulata	(g)	P	17.1	4.0	103.0	DBH?	<input type="checkbox"/>	45		<input checked="" type="checkbox"/>	2	UNK	leader broken
14	Nyssa sylvatica	(h)	P	18.0	0.2	96.0			98		<input type="checkbox"/>	3		
15	Viburnum dentatum	(j)	P	18.9	2.8	41.0		<input checked="" type="checkbox"/>	40		<input type="checkbox"/>	2		
16	Carpinus caroliniana	(i)	P	18.7	4.8	78.0			81		<input type="checkbox"/>	2		

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

*Notes by ID: 3-top broken off
19-top broken off
115-top broken off

*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 1
 *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): E92688-SD-0001				Sep 2012 Data			Notes*	2013 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

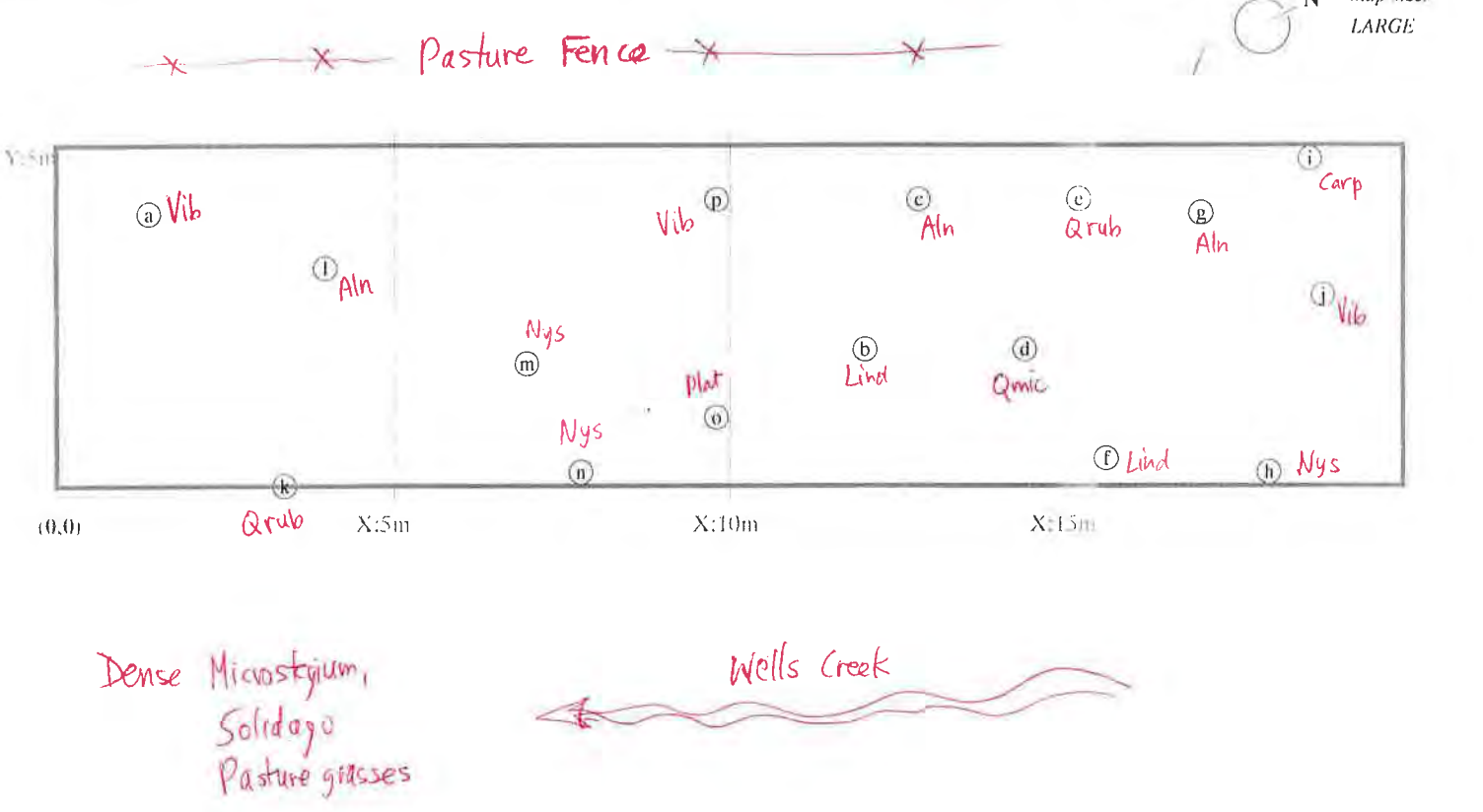
Natural Woody Stems - tallied by species											Explanation of cut-off & subsampling**:	
Height Cut-Off (All stems shorter than this are ignored. If >10cm, explain why to the right.):											<input type="checkbox"/> 10cm <input type="checkbox"/> 50cm <input type="checkbox"/> 100cm <input type="checkbox"/> 137cm	
Species Name	☑ e	SEEDLINGS — HEIGHT CLASSES			SAPLINGS — DBH			TREES — DBH			=10 (write 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-		
Frax penn		—	1:	.		—						
Liriod tulip		—	☒☒:	☒		—						
Cercis canad		—	.			—						
Lind benz		—	.			—						
Juglans nigra		—		.		—						
Ulmus amer		—	.			—						

**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 E92688-SD-0001



*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

Vegetation Monitoring Data (VMD) Datasheet

Please fill in any missing data and correct any errors.

Plot E92688-SD-0002

VMD Year (1-5): Date: 02 / OCT / 2013 / /

Taxonomic Standard: _____

Taxonomic Standard DATE: _____

Latitude or UTM-N: 790858.058 Datum: NAD83/W
(dec.deg. or m)

Longitude or UTM-E: 1867733.181 UTM Zone: 17

Coordinate Accuracy (m): X-Axis bearing (deg): 345

Plot Dimensions: X: 20 Y: 5 Plot has reverse orientation for X and Y axis (Y is 90 degrees to the right of X)

Party: S Pattern

Role: _____

Date last planted: _____

New planting date m/yy?

Check box if plot was not

Notes: sampled, specify reason below

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Sep 2012 Data		Notes*	2013 THIS YEAR'S DATA					
						Height 1cm*	DBH 1 cm		Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
18	Quercus michauxii	(a)	P	0.2	1.5	187.0	0.8	<input type="checkbox"/>	260	1.3	<input type="checkbox"/>	3		
20	Quercus velutina	(l)	P	7.2	4.2	110.0	DBH?	<input checked="" type="checkbox"/>	153	0.4	<input type="checkbox"/>	3		
21	Lindera benzoin	(k)	P	7.2	2.4	23.0		<input checked="" type="checkbox"/>	30		<input type="checkbox"/>	1		
22	Quercus michauxii	(m)	P	9.5	1.4	102.0	DBH?	<input checked="" type="checkbox"/>	56		<input type="checkbox"/>	1	UNKR	lead dead
23	Liriodendron tulipifera	(i)	P	2.5	1.1	65.0		<input type="checkbox"/>	112		<input type="checkbox"/>	3		
24	Lindera benzoin	(c)	P	11.9	1.5	46.0		<input checked="" type="checkbox"/>	57		<input type="checkbox"/>	2		
25	Liriodendron tulipifera	(d)	P	13.4	1.9	102.0	DBH?	<input type="checkbox"/>	142	0.5	<input type="checkbox"/>	3		
26	Liriodendron tulipifera	(g)	P	17.0	1.0	143.0	0.5	<input type="checkbox"/>	255	1.6	<input type="checkbox"/>	3		
27	Quercus stellata	(h)	P	18.6	1.9	160.0	0.8	<input type="checkbox"/>	230	1.8	<input type="checkbox"/>	3		galls
28	Lindera benzoin	(e)	P	16.7	2.3	64.0		<input checked="" type="checkbox"/>	44		<input type="checkbox"/>	1		lead dead
29	Fraxinus pennsylvanica	(f)	P	16.9	4.7	51.0		<input checked="" type="checkbox"/>	56		<input type="checkbox"/>	1		lead dead
30	Lindera benzoin	(b)	P	10.8	4.5	50.0		<input checked="" type="checkbox"/>	—		<input type="checkbox"/>	—		Missing
119	Diospyros virginiana	(j)	P	6.7	3.9	62.0		<input type="checkbox"/>	70		<input type="checkbox"/>	2		

stems: 13 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

- *Notes by ID:**
- 20-confirm species may be vol?
 - 21-yr0: confirm | yr2: resprout
 - 22-top dead
 - 24-yr0: confirm | yr2: resprout
 - 28-yr0: confirm | yr1: herbaceous are outcompeting plant | yr2: leader died
 - 29-leader died
 - 30-leader died

Plot (continued): **E92688-SD-0002**

Sep 2012 Data

Notes

2013

THIS YEAR'S DATA

ID	Species	map source char	X (m)	Y (m)	ddh (mm)	Height (cm)	DBH (cm)	ddh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*	Notes
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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	Sub-Seed	SEEDLINGS — HEIGHT CLASSES			SAPLINGS — DBH			TREES — DBH		
		10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	0-1 cm	1-2.5	2.5-5-	5-10 (write DBH)	
<i>Rhus copall</i>	---	u			---					
<i>Carya alba</i>	---	u	u	u	---					
<i>Carpinus carolin</i>	---	u	u	u	---					
<i>Bacc nalia</i>	---				---	u				
<i>Frax pon</i>	---	u	u		---					
<i>Lig stoy</i>	---	u	u	u	---					
<i>Liriod tulip</i>	---	u	u		---					

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



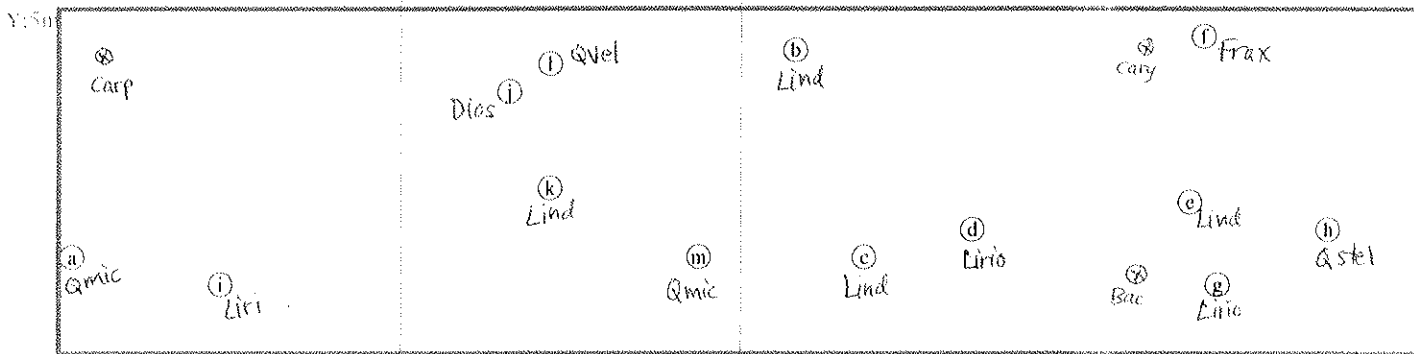
Form WS2, ver 9.1

Map of stems on plot E92688-SD-0002

X-axis: 345°

stems: 13
map size: LARGE

⊗ large volunteers



Pasture

*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, VINI? Strangulation, UNKNown, specify other.
 *HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.