

WELLS CREEK #2 -- NCEEP Project #92688
2012 MONITORING REPORT – MY-02
ALAMANCE COUNTY NC – CAPE FEAR RIVER BASIN

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



Final Report Submitted March 20, 2013 to:



North Carolina Department of
Environment and Natural Resources
Ecosystem Enhancement Program
1652 Mail Service Center
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WELLS CREEK #2 -- NCEEP Project #92688
2012 MONITORING REPORT – YEAR 2

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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: Two vegetation monitoring plots (20m x 5m) were established in April 2011 and resampled in September 2011 and September 2012. The two plots contained 16 and 13 live planted woody stems in 2012, and average density remained at 586 planted stems per acre, the same density as recorded in 2011. 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 1800 stems per acre. Based on visual assessment of the planted former pasture areas along

Wells Creek outside of the plots, planted woody stem survival and native volunteer recruitment appears to be good throughout the easement area.

Visual assessment of the understory enhancement area along UT3 revealed good survival but minimal growth of the planted shrubs. As reported in the May 2012 assessment, many planted shrubs had sparse or stunted leaves, possibly due to canopy shading. 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).

Herbicide treatment in 2010-2011 along the Enhancement Reach appears to have effectively reduced the abundance of tree of heaven, multiflora rose, privet and other woody exotic species in most areas, although patches of multiflora rose were observed resprouting in 2012, mainly in the area north of Carl Noah Rd. RJG&A marked approximately 30 patches of *Rosa* in this area with pink flagging to facilitate further herbicide treatment, if needed. A few persisting patches of multiflora rose, Chinese privet and Japanese honeysuckle that were not completely killed by spraying in 2010-2011 were also noted in 2012 along the Preservation Reach, mainly near the upper end (where they are common in the roadside scrub community along Longest Acres Rd) and near the confluence of UT1 and UT2 at the lower end.

1.4. Stream Channel Condition: Based on the permanent photopoints and overall visual assessment, 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.

1.5. Easement Integrity: The September 2011 monitoring report noted livestock encroachment (hog wallows and paths) in areas along tributary UT3 that hogs had used prior to fencing, and which were still accessible to smaller hogs that could go under the fence. In 2012 there was no further evidence of hogs getting inside the easement areas on either reach, and no livestock was present in the adjacent pastures outside the easement fence. A decomposing calf was present inside the easement fence just south of UT3 (near photopoint 8).

Fencing wire remains disengaged from the fence posts at the two cattle crossings across Wells Creek, as noted in the September 2011 and May 2012 reports, and should be repaired prior to releasing livestock into the adjacent pasture areas. Some fence posts near the confluence of Wells Creek and UT-3 have pulled loose from the soft muddy soil in this area, as noted in previous reports. Livestock exclusion fencing surrounding the Preservation Reach appears to be intact, and no livestock encroachment or damage inside the conservation area was evident.

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). 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 spring 2012 assessment 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 March 2011, September 2011, May 2012 or September 2012 site visits.

2.2. Vegetation Methodology

Two representative vegetation survey plots were selected and installed along Wells Creek in April 2011. Both plots measure five meters by 20 meters and are 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>.

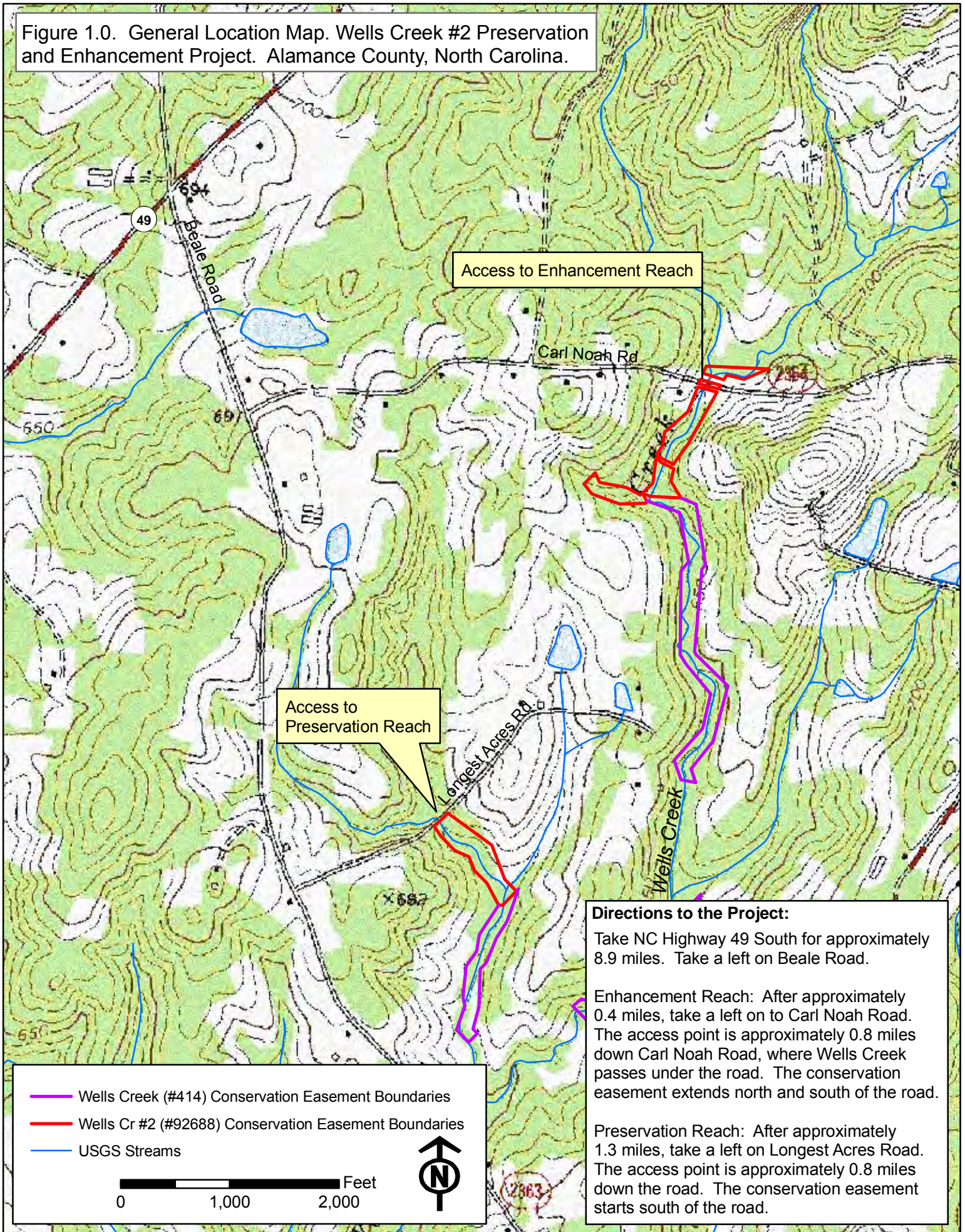
Radford, A.E., H.E. Ahles, and C.R. Bell (1968). *Manual of the Vascular Flora of the Carolinas*. University of North Carolina Press. Chapel Hill, NC.

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 1.0.	Project Vicinity Map and Directions
Table 1.A.	Project Restoration Components
Table 1.B.	Project Component Summations
Table 2.0	Project Activity and Reporting History
Table 3.0	Project Contacts Table
Table 4.0	Project Attributes Table

Figure 1.0. 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 2 (2012)**

Elapsed Time Since Grading Complete: n/a
Elapsed Time Since Planting Complete: 22 months
Number of Reporting Years¹: 2

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

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

Table 3. Project Contacts

Wells Creek #2 (#92688) - Monitoring Year 2 (2012)

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**

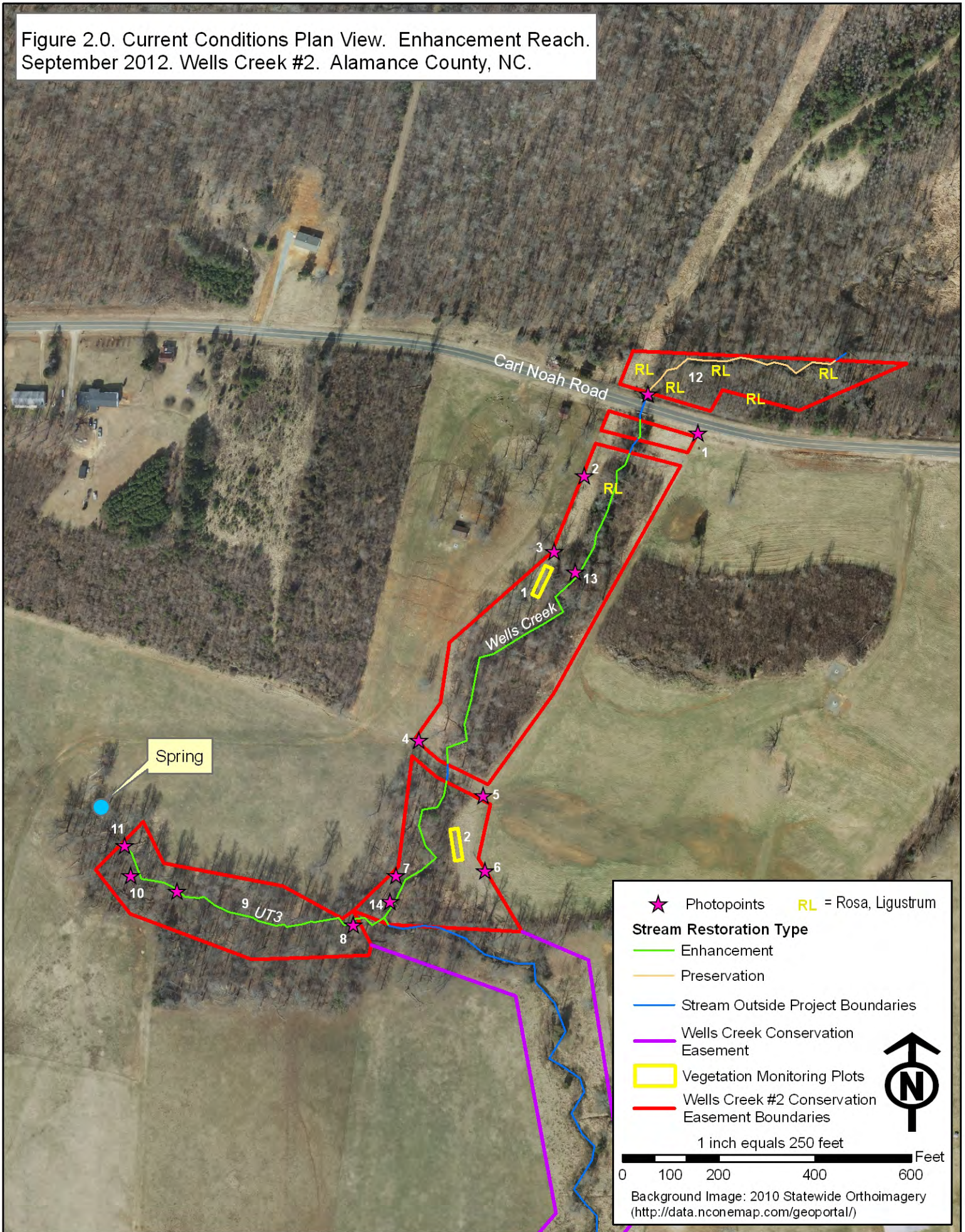
Project County	Alamance	
Physiographic Region	Piedmont	
Ecoregion	Carolina Slate Belt	
Project River Basin	Cape Fear	
USGS HUC for Project (14 digit)	3030002-050050	
NCDWQ Sub-basin for Project	Cape Fear 03-06-04	
Within extent of EEP Watershed Plan?	2009 Cape Fear River Basin Restoration Priority Report	
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 2.0.-2.1	Current Conditions Plan View
Table 5.0	Vegetation Condition Assessment
Figure 3.0-3.7	Permanent Stream Photopoints
Figure 4.0	Vegetation Monitoring Plot Photos

Figure 2.0. Current Conditions Plan View. Enhancement Reach. September 2012. 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/geportal/>)



Figure 2.1. Current Conditions Plan View. Preservation Reach. September 2012. Wells Creek #2. Alamance County, NC.

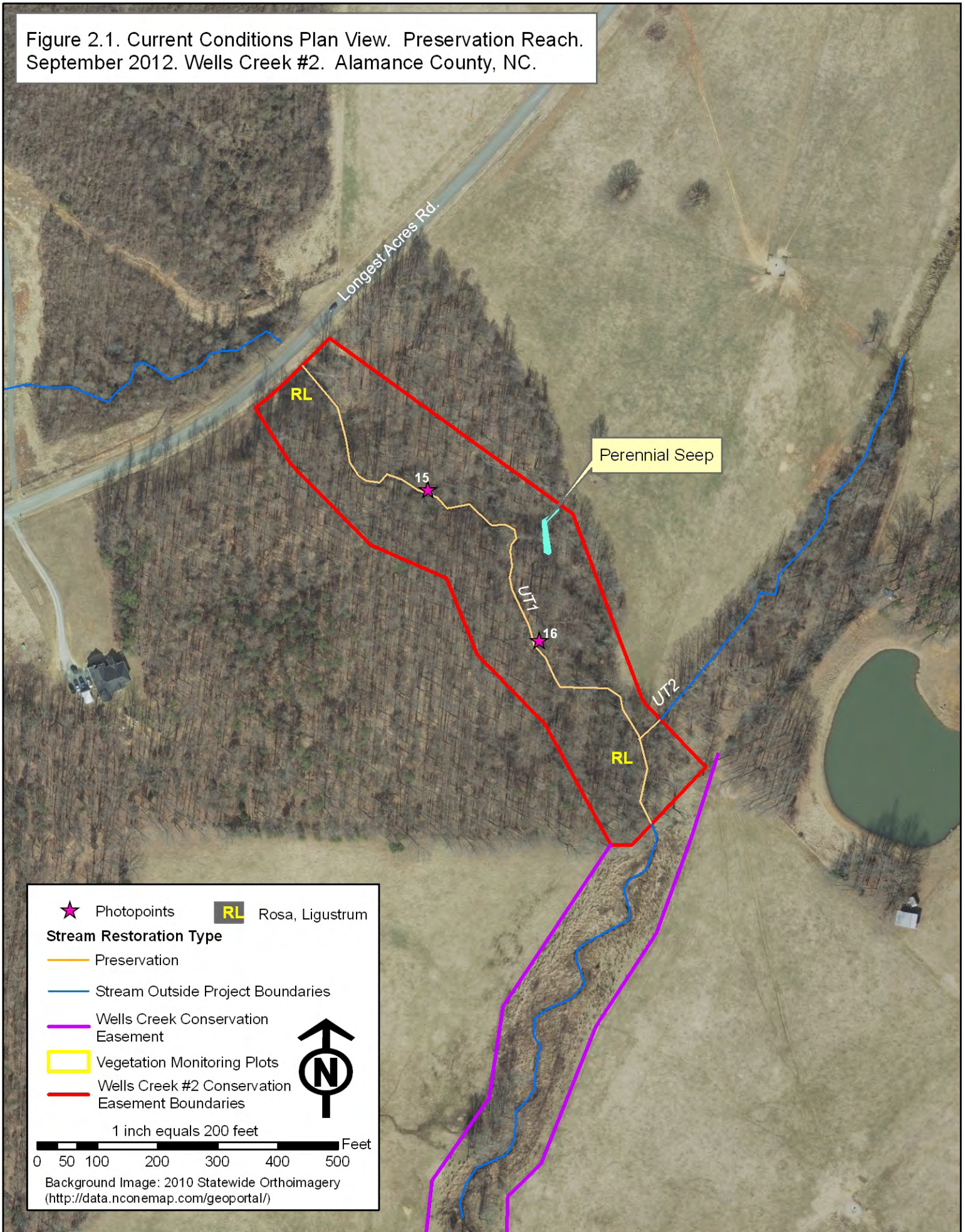


Table 5. Vegetation Assessment - Wells Creek #2 (#92688) - Monitoring Year 2 (2012)

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" designator 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 3.0. Stream Photo Station Photo - Wells Creek #2 - Monitoring Year 2 (2012) - 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 (09/26/12)



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



PP #2 – Looking S along easement, W of Wells Cr (09/26/12)

Figure 3.1. Stream Photo Station Photo - Wells Creek #2 - Monitoring Year 2 (2012) - 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 (09/26/12)



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



PP #4 – Looking East from easement toward Wells Cr (09/26/12)

Figure 3.2. Stream Photo Station Photo - Wells Creek #2 - Monitoring Year 2 (2012) - 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 (09/26/12)



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



PP #6 – Looking south from easement toward Wells Cr (09/26/12)

Figure 3.3. Stream Photo Station Photo - Wells Creek #2 - Monitoring Year 2 (2012) - Project #92688



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



PP #7 – Looking South beside RBK Wells Cr (09/26/12)



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



PP #8 – Looking up UT3 from lower end (09/26/12)

Figure 3.4. Stream Photo Station Photo - Wells Creek #2 - Monitoring Year 2 (2012) - Project #92688



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



PP #9 – Looking downstream (east) along UT3 (09/26/12)



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



PP #10 – Looking across trampled banks, upper UT3 (09/26/12)

Figure 3.5. Stream Photo Station Photo - Wells Creek #2 - Monitoring Year 2 (2012) - Project #92688



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



PP #11 – Looking downstream from UT3 Head (09/26/12)



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 (09/26/12)

Figure 3.6. Stream Photo Station Photo - Wells Creek #2 - Monitoring Year 2 (2012) - Project #92688



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



PP #13 – Wells Creek South of Carl Noah Road (09/26/12)



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



PP #14 – Confluence of Wells Creek and UT3 (09/26/12)

Figure 3.7. Stream Photo Station Photo - Wells Creek #2 - Monitoring Year 2 (2012) - Project #92688



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



PP #15 – UT#1 Preservation Reach (09/26/12)



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



PP #16 – UT1 Preservation Reach (09/26/12)

Figure 4.0. Vegetation Plot Photos - Wells Creek #2 - Monitoring Year 2 (2012) - Project #92688



VP 1 (April 27, 2011)



VP 1 (September 26, 2012)



VP 2 (April 27, 2011)



VP 2 (September 26, 2012)

Appendix C. Vegetation Plot Data

Table 6.0	CVS Vegetation Plot Mitigation Success Summary
Table 7.0	CVS Vegetation Monitoring Plot Metadata
Table 8.0	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 2 (26-Sep-2012) Vegetation Plot Summary Information

Plot #	Riparian Buffer Stems ¹	Stream/Wetland Stems ²	Live Stakes	Invasives	Volunteers ³	Total ⁴	Unknown Growth Form
1	n/a	16	0	0	25	41	0
2	n/a	13	0	0	35	48	0

Wetland/Stream Vegetation Totals (per acre)

Plot #	Stream/Wetland Stems ²	Volunteers ³	Total ⁴	Success Criteria Met?
1	647	1012	1659	Yes
2	526	1416	1942	Yes
Project Avg	587	1214	1801	Yes

Riparian Buffer Vegetation Totals (per acre)

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

Stem Class Characteristics

- 1 Buffer Stems: Native planted hardwood trees. NOT including pines, shrubs, vines or live-stakes.
- 2 Stream/Wetland Stems: Native planted hardwood trees + shrubs. NOT including vines, live stakes.
- 3 Volunteer Stems: Native trees and shrubs that were not planted. NOT including vines or exotics.
- 4 Total Stems: Planted + Volunteer native trees, shrubs and live stakes. NOT vines or exotics.

<p>Color for Density</p> <p>Exceeds requirements by 10%</p> <p>Exceeds requirements, but by less than 10%</p> <p>Fails to meet requirements, by less than 10%</p> <p>Fails to meet requirements by more than 10%</p>	<p>Stem Density Success Criteria:</p> <p>MY3 = 320/ac</p> <p>MY5 = 260/ac</p>
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Table 7. CVS Vegetation Metadata Table - Wells Creek #2 (#92688) - Monitoring Year 2(2012)

Report Prepared By	Gerald Pottern
Date Prepared	03/06/2013
database name	WellsCreek2_2012.mdb
database location	D:\Sean\EEP\Wells Creek MY2\2012
computer name	JESSIO
file size	35262464
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	92688
project Name	Wells Creek #2
Description	Stream enhancement project in Alamance County
River Basin	Cape Fear
length(ft)	2,026 (Wells Creek and UT3)
stream-to-edge width (ft)	65'-95'
area (sq m)	12,302 sq. meters, 6,677 sq. meters only planted understory
Required Plots (calculated)	3 (per CVS-EEP Access database)
Sampled Plots	2

Table 8. 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 (MY2 2012)						Annual Means								
			E92688-SD-0001			E92688-SD-0002			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
Acer rubrum	red maple	Tree														1	
Alnus serrulata	hazel alder	Shrub	3	3	3				3	3	3	3	3	3	3	3	
Baccharis halimifolia	eastern baccharis	Shrub			1			1			2			1		1	
Carpinus caroliniana	American hornbeam	Tree	1	1	1			5	1	1	6					7	
Carya alba	mockernut hickory	Tree						5			5						
Carya cordiformis	bitternut hickory	Tree											5			6	
Celtis laevigata	sugarberry	Tree										1	1	1	1	1	
Diospyros virginiana	common persimmon	Tree				1	1	1	1	1	1			1	1	1	
Fraxinus	ash	Tree												2		2	
Fraxinus pennsylvanica	green ash	Tree			3	1	1	5	1	1	8	1	1	1	2	2	
Juglans nigra	black walnut	Tree			2						2			3		1	
Lindera benzoin	northern spicebush	Shrub	2	2	2	4	4	4	6	6	6	6	6	6	6	6	
Liquidambar styraciflua	sweetgum	Tree						12			12			4		2	
Liriodendron tulipifera	tuliptree	Tree			16	3	3	9	3	3	25	3	3	15	3	3	
Nyssa sylvatica	blackgum	Tree	3	3	3				3	3	3	4	4	4	3	3	
Platanus occidentalis	American sycamore	Tree	1	1	1				1	1	1	1	1	1	1	1	
Prunus serotina	black cherry	Tree			1						1					1	
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	2	2	2	3	3	3	5	5	5	5	5	
Quercus rubra	northern red oak	Tree	2	2	2				2	2	2	1	1	1	2	2	
Quercus stellata	post oak	Tree				1	1	1	1	1	1	1	1	1			
Quercus velutina	black oak	Tree				1	1	1	1	1	1						
Rhus copallinum	flameleaf sumac	shrub						2			2			1			
Ulmus	elm	Tree												1			
Ulmus americana	American elm	Tree			2						2						
Viburnum dentatum	southern arrowwood	Shrub	3	3	3				3	3	3	3	3	3	3	3	
Stem count			16	16	41	13	13	48	29	29	89	29	29	58	30	30	52
size (ares)			1			1			2			2			2		
size (ACRES)			0.025			0.025			0.049			0.049			0.049		
Species count			8	8	14	7	7	12	13	13	20	11	11	18	11	11	19
Stems per ACRE			647.5	647.5	1659	526.1	526.1	1942	586.8	586.8	1801	586.8	586.8	1174	607	607	1052

Color Key for Density	
Exceeds requirements by 10% or more	(Green)
Exceeds requirements, but by less than 10%	(Light Green)
Fails to meet requirements, by less than 10%	(Orange)
Fails to meet requirements by more than 10%	(Red)

Stem Density Success Criteria:	
MY3 = 320/ac	
MY5 = 260/ac	

Plot (continued): 92688-SD-0001				Sep 2011 Data			Notes*	THIS YEAR'S DATA					
ID	Species	map char	source X (m) Y (m)	dbh (mm)	Height (cm)	DBH (cm)		dbh (mm)	Height (cm)	DBH (cm)	Re-sprout	Vigor*	Damage*

Plot 92688-SD-0001 Please fill in any missing data and fix incorrect data. Vegetation Monitoring Data (VMD) Datasheet

VMD Year (1-5): Date: 26 / Sep / 2012 - / / Party: GBPotterton Role: Notes on plot:

Taxonomic Standard: _____

Taxonomic Standard DATE: _____

Latitude or UTM-N: 791407.026 Datum: NAD83/W
(dec.deg. or m)

Longitude or UTM-E: 1867889.853 UTM Zone: 17

Coordinate Accuracy (m): _____ X-Axis bearing (deg): 30

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

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Sep 2011 Data			Notes*	THIS YEAR'S DATA						
						dbh 1 mm	Height 1cm*	DBH 1 cm		dbh 1mm	Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
1	Viburnum dentatum	(a)	P	1.4	4.0	6	43.0			6	46	-		2	DEER	
2	Alnus serrulata	(l)	P	4.1	3.3	8	64.0			8	53	-		2	DEER	
3	Quercus michauxii rubra	(k)	P	3.4	0.1	9	52.0			9	60	-		2		
4	Nyssa sylvatica	(m)	P	7.1	1.9	8	103.0	DBH?		8	99	-		1	UNK	
5	Nyssa sylvatica	(n)	P	7.9	0.2	10	84.0			10	80	-		1	UNK	
6	Platanus occidentalis	(o)	P	9.8	1.1	10	92.0			-	143	0.4		3		
7	Viburnum dentatum	(p)	P	9.9	4.3	5	45.0			5	48	-		3		
8	Lindera benzoin	(b)	P	12.0	2.0	6	66.0			7	82	-		3		
9	Alnus serrulata	(c)	P	12.8	4.3	10	97.0			11	96	-		2	DEER	
10	Quercus michauxii	(d)	P	14.4	2.0	12	133.0	DBH?		12	135	-		2		
11	Lindera benzoin	(f)	P	15.6	0.5	4	64.0			6	77	-		3		
12	Quercus michauxii rubra	(e)	P	15.3	4.2	11	115.0	DBH?		11	110	-		2	UNK	
13	Alnus serrulata	(g)	P	17.1	4.0	8	115.0	DBH?		9	103	-		2	UNK	
14	Nyssa sylvatica	(h)	P	18.0	0.2	11	100.0			11	96	-		2	DEER	
15	Viburnum dentatum	(j)	P	18.9	2.8	5	42.0			6	41	-		2	DEER	
16	Celtis laevigata Carpinus	(i)	P	18.7	4.8	6	78.0			7	78	-		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)	dbh 1 mm	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes

*Notes by ID: 3-top broken off
 9-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
 *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, HURRricane, 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 2.2.7

Plot 1

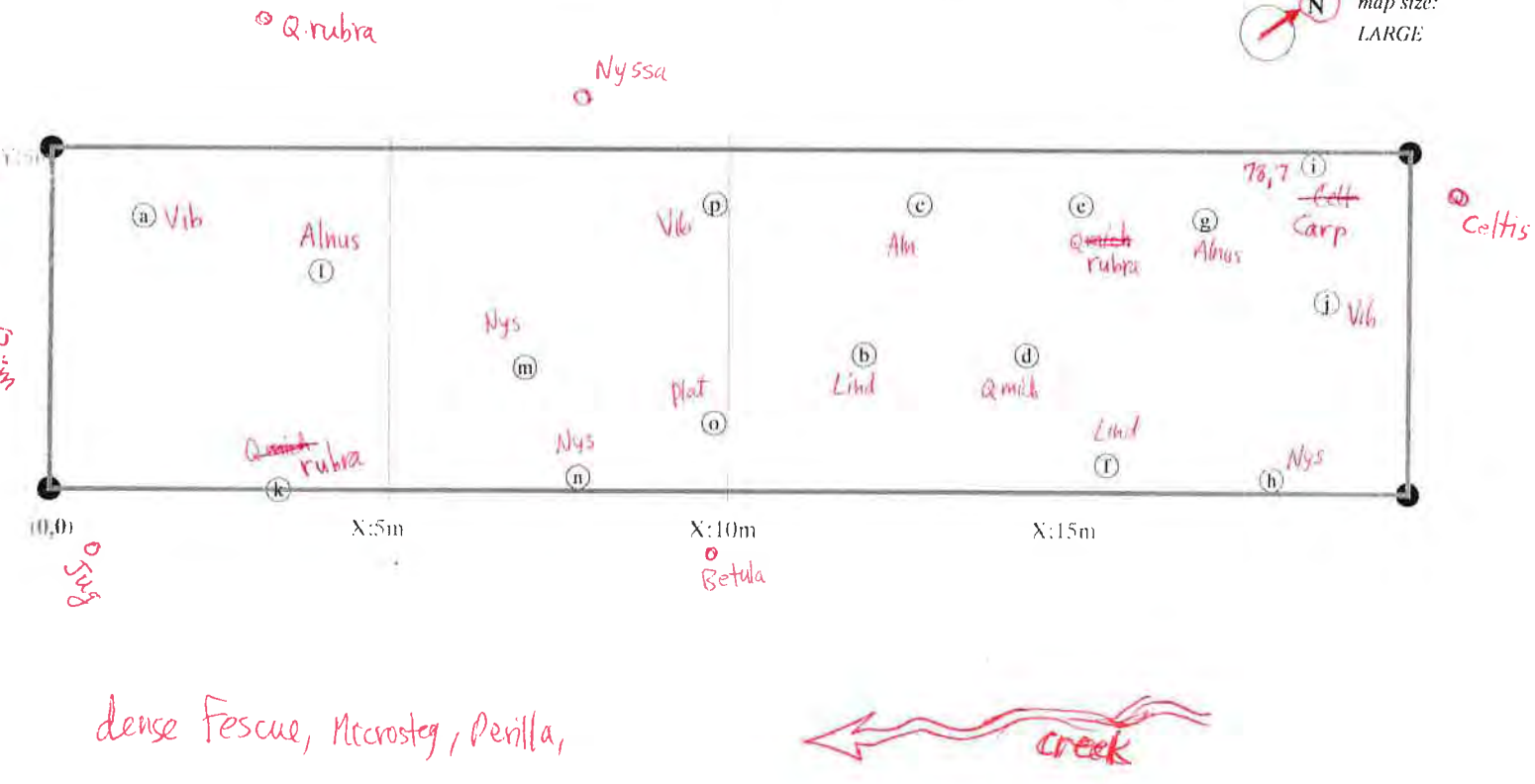
26 Sep 2012: GBP

Plot (continued): 92688-SD-0001				Sep 2011 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*

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	<input checked="" type="checkbox"/> Sub-seed	SEEDLINGS — HEIGHT CLASSES			SAPLINGS — DBH			TREES — DBH				
		10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapi	0-1 cm	1-2.5	2.5-	5-	=10 (write DBH)		
<i>Juglans nigra</i>		.	.									
<i>Liriodendron tulipifera</i>		✱										
<i>Ulmus americana</i>		.										
<i>Prunus serotina</i>		.										
<i>Baccharis halimifolia</i>		.										
<i>Fraxinus pennsylvanica</i>		.										

**Required if cut-off >10cm or subsample ? 100%.
 Legend: 1 dot, 2 dots, 3 dots, 4 dots, 5 dots, 6 dots, 7 dots, 8 dots, 9 dots, 10 dots. Form WS2, ver 9.1

Map of stems on plot 92688-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
 *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. p. 2

Plot 92688-SD-0002

Please fill in any missing data and fix incorrect data.

Vegetation Monitoring Data (VMD) Datasheet

VMD Year (1-5): 2 Date: 26 / Sep / 2012

Party: GR Pattern Role:

Notes on plot:

Taxonomic Standard:

Taxonomic Standard DATE:

Latitude or UTM-N: 790858.058 Datum: NAD83/W

Longitude or UTM-E: 1867733.181 UTM Zone: 17

Coordinate Accuracy (m):

Plot Dimensions: X: 20 Y: 5

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

ID	Species Name	Map char	Source*	X 0.1m	Y 0.1m	Sep 2011 Data			Notes*	THIS YEAR'S DATA						
						ddh 1 mm	Height 1cm*	DBH 1 cm		ddh 1mm	Height 1cm*	DBH 1 cm	Re-sprout	Vigor*	Damage*	Notes
18	Quercus michauxii	(a)	P	0.2	1.5	13	181.0	0.6	<input type="checkbox"/>	-	187	0.8	<input type="checkbox"/>	3		
20	Quercus rubra - velut	(l)	P	7.2	4.2	11	99.0		<input checked="" type="checkbox"/>	13	110	-	<input type="checkbox"/>	3		
21	Lindera benzoin	(k)	P	7.2	2.4	4	59.0		<input checked="" type="checkbox"/>	3	23	-	<input type="checkbox"/>	2		resprout
22	Quercus michauxii	(m)	P	9.5	1.4	9	103.0	DBH?	<input checked="" type="checkbox"/>	10	102	-	<input type="checkbox"/>	2		
23	Liriodendron tulipifera	(j)	P	2.5	1.1	6	53.0		<input type="checkbox"/>	9	65	-	<input type="checkbox"/>	3		
24	Lindera benzoin	(c)	P	11.9	1.5	4	61.0		<input checked="" type="checkbox"/>	3	46	-	<input type="checkbox"/>	3		resprout
25	Liriodendron tulipifera	(d)	P	13.4	1.9	6	80.0		<input type="checkbox"/>	8	102	-	<input type="checkbox"/>	3		
26	Liriodendron tulipifera	(g)	P	17.0	1.0	8	98.0		<input type="checkbox"/>	-	143	0.5	<input type="checkbox"/>	3		
27	Quercus stellata	(h)	P	18.6	1.9	27	162.0	0.5	<input type="checkbox"/>	-	160	0.8	<input type="checkbox"/>	3	DIS	
28	Lindera benzoin	(e)	P	16.7	2.3	5	78.0		<input checked="" type="checkbox"/>	05	64	-	<input type="checkbox"/>	2		leader died
29	Fraxinus pennsylvanica	(f)	P	16.9	4.7	9	63.0		<input type="checkbox"/>	9	51	-	<input type="checkbox"/>	1		leader died
30	Lindera benzoin	(b)	P	10.8	4.5	5	67.0		<input type="checkbox"/>	6	50	-	<input type="checkbox"/>	2		leader died
119	Nyssa sylvatica - Diospyros	(i)	P	6.7	3.9	6	51.0		<input type="checkbox"/>	7	62	-	<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)	ddh 1 mm	Height 1 cm*	DBH 1 cm	Vigor*	Damage*	Notes
Carpinus caroliniana		0.3	4.0		128				planted or (VOL?) other small ones

*Notes by ID: 20-confirm species may be vol?

- 21-confirm
- 22-top dead
- 24-confirm
- 28-yr0: confirm | yr1: herbaceous are outcompeting plant

*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, HURRricane, DISeased, VINE Strangulation, UNKNown, specify other.

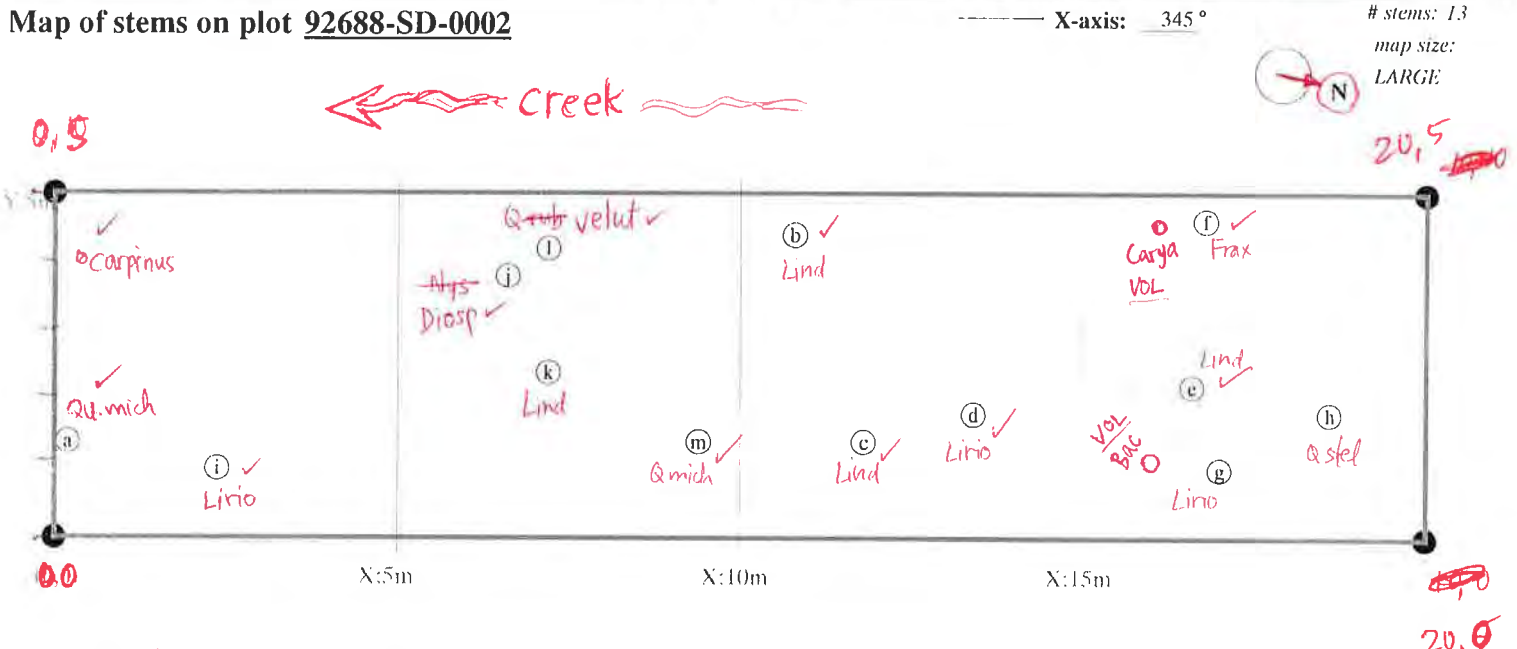
*HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m.

Plot (continued): 92688-SD-0002				Sep 2011 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*

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	Sub-Seed	SEEDLINGS — HEIGHT CLASSES			SAPLINGS — DBH			TREES — DBH							
		10 cm-50 cm	50 cm-100 cm	100 cm-137 cm	Sub-Sapl	>137 cm 0-1 cm	1-2.5	2.5-	5-	=10 (write DBH)					
<i>Rhus copal</i>		∴													
<i>Carya alba</i>		∴	∴	•											
<i>Carpinus carolin</i>		∴	∴	•											
<i>Baccharis halim</i>						•									
<i>Frax pen</i>		∴	•												
<i>Liriod</i>		∴	∴	∴											
<i>Lirio fulp</i>		∴	•												

**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 92688-SD-0002



Thick *Lespedeza cune*, *Eupat*, *Solidago*, *Fescue*,
Not counting *Rubus*

*SOURCE: Tr=Transplant, L=Live stake, B=Ball and burlap, P=Potted, Tu=Tubling, R=bare Root, M=Mechanically, U=Unknown p. 4
 *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, HURRricane, DISeased, VINE Strangulation, UNKNown, specify other.
 *HEIGHT PRECISION drops to 10cm if >2.5m and 50cm if >4m. Printed in the CVS-FEP Entry Tool ver. 2.2.7