

**Third Fork Creek Stream Restoration – NCEEP Project #139  
Durham, North Carolina**

**Second Annual Monitoring Report December 2006**



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Submitted to:



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**THIRD FORK CREEK STREAM RESTORATION – NCEEP Project #139  
2006 MONITORING REPORT – YEAR 2**

CONDUCTED FOR THE NORTH CAROLINA DEPARTMENT OF ENVIRONMENT  
AND NATURAL RESOURCES

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## **I. Executive Summary**

The Third Fork Creek stream restoration project is located in southwest-central Durham, North Carolina, in the headwaters of the Third Fork Creek watershed (US Geological Survey 14-digit Hydrologic Unit Code 03030002060120) within the New Hope Creek Sub-basin of the Upper Cape Fear River (NC Division of Water Quality Sub-basin 03-06-05). The project has restored approximately 2,900 linear feet of perennial stream in the Cape Fear River Basin. Evaluation and design were initiated during the summer of 2002. Construction was completed in January 2005. The stream restoration project's goals were: to restore stable channel morphology, which will reduce bank erosion; improve the watershed's sediment transport; improve aquatic habitat diversity; and increase aesthetic value to local stakeholders.

The preliminary qualitative evaluation was conducted by RJG&A in early February 2006. Subsequent qualitative evaluation was conducted during early March, late June, and September 2006. The second vegetation monitoring data were collected during September 2006, using EEP's August 2006 monitoring protocol. The second annual geomorphologic monitoring data were collected during October 2006.

Overall, the restoration project has met its design goals. Several major geomorphologic changes were documented during the second monitoring year, but overall the site is relatively stable. Aquatic and semi-aquatic organisms have colonized most of the restoration area and the average live planted woody stem density (926 per acre) has exceeded the vegetation restoration goal (320 per acre) by 289 percent.

## **II. Project Background**

### ***A. Location and Setting***

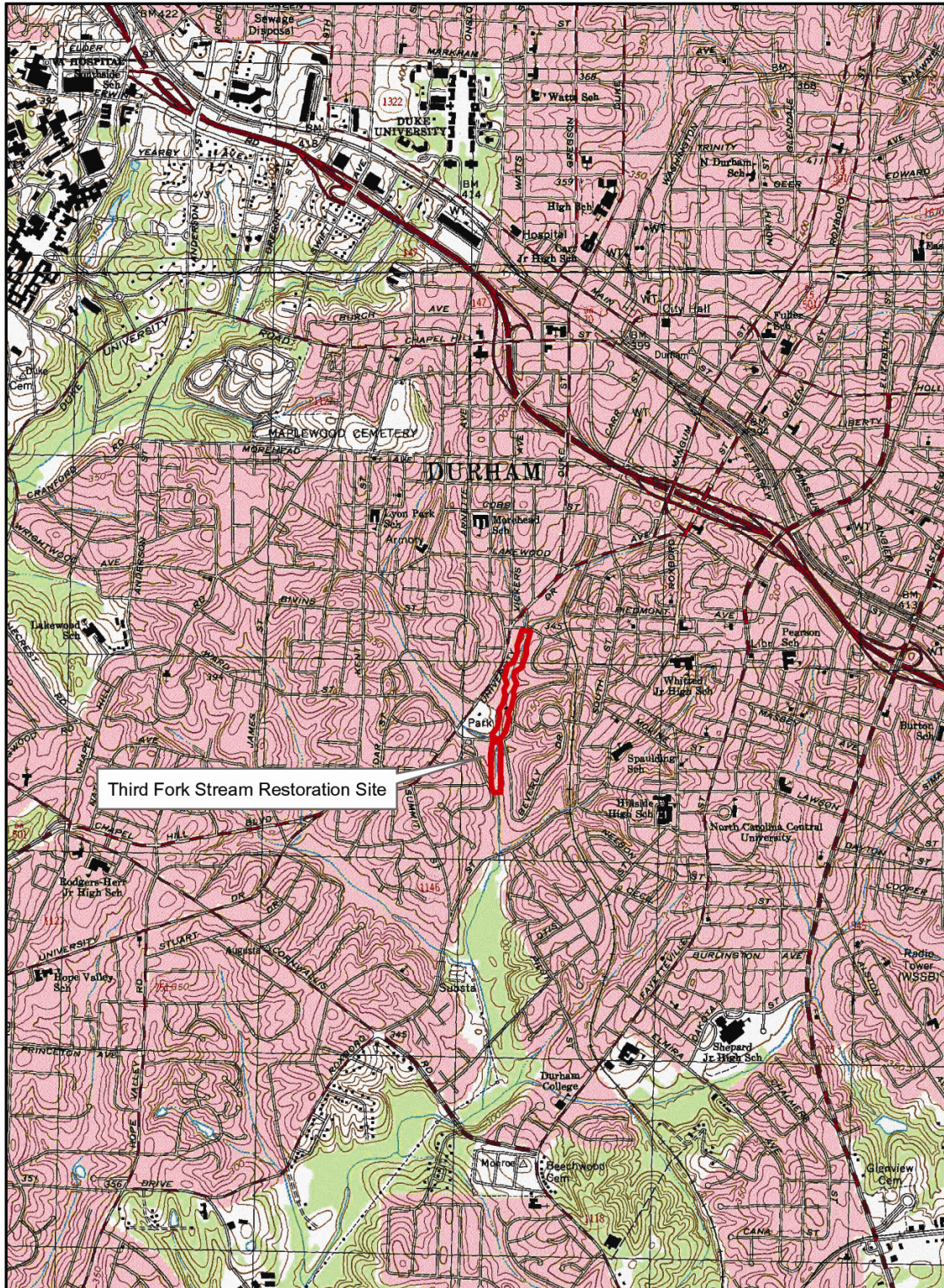
The entire restoration site is contained within Forest Hills Park, which is owned by the City of Durham. To get to the Third Fork Creek restoration site from NC 147, take exit 12B and travel south on Roxboro Road. Turn east on West Lakewood Avenue, which merges into University Drive. Forest Hills Park and the Third Fork restoration site are on the left (eastern) side of University Drive (US 15/501 Business, Figure 1). The upstream boundary of the restoration project is immediately downstream from where Third Fork Creek emerges from the box culvert under the northern stretch East Forest Hills Boulevard. The stream restoration extends downstream along the main channel from this point to the southern edge of the Forest Hills Park. The double box culvert under the southern stretch of the East Forest Hills Boulevard loop divides the restoration into upper and lower reaches. An unnamed tributary to Third Fork Creek joins the lower reach on the downstream end of the culvert. The lower reach therefore has a significantly larger watershed.

Forest Hills Park is dominated by lawn/open space with relatively little mature canopy cover (less than 25 percent). A playground and other facilities with impervious cover (e.g. swimming pool, tennis courts, and picnic shelter) are located near the southern portion of the restoration's upper reach. The surrounding area is highly urbanized. The majority of

the land use is dedicated to residential and commercial development and secondary roads. Prior to the restoration, both project reaches were incised and had active bed degradation and channel widening characterized by severe bank erosion.

### ***B. Structure and Objectives***

A priority 2 stream restoration approach was used to design and reestablish approximately 3,025 linear feet of meandering, bankfull channel and a new floodplain along Third Fork Creek. The project restored riffle-pool sequencing and used cross-vane and j-hook in-stream structures to provide grade control. The unnamed tributary that enters from the upper reach's left bank (station 20+33) was incorporated and stabilized with a grade control structure to match the grade of the restored channel. Coir fiber matting and live staking were installed/planted to help stabilize the graded stream banks. A 50 foot wide buffer was planted with native species on both sides the restored stream. Space and use needs in the park limited the woody plantings to within 30 feet of the stream. The buffers' outer twenty feet was planted in native grasses and is managed (mowed).



Third Fork Stream Restoration Site

<p><b>Figure 1. Third Fork Stream Restoration - Durham County, NC</b></p> <p>source: NCDOT Data Distribution - Tile 78  <a href="http://www.ncdot.org/it/gis/DataDistribution/">www.ncdot.org/it/gis/DataDistribution/</a></p>	 <p>Durham County</p>		 <p>Keene</p>
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**Exhibit Table I. Mitigation Structure and Objectives - Third Fork Creek Stream Restoration – EEP Project #139 – Durham, NC**

Reach ID	Mitigation Type	Approach	Linear Feet	Stationing	Mitigation Credits (ratio)	Comment
Upstream	Restoration	Priority 2	2,900	10+00-26+00	3,792 (1:1)	Realigned channel with restored floodplain to convey stormflow/ sediment and restore aquatic habitat
Downstream	Restoration	Priority 2		25+00 – 40+25		

***C. History and Background***

**Exhibit Table II. Activity and Reporting History - Third Fork Creek Stream Restoration – EEP Project #139– Durham, NC**

Activity or Report	Data Collection	Completion
Restoration Plan	2002	February 2003
Construction	NA	January 2005
Temporary S&E mix applied	NA	NA
Permanent seed mix applied	NA	NA
Bare Root Planting	NA	NA
Mitigation Plan	NA	December 2005 (report date)
As-built	March 2005	December 2005 (report date)
Year 1 Monitoring		December 2005 (report date)
Vegetation	September 2005	
Geomorphological	September 2005	
Year 2 Monitoring		December 2006 (report date)
Vegetation	September 2006	
Geomorphological	October 2006	

<b>Exhibit Table III. Project Contacts - Third Fork Creek Stream Restoration – EEP Project #139 – Durham, NC</b>	
Design:	KCI Associates of North Carolina, P.A. Landmark Center II, Suite 220 4601 Six Forks Road Raleigh, North Carolina 27609 Mr. Joe Pfeiffer (919) 783-9214
Construction Contractor:	NA
Monitoring Performers:	RJG&A 1221 Corporation Parkway, Suite 100 Raleigh, NC 27616 Mr. Ward Marotti (919) 872-1174

<b>Exhibit Table IV. Project Background - Third Fork Creek Stream – EEP Project #139</b>	
County	Durham
Drainage Area	1,126.4 acres (1.76 square miles)
Drainage Impervious Cover Estimate (%)	44%
Stream Order	Second Order
Physiographic Region	Piedmont
Ecoregion	Triassic Basins
Rosgen Classification of As-built	
Upper Reach	F5, G5, E5
Lower Reach	C5
Dominant Soil Types	
Upstream Reach	Congaree
Downstream Reach	Congaree
Reference Site ID	North Prong Creek
USGS HUC for Project and Reference	03030002060120, 03030002060140
NCDWQ Sub-basin for Project and Reference	03-06-05, 03-06-05
NCDWQ Classification for Project and Reference	C
Any portion of the project segment 303d listed?	Yes
Any portion of the project segment upstream of a 303d listed segment?	Yes
Reasons for 303d Listing or Stressor	Turbidity, low dissolved oxygen, fecal coliform bacteria
% of Project Easement Fenced	0%



**Figure 2. Monitoring Plan View**

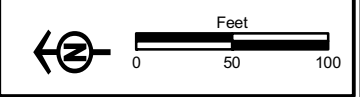


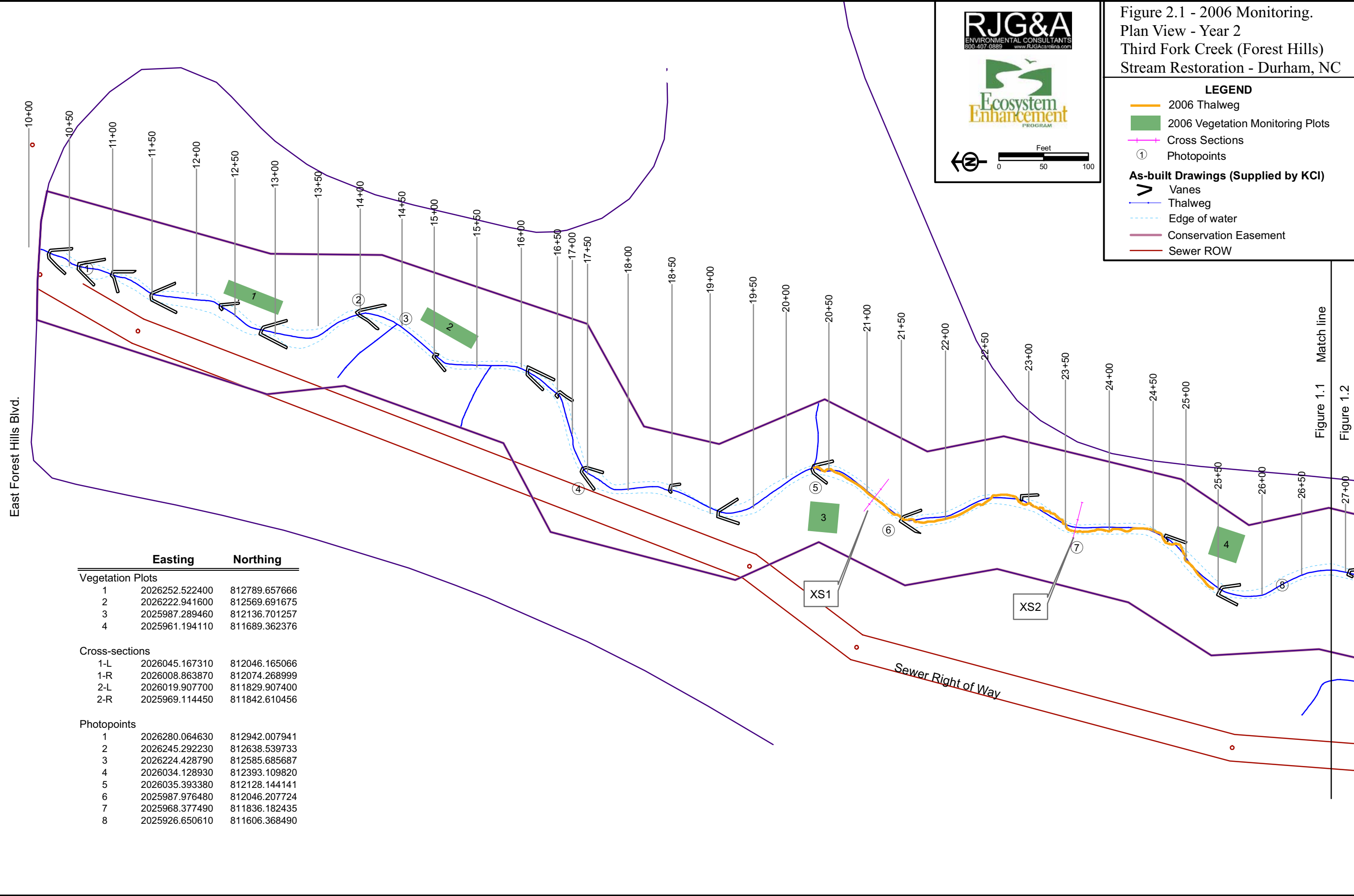
Figure 2.1 - 2006 Monitoring.  
Plan View - Year 2  
Third Fork Creek (Forest Hills)  
Stream Restoration - Durham, NC

**LEGEND**

- 2006 Thalweg
- 2006 Vegetation Monitoring Plots
- + Cross Sections
- ① Photopoints

**As-built Drawings (Supplied by KCI)**

- V Vanes
- Thalweg
- - - Edge of water
- Conservation Easement
- Sewer ROW



East Forest Hills Blvd.

Figure 1.1 Match line

Figure 1.2

	Easting	Northing
<b>Vegetation Plots</b>		
1	2026252.522400	812789.657666
2	2026222.941600	812569.691675
3	2025987.289460	812136.701257
4	2025961.194110	811689.362376
<b>Cross-sections</b>		
1-L	2026045.167310	812046.165066
1-R	2026008.863870	812074.268999
2-L	2026019.907700	811829.907400
2-R	2025969.114450	811842.610456
<b>Photopoints</b>		
1	2026280.064630	812942.007941
2	2026245.292230	812638.539733
3	2026224.428790	812585.685687
4	2026034.128930	812393.109820
5	2026035.393380	812128.144141
6	2025987.976480	812046.207724
7	2025968.377490	811836.182435
8	2025926.650610	811606.368490

Sewer Right of Way

XS1

XS2

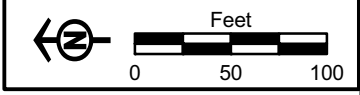


Figure 2.2 - 2006 Monitoring.  
Plan View - Year 2  
Third Fork Creek (Forest Hills)  
Stream Restoration - Durham, NC

**LEGEND**

- 2006 Thalweg
- 2006 Vegetation Monitoring Plots
- Cross Sections
- ① Photopoints

**As-built Drawings (Supplied by KCI)**

- V Vanes
- Thalweg
- Edge of water
- Conservation Easement
- Sewer ROW

	<u>Easting</u>	<u>Northing</u>
<b>Vegetation Plots</b>		
5	2025825.804140	811325.105992
6	2025751.559070	810836.827402
7	2025773.300850	810651.892462
8	2025829.725470	810411.548741

	<u>Easting</u>	<u>Northing</u>
<b>Cross-sections</b>		
3-L	2025870.880914	810673.554871
3-R	2025770.851314	810650.406271
4-L	2025798.603914	810554.818971
4-R	2025759.096714	810575.310971

	<u>Easting</u>	<u>Northing</u>
<b>Photopoints</b>		
9	2025883.659280	811374.025644
10	2025782.503210	811250.741684
11	2025792.618820	811001.328751
12	2025781.870990	810914.081641
13	2025766.697570	810688.630051
14	2025800.837750	810416.773115

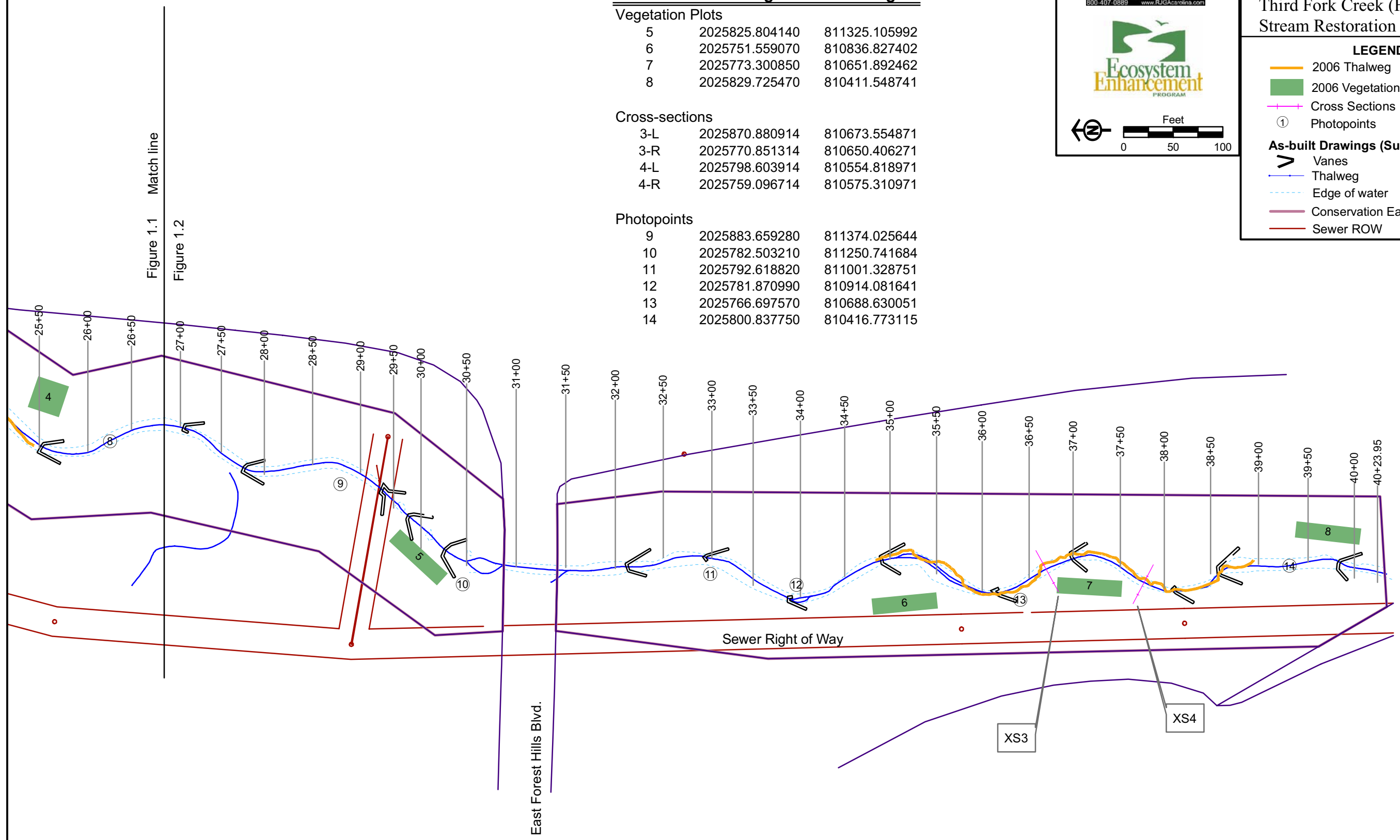


Figure 1.1 Match line

Figure 1.2

East Forest Hills Blvd.

Sewer Right of Way

XS3

XS4

### III. Project Conditions and Monitoring Results

RJG&A initially evaluated the site during early February 2006. It was qualitatively evaluated during and after significant storm events in April and May 2006, and during low flow in late June, September, and October. Vegetation monitoring was performed during September 2006, pursuant to the August 2006 EEP guidelines.

Structural failure and compromise were recorded in a number of specific locations. Exotic invasive woody stem density is relatively low. Planted woody stem density is high, as is success. Exotic invasive vines have had a moderate impact on planted woody stem success on several floodplain benches.

In spite of the problem areas the overall restoration project appears to be adequately transporting urban sediment loads and restoring aquatic habitat (i.e. meeting its design functions/goals).

#### A. Vegetation Assessment

##### 1. Soil Data

Series	Max Depth (in.)	% Clay on Surface	K	T	OM%
Congaree	80	7-27	0.37	5	0.5-2.0

##### 2. Vegetation Problem Areas

Planted woody vegetation appeared to be successful when qualitatively evaluated during September 2006. Invasive exotic woody species have colonized many locations but are quite sparse, relative to the planted native woody stems. Invasive exotic vines have had a detrimental impact to survival on several floodplain benches that have received overbank flow several times during the 2006 growing season.

Feature/Issue	Station/Range	Probable Cause	Photo #
Exotic Invasive Vines	12+75 – 14+00	Colonization of floodplain by waterborne seeds	VP2&3
Exotic Invasive Woody Stems	12+75 – 14+00	Colonization by air and water borne seeds	VP4&5
Exotic Invasive vines	16+75 – 19+75	Colonization of floodplain by waterborne seeds	VP2&3
Exotic Invasive vines	20+75 – 22+40	Colonization of floodplain by waterborne seeds	VP2&3
Exotic Invasive vines	24+60 – 26+25	Colonization of floodplain by waterborne seeds	VP2&3

<b>Exhibit Table VI. Vegetation Problem Areas – Third Fork Creek Stream – EEP Project #139 – Durham, NC</b>			
Disturbed area	29+90 – 30+80	Diseased tree removal by City of Durham maintenance crew	VP1
Woody invasives	34+20 – 35+70	Colonization by air and water borne seeds	VP4&5
Invasive vines	36+60 – 37+25	Colonization of floodplain by waterborne seeds	VP2&3

## **2.1. Upstream Reach**

Planted woody stem success was high in the upstream reach. Japanese hops (*Humulus japonicus*) and porcelainberry (*Ampelopsis brevipedunculata*) have densely colonized the floodplain benches inside several meanders. In addition to directly competing for light with the planted woody species, these exotic invasive woody vines have caused many of the planted woody stems in these areas to be severely impacted by storm flow. Once rooted, most woody stems can withstand moderate flood events (i.e. they are bent during over-bank flow, but not uprooted). With a dense layer of woody vine stems wrapped around and through them, many planted individuals are uprooted, overturned, and washed away entirely. Manual removal of these vines could be an effective management practice, if it is done regularly. If not, the vines will recolonize the floodplain benches from existing root stock, or from the large monocultures of these species upstream (on/over both banks throughout the American Tobacco Trail right-of-way (~1,400 feet upstream)).

## **2.2. Downstream Reach**

The downstream reach also has invasive exotic woody vines inside one meander and some exotic invasive woody species along a portion of one bank.

## **3. Stem Counts**

Eight representative vegetation survey plots were selected and installed in the upstream and downstream reaches during September 2006, pursuant to the new EEP vegetation monitoring protocol (August, 2006). Where appropriate, the new monitoring plots were co-located with the first year monitoring plots. Pursuant to the August 2006 protocol, all plots measure 100 square meters in area and are either 10 meters by 10 meters, or five meters by 20 meters. Level 1 (planted woody stems) and Level 2 (volunteer woody stems) data collection was performed concurrently with plot selection, during September 2006. Because the new plot dimensions are different than the first annual vegetation monitoring plots, direct comparison with the first year data is inappropriate.

Pursuant to the new guidelines, the four corners of each plot (e.g. 0,0; 0,10; 10,0; and 10,10; or 0,0; 0,20; 5,0; and 5,20.) were marked with 18 inch long one half inch diameter galvanized steel conduit. Within each plot, each planted woody stem location (x and y) was recorded and live stem diameter at decimeter height (ddm), and height (cm) were recorded.

The average live, planted woody stem density for all plots was 22.88 individuals per plot, which translates to 929.95 stems per acre. This exceeds the required 320 stems per acre by 291 percent.

Exhibit Table VII. Stem counts and summary data by species and plot – Third Fork Creek Stream – EEP Project #139, Durham County, NC

Species	Total Stems	Total Planted	Survival Percent	Average (all plots)	Average ddbh (mm)	Relative Abundance	Relative # Dead	Average # Stems	Total Dead	----- Reach -----							
										Upstream					Downstream		
										plot 1	plot 2	plot 3	plot 4	plot 5	plot 6	plot 7	plot 8
<i>Albizia julibrissin</i>	1	1	100	1.00	8.76	0.55	0		0	1							
<i>Alnus serrulata</i>	17	17	100	2.43	11.67	9.29	0		0	3	1	6	1	1	3	2	
<i>Amelanchier arborea</i>	1	1	100	0.13	23.97*	0.55	0	1.00	0								1
<i>Betula nigra</i>	12	12	100	1.50	13.35	6.56	0	1.71	0		2	1	2	1	3	2	1
<i>Callicarpa americana</i>	25	25	100	3.13	7.07	13.66	0	3.57	0	4	8	5		1	4	2	1
<i>Cercis canadensis</i>	2	2	100	0.25	14.64	1.09	0	1.00	0	1			1				
<i>Cornus amomum</i>	16	16	100	2.00	11.29	8.74	0	2.00	0	4	3	2	1	2	2	1	1
<i>Fraxinus pennsylvanica</i>	23	23	100	2.88	8.16	12.57	0	3.83	0		3	3	2	1	12		2
<i>Hamamelis virginiana</i>	7	7	100	0.88	6.55	3.83	0	1.40	0	1	1				2	1	2
<i>Ilex deciduas</i>	4	4	100	0.50	7.07	2.19	0	1.00	0	1	1	1		1			
<i>Ilex opaca</i>	4	4	100	0.50	12.52	2.19	0	1.33	0	1			2		1		
<i>Itea virginica</i>	14	14	100	1.75	5.94	7.65	0	2.80	0	6	1	3			2	2	
<i>Morella cerifera</i>	9	9	100	1.13	14.74	4.92	0	2.25	0	2		1			3	3	
<i>Platanus occidentalis</i>	18	18	100	2.25	15.78	9.84	0	2.57	0	7	2	1	2		3	2	1
<i>Salix nigra</i>	2	2	100	0.25	LS	1.09	0	2.00	0					2			
<i>Sambucus canadensis</i>	3	3	100	0.38	12.00	1.64	0	1.00	0	1					1	1	
<i>Symphoricarpos orbiculatus</i>	17	17	100	2.13	5.95	9.29	0	2.12	0	1	3	5	2	1	3	1	1
<i>Viburnum dentatum</i>	7	7	100	0.88	7.54	3.83	0	3.50	0		3	4					
<i>Viburnum nudum</i>	1	1	100	0.13	3.60	0.55	0	1.00	0		1						
<b>Total planted woody stems (all plots)</b>	<b>183</b>	<b>183</b>	<b>100</b>			<b>100</b>	<b>0</b>		<b>0</b>	<b>33</b>	<b>29</b>	<b>32</b>	<b>13</b>	<b>10</b>	<b>39</b>	<b>17</b>	<b>10</b>
<b>Average planted woody stems per acre</b>	<b>926</b>									<b>1,336</b>	<b>1,174</b>	<b>1,295</b>	<b>526</b>	<b>405</b>	<b>1,578</b>	<b>688</b>	<b>405</b>
<b>Average all woody stems per acre</b>	<b>1,2852</b>									<b>1,902</b>	<b>1,255</b>	<b>1,619</b>	<b>1,174</b>	<b>567</b>	<b>2,549</b>	<b>809</b>	<b>405</b>

\*DBH

#### **4. Vegetation Plot Photos**

Vegetation plot photos are in Appendix A.

#### ***B. Stream Assessment***

RJG&A personnel initially evaluated the site during early February 2006. It was qualitatively evaluated during and after significant storm events in April and May 2006, and during low flow in late June, September, and October 2006. The second annual cross section, pattern, and longitudinal profile data were collected during October 2006. Markers for cross sections one and two were not re-located in the field, using a total station and a metal detector. Their locations were established using total station survey equipment and best professional judgment. While not in the identical location as the monitoring year 01 and as-built cross sections, the Year 02 cross section locations are within 20 feet, likely upstream. Because these locations provide representative stability condition data very close to the year 1 and as-built, their comparison to the original data is appropriate. Photographs were taken at the four cross sections and at the 14 permanent photo locations that were established by KCI in March 2005.

Overall, the site is maintaining its as-built dimension, pattern, and profile, and planted woody stem success is high. Several stretches of bank erosion are present in both reaches. One of these (station 34+27) is fairly significant, and getting worse (i.e. it has expanded laterally and longitudinally since February). Remedial action (e.g. armoring with root wads and/or rock) should be considered. Overall, the remaining bank slumps and undercuts are relatively minor and should continue to be monitored, as they may equilibrate themselves over time. The only other significant problem area (i.e. remedial action should be considered) is a backcut j-hook that has had its upstream-most header rock undercut (station 27+04). The rock has been completely dislodged and fallen back (upstream) into the scoured channel. The remaining j-hook/cross vane problem areas are relatively minor and should continue to be observed, to determine if remedial action should occur.

A *wetted perimeter* bed material analysis was performed at each cross section during October 2006. The difference between the second annual monitoring substrate analysis and the first year's indicates that the upstream-most channel bed has become finer (xs1), while the downstream-most bed (xs2-4) have become coarser. The most significant change was observed at cross section 3.



**On-site evidence of over-bank flow (26 June 2007)**



Two pressure transducers were observed during the initial evaluation in February. The serial numbers, brands and model numbers were recorded. A Solinst Levelogger 3001 reader was subsequently purchased and installed into a laptop. The laptop was brought to the site on 25 April 2006. The gauges had been removed from the PVC crest gauge pipes that held them. Neither gauge was found, after an extensive search, including inside the installed pipe. The upstream unit still had

its lock, the lower one had a broken top (above photo). **The units are presumed to have been removed by vandals.** On-site hydrologic data are therefore not available for the second annual monitoring. Qualitative evaluation (rack and drift lines and downed herbaceous and woody vegetation on the floodplain) indicated at least three events during 2006 (April, June, and September (above photo)).

Potential bankfull events were also evaluated based on USGS stream gauge discharge data for Ellerbe Creek near Gorman (USGS 02086849). This gauge is located approximately 8 miles northeast of the restoration site and has a drainage area of 21.9 square miles. According to the urban piedmont regional curve, a stream with a drainage area of 21.9 square miles would reach a bankfull discharge at 2,144.5 cubic feet per second (cfs) (Doll et al., 2002). Based on USGS data for 2006 (Figure 3), there have been no bankfull events at this gauge. The highest flow event during 2006 was 1080 cfs on November 22<sup>th</sup>, which is less than half of the bankfull discharge predicted by the urban piedmont regional curve. Using the rural piedmont regional curve, bankfull discharge is 819.7 cfs, making the high flow event on November 22<sup>nd</sup> the only bankfull event of the year.

The 2006 qualitative evaluation of Third Fork Creek clearly indicates that at least one, probably three storm events resulted in flows over the designed/built bankfull elevation.

<b>Date of Data Collection</b>	<b>Date of Occurrence</b>	<b>Method</b>	<b>Photo # (if available)</b>
2006	22 November 2006	Proximal USGS gauge resource	NA
26 June 2006	15 June 2006	On-site high water indicators	above
15 September 2006	03 September 2006	On-site high water indicators	NA

Figure 3. USGS 2006 stream gauge discharge data for Ellerbe Creek near Gorman, N.C.

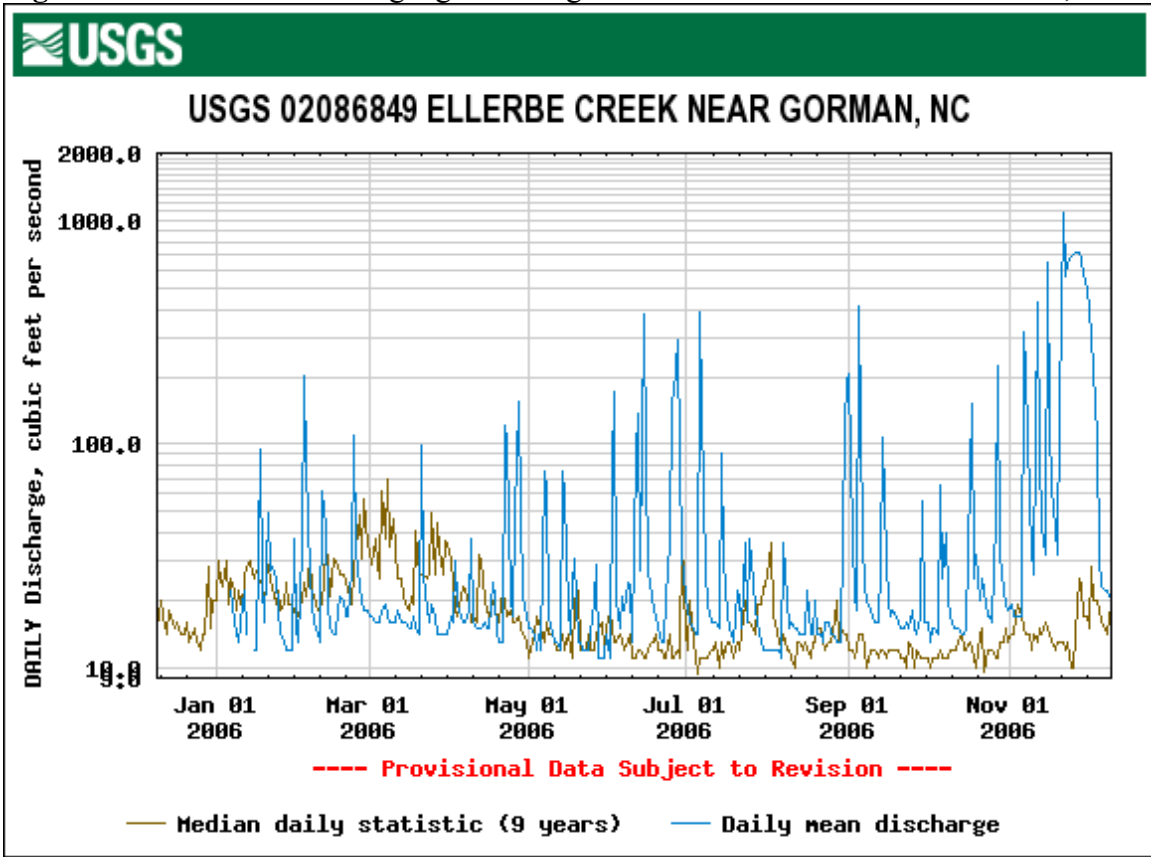


Table IX BEHI and Sediment Export Estimates only apply to Monitoring year 5 and was, therefore, not performed during 2006 (monitoring year 2).

**Exhibit Table X. Stream Problem Areas - Third Fork Stream Restoration – EEP Project #139**

<b>Feature/Issue</b>	<b>Station</b>	<b>Probable Cause</b>	<b>Photo</b>
Aggradation (bar)	1057	Offsite/upstream	SP1
Aggradation (bar)	1080	Offsite/upstream	SP1
Vane backcut/scour	1090	Insufficient/no coarse backfill	SP4&5
Aggradation (pool)	1110	Offsite/upstream	SP2
Aggradation (pool)	1151	Offsite/upstream	SP2
Aggradation (bar)	1193	Offsite/upstream	SP1
Vane backcut/scour	1419	Insufficient/no coarse backfill	SP4&5
Bank undercut/slump	1517	No armor/rootwad	SP3
Vane backcut/scour	1783	Insufficient/no coarse backfill	SP4&5
Vane backcut/scour	2034	Insufficient/no coarse backfill, storm flow from UT	SP4&5
Vane backcut/scour	2146	Insufficient/no coarse backfill	SP4&5
Vane backcut/scour	2171	Insufficient/no coarse backfill	SP4&5
Bank undercut/slump	2502	No armor/rootwad	SP3
Bank undercut/slump	2632	No armor/rootwad	SP3
Vane backcut/scour	2704	Insufficient/no coarse backfill	SP4&5
Vane backcut/scour	2801	Insufficient/no coarse backfill	SP4&5
Aggradation (bar)	3075	Double box culvert	SP1
Aggradation (bar)	3152	Confluence with channelized UT below box culverts	SP1
Aggradation (bar)	3208	Bank undercut/slump and offsite/upstream	SP1
Aggradation (pool)	3216	Bank undercut/slump and offsite/upstream	SP2
Aggradation (bar)	3292	Bank undercut/slump and offsite/upstream	SP1
Aggradation (bar)	3322	Bank undercut/slump and offsite/upstream	SP1
Aggradation (bar)	3404	Bank undercut/slump and offsite/upstream	SP1
Vane backcut/scour	3410	Insufficient/no coarse backfill	SP4&5
Bank undercut/slump	3427	No armor/rootwad	SP3
Aggradation (bar)	3485	Bank undercut/slump and offsite/upstream	SP1
Bank undercut/slump	3559	No armor/rootwad	SP3
Bank undercut/slump	3664	No armor/rootwad	SP3
Bank undercut/slump	3732	No armor/rootwad	SP3
Bank undercut/slump	3805	No armor/rootwad	SP3
Vane backcut/scour	3862	Insufficient/no coarse backfill	SP4&5
Aggradation (bar)	3976	Bank undercut/slump and offsite/upstream	SP1

<b>Exhibit Table XI. Categorical Stream Feature Visual Stability Assessment</b>						
<b>Third Fork Creek Stream Restoration – EEP Project #139</b>						
<b>Upstream Reach (1600 Feet)</b>						
Feature	Initial*	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles	100%	NA	92			
B. Pools	100%	NA	87			
C. Thalweg	100%	NA	69			
D. Meanders	100%	NA	90			
E. Bed General	100%	NA	100			
F. Vanes/J Hooks, etc.	100%	NA	93			
G. Wads and Boulders	NA	NA	NA			
<b>Downstream Reach (1525 Feet)</b>						
A. Riffles	100%	NA	56			
B. Pools	100%	NA	56			
C. Thalweg	100%	NA	57			
D. Meanders	100%	NA	67			
E. Bed General	100%	NA	100			
F. Vanes/J Hooks, etc.	100%	NA	89			
G. Wads and Boulders	100%	NA	NA			

\*These percentages are assumed. Neither the As-built Monitoring Report nor the First Year Monitoring Report contained any visual stability assessment data.

**Exhibit Table XII. Baseline Morphology and Hydraulic Summary - Third Fork Creek Stream Restoration– EEP Project #139 - Durham County, NC**

<b>Parameters</b>		<b>Pre-existing condition</b>		
<b>Dimension</b>	<b>USGS Data</b>	<b>Regional Curve Interval</b>	<b>Upstream Reach</b>	<b>Downstream Reach</b>
Floodprone Elevation (ft)			NA	NA
Bankfull Elevation (ft)			NA	NA
Floodprone Width (ft)			29.2-400	62-400
Bankfull Width (ft)			21.8-26.8	29.5
Entrenchment Ratio			1.1-18.3	6.8
Mean Depth (ft)			NA	NA
Maximum Depth (ft)			4.7	5.8
Width/Depth Ratio			8.3-15.9	12.2
Bankfull Area (sq ft)			45.1-57.2	71.4
Wetted Perimeter (ft)			NA	NA
Hydraulic Radius (ft)			NA	NA
<b>Substrate</b>				
d50 (mm)			0.31-0.38	0.41
d84 (mm)			NA	NA
<b>Pattern</b>				
Channel Beltwidth (ft)			NA	NA
Radius of Curvature (ft)			NA	NA
Meander Wavelength			NA	NA
Meander Width ratio				
<b>Profile</b>				
Riffle length (ft)			NA	NA
Riffle slope (ft/ft)			0.24-0.57	0.25-0.29
Pool length (ft)			NA	NA
Pool spacing (ft)			NA	NA
<b>Additional Reach Parameters</b>				
Valley Length (ft)			NA	NA
Channel Length (ft)			1890	900
Sinuosity			1.03	1.01
Water Surface Slope (ft/ft)			0.25	0.20
BF slope (ft/ft)			NA	NA
Rosgen Classification			F5, G5, E5	C5
Habitat Index			NA	NA
Macrobenthos			NA	NA

**Exhibit Table XII. Baseline Morphology and Hydraulic Summary - Third Fork Creek Stream Restoration – EEP Project #139 - Durham County, NC**

Parameters	Reference Reach	Design	
	North Prong Creek	Upstream Reach	Downstream Reach
<b>Dimension</b>			
Floodprone Elevation (ft)	NA	NA	NA
Bankfull Elevation (ft)	NA	NA	NA
Floodprone Width (ft)	NA	NA	NA
Bankfull Width (ft)	17.8	27	30
Entrenchment Ratio	33.7	2.3-14.8	6.7
Mean Depth (ft)	1.5	2.2	2.5
Maximum Depth (ft)	3.0	4.0	4.25
Width/Depth Ratio	12.1	12.1	12.0
Bankfull Area (sq ft)	26.2	60	75
Wetted Perimeter (ft)	NA	NA	NA
Hydraulic Radius (ft)	NA	NA	NA
<b>Substrate</b>			
d50 (mm)	0.20	0.31-0.38	0.41
d84 (mm)	NA	NA	NA
<b>Pattern</b>			
Channel Beltwidth (ft)	158	120	90
Radius of Curvature (ft)	37-40	60-75	60-80
Meander Wavelength (ft)	94-143	160-190	180-210
Meander Width ratio	8.9	4.4	3.0
<b>Profile</b>			
Riffle length (ft)	NA	NA	NA
Riffle slope (ft/ft)	0.2-2.1	0.25-0.29	0.25
Pool length (ft)	8-30	27-40	30-45
Pool spacing (ft)	40-85.5	60-125	70-140
<b>Additional Reach Parameters</b>			
Valley Length (ft)	NA	NA	NA
Channel Length (ft)	407	2083	925
Sinuosity	1.28	1.13	1.10
Water Surface Slope (ft/ft)	0.24	0.25	0.20
BF slope (ft/ft)	NA	NA	NA
Rosgen Classification	C5	C5	C5
Habitat Index	NA	NA	NA
Macrobenthos	NA	NA	NA

**Exhibit Table XII. Baseline Morphology and Hydraulic Summary - Third Fork Creek Stream Restoration – EEP Project #139 - Durham County, NC**

As-built\*

Parameters	Upstream Reach			Downstream Reach		
	min	max	average	min	max	average
<b>Dimension</b>						
Floodprone Elevation (ft)	NA	NA	NA	NA	NA	NA
Bankfull Elevation (ft)	NA	NA	NA	NA	NA	NA
Floodprone Width (ft)	NA	NA	NA	NA	NA	NA
Bankfull Width (ft)	NA	NA	27	NA	NA	30
Entrenchment Ratio	2.3	14.8	NA	NA	NA	6.7
Mean Depth (ft)	NA	NA	2.2	NA	NA	2.5
Maximum Depth (ft)	NA	NA	4.0	NA	NA	4.25
Width/Depth Ratio	NA	NA	12.1	NA	NA	12.0
Bankfull Area (sq ft)	NA	NA	60	NA	NA	75
Wetted Perimeter (ft)	NA	NA	NA	NA	NA	NA
Hydraulic Radius (ft)	NA	NA	NA	NA	NA	NA
<b>Substrate</b>						
d50 (mm)	0.31	0.38	NA	NA	NA	0.41
d84 (mm)	NA	NA	NA	NA	NA	NA
<b>Pattern</b>						
Channel Beltwidth (ft)	NA	NA	120	NA	NA	90
Radius of Curvature (ft)	60	75	NA	60	80	NA
Meander Wavelength	160	190	NA	180	210	NA
Meander Width ratio	NA	NA	4.4	NA	NA	3.0
<b>Profile</b>						
Riffle length (ft)	NA	NA	NA	NA	NA	NA
Riffle slope (ft/ft)	0.25	0.29	NA	NA	NA	0.25
Pool length (ft)	27	40	NA	30	45	NA
Pool spacing (ft)	NA	NA	NA	NA	NA	NA
<b>Additional Reach Parameters</b>						
Valley Length (ft)	NA	NA	NA	NA	NA	NA
Channel Length (ft)	NA	NA	2083	NA	NA	925
Sinuosity	NA	NA	1.13	NA	NA	1.10
Water Surface Slope (ft/ft)	NA	NA	0.25	NA	NA	0.20
BF slope (ft/ft)	NA	NA		NA	NA	NA
Rosgen Classification	NA	NA	C5	NA	NA	C5
Habitat Index	NA	NA		NA	NA	NA
Macrobenthos	NA	NA		NA	NA	NA

\*No as-built numbers were provided. The Third Fork mitigation plan (December 2005) and the First Year Monitoring Report (December 2005) both provide Design numbers only, therefore the design numbers have been provided in the as-built columns, but are redundant of those figures appearing earlier in the table.

**Exhibit Table XIII. Morphology and Hydraulic Monitoring Summary - Third Fork Creek Stream Restoration – EEP Project #139**

Dimension	XS 1			XS 2			XS 3			XS 4		
	As-built	Mon 01	Mon 02	As-built	Mon 01	Mon 02	As-built	Mon 01	Mon 02	As-built	Mon 01	Mon 02
Floodprone Elevation (ft)	301.46	301.49	301.74	301.88	302.21	302.65	295.37	295.75	295.88	297.07	297.50	297.05
Bankfull Elevation (ft)	297.55	297.54	297.55	297.07	297.10	297.20	292.09	292.27	292.40	292.56	292.53	292.49
Floodprone Width (ft)	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00	240.00
Bankfull Width (ft)	20.40	27.11	28.63	26.43	26.39	27.62	17.50	29.00	25.97	17.50	23.29	20.47
Entrenchment Ratio	11.76	8.85	8.38	9.08	NA	8.69	13.71	8.28	9.24	13.71	NA	11.72
Mean Depth (ft)	3.03	2.26	2.18	2.65	2.76	2.78	3.12	1.84	1.84	3.51	2.59	2.80
Maximum Depth (ft)	3.91	3.95	4.19	4.81	5.11	5.45	3.28	3.48	3.84	4.51	4.97	4.56
Width/Depth Ratio	6.70	12.00	13.12	9.97	NA	9.94	5.61	15.70	14.51	4.98	NA	7.31
Bankfull Area (sq ft)	61.87	61.37	62.47	70.07	72.88	76.71	54.61	53.46	47.67	61.50	60.40	57.34
Wetted Perimeter (ft)	NA	NA	30.91	NA	NA	31.70	NA	NA	28.31	NA	NA	23.99
Hydraulic Radius (ft)	NA	NA	2.02	NA	NA	2.42	NA	NA	1.68	NA	NA	2.39
<b>Substrate</b>												
d50 (mm)		0.06	0.04		0.06	0.09		0.49	6.27		1.00	0.85
d84 (mm)		0.60	0.06		0.10	0.78		1.50	16.6		2.00	11.3
		<b>Upstream Reach</b>			<b>Downstream Reach</b>							
<b>Pattern</b>	As-built	Mon 01	Mon 02		As-built	Mon 01	Mon 02					
Channel Beltwidth (ft)	NA	NA	33.88		NA	NA	35.77					
Radius of Curvature (ft)	NA	NA	69.42		NA	NA	57.96					
Meander Wavelength	NA	NA	177.65		NA	NA	162.56					
Meander Width ratio	NA	NA	1.20		NA	NA	1.54					
<b>Profile</b>												
Riffle length (ft)	NA	NA	51.43		NA	NA	14.24					
Riffle slope (ft/ft)	NA	0.001-0.002	0.002		NA	0.001-0.011	0.02					
Pool length (ft)	NA		28.60		NA	NA	101.45					
Pool spacing (ft)	NA	45-115	35.95		NA	14-82	23.28					
<b>Additional Reach Parameters</b>												
Valley Length (ft)	NA	NA	310		NA	NA	308					
Channel Length (ft)	NA	NA	350		NA	NA	350					
Sinuosity	NA	NA	1.13		NA	NA	1.14					
Water Surface Slope (ft/ft)	NA	NA	0.0018		NA	NA	0.0009					
BF slope (ft/ft)	NA	NA	0.0003		NA	NA	0.003					
Rosgen Classification	NA	NA	C5		NA	NA	C5b					
Habitat Index	NA	NA	NA		NA	NA	NA					
Macrobenthos			NA				NA					



***C. Wetland Assessment***

No wetland restoration was included in this project.

**Third Fork Creek Stream Restoration – Durham County, NC**

**Appendix A Vegetation Raw Data**

A-1 Vegetation Problem Area Plan View

A-2 Vegetation Problem Area Photo

A-3 Vegetation Survey Summary Data

A-4 Vegetation Monitoring Plot Photos

A-5 Vegetation Raw Data



Figure A1.1 - Vegetation Problem Areas  
 2006 Plan View - Year 2  
 Third Fork Creek (Forest Hills)  
 Stream Restoration - Project #139

**LEGEND**

**Vegetation Problem Areas**

- Vegetation/soil disturbance

**Exotic Species Colonization**

- Vines
- Woody species
- Vines and Woody species

**Other Features**

- 2006 Thalweg
- 2006 Vegetation Monitoring Plots
- Cross Sections

**As-built Drawings (Supplied by KCI)**

- Vanes
- Thalweg
- Edge of water
- Conservation Easement
- Sewer ROW

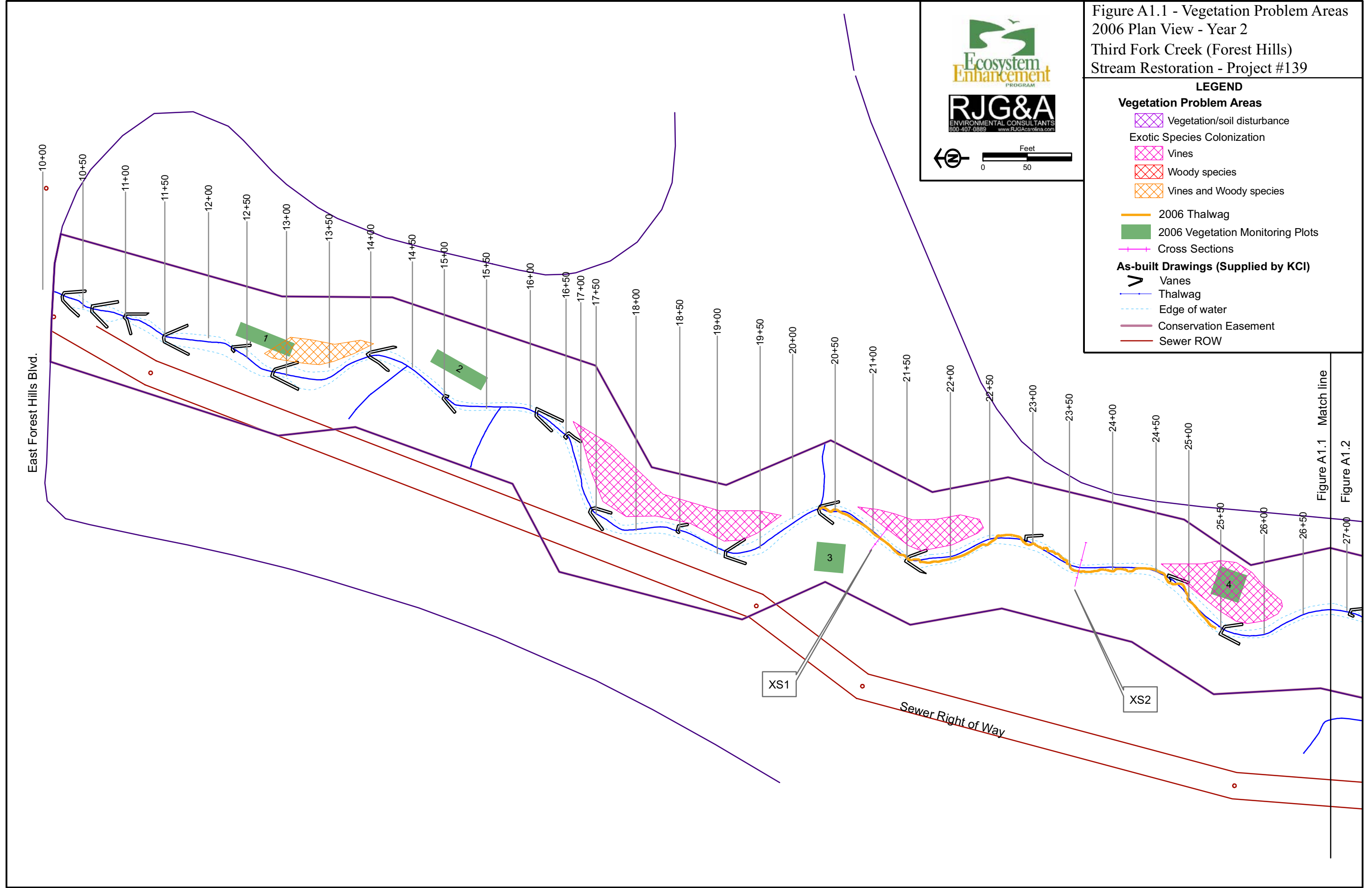
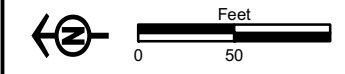


Figure A1.1 Match line

Figure A1.2

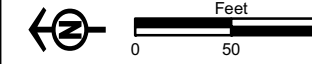
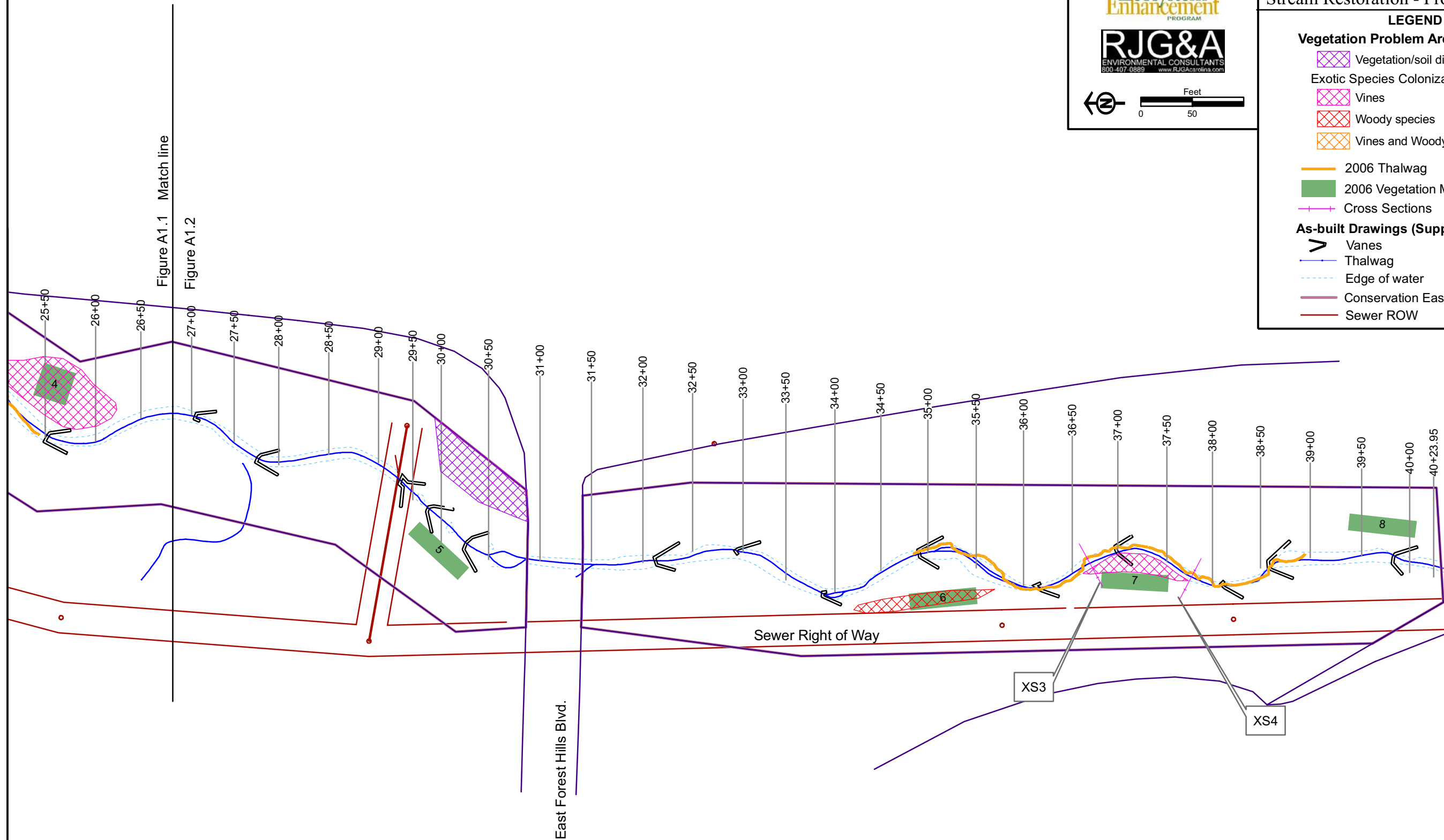


Figure A1.2 - Vegetation Problem Areas  
2006 Plan View - Year 2  
Third Fork Creek (Forest Hills)  
Stream Restoration - Project #139

- LEGEND**
- Vegetation Problem Areas**
- Vegetation/soil disturbance
  - Exotic Species Colonization**
    - Vines
    - Woody species
    - Vines and Woody species
  - 2006 Thalweg
  - 2006 Vegetation Monitoring Plots
  - Cross Sections
- As-built Drawings (Supplied by KCI)**
- Vanes
  - Thalweg
  - Edge of water
  - Conservation Easement
  - Sewer ROW



**Appendix A2. Representative Vegetation Problem Area Photographs - 2006 – Third Fork Creek Stream Restoration - Project #139**



**VP1. Disturbed Area**



**VP2. Vines**



**VP3. Vines**



**VP4. Vines**

**Appendix A2. Representative Vegetation Problem Area Photographs - 2006 – Third Fork Creek Stream Restoration- Project #139**



**VP5. Woody**



**VP6. Woody**

*Albizzia julibrissin*

A-3 Vegetation Survey Summary Data - Third Fork Stream Restoration, - Project #139										Reach							
										Upstream				Downstream			
Species	Total Live Stems Planted	Total Stems Planted*	Survival Percent	Average (all plots)	Average ddb (mm)	Relative Abundance	Relative # Dead	Average # Stems	Total Dead	plot 1	plot 2	plot 3	plot 4	plot 5	plot 6	plot 7	plot 8
<b>PLANTED WOODY STEMS</b>																	
<i>Albizia julibrissin</i>	1.0	1.0	100.0	1.0	8.8	0.5	0.0	1.0	0.0	1.0							
<i>Alnus serrulata</i>	17.0	17.0	100.0	2.4	10.8	9.3	0.0	2.4	0.0	3.0	1.0	6.0	1.0	1.0	3.0	2.0	
<i>Amelanchier arborea</i>	1.0	1.0	100.0	0.1	23.9**	0.5	0.0	1.0	0.0								1.0
<i>Betula nigra</i>	12.0	12.0	100.0	1.5	12.6	6.6	0.0	1.7	0.0		2.0	1.0	2.0	1.0	3.0	2.0	1.0
<i>Callicarpa americana</i>	25.0	25.0	100.0	3.1	8.2	13.7	0.0	3.6	0.0	4.0	8.0	5.0		1.0	4.0	2.0	1.0
<i>Cercis canadensis</i>	2.0	2.0	100.0	0.3	13.1	1.1	0.0	1.0	0.0	1.0			1.0				
<i>Cornus amomum</i>	16.0	16.0	100.0	2.0	10.1	8.7	0.0	2.0	0.0	4.0	3.0	2.0	1.0	2.0	2.0	1.0	1.0
<i>Fraxinus pennsylvanica</i>	23.0	23.0	100.0	2.9	9.2	12.6	0.0	3.8	0.0		3.0	3.0	2.0	1.0	12.0		2.0
<i>Hamamelis virginiana</i>	7.0	7.0	100.0	0.9	10.2	3.8	0.0	1.4	0.0	1.0	1.0				2.0	1.0	2.0
<i>Ilex decidua</i>	4.0	4.0	100.0	0.5	6.9	2.2	0.0	1.0	0.0	1.0	1.0	1.0		1.0			
<i>Ilex opaca</i>	4.0	4.0	100.0	0.5	8.3	2.2	0.0	1.3	0.0	1.0			2.0		1.0		
<i>Itea virginica</i>	14.0	14.0	100.0	1.8	6.5	7.7	0.0	2.8	0.0	6.0	1.0	3.0			2.0	2.0	
<i>Morella cerifera</i>	9.0	9.0	100.0	1.1	10.9	4.9	0.0	2.3	0.0	2.0		1.0			3.0	3.0	
<i>Platanus occidentalis</i>	18.0	18.0	100.0	2.3	15.8	9.8	0.0	2.6	0.0	7.0	2.0	1.0	2.0		3.0	2.0	1.0
<i>Salix nigra</i>	2.0	2.0	100.0	0.3	LS	1.1	0.0	2.0	0.0					2.0			
<i>Sambucus canadensis</i>	3.0	3.0	100.0	0.4	13.7	1.6	0.0	1.0	0.0	1.0					1.0	1.0	
<i>Symphoricarpos orbiculatus</i>	17.0	17.0	100.0	2.1	8.9	9.3	0.0	2.1	0.0	1.0	3.0	5.0	2.0	1.0	3.0	1.0	1.0
<i>Viburnum dentatum</i>	7.0	7.0	100.0	0.9	7.1	3.8	0.0	3.5	0.0		3.0	4.0					
<i>Viburnum nudum</i>	1.0	1.0	100.0	0.1	8.6	0.5	0.0	1.0	0.0		1.0						
<b>Total planted woody stems (all plots)</b>	<b>183.0</b>	<b>183.0</b>	<b>100.0</b>			<b>100.0</b>	<b>0.0</b>		<b>0.0</b>	<b>33.0</b>	<b>29.0</b>	<b>32.0</b>	<b>13.0</b>	<b>10.0</b>	<b>39.0</b>	<b>17.0</b>	<b>10.0</b>
<b>Live woody stems per acre (planted)</b>	<b>925.8</b>									<b>1335.5</b>	<b>1173.6</b>	<b>1295.0</b>	<b>526.1</b>	<b>404.7</b>	<b>1578.3</b>	<b>688.0</b>	<b>404.7</b>
<b>Live woody stems per acre (planted plus volunteer)</b>	<b>1284.9</b>									<b>1902.1</b>	<b>1254.6</b>	<b>1618.8</b>	<b>1173.6</b>	<b>566.6</b>	<b>2549.6</b>	<b>809.4</b>	<b>404.7</b>

\* Year 2 Monitoring (2006) planted live plus planted dead

\*\* DBH

A-3 Vegetation Survey Summary Data - Third Fork Stream Restoration, - Project #139											Reach							
											Upstream				Downstream			
Species	Total Live Stems Planted	Total Stems Planted*	Survival Percent	Average (all plots)	Average ddbh (mm)	Relative Abundance	Relative # Dead	Average # Stems	Total Dead	plot 1	plot 2	plot 3	plot 4	plot 5	plot 6	plot 7	plot 8	
<b>VOLUNTEER WOODY STEMS</b>																		
<i>Acer rubrum</i>	13.0					18.3				0.0	0.0	1.0	12.0	0.0	0.0	0.0	0.0	
<i>Amelanchier arborea</i>	2.0					2.8				0.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	
<i>Baccharis halimifolia</i>	1.0					1.4				1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
<i>Liquidambar styraciflua</i>	11.0					15.5				0.0	0.0	0.0	0.0	0.0	11.0	0.0	0.0	
<i>Paulownia tomentosa</i>	9.0					12.7				6.0	0.0	0.0	0.0	2.0	0.0	1.0	0.0	
<i>Pinus taeda</i>	3.0					4.2				0.0	0.0	0.0	0.0	0.0	3.0	0.0	0.0	
<i>Platanus occidentalis</i>	12.0					16.9				5.0	0.0	0.0	3.0	1.0	3.0	0.0	0.0	
<i>Prunus</i>	1.0					1.4				0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	
<i>Prunus serotina</i>	1.0					1.4				0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	
<i>Quercus phellos</i>	4.0					5.6				0.0	0.0	3.0	0.0	0.0	1.0	0.0	0.0	
<i>Sambucus canadensis</i>	1.0					1.4				0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	
<i>Taxodium distichum</i>	1.0					1.4				0.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	
<i>Ulmus</i>	2.0					2.8				0.0	0.0	2.0	0.0	0.0	0.0	0.0	0.0	
<i>Ulmus alata</i>	6.0					8.5				0.0	0.0	0.0	1.0	0.0	5.0	0.0	0.0	
<i>Ulmus americana</i>	4.0					5.6				2.0	0.0	1.0	0.0	0.0	0.0	1.0	0.0	
<b>Total volunteer woody stems</b>	71.0					100.0				14.0	2.0	8.0	16.0	4.0	24.0	3.0	0.0	
<b>Average density</b>	8.9																	
<b>Average volunteer woody stems per acre</b>	359.2									566.6	80.9	323.8	647.5	161.9	971.3	121.4	0.0	



**Appendix A4. Vegetation Monitoring Plot Photographs - 2006 – Third Fork Creek Stream Restoration- Project #139**



**Plot #1**



**Plot #2**



**Plot #3**



**Plot #4**

**Appendix A4. Vegetation Monitoring Plot Photographs - 2006 – Third Fork Creek Stream Restoration - Project #139**



**Plot #5**



**Plot #6**



**Plot #7**



**Plot #8**

**A 5. Planted Woody Stems Plot 1 - Third Fork Stream Restoration, - Project #139**

SCIENTIFIC_NAME	unknownSp	stemSource	stemX	stemY	ddh	Height	DBH	stemHealth	stemComment
<i>Albizia julibrissin</i>		R	11.12	0.65	8.76	82		2	
<i>Alnus serrulata</i>		R	1.83	2.15	9.21	92		4	
<i>Alnus serrulata</i>		R	10.4	3.64	9.82	86		3	
<i>Alnus serrulata</i>		R	13.77	3.87		128		4	
<i>Callicarpa americana</i>		R	1.29	2	2.35	47.5		2	
<i>Callicarpa americana</i>		R	13.3	4.68	4.98	66		3	
<i>Callicarpa americana</i>		R	15.69	3.47	7.58	103		3	
<i>Callicarpa americana</i>		R	17.99	4.51	5.68	70		3	
<i>Cercis canadensis</i>		R	6.92	4.1	21.38	194		4	
<i>Cornus amomum</i>		R	8.59	3.67		106		3	
<i>Cornus amomum</i>		R	10.46	2.42	5.24	87		3	
<i>Cornus amomum</i>		R	12.17	3.87	11.11	91		3	
<i>Cornus amomum</i>		R	14.51	1.14	13.24	190		4	
<i>Hamamelis virginiana</i>		R	8.31	0.63	7.22	70		3	
<i>Ilex decidua</i>		R	5.3	3.65	7.18	78		2	
<i>Ilex opaca</i>		R	14.1	1.47	14.83	103		2	
<i>Itea virginica</i>		R	1.17	3.35	4.56	52		2	
<i>Itea virginica</i>		R	9.54	1.17	4.14	37		3	
<i>Itea virginica</i>		R	12.72	2.05	6.07	59		3	
<i>Itea virginica</i>		R	15.28	4.07	5.16	68		3	
<i>Itea virginica</i>		R	19.46	3.61	5.66	83		3	
<i>Itea virginica</i>		R	4.35	0.04	5.04	61		1	
<i>Morella cerifera</i>		R	4.08	3.62	15.46	135		4	
<i>Morella cerifera</i>		R	7.53	0.58	21.15	161		3	
<i>Platanus occidentalis</i>		R	0.64	4.46	14.19	131		3	
<i>Platanus occidentalis</i>		R	2.03	4.38	15.76	129		3	
<i>Platanus occidentalis</i>		R	8.67	2.34	18.02	158		4	
<i>Platanus occidentalis</i>		R	6.14	0.2	4.5	51		2	
<i>Platanus occidentalis</i>		R	5.12	1.26	5.32	48		2	
<i>Platanus occidentalis</i>		R	14.33	4.99	13.36	117		3	
<i>Platanus occidentalis</i>		R	16.42	4.01	14.39	129		3	
<i>Sambucus canadensis</i>		R	3.16	3.5	5.71	61		2	
<i>Symphoricarpos orbiculatus</i>		R	17.35	2.9	9.2	68		3	



**A 5. Planted Woody Stems Plot 2 - Third Fork Stream Restoration, - Project #139**

<b>SCIENTIFIC_NAME</b>	<b>unknownSp</b>	<b>stemSource</b>	<b>stemX</b>	<b>stemY</b>	<b>ddh</b>	<b>Height</b>	<b>DBH</b>	<b>stemHealth</b>	<b>stemComment</b>
<i>Alnus serrulata</i>		R	5.78	1.48	6.7	58.5		3	
<i>Betula nigra</i>		R	6.7	4.96	18	176.8	3.4	4	
<i>Betula nigra</i>		R	11.04	0.88	14.2	94.5		4	
<i>Callicarpa americana</i>		R	2.39	3.16		152.4		4	
<i>Callicarpa americana</i>		R	6.92	2.42	9.2	88.4		4	
<i>Callicarpa americana</i>		R	12.67	1.03	3.1	34.4		3	
<i>Callicarpa americana</i>		R	13.01	3.98	4.2	45.7		3	
<i>Callicarpa americana</i>		R	14.3	3.26	10.6	103		3	
<i>Callicarpa americana</i>		R	15.56	3.3	3.4	45.7		3	
<i>Callicarpa americana</i>		R	18.65	3.4	9.7	96.9		3	
<i>Callicarpa americana</i>		R	19.5	4.38	7.1	70.1		3	
<i>Cornus amomum</i>		R	5.53	3.65	13.8	131.1		4	
<i>Cornus amomum</i>		R	9.1	1.3	10.2	77.7		3	
<i>Cornus amomum</i>		R	8.62	2.78	8.6	111.3		3	
<i>Fraxinus pennsylvanica</i>		R	2.42	2.29		173.7	7.1	4	
<i>Fraxinus pennsylvanica</i>		R	6.82	3.3	9.4	59.4		3	
<i>Fraxinus pennsylvanica</i>		R	15.46	4.28	12.7	74.7		2	
<i>Hamamelis virginiana</i>		R	14.5	0.45	9.5	88.4		3	
<i>Ilex decidua</i>		R	10.28	4.53	6.4	59.4		3	
<i>Itea virginica</i>		R	7.25	0.15	5.6	66.4		3	
<i>Platanus occidentalis</i>		R	3.7	4.15	14	114.3		3	
<i>Platanus occidentalis</i>		R	8.72	0.37	15.7	120.1		3	
<i>Symphoricarpos orbiculatus</i>		R	3.3	1.96	5.3	67.7		3	
<i>Symphoricarpos orbiculatus</i>		R	17.5	2.9	10.2	85.3		3	
<i>Symphoricarpos orbiculatus</i>		R	19.75	2.38	3.3	76.2		2	
<i>Viburnum dentatum</i>		R	2.8	0.79	5.75	54.9		3	
<i>Viburnum dentatum</i>		R	5.02	0.51	8.4	54.3		3	
<i>Viburnum dentatum</i>		R	4.56	1.78	8.6	69.5		3	
<i>Viburnum nudum</i>		R	17.35	0.3	3.6	27.4		2	



**A 5. Planted Woody Stems Plot 3 - Third Fork Stream Restoration, - Project #139**

SCIENTIFIC_NAME	unknownSp	stemSource	stemX	stemY	ddh	Height	DBH	stemHealth	stemComment
<i>Alnus serrulata</i>		R	0.2	3.63	12	98		3	Flood
<i>Alnus serrulata</i>		R	3.27	4.7	18	121		4	
<i>Alnus serrulata</i>		R	2.8	1.4	13	125		3	
<i>Alnus serrulata</i>		R	6.52	3.21		84		3	
<i>Alnus serrulata</i>		R	7.59	5.46	7	67		3	
<i>Alnus serrulata</i>		R	9.64	9.5	6	77		3	
<i>Betula nigra</i>		R	1.09	4.1	14	0.3		4	
<i>Callicarpa americana</i>		R	2.19	1.75	5	78		3	
<i>Callicarpa americana</i>		R	7.01	1.26	7	138		3	
<i>Callicarpa americana</i>		R	4.85	5.91	9	111		3	
<i>Callicarpa americana</i>		R	4.59	9.11	6	78		3	Flood
<i>Callicarpa americana</i>		R	8.69	1.85	10	85		3	
<i>Cornus amomum</i>		R	3.5	6.68	9	136		3	
<i>Cornus amomum</i>		R	7.41	8.59	11	69		3	
<i>Fraxinus pennsylvanica</i>		R	1.84	5.01	14	126		3	
<i>Fraxinus pennsylvanica</i>		R	5.47	0.84	18	146		3	
<i>Fraxinus pennsylvanica</i>		R	8.37	6.92	4	51		2	
<i>Ilex decidua</i>		R	5.21	2.69	5	78		2	
<i>Itea virginica</i>		R	2.29	4.72	5	57		3	
<i>Itea virginica</i>		R	6.31	7.88	7	88		3	
<i>Itea virginica</i>		R	7.52	8.66	7	107		3	
<i>Morella cerifera</i>	sp.	R	6.89	5.89	7	63		3	
<i>Platanus occidentalis</i>		R	3.8	7.53	26	189		3	
<i>Symphoricarpos orbiculatus</i>		R	0.92	4.85	9	81		3	Flood
<i>Symphoricarpos orbiculatus</i>		R	5.49	4.52	9	81		3	
<i>Symphoricarpos orbiculatus</i>		R	5.01	7.71	7	83		3	
<i>Symphoricarpos orbiculatus</i>		R	5.74	6.52	4	47		3	
<i>Symphoricarpos orbiculatus</i>		R	9.62	0.29	6	66		3	
<i>Viburnum dentatum</i>		R	6.08	9.11	15	104		3	
<i>Viburnum dentatum</i>		R	7.01	4.51	5	62		3	
<i>Viburnum dentatum</i>		R	8.04	3.45	6	54		3	
<i>Viburnum dentatum</i>		R	8.21	8.2	4	59		3	





**A 5. Planted Woody Stems Plot 4 - Third Fork Stream Restoration, - Project #139**

<b>SCIENTIFIC_NAME</b>	<b>unkno wnSp</b>	<b>ste mS our ce</b>	<b>ste mX</b>	<b>ste mY</b>	<b>ddh</b>	<b>Height</b>	<b>DBH</b>	<b>stemHeal th</b>	<b>stemCom ment</b>	
<i>Alnus serrulata</i>			2.3	5.8	16.7	125.9		3		
<i>Betula nigra</i>			0.7	1.9	17.1	131.1		3		
<i>Betula nigra</i>			1.2	3.2	20.5	169.2		3		
<i>Cercis canadensis</i>			8.0	5.0		48.2		2		
<i>Cornus amomum</i>			0.0	0.5	13.4	204.2		4		
<i>Fraxinus pennsylvanica</i>			3.8	5.8	4.8	25.9		2		
<i>Fraxinus pennsylvanica</i>			6.7	4.1	4.2	33.5		2		
<i>Ilex opaca</i>			4.2	5.6	15.8	102.1		2		
<i>Ilex opaca</i>			8.1	2.5	15.46	105.2		2		
<i>Platanus occidentalis</i>			4.8	7.1	23.3	160		3		
<i>Platanus occidentalis</i>			2.1	7.5	5.58	42.7		2		
<i>Symphoricarpos orbiculatus</i>			1.1	0.8	3.42	78		3		
<i>Symphoricarpos orbiculatus</i>			2.1	2.5	4.05	61		2		







**A 5. Planted Woody Stems Plot 6 - Third Fork Stream Restoration, - Project #139**

SCIENTIFIC_NAME	unknownSp	stemSource	stemX	stemY	ddh	Height	DBH	stemHealth	stemComment
<i>Alnus serrulata</i>		R	9.57	1.78	8	87		3	
<i>Alnus serrulata</i>		R	10.1	3.8	12	107		3	
<i>Alnus serrulata</i>		R	14.86	4.49	21	114		4	
<i>Betula nigra</i>		R	6.5	1.03		168	0.3	3	
<i>Betula nigra</i>		R	10.59	2.19	8	102		3	
<i>Betula nigra</i>		R	14.75	2.62	5	46		2	
<i>Callicarpa americana</i>		R	2.9	4.8	4	45		2	
<i>Callicarpa americana</i>		R	16.13	2.23	5	72		2	
<i>Callicarpa americana</i>	sp.	R	17.32	1.54	7	78		3	
<i>Callicarpa americana</i>		R	18.18	3.25	15	128		4	
<i>Cornus amomum</i>		R	12.38	1.58	6	94		3	
<i>Cornus amomum</i>		R	19.58	1.77	9	101		3	
<i>Fraxinus pennsylvanica</i>		R	1.43	2.27	4	27		2	
<i>Fraxinus pennsylvanica</i>		R	1.44	201	2	15		2	
<i>Fraxinus pennsylvanica</i>		R	8.97	1.85	7	45		3	
<i>Fraxinus pennsylvanica</i>		R	7.8	2.85	5	29		2	
<i>Fraxinus pennsylvanica</i>		R	8.41	2.68	4	25		2	
<i>Fraxinus pennsylvanica</i>		R	12.99	0.6	11	73		3	
<i>Fraxinus pennsylvanica</i>		R	14.34	1.41	13	86		3	
<i>Fraxinus pennsylvanica</i>		R	15.05	3.02	4	23		2	
<i>Fraxinus pennsylvanica</i>		R	18.75	1.1	5	19		2	
<i>Fraxinus pennsylvanica</i>		R	18.53	1.57	6	29		2	
<i>Fraxinus pennsylvanica</i>		R	18.63	1.81	8	59		2	
<i>Fraxinus pennsylvanica</i>		R	19.38	1.04	4	23		2	
<i>Hamamelis virginiana</i>	sp.	R	11.41	2.9	4	28		2	
<i>Hamamelis virginiana</i>		R	16.58	0.29	6	64		3	
<i>Ilex opaca</i>		R	1.95	3.34	4	45		2	
<i>Itea virginica</i>		R	19.17	4.29	11	103		4	
<i>Itea virginica</i>		R	6.62	1.32	6	58		3	
<i>Morella cerifera</i>		R	2.46	1.07	13	12.8		4	
<i>Morella cerifera</i>		R	7.46	1.05	19	139	6	4	
<i>Morella cerifera</i>		R	8.7	4.58	15	119		4	
<i>Platanus occidentalis</i>		R	4.2	1.05	44	210	1.1	4	
<i>Platanus occidentalis</i>		R	8.38	2.78	17	146	5	4	
<i>Platanus occidentalis</i>		R	17.71	0.7	16	121		3	
<i>Sambucus canadensis</i>		R	4.1	2.42	15	113		3	

Symphoricarpos orbiculatus		R	13.9	2.03	4	39		2		
Symphoricarpos orbiculatus		R	13.3	3.37	5	39		2		
Symphoricarpos orbiculatus		R	14.71	1.95	3	26		2		



**A 5. Planted Woody Stems Plot 7 - Third Fork Stream Restoration, - Project #139**

<b>SCIENTIFIC_NAME</b>	<b>unkno wnSp</b>	<b>ste mS our ce</b>	<b>ste mX</b>	<b>ste mY</b>	<b>ddh</b>	<b>Height</b>	<b>DBH</b>	<b>stemHeal th</b>	<b>stemCom ment</b>	
<i>Alnus serrulata</i>		R	15.9	1.4	12.1	89.9		3		
<i>Alnus serrulata</i>		R	17.2	4.7	13.2	79.2		3		
<i>Betula nigra</i>		R	6.3	2.1	13.1	125		3		
<i>Betula nigra</i>		R	15.0	1.7		117.3		3		
<i>Callicarpa americana</i>		R	6.5	1.0	4.6	61		3		
<i>Callicarpa americana</i>		R	17.8	3.2	6.8	70.1		4		
<i>Cornus amomum</i>		R	1.6	4.6	16.7	177.7		3		
<i>Hamamelis virginiana</i>		R	15.6	2.9	6.5	77.7		3		
<i>Itea virginica</i>		R	4.6	0.8	5.3	60		3		
<i>Itea virginica</i>		R	8.4	0.5	5.6	82.6		3		
<i>Morella cerifera</i>		R	1.7	1.2	10.1	118.9		3		
<i>Morella cerifera</i>		R	9.6	3.8	17.2	146.3		3		
<i>Morella cerifera</i>		R	17.6	1.1		182.9	5.9	4		
<i>Platanus occidentalis</i>		R	11.3	2.0	19.2	133.5		3		
<i>Platanus occidentalis</i>		R	15.0	4.3	11.3	153.9		3		
<i>Sambucus canadensis</i>		R	12.0	3.2	9	82.3		3		
<i>Symphoricarpos orbiculatus</i>		R	0.2	0.7	4.8	85.3		3		



A 5. Volunteer Woody Stems, Plot 7 - Third Fork Stream Restoration, - Project #139																							
SCIENTIFIC_NAME	unknownSp	Total for plot	CHt_0_50	CHt_50_100	CHt_100_137	SubSapling	C0_1	C1_2	C2Plus	C5Plus	C10Plus	C15Plus	C20Plus	C25Plus	C30Plus	C35Plus	BigStem1	BigStem2	BigStem3	BigStem4	BigStem5	BigStem6	NotesOrPTP
<i>Acer rubrum</i>	0	0																					
<i>Amelanchier arborea</i>		0																					
<i>Baccharis halimifolia</i>		0																					
<i>Liquidambar styraciflua</i>		0																					
<i>Paulownia tomentosa</i>		1	0	1	0		0	0	0	0	0	0	0	0	0	0							
<i>Pinus taeda</i>		0																					
<i>Platanus occidentalis</i>		0																					
<i>Prunus</i>		0																					
<i>Prunus serotina</i>		0																					
<i>Quercus phellos</i>		0																					
<i>Salix nigra</i>		0																					
<i>Sambucus canadensis</i>		1	1	0	0		0	0	0	0	0	0	0	0	0	0							
<i>Taxodium distichum</i>		0																					
<i>Ulmus</i>		0																					
<i>Ulmus alata</i>		0																					
<i>Ulmus americana</i>		1	1	0	0		0	0	0	0	0	0	0	0	0	0							





**Third Fork Creek Stream Restoration – Durham County, NC**

**Appendix B Geomorphologic Raw Data**

B-1 Exhibit – Problem Areas Plan View

B-2 Representative Stream Problem Area Photos

B-3 Stream Photo-station Photos

B-4 Table B.1 Qualitative Visual Stability Assessment

B-5 Cross section Plots and Raw Data Tables

B-6 Longitudinal Plots and Raw Data Tables

B-7 Pebble Counts



Figure B1.1 - Problem Areas- 2006  
Plan View - Year 2 - Project #139  
Third Fork Creek (Forest Hills)  
Stream Restoration - Durham, NC

**LEGEND**

**Problem Areas Observed (Year 2, 2006)**

<b>High Priority</b>	<b>Low Priority</b>
● Bank undercut/slump	● Bank undercut/slump
■ Vane backcut/scour	■ Vane backcut/scour
	◆ Aggradation (bar)
	★ Aggradation (pool)

— 2006 Thalweg  
 ■ 2006 Vegetation Monitoring Plots  
 + Cross Sections

**As-built Drawings (Supplied by KCI)**

∩ Vanes  
 — Thalweg  
 - - - Edge of water  
 - - - Conservation Easement  
 - - - Sewer ROW

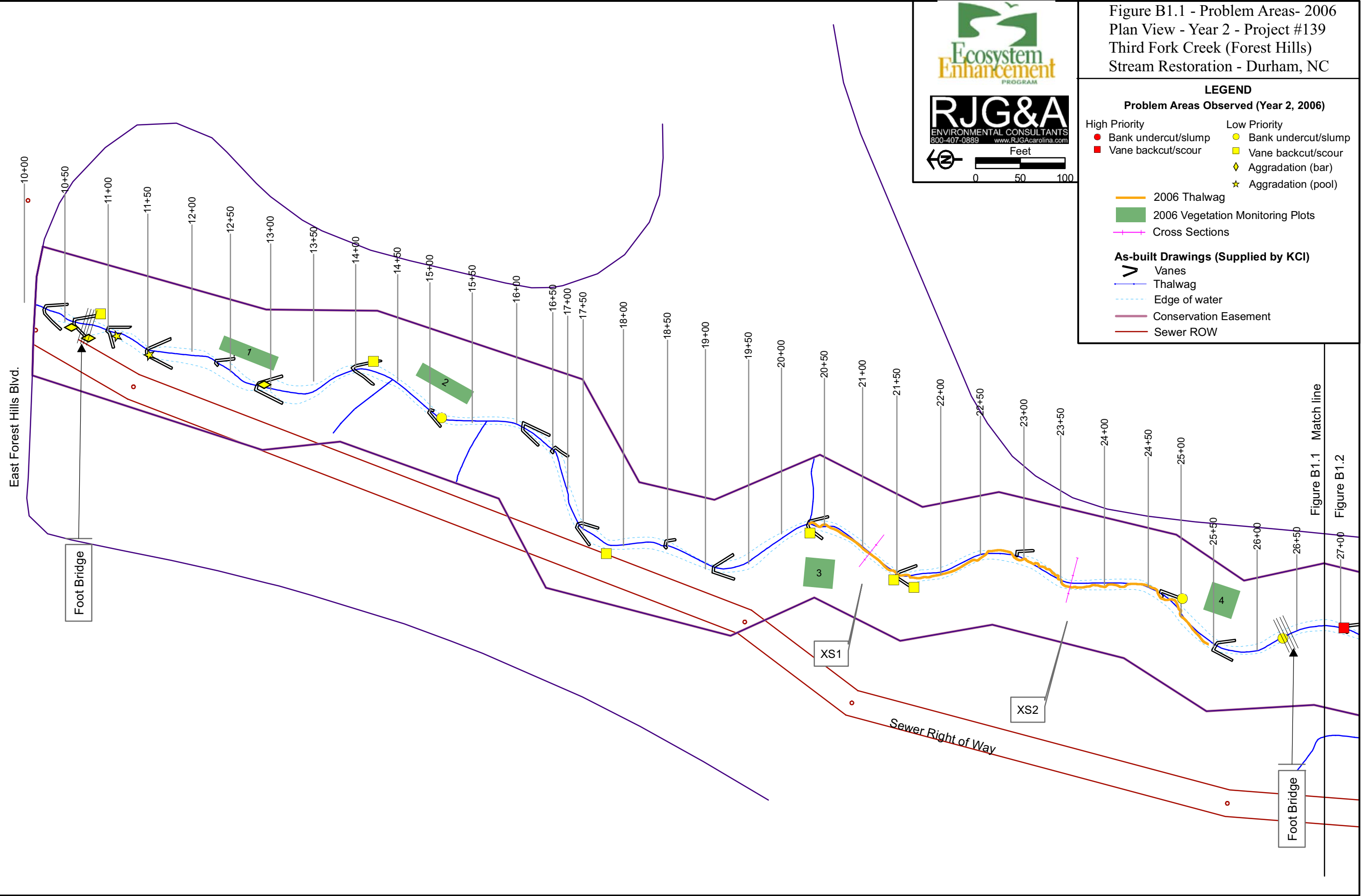


Figure B1.1 Match line

Figure B1.2

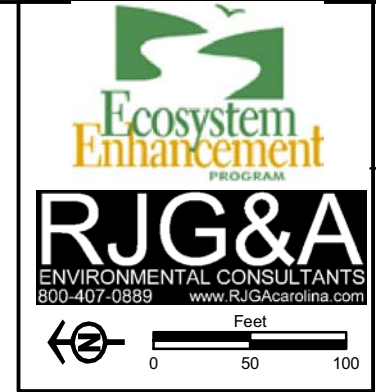


Figure B1.2 - Problem Areas- 2006  
Plan View - Year 2 - Project #139  
Third Fork Creek (Forest Hills)  
Stream Restoration - Durham, NC

	<u>Easting</u>	<u>Northing</u>
<b>Vegetation Plots</b>		
5	2025825.804140	811325.105992
6	2025751.559070	810836.827402
7	2025773.300850	810651.892462
8	2025829.725470	810411.548741
<b>Cross-sections</b>		
3-L	2025870.880914	810673.554871
3-R	2025770.851314	810650.406271
4-L	2025798.603914	810554.818971
4-R	2025759.096714	810575.310971
<b>Photopoints</b>		
9	2025883.659280	811374.025644
10	2025782.503210	811250.741684
11	2025792.618820	811001.328751
12	2025781.870990	810914.081641
13	2025766.697570	810688.630051
14	2025800.837750	810416.773115

**LEGEND**

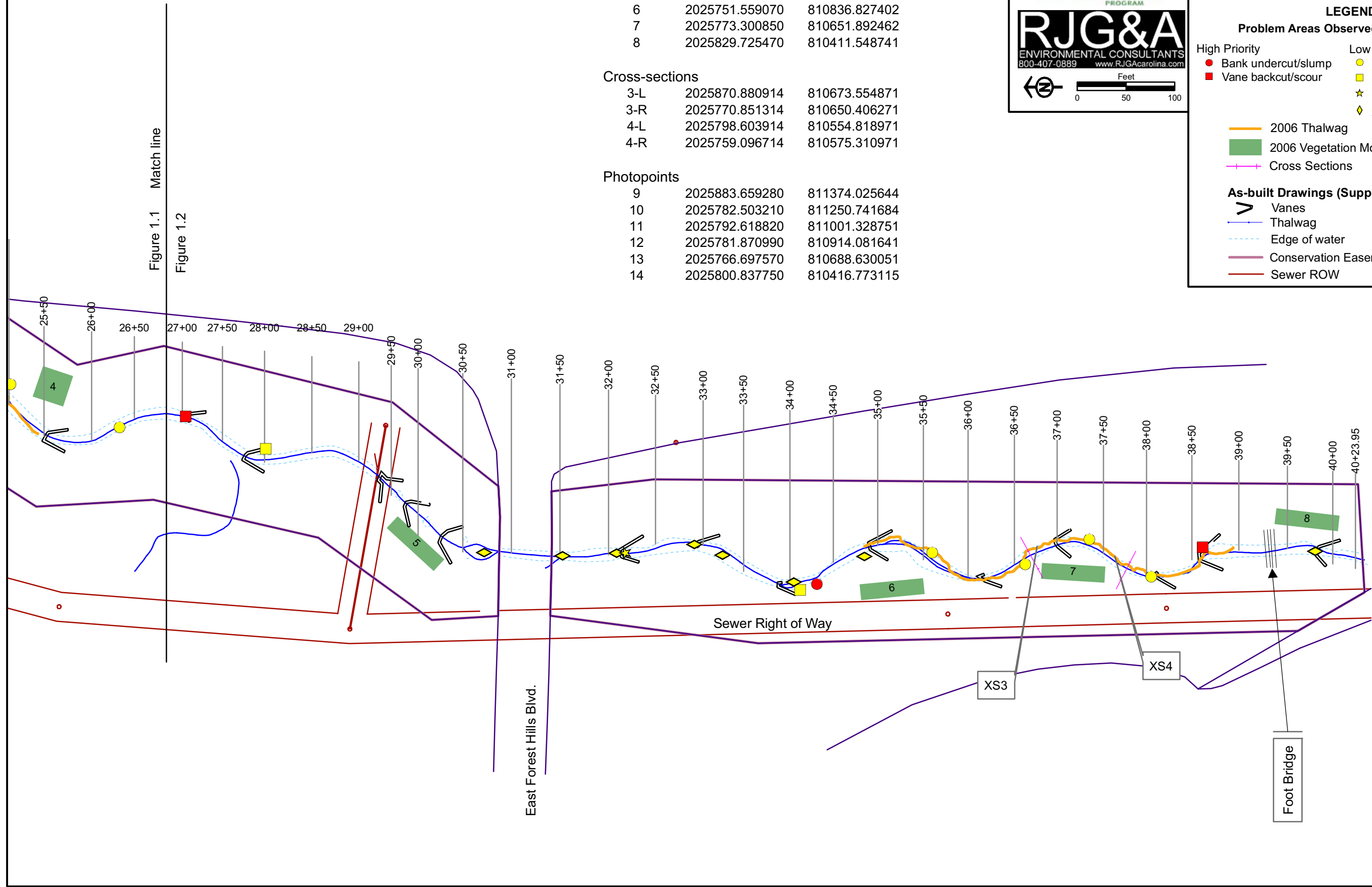
**Problem Areas Observed (Year 2, 2006)**

<b>High Priority</b>	<b>Low Priority</b>
● Bank undercut/slump	● Bank undercut/slump
■ Vane backcut/scour	■ Vane backcut/scour
	★ Aggradation (bar)
	◆ Aggradation (pool)

— 2006 Thalweg  
 ■ 2006 Vegetation Monitoring Plots  
 + Cross Sections

**As-built Drawings (Supplied by KCI)**

∨ Vanes  
 — Thalweg  
 - - - Edge of water  
 - - - Conservation Easement  
 - - - Sewer ROW



**Appendix B2. Representative Stream Problem Area Photographs - 2006 – Third Fork Creek Stream Restoration - Project #139**



**SP1. Aggradation (bar)**



**SP2. Aggradation (pool)**



**SP3. Bank undercut/slump**

**Appendix B2. Representative Stream Problem Area Photographs - 2006 – Third Fork Creek Stream Restoration - Project #139**



**SP4. Cross Vane Scour**



**SP5. Cross Vane Backcut**



**Appendix B3. Permanent Photopoint Photographs - 2006 – Third Fork Creek Stream Restoration – Project #139**



**PP #1 – Looking Upstream (11/20/06)**



**PP #2 – Looking Upstream (11/20/06)**



**PP #3 – Ditch Entering Stream (11/20/06)**



**PP #4 – Looking Downstream (11/20/06)**

**Appendix B3. Permanent Photopoint Photographs - 2006 – Third Fork Creek Stream Restoration – Project #139**



**PP #5 – UT Entering Stream (11/20/06)**



**PP #6 – Looking Downstream (11/20/06)**



**PP #7 – Looking Downstream (11/20/06)**



**PP #8 – Looking Upstream (11/20/06)**

**Appendix B3. Permanent Photopoint Photographs - 2006 – Third Fork Creek Stream Restoration – Project #139**



**PP #9 – Looking Upstream (11/20/06)**



**PP #10 – Looking Downstream (11/20/06)**



**PP #11 – Looking Upstream (11/20/06)**



**PP #12 – Looking Upstream (11/20/06)**

**Appendix B3. Permanent Photopoint Photographs - 2006 – Third Fork Creek Stream Restoration – Project #139**



**PP #13 – Looking Upstream (11/20/06)**



**PP #14 – Looking Upstream (11/20/06)**

**Table B1. Visual Morphological Assessment Third Fork Stream Restoration Project - Upstream Reach - Project #139**

<b>Feature Category</b>	<b>Metric (per As-built and reference baselines)</b>	<b>(# Stable) Number Performing as Intended</b>	<b>Total Number per As-built</b>	<b>Total Number/ feet in Unstable State</b>	<b>Percent Performing in Stable Condition</b>	<b>Feature Performing Mean (%)</b>
<b>A. Riffles</b>	1. Present	10	10	0/0	100	<b>92</b>
	2. Armor stable	9	10	1/4	90	
	3. Facet grade appears stable	9	10	2/12	90	
	4. Minimal evidence of embedding/fining	8	10	2/23	80	
	5. Length appropriate	10	10	0/0	100	
<b>B. Pools</b>	1. Present	12	15	3/35	80	<b>87</b>
	2. Sufficiently deep	13	15	2/23	87	
	3. Length appropriate	14	15	1/14	93	
<b>C. Thalweg</b>	1. Upstream of meander bend (run/inflection) centering	12	16	4/27	75	<b>69</b>
	2. Downstream of meander (glide/inflection) centering	10	16	6/47	63	
<b>D. Meanders</b>	1. Outer bend in state of limited/controlled erosion	11	16	5/27	69	<b>90</b>
	2. Of those eroding, # w/concomitant point bar formation	3	NA	3/25	NA	
	3. Apparent Rc within spec	16	16	0/0	100	
	4. Sufficient floodplain access and relief	16	16	0/0	100	
<b>E. Bed (General)</b>	1. General channel bed aggradation areas (bar formation)	5	NA	0/0	100	<b>100</b>
	2. Channel bed degradation – areas of increasing downcutting or head cutting	0	NA	0/0	100	
<b>F. Vanes</b>	1. Free of back or arm scour	17	23	0/0	74	<b>93</b>
	2. Height appropriate	23	23	0/0	100	
	3. Angle and geometry appear appropriate	23	23	0/0	100	
	4. Free of piping or other structural failures	23	23	0/0	100	
<b>G. Wads/Bould</b>	1. Free of scour	NA	NA	NA	NA	<b>NA</b>
	2. Footing stable	NA	NA	NA	NA	

**Table B1. Visual Morphological Assessment Third Fork Stream Restoration Project - Downstream Reach - Project #139**

<b>Feature Category</b>	<b>Metric (per As-built and reference baselines)</b>	<b>(# Stable) Number Performing as Intended</b>	<b>Total Number per As-built</b>	<b>Total Number/ feet in Unstable State</b>	<b>Percent Performing in Stable Condition</b>	<b>Feature Performing Mean (%)</b>
<b>A. Riffles</b>	1. Present	7	10	3/35	70	<b>56</b>
	2. Armor stable	6	10	4/30	60	
	3. Facet grade appears stable	5	10	5/60	50	
	4. Minimal evidence of embedding/fining	3	10	7/90	30	
	5. Length appropriate	7	10	3/25	70	
<b>B. Pools</b>	1. Present	6	12	6/25	50	<b>56</b>
	2. Sufficiently deep	6	12	6/40	50	
	3. Length appropriate	8	12	4/35	67	
<b>C. Thalweg</b>	1. Upstream of meander bend (run/inflection) centering	4	7	3/13	57	<b>57</b>
	2. Downstream of meander (glide/inflection) centering	4	7	3/25	57	
<b>D. Meanders</b>	1. Outer bend in state of limited/controlled erosion	4	7	0/0	57	<b>67</b>
	2. Of those eroding, # w/concomitant point bar formation	NA	NA	2/4	NA	
	3. Apparent Rc within spec	5	7	0/0	71	
	4. Sufficient floodplain access and relief	5	7	0/0	71	
<b>E. Bed (General)</b>	1. General channel bed aggradation areas (bar formation)	NA	NA	3/25	100	<b>100</b>
	2. Channel bed degradation – areas of increasing downcutting or head cutting	NA	NA	4/32	100	
<b>F. Vanes</b>	1. Free of back or arm scour	7	9	2/13	78	<b>89</b>
	2. Height appropriate	9	9	0/0	100	
	3. Angle and geometry appear appropriate	7	9	2/11	78	
	4. Free of piping or other structural failures	9	9	8/25	100	
<b>G. Wads/Bould</b>	1. Free of scour	NA	NA	NA	NA	<b>NA</b>
	2. Footing stable	NA	NA	NA	NA	

B5. Cross Section Plots, Photos, and Raw Data Tables - Third Fork Stream Restoration Monitoring Year 2 (2006) - Project #139

<b>River Basin:</b>	Cape Fear
<b>Watershed:</b>	Third Fork Creek
<b>XS ID:</b>	XS 1 (riffle)
<b>Reach:</b>	Upstream
<b>Date:</b>	10/15/2006
<b>Field Crew:</b>	W. Marotti and S. Doig

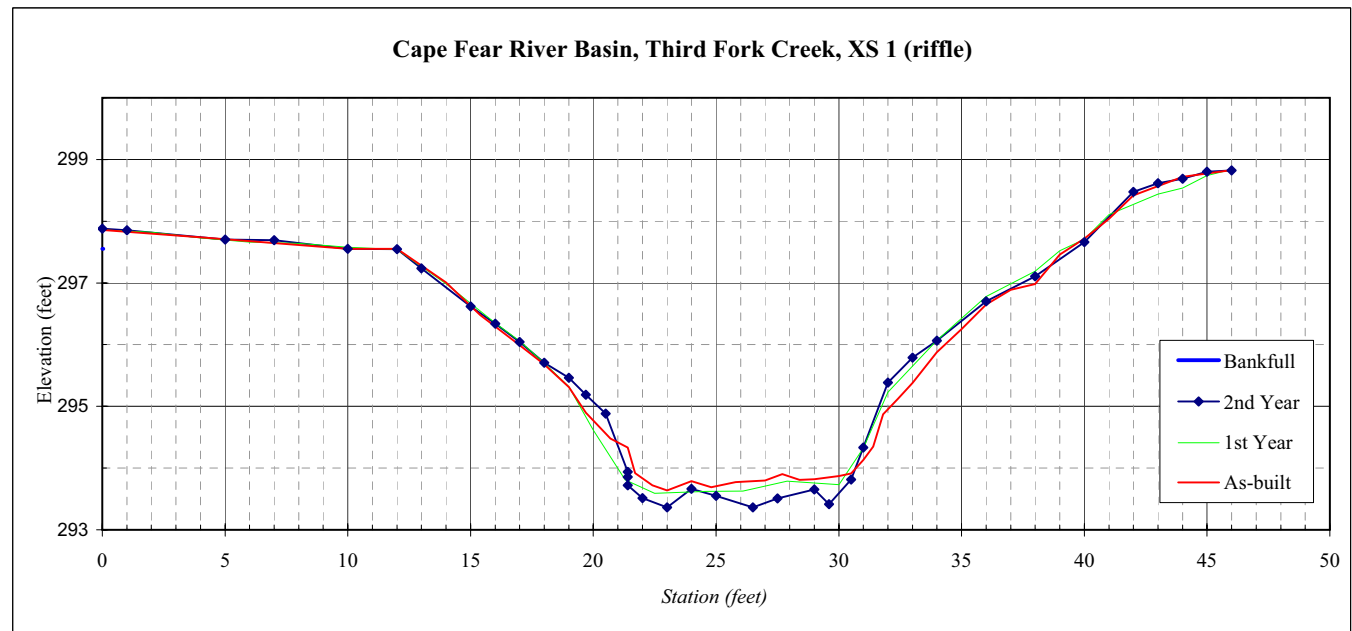


Stream Type: C5c

View of cross-section #1 looking upstream

Station	Rod Ht.	Elevation
0		297.88
1		297.85
5		297.70
7		297.69
10		297.55
12		297.55
13		297.24
15		296.62
16		296.34
17		296.04
18		295.71
19		295.46
19.7		295.19
20.5		294.88
21.4		293.94
21.4		293.86
21.4		293.72
22		293.51
23		293.36
24		293.67
25		293.55
26.5		293.37
27.5		293.51
29		293.65
29.6		293.41
30.5		293.81
31		294.33
32		295.38
33		295.79
34		296.06
36		296.70
38		297.11
40		297.66
42		298.47
43		298.62
44		298.69
45		298.80
46		298.82

SUMMARY DATA	
<b>Floodprone Elevation (ft)</b>	301.74
<b>Bankfull Elevation (ft)</b>	297.55
<b>Floodprone Width (ft)</b>	240.00
<b>Bankfull Width (ft)</b>	28.63
<b>Entrenchment Ratio</b>	8.38
<b>Mean Depth (ft)</b>	2.18
<b>Maximum Depth (ft)</b>	4.19
<b>Width/Depth Ratio</b>	13.12
<b>Bankfull Area (sq ft)</b>	62.47
<b>Wetted Perimeter (ft)</b>	30.91
<b>Hydraulic Radius (ft)</b>	2.02



B5. Cross Section Plots, Photos, and Raw Data Tables - Third Fork Stream Restoration Monitoring Year 2 (2006) - Project #139

**XS-1 As-built**

Station	Rod Ht.	Elevation
0	4.12	297.86
4	4.24	297.74
10	4.43	297.55
12	4.43	297.55
14	4.97	297.01
15.4	5.50	296.48
17	5.99	295.99
18	6.30	295.68
19	6.67	295.32
19.7	7.08	294.90
20.7	7.50	294.48
21.4	7.65	294.33
21.7	8.06	293.92
22.4	8.26	293.72
23	8.34	293.64
24	8.19	293.79
24.8	8.29	293.69
25.8	8.21	293.77
27	8.18	293.80
27.7	8.08	293.90
28.4	8.17	293.81
29	8.16	293.82
30	8.11	293.87
30.5	8.07	293.91
31	7.85	294.13
31.4	7.63	294.35
31.8	7.11	294.87
32.4	6.86	295.12
33	6.60	295.38
34	6.10	295.88
35	5.73	296.25
36	5.33	296.65
37	5.09	296.89
38	5.00	296.98
39	4.52	297.46
40	4.26	297.72
41	3.94	298.04
42	3.56	298.42
44	3.26	298.72
46	3.15	298.83

**XS-1 Year 01**

Station	Rod Ht.	Elevation
0	4.48	297.86
2	4.52	297.82
4	4.61	297.73
6	4.68	297.66
8	4.7	297.64
10	4.76	297.58
12	4.8	297.54
14	5.35	296.99
16	5.99	296.35
17	6.28	296.06
18	6.64	295.70
19	7.02	295.32
20	7.72	294.62
21.3	8.53	293.81
22.5	8.75	293.59
24.6	8.72	293.62
26.1	8.71	293.63
27.9	8.55	293.79
30	8.61	293.73
31	8.02	294.32
32	7.11	295.23
34	6.27	296.07
36	5.56	296.78
38	5.15	297.19
39	4.82	297.52
40	4.63	297.71
41	4.23	298.11
43	3.9	298.44
44	3.8	298.54
45	3.6	298.74
46	3.5	298.84



B5. Cross Section Plots, Photos, and Raw Data Tables - Third Fork Stream Restoration Monitoring Year 2 (2006) - Project #139

<b>River Basin:</b>	Cape Fear
<b>Watershed:</b>	Third Fork Creek
<b>XS ID</b>	XS 2 (pool)
<b>Reach:</b>	Upstream
<b>Date:</b>	10/15/2006
<b>Field Crew:</b>	W. Marotti and S. Doig

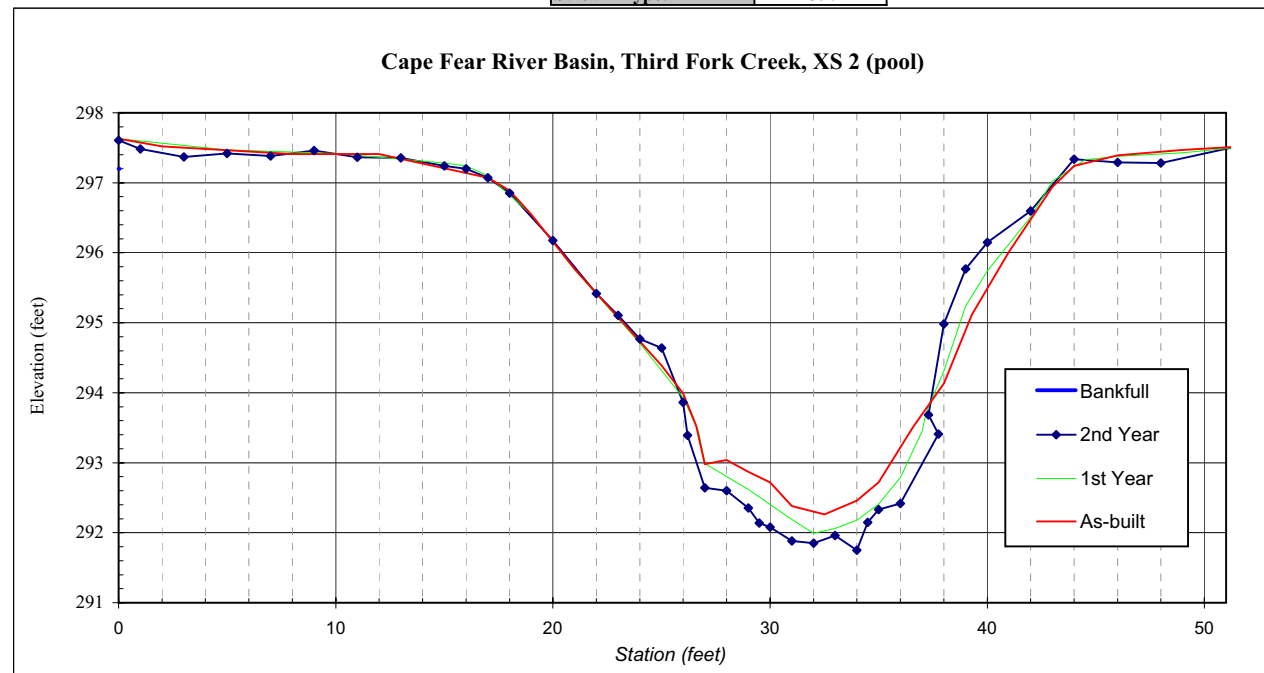


View of cross-section #2 looking upstream

Station	Rod Ht.	Elevation
0		297.606517
1		297.481454
3		297.369042
5		297.4173
7		297.382031
9		297.459866
11		297.365173
13		297.356933
15		297.240459
16		297.201
17		297.070574
18		296.850285
20		296.174067
22		295.417505
23		295.106085
24		294.769424
25		294.640941
26		293.860771
26.2		293.393193
27		292.643564
28		292.599563
29		292.354861
29.5		292.140037
30		292.079521
31		291.884023
32		291.852306
33		291.960497
34		291.747565
34.5		292.149781
35		292.330365
36		292.415472
37.75		293.410602
37.3		293.681958
38		294.981979
39		295.767864
40		296.149056
42		296.596839
44		297.3377
46		297.290974
48		297.283481
51.7		297.533483

SUMMARY DATA	
<b>Floodprone Elevation (ft)</b>	302.65
<b>Bankfull Elevation (ft)</b>	297.20
<b>Floodprone Width (ft)</b>	240.00
<b>Bankfull Width (ft)</b>	27.62
<b>Entrenchment Ratio</b>	8.69
<b>Mean Depth (ft)</b>	2.78
<b>Maximum Depth (ft)</b>	5.45
<b>Width/Depth Ratio</b>	9.94
<b>Bankfull Area (sq ft)</b>	76.71
<b>Wetted Perimeter (ft)</b>	31.70
<b>Hydraulic Radius (ft)</b>	2.42

Stream Type: C5c



B5. Cross Section Plots, Photos, and Raw Data Tables - Third Fork Stream Restoration Monitoring Year 2 (2006) - Project #139

**XS-1 As-built**

Station	Rod Ht.	Elevation
0	4.3	297.63
2	4.5	297.52
8	4.6	297.41
12	4.6	297.41
17	4.9	297.07
18	5.1	296.89
19	5.4	296.55
21	6.2	295.77
23	6.9	295.08
25	7.6	294.39
26	8.0	293.99
26.6	8.4	293.53
27	9.0	292.98
28	8.9	293.04
29	9.1	292.87
30	9.25	292.72
31	9.59	292.38
32.5	9.71	292.26
34	9.51	292.46
35	9.25	292.72
36.6	8.45	293.52
38	7.84	294.13
39.3	6.85	295.12
41	5.96	296.01
43	5.03	296.94
44	4.73	297.24
46	4.58	297.39
49	4.5	297.47
51.8	4.45	297.52

**XS-1 Year 01**

Station	Rod Ht.	Elevation
0	5.14	297.63
5	5.3	297.47
10	5.35	297.42
15	5.49	297.28
16	5.53	297.24
17	5.67	297.10
19	6.22	296.55
21	7.01	295.76
24	8.06	294.71
26	8.84	293.93
26.7	9.32	293.45
27	9.78	292.99
29	10.15	292.62
31	10.58	292.19
32	10.78	291.99
33	10.71	292.06
34	10.59	292.18
35	10.36	292.41
36	9.98	292.79
37	9.32	293.45
37.2	9.05	293.72
38	8.46	294.31
39	7.53	295.24
40	7.03	295.74
42	6.26	296.51
43	5.75	297.02
44.5	5.44	297.33
46	5.39	297.38
49	5.34	297.43
51.7	5.26	297.51

B5. Cross Section Plots, Photos, and Raw Data Tables - Third Fork Stream Restoration Monitoring Year 2 (2006) - Project #139

<b>River Basin:</b>	Cape Fear
<b>Watershed:</b>	Third Fork Creek
<b>XS ID</b>	XS 3 (riffle)
<b>Reach:</b>	Downstream
<b>Date:</b>	10/21/2006
<b>Field Crew:</b>	W. Marotti and S. Doig

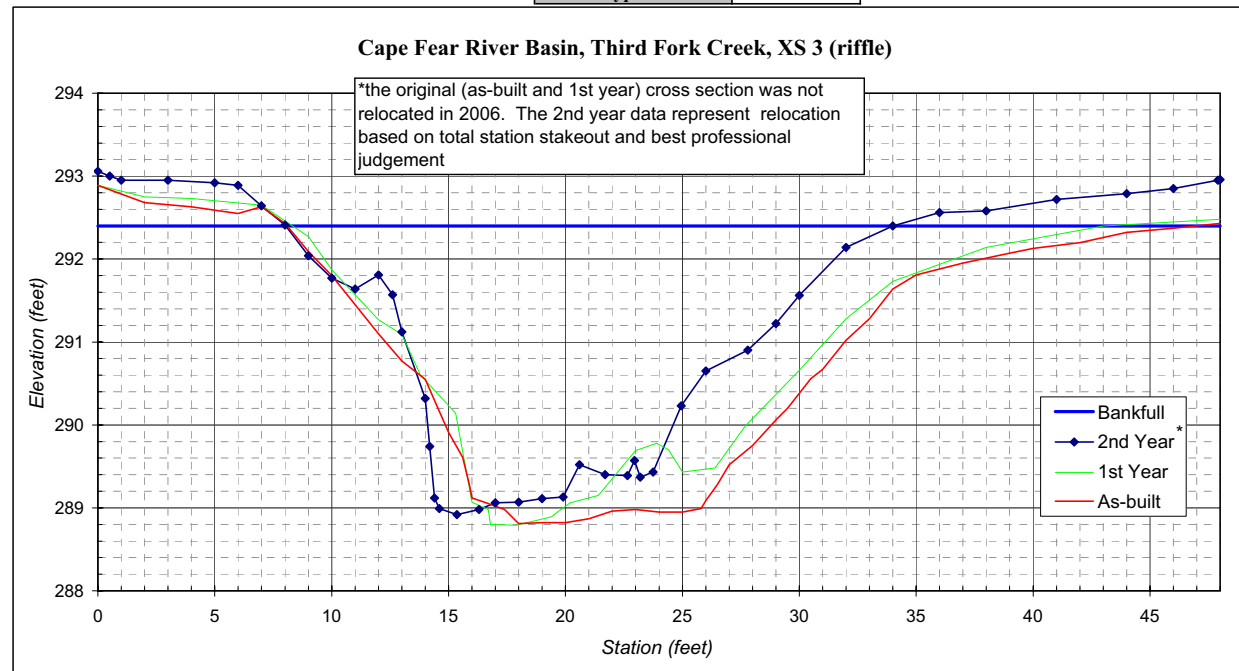


Station	Rod Ht.	Elevation
0	6.95	293.06
0.5	7.015	293
1	7.065	292.95
3	7.06	292.95
5	7.095	292.92
6	7.125	292.89
7	7.375	292.64
8	7.6	292.41
9	7.97	292.04
10	8.245	291.77
11	8.375	291.64
12	8.205	291.81
12.6	8.445	291.57
13	8.89	291.12
14	9.695	290.32
14.2	10.27	289.74
14.4	10.89	289.12
14.6	11.025	288.99
15.35	11.095	288.92
16.3	11.03	288.98
17	10.95	289.06
18	10.94	289.07
19	10.9	289.11
19.9	10.88	289.13
20.6	10.495	289.52
21.7	10.61	289.4
22.65	10.62	289.39
22.95	10.44	289.57
23.2	10.64	289.37
23.75	10.58	289.43
24.95	9.78	290.23
26	9.36	290.65
27.8	9.11	290.9
29	8.79	291.22
30	8.455	291.56
32	7.875	292.14
34	7.61	292.4
36	7.45	292.56
38	7.43	292.58
41	7.29	292.72
44	7.22	292.79
46	7.165	292.85
47.9	7.065	292.95
48	7.05	292.96

SUMMARY DATA	
<b>Floodprone Elevation (ft)</b>	295.88
<b>Bankfull Elevation (ft)</b>	292.40
<b>Floodprone Width (ft)</b>	240.00
<b>Bankfull Width (ft)</b>	25.97
<b>Entrenchment Ratio</b>	9.24
<b>Mean Depth (ft)</b>	1.84
<b>Maximum Depth (ft)</b>	3.84
<b>Width/Depth Ratio</b>	14.51
<b>Bankfull Area (sq ft)</b>	47.67
<b>Wetted Perimeter (ft)</b>	28.31
<b>Hydraulic Radius (ft)</b>	1.68

Stream Type: C5c

View of cross-section #3 looking upstream



B5. Cross Section Plots, Photos, and Raw Data Tables - Third Fork Stream Restoration Monitoring Year 2 (2006) - Project #139

**XS-1 As-built**

Station	Rod Ht.	Elevation
0	7.69	292.89
2	7.83	292.75
4	7.85	292.73
7	7.93	292.65
9	8.31	292.27
10	8.71	291.87
12	9.31	291.27
13	9.49	291.09
13.8	9.98	290.60
15.3	10.44	290.14
16	11.51	289.07
16.7	11.6	288.98
16.8	11.78	288.80
17.9	11.79	288.79
19.4	11.69	288.89
19.8	11.6	288.98
20.2	11.52	289.06
21.4	11.43	289.15
23	10.89	289.69
23.9	10.8	289.78
24.4	10.88	289.70
25	11.15	289.43
26.4	11.1	289.48
27.7	10.59	289.99
30	9.92	290.66
32	9.3	291.28
34	8.85	291.73
38	8.44	292.14
43	8.18	292.40
48	8.1	292.48

**XS-1 Year 01**

Station	Rod Ht.	Elevation
0	5.23	292.89
2	5.44	292.68
4	5.49	292.63
6	5.57	292.55
7	5.49	292.63
8	5.69	292.43
9	6.03	292.09
10	6.32	291.80
12	7.02	291.10
13	7.35	290.77
14	7.57	290.55
15	8.21	289.91
15.6	8.51	289.61
15.9	8.86	289.26
16	9	289.12
16.6	9.06	289.06
17.4	9.14	288.98
18	9.31	288.81
19	9.3	288.82
20	9.3	288.82
21	9.25	288.87
22	9.16	288.96
23	9.14	288.98
24	9.17	288.95
25	9.17	288.95
25.8	9.13	288.99
26	9.03	289.09
26.5	8.84	289.28
27	8.6	289.52
28	8.37	289.75
29	8.06	290.06
29.5	7.92	290.20
30.5	7.56	290.56
31	7.45	290.67
32	7.1	291.02
33	6.84	291.28
34	6.48	291.64
35	6.31	291.81
37	6.17	291.95
39	6.05	292.07
40	5.99	292.13
42	5.92	292.20
44	5.8	292.32
46	5.75	292.37
48	5.69	292.43

B5. Cross Section Plots, Photos, and Raw Data Tables - Third Fork Stream Restoration Monitoring Year 2 (2006) - Project #139

<b>River Basin:</b>	Cape Fear
<b>Watershed:</b>	Third Fork Creek
<b>XS ID</b>	XS 4 (pool)
<b>Reach:</b>	Downstream
<b>Date:</b>	10/21/2006
<b>Field Crew:</b>	W. Marotti and S. Doig

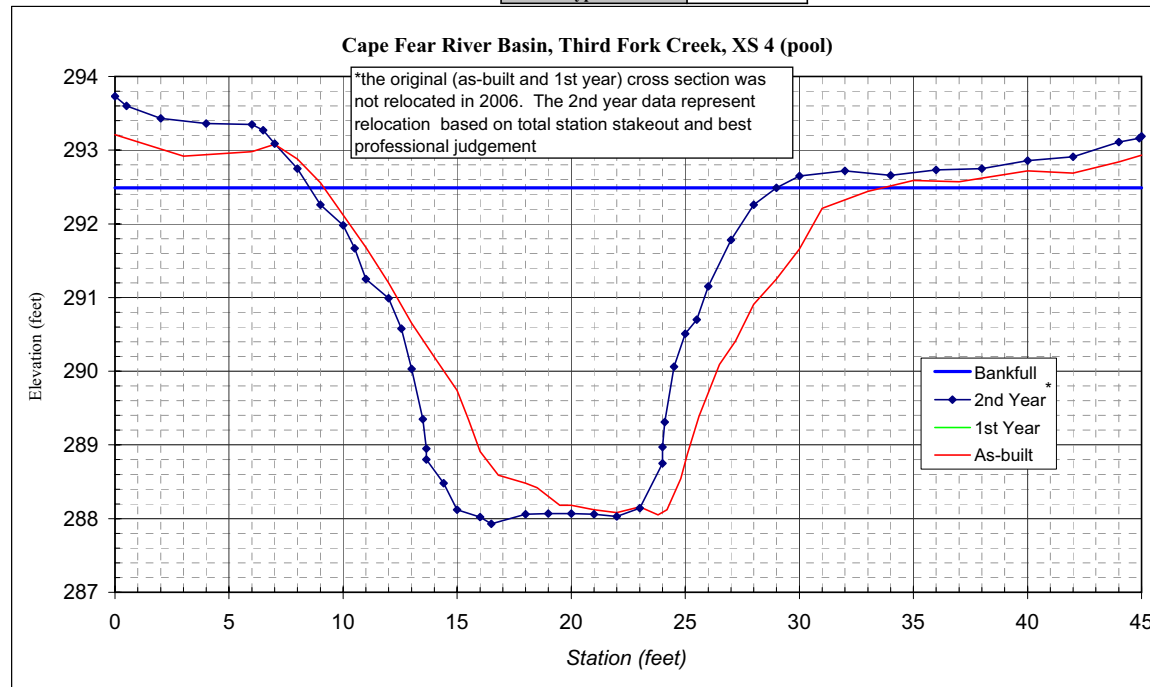


View of cross-section #3 looking upstream

Station	Rod Ht.	Elevation
0	6.285	293.73
0.5	6.41	293.6
2	6.585	293.43
4	6.65	293.36
6	6.66	293.35
6.5	6.74	293.27
7	6.92	293.09
8	7.265	292.75
9	7.75	292.26
10	8.03	291.98
10.5	8.34	291.67
11	8.76	291.25
12	9.02	290.99
12.55	9.43	290.58
13	9.985	290.03
13.5	10.66	289.35
13.65	11.065	288.95
13.65	11.21	288.8
14.4	11.53	288.48
15	11.89	288.12
16	11.99	288.02
16.5	12.08	287.93
18	11.95	288.06
19	11.94	288.07
20	11.94	288.07
21	11.95	288.06
22	11.98	288.03
23	11.87	288.14
24	11.26	288.75
24	11.04	288.97
24.1	10.7	289.31
24.5	9.95	290.06
25	9.5	290.51
25.5	9.31	290.7
26	8.865	291.15
27	8.23	291.78
28	7.75	292.26
29	7.525	292.49
30	7.36	292.65
32	7.29	292.72
34	7.35	292.66
36	7.28	292.73
38	7.26	292.75
40	7.155	292.86
42	7.105	292.91
44	6.9	293.11
44.9	6.85	293.16
45	6.825	293.19

SUMMARY DATA	
<b>Floodprone Elevation (ft)</b>	297.05
<b>Bankfull Elevation (ft)</b>	292.49
<b>Floodprone Width (ft)</b>	240.00
<b>Bankfull Width (ft)</b>	20.47
<b>Entrenchment Ratio</b>	11.72
<b>Mean Depth (ft)</b>	2.80
<b>Maximum Depth (ft)</b>	4.56
<b>Width/Depth Ratio</b>	7.31
<b>Bankfull Area (sq ft)</b>	57.34
<b>Wetted Perimeter (ft)</b>	23.99
<b>Hydraulic Radius (ft)</b>	2.39

Stream Type: E5



B5. Cross Section Plots, Photos, and Raw Data Tables - Third Fork Stream Restoration Monitoring Year 2 (2006) - Project #139

**XS-1 As-built**

Station	Rod Ht.	Elevation
0	4.89	293.21
3	5.18	292.92
6	5.12	292.98
7	5.02	293.08
8	5.22	292.88
9	5.54	292.56
10	5.98	292.12
11	6.42	291.68
12	6.9	291.20
13	7.45	290.65
14	7.91	290.19
15	8.36	289.74
15.5	8.76	289.34
16	9.19	288.91
16.8	9.51	288.59
18	9.62	288.48
18.5	9.68	288.42
19.5	9.92	288.18
20	9.92	288.18
21	9.98	288.12
22	10.02	288.08
23	9.94	288.16
23.8	10.05	288.05
24.2	9.98	288.12
24.8	9.56	288.54
25.1	9.22	288.88
25.6	8.71	289.39
26.5	8.01	290.09
27.2	7.69	290.41
28	7.19	290.91
29	6.85	291.25
30	6.44	291.66
31	5.89	292.21
33	5.66	292.44
35	5.51	292.59
37	5.53	292.57
40	5.38	292.72
42	5.41	292.69
44	5.26	292.84
45	5.17	292.93

**XS-1 Year 01**

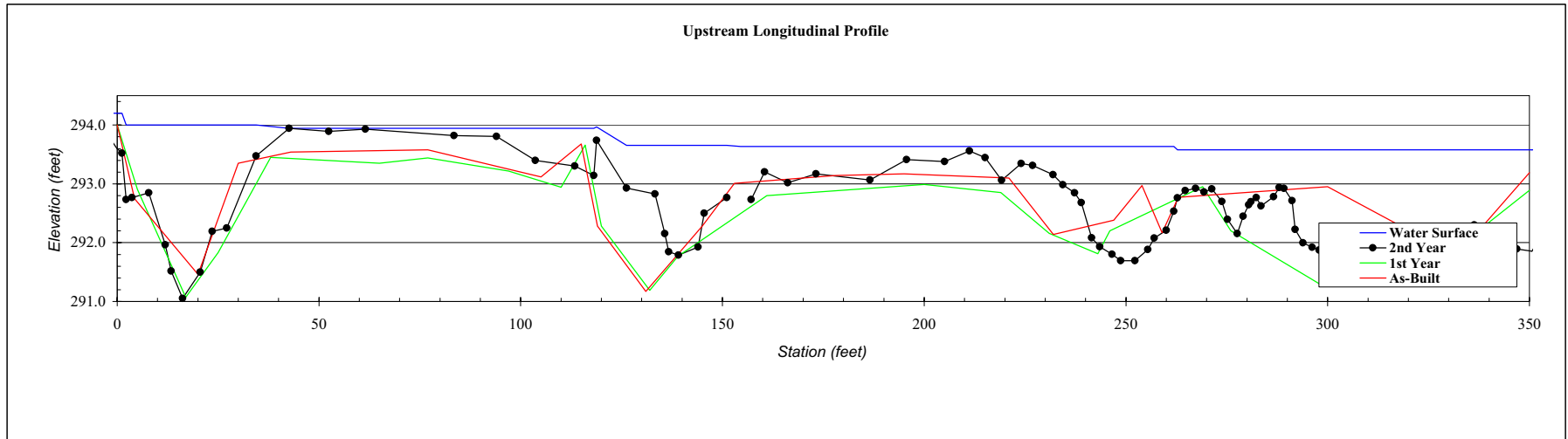
Station	Rod Ht.	Elevation
0	7.32	293.21
4	7.44	293.09
7	7.38	293.15
9	8	292.53
11	8.77	291.76
13	9.74	290.79
15	11.05	289.48
16	11.7	288.83
17	12.05	288.48
18	12.32	288.21
19	12.5	288.03
20	12.64	287.89
21	12.88	287.65
22	12.97	287.56
24	12.54	287.99
25	11.73	288.80
25.5	11.14	289.39
26	10.34	290.19
27.5	9.76	290.77
29	8.59	291.94
30	8.3	292.23
31	8.06	292.47
34	7.92	292.61
37	7.95	292.58
41	7.92	292.61
45	7.68	292.85

B4. Longitudinal Plots and Raw Data Tables - Third Fork Creek Stream Restoration Monitoring Year 2 (2006) - Project #139

River Basin:	Cape Fear
Watershed:	Third Fork Creek
Reach:	Upstream
Profile ID:	Profile 1
Date:	25 October 2006
Field Crew:	W. Marotti and S. Doig

Pattern	min	max	average
Channel Beltwidth (ft)	22.64	42.87	33.88
Radius of Curvature (ft)	24.58	103.19	69.42
Meander Wavelength	161.93	200.76	177.65
Meander Width ratio	0.82	1.50	1.20
Profile	min	max	average
Riffle length (ft)			51.43
Riffle slope (ft/ft)			0.002
Pool length (ft)	16.71	41.44	28.60
Pool spacing (ft)	6.53	78.45	35.95

Additional Reach Parameters	
Valley Length (ft)	310
Channel Length (ft)	350
Sinuosity	1.13
Water Surface Slope (ft/ft)	0.0018
BF slope (ft/ft)	0.00028
Rosgen Classification	C5
Habitat Index	NA
Macrobenthos	NA

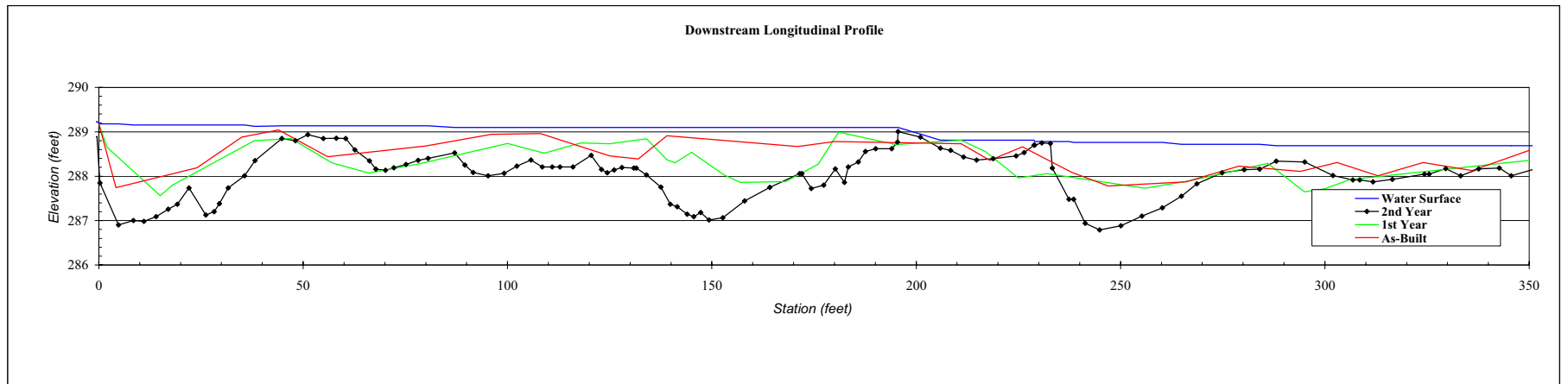


B4. Longitudinal Plots and Raw Data Tables - Third Fork Creek Stream Restoration Monitoring Year 2 (2006) - Project #139

<b>River Basin:</b>	Cape Fear
<b>Watershed:</b>	Third Fork Creek
<b>Reach:</b>	Downstream
<b>Profile ID:</b>	Profile 2
<b>Date:</b>	27 October 2006
<b>Field Crew:</b>	W. Marotii and S. Doig

<b>Pattern</b>	min	max	average
Channel Beltwidth (ft)	32.03	43.107	35.77
Radius of Curvature (ft)	51.72	64.76	57.96
Meander Wavelength	140.80	182.94	162.56
Meander Width ratio	1.56	1.66	1.54
<b>Profile</b>	min	max	average
Riffle length (ft)	9.25	19.24	14.24
Riffle slope (ft/ft)	0.009	0.033	0.021
Pool length (ft)	50.87	135.15	101.45
Pool spacing (ft)	9.25	37.31	23.28

<b>Additional Reach Parameters</b>	
Valley Length (ft)	308
Channel Length (ft)	350
Sinuosity	1.14
Water Surface Slope (ft/ft)	0.0009
BF slope (ft/ft)	0.00026
Rosgen Classification	C5b
Habitat Index	NA
Macrobenthos	NA

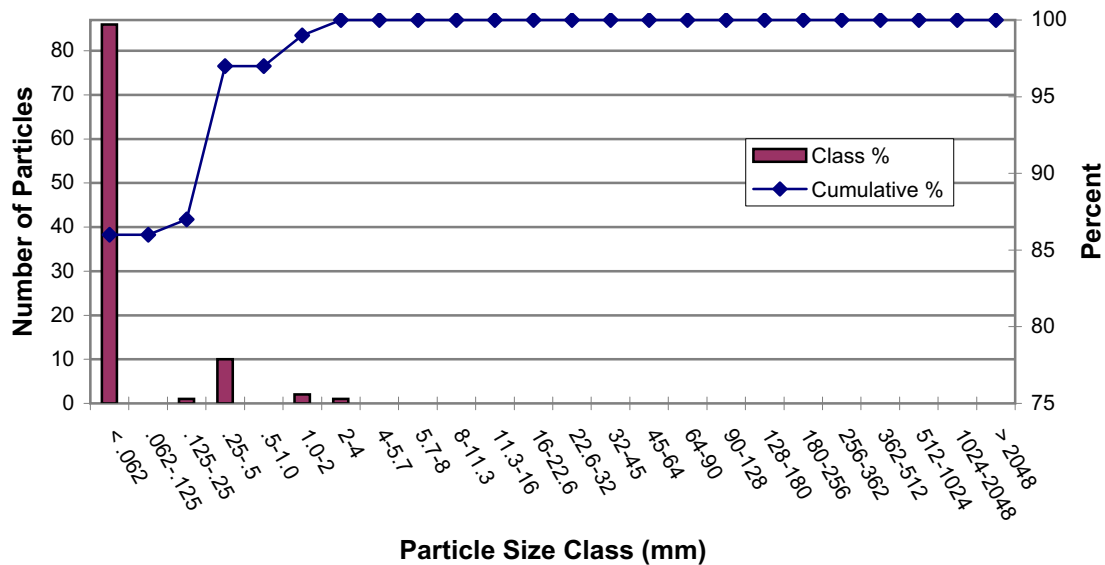




**B7. Pebble Count - Third Fork Creek Stream Restoration Second Year Monitoring 11/1/2006 - Project #139**

S/C	Size Range (mm)	Total #	Class %	Cumulative %
Silt/Clay	< .062	86	86	86
Very Fine Sand	.062-.125		0	86
	Fine Sand	.125-.25	1	87
	Medium Sand	.25-.5	10	97
	Coarse Sand	.5-1.0		97
	Very Course Sand	1.0-2	2	99
Gravel	Very Fine Gravel	2-4	1	100
	Fine Gravel	4-5.7		100
	Fine Gravel	5.7-8		100
	Medium Gravel	8-11.3		100
	Medium Gravel	11.3-16		100
	Coarse Gravel	16-22.6		100
	Coarse Gravel	22.6-32		100
	Very Course Gravel	32-45		100
	Very Course Gravel	45-64		100
	Cobble	Small Cobble	64-90	
Small Cobble		90-128		100
Medium Cobble		128-180		100
Large Cobble		180-256		100
Boulder	Small Boulders	256-362		100
	Small Boulders	362-512		100
	Medium Boulders	512-1024		100
	Large Boulders	1024-2048		100
Bedrock	> 2048		0	100
Total		100		

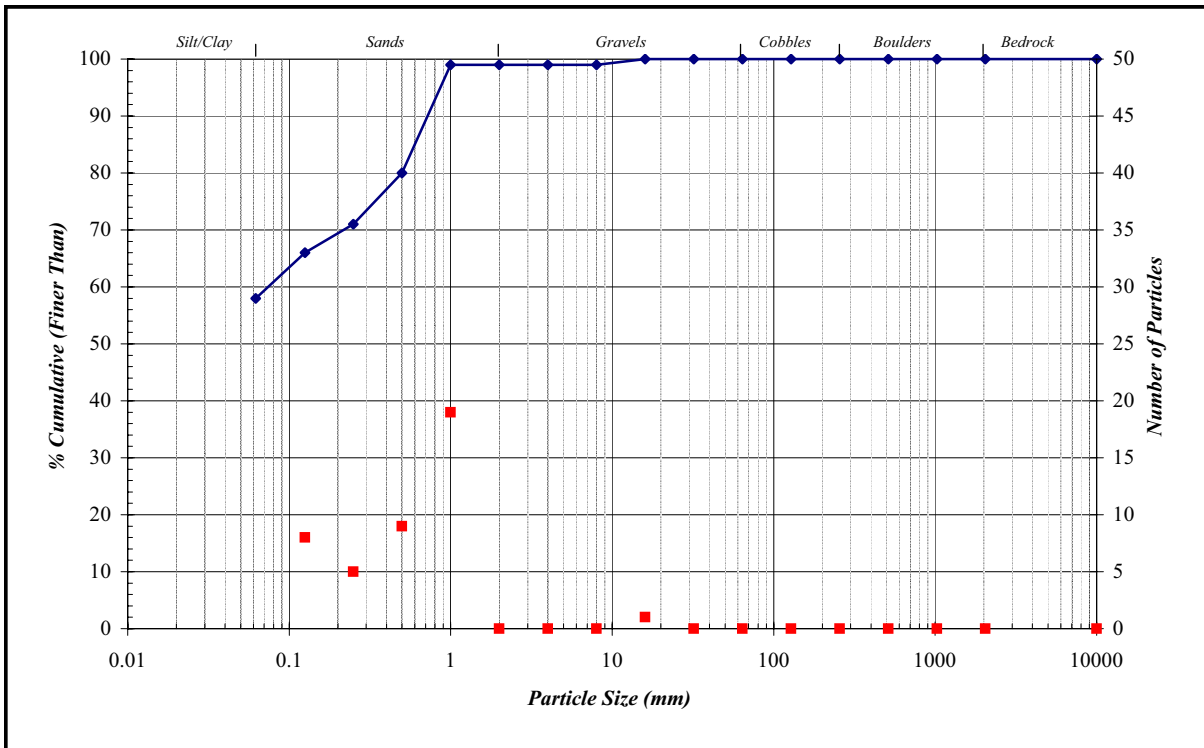
$d_{50} = 0.04 \text{ mm}$   
 $d_{84} = 0.06 \text{ mm}$



**Third Fork Creek Stream Monitoring**  
**Year 01**

<b>Stream:</b>	Third Fork Creek
<b>Location:</b>	XS 1 - Riffle
<b>Date:</b>	9/27/2005

	Particle	Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	58	58	58
Sand	Very Fine Sand	0.062 < 0.125	8	8	66
	Fine Sand	0.125 < 0.25	5	5	71
	Medium Sand	0.25 < 0.50	9	9	80
	Coarse Sand	0.50 < 1.0	19	19	99
	Very Coarse Sand	1 < 2	0	0	99
Gravel	Very Fine Gravel	2 < 4	0	0	99
	Fine Gravel	4 < 8	0	0	99
	Medium Gravel	8 < 16	1	1	100
	Coarse Gravel	16 < 32	0	0	100
	Very Coarse Gravel	32 < 64	0	0	100
Cbl	Small Cobble	64 < 128	0	0	100
	Large Cobble	128 < 256	0	0	100
Bldr	Small Boulder	256 < 512	0	0	100
	Medium Boulder	512 < 1024	0	0	100
	Large Boulder	1024 < 2048	0	0	100
Bdrk	Bedrock	Bedrock	0	0	100
<b>Totals:</b>			100	100	100



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.060	0.060	0.060	0.600	0.85

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
58	41	1	0	0	0

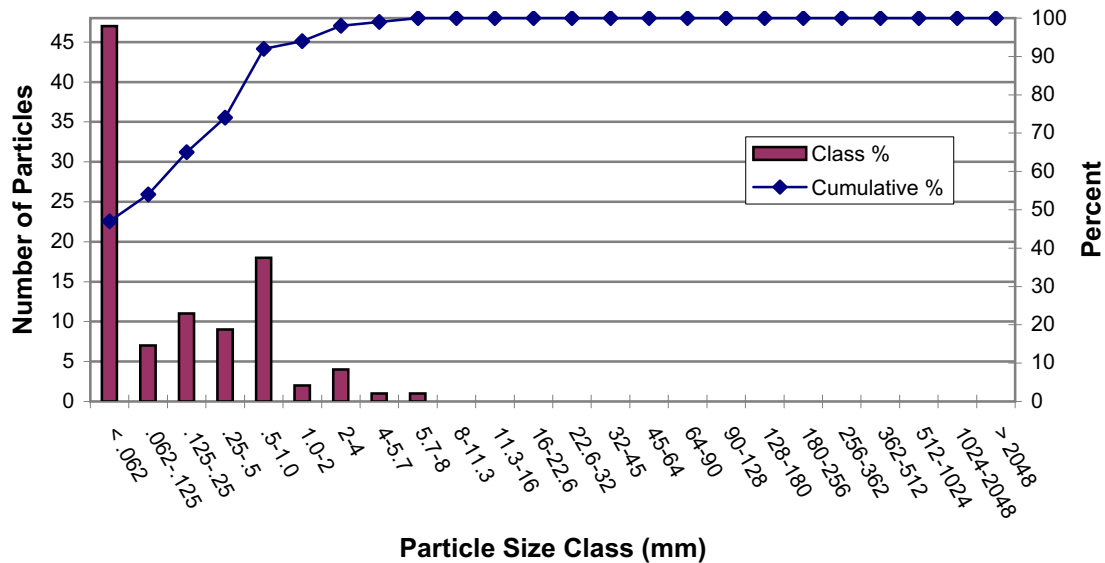
**B7. Pebble Count - Third Fork Creek Stream Restoration Second Year Monitoring 11/1/2006 - Project #139**

**Cross Section Two**

S/C	Particle	Size Range (mm)	Total #	Class %	Cumulative %
	Silt/Clay	< .062	47	47	47
Sand	Very Fine Sand	.062-.125	7	7	54
	Fine Sand	.125-.25	11	11	65
	Medium Sand	.25-.5	9	9	74
	Coarse Sand	.5-1.0	18	18	92
	Very Course Sand	1.0-2	2	2	94
Gravel	Very Fine Gravel	2-4	4	4	98
	Fine Gravel	4-5.7	1	1	99
	Fine Gravel	5.7-8	1	1	100
	Medium Gravel	8-11.3		0	100
	Medium Gravel	11.3-16		0	100
	Coarse Gravel	16-22.6		0	100
	Coarse Gravel	22.6-32		0	100
	Very Course Gravel	32-45		0	100
	Very Course Gravel	45-64		0	100
Cobble	Small Cobble	64-90		0	100
	Small Cobble	90-128		0	100
	Medium Cobble	128-180		0	100
	Large Cobble	180-256		0	100
Boulder	Small Boulders	256-362		0	100
	Small Boulders	362-512		0	100
	Medium Boulders	512-1024		0	100
	Large Boulders	1024-2048		0	100
	Bedrock	> 2048		0	100
Total			100		

d<sub>50</sub> = 0.09 mm

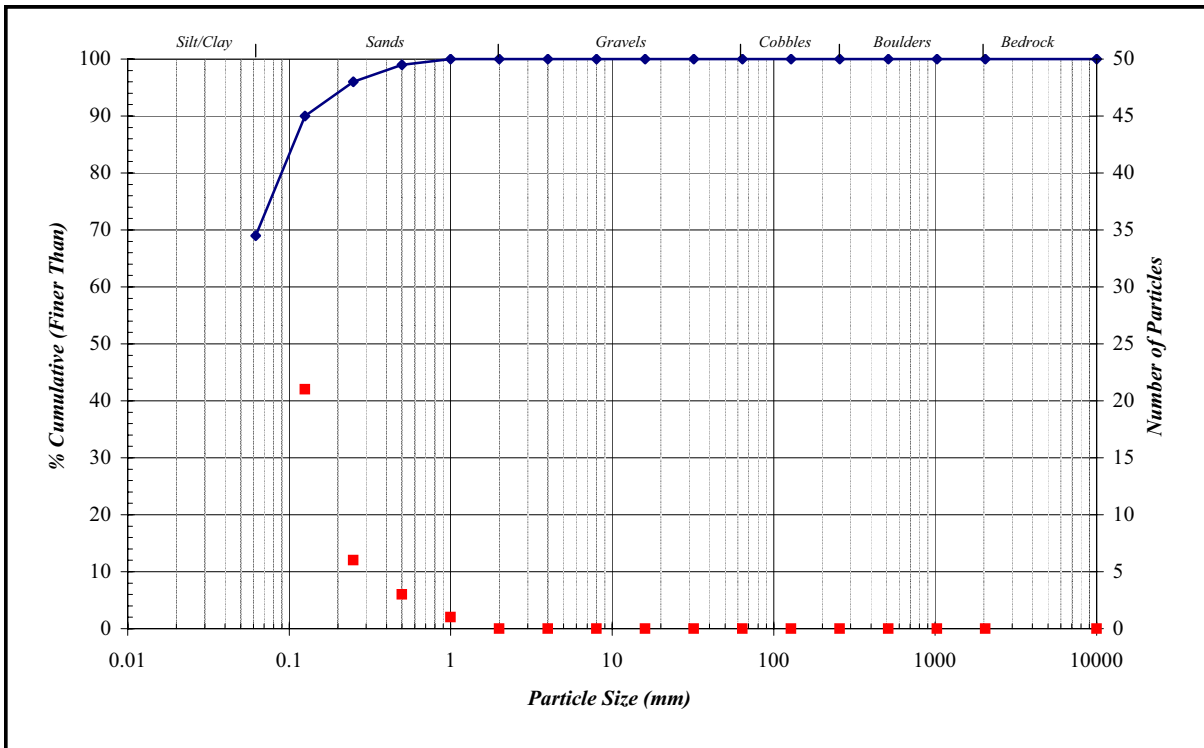
d<sub>84</sub> = 0.78 mm



**Third Fork Creek Stream Monitoring**  
**Year 01**

<b>Stream:</b>	Third Fork Creek
<b>Location:</b>	XS 2 - Pool
<b>Date:</b>	9/27/2005

	Particle	Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	69	69	69
Sand	Very Fine Sand	0.062 < 0.125	21	21	90
	Fine Sand	0.125 < 0.25	6	6	96
	Medium Sand	0.25 < 0.50	3	3	99
	Coarse Sand	0.50 < 1.0	1	1	100
	Very Coarse Sand	1 < 2	0	0	100
Gravel	Very Fine Gravel	2 < 4	0	0	100
	Fine Gravel	4 < 8	0	0	100
	Medium Gravel	8 < 16	0	0	100
	Coarse Gravel	16 < 32	0	0	100
	Very Coarse Gravel	32 < 64	0	0	100
Cbl	Small Cobble	64 < 128	0	0	100
	Large Cobble	128 < 256	0	0	100
Bldr	Small Boulder	256 < 512	0	0	100
	Medium Boulder	512 < 1024	0	0	100
	Large Boulder	1024 < 2048	0	0	100
Bdrk	Bedrock	Bedrock	0	0	100
<b>Totals:</b>			100	100	100



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.06	0.06	0.06	0.10	0.20

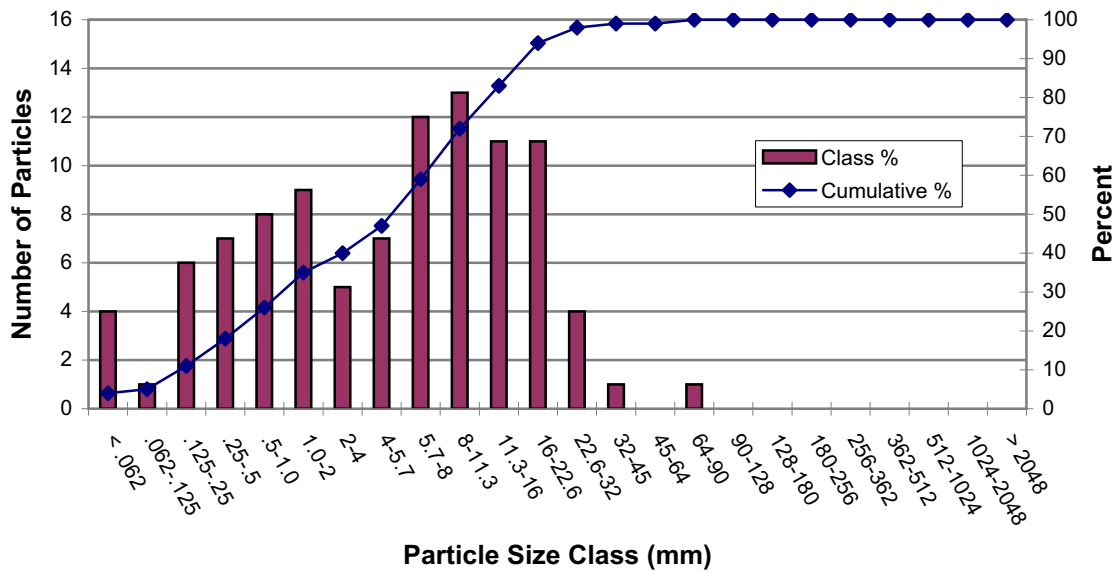
Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
69	31	0	0	0	0

**B7. Pebble Count - Third Fork Creek Stream Restoration Second Year Monitoring 11/1/2006 - Project #139**

**Cross Section Three**

S/C	Particle	Size Range (mm)	Total #	Class %	Cumulative %
	Silt/Clay	< .062	4	4	4
Sand	Very Fine Sand	.062-.125	1	1	5
	Fine Sand	.125-.25	6	6	11
	Medium Sand	.25-.5	7	7	18
	Coarse Sand	.5-1.0	8	8	26
	Very Coarse Sand	1.0-2	9	9	35
Gravel	Very Fine Gravel	2-4	5	5	40
	Fine Gravel	4-5.7	7	7	47
	Fine Gravel	5.7-8	12	12	59
	Medium Gravel	8-11.3	13	13	72
	Medium Gravel	11.3-16	11	11	83
	Coarse Gravel	16-22.6	11	11	94
	Coarse Gravel	22.6-32	4	4	98
	Very Coarse Gravel	32-45	1	1	99
	Very Coarse Gravel	45-64		0	99
	Cobble	Small Cobble	64-90	1	1
Small Cobble		90-128		0	100
Medium Cobble		128-180		0	100
Large Cobble		180-256		0	100
Boulder	Small Boulders	256-362		0	100
	Small Boulders	362-512		0	100
	Medium Boulders	512-1024		0	100
	Large Boulders	1024-2048		0	100
	Bedrock	> 2048		0	100
Total			100		

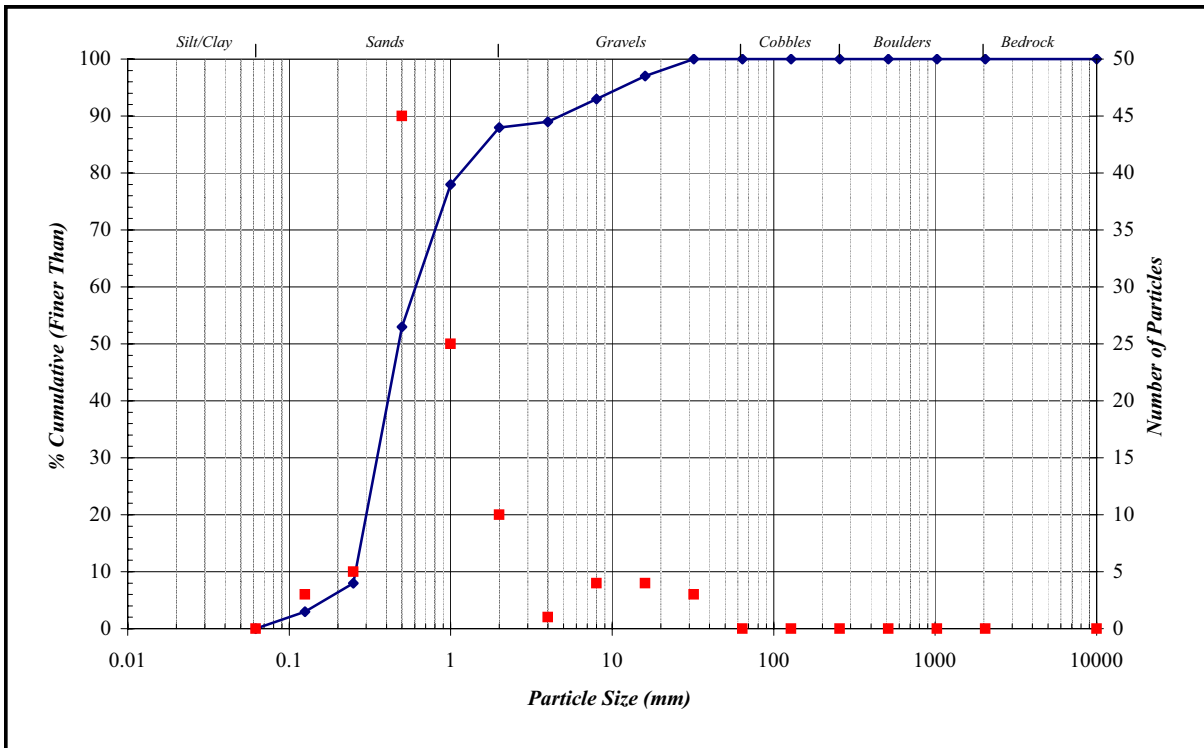
d<sub>50</sub> = 6.27 mm  
d<sub>84</sub> = 16.6 mm



**Third Fork Creek Stream Monitoring**  
**Year 01**

<b>Stream:</b>	Third Fork Creek
<b>Location:</b>	XS 3 - Riffle
<b>Date:</b>	9/27/2005

	Particle	Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	0	0	0
Sand	Very Fine Sand	0.062 < 0.125	3	3	3
	Fine Sand	0.125 < 0.25	5	5	8
	Medium Sand	0.25 < 0.50	45	45	53
	Coarse Sand	0.50 < 1.0	25	25	78
	Very Coarse Sand	1 < 2	10	10	88
Gravel	Very Fine Gravel	2 < 4	1	1	89
	Fine Gravel	4 < 8	4	4	93
	Medium Gravel	8 < 16	4	4	97
	Coarse Gravel	16 < 32	3	3	100
	Very Coarse Gravel	32 < 64	0	0	100
Cbl	Small Cobble	64 < 128	0	0	100
	Large Cobble	128 < 256	0	0	100
Bldr	Small Boulder	256 < 512	0	0	100
	Medium Boulder	512 < 1024	0	0	100
	Large Boulder	1024 < 2048	0	0	100
Bdrk	Bedrock	Bedrock	0	0	100
<b>Totals:</b>			100	100	100



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.28	0.38	0.49	1.50	11.00

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
0	88	12	0	0	0

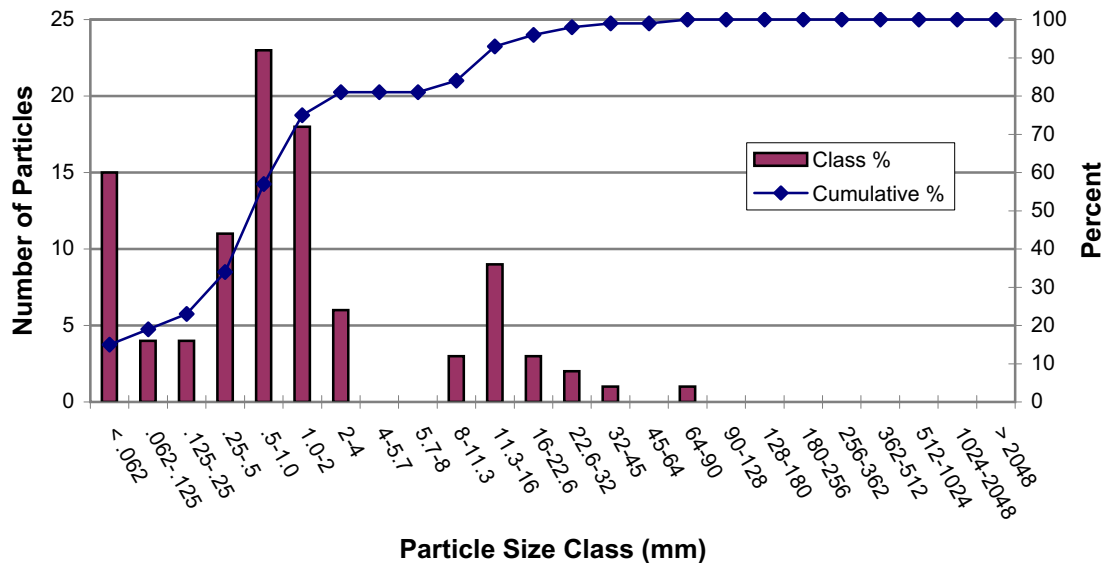
**B7. Pebble Count - Third Fork Creek Stream Restoration Second Year Monitoring 11/1/2006 - Project #139**

**Cross Section Four**

S/C	Particle	Size Range (mm)	Total #	Class %	Cumulative %
	Silt/Clay	< .062	15	15	15
Sand	Very Fine Sand	.062-.125	4	4	19
	Fine Sand	.125-.25	4	4	23
	Medium Sand	.25-.5	11	11	34
	Coarse Sand	.5-1.0	23	23	57
	Very Course Sand	1.0-2	18	18	75
	Gravel	Very Fine Gravel	2-4	6	6
Fine Gravel		4-5.7		0	81
Fine Gravel		5.7-8		0	81
Medium Gravel		8-11.3	3	3	84
Medium Gravel		11.3-16	9	9	93
Coarse Gravel		16-22.6	3	3	96
Coarse Gravel		22.6-32	2	2	98
Very Course Gravel		32-45	1	1	99
Very Course Gravel		45-64		0	99
Cobble	Small Cobble	64-90	1	1	100
	Small Cobble	90-128		0	100
	Medium Cobble	128-180		0	100
	Large Cobble	180-256		0	100
Boulder	Small Boulders	256-362		0	100
	Small Boulders	362-512		0	100
	Medium Boulders	512-1024		0	100
	Large Boulders	1024-2048		0	100
	Bedrock	> 2048		0	100
Total			100		

d<sub>50</sub> = 0.85 mm

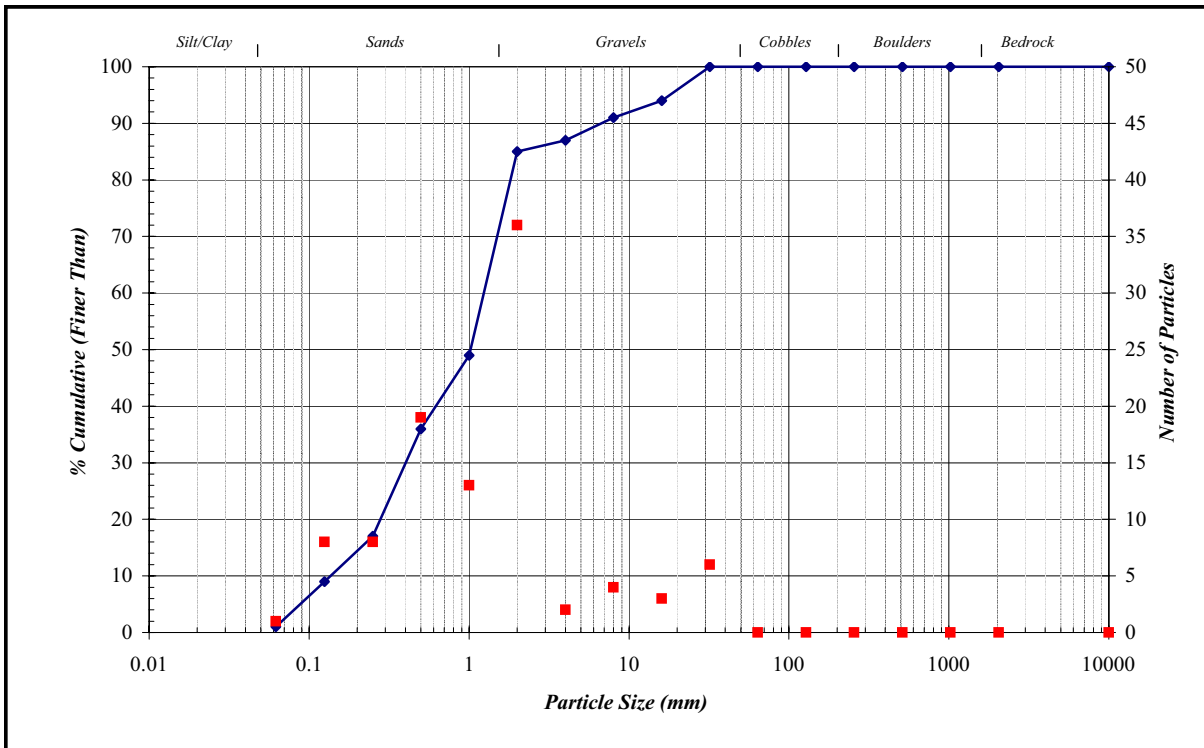
d<sub>84</sub> = 11.3 mm



**Third Fork Creek Stream Monitoring**  
**Year 01**

<b>Stream:</b>	Third Fork Creek
<b>Location:</b>	XS 4 - Pool
<b>Date:</b>	9/27/2005

	Particle	Size Range (mm)	Total #	Item %	% Cum.
S/C	Silt/Clay	0 < 0.062	1	1	1
Sand	Very Fine Sand	0.062 < 0.125	8	8	9
	Fine Sand	0.125 < 0.25	8	8	17
	Medium Sand	0.25 < 0.50	19	19	36
	Coarse Sand	0.50 < 1.0	13	13	49
	Very Coarse Sand	1 < 2	36	36	85
Gravel	Very Fine Gravel	2 < 4	2	2	87
	Fine Gravel	4 < 8	4	4	91
	Medium Gravel	8 < 16	3	3	94
	Coarse Gravel	16 < 32	6	6	100
	Very Coarse Gravel	32 < 64	0	0	100
Cbl	Small Cobble	64 < 128	0	0	100
	Large Cobble	128 < 256	0	0	100
Bldr	Small Boulder	256 < 512	0	0	100
	Medium Boulder	512 < 1024	0	0	100
	Large Boulder	1024 < 2048	0	0	100
Bdrk	Bedrock	Bedrock	0	0	100
<b>Totals:</b>			100	100	100



Size percent less than (mm)				
D16	D35	D50	D84	D95
0.25	0.48	1.00	2.00	18.00

Percent by substrate type (%)					
Silt/Clay	Sand	Gravel	Cobble	Boulder	Bedrock
1	84	15	0	0	0