

**UT to Crooked Creek  
Stream Restoration Monitoring Report  
EEP Project # 434  
Monitoring Year – 03  
2009**



Submitted to:



NCEEP, 1652 Mail Service Center, Raleigh, NC 27699-1652

**December 2009**



## Monitoring Firm



**Landmark Center II, Suite 220  
4601 Six Forks Road  
Raleigh, NC 27609  
Phone: (919) 278-2514  
Fax: (919) 783-9266**

**Project Contact: Adam Spiller  
Email: [adam.spiller@kci.com](mailto:adam.spiller@kci.com)  
KCI Project No: 12071067C\_CC**

## Design Firm



5121 Kingdom Way, Suite 100  
Raleigh, North Carolina 27607



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## 1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

The Unnamed Tributary to Crooked Creek (UTCC) in Franklin County, NC was identified as a restoration design project in 2004. The 0.52-mi<sup>2</sup> project watershed is located within the USGS 8-digit HUC 03020101 and the NCDWQ Sub-basin 03-03-01 of the Tar-Pamlico Basin. The project restored and preserved streams, restored riparian buffer, and created and preserved wetlands. The project goals and objectives are listed below.

- Restore the degraded channel to a stable, functioning channel by using Natural Channel Design principles.
- Enhance the ability of aquatic fauna and flora to survive and flourish by replacing the existing degraded stream habitat with a stable stream channel and riparian buffer that is more conducive to propagation.
- Restore a healthy, vegetated riparian community to the currently denuded, fallow floodplain and adjacent hill slopes.
- Enhance existing wetlands by planting supplementary vegetation.
- Preserve in perpetuity, through a conservation easement, lands surrounding the UTCC that will soon be impacted by residential development.

The previously unvegetated portion of the conservation easement, including the buffer restoration and wetland creation areas, was planted with an appropriate mix of bare root and live stake species. Three vegetative plots were established to monitor vegetative success criteria. The third year monitoring of these plots revealed an average density of 378 planted stems/acre and minimal coverage by invasive vegetation. Vegetation Plot 1 is not meeting the stem density of 260 planted stems/acre, and Plot 2 is right above this success criteria. However, both of these plots have extensive volunteer populations and densities over 1,300 total stems/acre. These findings indicate that the vegetation component of the site is on track to meeting the project's success criteria.

In 2009, the EEP completed a Buffer Audit Verification of the site, during which several field visits were made to delineate wetland soils, estimate the extent of buffer planting and locate stream preservation reaches. This monitoring report includes the findings of this verification, and Table 1 has been changed to reflect this. Other than visual inspection, the 0.3 acre of wetland creation and 17.5 acres of wetland preservation do not have additional monitoring requirements. However, four additional vegetation plots will be added in year 4 to obtain better coverage to assess the stem density for the site.

The stream monitoring at the site involves surveying eight permanent cross-sections and a longitudinal profile along the entire length of UTCC. The stream assessment completed during the third year of monitoring found the stream to be functioning and holding grade for the majority of the project. The site does not have any bank erosion problems or widespread problems with bed incision or aggradation. At the time of monitoring, beavers were beginning to construct a small dam on the upper reach of the project, and backwatering a portion of that reach. In the lower reach, the beaver dam from previous years has been breached, but there is still an area of backwater upstream of it. Another beaver dam is located below the restored channel, and it is causing backwater conditions in the downstream portion of the lower reach.

Summary information and data related to the occurrence of items such as beaver or encroachment 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 the EEPs website. All raw data supporting the tables and figures in the appendices are available upon request.

## **2.0 METHODOLOGY**

The Level 2 CVS-EEP protocol (<http://cvs.bio.unc.edu/methods.htm>) was used to collect vegetation data from UT to Crooked Creek this year, the third year of monitoring.

## **3.0 REFERENCES**

Lee, M. T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation, Version 4.0 (<http://cvs.bio.unc.edu/methods.htm>)

Weakley, A. S. 2006. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas. ([http://www.herbarium.unc.edu/FloraArchives/WeakleyFlora\\_2006-Jan.pdf](http://www.herbarium.unc.edu/FloraArchives/WeakleyFlora_2006-Jan.pdf))

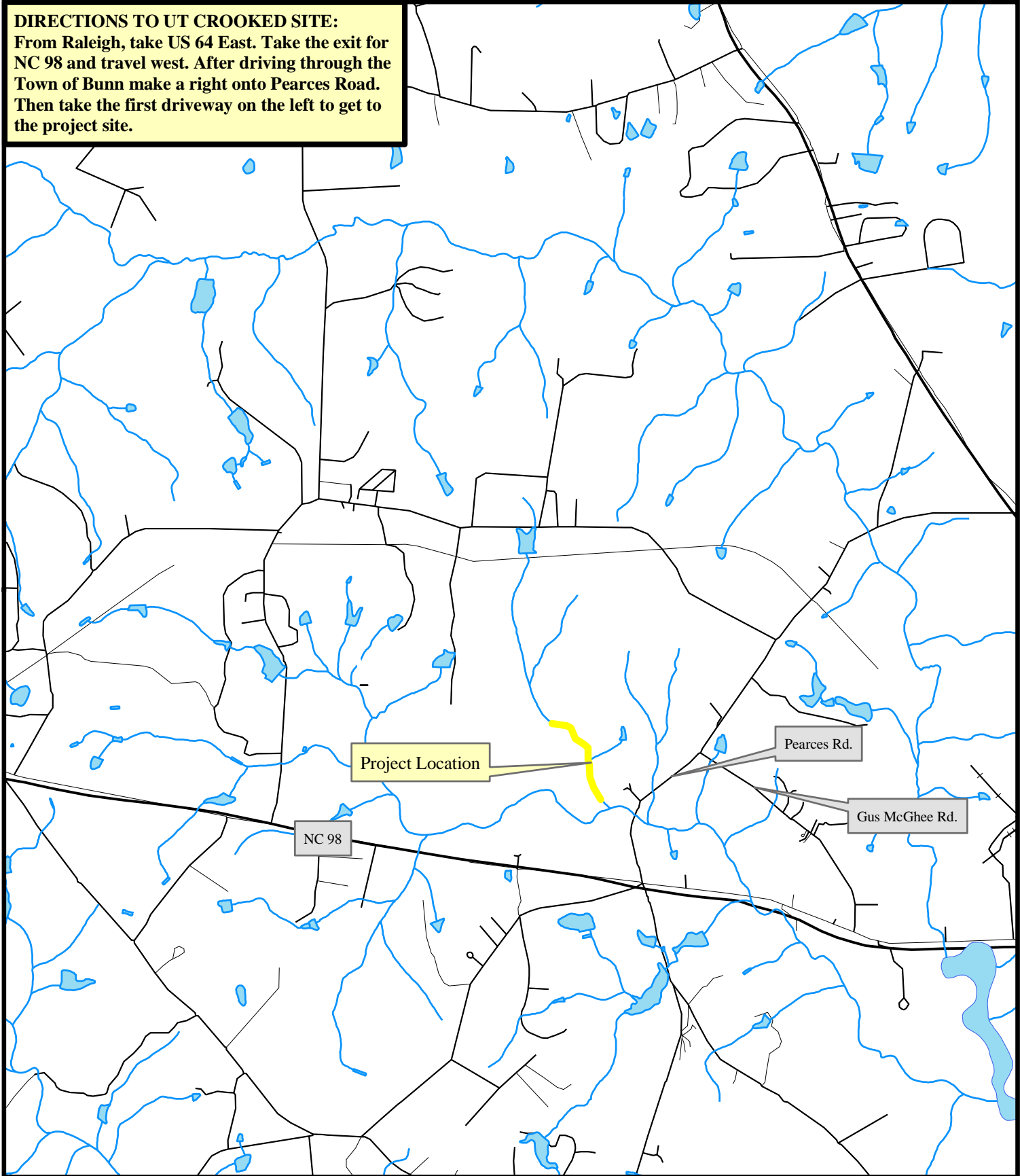




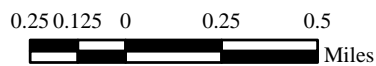
# **Appendix A**

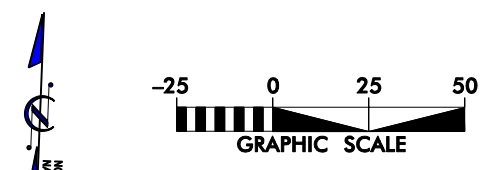
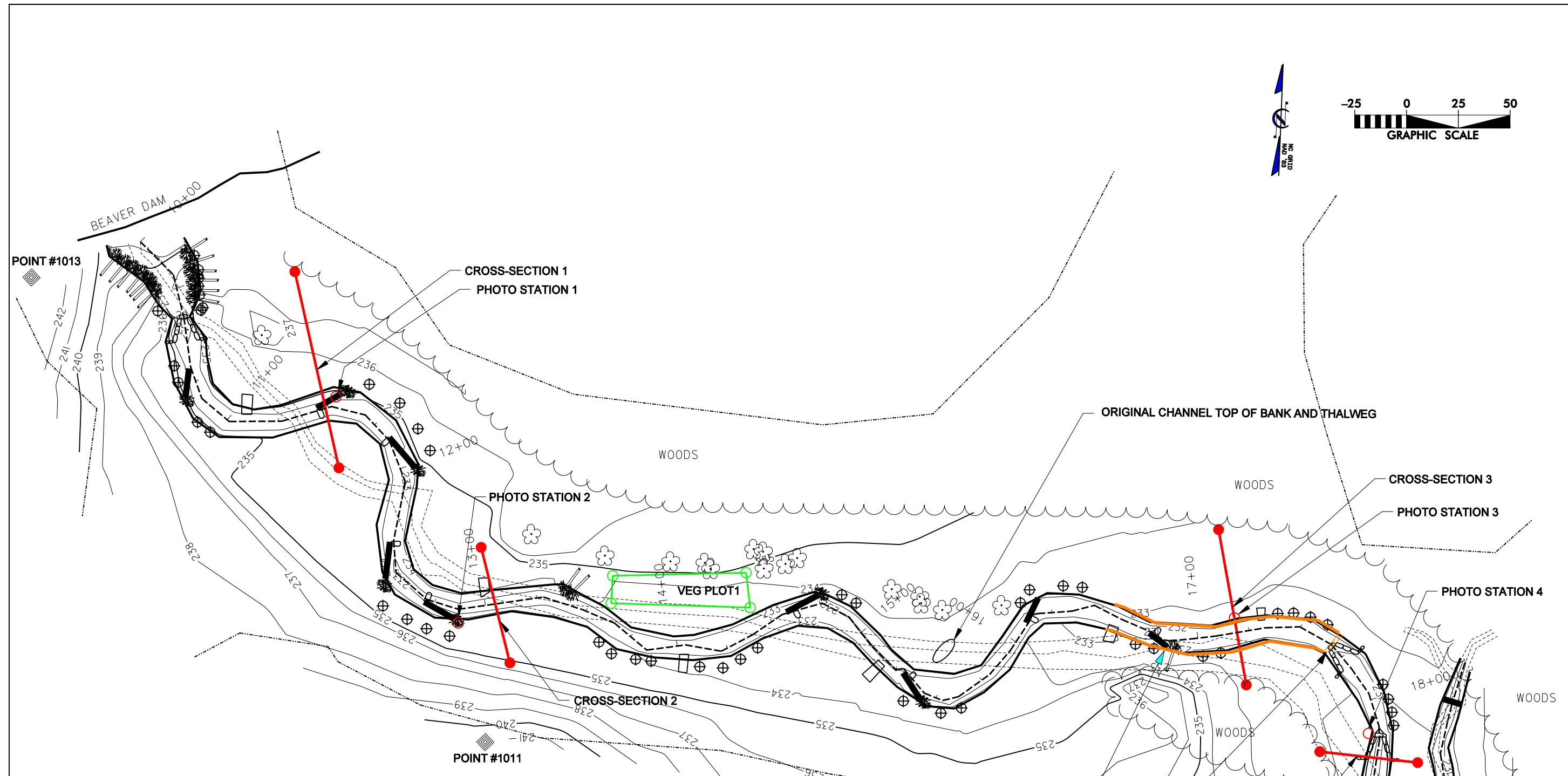
## **General Figures and Plan Views**

**DIRECTIONS TO UT CROOKED SITE:**  
From Raleigh, take US 64 East. Take the exit for NC 98 and travel west. After driving through the Town of Bunn make a right onto Pearces Road. Then take the first driveway on the left to get to the project site.



**Figure 1. Site Vicinity Map**  
**UT Crooked Creek, Franklin County, EEP Project # 434**

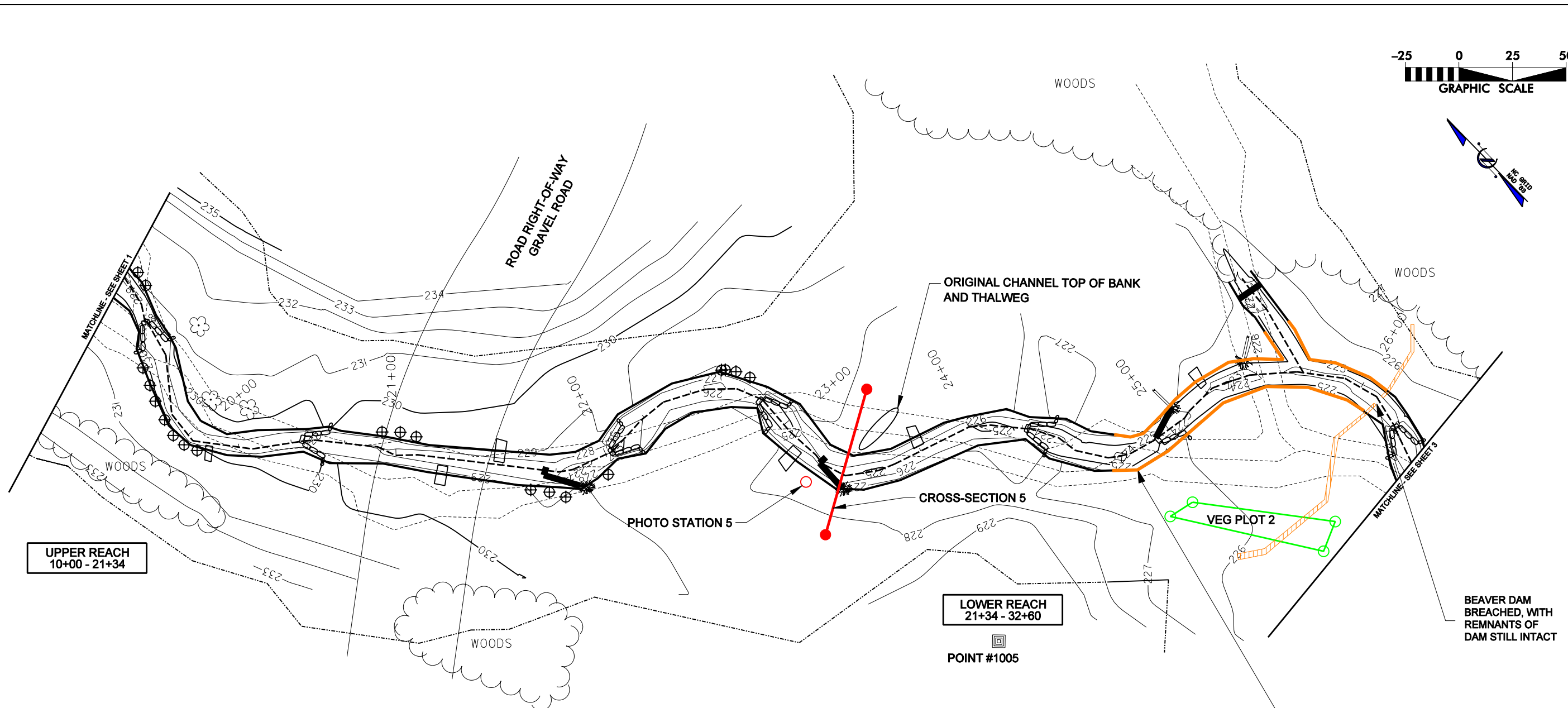
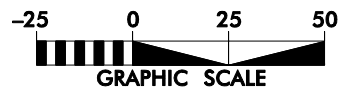













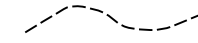

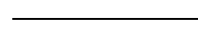

LEGEND	
	ROCK CROSS VANE
	LOG VANE
	ROOTWAD
	ROOTBALL
	RIP-RAP
	TRANSPLANTS
	BOULDER
	IRON REBAR SET W/CAP
	LOG VANE W/ LOG SILL
	THALWEG
	TOP OF BANK
	EASEMENT BOUNDARY
	METAL CONDUIT

UPPER REACH  
10+00 - 21+34

KCI ASSOC. OF NC ENGINEERS • PLANNERS • SCIENTISTS 4601 SIX FORKS ROAD RALEIGH, NORTH CAROLINA 27609	
<b>UT CROOKED CREEK</b> FRANKLIN COUNTY, NORTH CAROLINA EEP PROJECT NUMBER 434 - MY03 STATION 10+00 TO STATION 19+18	
DATE: DECEMBER 2009	APPROVED:
SCALE: 1"=50'	DATE:
CURRENT CONDITION PLAN VIEW	
SHEET 1 OF 3	REVISIONS:



**LEGEND**

-  ROCK CROSS VANE
-  LOG VANE
-  ROOTWAD
-  ROOTBALL
-  RIP-RAP
-  TRANSPLANTS
-  BOULDER
-  IRON REBAR SET W/CAP
-  LOG VANE W/ LOG SILL
-  THALWEG
-  TOP OF BANK
-  EASEMENT BOUNDARY
-  METAL CONDUIT

**CROSS-SECTION COORDINATES**

	NORTHING	EASTING	ELEVATION
CROSS-SECTION 1 LB	809227.8586	2207661.2124	237.58
RB	809136.3148	2207686.9233	234.78
CROSS-SECTION 2 LB	809101.6374	2207756.9831	234.69
RB	809043.3092	2207773.7872	234.84
CROSS-SECTION 3 LB	809122.6646	2208109.8384	233.86
RB	809048.3296	2208127.7163	232.80
CROSS-SECTION 4 LB	809015.5931	2208211.7425	231.91
RB	809016.7609	2208164.2989	232.01
CROSS-SECTION 5 LB	808663.4938	2208444.9826	227.94
RB	808628.6176	2208383.6872	228.35
CROSS-SECTION 6 LB	808435.3235	2208626.2467	225.05
RB	808407.9046	2208564.6884	225.48
CROSS-SECTION 7 LB	808296.4301	2208659.7698	223.53
RB	808262.8122	2208600.9732	223.15
CROSS-SECTION 8 LB	808152.1157	2208646.1846	222.25
RB	808123.8889	2208590.0284	221.78

**VEGETATION PLOT COORDINATES**

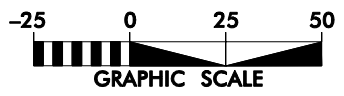
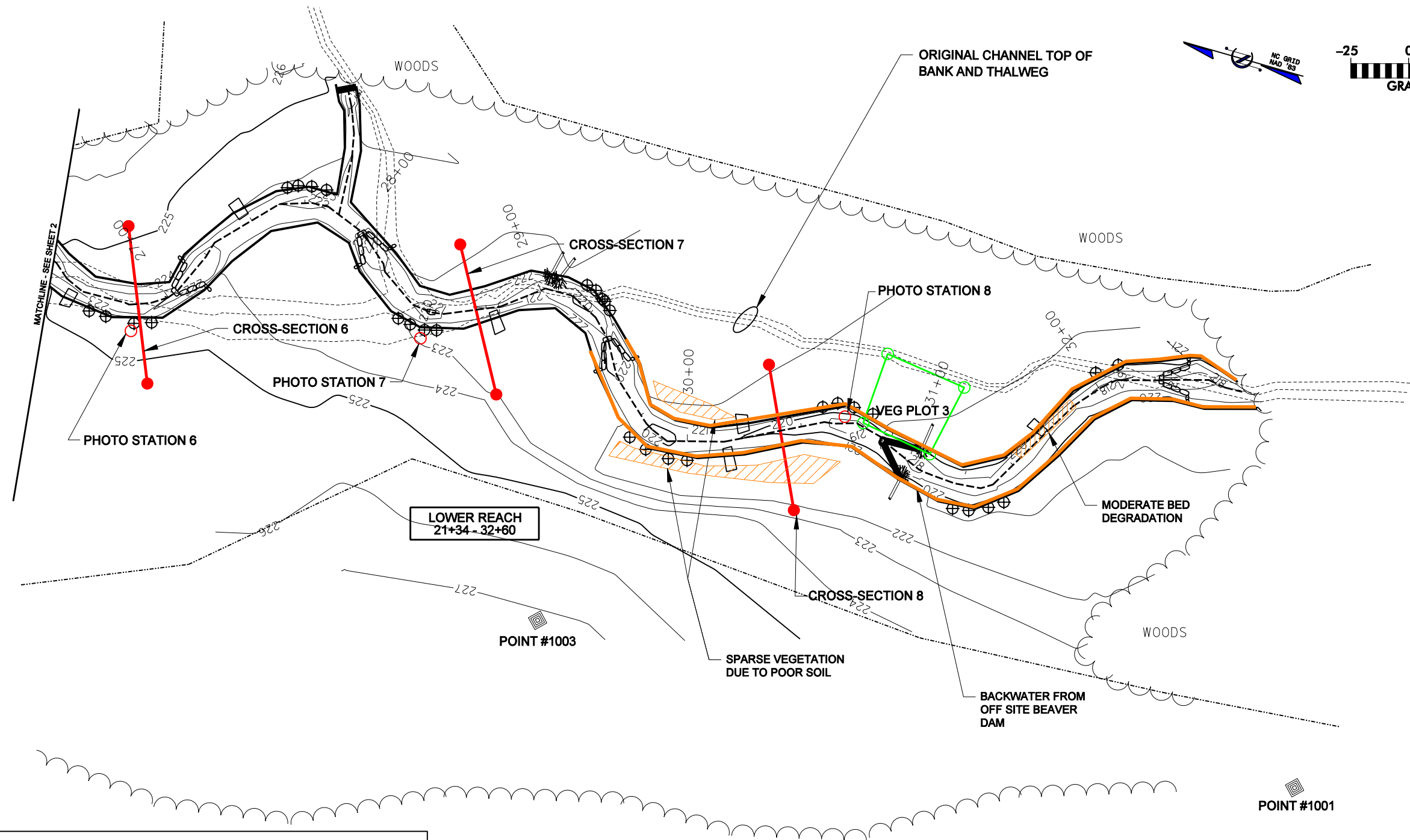
	NORTHING	EASTING
VEGETATION PLOT #1	809088.0273	2207817.2214
	809074.7469	2207817.0052
	809092.0115	2207881.4479
	809075.2499	2207884.0872
VEGETATION PLOT #2	808521.7492	2208502.0208
	808519.2502	2208514.0835
	808466.4143	2208555.5540
	808460.2522	2208541.9910
VEGETATION PLOT #3	808103.5181	2208661.1950
	808105.4396	2208629.5373
	808074.0439	2208624.5291
	808067.6447	2208656.3654

SYL	DESCRIPTION	DATE	APPROVED



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**UT CROOKED CREEK**  
FRANKLIN COUNTY, NORTH CAROLINA  
EEP PROJECT NUMBER 434 - MY03  
STATION 19+18 TO STATION 26+43



MATCHLINE - SEE SHEET 2

LOWER REACH  
21+34 - 32+60

POINT #1003

POINT #1001

**LEGEND**

- |  |                 |  |                      |
|--|-----------------|--|----------------------|
|  | ROCK CROSS VANE |  | IRON REBAR SET W/CAP |
|  | LOG VANE        |  | LOG VANE W/ LOG SILL |
|  | ROOTWAD         |  | THALWEG              |
|  | ROOTBALL        |  | TOP OF BANK          |
|  | RIP-RAP         |  | EASEMENT BOUNDARY    |
|  | TRANSPLANTS     |  | METAL CONDUIT        |
|  | BOULDER         |  |                      |

SYMBOL	DATE	DESCRIPTION	REVISIONS



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**UT CROOKED CREEK**  
FRANKLIN COUNTY, NORTH CAROLINA  
EEP PROJECT NUMBER 434 - MY03  
STATION 26+43 TO STATION 32+64

DATE: DECEMBER 2009  
SCALE: 1"=50'

**CURRENT  
CONDITION  
PLAN VIEW**



# **Appendix B**

## **General Project Tables**





<b>Table 1. Project Restoration Components</b>						
<b>Project Number and Name: 434 - UT to Crooked Creek</b>						
<b>Segment / Reach ID</b>	<b>Existing Linear Feet / Acreage</b>	<b>Type</b>	<b>Approach</b>	<b>Linear Feet / Acreage</b>	<b>Stationing</b>	<b>Comment</b>
Upper Reach	985	R	P1/2	1,134	10+00 - 21+34	Restored pattern, profile, and dimension
Lower Reach	991	R	P1/2	1,133	21+34 - 32+67	Restored pattern, profile, and dimension
Preservation Reach	1,262	P	-	1,262	-	
Buffer	4.8	R	-	4.8	-	Planting
Riparian Wetland	0	C	-	0.3	-	Graded to new floodplain elevation and planted
Riparian Wetland	17.5	P		17.5	-	

R - Restoration P - Preservation C - Creation P1 - Priority 1 P2 - Priority 2

<b>Table 2. Project Activity and Reporting History</b>		
<b>Project Number and Name: 434 - UT to Crooked Creek</b>		
<b>Activity or Report</b>	<b>Data Collection Complete</b>	<b>Actual Completion or Delivery</b>
Restoration Plan		Apr 05
Final Design - 90%		Jun 05
Construction		Jul 05
Mitigation Plan		Feb 07
Year 1 Monitoring	Dec 07	Dec 07
Year 2 Monitoring	Oct 08	Jan 08
Year 3 Monitoring	Nov 09	Dec 09
Year 4 Monitoring		
Year 5 Monitoring		

<b>Table 3. Project Contacts Table</b>	
<b>Project Number and Name: 434 - UT to Crooked Creek</b>	
<b>Design Firm</b>	Ko & Associates, P. C. 5121 Kingdom Way Suite, 100 Raleigh, NC 27607 Contact: R. Kevin Williams, PE Phone: (919) 851-6066 Fax: (919) 851-6846
<b>Construction Contractor</b>	Land Mechanics Designs 126 Circle G Lane Willow Springs, NC 27592 Contact: Mr. Lloyd Glover Phone: (919) 639-6132
<b>Vegetation Design Firm (2004 Vegetation and Stream Maintenance Plan)</b>	HARP 9305-D Monroe Rd. Charlotte, NC 28270 Contact: Mr. Alan Peoples Phone: (704) 841-2841 Fax: (704) 841-2447
<b>Nursery Stock Suppliers</b>	Goldsboro Forestry Service 762 Claridge Nursery Rd Goldsboro, NC 27530 Phone: (919) 731-7988
<b>MY-01</b>	<b>Stream</b>
	Ko & Associates, P. C. 5121 Kingdom Way Suite 100 Raleigh, NC 27607 Contact: R. Kevin Williams, PE Phone: (919) 851-6066 Fax: (919) 851-6846
	<b>Vegetation</b>
	Environmental Services, Inc. 524 S. New Hope Road Raleigh, North Carolina 27610 Todd Milam Phone: (919) 212-1760
<b>MY-02 - MY-05</b>	KCI Associates of NC Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

<b>Table 4. Project Attribute Table</b>	
<b>Project Number and Name: 434 - UT to Crooked Creek</b>	
Project County	Franklin County
Drainage Area	0.52 sq. mi.
Drainage Impervious Cover Estimate	<5%
Stream Order	Second Order
Physiographic Region	Piedmont
Ecoregion	Northern Outer Piedmont
Rosgen Classification of As-built	C5
Dominant Soil Types	Chewacla and Wehadkee Wedowee sandy loam
Reference Site ID	UT to Marks Creek
USGS HUC for Project and Reference	03020101
NCDWQ Sub-basin for Project and Reference	03-03-01
NCDWQ Classification for Project and Reference	C, NSW
Any portion of the project segment 303d listed?	No
Any portion of the project segment upstream of a 303d listed segment?	No
Reasons for 303d Listing or Stressor	N/A
% of Project Easement Fenced	0%



# **Appendix C**

## **Vegetation Assessment Data**



<b>Table 5. Vegetation Plot Mitigation Success Summary Table</b>		
<b>Project Number and Name: 434 - UT to Crooked Creek</b>		
<b>Vegetation Plot ID</b>	<b>Monitoring Year 03 Planted Stem Density (stems/acre)</b>	<b>Vegetation Survival Threshold Met?</b>
1	243	No
2	283	Yes
3	485	Yes

<b>Table 6. Vegetation Metadata Table</b>							
<b>Project Number and Name: 434 - UT to Crooked Creek</b>							
<b>Report Prepared By</b>	Brian Roberts						
<b>Date Prepared</b>	8/24/2009 16:24						
<b>Database Name</b>	434-UTCrookedCreek.mdb						
<b>Database Location</b>	M:\2007\12071067_2007 EEP OPEN END\Veg_database						
<b>PROJECT SUMMARY-----</b>							
<b>Project Code</b>	<b>Project Name</b>	<b>Description</b>	<b>Length (ft)</b>	<b>Stream-to-Edge Width (ft)</b>	<b>Area (sq m)</b>	<b>Required Plots (calculated)</b>	<b>Sampled Plots</b>
434	UT to Crooked Creek	Stream Restoration near Bunn, NC. Located in the Tar-Pamlico River Basin.	2,270	50	21,087	7	3





**Table 7. Stem Count Total and Planted Stems by Plot and Species**  
**Project Number and Name: 434 - UT to Crooked Creek**

Scientific Name	Common Name	Species Type	Current Plot Data (MY3 2009)									Annual Means											
			00434-GT-0001			00434-GT-0002			00434-GT-0003			MY3 (2009)			MY2 (2008)			MY1 (2007)			MY0 (2007)		
			P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T
<i>Alnus serrulata</i>	hazel alder	Shrub Tree		1	1					1	1		2	2		2	2		3	3			
<i>Baccharis</i>	baccharis	Shrub Tree			14			35			18			67									
<i>Betula nigra</i>	river birch	Tree		1	1						1	2		1	1			3	3				
<i>Cephalanthus occidentalis</i>	common buttonbush	Shrub Tree							3	3	3	3	3	3	5	5	5		1	1			
<i>Cornus amomum</i>	silky dogwood	Shrub							1	5	5	1	5	5	1	7	7	4	12	12			
<i>Fraxinus pennsylvanica</i>	green ash	Tree					1	1			1	1		1	1			1	1				
<i>Liriodendron tulipifera</i>	tuliptree	Tree																	1	1			
<i>Nyssa sylvatica</i>	blackgum	Tree		2	2					1	1		3	3		2	2		4	4			
<i>Pinus taeda</i>	loblolly pine	Tree			14			2			26			42			18						
<i>Quercus</i>	oak	Shrub Tree																	1	1			
<i>Quercus alba</i>	white oak	Tree				1	1					1	1		1	1			1	1			
<i>Quercus michauxii</i>	swamp chestnut oak	Tree		2	2					1	1		3	3		3	3		4	4			
<i>Quercus pagoda</i>	cherrybark oak	Tree																	2	2			
<i>Quercus phellos</i>	willow oak	Tree				6	6					6	6		6	6			6	6			
<i>Rhus</i>	sumac							2															
<i>Rhus copallinum</i>	flameleaf sumac	Shrub Tree																					
<i>Salix nigra</i>	black willow	Tree									3		3										
Unknown																						44	44
<b>Stem count</b>			0	6	34	0	7	46	4	12	60	4	25	140	6	28	51	4	39	39	0	44	44
<b>size (ares)</b>			1			1			1			3			3			3			3		
<b>size (ACRES)</b>			0.02			0.02			0.02			0.07			0.07			0.07			0.07		
<b>Species count</b>			0	4	6	0	2	5	2	6	10	2	9	13	2	9	12	1	12	12	0	1	1
<b>Stems per ACRE</b>			0	242.8	1376	0	283.3	1862	161.9	485.6	2428	53.96	337.2	1889	80.94	377.7	688	53.96	526.1	526.1	0	593.5	593.5

P-LS - Planted Live Stake Stems

P-all - Planted Stems Total (With Live Stakes)

T - Total (Planted in cluding Live Stakes and Volunteers)



## Vegetation Monitoring Plot Photos



Plot 1 Photo – 8/24/09 - MY 03



Plot 2 Photo – 8/24/09 - MY 03





Plot 3 Photo – 8/24/09 - MY 03

# **Appendix D**

## **Stream Assessment Data**





## Stream Station Photos



PS-1 Looking Downstream – 11/6/09 - MY 03



PS-2 Looking Upstream– 11/6/09 - MY 03





PS-3 Looking Downstream – 11/6/09 - MY 03



PS-4 Looking Downstream – 11/6/09 - MY 03





PS-5 Looking Downstream – 11/6/09 - MY 03



PS-6 Looking Downstream – 11/6/09 - MY 03





PS-7 Looking Downstream – 11/6/09 - MY 03



PS-8 Looking Downstream – 11/6/09 - MY 03

<b>Table 8. Visual Morphological Stability Assessment</b>						
<b>Project Number and Name: 434 - UT to Crooked Creek</b>						
<b>Segment Reach: UT to Crooked Creek (2,267 ft.)</b>						
Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total Number per As-built *	Total Number / feet in unstable state	% Perform. in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	39	30	N/A	130%	<b>128%</b>
	2. Armor stable (e.g. no displacement)?	39	30	N/A	130%	
	3. Facet grade appears stable?	39	30	N/A	130%	
	4. Minimal evidence of embedding/fining?	39	30	N/A	130%	
	5. Length appropriate?	36	30	N/A	120%	
B. Pools	1. Present? (e.g. no severe aggradation)	51	32	N/A	159%	<b>147%</b>
	2. Sufficiently deep (Dmax pool:Mean Bkf > 1.6?)	51	32	N/A	159%	
	3. Length appropriate?	39	32	N/A	122%	
C. Thalweg	1. Upstream of meander bend centering?	25	25	N/A	100%	<b>100%</b>
	2. Downstream of meander centering?	24	24	N/A	100%	
D. Meanders	1. Outer bend in state of limited/controlled erosion?	27	27	N/A	100%	<b>100%</b>
	2. Of those eroding, # w/ concomitant point bar formation?					
	3. Apparent Rc within spec?	27	27	N/A	100%	
	4. Sufficient floodplain access and relief?	27	27	N/A	100%	
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/0	100%	<b>99%</b>
	2. Channel bed degradation - areas of increasing down cutting or head cutting?	N/A	N/A	1/30	99%	
F. Bank	1. Actively eroding, wasting, or slumping bank	N/A	N/A	0/0	100%	<b>100%</b>
G. Vanes	1. Free of back or arm scour?	26	26	N/A	100%	<b>100%</b>
	2. Height appropriate?	26	26	N/A	100%	
	3. Angle and geometry appear appropriate?	26	26	N/A	100%	
	4. Free of piping or other structural failures?	26	26	N/A	100%	
H. Wads / Boulders	1. Free of scour?	4	4	N/A	100%	<b>100%</b>
	2. Footing stable?	4	4	N/A	100%	

\* Total number of features per as-built estimated from as-built profile and planview sheets.

<b>Table 9. Verification of Bankfull Events</b>			
<b>Project Number and Name: 434 - UT to Crooked Creek</b>			
Date of Data Collection	Date of Occurrence	Method	Photo Number
11/11/2009	06/18/09	Evaluation of rainfall data	N/A
11/25/2009	11/13/2009	Evaluation of rainfall data	N/A





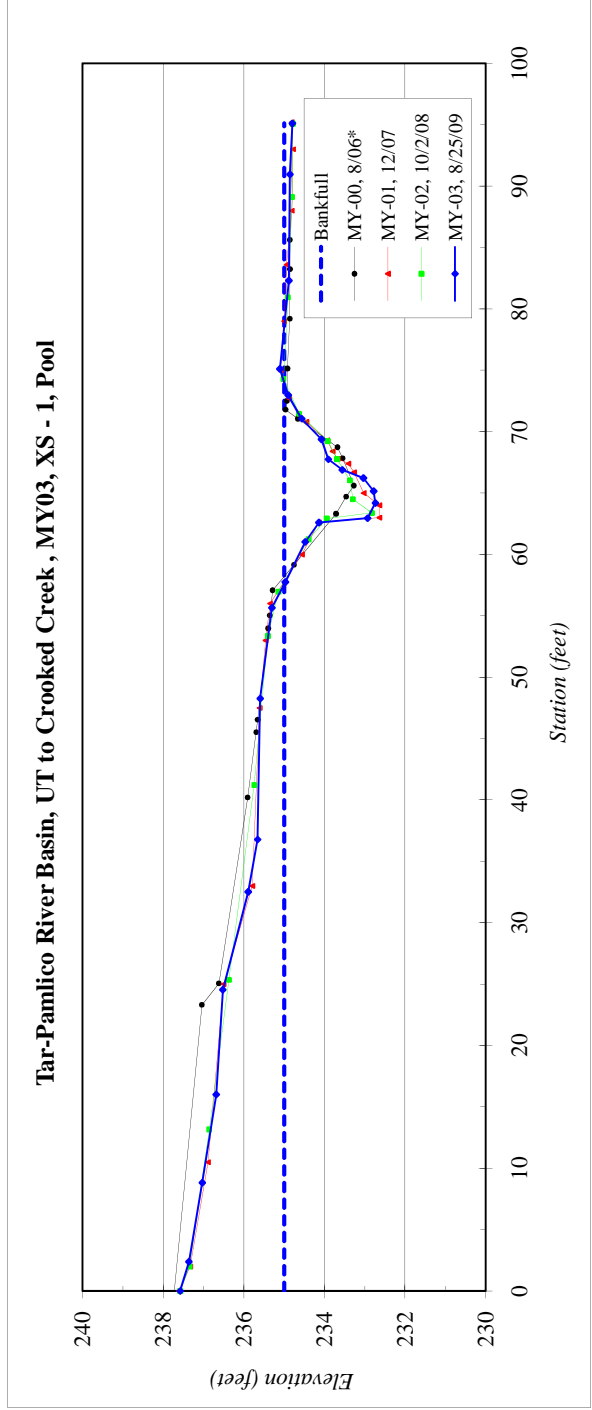
# Cross-Section Plots

<b>River Basin:</b>	Tar-Pamlico
<b>Watershed:</b>	UT to Crooked Creek , MY03
<b>XS ID</b>	XS - 1, Pool
<b>Drainage Area (sq mi):</b>	0.52
<b>Date:</b>	8/25/2009
<b>Field Crew:</b>	B. Roberts, T. Carey



Station	Elevation
0.0	237.58
2.4	237.36
8.8	237.03
16.0	236.69
24.5	236.52
32.5	235.89
36.8	235.66
48.3	235.59
55.6	235.31
57.7	234.97
61.0	234.48
62.6	234.14
62.9	232.93
64.2	232.74
65.1	232.78
66.2	233.03
66.9	233.56
67.7	233.90
69.4	234.07
71.0	234.56
73.0	234.90
75.1	235.11
82.3	234.88
90.9	234.86
95.1	234.80

SUMMARY DATA	
<b>Bankfull Elevation:</b>	235.0
<b>Bankfull Cross-Sectional Area:</b>	15.2
<b>Bankfull Width:</b>	16.4
<b>Flood Prone Area Elevation:</b>	-
<b>Flood Prone Width:</b>	-
<b>Max Depth at Bankfull:</b>	2.3
<b>W / D Ratio:</b>	0.9
<b>Entrenchment Ratio:</b>	-
<b>Bank Height Ratio:</b>	-



\*MY-00 cross-section plots shifted as needed due to likely stationing issue during baseline monitoring.

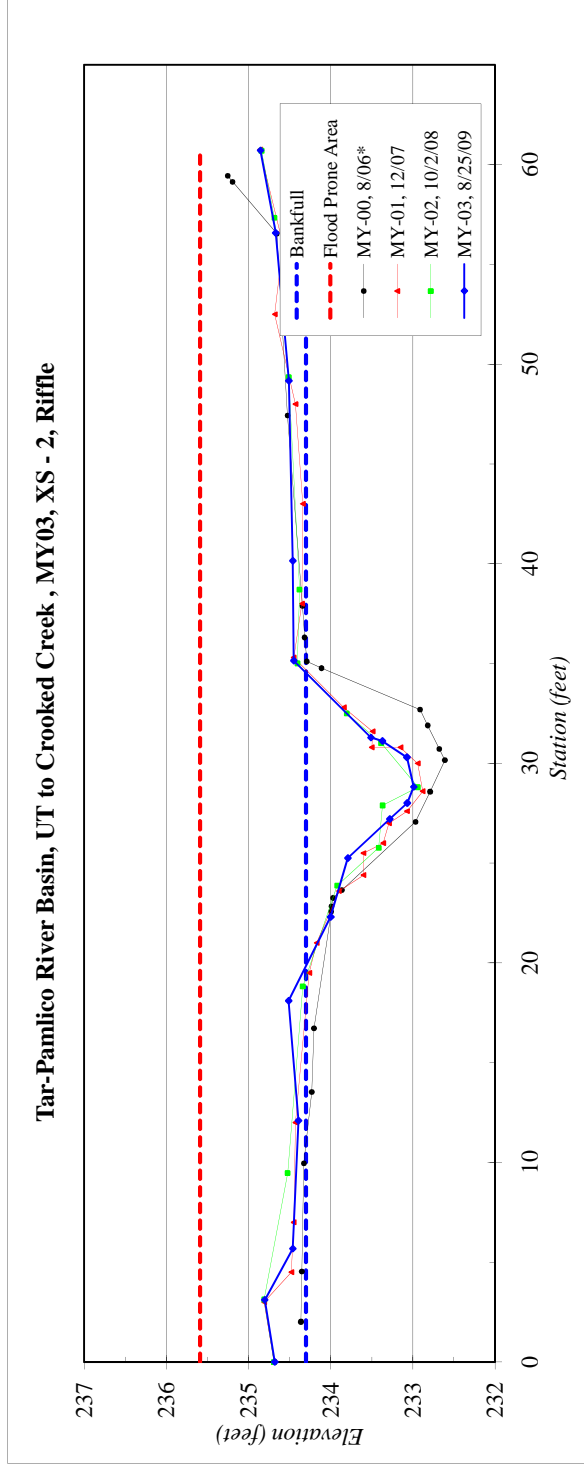
<b>River Basin:</b>	Tar-Pamlico
<b>Watershed:</b>	UT to Crooked Creek , MY03
<b>XS ID</b>	XS - 2, Riffle
<b>Drainage Area (sq mb):</b>	0.52
<b>Date:</b>	8/25/2009
<b>Field Crew:</b>	B. Roberts, T. Carey



Station	Elevation
0.0	234.68
3.1	234.80
5.7	234.46
12.1	234.39
18.1	234.51
22.3	234.00
25.2	233.79
27.2	233.28
28.0	233.07
28.8	232.99
30.3	233.07
31.1	233.37
31.3	233.51
35.1	234.45
40.1	234.46
49.2	234.51
56.6	234.67
60.7	234.85

SUMMARY DATA	
<b>Bankfull Elevation:</b>	234.3
<b>Bankfull Cross-Sectional Area:</b>	9.2
<b>Bankfull Width:</b>	14.7
<b>Flood Prone Area Elevation:</b>	235.6
<b>Flood Prone Area Width:</b>	>60
<b>Max Depth at Bankfull:</b>	1.3
<b>Mean Depth at Bankfull:</b>	0.6
<b>W / D Ratio:</b>	23.6
<b>Entrenchment Ratio:</b>	>4
<b>Bank Height Ratio:</b>	1.0

Tar-Pamlico River Basin, UT to Crooked Creek , MY03, XS - 2, Riffle



\*MY-00 cross-section plots shifted as needed due to likely stationing issue during baseline monitoring.

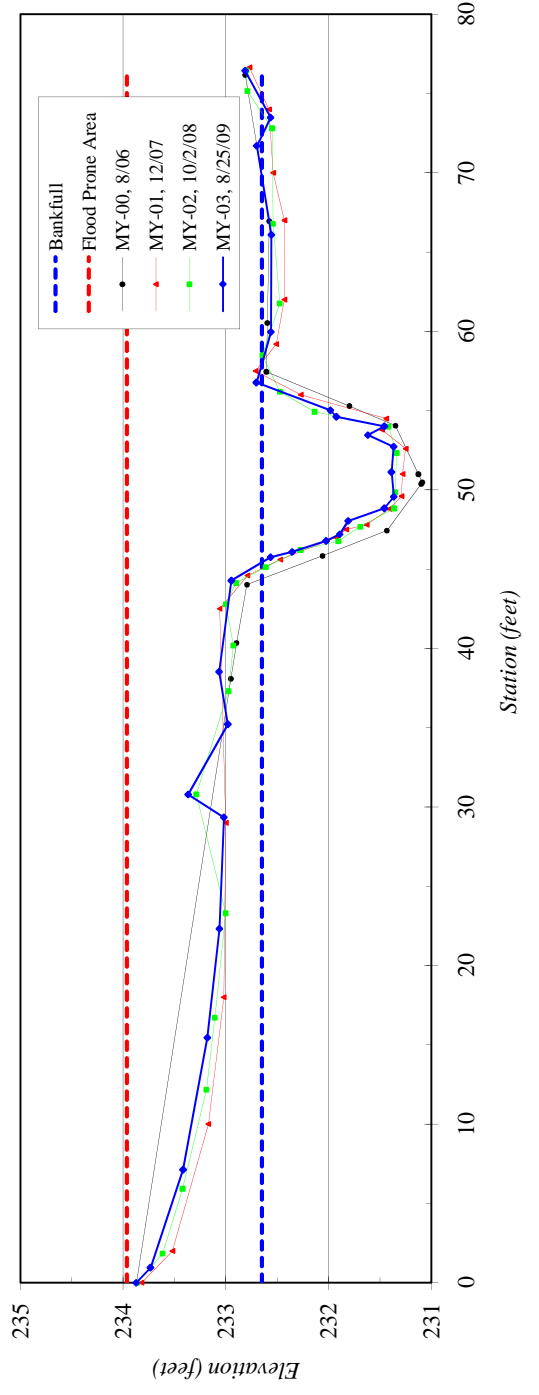
<b>River Basin:</b>	Tar-Pamlico
<b>Watershed:</b>	UT to Crooked Creek , MY03
<b>XS ID</b>	XS - 3, Riffle
<b>Drainage Area (sq mb):</b>	0.52
<b>Date:</b>	8/25/2009
<b>Field Crew:</b>	B. Roberts, T. Carey



Station	Elevation
0.0	233.87
1.0	233.73
7.1	233.42
15.5	233.18
22.3	233.06
29.4	233.02
30.8	233.37
35.2	232.98
38.5	233.07
44.3	232.95
45.8	232.56
46.1	232.35
46.8	232.02
47.2	231.89
48.0	231.81
48.8	231.46
49.6	231.36
51.1	231.39
52.7	231.37
53.5	231.62
54.0	231.46
54.6	231.92
55.0	231.98
56.8	232.70
60.0	232.56
66.1	232.56
71.7	232.70
73.5	232.56
76.4	232.81

SUMMARY DATA	
<b>Bankfull Elevation:</b>	232.7
<b>Bankfull Cross-Sectional Area:</b>	10.0
<b>Bankfull Width:</b>	11.2
<b>Flood Prone Area Elevation:</b>	234.0
<b>Flood Prone Width:</b>	>75
<b>Max Depth at Bankfull:</b>	1.3
<b>Mean Depth at Bankfull:</b>	0.9
<b>W / D Ratio:</b>	12.7
<b>Entrenchment Ratio:</b>	>6
<b>Bank Height Ratio:</b>	1.0

Tar-Pamlico River Basin, UT to Crooked Creek , MY03, XS - 3, Riffle

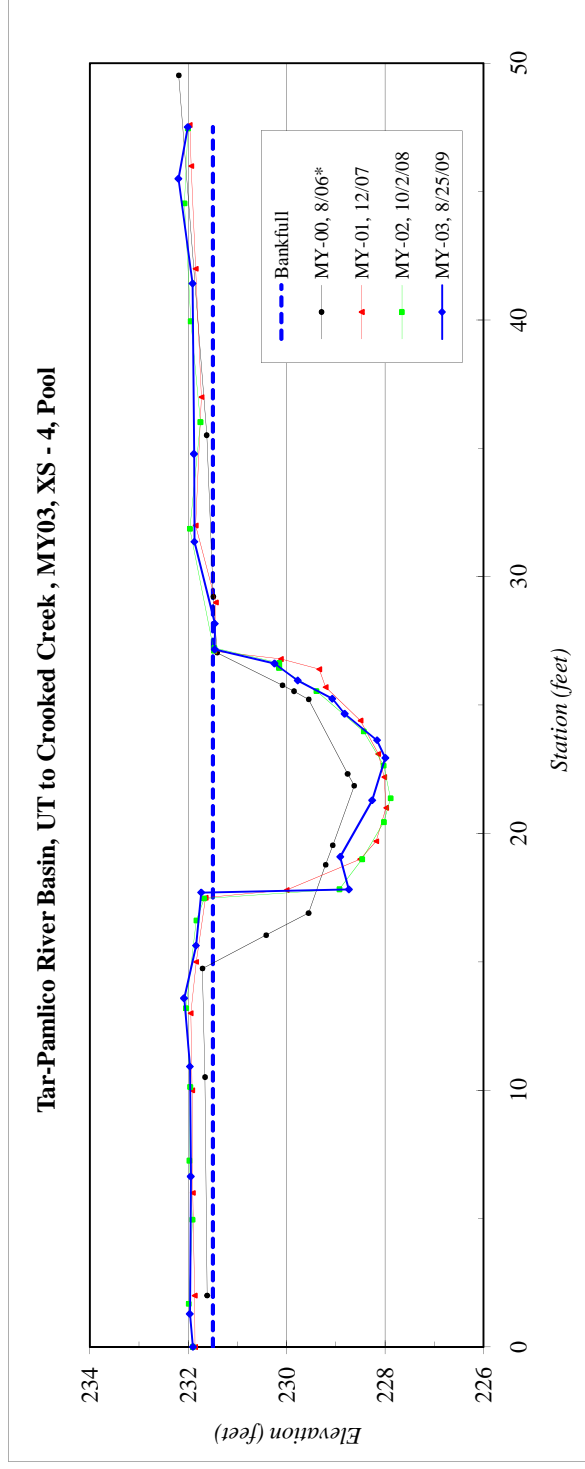


<b>River Basin:</b>	Tar-Pamlico
<b>Watershed:</b>	UT to Crooked Creek , MY03
<b>XS ID</b>	XS - 4, Pool
<b>Drainage Area (sq mb):</b>	0.52
<b>Date:</b>	8/25/2009
<b>Field Crew:</b>	B. Roberts, T. Carey



Station	Elevation
0.0	231.90
1.3	231.97
6.6	231.95
10.9	231.96
13.6	232.08
15.6	231.84
17.7	231.73
17.8	228.74
19.1	228.91
21.3	228.26
22.9	228.00
23.6	228.16
24.7	228.82
25.2	229.07
26.0	229.78
26.6	230.25
27.2	231.46
28.2	231.46
31.4	231.87
34.8	231.88
41.4	231.91
45.5	232.20
47.5	232.01

SUMMARY DATA	
<b>Bankfull Elevation:</b>	231.5
<b>Bankfull Cross-Sectional Area:</b>	25.3
<b>Bankfull Width:</b>	10.8
<b>Flood Prone Area Elevation:</b>	-
<b>Flood Prone Width:</b>	-
<b>Max Depth at Bankfull:</b>	3.5
<b>W / D Ratio:</b>	2.3
<b>Entrenchment Ratio:</b>	-
<b>Bank Height Ratio:</b>	-



\*MY-00 cross-section plots shifted as needed due to likely stationing issue during baseline monitoring.

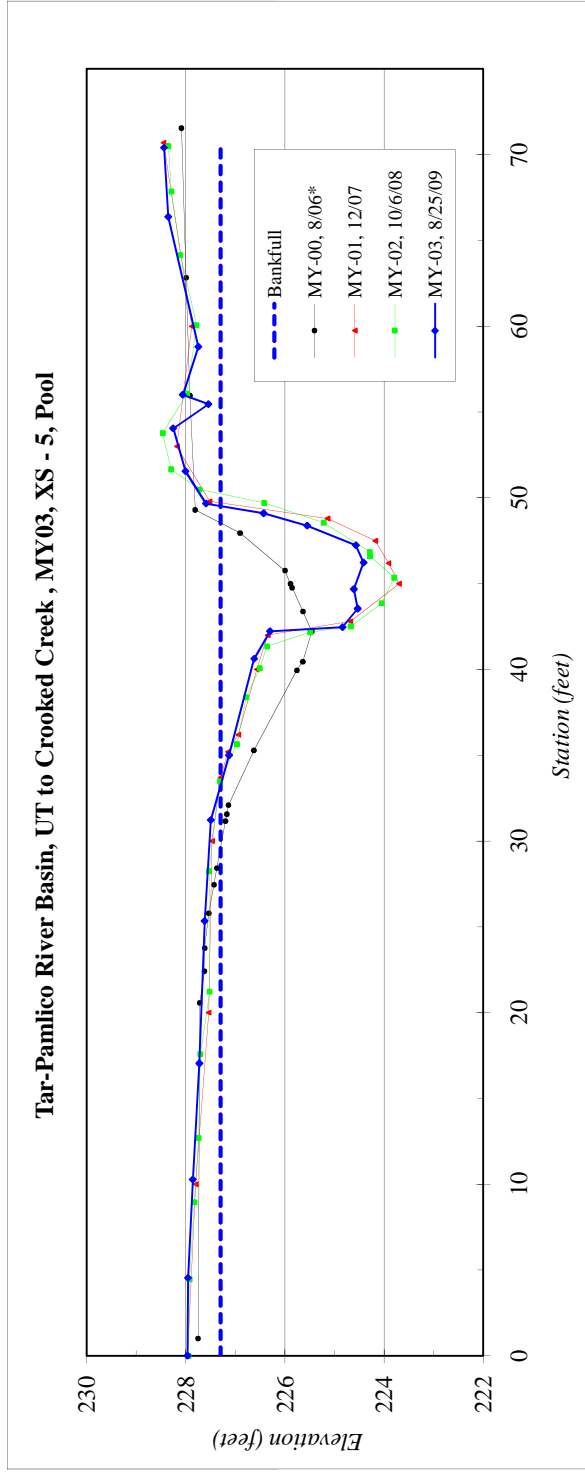


<b>River Basin:</b>	Tar-Pamlico
<b>Watershed:</b>	UT to Crooked Creek , MY03
<b>XS ID</b>	XS - 5, Pool
<b>Drainage Area (sq mb):</b>	0.52
<b>Date:</b>	8/25/2009
<b>Field Crew:</b>	B. Roberts, T. Carey



Station	Elevation
0.0	227.96
4.5	227.96
10.3	227.86
17.0	227.73
25.3	227.62
31.2	227.49
35.0	227.13
40.6	226.62
42.2	226.30
42.5	224.84
43.5	224.53
44.7	224.61
46.2	224.41
47.2	224.57
48.4	225.55
49.1	226.43
49.7	227.59
51.5	228.00
54.0	228.25
55.5	227.54
56.0	228.06
58.8	227.75
66.4	228.35
70.4	228.44

SUMMARY DATA		
<b>Bankfull Elevation:</b>		227.3
<b>Bankfull Cross-Sectional Area:</b>		21.1
<b>Bankfull Width:</b>		16.3
<b>Flood Prone Area Elevation:</b>		-
<b>Flood Prone Width:</b>		-
<b>Max Depth at Bankfull:</b>		2.9
<b>Mean Depth at Bankfull:</b>		1.3
<b>W / D Ratio:</b>		-
<b>Entrenchment Ratio:</b>		-
<b>Bank Height Ratio:</b>		-



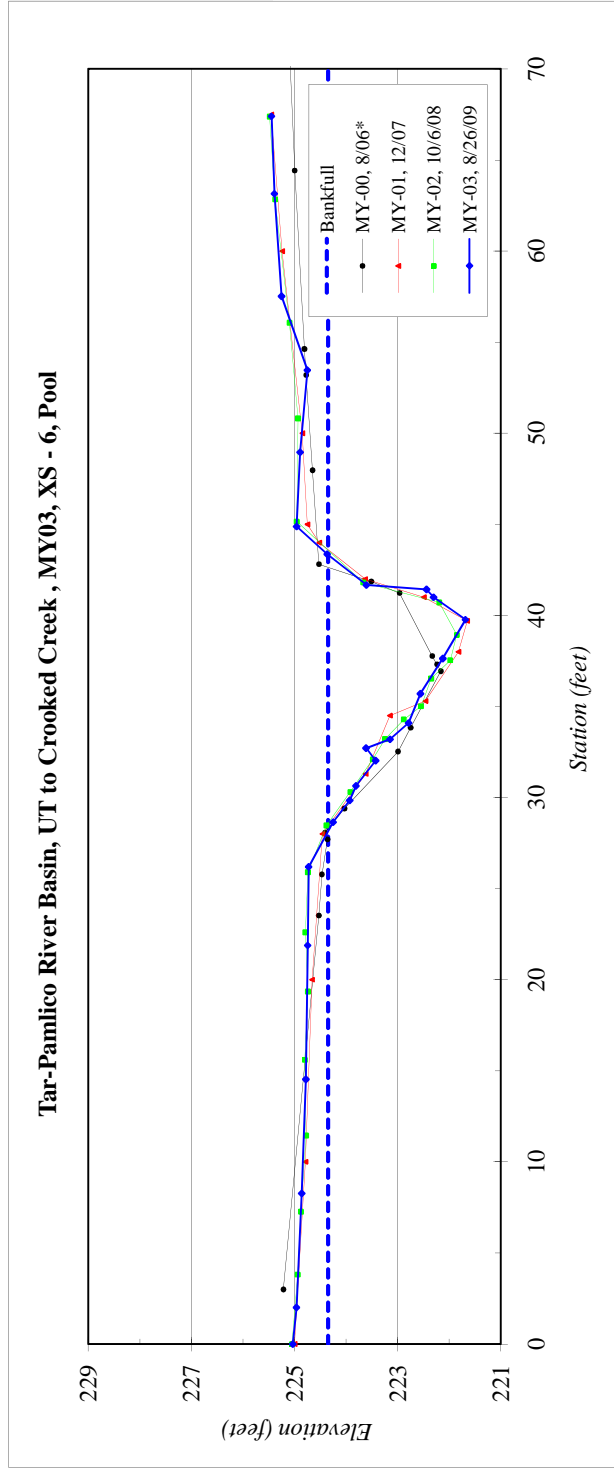
\*MY-00 cross-section plots shifted as needed due to likely stationing issue during baseline monitoring.

<b>River Basin:</b>	Tar-Pamlico
<b>Watershed:</b>	UT to Crooked Creek , MY03
<b>XS ID</b>	XS - 6, Pool
<b>Drainage Area (sq mb):</b>	0.52
<b>Date:</b>	8/26/2009
<b>Field Crew:</b>	B. Roberts, D. Carey



Station	Elevation
0.0	225.03
2.0	224.96
8.3	224.86
14.5	224.78
21.9	224.74
26.2	224.72
28.7	224.25
29.8	223.93
30.6	223.81
32.0	223.43
32.7	223.61
33.2	223.14
34.1	222.79
35.7	222.56
37.6	222.12
39.8	221.68
41.0	222.30
41.4	222.44
41.7	223.60
43.4	224.36
44.9	224.96
49.0	224.89
53.5	224.75
57.5	225.25
63.2	225.39
67.4	225.44

SUMMARY DATA	
Bankfull Elevation:	224.4
Bankfull Cross-Sectional Area:	20.5
Bankfull Width:	15.2
Flood Prone Area Elevation:	-
Flood Prone Area Width:	-
Max Depth at Bankfull:	2.7
Mean Depth at Bankfull:	1.4
W / D Ratio:	-
Entrenchment Ratio:	-
Bank Height Ratio:	-



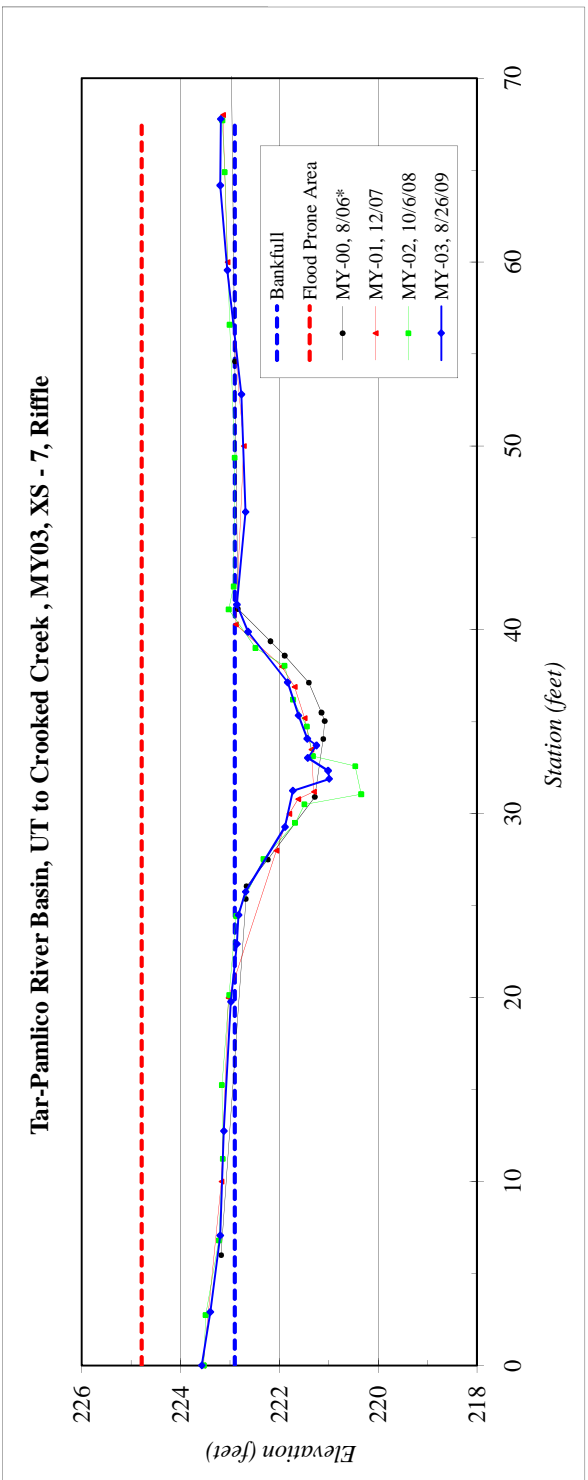
\*MY-00 cross-section plots shifted as needed due to likely stationing issue during baseline monitoring.

<b>River Basin:</b>	Tar-Pamlico
<b>Watershed:</b>	UT to Crooked Creek , MY03
<b>XS ID</b>	XS - 7, Riffle
<b>Drainage Area (sq mi):</b>	0.52
<b>Date:</b>	8/26/2009
<b>Field Crew:</b>	B. Roberts, D. Carey



Station	Elevation
0.0	223.57
2.9	223.40
7.1	223.20
12.7	223.12
19.8	222.98
22.9	222.86
24.5	222.82
25.8	222.68
29.3	221.88
31.3	221.73
31.9	220.99
32.3	221.01
33.0	221.42
33.7	221.25
34.1	221.43
35.3	221.61
37.1	221.83
39.9	222.63
41.4	222.86
46.4	222.68
52.8	222.77
59.6	223.05
64.2	223.20
67.8	223.19

SUMMARY DATA		
<b>Bankfull Elevation:</b>		222.9
<b>Bankfull Cross-Sectional Area:</b>		15.2
<b>Bankfull Width:</b>		18.5
<b>Flood Prone Area Elevation:</b>		224.8
<b>Flood Prone Width:</b>		>70
<b>Max Depth at Bankfull:</b>		1.9
<b>Mean Depth at Bankfull:</b>		0.8
<b>W / D Ratio:</b>		22.4
<b>Entrenchment Ratio:</b>		>3.5
<b>Bank Height Ratio:</b>		1.0



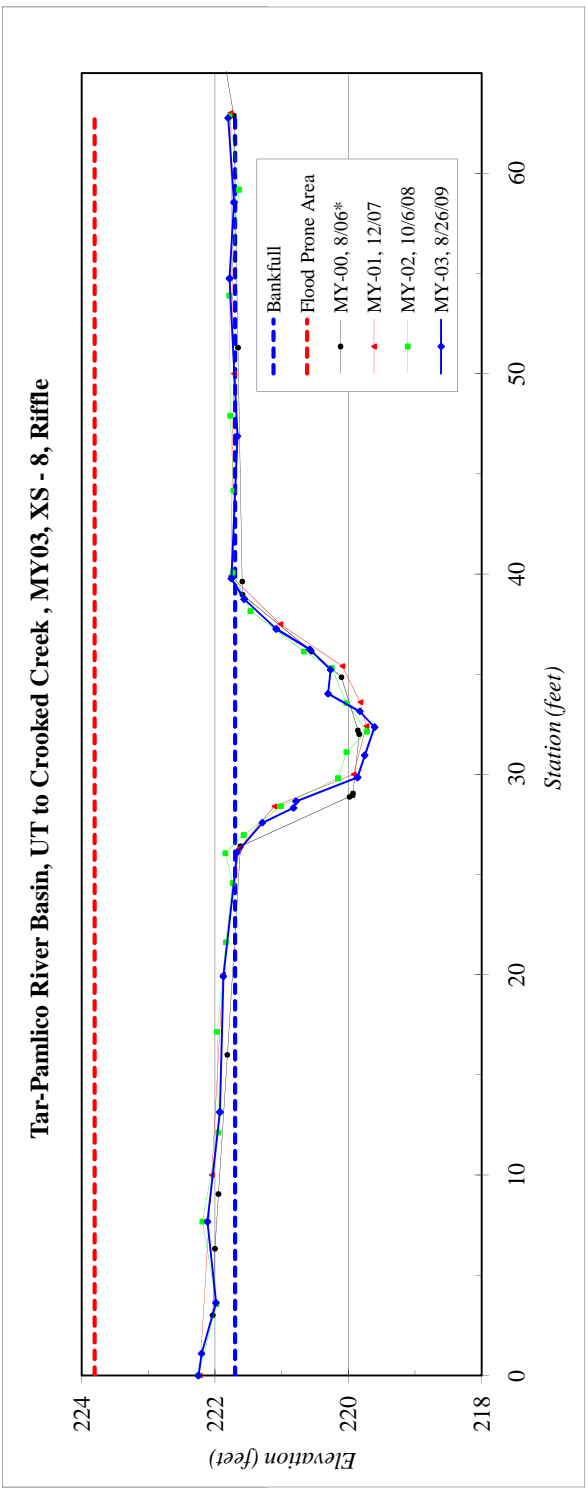
\*MY-00 cross-section plots shifted as needed due to likely stationing issue during baseline monitoring.

<b>River Basin:</b>	Tar-Pamlico
<b>Watershed:</b>	UT to Crooked Creek , MY03
<b>XS ID</b>	XS - 8, Riffle
<b>Drainage Area (sq mi):</b>	0.52
<b>Date:</b>	8/26/2009
<b>Field Crew:</b>	B. Roberts, D. Carey



Station	Elevation
0.0	222.25
1.1	222.20
3.6	221.98
7.7	222.11
13.2	221.92
19.9	221.87
26.1	221.67
27.6	221.29
28.3	220.82
28.7	220.78
29.9	219.86
31.0	219.75
32.4	219.61
33.1	219.83
34.0	220.30
35.2	220.27
36.2	220.58
37.3	221.08
38.7	221.56
39.8	221.75
46.9	221.66
54.7	221.78
58.5	221.71
62.8	221.80

SUMMARY DATA		
<b>Bankfull Elevation:</b>		221.7
<b>Bankfull Cross-Sectional Area:</b>		14.6
<b>Bankfull Width:</b>		12.1
<b>Flood Prone Area Elevation:</b>		223.8
<b>Flood Prone Width:</b>		>65
<b>Max Depth at Bankfull:</b>		2.1
<b>Mean Depth at Bankfull:</b>		1.2
<b>W / D Ratio:</b>		10.1
<b>Entrenchment Ratio:</b>		>4
<b>Bank Height Ratio:</b>		1.0

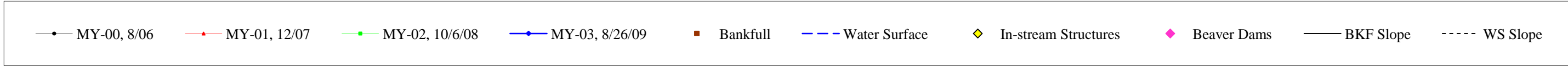
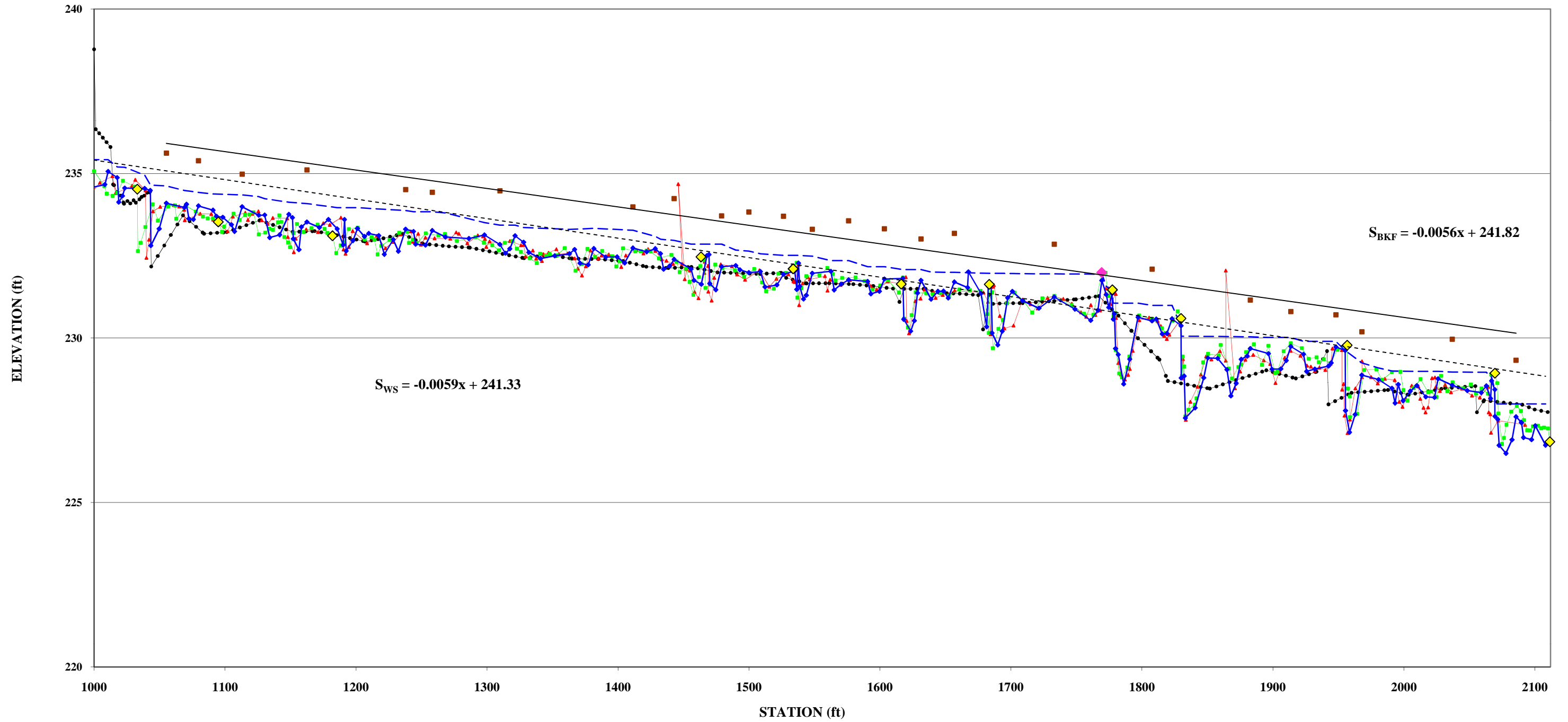


\*MY-00 cross-section plots shifted as needed due to likely stationing issue during baseline monitoring.

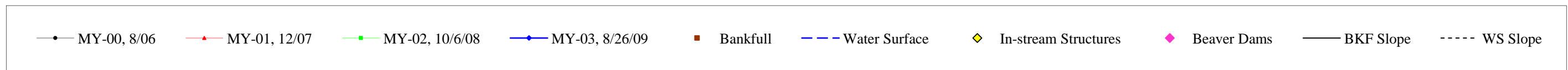
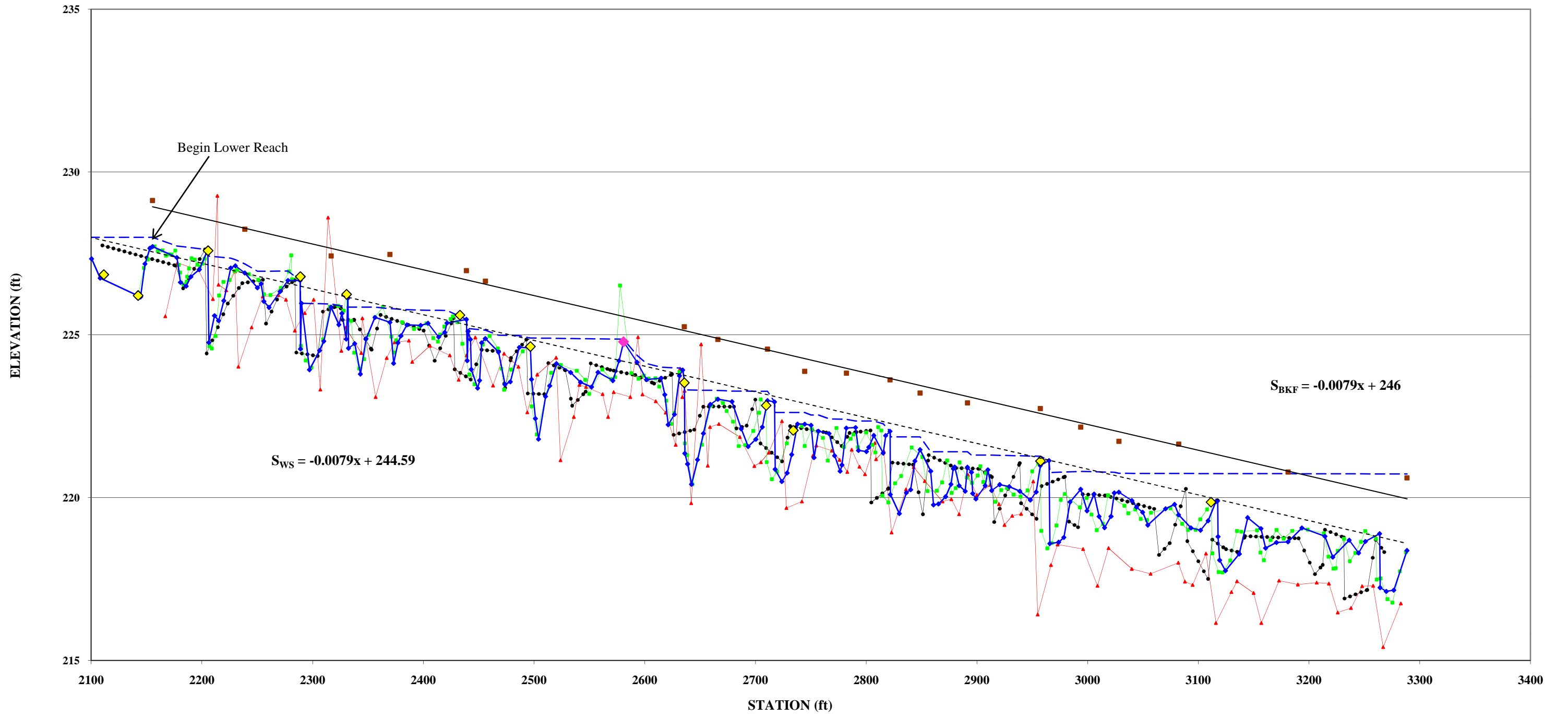


# Longitudinal Plots

Longitudinal Profile  
UT to Crooked Creek (Upper Reach), Franklin County  
EEP Project Number 434 - MY03



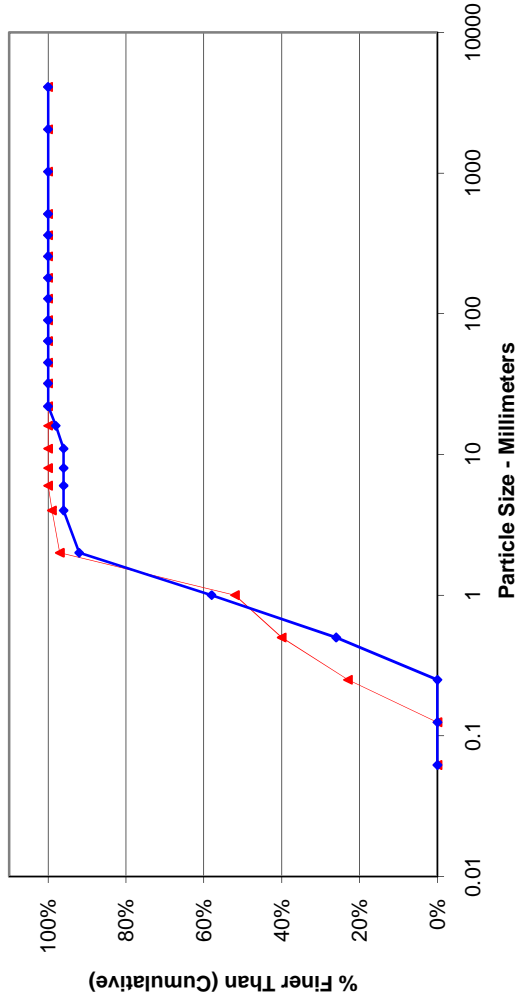
**Longitudinal Profile**  
**UT to Crooked Creek (Lower Reach), Franklin County**  
**EEP Project Number 434 - MY03**



# Pebble Count Plots

Cross-Section 1 Pool - MY03			
Particle	Millimeter	Count	
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	
Medium	.25 - .50	N	26
Coarse	.50 - 1	D	32
Very Coarse	1 - 2	S	34
Very Fine	2 - 4		4
Fine	4 - 5.7	G	
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
		<b>Total</b>	100

Particle Size Distribution  
UT to Crooked Creek  
XS 1 Pool



Size (mm)	
D16	0.38
D35	0.61
D50	0.84
D65	1.2
D84	1.7
D95	3.4

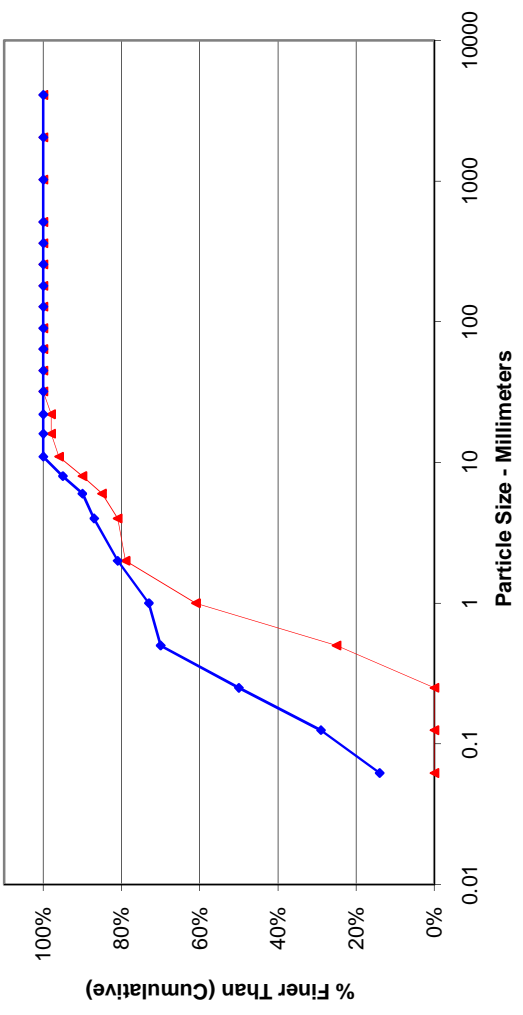
Size Distribution	
mean	0.8
dispersion	2.1
skewness	-0.02

Type	
silt/clay	0%
sand	92%
gravel	8%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Note:

Cross-Section 2 Riffle - MY03			
Particle	Millimeter	S/C	Count
Silt/Clay	< 0.062		14
Very Fine	.062 - .125	S	15
Fine	.125 - .25	A	21
Medium	.25 - .50	N	20
Coarse	.50 - 1	D	3
Very Coarse	1 - 2	S	8
Very Fine	2 - 4		6
Fine	4 - 5.7	G	3
Fine	5.7 - 8	R	5
Medium	8 - 11.3	A	5
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
<b>Total</b>			100

Particle Size Distribution  
UT to Crooked Creek  
XS 2 Riffle



Size (mm)	Count
D16	0.068
D35	0.15
D50	0.25
D65	0.42
D84	2.8
D95	8

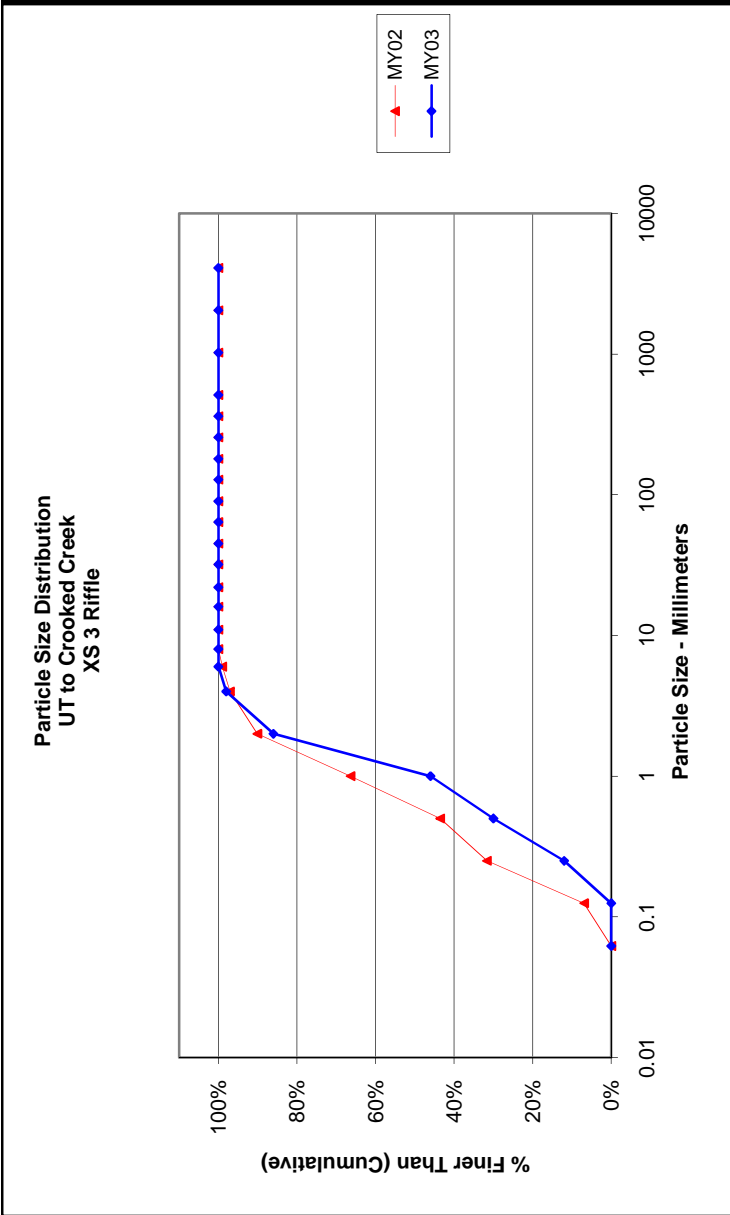
Size Distribution	
mean	0.4
dispersion	7.4
skewness	0.19

Type	Percentage
silt/clay	14%
sand	67%
gravel	19%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Note:

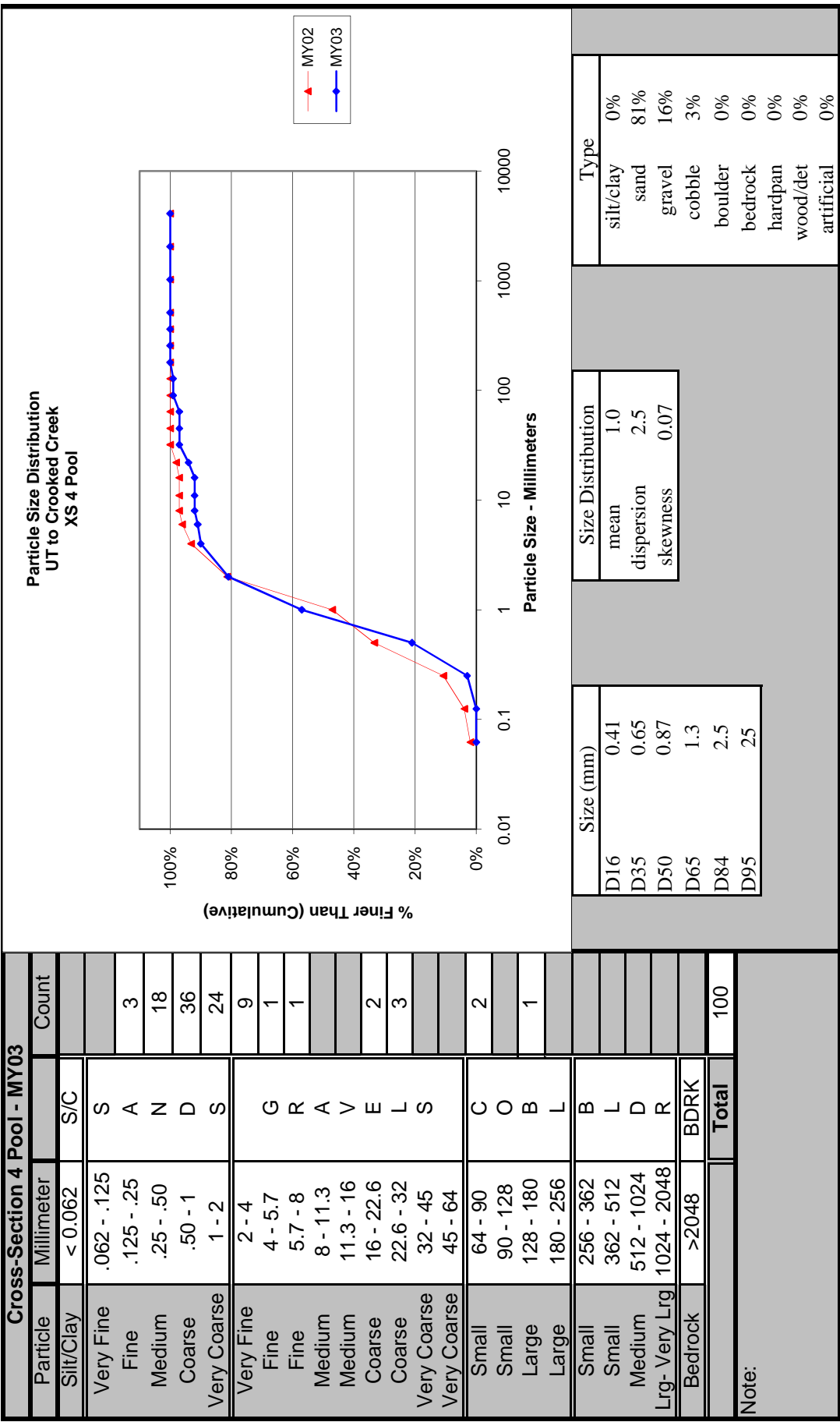


Cross-Section 3 Riffle - MY03			
Particle	Millimeter	S/C	Count
Silt/Clay	< 0.062	S/C	
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	12
Medium	.25 - .50	N	18
Coarse	.50 - 1	D	16
Very Coarse	1 - 2	S	40
Very Fine	2 - 4		12
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
<b>Total</b>			100

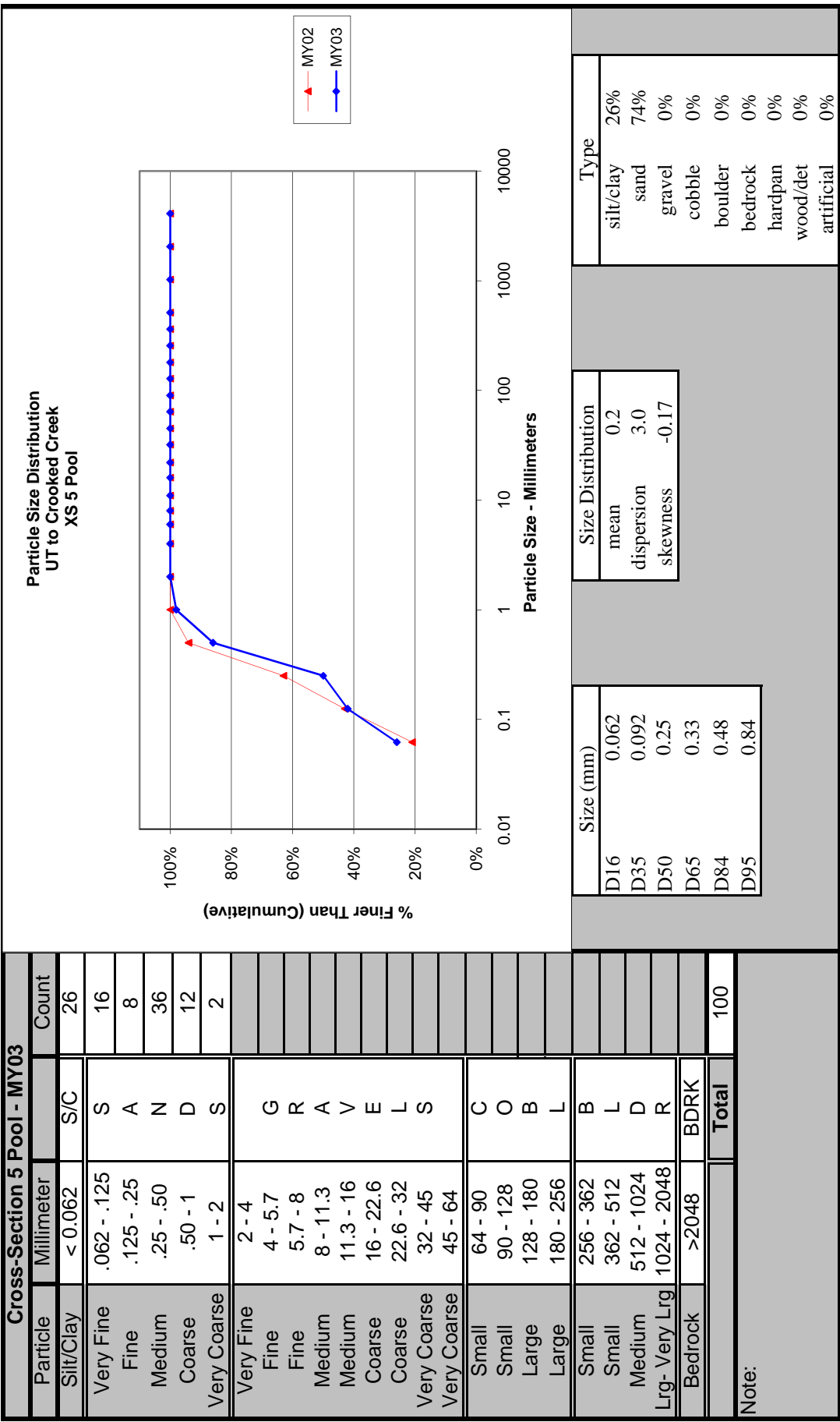


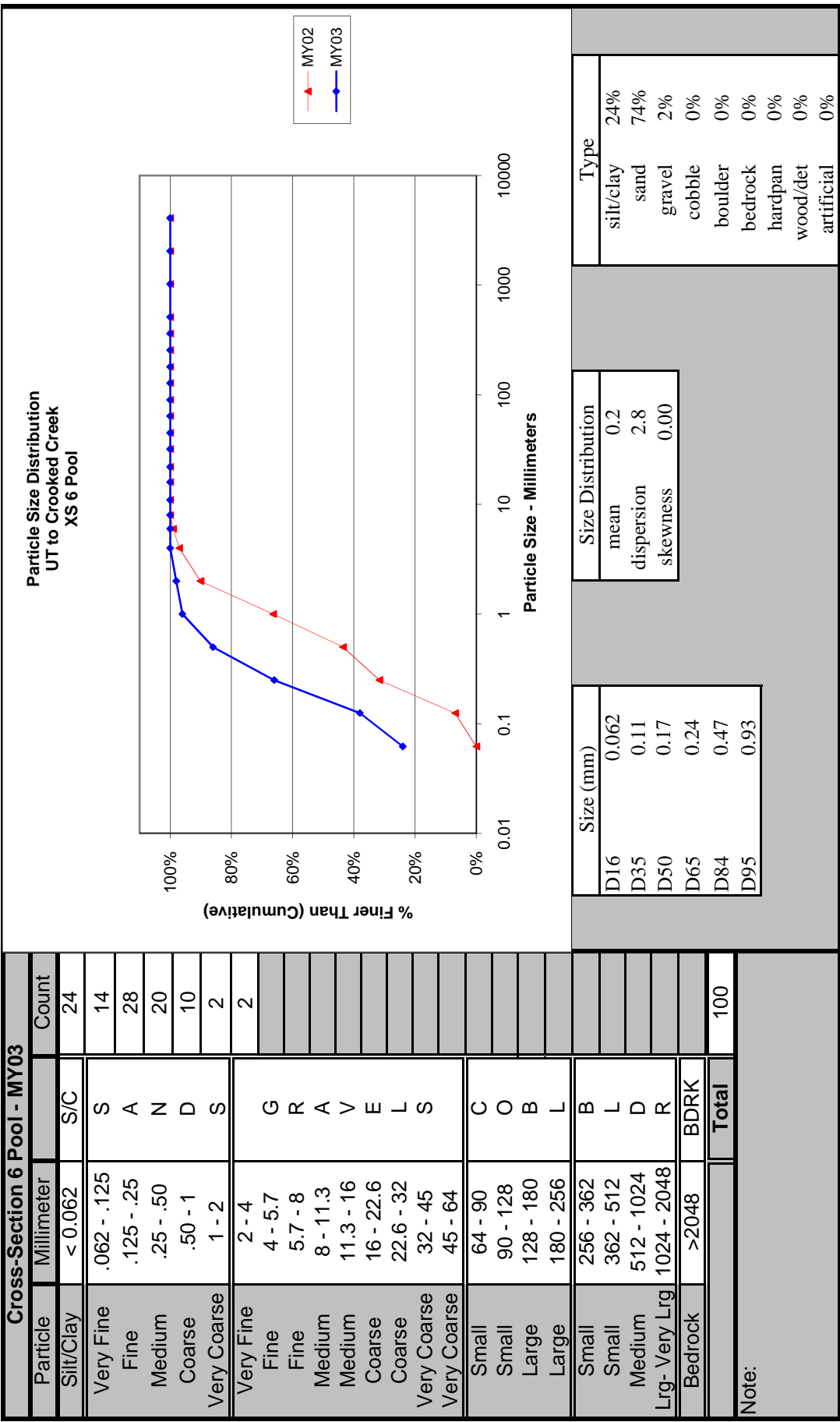
Size (mm)		Size Distribution		Type	
D16	0.29	mean	0.7	silt/clay	0%
D35	0.62	dispersion	2.8	sand	86%
D50	1.1	skewness	-0.19	gravel	14%
D65	1.4			cobble	0%
D84	1.9			boulder	0%
D95	3.4			bedrock	0%
				hardpan	0%
				wood/det	0%
				artificial	0%

Note:

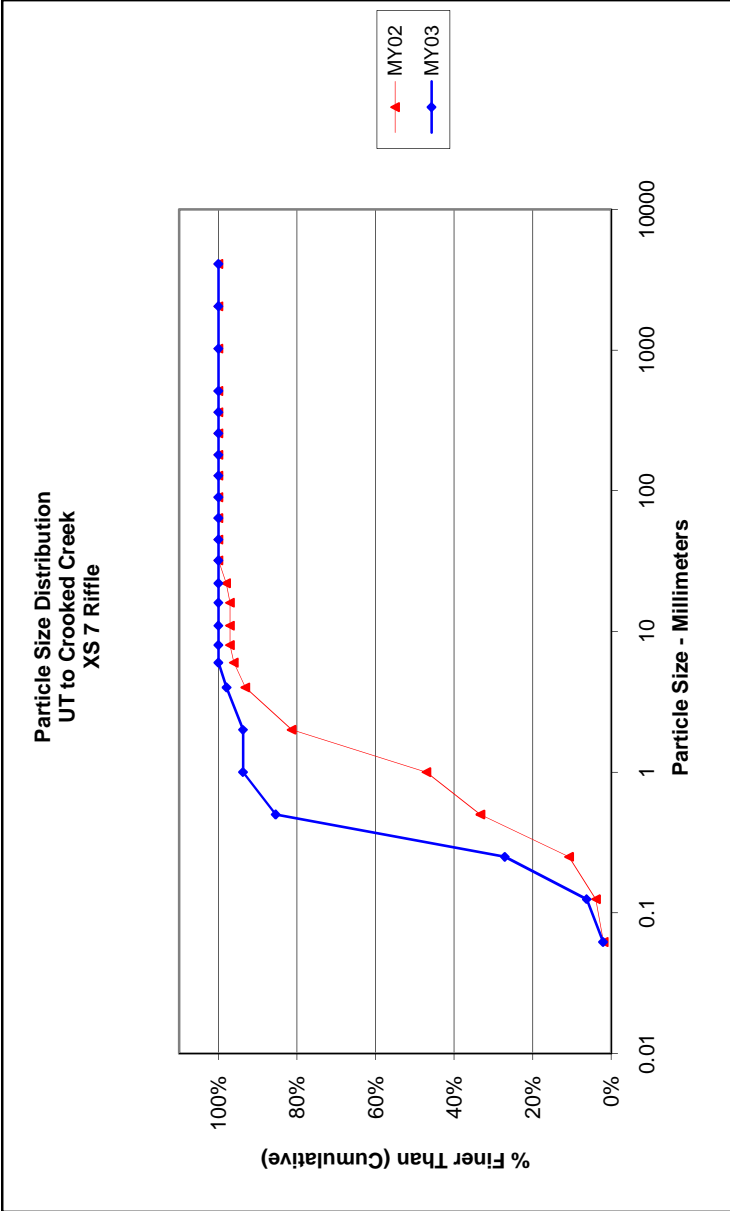


Note:





Cross-Section 7 Riffle - MY03			
Particle	Millimeter	S/C	Count
Silt/Clay	< 0.062	S/C	2
Very Fine	.062 - .125	S	4
Fine	.125 - .25	A	20
Medium	.25 - .50	N	56
Coarse	.50 - 1	D	8
Very Coarse	1 - 2	S	
Very Fine	2 - 4		4
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	
Medium	8 - 11.3	A	
Medium	11.3 - 16	V	
Coarse	16 - 22.6	E	
Coarse	22.6 - 32	L	
Very Coarse	32 - 45	S	
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
<b>Total</b>			96



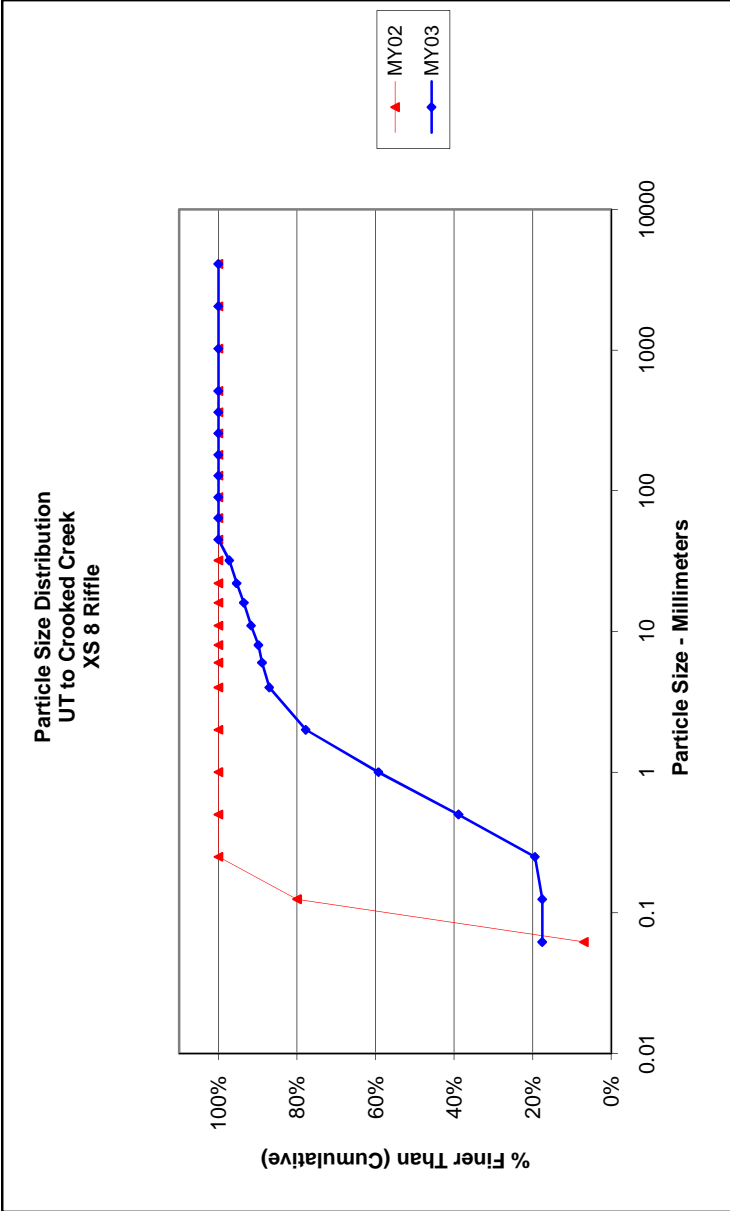
Size (mm)	
D16	0.17
D35	0.27
D50	0.33
D65	0.39
D84	0.49
D95	2.5

Size Distribution	
mean	0.3
dispersion	1.7
skewness	-0.09

Type	
silt/clay	2%
sand	92%
gravel	6%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Note:

Cross-Section 8 Riffle - MY03			
Particle	Millimeter	S/C	Count
Silt/Clay	< 0.062	S/C	19
Very Fine	.062 - .125	S	
Fine	.125 - .25	A	2
Medium	.25 - .50	N	21
Coarse	.50 - 1	D	22
Very Coarse	1 - 2	S	20
Very Fine	2 - 4		10
Fine	4 - 5.7	G	2
Fine	5.7 - 8	R	1
Medium	8 - 11.3	A	2
Medium	11.3 - 16	V	2
Coarse	16 - 22.6	E	2
Coarse	22.6 - 32	L	2
Very Coarse	32 - 45	S	3
Very Coarse	45 - 64		
Small	64 - 90	C	
Small	90 - 128	O	
Large	128 - 180	B	
Large	180 - 256	L	
Small	256 - 362	B	
Small	362 - 512	L	
Medium	512 - 1024	D	
Lrg- Very Lrg	1024 - 2048	R	
Bedrock	>2048	BDRK	
<b>Total</b>			<b>108</b>



Size (mm)	
D16	0.062
D35	0.44
D50	0.73
D65	1.2
D84	3.2
D95	21

Size Distribution	
mean	0.4
dispersion	8.1
skewness	-0.16

Type	
silt/clay	18%
sand	60%
gravel	22%
cobble	0%
boulder	0%
bedrock	0%
hardpan	0%
wood/det	0%
artificial	0%

Note: