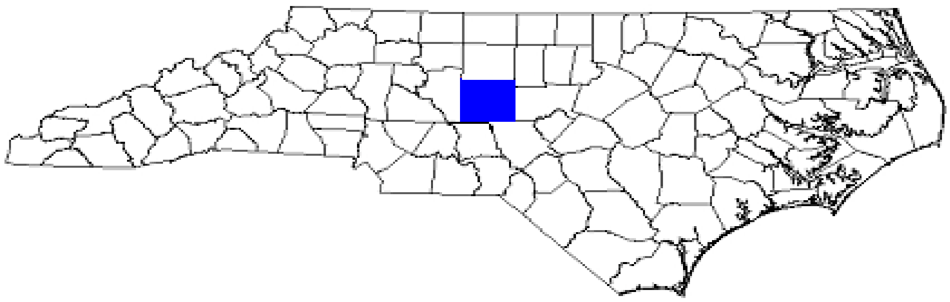
ANNUAL REPORT FOR 2004



Fork Creek Tributaries Stream Mitigation Site (Deaton Site)
Randolph County
WBS Element 34820.4.1
TIP No. R-2417WM

Prepared By:
Office of Natural Environment & Roadside Environmental Unit
North Carolina Department of Transportation
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APPENDICIES

Summary

The following report summarizes the stream monitoring activities that have occurred during the Year 2004 at the Deaton Site. The site is located in southeastern Randolph County, North Carolina. This site was designed during 2001 and constructed in 2003 by the North Carolina Department of Transportation (NCDOT). This report provides the monitoring results for the second documented year of monitoring (Year 2004). The Deaton Site will be monitored through the Year 2007 or until success criteria are met.

The Deaton Site was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2417 for 4,545 linear feet. This site provided 5,050 linear feet of stream mitigation credit. Overall, the two unnamed tributaries to Fork Creek remain stable. Based on information obtained from the USGS, the Deaton Site has met the required monitoring protocols for hydrology. No supplemental work is proposed at this time.

Per the letter from the Ecosystem Enhancement Program (EEP) to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all off-site mitigation projects. The EEP will be responsible for fulfilling the remaining monitoring requirements and future remediation for this project.

1.0 INTRODUCTION

1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during the Year 2004 at the Deaton Site. The site is situated along two unnamed tributaries (UTs) to Fork Creek, immediately adjacent to Erect Road (SR 1003) in the southeastern portion of Randolph County, North Carolina (Figure 1). It is approximately six miles (9.7 kilometers) southeast of Coleridge and nearly one mile (1.6 kilometers) north of Erect. The Deaton Site was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2417 in Lee County, North Carolina.

The mitigation project covers approximately 5,050 linear feet of UTs to Fork Creek, identified as the northern UT and the southern UT in this report. Approximately 4,100 linear feet were surveyed along the two main tributaries. Several smaller tributaries entering both the main tributaries were not surveyed as part of this assessment. Design and construction of the project was implemented between 2001 and 2003 by the North Carolina Department of Transportation (NCDOT). Priority Level I and II restorations were completed along both tributaries at the site. Construction involved establishing a new channel along each reach. Cross vanes were installed for grade control and bank stability. The adjacent streambanks were re-sloped to reduce overall erosion. It also included the installation of native vegetation and livestock management practices, including a 50-foot riparian buffer and at-grade stream crossings in several locations.

1.2 Purpose

According to the stream mitigation plan (NCDOT, 2001), the following objectives were proposed:

- Protection of the streams, including the smaller tributaries, and riparian zones via 50-foot conservation easements;
- Protection of the riparian zones vegetation from grazing by fencing livestock out of the easement area and installing watering tanks, stream crossings, etc.;
- Enhancement of overall stability by establishing the correct width/depth ratio, reducing entrenchment, sloping banks, and planting woody vegetation along the northern UT and southern UT tributaries to Fork Creek;
- Installation of rock cross vanes along eroding sections of the creek to reduce erosion and provide habitat diversity;
- Enhancement of instream habitat by constructing a series of cross vanes;

- Establishment of the proper width/depth by narrowing the channel and establishing a floodplain; and
- Planting of native trees, shrubs, and ground cover that will help to stabilize the stream banks, establish shade, and provide wildlife cover and food.

Based on the stream surveys completed as part of Year 2003 and 2004 monitoring, all of these objectives had been met.

Successful stream mitigation is demonstrated by a stable channel that neither aggrades nor degrades over time. It is also demonstrated by reduced erosion rates, the permanent establishment of native vegetation, and bed features consistent with the design stream type. Vegetation survival is based on federal guidelines denoting success criteria for wetland mitigation. Results of stream monitoring conducted during the 2004 growing season at the Deaton Site are included in this report.

Activities in 2004 reflect the second formal year of monitoring following the restoration efforts. Included in this report are analyses on stability (primarily the longitudinal profile and cross sections) and site photographs. Vegetation monitoring was conducted by NCDOT.

1.3 Project History

January 2003	Construction Completed.
February 2003	Site Planted
June 2003	Vegetation Monitoring (1 yr.)
September 2003	Stream Channel Monitoring (1 yr.)
July 2004	Stream Channel Monitoring (2 yr.)
August 2004	Vegetation Monitoring (2 yr.)

2.0 STREAM ASSESSMENT

2.1 Success Criteria

The success criteria, as defined by federal guidelines for stream mitigation, includes the following main parameters: no less than two bankfull events for the five-year monitoring period, reference photos, plant survivability analyses, and channel stability analyses (USACE, 2003). Biological data was not required; however, benthic monitoring was conducted as part of pre-construction sampling in April 2002.

Natural streams are dynamic systems that are in a constant state of change. Longitudinal profile and cross section surveys will differ from year to year based on changes in the watershed. Natural channel stability is achieved by allowing the stream to develop a proper dimension, pattern, and profile such that, over time, channel features are maintained and the stream system neither aggrades nor degrades. A stable stream consistently transports its sediment load, both in size and type, associated with local deposition and scour. Channel instability occurs when the scouring process leads to degradation, or excessive sediment deposition results in aggradation (Rosgen, 1996). The following surveys were conducted in support of the monitoring assessment:

- Longitudinal Profile Survey. This survey addressed the overall slope of the reach, as well as slopes between bed features. The bed features are secondary delineative criteria describing channel configuration in terms of riffle/pools, rapids, step/pools, cascades and convergence/divergence features which are inferred from channel plan form and gradient. The surveys are compared on a yearly basis to note and/or compare aggradation, degradation, head cuts, and areas of mass wasting. The longitudinal profile is expected to change from year to year. Significant changes may require additional monitoring.
- Cross Section Surveys. These surveys addressed the following characteristics at various locations along the reach: entrenchment ratio, width/depth ratio, and dominant channel materials. The entrenchment ratio is a computed index value used to describe the degree of vertical containment. The width/depth ratio is an index value which indicates the shape of the channel cross section. The dominant channel materials refer to a selected size index value, the D50, representing the most prevalent of one of six channel material types or size categories, as determined from a channel material size distribution index.

2.2 Stream Description

The proposed design for the northern UT to Fork Creek was an E4 stream type according to the Rosgen Classification of Natural Rivers. Prior to construction, the channel was incised below the historic stream grade by as much as two feet. A total of three cross sections (one pool and two riffles) were established and surveyed along the tributary. Based on survey measurements, the stream is characteristic of a C4 stream type as it crosses the property with a high width/depth ratio. The proposed design width/depth ratio was 10; however, higher ratios of 25 for the southern UT, and 18 for the northern UT were found. Sinuosity for this channel is comparable with other C stream types. A significant amount of herbaceous vegetation was found growing in and across the active channel during the survey, which may have contributed to the higher width/depth ratios. Overall, the channel is maintaining stability and is expected to narrow over time.

The proposed design for the southern UT to Fork Creek was an E4 stream type. A total of five cross sections (two pools and three riffles) were established and surveyed along the tributary. In 2003, Cross Section #3 was a riffle and in 2004 it has transitioned into a glide as the riffle has moved downstream. Survey data indicates that the existing channel transitions through stream types as it crosses the property. At Cross Sections #1 and #2, the upper portions of this reach are characteristic of a B4 and B6/4 type, respectively, where the surrounding topography confines the channel to the base of the slope. It should be noted that the B6/4 classification at Cross Section #2 is based on a pebble count that was dominated by silt/clay along the bankfull width but the bed material in the active channel was predominantly gravel. Width/depth ratios were higher in the upper reach possibly due to the greater than expected bankfull channel width. A significant amount of herbaceous vegetation was found growing in and across the active channel during the survey, which may have contributed to the higher width/depth ratios. The lower portions of the reach exhibit C4 stream type characteristics. These portions are maintaining stability and are expected to further narrow over time. A comparison of channel morphology is presented in Table 1.

Table 1. Abbreviated Morphological Summary Deaton Site

Variable		**Southern Tributary (Combined Cross Sections # 1 Thru #5)**						
		Pre-Const.		**Year 1**	**Year 2**	**Year 3***	**Year 4***	**Year 5***
Drainage Area (mi^2)		0.15		0.15	0.15	0.15	0.15	0.15
Bankfull Width (ft)	Mean	3 - 20		14.3	10.0			
Bankfull Mean Depth (ft)	Mean	0.4 - 1.3		0.6	0.6			
Width/Depth Ratio	Mean	6.5		30.9	31.1			
Bankfull Cross Sectional Area (ft^2)	Mean	2 - 18		8.2	5.9			
Maximum Bankfull Depth (ft)	Mean	0.8 - 2.7		1.4	1.2			
Width of Floodprone Area (ft)	Mean	8 - 160		44	46			
Entrenchment Ratio	Mean	2.6		4.2	6.3			
Slope		0.008 - 0.02		0.014	0.015			
Particle Sizes (Riffle Sections)								
D_{16} (mm)		0.1		<0.0062	<0.0062			
D_{35} (mm)		1		0.31	<0.0062			
D_{50} (mm)		9		6.6	2.0			
D_{84} (mm)		29		23	16			
D_{95} (mm)		128		42	38			
Variable		**Northern Tributary (Combined Cross Sections #6 Thru #8)**						
		Pre-Const.		**Year 1**	**Year 2**	**Year 3***	**Year 4***	**Year 5***
Drainage Area (mi^2)		0.35		0.35	0.35	0.35	0.35	0.35
Bankfull Width (ft)	Mean	3 - 20		13.1	14.6			
Bankfull Mean Depth (ft)	Mean	0.4 - 1.3		1.06	1.0			
Width/Depth Ratio	Mean	10.2		14	18.3			
Bankfull Cross Sectional Area (ft^2)	Mean	2 - 18		13.8	14.8			
Maximum Bankfull Depth (ft)	Mean	0.8 - 2.7		1.9	2			
Width of Floodprone Area (ft)	Mean	8 - 160		70	70			

Entrenchment Ratio Mean	4.9		5.7	4.7				
Slope	0.008 – 0.02		0.008	0.008				
Particle Sizes (Riffle Sections)								
D_{16} (mm)	0.1		<0.0062	<0.0062				
D_{35} (mm)	1		4.8	<0.0062				
D_{50} (mm)	9		9.9	<0.0062				
D_{84} (mm)	29		29	23				
D_{95} (mm)	128		49	41				

* Future monitoring will take place in 2005, 2006, and 2007.

2.3 Results of the Stream Assessment

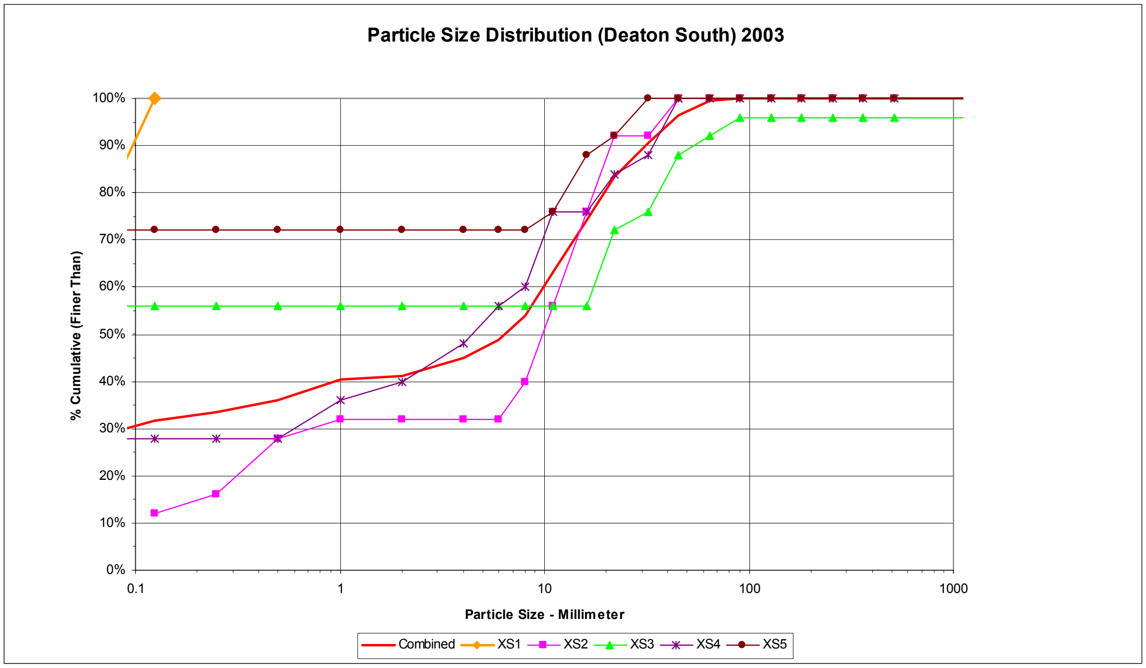
2.3.1 Site Data

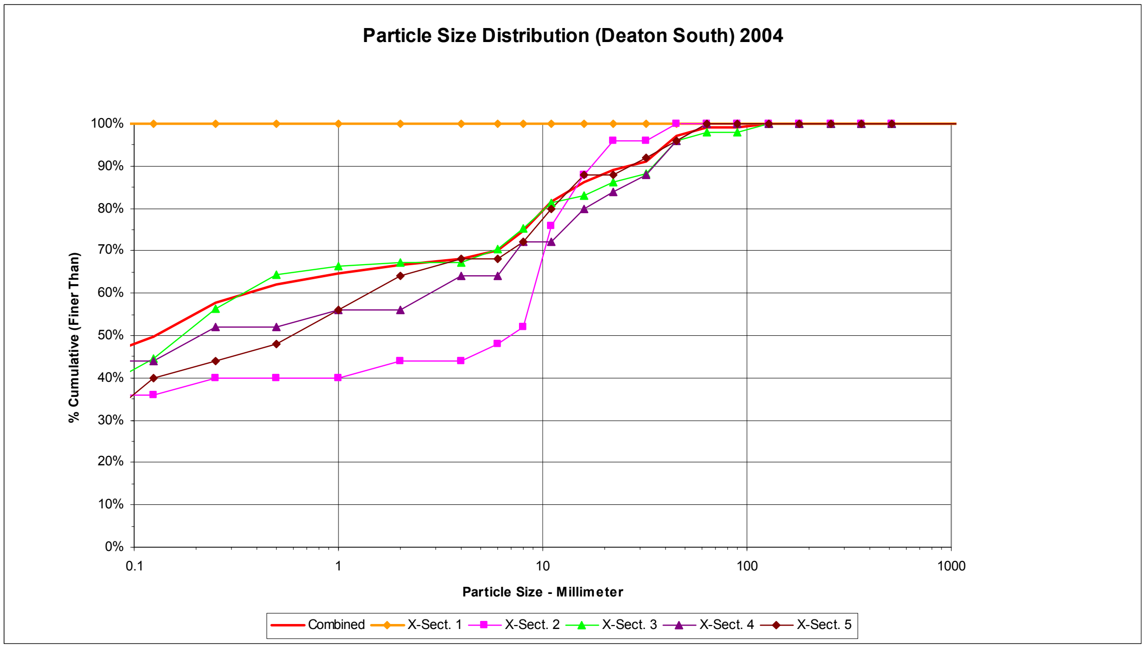
The assessment included the survey of eight total cross sections associated with both tributaries, as well as the longitudinal profiles. Cross section locations established by the NCDOT after construction were not available prior to the field survey. Approximately 1,374 linear feet of channel was surveyed along the northern UT. The southern UT was considerably longer, requiring the survey of approximately 2,697 linear feet. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. Benchmark stakes were installed on both the left and right stream banks for each cross section location.

- Cross Section #1. Southern UT, Station 0+69, midpoint of pool
- Cross Section #2. Southern UT, Station 8+63, midpoint of riffle
- Cross Section #3. Southern UT, Station 19+00, midpoint of riffle (2004, glide)
- Cross Section #4. Southern UT, Station 23+36, midpoint of riffle
- Cross Section #5. Southern UT, Station 24+17, midpoint of pool
- Cross Section #6. Northern UT, Station 4+51, midpoint of pool
- Cross Section #7. Northern UT, Station 5+76, midpoint of riffle
- Cross Section #8. Northern UT, Station 10+91, midpoint of riffle

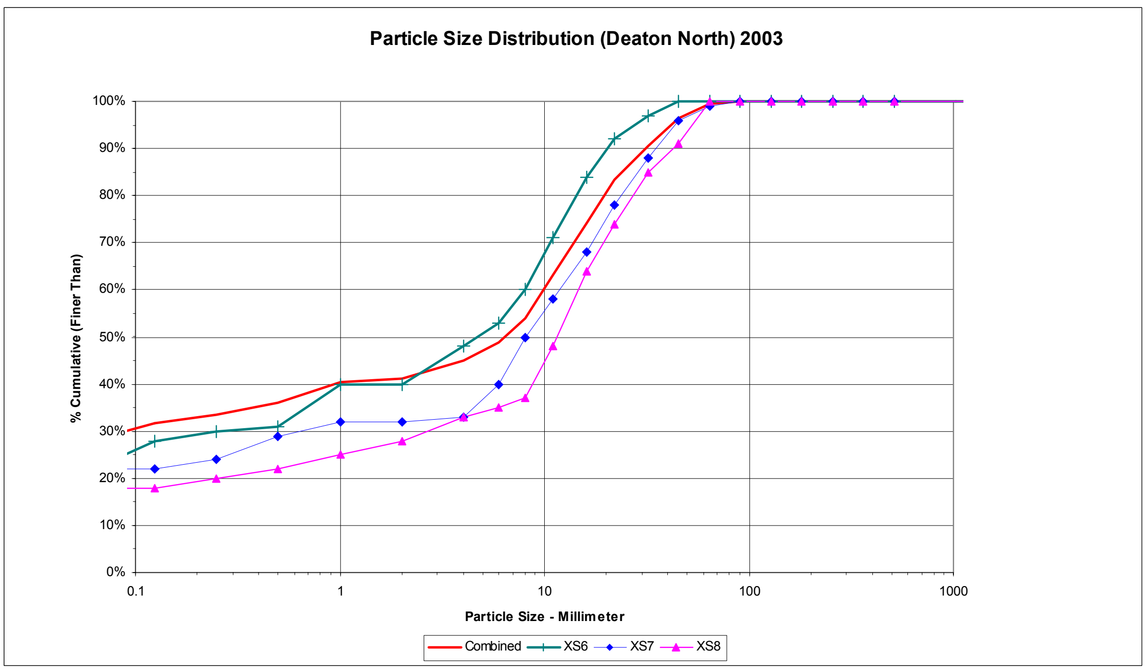
The cross sections established during the 2003 monitoring survey are currently being monitored to determine the actual extent of aggradation or degradation. All of the cross section locations appeared stable with little or no active bank erosion. Survey data collected during future monitoring periods may vary depending on actual location of rod placement and alignment; however, this information should remain similar in overall appearance. The cross section comparison is presented in Appendix A. Cross sections remain stable from 2003 to 2004.

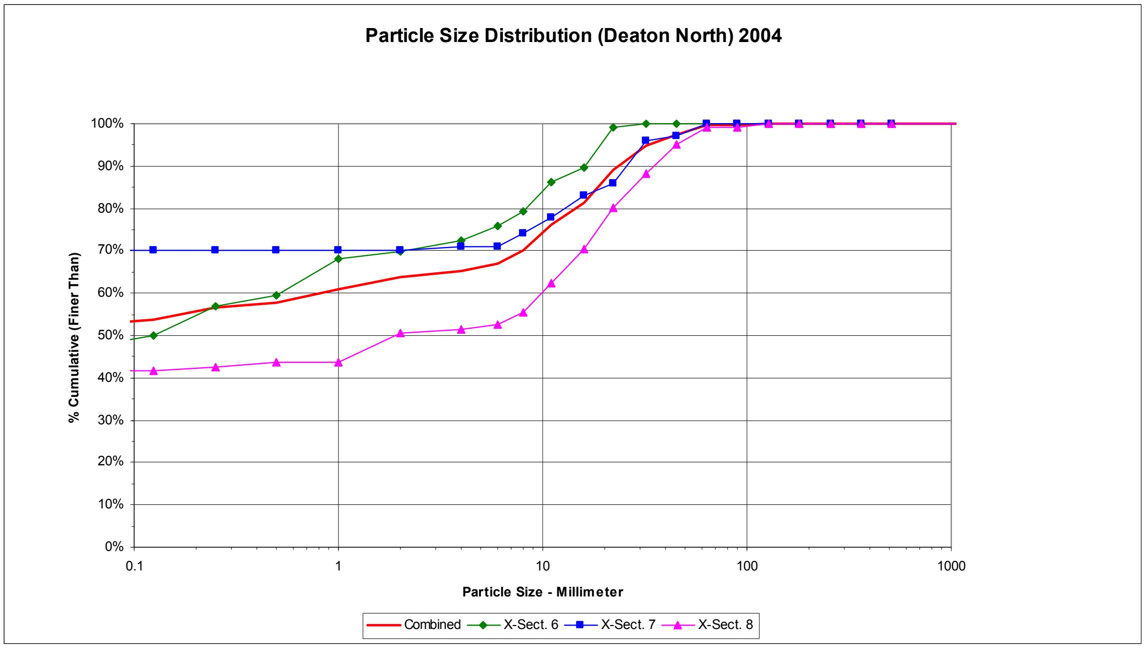
Pebble counts were taken at each cross section as a means to determine the composition of bed material during the monitoring period. However, only pebble counts taken at riffle sections will be utilized to classify the streams. Existing data for the Deaton Site was available from the mitigation plan. The comparison of pre-construction data with first and second year monitoring noted cumulative D_{50}s (50 percent of the sampled population is equal to or finer than the representative particle diameter) of 9 mm, 8 mm, and 2 mm, respectively. The similarity in bed material size from pre-construction to 2003 indicates overall stability after construction. However, the D_{50} for 2004 is significantly smaller than the D_{50}s from pre-construction and 2003. Since no significant amount of erosion was observed on site, the accumulation of finer material from 2003 to 2004 may be attributed to watershed problems outside and upstream of the Deaton Site. It could also be a result of the increased amount of vegetation in the channel which slows the velocity of the water causing sediment to accumulate. Charts noting the particle size distributions are presented for the northern and southern UTs in Table 1.





Note: Particle size distribution at Cross Section #1 in 2004 reflects the high level of silt/clay and fine sand in the bed material that is associated with herbaceous vegetation in the active channel.





Particle Size Distribution (Deaton North) 2004
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
% Cumulative (Finer Than)
0.1
1
10
100
1000
Particle Size - Millimeter
Combined
X-Sect. 6
X-Sect. 7
X-Sect. 8

Longitudinal profile surveys were conducted on predetermined segments of both streams. Bank stability was assessed during the longitudinal profile survey. A few areas of active scouring, aggradation, headcutting, and/or sloughing were observed in 2003. These areas were re-assessed in 2004. Descriptions and evaluations relating to these areas are as follows:

Northern UT

- Station 1+90 DN. A small transverse bar was observed in the middle of the channel through the riffle section in 2003. As a result, the right bank is exhibiting minor toe scour. This area has become vegetated in 2004 with no areas of scour noted.
- Station 4+40 DN. Active erosion was noted on the left bank just upstream from the maximum pool depth in 2003. Most of the erosion is due to overland flow spilling over banks with minimal vegetation. This area has become vegetated in 2004 with no areas of scour noted.
- Station 10+60 DN. Active erosion was noted along right side of cross vane arm in 2003. No erosion was noted in 2004.
- Pool migration into cattle crossing area was noted in 2004. This should be assessed during the next monitoring period to determine remedial actions, if necessary.
- Throughout the restored reach, herbaceous vegetation continues to dominate the stream banks and channel areas. This should continue to be assessed during the future monitoring periods to determine whether or not this vegetation will have a detrimental effect on the overall stability of the stream channel.

Southern UT

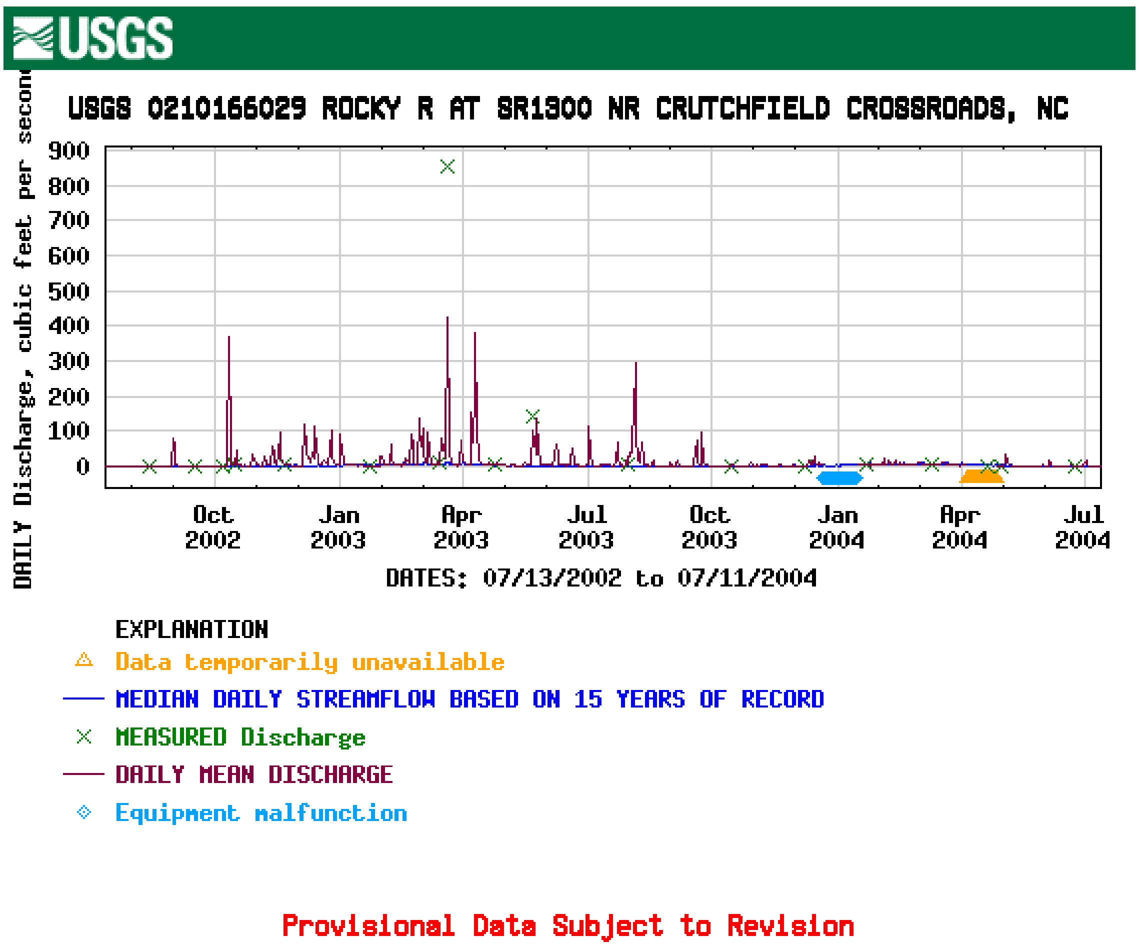
- Station 2+85 DS. The cross vane and header rock were covered by fine sediment in 2003 and 2004. The sediment may be originating from an area outside the mitigation buffer and immediately upstream of the headwaters. Flushing of the sediment is expected to occur once the vegetation dies back during the winter. This should be assessed during the future monitoring periods.
- Station 5+64 DS. Scour was noted around the cross vane structure in 2004. This location should be assessed during the next monitoring period.
- Station 5+77 DS. Sediment has accumulated and filled the pool below the cross vane. This sediment is not the result of eroding side slopes, rather it is most likely due to a high sediment load dropping out from upstream in the watershed. In addition, the increased amount of vegetation in the channel slows the velocity of water causing sediment to drop out. This location should be assessed during the next monitoring period to determine remedial actions, if necessary.
- Station 6+06 DS. Active scour was undercutting the outside of the meander bend in 2003. This area has become vegetated in 2004 with no areas of scour noted.

- Station 7+73 DS. Scour was noted around the cross vane structure in 2004. This location should be assessed during the next monitoring period to determine remedial actions, if necessary.
- Station 13+19 DS. The header rock of the cross vane was entirely covered by vegetation in 2004. The area should be assessed during the next monitoring period.
- Station 13+47 DS. Several rocks from the cross vane structure had fallen into the middle of the channel in 2003. No erosion was noted, possibly due to the thick herbaceous vegetation growing along the banks and across the channel. This area remained stable in 2004.
- Station 13+63 DS. Banks are actively eroding. This location should be assessed during the next monitoring period to determine remedial actions, if necessary.
- Station 13+89 DS. The formation of a center bar was observed in 2004. This area is stable and does not warrant any remedial action at this time.
- Station 14+48 DS. Sediment has accumulated and filled the pool below the cross vane. This sediment is not the result of eroding side slopes; rather it is most likely due to a high sediment load dropping out from upstream in the watershed. This location should be assessed during the next monitoring period to determine remedial actions, if necessary.
- Station 19+12 DS. A possible headcut was observed between Stations 19+12 and 19+15 in 2003. This has stabilized in 2004 and no remedial action is necessary.
- Station 23+67 DS. Scour associated with the outside of the meander bend had undercut the bank behind the erosion control matting in 2003. This area has become vegetated in 2004 with no areas of scour noted; no remedial action is necessary.
- Station 24+67 DS. Several rocks from the cross vane structure have fallen into the middle of the channel on 2003. No erosion was noted, possibly due to the thick herbaceous vegetation growing along the banks and across the channel. This area appeared stable in 2004 and no remedial action is required at this time.

2.3.2 Climatic Data

Monitoring requirements state that at least two bankfull events must be documented through the five-year monitoring period. No surface water gages exist on Fork Creek or its tributaries. A review of known U.S. Geological Survey (USGS) surface water gages identified two gages within 21 miles (32 kilometers) of the mitigation site: one along the Rocky River near Crutchfield Crossroads and one along Tick Creek approximately 5 miles southeast of Siler City. Both gage stations are located in Chatham County. The gage station on the Deep River near Ramseur is located closer to the project site; however, its large drainage area of 349 square miles does not accurately reflect the hydrology and precipitation of the Deaton Site.

The Rocky River gage was utilized for this report since it is the smaller of the two gages (7.42 square-miles drainage area as compared to the 15.5 square-miles drainage area associated with Tick Creek). The Rocky River gage is situated in USGS Hydrologic Unit 03030003 and has a datum of 620 feet above sea level NGVD29. Based on the drainage area associated with the gage, the correlated bankfull discharge according to the NC Rural Piedmont Regional Curves (USACE, 2004) is between 300 and 350 cubic feet per second (cfs). A review of peak flows was conducted for the period between October 2002 and July 2004. According to the graph, at least two bankfull events occurred during 2003. The USGS graph depicting these peak flows is presented below.



2.4 Conclusions

Overall, the two UTs to Fork Creek remain stable. Areas of degradation exist along both stream reaches; however, the extensive growth of herbaceous vegetation in and across the active channel may be contributing to this degradation. Work associated with corrective actions would likely cause more sedimentation than actual benefit at the current time.

The majority of the cross vane structures along both stream reaches remain intact. Failure of two structures was noted on the southern UT. Localized areas of active bank scour and erosion exist; however, from 2003 to 2004 vegetation has filled in some of these areas helping to fix the problem. These areas and all other areas will continue to be monitored during 2005. If significant problems are noted during the next monitoring period, NCDOT may conduct supplemental corrective-action work. This work would primarily include structure rehabilitation and bank stabilization.

Based on information obtained from the USGS, the Deaton Site has met the required monitoring protocols for hydrology. No supplemental work is proposed at this time.

The EEP will begin stream stability monitoring at the Deaton Farm Mitigation Site in 2005

3.0 VEGETATION: DEATON FARM MITIGATION SITE (YEAR 2 MONITORING)

3.1 Success Criteria

Success Criteria states that there must be a minimum of 320 trees per acre living after three years and 260 trees per acre after five years.

3.2 Description of Species

The following species were planted in the Wetland Restoration Area:

Fraxinus pennsylvanica, Green Ash

Quercus phellos, Willow Oak

Quercus nigra, Water Oak

Quercus laurifolia, Laurel Oak

Quercus falcata var*. falcata*, Southern Red Oak

3.3 Results of Vegetation Monitoring

Plot #	Green Ash	Willow Oak	Water Oak	Laurel Oak	Southern Red Oak	Total (2 year)	Total (at planting)	Density (Trees/Acre)
1	6	7	1	3		17	44	263
2	9	9	1		1	20	50	272
	AVERAGE DENSITY							**267**

Site Notes: Other species noted: *Juncus* sp., fescue, goldenrod, fennel, smartweed, ragweed, nutsedge, and multi-flora rose. Heavy fescue competition noted on site. There are a large number of trees living outside the plots where there is less competition.

3.4 Conclusions

There were 2 vegetation monitoring plots established throughout the 13 acre planting area. The 2004 vegetation monitoring of the site revealed an average tree density of 267 trees per acre. This average is below the minimum success criteria of 320 trees per acre.

The EEP will begin monitoring the vegetation at the Deaton Farm Mitigation Site in 2005.

Deaton Farm

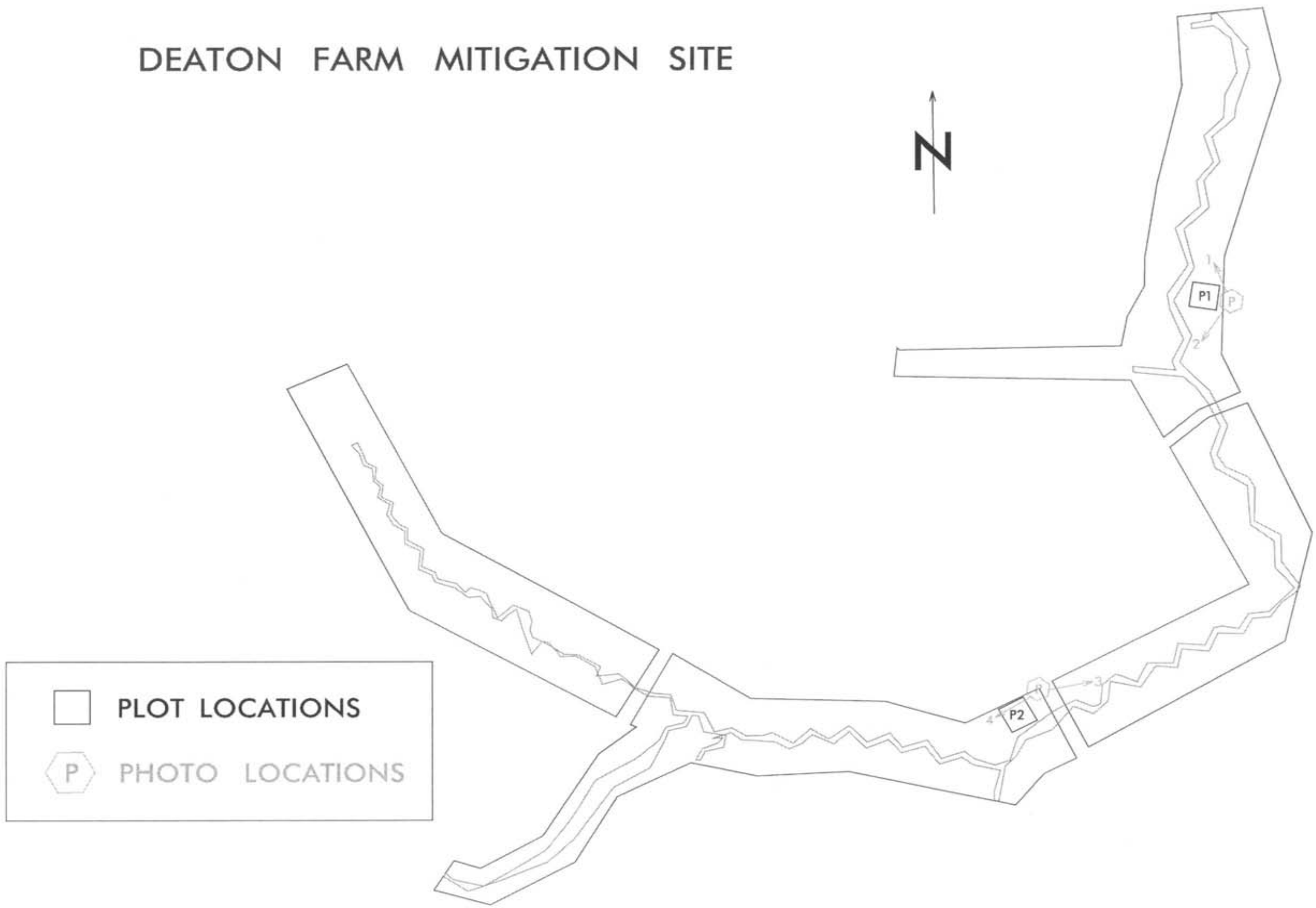
Photo 1

Photo 2

Photo 3

Photo 4

DEATON FARM MITIGATION SITE



4.0 REFERENCES

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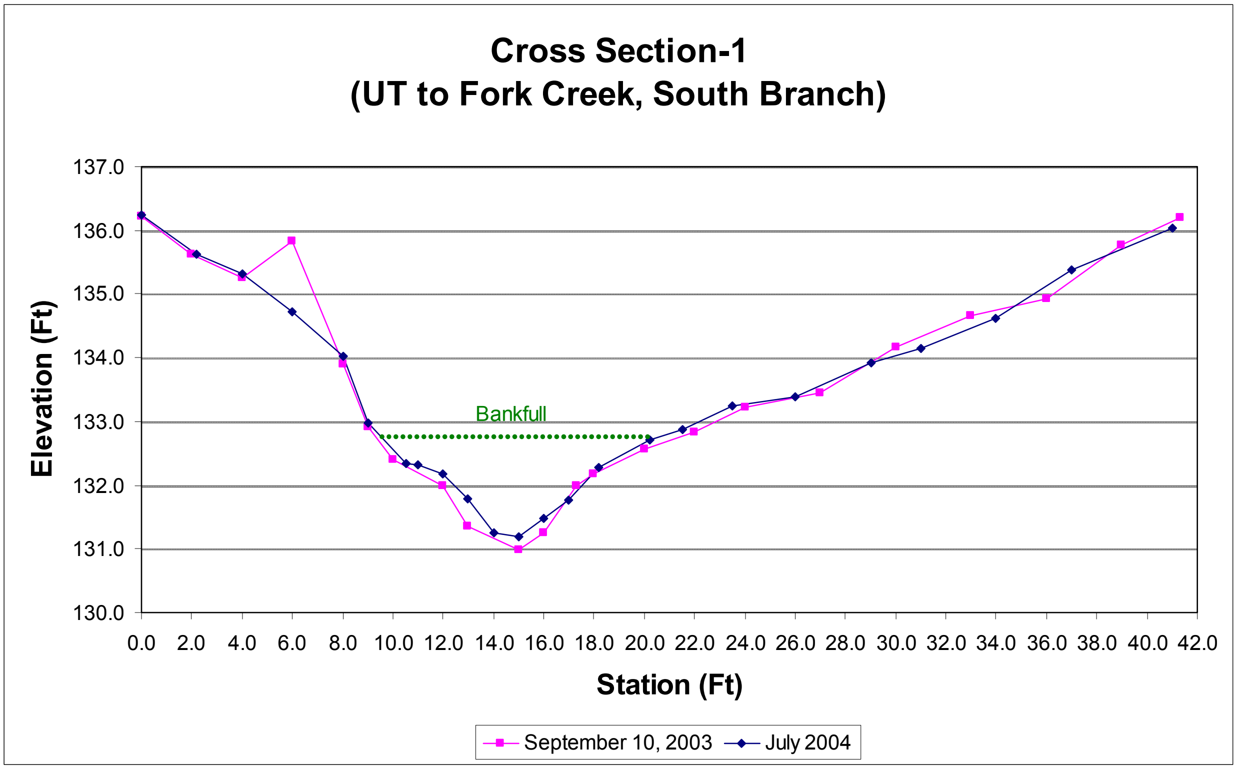
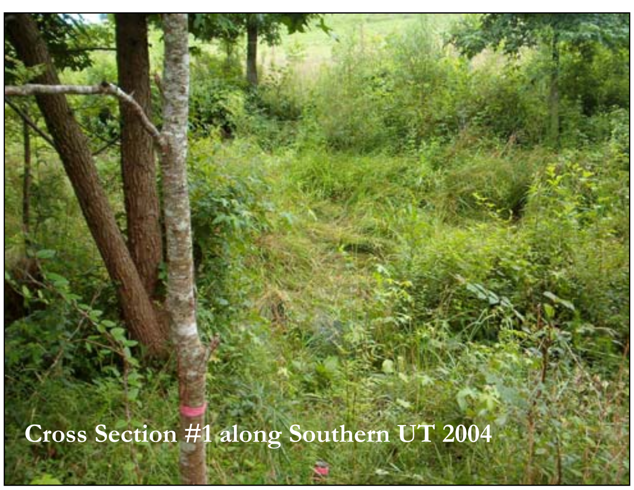
APPENDIX A

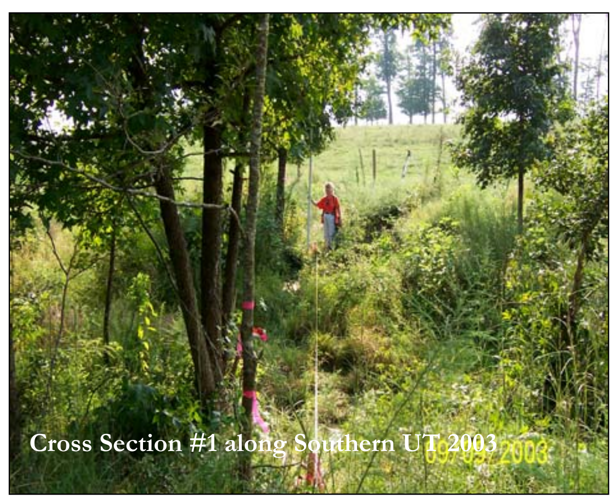
CROSS SECTIONS AND THE LONGITUDINAL PROFILE COMPARISON

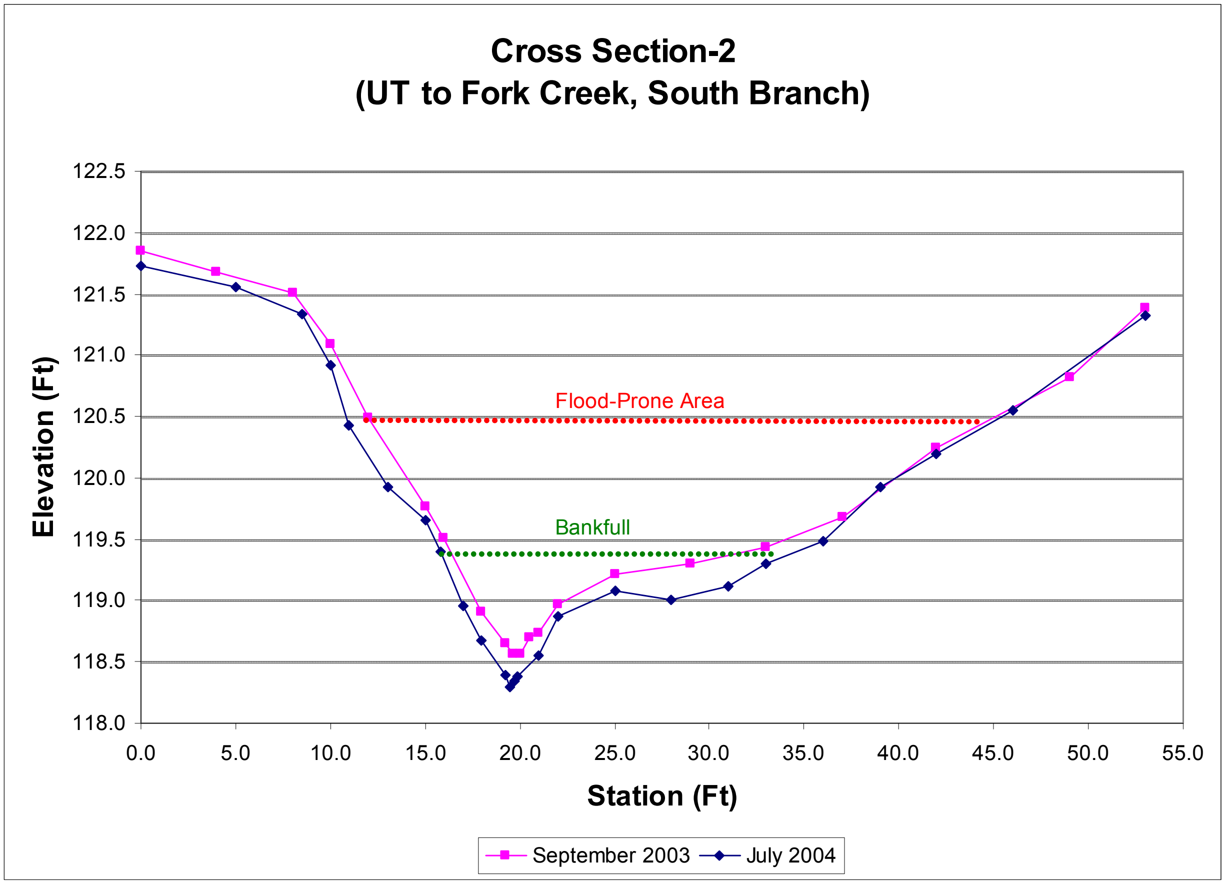


Cross-Section #1 (Pool) Abbreviated Morphological Summary*

	2003	2004	2005	2006	2007
Bankfull Cross Sectional Area (ft^2)	6.3	8			
Maximum Bankfull Depth (ft)	1.4	1.5			
Bankfull Mean Depth (ft)	0.7	0.8			
Bankfull Width (ft)	9.2	10.6			

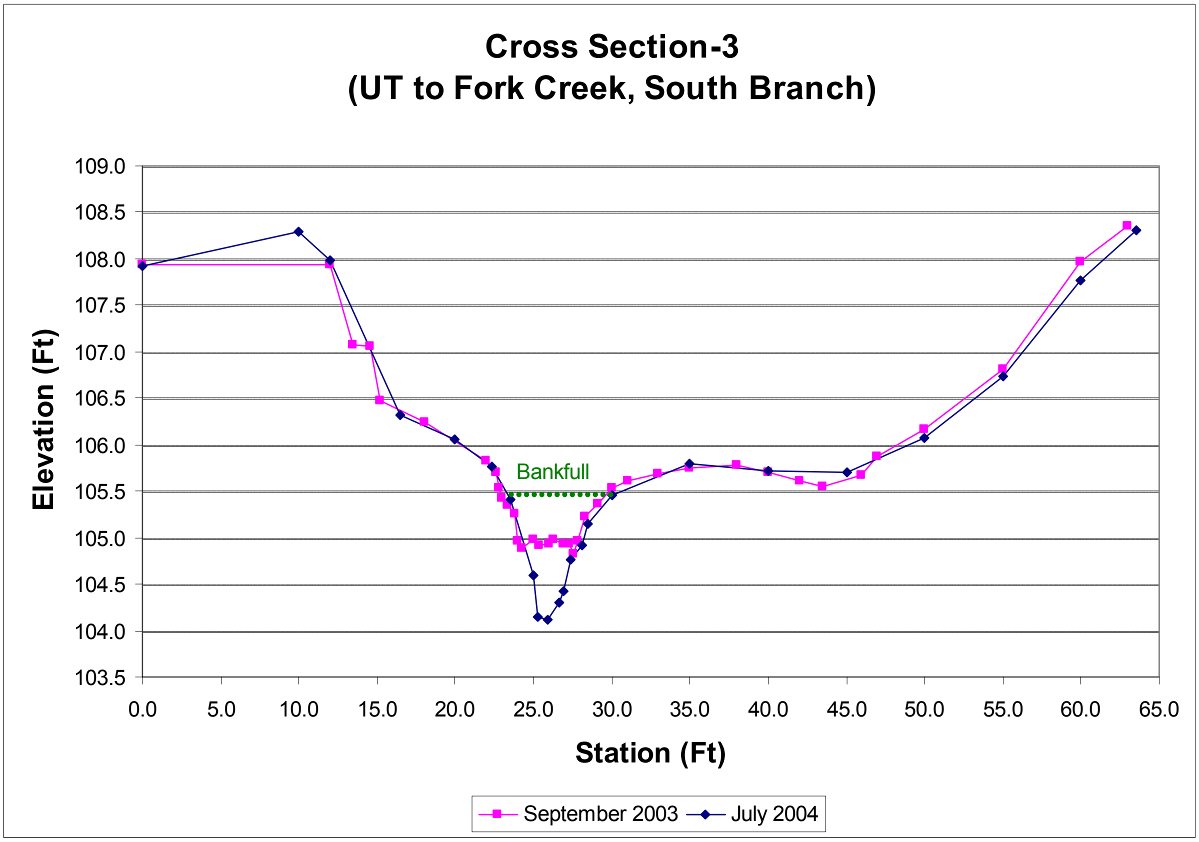

Cross Section #1 along Southern UT 2004


Cross Section #1 along Southern UT 2003



Cross-Section #2 (Riffle) Abbreviated Morphological Summary

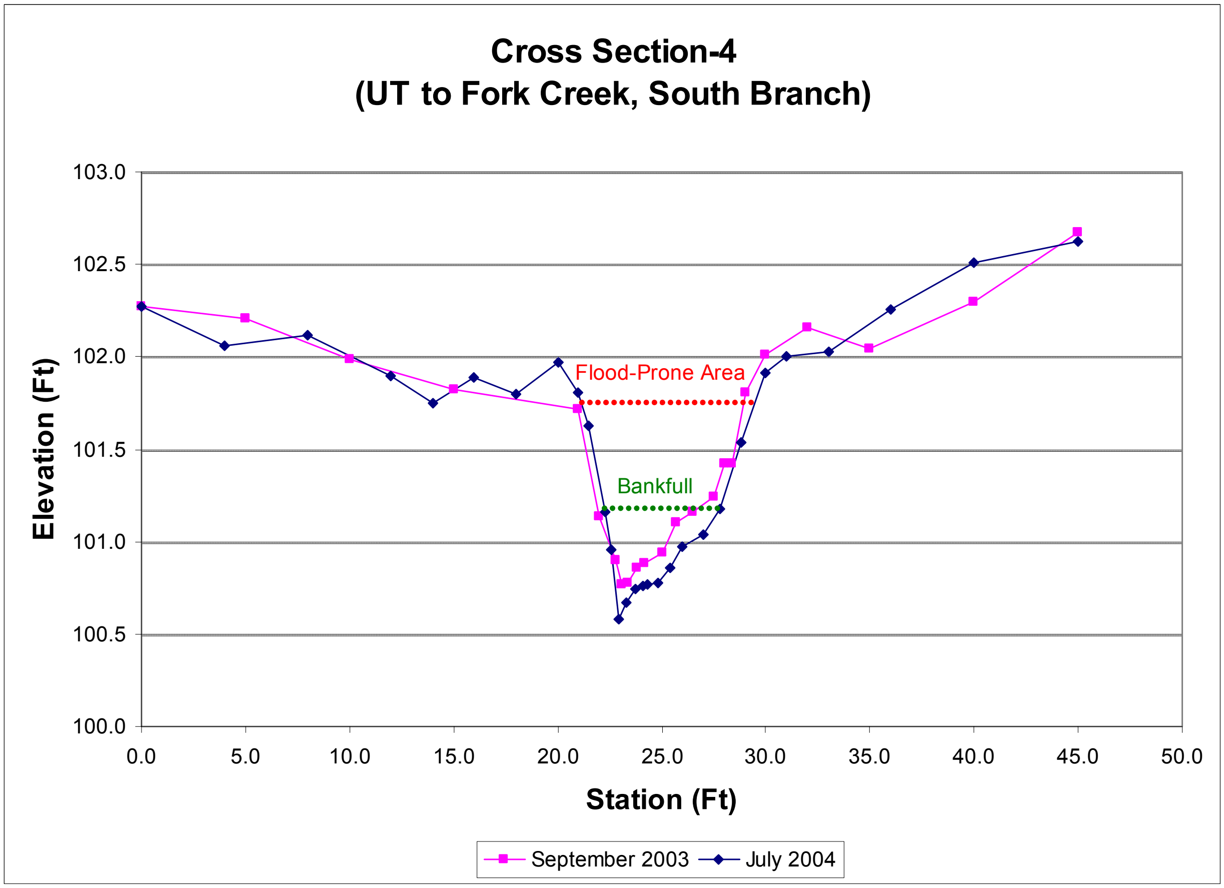
	2003	2004	2005	2006	2007
Bankfull Cross Sectional Area (ft^2)	3.3	8.2			
Maximum Bankfull Depth (ft)	0.7	1.1			
Bank Height (ft)	0.3	0.4			
Width/Depth Ratio	46	43.4			
Entrenchment Ratio	2.6	1.7			
Bankfull Width (ft)	12.3	18.9			



Cross-Section #3 (Glide) Abbreviated Morphological Summary*

	2003	2004	2005	2006	2007
Bankfull Cross Sectional Area (ft^2)	4.8	4			
Maximum Bankfull Depth (ft)	0.9	1.3			
Bankfull Mean Depth (ft)	0.3	0.6			
Bankfull Width (ft)	16.1	6.3			

*According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width/depth ratio are not measured in pool, glide or run features.

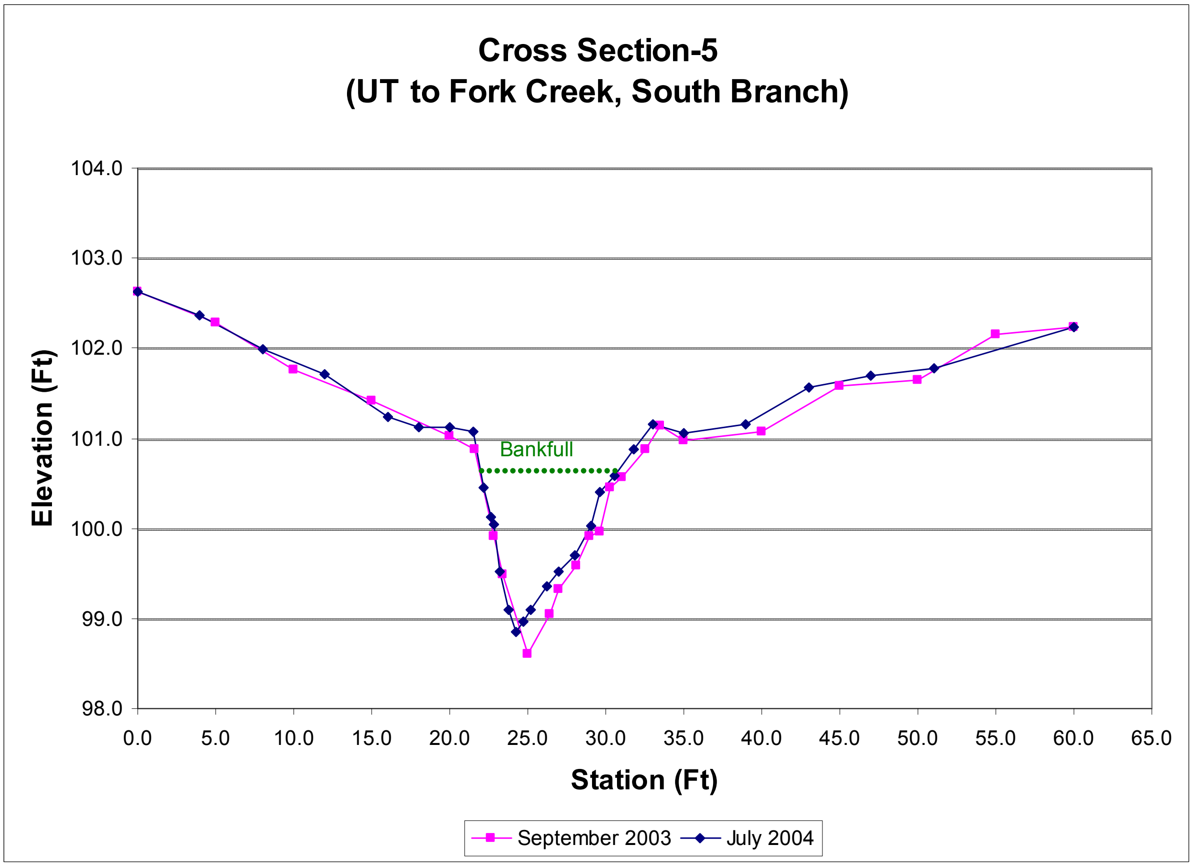


Cross-Section #4 (Riffle) Abbreviated Morphological Summary

	2003	2004	2005	2006	2007
Bankfull Cross Sectional Area (ft²)	4.6	1.6			
Maximum Bankfull Depth (ft)	1	0.6			
Bankfull Mean Depth (ft)	0.6	0.3			
Width/Depth Ratio	13.4	18.7			
Entrenchment Ratio	7.6	10.8			
Bankfull Width (ft)	7.9	5.5			


Cross Section #4 along Southern UT 2004

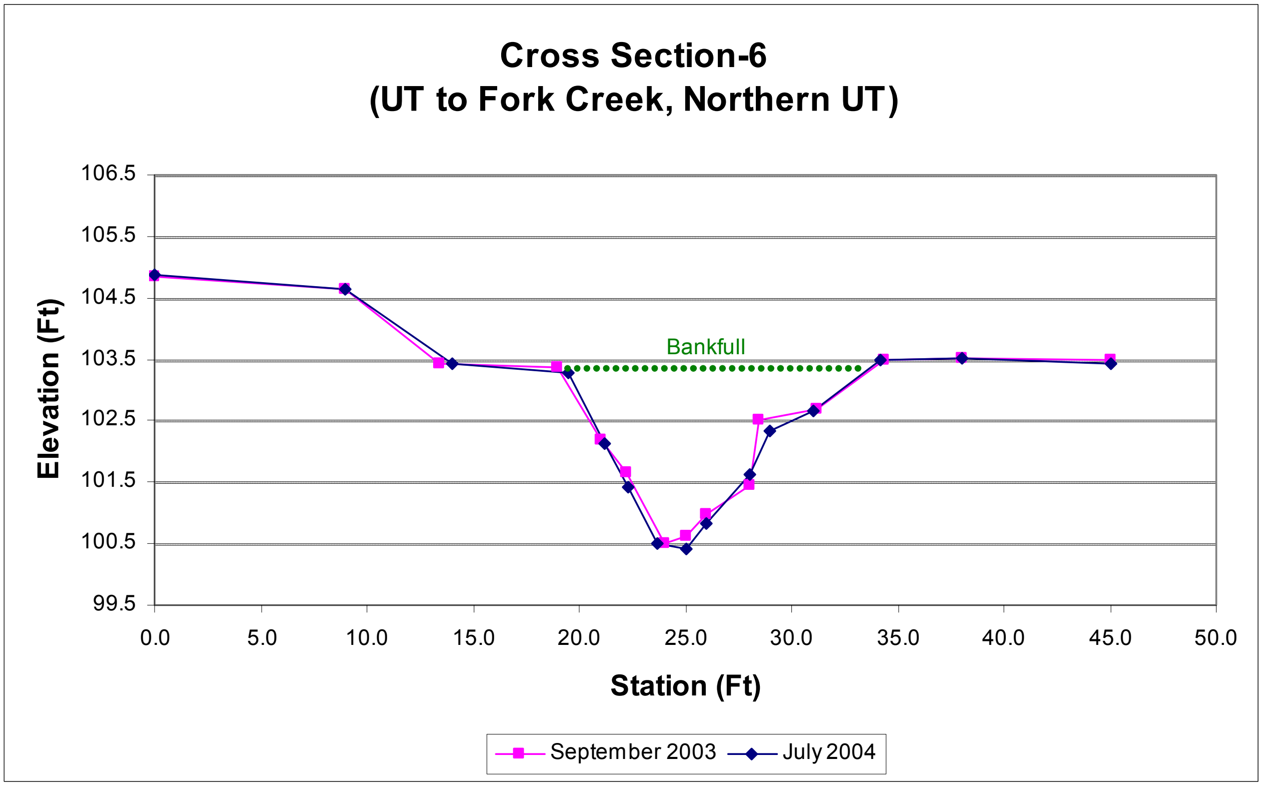

Cross Section #4 along Southern UT 2003



Cross-Section #5 (Pool) Abbreviated Morphological Summary*

	2003	2004	2005	2006	2007
Bankfull Cross Sectional Area (ft²)	12.2	7.9			
Maximum Bankfull Depth (ft)	2.3	1.7			
Bankfull Mean Depth (ft)	1.1	0.9			
Bankfull Width (ft)	10.9	8.5			

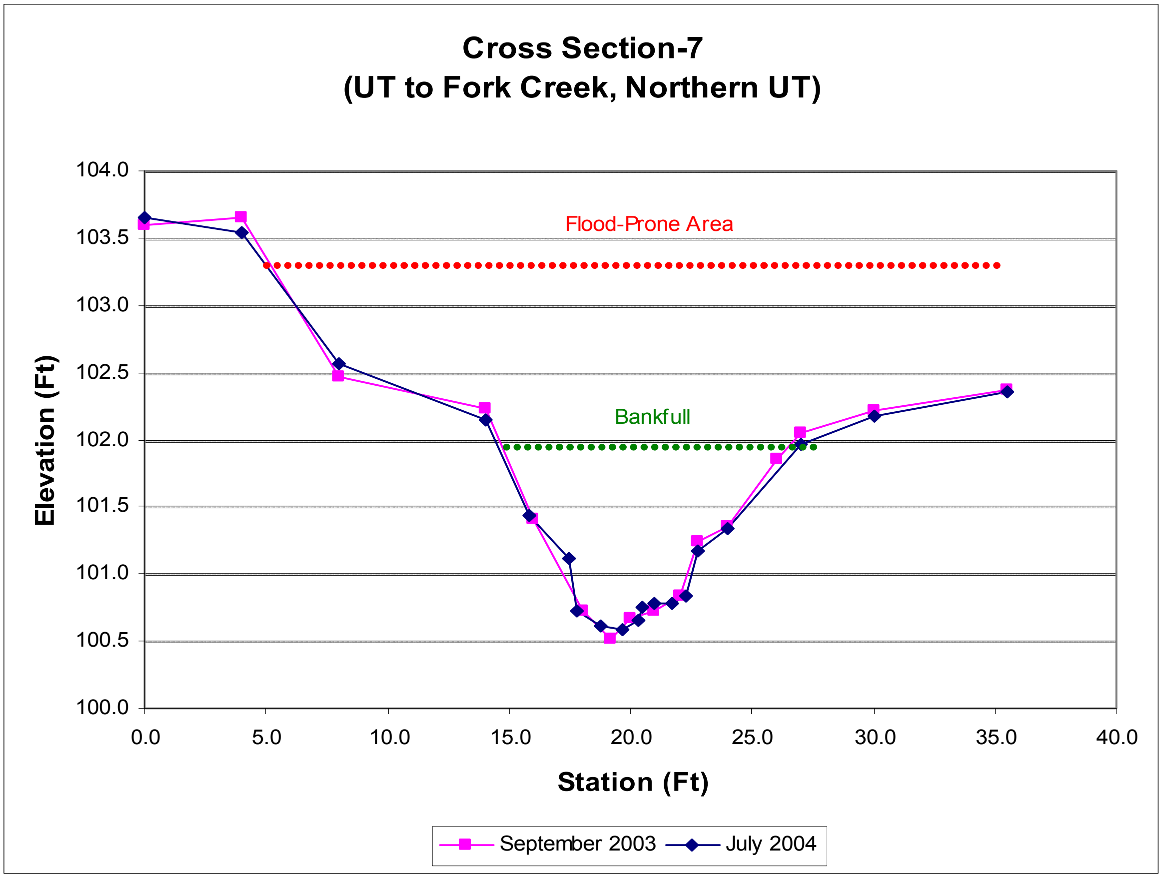
*According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width/depth ratio are not measured in pool, glide or run features.



Cross-Section #6 (Pool) Abbreviated Morphological Summary*

	2003	2004	2005	2006	2007
Bankfull Cross Sectional Area (ft^2)	11.5	19.9			
Maximum Bankfull Depth (ft)	2.2	2.9			
Bankfull Mean Depth (ft)	1	1.4			
Bankfull Width (ft)	11	13.9			

*According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width/depth ratio are not measured in pool, glide or run features.

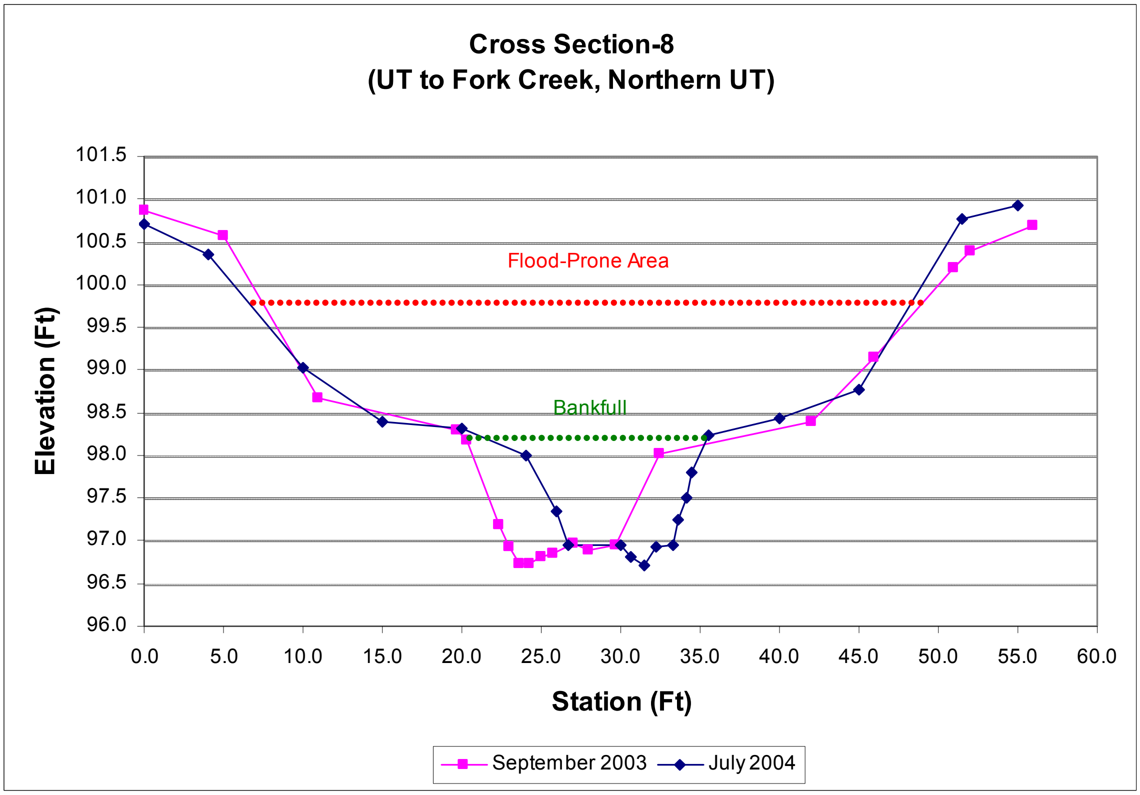


Cross-Section #7 (Riffle) Abbreviated Morphological Summary

	2003	2004	2005	2006	2007
Bankfull Cross Sectional Area (ft²)	10.7	12.3			
Maximum Bankfull Depth (ft)	1.5	1.6			
Bankfull Mean Depth (ft)	0.9	0.8			
Width/Depth Ratio	14.8	19.4			
Entrenchment Ratio	8	6.5			
Bankfull Width (ft)	12.6	15.5			


Cross Section #7 along Northern UT 2004


Cross Section #7 along Northern UT 2003

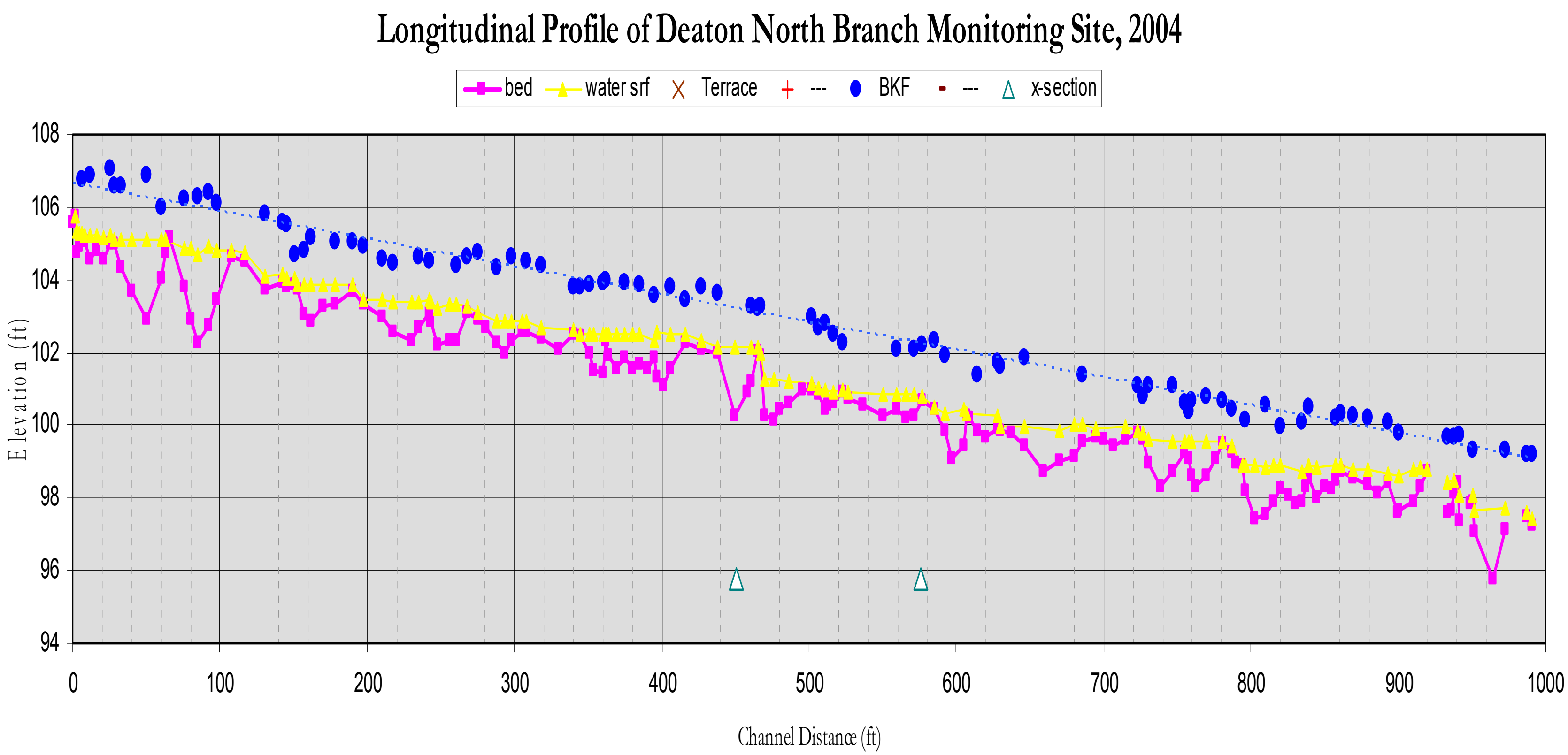


Cross-Section #8 (Riffle) Abbreviated Morphological Summary

	2003	2004	2005	2006	2007
Bankfull Cross Sectional Area (ft²)	10	12.3			
Maximum Bankfull Depth (ft)	1.3	1.5			
Bankfull Mean Depth (ft)	0.9	0.8			
Width/Depth Ratio	13.2	17.1			
Entrenchment Ratio	3.4	2.8			
Bankfull Width (ft)	11.8	14.5			

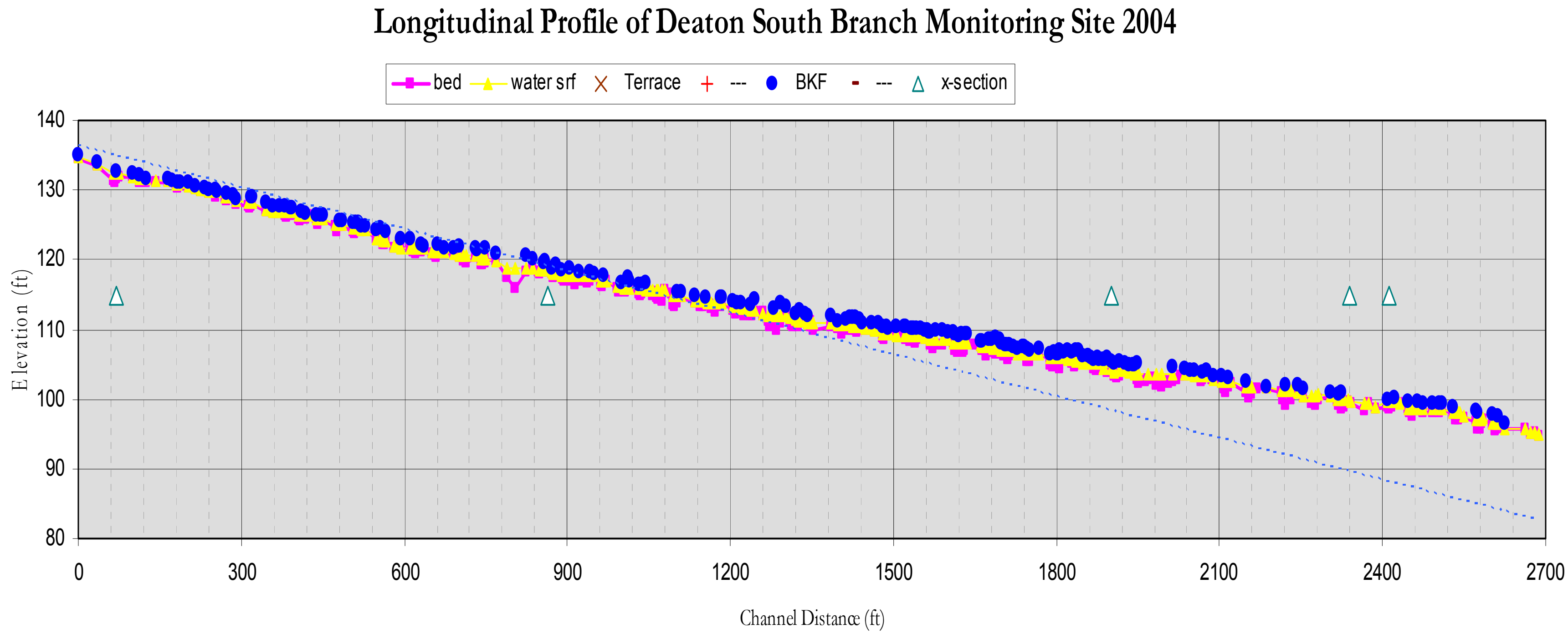

Cross Section #8 along Northern UT 2004


Cross Section #8 along Northern UT 2003



Longitudinal Profile of Deaton North Branch Monitoring Site, 2004
bed
water srf
Terrace

BKF
---
x-section
108
106
104
102
100
98
96
94
Elevation (ft)
0
100
200
300
400
500
600
700
800
900
1000
Channel Distance (ft)



Longitudinal Profile of Deaton South Branch Monitoring Site 2004
bed
water srf
Terrace

BKF
---
x-section
140
130
120
110
100
90
80
Elevation (ft)
0
300
600
900
1200
1500
1800
2100
2400
2700
Channel Distance (ft)

APPENDIX B

SITE PHOTOGRAPHS

Permanent Photo Points

Photo Point #1 – Facing Upstream
Northern Tributary 2004

Photo Point #1 – Facing Upstream
Northern Tributary 2003

Photo Point #1 – Facing Downstream
Northern Tributary 2004

Photo Point #1 – Facing Downstream
Northern Tributary 2003

Photo Point #2 – Facing Upstream
Northern Tributary 2004

Photo Point #2 – Facing Upstream
Northern Tributary 2003


Photo Point #2 – Facing Downstream
Northern Tributary 2004


Photo Point #2 – Facing Downstream
Northern Tributary 2003


Photo Point #3 – Facing Upstream
Southern Tributary 2004


Photo Point #3 – Facing Upstream
Southern Tributary 2003


Photo Point #3 – Facing Downstream
Southern Tributary 2004


Photo Point #3 – Facing Downstream
Southern Tributary 2003


Photo Point #4 – Facing Upstream
Southern Tributary 2004


Photo Point #4 – Facing Upstream
Southern Tributary 2003

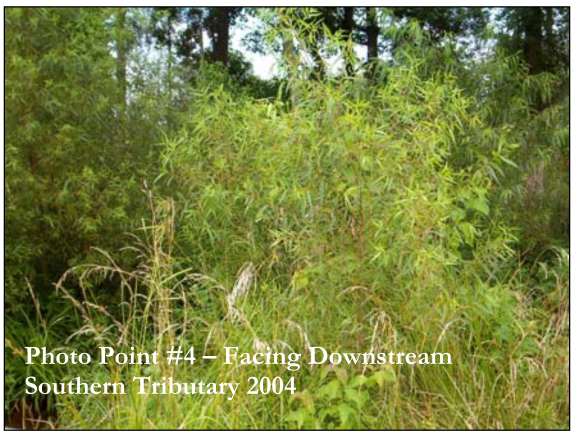


Photo Point #4 – Facing Downstream
Southern Tributary 2004


Photo Point #4 – Facing Downstream
Southern Tributary 2003


Photo Point #5 – Facing Upstream
Southern Tributary 2004


Photo Point #5 – Facing Upstream
Southern Tributary 2003


Photo Point #5 – Facing Downstream
Southern Tributary 2004


Photo Point #5 – Facing Downstream
Southern Tributary 2003


Photo Point #6 – Facing Downstream
Southern Tributary 2004


Photo Point #6 – Facing Downstream
Southern Tributary 2003

Northern UT


Transverse Bar at Station 1+90
along northern UT 2003


Pool migration into cattle
crossing 2004


Typical Vegetation in
channel 2004

Southern UT


Undercut Bank in Meander Bend at Station 24+51 2004


Undercut Bank in Meander Bend at Station 24+51 2003


Typical Livestock At-Grade Crossing


Station 5+64 Scour around X-vane 2004


Station 13+63 Eroding banks 2004


72 Inch CMP At Confluence of northern and southern tributaries 2003

Southern UT

Station 13+19 Vegetation on X-Vane 2004

Station 7+73 Erosion behind matting 2004