



**UT to BILLY'S CREEK  
FINAL MONITORING REPORT**

**YEAR 5 OF 5**

**2010**

EEP Project #36

Franklin County, North Carolina

**Submitted to:**



NCDENR-EEP

1652 Mail Service Center

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## MONITORING SUMMARY

The Unnamed Tributary (UT) to Billy's Creek Stream Restoration Project is located northeast of Franklinton in Franklin County, North Carolina. The project reach is located in a sparsely developed agricultural watershed, mostly used for cattle pasture. Pre-construction conditions of the UT to Billy's Creek included a 1,878 linear foot section of degraded, perennial channel and several ditch-like tributaries. The upstream portions of the project reach retained an active floodplain area, whereas the downstream portions were severely incised (4 to 6 feet). The restoration of the UT to Billy's Creek was conducted as a Priority I restoration by returning the channel to an elevation such that the historic floodplain is utilized for over-bank flows. The proposed stream classification for the project reach was a meandering E5 channel, with a total length of 2,101 linear feet. The goals and objectives for the Unnamed Tributary to Billy's Creek Stream Restoration Project are to:

- Restore the project reach to a more natural dimension, pattern and profile so that the stream will be able to efficiently transport water and sediment loads provided by the watershed;
- Reconnect the project reach's channel to its historic floodplain where feasible;
- Eliminate the excessive sediment contribution to the system by the mass wasting and erosion of the stream banks along the reach; and
- Repair and restore the riparian corridor along the project reach in order to improve habitat and protect the stream from further erosion.

Good planted stem densities were found for all five vegetation plots for UT to Billy's Creek. Stem densities were above the final Monitoring Year 5 goal of 260 stems per acre for all plots. The overall stem density (excluding live stakes) across all vegetation plots was over 420 living planted stems per acre. Several regions of invasive species were identified throughout the riparian buffer. The site was treated in 2010 for invasive species and will also be treated in 2011.

The majority of the UT Billy's Creek restoration reach remained stable through Monitoring Year 5 with the exception of a 384 foot section of sand deposition at the upstream end of the reach (Station 10+00 to 13+84). Excess sand deposition has completely filled the channel and blanketed out over the floodplain making it very difficult to locate the main channel in the upstream-most 150 feet due to braiding. This deposition has changed the channel dimension and profile significantly over the monitoring period. Cross Section 1 (Station 11+55) clearly shows a steady streambed elevation rise through Monitoring Year 5 that is likely correlated with this deposition. Furthermore, the Monitoring Year 5 bankfull cross sectional area of Cross Section 1 was the lowest documented compared to the four previous monitoring years. Approximately 15% of the channel has aggraded (primarily the upper section) or has significant bed deposition

Bank instability is a minor issue with bank erosion impacting less than 1% of the total bank length. All structures appeared to be in good physical condition. The only structure associated problems noted for Monitoring Year 5 are several structures and their associated pools that have been buried under excess sand deposition.

Summary information/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 EEPs website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.



## METHODOLOGY

### Vegetation Methodology

The following methodology was used for the stem count. The configuration of the vegetation plots was marked out with tape to measure 10 meters by 10 meters (or equivalent to 100 square meters) depending on buffer width. The planted material in the plot was marked with flagging. Plot inventories were conducted per the 2006 CVS-EEP Protocol for Recording Vegetation (EEP 2006).

### Stream Methodology

The project monitoring for the stream channel included a longitudinal survey, cross-sectional surveys, problem area identification, and photo documentation. The specific methodology for each portion of the stream monitoring is described in detail below.

#### *Longitudinal Profile and Plan View*

A longitudinal profile was surveyed with a Nikon DTM-520 Total Station, prism, and a TDS Recon Pocket PC. The heads of features (i.e., riffles, runs, pools, and glides) were surveyed, as well as the point of maximum depth of each pool, boundaries of problem areas, and any other significant slope-breaks or points of interest. At the head of each feature and at the maximum pool depth, thalweg, water surface, edge of water, left and right bankfull, and left and right top of bank (if different than bankfull) were surveyed. All profile measurements were extracted from this survey, including channel and valley length and length of each feature, water surface slope for each reach and feature, bankfull slope for the reach, and pool spacing. This survey also was used to draw plan view figures with Microstation v8 (Bentley Systems, Inc., Exton, PA). All pattern measurements (i.e. meander length, radius of curvature, belt width, meander width ratio, and sinuosity) were extracted from the plan view. Stationing was calculated along the thalweg.

#### *Permanent Cross Sections*

Four permanent cross sections (two riffles and two pools) were surveyed. The beginning and end of each permanent cross section were originally marked with a long PVC tube. Cross sections were installed perpendicular to the stream flow. Each cross section survey noted all changes in slopes, tops of both banks (if different from bankfull), left and right bankfull, edges of water, thalweg and water surface. The cross sections were then plotted, and Monitoring Year 5 data was overlain on data from all previous monitoring years for comparison. All dimension measurements (i.e. bankfull width, floodprone width, bankfull mean depth, cross sectional area, width-to-depth ratio, entrenchment ratio, bank height ratio, wetted perimeter, and hydraulic radius) were extracted from these plots and compared to the Monitoring Year 1 data.

#### *Pebble Counts*

Based on the fact that UT Billy's is a sand bed stream, it was determined that pebble counts were unnecessary as they would fail to detect changes in fine sediment amounts in the channel bed. Therefore, pebble counts were not performed for Monitoring Year 5.

### Photo Documentation

Permanent photo points were established during Monitoring Year 1. A set of three photographs (facing upstream, facing downstream, and facing the channel) were taken at each photo point with a digital camera. Two photographs were taken at each cross-section (facing upstream and downstream). A representative photograph of each vegetation plot was taken at the designated corner of the vegetation

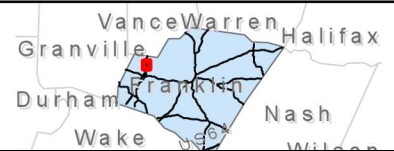
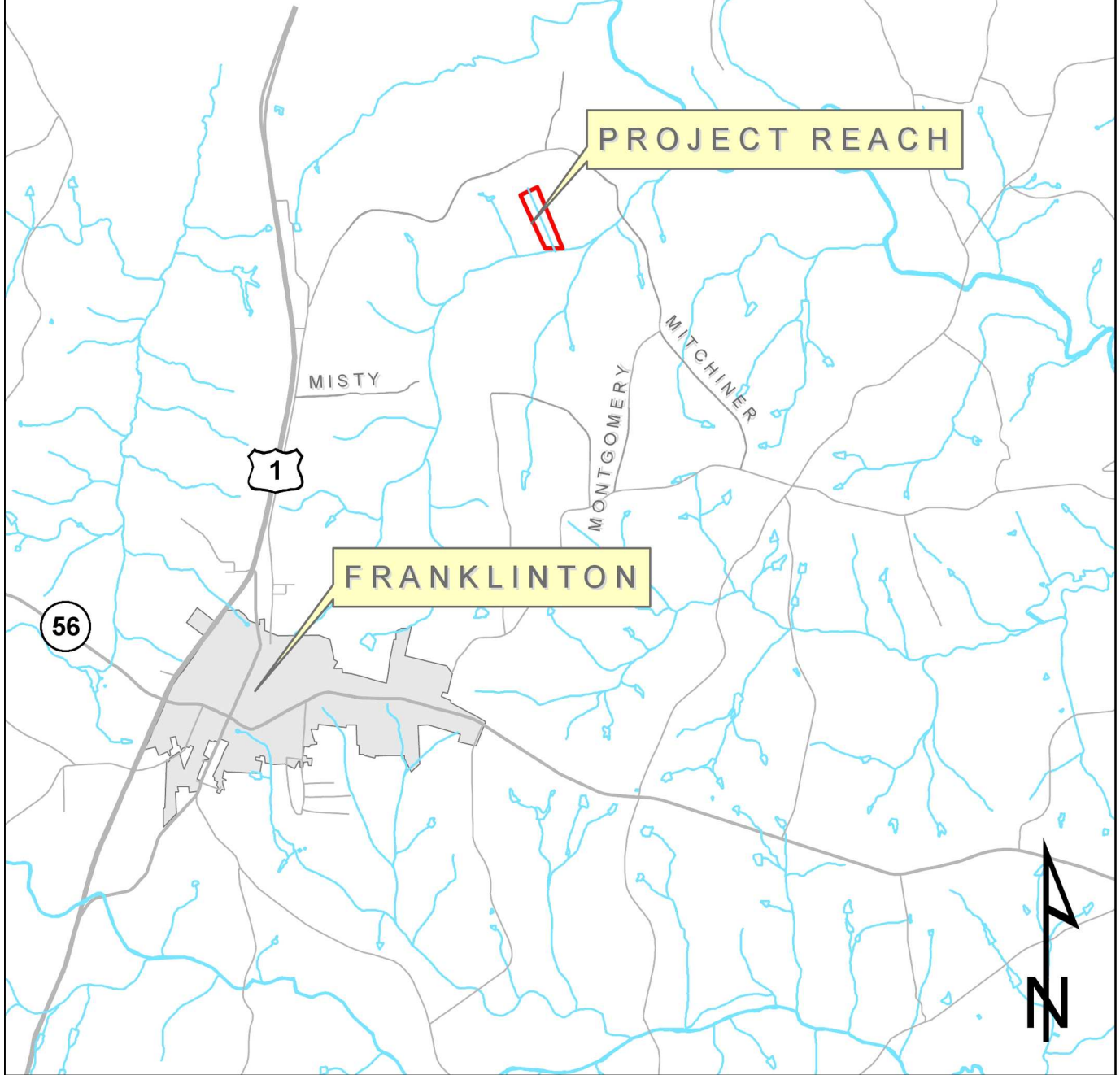
plot and in the same direction as the Monitoring Year 1 photograph. An arrow was placed on the designated corner of each vegetation plot on the plan view sheets to document the corner and direction of each photograph. Photos were also taken of all significant stream and vegetation problem areas.

## REFERENCES

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- Ecosystem Enhancement Program. 2006. CVS-EEP Protocol for Recording Vegetation. Level 1-2 Plot Sampling Only. Version 4.0. 2006. Michael T. Lee, Robert K. Peet, Steven D. Roberts, Thomas R. Wentworth.
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- North Carolina Ecosystem Enhancement Program. November 2006. *Content, Format and Data Requirements for EEP Monitoring Reports*.
- Rosgen, D.L. 1994. *A Classification of Natural Rivers*. Catena 22: 166-169.
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- SEPI Engineering Group. 2007. *UT to Billy's Creek Final Monitoring Report, Year 2 of 5*.
- SEPI Engineering Group. 2008. *UT to Billy's Creek Final Monitoring Report, Year 3 of 5*.
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[http://www.saw.usace.army.mil/wetlands/Mitigation/stream\\_mitigation.html](http://www.saw.usace.army.mil/wetlands/Mitigation/stream_mitigation.html)

Appendix A  
Project Vicinity Map and Background Files

Take US1 north through Franklinton and turn right on Eric Medlin Rd crossing the railroad tracks. Turn left on Montgomery Rd and proceed 2 miles. Pass through a gate on the right side of the road. Once inside the property, pass the small pond on the right and proceed up a very steep hill. The reach begins at the culvert at the bottom of the hill.



Project: Ut Billy's Creek (EEP #036) Year 5 (2010) Monitoring, Franklin County, North Carolina  
April 2011



Figure 1. Project Location Map

<b>Table 1. Project Restoration Components UT to Billy's Creek/EEP Project Number 36</b>							
<b>Project Segment or Reach ID</b>	<b>Pre-Existing Footage</b>	<b>Type</b>	<b>Approach</b>	<b>As-Built Footage</b>	<b>As-Built Stationing</b>	<b>Monitoring Year 4 Stationing</b>	<b>Comments</b>
UT to Billy's Creek	1,878	Restoration	PI/PII	2,101	0+00 – 21+01	10+00 – 30+92	Includes 2,101 linear feet per As-Built. The first 100 ft and the last 100 ft of project reach) is PII.

<b>Table 2. Project Activity and Reporting History UT to Billy's Creek/EEP Project No. 36</b>			
<b>Activity or Report</b>	<b>Scheduled Completion</b>	<b>Data Collection Complete</b>	<b>Actual Completion or Delivery</b>
Restoration Plan	4/15/2003	NA	August 2003
Final Design - 90%	5/31/2003	NA	8/11/2004
Construction	7/31/2003	NA	June 2005
Planting	Fall 2004	NA	December 2005
Mitigation Plan/ As-built	Fall 2005	Winter 2006	April 2006
Year 1 monitoring	September 2006	September 2006	November 2006
Year 2 monitoring	Fall 2007	October 2007	December 2007
Year 3 monitoring	Fall 2008	October 2008	November 15, 2008
Year 4 monitoring	Fall 2009	October 2009	November 15, 2009
Year 5 monitoring	Fall 2010	October 2010	November 20, 2010
Year 5+ monitoring	Not scheduled		

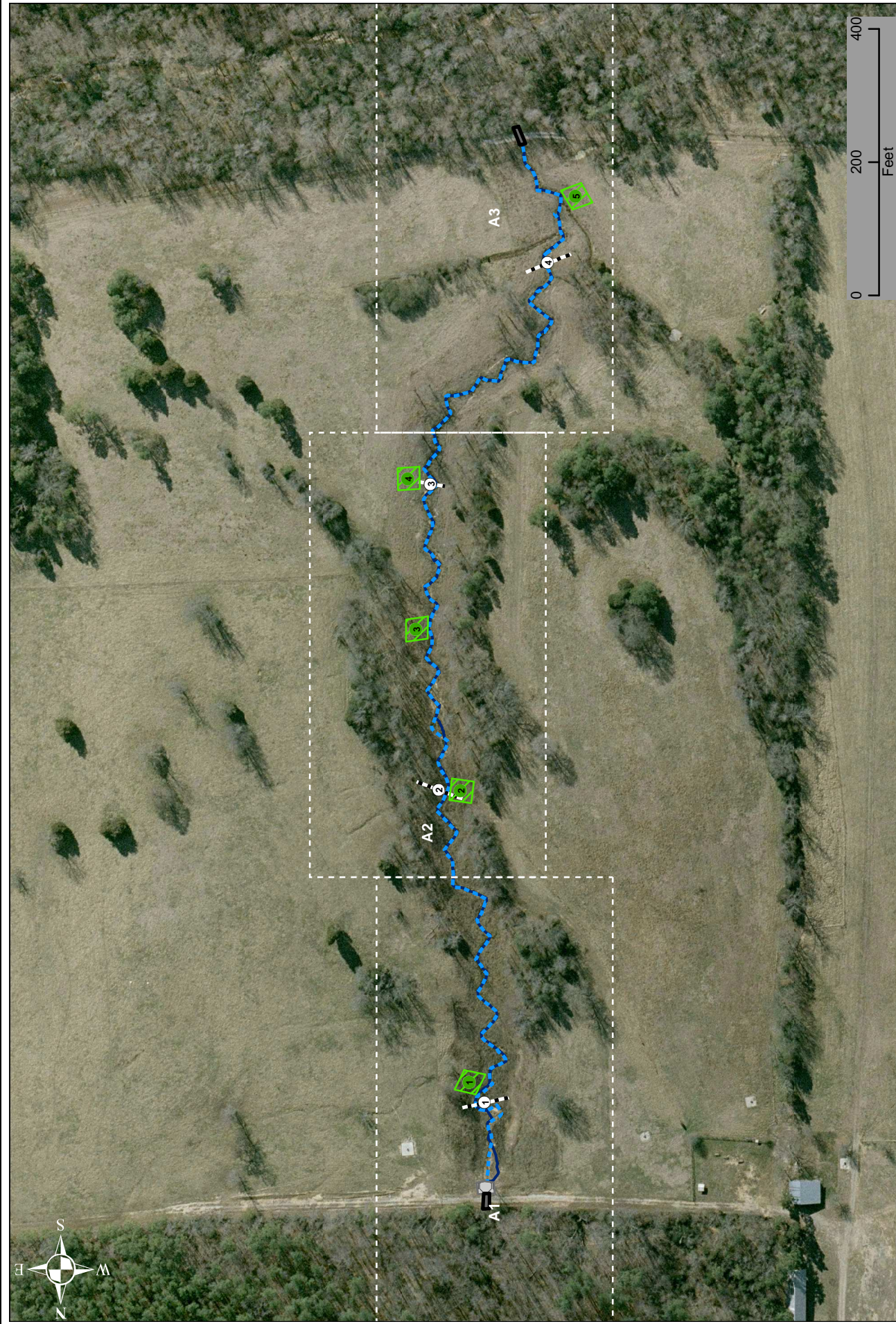
<b>Table 3. Project Contact Table UT to Billy's Creek/EEP Project No. 36</b>	
<b>Designer</b>	URS Corporation – North Carolina 1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560
<b>Construction Contractor</b>	McQueen Construction Inc. 619 Patrick Road Bahama, NC 27503
<b>Planting Contractor</b>	Carolina Environmental PO Box 1905 Mt. Airy, NC 27030
<b>Seeding and Matting Contractor</b>	Erosion Control Solutions 5508 Peakton Road Raleigh, NC 27604
<b>Monitoring Year 1 (2006) Monitoring Performers</b>	URS Corporation – North Carolina 1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560
<b>Monitoring Year 2 - 5 (2007 - 2010) Monitoring Performers</b>	SEPI Engineering Group 1025 Wade Avenue Raleigh, NC 27607 Phillip Todd (919) 789-9977
<b>Stream Monitoring POC</b>	Andy Kiley (919) 573-9914
<b>Vegetation Monitoring POC</b>	Phil Beach (919) 573-9936
<b>Wetland Monitoring POC</b>	N/A



<b>Table 4. Project Background Table</b>	
<b>UT to Billy's Creek/EEP Project No. 36</b>	
Project County	Franklin County, NC
Drainage Area	0.22 square miles
Drainage impervious cover estimate (%)	< 5%
Stream Order	1
Physiographic Region	Piedmont
Ecoregion	Northern Outer Piedmont (45f)
Rosgen Classification of As-built	E5
Dominant soil types	Chewcala, Altavista
Reference site ID	N/A
USGS HUC for Project and Reference	03020101
NCDWQ Sub-basin for Project and Reference	03-03-01
NCDWQ classification for Project and Reference	WS-IV; NSW
Any portion of any project segment 303d listed?	no
Any portion of any project segment upstream of a 303d listed segment?	no
Reasons for 303d listing or stressor	N/A
% of project easement fenced	100
% of project easement demarcated with bollards (if fencing absent)	N/A

Appendix B  
Visual Assessment Data





Project: Ut Billy's Creek (EEP #036) Year 5 (2010) Monitoring, Franklin County, North Carolina

April 2011

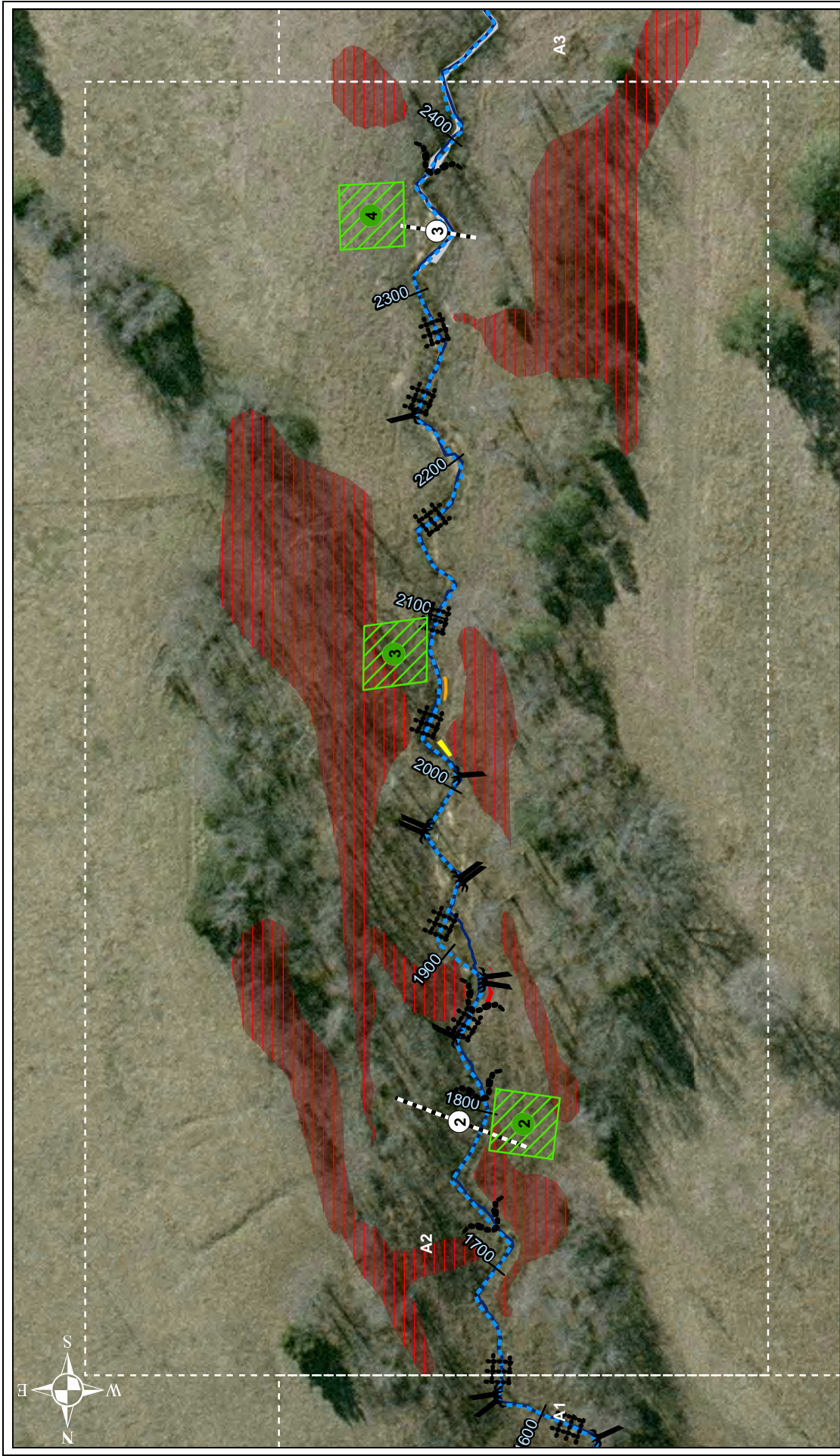
Figure 2a: CCPV Index Sheet (Aerials 2007 Franklin County)



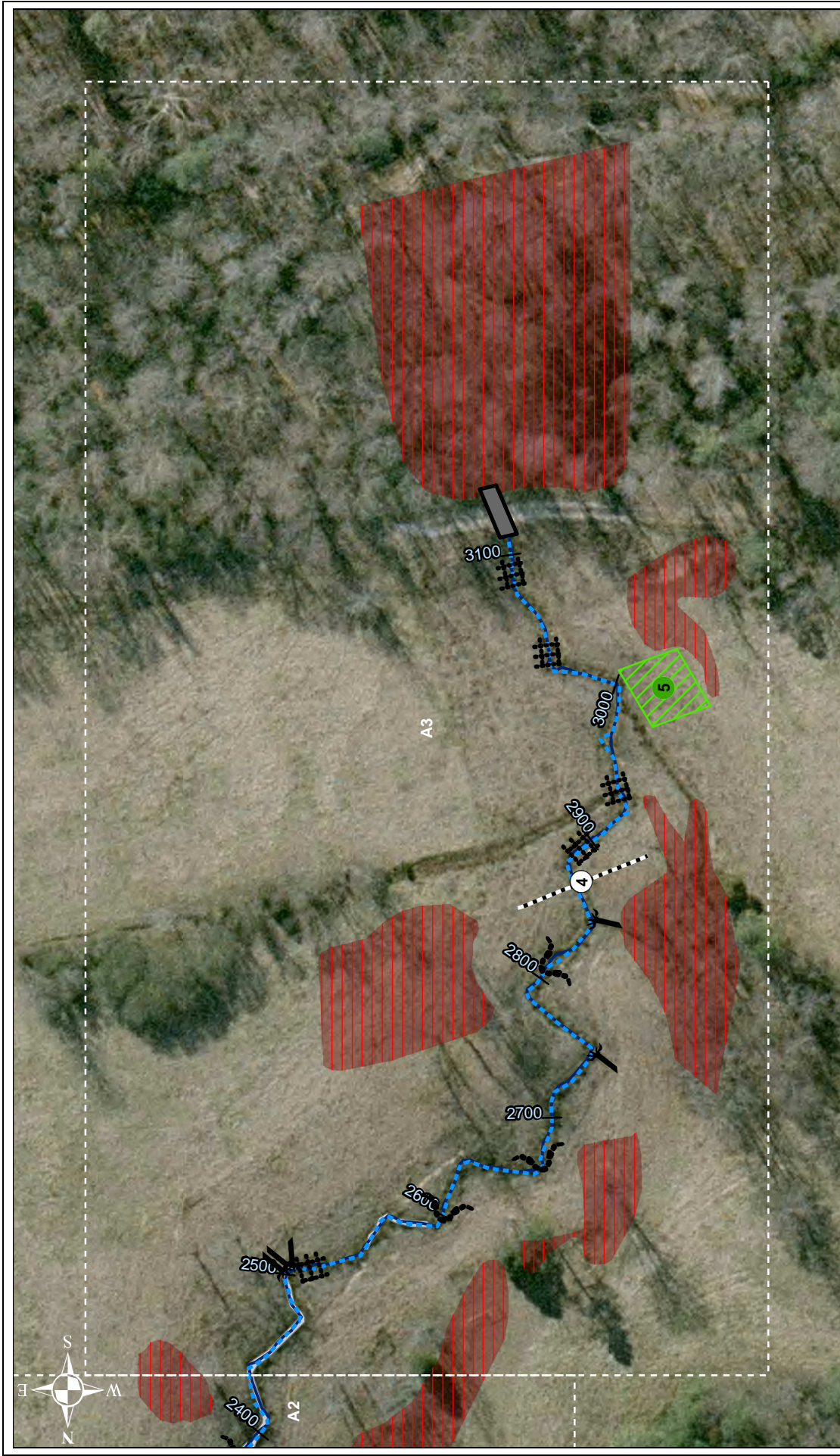














**Table 5**  
**Visual Stream Morphology Stability Assessment**  
**Ut Billy's Creek**  
**2107**


**Table 5**  
**Reach ID**  
**Assessed Length**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run units)	1. <u>Agradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			4	637	70%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate	28	49			57%			
		3. <u>Meander Pool Condition</u>	32	48			67%			
2. Bank	4. <u>Thalweg Position</u>	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle)	40	49			82%			
		1. <u>Thalweg</u> centering at upstream of meander bend (Run)	28	29			97%			
		2. <u>Thalweg</u> centering at downstream of meander (Glide)	23	28			82%			
		<b>Totals</b>			3	38	99%	3	38	100%
3. Engineered Structures	1. <u>Scoured/Eroding</u>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	11	100%	1	11	100%
		Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			1	11	100%	1	11	100%
		Bank slumping, calving, or collapse			1	16	100%	1	16	100%
	2. <u>Undercut</u>									
3. <u>Bank Protection</u>	4. <u>Habitat</u>	Structures physically intact with no dislodged boulders or logs.	26	26			100%			
		Grade control structures exhibiting maintenance of grade across the sill.	26	26			100%			
		Structures lacking any substantial flow underneath sills or arms.	26	26			100%			
		Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	26	26			100%			
		Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio $\geq 1.6$ Rootwads/logs providing some cover at base-flow.	23	26			88%			

**Table 6** Vegetation Condition Assessment

Planted Acreage<sup>1</sup>

2.6

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

Easement Acreage<sup>2</sup>

6.2

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern <sup>4</sup>	Areas or points (if too small to render as polygons at map scale).	1000 SF		16	1.80	29.0%
5. Easement Encroachment Areas <sup>3</sup>	Areas or points (if too small to render as polygons at map scale).	none		0	0.00	0.0%





Cross-Section/Photo Point 1: View Upstream (11-10-2010)



Cross-Section/Photo Point 2: View Upstream (11-10-2010)



Cross-Section/Photo Point 1: View Downstream (11-10-2010)



Cross-Section/Photo Point 2: View Downstream (11-10-2010)



Cross-Section/Photo Point 1: Facing Channel (11-10-2010)



Cross-Section/Photo Point 2: Facing Channel (11-10-2010)





Cross-Section/Photo Point 3: View Upstream (11-10-2010)



Cross-Section/Photo Point 4: View Upstream (11-10-2010)



Cross-Section/Photo Point 3: View Downstream (11-10-2010)



Cross-Section/Photo Point 4: View Downstream (11-10-2010)



Cross-Section/Photo point 3: Facing Channel (11-10-2010)



Cross-Section/Photo Point 4: Facing Channel (11-10-2010)





Photo 1: Vegetation Plot 1 (10-21-2010)



Photo 2: Vegetation Plot 2 (10-21-2010)



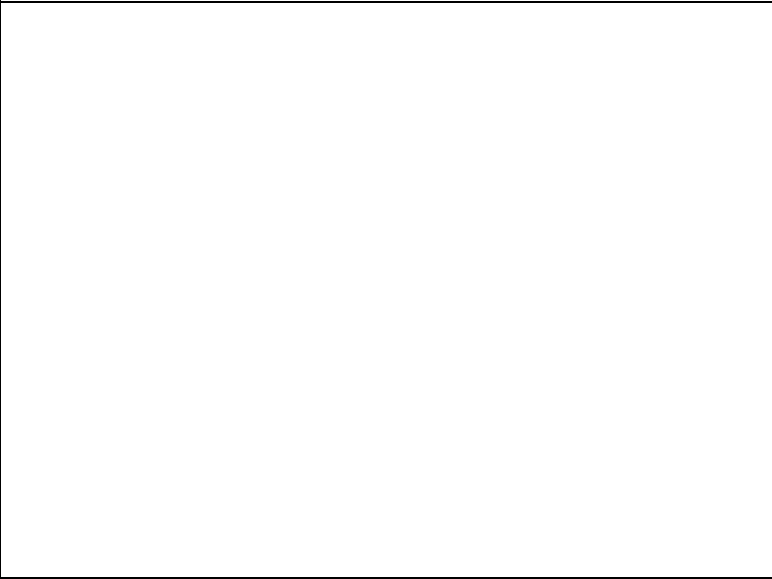
Photo 3: Vegetation Plot 3 (10-21-2010)



Photo 4: Vegetation Plot 4 (10-21-2010)



Photo 5: Vegetation Plot 5 (10-21-2010)





Appendix C  
Vegetation Plot Data





**Table 8: CVS Vegetation Metadata**  
**Report Prepared By**  
**Date Prepared**

PHILIP BEACH  
 11/2/2010 14:21

**database name** SEPI-2010-A.mdb.mdb  
**database location** G:\Environmental\EN10.009 - EEP Monitoring 2010\2010 - UT Billy's Creek\CVS  
**computer name** W47  
**file size** 64946176

**DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----**

- Metadata** Description of database file, the report worksheets, and a summary of project(s) and project data.
- Proj, planted** Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
- Proj, total stems** Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
- Plots** List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
- Vigor** Frequency distribution of vigor classes for stems for all plots.
- Vigor by Spp** Frequency distribution of vigor classes listed by species.
- Damage** List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
- Damage by Spp** Damage values tallied by type for each species.
- Damage by Plot** Damage values tallied by type for each plot.
- Planted Stems by Plot and Spp** A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
- ALL Stems by Plot and spp** A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.

**PROJECT SUMMARY-----**

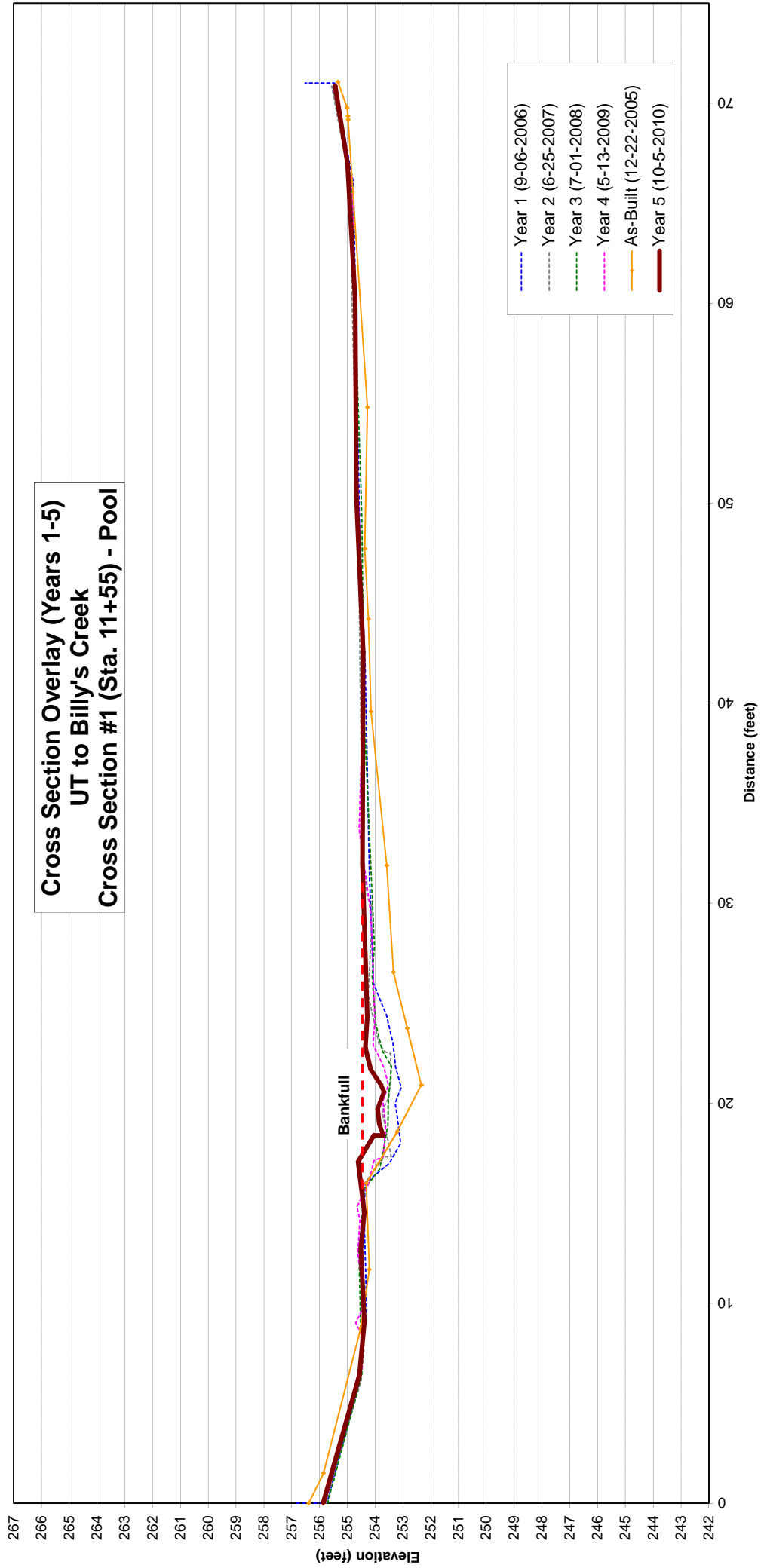
<b>Project Code</b>	36
<b>project Name</b>	Billy's Creek (G)
<b>Description</b>	Stream and Buffer Restoration
<b>River Basin</b>	03020101
<b>length(ft)</b>	2107
<b>stream-to-edge width (ft)</b>	50 - 70
<b>area (sq m)</b>	10521
<b>Required Plots (calculated)</b>	4
<b>Sampled Plots</b>	5

Table 9: CVS Stem Count Total and Planted by Plot and Species

	Comment	Species	CommonName	Total Stems	# plots	avg# stems	E36-01-0001-year:5	E36-01-0002-year:5	E36-01-0003-year:5	E36-01-0004-year:5	E36-01-0005-year:5
		Alnus serrulata	hazel alder	2	2	1	1		1		
		Aronia arbutifolia	Red Chokeberry	1	1	1				1	
		Betula nigra	river birch	4	2	2	2				2
		Callicarpa americana	American beautyberry	1	1	1			1		
		Carpinus caroliniana	American hornbeam	9	2	4.5	8	1			
		Celtis laevigata	sugarberry	2	2	1	1		1		
		Cephalanthus occidentalis	common buttonbush	4	3	1.33	1	1			2
		Cornus amomum	silky dogwood	6	4	1.5	1	1	3	1	
		Fraxinus pennsylvanica	green ash	4	3	1.33	1	2	1		
		Juniperus virginiana	eastern redcedar	1	1	1			1		
		Ligustrum sinense	Chinese privet	17	3	5.67			7	2	8
		Liquidambar styraciflua	sweetgum	9	3	3		1		7	1
		Liriodendron tulipifera	tuliptree	1	1	1	1				
		Nyssa sylvatica	blackgum	1	1	1			1		
		Pinus taeda	loblolly pine	17	3	5.67		3	5		9
		Quercus falcata	southern red oak	3	2	1.5		1			2
		Quercus phellos	willow oak	14	5	2.8	2	2	2	2	6
		Rhus copallinum	flameleaf sumac	10	5	2	1	1	3	3	2
		Salix nigra	black willow	5	3	1.67	1		3		1
		Sambucus canadensis	Common Elderberry	4	2	2			1		3
		Viburnum dentatum	southern arrowwood	3	3	1		1		1	1
<b>TOT:</b>	<b>0</b>	<b>21</b>	<b>21</b>	<b>118</b>	<b>21</b>		<b>9</b>	<b>24</b>	<b>30</b>	<b>18</b>	<b>37</b>

Appendix D  
Stream Survey Data

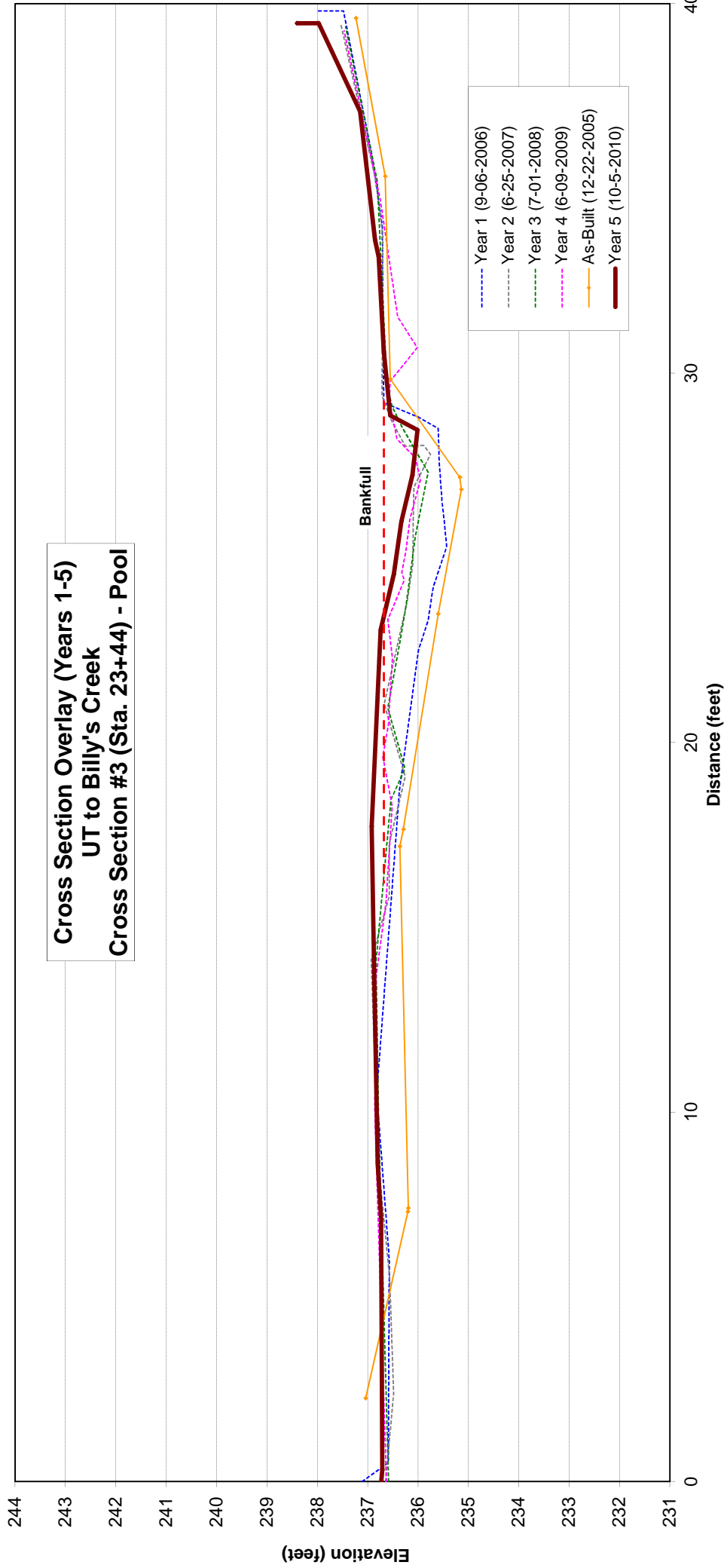
**Cross Section Overlay (Years 1-5)  
 UT to Billy's Creek  
 Cross Section #1 (Sta. 11+55) - Pool**



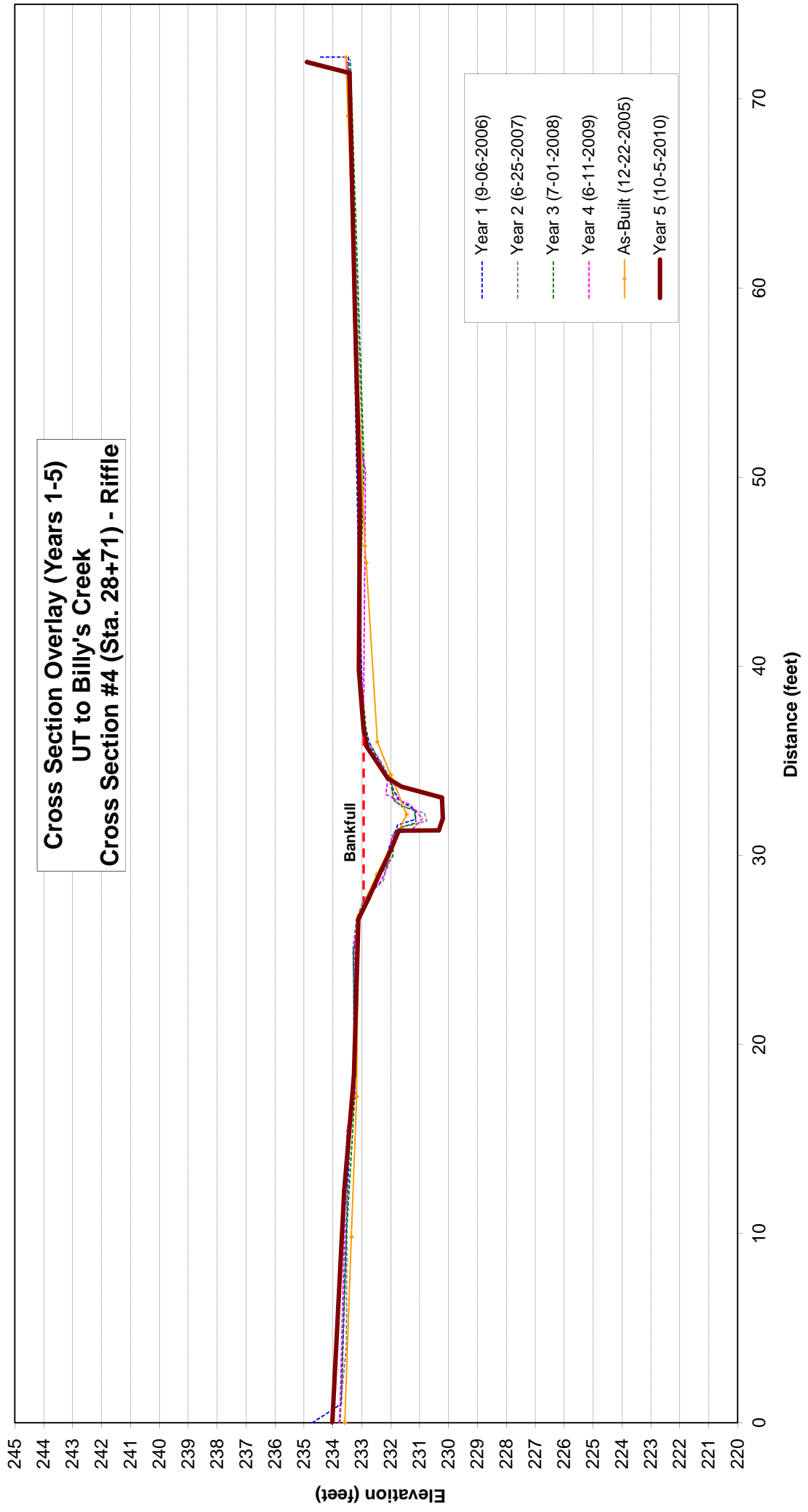




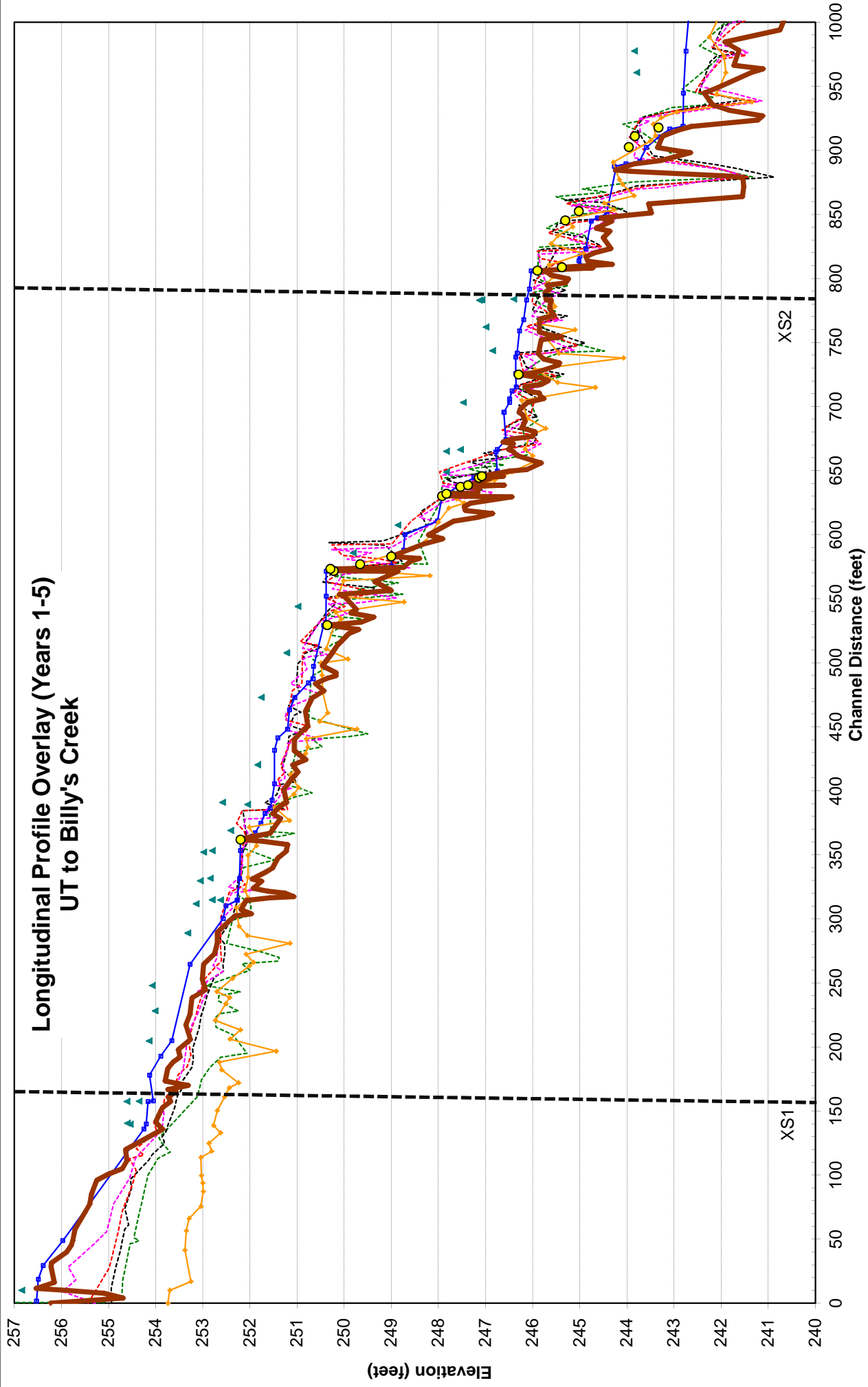
**Cross Section Overlay (Years 1-5)  
UT to Billy's Creek  
Cross Section #3 (Sta. 23+44) - Pool**



**Cross Section Overlay (Years 1-5)  
UT to Billy's Creek  
Cross Section #4 (Sta. 28+71) - Riffle**

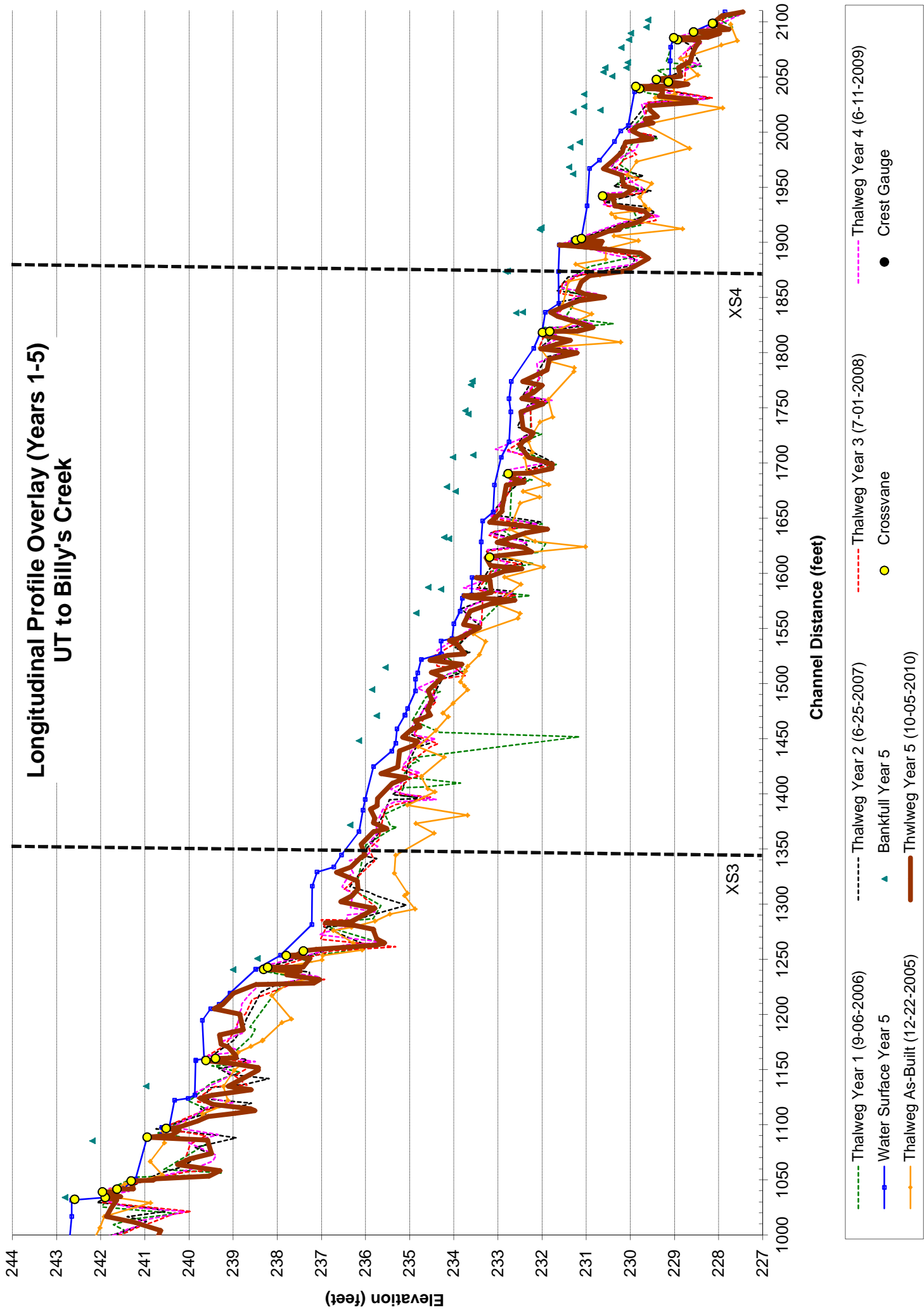


# Longitudinal Profile Overlay (Years 1-5) UT to Billy's Creek



- Thalweg Year 1 (9-06-2006)
- Thalweg Year 2 (6-25-2008)
- Thalweg Year 3 (7-01-2008)
- Thalweg Year 4 (6-11-2009)
- Thalweg Year 5 (10-05-2010)
- Water Surface Year 5
- Thalweg As-Built (12-22-2005)
- Crossvane
- ▲ Bankfull Year 5
- Thalweg Year 5 (10-05-2010)

# Longitudinal Profile Overlay (Years 1-5) UT to Billy's Creek



Channel Distance (feet)

- Thalweg Year 1 (9-06-2006)
- Thalweg Year 2 (6-25-2007)
- Thalweg Year 3 (7-01-2008)
- Thalweg Year 4 (6-11-2009)
- Thalweg As-Built (12-22-2005)
- Bankfull Year 5
- Crossvane
- Crest Gauge
- Water Surface Year 5



**Table 11. Morphology and Hydraulic Monitoring Summary**  
**UT Billys Creek**  
**(EEP Project No. 36)**

Parameter	Cross Section 1 Pool					Cross Section 2 Riffle					Cross Section 3 Pool					Cross Section 4 Riffle								
	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5
<b>Dimension</b>																								
BF Width (ft)	29.3	16.6	17.3	20.49		10.16	12.9	11.1	11.1	11.6	10.16	16.1	14.3	17.0	15.1	8.46	9.8	8.6	10.4	8.8	9.28			
Floodprone Width (ft)	75	NA	NA	NA	NA	72+	75	72+	72+	72+	72+	40	NA	NA	NA	NA	75	72+	72+	72+	72+			
Floodprone Area (ft)	11.5	7.9	10.4	7.5	3.17	8.0	9.7	8.4	6.8	8.0	7.71	9.5	5.1	5.5	4.6	2.43	7.2	7.5	7.1	7.3	9.57			
BF Mean Depth (ft)	0.4	0.5	0.4	0.4	0.15	0.7	0.8	0.8	0.6	0.7	0.76	0.6	0.4	0.3	0.3	0.29	0.7	0.9	0.7	0.8	1.03			
Width/Depth Ratio	74.6	NA	NA	NA	136.6	17.0	17	14.6	18.3	17.0	13.37	27.3	NA	NA	NA	29.17	13.3	10.0	15.2	10.5	9.01			
Entrenchment Ratio	2.6	NA	NA	NA	NA	6.6+	5.8	6.6+	6.5+	6.2+		2.5	NA	NA	NA	NA	7.7	8.4+	6.9+	8.2+	8.2+			
Bank Height Ratio	*	NA	NA	NA	NA	1.0	*	1.0	1.1	1.0	1.0	*	NA	NA	NA	NA	*	1.1	1.1	1.0	1.0			
Wetted Perimeter (ft)	29.9	17.4	27.9	17.6	21.1	12.6	13.3	11.5	12.1	12.6	11	16.8	14.9	17.3	15.5	8.8	10.8	11.5	11.5	10.2	12.13			
Hydraulic radius (ft)	0.4	0.5	0.4	0.4	0.15	0.7	0.7	0.7	0.6	0.6	0.7	0.6	0.3	0.3	0.3	0.28	0.7	0.7	0.6	0.7	0.79			
<b>Substrate</b>																								
d50 (mm)	1.1	1.7	NA	NA	NA	NA	1.5	0.5	NA	NA	NA	1.4	1.4	NA	NA	NA	1.2	1.4	NA	NA	NA	NA		
d84 (mm)	1.7	3.1	NA	NA	NA	NA	8	1	NA	NA	NA	1.8	1.9	NA	NA	NA	1.7	1.9	NA	NA	NA	NA		

\*Data was not provided in 2006 monitoring report

Parameter	MY-0 (2005)			MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
<b>Pattern</b>																		
Channel Belwidth (ft)	14	30	20	14.9	39.9	26.8	12.7	41.7	25.1	14.6	42.5	25.1	14.6	42.5	25.06			
Radius of Curvature (ft)	18	26	24	6.8	30.1	16.0	7.1	37.9	14.6	6.6	41.7	14.2	6.59	41.74	14.15			
Meander Wavelength (ft)	40	60	50	34.5	73.0	55.9	36.9	73.7	56.3	42.1	74.1	56.3	42.07	74.14	56.3			
Meander Width Ratio	1.2	2.6	1.8	1.5	4.1	2.7	1.2	4.0	2.4	1.4	4.2	2.5	1.4339	4.166	2.454			
<b>Profile</b>																		
Riffle length (ft)	2	64	16	2.2	66.0	16.4	3.2	65.4	19.9	3.2	207.2	20.8	2	90	16.9			
Riffle slope (ft/ft)	0.001	0.036	0.015	0.003	0.122	0.013	0.002	0.085	0.017	0.001	0.092	0.015	0	0.108	0.035			
Pool length (ft)	2	38	13	2.3	34.2	10.5	4.1	36.5	11.7	4.2	36.2	10.8	6	48	20.9			
Pool spacing (ft)	10	66	31	13.2	94.5	29.8	12.4	83.6	31.3	15.5	320.3	31.9	7	110	35.1			
<b>Additional Reach Parameters</b>																		
Valley Length (ft)	1580		1564	1564		1564	1564		1564	1564		1564	1564		1564			
Channel Length (ft)	2025		2092	2092		2082	2082		2107	2107		2107	2107		2107			
Sinuosity	1.28		1.34	1.34		1.33	1.33		1.35	1.35		1.35	1.35		1.35			
Water Surface Slope (ft/ft)	0.014		0.012	0.012		0.013	0.013		0.013	0.013		0.013	0.013		0.013			
BF slope (ft/ft)	0.040		0.012	0.012		0.013	0.013		0.013	0.013		0.013	0.013		0.013			
Rosgen Classification	C5		C/E5	C/E5		C5	C5		C5	C5		C5	C5		C5			
*Habitat Index	NA		NA	NA		NA	NA		NA	NA		NA	NA		NA			
*Macrobenthos	NA		NA	NA		NA	NA		NA	NA		NA	NA		NA			

Pebble counts were not performed for UT Billy's Creek during Monitoring Year 5 because it is a sandbed stream and the counts would not successfully detect changes in the amounts of fine sediments in the channel bed.

Appendix E  
Hydrologic Data



**Table 12. Verification of Bankfull Events**

Date of Data Collection	Date of Occurrence	Method	Photo # (if available)
6/28/2006	6/14/2006	Per NOAA staff member, Jonathan Blaes, Tropical Storm Alberto produced a 50-year storm event in the Franklinton/Louisburg area. The storm produced approximately 5.55 inches of rain on 6/14.	
6/4/2007	6/3/2007	Result of 1.5' rainfall event. Wrack lines noted.	None
10/15/2008	4/27/2008	According to NCDC Station Coop ID 313123 - Louisburg NC, 2.15 inches of precipitation fell over this 24 hour period. It was assumed, but not verified, that this rainfall produced a bankfull event.	None
10/15/2008	9/6/2008	According to NCDC Station Coop ID 313123 - Louisburg NC, 3.27 inches of precipitation fell over this 24 hour period. It was assumed, but not verified, that this rainfall produced a bankfull event.	None
1/27/2009	Unknown; but probably between the dates of January 5 and January 21, 2009.	Crest gauge reading of 6" on stick. Base of crest gauge (measuring stick) located at bankfull elevation. Date of bankfull flow unknown, but two 1+ inch precipitation events occurred between January 5 and January 27, 2009. Presumably, one of these two events caused the over-bank flow.	None
10/5/2010	Unknown. Likely between May and August 2010	Crest gauge reading above base, wrack lines observed during geomorphic survey. Two 2+ inch storm events occurred between May and August 2010.	None