Year 2 Monitoring Report for Stream Restoration of Bailey Fork

Burke County, NC
SCO # D04006-02

Prepared for:
NCDENR – EEP
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Ecosystem Enhancement PROGRAM

Submitted: January 2008

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I. EXECUTIVE SUMMARY

The Bailey Fork stream restoration project is located near Morganton in Burke County, North Carolina. Prior to restoration, the stream banks were denuded, actively eroding, and had a nearly vertical profile. Vegetative cover was minimal along the stream. The project goal for the restoration, completed during early 2006, was to modify the dimension, pattern, and profile of the existing stream channels to stable and self-maintaining conditions by utilizing natural channel design techniques and procedures. Elements of the restoration design included improved bedform features, enhanced aquatic habitat diversity, establishment of riffle-pool sequences, in-stream grade control structures, root wad bank stabilization, and establishment of a native forested riparian plant community. The following report documents the Year 2 Annual Monitoring for this project.

Monitoring of the vegetation was completed in September 2007 following the Carolina Vegetation Survey methodology. Stem counts completed in 10 vegetation plots show an average density of 332 stems per acre for the site, which meets the success criteria of 320 stems/acre after three years of monitoring. Four individual plots have stem densities below the minimum; these plots include one impacted by stream maintenance work, one infringed upon by pasture mowing in a previous year, and one covered by the invasive *Sericea lespedeza*. Stem counts for Year 2 represent 77 percent survival from the previous year. It is likely that the spread of *Sericea lespedeza* throughout much of the project corridor has hindered the growth and survival of woody vegetation. This species is a common component of pasture mixes and likely spread into the project area from the surrounding pasture lands. Management is planned for the spring of 2008 to combat this species and will include herbicide treatments, sprayed in a manner to minimize the impact on planted woody vegetation. After management of this species is conducted in the spring of 2008, a round of remedial tree plantings will be conducted. These plantings are intended to bring the site back into compliance with the 320 stems per acre minimum, and to replace any trees inadvertently impacted by the herbicide treatments.

Previous monitoring of stream geomorphology identified some problem areas associated with channel stability. In Year 1, several areas of streambank erosion, typically outer meander bends, resulted in bank scour and/or bank failure. The majority of the eroding banks were repaired during Year 2. Additionally, the extensive vegetative development along much of the channel has contributed to streambank stability in areas where bank scour was occurring or mid-channel bars were forming. Aggradation has occurred along project reaches, with a few structures embedded by the sand substrate readily available from high sediment supply in the watershed; however, at each location where a structure became embedded, the channel is stable with negligible indication of streambank erosion or bar formation.

Bedform features continue to evolve along the restored reaches as shown on the long-term longitudinal profiles. Riffle lengths and slopes are stable. Pool to pool spacings are representative of reference reach conditions, adjusted for drainage area and bankfull width. The pools have developed excellent glide features, providing spawning habitat for native fishes and riffle substrates conducive for benthic macro-invertebrate populations to re-emerge. Of interest is the change (median decrease) in pool to pool spacings between Year 1 and Year 2 on Lower Bailey Fork and to a lesser degree on the other long-term monitoring profiles. This bedform adjustment may be attributed to extended drought during the summer of 2007 (low flow conditions) and minimal flushing of sand-sized particles through the project reaches. Future monitoring may confirm this hypothesis. Comparison of As-Built, Year 1 and Year 2 long-term stream monitoring data show successive increases in channel-floodplain connectivity and increasingly stable channel dimensions, interpreted from width/depth ratios, entrenchment ratios, and bank height ratios, with exceptions noted, as shown on the long-term monitoring cross-sections. The median bankfull dimensions, pattern and profile measurements presented in Table XII for Upper

Bailey Fork, show this reach has re-established predominant C4 cross-section, bedform and planiform features.

The constructed riffles remain stable, with a median particle size ranging from very coarse gravel to small cobble. The pools substrate remained stable as well, with median particle sizes ranging from fine to coarse sand based on Year 2 substrate analysis. Further remedial maintenance work on the stream channel is not planned at this time.

II. PROJECT BACKGROUND

A. Location and Setting

The project site is located approximately 2 miles southwest of Morganton, Burke County, North Carolina. The site is located 1.7 miles southwest of the I-40/US 64 interchange, as shown in Figure 1. The stream channels included in this project are the mainstem of Bailey Fork, and two unnamed tributaries to Bailey Fork, designated as UT1 and UT2. The project reach along the mainstem includes a portion upstream of Propst Road (hereafter referred to as Upper) and a portion downstream of that road (hereafter referred to as Lower).

The directions to the project site are as follows:

> From I-40, take US 64 south to Propst Road (SR 1112) and turn right. The project site is located on the north and south sides of Propst Road approximately 1,800 feet from the Propst Road and US 64 intersection.

B. Project Structure, Mitigation Type, Approach and Objectives

The primary land use within the immediate project site was agricultural. Based on photographic interpretation, the site has been historically utilized for agricultural production of row crops and hay. It is very likely that the project site has been farmed since the Civil War era. The site had been degraded by past land management practices including mechanical land clearing, straightening and dredging the stream channels and hay production. The project site was most recently utilized to produce hay for livestock feed. The stream banks were denuded, actively eroding, with vertical to undercut streambanks. Vegetative cover was minimal along the stream corridor, resulting in streambank erosion and lateral channel migration. The channels were in a deeply incised state resulting in lateral confinement. Prior to restoration, the floodplain was functioning as an abandoned terrace perched above the bankfull elevation.

The project goal for the restoration was to modify the dimension, pattern, and profile of the existing stream channels to be stable and self-maintaining utilizing natural channel design techniques and procedures. Physical restoration and water quality improvements were accomplished by fulfilling the restoration objectives below:

- Design channels with the appropriate cross-sectional dimension, pattern, and longitudinal profile while based on reference reach conditions.
- Improve and create bedform and aquatic habitat features (riffles, runs, pools, and glides)
- Integrate, in conjunction with the stream restoration, a nested floodplain (bankfull bench) connected to the bankfull channel elevation (Priority II restoration) or raise the bed elevation of the stream reconnecting the bankfull elevation to the existing floodplain elevation (Priority I).
- Restore channel and streambank stability by integrating in-channel grade control structures, root wads, and native vegetation design while also creating stable and functional aquatic and terrestrial habitat.
- Establish a native forested riparian plant community within a minimum of 30 feet from the proposed top of the bankfull channel. Remove exotic vegetation during construction implementation and protect the riparian corridor with a perpetual conservation easement.
- Provide aesthetic and educational opportunities.

Information on the project structure and objectives is included in Tables I and II.

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BAILEY FORK STREAM RESTORATION

FIGURE 1: SITE VICINITY MAP

N.C. ECOSYSTEM ENHANCEMENT PROGRAM

Date:	December, 2006	Job No.	2006-1626	Scale:	1" = 3000'

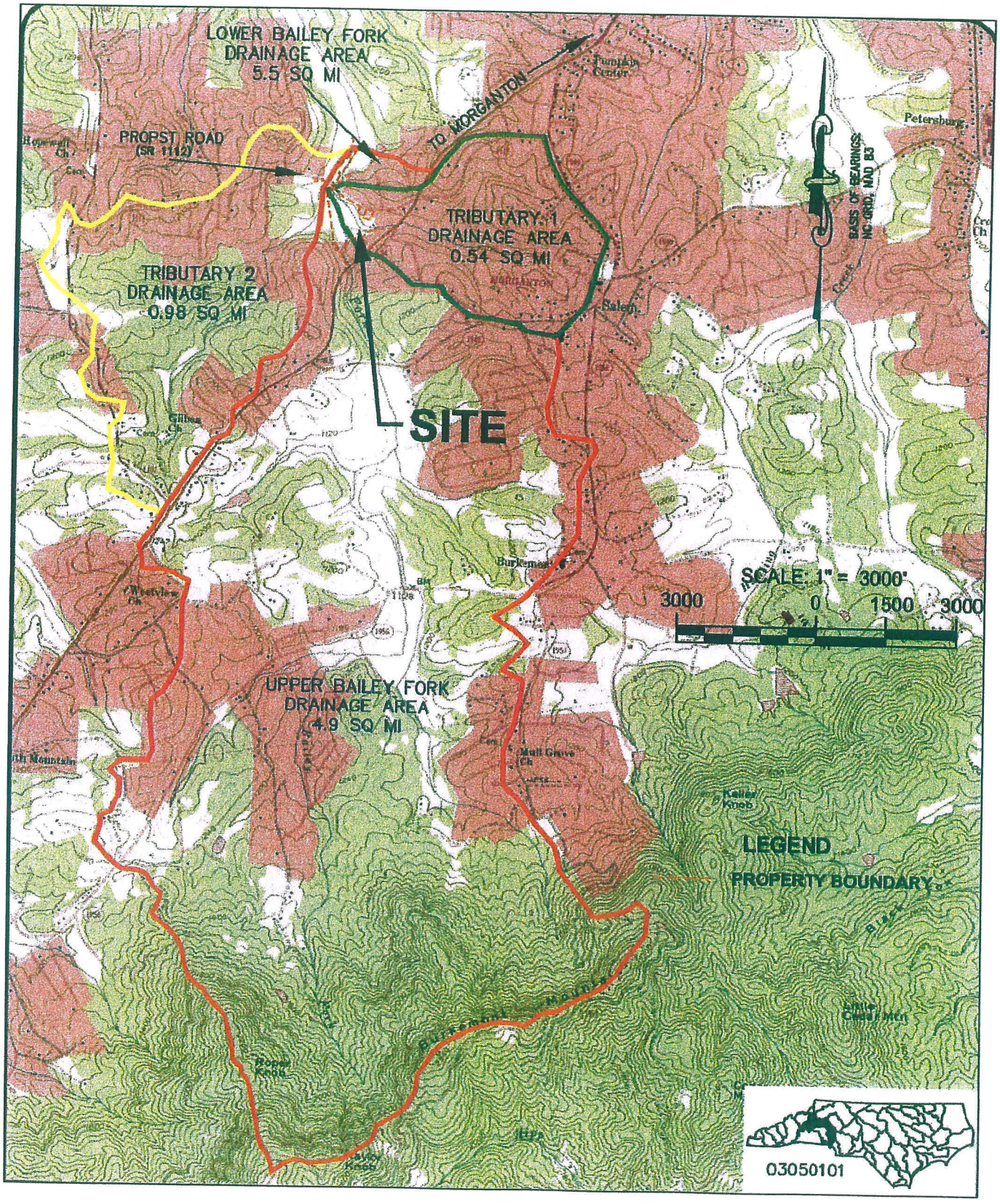

Table I. Project Structure Table Bailey Fork Stream Restoration / EEP Project No. D04006-02	
Project Segment/Reach ID	**Linear Footage or Acreage**
Upper	1,543.0 lf
Lower	1,170.4 lf
UT1	1,758.1 lf
UT2	1,271.0 lf
TOTAL	**5,742.5 lf**

Table II. Project Mitigation Objectives Table Bailey Fork Stream Restoration / EEP Project No. D04006-02				
Project Segment/ Reach ID	**Mitigation Type**	**Approach**	**Linear Footage or Acreage**	**Comment**
Upper	Restoration	Priority 2	1,543.0 lf	Restore dimension, pattern, and profile
Lower	Restoration	Priority 2	1,170.4 lf	Restore dimension, pattern, and profile
UT1	Restoration	Priority 1	1,758.1 lf	Restore dimension, pattern, and profile
UT2	Restoration	Priority 1	1,271.0 lf	Restore dimension, pattern, and profile
TOTAL			**5,742.5 lf**	

C. Project History and Background

Project activity and reporting history are provided in Table III. The project contact information is provided in Table IV. The project background history is provided in Table V.

Table III. Project Activity and Reporting History Bailey Fork Stream Restoration / EEP Project No. D04006-02			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration plan	Jan 2005	Oct 2004	Mar 2005
Final Design - 90%[1]	Jan 2005	N/A	Mar 2005
Construction	Aug 2005	N/A	Sep 2005
Temporary S&E applied to entire project area[2]	Feb 2005	N/A	Feb 2005
Permanent plantings	Mar 2006	N/A	Mar 2006
Mitigation plan/As-built	Dec 2005	May 2006	Aug 2006
Year 1 monitoring	2006	Sep 2006 (vegetation) Apr 2007 (geomorphology)	May 2007
Remedial Stream Maintenance*	Aug 2007	N/A	Aug 2007
Year 2 monitoring	2007	Sep 2007 (vegetation) Oct 2007 (geomorphology)	Dec 2007
Year 3 monitoring	2008		
Year 4 monitoring	2009		
Year 5 monitoring	2010		

[1]Full-delivery project; 90% submittal not provided.
[2]Erosion and sediment control applied incrementally throughout the course of the project.
N/A: Data collection is not an applicable task to these project activities.
*Remedial Maintenance involved efforts to repair the degraded reaches of the channel along Upper and Lower Bailey Fork, improving channel bank stability by creating a more stable bank slope, as shown on the August 2007 maintenance plan sheet.

Table IV. Project Contact Table Bailey Fork Stream Restoration / EEP Project No. D04006-02	
Designer	Natural Systems Engineering* 3719 Benson Drive , Raleigh, NC 27609
Construction Contractor	Natural Systems Engineering* 3719 Benson Drive , Raleigh, NC 27609
Monitoring Performers	EMH&T, Inc. 5500 New Albany Road, Columbus, OH 43054
Stream Monitoring POC	Warren E. Knotts, P.G., EMH&T
Vegetation Monitoring POC	Holly Blunck, EMH&T
*Contact:	Jim Halley at The John R. McAdams Company, Inc 2905 Meridian Parkway, Durham, NC 27713

Table V. Project Background Table
Bailey Fork Stream Restoration / EEP Project No. D04006-02

Project County	Burke
Drainage Area-Upper	4.9 sq mi
Drainage Area-Lower	5.5 sq mi
Drainage Area-UT1	0.55 sq mi
Drainage Area-UT2	0.98 sq mi
Drainage Impervious Cover Estimate	10%
Stream Order	2nd
Physiographic Region	Inner Piedmont
Ecoregion	Northern Inner Piedmont
Rosgen Classification of As-built	E/C type
Dominant Soil Types	Colvard sandy loam
Reference Site ID	Sal's Branch, Whites Creek, S. Muddy Birchfield, S. Muddy Tributary 4
USGS HUC for Project and Reference	03050101
NCDWQ Sub-basin for Project and Reference	03-08-31
NCDWQ Classification for Project and Reference	C
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reason for 303d listing or stressor	N/A
% of project easement fenced	20%

*Data for Table V was derived from information from reports produced by Natural Systems Engineering.

D. Monitoring Plan View

The monitoring plan view is included as Figure 2. The information shown in Figure 2 is derived entirely from the As-Built stream plan provided with the approved Mitigation Plan report. In-stream structures shown on the plan view have been verified by the stream restoration designer/contractor based on field reconnaissance. The monitoring plan view also depicts the locations of each monumented cross-section, vegetation plot, crest gage and photo point that are part of the five year monitoring effort for this project.

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BURKE COUNTY, NORTH CAROLINA

BAILEY FORK STREAM RESTORATION

FIGURE 2A - INDEX MAP

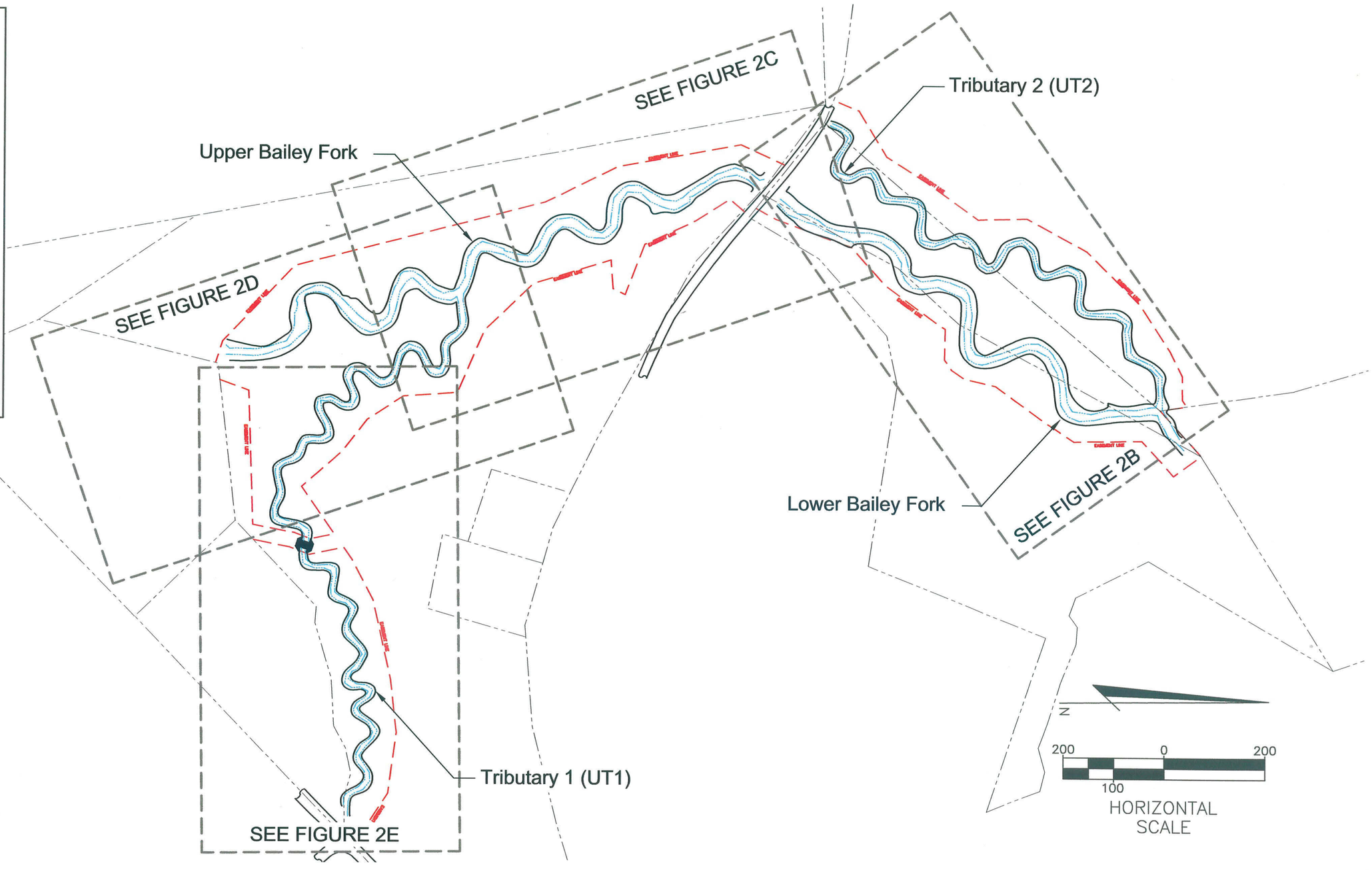
N.C. ECOSYSTEM ENHANCEMENT PROGRAM

Date:	December, 2007
Scale:	1" = 60'
Job No:	2006-1626

LEGEND

- Root Wad
- Step–Cross Vane
- "J" Hook
- Rock Channel Sill
- Log Channel Sill
- Riffle

Base map and structure locations are shown per the as–built plan completed by Natural Systems Engineering in Nov. 2007.



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BAILEY FORK STREAM RESTORATION

FIGURE 2B

N.C. ECOSYSTEM ENHANCEMENT PROGRAM

Date:	December, 2007
Scale:	1" = 60'
Job No:	2006-1626

LEGEND

- Vegetation Plot
- Photo Point
- Cross Section
- Crest Gauge

N/F
DAVID STROUP & WF
DB. 225 PG. 58

EASEMENT LINE

VP-10

VP-9

VP-8

VP-7

PHOTO POINT 13 (PHOTO #13)

PHOTO POINT 10 (PHOTO #10)

XSEC 10

PHOTO POINT 9 (PHOTO #9)

XSEC 9

PHOTO POINT 12 (PHOTO #12)

XSEC 12

PHOTO POINT 11 (PHOTO #11)

XSEC 11

CG3

CG4

NEW FENCE LINE

N/F
CHARLES TALBERT
DB. 1322 PG. 157
PB. 4 PG. 29

N

60 0 60
30
HORIZONTAL SCALE

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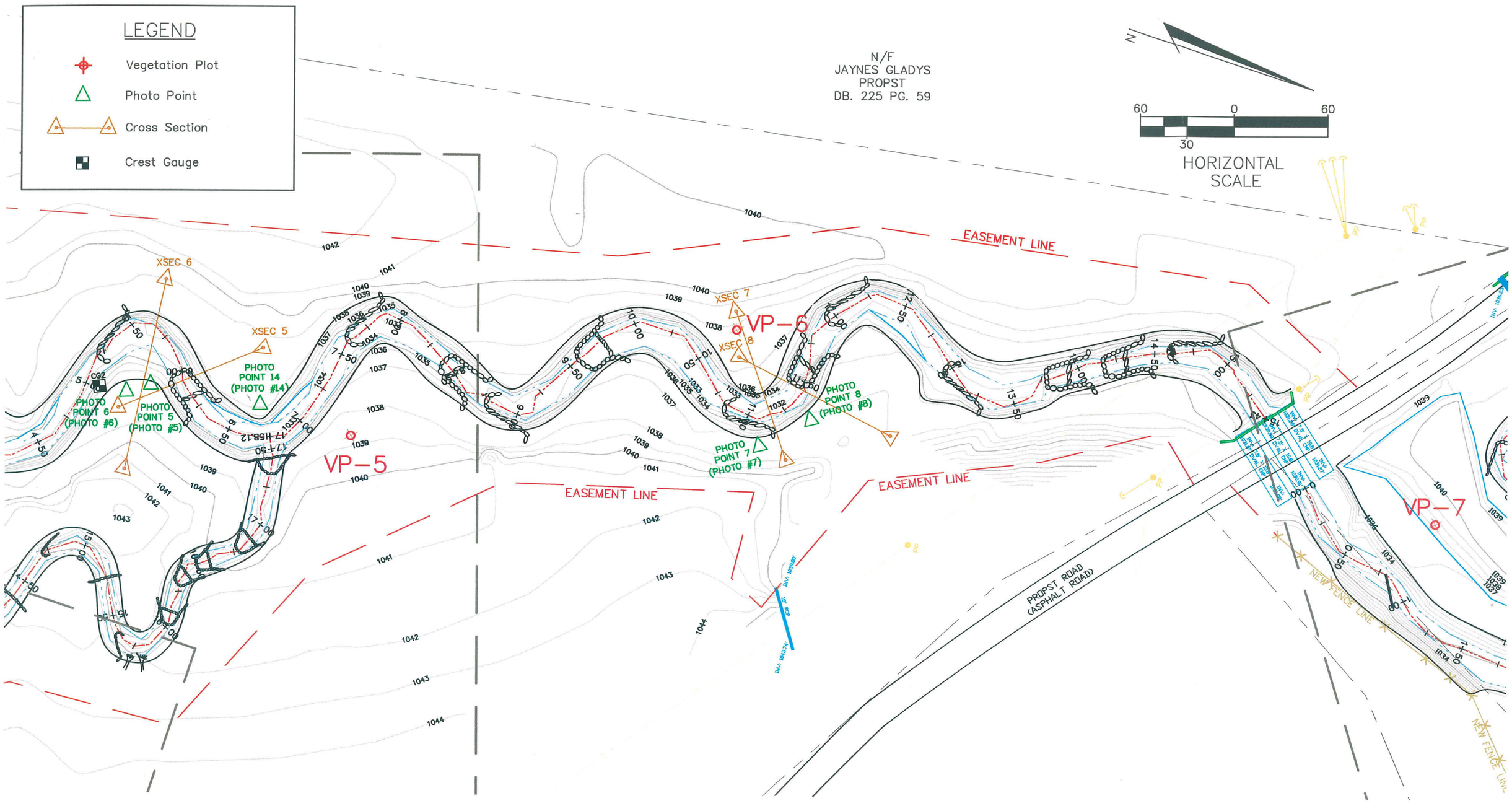
BAILEY FORK STREAM RESTORATION

FIGURE 2C

N.C. ECOSYSTEM ENHANCEMENT PROGRAM

Date:	December, 2007
Scale:	1" = 60'
Job No:	2006-1626



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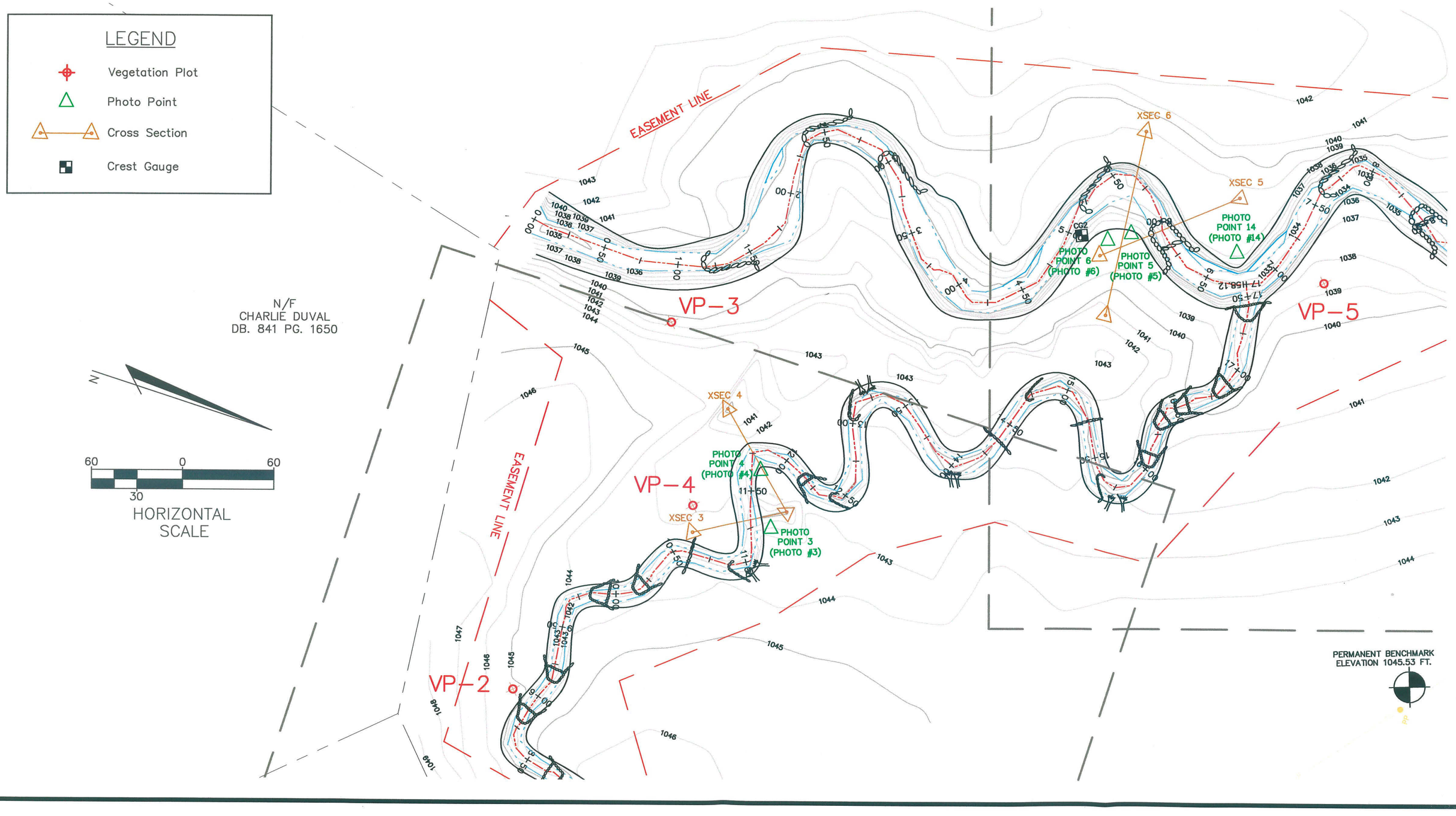
BAILEY FORK STREAM RESTORATION

FIGURE 2D

N.C. ECOSYSTEM ENHANCEMENT PROGRAM

Date:	December, 2007
Scale:	1" = 60'
Job No:	2006-1623



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BAILEY FORK STREAM RESTORATION

FIGURE 2E

N.C. ECOSYSTEM ENHANCEMENT PROGRAM

Date:	December, 2007
Scale:	1" = 60'
Job No:	2006-1626

LEGEND

- Vegetation Plot
- Photo Point
- Cross Section
- Crest Gauge

EASEMENT LINE

VP-1

XSEC 2

PHOTO POINT 2 (PHOTO #2)

XSEC 1

PHOTO POINT 1 (PHOTO #1)

CG1

PHOTO POINT 15 (PHOTO #15)

EASEMENT LINE

HWY 64 (ASPHALT ROAD)

PHOTO POINT 3 (PHOTO #3)

PHOTO POINT 4 (PHOTO #4)

XSEC 4

XSEC 3

VP-4

VP-2

EASEMENT LINE

N/F
CRYSTAL & JIMMA
SMITH
DB. 592 PG. 164

N

60 0 60
30
HORIZONTAL SCALE

III. PROJECT CONDITION AND MONITORING RESULTS

A. Vegetation Assessment

1. Soil Data

Soils present in the riparian area adjacent to Bailey Fork are characteristic of those found in alluvial landforms within the Northern Inner Piedmont ecoregion of North Carolina. Colvard sandy loam soils are mapped within the floodplain and immediately adjacent to the stream channels on the project site. Colvard soils are formed in loamy alluvial deposits, and are nearly level, very deep, and well-drained or moderately well-drained.

Other soils within the project's vicinity include Fairview sandy clay loam and Unison fine sandy loam, which are mapped on adjacent slopes and terraces. No hydric soils were mapped within the project corridor.

Data on the soils series found within and near the project site is summarized in Table VI.

Table VI. Preliminary Soil Data
Bailey Fork Stream Restoration / EEP Project No. D04006-02

Series	Max. Depth (in.)	% Clay on Surface	K[1]	T[2]	% Organic Matter
Colvard sandy loam	60+	8-18	0.24	5	1-2
Fairview sandy clay loam	60+	20-35	0.24	5	0.5-1
Unison fine sandy loam	60+	12-20	0.24	5	0.5-1

Data for Table VI was derived from information from reports produced by Natural Systems Engineering.
[1]Erosion Factor K indicates the susceptibility of a soil to sheet and rill erosion, ranging from 0.05 to 0.69.
[2]Erosion Factor T is an estimate of the maximum average annual rate of soil erosion by wind or water that can occur without affecting crop productivity, measured in tons per acre per year.

2. Vegetative Problem Areas

Vegetative Problem Areas are defined as areas either lacking vegetation or containing populations of exotic vegetation. Each problem areas identified during Monitoring Year 2 is summarized in Table VII. Photographs of the vegetative problem areas are shown in Appendix A. There are a few locations where the density of planted woody stems is not high enough to meet the required stem counts. Densities of planted woody species are discussed in the Stem Counts section of this report.

Table VII. Vegetative Problem Areas
Bailey Fork Stream Restoration / EEP Project No. D04006-02

Feature/Issue	Station # / Range	Probable Cause	Photo #
Invasive Population	Throughout: See VPA Plan View	*Sericea lespedeza*: encroachment from pasture	VPA 1, VPA 2
Bare Bank	Vegetation Plot 6	Plot has been partially removed during streambank maintenance; woody vegetation was lost	VPA 3

The most pervasive vegetative problem is the spread of an invasive species, *Sericea lespedeza.* This species is a common component of pasture mixes, and as this project is adjacent to

pasture/hay lands, it likely spread into the project area from the surrounding landscape. The spread of the species is extensive throughout the project corridor. Management is planned for the spring of 2008 to combat further spread and attempt to eradicate much of this species from areas where it has negatively impacted the survival of planted woody vegetation. This management will include herbicide treatments, sprayed in a manner to minimize the impact on planted woody vegetation. Management of the woody vegetation is discussed in the Stem Counts section of this report. Further spraying will be conducted during 2008 if deemed necessary.

The remaining vegetation problem area was a section along Upper Bailey Fork where remedial maintenance activities along the stream banks impacted Vegetation Plot #6. These activities were represented by a plan sent by email to EEP on August 3, 2007 and subsequently discussed in the field with the EEP following completion. The focus of the efforts to repair the degraded reaches of the channel was to improve channel bank stability by creating a more stable bank slope that also provided a more stable width to depth relationship within the bankfull channel. In order to accomplish this, the existing banks were cut back to decrease the slope, which disturbed half of Vegetation Plot #6. The vegetation in the remainder of the plot, along with much of the buffer vegetation along the top of the slope at this location was damaged or destroyed by the construction activities. The streambanks were reseeded upon completion of maintenance activities, and new trees will be planted in the spring of 2008.

3. Vegetation Problem Area Plan View

The location of each vegetation problem area is shown on the vegetative problem area plan view included in Appendix A. Each problem area is color coded with yellow for areas of low concern (areas to be watched) or red for high concern (areas where maintenance is warranted).

4. Stem Counts

A summary of the stem count data for each species arranged by plot is shown in Table 8. This data was compiled from the information collected on each plot using the *CVS-EEP Protocol for Recording Vegetation, Version 4.0.* Additional data tables generated using the CVS-EEP format are included in Appendix A. All vegetation plots are labeled as VP in Figure 2.

Table VIII. Stem counts for each species arranged by plot. Bailey Fork Stream Restoration / EEP Project No. D04006-02													
Species	Vegetation Plots										Year 1 Totals	Year 2 Totals	Survival %
	1	2	3	4	5	6	7	8	9	10			
Shrubs													
Alnus serrulata	1										1	1	100
Cephalanthus occidentalis	1		1				1				3	3	100
Cornus amomum				3				3	2	1	9	9	100
Rosa palustris	2										2	2	100
Trees													
Liriodendron tulipifera				1			3				15	4	27
Platanus occidentalis	1	1	10	4	1		6			7	35	30	86
Quercus pagoda	1	9					4	9	5		31	28	90
Quercus phellos			1	1			1	2			9	5	56
Salix nigra											1	0	0
Totals	6	10	12	9	1	0	15	14	7	8	106	82	77
Live Stem Density (stems per acre)	243	405	486	365	41	0	608	567	284	324			
Average Live Stem Density (stems per acre)	332												

The average stem density for the site exceeds the minimum criteria of 320 stems per acre after three years. Four individual plots have stem densities below the minimum; however, four seedlings have recruited in Plot #1, which would increase the stem count to exceed the minimum criteria. Plot #6 was discussed in the Vegetation Problem Areas section of this report. Plot #5 was damaged by pasture mowing in Year 1; seedlings have not recruited back into this plot. The final plot, Plot #9, is densely covered by *Sericea lespedeza.*

It is likely that the spread of *Sericea lespedeza* throughout much of the project corridor has hindered the growth and survival of woody vegetation. Where present, this species is dominant, providing a thick coverage of growth approximately three feet high through which any species must break in order to receive sunlight or rainfall. After management of this species is conducted in the spring of 2008, as discussed previously, a round of remedial tree plantings will be conducted. These plantings are intended to bring deficient areas of the site back into compliance with the 320 stems per acre minimum, and to replace trees inadvertently impacted by the herbicide treatments. The plantings will be spread throughout the project corridor, with an emphasis placed on those plots below the minimum stem count threshold.

5. Vegetation Plot Photos

Vegetation plot photos are provided in Appendix A.

B. Stream Assessment

1. Hydrologic Criteria

One bankfull event was documented for the site, as reported in the Mitigation As-Built Report. Additional events have been recorded, as listed in Table IX.

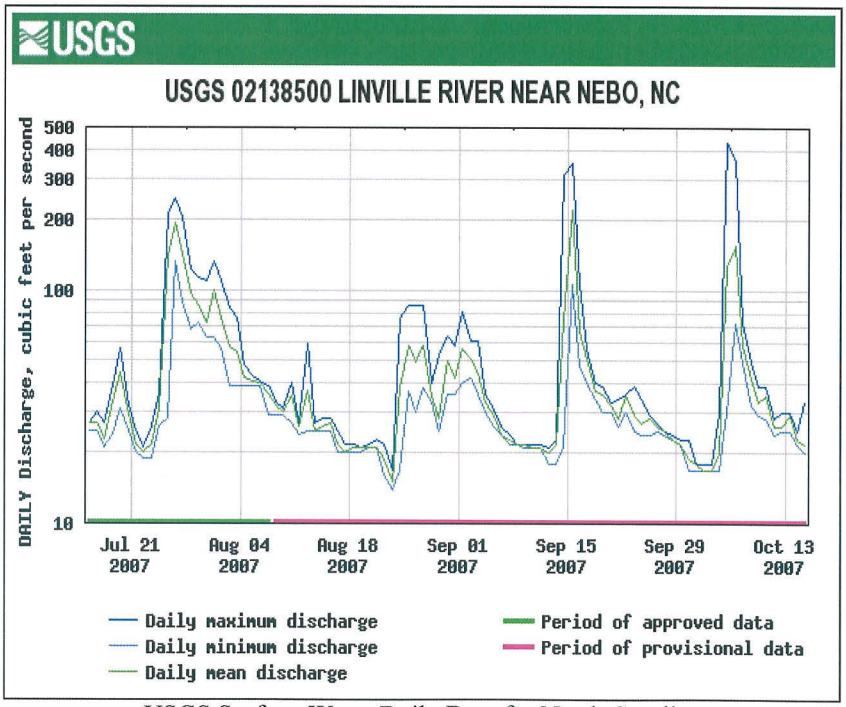
Table IX. Verification of Bankfull Events

Date of Data Collection	Date of Occurrence	Method	Photo #
10/31/05	10/7/05-10/8/05	Photographs; Stream Gage Data	In Mitigation Plan
7/19/07	Unknown	Crest Gage 1 on UT1	BF 1
10/17/07	9/14/07-9/15/07*	Crest Gage 4 on Lower Bailey	BF 2

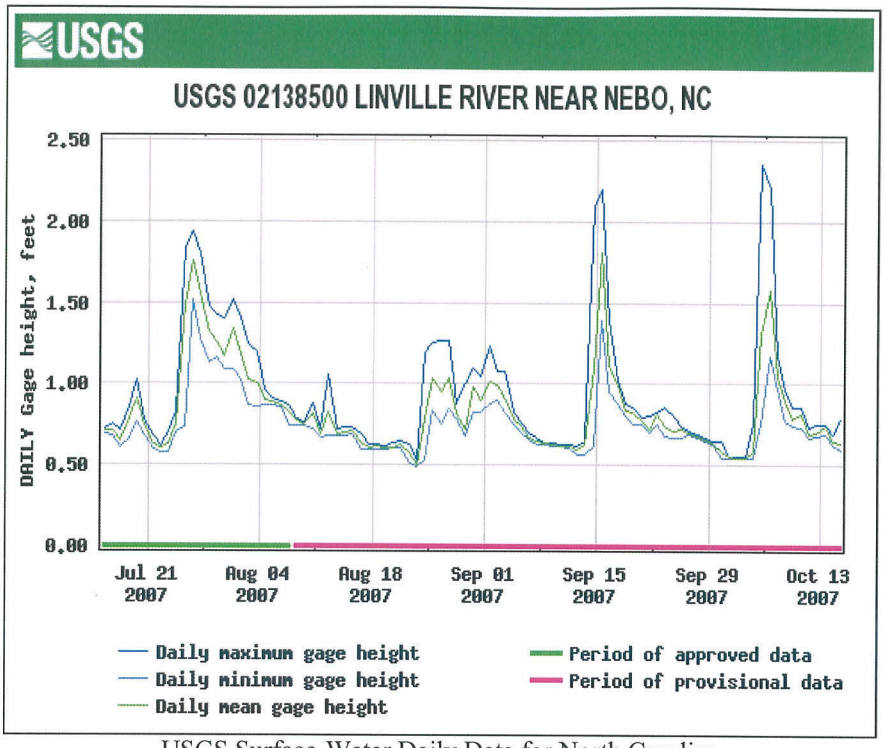
*Date is approximate; based on a review of recorded rainfall data

The crest gage on UT1 had registered a bankfull event when examined in July of 2007. In October 2007, the crest gage on Lower Bailey Fork registered a bankfull event. The height of the bankfull events were not measured for either crest gage. Photographs of the crest gages are shown in Appendix B.

The most likely date for the bankfull event between the July and October readings was after the September 14, 2007 rain event. On this date, rainfall as recorded in Morganton, NC totaled 1.47 inches, according to National Weather Service data. As this was the only precipitation event of significance during these three months, it is likely the bankfull event recorded by the crest gage read on October 17, 2007. This corresponds to a high discharge event on September 15, as recorded at USGS gage 02138500 at Nebo, NC, which lies approximately 15 miles west of Morganton and 5 miles east of Marion, NC. The discharge and gage height recorded at the Nebo station are graphed below.



USGS Surface-Water Daily Data for North Carolina
http://waterdata.usgs.gov/nc/nwis/dv?



USGS Surface-Water Daily Data for North Carolina
http://waterdata.usgs.gov/nc/nwis/dv?

2. Stream Problem Areas

A summary of the areas of concern identified during the visual assessment of the stream for each year of monitoring is included in Tables Xa and Xb.

A few unstable areas were found along the upper and lower reaches on Bailey Fork mainstem in Year 2, including areas of aggradation and bank scour. Bank scour at station 3+50 widened the channel increasing its width/depth ratio resulting in aggradation. The area of aggradation at station 4+00 on Upper Bailey Fork was no longer present in Year 2. In addition, most of the areas of bank scour at each of the areas of bank failure were repaired during the remedial stream maintenance conducted in August 2007. These repairs have been effective, with no anticipated need for further work. The remaining areas of aggradation and bank scour have become heavily vegetated in Year 2, which is providing greater streambank stability than was present during the previous year.

Several structures along Upper Bailey Fork and Tributaries UT1 and UT2 have become impacted by channel aggradation at these structures. Three additional structures were found to be at least partially embedded in sediment during the Year 2 visual assessment, including one J-hook on Upper Bailey Fork (station 2+50), one J-hook (station 0+50) and one rock sill (station 12+00) on UT1. Sand is the dominant streambed substrate in the project reaches. Sediment aggradation over the noted structures is attributed to high sediment supply upstream in the watershed; however, in each area where a structure is embedded, the channel is stable, with no bank failure or bar formation. One structure was also removed from the problem area list in Year 2, as the rock sill at the upstream end of UT1 (station 0+25) has become cleared of sand and is providing grade control.

Table Xa. Stream Problem Areas – Year 1 Bailey Fork Stream Restoration / EEP Project No. D04006-02			
Feature Issue	**Station Numbers**	**Suspected Cause**	**Photo Number**
Aggradation	4+00 - 4+25 Upper	Lateral bar; bank material moving	SPA 1 (Year 1 Report)
	1+50 - 2+00 Upper	Lateral bar; bank material moving	
Bank failure	9+00 Lower	Rootwad causing reverse circulation leading to downstream bank scour and undercutting	SPA 2 (Year 1 Report)
	8+00 Lower	Large boulder fell out of bank; bank undercutting	
	11+50 Upper	Bank armor has fallen, undercutting	
Bank scour	11+80 - 12+50 Upper	Coir matting has fallen, bank erosion; deposition downstream	SPA 3 (Year 1 Report)
	10+25 Upper	Rootwad causing reverse circulation leading to downstream bank scour and undercutting	
	3+50 Upper	Channel is over widened, bank is slumping	
Stressed/failing structure	5+60 UT2	Embedded rock sill; channel is stable	SPA 4 (Year 1 Report)
	2+50 UT2	Embedded cross-vane; channel is stable	
	1+25 UT2	Embedded J-hook; channel is stable	
	14+75 Upper	Partially embedded J-hook; channel is stable	
	13+00 Upper	Embedded J-hook; channel is stable	
	10+60 UT1	Embedded rock sill ; channel is stable	
	3+25 UT1	Partially embedded J-hook; channel is stable	
	0+50 UT1	Embedded J-hook; channel is stable	
	0+25 UT1	Embedded rock sill ; channel is stable	
Other	7+00 UT1	Sinkhole adjacent to channel; piping water	SPA 5 (Year 1 Report)

Table Xb. Stream Problem Areas – Year 2 Bailey Fork Stream Restoration / EEP Project No. D04006-02			
Feature Issue	**Station Numbers**	**Suspected Cause**	**Photo Number**
Aggradation	1+50 - 2+00 Upper	Point bar; vegetated and stable	SPA 1, SPA 2
	1+75 Lower	Mid-channel bar	
Bank scour	3+50 Upper	Channel overwidened, left bank is slumping, W/D too high resulting in aggradation.	SPA 3, SPA 4
Stressed/failing structure	5+60 UT2	Embedded rock sill; channel is stable	SPA 5, SPA 6
	2+50 UT2	Embedded cross-vane; channel is stable	
	1+25 UT2	Embedded J-hook; channel is stable	
	14+75 Upper	Partially embedded J-hook; channel is stable	
	13+00 Upper	Embedded J-hook; channel is stable	
	2+50 Upper	Embedded J-hook; channel is stable	
	12+00 UT1	Embedded rock sill; channel is stable	
	10+60 UT1	Embedded rock sill ; channel is stable	
	3+25 UT1	Partially embedded J-hook; channel is stable	
	2+00 UT1	Embedded J-hook; channel is stable	
	0+50 UT1	Embedded J-hook; channel is stable	
Other	7+00 UT1	Sinkhole adjacent to channel; has improved since the previous year due to floodplain deposition	

3. Stream Problem Areas Plan View

The location of each structural problem area is shown on the stream problem area plan view included in Appendix B. Each problem area is color coded with yellow for areas of low concern (areas to be watched) or red for high concern (areas where maintenance is warranted).

4. Stream Problem Areas Photos

Photographs of the stream problem areas noted in Table Xb are included in Appendix B.

5. Fixed Station Photos

Photographs were taken at each established photograph station on October 22, 2007. These photographs are provided in Appendix B.

6. Stability Assessment Table

The visual stream assessment was performed to determine the percentage of stream features remaining in a state of stability after the first year of monitoring. A summary of the visual assessment for each reach is included in Table XIa through Table XId. This summary was compiled from the more comprehensive Table B1, included in Appendix B. Each of the structures shown on the as-built plans were assessed during monitoring and reported in the tables.

Table Xa. Categorical Stream Feature Visual Stability Assessment
Bailey Fork Stream Restoration / EEP Project No. D04006-02
Segment/Reach: Upper

Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles[1]	100%	87%	87%			
B. Pools[2]	100%	88%	88%			
C. Thalweg	100%	100%	100%			
D. Meanders	100%	91%	98%			
E. Bed General	100%	98%	98%			
F. Vanes / J Hooks etc. [3]	100%	97%	96%			
G. Wads and Boulders[4]	N/A	N/A	100%			

Table Xb. Categorical Stream Feature Visual Stability Assessment
Bailey Fork Stream Restoration / EEP Project No. D04006-02
Segment/Reach: Lower

Feature	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
A. Riffles[1]	100%	100%	100%			
B. Pools[2]	100%	100%	100%			
C. Thalweg	100%	100%	100%			
D. Meanders	100%	91%	100%			
E. Bed General	100%	100%	99%			
F. Vanes / J Hooks etc. [3]	100%	100%	100%			
G. Wads and Boulders[4]	N/A	N/A	N/A			

Table Xc. Categorical Stream Feature Visual Stability Assessment Bailey Fork Stream Restoration / EEP Project No. D04006-02 Segment/Reach: UT1						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
A. Riffles[1]	100%	93%	92%			
B. Pools[2]	100%	89%	87%			
C. Thalweg	100%	100%	100%			
D. Meanders	100%	100%	100%			
E. Bed General	100%	100%	100%			
F. Vanes / J Hooks etc. [3]	100%	97%	97%			
G. Wads and Boulders[3]	100%	100%	100%			

Table Xd. Categorical Stream Feature Visual Stability Assessment Bailey Fork Stream Restoration / EEP Project No. D04006-02 Segment/Reach: UT2						
Feature	**Initial**	**MY-01**	**MY-02**	**MY-03**	**MY-04**	**MY-05**
A. Riffles[1]	100%	100%	89%			
B. Pools[2]	100%	96%	86%			
C. Thalweg	100%	100%	100%			
D. Meanders	100%	100%	100%			
E. Bed General	100%	100%	100%			
F. Vanes / J Hooks etc. [3]	100%	95%	95%			
G. Wads and Boulders[4]	N/A	N/A	N/A			

[1]Riffles are assessed using the longitudinal profile. A riffle is determined to be stable based on a comparison of location and elevation with respect to the as-built profile.
[2]Pools are assessed using the longitudinal profile. A pool is determined to be stable based on a comparison of location and elevation with respect to the as-built profile and a consideration of appropriate depth.
[3]Physical structures such as vanes, J-hooks, and root wads are assessed using the as-built plan sheets to define the location of such features. A structure is considered stable if the feature remains functional in the same location as shown in the as-built plan.
[4]Those features not included in the stream restoration were labeled N/A. This includes structures such as rootwads and boulders.

Identified problematic structures on Tributaries UT1 and UT2 were vanes/J-hooks. Each of the affected structures has become embedded in fine sediment. However, the channel is stable at each location where aggradation has covered a structure. The percentage of embedded features has remained relatively the same for both tributaries from Year 1 to Year 2.

As a result of the streambank maintenance that occurred along Lower Bailey Fork during August 2007, each meander that was in an unstable state during Year 1 has been repaired and stabilized. At profile station 1+75 on Lower Bailey Fork, bed instability was noted in Year 2 where a mid-channel bar formed. Mid-channel bars form due to over widening of the channel (i.e., increase in width/depth ratio). During high flows and bankfull events, the hydraulics created by a longitudinal mid-channel bars divert stream power from the center of the channel and increases shear stress in the near-bank region along both sides of the channel. Left unchecked, mid-channel bars have a general tendency to enlarge over time and contribute to ongoing channel overwidening by eroding both the left and right banks. This location will continue to be monitored for on-going instability in future monitoring years.

Upper Bailey Fork had several categories where unstable features were noted. However, the stability percentages between Year 1 and 2 are very similar for the categories "bed general", "vanes/J-hooks", and the stability percentage improved for the "meanders" category. As on Lower Bailey Fork, the eroding meanders were repaired and remained stable through Year 2. Noted structures are embedded by fine sediment along this reach. However, the channel remains stable at each location where aggradation has covered a structure.

Three of the four stream reaches were noted to have unstable pools and riffles; in the tributaries, particularly UT2, the stability percentage decreased from Year 1 to Year 2. Deposition was deemed the likely cause for those pools and riffles that differed in profile from the as-built. Some of the pools have become quite shallow, a few to the point of losing pool functions. The unstable riffles were typically areas where a structure had become covered by sediment. The decline in stability percentage from Year 1 to Year 2 was attributed to sedimentation, as aggradation was a visible trend throughout the profiles in Year 2. This bedform adjustment may be attributed to extended drought during the summer of 2007 and minimal flushing of sand-sized particles through the project reaches. Despite the deposition, the channel appears to be stable, and no maintenance is planned for these features.

7. Quantitative Measures

Graphic interpretations of cross-sections, profiles and pebble counts are provided in Appendix B. A summary of the baseline morphology for the site is included in Table XII for comparison with the monitoring data shown in the tables in the appendices. Geomorphic data in Table XII, except for the Year 1 and 2 monitoring data, was provided by Natural Systems Engineering. Year 0 data presented in cross-sections and profiles, contained in Appendix B, were also provided by Natural Systems Engineering.

The stream pattern data provided for Year 1 and Year 2 is the same as the data provided from the As-Built survey, as pattern has not changed based on Year 1 and Year 2 stream surveys and visual field assessments.

Bedform features continue to evolve along the restored reaches as shown on the long-term longitudinal profiles. Riffle lengths and slopes are stable. Pool to pool spacings are representative of reference reach conditions, adjusted for drainage area and bankfull width. The pools have developed excellent glide features, providing spawning habitat for native fishes and riffle substrates conducive for benthic macro-invertebrate populations to re-emerge. Of interest, is the change (median decrease) in pool to pool spacings between Year 1 and Year 2 on Lower Bailey Fork and to a lesser degree on the other long-term monitoring profiles. This bedform adjustment may be attributed to extended drought during the summer of 2007 (low flow conditions) and minimal flushing of sand-sized particles through the project reaches. Future monitoring may confirm this hypothesis. Comparison of As-Built, Year 1 and Year 2 long-term stream monitoring data show successive increases in channel-floodplain connectivity and increasingly stable channel dimensions, interpreted from width/depth ratios, entrenchment ratios, and bank height ratios, with exceptions noted, as shown on the long-term monitoring cross-sections.

The constructed riffles remain stable, with a median particle size ranging from very coarse gravel to small cobble. The pools substrate remained stable as well, with median particle sizes ranging from fine to coarse sand based on Year 2 substrate analysis. Further remedial maintenance work on the stream channel is not planned at this time.

The median bankfull dimensions, pattern and profile measurements presented in Table XII for Upper Bailey Fork, show this reach has re-established predominant C4 cross-section, bedform and planiform features.

Exhibit Table XII. Baseline Morphology and Hydraulic Summary

Bailey Fork Stream Restoration / EEP Project No. D04006-02

Station/Reach: Upper {Long-Term Monitoring Profile Station 0+00 to 8+00 (800 feet)}

Parameter	Regional Curve Data			Reference Reach			Pre-Existing Condition			Design			As-Built XSs 5 & 8			Year 1 Sta. 0+00 - 8+00			Year 2 Sta. 0+00 - 8+00		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area (mi^2)			4.90	0.14	1.70	0.92			4.90			4.90			4.90			4.90			4.90
BF Width (ft)			25.10	7.35	10.80	9.08	19.90	26.47	23.19			28.00	28.20	37.70	32.95	29.07	30.94	30.01	28.89	36.63	32.76
Floodprone Width (ft)				43.00	150.00	96.50	180.00	180.00	180.00			280.00	100.00	109.00	104.50	99.20	109.50	104.35	99.84	109.52	104.68
BF Cross Sectional Area (ft^2)			63.62	9.10	20.70	14.90	67.37	71.69	69.53			65.00	71.70	81.80	76.75	77.68	102.22	89.95	77.14	89.37	83.26
BF Mean Depth (ft)			2.53	1.30	2.10	1.70	2.71	3.38	3.05			2.30	2.30	2.30	2.30	2.67	3.30	2.99	2.44	2.67	2.56
BF Max Depth (ft)				1.80	2.80	2.30	4.55	4.96	4.76			4.20	4.10	5.20	4.65	4.14	5.39	4.77	4.25	4.63	4.44
Width/Depth (ft)			9.92	5.65	5.14	5.40	7.34	7.83	7.59			12.20	12.26	16.39	14.33	9.38	10.89	10.14	10.82	15.01	12.92
Entrenchment Ratio				5.85	13.89	9.87	9.05	9.04	9.04			10.00	3.55	2.89	3.22	3.41	3.54	3.48	2.99	3.46	3.23
Bank Height Ratio				0.70	1.00	0.85	1.80	2.10	1.95			1.00	1.00	1.10	1.05	1.00	1.10	1.05	1.10	1.15	1.13
Wetted Perimeter (ft)			30.16	9.95	15.00	12.48	25.32	33.23	29.28			32.60	32.80	42.30	37.55	30.60	34.41	32.51	30.42	37.94	34.18
Hydraulic Radius (ft)			2.11	0.91	1.38	1.15	2.66	2.16	2.41			1.99	1.93	2.19	2.06	2.54	2.97	2.76	2.36	2.54	2.45
Pattern																					
*Channel Beltwidth (ft)				20.00	50.00	35.00	75.00	105.00	90.00	70.00	153.00	111.50	70.00	153.00	111.50	70.00	153.00	111.50	70.00	153.00	111.50
*Radius of Curvature (ft)				10.00	21.00	15.50	18.00	30.00	24.00	42.00	84.00	63.00	42.00	84.00	63.00	42.00	84.00	63.00	42.00	84.00	63.00
*Meander Wavelength (ft)				35.00	50.00	42.50	60.00	96.00	78.00	70.00	154.00	112.00	70.00	154.00	112.00	70.00	154.00	112.00	70.00	154.00	112.00
*Meander Width Ratio				2.00	21.80	11.90	3.20	3.60	3.40	2.50	5.50	4.00	2.50	5.50	4.00	2.41	4.95	3.72	2.42	4.18	3.40
Profile																					
Riffle Length (ft)				3.00	26.40	14.70	15.00	67.80	41.40	23.80	68.00	45.90	23.80	68.00	45.90	5.60	24.00	12.70	13.40	23.75	17.77
Riffle Slope (ft/ft)				0.0068	0.0700	0.0384	0.0086	0.0860	0.0473	0.0020	0.0035	0.0028	0.0020	0.0035	0.0028	0.0120	0.0456	0.0238	0.0045	0.0260	0.0173
Pool Length (ft)				5.50	41.30	23.40	80.00	100.00	90.00	45.00	96.00	70.50	45.00	96.00	70.50	27.90	72.20	51.20	28.23	80.25	53.58
**d50 (mm)				20.0	29.0	24.5	6.0	24.0	15.0				6.9	19.6	13.3			113.4			87.4
Valley Length (ft)				209	295	252.00			1108			1108			1108			550			550
Channel Length (ft)				406	479	442.50			1383.0			1410.4			1543.0			800			800
Sinuosity				1.9	1.6	1.8			1.1			1.3			1.3			1.5			1.5
Water Surface Slope (ft/ft)				0.0044	0.0219	0.0132			0.0024			0.0025			0.0027			0.0019			0.0019
BF Slope (ft/ft)				0.0044	0.0219	0.0132			0.0035			0.0033			0.0020			0.0017			0.0024
Rosgen Classification			E	E4	E4	E4			E-F-G			E4/C4			C4			E4			C4
*Habitat Index																					

* Inclusion will be project specific and determined primarily by As-built monitoring plan/success criteria

Note: Blank fields = Historic project documentation necessary to provide these data were unavailable at the time of this report submission.

**Year 1 data was derived using only the three riffle cross-sections out of the six total cross-sections where pebble count data was collected. For this reach, XS 5 was the only riffle cross-section for which data was collected.

Note: Where only one measurement was taken, that value is posted in the "Med" column.

Exhibit Table XII. Baseline Morphology and Hydraulic Summary

Bailey Fork Stream Restoration / EEP Project No. D04006-02

Station/Reach: Lower {Long-Term Monitoring Profile Station 0+00 to 8+00 (800 feet)}

Parameter	Regional Curve Data			Reference Reach			Pre-Existing Condition			Design			As-Built XS 12			Year 1 Sta 0+00 - 8+00			Year 2 Sta 0+00 - 8+01		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area (mi^2)			5.50	0.14	1.70	0.92			5.50			5.50			5.50			5.50			5.50
BF Width (ft)			26.02	7.35	10.80	9.08	19.90	37.42	28.66			30.00			31.50			32.36			32.71
Floodprone Width (ft)				43.00	150.00	96.50	70.00	143.33	70.00			250.00			106.00			104.21			104.81
BF Cross Sectional Area (ft^2)			67.85	9.10	20.70	14.90	78.11	95.26	86.69			75.00			81.40			81.42			83.19
BF Mean Depth (ft)			2.61	1.30	2.10	1.70	1.60	3.00	2.30			2.50			2.60			2.52			2.54
BF Max Depth (ft)				1.80	2.80	2.30	4.55	4.96	4.76			4.50			4.30			4.35			4.28
Width/Depth (ft)			9.97	5.65	5.14	5.40	5.88	9.77	7.83			12.00			12.12			12.84			12.88
Entrenchment Ratio				5.85	13.89	9.87	6.80	9.04	7.92			8.33			3.37			3.22			3.18
Bank Height Ratio				0.70	1.00	0.85	1.80	2.10	1.95			1.00			1.05			1.05			1.01
Wetted Perimeter (ft)			31.24	9.95	15.00	12.48	23.10	43.42	33.26			35.00			36.70			34.27			34.44
Hydraulic Radius (ft)			2.17	0.91	1.38	1.15	3.38	2.19	2.79			2.14			2.22			2.38			2.42
Pattern																					
*Channel Beltwidth (ft)				20.00	50.00	35.00	75.00	105.00	90.00	98.00	120.00	109.00	98.00	120.00	109.00	98.00	120.00	109.00	98.00	120.00	109.00
*Radius of Curvature (ft)				10.00	21.00	15.50	18.00	30.00	24.00	45.00	90.00	67.50	45.00	90.00	67.50	45.00	90.00	67.50	45.00	90.00	67.50
*Meander Wavelength (ft)				35.00	50.00	42.50	60.00	96.00	78.00	200.00	220.00	210.00	200.00	220.00	210.00	200.00	220.00	210.00	200.00	220.00	210.00
*Meander Width Ratio				2.00	21.80	11.90	3.20	3.60	3.40	3.27	4.00	3.63	3.11	3.81	3.46	3.03	3.71	3.37	3.00	3.67	3.33
Profile																					
Riffle Length (ft)				3.00	26.40	14.70	34.80	69.50	52.15	14.00	40.00	27.00	30.00	55.00	42.50	6.90	15.80	11.35	7.15	18.89	13.13
Riffle Slope (ft/ft)				0.0068	0.0700	0.0384	0.0070	0.0235	0.0153	0.0025	0.0070	0.0048	0.0013	0.0029	0.0021	0.0095	0.0447	0.0271	0.0021	0.0434	0.0196
Pool Length (ft)				5.50	41.30	23.40	27.20	60.00	43.60	20.00	45.00	32.50	50.00	100.00	75.00	27.70	54.10	40.90	14.85	52.77	29.93
**d50 (mm)				20.0	29.0	24.5	6.0	24.0	15.0				6.9	19.6	13.3			46.1			41.8
Valley Length (ft)				209	295	252.00			920			920			920			635			635
Channel Length (ft)				406	479	442.50			1125.3			1174.1			1170.4			800			800
Sinuosity				1.9	1.6	1.8			1.2			1.3			1.3			1.3			1.3
Water Surface Slope (ft/ft)				0.0044	0.0219	0.0132			0.0049			0.0025			0.0028			0.0018			0.0019
BF Slope (ft/ft)				0.0044	0.0219	0.0132			0.0075			0.0033			0.0030			0.0018			0.0016
Rosgen Classification			E	E4	E4	E4			G4/F4			E4/C4			C4			C4			C4
*Habitat Index																					

* Inclusion will be project specific and determined primarily by As-built monitoring plan/success criteria.

Note: Blank fields = Historic project documentation necessary to provide these data were unavailable at the time of this report submission.

**Year 1 data was derived using three riffle cross-sections out of the six total cross-sections from which pebble count data was collected. For this reach, XS 12 was the only riffle cross-section for which data was collected.

Note: Where only one measurement was taken, that value is posted in the "Med" column.

Exhibit Table XII. Baseline Morphology and Hydraulic Summary

Bailey Fork Stream Restoration / EEP Project No. D04006-02

Station/Reach: UT1 {Long-Term Monitoring Profile Station 0+00 to 8+00 (800 feet)}

Parameter	Regional Curve Data			Reference Reach			Pre-Existing Condition			Design			As-Built XSs 1 & 3			Year 1 Sta. 0+00 - 8+00			Year 2 Sta. 0+00 - 8+00		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area (mi^2)			0.54	0.14	1.70	0.92			0.54			0.54			0.54			0.54			0.54
BF Width (ft)			10.93	7.35	10.80	9.08	19.90	26.47	23.19			14.00	16.60	27.40	22.00	14.43	17.76	16.10	14.69	16.26	15.48
Floodprone Width (ft)				43.00	150.00	96.50	180.00	180.00	180.00	65.00	120.00	92.50	64.40	74.00	69.20	63.78	72.92	68.35	58.45	74.45	66.45
BF Cross Sectional Area (ft^2)			14.30	9.10	20.70	14.90	67.37	71.69	69.53			17.50	15.40	27.40	21.40	12.60	15.45	14.03	13.03	16.08	14.56
BF Mean Depth (ft)			1.30	1.30	2.10	1.70	2.71	3.38	3.05			1.30	0.56	1.73	1.15	0.87	0.87	0.87	0.89	0.99	0.94
BF Max Depth (ft)				1.80	2.80	2.30	4.55	4.96	4.76			1.80	1.80	3.00	2.40	1.66	1.98	1.82	1.66	2.03	1.85
Width/Depth (ft)			8.41	5.65	5.14	5.40	5.88	9.77	7.83			10.77	15.84	29.64	22.74	16.59	20.41	18.50	16.42	16.51	16.47
Entrenchment Ratio				5.85	13.89	9.87	6.80	9.04	7.92			6.61	2.70	3.88	3.29	3.59	5.05	4.32	3.59	5.07	4.33
Bank Height Ratio				0.70	1.00	0.85	2.05	2.15	2.10			1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.05	1.03
Wetted Perimeter (ft)			13.53	9.95	15.00	12.48	25.32	33.23	29.28			16.60	17.72	30.86	24.29	15.20	19.06	17.13	15.45	17.34	16.40
Hydraulic Radius (ft)			1.06	0.91	1.38	1.15	2.66	2.16	2.41			1.05	0.87	0.89	0.88	0.81	0.83	0.82	0.84	0.93	0.89
Pattern																					
*Channel Beltwidth (ft)				20.00	50.00	35.00	30.00	40.00	35.00	30.00	80.00	55.00	30.00	80.00	55.00	30.00	80.00	55.00	30.00	80.00	55.00
*Radius of Curvature (ft)				10.00	21.00	15.50	9.00	18.00	13.50	15.00	35.00	25.00	15.00	35.00	25.00	15.00	35.00	25.00	15.00	35.00	25.00
*Meander Wavelength (ft)				35.00	50.00	42.50	48.00	60.00	54.00	55.00	100.00	77.50	55.00	100.00	77.50	55.00	100.00	77.50	55.00	100.00	77.50
*Meander Width Ratio				2.00	21.80	11.90	2.80	3.70	3.25	2.10	5.70	3.90	2.10	5.70	3.90	2.08	4.50	3.42	2.04	4.92	3.55
Profile																					
Riffle Length (ft)				3.00	26.40	14.70	34.80	69.50	52.15	14.00	40.00	27.00	4.00	37.00	14.22	4.70	28.60	15.70	5.02	26.34	14.17
Riffle Slope (ft/ft)				0.0068	0.0700	0.0384	0.0070	0.0235	0.0153	0.0025	0.0070	0.0048	0.0010	0.1830	0.0020	0.0046	0.0645	0.0254	0.0097	0.0559	0.0259
Pool Length (ft)				5.50	41.30	23.40	27.20	60.00	43.60	20.00	45.00	32.50	3.00	37.00	20.00	8.40	56.90	30.80	7.44	54.86	27.36
**d50 (mm)				20.0	29.0	24.5	6.0	24.0	15.0				16.7	22.4	19.6						
Valley Length (ft)				209	295	252.00			1225			1225			1225			575			575
Channel Length (ft)				406	479	442.50			1648.1			1707.3			1758.1			800			800
Sinuosity				1.9	1.6	1.8			1.3			1.4			1.4			1.4			1.4
Water Surface Slope (ft/ft)				0.0044	0.0219	0.0132			0.0024			0.0025			0.0071			0.0047			0.0050
BF Slope (ft/ft)				0.0044	0.0219	0.0132			0.0035			0.0033			0.0064			0.0046			0.0049
Rosgen Classification			E	E4	E4	E4			G4/F4			E4/C4			C4			C4			C4
*Habitat Index																					

* Inclusion will be project specific and determined primarily by As-built monitoring plan/success criteria

Note: Blank fields = Historic project documentation necessary to provide these data were unavailable at the time of this report submission.

**Year 1 and 2 data were derived using three riffle cross-sections out of the six total cross-sections from which pebble count data was collected. No data is reported, as only substrate samples at pool cross-sections were collected.

Note: Where only one measurement was taken, that value is posted in the "Med" column.

Exhibit Table XII. Baseline Morphology and Hydraulic Summary

Bailey Fork Stream Restoration / EEP Project No. D04006-02

Station/Reach: UT2 {Long-Term Monitoring Profile Station 0+00 to 6+00 (600 feet)}

Parameter	Regional Curve Data			Reference Reach			Pre-Existing Condition			Design			As-Built XS 10			Year 1 Sta. 0+00 - 6+00			Year 2 Sta. 0+00 - 6+00		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Drainage Area (mi^2)			0.98	0.14	1.70	0.92			0.98			0.98			0.98			0.98			0.98
BF Width (ft)			13.59	7.35	10.80	9.08			8.20			16.00			18.60			16.97			13.36
Floodprone Width (ft)				43.00	150.00	96.50	12.00	150.00	81.00	60.00	180.00	120.00			67.00			67.00			67.15
BF Cross Sectional Area (ft^2)			21.14	9.10	20.70	14.90			20.10			23.00			18.70			15.43			10.63
BF Mean Depth (ft)			1.55	1.30	2.10	1.70			2.40			1.40			1.00			0.91			0.80
BF Max Depth (ft)				1.80	2.80	2.30			3.50			2.00			1.90			1.55			1.28
Width/Depth (ft)			8.77	5.65	5.14	5.40			3.42			8.00			18.60			18.65			16.70
Entrenchment Ratio				5.85	13.89	9.87			0.00			7.50			3.60			3.95			5.03
Bank Height Ratio				0.70	1.00	0.85			0.00			1.00			1.00			1.00			1.14
Wetted Perimeter (ft)			16.69	9.95	15.00	12.48			0.00			18.80			20.60			17.41			13.98
Hydraulic Radius (ft)			1.27	0.91	1.38	1.15			0.00			1.22			0.91			0.89			0.76
Pattern																					
*Channel Beltwidth (ft)				20.00	50.00	35.00	30.00	33.00	31.50	34.00	91.20	62.60	34.00	91.20	62.60	34.00	91.20	62.60	34.00	91.20	62.60
*Radius of Curvature (ft)				10.00	21.00	15.50	15.00	18.00	16.50	24.00	40.00	32.00	24.00	40.00	32.00	24.00	40.00	32.00	24.00	40.00	32.00
*Meander Wavelength (ft)				35.00	50.00	42.50	66.00	78.00	72.00	56.00	104.00	80.00	56.00	104.00	80.00	56.00	104.00	80.00	56.00	104.00	80.00
*Meander Width Ratio				2.00	21.80	11.90	3.70	4.00	3.85	2.10	5.70	3.90	2.10	5.70	3.90	2.10	5.70	3.90	2.54	6.83	4.69
Profile																					
Riffle Length (ft)				3.00	26.40	14.70	16.00	24.00	20.00	16.00	44.80	30.40	16.00	44.80	30.40	3.60	13.10	8.90	7.71	22.58	14.81
Riffle Slope (ft/ft)				0.0068	0.0700	0.0384	0.0072	0.0650	0.0361	0.0020	0.0045	0.0033	0.0020	0.0045	0.0033	0.0080	0.0616	0.0259	0.0062	0.0108	0.0082
Pool Length (ft)				5.50	41.30	23.40				22.40	48.00	35.20	22.40	48.00	35.20	12.50	53.10	29.00	14.10	48.32	31.78
**d50 (mm)				20.0	29.0	24.5	6.0	24.0	15.0						2.0			45.0			38.5
Valley Length (ft)				209	295	252.00			860			860			860			425			425
Channel Length (ft)				406	479	442.50			898.9			1181.6			1271.0			600			600
Sinuosity				1.9	1.6	1.8			1.1			1.4			1.5			1.4			1.4
Water Surface Slope (ft/ft)				0.0044	0.0219	0.0132			0.0024			0.0025			0.0051			0.0024			0.0030
BF Slope (ft/ft)				0.0044	0.0219	0.0132			0.0035			0.0033			0.0047			0.0026			0.0028
Rosgen Classification			E	E4	E4	E4			G4/F4			E4/C4			C4			C4			C4
*Habitat Index																					

* Inclusion will be project specific and determined primarily by As-built monitoring plan/success criteria

Note: Blank fields = Historic project documentation necessary to provide these data were unavailable at the time of this report submission.

**Year 1 data was derived using three riffle cross-sections out of the six total cross-sections from which pebble count data was collected. For this reach, XS 10 was the only riffle cross-section for which data was collected.

Note: Where only one measurement was taken, that value is posted in the "Med" column.

IV. METHODOLOGY

Year 1 vegetation monitoring was conducted in September 2006 using the *CVS-EEP Protocol for Recording Vegetation, Version 4.0* (Lee, M.T., Peet, RK., Roberts, S.R., Wentworth, T.R. 2006). Year 2 vegetation monitoring was conducted in September 2007 using the same protocol. Year 1 stream monitoring was conducted in April 2007 to provide adequate time between the as-built survey (completed in August 2006) and the Year 1 monitoring survey. Stream monitoring for Year 2 occurred in the fall of 2007, to provide six months between the Year 1 and Year 2 surveys. Subsequent stream monitoring will occur in the fall of Years 3, 4 and 5 to provide a full year between surveys. Vegetation monitoring will continue to be conducted in the fall of each subsequent year of monitoring, providing a full year between vegetative surveys.

APPENDIX A

Vegetation Raw Data

1. Vegetation Problem Area Photos
2. Vegetation Problem Area Plan View
3. Vegetation Monitoring Plot Photos
4. Vegetation Data Tables

VPA 1
View of the dominance of *Sericea lespedeza* in Vegetation Plot 5.
(EMH&T, Inc. 9/18/07)

VPA 2
Overview of the spread of *Sericea lespedeza* along Upper Bailey Fork, looking upstream near station 10+00.
(EMH&T, Inc. 9/18/07)

VPA 3
View of Vegetation Plot 6, where remedial maintenance on the stream impacted the vegetation plot. Half of the plot is missing due to the reshaping of the stream bank and planted woody vegetation has been lost.
(EMH&T, Inc. 9/18/07)

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COUNTY, NORTH CAROLINA

BAILEY FORK

MONITORING

APPENDIX A

VEGETATION PROBLEM AREA PLAN VIEW - YEAR 2

Date:	December, 2007
Scale:	1" = 200'
Job No:	2006-1626

Vegetation Plot 1
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Vegetation Plot 2
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Vegetation Plot 3
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Vegetation Plot 4
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Vegetation Plot 5
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Vegetation Plot 6
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Vegetation Plot 7
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Vegetation Plot 8
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Vegetation Plot 9
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Vegetation Plot 10
Monitoring Year 2
(EMH&T, Inc. 9/18/07)

Table 1. Vegetation Metadata	
Report Prepared By	Holly Blunck
Date Prepared	11/14/2007 8:16
database name	CVS_EEP_DataEntry_v202.mdb
database location	Q:\ENVIRONMENTAL\Monitoring\EEP Vegetation Database
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	This worksheet, which is a summary of the project and the project data.
Plots	List of plots surveyed.
Vigor	Frequency distribution of vigor classes.
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.
Stem Count by Plot and Spp	Count of living stems of each species for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	D040062
project Name	Bailey Fork
Description	Restoration of Bailey Fork and unnamed tributaries
length (ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	10

Table 2. Vegetation Vigor by Species							
	Species	**4**	**3**	**2**	**1**	**0**	**Missing**
	Alnus serrulata	1					
	Cephalanthus occidentalis	3					
	Cornus amomum	6					3
	Quercus pagoda	25	3			1	2
	Quercus phellos	5					3
	Rosa palustris	2					
	Liriodendron tulipifera	2	2			2	9
	Platanus occidentalis	22	8				4
TOT:	**8**	**70**	**16**	**2**	**1**	**3**	**21**

Table 3. Vegetation Damage by Species													
	Species	All Damage Categories	(no damage)	_Enter other damage_	Deer	Diseased	Flood	Insects	Other/Unknown Animal	Site Too Dry	Unknown	(other damage)
	Alnus serrulata	1	1									
	Cephalanthus occidentalis	3	3									
	Cornus amomum	9	9									
	Liriodendron tulipifera	15	15									
	Platanus occidentalis	34	34									
	Quercus pagoda	31	31									
	Quercus phellos	8	8									
	Rosa palustris	2	2									
TOT:	**8**	**103**	**103**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

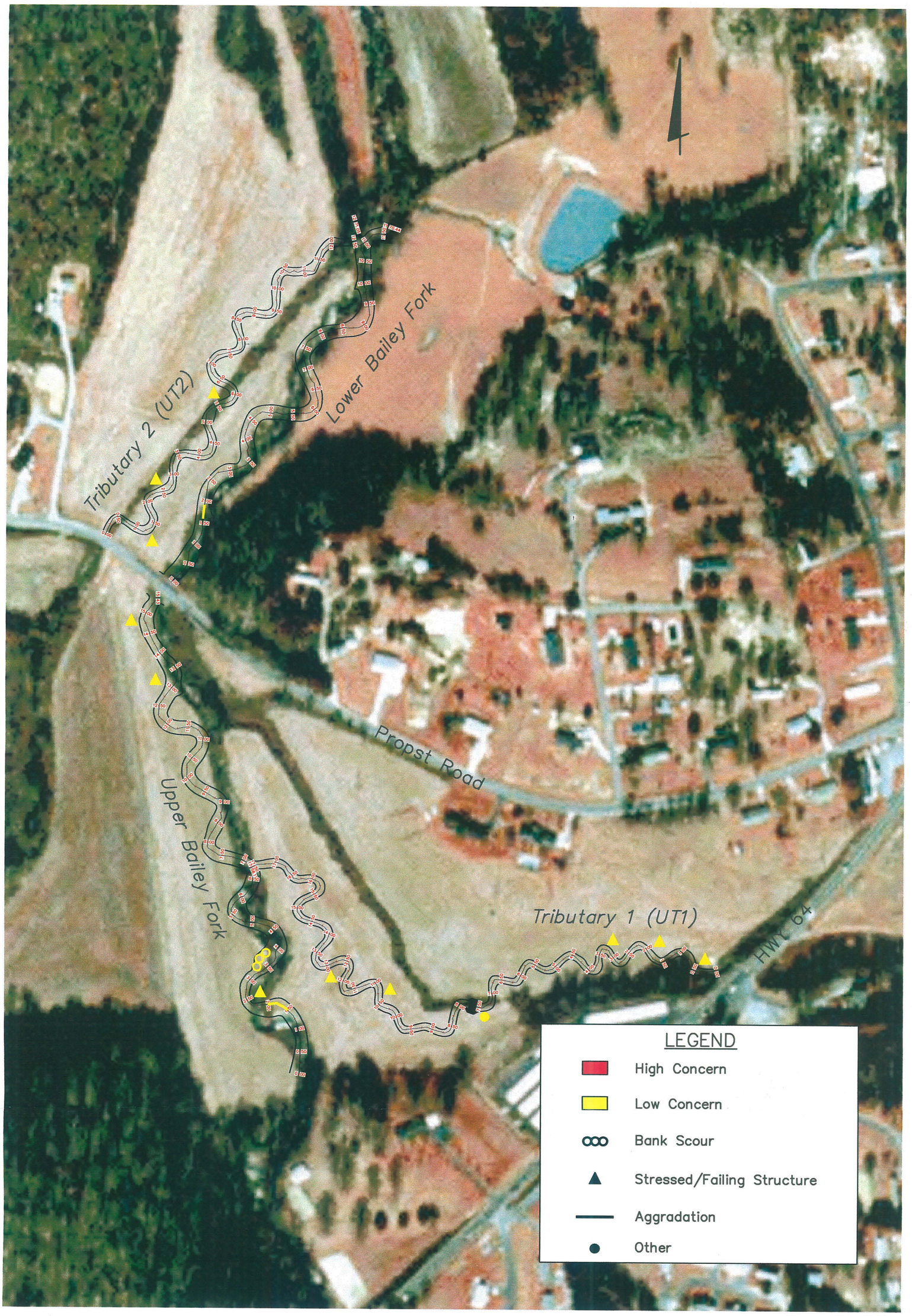
Table 4. Vegetation Damage by Plot												
	plot	All Damage Categories	(no damage)	_Enter other damage_	Deer	Diseased	Flood	Insects	Other/Unknown Animal	Site Too Dry	Unknown	(other damage)
	D040062-01-0001 (year 2)	9	9									
	D040062-01-0002 (year 2)	14	14									
	D040062-01-0003 (year 2)	17	17									
	D040062-01-0004 (year 2)	10	10									
	D040062-01-0005 (year 2)	1	1									
	D040062-01-0006 (year 2)	13	13									
	D040062-01-0007 (year 2)	17	17									
	D040062-01-0008 (year 2)	14	14									
	D040062-01-0009 (year 2)	10	10									
	D040062-01-0010 (year 2)	16	16									
TOT:	**10**	**121**	**121**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**

Table 5. Stem Count by Plot and Species														
	Species	Total Stems	# plots	avg# stems	plot D040062-01-0001 (year 2)	plot D040062-01-0002 (year 2)	plot D040062-01-0003 (year 2)	plot D040062-01-0004 (year 2)	plot D040062-01-0005 (year 2)	plot D040062-01-0006 (year 2)	plot D040062-01-0007 (year 2)	plot D040062-01-0008 (year 2)	plot D040062-01-0009 (year 2)	plot D040062-01-0010 (year 2)
	Alnus serrulata	1	1	1	1									
	Cephalanthus occidentalis	2	2	1	1		1							
	Cornus amomum	8	5	1.6				1			1	3	2	1
	Liriodendron tulipifera	4	2	2				1			3			
	Platanus occidentalis	30	7	4.29	1	1	10	4	1		6			7
	Quercus pagoda	26	5	5.2	1	8					4	9	4	
	Quercus phellos	5	4	1.25			1	1			1	2		
	Rosa palustris	2	1	2	2									
TOT:	**8**	**78**	**8**		**6**	**9**	**12**	**7**	**1**	**0**	**15**	**14**	**6**	**8**

APPENDIX B

Geomorphologic Raw Data

1. Stream Problem Areas Plan View
2. Stream Problem Area Photos
3. Fixed Station Photos
4. Table B1. Qualitative Visual Stability Assessment
5. Cross Section Plots
6. Longitudinal Plots
7. Pebble Count Plots
8. Bankfull Event Photos



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COUNTY, NORTH CAROLINA

BAILEY FORK

MONITORING

APPENDIX B

STREAM PROBLEM AREA PLAN VIEW - YEAR 2

Date:	December, 2007
Scale:	1" = 200'
Job No:	2006-1626

SPA 1
Area of aggradation in Year 1 along Upper Bailey Fork between stations 1+50 and 2+00.
(EMH&T, Inc. 4/13/07)

SPA 2
Area of aggradation in Year 2 along Upper Bailey Fork between stations 1+50 and 2+00.
Lateral bar has become vegetated and is stable.
(EMH&T, Inc. 10/22/07)

SPA 3
Bank scour in Year 1 along Upper Bailey Fork at station 3+50.
(EMH&T, Inc. 4/13/07)

SPA 4
Bank scour in Year 2 along Upper Bailey Fork at station 3+50.
Bank is now vegetated. W/D ratio is too high resulting in aggradation.
(EMH&T, Inc. 10/22/07)

SPA 5
J-hook and root wad in UT1 that have eroded out of channel near station 0+50.
(EMH&T, Inc. 10/22/07)

SPA 6
Embedded J-hook in Upper Bailey Fork near station 2+50.
(EMH&T, Inc. 10/22/07)

Fixed Station 1 (Photo Point 13)
Overview of the valley at the confluence of Lower Bailey Fork and UT2, near the downstream terminus of the project, facing upstream.
(EMH&T, Inc. 10/22/07)

Fixed Station 2 (Photo Point 14)
Overview of valley at confluence of Upper Bailey Fork and UT1, facing across the channel from the left to right bank.
(EMH&T, Inc. 10/22/07)

Fixed Station 3 (Photo Point 15)
Overview of valley along UT1 near the upstream terminus of the project, facing downstream.
(EMH&T, Inc. 10/22/07)

Table B1. Visual Morphological Stability Assessment
Bailey Fork Stream Restoration / EEP Project No. D04006-02
Segment/Reach: Upper

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?	13	15	2	87	
	2. Armor stable (e.g. no displacement)?	13	15	2	87	
	3. Facet grade appears stable?	13	15	2	87	
	4. Minimal evidence of embedding/fining?	13	15	2	87	
	5. Length appropriate?	13	15	2	87	**87%**
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	14	16	2	88	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	14	16	2	88	
	3. Length appropriate?	14	16	2	88	**88%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	11	11	0	100	
	2. Downstream of meander (glide/inflection) centering?	11	11	0	100	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	10	11	1	91	
	2. Of those eroding, # w/concomitant point bar formation?	11	11	0	100	
	3. Apparent Rc within spec?	11	11	0	100	
	4. Sufficient floodplain access and relief?	11	11	0	100	**98%**
E. Bed General	1. Geveral channel bed aggradation areas (bar formation)	N/A	N/A	1/ 50 feet	97	
	2. Channel bed degradation - areas of increasing downcutting or headcutting?	N/A	N/A	0/ 0 feet	100	**98%**
F. Vanes	1. Free of back or arm scour?	16	16	0	100	
	2. Height appropriate?	16	16	0	100	
	3. Angle and geometry appear appropriate?	16	16	0	100	
	4. Free of piping or other structural failures?	16	16	0	100	
	5. Structure buried under aggraded material?	13	16	3	81	**96%**
G. Wads/ Boulders	1. Free of scour?	N/A	0	N/A	N/A	
	2. Footing stable?	N/A	0	N/A	N/A	N/A

Table B1. Visual Morphological Stability Assessment

Bailey Fork Stream Restoration / EEP Project No. D04006-02

Segment/Reach: Lower

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?	9	9	0	100	
	2. Armor stable (e.g. no displacement)?	9	9	0	100	
	3. Facet grade appears stable?	9	9	0	100	
	4. Minimal evidence of embedding/fining?	9	9	0	100	
	5. Length appropriate?	9	9	0	100	**100%**
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	10	10	0	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	10	10	0	100	
	3. Length appropriate?	10	10	0	100	**100%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	6	6	0	100	
	2. Downstream of meander (glide/inflection) centering?	6	6	0	100	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	6	6	0	100	
	2. Of those eroding, # w/concomitant point bar formation?	6	6	0	100	
	3. Apparent Rc within spec?	6	6	0	100	
	4. Sufficient floodplain access and relief?	6	6	0	100	**100%**
E. Bed General	1. Geveral channel bed aggradation areas (bar formation)	N/A	N/A	1/ 25 feet	98	
	2. Channel bed degradation - areas of increasing downcutting or headcutting?	N/A	N/A	0/ 0 feet	100	**99%**
F. Vanes	1. Free of back or arm scour?	9	9	0	100	
	2. Height appropriate?	9	9	0	100	
	3. Angle and geometry appear appropriate?	9	9	0	100	
	4. Free of piping or other structural failures?	9	9	0	100	
	5. Structure buried under aggraded material?	9	9	0	100	**100%**
G. Wads/ Boulders	1. Free of scour?	N/A	0	N/A	N/A	
	2. Footing stable?	N/A	0	N/A	N/A	N/A

Table B1. Visual Morphological Stability Assessment
Bailey Fork Stream Restoration / EEP Project No. D04006-02
Segment/Reach: UT1

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?	33	35	2	94	
	2. Armor stable (e.g. no displacement)?	33	35	2	94	
	3. Facet grade appears stable?	33	35	2	94	
	4. Minimal evidence of embedding/fining?	30	35	5	86	
	5. Length appropriate?	33	35	2	94	**92%**
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	33	35	2	94	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	26	35	9	74	
	3. Length appropriate?	33	35	2	94	**87%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	28	28	0	100	
	2. Downstream of meander (glide/inflection) centering?	28	28	0	100	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	28	28	0	100	
	2. Of those eroding, # w/concomitant point bar formation?	28	28	0	100	
	3. Apparent Rc within spec?	28	28	0	100	
	4. Sufficient floodplain access and relief?	28	28	0	100	**100%**
E. Bed General	1. Geveral channel bed aggradation areas (bar formation)	N/A	N/A	0/ 0 feet	100	
	2. Channel bed degradation - areas of increasing downcutting or headcutting?	N/A	N/A	0/ 0 feet	100	**100%**
F. Vanes	1. Free of back or arm scour?	31	31	0	100	
	2. Height appropriate?	31	31	0	100	
	3. Angle and geometry appear appropriate?	31	31	0	100	
	4. Free of piping or other structural failures?	31	31	0	100	
	5. Structure buried under aggraded material?	26	31	5	84	**97%**
G. Wads/ Boulders	1. Free of scour?	12	12	0	100	
	2. Footing stable?	12	12	0	100	**100%**

Table B1. Visual Morphological Stability Assessment
Bailey Fork Stream Restoration / EEP Project No. D04006-02
Segment/Reach: UT2

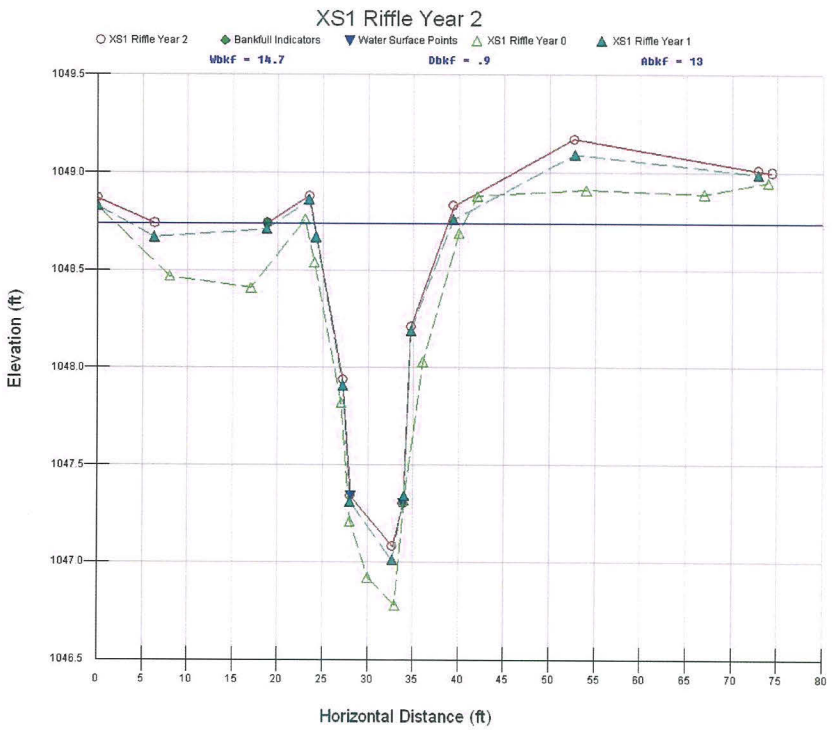
Feature Category	Metric (per As-built and reference baselines	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	17	19	2	89	
	2. Armor stable (e.g. no displacement)?	17	19	2	89	
	3. Facet grade appears stable?	17	19	2	89	
	4. Minimal evidence of embedding/fining?	17	19	2	89	
	5. Length appropriate?	17	19	2	89	**89%**
B. Pools	1. Present? (e.g. not subject to severe aggrad. or migrat.?)	17	19	2	89	
	2. Sufficiently deep (Max Pool D:Mean Bkf>1.6?)	17	19	2	89	
	3. Length appropriate?	15	19	4	79	**86%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	15	15	0	100	
	2. Downstream of meander (glide/inflection) centering?	15	15	0	100	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	15	15	0	100	
	2. Of those eroding, # w/concomitant point bar formation?	15	15	0	100	
	3. Apparent Rc within spec?	15	15	0	100	
	4. Sufficient floodplain access and relief?	15	15	0	100	**100%**
E. Bed General	1. Geveral channel bed aggradation areas (bar formation)	N/A	N/A	0/ 0 feet	100	
	2. Channel bed degradation - areas of increasing downcutting or headcutting?	N/A	N/A	0/ 0 feet	100	**100%**
F. Vanes	1. Free of back or arm scour?	11	11	0	100	
	2. Height appropriate?	11	11	0	100	
	3. Angle and geometry appear appropriate?	11	11	0	100	
	4. Free of piping or other structural failures?	11	11	0	100	
	5. Structure buried under aggraded material?	8	11	3	73	**95%**
G. Wads/ Boulders	1. Free of scour?	N/A	0	N/A	N/A	
	2. Footing stable?	N/A	0	N/A	N/A	N/A

Summary Data

Bankfull Area	13.03 ft^2
Bankfull Width	14.69 ft
Mean Depth	0.89 ft
Maximum Depth	1.66 ft
Width/Depth Ratio	16.51
Entrenchment Ratio	5.07
Classification	C

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	UT1
DATE	10/10/07
CROSS SECTION:	1
FEATURE:	Riffle

Cross-section photo – looking downstream

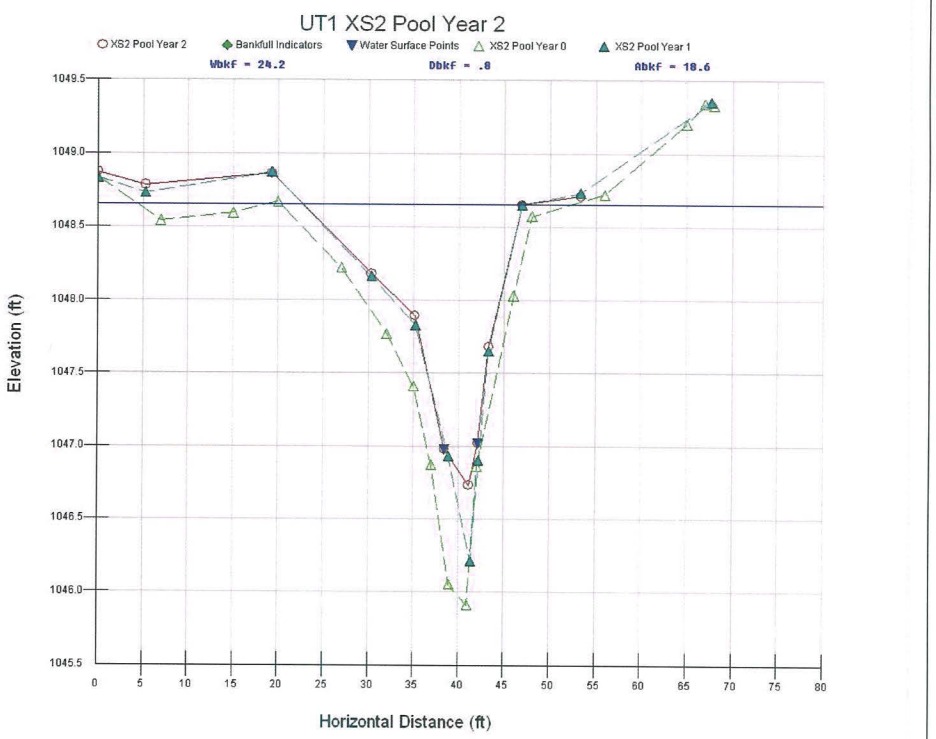


Summary Data

Bankfull Area	18.62 ft^2
Bankfull Width	24.25 ft
Mean Depth	0.77 ft
Maximum Depth	1.92 ft
Width/Depth Ratio	31.49
Entrenchment Ratio	2.2
Classification	C

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	UT1
DATE	10/10/07
CROSS SECTION:	2
FEATURE:	Pool

Cross-section photo – looking downstream

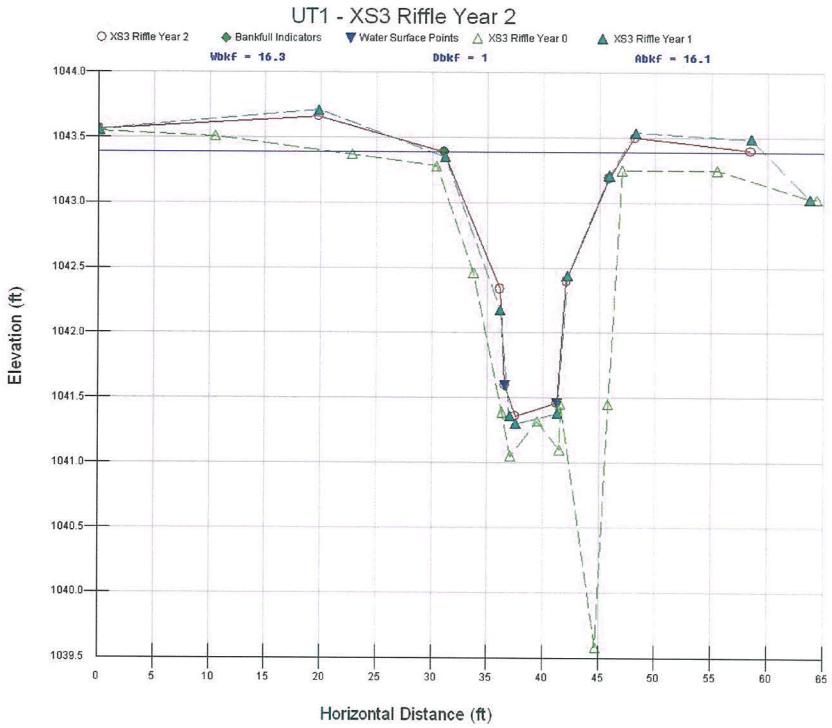


Summary Data

Bankfull Area	16.08 ft^2
Bankfull Width	16.26 ft
Mean Depth	0.99 ft
Maximum Depth	2.03 ft
Width/Depth Ratio	16.42
Entrenchment Ratio	3.59
Classification	C

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	UT1
DATE	10/10/07
CROSS SECTION:	3
FEATURE:	Riffle

Cross-section photo – looking downstream

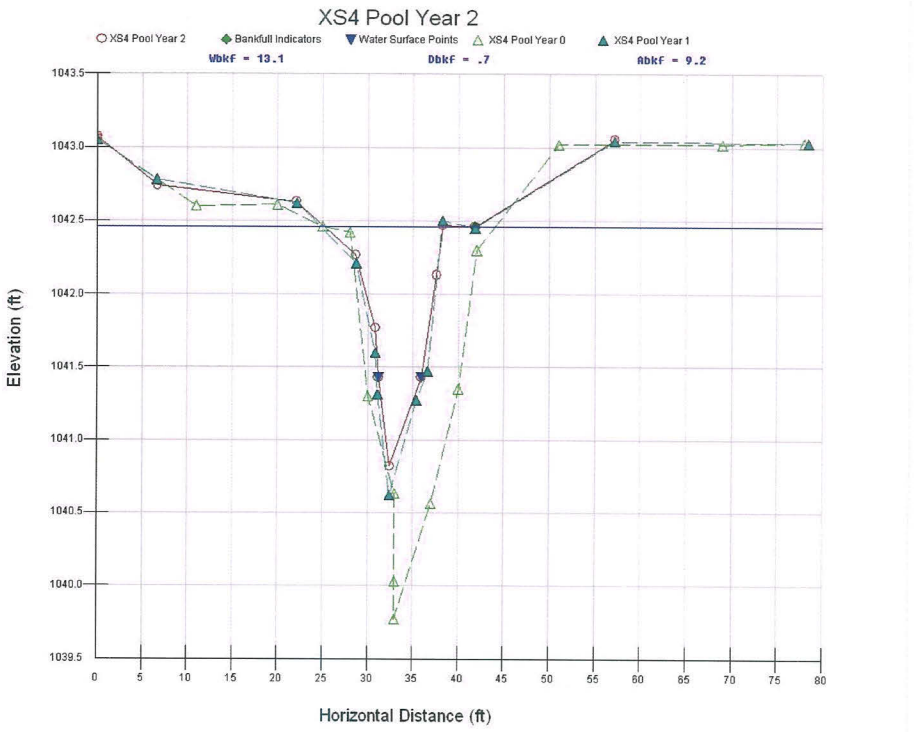


Summary Data

Bankfull Area	9.17 ft^2
Bankfull Width	13.07 ft
Mean Depth	0.70 ft
Maximum Depth	1.64 ft
Width/Depth Ratio	18.67
Entrenchment Ratio	4.38
Classification	C

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	UT1
DATE	10/10/07
CROSS SECTION:	4
FEATURE:	Pool

Cross-section photo – looking downstream



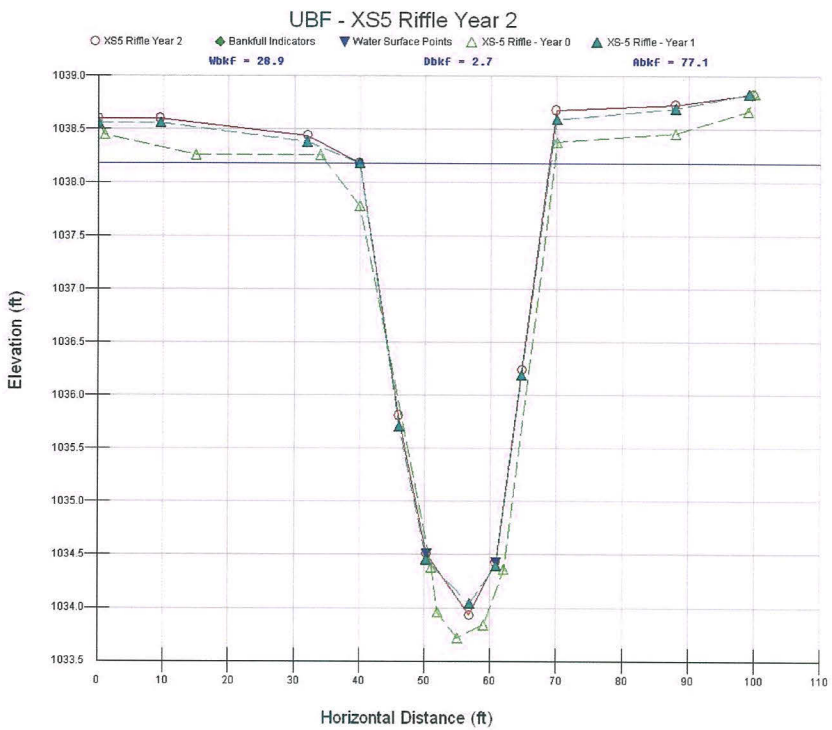
EMH&T

Summary Data

Bankfull Area	77.14 ft^2
Bankfull Width	28.89 ft
Mean Depth	2.67 ft
Maximum Depth	4.25 ft
Width/Depth Ratio	10.82
Entrenchment Ratio	3.46
Classification	E

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	Upper
DATE	10/10/07
CROSS SECTION:	5
FEATURE:	Riffle

Cross-section photo – looking downstream

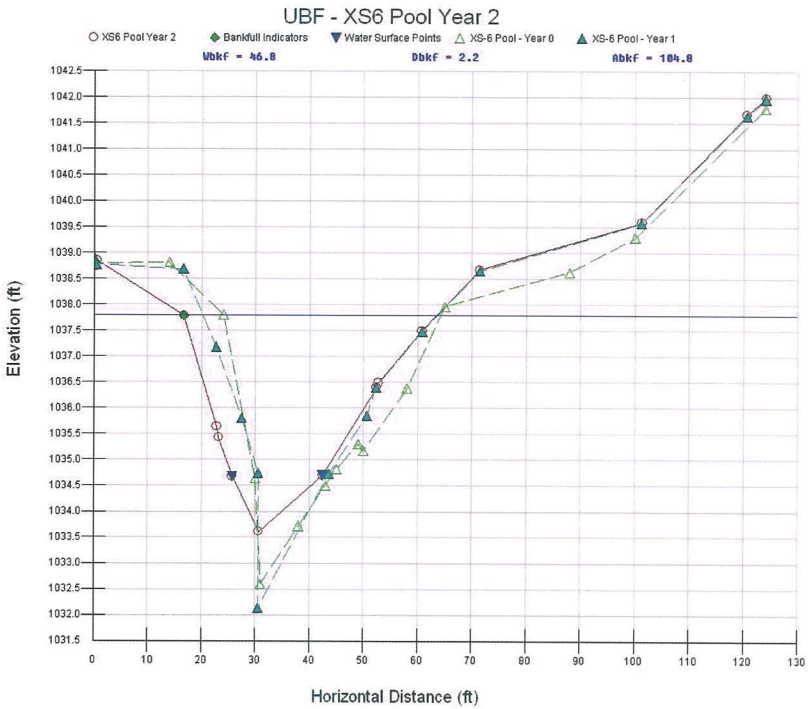


Summary Data

Bankfull Area	104.83 ft^2
Bankfull Width	46.78 ft
Mean Depth	2.24 ft
Maximum Depth	4.18 ft
Width/Depth Ratio	20.88
Entrenchment Ratio	2.65
Classification	C

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	Upper
DATE	10/10/07
CROSS SECTION:	6
FEATURE:	Pool

Cross-section photo – looking downstream

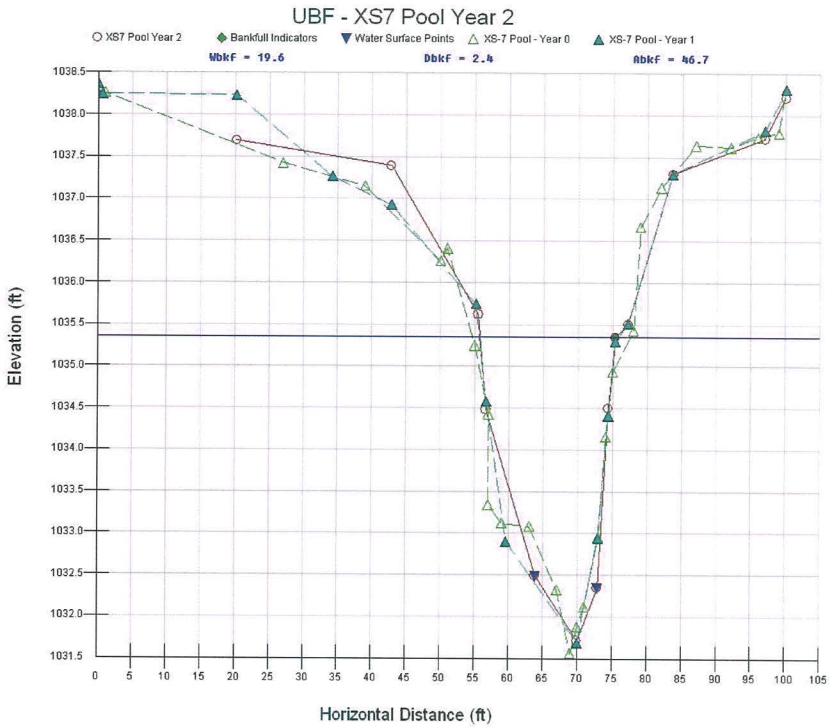


Summary Data

Bankfull Area	46.71 ft^2
Bankfull Width	19.61 ft
Mean Depth	2.38 ft
Maximum Depth	3.64 ft
Width/Depth Ratio	8.24
Entrenchment Ratio	4.07
Classification	E

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	Upper
DATE	10/10/07
CROSS SECTION:	7
FEATURE:	Pool

Cross-section photo – looking downstream

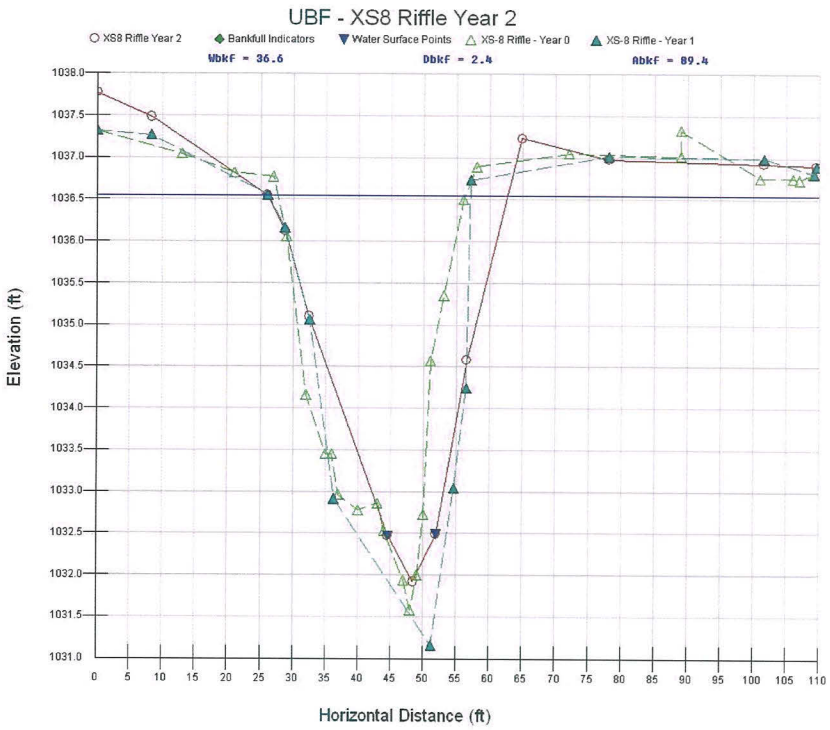


Summary Data

Bankfull Area	89.37 ft^2
Bankfull Width	36.63 ft
Mean Depth	2.44 ft
Maximum Depth	4.63 ft
Width/Depth Ratio	15.01
Entrenchment Ratio	2.99
Classification	E

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	Upper
DATE	10/10/07
CROSS SECTION:	8
FEATURE:	Riffle

Cross-section photo – looking downstream

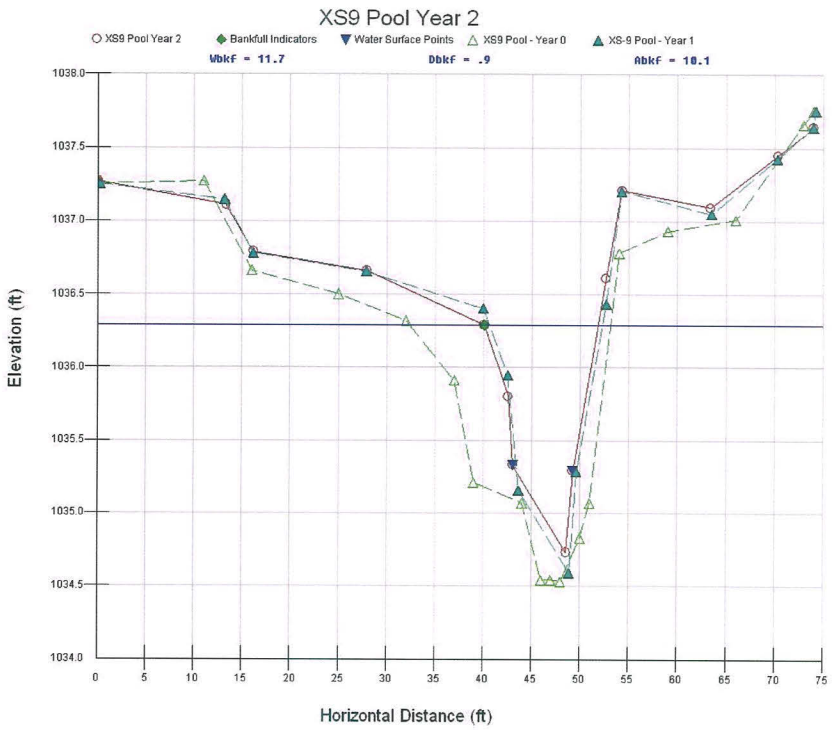


Summary Data

Bankfull Area	10.05 ft^2
Bankfull Width	11.71 ft
Mean Depth	0.86 ft
Maximum Depth	1.56 ft
Width/Depth Ratio	13.62
Entrenchment Ratio	6.32
Classification	C

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	UT2
DATE	10/10/07
CROSS SECTION:	9
FEATURE:	Pool

Cross-section photo – looking downstream

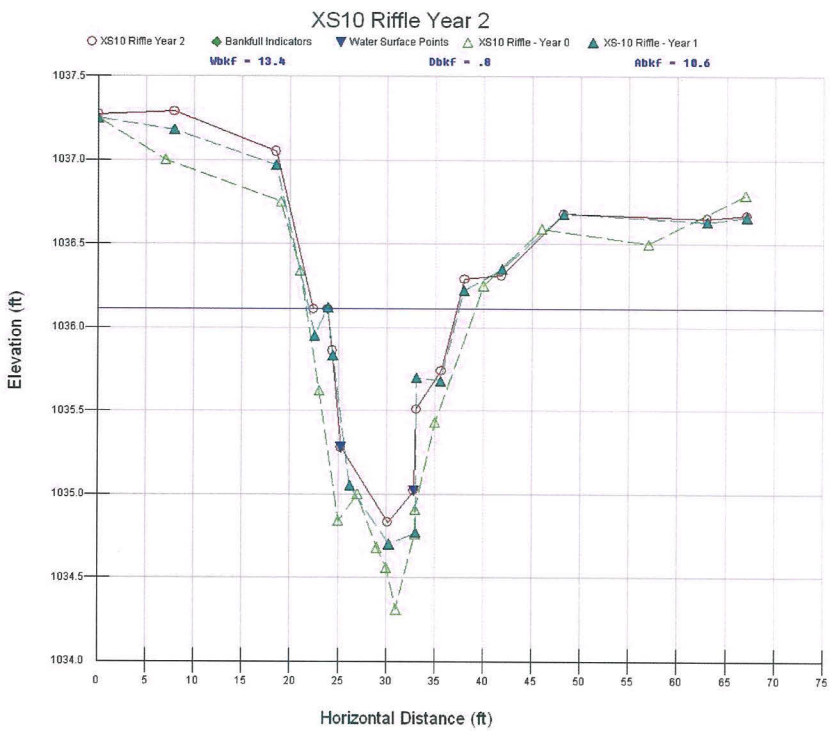


Summary Data

Bankfull Area	10.63 ft^2
Bankfull Width	13.36 ft
Mean Depth	0.80 ft
Maximum Depth	1.28 ft
Width/Depth Ratio	16.70
Entrenchment Ratio	5.03
Classification	C

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	UT2
DATE	10/10/07
CROSS SECTION:	10
FEATURE:	Riffle

Cross-section photo – looking downstream

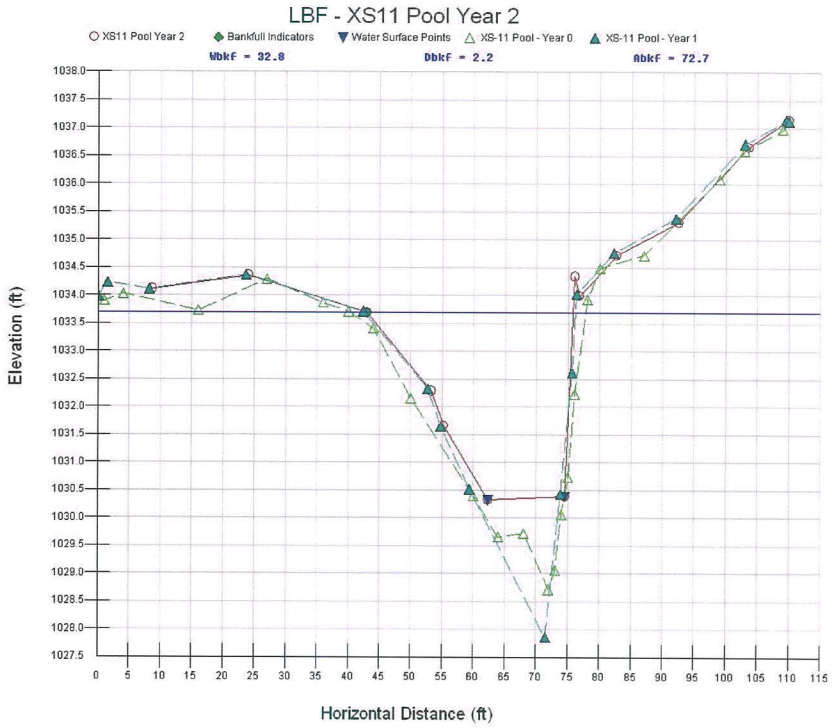


Summary Data

Bankfull Area	72.71 ft^2
Bankfull Width	32.84 ft
Mean Depth	2.21 ft
Maximum Depth	3.37 ft
Width/Depth Ratio	14.86
Entrenchment Ratio	3.05
Classification	C

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	Lower
DATE	10/10/07
CROSS SECTION:	11
FEATURE:	Pool

Cross-section photo – looking downstream

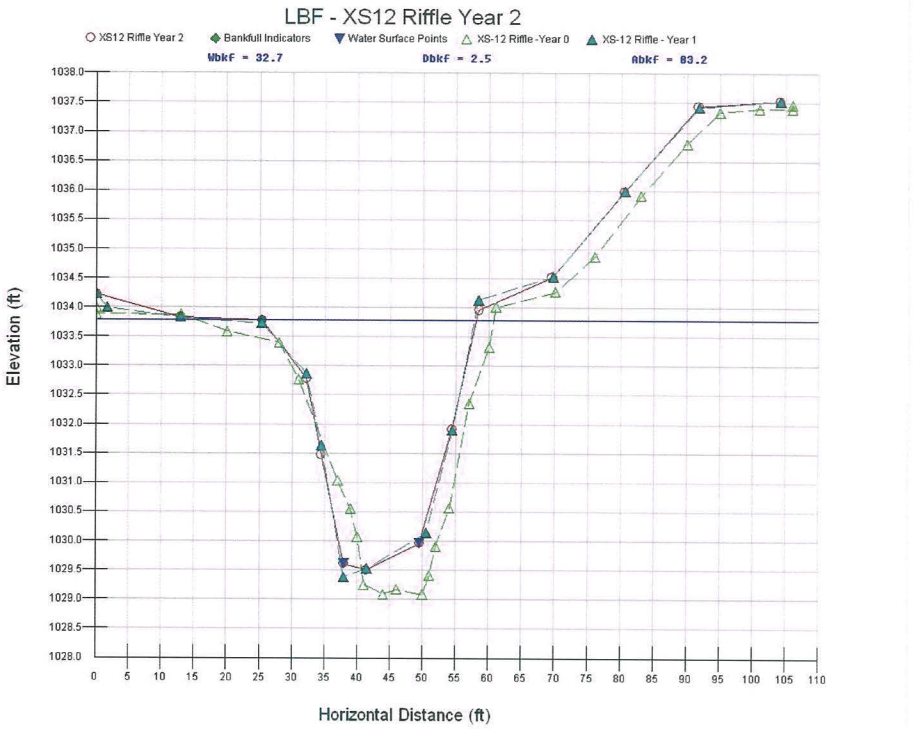


Summary Data

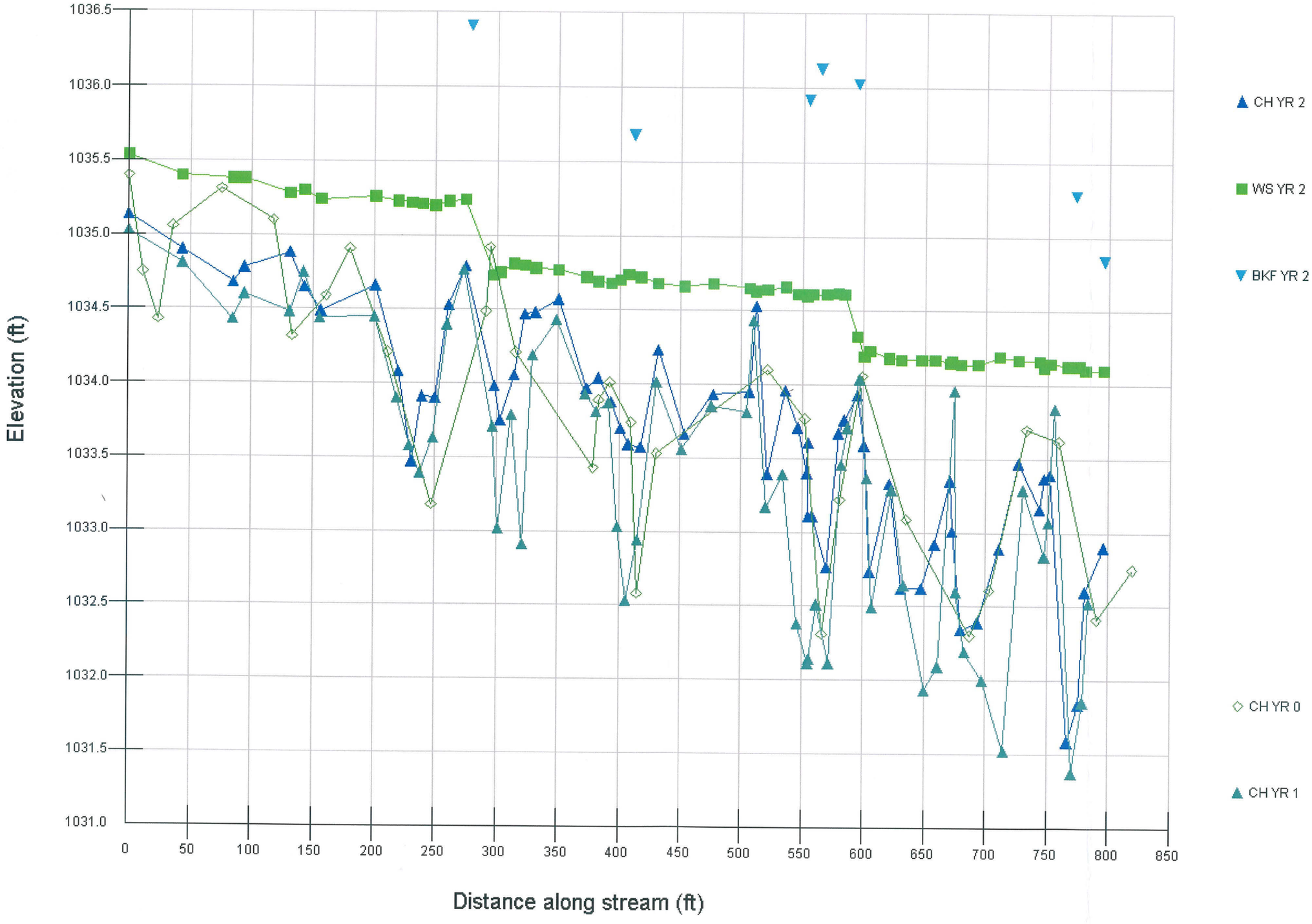
Bankfull Area	83.19 ft^2
Bankfull Width	32.71 ft
Mean Depth	2.54 ft
Maximum Depth	4.28 ft
Width/Depth Ratio	12.88
Entrenchment Ratio	3.18
Classification	C

PROJECT	Bailey Fork
	D04006-2
	2-YEAR
TASK	Cross-Section
REACH	Lower
DATE	10/10/07
CROSS SECTION:	12
FEATURE:	Riffle

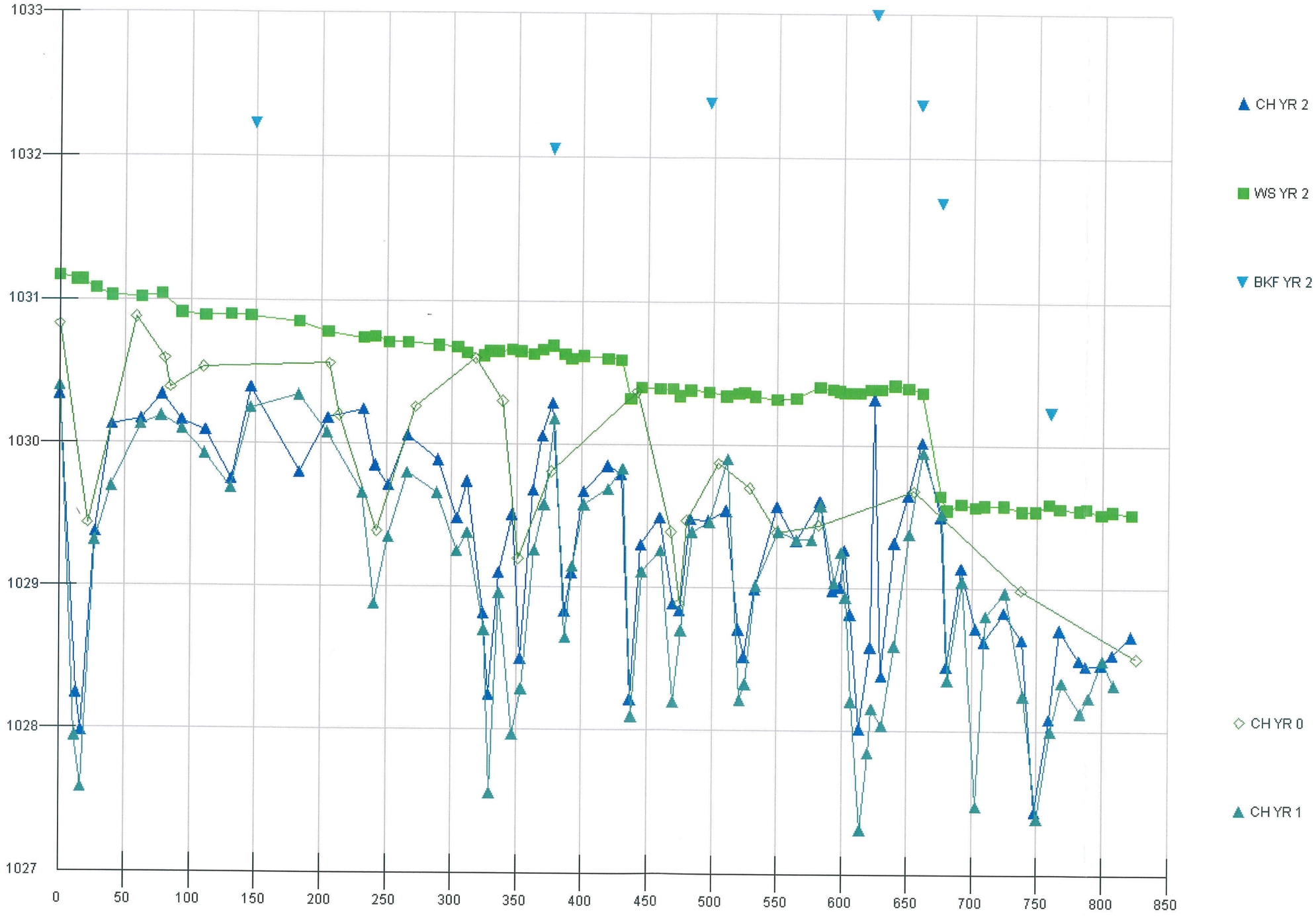
Cross-section photo – looking downstream



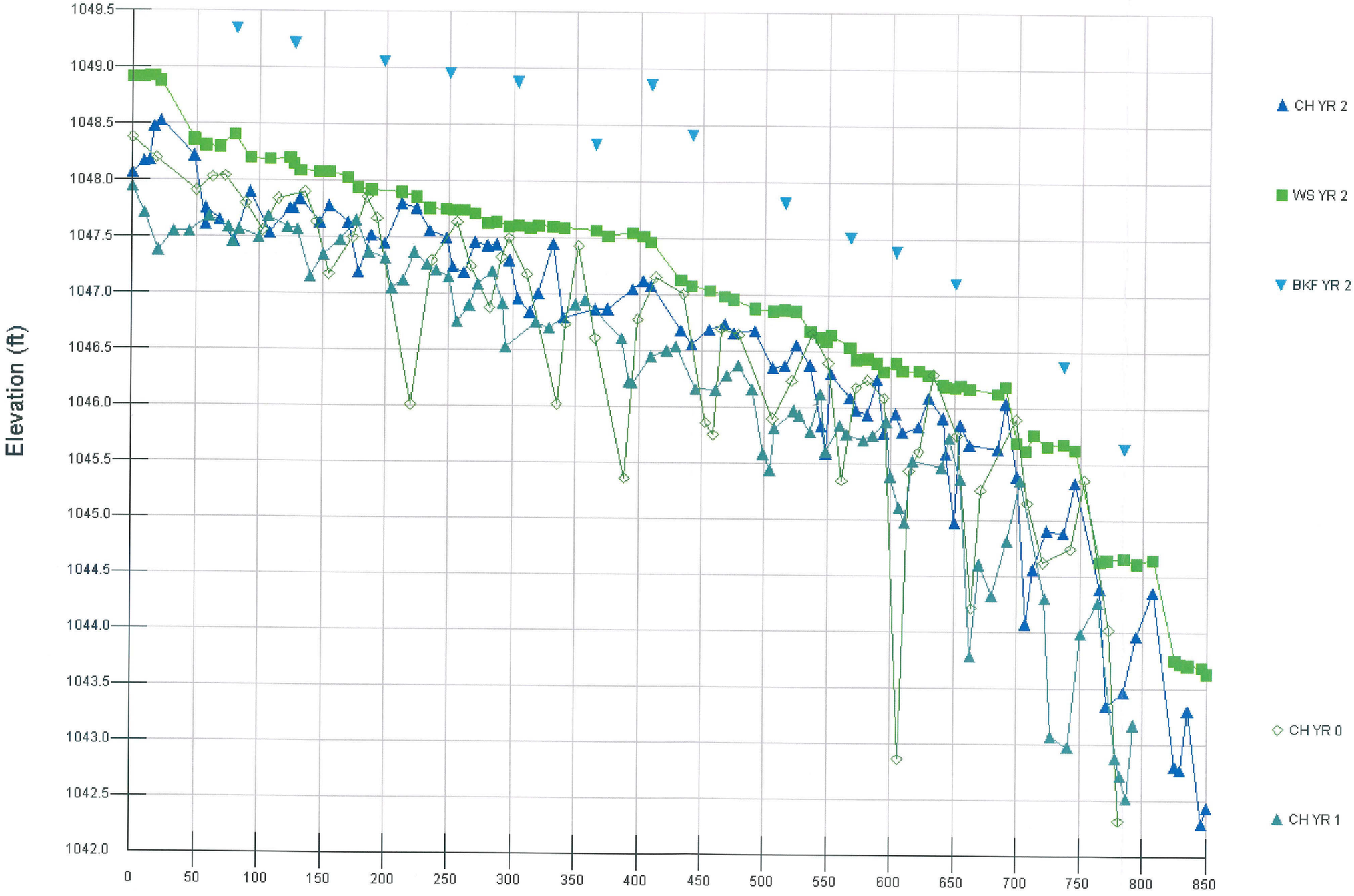
Upper Bailey Fork Longitudinal Profile - Year 2



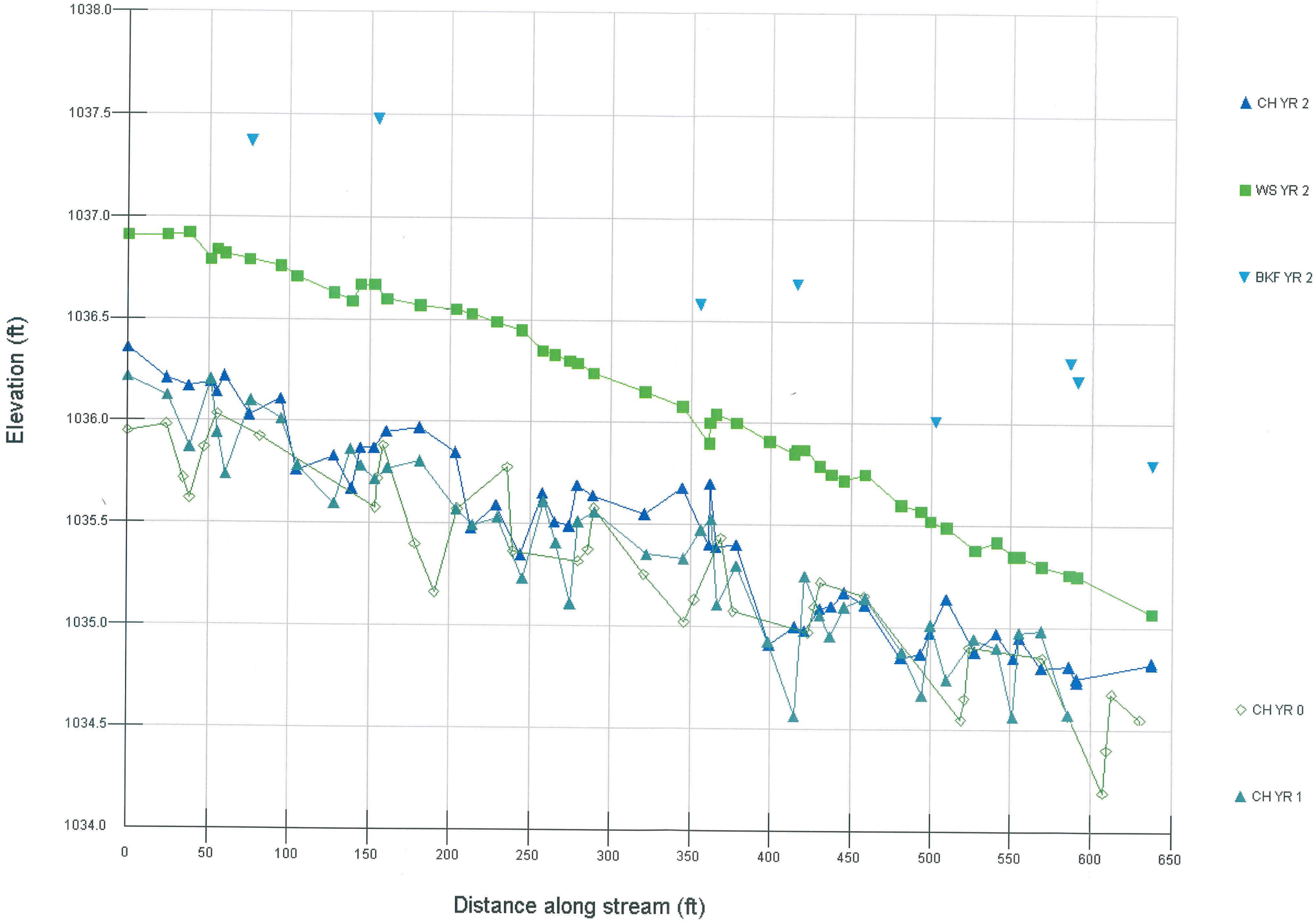
Lower Bailey Fork Longitudinal Profile - Year 2



UT1 Longitudinal Profile - Year 2

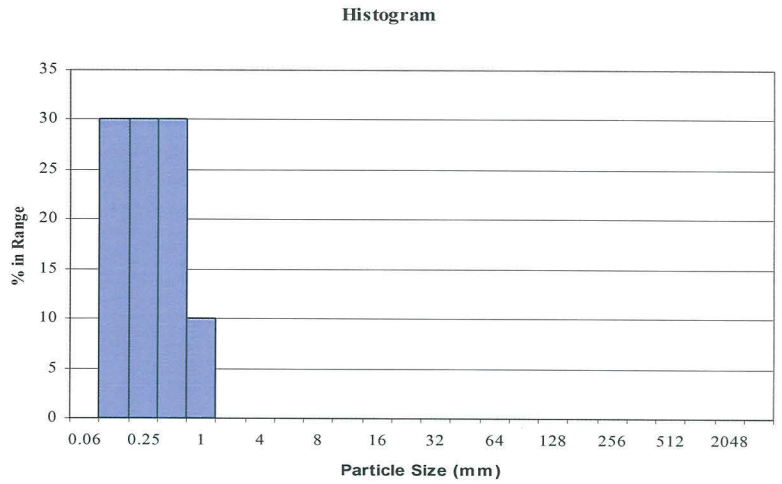


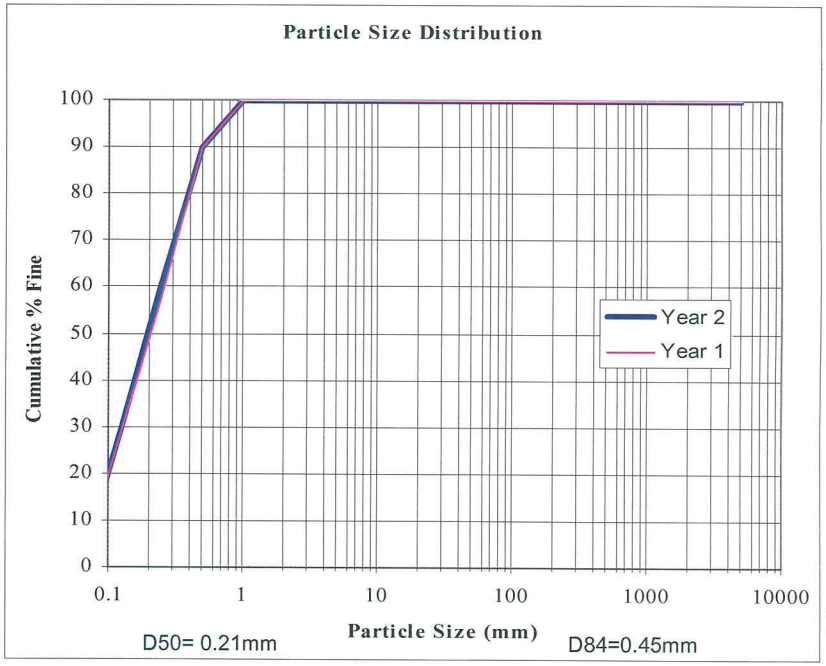
UT2 Longitudinal Profile - Year 2



Pebble Count - Pool				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	0	0	0
Very Fine Sand	0.062-0.125	30	30	30
Fine Sand	0.125-0.25	30	30	60
Medium Sand	0.25-0.5	30	30	90
Coarse Sand	0.5-1.0	10	10	100
Very Coarse Sand	1.0-2.0	0	0	100
Very Fine Gravel	2.0-4.0	0	0	100
Fine Gravel	4.0-5.7	0	0	100
Fine Gravel	5.7-8.0	0	0	100
Medium Gravel	8.0-11.3	0	0	100
Medium Gravel	11.3-16.0	0	0	100
Coarse Gravel	16.0-22.6	0	0	100
Coarse Gravel	22.6-32	0	0	100
Very Coarse Gravel	32-45	0	0	100
Very Coarse Gravel	45-64	0	0	100
Small Cobble	64-90	0	0	100
Small Cobble	90-128	0	0	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		100	100	

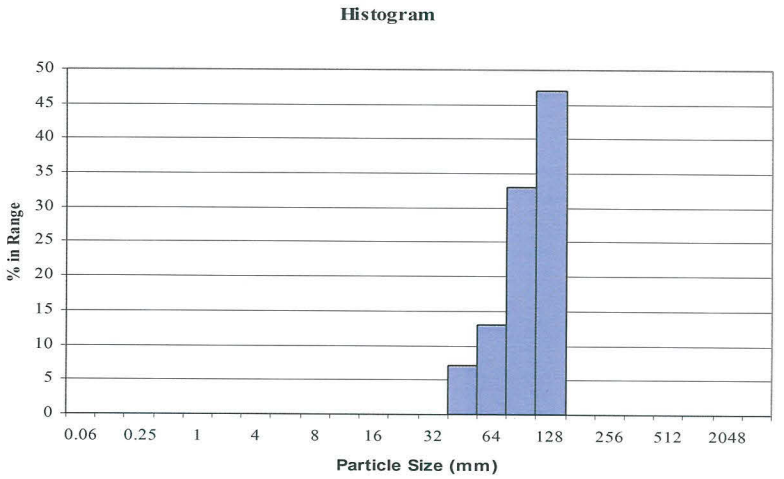
Bailey Fork Stream Restoration EEP Project No. D04006-02			
Reach	UT1	**X Sec**	2
Date	10/17/07	**Sta No.**	4+50

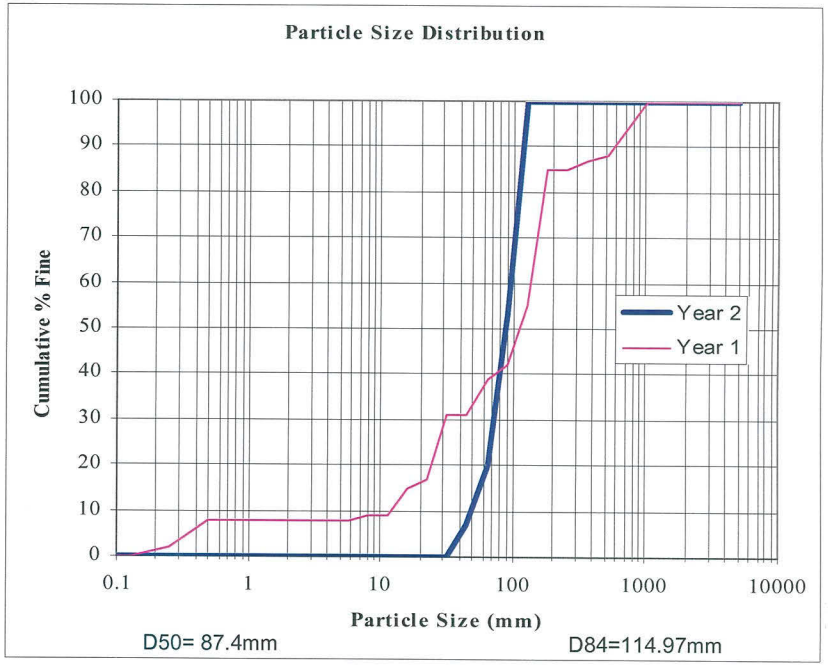




Pebble Count - Riffle				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	0	0	0
Very Fine Sand	0.062-0.125	0	0	0
Fine Sand	0.125-0.25	0	0	0
Medium Sand	0.25-0.5	0	0	0
Coarse Sand	0.5-1.0	0	0	0
Very Coarse Sand	1.0-2.0	0	0	0
Very Fine Gravel	2.0-4.0	0	0	0
Fine Gravel	4.0-5.7	0	0	0
Fine Gravel	5.7-8.0	0	0	0
Medium Gravel	8.0-11.3	0	0	0
Medium Gravel	11.3-16.0	0	0	0
Coarse Gravel	16.0-22.6	0	0	0
Coarse Gravel	22.6-32	0	0	0
Very Coarse Gravel	32-45	4	7	7
Very Coarse Gravel	45-64	8	13	20
Small Cobble	64-90	20	33	53
Small Cobble	90-128	28	47	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		60	100	

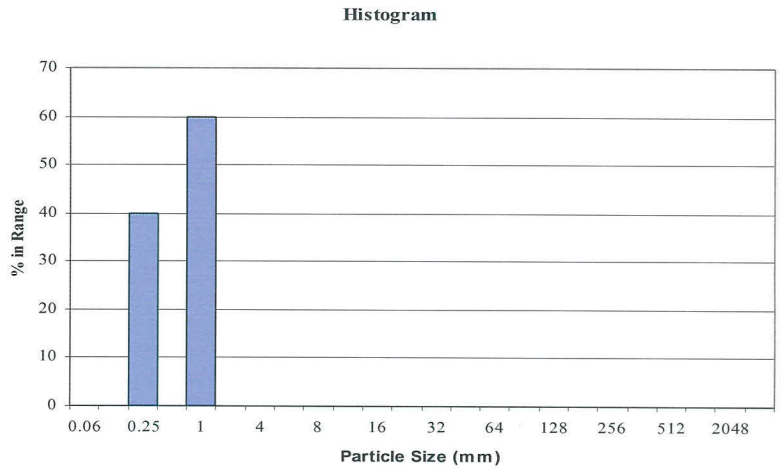
Bailey Fork Stream Restoration EEP Project No. D04006-02			
Reach	Upper	**X Sec**	5
Date	10/17/07	**Sta No.**	6+00

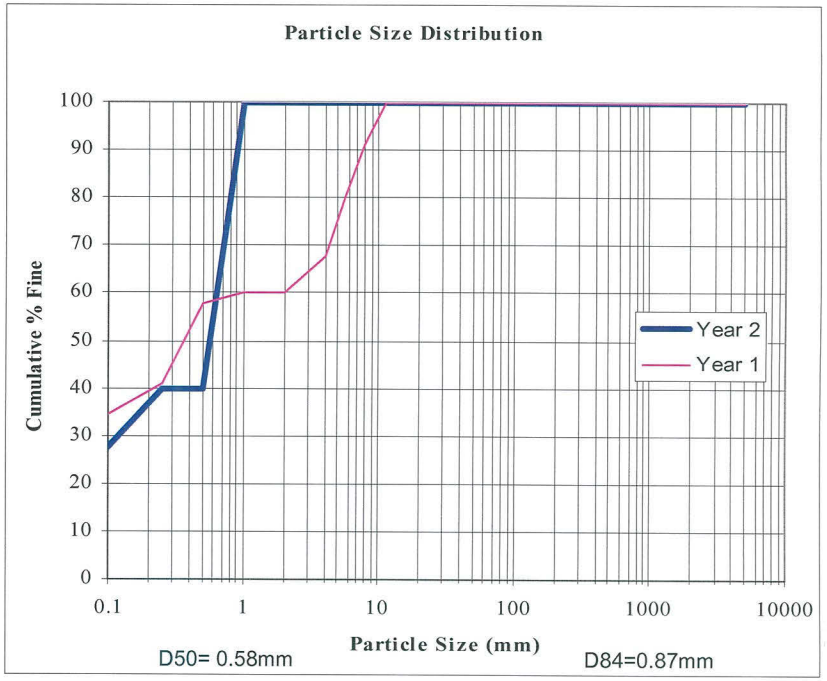




Pebble Count - Pool				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	0	0	0
Very Fine Sand	0.062-0.125	0	0	0
Fine Sand	0.125-0.25	40	40	40
Medium Sand	0.25-0.5	0	0	40
Coarse Sand	0.5-1.0	60	60	100
Very Coarse Sand	1.0-2.0	0	0	100
Very Fine Gravel	2.0-4.0	0	0	100
Fine Gravel	4.0-5.7	0	0	100
Fine Gravel	5.7-8.0	0	0	100
Medium Gravel	8.0-11.3	0	0	100
Medium Gravel	11.3-16.0	0	0	100
Coarse Gravel	16.0-22.6	0	0	100
Coarse Gravel	22.6-32	0	0	100
Very Coarse Gravel	32-45	0	0	100
Very Coarse Gravel	45-64	0	0	100
Small Cobble	64-90	0	0	100
Small Cobble	90-128	0	0	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		100	100	

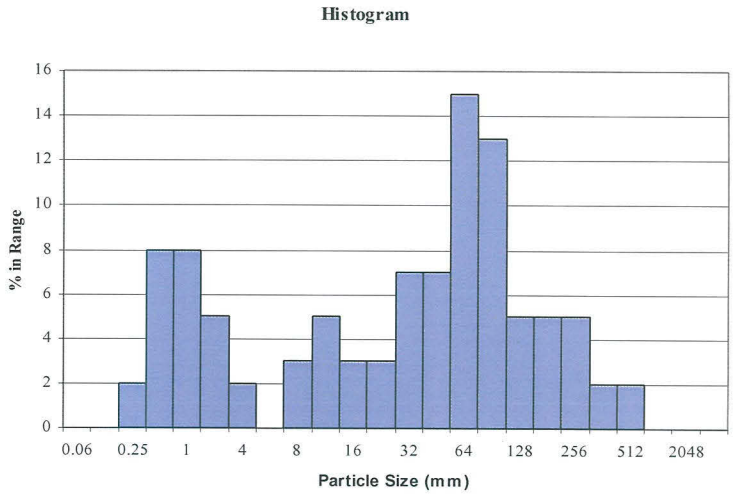
Bailey Fork Stream Restoration EEP Project No. D04006-02			
Reach	Upper	**X Sec**	7
Date	10/17/07	**Sta No.**	11+00

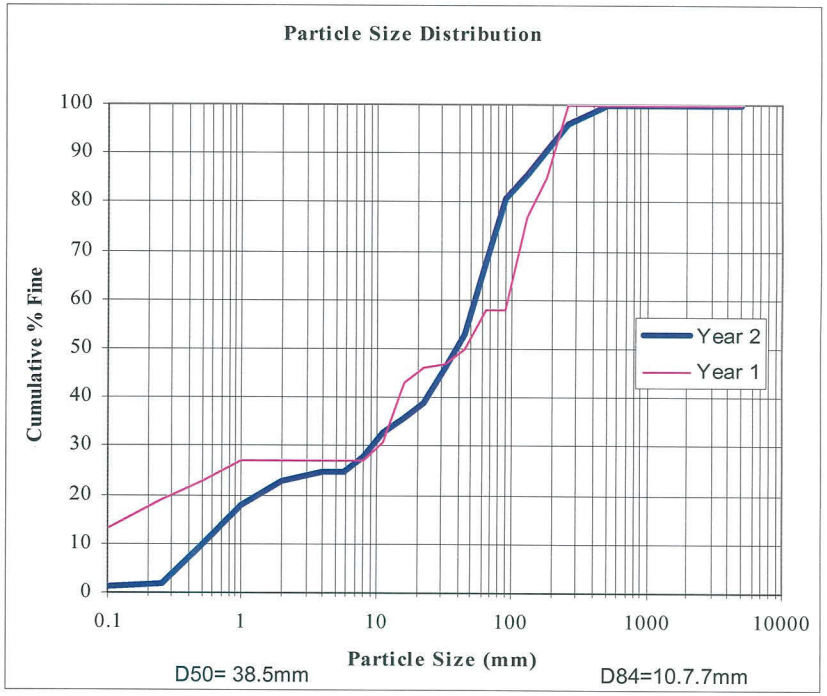




Pebble Count - Riffle				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	0	0	0
Very Fine Sand	0.062-0.125	0	0	0
Fine Sand	0.125-0.25	1	2	2
Medium Sand	0.25-0.5	5	8	10
Coarse Sand	0.5-1.0	5	8	18
Very Coarse Sand	1.0-2.0	3	5	23
Very Fine Gravel	2.0-4.0	1	2	25
Fine Gravel	4.0-5.7	0	0	100
Fine Gravel	5.7-8.0	2	3	28
Medium Gravel	8.0-11.3	3	5	33
Medium Gravel	11.3-16.0	2	3	36
Coarse Gravel	16.0-22.6	2	3	39
Coarse Gravel	22.6-32	4	7	46
Very Coarse Gravel	32-45	4	7	53
Very Coarse Gravel	45-64	9	15	68
Small Cobble	64-90	8	13	81
Small Cobble	90-128	3	5	86
Large Cobble	128-180	3	5	91
Large Cobble	180-256	3	5	96
Small Boulder	256-362	1	2	98
Small Boulder	362-512	1	2	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		60	100	

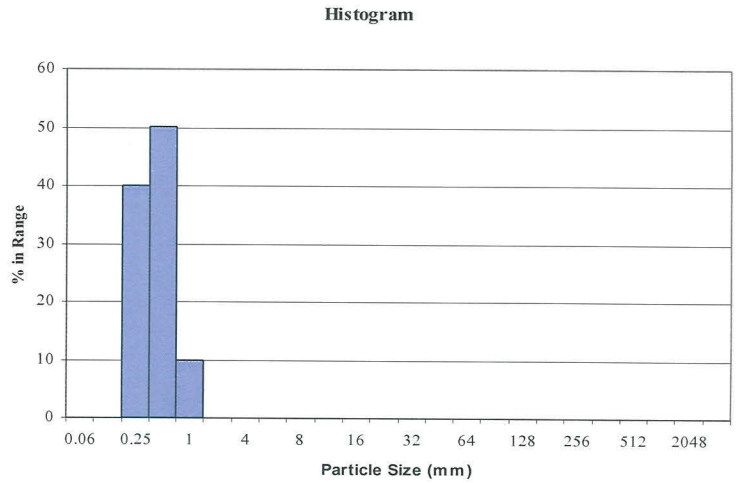
Bailey Fork Stream Restoration EEP Project No. D04006-02			
Reach	UT2	**X Sec**	10
Date	10/17/07	**Sta No.**	6+50

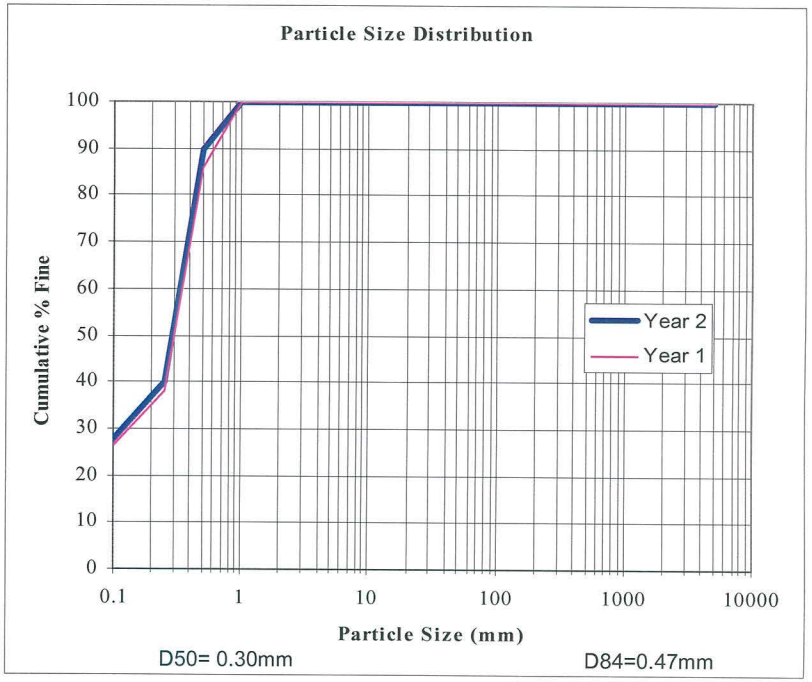




Pebble Count - Pool				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	0	0	0
Very Fine Sand	0.062-0.125	0	0	0
Fine Sand	0.125-0.25	40	40	40
Medium Sand	0.25-0.5	50	50	90
Coarse Sand	0.5-1.0	10	10	100
Very Coarse Sand	1.0-2.0	0	0	100
Very Fine Gravel	2.0-4.0	0	0	100
Fine Gravel	4.0-5.7	0	0	100
Fine Gravel	5.7-8.0	0	0	100
Medium Gravel	8.0-11.3	0	0	100
Medium Gravel	11.3-16.0	0	0	100
Coarse Gravel	16.0-22.6	0	0	100
Coarse Gravel	22.6-32	0	0	100
Very Coarse Gravel	32-45	0	0	100
Very Coarse Gravel	45-64	0	0	100
Small Cobble	64-90	0	0	100
Small Cobble	90-128	0	0	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		100	100	

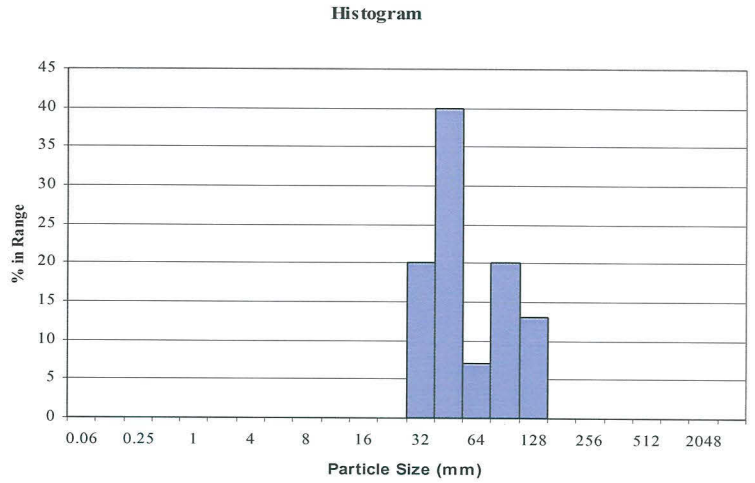
Bailey Fork Stream Restoration EEP Project No. D04006-02			
Reach	Lower	**X Sec**	11
Date	10/17/07	**Sta No.**	6+00

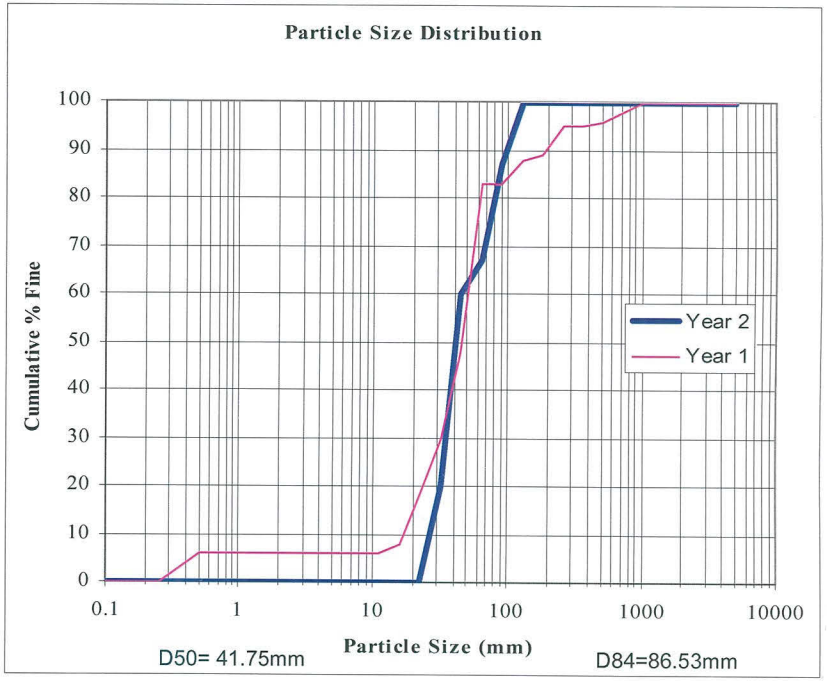




Pebble Count - Riffle				
Material	**Particle Size (mm)**	**Count**	**% in Range**	**% Cumulative**
Silt/Clay	<0.062	0	0	0
Very Fine Sand	0.062-0.125	0	0	0
Fine Sand	0.125-0.25	0	0	0
Medium Sand	0.25-0.5	0	0	0
Coarse Sand	0.5-1.0	0	0	0
Very Coarse Sand	1.0-2.0	0	0	0
Very Fine Gravel	2.0-4.0	0	0	0
Fine Gravel	4.0-5.7	0	0	0
Fine Gravel	5.7-8.0	0	0	0
Medium Gravel	8.0-11.3	0	0	0
Medium Gravel	11.3-16.0	0	0	0
Coarse Gravel	16.0-22.6	0	0	0
Coarse Gravel	22.6-32	12	20	20
Very Coarse Gravel	32-45	24	40	60
Very Coarse Gravel	45-64	4	7	67
Small Cobble	64-90	12	20	87
Small Cobble	90-128	8	13	100
Large Cobble	128-180	0	0	100
Large Cobble	180-256	0	0	100
Small Boulder	256-362	0	0	100
Small Boulder	362-512	0	0	100
Medium Boulder	512-1024	0	0	100
Large Boulder	1024-2048	0	0	100
Bedrock	<2048	0	0	100
Totals		60	100	

Bailey Fork Stream Restoration EEP Project No. D04006-02			
Reach	Lower	**X Sec**	12
Date	10/17/07	**Sta No.**	6+50





BF 1
Crest Gage 1 on UT1.
(EMH&T, Inc. 7/19/07)

BF 2
Crest Gage 4 on Lower Bailey.
(EMH&T, Inc. 10/17/07)