

Beaver Creek Stream Restoration 2005 Monitoring Report Year Two of Monitoring

Ecosystem Enhancement Program Project Number 00028



Submitted to: NCDENR-Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1962

Prepared by: EcoLogic Associates, P.C.
4321-A S. Elm-Eugene St.
Greensboro, NC 27406

Project Designed by: Earth Tech of North Carolina
701 Corporate Center Dr., Suite 475
Raleigh, NC 27607

Submitted: March, 2006



Table of Contents

I. EXECUTIVE SUMMARY/PROJECT ABSTRACT.....	1
II. PROJECT BACKGROUND	1
1. LOCATION AND SETTING	1
2. STRUCTURE AND OBJECTIVES.....	4
3. PROJECT HISTORY AND BACKGROUND.....	3
4. MONITORING PLAN VIEW.....	6
III. PROJECT CONDITION AND MONITORING RESULTS	6
A. VEGETATION ASSESSMENT.....	6
1. Vegetation Problem Areas Plan View	6
2. Soil Data	6
3. Problem Areas Table (vegetation).....	6
4. Stem Counts.....	8
5. Vegetation Plot Photos.....	8
B. STREAM ASSESSMENT	7
1. Problem Areas Plan View.....	7
2. Problem Areas Table Summary.....	9
3. Numbered Issues Photo Section	9
4. Fixed Photo Station Points	9
5. Stability Assessment.....	9
6. Quantitative Morphology.....	10
IV. METHODOLOGY SECTION.....	11
TABLES	
Table 1. Project Structure Table.....	5
Table II. Project Objectives Table.....	5
Table III. Project Activity and Reporting History.....	5
Table IV. Project Contact Table.....	6
Table V. Project Background Table.....	6
Table VI. Preliminary Soil Data.....	7
Table VII. Vegetative Problem Areas.....	7
Table VIII. Stem Counts for Each Species Arranged by Plot.....	8
Table IX. Stream Problem Areas.....	9
Table X. Categorical Stream Feature Visual Stability Assessment.....	n/a
Table XI. Baseline Morphology and Hydraulic Summary.....	12
Table XII. Morphology and Hydraulic Monitoring Summary.....	13
Appendix A Vegetation Raw Data	
1. Vegetation Problem Area Plan View	
2. Vegetation Survey Data Tables	
3. Vegetation Problem Area Photos	
4. Vegetation Monitoring Plot Photos	
Appendix B Geomorphologic Raw Data	
1. Stream Problem Areas Plan View	
2. Stream Problem Area Photos	
3. Stream Photo-station Photos	
4. Table B.1 Qualitative Visual Stability Assessment	
5. Cross section Plots and Raw Data Tables	
6. Longitudinal Plots and Raw Data Tables	
7. Pebble Count Plots and Raw Data Tables	

I. Executive Summary/Project Abstract

Beaver Creek is 3.6 miles southeast of Dobson, NC. The site is accessed from the end of Johnny Bowman Road (SR 2212). At the end of the Johnny Bowman Road and to the left, is a farm driveway that is currently owned by Mr. Mike Jones. About half way down the driveway, a farm road branches off to the right. This farm road leads to the Beaver Creek and parallels the first two thirds of the restoration reach.

The Beaver Creek project consists of 4360 linear feet of stream restoration. The restoration is the last 4360 feet of Beaver Creek prior to the confluence with the Fisher River. Beaver Creek (NCDWQ Stream Index Number – 12-63-12) is located on agricultural land and within one of the most significant agricultural districts in Surry County. The land use in the watershed is a mixture of pasture, row crops and forests. The Beaver Creek watershed covers an area of 5.9 square miles. The project is fully contained within the property of five landowners.

Following are the goals and objectives for the Beaver Creek project:

1. Restore 4360 linear feet of Beaver Creek (as measured along the thalweg).
2. Provide a stable stream channel that neither aggrades nor degrades while maintaining its dimension, pattern, and profile with the capacity to transport its watershed's water and sediment load.
3. Improve water quality and reduce further property loss by stabilizing eroding stream banks.
4. Reconnect the stream to its floodplain or establish a new floodplain at a lower elevation.
5. Improve aquatic habitat with the use of natural material stabilization structures such as root wads, rock vanes, woody debris and establish a riparian buffer.
6. Provide aesthetic value, wildlife habitat and bank stability through the creation or enhancement of a riparian zone.

The Priority I restoration involved converting the impaired channel into a sinuous channel that meanders for a total of 4360 ft as measured along the thalweg. Rock and log cross-vanes and rootwads were incorporated for aquatic habitat enhancement and bed and bank stability. A 50-foot riparian buffer on either side of the stream was planted with native vegetation.

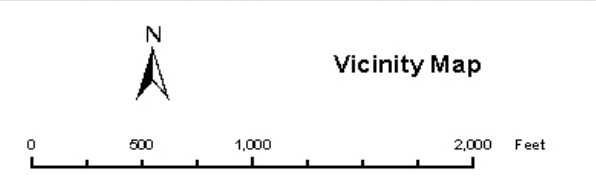
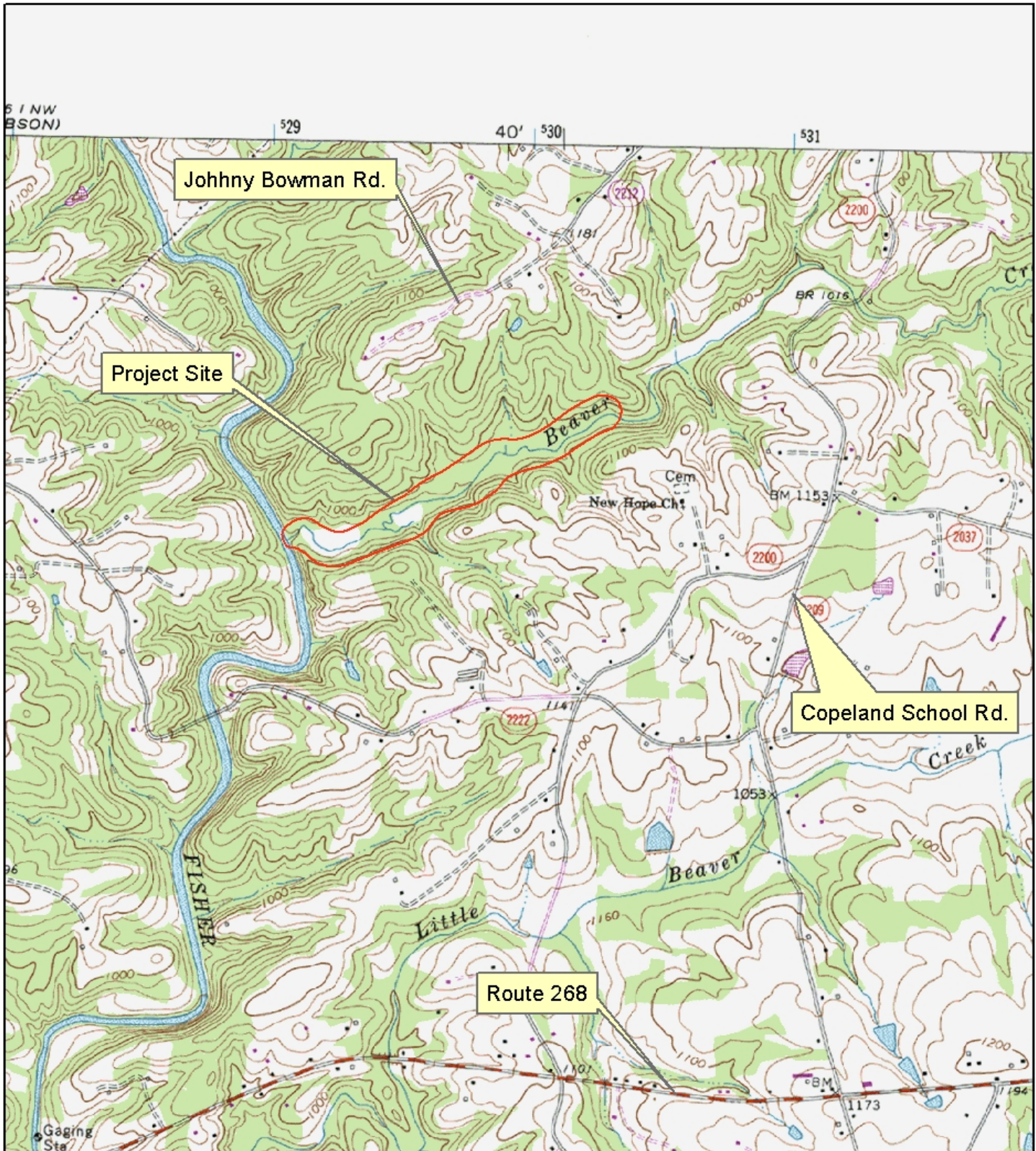
Currently, the Beaver Creek project substantially fails to meet the goals and objectives. Design of the Beaver Creek restoration was completed during 2001 and construction was completed in 2002. Serious damage and deterioration of the restoration started in 2003 and continues to the present day. Many of the same problem areas that are documented in this 2005 report were also noted in the past monitoring reports conducted by NCSU. The stream continues to deteriorate and will not recover and stabilize without further design and construction.

II. Project Background

1. Location and Setting

Beaver Creek is 3.6 miles southeast of Dobson, NC. The site is accessed from the end of Johnny Bowman Road (SR 2212). At the end of the Johnny Bowman Road and to the left, is a farm driveway that is currently owned by Mike Jones. About half way down the driveway, a farm road branches off to the right. This farm road leads to the Beaver Creek and parallels the first two thirds of the restoration reach.

The Beaver Creek project consists of 4670 linear feet of stream restoration. The restoration is the last 4360 feet of Beaver Creek prior to the confluence with the Fisher River. Beaver Creek (NCDWQ Stream Index Number – 12-63-12) is located on agricultural land and within one of the most significant agricultural districts in Surry County. The land use in the watershed is a mixture of pasture, row crops and forests. The Beaver Creek watershed covers an area of 5.9 square miles. The project is fully contained within the property of five landowners.



EcoLogic Associates, PC April 2006
Beaver Creek Stream Restoration
EEP Project # 28, MY 2 (2005)
Surry County, NC
Source: Maptech USGS Topographic Series, Maptech Inc.
www.maptech.com/topo
Copyright 2002 Maptech

2. Structure and Objectives

The Beaver Creek restoration site is located entirely within undeveloped land consisting of agricultural land predominantly being used for hay production, woodland, and sparse crop production. There are no utilities within the project limits. The combination of these characteristics makes Beaver Creek an excellent restoration site.

Following are the goals and objectives for the Beaver Creek project:

1. Restore 4360 linear feet of Beaver Creek (as measured along the thalweg).
2. Provide a stable stream channel that neither aggrades nor degrades while maintaining its dimension, pattern, and profile with the capacity to transport its watershed's water and sediment load.
3. Improve water quality and reduce further property loss by stabilizing eroding stream banks.
4. Reconnect the stream to its floodplain or establish a new floodplain at a lower elevation.
5. Improve aquatic habitat with the use of natural material stabilization structures such as root wads, rock vanes, woody debris and establish a riparian buffer.
6. Provide aesthetic value, wildlife habitat and bank stability through the creation or enhancement of a riparian zone.

The Priority I restoration involved converting the impaired channel into a sinuous channel that meanders for a total of 4360 ft as measured along the thalweg. Rock and log cross-vanes and rootwads were incorporated for aquatic habitat enhancement and bed and bank stability. A 50-foot riparian buffer on either side of the stream was planted with native vegetation.

3. Project History and Background

The Surry County Soil and Water Conservation District (SCSWCD) staff identified Beaver Creek as a potential restoration site after landowners complained about active erosion and flooding adjacent to the stream. The stream was actively eroding along a tight meander located on the property owned by Mr. Mike Jones. The extensive erosion created a meander with a sharp radius where during storm events; water was overtopping the bank and flooding the adjacent landowner, Mr. Wayne Draughn.

Besides the above stated problem area, Beaver Creek had other areas of significant active bank erosion throughout the proposed project limits. There is evidence of historic straightening that resulted in stream degradation. Thinning and removal of riparian vegetation also contributed to the stream degradation. The degradation included a deeply incised channel that accelerated the erosion process and forced the channel to contain larger than bankfull storm events. One of the three tributaries, within the project limits, had also been straightened. Currently, the Beaver Creek project substantially fails to meet the goals and objectives. Design of the Beaver Creek restoration was completed during 2001 and construction was completed in 2002. Serious damage and deterioration of the restoration started in 2003 and continues to the present day. Many of the same problem areas that are documented in this 2005 report were also noted in the past monitoring reports conducted by NCSU. The stream continues to deteriorate and will not recover and stabilize without further design and construction.

Table I. Project Structure**Project Number and Name: 00028 (Beaver Creek)**

Segment/Reach ID	Linear Feet or Acreage
Beaver Creek	4360 linear feet

Table II. Project Objectives Table**Project Number and Name: 00028 (Beaver Creek)**

Segment/Reach ID	Objectives	Linear Feet or Acreage	Comment
Beaver Creek	Full Restoration	4,360 linear feet	Priority 1 Approach
Beaver Creek	Buffer Restoration	9.4 Acres	Buffer Replanting

Table III. Project Activity and Reporting History**Project Number and Name: 00028 (Beaver Creek)**

Activity or Report	Calendar Year of Completion or Planned Completion	Actual Completion Date
Restoration Plan	2001	2001
Mitigation Plan	2001	2001
Construction	Fall 2002	Fall 2002
Temporary S&E mix applied to entire project area	Fall 2002	Fall 2002
As-Built report	Fall 2002	February-2003
Permanent seed mix applied to reach	Fall 2002	Fall 2002
Structural maintenance (bank and structure repairs)	Spring 2004	Spring 2004
Supplemental planting of bare root and containerized material	Spring 2004	Spring 2004
Initial – Year 1 monitoring	Fall 2003	September-2004
Year 2 Monitoring	August-2005	September-2005
Year 3 Monitoring	August-2006	
Year 4 Monitoring	August-2007	
Year 5 Monitoring	August-2008	
Year 5+ Monitoring	Not Scheduled	

Table IV. Project Contact Table	
Project Number and Name: 00028 (Beaver Creek)	
Designer Primary project design POC	Earth Tech of North Carolina 701 Corporate Center Drive, Suite 475 Raleigh, NC 27607 Mr. Bill Jenkins (919) 854-6200
Construction Contractor Construction contractor POC	West Contracting Post Office Box 310 Marble NC, 28905 Maurice West Jr. (828) 837-2280
Planting Contractor Planting contractor POC	Carolina Environmental Post Office Box 1905 Mount Airy NC, 27030 Joanne Cheatham (336) 320-3849
Seeding Contractor Planting contractor point of contact	Carolina Environmental Post Office Box 1905 Mount Airy NC, 27030 Joanne Cheatham (336) 320-3849
Seed Mix Sources	NA*
Nursery Stock Suppliers	NA*
Monitoring Performers	EcoLogic Associates, P.C. 4321-A South Elm-Eugene St. Greensboro, NC 27406
Stream Monitoring POC	Kyle Hoover (336) 355-1108
Vegetation Monitoring POC	Moni Bates (336) 335-1108
*Historical project documents necessary to provide this data were unavailable at the time of this report submission.	

Table V. Project Background Table	
Project Number: 00028 (Beaver Creek)	
Project County	Surry County
Drainage Area	5.9 sq miles
Drainage impervious cover estimate (%)	Estimated at <5%
Stream Order	3rd order
Physiographic Region	Piedmont/Foothills
Ecoregion	Northern Inner Piedmont (45e)
Rosgen Classification of As-built	E-Stream Type
Cowardin Classification	NA*
Dominant soil types	NA*
Reference site ID	NA*
USGS HUC for Project and Reference	03040101
NCDWQ Sub-basin for Project and Reference	12-63-12
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
Reasons for 303d listing or stressor	NA*
% of project easement fenced	0% - No cattle
Project County	Surry County
*Historical project documents necessary to provide this data were unavailable at the time of this report submission.	

4. Monitoring Plan View

Please see following insert (Figure 3)

III. Project Condition and Monitoring Results

A. Vegetation Assessment

1. Soil Data

Series	Max Depth (in.)	% Clay on Surface	K	T	OM %
Chewacla	72	10-27	0.28	5	1-4

2. Problem Areas Table (vegetation)

Feature Issue	Station	Suspected Cause	Photo	Severity
Density	42+00	Bank erosion	PA1	Red
Density	22+50	Bank erosion	PA18	Red

Please see Appendix A.2

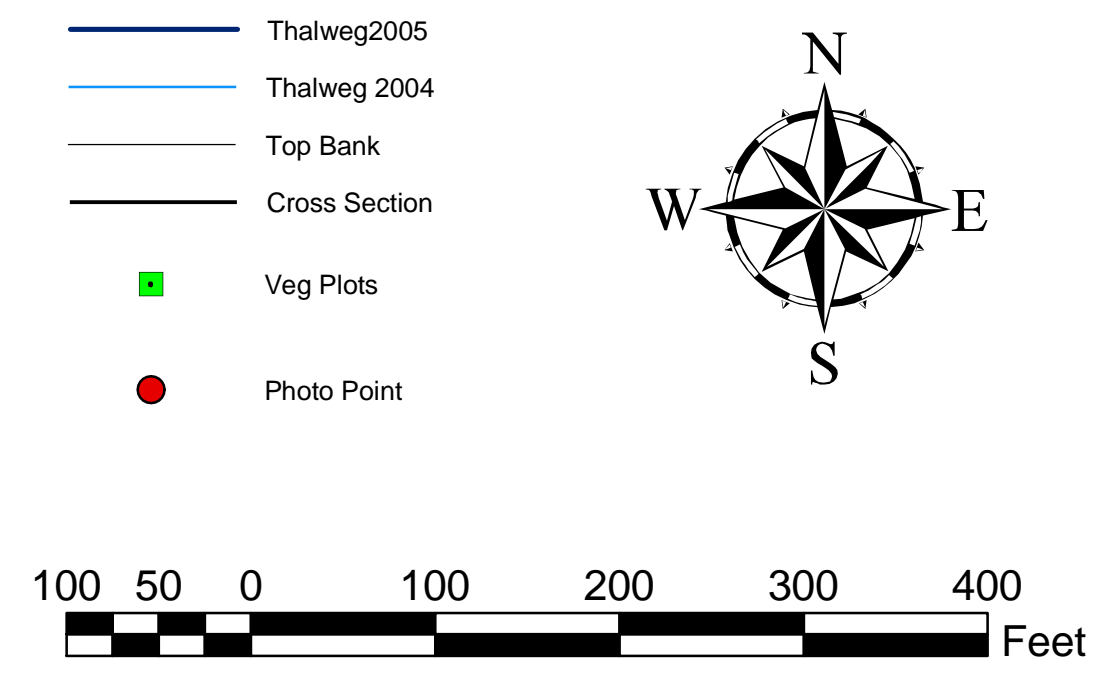
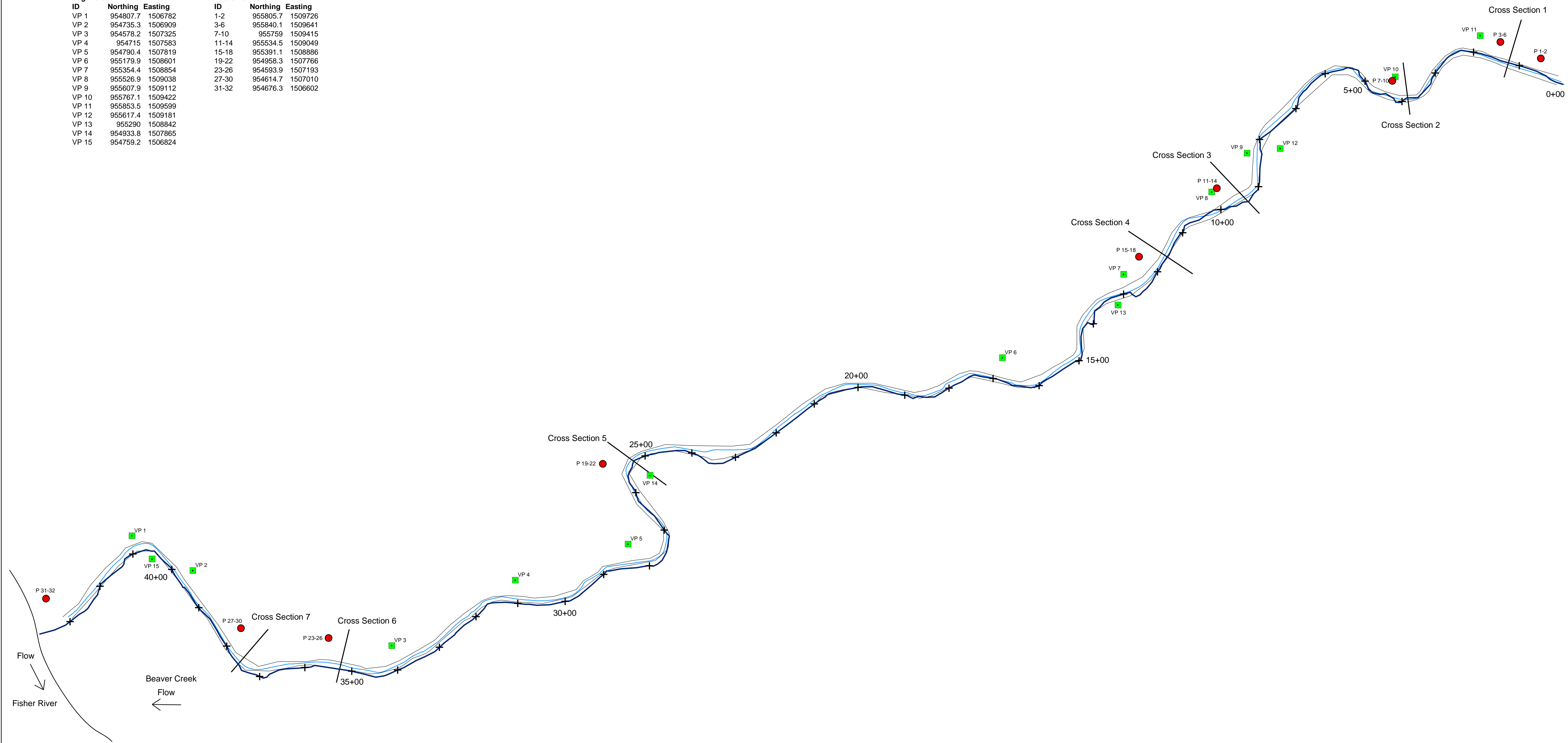
3. Vegetation Problem Areas Plan View

Vegetation within the riparian buffer of Beaver Creek varies in success. Much of the buffer is covered with dense, lush, native herbaceous vegetation. Live stakes are marginally healthy in certain areas, although many were washed out due to high water and bank sloughing. Planted trees and shrubs are doing poorly throughout the entire buffer. Few trees were counted in vegetation monitoring plots. Although some stakes were thriving, most stakes and trees were missing. Further, the live shrub and tree stems were heavily browsed by deer. Overall, planted trees were not successful.

Deposition, over wash, and erosion has occurred since construction, and large areas that were originally impacted by construction have little existing cover. However, the banks that were less impacted by construction have a good cover of mature trees that provide bank stability and provide a potential seed source for natural tree regeneration.

Veg Plots		
ID	Northing	Eastng
VP 1	954807.7	1506782
VP 2	954735.3	1506909
VP 3	954578.2	1507325
VP 4	954715	1507583
VP 5	954790.4	1507819
VP 6	955179.9	1508601
VP 7	955354.4	1508854
VP 8	955526.9	1509038
VP 9	955607.9	1509112
VP 10	955767.1	1509422
VP 11	955853.5	1509599
VP 12	955617.4	1509181
VP 13	955290	1508842
VP 14	954933.8	1507865
VP 15	954759.2	1506824

Photo Points		
ID	Northing	Eastng
1-2	955805.7	1509726
3-6	955840.1	1509641
7-10	955759	1509415
11-14	955534.5	1509049
15-18	955391.1	1508886
19-22	954958.3	1507766
23-26	954593.9	1507193
27-30	954614.7	1507010
31-32	954676.3	1506602



Recommendations include replanting larger containerized trees to obtain mitigation requirements and staking in areas where erosion is problematic. Measures should be taken to prevent deer browse of planted vegetation. Although invasive vegetation is not a major issue on this project site, exotic invasive species present include *Microstegium vimineum* (Japanese grass), *Lonicera japonica* (Japanese honeysuckle), *Puerariaia montana* var. *lobata* (Kudzu) and *Paulownia tomentosa* (Princess tree). Control measures may be necessary if these species become dense.

Please see Appendix A.1.

4. Stem Counts

Please see following page for Table VIII

Please see Appendix A.2 for raw data tables

5. Vegetation Plot Photos

Please see Appendix A.4

B. Stream Assessment

1. Problem Areas Plan View

The Beaver Creek restoration has deteriorated since construction. There is evidence in the field of insufficient length and caliper rootwads that were improperly installed. The constructed structures contain poorly fitted small and odd size rocks. For these reasons, many, if not most, of the structures have failed to control the thalweg at low flows, have failed at high flows and do not protect the adjacent stream banks. The result is a cascade failure of structures, channel morphology and banks that results in a channel that is failing to meet the restoration goals. EcoLogic recommends that a re-design and re-construction is required to stabilize Beaver Creek and to meet the restoration goals and objectives.

Please see Appendix B.1

Table VIII. Stem counts for each species arranged by plot.
Project Number: 00028
Segment Reach: Beaver Creek

Species	Plots														Year 2 Totals	Year 1 Totals	Initial Totals	Survival %
	1	2	3	4	5	6	7	8	9	10	11	12	13	14				
Shrubs																		
Cornus amomum											3				3	2*	NA	
Alnus serrulata								5	6		4	1			16		NA	
Salix sericea					1						2				3	7*	NA	
Cephalanthus occidentalis										1		2			3		NA	
Trees																		
Salix nigra				9	2								1	1	13		NA	
Platanus occidentalis															0		NA	
Prunus sp				1				1	2						4		NA	
Cornus florida									1						1		NA	
Cercis canadensis											1				1		NA	
Quercus sp.				1											1		NA	
Juglans nigra						2					1			1	4		NA	
Quercus phellos										3	7	4			14		NA	
Nyssa sylvatica	1			1	1	1				1	3				8		NA	
Fraxinus pennsylvanica		4		1		2		1		2	5	5			20		NA	
Quercus michauxii				1				1				7			9		NA	
Betula sp.				2								1			3		NA	
Betula lenta					2	1					3				6		NA	
Betula nigra								1		1					2	3*	NA	
Prunus serotina										1					1		NA	
Liriodendron tulipifera										1					1		NA	
Carya tomentosa												1			1		NA	

*Year 1 totals obtained from NCSU

NA = Historical project documents necessary to provide this data were unavailable at the time of this report submission

2. Problem Areas Table Summary

Exhibit Table IX. Stream Problem Areas				
Project Number: 00028				
Segment Reach: Beaver Creek				
Feature Issue	Station	Suspected Cause	Photo	Severity
Bank erosion	42+00	Scour	bc162	Red
Structure degradation	41+75	Arm scour	bc165	Yellow
Bank erosion	40+00	Outer bend scour	bc166	Red
Structure degradation	39+15	Stability	bc167	Red
Structure degradation	38+60	Leakage	bc168	Red
Bank erosion	38+25	Scour	bc169	Red
Structure degradation	38+00	Arm scour	bc170	Yellow
Bank erosion	37+50	Mass wasting	bc171	Red
Structure degradation	37+00	Leakage	bc176	Red
Channel widening	35+25	Toe scour	bc177	Yellow
Bridge collects debris	31+00	Bridge dimension	bc182	Yellow
Bank erosion	30+70	Scour	bc183	Yellow
Structure degradation	29+90	Height/angle	bc184	Red
Bank erosion	28+80	Scour	bc185	Red
Bank erosion	27+25	Mass wasting	bc186	Red
Structure degradation	25+00	Scour	bc188	Red
Bank erosion	23+75	Scour	bc193	Red
Bank erosion	22+50	Scour/central bar	bc194	Red
Bank erosion	21+00	Scour	bc196	Red
Structure degradation	20+00	Leakage	bc198	Red
Structure degradation	19+65	Leakage	bc199	Red
Structure degradation	18+75	Leakage/arm scour	bc200	Red
Bank erosion	18+00	Scour	bc201	Yellow
Structure degradation	17+05	Arm scour	bc202	Red
Channel widening	18+25	Toe scour	bc203	Yellow
Bank erosion	15+85	Scour	bc204	Yellow
Structure degradation	14+50	Leakage	bc206	Red
Bank erosion	14+40	Scour	bc207	Yellow
Bank erosion	13+90	Scour	bc208	Yellow
Structure degradation	13+50	Height/angle	bc209	Red
Structure degradation	12+25	Arm scour/leakage/mass wasting	bc210	Red
Bank erosion	11+00	Scour	bc215	Red
Structure degradation	10+75	Leakage	bc216	Red
Channel widening	10+00	Toe scour	bc217	Yellow
Structure degradation	9+15	Stability	bc222	Red
Bank erosion	8+00	Scour	bc223	Yellow
Structure degradation	4+00	Height/angle/stability	bc227	Red
Bank erosion	3+00	Scour	bc228	Yellow
Bank erosion	2+25	Scour	bc233	Yellow

3. Numbered Issues Photo Section

Please see Appendix B.2

4. Fixed Photo Station Points

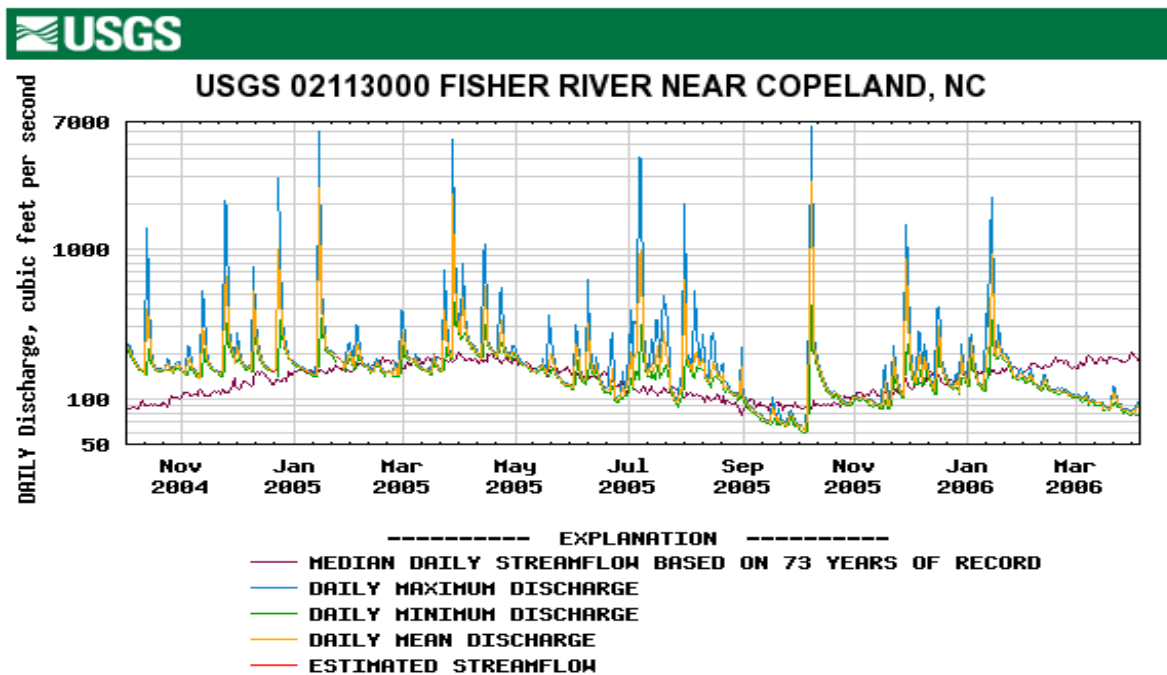
Please see Appendix B.3

5. Stability Assessment

No Table X exists because it was not applicable to this project.

6. Quantitative Morphology

No crest gages are installed at this site to document bankfull events. Therefore, potential occurrence was extrapolated based on USGS stream gage discharge data for the Fisher River near Copeland, NC. The gage is located within 1 mile of the project site in the same watershed and has a drainage area of 128 square miles. An estimate of the number of bankfull events in 2005 was made by comparing the stream discharges from the USGS data in cubic feet per second (cfs) against the bankfull discharge estimated from the drainage area on the Rural Piedmont NC Regional Curve. According to the regional curve, a bankfull event occurs on a stream with a 128-mi² drainage area when the discharge is about 2,930 cfs. Based on this primary surrogate USGS data, an estimated four (4) bankfull events occurred in 2005.



Provisional Data Subject to Revision

Please see pages 12-13 for Table XI and XII

IV. Methodology Section

The methods used to generate the data in this monitoring report are standard fluvial geomorphology techniques as described in *Applied River Morphology*, 1996, D.L. Rosgen and related publications from US Forest Service and the interagency Stream Mitigation Guidelines, 2003, USACOE, USEPA, NCWRC, NCDENR-DWQ.

EcoLogic's field morphology survey was conducted using a Nikon total station and the data was analyzed and displayed using RiverMorph version 3.1 software. The pebble counts were conducted using Pocket RiverMorph software and a PDA. The vegetation problem areas and structural problem areas were noted in the field on the PDA.

Photographs were taken at medium-high resolution using a Nikon Coolpix 4600 digital camera.

GPS location information was collected using a Trimble Geo XT handheld mapping grade GPS unit. GPS locations were collected on all problem areas, photo points and at least one corner of each vegetation-monitoring plot.

Vegetation monitoring plots were marked in the field by placing a steel conduit with blue flagged at each corner. In addition, the up-stream, outside corner was marked with a three-foot length of white plastic pipe tied with orange flagging. Individual plants in the monitoring plots were tied with white flagging.

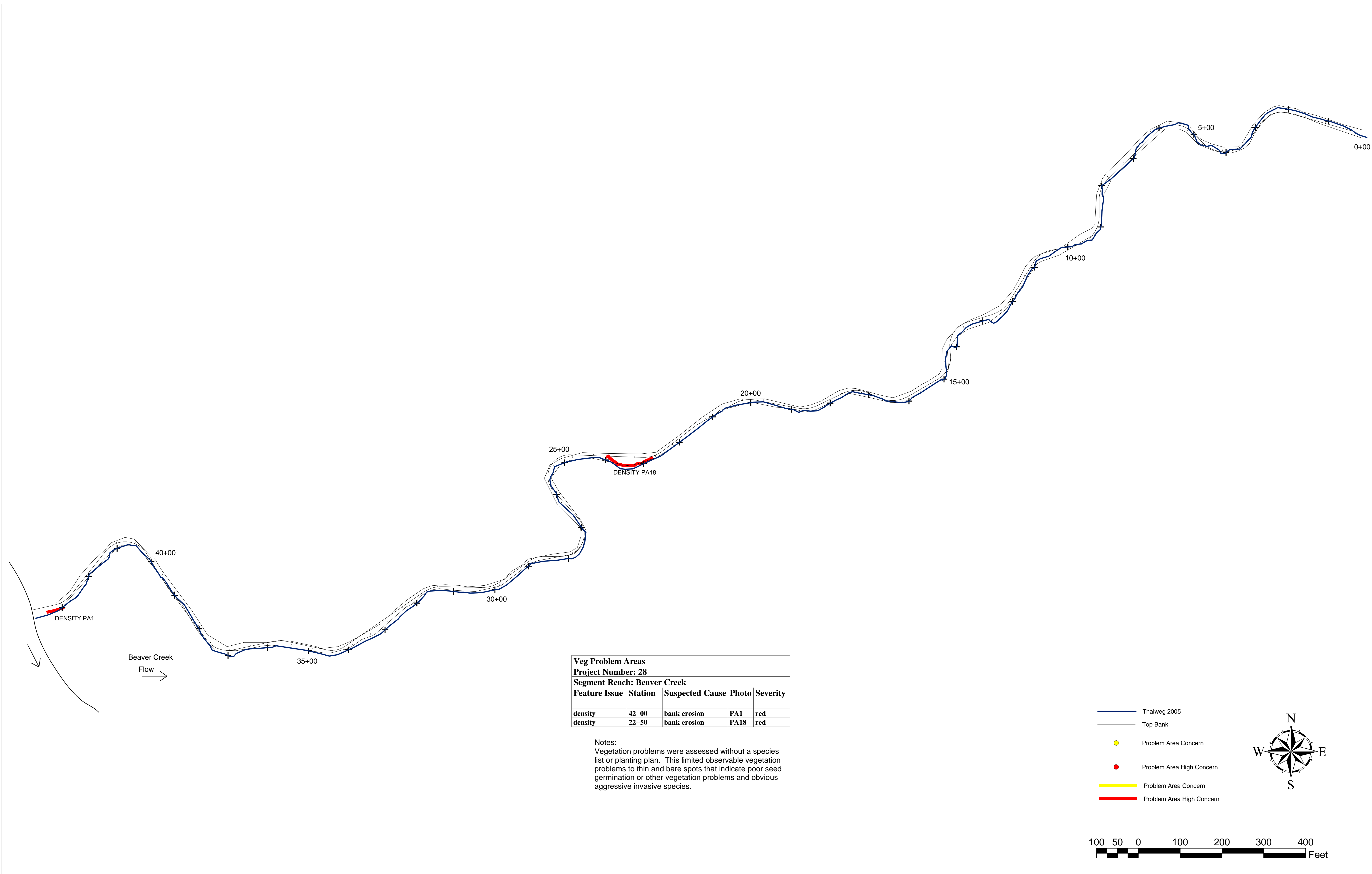
Table XI. Baseline Morphology and Hydraulic Summary																		
Project Number: 00028																		
Segment/Reach: Beaver Creek																		
Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension																		
BF Width (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	22	34	27.3
Floodprone Width (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
BF Cross Sectional Area (ft ²)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	55	111	83.3
BF Mean Depth (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	2.5	3.1	2.8
BF Max Depth (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	4.3	5.2	4.7
Width/Depth Ratio	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	7.3	10.8	9.5
Entrenchment Ratio	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Wetted Perimeter(ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hydraulic radius (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pattern																		
Channel Beltwidth (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	43	208	87
Radius of Curvature (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	45	76	65
Meander Wavelength (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	192	485	275
Meander Width ratio	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Profile																		
Riffle length (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Riffle slope (ft/ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pool length (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pool spacing (ft)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Substrate																		
d50 (mm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.11	11.7	7.3
d84 (mm)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.36	71.4	36.6
Additional Reach Parameters																		
Valley Length (ft)	NA	NA	NA	NA	NA	NA											NA	NA
Channel Length (ft)	NA	NA	NA	NA	NA	NA											NA	NA
Sinuosity	NA	NA	NA	NA	NA	NA											NA	NA
Water Surface Slope (ft/ft)	NA	NA	NA	NA	NA	NA											NA	NA
BF slope (ft/ft)	NA	NA	NA	NA	NA	NA											NA	NA
Rosgen Classification	NA	NA	NA	NA	NA	NA											NA	NA
Number of Bankfull Events	NA	NA	NA	NA	NA	NA											NA	NA
Extent of BF floodplain (acres)	NA	NA	NA	NA	NA	NA											NA	NA
*BEHI	NA	NA	NA	NA	NA	NA											NA	NA
*Habitat Index	NA	NA	NA	NA	NA	NA											NA	NA
*Macrobenthos	NA	NA	NA	NA	NA	NA											NA	NA

NA = Historical project documents necessary to provide this data were unavailable at the time of this report submission

Table XII. Morphology and Hydraulic Monitoring Summary																																									
Project Number: 00028																																									
Segment/Reach: Beaver Creek																																									
Parameter	Cross Section 1 1+17 Riffle					Cross Section 2 3+80 Pool					Cross Section 3 9+11 Pool					Cross Section 4 11+30 Riffle					Cross Section 5 24+50 Pool					Cross Section 6 34+34 Riffle					Cross Section 7 36+50 Pool										
	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4	MY5	MY0	MY1	MY2	MY3	MY4
Dimension	BF Width (ft)	33.6	29.1	19.3			NA	29.1	25.6			27.4	24.6	21.2				33	32.9	19.1				21.9	48	34				25.7	34.6	33.2				22	38.2	20.77			
	Floodprone Width (ft)	315	315	33.9			NA		62.1					39.2				315	315	31.2				315	315	43.1				315	315	43.1						45.3			
	BF Cross Sectional Area (ft ²)	104.6	86.8	32.14			NA	110.6	71.7			75.6	78.2	48.8				103.8	108	38.9				55.1	125.8	88.8				67.5	93.6	78.2				66	95.2	47			
	BF Mean Depth (ft)	3.1	2.7	1.67			NA	3.8	2.79			4.8	5.2	3.3				3.1	3.3	2.04				2.5	2.6	2.6				2.6	2.7	2.35				3	2.5	2.28			
	BF Max Depth (ft)	4.6	4.5	2.19			NA	5.8	4.8			4.8	5.2	3.3				4.8	6.7	2.84				5	5.7	4.5				4.3	4.8	4.32				5.2	5.8	3.88			
	Width/Depth Ratio	10.8	11.8	11.6			NA		9.2					9.23				10.5	10	9.33						13.13				9.8	12.8	14.11						9.12			
	Entrenchment Ratio	9.4	10.8	1.7			NA		2.4					1.85				9.5	9.6	1.64						1.49				12.3	9.1	1.3						2.18			
	Wetted Perimeter (ft)	NA	NA	20.62			NA	NA	28.9					23.2				NA	NA	20.84				NA	NA	35.7				NA	NA	36				NA	NA	22.64			
	Hydraulic radius (ft)	NA	NA	1.56			NA	NA	2.5					2.11				NA	NA	1.87				NA	NA	2.5				NA	NA	2.17				NA	NA	2.09			
Substrate	d50 (mm)	3.93	1.13	3.2			NA	0.36	0.69					0.14	0.44	1.59							11.65	0.55	1.96				0.94	5.25	1.38				0.11	0.36	11.03				
	d84 (mm)	71.37	45.32	32			NA	27.88	1					16.48	21.7	16							38.5	22.02	52.6				24.63	38.5	16				0.36	27.88	32				
Parameter		MY-00 (2002)			MY-01 (2004)			MY-02 (2005)					MY-03 (2006)			MY-04 (2007)																							MY-05 (2008)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med					
	Channel Beltwidth (ft)	43	208	87	39	192	80	40	240	90																															
	Radius of Curvature (ft)	45	76	65	42	170	90	50	100	70																															
	Meander Wavelength (ft)	192	485	275	182	481	267	225	435	262																															
	Meander Width ratio	NA	NA	NA	NA	NA	NA	11.6	22.5	13.5																															
Profile	Riffle length (ft)							5.2	53.3	21.1																															
	Riffle slope (ft/ft)							0.0053	0.069	0.029																															
	Pool length (ft)							33.9	195	89																															
	Pool spacing (ft)							17.5	219	84																															
Additional Reach Parameters	Valley Length (ft)	3314					3314			3314																															
	Channel Length (ft)	4220					4198			4360																															
	Sinuosity	1.3					1.3			1.3																															
	Water Surface Slope (ft/ft)	0.50%					0.55%			0.005																															
	BF slope (ft/ft)	NA					0.54%			0.005																															
	Rosgen Classification	E5					E5			B5																															
	Number of Bankfull Events	0					3			4 est																															
	Extent of BF floodplain (area)	NA					NA			<1.0 ac																															
	BEHI*																																								
	Habitat Index*																																								
	Macrobenthos*																																								

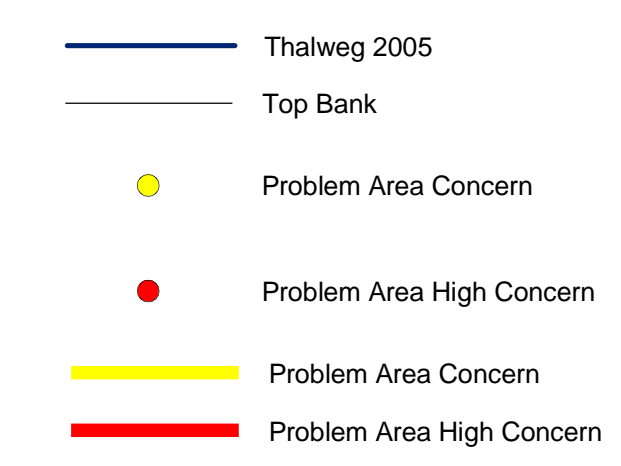
NA = Historical project documents necessary to provide this data were unavailable at the time of this report submission

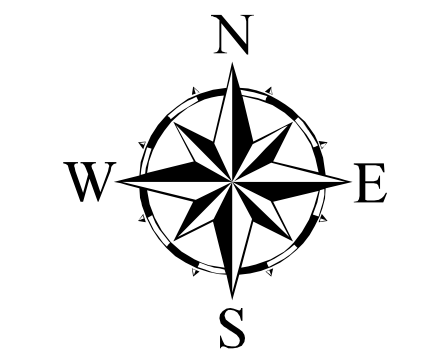
Appendix A. 1

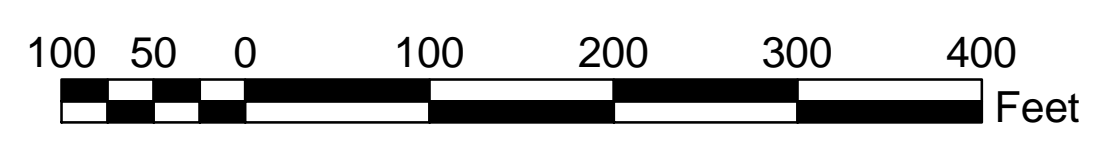


Veg Problem Areas				
Project Number: 28				
Segment Reach: Beaver Creek				
Feature Issue	Station	Suspected Cause	Photo	Severity
density	42+00	bank erosion	PA1	red
density	22+50	bank erosion	PA18	red

Notes:
 Vegetation problems were assessed without a species list or planting plan. This limited observable vegetation problems to thin and bare spots that indicate poor seed germination or other vegetation problems and obvious aggressive invasive species.







Appendix A. 2

Raw Data - Stem Counts	
EEP Project #: 00028	Date: 8/10/2005
Project Name: Beaver Creek	Staff Name Moni Bates
Monitoring Contractor: EcoLogic	Staff Name Darrell Timpany
County: Surry	Staff Name
8 Digit Catalog Unit: 03040101	Staff Name
Stream/Wetland Name: Beaver Creek	Staff Name

Plot Location		
Plot ID	Species	Stem #
1	Nyssa sylvatica	1

Plot Location		
Plot ID	Species	Stem #
3	none	

Plot Location		
Plot ID	Species	Stem #
5	Betula lenta	2
	Salix nigra	2
	Nyssa sylvatica	1
	Salix sericea	1

Plot Location		
Plot ID	Species	Stem #
7	Quercus michauxii	1

Plot Location		
Plot ID	Species	Stem #
9	Cornus florida	1
	Alnus serrulata	6
	Prunus sp. (?)	2

Plot Location		
Plot ID	Species	Stem #
11	Quercus species	7
	Juglans nigra	1
	Alnus serrulata	4
	Fraxinus pennsylvanica	5
	Cercis canadensis	1
	Salix sericea	2
	Cornus amomum	3
	Nyssa sylvatica	3

Plot Location		
Plot ID	Species	Stem #
2	Fraxinus pennsylvanica	4
	Lots of Microstegium	
	virmineum and	
	Arthraxon hispidus	
	var. cryptatherus in	

Plot Location		
Plot ID	Species	Stem #
4	Quercus sp.	1
	Nyssa sylvatica	1
	Salix nigra	9
	Betula sp. (volunteers?)	2
	Quercus michauxii	1
	Fraxinus pennsylvanica	1
	Prunus sp.	1

Plot Location		
Plot ID	Species	Stem #
6	Betula lenta	1
	Juglans nigra	2
	Nyssa sylvatica	1
	Fraxinus pennsylvanica	2

Plot Location		
Plot ID	Species	Stem #
8	Betula nigra	1
	Prunus sp.	1
	Fraxinus pennsylvanica	1
	Alnus serrulata	5
	Cephalanthus	
	occidentalis	1

Plot Location		
Plot ID	Species	Stem #
13	Salix nigra	1

Plot Location		
Plot ID	Species	Stem #
15	none	

Plot Location		
Plot ID	Species	Stem #
10	Betula lenta	3
	Fraxinus pennsylvanica	2
	Prunus serotina	1
	Prunus sp. (volunteers?)	3
	Juglans nigra	1
	Quercus species	3
	Cephalanthus	
	occidentalis	1
	Nyssa sylvatica	1
	Liriodendron tulipifera	1

Plot Location		
Plot ID	Species	Stem #
12	Quercus species	4
	Quercus phellos	2
	Quercus michauxii	7
	Carya tomentosa	1
	Alnus serrulata	1
	Fraxinus pennsylvanica	5
	Cephalanthus	
	occidentalis	2
	Betula sp.	1

Plot Location		
Plot ID	Species	Stem #
14	Juglans nigra	1
	Salix nigra	1
	Quercus phellos	

Appendix A. 3

Beaver Creek Stream Restoration Photos



PA 1



PA 18

Appendix A. 4

Beaver Creek Stream Restoration Veg. Plot Photos



VP 4



VP 5



VP 6



VP 7



VP 8



VP 10

Beaver Creek Stream Restoration Veg. Plot Photos



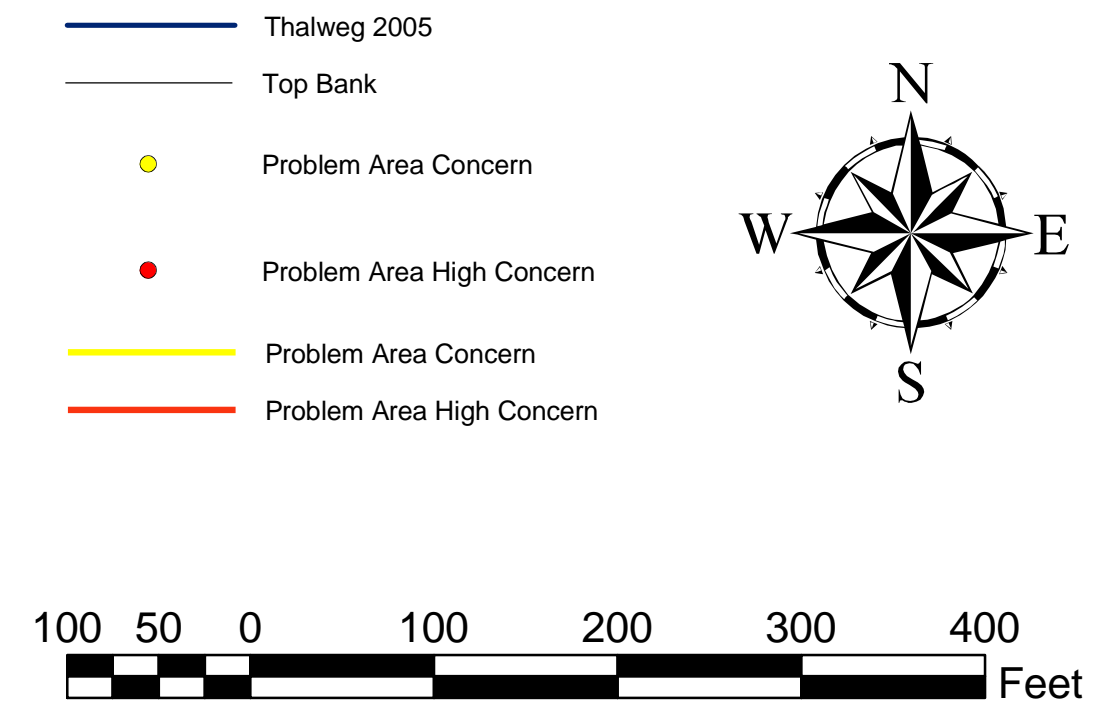
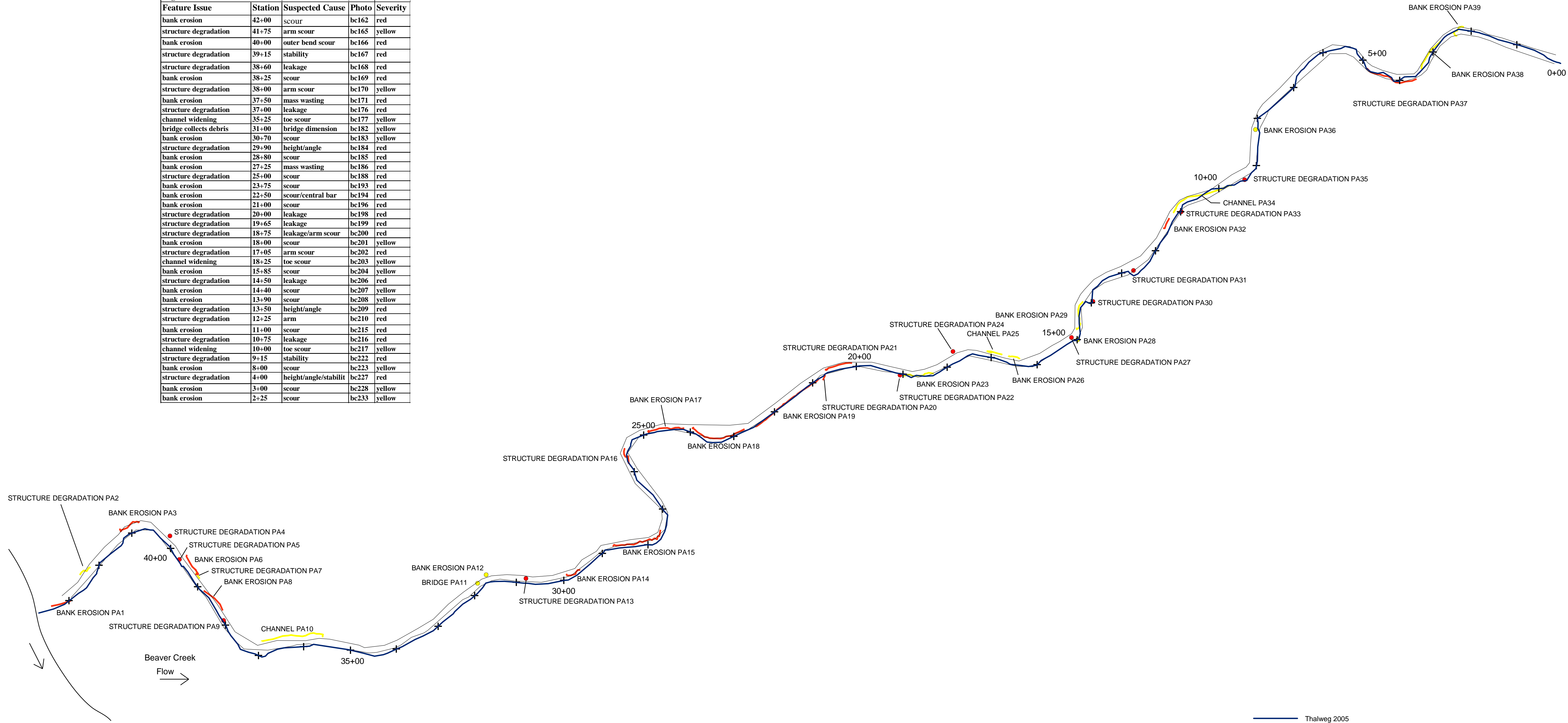
VP 11



VP 14

Appendix B. 1

Stream Problem Areas				
Project Number: 28				
Segment Reach: Beaver Creek				
Feature Issue	Station	Suspected Cause	Photo	Severity
bank erosion	42+00	scour	bc162	red
structure degradation	41+75	arm scour	bc165	yellow
bank erosion	40+00	outer bend scour	bc166	red
structure degradation	39+15	stability	bc167	red
structure degradation	38+60	leakage	bc168	red
bank erosion	38+25	scour	bc169	red
structure degradation	38+00	arm scour	bc170	yellow
bank erosion	37+50	mass wasting	bc171	red
structure degradation	37+00	leakage	bc176	red
channel widening	35+25	toe scour	bc177	yellow
bridge collects debris	31+00	bridge dimension	bc182	yellow
bank erosion	30+70	scour	bc183	yellow
structure degradation	29+90	height/angle	bc184	red
bank erosion	28+80	scour	bc185	red
bank erosion	27+25	mass wasting	bc186	red
structure degradation	25+00	scour	bc188	red
bank erosion	23+75	scour	bc193	red
bank erosion	22+50	scour/central bar	bc194	red
bank erosion	21+00	scour	bc196	red
structure degradation	20+00	leakage	bc198	red
structure degradation	19+65	leakage	bc199	red
structure degradation	18+75	leakage/arm scour	bc200	red
bank erosion	18+00	scour	bc201	yellow
structure degradation	17+05	arm scour	bc202	red
channel widening	18+25	toe scour	bc203	yellow
bank erosion	15+85	scour	bc204	yellow
structure degradation	14+50	leakage	bc206	red
bank erosion	14+40	scour	bc207	yellow
bank erosion	13+90	scour	bc208	yellow
structure degradation	13+50	height/angle	bc209	red
structure degradation	12+25	arm	bc210	red
bank erosion	11+00	scour	bc215	red
structure degradation	10+75	leakage	bc216	red
channel widening	10+00	toe scour	bc217	yellow
structure degradation	9+15	stability	bc222	red
bank erosion	8+00	scour	bc223	yellow
structure degradation	4+00	height/angle/stability	bc227	red
bank erosion	3+00	scour	bc228	yellow
bank erosion	2+25	scour	bc233	yellow



Appendix B.2

Beaver Creek Stream Restoration Problem Areas



PA 2



PA 3



PA 4



PA 5



PA 6



PA 7

Beaver Creek Stream Restoration Problem Areas



PA 8



PA 9



PA 10



PA 11



PA 12



PA 13

Beaver Creek Stream Restoration Problem Areas



PA 14



PA 15



PA 16



PA 17



PA 19



PA 20

Beaver Creek Stream Restoration Problem Areas



PA 21



PA 22



PA 23



PA 24



PA 25



PA 26

Beaver Creek Stream Restoration Problem Areas



PA 27



PA 28



PA 29



PA 30



PA 31



PA 32

Beaver Creek Stream Restoration Problem Areas



PA 33



PA 34



PA 35



PA 36



PA 37



PA 38

Beaver Creek Stream Restoration Problem Areas



PA 39

Appendix B.3

Beaver Creek Stream Restoration Photos



1



2



3



4



5



6

Beaver Creek Stream Restoration Photos



7



8



9



10



11



12

Beaver Creek Stream Restoration Photos



13



14



15



16



17



18

Beaver Creek Stream Restoration Photos



19



20



21



22



23



24

Beaver Creek Stream Restoration Photos



25



26



27



28



29



30

Beaver Creek Stream Restoration Photos



31

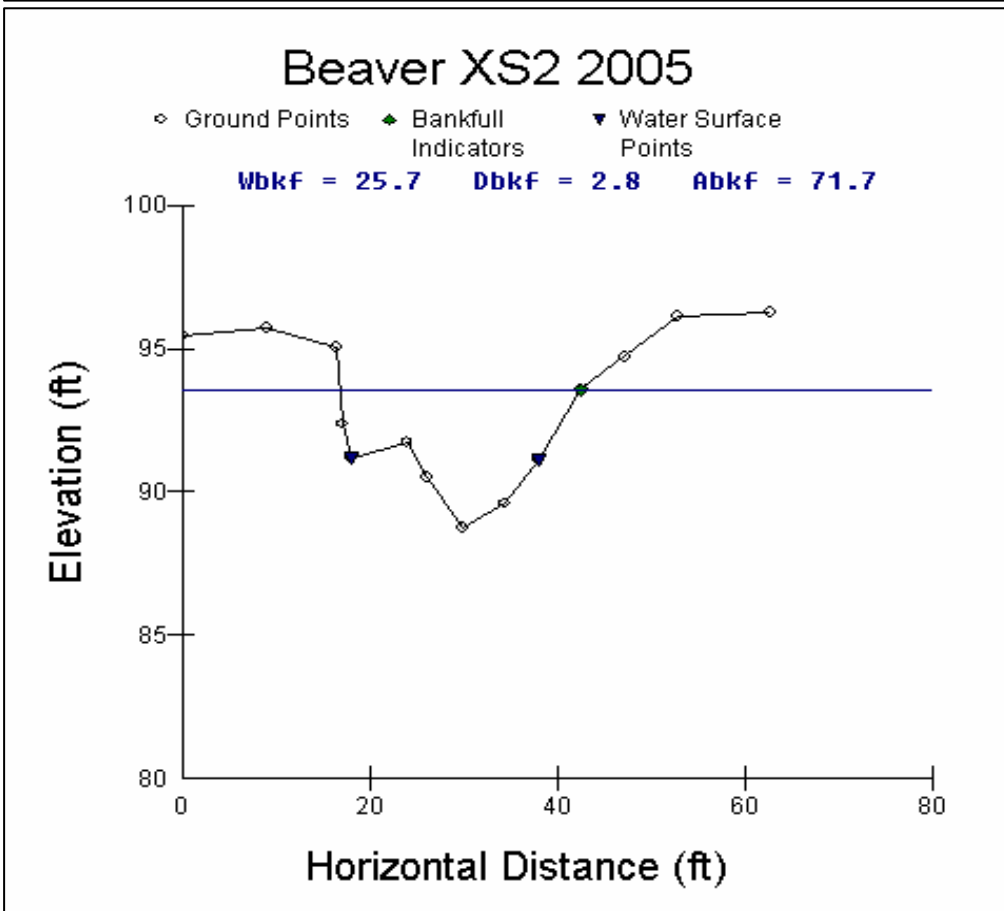
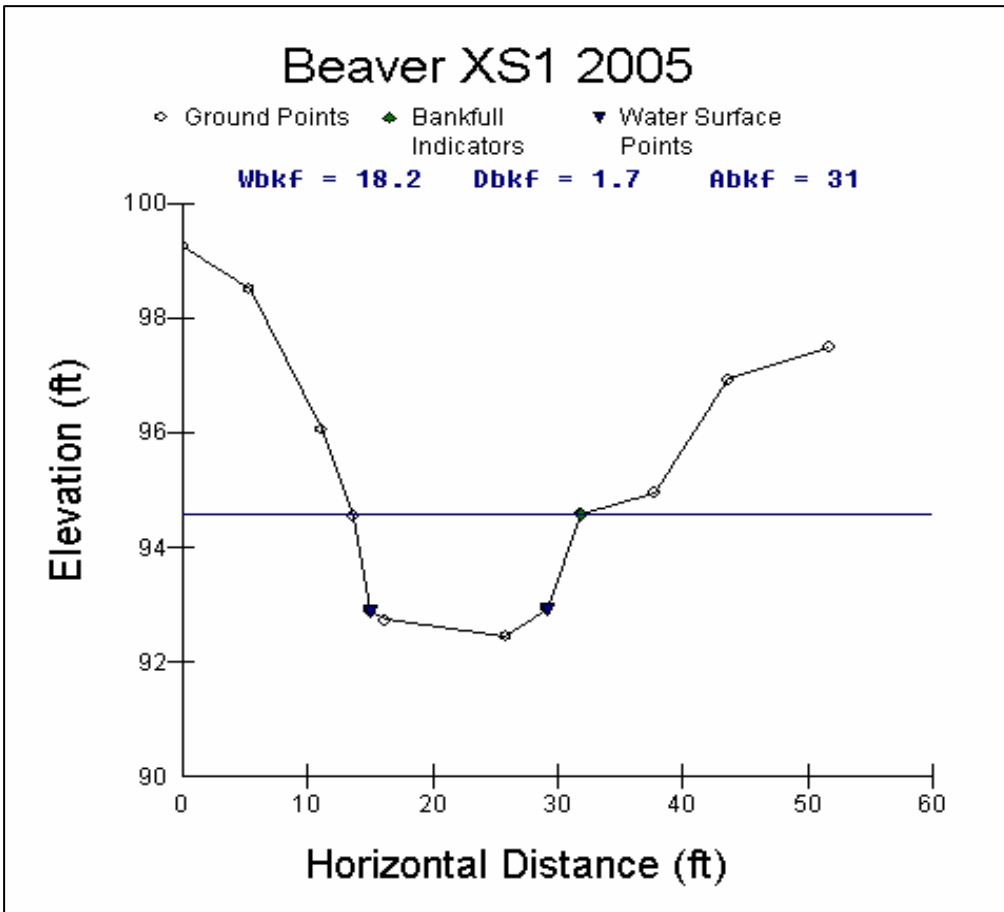


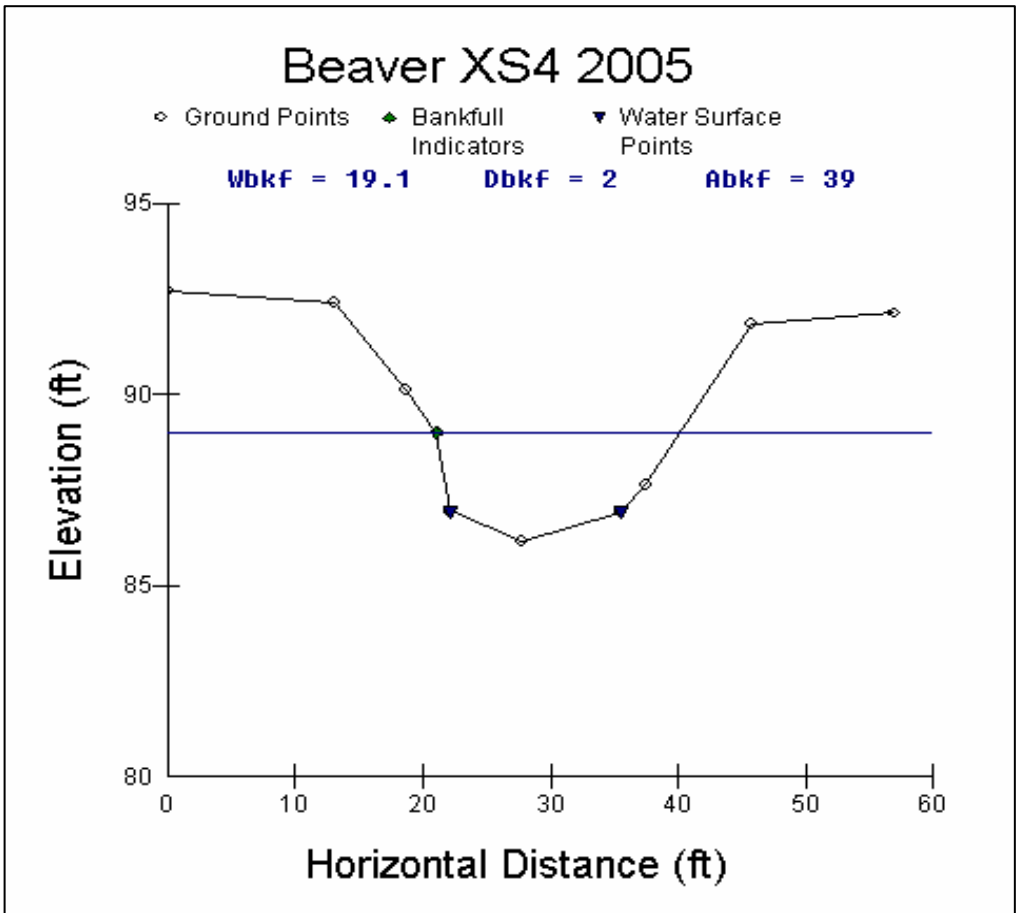
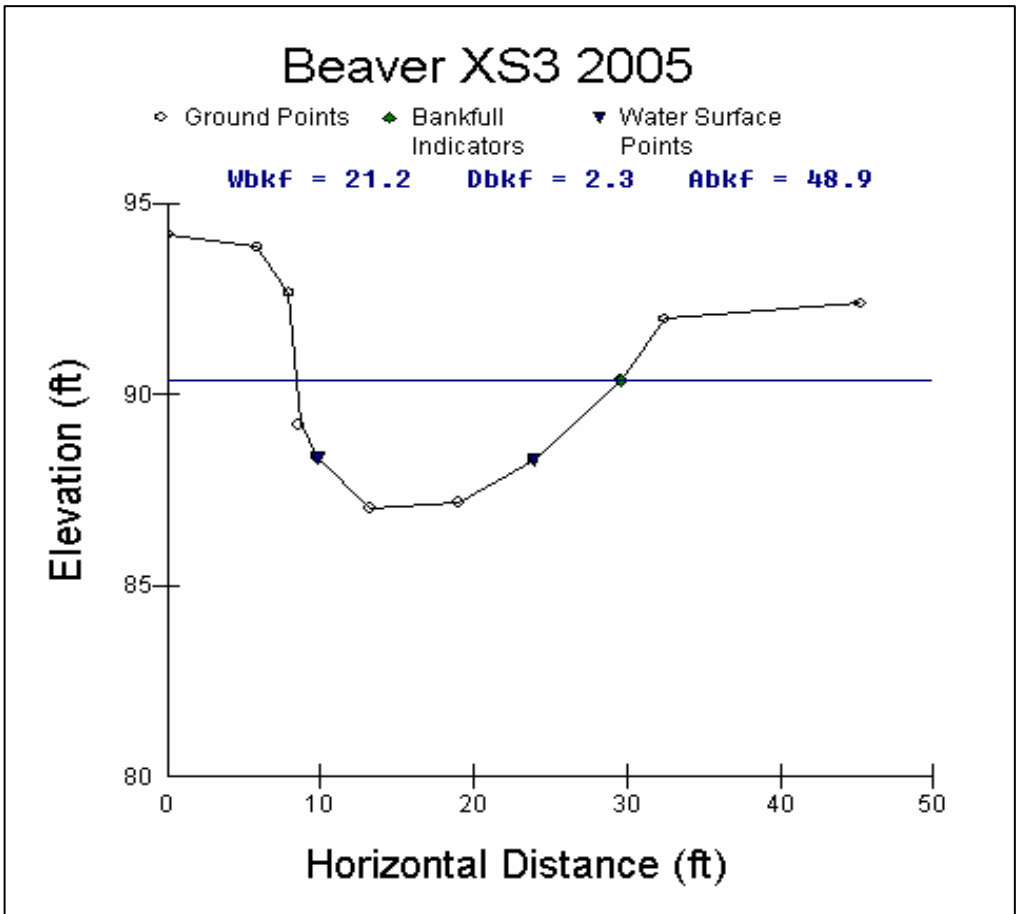
32

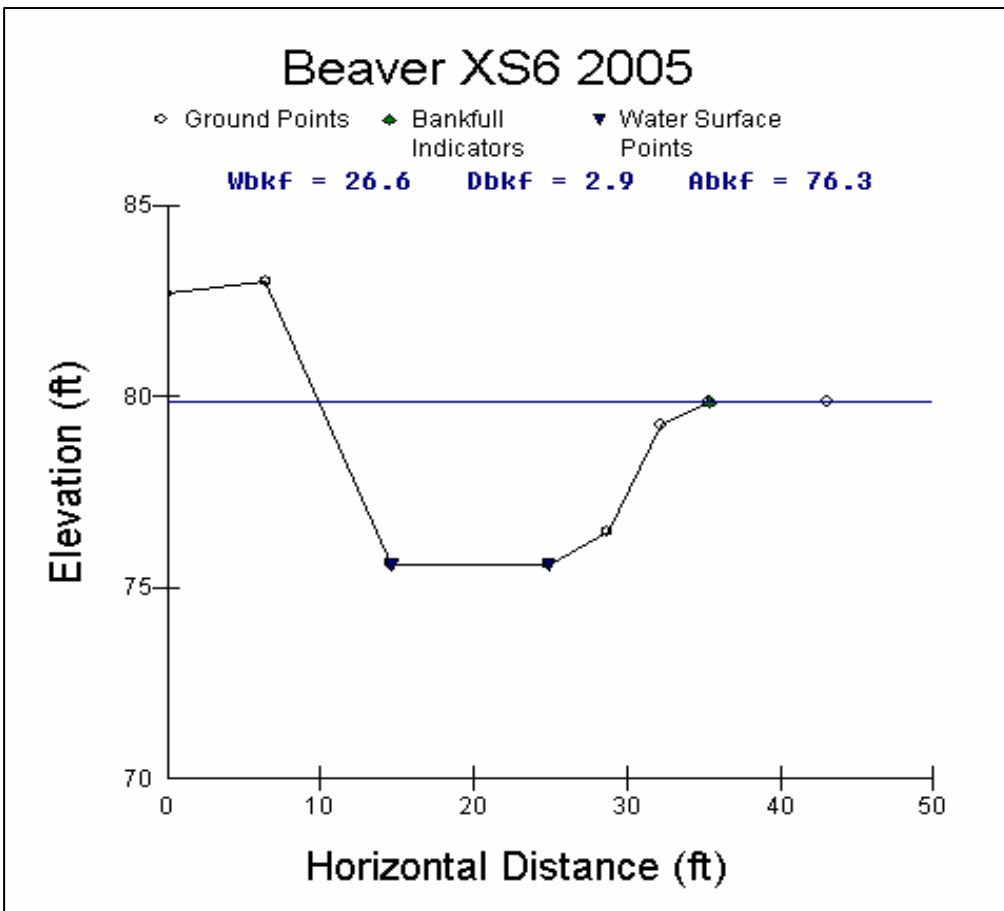
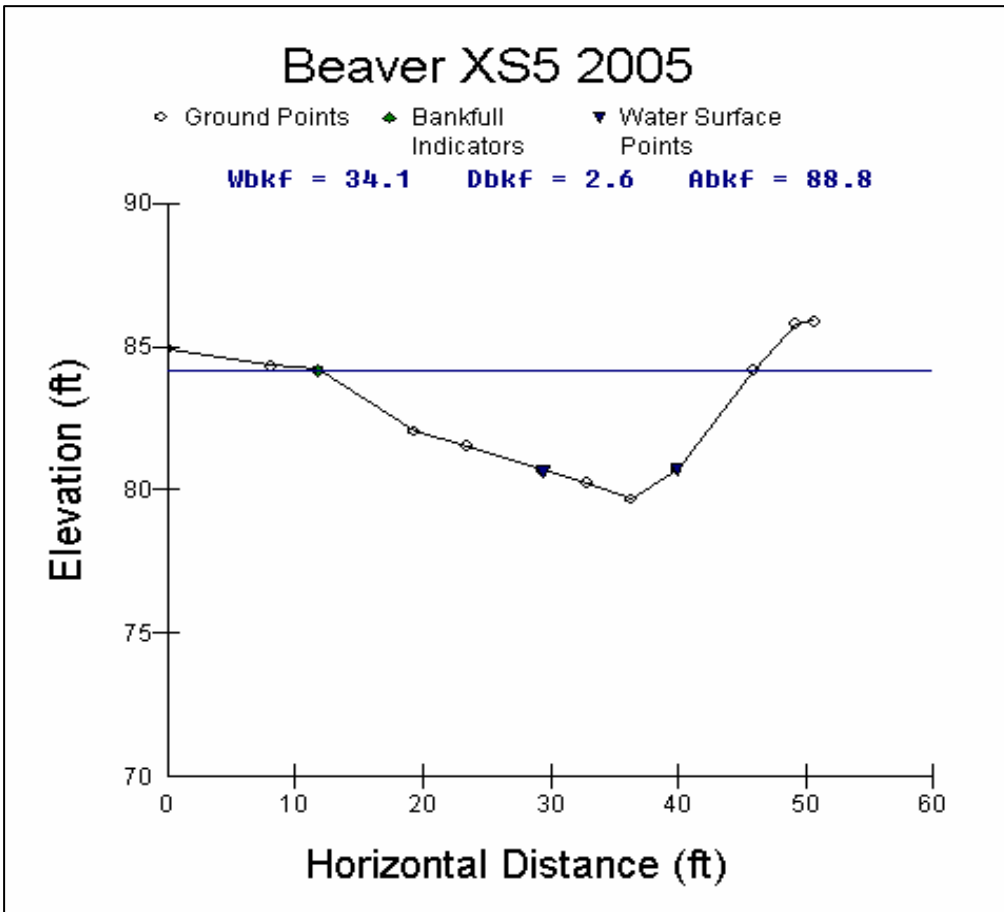
Appendix B.4

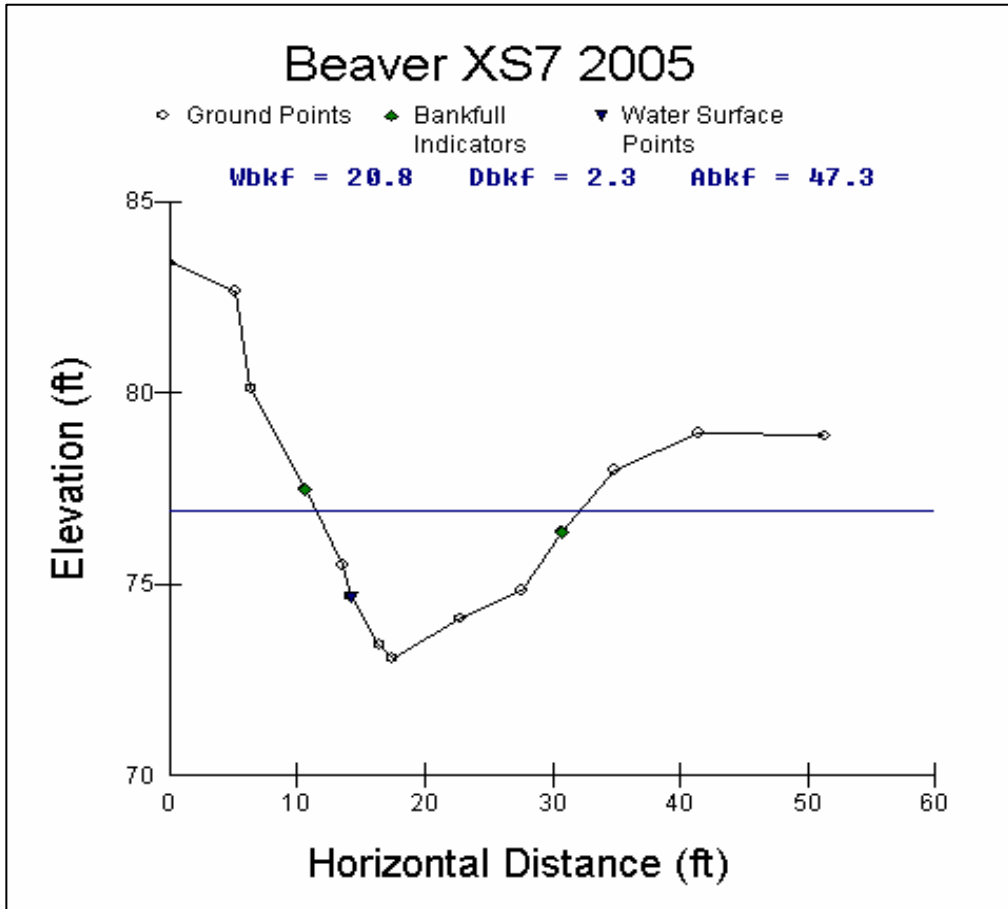
Table B1. Qualitative Visual Stability Assessment						
Project Number: 00028						
Segment/Reach: Beaver Creek						
Feature Category	Metric (per as-built and reference baselines)	(# Stable) Number performing as intended	Total number per as-built	Total number / feet in unstable state	% Perform in stable condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	28	28	0	100	
	2. Armor stable (e.g. no displacement)?	28	28	0	100	
	3. Facet grade appears stable?	28	28	0	100	
	4. Stable interval grade?	14	28	14/1300	50	
	5. Feature spacing appropriate?	28	28	0	100	
	6. Minimal evidence of embedding/fining?	28	28	0	100	
	7. Depth appears appropriate for current discharge?	28	28	0	100	
	8. Length appropriate?	14	28	14/1300	50	
						87.5
B. Pools	1. Present? (e.g not subject to severe aggradation?) 4	35	35	0	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf >1.6?)	35	35	0	100	
	3. Thalweg located outer bend?	11	35	750	31	
	4. Spacing appropriate?	35	35	0	100	
	5. Non-aggrading (not filling)?	35	35	0	90	
	6. Length appropriate?	35	35	0	100	
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	35	35	0	100	
	2. Downstream of meander (glide/inflection) centering?	35	35	0	100	
D. Meanders	1. Outer bend in state of limited/controlled erosion?	35	35	0	100	20
	2. Of those eroding, # w/concomitant point bar formation?	0	NA	0	NA	NA
	3. Apparent Rc within spec?	NA	NA	NA	NA	NA
	4. Sufficient floodplain access and relief?	All	NA	None	100	NA
E. Bed - General	1. General channel bed aggradation areas (bar formation)	All	NA	None	100	
	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	All	NA	None	100	
F. Channel Capac./Dimen.	1. Channel width: depth appears out of design/type spec?	All	NA	None	100	
G. Banks	1. Apparent scour points from channel processes	3	NA	3/300	NA	3
	2. Apparent cut points from overland flow	All	NA	None	100	
	3. Apparent cut or scour from flood water re-entry to channel (e.g. inadequate floodplain access?)	All	NA	None	100	NA
	4. Tension cracks	All	NA	None	100	NA
	5. Unstable cantilever blocks (e.g. height/undercut/soil type versus vegetation penetration and extent)	All	NA	None	100	NA
	6. Bank gradient in excess of 40%?	All	NA	None	100	NA
	7. Collapse/slumping	18	NA	18/770	NA	18
	8. Ratio of bank height: bankfull height elevated	All	NA	None	100	NA
H. Vanes	1. Free of back or arm scour?	16	30			
	2. Height appropriate?	All	NA	None	100	NA
	3. Angle and geometry appear appropriate?	All	NA	None	100	NA
	4. Free of piping or other structural failures?	All	NA	None	100	NA
I. Wads/ Boulders	1. Free of scour?	20	52	32	38	38
	2. Footing stable?	20	52	32	38	38
NA = Historical project documents necessary to provide this data were unavailable at the time of this report submission						

Appendix B.5









River Name: Fisher
 Reach Name: Beaver Creek
 Cross Section Name: Beaver XS1
 Survey Date: 10/25/05

River Name: Fisher
 Reach Name: Beaver Creek
 Cross Section Name: Beaver XS2
 Survey Date: 10/25/05

 Cross Section Data Entry

BM Elevation: 0 ft
 Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	99.2356128	LB
5.37	0	98.5005929	
11.22	0	96.0454151	
13.63	0	94.5400112	
15.05	0	92.8742676	LEW
16.28	0	92.7246456	
25.89	0	92.4456973	TW.5
29.14	0	92.9093525	REW
31.81	0	94.5808656	BKF
37.81	0	94.9510747	
43.58	0	96.9203262	
51.65	0	97.4898395	RB

 Cross Section Data Entry

BM Elevation: 0 ft
 Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	95.4541059	LB
8.97	0	95.735899	
16.52	0	95.0225729	
17.15	0	92.3743505	
18.11	0	91.1858558	LEW
23.98	0	91.7255866	
26.13	0	90.5172729	
29.92	0	88.7544151	TW2.4
34.42	0	89.5893171	
38	0	91.0911696	REW
42.55	0	93.5818267	BKF
47.16	0	94.7211557	
52.86	0	96.1025356	RB
62.61	0	96.2593045	LPIN

 Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	96.71	96.71	96.71
Bankfull Elevation (ft)	94.58	94.58	94.58
Floodprone Width (ft)	33.35	----	----
Bankfull Width (ft)	18.24	9.12	9.12
Entrenchment Ratio	1.83	----	----
Mean Depth (ft)	1.7	1.74	1.66
Maximum Depth (ft)	2.13	2.04	2.13
Width/Depth Ratio	10.73	5.23	5.51
Bankfull Area (sq ft)	31.01	15.92	15.09
Wetted Perimeter (ft)	19.55	11.96	11.67
Hydraulic Radius (ft)	1.59	1.33	1.29
Begin BKF Station	13.57	13.57	22.69
End BKF Station	31.81	22.69	31.81

 Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	98.41	98.41	98.41
Bankfull Elevation (ft)	93.58	93.58	93.58
Floodprone Width (ft)	62.61	----	----
Bankfull Width (ft)	25.68	12.84	12.85
Entrenchment Ratio	2.44	----	----
Mean Depth (ft)	2.79	2.61	2.97
Maximum Depth (ft)	4.83	4.72	4.83
Width/Depth Ratio	9.2	4.91	4.33
Bankfull Area (sq ft)	71.7	33.55	38.14
Wetted Perimeter (ft)	28.95	19.79	18.61
Hydraulic Radius (ft)	2.48	1.7	2.05
Begin BKF Station	16.86	16.86	29.7
End BKF Station	42.55	29.7	42.55

River Name: Fisher
 Reach Name: Beaver Creek
 Cross Section Name: Beaver XS3
 Survey Date: 10/25/05

River Name: Fisher
 Reach Name: Beaver Creek
 Cross Section Name: Beaver XS4
 Survey Date: 10/25/05

 Cross Section Data Entry

BM Elevation: 0 ft
 Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	94.1870093	LPIN
5.87	0	93.8455222	LB
7.93	0	92.6420527	
8.63	0	89.2149236	
9.83	0	88.3395588	LEW
13.28	0	87.0266782	TW1.3
19	0	87.1773369	
23.9	0	88.2941977	REW
29.63	0	90.3675554	BKF
32.53	0	91.9636593	
45.29	0	92.3657946	RPIN

 Cross Section Data Entry

BM Elevation: 0 ft
 Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	92.6979124	LPIN
13.13	0	92.3801828	
18.68	0	90.1172254	
21.09	0	88.9878326	BKF
22.18	0	86.931494	LEW
27.75	0	86.1504465	TW.9
35.48	0	86.9250914	REW
37.5	0	87.6423254	
45.76	0	91.848388	RB
56.94	0	92.1183231	RPIN

 Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	93.71	93.71	93.71
Bankfull Elevation (ft)	90.37	90.37	90.37
Floodprone Width (ft)	39.19	----	----
Bankfull Width (ft)	21.24	10.62	10.62
Entrenchment Ratio	1.85	----	----
Mean Depth (ft)	2.3	2.83	1.77
Maximum Depth (ft)	3.34	3.34	3.19
Width/Depth Ratio	9.23	3.75	5.99
Bankfull Area (sq ft)	48.87	30.04	18.83
Wetted Perimeter (ft)	23.2	15.28	14.3
Hydraulic Radius (ft)	2.11	1.97	1.32
Begin BKF Station	8.39	8.39	19.01
End BKF Station	29.63	19.01	29.63

 Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	91.83	91.83	91.83
Bankfull Elevation (ft)	88.99	88.99	88.99
Floodprone Width (ft)	31.24	----	----
Bankfull Width (ft)	19.06	9.53	9.53
Entrenchment Ratio	1.64	----	----
Mean Depth (ft)	2.04	2.36	1.73
Maximum Depth (ft)	2.84	2.84	2.55
Width/Depth Ratio	9.33	4.04	5.52
Bankfull Area (sq ft)	38.95	22.5	16.45
Wetted Perimeter (ft)	20.84	13.39	12.55
Hydraulic Radius (ft)	1.87	1.68	1.31
Begin BKF Station	21.09	21.09	30.62
End BKF Station	40.15	30.62	40.15

River Name: Fisher
 Reach Name: Beaver Creek
 Cross Section Name: Beaver XS5
 Survey Date: 10/25/05

River Name: Fisher
 Reach Name: Beaver Creek
 Cross Section Name: Beaver XS6
 Survey Date: 10/25/05

 Cross Section Data Entry

BM Elevation: 0 ft
 Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	84.9124704	LB
8.18	0	84.3184088	
11.84	0	84.1814009	bkf
19.34	0	82.0268514	
23.48	0	81.5357396	
29.38	0	80.6660925	LEW
32.91	0	80.2314182	
36.4	0	79.6567302	TW1.1
39.91	0	80.6838228	REW
45.92	0	84.1471348	
49.21	0	85.8007355	RB
50.7	0	85.8672932	RPIN

 Cross Section Data Entry

BM Elevation: 0 ft
 Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	82.6758351	LPIN
6.42	0	83.0124466	LB
14.64	0	75.597888	LEW
24.87	0	75.5763827	REW
28.72	0	76.4473632	
32.26	0	79.2298348	
35.4	0	79.8356467	bkf
43.08	0	79.8649527	PIN

 Cross Sectional Geometry

 Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	88.7	88.7	88.7
Bankfull Elevation (ft)	84.18	84.18	84.18
Floodprone Width (ft)	50.7	-----	-----
Bankfull Width (ft)	34.14	17.08	17.07
Entrenchment Ratio	1.49	-----	-----
Mean Depth (ft)	2.6	2.02	3.18
Maximum Depth (ft)	4.52	3.45	4.52
Width/Depth Ratio	13.13	8.43	5.37
Bankfull Area (sq ft)	88.8	34.57	54.24
Wetted Perimeter (ft)	35.69	20.91	21.67
Hydraulic Radius (ft)	2.49	1.65	2.5
Begin BKF Station	11.84	11.84	28.92
End BKF Station	45.99	28.92	45.99

	Channel	Left	Right
Floodprone Elevation (ft)	84.1	84.1	84.1
Bankfull Elevation (ft)	79.84	79.84	79.84
Floodprone Width (ft)	43.08	-----	-----
Bankfull Width (ft)	26.6	16.54	10.06
Entrenchment Ratio	1.62	-----	-----
Mean Depth (ft)	2.87	3.63	1.61
Maximum Depth (ft)	4.26	4.26	3.9
Width/Depth Ratio	9.28	4.56	6.24
Bankfull Area (sq ft)	76.27	60.05	16.22
Wetted Perimeter (ft)	29.35	22.11	15.04
Hydraulic Radius (ft)	2.6	2.72	1.08
Begin BKF Station	9.94	9.94	26.48
End BKF Station	36.54	26.48	36.54

River Name: Fisher
 Reach Name: Beaver Creek
 Cross Section Name: Beaver XS7
 Survey Date: 10/25/05

 Cross Section Data Entry

BM Elevation: 0 ft
 Backsight Rod Reading: 0 ft

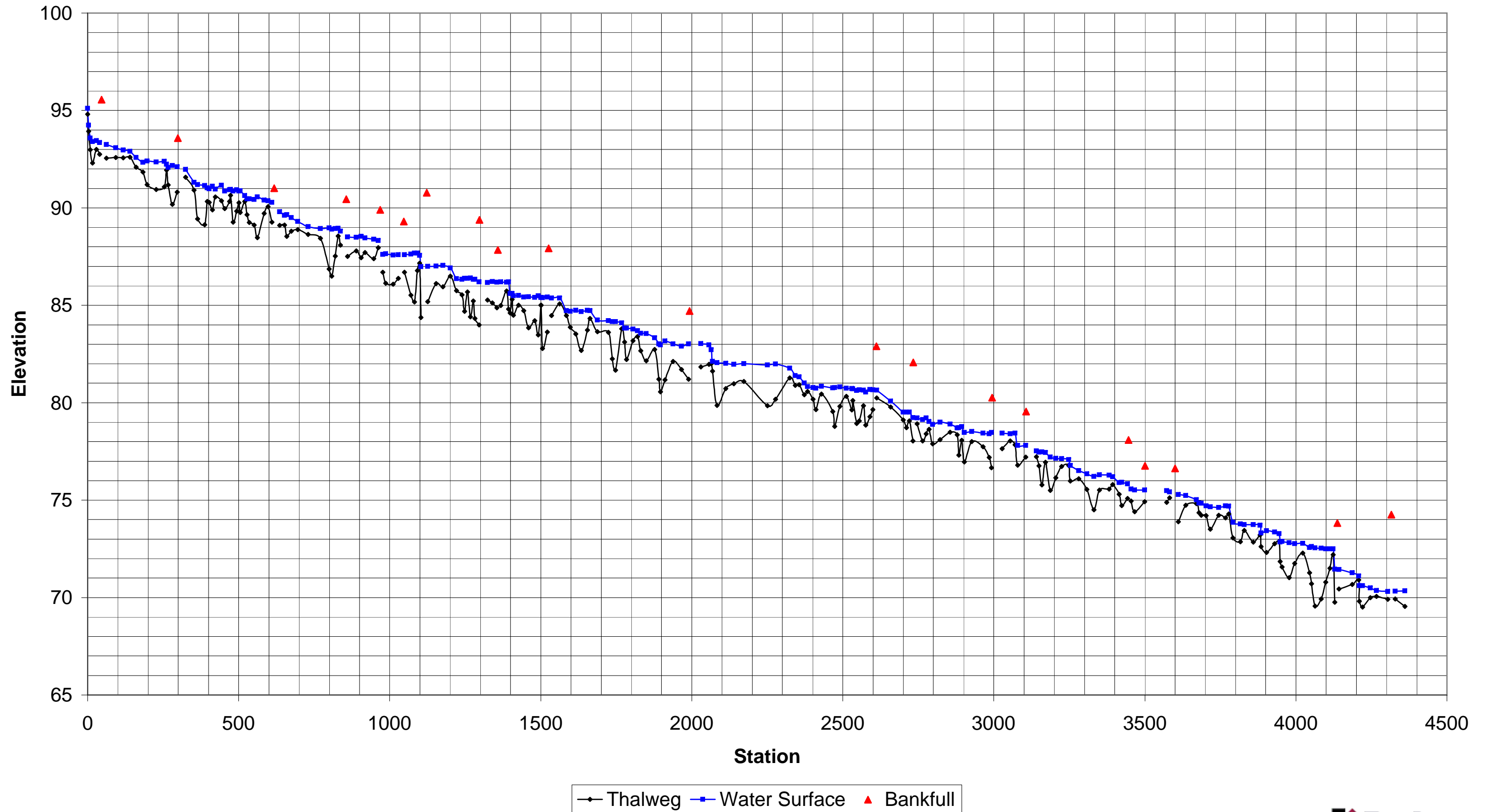
TAPE	FS	ELEV	NOTE
0	0	83.3896209	LPIN
5.12	0	82.6356119	
6.38	0	80.1047251	
10.59	0	77.4918059	BKF
13.62	0	75.4859235	
14.2	0	74.6550187	LEW
16.46	0	73.4207681	
17.46	0	73.0364261	TW1.7
22.83	0	74.0950294	
27.61	0	74.8122812	
30.78	0	76.3475177	BKF
34.91	0	77.9832411	
41.48	0	78.9355591	
51.36	0	78.8715184	RPIN

 Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	80.8	80.8	80.8
Bankfull Elevation (ft)	76.92	76.92	76.92
Floodprone Width (ft)	45.33	-----	-----
Bankfull Width (ft)	20.77	10.39	10.39
Entrenchment Ratio	2.18	-----	-----
Mean Depth (ft)	2.28	2.69	1.86
Maximum Depth (ft)	3.88	3.88	3.02
Width/Depth Ratio	9.12	3.86	5.58
Bankfull Area (sq ft)	47.29	27.95	19.34
Wetted Perimeter (ft)	22.64	14.74	13.94
Hydraulic Radius (ft)	2.09	1.9	1.39
Begin BKF Station	11.45	11.45	21.84
End BKF Station	32.23	21.84	32.23

Appendix B.6

Beaver Creek Long Profile 2005 MY2



River Name: Fisher
 Reach Name: Beaver Creek
 Profile Name: Beaver 2005
 Survey Date: 10/25/05

Survey Data

STA	Thalweg	Water Surface	Bankfull
0	94.8	95.1	
3.42	93.937	94.237	
8.397	92.986	93.586	
16.406	92.305	93.405	
29.112	93.004	93.454	
39.539	92.749	93.349	
46.509			95.558
61.901	92.544	93.244	
92.693	92.581	93.081	
118.134	92.572	92.972	
140.376	92.597	92.897	
160.877	92.087	92.587	
182.762	91.834	92.334	
196.917	91.199	92.399	
226.711	90.95	92.35	
253.317	91.081	92.381	
261.223	91.939	92.239	
266.829	91.168	92.068	
280.885	90.174	92.174	
296.423	90.806	92.106	
298.272			93.582
323.846	91.575	91.975	
351.854	90.903	91.303	
363.922	89.433	91.2	
387.142	89.137	91.137	
395.472	90.332	91.032	
402.187	90.274	90.974	
413.355	89.906	91.106	
422.191	90.564	90.964	
442.627	90.355	91.155	
454.088	89.968	90.868	
469.493	90.325	90.925	
472.638	90.637	90.937	
481.432	89.266	90.866	
493.368	89.829	90.929	
500.485	90.263	90.863	
505.001	89.769	90.869	
519.667	90.336	90.636	
527.225	89.655	90.455	
535.304	89.259	90.459	
550.703	89.123	90.423	
561.367	88.468	90.568	
584.196	89.709	90.4	
597.641	90.064	90.364	
609.574	89.273	90.28	

River Name: Fisher
 Reach Name: Beaver Creek
 Profile Name: Beaver 2005
 Survey Date: 10/25/05

Survey Data

STA	Thalweg	Water Surface	Bankfull
0	94.8	95.1	
617.095			91.009
635.476	89.104	89.804	
652.097	89.111	89.611	
658.99	88.543	89.643	
674.457	88.803	89.503	
695.786	88.894	89.294	
729.744	88.63	89.03	
770.971	88.436	88.936	
799.224	86.868	88.968	
807.901	86.503	88.903	
819.972	87.531	88.931	
829.677	88.552	88.952	
837.106	88.097	88.797	
855.684			90.444
860.081	87.512	88.512	
889.348	87.784	88.484	
905.65	87.445	88.545	
918.108	87.713	88.463	
946.938	87.389	88.389	
962.151	87.964	88.314	
968.992			89.902
976.518	86.701	87.601	
986.896	86.14	87.64	
1011.21	86.078	87.578	
1028.284	86.387	87.587	
1046.45			89.306
1048.515	86.691	87.591	
1069.772	85.52	87.62	
1081.49	85.17	87.67	
1091.495	86.773	87.673	
1098.825	87.154	87.554	
1103.408	84.375	86.975	
1122.132			90.769
1125.468	85.195	86.995	
1153.301	86.113	87.013	
1176.572	85.947	87.047	
1200.707	86.505	86.905	
1221.148	85.758	86.358	
1239.381	85.539	86.339	
1247.437	84.683	86.383	
1257.415	85.688	86.388	
1267.056	84.404	86.404	
1277.029	85.224	86.324	
1281.961	84.326	86.326	
1296.335	83.994	86.194	

River Name: Fisher
 Reach Name: Beaver Creek
 Profile Name: Beaver 2005
 Survey Date: 10/25/05

Survey Data

STA	Thalweg	Water Surface	Bankfull
0	94.8	95.1	
1297.323			89.382
1323.663	85.27	86.17	
1339.668	85.117	86.217	
1354.478	84.878	86.178	
1357.825			87.847
1367.826	84.994	86.194	
1386.852	85.729	86.179	
1393.51	84.803	86.203	
1399.211	84.609	85.609	
1405.591	85.298	85.598	
1409.378	84.488	85.488	
1426.054	85.002	85.502	
1443.292	84.722	85.422	
1459.674	83.84	85.44	
1480.512	84.209	85.409	
1492.09	83.478	85.478	
1500.837	84.999	85.399	
1501.391	84.999	85.399	
1505.255	82.78	85.38	
1521.569	83.622	85.422	
1526.35			87.929
1535.896	84.474	85.374	
1562.369	85.072	85.372	
1585.001	84.478	84.728	
1598.215	83.883	84.683	
1615.722	83.534	84.734	
1633.991	82.676	84.676	
1654.22	83.734	84.734	
1662.955	84.32	84.72	
1687.928	83.638	84.238	
1723.675	83.604	84.204	
1736.924	82.259	84.159	
1747.384	81.665	84.165	
1767.445	83.794	84.094	
1777.149	83.12	83.82	
1783.75	82.221	83.821	
1805.196	83.182	83.782	
1820.53	83.401	83.701	
1831.444	82.658	83.558	
1849.46	82.151	83.551	
1877.271	82.73	83.33	
1890.622	81.211	83.011	
1896.757	80.559	82.959	
1911.369	81.166	83.166	
1937.883	82.115	83.015	

River Name: Fisher
 Reach Name: Beaver Creek
 Profile Name: Beaver 2005
 Survey Date: 10/25/05

Survey Data

STA	Thalweg	Water Surface	Bankfull
0	94.8	95.1	
1965.894	81.697	82.897	
1988.917	81.211	83.011	
1993.069			84.701
2030.382	81.83	83.03	
2057.191	81.966	82.966	
2064.172	82.008	82.708	
2068.281	81.62	82.12	
2084.121	79.855	82.055	
2112.785	80.717	82.017	
2139.654	80.975	81.975	
2172.685	81.097	81.997	
2250.678	79.841	81.941	
2277.534	80.184	81.984	
2324.388	81.274	81.774	
2342.973	80.883	81.383	
2354.974	80.917	81.317	
2372.053	80.403	81.003	
2383.426	80.574	80.824	
2401.518	80.171	80.771	
2411.508	79.646	80.746	
2428.894	80.435	80.835	
2466.498	79.552	80.752	
2473.332	78.78	80.78	
2490.692	79.811	80.811	
2511.318	80.335	80.735	
2529.565	79.629	80.729	
2533.558	80.107	80.707	
2545.966	78.929	80.629	
2553.95	79.061	80.661	
2568.306	79.838	80.638	
2576.11	78.85	80.55	
2590.269	79.275	80.675	
2599.16	79.654	80.654	
2611.411			82.904
2612.463	80.245	80.645	
2658.232	79.781	80.081	
2699.734	79.12	79.52	
2710.185	78.715	79.515	
2720.2	79.064	79.514	
2732.132	78.036	79.236	
2733.689			82.077
2745.665	78.916	79.216	
2763.946	78.032	79.132	
2776.021	78.411	79.211	
2785.382	78.635	79.035	

River Name: Fisher
 Reach Name: Beaver Creek
 Profile Name: Beaver 2005
 Survey Date: 10/25/05

Survey Data

STA	Thalweg	Water Surface	Bankfull
0	94.8	95.1	
2797.147	77.884	78.884	
2821.524	78.102	79.002	
2854.984	78.493	78.893	
2878.717	78.359	78.709	
2884.492	77.314	78.714	
2893.404	78.072	78.772	
2902.79	76.966	78.466	
2926.9	78.011	78.511	
2963.891	77.74	78.44	
2984.612	77.197	78.397	
2992.615	76.669	78.469	
2993.86			80.258
3027.369	77.64	78.44	
3054.433	78.046	78.41	
3070.163	77.837	78.437	
3079.212	76.799	77.799	
3105.749	77.213	77.813	
3106.521			79.555
3140.555	77.231	77.531	
3149.228	76.765	77.465	
3158.982	75.778	77.478	
3170.751	76.94	77.44	
3186.402	75.504	77.204	
3204.964	76.148	77.148	
3224.888	76.725	77.125	
3247.678	76.782	77.082	
3253.381	75.975	76.775	
3281.156	76.104	76.504	
3307.54	75.55	76.35	
3331.822	74.508	76.208	
3350.072	75.516	76.3	
3381.177	75.574	76.274	
3392.96	75.792	76.192	
3414.69	75.306	75.906	
3423.907	74.722	75.922	
3442.662	75.082	75.84	
3446.016			78.088
3454.207	74.959	75.559	
3466.713	74.412	75.512	
3498.9	74.919	75.519	
3500.078			76.753
3572.699	74.885	75.485	
3582.043	75.115	75.415	
3600.074			76.627
3610.803	73.884	75.284	

River Name: Fisher
 Reach Name: Beaver Creek
 Profile Name: Beaver 2005
 Survey Date: 10/25/05

Survey Data

STA	Thalweg	Water Surface	Bankfull
0	94.8	95.1	
3635.183	74.733	75.233	
3670.961	74.827	75.027	
3678.952	74.36	74.86	
3686.672	74.231	74.831	
3702.728	74.209	74.709	
3717.009	73.515	74.66	
3744.137	74.227	74.627	
3766.976	74.096	74.696	
3777.667	74.281	74.681	
3791.084	73.061	73.861	
3815.943	72.869	73.769	
3828.549	73.436	73.736	
3859.208	72.838	73.738	
3881.864	73.209	73.709	
3884.281	72.616	73.316	
3902.921	72.32	73.42	
3929.3	72.756	73.36	
3944.509	72.884	73.284	
3947.828	71.846	72.846	
3954.692	71.575	72.875	
3978.15	71.014	72.814	
3996.173	71.758	72.758	
4023.194	72.279	72.779	
4045.119	71.265	72.565	
4052.022	70.71	72.61	
4063.358	69.555	72.555	
4083.377	69.927	72.527	
4098.364	70.792	72.492	
4112.141	71.499	72.499	
4122.921	72.199	72.499	
4129.151	69.757	71.457	
4136.792			73.821
4142.071	70.435	71.435	
4186.331	70.673	71.273	
4207.785	70.908	71.108	
4209.8	69.814	70.614	
4221.055	69.505	70.605	
4246.384	69.993	70.493	
4266.724	70.063	70.363	
4303.868	69.911	70.311	
4316.38			74.25
4328.948	69.931	70.331	
4360.811	69.544	70.344	

River Name: Fisher
 Reach Name: Beaver Creek
 Profile Name: Beaver 2005
 Survey Date: 10/25/05

Survey Data

STA	Thalweg	Water Surface	Bankfull
0	94.8	95.1	

Cross Section Locations

Cross Section Name	Type	Profile Station
XS1	Riffle	0
XS2	Pool	0
XS3	Pool	0
XS4	Riffle	0
XS5	Pool	0
XS6	Riffle	0
XS7	Pool	0

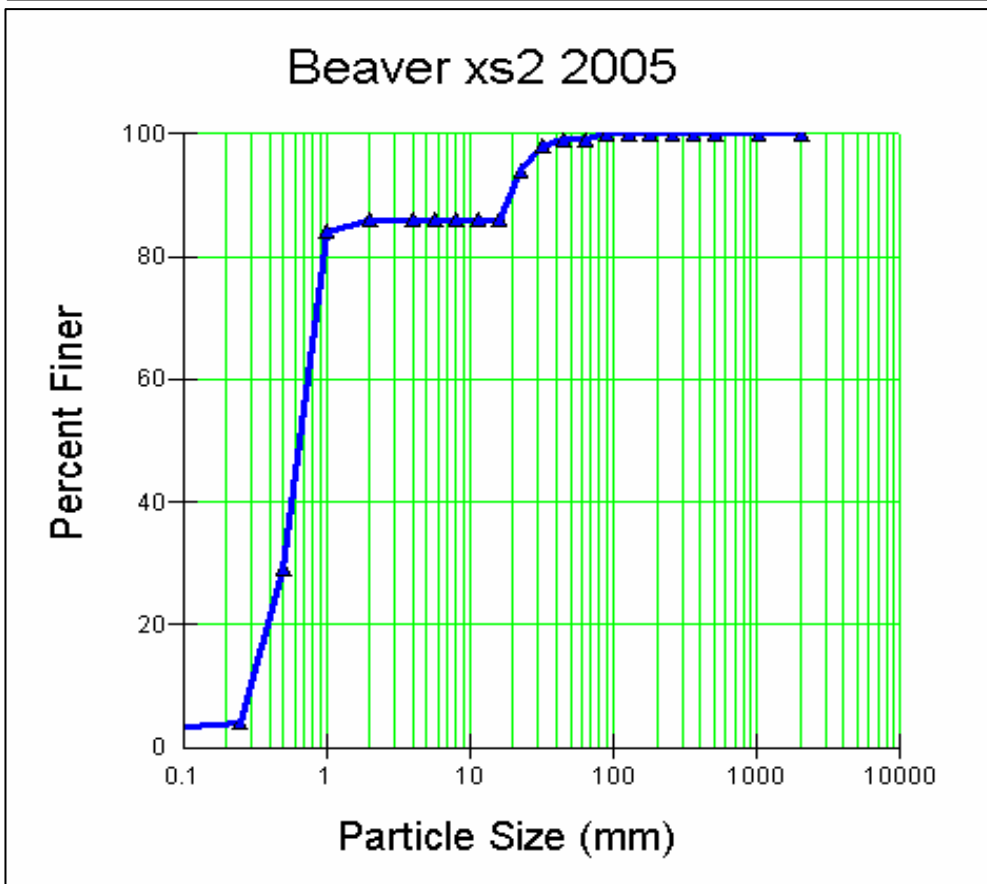
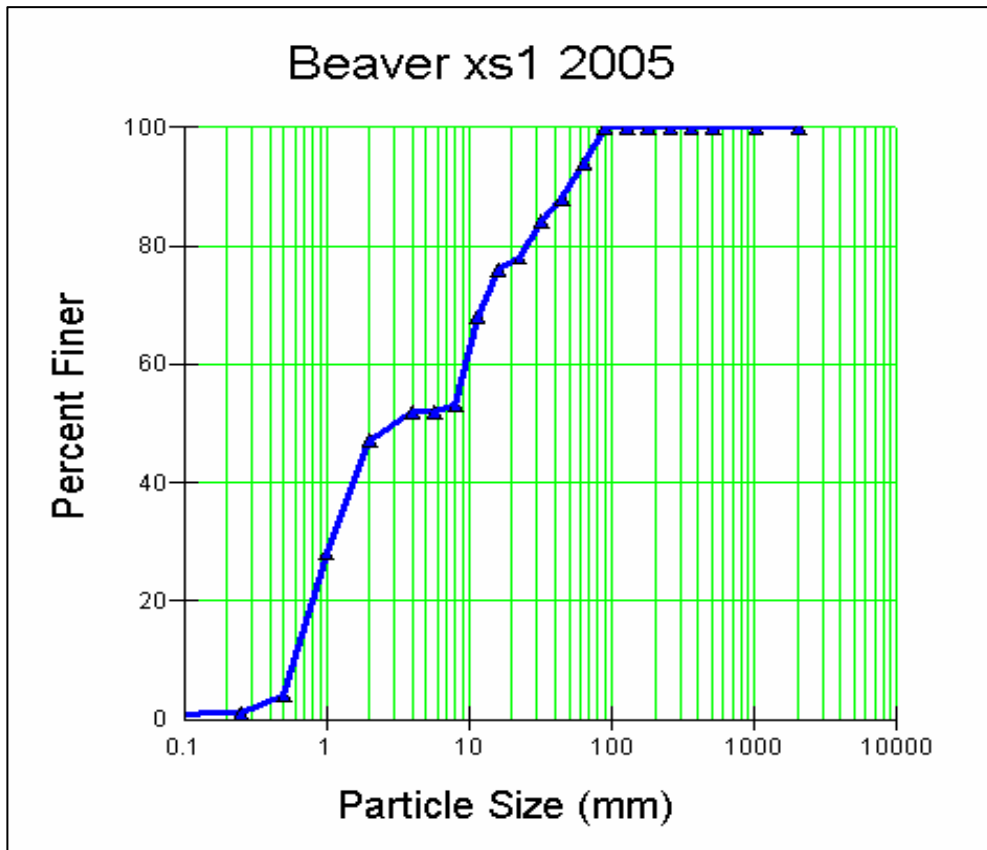
Measurements from Graph

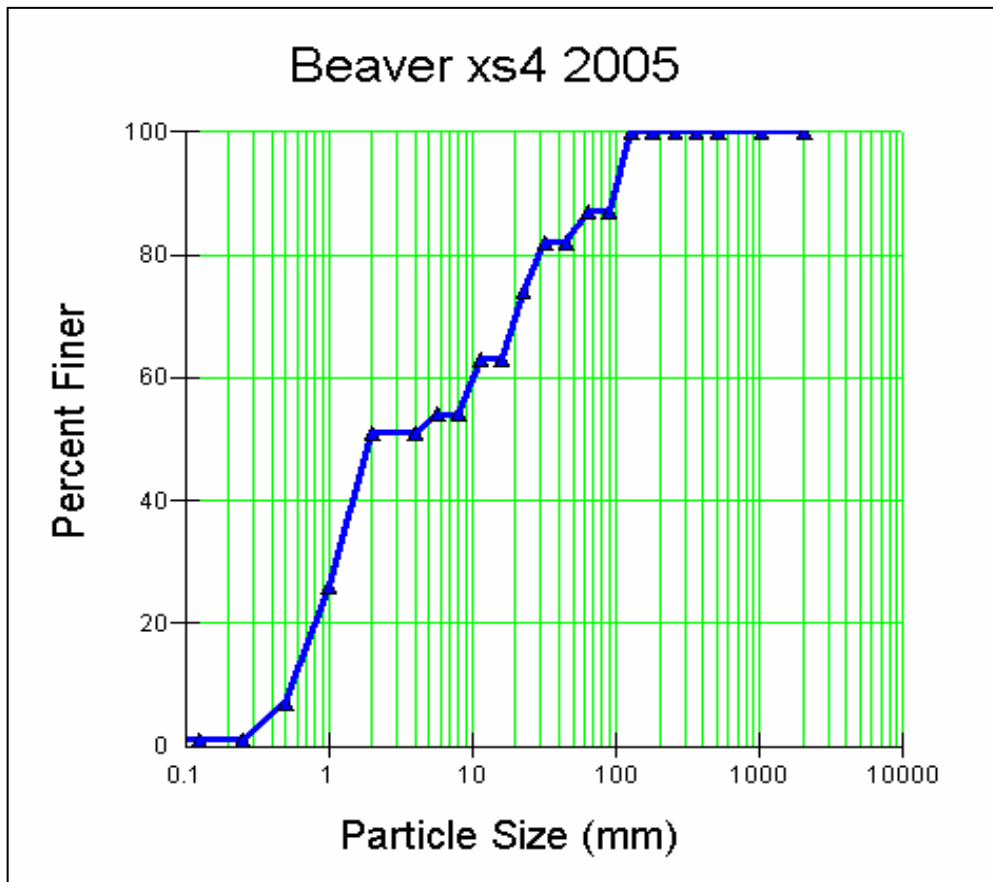
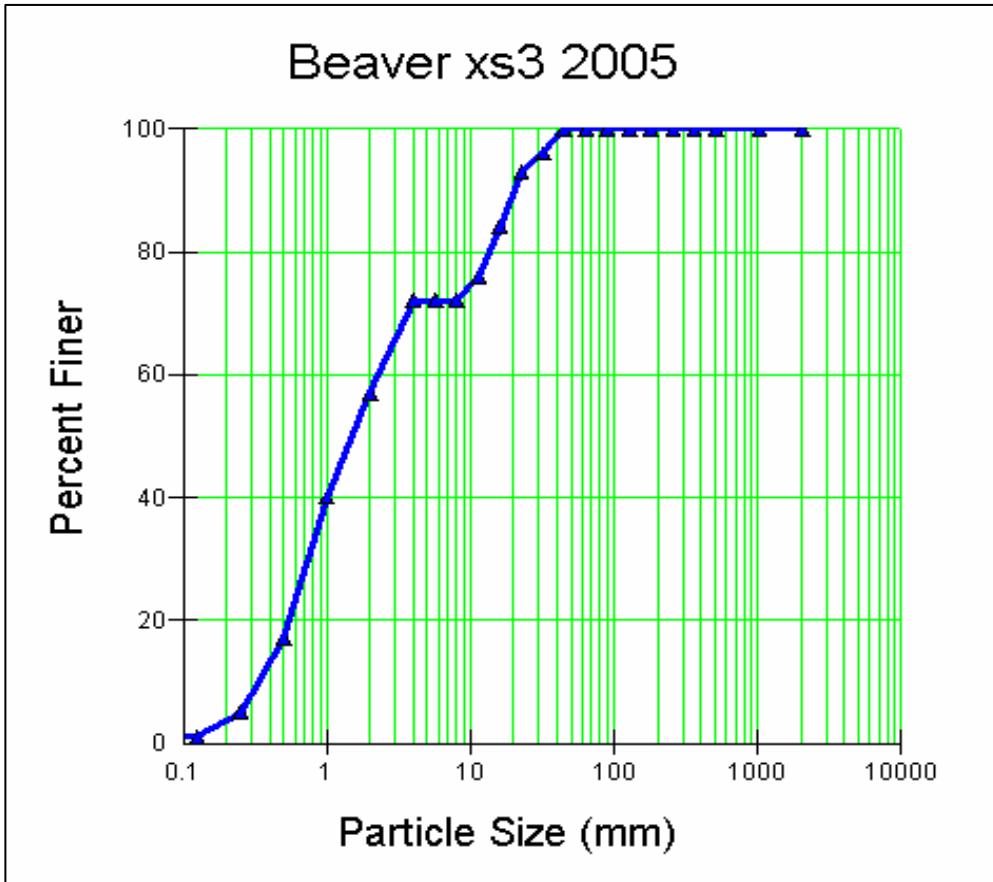
Bankfull Slope: 0.00502

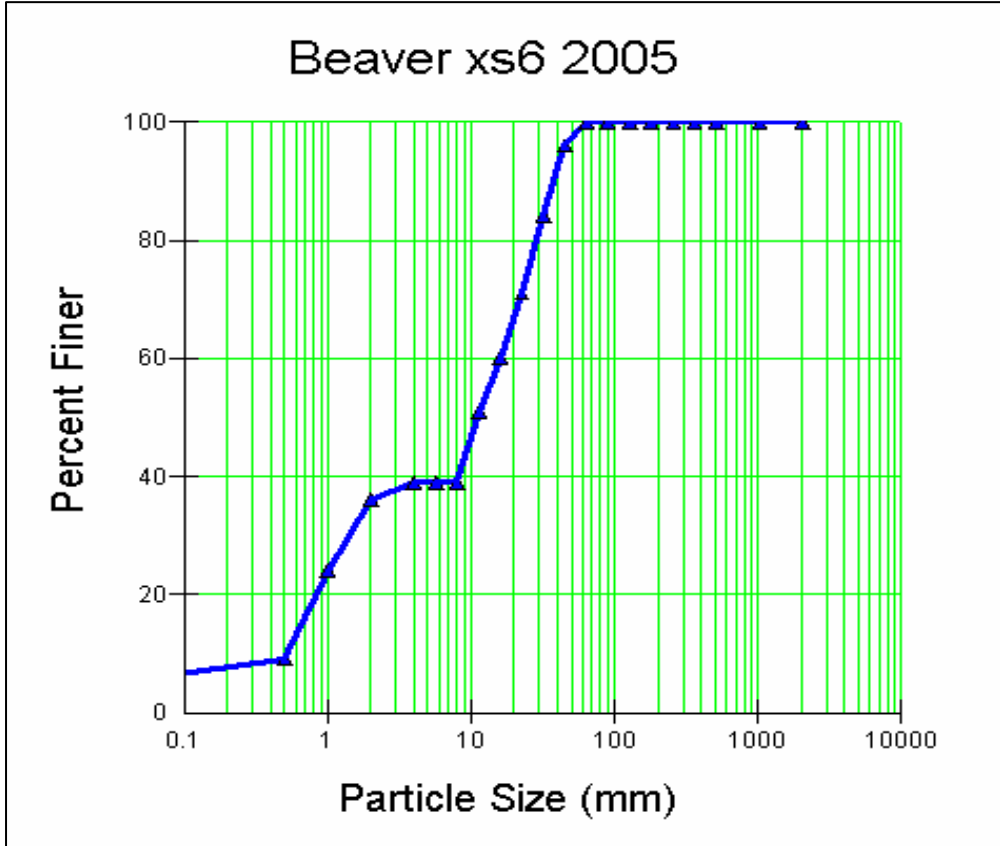
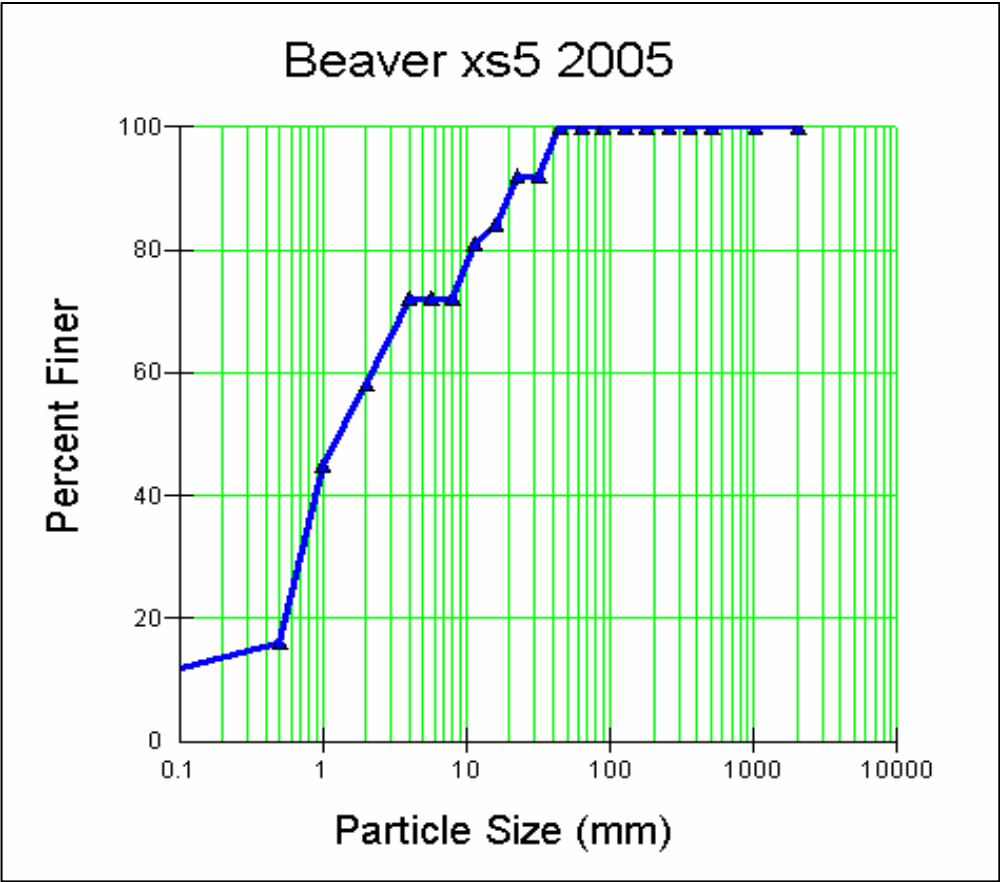
Variable	Min	Avg	Max
S riffle	0.00533	0.02872	0.06888
S pool	0	0	0
S run	0	0	0
S glide	0	0	0
P - P	17.75	84.57	219.01
P length	33.92	89.44	195.02
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low Bank Ht	0	0	0

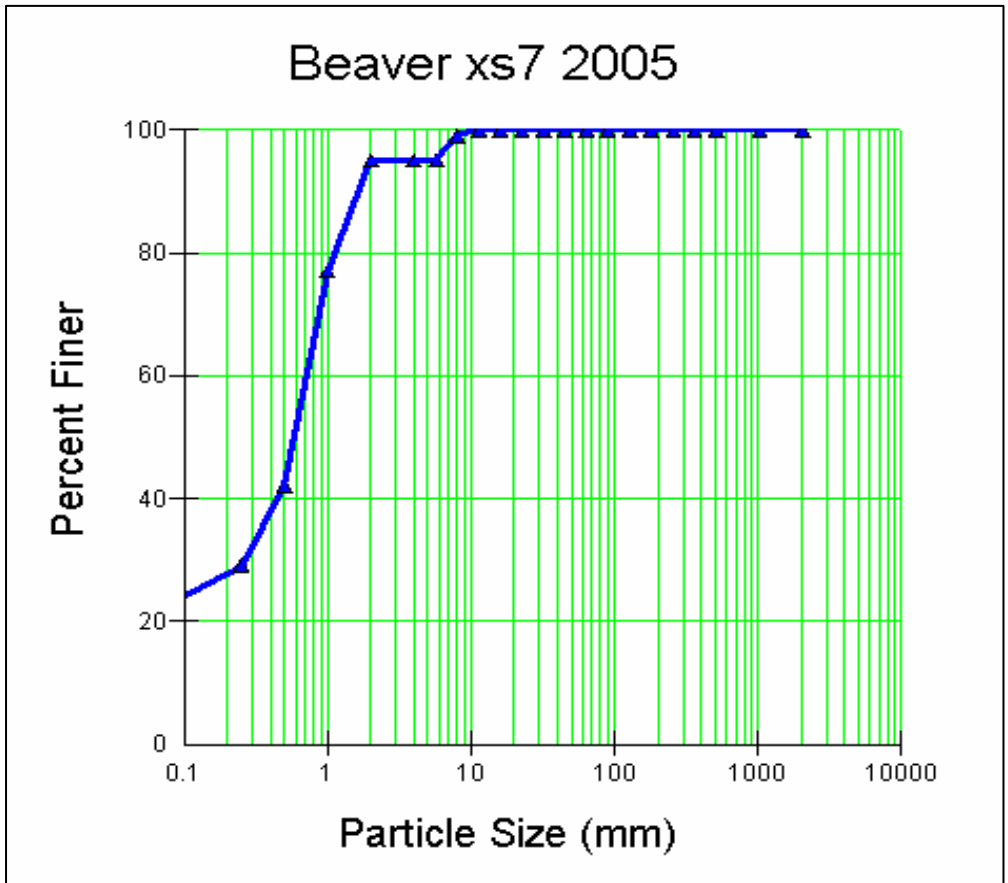
Length and depth measurements in feet, slopes in ft/ft.

Appendix B.7









River Name: Fisher
 Reach Name: Beaver Creek
 Sample Name: Beaver Pebble Count xs1
 Survey Date: 11/21/05

River Name: Fisher
 Reach Name: Beaver Creek
 Sample Name: Beaver Pebble Count xs2
 Survey Date: 11/21/05

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	1	1.00	1.00
0.25 - 0.50	3	3.00	4.00
0.50 - 1.0	24	24.00	28.00
1.0 - 2.0	19	19.00	47.00
2.0 - 4.0	5	5.00	52.00
4.0 - 5.7	0	0.00	52.00
5.7 - 8.0	1	1.00	53.00
8.0 - 11.3	15	15.00	68.00
11.3 - 16.0	8	8.00	76.00
16.0 - 22.6	2	2.00	78.00
22.6 - 32.0	6	6.00	84.00
32 - 45	4	4.00	88.00
45 - 64	6	6.00	94.00
64 - 90	6	6.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
2048 -	0	0.00	100.00

D16 (mm)	0.75
D35 (mm)	1.37
D50 (mm)	3.2
D84 (mm)	32
D95 (mm)	68.33
D100 (mm)	90
Silt/Clay (%)	0
Sand (%)	47
Gravel (%)	47
Cobble (%)	6
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	4	4.00	4.00
0.25 - 0.50	25	25.00	29.00
0.50 - 1.0	55	55.00	84.00
1.0 - 2.0	2	2.00	86.00
2.0 - 4.0	0	0.00	86.00
4.0 - 5.7	0	0.00	86.00
5.7 - 8.0	0	0.00	86.00
8.0 - 11.3	0	0.00	86.00
11.3 - 16.0	0	0.00	86.00
16.0 - 22.6	8	8.00	94.00
22.6 - 32.0	4	4.00	98.00
32 - 45	1	1.00	99.00
45 - 64	0	0.00	99.00
64 - 90	1	1.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
2048 -	0	0.00	100.00

D16 (mm)	0.37
D35 (mm)	0.55
D50 (mm)	0.69
D84 (mm)	1
D95 (mm)	24.95
D100 (mm)	90
Silt/Clay (%)	0
Sand (%)	86
Gravel (%)	13
Cobble (%)	1
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.

River Name: Fisher
 Reach Name: Beaver Creek
 Sample Name: Beaver Pebble Count xs3
 Survey Date: 11/21/05

River Name: Fisher
 Reach Name: Beaver Creek
 Sample Name: Beaver Pebble Count xs4
 Survey Date: 11/21/05

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	1	1.00	1.00
0.125 - 0.25	4	4.00	5.00
0.25 - 0.50	12	12.00	17.00
0.50 - 1.0	23	23.00	40.00
1.0 - 2.0	17	17.00	57.00
2.0 - 4.0	15	15.00	72.00
4.0 - 5.7	0	0.00	72.00
5.7 - 8.0	0	0.00	72.00
8.0 - 11.3	4	4.00	76.00
11.3 - 16.0	8	8.00	84.00
16.0 - 22.6	9	9.00	93.00
22.6 - 32.0	3	3.00	96.00
32 - 45	4	4.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
2048 -	0	0.00	100.00

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	1	1.00	1.00
0.125 - 0.25	0	0.00	1.00
0.25 - 0.50	6	6.00	7.00
0.50 - 1.0	19	19.00	26.00
1.0 - 2.0	25	25.00	51.00
2.0 - 4.0	0	0.00	51.00
4.0 - 5.7	3	3.00	54.00
5.7 - 8.0	0	0.00	54.00
8.0 - 11.3	9	9.00	63.00
11.3 - 16.0	0	0.00	63.00
16.0 - 22.6	11	11.00	74.00
22.6 - 32.0	8	8.00	82.00
32 - 45	0	0.00	82.00
45 - 64	5	5.00	87.00
64 - 90	0	0.00	87.00
90 - 128	13	13.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
2048 -	0	0.00	100.00

D16 (mm)	0.48
D35 (mm)	0.89
D50 (mm)	1.59
D84 (mm)	16
D95 (mm)	28.87
D100 (mm)	45
Silt/Clay (%)	0
Sand (%)	57
Gravel (%)	43
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

D16 (mm)	0.74
D35 (mm)	1.36
D50 (mm)	1.96
D84 (mm)	52.6
D95 (mm)	113.38
D100 (mm)	128
Silt/Clay (%)	0
Sand (%)	51
Gravel (%)	36
Cobble (%)	13
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.

Total Particles = 100.

River Name: Fisher
 Reach Name: Beaver Creek
 Sample Name: Beaver Pebble Count xs5
 Survey Date: 11/21/05

River Name: Fisher
 Reach Name: Beaver Creek
 Sample Name: Beaver Pebble Count xs6
 Survey Date: 11/21/05

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	16	16.00	16.00
0.50 - 1.0	29	29.00	45.00
1.0 - 2.0	13	13.00	58.00
2.0 - 4.0	14	14.00	72.00
4.0 - 5.7	0	0.00	72.00
5.7 - 8.0	0	0.00	72.00
8.0 - 11.3	9	9.00	81.00
11.3 - 16.0	3	3.00	84.00
16.0 - 22.6	8	8.00	92.00
22.6 - 32.0	0	0.00	92.00
32 - 45	8	8.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
2048 -	0	0.00	100.00

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	0	0.00	0.00
0.25 - 0.50	9	9.00	9.00
0.50 - 1.0	15	15.00	24.00
1.0 - 2.0	12	12.00	36.00
2.0 - 4.0	3	3.00	39.00
4.0 - 5.7	0	0.00	39.00
5.7 - 8.0	0	0.00	39.00
8.0 - 11.3	12	12.00	51.00
11.3 - 16.0	9	9.00	60.00
16.0 - 22.6	11	11.00	71.00
22.6 - 32.0	13	13.00	84.00
32 - 45	12	12.00	96.00
45 - 64	4	4.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
2048 -	0	0.00	100.00

D16 (mm)	0.5
D35 (mm)	0.83
D50 (mm)	1.38
D84 (mm)	16
D95 (mm)	36.88
D100 (mm)	45
Silt/Clay (%)	0
Sand (%)	58
Gravel (%)	42
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

D16 (mm)	0.73
D35 (mm)	1.92
D50 (mm)	11.03
D84 (mm)	32
D95 (mm)	43.92
D100 (mm)	64
Silt/Clay (%)	0
Sand (%)	36
Gravel (%)	64
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.

Total Particles = 100.

River Name: Fisher
 Reach Name: Beaver Creek
 Sample Name: Beaver Pebble Count xs7
 Survey Date: 11/21/05

Size (mm)	TOT #	ITEM %	CUM %
0 - 0.062	0	0.00	0.00
0.062 - 0.125	0	0.00	0.00
0.125 - 0.25	29	29.00	29.00
0.25 - 0.50	13	13.00	42.00
0.50 - 1.0	35	35.00	77.00
1.0 - 2.0	18	18.00	95.00
2.0 - 4.0	0	0.00	95.00
4.0 - 5.7	0	0.00	95.00
5.7 - 8.0	4	4.00	99.00
8.0 - 11.3	1	1.00	100.00
11.3 - 16.0	0	0.00	100.00
16.0 - 22.6	0	0.00	100.00
22.6 - 32.0	0	0.00	100.00
32 - 45	0	0.00	100.00
45 - 64	0	0.00	100.00
64 - 90	0	0.00	100.00
90 - 128	0	0.00	100.00
128 - 180	0	0.00	100.00
180 - 256	0	0.00	100.00
256 - 362	0	0.00	100.00
362 - 512	0	0.00	100.00
512 - 1024	0	0.00	100.00
1024 - 2048	0	0.00	100.00
2048 -	0	0.00	100.00

D16 (mm)	0.19
D35 (mm)	0.37
D50 (mm)	0.61
D84 (mm)	1.39
D95 (mm)	2
D100 (mm)	11.3
Silt/Clay (%)	0
Sand (%)	95
Gravel (%)	5
Cobble (%)	0
Boulder (%)	0
Bedrock (%)	0

Total Particles = 100.