

**Cane Creek (EEP #69)
Stream Restoration Site
2009 Annual Monitoring Report (Year 3)**

**Alamance County
EEP Project No. 69
Design Firm: Stantec Consulting Services, Inc.**



December 2009

Prepared for:



**NCDENR/ Ecosystem Enhancement
Program
1619 Mail Service Center
Raleigh, NC 27699-1619**

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I. Executive Summary

The Cane Creek (EEP #69) stream restoration project comprises 2,232 linear feet of stream restoration with 10 acres of buffer restoration. The project is in Alamance County north of Siler City, north of Old Dam Road (SR 2370) and west of Snow Camp Road (SR 1004). The project site is located in the Cape Fear River Basin (HUC 03030002050050); this HUC has been identified as a TLW in EEP's Cape Fear River Basin restoration Priorities 2009. Site construction and plantings were completed in March of 2006. The goals and objectives for Cane Creek (EEP #69) stream restoration are:

- Improving water quality
- Providing wildlife habitat through the creation of a riparian zone
- Improving aquatic habitat with the use of natural material stabilization structures and a riparian buffer
- Excluding cattle from the stream
- Reducing nutrient loads from entering the stream through a filtration buffer
- Increasing the streams access to its floodplain
- Reducing erosion and sedimentation

There are five vegetation plots, with only one (Plot 4) having identifiable planted stems which are live stakes. Four of the vegetation monitoring plots were added after the first monitoring year, therefore to err on the side of caution, stems, planted or not, were identified as natural stems. The plots were monitored using the CVS-EEP vegetation monitoring protocol, which was implemented for monitoring year (MY) -02 and will continue to be used for the remainder of the monitoring period. Including all five monitoring plots, there are 2226stems/acre; this includes live stakes, planted stems, and natural/volunteer stems. Vegetation Plot 2 is the only plot with stem counts below the success criteria. This is due to a combination of failed plantings and mowing within the plot. The success criterion for planted woody species is 320 stems/acre after MY-03. A mortality rate of ten percent will be allowed after MY-04 (288 stems/acre), with another ten percent allowed after MY-05 (260 stems/acre). Natural woody stems are quantified on separate data sheets. An accurate number of planted stems /acre could not be determined since the planted stems could not be distinguished from natural stems. The vegetation problem areas are mainly composed of a few bare benches, easement encroachment, and invasive exotics. Easement encroachment entails signs of cattle, mowing In some areas by the property owner, and encroachment by tall fescue which thrives in the adjacent cattle pastureland. Invasive exotics throughout the conservation easement that are a threat to native vegetation include tall fescue (*Schedonurus arundinaceus*), multiflora rose (*Rosa multiflora*), and Japanese stiltgrass (*Microstegium vimineum*). Other invasive exotics infrequently observed that did not seem to be threatening at this point include Japanese honeysuckle (*Lonicera japonica*) and Chinese privet (*Ligustrum sinense*). According to the NC Native Plant Society, all of these species, with the exception of tall fescue, are classified as "Rank 1", which is defined as exotic plant species that have invasive characteristics and spread readily into native plant communities, displacing native vegetation. Tall fescue is identified as invasive by the United States Department of Agriculture (Miller 2003). For additional information relating to vegetation, see Appendix C.

The Cane Creek (EEP #69) Restoration project shows little change from MY-02 to MY-03. The channel was mainly dry and overgrown with vegetation during the monitoring period. Vegetation is becoming well established on the banks. The banks and structures are stable and holding grade. A comparison of the longitudinal profile and cross sections between MY-02 and MY-03 shows little change in the profile or dimension of the restored reach. Aggradation and the formation of mid-channel bars, present in MY-02, are still an issue throughout most of the project due primarily to the low flows associated with the drought which promoted in-channel growth of vegetation. In some areas the aggradation is being exacerbated by backwater at crossings, however as mentioned, the thalweg elevation has not appreciably changed. The mid-channel bars are preventing the flow from centering in the channel. Pebble counts at cross sections one and three show a trend towards a finer substrate from MY-02 to MY-03; with the d_{50} shifting from 22.6mm to 1.3mm and 42mm to 15.6mm, respectively. The increased vegetation and low rainfall in 2009, likely contributed to the further accumulation of fine sediment. Aggradation is occurring in approximately 38% of the project length. The two stream crossings, at stations 19+10 and 32+50, continue to cause backwater conditions for distances of 300 and 200 feet upstream, respectively

Summary information/data related to the occurrence of items such as beaver or encroachment, and statistics related to performance of various project and monitoring elements, can be found in the tables and figures in the report appendices. Narrative background and supporting information formally found in these reports can be found in the mitigation and restoration plan documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

II. Methodology

Methodologies follow EEP monitoring report template Version 1.2.1 (06/01/09) and guidelines (Lee et al 2008). Photos were taken with a digital camera. A Trimble Geo XT handheld unit with sub-meter accuracy was used to collect groundwater gauge locations, vegetation monitoring plot origins, and problem area locations. Cross sectional and longitudinal surveys were conducted using total station survey equipment. Data was entered into AutoCAD Civil3D to obtain dimensions of the cross sections and parameters applicable to the longitudinal profile. Reports were then generated to display summaries of the stream survey.

A. Vegetation Methodologies

Level II of the EEP/CVS protocol Version 4.2 was used to collect data for MY-03, which includes natural stems. Since plots 1, 2, 3, and 5 were established in MY-02, all stems recorded in these plots were classified as natural stems. Data collected for these plots are in Appendix C.

B. Stream Methodologies

Stream profile and cross-sections were surveyed using total station equipment and methods. The survey data was plotted using AutoCAD Civil3D. The longitudinal profile was generated using the MY-02 alignment. Cross sectional data was extracted based on a linear alignment between the end pins.

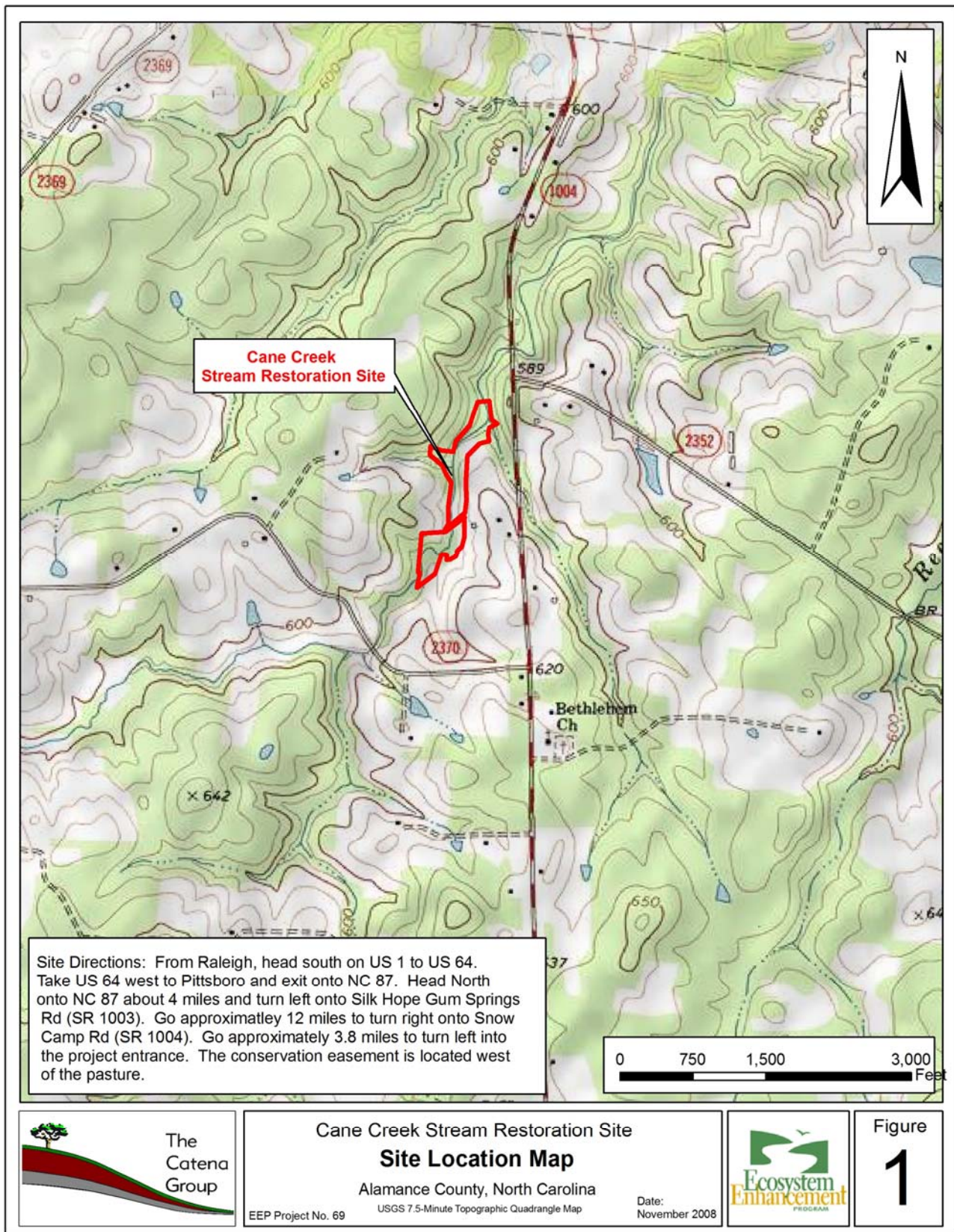
III. References

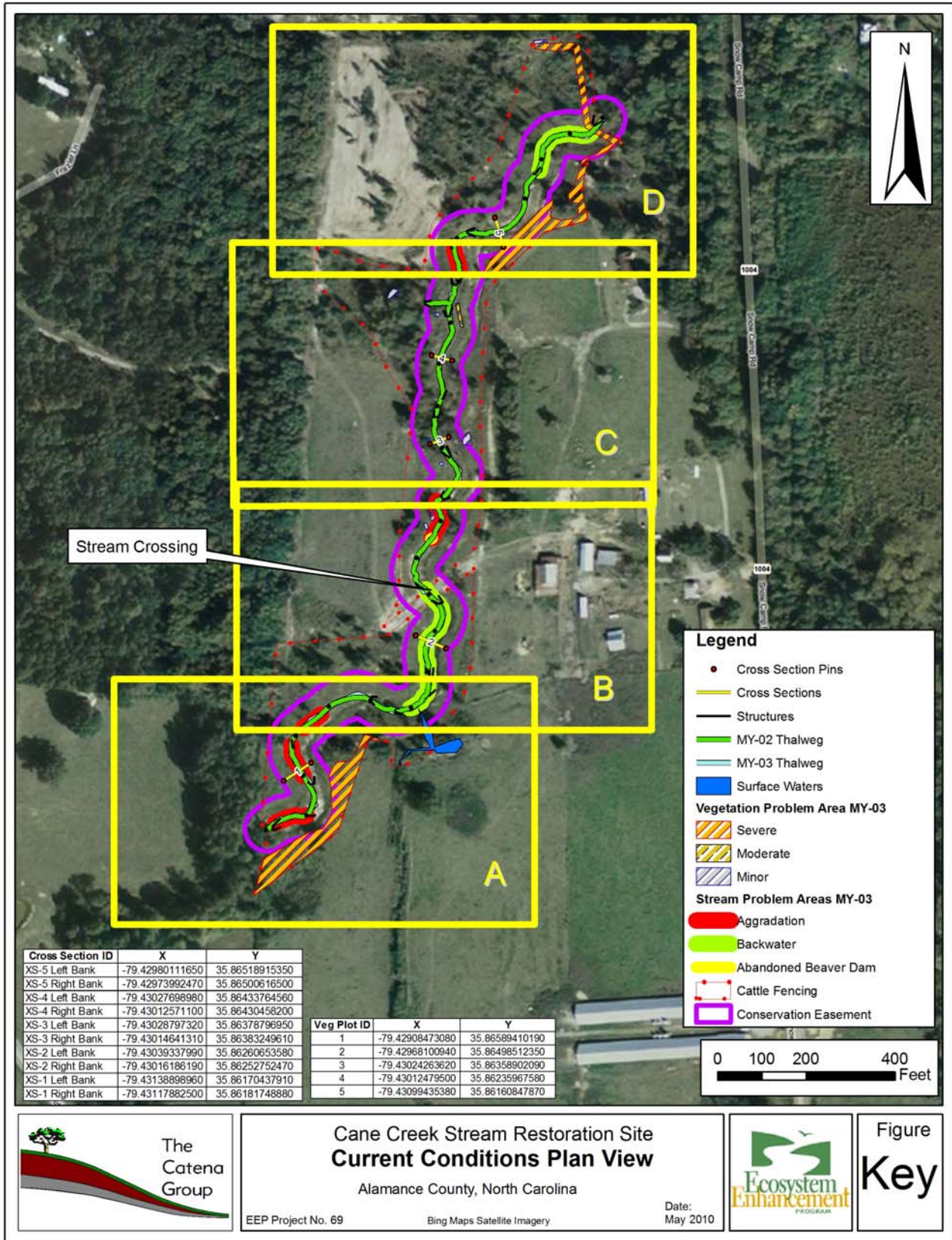
Lee, Michael T. Peet, Robert K. Roberts, Steven D., Wentworth, Thomas R. (2008). *CVS-EEP Protocol for Recording Vegetation Version 4.2*.

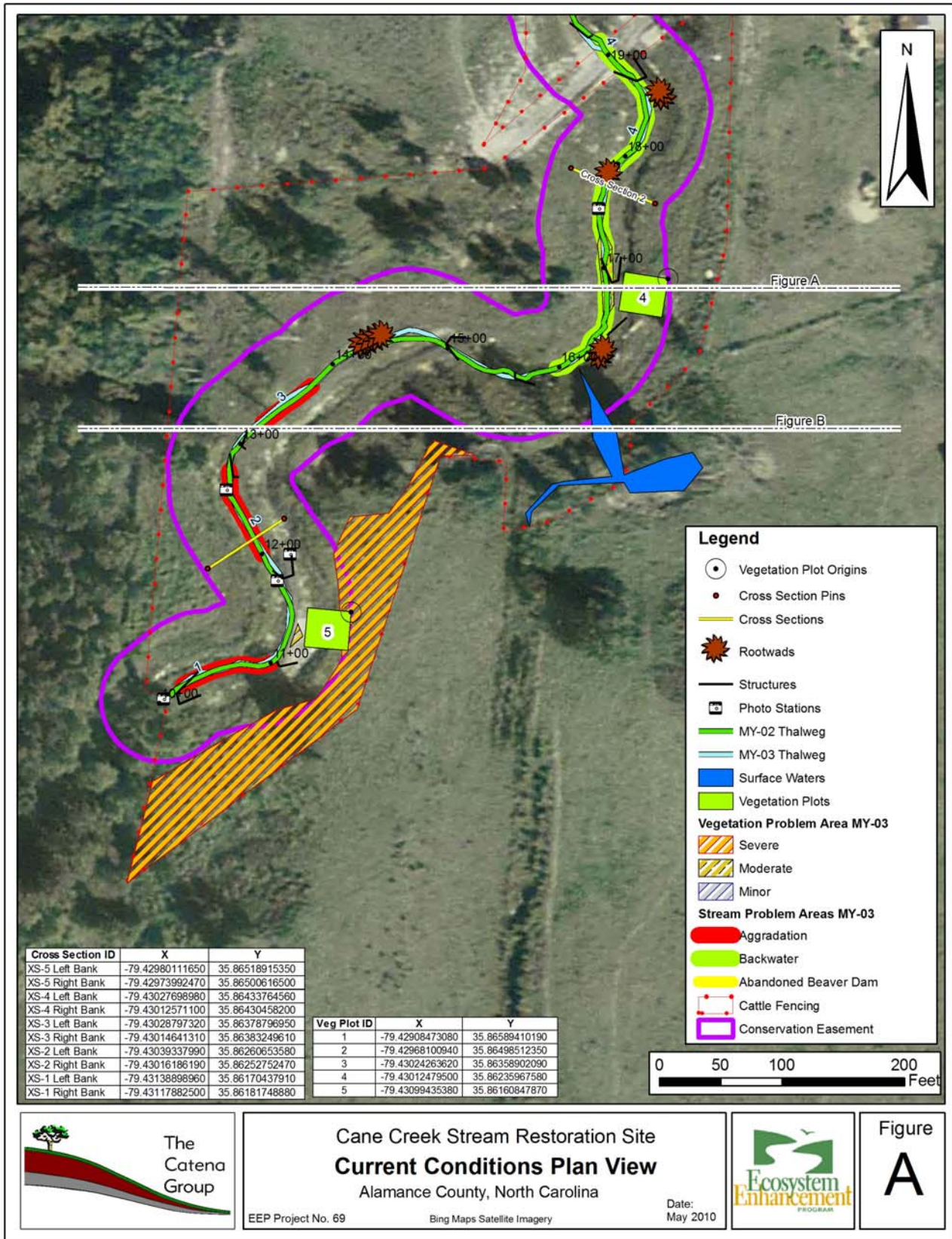
Miller, James H. 2003. [Nonnative invasive plants of southern forests: a field guide for identification and control](#). Gen. Tech. Rep. SRS-62. Asheville, NC: U.S. Department of Agriculture, Forest Service, Southern Research Station. 93 p.

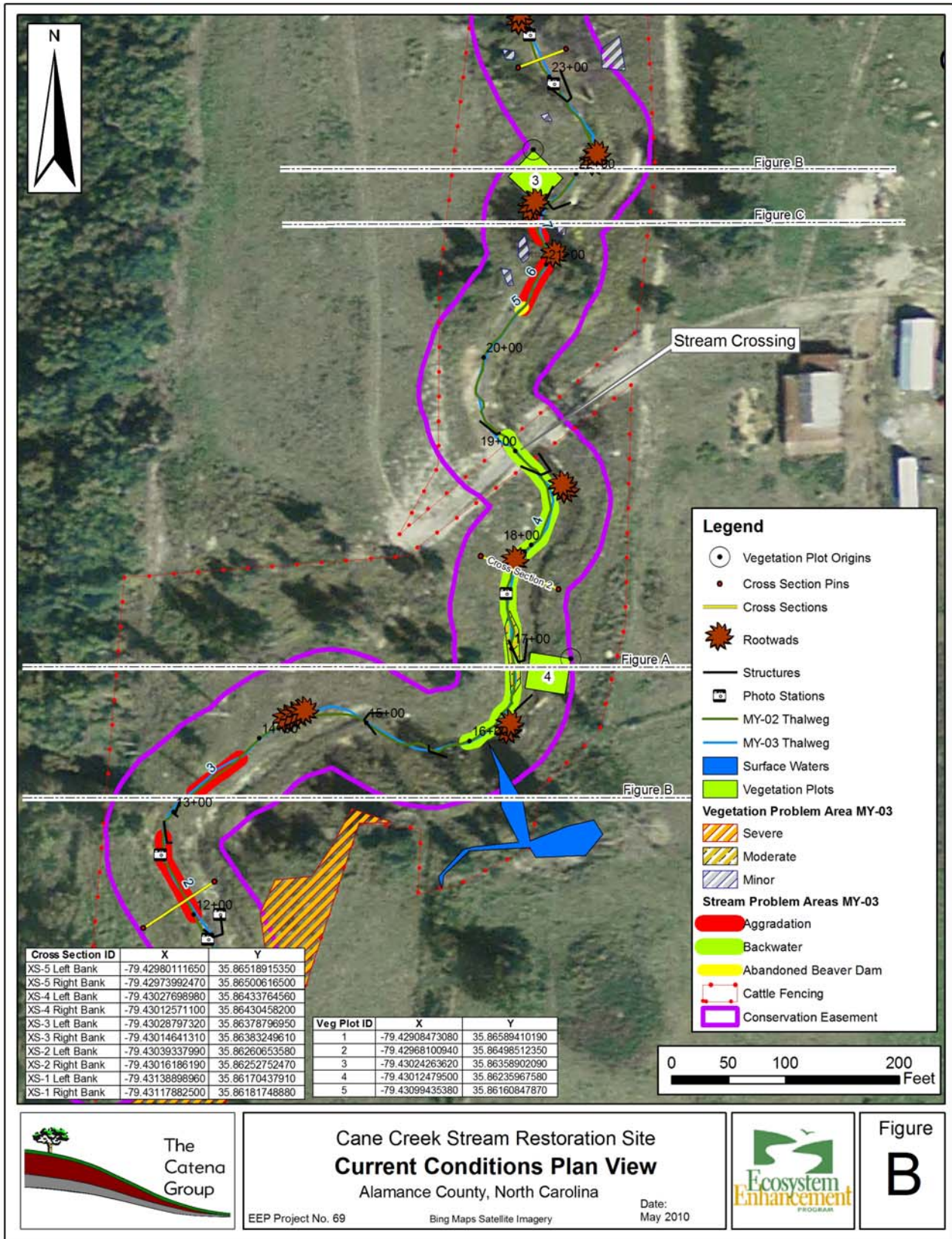
Weakley, Alan (2006). *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas*. <http://www.herbarium.unc.edu/flora.htm>.

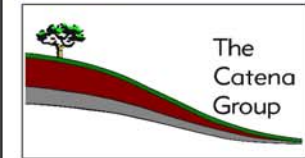
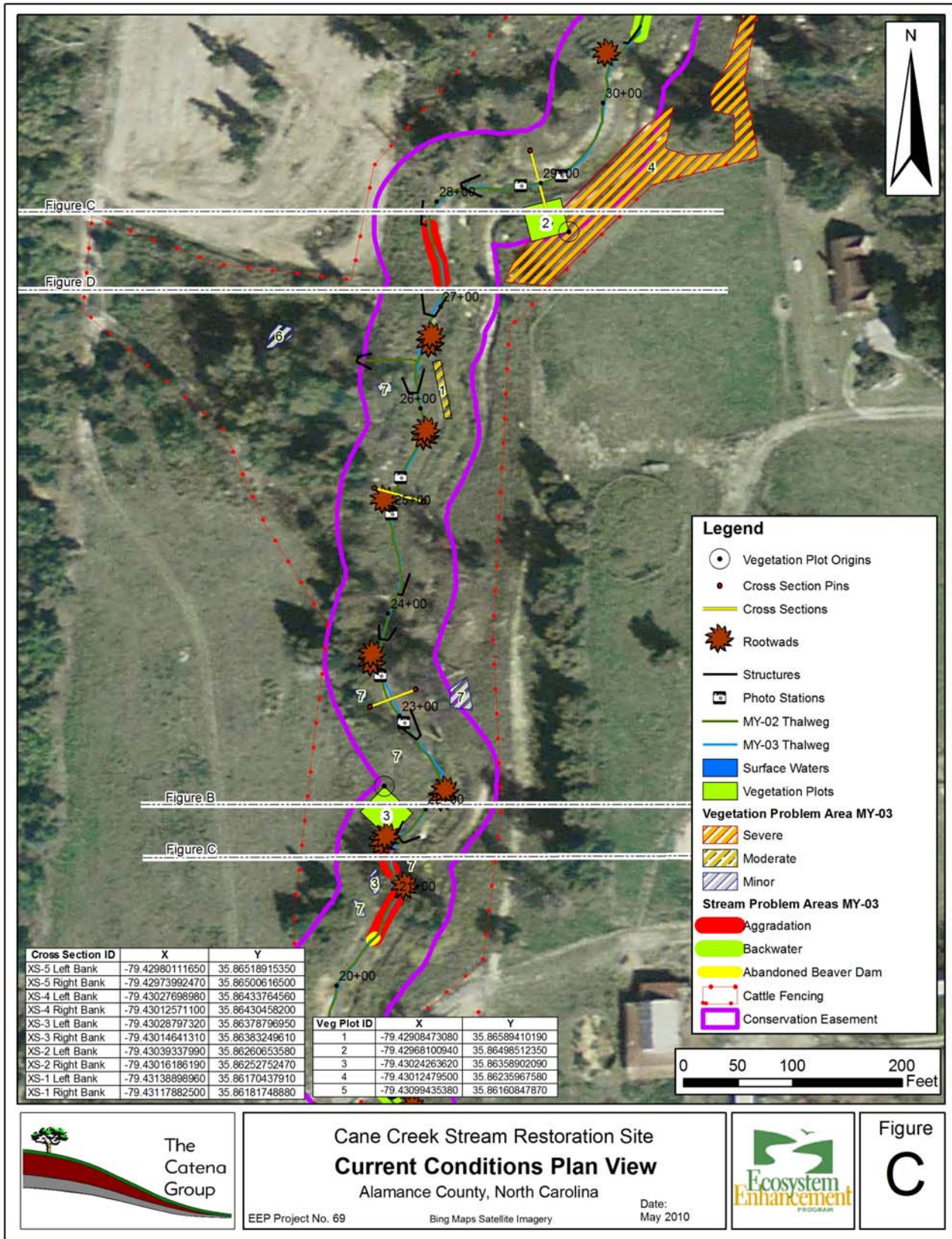
Appendix A. General Figures and Plan Views







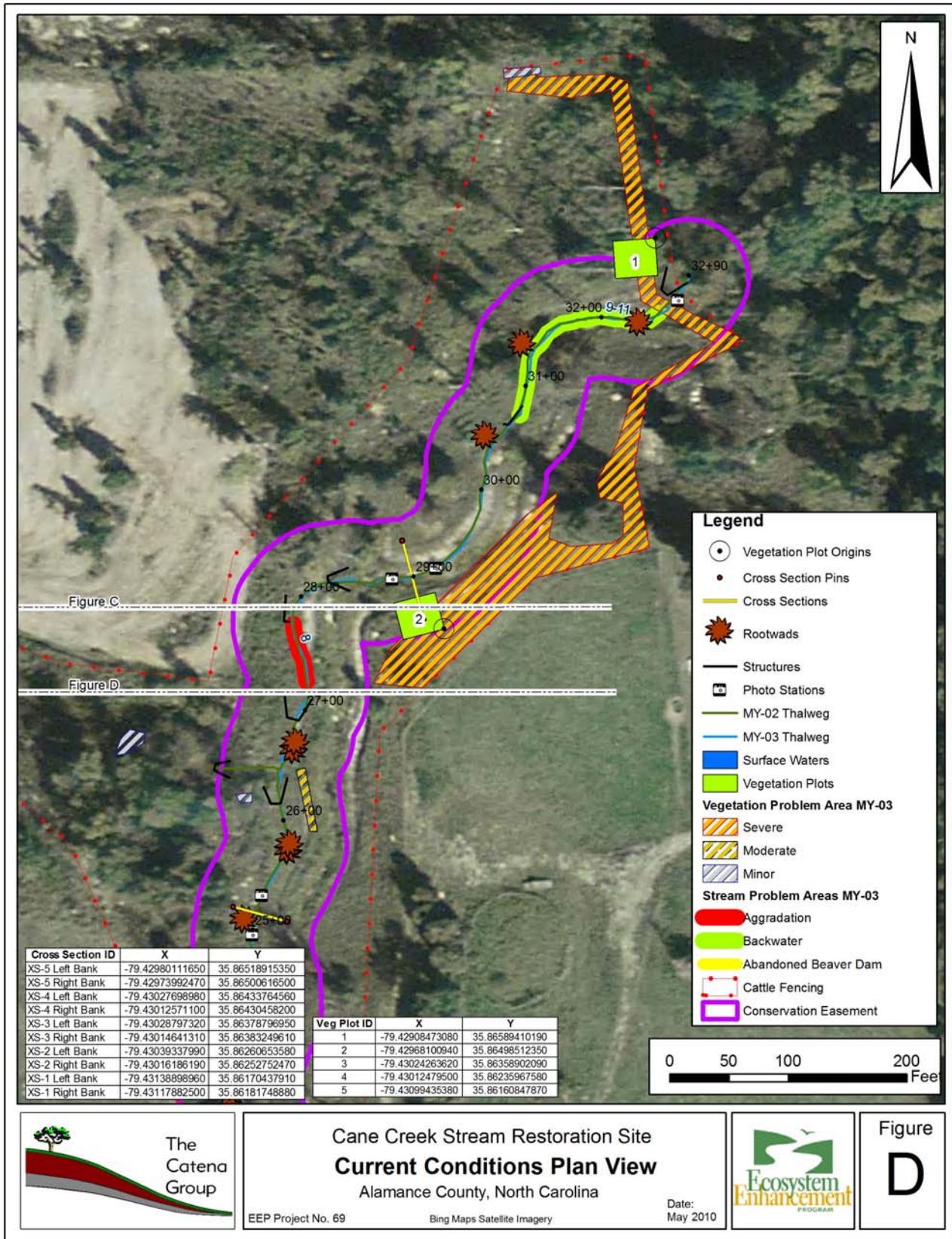




Cane Creek Stream Restoration Site
Current Conditions Plan View
 Alamance County, North Carolina
 Date: May 2010
 EEP Project No. 69 Bing Maps Satellite Imagery



Figure
C



Appendix B. General Projects Tables

Table 1A and 1B. Project Restoration Components

Table 1A. Project Components Cane Creek (EEP #69)								
Project Component or Reach ID	Existing Feet / Acres	Restoration Level	Approach	Footage or Acreage	Stationing	Buffer Acres	BMP Elements ¹	Comment
Main Channel	2301	R	P2	2277lf	10+11-32+88	10.1	CF=5739lf	Instream Structure and Vegetated Buffers

1 = CF = Cattle Fencing

Table 1B. Component Summations Cane Creek (EEP #69)							
Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	2277						
Enhancement							
Enhancement I							
Enhancement II							
Creation							
Preservation							
HQ Preservation							
		0	0				
Totals	2277	0		0	0	10.1	Count
	Non-Applicable						

Table 2. Project Activity and Reporting History

Project Activity and Reporting History Cane Creek (EEP #69) Stream Restoration Site-Project No.69			
Activity or Reporting	Scheduled Completion	Data Collection Complete	Actual Completion Date
Restoration Plan	NA	NA	April 2003
Final Design-90%	NA	NA	October 2005
Construction	NA	NA	March 2006
Temporary S&E mix applied to entire project area	NA	NA	March 2006
Permanent seed mix applied to entire project area	NA	NA	March 2006
Containerized, B&B, and livestake planting	NA	NA	March 2006
Mitigation Plan/As-built (Year 0 Monitoring-baseline)	NA	May 2006	June 2006
Year 1 Monitoring	NA	February 2007	March 2007
Year 2 Monitoring	January 2009	October 2008	January 2009

Table 3. Project Contacts Table

Project Contact Table Cane Creek (EEP #69) Stream Restoration Site-Project No. 69	
Designer	Stantec Consulting Services Inc 801 Jones Franklin Road, Suite 300 Raleigh, North Carolina 27606 David Bidelspach - (919) 851-6866
Construction Contractor	Shamrock Environmental Corp. 6101 Corporate Park Drive Browns Summit, North Carolina 27699 Bill Wright - (800) 881-1098
Planting Contractor POC	Seal Brothers Contracting, LLC P.O.Box 86 Dobson, North Carolina 27017 Brian Seal
Seeding Contractor POC	Shamrock Environmental Corp. 6101 Corporate Park Drive Browns Summit, North Carolina 27699 Bill Wright - (800) 881-1098
Seed Mix Sources	contact Shamrock Environmental Corp.
Nursery Stock Suppliers	Hills Nursery Co., Inc. (931) 668-4364
Monitoring Performers	The Catena Group (TCG) 410-B Millstone Drive Hillsborough, North Carolina 27678
Stream Monitoring	Ward Consulting Engineers 8368 Six Forks Road, Suite 104 Raleigh, NC 27613-5083
Vegetation Monitoring	The Catena Group 410-B Millstone Dr. Hillsborough, NC 27278

Table 4. Project Attribute Table

Project Attribute Table Cane Creek (EEP #69) Stream Restoration Site-Project No. 69	
Project County	Alamance
<i>Drainage Area</i>	
UT to Cane Creek	2003 acres
Drainage impervious surface cover estimate (%)	< 5%
<i>Stream Order</i>	
Main Channel	3rd
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt
Rosgen Classification of As-Built	C
Cowardin Classification	Stream (R3UB1)
Dominant Soil Types	Herndon Silt Loam
Reference Site ID	UT to Cabin Branch (CB) & Landrum Creek (LC)
USGS HUC for Project	03030002
USGS HUC for Reference-CB	03020201
USGS HUC for Reference-LC	03030003
NCDWQ Sub-basin for Project	03-06-04
NCDWQ Sub-basin for Reference Reach-CB	03-04-01
NCDWQ Sub-basin for Reference Reach-LC	03-06-12
NCDWQ Classification for Project	C, NSW
NCDWQ Classification for Reference -CB	WS-IV NSW
NCDWQ Classification for Reference -LC	C
Is any portion of any project segment 303D listed?	No
Is any portion of any project segment upstream of a 303D listed segment?	No
Reasons for 303D listing or stressor	N/A
% of project easement fenced	100%

Appendix C. Vegetation Assessment Data

Table 5. Vegetation Plot Mitigation Success Summary Table

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
01	N/A	100%*
02	N/A	
03	N/A	
04	Yes	
05	N/A	

*Tract Mean met for Plot 04, the only plot with confirmed planted stems

Vegetation Monitoring Plots Photos



Photo 1. Vegetation Plot 1



Photo 2. Vegetation Plot 2



Photo 3. Vegetation Plot 3



Photo 4. Vegetation Plot 4



Photo 5. Vegetation Plot 5

CVS Summary Data Tables

Table 6. Vegetation Metadata Table

Report Prepared By	Kate Montieth
Date Prepared	11/16/2009 16:12
database name	TheCatenaGroup 2009-B.mdb
-----DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
-----PROJECT SUMMARY-----	
Project Code	69
project Name	UT to Cane Creek
Description	2096 lf of stream restoration; no wetlands
River Basin	Cape Fear
length(ft)	2232
stream-to-edge width (ft)	15-20
area (sq m)	5 acres
Required Plots (calculated)	
Sampled Plots	5

Table 7. Stem Count Total and Planted by Plot and Species

EEP Project Code 69. Project Name: UT to Cane Creek

Scientific Name	Common Name	Species Type	Current Plot Data (MY3 2009)															Annual Means					
			069-01-VP1			069-01-VP2			069-01-VP3			069-01-VP4			069-01-VP5			MY3 (2009)			MY2 (2008)		
			P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T
Acer negundo	boxelder	Tree			14									1						15			17
Acer rubrum	red maple	Tree			36					5			13			9				63			62
Baccharis halimifolia	eastern baccharis	Shrub Tree								1			1			1				3			1
Carpinus caroliniana	American hornbeam	Shrub Tree			9															9			14
Cornus amomum	silky dogwood	Shrub			1					1			2							4			3
Fraxinus pennsylvanica	green ash	Tree			2			1		1			12			1				17			17
Juniperus virginiana	eastern redcedar	Tree						1		7										8			10
Liquidambar styraciflua	sweetgum	Tree								7			35			9				51			35
Prunus serotina	black cherry	Shrub Tree																					1
Quercus lyrata	overcup oak	Tree						1		3						1				5			4
Quercus michauxii	swamp chestnut oak	Tree			2															2			4
Rhus copallinum	flameleaf sumac	Shrub Tree						1		1										2			1
Salix nigra	black willow	Tree								1		11	11						11	12		13	15
Salix sericea	silky willow	Shrub Tree										2	2						2	2		2	2
Sambucus canadensis	Common Elderberry	Shrub Tree								1			3							4			8
Ulmus	elm	Tree														14				14			59
Ulmus alata	winged elm	Tree			2								1			4				7			
Ulmus rubra	slippery elm	Tree			6					3			48							57			
Stem count size (ares)			0	0	72	0	0	4	0	0	31	0	13	129	0	0	39	0	13	275	0	15	253
size (ACRES)			1			1			1			1			1			5			5		
Species count			0.02			0.02			0.02			0.02			0.02			0.12			0.12		
Stems per ACRE			0	0	8	0	0	4	0	0	11	0	2	11	0	0	7	0	2	17	0	2	16
			0	0	2914	0	0	161.9	0	0	1255	0	526.1	5220	0	0	1578	0	105.2	2226	0	121.4	2048

Appendix D. Stream Assessment Data

Stream Station Photos



Photo 6. Looking downstream at XS-1



Photo 7. Looking downstream at XS-2



Photo 8. Looking downstream at XS-3



Photo 9. Looking downstream at XS-4



Photo 10. Looking downstream at XS-5

Table 8. Visual Morphological Stability Assessment

Visual Morphological Stability Assessment Cane Creek (EEP #69) Stream Mitigation Site/Project No. CMC/CPF/02 Main Channel: (2232 feet)						
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?	18	22	NA	82%	
	2. Armor stable (e.g.no displacement?)	18	22	NA	82%	
	3. Facet grade appears stable?	16	22	NA	73%	
	4. Minimal evidence of embedding/fining?	3	22	NA	14%	
	5. Length appropriate?	17	22	NA	77%	65%
B. Pools	1. Present? (e.g. not subject to severe aggrad. Or migrat.?)	17	23	NA	74%	
	2. Sufficiently deep (Max. Pool D:Mean Bkf>1.6?)	17	23	NA	74%	
	3. Length appropriate?	16	23	NA	70%	72%
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	10	22	NA	45%	
	2. Downstream of meander (glide/inflection) centering?	13	22	NA	59%	52%
D. Meanders	1. Outer bend in state of limited/controlled erosion?	23	23	NA	100%	
	2. Of those eroding, # w/concomitant point bar formation?	0	0	NA	100%	
	3. Apparent Rc within spec?	23	23	NA	100%	
	4. Sufficient floodplain access and relief?	12	23	NA	52%	88%
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	11/855	62%	
	2. Channel bed degradation-areas of increasing downcutting of head cutting?	NA	NA	0	100%	81%
F. Bank	1. Actively eroding, wasting, or slumping bank?	NA	NA	1/10	100%	100%
G. Cross vanes, sills, single wing vanes	1. Free of back or arm scour?	17	21	NA	81%	
	2. Height appropriate?	16	21	NA	76%	
	3. Angle and geometry appear appropriate?	16	21	NA	76%	
	4. Free of piping or other structural failures?	13	21	NA	62%	74%
H. Wads/ Boulders	1. Free of scour?	11	11	NA	100%	
	2. Footing stable?	11	11	NA	100%	100%

Table 9. Verification of Bankfull Events

Verification of Bankfull Events Cane Creek (EEP #69) Stream Restoration Site			
Date of Data Collection	Date of Occurrence	Method	Photo #
Late 2005/Early 2006	Late 2005/Early 2006	Visual during construction	N/A
October 23, 2008	September 7, 2008	wrack lines	None
July 24, 2009	Unsure (June 6, 2009)	Crest Gauge	N/A

Cross-Sections with Annual Overlays

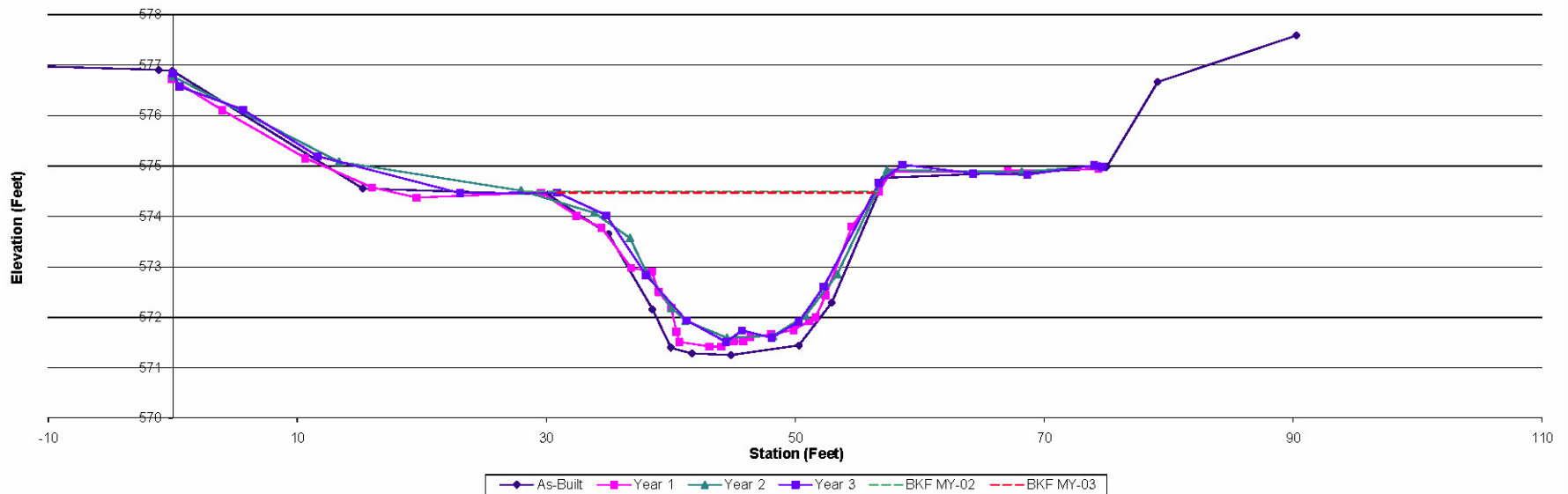
Project:	UT to Cane Creek	Summary (bankfull)						
Cross Section:	Cross Section 1	A (BKF)	MY0	MY1	MY2	MY3	MY4	MY5
Feature:	Riffle	W (BKF)	26.6	27.2	28.3	25.5		
Station:	12+15	Max d	3.2	3.1	2.9	3.0		
Date:	11/4/09	Mean d	1.9	1.8	1.7	1.7		
Crew:	RL,BW,SV,RW	W/D	13.9	15.4	17.1	14.7		

MY0-2006			MY1-2007			MY2-2008			MY3-2009		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-10.94	576.97		-0.08	576.72	LPIN	0.00	576.77	LPIN	0.00	576.83	LPIN
-1.12	576.9		3.97	576.1		13.34	575.08		0.52	576.57	
-0.02	576.88	LPIN	10.65	575.15		27.96	574.51		5.63	576.11	
15.26	574.55		16	574.57		33.85	574.07	LBKF	11.62	575.19	
30.13	574.43	LBKF	19.58	574.37		36.71	573.57		23.08	574.46	
34.99	573.85		29.58	574.47	LBKF	38.01	572.90		30.85	574.47	LBKF
38.52	572.16		32.42	574.01		40.05	572.18		34.79	574.02	
40.02	571.39		34.44	573.77		41.18	571.93		37.99	572.84	
41.73	571.28		36.81	572.98		44.51	571.59	TW	41.27	571.94	
44.86	571.25		38.47	572.9		48.21	571.63		44.44	571.51	
50.29	571.44		39.03	572.5		50.80	572.03		45.73	571.74	TW
52.93	572.29		40.03	572.19		53.37	572.85		48.11	571.59	
56.74	574.5	RBKF	40.45	571.71		57.35	574.91	RBKF	50.29	571.91	
57.18	574.76		40.69	571.51		68.18	574.88		52.30	572.61	
74.45	574.94	RPIN	43.11	571.42		74.41	575.00	RPIN	56.71	574.66	
75	574.98		44.05	571.42					58.82	575.02	RBKF
79.12	576.66		45.06	571.53					64.28	574.65	
90.25	577.58		45.82	571.52					68.65	574.82	
			46.4	571.61					74.01	575.01	
			48.09	571.66					74.65	574.98	RPIN
			49.88	571.75							
			51.11	571.92							
			51.65	572							
			52.44	572.43							
			54.55	573.8							
			56.74	574.5	RBKF						
			57.64	574.87							
			67.08	574.9							
			74.35	574.94	RPIN						



Photo of XS-1, looking in the downstream direction

Cross Section 1 Station 12+15 Riffle

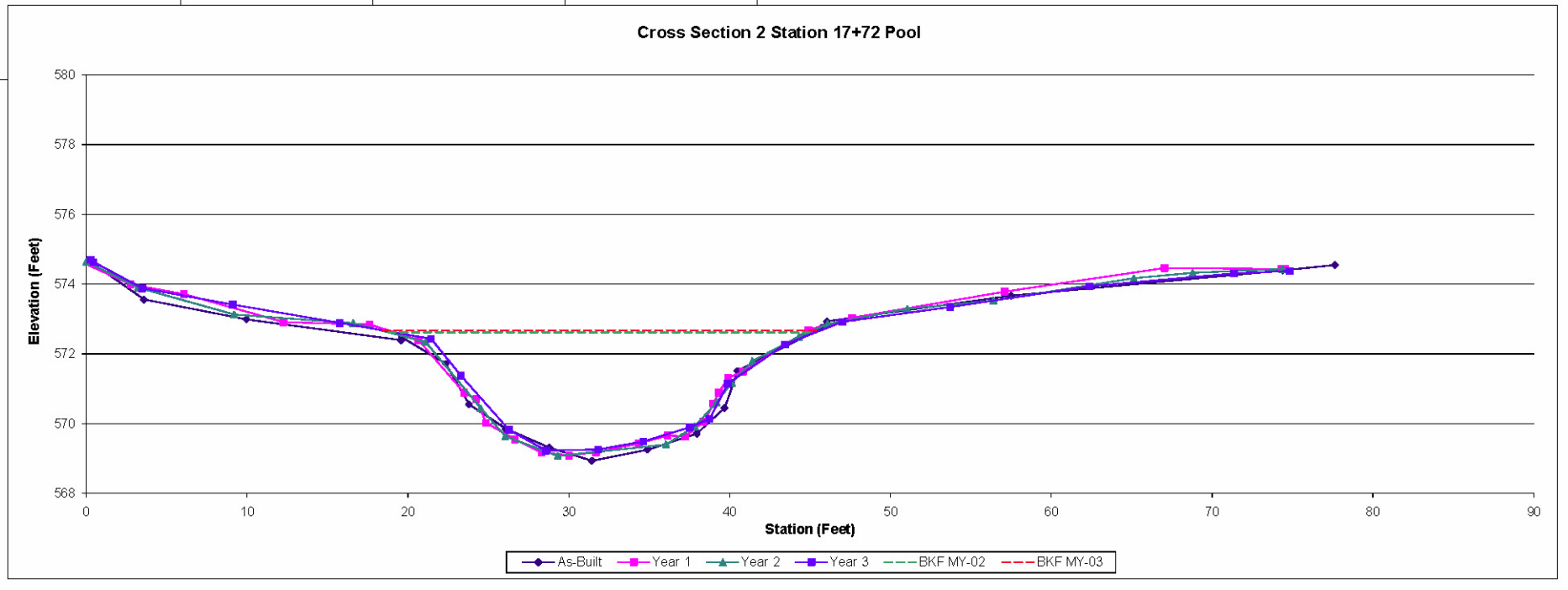


Project:	UT to Cane Creek	Summary (bankfull)						
Cross Section:	Cross Section 2	MY0	MY1	MY2	MY3	MY4	MY5	
Feature:	Pool	A (BKF)	56.5	53.6	56.7	55.1		
Station:	17+72	W (BKF)	26.2	24.2	26.2	27.2		
Date:	11/4/09	Max d	3.7	3.6	3.5	3.4		
Crew:	RL,BW,SV,RW	Mean d	2.2	2.2	2.2	2.0		
		W/D	12.1	11.0	12.1	13.5		

MY0-2006			MY1-2007			MY2-2008			MY3-2009		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-21.21	578.97		-0.34	574.64	LPIN	0.00	574.65	LPIN	0.26	574.70	LPIN
-10.81	577.1		2.75	573.99		3.22	573.90		0.44	574.63	
-0.08	574.74	LPIN	6.07	573.71		9.20	573.13		3.48	573.88	
3.59	573.56		12.26	572.91		16.59	572.88	LBKF	9.09	573.41	
9.95	572.99		17.62	572.84		21.10	572.34		15.76	572.89	
19.57	572.39	LBKF	20.65	572.4	LBKF	24.52	570.44		21.43	572.43	LBKF
19.81	572.48		23.49	570.89		26.06	569.63		23.29	571.37	
22.34	571.72		24.25	570.7		29.32	569.07		26.28	569.82	
23.8	570.55		24.84	570.02		36.04	569.40		29.58	569.23	
26.08	569.85		26.65	569.54		37.83	569.91		31.82	569.26	TW
28.78	569.31		28.31	569.17		39.18	570.61		34.64	569.49	
31.44	568.93		30.02	569.09		40.13	571.17		37.52	569.89	
34.9	569.25		31.89	569.18		41.41	571.79		38.75	570.14	
37.96	569.71		34.37	569.43		44.30	572.49		39.87	571.14	
39.68	570.45		36.14	569.66		46.09	572.86	RBKF	43.43	572.27	
40.49	571.51		37.23	569.63		51.04	573.29		47.00	572.92	RBKF
45.72	572.75	RBKF	38.39	570.05		56.40	573.53		53.72	573.34	
46.05	572.93		38.99	570.56		65.12	574.17		62.37	573.94	
57.49	573.67		39.32	570.89		68.78	574.32		71.36	574.31	
74.4	574.39	RPIN	39.9	571.31		74.38	574.43	RPIN	74.82	574.38	RPIN
77.65	574.55		40.83	571.49							
			44.89	572.89	RBKF						
			47.62	573.03							
			57.09	573.78							
			67.05	574.46							
			74.32	574.43	RPIN						
			74.53	574.43							



Photo of XS-2, looking in the downstream direction



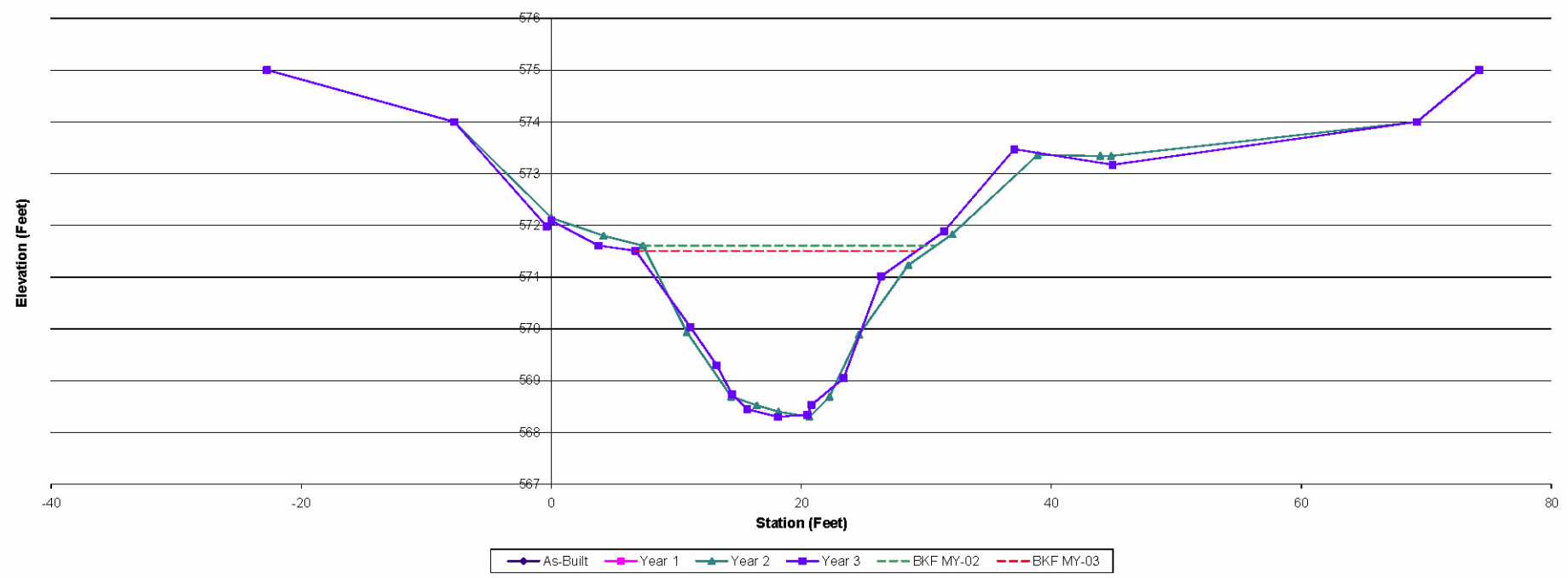
Project:	UT to Cane Creek	Summary (bankfull)						
Cross Section:	Cross Section 3		MY0	MY1	MY2	MY3	MY4	MY5
Feature:	Riffle	A (BKF)	NA	NA	45.8	42.1		
Station:	23+18	W (BKF)	NA	NA	23.5	22.5		
Date:	11/4/09	Max d	NA	NA	3.3	3.2		
Crew:	RL,BW,SV,RW	Mean d	NA	NA	2.0	1.9		
		W/D	NA	NA	12.0	12.0		

MY0-2006			MY1-2007			MY2-2008			MY3-2009		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						-22.76	575.00		-22.76	575.00	
						-7.76	574.00		-7.76	574.00	
						0.00	572.14	LPIN	-0.37	571.98	
						4.17	571.80		0.00	572.09	LPIN
						7.33	571.61	LBKF	3.76	571.61	
						10.83	569.94		6.73	571.51	LBKF
						14.38	568.69		11.12	570.03	
						16.43	568.52		13.23	569.30	
						18.17	568.40		14.45	568.74	
						20.65	568.30	TW	15.68	568.45	
						22.24	568.69		18.11	568.30	TW
						24.60	568.89		20.48	568.34	
						28.54	571.23	RBKF	20.82	568.53	
						32.08	571.83		23.38	569.05	
						38.89	573.36		26.39	571.02	RBKF
						43.91	573.34		31.44	571.89	
						44.78	573.34	RPIN	37.04	573.47	
						69.24	574.00	0.00	44.91	573.17	RPIN
						74.24	575.00		69.24	574.00	
									74.24	575.00	



Photo of XS-3, looking in the downstream direction

Cross Section 3 Station 23+18 Riffle

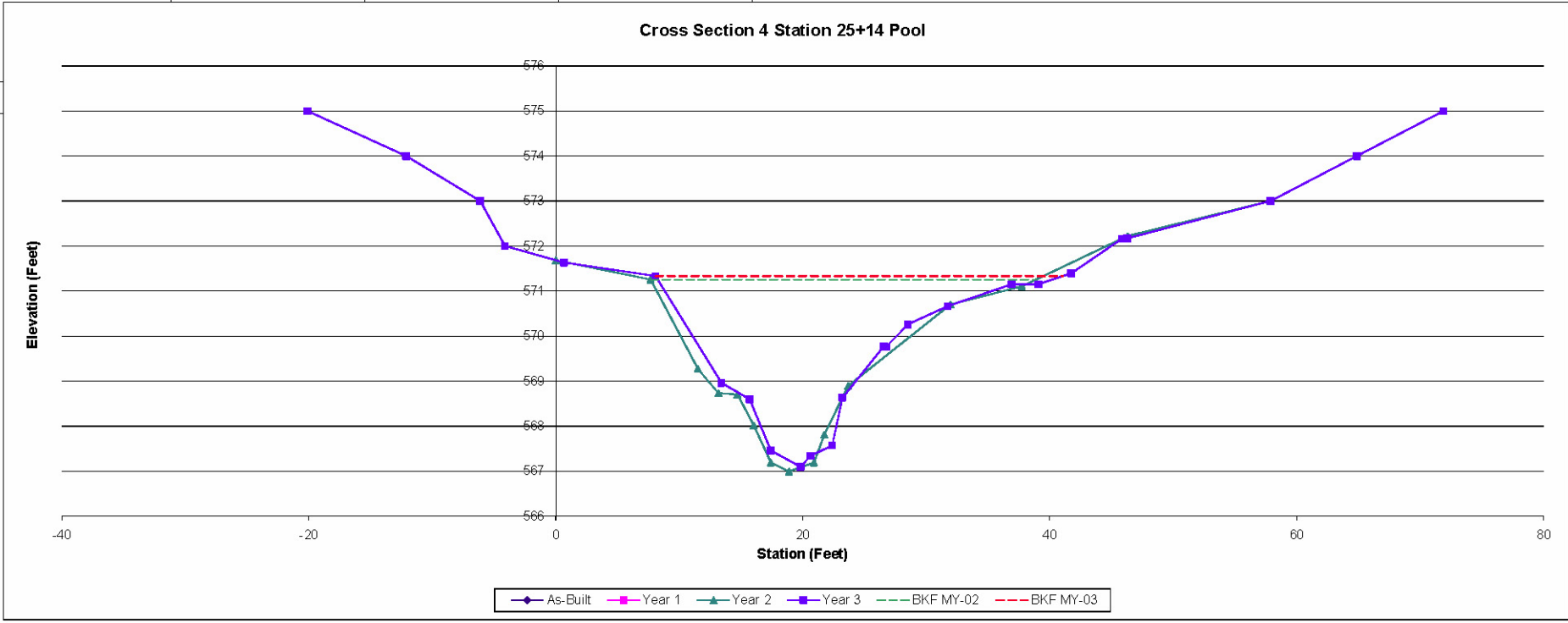


Project:	UT to Cane Creek	Summary (bankfull)						
Cross Section:	Cross Section 4		MY0	MY1	MY2	MY3	MY4	MY5
Feature:	Pool	A (BKF)	NA	NA	57.8	55.8		
Station:	25+14	W (BKF)	NA	NA	31.2	33.0		
Date:	11/4/09	Max d	NA	NA	4.3	4.2		
Crew:	RL,BW,SV,RW	Mean d	NA	NA	1.9	1.7		
		W/D	NA	NA	16.9	19.5		

MY0-2006			MY1-2007			MY2-2008			MY3-2009		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						-20.12	575.00		-20.12	575.00	
						-12.12	574.00		-12.12	574.00	
						-6.12	573.00		-6.12	573.00	
						-4.12	572.00		-4.12	572.00	
						0.00	571.68	LPIN	0.67	571.83	LPIN
						7.67	571.25	LBKF	8.07	571.33	LBKF
						11.49	569.27		13.40	568.96	
						13.17	568.73		15.70	568.59	
						14.70	568.70		17.40	567.45	
						16.02	568.01		19.83	567.09	TW
						17.40	567.19		20.64	567.34	
						18.88	566.99	TW	22.38	567.57	
						20.90	567.19		23.21	568.63	
						21.74	567.81		26.57	569.78	
						23.67	568.89		26.76	569.76	
						31.96	570.70	RBKF	28.50	570.26	RBKF
						37.73	571.10		31.74	570.86	
						46.31	572.22	RPIN	36.93	571.15	
						57.88	573.00		39.08	571.15	
						64.88	574.00		41.73	571.39	
						71.88	575.00		45.85	572.16	
									46.28	572.17	RPIN
									57.88	573.00	
									64.88	574.00	
									71.88	575.00	



Photo of XS-4, looking in the downstream direction



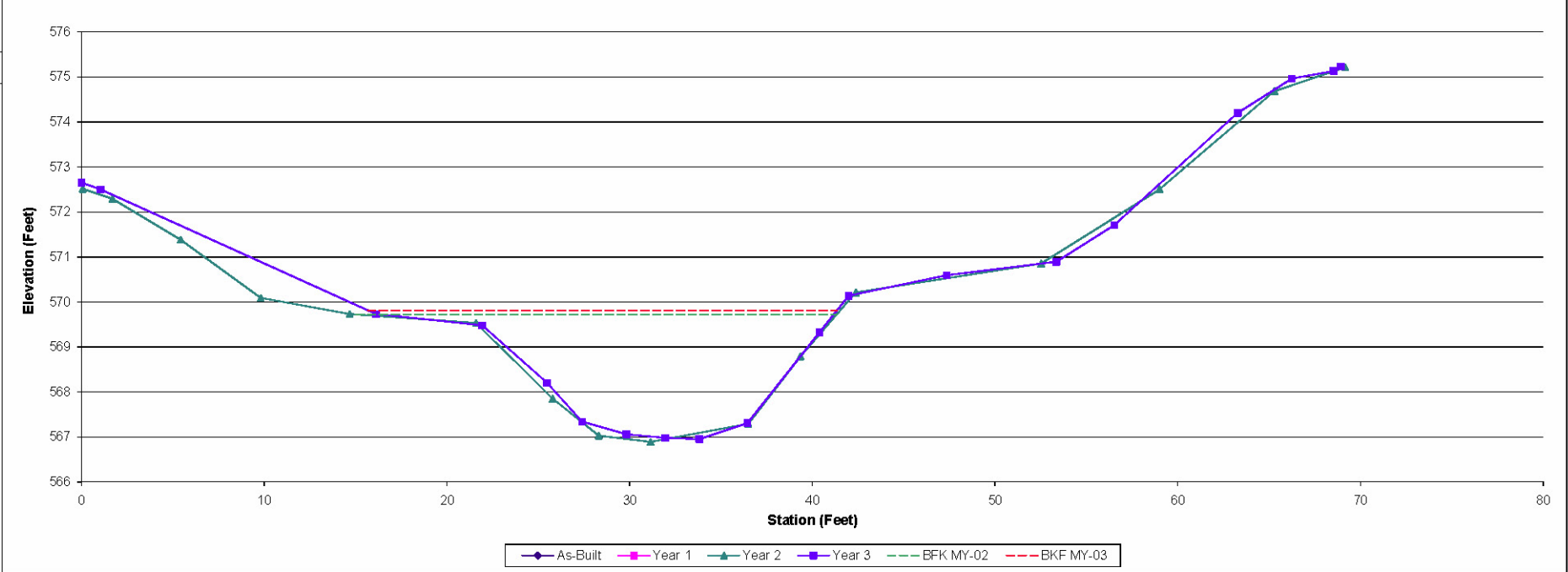
Project:	UT to Cane Creek	Summary (bankfull)						
Cross Section:	Cross Section 5		MY0	MY1	MY2	MY3	MY4	MY5
Feature:	Riffle	A (BKF)	NA	NA	43.4	39.3		
Station:	28+99	W (BKF)	NA	NA	26.3	25.7		
Date:	11/4/09	Max d	NA	NA	2.8	2.9		
Crew:	RL,BW,SV,RW	Mean d	NA	NA	1.7	1.5		
		W/D	NA	NA	15.9	16.8		



Photo of XS-5, looking in the downstream direction

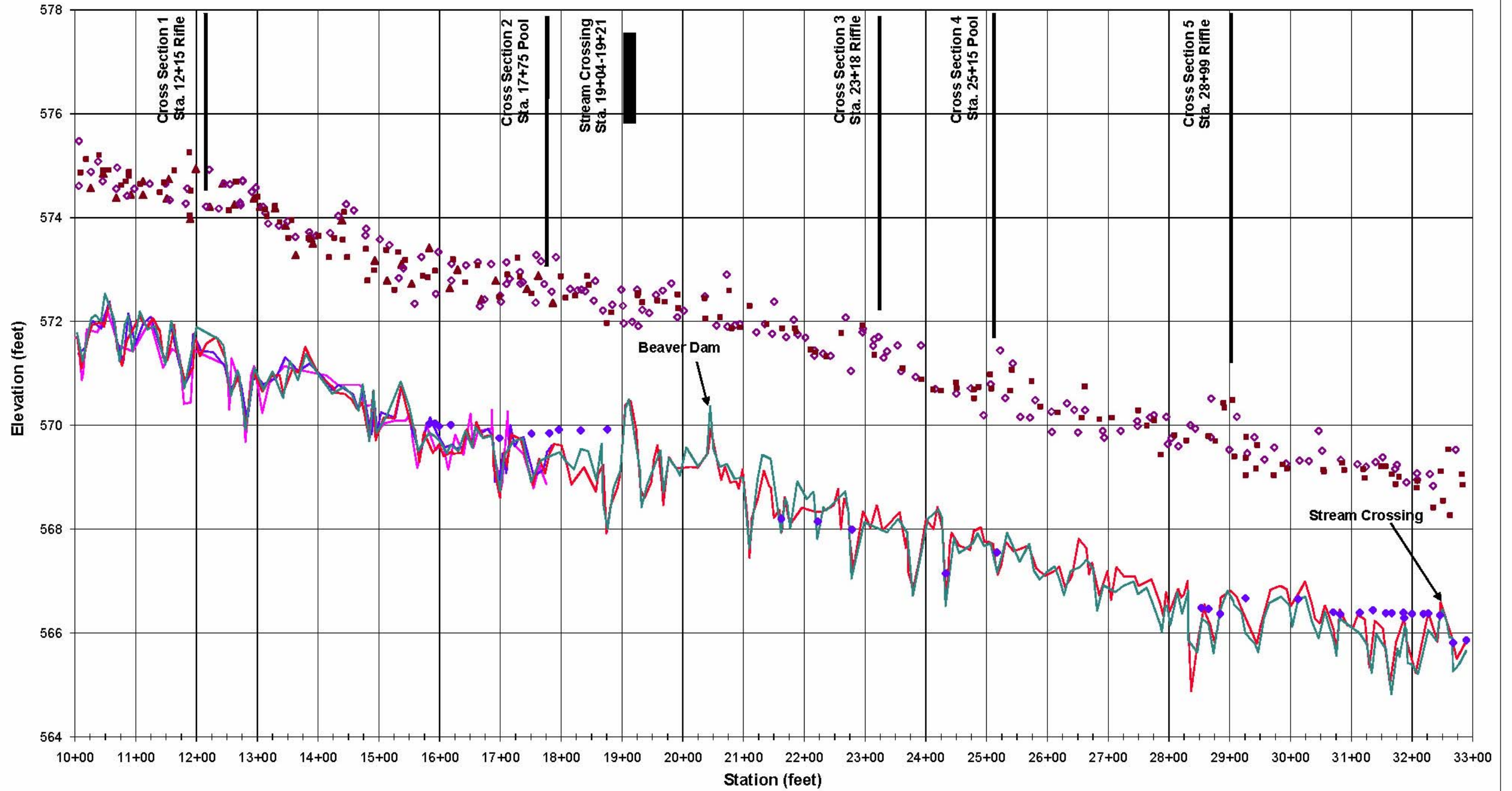
MY0-2006			MY1-2007			MY2-2008			MY3-2009		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
						0.00	572.65	LPIN	0.00	572.65	LPIN
						0.06	572.51		1.04	572.50	
						1.69	572.29		16.11	569.73	
						5.43	571.38		16.15	569.73	
						9.81	570.09		21.93	569.48	LBKF
						14.67	569.73		25.47	569.20	
						21.59	569.53	LBKF	27.40	567.34	
						25.79	567.85		29.83	567.06	
						28.31	567.03		31.96	566.98	TW
						31.14	566.89	TW	33.82	566.95	
						36.50	567.29		36.45	567.31	
						39.34	568.79		40.40	569.33	
						42.38	570.21	RBKF	41.99	570.14	RBKF
						52.52	570.95		47.36	570.59	
						59.00	572.50		53.36	570.89	
						65.28	574.68		56.53	571.71	
						69.17	575.21	RPIN	63.29	574.20	
									66.24	574.96	
									68.53	575.13	
									68.93	575.23	RPIN

Cross Section 5 Station 28+99 Riffle



Longitudinal Profiles with Annual Overlays

UT to Cane Creek
Longitudinal Profile
Main Channel: Station 10+00-32+90



— TW MY-00 — TW MY-01 — TW MY-02 — TW MY-03 ▲ BKF MY-01 ◆ BKF MY-02 ■ BKF MY-03 ● WS MY-03

Pebble Count Plots with Annual Overlays

Figure 9. Pebble Count Plots – XS-1

PEBBLE COUNT								
Project: UT to Cane Creek MY-03						Date: 11/2/2009		
Location: Cross Section #1								
Particle Counts								
Inches	Particle	Millimeter	S/C	Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	12	0	12	11%	11%
.04 - .08	Very Fine	.062 - .125	S	11	0	11	10%	20%
	Fine	.125 - .25	A	12	0	12	11%	31%
	Medium	.25 - .50	N	6	0	6	5%	36%
	Coarse	.50 - 1.0	D	15	0	15	13%	49%
.08 - .16 .16 - .22 .22 - .31 .31 - .44 .44 - .63 .63 - .89 .89 - 1.26 1.26 - 1.77 1.77 - 2.5	Very Coarse	1.0 - 2.0	S	3	0	3	3%	52%
	Very Fine	2.0 - 4.0	G	0	0	0	0%	52%
	Fine	4.0 - 5.7	G	3	0	3	3%	54%
	Fine	5.7 - 8.0	R	3	0	3	3%	57%
	Medium	8.0 - 11.3	A	3	0	3	3%	60%
	Medium	11.3 - 16.0	V	2	0	2	2%	61%
	Coarse	16.0 - 22.6	E	1	0	1	1%	62%
	Coarse	22.6 - 32.0	L	0	0	0	0%	62%
	Very Coarse	32.0 - 45.0	S	2	0	2	2%	64%
	Very Coarse	45.0 - 64.0	S	3	0	3	3%	67%
2.5 - 3.5 3.5 - 5.0 5.0 - 7.1 7.1 - 10.1	Small	64 - 90	C	13	0	13	11%	78%
	Small	90 - 128	O	11	0	11	10%	88%
	Large	128 - 180	B	8	0	8	7%	95%
	Large	180 - 256	L	4	0	4	4%	98%
10.1 - 14.3 14.3 - 20 20 - 40 40 - 80	Small	256 - 362	B	1	0	1	1%	99%
	Small	362 - 512	L	1	0	1	1%	100%
	Medium	512 - 1024	D	0	0	0	0%	100%
	Lrg- Very Lrg	1024 - 2048	R	0	0	0	0%	100%
	Bedrock		BDRK	0	0	0	0%	100%
Totals				114	0	114	100%	100%

d16	d35	d50	d84	d95
Silt/Clay	0.5	1.3	113.4	185.7

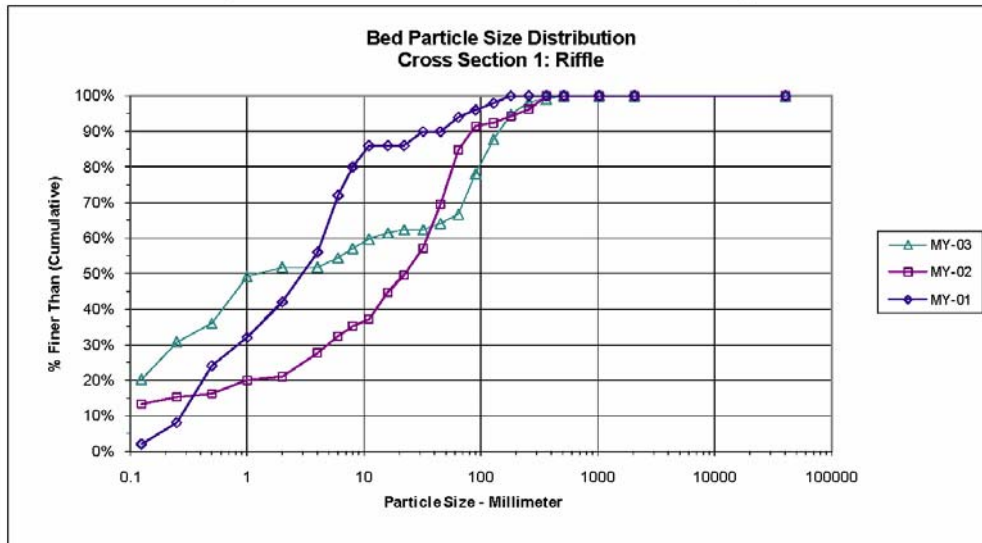


Figure 10. Pebble Count Plots – XS-3

PEBBLE COUNT								
Project: UT to Cane Creek MY-03					Date: 11/2/2009			
Location: Cross Section #3								
Particle Counts								
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	29	0	29	28%	28%
.04 - .08	Very Fine	.062 - .125	S	2	0	2	2%	30%
	Fine	.125 - .25	A	3	0	3	3%	33%
	Medium	.25 - .50	N	3	0	3	3%	36%
	Coarse	.50 - 1.0	D	6	0	6	6%	42%
	Very Coarse	1.0 - 2.0	S	0	0	0	0%	42%
.08 - .16	Very Fine	2.0 - 4.0		0	0	0	0%	42%
.16 - .22	Fine	4.0 - 5.7	G	0	0	0	0%	42%
.22 - .31	Fine	5.7 - 8.0	R	1	0	1	1%	43%
.31 - .44	Medium	8.0 - 11.3	A	2	0	2	2%	45%
.44 - .63	Medium	11.3 - 16.0	V	6	0	6	6%	50%
.63 - .89	Coarse	16.0 - 22.6	E	4	0	4	4%	54%
.89 - 1.26	Coarse	22.6 - 32.0	L	8	0	8	8%	62%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	9	0	9	9%	71%
1.77 - 2.5	Very Coarse	45.0 - 64.0		11	0	11	11%	82%
2.5 - 3.5	Small	64 - 90	C	9	0	9	9%	90%
3.5 - 5.0	Small	90 - 128	O	3	0	3	3%	93%
5.0 - 7.1	Large	128 - 180	B	5	0	5	5%	98%
7.1 - 10.1	Large	180 - 256	L	1	0	1	1%	99%
10.1 - 14.3	Small	256 - 362	B	0	0	0	0%	99%
14.3 - 20	Small	362 - 512	L	0	0	0	0%	99%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	99%
40 - 80	Lrg- Very Lrg	1024 - 2048	R	0	0	0	0%	99%
	Bedrock		BDRK	1	0	1	1%	100%
Totals				103	0	103	100%	100%

	d16	d35	d50	d84	d95
Silt/Clay	0.4	15.6	71.3	147.2	

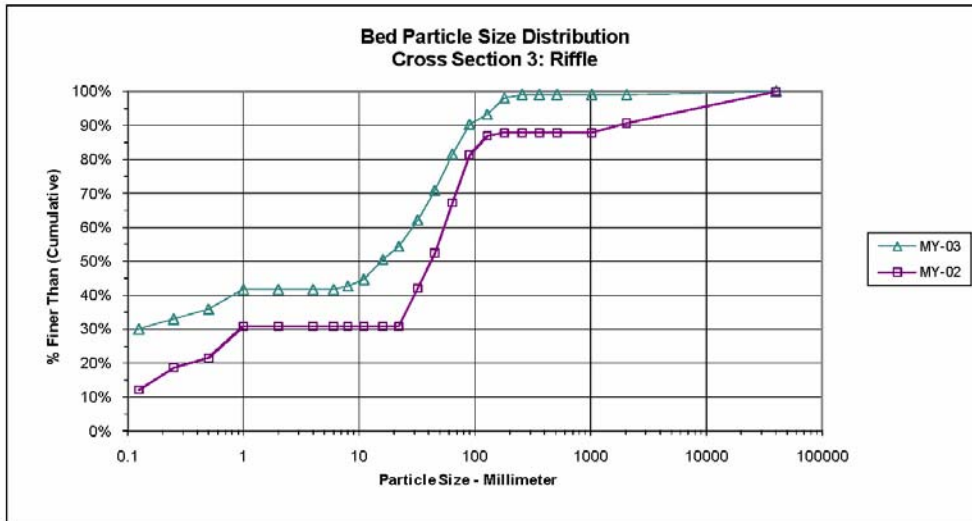


Figure 11. Pebble Count Plots – XS-5

PEBBLE COUNT								
Project: UT to Cane Creek MY-03						Date: 11/2/2009		
Location: Cross Section #5								
Particle Counts								
Inches	Particle	Millimeter	S/C	Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	22	0	22	19%	19%
.04 - .08	Very Fine	.062 - .125	S	0	0	0	0%	19%
	Fine	.125 - .25	A	6	0	6	5%	24%
	Medium	.25 - .50	N	3	0	3	3%	26%
	Coarse	.50 - 1.0	D	3	0	3	3%	29%
.08 - .16	Very Coarse	1.0 - 2.0	S	4	0	4	3%	32%
	Very Fine	2.0 - 4.0	G	0	0	0	0%	32%
	Fine	4.0 - 5.7	R	3	0	3	3%	35%
	Fine	5.7 - 8.0	A	4	0	4	3%	38%
.16 - .22	Medium	8.0 - 11.3	V	11	0	11	9%	48%
	Medium	11.3 - 16.0	E	7	0	7	6%	54%
.22 - .31	Coarse	16.0 - 22.6	L	12	0	12	10%	64%
	Coarse	22.6 - 32.0	S	19	0	19	16%	80%
.31 - .44	Very Coarse	32.0 - 45.0	L	11	0	11	9%	90%
	Very Coarse	45.0 - 64.0	C	6	0	6	5%	95%
.44 - .63	Small	64 - 90	O	2	0	2	2%	97%
	Small	90 - 128	B	3	0	3	3%	99%
.63 - .89	Large	128 - 180	L	0	0	0	0%	99%
	Large	180 - 256	B	0	0	0	0%	99%
.89 - 1.26	Small	256 - 362	L	0	0	0	0%	99%
	Small	362 - 512	D	0	0	0	0%	99%
1.26 - 1.77	Medium	512 - 1024	R	0	0	0	0%	99%
	Medium	1024 - 2048	R	0	0	0	0%	99%
1.77 - 2.5	Lrg- Very Lrg	1024 - 2048	R	0	0	0	0%	99%
	Bedrock		BDRK	1	0	1	1%	100%
Totals				117	0	117	100%	100%

d16	d35	d50	d84	d95
0.1	8.0	18.1	52.4	92.9

