UT to Mary's Creek Stream Restoration Site

2008 Annual Monitoring Report (Year 2)

Alamance County
EEP Project No. 241
Design Firm: Stantec Consulting Services, Inc.

May 2009

Prepared for:

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

Prepared by:

The Catena Group
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Appendix A. Vegetation

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I. Executive Summary

The UT to Mary's Creek stream restoration project consists of 2,082 linear feet of stream restoration with just over 5 acres of buffer restoration. The property is located northwest of the small community of Eli Whitney at the end of Dixon Lamb Rd (SR 2336) in Alamance County, North Carolina. Construction began on January 5, 2006, and completed on March 10, 2006. The planting was completed on March 15, 2006. Four bankfull events occurred during construction.

The project contains a portion of an unnamed tributary (UT) to Mary's Creek, which drains to the Haw River of the greater Cape Fear River Basin. The drainage area is 1,145 acres. The North Carolina Wetland Restoration Program (NCWRP), now know as the North Carolina Ecosystem Enhancement Program (NCEEP), identified UT to Mary's Creek as a potential stream mitigation site. Prior to restoration, UT to Mary's Creek was incised with moderate habitat and an actively migrating unstable pattern. Sand bars were composed of erodible material that migrated frequently during small storm events. Sections of the channel that had been straightened for agricultural purposes contained mid channel bars indicating an over-widened channel. The mid channel bars were deflecting the stream flow into the banks accelerating stream bank erosion.

Overall, the banks are now stable and well vegetated on UT to Mary's Creek and the tributary to UT to Mary's Creek. The majority of the structures are also functioning properly and there is little evidence of needed repairs except at the stream crossing on Mary's Creek.

The main concerns for the project's long term stability on UT to Mary's Creek is the degrading condition of the stream crossing and the establishment of a beaver dam in the lower reach. The culvert crossing capacity of the triple culverts has been limited by the narrowing of the channel upstream and downstream of the culverts. The upstream face of the roadway embankment has eroded and is in need of repair. The beaver dam is causing backwater conditions on approximately 365 linear feet of channel.

Aggradation is occurring throughout the tributary to UT to Mary's Creek dues to the incoming sediment load and the constructed channel slope not having the capacity to transport the available sediment, however the banks and structures are stable. The channel bankfull slope has adjusted from 0.0037% to 0.0062% over the Monitoring Year 2 (MY-02) due to the sediment influx in the upper reach. The tributary slope should be closely reviewed next year to determine if the current excess sediment passes through the system and the slope returns to design values. One bankfull event was recorded on September 6, 2008 as a result of Tropical Storm Hannah, which created a rain event of greater than four inches in nearby Snow Camp.

The new CVS-EEP protocol was administered for MY-02. Three vegetation monitoring plots were added to the original two that were established during baseline data collection. Planted stems could not be distinguished from natural stems during the vegetation data

collection therefore stems were labeled as natural to err on the side of caution. Black willow livestakes in Plot 4 were recorded as planted. There are 4,727 stems/acre including natural and planted stems. The vegetation problem areas are mainly composed of invasive exotics and beaver encroachment. Invasive exotics include tall fescue (*Schedonurus arundinaceus*), tree of heaven (*Ailanthus altissima*), Chinese privet (*Ligustrum sinense*), Japanese honeysuckle (*Lonicera japonica*), Japanese stiltgrass (*Microstegium vimineum*), and multiflora rose (*Rosa multiflora*).

II. Project Background

A. Project Objectives

The project goals for UT to Mary's Creek include:

- 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

The UT to Mary's Creek project site is divided into two reaches: the main channel (UT to Mary's Creek) and the tributary to UT to Mary's Creek). UT to Mary's Creek is a third order stream that flows south to north through the majority of the project site before making a more than 90 degree turn to the east. The tributary to UT to Mary's Creek is a first order stream that flows in from the south and joins the main channel in the upstream portion of the reach. The project is located on the southeast portion of the Dixon property off of Dixon Lamb Road (SR 2336) and has a total drainage area of 1,145 acres. The conservation easement encompassing the project site is 6.8 acres. Prior to construction, the banks of UT to Mary's Creek were severely eroded and unstable with little or no riparian buffer. Cattle had unlimited access to the stream and had numerous crossings throughout the proposed project site. The tributary to UT to Mary's Creek and the smaller upstream portion of UT to Mary's Creek were classified as unstable C4 channel types while the downstream portion of UT to Mary's Creek was classified as an F4 channel type.

Priority 2 stream restoration was performed on both streams resulting in restored C channel types. The pattern, dimension, and profile were restored throughout the project site. Boulder structures and root wads were installed to provide further stability as well as to enhance aquatic wildlife habitat. Fencing was installed along the conservation easement boundaries to prevent cattle access to the stream and buffers. Streambanks, the floodplain, and upland areas within the easement were all planted with vegetation to stabilize the channel and providing shading, food, and habitat as well as a vegetated buffer to treat surrounding overland flows.

B. Project Structure

The Priority 2 restoration converted 1,632 linear feet (LF) of UT to Mary's Creek and 450 LF of a tributary to UT to Mary's Creek into a sinuous channel, as measured along the centerline. The stream's dimension, pattern, and profile were adjusted to allow for adequate sediment transport within the stream. Restoration of UT to Mary's Creek and the tributary to UT to Mary's Creek involved a combination of bedform transformation, channel dimension adjustments, pattern alterations, and the installation of rock vane structures and rootwads to serve as grade control. The natural meander patterns were restored and channel stabilizing structures such as rootwads and rock vanes were installed not only to serve as bank protection and grade control, but to enhance aquatic habitat. Planting of the riparian buffer within the permanent conservation easement was completed on March 25, 2006.

Table I.a. Project Components

Table I.a. Project Components UT to Mary's Creek / Project No. 241								
Project Component or Reach ID	**Existing Feet/Acres**	**Restoration Level**	**Approach**	**Footage or Acreage**	**Stationing**	**Buffer Acres**	**BMP Elements[1]**	**Comment**
UT to Mary's Creek	1750	R	P2	1632 lf	10+00-26+31.8	6.1	CF=4505 lf	Instream Structure and Vegetated Buffers
Tributary to the UT to Mary's Creek	360	R	P2	450 lf	10+00 – 14+50	1.2		Instream Structure and Vegetated Buffers

1 = BR = Bioretention Cell; SF = Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; Grassed Swale = S; LS = Level Spreader; NI = Natural Infiltration Area; O = Other
CF = Cattle Fencing; WS = Watering System; CH = Livestock Housing

Table I.b. Component Summations

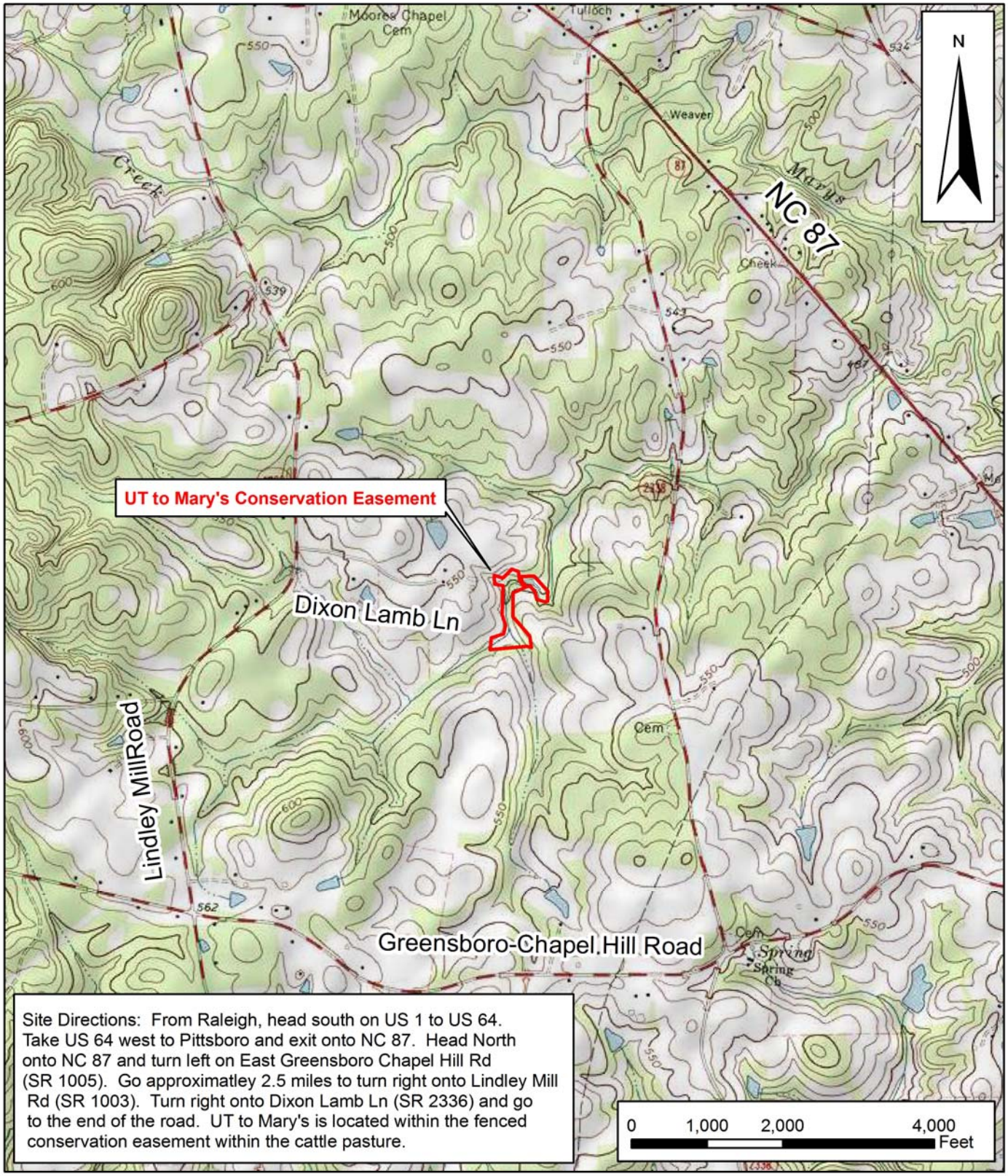
Table I.b. Component Summations UT to Mary's Creek/Project No. 241							
Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Ripar (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	2082					6.7	
Enhancement							
Enhancement I							
Enhancement II							
Creation							
Preservation							

HQ Preservation							
		0	0				
Totals	**20**	**82**	**0**	**0**	**0**	**7.3**	**Count**
	=Non-Applicable						

C. Location and Settings

UT to Mary's Creek is a tributary of the Haw River Basin and is located within a rural setting in the North Carolina Slate Belt. The project site is surrounded by cattle pasture on the Dixon property located off Dixon Lamb Road (SR 2336), east of Lindley Mill Road (SR 1003) and northwest of the Eli Whitney community (Figure 1). The project is located in Alamance County, North Carolina, in the Cape Fear 03030002 Cataloging Unit (CU) and North Carolina Division of Water Quality Subbasin 03-06-04.

Site Directions: From Raleigh, head south on US 1 to US 64. Take US 64 west to Pittsboro and exit onto NC 87. Head North onto NC 87 and turn left on East Greensboro Chapel Hill Rd (SR 1005). Go approximately 2.5 miles to turn right onto Lindley Mill Rd (SR 1003). Turn right onto Dixon Lamb Ln (SR 2336) and go to the end of the road. UT to Mary's is located within the fenced conservation easement within the cattle pasture.



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UT to Mary's Creek Stream Restoration Site

Site Location Map

Alamance County, North Carolina

USGS 7.5-Minute Topographic Quadrangle Map

EEP Project No. 241

Date: November 2008

Ecosystem Enhancement Program

Figure 1

D. History and Background

The North Carolina Wetland Restoration Program (NCWRP, now known as North Carolina Ecosystem Enhancement Program, NCEEP), identified UT to Mary's Creek as having potential for stream restoration.

Prior to restoration, UT to Mary's Creek and its tributary consisted of an incised channel with moderate habitat and an unstable pattern that was actively migrating. Stream banks were steep with areas of active erosion, particularly along the outside of meander bends. Sand bars were composed of easily erodible material that migrated frequently during small storm events. Cattle had unlimited access to the stream and as many as 30 crossings were observed through the project area. The stream buffer was nearly absent. The tributary and the smaller upstream portion of UT to Mary's Creek were classified as a C4 channel type and the downstream portion of UT to Mary's Creek was classified as a F4 channel type.

The tributary to UT to Mary's Creek enters the site as a second order stream before draining into the third order stream, UT to Mary's Creek. Downstream of the property UT to Mary's Creek converges with Mary's Creek, a tributary of the Haw River within the greater Cape Fear River Basin. UT to Mary's Creek is within the Piedmont Physiographic Province of the Cape Fear River Basin (USGS Cataloging Unit 03030002). UT to Mary's Creek and its tributary is located within the NCDWQ Subbasin 03-06-04. The watershed is located to the southwest of Saxapahaw, North Carolina. The topography is gentle sloping occurring along UT to Mary's Creek. Land surface elevations range from approximately 498 to 508 feet above mean sea level.

Table II. Project Activity and Reporting History

UT to Mary's Creek Stream Restoration Site-Project No. 241			
Activity or Reporting	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion Date**
Restoration Plan	N/A	-	April 2003
Final Design-90%	N/A	N/A	October 2005
Construction	N/A	N/A	March 2006
Temporary S&E mix applied to entire project area	N/A	N/A	March 2006
Permanent seed mix applied to entire project area	N/A	N/A	March 2006
Containerized, B&B, and livestake planting	N/A	N/A	March 2006
Mitigation Plan/As-built (Year 0 Monitoring-baseline)	N/A	May 2006	June 2006
Year 1 Monitoring	N/A	February 2007	March 2007
Year 2 Monitoring	N/A	July 2008	December 2008

Table III. Project Contact Table

Table III. Project Contact Table UT to Mary's Creek Stream Restoration Site-Project No. 241	
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.
Nursury 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 8386 Six Forks Road, Suite 101 Raleigh, NC 27613-5088
Vegetation Monitoring	The Catena Group 410-B Millstone Dr. Hillsborough, NC 27278

Table IV. Project Background Table

Table IV. Project Background Table UT to Mary's Creek Stream Restoration Site-Project No. 241	
Project County	Alamance
Drainage Area	
UT to Mary's Creek	1145 acres
Drainage impervious surface cover estimate (%)	< 5%
Stream Order	
Main Channel	3rd
Tributary	1st
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt
Rosgen Classification of As-Built	C
Cowardin Classification	Stream (R3UB1)
Dominant Soil Types	Starr 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%

E. Monitoring Plan View

See the Figures A-E on pages 12-17 for the Monitoring Plan View.

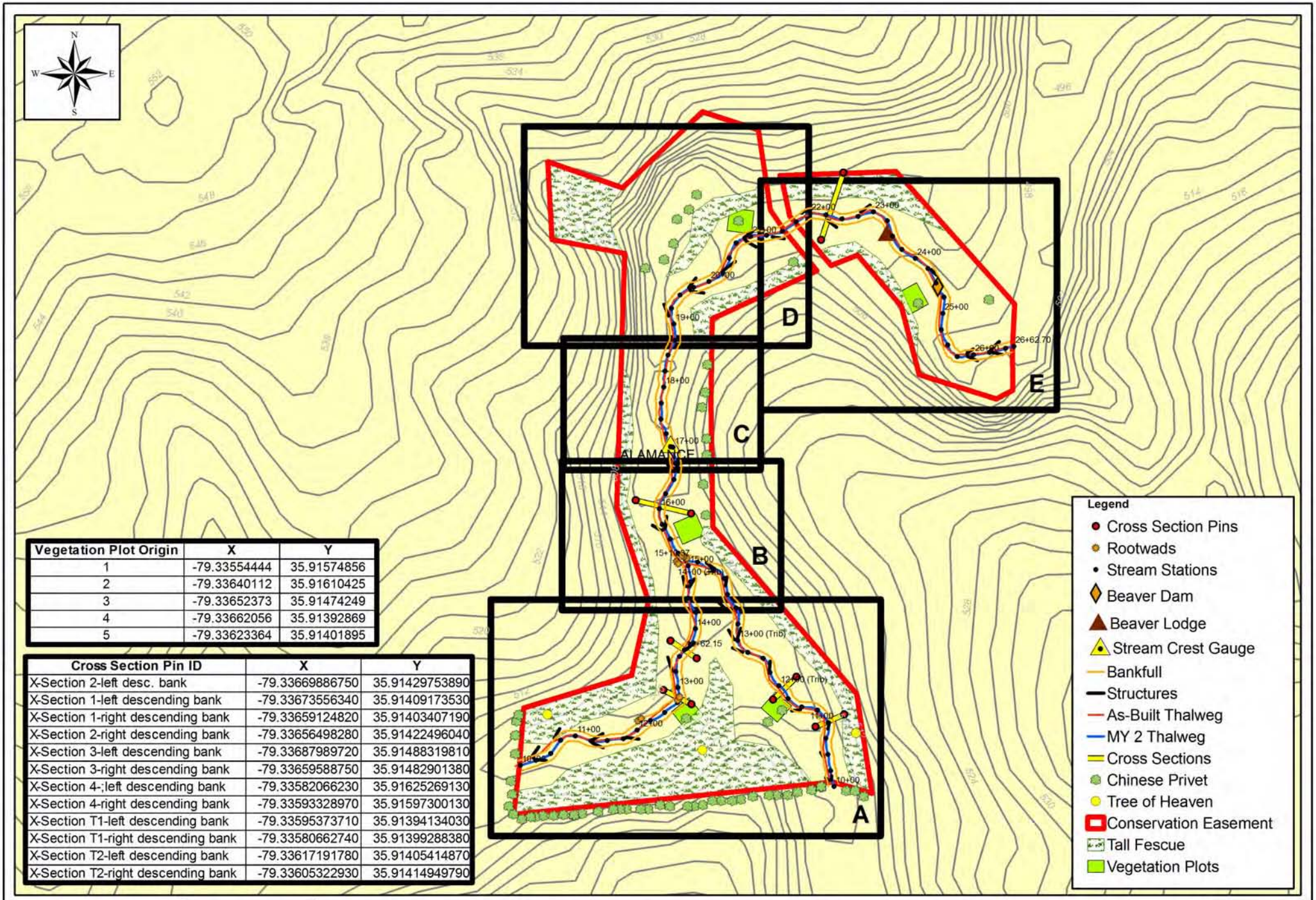
III. Project Condition and Monitoring Results

A. Vegetation Assessment

The new CVS-EEP protocol was administered for monitoring Year 2. By recommendation from EEP, three vegetation monitoring plots were added to the original two established during baseline data collection. Level II of the protocol was followed due to the fact that planted stems could not be distinguished from natural stems during the vegetation data collection, resulting in stems being labeled as natural to err on the side of caution. Some black willow livestakes located within Plot 4 were recorded. There are 4,727 stems/acre including natural and planted stems. The CVS-EEP protocol was not followed for the Year 1 monitoring. Level II of the CVS-EEP protocol will be used for the remainder of the monitoring period. Level II includes planted woody stems and natural woody stems. The success criterion for planted woody species is 320 stems/acre after monitoring year three (MY3). A mortality rate of ten percent will be allowed after MY4 (288 stems/acre), with another ten percent allowed after MY5 (260 stems/acre). Natural woody stems are quantified on separate data sheets. An accurate number of planted stems /acre could not be determined for this project due to the planted stems not being distinguishable from natural stems.

The successional species dog fennel (*Eupatorium capillifolium*) was ubiquitous throughout the conservation easement along with the invasive exotics tall fescue (*Schedonurus arundinaceus*). Other invasive exotics observed within the conservation easement include Japanese honeysuckle (*Lonicera japonica*), Japanese stiltgrass (*Microstegium vimineum*), tree of heaven (*Ailanthus altissima*), multiflora rose (*Rosa multiflora*), 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

"Severe Threat" species, which is defined as exotic plant species that have invasive characteristics and spread readily into native plant communities, displacing native vegetation. Although these species have been given this rank, the functionality of the project is not expected to be impaired significantly. For additional information relating to vegetation see Appendix A.



Vegetation Plot Origin	X	Y
1	-79.33554444	35.91574856
2	-79.33640112	35.91610425
3	-79.33652373	35.91474249
4	-79.33662056	35.91392869
5	-79.33623364	35.91401895

Cross Section Pin ID	X	Y
X-Section 2-left desc. bank	-79.33669886750	35.91429753890
X-Section 1-left descending bank	-79.33673556340	35.91409173530
X-Section 1-right descending bank	-79.33659124820	35.91403407190
X-Section 2-right descending bank	-79.33656498280	35.91422496040
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X-Section 3-right descending bank	-79.33659588750	35.91482901380
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X-Section T2-right descending bank	-79.33605322930	35.91414949790

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Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site

Monitoring Plan View

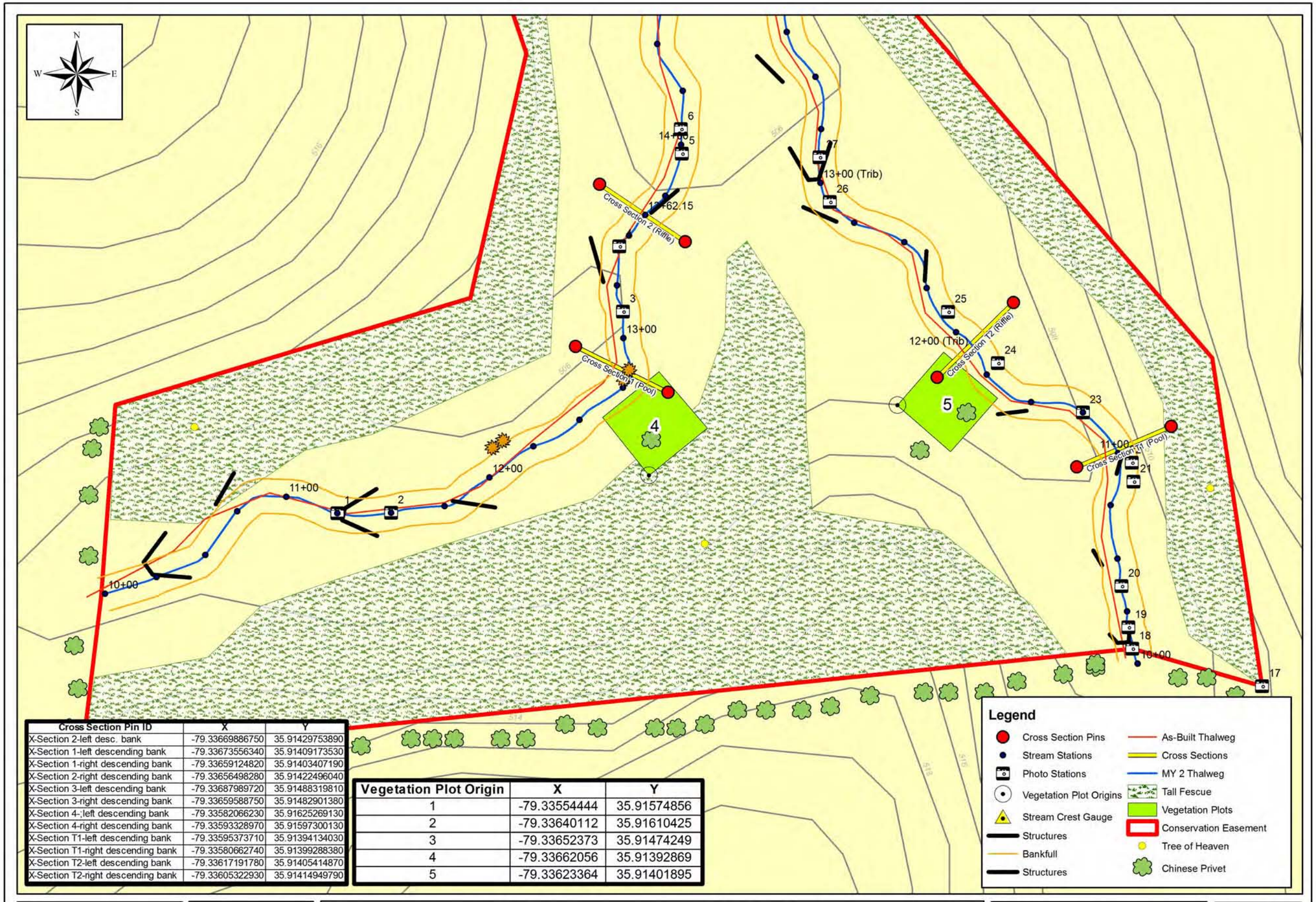
Alamance County, North Carolina

0 62.5 125 250 Feet

EEP Project No. 241

Date: May 20, 2009

Figure Key



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Legend

- Cross Section Pins
- Stream Stations
- Photo Stations
- Vegetation Plot Origins
- Stream Crest Gauge
- Structures
- Bankfull
- Structures
- As-Built Thalweg
- Cross Sections
- MY 2 Thalweg
- Tall Fescue
- Vegetation Plots
- Conservation Easement
- Tree of Heaven
- Chinese Privet

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UT to Mary's Creek Stream Restoration Site

Monitoring Plan View

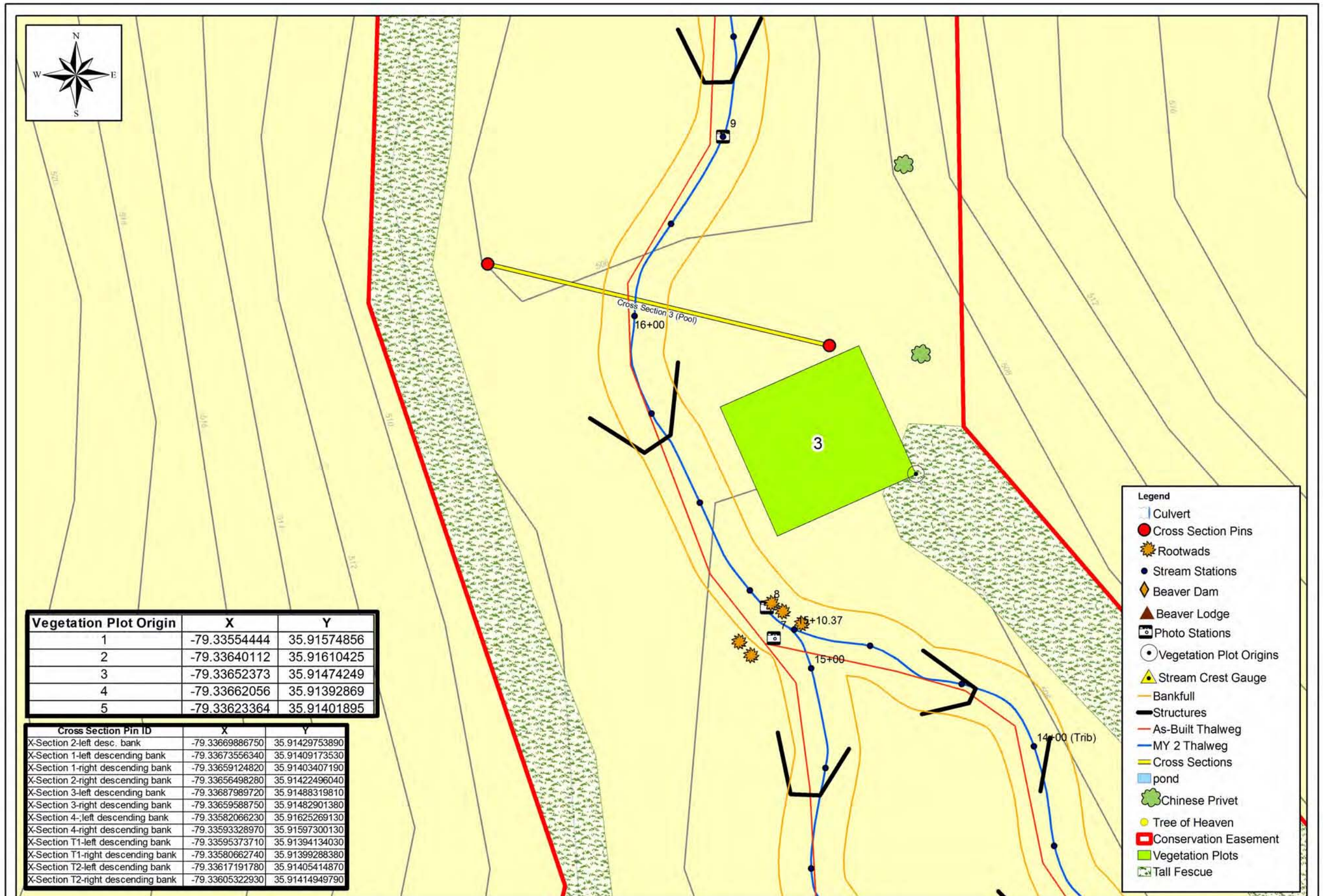
Alamance County, North Carolina

0 15 30 60 Feet

EEP Project No. 241

Date: May 20, 2009

Figure A



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UT to Mary's Creek Stream Restoration Site

Monitoring Plan View

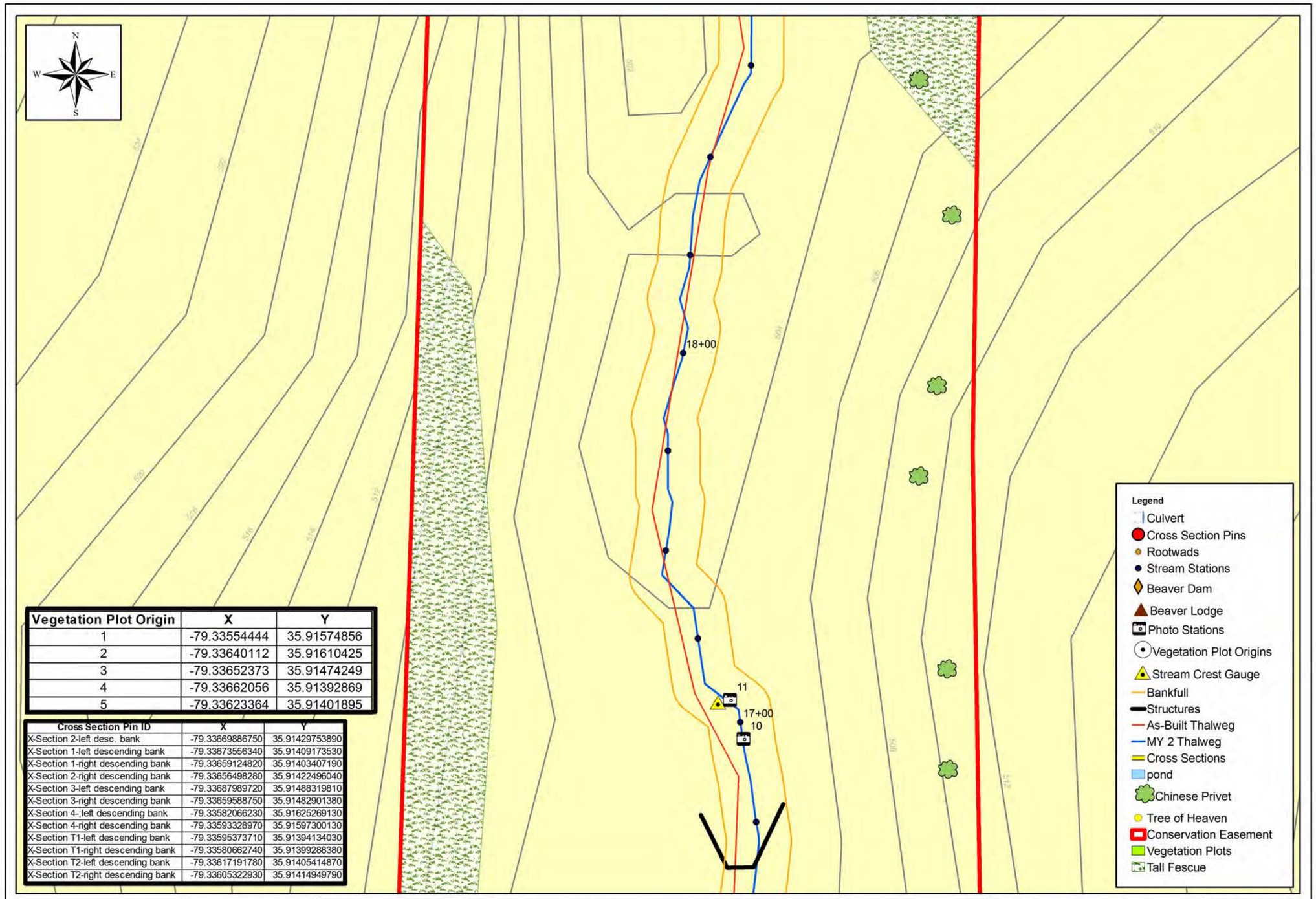
Alamance County, North Carolina

0 10 20 40 Feet

EEP Project No. 241

Date: May 20, 2009

Figure B



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Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site

Monitoring Plan View

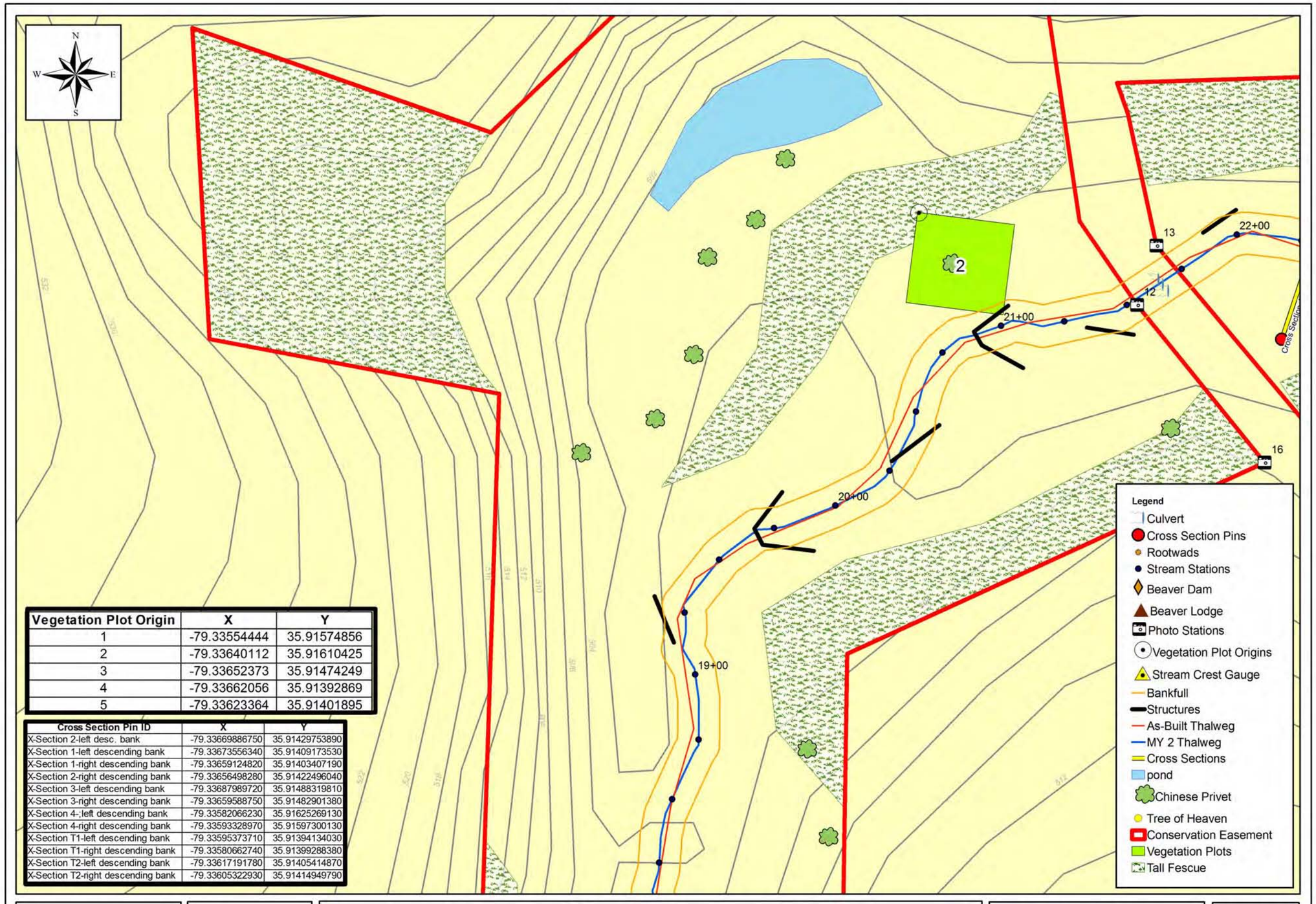
Alamance County, North Carolina

0 10 20 40 Feet

EEP Project No. 241

Date: May 20, 2009

Figure C



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Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site

Monitoring Plan View

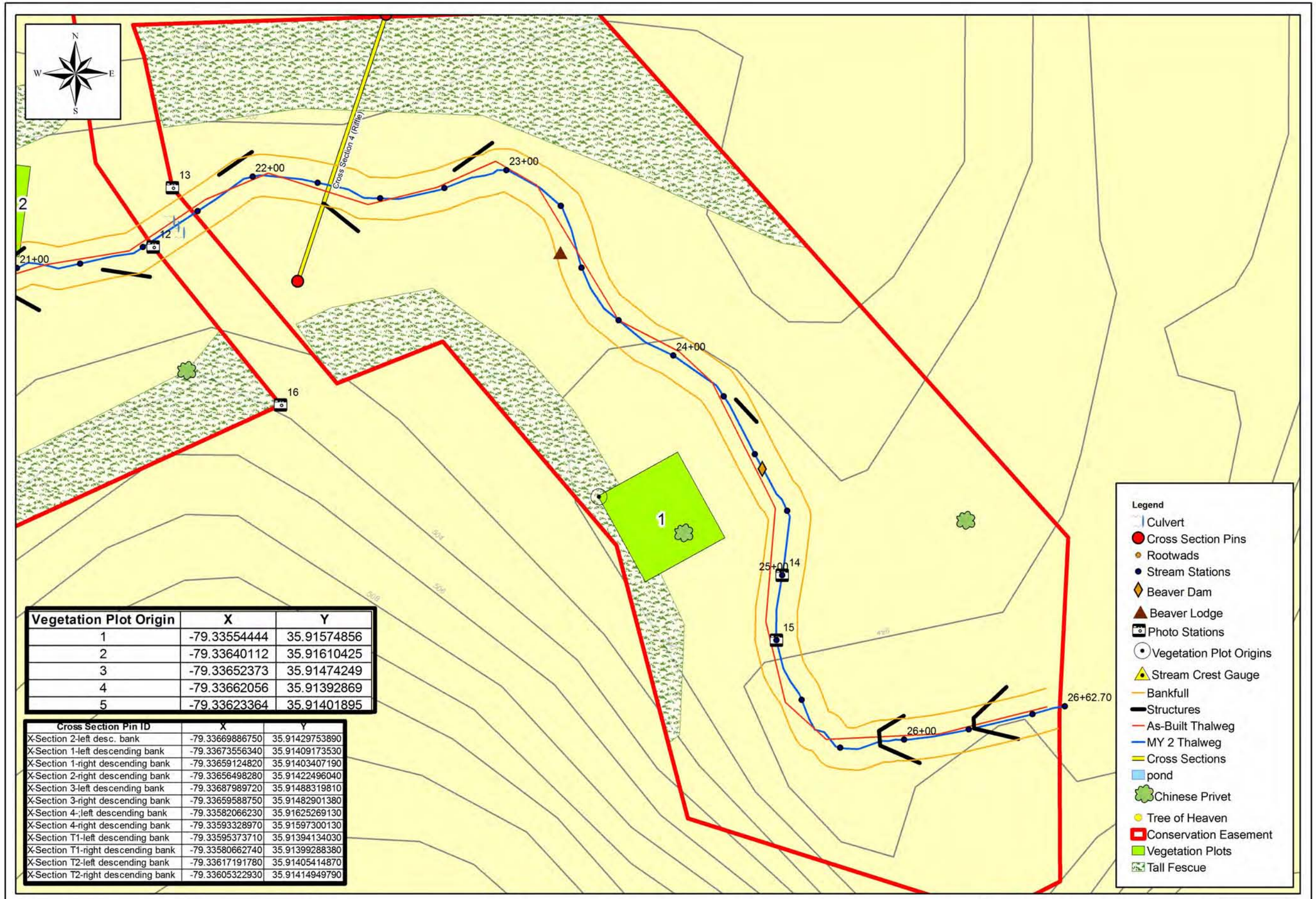
Alamance County, North Carolina

0 12.5 25 50 Feet

EEP Project No. 241

Date: May 20, 2009

Figure D



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Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site

Monitoring Plan View

Alamance County, North Carolina

0 12.5 25 50 Feet

EEP Project No. 241

Date: May 20, 2009

Figure E

1. Vegetation Problem Areas

The vegetation problem areas are eroding banks, beaver encroachment, and invasive exotic species encroachment of the conservation easement. Tall fescue, which is encroaching from the surrounding cattle pasture throughout the conservation easement, is the most common invasive. The beaver activity is in the northern portion of the conservation easement. The dam has been destroyed during each site visit but the beavers are persistent and have rebuilt the dam on a bedrock riffle at station 24+60. The beaver lodge is located at station 23+50. Erosion has occurred around the culverts of the cattle crossing from the overbank flooding events that occurred in September 2008. See Table 6 in Appendix A for locations of problem areas identified within the conservation easement. See section two of Appendix A for representative photos of the vegetation problem areas observed within the conservation easement of UT to Mary's Creek.

2. Integrated Vegetation and Stream Current Conditions Plan View (CCPV)

The problem areas associated with erosion are colored yellow and the area of beaver activity is represented with blue hatching. The specific invasive exotics are symbolized and depicted in the legend.

B. Stream Assessment

1. Procedural Items

a) Morphological Criteria

The restoration site was surveyed by total station in November, 20 2008. This survey includes a profile of entire length of the Main Channel, 1,632 feet; the Tributary; 450 feet; and six cross-sections. Pebble counts, the visual stability assessment, the problem area assessment, and the photo points were conducted on December 2, 2008.

The existing cross-sections pins were located and marked with fiberglass poles and flagging tape. Two additional cross sections, one riffle and one pool, were established on UT to Mary's Creek downstream of the confluence with the tributary to UT to Mary's Creek.

The permanent cross section locations are listed below:
Cross Section 1. Main Channel, Station 12+83, pool.
Cross Section 2. Main Channel, Station 13+62, riffle.
Cross Section 3. Main Channel, Station 16+04, pool.
Cross Section 4. Main Channel, Station 22+30, riffle.
Cross Section T1. Tributary 1, Station 11+02, pool.
Cross Section T2. Tributary 1, Station 11+91, riffle.

b) Hydrological Criteria

Monitoring requirements state that at least two bankfull events are to be documented within the five year monitoring period. Currently, there is one crest gauge at UT to Mary's Creek. Five documented bankfull events have occurred to date. Four bankful events occurred in late 2005 and early 2006 during stream construction and one occurred on 09/07/08.

Table V. Verification of Bankfull Events

UT to Mary's Creek Stream Restoration Site Project No. 241			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photo #**
Late 2005/Early 2006	Late 2005/Early 2006	Visual during construction	N/A
September 18, 2008	September 7, 2008	Wrack lines	N/A

2. Integrated Vegetation and Stream Current Conditions Plan View

See Figures in Appendix B for the Integrated Vegetation and Stream Current Conditions Plan View including stream and vegetation problem areas.

3. Problem Areas Table Summary

Overall Mary's Creek has problem areas that are limited in number and extent; a 30 foot segment of bank erosion, one structure that has limited piping, erosion and deposition around the stream crossing, and the beaver impacts. The main area of concern is the condition of the stream crossing, which has significant erosion on the upstream side roadway embankment and will most likely continue to degrade. The over-widened channel built for the triple culverts have narrowed to a single channel width centered on the middle culvert on the upstream and downstream side of the culverts, thereby limiting the culverts capacity to pass large storm events. It appears that the road has been overtopped during storm events since upstream roadway embankment has eroded several feet exposing the culverts. The overflow is causing the stone on the roadway to wash into the stream. The culverts are flooded to an approximate depth of 1.8 feet during normal flows which are approximately 2/3 of the available culvert area. Sediment deposits just upstream and downstream of the culverts have formed elevated riffles.

The beaver dam also has significant effects on Mary's Creek. The dam elevation is 498.6 feet and is located on a bedrock outcrop with an elevation 497.6 feet at station 24+67. It is causing backwater for a distance of approximately 365 feet to station 21+00. The location of the dam downstream of the culverts is adversely impacting their functionality. It should be noted that a bedrock outcrop exists at the beaver dam location, which, in the absence of the beaver dam, would still cause some backwater effects. Problem area photos are located in Appendix B for Mary's Creek.

The only problem noted on the Tributary is the aggradation of the channel. The stream banks and structures are stable. Photos of the problem areas listed in the table can be seen in Appendix B.

4. Fixed Station Photos

Stream photos from the established photo stations were taken in October 2008 and can be viewed in Appendix B.

5. Stability Assessment

A visual morphological stability assessment, conducted on December 2, 2008, was broken into two parts, one for UT to Mary's Creek and one for the tributary to UT to Mary's Creek. Since MY-01 only analyzed 20 bankfull widths of the Main Channel, from approximately stations 11+38 to 17+00, as-built quantities for the entire reach were not available and had to be determined by examination of the Restoration Plan design plan-view and longitudinal profile to quantify the number of riffles and pools. The as-built quantities of structures were taken from the surveyed as-built drawings. The design and restoration quantities have been updated to reflect the entire reach of UT to Mary's Creek and the tributary to UT to Mary's Creek in this year two monitoring report.

UT to Mary's Creek

The stability assessment of Mary's Creek indicates that overall the meanders, thalweg position, bed condition, and structures are very stable. The riffle stability values that scored lower than some of the other features were affected by the loss of riffles in elongated pools or riffles that were too short. Additionally, the area with the backwater caused by the combination of the beaver dam and bedrock outcrop no longer had well defined riffles. The mean performance of the pools was greater than the riffles at 71%. The pool performance was based on the migration of pools into riffle areas, elongated pool lengths, and the amount of sediment accumulation. The presence of bedrock throughout the site was also a factor in the pool assessment.

Tributary to UT to Mary's Creek

The meanders, thalweg, bank, and structures are all stable throughout the tributary. The tributary bed at the top of the reach is experiencing aggradation due to the incoming sediment load from the degraded upstream channel, as evident in the longitudinal profile plot located in Appendix B. Although the channel is stable, the riffles and pools show low performance in Table B2, 54% and 42%, respectively. The aggradation has filled some pools within the upper reach and resulted in the migration of some features into inappropriate plan form locations within the channel. The aggradation of the channel in the upstream end of the reach has shifted the stream slope from 0.0037% to 0.0062% over the year two monitoring period. This change in slope may be temporary as the sediment input upstream decreases and the aggraded soil passes through the system during future storm events. The tributary longitudinal profile obtained in next years monitoring will provide additional data to quantify the aggradation as a temporary or a long term issue.

Table VII. Categorical Stream Feature Visual Stability Assessment

Exhibit Table VII. Categorical Stream Feature Visual Stability Assessment
Mary's Creek Stream Mitigation Site/Project No. CMC/CPF/02
UT to Mary's Creek: (1632 feet)

Feature Ini	tial	MY-01*	MY-02	MY-03	MY-04	MY-05
A. Riffles	100%	84%	55%			
B. Pools	100%	97%	71%			
C. Thalweg	100%	89%	100%			
D. Meanders	100%	93%	100%			
E. Bed General	100%	93%	96%			
F. Bank Condition	NA	95%	98%			
G. Vanes/J Hooks etc.	100%	89%	97%			
H. Wads and Boulders	100%	50%	100%			

*MY-01 monitoring reach did not include entire length of restortation project. MY-02 and subsequent monitoring shall.

Exhibit Table VII. Categorical Stream Feature Visual Stability Assessment
Mary's Creek Stream Mitigation Site/Project No. CMC/CPF/02
Tributary to UT to Mary's Creek: (450 feet)

Feature Initia	l	MY-01*	MY-02	MY-03	MY -04	MY-05
A. Riffles	100%	92%	54%			
B. Pools	100%	113%	42%			
C. Thalweg	100%	90%	100%			
D. Meanders	100%	100%	100%			
E. Bed General	100%	100%	79%			
F. Bank Condition	NA	100%	100%			
G. Vanes/J Hooks etc.	100%	95%	100%			
H. Wads and Boulders	100%	100%	NA			

*MY-01 monitoring reach did not include entire length of restortation project. MY-02 and subsequent monitoring shall.

6. Quantitative Measures Summary Tables Stability Assessment

UT to Mary's Creek

The year one monitoring (MY-01) did not evaluate the entire reach, however the second year monitoring presented herein does. As a result of this extended monitoring length, some variation in the pattern and profile parameters has occurred.

There are two cross sections located above the tributary confluence that can be compared to MY-01 data. Two additional cross sections were added for MY-02 below the tributary confluence. Comparison of the two sections above the tributary, one riffle and one pool, with the MY-01 data, shows that the cross sectional areas of the channel have seen a reduction of 19% and 6%, respectively. The bankfull width of the pool section compared favorably with MY-01 data. The riffle data comparison, however, showed a 24% reduction in width. With only one section for the channel it is difficult to evaluate any trends. Better comparisons will be possible next year with the additional cross sectional data.

The MY-02 pattern data shows a larger range and average for most of the parameters since it includes the entire channel length. The riffle and pool profile data indicates larger ranges based on the larger sample size, however the median values are not that dissimilar between the two years. The channel slope is significantly different between MY-01 and MY-02. The slope shown for MY-02 is based on the slope for the entire 1650 linear feet of restoration from station 10+00 to 26+50. The MY-01 data was based on a 20 bankfull width segment of 450 linear feet from station 11+50 to 16+00. The d50 and d84 pebble count results have increased from MY-01 and is likely due to the increased rainfall and sediment available to the stream in this wetter monitoring year.

Tributary to UT to Mary's Creek

Since the MY-01 monitoring data included the entire reach of the tributary to Mary's Creek, channel stability between MY-01 and MY-02 was able to be compared.

Examination of the cross sections reflects the aggradation that is occurring within the tributary. The pool shows a 9% decrease in width, 13% decrease in area, and a 6% decrease in mean bankfull depth, however the maximum depth has remained essentially the same. The riffle section has essentially the same cross sectional area as the MY-01 monitoring data. The riffle width has increased by 9%, the mean bankfull depth has decrease by 9%, and the maximum depth has decreased by 7%.

The pattern data obtained in MY-02 compares well to the MY-01 data, therefore the pattern has been stable over the past year. The channel and bankfull slopes show a large change between the MY-01 and MY-02, as they have almost doubled due to the aggradation that has incurred in the upper reach of the tributary. The data from next year's monitoring will need to be reviewed to determine if the upstream aggradation is local and due to excess sediment import or if it is a response of the channel adjusting its slope permanently.

Table VIII. A. Baseline Morphology and Hydraulic Summary

Table VIII. A. (UT to Mary's Creek) Baseline Morphology and Hydraulics Summary UT to Mary's Creek Stream Restoration Project (Project No. 241)															
Parameter	**USGS Gage Data**			**Regional Curve Interval Pre-**			**Existin**		**g Condition**	**Design**			**As-Built**		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)									34.5			18			26.5
Flood Prone Width (ft)									37			54			54
BF Cross Sectional Area (SF)									24.1			28			28.1
BF Mean Depth (ft)									0.7			1.5			1.1
Width/Depth Ratio									50			12			25
Entrenchment Ratio									1.07			3			2
Bank Height Ratio									2.9			1			1
Wetted Perimeter (ft)															19.2
Hydraulic Radius (ft)															1.46
Pattern															
Channel Beltwidth (ft)									105	54	108	81	30	100	65
Radius of Curvature (ft)							na	na	na	36	54	45	40	78	59
Meander Wavelength (ft)							330	840	585	54	144	99	68	133	100
Meander Width ratio									3	3	6	4.5	1.1	3.8	2.5
Profile															
Riffle Length													17	45	31
Riffle Slope									0.0225			0.0053	0.0043	0.0096	0.007
Pool Length													20	34	27
Pool Spacing							28	148				41	30	90	45
Substrate															
d50									69						1.1
d84									275						11
Additional Reach Parameters															
Valley Length (ft)															
Channel Length (ft)									1750			1632			1632
Sinuosity									1.03			1.2			1.2
Water Surface Slope									0.0057			0.0031			0.0033
BF Slope									0.0057			0.0031			0.0034
Rosgen Classification									F4			C4			C4
Habitat Index															
Macrobenthos															

Table VIII. B. Baseline Morphology and Hydraulic Summary

Table VIII. B. (Tributary to UT to Mary's Creek) Baseline Morphology and Hydraulics Summary UT to Mary's Creek Stream Restoration Project (Project No. 241)															
Parameter	**USGS Gage Data**			**Regional Curve Interval**			**Pre-Existing Condition**			**Design**			**As-Built**		
Dimension	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
BF Width (ft)												12			11.8
Flood Prone Width (ft)												36			36
BF Cross Sectional Area (SF)												11			10
BF Mean Depth (ft)												1			0.8
Width/Depth Ratio												12			13.9
Entrenchment Ratio												3			3
Bank Height Ratio												1			1
Wetted Perimeter (ft)															12
Hydraulic Radius (ft)															0.83
Pattern															
Channel Beltwidth (ft)										36	72	54	28	35	
Radius of Curvature (ft)										24	36	30	38	54	46
Meander Wavelength (ft)										36	96	66	na	na	108
Meander Width ratio										3	6	4.5	2.4	3	
Profile															
Riffle Length													16	44	30
Riffle Slope												0.0077	0.005	0.01	0.007
Pool Length													14	41	28
Pool Spacing												28	45	67	56
Substrate															
d50															0.062
d84															11
Additional Reach Parameters															
Valley Length (ft)															
Channel Length (ft)												450			450
Sinuosity												1.2			1.2
Water Surface Slope												0.0044			0.0039
BF Slope												0.0044			0.0037
Rosgen Classification												C4			C4
Habitat Index															
Macrobenthos															

Table IX A. Morphology and Hydraulic Monitoring Summary

Exhibit Table IX. A. Morphology and Hydraulic Monitoring Summary
UT to Mary's Creek Stream Restoration Project (Project No. 241)
UT to Mary's Creek (1632 feet)

Parameter	Cross Section 1 Pool						Cross Section 2 Riffle						Cross Section 3 Pool[1]						Cross Section 4 Riffle[1]					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	18.3	17.997					26.6	20.19					NA	25.22					NA	21.281				
Floodprone Width (ft)	54	54					54	54					NA	81.9					NA	81.8				
BF Cross Sectional Area (sq.ft)	27.3	24.495					26.6	21.413					NA	23.57					NA	29.399				
BF Mean Depth (ft)	1.5	1.3611					1	1.0606					NA	0.935					NA	1.3815				
BF Max Depth (ft)	2.8	2.77					2.2	2.21					NA	2.055					NA	2.47				
Width/Depth Ratio	12.3	13.222					26.6	19.037					NA	27.0					NA	15.4				
Entrenchment Ratio	2.95	3.0006					2	2.6746					NA	3.247					NA	3.8426				
Wetted Perimeter (ft)	19.5	19.583					30	21.062					NA	25.77					NA	22.136				
Hydraulic Radius (ft)	1.4	1.2508					0.89	1.0166					NA	0.914					NA	1.3281				
Bank Height Ratio	1	1					1	0.8733					NA	0.701					NA	1				
Substrate																								
d50 (mm)	NA	NA					0.23	21.75					NA	N/A					NA	50.7				
d84 (mm)	NA	NA					11.7	bdrk					NA	N/A					NA	106				

Parameter	MY-01 (2007)			MY-02 (2008)[2]			MY-03 (2009)			MY-04 (2010)			MY-05 (2011)			MY-06 (2012)			MY+ (2013)			MY+ (2014)		
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
Channel Beltwidth (ft)	4	26	20	31	57	42																		
Radius of Curvature (ft)	16	39	25	12	76	41																		
Meander Wavelength (ft)	28	84	54	65	150	105																		
Meander Width Ratio	1.11	1.97	1.75	1.48	2.73	2.02																		
Profile																								
Riffle length (ft)	18	23	19.5	2.2	108	27																		
Riffle slope (ft/ft)	0.008	0.017	0.014	0	0.05	0.02																		
Pool length (ft)	22	67	31	7.7	98	41.6																		
Pool spacing (ft)	35	92	70	36	222	85																		

Additional Reach parameters						
Valley Length (ft)		1519				
Channel Length (ft)	1632	1662				
Sinuosity	1.2	1.09				
Water Surface Slope (ft/ft)	0.0038	0.0062				
BF Slope (ft/ft)	0.0034	0.0057				
Rosgen Classification	C4	C4				
Habitat Index*						
Macrobenthos*						

1. These sections were added for MY-02 and subsequent monitoring, there is no data prior to MY-02.
2. Pattern and profile parameters for MY-02 were based on the entire restoration reach. MY-00 and MY-01 surveyed the upper 20 bankfull widths, or about 600 feet.

Table IX B. Morphology and Hydraulic Monitoring Summary

Exhibit Table IX. B. Morphology and Hydraulic Monitoring Summary
UT to Mary's Creek Stream Restoration Project (Project No. 241)
Tributary to UT to Mary's Creek (450 feet)

Parameter	Cross Section T1 (Tributary) Pool						Cross Section T2 (Tributary) Riffle																	
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+												
BF Width (ft)	14.7	13.39					11.2	12.2																
Floodprone Width (ft)	36	36					36	36																
BF Cross Sectional Area (sq.ft)	13	11.32					8.8	8.881																
BF Mean Depth (ft)	0.9	0.845					0.8	0.728																
BF Max Depth (ft)	1.8	1.81					1.4	1.3																
Width/Depth Ratio	16.5	15.85					14.3	16.76																
Entrenchment Ratio	2.4	2.688					3.2	2.951																
Wetted Perimeter (ft)	15	14.21					11	12.49																
Hydraulic Radius (ft)	0.87	0.797					0.8	0.711																
Bank Height Ratio	1	1					1	1																
Substrate																								
d50 (mm)	N/A	N/A					1.8	0.18																
d84 (mm)	N/A	N/A					15.06	1.38																

Parameter	MY-01 (2007)			MY-02 (2008)			MY-03 (2009)			MY-04 (2010)			MY-05 (2011)			MY-06 (2012)			MY+ (2013)			MY+ (2014)		
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
Channel Beltwidth (ft)	26	41	33	25	45	32																		
Radius of Curvature (ft)	24	42	33	16	57	31																		
Meander Wavelength (ft)	69	120	82	50	90	67																		
Meander Width Ratio	2.2	3.47	2.8	2.02	3.67	2.61																		
Profile																								
Riffle length (ft)	17	34	29	3	42	21																		
Riffle slope (ft/ft)	0.008	0.022	0.011	0	0.03	0.02																		
Pool length (ft)	13	50	18	10	30	18																		
Pool spacing (ft)	32	74	65	26	67	44																		

Additional Reach parameters												
Valley Length (ft)			421									
Channel Length (ft)		450		469								
Sinuosity		1.2		1.11								
Water Surface Slope (ft/ft)		0.0034		0.0076								
BF Slope (ft/ft)		0.0037		0.0062								
Rosgen Classification		C4		C4								
Habitat Index*												
Macrobenthos*												

IV. Methodology

Methodologies follow the current EEP monitoring report template (Version 1.2-11/16/06) and the CVS-EEP protocol for recording vegetation (Lee et al 2006). 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.

A. Vegetation Methodologies

Three vegetation monitoring plots were added to the original two plots that were established during as built data collection, for a total of five plots. Level II of the EEP/CVS protocol Version 4.0 was used to collect data for MY-02 which includes natural stems. This is the first year of monitoring for the three new plots, and it has been two years since the initial planting. Since there was no clear evidence of which plants had been planted, all stems recorded in the plots for plots 1, 2, and 3 were classified as natural stems. Data collected for these plots are in Appendix A.

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 monitoring baseline alignment provided by Stantec. This alignment, however, only covered the upper 600 feet of the Main Channel. WCE generated the monitoring alignment for the balance of the Main Channel. This hybrid alignment will be used for subsequent monitoring years.

Cross sectional data was extracted based on a linear alignment between the end pins. Two additional cross sections were added, one riffle and one pool downstream of the confluence of the UT to Mary's Creek and the tributary to UT to Mary's Creek.

Pattern parameters were calculated by measuring the plotted dimensions of the MY-02 surveyed thalweg. Profile parameters were determined through analysis of a Microsoft Excel generated plot of the profile based on the aforementioned baseline alignment.

V. References

Lee, Michael T. Peet, Robert K. Roberts, Steven D., Wentworth, Thomas R. (2006). *CVS-EEP Protocol for Recording Vegetation Version 4.0.*

Weakley, Alan (2007). *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas*. http://www.herbarium.unc.edu/flora.htm.

Appendix A

Vegetation Raw Data

Appendix A. Table 1. Vegetation Metadata

Report Prepared By	The Catena Group
Date Prepared	11/11/2008 14:10
database name	cvs-eep-entrytool-v2.2.5.mdb
database location	
computer name	TOSHIBA-USER
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	241
project Name	UT to Mary's Creek
Description	2096 lf of stream restoration; no wetlands
River Basin	Cape Fear
length(ft)	2096
stream-to-edge width (ft)	7
area (sq m)	
Required Plots (calculated)	
Sampled Plots	5

Appendix A. Table 2. Vegetation Vigor by Species

	Species	4	3	2	1	0	Missing	Unknown
	Salix nigra*	2	1					
TOT:	1	2	1					

* - This species was the only species confirmed to be planted within all vegetation plots on site.

Appendix A. Table 3. Vegetation Damage by Species

	Species	All Damage Categories	(No damage)
	Salix nigra*	3	3
TOT:	1	3	3

* - This species was the only species confirmed to be planted within all vegetation plots on site.

Appendix A. Table 4. Vegetation Damage by Plot

	Plot	All Damage Categories	(No damage)
	241-01-VP4-year:2*	3	3
TOT:	1	3	3

* - *Salix nigra* was the only species confirmed to be planted within all vegetation plots on site.

Appendix A. Table 5. All Stem Counts by Plots and Species (Planted and Natural Stems)

	Species	Total Stems	# Plots	Avg # stems	241-01-VP1-year:2	241-01-VP2-year:2	241-01-VP3-year:2	241-01-VP4-year:2	241-01-VP5-year:2
	Acer rubrum var. rubrum	12	3	4	1		2	9	
	Alnus serrulata	1	1	1			1		
	Baccharis halimifolia	1	1	1					1
	Celtis laevigata	3	1	3					3
	Cornus amomum	3	2	1.5			1		2
	Diospyros virginiana	2	1	2	2				
	Fraxinus pennsylvanica	202	5	40.4	160	24	6	4	8
	Juniperus virginiana var. virginiana	103	3	34.33	2			1	100
	Ligustrum sinense	132	4	33	9	14		1	108
	Liquidambar styraciflua	61	5	12.2	22	2	4	7	26
	Pinus taeda	8	2	4	6				2
	Platanus occidentalis var. occidentalis	1	1	1			1		
	Rosa multiflora	8	2	4	1				7
	Salix nigra	14	3	4.67			2	6	6
	Sambucus canadensis	6	4	1.5	2		1	2	1
	Ulmus alata	5	3	1.67		1	1		3
	Ulmus rubra	1	1	1	1				
	Carpinus caroliniana	10	1	10	10				
	Hypericum	2	1	2	2				
	Prunus serotina	2	1	2					2
	Acer rubrum	7	1	7					7
TOT:	**21**	**584**	**21**		**218**	**41**	**19**	**30**	**276**

Appendix A. Table 6. Vegetation Problem Areas Table

VPA #	Station #	Probable Cause	Photo #
Eroding Banks			
1	21+50	Erosion occurred aroung culverts during bankfull event	1
Beaver Activity			
2	21+00-25+20	Livestakes gnawed by beaver throughout this section	2,3
3	23+40	Beaver lodge constructed of livestakes from streambanks	4
4	25+20	Beaver dam constructed of livestakes from streambanks	5
Invasive Exotics			
5	throughout easement	Tall fescue encroaching buffer throughout conservation easement	6,7,8
6	throughout easement	Chinese privet observed throughout the conservation easement.	9
7	See integrated PAPV	Tree of heaven observed within southern portion of the conservation easement.	10

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Vegetation Problem Area Photos

Photo 1. Erosion occurred around culverts during bankfull event in September 2008. Notice on the left the one of many invasive exotic Chinese privet (*Ligustrum sinense*) shrubs observed on site.

Photo 2. Beaver gnawed livestakes used for lodge and dam construction.

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Vegetation Problem Area Photos

Photo 3. Beaver gnawed livestakes downstream of the cattle crossing.

Photo 4. A beaver lodge constructed of a mix of livestakes planted along the stream.

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Vegetation Problem Area Photos

Photo 5. Beaver dam constructed of livestakes gnawed by beaver upstream.

Photo 6. Tall fescue encroaching the conservation easement on the south side of the stream downstream of the cattle crossing.

Photo 7. Tall fescue encroaching conservation easement on the north side of the stream upstream of the confluence with the tributary.

Photo 8. South facing view of tall fescue encroaching conservation easement east of the tributary.

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Vegetation Problem Area Photos

Photo 9. One of many Chinese privet shrubs observed throughout the area.

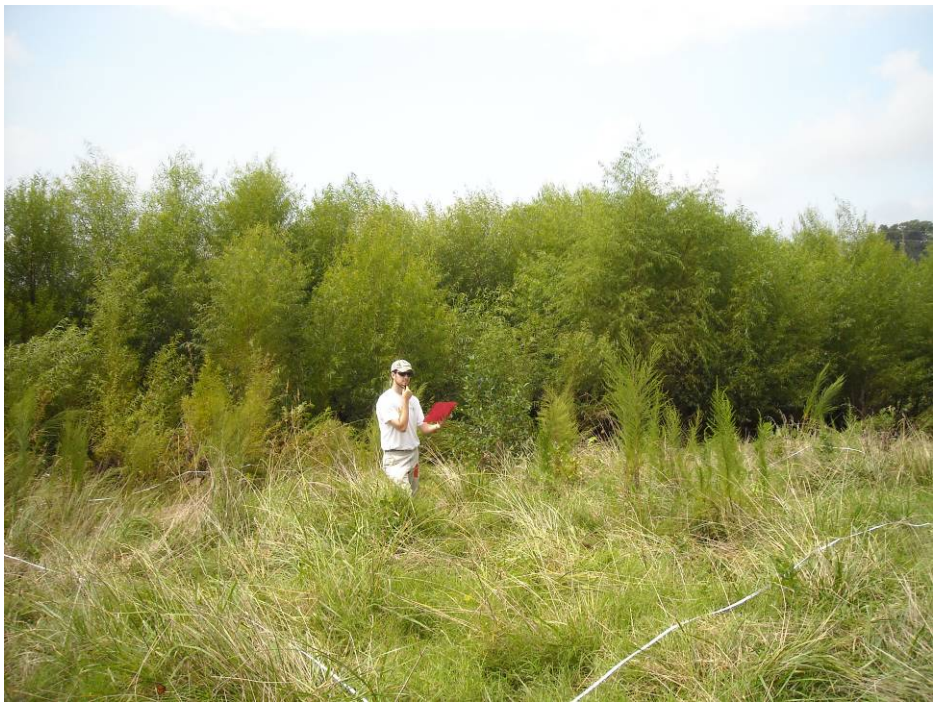
Photo 10. A colony of tree of heaven (*Ailanthus altissima*) located near the upstream end of the stream.

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Vegetation Monitoring Plot Photos

Vegetation Plot 1

Vegetation Plot 2

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Vegetation Monitoring Plot Photos



Vegetation Plot 3

Vegetation Plot 4 (Tributary)

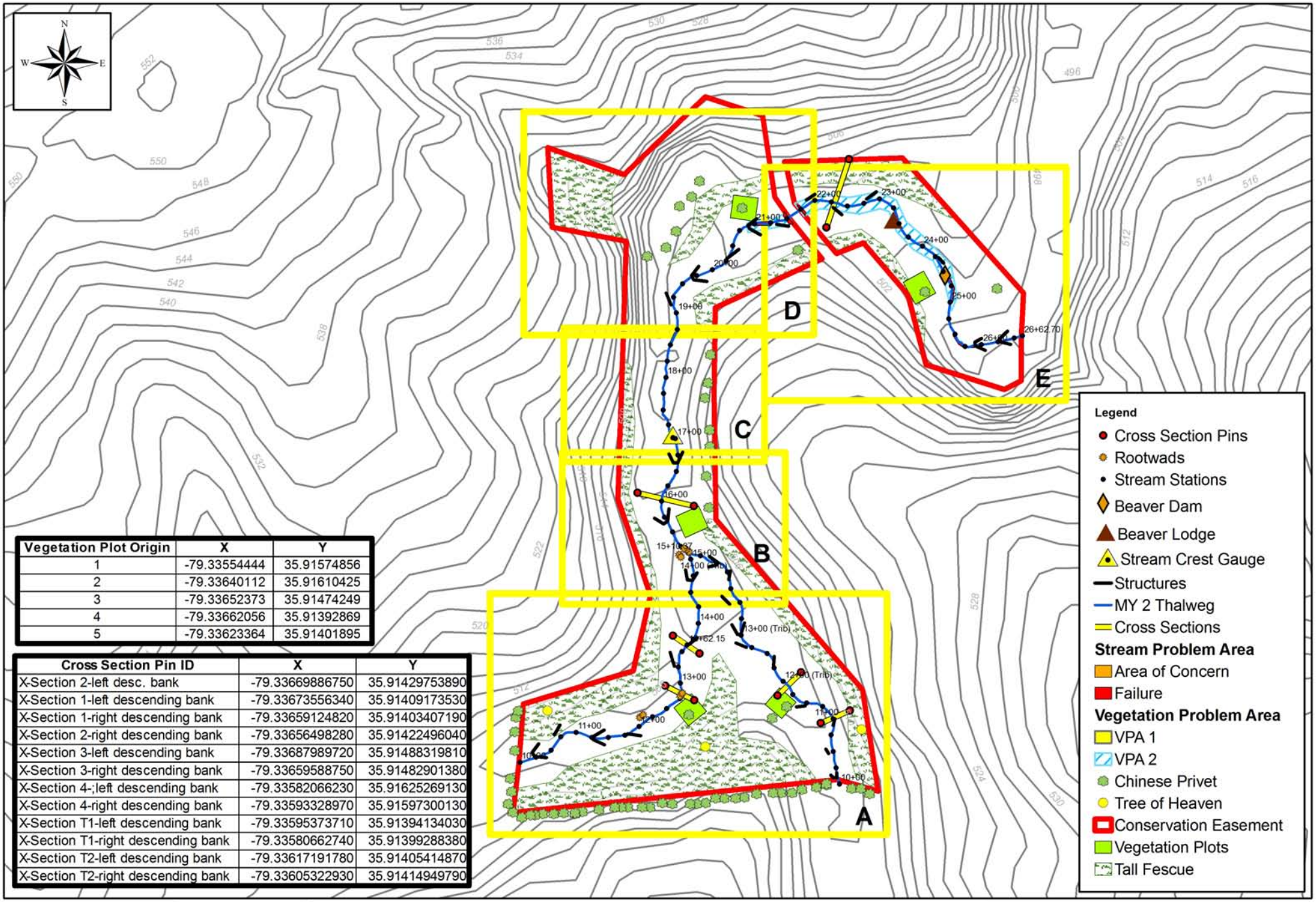
UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Vegetation Monitoring Plot Photos

Vegetation Plot 5 (Main Channel)

Appendix B

Geomorphologic Raw Data

1. Integrated Vegetation and Stream Current Conditions Plan View



Vegetation Plot Origin	X	Y
1	-79.33554444	35.91574856
2	-79.33640112	35.91610425
3	-79.33652373	35.91474249
4	-79.33662056	35.91392869
5	-79.33623364	35.91401895

Cross Section Pin ID	X	Y
X-Section 2-left desc. bank	-79.33669886750	35.91429753890
X-Section 1-left descending bank	-79.33673556340	35.91409173530
X-Section 1-right descending bank	-79.33659124820	35.91403407190
X-Section 2-right descending bank	-79.33656498280	35.91422496040
X-Section 3-left descending bank	-79.33687989720	35.91488319810
X-Section 3-right descending bank	-79.33659588750	35.91482901380
X-Section 4-;left descending bank	-79.33582066230	35.91625269130
X-Section 4-right descending bank	-79.33593328970	35.91597300130
X-Section T1-left descending bank	-79.33595373710	35.91394134030
X-Section T1-right descending bank	-79.33580662740	35.91399288380
X-Section T2-left descending bank	-79.33617191780	35.91405414870
X-Section T2-right descending bank	-79.33605322930	35.91414949790

The Catena Group

Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site
Integrated Vegetation and Stream
Current Conditions Plan View

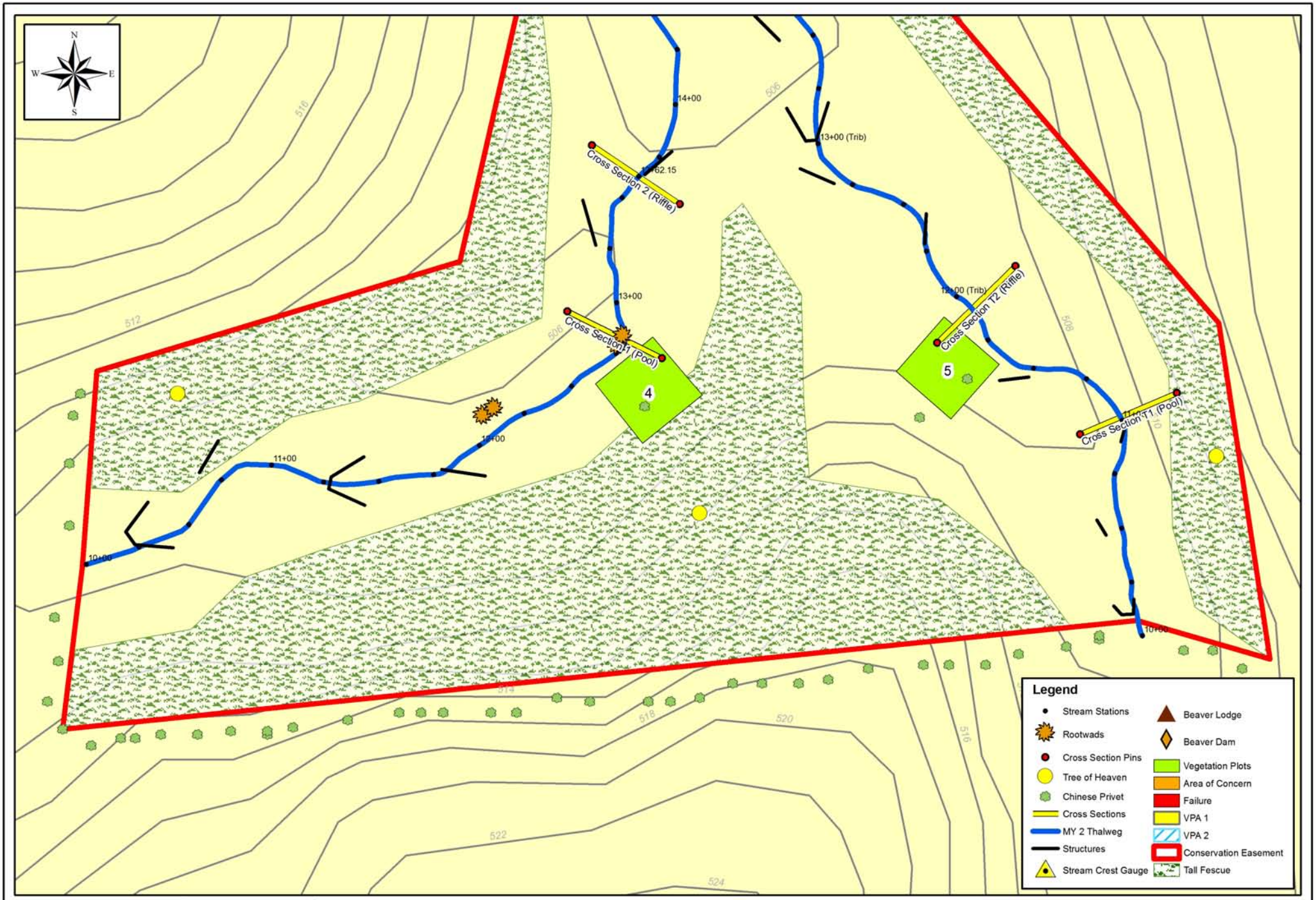
Alamance County, North Carolina

0 62.5 125 250 Feet

EEP Project No. 241

Date: May 20, 2009

Figure Key



The Catena Group

Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site
Integrated Vegetation and Stream
Current Conditions Plan View

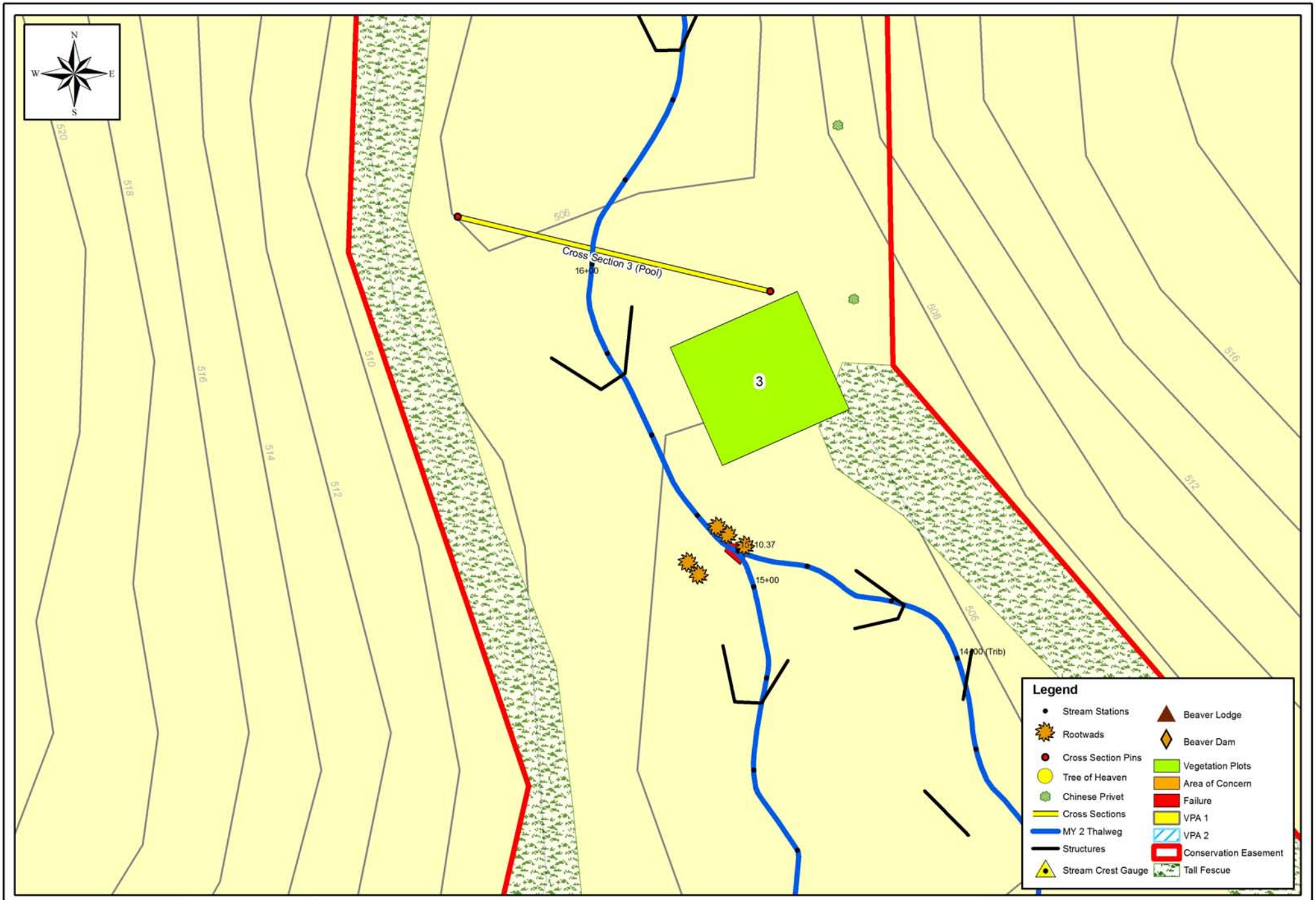
Alamance County, North Carolina

0 12.5 25 50 Feet

EEP Project No. 241

Date: May 20, 2009

Figure A



The Catena Group

Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site
Integrated Vegetation and Stream
Current Conditions Plan View

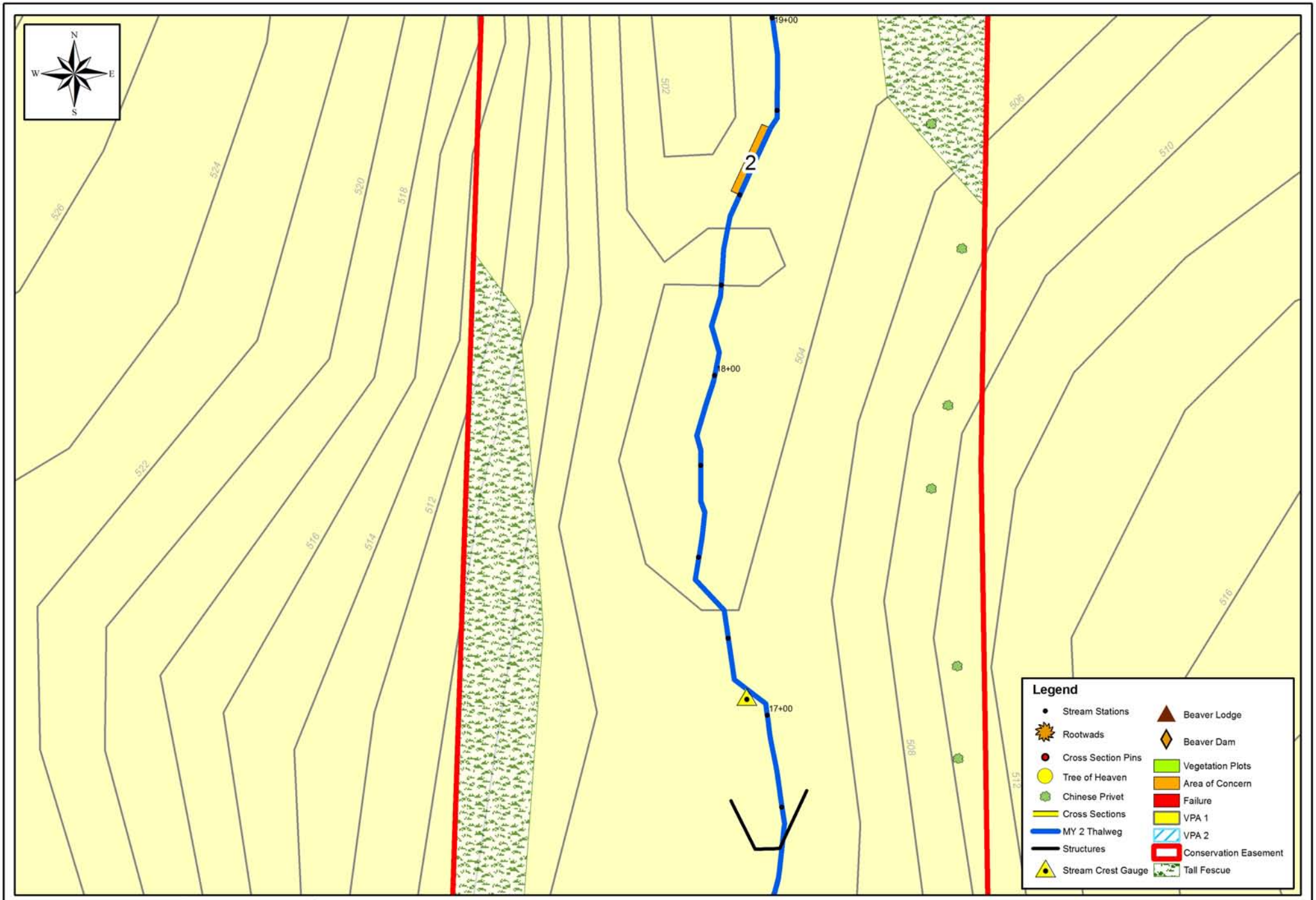
Alamance County, North Carolina

0 10 20 40 Feet

EEP Project No. 241

Date: May 20, 2009

Figure B



The Catena Group

Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site
Integrated Vegetation and Stream
Current Conditions Plan View

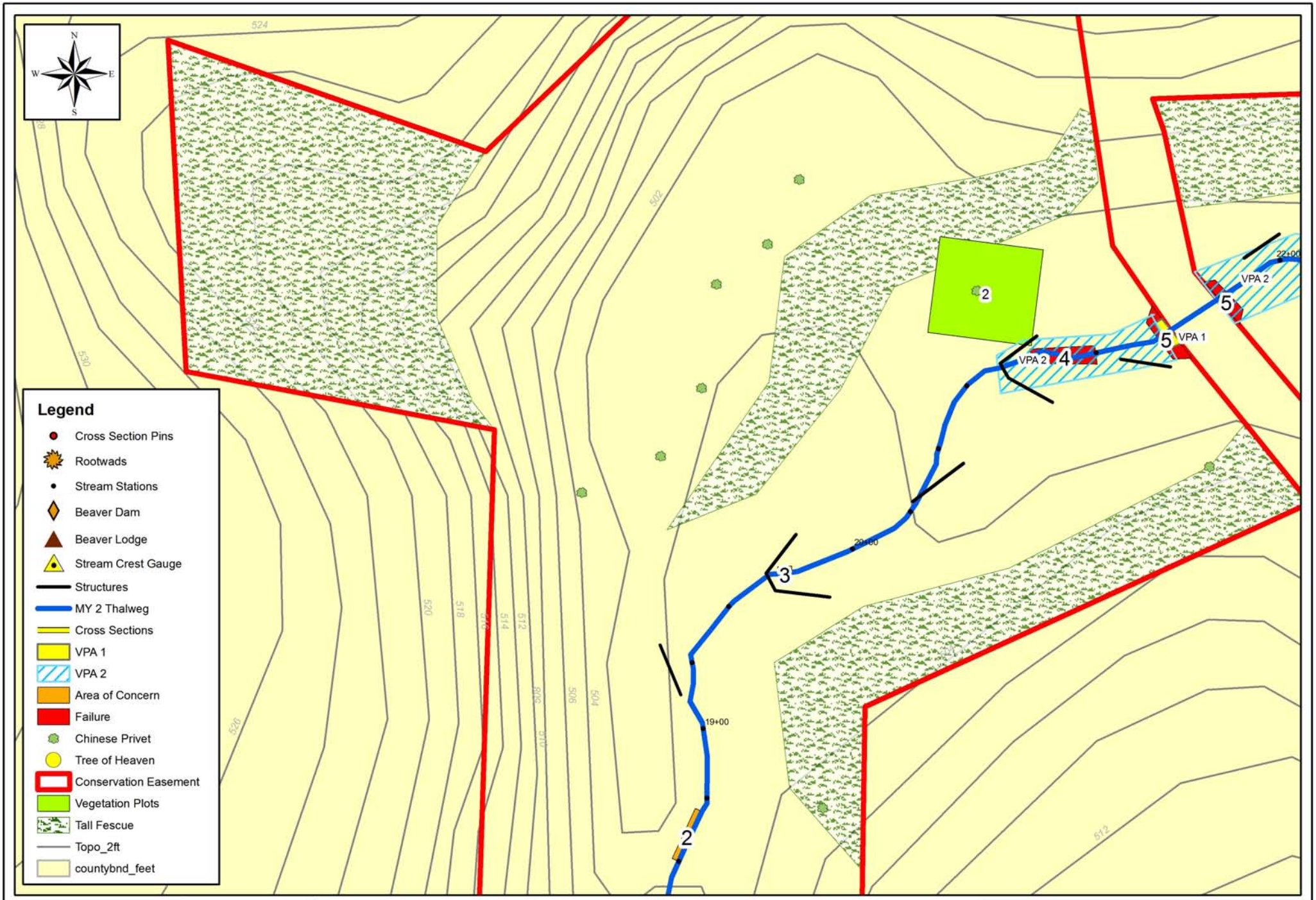
Alamance County, North Carolina

0 10 20 40 Feet

EEP Project No. 241

Date: May 20, 2009

Figure C



The Catena Group

Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site
Integrated Vegetation and Stream
Current Conditions Plan View

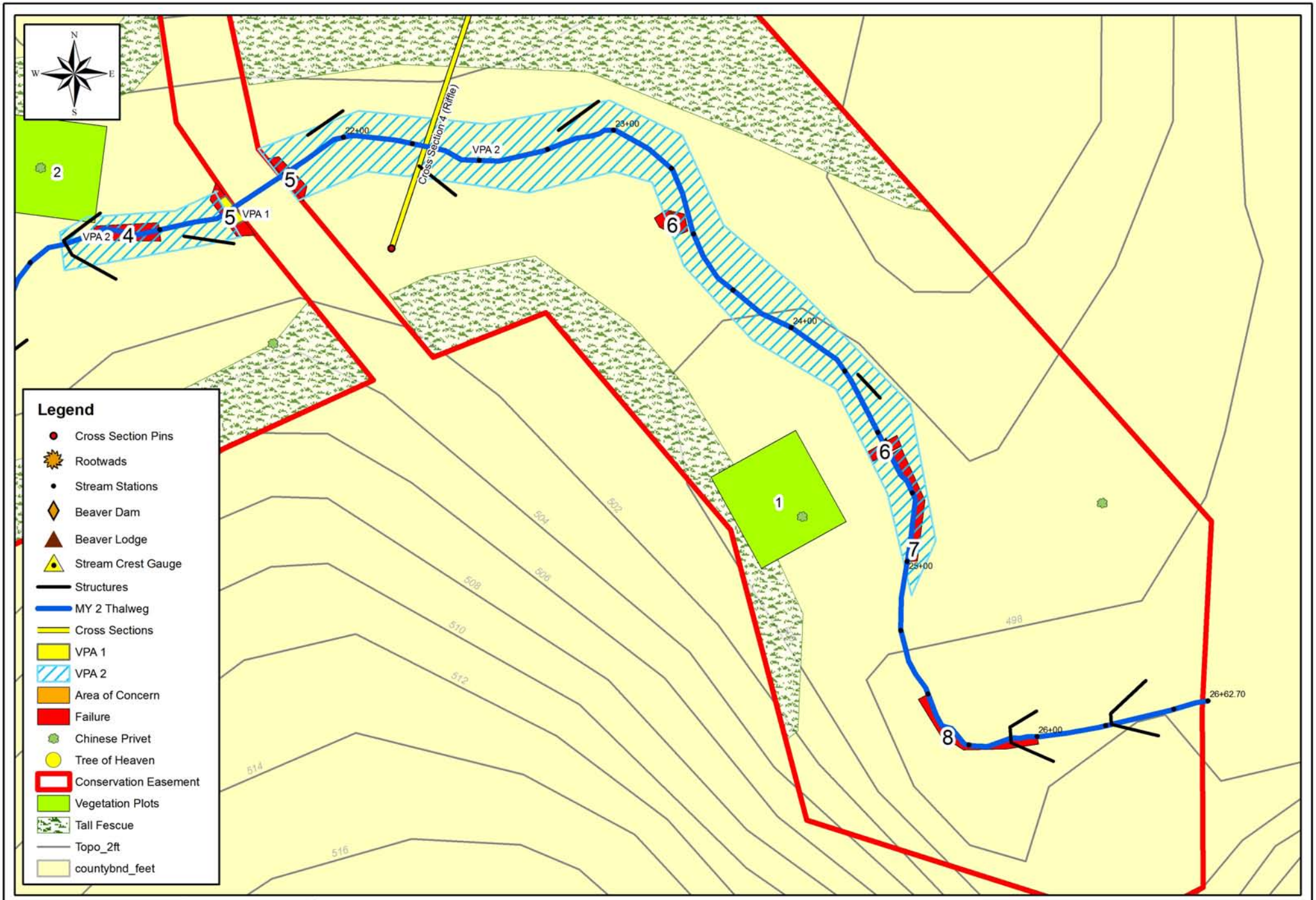
Alamance County, North Carolina

0 12.5 25 50 Feet

EEP Project No. 241

Date: May 20, 2009

Figure D



The Catena Group

Ecosystem Enhancement Program

UT to Mary's Creek Stream Restoration Site
Integrated Vegetation and Stream Current Conditions Plan View

Alamance County, North Carolina

0 12.5 25 50 Feet

EEP Project No. 241

Date: May 20, 2009

Figure E

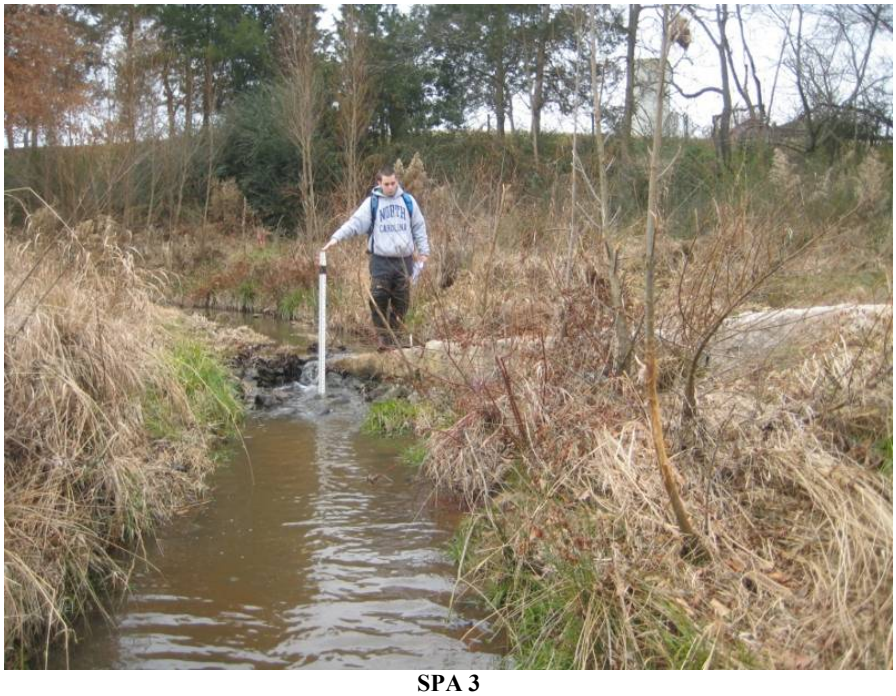
2. Stream Problem Areas Table

Exhibit Table B.1. Stream Problem Areas Mary's Creek Stream Mitigation Site/Project No. CMC/CPF/02			
Feature Issue	**Station Numbers**	**Suspected Cause**	**Photo Number**
Channel Condition: Narrow and Deep	15+00 15+25	Rootwad placement is too high, causing channel constriction which could lead to further problems.	SPA 1
Bank Erosion	18+50 18+70	Left bank is an area of concern. Bank is beginning to erode most likey a result of large storm/flow events.	SPA 2
Structural	19+75 19+75	The structure elevation appears to be too high. Significant drop in grade, potential scour. Slight scour to left arm.	SPA 3
Structural	20+95 21+30	Structure is beginning to pipe, channel has shifted to left, scour on left wing, aggradation on right wing.	SPA 4
Structural	21+50 21+50	Crossing scour occurring. Most likley caused by upstream channel changes due to structural failure.	SPA 5A
Structural	21+80 21+80	Upstream erosion depositing causing daming and backwater. Channel aggredation and beaver are causes.	SPA 5B
Beaver Population	23+50 23+65	Beaver hut on right bank. Beavers are causing bank, vegetation, and stream damage.	SPA 6A
Beaver Dam	24+60 24+60	Beaver dam, causing backwater upstream to crossing. Structure and design functional loss of stream.	SPA 6B
Bank Undercut and Erosion	24+65 24+95	Bank undercutting, a result of upstream beaver dam and bedrock, are concentrating flows to left bank.	SPA 7
Bank Erosion and Scour	25+40 26+00	Right bank erosion and scour occuring, no structure and high fast flows accompanied by steep upstream riffle.	SPA 8

3. Representative Stream Problem Area Photos

SPA 1

SPA 2 (Area of Concern) Light Erosion on Left Bank



SPA 3

SPA 4

SPA 5A Upstream of Crossing

SPA 5B Downstream of Crossing

SPA 6A Beaver Hut

SPA 6B Beaver Dam

SPA 7

SPA 8

4. Stream Photo Station Photos

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Established Photo-Station Photos
Photo Date: October 23, 2008

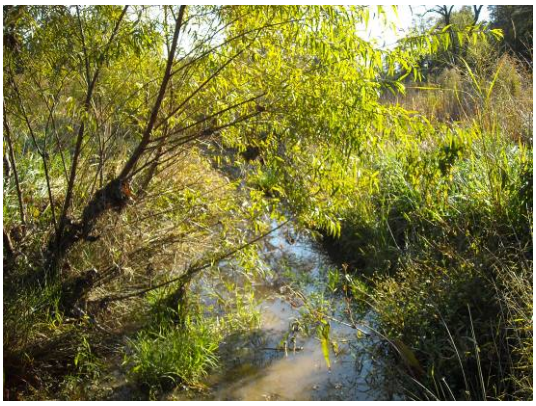


Photo Station 1. Downstream view.

Photo Station 4. Downstream view of Cross Section 2.

Photo Station 2. Upstream view.

Photo Station 5. Upstream view of Cross Section 2.

Photo Station 3. Upstream view of Cross Section 1.

Photo Station 6. Downstream view.

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Established Photo-Station Photos
Photo Date: October 23, 2008


Photo Station 7. Downstream view.


Photo Station 10. Downstream view with stream crest gauge.


Photo Station 8. Upstream view.


Photo Station 11. Upstream view from stream crest gauge.


Photo Station 9. Downstream view with stream crest gauge.


Photo Station 12. Upstream view from cattle crossing.

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Established Photo-Station Photos
Photo Date: October 23, 2008

Photo Station 13. Downstream view from cattle crossing.

Photo Station 16. West facing view of tall fescue encroaching the easement.

Photo Station 14. Downstream view with beaver dam in foreground.

Photo Station 17. Northwest view of easement with encroaching tall fescue.

Photo Station 15. Upstream view of beaver dam.

Photo Station 18. Upstream view of tributary outside of the easement.

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Established Photo-Station Photos
Photo Date: October 23, 2008

Photo Station 19. Downstream view.

Photo Station 22. Downstream view of Cross Section T1.

Photo Station 20. Upstream view.

Photo Station 23. Upstream view of Cross Section T1.

Photo Station 21. Upstream view.

Photo Station 24. Downstream view of Cross Section T2.

UT to Mary's Creek Stream Restoration Site
Monitoring Year 2 Report
Established Photo-Station Photos
Photo Date: October 23, 2008

Photo Station 25. Upstream view of Cross Section T2.

Photo Station 26. Downstream view.

Photo Station 27. Upstream view.

5. Exhibit Table B2. Qualitative Visual Assessment

Table B2. Visual Morphological Stability Assessment
Mary's Creek Stream Mitigation Site/Project No. CMC/CPF/02
Main Channel: (1632 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?	13	23	NA	57%	
	2. Armor stable (e.g.no displacement?)	13	23	NA	57%	
	3. Facet grade appears stable?	13	23	NA	57%	
	4. Minimal evidence of embedding/fining?	13	23	NA	57%	
	5. Length appropriate?	11	23	NA	48%	**55%**
B. Pools	1. Present? (e.g. not subject to severe aggrad. Or migrat.?)	16	21	NA	76%	
	2. Sufficiently deep (Max. Pool D:Mean Bkf>1.6?)	15	21	NA	71%	
	3. Length appropriate?	14	21	NA	67%	**71%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	23	23	NA	100%	
	2. Downstream of meander (glide/inflection) centering?	23	23	NA	100%	**100%**
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?	23	23	NA	100%	**100%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	1/10	99%	
	2. Channel bed degradation-areas of increasing downcutting of head cutting?	NA	NA	4/134	92%	**96%**
F. Bank	1. Actively eroding, wasting, or slumping bank?	NA	NA	2/70	98%	**98%**
G. Cross vanes, sills, single wing vanes	1. Free of back or arm scour?	17	17	NA	100%	
	2. Height appropriate?	17	17	NA	100%	
	3. Angle and geometry appear appropriate?	16	17	NA	94%	
	4. Free of piping or other structural failures?	16	17	NA	94%	**97%**
H. Wads/ Boulders	1. Free of scour?	4	4	NA	100%	
	2. Footing stable?	4	4	NA	100%	**100%**

Table B2. Visual Morphological Stability Assessment
Mary's Creek Stream Mitigation Site/Project No. CMC/CPF/02
Tributary: (450 feet)

Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total number per As-built [1]	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform Mean or Total
A. Riffles	1. Present?	8	10	NA	80%	
	2. Armor stable (e.g.no displacement?)	6	10	NA	60%	
	3. Facet grade appears stable?	5	10	NA	50%	
	4. Minimal evidence of embedding/fining?	2	10	NA	20%	
	5. Length appropriate?	6	10	NA	60%	**54%**
B. Pools	1. Present? (e.g. not subject to severe aggrad. Or migrat.?)	7	11	NA	64%	
	2. Sufficiently deep (Max. Pool D:Mean Bkf>1.6?)	5	11	NA	45%	
	3. Length appropriate?	2	11	NA	18%	**42%**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	11	11	NA	100%	
	2. Downstream of meander (glide/inflection) centering?	11	11	NA	100%	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	11	11	NA	100%	
	2. Of those eroding, # w/concomitant point bar formation?	0	0	NA	100%	
	3. Apparent Rc within spec?	11	11	NA	100%	
	4. Sufficient floodplain access and relief?	11	11	NA	100%	**100%**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	3/188	58%	
	2. Channel bed degradation-areas of increasing downcutting of head cutting?	NA	NA	0	100%	**79%**
F. Bank	1. Actively eroding, wasting, or slumping bank?	NA	NA	0	100%	**100%**
G. Cross vanes, sills, single wing vanes	1. Free of back or arm scour?	5	5	NA	100%	
	2. Height appropriate?	5	5	NA	100%	
	3. Angle and geometry appear appropriate?	5	5	NA	100%	
	4. Free of piping or other structural failures?	5	5	NA	100%	**100%**
H. Wads/ Boulders	1. Free of scour?	0	0	NA	NA	
	2. Footing stable?	0	0	NA	NA	**NA**

6. Cross Sections

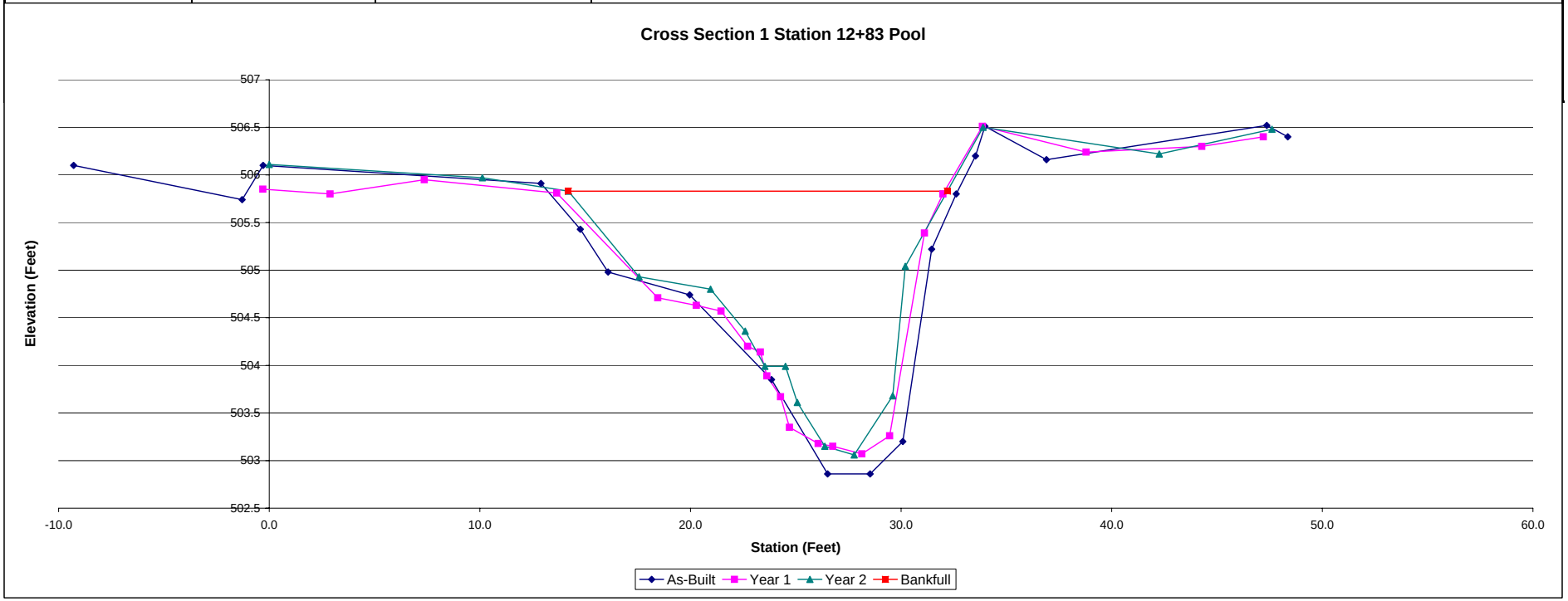
Project:	Mary's Creek
Cross Section:	Cross Section 1
Feature	Pool
Station:	12+83
Date:	10/30/08
Crew:	RL, JW, ZP

Summary (bankfull)

	MY0	MY1	MY2
A (BKF)	30.4	27.3	24.5
W (BKF)	19.7	18.3	18.0
Max d	3.0	2.8	2.8
Mean d	1.5	1.5	1.4
W/D	12.8	12.3	13.2

MY0-2006			MY1-2007			MY2-2008		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-9.3	506.1		-0.3	505.85	LPIN	0.00	506.11	LP
-1.3	505.74		2.89	505.8		10.12	505.97	
-0.3	506.1	LPIN	7.36	505.95		14.20	505.83	LBKF
12.9	505.91	LBKF	13.65	505.81	LBKF	17.56	504.93	
14.8	505.43		18.45	504.71		20.95	504.80	
16.1	504.98		20.28	504.63		22.60	504.36	
20.0	504.74		21.45	504.57		23.53	503.99	
23.9	503.85		22.71	504.2		24.51	503.99	
26.5	502.86		23.32	504.14		25.07	503.61	TOE L
28.5	502.86		23.63	503.89		26.38	503.15	
30.1	503.2		24.28	503.67		27.77	503.06	TW
31.5	505.22		24.7	503.35		29.60	503.68	TOE R
32.6	505.8	RBKF	26.06	503.18		30.20	505.04	
33.5	506.2		26.76	503.15		33.89	506.50	RBKF
34.0	506.51		28.14	503.07		42.26	506.22	
36.9	506.16		29.46	503.26		47.61	506.48	RP
47.4	506.52	RPIN	31.11	505.39				
48.4	506.4		31.99	505.8	RBKF			
			33.86	506.51				
			38.78	506.24				
			44.28	506.3				
			47.2	506.4				

Photo of XS-1, looking in the downstream direction



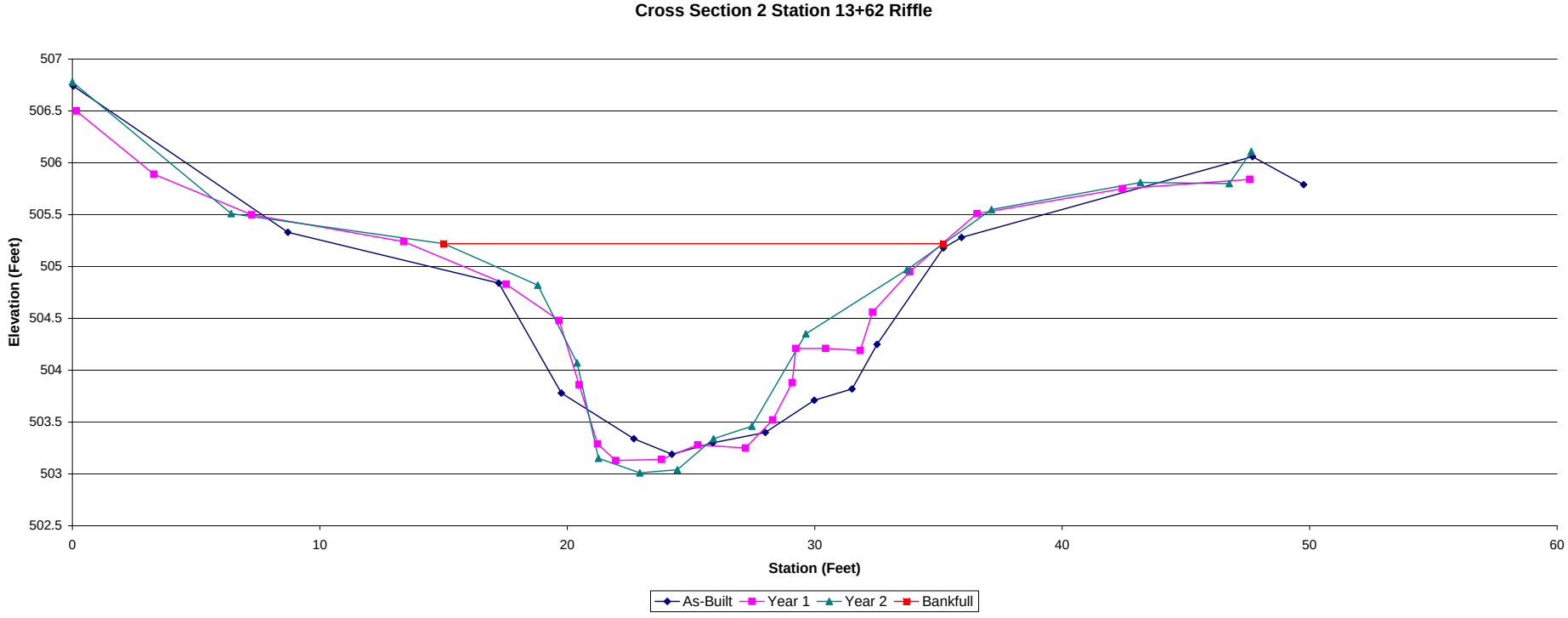
Project:	Mary's Creek
Cross Section:	Cross Section 2
Feature	Riffle
Station:	13+62
Date:	10/30/08
Crew:	RL, JW, ZP

Summary (bankfull)

	MY0	MY1	MY2
A (BKF)	28.1	26.6	21.4
W (BKF)	26.5	26.6	20.2
Max d	2.1	2.2	2.2
Mean d	1.1	1.0	1.1
W/D	25.0	26.6	19.0

MY0-2006			MY1-2007			MY2-2008		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.04	506.74	LPIN	0.16	506.5	LPIN	0	506.78	LP
8.71	505.33	LBKF	3.29	505.89		6.42	505.51	
17.23	504.84		7.25	505.5	LBKF	15.01	505.22	LBKF
19.76	503.78		13.39	505.24		18.81	504.82	
22.69	503.34		17.53	504.83		20.4	504.07	
24.23	503.19		19.67	504.48		21.26	503.15	TOE L
25.88	503.3		20.48	503.86		22.93	503.01	
28	503.4		21.22	503.29		24.45	503.04	TW
29.98	503.71		21.96	503.13		25.91	503.34	
31.51	503.82		23.81	503.14		27.46	503.46	TOE R
32.52	504.25		25.27	503.28		29.64	504.35	
35.2	505.18	RBKF	27.2	503.25		33.73	504.97	RBKF
35.93	505.28		28.3	503.52		37.14	505.55	
47.69	506.06	RPIN	29.09	503.88		43.16	505.81	
49.76	505.79		29.24	504.21		46.75	505.8	
			30.44	504.21		47.64	506.11	RP
			31.84	504.19				
			32.34	504.56				
			33.84	504.95	RBKF			
			36.56	505.51				
			42.43	505.75				
			47.58	505.84	RPIN			

Photo of XS-2, looking in the downstream direction

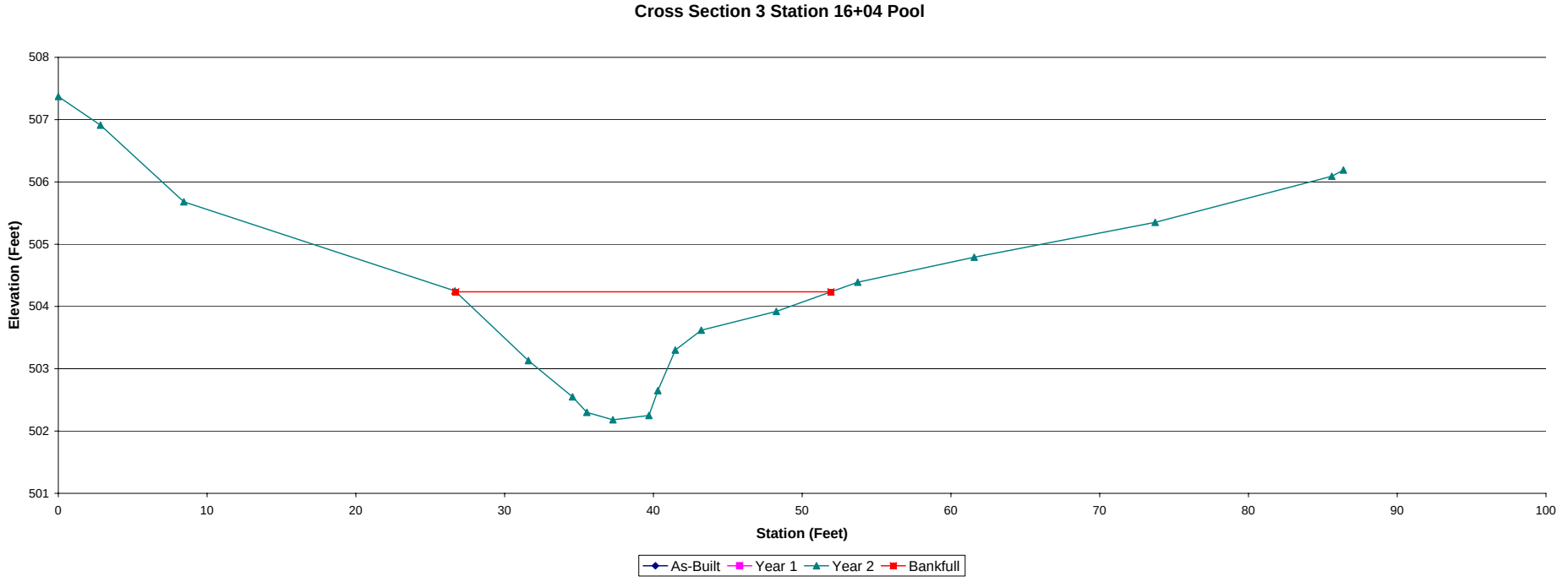


Project:	Mary's Creek
Cross Section:	Cross Section 3
Feature	Pool
Station:	16+04
Date:	10/30/08
Crew:	RL, JW, ZP

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	NA	NA	23.6
W (BKF)	NA	NA	25.2
Max d	NA	NA	2.1
Mean d	NA	NA	0.9
W/D	NA	NA	27.0

MY0-2006*			MY1-2007*			MY2-2008		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
*This section was added for MY-02 and subsequent monitoring.						0.00	507.37	LP
No prior data exists.						2.84	506.91	
						8.44	505.68	
						26.65	504.25	LBKF
						31.60	503.13	
						34.56	502.55	TOE L
						35.53	502.30	
						37.28	502.18	TW BEDROCK
						39.70	502.25	
						40.30	502.65	TOE R
						41.47	503.30	
						43.22	503.62	RBKF
						48.26	503.92	
						53.74	504.39	
						61.56	504.79	
						73.73	505.35	
						85.60	506.09	
						86.38	506.19	RP

Photo of XS-3, looking in the downstream direction

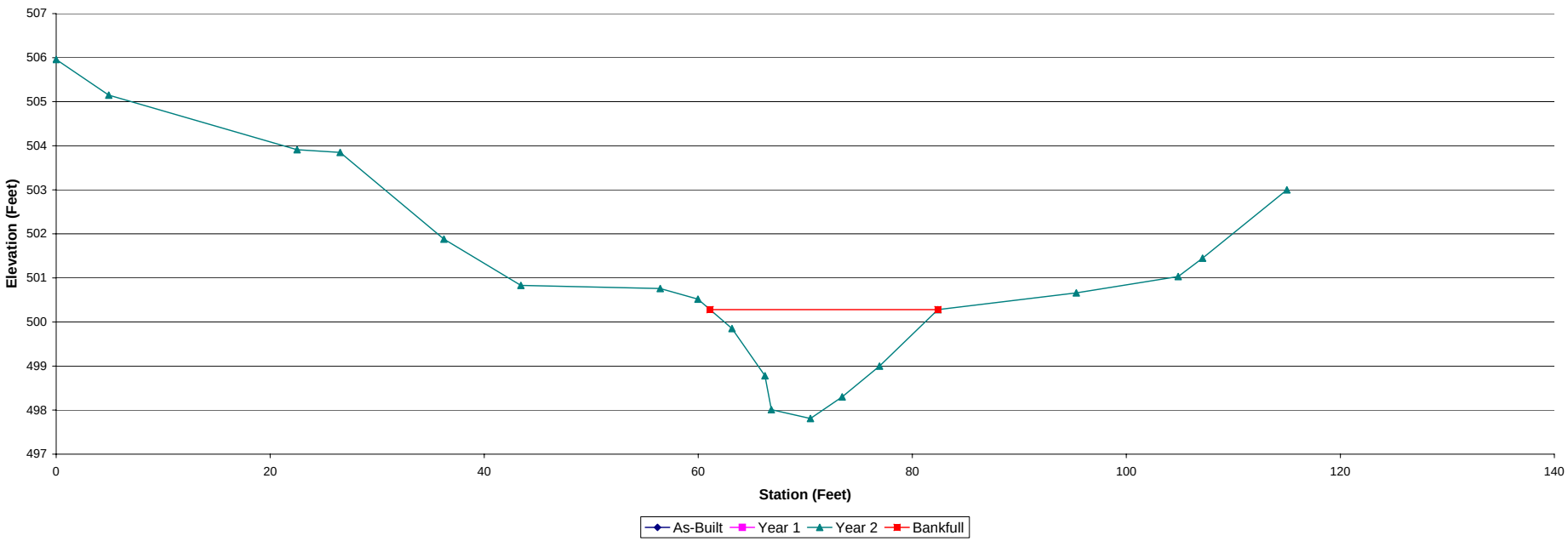


Project:	Mary's Creek
Cross Section:	Cross Section 4
Feature	Riffle
Station:	22+30
Date:	10/30/08
Crew:	RL, JW, ZP

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	NA	NA	29.4
W (BKF)	NA	NA	21.3
Max d	NA	NA	2.5
Mean d	NA	NA	1.4
W/D	NA	NA	15.4

MY0-2006*			MY1-2007*			MY2-2008		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
*This section was added for MY-02 and subsequent monitoring.						0.00	505.96	LP
No prior data exists.						4.91	505.15	
						22.52	503.91	
						26.54	503.85	
						36.24	501.88	
						43.42	500.83	
						56.44	500.76	
						59.97	500.52	LBKF
						63.15	499.85	
						66.23	498.78	
						66.83	498.01	TOE L
						70.49	497.81	TW
						73.45	498.30	TOE R
						76.93	499.00	
						82.39	500.28	RBKF
						95.33	500.66	
						104.85	501.03	
						107.13	501.45	LP
						115.00	503.00	

Photo of XS-4, looking in the downstream direction

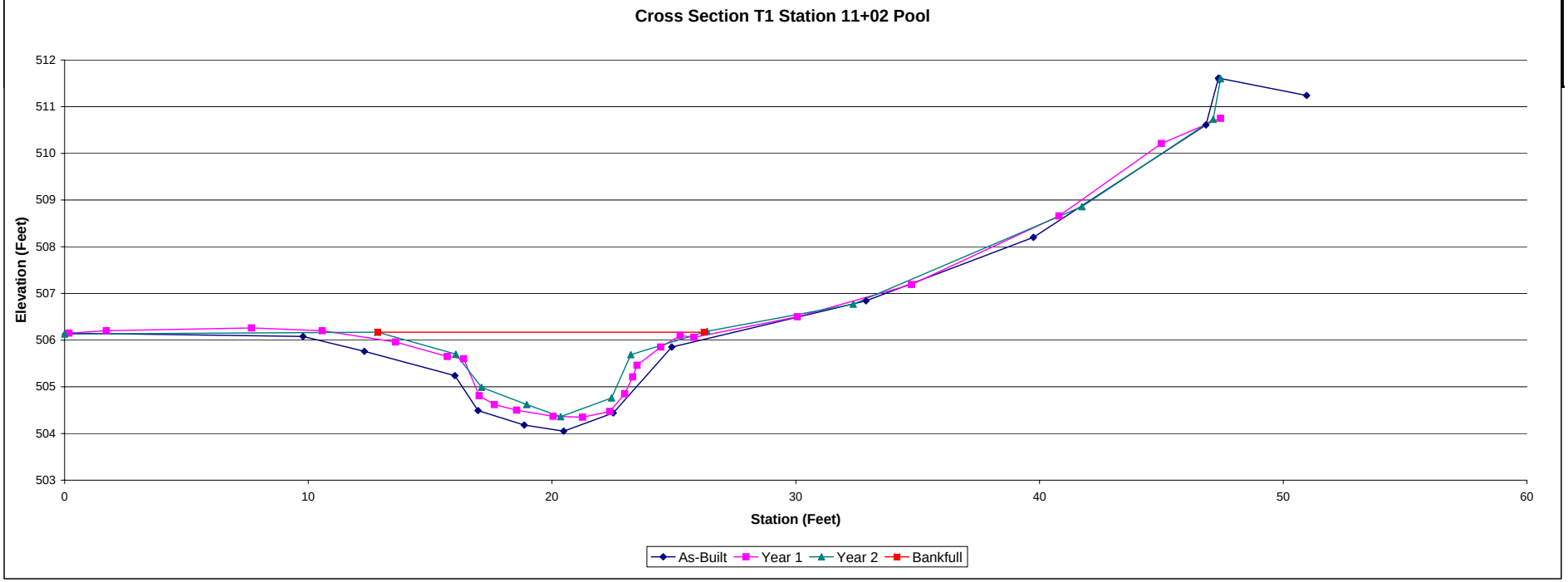


Project:	Mary's Creek
Cross Section:	Cross Section T1 (Tributary)
Feature	Pool
Station:	11+02
Date:	10/30/08
Crew:	RL, JW, ZP

Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	17.2	13.0	11.3
W (BKF)	15.1	14.7	13.4
Max d	2.1	1.8	1.8
Mean d	1.1	0.9	0.8
W/D	13.3	16.5	15.8

MY0-2006			MY1-2007			MY2-2008		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
0.04	506.13	LPIN	0.18	506.15	LPIN	0.00	506.13	LP
0.09	506.15	LBKF	1.71	506.2		12.84	506.17	LBKF
9.78	506.08		7.67	506.26		16.05	505.70	
12.3	505.76		10.57	506.2	LBKF	17.11	504.99	TOE L
16.01	505.24		13.58	505.96		18.96	504.62	
16.96	504.49		15.7	505.65		20.35	504.36	TW
18.86	504.18		16.37	505.6		22.44	504.76	TOE R
20.48	504.05		17.01	504.81		23.23	505.69	
22.51	504.44		17.63	504.62		26.36	506.19	RBKF
24.91	505.85		18.55	504.5		32.36	506.77	
32.88	506.84	RBKF	20.04	504.37		41.74	508.86	
39.75	508.2		21.25	504.35		47.13	510.73	
46.83	510.61	RPIN	22.37	504.47		47.43	511.60	RP
47.34	511.61		22.98	504.85				
47.37	511.58		23.31	505.21				
47.37	511.61		23.49	505.46				
50.96	511.24		24.46	505.85				
			25.26	506.1	RBKF			
			25.82	506.06				
			30.06	506.5				
			34.75	507.19				
			40.8	508.66				
			45	510.21				
			47.43	510.75	RPIN			

Photo of XS-T1, looking in the downstream direction

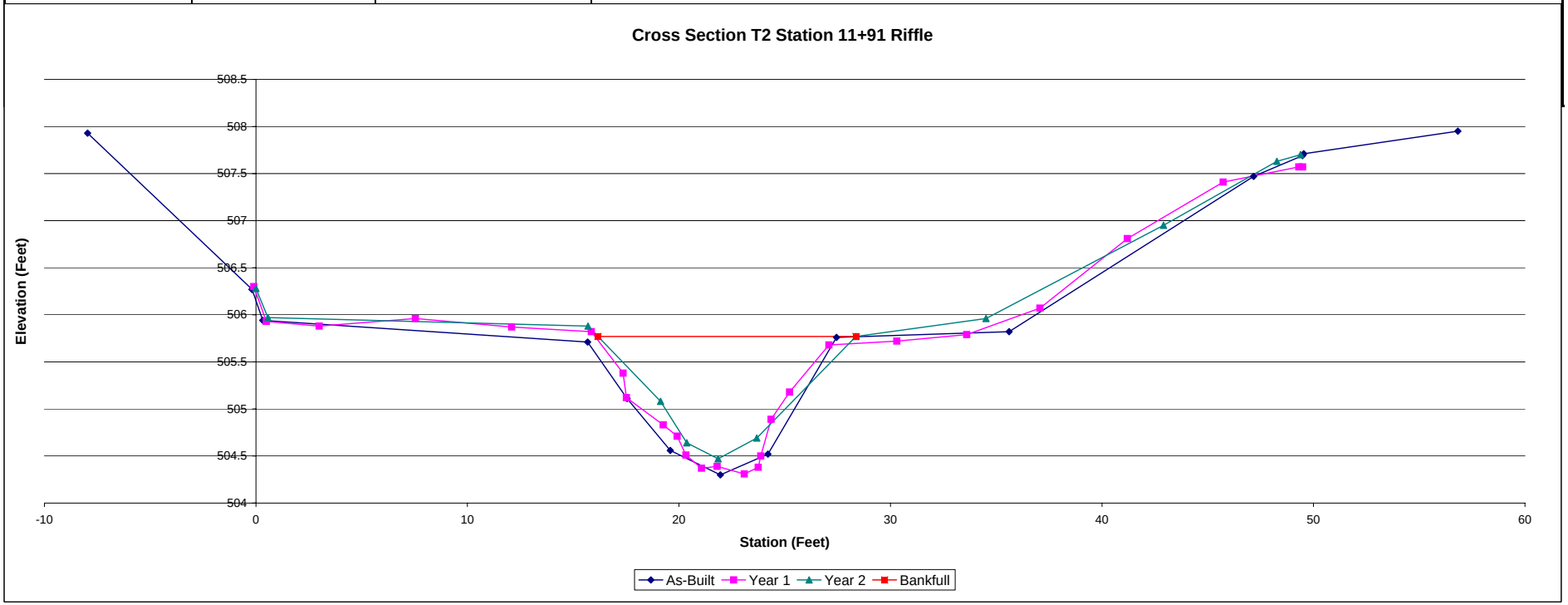


Project:	Mary's Creek
Cross Section:	Cross Section T2 (Tributary)
Feature	Riffle
Station:	11+91
Date:	10/30/08
Crew:	RL, JW, ZP

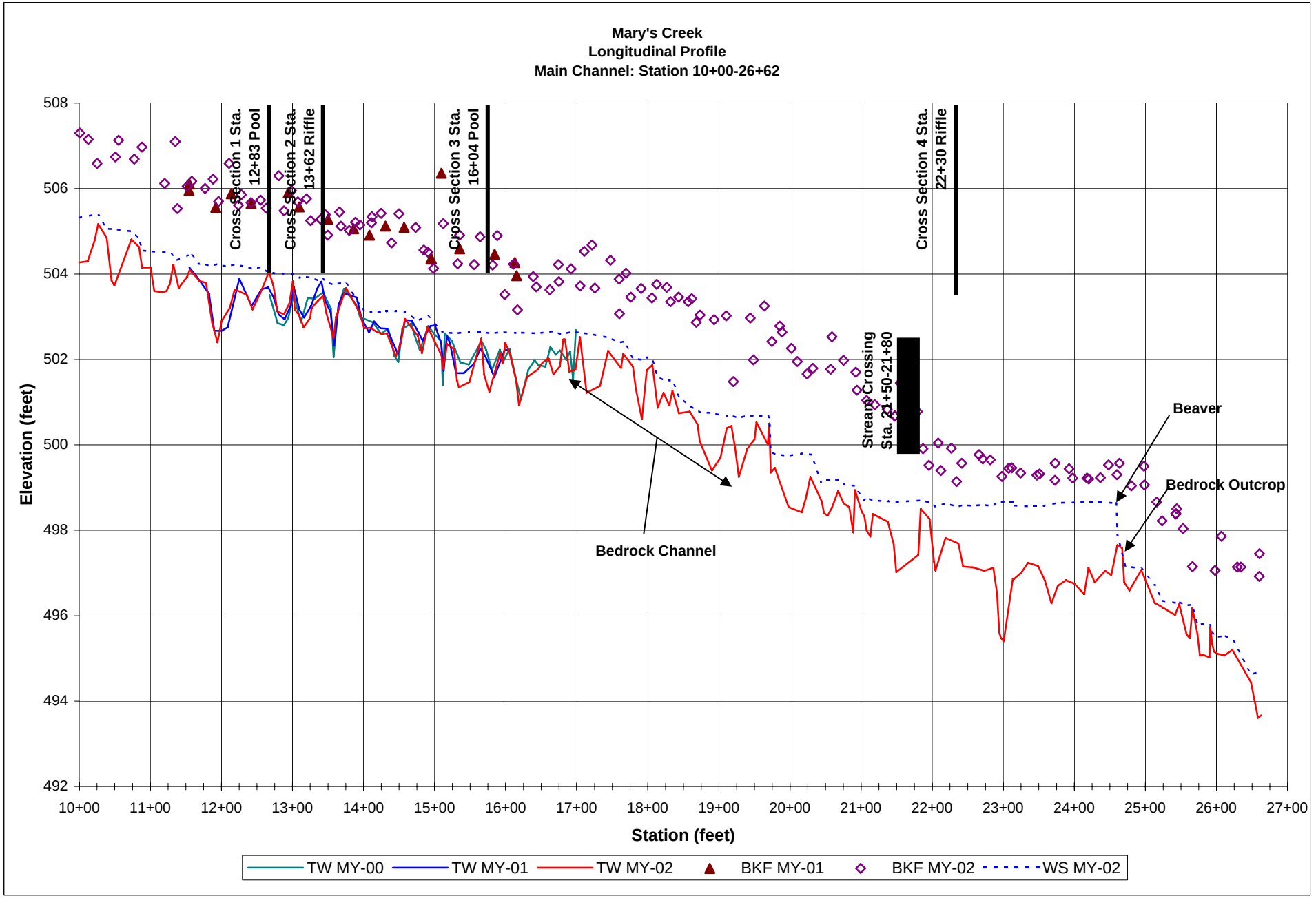
Summary (bankfull)			
	MY0	MY1	MY2
A (BKF)	10.0	8.8	8.9
W (BKF)	11.8	11.2	12.2
Max d	1.4	1.4	1.3
Mean d	0.8	0.8	0.7
W/D	13.9	14.3	16.8

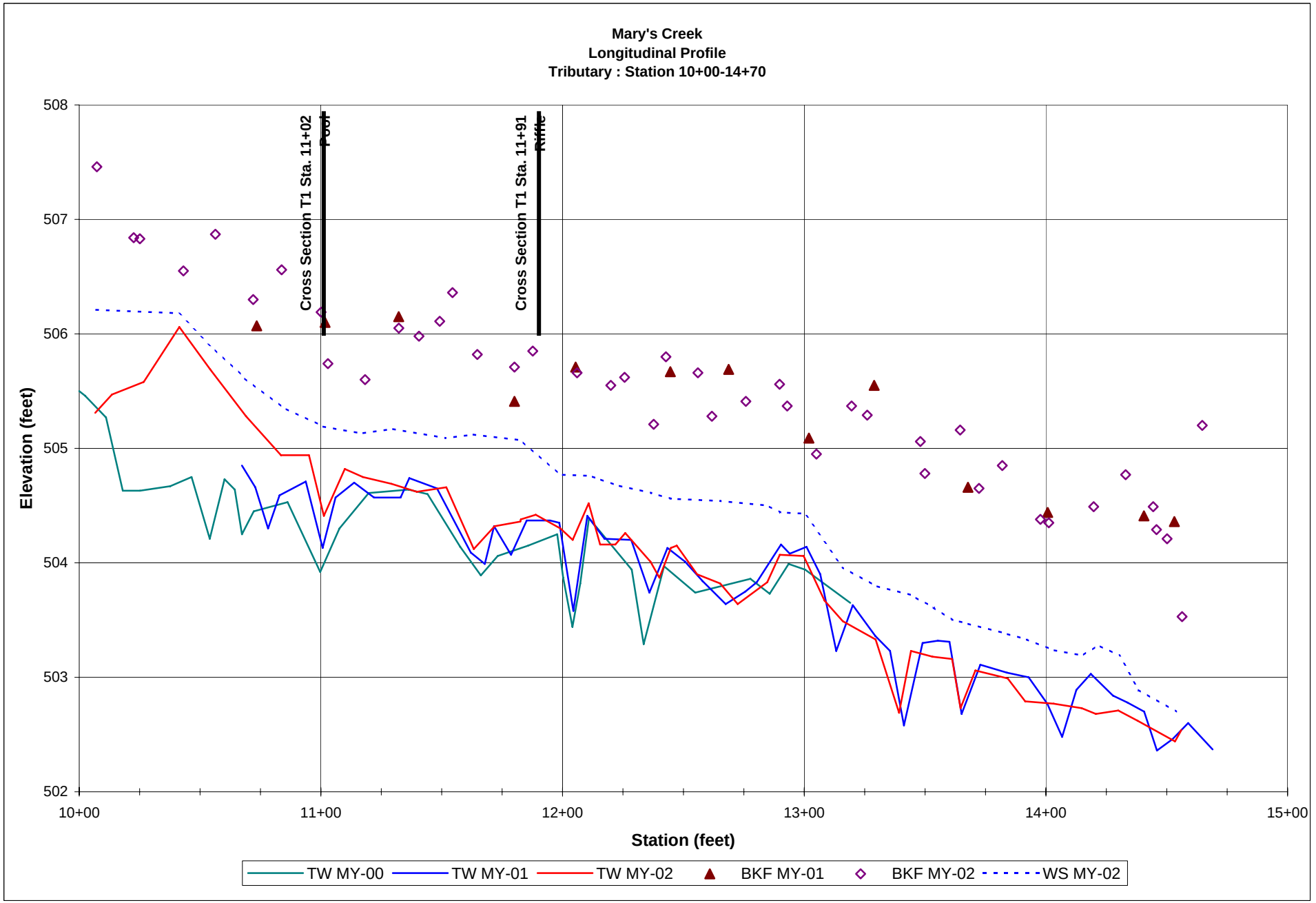
MY0-2006			MY1-2007			MY2-2008		
Station	Elevation	Notes	Station	Elevation	Notes	Station	Elevation	Notes
-7.96	507.93		-0.1	506.3	LPIN	0.00	506.28	LP
-0.18	506.27	LPIN	0.49	505.93		0.57	505.97	
-0.18	506.27		2.99	505.88		15.70	505.88	LBKF
0.32	505.94		7.54	505.96		19.13	505.08	
15.68	505.71	LBKF	12.09	505.87		20.37	504.64	TOE L
17.55	505.11		15.86	505.82	LBKF	21.85	504.47	TW
19.59	504.56		17.36	505.38		23.68	504.69	TOE R
21.96	504.3		17.52	505.12		28.37	505.77	RBKF
24.21	504.52		19.26	504.83		34.52	505.96	
27.45	505.76	RBKF	19.92	504.71		42.91	506.95	
35.61	505.82		20.33	504.51		48.27	507.63	
47.17	507.47		21.07	504.37		49.39	507.70	RP
49.48	507.69		21.81	504.39				
49.54	507.71	RPIN	23.09	504.31				
56.83	507.95		23.75	504.38				
			23.87	504.5				
			24.36	504.89				
			25.23	505.18				
			27.09	505.68	RBKF			
			30.3	505.72				
			33.61	505.79				
			37.07	506.07				
			41.2	506.81				
			45.73	507.41				
			49.31	507.57				
			49.49	507.57	RPIN			

Photo of XS-T2, looking in the downstream direction



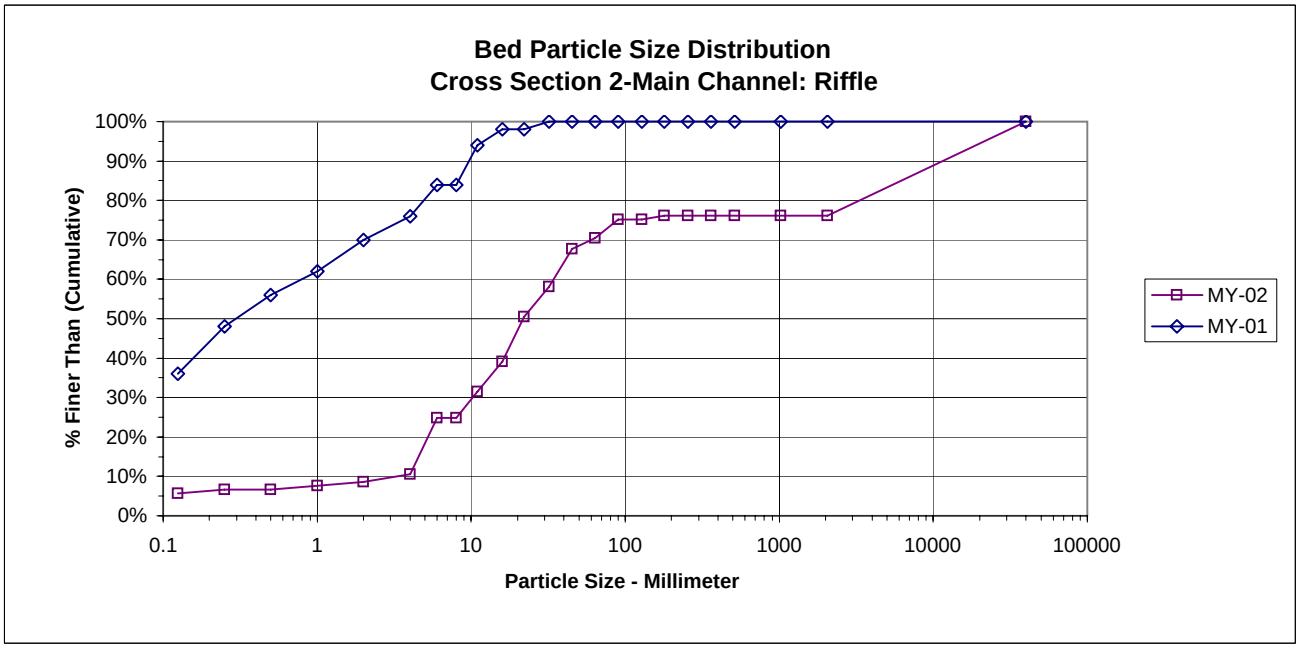
7. Longitudinal Profiles


Mary's Creek
Longitudinal Profile
Main Channel: Station 10+00-26+62
Elevation (feet)
Station (feet)
508
506
504
502
500
498
496
494
492
10+00
11+00
12+00
13+00
14+00
15+00
16+00
17+00
18+00
19+00
20+00
21+00
22+00
23+00
24+00
25+00
26+00
27+00
Cross Section 1 Sta. 12+83 Pool
Cross Section 2 Sta. 13+62 Riffle
Cross Section 3 Sta. 16+04 Pool
Cross Section 4 Sta. 22+30 Riffle
Stream Crossing Sta. 21+50-21+80
Bedrock Channel
Beaver
Bedrock Outcrop
TW MY-00
TW MY-01
TW MY-02
BKF MY-01
BKF MY-02
WS MY-02

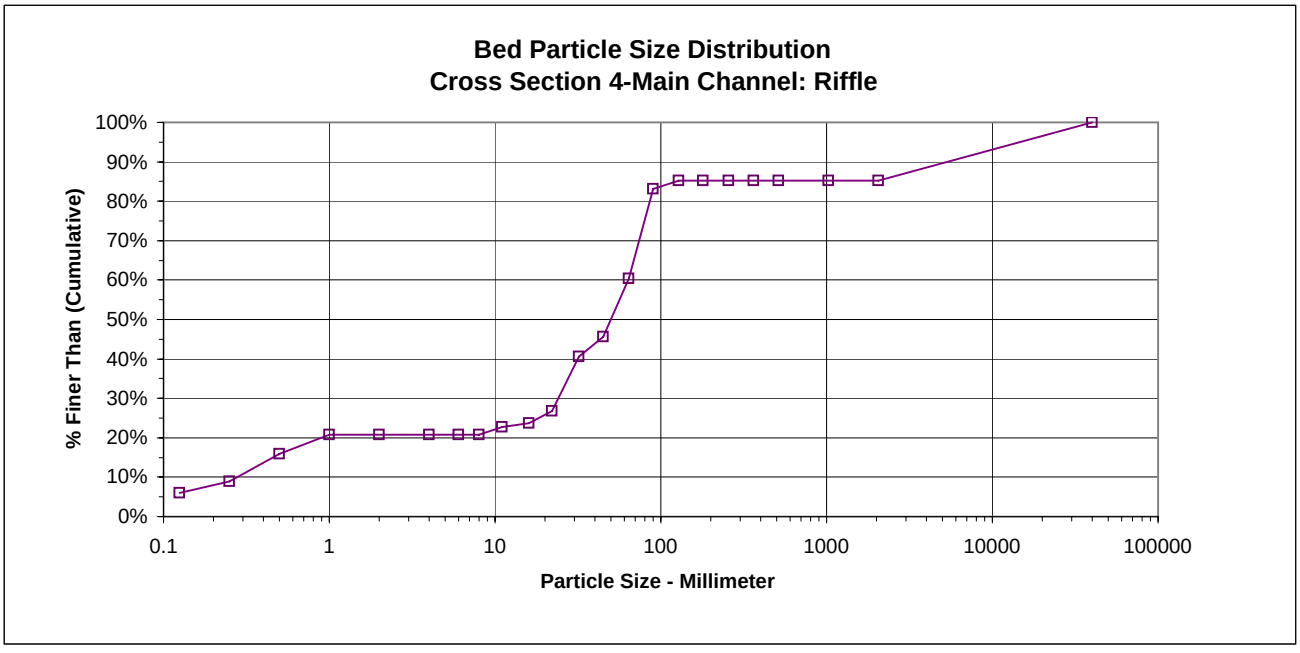

Mary's Creek
Longitudinal Profile
Tributary : Station 10+00-14+70
Cross Section T1 Sta. 11+02
Pool
Cross Section T1 Sta. 11+91
Riffle
Elevation (feet)
508
507
506
505
504
503
502
10+00
11+00
12+00
13+00
14+00
15+00
Station (feet)
TW MY-00
TW MY-01
TW MY-02
BKF MY-01
BKF MY-02
WS MY-02

8. Pebble Counts

PEBBLE COUNT								
Project:	Mary's Creek Main Channel MY-02					**Date:**	12/9/2008	
Location:	Cross Section #2							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	5	0	5	5%	5%
	Very Fine	.062 - .125	S	1	0	1	1%	6%
	Fine	.125 - .25	A	1	0	1	1%	7%
	Medium	.25 - .50	N	0	0	0	0%	7%
	Coarse	.50 - 1.0	D	1	0	1	1%	8%
.04 -.08	Very Coarse	1.0 - 2.0	S	1	0	1	1%	9%
.08 - .16	Very Fine	2.0 - 4.0		2	0	2	2%	10%
.16 - .22	Fine	4.0 - 5.7	G	15	0	15	14%	25%
.22 - .31	Fine	5.7 - 8.0	R	0	0	0	0%	25%
.31 - .44	Medium	8.0 - 11.3	A	7	0	7	7%	31%
.44 - .63	Medium	11.3 - 16.0	V	8	0	8	8%	39%
.63 - .89	Coarse	16.0 - 22.6	E	12	0	12	11%	50%
.89 - 1.26	Coarse	22.6 - 32.0	L	8	0	8	8%	58%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	10	0	10	10%	68%
1.77 - 2.5	Very Coarse	45.0 - 64.0		3	0	3	3%	70%
2.5 - 3.5	Small	64 - 90	C	5	0	5	5%	75%
3.5 - 5.0	Small	90 - 128	O	0	0	0	0%	75%
5.0 - 7.1	Large	128 - 180	B	1	0	1	1%	76%
7.1 - 10.1	Large	180 - 256	L	0	0	0	0%	76%
10.1 - 14.3	Small	256 - 362	B	0	0	0	0%	76%
14.3 - 20	Small	362 - 512	L	0	0	0	0%	76%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	76%
40 - 80	Lrg- Very Lrg	1024 - 2048	R	0	0	0	0%	76%
	Bedrock		BDRK	25	0	25	24%	100%
			Totals	**105**	**0**	**105**	**100%**	**100%**



PEBBLE COUNT								
Project:	Mary's Creek Main Channel MY-02					**Date:**	12/9/2008	
Location:	Cross Section #4							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	5	0	5	5%	5%
	Very Fine	.062 - .125	S	1	0	1	1%	6%
	Fine	.125 - .25	A	3	0	3	3%	9%
	Medium	.25 - .50	N	7	0	7	7%	16%
	Coarse	.50 - 1.0	D	5	0	5	5%	21%
.04 -.08	Very Coarse	1.0 - 2.0	S	0	0	0	0%	21%
.08 - .16	Very Fine	2.0 - 4.0		0	0	0	0%	21%
.16 - .22	Fine	4.0 - 5.7	G	0	0	0	0%	21%
.22 - .31	Fine	5.7 - 8.0	R	0	0	0	0%	21%
.31 - .44	Medium	8.0 - 11.3	A	2	0	2	2%	23%
.44 - .63	Medium	11.3 - 16.0	V	1	0	1	1%	24%
.63 - .89	Coarse	16.0 - 22.6	E	3	0	3	3%	27%
.89 - 1.26	Coarse	22.6 - 32.0	L	14	0	14	14%	41%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	5	0	5	5%	46%
1.77 - 2.5	Very Coarse	45.0 - 64.0		15	0	15	15%	60%
2.5 - 3.5	Small	64 - 90	C	23	0	23	23%	83%
3.5 - 5.0	Small	90 - 128	O	2	0	2	2%	85%
5.0 - 7.1	Large	128 - 180	B	0	0	0	0%	85%
7.1 - 10.1	Large	180 - 256	L	0	0	0	0%	85%
10.1 - 14.3	Small	256 - 362	B	0	0	0	0%	85%
14.3 - 20	Small	362 - 512	L	0	0	0	0%	85%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	85%
40 - 80	Lrg- Very Lrg	1024 - 2048	R	0	0	0	0%	85%
	Bedrock		BDRK	15	0	15	15%	100%
			Totals	**101**	**0**	**101**	**100%**	**100%**



PEBBLE COUNT								
Project:	Mary's Creek Tributary MY-02					**Date:**	12/9/2008	
Location:	Cross Section #T2							
				Particle Counts				
Inches	Particle	Millimeter		Riffles	Pools	Total No.	Item %	% Cumulative
	Silt/Clay	< 0.062	S/C	30	0	30	29%	29%
	Very Fine	.062 - .125	S	16	0	16	15%	44%
	Fine	.125 - .25	A	16	0	16	15%	59%
	Medium	.25 - .50	N	6	0	6	6%	65%
	Coarse	.50 - 1.0	D	16	0	16	15%	80%
.04 -.08	Very Coarse	1.0 - 2.0	S	11	0	11	10%	90%
.08 - .16	Very Fine	2.0 - 4.0		0	0	0	0%	90%
.16 - .22	Fine	4.0 - 5.7	G	0	0	0	0%	90%
.22 - .31	Fine	5.7 - 8.0	R	0	0	0	0%	90%
.31 - .44	Medium	8.0 - 11.3	A	0	0	0	0%	90%
.44 - .63	Medium	11.3 - 16.0	V	0	0	0	0%	90%
.63 - .89	Coarse	16.0 - 22.6	E	0	0	0	0%	90%
.89 - 1.26	Coarse	22.6 - 32.0	L	0	0	0	0%	90%
1.26 - 1.77	Very Coarse	32.0 - 45.0	S	0	0	0	0%	90%
1.77 - 2.5	Very Coarse	45.0 - 64.0		0	0	0	0%	90%
2.5 - 3.5	Small	64 - 90	C	0	0	0	0%	90%
3.5 - 5.0	Small	90 - 128	O	0	0	0	0%	90%
5.0 - 7.1	Large	128 - 180	B	0	0	0	0%	90%
7.1 - 10.1	Large	180 - 256	L	0	0	0	0%	90%
10.1 - 14.3	Small	256 - 362	B	0	0	0	0%	90%
14.3 - 20	Small	362 - 512	L	0	0	0	0%	90%
20 - 40	Medium	512 - 1024	D	0	0	0	0%	90%
40 - 80	Lrg- Very Lrg	1024 - 2048	R	0	0	0	0%	90%
	Bedrock		BDRK	10	0	10	10%	100%
			Totals	**105**	**0**	**105**	**100%**	**100%**