UT TO SOUTH FORK
FINAL MONITORING REPORT
YEAR 5 OF 5
2010
EEP Project #435
Alamance County, North Carolina

Submitted to:

NCDENR-EEP
1652 Mail Service Center
Raleigh, NC 27699

Monitoring Firm:

1025 Wade Avenue

Raleigh, NC 27605

Phone (919) 789-9977

Project Manager:

Phillip Todd

ptodd@sepiengineering.com

TABLE OF CONTENTS

APPENDICIES

MONITORING SUMMARY

The North Carolina Ecosystem Enhancement Program (EEP) restored sections of an unnamed tributary to South Fork (UT South Fork) in 2004. This project is located in the southern portion of Alamance County, NC. The different reaches flow through former pasture and wooded areas. Prior to restoration, cattle damage resulted in areas of severe bank erosion and loss of vegetation. Since the restoration has been completed, the livestock have been fenced out of the stream. The overall goal of this project was to help improve water quality in the Cape Fear River basin. Specific objectives to meet this goal were to:

- Reduce bank erosion;
- Reduce nutrient runoff on the site;
- Stabilize stream channel banks by planting vegetation;
- Help the stream reach its equilibrium through the reestablishment of proper dimension, pattern, and profile.

There was strong vegetative cover along the length of the project. Fescue continues to dominate the herbaceous understory of monitoring reach 1, which appears to be preventing the establishment of the planted bare root trees and other native vegetation. In Monitoring Year 5, several populations of exotic invasive species were noted. Invasive species found include: *Festuca spp., Ligustrum sinense*, *Rosa multiflora*, *Microstegium virmineum*, *Lonicera japonica*, and *Ailanthus altissima*. Planted stem survival in monitoring reach 1 remains a concern due to fescue dominance. All plots in monitoring reach 1 had planted stem densities below the Year 5 goal of 260 stems per acre. Vegetation Plot 2 is of particular concern because no planted stems were counted in this plot in Monitoring Year 5. The overall planted stem survival from Monitoring Year 1 to Monitoring Year 5 was 62% among all vegetation plots in all reaches. The overall planted stem density across all vegetation plots was 560 stems per acre.

All Monitoring Year 5 profile and pattern parameters were consistent with Monitoring Year 4 values. Deposition in riffle sections remains a minor problem in monitoring reaches 1 and 2. The number of depositional areas and overall length of deposition identified decreased during Monitoring Year 5 for all monitoring reaches. Stream structures with problems were limited to Reaches 1 and 2. In monitoring reach 1, a total of 10 structures were found to have significant problems of concern out of 58 surveyed. One structure had significant problems of concern out of the 39 structures surveyed at monitoring reach 2. The most severe structural problem along monitoring reach 1 was a rootwad (Station 15+56) where the bank has caved in around the footing, leaving the footing almost completely exposed. There were small amounts of bank erosion in all monitoring reaches, but none were severe. Less than 1% of the banks in any of the reaches exhibited significant erosion. Evidence of recent beaver activity at the downstream end of Monitoring Reach 3 was observed during geomorphic survey during November 2010. No bank erosion was noted in the area and the impacted trees are species that have strong root systems that will resprout.

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

METHODOLOGY

Vegetation Methodology

For this monitoring project, a total of twelve (12) plots were studied. Plot sizes measure 10 meters by 10 meters (or equivalent to 100 square meters), depending on buffer width. The vegetation monitoring was not the Carolina Vegetation Survey (CVS) protocol, but was based on the number of stems for the targeted species that were planted for the stream restoration project. The planted material in the plot (previously marked with flagging) was identified by species and a tally of each species was kept and recorded in a field book. Any stems for a given species in a given plot that were not flagged and were counted over and above the baseline total were considered volunteers.

It should be noted that no initial planting documentation has ever been received by SEPI, so all survivability and density calculations are based on using the Monitoring Year 1 stem counts as a baseline. In Monitoring Year 1, SEPI project scientists used their best professional judgement to distinguish planted stems from volunteers.

Stream Methodology

The project monitoring for the stream channel included a longitudinal survey, cross-sectional surveys, and photo documentation. These measurements were taken at each reach. The stationing was based on thalweg. The methodology for each portion of the stream monitoring is described in detail below.

Longitudinal Profile and Plan View

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

Permanent Cross Sections

Four permanent cross sections (two riffles and two pools) were surveyed at Monitoring Reach 1. Two permanent cross sections (one riffle and one pool) were surveyed at Monitoring Reach 2, and six permanent cross sections (3 riffles and 3 pools) were surveyed at Monitoring Reach 3. The beginning and end of each permanent cross section were originally marked with a wooden stake and metal conduit. Cross sections were installed perpendicular to the stream flow. Each survey noted all changes in slope, tops of both banks, left and right bankfull, edges of water, thalweg, and water surface. The cross sections were then plotted and overlain on the cross section surveys from all previous monitoring years. All dimension measurements (i.e. bankfull width, floodprone width, bankfull mean depth, cross sectional area, width-to-depth ratio, entrenchment ratio, bank height ratio, wetted perimeter, and hydraulic radius) were extracted from these plots and compared to data from all previous monitoring years.

Pebble Counts

A modified Wolman pebble count (Rosgen 1994), consisting of 50 samples, was conducted at each permanent cross section. The cumulative percentages were graphed, and the D50 and D84 particle sizes were calculated and compared to data from all previous monitoring years.

Photo Documentation

Permanent photo points were established during Monitoring Year 1. A set of three photographs (facing upstream, facing downstream, and facing the channel) were taken at each photo point with a digital camera. Two photographs were taken at each cross-section (facing upstream and downstream). A representative photograph of each vegetation plot was taken at the designated corner of the vegetation plot and in the same direction as the Monitoring Year 1 photograph. An arrow was placed on the designated corner of each vegetation plot on the plan view sheets to document the corner and direction of each photograph. Photos were also taken of all significant stream and vegetation problem areas.

REFERENCES

ARCADIS G&M of North Carolina, Inc (ARCADIS). September 2002. Restoration Design Report, Unnamed Tributary to South Fork.

DeLorme. 1997. The North Carolina Atlas and Gazateer.

Harman, W.H., et al. 1999. Bankfull Hydraulic Geometry Relationships for North Carolina Streams. AWRA Wildland Hydrology Symposium Proceedings. Edited by D.S. Olson and J.P. Potyondy. AWRA Summer Synposium. Bozeman, MT.

North Carolina Ecosystem Enhancement Program. November 2006. Content, Format and Data Requirements for EEP Monitoring Reports.

Rosgen, D.L. 1994. A Classification of Natural Rivers. Catena 22: 166-169.

SEPI Engineering Group. 2006. UT to South Fork Final Monitoring Report, Year 1 of 5.

SEPI Engineering Group. 2007. UT to South Fork Final Monitoring Report, Year 2 of 5.

SEPI Engineering Group. 2008. UT to South Fork Final Monitoring Report, Year 3 of 5.

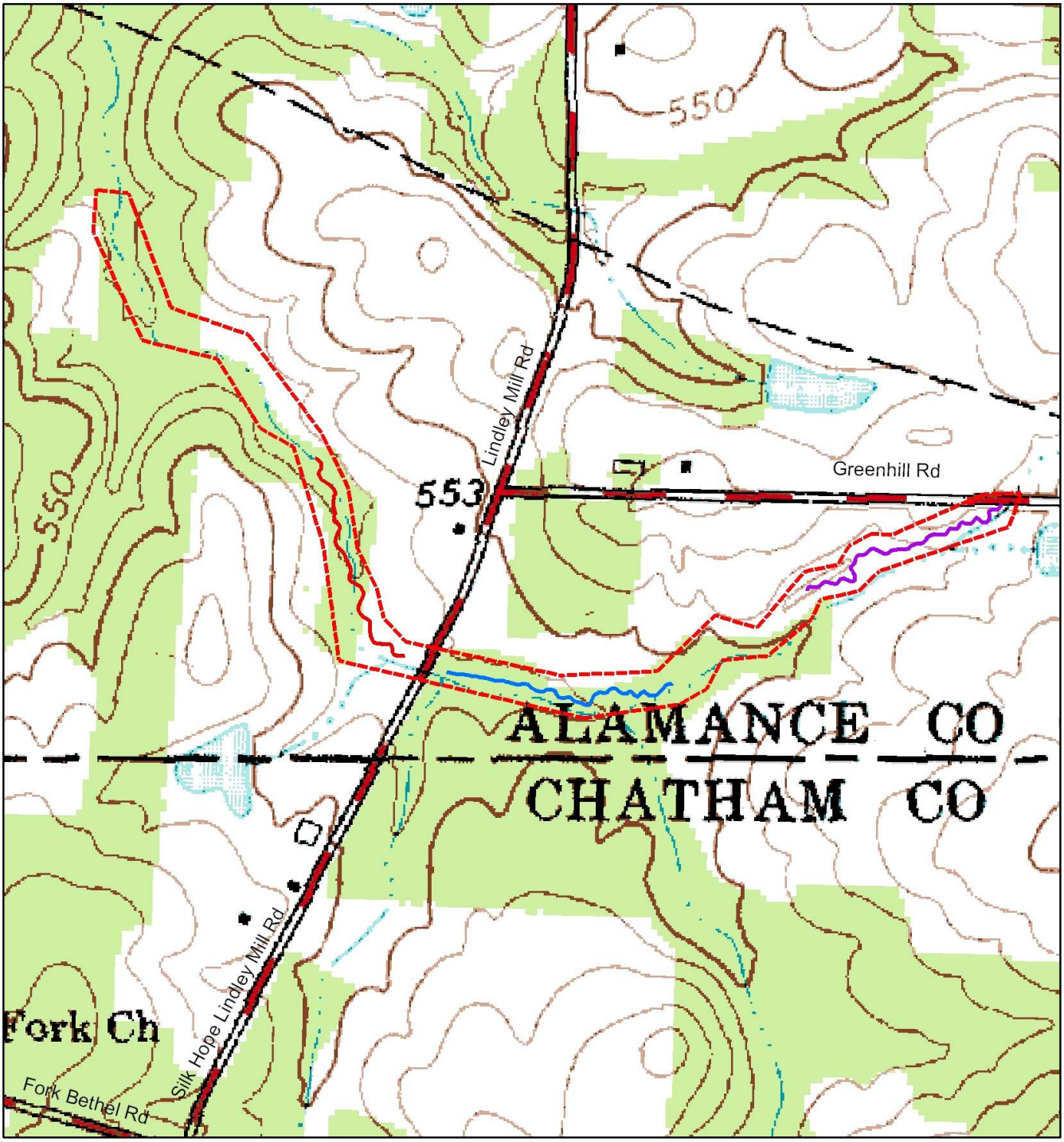
SEPI Engineering Group. 2009. UT to South Fork Final Monitoring Report, Year 4 of 5.

U.S. Department of Agriculture, Soil Conversation Service. April 1960. Soil Survey Alamance County, North Carolina.

U.S. Department of Army, Corps of Engineers. 2003. Stream Mitigation Guidelines. http://www.saw.usace.army.mil/wetlands/Mitigation/stream_mitigation.html

Appendix A

Project Vicinity Map and Background Files



UT SOUTH FORK SITE VICINITY MAP

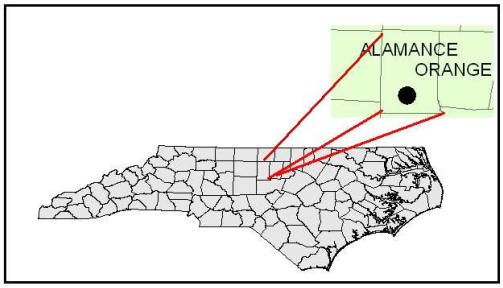
FIGURE 1
ALAMANCE COUNTY NC

500 250 0 500 Feet

Ecosystem Enhancement

Legend

- Monitoring Reach 1
- Monitoring Reach 2
- Monitoring Reach 3
- Project Easement



SEPI Engineering & Construction	Ecosystem Enhancement	Project: Ut to South Fork (EEP #435) Year 5 (2010) Monitoring, Alamance County, North Carolina
		June 2011
		Figure 1. Project Location Map

Table 1. Project Restoration Components UT to South Fork/EEP Project Number 435							
Project Segment or Reach ID	**Pre-Existing Footage**	**Type**	**Approach**	**As-Built* Footage**	**As-Built Stationing***	**Monitoring Year 4 Stationing****	**Comments**
Subreach 1	1,525	Restoration	P I	1,503	10+00 to 26+03	Reach 1 - 10+00 – 20+57.63	New channel construction
Subreach 2	600	Restoration	P I, PII	710	26+03 to 33+13	Reach 2 - 10+00 – 20+33.78	Modified pattern, dimension & profile
Subreach 3	887	Enhancement Level I	P II, P III	887	33+13 to 42+00		Modified dimension & profile
Subreach 4	2,795	Restoration	P I, P II	2,837	42+00 to 70+37	Reach 3 - 10+00 – 20+32.36	Modified pattern, dimension & profile

* – Estimations based upon the design length from the Restoration Design Report for the project. SEPI does not currently possess as-built documentation.

** – For monitoring purposes Reach 1 is Design Subreach 1, Reach 2 combines portions of both Design Subreach 2 and Design Subreach 3, and Reach 3 is Design Subreach 4.

Table 2. Project Activity and Reporting History UT to South Fork/EEP Project Number 435			
Activity or Report	**Scheduled Completion**	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan			September 2002
Final Design - 90%	Currently Unavailable		
Construction			
Temporary S&E mix applies to entire project area			
Permanent seed mix applies to reach/segments 1&2			
Containerized and B&B plantings for reach/segments 1&2			
Mitigation Plan/ As-built (Year 0 Monitoring - baseline)			
Year 1 monitoring	December 1, 2006	June 1, 2006	November 2006
Year 2 monitoring	December 1, 2007	October 2007	December 1, 2007
Year 3 monitoring	December 1, 2008	November 2008	November 15, 2008
Year 4 monitoring	December 1, 2009	October 2009	November 15, 2009
Year 5 monitoring	December 1, 2010	October 2010	November 20, 2010

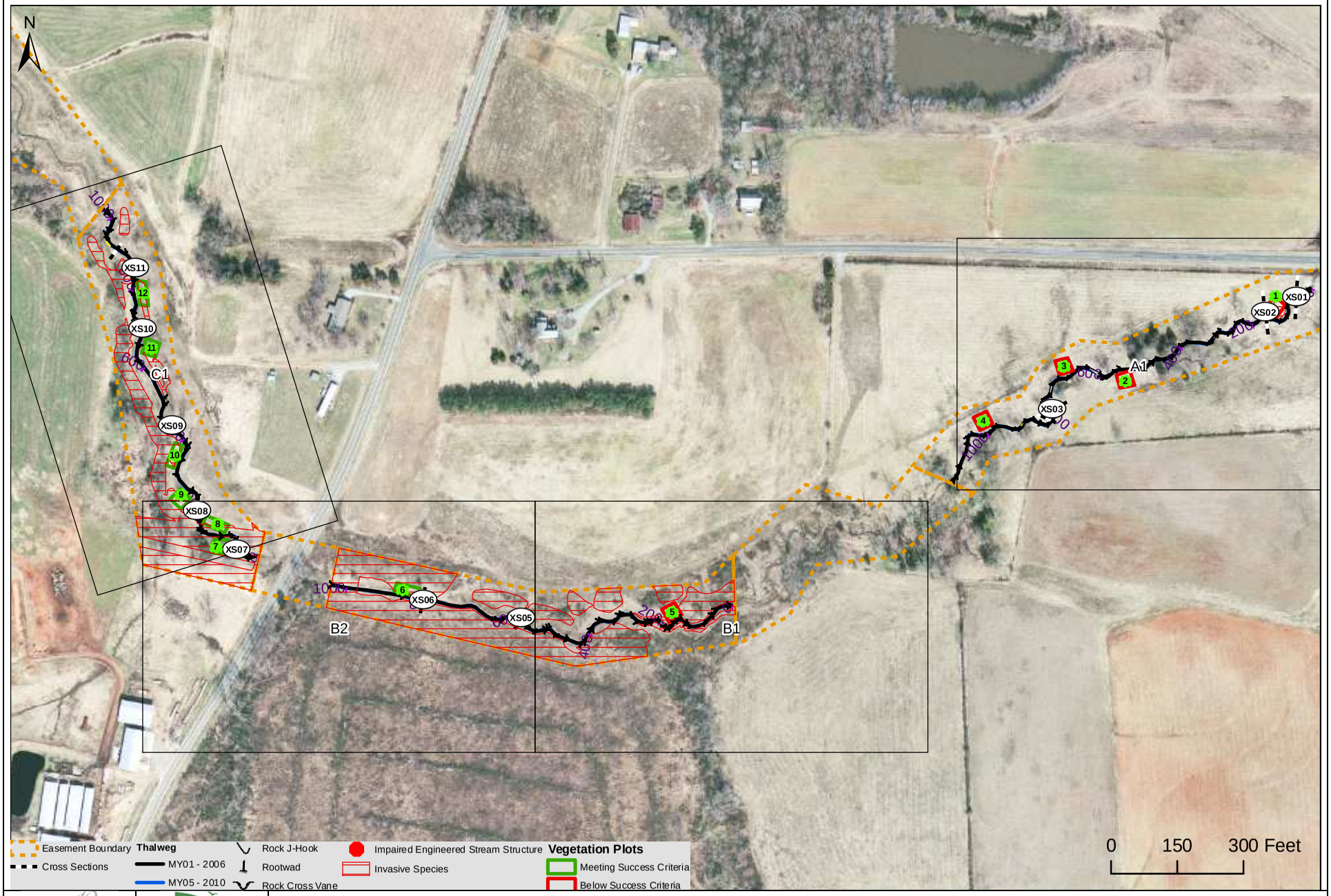
Table 3. Project Contact Table	
UT to South Fork/EEP Project Number 445	
Designer	ARCADIS G&M 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607
Construction Contractor	*
Planting Contractor	*
Seeding Contractor	*
2006 – 2010 Monitoring Performers	SEPI Engineering Group 1025 Wade Avenue Raleigh, NC 27607 Phillip Todd (919) 789-9977
Stream Monitoring POC	Andy Kiley (919) 789-9977
Vegetation Monitoring POC	Phil Beach (919) 789-9977
Wetland Monitoring POC	N/A

*Raw data currently unavailable.

Table 4. Project Background Table	
UT to South Fork/EEP Project Number 445	
Project County	Alamance County, NC
Drainage impervious cover estimate (%)	5
Stream Order	1
Physiographic Region	Piedmont
Ecoregion	Carolina Slate Belt
Rosgen Classification of As-built	E
Cowardin Classification	N/A
Dominant soil types	Georgeville-Heron-Alamance & Orange-Efland-Herndon
Reference site ID	UT Wells Creek & UT Varnal Creek
USGS HUC for Project and Reference	03030002 Haw River
NCDWQ Sub-basin for Project and Reference	03-04-06
NCDWQ classification for Project and Reference	C, NSW
Any portion of any project segment 303d listed?	no
Any portion of any project segment upstream of a 303d listed segment?	no
Reasons for 303d listing or stressor	N/A
% of project easement fenced	99
% of project easement demarcated with bollards (if fencing absent)	0

Appendix B

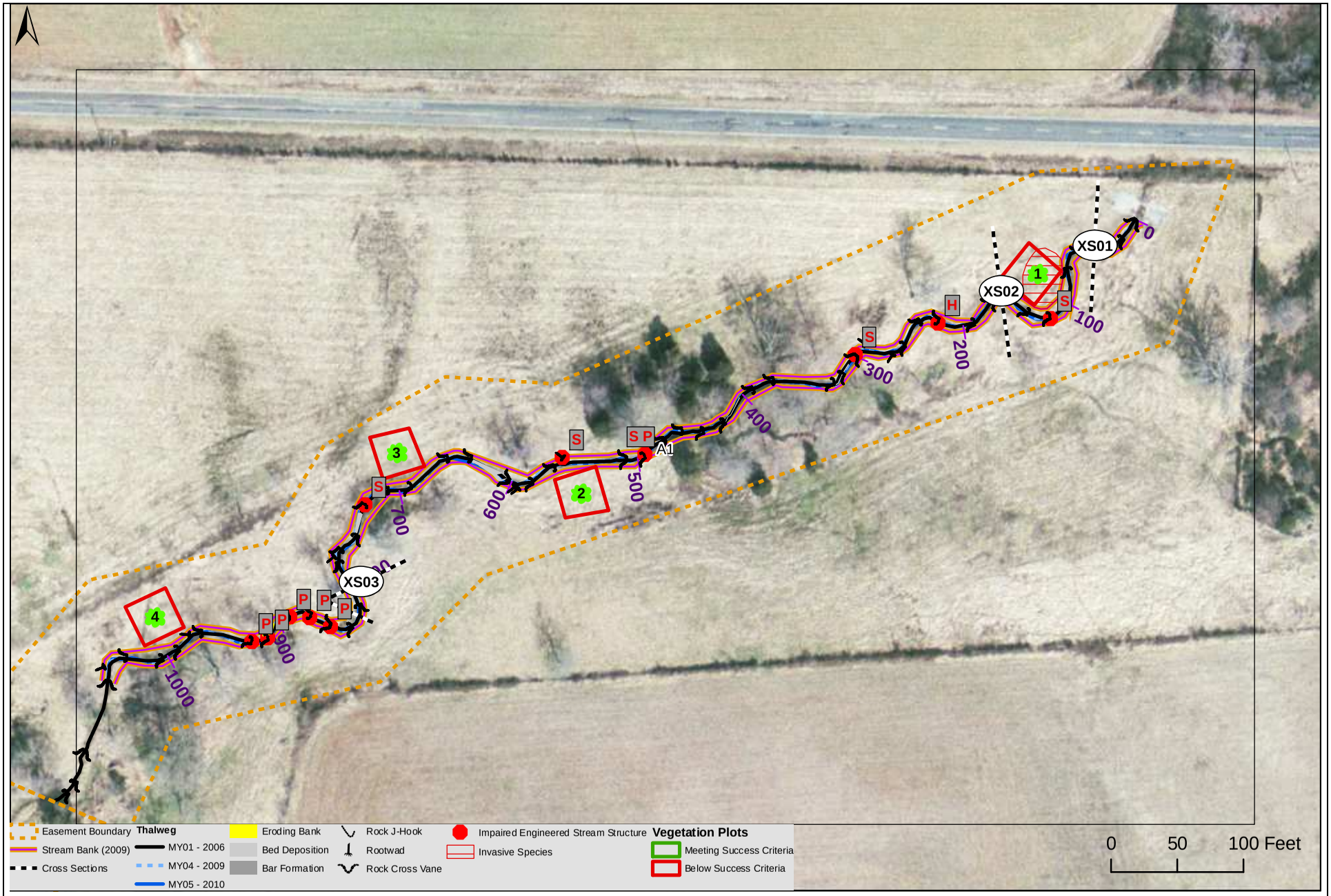
Visual Assessment Data



Project: Ut to South Fork (EEP #435) Year 5 (2010) Monitoring, Alamance County, North Carolina

June 2011

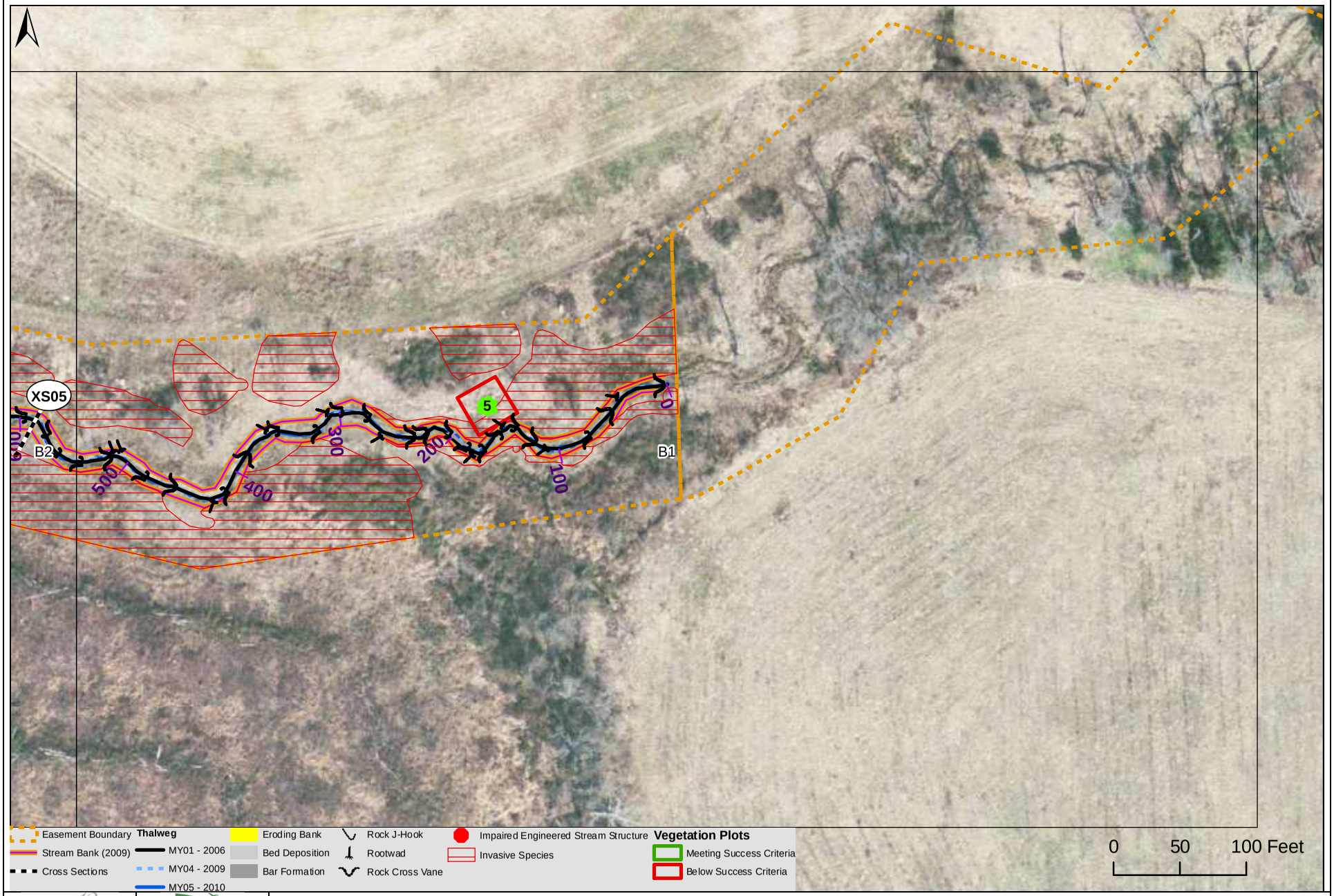
Figure 2a: CCPV Index Sheet (Aerials 2005 Alamance County)



Project: Ut to South Fork (EEP #435) Year 5 (2010) Monitoring, Alamance County, North Carolina

June 2011

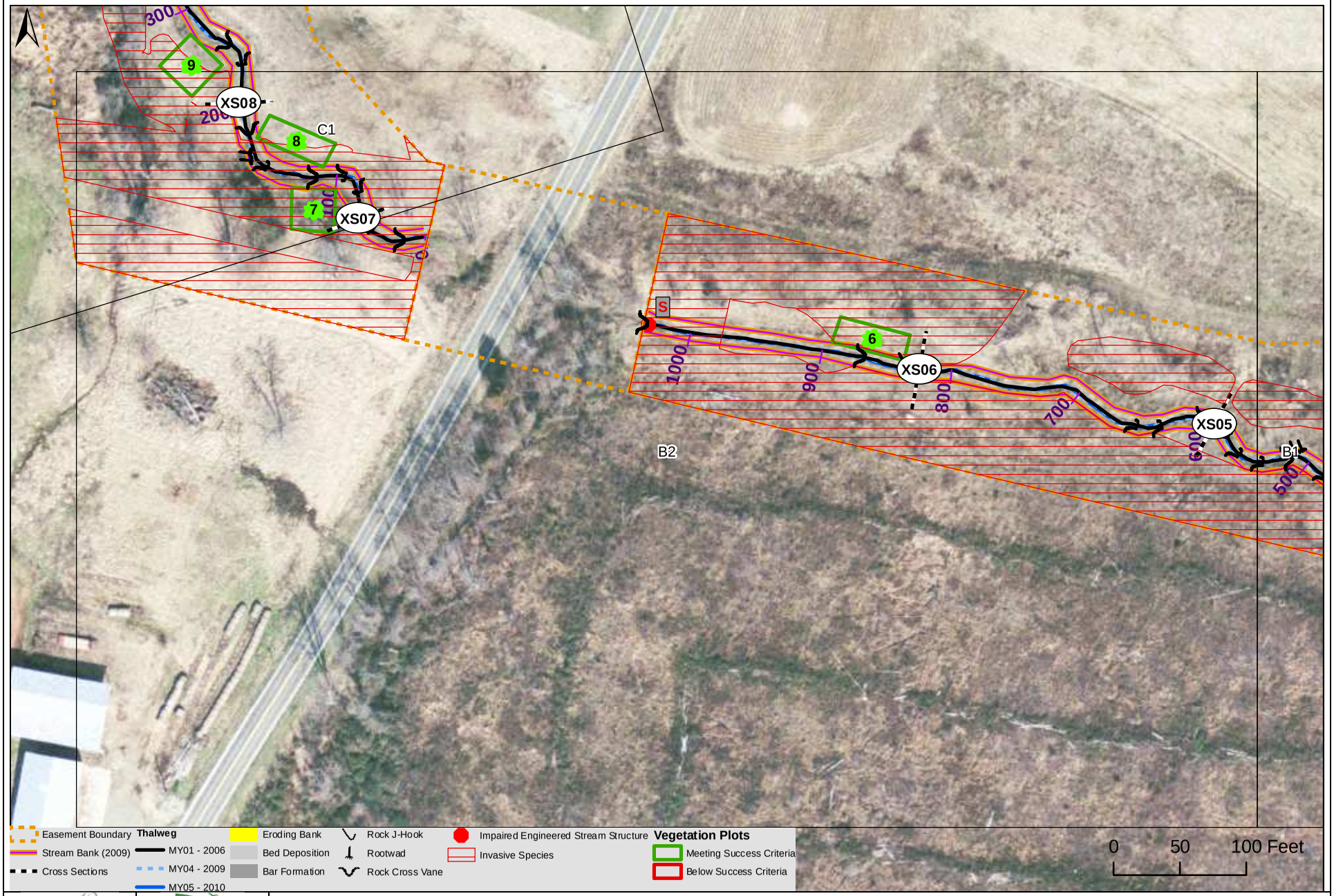
Figure 2b: CCPV Sheet 1 Reach 1(Aerials 2005 Alamance County)



Project: Ut to South Fork (EEP #435) Year 5 (2010) Monitoring, Alamance County, North Carolina

June 2011

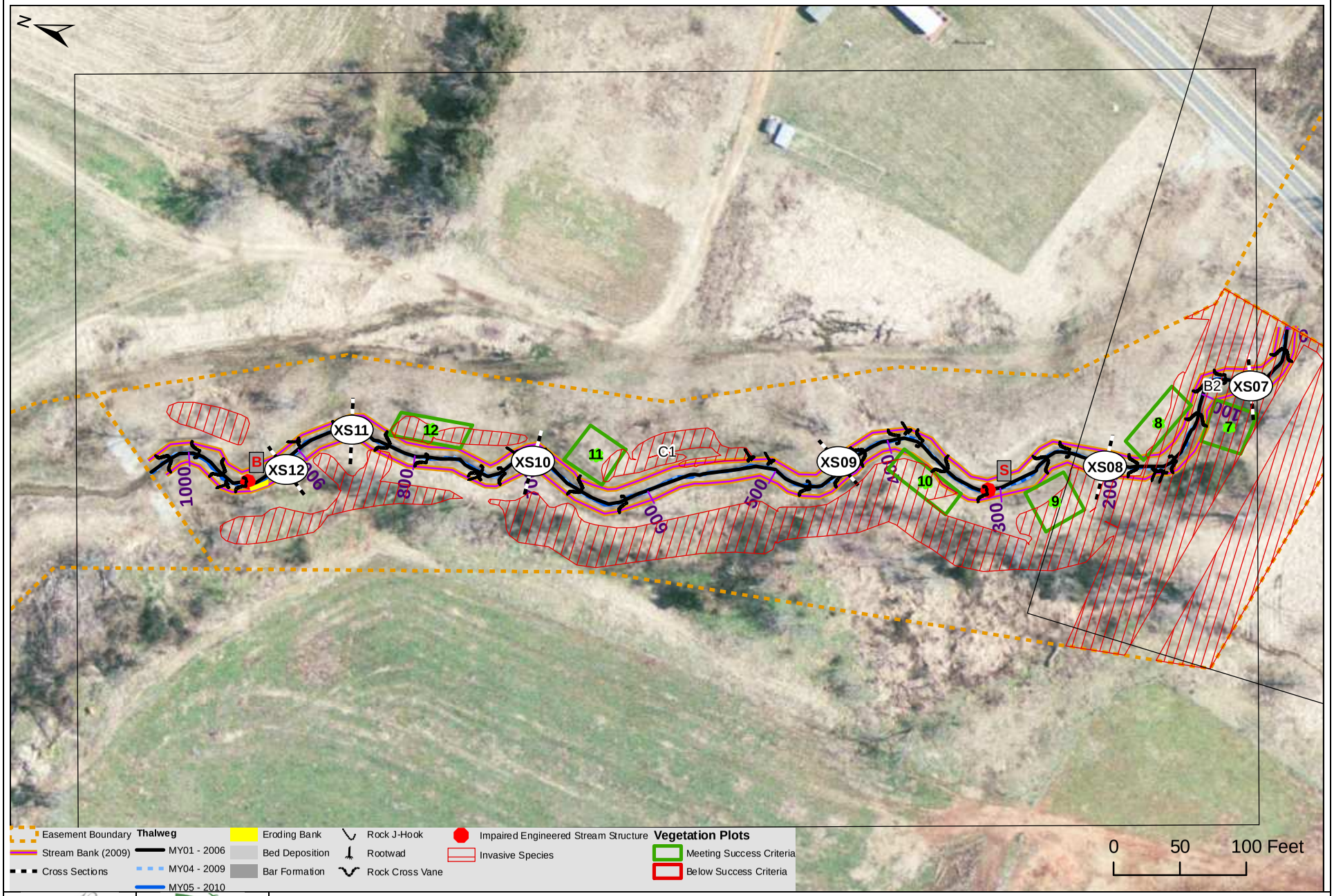
Figure 2c: CCPV Sheet 2 Reach 2 (Aerials 2005 Alamance County)



Project: Ut to South Fork (EEP #435) Year 5 (2010) Monitoring, Alamance County, North Carolina

June 2011

Figure 2d: CCPV Sheet 3 Reach 2 (Aerials 2005 Alamance County)



Project: Ut to South Fork (EEP #435) Year 5 (2010) Monitoring, Alamance County, North Carolina

June 2011

Figure 2e: CCPV Sheet 4 Reach 3 (Aerials 2005 Alamance County)

Table 5a **Visual Stream Morphology Stability Assessment**
Reach ID **Ut of South Fork - Reach 1**
Assessed Length **1,152**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			6	102	91%			
		2. Degradation - Evidence of downcutting			1	15	99%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	12	28			43%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	23	25			92%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	22	25			88%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	13	13			100%			
		2. Thalweg centering at downstream of meander (Glide)	13	13			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	15	99%	0	0	99%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	1	15	99%	0	0	99%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	47	50			94%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	49	50			98%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	44	50			88%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	50	50			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	49	50			98%			

Table 5b **Visual Stream Morphology Stability Assessment**
Reach ID **Ut of South Fork - Reach 2**
Assessed Length **1,030**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			2	25	98%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	8	13			62%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	13	14			93%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	10	14			71%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	7	8			88%			
		2. Thalweg centering at downstream of meander (Glide)	7	7			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%			100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	28	28			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	28	28			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	27	28			96%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	28	28			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	28	28			100%			

Table 5c **Visual Stream Morphology Stability Assessment**
Reach ID **Ut of South Fork - Reach 3**
Assessed Length **1,028**

Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. **Vertical Stability** (Riffle and Run units)	1. Aggradation - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars)			0	0	100%			
		2. Degradation - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. Texture/Substrate - Riffle maintains coarser substrate	15	16			94%			
	3. Meander Pool Condition	1. Depth Sufficient (Max Pool Depth : Mean Bankfull Depth ≥ 1.6)	19	19			100%			
		2. Length appropriate (>30% of centerline distance between tail of upstream riffle and head of downstrem riffle)	16	19			84%			
	4.**Thalweg Position**	1. Thalweg centering at upstream of meander bend (Run)	6	6			100%			
		2. Thalweg centering at downstream of meander (Glide)	7	7			100%			
2. Bank	**1. Scoured/Eroding**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			1	14	99%			99%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%			100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%			100%
				Totals	1	14	99%	0	0	99%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dislodged boulders or logs.	29	30			97%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	30	30			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	30	30			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%. (See guidance for this table in EEP monitoring guidance document)	30	30			100%			
	4. Habitat	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth ratio ≥ 1.6 Rootwads/logs providing some cover at base-flow.	30	30			100%			

Table 6 Vegetation Condition Assessment

Planted Acreage[1] **9.92**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres		0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1 acres		0	3.10	31.3%
			Total	0	3.10	31.3%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres		0	0.00	0.0%
			Cumulative Total	0	3.10	31.3%

Easement Acreage[2] **9.92**

Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern[4]	Areas or points (if too small to render as polygons at map scale).	1000 SF		14	3.16	31.9%
5. Easement Encroachment Areas[3]	Areas or points (if too small to render as polygons at map scale).	none		0	0.00	0.0%

Cross-Section 1: View Upstream (10-27-2010)

Cross-Section 1: View Downstream (10-27-2010)

Cross-Section 2: View Upstream (10-27-2010)

Cross-Section 2: View Downstream (10-27-2010)

Cross-Section 3: View Upstream (10-27-2010)

Cross-Section 3: View Downstream (10-27-2010)

	
Cross-Section 4: View Upstream (10-27-2010)	Cross-Section 4: View Downstream (10-27-2010)
	
Photo point 1 (R1): View Upstream (10-27-2010)	Photo point 1 (R1): View Downstream (10-27-2010)
	
Photo point 2 (R1): View Upstream (10-27-2010)	Photo point 2 (R1): View Downstream (10-27-2010).

Photo point 3 (R1): View Upstream (10-27-2010)

Photo point 3 (R1): View Downstream (10-27-2010)

Photo point 4 (R1): View Upstream (10-27-2010)

Photo point 4 (R1): View Downstream (10-27-2010)

Photo point 5 (R1): View Upstream (10-27-2010)

Photo point 5 (R1): View Downstream (10-27-2010)

	
Photo point 6 (R1): View Upstream (10-27-2010)	Photo point 6 (R1): View Downstream (10-27-2010)
	
Photo point 7 (R1): View Upstream (10-27-2010)	Photo point 7 (R1): View Downstream (10-27-2010)
	
Photo point 8 (R1): Facing Channel (3-12-2009).	

	
Cross-Section 5: View Upstream (10-28-2010)	Cross-Section 5: View Downstream (10-28-2010)
	
Cross-Section 6: View Upstream (10-28-2010)	Cross-Section 6: View Downstream (10-28-2010)

	
Photo point 1(R2): View Upstream (10-28-2010)	Photo point 1 (R2): View Downstream (10-28-2010)
	
Photo point 2 (R2): View Upstream (10-28-2010)	Photo point 2 (R2): View Downstream (10-28-2010)
	
Photo point 3 (R2): View Upstream (10-28-2010)	Photo point 3 (R2): View Downstream (10-28-2010)

	
Photo point 4 (R2): View Upstream (10-28-2010)	Photo point 4 (R2): View Downstream (10-28-2010)
	
Photo point 5 (R2): View Upstream (10-28-2010)	Photo point 5 (R2): View Downstream (10-28-2010)
	
Photo point 6 (R2): View Upstream (10-28-2010)	Photo point 6 (R2): View Downstream (10-28-2010)

	
Photo point 7 (R2): View Upstream (10-28-2010)	Photo point 7 (R2): View Downstream (10-28-2010)
	
Cross-Section 7: View Upstream (10-28-2010)	Cross-Section 7: View Downstream (10-28-2010)
	
Cross-Section 8: View Upstream (10-28-2010)	Cross-Section 8: View Downstream (10-28-2010)

	
Cross-Section 9: View Upstream (10-28-2010)	Cross-Section 9: View Downstream (10-28-2010)
	
Cross-Section 10: View Upstream (10-28-2010)	Cross-Section 10: View Downstream (10-28-2010)
	
Cross-Section 11: View Upstream (10-28-2010)	Cross-Section 11: View Downstream (10-28-2010)

Cross-Section 12: View Upstream (10-28-2010)

Cross-Section 12: View Downstream (10-28-2010)

Photo point 1 (R3): View Upstream (10-28-2010)

Photo point 2 (R3): View Upstream (10-28-2010)

Photo point 1 (R3): View Downstream (10-28-2010)

Photo point 2 (R3): View Downstream (10-28-2010)

Photo point 1 (R3): Facing Channel (10-28-2010)

Photo point 2 (R3): Facing Channel (10-28-2010)

Photo point 3 (R3): View Upstream (10-28-2010)

Photo point 4 (R3): View Upstream (10-28-2010)

Photo point 3 (R3): View Downstream (10-28-2010)

Photo point 4 (R3): View Downstream (10-28-2010)

Photo point 3 (R3): Facing Channel (10-28-2010)

Photo point 4 (R3): Facing Channel (10-28-2010)

Photo point 5 (R3): View Upstream (10-28-2010)

Photo point 5 (R3): Facing Channel (10-28-2010)

Photo point 5 (R3): View Downstream (10-28-2010)

Photo 1: Vegetation Plot 1 (10-28-2010)

Photo 2: Vegetation Plot 2 (10-28-2010)

Photo 3: Vegetation Plot 3 (10-28-2010)

Photo 4: Vegetation Plot 4 (10-28-2010)

Photo 5: Vegetation Plot 5 (10-28-2010)

Photo 6: Vegetation Plot 6 (10-28-2010)

	
Photo 7: Vegetation Plot 7 (10-28-2010)	Photo 8: Vegetation Plot 8 (10-18-2009).
	
Photo 9: Vegetation Plot 9 (10-28-2010)	Photo 10: Vegetation Plot 10 (10-28-2010)
	
Photo 11: Vegetation Plot 11 (10-28-2010)	Photo 12: Vegetation Plot 12 (10-28-2010)

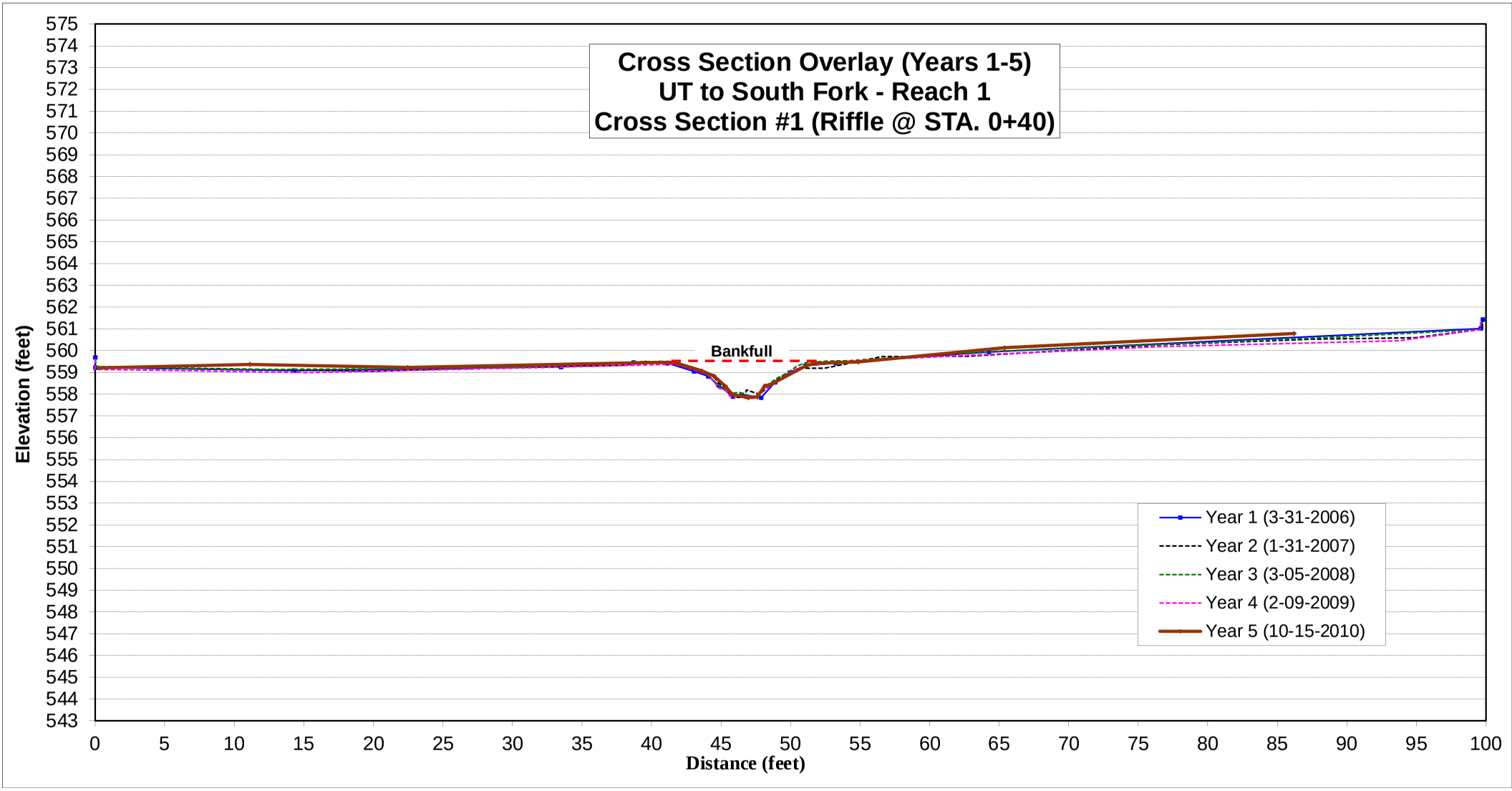
Appendix C
Vegetation Plot Data

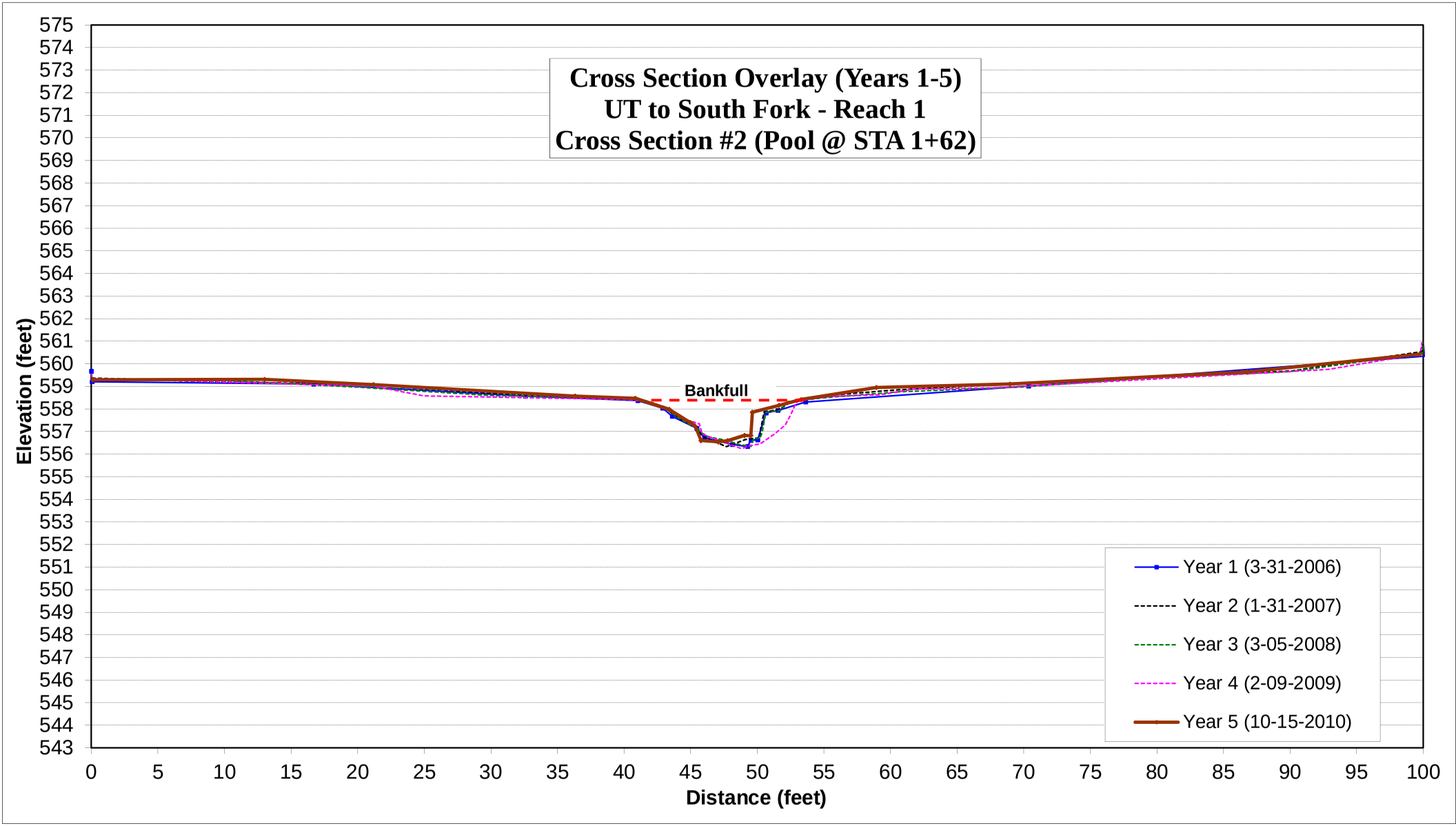
Table 7. Vegetation Plot Mitigation Success Summary Table																		
Species	**Plots**												**Year 1 Totals**	**Year 2 Totals**	**Year 3 Totals**	**Year 4 Totals**	**Year 5 Totals**	**Survival %**
	1	2	3	4	5	6	7	8	9	10	11	12						
Shrubs																		
Cornus ammomum						(LS 15)			(LS 1)	2 (LS 5)	(LS 5)	(LS 1)	3 (LS 31)	3 (LS 31)	2 (LS 31)	2 (LS 27)	2 (LS 27)	85.3%
Salix nigra													1	1	0	0	0	0.0%
Trees																		
Acer negundo											1		1	1	1	1	1	100.0%
Acer rubrum				5			1						7	6	6	6	6	85.7%
Betula nigra							1	**1**	1	10	3	7	31	27	27	24	23	74.2%
Carpinus caroliniana													2	0	0	0	0	0.0%
Diospyros virginiana						1	2	3	0	3	1	0	18	16	13	10	10	55.6%
Fraxinis pennsylvanica	3		3	1	3		8	4	10	15	1	3	70	63	59	51	51	72.9%
Symphoricarpos orbiculatus			2							**0**			4	4	4	3	2	50.0%
Juglans nigra									2	0		0	27	8	5	2	2	7.4%
Platanus occidentalis						10	13	1	1		1	2	32	30	30	28	28	87.5%
Sambucus canandensis					2								5	2	2	2	2	40.0%
Quercus michauxii									1	5	2	**2**	14	10	10	10	10	71.4%
Quercus sp.							1						1	1	1	1	1	100.0%
Quercus alba								1					10	7	5	1	1	10.0%
Ulmus americana							1				1		3	2	2	2	2	66.7%
Total including live stake	3	0	5	6	5	26	27	10	16	40	15	15	260	212	195	168	168	64.6%
Stems per acre	120	0	200	240	200	1040	1080	400	640	1600	600	600	867	707	650	567	560	
Total excluding live stake	3	0	5	6	5	11	27	10	15	35	10	14	229	181	164	146	141	61.6%
Stems per acre	120	0	200	240	200	440	1080	400	600	1400	400	560	763	603	547	487	470	

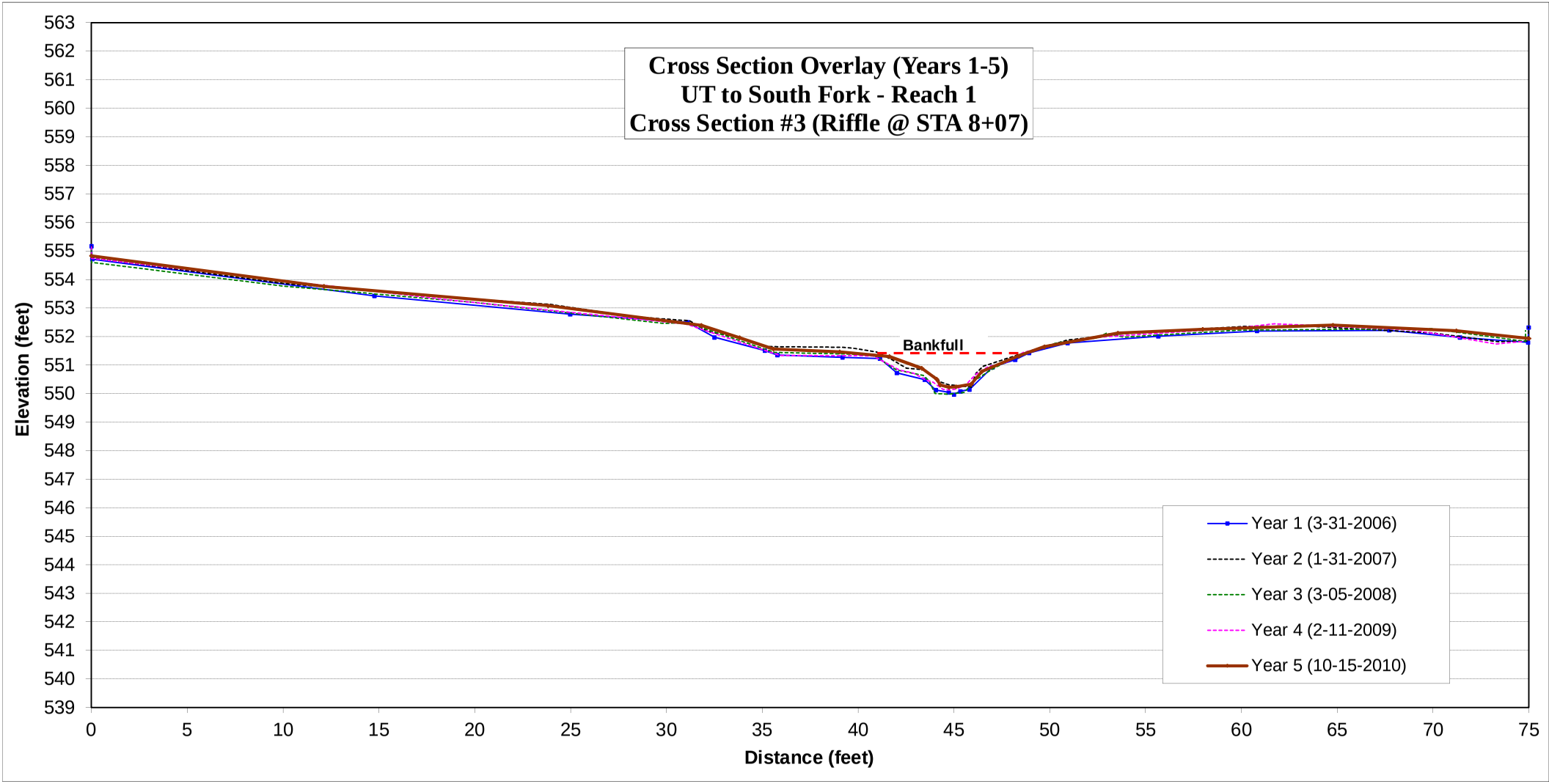
**Volunteers of the following species, not initially recorded as planted, were counted: Cornus ammomum (VP 6, 7, 8, 10), Acer negundo (VP 7, 10), Acer rubrum (VP 3,4, 7), Betula nigra (VP 7, 9, 11), Fraxinus pennsylvanica (VP 1, 4, 7, 8,11), Quercus michauxii (VP 6, 8, 10, 11), Juglans nigra (VP 6), Platanus occidentalis (VP 6, 9), Symphoricarpos orbiculatus (VP 9), Celtis laevigata (VP 10), Liquidambar styraciflua (VP 3, 7, 8, 9, 10), Quercus sp. (VP 7, 8, 10, 12), Quercus alba (VP 8, 10), Diospyros virginiana (VP 11), Sambucus canadensis (VP 6), Pinus taeda (VP 3, 8, 9), Cercis canadensis (VP 5), Salix nigra (VP 8) and Ailanthus altissima (VP 11).*

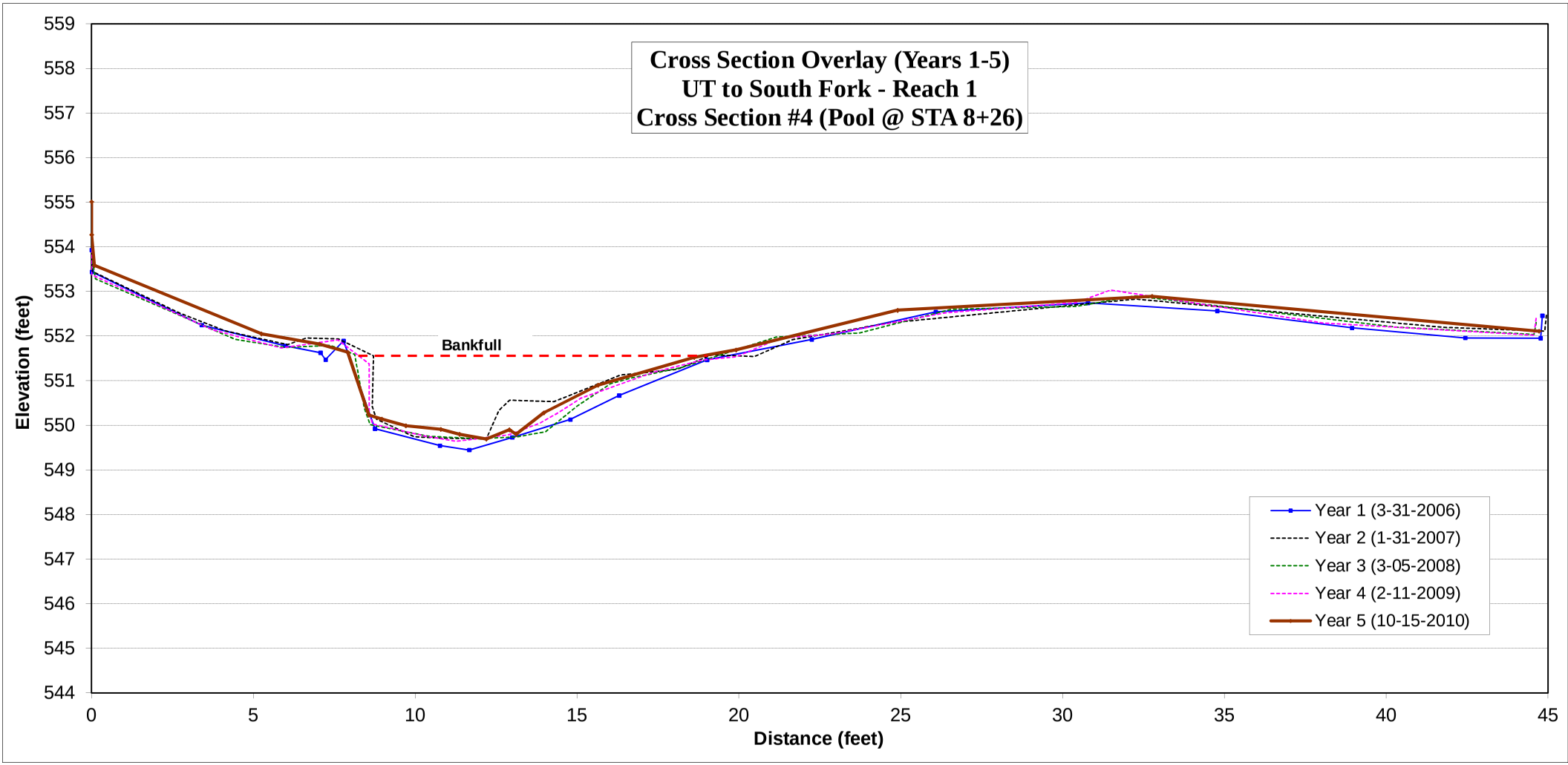
**Liquidambar styraciflua were too numerous to count in vegetation plots 8, 9, and 10.*

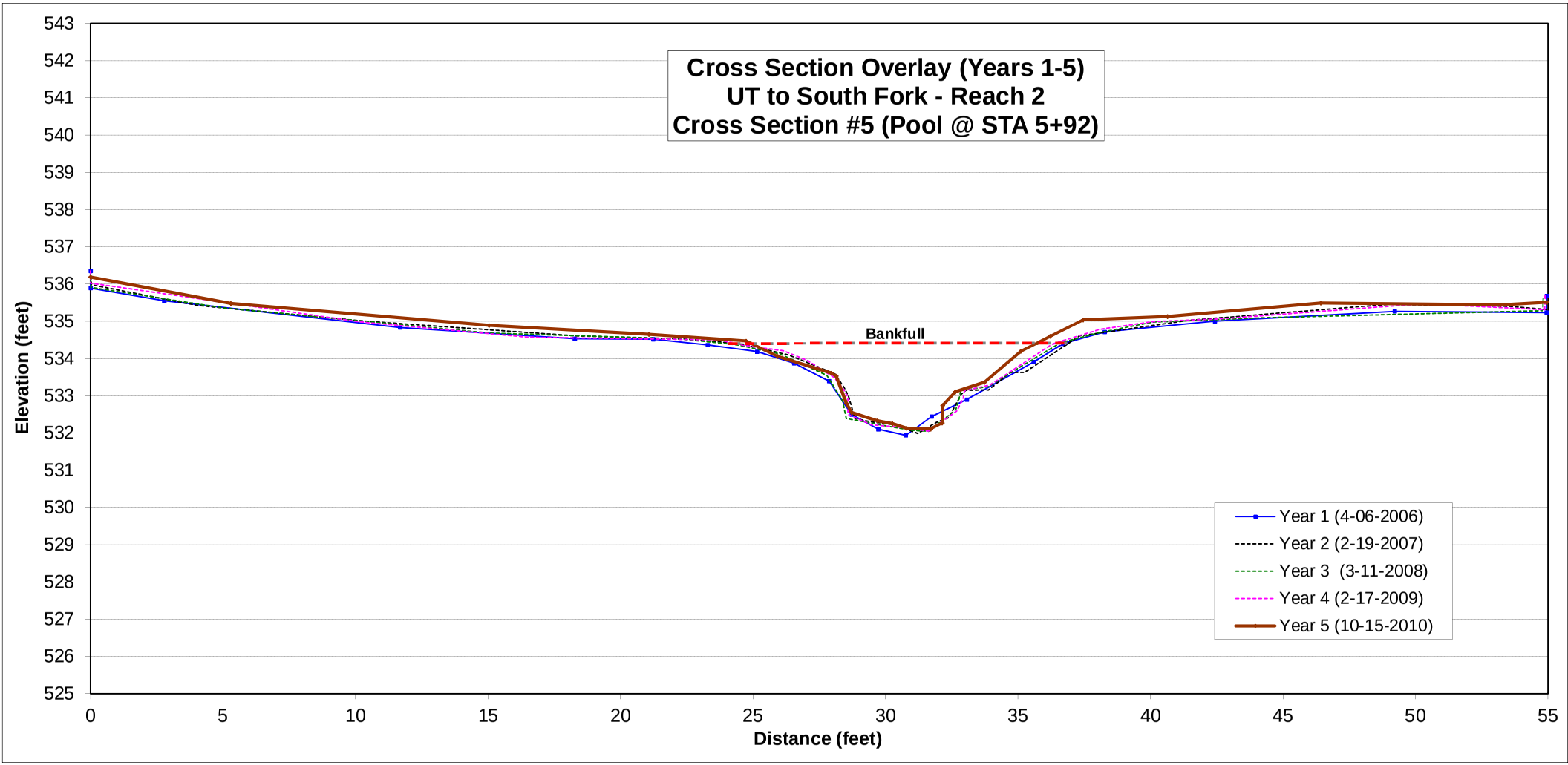
Appendix D
Stream Survey Data

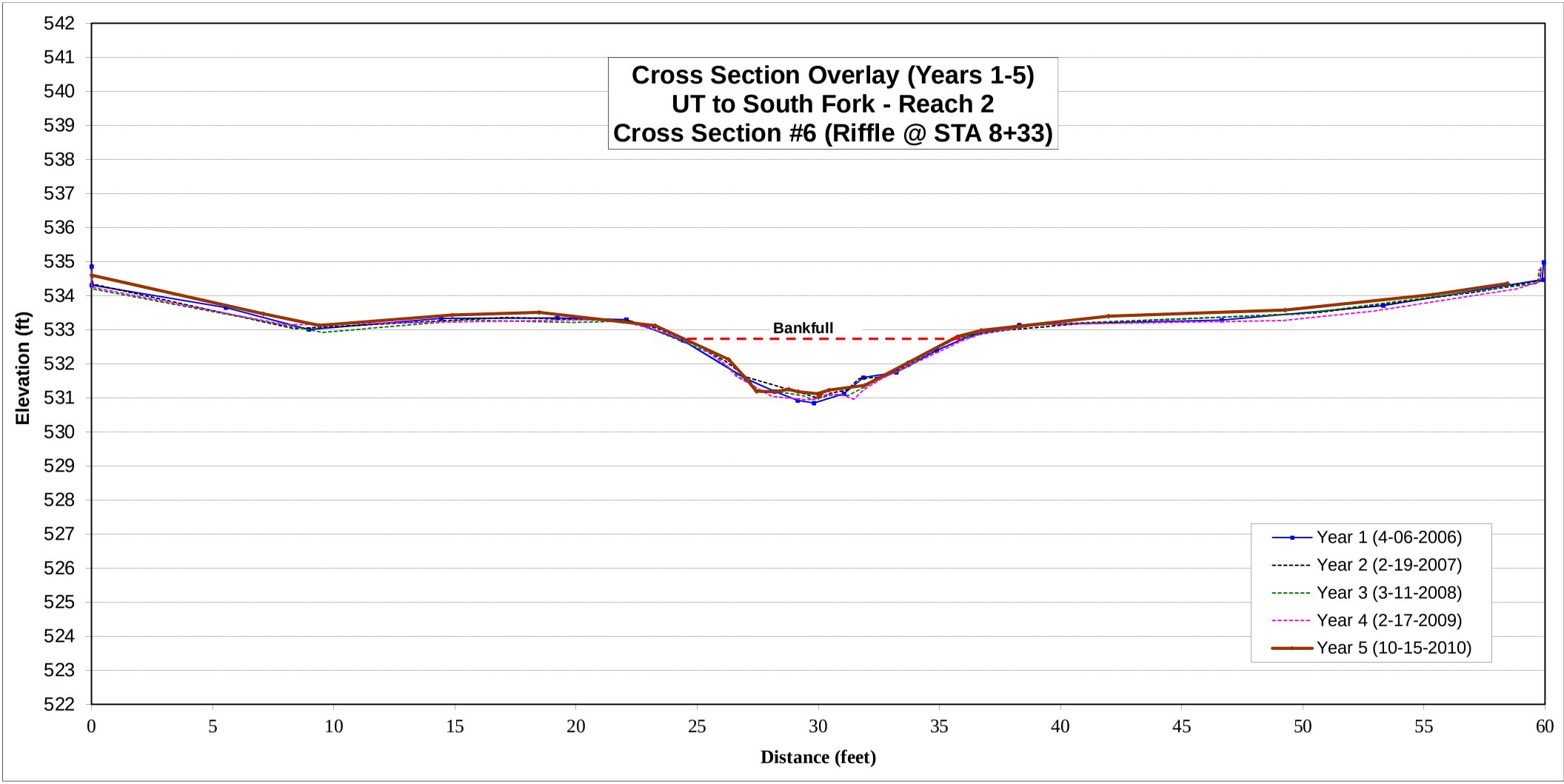

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 1
Cross Section #1 (Riffle @ STA. 0+40)
Bankfull
Elevation (feet)
Distance (feet)
575
574
573
572
571
570
569
568
567
566
565
564
563
562
561
560
559
558
557
556
555
554
553
552
551
550
549
548
547
546
545
544
543
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
Year 1 (3-31-2006)
Year 2 (1-31-2007)
Year 3 (3-05-2008)
Year 4 (2-09-2009)
Year 5 (10-15-2010)

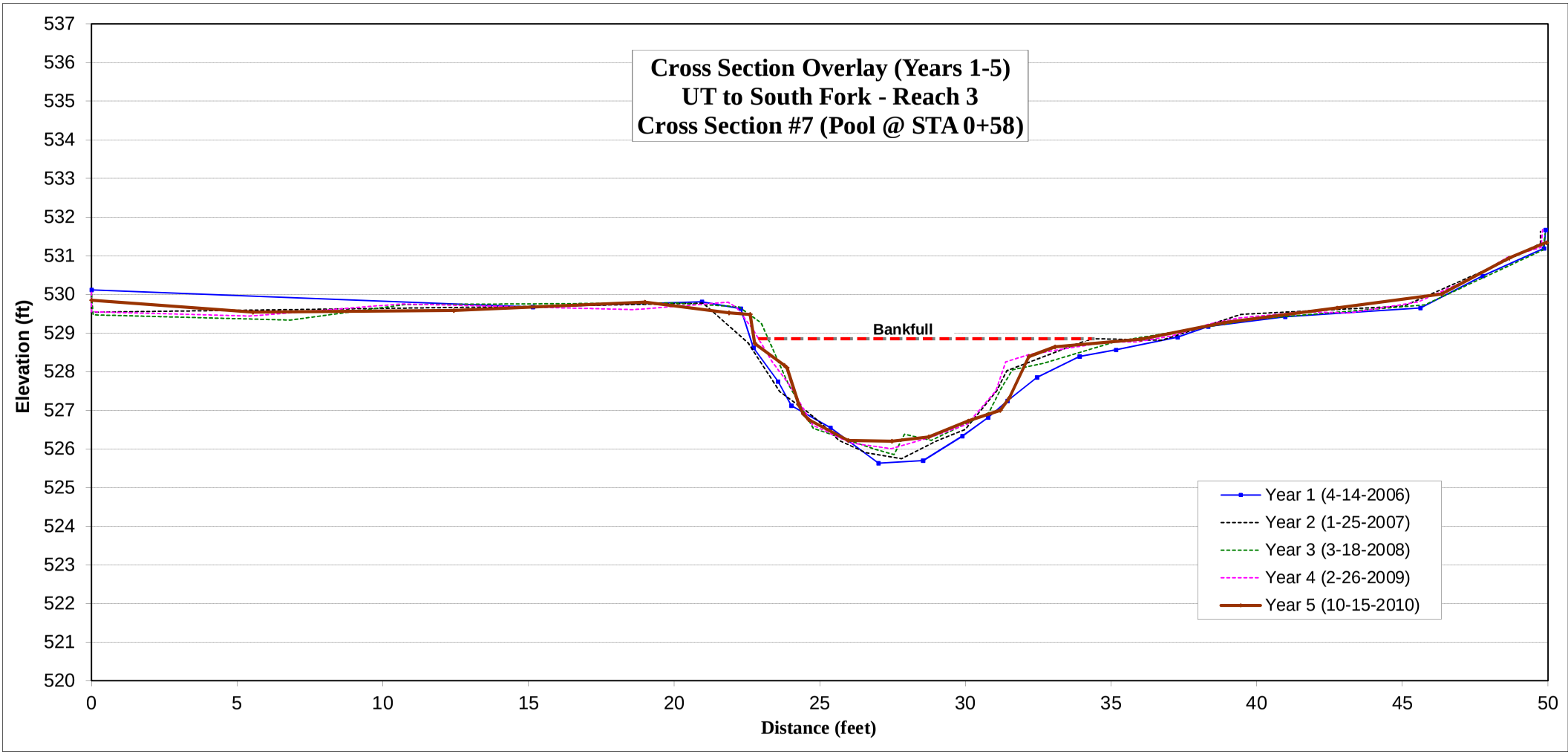

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 1
Cross Section #2 (Pool @ STA 1+62)
Elevation (feet)
575
574
573
572
571
570
569
568
567
566
565
564
563
562
561
560
559
558
557
556
555
554
553
552
551
550
549
548
547
546
545
544
543
Bankfull
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100
Distance (feet)
Year 1 (3-31-2006)
Year 2 (1-31-2007)
Year 3 (3-05-2008)
Year 4 (2-09-2009)
Year 5 (10-15-2010)

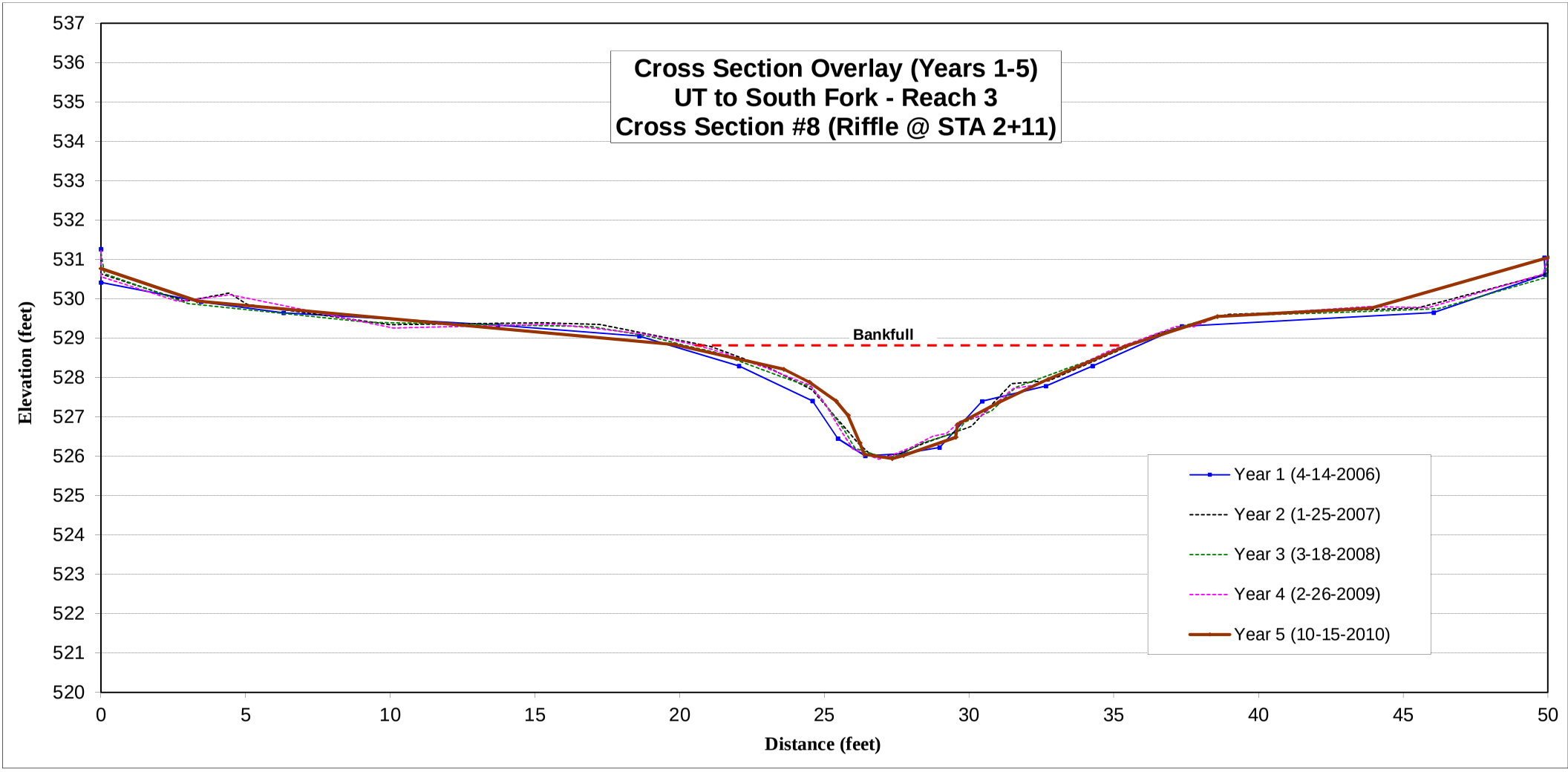

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 1
Cross Section #3 (Riffle @ STA 8+07)
Bankfull
Elevation (feet)
Distance (feet)
563
562
561
560
559
558
557
556
555
554
553
552
551
550
549
548
547
546
545
544
543
542
541
540
539
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Year 1 (3-31-2006)
Year 2 (1-31-2007)
Year 3 (3-05-2008)
Year 4 (2-11-2009)
Year 5 (10-15-2010)

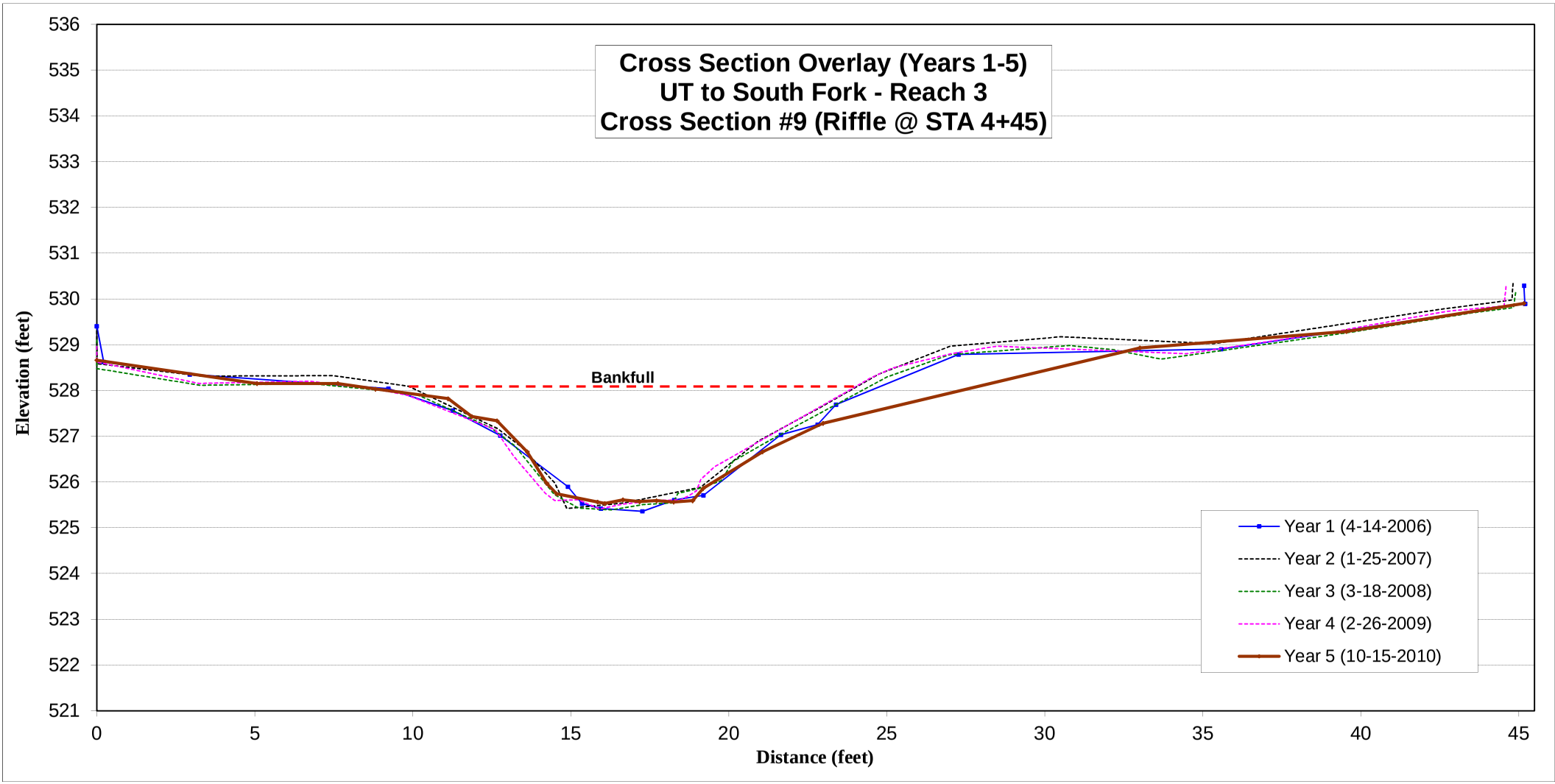

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 1
Cross Section #4 (Pool @ STA 8+26)
Bankfull
Elevation (feet)
Distance (feet)
559
558
557
556
555
554
553
552
551
550
549
548
547
546
545
544
0
5
10
15
20
25
30
35
40
45
Year 1 (3-31-2006)
Year 2 (1-31-2007)
Year 3 (3-05-2008)
Year 4 (2-11-2009)
Year 5 (10-15-2010)

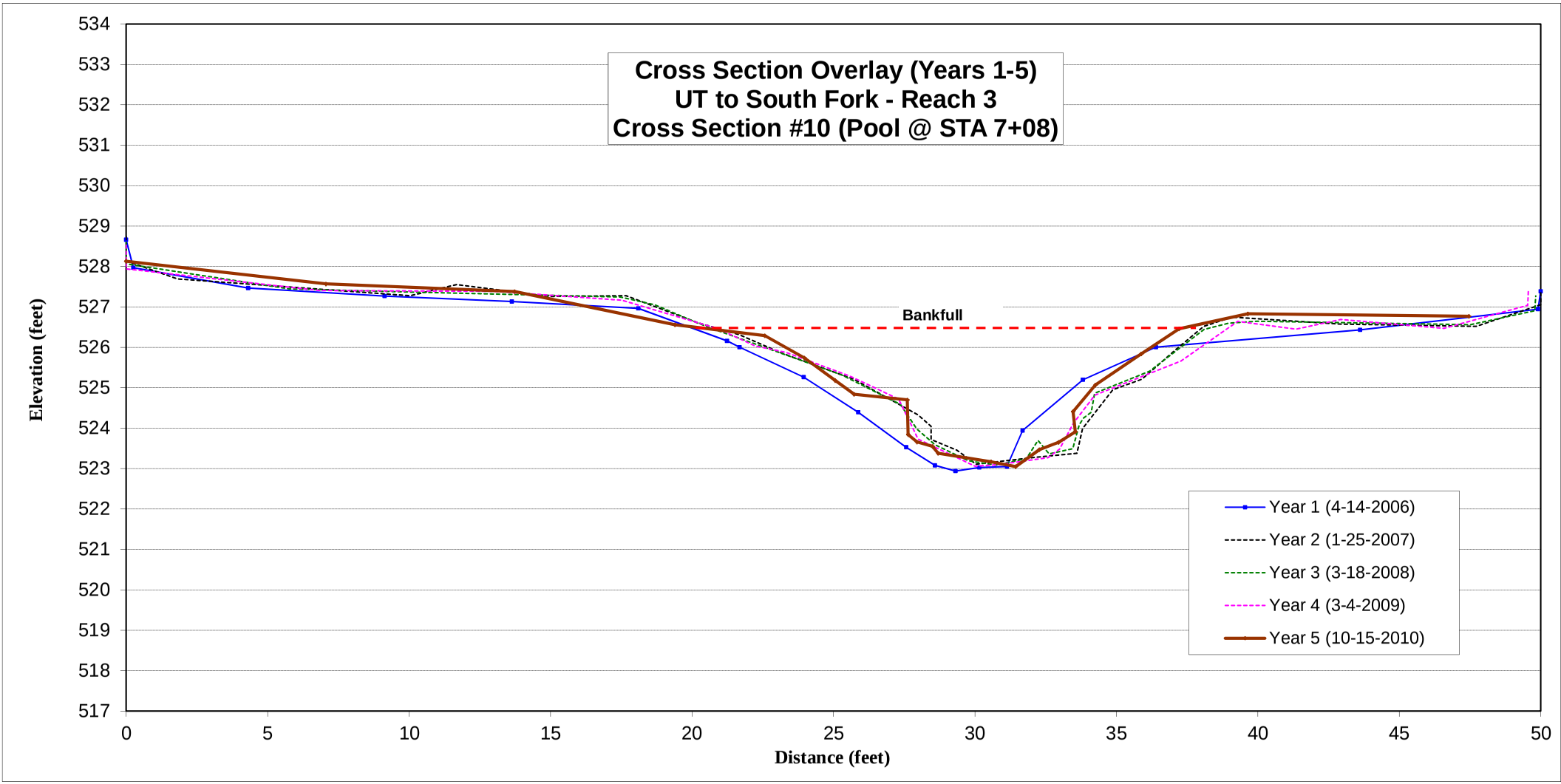

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 2
Cross Section #5 (Pool @ STA 5+92)
Bankfull
Elevation (feet)
Distance (feet)
543
542
541
540
539
538
537
536
535
534
533
532
531
530
529
528
527
526
525
0
5
10
15
20
25
30
35
40
45
50
55
Year 1 (4-06-2006)
Year 2 (2-19-2007)
Year 3 (3-11-2008)
Year 4 (2-17-2009)
Year 5 (10-15-2010)

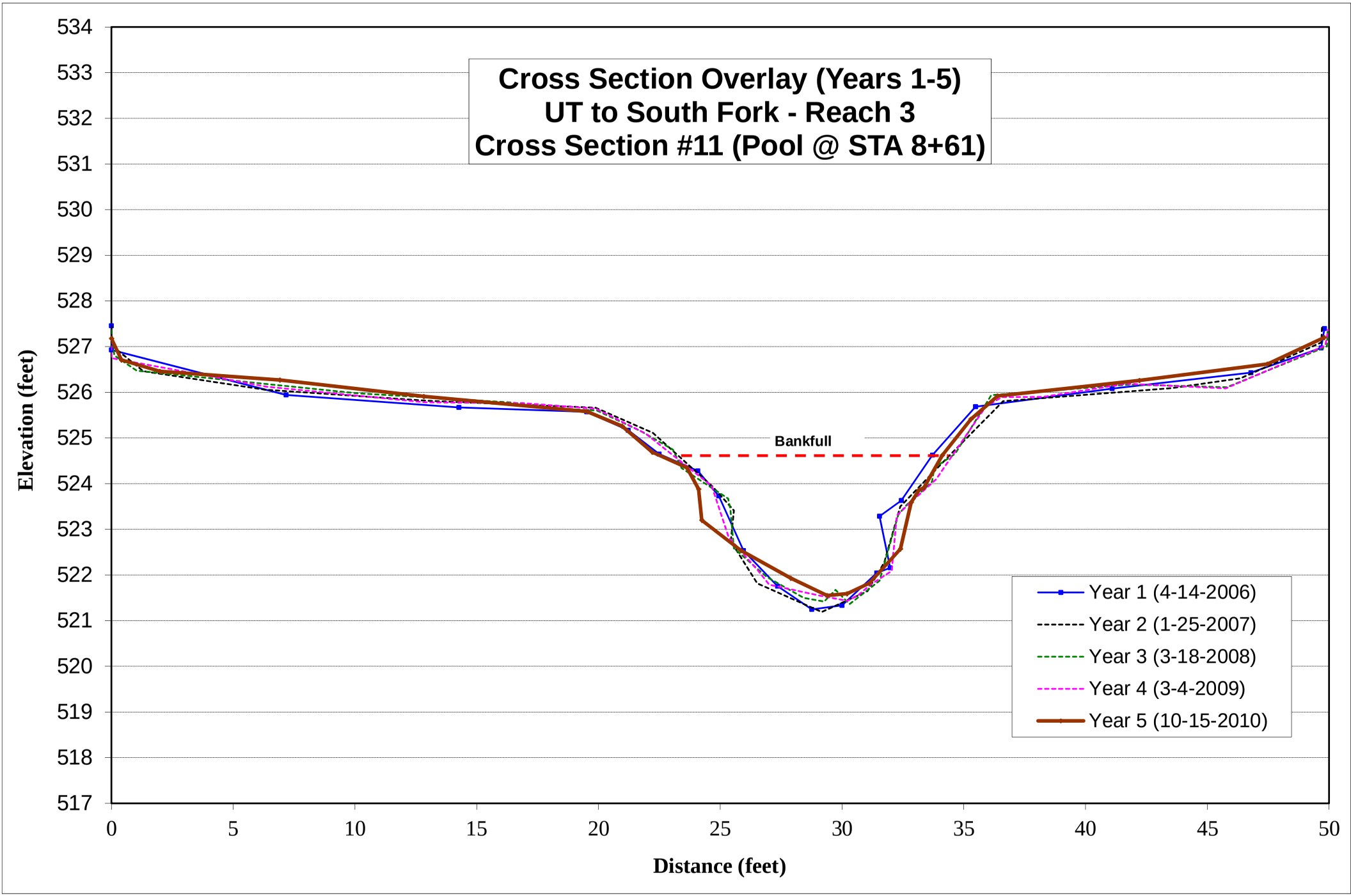

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 2
Cross Section #6 (Riffle @ STA 8+33)
Bankfull
Elevation (ft)
Distance (feet)
542
541
540
539
538
537
536
535
534
533
532
531
530
529
528
527
526
525
524
523
522
0
5
10
15
20
25
30
35
40
45
50
55
60
Year 1 (4-06-2006)
Year 2 (2-19-2007)
Year 3 (3-11-2008)
Year 4 (2-17-2009)
Year 5 (10-15-2010)

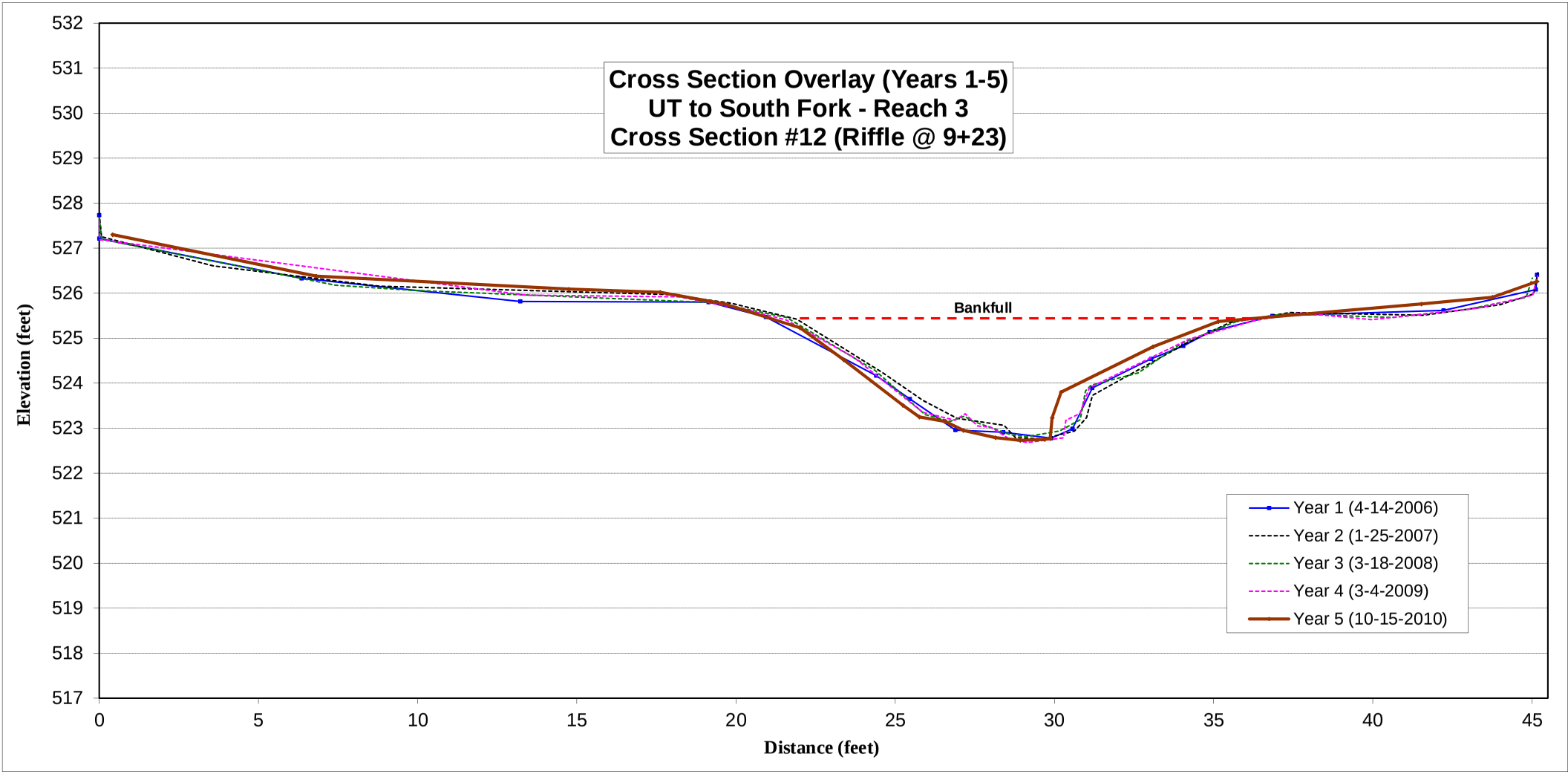

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 3
Cross Section #7 (Pool @ STA 0+58)
Bankfull
Elevation (ft)
Distance (feet)
537
536
535
534
533
532
531
530
529
528
527
526
525
524
523
522
521
520
0
5
10
15
20
25
30
35
40
45
50
Year 1 (4-14-2006)
Year 2 (1-25-2007)
Year 3 (3-18-2008)
Year 4 (2-26-2009)
Year 5 (10-15-2010)

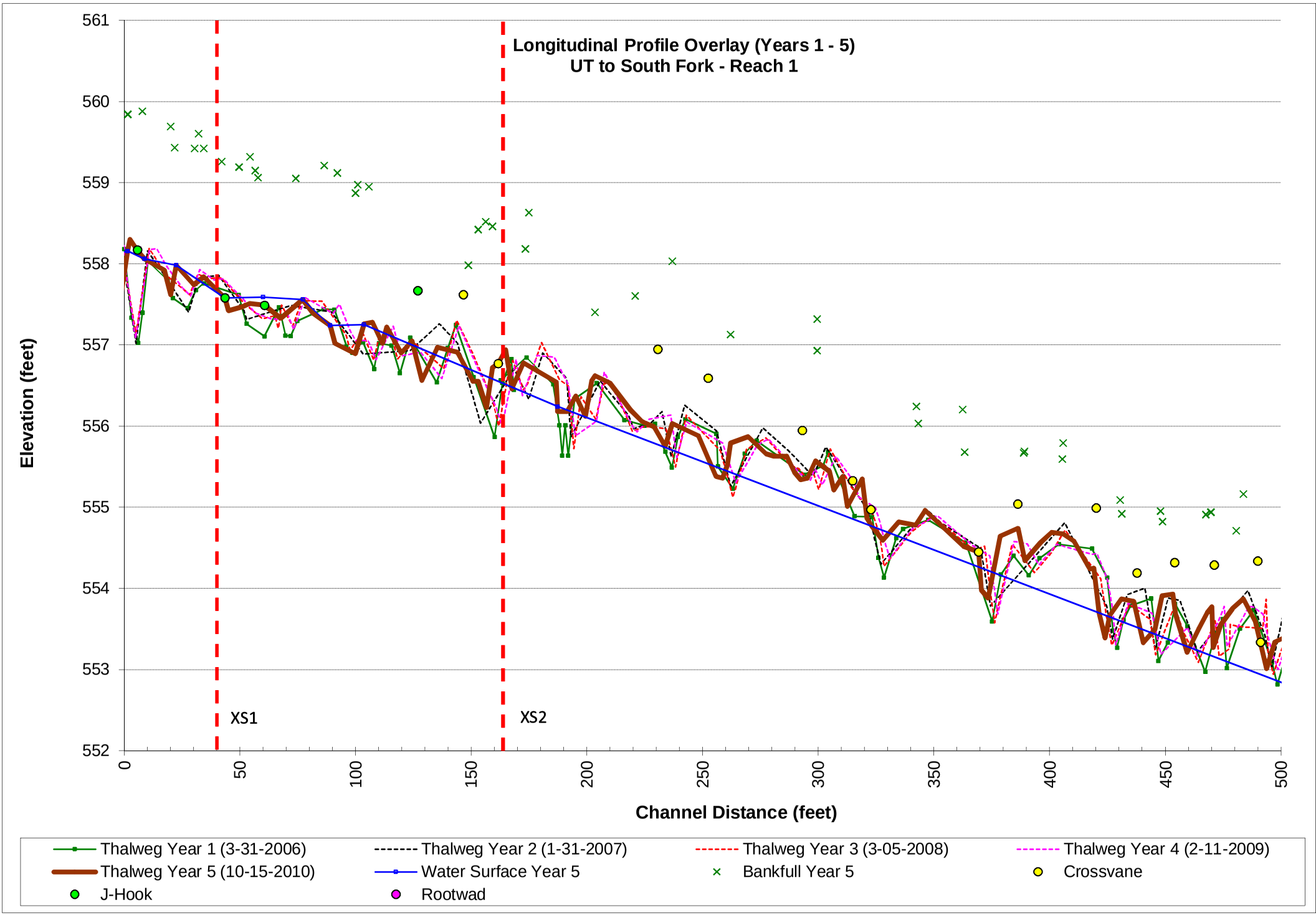

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 3
Cross Section #8 (Riffle @ STA 2+11)
Bankfull
Elevation (feet)
Distance (feet)
537
536
535
534
533
532
531
530
529
528
527
526
525
524
523
522
521
520
0
5
10
15
20
25
30
35
40
45
50
Year 1 (4-14-2006)
Year 2 (1-25-2007)
Year 3 (3-18-2008)
Year 4 (2-26-2009)
Year 5 (10-15-2010)

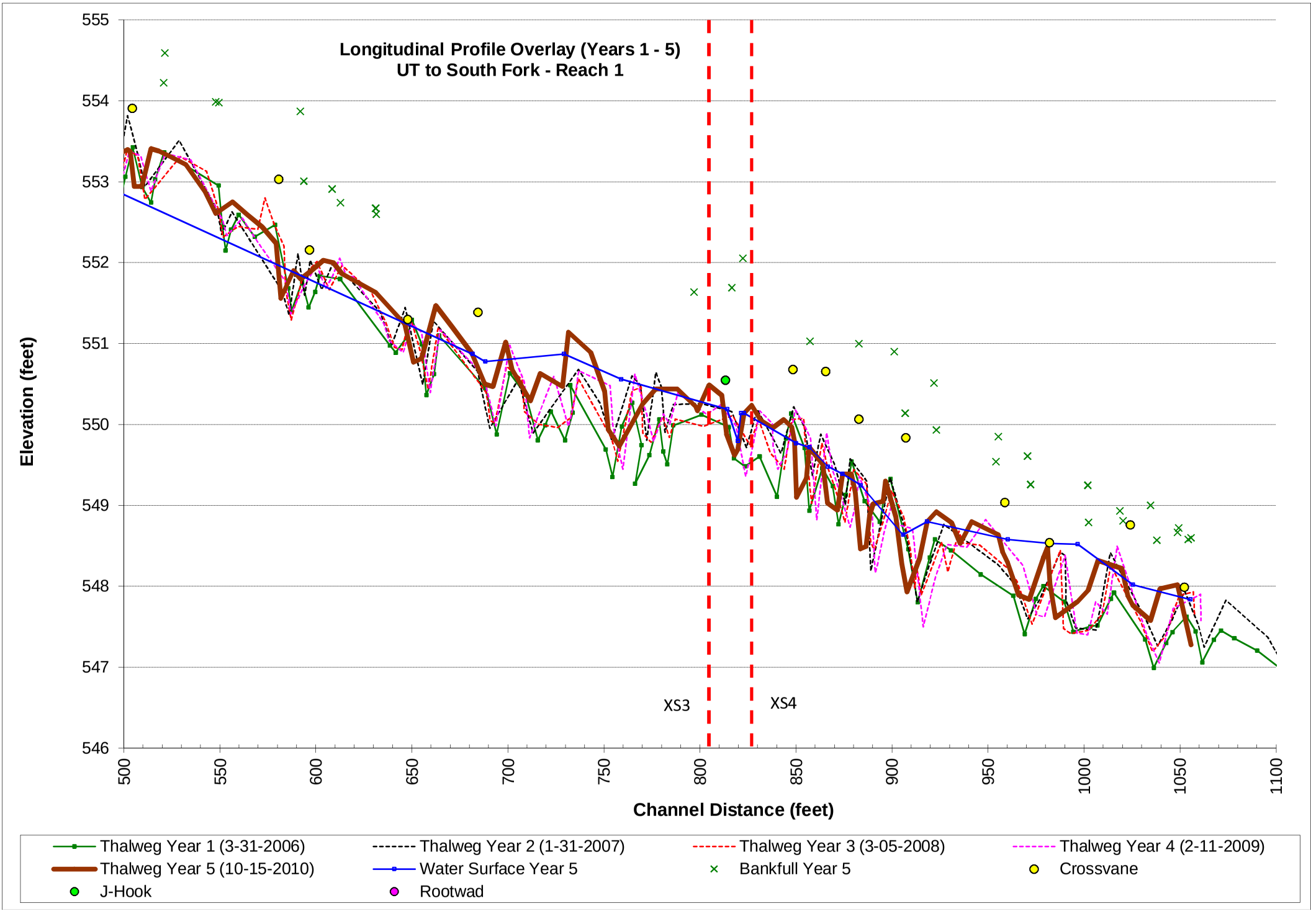

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 3
Cross Section #9 (Riffle @ STA 4+45)
Bankfull
Elevation (feet)
Distance (feet)
536
535
534
533
532
531
530
529
528
527
526
525
524
523
522
521
0
5
10
15
20
25
30
35
40
45
Year 1 (4-14-2006)
Year 2 (1-25-2007)
Year 3 (3-18-2008)
Year 4 (2-26-2009)
Year 5 (10-15-2010)

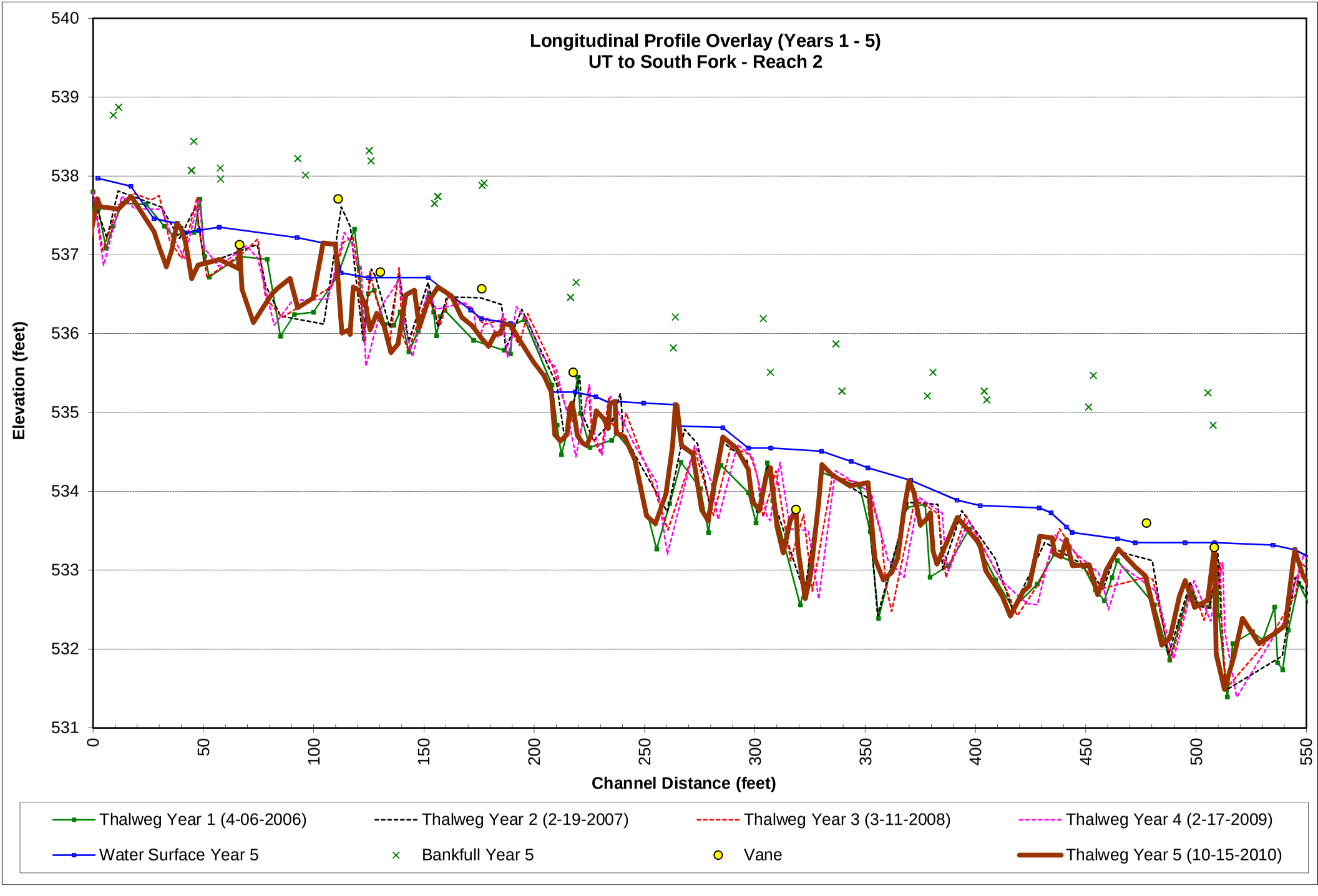

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 3
Cross Section #10 (Pool @ STA 7+08)
Bankfull
Elevation (feet)
Distance (feet)
534
533
532
531
530
529
528
527
526
525
524
523
522
521
520
519
518
517
0
5
10
15
20
25
30
35
40
45
50
Year 1 (4-14-2006)
Year 2 (1-25-2007)
Year 3 (3-18-2008)
Year 4 (3-4-2009)
Year 5 (10-15-2010)

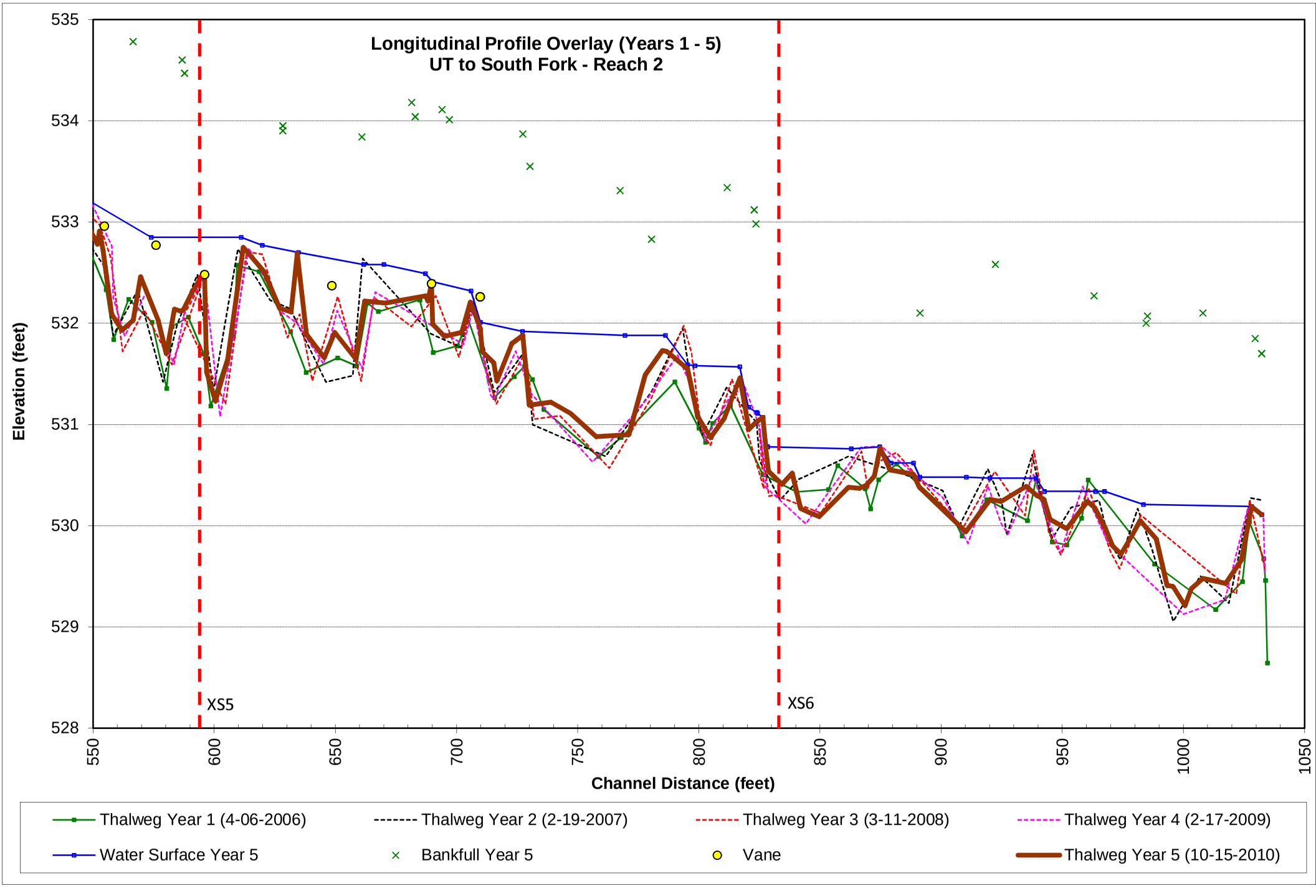

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 3
Cross Section #11 (Pool @ STA 8+61)
Elevation (feet)
Distance (feet)
Bankfull
534
533
532
531
530
529
528
527
526
525
524
523
522
521
520
519
518
517
0
5
10
15
20
25
30
35
40
45
50
Year 1 (4-14-2006)
Year 2 (1-25-2007)
Year 3 (3-18-2008)
Year 4 (3-4-2009)
Year 5 (10-15-2010)

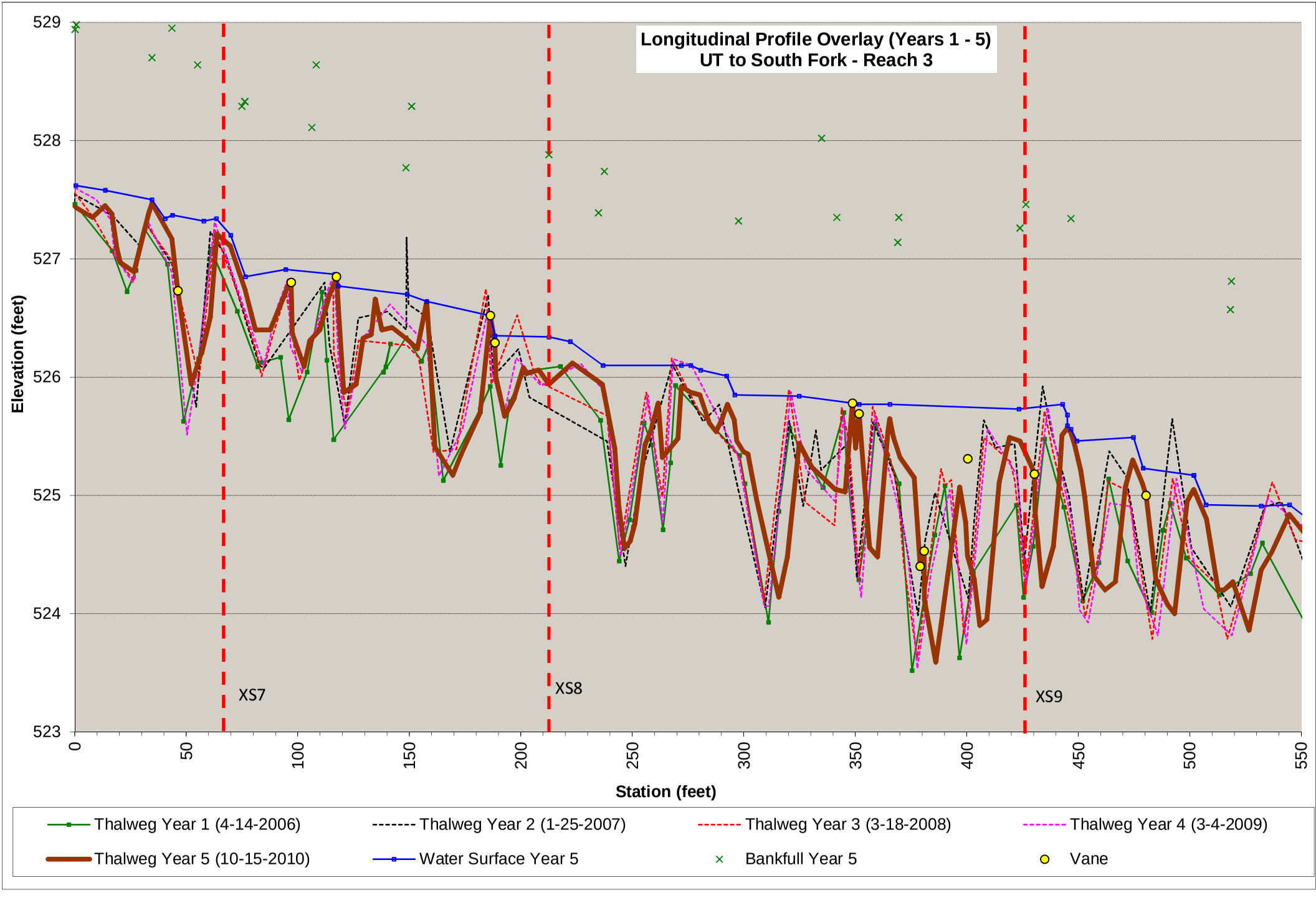

Cross Section Overlay (Years 1-5)
UT to South Fork - Reach 3
Cross Section #12 (Riffle @ 9+23)
Bankfull
Elevation (feet)
Distance (feet)
532
531
530
529
528
527
526
525
524
523
522
521
520
519
518
517
0
5
10
15
20
25
30
35
40
45
Year 1 (4-14-2006)
Year 2 (1-25-2007)
Year 3 (3-18-2008)
Year 4 (3-4-2009)
Year 5 (10-15-2010)

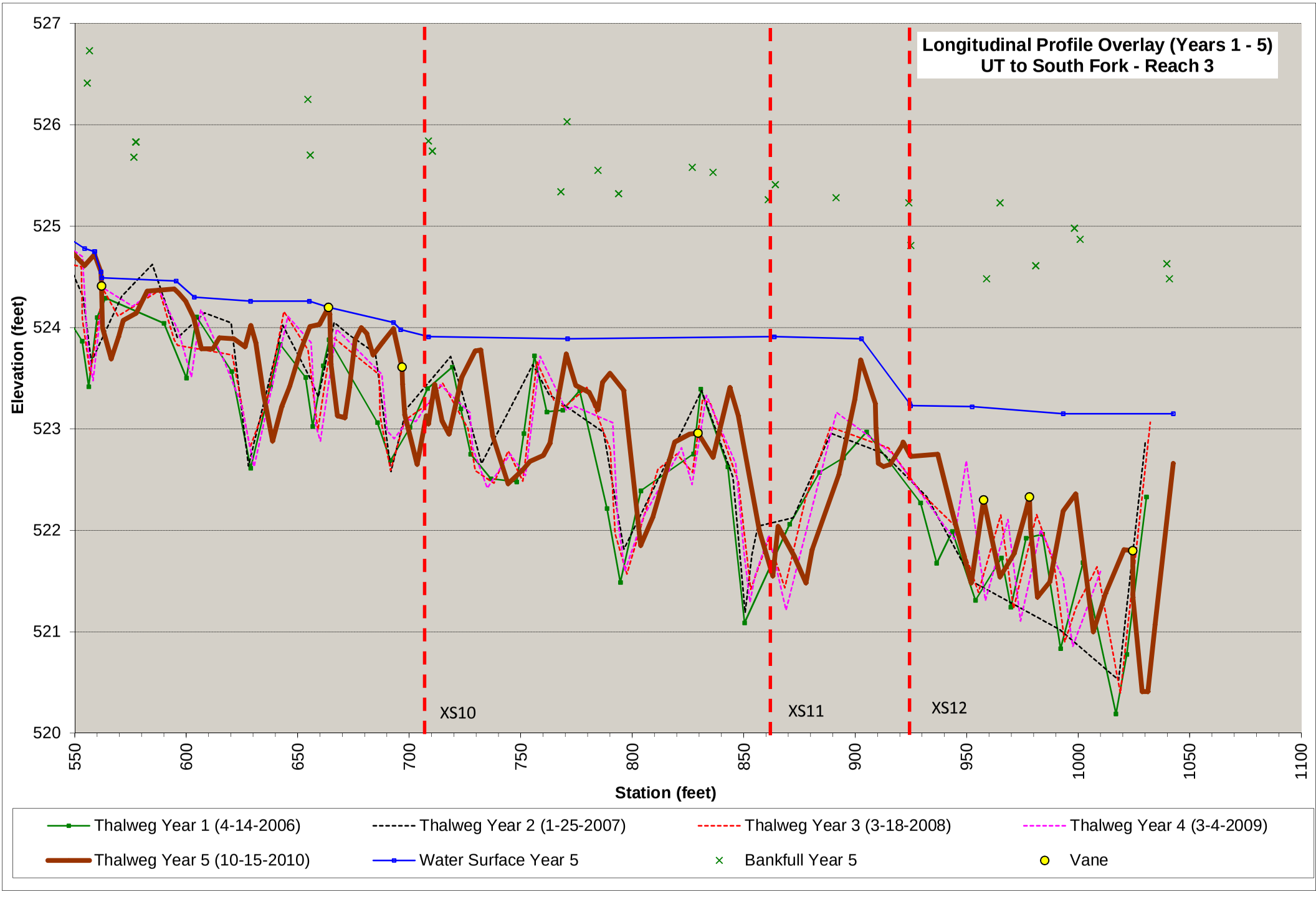

Longitudinal Profile Overlay (Years 1 - 5)
UT to South Fork - Reach 1
Elevation (feet)
561
560
559
558
557
556
555
554
553
552
XS1
XS2
0
50
100
150
200
250
300
350
400
450
500
Channel Distance (feet)
Thalweg Year 1 (3-31-2006)
Thalweg Year 2 (1-31-2007)
Thalweg Year 3 (3-05-2008)
Thalweg Year 4 (2-11-2009)
Thalweg Year 5 (10-15-2010)
Water Surface Year 5
Bankfull Year 5
Crossvane
J-Hook
Rootwad


Longitudinal Profile Overlay (Years 1 - 5)
UT to South Fork - Reach 1
Elevation (feet)
555
554
553
552
551
550
549
548
547
546
500
550
600
650
700
750
800
850
900
950
1000
1050
1100
Channel Distance (feet)
XS3
XS4
Thalweg Year 1 (3-31-2006)
Thalweg Year 2 (1-31-2007)
Thalweg Year 3 (3-05-2008)
Thalweg Year 4 (2-11-2009)
Thalweg Year 5 (10-15-2010)
Water Surface Year 5
Bankfull Year 5
Crossvane
J-Hook
Rootwad


Longitudinal Profile Overlay (Years 1 - 5)
UT to South Fork - Reach 2
Elevation (feet)
Channel Distance (feet)
540
539
538
537
536
535
534
533
532
531
0
50
100
150
200
250
300
350
400
450
500
550
Thalweg Year 1 (4-06-2006)
Thalweg Year 2 (2-19-2007)
Thalweg Year 3 (3-11-2008)
Thalweg Year 4 (2-17-2009)
Water Surface Year 5
Bankfull Year 5
Vane
Thalweg Year 5 (10-15-2010)


Longitudinal Profile Overlay (Years 1 - 5)
UT to South Fork - Reach 2
Elevation (feet)
535
534
533
532
531
530
529
528
550
600
650
700
750
800
850
900
950
1000
1050
Channel Distance (feet)
XS5
XS6
Thalweg Year 1 (4-06-2006)
Thalweg Year 2 (2-19-2007)
Thalweg Year 3 (3-11-2008)
Thalweg Year 4 (2-17-2009)
Water Surface Year 5
Bankfull Year 5
Vane
Thalweg Year 5 (10-15-2010)


Longitudinal Profile Overlay (Years 1 - 5)
UT to South Fork - Reach 3
Elevation (feet)
529
528
527
526
525
524
523
0
50
100
150
200
250
300
350
400
450
500
550
Station (feet)
XS7
XS8
XS9
Thalweg Year 1 (4-14-2006)
Thalweg Year 2 (1-25-2007)
Thalweg Year 3 (3-18-2008)
Thalweg Year 4 (3-4-2009)
Thalweg Year 5 (10-15-2010)
Water Surface Year 5
Bankfull Year 5
Vane


Longitudinal Profile Overlay (Years 1 - 5)
UT to South Fork - Reach 3
Elevation (feet)
Station (feet)
527
526
525
524
523
522
521
520
550
600
650
700
750
800
850
900
950
1000
1050
1100
XS10
XS11
XS12
Thalweg Year 1 (4-14-2006)
Thalweg Year 2 (1-25-2007)
Thalweg Year 3 (3-18-2008)
Thalweg Year 4 (3-4-2009)
Thalweg Year 5 (10-15-2010)
Water Surface Year 5
Bankfull Year 5
Vane

PEBBLE COUNT

Site: UT South Fork

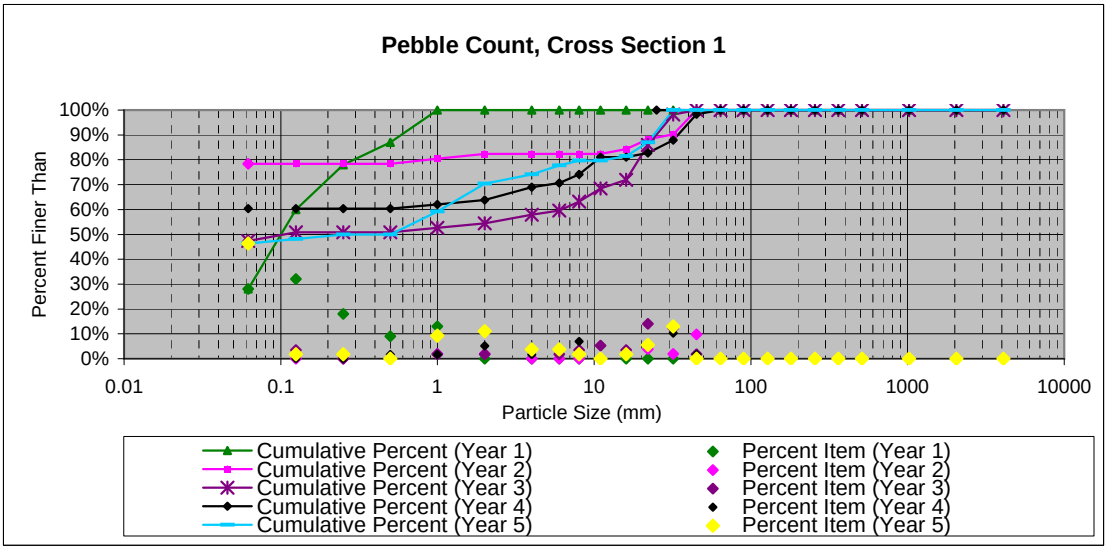
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 1	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	25	25	46%	46%
	Very Fine	.062-.125	SAND	1	1	2%	48%
	Fine	.125-.25	SAND	1	1	2%	50%
	Medium	.25-.50	SAND		0	0%	50%
	Coarse	.50-1.0	SAND	5	5	9%	59%
.04-.08	Very Coarse	1.0-2	SAND	6	6	11%	70%
.08-.16	Very Fine	2.0-4.0	GRAVEL	2	2	4%	74%
.16-.22	Fine	4-5.7	GRAVEL	2	2	4%	78%
.22-.31	Fine	5.7-8	GRAVEL	1	1	2%	80%
.31-.44	Medium	8-11.3	GRAVEL		0	0%	80%
.44-.63	Medium	11.3-16	GRAVEL	1	1	2%	81%
.63-.89	Coarse	16-22.6	GRAVEL	3	3	6%	87%
.89-1.26	Coarse	22.6-32	GRAVEL	7	7	13%	100%
1.26-1.77	Very Coarse	32-45	GRAVEL		0	0%	100%
1.77-2.5	Very Coarse	45-64	GRAVEL		0	0%	100%
2.5-3.5	Small	64-90	COBBLE		0	0%	100%
3.5-5.0	Small	90-128	COBBLE		0	0%	100%
5.0-7.1	Large	128-180	COBBLE		0	0%	100%
7.1-10.1	Large	180-256	COBBLE		0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	54	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

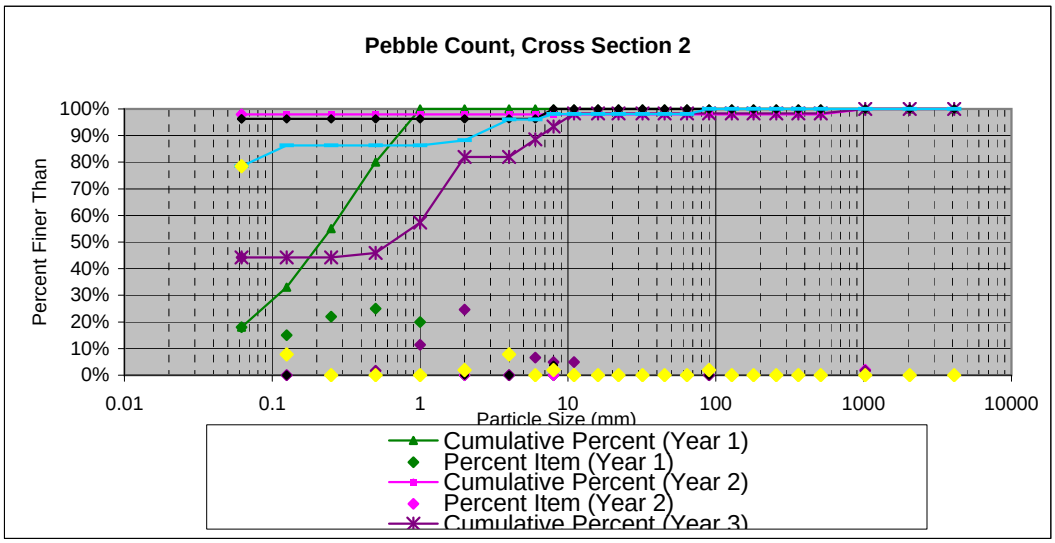
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 2	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	40	40	78%	78%
	Very Fine	.062-.125	SAND	4	4	8%	86%
	Fine	.125-.25			0	0%	86%
	Medium	.25-.50			0	0%	86%
	Coarse	.50-1.0			0	0%	86%
.04-.08	Very Coarse	1.0-2		1	1	2%	88%
.08-.16	Very Fine	2.0-4.0	GRAVEL	4	4	8%	96%
.16-.22	Fine	4-5.7			0	0%	96%
.22-.31	Fine	5.7-8		1	1	2%	98%
.31-.44	Medium	8-11.3			0	0%	98%
.44-.63	Medium	11.3-16			0	0%	98%
.63-.89	Coarse	16-22.6			0	0%	98%
.89-1.26	Coarse	22.6-32			0	0%	98%
1.26-1.77	Very Coarse	32-45			0	0%	98%
1.77-2.5	Very Coarse	45-64			0	0%	98%
2.5-3.5	Small	64-90	COBBLE	1	1	2%	100%
3.5-5.0	Small	90-128			0	0%	100%
5.0-7.1	Large	128-180			0	0%	100%
7.1-10.1	Large	180-256			0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512			0	0%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	51	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

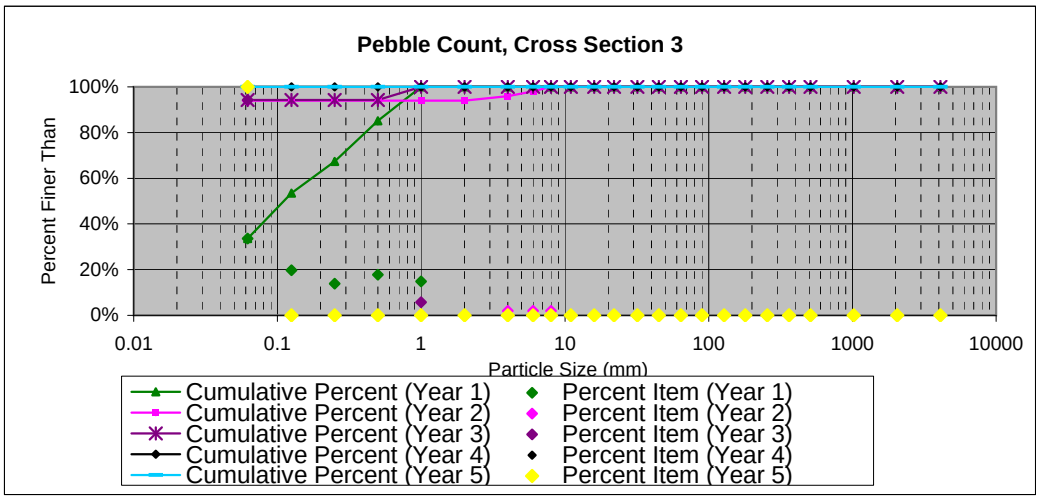
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 3	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	50	50	100%	100%
	Very Fine	.062-.125	SAND		0	0%	100%
	Fine	.125-.25			0	0%	100%
	Medium	.25-.50			0	0%	100%
	Coarse	.50-1.0			0	0%	100%
.04-.08	Very Coarse	1.0-2			0	0%	100%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	100%
.16-.22	Fine	4-5.7			0	0%	100%
.22-.31	Fine	5.7-8			0	0%	100%
.31-.44	Medium	8-11.3			0	0%	100%
.44-.63	Medium	11.3-16			0	0%	100%
.63-.89	Coarse	16-22.6			0	0%	100%
.89-1.26	Coarse	22.6-32			0	0%	100%
1.26-1.77	Very Coarse	32-45			0	0%	100%
1.77-2.5	Very Coarse	45-64			0	0%	100%
2.5-3.5	Small	64-90	COBBLE		0	0%	100%
3.5-5.0	Small	90-128			0	0%	100%
5.0-7.1	Large	128-180			0	0%	100%
7.1-10.1	Large	180-256			0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512			0	0%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	50	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

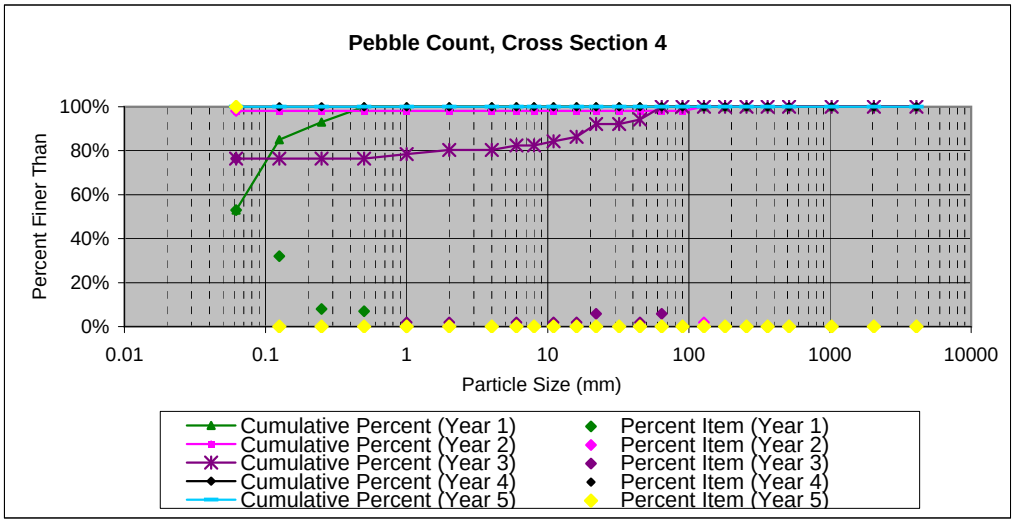
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 4	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	50	50	100%	100%
	Very Fine	.062-.125	SAND		0	0%	100%
	Fine	.125-.25			0	0%	100%
	Medium	.25-.50			0	0%	100%
	Coarse	.50-1.0			0	0%	100%
.04-.08	Very Coarse	1.0-2			0	0%	100%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	100%
.16-.22	Fine	4-5.7			0	0%	100%
.22-.31	Fine	5.7-8			0	0%	100%
.31-.44	Medium	8-11.3			0	0%	100%
.44-.63	Medium	11.3-16			0	0%	100%
.63-.89	Coarse	16-22.6			0	0%	100%
.89-1.26	Coarse	22.6-32			0	0%	100%
1.26-1.77	Very Coarse	32-45			0	0%	100%
1.77-2.5	Very Coarse	45-64			0	0%	100%
2.5-3.5	Small	64-90	COBBLE		0	0%	100%
3.5-5.0	Small	90-128			0	0%	100%
5.0-7.1	Large	128-180			0	0%	100%
7.1-10.1	Large	180-256			0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512			0	0%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	50	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

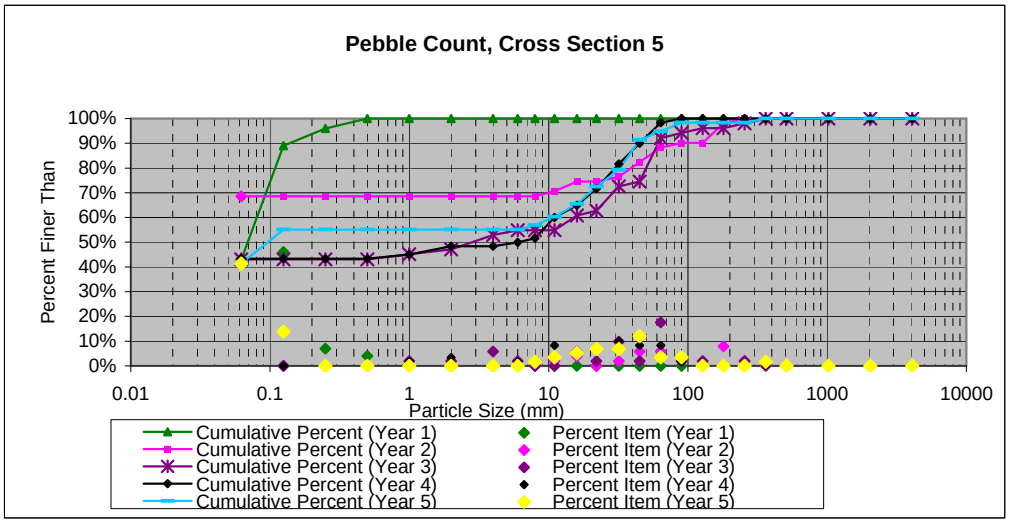
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 5	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	24	24	41%	41%
	Very Fine	.062-.125	SAND	8	8	14%	55%
	Fine	.125-.25			0	0%	55%
	Medium	.25-.50			0	0%	55%
	Coarse	.50-1.0			0	0%	55%
.04-.08	Very Coarse	1.0-2			0	0%	55%
.08-.16	Very Fine	2.0-4.0			0	0%	55%
.16-.22	Fine	4-5.7			0	0%	55%
.22-.31	Fine	5.7-8	GRAVEL	1	1	2%	57%
.31-.44	Medium	8-11.3		2	2	3%	60%
.44-.63	Medium	11.3-16		3	3	5%	66%
.63-.89	Coarse	16-22.6		4	4	7%	72%
.89-1.26	Coarse	22.6-32		4	4	7%	79%
1.26-1.77	Very Coarse	32-45		7	7	12%	91%
1.77-2.5	Very Coarse	45-64		2	2	3%	95%
2.5-3.5	Small	64-90	COBBLE	2	2	3%	98%
3.5-5.0	Small	90-128			0	0%	98%
5.0-7.1	Large	128-180			0	0%	98%
7.1-10.1	Large	180-256			0	0%	98%
10.1-14.3	Small	256-362	BOULDER	1	1	2%	100%
14.3-20	Small	362-512			0	0%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	58	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

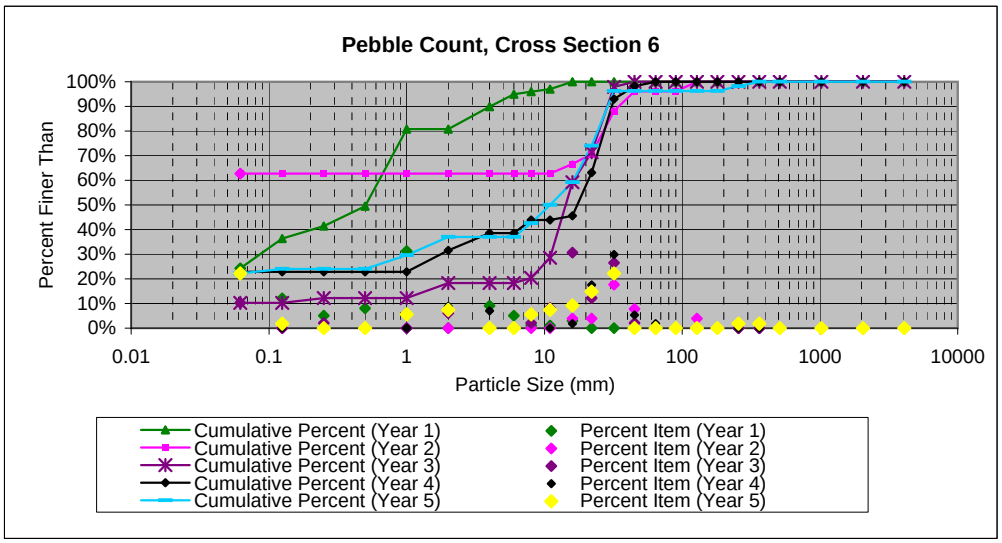
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 6	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	12	12	22%	22%
	Very Fine	.062-.125	SAND	1	1	2%	24%
	Fine	.125-.25			0	0%	24%
	Medium	.25-.50			0	0%	24%
	Coarse	.50-1.0		3	3	6%	30%
.04-.08	Very Coarse	1.0-2		4	4	7%	37%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	37%
.16-.22	Fine	4-5.7			0	0%	37%
.22-.31	Fine	5.7-8		3	3	6%	43%
.31-.44	Medium	8-11.3		4	4	7%	50%
.44-.63	Medium	11.3-16		5	5	9%	59%
.63-.89	Coarse	16-22.6		8	8	15%	74%
.89-1.26	Coarse	22.6-32		12	12	22%	96%
1.26-1.77	Very Coarse	32-45			0	0%	96%
1.77-2.5	Very Coarse	45-64			0	0%	96%
2.5-3.5	Small	64-90	COBBLE		0	0%	96%
3.5-5.0	Small	90-128			0	0%	96%
5.0-7.1	Large	128-180			0	0%	96%
7.1-10.1	Large	180-256		1	1	2%	98%
10.1-14.3	Small	256-362	BOULDER	1	1	2%	100%
14.3-20	Small	362-512			0	0%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	54	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

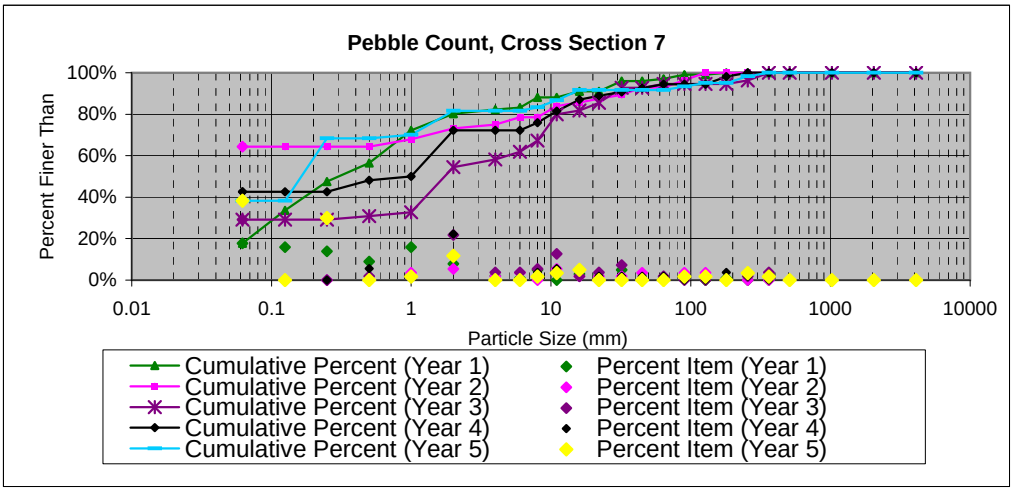
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 7	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	23	23	38%	38%
	Very Fine	.062-.125	SAND		0	0%	38%
	Fine	.125-.25	SAND	18	18	30%	68%
	Medium	.25-.50	SAND		0	0%	68%
	Coarse	.50-1.0	SAND	1	1	2%	70%
.04-.08	Very Coarse	1.0-2	SAND	7	7	12%	82%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	82%
.16-.22	Fine	4-5.7	GRAVEL		0	0%	82%
.22-.31	Fine	5.7-8	GRAVEL	1	1	2%	83%
.31-.44	Medium	8-11.3	GRAVEL	2	2	3%	87%
.44-.63	Medium	11.3-16	GRAVEL	3	3	5%	92%
.63-.89	Coarse	16-22.6	GRAVEL		0	0%	92%
.89-1.26	Coarse	22.6-32	GRAVEL		0	0%	92%
1.26-1.77	Very Coarse	32-45	GRAVEL		0	0%	92%
1.77-2.5	Very Coarse	45-64	GRAVEL		0	0%	92%
2.5-3.5	Small	64-90	COBBLE	1	1	2%	93%
3.5-5.0	Small	90-128	COBBLE	1	1	2%	95%
5.0-7.1	Large	128-180	COBBLE		0	0%	95%
7.1-10.1	Large	180-256	COBBLE	2	2	3%	98%
10.1-14.3	Small	256-362	BOULDER	1	1	2%	100%
14.3-20	Small	362-512	BOULDER		0	0%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	60	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

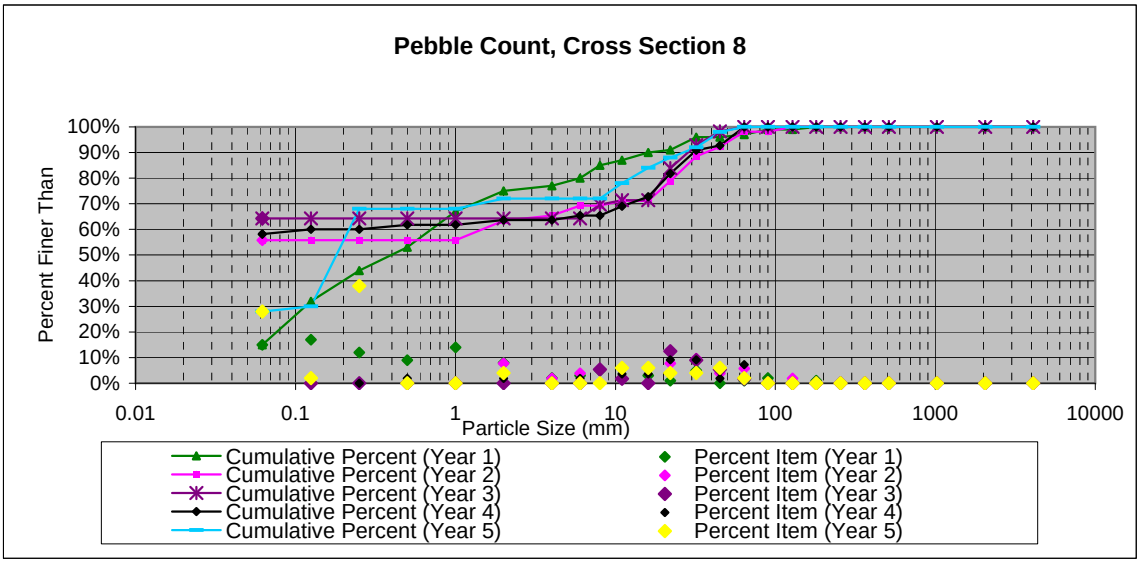
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 8	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	14	14	28%	28%
	Very Fine	.062-.125	SAND	1	1	2%	30%
	Fine	.125-.25		19	19	38%	68%
	Medium	.25-.50			0	0%	68%
	Coarse	.50-1.0			0	0%	68%
.04-.08	Very Coarse	1.0-2		2	2	4%	72%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	72%
.16-.22	Fine	4-5.7			0	0%	72%
.22-.31	Fine	5.7-8			0	0%	72%
.31-.44	Medium	8-11.3		3	3	6%	78%
.44-.63	Medium	11.3-16		3	3	6%	84%
.63-.89	Coarse	16-22.6		2	2	4%	88%
.89-1.26	Coarse	22.6-32		2	2	4%	92%
1.26-1.77	Very Coarse	32-45		3	3	6%	98%
1.77-2.5	Very Coarse	45-64		1	1	2%	100%
2.5-3.5	Small	64-90	COBBLE		0	0%	100%
3.5-5.0	Small	90-128			0	0%	100%
5.0-7.1	Large	128-180			0	0%	100%
7.1-10.1	Large	180-256			0	0%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512			0	0%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	50	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

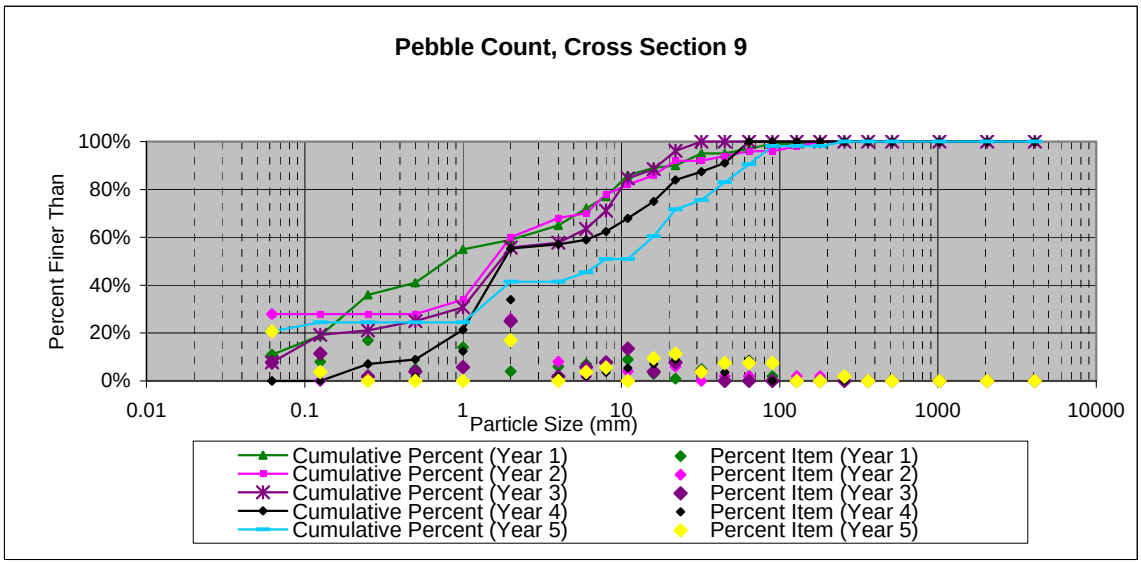
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 9	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	11	11	21%	21%
	Very Fine	.062-.125	SAND	2	2	4%	25%
	Fine	.125-.25			0	0%	25%
	Medium	.25-.50			0	0%	25%
	Coarse	.50-1.0			0	0%	25%
.04-.08	Very Coarse	1.0-2		9	9	17%	42%
.08-.16	Very Fine	2.0-4.0			0	0%	42%
.16-.22	Fine	4-5.7	GRAVEL	2	2	4%	45%
.22-.31	Fine	5.7-8		3	3	6%	51%
.31-.44	Medium	8-11.3			0	0%	51%
.44-.63	Medium	11.3-16		5	5	9%	60%
.63-.89	Coarse	16-22.6		6	6	11%	72%
.89-1.26	Coarse	22.6-32		2	2	4%	75%
1.26-1.77	Very Coarse	32-45		4	4	8%	83%
1.77-2.5	Very Coarse	45-64		4	4	8%	91%
2.5-3.5	Small	64-90	COBBLE	4	4	8%	98%
3.5-5.0	Small	90-128			0	0%	98%
5.0-7.1	Large	128-180			0	0%	98%
7.1-10.1	Large	180-256		1	1	2%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512			0	0%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	53	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

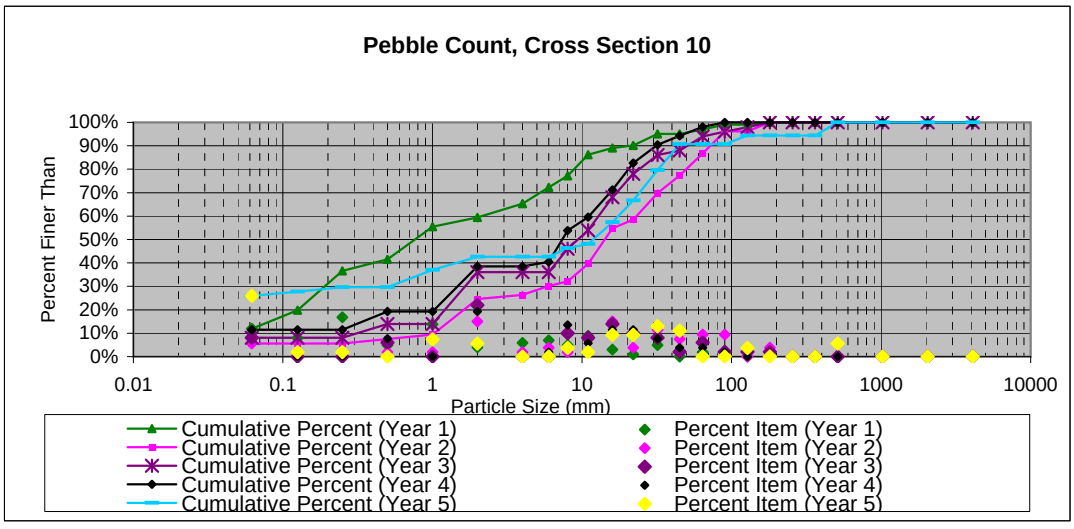
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 10	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	14	14	26%	26%
	Very Fine	.062-.125	SAND	1	1	2%	28%
	Fine	.125-.25		1	1	2%	30%
	Medium	.25-.50			0	0%	30%
	Coarse	.50-1.0		4	4	7%	37%
.04-.08	Very Coarse	1.0-2		3	3	6%	43%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	43%
.16-.22	Fine	4-5.7			0	0%	43%
.22-.31	Fine	5.7-8		2	2	4%	46%
.31-.44	Medium	8-11.3		1	1	2%	48%
.44-.63	Medium	11.3-16		5	5	9%	57%
.63-.89	Coarse	16-22.6		5	5	9%	67%
.89-1.26	Coarse	22.6-32		7	7	13%	80%
1.26-1.77	Very Coarse	32-45		6	6	11%	91%
1.77-2.5	Very Coarse	45-64			0	0%	91%
2.5-3.5	Small	64-90	COBBLE		0	0%	91%
3.5-5.0	Small	90-128		2	2	4%	94%
5.0-7.1	Large	128-180			0	0%	94%
7.1-10.1	Large	180-256			0	0%	94%
10.1-14.3	Small	256-362	BOULDER		0	0%	94%
14.3-20	Small	362-512		3	3	6%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	54	**100%**	**100%**



PEBBLE COUNT

Site: UT South Fork

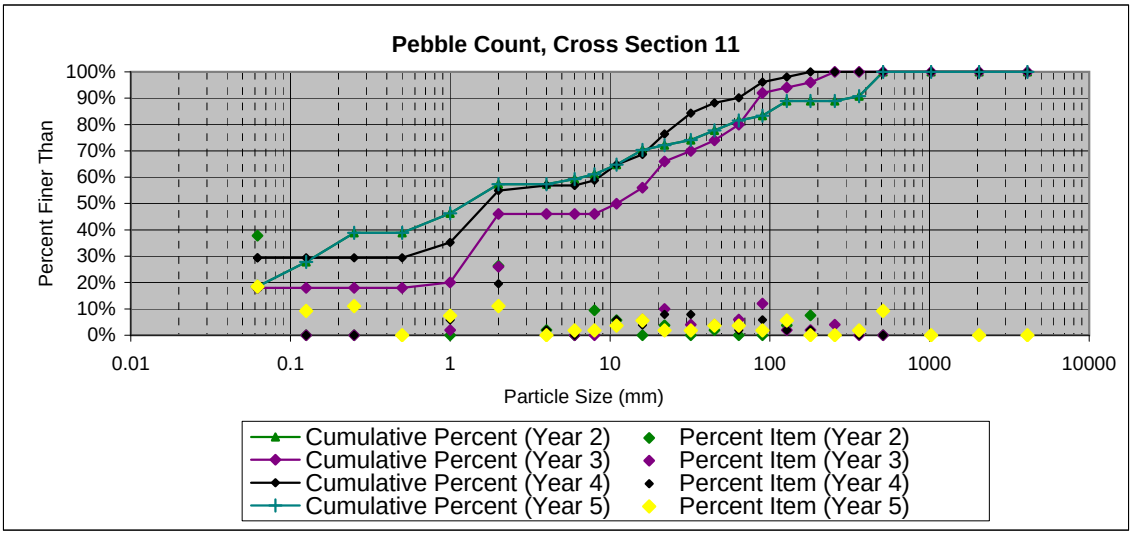
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 11	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	10	10	19%	19%
	Very Fine	.062-.125	SAND	5	5	9%	28%
	Fine	.125-.25	SAND	6	6	11%	39%
	Medium	.25-.50	SAND		0	0%	39%
	Coarse	.50-1.0	SAND	4	4	7%	46%
.04-.08	Very Coarse	1.0-2	SAND	6	6	11%	57%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	57%
.16-.22	Fine	4-5.7	GRAVEL	1	1	2%	59%
.22-.31	Fine	5.7-8	GRAVEL	1	1	2%	61%
.31-.44	Medium	8-11.3	GRAVEL	2	2	4%	65%
.44-.63	Medium	11.3-16	GRAVEL	3	3	6%	70%
.63-.89	Coarse	16-22.6	GRAVEL	1	1	2%	72%
.89-1.26	Coarse	22.6-32	GRAVEL	1	1	2%	74%
1.26-1.77	Very Coarse	32-45	GRAVEL	2	2	4%	78%
1.77-2.5	Very Coarse	45-64	GRAVEL	2	2	4%	81%
2.5-3.5	Small	64-90	COBBLE	1	1	2%	83%
3.5-5.0	Small	90-128	COBBLE	3	3	6%	89%
5.0-7.1	Large	128-180	COBBLE		0	0%	89%
7.1-10.1	Large	180-256	COBBLE		0	0%	89%
10.1-14.3	Small	256-362	BOULDER	1	1	2%	91%
14.3-20	Small	362-512	BOULDER	5	5	9%	100%
20-40	Medium	512-1024	BOULDER		0	0%	100%
40-80	Large	1024-2048	BOULDER		0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	54	**100%**	**100%**



*Year 1 data not available.

PEBBLE COUNT

Site: UT South Fork

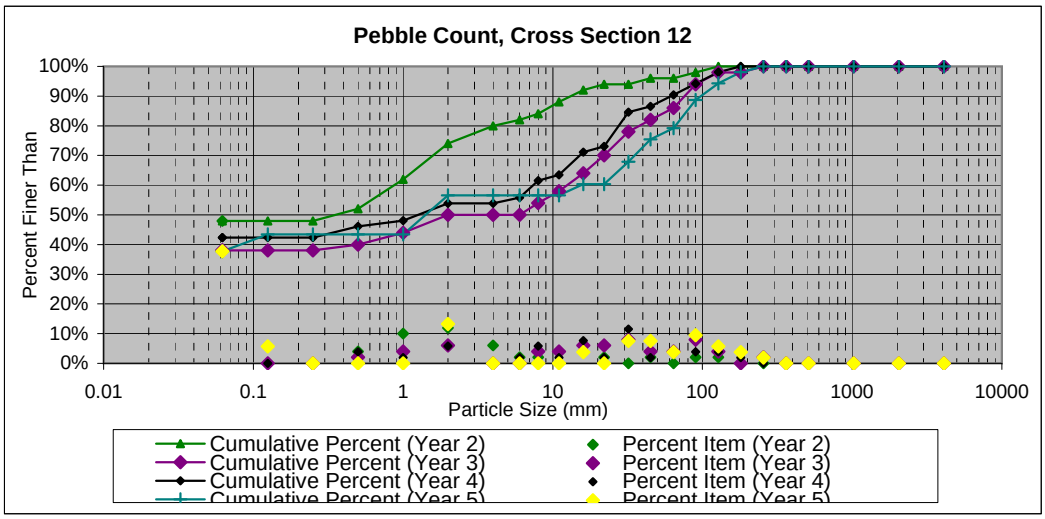
Party: PDB / JW

Date: 11/11/2010

SEPI ENGINEERING GROUP

PARTICLE COUNT

Inches	Particle	Millimeters		CS 12	TOT#	ITEM %	% CUM
	Silt/Clay	< 0.062	**S/C**	20	20	38%	38%
	Very Fine	.062-.125	SAND	3	3	6%	43%
	Fine	.125-.25			0	0%	43%
	Medium	.25-.50			0	0%	43%
	Coarse	.50-1.0			0	0%	43%
.04-.08	Very Coarse	1.0-2		7	7	13%	57%
.08-.16	Very Fine	2.0-4.0	GRAVEL		0	0%	57%
.16-.22	Fine	4-5.7			0	0%	57%
.22-.31	Fine	5.7-8			0	0%	57%
.31-.44	Medium	8-11.3			0	0%	57%
.44-.63	Medium	11.3-16		2	2	4%	60%
.63-.89	Coarse	16-22.6			0	0%	60%
.89-1.26	Coarse	22.6-32		4	4	8%	68%
1.26-1.77	Very Coarse	32-45		4	4	8%	75%
1.77-2.5	Very Coarse	45-64		2	2	4%	79%
2.5-3.5	Small	64-90	COBBLE	5	5	9%	89%
3.5-5.0	Small	90-128		3	3	6%	94%
5.0-7.1	Large	128-180		2	2	4%	98%
7.1-10.1	Large	180-256		1	1	2%	100%
10.1-14.3	Small	256-362	BOULDER		0	0%	100%
14.3-20	Small	362-512			0	0%	100%
20-40	Medium	512-1024			0	0%	100%
40-80	Large	1024-2048			0	0%	100%
	Bedrock		**BDRK**		0	0%	100%
				TOTALS →	53	**100%**	**100%**



*Year 1 data not available.

Table 8 a. Baseline Morphology and Hydraulic Summary

UT to South Fork (Restoration Subreach 1)

Project Number 435

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built*		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension																		
BF Width (ft)	28.00	30.00	29.00				3.00	3.40	3.20	6.50	10.00	8.00	N/A	N/A	9.40			
Floodprone Width (ft)	40.00	100.00	70.00				N/A	N/A	10.00	16.00	22.00	18.80	N/A	N/A	>33			
BFCross Sectional Area (ft)	58.60	58.90	58.80				2.90	3.60	3.20	3.90	6.30	5.30	N/A	N/A	5.90			
BF Mean Depth (ft)	2.00	2.10	2.00				1.00	1.10	1.00	0.40	1.00	0.70	N/A	N/A	0.60			
Max Depth (ft)	2.70	3.00	2.90				1.00	1.80	1.40	0.90	1.40	1.10	0.80	1.30	1.00			
Width/Depth Ratio	13.00	15.00	14.00				N/A	N/A	3.00	7.00	26.00	13.50	N/A	N/A	15.00			
Entrenchment Ratio	1.30	3.60	2.40				2.90	3.30	3.10	2.00	3.40	2.40	N/A	N/A	>2.2			
Bank Height Ratio	N/A	N/A	N/A				0.60	3.10	1.80	1.40	2.50	1.80	N/A	N/A	1.00			
Wetted Perimeter (ft)	32.00	34.20	33.00				5.00	5.60	5.20	7.30	12.00	9.40	N/A	N/A	10.60			
Hydraulic radius (ft)	1.83	1.72	1.78				0.58	0.64	0.62	0.53	0.53	0.56	N/A	N/A	0.56			
Pattern																		
Channel Beltwidth (ft)	N/A	N/A	N/A				22.00	122.00	48.90	10.00	35.00	20.90	12.20	41.40	24.50			
Radius of Curvature (ft)	N/A	N/A	N/A				7.00	100.00	26.10	2.30	31.80	13.50	2.80	37.60	15.10			
Meander Wavelenght (ft)	N/A	N/A	N/A				21.00	282.00	136.70	35.00	70.00	50.00	41.40	82.80	59.30			
Meander Width Ratio	N/A	N/A	N/A				6.90	38.10	15.30	1.30	4.40	2.60	1.30	4.40	2.60			
Profile																		
Riffle length (ft)	N/A	N/A	N/A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Riffle slope (ft/ft)	N/A	N/A	N/A				0.01	0.03	0.02	0.02	0.08	0.04	0.01	0.04	0.02			
Pool length (ft)	N/A	N/A	N/A				3.80	27.60	11.70	7.00	27.00	14.50	8.50	32.00	16.90			
Pool spacing (ft)	N/A	N/A	N/A				23.20	165.60	75.40	17.00	63.00	36.50	19.80	74.30	43.30			
Substrate																		
d50 (mm)	N/A	N/A	N/A				N/A	N/A	13.00	N/A	N/A	4.50	N/A	N/A	N/A			
d84 (mm)	N/A	N/A	N/A				N/A	N/A	44.00	N/A	N/A	33.00	N/A	N/A	N/A			
Additional Reach Parameters																		
Valley Length (ft)	N/A	N/A	N/A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Channel Length (ft)	N/A	N/A	N/A				N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A			
Sinuosity	N/A	N/A	N/A				N/A	N/A	1.22	N/A	N/A	1.40	N/A	N/A	1.26			
Water Surface Slope (ft/ft)	N/A	N/A	0.00				N/A	N/A	0.01	N/A	N/A	0.02	N/A	N/A	0.01			
BF slope (ft/ft)	N/A	N/A	0.00				N/A	N/A	0.01	N/A	N/A	0.02	N/A	N/A	0.01			
Rosgen Classification	N/A	N/A	B/C				N/A	N/A	E 4/1	N/A	N/A	C/E 4/1	N/A	N/A	C/E 4/1			
*Habitat Index																		
*Macrobenthos																		

*As-built information is unavailable to SEPI at this time.

Table 8 b. Baseline Morphology and Hydraulic Summary

UT to South Fork (Restoration Subreach 2)

Project Number 435

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built*		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension																		
BF Width (ft)	**28.00**	**30.00**	**29.00**				**N/A**	**N/A**	**9.00**	**6.50**	**10.00**	**8.00**	**N/A**	**N/A**	**12.20**			
Floodprone Width (ft)	**40.00**	**100.00**	**70.00**				**N/A**	**N/A**	**68.00**	**16.00**	**22.00**	**18.80**	**N/A**	**N/A**	**>26.8**			
BFCross Sectional Area (ft)	**58.60**	**58.90**	**58.80**				**N/A**	**N/A**	**10.20**	**3.90**	**6.30**	**5.30**	**N/A**	**N/A**	**10.00**			
BF Mean Depth (ft)	**2.00**	**2.10**	**2.00**				**N/A**	**N/A**	**1.10**	**0.40**	**1.00**	**0.70**	**N/A**	**N/A**	**0.80**			
Max Depth (ft)	**2.70**	**3.00**	**2.90**				**1.00**	**2.10**	**1.50**	**0.90**	**1.40**	**1.10**	**1.00**	**1.60**	**1.30**			
Width/Depth Ratio	**13.00**	**15.00**	**14.00**				**N/A**	**N/A**	**8.00**	**7.00**	**26.00**	**13.50**	**N/A**	**N/A**	**15.00**			
Entrenchment Ratio	**1.30**	**3.60**	**2.40**				**N/A**	**N/A**	**7.60**	**2.00**	**3.40**	**2.40**	**N/A**	**N/A**	**>2.2**			
Bank Height Ratio	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**1.70**	**1.40**	**2.50**	**1.80**	**N/A**	**N/A**	**1.00**			
Wetted Perimeter (ft)	**32.00**	**34.20**	**33.00**				**N/A**	**N/A**	**11.20**	**7.30**	**12.00**	**9.40**	**N/A**	**N/A**	**13.80**			
Hydraulic radius (ft)	**1.83**	**1.72**	**1.78**				**N/A**	**N/A**	**0.91**	**0.53**	**0.53**	**0.56**	**N/A**	**N/A**	**0.72**			
Pattern																		
Channel Beltwidth (ft)	**N/A**	**N/A**	**N/A**				**12.00**	**114.00**	**45.70**	**10.00**	**35.00**	**20.90**	**15.90**	**53.90**	**31.80**			
Radius of Curvature (ft)	**N/A**	**N/A**	**N/A**				**5.00**	**140.00**	**28.00**	**2.30**	**31.80**	**13.50**	**3.70**	**49.00**	**19.60**			
Meander Wavelenght (ft)	**N/A**	**N/A**	**N/A**				**40.00**	**172.00**	**87.90**	**35.00**	**70.00**	**50.00**	**53.90**	**107.80**	**77.20**			
Meander Width Ratio	**N/A**	**N/A**	**N/A**				**1.30**	**12.70**	**5.10**	**1.30**	**4.40**	**2.60**	**1.30**	**4.40**	**2.60**			
Profile																		
Riffle length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Riffle slope (ft/ft)	**N/A**	**N/A**	**N/A**				**0.00**	**0.08**	**0.03**	**0.02**	**0.08**	**0.04**	**0.01**	**0.05**	**0.03**			
Pool length (ft)	**N/A**	**N/A**	**N/A**				**3.80**	**27.60**	**12.40**	**7.00**	**27.00**	**14.50**	**11.00**	**41.60**	**22.00**			
Pool spacing (ft)	**N/A**	**N/A**	**N/A**				**12.90**	**75.90**	**35.40**	**17.00**	**63.00**	**36.50**	**25.70**	**96.80**	**56.30**			
Substrate																		
d50 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**13.00**	**N/A**	**N/A**	**4.50**	**N/A**	**N/A**	**N/A**			
d84 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**44.00**	**N/A**	**N/A**	**53.00**	**N/A**	**N/A**	**N/A**			
Additional Reach Parameters																		
Valley Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Channel Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Sinuosity	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**1.27**	**N/A**	**N/A**	**1.40**	**N/A**	**N/A**	**1.58**			
Water Surface Slope (ft/ft)	**N/A**	**N/A**	**0.00**				**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**			
BF slope (ft/ft)	**N/A**	**N/A**	**0.00**				**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**			
Rosgen Classification	**N/A**	**N/A**	**B/C**				**N/A**	**N/A**	**E 4/1**	**N/A**	**N/A**	**C/E 4/1**	**N/A**	**N/A**	**C/E 4/1**			
*Habitat Index																		
*Macrobenthos																		

*As-built information is unavailable to SEPI at this time.

Table 8 c. Baseline Morphology and Hydraulic Summary																		
UT to South Fork (Restoration Subreach 3)																		
Project Number 435																		
Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built*		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension																		
BF Width (ft)	**28.00**	**30.00**	**29.00**				**N/A**	**N/A**	**12.00**	**6.50**	**10.00**	**8.00**	**N/A**	**N/A**	**14.00**			
Floodprone Width (ft)	**40.00**	**100.00**	**70.00**				**N/A**	**N/A**	**25.00**	**16.00**	**22.00**	**18.80**	**N/A**	**N/A**	**>30.8**			
BFCross Sectional Area (ft)	**58.60**	**58.90**	**58.80**				**N/A**	**N/A**	**12.10**	**3.90**	**6.30**	**5.30**	**N/A**	**N/A**	**15.00**			
BF Mean Depth (ft)	**2.00**	**2.10**	**2.00**				**N/A**	**N/A**	**1.00**	**0.40**	**1.00**	**0.70**	**N/A**	**N/A**	**1.10**			
Max Depth (ft)	**2.70**	**3.00**	**2.90**				**1.20**	**3.20**	**1.80**	**0.90**	**1.40**	**1.10**	**1.40**	**2.20**	**1.80**			
Width/Depth Ratio	**13.00**	**15.00**	**14.00**				**N/A**	**N/A**	**12.00**	**7.00**	**26.00**	**13.50**	**N/A**	**N/A**	**13.00**			
Entrenchment Ratio	**1.30**	**3.60**	**2.40**				**N/A**	**N/A**	**2.10**	**2.00**	**3.40**	**2.40**	**N/A**	**N/A**	**>2.2**			
Bank Height Ratio	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**2.40**	**1.40**	**2.50**	**1.80**	**N/A**	**N/A**	**1.00**			
Wetted Perimeter (ft)	**32.00**	**34.20**	**33.00**				**N/A**	**N/A**	**14.00**	**7.30**	**12.00**	**9.40**	**N/A**	**N/A**	**16.20**			
Hydraulic radius (ft)	**1.83**	**1.72**	**1.78**				**N/A**	**N/A**	**0.86**	**0.53**	**0.53**	**0.56**	**N/A**	**N/A**	**0.93**			
Pattern																		
Channel Beltwidth (ft)	**N/A**	**N/A**	**N/A**				**19.00**	**77.00**	**39.70**	**10.00**	**35.00**	**20.90**	**4.00**	**56.00**	**22.00**			
Radius of Curvature (ft)	**N/A**	**N/A**	**N/A**				**11.00**	**46.00**	**22.20**	**2.30**	**31.80**	**13.50**	**4.00**	**56.00**	**22.00**			
Meander Wavelenght (ft)	**N/A**	**N/A**	**N/A**				**60.00**	**109.00**	**80.40**	**35.00**	**70.00**	**50.00**	**62.00**	**123.00**	**88.00**			
Meander Width Ratio	**N/A**	**N/A**	**N/A**				**1.60**	**6.40**	**3.30**	**1.30**	**4.40**	**2.60**	**1.30**	**4.40**	**2.60**			
Profile																		
Riffle length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Riffle slope (ft/ft)	**N/A**	**N/A**	**N/A**				**0.00**	**0.05**	**0.02**	**0.02**	**0.08**	**0.04**	**0.00**	**0.02**	**0.01**			
Pool length (ft)	**N/A**	**N/A**	**N/A**				**9.40**	**59.20**	**35.30**	**7.00**	**27.00**	**14.50**	**13.00**	**48.00**	**25.00**			
Pool spacing (ft)	**N/A**	**N/A**	**N/A**				**37.80**	**103.90**	**73.20**	**17.00**	**63.00**	**36.50**	**29.00**	**111.00**	**64.00**			
Substrate																		
d50 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**13.00**	**N/A**	**N/A**	**4.50**	**N/A**	**N/A**	**N/A**			
d84 (mm)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**45.00**	**N/A**	**N/A**	**53.00**	**N/A**	**N/A**	**N/A**			
Additional Reach Parameters																		
Valley Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Channel Length (ft)	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**	**N/A**			
Sinuosity	**N/A**	**N/A**	**N/A**				**N/A**	**N/A**	**1.16**	**N/A**	**N/A**	**1.40**	**N/A**	**N/A**	**1.16**			
Water Surface Slope (ft/ft)	**N/A**	**N/A**	**0.00**				**N/A**	**N/A**	**0.01**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**			
BF slope (ft/ft)	**N/A**	**N/A**	**0.00**				**N/A**	**N/A**	**0.01**	**N/A**	**N/A**	**0.02**	**N/A**	**N/A**	**0.01**			
Rosgen Classification	**N/A**	**N/A**	**B/C**				**N/A**	**N/A**	**E 4/1**	**N/A**	**N/A**	**C/E 4/1**	**N/A**	**N/A**	**C/E 4/1**			
*Habitat Index																		
*Macrobenthos																		

*As-built information is unavailable to SEPI at this time.

Table 9 a. Morphology and Hydraulic Monitoring Summary

UT to South Fork Creek

Segment/Reach: 1 (1140 linear feet)

Parameter	Cross Section 1 Riffle						Cross Section 2 Pool						Cross Section 3 Riffle						Cross Section 4 Pool					
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)	12.1	13.4	11.0	12.7	13.8		12.6	12.6	12.6	12.8	11.97		13.8	10.9	9.0	8.8	8.5		11.8	12.0	11.3	11.85	11.1	
Floodporne Width (ft)	99	100+	100+	100+	100+		NA	NA	NA	NA	NA		40+	35+	24+	48+	48+		NA	NA	NA	NA	NA	
BFCross Sectional Area (ft)	8.2	8.7	7.8	8.9	8.4		12.3	11.9	11.9	14.2	10.3		8.1	6.1	5.7	5.1	4.2		13.7	11.1	13.6	13.0	12.1	
BF Mean Depth (ft)	0.7	0.6	0.7	0.7	0.61		1.0	0.9	0.9	1.1	0.9		0.6	0.6	0.6	0.6	0.5		1.2	0.9	1.2	1.1	1.1	
Width/Depth Ratio	17.9	20.7	15.4	18.07	22.6		NA	NA	NA	NA	NA		23.6	18.1	14.3	15.1	17		NA	NA	NA	NA	NA	
Entrenchment Ratio	8.5	7.5+	9.1+	10.7+	10.7+		NA	NA	NA	NA	NA		3.0+	3.2+	2.7+	5.5+	5.5+		NA	NA	NA	NA	NA	
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0		NA	NA	NA	NA	NA		1.0	1.0	1.4	1.0	1.0		NA	NA	NA	NA	NA	
Wetted Perimeter (ft)	50.5	15.6	11.6	13.5	14.4		13.6	14.1	14.1	14.0	13.5		14.9	14.2	9.8	9.3	9.0		12.3	14	13.6	13.47	12.4	
Hydraulic radius (ft)	0.4	0.5	0.9	0.9	0.6		0.9	0.8	0.8	1.0	0.8		0.5	0.4	0.6	0.6	0.5		1.1	0.8	1.1	1.0	1.0	
Substrate																								
d50 (mm)	sand	<0.062	0.1	<0.062	0.13		sand	<0.062	0.63	<0.062	<0.062		sand	<0.062	<0.062	<0.062	<0.062		sand	<0.062	<0.062	<0.062	<0.062	
d84 (mm)	sand	15	21	15.9	16		sand	<0.062	4.8	<0.062	0.062		sand	<0.062	<0.062	<0.062	<0.062		sand	<0.062	11	<0.062	<0.062	

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	8.9	51.8	20.7	17.7	63.6	24.8	15.1	48.2	24.2	16.0	48.6	23.9	16.0	48.6	23.9			
Radius of Curvature (ft)	9.1	39.1	14.4	8.5	41.7	20.1	10.5	44.6	21.1	7.6	47.0	21.5	7.6	47.0	21.5			
Meander Wavelenght (ft)	46.4	95.8	62.9	38.6	120	68.4	46.4	101.0	67.3	48.5	97.1	67.1	48.5	97.1	67.1			
Meander Width Ratio	0.69	4.02	1.61	1.32	4.73	1.90	1.38	4.38	2.20	1.26	3.83	1.88	1.26	3.83	1.88			
Profile																		
Riffle length (ft)	2.6	61.1	8.9	2.7	43.7	11.1	3.7	30.0	11.3	5.2	30.6	14.0	4.0	34.0	14.0			
Riffle slope (ft/ft)	0.000	0.082	0.014	0.002	0.113	0.023	0.005	0.145	0.029	0.002	0.050	0.026	0.000	0.082	0.020			
Pool length (ft)	4.4	71.0	12.10	5.6	46.6	13.8	7.3	44.4	15.6	6.6	49.0	15.2	5.0	34.0	17.7			
Pool spacing (ft)	8.5	126.5	34.4	6.4	72.2	25.7	12.8	64.3	31.7	12.7	64.2	32.9	15.0	57.0	32.2			
Additional Reach Parameters																		
Valley Length (ft)	926			925			850			850			850					
Channel Length (ft)	1166			1140			1058			1061			1061					
Sinuosity	1.26			1.23			1.24			1.25			1.25					
Water Surface Slope (ft/ft)	0.0098			0.0096			0.0096			0.0097			0.0097					
BF slope (ft/ft)	0.0094			0.0099			0.0102			0.0105			0.0106					
Rosgen Classification	C5			C6			C5/6			C6			C6					
*Habitat Index	NA			NA			NA			NA			NA					
*Macrobenthos	NA			NA			NA			NA			NA					

Table 9 b. Morphology and Hydraulic Monitoring Summary

UT to South Fork Creek

Segment/Reach: 2 (1022 linear feet)

Parameter	Cross Section 5 Pool						Cross Section 6 Riffle					
Dimension	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	10.5	12.2	12.3	11.72	10.67		10.4	11.3	11.5	12.0	11.2	
Floodporne Width (ft)	NA	NA	NA	NA	NA		50+	60+	60+	60+	60+	
BFCross Sectional Area (ft)	11.4	13.7	14.1	13.418	12.42		12.1	11.0	12.1	12.7	11.1	
BF Mean Depth (ft)	1.1	1.1	1.1	1.1	1.2		1.2	1.0	1.1	1.1	1.0	
Width/Depth Ratio	NA	NA	NA	NA	9.2		9.0	11.5	10.9	11.4	11.3	
Entrenchment Ratio	NA	NA	NA	NA	NA		4.8+	5.3+	5.2+	5.0+	5.0+	
Bank Height Ratio	NA	NA	NA	NA	NA		1.0	1.0	1.5	1.1	1.1	
Wetted Perimeter (ft)	39.0	13.8	13.9	13.331	12.3		12.3	11.9	12.2	12.8	12.2	
Hydraulic radius (ft)	0.6	1.0	1.0	1.0	1.0		1.0	0.9	1.0	1.0	0.9	
Substrate												
d50 (mm)	sand	<0.062	2.9	6	0.062		sand	<0.062	15	18	8	
d84 (mm)	sand	51	51	35	32		sand	30	28	28	22.6	

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	14.3	64.2	27.5	21.2	54.0	30.9	18.3	50.5	28.1	17.62	54.74	30.59	17.62	54.74	30.59			
Radius of Curvature (ft)	7.9	45.5	24.8	5.2	45.5	26.7	13.2	71.8	30.0	13.26	87.55	31.19	13.26	87.55	31.19			
Meander Wavelenght (ft)	56.6	116.7	73.4	54.4	115.6	74.1	51.9	122.3	78.7	55.22	126	81.36	55.22	126	81.36			
Meander Width Ratio	1.38	6.17	2.65	1.88	4.78	2.74	1.5878	4.38957	2.45	1.4683	4.562	2.549	1.4683	4.562	2.549			
Profile																		
Riffle length (ft)	1.3	30.1	9.1	1.9	46.7	11.6	6.2	46.2	11.2	3.1	47.6	13.3	3	21	9.7			
Riffle slope (ft/ft)	0.000	0.383	0.020	0.000	0.133	0.015	0.002	0.093	0.022	0.001	0.084	0.017	0	0.068	0.027			
Pool length (ft)	7.0	53.0	20.6	5.2	52.2	16.0	7.0	68.3	17.5	6.0	57.6	17.6	12	60	29.6			
Pool spacing (ft)	22.0	188.0	56.7	7.2	77.6	26.2	8.4	88.8	36.4	10.6	85.9	29.4	14	70	38.4			
Additional Reach Parameters																		
Valley Length (ft)	907			906			905			905			905					
Channel Length (ft)	1029			1022			1034			1034			1034					
Sinuosity	1.1			1.1			1.1			1.1			1.1					
Water Surface Slope (ft/ft)	0.0081			0.0077			0.0075			0.0079			0.0079					
BF slope (ft/ft)	0.0073			0.0074			0.0071			0.0070			0.0067					
Rosgen Classification	C5			C6			C4			C4			C4					
*Habitat Index	NA			NA			NA			NA			NA					
*Macrobenthos	NA			NA			NA			NA			NA					

Table 9 c. Morphology and Hydraulic Monitoring Summary
UT to South Fork Creek
Segment/Reach: 3 (1024 linear feet)

Parameter	Cross Section 7 Pool						Cross Section 8 Riffle						Cross Section 9 Riffle						Cross Section 10 Pool						Cross Section 11 Pool						Cross Section 12 Riffle					
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+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
BF Width (ft)	12.4	11.9	12.6	13.5	13.4		12.2	14.4	15.2	14.5	12.7		15.3	14.2	16.7	15.1	19.7		15	17.4	18.2	18.3	17.7		11.2	11.2	11.4	11.4	10.9		15.9	14.4	14.4	15	14.8	
Floodporne Width (ft)	NA	NA	NA	NA			50+	50+	50+	50+			45+	45+	45+	45+			NA	NA	NA	NA			NA	NA	NA	NA			45+	45+	45+	45+		
BFCross Sectional Area (ft)	20.4	20.6	19.9	19.0	19.3		14	18.8	19.0	18.8	17.5		21.4	20.4	22.0	21.5	23.2		26.6	30.5	30.4	31.1	28.5		21	22.0	21.6	22.1	21.9		21.6	19.7	20.0	20.1	19.4	
BF Mean Depth (ft)	1.6	1.7	1.6	1.4	1.4		1.2	1.3	1.3	1.3	1.4		1.4	1.4	1.3	1.4	1.2		1.8	1.7	1.7	1.7	1.6		1.9	2.0	1.9	1.9	2.0		1.4	1.4	1.4	1.3	1.3	
Width/Depth Ratio	NA	NA	NA	NA	9.3		10.6	11.1	12.1	11.2	9.2		11.0	9.9	12.7	10.6	16.7		NA	NA	NA	NA	11.1		NA	NA	NA	NA	5.4		11.7	10.3	10.4	11.2	11.3	
Entrenchment Ratio	NA	NA	NA	NA			3.2+	3.5+	3.3+	3.5+			3.2+	3.2+	2.7+	3.0+			NA	NA	NA	NA			NA	NA	NA	NA			3.2+	3.1+	2.9+	3.0+		
Bank Height Ratio	NA	NA	NA	NA			1.0	1.0	1.2	1.1			1.0	1.0	1.0	1.0			NA	NA	NA	NA			NA	NA	NA	NA			1.0	1.0	1.0	1.1		
Wetted Perimeter (ft)	14.4	13.9	15.0	15.6	15.4		13.4	15.8	16.6	15.9	14.1		16.5	15.5	18	16.5	20.8		16.3	19.5	20.5	20.1	20.4		14.2	14.0	14.3	14.0	12.9		17.6	15.6	15.8	16.6	16.4	
Hydraulic radius (ft)	1.4	1.5	1.3	1.2	1.3		1.0	1.2	1.2	1.2	1.2		1.3	1.3	1.2	1.3	1.1		1.4	1.6	1.5	1.5	1.4		1.6	1.6	1.5	1.6	1.7		1.3	1.3	1.3	1.2	1.2	
Substrate																																				
d50 (mm)	sand	<0.062	1.8	1	0.125		sand	<0.062	<0.062	<0.062	0.125		sand	1.6	1.7	1.8	5.7		sand	15	9.2	7.4	11.3		sand	1.5	11	17.5	1		sand	0.35	2	1.4	1	
d84 (mm)	sand	11.3	20	14	8		sand	26	22	15	11.3		sand	13.7	10.9	22.2	45		sand	59	30	23	32		sand	18	70	32	90		sand	8	55	31.5	64	

Parameter	MY-01 (2006)			MY-02 (2007)			MY-03 (2008)			MY-04 (2009)			MY-05 (2010)			MY+ (2011)		
Pattern	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Channel Beltwidth (ft)	13.8	68.7	37.1	31.1	53.3	42.2	22.0	56.6	41.0	22.2	57.5	40.7	22.2	57.5	40.7			
Radius of Curvature (ft)	16.8	107.9	30.9	19.5	51.5	33.6	19.8	114.9	37.0	7.6	115.4	31.2	7.6	115.4	31.2			
Meander Wavelenght (ft)	79.3	151.6	125.3	87.9	197.5	94.2	60.7	155.7	117.7	60.3	177.2	119.6	60.3	177.2	119.6			
Meander Width Ratio	0.91	4.55	2.46	2.18	3.74	2.71	1.43	3.67	2.66	1.49	3.87	2.74	1.49	3.87	2.74			
Profile																		
Riffle length (ft)	2.1	40.9	12.0	2.2	43.1	11.3	2.7	58.0	14.9	3.3	45.7	14.6	1.0	26.0	11.4			
Riffle slope (ft/ft)	0.000	0.140	0.012	0.000	0.162	0.015	0.000	0.044	0.010	0.000	0.040	0.009	0.000	0.100	0.033			
Pool length (ft)	7.0	84.0	28.8	11.0	83.0	23.9	9.7	102.4	21.4	7.0	97.0	17.1	11.0	106.0	32.3			
Pool spacing (ft)	21.0	101.0	45.8	20.8	86.9	42.3	18.1	89.8	36.9	20.6	87.2	32.2	15.0	92.0	40.0			
Additional Reach Parameters																		
Valley Length (ft)	862			863			864			864			864					
Channel Length (ft)	1020			1024			1032			1034			1034					
Sinuosity	1.2			1.2			1.2			1.2			1.2					
Water Surface Slope (ft/ft)	0.0046			0.0049			0.0045			0.0043			0.0043					
BF slope (ft/ft)	0.0036			0.0039			0.0039			0.0043			0.0042					
Rosgen Classification	C5			C5/6			C5/6			C5/6			C5/6					
*Habitat Index	NA			NA			NA			NA			NA					
*Macrobenthos	NA			NA			NA			NA			NA					

Appendix E
Hydrologic Data

Table 10. Verification of Bankfull Events

Date of Data Collection	Likely Date of Occurrence	Method	Photo # (if available)
1/9/2007	Unknown	Crest Stage Gauge measurement of approximately 7 inches on stick (bottom of gauge at bankfull).	no photo
4/5/2007	Unknown	Crest Stage Gauge measurement of 16" (bottom of gauge 12" below bkf).	no photo
6/4/2007	6/3/2007	Result of an approximate 1.5 inch rain event. Wrack lines observed.	no photo
2/27/2008	1/20/2008	Crest gauge reading of 28 inches over bankfull (located at 15-20 inches on gauge). Also wrack lines observed above bankfull elevation.	no photo
3/17/2008	3/5/2008	Wrack line from bankfull event observed above bankfull.	Photo 4 in SR-3 SPA Photolog
9/1/2008	8/27/2008 - 8/28/2008	According to NCDC Station Coop ID 313555 - Graham ENE, NC , 6.58 inches of precipitation fell on this day. It was assumed, but not verified, that this rainfall produced a bankfull event.	no photo
3/8/2009	3/7/2009	Crest gauge reading of 16.5 inches (bankfull level set at 15 inches).	Photos 5 and 6 in SR-3 SPA Photolog.
9/15/2010	Between 2/16/2009 and 9/15/2010	Creast gage reading above bankfull and wrack lines on channel banks. Three storms above 3 inches rainfall occurred between May and September 2010.	no photo