

# **Unnamed Tributary to Crab Creek Stream and Wetland Restoration**

**NCEEP Project Number: 857**

**Monitoring Year 2**

**2011 Final Report**

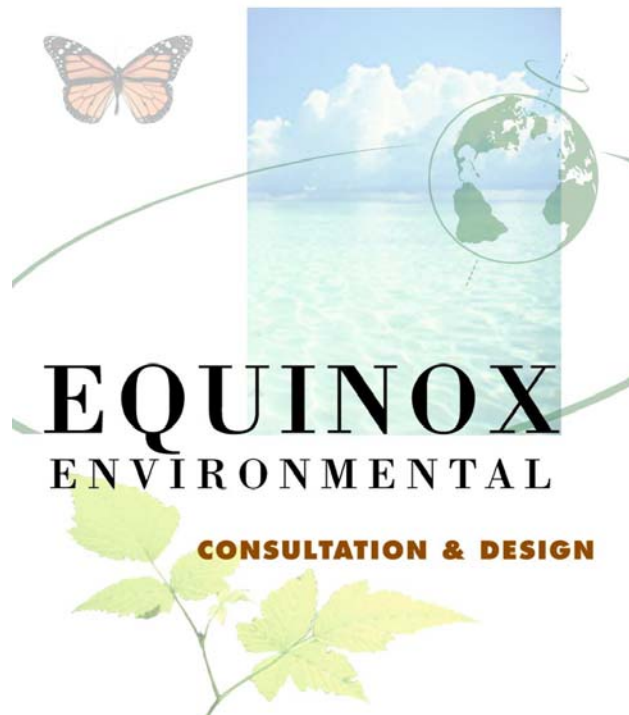


**Submitted to  
North Carolina Ecosystem Enhancement Program  
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# Monitoring Firm



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# **Unnamed Tributary to Crab Creek Stream and Wetland Restoration 2011 Monitoring Report (MY 2)**

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## 1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

The goals and objectives stated in the Unnamed Tributary to Crab Creek Restoration Plan (NCEEP 2007) are as follows:

### Project Goals:

- Reduce bank sediment export and nutrient inputs to the receiving watershed of Crab Creek, a Class C Trout Water;
- Enhance and preserve riparian buffers of a headwater trout stream;
- Enhance aquatic and terrestrial habitat along an intact stream corridor;
- Improve wetland functions by connecting and expanding the following wetland communities: Swamp Forest-Bog Complex, Southern Appalachian Bog, and Montane Alluvial Forest and;
- Improve and expand Southern Appalachian Bog wetland habitat for the Bog Turtle *Clemmys muhlenburgii*.

### Project Objectives:

- Restore 4,026 linear feet of stream channel with appropriate pattern, profile, and dimension to support a gravel transport system;
- Re-establish the natural stream features (bed heterogeneity) to restore aquatic habitat;
- Improve aquatic organism passage and habitat corridor continuity by replacing the culvert; and
- Convert existing croplands into Swamp Forest-Bog Complex and Southern Appalachian Bog Communities.

The monitoring year two (MY2) vegetation plot data indicate that the project currently meets the established criterion for planted stem density, which is a minimum survival of 320 planted stems per acre at the end of the year three monitoring period. However, while the average living stem densities for planted stems in MY2 is approximately 328 stems per acre, several plots (~44%) did not meet the year three interim success criteria numbers per acre. These include VP 1, 4, 5, and 6, which had 121, 162, 121, and 243 stems per acre, respectively. Due to dead or missing stems there was an approximately 13% decrease in total stem densities between MY1 and MY2. However, when planted and natural stems are combined, the average stem density is 643 stems per acre, which is above the minimum established criterion.

Two planting zones (Zones D and E1) were subject to low density planting efforts. Planting zone D is classified as a Southern Appalachian Bog community in which vegetation establishment consisted of an open shrub layer with areas dominated by herbaceous vegetation. Zone E1 classified as Montane Alluvial Forest community consisted of a supplemental planting to enhance the existing vegetative community. To capture planting zones with lower, planted woody stem densities, data was collected from eight temporary, random 200m<sup>2</sup> circular plots in Zone D to document species presence during year two. Random circular plots were not employed in Zone E1 due to existing mature trees within this zone. Woody stem densities within Zone D ranged from 0 to 324 planted stems per acre. The overall average was 71 stems per acre which is well above the proposed planting rate of 28 woody stems per acre. When planted and natural stems are combined, the average woody stem density is 202 stems per acre. Additionally,

herbaceous coverage within the random plots ranged from 65 to 100%, with an overall average of 88%.

Problems with vegetation consist of approximately 20 currently isolated patches of high threat invasive plant species that span the project extent. The dominant species noted for the site is multiflora rose *Rosa multiflora* with additional species comprised of oriental bittersweet *Celastrus orbiculatus*, privet *Ligustrum sp.*, and Japanese honeysuckle *Lonicera japonica*. Additionally, there are 2 areas noted as having low stem densities associated with the bank erosion areas noted below.

Stream longitudinal profiles have remained stable among monitoring years. Stream issues observed during MY2 were minimal and consisted of two bank erosion areas. No bankfull events were documented during MY2.

Data from the groundwater monitoring stations resulted in all but one station exceeding saturation of the upper soil surfaces for five percent of the growing season. The on-site rain gauge documented below normal precipitation during the majority of the growing season. During normal rainfall years all groundwater gauges are expected to meet criteria.

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

## 2.0 Methodology

The stream monitoring methodologies utilized in MY2 were intended to replicate those employed during the previous monitoring years and are based on standard guidance and procedures documents (Rosgen 1996 and USACE 2003).

Vegetation plot monitoring data were collected following the standard CVS-EEP Protocol for Recording Vegetation, Level II (Lee et al. 2008). To capture conditions within planting zones with lower, planted woody stem densities, eight 200m<sup>2</sup> plots were randomly selected in Zone D utilizing geographic information system (GIS) and uploaded to a handheld global positioning system (GPS) unit for field location. Field delineation occurred by pulling a tape 7.98 m from a temporary stake in a circle while the two person team identified and recorded any woody species located within the interior of the temporary plot. Identified stems were considered planted versus recruits based on the species type and height. All other woody stems were classified as recruits.

Wetland hydrology was considered established if groundwater monitoring data indicated saturated soils within 12 inches of the soil surface for 5% of the growing season. Due to the Alleghany County data set being based on a site with elevations approximately 1,000 feet different from the project site, the growing season for the site was based on the Natural Resource Conservation Service (NRCS) data set for Ashe County (NRCS 2009).

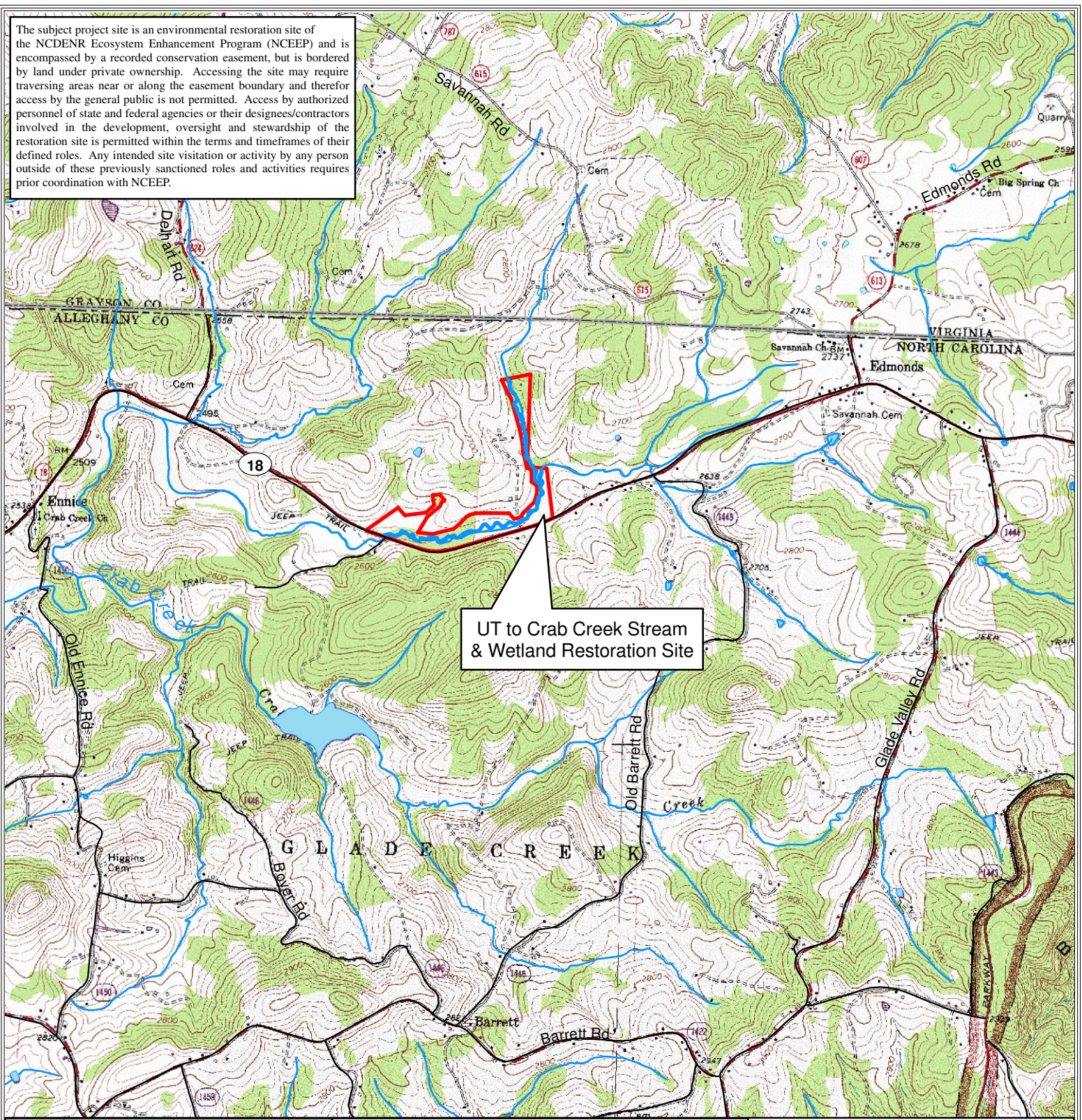
### 3.0 References

- Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2.
- NCEEP (North Carolina Ecosystem Enhancement Program). December 2007. UT to Crab Creek Restoration Site. Alleghany County, North Carolina. Restoration Plan. Raleigh, NC.
- NRCS (Natural Resources Conservation Service). Accessed October 2009. Climate Analysis for Wetlands by County. <http://www.wcc.nrcs.usda.gov/climate/wetlands.html>
- Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology Books, Pagosa Springs, CO.
- USACE (U.S. Army Corps of Engineers). 2003. Stream Mitigation Guidelines. USACOE, USEPA, NCWRC, NCDENR-DWQ. Wilmington District.

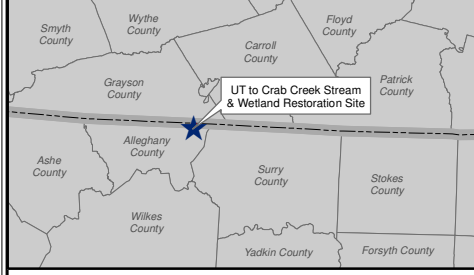


**Appendix A**  
**Project Vicinity Map and Background Tables**

The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (NCEEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with NCEEP.



UT to Crab Creek Stream & Wetland Restoration Site



Directions: From Raleigh, proceed west on I-40 towards Winston Salem. Take Exit 193 B (NC-8N/US-52N) towards Mount Airy. Proceed on US-52N to I-74W towards Wytheville, VA. Take Exit 5 (I-77S) and proceed to Exit 100 (Mount Airy/Galax/NC-89). Turn left and proceed west on NC-89. Turn left at NC-18 and go approximately 6 miles to the project site. The site is located on the north side of NC-18.

**Figure 1 - Vicinity Map**  
 UT to Crab Creek Stream & Wetland Restoration Site  
 Project No. 857  
 Alleghany County, North Carolina

0 1,250 2,500 5,000 Feet

7.5 Minute Series Cumberland Knob Quadrangle

Table 1a. Project Components UT Crab Creek Stream & Wetland / Project No. 857									
Project Component or Reach ID	Existing Feet/Acres	Restoration Level	Approach	Footage or Acreage	Stationing	Buffer Acres	BMP Elements	Comment	
UT1	2,313 lf	R	P3	1,775 lf	100+00 - 101+71		Existing culvert and crossing removed.	Stream channel stabilized with in-stream structures, including step pools and riffle grade control.	
					103+00 - 104+35				
					105+34 - 112+29				
					113+51 - 116+88				
		E	EII	496 lf	120+26 - 124+65			101+71 - 103+00	Included revegetation and stream bank stabilization.
					104+35 - 105+34				
					112+29 - 113+51				
				116+88 - 118+34					
UTCC-US	2,086 lf	R	P2	2,485 lf	10+00 - 34+85		Existing culvert and crossing replaced with open bottom arch culvert.	Stream channel stabilized with in-stream structures, including step pools and riffle grade control.	
UTCC-DS	2,172 lf	P		2,172 lf	34+85 - 56+57				
Wetland 1	0.5 ac	P		0.5 ac				Intact Swamp Forest-Bog Complex. UT1 restoration and enhancement reach goes through this wetland. Wetland preservation limited to areas outside of the stream buffer.	
Wetland 2	6.7	R		6.9				Overfill cropland soil removed, cropland ditches filled, wellhead removed, and site graded to restore Southern Appalachian Bog Community hydrology.	
Wetland 3	2.7 ac	P		2.7 ac				Preservation of Swamp Forest-Bog Complex along UTCC-DS reach.	
Wetland 4	0.9 ac	R		0.8 ac				Ditch filled and existing fill, debris, and culvert drain removed. Existing seep heads developed and additional hardwood trees planted to restore and enhance Montane Alluvial Forest.	
	3.1 ac	E		3.1 ac					
Wetland 5	0.3 ac	R		0.3 ac				Overfill cropland soil removed, groundwater springs exposed, and bog wetland species planted to restore and create Southern Appalachian Bog Community hydrology.	
	0.0 ac	C		0.2 ac					
Wetland 6	2.2 ac	P		2.2 ac				Preservation of Southern Appalachian Bog Community.	
Non-Applicable									

Table 1b. Component Summations UT Crab Creek Stream & Wetland / Project No. 857							
Restoration Level	Stream (lf)	Riparian Wetland (Ac)		Non-Riparian (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	4,260	8.0					
Enhancement		3.1					
Enhancement I	0						
Enhancement II	496						
Creation		0.2					
Preservation	2,172	5.3					
HQ Preservation	0	0	0				
		16.6	0.0				
<b>Totals</b>	<b>6,928</b>	<b>16.6</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>

Non-Applicable

<b>Table 2. Project Activity &amp; Reporting History UT Crab Creek Stream &amp; Wetland / Project No. 857</b>		
<b>Activity or Report</b>	<b>Data Collection Complete</b>	<b>Actual Completion or Delivery</b>
Land Acquisition	N/A	5/9/2006
Environmental Resource Technical Report	2006	May 2007
Restoration Plan	2007	Dec 2007
Permit Date	N/A	4/30/2008
Final Design - Construction Plans	N/A	Aug 2008
Construction	N/A	April 2010
Temporary S&E mix applied	N/A	2009 - 2010
Permanent seed mix applied	N/A	April 2010
Planting	N/A	April 2010
Initial Wetland Monitoring Gauges & Rain Gauge Installed	N/A	April 2010
Morphological Data Collection	June 2010	N/A
Mitigation Plan / As-built (Year 0 Monitoring - Baseline)	June 2010	Feb 2011
Year 1 Monitoring	March 2011	Oct 2011
Year 2 Monitoring	Oct 2011	Dec 2011
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

N/A - Item does not apply.

<b>Table 3. Project Contacts</b> <b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>	
<b>Designer</b>	KCI Associates of North Carolina Landmark Center II, Suite 220 4601 Six Forks Road Raleigh, NC 27609
Primary Project Design POC	April Davis (919) 783-9214
<b>Construction Contractor</b>	Carolina Environmental Contracting Inc. P.O. Box 1905 Mount Airy, NC 27030
Construction Contractor POC	Stephen James (336) 320-3849
<b>Planting Contractor</b>	Carolina Environmental Contracting Inc. P.O. Box 1905 Mount Airy, NC 27030
Planting Contractor POC	Stephen James (336) 320-3849
<b>Seeding Contractor</b>	Carolina Environmental Contracting Inc. P.O. Box 1905 Mount Airy, NC 27030
Seeding Contractor POC	Stephen James (336) 320-3849
Seed Mix Sources	Green Resources
Nursery Stock Suppliers	Mellow Marsh Farm (919) 742-1200
<b>Monitoring Performers (Y0) - 2009</b>	Equinox Environmental Consultation & Design, Inc. 37 Haywood Street, Suite 100 Asheville, North Carolina 28801
Stream Monitoring POC	Win Taylor (828) 253-6856
Vegetation Monitoring POC	Win Taylor (828) 253-6856
Wetland Monitoring POC	Win Taylor (828) 253-6856
<b>Monitoring Performers (Y1) - 2010</b>	Equinox Environmental Consultation & Design, Inc. 37 Haywood Street, Suite 100 Asheville, North Carolina 28801
Stream Monitoring POC	Win Taylor (828) 253-6856
Vegetation Monitoring POC	Win Taylor (828) 253-6856
Wetland Monitoring POC	Win Taylor (828) 253-6856
<b>Monitoring Performers (Y2) - 2011</b>	Equinox Environmental Consultation & Design, Inc. 37 Haywood Street, Suite 100 Asheville, North Carolina 28801
Stream Monitoring POC	Win Taylor (828) 253-6856
Vegetation Monitoring POC	Win Taylor (828) 253-6856
Wetland Monitoring POC	Win Taylor (828) 253-6856
<b>Monitoring Performers (Y3)- 2012</b>	
Stream Monitoring POC	
Vegetation Monitoring POC	
Wetland Monitoring POC	
<b>Monitoring Performers (Y4)- 2013</b>	
Stream Monitoring POC	
Vegetation Monitoring POC	
Wetland Monitoring POC	
<b>Monitoring Performers (Y5)- 2014</b>	
Stream Monitoring POC	
Vegetation Monitoring POC	
Wetland Monitoring POC	

<b>Table 4. Project Attributes</b>			
<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>			
Project County	Alleghany		
Physiographic Region	Blue Ridge		
Ecoregion	New River Plateau		
River Basin	Little River		
USGS HUC	05050001030020		
NCDWQ Sub-Basin	05-07-03		
Within Extent of EEP Watershed Plan	Little River and Laurel Branch Local Watershed Plans		
WRC Class	Cold		
% of Project Easement Fenced or Demarcated	100%		
Beaver Activity Observed During Design Phase	No		
<b>Restoration Component Attributes</b>			
	<b>UT1</b>	<b>UTCC-US</b>	<b>UTCC-DS</b>
Drainage Area (sq.mi.)	0.53	1.65	2.64
Stream Order	First	Second	Second
Restored Length (feet)	1,775	2,485	N/A
Perennial or Intermittent	Perennial	Perennial	Perennial
Watershed Type	Rural		
Watershed LULC Distribution			
	Forest/Wetland	53%	
	Pasture/Managed Herbaceous	45%	
	Other	2%	
Watershed Impervious Cover	-	-	-
NCDWQ AU/Index Number	10-9-12	10-9-12	10-9-12
NCDWQ Classification	C; Tr	C; Tr	C; Tr
303d Listed	No	No	No
Upstream of 303d Listed Segment	No	No	No
Reasons for 303d Listing or Stressor	N/A	N/A	N/A
Total Acreage of Easement	47.8		
Total Vegetated Acreage within Easement	9.0	10.6	19.7
Total Planted Acreage as Part of Restoration	3.3	10.6	1.5
Rosgen Classification of Pre-Existing	G4/C4	C4	E4
Rosgen Classification of As-Built	Cb/C	C	N/A
Valley Type	-	-	-
Valley Slope	0.025	0.010	-
Valley Side Slope Range	-	-	-
Valley Toe Slope Range	-	-	-
Cowardin Classification	N/A	N/A	N/A
Trout Waters Designation	Yes	Yes	Yes
Species of Concern, Endangered, Etc.	Bog Turtle, American Speedwell, and Canadian Burnet		
Dominant Soil Series and Characteristics			
	Series	Nikwasi	
	Depth	-	-
	Clay%	-	-
	K	-	-
	T	-	-

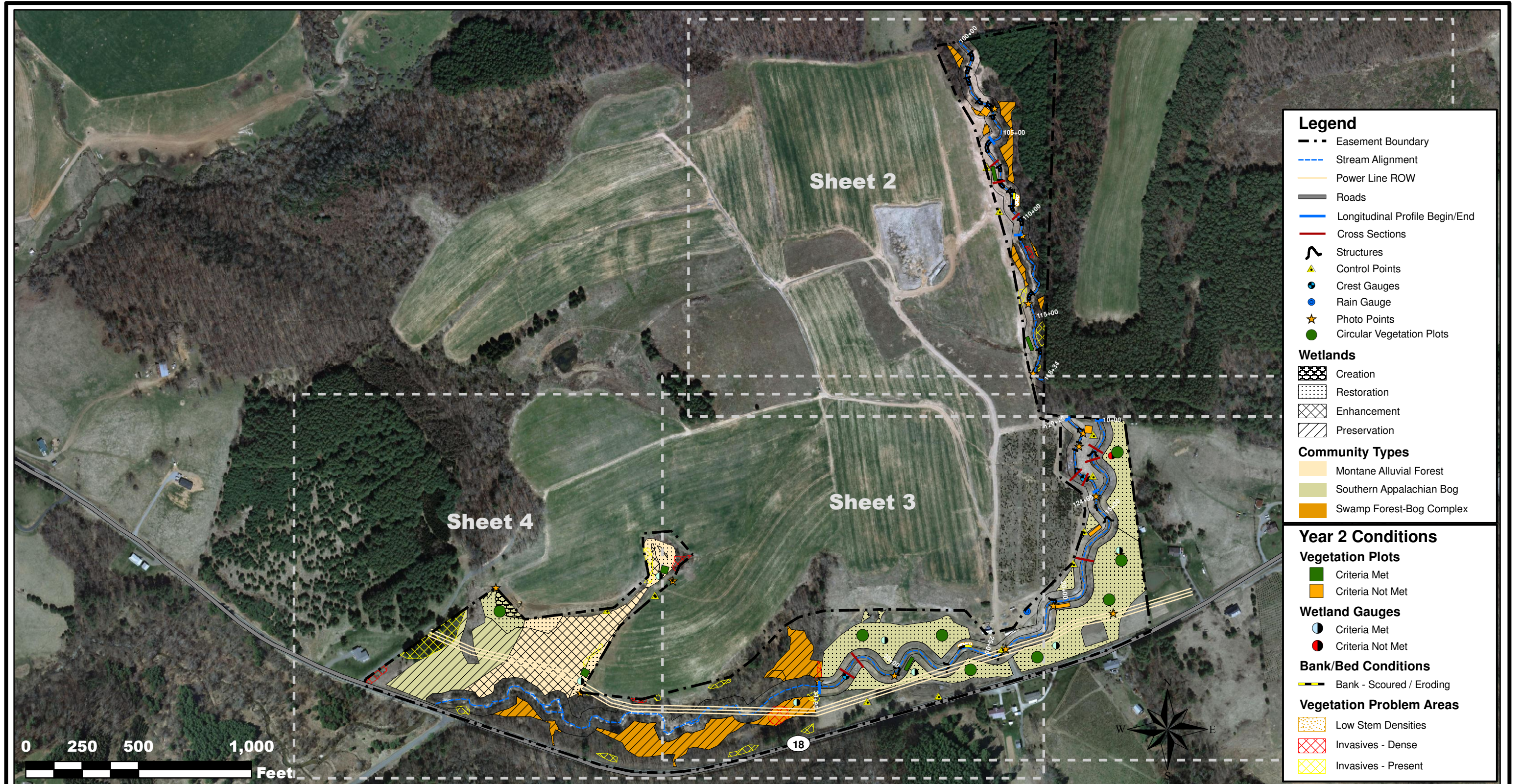
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N/A - Item does not apply.

# **Appendix B**

## **Visual Assessment Data**

Figure 2. Integrated Current Condition Plan View



Prepared for	<b>Project:</b> UT to Crab Creek Stream and Wetland Restoration Year 2 Monitoring Alleghany County, North Carolina	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A. 2) 2010 Aerial Photo	Prepared by
	Sheet 1 of 4		
	Date	Project Number	
	November 2011	NCEEP # 857	



Figure 2. Integrated Current Condition Plan View



**Legend**

- Easement Boundary
- Stream Alignment
- Power Line ROW
- Roads
- Longitudinal Profile Begin/End
- Cross Sections
- Structures
- ▲ Control Points
- Crest Gauges
- Rain Gauge
- ★ Photo Points
- Circular Vegetation Plots

**Wetlands**

- ▨ Creation
- ▨ Restoration
- ▨ Enhancement
- ▨ Preservation

**Community Types**

- Montane Alluvial Forest
- Southern Appalachian Bog
- Swamp Forest-Bog Complex

**Year 2 Conditions**

**Vegetation Plots**

- Criteria Met
- Criteria Not Met

**Wetland Gauges**

- Criteria Met
- Criteria Not Met

**Bank/Bed Conditions**

- Bank - Scoured / Eroding

**Vegetation Problem Areas**

- ▨ Low Stem Densities
- ▨ Invasives - Dense
- ▨ Invasives - Present



Prepared for	<b>Project:</b> UT to Crab Creek Stream and Wetland Restoration Year 2 Monitoring Alleghany County, North Carolina	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A. 2) 2010 Aerial Photo	Prepared by
	Sheet 2 of 4		
	Date	Project Number	
	November 2011	NCEEP # 857	

Figure 2. Integrated Current Condition Plan View




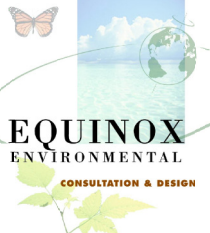

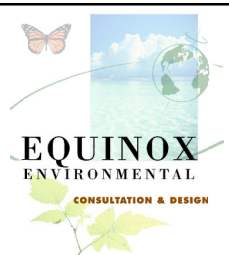
Prepared for	<b>Project:</b> UT to Crab Creek Stream and Wetland Restoration	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A.	Prepared by
	Year 2 Monitoring Alleghany County, North Carolina	2) 2010 Aerial Photo	
	Sheet 3 of 4		
	Date November 2011	Project Number NCEEP # 857	

Figure 2. Integrated Current Condition Plan View



Prepared for	<b>Project:</b> UT to Crab Creek Stream and Wetland Restoration Year 2 Monitoring Alleghany County, North Carolina	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A. 2) 2010 Aerial Photo	Prepared by
	Sheet 4 of 4		
	Date	Project Number	
	November 2011	NCEEP # 857	

<b>Table 5. Visual Stream Morphology Stability Assessment</b> <b>UT Crab Creek Stream &amp; Wetland / Project No. 857 - UT1 - Upper</b> <b>Assessed Length 1,832 feet</b>										
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
<b>1. Bed</b>	<b>1. Vertical Stability</b> (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	<b>2. Riffle Condition</b>	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	17	17			100%			
		<b>3. Meander Pool Condition</b>	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	20	20					
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).		20	20			100%			
	<b>4. Thalweg Position</b>	1. Thalweg centering at upstream of meander bend (Run).	20	20			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	19	20			95%			
<b>2. Bank</b>	<b>1. Scoured / Eroding</b>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			1	25	99%	0	0	99%
	<b>2. Undercut</b>	Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
	<b>3. Mass Wasting</b>	Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
<b>Totals</b>					1	25	99%	0	0	99%
<b>3. Engineered Structures</b>	<b>1. Overall Integrity</b>	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	<b>2. Grade Control</b>	Grade control structures exhibiting maintenance of grade across the sill.	15	15			100%			
	<b>2a. Piping</b>	Structures lacking any substantial flow underneath sills or arms.	15	15			100%			
	<b>3. Bank Protection</b>	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	15	15			100%			
	<b>4. Habitat</b>	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio $\geq$ 1.6. Rootwads/logs providing some cover at base-flow.	15	15			100%			

N/A - Item does not apply.

<b>Table 5. Visual Stream Morphology Stability Assessment</b> <b>UT Crab Creek Stream &amp; Wetland / Project No. 857 - UT1 - Lower</b> <b>Assessed Length 438 feet</b>										
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
<b>1. Bed</b>	<b>1. Vertical Stability</b> (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	<b>2. Riffle Condition</b>	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	5	5			100%			
		<b>3. Meander Pool Condition</b>	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	4	4					
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).		4	4			100%			
	<b>4. Thalweg Position</b>	1. Thalweg centering at upstream of meander bend (Run).	4	4			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	4	4			100%			
	<b>2. Bank</b>	<b>1. Scoured / Eroding</b>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0			
<b>2. Undercut</b>		Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
<b>3. Mass Wasting</b>		Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
<b>Totals</b>					0	0	100%	N/A	N/A	N/A
<b>3. Engineered Structures</b>	<b>1. Overall Integrity</b>	Structures physically intact with no dislodged boulders or logs.	5	5			100%			
	<b>2. Grade Control</b>	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	<b>2a. Piping</b>	Structures lacking any substantial flow underneath sills or arms.	5	5			100%			
	<b>3. Bank Protection</b>	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	5	5			100%			
	<b>4. Habitat</b>	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio $\geq$ 1.6. Rootwads/logs providing some cover at base-flow.	5	5			100%			

N/A - Item does not apply.

<b>Table 5. Visual Stream Morphology Stability Assessment</b> <b>UT Crab Creek Stream &amp; Wetland / Project No. 857 - UTCC - US</b> <b>Assessed Length 2,485 feet</b>										
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
<b>1. Bed</b>	<b>1. Vertical Stability</b> (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			0	0	100%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	<b>2. Riffle Condition</b>	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	17	17			100%			
		<b>3. Meander Pool Condition</b>	1. <u>Depth</u> Sufficient (Max Pool Depth : Mean Bankfull Depth $\geq$ 1.6).	15	15					
	2. <u>Length</u> appropriate (>30% of centerline distance between tail of upstream riffle and head of downstream riffle).		15	15			100%			
	<b>4. Thalweg Position</b>	1. Thalweg centering at upstream of meander bend (Run).	15	15			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	15	15			100%			
	<b>2. Bank</b>	<b>1. Scoured / Eroding</b>	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			1	60			
<b>2. Undercut</b>		Banks undercut/overhanging to the extent that mass wasting appears likely. Does <u>NOT</u> include undercuts that are modest, appear sustainable and are providing habitat.			0	0	100%	N/A	N/A	N/A
<b>3. Mass Wasting</b>		Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
<b>Totals</b>					1	60	99%	0	0	99%
<b>3. Engineered Structures</b>	<b>1. Overall Integrity</b>	Structures physically intact with no dislodged boulders or logs.	7	7			100%			
	<b>2. Grade Control</b>	Grade control structures exhibiting maintenance of grade across the sill.	7	7			100%			
	<b>2a. Piping</b>	Structures lacking any substantial flow underneath sills or arms.	7	7			100%			
	<b>3. Bank Protection</b>	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	7	7			100%			
	<b>4. Habitat</b>	Pool forming structures maintaining ~ Max Pool Depth : Mean Bankfull Depth Ratio $\geq$ 1.6. Rootwads/logs providing some cover at base-flow.	7	7			100%			

N/A - Item does not apply.

<b>Table 6. Vegetation Condition Assessment</b> <b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b> <b>Planted Acreage 15.4</b>					
Vegetation Category	Definitions	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
<b>1. Bare Areas</b>	Very limited cover of both woody and herbaceous material.	N/A	0	0	0%
<b>2. Low Stem Density Areas</b>	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	Stipple Black Dots White Background	2	<1.0	<1%
<b>Totals</b>			2	0	0%
<b>3. Areas of Poor Growth Rates or Vigor</b>	Areas with woody stems of a size class that are obviously small given the monitoring year.	N/A	0	0	0%
<b>Cumulative Totals</b>			2	0.00	0%
<b>Easement Acreage 47.8</b>					
Vegetation Category	Definitions	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
<b>4. Invasive Areas of Concern</b>	Areas or points (if too small to render as polygons at map scale).	Cross Hatch (Red - Dense/Yellow - Present)	20	1.36	3%
<b>5. Easement Encroachment Areas</b>	Areas or points (if too small to render as polygons at map scale).	Stipple Orange Dots White Background & ATV Trail	0	0.00	0%

N/A - Item does not apply.



Unnamed Tributary 1 – Permanent Photo Station 1  
Looking Upstream



Unnamed Tributary 1 – Permanent Photo Station 2  
Looking Upstream





Unnamed Tributary 1 – Permanent Photo Station 3  
Looking Upstream



Unnamed Tributary 1 – Permanent Photo Station 3  
Looking Downstream



Unnamed Tributary 1 – Permanent Photo Station 4  
Looking Upstream



Unnamed Tributary 1 – Permanent Photo Station 5  
Looking Upstream



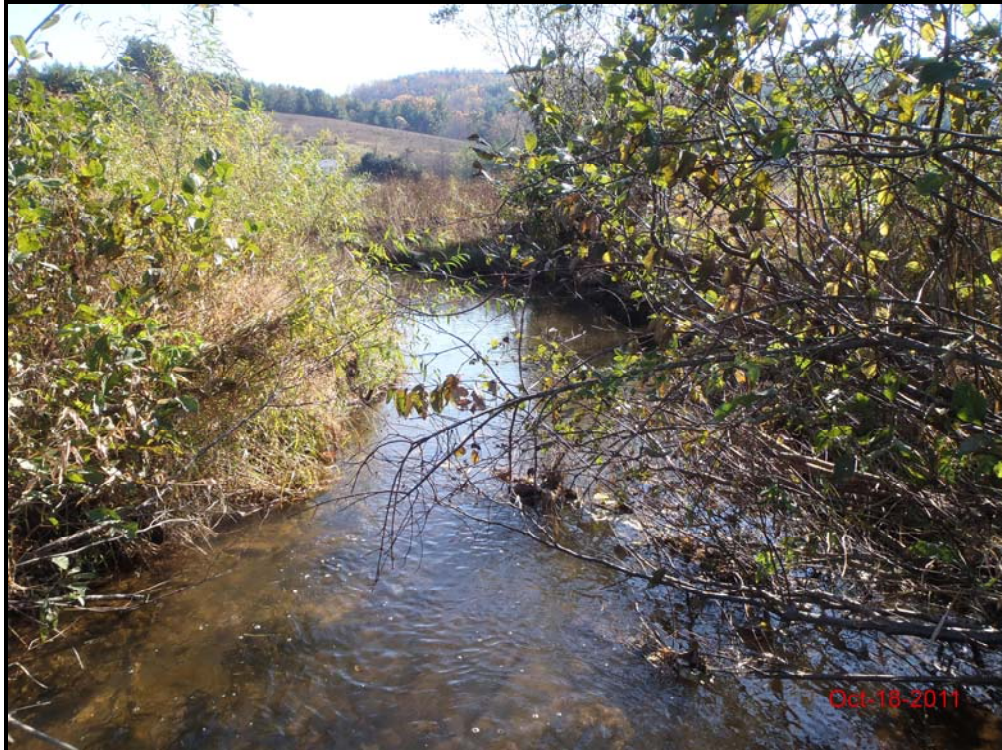
Unnamed Tributary 1 – Permanent Photo Station 6  
Looking Upstream



Unnamed Tributary 1 – Permanent Photo Station 7  
Looking Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 7  
Looking Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 7  
Looking Downstream



Wetland Area 2 – Permanent Photo Station 8  
Looking North



Wetland Area 2 – Permanent Photo Station 8  
Looking Southwest



Wetland Area 2 – Permanent Photo Station 9  
Looking North



Wetland Area 2 – Permanent Photo Station 9  
Looking West



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 10  
Looking Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 11  
Looking Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 11  
Looking Downstream





Unnamed Tributary Crab Creek Upper – Permanent Photo Station 12  
Looking Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 13  
Looking Upstream



Wetland Area 4 – Permanent Photo Station 14  
Looking West



Wetland Area 4 – Permanent Photo Station 15  
Looking Southwest



Wetland Area 5 & 6 – Permanent Photo Station 16  
Looking South

# **Appendix C**

## **Vegetation Plot Data**

<b>Table 7. Vegetation Plot Criteria Attainment UT Crab Creek / Project No. 857</b>		
<b>Vegetation Plot ID</b>	<b>Vegetation Survival Threshold Met?</b>	<b>Tract Mean</b>
1	No	56%
2	Yes	
3	Yes	
4	No	
5	No	
6	No	
7	Yes	
8	Yes	
9	Yes	



Vegetation Monitoring Plot 1  
Monitoring Year 2 – June 1, 2011



Vegetation Monitoring Plot 2  
Monitoring Year 2 – June 1, 2011



Vegetation Monitoring Plot 3  
Monitoring Year 2 – June 1, 2011



Vegetation Monitoring Plot 4  
Monitoring Year 2 – June 1, 2011



Vegetation Monitoring Plot 5  
Monitoring Year 2 – June 1, 2011



Vegetation Monitoring Plot 6  
Monitoring Year 2 – June 1, 2011





Vegetation Monitoring Plot 7  
Monitoring Year 2 – June 1, 2011



Vegetation Monitoring Plot 8  
Monitoring Year 2 – June 1, 2011



Vegetation Monitoring Plot 9  
Monitoring Year 2 – June 1, 2011

<b>Table 8. CVS Vegetation Plot Metadata UT Crab Creek - 857</b>	
<b>Report Prepared By</b>	Kevin Mitchell
<b>Date Prepared</b>	7/13/2011 11:06
<b>Database Name</b>	Equinox-2011-A-UTCrab-MY2.mdb
<b>Database Location</b>	ZAES\NRI&MEEP Monitoring\UT Crab Creek\UTC-MY2-2011\Data\Veg
<b>Computer Name</b>	D16TNK71
<b>File Size</b>	40484864
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----</b>	
<b>Metadata</b>	Description of database file, the report worksheets, and a summary of project(s) and project data.
<b>Proj. Planted</b>	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
<b>Proj. Total Stems</b>	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.
<b>Plots</b>	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
<b>Vigor</b>	Frequency distribution of vigor classes for stems for all plots.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage</b>	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>Planted Stems by Plot and Spp</b>	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
<b>ALL Stems by Plot and spp</b>	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.
<b>PROJECT SUMMARY-----</b>	
<b>Project Code</b>	857
<b>Project Name</b>	UT-Crab Creek Stream & Wetland Restoration
<b>Description</b>	
<b>River Basin</b>	New
<b>Length(ft)</b>	
<b>Stream-to-Edge Width (ft)</b>	
<b>Area (sq m)</b>	
<b>Required Plots (calculated)</b>	
<b>Sampled Plots</b>	9

Table 9a. Planted and Total Stem Counts (Species by Plot with Annual Means)																																						
UT Crab Creek Stream & Wetland / Project No. 857																																						
Scientific Name	Common Name	Species Type	Current Plot Data (MY2 2011)																																			
			E857-01-0001			E857-01-0002			E857-01-0003			E857-01-0004			E857-01-0005			E857-01-0006			E857-01-0007			E857-01-0008			E857-01-0009			Annual Means								
			P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T	P-noLS	P-all	T			
Acer rubrum	Red maple	Tree						3																														
Alnus serrulata	Hazel alder	Shrub Tree	1	1	1	7	7	7	7	7	7	2	2	2	2	2	16	4	4	35	1	1	13	5	5	5	3	3	3	32	32	89	21	21	50	11	11	11
Aronia arbutifolia	Red chokeberry	Shrub										1	1	1							7	7	7							8	8	8	8	8	8	6	6	6
Betula lenta var. lenta	Sweet birch	Tree																1	1	1				4	4	4	4	4	4	9	9	9	9	9	9	15	15	15
Carpinus caroliniana var. virginiana	American hornbeam	Shrub Tree						4	1	1	1																3	3	3	4	4	8	15	15	15	25	25	25
Cornus amomum	Silky dogwood	Shrub												1																								
Ilex verticillata	Common winterberry	Shrub Tree				8	8	8				1	1	1	1	1	1	1	1	1										11	11	11	12	12	12	7	7	7
Lindera benzoin var. benzoin	Northem spicebush	Shrub Tree							3	3	3													2	2	2	2	2	2	7	7	7	11	11	11	23	23	23
Prunus serotina	Black cherry	Shrub Tree			1																																	
Robinia pseudoacacia	Black locust	Tree																																				
Salix nigra	Black willow	Tree																		1																		
Sambucus canadensis	Common elderberry	Shrub Tree																																				
Unknown		Unknown																																				
Viburnum nudum	Possumhaw	Shrub Tree	2	2	2																									2	2	2	8	8	8	8	8	8
<b>Stem count</b>			3	3	4	15	15	22	11	11	11	4	4	5	3	3	17	6	6	38	8	8	20	11	11	13	12	12	13	73	73	143	84	84	117	100	100	100
<b>Size (ares)</b>			1			1			1			1			1			1			1			1			1			9			9			9		
<b>Size (ACRES)</b>			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.22			0.22			0.22		
<b>Species count</b>			2	2	3	2	2	4	3	3	3	3	3	4	2	2	2	3	3	4	2	2	2	3	3	5	4	4	5	7	7	12	7	7	10	8	8	8
<b>Stems per ACRE</b>			121.41	121.41	161.87	607.03	607.03	890.31	445.15	445.15	445.15	161.87	161.87	202.34	121.41	121.41	687.97	242.81	242.81	1537.8	323.75	323.75	809.37	445.15	445.15	526.09	485.62	485.62	526.09	328.25	328.25	643	377.71	377.71	526.09	449.65	449.65	449.65
Exceeds requirements by 10% Exceeds requirements, but by less than 10% Fails to meet requirements by more than 10%																																						

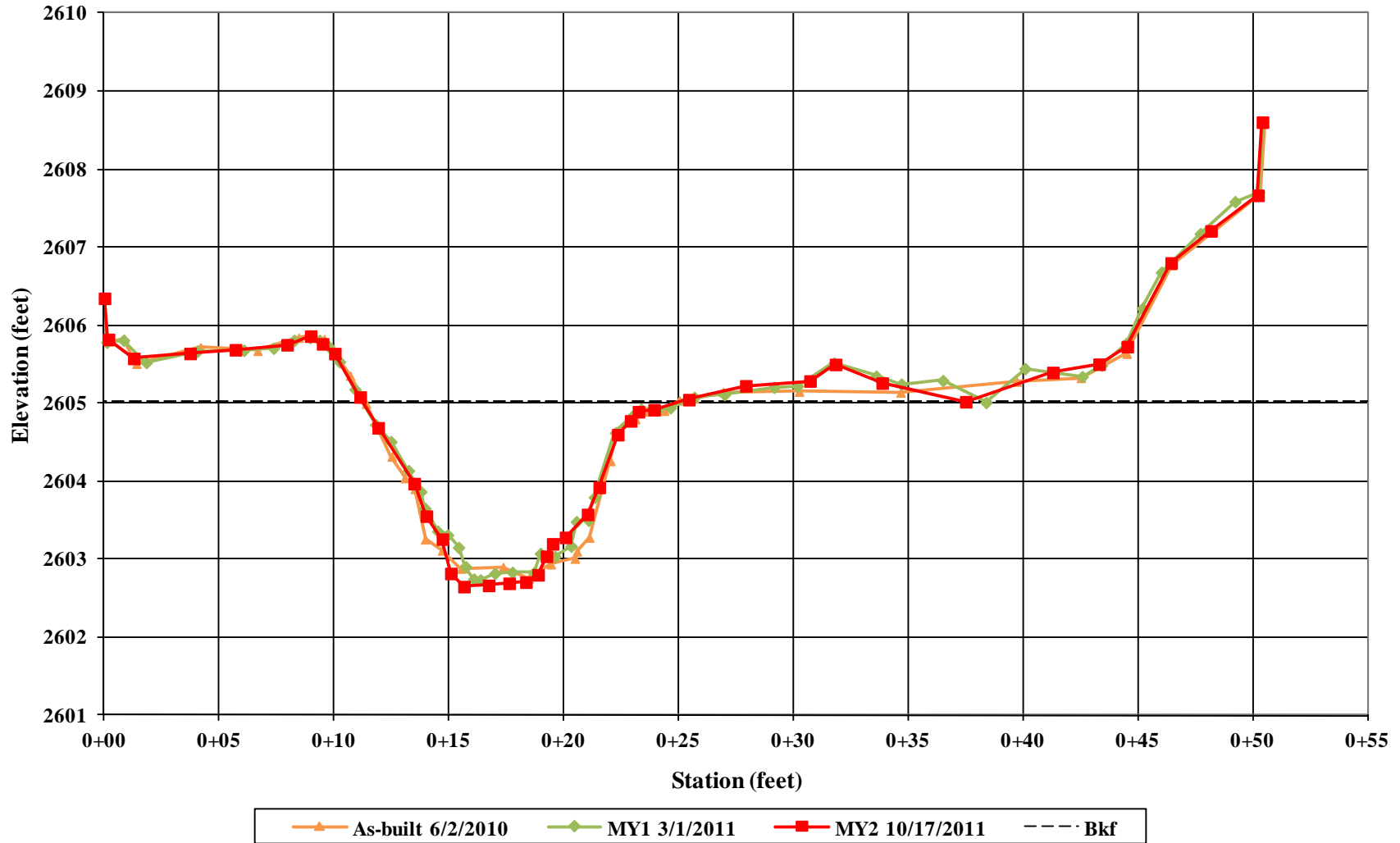
Table 9b. Planting Zone D Random Circular Plot Data UT Crab Creek Stream & Wetland / Project No. 857																												
Scientific Name	Common Name	Random Plot 1			Random Plot 2			Random Plot 3			Random Plot 4			Random Plot 5			Random Plot 6			Random Plot 7			Random Plot 8			Annual Mean MY2 (2011)		
		Recruit	Planted*	Total	Recruit	Planted*	Total	Recruit	Planted*	Total	Recruit	Planted*	Total	Recruit	Planted*	Total	Recruit	Planted*	Total	Recruit	Planted*	Total	Recruit	Planted*	Total	Recruit	Planted*	Total
Alnus serrulata	Hazel alder															19		19	4		4			12	12	23	12	35
Aronia arbutifolia	Red chokeberry							1	1								1	1								0	2	2
Betula lenta var. lenta	Sweet birch																						4	4	0	4	4	
Rosa palustris	Swamp rose					3	3										1	1			6	6				0	10	10
Pinus strobus	Eastern white pine	2		2																						2	0	2
Acer rubrum	Red maple	12		12															15		15					27	0	27
<b>Stem count</b>		14	0	14	0	3	3	0	1	1	0	0	0	0	0	0	19	2	21	19	6	25	0	16	16	52	28	80
<b>Size (ACRES)</b>		0.05			0.05			0.05			0.05			0.05			0.05			0.05			0.05			0.40		
<b>Species count</b>		2	0	2	0	1	1	0	1	1	0	0	0	0	0	0	1	2	3	2	1	3	0	2	2	3	6	6
<b>Stems per ACRE</b>		283.28	0	283.28	0	60.70	60.70	0	20.23	20.23	0	0	0	0	0	0	384.45	40.47	424.92	384.45	121.41	505.86	0	323.75	323.75	131.52	70.82	202.34
<b>Herbaceous Coverage (%)</b>		65			95			100			100			85			95			90			75			88		

\*Assumed to be planted based on species and height.

# **Appendix D**

## **Stream Survey Data**

**Unnamed Tributary 1 - Upper  
Cross-Section 1 - Riffle  
Station 106 + 83.73**





Cross-Section 1 – Riffle  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 17, 2011



Cross-Section 1 – Riffle  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 17, 2011



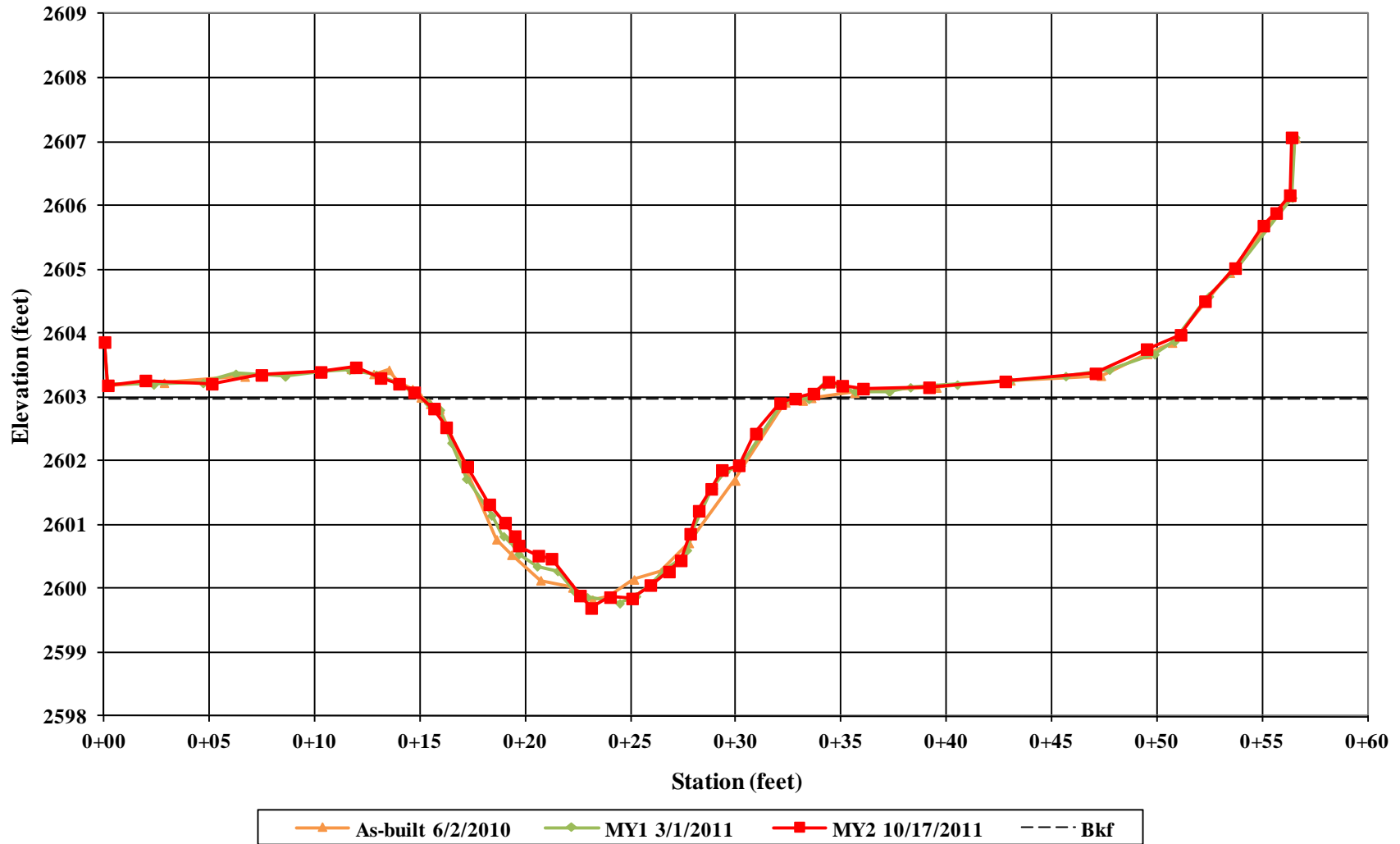


Cross-Section 1 – Riffle  
(Looking Downstream)  
Monitoring Year 2 – October 17, 2011



Cross-Section 1 – Riffle  
(Looking Upstream)  
Monitoring Year 2 – October 17, 2011

**Unnamed Tributary 1 - Upper  
Cross-Section 2 - Pool  
Station 107 + 77.18**





Cross-Section 2 – Pool  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 17, 2011



Cross-Section 2 – Pool  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 17, 2011

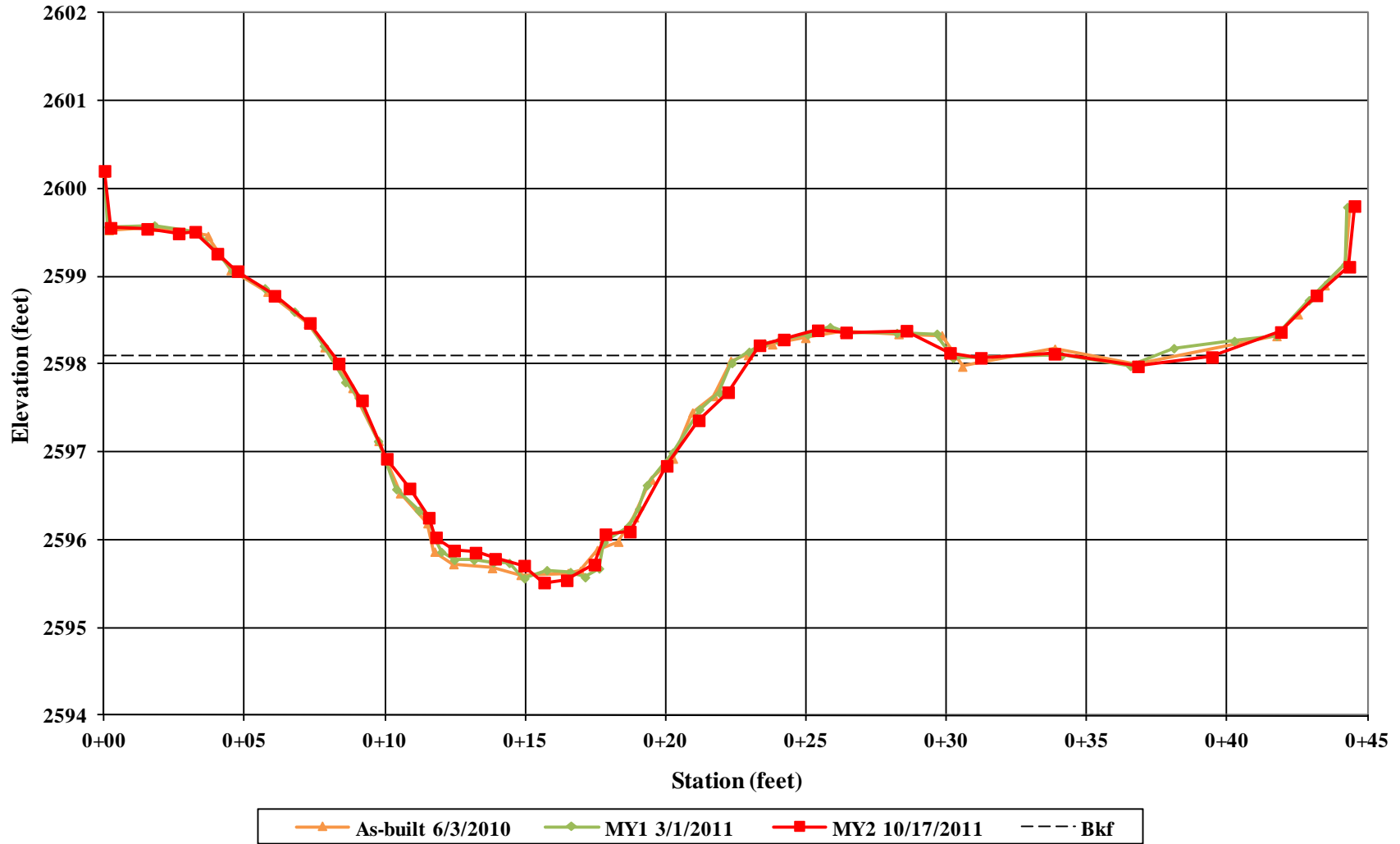


Cross-Section 2 – Pool  
(Looking Downstream)  
Monitoring Year 2 – October 17, 2011



Cross-Section 2 – Pool  
(Looking Upstream)  
Monitoring Year 2 – October 17, 2011

**Unnamed Tributary 1 - Upper  
Cross-Section 3 - Riffle  
Station 109 + 65.00**





Cross-Section 3 – Riffle  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 17, 2011



Cross-Section 3 – Riffle  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 17, 2011

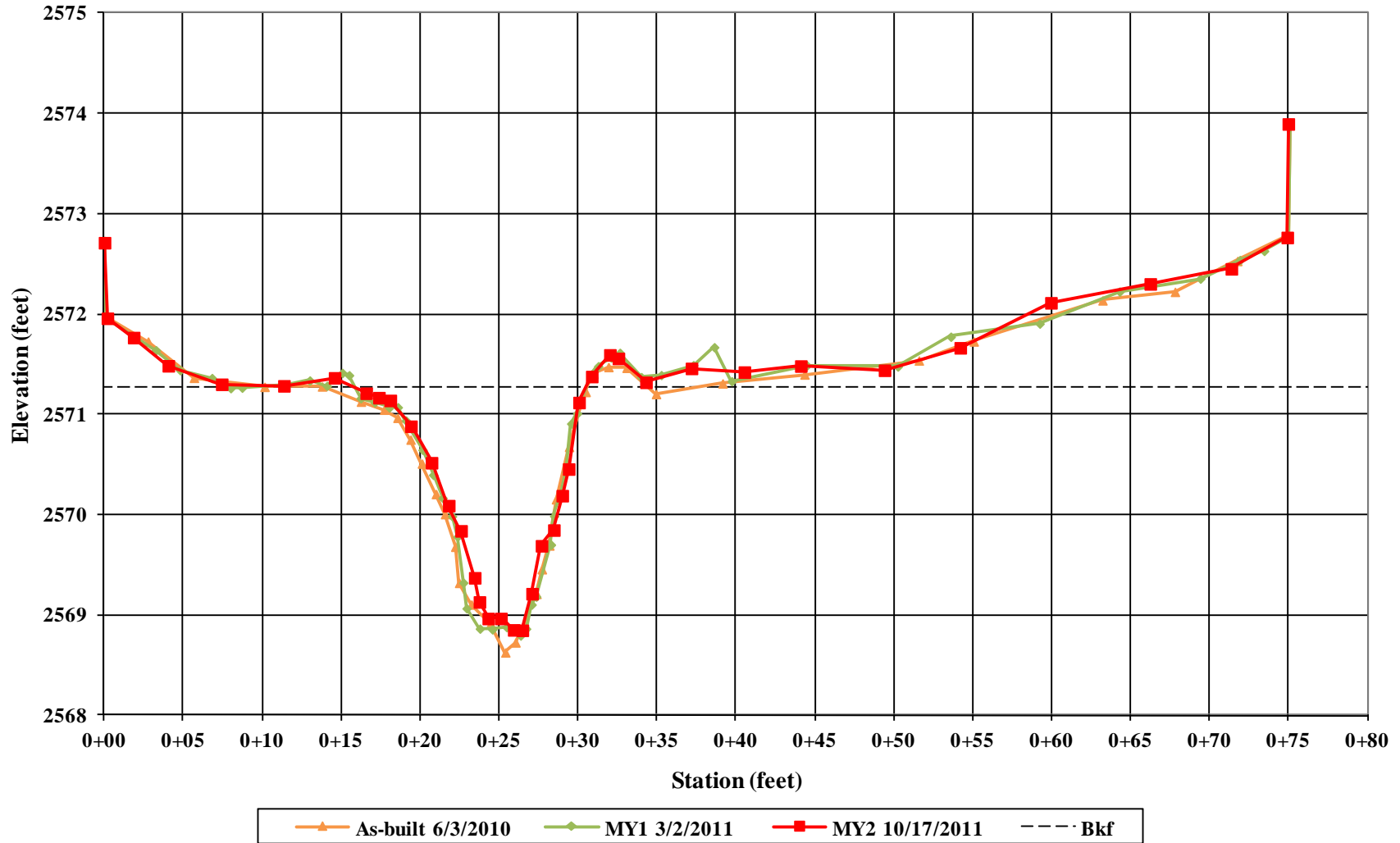


Cross-Section 3 – Riffle  
(Looking Downstream)  
Monitoring Year 2 – October 17, 2011



Cross-Section 3 – Riffle  
(Looking Upstream)  
Monitoring Year 2 – October 17, 2011

**Unnamed Tributary 1 - Lower  
Cross-Section 4 - Pool  
Station 123 + 11.85**







Cross-Section 4 – Pool  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 17, 2011



Cross-Section 4 – Pool  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 17, 2011

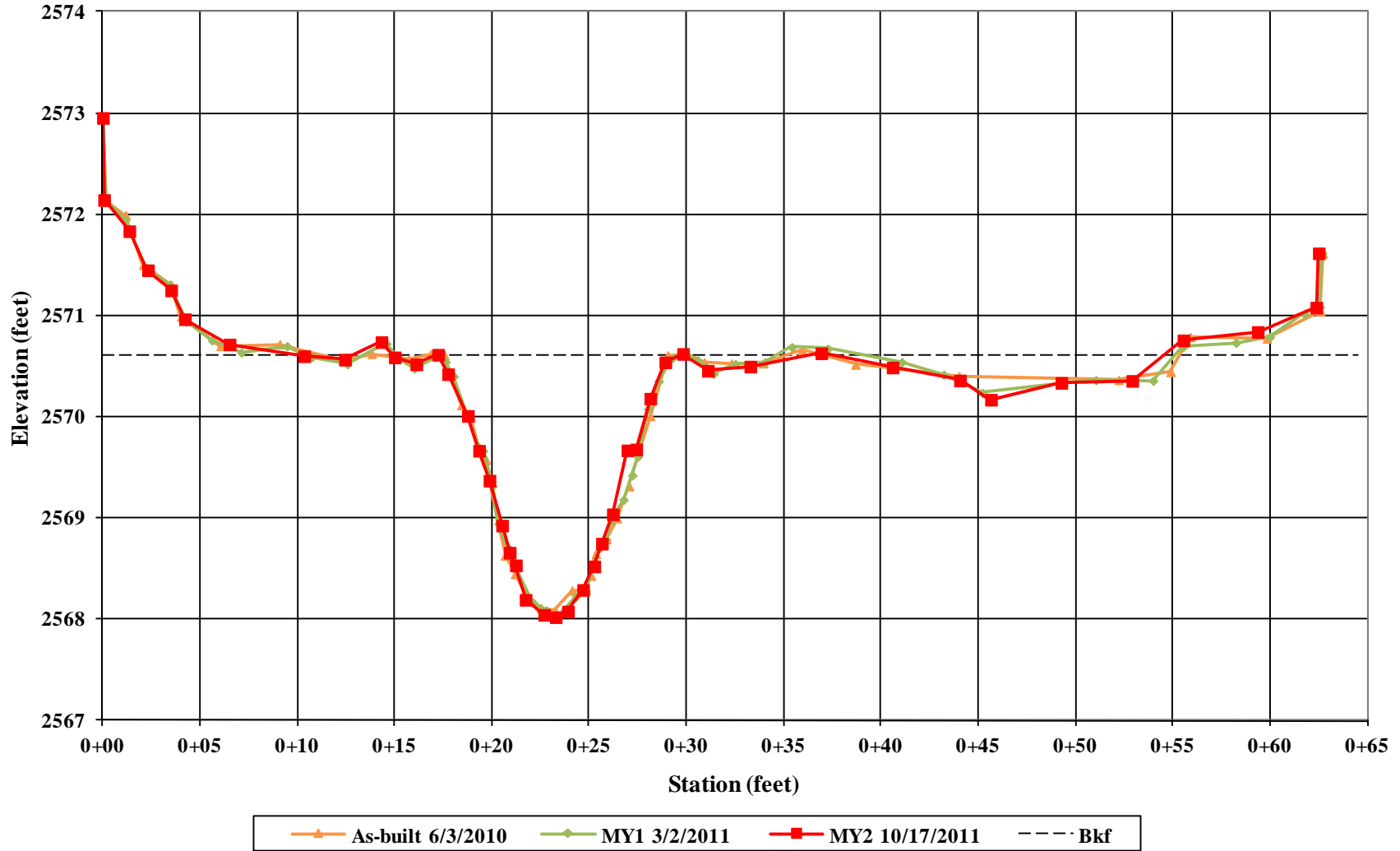


Cross-Section 4 – Pool  
(Looking Downstream)  
Monitoring Year 2 – October 17, 2011



Cross-Section 4 – Pool  
(Looking Upstream)  
Monitoring Year 2 – October 17, 2011

**Unnamed Tributary 1 - Lower  
Cross-Section 5 - Riffle  
Station 123 + 54.60**





Cross-Section 5 – Riffle  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 17, 2011



Cross-Section 5 – Riffle  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 17, 2011

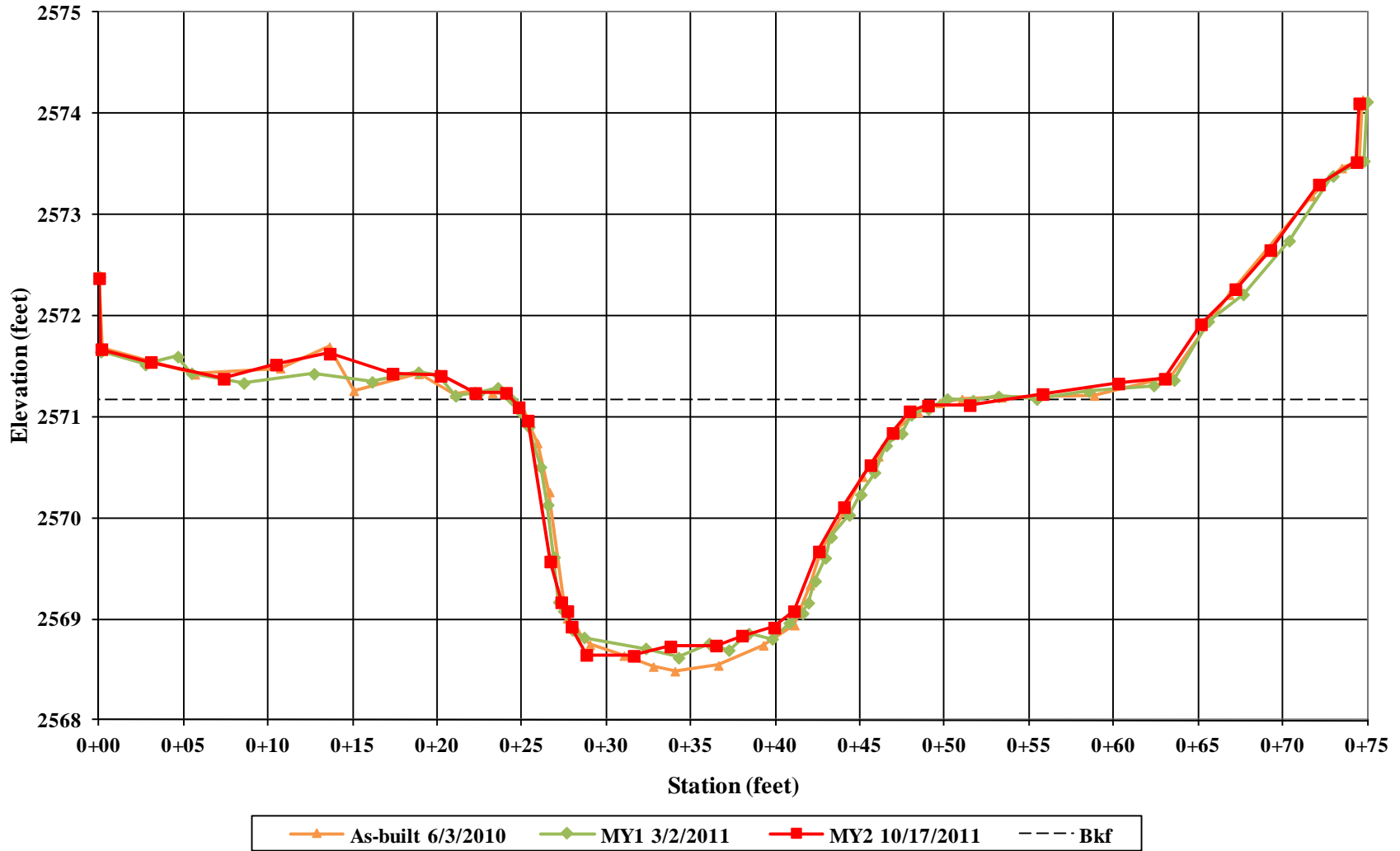


Cross-Section 5 – Riffle  
(Looking Downstream)  
Monitoring Year 2 – October 17, 2011



Cross-Section 5 – Riffle  
(Looking Upstream)  
Monitoring Year 2 – October 17, 2011

**UT Crab Creek - Upstream  
Cross-Section 6 - Riffle  
Station 11 + 47.00**





Cross-Section 6 – Riffle  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 17, 2011



Cross-Section 6 – Riffle  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 17, 2011



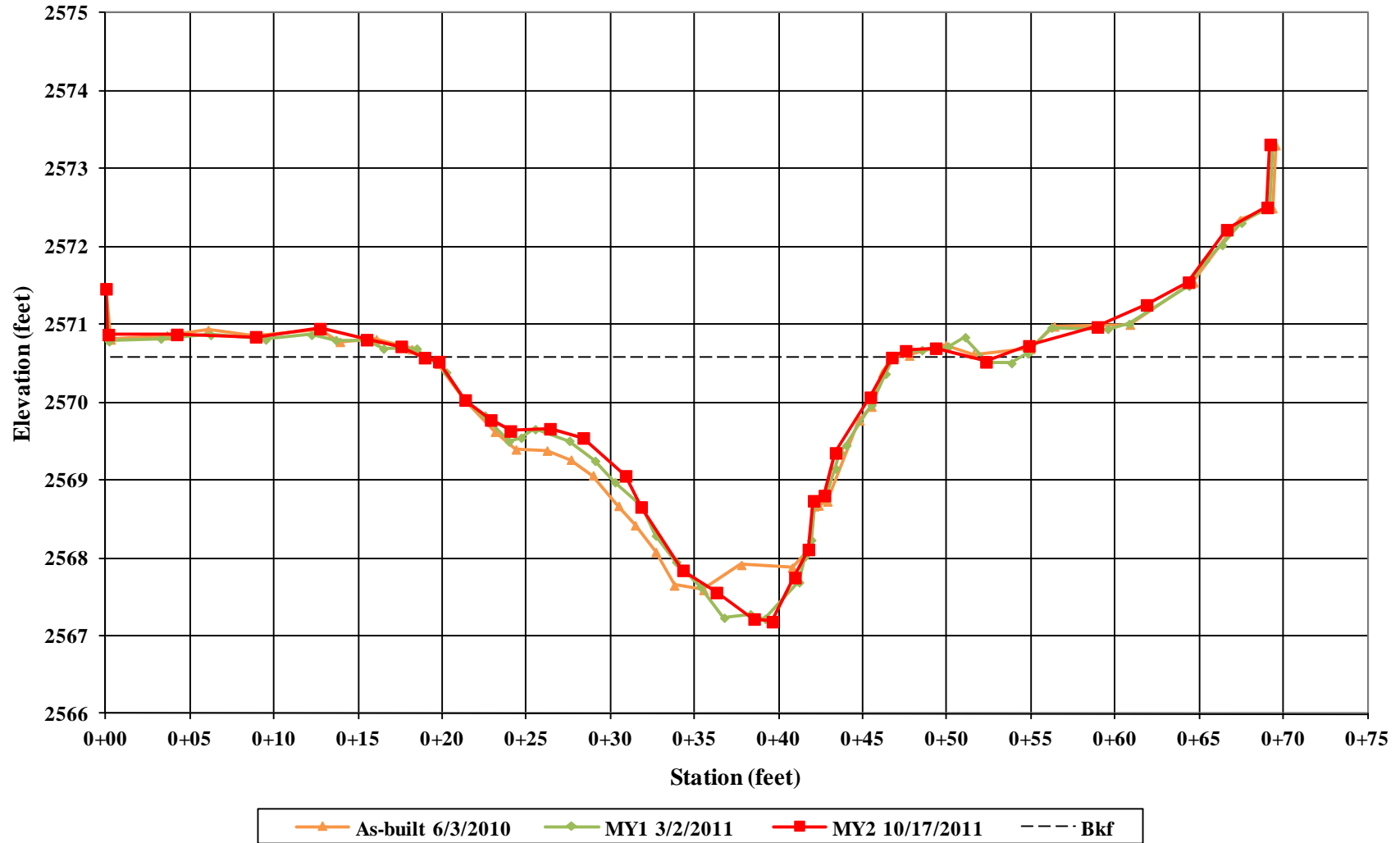
Cross-Section 6 – Riffle  
(Looking Downstream)  
Monitoring Year 2 – October 17, 2011



Cross-Section 6 – Riffle  
(Looking Upstream)  
Monitoring Year 2 – October 17, 2011



**UT Crab Creek - Upstream  
Cross-Section 7 - Pool  
Station 12 + 02.03**





Cross-Section 7 – Pool  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 17, 2011



Cross-Section 7 – Pool  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 17, 2011

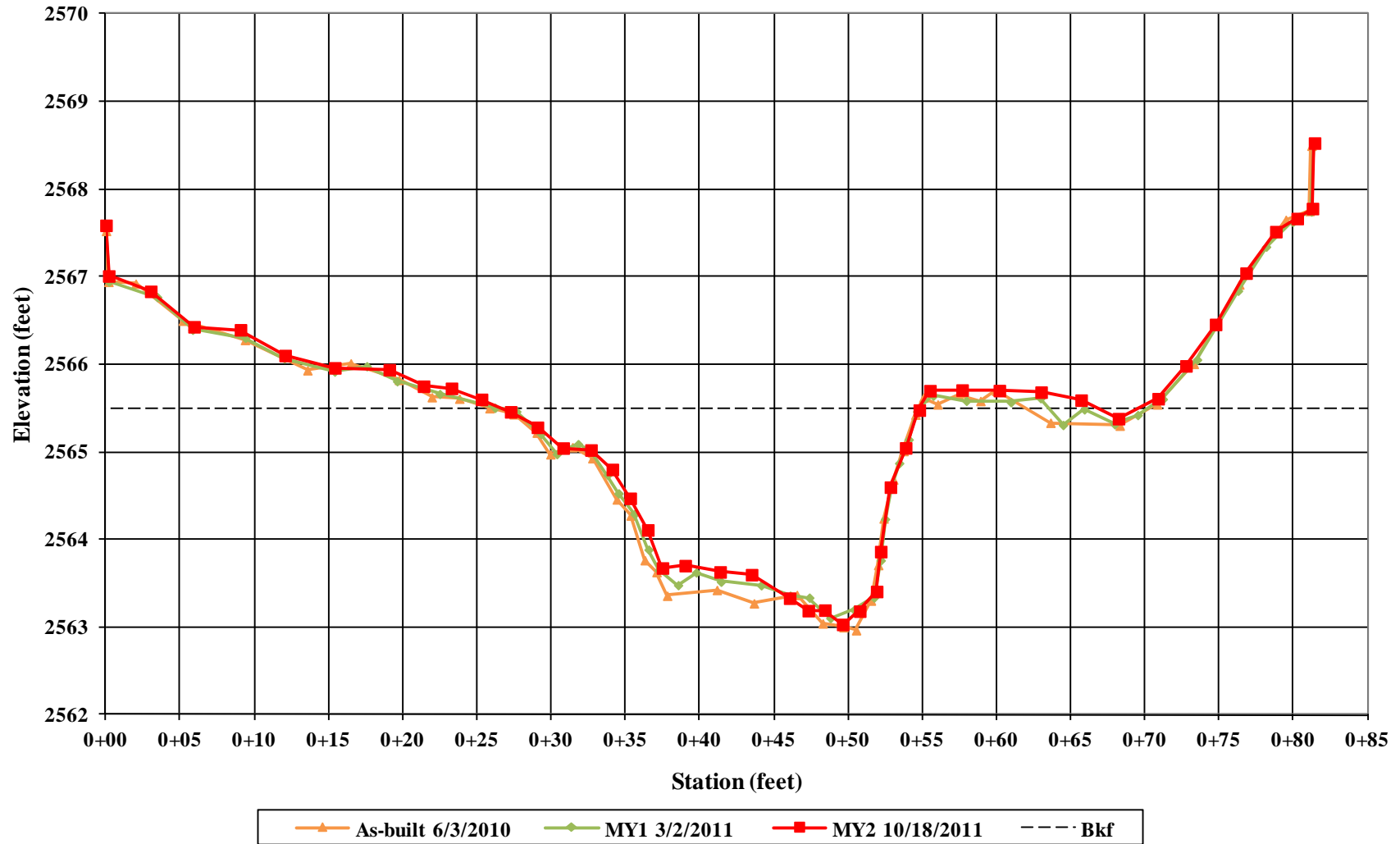


Cross-Section 7 – Pool  
(Looking Downstream)  
Monitoring Year 2 – October 17, 2011



Cross-Section 7 – Pool  
(Looking Upstream)  
Monitoring Year 2 – October 17, 2011

**UT Crab Creek - Upstream  
Cross-Section 8 - Riffle  
Station 17 + 49.02**





Cross-Section 8 – Riffle  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 18, 2011



Cross-Section 8 – Riffle  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 18, 2011

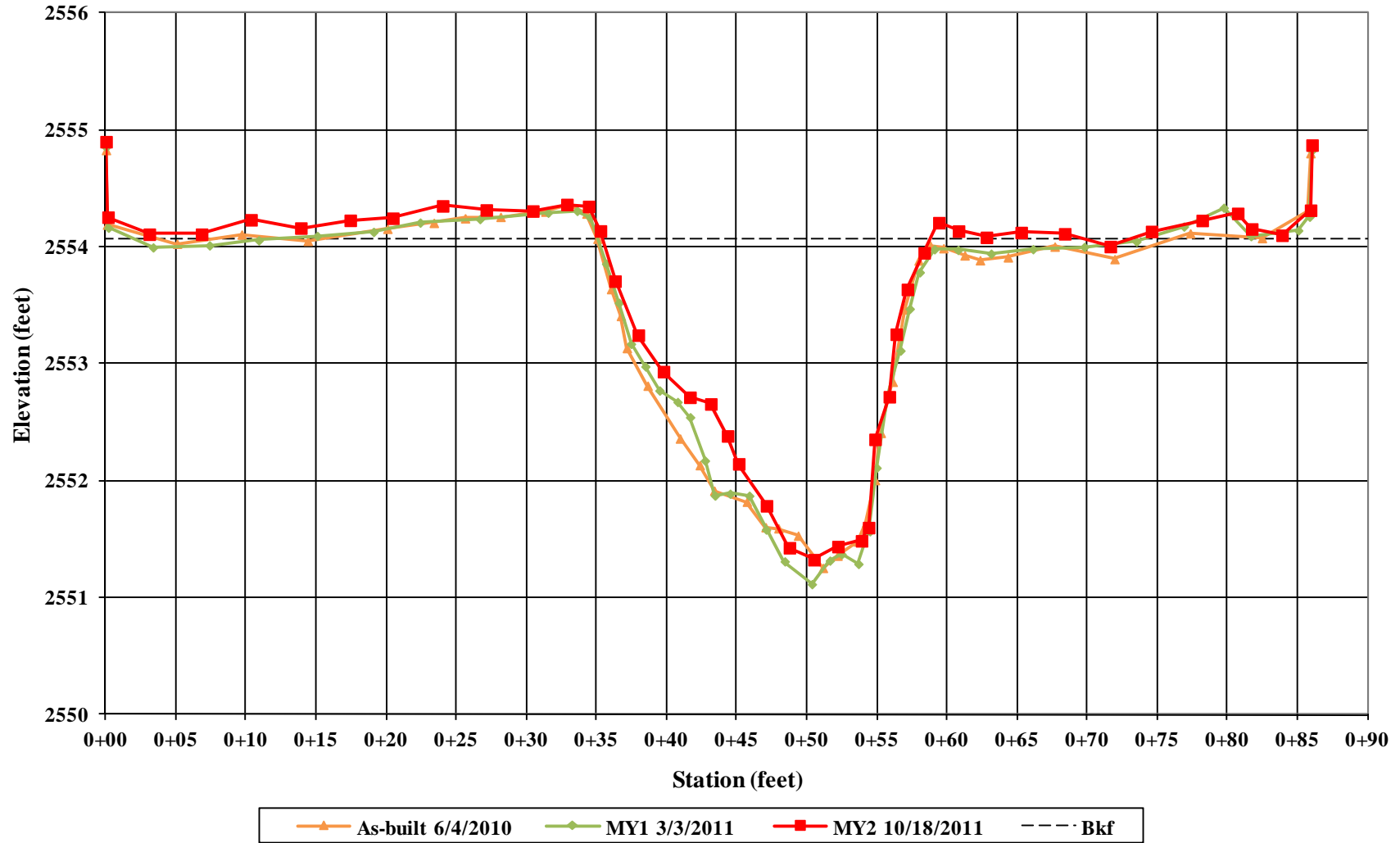


Cross-Section 8 – Riffle  
(Looking Downstream)  
Monitoring Year 2 – October 18, 2011



Cross-Section 8 – Riffle  
(Looking Upstream)  
Monitoring Year 2 – October 18, 2011

**UT Crab Creek - Upstream  
Cross-Section 9 - Pool  
Station 32 + 30.85**





Cross-Section 9 – Pool  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 18, 2011



Cross-Section 9 – Pool  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 18, 2011



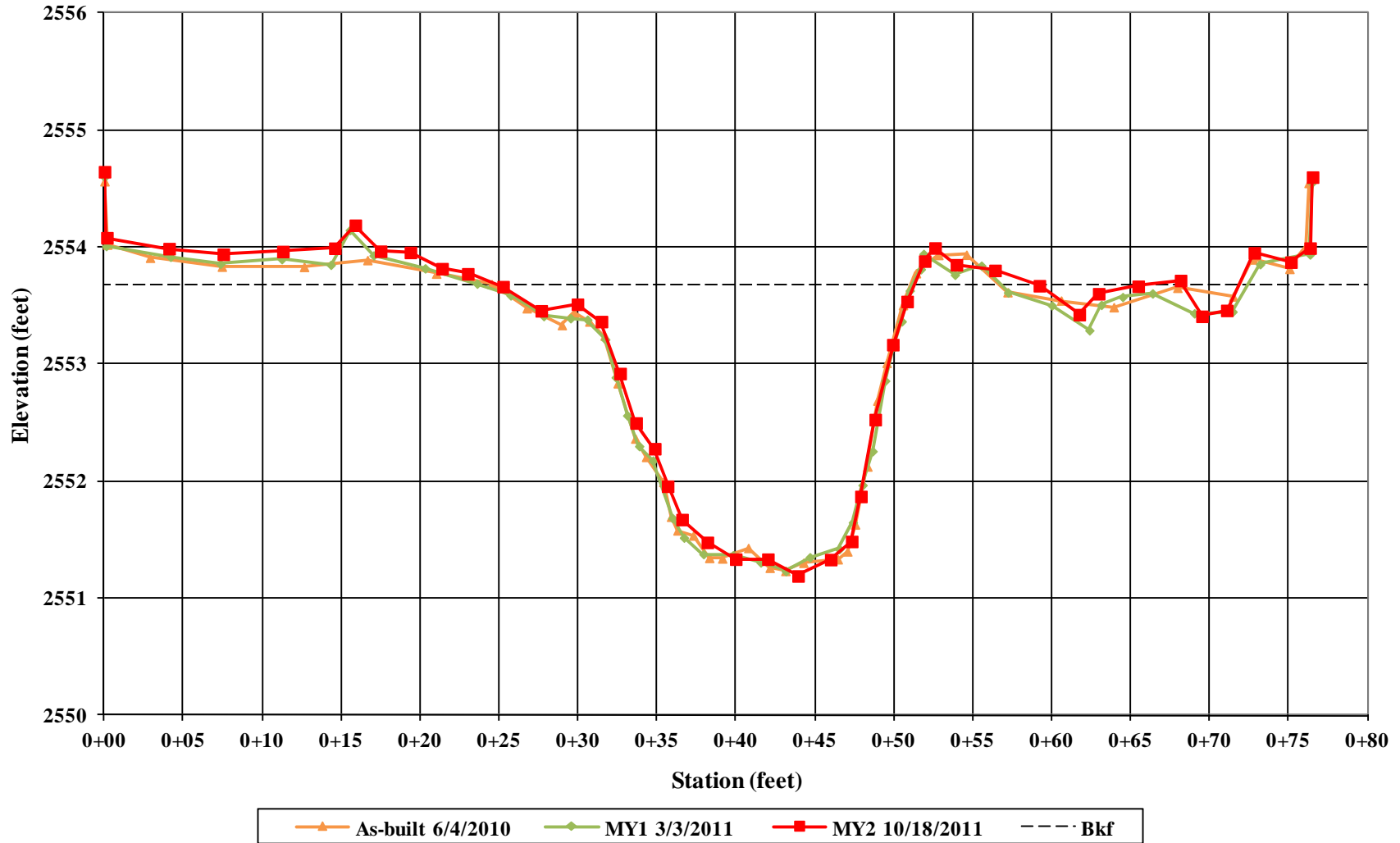


Cross-Section 9 – Pool  
(Looking Downstream)  
Monitoring Year 2 – October 18, 2011



Cross-Section 9 – Pool  
(Looking Upstream)  
Monitoring Year 2 – October 18, 2011

**UT Crab Creek - Upstream  
Cross-Section 10 - Riffle  
Station 33 + 08.78**





Cross-Section 10 – Riffle  
(Looking at Left Bank Descending)  
Monitoring Year 2 – October 18, 2011



Cross-Section 10 – Riffle  
(Looking at Right Bank Descending)  
Monitoring Year 2 – October 18, 2011

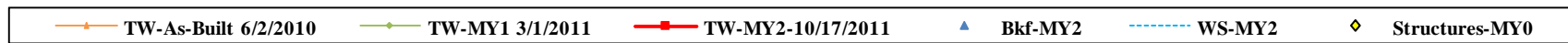
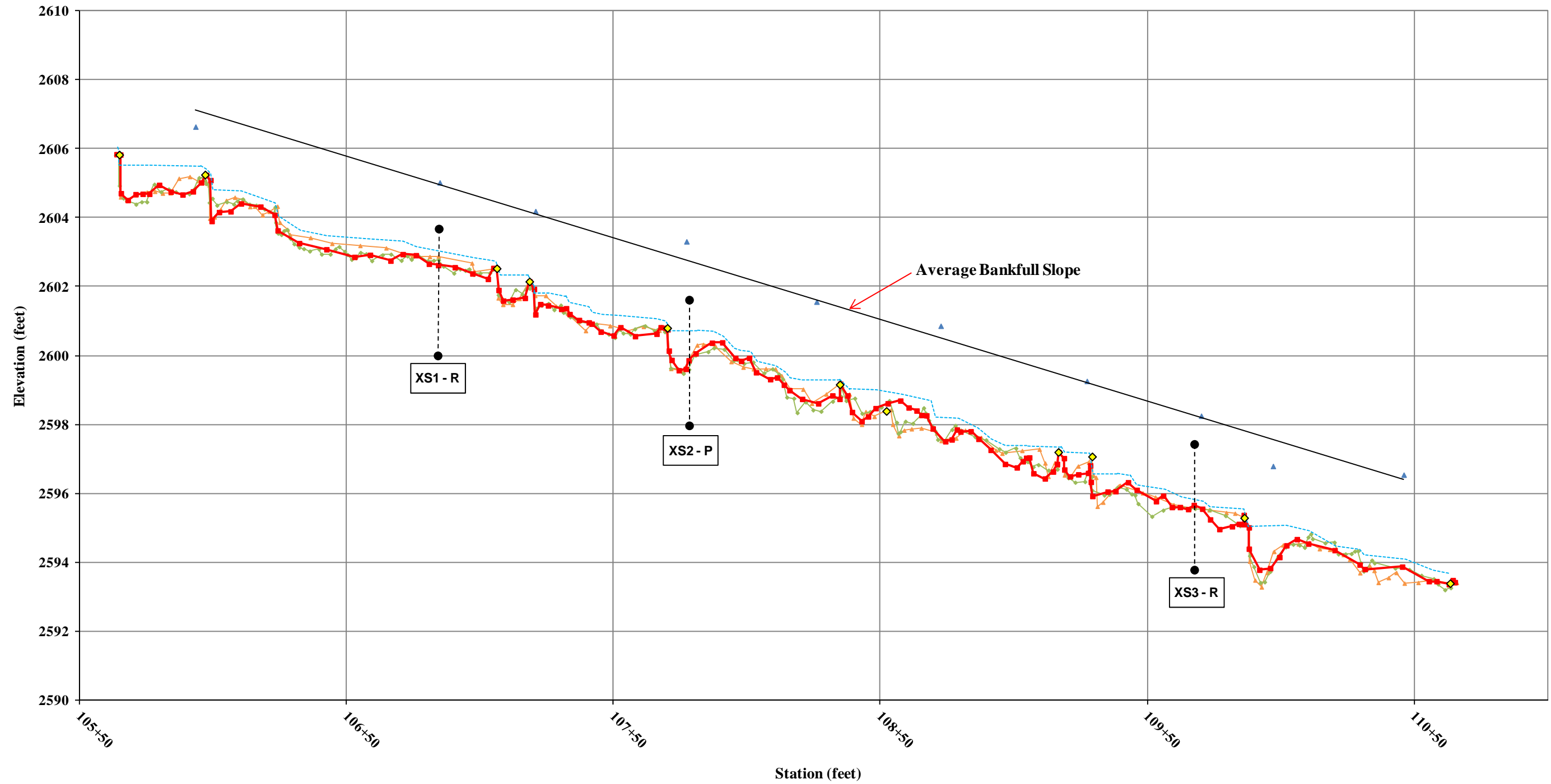


Cross-Section 10 – Riffle  
(Looking Downstream)  
Monitoring Year 2 – October 18, 2011

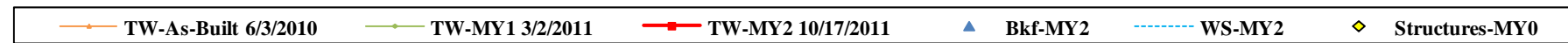
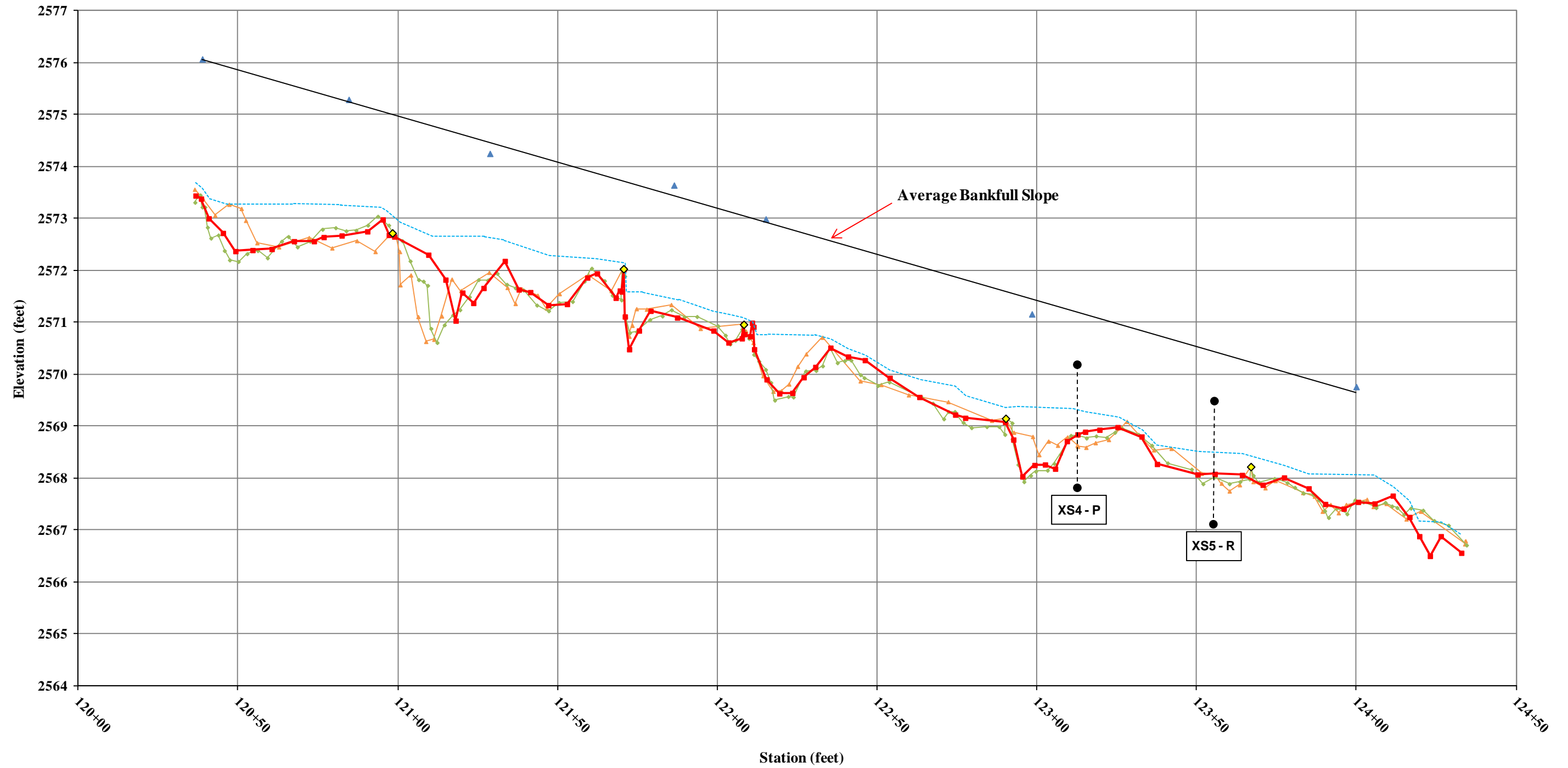


Cross-Section 10 – Riffle  
(Looking Upstream)  
Monitoring Year 2 – October 18, 2011

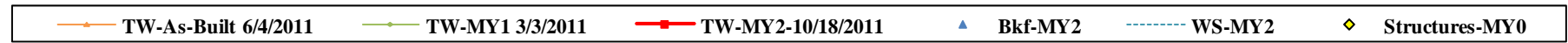
**UT to Crab - Upper  
Longitudinal Profile  
Stationing 105+63 - 110+63**



**UT to Crab - Lower  
Longitudinal Profile  
Stationing 120+36 - 124+33**



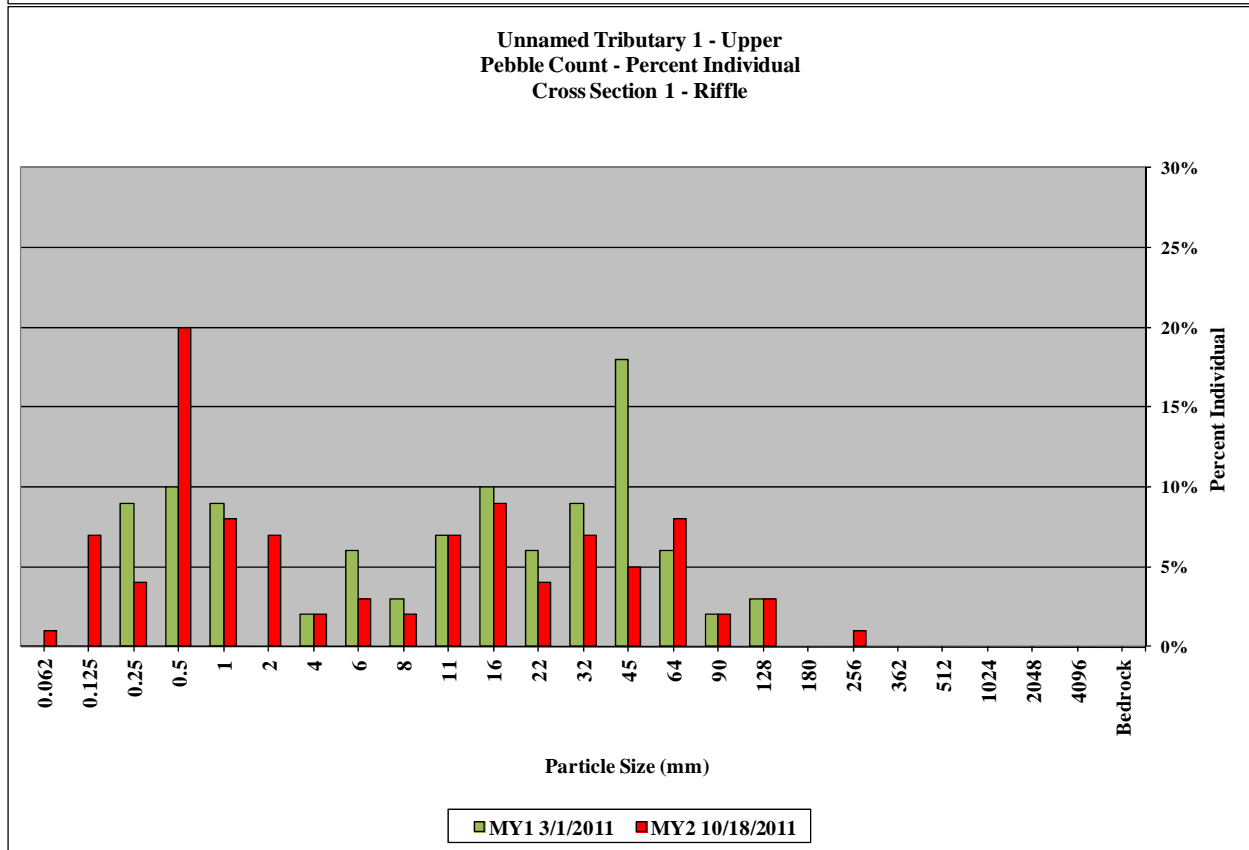
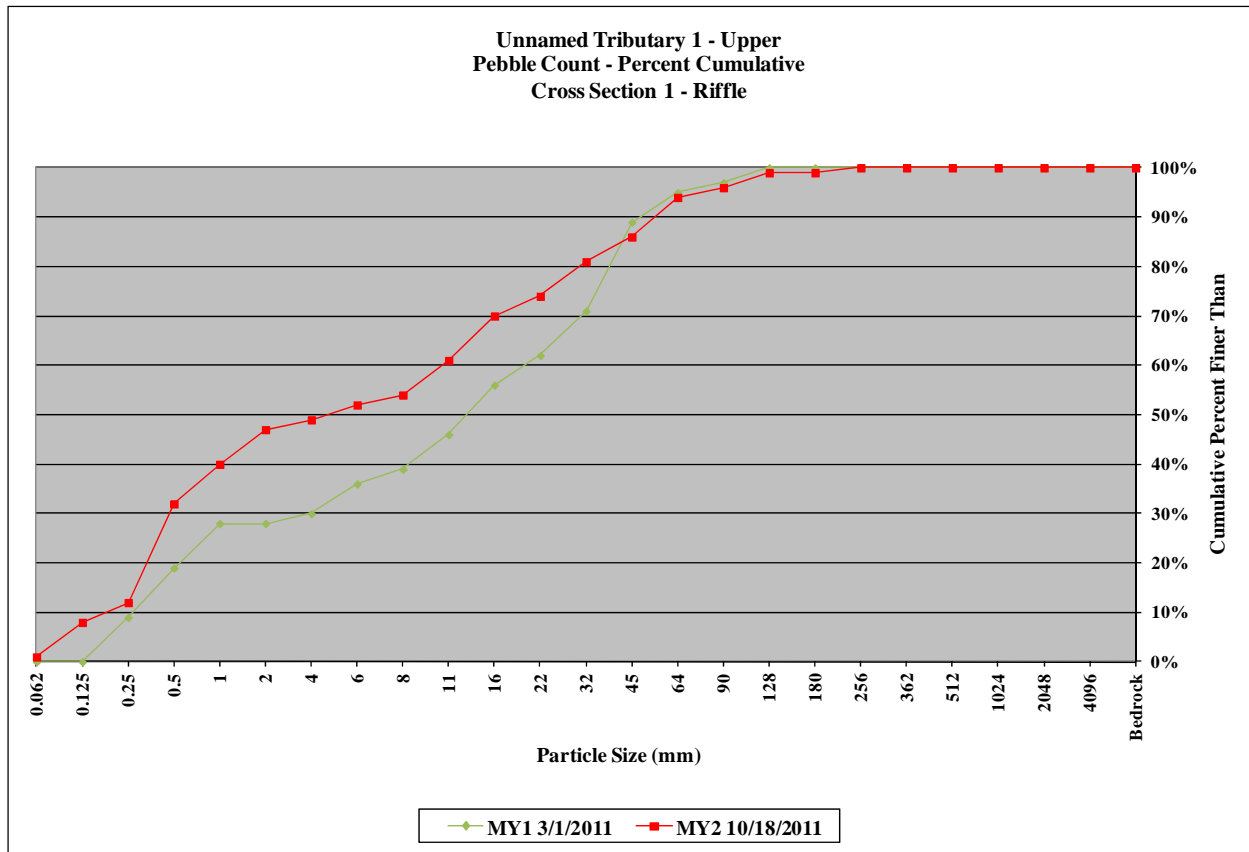
**UT to Crab - Upstream  
Longitudinal Profile  
Stationing 10+02 - 34+57**



<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UT1 - Upper - Cross-Section 1 - Riffle</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	1	1%	1%
<b>Sand</b>	very fine sand	0.125	7	7%	8%
	fine sand	0.25	4	4%	12%
	medium sand	0.50	20	20%	32%
	coarse sand	1.00	8	8%	40%
	very coarse sand	2.00	7	7%	47%
<b>Gravel</b>	very fine gravel	4.0	2	2%	49%
	fine gravel	5.7	3	3%	52%
	fine gravel	8.0	2	2%	54%
	medium gravel	11.3	7	7%	61%
	medium gravel	16.0	9	9%	70%
	coarse gravel	22.3	4	4%	74%
	coarse gravel	32	7	7%	81%
	very coarse gravel	45	5	5%	86%
	very coarse gravel	64	8	8%	94%
<b>Cobble</b>	small cobble	90	2	2%	96%
	medium cobble	128	3	3%	99%
	large cobble	180	0	0%	99%
	very large cobble	256	1	1%	100%
<b>Boulder</b>	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

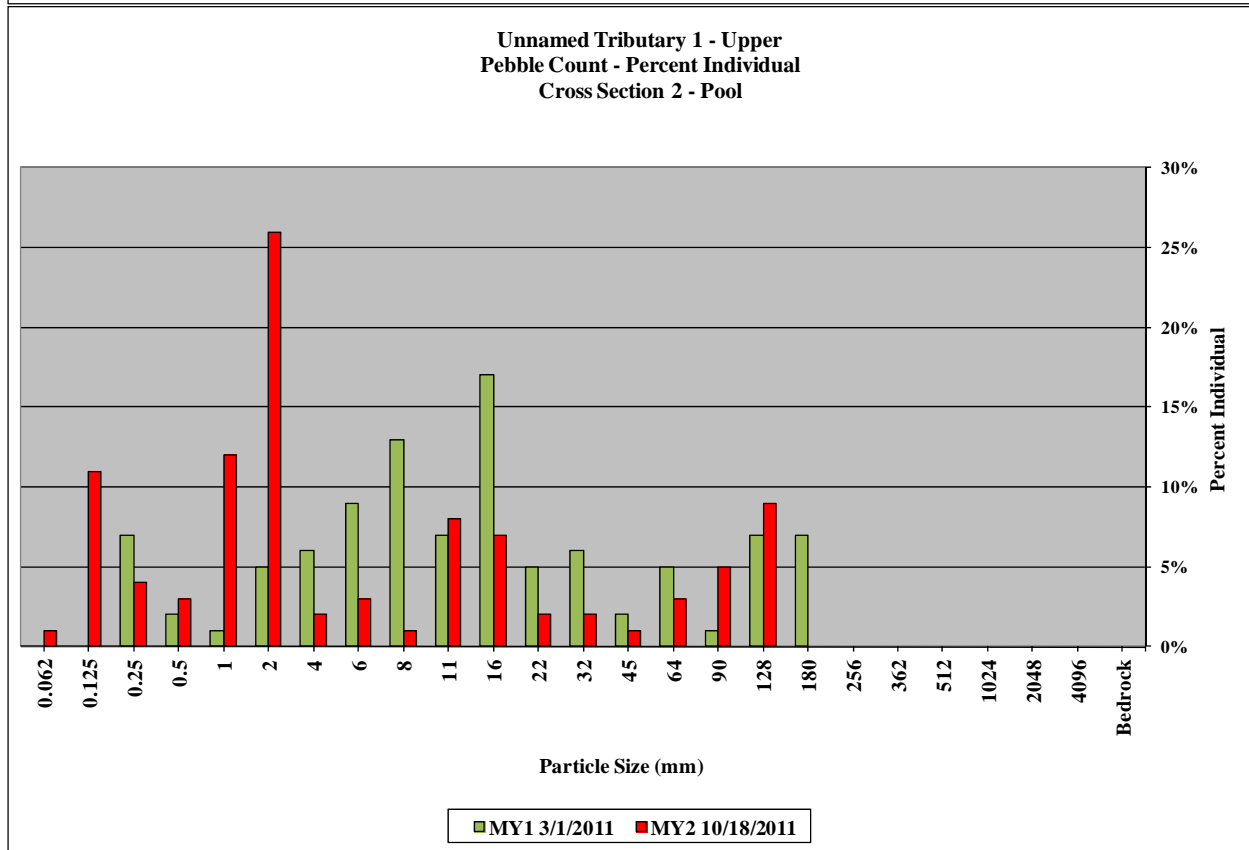
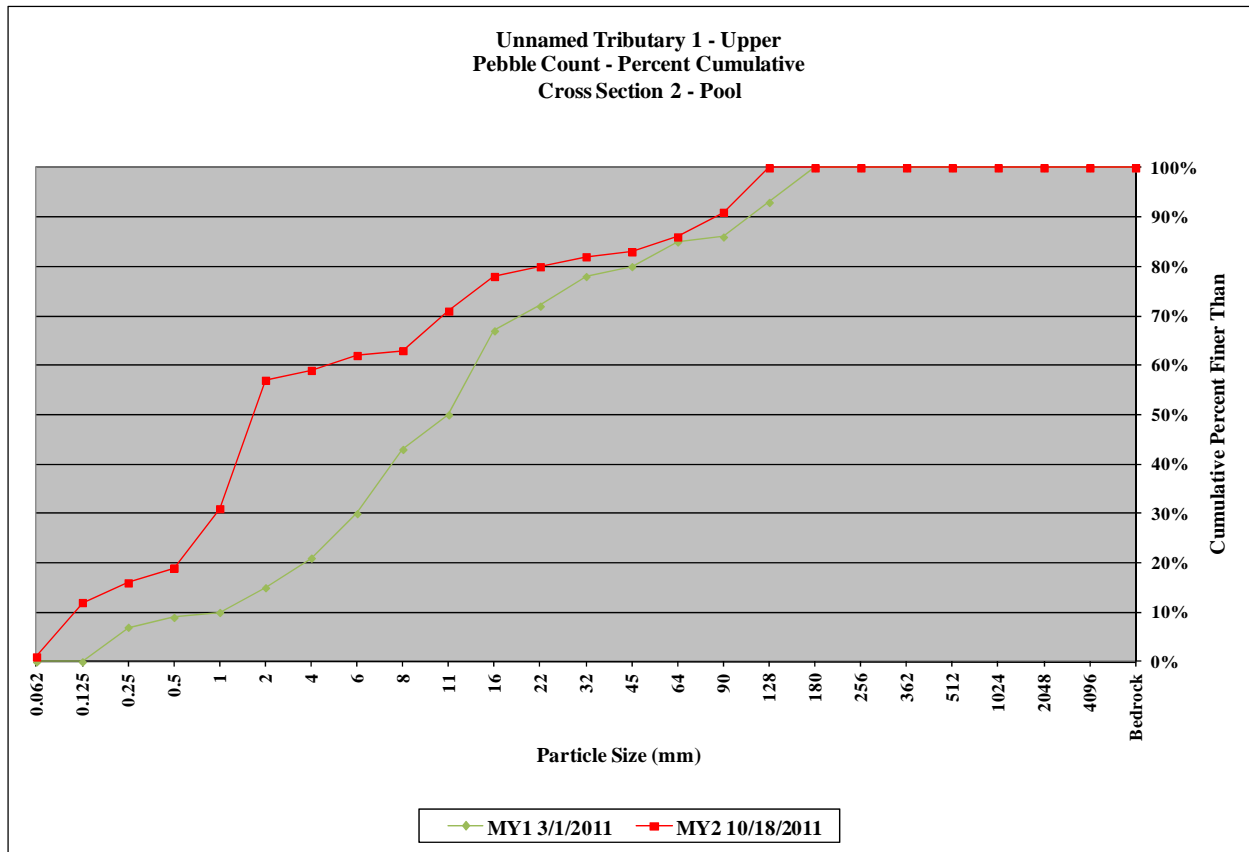
<b>Summary Data</b>	
D50	4.6
D84	39
D95	76





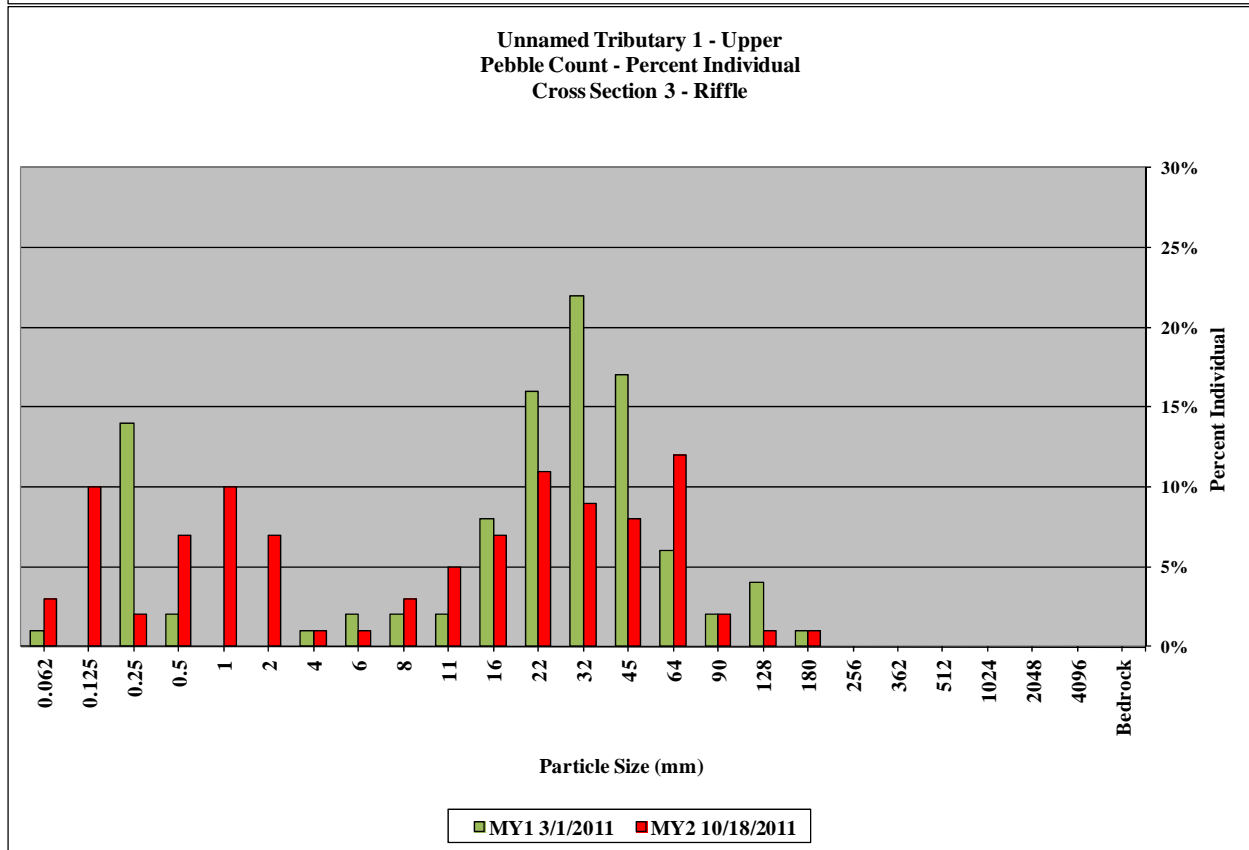
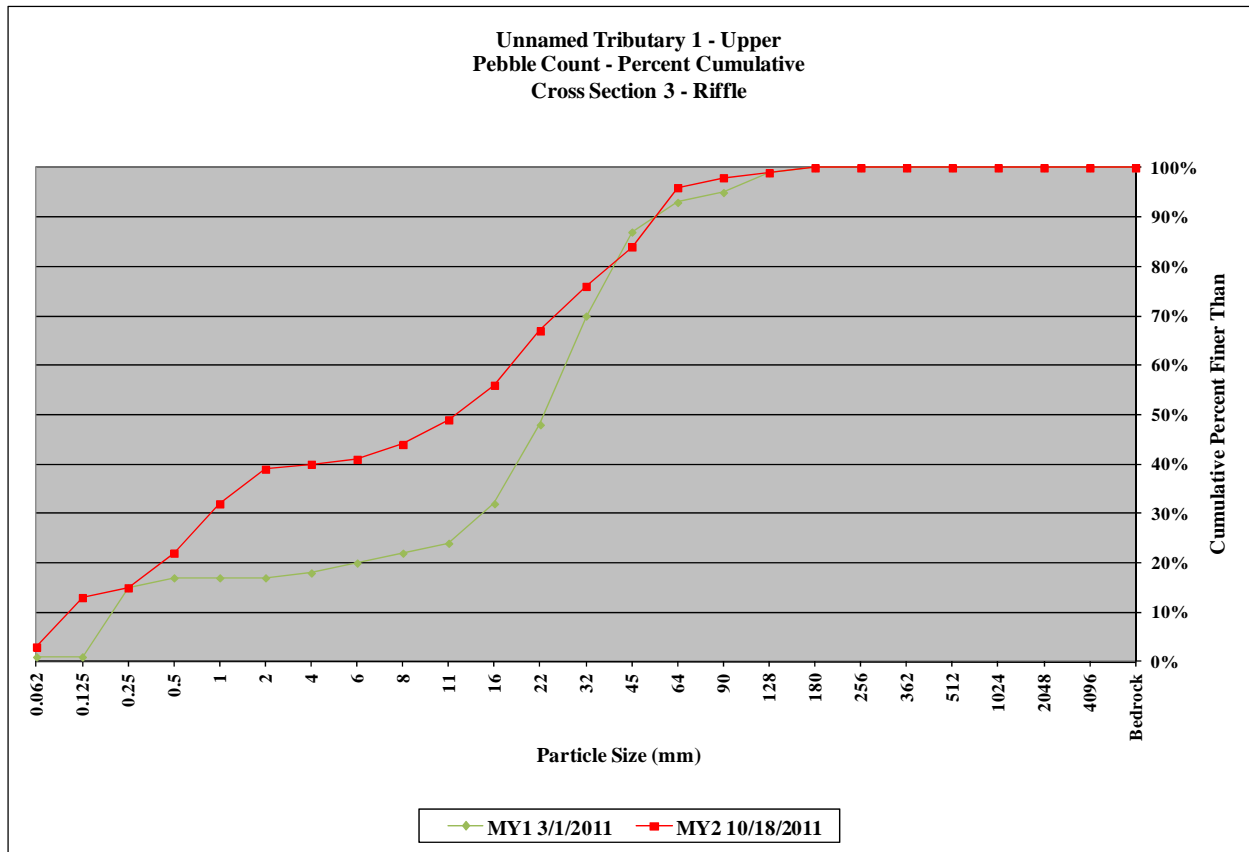
<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UT1 - Upper - Cross-Section 2 - Pool</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	1	1%	1%
<b>Sand</b>	very fine sand	0.125	11	11%	12%
	fine sand	0.25	4	4%	16%
	medium sand	0.50	3	3%	19%
	coarse sand	1.00	12	12%	31%
	very coarse sand	2.00	26	26%	57%
<b>Gravel</b>	very fine gravel	4.0	2	2%	59%
	fine gravel	5.7	3	3%	62%
	fine gravel	8.0	1	1%	63%
	medium gravel	11.3	8	8%	71%
	medium gravel	16.0	7	7%	78%
	coarse gravel	22.3	2	2%	80%
	coarse gravel	32	2	2%	82%
	very coarse gravel	45	1	1%	83%
	very coarse gravel	64	3	3%	86%
<b>Cobble</b>	small cobble	90	5	5%	91%
	medium cobble	128	9	9%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
<b>Boulder</b>	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

<b>Summary Data</b>	
D50	1.7
D84	51
D95	110



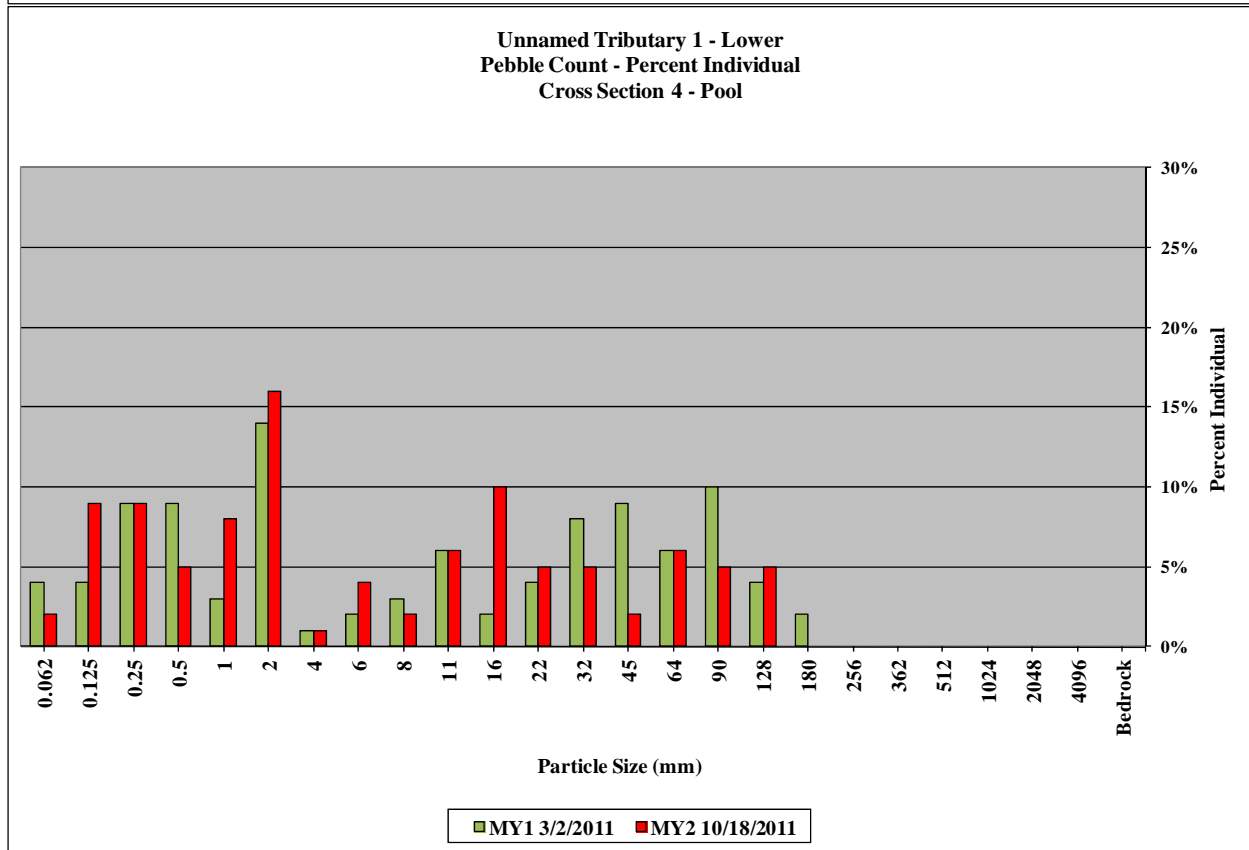
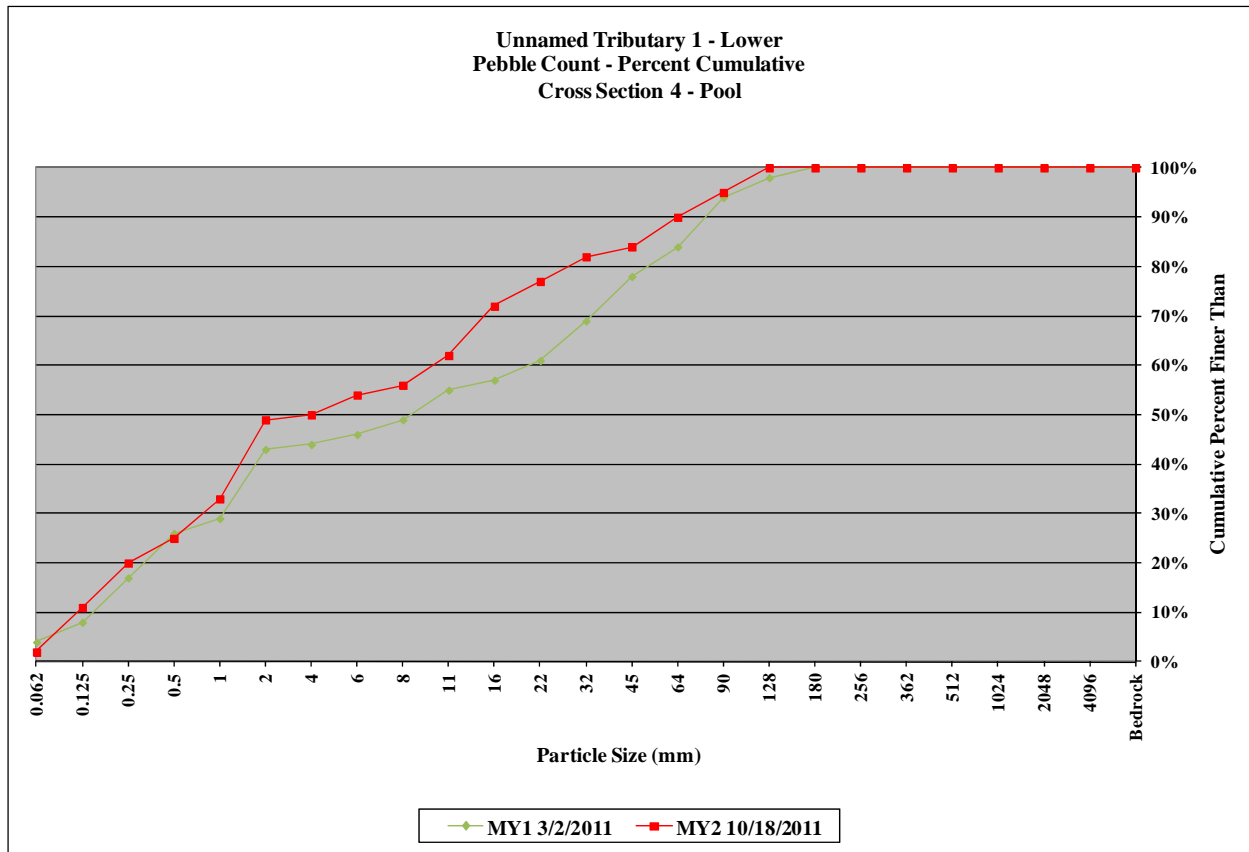
<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UT1 - Upper - Cross-Section 3 - Riffle</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	3	3%	3%
<b>Sand</b>	very fine sand	0.125	10	10%	13%
	fine sand	0.25	2	2%	15%
	medium sand	0.50	7	7%	22%
	coarse sand	1.00	10	10%	32%
	very coarse sand	2.00	7	7%	39%
<b>Gravel</b>	very fine gravel	4.0	1	1%	40%
	fine gravel	5.7	1	1%	41%
	fine gravel	8.0	3	3%	44%
	medium gravel	11.3	5	5%	49%
	medium gravel	16.0	7	7%	56%
	coarse gravel	22.3	11	11%	67%
	coarse gravel	32	9	9%	76%
	very coarse gravel	45	8	8%	84%
	very coarse gravel	64	12	12%	96%
<b>Cobble</b>	small cobble	90	2	2%	98%
	medium cobble	128	1	1%	99%
	large cobble	180	1	1%	100%
	very large cobble	256	0	0%	100%
<b>Boulder</b>	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

<b>Summary Data</b>	
D50	12
D84	45
D95	62



<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UT1 - Lower - Cross-Section 4 - Pool</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	2	2%	2%
<b>Sand</b>	very fine sand	0.125	9	9%	11%
	fine sand	0.25	9	9%	20%
	medium sand	0.50	5	5%	25%
	coarse sand	1.00	8	8%	33%
	very coarse sand	2.00	16	16%	49%
<b>Gravel</b>	very fine gravel	4.0	1	1%	50%
	fine gravel	5.7	4	4%	54%
	fine gravel	8.0	2	2%	56%
	medium gravel	11.3	6	6%	62%
	medium gravel	16.0	10	10%	72%
	coarse gravel	22.3	5	5%	77%
	coarse gravel	32	5	5%	82%
	very coarse gravel	45	2	2%	84%
	very coarse gravel	64	6	6%	90%
<b>Cobble</b>	small cobble	90	5	5%	95%
	medium cobble	128	5	5%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
<b>Boulder</b>	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

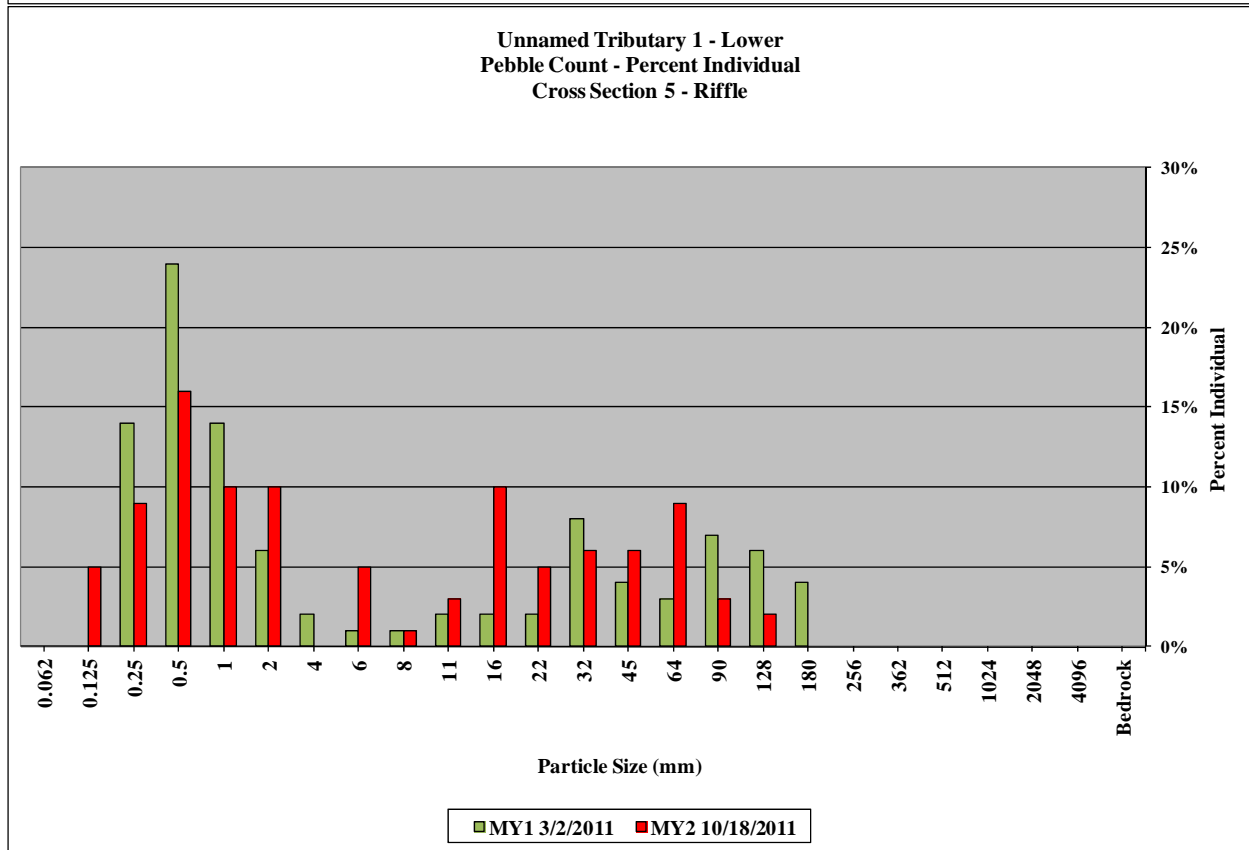
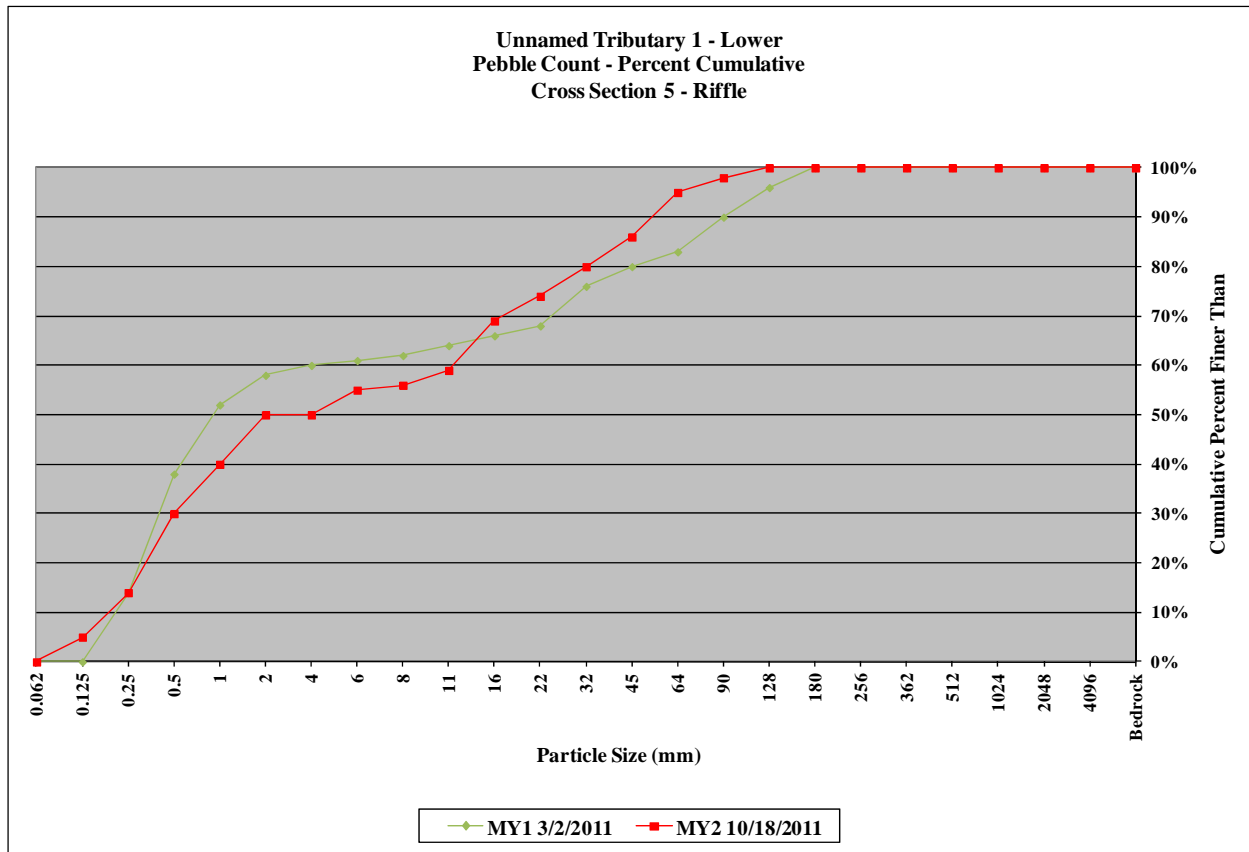
<b>Summary Data</b>	
D50	4
D84	45
D95	90



<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UT1 - Lower - Cross-Section 5 - Riffle</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	0	0%	0%
<b>Sand</b>	very fine sand	0.125	5	5%	5%
	fine sand	0.25	9	9%	14%
	medium sand	0.50	16	16%	30%
	coarse sand	1.00	10	10%	40%
	very coarse sand	2.00	10	10%	50%
<b>Gravel</b>	very fine gravel	4.0	0	0%	50%
	fine gravel	5.7	5	5%	55%
	fine gravel	8.0	1	1%	56%
	medium gravel	11.3	3	3%	59%
	medium gravel	16.0	10	10%	69%
	coarse gravel	22.3	5	5%	74%
	coarse gravel	32	6	6%	80%
	very coarse gravel	45	6	6%	86%
	very coarse gravel	64	9	9%	95%
<b>Cobble</b>	small cobble	90	3	3%	98%
	medium cobble	128	2	2%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
<b>Boulder</b>	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

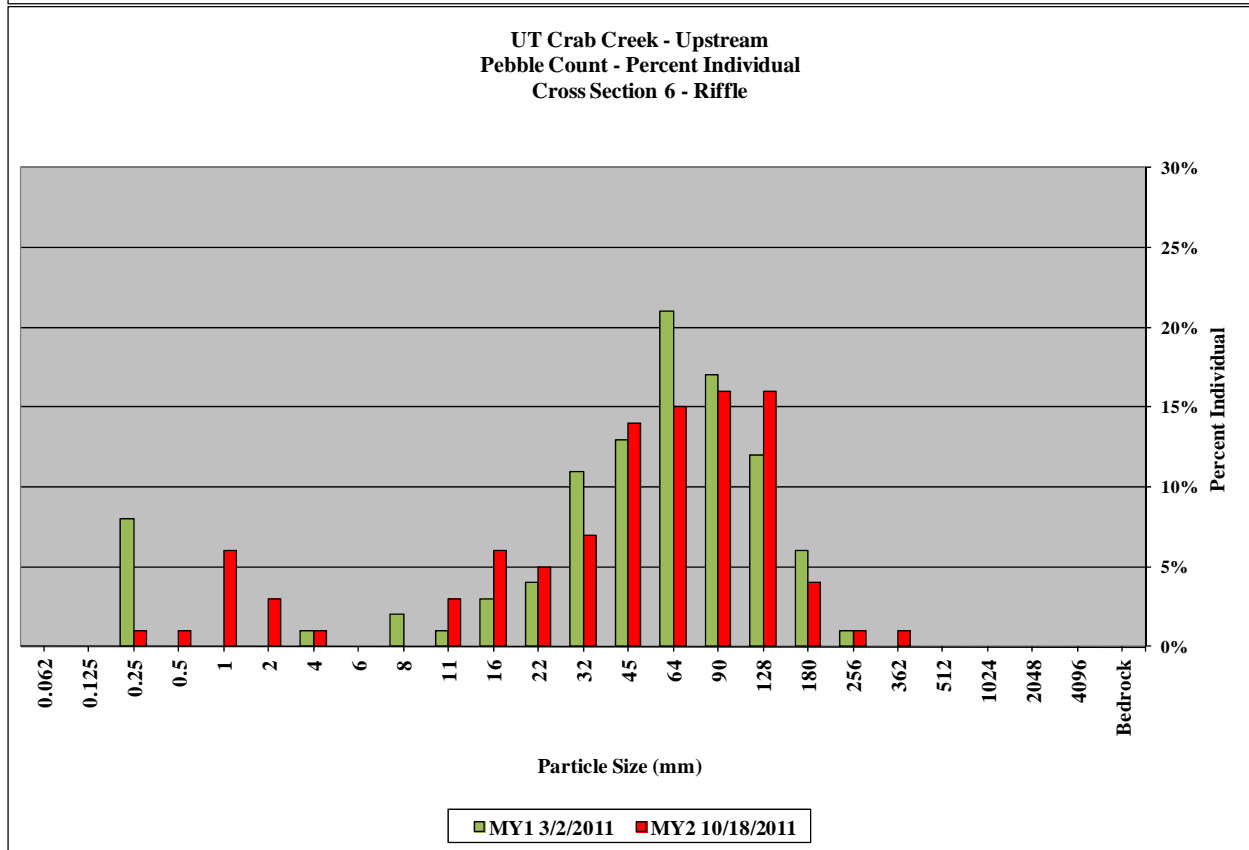
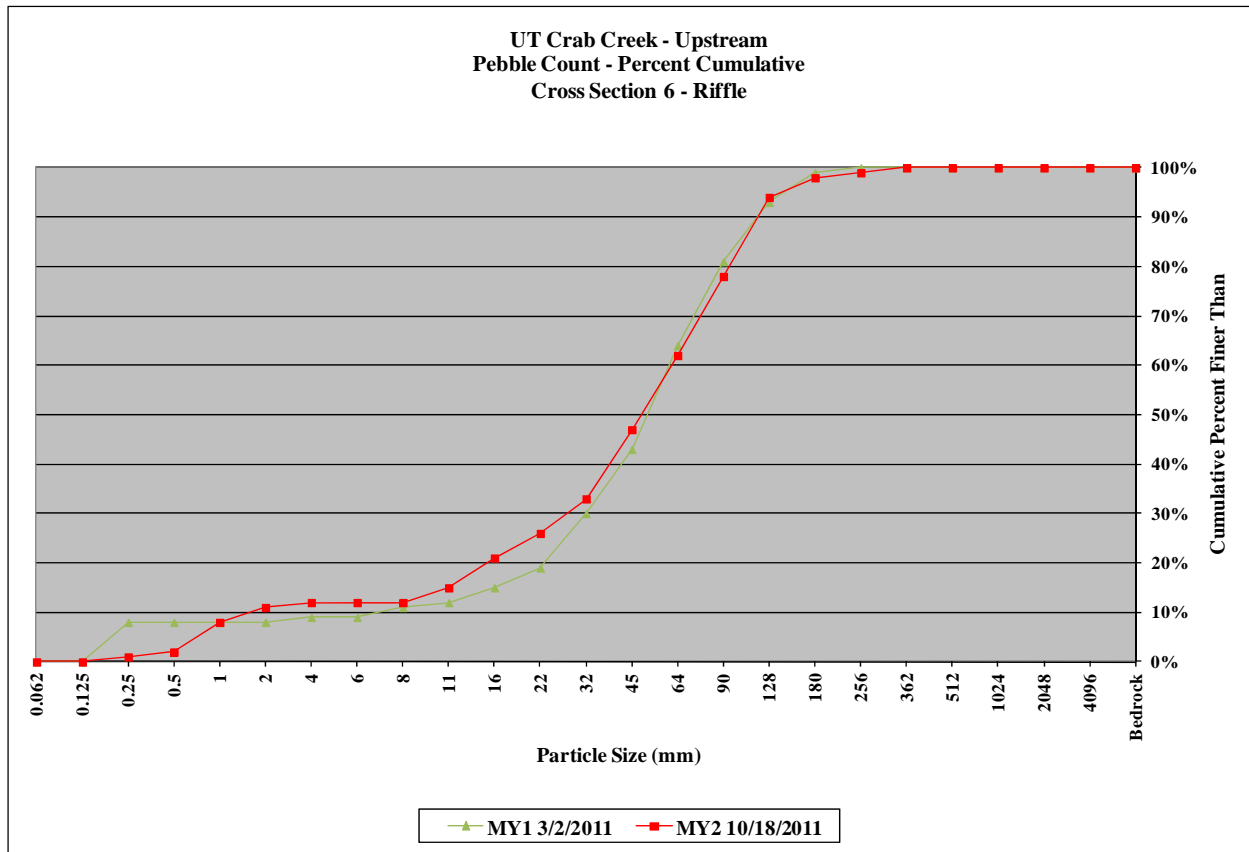
<b>Summary Data</b>	
D50	2
D84	40
D95	64





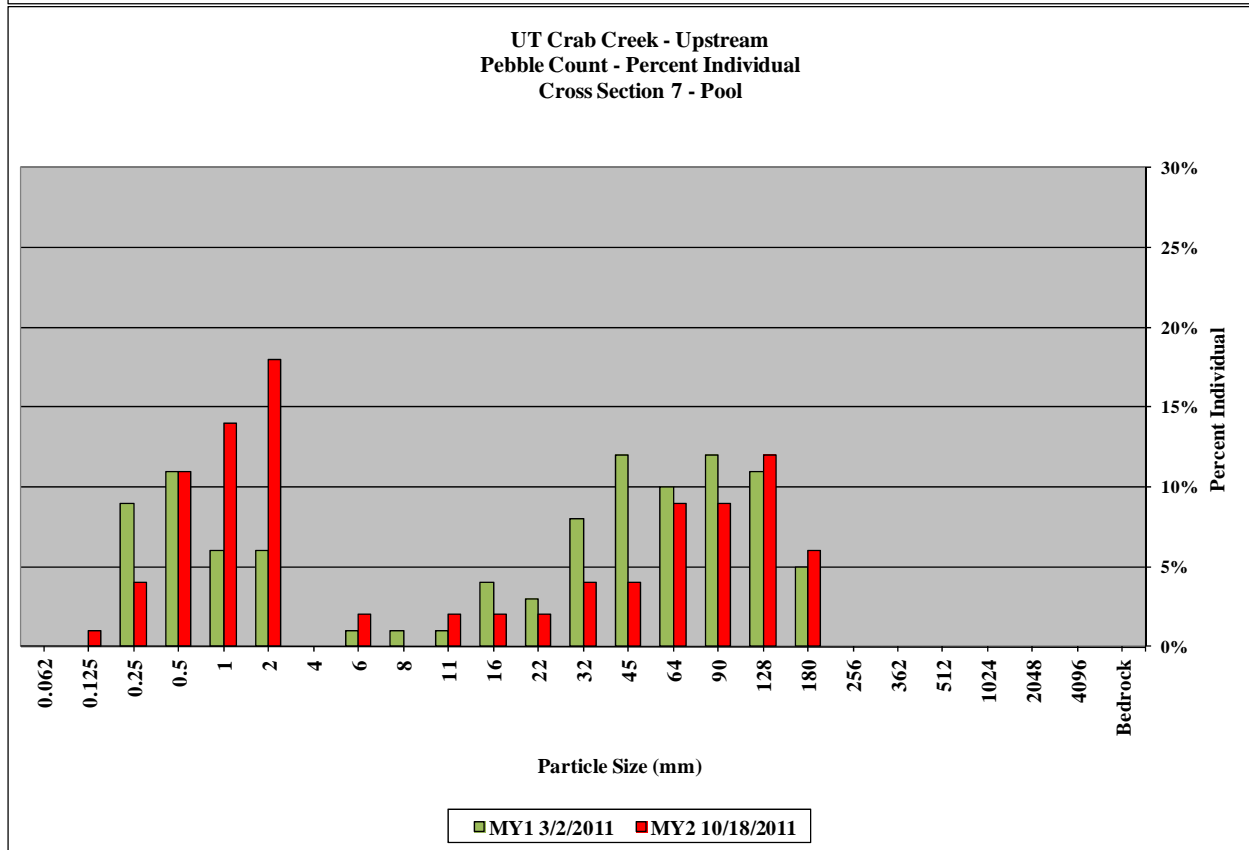
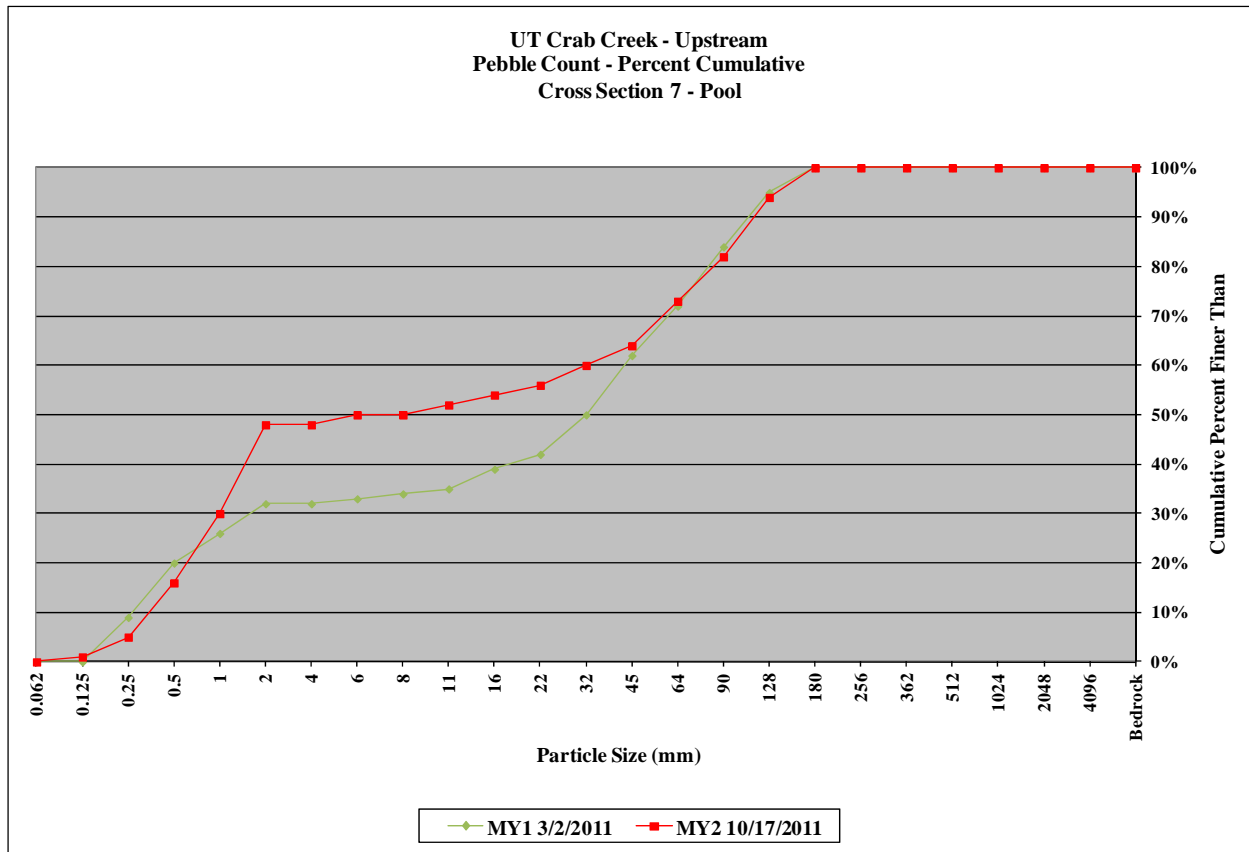
<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UTCC - Upstream - Cross-Section 6 - Riffle</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	0	0%	0%
<b>Sand</b>	very fine sand	0.125	0	0%	0%
	fine sand	0.25	1	1%	1%
	medium sand	0.50	1	1%	2%
	coarse sand	1.00	6	6%	8%
	very coarse sand	2.00	3	3%	11%
<b>Gravel</b>	very fine gravel	4.0	1	1%	12%
	fine gravel	5.7	0	0%	12%
	fine gravel	8.0	0	0%	12%
	medium gravel	11.3	3	3%	15%
	medium gravel	16.0	6	6%	21%
	coarse gravel	22.3	5	5%	26%
	coarse gravel	32	7	7%	33%
	very coarse gravel	45	14	14%	47%
	very coarse gravel	64	15	15%	62%
<b>Cobble</b>	small cobble	90	16	16%	78%
	medium cobble	128	16	16%	94%
	large cobble	180	4	4%	98%
	very large cobble	256	1	1%	99%
<b>Boulder</b>	small boulder	362	1	1%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

<b>Summary Data</b>	
D50	48
D84	100
D95	140



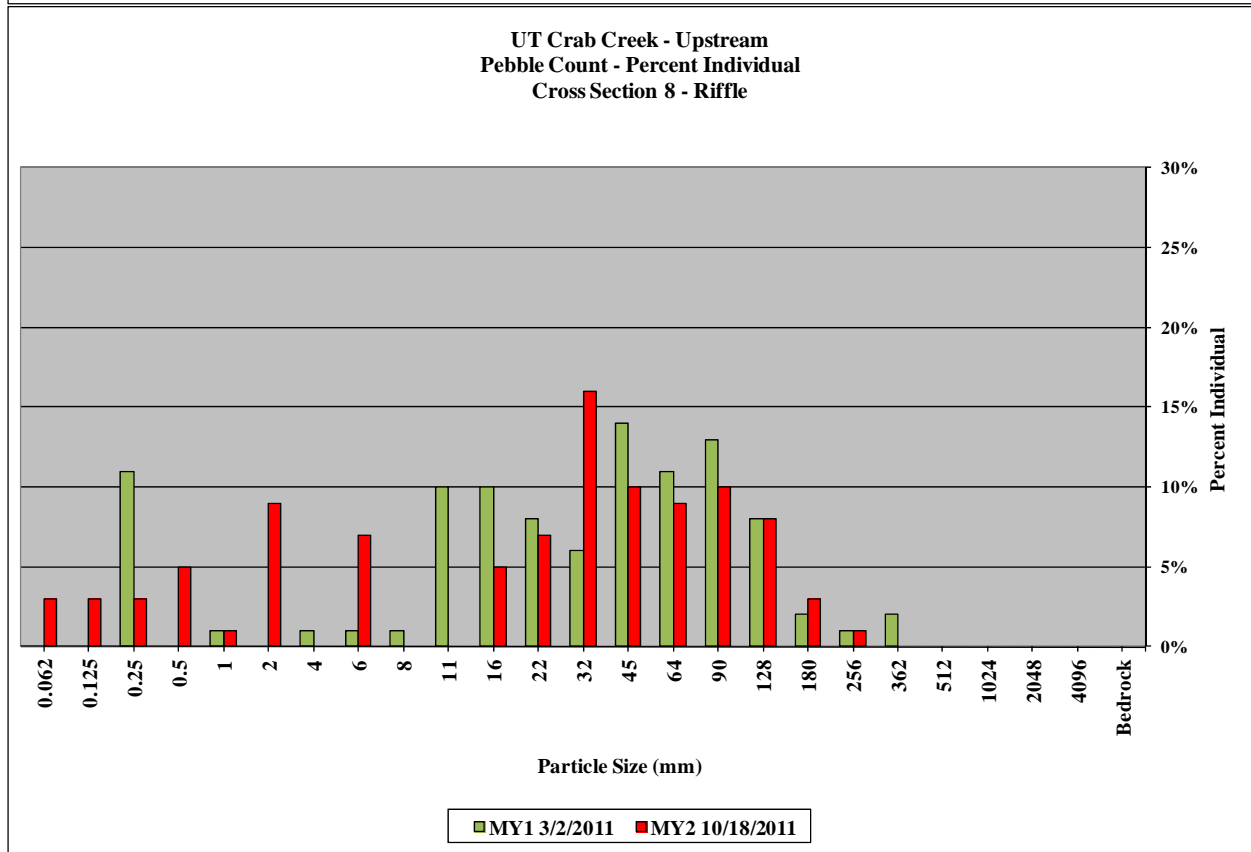
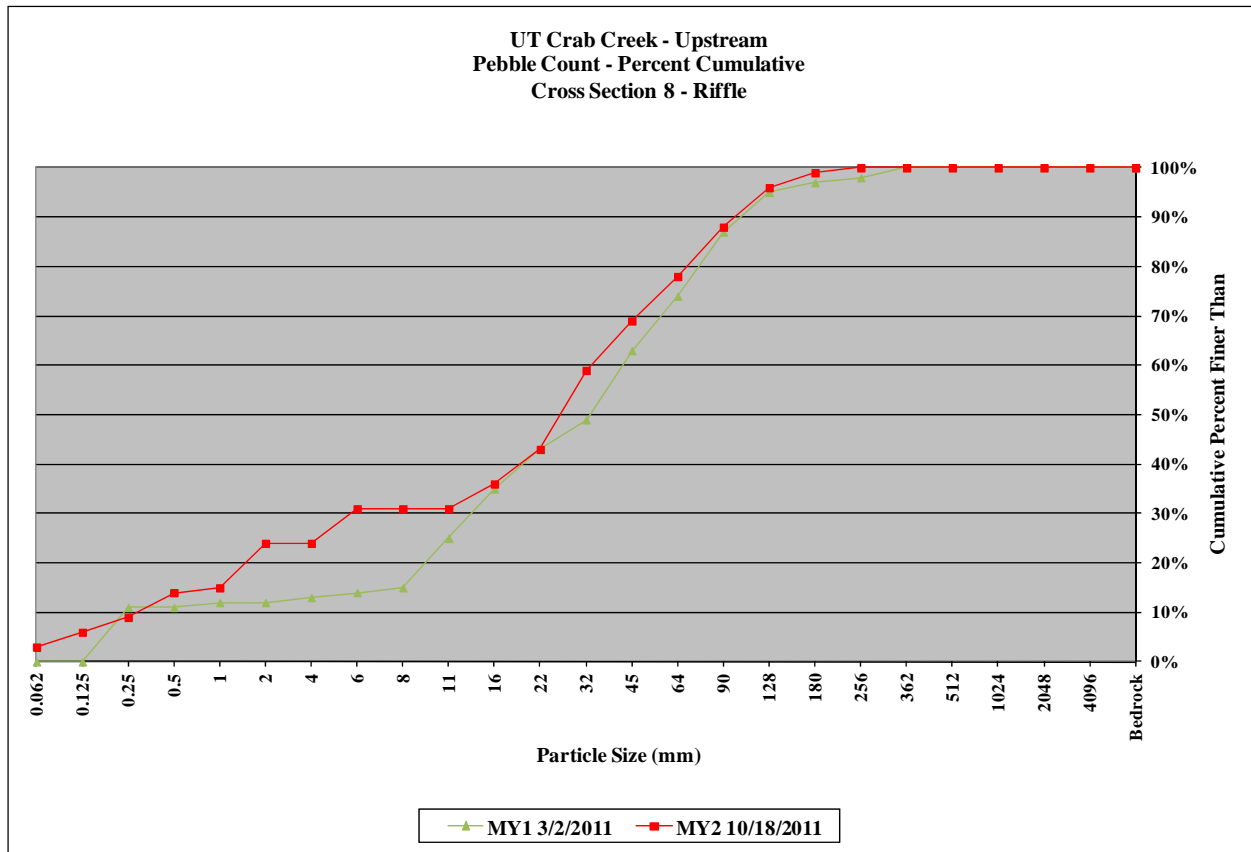
<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UTCC - Upstream - Cross-Section 7 - Pool</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	0	0%	0%
<b>Sand</b>	very fine sand	0.125	1	1%	1%
	fine sand	0.25	4	4%	5%
	medium sand	0.50	11	11%	16%
	coarse sand	1.00	14	14%	30%
	very coarse sand	2.00	18	18%	48%
<b>Gravel</b>	very fine gravel	4.0	0	0%	48%
	fine gravel	5.7	2	2%	50%
	fine gravel	8.0	0	0%	50%
	medium gravel	11.3	2	2%	52%
	medium gravel	16.0	2	2%	54%
	coarse gravel	22.3	2	2%	56%
	coarse gravel	32	4	4%	60%
	very coarse gravel	45	4	4%	64%
	very coarse gravel	64	9	9%	73%
<b>Cobble</b>	small cobble	90	9	9%	82%
	medium cobble	128	12	12%	94%
	large cobble	180	6	6%	100%
	very large cobble	256	0	0%	100%
<b>Boulder</b>	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

<b>Summary Data</b>	
D50	6
D84	95
D95	140



<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UTCC - Upstream - Cross-Section 8 - Riffle</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	3	3%	3%
<b>Sand</b>	very fine sand	0.125	3	3%	6%
	fine sand	0.25	3	3%	9%
	medium sand	0.50	5	5%	14%
	coarse sand	1.00	1	1%	15%
	very coarse sand	2.00	9	9%	24%
<b>Gravel</b>	very fine gravel	4.0	0	0%	24%
	fine gravel	5.7	7	7%	31%
	fine gravel	8.0	0	0%	31%
	medium gravel	11.3	0	0%	31%
	medium gravel	16.0	5	5%	36%
	coarse gravel	22.3	7	7%	43%
	coarse gravel	32	16	16%	59%
	very coarse gravel	45	10	10%	69%
	very coarse gravel	64	9	9%	78%
<b>Cobble</b>	small cobble	90	10	10%	88%
	medium cobble	128	8	8%	96%
	large cobble	180	3	3%	99%
	very large cobble	256	1	1%	100%
<b>Boulder</b>	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

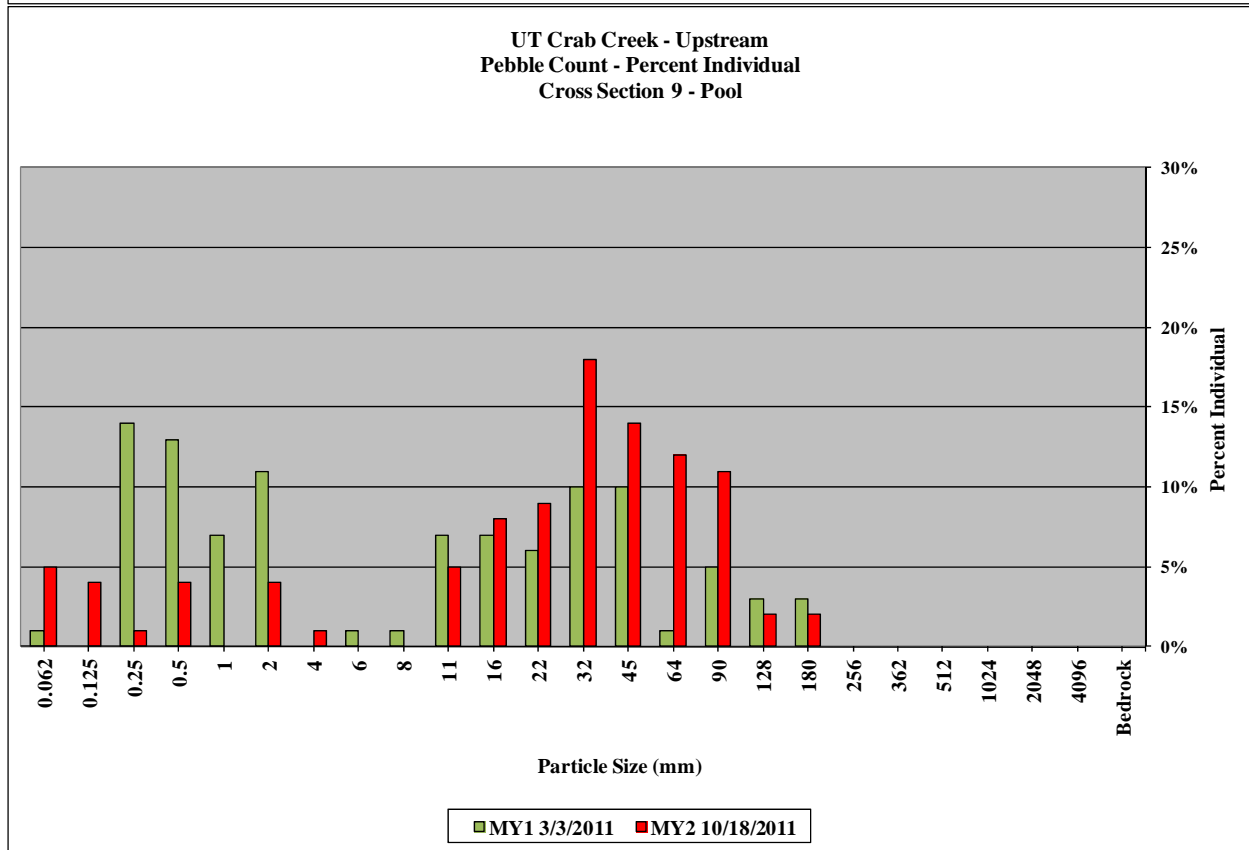
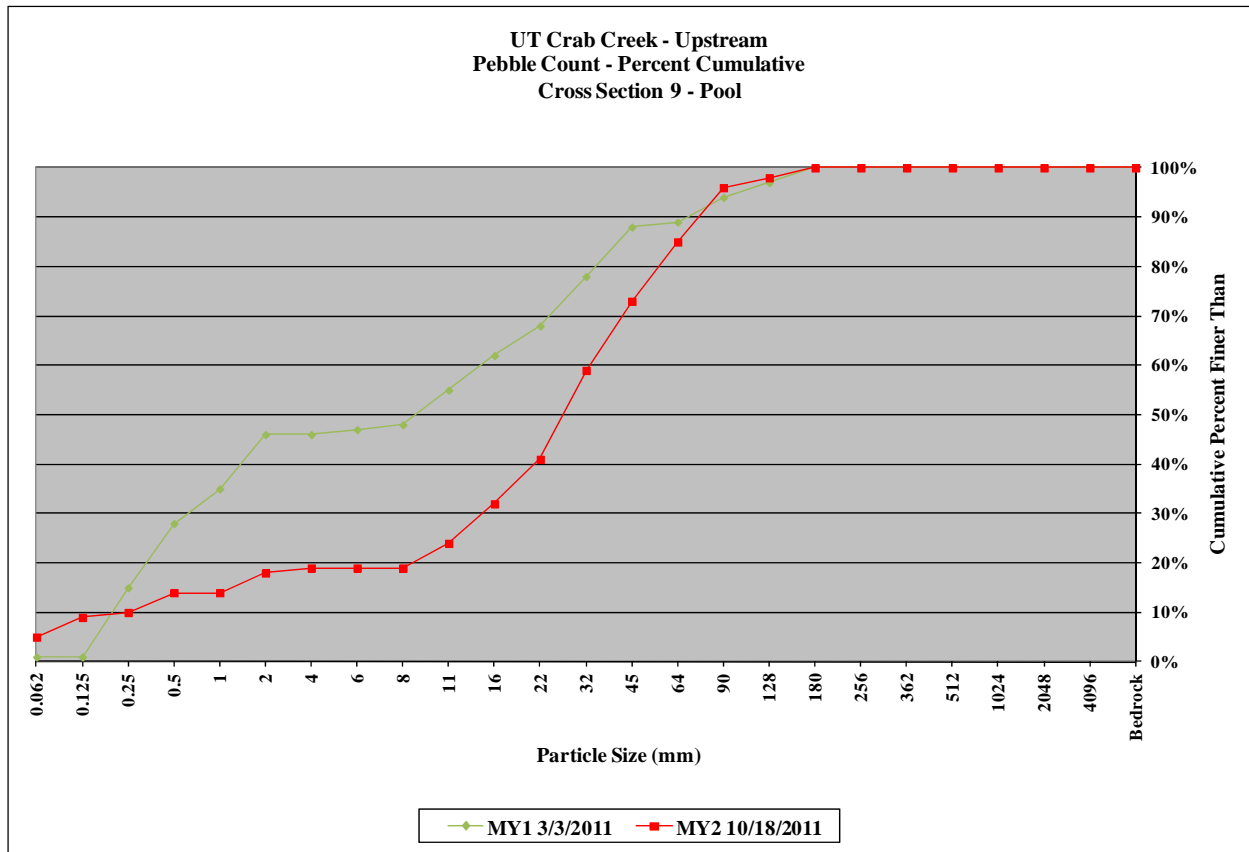
<b>Summary Data</b>	
D50	26
D84	79
D95	120



<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UTCC - Upstream - Cross-Section 9 - Pool</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	5	5%	5%
<b>Sand</b>	very fine sand	0.125	4	4%	9%
	fine sand	0.25	1	1%	10%
	medium sand	0.50	4	4%	14%
	coarse sand	1.00	0	0%	14%
	very coarse sand	2.00	4	4%	18%
<b>Gravel</b>	very fine gravel	4.0	1	1%	19%
	fine gravel	5.7	0	0%	19%
	fine gravel	8.0	0	0%	19%
	medium gravel	11.3	5	5%	24%
	medium gravel	16.0	8	8%	32%
	coarse gravel	22.3	9	9%	41%
	coarse gravel	32	18	18%	59%
	very coarse gravel	45	14	14%	73%
	very coarse gravel	64	12	12%	85%
<b>Cobble</b>	small cobble	90	11	11%	96%
	medium cobble	128	2	2%	98%
	large cobble	180	2	2%	100%
	very large cobble	256	0	0%	100%
<b>Boulder</b>	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

<b>Summary Data</b>	
D50	27
D84	62
D95	87





<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>UTCC - Upstream - Cross-Section 10 - Riffle</b>					
<b>Pebble Count Summary</b>					
			Monitoring Year 2		
<b>Description</b>	<b>Material</b>	<b>Size (mm)</b>	<b>Total #</b>	<b>Item %</b>	<b>Cum %</b>
<b>Silt/Clay</b>	silt/clay	0.062	4	4%	4%
<b>Sand</b>	very fine sand	0.125	11	11%	15%
	fine sand	0.25	9	9%	24%
	medium sand	0.50	7	7%	31%
	coarse sand	1.00	6	6%	37%
	very coarse sand	2.00	1	1%	38%
<b>Gravel</b>	very fine gravel	4.0	0	0%	38%
	fine gravel	5.7	1	1%	39%
	fine gravel	8.0	0	0%	39%
	medium gravel	11.3	5	5%	44%
	medium gravel	16.0	8	8%	52%
	coarse gravel	22.3	12	12%	64%
	coarse gravel	32	14	14%	78%
	very coarse gravel	45	8	8%	86%
	very coarse gravel	64	9	9%	95%
<b>Cobble</b>	small cobble	90	2	2%	97%
	medium cobble	128	2	2%	99%
	large cobble	180	1	1%	100%
	very large cobble	256	0	0%	100%
<b>Boulder</b>	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
	very large boulder	4096	0	0%	100%
<b>Bedrock</b>	bedrock	>4096	0	0%	100%
<b>TOTALS</b>			100	100%	100%

<b>Summary Data</b>	
D50	15
D84	41
D95	64

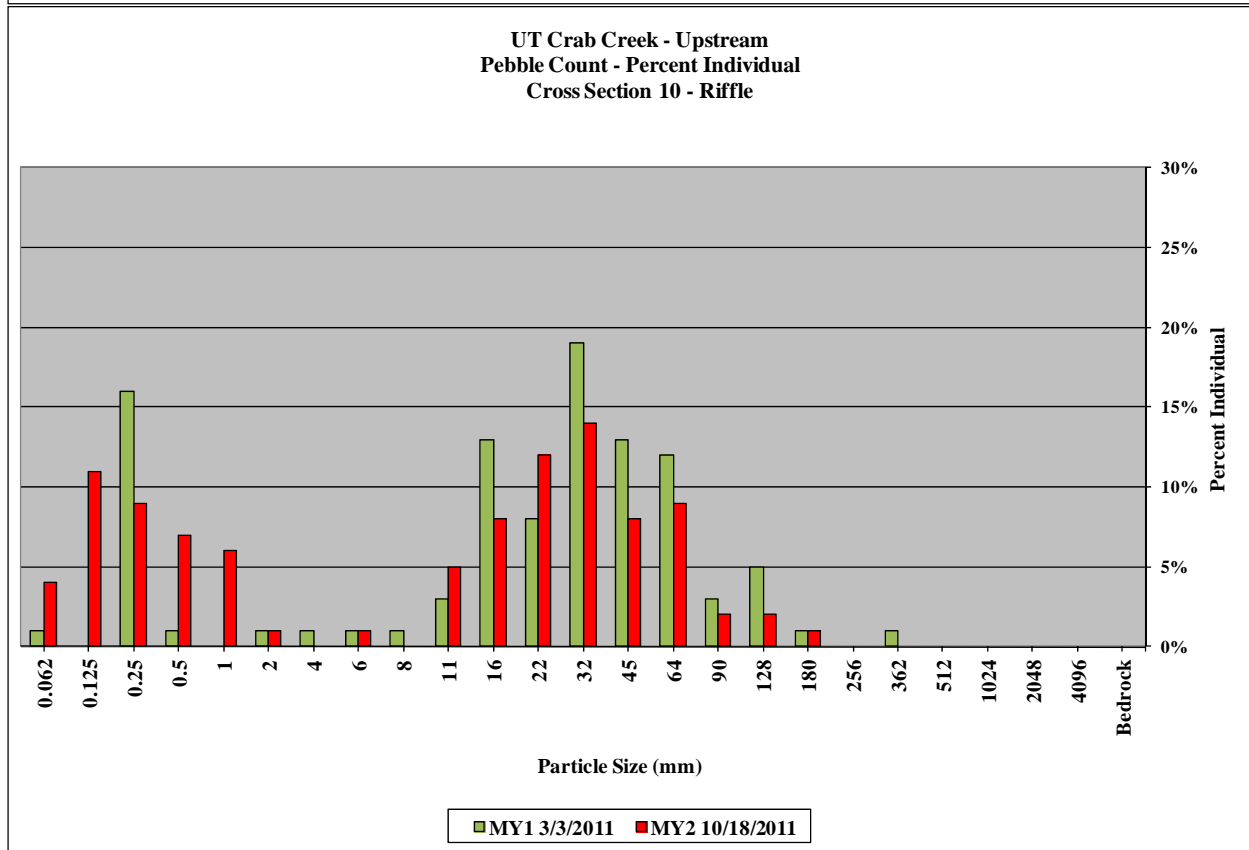
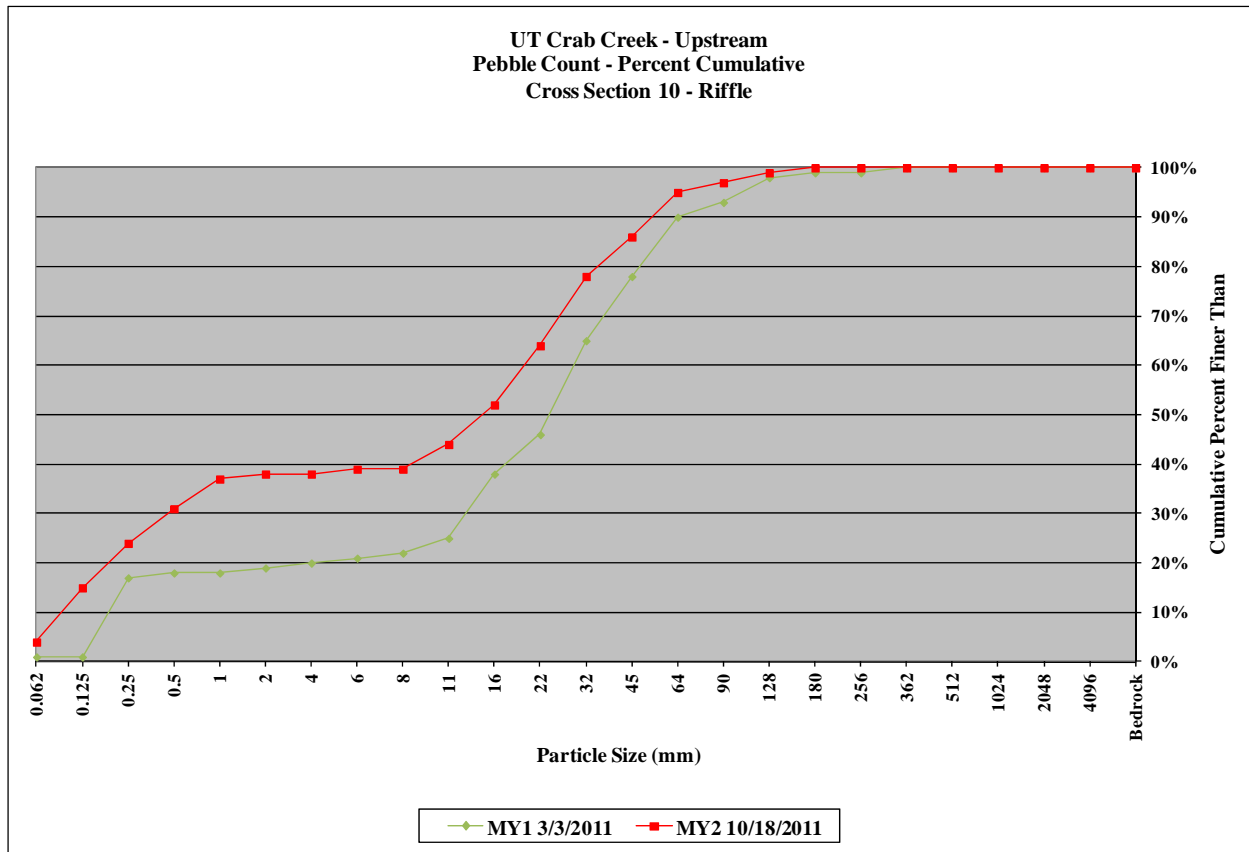


Table 10a. Baseline Stream Data Summary																								
UT Crab Creek Stream & Wetland / Project No. 857 - UT1 - Upper (500 feet)																								
Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design*			Monitoring Baseline					
	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N
<b>Dimension &amp; Substrate - Riffle</b>																								
Bankfull Width (ft)	-	-	-	9.9	13.5	13.6	15.8	2.51	5	N/A	N/A	N/A	N/A	N/A	N/A	-	13.1	-	14.8	15.3	15.3	15.7	N/A	2
Floodprone Width (ft)				18.2	N/A	N/A	>55	N/A	5	N/A	N/A	N/A	N/A	N/A	N/A	22	-	33	>100	>100	>100	>100	N/A	2
Bankfull Mean Depth (ft)	-	-	-	0.90	1.20	1.20	1.50	0.23	5	N/A	N/A	N/A	N/A	N/A	N/A	-	1.10	-	1.30	1.50	1.50	1.60	N/A	2
Bankfull Max Depth (ft)				1.20	1.80	1.80	2.40	0.51	5	N/A	N/A	N/A	N/A	N/A	N/A	-	2.00	-	2.40	2.50	2.50	2.50	N/A	2
Bankfull Cross Sectional Area (ft <sup>2</sup> )	14.0			14.1	15.1	15.0	15.9	0.72	5	N/A	N/A	N/A	N/A	N/A	N/A	-	14.8	-	20.3	22.2	22.2	24.0	N/A	2
Width/Depth Ratio				6.5	12.2	11.7	16.7	4.12	5	N/A	N/A	N/A	N/A	N/A	N/A	-	12.0	-	9.2	10.7	10.7	12.2	N/A	2
Entrenchment Ratio				1.2	3.4	3.3	>5.6	1.56	5	N/A	N/A	N/A	N/A	N/A	N/A	-	1.7	-	>6.4	>6.6	>6.6	>6.7	N/A	2
Bank Height Ratio				1.0	1.6	1.7	2.4	0.54	5	N/A	N/A	N/A	N/A	N/A	N/A	-	1.0	-	1.0	1.1	1.1	1.1	N/A	2
<b>Profile</b>																								
Riffle Length (ft)				-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	-	-	5.8	28.7	22.6	68.2	23.42	7
Riffle Slope (ft/ft)				0.023	-	-	0.057	-	-	0.014	-	-	0.03	-	-	0.014	-	0.03	0.014	0.023	0.022	0.033	0.007	7
Pool Length (ft)				7.0	-	-	13.0	-	-	14	-	-	47	-	-	14.0	-	47.0	3.5	8.6	8.1	19.8	4.44	13
Pool Max Depth (ft)				1.9	2.1	2.1	2.2	0.13	5	N/A	N/A	N/A	N/A	N/A	N/A	-	1.0	-	3.2	3.2	3.2	3.2	N/A	1
Pool Spacing (ft)				60.0	-	-	65.0	-	-	54	-	-	126	-	-	54.0	-	126.0	6.8	38.9	34.0	113.1	30.33	12
<b>Pattern</b>																								
Channel Belt Width (ft)				21.0	-	-	58.0	-	-	32	-	-	58	-	-	32.0	-	58.0	26.8	37.4	40.1	44.4	7.06	6
Radius of Curvature (ft)				11.0	-	-	37.0	-	-	20	-	-	37	-	-	20.0	-	37.0	28.7	34.7	32.4	51.3	8.35	6
Rc: Bankfull Width (ft/ft)				0.7	-	-	3.7	-	-	N/A	N/A	N/A	N/A	N/A	N/A	1.5	-	2.8	1.9	2.3	2.1	3.3	N/A	N/A
Meander Wavelength (ft)				90.0	-	-	191.0	-	-	90.0	-	-	191.0	-	-	90.0	-	191.0	117.9	135.5	130.7	162.6	20.10	4
Meander Width Ratio				1.3	-	-	5.8	-	-	N/A	N/A	N/A	N/A	N/A	N/A	2.4	-	4.4	2.6	2.6	2.6	2.7	N/A	2
<b>Transport Parameters</b>																								
Reach Shear Stress (Competency) lb/ft <sup>2</sup>													N/A										2.08	
Max Part Size (mm) Mobilized at Bankfull													N/A										262	
Stream Power (Transport Capacity) W/m <sup>2</sup>													N/A											
<b>Additional Reach Parameters</b>																								
Rosgen Classification							G4/C4						N/A					B4c/C4				Cb		
Bankfull Velocity (fps)							3.9 - 4.7						N/A					4.5						
Bankfull Discharge (cfs)							59 - 71						N/A					66						
Valley Length (ft)													N/A											
Channel Thalweg Length (ft)							1,730						N/A					1,621					500	
Sinuosity							1.19						N/A					1.14					1.14	
Water Surface Slope (ft/ft)							0.0210						N/A					0.0210					0.0238	
Bankfull Slope (ft/ft)													N/A										0.0251	
Bankfull Floodplain Area (acres)													N/A											
% of Reach with Eroding Banks																								
Channel Stability or Habitat Metric													N/A											
Biological or Other													N/A											

- Information unavailable.

N/A - Item does not apply.

\* The design cross-section criteria were developed using an analytical design approach. Pattern and profile data derived from stable enhancement reaches from the existing UT1 data.

Non-Applicable.

Table 10a. Baseline Stream Data Summary																								
UT Crab Creek Stream & Wetland / Project No. 857 - UT1 - Lower (397 feet)																								
Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design*			Monitoring Baseline					
	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N
Dimension & Substrate - Riffle																								
Bankfull Width (ft)	-	-	-	9.9	13.5	13.6	15.8	2.51	5	N/A	N/A	N/A	N/A	N/A	N/A	-	13.1	-	11.5	11.5	11.5	11.5	N/A	1
Floodprone Width (ft)				18.2	N/A	N/A	>55	N/A	5	N/A	N/A	N/A	N/A	N/A	N/A	22.0	-	33.0	>100	>100	>100	>100	N/A	1
Bankfull Mean Depth (ft)	-	-	-	0.90	1.20	1.20	1.50	0.23	5	N/A	N/A	N/A	N/A	N/A	N/A	-	1.1	-	1.50	1.50	1.50	1.50	N/A	1
Bankfull Max Depth (ft)				1.20	1.80	1.80	2.40	0.51	5	N/A	N/A	N/A	N/A	N/A	N/A	-	2.0	-	2.50	2.50	2.50	2.50	N/A	1
Bankfull Cross Sectional Area (ft <sup>2</sup> )	14.0			14.1	15.1	15.0	15.9	0.72	5	N/A	N/A	N/A	N/A	N/A	N/A	-	14.8	-	17.6	17.6	17.6	17.6	N/A	1
Width/Depth Ratio				6.5	12.2	11.7	16.7	4.12	5	N/A	N/A	N/A	N/A	N/A	N/A	-	12.0	-	7.5	7.5	7.5	7.5	N/A	1
Entrenchment Ratio				1.2	3.4	3.3	>5.6	1.56	5	N/A	N/A	N/A	N/A	N/A	N/A	-	1.7	-	>8.7	>8.7	>8.7	>8.7	N/A	1
Bank Height Ratio				1.0	1.6	1.7	2.4	0.54	5	N/A	N/A	N/A	N/A	N/A	N/A	-	1.0	-	1.0	1.0	1.0	1.0	N/A	1
Profile																								
Riffle Length (ft)				-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	-	-	21.0	37.6	40.2	52.6	15.19	5
Riffle Slope (ft/ft)				0.023	-	-	0.057	-	-	0.014	-	-	0.030	-	-	0.014	-	0.030	0.020	0.026	0.027	0.033	0.005	5
Pool Length (ft)				7.0	-	-	13.0	-	-	14.0	-	-	47.0	-	-	14.0	-	47.0	11.8	17.4	17.4	27.1	6.24	5
Pool Max Depth (ft)				1.9	2.1	2.1	2.2	0.13	5	N/A	N/A	N/A	N/A	N/A	N/A	-	1.0	-	2.6	2.6	2.6	2.6	N/A	1
Pool Spacing (ft)				60.0	-	-	65.0	-	-	54.0	-	-	126.0	-	-	54.0	-	126.0	45.0	71.3	73.4	93.6	21.55	4
Pattern																								
Channel Belt Width (ft)				21.0	-	-	58.0	-	-	32	-	-	58	-	-	32.0	-	58.0	57.2	62.9	64.2	66.2	3.9	4
Radius of Curvature (ft)				11.0	-	-	37.0	-	-	20	-	-	37	-	-	20.0	-	37.0	31.2	36.6	37.8	39.7	3.8	4
Rc: Bankfull Width (ft/ft)				0.7	-	-	3.7	-	-	N/A	N/A	N/A	N/A	N/A	N/A	1.5	-	2.8	2.71	3.18	3.28	3.45	N/A	N/A
Meander Wavelength (ft)				90.0	-	-	191.0	-	-	90.0	-	-	191.0	-	-	90.0	-	191.0	142.0	196.0	202.0	244.0	N/A	3
Meander Width Ratio				1.3	-	-	5.8	-	-	N/A	N/A	N/A	N/A	N/A	N/A	2.4	-	4.4	5.58	5.58	5.58	5.58	N/A	1
Transport Parameters																								
Reach Shear Stress (Competency) lb/ft <sup>2</sup>													N/A										1.36	
Max Part Size (mm) Mobilized at Bankfull													N/A										191	
Stream Power (Transport Capacity) W/m <sup>2</sup>													N/A											
Additional Reach Parameters																								
Rosgen Classification							G4/C4						N/A					B4c/C4					C	
Bankfull Velocity (fps)				-			3.9 - 4.7						N/A					4.5						
Bankfull Discharge (cfs)				62			59 - 71						N/A					66						
Valley Length (ft)							-						N/A					-						
Channel Thalweg Length (ft)							1,730						N/A					1,621					397	
Sinuosity							1.19						N/A					1.14					1.15	
Water Surface Slope (ft/ft)							0.0210						N/A					0.0210					0.0156	
Bankfull Slope (ft/ft)							-						N/A					-					0.0174	
Bankfull Floodplain Area (acres)							-						N/A					-						
% of Reach with Eroding Banks							-						-					-						
Channel Stability or Habitat Metric							-						N/A					-						
Biological or Other							-						N/A					-						

- Information unavailable.

N/A - Item does not apply.

\* The design cross-section criteria were developed using an analytical design approach. Pattern and profile data derived from stable enhancement reaches from the existing UT 1 data.

Non-Applicable.

Table 10a. Baseline Stream Data Summary																								
UT Crab Creek Stream & Wetland / Project No. 857 - UTCC-US (2,455 feet)																								
Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design			Monitoring Baseline					
	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N
<b>Dimension &amp; Substrate - Riffle</b>																								
Bankfull Width (ft)	-	-	-	17.6	20.4	19.8	24.5	2.91	4	59.7	62.3	62.3	64.9	N/A	2	-	24.0	-	25.0	26.7	26.5	28.7	N/A	3
Floodprone Width (ft)				65	-	-	>80	-	4	200	248	248	296	N/A	2	-	54.0	-	>200	>200	>200	>200	N/A	3
Bankfull Mean Depth (ft)	-	-	-	1.40	1.65	1.70	1.80	0.17	4	3.30	3.35	3.35	3.40	N/A	2	-	1.4	-	1.40	1.53	1.50	1.70	N/A	3
Bankfull Max Depth (ft)				2.40	2.78	2.75	3.20	0.33	4	5.00	5.40	5.40	5.80	N/A	2	-	2.3	-	2.40	2.50	2.50	2.60	N/A	3
Bankfull Cross Sectional Area (ft <sup>2</sup> )	39.0			30.8	33.1	33.7	34.2	1.57	4	198.0	208.0	208.0	218.0	N/A	2	-	34.2	-	37.0	40.5	42.1	42.4	N/A	3
Width/Depth Ratio				10.0	12.7	11.5	17.9	3.52	4	18.1	18.6	-	19.1	-	-	-	17.1	-	14.7	17.7	19.0	19.5	N/A	3
Entrenchment Ratio				3.1	-	-	>4.1	-	4	3.1	4.0	-	5.0	-	-	-	2.3	-	>7.0	>7.5	>7.5	>8.0	N/A	3
Bank Height Ratio				1.0	1.1	1.0	1.2	0.10	4	1.0	1.0	1.0	1.0	N/A	-	-	1.0	-	1.0	1.0	1.0	1.1	N/A	3
<b>Profile</b>																								
Riffle Length (ft)				-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.9	60.5	64.9	100.0	22.55	19
Riffle Slope (ft/ft)				0.020	-	-	0.042	-	-	0.015	0.029	0.027	0.048	0.012	5	0.014	-	0.045	0.006	0.013	0.012	0.021	0.005	19
Pool Length (ft)				29.0	-	-	53.0	-	-	-	-	-	-	-	-	21.0	-	105.0	10.4	41.1	39.0	79.2	21.76	19
Pool Max Depth (ft)				3.0	3.1	3.1	3.3	NA	3	-	-	-	-	-	-	-	1.9	-	2.7	2.9	2.9	3.0	N/A	2
Pool Spacing (ft)				-	95.0	-	-	-	-	116.0	190.0	161.0	188.0	93.70	4	45.0	-	136.0	51.7	130.7	113.2	241.7	52.31	18
<b>Pattern</b>																								
Channel Belt Width (ft)				13.0	-	-	43.0	-	-	-	500	-	-	N/A	1	75.0	-	211.0	54.7	101.7	102.5	132.8	23.59	15
Radius of Curvature (ft)				0.0*	-	-	51*	-	-	-	55.1	-	-	N/A	1	43.0	-	128.0	37.5	51.1	42.5	146.7	26.21	16
Rc: Bankfull Width (ft/ft)				0.0*	-	-	2.9*	-	-	0.88	0.88	0.88	0.88	-	-	1.7	-	5.1	1.5	1.9	1.6	5.1	N/A	N/A
Meander Wavelength (ft)				*	-	-	*	-	-	51.3	159.0	61.6	540.0	213.0	5	20.0	-	228.0	204.4	238.7	234.4	314.2	32.62	15
Meander Width Ratio				0.5	-	-	2.4	-	-	8.0	8.0	8.0	8.0	N/A	-	3.0	-	8.4	3.6	3.9	3.9	4.1	N/A	3
<b>Transport Parameters</b>																								
Reach Shear Stress (Competency) lb/ft <sup>2</sup>				0.89						-						0.73			0.71					
Max Part Size (mm) Mobilized at Bankfull				130						-						125			118					
Stream Power (Transport Capacity) W/m <sup>2</sup>				-						-						-			-					
<b>Additional Reach Parameters</b>																								
Rosgen Classification				C4						C3						C4			C					
Bankfull Velocity (fps)	-			3.3 - 3.8						-						3.3								
Bankfull Discharge (cfs)	197			111 - 130						-						117								
Valley Length (ft)				-						-						-								
Channel Thalweg Length (ft)				2,086						1,034						2,405			2,455					
Sinuosity				1.04						1.20						1.20			1.21					
Water Surface Slope (Channel) (ft/ft)				0.0090						0.0088						0.0080			0.0080					
Bankfull Slope (ft/ft)				-						-						-			0.0083					
Bankfull Floodplain Area (acres)				-						-						-								
% of Reach with Eroding Banks				-						-						-								
Channel Stability or Habitat Metric				-						-						-								
Channel Stability or Habitat Metric				-						-						-								
Biological or Other				-						-						-								

- Information unavailable.

N/A - Item does not apply.

\*Existing stream has been channelized and does not have a natural meander pattern with distinct pool and riffle features.

Non-Applicable.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) UT to Crab Creek Stream & Wetland / Project No. 857 - UT1-Upper (500 feet)																									
Parameter	Pre-Existing Condition						Reference Reach Data						Design						Monitoring Baseline						
Ri% / Ru% / P% / G% / S%	-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	-	-	-	-	-	-	-	42	8	24	22	4
SC% / Sa% / G% / C% / B% / Be%	<1*	10*	59*	28*	3*	0*	N/A	N/A	N/A	N/A	N/A	N/A													
d16 / D35 / d50 / d84 / d95 / d <sup>p</sup> / d <sup>100</sup> (mm)	7.2*	22.2*	40.0*	103.0*	197.0*	-	N/A	N/A	N/A	N/A	N/A	N/A													
Entrenchment Class <1.5 / 1.5 - 1.99 / 2 - 4.9 / 5.0 - 9.9 / >10	-	-	-	-	-	-	-	-	-	-	-	-													
Incision Class <1.2 / 1.2 - 1.49 / 1.5 - 1.99 / >2.0	-	-	-	-	-	-	-	-	-	-	-	-													

- Information unavailable.  
N/A - Item does not apply.  
\* Numbers reported are the mean percentages from the riffle surface pebble counts.  
Non-Applicable.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) UT to Crab Creek Stream & Wetland / Project No. 857 - UT1-Lower (397 feet)																									
Parameter	Pre-Existing Condition						Reference Reach Data						Design						Monitoring Baseline						
Ri% / Ru% / P% / G% / S%	-	-	-	-	-	-	N/A	N/A	N/A	N/A	N/A	N/A	-	-	-	-	-	-	-	-	48	5	22	25	1
SC% / Sa% / G% / C% / B% / Be%	<1*	10*	59*	28*	3*	0*	N/A	N/A	N/A	N/A	N/A	N/A													
d16 / D35 / d50 / d84 / d95 / d <sup>p</sup> / d <sup>100</sup> (mm)	7.2*	22.2*	40.0*	103.0*	197.0*	-	N/A	N/A	N/A	N/A	N/A	N/A													
Entrenchment Class <1.5 / 1.5 - 1.99 / 2 - 4.9 / 5.0 - 9.9 / >10	-	-	-	-	-	-	-	-	-	-	-	-													
Incision Class <1.2 / 1.2 - 1.49 / 1.5 - 1.99 / >2.0	-	-	-	-	-	-	-	-	-	-	-	-													

- Information unavailable.  
N/A - Item does not apply.  
\* Numbers reported are the mean percentages from the riffle surface pebble counts.  
Non-Applicable.

Table 10b. Baseline Stream Data Summary (Substrate, Bed, Bank, and Hydrologic Containment Parameter Distributions) UT to Crab Creek Stream & Wetland / Project No. 857 - UTCC-US (2,455 feet)																									
Parameter	Pre-Existing Condition						Reference Reach Data						Design						Monitoring Baseline						
Ri% / Ru% / P% / G% / S%	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	47	9	32	12	0
SC% / Sa% / G% / C% / B% / Be%	0*	1*	62*	36*	<1*	0*	0	18	5	48	18	11													
d16 / D35 / d50 / d84 / d95 / d <sup>p</sup> / d <sup>100</sup> (mm)	11*	23*	44*	104*	150*	-	1.4	-	144	512	-	-													
Entrenchment Class <1.5 / 1.5 - 1.99 / 2 - 4.9 / 5.0 - 9.9 / >10	-	-	-	-	-	-	-	-	-	-	-	-													
Incision Class <1.2 / 1.2 - 1.49 / 1.5 - 1.99 / >2.0	-	-	-	-	-	-	-	-	-	-	-	-													

- Information unavailable.  
\* Numbers reported are the mean percentages from the riffle surface pebble counts.  
Non-Applicable.

<b>Table 11a. Monitoring Data - Dimensional Morphology Summary</b>																		
<b>(Dimensional Parameters - Cross-Sections)</b>																		
<b>UT Crab Stream &amp; Wetland / Project No. 857 - UT1-Upper (500 feet)</b>																		
	<b>Cross-Section 1 Riffle</b>						<b>Cross-Section 2 Pool</b>						<b>Cross-Section 3 Riffle</b>					
<b>Dimension</b>	<b>Base</b>	<b>MY1</b>	<b>MY2</b>	<b>MY3</b>	<b>MY4</b>	<b>MY5</b>	<b>Base</b>	<b>MY1</b>	<b>MY2</b>	<b>MY3</b>	<b>MY4</b>	<b>MY5</b>	<b>Base</b>	<b>MY1</b>	<b>MY2</b>	<b>MY3</b>	<b>MY4</b>	<b>MY5</b>
Record Elevation (datum) Used	2,605	2,605	2,605				2,603	2,603	2,603				2,598	2,598	2,598			
Bankfull Width (ft)	15.7	15.9	15.3				18.4	18.0	17.6				14.8	14.7	14.9			
Floodprone Width (ft)	>100	>100	>100				>100	>100	>100				>100	>100	>100			
Bankfull Mean Depth (ft)	1.3	1.2	1.3				1.9	1.9	1.8				1.6	1.6	1.6			
Bankfull Max Depth (ft)	2.4	2.4	2.5				3.2	3.2	3.3				2.5	2.5	2.6			
Bankfull Cross Sectional Area (ft <sup>2</sup> )	20.3	18.5	19.3				34.3	33.4	32.2				24.0	23.8	23.8			
Bankfull Width/Depth Ratio	12.2	13.8	12.1				9.9	9.7	9.6				9.2	9.1	9.4			
Bankfull Entrenchment Ratio	>6.4	>6.3	>6.5				>5.4	>5.5	>5.7				>6.7	>6.8	>6.7			
Bankfull Bank Height Ratio	1.0	1.0	1.1				1.1	1.1	1.1				1.1	1.1	1.1			
Cross Sectional Area between End Pins (ft <sup>2</sup> )	20.3	19.0	19.4				34.3	33.6	32.2				24.3	24.1	24.2			
d50 (mm)	N/A	17	4.6				N/A	11	1.7				N/A	23	12			

N/A - Item does not apply.



<b>Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections) UT Crab Creek Stream &amp; Wetland / Project No. 857 - UT1-Lower (397 feet)</b>												
	<b>Cross-Section 4 Pool</b>						<b>Cross-Section 5 Rifle</b>					
<b>Dimension</b>	<b>Base</b>	<b>MY1</b>	<b>MY2</b>	<b>MY3</b>	<b>MY4</b>	<b>MY5</b>	<b>Base</b>	<b>MY1</b>	<b>MY2</b>	<b>MY3</b>	<b>MY4</b>	<b>MY5</b>
Record Elevation (datum) Used	2,571	2,571	2,571				2,571	2,571	2,571			
Bankfull Width (ft)	16.7	14.3	14.7				11.5	12.2	12.3			
Floodprone Width (ft)	>100	>100	>100				>100	>100	>100			
Bankfull Mean Depth (ft)	1.1	1.3	1.1				1.5	1.4	1.4			
Bankfull Max Depth (ft)	2.6	2.5	2.4				2.5	2.6	2.6			
Bankfull Cross Sectional Area (ft <sup>2</sup> )	18.8	18.0	16.7				17.6	17.5	17.3			
Bankfull Width/Depth Ratio	14.8	11.4	12.9				7.5	8.5	8.8			
Bankfull Entrenchment Ratio	>6.0	>7.0	>6.8				>8.7	>8.2	>8.1			
Bankfull Bank Height Ratio	1.0	1.0	1.0				1.0	1.0	1.0			
Cross Sectional Area between End Pins (ft <sup>2</sup> )	18.9	18.0	16.7				21.1	21.5	21.6			
d50 (mm)	N/A	8.4	4				N/A	0.91	2			

N/A - Item does not apply.

<b>Table 11a. Monitoring Data - Dimensional Morphology Summary</b> <b>(Dimensional Parameters - Cross-Sections)</b> <b>UT Crab Creek Stream &amp; Wetland / Project No. 857 - UTCC-US (2,455 feet)</b>																														
Dimension	Cross-Section 6 Riffle						Cross-Section 7 Pool						Cross-Section 8 Riffle						Cross-Section 9 Pool						Cross-Section 10 Riffle					
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2,571	2,571	2,571				2,571	2,571	2,571				2,566	2,566	2,566				2,554	2,554	2,554				2,554	2,554	2,554			
Bankfull Width (ft)	25.0	24.7	27.2				27.7	27.8	27.8				28.7	27.9	28.0				23.5	23.8	23.0				26.5	27.2	26.4			
Floodprone Width (ft)	>200	>200	>200				>200	>200	>200				>200	>200	>200				>200	>200	>200				>200	>200	>200			
Bankfull Mean Depth (ft)	1.7	1.7	1.5				1.7	1.7	1.6				1.5	1.4	1.4				1.7	1.7	1.6				1.4	1.4	1.4			
Bankfull Max Depth (ft)	2.6	2.5	2.5				3.0	3.4	3.4				2.5	2.4	2.5				2.7	2.9	2.7				2.4	2.4	2.5			
Bankfull Cross Sectional Area (ft <sup>2</sup> )	42.4	41.9	41.3				47.3	47.1	45.1				42.1	39.5	38.4				40.7	40.9	36.1				37.0	37.2	35.9			
Bankfull Width/Depth Ratio	14.7	14.6	17.9				16.3	16.4	17.1				19.5	19.7	20.4				13.5	13.9	14.6				19.0	19.9	19.4			
Bankfull Entrenchment Ratio	>8.0	>8.1	>7.4				>7.2	>7.2	>7.2				>7.0	>7.2	>7.1				>8.5	>8.4	>8.7				>7.5	>7.3	>7.6			
Bankfull Bank Height Ratio	1.0	1.0	1.1				1.1	1.1	1.1				1.1	1.1	1.1				1.0	1.0	1.0				1.0	1.0	1.0			
Cross Sectional Area between End Pins (ft <sup>2</sup> )	42.4	41.9	41.3				47.3	47.3	45.1				43.2	40.1	38.5				41.5	41.2	36.1				38.6	39.9	37.1			
d50 (mm)	N/A	51	48				N/A	32	6				N/A	33	26				N/A	8.8	27				NA	24	15			

N/A - Item does not apply.

Table 11b. Monitoring Data - Stream Reach Data Summary																																
UT Crab Creek Stream & Wetland / Project No. 857 - UT1-Upper (503 feet)																																
Parameter	Baseline					MY - 1					MY - 2					MY - 3					MY - 4					MY - 5						
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n		
Bankfull Width (ft)	14.8	15.3	15.3	15.7	N/A	2	14.7	15.3	15.3	15.9	N/A	2	14.9	15.1	15.1	15.3	N/A	2														
Floodprone Width (ft)	>100	>100	>100	>100	N/A	2	>100	>100	>100	>100	N/A	2	>100	>100	>100	>100	N/A	2														
Bankfull Mean Depth (ft)	1.3	1.5	1.5	1.6	N/A	2	1.2	1.4	1.4	1.6	N/A	2	1.3	1.5	1.5	1.6	N/A	2														
Bankfull Max Depth (ft)	2.4	2.5	2.5	2.5	N/A	2	2.4	2.5	2.5	2.5	N/A	2	2.5	2.6	2.6	2.6	N/A	2														
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	20.3	22.2	22.2	24.0	N/A	2	18.5	21.2	21.2	23.8	N/A	2	19.3	21.6	21.6	23.8	N/A	2														
Width/Depth Ratio	9.2	10.7	10.7	12.2	N/A	2	9.1	11.4	11.4	13.8	N/A	2	9.4	10.8	10.8	12.1	N/A	2														
Entrenchment Ratio	>6.4	>6.6	>6.6	>6.7	N/A	2	>6.3	>6.5	>6.5	>6.8	N/A	2	>6.5	>6.6	>6.6	>6.7	N/A	2														
Bank Height Ratio	1.0	1.1	1.1	1.1	N/A	2	1.0	1.1	1.1	1.1	N/A	2	1.1	1.1	1.1	1.1	N/A	2														
<b>Profile</b>																																
Rifle Length (ft)	5.8	28.7	22.6	68.2	23.4	7	11.7	37.5	35.0	76.0	24.3	6	11.1	36.8	33.0	80.7	26.1	6														
Rifle Slope (ft/ft)	0.0143	0.0233	0.0220	0.0333	0.0065	7	0.0136	0.0193	0.0192	0.0273	0.0052	6	0.0160	0.0257	0.0209	0.0432	0.0110	6														
Pool Length (ft)	3.5	8.6	8.1	19.8	4.4	13	4.3	9.1	8.7	15.6	3.2	12	6.6	10.0	9.5	15.8	2.7	12														
Pool Max Depth (ft)	3.2	3.2	3.2	3.2	N/A	1	3.2	3.2	3.2	3.2	N/A	1	2.9	3.2	3.1	3.9	0.3	11														
Pool Spacing (ft)	6.8	38.9	34.0	113.1	30.3	12	10.3	41.7	38.5	109.1	28.1	11	8.6	42.2	37.4	109.0	29.4	11														
<b>Pattern</b>																																
Channel Belt Width (ft)	26.8	37.4	40.1	44.4	7.06	6																										
Radius of Curvature (ft)	28.7	34.7	32.4	51.3	8.35	6																										
Rc: Bankfull Width (ft/ft)	1.9	2.3	2.1	3.3	N/A	N/A																										
Meander Wavelength (ft)	117.9	135.5	130.7	162.6	20.10	4																										
Meander Width Ratio	2.6	2.6	2.6	2.7	N/A	2																										
<b>Additional Reach Parameters</b>																																
Rosgen Classification	Cb					C4b					C5b																					
Channel Thalweg Length (ft)	500					511					503																					
Sinuosity (ft)	1.14					1.17					1.15																					
Water Surface Slope (Channel) (ft/ft)	0.0238					0.0228					0.0240																					
Bankfull Slope (ft/ft)	0.0251					0.0229					0.0240																					
Rt% / Ru% / P% / G% / S%	42	8	24	22	4		45%	10%	22%	19%	5%		45%	11%	25%	15%	4%															
SC% / SA% / G% / C% / B% / Be%*							<1%	20%	71%	9%	0%	0%	2%	46%	44%	8%	0%	0%														
d16 / d35 / d50 / d84 / d95 (mm)																																
% of Reach with Eroding Banks	0%					1%					1%																					
Channel Stability or Habitat Metric	N/A					N/A					N/A																					
Biological or Other	N/A					N/A					N/A																					

N/A - Information does not apply.  
 Ri = Rifle / Ru = Run / P = Pool / G = Glide / S = Step  
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock  
 \*Percentages based on rifle and pool pebble counts.

Table 11b. Monitoring Data - Stream Reach Data Summary																															
UT Crab Creek Stream & Wetland / Project No. 857 - UT1-Lower (396 feet)																															
Parameter	Baseline					MY - 1					MY - 2					MY - 3					MY - 4					MY - 5					
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	
Bankfull Width (ft)	11.5	11.5	11.5	11.5	N/A	1	12.2	12.2	12.2	12.2	N/A	1	12.3	12.3	12.3	12.3	N/A	1													
Floodprone Width (ft)	>100	>100	>100	>100	N/A	1	>100	>100	>100	>100	N/A	1	>100	>100	>100	>100	N/A	1													
Bankfull Mean Depth (ft)	1.5	1.5	1.5	1.5	N/A	1	1.4	1.4	1.4	1.4	N/A	1	1.4	1.4	1.4	1.4	N/A	1													
Bankfull Max Depth (ft)	2.5	2.5	2.5	2.5	N/A	1	2.6	2.6	2.6	2.6	N/A	1	2.6	2.6	2.6	2.6	N/A	1													
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	17.6	17.6	17.6	17.6	N/A	1	17.5	17.5	17.5	17.5	N/A	1	17.3	17.3	17.3	17.3	N/A	1													
Width/Depth Ratio	7.5	7.5	7.5	7.5	N/A	1	8.5	8.5	8.5	8.5	N/A	1	8.8	8.8	8.8	8.8	N/A	1													
Entrenchment Ratio	>8.7	>8.7	>8.7	>8.7	N/A	1	>8.2	>8.2	>8.2	>8.2	N/A	1	>8.1	>8.1	>8.1	>8.1	N/A	1													
Bank Height Ratio	1.0	1.0	1.0	1.0	N/A	1	1.0	1.0	1.0	1.0	N/A	1	1.0	1.0	1.0	1.0	N/A	1													
<b>Profile</b>																															
Riffle Length (ft)	21.0	37.6	40.2	52.6	15.2	5	25.2	39.1	32.0	55.5	14.4	5	27.9	38.2	29.3	54.3	13.5	5													
Riffle Slope (ft/ft)	0.0199	0.0257	0.0266	0.0334	0.0054	5	0.0015	0.0196	0.0239	0.0288	0.0108	5	0.002	0.020	0.018	0.040	0.014	5													
Pool Length (ft)	11.8	17.4	17.4	27.1	6.2	5	8.4	14.3	16.3	18.8	4.6	5	5.6	14.4	16.3	18.3	5.1	5													
Pool Max Depth (ft)	2.6	2.6	2.6	2.6	N/A	1	2.5	2.5	2.5	2.5	N/A	1	2.3	3.1	3.2	3.6	0.5	5													
Pool Spacing (ft)	45.0	71.3	73.4	93.6	21.6	4	45.5	68.9	68.3	95.5	21.7	4	51.0	69.4	62.9	100.8	22.8	4													
<b>Pattern</b>																															
Channel Belt Width (ft)	57.2	62.9	64.2	66.2	3.9	4																									
Radius of Curvature (ft)	31.2	36.6	37.8	39.7	3.8	4																									
Rc: Bankfull Width (ft/ft)	2.7	3.2	3.3	3.5	N/A	N/A																									
Meander Wavelength (ft)	142.0	196.0	202.0	244.0	N/A	3																									
Meander Width Ratio	5.58	5.58	5.58	5.58	N/A	1																									
<b>Additional Reach Parameters</b>																															
Rosgen Classification	C					C5b					C5b																				
Channel Thalweg Length (ft)	397					400					396																				
Sinuosity (ft)	1.15					1.16					1.15																				
Water Surface Slope (Channel) (ft/ft)	0.0156					0.0156					0.0154																				
Bankfull Slope (ft/ft)	0.0174					0.0172					0.0175																				
Rt% / Ru% / P% / G% / S%	48	5	22	25	1		50%	6%	18%	26%	0%		53%	8%	20%	19%	0%														
SC% / SA% / G% / C% / B% / Be%*							2%	48%	33%	17%	0%	0%	1%	48%	43%	8%	0%	0%													
d16 / d35 / d50 / d84 / d95 (mm)																															
% of Reach with Eroding Banks	0%					0%					0%																				
Channel Stability or Habitat Metric	N/A					N/A					N/A																				
Biological or Other	N/A					N/A					N/A																				

N/A - Information does not apply.  
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step  
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock  
 \*Percentages based on riffle and pool pebble counts.

Table 11b. Monitoring Data - Stream Reach Data Summary																														
UT Crab Creek Stream & Wetland / Project No. 857 - UTCC-US (2,465 feet)																														
Parameter	Baseline					MY - 1					MY - 2					MY - 3					MY - 4					MY - 5				
	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n	Min	Mean	Med	Max	SD	n
Dimension & Substrate - Riffle																														
Bankfull Width (ft)	25.0	26.7	26.5	28.7	N/A	3	24.7	26.6	27.2	27.9	N/A	3	26.4	27.2	27.2	28.0	N/A	3												
Floodprone Width (ft)	>200	>200	>200	>200	N/A	3	>200	>200	>200	>200	N/A	3	>200	>200	>200	>200	N/A	3												
Bankfull Mean Depth (ft)	1.4	1.5	1.5	1.7	N/A	3	1.4	1.5	1.4	1.7	N/A	3	1.4	1.4	1.4	1.5	N/A	3												
Bankfull Max Depth (ft)	2.4	2.5	2.5	2.6	N/A	3	2.4	2.4	2.4	2.5	N/A	3	2.5	2.5	2.5	2.5	N/A	3												
Bankfull Cross-Sectional Area (ft <sup>2</sup> )	37.0	40.5	42.1	42.4	N/A	3	37.2	39.5	39.5	41.9	N/A	3	35.9	38.5	38.4	41.3	N/A	3												
Width/Depth Ratio	14.7	17.7	19.0	19.5	N/A	3	14.6	18.1	19.7	19.9	N/A	3	17.9	19.2	19.4	20.4	N/A	3												
Entrenchment Ratio	>7.0	>7.5	>7.5	>8.0	N/A	3	>7.2	>7.5	>7.3	>8.1	N/A	3	>7.1	>7.36	>7.4	>7.6	N/A	3												
Bank Height Ratio	1.0	1.0	1.0	1.1	N/A	3	1.0	1.0	1.0	1.1	N/A	3	1.0	1.1	1.1	1.1	N/A	3												
<b>Profile</b>																														
Riffle Length (ft)	14.9	60.5	64.9	100.0	22.6	19	14.4	61.4	59.1	169.0	32.9	18	11.4	56.8	51.3	214.2	46.5	17												
Riffle Slope (ft/ft)	0.0058	0.0131	0.0119	0.0214	0.0048	19	0.0046	0.0127	0.0123	0.0180	0.0043	18	0.0050	0.0148	0.0132	0.0360	0.0081	17												
Pool Length (ft)	10.7	46.0	52.7	103.5	24.7	19	11.0	42.6	40.7	87.7	21.1	19	18.7	43.0	44.9	83.7	16.3	19												
Pool Max Depth (ft)	2.7	2.9	2.9	3.0	N/A	2	2.9	3.2	3.2	3.4	0.4	2	2.2	3.9	4.0	4.9	0.8	18												
Pool Spacing (ft)	51.7	130.7	113.2	241.7	52.3	18	57.3	130.9	124.1	244.4	53.4	18	49.9	128.9	132.5	301.0	63.2	18												
<b>Pattern</b>																														
Channel Belt Width (ft)	54.7	101.7	102.5	132.8	23.6	15																								
Radius of Curvature (ft)	37.5	51.1	42.5	146.7	26.2	16																								
Rc: Bankfull Width (ft/ft)	1.5	1.9	1.6	5.1	N/A	N/A																								
Meander Wavelength (ft)	204.4	238.7	234.4	314.2	32.6	15																								
Meander Width Ratio	3.6	3.9	3.9	4.1	N/A	3																								
<b>Additional Reach Parameters</b>																														
Rosgen Classification	C					C4					C4																			
Channel Thalweg Length (ft)	2,455					2,465					2,465																			
Sinuosity (ft)	1.21					1.22					1.22																			
Water Surface Slope (Channel) (ft/ft)	0.0080					0.0081					0.0081																			
Bankfull Slope (ft/ft)	0.0083					0.0083					0.0082																			
Rt% / Ru% / P% / G% / S%	47	9	32	12	0		45%	8%	33%	14%	0%		40%	9%	34%	17%	0%													
SC% / SA% / G% / C% / B% / Be%*							<1%	23%	54%	22%	<1%	0%	2%	26%	51%	21%	0%	0%												
d16 / d35 / d50 / d84 / d95 (mm)																														
% of Reach with Eroding Banks	0%					1%					1%																			
Channel Stability or Habitat Metric	N/A					N/A					N/A																			
Biological or Other	N/A					N/A					N/A																			

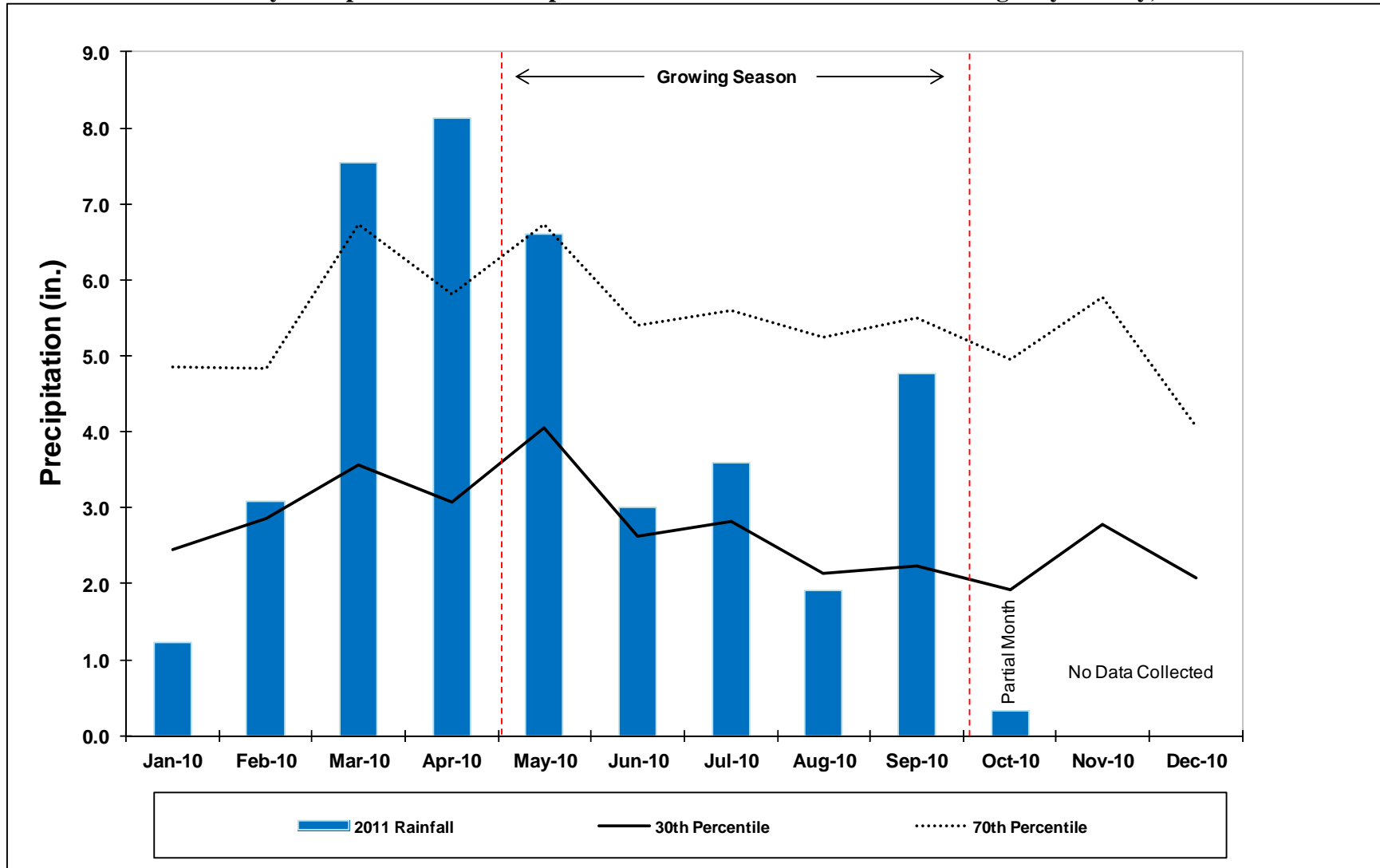
N/A - Information does not apply.  
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step  
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock  
 \*Percentages based on riffle and pool pebble counts.

# **Appendix E**

## **Hydrologic Data**

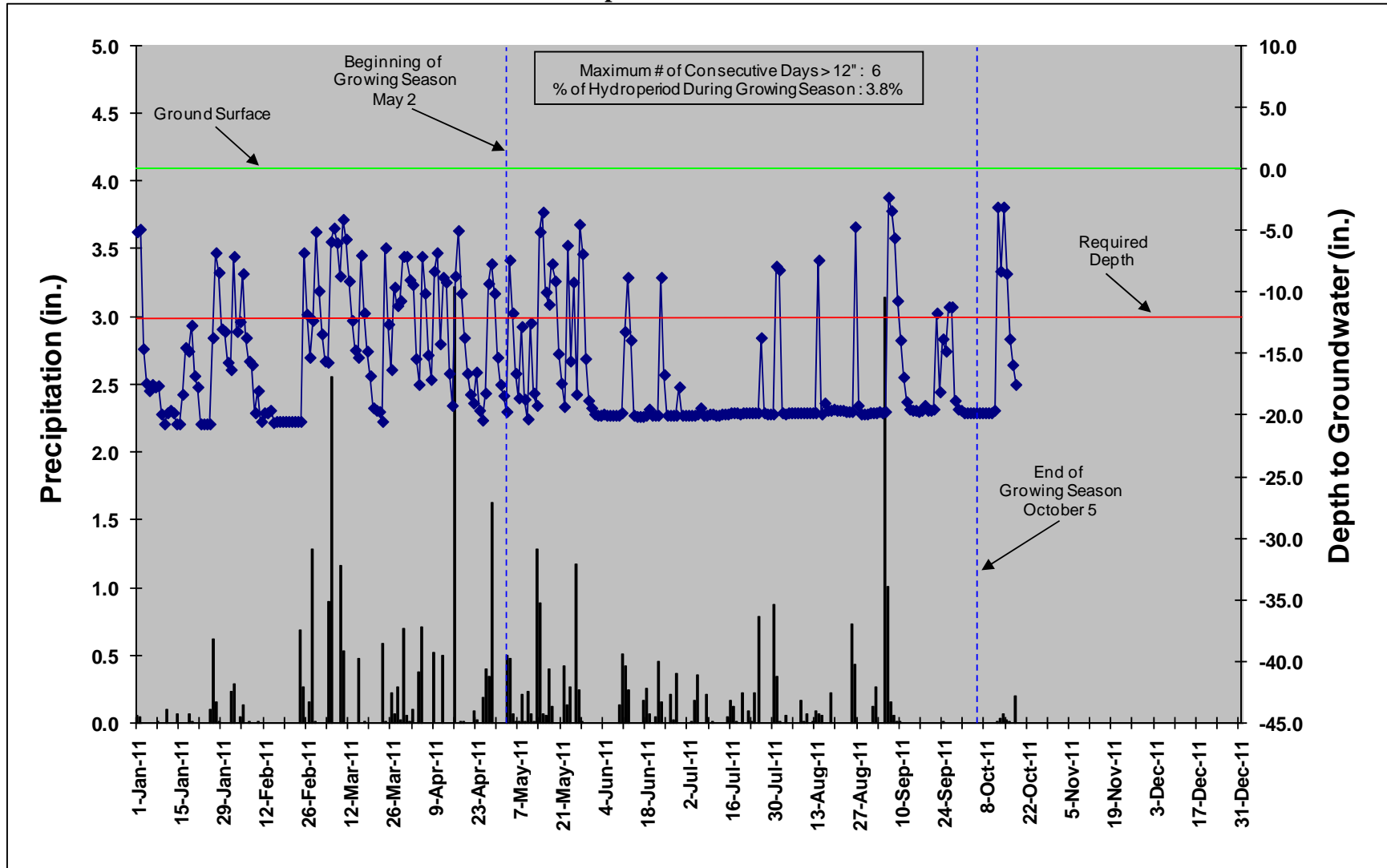
<b>Table 12. Verification of Bankfull Events</b>			
<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>			
<b>Date of Data Collection</b>	<b>Date of Occurrence</b>	<b>Method</b>	<b>Photo # (if available)</b>
2/2/2011	12/2/2010	Crest gauge & wrack lines	

Monthly Precipitation Data Compared to 30<sup>th</sup> and 70<sup>th</sup> Percentiles for Alleghany County, NC

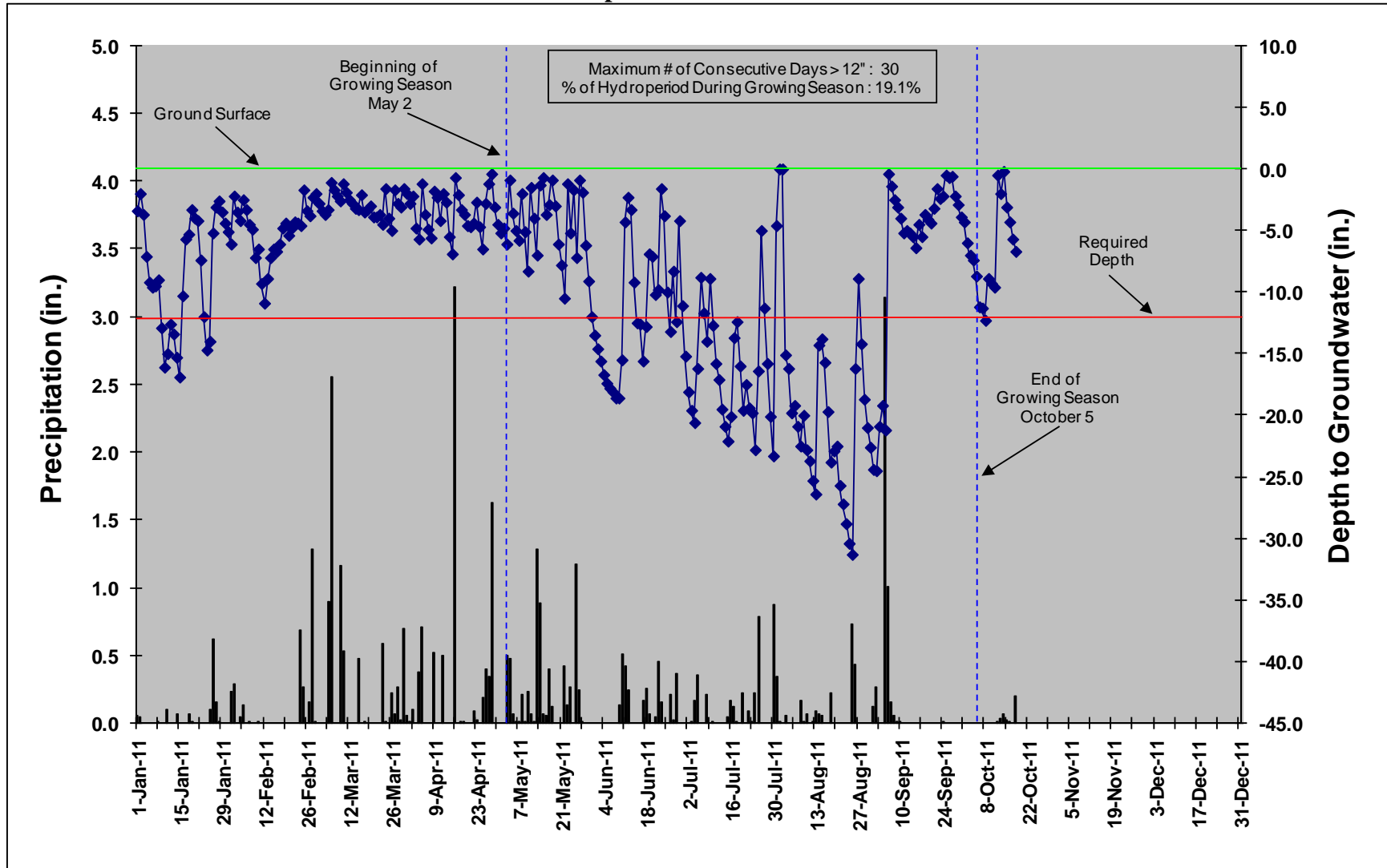




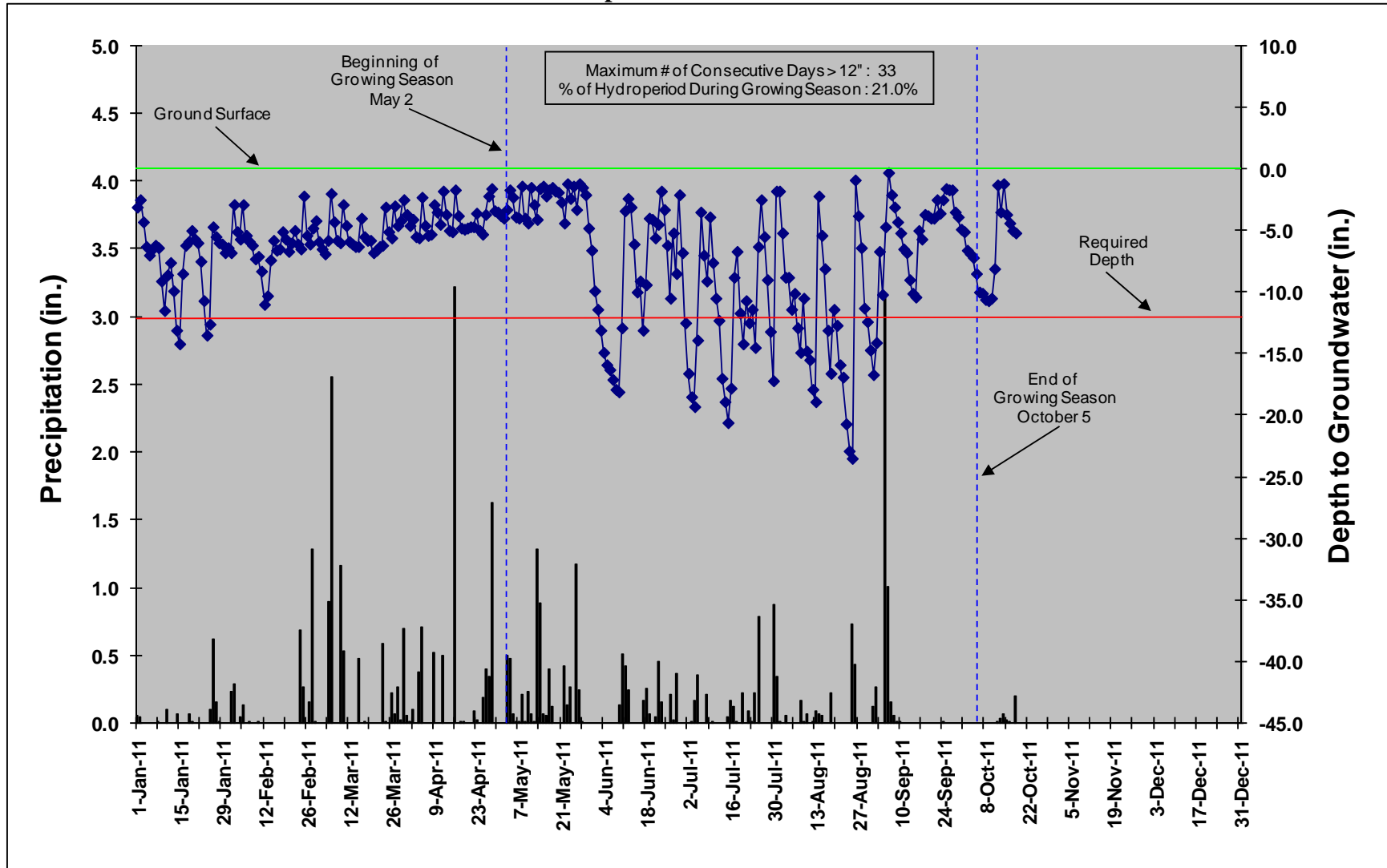
UTC-1 Precipitation and Water Level Plot



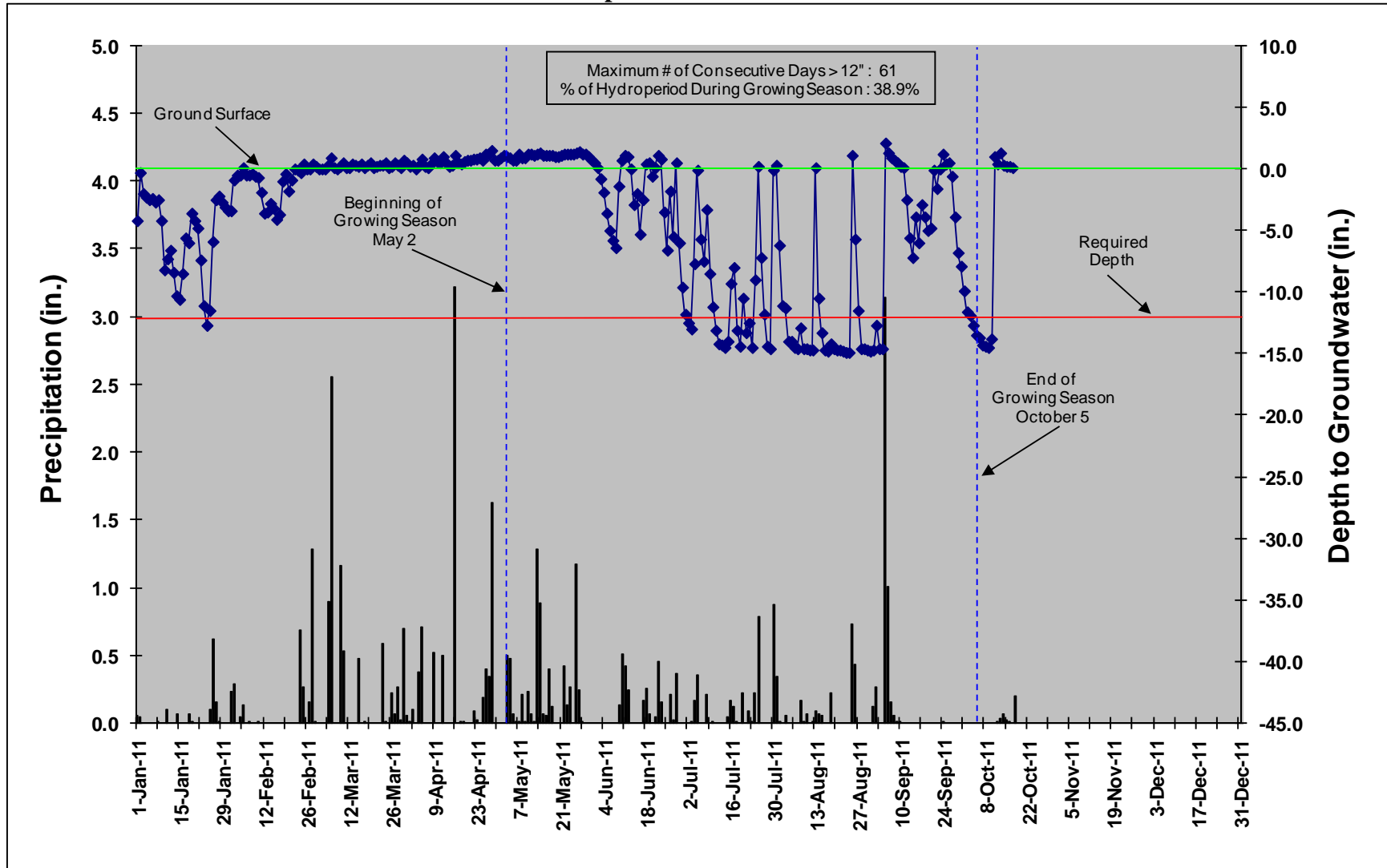
UTC-2 Precipitation and Water Level Plot



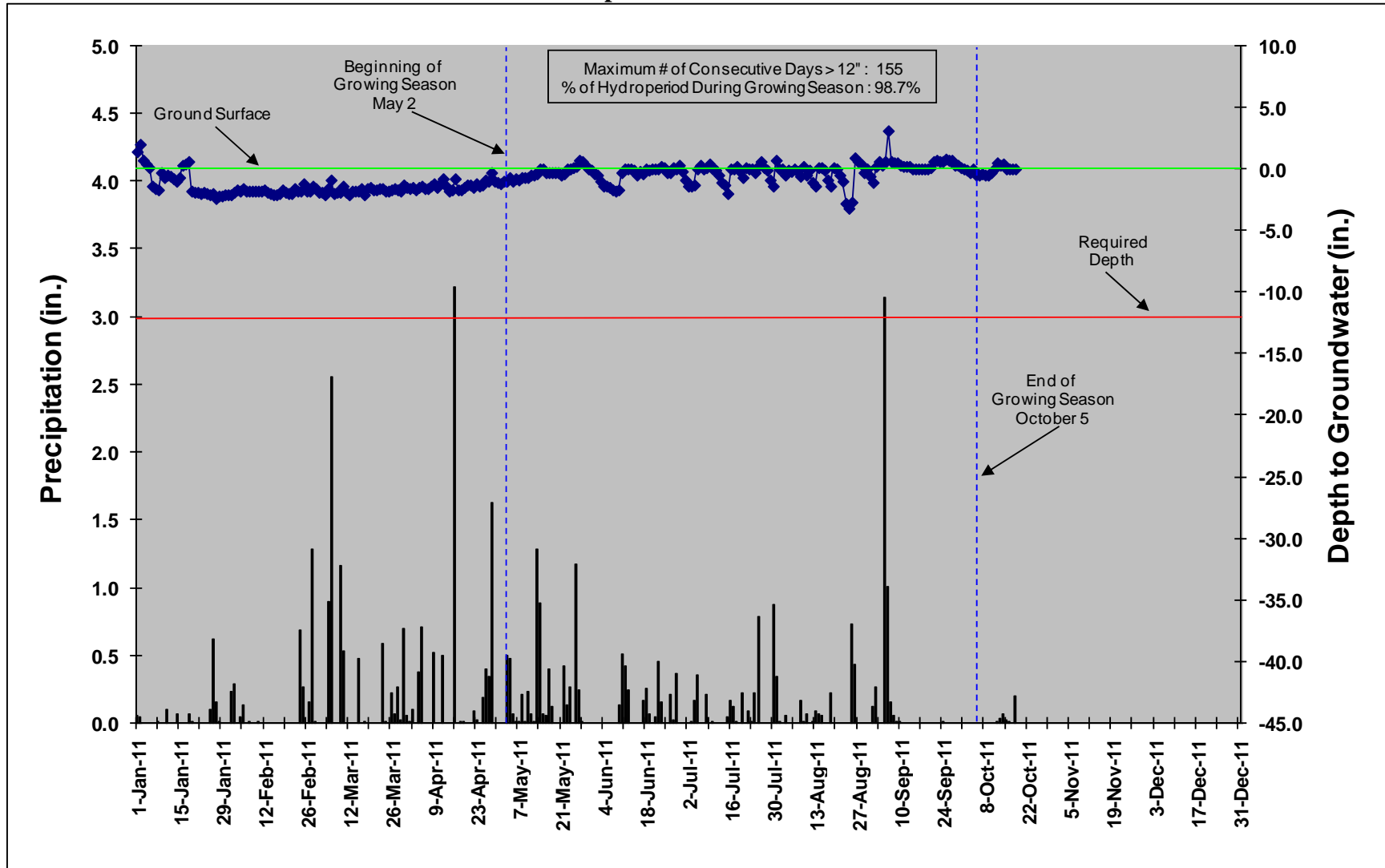
UTC-3 Precipitation and Water Level Plot



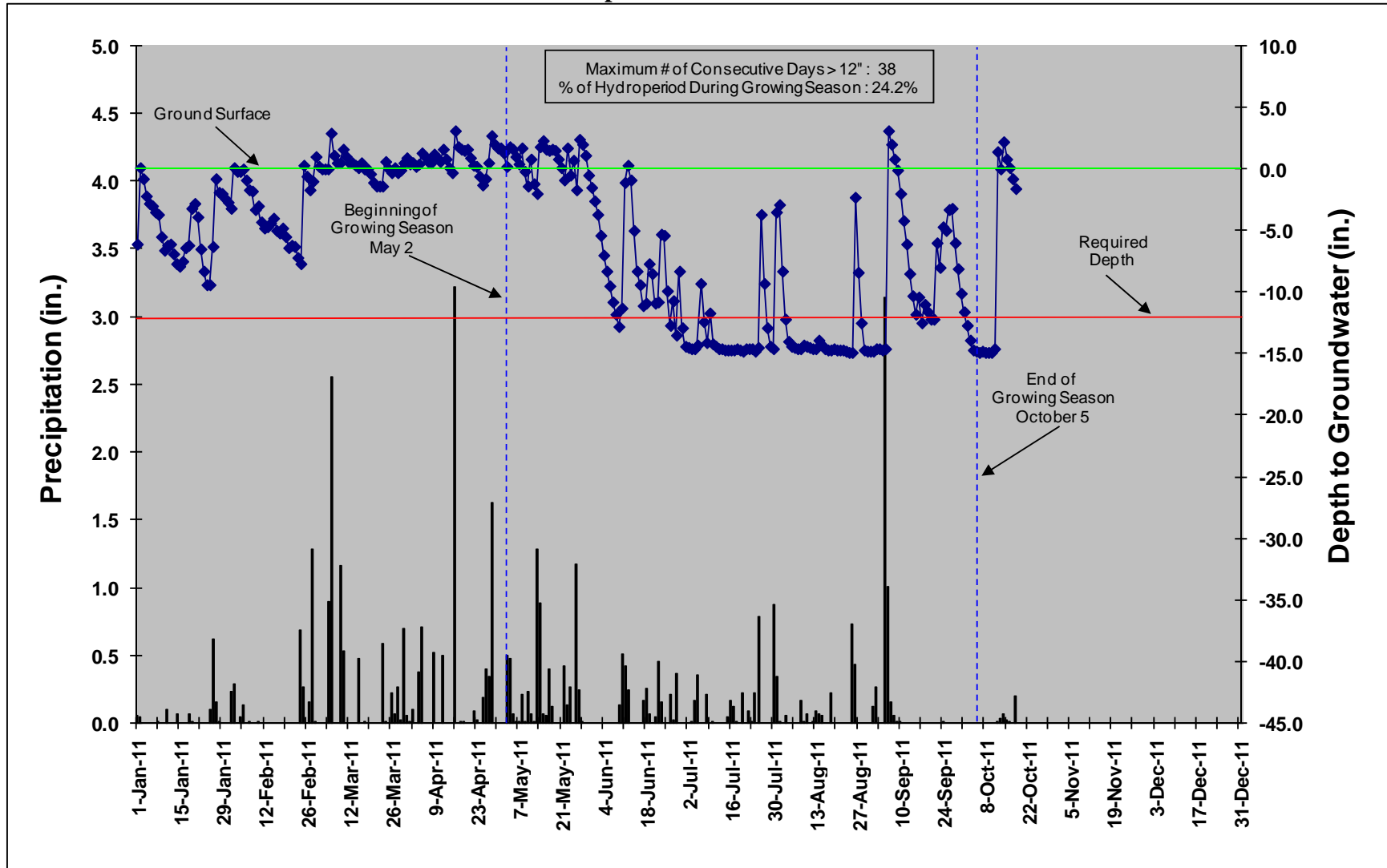
UTC-4 Precipitation and Water Level Plot



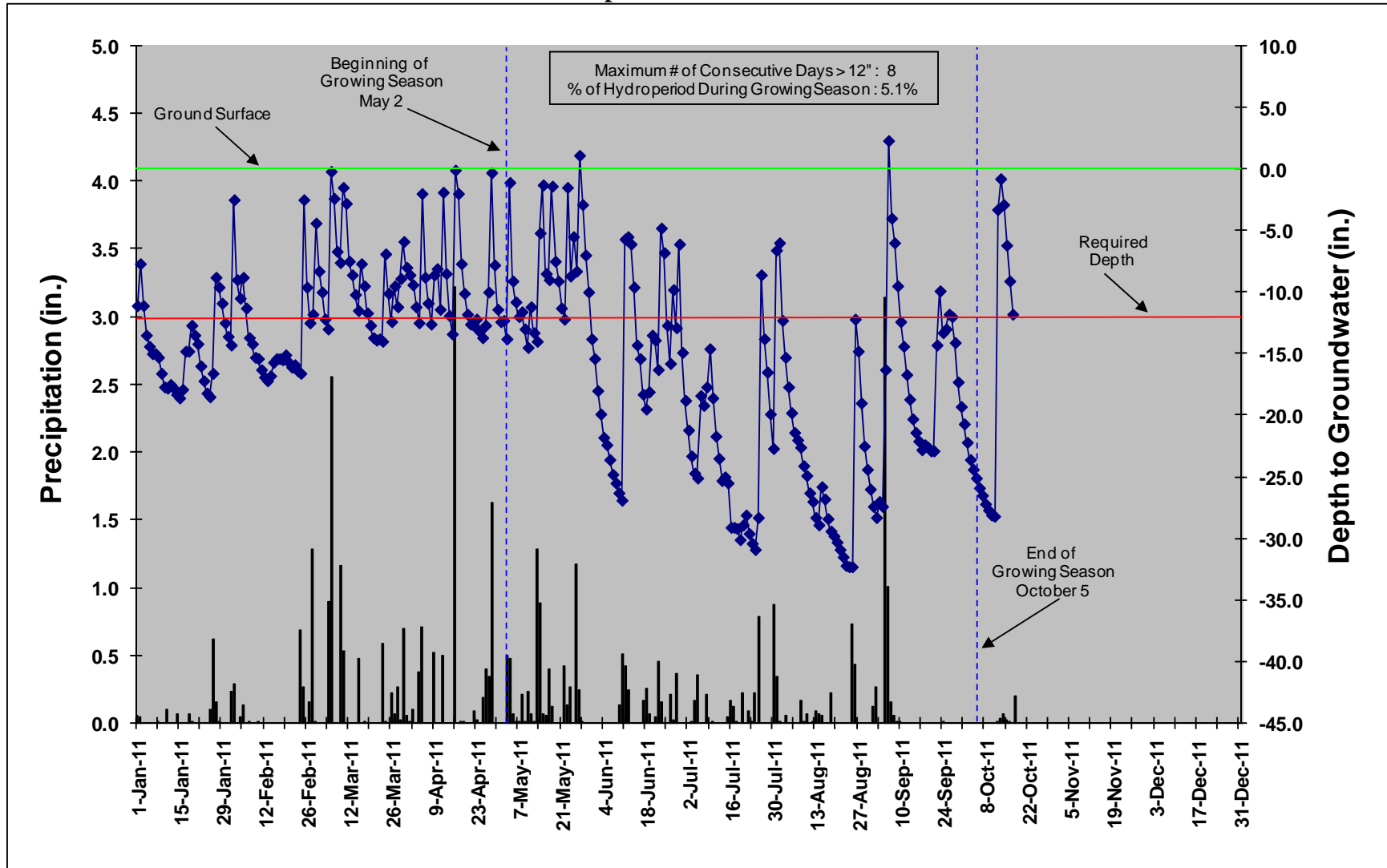
UTC-5 Precipitation and Water Level Plot



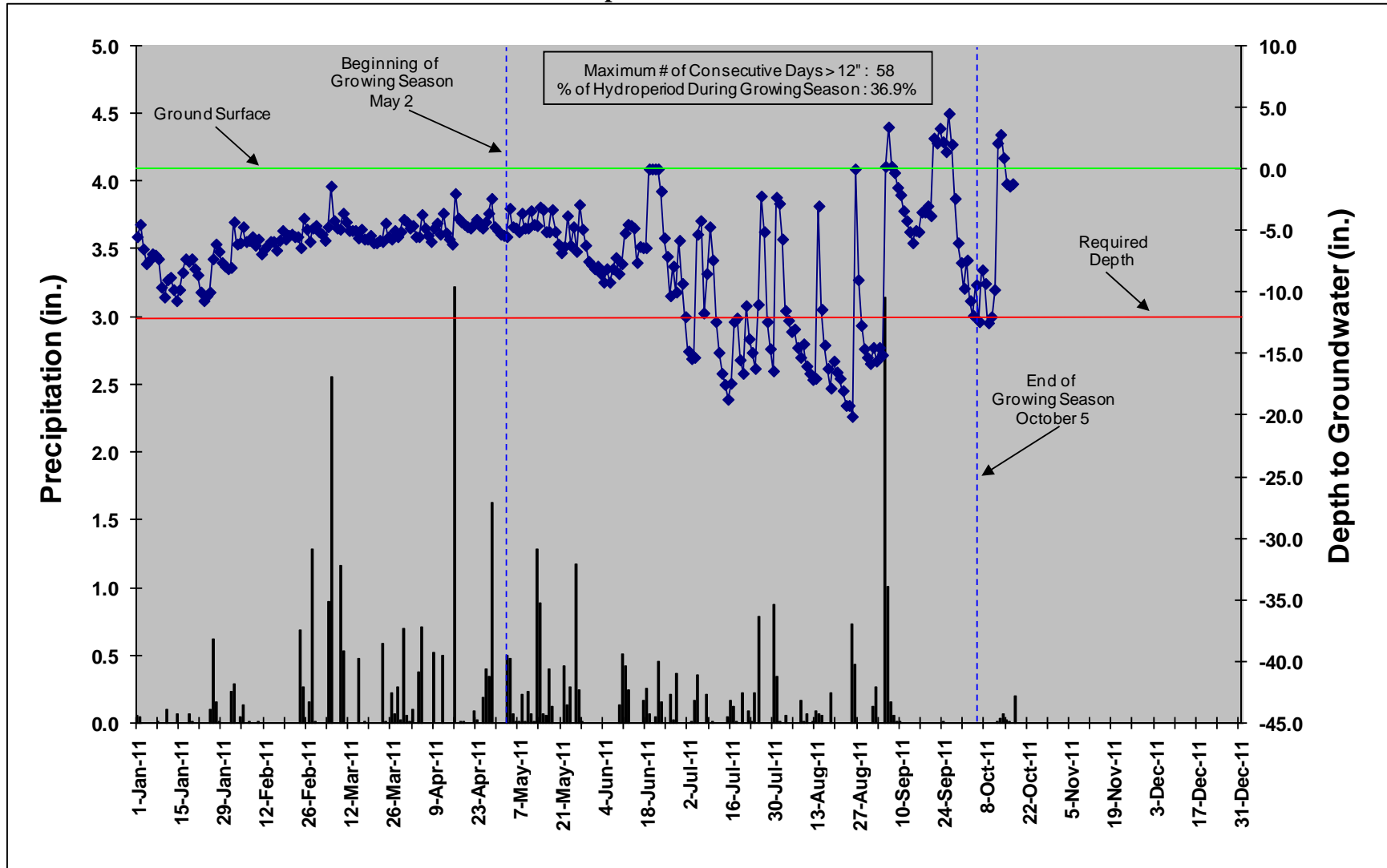
UTC-6 Precipitation and Water Level Plot



UTC-7 Precipitation and Water Level Plot



UTC-8 Precipitation and Water Level Plot





<b>Table 13. Wetland Gauge Attainment Data</b>					
<b>Summary of Groundwater Gauge Results</b>					
<b>UT Crab Creek Stream &amp; Wetland / Project No. 857</b>					
<b>Gauge ID</b>	<b>Success Criteria Achieved/Max Consecutive Days During Growing Season</b>				
	<b>(Percentage)</b>				
	<b>Year 1 (2010)</b>	<b>Year 2 (2011)</b>	<b>Year 3 (2012)</b>	<b>Year 4 (2013)</b>	<b>Year 5 (2014)</b>
<b>UTC-1</b>	No/6 3.8 Percent	No/6 3.8 Percent			
<b>UTC-2</b>	Yes/70 44.6 Percent	Yes/30 19.1 Percent			
<b>UTC-3</b>	Yes/35 22.3 Percent	Yes/33 21.0 Percent			
<b>UTC-4</b>	Yes/52 33.1 Percent	Yes/61 38.9 Percent			
<b>UTC-5</b>	Yes/157 100.0 Percent	Yes/155 98.7 Percent			
<b>UTC-6</b>	Yes/22 14.0 Percent	Yes/38 24.2 Percent			
<b>UTC-7</b>	Yes/15 9.6 Percent	Yes/8 5.1 Percent			
<b>UTC-8</b>	Yes/37 23.6 Percent	Yes/58 36.9 Percent			