

Unnamed Tributary to Crab Creek Stream and Wetland Restoration

NCEEP Project Number: 857

Monitoring Year 1

2010 – 2011 Final Report

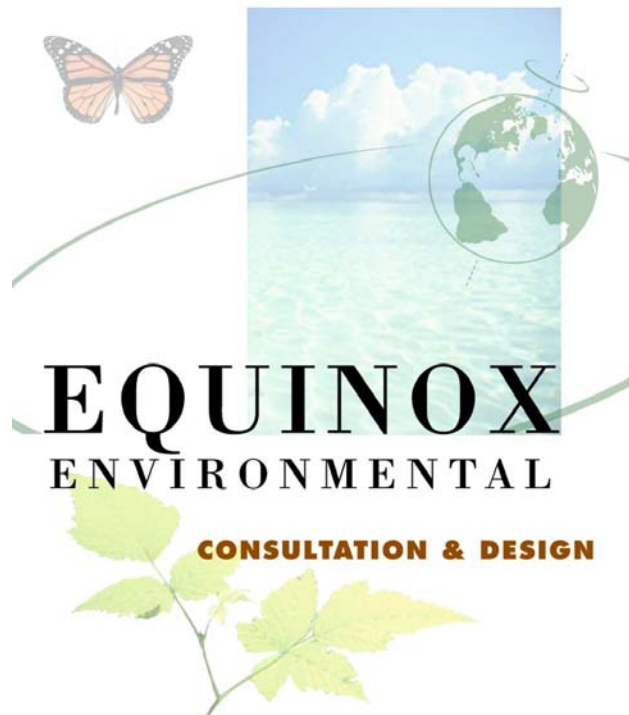


**Submitted to
North Carolina Ecosystem Enhancement Program
North Carolina Department of Environment and Natural Resources
October 2011**



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Unnamed Tributary to Crab Creek Stream and Wetland Restoration 2010 - 2011 Monitoring Report (MY 1)

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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 one (MY1) vegetation plot data indicate that the project 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. While the average living stem densities for planted stems in MY1 is approximately 378 stems per acre, several plots (~33%) did not meet the year three interim success criteria numbers per acre. These include VP 4, 5, and 6, which had 162, 121, and 283 stems per acre, respectively. Due to dead or missing stems there was an approximately 16% decrease in total stem densities between MY0 and MY1. However, when planted and natural stems are combined, the average stem density is 526 stems per acre, which is above the minimum established criterion. Problems with vegetation consist of approximately 13 currently isolated patches of high threat invasive plant species that span the project extent. Additionally, 4 areas of easement encroachment were noted during MY1 which are impacting vegetative coverage within the easement area.

Stream longitudinal profiles have remained stable among monitoring years. Stream issues observed during MY1 were minimal and consisted of two bank erosion areas and one area of bed aggradation. Additionally, one beaver dam was noted at the lower end of the preservation reach. Based on the presence of wrack lines and crest gauge monitoring one bankfull event was documented in MY1.

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 initial part 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.

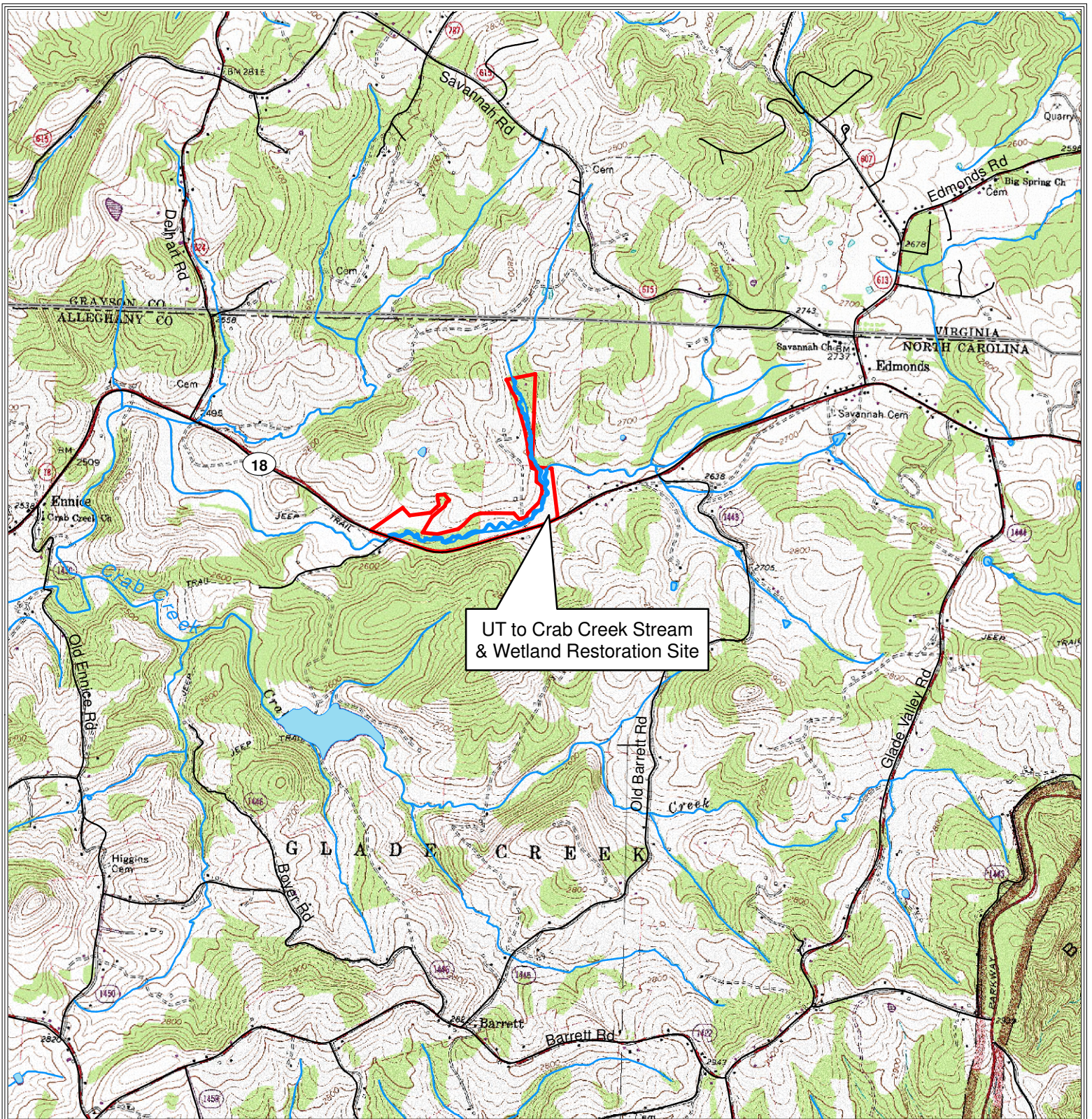
2.0 Methodology

The stream monitoring methodologies utilized in MY1 were intended to replicate those employed during the previous monitoring year and are based on standard guidance and procedures documents (Rosgen 1996 and USACE 2003). Vegetation monitoring data were collected following the standard CVS-EEP Protocol for Recording Vegetation, Level II (Lee et al. 2008). 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. 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



UT to Crab Creek Stream
& Wetland Restoration Site

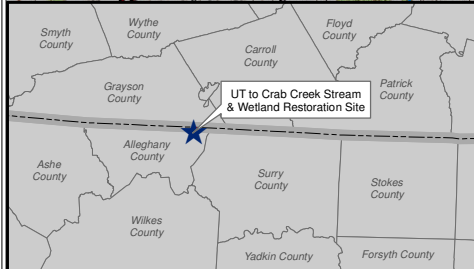


Figure 1 - Vicinity Map

UT to Crab Creek Stream &
Wetland Restoration Site

Project No. 857

Alleghany County, North Carolina

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.



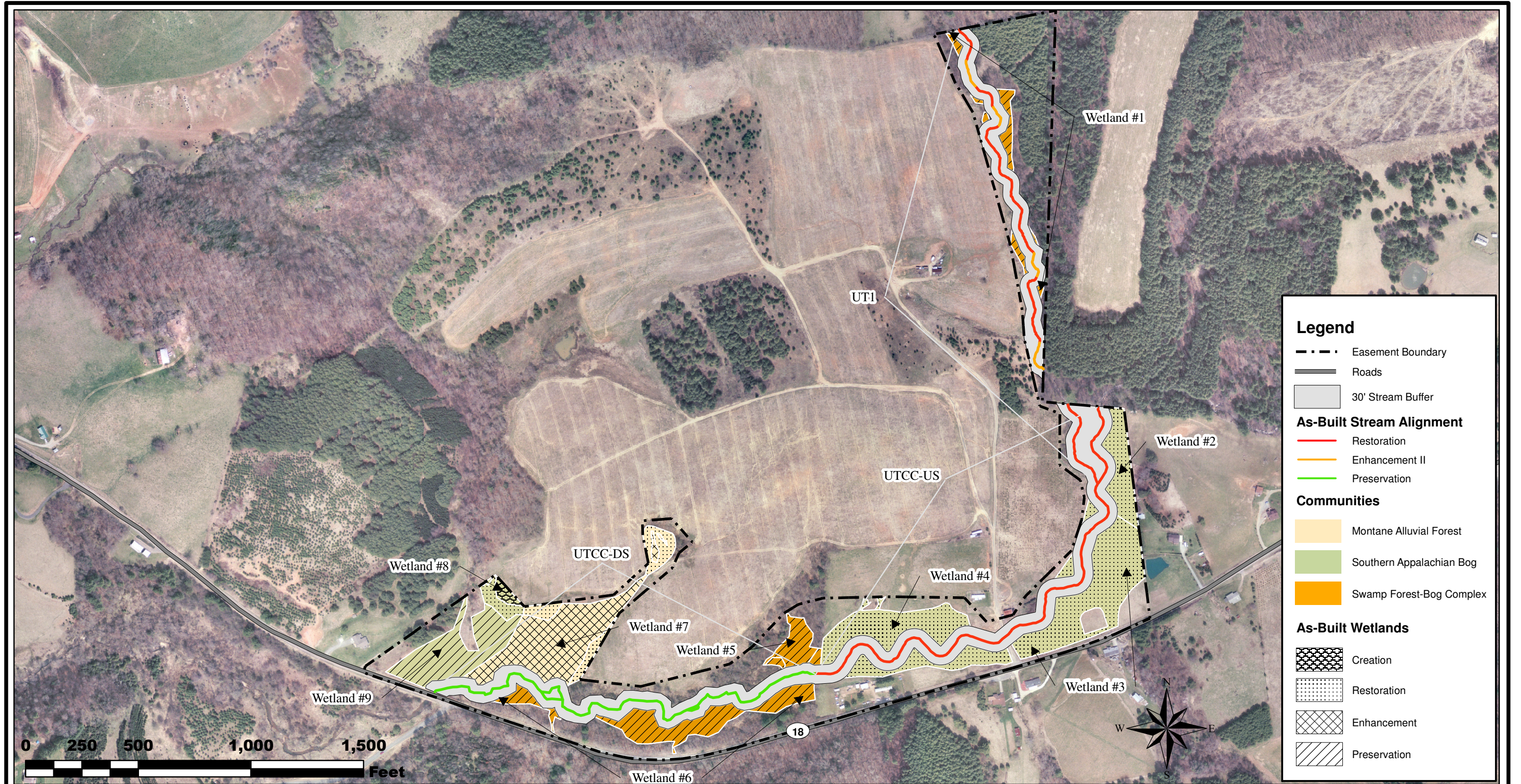
0 1,250 2,500 5,000 Feet

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	1.0 ac	R		1.0 ac				Overfill cropland soil removed and site graded to restore Southern Appalachian Bog Community hydrology.	
Wetland 3	3.0 ac	R		3.2 ac				Cropland drainage ditches filled to restore Southern Appalachian Bog Community hydrology.	
Wetland 4	2.7 ac	R		2.7 ac				Overfill cropland soil removed, ditch filled, and wellhead removed to restore Southern Appalachian Bog Community hydrology.	
Wetland 5	0.7 ac	P		0.7 ac				Preservation of Swamp Forest-Bog Complex along UTCC-DS reach.	
Wetland 6	2.0 ac	P		2.0 ac				Preservation of Swamp Forest-Bog Complex along UTCC-DS reach.	
Wetland 7	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 8	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 9	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				
Totals	6,928	16.6		0	0	0	0
Non-Applicable							

Figure 2: Project Components and Assets Map



Legend

- Easement Boundary
- Roads
- 30' Stream Buffer

As-Built Stream Alignment

- Restoration
- Enhancement II
- Preservation

Communities

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

As-Built Wetlands

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


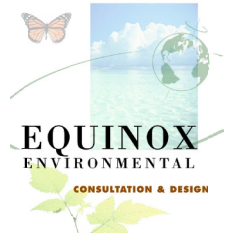
Prepared for	Project: UT to Crab Creek Stream and Wetland Restoration Mitigation Plan Alleghany County, North Carolina	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A. 2) 2005 Aerial Photo	Prepared by
	Sheet 1 of 1		
	Date	Project Number	
	February 2011	NCEEP # 857	

Table 2. Project Activity & Reporting History UT Crab Creek Stream & Wetland / Project No. 857		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
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		
Year 3 Monitoring		
Year 4 Monitoring		
Year 5 Monitoring		

N/A - Item does not apply.

Table 3. Project Contacts UT Crab Creek Stream & Wetland / Project No. 857	
Designer	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
Construction Contractor	Carolina Environmental Contracting Inc. P.O. Box 1905 Mount Airy, NC 27030
Construction Contractor POC	Stephen James (336) 320-3849
Planting Contractor	Carolina Environmental Contracting Inc. P.O. Box 1905 Mount Airy, NC 27030
Planting Contractor POC	Stephen James (336) 320-3849
Seeding Contractor	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
Monitoring Performers (Y0) - 2009	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
Monitoring Performers (Y1) - 2010	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
Monitoring Performers (Y2) - 2011	
Stream Monitoring POC	
Vegetation Monitoring POC	
Wetland Monitoring POC	
Monitoring Performers (Y3)- 2012	
Stream Monitoring POC	
Vegetation Monitoring POC	
Wetland Monitoring POC	
Monitoring Performers (Y4)- 2013	
Stream Monitoring POC	
Vegetation Monitoring POC	
Wetland Monitoring POC	
Monitoring Performers (Y5)- 2014	
Stream Monitoring POC	
Vegetation Monitoring POC	
Wetland Monitoring POC	

Table 4. Project Attributes			
UT Crab Creek Stream & Wetland / Project No. 857			
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	0%		
Beaver Activity Observed During Design Phase	No		
Restoration Component Attributes			
	UT1	UTCC-US	UTCC-DS
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	5.7	0.0	18.2
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	-	-

- Information unavailable.

N/A - Item does not apply.

Appendix B

Visual Assessment Data

Figure 3. Integrated Current Condition Plan View



Prepared for	Project: UT to Crab Creek Stream and Wetland Restoration Year 1 Monitoring Alleghany County, North Carolina	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A. 2) 2005 Aerial Photo	Prepared by
	Sheet 1 of 4		
	Date	Project Number	
	March 2011	NCEP # 857	

Figure 3. Integrated Current Condition Plan View




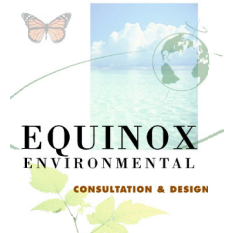
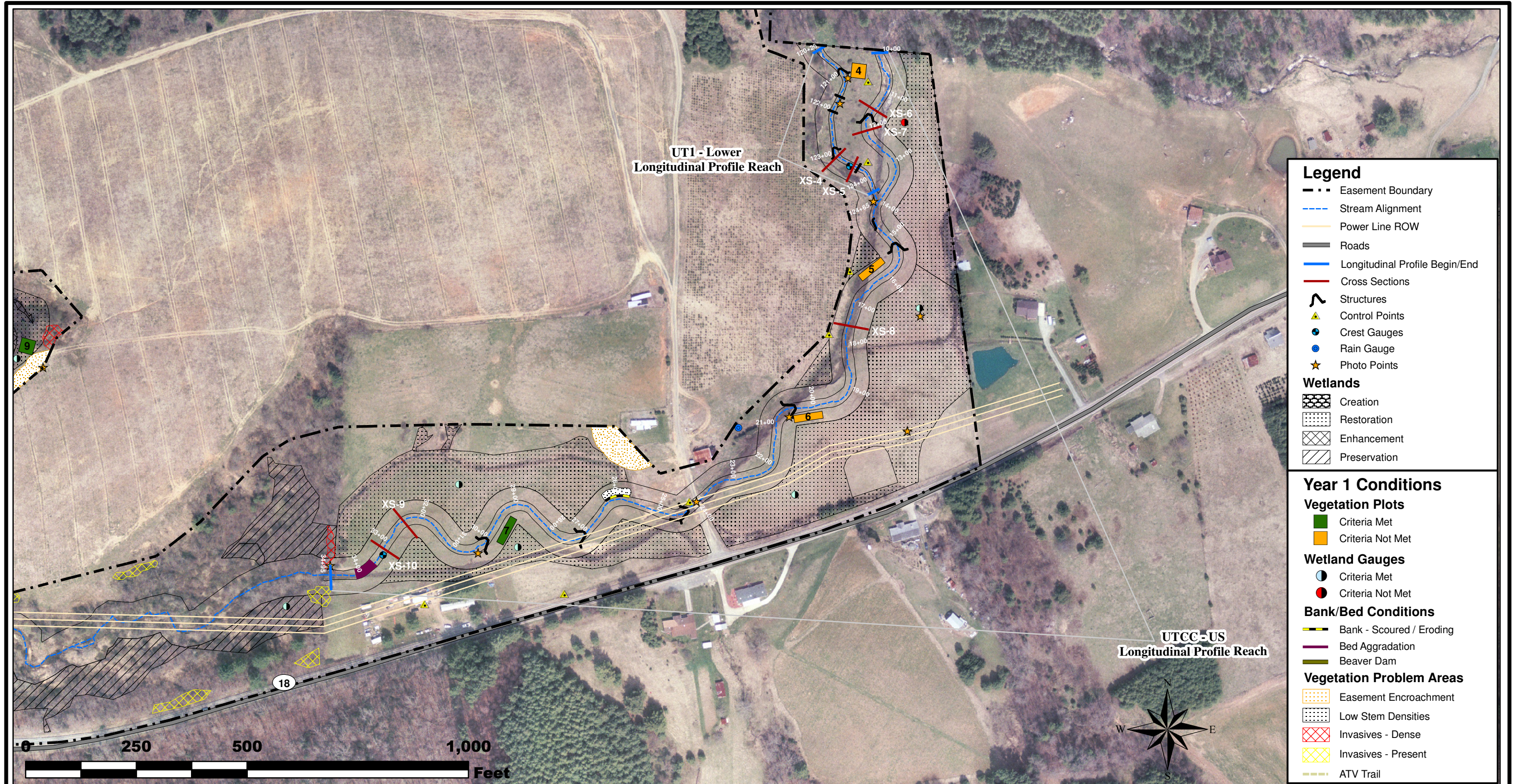
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	Year 1 Monitoring Alleghany County, North Carolina	2) 2005 Aerial Photo	
	Sheet 2 of 4	Project Number	
	Date March 2011	NCEEP # 857	

Figure 3. Integrated Current Condition Plan View




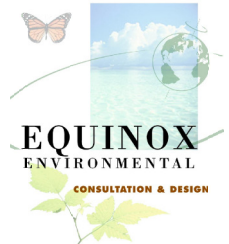
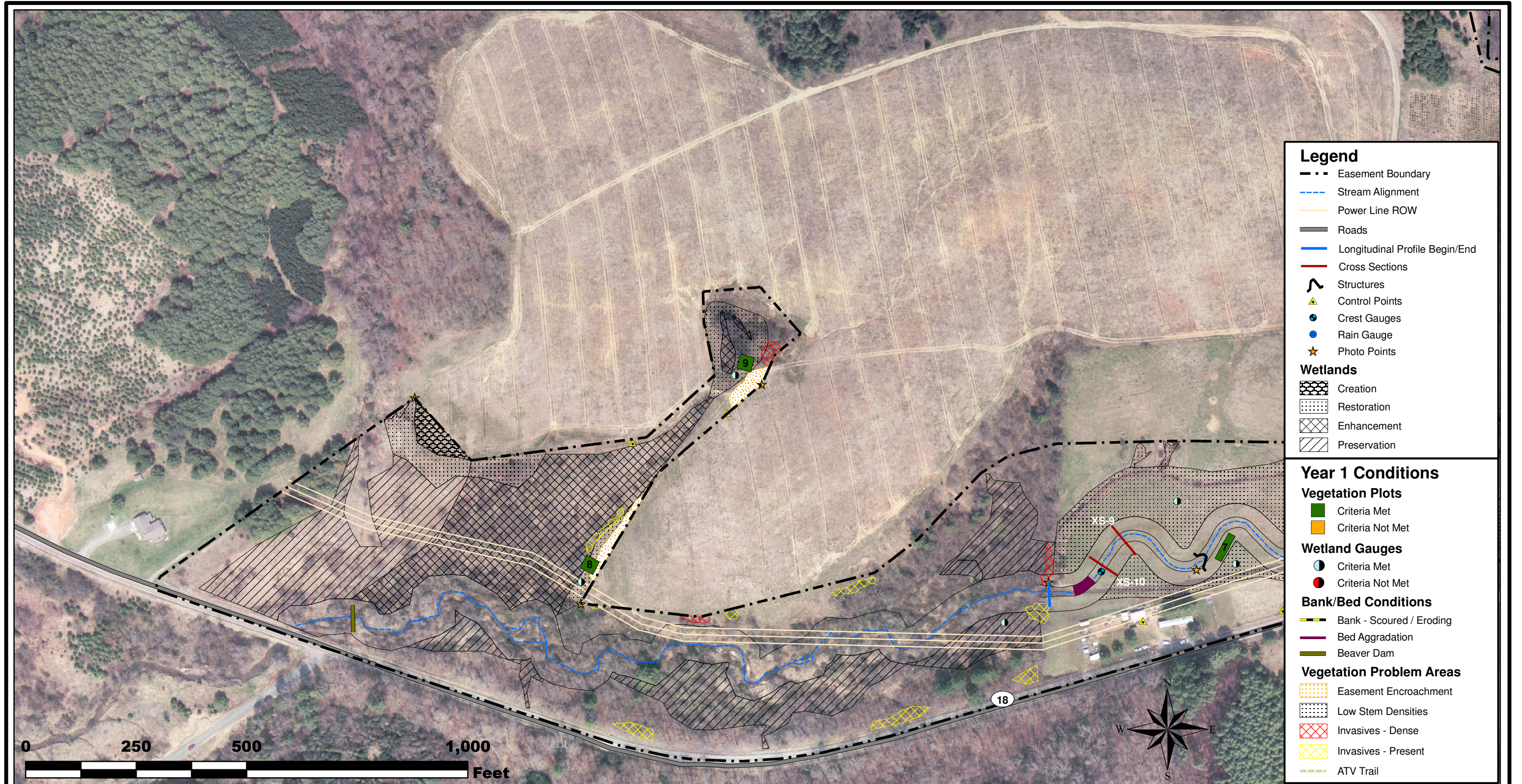
Prepared for	Project: UT to Crab Creek Stream and Wetland Restoration	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A.	Prepared by
	Year 1 Monitoring Alleghany County, North Carolina	2) 2005 Aerial Photo	
	Sheet 3 of 4		
	Date March 2011	Project Number NCEP # 857	

Figure 3. 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

Wetlands

- ▨ Creation
- ▩ Restoration
- ▧ Enhancement
- ▬ Preservation

Year 1 Conditions

Vegetation Plots

- Criteria Met
- Criteria Not Met

Wetland Gauges

- Criteria Met
- Criteria Not Met

Bank/Bed Conditions

- Bank - Scoured / Eroding
- Bed Aggradation
- Beaver Dam

Vegetation Problem Areas

- ▨ Easement Encroachment
- ▩ Low Stem Densities
- ▧ Invasives - Dense
- ▬ Invasives - Present
- ATV Trail


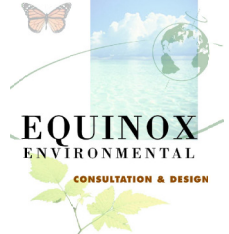
Prepared for	Project: UT to Crab Creek Stream and Wetland Restoration	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A.	Prepared by
	Year 1 Monitoring Alleghany County, North Carolina	2) 2005 Aerial Photo	
	Sheet 4 of 4		
	Date	Project Number	
	March 2011	NCEEP # 857	

Table 5. Visual Stream Morphology Stability Assessment UT Crab Creek Stream & Wetland / Project No. 857 - UT1 - Upper Assessed Length 1,832 feet										
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. <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%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	17	17			100%			
		3. Meander Pool Condition	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%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	20	20			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	19	20			95%			
	2. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			1	25			
2. Undercut		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
3. Mass Wasting		Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
Totals					1	25	99%	0	0	99%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	15	15			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	15	15			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	15	15			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	15	15			100%			
	4. Habitat	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.

Table 5. Visual Stream Morphology Stability Assessment UT Crab Creek Stream & Wetland / Project No. 857 - UT1 - Lower Assessed Length 438 feet										
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. <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%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	5	5			100%			
		3. Meander Pool Condition	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%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	4	4			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	4	4			100%			
	2. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			0	0			
2. Undercut		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
3. Mass Wasting		Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
Totals					0	0	100%	N/A	N/A	N/A
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	5	5			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	5	5			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	5	5			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	5	5			100%			
	4. Habitat	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.

Table 5. Visual Stream Morphology Stability Assessment UT Crab Creek Stream & Wetland / Project No. 857 - UTCC - US Assessed Length 2,485 feet										
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number in As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Vegetation	Footage with Stabilizing Woody Vegetation	Adjusted % for Stabilizing Woody Vegetation
1. Bed	1. Vertical Stability (Riffle and Run Units)	1. <u>Aggradation</u> - Bar formation/growth sufficient to significantly deflect flow laterally (not to include point bars).			1	50	98%			
		2. <u>Degradation</u> - Evidence of downcutting			0	0	100%			
	2. Riffle Condition	1. <u>Texture/Substrate</u> - Riffle maintains coarser substrate.	17	17			100%			
		3. Meander Pool Condition	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%			
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run).	15	15			100%			
		2. Thalweg centering at downstream of meander bend (Glide).	15	15			100%			
	2. Bank	1. Scoured / Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion.			1	60			
2. Undercut		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
3. Mass Wasting		Bank slumping, calving, or collapse.			0	0	100%	N/A	N/A	N/A
Totals					1	60	99%	0	0	99%
3. Engineered Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs.	7	7			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill.	7	7			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	7	7			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does <u>NOT</u> exceed 15%.	7	7			100%			
	4. Habitat	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.

Table 6. Vegetation Condition Assessment UT Crab Creek Stream & Wetland / Project No. 857 Planted Acreage 15.4					
Vegetation Category	Definitions	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	N/A	0	0	0%
2. Low Stem Density Areas	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%
Totals			2	0	0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	N/A	0	0	0%
Cumulative Totals			2	0.00	0%
Easement Acreage 47.8					
Vegetation Category	Definitions	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Acreage
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	Cross Hatch (Red - Dense/Yellow - Present)	13	0.40	1%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	Stipple Orange Dots White Background & ATV Trail	4	0.60	1%

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 3 – Permanent Photo Station 8
Looking North



Wetland Area 3 – Permanent Photo Station 8
Looking Southwest



Wetland Area 3 – Permanent Photo Station 9
Looking North



Wetland Area 3 – 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 7 – Permanent Photo Station 14
Looking West



Wetland Area 7 – Permanent Photo Station 15
Looking Southwest



Wetland Area 8 – Permanent Photo Station 16
Looking South

Appendix C

Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment UT Crab Creek / Project No. 857		
Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	67%
2	Yes	
3	Yes	
4	No	
5	No	
6	No	
7	Yes	
8	Yes	
9	Yes	



Vegetation Monitoring Plot 1
Monitoring Year 1 – September 15, 2010



Vegetation Monitoring Plot 2
Monitoring Year 1 – September 15, 2010



Vegetation Monitoring Plot 3
Monitoring Year 1 – September 15, 2010



Vegetation Monitoring Plot 4
Monitoring Year 1 – September 15, 2010



Vegetation Monitoring Plot 5
Monitoring Year 1 – September 15, 2010



Vegetation Monitoring Plot 6
Monitoring Year 1 – September 15, 2010



Vegetation Monitoring Plot 7
Monitoring Year 1 – September 15, 2010



Vegetation Monitoring Plot 8
Monitoring Year 1 – September 15, 2010



Vegetation Monitoring Plot 9
Monitoring Year 1 – September 15, 2010

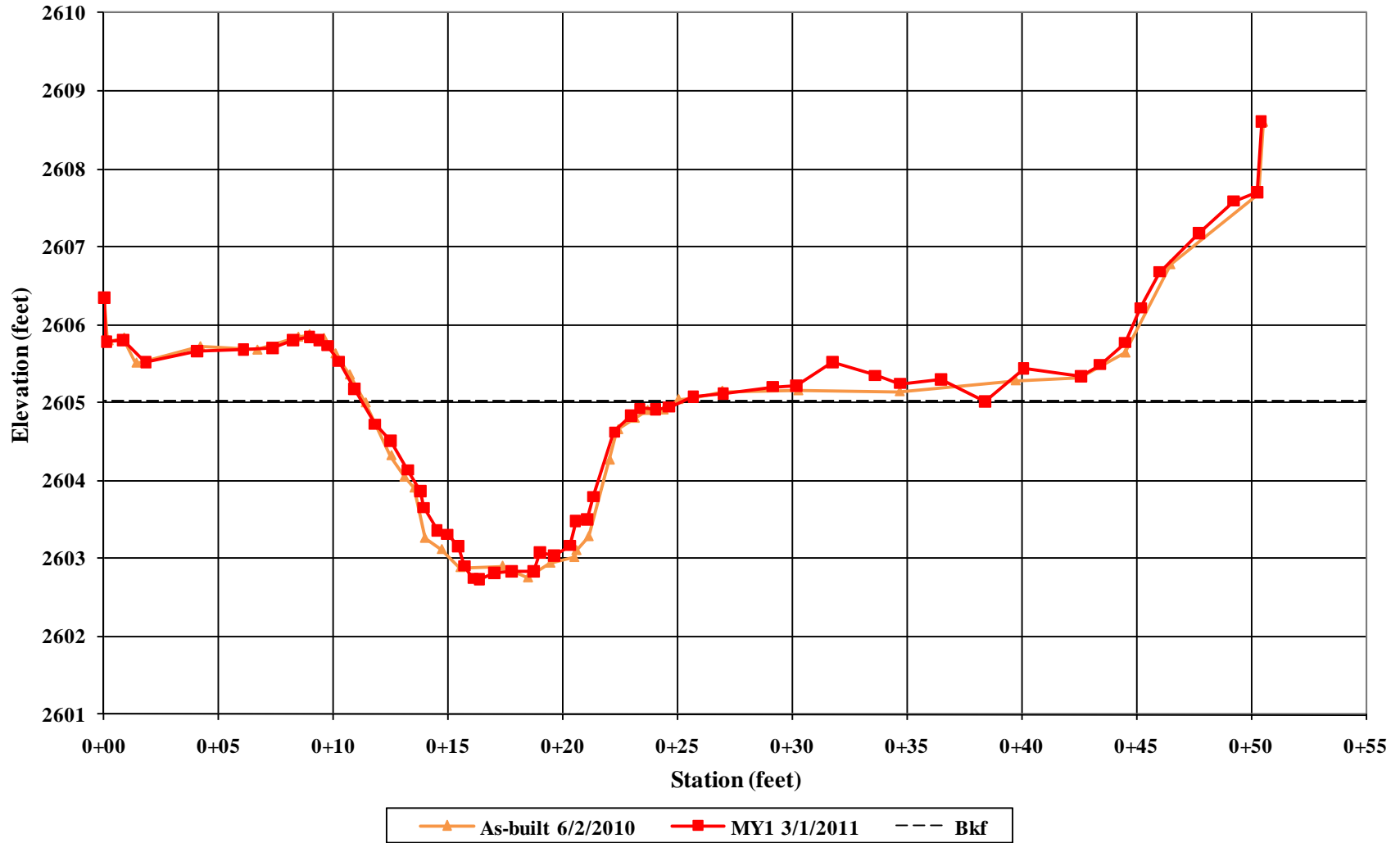
Table 8. CVS Vegetation Plot Metadata UT Crab Creek - 857	
Report Prepared By	Sarah Marcinko
Date Prepared	9/24/2010 14:48
Database Name	UT-Crab_2010.mdb
Database Location	ZAES\NRI&MEEP Monitoring\UT Crab Creek\UTC-MY1-2010\Data\Veg
Computer Name	D16TNK71
File Size	40484864
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj. Planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj. Total Stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	857
Project Name	UT-Crab Creek Stream & Wetland Restoration
Description	
River Basin	New
Length(ft)	
Stream-to-Edge Width (ft)	
Area (sq m)	
Required Plots (calculated)	
Sampled Plots	9

Table 9. Planted and Total Stem Counts (Species by Plot with Annual Means)																																			
UT Crab Creek Stream & Wetland / Project No. 857																																			
		Current Plot Data (MY1 2010)																				Annual Means													
Scientific Name	Common Name	Species Type	857-01-0001			857-01-0002			857-01-0003			857-01-0004			857-01-0005			857-01-0006			857-01-0007			857-01-0008			857-01-0009			MY1 (2010)		MY0 (2010)			
			P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T			
<i>Alnus serrulata</i>	Hazelalder	Shrub Tree	1	1		4	4		2	2		2	2		2	10		4	18		1	8		4	4		1	1		21	50		11	11	
<i>Aronia arbutifolia</i>	Red chokeberry	Shrub										1	1								7	7								8	8		6	6	
<i>Betula lenta</i> var. <i>lenta</i>	Sweet birch	Tree														1	1							4	4		4	4		9	9		15	15	
<i>Carpinus caroliniana</i> var. <i>virginiana</i>	American hophornbeam	Shrub Tree				3	3		6	6													1	1		5	5		15	15		25	25		
<i>Cornus amomum</i>	Silky dogwood	Shrub																					1							1					
<i>Ilex verticillata</i>	Common winterberry	Shrub Tree				9	9					1	1		1	1		1	1										12	12		7	7		
<i>Lindera benzoin</i> var. <i>benzoin</i>	Northern spicebush	Shrub Tree							3	3								1	1					2	2		5	5		11	11		23	23	
<i>Robinia pseudoacacia</i>	Black locust	Tree																			1									1					
<i>Sambucus canadensis</i>	Common elderberry	Shrub Tree																						2						2					
Unknown	Unknown	Unknown																														5	5		
<i>Viburnum nudum</i>	Poosumhaw	Shrub Tree	7	7		1	1																						8	8		8	8		
Stem count			0	8	8	0	17	17	0	11	11	0	4	4	0	3	11	0	7	21	0	8	16	0	11	14	0	15	15	0	84	117	0	100	100
size (ares)			1			1			1			1			1			1			1			1			9		9						
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.22		0.22						
Species count			0	2	2	0	4	4	0	3	3	0	3	3	0	2	2	0	4	4	0	2	3	0	4	6	0	4	4	0	7	10	0	8	8
Stems per ACRE			0	323.75	323.75	0	687.97	687.97	0	445.15	445.15	0	161.87	161.87	0	121.41	445.15	0	283.28	849.84	0	323.75	647.5	0	445.15	566.56	0	607.03	607.03	0	377.71	526.09	0	449.65	449.65

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 1 – March 1, 2011



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

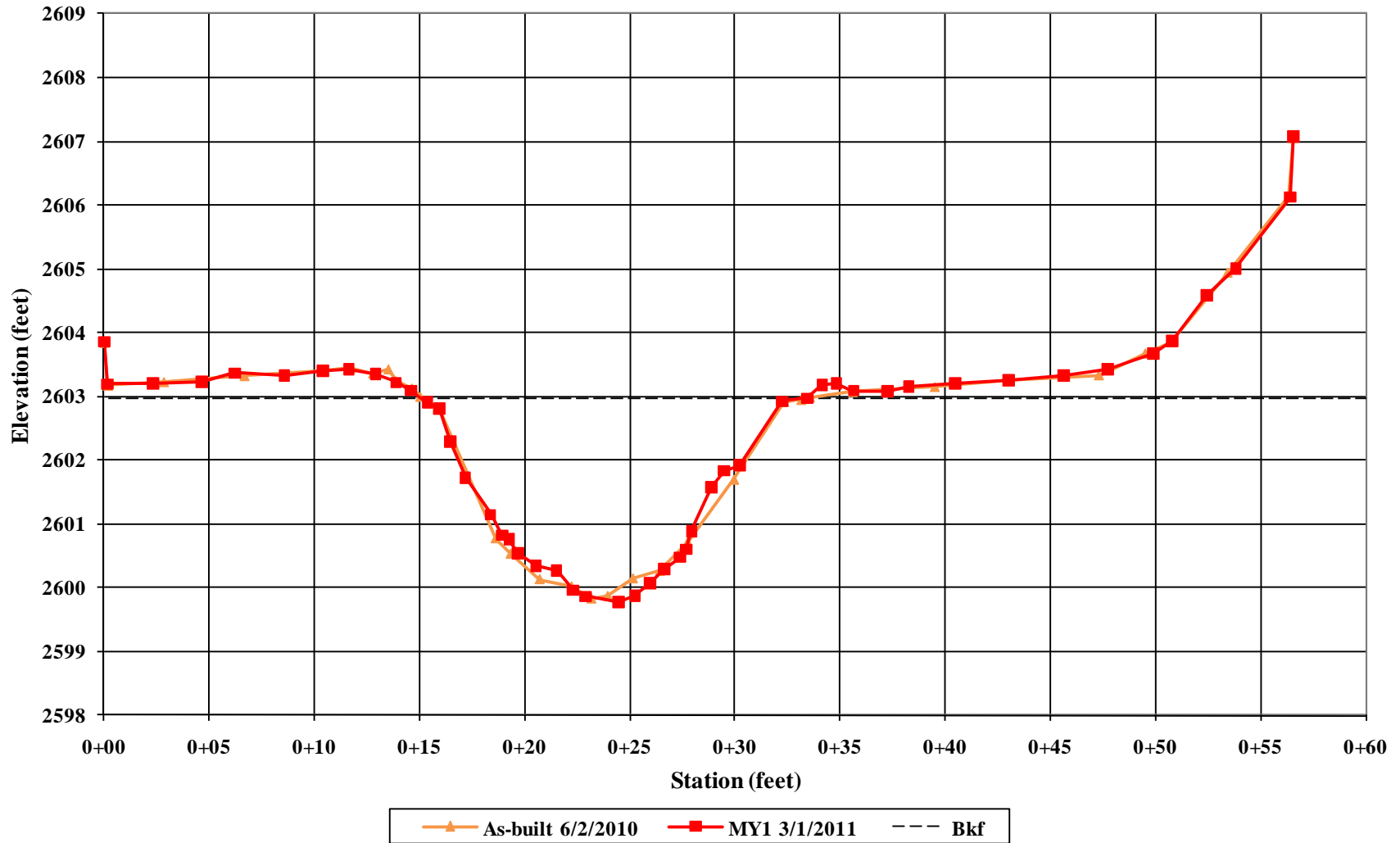


Cross-Section 1 – Riffle
(Looking Downstream)
Monitoring Year 1 – March 1, 2011



Cross-Section 1 – Riffle
(Looking Upstream)
Monitoring Year 1 – March 1, 2011

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





Cross-Section 2 – Pool
(Looking at Left Bank Descending)
Monitoring Year 1 – March 1, 2011



Cross-Section 2 – Pool
(Looking at Right Bank Descending)
Monitoring Year 1 – March 1, 2011

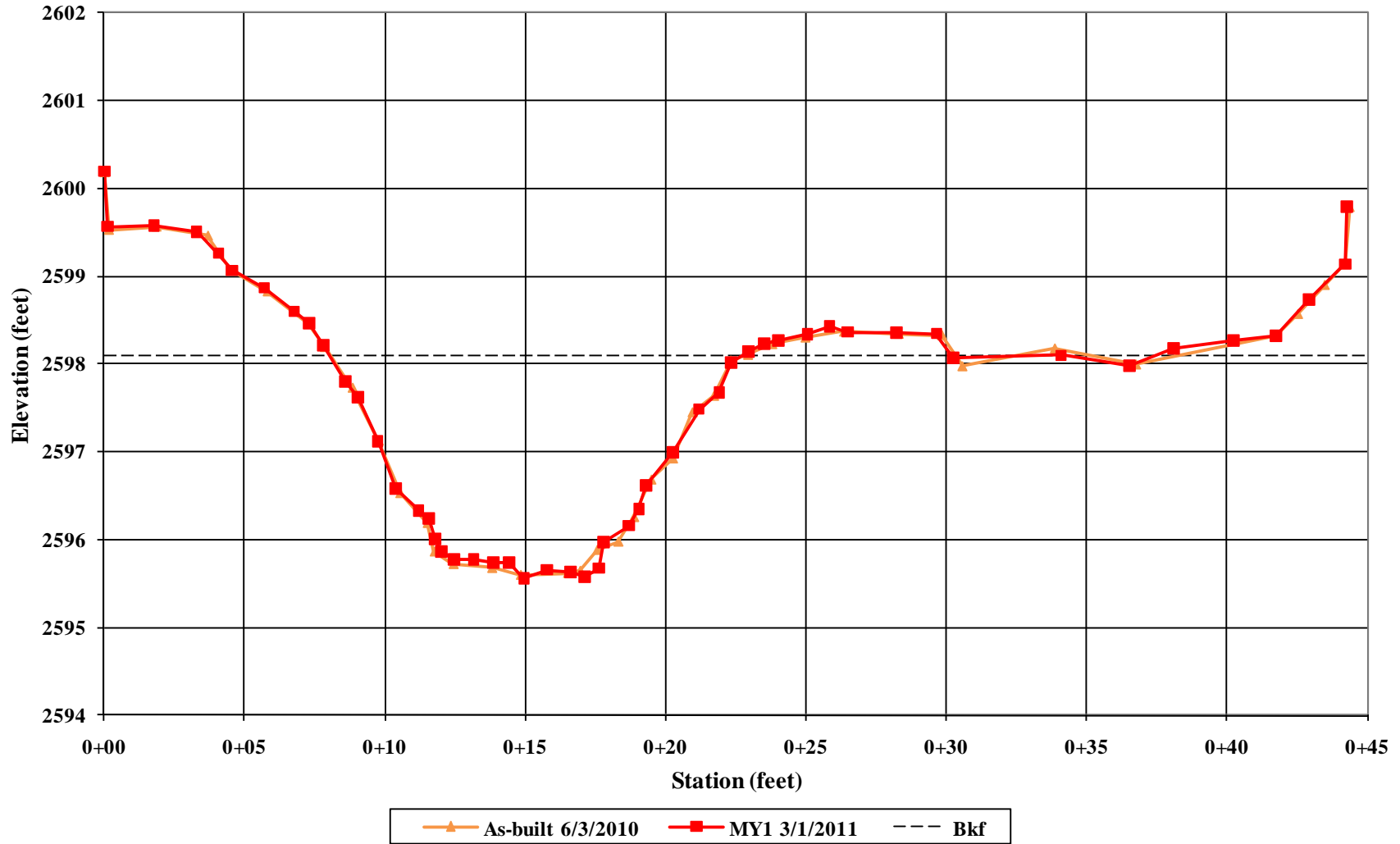


Cross-Section 2 – Pool
(Looking Downstream)
Monitoring Year 1 – March 1, 2011



Cross-Section 2 – Pool
(Looking Upstream)
Monitoring Year 1 – March 1, 2011

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





Cross-Section 3 – Riffle
(Looking at Left Bank Descending)
Monitoring Year 1 – March 1, 2011



Cross-Section 3 – Riffle
(Looking at Right Bank Descending)
Monitoring Year 1 – March 1, 2011

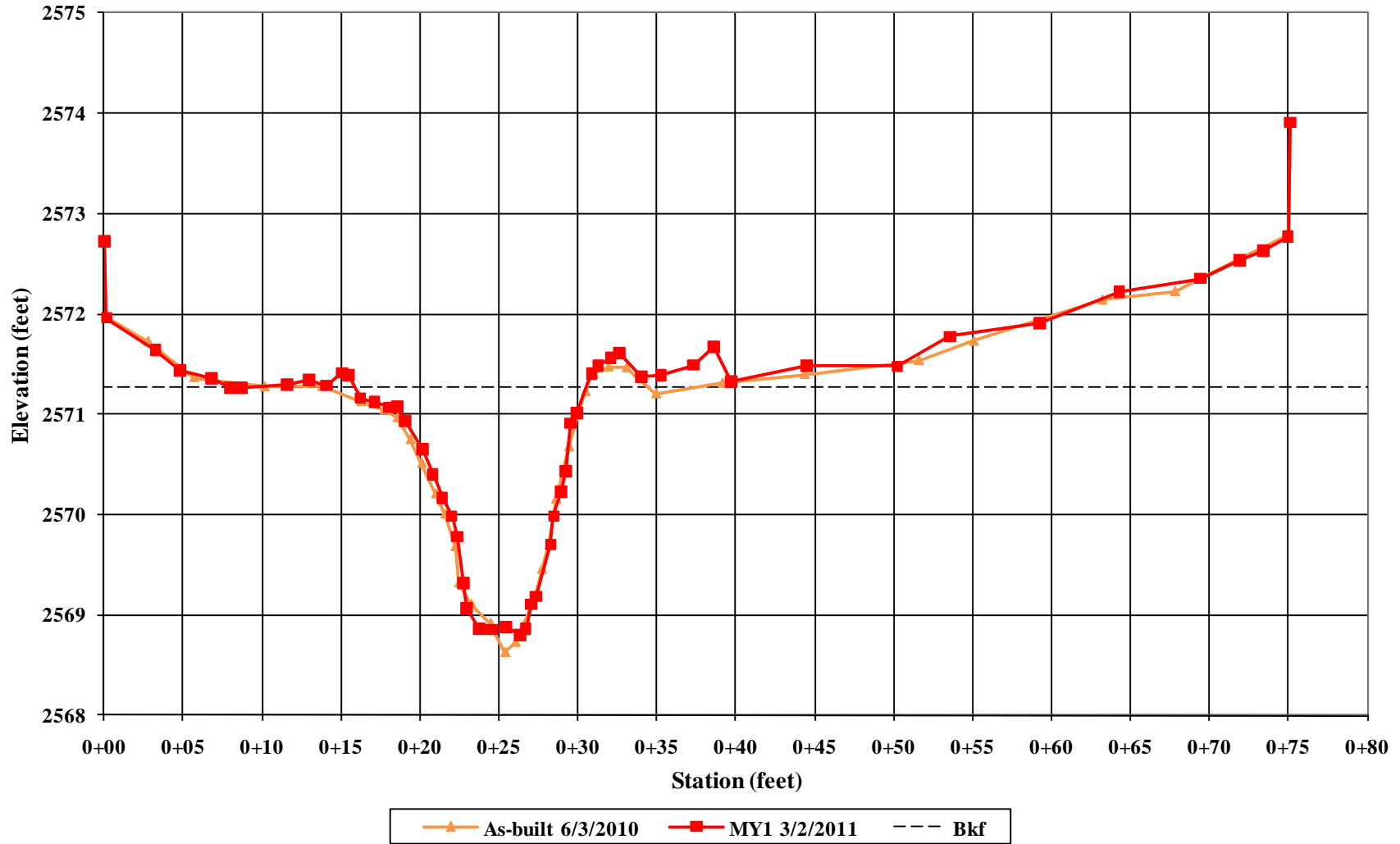


Cross-Section 3 – Riffle
(Looking Downstream)
Monitoring Year 1 – March 1, 2011



Cross-Section 3 – Riffle
(Looking Upstream)
Monitoring Year 1 – March 1, 2011

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





Cross-Section 4 – Pool
(Looking at Left Bank Descending)
Monitoring Year 1 – March 1, 2011



Cross-Section 4 – Pool
(Looking at Right Bank Descending)
Monitoring Year 1 – March 1, 2011

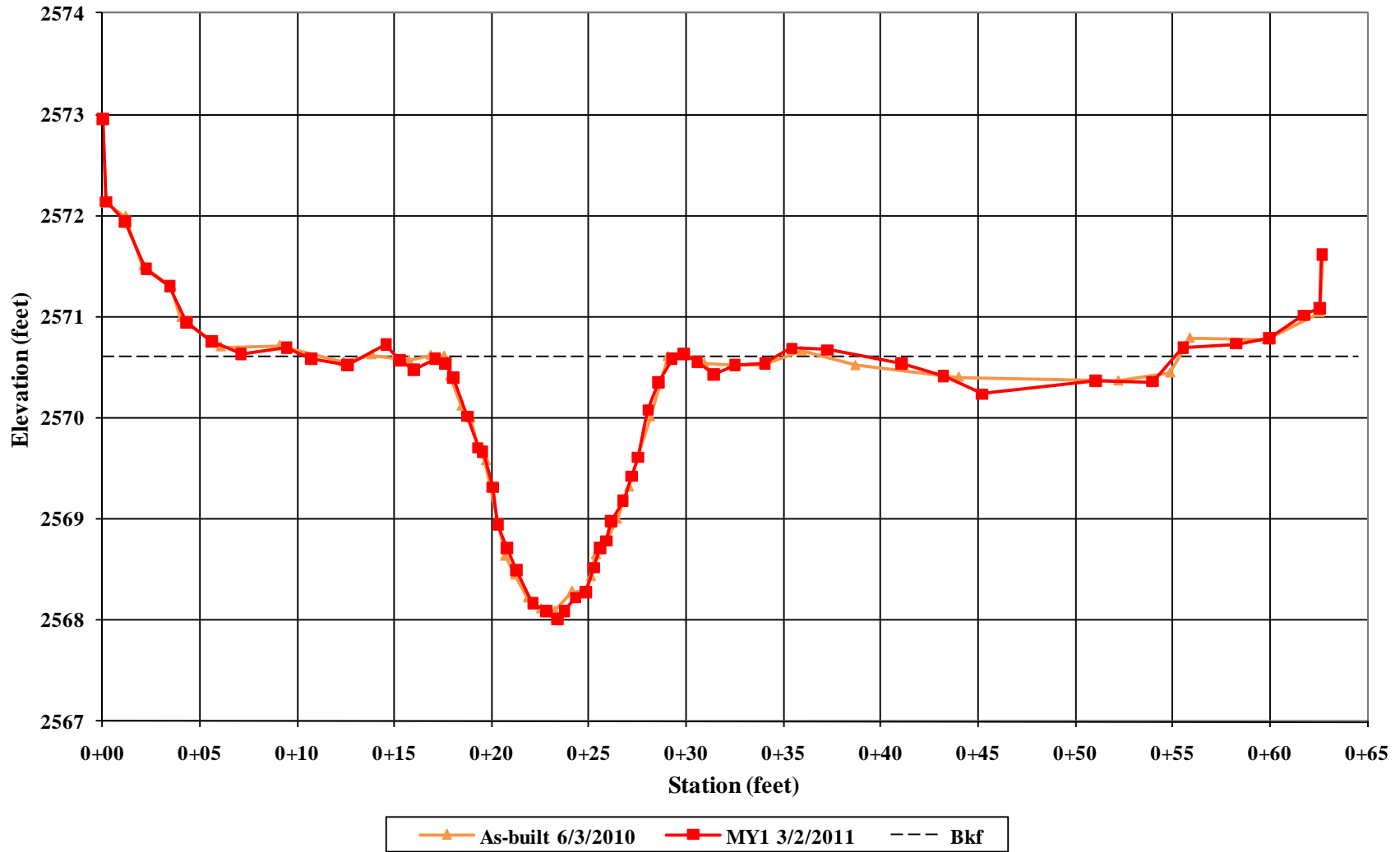


Cross-Section 4 – Pool
(Looking Downstream)
Monitoring Year 1 – March 1, 2011



Cross-Section 4 – Pool
(Looking Upstream)
Monitoring Year 1 – March 1, 2011

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





Cross-Section 5 – Riffle
(Looking at Left Bank Descending)
Monitoring Year 1 – March 2, 2011



Cross-Section 5 – Riffle
(Looking at Right Bank Descending)
Monitoring Year 1 – March 2, 2011

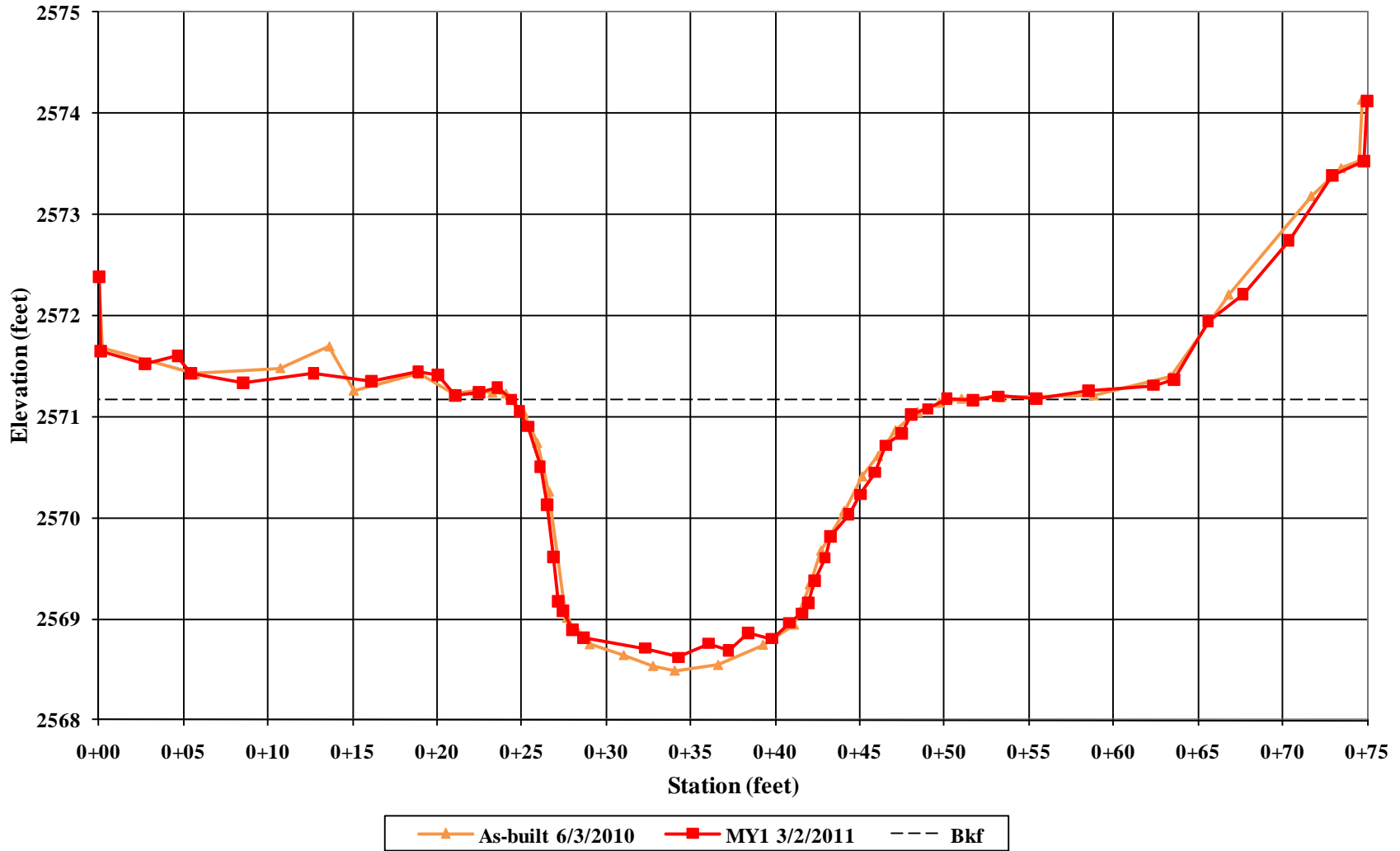


Cross-Section 5 – Riffle
(Looking Downstream)
Monitoring Year 1 – March 2, 2011



Cross-Section 5 – Riffle
(Looking Upstream)
Monitoring Year 1 – March 2, 2011

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





Cross-Section 6 – Riffle
(Looking at Left Bank Descending)
Monitoring Year 1 – March 2, 2011



Cross-Section 6 – Riffle
(Looking at Right Bank Descending)
Monitoring Year 1 – March 2, 2011

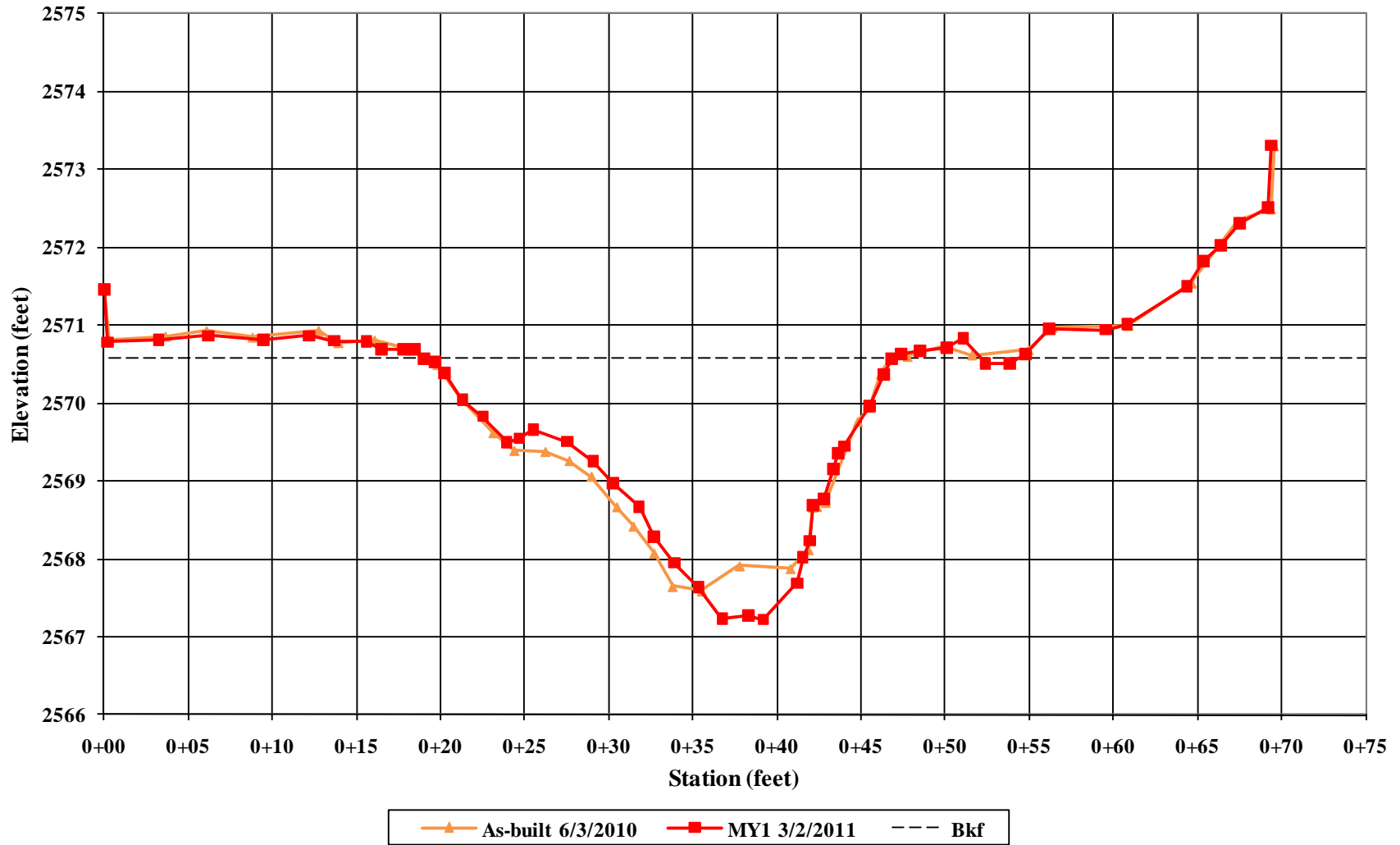


Cross-Section 6 – Riffle
(Looking Downstream)
Monitoring Year 1 – March 2, 2011



Cross-Section 6 – Riffle
(Looking Upstream)
Monitoring Year 1 – March 2, 2011

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





Cross-Section 7 – Pool
(Looking at Left Bank Descending)
Monitoring Year 1 – March 2, 2011



Cross-Section 7 – Pool
(Looking at Right Bank Descending)
Monitoring Year 1 – March 2, 2011

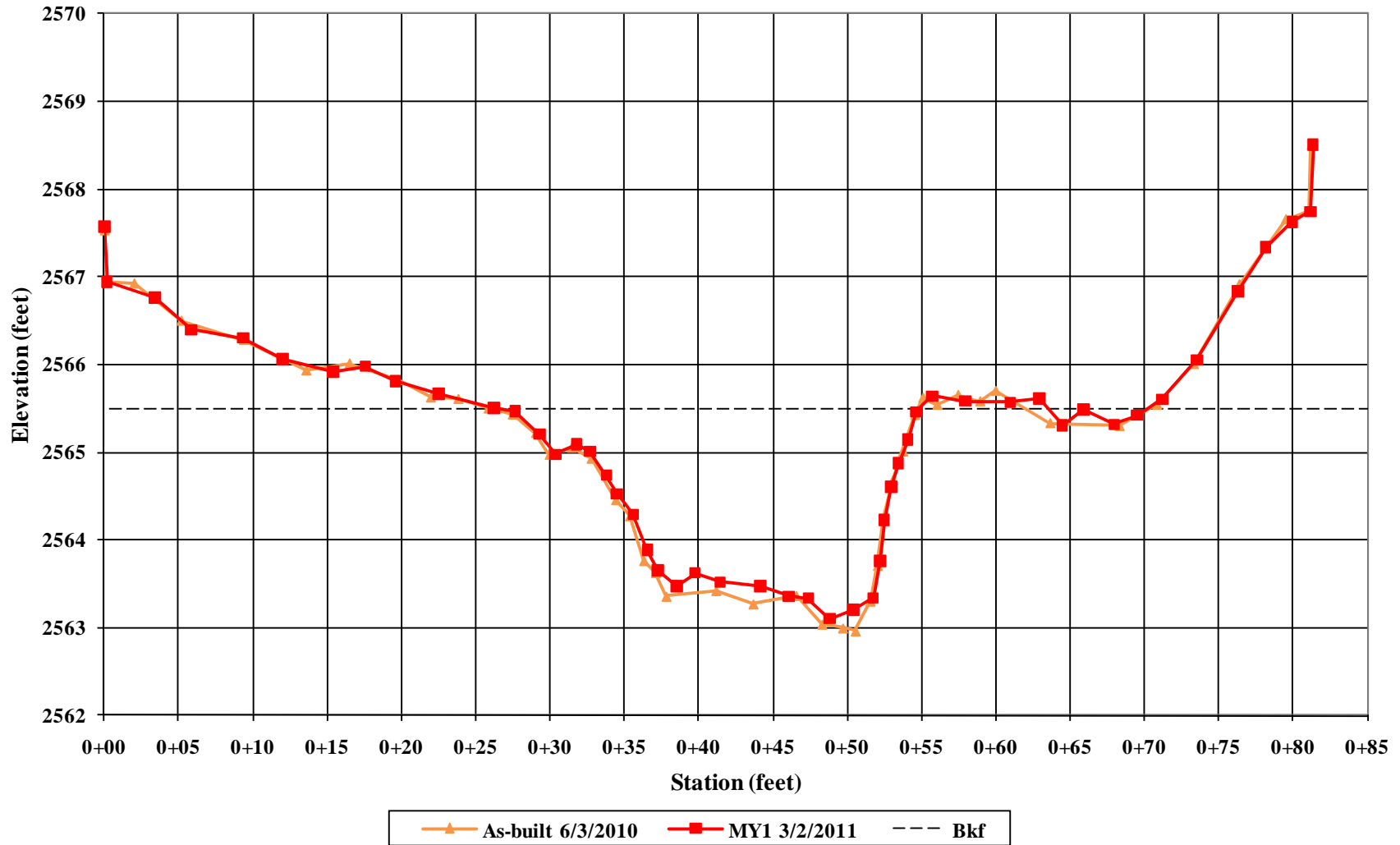


Cross-Section 7 – Pool
(Looking Downstream)
Monitoring Year 1 – March 2, 2011



Cross-Section 7 – Pool
(Looking Upstream)
Monitoring Year 1 – March 2, 2011

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





Cross-Section 8 – Riffle
(Looking at Left Bank Descending)
Monitoring Year 1 – March 2, 2011



Cross-Section 8 – Riffle
(Looking at Right Bank Descending)
Monitoring Year 1 – March 2, 2011

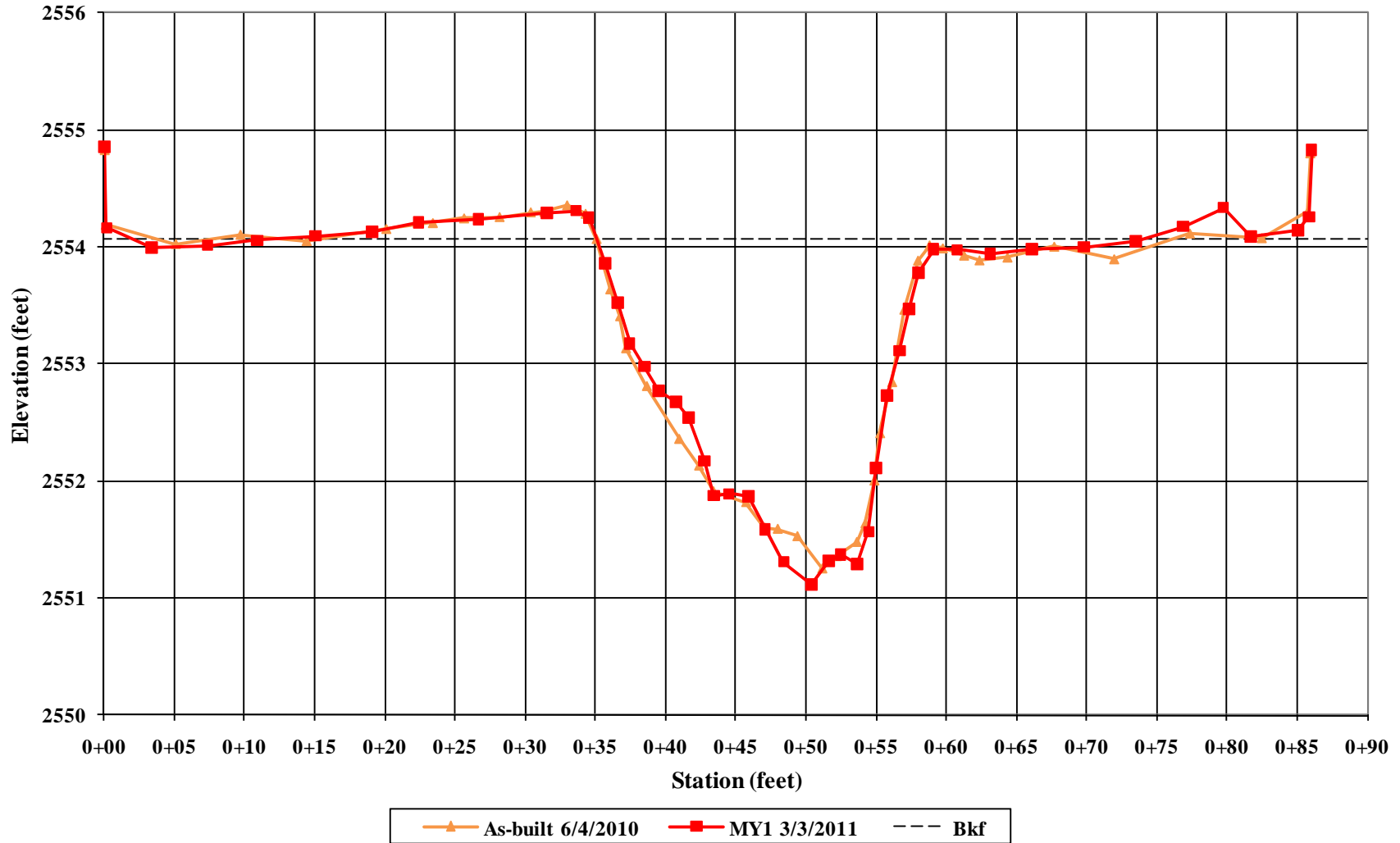


Cross-Section 8 – Riffle
(Looking Downstream)
Monitoring Year 1 – March 2, 2011



Cross-Section 8 – Riffle
(Looking Upstream)
Monitoring Year 1 – March 2, 2011

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





Cross-Section 9 – Pool
(Looking at Left Bank Descending)
Monitoring Year 1 – March 3, 2011



Cross-Section 9 – Pool
(Looking at Right Bank Descending)
Monitoring Year 1 – March 3, 2011

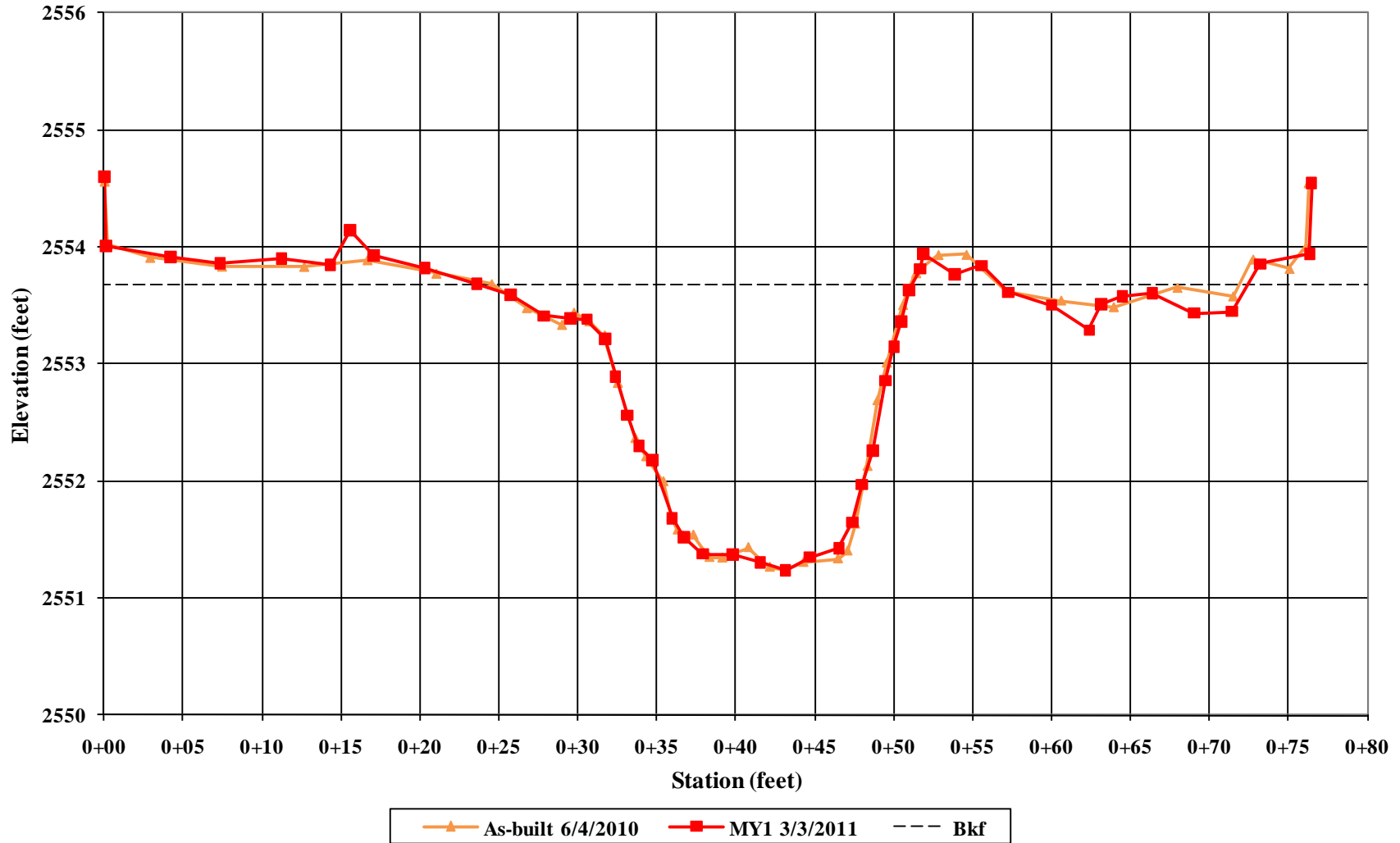


Cross-Section 9 – Pool
(Looking Downstream)
Monitoring Year 1 – March 3, 2011



Cross-Section 9 – Pool
(Looking Upstream)
Monitoring Year 1 – March 3, 2011

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





Cross-Section 10 – Riffle
(Looking at Left Bank Descending)
Monitoring Year 1 – March 3, 2011



Cross-Section 10 – Riffle
(Looking at Right Bank Descending)
Monitoring Year 1 – March 3, 2011

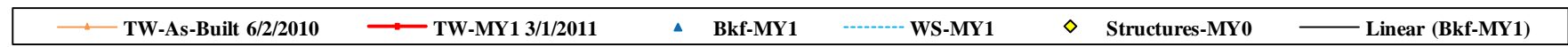
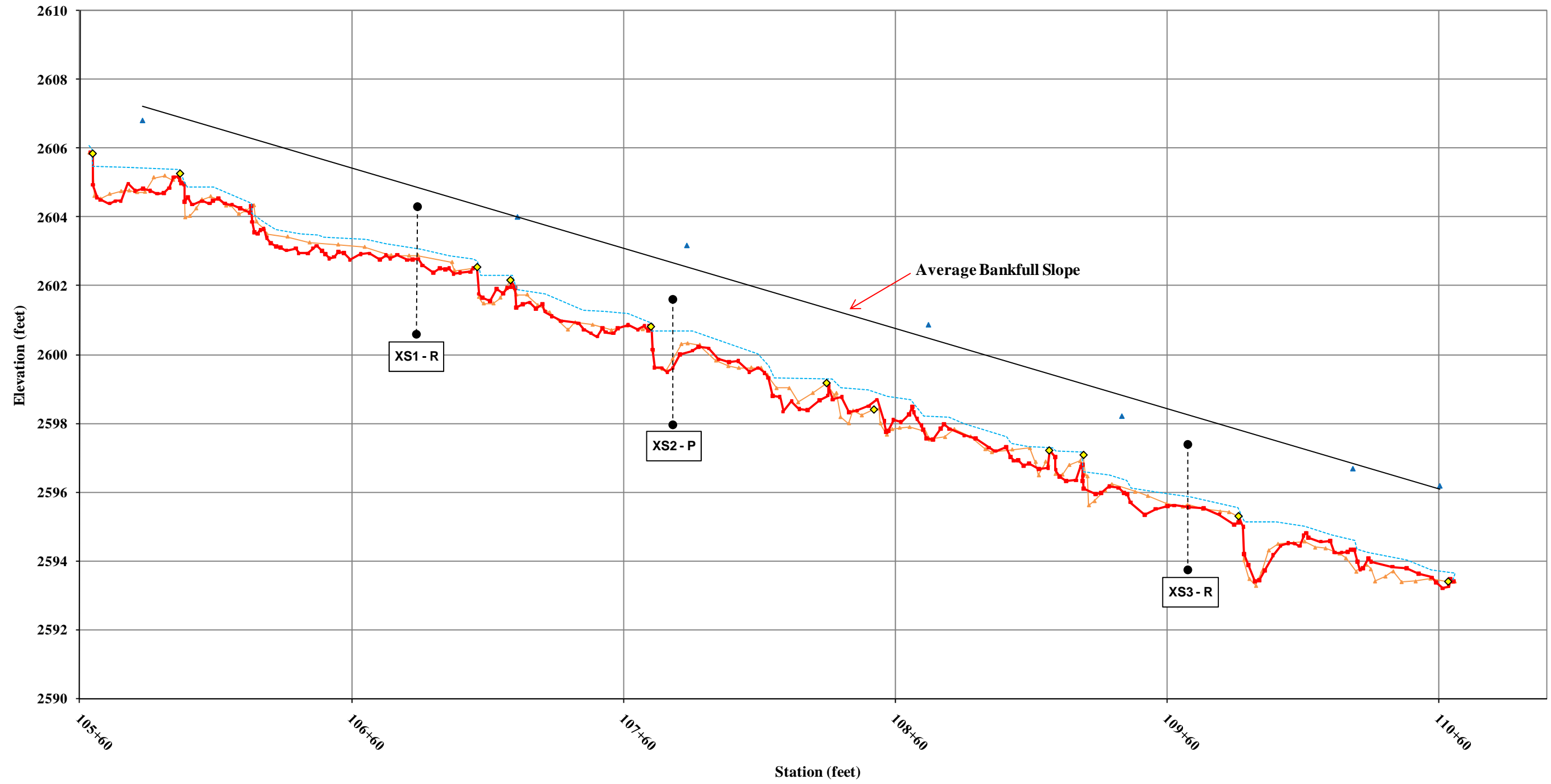


Cross-Section 10 – Riffle
(Looking Downstream)
Monitoring Year 1 – March 3, 2011

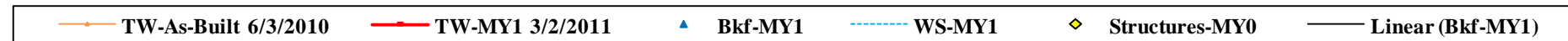
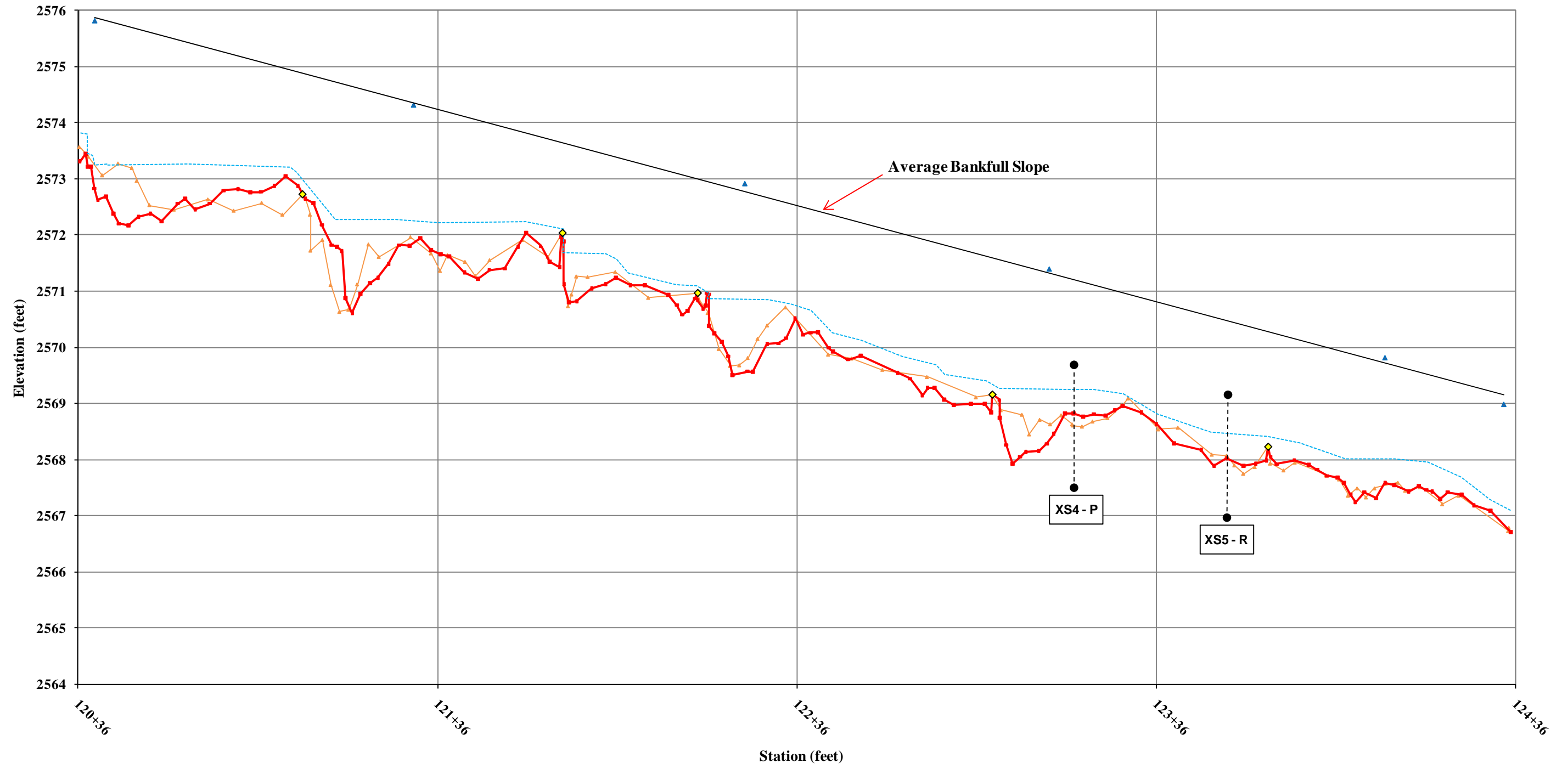


Cross-Section 10 – Riffle
(Looking Upstream)
Monitoring Year 1 – March 3, 2011

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



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

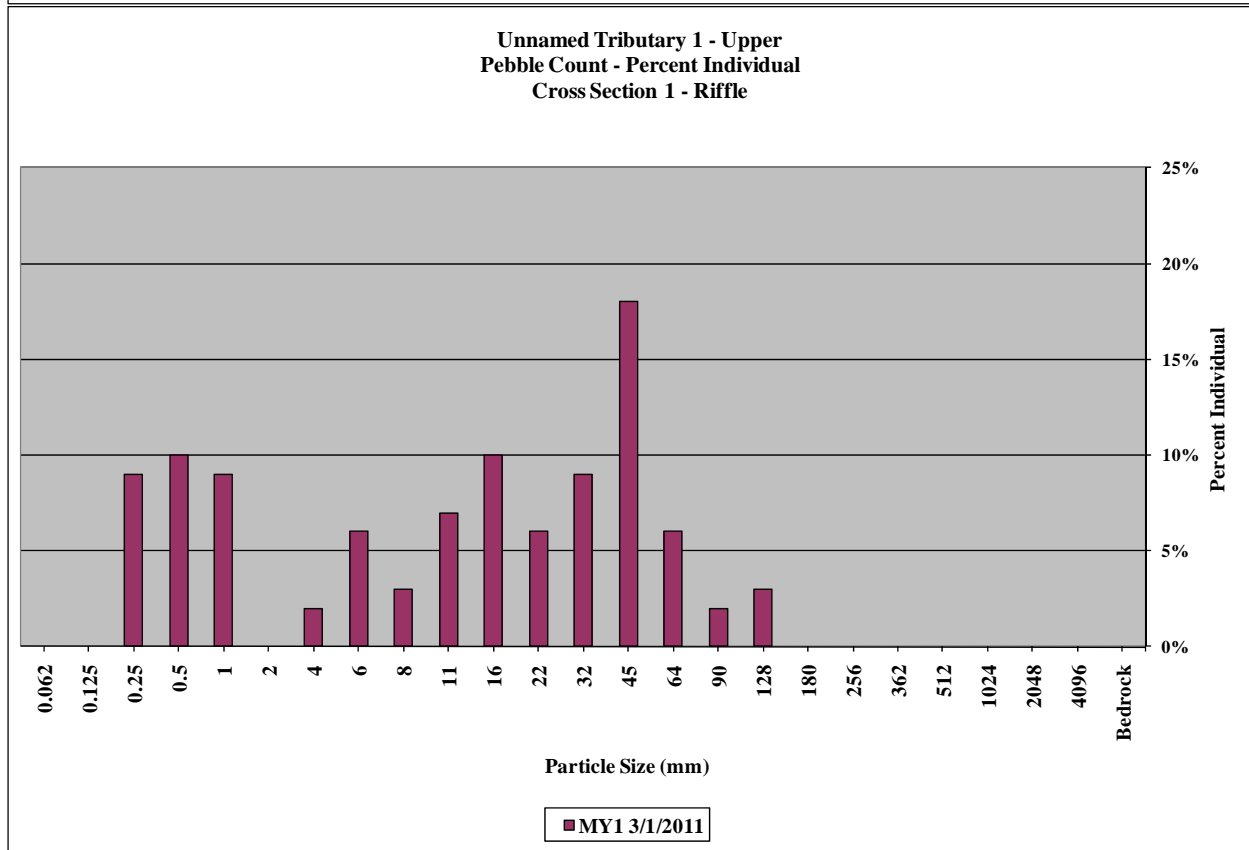
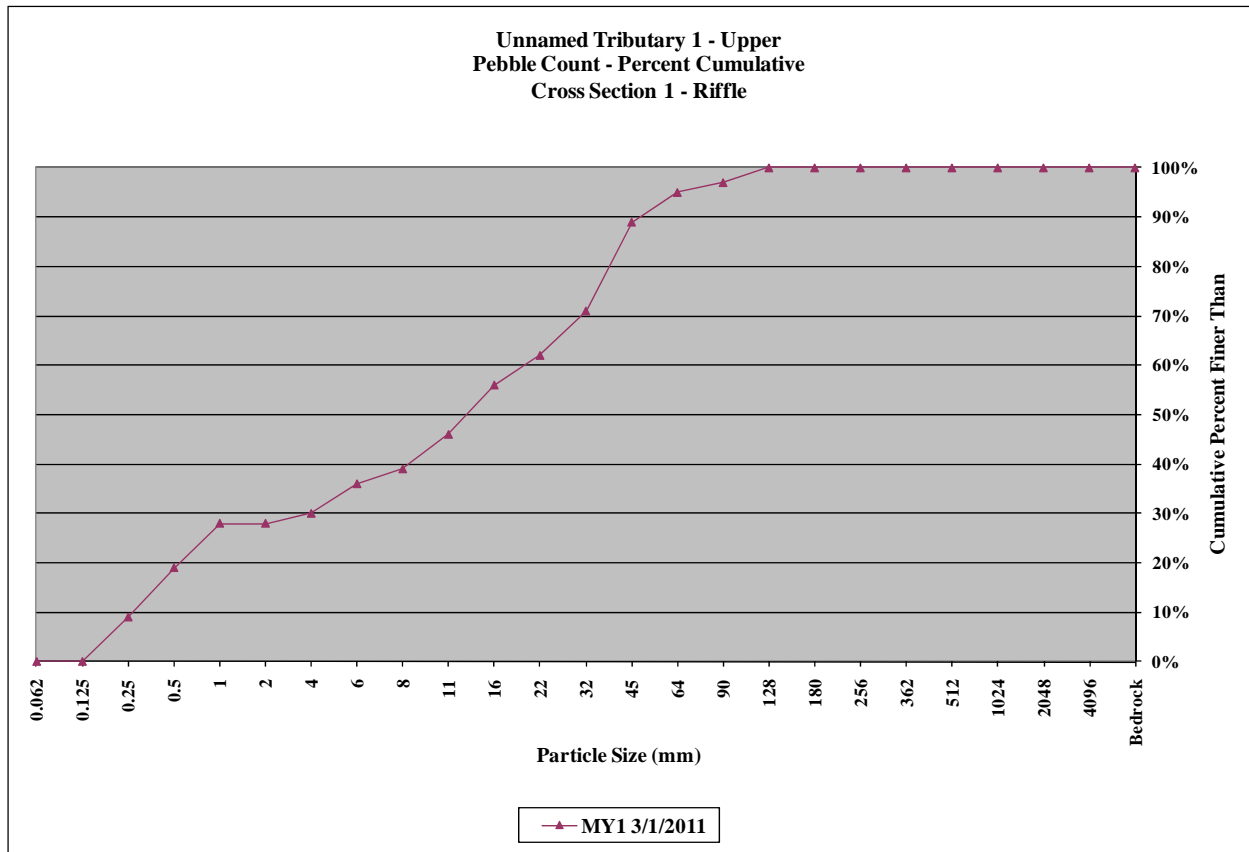


**UT to Crab - Upstream
Longitudinal Profile
Stationing 10+02 - 34+57**



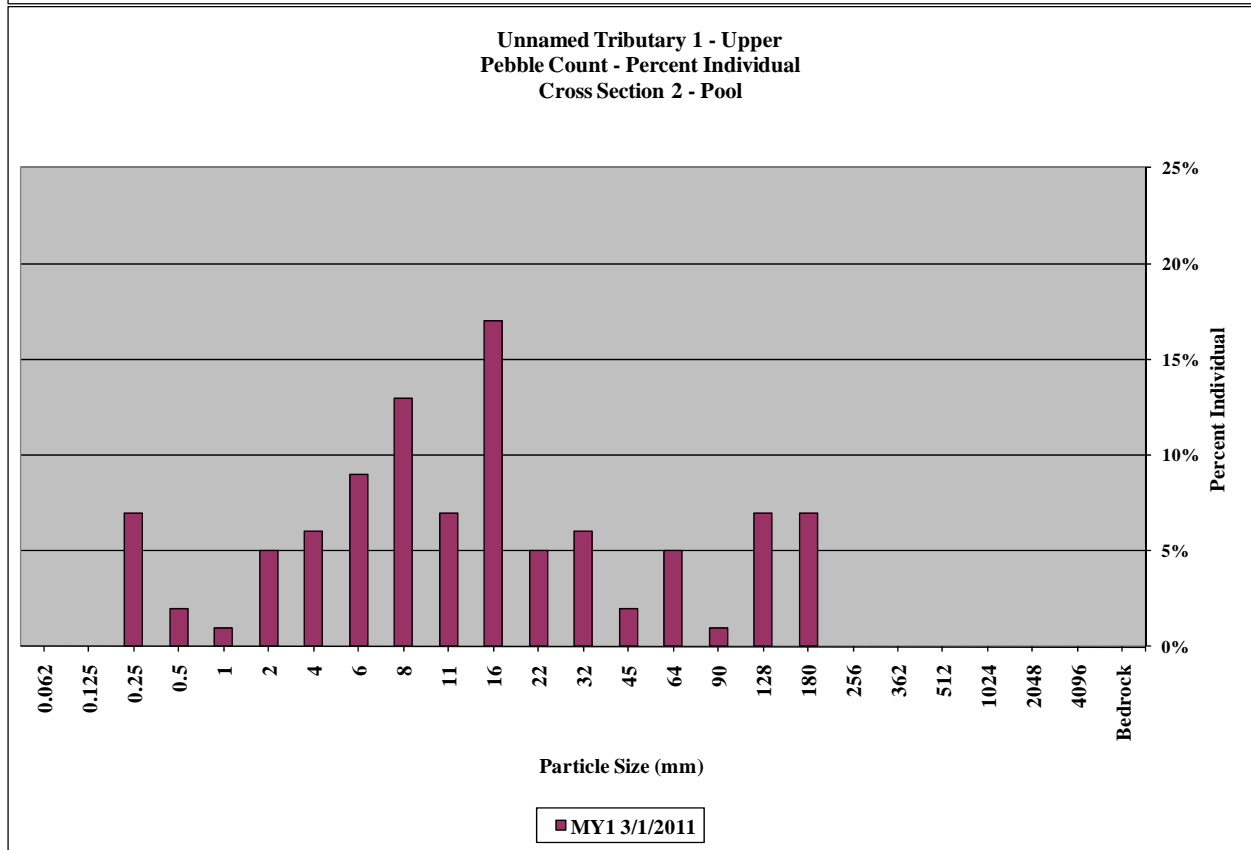
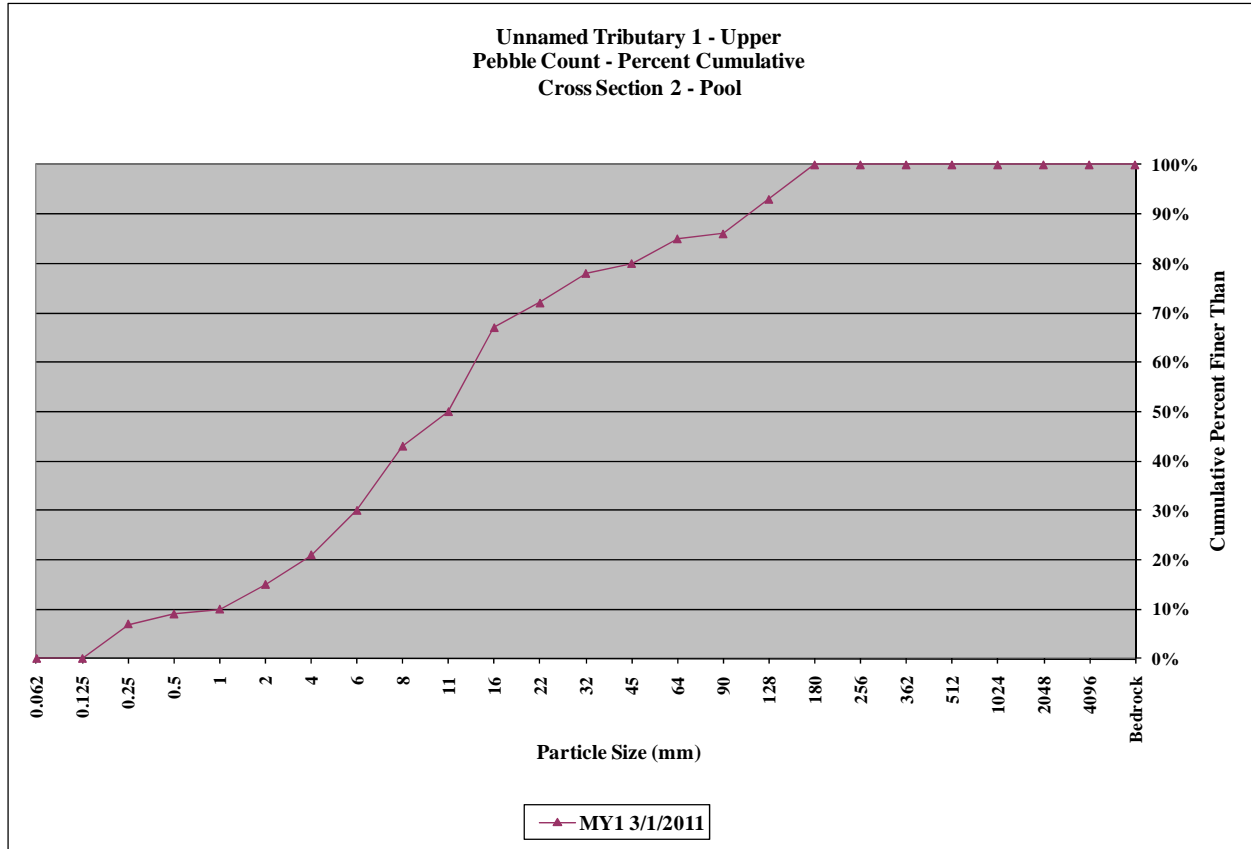
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Upper - Cross-Section 1 - Riffle					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	0	0%	0%
	fine sand	0.25	9	9%	9%
	medium sand	0.50	10	10%	19%
	coarse sand	1.00	9	9%	28%
	very coarse sand	2.00	0	0%	28%
Gravel	very fine gravel	4.0	2	2%	30%
	fine gravel	5.7	6	6%	36%
	fine gravel	8.0	3	3%	39%
	medium gravel	11.3	7	7%	46%
	medium gravel	16.0	10	10%	56%
	coarse gravel	22.3	6	6%	62%
	coarse gravel	32	9	9%	71%
	very coarse gravel	45	18	18%	89%
	very coarse gravel	64	6	6%	95%
Cobble	small cobble	90	2	2%	97%
	medium cobble	128	3	3%	100%
	large cobble	180	0	0%	100%
	very large cobble	256	0	0%	100%
Boulder	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	13
D84	41
D95	64



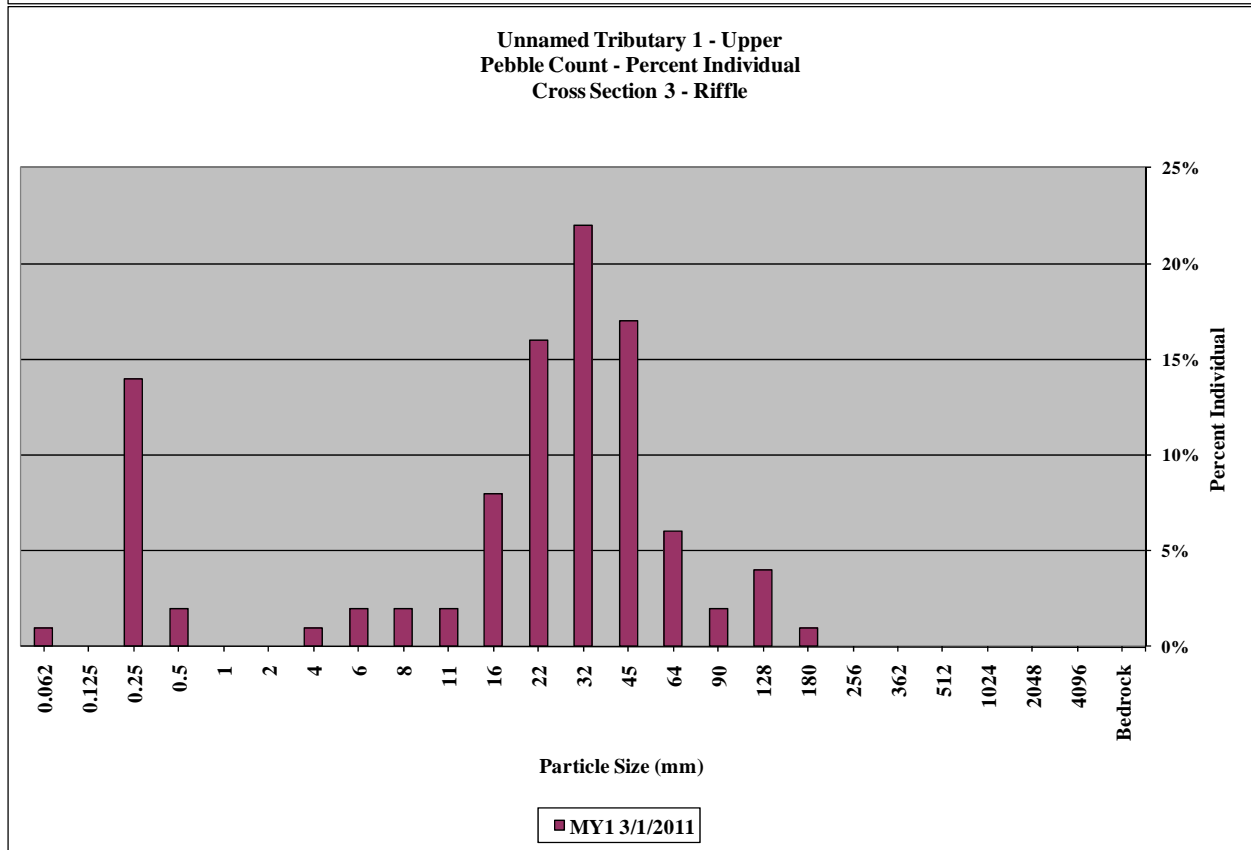
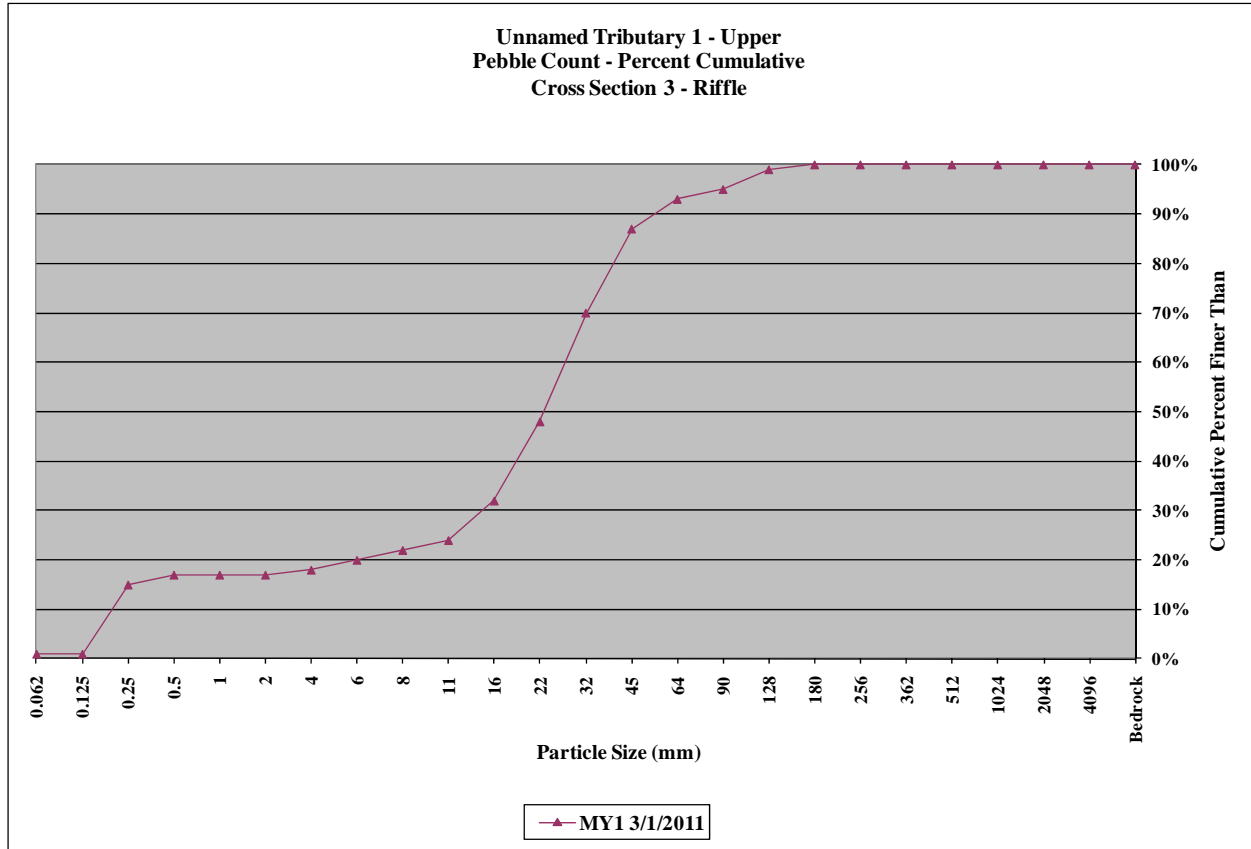
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Upper - Cross-Section 2 - Pool					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	0	0%	0%
	fine sand	0.25	7	7%	7%
	medium sand	0.50	2	2%	9%
	coarse sand	1.00	1	1%	10%
	very coarse sand	2.00	5	5%	15%
Gravel	very fine gravel	4.0	6	6%	21%
	fine gravel	5.7	9	9%	30%
	fine gravel	8.0	13	13%	43%
	medium gravel	11.3	7	7%	50%
	medium gravel	16.0	17	17%	67%
	coarse gravel	22.3	5	5%	72%
	coarse gravel	32	6	6%	78%
	very coarse gravel	45	2	2%	80%
	very coarse gravel	64	5	5%	85%
Cobble	small cobble	90	1	1%	86%
	medium cobble	128	7	7%	93%
	large cobble	180	7	7%	100%
	very large cobble	256	0	0%	100%
Boulder	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	11
D84	60
D95	140



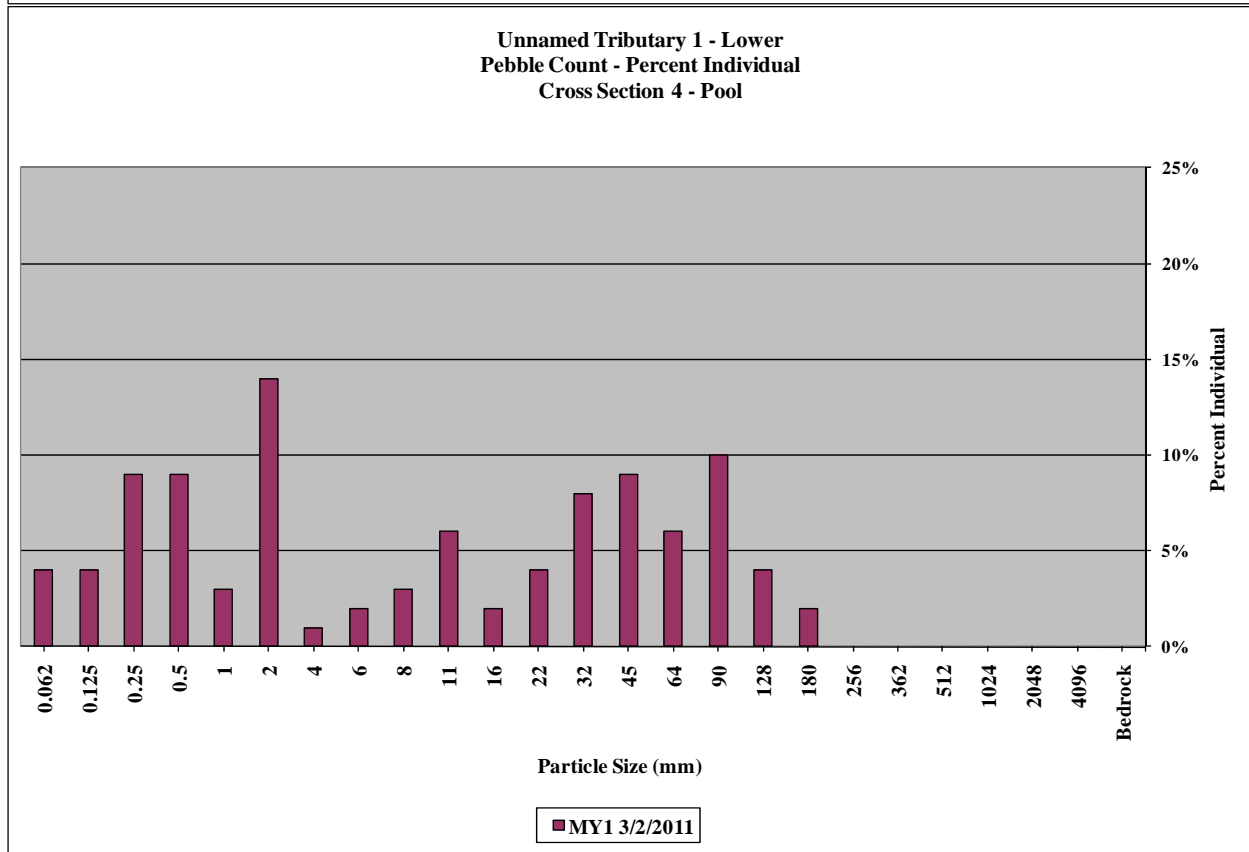
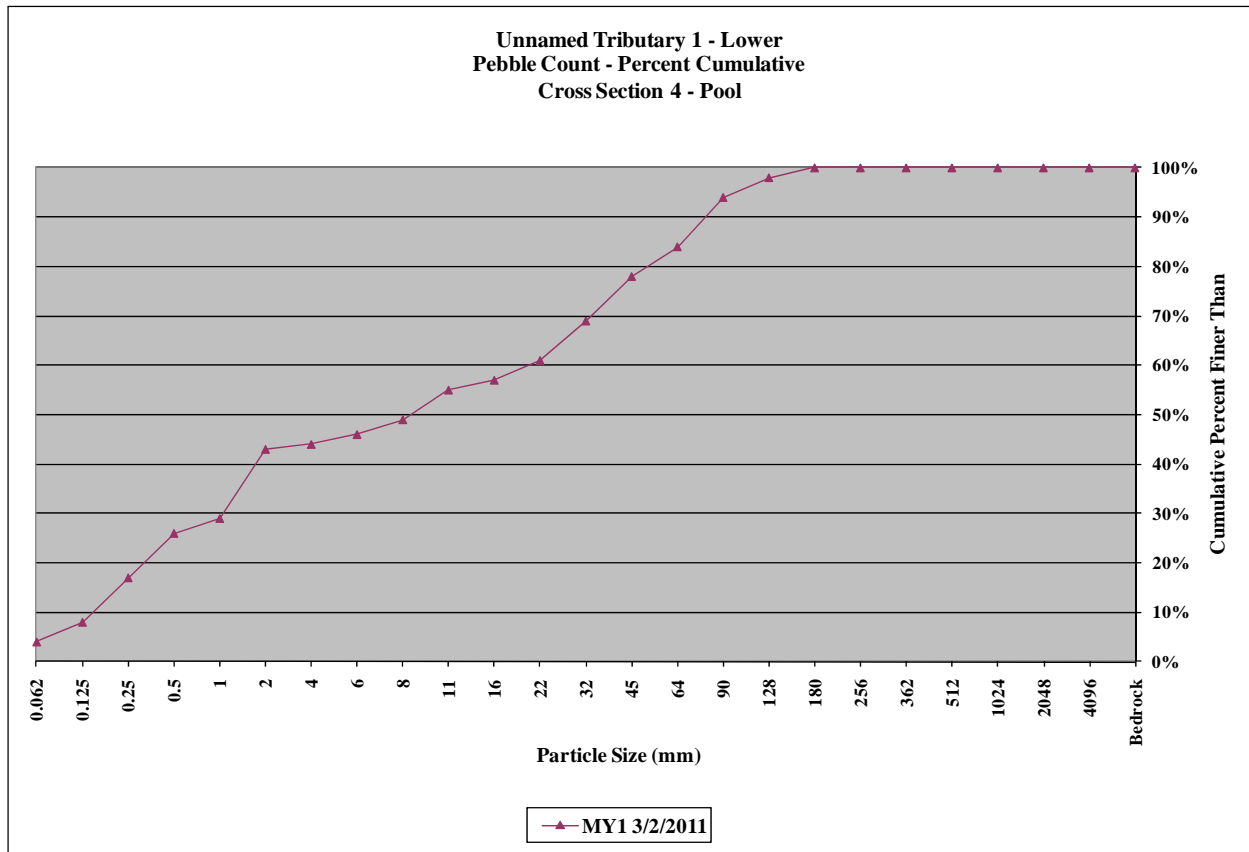
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Upper - Cross-Section 3 - Riffle					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	1	1%	1%
Sand	very fine sand	0.125	0	0%	1%
	fine sand	0.25	14	14%	15%
	medium sand	0.50	2	2%	17%
	coarse sand	1.00	0	0%	17%
	very coarse sand	2.00	0	0%	17%
Gravel	very fine gravel	4.0	1	1%	18%
	fine gravel	5.7	2	2%	20%
	fine gravel	8.0	2	2%	22%
	medium gravel	11.3	2	2%	24%
	medium gravel	16.0	8	8%	32%
	coarse gravel	22.3	16	16%	48%
	coarse gravel	32	22	22%	70%
	very coarse gravel	45	17	17%	87%
	very coarse gravel	64	6	6%	93%
Cobble	small cobble	90	2	2%	95%
	medium cobble	128	4	4%	99%
	large cobble	180	1	1%	100%
	very large cobble	256	0	0%	100%
Boulder	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	23
D84	42
D95	90



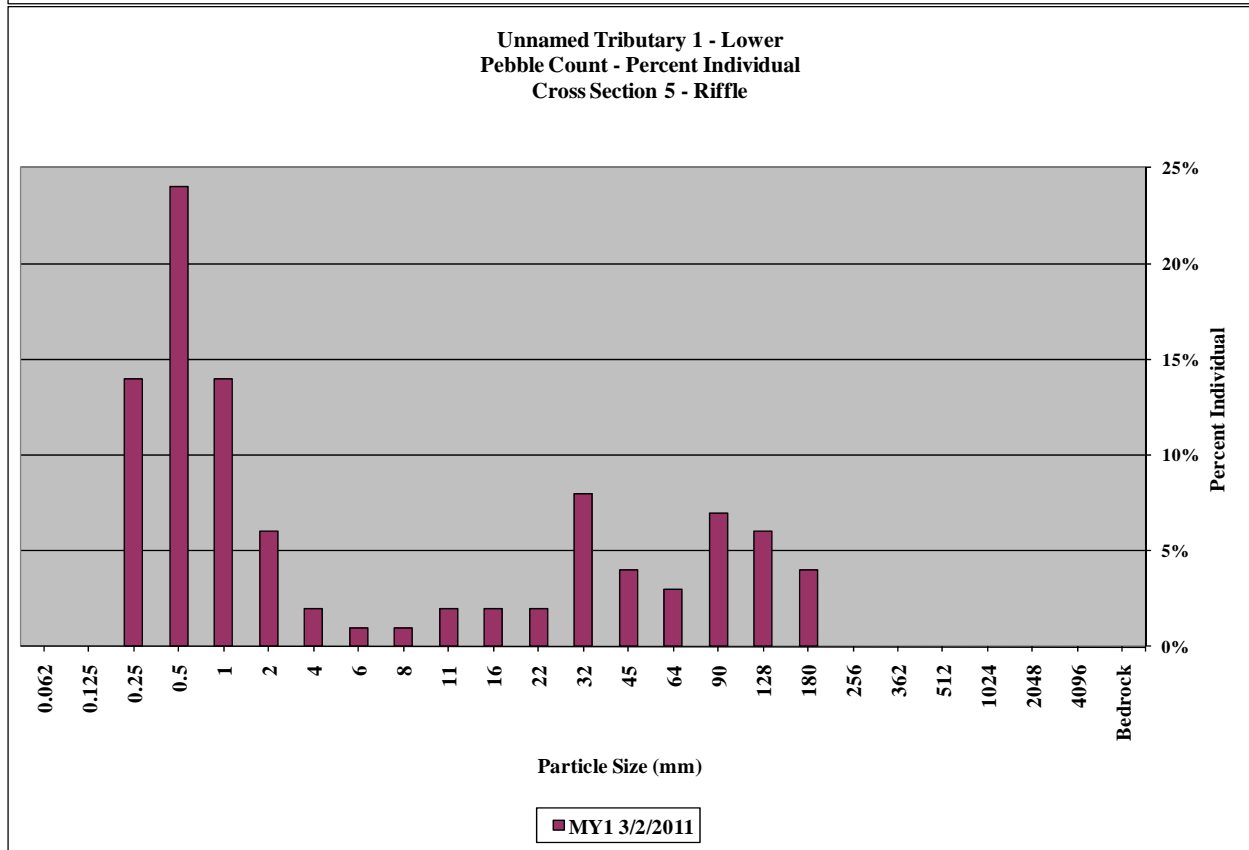
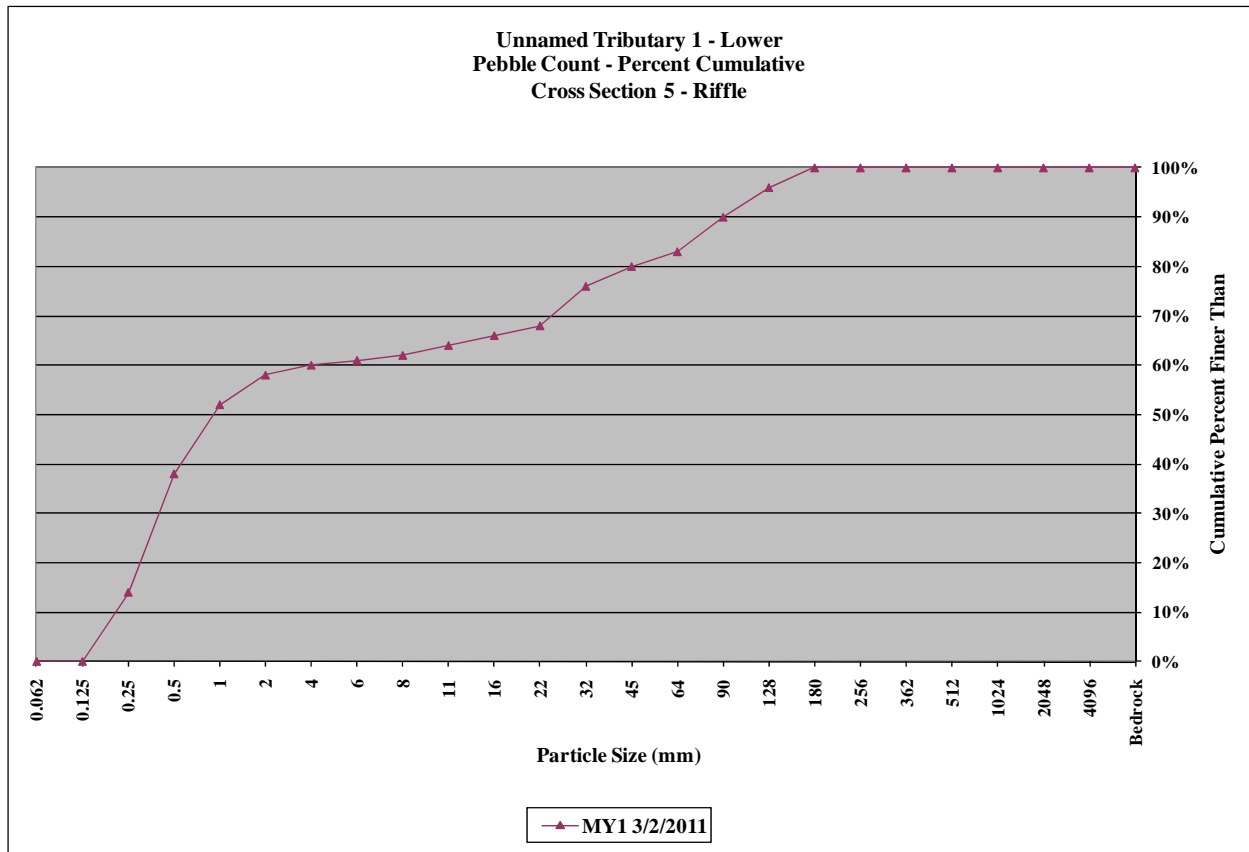
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Lower - Cross-Section 4 - Pool					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	4	4%	4%
Sand	very fine sand	0.125	4	4%	8%
	fine sand	0.25	9	9%	17%
	medium sand	0.50	9	9%	26%
	coarse sand	1.00	3	3%	29%
	very coarse sand	2.00	14	14%	43%
Gravel	very fine gravel	4.0	1	1%	44%
	fine gravel	5.7	2	2%	46%
	fine gravel	8.0	3	3%	49%
	medium gravel	11.3	6	6%	55%
	medium gravel	16.0	2	2%	57%
	coarse gravel	22.3	4	4%	61%
	coarse gravel	32	8	8%	69%
	very coarse gravel	45	9	9%	78%
	very coarse gravel	64	6	6%	84%
Cobble	small cobble	90	10	10%	94%
	medium cobble	128	4	4%	98%
	large cobble	180	2	2%	100%
	very large cobble	256	0	0%	100%
Boulder	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	8.4
D84	64
D95	98



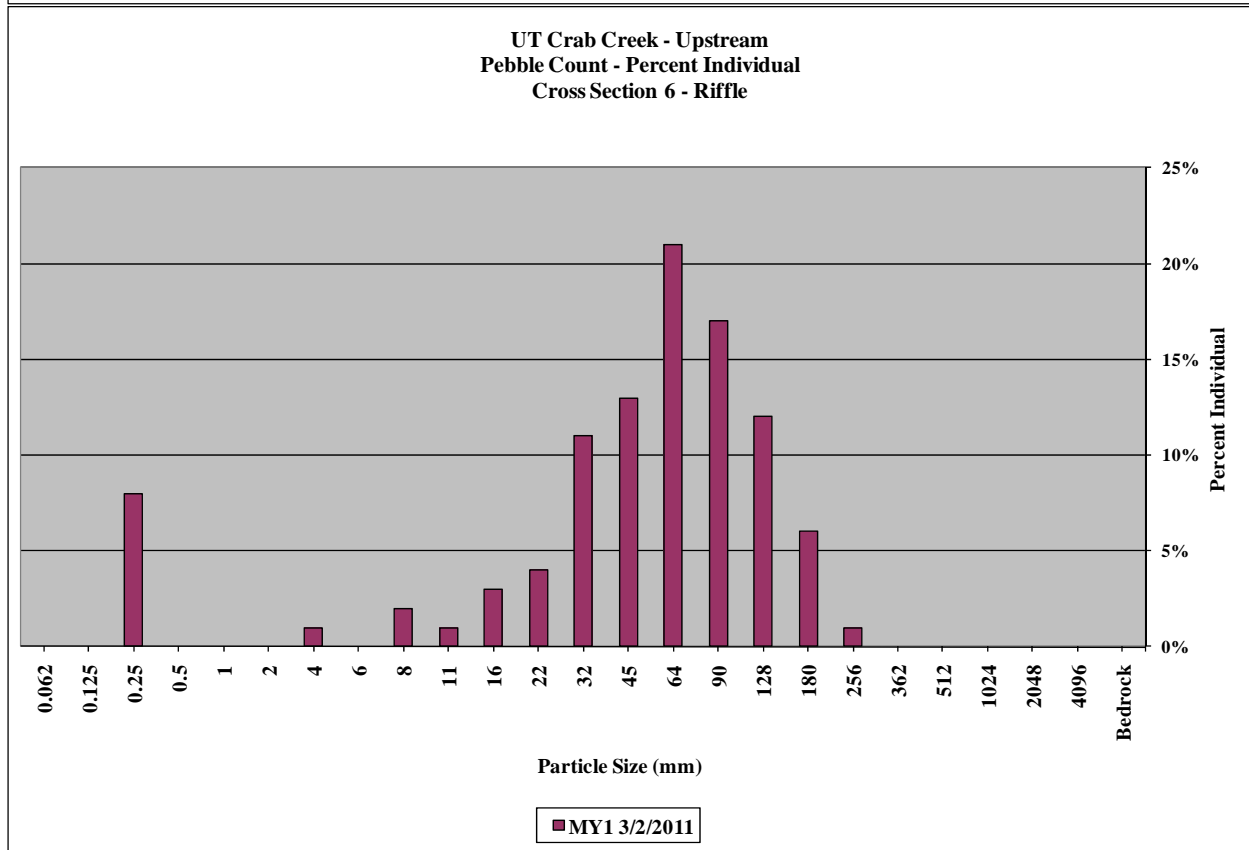
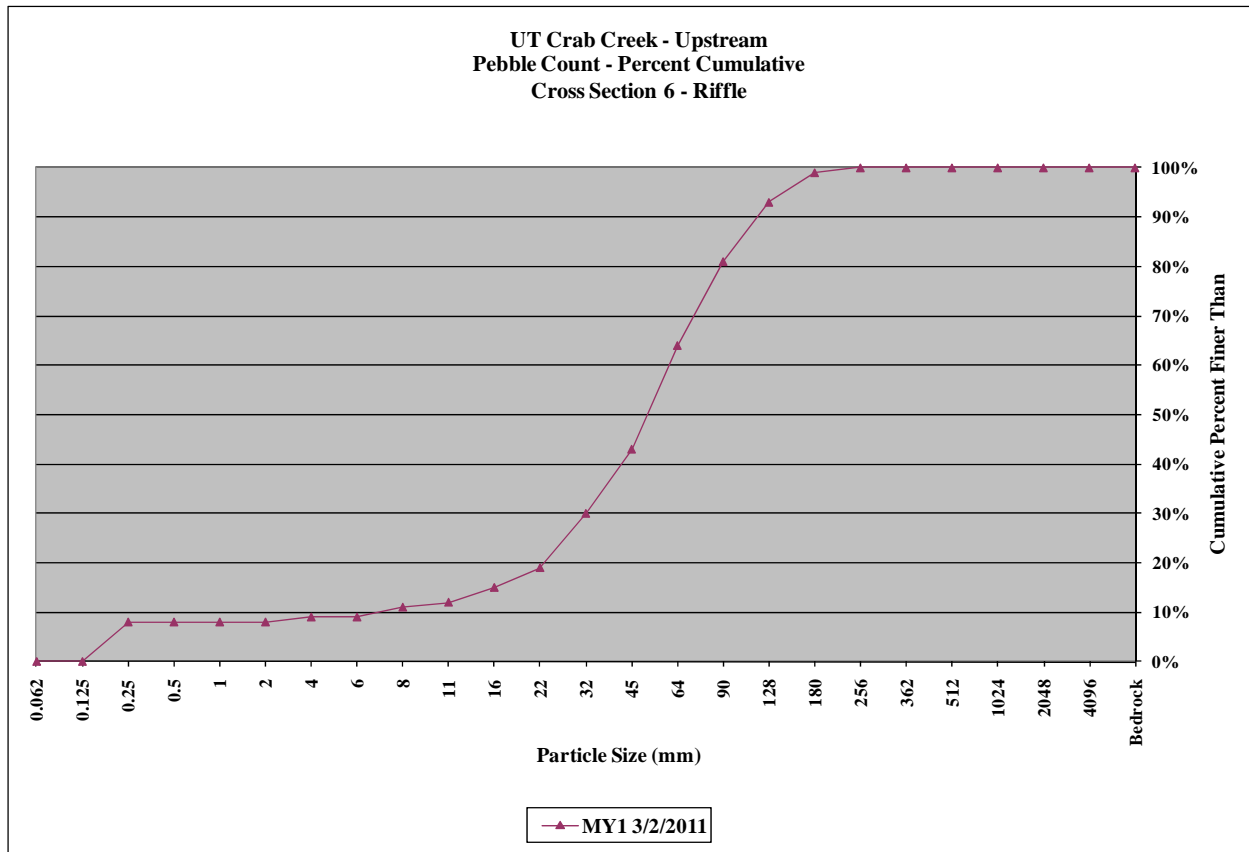
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Lower - Cross-Section 5 - Riffle					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	0	0%	0%
	fine sand	0.25	14	14%	14%
	medium sand	0.50	24	24%	38%
	coarse sand	1.00	14	14%	52%
	very coarse sand	2.00	6	6%	58%
Gravel	very fine gravel	4.0	2	2%	60%
	fine gravel	5.7	1	1%	61%
	fine gravel	8.0	1	1%	62%
	medium gravel	11.3	2	2%	64%
	medium gravel	16.0	2	2%	66%
	coarse gravel	22.3	2	2%	68%
	coarse gravel	32	8	8%	76%
	very coarse gravel	45	4	4%	80%
	very coarse gravel	64	3	3%	83%
Cobble	small cobble	90	7	7%	90%
	medium cobble	128	6	6%	96%
	large cobble	180	4	4%	100%
	very large cobble	256	0	0%	100%
Boulder	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	0.91
D84	67
D95	120



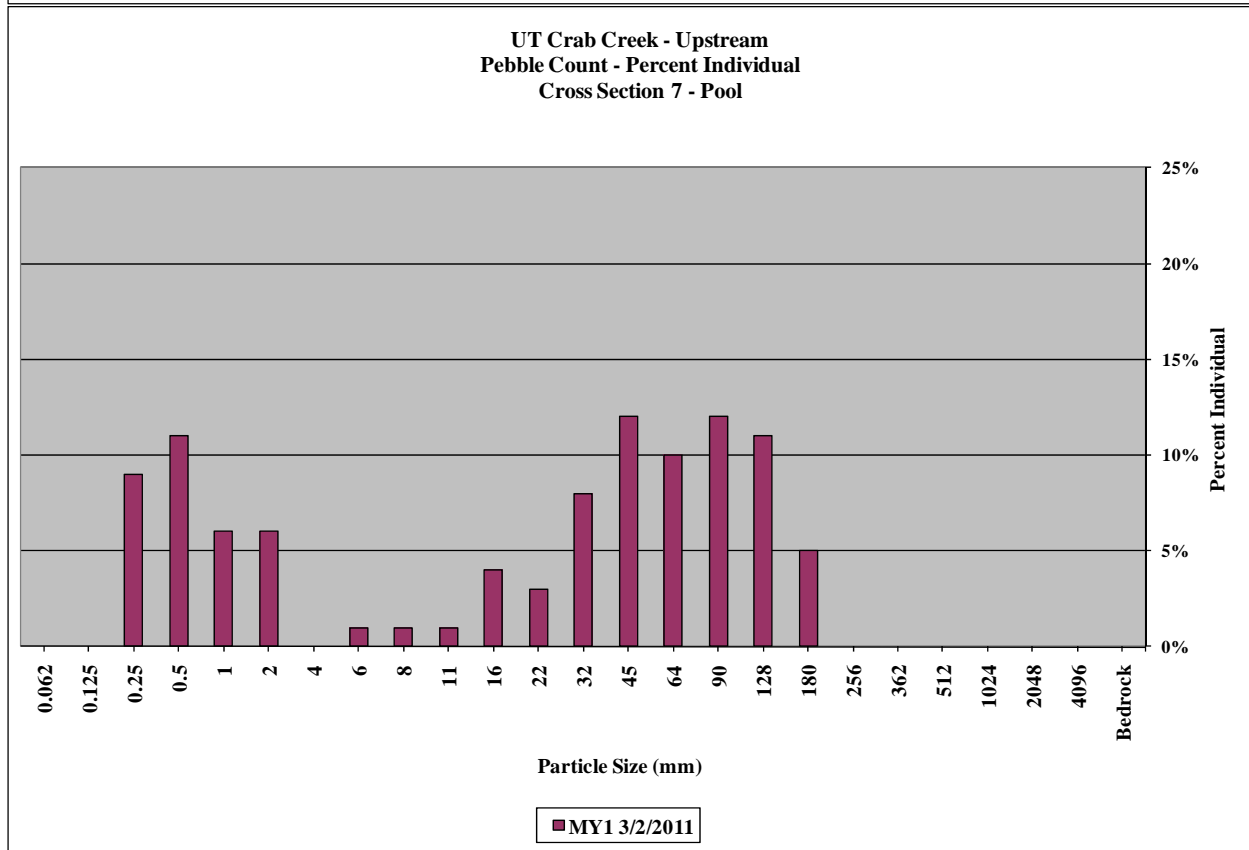
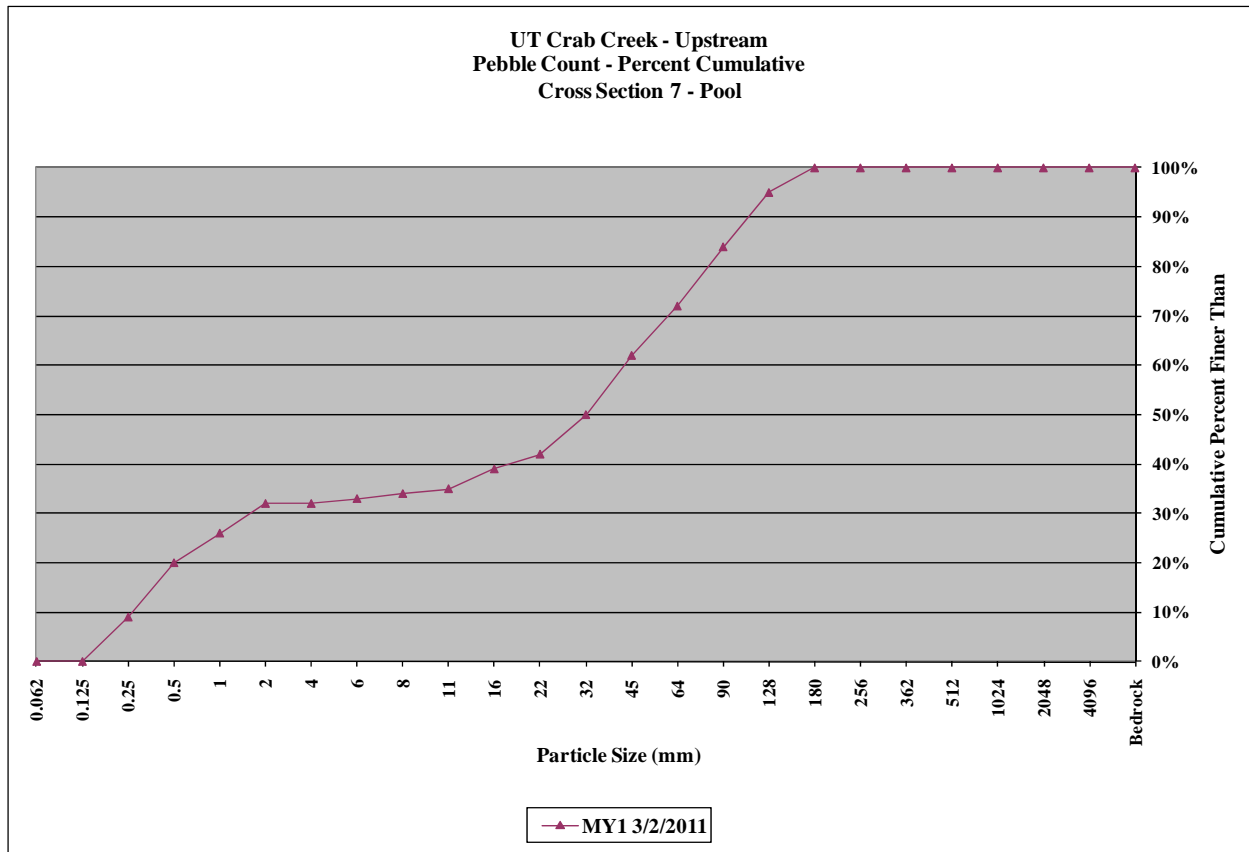
UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 6 - Riffle					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	0	0%	0%
	fine sand	0.25	8	8%	8%
	medium sand	0.50	0	0%	8%
	coarse sand	1.00	0	0%	8%
	very coarse sand	2.00	0	0%	8%
Gravel	very fine gravel	4.0	1	1%	9%
	fine gravel	5.7	0	0%	9%
	fine gravel	8.0	2	2%	11%
	medium gravel	11.3	1	1%	12%
	medium gravel	16.0	3	3%	15%
	coarse gravel	22.3	4	4%	19%
	coarse gravel	32	11	11%	30%
	very coarse gravel	45	13	13%	43%
	very coarse gravel	64	21	21%	64%
Cobble	small cobble	90	17	17%	81%
	medium cobble	128	12	12%	93%
	large cobble	180	6	6%	99%
	very large cobble	256	1	1%	100%
Boulder	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	51
D84	98
D95	140



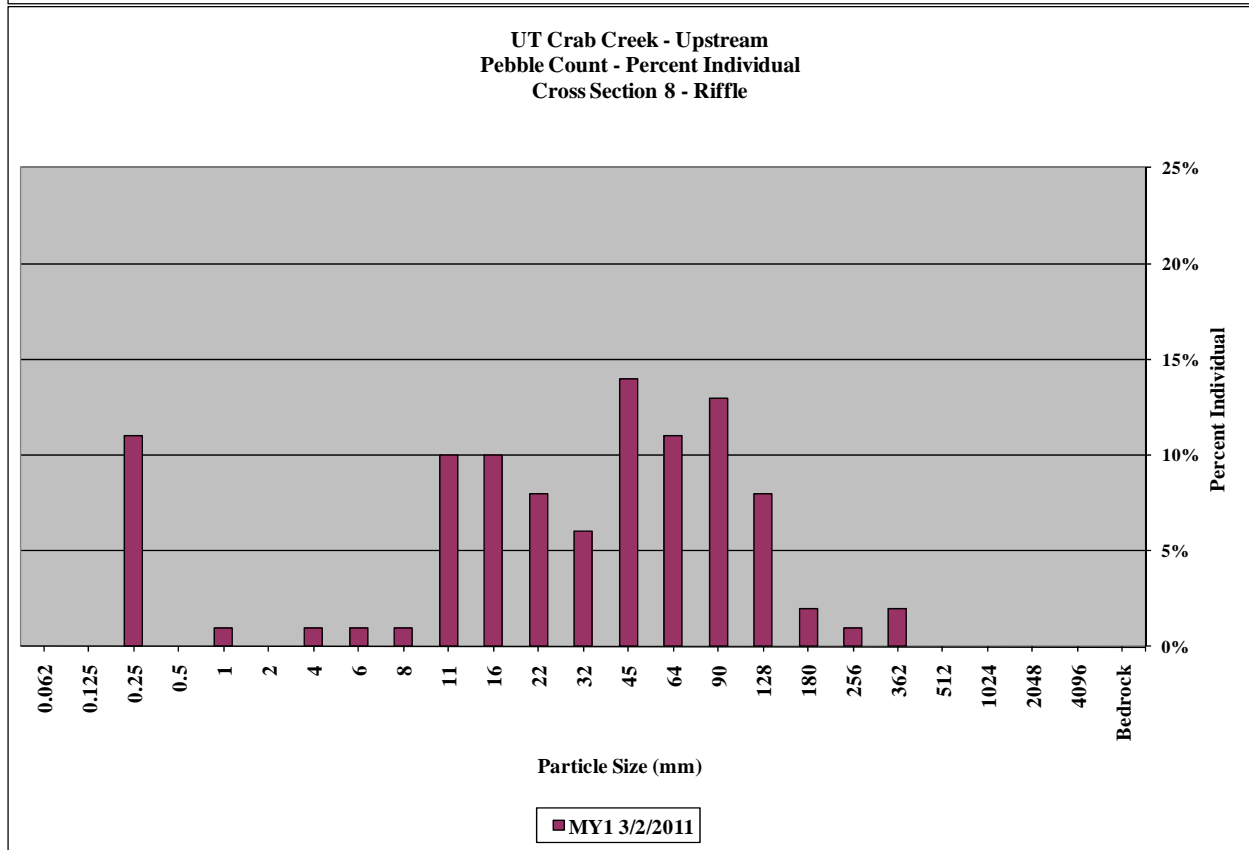
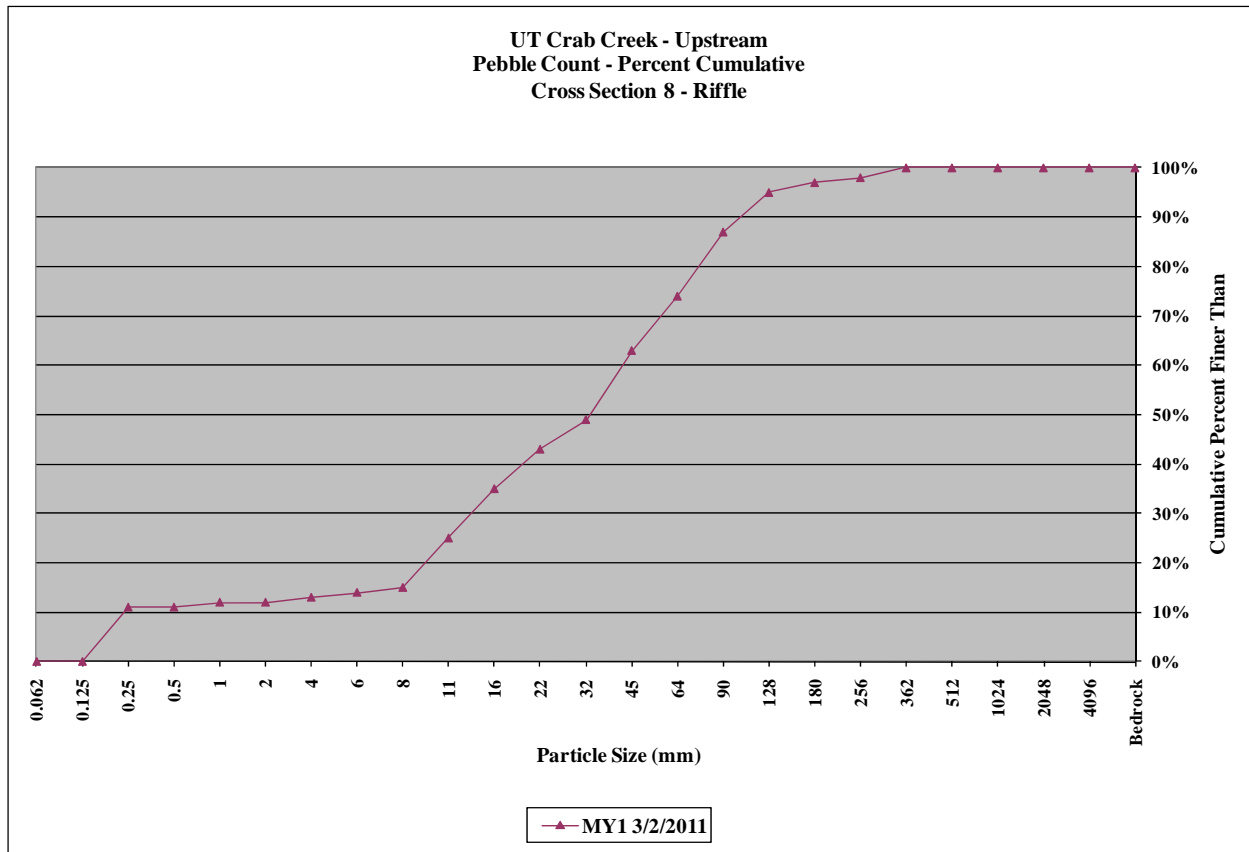
UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 7 - Pool					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	0	0%	0%
	fine sand	0.25	9	9%	9%
	medium sand	0.50	11	11%	20%
	coarse sand	1.00	6	6%	26%
	very coarse sand	2.00	6	6%	32%
Gravel	very fine gravel	4.0	0	0%	32%
	fine gravel	5.7	1	1%	33%
	fine gravel	8.0	1	1%	34%
	medium gravel	11.3	1	1%	35%
	medium gravel	16.0	4	4%	39%
	coarse gravel	22.3	3	3%	42%
	coarse gravel	32	8	8%	50%
	very coarse gravel	45	12	12%	62%
	very coarse gravel	64	10	10%	72%
Cobble	small cobble	90	12	12%	84%
	medium cobble	128	11	11%	95%
	large cobble	180	5	5%	100%
	very large cobble	256	0	0%	100%
Boulder	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	32
D84	90
D95	130



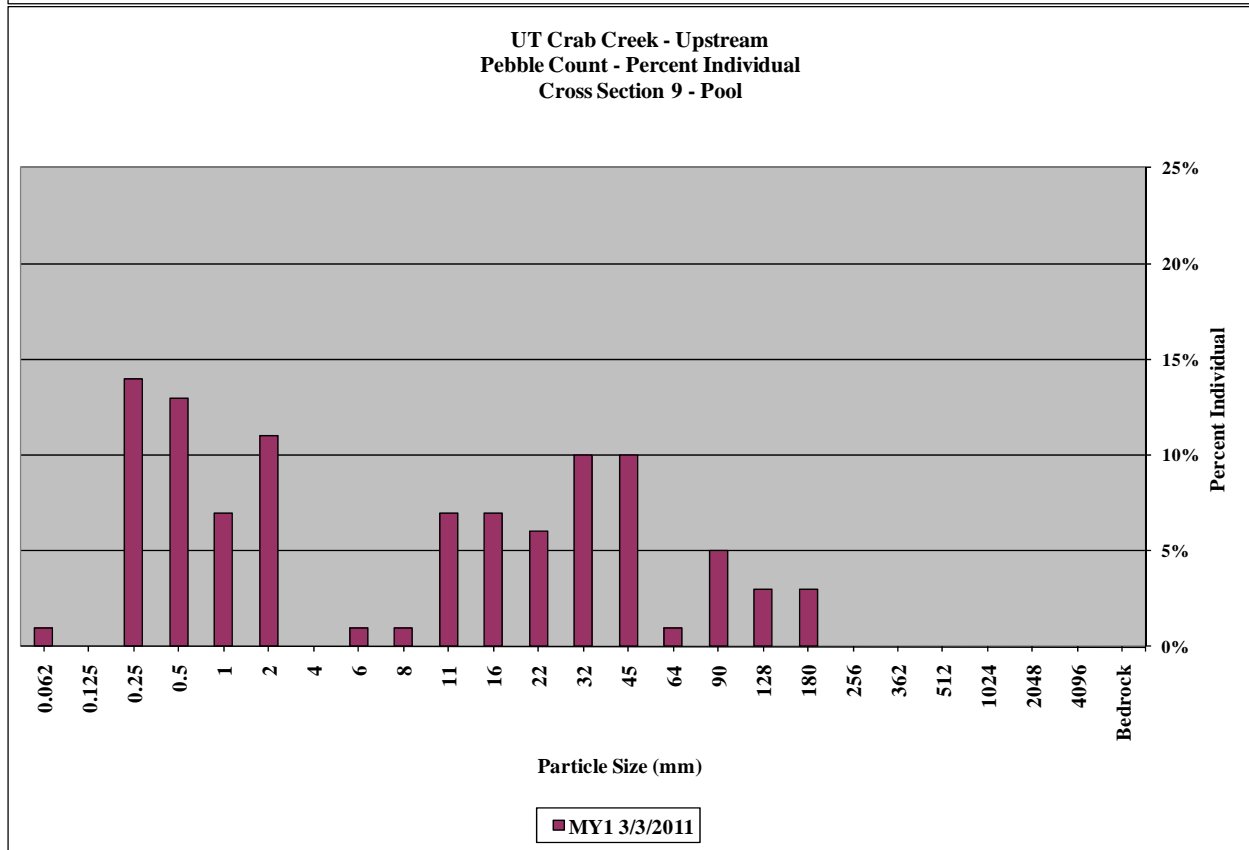
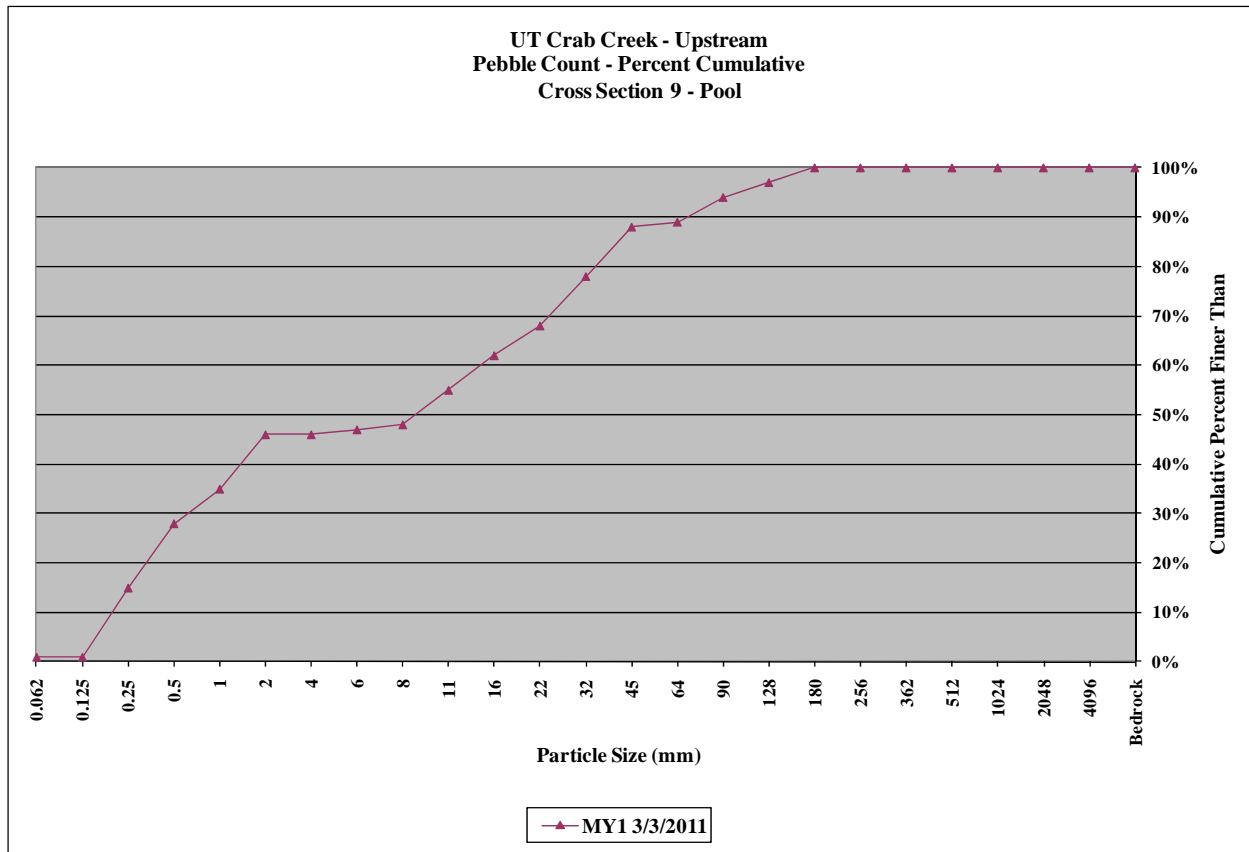
UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 8 - Riffle					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	0	0%	0%
	fine sand	0.25	11	11%	11%
	medium sand	0.50	0	0%	11%
	coarse sand	1.00	1	1%	12%
	very coarse sand	2.00	0	0%	12%
Gravel	very fine gravel	4.0	1	1%	13%
	fine gravel	5.7	1	1%	14%
	fine gravel	8.0	1	1%	15%
	medium gravel	11.3	10	10%	25%
	medium gravel	16.0	10	10%	35%
	coarse gravel	22.3	8	8%	43%
	coarse gravel	32	6	6%	49%
	very coarse gravel	45	14	14%	63%
	very coarse gravel	64	11	11%	74%
Cobble	small cobble	90	13	13%	87%
	medium cobble	128	8	8%	95%
	large cobble	180	2	2%	97%
	very large cobble	256	1	1%	98%
Boulder	small boulder	362	2	2%	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	33
D84	83
D95	130



UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 9 - Pool					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	1	1%	1%
Sand	very fine sand	0.125	0	0%	1%
	fine sand	0.25	14	14%	15%
	medium sand	0.50	13	13%	28%
	coarse sand	1.00	7	7%	35%
	very coarse sand	2.00	11	11%	46%
Gravel	very fine gravel	4.0	0	0%	46%
	fine gravel	5.7	1	1%	47%
	fine gravel	8.0	1	1%	48%
	medium gravel	11.3	7	7%	55%
	medium gravel	16.0	7	7%	62%
	coarse gravel	22.3	6	6%	68%
	coarse gravel	32	10	10%	78%
	very coarse gravel	45	10	10%	88%
	very coarse gravel	64	1	1%	89%
Cobble	small cobble	90	5	5%	94%
	medium cobble	128	3	3%	97%
	large cobble	180	3	3%	100%
	very large cobble	256	0	0%	100%
Boulder	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	8.8
D84	39
D95	100



UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 10 - Riffle					
Pebble Count Summary					
			Monitoring Year 1		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	1	1%	1%
Sand	very fine sand	0.125	0	0%	1%
	fine sand	0.25	16	16%	17%
	medium sand	0.50	1	1%	18%
	coarse sand	1.00	0	0%	18%
	very coarse sand	2.00	1	1%	19%
Gravel	very fine gravel	4.0	1	1%	20%
	fine gravel	5.7	1	1%	21%
	fine gravel	8.0	1	1%	22%
	medium gravel	11.3	3	3%	25%
	medium gravel	16.0	13	13%	38%
	coarse gravel	22.3	8	8%	46%
	coarse gravel	32	19	19%	65%
	very coarse gravel	45	13	13%	78%
	very coarse gravel	64	12	12%	90%
Cobble	small cobble	90	3	3%	93%
	medium cobble	128	5	5%	98%
	large cobble	180	1	1%	99%
	very large cobble	256	0	0%	99%
Boulder	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%
Bedrock	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	24
D84	54
D95	100

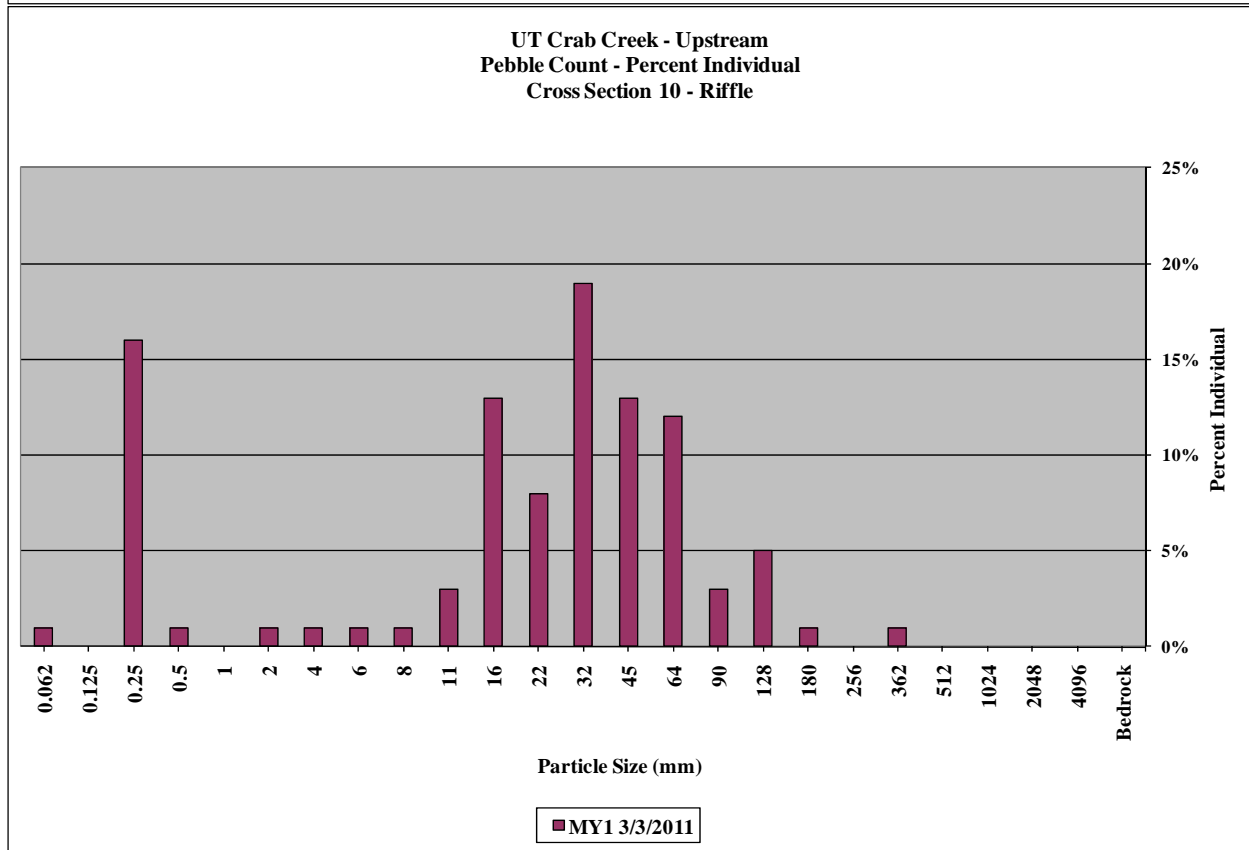
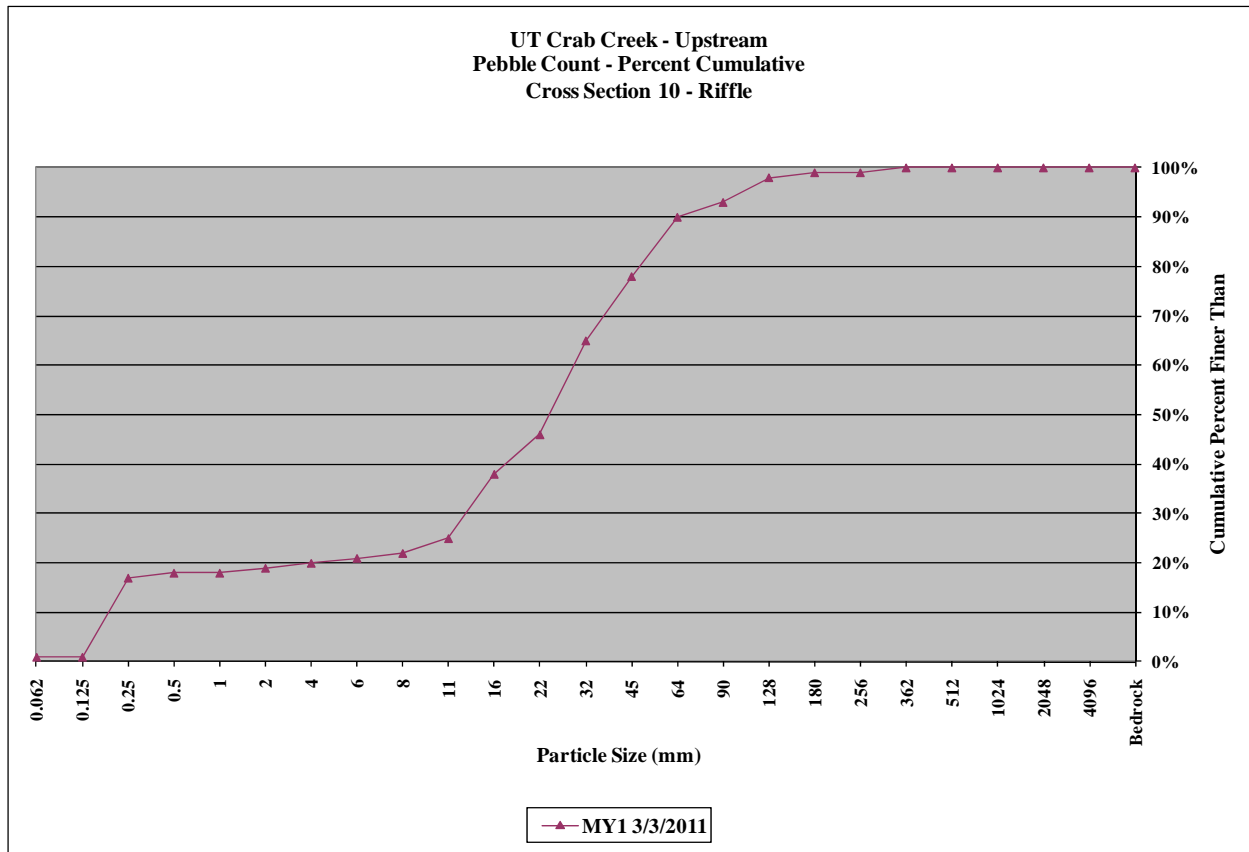


Table 10a. Baseline Stream Data Summary																								
UT Crab Creek Stream & Wetland / Project No. 857 - UT1 - Upper (500 feet)																								
Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design*			Monitoring Baseline					
	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N
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	-	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 ²)	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
Profile																								
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
Pattern																								
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
Transport Parameters																								
Reach Shear Stress (Competency) lb/ft ²													N/A										2.08	
Max Part Size (mm) Mobilized at Bankfull													N/A										262	
Stream Power (Transport Capacity) W/m ²													N/A											
Additional Reach Parameters																								
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 ²)	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 ²													N/A										1.36	
Max Part Size (mm) Mobilized at Bankfull													N/A										191	
Stream Power (Transport Capacity) W/m ²													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
Dimension & Substrate - Riffle																								
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 ²)	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
Profile																								
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
Pattern																								
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
Transport Parameters																								
Reach Shear Stress (Competency) lb/ft ²				0.89						-						0.73			0.71					
Max Part Size (mm) Mobilized at Bankfull				130						-						125			118					
Stream Power (Transport Capacity) W/m ²				-						-						-			-					
Additional Reach Parameters																								
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 ^p / d ¹⁰⁰ (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 ^p / d ¹⁰⁰ (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 ^p / d ¹⁰⁰ (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.

Table 11a. Monitoring Data - Dimensional Morphology Summary																		
(Dimensional Parameters - Cross-Sections)																		
UT Crab Stream & Wetland / Project No. 857 - UT1-Upper (500 feet)																		
	Cross-Section 1 Riffle						Cross-Section 2 Pool						Cross-Section 3 Riffle					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2605	2605					2603	2603					2598	2598				
Bankfull Width (ft)	15.7	15.9					18.4	18.0					14.8	14.7				
Floodprone Width (ft)	>100	>100					>100	>100					>100	>100				
Bankfull Mean Depth (ft)	1.3	1.2					1.9	1.9					1.6	1.6				
Bankfull Max Depth (ft)	2.4	2.4					3.2	3.2					2.5	2.5				
Bankfull Cross Sectional Area (ft ²)	20.3	18.5					34.3	33.4					24.0	23.8				
Bankfull Width/Depth Ratio	12.2	13.8					9.9	9.7					9.2	9.1				
Bankfull Entrenchment Ratio	>6.4	>6.3					>5.4	>5.5					>6.7	>6.8				
Bankfull Bank Height Ratio	1.0	1.0					1.1	1.1					1.1	1.1				
Cross Sectional Area between End Pins (ft ²)	20.3	19.0					34.3	33.6					24.3	24.1				
d50 (mm)	N/A	17					N/A	11					N/A	23				

N/A - Item does not apply.

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections) UT Crab Creek Stream & Wetland / Project No. 857 - UT1-Lower (397 feet)												
	Cross-Section 4 Pool						Cross-Section 5 Rifle					
Dimension	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2571	2571					2571	2571				
Bankfull Width (ft)	16.7	14.3					11.5	12.2				
Floodprone Width (ft)	>100	>100					>100	>100				
Bankfull Mean Depth (ft)	1.1	1.3					1.5	1.4				
Bankfull Max Depth (ft)	2.6	2.5					2.5	2.6				
Bankfull Cross Sectional Area (ft ²)	18.8	18.0					17.6	17.5				
Bankfull Width/Depth Ratio	14.8	11.4					7.5	8.5				
Bankfull Entrenchment Ratio	>6.0	>7.0					>8.7	>8.2				
Bankfull Bank Height Ratio	1.0	1.0					1.0	1.0				
Cross Sectional Area between End Pins (ft ²)	18.9	18.0					21.1	21.5				
d50 (mm)	N/A	8.4					N/A	0.91				

N/A - Item does not apply.

Table 11a. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Sections) UT Crab Creek Stream & Wetland / Project No. 857 - UTCC-US (2,455 feet)																														
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	2571	2571					2571	2571					2566	2566					2554	2554					2554	2554				
Bankfull Width (ft)	25.0	24.7					27.7	27.8					28.7	27.9					23.5	23.8					26.5	27.2				
Floodprone Width (ft)	>200	>200					>200	>200					>200	>200					>200	>200					>200	>200				
Bankfull Mean Depth (ft)	1.7	1.7					1.7	1.7					1.5	1.4					1.7	1.7					1.4	1.4				
Bankfull Max Depth (ft)	2.6	2.5					3.0	3.4					2.5	2.4					2.7	2.9					2.4	2.4				
Bankfull Cross Sectional Area (ft ²)	42.4	41.9					47.3	47.1					42.1	39.5					40.7	40.9					37.0	37.2				
Bankfull Width/Depth Ratio	14.7	14.6					16.3	16.4					19.5	19.7					13.5	13.9					19.0	19.9				
Bankfull Entrenchment Ratio	>8.0	>8.1					>7.2	>7.2					>7.0	>7.2					>8.5	>8.4					>7.5	>7.3				
Bankfull Bank Height Ratio	1.0	1.0					1.1	1.1					1.1	1.1					1.0	1.0					1.0	1.0				
Cross Sectional Area between End Pins (ft ²)	42.4	41.9					47.3	47.3					43.2	40.1					41.5	41.2					38.6	39.9				
d50 (mm)	N/A	51					N/A	32					N/A	33					N/A	8.8					NA	24				

N/A - Item does not apply.

Table 11b. Monitoring Data - Stream Reach Data Summary																																				
UT Crab Creek Stream & Wetland / Project No. 857 - UT1-Upper (511 feet)																																				
Parameter	Baseline					MY - 1					MY - 2					MY - 3					MY - 4					MY - 5										
Dimension & Substrate - Riffle	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	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																								
Floodprone Width (ft)	>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																								
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																								
Bankfull Cross-Sectional Area (ft ²)	20.3	22.2	22.2	24.0	N/A	2	18.5	21.2	21.2	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																								
Entrenchment Ratio	>6.4	>6.6	>6.6	>6.7	N/A	2	>6.3	>6.5	>6.5	>6.8	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																								
Profile																																				
Riffle Length (ft)	5.8	28.7	22.6	68.2	23.4	7	11.7	37.5	35.0	76.0	24.3	6																								
Riffle 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																								
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																								
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																								
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																								
Pattern																																				
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																														
Additional Reach Parameters																																				
Rosgen Classification	Cb					C4b																														
Channel Thalweg Length (ft)	500					511																														
Sinuosity (ft)	1.14					1.17																														
Water Surface Slope (Channel) (ft/ft)	0.0238					0.0228																														
Bankfull Slope (ft/ft)	0.0251					0.0229																														
Ri% / Ru% / P% / G% / S%	42	8	24	22	4	45%	10%	22%	19%	5%																										
SC% / SA% / G% / C% / B% / Be%*						<1%	20%	71%	9%	0%	0%																									
d16 / d35 / d50 / d84 / d95 (mm)																																				
% of Reach with Eroding Banks	0%					1%																														
Channel Stability or Habitat Metric	N/A					N/A																														
Biological or Other	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 - UT1-Lower (400 feet)																																				
Parameter	Baseline					MY - 1					MY - 2					MY - 3					MY - 4					MY - 5										
Dimension & Substrate - Riffle	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	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																								
Floodprone Width (ft)	>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																								
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																								
Bankfull Cross-Sectional Area (ft ²)	17.6	17.6	17.6	17.6	N/A	1	17.5	17.5	17.5	17.5	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																								
Entrenchment Ratio	>8.7	>8.7	>8.7	>8.7	N/A	1	>8.2	>8.2	>8.2	>8.2	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																								
Profile																																				
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																								
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																								
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																								
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																								
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																								
Pattern																																				
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																														
Additional Reach Parameters																																				
Rosgen Classification	C					C5b																														
Channel Thalweg Length (ft)	397					400																														
Sinuosity (ft)	1.15					1.16																														
Water Surface Slope (Channel) (ft/ft)	0.0156					0.0156																														
Bankfull Slope (ft/ft)	0.0174					0.0172																														
Ri% / Ru% / P% / G% / S%	48	5	22	25	1	50%	6%	18%	26%	0%																										
SC% / SA% / G% / C% / B% / Be%*						2%	48%	33%	17%	0%	0%																									
d16 / d35 / d50 / d84 / d95 (mm)																																				
% of Reach with Eroding Banks	0%					0%																														
Channel Stability or Habitat Metric	N/A					N/A																														
Biological or Other	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 (2,465feet)																														
Parameter	Baseline					MY - 1					MY - 2					MY - 3					MY - 4					MY - 5				
Dimension & Substrate - Riffle	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)	25.0	26.7	26.5	28.7	N/A	3	24.7	26.6	27.2	27.9	N/A	3																		
Floodprone Width (ft)	>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																		
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																		
Bankfull Cross-Sectional Area (ft ²)	37.0	40.5	42.1	42.4	N/A	3	37.2	39.5	39.5	41.9	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																		
Entrenchment Ratio	>7.0	>7.5	>7.5	>8.0	N/A	3	>7.2	>7.5	>7.3	>8.1	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																		
Profile																														
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																		
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																		
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																		
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																		
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																		
Pattern																														
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																								
Additional Reach Parameters																														
Rosgen Classification	C											C4b																		
Channel Thalweg Length (ft)	2,455											2,465																		
Sinuosity (ft)	1.21											1.22																		
Water Surface Slope (Channel) (ft/ft)	0.0080											0.0081																		
Bankfull Slope (ft/ft)	0.0083											0.0083																		
Ri% / Ru% / P% / G% / S%	47	9	32	12	0		45%	8%	33%	14%	0%																			
SC% / SA% / G% / C% / B% / Be%*							<1%	23%	54%	22%	<1%																			
d16 / d35 / d50 / d84 / d95 (mm)																														
% of Reach with Eroding Banks	0%											1%																		
Channel Stability or Habitat Metric	N/A											N/A																		
Biological or Other	N/A											N/A																		

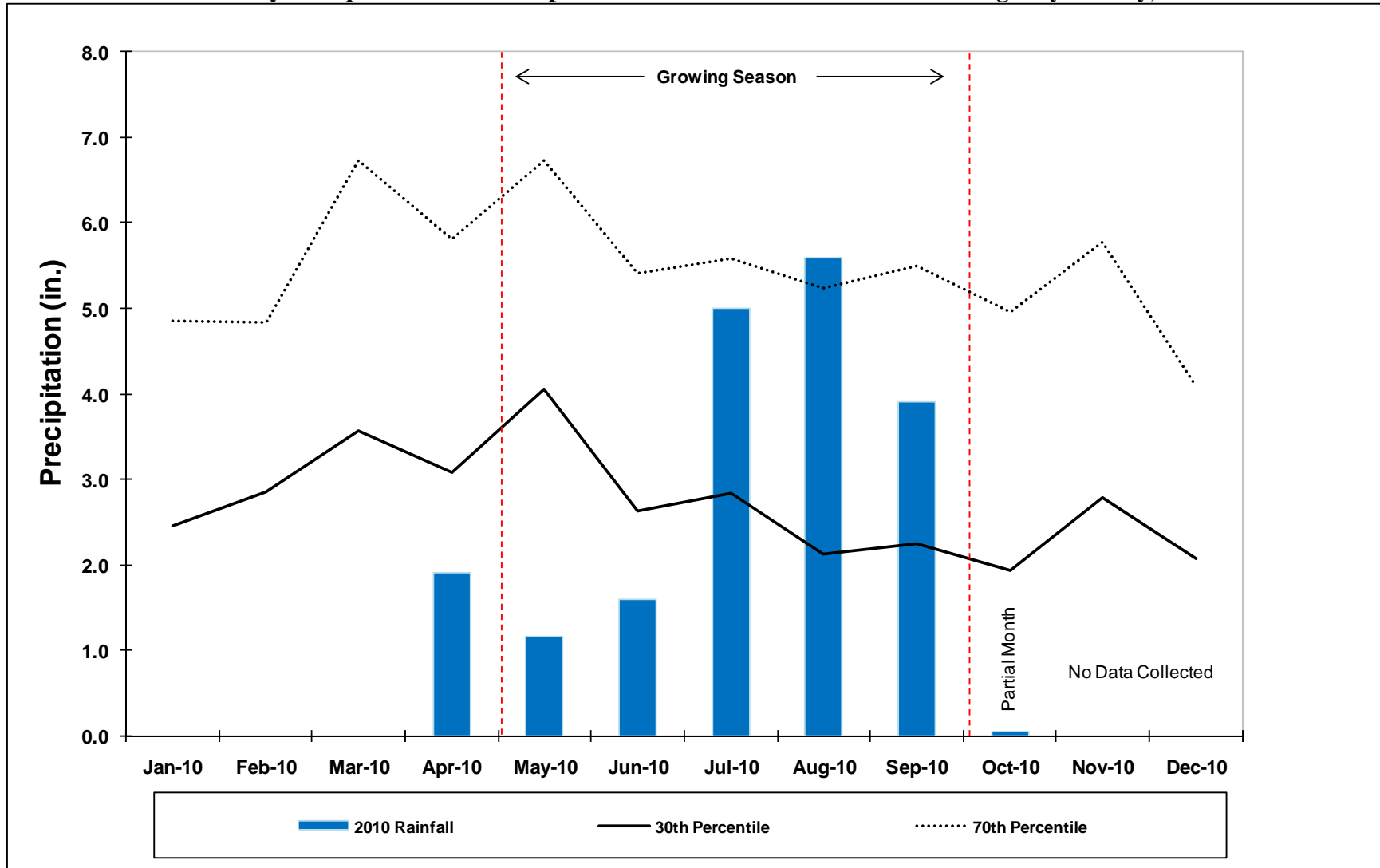
N/A - Information does not apply.
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock
 *Percentages based on riffle and pool pebble counts.

Appendix E

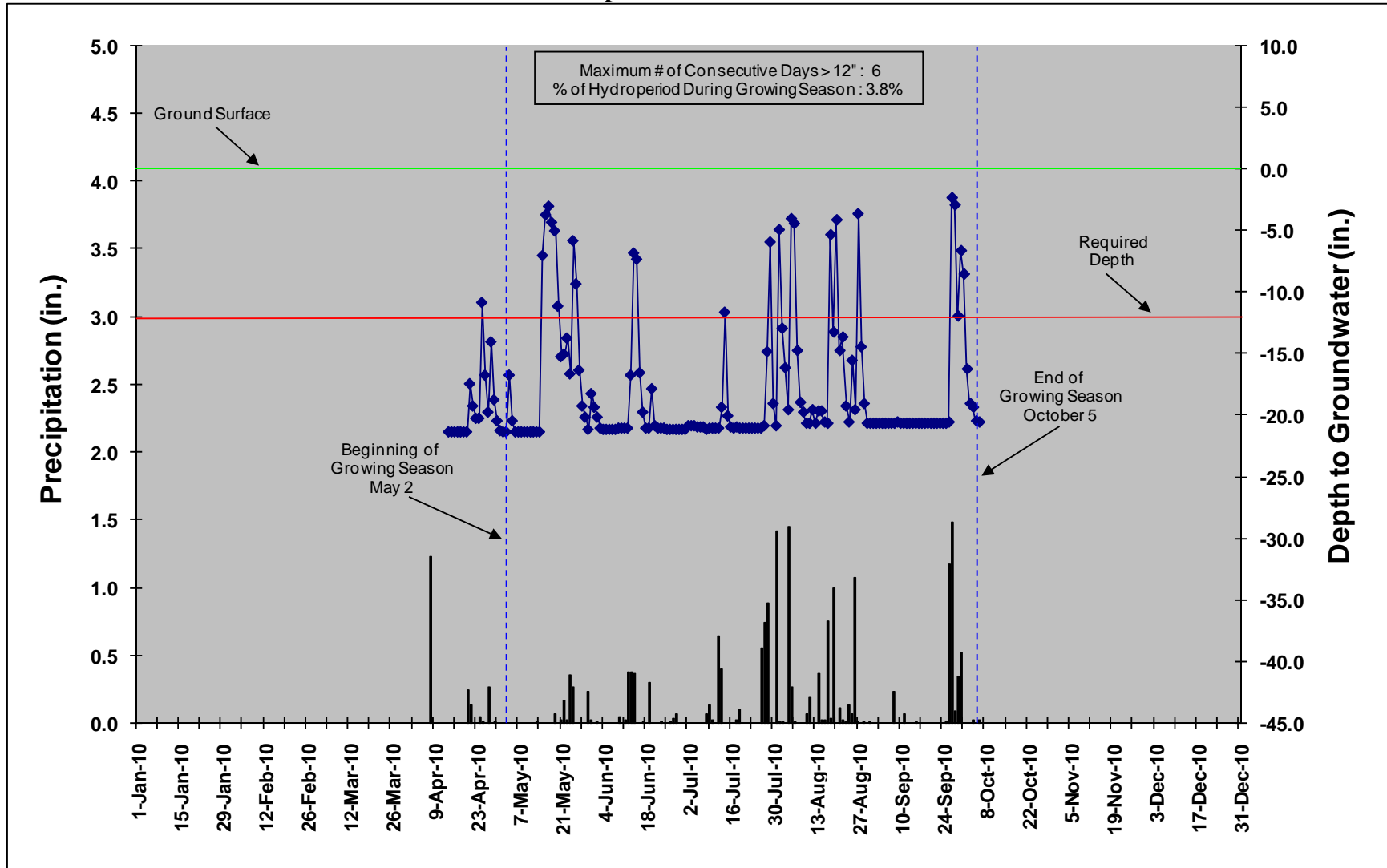
Hydrologic Data

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

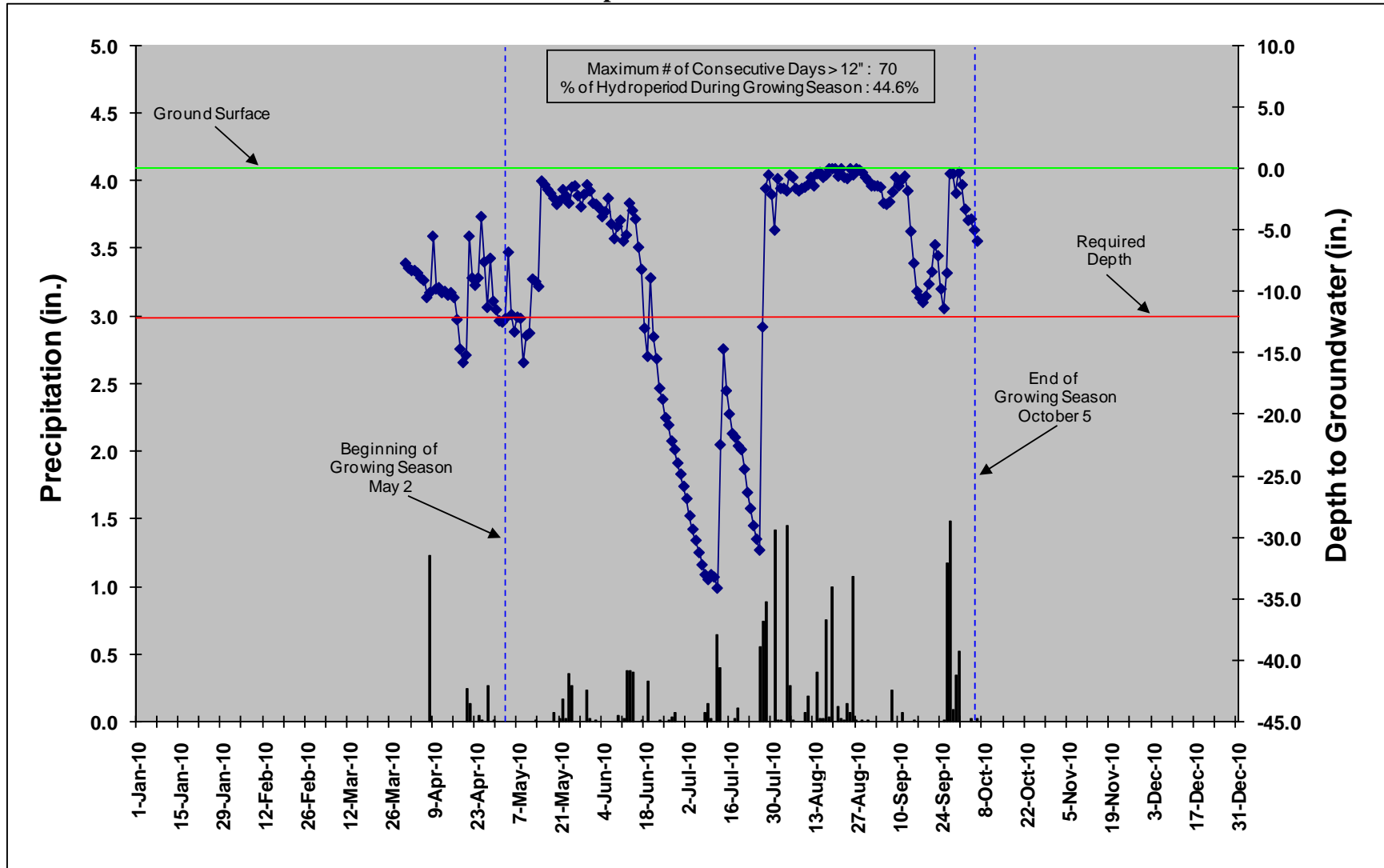
Monthly Precipitation Data Compared to 30th and 70th Percentiles for Alleghany County, NC



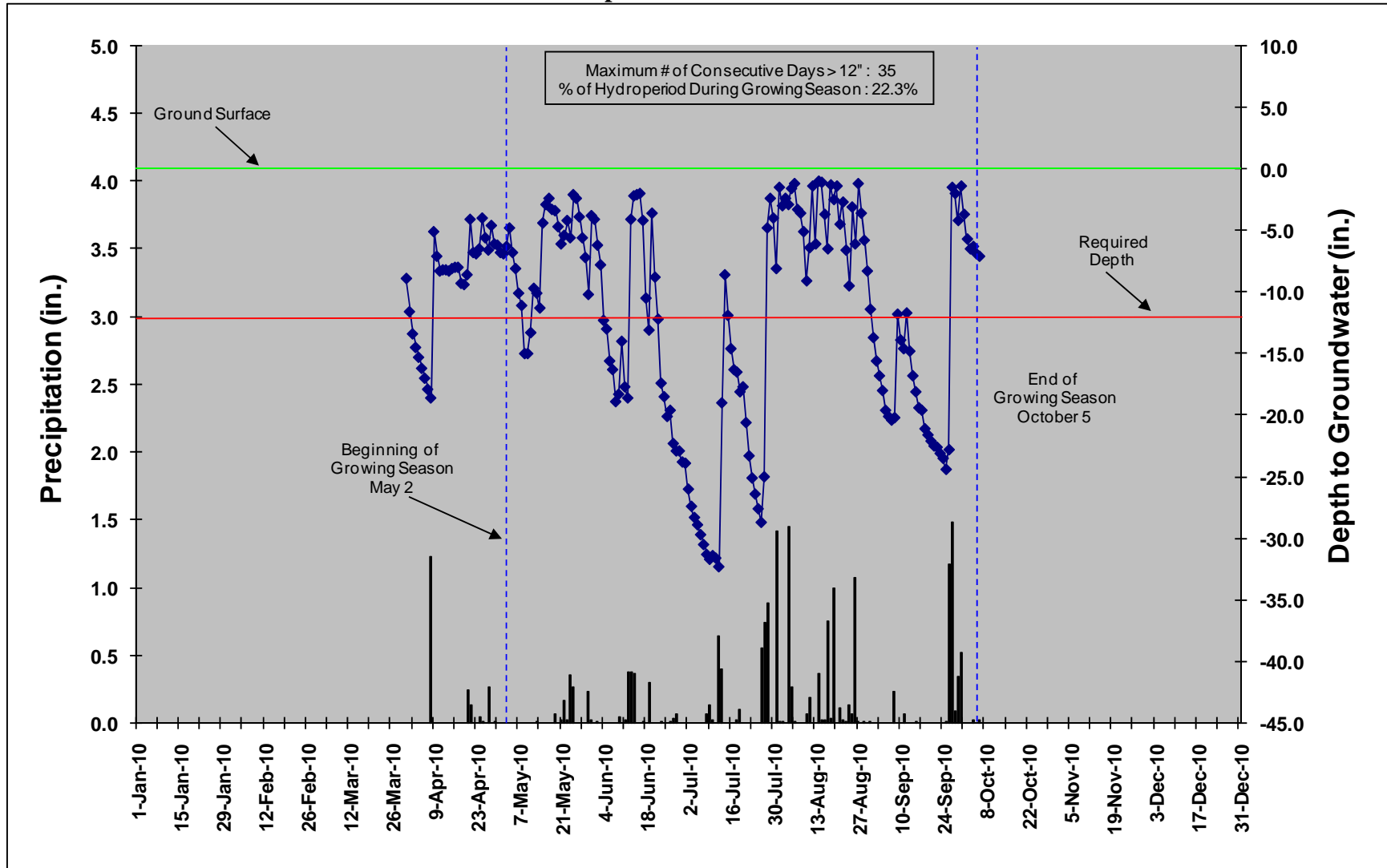
UTC-1 Precipitation and Water Level Plot



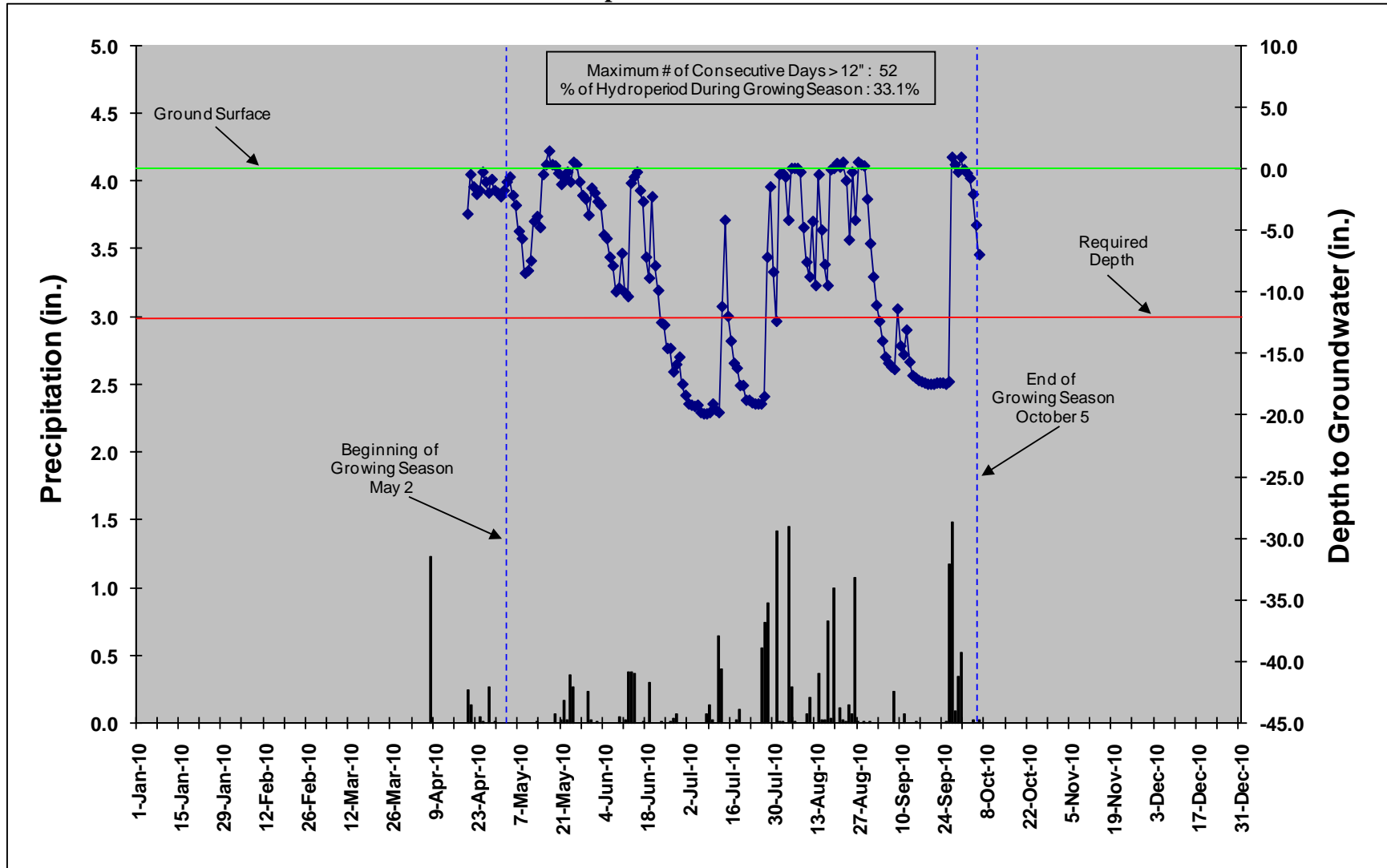
UTC-2 Precipitation and Water Level Plot



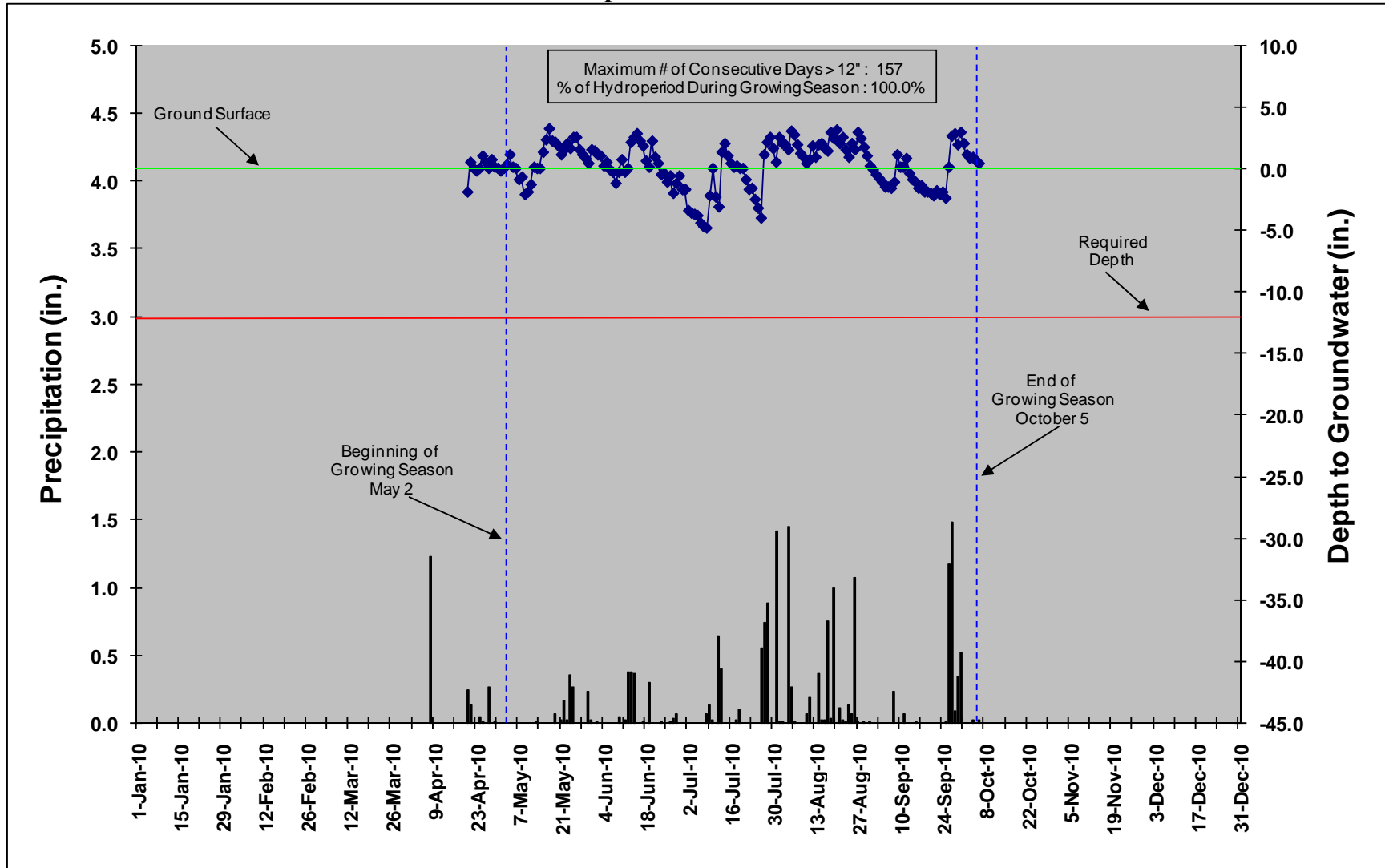
UTC-3 Precipitation and Water Level Plot



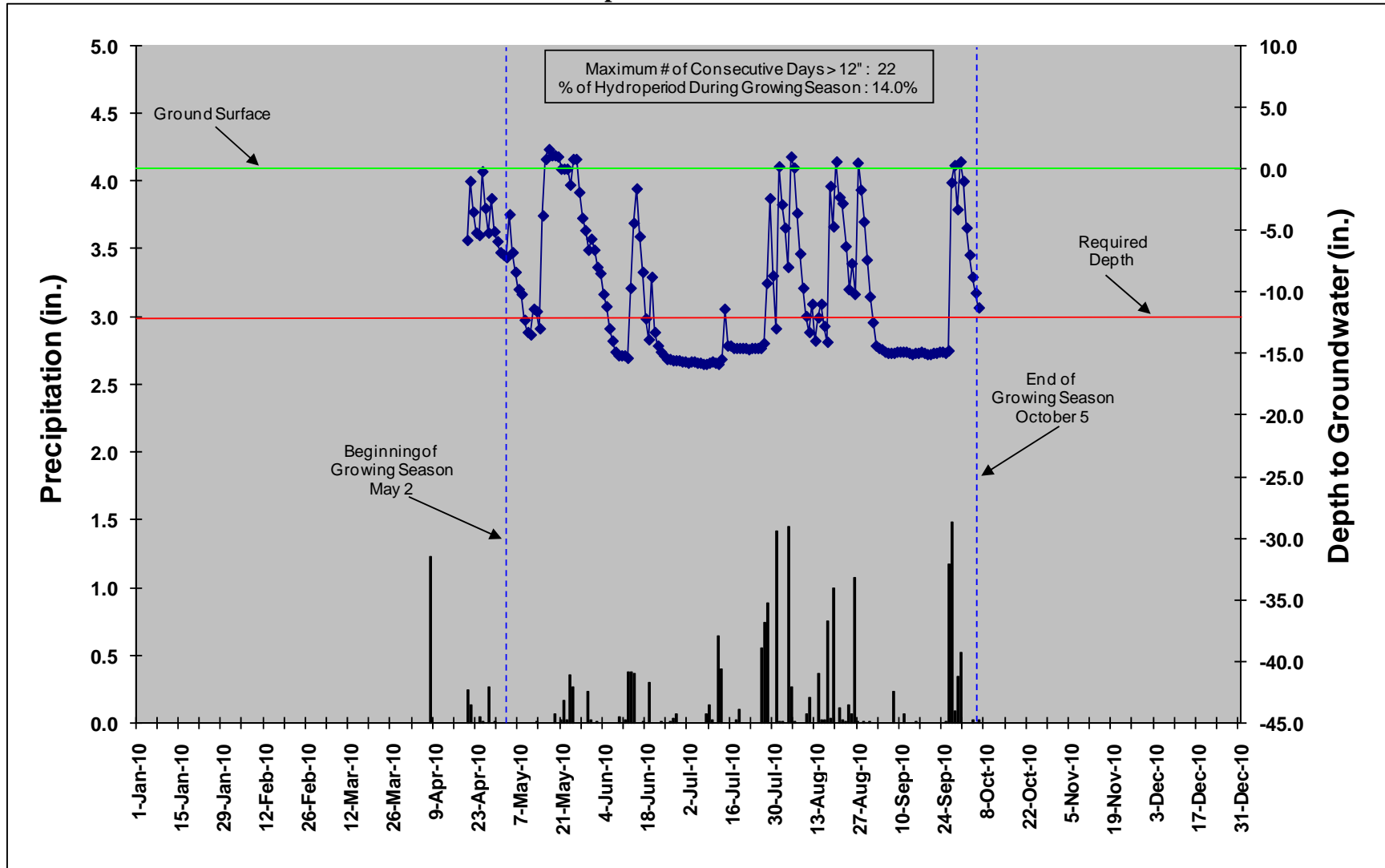
UTC-4 Precipitation and Water Level Plot



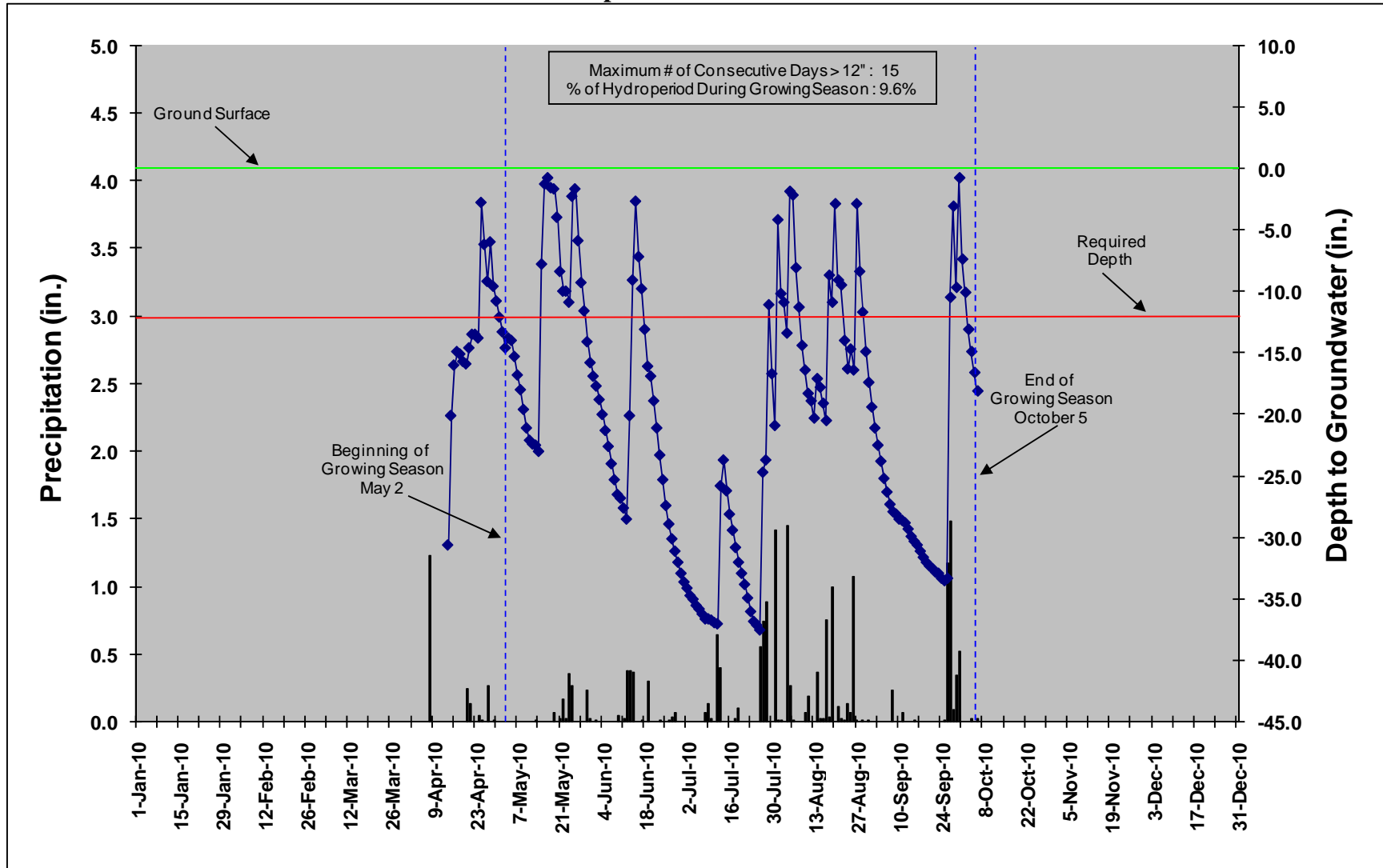
UTC-5 Precipitation and Water Level Plot



UTC-6 Precipitation and Water Level Plot



UTC-7 Precipitation and Water Level Plot



UTC-8 Precipitation and Water Level Plot

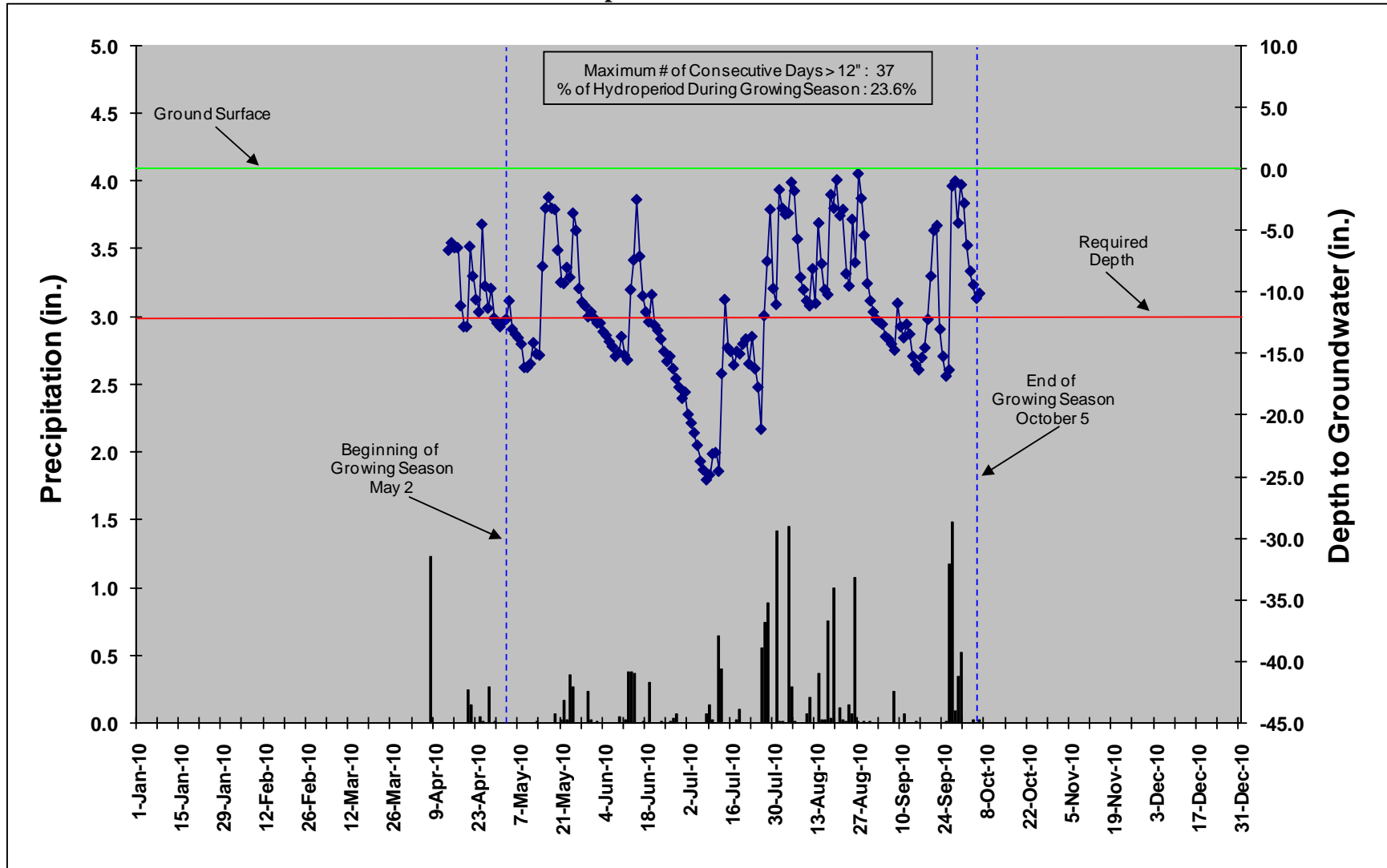


Table 13. Wetland Gauge Attainment Data					
Summary of Groundwater Gauge Results					
UT Crab Creek Stream & Wetland / Project No. 857					
Gauge ID	Success Criteria Achieved/Max Consecutive Days During Growing Season				
	(Percentage)				
	Year 1	Year 2	Year 3	Year 4	Year 5
	(2010)	(2011)	(2012)	(2013)	(2014)
UTC-1	No/6 3.8 Percent				
UTC-2	Yes/70 44.6 Percent				
UTC-3	Yes/35 22.3 Percent				
UTC-4	Yes/52 33.1 Percent				
UTC-5	Yes/157 100.0 Percent				
UTC-6	Yes/22 14.0 Percent				
UTC-7	Yes/15 9.6 Percent				
UTC-8	Yes/37 23.6 Percent				