

Unnamed Tributary to Crab Creek Stream and Wetland Restoration

NCEEP Project Number: 857

Monitoring Contract Number: 004495

Monitoring Year 4

2013 Final Report

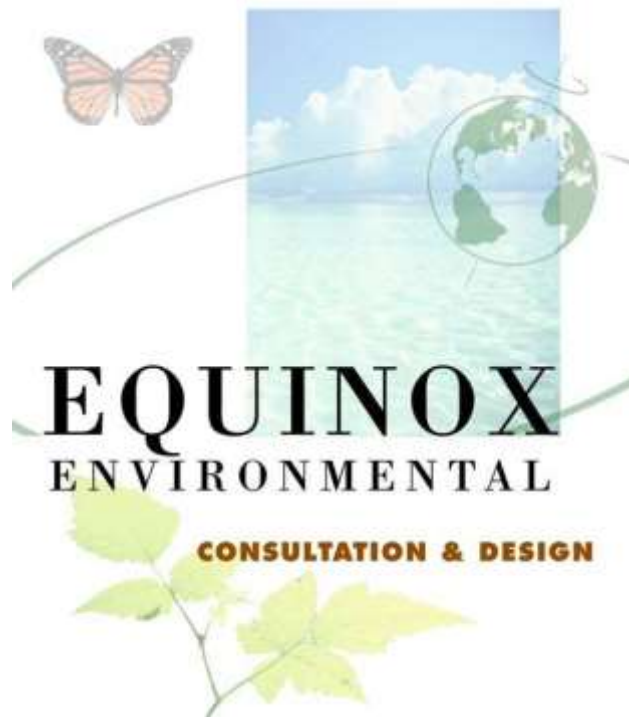


**Submitted to
North Carolina Ecosystem Enhancement Program
North Carolina Department of Environment and Natural Resources
November 2013**



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Unnamed Tributary to Crab Creek Stream and Wetland Restoration 2013 Monitoring Report (MY 4)

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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 four (MY4) vegetation plot data indicate that the project is not meeting the established criterion for planted stem density, which is a minimum survival of 288 planted stems per acre at the end of year four. Average stem density for planted stems in MY4 is 275 stems per acre. Six of the nine vegetation plots ($\approx 67\%$) did not meet the year three interim success criteria numbers per acre. These include VP 1, 4, 5, 6, 7, and 8; which had 121.4, 161.9, 121.4, 202.3, 283.3, and 242.3 stems per acre, respectively. However, when planted and naturally regenerated stems are combined, the average stem density is 854.3 stems per acre, with all plots meeting or exceeding the criterion. The number of native woody species ranged from 2-5 across all plots with 10 species noted site wide.

There are also approximately 20 isolated patches of high threat invasive plants that are distributed throughout the project area. Three percent of the easement acreage is comprised of these invasive plants and this percentage has remained the same since the 2011 MY2 monitoring efforts. The dominant species is multiflora rose *Rosa multiflora*; other species present include oriental bittersweet *Celastrus orbiculatus*, privet *Ligustrum sp.*, and Japanese honeysuckle *Lonicera japonica*. There also are two areas with low stem densities that are associated with the streambank erosion areas as noted below.

All cross sections have remained stable through MY4. With the exception of cross-sections 3 and 4 on the lower reach of the Unnamed Tributary, all cross sections are well vegetated and

show no signs of erosion or deterioration. Vegetation at cross sections 3 and 4 is limited due to the recent removal of beaver dams in the reach; however, shows no signs of channel instability.

Stream reach geomorphological data indicates the stream channels have remained very stable since construction. Stream longitudinal profiles also have remained stable between monitoring years. Stream channel problems observed during MY4 were minimal and consisted of six areas, totaling 240 feet, throughout all assessed reaches. Two bankfull events were documented on both UT1 and UTCC during MY4.

Beaver activity was documented on the mainstem and on the lower portion of UT1. This information was conveyed to NCEEP, who prepared a beaver removal request form that was submitted to the Animal and Plant Health Inspections Service (APHIS). Two beavers and a large food cache were removed during MY4.

Particle-size distributions remain stable, with no significant trends towards coarser or finer materials. This indicates that the channel is transporting sediment as designed.

Data from the eight groundwater monitoring stations indicated that all stations met the soil saturation criterion of groundwater being within 12 inches of the soil surfaces for at least five percent of the Hydro period during the MY4 growing season. The on-site rain gauge documented above normal precipitation during May-July. During normal rainfall years all groundwater gauges are expected to meet the minimum criteria.

In October 2013, wetland boundary delineations were performed to confirm the boundary of wetland features on the project site. A total of 16 acres of wetland were delineated within the project site. This included 7.4 acres of restoration, 3.1 acres of enhancement, 0.1 acres of creation, and 5.4 acres of preservation. The total acreage showed a 0.7 acre decline in total wetland area compared to the original baseline delineation of 16.7 acres, resulting from a 0.6 acre area and 0.1 acre area in Wetland 2 and Wetland 3, respectively, failing to meet criteria for jurisdictional wetlands. The failing area in Wetland 2 was located in the restoration area around Monitoring Well 1, which has failed to meet the hydrologic success criteria three out of four monitoring years. Additionally, this area failed to meet the hydric soil indicator. The failing area in Wetland 3, consisting of both restoration and creation, failed to meet the hydric soil indicator; which, was due to a large deposit of sand burying hydric soil.

Summary information and data related to the occurrence of items such as beaver or easement 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 NCEEP's website. All raw data supporting tables and figures in the appendices are available from NCEEP upon request.

2.0 Methodology

The stream monitoring methodologies utilized in MY4 replicate those employed during the previous monitoring years and are based on standard guidance and procedures documents (Rosgen 1996; USACE 2003).

Vegetation plot monitoring data were collected following the standard CVS-EEP Protocol for Recording Vegetation, Level II, Version 4.2 (Lee et al. 2008).

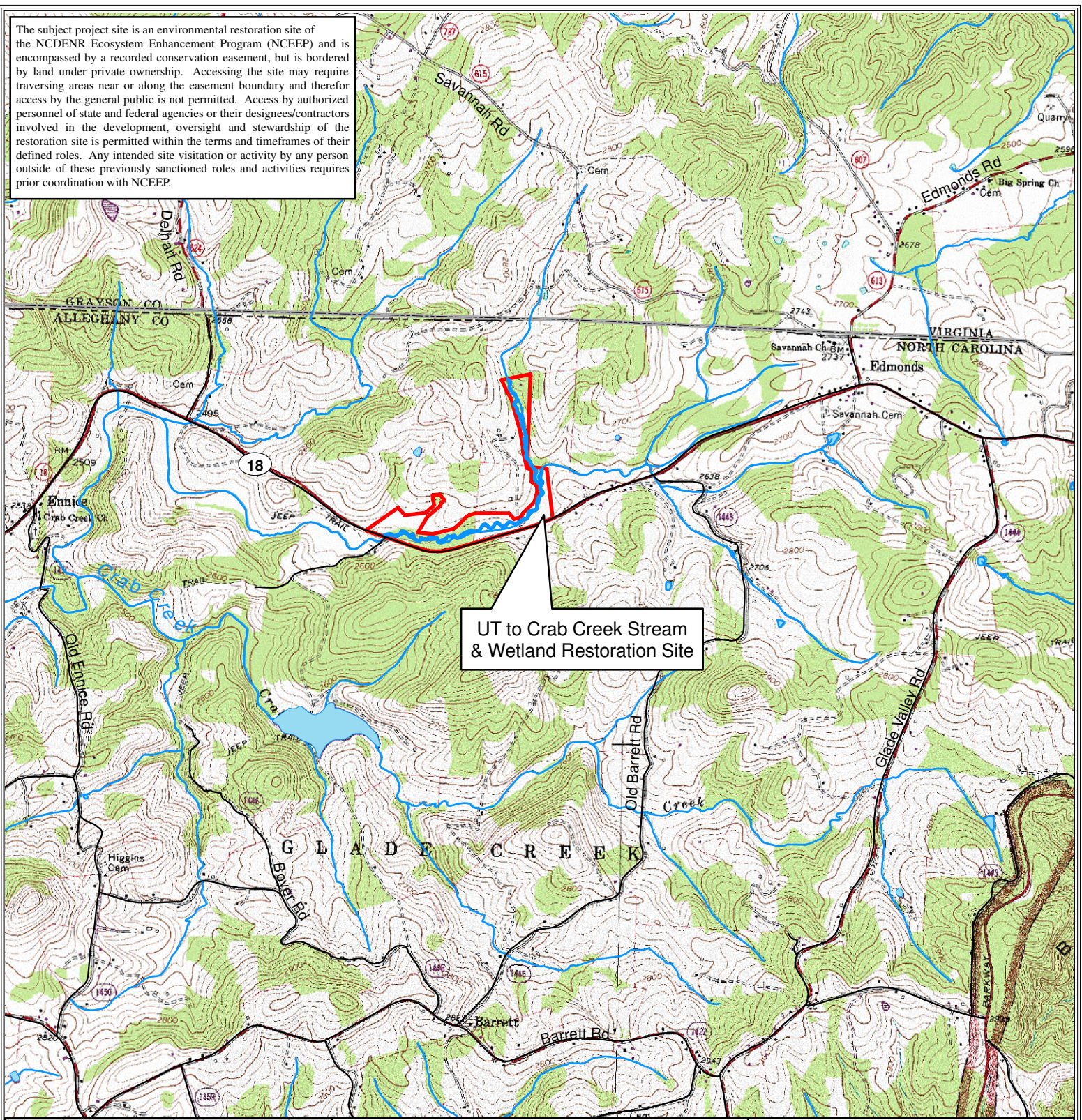
Wetland hydrology was considered established if groundwater monitoring data indicated saturated soils within 12 inches of the soil surface for 5% of the Hydro period. Due to the Alleghany County data set being based on a site with elevations approximately 1,000 feet different from the project site, the growing season for the site was based on the Natural Resource Conservation Service (NRCS) data set for Ashe County (NRCS 2009). During October 2013, a wetland boundary delineation was performed to confirm the presence of wetland features on the project site. The delineation utilized the Level II Routine Wetland Determination method as defined in the 1987 USACE Wetlands Delineation Manual and the 2010 USACE Interim Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region.

3.0 References

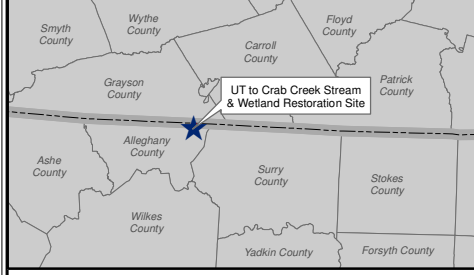
- Lee, M.T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2008. CVS-EEP Protocol for Recording Vegetation. Version 4.2. The University of North Carolina at Chapel Hill, Department of Biology.
- NCEEP (North Carolina Ecosystem Enhancement Program). 2007. UT to Crab Creek Restoration Site. Alleghany County, North Carolina. Restoration Plan. Raleigh.
- NRCS (Natural Resources Conservation Service). Undated. Climate Analysis for Wetlands by County. <http://www.wcc.nrcs.usda.gov/climate/wetlands.html>; accessed November 2012.
- Rosgen, D.L. 1996. Applied River Morphology. Wildland Hydrology Books. Pagosa Springs, Colorado.
- USACE (U.S. Army Corps of Engineers). 2003. Stream Mitigation Guidelines. U.S. Army Corps of Engineers, U.S. Environmental Protection Agency, North Carolina Wildlife Resources Commission, North Carolina Department of Environment and Natural Resources-Division of Water Quality. 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 ¹	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	Existing culvert and crossing replaced with open bottom arch culvert.	Stream channel stabilized with in-stream structures, including step pools and riffle grade control.
					104+35 - 105+34					
					112+29 - 113+51					
				116+88 - 118+34			Included revegetation and stream bank stabilization.			
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 ac	R		6.4 ac				Overfill cropland soil removed, cropland ditches filled, wellhead removed, and site graded to restore Southern Appalachian Bog Community hydrology.		
Wetland 2	2.7 ac	P		2.7 ac				Preservation of Swamp Forest-Bog Complex along UTCC-DS reach.		
Wetland 2	0.9 ac	R		0.9 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 3	0.3 ac	R		0.2 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		0.1 ac						
Wetland 3	2.1 ac	P		2.1 ac				Preservation of Southern Appalachian Bog Community.		

=Non-Applicable

¹Acreage updated based on MY4 wetland boundary delineation

Table 1b. Component Summations UT Crab Creek Stream & Wetland / Project No. 857							
Restoration Level	Stream (lf)	Riparian Wetland (Ac) ¹		Non-Riparian (Ac)	Upland (Ac)	Buffer (Ac)	BMP
		Riverine	Non-Riverine				
Restoration	4,260		7.5				
Enhancement			3.1				
Enhancement I	0						
Enhancement II	496						
Creation			0.1				
Preservation	2,172		5.3				
HQ Preservation	0		0				
		0.0	0.0				
Totals	6,928		16.0	0	0	0	0

=Non-Applicable

¹Acreage updated based on MY4 wetland boundary delineation

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	May 2006
Environmental Resource Technical Report	2006	May 2007
Restoration Plan	2007	Dec 2007
Permit Date	N/A	April 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	Nov 2012	Jan 2013
Year 4 Monitoring	Nov 2013	Jan 2014
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	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 (Y3)- 2012	Equinox Environmental Consultation & Design, Inc. 37 Haywood Street, Suite 100 Asheville, North Carolina 28801
Stream Monitoring POC	Kevin Mitchell (828) 253-6856
Vegetation Monitoring POC	Kevin Mitchell (828) 253-6856
Wetland Monitoring POC	Kevin Mitchell (828) 253-6856
Monitoring Performers (Y4)- 2013	
Stream Monitoring POC	Hunter Terrell (828) 253-6856
Vegetation Monitoring POC	Hunter Terrell (828) 253-6856
Wetland Monitoring POC	Hunter Terrell (828) 253-6856
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	100%		
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	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	-	-	-

- Information unavailable.

N/A - Item does not apply.

Appendix B

Visual Assessment Data

Figure 2. Integrated Current Condition Plan View - Draft




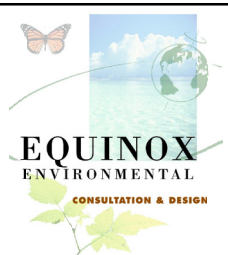
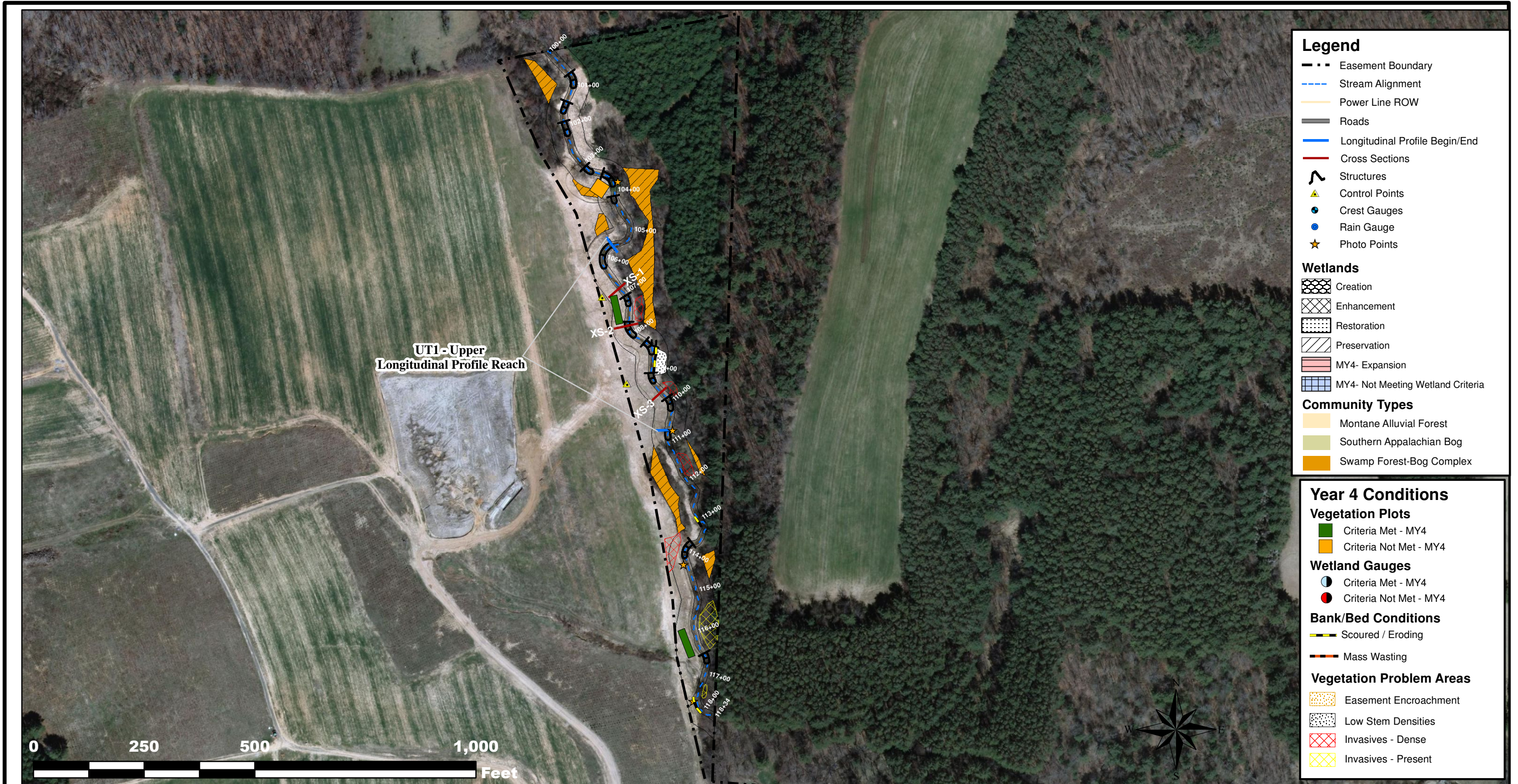
Prepared for	Project: UT to Crab Creek Stream and Wetland Restoration Year 4 Monitoring Alleghany County, North Carolina	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A. 2) NC OneMap 2010 Aerial Photo 3) Wetland boundaries updated using MY4 Wetland Boundary Delineation data	Prepared by
			
	Sheet 1 of 4		
	Date	Project Number	
	November 2013	NCEP # 857	

Figure 2. Integrated Current Condition Plan View - Draft




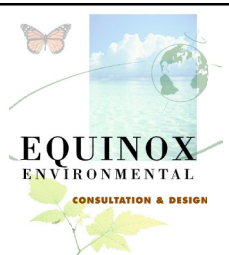
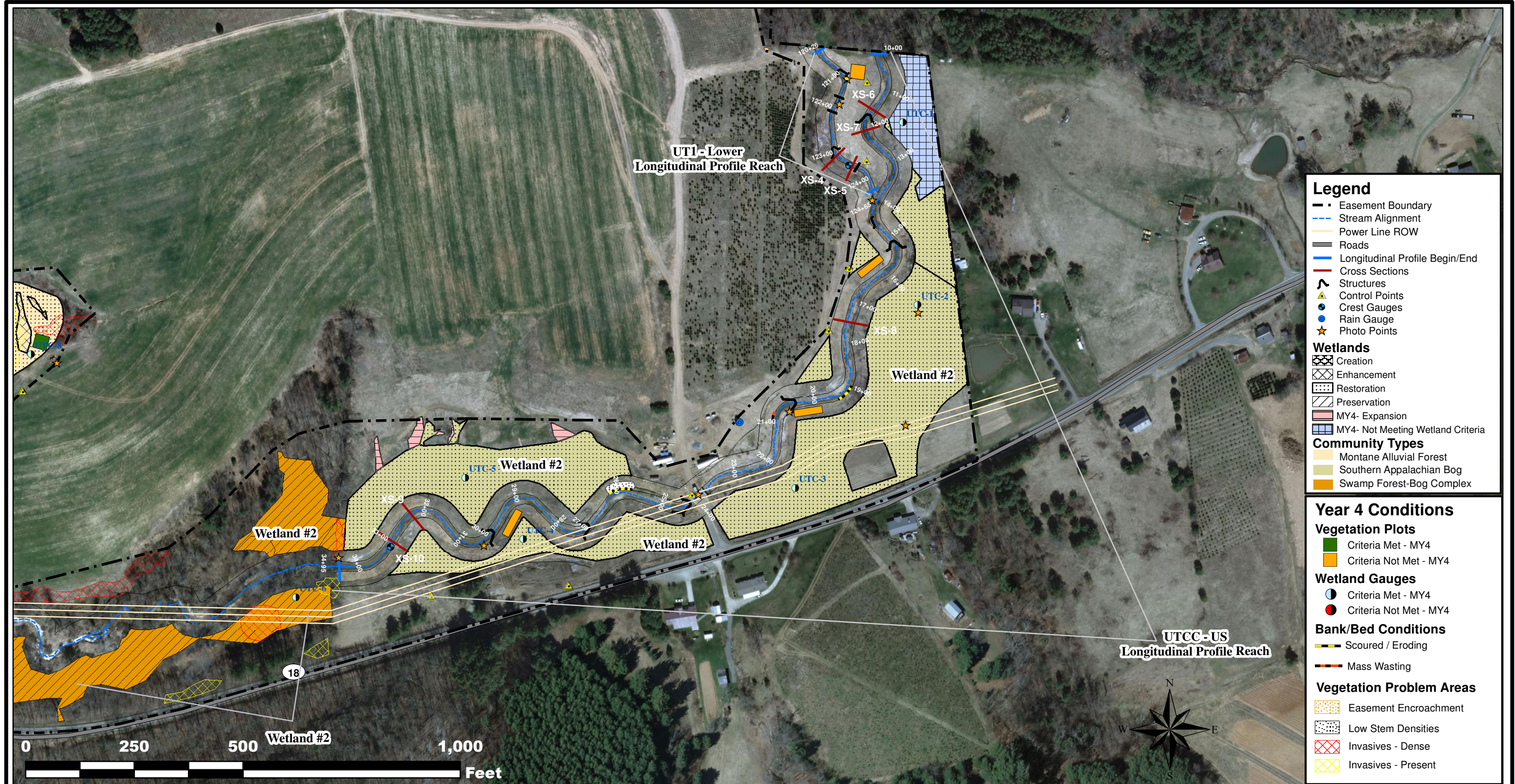
Prepared for	Project: UT to Crab Creek Stream and Wetland Restoration Year 4 Monitoring Alleghany County, North Carolina	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A. 2) NC OneMap 2010 Aerial Photo 3) Wetland boundaries updated using MY4 Wetland Boundary Delineation data	Prepared by
	Sheet 2 of 4		
	Date	Project Number	
	November 2013	NCEEP # 857	

Figure 2. Integrated Current Condition Plan View - Draft




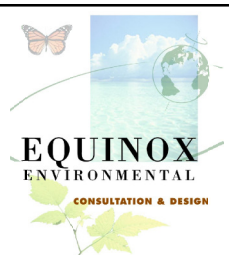
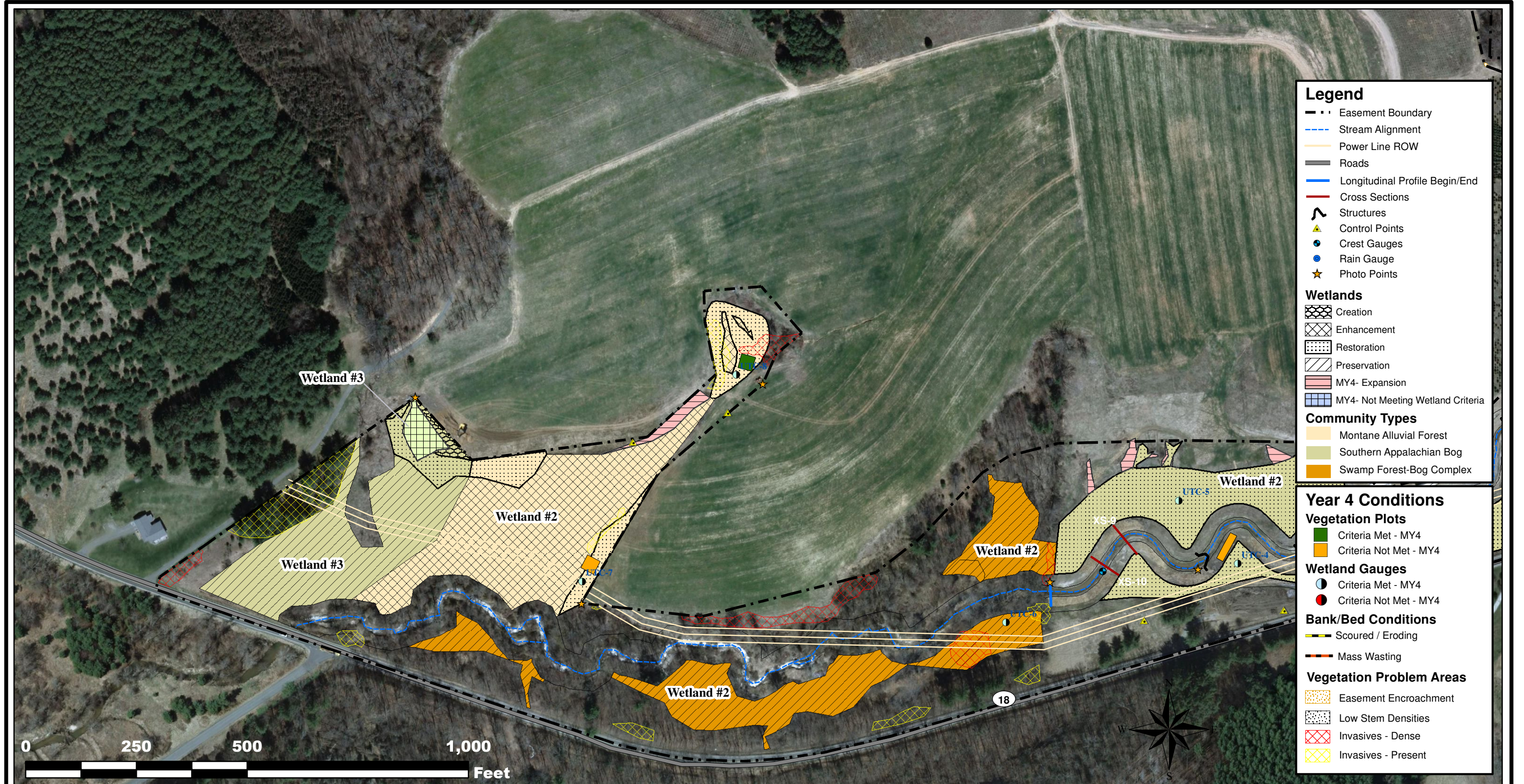
Prepared for	Project: UT to Crab Creek Stream and Wetland Restoration Year 4 Monitoring Alleghany County, North Carolina	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A. 2) NC OneMap 2010 Aerial Photo 3) Wetland boundaries updated using MY4 Wetland Boundary Delineation data	Prepared by
			
	Sheet 3 of 4		
	Date	Project Number	
	November 2013	NCEP # 857	

Figure 2. Integrated Current Condition Plan View - Draft




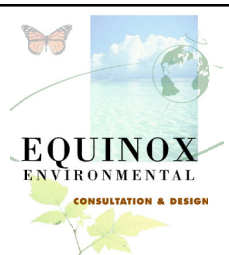
Prepared for	Project: UT to Crab Creek Stream and Wetland Restoration Year 4 Monitoring Alleghany County, North Carolina	Notes: 1) Base Map from CAD file "Crab_base_final" Provided by KCI Associates of NC P.A. 2) NC OneMap2010 Aerial Photo 3) Wetland boundaries updated using MY4 Wetland Boundary Delineation data	Prepared by
	Sheet 4 of 4		
	Date	Project Number	
	November 2013	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 ≥ 1.6).	20	20			100%			
		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.			3	125	97%	2	70	98%
	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%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse.			0	0	100%	0	0	100%
Totals					3	125	97%	2	70	98%
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 ≥ 1.6. Rootwads/logs providing some cover at base-flow.	15	15			100%			

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
	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							100%
		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.								
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%	0	0	100%		
3. Mass Wasting		Bank slumping, calving, or collapse.	0		0	100%	0	0	100%		
Totals					1	18	98%	0	0	98%	
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%				

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).			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 ≥ 1.6).	15	15			100%			
		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.			2	101	98%	0	0	98%
	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%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse.			1	21	100%	1	21	100%
Totals					3	122	98%	1	21	98%
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 ≥ 1.6. Rootwads/logs providing some cover at base-flow.	7	7			100%			

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	0.00	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	0.06	<1%
Totals			2	0.06	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	0.00	0%
Cumulative Totals			2	0.06	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)	20	1.63	3%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	Stipple Orange Dots White Background & ATV Trail	3	0.46	<1%

N/A - Item does not apply.



Unnamed Tributary 1 – Permanent Photo Station 1
Upstream



Unnamed Tributary 1 – Permanent Photo Station 2
Upstream



Unnamed Tributary 1 – Permanent Photo Station 3
Upstream



Unnamed Tributary 1 – Permanent Photo Station 3
Downstream



Unnamed Tributary 1 – Permanent Photo Station 4
Upstream



Unnamed Tributary 1 – Permanent Photo Station 5
Upstream



Unnamed Tributary 1 – Permanent Photo Station 6
Upstream



Unnamed Tributary 1 – Permanent Photo Station 7
Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 7
Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 7
Downstream



Wetland Area 2 – Permanent Photo Station 8
North



Wetland Area 2 – Permanent Photo Station 8
Southwest



Wetland Area 2 – Permanent Photo Station 9
North



Wetland Area 2 – Permanent Photo Station 9
West



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 10
Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 11
Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 11
Downstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 12
Upstream



Unnamed Tributary Crab Creek Upper – Permanent Photo Station 13
Upstream



Wetland Area 2 – Permanent Photo Station 14
West



Wetland Area 2 – Permanent Photo Station 15
Southwest



Wetland Area 3 – Permanent Photo Station 16
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	No	33%
2	Yes	
3	Yes	
4	No	
5	No	
6	No	
7	No	
8	No	
9	Yes	



Vegetation Monitoring Plot 1
Monitoring Year 4 – Aug 5, 2013



Vegetation Monitoring Plot 2
Monitoring Year 4 – Aug 5, 2013



Vegetation Monitoring Plot 3
Monitoring Year 4 – Aug 5, 2013



Vegetation Monitoring Plot 4
Monitoring Year 4 – Aug 5, 2013



Vegetation Monitoring Plot 5
Monitoring Year 4 – Aug 5, 2013



Vegetation Monitoring Plot 6
Monitoring Year 4 – Aug 5, 2013



Vegetation Monitoring Plot 7
Monitoring Year 4 – Aug 5, 2013



Vegetation Monitoring Plot 8
Monitoring Year 4 – Aug 5, 2013



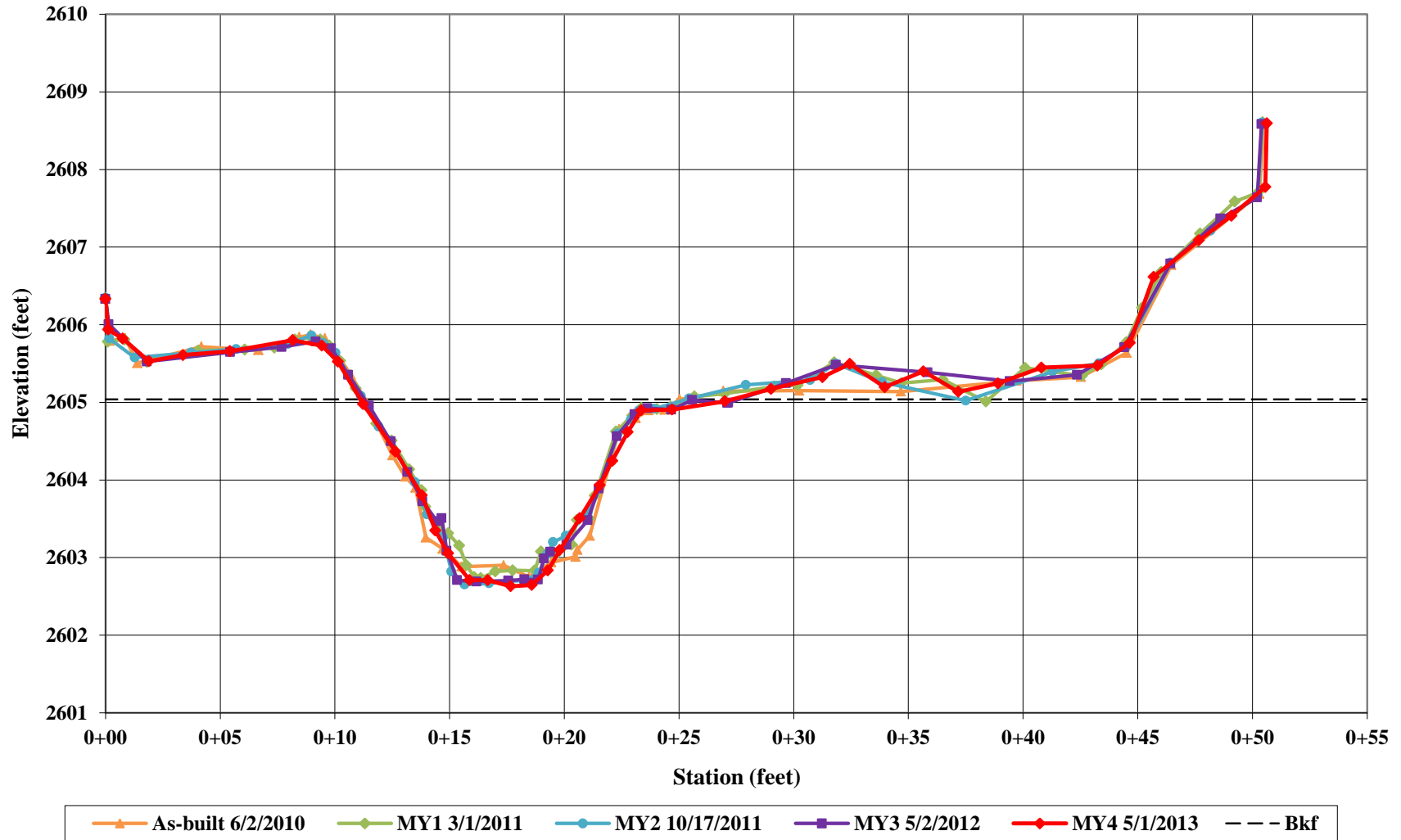
Vegetation Monitoring Plot 9
Monitoring Year 4 – Aug 5, 2013

Table 8. CVS Vegetation Plot Metadata UT Crab Creek - 857	
Report Prepared By	Owen Carson
Date Prepared	8/13/2013 10:39
Database Name	Equinox-2013-A-UTCrab-MY4.mdb
Database Location	Z:\ES\NRI&M\EEP Monitoring\UT Crab Creek\UTC-MY4-2013\Data\Veg
Computer Name	D16TNK71
File Size	46755840
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 (MY4 2013)																		Annual Means																												
Scientific Name	Common Name	Species Type	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			MY4 (2013)			MY3 (2012)			MY2 (2011)			MY1 (2010)			MY0 (2010)						
			P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all	P-no	L-S	P-all										
Acer rubrum	red maple	Tree																																														
Alnus serrulata	hazel alder	Shrub	1		9	7	7	7	8	8	8	2	2	2	2	2	46	4	4	22	1	1	15	4	4	4	6	6	6	35	35	119	35	35	133	32	32	89	21	21	50	11	11	11				
Aronia arbutifolia	Red Chokeberry	Shrub										1	1	1						6	6	6							7	7	7	8	8	8	8	8	8	8	8	8	8	6	6	6				
Aronia prunifolia																																																
Betula lenta var. lenta	sweet birch	Tree																											1	1	1	9	9	9	9	9	9	9	9	9	9	15	15	15				
Betula nigra	river birch	Tree																						2	2	2	3	3	3	5	5	5	5	5	5													
Carpinus caroliniana var. virginiana		Tree																																														
Cornus amomum	silky dogwood	Shrub			7									6		7																																
Ilex verticillata	common winterberry	Shrub				3	3	3				1	1	1	1	1	1	1	1	1									6	6	6	6	6	6	6	6	6	6	6	11	11	11	12	12	12	7	7	7
Lindera benzoin var. benzoin	northern spicebush	Shrub							1	1	1																																					
Nyssa sylvatica	blackgum	Tree				5	5	5																																								
Prunus serotina	black cherry	Tree																																														
Robinia pseudoacacia	black locust	Tree																																														
Rosa palustris	swamp rose	Shrub											8																																			
Salix nigra	black willow	Tree																																														
Sambucus canadensis	Common Elderberry	Shrub																																														
Unknown		Shrub or Tree																																														
Viburnum nudum	possumhaw	Shrub	2		2																																											
Stem count			3	3	18	15	15	15	9	9	9	4	4	18	3	3	54	5	5	23	7	7	34	6	6	8	9	9	11	61	61	190	66	66	232	73	73	143	84	84	117	100	100	100				
size (ares)			1			1			1			1			1			1			1			1			1			9			9			9			9			9			9			
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.22			0.22			0.22			0.22			0.22			0.22			
Species count			2	2	3	3	3	3	2	2	2	3	3	5	2	2	3	2	2	2	2	2	4	2	2	3	2	2	3	7	7	10	8	8	14	7	7	12	7	7	10	8	8	8				
Stems per ACRE			121.4	121.4	728.4	607	607	607	364.2	364.2	364.2	161.9	161.9	728.4	121.4	121.4	2185	202.3	202.3	930.8	283.3	283.3	1376	242.8	242.8	323.7	364.2	364.2	445.2	274.3	274.3	854.3	296.8	296.8	1043	328.2	328.2	643	377.7	377.7	526.1	449.7	449.7	449.7				
<div style="display: flex; flex-direction: column;"> <div style="background-color: #d4edda; padding: 2px;">Exceeds requirements by 10%</div> <div style="background-color: #fff3cd; padding: 2px;">Exceeds requirements, but by less than 10%</div> <div style="background-color: #f8d7da; padding: 2px;">Fails to meet requirements, by less than 10%</div> <div style="background-color: #f8d7da; padding: 2px;">Fails to meet requirements by more than 10%</div> </div>																																																

Appendix D
Stream Survey Data

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





Cross-Section 1 – Riffle
Left Bank Descending
Monitoring Year 4 – May 1, 2013



Cross-Section 1 – Riffle
Right Bank Descending
Monitoring Year 4 – May 1, 2013

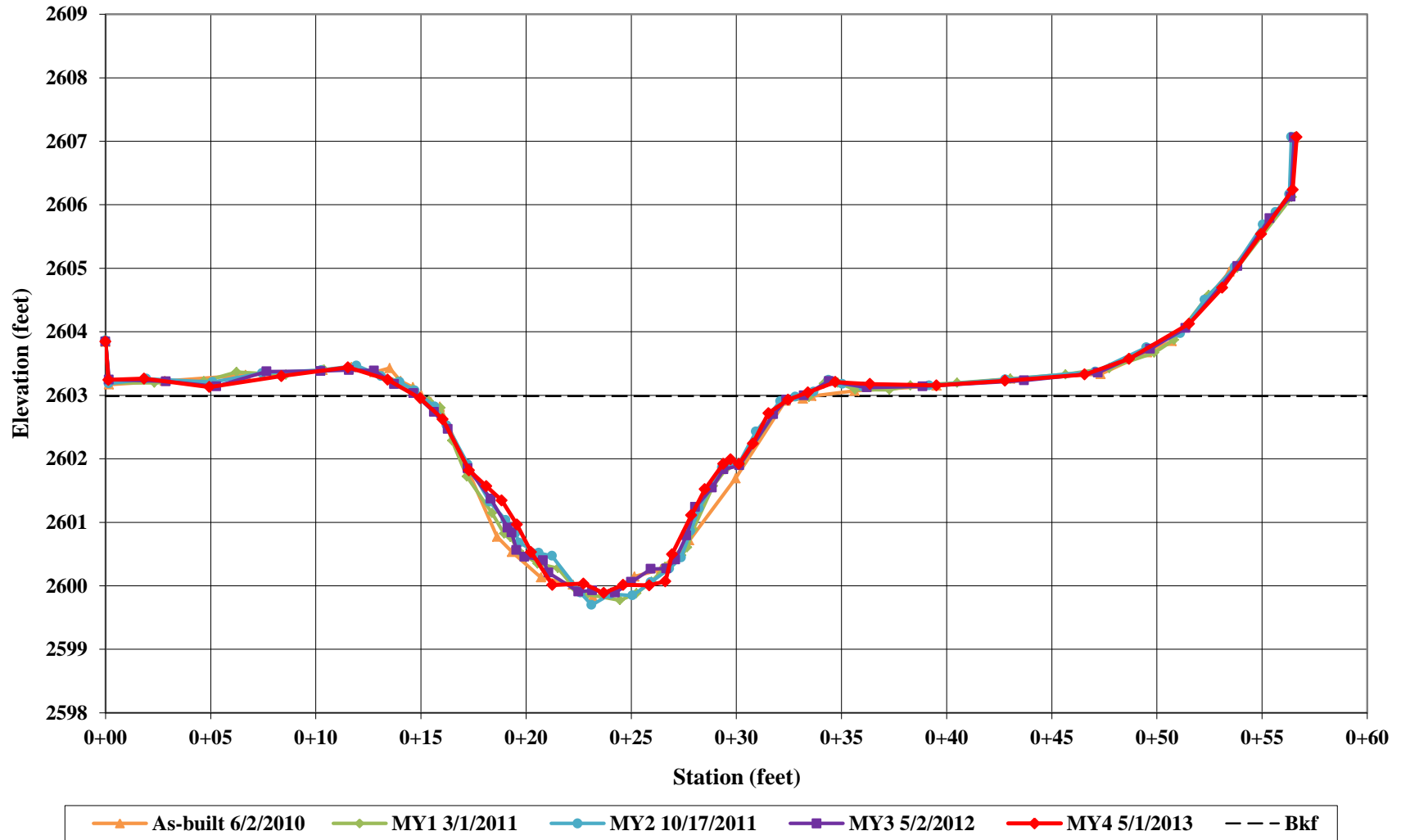


Cross-Section 1 – Riffle
Downstream
Monitoring Year 4 – May 1, 2013



Cross-Section 1 – Riffle
Upstream
Monitoring Year 4 – May 1, 2013

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





Cross-Section 2 – Pool
Left Bank Descending
Monitoring Year 4 – May 1, 2013



Cross-Section 2 – Pool
Right Bank Descending
Monitoring Year 4 – May 1, 2013

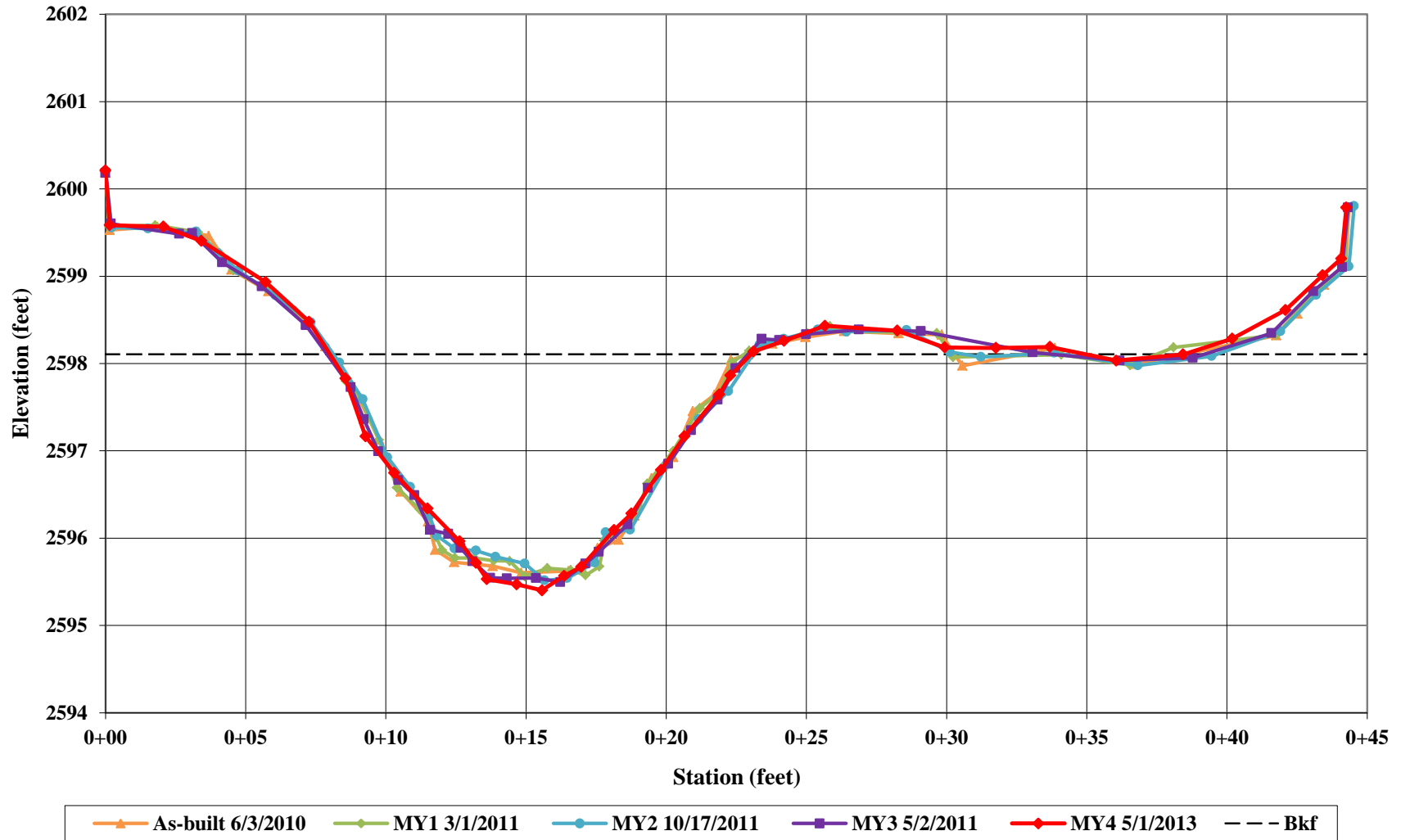


Cross-Section 2 – Pool
Downstream
Monitoring Year 4 – May 1, 2013



Cross-Section 2 – Pool
Upstream
Monitoring Year 4 – May 1, 2013

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





Cross-Section 3 – Riffle
Left Bank Descending
Monitoring Year 4 – May 1, 2013



Cross-Section 3 – Riffle
Right Bank Descending
Monitoring Year 4 – May 1, 2013

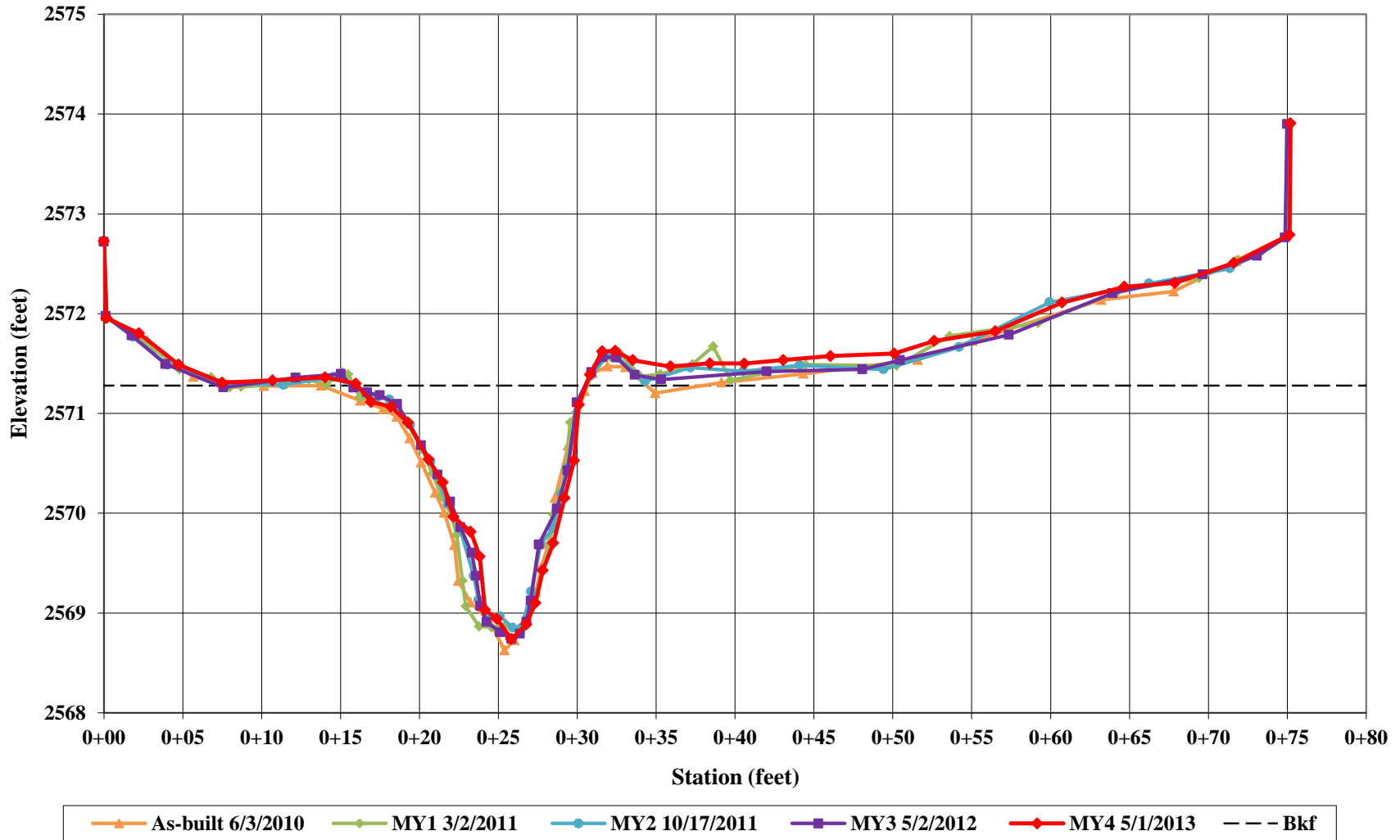


Cross-Section 3 – Riffle
Downstream
Monitoring Year 4 – May 1, 2013



Cross-Section 3 – Riffle
Upstream
Monitoring Year 4 – May 1, 2013

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





Cross-Section 4 – Pool
Left Bank Descending
Monitoring Year 4 – May 1, 2013



Cross-Section 4 – Pool
Right Bank Descending
Monitoring Year 4 – May 1, 2013

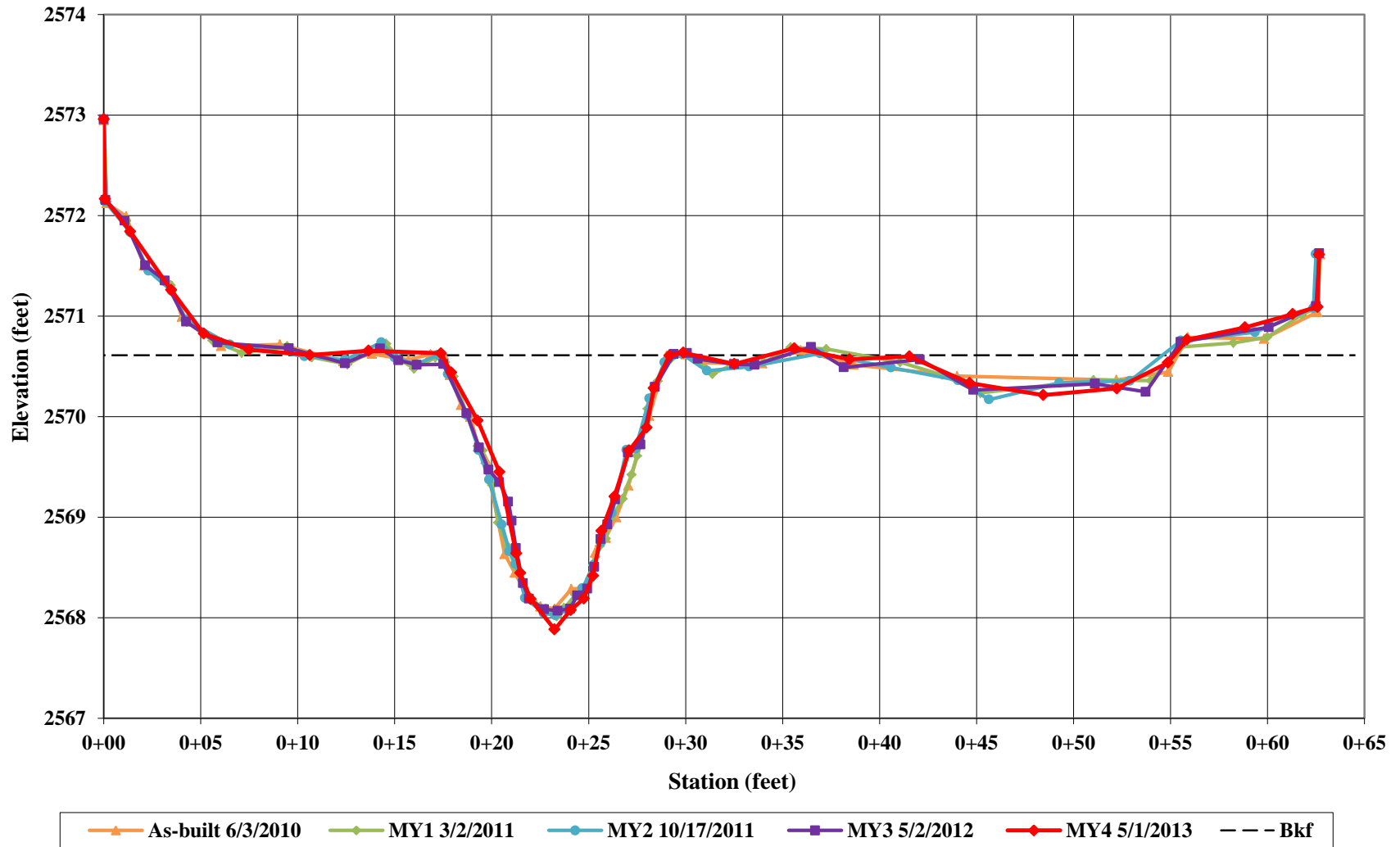


Cross-Section 4 – Pool
Downstream
Monitoring Year 4 – May 1, 2013



Cross-Section 4 – Pool
Upstream
Monitoring Year 4 – May 1, 2013

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





Cross-Section 5 – Riffle
Left Bank Descending
Monitoring Year 4 – May 1, 2013



Cross-Section 5 – Riffle
Right Bank Descending
Monitoring Year 4 – May 1, 2013

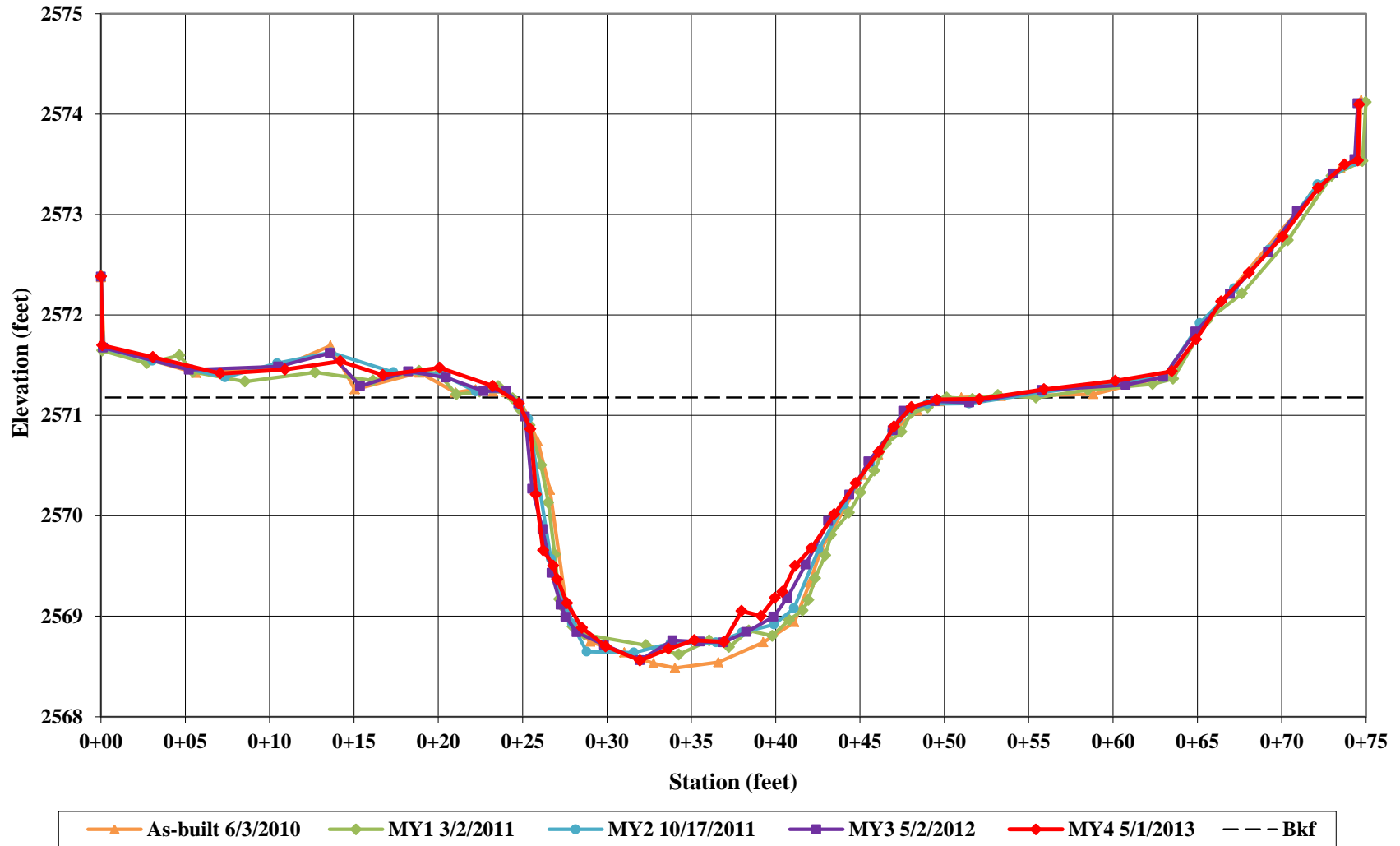


Cross-Section 5 – Riffle
Downstream
Monitoring Year 4 – May 1, 2013



Cross-Section 5 – Riffle
Upstream
Monitoring Year 4 – May 1, 2013

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





Cross-Section 6 – Riffle
Left Bank Descending
Monitoring Year 4 – May 1, 2013



Cross-Section 6 – Riffle
Right Bank Descending
Monitoring Year 4 – May 1, 2013

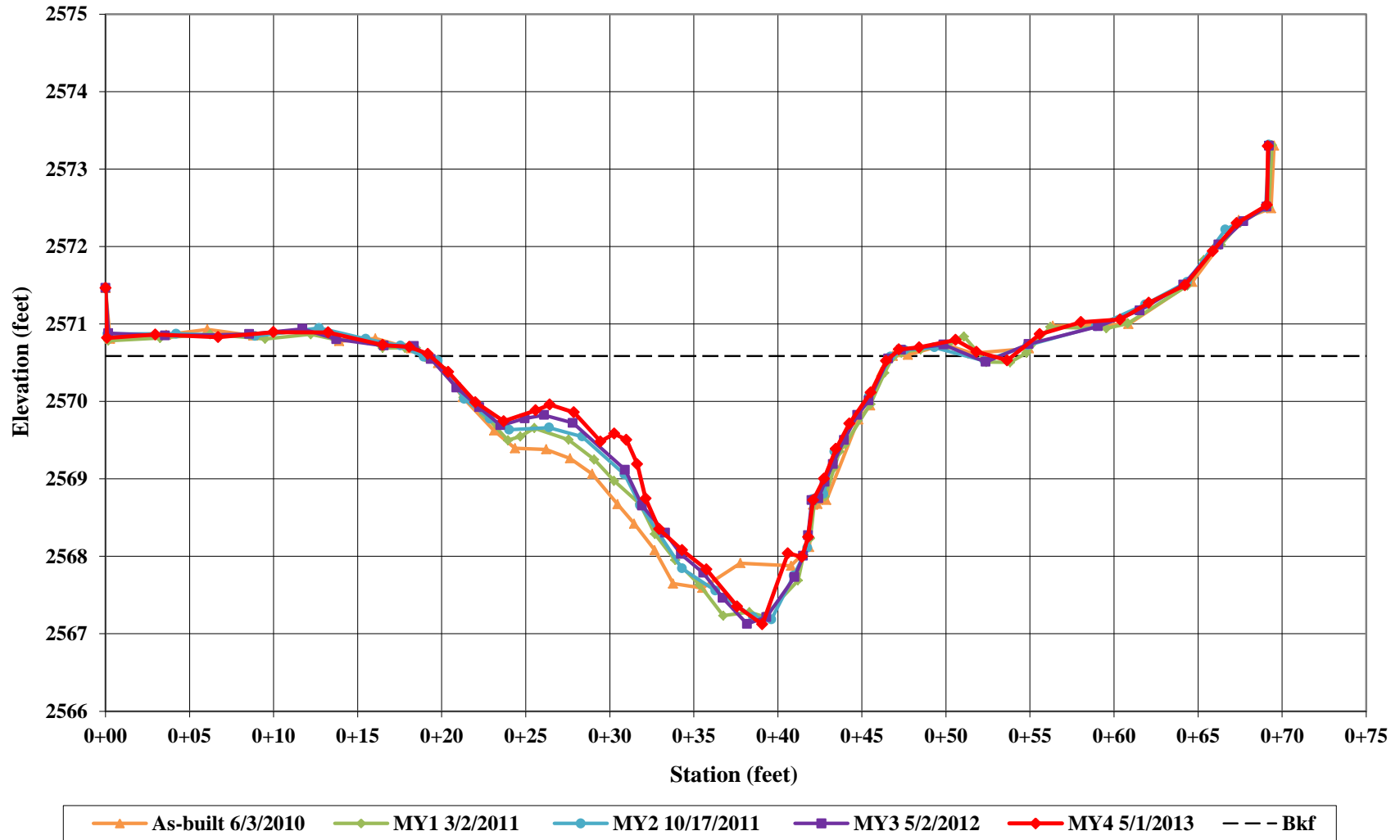


Cross-Section 6 – Riffle
Downstream
Monitoring Year 4 – May 1, 2013



Cross-Section 6 – Riffle
Upstream
Monitoring Year 4 – May 1, 2013

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





Cross-Section 7 – Pool
Left Bank Descending
Monitoring Year 4 – May 1, 2013



Cross-Section 7 – Pool
Right Bank Descending
Monitoring Year 4 – May 1, 2013

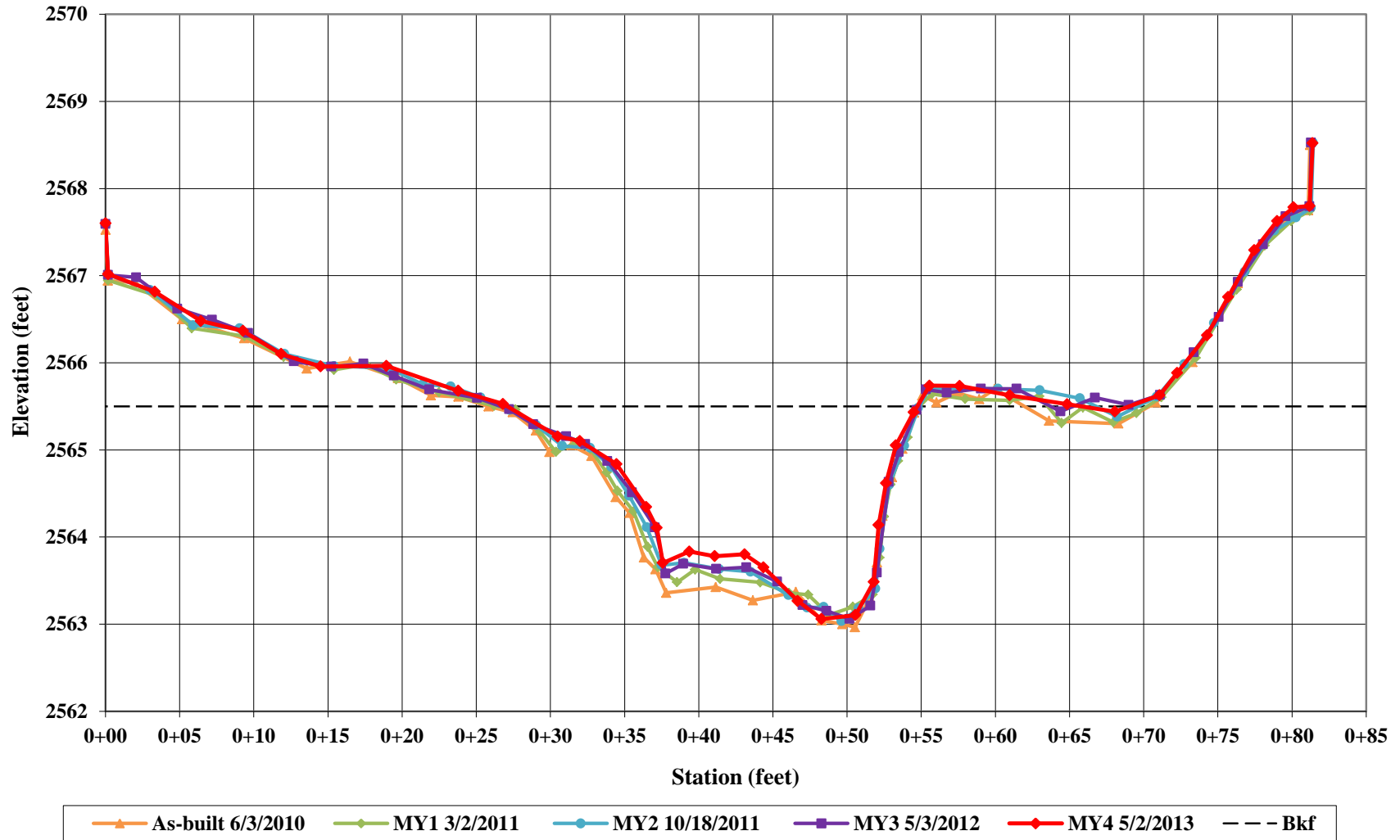


Cross-Section 7 – Pool
Downstream
Monitoring Year 4 – May 1, 2013



Cross-Section 7 – Pool
Upstream
Monitoring Year 4 – May 1, 2013

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





Cross-Section 8 – Riffle
Left Bank Descending
Monitoring Year 4 – May 2, 2013



Cross-Section 8 – Riffle
Right Bank Descending
Monitoring Year 4 – May 2, 2013

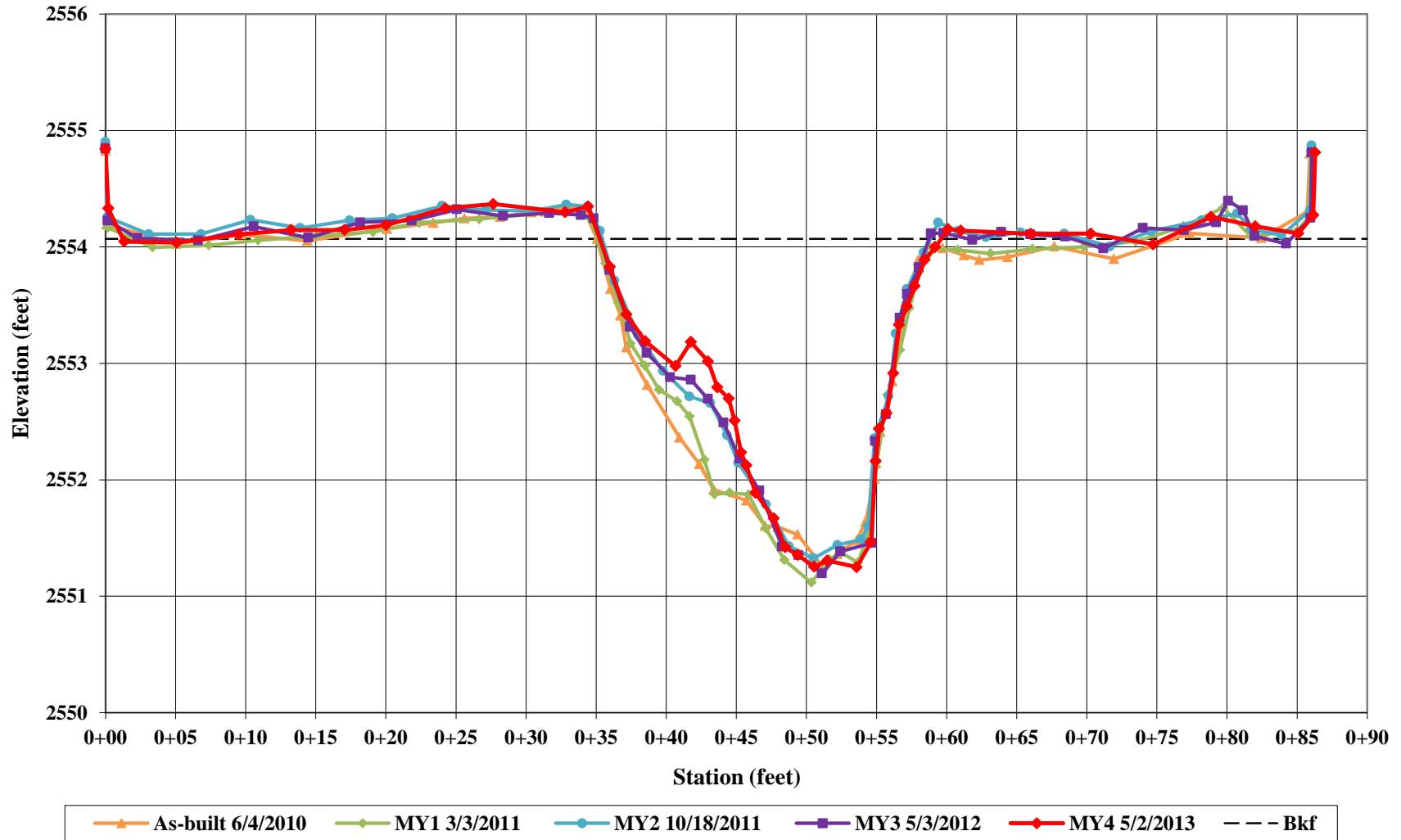


Cross-Section 8 – Riffle
Downstream
Monitoring Year 4 – May 2, 2013



Cross-Section 8 – Riffle
Upstream
Monitoring Year 4 – May 2, 2013

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





Cross-Section 9 – Pool
Left Bank Descending
Monitoring Year 4 – May 2, 2013



Cross-Section 9 – Pool
Right Bank Descending
Monitoring Year 4 – May 2, 2013

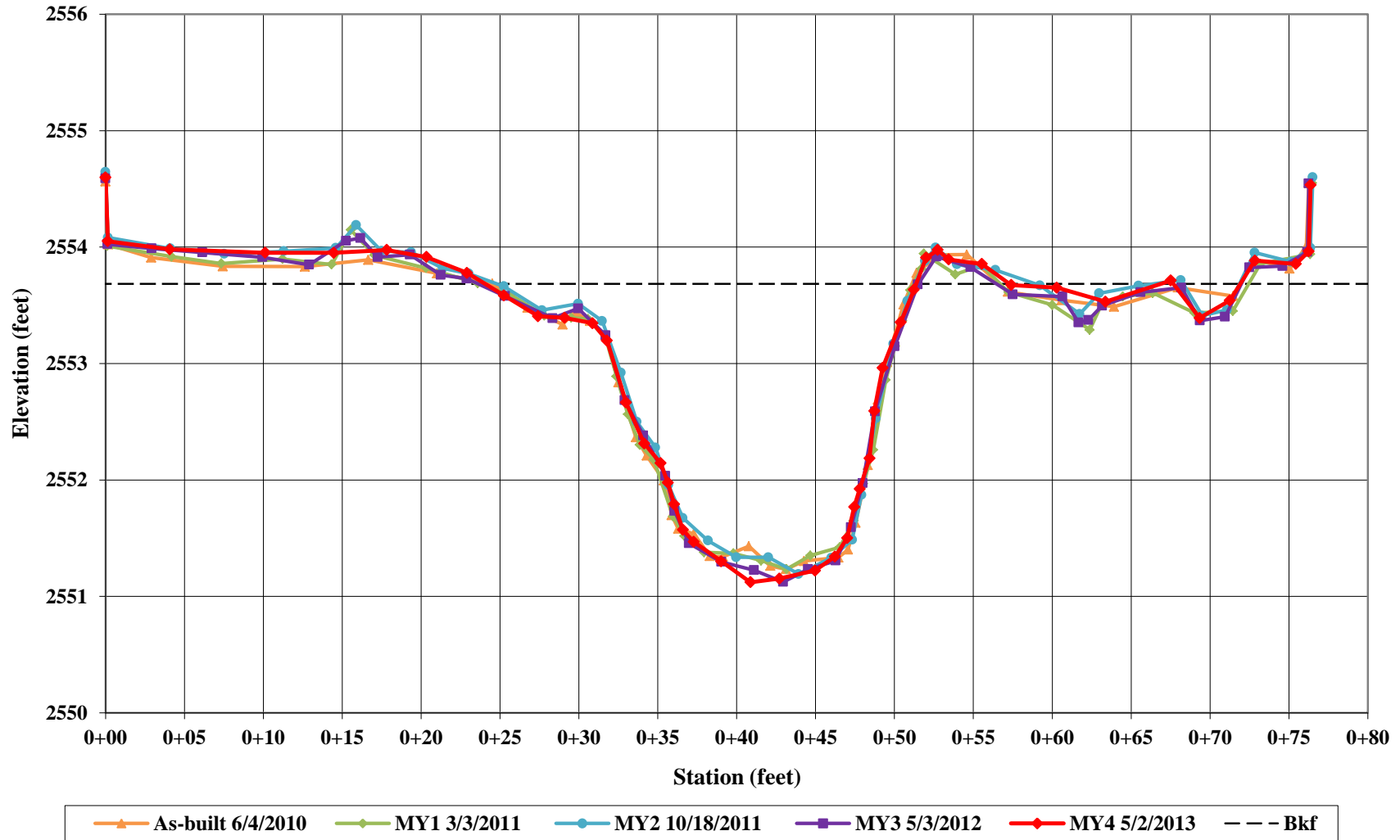


Cross-Section 9 – Pool
Downstream
Monitoring Year 4 – May 2, 2013



Cross-Section 9 – Pool
Upstream
Monitoring Year 4 – May 2, 2013

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





Cross-Section 10 – Riffle
Left Bank Descending
Monitoring Year 4 – May 2, 2013



Cross-Section 10 – Riffle
Right Bank Descending
Monitoring Year 4 – May 2, 2013



Cross-Section 10 – Riffle
Downstream
Monitoring Year 4 – May 2, 2013



Cross-Section 10 – Riffle
Upstream
Monitoring Year 4 – May 2, 2013

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



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

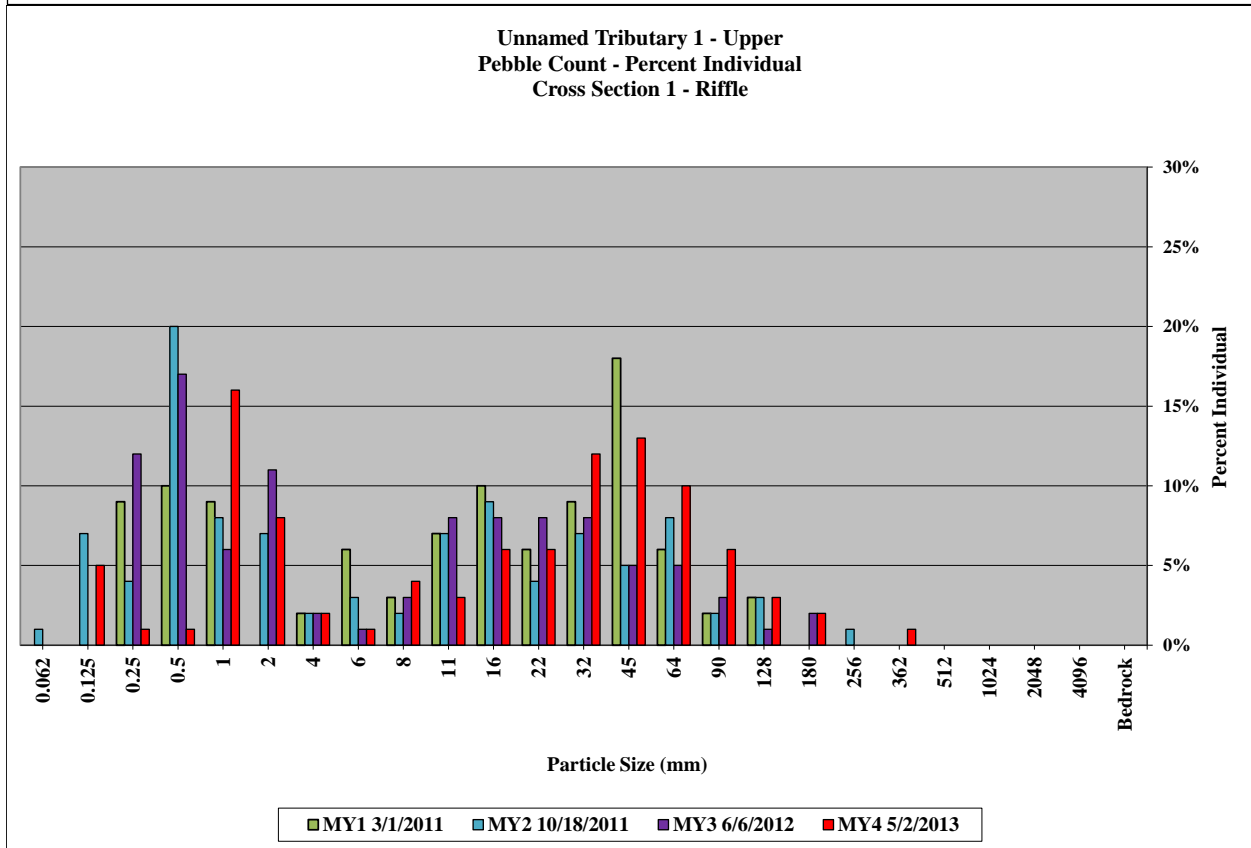
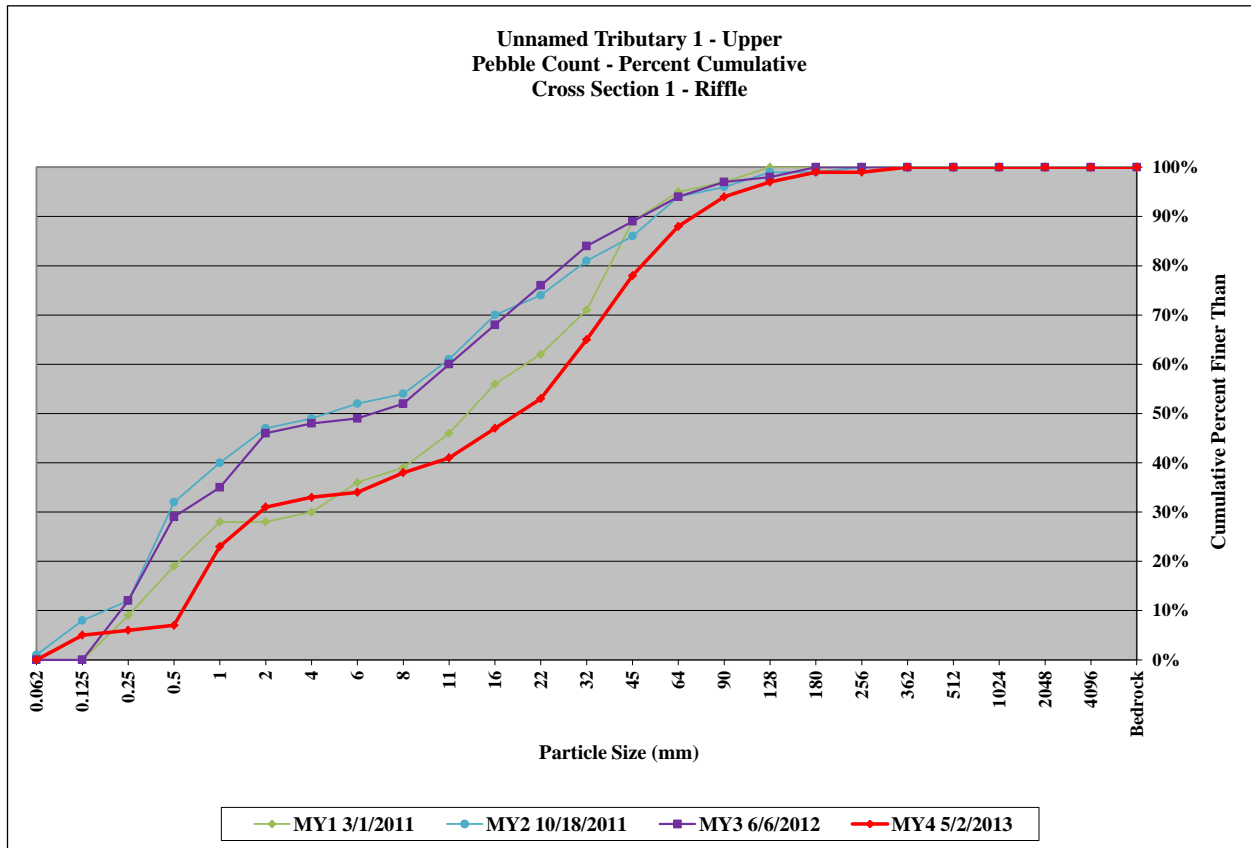


**UT to Crab Creek- Upstream
Longitudinal Profile
Stationing 10+02 - 34+57**



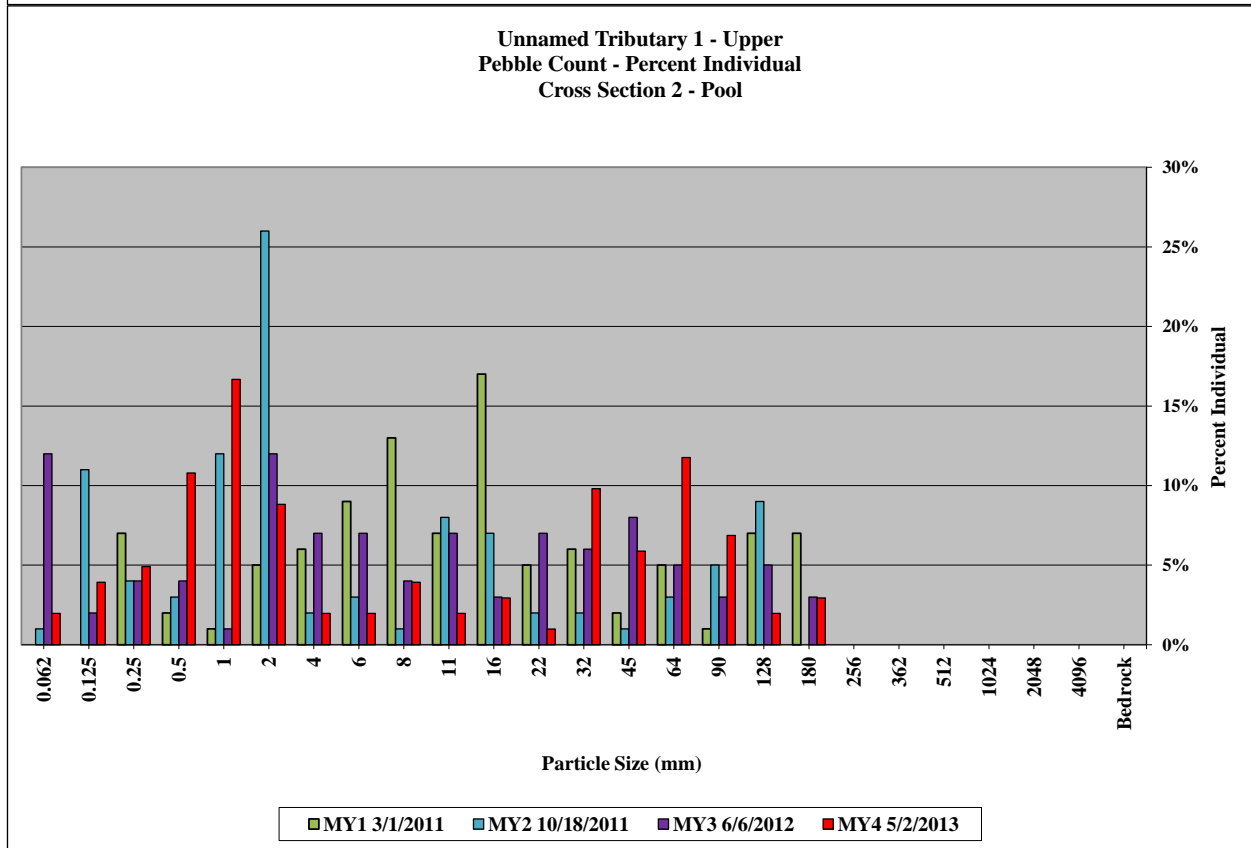
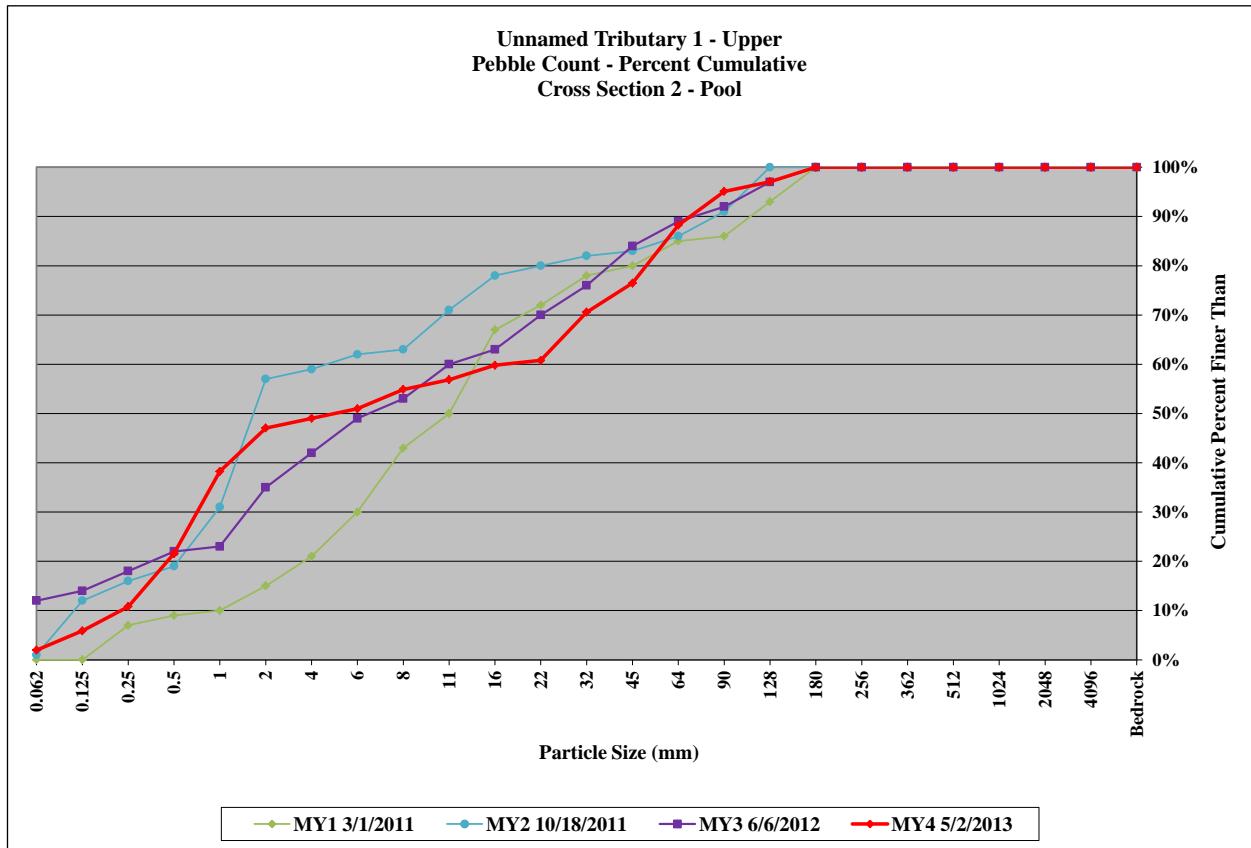
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Upper - Cross-Section 1 - Riffle					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	5	5%	5%
	fine sand	0.25	1	1%	6%
	medium sand	0.50	1	1%	7%
	coarse sand	1.00	16	16%	23%
	very coarse sand	2.00	8	8%	31%
Gravel	very fine gravel	4.0	2	2%	33%
	fine gravel	5.7	1	1%	34%
	fine gravel	8.0	4	4%	38%
	medium gravel	11.3	3	3%	41%
	medium gravel	16.0	6	6%	47%
	coarse gravel	22.3	6	6%	53%
	coarse gravel	32	12	12%	65%
	very coarse gravel	45	13	13%	78%
Cobble	very coarse gravel	64	10	10%	88%
	small cobble	90	6	6%	94%
	medium cobble	128	3	3%	97%
	large cobble	180	2	2%	99%
Boulder	very large cobble	256	0	0%	99%
	small boulder	362	1	1%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	very large boulder	4096	0	0%	100%
	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	19
D84	56
D95	100



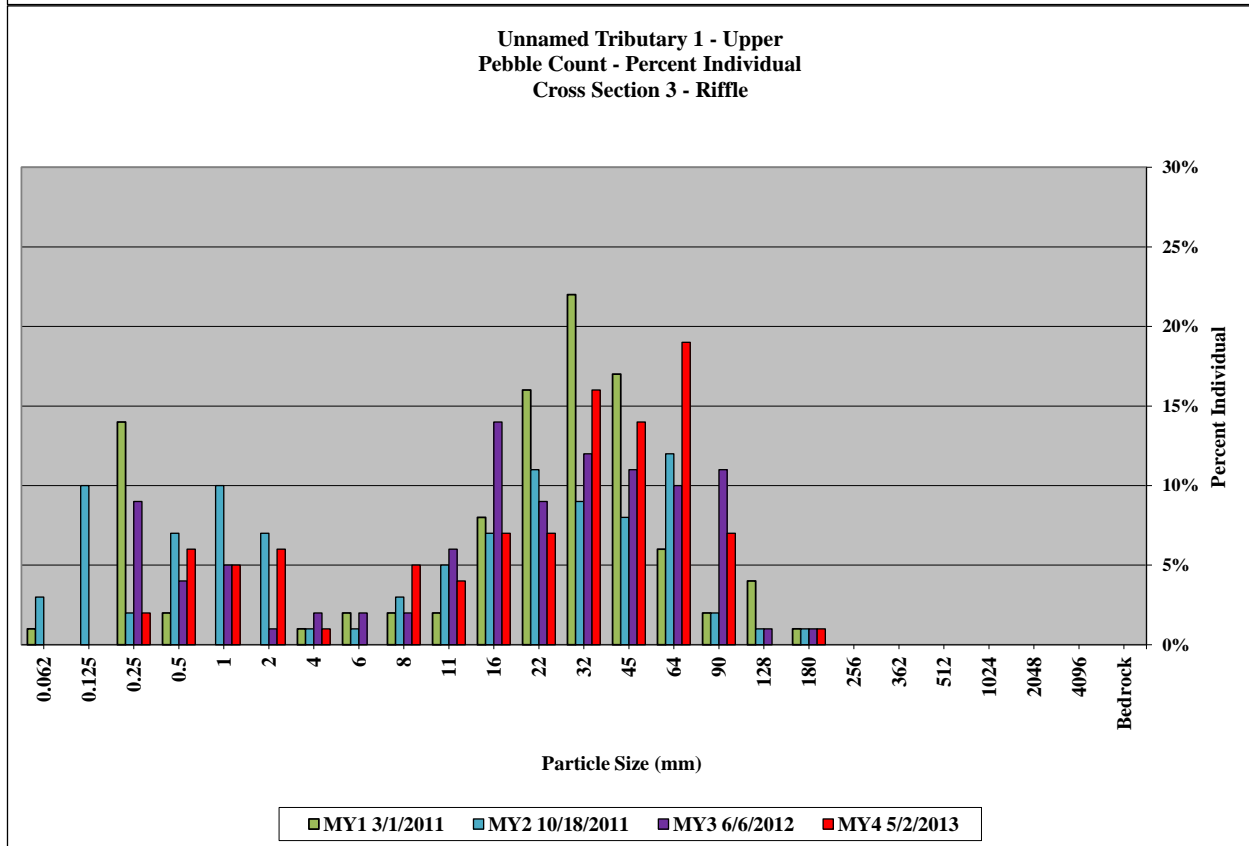
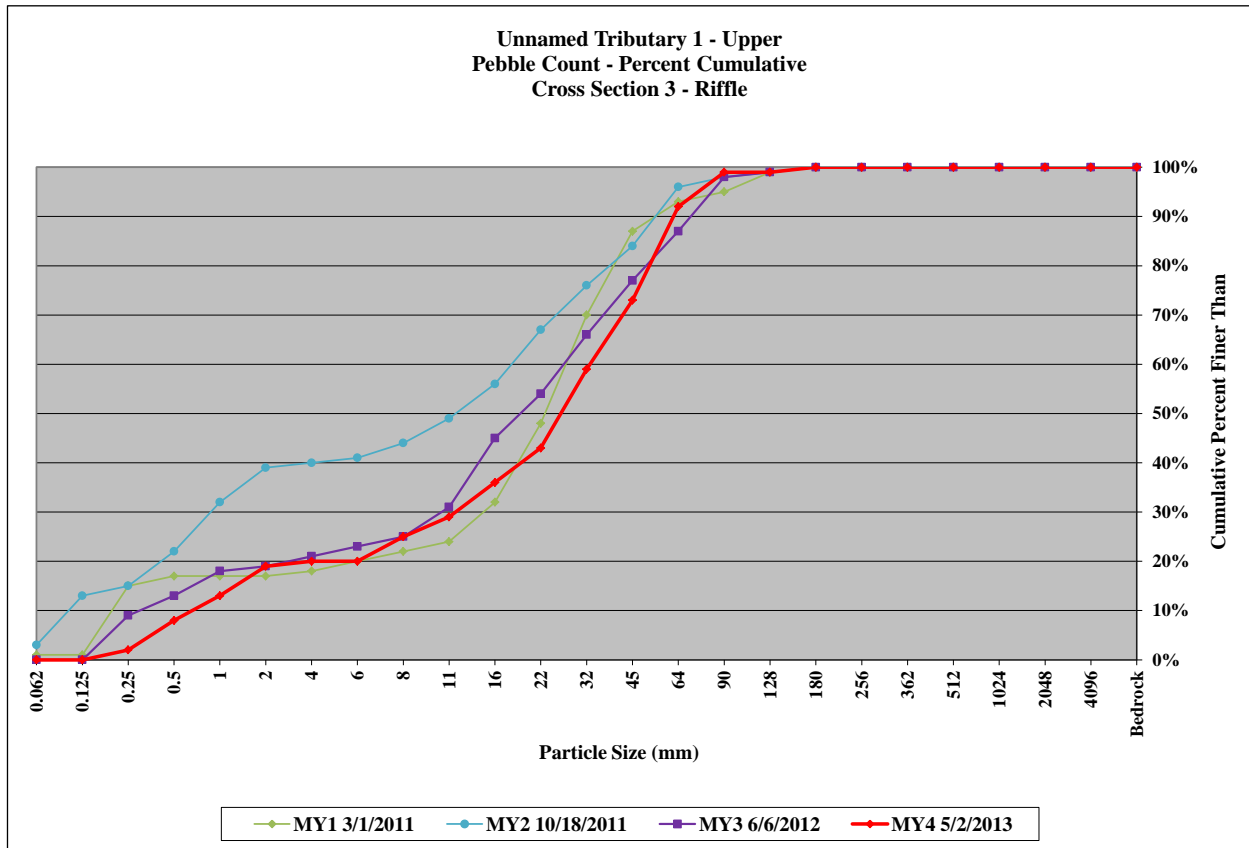
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Upper - Cross-Section 2 - Pool					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	2	2%	2%
Sand	very fine sand	0.125	4	4%	6%
	fine sand	0.25	5	5%	11%
	medium sand	0.50	11	11%	22%
	coarse sand	1.00	17	17%	39%
	very coarse sand	2.00	9	9%	48%
Gravel	very fine gravel	4.0	2	2%	50%
	fine gravel	5.7	2	2%	52%
	fine gravel	8.0	4	4%	56%
	medium gravel	11.3	2	2%	58%
	medium gravel	16.0	3	3%	61%
	coarse gravel	22.3	1	1%	62%
	coarse gravel	32	10	10%	72%
	very coarse gravel	45	6	6%	78%
Cobble	very coarse gravel	64	12	12%	90%
	small cobble	90	7	7%	97%
	medium cobble	128	2	2%	99%
	large cobble	180	3	3%	102%
Boulder	very large cobble	256	0	0%	102%
	small boulder	362	0	0%	102%
	small boulder	512	0	0%	102%
	medium boulder	1024	0	0%	102%
	large boulder	2048	0	0%	102%
Bedrock	very large boulder	4096	0	0%	102%
	bedrock	>4096	0	0%	102%
TOTALS			102	102%	102%

Summary Data	
D50	4.9
D84	56
D95	90



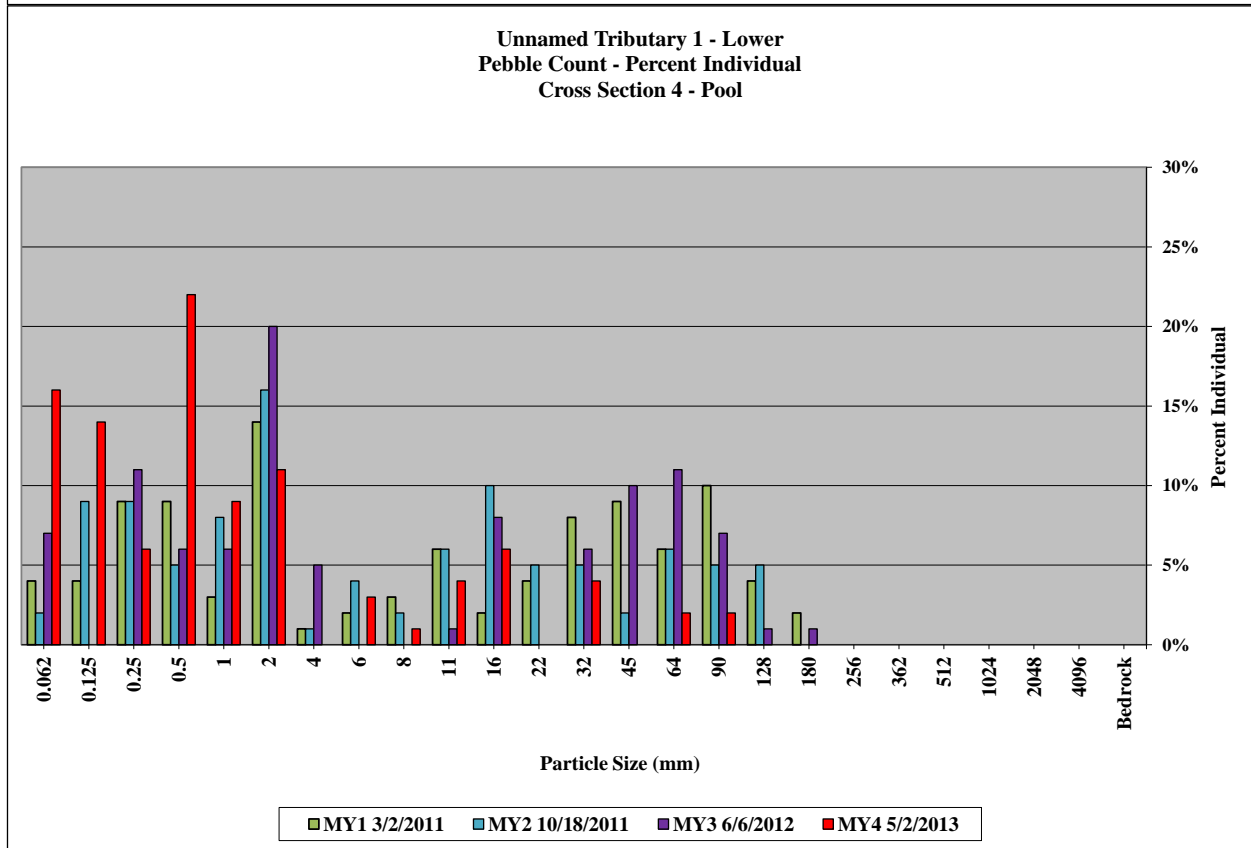
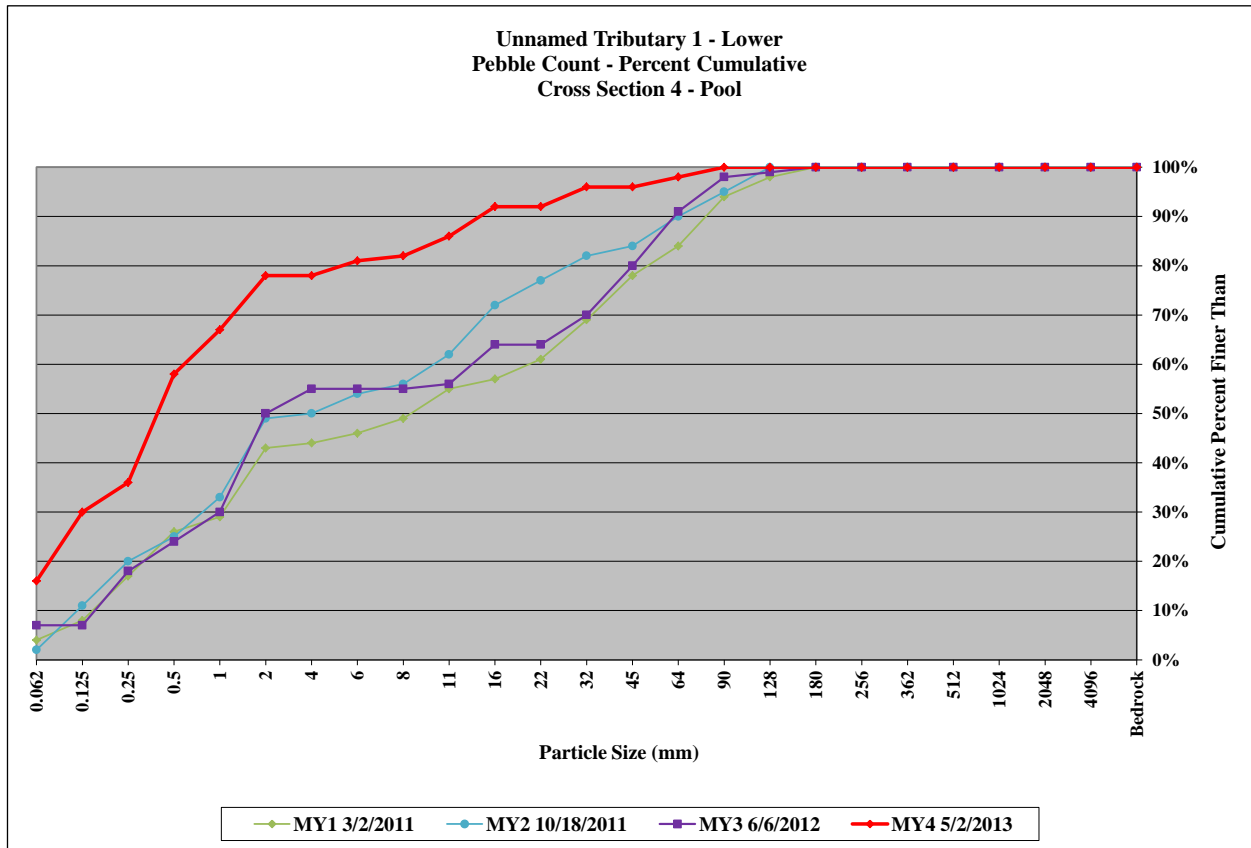
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Upper - Cross-Section 3 - Riffle					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	0	0%	0%
	fine sand	0.25	2	2%	2%
	medium sand	0.50	6	6%	8%
	coarse sand	1.00	5	5%	13%
	very coarse sand	2.00	6	6%	19%
Gravel	very fine gravel	4.0	1	1%	20%
	fine gravel	5.7	0	0%	20%
	fine gravel	8.0	5	5%	25%
	medium gravel	11.3	4	4%	29%
	medium gravel	16.0	7	7%	36%
	coarse gravel	22.3	7	7%	43%
	coarse gravel	32	16	16%	59%
	very coarse gravel	45	14	14%	73%
Cobble	very coarse gravel	64	19	19%	92%
	small cobble	90	7	7%	99%
	medium cobble	128	0	0%	99%
	large cobble	180	1	1%	100%
Boulder	very large cobble	256	0	0%	100%
	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	very large boulder	4096	0	0%	100%
	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	26
D84	55
D95	74



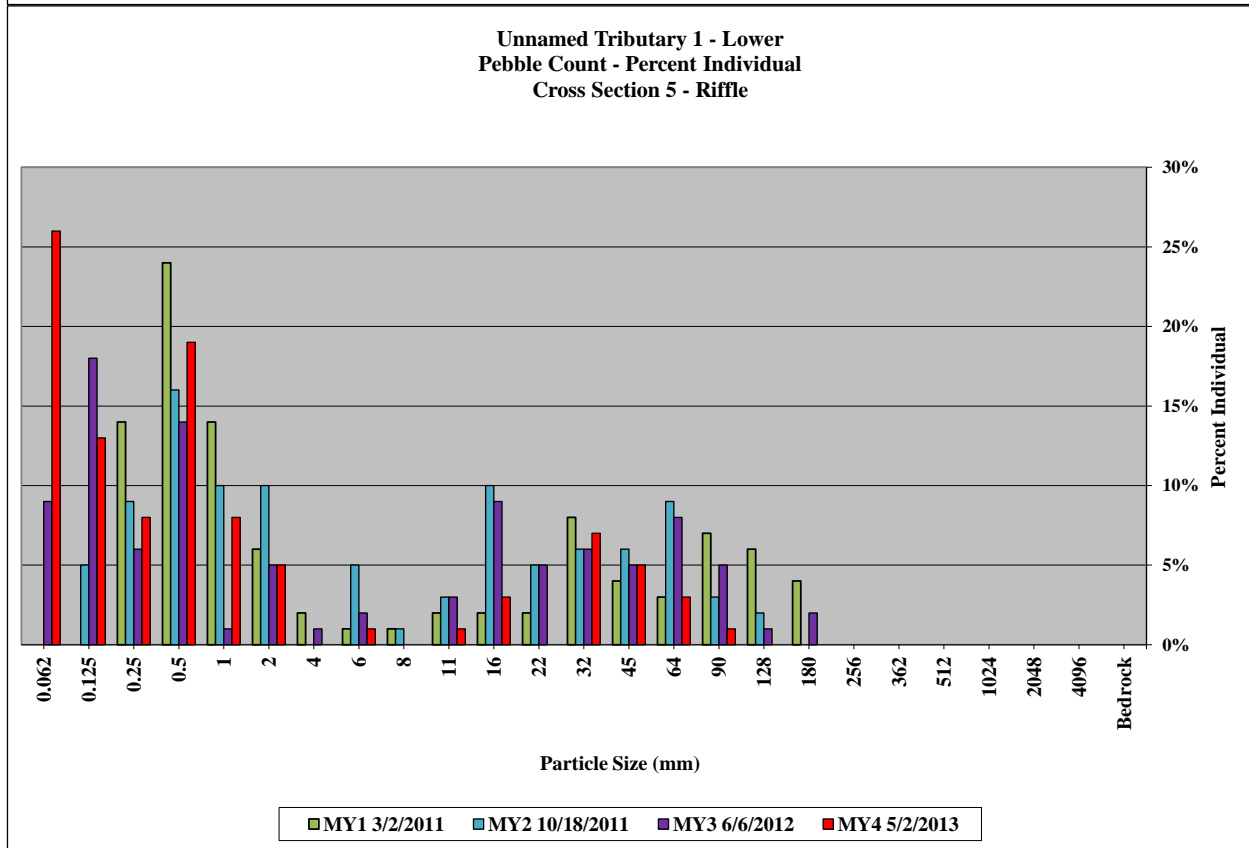
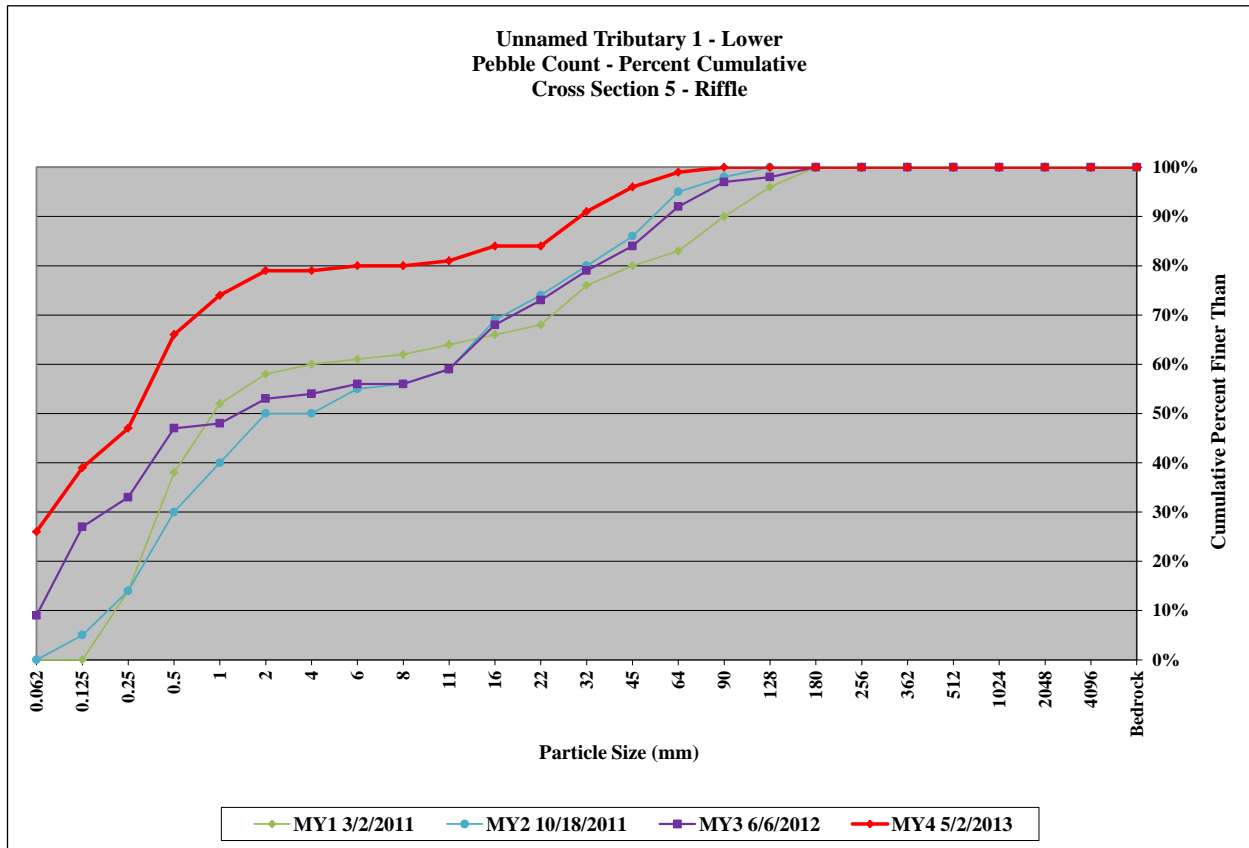
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Lower - Cross-Section 4 - Pool					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	16	16%	16%
Sand	very fine sand	0.125	14	14%	30%
	fine sand	0.25	6	6%	36%
	medium sand	0.50	22	22%	58%
	coarse sand	1.00	9	9%	67%
	very coarse sand	2.00	11	11%	78%
Gravel	very fine gravel	4.0	0	0%	78%
	fine gravel	5.7	3	3%	81%
	fine gravel	8.0	1	1%	82%
	medium gravel	11.3	4	4%	86%
	medium gravel	16.0	6	6%	92%
	coarse gravel	22.3	0	0%	92%
	coarse gravel	32	4	4%	96%
	very coarse gravel	45	0	0%	96%
	very coarse gravel	64	2	2%	98%
Cobble	small cobble	90	2	2%	100%
	medium cobble	128	0	0%	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	0.4
D84	9.4
D95	29



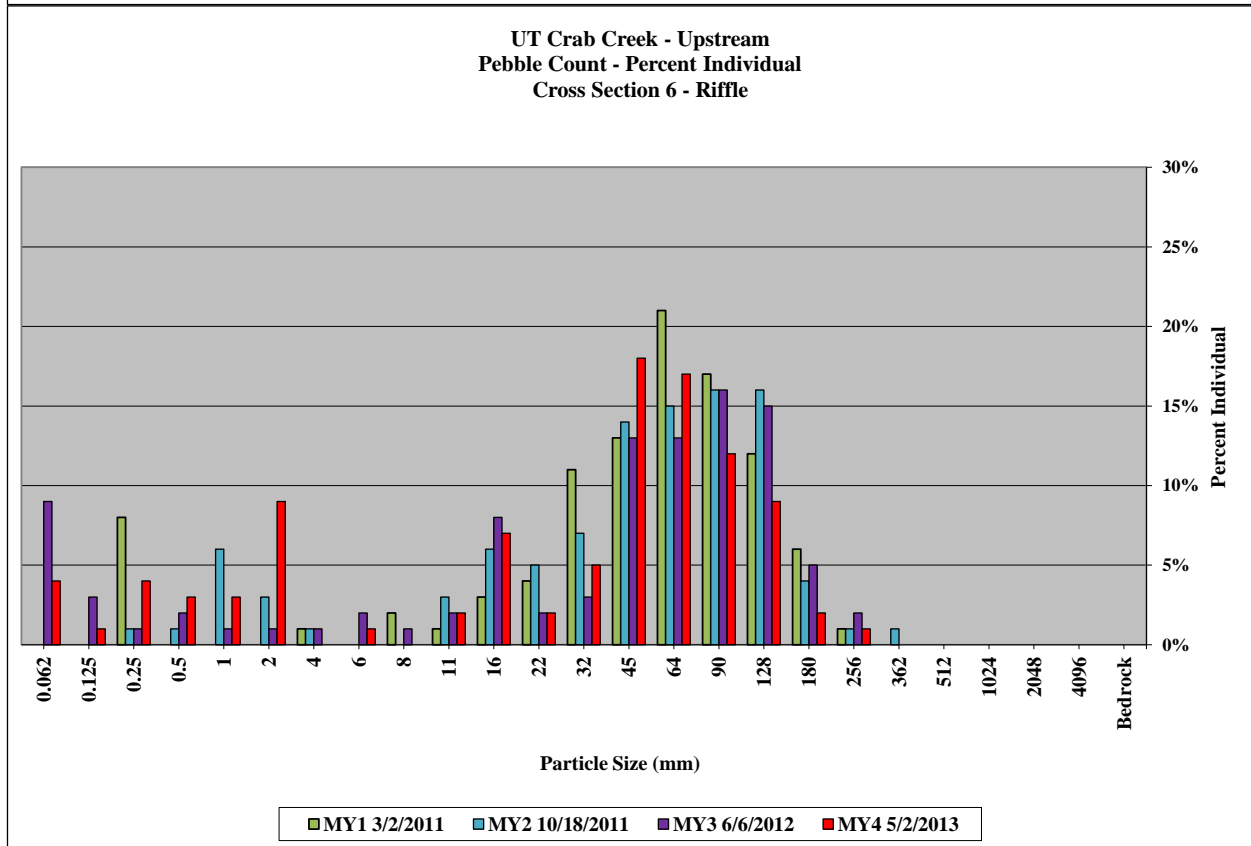
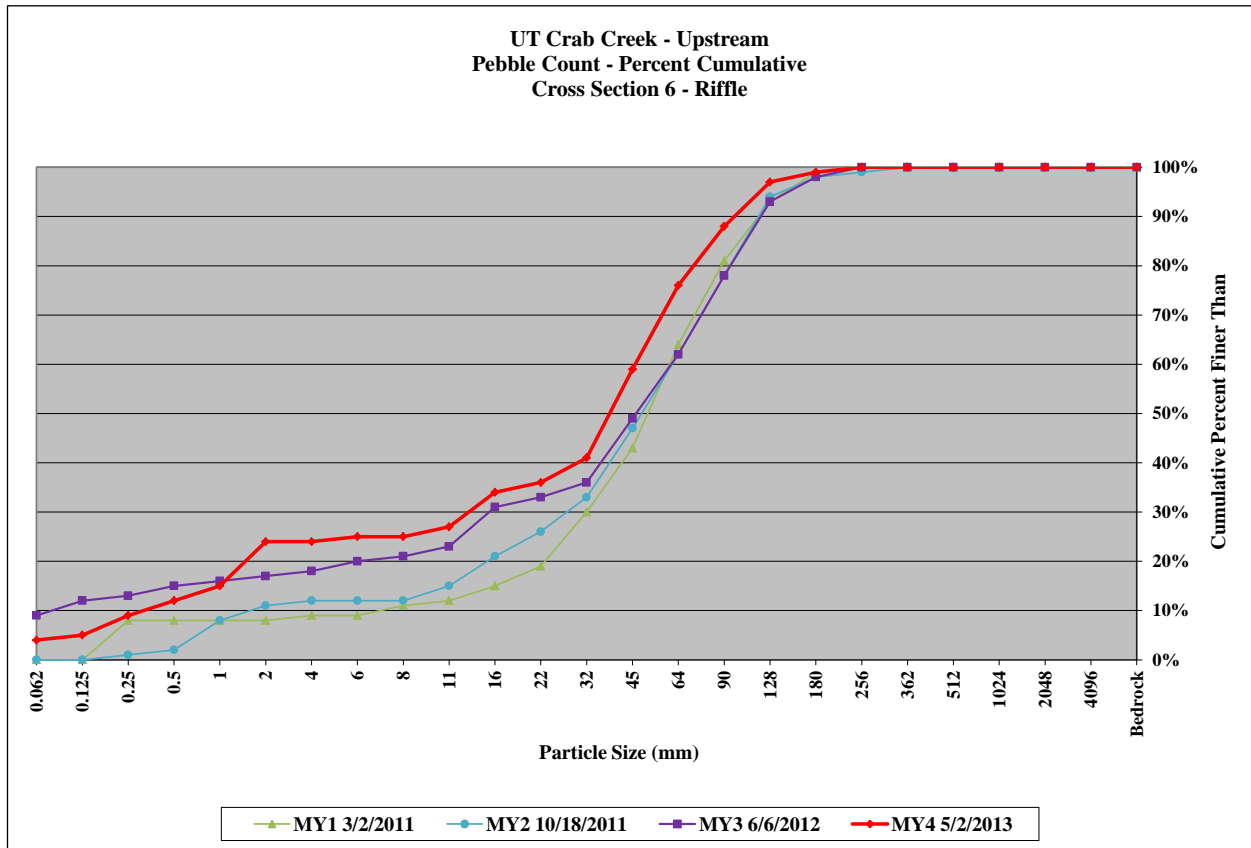
UT Crab Creek Stream & Wetland / Project No. 857					
UT1 - Lower - Cross-Section 5 - Riffle					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	26	26%	26%
Sand	very fine sand	0.125	13	13%	39%
	fine sand	0.25	8	8%	47%
	medium sand	0.50	19	19%	66%
	coarse sand	1.00	8	8%	74%
	very coarse sand	2.00	5	5%	79%
Gravel	very fine gravel	4.0	0	0%	79%
	fine gravel	5.7	1	1%	80%
	fine gravel	8.0	0	0%	80%
	medium gravel	11.3	1	1%	81%
	medium gravel	16.0	3	3%	84%
	coarse gravel	22.3	0	0%	84%
	coarse gravel	32	7	7%	91%
	very coarse gravel	45	5	5%	96%
Cobble	very coarse gravel	64	3	3%	99%
	small cobble	90	1	1%	100%
	medium cobble	128	0	0%	100%
	large cobble	180	0	0%	100%
Boulder	very large cobble	256	0	0%	100%
	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	very large boulder	4096	0	0%	100%
	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	0.06
D84	22
D95	42



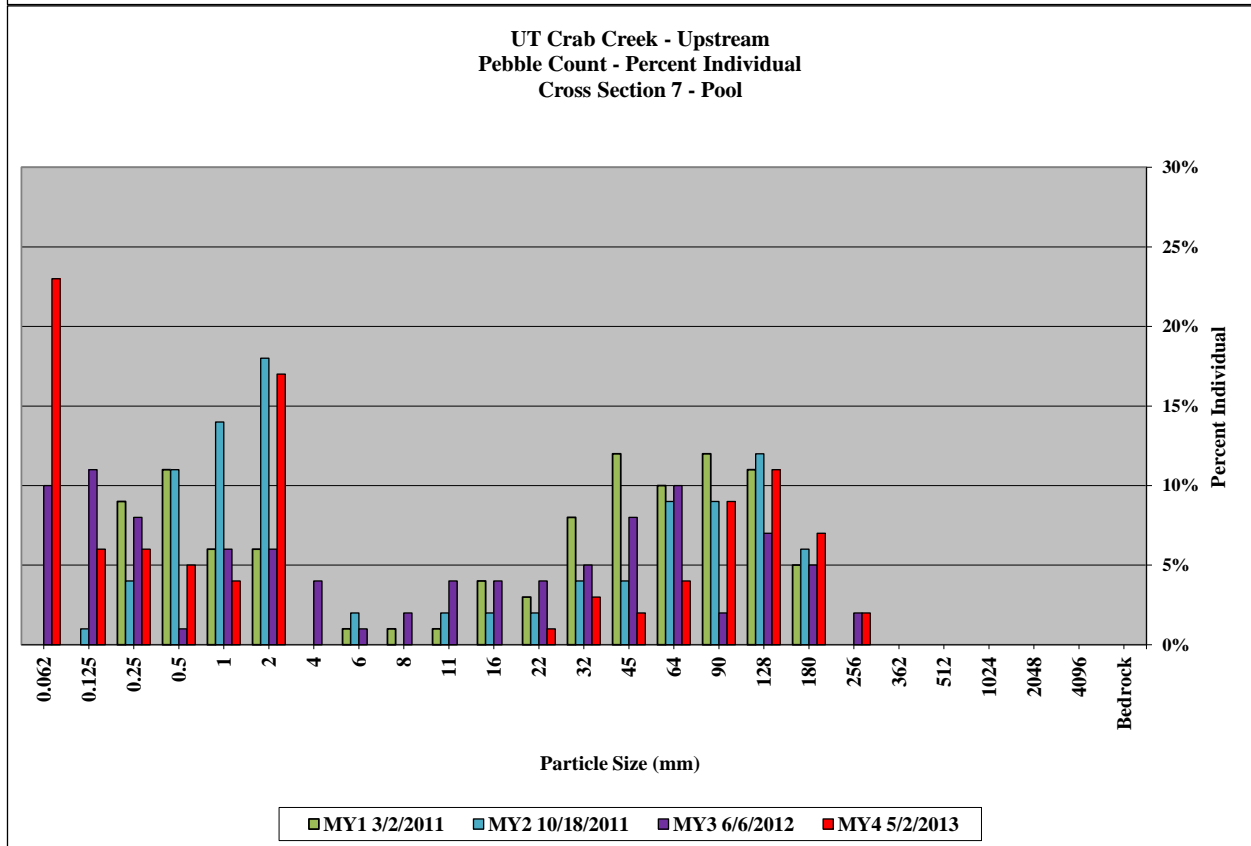
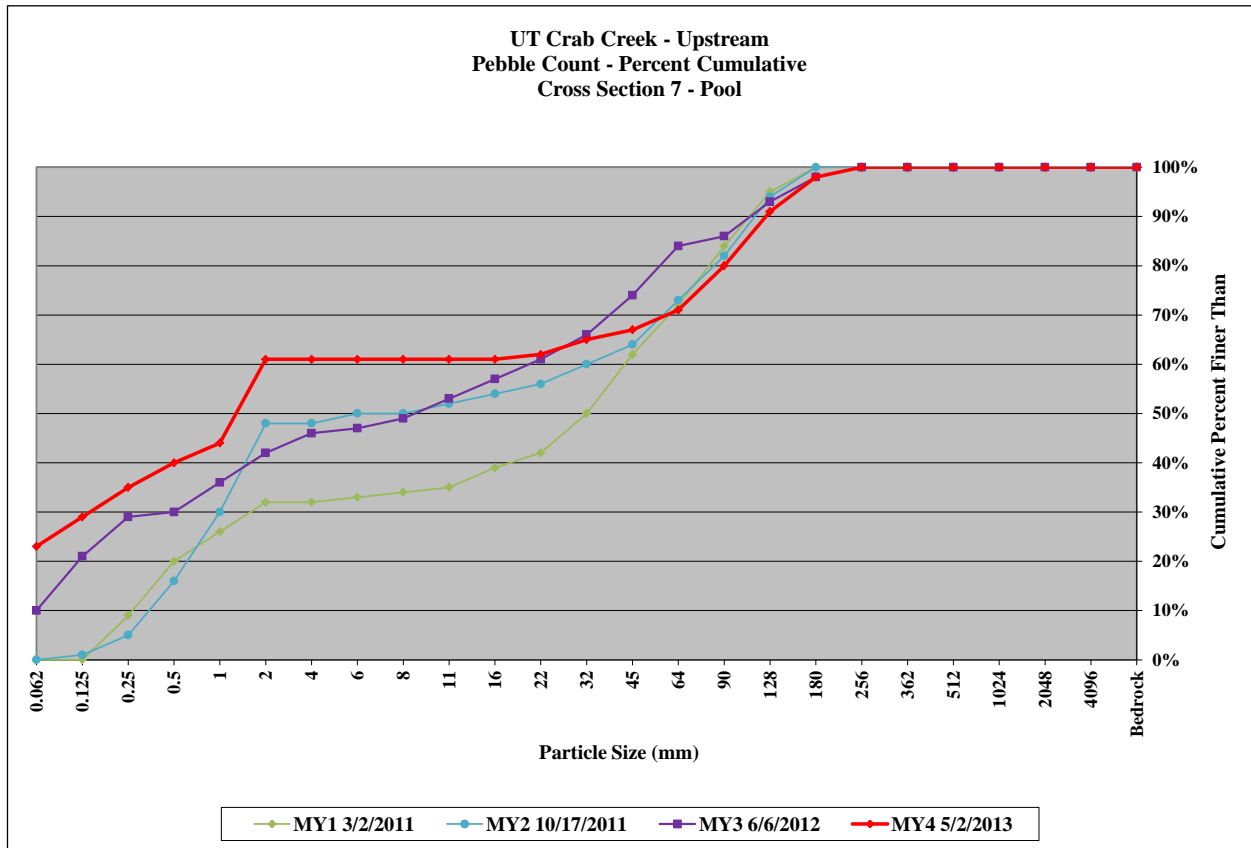
UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 6 - Riffle					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	4	4%	4%
Sand	very fine sand	0.125	1	1%	5%
	fine sand	0.25	4	4%	9%
	medium sand	0.50	3	3%	12%
	coarse sand	1.00	3	3%	15%
	very coarse sand	2.00	9	9%	24%
Gravel	very fine gravel	4.0	0	0%	24%
	fine gravel	5.7	1	1%	25%
	fine gravel	8.0	0	0%	25%
	medium gravel	11.3	2	2%	27%
	medium gravel	16.0	7	7%	34%
	coarse gravel	22.3	2	2%	36%
	coarse gravel	32	5	5%	41%
	very coarse gravel	45	18	18%	59%
Cobble	very coarse gravel	64	17	17%	76%
	small cobble	90	12	12%	88%
	medium cobble	128	9	9%	97%
	large cobble	180	2	2%	99%
Boulder	very large cobble	256	1	1%	100%
	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	very large boulder	4096	0	0%	100%
	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	38
D84	80
D95	120



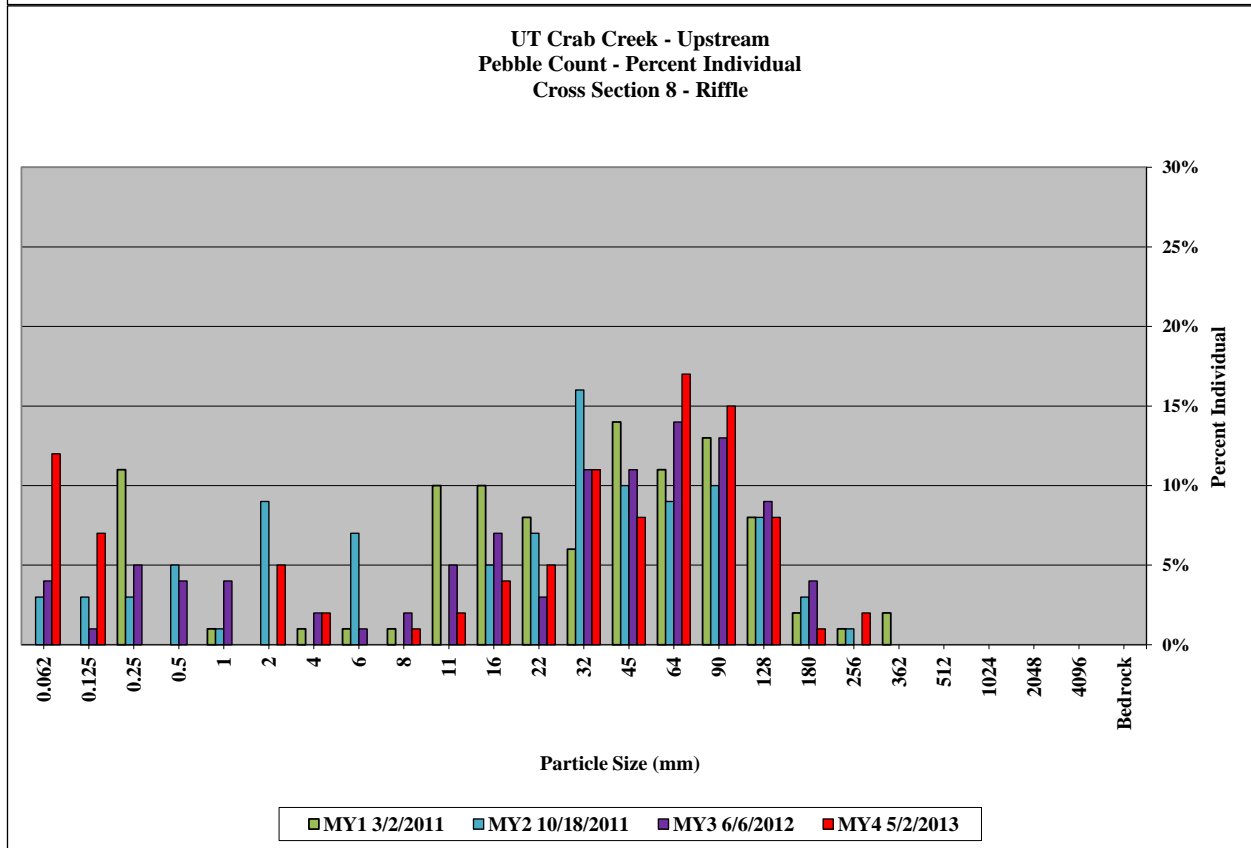
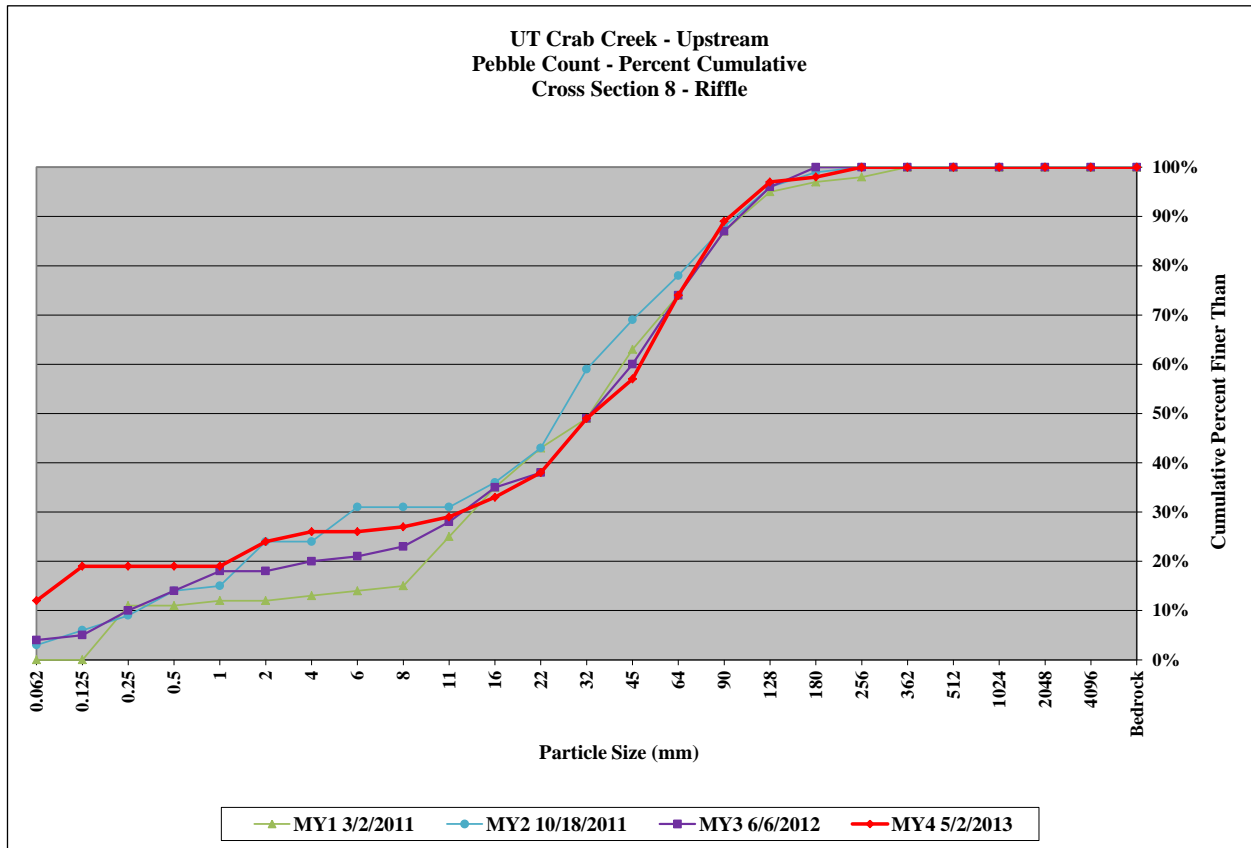
UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 7 - Pool					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	23	23%	23%
Sand	very fine sand	0.125	6	6%	29%
	fine sand	0.25	6	6%	35%
	medium sand	0.50	5	5%	40%
	coarse sand	1.00	4	4%	44%
	very coarse sand	2.00	17	17%	61%
Gravel	very fine gravel	4.0	0	0%	61%
	fine gravel	5.7	0	0%	61%
	fine gravel	8.0	0	0%	61%
	medium gravel	11.3	0	0%	61%
	medium gravel	16.0	0	0%	61%
	coarse gravel	22.3	1	1%	62%
	coarse gravel	32	3	3%	65%
	very coarse gravel	45	2	2%	67%
Cobble	very coarse gravel	64	4	4%	71%
	small cobble	90	9	9%	80%
	medium cobble	128	11	11%	91%
	large cobble	180	7	7%	98%
Boulder	very large cobble	256	2	2%	100%
	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	very large boulder	4096	0	0%	100%
	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	1.3
D84	100
D95	160



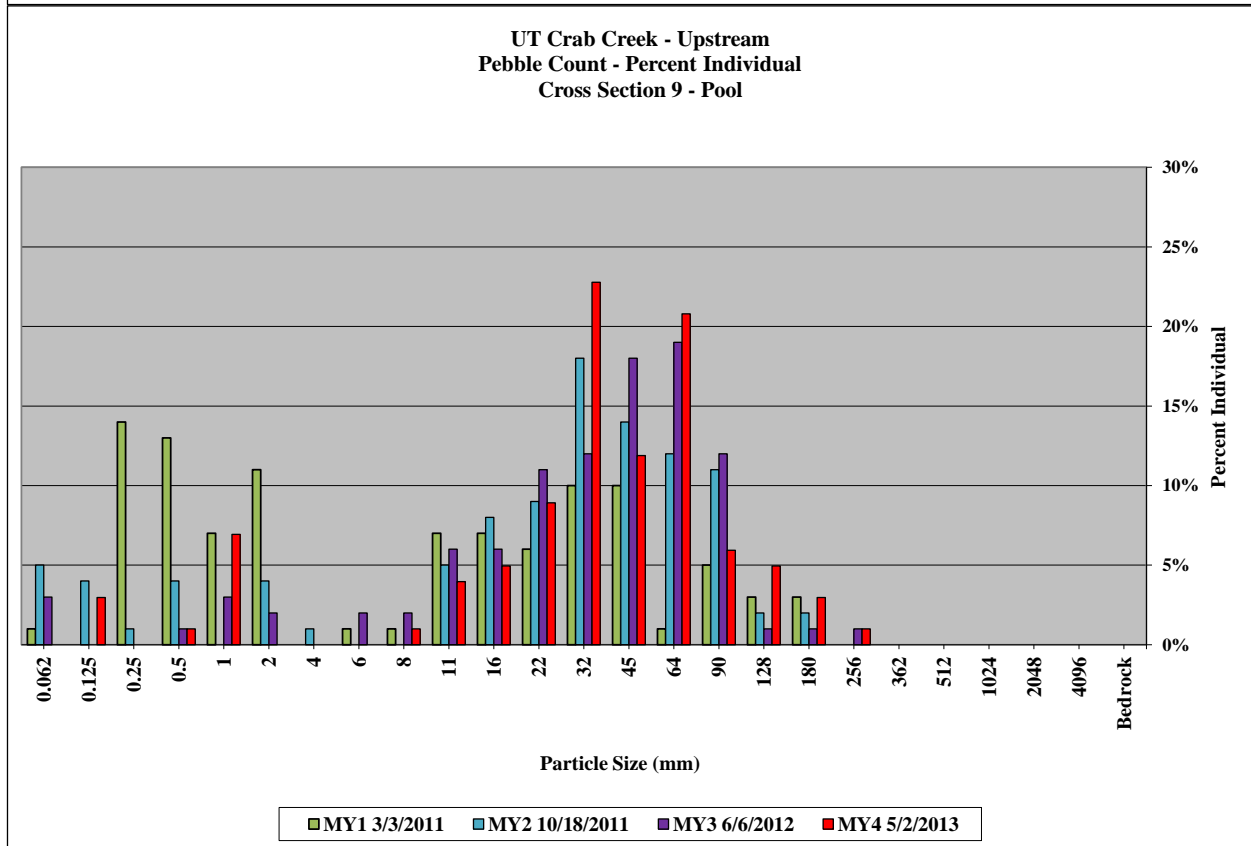
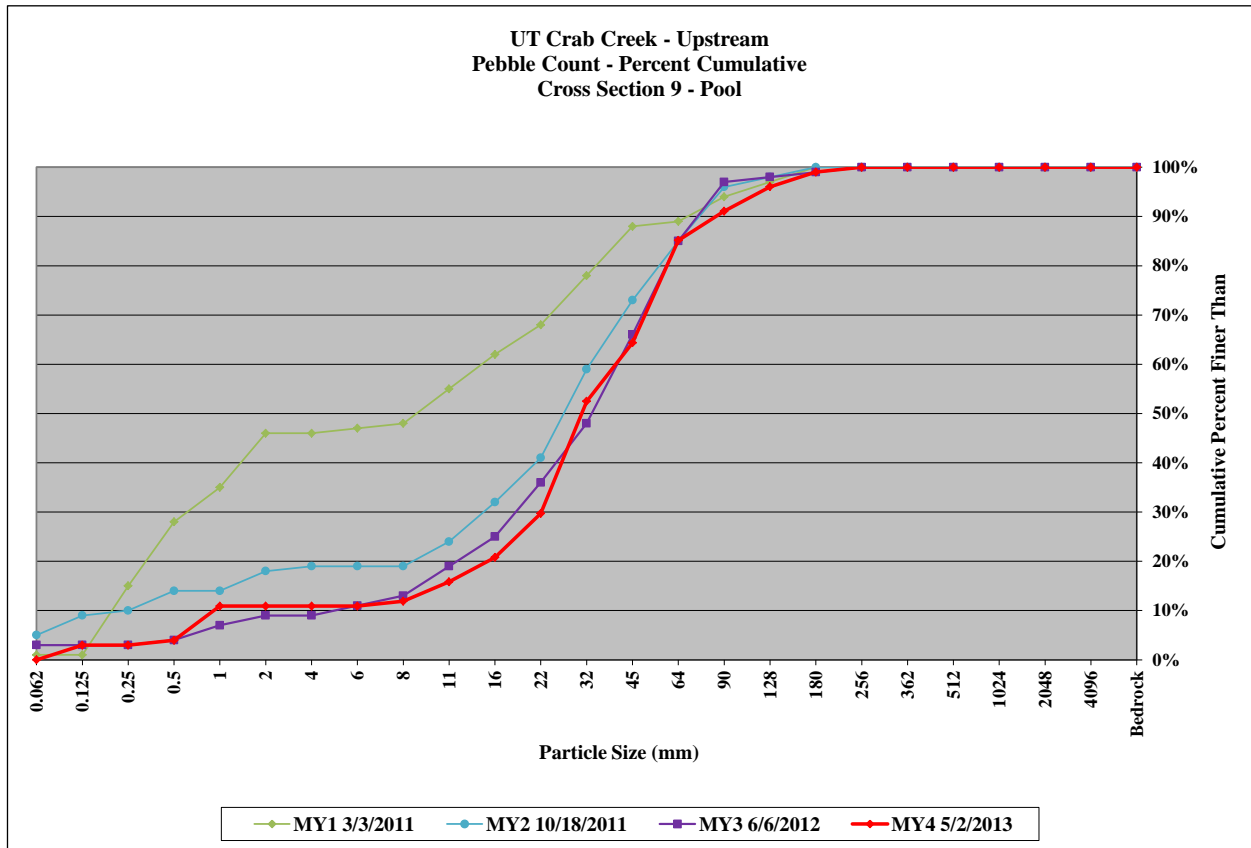
UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 8 - Riffle					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	12	12%	12%
Sand	very fine sand	0.125	7	7%	19%
	fine sand	0.25	0	0%	19%
	medium sand	0.50	0	0%	19%
	coarse sand	1.00	0	0%	19%
	very coarse sand	2.00	5	5%	24%
Gravel	very fine gravel	4.0	2	2%	26%
	fine gravel	5.7	0	0%	26%
	fine gravel	8.0	1	1%	27%
	medium gravel	11.3	2	2%	29%
	medium gravel	16.0	4	4%	33%
	coarse gravel	22.3	5	5%	38%
	coarse gravel	32	11	11%	49%
	very coarse gravel	45	8	8%	57%
Cobble	very coarse gravel	64	17	17%	74%
	small cobble	90	15	15%	89%
	medium cobble	128	8	8%	97%
	large cobble	180	1	1%	98%
Boulder	very large cobble	256	2	2%	100%
	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	very large boulder	4096	0	0%	100%
	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	33
D84	80
D95	120



UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 9 - Pool					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	0	0%	0%
Sand	very fine sand	0.125	3	3%	3%
	fine sand	0.25	0	0%	3%
	medium sand	0.50	1	1%	4%
	coarse sand	1.00	7	7%	11%
	very coarse sand	2.00	0	0%	11%
Gravel	very fine gravel	4.0	0	0%	11%
	fine gravel	5.7	0	0%	11%
	fine gravel	8.0	1	1%	12%
	medium gravel	11.3	4	4%	16%
	medium gravel	16.0	5	5%	21%
	coarse gravel	22.3	9	9%	30%
	coarse gravel	32	23	23%	53%
	very coarse gravel	45	12	12%	65%
Cobble	very coarse gravel	64	21	21%	86%
	small cobble	90	6	6%	92%
	medium cobble	128	5	5%	97%
	large cobble	180	3	3%	100%
Boulder	very large cobble	256	1	1%	101%
	small boulder	362	0	0%	101%
	small boulder	512	0	0%	101%
	medium boulder	1024	0	0%	101%
	large boulder	2048	0	0%	101%
Bedrock	very large boulder	4096	0	0%	101%
	bedrock	>4096	0	0%	101%
TOTALS			101	101%	101%

Summary Data	
D50	31
D84	63
D95	120



UT Crab Creek Stream & Wetland / Project No. 857					
UTCC - Upstream - Cross-Section 10 - Riffle					
Pebble Count Summary					
			Monitoring Year 4		
Description	Material	Size (mm)	Total #	Item %	Cum %
Silt/Clay	silt/clay	0.062	3	3%	3%
Sand	very fine sand	0.125	6	6%	9%
	fine sand	0.25	0	0%	9%
	medium sand	0.50	6	6%	15%
	coarse sand	1.00	0	0%	15%
	very coarse sand	2.00	0	0%	15%
Gravel	very fine gravel	4.0	0	0%	15%
	fine gravel	5.7	0	0%	15%
	fine gravel	8.0	0	0%	15%
	medium gravel	11.3	2	2%	17%
	medium gravel	16.0	5	5%	22%
	coarse gravel	22.3	13	13%	35%
	coarse gravel	32	18	18%	53%
	very coarse gravel	45	18	18%	71%
Cobble	very coarse gravel	64	16	16%	87%
	small cobble	90	8	8%	95%
	medium cobble	128	4	4%	99%
	large cobble	180	1	1%	100%
Boulder	very large cobble	256	0	0%	100%
	small boulder	362	0	0%	100%
	small boulder	512	0	0%	100%
	medium boulder	1024	0	0%	100%
	large boulder	2048	0	0%	100%
Bedrock	very large boulder	4096	0	0%	100%
	bedrock	>4096	0	0%	100%
TOTALS			100	100%	100%

Summary Data	
D50	30
D84	60
D95	90

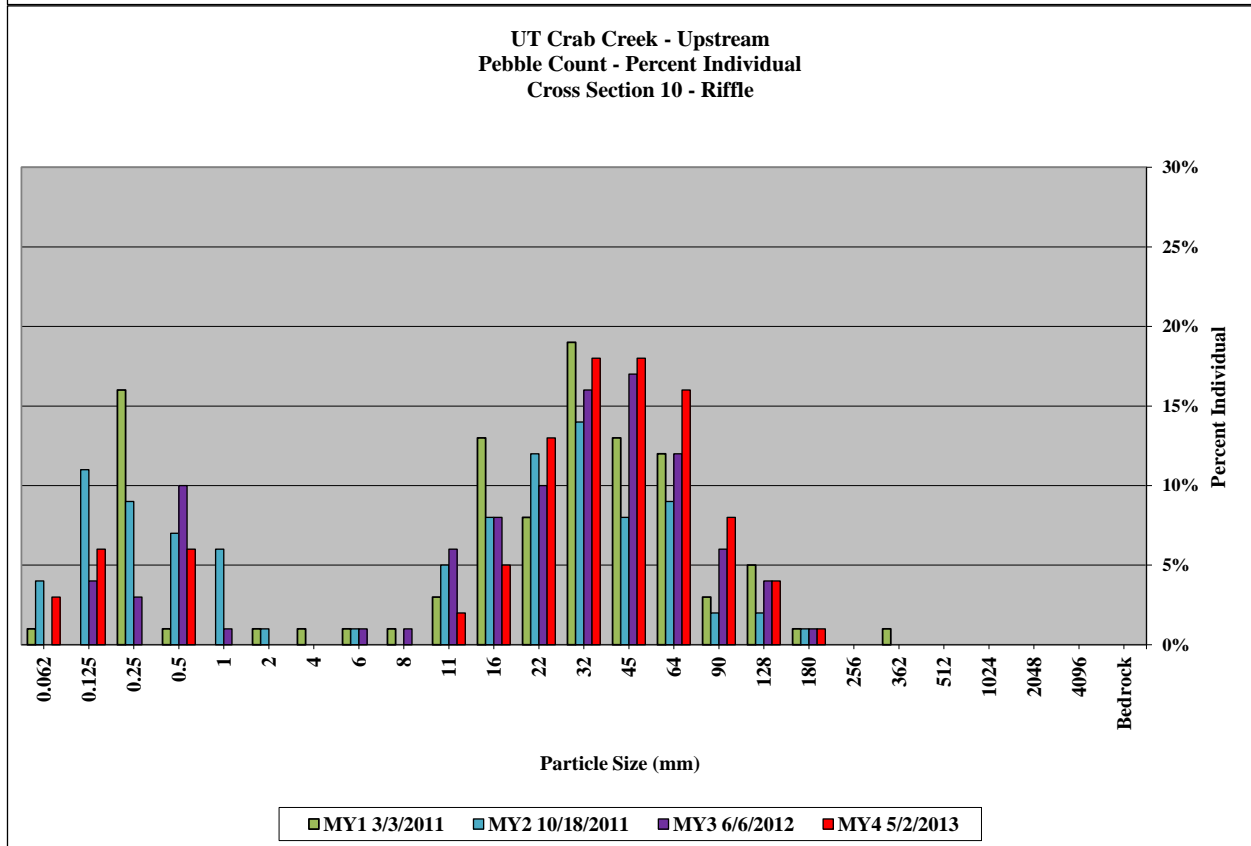
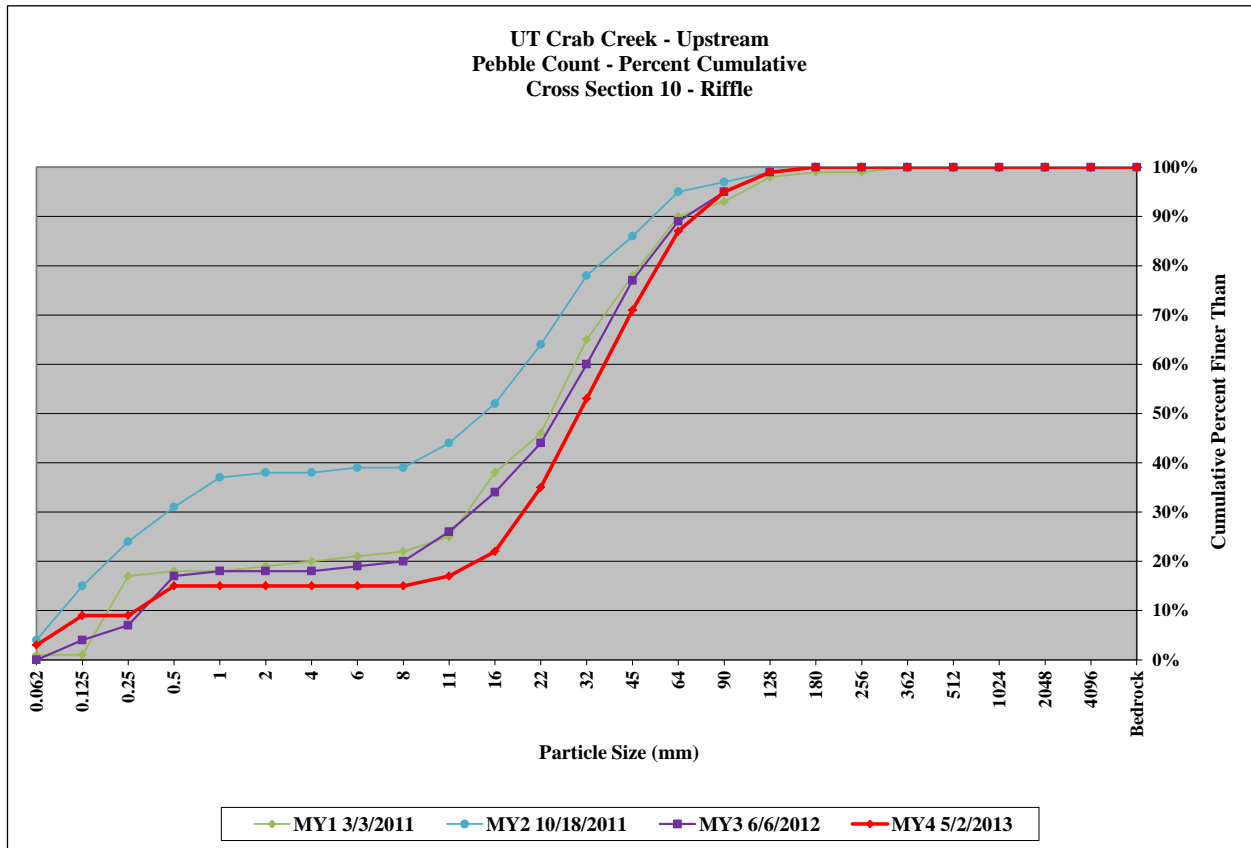


Table 10a. Baseline Stream Data Summary																								
UT Crab Creek Stream & Wetland / Project No. 857 - UT1 - Upper (500 feet)																								
Parameter	Regional Curve			Pre-Existing Condition						Reference Reach Data						Design*			Monitoring Baseline					
	LL	UL	Eq.	Min	Mean	Med	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	>5	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)	62			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 UT 1 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					
Dimension & Substrate - Riffle	LL	UL	Eq.	Min	Mean	Med	Max	SD	N	Min	Mean	Med	Max	SD	N	Min	Mean	Max	Min	Mean	Med	Max	SD	N
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)							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 / di ^p / di ^{sp} (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 / di ^p / di ^{sp} (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 / di ^p / di ^{sp} (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)																		
Dimension	Cross-Section 1 Riffle						Cross-Section 2 Pool						Cross-Section 3 Riffle					
	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5	Base	MY1	MY2	MY3	MY4	MY5
Record Elevation (datum) Used	2,605	2,605	2,605	2,605	2,605		2,603	2,603	2,603	2,603	2,603		2,598	2,598	2,598	2,598	2,598	
Bankfull Width (ft)	15.7	15.9	15.3	16.0	17.3		18.4	18.0	17.6	18.0	17.9		14.8	14.7	14.9	15.0	15.0	
Floodprone Width (ft)	>100	>100	>100	>100	>100		>100	>100	>100	>100	>100		>100	>100	>100	>100	>100	
Bankfull Mean Depth (ft)	1.3	1.2	1.3	1.2	1.2		1.9	1.9	1.8	1.8	1.7671		1.6	1.6	1.6	1.6	1.6179	
Bankfull Max Depth (ft)	2.4	2.4	2.5	2.4	2.5		3.2	3.2	3.3	3.1	3.0831		2.5	2.5	2.6	2.6	2.6978	
Bankfull Cross Sectional Area (ft ²)	20.3	18.5	19.3	19.5	20.0		34.3	33.4	32.2	32.4	31.651		24.0	23.8	23.8	24.4	24.246	
Bankfull Width/Depth Ratio	12.2	13.8	12.1	13.1	14.9		9.9	9.7	9.6	10.0	10.136		9.2	9.1	9.4	9.2	9.2625	
Bankfull Entrenchment Ratio	>6.4	>6.3	>6.5	>6.3	>5.8		>5.4	>5.5	>5.7	>5.5	>5.6		>6.7	>6.8	>6.7	>6.7	>6.7	
Bankfull Bank Height Ratio	1.0	1.0	1.1	1.1	1.1		1.1	1.1	1.1	1.1	1.0649		1.1	1.1	1.1	1.1	1.0964	
Cross Sectional Area between End Pins (ft ²)	20.3	19.0	19.4	19.6	20.0		34.3	33.6	32.2	32.4	32		24.3	24.1	24.2	24.6	24	
d50 (mm)	N/A	17	4.6	6.6	19		N/A	11	1.7	6.4	4.9		N/A	23	12	19	26	

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	2,571	2,571	2,571	2,571	2,571		2,571	2,571	2,571	2,571	2,571	
Bankfull Width (ft)	16.7	14.3	14.7	14.7	14.4		11.5	12.2	12.3	11.8	11.7	
Floodprone Width (ft)	>100	>100	>100	>100	>100		>100	>100	>100	>100	>100	
Bankfull Mean Depth (ft)	1.1	1.3	1.1	1.1	1.2		1.5	1.4	1.4	1.4	1.42	
Bankfull Max Depth (ft)	2.6	2.5	2.4	2.5	2.5		2.5	2.6	2.6	2.5	2.72	
Bankfull Cross Sectional Area (ft ²)	18.8	18.0	16.7	16.7	17.3		17.6	17.5	17.3	16.8	16.5	
Bankfull Width/Depth Ratio	14.8	11.4	12.9	13.0	12.0		7.5	8.5	8.8	8.3	8.25	
Bankfull Entrenchment Ratio	>6.0	>7.0	>6.8	>6.8	>6.9		>8.7	>8.2	>8.1	>8.5	>8.6	
Bankfull Bank Height Ratio	1.0	1.0	1.0	1.0	1.0		1.0	1.0	1.0	1.0	1.02	
Cross Sectional Area between End Pins (ft ²)	18.9	18.0	16.7	16.7	17.3		21.1	21.5	21.6	21.1	16.5	
d50 (mm)	N/A	8.4	4	2	0.4		N/A	0.91	2	1.3	0.06	

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	2,571	2,571	2,571	2,571	2,571		2,571	2,571	2,571	2,571	2,571		2,566	2,566	2,566	2,566			2,554	2,554	2,554	2,554	2,554			2,554	2,554	2,554	2,554	2,554	
Bankfull Width (ft)	25.0	24.7	27.2	25.1	24.3		27.7	27.8	27.8	27.6	27.4		28.7	27.9	28.0	27.9	27.5		23.5	23.8	23.0	23.1	23.7			26.5	27.2	26.4	27.8	27.3	
Floodprone Width (ft)	>200	>200	>200	>200	>200		>200	>200	>200	>200	>200		>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	1.6	1.6		1.7	1.7	1.6	1.6	1.5		1.5	1.4	1.4	1.3	1.3		1.7	1.7	1.6	1.6	1.5			1.4	1.4	1.4	1.3	1.38	
Bankfull Max Depth (ft)	2.6	2.5	2.5	2.6	2.6		3.0	3.4	3.4	3.5	3.46		2.5	2.4	2.5	2.4	2.43		2.7	2.9	2.7	2.8	2.75			2.4	2.4	2.5	2.6	2.56	
Bankfull Cross Sectional Area (ft ²)	42.4	41.9	41.3	41.0	40.0		47.3	47.1	45.1	43.9	40.9		42.1	39.5	38.4	37.6	35.9		40.7	40.9	36.1	36.8	35.6			37.0	37.2	35.9	37.5	37.5	
Bankfull Width/Depth Ratio	14.7	14.6	17.9	15.3	14.8		16.3	16.4	17.1	17.4	18.3		19.5	19.7	20.4	20.7	21.1		13.5	13.9	14.6	14.5	15.8			19.0	19.9	19.4	20.6	19.8	
Bankfull Entrenchment Ratio	>8.0	>8.1	>7.4	>8.0	>8.2		>7.2	>7.2	>7.2	>7.2	>7.3		>7.0	>7.2	>7.1	>7.2	>7.3		>8.5	>8.4	>8.7	>8.7	>8.4			>7.5	>7.3	>7.6	>7.2	>7.3	
Bankfull Bank Height Ratio	1.0	1.0	1.1	1.1	1.1		1.1	1.1	1.1	1.1	1.1		1.1	1.1	1.1	1.1	1.05		1.0	1.0	1.0	1.0	1.04			1.0	1.0	1.0	1.0	1.04	
Cross Sectional Area between End Pins (ft ²)	42.4	41.9	41.3	41.0	40.0		47.3	47.3	45.1	43.9	40.9		43.2	40.1	38.5	37.6	35.9		41.5	41.2	36.1	36.8	35.6			38.6	39.9	37.1	39.7	37.5	
d50 (mm)	N/A	51	48	46	38		N/A	32	6	8.7	1.3		N/A	33	26	33	33		N/A	8.8	27	33	31			NA	24	15	25	30	

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					
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)	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	15.0	15.5	15.5	16.0	N/A	2	15.0	16.2	16.2	17.3	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	>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	1.2	1.4	1.4	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	2.5	2.6	2.6	2.6	N/A	2	2.4	2.5	2.5	2.6	N/A	2	2.5	2.6	2.6	2.7	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	19.3	21.6	21.6	23.8	N/A	2	19.5	22.0	22.0	24.4	N/A	2	20.0	22.1	22.1	24.2	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	9.2	11.2	11.2	13.1	N/A	2	9.3	12.1	12.1	14.9	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	>6.3	>6.5	>6.5	>6.7	N/A	2	>5.8	>6.25	>6.25	>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	1.1	1.1	1.1	1.1	N/A	2	1.1	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	11.1	36.8	33.0	80.7	26.1	6	15.1	38.2	34.2	79.3	24.4	6	30.3	49.1	48.1	79.1	18.0	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	0.0160	0.0257	0.0209	0.0432	0.0110	6	0.0152	0.0219	0.0196	0.0365	0.0077	6	0.0	0.0	0.0	0.0	0.0	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	6.4	10.2	9.7	14.5	2.2	11	5.7	9.8	10.5	14.0	2.7	10	
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	2.5	2.9	2.9	3.8	0.4	10	2.0	2.3	2.2	3.1	0.4	8	
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	9.2	47.2	47.6	106.8	30.1	10	9.2	45.4	43.0	110.3	31.4	10	
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					C5b					C4b					C4b										
Channel Thalweg Length (ft)	500					511					503					506					507										
Sinuosity (ft)	1.14					1.17					1.15					1.16					1.16										
Water Surface Slope (Channel) (ft/ft)	0.0238					0.0228					0.0240					0.0233					0.0238										
Bankfull Slope (ft/ft)	0.0251					0.0229					0.0240					0.0226					0.0242										
Ri% / Ru% / P% / G% / S%	42	8	24	22	4	45%	10%	22%	19%	5%	45%	11%	25%	15%	4%	48%	13%	23%	11%	5%	61%	9%	21%	5%	4%						
SC% / SA% / G% / C% / B% / Be%*						<1%	20%	71%	9%	0%	0%	2%	46%	44%	8%	0%	0%	4%	29%	57%	10%	0%	0%	2%	31%	57%	10%	0%	0%		
d16 / d35 / d50 / d84 / d95 (mm)																															
% of Reach with Eroding Banks	0%					1%					1%					1%					2%										
Channel Stability or Habitat Metric	N/A					N/A					N/A					N/A					N/A										
Biological or Other	N/A					N/A					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.

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	Min	Mean	Med	Max	SD	n	
Dimension & Substrate - Riffle																																					
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	11.8	11.8	11.8	11.8	N/A	1	11.7	11.7	11.7	11.7	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	>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	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	2.5	2.5	2.5	2.5	N/A	1	2.7	2.7	2.7	2.7	N/A	1							
Bankfull Cross-Sectional Area (ft²)	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	16.8	16.8	16.8	16.8	N/A	1	16.5	16.5	16.5	16.5	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	8.8	8.8	8.8	8.8	N/A	1	8.3	8.3	8.3	8.3	N/A	1	8.3	8.3	8.3	8.3	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	>8.5	>8.5	>8.5	>8.5	N/A	1	>8.6	>8.6	>8.6	>8.6	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	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	27.9	38.2	29.3	54.3	13.5	5	22.7	38.0	36.9	50.8	12.6	5	13.5	34.3	33.2	57.2	19.3	4							
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	0.0022	0.0198	0.0178	0.0398	0.0137	5	0.0026	0.0149	0.0139	0.0254	0.0084	5	0.0	0.0	0.1	0.0	4								
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	4.9	19.8	16.3	41.4	13.4	5	10.7	21.1	11.7	46.6	15.6	6							
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	2.3	3.0	3.2	3.4	0.4	5	2.6	3.1	3.0	3.5	0.3	6							
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	52.3	71.6	64.8	104.5	24.9	4	45.3	70.5	73.3	106.0	24.7	5							
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					C5b					C5b					C5b																
Channel Thalweg Length (ft)	397					400					396					398					399																
Sinuosity (ft)	1.15					1.16					1.15					1.15					1.16																
Water Surface Slope (Channel) (ft/ft)	0.0156					0.0156					0.0154					0.0167					0.0166																
Bankfull Slope (ft/ft)	0.0174					0.0172					0.0175					0.0175					0.0177																
Ri% / Ru% / P% / G% / S%	48	5	22	25	1	50%	6%	18%	26%	0%	53%	8%	20%	19%	0%	50%	10%	26%	12%	1%	35%	17%	33%	15%	0%												
SC% / SA% / G% / C% / B% / Be%*						2%	48%	33%	17%	0%	1%	48%	43%	8%	0%	8%	44%	40%	9%	0%	15%	51%	30%	5%	0%												
d16 / d35 / d50 / d84 / d95 (mm)																																					
% of Reach with Eroding Banks	0%					0%					0%					0%					2%																
Channel Stability or Habitat Metric	N/A																																				
Biological or Other	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	25.1	26.9	27.8	27.9	N/A	3	24.3	26.4	27.3	27.5	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	>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	1.3	1.4	1.3	1.6	N/A	3	1.3	1.4	1.4	1.6	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	2.4	2.5	2.6	2.6	N/A	3	2.4	2.5	2.6	2.6	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	35.9	38.5	38.4	41.3	N/A	3	37.5	38.7	37.6	41.0	N/A	3	35.9	37.8	37.5	40.0	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	15.3	18.9	20.6	20.7	N/A	3	14.8	18.6	19.8	21.1	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	>7.4	>7.4	>7.6	N/A	3	>7.2	>7.5	>7.2	>8.0	N/A	3	>7.3	>7.6	>7.3	>8.2	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	1.0	1.1	1.1	1.1	N/A	3	1.0	1.1	1.1	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	11.4	56.8	51.3	214.2	46.5	17	11.9	56.2	57.3	214.0	46.3	17	16.9	66.7	61.3	243.9	52.8	16				
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	0.0049	0.0133	0.0129	0.0227	0.0055	17	0.0	0.0	0.0	0.0	0.0	16				
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	18.6	40.4	44.4	89.9	13.0	19	18.5	39.4	37.3	59.3	12.5	18				
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	1.8	3.6	3.7	4.6	0.7	19	1.5	3.3	3.4	4.1	0.7	17				
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	55.4	129.3	126.4	295.6	61.5	18	47.2	136.9	134.7	296.5	69.7	17				
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					C4					C4					C4					C4													
Channel Thalweg Length (ft)	2,455					2,465					2,465					2,475					2,469													
Sinuosity (ft)	1.21					1.22					1.22					1.22					1.22													
Water Surface Slope (Channel) (ft/ft)	0.0080					0.0081					0.0081					0.0078					0.0078													
Bankfull Slope (ft/ft)	0.0083					0.0083					0.0082					0.0079					0.0084													
Ri% / Ru% / P% / G% / S%	47	9	32	12	0	45%	8%	33%	14%	0%	40%	9%	34%	17%	0%	40%	8%	32%	19%	1%	45%	10%	30%	14%	0%									
SC% / SA% / G% / C% / B% / Be%*						<1%	23%	54%	22%	<1%	0%	2%	26%	51%	21%	0%	0%	5%	16%	58%	21%	0%	0%	7%	17%	55%	21%	0%	0%					
d16 / d35 / d50 / d84 / d95 (mm)																																		
% of Reach with Eroding Banks	0%					1%					1%					1%					2%													
Channel Stability or Habitat Metric	N/A					N/A					N/A					N/A					N/A													
Biological or Other	N/A					N/A					N/A					N/A					N/A													

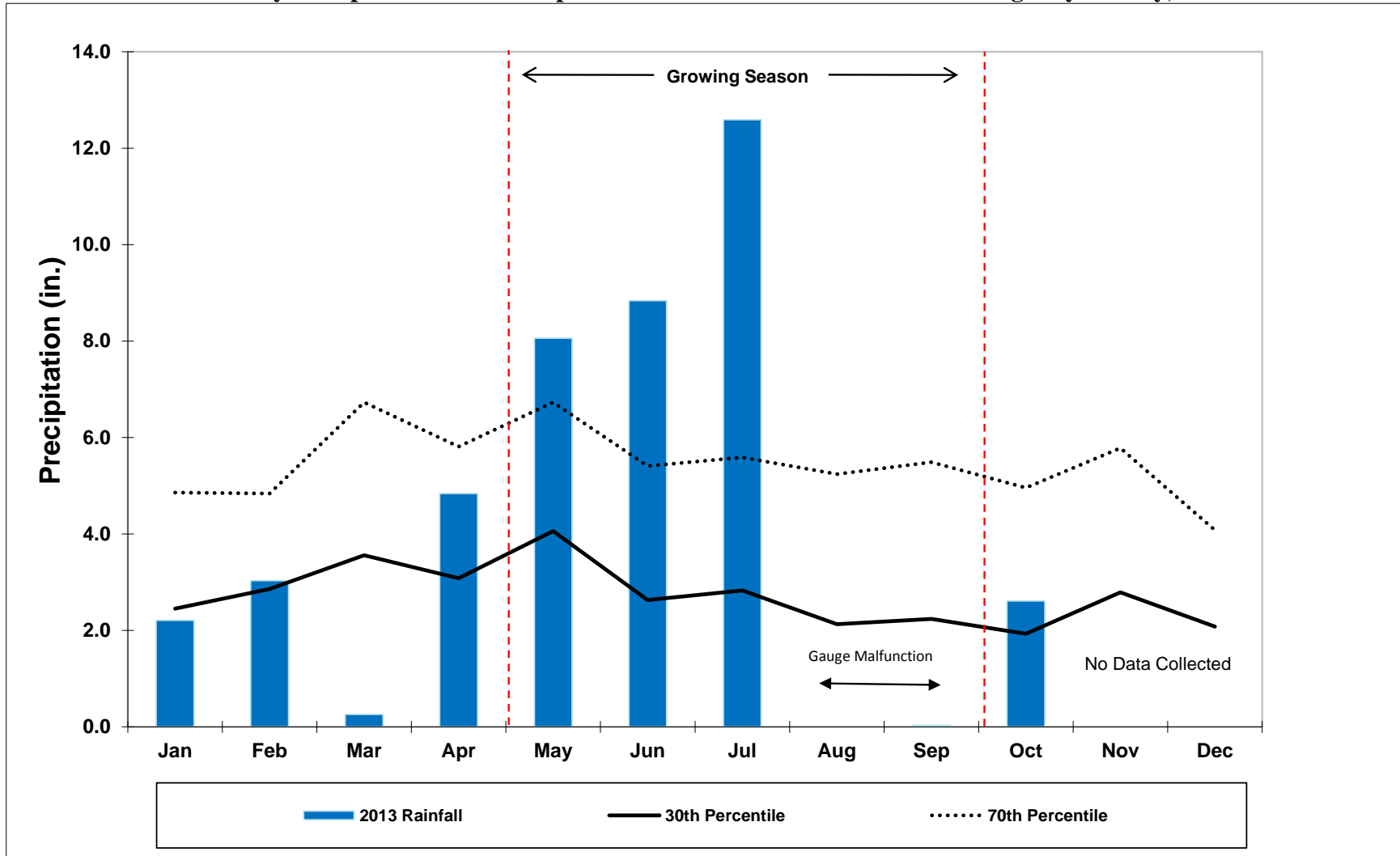
N/A - Information does not apply.
 Ri = Riffle / Ru = Run / P = Pool / G = Glide / S = Step
 SC = Silt-Clay / SA = Sand / G = Gravel / C = Cobble / B = Boulder / Be = Bedrock
 *Percentages based on riffle and pool pebble counts.

Appendix E

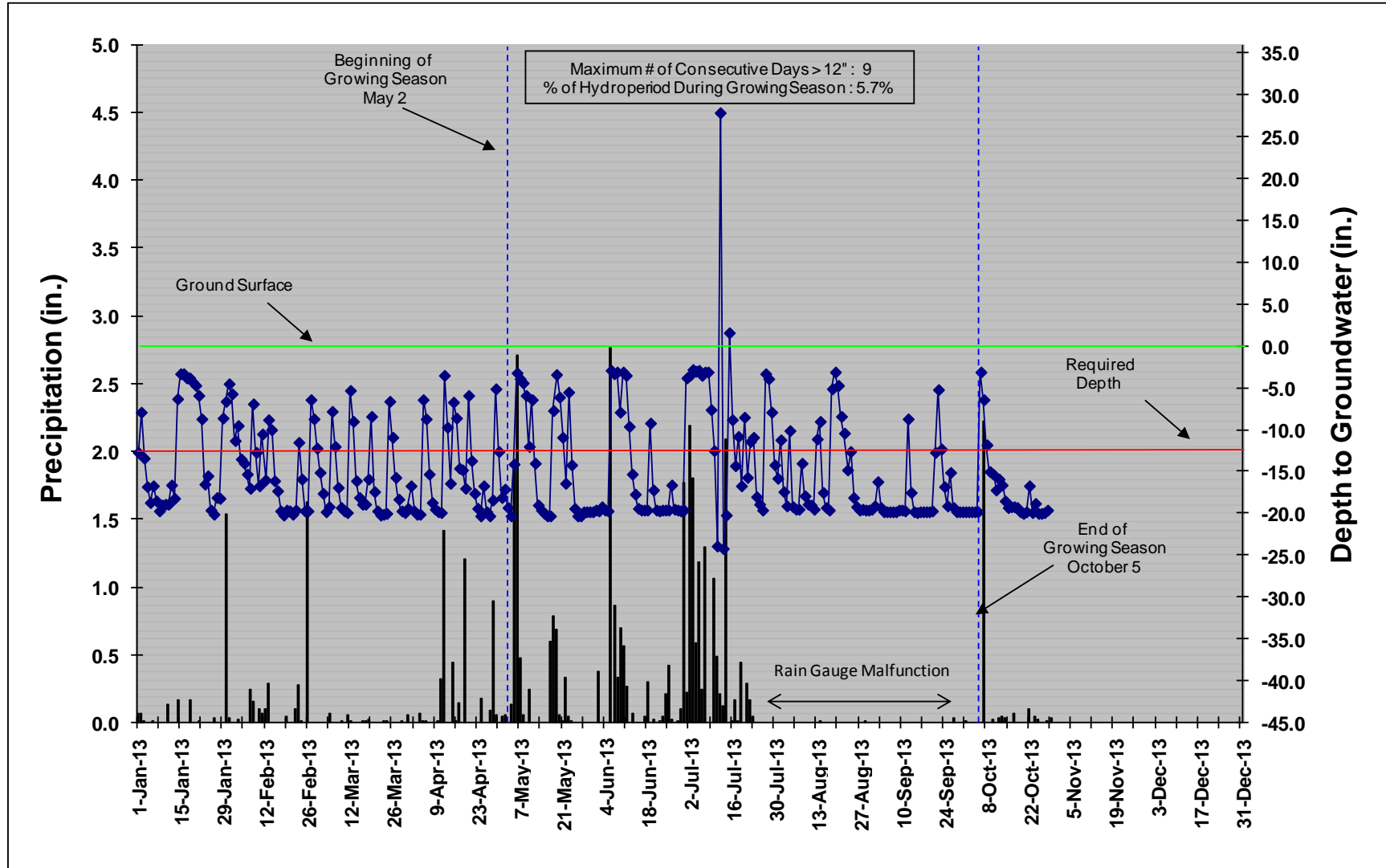
Hydrologic Data

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)
4/2010	4/2010	Wrack lines	
2/2/2011	12/2/2010	Crest gauge & wrack lines	
4/10/2013	2/26/2013	Crest gauge & wrack lines	

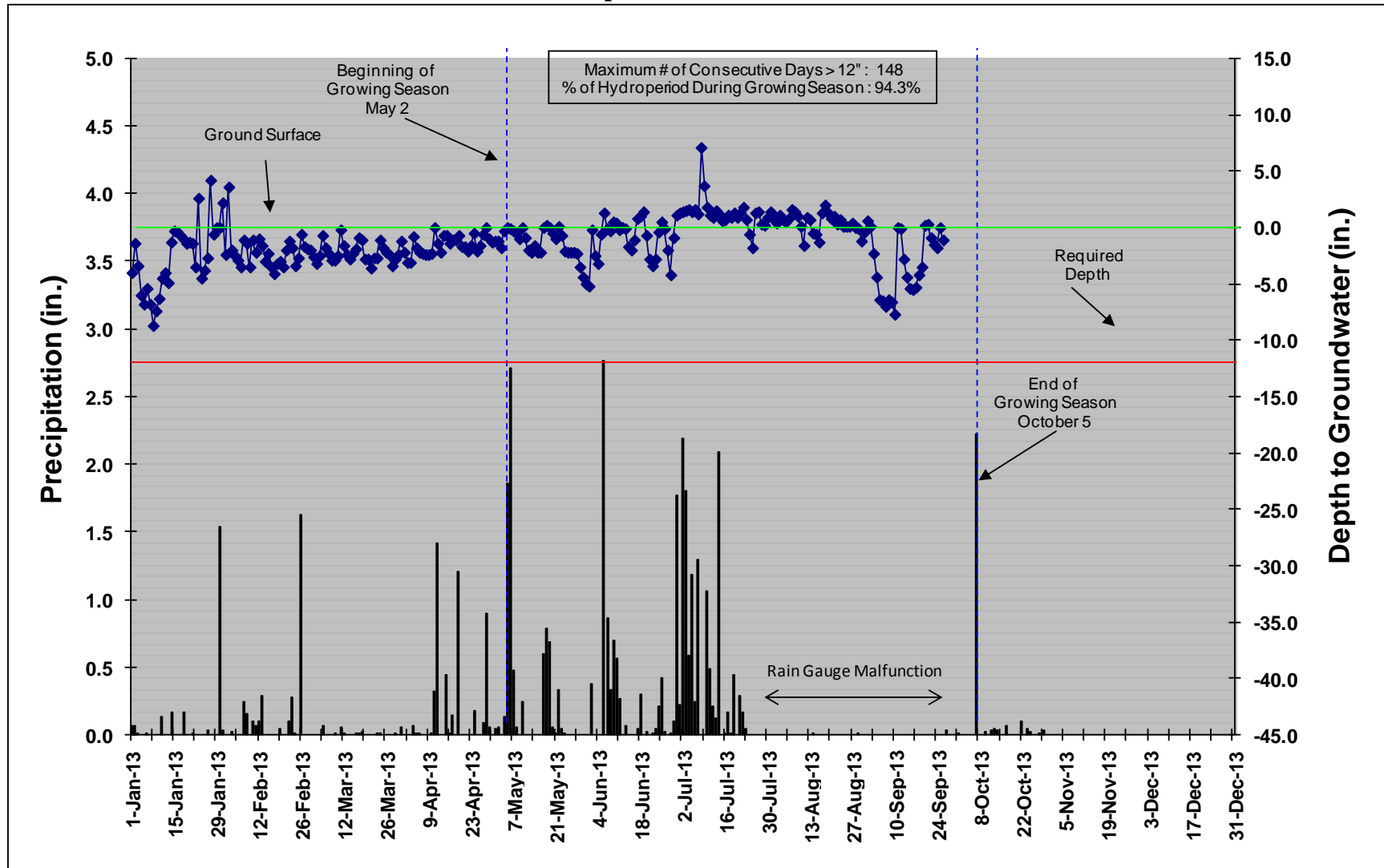
Monthly Precipitation Data Compared to 30th and 70th Percentiles for Alleghany County, NC



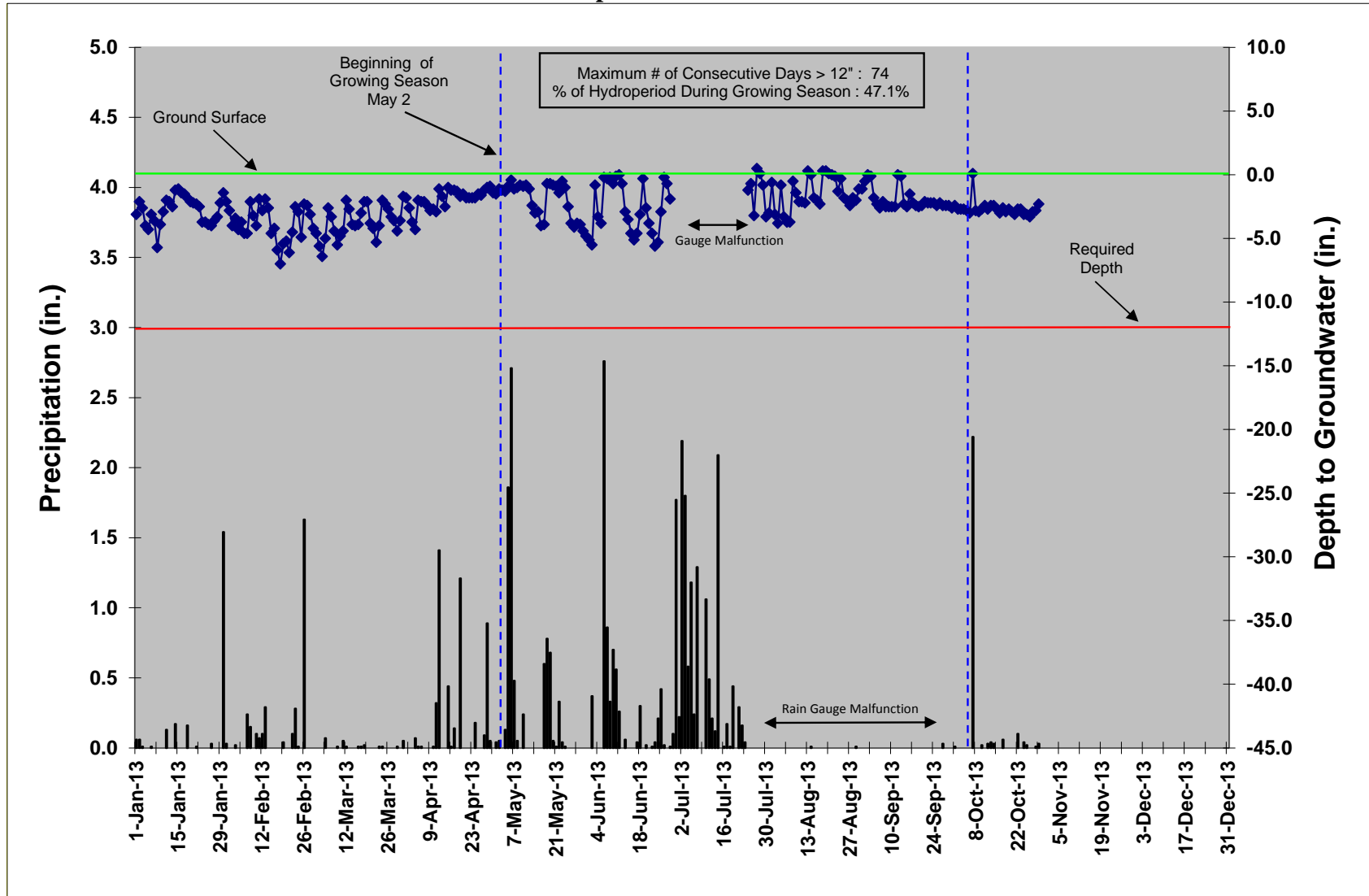
UTC-1 Precipitation and Water Level Plot



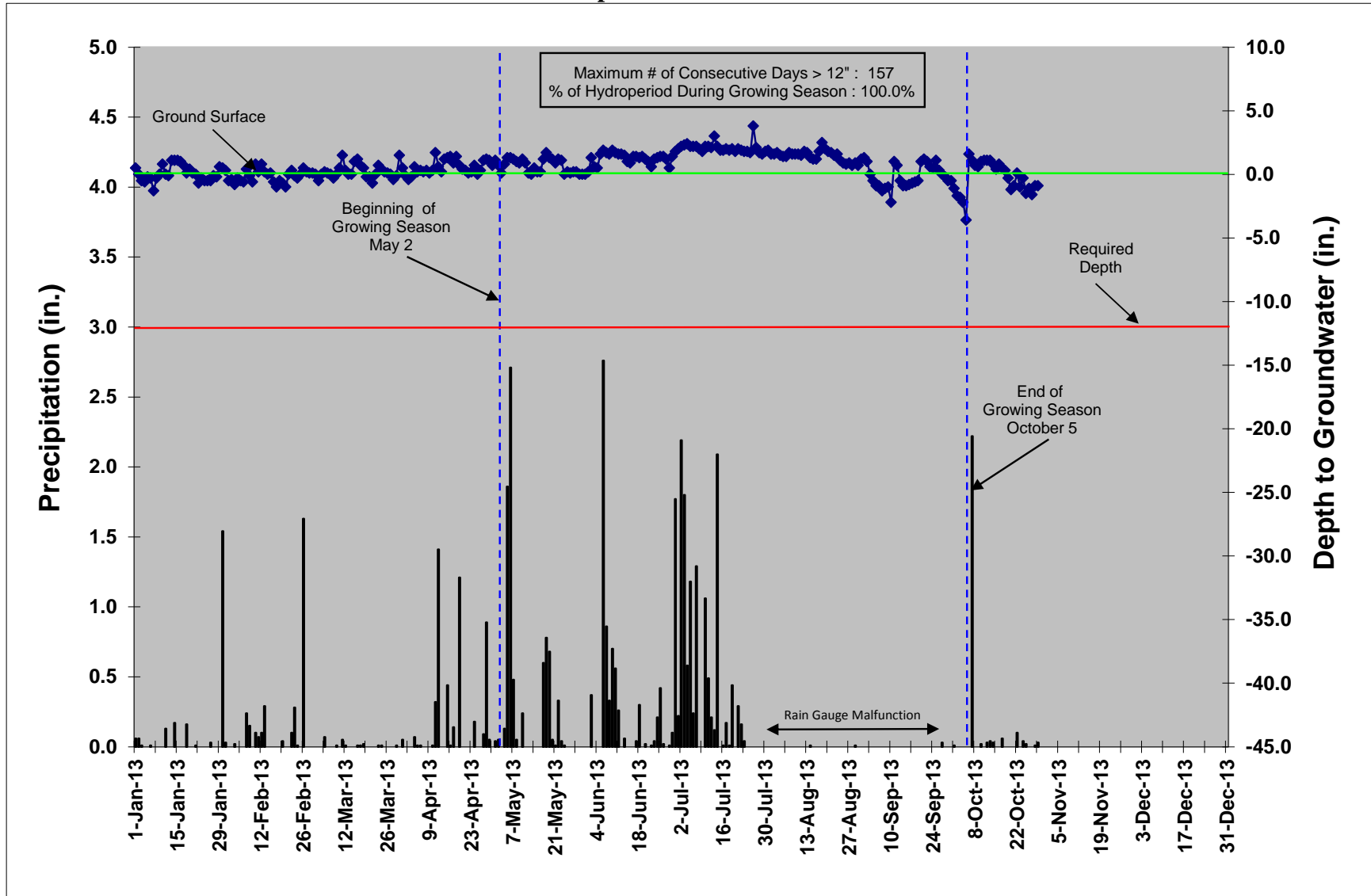
UTC-2 Precipitation and Water Level Plot



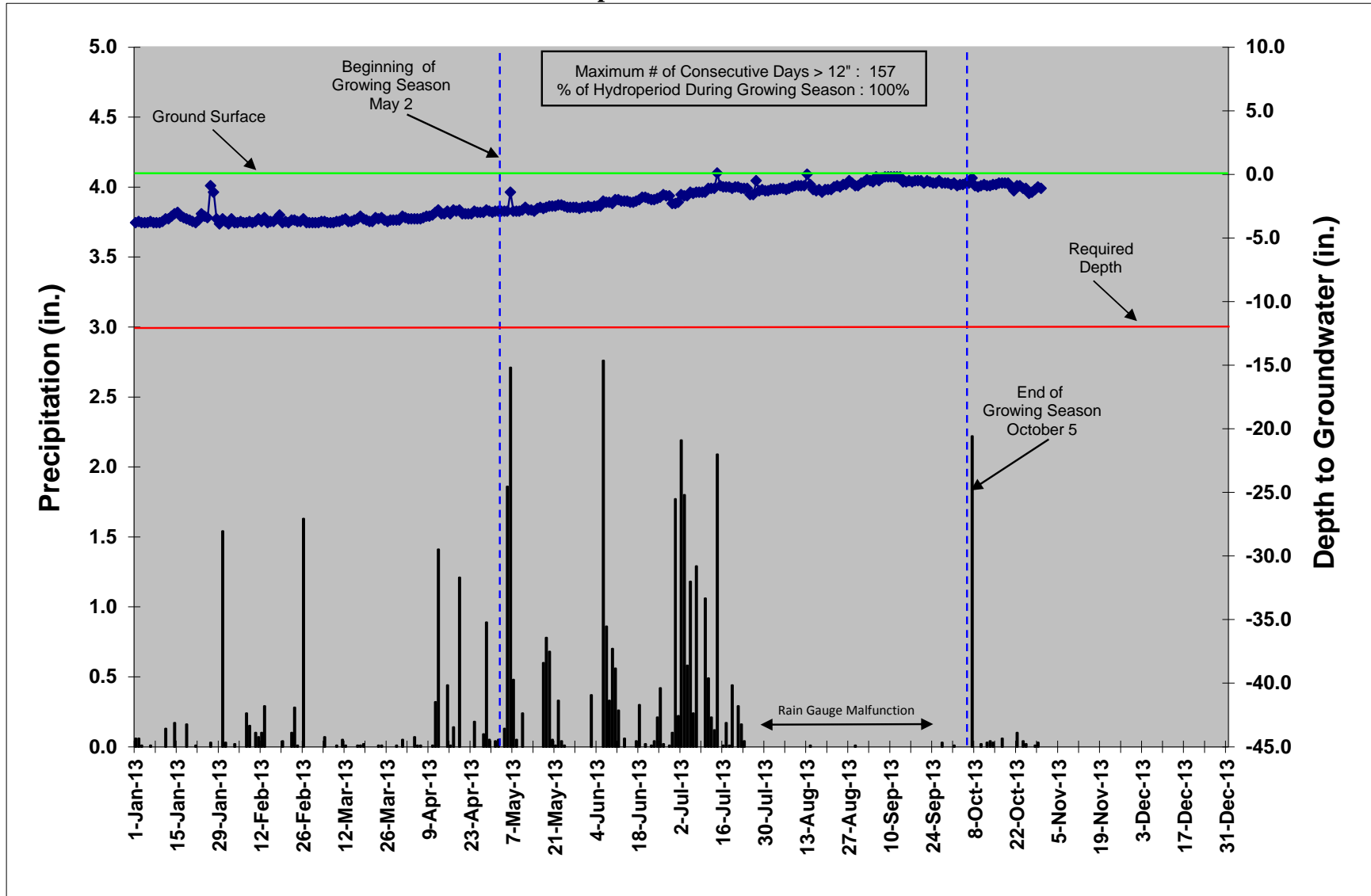
UTC-3 Precipitation and Water Level Plot



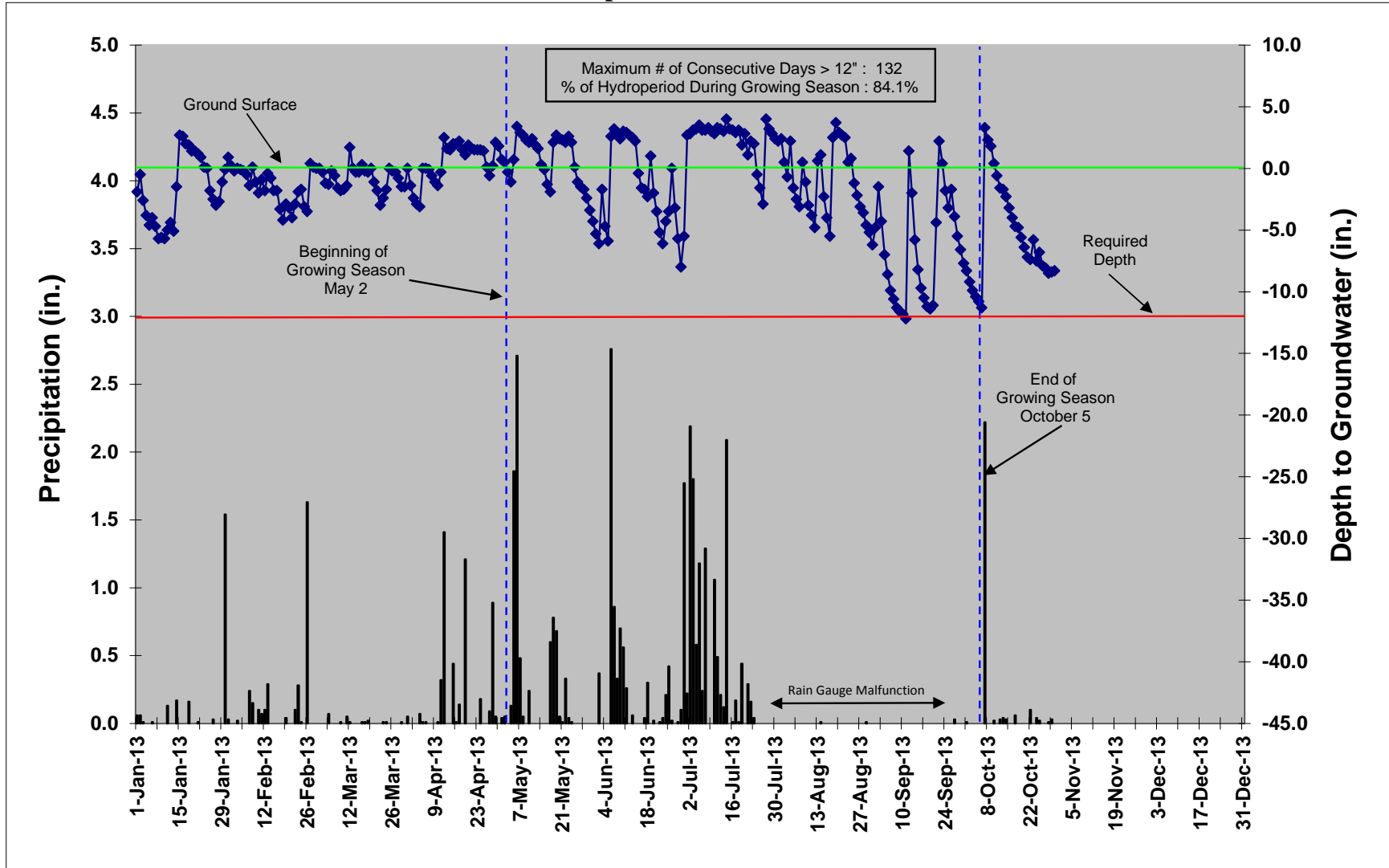
UTC-4 Precipitation and Water Level Plot



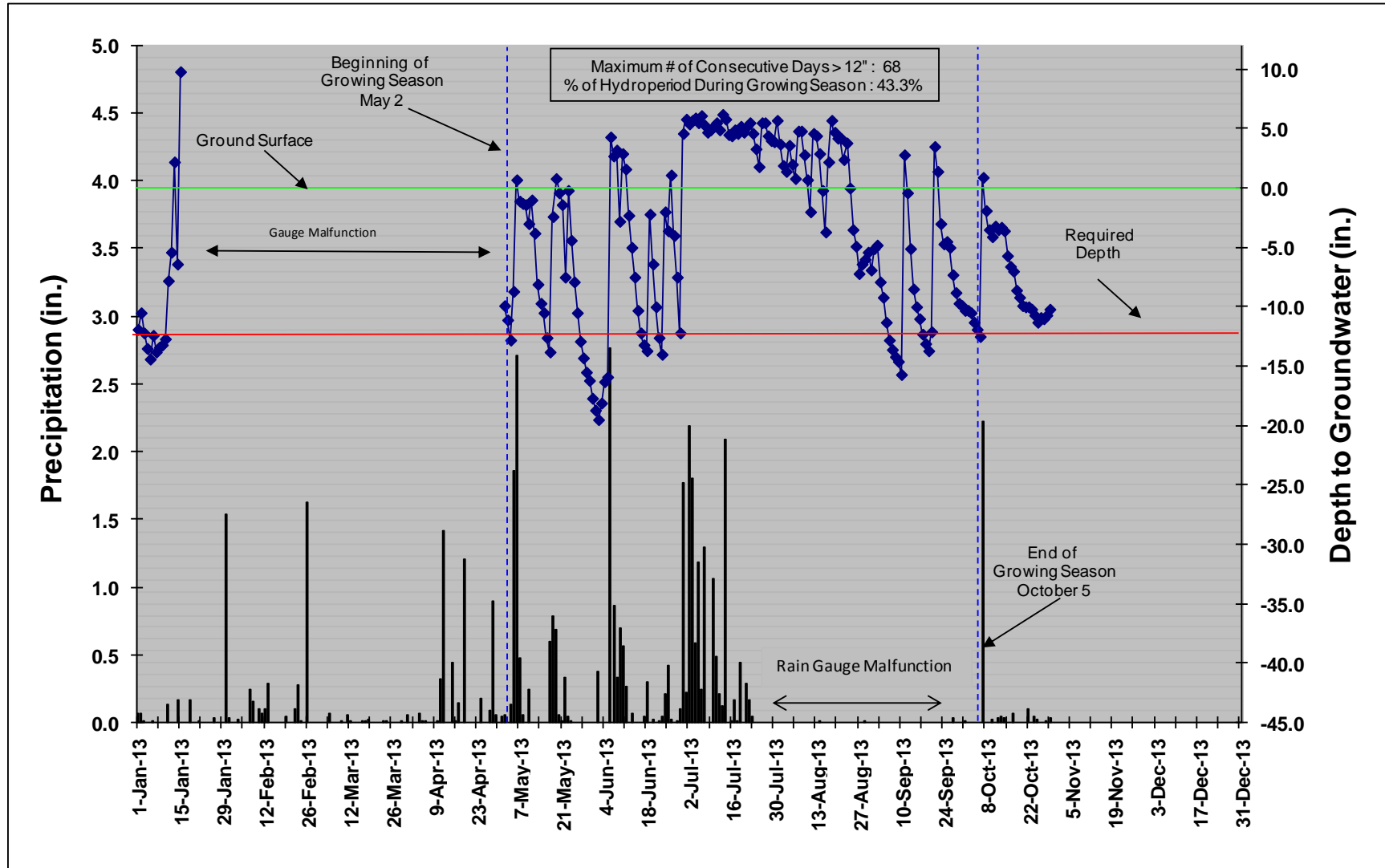
UTC-5 Precipitation and Water Level Plot



UTC-6 Precipitation and Water Level Plot



UTC-7 Precipitation and Water Level Plot



UTC-8 Precipitation and Water Level Plot

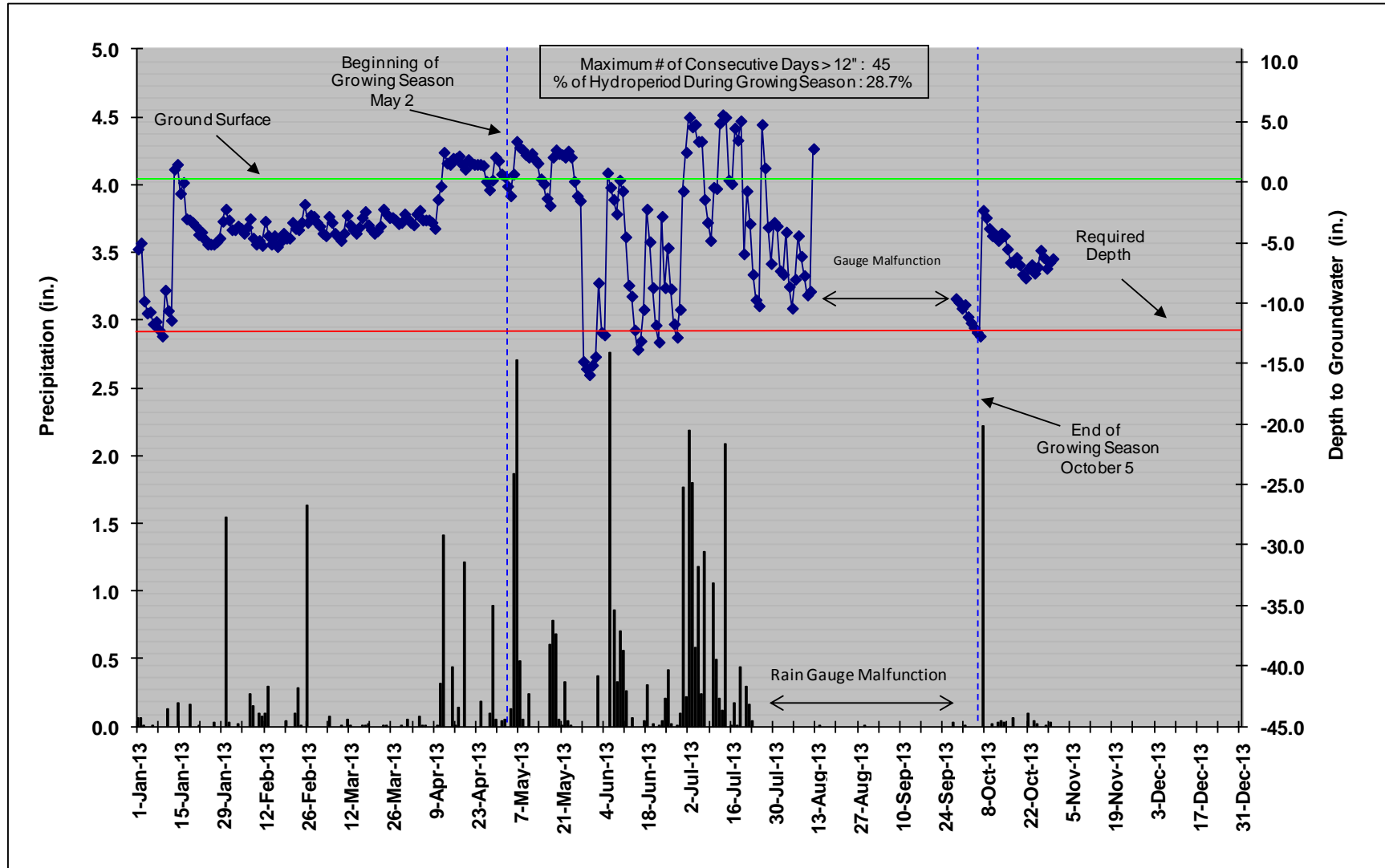


Table 13. Wetland Gauge Attainment Data					
Summary of Groundwater Gauge Results					
UT Crab Creek Stream & Wetland / Project No. 857					
Gauge ID	Success Criteria Achieved/Max Consecutive Days During Growing Season				
	(Percentage)				
	Year 1	Year 2	Year 3	Year 4	Year 5
	(2010)	(2011)	(2012)	(2013)	(2014)
UTC-1	No/6 3.8 Percent	No/6 3.8 Percent	No/4 2.5 Percent	Yes/9 5.7 Percent	
UTC-2	Yes/70 44.6 Percent	Yes/30 19.1 Percent	Yes/39 24.8 Percent	Yes/148 94.3 Percent	
UTC-3	Yes/35 22.3 Percent	Yes/33 21.0 Percent	Yes/143 91.1 Percent	Yes/74 47.1 Percent	
UTC-4	Yes/52 33.1 Percent	Yes/61 38.9 Percent	Yes/55 35.0 Percent	Yes/157 100.0 Percent	
UTC-5	Yes/157 100.0 Percent	Yes/155 98.7 Percent	Yes/157 100.0 Percent	Yes/157 100.0 Percent	
UTC-6	Yes/22 14.0 Percent	Yes/38 24.2 Percent	Yes/45 28.7 Percent	Yes/132 100.0 Percent	
UTC-7	Yes/15 9.6 Percent	Yes/8 5.1 Percent	No/6 3.8 Percent	Yes/68 43.3 Percent	
UTC-8	Yes/37 23.6 Percent	Yes/58 36.9 Percent	Yes/48 30.6 Percent	Yes/45 28.7 Percent	

Growing season = 157 days