SCALY BARK CREEK MITIGATION SITE

Stanly County, NC
DENR Contract 002030
EEP Project Number 94148

Monitoring Year 2 Annual Report

FINAL
Data Collection Period: June-September 2012
Submission Date: January 11, 2013

Prepared for:

Ecosystem Enhancement PROGRAM

NCDENR, EEP
1652 Mail Service Center
Raleigh, NC
27699-1652

Prepared by:

Wildlands Engineering, Inc.
1430 S. Mint Street, #104
Charlotte, NC 28203
P – 704-332-7754
F – 704-332-3306

SCALY BARK CREEK MITIGATION SITE
Monitoring Year 2 Annual Report

APPENDICES

1.0 Executive Summary

The Scaly Bark Creek Mitigation Site, hereafter referred to as the Site, is located off of NC Highway 24/27 in the central portion of Stanly County, NC. The project site is approximately 2.6 miles southwest of downtown Albemarle, NC within the Rocky River watershed (North Carolina Division of Water Quality (NCDWQ) Subbasin 03-07-13) of the Yadkin River Basin (USGS Hydrologic Unit 03040105060030). The Site is located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). Land use within the watershed is rural and is dominated by forestry, agriculture, and livestock operations; with approximately 60% of the watershed forested and 40% used for agriculture. The Site is located in an active cattle pasture surrounded by wooded lots, small agricultural operations, and rural residential areas within a 212-acre tract of land owned by Franchot Palmer. A conservation easement has been recorded to protect the 26.6 acres of riparian corridor and stream resources in perpetuity.

The Site consists of Scaly Bark Creek, a third order stream, as well as six unnamed first and second order tributaries (UTs) to Scaly Bark Creek (UT1, UT1a, UT1b, UT2, UT3, and UT4). At the downstream limits of the project, the drainage area is 1,619 acres (2.5 square miles). Scaly Bark Creek (NCDWQ Index No. 13-17-31-2), which is the main creek on the project site, has been classified as Class C waters. Class C waters are protected for secondary recreation, fishing, wildlife, fish and aquatic life propagation and survival, agriculture, and other uses. Directions and a map of the Site are provided in Figure 1.

1.1 Project Goals and Objectives

Prior to construction activities, the primary watershed stressor was the high sediment load received from the upstream watershed due to bank erosion and lack of erosion control during agricultural practices. Activities such as livestock trampling on the banks, vegetation maintenance and removal by the landowner, lack of riparian buffer to stabilize banks and filter runoff, and channel maintenance and straightening by the landowner, resulted in an unstable stream system. As a result of the aforementioned watershed and land activities, the Site had poor water quality due to sediment and fecal pollution, poor habitat due to lack of riparian vegetation and lack of in-stream bed diversity, and unstable geomorphic conditions. Tables 1-4 in Appendix 1 presents the pre-restoration conditions in detail for the Site.

The primary objectives of the project were to decrease nutrient and fecal coliform levels, sediment input, and water temperature, increase dissolved oxygen concentrations, create appropriate in-stream and terrestrial habitat, and decrease channel velocities. These objectives were achieved by restoring 4,860 linear feet (LF) of perennial stream channel, enhancing 3,578 LF of perennial and intermittent stream channel, and preserving 700 LF of intermittent stream channel. Restoration of dimension, pattern, and profile was implemented for Scaly Bark Creek, the lower portion of UT1, and UT2; enhancement of profile and dimension, working within the existing channel, was implemented for the remaining portion of UT1, UT1a, UT1b, UT3, and a portion of UT4. The Site's riparian areas were also planted to stabilize streambanks, improve habitat, and protect water quality. Figure 2 and Table 1 present the restoration and enhancement design for the Site.

The following project goals were established to address the effects listed above in the executive summary from watershed and project site stressors:

- Remove harmful nutrients from creek flow, including fecal pollution;

- Reduce pollution of the creek by excess sediment;
- Increase dissolved oxygen concentrations;
- Improve stream bank stability;
- Improve in-stream habitat;
- Restore terrestrial habitat; and
- Improve aesthetics of the riparian corridor.

The project objectives to meet these goals are to:

- Fence out cattle from the riparian corridor to remove fecal contamination and eliminate bank trampling;
- Provide a floodplain for excess sediment to settle out while maintaining appropriate sediment transport through the design reach and eliminating sediment contributions from bank erosion in the project reaches;
- Provide aeration points at riffle and drop structures to increase dissolved oxygen;
- Provide riparian vegetation root mass to stabilize banks and to provide terrestrial habitat;
- Construct a geomorphically stable, self-maintaining channel to provide for stable stream form;
- Provide aquatic habitat bedform diversity in the form of riffles and pools, as well as terrestrial habitat with riparian planting; and
- Provide channel shading to reduce water temperatures which will improve habitat quality and help to improve dissolved oxygen concentrations.

1.2 Monitoring Year 2 Data Assessment

Annual monitoring and quarterly site visits were conducted during 2012 to assess the condition of the project. The stream restoration success criteria for the project site follows the approved success criteria presented in the Scaly Bark Mitigation Plan (Approved 7/15/2011).

1.2.1 Vegetative Assessment

A total of 29 vegetation plots were established within the project easement area using standard 10 meter by 10 meter vegetation monitoring plots. Plots were randomly established within planted portions of the stream restoration and enhancement areas to capture the heterogeneity of the designed vegetative communities. The plot corners were marked and are recoverable either through field identification or with the use of a GPS unit. Reference photographs at the origin looking diagonally across the plot to the opposite corner were taken to capture the same reference photograph locations as the as-built. The final vegetative success criteria will be the survival of 260 planted stems per acre in the riparian corridor along restored and enhanced reaches at the end of year five (5) of the monitoring period. The interim measure of vegetative success for the Site will be the survival of at least 320 planted stems per acre at the end of year three (3) of the monitoring period.

The Site received additional planting in late winter of 2012 in response to the quantity of dead bare roots observed during the 2011 vegetative survey. To promote better success, the planting list was modified slightly to account for species that were not successful in the initial planting. The annual vegetation monitoring was completed in September 2012 and resulted in an average survivability of 346 stems per acre, which is greater than the interim requirement of 320 stems per acre. There was an average of 9 stems per plot compared to 10 stems per plot in monitoring year one (MY-1). A total of 17 out of 29 plots met the success criteria required for monitoring year two (MY-2) (Plots 1,

4, 5, 7, 8, 9, 12, 13, 14, 17, 21, 22, 23, 24, 25, 26 and 27). The slight decrease in overall stems per acre after the additional planting is likely the result of below normal precipitation and grass suffocation/crowding of planted stems by thriving herbaceous species. The area has experienced drier than normal conditions over the past 2 years compared to historical averages. There is no onsite rain gage so rainfall data was collected from a weather station located at the Stanly County Airport. This station is part of the North Carolina Climate Retrieval and Observations Network of the Southeast Database (CRONOS) developed by the State Climate Office (SCO) of North Carolina. During all of 2011 and the first 9 months of 2012, 24.05 and 24.21 inches of precipitation respectively, were recorded at the Stanly County Airport weather station (SCO, 2012). These are significantly lower than the historical average for Stanly County of 48.71 inches (USDA, 2002). Additional vegetation observations will be conducted during the winter of 2012-2013 to identify any planted stems missed during the 2012 vegetation survey once herbaceous vegetation has gone dormant.

A few small pockets of invasive Johnson grass were noted along Scaly Bark and UT1. These areas are isolated and currently aren't impacting planted vegetation. These areas will be monitored and may require maintenance. Please refer to Appendix 3 for vegetation summary tables and raw data tables and Appendix 2 for vegetation plot photographs and the vegetation condition assessment table.

Maintenance Plan

At this point, no replanting is planned; however, additional vegetation observations will be performed during the winter of 2012-2013. If these surveys do not show an increase in density of planted species, isolated areas may receive supplemental planting. The site vegetation will also be monitored during the 2013 growing season to determine if mowing and/or herbicide applications will be needed to suppress weeds or invasive grasses.

1.2.2 Stream Assessment

Morphological surveys for theMY-2 were conducted between June and July 2012. All streams within the Site met the success criteria for MY-2. Please refer to Appendix 2 for the visual assessment table, current condition plan view (CCPV), and photographs and Appendix 4 for morphological data and plots.

Riffle cross-sections surveyed along the restoration reaches have met success criteria for MY-2. The cross-sections appear stable and show little to no change in the bankfull area, maximum depth ratio, or width-to-depth ratio. All surveyed riffle cross-sections fell within the parameters defined for channels of the appropriate Rosgen stream type. The surveyed longitudinal profile data for the stream restoration reaches illustrates that the bedform features are maintaining lateral and vertical stability. Due to the lack of sufficient baseflow, water surface data wasn't collected during MY2. Profile measurements including riffle slope, riffle length, pool length, and pool-to-pool spacing were subsequently based on bed profile. The riffles are remaining steeper and shallower than the pools. The longitudinal profiles show that the bank height ratios remain very near to 1.0 for all of the restoration reaches. In-stream structures, such as root wads and brush toe used to enhance channel habitat and stability on the outside bank of meander bends are providing stability and habitat as designed. Pattern data will only be completed in MY-5 if there are indicators from the profile or dimensions that significant geomorphic adjustments have occurred. No changes were

observed that indicated a change in the radius of curvature or channel belt width; therefore, pattern data is not included in the MY-2 report.

Substrate materials in the restoration reaches indicate maintenance of coarser materials in the riffle features and smaller particles in the pool features. As-built shear stresses were similar to design parameters and should reduce the risk of further erosion along all three restoration reaches.

At the end of the five (5) year monitoring period, two (2) or more bankfull events must occur in separate years within the restoration reach. No bankfull events were recorded with the crest gauge during the MY-2 data gathering; therefore, the Site has not met the MY-5 hydrology criteria at this time.

1.3 Monitoring Year 2 Summary

Overall, the Site has met the required mitigation success criteria for MY-2. All streams within the Site are stable and functioning as designed. The average stem density for the Site met the interim MY-3 success criteria; however, a portion of the individual vegetation plots did not meet the interim success criteria as seen in the CCPV. There have been zero (0) bankfull events recorded since construction commenced, therefore, the MY-5 hydrology attainment requirement has not been met for the Site at this time. This is likely due in part to the drier than normal precipitation amounts in years 1 and 2. This is not a concern at this time since there are three more years of monitoring remaining.

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

2.0 Methodology

Geomorphic data collected followed the standards outlined in The Stream Channel Reference Site: An Illustrated Guide to Field Techniques (Harrelson et al., 1994) and in the Stream Restoration: A Natural Channel Design Handbook (Doll et al., 2003). Longitudinal and cross-sectional data were collected using a total station and were georeferenced. Reachwide pebble counts were conducted along each restored reach for channel classification. Cross-section substrate analyses conducted in each surveyed riffle followed the 100 count wetted perimeter methodology. All CCPV mapping was recorded using a Trimble handheld GPS with sub-meter accuracy and processed using was Pathfinder and ArcView. Crest gauges were installed in surveyed riffle cross-sections and monitored quarterly. Hydrology attainment installation and monitoring methods are in accordance with the USACE (2003) standards. Vegetation monitoring protocols followed the Carolina Vegetation Survey-NCEEP Level 2 Protocol (Lee et al., 2006).

3.0 References

Doll, B.A., Grabow, G.L., Hall, K.A., Halley, J., Harman, W.A., Jennings, G.D., and Wise, D.E. 2003. Stream Restoration A Natural Channel Design Handbook.

Harrelson, C.C., Rawlins, C.L., Potyondy, J.P. 1994. *Stream Channel Reference Sites: An Illustrated Guide to Field Technique.* Gen. Tech. Rep. RM-245. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station. 61 p.

Lee, M.T., Peet, R.K., S.D., Wentworth, T.R. 2006. CVS-EEP Protocol for Recording Vegetation Version 4.0. Retrieved from http://www.nceep.net/business/monitoring/veg/datasheets.htm.

Rosgen, D. L. 1994. A classification of natural rivers. *Catena* 22:169-199.

Rosgen, D.L. 1996. Applied River Morphology. Pagosa Springs, CO: Wildland Hydrology Books.

Rosgen, D.L. 1997. A Geomorphological Approach to Restoration of Incised Rivers. Proceedings of the Conference on Management of Landscapes Disturbed by Channel Incision. Center For Computational Hydroscience and Bioengineering, Oxford Campus, University of Mississippi, Pages 12-22.

Schafale, M.P. and A.S. Weakley. 1990. Classification of the Natural Communities of North Carolina, 3rd approx. North Carolina Natural Heritage Program, Raleigh, North Carolina.

Simon, A. 1989. A model of channel response in disturbed alluvial channels. *Earth Surface Processes and Landforms* 14(1):11-26.

State Climate Office (SCO) of North Carolina. 2012. NCCRONOS database, Station ID: KVUJ, Stanly County Airport in Stanly County, NC. Retrieved on 10-29-2012. http://www.nc-climate.ncsu.edu/cronos/?station=KVUJ

United States Department of Agriculture (USDA). 2002. Natural Resources Conservation Service, Climate Information for Stanly County, NC (1971-2000). WETS Station: Albemarle, NC0090. http://www.wcc.nrcs.usda.gov/ftpref/support/climate/wetlands/nc/37167.txt

United States Department of Agriculture (USDA). 2009. Natural Resources Conservation Service, Soil Survey Geographic (SSURGO) database for Stanly County, North Carolina. http://SoilDataMart.nrcs.usda.gov

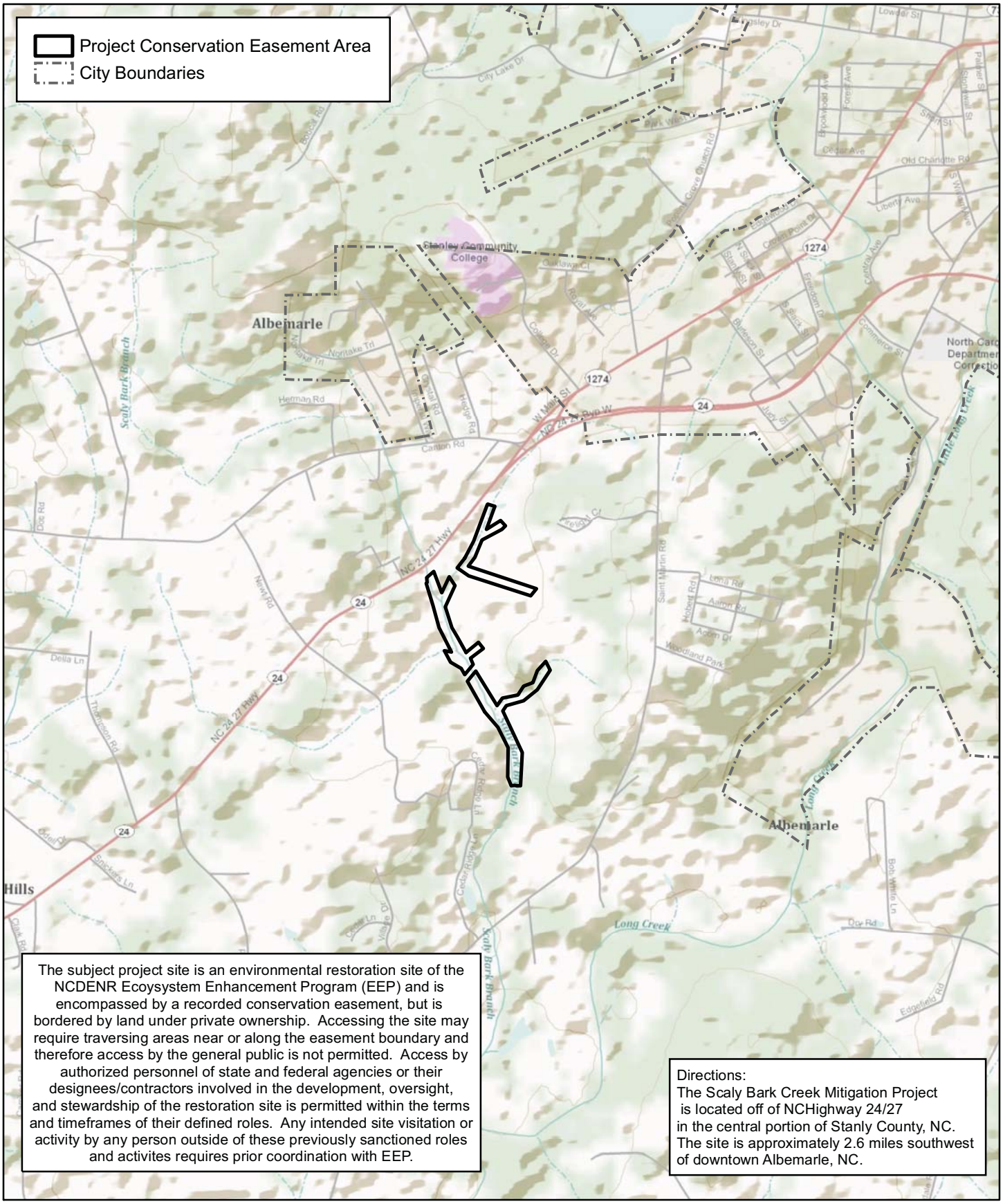
United States Geological Survey (USGS). 1998. North Carolina Geology. http:// http://www.geology.enr.state.nc.us/usgs/carolina.htm

Weakley, A.S. 2008. *Flora of the Carolinas, Virginia, Georgia, Northern Florida, and Surrounding Areas* (Draft April 2008). University of North Carolina at Chapel Hill: Chapel Hill, NC.

Wildlands Engineering, Inc. 2010. Scaly Bark Mitigation Site Restoration Plan. NCEEP, Raleigh, NC.

Wildlands Engineering, Inc. 2011. Scaly Bark Mitigation Site Baseline Monitoring Document and As-Built Baseline Report. NCEEP, Raleigh, NC.

APPENDIX 1. General Tables and Figures



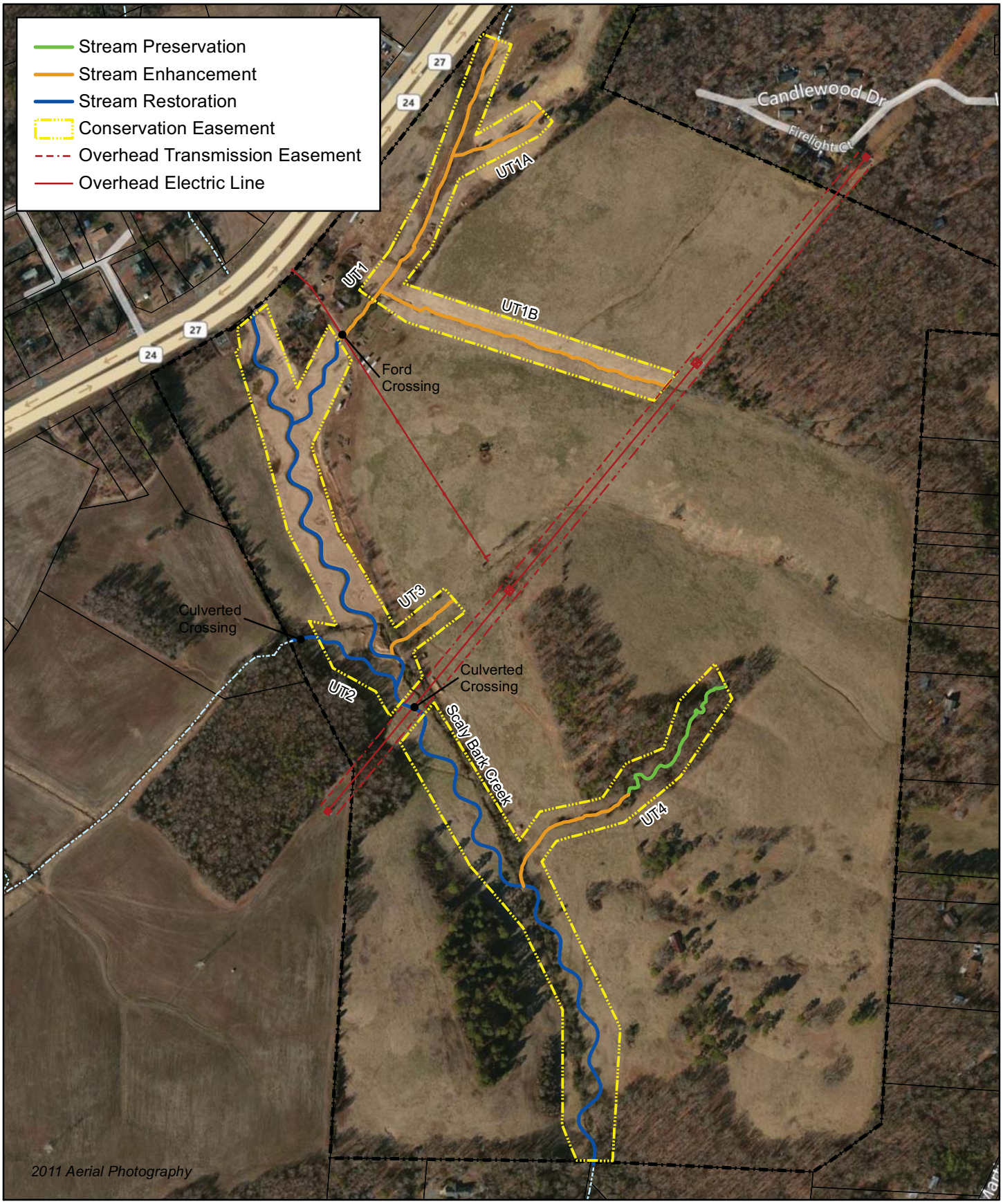
WILDLANDS ENGINEERING

Ecosystem Enhancement PROGRAM

0 1,000 2,000 Feet

N

Figure 1. Project Vicinity Map
Scaly Bark Creek Mitigation Site
EEP Project Number 94148
Monitoring Year 2 of 5
Stanly County, NC



WILDLANDS ENGINEERING

Ecosystem Enhancement PROGRAM

0 250 500 Feet

N

Figure 2. Project Component/Asset Map
Scaly Bark Creek Mitigation Site
EEP Project Number 94148
Monitoring Year 2 of 5

Stanly County, NC

Appendix 1. General Tables and Figures
Table 1. Project Components and Mitigation Credits
Scaly Bark Creek Mitigation Site (EEP Project No.94148)
Monitoring Year 2

Mitigation Credits										
	Stream		Riparian Wetland		Non-Riparian Wetland		Buffer	Nitrogen Nutrient Offet	Phosphorous Nutrient Offset	
Type	R	RE	R	RE	R	RE				
Totals	4,860	1,571	N/A	N/A	N/A	N/A		N/A	N/A	

Project Components						
Reach ID	Stationing/ Location	Exisitng Footage (LF)	Approach	Restoration or Restoration Equivalent	Restoration Footage (LF)*	Mitigation Ratio
Scaly Bark Creek Reaches 1 & 2	100+00.00-141+71.79	3,600	Priority 1	Restoration	4,058	1:1
UT1 Reach 1	200+00.00-211+10.37	1,104	spot grading and planting	Enhancement II	1,098	2.5:1
UT1 Reach 2	213+10.37-217+32.36	330	Priority 1	Restoration	402	1:1
UT1a	302+78.00-306+68.00	390	spot grading and planting	Enhancement II	390	2.5:1
UT1b	400+10.00-412+08.00	1,198	spot grading and planting	Enhancement II	1,166	2.5:1
UT2	500+00.00-503+93.00	262	Priority 1	Restoration	400	1:1
UT3	600+00.00-603+26.00	282	spot grading and planting	Enhancement II	341	2.5:1
UT4	707+00.00-712+69.00	516	spot grading and planting	Enhancement II	583	2.5:1
UT4	700+00.00-707+00.00	700	spot grading and planting	Preservation	700	5:1

Component Summation						
Restoration Level	Stream (linear feet)	Riparian Wetland (acres)		Non-Riparian Wetland (acres)	Buffer (square feet)	Upland (acres)
		Riverine	Non-Riverine			
Restoration	4,860	-	-	- -	-	-
Enhancement		-	-	- -	-	-
Enhancement I	-					
Enhancement II	3,578					
Creation		-	-	-		
Preservation	700	-	-	-		-
High Quality Preservation	-	-	-	-		-

BMP Elements										
Elements		Location		Purpose/Function		Notes				
-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	
-	-	-	-	-	-	-	-	-	-	

BMP Elements

BR = Bioretention Cell; S F= Sand Filter; SW = Stormwater Wetland; WDP = Wet Detention Pond; DDP = Dry Detention Pond; FS = Filter Strip; S = Grassed Swale; LS = Level Spreader; NI = Natural Infiltration Area; FB = Forested Buffer

*Linear footage excludes crossings.

Appendix 1. General Tables and Figures
Table 2. Project Activity and Reporting History
Scaly Bark Creek Mitigation Site (EEP Project No.94148)
Monitoring Year 2

Activity or Report	Date Collection Complete	Completion or Delivery
Mitigation Plan	May 2010	May 2010
Final Design - Construction Plans	December 2010	December 2010
Construction	April 2011	April 2011
Temporary S&E mix applied to entire project area*	April 2011	April 2011
Permanent seed mix applied to reach/segments	April 2011	April 2011
Containerized and B&B plantings for reach/segments	April 2011	April 2011
Baseline Monitoring Document (Year 0 Monitoring - baseline)	March 2011/April 2011	June 2011
Year 1 Monitoring	November 2011	November 2011
Year 2 Monitoring	September 2012	November 2012
Year 3 Monitoring	2013	December 2013
Year 4 Monitoring	2014	December 2014
Year 5 Monitoring	2015	December 2015

*Seed and mulch is added as each section of construction is completed.

Appendix 1. General Tables and Figures
Table 3. Project Contacts Table
Scaly Bark Creek Mitigation Site (EEP Project No.94148)
Monitoring Year 2

Designer	**Wildlands Engineering, Inc.**
	1430 South Mint Street, Suite 104
	Charlotte, NC 28203
Shawn Wilkerson	704.332.7754
Construction Contractor	**North State Environmental, Inc.**
	2889 Lowery Street
	Winston-Salem, NC 27101
Darrell Westmoreland	336.725.2010
Planting Contractor	**North State Environmental, Inc.**
	2889 Lowery Street
	Winston-Salem, NC 27101
Stephen Joyce	336.725.2010
Seeding Contractor	**North State Environmental, Inc.**
	2889 Lowery Street
	Winston-Salem, NC 27101
Stephen Joyce	336.725.2010
Seed Mix Sources	**Green Resource**
Nursery Stock Suppliers	
Bare Roots	**Dykes and Son Nursery**
Plugs	**Pinelands Nursery**
Live Stakes/Brush Mattress	**North State Environmental, Inc.**
Monitoring Performers	**Wildlands Engineering, Inc.**
Stream Monitoring, POC	Kirsten Y. Gimbert
Vegetation Monitoring, POC	704.332.7754, ext. 110

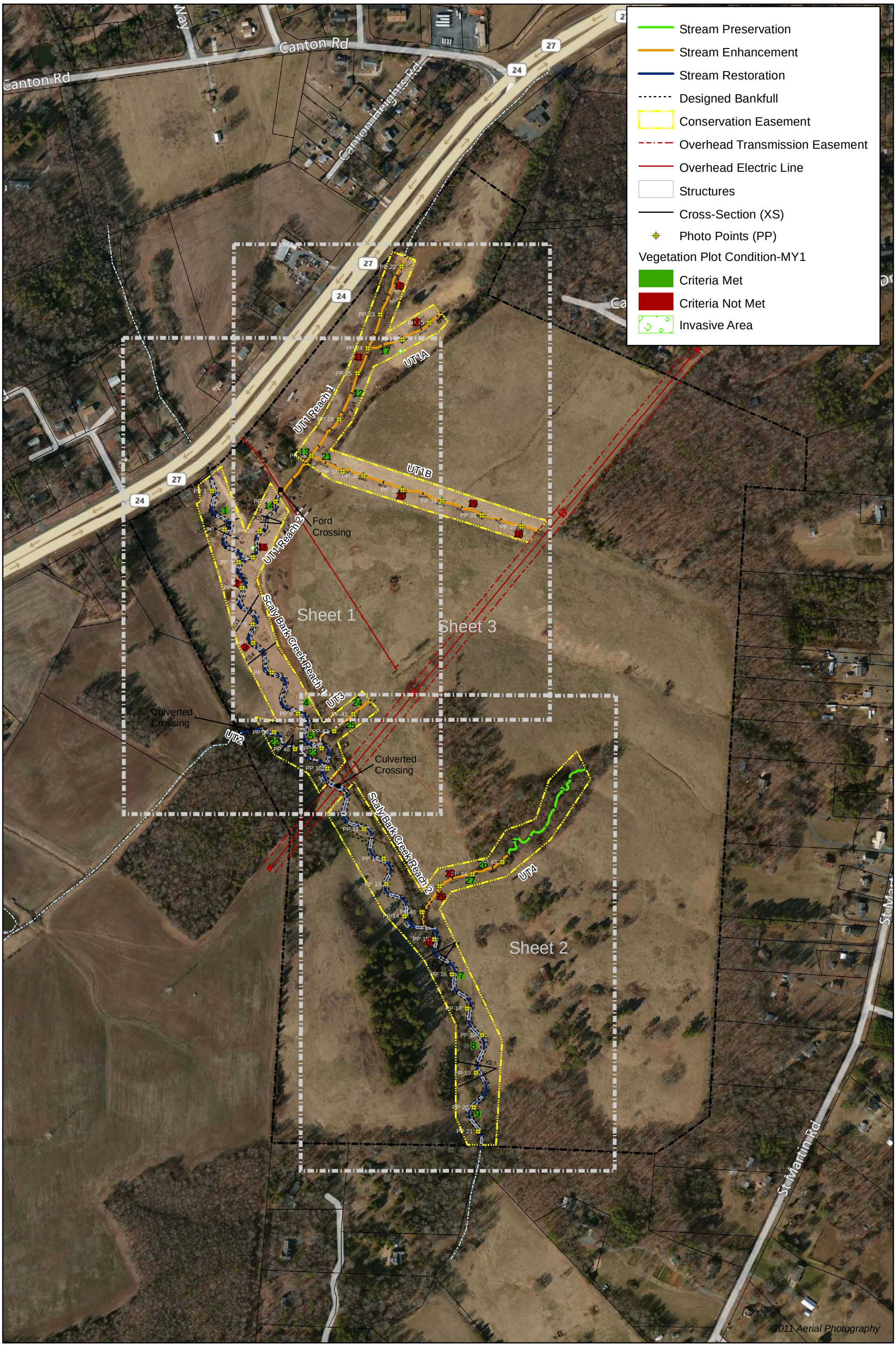
Appendix 1. General Tables and Figures
Table 4. Project Baseline Information and Attributes
Scaly Bark Creek Mitigation Site (EEP Project No.94148)
Monitoring Year 2

Project Information (Pre-Restoration)							
Project Name	Scaly Bark Creek Mitigation Site						
County	Stanly						
Project Area (acres)	26.6						
Project Coordinates (latitude and longitude)	35° 19' 38.338" N, 80° 14' 19.315"W						
Project Watershed Summary Information							
Physiographic Province	Piedmont						
River Basin	Yadkin						
USGS Hydrologic Unit 8-digit	03040105	USGS Hydrologic Unit 14-digit	03040105060030				
DWQ Sub-basin	Rocky River (03-07-13)						
Project Drainiage Area (acres)	1,619						
Project Drainage Area Percentage of Impervious Area	<10%						
CGIA Land Use Classification	U						
Reach Summary Information							
Parameters	**Scaly Bark Creek**	**UT1**	**UT1a**	**UT1b**	**UT2**	**UT3**	**UT4**
Length of reach (linear feet) - Post-Restoration	4,058	1,500	390	1,166	400	341	583
Valley classification	VIII						
Drainage area (acres)	1,619	173	46	83	436	36	25
NCDWQ stream identification score	43.5	31	21.5	26.5	37.5	19.5	24
NCDWQ Water Quality Classification	C	-	-	-	-	-	-
Morphological Desription (stream type)	C4	Reach1: E4 Reach 2: C4	E4	C4b	C4	C4	Reach 1: B4 Reach 2: C4
Evolutionary trend (Simon's Model) - Pre- Restoration	Reach 1: Stage 2 Reach 2: Stage 3, 4 & 5	Reach 2: Stage 2 & 4	n/a	n/a	Stage 4	n/a	n/a
Underlying mapped soils	*BaB, BaD,BbB & BbD*		*GoC, GoF*		*KkB*	*MhB*	*Oa*
Drainage class	well drained		well-drained to excessively drained		moderately well-drained	moderate to moderately rapid	moderately well-drained
Soil Hydric status	No		No		No	No	Yes (inclusions)
Slope	gently sloping to steep uplands		gently sloping to strongly sloping		lower slopes	nearly level to gently sloping	nearly level
FEMA classification	Zone AE (downstream end of Scaly Bark only); all other areas were not mapped						
Native vegetation community	Piedmont Bottomland Forest						
Percent composition of exotic invasive vegetation - Post-Restoration	0%						

Regulatory Considerations			
Regulation	**Applicable?**	**Resolved?**	**Supporting Documentation**
Waters of the United States - Section 404	Yes	Yes	USACE Nationwide Permit No.27 and DWQ 401 Water Quality Certification No. 3689
Waters of the United States - Section 401	Yes	Yes	
Endangered Species Act	Yes	Yes	Scaly Bark Mitigation Plan; studies found suitable habitat not present for listed species
Historic Preservation Act	Yes	Yes	No historic resources were found to be impacted (letter from SHPO)
Coastal Zone Management Act (CZMA)/Coastal Area Management Act (CAMA)	No	n/a	n/a
FEMA Floodplain Compliance	Yes	Yes	CLOMR approved
Essential Fisheries Habitat	Yes	Yes	No adverse impacts to aquatic resources were found (letter from NCWRC)

U= Unknown

APPENDIX 2. Visual Assessment Data



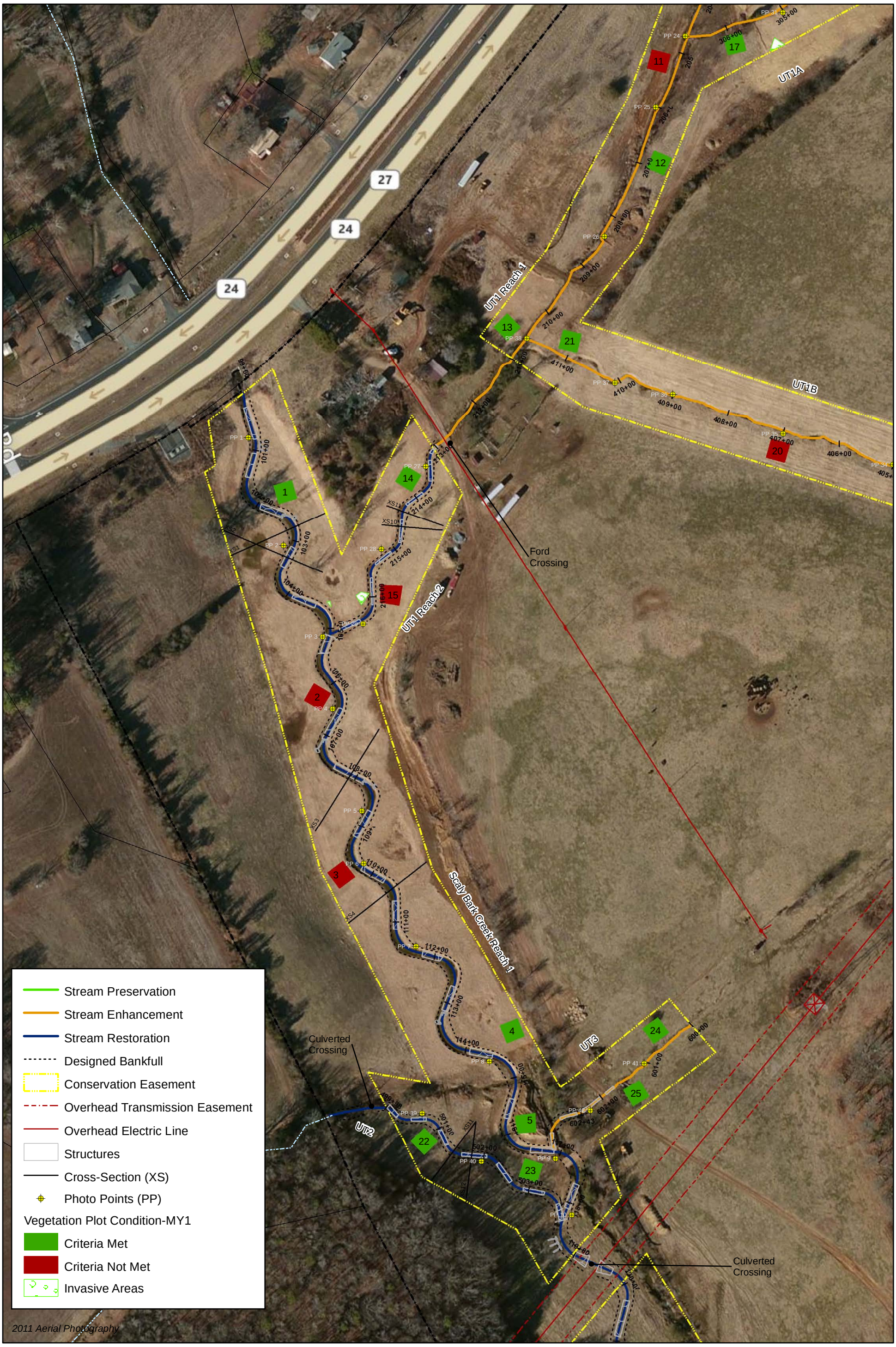
WILDLANDS ENGINEERING

Ecosystem Enhancement PROGRAM

0 175 350 Feet

Figure 3.0 Integrated Current Condition Plan View (Key)
Scaly Bark Creek Mitigation Site
EEP Project Number 94148
Monitoring Year 2 of 5

Stanly County, NC



WILDLANDS ENGINEERING

Ecosystem Enhancement PROGRAM

0 75 150 Feet

N

Figure 3.1 Integrated Current Condition Plan View (Sheet 1 of 3)
Scaly Bark Creek Mitigation Site
EEP Project Number 94148
Monitoring Year 2 of 5

Stanly County, NC

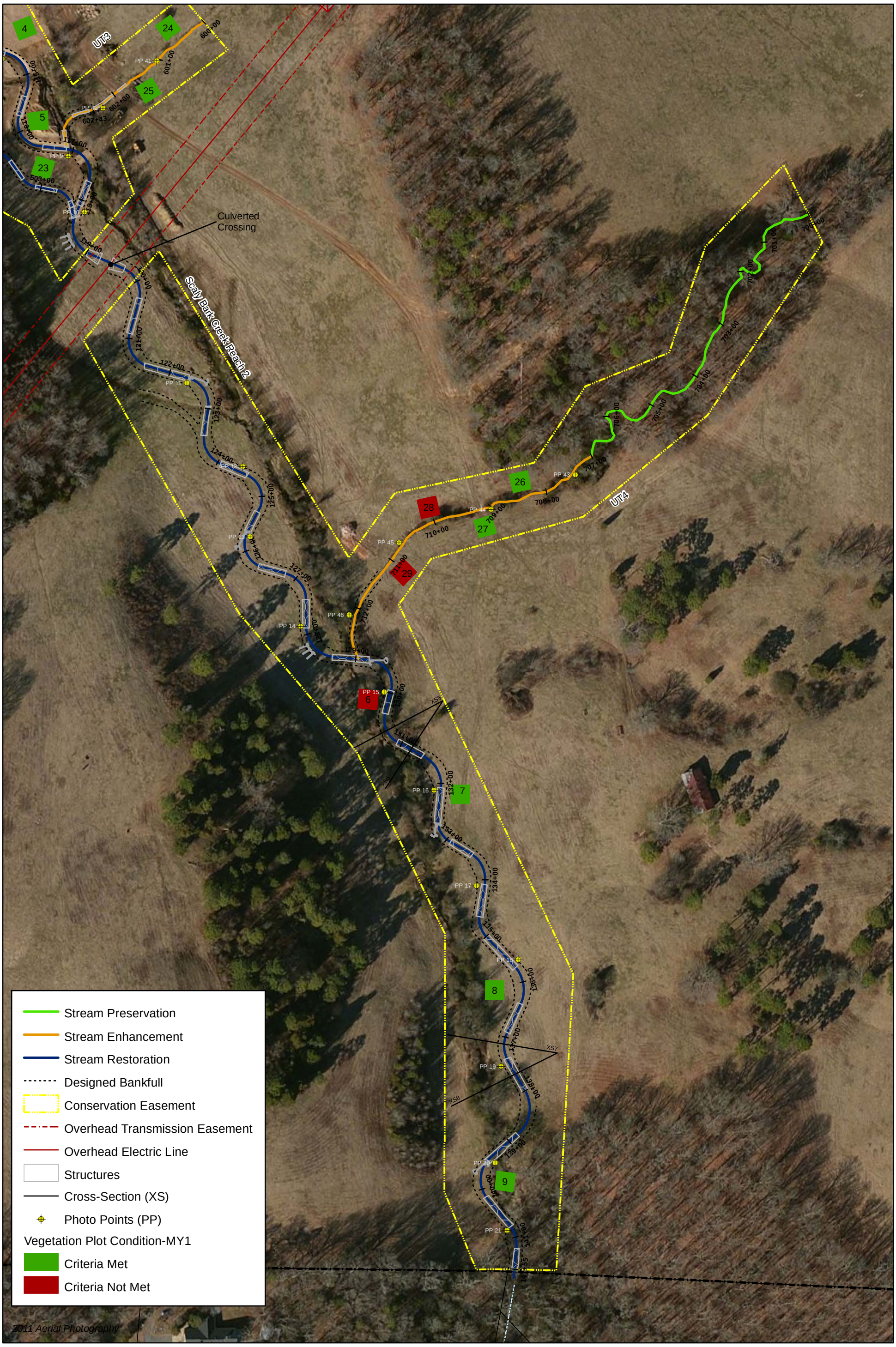
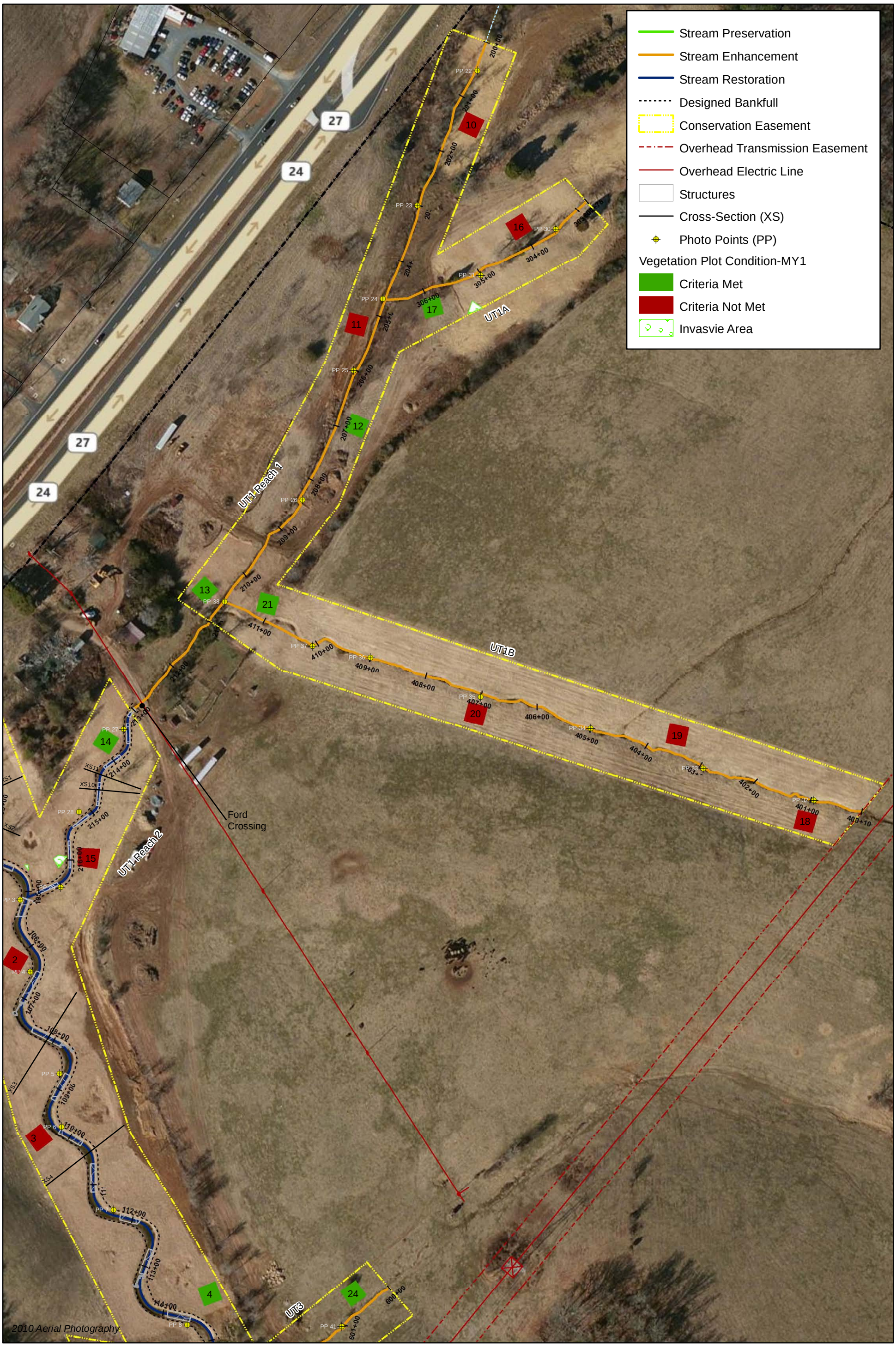


Figure 3.2 Integrated Current Condition Plan View (Sheet 2 of 3)
Scaly Bark Creek Mitigation Site
EEP Project Number 94148
Monitoring Year 2 of 5

Stanly County, NC



WILDLANDS ENGINEERING

Ecosystem Enhancement PROGRAM

0 75 150 Feet

N

Figure 3.3 Integrated Current Condition Plan View (Sheet 3 of 3)
Scaly Bark Creek Mitigation Site
EEP Project Number 94148
Monitoring Year 2 of 5

Stanly County, NC

Appendix 2. Visual Assessment Data
Table 5a. Visual Stream Morphology Stability Assessment Table
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reaches 1 and 2 (4,058 LF)
Monitoring Year 2

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	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	37	37			100%			
	3. Meander Pool Condition	Depth Sufficient	37	37			100%			
		Lenth Appropriate	37	37			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	37	37			100%			
		Thalweg centering at downstream of meander bend (Glide)	37	37			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	13	13			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	13	13			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	13	13			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	13	13			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	13	13			100%			

Appendix 2. Visual Assessment Data
Table 5b. Visual Stream Morphology Stability Assessment Table
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT1 Reach 2 (402 LF)
Monitoring Year 2

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	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	6	6			100%			
	3. Meander Pool Condition	Depth Sufficient	6	6			100%			
		Lenth Appropriate	6	6			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	6	6			100%			
		Thalweg centering at downstream of meander bend (Glide)	6	6			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.								
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill								
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	n/a				n/a			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.								
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.								

Appendix 2. Visual Assessment Data
Table 5c. Visual Stream Morphology Stability Assessment Table
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT2 (400 LF)
Monitoring Year 2

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	Adjust % for Stabilizing Woody Vegetation
1. Bed	**1. Vertical Stability (Riffle and Run units)**	Aggradation			0	0	100%			
		Degredation			0	0	100%			
	2. Riffle Condition	Texture/Substrate	7	7			100%			
	3. Meander Pool Condition	Depth Sufficient	7	7			100%			
		Lenth Appropriate	7	7			100%			
	4. Thalweg Position	Thalweg centering at upstream of meander bend (Run)	7	7			100%			
		Thalweg centering at downstream of meander bend (Glide)	7	7			100%			
2. Bank	**1. Scoured/Eroded**	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely. Does NOT include undercuts that are modest, appear sustainable and are providing habitat			0	0	100%	0	0	100%
	3. Mass Wasting	Bank slumping, calving, or collapse			0	0	100%	0	0	100%
				Totals	0	0	100%	0	0	100%
3. Engineered Structures	**1. Overall Integrity**	Structures physically intact with no dilodged boulders or logs.	1	1			100%			
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	1	1			100%			
	2a. Piping	Structures lacking any substantial flow underneath sills or arms.	1	1			100%			
	3. Bank Protection	Bank erosion within the structures extent of influence does not exceed 15%.	1	1			100%			
	4. Habitat	Pool forming structures maintaining ~Max Pool Depth : Bankfull Depth ≥ 1.6 Rootwads/logs providing some cover at baseflow.	1	1			100%			

Appendix 2. Visual Assessment Data
Table 6. Vegetation Condition Assessment Table
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Monitoring Year 2

Planted Acreage **25.4**

Vegetation Category	Definitions	Mapping Threshold (acres)	Number of Polygons	Combined Acreage	% of Planted Acreage*
Bare Areas	Very limited cover of both woody and herbaceous material	0.1	0	0	0.00%
Low Stem Density Areas^	Woody stem densities clearly below target levels based on MY3, 4, or 5 stem count criteria.	0.1	12	0.3	1%
		Total	**12**	**0.3**	**1%**
Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	*	*	41%
		Cumulative Total	**12**	**0.3**	**42%**

Easement Acreage **26.6**

Vegetation Category	Definitions	Mapping Threshold (SF)	Number of Polygons	Combined Acreage	% of Planted Acreage
Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000	3	0.012	0.05%
Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	0	0	0%

^Acreage calculated from vegetation plots monitored for site.
*Areas of Poor Growth Rates were estimated based on planted stem mortality.

Stream Photographs

	
Photo Point 1 – looking upstream (06/15/2012)	Photo Point 1 – looking downstream (06/15/2012)
	
Photo Point 2 – looking upstream (06/15/2012)	Photo Point 2 – looking downstream (06/15/2012)
	
Photo Point 3 – looking upstream (06/15/2012)	Photo Point 3 – looking downstream (06/15/2012)

	
Photo Point 4 – looking upstream (06/15/2012)	Photo Point 4 – looking downstream (06/15/2012)
	
Photo Point 5 – looking upstream (06/15/2012)	Photo Point 5 – looking downstream (06/15/2012)
	
Photo Point 6 – looking upstream (06/15/2012)	Photo Point 6 – looking downstream (06/15/2012)

	
Photo Point 7 – looking upstream (06/15/2012)	Photo Point 7 – looking downstream (06/15/2012)
	
Photo Point 8 – looking upstream (06/15/2012)	Photo Point 8 – looking downstream (06/15/2012)
	
Photo Point 9 – looking upstream (06/15/2012)	Photo Point 9 – looking downstream (06/15/2012)

	
Photo Point 10 – looking upstream (06/15/2012)	Photo Point 10 – looking downstream (06/15/2012)
	
Photo Point 11 – looking upstream (06/15/2012)	Photo Point 11 – looking downstream (06/15/2012)
	
Photo Point 12 – looking upstream (06/15/2012)	Photo Point 12 – looking downstream (06/15/2012)

	
Photo Point 13 – looking upstream (06/15/2012)	Photo Point 13 – looking downstream (06/15/2012)
	
Photo Point 14 – looking upstream (06/15/2012)	Photo Point 14 – looking downstream (06/15/2012)
	
Photo Point 15 – looking upstream (06/15/2012)	Photo Point 15 – looking downstream (06/15/2012)

	
Photo Point 16 – looking upstream (06/15/2012)	Photo Point 16 – looking downstream (06/15/2012)
	
Photo Point 17 – looking upstream (06/15/2012)	Photo Point 17 – looking downstream (06/15/2012)
	
Photo Point 18 – looking upstream (06/15/2012)	Photo Point 18 – looking downstream (06/15/2012)

	
Photo Point 19 – looking upstream (06/15/2012)	Photo Point 19 – looking downstream (06/15/2012)
	
Photo Point 20 – looking upstream (06/15/2012)	Photo Point 20 – looking downstream (06/15/2012)
	
Photo Point 21 – looking upstream (06/15/2012)	Photo Point 21 – looking downstream (06/15/2012)

	
Photo Point 22 – looking upstream (06/15/2012)	Photo Point 22 – looking downstream (06/15/2012)
	
Photo Point 23 – looking upstream (06/15/2012)	Photo Point 23 – looking downstream (06/15/2012)
	
Photo Point 24 – looking upstream (06/15/2012)	Photo Point 24 – looking downstream (06/15/2012)

	
Photo Point 25 – looking upstream (06/15/2012)	Photo Point 25 – looking downstream (06/15/2012)
	
Photo Point 26 – looking upstream (06/15/2012)	Photo Point 26 – looking downstream (06/15/2012)
	
Photo Point 27 – looking upstream (06/15/2012)	Photo Point 27 – looking downstream (06/15/2012)

	
Photo Point 28 – looking upstream (06/15/2012)	Photo Point 28 – looking downstream (06/15/2012)
	
Photo Point 29 – looking upstream (06/15/2012)	Photo Point 29 – looking downstream (06/15/2012)
	
Photo Point 30 – looking upstream (06/15/2012)	Photo Point 30 – looking downstream (06/15/2012)

	
Photo Point 31 – looking upstream (06/15/2012)	Photo Point 31 – looking downstream (06/15/2012)
	
Photo Point 32 – looking upstream (06/15/2012)	Photo Point 32 – looking downstream (06/15/2012)
	
Photo Point 33 – looking upstream (06/15/2012)	Photo Point 33 – looking downstream (06/15/2012)

	
Photo Point 34 – looking upstream (06/15/2012)	Photo Point 34 – looking downstream (06/15/2012)
	
Photo Point 35 – looking upstream (06/15/2012)	Photo Point 35 – looking downstream (06/15/2012)
	
Photo Point 36 – looking upstream (06/15/2012)	Photo Point 36 – looking downstream (06/15/2012)

	
Photo Point 37 – looking upstream (06/15/2012)	Photo Point 37 – looking downstream (06/15/2012)
	
Photo Point 38 – looking upstream (06/15/2012)	Photo Point 38 – looking downstream (06/15/2012)
	
Photo Point 39 – looking upstream (06/15/2012)	Photo Point 39 – looking downstream (06/15/2012)

	
Photo Point 40 – looking upstream (06/15/2012)	Photo Point 40 – looking downstream (06/15/2012)
	
Photo Point 41 – looking upstream (06/15/2012)	Photo Point 41 – looking downstream (06/15/2012)
	
Photo Point 42 – looking upstream (06/15/2012)	Photo Point 42 – looking downstream (06/15/2012)

	
Photo Point 43 – looking upstream (06/15/2012)	Photo Point 43 – looking downstream (06/15/2012)
	
Photo Point 44 – looking upstream (06/15/2012)	Photo Point 44 – looking downstream (06/15/2012)
	
Photo Point 45 – looking upstream (06/15/2012)	Photo Point 45 – looking downstream (06/15/2012)

	
Photo Point 46 – looking upstream (06/15/2012)	Photo Point 46 – looking downstream (06/15/2012)

Vegetation Photographs

Vegetation Plot 1 (9/11/2012)

Vegetation Plot 2 (9/11/2012)

Vegetation Plot 3 (9/13/2011)

Vegetation Plot 4 (9/13/2012)

Vegetation Plot 5 (9/13/2012)

Vegetation Plot 6 (9/19/2012)

Vegetation Plot 7 (9/19/2012)

Vegetation Plot 8 (9/14/2012)

Vegetation Plot 9 (9/14/2012)

Vegetation Plot 10 (9/12/2012)

Vegetation Plot 11 (9/12/2012)

Vegetation Plot 12 (9/12/2012)

Vegetation Plot 13 (9/12/2012)

Vegetation Plot 14 (9/11/2012)

Vegetation Plot 15 (9/11/2012)

Vegetation Plot 16 (9/12/2012)

Vegetation Plot 17 (9/12/2012)

Vegetation Plot 18 (9/12/2012)

Vegetation Plot 19 (9/12/2012)

Vegetation Plot 20 (9/12/2012)

Vegetation Plot 21 (9/12/2012)

Vegetation Plot 22 (9/13/2012)

Vegetation Plot 23 (9/13/2012)

Vegetation Plot 24 (9/13/2012)

Vegetation Plot 25 (9/13/2012)

Vegetation Plot 26 (9/14/2012)

Vegetation Plot 27 (9/14/2012)

Vegetation Plot 28 (9/14/2012)

Vegetation Plot 29 (9/14/2012)

APPENDIX 3. Vegetation Plot Data

Appendix 3. Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment

Scaly Bark Creek Mitigation Site (EEP Project No. 94148)

Monitoring Year 2

Plot	MY1 Success Criteria Met (Y/N)	Tract Mean
1	Y	
2	N	
3	N	
4	Y	
5	Y	
6	N	
7	Y	
8	Y	
9	Y	
10	N	
11	N	
12	Y	
13	Y	
14	Y	
15	N	59%
16	N	
17	Y	
18	N	
19	N	
20	N	
21	Y	
22	Y	
23	Y	
24	Y	
25	Y	
26	Y	
27	Y	
28	N	
29	N	

Appendix 3. Vegetation Plot Data
Table 8. CVS Vegetation Plot Metadata
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Monitoring Year 2

Report Prepared By	Ian Eckardt
Date Prepared	*9/28/2011 10:53*
database name	*ScalyBark_MY2.mdb*
database location	*Q:\ActiveProjects\005-02122 Scaly Bark Creek Mitigation Project\Monitoring\Monitoring Year 2\Vegetation Assessment*
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	*This worksheet, which is a summary of the project and the project data.*
Plots	*List of plots surveyed.*
Stem Count by Plot and Spp	*Unknown*
PROJECT SUMMARY----------	
Project Code	94148
project Name	Scaly Bark Creek
Description	Scaly Bark Creek Mitigation Site
length (ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	29

Appendix 3. Vegetation Plot Data
Table 9a. Planted and Total Stem Counts (Species by Plot with Annual Means)
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reaches 1 and 2
Monitoring Year 2

			Current Data (MY2-9/2012)																		Annual Means					
			Plot 1		Plot 2		Plot 3		Plot 4		Plot 5		Plot 6		Plot 7		Plot 8		Plot 9		Current Mean		MY0-4/2011		MY1-9/2011	
Species	**Common Name**	**Type**	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer floridanum	Southern Sugar Maple	Tree	1	1			1	1	4	4	1	1			3	3	3	3	5	5	**2**	**2**	**4**	**4**	**2**	**2**
Alnus serrulata	Tag Alder	Tree/Shrub																			**0**	**0**	**2**	**2**	**2**	**2**
Betula nigra	River Birch	Tree							1	1											**1**	**1**	**2**	**2**	**2**	**2**
Carpinus caroliniana	American Hornbeam	Tree							1	1											**1**	**1**	**n/a**	**n/a**	**n/a**	**n/a**
Carya sp.	Hickory	Tree																			**0**	**0**	**1**	**1**	**1**	**1**
Carya cordiformis	Bitternut Hickory	Tree	1	1													1	1			**1**	**1**	**1**	**1**	**2**	**2**
Carya ovata	Shagbark Hickory	Tree	1	1					1	1			2	2							**2**	**2**	**1**	**1**	**1**	**1**
Celtis laevigata	Sugarberry	Tree			1	1									1	1					**2**	**2**	**n/a**	**n/a**	**n/a**	**n/a**
Celtis occidentalis	Hackberry	Tree/Shrub													1	1					**1**	**1**	**1**	**1**	**1**	**1**
Cornus sp.	Dogwood	Shrub																			**0**	**0**	**2**	**2**	**1**	**1**
Cornus amomum	Silky Dogwood	Shrub					2	2			1	1	1	1	1	1			1	1	**1**	**1**	**1**	**1**	**1**	**1**
Cornus florida	Flowering Dogwood	Tree/Shrub	1	1	1	1					2	2			2	2	1	1	1	1	**2**	**2**	**4**	**4**	**2**	**2**
Ilex opaca	American Holly	Tree/Shrub							1	1							1	1	1	1	**1**	**1**	**3**	**3**	**2**	**2**
Liquidambar styraciflua	Sweet Gm	Tree													1	1					**1**	**1**	**1**	**1**	**1**	**1**
Liriodendron tulipifera	Tulip Poplar	Tree	2	2	1	1	2	2			2	2					2	2			**2**	**2**	**5**	**5**	**2**	**2**
Platanus occidentalis	Sycamore	Tree	2	2			1	1	2	2	3	3	2	2					7	7	**2**	**2**	**1**	**1**	**1**	**1**
Quercus	Oak	Tree																			**1**	**1**	**n/a**	**n/a**	**1**	**1**
Quercus falcata	Southern Red Oak	Tree																			**1**	**1**	**n/a**	**n/a**	**n/a**	**n/a**
Quercus michauxii	Swamp Chestnut Oak	Tree									1	1			1	1					**1**	**1**	**4**	**4**	**2**	**2**
Quercus nigra	Water Oak	Tree							2	2	2	2			1	1					**2**	**2**	**n/a**	**n/a**	**n/a**	**n/a**
Quercus phellos	Willow Oak	Tree							1	1	4	4			2	2					**2**	**2**	**n/a**	**n/a**	**n/a**	**n/a**
Quercus rubra	Northern Red Oak	Tree	2	2			1	1													**1**	**1**	**n/a**	**n/a**	**n/a**	**n/a**
Unknown sp.	Unknown																				**0**	**0**	**2**	**2**	**1**	**1**
		Plot Area (acres)	**0.0247**																							
		Species Count	**7**	**7**	**3**	**3**	**5**	**5**	**8**	**8**	**8**	**8**	**3**	**3**	**9**	**9**	**5**	**5**	**5**	**5**	**5**	**5**	**7**	**7**	**5**	**5**
		Stem Count	**10**	**10**	**3**	**3**	**7**	**7**	**13**	**13**	**16**	**16**	**5**	**5**	**13**	**13**	**8**	**8**	**15**	**15**	**9**	**9**	**20**	**20**	**9**	**9**
		Stems per Acre	**405**	**405**	**121**	**121**	**283**	**283**	**526**	**526**	**648**	**648**	**202**	**202**	**526**	**526**	**324**	**324**	**607**	**607**	**346**	**346**	**810**	**810**	**362**	**362**

Type=**S**hrub or **T**ree

P = Planted

T = Total

n/a = Not applicable because species was introduced during Year 2 replanting.

Appendix 3. Vegetation Plot Data
Table 9b. Planted and Total Stem Counts (Species by Plot with Annual Means)
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT1, UT1a, UT1b
Monitoring Year 2

			Current Data (MY2-9/2012)																								Annual Means					
			Plot 10		Plot 11		Plot 12		Plot 13		Plot 14		Plot 15		Plot 16		Plot 17		Plot 18		Plot 19		Plot 20		Plot 21		Current Mean		MY0-4/2011		MY1-9/2011	
Species	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer floridanum	Southern Sugar Maple	Tree	1	1	2	2	2	2	2	2							1	1	4	4			3	3			2	2	**4**	**4**	**2**	**2**
Alnus serrulata	Tag Alder	Tree/Shrub																									0	0	**2**	**2**	**2**	**2**
Betula nigra	River Birch	Tree											1	1			1	1									1	1	**2**	**2**	**2**	**2**
Carpinus caroliniana	American Hornbeam	Tree											1	1													1	1	**n/a**	**n/a**	**n/a**	**n/a**
Carya sp.	Hickory	Tree																									0	0	**1**	**1**	**1**	**1**
Carya cordiformis	Bitternut Hickory	Tree																									1	1	**1**	**1**	**2**	**2**
Carya ovata	Shagbark Hickory	Tree					1	1	1	1	1	1			1	1					1	1	1	1	7	7	2	2	**1**	**1**	**1**	**1**
Celtis laevigata	Sugarberry	Tree									4	4	1	1													2	2	**n/a**	**n/a**	**n/a**	**n/a**
Celtis occidentalis	Hackberry	Tree/Shrub							1	1																	1	1	**1**	**1**	**1**	**1**
Cornus sp.	Dogwood	Shrub																									0	0	**2**	**2**	**1**	**1**
Cornus amomum	Silky Dogwood	Shrub																									1	1	**1**	**1**	**1**	**1**
Cornus florida	Flowering Dogwood	Tree/Shrub	1	1	2	2	3	3	1	1	1	1	1	1			5	5			1	1					2	2	**4**	**4**	**2**	**2**
Ilex opaca	American Holly	Tree/Shrub											1	1													1	1	**3**	**3**	**2**	**2**
Liquidambar styraciflua	Sweet Gm	Tree																									1	1	**1**	**1**	**1**	**1**
Liriodendron tulipifera	Tulip Poplar	Tree					1	1	4	4	2	2	1	1			2	2									2	2	**5**	**5**	**2**	**2**
Platanus occidentalis	Sycamore	Tree			1	1	5	5	2	2	2	2			1	1					2	2			2	2	2	2	**1**	**1**	**1**	**1**
Quercus sp.	Oak	Tree									1	1															1	1	**n/a**	**n/a**	**1**	**1**
Quercus falcata	Southern Red Oak	Tree									1	1															1	1	**n/a**	**n/a**	**n/a**	**n/a**
Quercus michauxii	Swamp Chestnut Oak	Tree																									1	1	**4**	**4**	**2**	**2**
Quercus nigra	Water Oak	Tree	1	1	1	1	1	1	1	1																	2	2	**n/a**	**n/a**	**n/a**	**n/a**
Quercus phellos	Willow Oak	Tree	2	2	1	1	1	1															1	1			2	2	**n/a**	**n/a**	**n/a**	**n/a**
Quercus rubra	Northern Red Oak	Tree	1	1																							1	1	**n/a**	**n/a**	**n/a**	**n/a**
Unknown sp.	Unknown																										0	0	**2**	**2**	**1**	**1**
Plot Area (acres)			**0.0247**																													
Species Count			**5**	**5**	**5**	**5**	**7**	**7**	**7**	**7**	**7**	**7**	**6**	**6**	**2**	**2**	**4**	**4**	**1**	**1**	**3**	**3**	**3**	**3**	**2**	**2**	**5**	**5**	**7**	**7**	**5**	**5**
Stem Count			**6**	**6**	**7**	**7**	**14**	**14**	**12**	**12**	**12**	**12**	**6**	**6**	**2**	**2**	**9**	**9**	**4**	**4**	**4**	**4**	**5**	**5**	**9**	**9**	**9**	**9**	**20**	**20**	**9**	**9**
Stems per Acre			**243**	**243**	**283**	**283**	**567**	**567**	**486**	**486**	**486**	**486**	**243**	**243**	**81**	**81**	**364**	**364**	**162**	**162**	**162**	**162**	**202**	**202**	**364**	**364**	**346**	**346**	**810**	**810**	**362**	**362**

Type=**S**hrub or **T**ree

P = Planted

T = Total

n/a = Not applicable because species was introduced during Year 2 replanting.

Appendix 3. Vegetation Plot Data
Table 9c. Planted and Total Stem Counts (Species by Plot with Annual Means)
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT2, UT3, UT4
Monitoring Year 2

			Current Data (MY2-9/2012)																Annual Means					
			Plot 22		Plot 23		Plot 24		Plot 25		Plot 26		Plot 27		Plot 28		Plot 29		Current Mean		MY0-4/2011		MY1-9/2011	
Species	Common Name	Type	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T	P	T
Acer floridanum	Southern Sugar Maple	Tree	2	2			3	3			2	2			3	3	1	1	**2**	**2**	**4**	**4**	**2**	**2**
Alnus serrulata	Tag Alder	Tree/Shrub																	**0**	**0**	**2**	**2**	**2**	**2**
Betula nigra	River Birch	Tree											2	2					**1**	**1**	**2**	**2**	**2**	**2**
Carpinus caroliniana	American Hornbeam	Tree									2	2							**1**	**1**	**n/a**	**n/a**	**n/a**	**n/a**
Carya sp.	Hickory	Tree																	**0**	**0**	**1**	**1**	**1**	**1**
Carya cordiformis	Bitternut Hickory	Tree					2	2											**1**	**1**	**1**	**1**	**2**	**2**
Carya ovata	Shagbark Hickory	Tree			1	1	1	1											**2**	**2**	**1**	**1**	**1**	**1**
Celtis laevigata	Sugarberry	Tree			1	1			2	2	6	6	1	1					**2**	**2**	**n/a**	**n/a**	**n/a**	**n/a**
Celtis occidentalis	Hackberry	Tree/Shrub									1	1							**1**	**1**	**1**	**1**	**1**	**1**
Cornus sp.	Dogwood	Shrub																	**0**	**0**	**2**	**2**	**1**	**1**
Cornus amomum	Silky Dogwood	Shrub	2	2															**1**	**1**	**1**	**1**	**1**	**1**
Cornus florida	Flowering Dogwood	Tree/Shrub	3	3			3	3	1	1									**2**	**2**	**4**	**4**	**2**	**2**
Ilex opaca	American Holly	Tree/Shrub																	**1**	**1**	**3**	**3**	**2**	**2**
Liquidambar styraciflua	Sweet Gm	Tree													1	1			**1**	**1**	**1**	**1**	**1**	**1**
Liriodendron tulipifera	Tulip Poplar	Tree	1	1	2	2	1	1			1	1					1	1	**2**	**2**	**5**	**5**	**2**	**2**
Platanus occidentalis	Sycamore	Tree			4	4									1	1			**2**	**2**	**1**	**1**	**1**	**1**
Quercus sp.	Oak	Tree											1	1					**1**	**1**	**n/a**	**n/a**	**1**	**1**
Quercus falcata	Southern Red Oak	Tree																	**1**	**1**	**n/a**	**n/a**	**n/a**	**n/a**
Quercus michauxii	Swamp Chestnut Oak	Tree																	**1**	**1**	**4**	**4**	**2**	**2**
Quercus nigra	Water Oak	Tree	2	2					3	3									**2**	**2**	**n/a**	**n/a**	**n/a**	**n/a**
Quercus phellos	Willow Oak	Tree	1	1					1	1	2	2	1	1					**2**	**2**	**n/a**	**n/a**	**n/a**	**n/a**
Quercus rubra	Northern Red Oak	Tree	1	1					1	1			3	3			1	1	**1**	**1**	**n/a**	**n/a**	**n/a**	**n/a**
Unknown sp.	Unknown																		**0**	**0**	**2**	**2**	**1**	**1**
Plot Area (acres)			**0.0247**																					
Species Count			**7**	**7**	**4**	**4**	**5**	**5**	**5**	**5**	**6**	**6**	**5**	**5**	**3**	**3**	**3**	**3**	**5**	**5**	**7**	**7**	**5**	**5**
Stem Count			**12**	**12**	**8**	**8**	**10**	**10**	**8**	**8**	**14**	**14**	**8**	**8**	**5**	**5**	**3**	**3**	**9**	**9**	**20**	**20**	**9**	**9**
Stems per Acre			**486**	**486**	**324**	**324**	**405**	**405**	**324**	**324**	**567**	**567**	**324**	**324**	**202**	**202**	**121**	**121**	**346**	**346**	**810**	**810**	**362**	**362**

Type=Shrub or Tree

P = Planted

T = Total

n/a = Not applicable because species was introduced during Year 2 replanting.

APPENDIX 4. Morphological Summary Data and Plots

Appendix 4. Morphological Summary Data and Plots
Table 10a. Baseline Stream Data Summary
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reaches 1 and 2
Monitoring Year 2

Parameter	Gauge	Regional Curve						Pre-Restoration Condition				Reference Reach Data						Design				As-Built / Baseline					
		Reach 1			Reach 2			Reach 1		Reach 2		UT to Rocky Creek		Spencer Creek 1		Spencer Creek 2		Reach 1		Reach 2		Reach 1			Reach 2		
		LL	UL	Eq.	LL	UL	Eq.	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Med	Max	Min	Med	Max
Dimension and Substrate - Riffle																											
Bankfull Width (ft)	n/a							27.6		17.0	23.9	12.2		8.7		10.7	11.2	17.0		20.0		17.7	18.0	18.3	21.2	21.3	21.4
Floodprone Width (ft)								87.0		111.0	112.0	72.0		229.0		60.0	114+	37+		44+		200+	200+	200+	200+	200+	200+
Bankfull Mean Depth								1.0		1.6	2.0	1.3		1.2		1.6	1.8	1.6		1.8		1.4	1.4	1.4	1.6	1.7	1.7
Bankfull Max Depth								2.6		2.8	3.0	1.8		1.9		2.1	2.6	2.3		2.5		2.0	2.2	2.3	2.3	2.4	2.6
Bankfull Cross-sectional Area (ft^2)								26.3		33.2	39.0	16.3		10.6		17.8	19.7	27.1		36.3		24.6	25.2	25.8	34.3	35.6	36.8
Width/Depth Ratio								29.0		10.6	12.0	9.1		7.3		5.8	7.1	10.7		11.0		13.0	13.0	13.0	12.2	12.8	13.3
Entrenchment Ratio								3.1		4.7	6.5	6.0		26.3		5.5	10.2	2.2+		2.2+		2.2+	2.2+	2.2+	2.2+	2.2+	2.2+
Bank Height Ratio								1.0		1.0	1.0	1.0		1.0		1.0		1.0		1.0		1.0	1.0	1.0	1.0	1.0	1.0
D50 (mm)								57.8		56.9	53.7	22.6		8.6		8.8											
Profile																											
Riffle Length (ft)	n/a							7 (min) - 22 (max)				N/P		N/P		N/P		20	52	10	63	17	35	55	30	49	69
Riffle Slope (ft/ft)								0.0180	0.0260	0.0033	0.0490	0.0606	0.0892	0.0100	0.0670	0.0130		0.0087	0.0204	0.0069	0.0203	0.0050	0.0136	0.0283	0.0023	0.0075	0.0188
Pool Length (ft)								31 (min) - 184 (max)				N/P		N/P		N/P		30	84	42	81	37	62	98	45	67	96
Pool Max Depth (ft)								2.26	2.85	2.22	3.31	2.2		2.5		3.3		3.5	4.5	4.0	5.5	3.4	4.3	6.1	3.6	4.6	5.5
Pool Spacing (ft)*								31	62	45	117	26	81	13	47	71		38	114	45	132	71	104	165	92	119	147
Pool Volume (ft^3)												-		-		-		-		-							
Pattern																											
Channel Beltwidth (ft)	n/a							52		54	69			24	52	38	41	60	120	80	140	60	-	120	80	-	140
Radius of Curvature (ft)								43	93	15	146			5	22	11	15	35	50	40	60	35	-	50	40	-	60
Rc:Bankfull Width (ft/ft)								1.6	3.4	0.9	6.1	n/a		0.6	2.5	1.3	1.4	2.1	2.9	2.0	3.0	2.1	-	2.9	2.0	-	3.0
Meander Wave Length (ft)								81	163	60	190			54	196	46	48	125	160	160	200	125	-	160	160	-	200
Meander Width Ratio								1.9		2.9	3.2			2.8	6	3.4	3.6	3.5	7.1	4.0	7.0	3.5	-	7.1	4.0	-	7.0
Substrate, Bed and Transport Parameters																											
Ri%/Ru%/P%/G%/S%	n/a																										
SC%/Sa%/G%/C%/B%/Be%																											
d16/d35/d50/d84/d95/d100								0.9/13.7/35.9/101.2/172.5/>2048				<0.063/2.4/22.6/120/256		0.1/3/8.6/77/180		<0.062/3/8.8/42/90						SC/SC/5.78/71.7/137/362			SC/7.6/21.5/83.2/151.8/362		
Reach Shear Stress (Competency) lb/ft^2								0.47		0.50-0.55								0.56		0.59		0.50	-	0.51	0.43	-	0.45
Max part size (mm) mobilized at bankfull								30-40		30-40								30	40	40	50	27	-	28	23	-	25
Stream Power (Capacity) W/m^2																											
Additional Reach Parameters																											
Drainage Area (SM)	n/a							1.09	1.65	2.38	2.53	1.10		0.50		0.96											
Impervious Cover Estimate (%)								27%				N/P		N/P		N/P											
Rosgen Classification								C4		C4		E4b		E3/C4		E4		C4		C4		C4			C4		
Bankfull Velocity (fps)		-	-	-	-	-	-	3.8		3.8	4.5							3.7		4.1		3.7			4.1		
Bankfull Discharge (cfs)		95	128	-	167	174	-					85		-		97		100		150							
Q-NFF regression								192		259																	
Q-USGS extrapolation								87	162	123	221																
Q-Mannings								80		85	96																
Valley Length (ft)								1480		2003		N/P		N/P		N/P		1480		2003							
Channel Thalweg Length (ft)								3600				N/P		N/P		N/P		4060				4058					
Sinuosity (ft)								1.1		1.0		N/P		N/P		N/P		1.2		1.2		2.7			0.0		
Water Surface Slope (ft/ft)								0.0087		0.0025	0.0051	N/P		N/P		N/P		0.0067		0.0053		0.0067			0.0049		
Bankfull Slope (ft/ft)								0.00568 (min) - 0.00944 (max)				N/P		N/P		N/P		0.0064		0.0056		0.0067			0.0050		

N/P: Data was not provided

*Design P:P spacing reported in the Restoration Plan included in-line pools, which are considered a habitat quality rather than a stability parameter, for evaluating for a channels profile stability. Subsequent monitoring years will evaluate pool Dmax for spacing.

Appendix 4. Morphological Summary Data and Plots
Table 10b. Baseline Stream Data Summary
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT1 Reach 2 and UT2
Monitoring Year 2

Parameter	Gauge	Regional Curve						Pre-Restoration Condition				Reference Reach Data						Design				As-Built / Baseline					
		UT1 Reach 2			UT2			UT1 Reach 2		UT2		UT to Rocky Creek		Spencer Creek 1		Spencer Creek 2		UT1 Reach 2		UT2		UT1 Reach 2			UT2		
		LL	UL	Eq.	LL	UL	Eq.	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Med	Max	Min	Med	Max
Dimension and Substrate - Riffle																											
Bankfull Width (ft)	n/a							10.6		13.3		12.2		8.7		10.7	11.2	11.0		12.0		12.1			13.0		
Floodprone Width (ft)								78.0		94.0		72.0		229.0		60.0	114+	24+		26+		200+			200+		
Bankfull Mean Depth								1.1		1.0		1.3		1.2		1.6	1.8	1.1		1.1		1.0			0.9		
Bankfull Max Depth								1.6		1.8		1.8		1.9		2.1	2.6	1.5		1.5		1.7			1.5		
Bankfull Cross-sectional Area (ft^2)								12.0		13.0		16.3		10.6		17.8	19.7	12.0		13.5		12.4			11.4		
Width/Depth Ratio								9.4		13.6		9.1		7.3		5.8	7.1	10.1		10.7		11.9			14.8		
Entrenchment Ratio								7.3		7.1		6.0		26.3		5.5	10.2	2.2+		2.2+		2.2+			2.2+		
Bank Height Ratio								1.3		1.2		1.0		1.0		1.0		1.0		1.0		1.0			1.0		
D50 (mm)								27.3		55.6		22.6		8.6		8.8											
Profile																											
Riffle Length (ft)	n/a							5	32	6	23	N/P		N/P		N/P		29	42	23	37	11	30	41	21	29	41
Riffle Slope (ft/ft)								0.0050	0.0250	0.0137	0.0740	0.0606	0.0892	0.0100	0.0670	0.0130		0.0153	0.0245	0.0162	0.0281	0.0150	0.0187	0.0233	0.0215	0.0230	0.0272
Pool Length (ft)								37	61	26	40	N/P		N/P		N/P		14	39	20	44	21	30	43	27	31	37
Pool Max Depth (ft)								1.36	1.87	1.71	2.07	2.20		2.50		3.30		2.3	3.5	2.2	3.5	2.5	3.3	4.0	2.9	3.1	3.5
Pool Spacing (ft)*								75	88	48	90	26	81	13	47	71		17	55	18	60	55	59	77	55	59	70
Pool Volume (ft^3)																											
Pattern																											
Channel Beltwidth (ft)	n/a							20		28				24	52	38	41	50	80	50	80	50	-	80	50	-	80
Radius of Curvature (ft)								22	83	23	89			5	22	11	15	25	33	25	34	25	-	33	25	-	34
Rc:Bankfull Width (ft/ft)								2.1	7.8	1.7	6.7	n/a		0.6	2.5	1.3	1.4	2.3	3.0	2.1	2.8	2.3	-	3.0	2.1	-	2.8
Meander Wave Length (ft)								45	93	39	113			54	196	46	48	80	100	90	120	80	-	100	90	-	120
Meander Width Ratio								1.9		2.1				2.8	6.0	3.4	3.6	4.5	7.3	4.2	6.7	4.5	-	7.3	4.2	-	6.7
Substrate, Bed and Transport Parameters																											
Ri%/Ru%/P%/G%/S%	n/a																										
SC%/Sa%/G%/C%/B%/Be%																											
d16/d35/d50/d84/d95/d100								SC/0.9/27.3/94.6/158.4/>2048		16.0/30/55.6/128/164.4/>2048		<0.063/2.4/22.6/120/256		0.1/3/8.6/77/180		<0.062/3/8.8/42/90						0.025/16/37.24/104.7/157.1/362			SC/8.8/16.9/75.9/152/512		
Reach Shear Stress (Competency) lb/ft^2								0.7		0.52								0.61		0.67		0.55			0.68		
Max part size (mm) mobilized at bankfull								50-60		30-40								40	50	50	60	31			39		
Stream Power (Capacity) W/m^2																											
Additional Reach Parameters																											
Drainage Area (SM)	n/a							0.47		0.68		1.10		0.50		0.96											
Impervious Cover Estimate (%)								33%		4%		N/P		N/P		N/P											
Rosgen Classification								E4		C4		E4b		E3/C4		E4		C4		C4		C4			C4		
Bankfull Velocity (fps)		-	-	-	-	-	-	4.2		3.8								4.2		3.7		4.2			3.7		
Bankfull Discharge (cfs)		52			67			50		50		85		-		97		50		50							
Q-NFF regression								79		103																	
Q-USGS extrapolation								42	85	31	65																
Q-Mannings								47		52																	
Valley Length (ft)								358		356		N/P		N/P		N/P		358		356							
Channel Thalweg Length (ft)								330		262		N/P		N/P		N/P		422		393		402			400		
Sinuosity (ft)								1.0		1.1		N/P		N/P		N/P		1.1		1.1		1.1			1.1		
Water Surface Slope (ft/ft)								0.0130		0.0189		N/P		N/P		N/P		0.0107		0.0113		0.0101			0.0121		
Bankfull Slope (ft/ft)								0.0119		0.0177		N/P		N/P		N/P		0.0097		0.0116		0.0094			0.0130		

N/P: Data was not provided

*Design P:P spacing reported in the Restoration Plan included in-line pools, which are considered a habitat quality rather than a stability parameter, for evaluating for a channels profile stability. Subsequent monitoring years will evaluate pool Dmax for spacing.

Appendix 4. Morphological Summary Data and Plots
Table 11. Monitoring Data - Dimensional Morphology Summary (Dimensional Parameters - Cross-Section)
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reaches 1 and 2, UT1 Reach 2, and UT2
Monitoring Year 2

	Scaly Bark Reach 1																							
	Cross-Section 1 (Pool)						Cross-Section 2 (Riffle)						Cross-Section 3 (Riffle)						Cross-Section 4 (Pool)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																								
Bankfull Width (ft)	21.13	19.61	19.37				17.86	17.7	24.65				18.29	18.29	19.09				24.12	25.80	23.52			
Floodprone Width (ft)	n/a	n/a	n/a				200+	200+	200+				200+	200+	200+				n/a	n/a	n/a			
Bankfull Mean Depth (ft)	1.83	1.78	1.69				1.38	1.3	1.09				1.41	1.37	1.31				1.87	1.69	1.87			
Bankfull Max Depth (ft)	3.48	3.37	2.84				2.20	2.04	2.26				2.20	2.26	2.22				3.67	3.36	3.38			
Bankfull Cross-Sectional Area (ft^2)	38.63	34.95	32.79				24.64	23.07	26.83				25.82	24.15	24.96				45.17	43.63	43.9			
Bankfull Width/Depth Ratio	11.55	11	11.45				12.95	13.57	22.66				12.95	13.31	14.6				12.88	15.26	12.59			
Bankfull Entrenchment Ratio	n/a	n/a	n/a				2.2+	2.2+	2.2+				2.2+	2.2+	2.2+				n/a	n/a	n/a			
Bankfull Bank Height Ratio	1.00	1.00	1.00				1.00	1.00	1.00				1.00	1.00	1.00				1.00	1.00	1.00			
d50 (mm)							26.89	42.14	22.28				29.62	29.62	45									

	Scaly Bark Reach 2																							
	Cross-Section 5 (Pool)						Cross-Section 6 (Riffle)						Cross-Section 7 (Pool)						Cross-Section 8 (Riffle)					
based on fixed bankfull elevation	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
Bankfull Width (ft)	26.64	27.41	30.69				21.35	26.65	23.6				24.73	24.54	25.02				21.2	21.37	22.50			
Floodprone Width (ft)	n/a	n/a	n/a				200+	200+	200+				n/a	n/a	n				200+	200+	200+			
Bankfull Mean Depth (ft)	1.96	1.97	1.8				1.61	1.27	1.5				1.95	1.89	1.8				1.74	1.65	1.59			
Bankfull Max Depth (ft)	4.63	4.40	4.46				2.27	2.25	2.38				3.9	3.66	3.61				2.6	2.60	2.68			
Bankfull Cross-Sectional Area (ft^2)	52.24	53.92	55.28				34.33	33.76	35.45				48.29	46.34	45.09				36.79	35.25	35.80			
Bankfull Width/Depth Ratio	13.58	13.93	17.04				13.28	21.04	15.71				12.67	12.99	13.88				12.22	12.96	14.14			
Bankfull Entrenchment Ratio	n/a	n/a	n/a				2.2+	2.2+	2.2+				n/a	n/a	n				2.2+	2.2+	2.2+			
Bankfull Bank Height Ratio	1.00	1.00	1.00				1.00	1.00	1.00				1.00	1.00	1.00				1.00	1.00	1.00			
d50 (mm)							45	56.91	37.95										23	49.14	33.11			

	UT1 Reach 2												UT2											
	Cross-Section 9 (Pool)						Cross-Section 10 (Riffle)						Cross-Section 11 (Pool)						Cross-Section 12 (Riffle)					
Dimension and Substrate	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**	**Base**	**MY1**	**MY2**	**MY3**	**MY4**	**MY5**
based on fixed bankfull elevation																								
Bankfull Width (ft)	18.21	26.61	17.6				12.14	11.85	12.2				15.38	14.82	16.98				12.99	13.03	13			
Floodprone Width (ft)	n/a	n/a	n/a				200+	200+	200+				n/a	n/a	n/a				200+	200+	200+			
Bankfull Mean Depth (ft)	1.53	1.23	1.33				1.02	0.96	0.97				1.51	1.40	1.4				0.88	0.90	0.99			
Bankfull Max Depth (ft)	3.26	2.98	2.73				1.73	1.64	1.73				2.90	2.62	2.87				1.46	1.53	1.71			
Bankfull Cross-Sectional Area (ft^2)	27.95	26.61	23.47				12.39	11.40	11.8				23.28	20.79	23.82				11.40	11.73	12.89			
Bankfull Width/Depth Ratio	11.87	17.62	13.2				11.89	12.32	12.61				10.16	10.57	12.11				14.82	14.47	13.11			
Bankfull Entrenchment Ratio	n/a	n/a	n/a				2.2+	2.2+	2.2+				n/a	n/a	n/a				2.2+	2.2+	2.2+			
Bankfull Bank Height Ratio	1.00	1.00	1.00				1.00	1.00	1.00				1.00	1.00	1.00				1.00	1.00	1.00			
d50 (mm)							48	38.88	11.75										35	15.35	41.32			

Appendix 4. Morphological Summary Data and Plots
Table 12a. Monitoring Data - Stream Reach Data Summary
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reach 1
Monitoring Year 2

Parameter	As-Built/Baseline			MY-1			MY-2			MY-3			MY-4			MY-5		
	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max
Dimension and Substrate - Riffle																		
Bankfull Width (ft)	17.9	18.1	18.3	17.7	18.0	18.3	19.1	21.9	24.7									
Floodprone Width (ft)	200+	200+	200+	200+	200+	200+	200+	200+	200+									
Bankfull Mean Depth	1.4	1.4	1.4	1.3	1.3	1.4	1.1	1.2	1.3									
Bankfull Max Depth	2.2	2.2	2.2	2.0	2.2	2.3	2.2	2.2	2.3									
Bankfull Cross-sectional Area (ft^2)	24.6	25.2	25.8	23.1	23.6	24.2	25.0	25.9	26.8									
Width/Depth Ratio	13.0	13.0	13.0	13.3	13.4	13.6	14.6	18.6	22.7									
Entrenchment Ratio	2.2+	2.2+	2.2+	2.2+	2.2+	2.2+	2.2+	2.2+	2.2+									
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0									
D50 (mm)																		
Profile																		
Riffle Length (ft)	17	35	55	22	34	52	16	30	67									
Riffle Slope (ft/ft)	0.0050	0.0136	0.0283	0.0052	0.0149	0.0332	0.0055	0.0133	0.0372									
Pool Length (ft)	37	62	98	39	63	89	32	56	82									
Pool Max Depth (ft)	3.4	4.3	6.1	3.4	3.9	6.8	3.2	4.1	6.6									
Pool Spacing (ft)	71	104	165	67	103	160	72	100	165									
Pool Volume (ft^3)																		
Pattern																		
Channel Beltwidth (ft)	60	-	120															
Radius of Curvature (ft)	35	-	50															
Rc:Bankfull Width (ft/ft)	2.1	-	2.9															
Meander Wave Length (ft)	125	-	160															
Meander Width Ratio	3.5	-	7.1															
Additional Reach Parameters																		
Rosgen Classification	C4			C4			C4											
Channel Thalweg Length (ft)	1886			1886			1886											
Sinuosity (ft)	1.3			1.3			1.3											
Water Surface Slope (ft/ft)	0.0067			0.0069			n/a[1]											
Bankfull Slope (ft/ft)	0.0067			0.0069			0.0071											
Ri%/Ru%/P%/G%/S%																		
SC%/Sa%/G%/C%/B%/Be%																		
d16/d35/d50/d84/d95/d100	SC/SC/5.78/71.7/137/362			SC/SC/21.9/101.21/165.29/512			SC/SC/22.86/97.15/170/256											
% of Reach with Eroding Banks				0%			0%											

[1] Water surface slope wasn't calculated because there was little to no baseflow during Year 1 Monitoring.

Appendix 4. Morphological Summary Data and Plots
Table 12b. Monitoring Data - Stream Reach Data Summary
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reach 2
Monitoring Year 2

Parameter	As-Built / Baseline			MY-1			MY-2			MY-3			MY-4			MY-5		
	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max
Dimension and Substrate - Riffle																		
Bankfull Width (ft)	21.2	21.3	21.4	21.4	24.0	26.7	22.5	23.1	23.6									
Floodprone Width (ft)	200+	200+	200+	200+	200+	200+	200+	200+	200+									
Bankfull Mean Depth	1.6	1.7	1.7	1.3	1.5	1.7	1.5	1.5	1.6									
Bankfull Max Depth	2.3	2.4	2.6	2.3	2.4	2.6	2.4	2.5	2.7									
Bankfull Cross-sectional Area (ft^2)	34.3	35.6	36.8	33.8	34.5	35.3	35.5	35.6	35.8									
Width/Depth Ratio	12.2	12.8	13.3	13.0	17.0	21.0	14.1	14.9	15.7									
Entrenchment Ratio	2.2+	2.2+	2.2+	2.2+	2.2+	2.2+	2.2+	2.2+	2.2+									
Bank Height Ratio	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0									
D50 (mm)																		
Profile																		
Riffle Length (ft)	30	49	69	24	41	66	25	42	67									
Riffle Slope (ft/ft)	0.0023	0.0075	0.0188	0.0041	0.0091	0.0168	0.0051	0.0107	0.0265									
Pool Length (ft)	45	67	96	43	65	82	24	51	72									
Pool Max Depth (ft)	3.6	4.6	5.5	3.5	4.4	5.2	3.6	4.5	5.4									
Pool Spacing (ft)	92	119	147	91	109	154	93	113	140									
Pool Volume (ft^3)																		
Pattern																		
Channel Beltwidth (ft)	80	-	140															
Radius of Curvature (ft)	40	-	60															
Rc:Bankfull Width (ft/ft)	2.0	-	3.0															
Meander Wave Length (ft)	160	-	200															
Meander Width Ratio	4.0	-	7.0															
Additional Reach Parameters																		
Rosgen Classification	C4			C4			C4											
Channel Thalweg Length (ft)	2220			2220			2220											
Sinuosity (ft)	1.1			1.1			1.1											
Water Surface Slope (ft/ft)	0.0049			0.0046			n/a											
Bankfull Slope (ft/ft)	0.0050			0.0048			0.0049											
Ri%/Ru%/P%/G%/S%																		
SC%/Sa%/G%/C%/B%/Be%																		
d16/d35/d50/d84/d95/d100	SC/7.6/21.5/83.2/151.8/362			SC/SC/21.9/101.21/165.29/512			SC/SC/28.2/108.31/200.06/512											
% of Reach with Eroding Banks				0%			0%											

[1] Water surface slope wasn't calculated because there was little to no baseflow during Year 1 Monitoring.

Appendix 4. Morphological Summary Data and Plots
Table 12c. Monitoring Data - Stream Reach Data Summary
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT1 Reach 2
Monitoring Year 2

Parameter	As-Built/Baseline			MY-1			MY-2			MY-3			MY-4			MY-5		
	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max
Dimension and Substrate - Riffle																		
Bankfull Width (ft)		12.1			11.9			12.2										
Floodprone Width (ft)		200+			200+			200+										
Bankfull Mean Depth		1.0			1.0			1.0										
Bankfull Max Depth		1.7			1.6			1.7										
Bankfull Cross-sectional Area (ft^2)		12.4			11.4			11.8										
Width/Depth Ratio		11.9			12.3			12.6										
Entrenchment Ratio		2.2+			2.2+			2.2+										
Bank Height Ratio		1.0			1.0			1.0										
D50 (mm)																		
Profile																		
Riffle Length (ft)	11	30	41	6	31	44	8	24	44									
Riffle Slope (ft/ft)	0.0150	0.0187	0.0233	0.0132	0.0161	0.0272	0.0104	0.0172	0.0280									
Pool Length (ft)	21	30	43	19	27	40	15	27	31									
Pool Max Depth (ft)	2.5	3.3	4.0	2.3	2.9	3.8	2.2	2.7	3.4									
Pool Spacing (ft)	55	59	77	55	59	79	49	59	73									
Pool Volume (ft^3)																		
Pattern																		
Channel Beltwidth (ft)	50	-	80															
Radius of Curvature (ft)	25	-	33															
Rc:Bankfull Width (ft/ft)	2.3	-	3.0															
Meander Wave Length (ft)	80	-	100															
Meander Width Ratio	4.5	-	7.3															
Additional Reach Parameters																		
Rosgen Classification		C4			C4			C4										
Channel Thalweg Length (ft)		399			399			399										
Sinuosity (ft)		1.1			1.1			1.1										
Water Surface Slope (ft/ft)		0.0101			0.0100			n/a										
Bankfull Slope (ft/ft)		0.0094			0.0092			0.0096										
Ri%/Ru%/P%/G%/S%																		
SC%/Sa%/G%/C%/B%/Be%																		
d16/d35/d50/d84/d95/d100	0.025/16/37.24/104.7/157.1/362			SC/25.65/38.38/94.05/190.88/256			SC/4.42/8.9/95.95/151.79/362											
% of Reach with Eroding Banks					0%			0%										

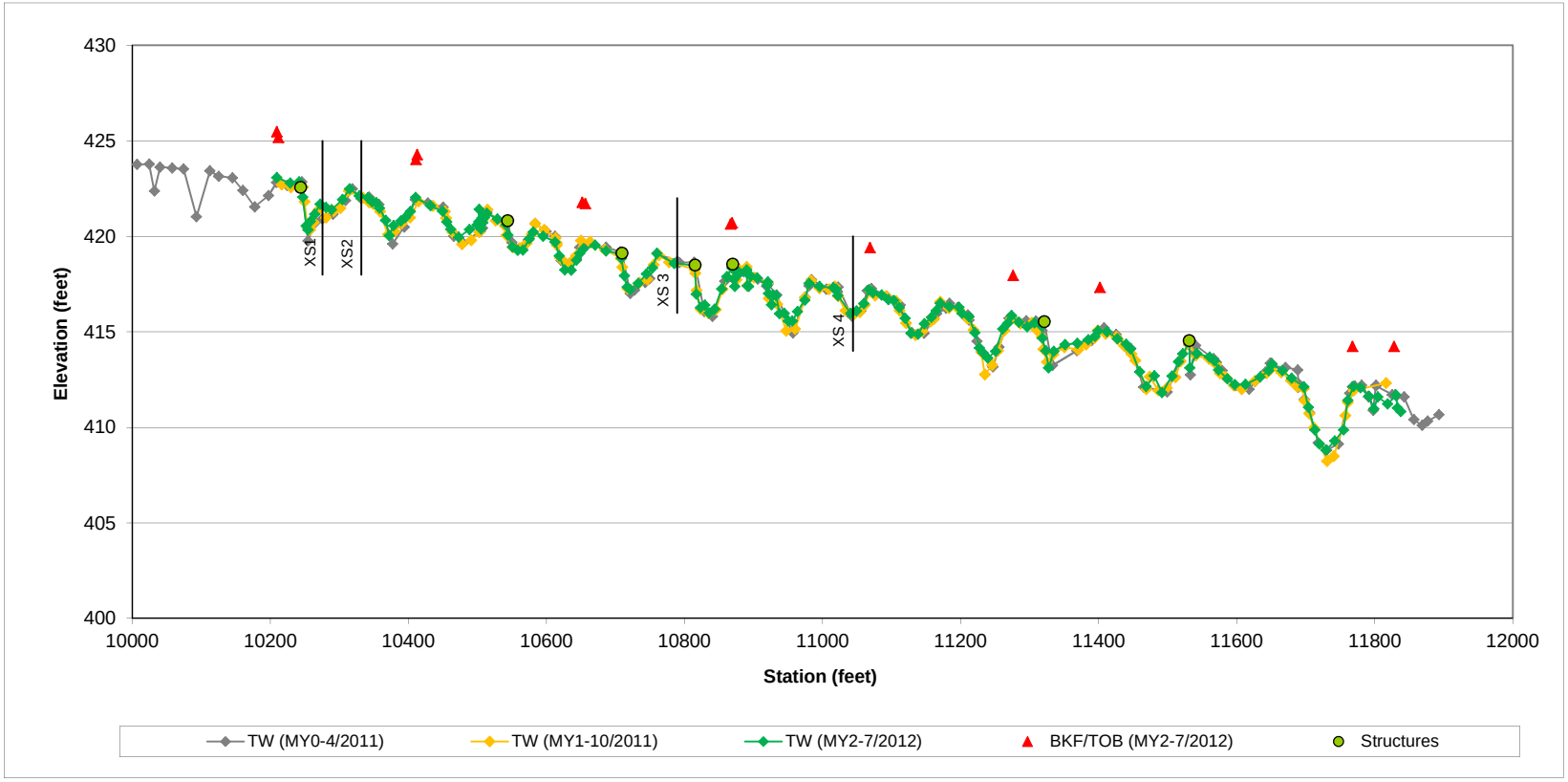
[1] Water surface slope wasn't calculated because there was little to no baseflow during Year 1 Monitoring.

Appendix 4. Morphological Summary Data and Plots
Table 12d. Monitoring Data - Stream Reach Data Summary
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT2
Monitoring Year 2

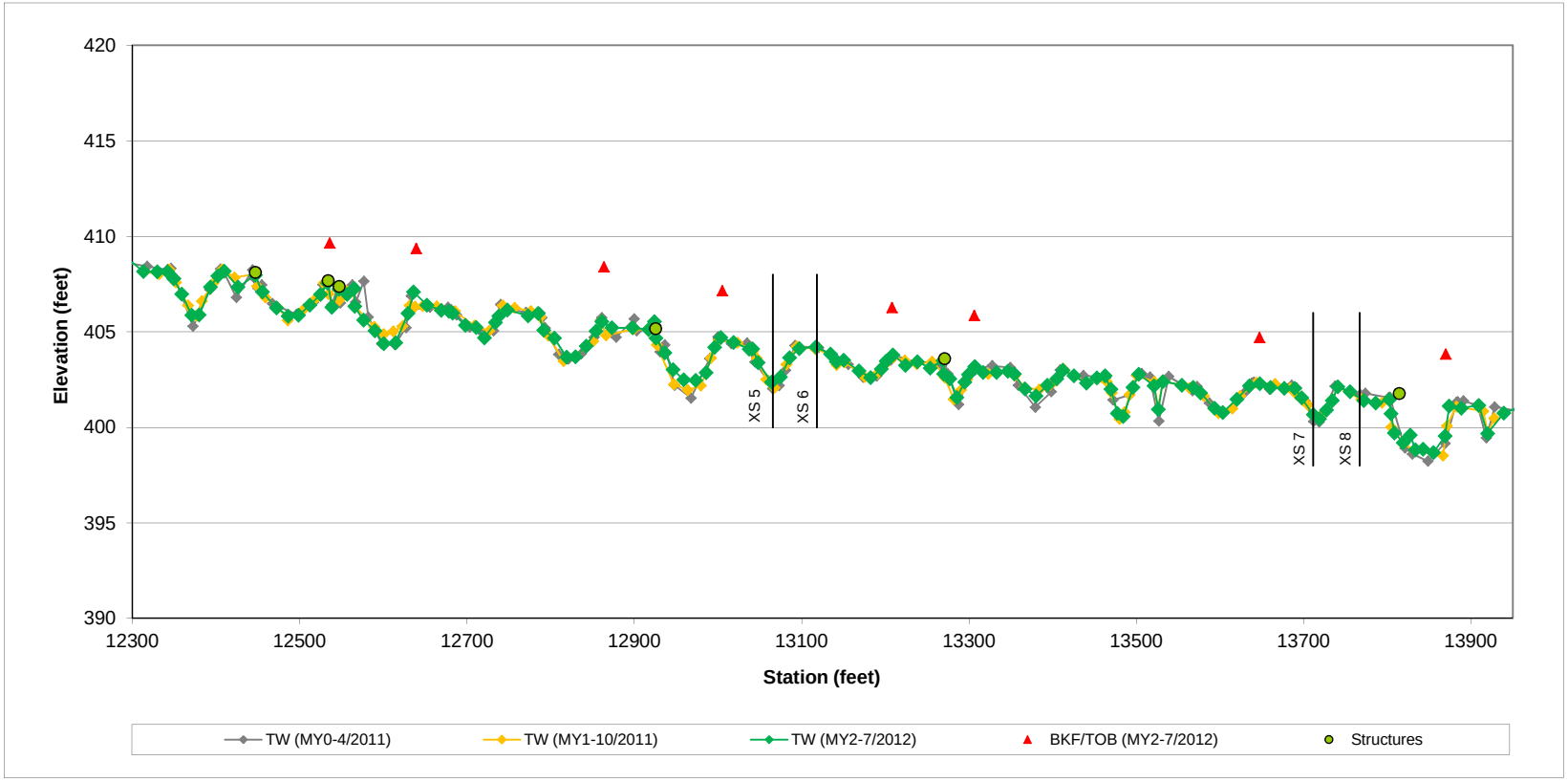
Parameter	As-Built/Baseline			MY-1			MY-2			MY-3			MY-4			MY-5		
	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max	Min	Med	Max
Dimension and Substrate - Riffle																		
Bankfull Width (ft)		13.0			13.0			13.0										
Floodprone Width (ft)		200+			200+			200+										
Bankfull Mean Depth		0.9			0.9			1.0										
Bankfull Max Depth		1.5			1.5			1.7										
Bankfull Cross-sectional Area (ft^2)		11.4			11.7			12.9										
Width/Depth Ratio		14.8			14.5			13.1										
Entrenchment Ratio		2.2+			2.2+			2.2+										
Bank Height Ratio		1.0			1.0			1.0										
D50 (mm)																		
Profile																		
Riffle Length (ft)	21	29	41	16	26	38	18	23	33									
Riffle Slope (ft/ft)	0.0215	0.0230	0.0272	0.0187	0.0264	0.0543	0.0190	0.0267	0.0369									
Pool Length (ft)	27	31	37	28	31	37	27	33	39									
Pool Max Depth (ft)	2.9	3.1	3.5	2.5	3.0	3.3	3.0	3.2	3.4									
Pool Spacing (ft)	55	59	70	51	58	78	54	57	75									
Pool Volume (ft^3)																		
Pattern																		
Channel Beltwidth (ft)	50	-	80															
Radius of Curvature (ft)	25	-	34															
Rc:Bankfull Width (ft/ft)	2.1	-	2.8															
Meander Wave Length (ft)	90	-	120															
Meander Width Ratio	4.2	-	6.7															
Additional Reach Parameters																		
Rosgen Classification		C4			C4			C4										
Channel Thalweg Length (ft)		380			380			380										
Sinuosity (ft)		1.1			1.1			1.1										
Water Surface Slope (ft/ft)		0.0121			0.0121			n/a										
Bankfull Slope (ft/ft)		0.0130			0.0130			0.0127										
Ri%/Ru%/P%/G%/S%																		
SC%/Sa%/G%/C%/B%/Be%																		
d16/d35/d50/d84/d95/d100		SC/8.8/16.9/75.9/152/512			SC/6.2/13.63/77.35/157.05/362			SC/13.02/25.1/94.07/162.85/362										
% of Reach with Eroding Banks					0%			0%										

[1] Water surface slope wasn't calculated because there was little to no baseflow during Year 1 Monitoring.

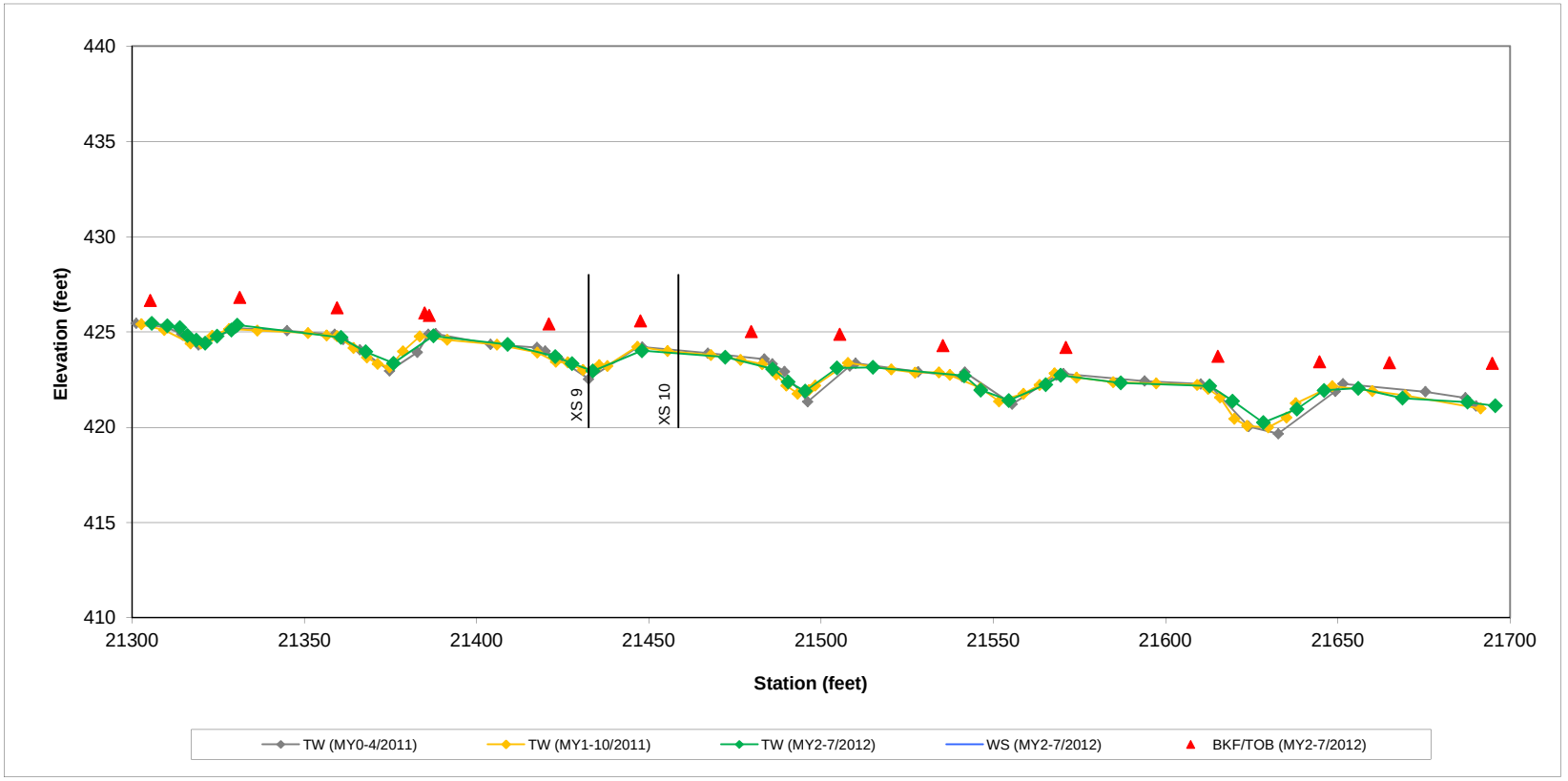
Appendix 4. Morphological Summary Data and Plots
Figure 4a. Longitudinal Profile Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reach 1
Monitoring Year 2



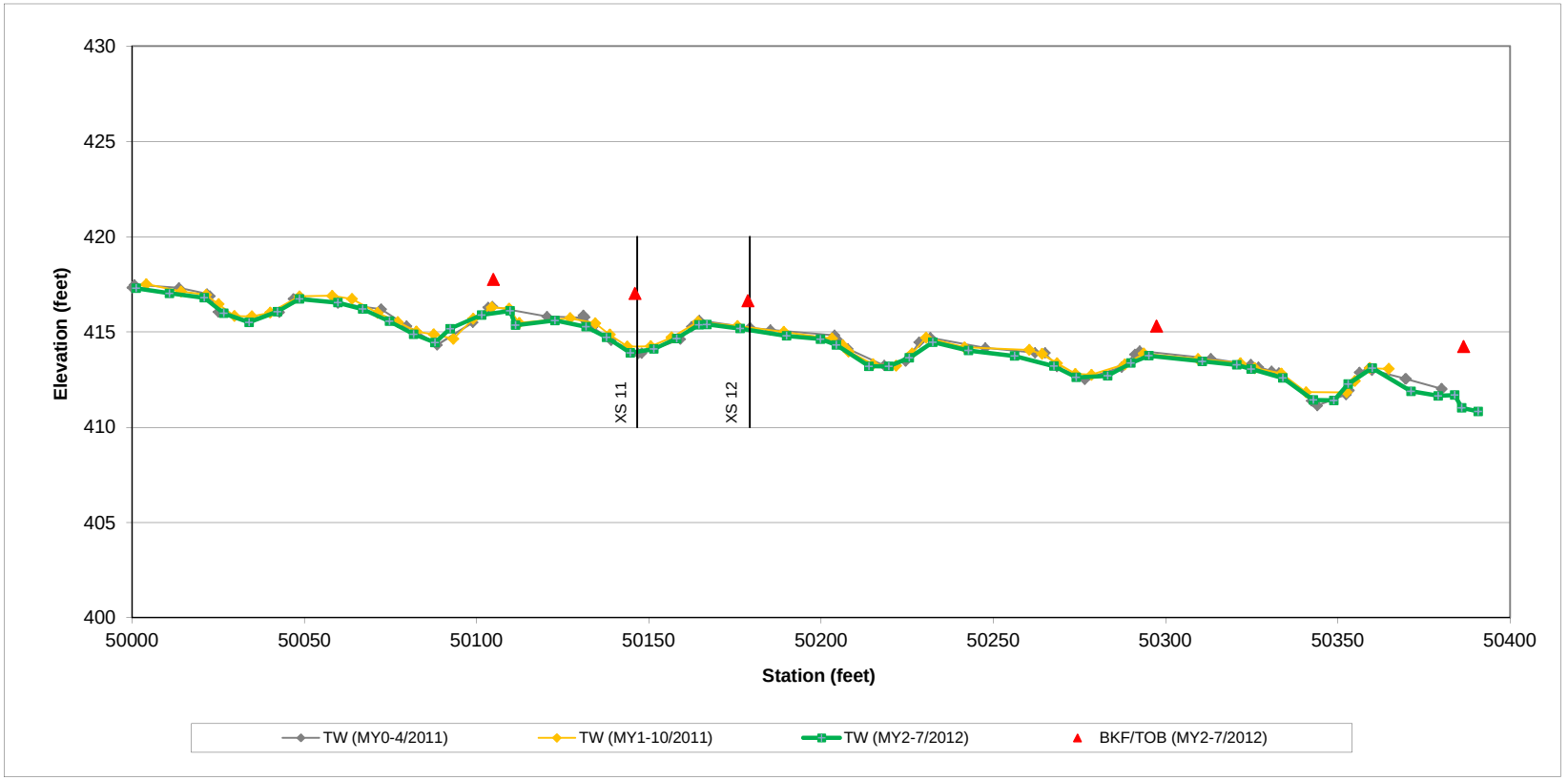
Appendix 4. Morphological Summary Data and Plots
Figure 4b. Longitudinal Profile Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 2
Monitoring Year 2



Appendix 4. Morphological Summary Data and Plots
Figure 4c. Longitudinal Profile Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT1 Reach 2
Monitoring Year 2



Appendix 4. Morphological Summary Data and Plots
Figure 4d. Longitudinal Profile Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT2
Monitoring Year 2



Appendix 4. Morphological Summary Data and Plots
Figure 5a. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 1, Cross-Section 1 (Pool)
Monitoring Year 2

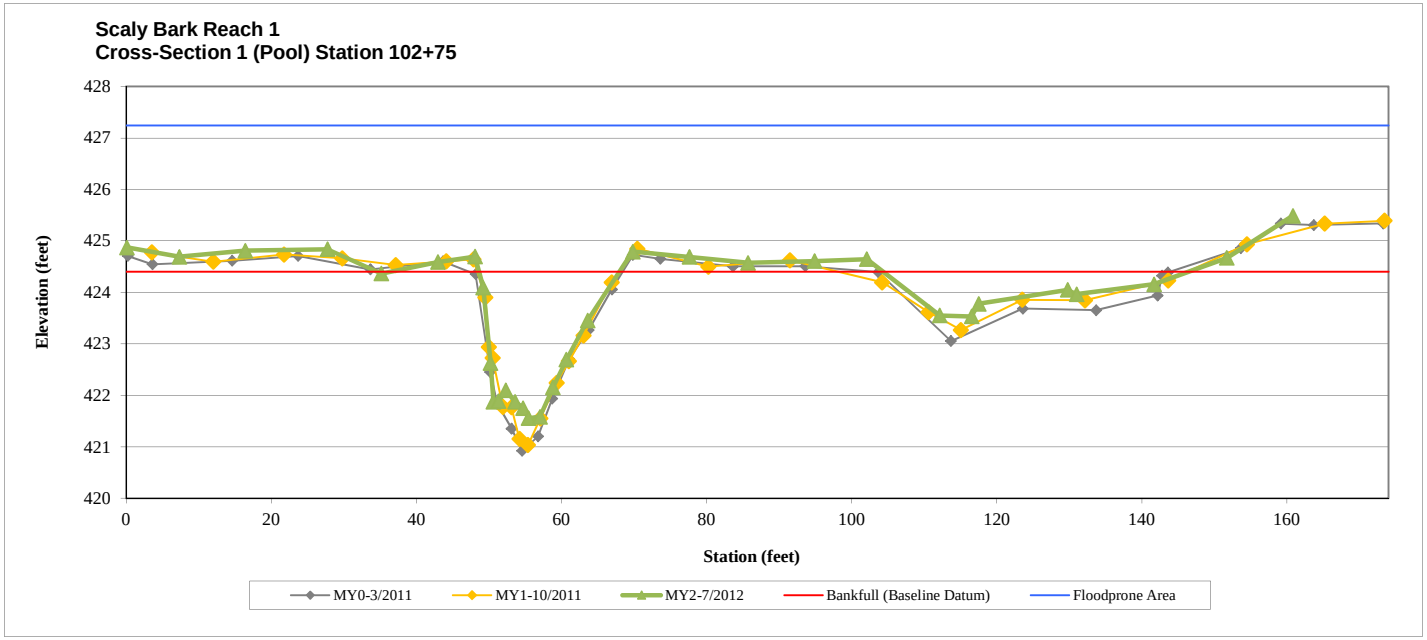
River Basin	Yadkin 03040105
Watershed HUC	NCDWQ Subbasin 03-07-13
XS ID	1
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	424.4
Bankfull Cross-Sectional Area (ft2)	32.79
Bankfull Width (ft)	19.37
Flood Prone Area Elevation (ft)	n/a
Flood Prone Width (ft)	n/a
Max Depth at Bankfull (ft)	2.84
Mean Depth at Bankfull (ft)	1.69
W/D Ratio	11.45
Entrenchment Ratio	n/a
Bank Height Ratio	1
Stream Type	n/a

Cross-Section 1: View Upstream (7/25/2012)

Cross-Section 1: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
0.12	424.872	112.15	423.552
7.33	424.691	116.54	423.531
16.44	424.811	117.5	423.778
27.75	424.838	129.78	424.048
35.18	424.367	131.01	423.964
42.98	424.59	141.68	424.156
48.09	424.696	151.71	424.671
49.22	424.095	160.82	425.487
50.23	422.627		
50.62	421.877		
51.33	421.886		
52.35	422.099		
53.6	421.877		
54.73	421.75		
55.47	421.556		
57.03	421.584		
58.83	422.153		
60.68	422.694		
63.62	423.455		
69.84	424.791		
77.64	424.688		
85.73	424.573		
94.89	424.609		
102.1	424.644		



Appendix 4. Morphological Summary Data and Plots
Figure 5b. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 1, Cross-Section 2 (Riffle)
Monitoring Year 2

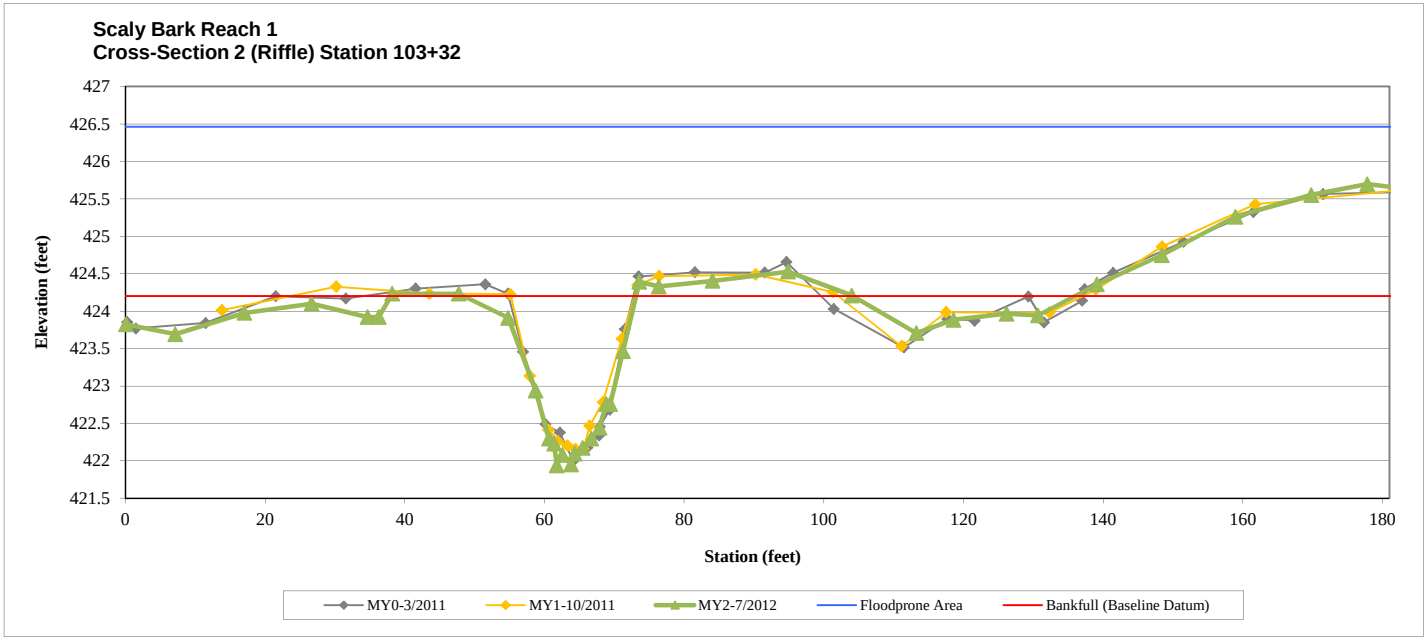
River Basin	Yadkin 03040105
Watershed HUC	NCDWQ Subbasin 03-07-13
XS ID	2
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	424.2
Bankfull Cross-Sectional Area (ft2)	26.83
Bankfull Width (ft)	24.65
Flood Prone Area Elevation (ft)	424.46
Flood Prone Width (ft)	200+
Max Depth at Bankfull (ft)	2.26
Mean Depth at Bankfull (ft)	1.09
W/D Ratio	22.66
Entrenchment Ratio	7.36
Bank Height Ratio	1
Stream Type	C

Cross-Section 2: View Upstream (7/25/2012)

Cross-Section 2: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
0.09	423.821	84.04	424.40
7.13	423.691	94.88	424.53
17.03	423.975	104.00	424.21
26.66	424.099	113.27	423.71
34.67	423.921	118.55	423.88
36.25	423.921	126.17	423.96
38.2	424.233	130.65	423.94
47.74	424.232	139.11	424.36
54.79	423.909	148.41	424.75
58.73	422.936	158.92	425.26
60.63	422.295	169.78	425.55
61.36	422.229	177.82	425.70
61.75	421.94	181.52	425.65
62.59	422.08		
63.82	421.95		
64.3	422.096		
65.44	422.172		
66.69	422.296		
67.87	422.443		
68.87	422.76		
69.4	422.76		
71.24	423.464		
73.57	424.39		
76.37	424.329		



Appendix 4. Morphological Summary Data and Plots
Figure 5c. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 1, Cross-Section 3 (Riffle)
Monitoring Year 2

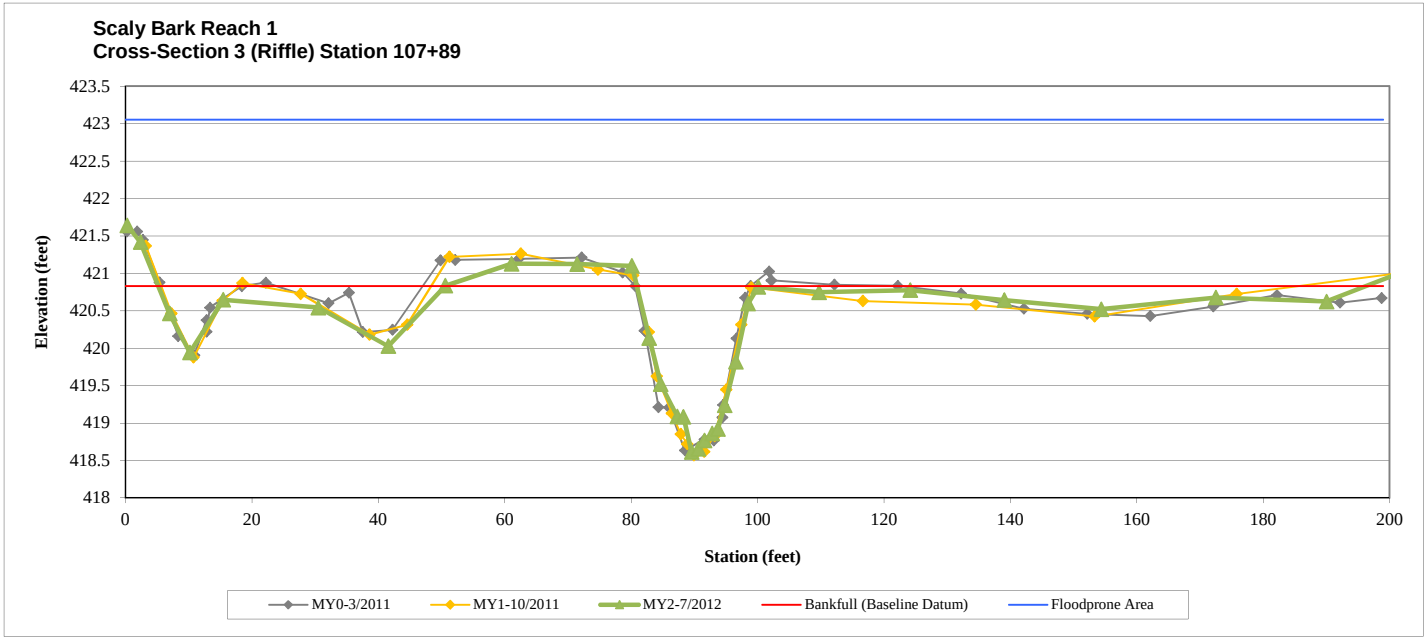
River Basin	Yadkin 03040105
Watershed HUC	NCDWQ Subbasin 03-07-13
XS ID	3
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	420.83
Bankfull Cross-Sectional Area (ft2)	24.96
Bankfull Width (ft)	19.09
Flood Prone Area Elevation (ft)	423.05
Flood Prone Width (ft)	200+
Max Depth at Bankfull (ft)	2.22
Mean Depth at Bankfull (ft)	1.31
W/D Ratio	14.60
Entrenchment Ratio	10.58
Bank Height Ratio	1.00
Stream Type	C

Cross-Section 3: View Upstream (7/25/2012)

Cross-Section 3: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
0.29	421.64	109.76	420.75
2.39	421.42	124.20	420.78
6.99	420.46	139.05	420.64
10.18	419.94	154.40	420.52
15.47	420.65	172.55	420.68
30.51	420.54	190.07	420.62
41.59	420.03	202.15	421.02
50.62	420.84		
61.11	421.13		
71.45	421.12		
80.15	421.10		
82.88	420.14		
84.69	419.52		
87.32	419.09		
88.30	419.08		
89.57	418.61		
90.67	418.66		
91.64	418.77		
92.86	418.86		
93.73	418.92		
94.82	419.24		
96.56	419.82		
98.53	420.60		
100.12	420.82		



Appendix 4. Morphological Summary Data and Plots
Figure 5d. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 1, Cross-Section 4 (Pool)
Monitoring Year 2

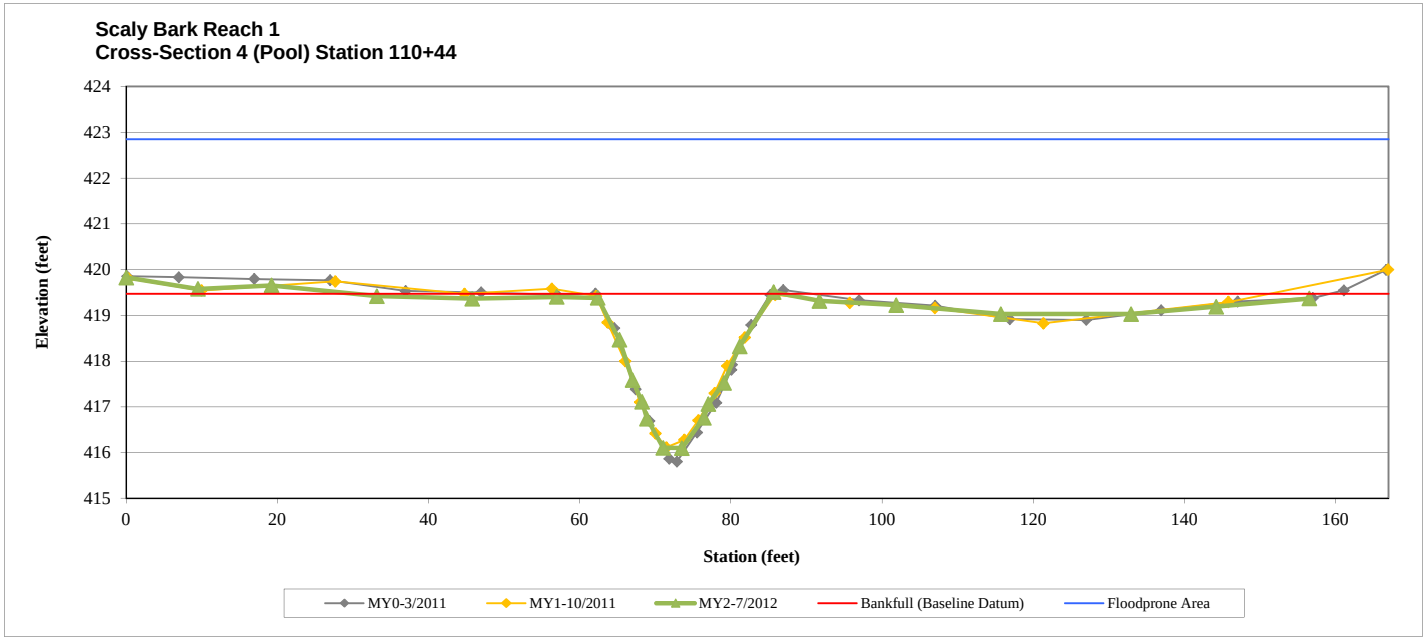
River Basin	Yadkin 03040105
Watershed HUC	NCDWQ Subbasin 03-07-13
XS ID	4
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	419.47
Bankfull Cross-Sectional Area (ft2)	43.90
Bankfull Width (ft)	23.52
Flood Prone Area Elevation (ft)	n/a
Flood Prone Width (ft)	n/a
Max Depth at Bankfull (ft)	3.38
Mean Depth at Bankfull (ft)	1.87
W/D Ratio	12.59
Entrenchment Ratio	n/a
Bank Height Ratio	1.00
Stream Type	n/a

Cross-Section 4: View Upstream (7/25/2012)

Cross-Section 4: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
0.04	419.83		
9.49	419.58		
19.22	419.65		
33.15	419.42		
45.78	419.36		
56.94	419.40		
62.38	419.38		
65.24	418.47		
67.00	417.58		
68.24	417.11		
68.91	416.74		
71.05	416.10		
73.51	416.10		
76.43	416.76		
77.03	417.06		
79.09	417.52		
81.16	418.32		
85.66	419.51		
91.72	419.31		
101.86	419.22		
115.71	419.03		
132.93	419.03		
144.19	419.19		
156.51	419.37		



Appendix 4. Morphological Summary Data and Plots
Figure 5e. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 2, Cross-Section 5 (Pool)
Monitoring Year 2

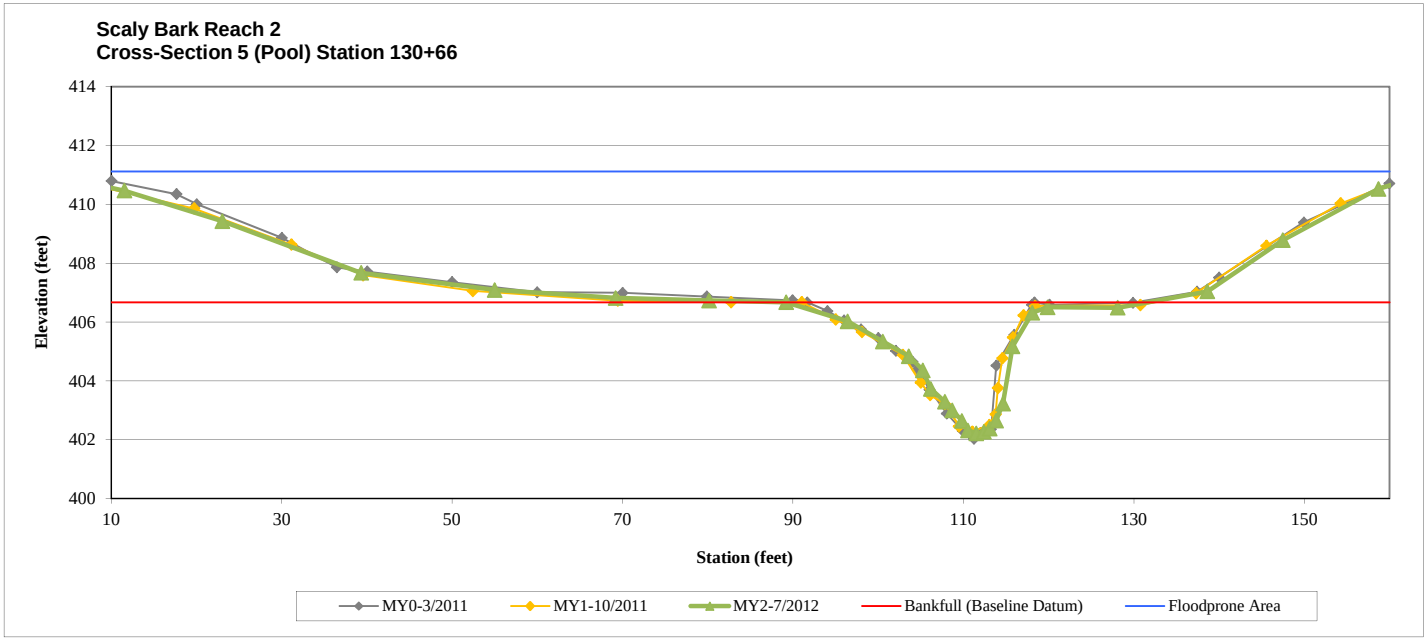
River Basin	Yadkin 03040105
Watershed	NCDWQ Subbasin 03-07-13
XS ID	5
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	406.67
Bankfull Cross-Sectional Area (ft2)	55.28
Bankfull Width (ft)	30.69
Flood Prone Area Elevation (ft)	n/a
Flood Prone Width (ft)	n/a
Max Depth at Bankfull (ft)	4.46
Mean Depth at Bankfull (ft)	1.80
W/D Ratio	17.04
Entrenchment Ratio	n/a
Bank Height Ratio	1.00
Stream Type	n/a

Cross-Section 5: View Upstream (7/25/2012)

Cross-Section 5: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
0.47	411.17	119.88	406.50
11.54	410.47	128.12	406.49
23.04	409.43	138.62	407.04
39.34	407.67	147.47	408.78
55.01	407.09	158.70	410.53
69.21	406.82	166.55	411.17
80.16	406.73		
89.22	406.67		
96.43	406.03		
100.55	405.34		
103.60	404.84		
105.25	404.36		
106.17	403.73		
107.84	403.29		
108.69	403.00		
109.83	402.64		
110.55	402.31		
111.49	402.21		
112.41	402.27		
113.10	402.37		
113.84	402.65		
114.66	403.23		
115.76	405.17		
118.08	406.32		



Appendix 4. Morphological Summary Data and Plots
Figure 5f. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 2, Cross-Section 6 (Riffle)
Monitoring Year 2

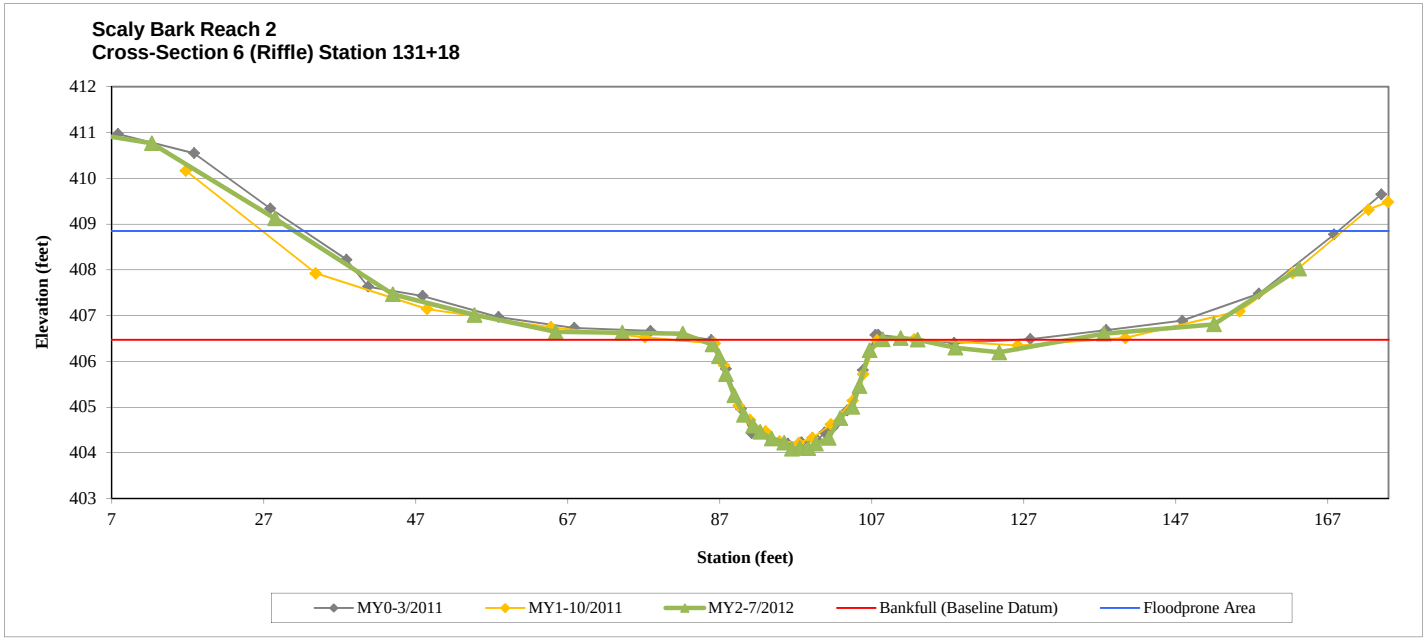
River Basin	Yadkin 03040105
Watershed HUC	NCDWQ Subbasin 03-07-13
XS ID	6
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	406.47
Bankfull Cross-Sectional Area (ft2)	35.45
Bankfull Width (ft)	23.60
Flood Prone Area Elevation (ft)	408.85
Flood Prone Width (ft)	200+
Max Depth at Bankfull (ft)	2.38
Mean Depth at Bankfull (ft)	1.50
W/D Ratio	15.71
Entrenchment Ratio	2.2+
Bank Height Ratio	1.00
Stream Type	C

Cross-Section 6: View Upstream (7/25/2012)

Cross-Section 6: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
2.68	411.02	105.36	405.46
12.28	410.77	106.72	406.24
28.49	409.12	108.44	406.48
43.99	407.46	110.80	406.51
54.73	407.01	113.03	406.47
65.40	406.64	118.03	406.30
74.18	406.62	123.77	406.20
82.15	406.61	137.54	406.61
86.05	406.37	152.02	406.81
86.90	406.11	163.22	408.02
87.83	405.72		
88.91	405.25		
90.16	404.83		
91.39	404.59		
92.31	404.46		
93.85	404.31		
95.50	404.22		
96.51	404.09		
97.56	404.11		
98.65	404.10		
99.67	404.20		
101.35	404.32		
102.85	404.76		
104.46	405.00		



Appendix 4. Morphological Summary Data and Plots
Figure 5g. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 2, Cross-Section 7 (Pool)
Monitoring Year 2

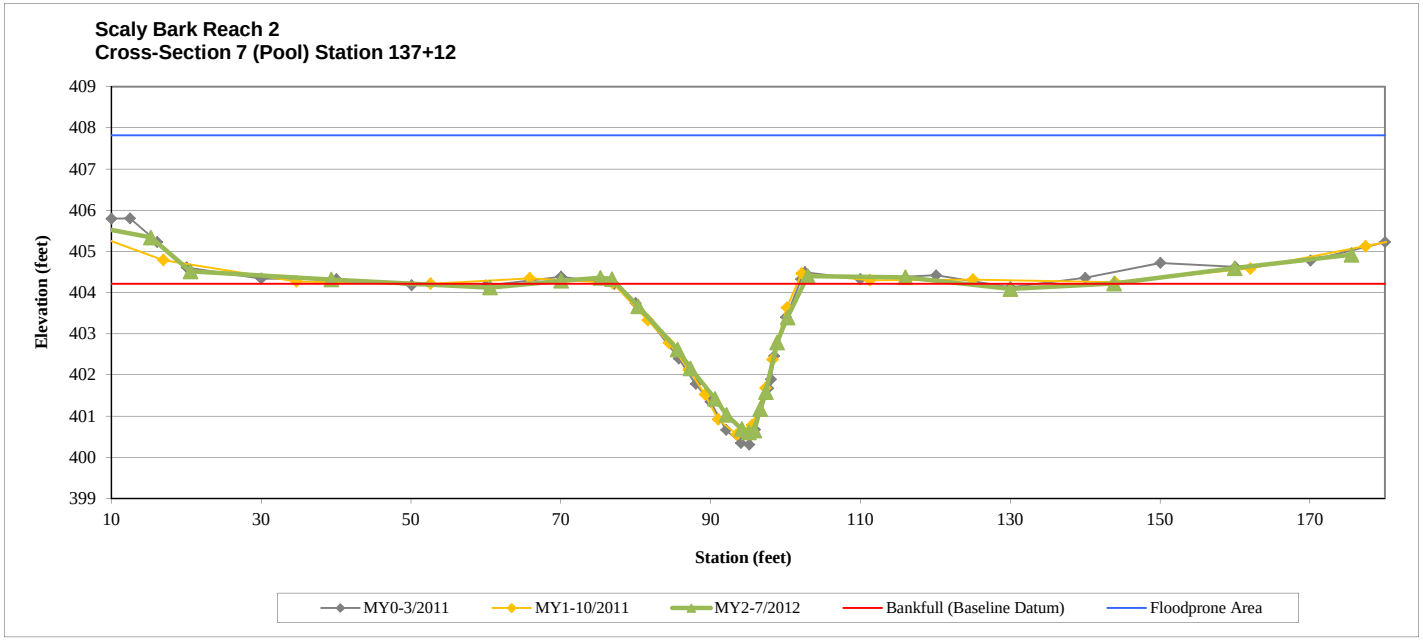
River Basin	Yadkin 03040105
Watershed HUC	NCDWQ Subbasin 03-07-13
XS ID	7
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	404.21
Bankfull Cross-Sectional Area (ft2)	45.09
Bankfull Width (ft)	25.02
Flood Prone Area Elevation (ft)	n/a
Flood Prone Width (ft)	n/a
Max Depth at Bankfull (ft)	3.61
Mean Depth at Bankfull (ft)	1.80
W/D Ratio	13.88
Entrenchment Ratio	n/a
Bank Height Ratio	1.00
Stream Type	n/a

Cross-Section 7: View Upstream (7/25/2012)

Cross-Section 7: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
0.28	405.88	143.83	404.22
0.29	405.85	159.94	404.59
15.28	405.34	175.52	404.92
20.56	404.52		
39.38	404.32		
60.55	404.12		
70.03	404.29		
75.29	404.36		
76.82	404.33		
80.34	403.66		
85.59	402.62		
87.31	402.16		
90.60	401.42		
92.13	401.03		
94.15	400.69		
95.11	400.61		
95.83	400.65		
96.59	401.18		
97.35	401.59		
98.87	402.79		
100.27	403.40		
102.95	404.40		
116.01	404.37		
130.02	404.09		



Appendix 4. Morphological Summary Data and Plots
Figure 5h. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 2, Cross-Section 8 (Riffle)
Monitoring Year 2

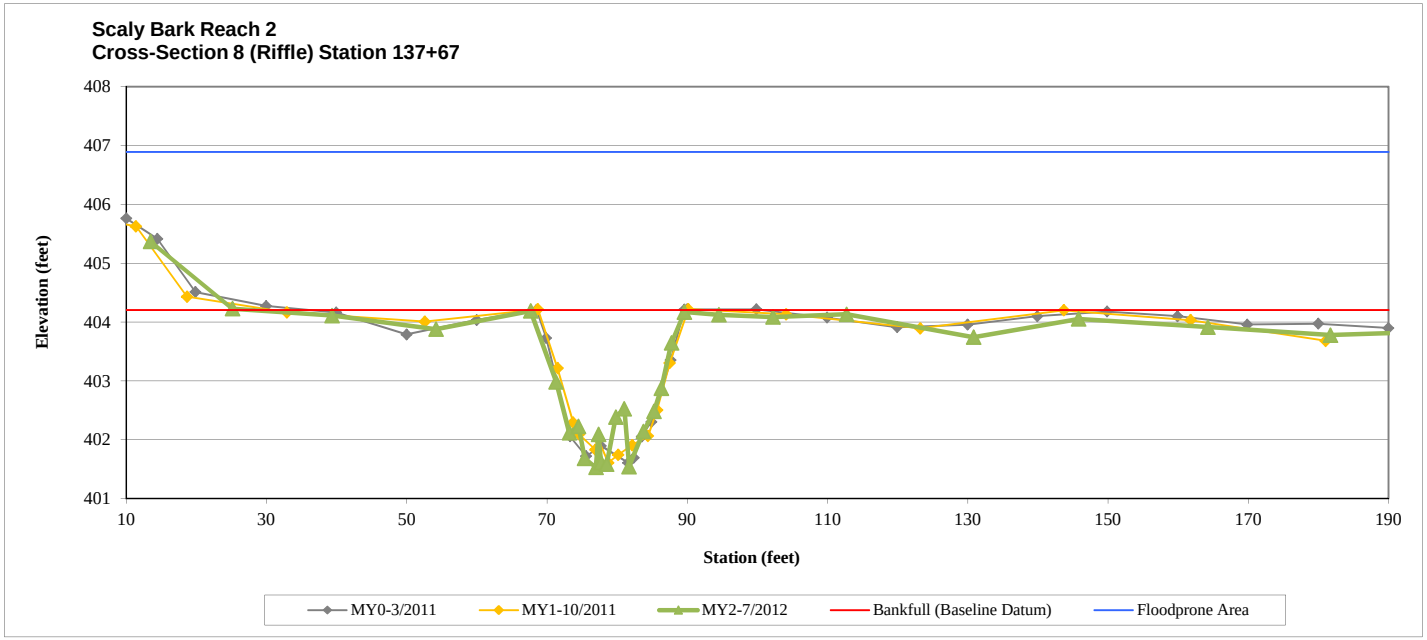
River Basin	Yadkin 03040105
Watershed HUC	NCDWQ Subbasin 03-07-13
XS ID	8
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	404.21
Bankfull Cross-Sectional Area (ft2)	35.80
Bankfull Width (ft)	22.50
Flood Prone Area Elevation (ft)	406.89
Flood Prone Width (ft)	200+
Max Depth at Bankfull (ft)	2.68
Mean Depth at Bankfull (ft)	1.59
W/D Ratio	14.14
Entrenchment Ratio	2.2+
Bank Height Ratio	1.00
Stream Type	C

Cross-Section 8: View Upstream (7/25/2012)

Cross-Section 8: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
13.47	405.368	130.83	403.74
25.16	404.226	145.82	404.05
39.37	404.11	164.23	403.92
54.17	403.88	181.72	403.78
67.69	404.19	200.11	403.85
71.32	402.984		
73.21	402.117		
74.51	402.224		
75.38	401.685		
77	401.528		
77.35	402.092		
77.72	401.614		
78.53	401.586		
79.82	402.383		
81.03	402.527		
81.71	401.543		
83.76	402.137		
85.27	402.483		
86.32	402.876		
87.75	403.644		
89.6	404.169		
94.52	404.124		
102.25	404.086		
112.72	404.132		



Appendix 4. Morphological Summary Data and Plots
Figure 5i. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT1 Reach 2, Cross-Section 9 (Pool)
Monitoring Year 2

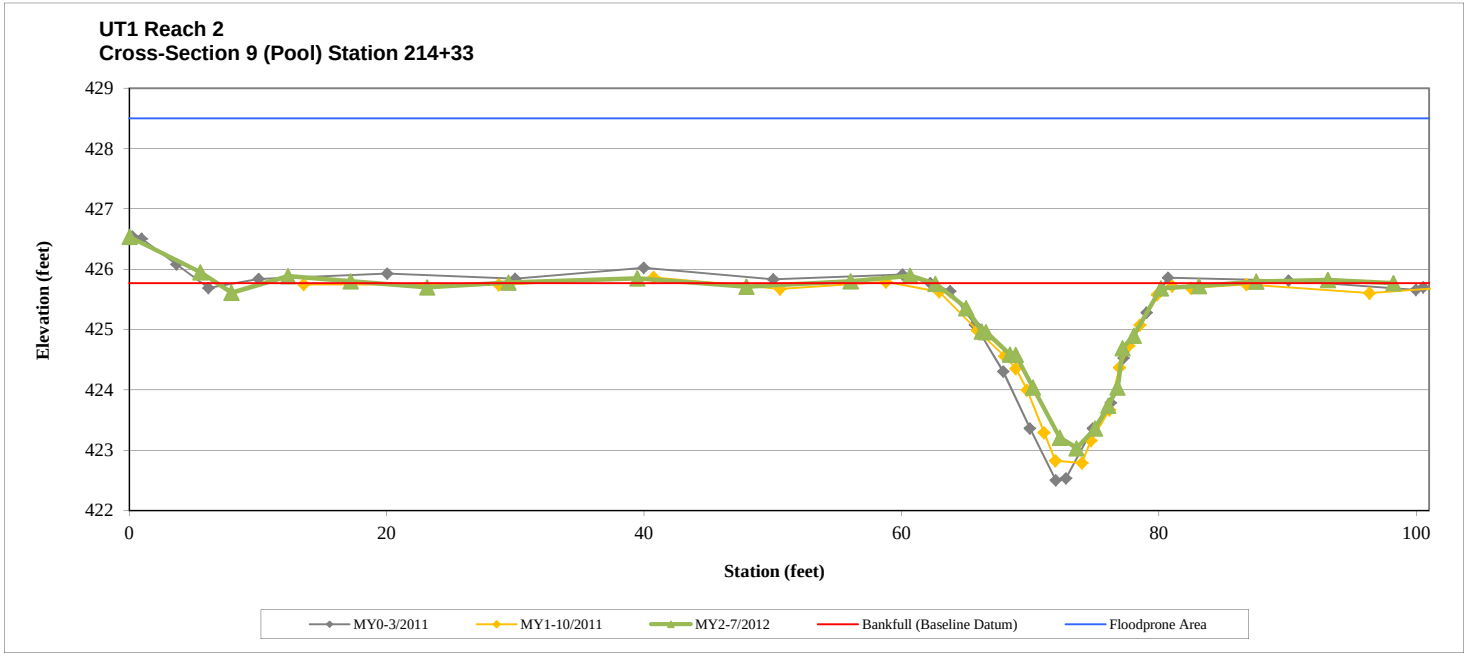
River Basin	Yadkin 03040105
Watershed	NCDWQ Subbasin 03-07-13
XS ID	9
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	425.77
Bankfull Cross-Sectional Area (ft2)	23.47
Bankfull Width (ft)	17.60
Flood Prone Area Elevation (ft)	n/a
Flood Prone Width (ft)	n/a
Max Depth at Bankfull (ft)	2.73
Mean Depth at Bankfull (ft)	1.33
W/D Ratio	13.20
Entrenchment Ratio	n/a
Bank Height Ratio	1.00
Stream Type	C

Cross-Section 9: View Upstream (7/25/2012)

Cross-Section 9: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
0.04	426.54	78.04	424.90
5.54	425.95	80.16	425.69
7.95	425.61	83.13	425.72
12.35	425.89	87.56	425.80
17.20	425.80	93.13	425.82
23.14	425.70	98.22	425.77
29.47	425.78		
39.49	425.85		
47.96	425.71		
56.06	425.80		
60.69	425.89		
62.65	425.76		
65.03	425.36		
66.24	424.97		
66.58	424.96		
68.43	424.59		
68.88	424.58		
70.22	424.04		
72.31	423.21		
73.61	423.04		
75.05	423.36		
76.07	423.74		
76.79	424.04		
77.19	424.69		



Appendix 4. Morphological Summary Data and Plots
Figure 5j. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT1 Reach 2, Cross-Section 10 (Riffle)
Monitoring Year 2 of 5

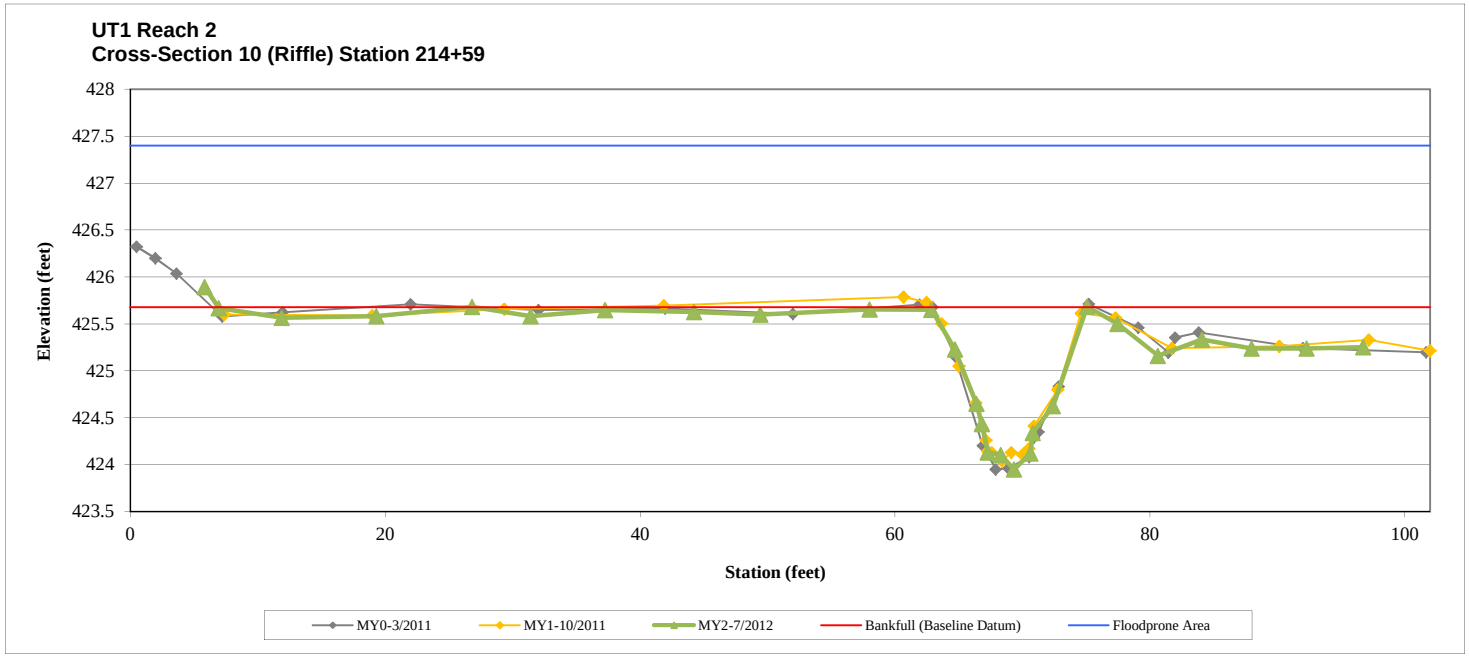
River Basin	Yadkin 03040105
Watershed	NCDWQ Subbasin 03-07-13
XS ID	10
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	425.68
Bankfull Cross-Sectional Area (ft2)	11.80
Bankfull Width (ft)	12.20
Flood Prone Area Elevation (ft)	427.41
Flood Prone Width (ft)	200+
Max Depth at Bankfull (ft)	1.73
Mean Depth at Bankfull (ft)	0.97
W/D Ratio	12.61
Entrenchment Ratio	2.2+
Bank Height Ratio	1.00
Stream Type	C

Cross-Section 10: View Upstream (7/25/2012)

Cross-Section 10: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
5.84	425.89	87.99	425.24
6.94	425.67	92.30	425.24
11.89	425.57	96.75	425.25
19.31	425.58		
26.82	425.68		
31.41	425.58		
37.26	425.65		
44.24	425.63		
49.44	425.60		
58.01	425.65		
62.87	425.65		
64.71	425.23		
66.41	424.65		
66.82	424.43		
67.28	424.13		
68.30	424.10		
69.34	423.95		
70.64	424.12		
70.81	424.34		
72.40	424.63		
75.08	425.69		
77.47	425.50		
80.64	425.16		
84.10	425.33		



Appendix 4. Morphological Summary Data and Plots
Figure 5k. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT2, Cross-Section 11 (Pool)
Monitoring Year 2

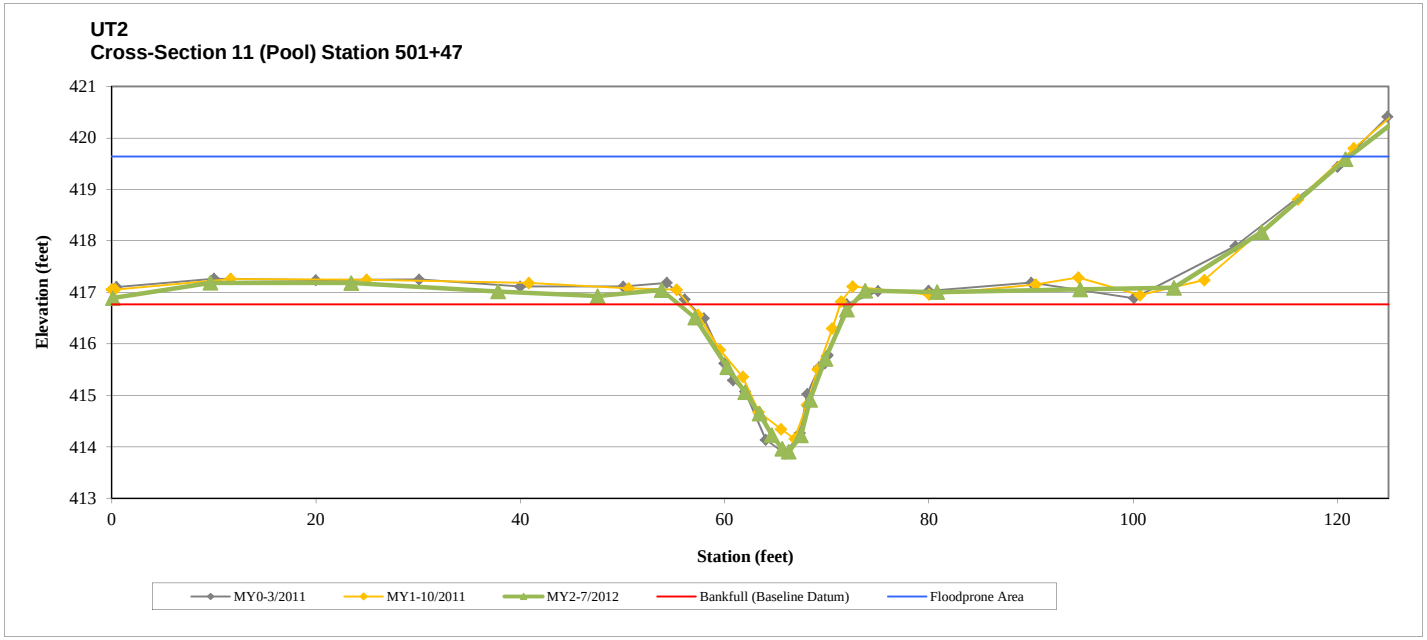
River Basin	Yadkin 03040105
Watershed	NCDWQ Subbasin 03-07-13
XS ID	11
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	416.77
Bankfull Cross-Sectional Area (ft2)	23.82
Bankfull Width (ft)	16.98
Flood Prone Area Elevation (ft)	n/a
Flood Prone Width (ft)	n/a
Max Depth at Bankfull (ft)	2.87
Mean Depth at Bankfull (ft)	1.40
W/D Ratio	12.11
Entrenchment Ratio	n/a
Bank Height Ratio	1.00
Stream Type	n/a

Cross-Section 11: View Upstream (7/25/2012)

Cross-Section 11: View Downstream (7/25/2012)

Station	Elevation	Station	Elevation
0.12	416.89		
9.65	417.185		
23.46	417.183		
37.82	417.019		
47.56	416.926		
53.83	417.045		
57.12	416.509		
60.26	415.545		
62.01	415.06		
63.42	414.645		
64.62	414.225		
65.65	413.96		
66.29	413.905		
67.47	414.22		
68.37	414.913		
69.87	415.71		
71.99	416.662		
73.75	417.033		
80.81	417.004		
94.83	417.058		
103.98	417.09		
112.59	418.171		
120.8	419.586		
125.24	420.267		



Appendix 4. Morphological Summary Data and Plots
Figure 5l. Cross-Section Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT2, Cross-Section 12 (Riffle)
Monitoring Year 2

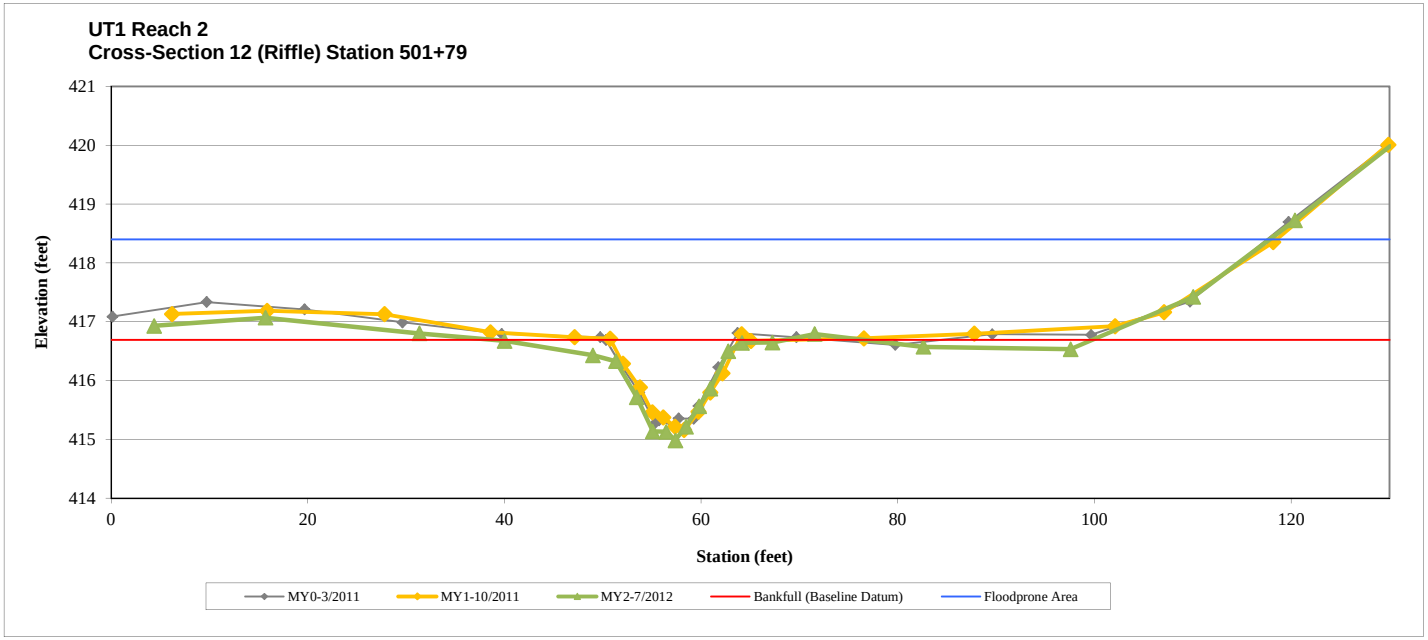
River Basin	Yadkin 03040105
Watershed	NCDWQ Subbasin 03-07-13
XS ID	12
Drainage Area	2.5 sq.mi
Date	7/2012
Field Crew	Wildlands Engineering

Summary Data	
Bankfull Elevation (ft)	416.69
Bankfull Cross-Sectional Area (ft2)	12.89
Bankfull Width (ft)	13.00
Flood Prone Area Elevation (ft)	418.40
Flood Prone Width (ft)	200+
Max Depth at Bankfull (ft)	1.71
Mean Depth at Bankfull (ft)	0.99
W/D Ratio	13.11
Entrenchment Ratio	2.2+
Bank Height Ratio	1.00
Stream Type	C

Cross-Section 12: View Upstream (7/25/2012)

Cross-Section 12: View Downstream (7/25/2012)

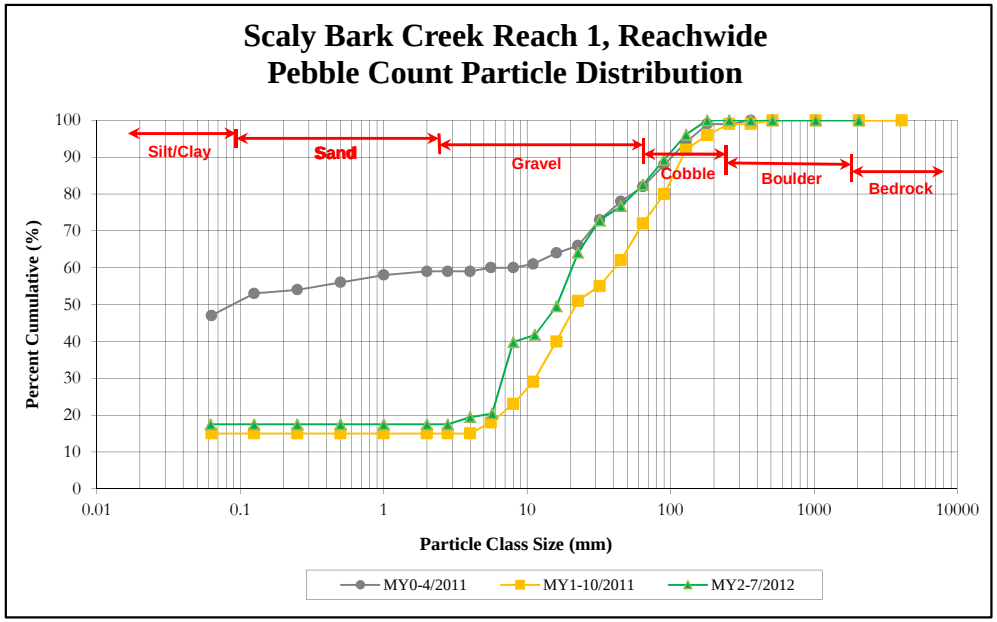
Station	Elevation	Station	Elevation
4.38	416.93		
15.70	417.07		
31.34	416.80		
40.02	416.67		
48.99	416.43		
51.33	416.33		
53.46	415.72		
55.09	415.14		
56.45	415.13		
57.38	414.98		
58.46	415.22		
59.80	415.56		
60.92	415.86		
62.76	416.50		
64.14	416.64		
67.25	416.65		
71.55	416.79		
82.59	416.58		
97.57	416.53		
110.03	417.42		
120.37	418.72		
130.05	419.98		

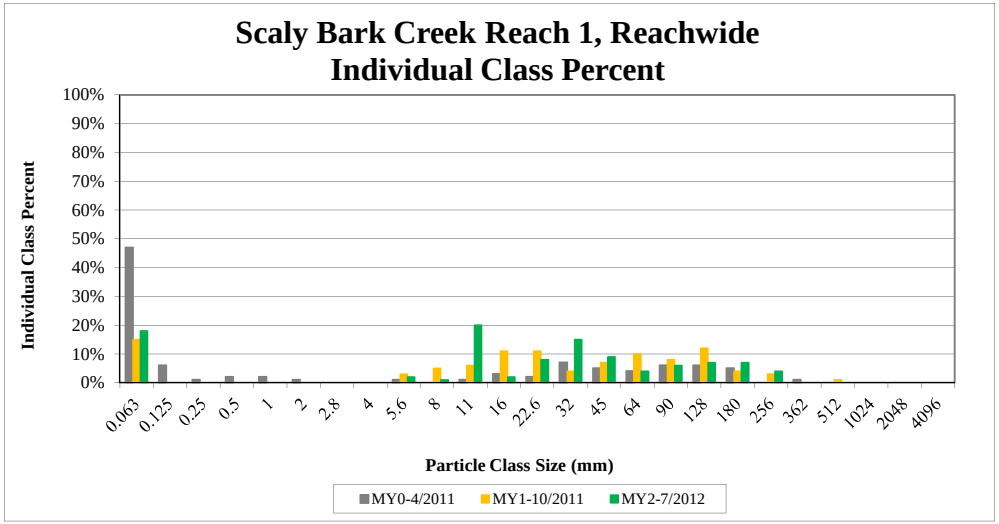


Appendix 4. Morphological Summary Data and Plots
Figure 6a. Reachwide and Cross-Section Pebble Count Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reach 1, Reachwide
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			Scaly Bark Reach 1 Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	16	18	17	17
SAND	Very fine	0.062	0.125					17
	Fine	0.125	0.250					17
	Medium	0.250	0.500					17
	Coarse	0.5	1.0					17
	Very Coarse	1.0	2.0					17
GRAVEL	Very Fine	2.0	2.8					17
	Very Fine	2.8	4.0					17
	Fine	4.0	5.7		2	2	2	19
	Fine	5.7	8.0		1	1	1	20
	Medium	8.0	11.3	7	13	20	19	40
	Medium	11.3	16.0		2	2	2	42
	Coarse	16.0	22.6	1	7	8	8	50
	Coarse	22.6	32	8	7	15	15	64
	Very Coarse	32	45	7	2	9	9	73
	Very Coarse	45	64	3	1	4	4	77
COBBLE	Small	64	90	5	1	6	6	83
	Small	90	128	7		7	7	89
	Large	128	180	7		7	7	96
	Large	180	256	4		4	4	100
BOULDER	Small	256	362					100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**51**	**52**	**103**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	22.86
D_{84} =	97.15
D_{95} =	170.20
D_{100} =	256.00

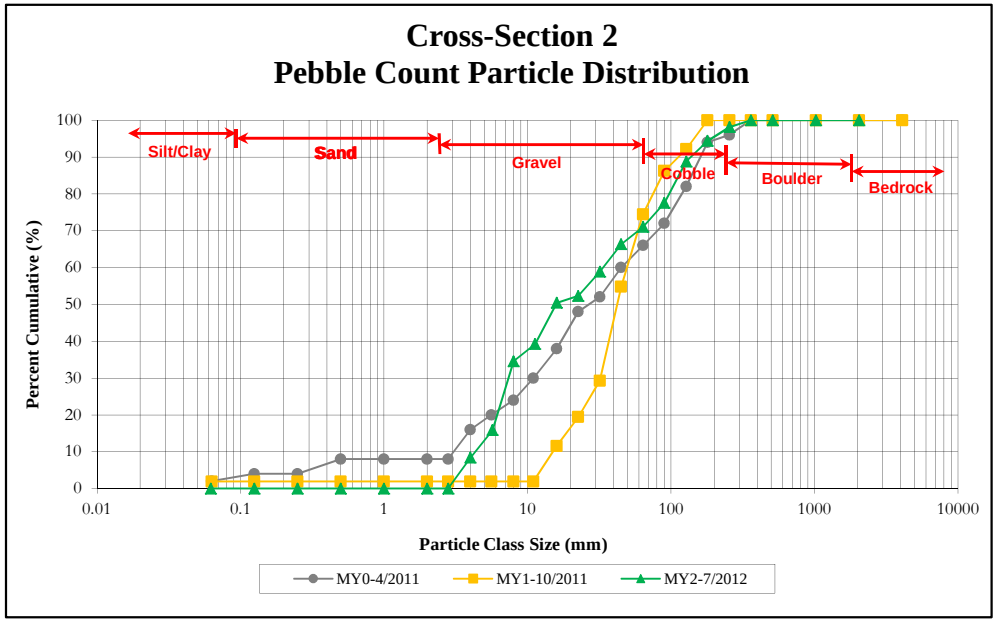


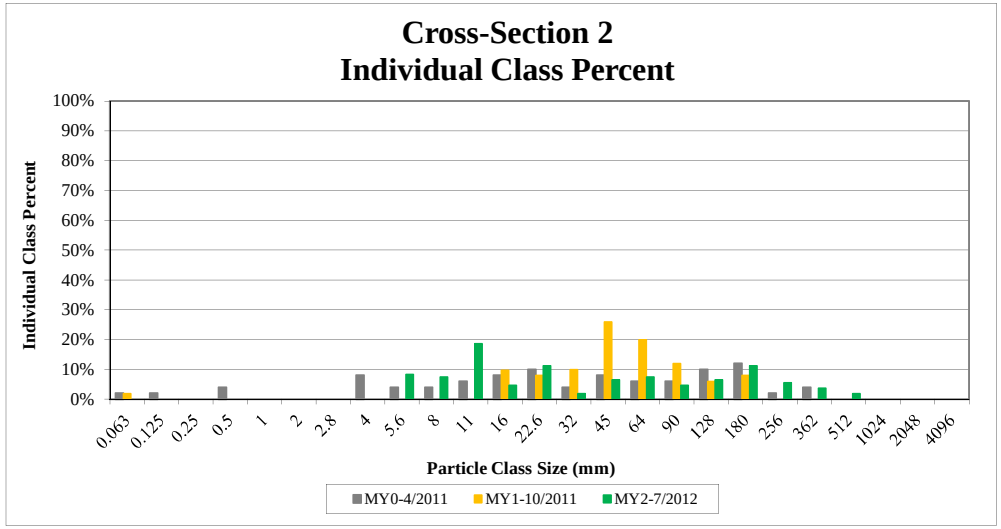


Appendix 4. Morphological Summary Data and Plots
Figure 6b. Reachwide and Cross-Section Substrate Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reach 1, Cross-Section 2 (Riffle)
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 2 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.250	0.500			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.7	9	8	8
	Fine	5.7	8.0	8	7	16
	Medium	8.0	11.3	20	19	35
	Medium	11.3	16.0	5	5	39
	Coarse	16.0	22.6	12	11	50
	Coarse	22.6	32	2	2	52
	Very Coarse	32	45	7	7	59
	Very Coarse	45	64	8	7	66
COBBLE	Small	64	90	5	5	71
	Small	90	128	7	7	78
	Large	128	180	12	11	89
	Large	180	256	6	6	94
BOULDER	Small	256	362	4	4	98
	Small	362	512	2	2	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**107**	**100**	**100**

Cross-Section 2 Channel materials (mm)	
D_{16} =	8.02
D_{35} =	11.38
D_{50} =	22.28
D_{84} =	155.63
D_{95} =	270.83
D_{100} =	512.00

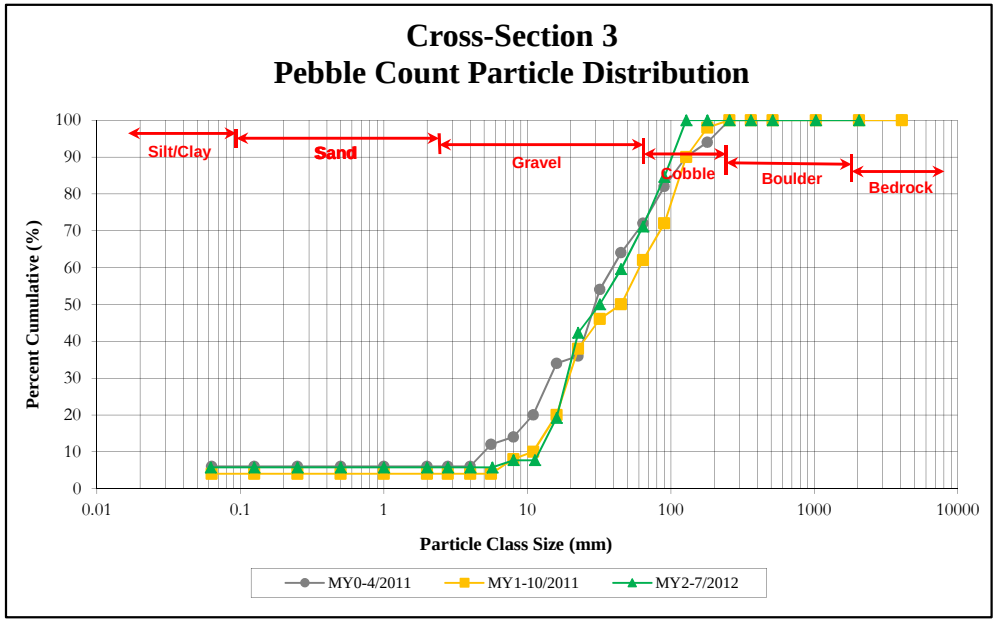


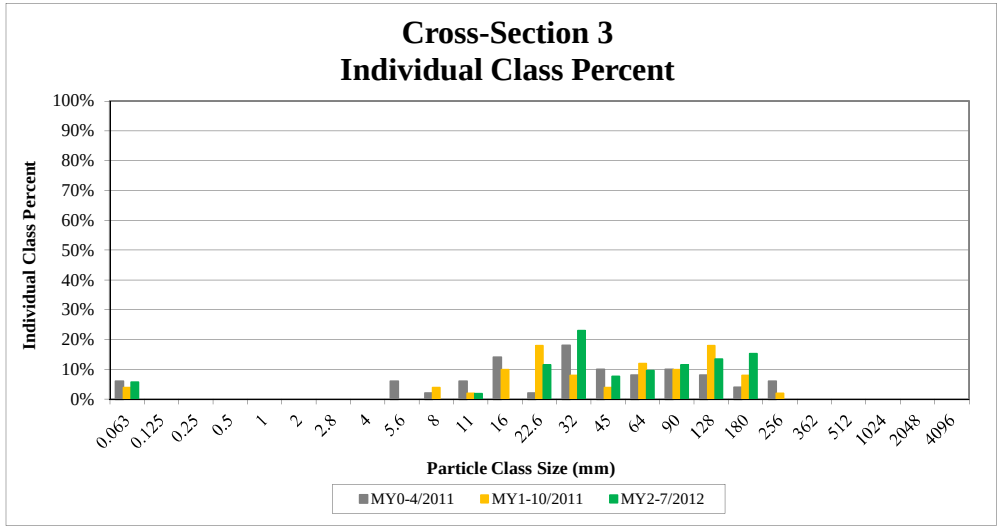


Appendix 4. Morphological Summary Data and Plots
Figure 6c. Reachwide and Cross-Section Substrate Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reach 1, Cross-Section 3 (Riffle)
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 3 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	6	6
SAND	Very fine	0.062	0.125			6
	Fine	0.125	0.250			6
	Medium	0.250	0.500			6
	Coarse	0.5	1.0			6
	Very Coarse	1.0	2.0			6
GRAVEL	Very Fine	2.0	2.8			6
	Very Fine	2.8	4.0			6
	Fine	4.0	5.7			6
	Fine	5.7	8.0			6
	Medium	8.0	11.3	2	2	8
	Medium	11.3	16.0			8
	Coarse	16.0	22.6	12	12	19
	Coarse	22.6	32	24	23	42
	Very Coarse	32	45	8	8	50
	Very Coarse	45	64	10	10	60
COBBLE	Small	64	90	12	12	71
	Small	90	128	14	13	85
	Large	128	180	16	15	100
	Large	180	256			100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**104**	**100**	**100**

Cross-Section 3 Channel materials (mm)	
D_{16} =	20.52
D_{35} =	28.66
D_{50} =	45.00
D_{84} =	125.96
D_{95} =	161.12
D_{100} =	180.00

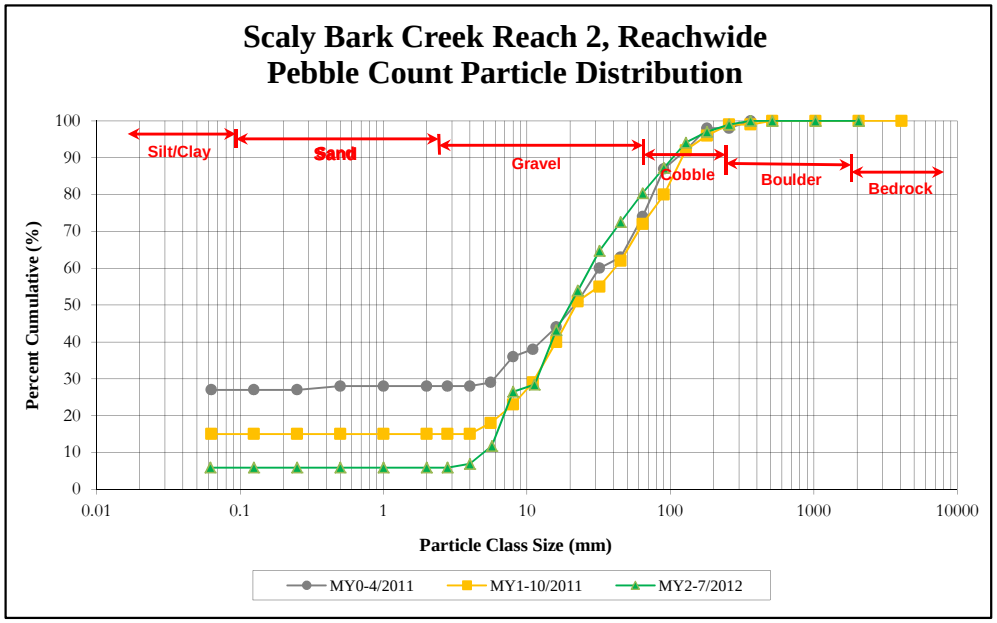


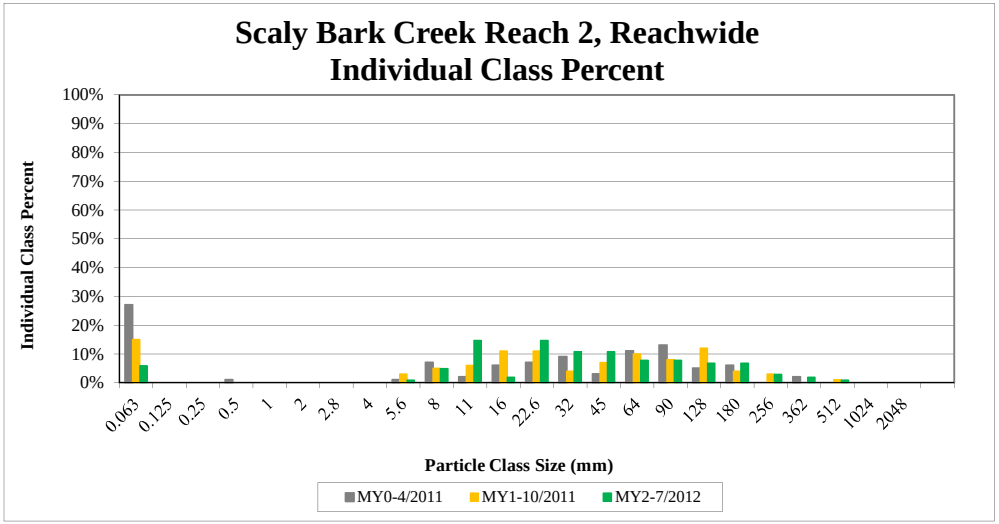


Appendix 4. Morphological Summary Data and Plots
Figure 6d. Reachwide and Cross-Section Substrate Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Creek Reach 2, Reachwide
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			Scaly Bark Reach 2 Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		6	6	6	6
SAND	Very fine	0.062	0.125					6
	Fine	0.125	0.250					6
	Medium	0.250	0.500					6
	Coarse	0.5	1.0					6
	Very Coarse	1.0	2.0					6
GRAVEL	Very Fine	2.0	2.8					6
	Very Fine	2.8	4.0					6
	Fine	4.0	5.7		1	1	1	7
	Fine	5.7	8.0		5	5	5	12
	Medium	8.0	11.3	4	11	15	15	26
	Medium	11.3	16.0		2	2	2	28
	Coarse	16.0	22.6	4	11	15	15	43
	Coarse	22.6	32	3	8	11	11	54
	Very Coarse	32	45	7	4	11	11	65
	Very Coarse	45	64	5	3	8	8	73
COBBLE	Small	64	90	8		8	8	80
	Small	90	128	6	1	7	7	87
	Large	128	180	7		7	7	94
	Large	180	256	3		3	3	97
BOULDER	Small	256	362	2		2	2	99
	Small	362	512	1		1	1	100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**52**	**102**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	Silt/Clay
D_{50} =	28.20
D_{84} =	108.31
D_{95} =	200.06
D_{100} =	512.00

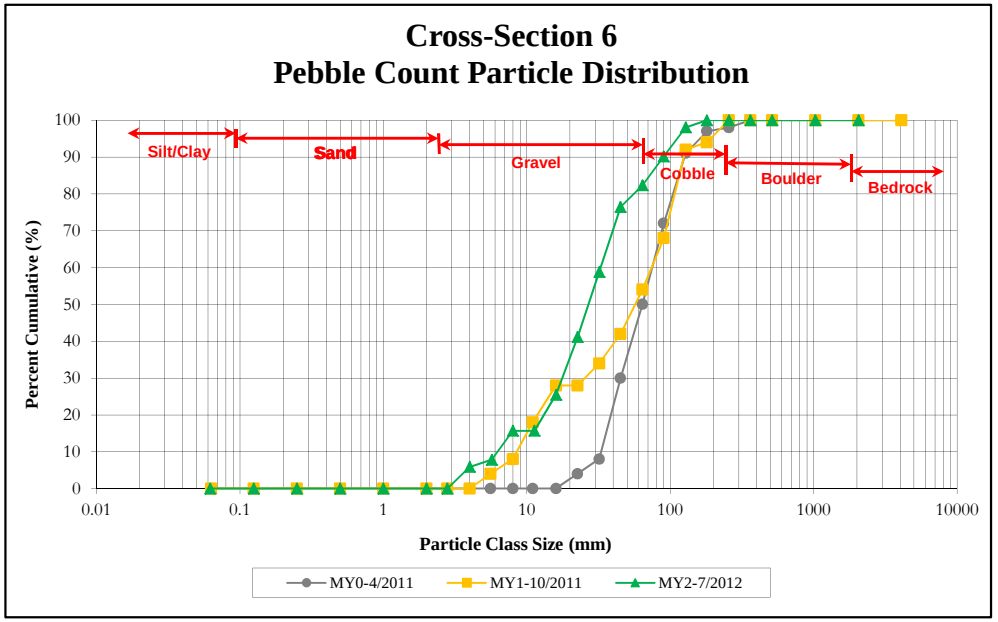


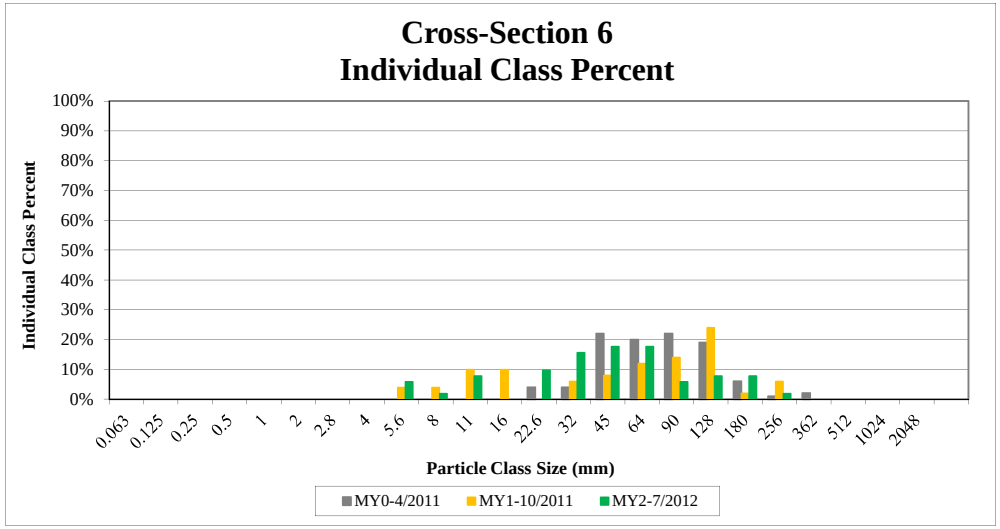


Appendix 4. Morphological Summary Data and Plots
Figure 6e. Reachwide and Cross-Section Substrate Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 2, Cross-Section 6 (Riffle)
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 6 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.250	0.500			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.7	6	6	6
	Fine	5.7	8.0	2	2	8
	Medium	8.0	11.3	8	8	16
	Medium	11.3	16.0			16
	Coarse	16.0	22.6	10	10	25
	Coarse	22.6	32	16	16	41
	Very Coarse	32	45	18	18	59
	Very Coarse	45	64	18	18	76
COBBLE	Small	64	90	6	6	82
	Small	90	128	8	8	90
	Large	128	180	8	8	98
	Large	180	256	2	2	100
BOULDER	Small	256	362			100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**102**	**100**	**100**

Cross-Section 6 Channel materials (mm)	
D_{16} =	16.18
D_{35} =	27.90
D_{50} =	37.95
D_{84} =	96.91
D_{95} =	157.72
D_{100} =	256.00

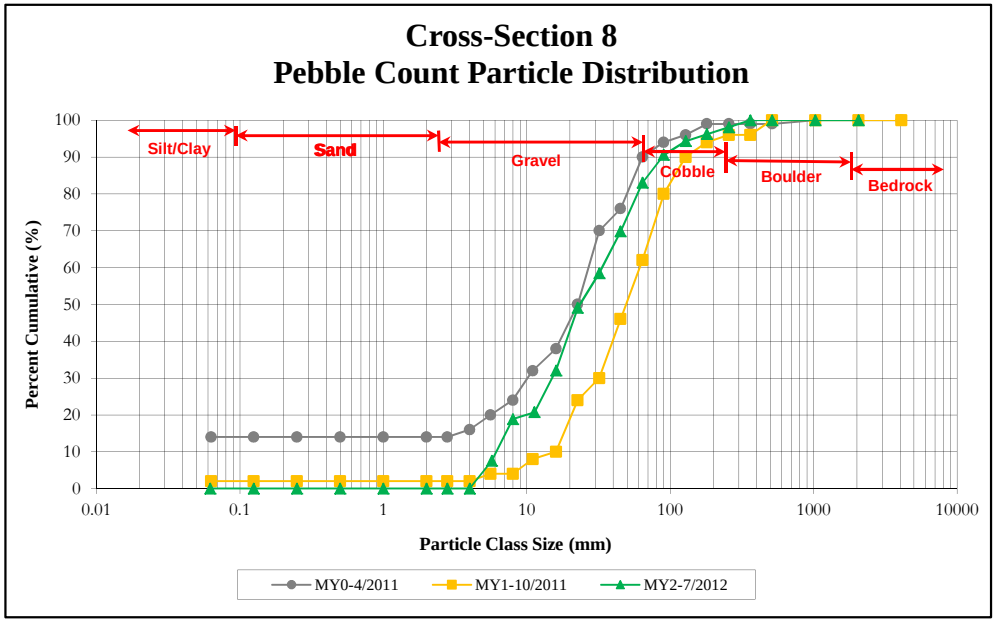


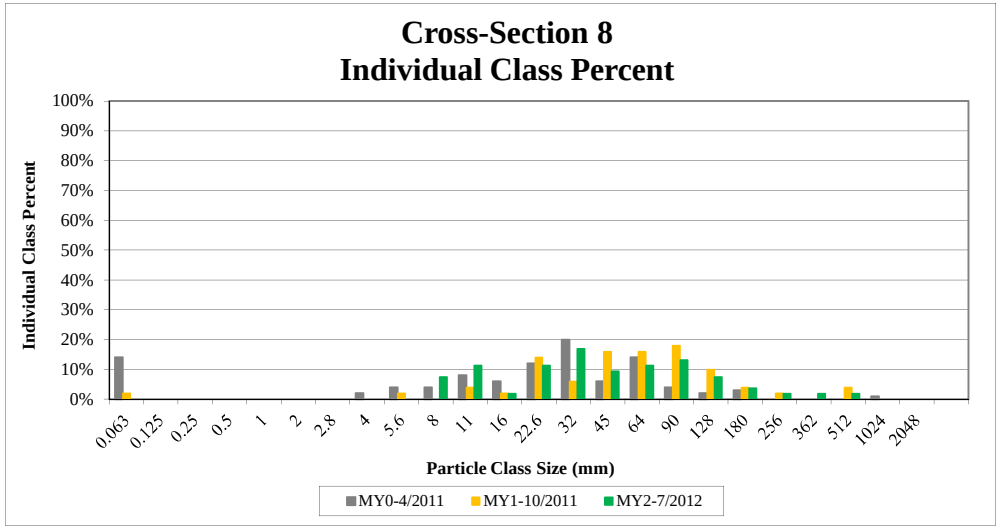


Appendix 4. Morphological Summary Data and Plots
Figure 6f. Reachwide and Cross-Section Substrate Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
Scaly Bark Reach 2, Cross-Section 8 (Riffle)
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 8 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.250	0.500			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.7			0
	Fine	5.7	8.0	8	8	8
	Medium	8.0	11.3	12	11	19
	Medium	11.3	16.0	2	2	21
	Coarse	16.0	22.6	12	11	32
	Coarse	22.6	32	18	17	49
	Very Coarse	32	45	10	9	58
	Very Coarse	45	64	12	11	70
COBBLE	Small	64	90	14	13	83
	Small	90	128	8	8	91
	Large	128	180	4	4	94
	Large	180	256	2	2	96
BOULDER	Small	256	362	2	2	98
	Small	362	512	2	2	100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**106**	**100**	**100**

Cross-Section 8	
Channel materials (mm)	
D_{16} =	10.15
D_{35} =	24.00
D_{50} =	33.11
D_{84} =	94.22
D_{95} =	203.62
D_{100} =	512.00

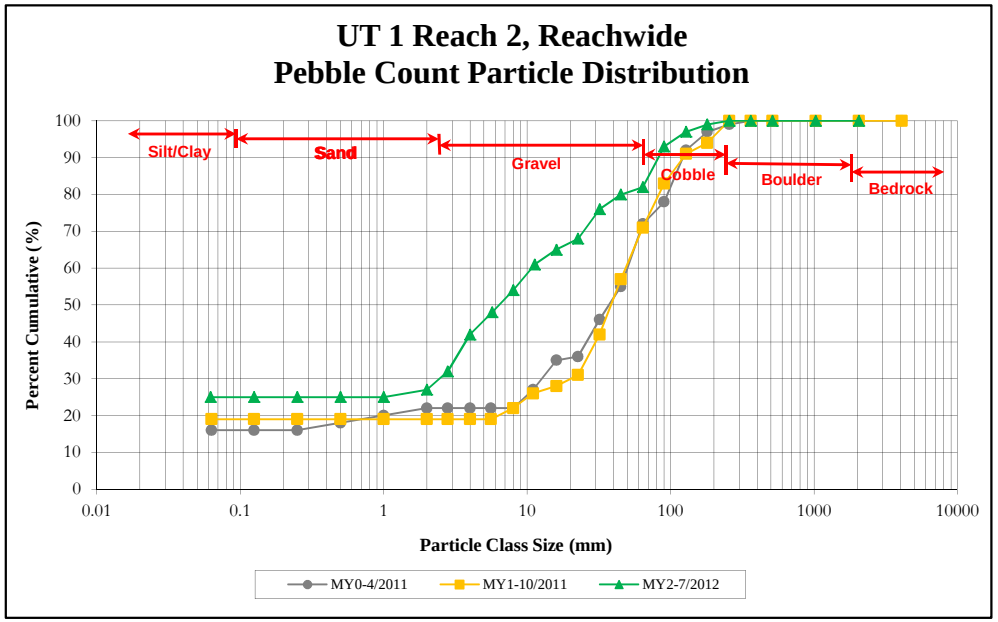


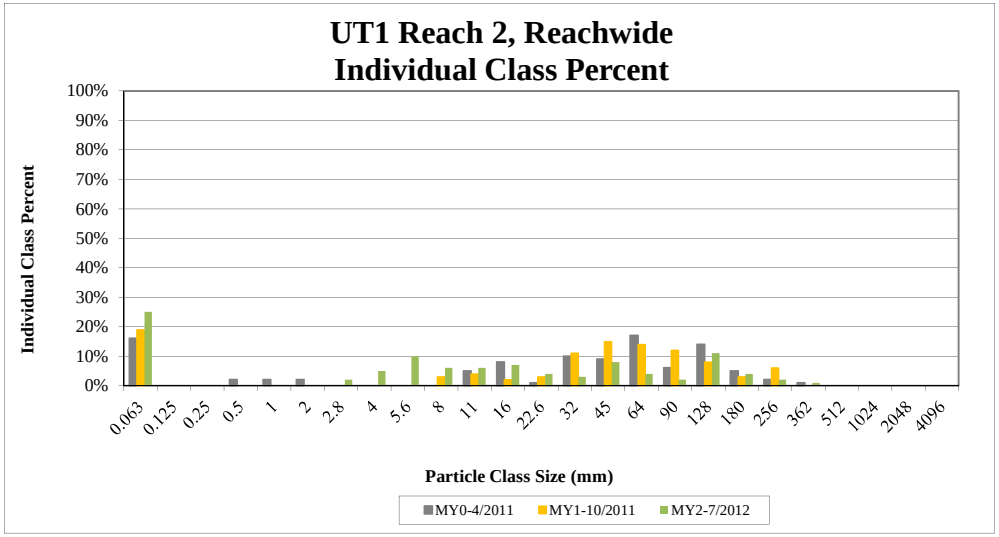


Appendix 4. Morphological Summary Data and Plots
Figure 6g. Reachwide and Cross-Section Pebble Count Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT1 Reach 2, Reachwide
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			UT1 Reach 2 Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4	21	25	25	25
SAND	Very fine	0.062	0.125					25
	Fine	0.125	0.250					25
	Medium	0.250	0.500					25
	Coarse	0.5	1.0					25
	Very Coarse	1.0	2.0					25
GRAVEL	Very Fine	2.0	2.8	1	1	2	2	27
	Very Fine	2.8	4.0	1	4	5	5	32
	Fine	4.0	5.7	3	7	10	10	42
	Fine	5.7	8.0	4	2	6	6	48
	Medium	8.0	11.3	5	1	6	6	54
	Medium	11.3	16.0	4	3	7	7	61
	Coarse	16.0	22.6	4		4	4	65
	Coarse	22.6	32	3		3	3	68
	Very Coarse	32	45	6	2	8	8	76
	Very Coarse	45	64	2	2	4	4	80
COBBLE	Small	64	90	1	1	2	2	82
	Small	90	128	7	4	11	11	93
	Large	128	180	2	2	4	4	97
	Large	180	256	2		2	2	99
BOULDER	Small	256	362	1		1	1	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**50**	**50**	**100**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	4.42
D_{50} =	8.90
D_{84} =	95.95
D_{95} =	151.79
D_{100} =	362

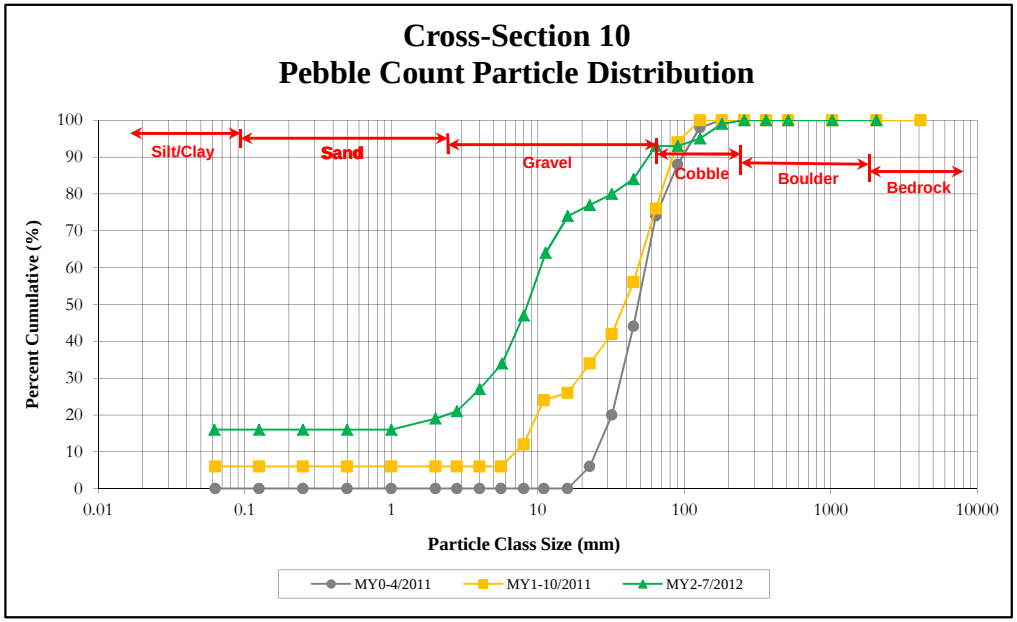


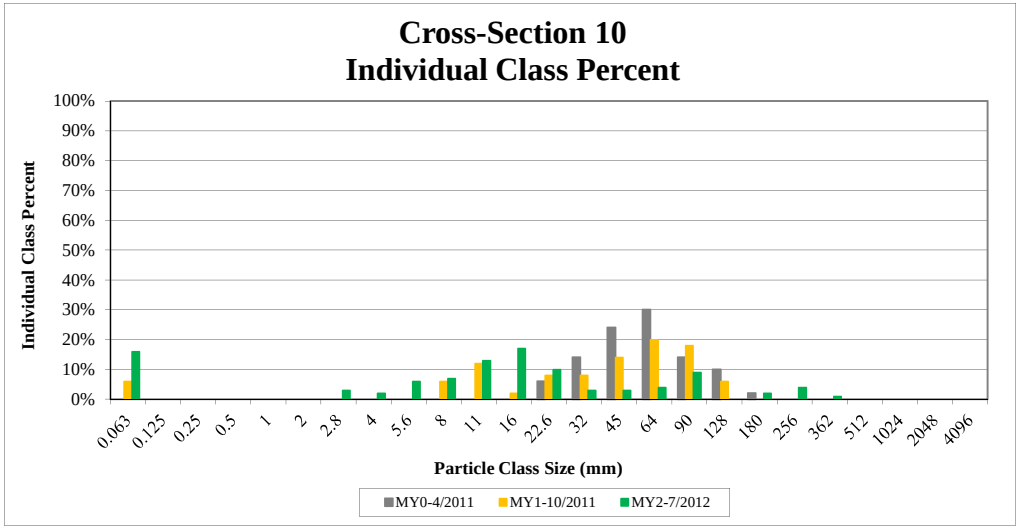


Appendix 4. Morphological Summary Data and Plots
Figure 6h. Reachwide and Cross-Section Pebble Count Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT1 Reach 2, Cross-Section 10 (Riffle)
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 10 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	16	16	16
SAND	Very fine	0.062	0.125			16
	Fine	0.125	0.250			16
	Medium	0.250	0.500			16
	Coarse	0.5	1.0			16
	Very Coarse	1.0	2.0			16
GRAVEL	Very Fine	2.0	2.8	3	3	19
	Very Fine	2.8	4.0	2	2	21
	Fine	4.0	5.7	6	6	27
	Fine	5.7	8.0	7	7	34
	Medium	8.0	11.3	13	13	47
	Medium	11.3	16.0	17	17	64
	Coarse	16.0	22.6	10	10	74
	Coarse	22.6	32	3	3	77
	Very Coarse	32	45	3	3	80
	Very Coarse	45	64	4	4	84
COBBLE	Small	64	90	9	9	93
	Small	90	128			93
	Large	128	180	2	2	95
	Large	180	256	4	4	99
BOULDER	Small	256	362	1	1	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	100	100	100

Cross-Section 10 Channel materials (mm)	
D_{16} =	2.00
D_{35} =	8.20
D_{50} =	11.75
D_{84} =	64.00
D_{95} =	180.00
D_{100} =	362.00

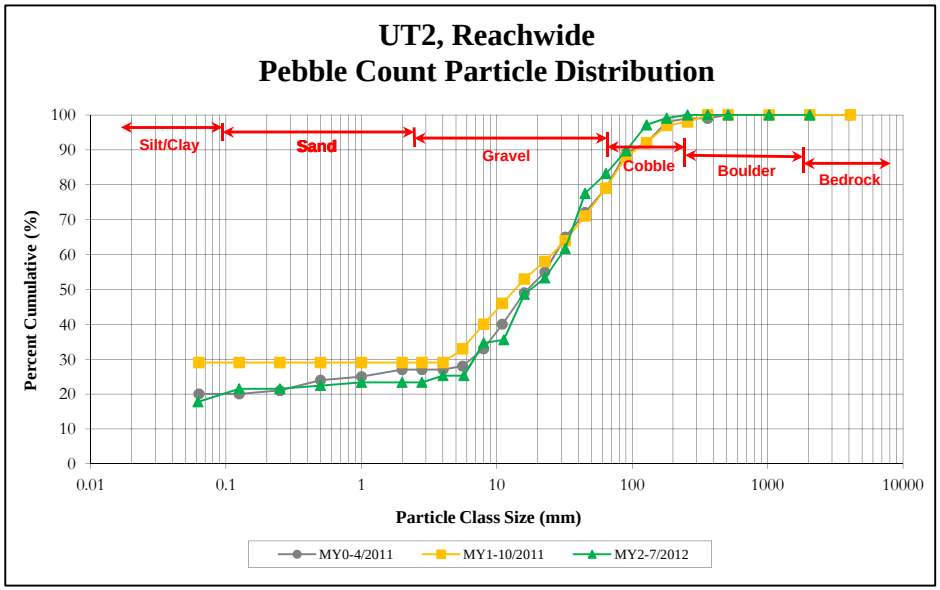


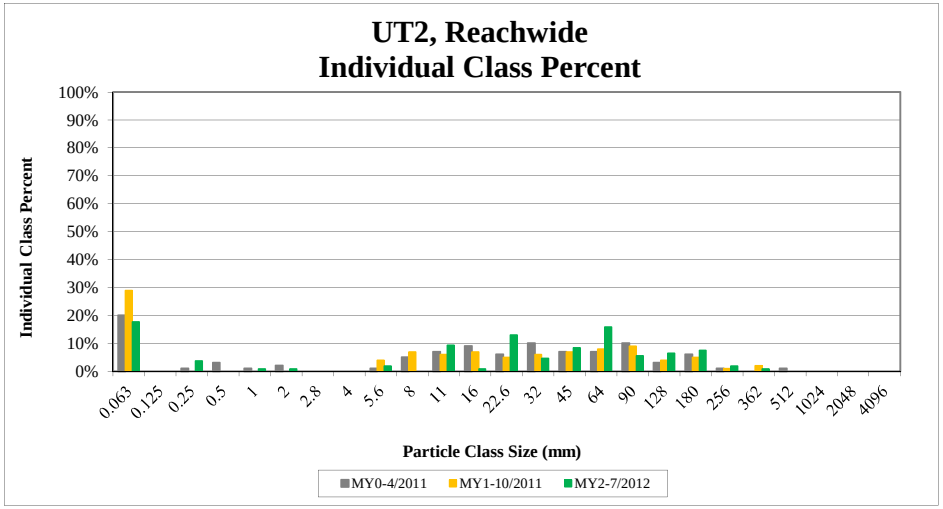


Appendix 4. Morphological Summary Data and Plots
Figure 6i. Reachwide and Cross-Section Pebble Count Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT2, Reachwide
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count			UT2 Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		19	19	18	18
SAND	Very fine	0.062	0.125					18
	Fine	0.125	0.250		4	4	4	21
	Medium	0.250	0.500					21
	Coarse	0.5	1.0		1	1	1	22
	Very Coarse	1.0	2.0		1	1	1	23
GRAVEL	Very Fine	2.0	2.8					23
	Very Fine	2.8	4.0					23
	Fine	4.0	5.7		2	2	2	25
	Fine	5.7	8.0					25
	Medium	8.0	11.3	7	3	10	9	35
	Medium	11.3	16.0		1	1	1	36
	Coarse	16.0	22.6	9	5	14	13	49
	Coarse	22.6	32	1	4	5	5	53
	Very Coarse	32	45	6	3	9	8	62
	Very Coarse	45	64	10	7	17	16	78
COBBLE	Small	64	90	4	2	6	6	83
	Small	90	128	6	1	7	7	90
	Large	128	180	7	1	8	7	97
	Large	180	256	2		2	2	99
BOULDER	Small	256	362	1		1	1	100
	Small	362	512					100
	Medium	512	1024					100
	Large/Very Large	1024	2048					100
BEDROCK	Bedrock	2048	>2048					100
			Total	**53**	**54**	**107**	**100**	**100**

Reachwide	
Channel materials (mm)	
D_{16} =	Silt/Clay
D_{35} =	13.02
D_{50} =	25.09
D_{84} =	94.07
D_{95} =	162.85
D_{100} =	362





Appendix 4. Morphological Summary Data and Plots
Figure 6j. Reachwide and Cross-Section Substrate Plots
Scaly Bark Creek Mitigation Site (EEP Project No. 94148)
UT2, Cross-Section 12 (Riffle)
Monitoring Year 2

Particle Class		Diameter (mm)		Particle Count	Cross-Section 12 Summary	
		min	max	Total	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062			0
SAND	Very fine	0.062	0.125			0
	Fine	0.125	0.250			0
	Medium	0.250	0.500			0
	Coarse	0.5	1.0			0
	Very Coarse	1.0	2.0			0
GRAVEL	Very Fine	2.0	2.8			0
	Very Fine	2.8	4.0			0
	Fine	4.0	5.7			0
	Fine	5.7	8.0			0
	Medium	8.0	11.3	12	12	12
	Medium	11.3	16.0			12
	Coarse	16.0	22.6	14	14	26
	Coarse	22.6	32	6	6	32
	Very Coarse	32	45	24	24	56
	Very Coarse	45	64	10	10	66
COBBLE	Small	64	90	10	10	76
	Small	90	128	8	8	84
	Large	128	180	14	14	98
	Large	180	256			98
BOULDER	Small	256	362	2	2	100
	Small	362	512			100
	Medium	512	1024			100
	Large/Very Large	1024	2048			100
BEDROCK	Bedrock	2048	>2048			100
			Total	**100**	**100**	**100**

Cross-Section 12 Channel materials (mm)	
D_{16} =	17.66
D_{35} =	33.39
D_{50} =	41.32
D_{84} =	128.00
D_{95} =	167.32
D_{100} =	362.00