SCALY BARK CREEK MITIGATION SITE

Stanly County, NC

DENR Contract 002030

Restoration Plan

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Prepared for:

Ecosystem Enhancement PROGRAM

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EXECUTIVE SUMMARY

Wildlands Engineering, Inc. proposes to provide 6,450 Stream Mitigation Units (SMUs) by restoring, enhancing, and preserving portions of Scaly Bark Creek and six tributaries. The proposed work is summarized in Table ES.1. The Scaly Bark Creek Mitigation Site is located in rural Stanly County, southwest of Albemarle, NC, in the Yadkin River Basin (USGS Hydrologic Unit 03040105).

Table ES.1. Project Component Summary
Scaly Bark Creek Mitigation Site

Project Reach	Existing Length (LF)	Restoration Level	Proposed Length (LF)	SMUs
Scaly Bark Creek	3,600	Restoration	4,060	4,060
UT1	330	Restoration	422	422
UT1	1,104	Enhancement 2	1,104	441.6
UT1a	390	Enhancement 2	390	156
UT1b	1,198	Enhancement 2	1,198	479.2
UT2	262	Restoration	393	393
UT3	282	Enhancement 2	326	130.4
UT4	516	Enhancement 2	569	227.6
UT4	700	Preservation	700	140
Total	**8,382**		**9,162**	**6,450**

The proposed project will provide numerous ecological benefits within the Yadkin River Basin. While many of these benefits are limited to the Scaly Bark Creek project area, others, such as pollutant removal and improved aquatic and terrestrial habitat have more far-reaching effects. Expected improvements to water quality and ecological processes are outlined below in Table ES.2 as project goals.

Table ES.2. Project Goals and Objectives
Scaly Bark Creek Mitigation Site

Project Goal	How project will seek to reach goal
Decrease nutrient and fecal coliform levels	Nutrient and fecal coliform input will be decreased by removing cattle from the streams and filtering runoff from cattle pastures through restored native buffer zones. Off-site nutrient input will be absorbed on-site by filtering flood flows through restored floodplain areas, where flood flows can disperse through native vegetation and be captured in vernal pools.
Decrease sediment input	Sediment input from eroding stream banks will be reduced by installing bioengineering and in-stream structures while creating a stable channel form using geomorphic design principles. Cattle exclusion will eliminate bank sloughing at crossing locations. Sediment from off-site sources will be captured by deposition on restored floodplain areas where native vegetation will slow overland flow velocities.

Table ES.2. Project Goals and Objectives
Scaly Bark Creek Mitigation Site

Project Goal	How project will seek to reach goal
Decrease water temperature and increase dissolved oxygen concentrations	Restored riffle/step-pool sequences where distinct points of re-aeration can occur will allow for oxygen levels to be maintained in the perennial reaches. Creation of deep pool zones will lower temperature, helping to maintain dissolved oxygen concentrations. Establishment and maintenance of riparian buffers will create long-term shading of the channel flow to minimize thermal heating.
Create appropriate in-stream habitat	In-stream habitat will be improved by creating a channel form that includes riffle and pool sequences, gravel and cobble zones of macroinvertebrate habitat and deep pool habitat for fish. Introduction of large woody debris, rock structures, root wads, and native stream bank vegetation will substantially increase habitat value.
Create appropriate terrestrial habitat	Adjacent buffer areas will be restored by removing invasive vegetation and planting native vegetation. These areas will be allowed to receive more regular inundating flows. Pocket vernal pools will create wetland habitat.
Decrease channel velocities	By allowing for more overbank flooding and by increasing channel roughness, local channel velocities can be reduced. This will allow for less bank shear stress, formation of refuge zones during large storm events and zonal sorting of depositional material.

1.0 Project Site Identification and Location

As part of the Scaly Bark Creek Mitigation Site, approximately 4,875 linear feet (LF) of perennial stream channel will be restored along with the enhancement of approximately 3,587 LF of perennial and intermittent stream channel and preservation of 700 LF of intermittent stream channel. The streams proposed for restoration and enhancement work include Scaly Bark Creek, a third order stream, as well as six unnamed first and second order tributaries (UTs) to Scaly Bark Creek. The project streams ultimately flow into the Rocky River which is part of the Yadkin River Basin. Photographs of the project site are included in Appendix 1.

1.1 Directions to Project Site

The proposed Scaly Bark Creek Mitigation Project is located off of NC Highway 24/27 in the central portion of Stanly County, NC. The site is approximately 2.6 miles southwest of downtown Albemarle, NC. The proposed project is located in an active cattle pasture surrounded by wooded lots, small agricultural operations, and rural residential areas.

1.2 USGS Hydrologic Unit Code and NCDWQ River Basin Designations

Scaly Bark Creek is located within the Rocky River watershed (NCDWQ Subbasin 03-07-13) of the Yadkin River Basin (USGS Hydrologic Unit 03040105060030) as shown in Figure 1.

The North Carolina Division of Water Quality (NCDWQ) assigns best usage classifications to the State Waters that reflect water quality conditions and potential resource usage. Scaly Bark Creek (NCDWQ Index No. 13-17-31-2) is the main creek on the project and 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.

1.3 Project Components and Structure

Table 1a. Project Components
Scaly Bark Creek Mitigation Site

Project Reach	Existing Length (LF)	Restoration Level	Approach	Proposed Length (LF)	Stationing	Buffer Acreage	Comment
Scaly Bark Creek Reaches 1 & 2	3,600	Restoration	Priority 1	4,060	100+00.00-141+71.79	14.32	Perennial
UT1 Reach 1	330	Restoration	Priority 1	422	213+10.37-217+32.36	0.98	Perennial
UT1 Reach 2	1,104	Enhancement 2	Spot grading and planting	1,104	200+00.00-211+10.37	2.95	Perennial
UT1a	390	Enhancement 2	Spot grading and planting	390	302+78.00-306+68.00	0.91	Intermittent
UT1b	1,198	Enhancement 2	Spot grading and planting	1,198	400+10.00-412+08.00	3.18	Intermittent

Table 1a. Project Components
Scaly Bark Creek Mitigation Site

UT2	262	Restoration	Priority 1	393	500+00.00-503+93.00	0.50	Perennial
UT3	282	Enhancement 2	spot grading and planting	326	600+00.00-603+26.00	0.65	Intermittent. UT3 will be enhanced and must be lengthened to connect to new Scaly Bark location.
UT4	516	Enhancement 2	spot grading and planting	569	707+00.00-712+69.00	1.23	Intermittent. UT4 will be enhanced and must be lengthened to connect to new Scaly Bark location.
UT4	700	Preservation	spot grading and planting	700	700+00.00-707+00.00	1.88	Intermittent

Table 1b. Summary of Restoration Levels
Scaly Bark Creek Mitigation Site

Restoration Level	Stream Length (LF)	Wetland (acres)	Upland (acres)	Buffer (acres)
Restoration	4,875	-	-	-
Enhancement 2	3,587	-	-	-
Preservation	700	-	-	-
TOTAL	9,162	-	-	-

2.0 Watershed Characterization

2.1 Drainage Area, Project Area, and Easement Acreage

The Scaly Bark Creek watershed is located in a rural area of Stanly County in the Yadkin River Basin. At the downstream limits of the project, the drainage area is 1,619 acres (2.5 square miles). The drainage areas of each of the six project reaches are shown on Figure 2 and included in Table 2.

Table 2. Drainage Areas
Scaly Bark Creek Mitigation Site

Project Reach	Existing Length (LF)	Drainage Area (acres)
Scaly Bark Creek	3,600	1619
UT1	1,434	173
UT1a	390	46
UT1b	1,198	83
UT2	262	436
UT3	282	36
UT4	1,216	25

The Scaly Bark Mitigation Site is located within a 212-acre tract of land owned by Franchot Palmer. A conservation easement has been prepared to protect the 26.6 acres of riparian corridor and stream resources in perpetuity. The finalized conservation easement area is shown in Figure 3.

2.2 Surface Water Classification and Water Quality

On July 11, 2008, Wildlands Engineering investigated on-site jurisdictional waters of the U.S. using the U.S. Army Corps of Engineers (USACE) Routine On-Site Determination Method. This method is defined in the 1987 USACE Delineation Manual. Determination methods included stream classification utilizing the NCDWQ Stream Identification Form and the USACE Stream Quality Assessment Worksheet. Potential jurisdictional wetland areas as well as typical upland areas were classified using the USACE Routine Wetland Determination Data Form. All USACE forms are included in Appendix 2. A request for verification of on-site jurisdictional waters will be submitted along with 404/401 permit applications for this project.

The results of the on-site field investigation indicate that there are seven jurisdictional stream channels located within the proposed project area: Scaly Bark Creek and six unnamed tributaries (UT). Scaly Bark Creek, UT1, and UT2 were determined to be perennial streams, while UT1a, UT1b, UT3, and UT4 were determined to be intermittent streams. All NCDWQ Stream Classification Forms are included in Appendix 2.

Two jurisdictional wetland areas (Wetlands AA and BB) are located within the project area (Figure 4). Wetland AA (0.22 acre) is located in the upstream portion of UT1 and is located within the footprint of an old farm pond. A portion of this wetland area falls within the conservation easement, however no impacts to this wetland system will occur as a result of the enhancement activities to UT1. The portion of the wetland within the easement will be planted with native riparian vegetation. Wetland BB (0.09 acre) is located within a small depressional area adjacent to Scaly Bark Creek. This system is located entirely within the conservation easement; as a result, the proposed alignment of Scaly Bark Creek will slightly encroach upon this area. Minimal grading will be required in this area since the proposed bankfull floodplain elevation has been set to match the wetland elevation. Impacts to this area will be kept to a minimum. Hydrologic connections will be improved with the adjacent Priority 1 stream restoration which will raise the channel and associated water table, and allow flood flows to

inundate the floodplain wetland area. Wetland BB will be improved with native plantings throughout. Wetlands will be created throughout the site by leaving low depressions (vernal pools) in the channels that will be filled.

2.3 Physiography, Geology, and Soils

The Scaly Bark site is located in the Carolina Slate Belt of the Piedmont Physiographic Province (USGS, 1998). The Piedmont Province is characterized by gently rolling, well rounded hills with long low ridges, with elevations ranging anywhere from 300 to 1500 feet above sea level. The Carolina Slate belt consists of heated and deformed volcanic and sedimentary rocks. Approximately 550 to 650 million years ago, this region was the site of a series of oceanic volcanic islands. The belt is known for its numerous abandoned gold mines and prospects. Specifically, the proposed restoration site is located in the CZmd region of the Carolina Slate Belt. This region is classified as a metamorphic formation of metamudstone and meta-argillite rocks. These rock types are described as thin to thick bedded and interbedded with metasandstone, metaconglomerate, and metavolcanic rock (NCGS, 2009).

Soil mapping units are based on the U.S. Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) Soil Survey Geographic (SSURGO) database for Stanly County. Soil types within the study area include Badin (BaB, BaD), Badin-Urban land complex (BbB, BbD), Goldston (GoC, GoF), Kirksey (KkB), Misenheimer (MhB), and Oakboro (Oa) as show in Figure 5. Badin soils are well-drained, found mainly on gently sloping to steep uplands within the Piedmont and exhibit moderate permeability. Within the Badin-Urban land complex, the Urban land portion comprises approximately 25% of the unit and are typically areas that have been greatly disturbed or are covered with impervious structures including buildings, parking lots, and roadways. Goldston soils are gently sloping to strongly sloping, shallow, well-drained to excessively drained soils. They have a loamy surface layer and subsoil with many channers. Permeability is moderately rapid and shrink-swell potential is low. Kirksey soils types are generally found on lower slopes ranging from 0 to 10% and include materials from weathered upland Carolina slate. Kirksey soils are moderately well-drained and exhibit moderately slow permeability. Misenheimer soils are nearly level to gently sloping, shallow, and moderately well-drained to somewhat poorly drained soils. They are often found in upland areas and exhibit moderate to moderately rapid permeability. The Oakboro soil type consists of nearly level, very deep, moderately well-drained soils. These soils are typically found in floodplain areas subjected to frequent flooding and exhibit moderate permeability and low shrink-swell potential. Oakboro soils are listed by the NRCS as having inclusions of hydric soils for Stanly County.

2.4 Historical Land Use and Development Trends

Land use within the watershed is historically rural and is dominated by forestry, agriculture, and livestock operations; with approximately 60% of the watershed forested and 40% used for agriculture. While relatively small pockets of development may be occurring around the town of Albemarle, approximately 2.6 miles to the northeast, there is no evidence of increased development pressure within the Scaly Bark Creek watershed aside from the recent widening of NC Highway 24/27.

The Scaly Bark Creek Site has historically been utilized for agricultural purposes. Historical aerial photos are included in Appendix 3. Currently, the Scaly Bark Creek watershed originates

in an agricultural and forested headwater area and the channel continues through the site within an agricultural pasture. The remaining unnamed tributaries exhibit similar watershed systems dominated by open agricultural pastures and small areas of mixed hardwood forests. The primary stressors within these watersheds are most likely sediment and nutrient loading from overland runoff of disturbed surfaces and stream bank erosion.

2.5 Endangered and Threatened Species

2.5.1 Site Evaluation Methodology

The Endangered Species Act (ESA) of 1973, amended (16 U.S.C. 1531 et seq.), defines protection for species with the Federal Classification of Threatened (T) or Endangered (E). An "Endangered Species" is defined as "any species which is in danger of extinction throughout all or a significant portion of its range" and a "Threatened Species" is defined as "any species which is likely to become an Endangered Species within the foreseeable future throughout all or a significant portion of its range" (16 U.S.C. 1532).

Wildlands utilized the U.S. Fish and Wildlife Service (USFWS) and North Carolina Natural Heritage Program (NHP) databases in order to identify federally listed Threatened and Endangered plant and animal species for Stanly County, NC (USFWS, 2008 and NHP, 2009). Two federally listed species, the bald eagle (*Haliaeetus leucocephalus*) and Schweinitz's sunflower (*Helianthus schweinitzii*), are currently listed in Stanly County (Table 3).

Table 3. Listed Threatened and Endangered Species in Stanly County, NC
Scaly Bark Creek Mitigation Site

Species	Federal Status	Habitat
Vertebrate		
Bald eagle (*Haliaeetus leucocephalus*)	BGPA	Near large open water bodies: lakes, marshes, seacoasts, and rivers
Vascular Plant		
Schweinitz's sunflower (*Helianthus schweinitzii*)	E	Rocky or gravely shoals of clear swift-moving streams
E = Endangered; T=Threatened; NS=No State Status; BGPA=Bald & Golden Eagle Protection Act		

2.5.2 Threatened and Endangered Species

2.5.2.1 Species Description

Bald Eagle

The bald eagle is a very large raptor species, typically 28 to 38 inches in length. Adult individuals are brown in color with a very distinctive white head and tail. Bald eagles typically live near large bodies of open water with suitable fish habitat including: lakes, marshes, seacoasts, and rivers. This species generally requires tall, mature tree species for nesting and roosting. Bald eagles were de-listed from the Endangered Species List in June 2007; however, this species remains under the protection of the Migratory Bird

Treaty Act and the Bald and Golden Eagle Protection Act (BGPA). This species is known to occur in every U.S. state except Hawaii.

Schweinitz's Sunflower

Schweinitz's sunflower is a perennial herb, usually growing 1 to 2 meters tall with yellow disk and ray flowers. This species is found in semi-sunny to sunny open areas where disturbance has occurred such as roadsides, power line clearings, old pastures and woodland openings. This species is generally found growing in shallow, poor, clayey and/or rocky soils. Known population occurrences of Schweinitz's sunflower have been observed in Stanly County within the past 20 years.

2.5.2.2 Biological Conclusion

A pedestrian survey of the site was performed on August 5, 2008. On-site habitats include active pastures, successional woodlands, and streamside thickets. There is minimal habitat available for Schweinitz's sunflower on-site. Much of the soil is degraded and barren due to cattle activity and unstable, eroding banks. The majority of native plant growth at the site is present on the channel banks and buffer zones, which lack the proper soil conditions for Schweinitz's sunflower. No individual species of Schweinitz's sunflower were found to exist on-site. There is no suitable nesting or breeding habitat for bald eagles located within the site, as they require tall, mature trees. Additionally, no suitable feeding habitat for bald eagles is located at the site nor within proximity, such as lakes or large rivers. As a result of the pedestrian survey, no individual species or nests of bald eagles were found to exist on the site.

It is determined that the proposed restoration activities will have no effect on these federally listed species. A letter was submitted to the USFWS on October 2, 2009, (Appendix 4) requesting any comment on the results of the site investigation. Since no response was received from the USFWS within a 30-day time frame, it is assumed that the site determination is correct and that no additional, relevant information is available for this site.

2.5.3 Federal Designated Critical Habitat

According to the USFWS database, no federally designated critical habitat is listed within Stanly County. As a result, it is determined that the proposed restoration project will have no effect on federally listed habitats.

2.5.4 NCWRC Concurrence

The North Carolina Wildlife Resource Commission (NCWRC) was notified of the Scaly Bark Creek Mitigation Project via letter on October 2, 2009. The NCWRC responded on October 22, 2009, and stated that they have records for the federal species of concern and state special concern Carolina darter (*Ethestoma collis*) in the downstream system of Long Creek. However, it was determined that they "do not anticipate the project to result in significant adverse impacts to aquatic and terrestrial wildlife resources," provided that the proposed restoration activities utilize natural channel design methods, minimize erosion and sedimentation from construction activities, and establish native forested riparian buffers. A copy of the NCWRC letter is included in Appendix 4.

2.6 Cultural Resources

2.6.1 Site Evaluation Methodology

The National Historic Preservation Act (NHPA) of 1966, amended (16 U.S.C. 470), defines the policy of historic preservation to protect, restore, and reuse districts, sites, structures, and objects significant in American history, architecture, and culture. Section 106 of the NHPA mandates that federal agencies take into account the effect of an undertaking on any property, which is included in, or eligible for inclusion in, the National Register of Historic Places.

Wildlands Engineering contracted New South Associates to perform an "in-office" historical and archaeological screening of the Scaly Bark Creek site. Their findings indicate that the area in general has a low potential for archaeological sites and that the Oakboro silt loam and Misenheimer channery silt loam soils located in the floodplain in particular have very low potential. The Scaly Bark project is contained primarily within these soil types so the likelihood of encountering archaeological sites in these areas is extremely low. Ridge noses and tops in Badin and Goldston soils that could have a moderately high potential of containing areas of archaeological remains will not be impacted by the proposed mitigation project. New South Associates' professional opinion is that more detailed surveys would not be required.

2.6.2 SHPO/THPO Concurrence

A letter was sent to the North Carolina State Historic Preservation Office (SHPO) on October 2, 2009, requesting review and comment for the potential of cultural resources potentially affected by the Scaly Bark Creek Mitigation Project. In a letter, dated November 2, 2009, SHPO stated that they "are aware of no historic resources which would be affected by the project." A copy of the SHPO correspondence is included in Appendix 4.

2.7 Physical Constraints

2.7.1 Property Ownership and Boundary, Boundary, and Utilities

The Scaly Bark Creek Site is located on one parcel owned by M. Franchot. and Carol D. Palmer (PIN 653701159806). An option agreement for the conservation easement area has been signed by the property owners and a Memorandum of Option is recorded at the Stanly County Register of Deeds, Deed Book 1246 and Page Number 395(5). The option agreement allows Wildlands to restrict the land use in perpetuity through a conservation easement. The conservation easement plat and protection agreement has been prepared and is under review by the property owner.

The project is easily accessed from NC Highway 24/27 (Figure 3). An electric transmission line easement crosses Scaly Bark Creek downstream of the UT3 confluence in addition to a smaller electric distribution line that crosses UT1 downstream of the UT1b confluence. This smaller distribution line is adjacent to the primary driveway access to the site. Easement breaks have been designed to coincide with these existing overhead distribution line crossings.

2.7.2 FEMA and Hydrologic Trespass

The downstream portion of Scaly Bark Creek is mapped as a FEMA Zone AE floodplain on FIRM panel 6537 (Figure 6). Base flood elevations have been defined, but no floodway is mapped on the FIRM panel. Limited detailed methods were used to study Scaly Bark Creek and non-encroachment widths are published in the Stanly County Community 370361 Flood Insurance Study dated September 3, 2008. The EEP Floodplain Requirements Checklist is included in the appendix and has been reviewed by the Stanly County floodplain administrator. The hydraulic modeling for the FEMA-mapped floodplain is discussed further in Section 5.4.

The project will be designed so that any increase in flooding will be contained on the project site and will not extend upstream to adjacent parcels, so hydrologic trespass will not be a concern.

3.0 Project Site Streams – Existing Conditions

3.1 Existing Conditions Survey

The on-site existing conditions data were collected by Wildlands Engineering in October, 2009. This survey included the assessment of Scaly Bark Creek and its six unnamed tributaries UT1, UT1a, UT1b, UT2, UT3, and UT4. Scaly Bark Creek, UT1, and UT2 were determined to be perennial streams while the remaining tributaries were classified as intermittent channels. The locations of the project reaches and surveyed cross sections are shown in Figure 7. Existing geomorphic survey data is included in Appendix 5.

Scaly Bark Creek has likely been historically channelized and straightened for agricultural purposes. Cattle access to the entire reach of the channel has resulted in areas of over-widening and stream banks that have been trampled and heavily grazed. Some areas of shallow bedrock in the upstream portions of Scaly Bark Creek (Reach 1) have protected the channel from vertical incision; however the remainder of the downstream reach (Reach 2) does not exhibit shallow bedrock allowing for increased vertical incision. A single line of woody vegetation exists along most of the stream banks, while small pockets completely devoid of vegetation exist. Bare vertical banks, historical channelization, and cattle access are likely the dominant cause of in-stream sediment deposition.

UT1 has been ditched and is situated in a somewhat narrow valley. This perennial tributary was historically grazed, but has been recently fenced allowing for early successional vegetation to flourish including goldenrod, blackberry, and graminoid species. The majority of the tributary exhibits only minor instability with increased incision and bank erosion at the downstream end (Reach 2). Reach 2 continues to be impacted by active cattle grazing and trampling of banks.

UT1a and UT1b are intermittent drainages to UT1. UT1a has been recently fenced and exhibits early successional vegetation along with few mature canopy tree species. UT1a has been historically straightened and exhibits little to no pattern or bed form. Similarly, UT1b has been straightened, however this channel continues to be heavily impacted from cattle grazing and trampling. No riparian vegetation exists for this channel. The majority of this reach exhibits shallow bedrock which provides vertical stability.

UT2, similar to Reach 2 of UT1, is actively impacted by cattle access and grazing. UT2 exhibits minor incision throughout the reach along with bare vertical banks. Further instability is caused by relatively tight meanders in the upstream portion of the reach and trampling of the banks by cattle. A narrow buffer of invasive species including Chinese privet and blackberry has been heavily managed, providing little to no canopy coverage for this channel.

UT3 and UT4 are relatively small intermittent tributaries that drain agricultural and forest land. UT3 is a straightened channel located entirely within an active pasture and exhibits small pockets of instability along with a sparse, grassy riparian buffer. The upstream portion of UT4 flows through a relatively steep forested area, with mature canopy trees but little to no understory growth. The downstream pasture portion of this channel is completely accessible to cattle and exhibits a sparse riparian buffer of Chinese privet. UT4 exhibits little to no bed and bank structure near its confluence with Scaly Bark Creek.

3.2 Channel Classification

This section discusses the reaches proposed for restoration on Scaly Bark Creek, Reach 1 of UT`, and UT2, as well as the reaches proposed for enhancement on Reach 1 of UT1, UT3, and UT4. The upstream portion of UT4 is proposed for preservation.

3.2.1 Restoration Reaches

Scaly Bark Creek was divided into two separate reaches for classification due to differences in stream morphology and drainage area size. Reach 1 of Scaly Bark Creek includes the area upstream of the UT2 confluence and a drainage area of 1.65 square miles. This upstream reach of Scaly Bark Creek classifies as a straightened Rosgen C4 stream (Rosgen, 1994). The channel is located in a moderately narrow valley and is only slightly incised with an entrenchment ratio of 3.1. This upstream reach exhibits pockets of shallow bedrock, which has prevented vertical incision. The shallow depth and wide bankfull elevations result in a width-to-depth ratio of 29. The channel has been managed and straightened, so sinuosity cannot be used for classification. This reach exhibits a very coarse gravel substrate underlain by shallow bedrock outcrops. Due to extensive impact from cattle and past agricultural activity at a point just upstream of UT1, a very deep and overly wide pool structure extends from the property line downstream approximately 330 linear feet. Since this area is atypical of the overall morphology, this area was not utilized in the classification of Reach 1.

Scaly Bark Creek Reach 2 includes the area downstream of the UT2 confluence with an increased drainage area of 2.38 to 2.53 square miles. This reach of Scaly Bark Creek classifies as a Rosgen C4 stream. Reach 2 is slightly less incised than Reach 1, leading to higher entrenchment ratios ranging from 4.7 to 6.5. This reach is deeper than and not as wide as Reach 1, resulting in lower width-to-depth ratios ranging from 10.6 to 12. As with Reach 1, Reach 2 has been maintained and not allowed to freely form its own pattern, so sinuosity cannot be used for classification. Substrate throughout this reach includes very coarse gravel with much deeper bedrock than Reach 1, resulting in a coarse gravel subpavement. Existing geomorphic conditions for Scaly Bark Creek are summarized below in Table 4.

Table 4: Scaly Bark Creek Existing Conditions
Scaly Bark Creek Mitigation Site

	Notation	Units	Reach 1		Reach 2	
			min	max	min	max
stream type			C4		C4	
drainage area	DA	sq mi	1.09	1.65	2.38	2.53
Q- NC Rural Regional Curve			95	128	167	174
$Q_{2\text{-}yr}$ NFF regression			192		259	
Q- USGS extrapolation			87	162	123	221
Q Mannings			80		85	96
bankfull design discharge	Q_{bkf}	cfs	100		150	
Cross-Section Features						
bankfull cross-sectional area	A_{bkf}	SF	26.3		33.2	39.0
average velocity during bankfull event	v_{bkf}	fps	3.8		3.8	4.5
width at bankfull	w_{bkf}	feet	27.6		17.0	23.9
maximum depth at bankfull	d_{max}	feet	2.6		2.8	3.0
mean depth at bankfull	d_{bkf}	feet	1.0		1.6	2.0
bankfull width to depth ratio	w_{bkf}/d_{bkf}		29.0		10.6	12.0
depth ratio	d_{max}/d_{bkf}		2.8		1.5	1.8
low bank height			2.7		2.9	3.0
bank height ratio	BHR		1.0		1.0	1.0
floodprone area width	w_{fpa}	feet	87		111	112
entrenchment ratio	ER		3.1		4.7	6.5
Sinuosity						
valley slope	S_{valley}	feet/ foot	0.0097		0.0026	0.0052
channel slope	$S_{channel}$	feet/ foot	0.0087		0.0025	0.0051
sinuosity	K		1.1		1.0	1.0
Riffle Features						
riffle slope	S_{riffle}	feet/ foot	0.018	0.026	0.0033	0.049
riffle slope ratio	$S_{riffle}/S_{channel}$		2.1	3.0	1.3	20.0
Pool Features						
pool slope	S_{pool}	feet/ foot	0.0004	0.0121	0.000	0.004
pool slope ratio	$S_{poo}l/S_{channel}$		0.0	1.4	0.0	1.4
pool-to-pool spacing	$L_{p\text{-}p}$	feet	31	62	45	117
pool spacing ratio	$L_{p\text{-}p}/w_{bkf}$		1.1	2.2	2.6	4.9
maximum pool depth at bankfull	d_{pool}	feet	2.26	2.85	2.22	3.31
pool depth ratio	d_{pool}/d_{bkf}		2.4	3.0	1.4	1.7
pool width at bankfull	w_{pool}	feet	26.0		26.8	27.4
pool width ratio	w_{pool}/w_{bkf}		0.9		1.6	1.1
pool cross-sectional area	A_{pool}	SF	44.8		55.7	62.6

Table 4: Scaly Bark Creek Existing Conditions
Scaly Bark Creek Mitigation Site

	Notation	Units	Reach 1		Reach 2	
			min	max	min	max
at bankfull						
pool area ratio	A_{pool}/A_{bkf}		1.7		1.7	1.6
Pattern Features						
belt width	w_{blt}	feet	52		54	69
meander width ratio	w_{blt}/w_{bkf}		1.9		2.9	3.2
meander length	L_m	feet	81	163	60	190
meander length ratio	L_m/w_{bkf}		2.9	5.9	3.5	7.9
radius of curvature	R_c	feet	43.0	93.0	15	146
radius of curvature ratio	R_c/ w_{bkf}		1.6	3.4	0.9	6.1
Sediment						
Particle Size Distribution from Riffle 100-Count			X2		X3	X5
	d_{50}		Very Coarse Gravel		Very Coarse Gravel	Very Coarse Gravel
	d_{16}	mm	16.7		5.6	9.4
	d_{35}	mm	40.2		35.4	28.3
	d_{50}	mm	57.8		56.9	53.7
	d_{84}	mm	2313.7		113.8	143.4
	d_{95}	mm	3426.5		170.1	2655.9
	d_{100}	mm	>2048		>2048	>2048
Particle Size Distribution from Subpavement Analysis						
Sub-pavement	d_{16}	mm	Bedrock		4.5	3.6
	d_{35}	mm	Bedrock		10.2	8.5
	d_{50}	mm	Bedrock		17.4	13.3
	d_{84}	mm	Bedrock		33.7	46.2
	d_{94}	mm	Bedrock		42.9	57.8
	d_{99}	mm	Bedrock		64.0	64.0
Particle Size Distribution from Reachwide Count						
	d_{16}	mm	0.9			
	d_{35}	mm	13.7			
	d_{50}	mm	35.9			
	d_{84}	mm	101.2			
	d_{95}	mm	172.5			
	d_{99}	mm	>2048			

Reach 2 of UT1 extends from the existing low-water crossing approximately 340 linear feet downstream to its confluence with Scaly Bark Creek. UT1 classifies as a straightened Rosgen E4 stream, with a low width-to-depth ratio of 9.4 and a high entrenchment ratio of 7.3. The channel bed exhibits a d_{50} substrate of very coarse gravel. Since this reach has been channelized and straightened, sinuosity cannot be used for classification.

UT2 to Scaly Bark Creek classifies as a C4 Rosgen stream, with a moderate width-to-depth ratio of 13.6 and high entrenchment ratio of 7.1. As with Scaly Bark Creek, the majority of this channel has been maintained and not allowed to freely form its own pattern, so sinuosity cannot be used for classification. Substrate throughout this reach includes small cobble with a medium

gravel subpavement. Existing geomorphic conditions for unnamed tributaries UT1 and UT2 are summarized below in Table 5.

Table 5: Restoration Tributaries Existing Conditions
Scaly Bark Creek Mitigation Site

	Notation	Units	UT1 Reach 2		UT2	
			min	max	min	max
stream type			E4		C4	
drainage area	DA	sq mi	0.47		0.68	
Q- NC Rural Regional Curve			52		67	
$Q_{2\text{-}yr}$ NFF regression			79		103	
Q- USGS extrapolation			42	85	31	65
Q Mannings			47		52	
bankfull design discharge	Q_{bkf}	cfs	50		50	
Cross-Section Features						
bankfull cross-sectional area	A_{bkf}	SF	12.0		13.0	
average velocity during bankfull event	v_{bkf}	fps	4.2		3.8	
width at bankfull	w_{bkf}	feet	10.6		13.3	
maximum depth at bankfull	d_{max}	feet	1.6		1.78	
mean depth at bankfull	d_{bkf}	feet	1.1		0.98	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		9.4		13.6	
depth ratio	d_{max}/d_{bkf}		1.4		1.8	
low bank height			2.1		2.2	
bank height ratio	BHR		1.3		1.2	
floodprone area width	w_{fpa}	feet	78		94	
entrenchment ratio	ER		7.3		7.1	
Sinuosity						
valley slope	S_{valley}	feet/ foot	0.0134		0.0202	
channel slope	$S_{channel}$	feet/ foot	0.0130		0.0189	
sinuosity	K		1.0		1.1	
Riffle Features						
riffle slope	S_{riffle}	feet/ foot	0.005	0.025	0.0137	0.074
riffle slope ratio	$S_{riffle}/S_{channel}$		0.4	2.0	0.7	3.9
Pool Features						
pool slope	S_{pool}	feet/ foot	0.0004	0.0038	0.002	0.005
pool slope ratio	$S_{pool}/S_{channel}$		0.0	0.3	0.1	0.3
pool-to-pool spacing	$L_{p\text{-}p}$	feet	75	88	48	90
pool spacing ratio	$L_{p\text{-}p}/w_{bkf}$		7.1	8.3	3.6	6.8
maximum pool depth at bankfull	d_{pool}	feet	1.36	1.87	1.71	2.07
pool depth ratio	d_{pool}/d_{bkf}		1.2	1.7	1.7	2.1
pool width at bankfull	w_{pool}	feet	13.8		13.1	
pool width ratio	w_{pool}/w_{bkf}		1.3		1.0	
pool cross-sectional area at bankfull	A_{pool}	SF	20.4		15.7	
pool area ratio	A_{pool}/A_{bkf}		1.7		1.2	

Table 5: Restoration Tributaries Existing Conditions
Scaly Bark Creek Mitigation Site

	Notation	Units	UT1 Reach 2		UT2	
			min	max	min	max
Pattern Features						
belt width	w_{blt}	feet	20		28	
meander width ratio	w_{blt}/w_{bkf}		1.9		2.1	
meander length	L_m	feet	45	93	39	113
meander length ratio	L_m/w_{bkf}		4.2	8.8	2.9	8.5
radius of curvature	R_c	feet	22.0	83.0	23	89
radius of curvature ratio	R_c/ w_{bkf}		2.1	7.8	1.7	6.7
Sediment						
Particle Size Distribution from Riffle 100-Count			X9		X12	
		d_{50}	Very Coarse Gravel		Small Cobble	
	d_{16}	mm	#N/A		16.0	
	d_{35}	mm	23.6		52.3	
	d_{50}	mm	48.3		69.9	
	d_{84}	mm	113.8		122.5	
	d_{95}	mm	171.4		174.0	
	d_{100}	mm	256.0		512.0	
Particle Size Distribution from Subpavement Analysis						
Sub-pavement	d_{16}	mm	2.1		2.3	
	d_{35}	mm	5.4		5.4	
	d_{50}	mm	13.0		8.6	
	d_{84}	mm	36.0		23.6	
	d_{94}	mm	48.8		46.7	
	d_{99}	mm	64.0		64.0	
Particle Size Distribution from Reachwide Count						
	d_{16}	mm	#N/A		16.0	
	d_{35}	mm	0.9		30.0	
	d_{50}	mm	27.3		55.6	
	d_{84}	mm	94.6		128.0	
	d_{95}	mm	158.4		164.4	
	d_{99}	mm	>2048		>2048	

3.2.2 Enhancement and Preservation Reaches

Reach 1 of UT1 extends from the upstream portion of the project area near NC Highway 24/27 down to the existing low-water crossing at the entrance to the site. Similar to UT1 Reach 2, this portion of the channel classifies as a straightened Rosgen E4 stream, with a low width-to-depth ratio. UT1 is almost entirely fenced off from cattle grazing and is not currently exhibiting the same high levels of bed and bank erosion as the downstream portion.

UT1a and UT1b are intermittent drainages to UT1. While Rosgen classification is not considered suitable for a drainage area of this small size, UT1a most closely resembles a straightened Rosgen E channel that receives water from a small subdivision to the northeast. Similar to UT1, this tributary has been fenced within recent years and is not currently grazed;

this portion of the channel has not been recently affected by active cattle grazing and trampling. UT1b most nearly resembles a Rosgen Cb type channel that drains pasture and woodland from the northeast portion of the Scaly Bark Creek site. The stream banks along this creek are grazed and trampled by cattle. No riparian buffer currently exists along this stream, so there is no shading to protect the stream bed from extreme temperature fluctuations and no cover for habitat.

UT3 and UT4 are intermittent channels that drain agricultural and forest land. UT3 most resembles a steep Rosgen C channel with a sparse, grassy riparian buffer. Cattle have grazing access to this creek, which provides a continuous source of instability. The upstream portion of UT4 resembles a steep Rosgen B channel that flows through a wooded area of the site then transitions to a Rosgen C channel through pasture land into Scaly Bark Creek. The wooded area has mature hardwoods, but is accessible to the cattle while the pasture portion of the channel has some smaller shrub and woody vegetation. Portions of this channel exhibit moderately unstable headcuts. Existing geomorphic conditions for unnamed tributaries UT1, UT1a, UT1b, UT3, and UT4 are summarized below in Table 6.

Table 6: Enhancement & Preservation Tributaries Existing Conditions
Scaly Bark Creek Mitigation Site

	Notation	Units	UT1 Reach 1	UT1a	UT1b	UT3	UT4 Reach 1	UT4 Reach 2
stream type			E4	E4	C4b	C4	B4	C4
drainage area	DA	sq mi	0.47	0.07	0.13	0.06	0.04	0.04
bankfull cross-sectional area	A_{bkf}	SF	4.8	3.6	4.5	3.7	2.3	2.6
width at bankfull	w_{bkf}	feet	5.9	6.0	8.2	6.8	6.4	6.1
mean depth at bankfull	d_{bkf}	feet	0.8	0.6	0.6	0.6	0.4	0.4
bankfull width to depth ratio	w_{bkf}/d_{bkf}		7.3	10.0	14.9	12.3	17.3	14.2
bank height ratio	BHR		1.7	1.4	1.4	1.7	1.8	2.0

3.3 Valley Classification

The project reaches are located in a surrounding fluvial and morphological landform classified as Valley Type VIII (Rosgen, 1996). Alluvial terraces and broad floodplains are typically the predominant depositional features for this valley type. Slightly entrenched and meandering Rosgen C or E channels are the typical stream types found in Type VIII valleys, in addition to D, F, and G stream types (Rosgen, 1996). Reach 1 of UT4 drains an area of the site that exhibits more elevation relief than the rest of the project area and more closely classifies as Valley Type II. Reach 1 is a stable stream system with low sediment supply, moderate side slopes, and channel slopes ranging from 4% to 6%.

3.4 Discharge

Several methods were used to evaluate bankfull discharges for Scaly Bark Creek and its unnamed tributaries UT1 and UT2. USGS regression equations were used to estimate a 2-year flow and to extrapolate a 1.2-year recurrence interval flow. Manning's equation was used to estimate a bankfull discharge with the existing cross-section dimensions. These estimations were plotted with the regional curve data to show the range of discharge estimations as shown in Figure 8. For the design, a bankfull discharge of 100 cfs was chosen for Reach 1 of Scaly Bark

Creek (upstream of the UT2 confluence) and a discharge of 150 cfs was chosen for Reach 2. A bankfull design discharge of 50 cfs was selected for UT1 and UT2.

3.5 Channel Morphology

Overall, Scaly Bark Creek exhibits vertical incision and areas of over-widening. Portions of the upstream reach exhibit shallow bedrock which is preventing vertical incision. Cattle trampling, throughout the entire length of the reach, has destabilized the banks. The riparian buffer is narrow, typically a row of shrub and herbaceous species, with pasture extending across the floodplain. In-stream structure includes well-defined short riffles with large areas of stagnant pools and runs.

Reach 2 of UT1 exhibits areas of over-widening with increasing vertical incision towards the downstream end of the reach. The entire lower portion of this reach has been impacted by cattle trampling and grazing resulting in destabilized banks. The riparian buffer is dominated by pasture and low growth herbaceous vegetation with sparse shrub species. Bed form includes long riffle structures with areas of shallow bedrock and few well-defined pool structures.

UT2 displays similar impacts from cattle activity as UT1. Vertical, unstable banks are prominent throughout the reach. The upstream portion of this reach has several tight meanders resulting in increased bank erosion during higher flow events. The riparian buffer is comprised of mature shrub species and small trees with areas of grass species. In-stream structures include moderate riffle-pool sequences.

3.6 Channel Evolution

Reach 1 of Scaly Bark Creek is currently in Stage 2 of Simon's channel evolution model, illustrated in Figure 9 (Simon, 1989). Portions of this reach are underlain by shallow bedrock, preventing further vertical degradation. Reach 1 exhibits sections of heavily trampled banks, however widening of the channel is only evident in the upstream pool section. As Scaly Bark Creek transitions to Reach 2 (downstream of UT2 confluence), the channel begins to exhibit both Stage 3 and Stage 4 evolution models. Since bedrock is much deeper through this portion of the channel and offers little to no stabilization, the channel bed is displaying degradation. Additionally, heavily trampled banks are present in areas with increased cattle activity. These areas are experiencing widening along with slumped material and sediment deposition. The remaining approximately 300 linear feet of the channel is in Stage 5. This portion of the reach is extremely over-wide and large mid-channel bars of aggraded material are present. Removal of cattle and restoration of a woody vegetated buffer along Scaly Bark Creek will help stabilize the channel. Construction of a stable cross-section and meandering pattern will reduce the slope and allow energy to be dissipated through meander bends.

Reach 2 of UT1 is currently in Stage 2 of channel evolution. Similar to Reach 1 of Scaly Bark Creek, this section of channel displays few areas of shallow bedrock, providing vertical stabilization. As the channel approaches its confluence with Scaly Bark Creek, it transitions to Stage 4 evolution. This portion of the channel experiences greatly increased trampling from cattle activity and as a result the banks are destabilized and widening.

UT2 demonstrates relatively tight meanders in the upstream portion of the reach and impacts from heavy cattle activity. This channel is in Stage 4 of channel evolution and is slightly over-wide in sections. Lack of stabilizing riparian vegetation allows for additional bank degradation and stability problems.

The remaining tributaries to Scaly Bark Creek including Reach 1 of UT1, UT1a, UT1b, UT3, and UT4 are currently in Stage 2 of channel evolution. These channels exhibit overall vertical stability due to the presence of shallow bedrock with only minor instances of headcutting. Portions of these reaches are either partially or completely fenced off from cattle; as a result, these tributaries have few pockets of bank instability resulting from trampling and grazing activities.

3.7 Channel Stability Assessment

The primary destabilizing force in Scaly Bark Creek is cattle access to the stream channel. Additionally, vertical stream banks and a lack of significant riparian vegetation and root depth provide further instability. Shallow bedrock in portions of Reach 1 provides some vertical stabilization to the channel bed. Reach 2 exhibits continued vertical bank erosion along with areas of over-widening. Due to this relatively shallow bedrock, Scaly Bark Creek is experiencing only minimal to moderate amounts of incision and vertical degradation; as a result, the channel does have access to the existing floodplain along portions of the reach. Continued cattle-access to the channel will reduce existing woody vegetation and prevent future stabilizing vegetation from becoming established, allowing for further bank degradation. Scaly Bark Creek is likely to continue to have stability problems without corrective action.

UT1 Reach 2 is equally impacted by cattle access as Scaly Bark Creek. Fewer areas of this channel exhibit near vertical banks, however the predominant grass riparian buffer offers no stabilization to the reach. Vertical instability increases near the confluence with Scaly Bark Creek as width-to-depth ratios decrease. The downstream portion of UT1 will continue to experience stability issues with on-going cattle access, lack of woody stabilizing vegetation, and unstable vertical banks.

UT2 exhibits reach-wide impacts from cattle access resulting in vertical banks, tight meander bends, and lack of stabilizing riparian vegetation. Table 7 summarizes total Bank Erosion Hazard Index (BEHI) values and estimated sediment export for Scaly Bark Creek, UT1, and UT2.

Table 7. Pre-Construction BEHI and Sediment Export Estimates for Project Streams Scaly Bark Creek Mitigation Site

	Left Bank			Right Bank		
	BEHI	Linear Footage	Sediment Export Ft³/Yr	BEHI	Linear Footage	Sediment Export Ft³/Yr
Scaly Bark Creek	High	1236	1243.05	High	1518	1360.7
	Mod	1790	1179.785	Mod	1734	1555.93
	Low	442	60.112	Low	216	29.376
	Total Ft³/Yr		2482.95			2946.01
	Tons/Yr		119.55			141.84
		Reach Total	**261.39 Tons/Yr**			
UT1 Reach 2	Extreme	118	389.4	-	-	-
	High	153	91.8	High	271	198
	Mod	97	17.46	Mod	97	17.46
	Total Ft³/Yr		498.66			215.46
	Tons/Yr		24.01			10.37
		Reach Total	**34.38 Tons/Yr**			
UT2	-	-	-	V. High	111	266.4
	-	-	-	High	81	72.9
	Mod	256	116.37	Mod	175	94.5
	Low	111	11.322	-	-	-
	Total Ft³/Yr		127.69			433.80
	Tons/Yr		6.15			20.89
		Reach Total	**27.04 Tons/Yr**			

3.8 Bankfull Verification

Bankfull stage indicators identified throughout the reaches of Scaly Bark Creek and its unnamed tributaries include a break in slope on flat depositional features, scour lines on steep banks, and minor sediment deposition on vegetation indicative of high water levels. These indicators are consistent with other NC rural piedmont streams. Bankfull data for the project reaches were compared with the NC rural piedmont regional curve. The surveyed cross-sectional areas for UT1, UT2, and Scaly Bark Creek are shown overlaid with the NC rural regional curve in the attached Figure 8. Analysis of the bankfull cross-sectional areas for the project reaches reveal consistent plotting of the data at or just below the NC rural piedmont regional curve data, indicating that bankfull stage was adequately selected throughout the project area.

The effective FEMA model was used to verify the bankfull discharge estimate for Scaly Bark Creek. A range of flows from the 1-year discharge to the 2-year discharge was run through the model. The resulting stage for each flow was compared to the bankfull elevations noted in the field. The hydraulic model indicated that a discharge of 120 to 220 cfs corresponds to the elevation of bankfull indicators observed in the field. Based on extrapolation from the USGS regression equations, the recurrence interval of this flow range is between 1.2 and 1.8 years.

3.9 Vegetation Community Types Descriptions

Vegetation habitats within the project area are primarily comprised of open pastures dominated by various grass and sedge species, in addition to a few small areas of riparian and upland mixed hardwood forest. The stream banks of Scaly Bark Creek and UT2 are dominated by small sub-canopy trees, riparian shrubs, and herbaceous species. These areas are of moderate to poor quality as a result of active cattle grazing. Typical herbaceous vegetation includes: Canada goldenrod (*Solidago canadensis*), smartweed (*Polygonum pensylvanicum*), cocklebur (*Xanthium strumarium*), narrowleaf lespedeza (*Lespedeza angustifolia*), dogfennel (*Eupatorium capillifolium*), and various grass species (*Festuca* spp.). Riparian shrub and understory species include: common blackberry (*Rubus argutus*), Chinese privet (*Ligustrum sinense*), black willow (*Salix nigra*), multiflora rose (*Rosa multiflora*), green ash (*Fraxinus pennsylvanica*), winged elm (*Ulmus alata*), and red maple (*Acer rubrum*). The downstream end of Scaly Bark Creek exhibits a larger number of mature canopy species including green ash with little to no sub-canopy or shrub species.

The remaining unnamed tributaries to Scaly Bark Creek, including UT1, UT1a, UT1b, UT3, and the downstream portion of UT4 exhibit little to no riparian species. These riparian areas are dominated by herbaceous species including Canada goldenrod, milkweed (*Asclepias syriaca*), common blackberry, various grasses, and small pockets of Chinese privet. These areas are of poor quality as a result of active cattle grazing and brush mowing. The upstream portion of UT4, being proposed for stream preservation, is dominated by mixed hardwood canopy trees. This upstream reach exhibits minor impacts by cattle grazing to sub-canopy species; however the riparian area remains in moderate to high quality. Canopy tree species include mature red oak (*Quercus rubra*), white oak (*Quercus alba*), sweetgum (*Liquidambar styraciflua*), green ash, and red maple. The few sub-canopy species present include red cedar (*Juniperus virginiana*), and Chinese privet.

4.0 Reference Streams

In order to establish stable design parameters for the proposed restoration reaches, Wildlands Engineering evaluated two reference reach sites. An undisturbed reference reach could not be found within adjacent reaches or the same watershed as Scaly Bark Creek, so reference reaches in adjacent watersheds were identified and field investigations were performed. The two reference channels selected exhibit pattern, profile, and dimensions that are largely controlled by large trees and established woody vegetation and are not free to adjust to channel-forming flow influences. The riparian vegetation community species observed at these sites will be used to develop a portion of the riparian planting plan. Dimensionless ratios will be developed from the previously surveyed reference reaches and applied to the proposed design parameters; these reference sites include UT to Rocky Creek and Spencer Creek. Photographs of these reference reaches are included in Appendix 6.

4.1 Reference Streams Channel Morphology and Classification

Data from the UT to Rocky Creek and Spencer Creek reference sites located in the nearby Uwharrie National Forest will be used from the Big Cedar Creek Restoration Plan by Baker Engineering (2007) and from the NC Department of Transportation Reference Reach Database.

The reference reaches are located along a UT to Rocky Creek and along two reaches of Spencer Creek in a mature forested area with 20- to 50-year-old forest growth. These reference reaches are vertically and horizontally stable, have moderate pattern with sinuosity measurements ranging from 1.1 to 2.3, have well-established pools at outside of channel bends, have several points of aeration in the form of riffles and woody debris jams and tree roots, and show excellent in-stream habitat. The geomorphic summaries for UT to Rocky Creek and Spencer Creek are located in Table 8. The reference reach data were useful in evaluating the eventual design goal of the project with the realization that without the mature vegetation observed on the reference reaches, the extreme dimensionless ratios are not appropriate for a newly-restored stream with little or no bank and floodplain vegetation.

Table 8. Reference Reach Geomorphic Data
Scaly Bark Creek Mitigation Site

			UT to Rocky Creek		Spencer Creek 1		Spencer Creek 2	
	Notation	**Units**	**min**	**max**	**min**	**max**	**min**	**max**
stream type			E4b		E4/C4		E4	
drainage area	DA	sq mi	1.1		0.5		0.96	
bankfull discharge	Q_{bkf}	cfs	85		N/P		97	
Cross-Section Features								
bankfull cross-sectional area	A_{bkf}	SF	16.3		10.6		17.8	19.7
average velocity during bankfull event	v_{bkf}	fps	5.5		N/P		4.9	5.4
width at bankfull	w_{bkf}	feet	12.2		8.7		10.7	11.2
maximum depth at bankfull	d_{max}	feet	1.8		1.9		2.1	2.6
mean depth at bankfull	d_{bkf}	feet	1.3		1.2		1.6	1.8
bankfull width to depth ratio	w_{bkf}/d_{bkf}		9.1		7.3		5.8	7.1
depth ratio	d_{max}/d_{bkf}		1.3		1.6		1.3	1.4
bank height ratio	BHR		1		1		1.0	
floodprone area width	w_{fpa}	feet	72		229		60	114+
entrenchment ratio	ER		6		26.3		5.5	10.2
Sinuosity								
valley slope	S_{valley}	feet/ foot	0.0261		0.0139		0.0109	
channel slope	$S_{channel}$	feet/ foot	0.0235		0.0132		0.0047	
sinuosity	K		1.1		1.05		2.32	
Riffle Features								
riffle slope	S_{riffle}	feet/ foot	0.0606	0.0892	0.01	0.067	0.0130	
riffle slope ratio	$S_{riffle}/S_{channel}$		2.6	3.8	0.8	5.1	0.0	
Pool Features								
pool slope	S_{pool}	feet/ foot	0	0.0037	0		0.0007	0.0009
pool slope ratio	$S_{pool}l/S_{channel}$		0	0.16	0.01		0.15	0.19
pool-to-pool spacing	L_{p-p}	feet	26	81	13	47	71	
pool spacing ratio	L_{p-p}/w_{bkf}		2.2	6.7	1.5	5.3	6.3	6.6
maximum pool depth at bankfull	d_{pool}	feet	2.2		2.5		3.3	
pool depth ratio	d_{pool}/d_{bkf}		1.6		2.1		1.8	2.0

Table 8. Reference Reach Geomorphic Data
Scaly Bark Creek Mitigation Site

			UT to Rocky Creek		Spencer Creek 1		Spencer Creek 2	
	Notation	**Units**	**min**	**max**	**min**	**max**	**min**	**max**
pool width at bankfull	w_{pool}	feet	10.9		8.4		17.5	
pool width ratio	w_{pool}/w_{bkf}		0.9		1		2.7	
pool cross-sectional area at bankfull	A_{pool}	SF	19.3		12.8		24.5	
pool area ratio	A_{pool}/A_{bkf}		1.2		1.2		1.2	1.4
Pattern Features								
belt width	w_{blt}	feet	N/A		24	52	38	41
meander width ratio	w_{blt}/w_{bkf}		N/A		2.8	6	3.4	3.6
meander length	L_m	feet	N/A		54	196	46	48
meander length ratio	L_m/w_{bkf}		N/A		6.2	22.5	4.1	4.4
radius of curvature	R_c	feet	N/A		5	22	11	15
radius of curvature ratio	R_c/ w_{bkf}		N/A		0.6	2.5	1.3	1.4
Sediment								
Particle Size Distribution of Riffle Material								
d_{50} material for Rosgen classification			coarse gravel		medium gravel		Fine Gravel	
	d_{16}	mm	<0.063		0.1		< 0.062	
	d_{35}	mm	2.4		3		3.0	
	d_{50}	mm	22.6		8.6		8.8	
	d_{84}	mm	120		77		42.0	
	d_{95}	mm	256		180		90.0	

Notes:
N/A: Channel was straight - no pattern
N/P: Data was not provided in the NCDOT reference reach database

4.2 Reference Streams Vegetation Community Types Description

UT to Rocky Creek and Spencer Creek are surrounded by mature hardwood forests composed of typical Piedmont bottomland riparian forest tree species. Dominant species include sweetgum, tulip tree (*Liriodendron tulipifera*), hackberry (*Celtis occidentalis*), red maple, and American elm (*Ulmus americana*). Common understory vegetation includes ironwood (*Carpinus caroliniana*), American holly (*Ilex opaca*), paw paw (*Asimina triloba*), and flowering dogwood (*Cornus florida*). The mature species within these riparian vegetation communities provide a large portion of the vertical and horizontal stabilizing force to these reference reach systems.

5.0 Project Site Restoration Plan

The project site restoration plan proposes to restore a high quality of riparian function to the streams and riparian corridors on the project site. The ecological uplift can be summarized as starting from cattle-impacted streams and moving to stable channels in a protected riparian corridor. Restoration of dimension, pattern, and profile is planned for Scaly Bark Creek, the lower portion of UT1, and UT2; enhancement of profile and dimension, working within the existing channel, is planned for the remaining portion of UT1, UT1a, UT1b, UT3, and a portion of UT4. Figure 10 illustrates the proposed restoration and enhancement design for the site.

5.1 Stream Design

Scaly Bark Creek as well as sections of UT 1 and UT 2 will be improved to provide a stable, protected aquatic and terrestrial habitat. A Rosgen Priority 1 type restoration will be utilized to create a new stable, functional stream channel based on reference reach and sediment transport analysis. The channel beds will be raised slightly and meandering channels will be constructed with stable cross-sections. A Rosgen C channel type will be constructed for Scaly Bark Creek and portions of UT1 and UT2 with width/depth ratios ranging between 10 and 11. The channel will be allowed to narrow over time as bank vegetation is established. Gradual bank slopes of 2:1 are planned to provide adequate rooting area and stability for plant establishment. By using gradual bank slopes and keeping the top widths of the channels narrow, the width of the channel bottom will be effectively narrowed allowing for a minimal base flow and will improve in-stream habitat. Table 9 provides a summary of the design geomorphic values for the proposed restoration reaches.

Table 9. Design Parameters Summary
Scaly Bark Creek Mitigation Site

			Scaly Bark Reach 1		Scaly Bark Reach 2		UT1		UT2	
	Notation	Units	min	max	min	max	min	max	min	max
stream type			C4		C4		C4		C4	
drainage area	DA	sq mi	1.65		2.53		0.47		0.68	
bankfull design discharge	Q_{bkf}	cfs	100		150		50		50	
Cross-Section Features										
bankfull cross-sectional area	A_{bkf}	SF	27.1		36.3		12.0		13.5	
average velocity during bankfull event	v_{bkf}	fps	3.7		4.1		4.2		3.7	
width at bankfull	w_{bkf}	feet	17		20		11		12	
maximum depth at bankfull	d_{max}	feet	2.25		2.50		1.5		1.5	
mean depth at bankfull	d_{bkf}	feet	1.6		1.8		1.1		1.1	
bankfull width to depth ratio	w_{bkf}/d_{bkf}		10.7		11.0		10.1		10.7	
depth ratio	d_{max}/d_{bkf}		1.4		1.4		1.4		1.3	
bank height ratio	BHR		1.0		1.0		1.0		1.0	
floodprone area width	w_{fpa}	feet	37+		44+		24+		26+	
entrenchment ratio	ER		2.2+		2.2+		2.2+		2.2+	
Sinuosity										
valley slope	S_{valley}	feet/ foot	0.0080		0.0064		0.0118		0.0123	
channel slope	$S_{channel}$	feet/ foot	0.0067		0.0053		0.0107		0.0113	
sinuosity	K		1.19		1.20		1.10		1.09	
Riffle Features										
riffle slope	S_{riffle}	feet/ foot	0.0087	0.0204	0.0069	0.0203	0.0153	0.0245	0.0162	0.0281

Table 9. Design Parameters Summary
Scaly Bark Creek Mitigation Site

			Scaly Bark Reach 1		Scaly Bark Reach 2		UT1		UT2	
	Notation	**Units**	**min**	**max**	**min**	**max**	**min**	**max**	**min**	**max**
riffle slope ratio	$S_{riffle}/S_{channel}$		1.3	3.0	1.3	3.8	1.4	2.3	1.5	3.3
Pool Features										
pool slope	S_{pool}	feet/ foot	0.0000	0.0015	0.0000	0.0013	0.0000	0.0000	0.0000	0.0022
pool slope ratio	$S_{pool}/S_{channel}$		0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.2
pool-to-pool spacing	L_{p-p}	feet	38	114	45	132	17	55	18	60
pool spacing ratio	L_{p-p}/w_{bkf}		2.2	6.7	2.3	6.6	1.5	5.0	1.5	5.0
maximum pool depth at bankfull	d_{pool}	feet	3.5	4.5	4.0	5.5	2.3	3.5	2.2	3.5
pool depth ratio	d_{pool}/d_{bkf}		2.2	2.8	2.2	3.0	2.1	3.2	2.0	3.1
pool width at bankfull	w_{pool}	feet	24		27		16		16	
pool width ratio	w_{pool}/w_{bkf}		1.4		1.4		1.4		1.3	
pool cross-sectional area at bankfull	A_{pool}	SF	47+		60+		19+		19+	
pool area ratio	A_{pool}/A_{bkf}		1.7+		1.7+		1.6+		1.5+	
Pattern Features										
belt width	w_{blt}	feet	60	120	80	140	50	80	50	80
meander width ratio	w_{blt}/w_{bkf}		3.5	7.1	4.0	7.0	4.5	7.3	4.2	6.7
meander length	L_m	feet	125	160	160	200	80	100	90	120
meander length ratio	L_m/w_{bkf}		7.4	9.4	8.0	10.0	7.3	9.1	7.5	10.0
radius of curvature	R_c	feet	35	50	40	60	25	33	25	34
radius of curvature ratio	R_c/w_{bkf}		2.1	2.9	2.0	3.0	2.3	3.0	2.1	2.8

The remaining upstream portion of UT1 as well as UT1a, UT1b, UT3 and part of UT4 will be enhanced by removing invasive species, permanently fencing out cattle, spot repairing bank erosion, enhancing bed form, and restoring a native riparian buffer. Log and boulder sill structures will be utilized in these tributaries as needed in order to provide increased bed stabilization and in-stream habitat. Few structures are needed due to the prevalence of shallow bedrock knick points in these channels. The enhancements and protection of these reaches will add significant water quality and biological lift to the site. The upper most reach of UT4 is stable and running through a mature forest and will be fenced out from cattle access and will be preserved.

5.2 Restoration Project Goals and Objectives

5.2.1 Designed Channel Classification

The primary causes of watershed stressors are sediment load received from the upstream watershed due to bank erosion and lack of erosion control during agricultural activities. The primary causes of stressors on the project site are cattle 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.

The effects of the above watershed and project site stressors are poor water quality due to sediment and fecal pollution, poor habitat due to lack of riparian vegetation and in-stream bed diversity, and unstable geomorphic conditions.

The project goals are to address the effects listed above 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.

5.2.2 Target Buffer Communities

Riparian stream buffers will be restored to a Piedmont Bottomland Forest community as described in the natural plant community restoration plan in Section 5.5.

5.3 Sediment Transport Analysis

5.3.1 Methodology

The analysis of sediment transport is intended to ensure that the proposed channel restoration design will create a stable channel that does not aggrade or degrade over time, but adjusts within its stable limits. The ideal condition is that the restored project reaches should transport all sediment being delivered from upstream sources.

The assessment of sediment transport is typically done by computing channel competency and/or channel capacity. Sediment transport competency is a measure of force (lbs/ft^2), which refers to a stream's ability to move a particular grain size. Quantitative assessments include shear stress, tractive force, and critical dimensionless shear stress. Since these assessments help determine a size class that is mobile under certain flow conditions, they are most important in gravel bed studies in which the bed material ranges in size from sand to cobble.

The project reaches, including Scaly Bark Creek, UT1, and UT2 were separated for sediment transport analysis based on median particle size and channel slope and dimension. Sediment transport competency was analyzed for each of these reaches since it was determined that the coarse riffle materials were controlling sediment transport in each system.

5.3.2 Calculations and Discussion

Sediment transport competency is measured in terms of the relationship between critical and actual depth at a given slope. A channel is considered to be competent to move its sediment load when the critical depth and slope produce enough shear stress to move the largest subpavement particles (D_{84} to D_{100}).

Table 10 summarizes the existing sediment transport competency calculations for the restoration reaches of Scaly Bark Creek, Reach 2 of UT1, and UT2. Enhancement reaches were not analyzed because they are currently stable with respect to sediment transport: no aggradation or degradation. Reach 1 of Scaly Bark Creek is vertically stable due to relatively shallow bedrock, however, this reach exhibits lateral instability and bank erosion. The determination of critical depth and slope for this reach is not applicable due to the existing stable subpavement (bedrock) conditions. Reach 2 has an existing depth ranging from 1.6 to 2.0 feet with an existing slope of 0.0056 feet/ foot. The existing conditions for this reach are slightly more than the required critical depth of 1.1 to 1.6 feet or critical slope of 0.0039 to 0.0045 feet/foot. The bankfull shear stress predicts that this reach is capable of moving particles ranging from 30 to 40mm in size, closely corresponding to the existing D_{84} (34 to 46mm) and D_{100} (48 to 55mm) particle sizes of Reach 2. This lower reach of Scaly Bark Creek does not exhibit major vertical degradation due to shallow bedrock features.

Reach 2 of UT1 is slightly deeper or exhibits a steeper slope than the critical values predicted to be required for the sediment load. The predicted particle size to be moved by this reach ranged from 50 to 60 mm, which is comparable to the existing D_{84} (36mm) and D_{100} (68mm) particle sizes. UT1 exhibits similar shallow, stabilizing bedrock and lateral erosion as Reach 1 of Scaly Bark Creek. UT2 has an existing depth or flatter slope less than that of the critical

values. Predictions of particle size movement for this reach ranged from 30 to 40mm, corresponding to the range of the existing particle sizes of 24 mm (D_{84}) to 60 mm (D_{100}). Similar to UT1 and Scaly Bark Creek, this reach currently exhibits lateral erosion and little to no vertical instability.

Table 10. Existing Boundary Shear Stress and Sediment Transport Analysis Scaly Bark Creek Mitigation Site

Parameter	Scaly Bark Creek		UT1	UT2
	Reach 1	Reach 2	Reach 2	Reach-wide
Bankfull Discharge, Q (cfs)	100	150	50	50
Bankfull Area (square feet)	26.3	33.2-39.0	12.0	13.0
Mean Bankfull Velocity (cfs)	3.8	3.8-4.5	4.2	3.8
Bankfull Width, W (feet)	27.6	17.0-23.9	10.6	13.3
Bankfull Mean Depth, D (feet)	1.0	1.6-2.0	1.1	0.98
Width to Depth Ratio, w/d (feet/ foot)	29.0	10.6-12.0	9.4	13.6
Wetted Perimeter (feet)	29.5	20.9-27.2	12.9	15.3
Hydraulic Radius, R (feet)	0.9	1.4-1.6	0.9	0.9
Channel Slope (feet/ foot)	0.0084	0.0056	0.012	0.0097
Boundary Shear Stress, τ (lbs/ft^2)	0.47	0.50-0.55	0.70	0.52
Subpavement D_{84} (mm)	Bedrock	34-46	36	24
Subpavement D_{100} (mm)	Bedrock	48-55	68	60
Largest Moveable Particle (mm) per Shield's Curve	30-40	30-40	50-60	30-40
Critical Depth (feet)	N/A	1.1-1.6	0.8	1.5
Critical Slope (feet/ foot)	N/A	0.0039-0.0045	0.0086	0.0146

Table 11 summarizes the proposed channel dimensions and critical depths and slopes for Scaly Bark Creek, UT1, and UT2. For Reach 1 of Scaly Bark Creek, a boundary shear stress of 0.56 lbs/ ft^2 was calculated that will be capable of moving particles of diameter 30 to 40 mm, based on the modified Shield's curve shown in Figure 11. Since the majority of this reach is underlain with bedrock and structures will be used in the channel construction, it was determined these factors would protect against vertical incision within the newly aligned channel. Scaly Bark Reach 2 has a slightly higher proposed channel depth and slope than the critical depth and slope; this channel will have the predicted shear stress to move substrate of 40 to 50 mm in size, less than the existing D_{100} of 55 mm. The proposed channel dimensions will not increase the potential for vertical incision. Additionally, the underlying bedrock and the use of constructed riffle and pool features throughout the proposed channel alignment of Scaly Bark Creek will provide additional stability.

Reach 2 of UT1 has a slightly higher design depth and slope than the critical sediment transport values and will have a predicted capacity to move particles ranging from 40 to 50 mm in size compared to the existing D_{100} of 68 mm. Similar to Scaly Bark Creek, any degradational forces in this reach will be addressed through structure placement and installation of constructed riffles. UT2 is designed to closely match critical values, with a slightly higher slope and less channel depth. Predicted particle movement of 50 to 60 mm in

size is expected to match the existing D_{100} of 60 mm. Additionally, UT2 is not expected to experience vertical stability issues, however, sills and constructed riffles were designed throughout this new alignment.

Table 11. Proposed Boundary Shear Stress and Sediment Transport Analysis Scaly Bark Creek Mitigation Site

Parameter	Scaly Bark Creek		UT1	UT2
	Reach 1	Reach 2	Reach 2	Reach-wide
Bankfull Discharge, Q (cfs)	100	150	50	50
Bankfull Area (square feet)	27.1	36.3	12.0	13.5
Mean Bankfull Velocity (cfs)	3.7	4.1	4.2	3.7
Bankfull Width, W (feet)	17.0	20.0	11.0	12.0
Bankfull Mean Depth, D (feet)	1.6	1.8	1.1	1.1
Width to Depth Ratio, w/d (feet/ foot)	10.7	11.0	10.1	10.7
Wetted Perimeter (feet)	20.2	32.5	13.2	14.3
Hydraulic Radius, R (feet)	1.3	1.8	0.9	0.9
Channel Slope (feet/ foot)	0.0067	0.0053	0.0107	0.0113
Boundary Shear Stress, τ (lbs/ft^2)	0.56	0.59	0.61	0.67
Subpavement D_{100} (mm)	Bedrock	55	68	60
Largest Moveable Particle (mm) per Shield's Curve	30-40	40-50	40-50	50-60
Critical Depth (feet)	N/A	1.7	0.9	1.3
Critical Slope (feet/ foot)	N/A	0.0044	0.0090	0.0127

5.4 HEC-RAS Analysis

5.4.1 CLOMR and LOMR

The downstream portion of Scaly Bark Creek is mapped as a FEMA Zone AE floodplain on FIRM panel 6537 (Figure 6). Base flood elevations have been defined, but no floodway is mapped on the FIRM panel. Limited detailed methods were used to study Scaly Bark Creek and non-encroachment widths are published in the Stanly County Community 370361 Flood Insurance Study dated September 3, 2008.

A Rosgen Priority 1 restoration approach is proposed for Scaly Bark Creek (Rosgen, 1997). The channel will tie into the existing adjacent floodplain elevation which preliminary modeling indicates will result in an increase in the 100-year base flood elevations by approximately 0.5 feet. The effective hydraulic model has been obtained from the NC Floodplain Mapping Program. Wildlands will model existing and proposed hydraulic conditions on the site for the 100-year flood event along Scaly Bark Creek. A Conditional Letter of Map Revision (CLOMR) will be prepared for submittal to the Stanly County local floodplain administrator and the NC Floodplain Mapping Program for approval prior to construction to document the increase in the base flood elevation. If hydraulic modeling indicates that the 100-year flood elevation will not increase, then a no-rise study will be submitted. Following construction completion, if a CLOMR was required or a no-rise indicates that flood elevations will drop by more than 0.1' or non-encroachment widths will change, an as-built survey and Letter of Map Revision (LOMR) will be finalized and

submitted to the Stanly County local floodplain administrator and the NC Floodplain Mapping Program. The EEP Floodplain Requirements Checklist is included in an appendix and has been reviewed by the Stanly County floodplain administrator.

5.4.2 Hydrologic Trespass

The project will be designed so that any increase in flooding will be contained on the project site and will not extend upstream to adjacent parcels, so hydrologic trespass will not be a concern. The proposed restoration has been designed to transition back to the existing boundary conditions in a gradual manner.

5.5 Natural Plant Community Restoration

5.5.1 Narrative of Plant Community Restoration

As a final stage of construction, riparian stream buffers will be planted and restored to the dominant natural plant community that exists within the project watershed. This natural community within and adjacent to the project easement is classified as Piedmont Bottomland Forest and was determined based on existing canopy and herbaceous species (Schafale and Weakley, 1990). Proposed plant and seed materials will be placed on stream banks and bench areas as well as from the tops of banks out to the projects easement limits. These areas will be planted with bare root trees, live stakes, and a seed mixture of permanent herbaceous vegetation ground cover.

5.5.2 Seeding Plan Summary for Vegetation Communities and Zones

A permanent seed mixture of native herbaceous and grass species will be applied to all disturbed areas within the project easement. An herbaceous seed mixture was chosen that would provide quick stabilization of constructed stream banks, benches, and side slopes. These species will also provide early habitat value through rapid growth of ground cover to the tops of banks and floodplain areas. Proposed herbaceous species are shown in Table 12.

Table 12. Permanent Herbaceous Seed Mixture
Scaly Bark Creek Mitigation Site

Scientific Name	Common Name
Ludwigia alternifolia	Bushy seedbox
Schizachyrium scoparium	Little bluestem
Scirpus cyperinus	Wool grass
Uniola latifolia	River oats
Trifolium repens	White clover
Carex crinita	Fringed sedge
Juncus effusus	Soft stem rush
Elymus virginica	Virginia wild rye
Panicum virgatum	Switchgrass

5.5.3 Planting Plan Summary for Vegetation Communities and Zones

Individual tree and shrub species will be planted throughout the project easement including stream banks, benches, tops of banks, and floodplains zones. These species will be planted as bare root and live stakes and will provide additional stabilization to the outsides of constructed meander bends and side slopes. Species planted as bare roots will be spaced at

an initial density of 680 plants per acre (8 feet on center). Live stakes will be planted at 4,840 stakes per acre (3 feet on center). Targeted densities after monitoring year 3 are 320 woody stems per acre. Proposed tree and shrub species are representative of existing on-site vegetation communities and are typical of Piedmont Bottomland Forests, shown in Table 13.

Table 13. Riparian Woody Vegetation
Scaly Bark Creek Mitigation Site

Scientific Name	Common Name
Stream Bank Live Stakes	
Salix nigra	Black willow
Cornus amomum	Silky dogwood
Sambucus canadensis	Elderberry
Salix sericea	Silky willow
Stream Benches/ Upper Banks Bare Roots	
Quercus michauxii	Swamp chestnut oak
Quercus nigra	Water oak
Acer negundo	Box elder
Betula nigra	River birch
Platanus occidentalis	Sycamore
Alnus serrulata	Tag alder
Carpinus caroliniana	Ironwood
Cornus amomum	Silky dogwood
Lindera benzoin	Spicebush
Viburnum dentatum	Arrowwood
Quercus falcata	Southern red oak
Acer rubrum	Red maple
Corylus americana	Hazelnut
Symphoricarpos orbiculatus	Coralberry

5.5.4 Narrative of Invasive Species Management

During the on-site field investigation, occurrences of invasive species were identified throughout the project reaches. Chinese privet, the on-site dominant shrub species, along with sporadic occurrences of Lespedeza were observed throughout the entire reaches of Scaly Bark Creek and UT2. Lespedeza is an aggressive warm-season perennial legume originally utilized for wildlife and livestock forage and hay. This drought resistant species is able to invade a variety of habitats including fields, meadows, marshes, open woodlands, and roadsides. Chinese privet is an aggressive, invasive shrub that encroaches and out-competes native vegetation. Fruiting season for this species generally occurs from July through March. Mechanical extraction of privet and lespedeza will be performed in tandem with stream restoration activities. Long term management of these species with herbicide should be applied prior to the fruiting season of adjacent native shrubs and trees to avoid minimal damage.

6.0 Performance Criteria

The stream restoration success criteria for the project site will follow approved success criteria presented in the EEP Mitigation Plan Template (version 2.0, 03/27/08) and the Stream Mitigation Guidelines issued in April 2003 by the USACE and NCDWQ. Annual monitoring

and quarterly site visits will be conducted to assess the condition of the finished project. The preservation reach on UT4 will be documented through photographs only to verify that no significant degradational changes are occurring in the stream channel or riparian corridor. The stability of the enhancement reaches will also be documented through photographs and the vegetation of these reaches will be assigned specific success criteria listed in Section 6.2. The stream restoration sections of the project will be assigned specific success criteria components for stream morphology, vegetation, and hydrology.

6.1 Streams

6.1.1 Dimension

Riffle cross-sections on the restoration reaches should be stable and should show little change in bankfull area, maximum depth ratio and width-to-depth ratio. Riffle cross-sections should fall within the parameters defined for channels of the appropriate Rosgen stream type. If any changes do occur, these changes will be evaluated to assess whether the stream channel is showing signs of instability. Indicators of instability include a vertically incising thalweg or eroding channel banks. Changes in the channel that indicate a movement toward stability or enhanced habitat include a decrease in the width-to-depth ratio in meandering channels or an increase in pool depth. Remedial action would not be taken if channel changes indicate a movement toward stability.

In order to monitor the channel dimension, two permanent cross-sections will be installed per 1,000 linear feet of stream restoration work, with one section located at a riffle section and one located at a pool section. Each cross-section will be permanently marked with pins to establish its location. An annual cross-section survey will include points measured at all breaks in slope, including top of bank, bankfull, edge of water, and thalweg.

6.1.2 Profile and Pattern

Longitudinal profile data for the stream restoration reaches should show that the bedform features are remaining stable. The riffles should be steeper and shallower than the pools, while the pools should be deep with flat water surface slopes. The relative percentage of riffles and pools should not change significantly from the design parameters. Adjustments in length and slope of run and glide features are expected and will not be considered a sign of instability. The longitudinal profiles should show that the bank height ratios remains very near to 1.0 for all of the restoration reaches.

Longitudinal profiles will be completed for the restoration reaches of the project as part of the as-built baseline monitoring and will be surveyed annually for the duration of the five-year monitoring period. For reaches greater than 3,000 feet in length, the profile will be conducted for at least 30% of the restoration length of the channel, per USACE and NCDWQ Stream Mitigation Guidance. For shorter reaches, the profile will be completed for the entire reach length. Measurements will include thalweg, water surface, bankfull, and top of low bank. These profile measurements will be taken at the head of each riffle, run, pool, and glide, as well as at the maximum pool depth. The survey will be tied to a permanent benchmark and NC State Plane coordinates.

6.1.3 Substrate

Substrate materials in the restoration reaches should indicate a progression towards or the maintenance of coarser materials in the riffle features and smaller particles in the pool features.

A reach-wide pebble count will be performed in each restoration reach each year for classification purposes. A pebble count will be performed at each surveyed riffle to characterize the pavement. Also, a subpavement sample will be taken at each surveyed riffle to characterize the subpavement particle distribution.

6.2 Vegetation

The final vegetative success criteria will be the survival of 260, five-year-old, planted trees per acre in the riparian corridor along restored and enhanced reaches at the end of year five of the monitoring period. The interim measure of vegetative success for the site will be the survival of at least 320 three-year-old planted trees per acre at the end of year three of the monitoring period. The extent of invasive species coverage will also be monitored and controlled as necessary.

At the end of the first growing season, species composition, density, and survival will be evaluated. The restoration site will then be evaluated each subsequent year between July and November until the final success criteria are achieved.

Vegetation-monitoring quadrants will be installed across the restoration site to measure the survival of the planted trees. The number of monitoring quadrants required will based on the EEP monitoring guidance documents (version 1.2, 11/16/06). The size of individual quadrants will be 100 square meters for woody tree species and shrubs and 1 square meter for herbaceous vegetation. Vegetation monitoring will occur in the fall. Individual quadrant data will be provided and will include diameter, height, density, and coverage quantities. Relative values will be calculated and importance values will be determined. Individual seedlings will be marked so they can be found in succeeding monitoring years. Mortality will be determined from the difference between the previous year's living planted seedlings and the current year's living planted seedlings.

6.3 Schedule and Reporting

Using the EEP Mitigation Template (version 2.0, 03/27/08), a mitigation plan and as-built report documenting the stream restoration will be developed within 60 days of the planting completion and monitoring installation on the restored site. The report will include elevations, photographs, sampling plot locations, a description of initial species composition by community type, and monitoring stations. The report will include a list of the species planted and the associated densities.

Monitoring reports will be prepared in the fall of each year of monitoring and submitted to EEP. Based on the EEP Monitoring Report Template (version 1.2, 11/16/06), the monitoring reports will include the following:

1. Project background which includes project objectives, project structure, restoration type and approach, location and setting, history and background.

2. As-built topographic plans of major project elements including such items as grade control structures, vegetation plots, monitoring cross-sections, and crest gage.
3. Photographs showing views of the restored site taken from fixed point stations
4. Assessment of the stability of the project based on the cross-sections and longitudinal profile, where applicable.
5. Vegetative data as described above including the identification of any invasion by undesirable plant species.
6. A description of damage by animals or vandalism.
7. Maintenance issues and recommended remediation measures will be detailed and documented.
8. Wildlife observations.

7.0 References

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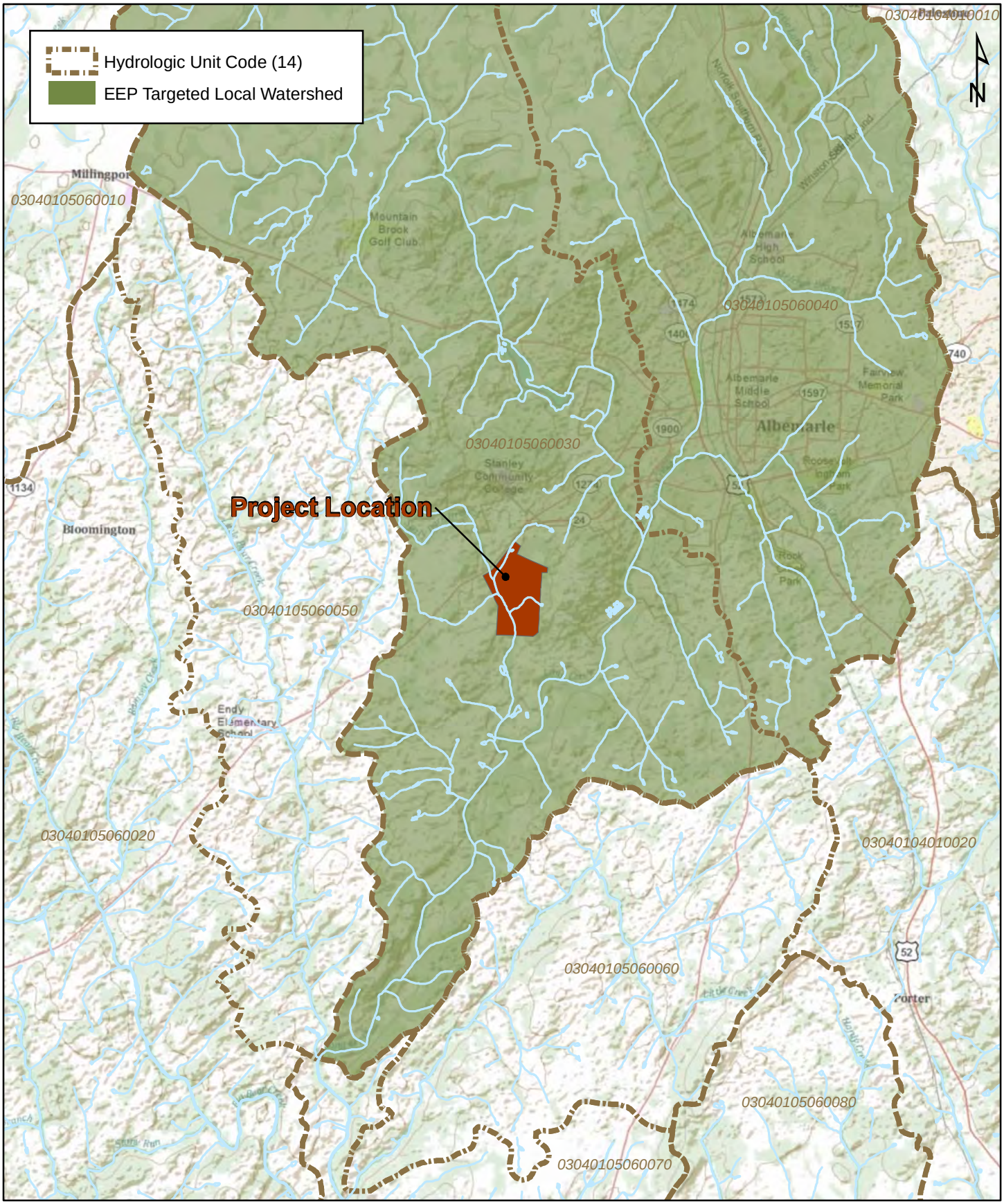

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Figure 1. Vicinity Map
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC

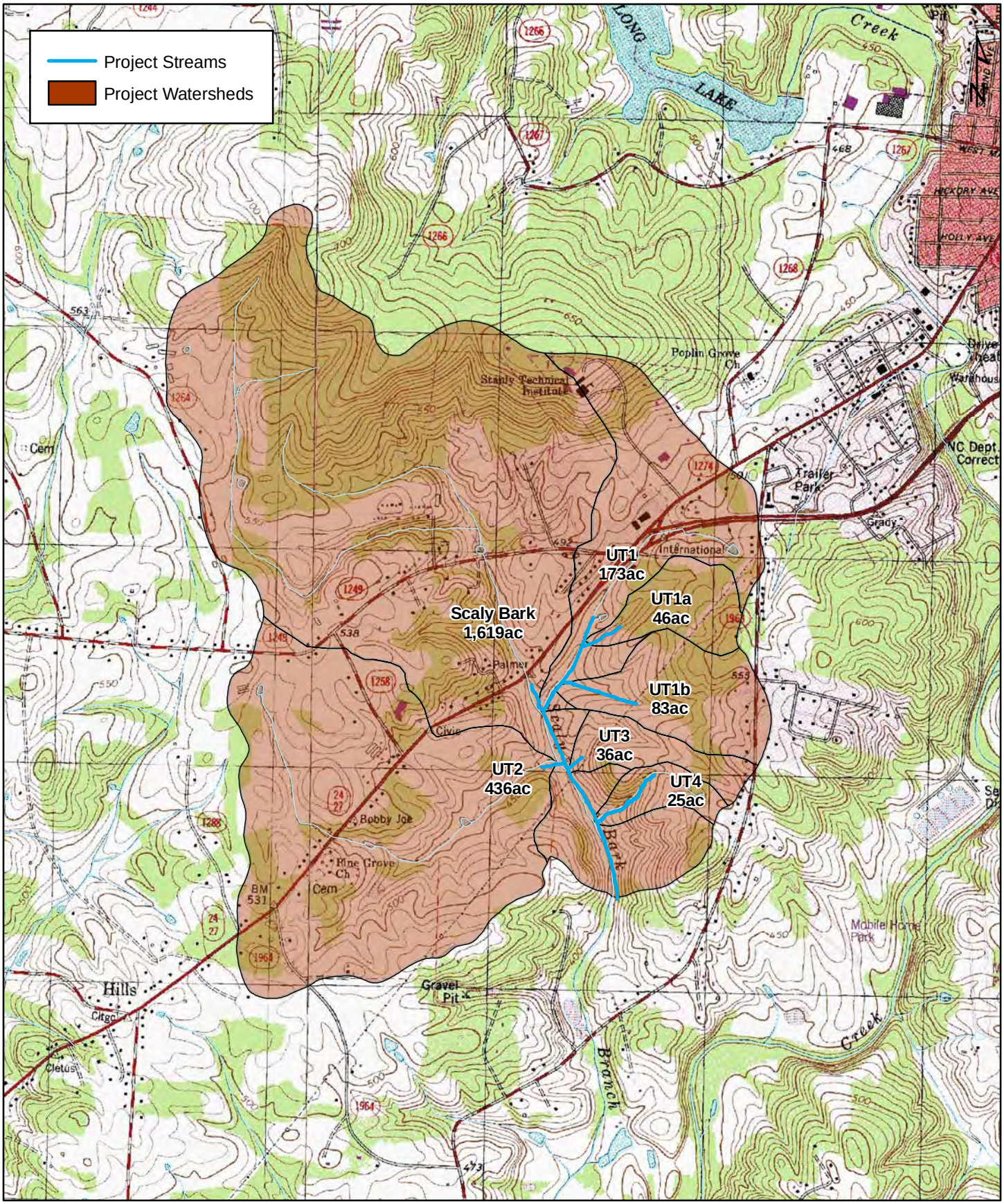
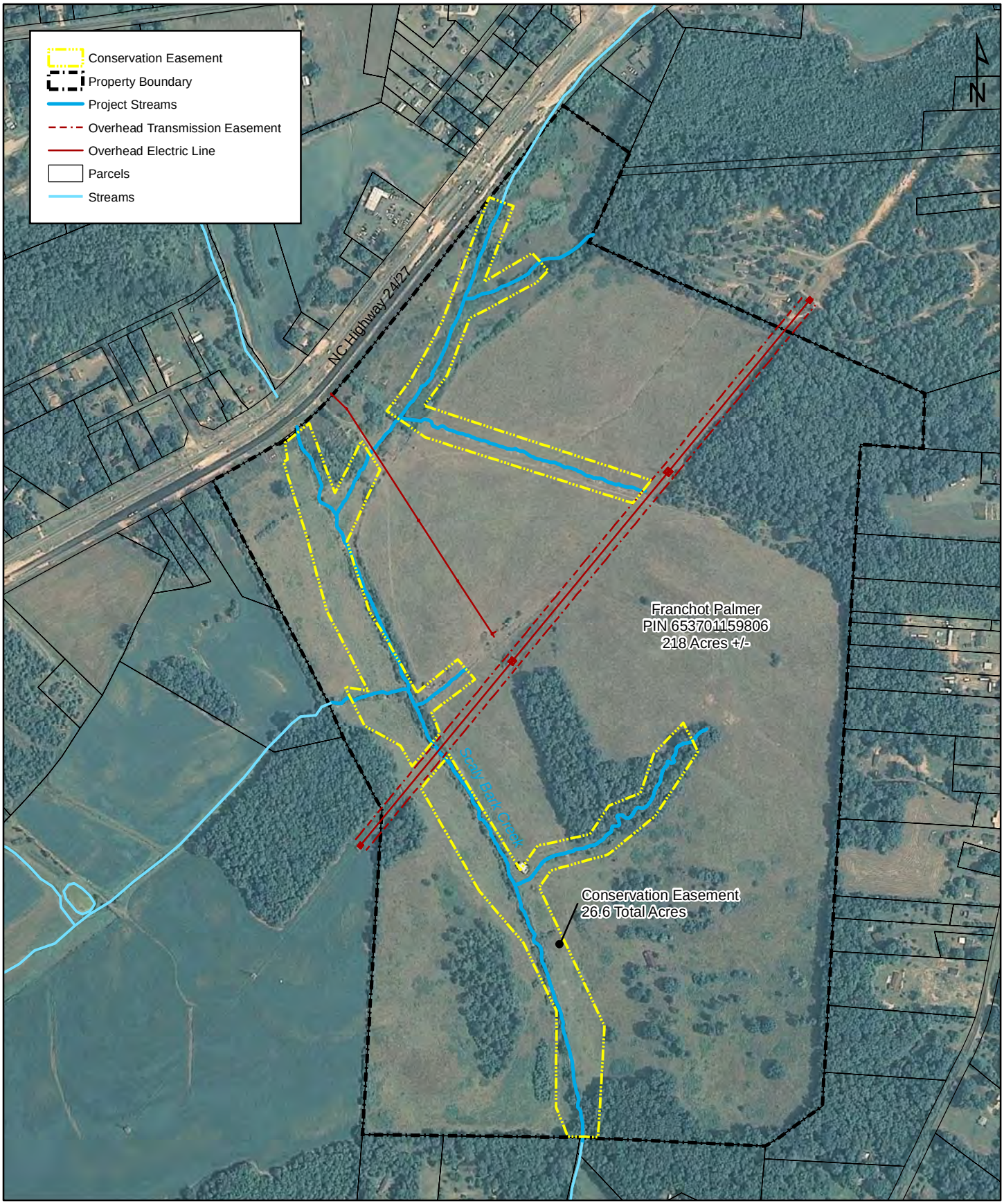


Figure 2. Watershed Map
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC



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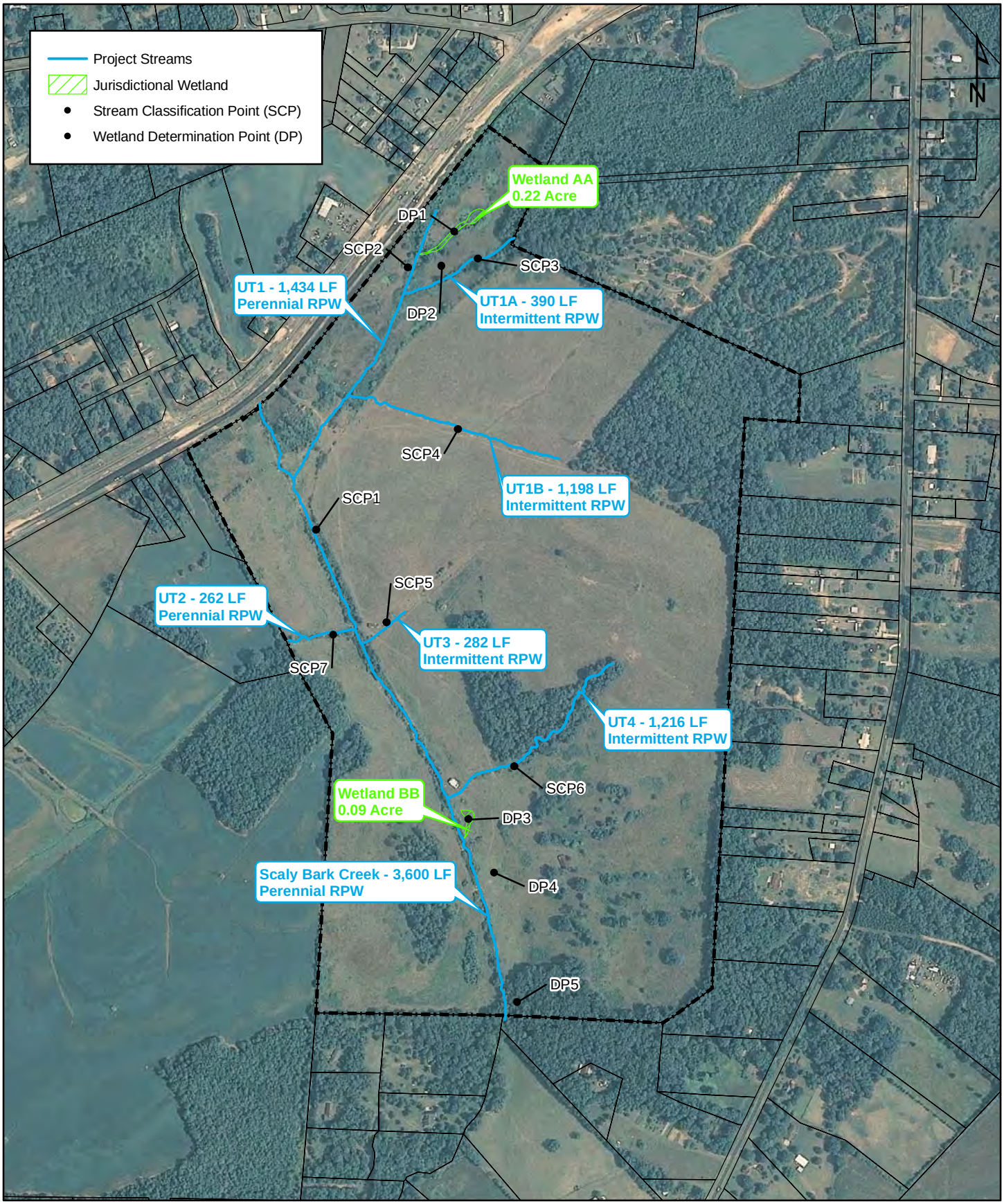
0 300 600 Feet

Figure 3. Site Map
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC



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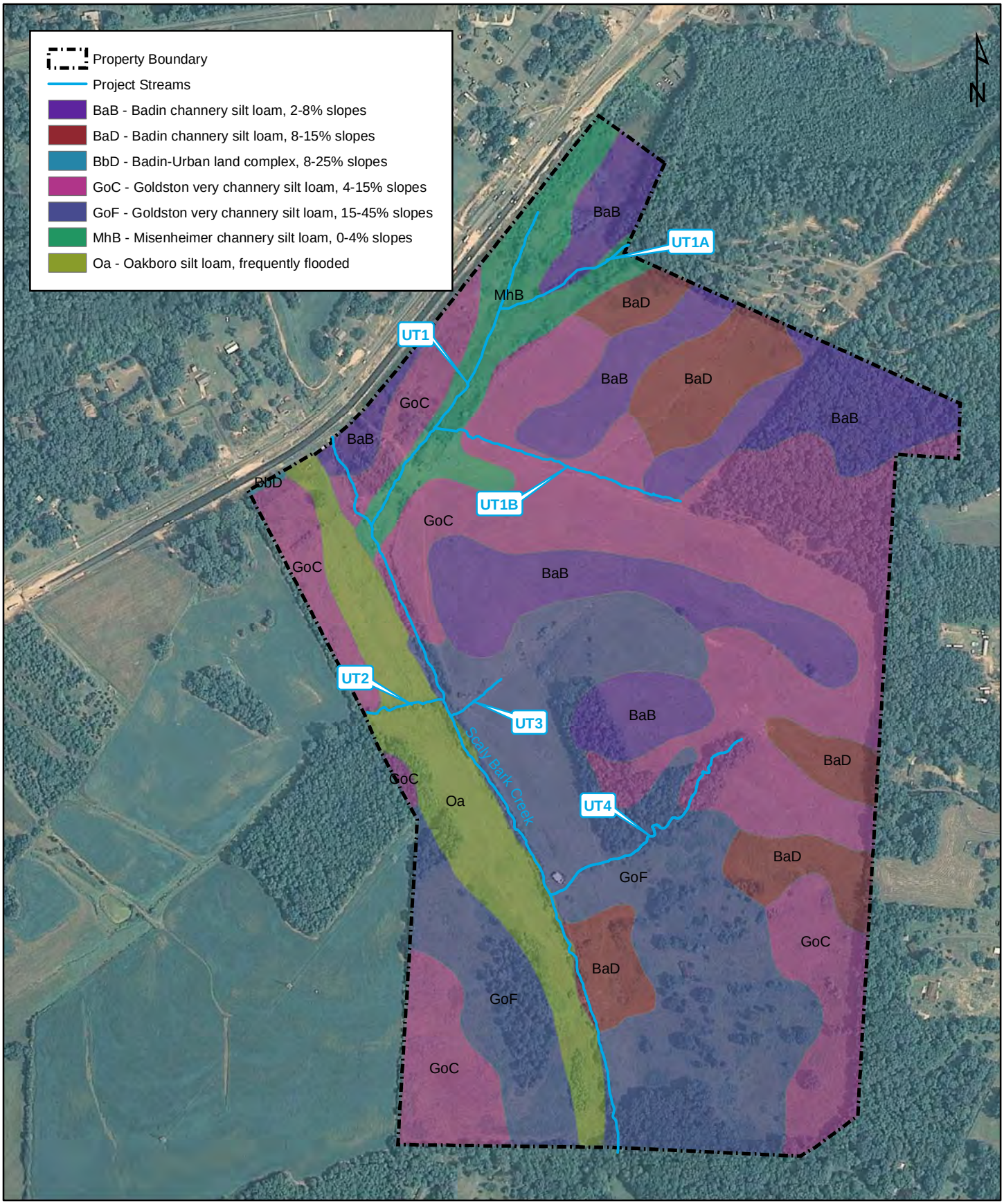
0 350 700 Feet

Figure 4. Wetland Delineation Map
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC

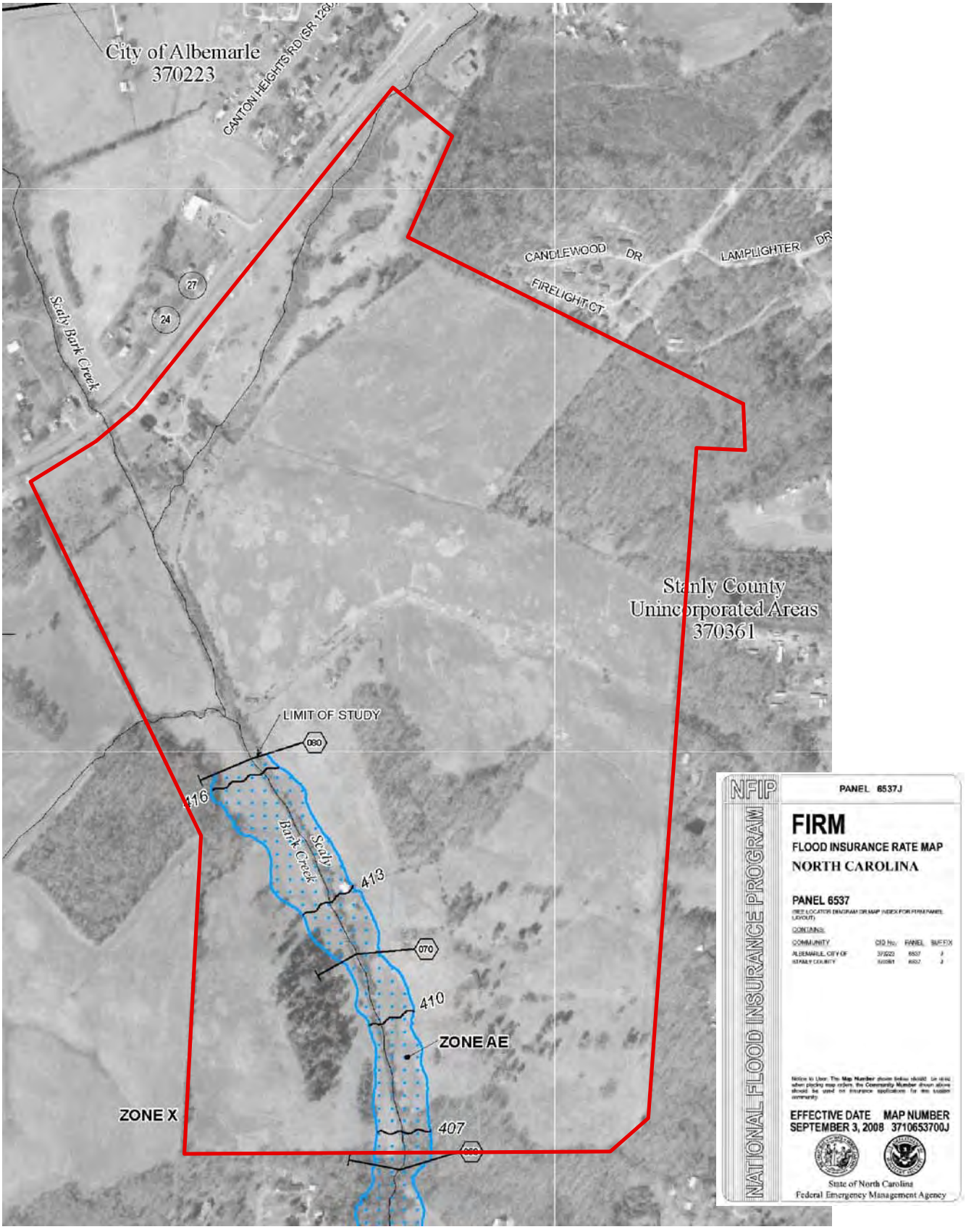


WILDLANDS

Ecosystem Enhancement PROGRAM

0 300 600 Feet

Figure 5. NRCS Soils Map
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC

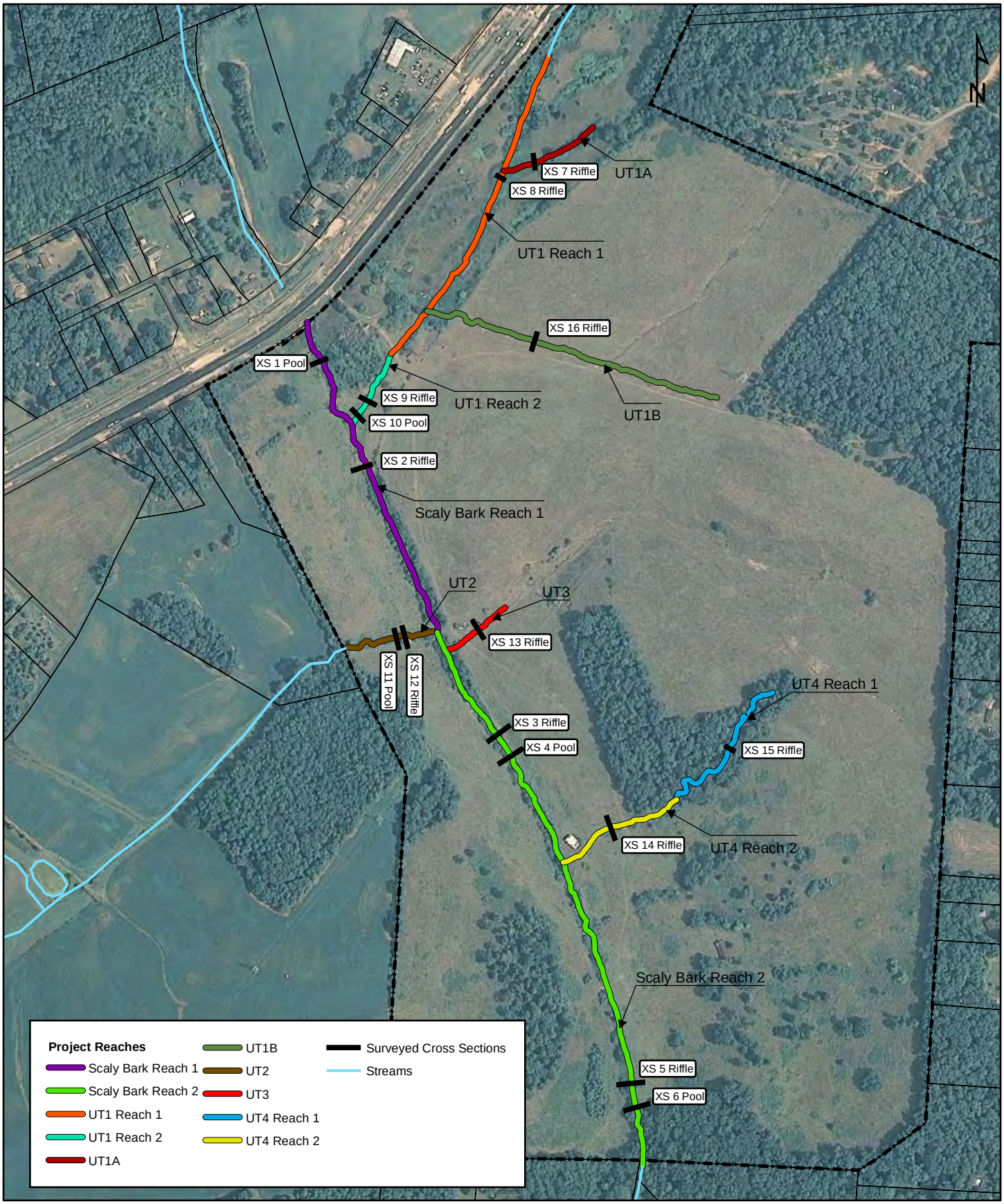


WILDLANDS

Ecosystem Enhancement Program

0 300 600 Feet

Figure 6. FEMA Flood Map
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC

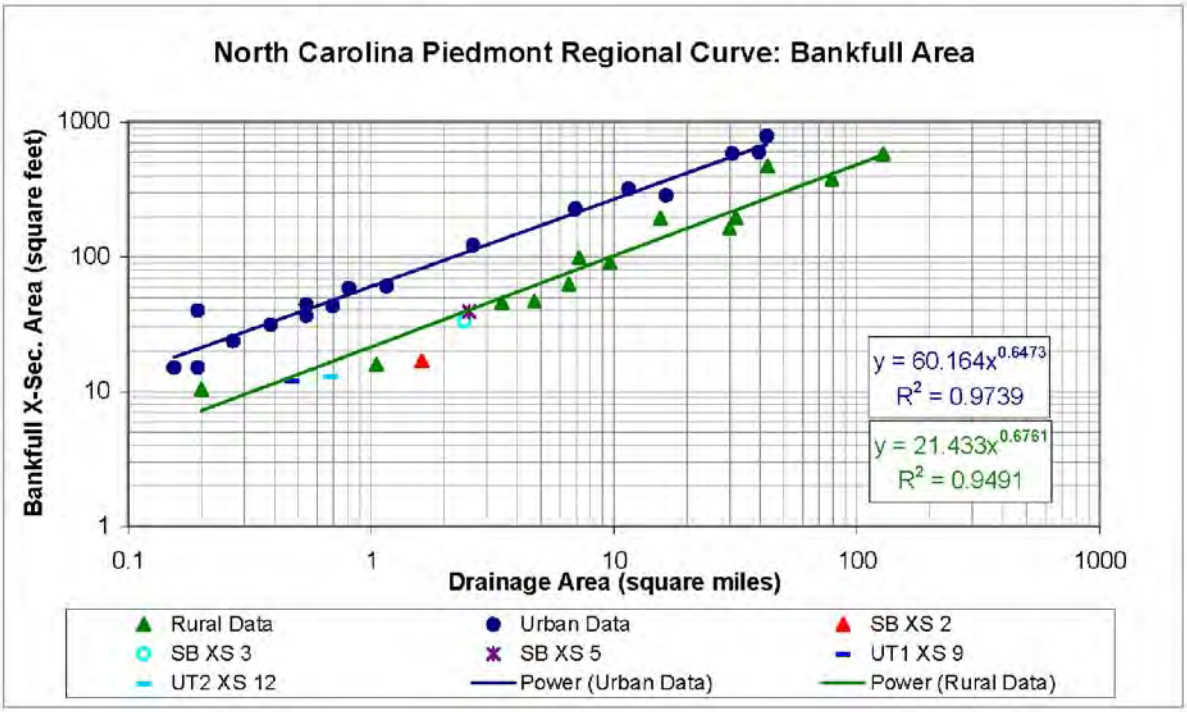


WILDLANDS

Ecosystem Enhancement PROGRAM

0 250 500 Feet

Figure 7. Existing Conditions Survey
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC



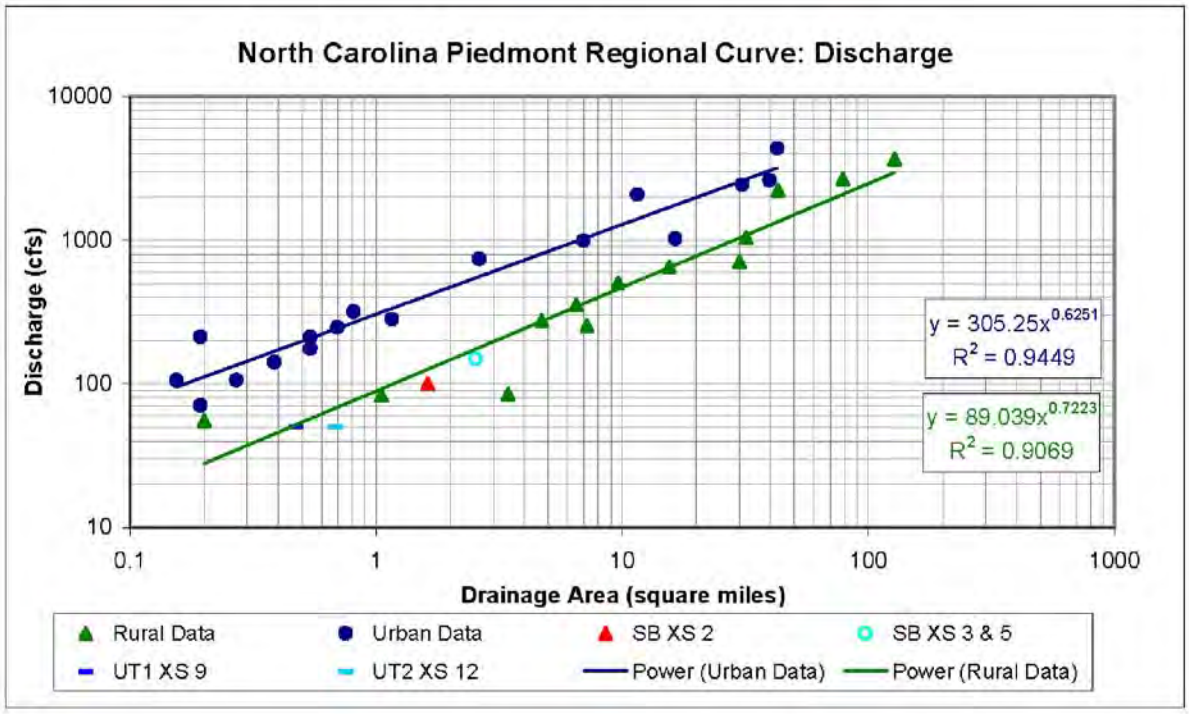
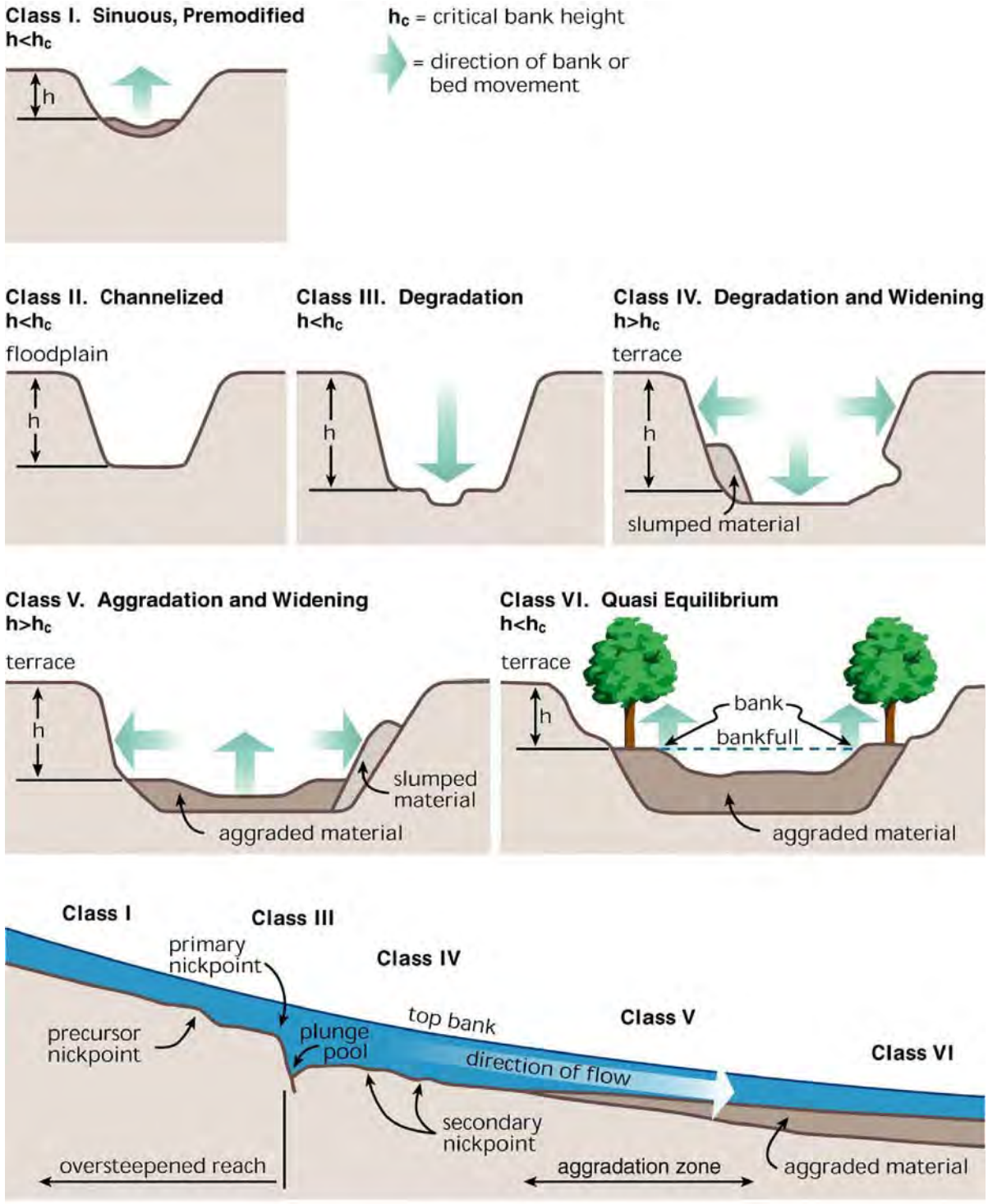


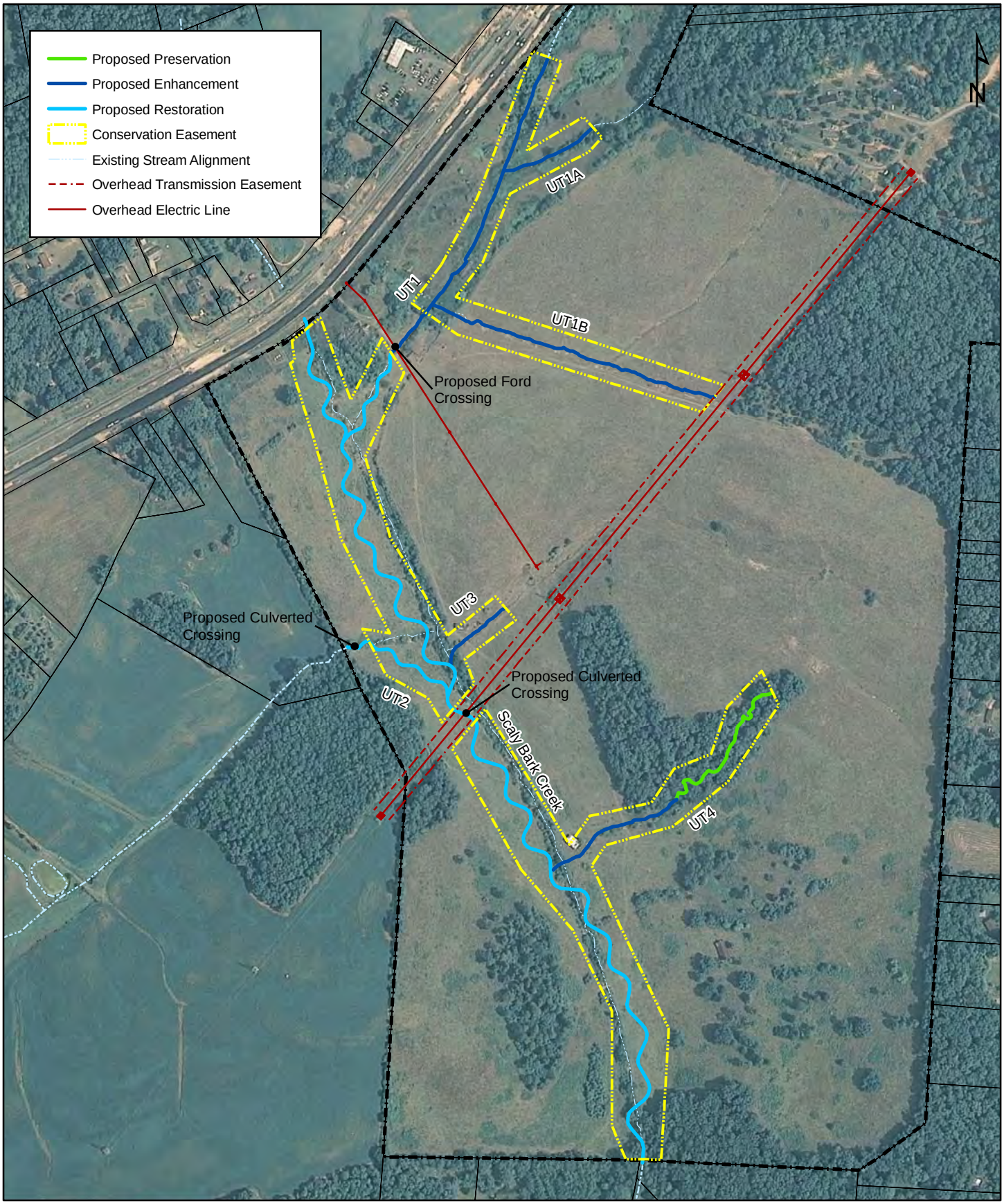
Figure 8. NC Piedmont Regional Curve Data
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC



Source: Simon, 1989; US Army Corps of Engineers, 1990.
Fig. 7.14 -- Channel evolution model..
In Stream Corridor Restoration: Principles, Processes, and Practices, 10/98.
Interagency Stream Restoration Working Group (FISRWG)(15 Federal agencies of the US).

Source: Simon, 1989

Figure 9. Simon Channel Evolution Model
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC



WILDLANDS

Ecosystem Enhancement PROGRAM

0 250 500 Feet

Figure 10. Proposed Stream Restoration Design
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC

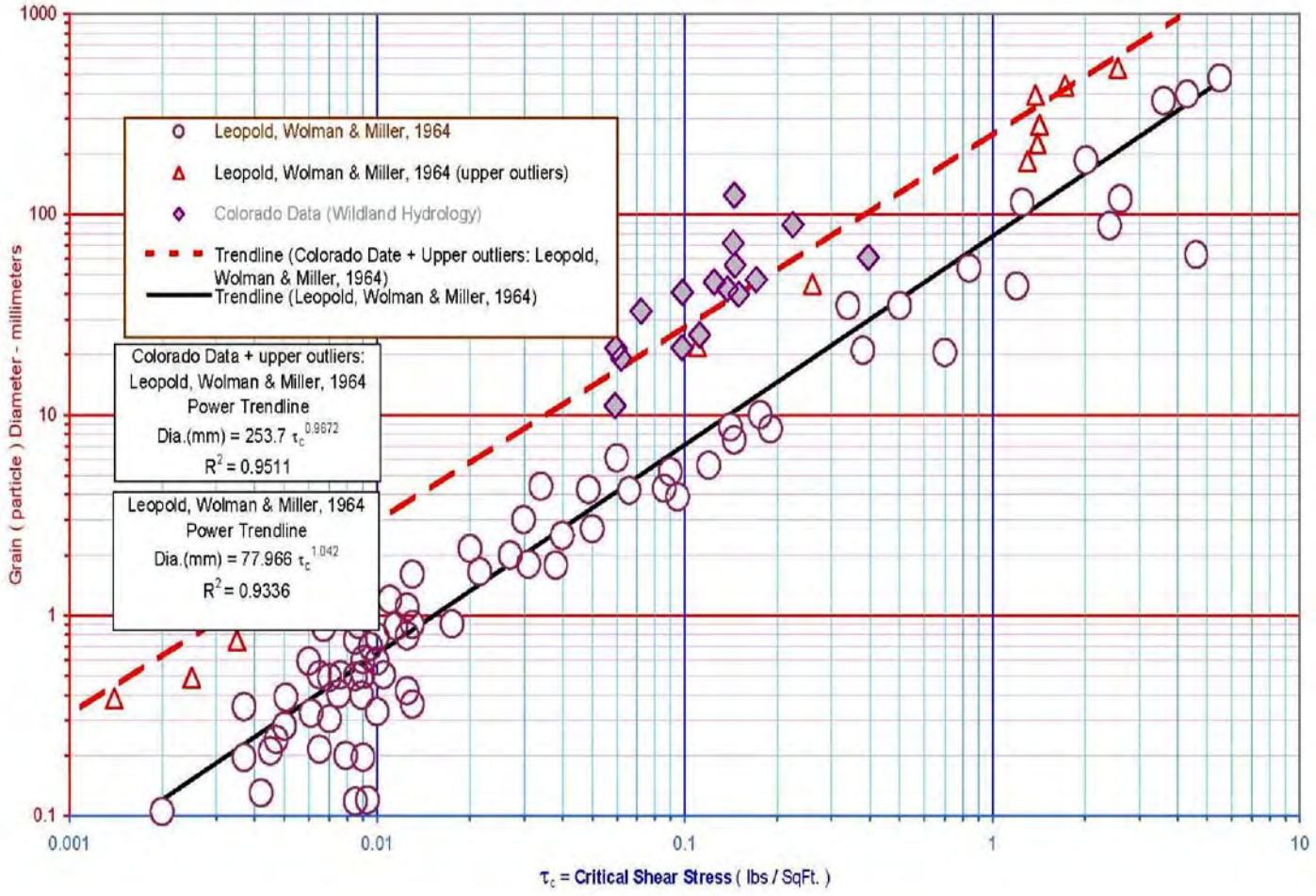


Figure 11. Shield's Curve Modified
Scaly Bark Creek Mitigation Site
Yadkin River Basin (03040105)
May 14, 2010
Stanly County, NC

Appendix 1:
Project Site Photographs

Photo 1-View of Scaly Bark Creek at XS 1, facing downstream.

Photo 2-View of Scaly Bark Creek, facing upstream.

Photo 3-View of left bank erosion at Scaly Bark Creek XS 4.

Photo 4-View of right bank erosion along Scaly Bark Creek, facing upstream.

Photo 5- View of UT1 left bank erosion at XS 10.

Photo 6-View of UT1 at XS 8, facing downstream.

Photo 7-View of UT1 near confluence with Scaly Bark Creek, facing upstream.

Photo 8-View of existing ford crossing at UT1, facing upstream.

Photo 9-View of UT1A left bank at XS 7.

Photo 10-View of UT1B, facing upstream.

Photo 11-View of UT1B, facing upstream.

Photo 12-View of UT2 right bank erosion, facing downstream.

Photo 13-View of UT2 at XS 12, facing downstream.

Photo 14-View of UT2 right bank at XS 11.

Photo 15-View of UT3 at XS 13, facing upstream.

Photo 16- View of UT4 at XS 14, facing upstream.

Photo 17-View of UT4 proposed preservation reach, facing upstream.

Photo 18-View of Wetland AA, facing north.

	
Photo 19-View of linear portion of Wetland AA, facing west toward jurisdictional connection with UT1.	Photo 20-View of floodplain at the confluence of Scaly Bark Creek and UT1, facing downstream.
	
Photo 21-View of Scaly Bark Creek floodplain, facing north.	Photo 22-View of floodplain at the confluence of Scaly Bark Creek and UT2, facing southeast.

Appendix 2:
NCDWQ/USACE Stream and Wetland Data Forms

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 07/11/2008	Project: Scaly Bark Creek	Latitude: N 35.323067°	
Evaluator: MLJ	Site: SCP1	Longitude: W 80.236167°	
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* **43.50**	County: Stanly	Other *e.g. Quad Name:*	Scaly Bark Creek Perennial RPW

A. Geomorphology (Subtotal = 24.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a] Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 8.50)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 07/11/2008	Project: Scaly Bark Creek	Latitude: N 35.329368°
Evaluator: MLJ	Site: SCP2	Longitude: W 80.236059°
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* **31.00**	County: Stanly	Other *e.g. Quad Name:* UT1 Perennial RPW

A. Geomorphology (Subtotal = 17.0)		Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	2.0	0	1	2	3
2. Sinuosity	1.0	0	1	2	3
3. In-channel structure: riffle-pool sequence	2.0	0	1	2	3
4. Soil texture or stream substrate sorting	2.0	0	1	2	3
5. Active/relic floodplain	2.0	0	1	2	3
6. Depositional bars or benches	1.0	0	1	2	3
7. Braided channel		0	1	2	3
8. Recent alluvial deposits	1.0	0	1	2	3
9[a] Natural levees	1.0	0	1	2	3
10. Headcuts		0	1	2	3
11. Grade controls	1.0	0	0.5	1	1.5
12. Natural valley or drainageway	1.0	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	3.0	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 7.0)					
14. Groundwater flow/discharge	2.0	0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season	1.0	0	1	2	3
16. Leaflitter	1.0	1.5	1	0.5	0
17. Sediment on plants or debris	0.5	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	1.0	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	1.5	No = 0		Yes = 1.5	

C. Biology (Subtotal = 7.00)					
20[b]. Fibrous roots in channel	3.0	3	2	1	0
21[b]. Rooted plants in channel	3.0	3	2	1	0
22. Crayfish		0	0.5	1	1.5
23. Bivalves		0	1	2	3
24. Fish		0	0.5	1	1.5
25. Amphibians	1.0	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)		0	0.5	1	1.5
27. Filamentous algae; periphyton		0	1	2	3
28. Iron oxidizing bacteria/fungus.		0	0.5	1	1.5
29[b]. Wetland plants in streambed		FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 07/11/2008	Project: Scaly Bark Creek	Latitude: N 35.329509°
Evaluator: MLJ	Site: SCP3	Longitude: W 80.234973°
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* **21.50**	County: Stanly	Other e.g. Quad Name: UT1A Intermittent RPW

A. Geomorphology (Subtotal = 11.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a] Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 4.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 5.50)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 07/11/2008	Project: Scaly Bark Creek	Latitude: N 35.327072°
Evaluator: MLJ	Site: SCP4	Longitude: W 80.235185°
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* **26.50**	County: Stanly	Other e.g. Quad Name: UT1B Intermittent RPW

A. Geomorphology (Subtotal = 12.5)		Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	2.0	0	1	2	3
2. Sinuosity		0	1	2	3
3. In-channel structure: riffle-pool sequence	1.0	0	1	2	3
4. Soil texture or stream substrate sorting	2.0	0	1	2	3
5. Active/relic floodplain	2.0	0	1	2	3
6. Depositional bars or benches		0	1	2	3
7. Braided channel		0	1	2	3
8. Recent alluvial deposits	1.0	0	1	2	3
9[a] Natural levees		0	1	2	3
10. Headcuts	2.0	0	1	2	3
11. Grade controls	1.5	0	0.5	1	1.5
12. Natural valley or drainageway	1.0	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.		No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 6.0)					
14. Groundwater flow/discharge	1.0	0	1	2	3
15. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	1.0	0	1	2	3
16. Leaflitter	1.5	1.5	1	0.5	0
17. Sediment on plants or debris	1.0	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	1.0	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	1.5	No = 0		Yes = 1.5	

C. Biology (Subtotal = 8.00)					
20[b]. Fibrous roots in channel	2.0	3	2	1	0
21[b]. Rooted plants in channel	2.0	3	2	1	0
22. Crayfish		0	0.5	1	1.5
23. Bivalves		0	1	2	3
24. Fish		0	0.5	1	1.5
25. Amphibians		0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)		0	0.5	1	1.5
27. Filamentous algae; periphyton	1.0	0	1	2	3
28. Iron oxidizing bacteria/fungus.		0	0.5	1	1.5
29[b]. Wetland plants in streambed		FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 07/11/2008	Project: Scaly Bark Creek	Latitude: N 35.324217°
Evaluator: MLJ	Site: SCP5	Longitude: W 80.236434°
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* **19.50**	County: Stanly	Other *e.g. Quad Name:* UT3 Intermittent RPW

A. Geomorphology (Subtotal = 10.0)		Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	1.0	0	1	2	3
2. Sinuosity		0	1	2	3
3. In-channel structure: riffle-pool sequence	1.0	0	1	2	3
4. Soil texture or stream substrate sorting	2.0	0	1	2	3
5. Active/relic floodplain	2.0	0	1	2	3
6. Depositional bars or benches		0	1	2	3
7. Braided channel		0	1	2	3
8. Recent alluvial deposits	1.0	0	1	2	3
9[a] Natural levees		0	1	2	3
10. Headcuts	1.0	0	1	2	3
11. Grade controls	1.0	0	0.5	1	1.5
12. Natural valley or drainageway	1.0	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.		No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 4.0)					
14. Groundwater flow/discharge		0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season		0	1	2	3
16. Leaflitter	1.5	1.5	1	0.5	0
17. Sediment on plants or debris	0.5	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0.5	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	1.5	No = 0		Yes = 1.5	

C. Biology (Subtotal = 5.50)					
20[b]. Fibrous roots in channel	2.0	3	2	1	0
21[b]. Rooted plants in channel	2.0	3	2	1	0
22. Crayfish		0	0.5	1	1.5
23. Bivalves		0	1	2	3
24. Fish		0	0.5	1	1.5
25. Amphibians		0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)		0	0.5	1	1.5
27. Filamentous algae; periphyton		0	1	2	3
28. Iron oxidizing bacteria/fungus.		0	0.5	1	1.5
29[b]. Wetland plants in streambed	0.50	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 07/11/2008	Project: Scaly Bark Creek	Latitude: N 35.322233°
Evaluator: MLJ	Site: SCP6	Longitude: W 80.234182°
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* **24.00**	County: Stanly	Other *e.g. Quad Name:* UT4 Intermittent RPW

A. Geomorphology (Subtotal = 14.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a] Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 3.5)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, **or** Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 6.00)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

North Carolina Division of Water Quality – Stream Identification Form; Version 3.1

Date: 07/11/2008	Project: Scaly Bark Creek	Latitude: N 35.324114°
Evaluator: MLJ	Site: SCP7	Longitude: W 80.237362°
Total Points: *Stream is at least intermittent if ≥ 19 or perennial if ≥ 30* **37.50**	County: Stanly	Other *e.g. Quad Name:* UT2 Perennial RPW

A. Geomorphology (Subtotal = 20.5)	Absent	Weak	Moderate	Strong
1[a]. Continuous bed and bank	0	1	2	3
2. Sinuosity	0	1	2	3
3. In-channel structure: riffle-pool sequence	0	1	2	3
4. Soil texture or stream substrate sorting	0	1	2	3
5. Active/relic floodplain	0	1	2	3
6. Depositional bars or benches	0	1	2	3
7. Braided channel	0	1	2	3
8. Recent alluvial deposits	0	1	2	3
9[a] Natural levees	0	1	2	3
10. Headcuts	0	1	2	3
11. Grade controls	0	0.5	1	1.5
12. Natural valley or drainageway	0	0.5	1	1.5
13. Second or greater order channel on existing USGS or NRCS map or other documented evidence.	No = 0		Yes = 3	

[a] Man-made ditches are not rated; see discussions in manual

B. Hydrology (Subtotal = 10.0)				
14. Groundwater flow/discharge	0	1	2	3
15. Water in channel and > 48 hrs since rain, or Water in channel -- dry or growing season	0	1	2	3
16. Leaflitter	1.5	1	0.5	0
17. Sediment on plants or debris	0	0.5	1	1.5
18. Organic debris lines or piles (Wrack lines)	0	0.5	1	1.5
19. Hydric soils (redoximorphic features) present?	No = 0		Yes = 1.5	

C. Biology (Subtotal = 7.00)				
20[b]. Fibrous roots in channel	3	2	1	0
21[b]. Rooted plants in channel	3	2	1	0
22. Crayfish	0	0.5	1	1.5
23. Bivalves	0	1	2	3
24. Fish	0	0.5	1	1.5
25. Amphibians	0	0.5	1	1.5
26. Macrobenthos (note diversity and abundance)	0	0.5	1	1.5
27. Filamentous algae; periphyton	0	1	2	3
28. Iron oxidizing bacteria/fungus.	0	0.5	1	1.5
29[b]. Wetland plants in streambed	FAC = 0.5; FACW = 0.75; OBL = 1.5 SAV = 2.0; Other = 0			

[b] Items 20 and 21 focus on the presence of upland plants. Item 29 focuses on the presence of aquatic or wetland plants.

Notes: (use back side of this form for additional notes.)

Sketch:

OFFICE USE ONLY: USACE AID#_____ DWQ #_____

SCP1 – Scaly Bark Creek (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name:_____ 2. Evaluator's Name: Matt Jenkins

3. Date of Evaluation: 7/11/08 4. Time of Evaluation: 9:00am

5. Name of Stream: Scaly Bark Creek 6. River Basin: Yadkin 03040105

7. Approximate Drainage Area: 1,619 acres 8. Stream Order: Second

9. Length of Reach Evaluated: 200 lf 10. County: Stanly

11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Charlotte travel west on US-74 for approximately 4 miles. Take exit 246 on the left to merge onto Albemarle Road/ NC-27. Travel approximately 33 miles, site is on the right just past Tom Thumb Road.

12. Site Coordinates (if known): N 35.323067°, W 80.236167°

13. Proposed Channel Work (if any): restoration

14. Recent Weather Conditions: rain within the past 24 hours

15. Site conditions at time of visit: overcast, 80°

16. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)

17. Is there a pond or lake located upstream of the evaluation point? (YES) NO If yes, estimate the water surface area: ~ 1ac.

18. Does channel appear on USGS quad map? (YES) NO 19. Does channel appear on USDA Soil Survey? (YES) NO

20. Estimated Watershed Land Use: 10 % Residential ___% Commercial ___% Industrial 70 % Agricultural 20 % Forested ___% Cleared / Logged ___% Other (_____)

21. Bankfull Width: 10 feet 22. Bank Height (from bed to top of bank): 3-4 feet

23. Channel slope down center of stream: X Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

24. Channel Sinuosity: ____Straight X Occasional Bends ___Frequent Meander ___Very Sinuous ___Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 51 **Comments:**_____

Evaluator's Signature_____ **Date**_____

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP1 – Scaly Bark Creek (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	3
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	3
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	4
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	3
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	2
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	2
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	4
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	2
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	1
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	4
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	2
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	3
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	2
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						51

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#_____ DWQ #_____

SCP2 – UT1 (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name:_____ 2. Evaluator's Name: Matt Jenkins

3. Date of Evaluation: 7/11/08 4. Time of Evaluation: 9:30am

5. Name of Stream: UT1 to Scaly Bark Creek 6. River Basin: Yadkin 03040105

7. Approximate Drainage Area: 301 acres 8. Stream Order: First

9. Length of Reach Evaluated: 100 lf 10. County: Stanly

11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Charlotte travel west on US-74 for approximately 4 miles. Take exit 246 on the left to merge onto Albemarle Road/ NC-27. Travel approximately 33 miles, site is on the right just past Tom Thumb Road.

12. Site Coordinates (if known): N 35.3293688°, W 80.236059°

13. Proposed Channel Work (if any): restoration

14. Recent Weather Conditions: rain within the past 24 hours

15. Site conditions at time of visit: overcast, 80°

16. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)

17. Is there a pond or lake located upstream of the evaluation point? (YES) NO If yes, estimate the water surface area: 0.1 ac.

18. Does channel appear on USGS quad map? (YES) NO 19. Does channel appear on USDA Soil Survey? (YES) NO

20. Estimated Watershed Land Use: 10 % Residential ___% Commercial ___% Industrial 90 % Agricultural ___% Forested ___% Cleared / Logged ___% Other (_____)

21. Bankfull Width: 3-5 feet 22. Bank Height (from bed to top of bank): 1-3 feet

23. Channel slope down center of stream: X Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

24. Channel Sinuosity: X Straight ___Occasional Bends ___Frequent Meander ___Very Sinuous ___Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 47 **Comments:**_____

Evaluator's Signature_____ **Date**_____

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP2 – UT1 (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	4
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	2
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	2
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	3
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	3
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	2
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	2
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	2
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	1
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	3
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	3
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	2
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						47

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#_____ DWQ #_____

SCP3 – UT1A (Intermittent RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name:_____ 2. Evaluator's Name: Matt Jenkins

3. Date of Evaluation: 7/11/08 4. Time of Evaluation: 9:15am

5. Name of Stream: UT1A to Scaly Bark Creek 6. River Basin: Yadkin 03040105

7. Approximate Drainage Area: 46 acres 8. Stream Order: First

9. Length of Reach Evaluated: 100 lf 10. County: Stanly

11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Charlotte travel west on US-74 for approximately 4 miles. Take exit 246 on the left to merge onto Albemarle Road/ NC-27. Travel approximately 33 miles, site is on the right just past Tom Thumb Road.

12. Site Coordinates (if known): N 35.329509°, W 80.234973°

13. Proposed Channel Work (if any): restoration

14. Recent Weather Conditions: rain within the past 24 hours

15. Site conditions at time of visit: overcast, 80°

16. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)

17. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:_____

18. Does channel appear on USGS quad map? YES (NO) 19. Does channel appear on USDA Soil Survey? YES (NO)

20. Estimated Watershed Land Use: ___% Residential ___% Commercial ___% Industrial 60 % Agricultural 40 % Forested ___% Cleared / Logged ___% Other (_____)

21. Bankfull Width: 1-2 feet 22. Bank Height (from bed to top of bank): 1-2 feet

23. Channel slope down center of stream: ___Flat (0 to 2%) X Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

24. Channel Sinuosity: X Straight ___Occasional Bends ___Frequent Meander ___Very Sinuous ___Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 35 **Comments:**_____

Evaluator's Signature_____ **Date**_____

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP3 – UT1A (Intermittent RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	1
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	3
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	1
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	2
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	3
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	2
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	2
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	1
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	2
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	2
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	3
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	1
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						35

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#_____ DWQ #_____

SCP4 – UT1B (Intermittent RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name:_____ 2. Evaluator's Name: Matt Jenkins

3. Date of Evaluation: 7/11/08 4. Time of Evaluation: 10:00am

5. Name of Stream: UT1B to Scaly Bark Creek 6. River Basin: Yadkin 03040105

7. Approximate Drainage Area: 83 acres 8. Stream Order: First

9. Length of Reach Evaluated: 300 lf 10. County: Stanly

11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Charlotte travel west on US-74 for approximately 4 miles. Take exit 246 on the left to merge onto Albemarle Road/ NC-27. Travel approximately 33 miles, site is on the right just past Tom Thumb Road.

12. Site Coordinates (if known): N 35.327072°, W 80.235185°

13. Proposed Channel Work (if any): restoration

14. Recent Weather Conditions: rain within the past 24 hours

15. Site conditions at time of visit: overcast, 80°

16. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)

17. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:_____

18. Does channel appear on USGS quad map? YES (NO) 19. Does channel appear on USDA Soil Survey? YES (NO)

20. Estimated Watershed Land Use: ___% Residential ___% Commercial ___% Industrial 70 % Agricultural 30 % Forested ___% Cleared / Logged ___% Other (_____)

21. Bankfull Width: 2-4 feet 22. Bank Height (from bed to top of bank): 1-3 feet

23. Channel slope down center of stream: X Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

24. Channel Sinuosity: X Straight ___Occasional Bends ___Frequent Meander ___Very Sinuous ___Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 31 **Comments:**_____

Evaluator's Signature_____ **Date**_____

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP4 – UT1B (Intermittent RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	1
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	1
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	3
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	3
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	3
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	4
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	1
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	3
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	2
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						31

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#_____ DWQ #_____

SCP5 – UT3 (Intermittent RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name:_____ 2. Evaluator's Name: Matt Jenkins

3. Date of Evaluation: 7/11/08 4. Time of Evaluation: 10:45am

5. Name of Stream: UT3 to Scaly Bark Creek 6. River Basin: Yadkin 03040105

7. Approximate Drainage Area: 36 acres 8. Stream Order: First

9. Length of Reach Evaluated: 500 lf 10. County: Stanly

11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Charlotte travel west on US-74 for approximately 4 miles. Take exit 246 on the left to merge onto Albemarle Road/ NC-27. Travel approximately 33 miles, site is on the right just past Tom Thumb Road.

12. Site Coordinates (if known): N 35.324217°, W 80.236434°

13. Proposed Channel Work (if any): restoration

14. Recent Weather Conditions: rain within the past 24 hours

15. Site conditions at time of visit: overcast, 80°

16. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)

17. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:_____

18. Does channel appear on USGS quad map? YES (NO) 19. Does channel appear on USDA Soil Survey? YES (NO)

20. Estimated Watershed Land Use: ___% Residential ___% Commercial ___% Industrial 100% Agricultural ___% Forested ___% Cleared / Logged ___% Other (_____)

21. Bankfull Width: 1-2 feet 22. Bank Height (from bed to top of bank): 2 feet

23. Channel slope down center of stream: ___Flat (0 to 2%) _X_Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

24. Channel Sinuosity: _X_Straight ___Occasional Bends ___Frequent Meander ___Very Sinuous ___Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 24 **Comments:**_____

Evaluator's Signature_____ **Date**_____

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP5 – UT3 (Intermittent RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	0
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	1
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	0
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	1
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	3
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	3
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	0
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	2
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	3
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	1
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	1
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	0
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	0
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	1
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						24

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#_____ DWQ #_____

SCP6 – UT4 (Intermittent RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name:_____ 2. Evaluator's Name: Matt Jenkins

3. Date of Evaluation: 7/11/08 4. Time of Evaluation: 11:00am

5. Name of Stream: UT4 to Scaly Bark Creek 6. River Basin: Yadkin 03040105

7. Approximate Drainage Area: 25 acres 8. Stream Order: First

9. Length of Reach Evaluated: 300 lf 10. County: Stanly

11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Charlotte travel west on US-74 for approximately 4 miles. Take exit 246 on the left to merge onto Albemarle Road/ NC-27. Travel approximately 33 miles, site is on the right just past Tom Thumb Road.

12. Site Coordinates (if known): N 35.322233°, W 80.234182°

13. Proposed Channel Work (if any): restoration

14. Recent Weather Conditions: rain within the past 24 hours

15. Site conditions at time of visit: overcast, 80°

16. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)

17. Is there a pond or lake located upstream of the evaluation point? YES (NO) If yes, estimate the water surface area:_____

18. Does channel appear on USGS quad map? (YES) NO 19. Does channel appear on USDA Soil Survey? (YES) NO

20. Estimated Watershed Land Use: ___% Residential ___% Commercial ___% Industrial 50 % Agricultural 50 % Forested ___% Cleared / Logged ___% Other (_____)

21. Bankfull Width: 2-3 feet 22. Bank Height (from bed to top of bank): 1-2 feet

23. Channel slope down center of stream: ___Flat (0 to 2%) ___Gentle (2 to 4%) _X_Moderate (4 to 10%) ___Steep (>10%)

24. Channel Sinuosity: ____Straight _X_Occasional Bends ___Frequent Meander ___Very Sinuous ___Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 41 **Comments:**_____

Evaluator's Signature_____ **Date**_____

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STREAM QUALITY ASSESSMENT WORKSHEET
SCP6 – UT4 (Intermittent RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	0
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	3
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	2
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	3
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	0
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	3
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	3
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	1
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	3
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	3
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	3
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	2
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	1
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	3
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	1
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	3
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	3
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	0
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	1
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						41

* These characteristics are not assessed in coastal streams.

OFFICE USE ONLY: USACE AID#_____ DWQ #_____

SCP7 – UT2 (Perennial RPW)

STREAM QUALITY ASSESSMENT WORKSHEET

1. Applicant's Name:_____ 2. Evaluator's Name: Matt Jenkins

3. Date of Evaluation: 7/11/08 4. Time of Evaluation: 11:10am

5. Name of Stream: UT2 to Scaly Bark Creek 6. River Basin: Yadkin 03040105

7. Approximate Drainage Area: 436 acres 8. Stream Order: Second

9. Length of Reach Evaluated: 100 lf 10. County: Stanly

11. Location of reach under evaluation (include nearby roads and landmarks): From downtown Charlotte travel west on US-74 for approximately 4 miles. Take exit 246 on the left to merge onto Albemarle Road/ NC-27. Travel approximately 33 miles, site is on the right just past Tom Thumb Road.

12. Site Coordinates (if known): N 35.324114°, W 80.237362°

13. Proposed Channel Work (if any): restoration

14. Recent Weather Conditions: rain within the past 24 hours

15. Site conditions at time of visit: overcast, 80°

16. Identify any special waterway classifications known: ___Section 10 ___Tidal Waters ___Essential Fisheries Habitat ___Trout Waters ___Outstanding Resource Waters ___ Nutrient Sensitive Waters ___Water Supply Watershed ____(I-IV)

17. Is there a pond or lake located upstream of the evaluation point? (YES) NO If yes, estimate the water surface area: ~0.1 ac.

18. Does channel appear on USGS quad map? (YES) NO 19. Does channel appear on USDA Soil Survey? (YES) NO

20. Estimated Watershed Land Use: 5 % Residential ___% Commercial ___% Industrial 75 % Agricultural 20 % Forested ___% Cleared / Logged ___% Other (_____)

21. Bankfull Width: 3-4 feet 22. Bank Height (from bed to top of bank): 2-3 feet

23. Channel slope down center of stream: X Flat (0 to 2%) ___Gentle (2 to 4%) ___Moderate (4 to 10%) ___Steep (>10%)

24. Channel Sinuosity: ____Straight ___Occasional Bends X Frequent Meander ___Very Sinuous ___Braided Channel

Instructions for completion of worksheet (located on page 2): Begin by determining the most appropriate ecoregion based on location, terrain, vegetation, stream classification, etc. Every characteristic must be scored using the same ecoregion. Assign points to each characteristic within the range shown for the ecoregion. Page 3 provides a brief description of how to review the characteristics identified in the worksheet. Scores should reflect an overall assessment of the stream reach under evaluation. If a characteristic cannot be evaluated due to site or weather conditions, enter 0 in the scoring box and provide an explanation in the comment section. Where there are obvious changes in the character of a stream under review (e.g., the stream flows from a pasture into a forest), the stream may be divided into smaller reaches that display more continuity, and a separate form used to evaluate each reach. The total score assigned to a stream reach must range between 0 and 100, with a score of 100 representing a stream of the highest quality.

Total Score (from reverse): 45 **Comments:**_____

Evaluator's Signature_____ **Date**_____

This channel evaluation form is intended to be used only as a guide to assist landowners and environmental professionals in gathering the data required by the United States Army Corps of Engineers in order to make a preliminary assessment of stream quality. The total score resulting from the completion of this form is subject to USACE approval and does not imply a particular mitigation ratio or requirement. Form subject to change – version 05/03. To Comment, please call 919-876-8441 x 26.

STREAM QUALITY ASSESSMENT WORKSHEET
SCP7 – UT2 (Perennial RPW)

	#	CHARACTERISTICS	ECOREGION POINT RANGE			SCORE
			Coastal	Piedmont	Mountain	
PHYSICAL	1	**Presence of flow / persistent pools in stream** (no flow or saturation = 0; strong flow = max points)	0 – 5	0 – 4	0 – 5	3
	2	**Evidence of past human alteration** (extensive alteration = 0; no alteration = max points)	0 – 6	0 – 5	0 – 5	2
	3	**Riparian zone** (no buffer = 0; contiguous, wide buffer = max points)	0 – 6	0 – 4	0 – 5	1
	4	**Evidence of nutrient or chemical discharges** (extensive discharges = 0; no discharges = max points)	0 – 5	0 – 4	0 – 4	2
	5	**Groundwater discharge** (no discharge = 0; springs, seeps, wetlands, etc. = max points)	0 – 3	0 – 4	0 – 4	3
	6	**Presence of adjacent floodplain** (no floodplain = 0; extensive floodplain = max points)	0 – 4	0 – 4	0 – 2	4
	7	**Entrenchment / floodplain access** (deeply entrenched = 0; frequent flooding = max points)	0 – 5	0 – 4	0 – 2	3
	8	**Presence of adjacent wetlands** (no wetlands = 0; large adjacent wetlands = max points)	0 – 6	0 – 4	0 – 2	0
	9	**Channel sinuosity** (extensive channelization = 0; natural meander = max points)	0 – 5	0 – 4	0 – 3	3
	10	**Sediment input** (extensive deposition= 0; little or no sediment = max points)	0 – 5	0 – 4	0 – 4	3
	11	**Size & diversity of channel bed substrate** (fine, homogenous = 0; large, diverse sizes = max points)	NA*	0 – 4	0 – 5	3
STABILITY	12	**Evidence of channel incision or widening** (deeply incised = 0; stable bed & banks = max points)	0 – 5	0 – 4	0 – 5	2
	13	**Presence of major bank failures** (severe erosion = 0; no erosion, stable banks = max points)	0 – 5	0 – 5	0 – 5	2
	14	**Root depth and density on banks** (no visible roots = 0; dense roots throughout = max points)	0 – 3	0 – 4	0 – 5	1
	15	**Impact by agriculture or livestock production** (substantial impact =0; no evidence = max points)	0 – 5	0 – 4	0 – 5	0
HABITAT	16	**Presence of riffle-pool/ripple-pool complexes** (no riffles/ripples or pools = 0; well-developed = max points)	0 – 3	0 – 5	0 – 6	4
	17	**Habitat complexity** (little or no habitat = 0; frequent, varied habitats = max points)	0 – 6	0 – 6	0 – 6	3
	18	**Canopy coverage over streambed** (no shading vegetation = 0; continuous canopy = max points)	0 – 5	0 – 5	0 – 5	1
	19	**Substrate embeddedness** (deeply embedded = 0; loose structure = max)	NA*	0 – 4	0 – 4	3
BIOLOGY	20	**Presence of stream invertebrates** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 5	0 – 5	1
	21	**Presence of amphibians** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	1
	22	**Presence of fish** (no evidence = 0; common, numerous types = max points)	0 – 4	0 – 4	0 – 4	0
	23	**Evidence of wildlife use** (no evidence = 0; abundant evidence = max points)	0 – 6	0 – 5	0 – 5	0
Total Points Possible			100	100	100	
TOTAL SCORE (also enter on first page)						45

* These characteristics are not assessed in coastal streams.

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	**Scaly Bark Creek Stream Restoration**		Date:	**10/08/09**
Applicant/Owner:	**Wildlands Engineering**		County:	**Stanly**
Investigator(s):	**Matt Jenkins, PWS**		State:	**NC**
Do Normal Circumstances exist on the site?	(Yes)	No	Community ID:	**wetland**
Is the site significantly disturbed (Atypical Situation)?	Yes	(No)	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse.)	Yes	(No)	Plot ID:	**DP1**

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 *Scirpus cyperinus*	herb	OBL	9		
2 *Polygonum pensylvanicum*	herb	FACW	10		
3 *Juncus effusus*	herb	FACW+	11		
4 *Salix nigra*	tree	OBL	12		
5 *Acer rubrum*	tree	FAC	13		
6 *Ludwigia alternifolia*	herb	OBL	14		
7 *Festuca spp.*	herb	-	15		
8			16		

Percent of Dominant Species that are OBL, FACW or FAC

100%

Remarks:

100% of the dominant plant species are FAC or wetter.

HYDROLOGY

____ Recorded Data (Describe in remarks):
____ Stream, Lake or Tide Gauge
____ Aerial Photographs
____ Other
X No Recorded Data Available

Field Observations:

Depth of Surface Water:	**N/A**	(in.)
Depth to Free Water in Pit:	**N/A**	(in.)
Depth to Saturated Soil:	**<12**	(in.)

Wetland Hydrology Indicators:

Primary Indicators:
____ Inundated
X Saturated in Upper 12 Inches
X Water Marks
____ Drift Lines
____ Sediment Deposits (on leaves)
X Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
X Oxidized Root Channels in Upper 12 Inches
____ Water-Stained Leaves
____ Local Soil Survey Data
____ FAC-Neutral Test
____ Other (Explain in Remarks)

Remarks:

Indicators of wetland hydrology are present.

SOILS

Map Unit Name
(Series and Phase): **Misenheimer channery silt loam (MhB)** Drainage Class **mod. well-drained**
Field Observations

Taxonomy (Subgroup): **shallow Aquic Dystrudepts** Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	**B**	**10YR 5/1**	**7.5YR 4/6**	**few/distinct**	**silty clay**

___	Histosol	___	Concretions
___	Histic Epipedon	___	High Organic Content in Surface Layer in Sandy Soils
___	Sulfidic Odor	___	Organic Streaking in Sandy Soils
___	Aquic Moisture Regime	___	Listed on Local Hydric Soils List (Inclusions)
___	Reducing Conditions	___	Listed on National Hydric Soils List
X	Gleyed or Low-Chroma Colors	___	Other (Explain in Remarks)

Remarks:

Indicators of hydric soils are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)	
Wetland Hydrology Present?	(Yes)	No		(Circle)
Hydric Soils Present?	(Yes)	No	Is this Sampling Point Within a Wetland?	(Yes) No

Remarks:

Data point is representative of a jurisdictional wetland area.

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	**Scaly Bark Creek Restoration**			Date:	**10/08/09**
Applicant/Owner:	**Wildlands Engineering**			County:	**Stanly**
Investigator(s):	**Matt Jenkins, PWS**			State:	**NC**
Do Normal Circumstances exist on the site?		(Yes)	No	Community ID:	**upland**
Is the site significantly disturbed (Atypical Situation)?		Yes	(No)	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse.)		Yes	(No)	Plot ID:	**DP2**

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 *Eupatorium capillifolium*	herb	FACU	9		
2 *Ambrosia artemisiifolia*	herb	FACU	10		
3 *Solidago canadensis*	herb	FACU	11		
4 *Rubus argutus*	shrub	FACU+	12		
5 *Phytolacca americana*	herb	FACU+	13		
6 *Rosa multiflora*	shrub	UPL	14		
7 *Asclepias syriaca*	herb	UPL	15		
8 *Festuca spp.*	herb	-	16		

Percent of Dominant Species that are OBL, FACW or FAC

0%

Remarks:

None of the dominant plant species are FAC or wetter.

HYDROLOGY

Recorded Data (Describe in remarks):
- ____ Stream, Lake or Tide Gauge
- ____ Aerial Photographs
- ____ Other
- **X** No Recorded Data Available

Field Observations:

Depth of Surface Water:	**N/A**	(in.)
Depth to Free Water in Pit:	**N/A**	(in.)
Depth to Saturated Soil:	**>12**	(in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 Inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits (on leaves)
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 Inches
- ____ Water-Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

No indicators of wetland hydrology are present.

SOILS

Map Unit Name
(Series and Phase): **Misenheimer channery silt loam (MhB)** Drainage Class **mod. well-drained**
Field Observations

Taxonomy (Subgroup): **shallow Aquic Dystrudepts** Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	**B**	**7.5YR 4/6**	**N/A**	**N/A**	**silt loam**

____ Histosol	____ Concretions
____ Histic Epipedon	____ High Organic Content in Surface Layer in Sandy Soils
____ Sulfidic Odor	____ Organic Streaking in Sandy Soils
____ Aquic Moisture Regime	____ Listed on Local Hydric Soils List (Inclusions)
____ Reducing Conditions	____ Listed on National Hydric Soils List
____ Gleyed or Low-Chroma Colors	____ Other (Explain in Remarks)

Remarks:

No indicators of hydric soils are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	Yes	(No) (Circle)	
Wetland Hydrology Present?	Yes	(No)	(Circle)
Hydric Soils Present?	Yes	(No)	Is this Sampling Point Within a Wetland? Yes (No)

Remarks:

Data point is representative of a non-jurisdictional upland area.

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	**Scaly Bark Creek Restoration**			Date:	**10/08/09**
Applicant/Owner:	**Wildlands Engineering**			County:	**Stanly**
Investigator(s):	**Matt Jenkins, PWS**			State:	**NC**
Do Normal Circumstances exist on the site?		(Yes)	No	Community ID:	**wetland**
Is the site significantly disturbed (Atypical Situation)?		Yes	(No)	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse.)		Yes	(No)	Plot ID:	**DP3**

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 *Juncus effusus*	herb	FACW+	9		
2 *Xanthium strumarium*	herb	FAC	10		
3 *Solidago canadensis*	herb	FACU	11		
4 *Ambrosia artemisiifolia*	herb	FACU	12		
5 *Festuca spp.*	herb	-	13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW or FAC

50%

Remarks:

50% of the dominant plant species are FAC or wetter.

HYDROLOGY

Recorded Data (Describe in remarks):
- ____ Stream, Lake or Tide Gauge
- ____ Aerial Photographs
- ____ Other
- **X** No Recorded Data Available

Field Observations:

Depth of Surface Water:	**N/A**	(in.)
Depth to Free Water in Pit:	**N/A**	(in.)
Depth to Saturated Soil:	**<12**	(in.)

Wetland Hydrology Indicators:

Primary Indicators:
- **X** Inundated
- **X** Saturated in Upper 12 Inches
- **X** Water Marks
- ____ Drift Lines
- ____ Sediment Deposits (on leaves)
- **X** Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 Inches
- ____ Water-Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

Indicators of wetland hydrology are present.

SOILS

Map Unit Name
(Series and Phase): **Badin channery silt loam (BaD)** Drainage Class **well-drained**
Field Observations

Taxonomy (Subgroup): **thermic Typic Hapludults** Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	**B**	**7.5YR 4/2**	**7.5YR 4/6**	**many/faint**	**silt loam**

___ Histosol	___ Concretions
___ Histic Epipedon	___ High Organic Content in Surface Layer in Sandy Soils
___ Sulfidic Odor	___ Organic Streaking in Sandy Soils
___ Aquic Moisture Regime	___ Listed on Local Hydric Soils List (Inclusions)
___ Reducing Conditions	___ Listed on National Hydric Soils List
___ Gleyed or Low-Chroma Colors	___ Other (Explain in Remarks)

Remarks:

Indicators of hydric soils are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)
Wetland Hydrology Present?	(Yes)	No	
Hydric Soils Present?	(Yes)	No	

Is this Sampling Point Within a Wetland? (Yes) No (Circle)

Remarks:

Data point is representative of a jurisdictional wetland area.

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	**Scaly Bark Creek Restoration**		Date:	**10/08/09**
Applicant/Owner:	**Wildlands Engineering**		County:	**Stanly**
Investigator(s):	**Matt Jenkins, PWS**		State:	**NC**
Do Normal Circumstances exist on the site?	(Yes)	No	Community ID:	**upland**
Is the site significantly disturbed (Atypical Situation)?	Yes	(No)	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse.)	Yes	(No)	Plot ID:	**DP4**

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 *Juncus effusus*	herb	FACW+	9		
2 *Xanthium strumarium*	herb	FAC	10		
3 *Solidago canadensis*	herb	FACU	11		
4 *Ambrosia artemisiifolia*	herb	FACU	12		
5 *Festuca spp.*	herb	-	13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW or FAC

50%

Remarks:

50% of the dominant plant species are FAC or wetter.

HYDROLOGY

Recorded Data (Describe in remarks):
- ____ Stream, Lake or Tide Gauge
- ____ Aerial Photographs
- ____ Other
- **X** No Recorded Data Available

Field Observations:

Depth of Surface Water:	**N/A**	(in.)
Depth to Free Water in Pit:	**N/A**	(in.)
Depth to Saturated Soil:	**>12**	(in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 Inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits (on leaves)
- ____ Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 Inches
- ____ Water-Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

No indicators of wetland hydrology are present.

SOILS

Map Unit Name
(Series and Phase): **Goldston very channery silt loam (GoF)** Drainage Class Field Observations **well-drained**

Taxonomy (Subgroup): **shallow Typic Dystrudepts** Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	**B**	**2.5Y 5/3**	**5YR 4/6**	**few/distinct**	**silt loam**

____ Histosol
____ Histic Epipedon
____ Sulfidic Odor
____ Aquic Moisture Regime
____ Reducing Conditions
____ Gleyed or Low-Chroma Colors
____ Concretions
____ High Organic Content in Surface Layer in Sandy Soils
____ Organic Streaking in Sandy Soils
____ Listed on Local Hydric Soils List (Inclusions)
____ Listed on National Hydric Soils List
____ Other (Explain in Remarks)

Remarks:

No indicators of hydric soils are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present? Yes (No) (Circle)
Wetland Hydrology Present? Yes (No)
Hydric Soils Present? Yes (No)

Is this Sampling Point Within a Wetland? (Circle) Yes (No)

Remarks:

Data point is representative of a non-jurisdictional upland area.

Approved by HQUSACE 2/92

DATA FORM
ROUTINE WETLAND DETERMINATION
(1987 COE Wetlands Delineation Manual)

Project/Site:	**Scaly Bark Creek Restoration**			Date:	**10/08/09**
Applicant/Owner:	**Wildlands Engineering**			County:	**Stanly**
Investigator(s):	**Matt Jenkins, PWS**			State:	**NC**
Do Normal Circumstances exist on the site?		(Yes)	No	Community ID:	**upland**
Is the site significantly disturbed (Atypical Situation)?		(Yes)	No	Transect ID:	
Is the area a potential Problem Area? (If needed, explain on reverse.)		Yes	(No)	Plot ID:	**DP5**

VEGETATION

Dominant Plant Species	Stratum	Indicator	Dominant Plant Species	Stratum	Indicator
1 *Juncus effusus*	herb	FACW+	9		
2 *Microstegium vimineum*	herb	FAC+	10		
3 *Polygonum pensylvanicum*	herb	FACW	11		
4 *Ranunculus acris*	herb	FACW	12		
5 *Festuca spp.*	herb	-	13		
6			14		
7			15		
8			16		

Percent of Dominant Species that are OBL, FACW or FAC

100%

Remarks:

All of the dominant plant species are FAC or wetter.

HYDROLOGY

Recorded Data (Describe in remarks):
- ____ Stream, Lake or Tide Gauge
- ____ Aerial Photographs
- ____ Other
- **X** No Recorded Data Available

Field Observations:

Depth of Surface Water:	**N/A**	(in.)
Depth to Free Water in Pit:	**N/A**	(in.)
Depth to Saturated Soil:	**>12**	(in.)

Wetland Hydrology Indicators:

Primary Indicators:
- ____ Inundated
- ____ Saturated in Upper 12 Inches
- ____ Water Marks
- ____ Drift Lines
- ____ Sediment Deposits (on leaves)
- **X** Drainage Patterns in Wetlands

Secondary Indicators (2 or more required):
- ____ Oxidized Root Channels in Upper 12 Inches
- **X** Water-Stained Leaves
- ____ Local Soil Survey Data
- ____ FAC-Neutral Test
- ____ Other (Explain in Remarks)

Remarks:

Indicators of wetland hydrology are present.

SOILS

Map Unit Name
(Series and Phase): **Goldston very channery silt loam (GoF)** Drainage Class Field Observations **well-drained**

Taxonomy (Subgroup): **shallow Typic Dystrudepts** Confirm Mapped Type? Yes (No)

Profile Description:

Depth (inches)	Horizon	Matrix Color (Munsell Moist)	Mottle Colors (Munsell Moist)	Mottle Abundance/Contrast	Texture, Concretions, Structure, etc.
0-12	**B**	**2.5Y 3/2**	**N/A**	**N/A**	**silt loam**

____ Histosol	____ Concretions
____ Histic Epipedon	____ High Organic Content in Surface Layer in Sandy Soils
____ Sulfidic Odor	____ Organic Streaking in Sandy Soils
____ Aquic Moisture Regime	____ Listed on Local Hydric Soils List (Inclusions)
____ Reducing Conditions	____ Listed on National Hydric Soils List
____ Gleyed or Low-Chroma Colors	____ Other (Explain in Remarks)

Remarks:

No indicators of hydric soils are present.

WETLAND DETERMINATION

Hydrophytic Vegetation Present?	(Yes)	No	(Circle)
Wetland Hydrology Present?	(Yes)	No	
Hydric Soils Present?	Yes	(No)	

Is this Sampling Point Within a Wetland? Yes (No) (Circle)

Remarks:

Data point represents a non-jurisdictional flooplain depression. The area is heavily trampled from cattle activity and shows signs of drainage from adjacent upland areas, however no hydric soils were present.

Approved by HQUSACE 2/92

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): April, 2010

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Scaly Bark Creek Mitigation Site - Scaly Bark Creek & Wetland BB

State:NC County/parish/borough: Stanly City: Albemarle
Center coordinates of site (lat/long in degree decimal format): Lat. 35.329368° **N**, Long. 800.236059° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Long Creek

Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Rocky River
Name of watershed or Hydrologic Unit Code (HUC): Yadkin 03040105

☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):

☒ Office (Desk) Determination. Date: July 12, 2008
☒ Field Determination. Date(s): July 11, 2008

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]

☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. Waters of the U.S.

a. Indicate presence of waters of U.S. in review area (check all that apply): [1]

☐ TNWs, including territorial seas
☐ Wetlands adjacent to TNWs
☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
☐ Non-RPWs that flow directly or indirectly into TNWs
☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
☐ Impoundments of jurisdictional waters
☐ Isolated (interstate or intrastate) waters, including isolated wetlands

b. Identify (estimate) size of waters of the U.S. in the review area:
Non-wetland waters: 3,600 linear feet: 6-8 width (ft) and/or 0.58 acres.
Wetlands: 0.09 acres.

c. Limits (boundaries) of jurisdiction based on: **1987 Delineation Manual**
Elevation of established OHWM (if known): .

2. Non-regulated waters/wetlands (check if applicable):[3]

☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts	☐ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank	☐ the presence of litter and debris
☐ changes in the character of soil	☐ destruction of terrestrial vegetation
☐ shelving	☐ the presence of wrack line
☐ vegetation matted down, bent, or absent	☐ sediment sorting
☐ leaf litter disturbed or washed away	☐ scour
☐ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size:0.09acres

Wetland type. Explain:palustrine emergent system.

Wetland quality. Explain:system heavily impacted from cattle activity, grazing, trampling.

Project wetlands cross or serve as state boundaries. Explain: N/A.

(b) General Flow Relationship with Non-TNW:

Flow is: **Intermittent flow**. Explain: receives seasonal water table and overland flow/ runoff.

Surface flow is**: Discrete**

Characteristics: wetland is located within a floodplain depression of Scaly Bark Creek.

Subsurface flow: **Yes**. Explain findings: inundation from groundwater flow.

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☒ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** river miles from TNW.

Project waters are **5-10** aerial (straight) miles from TNW.

Flow is from: **Wetland to navigable waters.**

Estimate approximate location of wetland as within the **5 - 10-year** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: This wetland exhibited inundation of 1-4", drainage patterns, water marks, low-chroma soils (7.5YR 4/2), many/faint mottles (7.5YR 4/6), and saturation in the upper 12 inches of the soil profile. Heavily impacted from cattle grazing and waste.

Identify specific pollutants, if known: Cow manure.

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☒ Vegetation type/percent cover. Explain:herbaceous (100%), vegetated mostly with fescue, large amount of Juncus effusus.
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **1**

Approximately (0.09) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland BB	0.09		

Summarize overall biological, chemical and physical functions being performed: wetland performs mostly flood storage.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: Scaly Bark Creek exhibited strong perennial flow, average bankfull widths of 15-20 feet, strong groundwater flow, strong riffle-pool sequences, and substrate consisting of coarse gravel and bed rock outcrops. Biological sampling within Scaly Bark creek resulted in a weak presence of benthic macroinvertebrates, amphibians, and filamentous algae.
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **3,600** linear feet **6-8** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: .
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☒ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): April, 2010

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Scaly Bark Creek Mitigation Site - UT1 & Wetland AA
State:NC County/parish/borough: Stanly City: Albemarle
Center coordinates of site (lat/long in degree decimal format): Lat. 35.329368° **N**, Long. 800.236059° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Scaly Bark Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Rocky River
Name of watershed or Hydrologic Unit Code (HUC): Yadkin 03040105
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: July 12, 2008
☒ Field Determination. Date(s): July 11, 2008

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. Waters of the U.S.

a. Indicate presence of waters of U.S. in review area (check all that apply): [1]
☐ TNWs, including territorial seas
☐ Wetlands adjacent to TNWs
☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
☐ Non-RPWs that flow directly or indirectly into TNWs
☒ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
☐ Impoundments of jurisdictional waters
☐ Isolated (interstate or intrastate) waters, including isolated wetlands

b. Identify (estimate) size of waters of the U.S. in the review area:
Non-wetland waters: 1,434 linear feet: 2-4 width (ft) and/or 0.01 acres.
Wetlands: 0.14 acres.

c. Limits (boundaries) of jurisdiction based on: **1987 Delineation Manual**
Elevation of established OHWM (if known): .

2. Non-regulated waters/wetlands (check if applicable):[3]
☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts	☐ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank	☐ the presence of litter and debris
☐ changes in the character of soil	☐ destruction of terrestrial vegetation
☐ shelving	☐ the presence of wrack line
☐ vegetation matted down, bent, or absent	☐ sediment sorting
☐ leaf litter disturbed or washed away	☐ scour
☐ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size:0.22 acres

Wetland type. Explain:palustrine emergent system, formerly a farm pond.

Wetland quality. Explain:system has been altered in the past, exhibits overall good quality vegetation and ground water.

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Intermittent flow**. Explain: typically inundates during storm events from runoff from adjacent slopes.

Surface flow is**: Confined**

Characteristics: wetland is located within the footprint of a drained pond, portions are channelized.

Subsurface flow: **Yes**. Explain findings: evidence of soil saturation and inundation throughout.

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☒ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **5-10** river miles from TNW.

Project waters are **5-10** aerial (straight) miles from TNW.

Flow is from: **Wetland to navigable waters.**

Estimate approximate location of wetland as within the **500-year or greater** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: This wetland exhibited sediment deposits, drainage patterns, water marks, oxidized root channels, low-chroma soils (10YR 5/1), few distinct mottles (7.5YR 4/6), and saturation in the upper 12 inches of the soil profile. No evidence of pollutant discharge was noted during investigation.

Identify specific pollutants, if known: N/A.

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☒ Riparian buffer. Characteristics (type, average width):narrow shrub/scrub buffer, ~5-10 feet wide.
- ☒ Vegetation type/percent cover. Explain:FACW, mostly herbaceous and shrub species, minor canopy coverage from adjacent mature trees.
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **1**

Approximately (0.22) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)
Wetland AA (Y)	0.22 acre		

Summarize overall biological, chemical and physical functions being performed: wetland performs mostly flood storage and pollutant removal.

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT1 to Scaly Bark Creek exhibited perennial flow, ordinary high water marks, average channel widths of 2-4 feet, moderate groundwater flow, alluvial deposits, and substrate consisting of coarse gravel.
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **1,434** linear feet **2-4** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☒ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☒ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: Wetland AA is directly connected to UT1 via surface water connection. Wetland area receives overflow from channel during stormwater events and runoff from adjacent upland areas.

Provide acreage estimates for jurisdictional wetlands in the review area: **0.22**acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

☐ Other factors. Explain: .

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: .
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☒ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): April, 2010

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Scaly Bark Creek Mitigation Site - UT1A
State:NC County/parish/borough: Stanly City: Albemarle
Center coordinates of site (lat/long in degree decimal format): Lat. 35.329368° **N**, Long. 800.236059° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Scaly Bark Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Rocky River
Name of watershed or Hydrologic Unit Code (HUC): Yadkin 03040105
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: July 12, 2008
☒ Field Determination. Date(s): July 11, 2008

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 390 linear feet: 1-3 width (ft) and/or 0.02 acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
   Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 1,619 **acres**
Drainage area: 46 **acres**
Average annual rainfall: 40 inches
Average annual snowfall: 6 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **4** tributaries before entering TNW.

Project waters are **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: UT1A flows to UT1 to Scaly Bark Creek to Long Creek to Rocky River.
Tributary stream order, if known: First.

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: channel is located in an early successional pasture, historic straightening most likely.

Tributary properties with respect to top of bank (estimate):
Average width: 2-3 feet
Average depth: 1-2 feet
Average side slopes: **2:1.**

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: channel is in moderately good condition, shows little erosion of banks, lacks suitable riparian buffer.
Presence of run/riffle/pool complexes. Explain: little to no bed structure.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): 1-2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **6-10**
Describe flow regime: flows during rain events and during non-growing season.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: established bed and bank throughout.

Subsurface flow: **Unknown**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☒ clear, natural line impressed on the bank	☒ the presence of litter and debris
☒ changes in the character of soil	☐ destruction of terrestrial vegetation
☒ shelving	☒ the presence of wrack line
☐ vegetation matted down, bent, or absent	☒ sediment sorting
☒ leaf litter disturbed or washed away	☐ scour
☒ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: water in channel appears relatively good quality; channel may receive agricultural runoff from adjacent cattle pasture.
Identify specific pollutants, if known: N/A.

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☒ Riparian corridor. Characteristics (type, average width): narrow forested buffer, 5-10 feet.
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☒ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: UT1A to Scaly Bark Creek exhibited a continuous bed and bank, average bankfull widths of 3-4 feet, minor alluvial deposits, moderate flow during winter months, and substrate consisting of silt to coarse sand.

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **390** linear feet**1-3** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: .
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☒ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): April, 2010

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Scaly Bark Creek Mitigation Site - UT1B
State:NC County/parish/borough: Stanly City: Albemarle
Center coordinates of site (lat/long in degree decimal format): Lat. 35.329368° **N**, Long. 800.236059° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Scaly Bark Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Rocky River
Name of watershed or Hydrologic Unit Code (HUC): Yadkin 03040105
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: July 12, 2008
☒ Field Determination. Date(s): July 11, 2008

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 1,198 linear feet: 4-6 width (ft) and/or 0.14 acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
   Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 1,619 **acres**
Drainage area: 83 **acres**
Average annual rainfall: 40 inches
Average annual snowfall: 6 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **4** tributaries before entering TNW.

Project waters are **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: UT1B flows to UT1 to Scaly Bark Creek to Long Creek to Rocky River.
Tributary stream order, if known: First.

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: channel is located in an early successional pasture, historic straightening most likely.

Tributary properties with respect to top of bank (estimate):
Average width: 4-6 feet
Average depth: 1-2 feet
Average side slopes: **2:1.**

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☐ Concrete
☐ Cobbles	☒ Gravel	☐ Muck
☒ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: channel bed is relatively stable due to bedrock outcropping; completely lacks suitable vegetative buffer.
Presence of run/riffle/pool complexes. Explain: moderate presence.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): 1-2 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **6-10**
Describe flow regime: flows during rain events and during non-growing season.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: established bed and bank throughout.

Subsurface flow: **Unknown**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☒ clear, natural line impressed on the bank	☐ the presence of litter and debris
☒ changes in the character of soil	☒ destruction of terrestrial vegetation
☒ shelving	☐ the presence of wrack line
☒ vegetation matted down, bent, or absent	☒ sediment sorting
☐ leaf litter disturbed or washed away	☐ scour
☒ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: channel receives agricultural runoff from adjacent cattle pastures; cattle have full access to channel.
Identify specific pollutants, if known: cow manure.

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☒ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: UT1B to Scaly Bark Creek exhibited a continuous bed and bank, average bankfull widths of 8-10 feet, minor alluvial deposits, moderate flow during winter months, and substrate consisting of silt to coarse sand and areas of bedrock outcropping.

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **1,198** linear feet **4-6** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: .
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☒ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): April, 2010

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Scaly Bark Creek Mitigation Site - UT2
State:NC County/parish/borough: Stanly City: Albemarle
Center coordinates of site (lat/long in degree decimal format): Lat. 35.329368° **N**, Long. 800.236059° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Scaly Bark Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Rocky River
Name of watershed or Hydrologic Unit Code (HUC): Yadkin 03040105
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: July 12, 2008
☒ Field Determination. Date(s): July 11, 2008

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 300 linear feet: 5-6 width (ft) and/or 0.04 acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
   Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: **Pick List**
Drainage area: **Pick List**
Average annual rainfall: inches
Average annual snowfall: inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☐ Tributary flows through **Pick List** tributaries before entering TNW.

Project waters are **Pick List** river miles from TNW.
Project waters are **Pick List** river miles from RPW.
Project waters are **Pick List** aerial (straight) miles from TNW.
Project waters are **Pick List** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: .
Tributary stream order, if known: .

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☐ Natural
☐ Artificial (man-made). Explain: .
☐ Manipulated (man-altered). Explain: .

Tributary properties with respect to top of bank (estimate):
Average width: feet
Average depth: feet
Average side slopes: **Pick List.**

Primary tributary substrate composition (check all that apply):

☐ Silts	☐ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: .
Presence of run/riffle/pool complexes. Explain: .
Tributary geometry: **Pick List**
Tributary gradient (approximate average slope): %

(c) Flow:
Tributary provides for: **Pick List**
Estimate average number of flow events in review area/year: **Pick List**
Describe flow regime: .
Other information on duration and volume: .

Surface flow is: **Pick List.** Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☐ Bed and banks
☐ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank	☐ the presence of litter and debris
☐ changes in the character of soil	☐ destruction of terrestrial vegetation
☐ shelving	☐ the presence of wrack line
☐ vegetation matted down, bent, or absent	☐ sediment sorting
☐ leaf litter disturbed or washed away	☐ scour
☐ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: .
Identify specific pollutants, if known: .

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☒ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: UT2 to Scaly Bark Creek exhibited strong perennial flow, average bankfull widths of 10-15 feet, moderate groundwater flow, moderate riffle-pool sequences, and substrate consisting of coarse gravel to small cobbles. Biological sampling within Scaly Bark creek resulted in a weak presence of benthic macroinvertebrates and amphibians.
   - ☐ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **300** linear feet**5-6** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: .
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☒ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): April, 2010

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Scaly Bark Creek Mitigation Site - UT3
State:NC County/parish/borough: Stanly City: Albemarle
Center coordinates of site (lat/long in degree decimal format): Lat. 35.329368° **N**, Long. 800.236059° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Scaly Bark Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Rocky River
Name of watershed or Hydrologic Unit Code (HUC): Yadkin 03040105
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: July 12, 2008
☒ Field Determination. Date(s): July 11, 2008

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 282 linear feet: 2-3 width (ft) and/or 0.02 acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
   Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 1,619 **acres**
Drainage area: 36 **acres**
Average annual rainfall: 40 inches
Average annual snowfall: 6 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **3** tributaries before entering TNW.

Project waters are **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: UT3 flows to Scaly Bark Creek to Long Creek to Rocky River.
Tributary stream order, if known: First.

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: channel is located in an early successional pasture, channel has been straightened, large impact from cattle activity.

Tributary properties with respect to top of bank (estimate):
Average width: 2-3 feet
Average depth: 1 feet
Average side slopes: **2:1.**

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☐ Concrete
☐ Cobbles	☐ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: channel is in moderately poor condition from heavy cattle activity, exhibits little to no erosion, completely lacks vegetative buffer.
Presence of run/riffle/pool complexes. Explain: none.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): ~1 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **2-5**
Describe flow regime: flows during rain events and during non-growing season.
Other information on duration and volume: .

Surface flow is: **Confined.** Characteristics: established bed and bank throughout.

Subsurface flow: **Unknown**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☐ clear, natural line impressed on the bank	☐ the presence of litter and debris
☒ changes in the character of soil	☒ destruction of terrestrial vegetation
☐ shelving	☐ the presence of wrack line
☒ vegetation matted down, bent, or absent	☒ sediment sorting
☐ leaf litter disturbed or washed away	☐ scour
☒ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: channel receives agricultural runoff from adjacent cattle pastures; cattle have full access to channel.
Identify specific pollutants, if known: cow manure.

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[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☒ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: UT3 to Scaly Bark Creek exhibited a continuous bed and bank, average bankfull widths of 6-8 feet, minor alluvial deposits, moderate flow during winter months, and substrate consisting of silt to coarse sand.

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **282** linear feet**2-3**width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: **.**

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: **.**

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: .
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☒ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

APPROVED JURISDICTIONAL DETERMINATION FORM
U.S. Army Corps of Engineers

This form should be completed by following the instructions provided in Section IV of the JD Form Instructional Guidebook.

SECTION I: BACKGROUND INFORMATION

A. REPORT COMPLETION DATE FOR APPROVED JURISDICTIONAL DETERMINATION (JD): April, 2010

B. DISTRICT OFFICE, FILE NAME, AND NUMBER:Asheville Regional Office

C. PROJECT LOCATION AND BACKGROUND INFORMATION: Scaly Bark Creek Mitigation Site - UT4
State:NC County/parish/borough: Stanly City: Albemarle
Center coordinates of site (lat/long in degree decimal format): Lat. 35.329368° **N**, Long. 800.236059° **W**.
Universal Transverse Mercator:
Name of nearest waterbody: Scaly Bark Creek
Name of nearest Traditional Navigable Water (TNW) into which the aquatic resource flows: Rocky River
Name of watershed or Hydrologic Unit Code (HUC): Yadkin 03040105
☒ Check if map/diagram of review area and/or potential jurisdictional areas is/are available upon request.
☐ Check if other sites (e.g., offsite mitigation sites, disposal sites, etc…) are associated with this action and are recorded on a different JD form.

D. REVIEW PERFORMED FOR SITE EVALUATION (CHECK ALL THAT APPLY):
☒ Office (Desk) Determination. Date: July 12, 2008
☒ Field Determination. Date(s): July 11, 2008

SECTION II: SUMMARY OF FINDINGS

A. RHA SECTION 10 DETERMINATION OF JURISDICTION.

There **Are no** *"navigable waters of the U.S."* within Rivers and Harbors Act (RHA) jurisdiction (as defined by 33 CFR part 329) in the review area. [*Required*]
☐ Waters subject to the ebb and flow of the tide.
☐ Waters are presently used, or have been used in the past, or may be susceptible for use to transport interstate or foreign commerce.
Explain: .

B. CWA SECTION 404 DETERMINATION OF JURISDICTION.

There **Are** "*waters of the U.S.*" within Clean Water Act (CWA) jurisdiction (as defined by 33 CFR part 328) in the review area. [*Required*]

1. **Waters of the U.S.**
   a. **Indicate presence of waters of U.S. in review area (check all that apply):** [1]
      ☐ TNWs, including territorial seas
      ☐ Wetlands adjacent to TNWs
      ☒ Relatively permanent waters[2] (RPWs) that flow directly or indirectly into TNWs
      ☐ Non-RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to but not directly abutting RPWs that flow directly or indirectly into TNWs
      ☐ Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs
      ☐ Impoundments of jurisdictional waters
      ☐ Isolated (interstate or intrastate) waters, including isolated wetlands

   b. **Identify (estimate) size of waters of the U.S. in the review area:**
      Non-wetland waters: 1,116 linear feet: 2-3 width (ft) and/or 0.07 acres.
      Wetlands: acres.

   c. **Limits (boundaries) of jurisdiction** based on: **1987 Delineation Manual**
      Elevation of established OHWM (if known): .

2. **Non-regulated waters/wetlands (check if applicable):**[3]
   ☐ Potentially jurisdictional waters and/or wetlands were assessed within the review area and determined to be not jurisdictional.
   Explain: .

[1] Boxes checked below shall be supported by completing the appropriate sections in Section III below.
[2] For purposes of this form, an RPW is defined as a tributary that is not a TNW and that typically flows year-round or has continuous flow at least "seasonally" (e.g., typically 3 months).
[3] Supporting documentation is presented in Section III.F.

SECTION III: CWA ANALYSIS

A. TNWs AND WETLANDS ADJACENT TO TNWs

The agencies will assert jurisdiction over TNWs and wetlands adjacent to TNWs. If the aquatic resource is a TNW, complete Section III.A.1 and Section III.D.1. only; if the aquatic resource is a wetland adjacent to a TNW, complete Sections III.A.1 and 2 and Section III.D.1.; otherwise, see Section III.B below.

1. TNW
Identify TNW: .

Summarize rationale supporting determination: .

2. Wetland adjacent to TNW
Summarize rationale supporting conclusion that wetland is "adjacent": .

B. CHARACTERISTICS OF TRIBUTARY (THAT IS NOT A TNW) AND ITS ADJACENT WETLANDS (IF ANY):

This section summarizes information regarding characteristics of the tributary and its adjacent wetlands, if any, and it helps determine whether or not the standards for jurisdiction established under *Rapanos* have been met.

The agencies will assert jurisdiction over non-navigable tributaries of TNWs where the tributaries are "relatively permanent waters" (RPWs), i.e. tributaries that typically flow year-round or have continuous flow at least seasonally (e.g., typically 3 months). A wetland that directly abuts an RPW is also jurisdictional. If the aquatic resource is not a TNW, but has year-round (perennial) flow, skip to Section III.D.2. If the aquatic resource is a wetland directly abutting a tributary with perennial flow, skip to Section III.D.4.

A wetland that is adjacent to but that does not directly abut an RPW requires a significant nexus evaluation. Corps districts and EPA regions will include in the record any available information that documents the existence of a significant nexus between a relatively permanent tributary that is not perennial (and its adjacent wetlands if any) and a traditional navigable water, even though a significant nexus finding is not required as a matter of law.

If the waterbody[4] is not an RPW, or a wetland directly abutting an RPW, a JD will require additional data to determine if the waterbody has a significant nexus with a TNW. If the tributary has adjacent wetlands, the significant nexus evaluation must consider the tributary in combination with all of its adjacent wetlands. This significant nexus evaluation that combines, for analytical purposes, the tributary and all of its adjacent wetlands is used whether the review area identified in the JD request is the tributary, or its adjacent wetlands, or both. If the JD covers a tributary with adjacent wetlands, complete Section III.B.1 for the tributary, Section III.B.2 for any onsite wetlands, and Section III.B.3 for all wetlands adjacent to that tributary, both onsite and offsite. The determination whether a significant nexus exists is determined in Section III.C below.

1. Characteristics of non-TNWs that flow directly or indirectly into TNW

(i) General Area Conditions:
Watershed size: 1,619 **acres**
Drainage area: 25 **acres**
Average annual rainfall: 40 inches
Average annual snowfall: 6 inches

(ii) Physical Characteristics:
(a) Relationship with TNW:
☐ Tributary flows directly into TNW.
☒ Tributary flows through **3** tributaries before entering TNW.

Project waters are **5-10** river miles from TNW.
Project waters are **1 (or less)** river miles from RPW.
Project waters are **5-10** aerial (straight) miles from TNW.
Project waters are **1 (or less)** aerial (straight) miles from RPW.
Project waters cross or serve as state boundaries. Explain: .

Identify flow route to TNW[5]: UT4 flows to Scaly Bark Creek to Long Creek to Rocky River.
Tributary stream order, if known: First.

[4] Note that the Instructional Guidebook contains additional information regarding swales, ditches, washes, and erosional features generally and in the arid West.
[5] Flow route can be described by identifying, e.g., tributary a, which flows through the review area, to flow into tributary b, which then flows into TNW.

(b) General Tributary Characteristics (check all that apply):

Tributary is: ☒ Natural
☐ Artificial (man-made). Explain: .
☒ Manipulated (man-altered). Explain: portions of this channel are located in an early successional pasture, the channel, in these areas, has been straightened + some culvert placement.

Tributary properties with respect to top of bank (estimate):
Average width: 2-3 feet
Average depth: 1 feet
Average side slopes: **2:1.**

Primary tributary substrate composition (check all that apply):

☒ Silts	☒ Sands	☐ Concrete
☐ Cobbles	☒ Gravel	☐ Muck
☐ Bedrock	☐ Vegetation. Type/% cover:	
☐ Other. Explain: .		

Tributary condition/stability [e.g., highly eroding, sloughing banks]. Explain: the lower portion of the channel is in moderately poor condition from heavy cattle activity, exhibits little to no erosion. The upper portion of the channel shows good stability and bed form, little to no cattle impact.
Presence of run/riffle/pool complexes. Explain: weak to moderate riffle-pool sequences.
Tributary geometry: **Relatively straight**
Tributary gradient (approximate average slope): 2-6 %

(c) Flow:
Tributary provides for: **Seasonal flow**
Estimate average number of flow events in review area/year: **2-5**
Describe flow regime: flows during rain events and during non-growing season.
Other information on duration and volume: .

Surface flow is: **Confined**. Characteristics: established bed and bank throughout.

Subsurface flow: **Unknown**. Explain findings: .
☐ Dye (or other) test performed: .

Tributary has (check all that apply):
☒ Bed and banks
☒ OHWM[6] (check all indicators that apply):

☒ clear, natural line impressed on the bank	☒ the presence of litter and debris
☒ changes in the character of soil	☒ destruction of terrestrial vegetation
☐ shelving	☒ the presence of wrack line
☒ vegetation matted down, bent, or absent	☒ sediment sorting
☒ leaf litter disturbed or washed away	☒ scour
☒ sediment deposition	☐ multiple observed or predicted flow events
☐ water staining	☐ abrupt change in plant community
☐ other (list):	

☐ Discontinuous OHWM.[7] Explain: .

If factors other than the OHWM were used to determine lateral extent of CWA jurisdiction (check all that apply):

☐ High Tide Line indicated by:	☐ Mean High Water Mark indicated by:
☐ oil or scum line along shore objects	☐ survey to available datum;
☐ fine shell or debris deposits (foreshore)	☐ physical markings;
☐ physical markings/characteristics	☐ vegetation lines/changes in vegetation types.
☐ tidal gauges	
☐ other (list):	

(iii) Chemical Characteristics:
Characterize tributary (e.g., water color is clear, discolored, oily film; water quality; general watershed characteristics, etc.).
Explain: channel receives agricultural runoff from adjacent cattle pastures; cattle have full access to channel.
Identify specific pollutants, if known: cow manure.

[6]A natural or man-made discontinuity in the OHWM does not necessarily sever jurisdiction (e.g., where the stream temporarily flows underground, or where the OHWM has been removed by development or agricultural practices). Where there is a break in the OHWM that is unrelated to the waterbody's flow regime (e.g., flow over a rock outcrop or through a culvert), the agencies will look for indicators of flow above and below the break.
[7]Ibid.

(iv) Biological Characteristics. Channel supports (check all that apply):

- ☐ Riparian corridor. Characteristics (type, average width): .
- ☐ Wetland fringe. Characteristics: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

2. Characteristics of wetlands adjacent to non-TNW that flow directly or indirectly into TNW

(i) Physical Characteristics:

(a) General Wetland Characteristics:

Properties:

Wetland size: acres

Wetland type. Explain: .

Wetland quality. Explain: .

Project wetlands cross or serve as state boundaries. Explain: .

(b) General Flow Relationship with Non-TNW:

Flow is: **Pick List**. Explain: .

Surface flow is**: Pick List**

Characteristics: .

Subsurface flow: **Pick List**. Explain findings: .

- ☐ Dye (or other) test performed: .

(c) Wetland Adjacency Determination with Non-TNW:

- ☐ Directly abutting
- ☐ Not directly abutting
  - ☐ Discrete wetland hydrologic connection. Explain: .
  - ☐ Ecological connection. Explain: .
  - ☐ Separated by berm/barrier. Explain: .

(d) Proximity (Relationship) to TNW

Project wetlands are **Pick List** river miles from TNW.

Project waters are **Pick List** aerial (straight) miles from TNW.

Flow is from: **Pick List.**

Estimate approximate location of wetland as within the **Pick List** floodplain.

(ii) Chemical Characteristics:

Characterize wetland system (e.g., water color is clear, brown, oil film on surface; water quality; general watershed characteristics; etc.). Explain: .

Identify specific pollutants, if known: .

(iii) Biological Characteristics. Wetland supports (check all that apply):

- ☐ Riparian buffer. Characteristics (type, average width): .
- ☐ Vegetation type/percent cover. Explain: .
- ☐ Habitat for:
  - ☐ Federally Listed species. Explain findings: .
  - ☐ Fish/spawn areas. Explain findings: .
  - ☐ Other environmentally-sensitive species. Explain findings: .
  - ☐ Aquatic/wildlife diversity. Explain findings: .

3. Characteristics of all wetlands adjacent to the tributary (if any)

All wetland(s) being considered in the cumulative analysis: **Pick List**

Approximately ( ) acres in total are being considered in the cumulative analysis.

For each wetland, specify the following:

Directly abuts? (Y/N)	Size (in acres)	Directly abuts? (Y/N)	Size (in acres)

Summarize overall biological, chemical and physical functions being performed: .

C. SIGNIFICANT NEXUS DETERMINATION

A significant nexus analysis will assess the flow characteristics and functions of the tributary itself and the functions performed by any wetlands adjacent to the tributary to determine if they significantly affect the chemical, physical, and biological integrity of a TNW. For each of the following situations, a significant nexus exists if the tributary, in combination with all of its adjacent wetlands, has more than a speculative or insubstantial effect on the chemical, physical and/or biological integrity of a TNW. Considerations when evaluating significant nexus include, but are not limited to the volume, duration, and frequency of the flow of water in the tributary and its proximity to a TNW, and the functions performed by the tributary and all its adjacent wetlands. It is not appropriate to determine significant nexus based solely on any specific threshold of distance (e.g. between a tributary and its adjacent wetland or between a tributary and the TNW). Similarly, the fact an adjacent wetland lies within or outside of a floodplain is not solely determinative of significant nexus.

Draw connections between the features documented and the effects on the TNW, as identified in the *Rapanos* Guidance and discussed in the Instructional Guidebook. Factors to consider include, for example:

- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to carry pollutants or flood waters to TNWs, or to reduce the amount of pollutants or flood waters reaching a TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), provide habitat and lifecycle support functions for fish and other species, such as feeding, nesting, spawning, or rearing young for species that are present in the TNW?
- Does the tributary, in combination with its adjacent wetlands (if any), have the capacity to transfer nutrients and organic carbon that support downstream foodwebs?
- Does the tributary, in combination with its adjacent wetlands (if any), have other relationships to the physical, chemical, or biological integrity of the TNW?

Note: the above list of considerations is not inclusive and other functions observed or known to occur should be documented below:

1. **Significant nexus findings for non-RPW that has no adjacent wetlands and flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary itself, then go to Section III.D: .

2. **Significant nexus findings for non-RPW and its adjacent wetlands, where the non-RPW flows directly or indirectly into TNWs.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

3. **Significant nexus findings for wetlands adjacent to an RPW but that do not directly abut the RPW.** Explain findings of presence or absence of significant nexus below, based on the tributary in combination with all of its adjacent wetlands, then go to Section III.D: .

D. DETERMINATIONS OF JURISDICTIONAL FINDINGS. THE SUBJECT WATERS/WETLANDS ARE (CHECK ALL THAT APPLY):

1. **TNWs and Adjacent Wetlands.** Check all that apply and provide size estimates in review area:
   - ☐ TNWs: linear feet width (ft), Or, acres.
   - ☐ Wetlands adjacent to TNWs: acres.

2. **RPWs that flow directly or indirectly into TNWs.**
   - ☐ Tributaries of TNWs where tributaries typically flow year-round are jurisdictional. Provide data and rationale indicating that tributary is perennial: .
   - ☒ Tributaries of TNW where tributaries have continuous flow "seasonally" (e.g., typically three months each year) are jurisdictional. Data supporting this conclusion is provided at Section III.B. Provide rationale indicating that tributary flows seasonally: UT4 to Scaly Bark Creek exhibited a continuous bed and bank, average bankfull widths of 6-8 feet, moderate alluvial deposits, moderate flow during winter months, moderate headcuts, and substrate consisting of silt to coarse gravel.

Provide estimates for jurisdictional waters in the review area (check all that apply):
☒ Tributary waters: **1,216** linear feet **2-3** width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

3. Non-RPWs[8] that flow directly or indirectly into TNWs.
☐ Waterbody that is not a TNW or an RPW, but flows directly or indirectly into a TNW, and it has a significant nexus with a TNW is jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional waters within the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .

4. Wetlands directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands directly abut RPW and thus are jurisdictional as adjacent wetlands.
☐ Wetlands directly abutting an RPW where tributaries typically flow year-round. Provide data and rationale indicating that tributary is perennial in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

☐ Wetlands directly abutting an RPW where tributaries typically flow "seasonally." Provide data indicating that tributary is seasonal in Section III.B and rationale in Section III.D.2, above. Provide rationale indicating that wetland is directly abutting an RPW: .

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

5. Wetlands adjacent to but not directly abutting an RPW that flow directly or indirectly into TNWs.
☐ Wetlands that do not directly abut an RPW, but when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisidictional. Data supporting this conclusion is provided at Section III.C.

Provide acreage estimates for jurisdictional wetlands in the review area: acres.

6. Wetlands adjacent to non-RPWs that flow directly or indirectly into TNWs.
☐ Wetlands adjacent to such waters, and have when considered in combination with the tributary to which they are adjacent and with similarly situated adjacent wetlands, have a significant nexus with a TNW are jurisdictional. Data supporting this conclusion is provided at Section III.C.

Provide estimates for jurisdictional wetlands in the review area: acres.

7. Impoundments of jurisdictional waters.[9]
As a general rule, the impoundment of a jurisdictional tributary remains jurisdictional.
☐ Demonstrate that impoundment was created from "waters of the U.S.," or
☐ Demonstrate that water meets the criteria for one of the categories presented above (1-6), or
☐ Demonstrate that water is isolated with a nexus to commerce (see E below).

E. ISOLATED [INTERSTATE OR INTRA-STATE] WATERS, INCLUDING ISOLATED WETLANDS, THE USE, DEGRADATION OR DESTRUCTION OF WHICH COULD AFFECT INTERSTATE COMMERCE, INCLUDING ANY SUCH WATERS (CHECK ALL THAT APPLY):[10]
☐ which are or could be used by interstate or foreign travelers for recreational or other purposes.
☐ from which fish or shellfish are or could be taken and sold in interstate or foreign commerce.
☐ which are or could be used for industrial purposes by industries in interstate commerce.
☐ Interstate isolated waters. Explain: .
☐ Other factors. Explain: .

[8] See Footnote # 3.
[9] To complete the analysis refer to the key in Section III.D.6 of the Instructional Guidebook.
[10] Prior to asserting or declining CWA jurisdiction based solely on this category, Corps Districts will elevate the action to Corps and EPA HQ for review consistent with the process described in the Corps/EPA *Memorandum Regarding CWA Act Jurisdiction Following Rapanos.*

Identify water body and summarize rationale supporting determination: .

Provide estimates for jurisdictional waters in the review area (check all that apply):
☐ Tributary waters: linear feet width (ft).
☐ Other non-wetland waters: acres.
Identify type(s) of waters: .
☐ Wetlands: acres.

F. NON-JURISDICTIONAL WATERS, INCLUDING WETLANDS (CHECK ALL THAT APPLY):
☐ If potential wetlands were assessed within the review area, these areas did not meet the criteria in the 1987 Corps of Engineers Wetland Delineation Manual and/or appropriate Regional Supplements.
☐ Review area included isolated waters with no substantial nexus to interstate (or foreign) commerce.
☐ Prior to the Jan 2001 Supreme Court decision in "*SWANCC*," the review area would have been regulated based solely on the "Migratory Bird Rule" (MBR).
☐ Waters do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction. Explain: .
☐ Other: (explain, if not covered above): .

Provide acreage estimates for non-jurisdictional waters in the review area, where the sole potential basis of jurisdiction is the MBR factors (i.e., presence of migratory birds, presence of endangered species, use of water for irrigated agriculture), using best professional judgment (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

Provide acreage estimates for non-jurisdictional waters in the review area that do not meet the "Significant Nexus" standard, where such a finding is required for jurisdiction (check all that apply):
☐ Non-wetland waters (i.e., rivers, streams): linear feet, width (ft).
☐ Lakes/ponds: acres.
☐ Other non-wetland waters: acres. List type of aquatic resource: .
☐ Wetlands: acres.

SECTION IV: DATA SOURCES.

A. SUPPORTING DATA. Data reviewed for JD (check all that apply - checked items shall be included in case file and, where checked and requested, appropriately reference sources below):
☒ Maps, plans, plots or plat submitted by or on behalf of the applicant/consultant: .
☒ Data sheets prepared/submitted by or on behalf of the applicant/consultant.
☐ Office concurs with data sheets/delineation report.
☐ Office does not concur with data sheets/delineation report.
☐ Data sheets prepared by the Corps: .
☐ Corps navigable waters' study: .
☒ U.S. Geological Survey Hydrologic Atlas: .
☐ USGS NHD data.
☒ USGS 8 and 12 digit HUC maps.
☒ U.S. Geological Survey map(s). Cite scale & quad name: .
☒ USDA Natural Resources Conservation Service Soil Survey. Citation: .
☐ National wetlands inventory map(s). Cite name: .
☐ State/Local wetland inventory map(s): .
☒ FEMA/FIRM maps: .
☐ 100-year Floodplain Elevation is: (National Geodectic Vertical Datum of 1929)
☒ Photographs: ☒ Aerial (Name & Date): .
or ☒ Other (Name & Date):see attached report.
☐ Previous determination(s). File no. and date of response letter: .
☐ Applicable/supporting case law: .
☐ Applicable/supporting scientific literature: .
☐ Other information (please specify): .

B. ADDITIONAL COMMENTS TO SUPPORT JD: .

Appendix 3:
Historical Aerial Photographs

Scaly Bark Creek Mitigation Site
NC 24/27 HWY
Albemarle, NC 28001

Inquiry Number: 2604697.4
October 02, 2009

The EDR Aerial Photo Decade Package

EDR® Environmental Data Resources Inc

440 Wheelers Farms Road
Milford, CT 06461
800.352.0050
www.edrnet.com

EDR Aerial Photo Decade Package

Environmental Data Resources, Inc. (EDR) Aerial Photo Decade Package is a screening tool designed to assist environmental professionals in evaluating potential liability on a target property resulting from past activities. EDRs professional researchers provide digitally reproduced historical aerial photographs, and when available, provide one photo per decade.

When delivered electronically by EDR, the aerial photo images included with this report are for ONE TIME USE ONLY. Further reproduction of these aerial photo images is prohibited without permission from EDR. For more information contact your EDR Account Executive.

Thank you for your business.
Please contact EDR at 1-800-352-0050
with any questions or comments.

Date EDR Searched Historical Sources:

Aerial Photography October 02, 2009

Target Property:

NC 24/27 HWY

Albemarle, NC 28001

Year	***Scale***	***Details***	***Source***
1977	Aerial Photograph. Scale: 1"=1000'	Panel #: 2435080-C2/Flight Date: March 01, 1977	EDR
1983	Aerial Photograph. Scale: 1"=1000'	Panel #: 2435080-C2/Flight Date: January 19, 1983	EDR
1993	Aerial Photograph. Scale: 1"=750'	Panel #: 2435080-C2/Flight Date: January 23, 1993	EDR
1998	Aerial Photograph. Scale: 1"=750'	Panel #: 2435080-C2/Flight Date: March 11, 1998	EDR
2006	Aerial Photograph. 1" = 604'	Flight Year: 2006	EDR


INQUIRY #: 2604697.4
YEAR: 1977
= 1000'
N


INQUIRY #: 2604697.4
YEAR: 1983
= 1000'
N


INQUIRY #: 2604697.4
YEAR: 1993
= 750'
N


INQUIRY #: 2604697.4
YEAR: 1998
= 750'
N


INQUIRY #: 2604697.4
YEAR: 2006
= 604'
N

Appendix 4:
Regulatory Agency Correspondence

October 2, 2009

Marella Buncick
US Fish and Wildlife Service
Asheville Field Office
160 Zillicoa Street
Asheville, NC 28801

Subject: **Scaly Bark Creek Stream Mitigation Project**
Stanly County, North Carolina

Dear Ms. Buncick,

The Scaly Bark Creek Mitigation site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel impacts. Several sections of channel throughout the site have been identified as significantly degraded as a result of past agricultural activities.

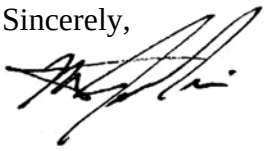
We have already obtained an updated species list for Stanly County from your web site (http://nc-es.fws.gov/es/countyfr.html). The threatened or endangered species for this county are: Schweinitz's sunflower (*Helianthus schweinitzii*). A pedestrian survey of the site was performed on August 5, 2008. On-site habitats include active pastures, streamside thickets, and late successional woodlands. There is minimal habitat available for Schweinitz's sunflower on-site. Much of the soil is degraded and barren due to cattle activity and unstable, eroding banks. The majority of native plant growth at the site is present on the channel banks and buffer zones, which lack the proper soil conditions for Schweinitz's sunflower. As a result of the pedestrian survey, no individual species were found to exist on the site and it is determined that no species will be effected as a result of this project.

Please provide comments on any possible issues that might emerge with respect to endangered species, migratory birds or other trust resources from the construction of a stream restoration project on the subject property. A USGS map (Figure 1) showing the approximate property lines and areas of potential ground disturbance is enclosed. Figure 1 was prepared from the Albemarle, NC 7.5-Minute Topographic Quadrangle.

If we have not heard from you in 30 days we will assume that our species list and site determination are correct, that you do not have any comments regarding associated laws, and that you do not have any information relevant to this project at the current time.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,



Matt L. Jenkins, PWS
Environmental Scientist

Attachment:
Figure 1. USGS Site Location Map

October 2, 2009

Shannon Deaton
North Carolina Wildlife Resource Commission
Division of Inland Fisheries
1721 Mail Service Center
Raleigh, NC 27699

Subject: **Scaly Bark Creek Stream Mitigation Project**
Stanly County, North Carolina

Dear Mr. Deaton,

The purpose of this letter is to request review and comment on any possible issues that might emerge with respect to fish and wildlife issues associated with a potential stream restoration project on the attached site. A USGS map (Figure 1) showing the approximate property lines and areas of potential ground disturbance is enclosed. Figure 1 was prepared from the Albemarle, NC 7.5-Minute Topographic Quadrangle.

The Scaly Bark Stream Mitigation Project site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel impacts. Several sections of channel throughout the site have been identified as significantly degraded as a result of past agricultural activities

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,

Matt L. Jenkins, PWS
Environmental Scientist

Attachment:
Figure 1. USGS Site Location Map

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

22 October 2009

Mr. Matt L. Jenkins
Wildlands Engineering, Inc.
1430 South Mint Street
Suite 104
Charlotte, NC 28203

Subject: Scaly Bark Creek Stream Mitigation Project – Stanly County, North Carolina.

Dear Mr. Jenkins:

Biologists with the North Carolina Wildlife Resources Commission have reviewed the subject information. Our comments are provided in accordance with provisions of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661-667d) and North Carolina General Statutes (G.S. 113-131 et seq.).

The proposed project includes restoration of a stream channel that has been significantly degraded by agricultural activities. Scaly Bark Creek is a tributary to Long Creek in the Yadkin-Pee Dee River basin. There are records for the federal species of concern and state special concern Carolina darter (*Ethestoma collis*) in Long Creek.

Stream and wetland restoration projects often improve water quality and aquatic habitat. We recommend establishing native, forested buffers in riparian areas to protect water quality, improve terrestrial habitat, and provide a travel corridor for wildlife species. Provided natural channel design methods are used and measures are taken to minimize erosion and sedimentation from construction/restoration activities, we do not anticipate the project to result in significant adverse impacts to aquatic and terrestrial wildlife resources.

Thank you for the opportunity to review this project. If we can provide further assistance, please contact our office at (336) 449-7625.

Sincerely,

Shari L. Bryant

Shari L. Bryant
Piedmont Region Coordinator
Habitat Conservation Program

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

October 2, 2009

Renee Gledhill-Earley
State Historic Preservation Office
4617 Mail Service Center
Raleigh, NC 27699-4617

Subject: **Scaly Bark Creek Stream Mitigation Project**
Stanly County, North Carolina

Dear Ms. Gledhill-Earley,

The Ecosystem Enhancement Program (EEP) requests review and comment on any possible issues that might emerge with respect to archaeological or cultural resources associated with a potential stream restoration project on the attached site. A USGS map (Figure 1) showing the approximate property lines and areas of potential ground disturbance is enclosed. Figure 1 was prepared from the Albemarle, NC 7.5-Minute Topographic Quadrangle.

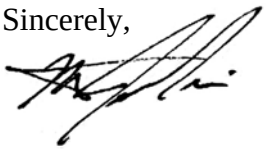
The Scaly Bark Creek Stream Mitigation site has been identified for the purpose of providing in-kind mitigation for unavoidable stream channel impacts. Several sections of channel throughout the site have been identified as significantly degraded as a result of past agricultural activities.

The majority of the site has historically been disturbed due to agricultural purposes such as tilling, land clearing for pastures, and active cattle grazing. Wildlands contracted New South Associates to perform an "in-office" historical and archaeological screening of the Scaly Bark Creek site. Their findings indicate that the area in general has a low potential for archaeological sites and that the Oaksboro silt loam and Misenheimer channery silt loam soils located in the floodplain in particular have a very low potential. The Scaly Bark project is contained primarily within these soil types so the likelihood of encountering archaeological sites in these areas is extremely low. Ridge noses and tops in Badin and Goldston soils that could have a moderately high potential of containing areas of archaeological remains will not be impacted by the proposed mitigation project. New South Associates' professional opinion is that more detailed surveys would not be required.

We ask that you review this site based on the attached information to determine the presence of any historic properties.

We thank you in advance for your timely response and cooperation. Please feel free to contact us with any questions that you may have concerning the extent of site disturbance associated with this project.

Sincerely,



Matt L. Jenkins, PWS
Environmental Scientist

Attachment:
Figure 1. USGS Site Location Map

North Carolina Department of Cultural Resources

State Historic Preservation Office

Peter B. Sandbeck, Administrator

Michael F. Easley, Governor
Lisbeth C. Evans, Secretary
Jeffrey J. Crow, Deputy Secretary

Office of Archives and History
Division of Historical Resources
David Brook, Director

November 2, 2009

Matt Jenkins
Wildlands Engineering, Inc.
1430 South Mint Street
Suite 104
Charlotte, NC 28203

Re: Scaly Bark Creek Stream Mitigation, Stanly County, ER 09-2452

Dear Mr. Jenkins:

Thank you for your email of October 2, 2009, concerning the above project.

We have conducted a review of the project and are aware of no historic resources which would be affected by the project. Therefore, we have no comment on the project as proposed.

The above comments are made pursuant to Section 106 of the National Historic Preservation Act and the Advisory Council on Historic Preservation's Regulations for Compliance with Section 106 codified at 36 CFR Part 800.

Thank you for your cooperation and consideration. If you have questions concerning the above comment, please contact Renee Gledhill-Earley, environmental review coordinator, at 919-807-6579. In all future communication concerning this project, please cite the above-referenced tracking number.

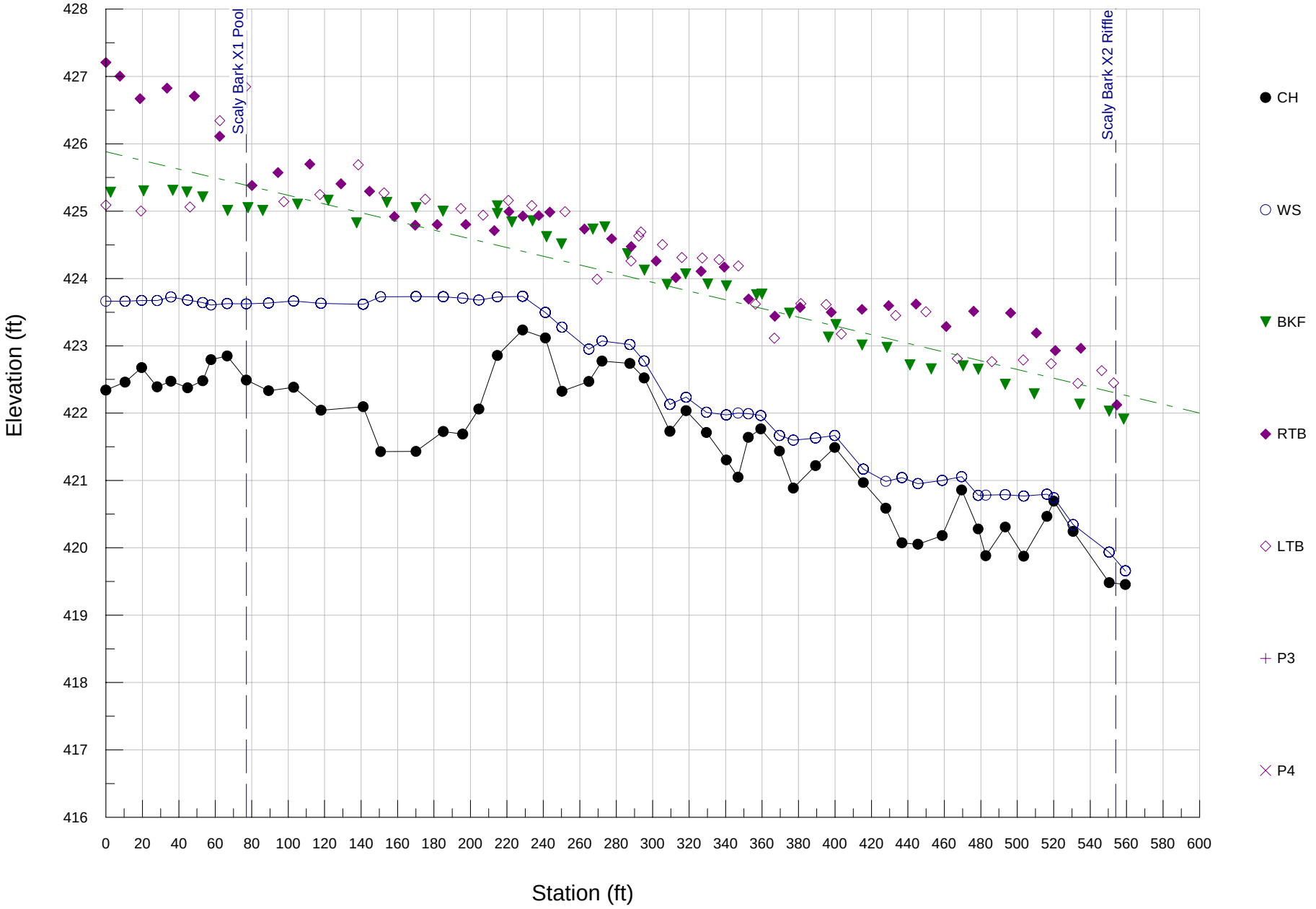
Sincerely,

Renee Gledhill-Earley

Peter Sandbeck

Appendix 5:
Existing Conditions Geomorphic Survey Data

Scaly Bark Creek Reach 1 Profile



Scaly Bark US Profile
RIVERMORPH PROFILE SUMMARY

River Name: Scaly Bark Creek
Reach Name: Reach 1
Profile Name: Scaly Bark Reach 1 Profile
Survey Date: 11/10/09

Survey Data

DIST	CH	WS	BKF	RTB	LTB
0	422.341	423.661		427.207	425.09
2.555			425.28		
7.701				427.004	
10.484	422.461	423.661			
18.716				426.669	
19.292					425.003
19.572	422.674	423.674			
20.718			425.3		
28.08	422.392	423.672			
33.523				426.828	
35.688	422.475	423.725			
36.713			425.31		
44.395			425.284		
44.814	422.378	423.678			
46.127					425.062
48.582				426.707	
53.13	422.482	423.642			
53.13			425.21		
57.697	422.795	423.605			
62.435				426.111	
62.474					426.344
66.504	422.848	423.628			
66.809			425.01		
76.653					426.848
77.053	422.492	423.622			
77.978			425.052		
80.194				425.381	
86.101			425.011		
89.275	422.333	423.633			
94.383				425.572	
97.611					425.14
102.991	422.385	423.665			
105.128			425.105		
111.883				425.698	
117.422					425.246
118.087	422.042	423.632			
121.955			425.164		
128.971				425.406	
137.499			424.827		
138.468					425.688
141.105	422.096	423.616			
144.575				425.293	
150.728	421.427	423.727			
152.62					425.269
154.171			425.13		
158.302				424.921	
169.624				424.791	

Scaly Bark US Profile

170.126	421.433	423.733			
170.126			425.053		
175.202					425.176
181.806				424.8	
184.951			424.998		
185.11	421.727	423.727			
194.783					425.037
195.801	421.688	423.708			
197.44				424.803	
204.644	422.06	423.68			
206.882					424.939
213.047				424.71	
214.768	422.856	423.726			
214.768			425.08		
214.768			424.965		
220.768					425.158
221.13				424.992	
222.79			424.839		
228.653	423.236	423.736			
228.743				424.925	
233.711					425.084
233.996			424.856		
237.567				424.935	
241.076	423.116	423.496			
241.716			424.621		
243.49				424.986	
249.924			424.514		
250.224	422.326	423.276			
251.875					424.992
262.497				424.734	
265.045	422.47	422.95			
267.152			424.734		
269.529					423.989
272.237	422.771	423.071			
273.781			424.768		
277.433				424.591	
286.141			424.366		
287.499	422.739	423.019			
288.145					424.258
288.191				424.476	
292.324					424.63
293.58					424.691
295.288	422.524	422.774			
295.448			424.123		
301.855				424.258	
305.397					424.502
307.864			423.912		
309.395	421.73	422.13			
312.724				424.012	
316.007					424.312
318.023			424.07		
318.336	422.036	422.236			
326.487				424.105	
327.135					424.303
329.521	421.713	422.013			
330.199			423.92		
336.412					424.281
339.225				424.168	
340.452			423.89		
340.452	421.305	421.975			
346.893	421.051	422.001			
346.957					424.187
352.542	421.641	421.991			

352.583			423.695	
356.354				423.619
357.042		423.758		
359.331	421.765	421.965		
359.919		423.771		
366.768				423.114
367.042			423.439	
369.599	421.437	421.667		
375.035		423.486		
377.163	420.887	421.597		
380.903			423.571	
381.222				423.626
389.31	421.221	421.631		
395.168				423.614
396.422		423.131		
397.998			423.497	
399.867	421.489	421.669		
400.488		423.314		
403.499				423.177
414.853			423.542	
414.861		423.012		
415.603	420.968	421.168		
427.946	420.586	420.986		
428.543		422.977		
429.435			423.597	
433.326				423.451
436.786	420.074	421.044		
441.092		422.717		
444.476			423.621	
445.491	420.052	420.952		
449.912				423.505
452.812		422.658		
458.865	420.18	421		
460.982			423.288	
467.084				422.812
469.565	420.858	421.058		
470.32		422.704		
476.033			423.513	
478.579		422.651		
478.579	420.28	420.78		
482.738	419.882	420.782		
486.07				422.766
493.389	420.308	420.788		
493.389		422.429		
496.349			423.488	
503.253				422.791
503.578	419.877	420.767		
509.401		422.287		
510.525			423.188	
516.308	420.465	420.795		
518.605				422.733
520.075	420.693	420.743		
520.863			422.928	
530.654	420.245	420.345		
533.287				422.441
534.261		422.132		
534.847			422.963	
546.369				422.632
550.427	419.483	419.933		
550.504		422.03		
552.876				422.451
554.631			422.122	
558.374		421.912		

Scaly Bark US Profile

559.346 419.456 419.656

Cross Section Locations

Cross Section Name	Type	Profile Station
Scaly Bark X1 Pool	Pool	76.78
Scaly Bark X2 Riffle	Riffle	554.16

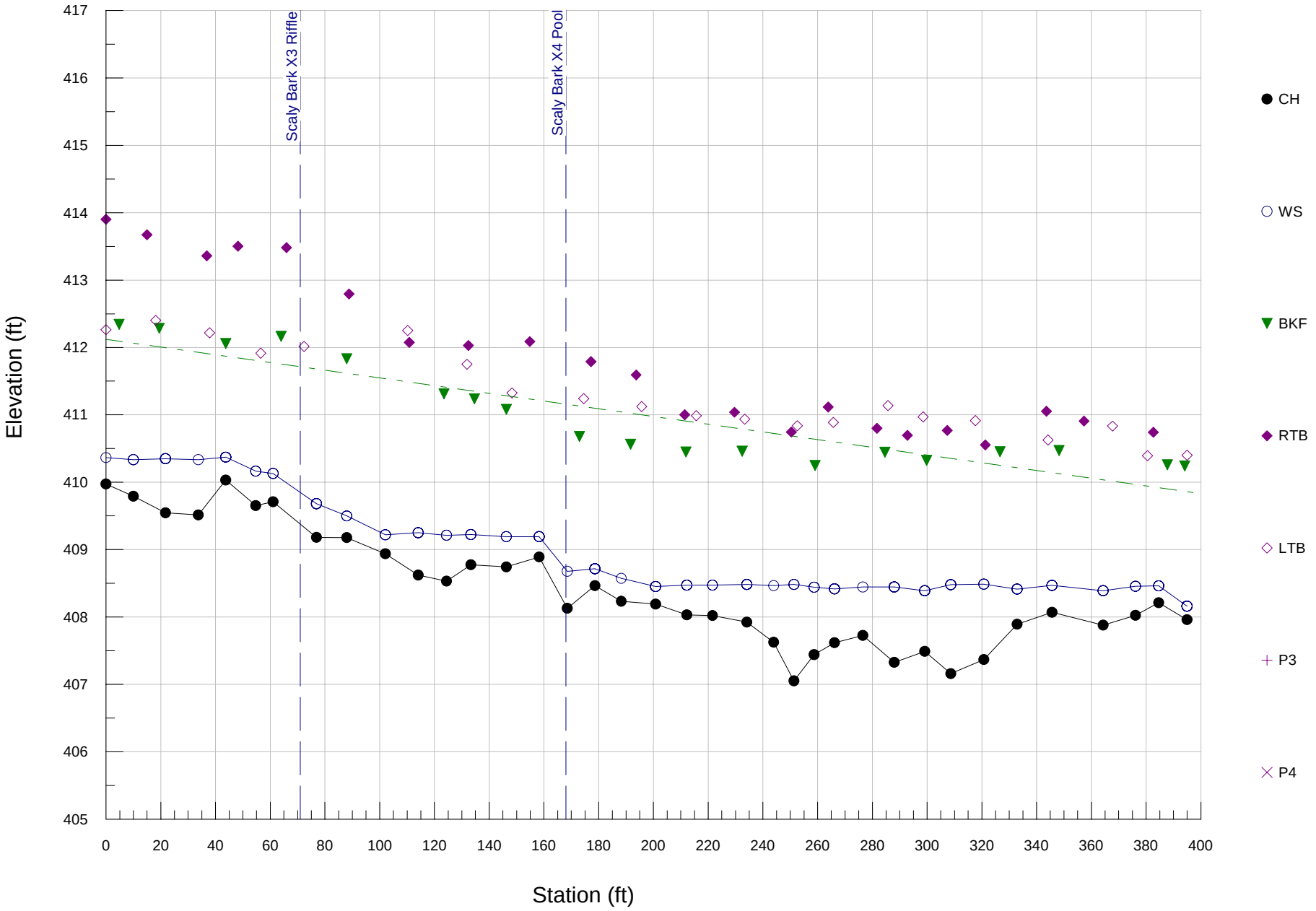
Measurements from Graph

Bankfull Slope: 0.00648

Variable	Min	Avg	Max
S riffle	0.01202	0.02058	0.02617
S pool	0	0.00037	0.00064
S run	0.00392	0.0135	0.02617
S glide	0.00174	0.00548	0.01121
P - P	32.56	57.81	82.56
P length	18.61	59.55	226.75
Dmax riffle	1.64	1.89	2.07
Dmax pool	2.31	2.77	3.7
Dmax run	1.9	2.16	2.37
Dmax glide	1.96	2.24	2.84
Low Bank Ht	1.78	2.72	4.11

Length and depth measurements in feet, slopes in ft/ft.

Scaly Bark Creek Reach 2 Profile



Scaly Bark MS Profile
RIVERMORPH PROFILE SUMMARY

River Name: Scaly Bark Creek
Reach Name: Reach 2
Profile Name: Scaly Bark Reach 2 Profile
Survey Date: 11/10/09

Survey Data

DIST	CH	WS	BKF	RTB	LTB
0	409.974	410.364		413.902	412.264
4.812			412.341		
10.013	409.793	410.333			
14.96				413.674	
18.132					412.403
19.465			412.285		
21.742	409.547	410.347			
33.753	409.516	410.336			
36.827				413.359	
37.844					412.218
43.776			412.058		
43.776	410.031	410.371			
48.217				413.504	
54.743	409.653	410.163			
56.548					411.914
61.078	409.709	410.129			
63.971			412.165		
65.931				413.483	
72.347					412.015
76.874	409.181	409.681			
87.972			411.831		
87.972	409.179	409.499			
88.766				412.794	
102.063	408.939	409.219			
110.181					412.252
110.769				412.074	
114.064	408.621	409.251			
123.518			411.31		
124.446	408.531	409.211			
131.841					411.75
132.388				412.031	
133.318	408.774	409.224			
134.598			411.237		
146.276	408.743	409.193			
146.276			411.082		
148.347					411.326
154.856				412.087	
158.269	408.891	409.191			
168.503	408.128	408.678			
172.961			410.677		
174.528					411.242
177.158				411.79	
178.632	408.466	408.716			
188.271	408.232	408.572			
191.67			410.565		
193.671				411.591	
195.723					411.123

Scaly Bark MS Profile

200.809	408.19	408.45			
211.453				411.003	
211.845			410.449		
212.238	408.031	408.471			
215.677					410.986
221.591	408.022	408.472			
229.637				411.038	
232.427			410.458		
233.39					410.934
234.168	407.922	408.482			
243.941	407.625	408.465			
250.437				410.744	
251.316	407.053	408.483			
252.568					410.837
258.743	407.442	408.442			
259.047			410.248		
263.859				411.115	
265.712					410.888
266.181	407.617	408.417			
276.514	407.725	408.445			
281.669				410.8	
284.604			410.445		
285.709					411.137
288.016	407.325	408.445			
292.802				410.697	
298.506					410.969
299.144	407.49	408.39			
299.829			410.325		
307.341				410.768	
308.643	407.158	408.478			
317.635					410.916
320.715	407.367	408.487			
321.276				410.553	
326.656			410.453		
332.873	407.893	408.413			
343.621				411.052	
344.166					410.626
345.631	408.069	408.469			
348.213			410.469		
357.332				410.908	
364.328	407.878	408.388			
367.721					410.833
376.14	408.025	408.455			
380.497					410.395
382.669				410.74	
384.603	408.213	408.463			
387.796			410.258		
394.128			410.241		
395.01					410.4
395.012	407.96	408.16			

Cross Section Locations

Cross Section Name	Type	Profile Station
Scaly Bark X3 Riffle	Riffle	71.26
Scaly Bark X4 Pool	Pool	167.79

Measurements from Graph

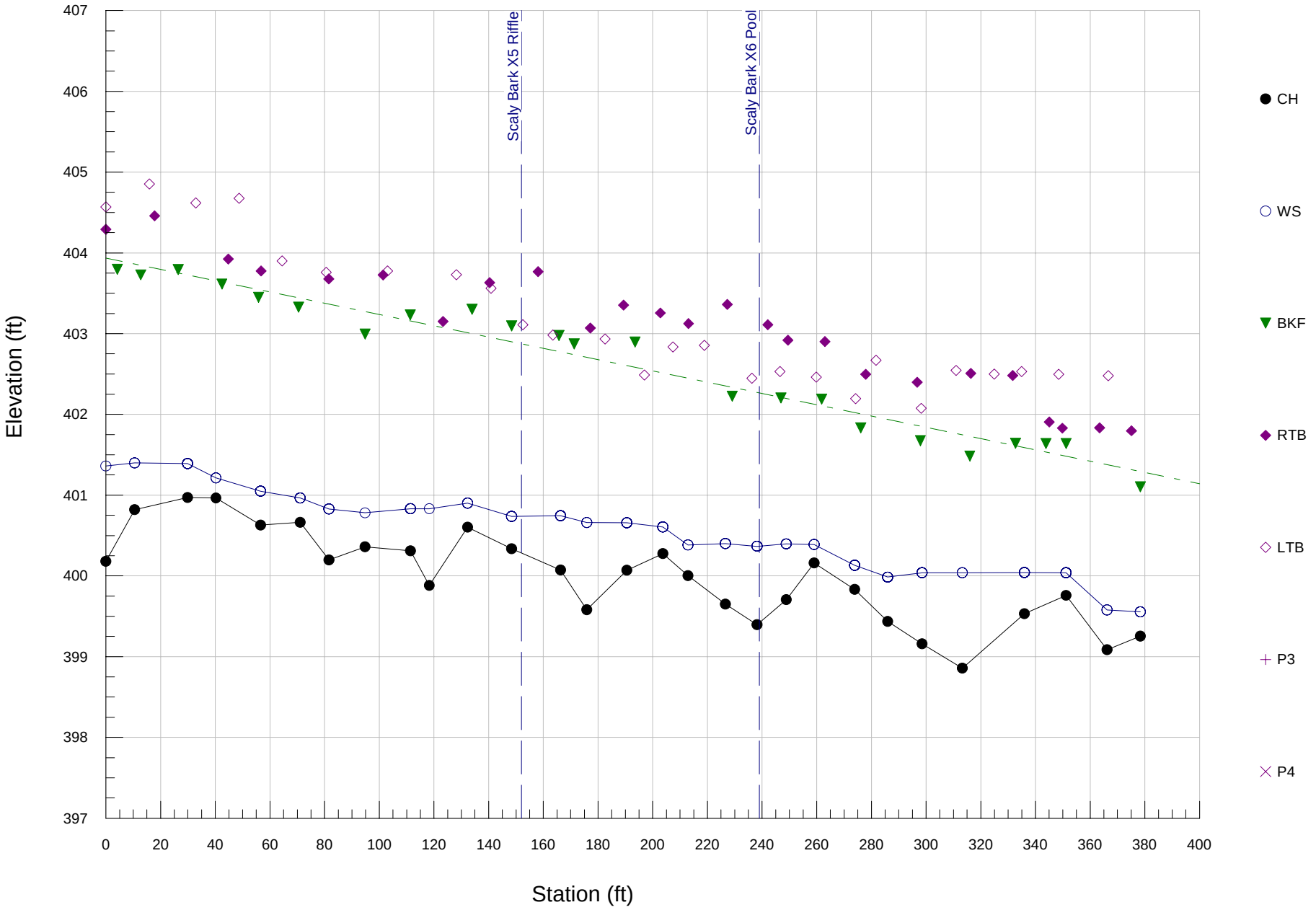
Bankfull Slope: 0.00568

Scaly Bark MS Profile

Variable	Min	Avg	Max
S riffle	0.00327	0.02049	0.04906
S pool	0	0.00074	0.00151
S run	0.00084	0.01596	0.05046
S glide	0.00041	0.00208	0.00436
P - P	44.96	65.74	89.54
P length	13.95	52.48	111.63
Dmax riffle	2.07	2.29	2.62
Dmax pool	2.56	2.86	3.24
Dmax run	2.18	2.46	2.71
Dmax glide	2.24	2.43	2.68
Low Bank Ht	2.21	2.92	3.65

Length and depth measurements in feet, slopes in ft/ft.

Scaly Bark Creek Reach 3 Profile



Scaly Bark DS Profile
RIVERMORPH PROFILE SUMMARY

River Name: Scaly Bark Creek
Reach Name: Reach 3
Profile Name: Scaly Bark Reach 3 Profile
Survey Date: 11/10/09

Survey Data

DIST	CH	WS	BKF	RTB	LTB
0	400.181	401.36		404.291	404.568
4.212			403.796		
10.552	400.819	401.399			
12.751			403.728		
15.929					404.853
17.836				404.459	
26.482			403.792		
29.885	400.971	401.391			
32.87					404.619
40.277	400.964	401.214			
42.421			403.613		
44.749				403.923	
48.731					404.675
55.791			403.449		
56.573	400.629	401.049			
56.766				403.777	
64.433					403.899
70.465			403.326		
71.07	400.665	400.965			
80.61					403.758
81.548				403.678	
81.641	400.198	400.828			
94.826	400.361	400.781			
94.826			402.995		
101.357				403.726	
102.982					403.775
111.335			403.231		
111.425	400.311	400.831			
118.299	399.882	400.832			
123.315				403.15	
128.2					403.729
132.337	400.602	400.902			
133.958			403.302		
140.332				403.63	
140.872					403.562
148.383	400.336	400.736			
148.383			403.095		
152.515					403.109
158.115				403.768	
163.467					402.982
165.683			402.978		
166.336	400.074	400.744			
171.297			402.872		
175.927	399.58	400.66			
177.176				403.069	
182.574					402.932
189.343				403.354	

Scaly Bark DS Profile

190.566	400.069	400.659			
193.562			402.896		
196.954					402.487
202.769				403.256	
203.704	400.277	400.607			
207.453					402.836
212.886	400.004	400.384			
213.108				403.125	
218.875					402.854
226.628	399.65	400.4			
227.302				403.363	
229.091			402.223		
236.263					402.447
238.162	399.397	400.367			
242.115				403.111	
246.52					402.53
246.93			402.204		
248.882	399.706	400.396			
249.454				402.918	
259.091	400.16	400.39			
259.836					402.461
261.802			402.19		
263.004				402.902	
273.849	399.832	400.132			
274.207					402.194
276.13			401.832		
277.928				402.496	
281.644					402.67
285.95	399.435	399.985			
296.712				402.399	
297.899			401.675		
298.191					402.075
298.552	399.158	400.038			
310.947					402.544
313.241	398.858	400.038			
315.971			401.482		
316.352				402.508	
324.881					402.498
331.685				402.481	
332.729			401.641		
334.921					402.53
335.986	399.531	400.041			
343.817			401.639		
345.075				401.906	
348.512					402.495
349.844				401.829	
351.237			401.639		
351.237	399.759	400.039			
363.49				401.832	
366.164	399.087	399.577			
366.616					402.478
375.131				401.797	
378.376	399.254	399.554	401.103		

Cross Section Locations

Cross Section Name	Type	Profile Station
Scaly Bark X5 Riffle	Riffle	151.9
Scaly Bark X6 Pool	Pool	239

Measurements from Graph

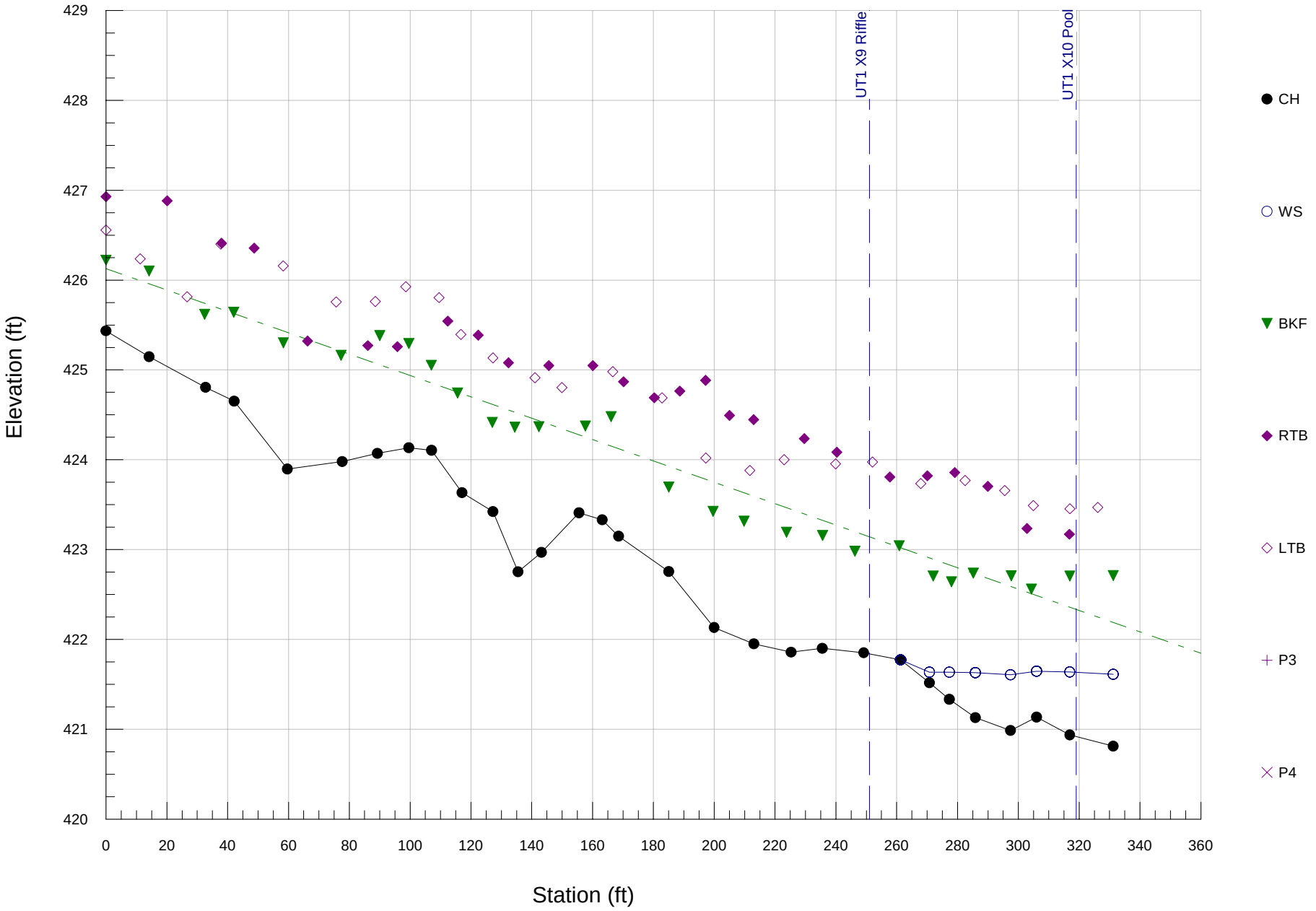
Scaly Bark DS Profile

Bankfull Slope: 0.00698

Variable	Min	Avg	Max
S riffle	0.00558	0.0169	0.02814
S pool	0.00055	0.0016	0.00348
S run	0.00088	0.00881	0.02676
S glide	0	0.00176	0.00485
P - P	53.49	73.41	117.06
P length	51.55	59.6	74.81
Dmax riffle	1.86	2.38	2.68
Dmax pool	2.22	2.87	3.31
Dmax run	2.07	2.53	2.9
Dmax glide	2.08	2.59	2.89
Low Bank Ht	2.08	2.93	3.65

Length and depth measurements in feet, slopes in ft/ft.

UT1 Reach 2 Profile



UT1 DS Profile
RIVERMORPH PROFILE SUMMARY

River Name: UT1
Reach Name: Reach 2 (Restoration)
Profile Name: UT1 Reach 2 Profile
Survey Date: 11/10/09

Survey Data

DIST	CH	WS	BKF	RTB	LTB
0	425.435		426.222	426.93	426.557
11.249					426.236
14.156	425.147				
14.184			426.1		
20.118				426.882	
26.677					425.813
32.406			425.618		
32.757	424.806				
37.72					426.4
38.023				426.412	
41.976			425.643		
42.135	424.653				
48.726				426.356	
58.258					426.157
58.296			425.302		
59.655	423.896				
66.268				425.322	
75.701					425.757
77.285			425.163		
77.714	423.98				
86.068				425.271	
88.519					425.763
89.224	424.07				
90.026			425.382		
95.822				425.259	
98.543					425.927
99.537	424.134				
99.537			425.293		
106.963			425.052		
107.018	424.104				
109.493					425.805
112.402				425.544	
115.571			424.743		
116.682					425.395
117.084	423.633				
122.416				425.386	
127.044			424.414		
127.207					425.133
127.278	423.422				
132.347				425.079	
134.449			424.362		
135.465	422.754				
141.03					424.912
142.378			424.369		
143.165	422.97				
145.572				425.048	
149.937					424.804

155.499	423.409				
157.579			424.377		
160.106				425.047	
163.176	423.332				
166.08			424.481		
166.607					424.98
168.54	423.149				
170.146				424.869	
180.284				424.69	
182.813					424.689
185.078			423.696		
185.078	422.756				
188.661				424.764	
197.125				424.884	
197.197					424.02
199.618			423.426		
199.968	422.133				
205.044				424.493	
209.799			423.315		
211.685					423.882
212.961				424.446	
213.051	421.95				
222.957					424
223.767			423.194		
225.298	421.858				
229.613				424.235	
235.528	421.902				
235.607			423.157		
239.898					423.954
240.288				424.085	
246.245			422.982		
249.143	421.852				
252.012					423.974
257.734				423.809	
260.798			423.042		
261.284	421.772	421.772			
267.919					423.735
270.059				423.822	
270.761	421.517	421.634			
272.019			422.706		
277.302	421.334	421.634			
277.977			422.642		
279.108				423.858	
282.487					423.769
285.146			422.738		
285.873	421.13	421.63			
289.937				423.704	
295.482					423.656
297.459	420.987	421.607			
297.65			422.709		
302.843				423.236	
304.294			422.559		
304.912					423.491
306.014	421.135	421.645			
316.814				423.171	
316.9			422.706		
316.9	420.937	421.637			
316.914					423.455
326.11					423.469
331.226	420.811	421.611	422.711		

Cross Section Locations

UT1 DS Profile

Cross Section Name	Type	Profile Station
UT1 X9 Riffle	Riffle	251.31
UT1 X10 Pool	Pool	318.88

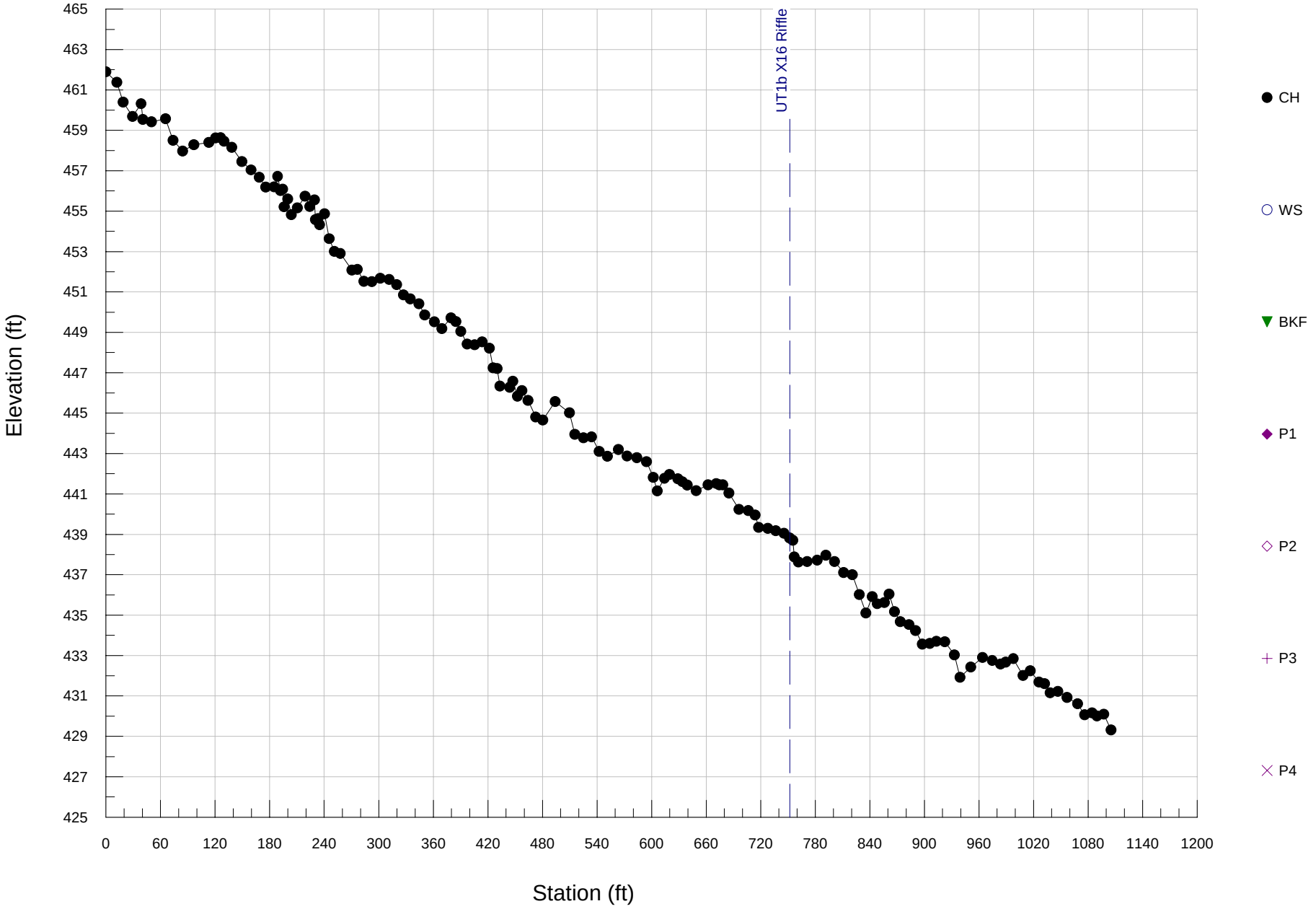
Measurements from Graph

Bankfull Slope: 0.01189

Variable	Min	Avg	Max
S riffle	0.01881	0.02689	0.03491
S pool	0.00038	0.0024	0.00382
S run	0.01028	0.02047	0.02804
S glide	0.00102	0.00403	0.00679
P - P	75	80.12	87.91
P length	23.72	33.49	43.96
Dmax riffle	0.92	1.04	1.19
Dmax pool	1.36	1.61	1.87
Dmax run	0.99	1.11	1.24
Dmax glide	1.13	1.27	1.44
Low Bank Ht	1.07	1.88	2.56

Length and depth measurements in feet, slopes in ft/ft.

UT1b Profile



UT1b TWG Profile
RIVERMORPH PROFILE SUMMARY

River Name: UT1
Reach Name: UT1b
Profile Name: UT1b Profile
Survey Date: 10/29/09

Survey Data

DIST	CH	WS	BKF	P1	P2
0	461.894				
12.05	461.378				
18.868	460.393				
29.352	459.684				
38.646	460.318				
40.486	459.533				
50.142	459.423				
65.449	459.576				
73.83	458.511				
84.385	457.972				
96.767	458.284				
113.265	458.406				
120.766	458.627				
126.11	458.636				
130.005	458.464				
138.487	458.161				
149.408	457.455				
159.642	457.041				
168.658	456.676				
175.735	456.191				
184.953	456.199				
188.76	456.727				
192.086	456.014				
194.289	456.084				
195.953	455.212				
200.044	455.596				
203.766	454.819				
210.567	455.158				
218.902	455.74				
224.24	455.23				
229.262	455.557				
230.342	454.585				
233.314	454.627				
235.088	454.324				
240.359	454.867				
245.449	453.637				
251.303	453.006				
257.768	452.897				
270.535	452.081				
276.56	452.119				
283.761	451.528				
292.298	451.512				
301.56	451.672				
311.468	451.62				
319.745	451.366				
327.197	450.849				
334.745	450.66				

344.107	450.409
350.669	449.859
361.067	449.518
369.395	449.181
379.471	449.716
384.774	449.535
390.285	449.045
397.287	448.423
405.361	448.387
413.687	448.529
421.66	448.217
425.681	447.239
430.241	447.207
433.362	446.331
444.082	446.279
447.468	446.58
452.485	445.84
457.429	446.113
464.174	445.628
472.513	444.803
480.251	444.652
494.015	445.568
509.666	445.019
515.698	443.956
525.16	443.774
534.059	443.827
542.373	443.101
551.47	442.862
563.477	443.201
573.172	442.87
583.944	442.789
594.485	442.597
601.814	441.819
606.283	441.149
614.134	441.779
619.637	441.955
628.942	441.748
633.8	441.606
639.163	441.439
648.919	441.162
662.265	441.449
671.089	441.513
674.559	441.451
678.49	441.446
684.963	441.045
696.131	440.232
706.493	440.176
713.839	439.956
717.753	439.34
727.924	439.292
736.452	439.179
745.561	439.055
751.875	438.826
755.313	438.701
757.007	437.888
761.553	437.633
771.007	437.648
782.102	437.725
791.716	437.968
801.12	437.649
811.18	437.112
820.785	436.999
828.604	436.019

835.747	435.102
842.643	435.915
848.176	435.562
856.125	435.624
861.077	436.037
867.036	435.176
873.5	434.679
882.964	434.531
890.293	434.233
897.83	433.569
905.886	433.594
913.097	433.698
922.57	433.679
932.969	433.035
939.234	431.919
951.127	432.429
964.042	432.899
974.617	432.751
983.81	432.577
989.508	432.675
997.784	432.844
1008.524	432.017
1016.42	432.243
1025.971	431.687
1032.074	431.602
1038.311	431.156
1046.828	431.226
1056.905	430.921
1068.564	430.613
1076.111	430.065
1084.43	430.163
1089.952	430.012
1097.33	430.096
1105.297	429.317

Cross Section Locations

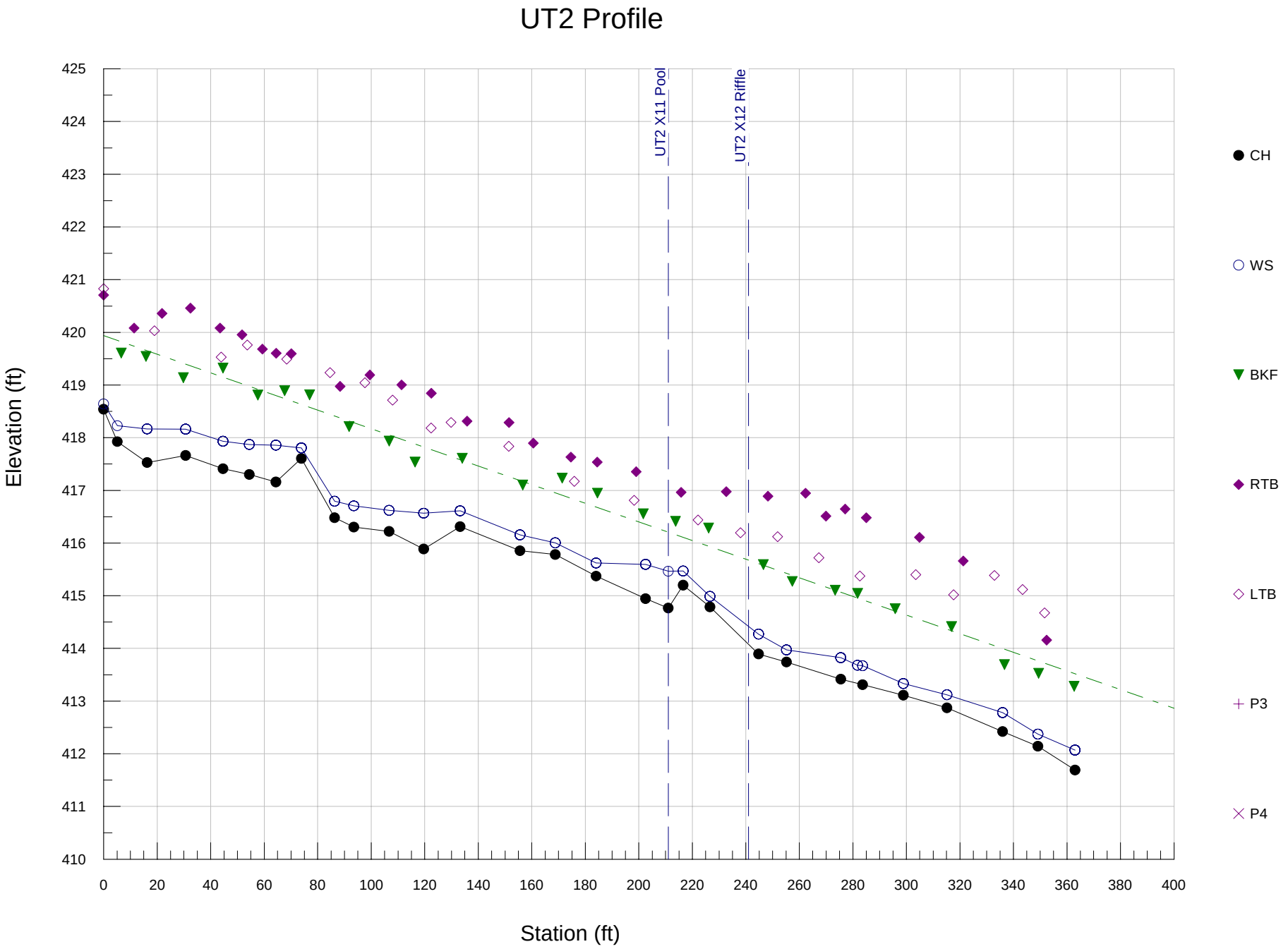
Cross Section Name	Type	Profile Station
UT1b X16 Riffle	Riffle	751.92

Measurements from Graph

Bankfull Slope: 0

Variable	Min	Avg	Max
S riffle	0.02491	0.061	0.14739
S pool	0	0.00783	0.01275
S run	0.06317	0.09654	0.15792
S glide	0.01269	0.03928	0.06712
P - P	28.48	75.17	140.54
P length	13.07	28.45	50.89
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low Bank Ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.


UT2 Profile
Elevation (ft)
Station (ft)
UT2 X11 Pool
UT2 X12 Riffle
425
424
423
422
421
420
419
418
417
416
415
414
413
412
411
410
0
20
40
60
80
100
120
140
160
180
200
220
240
260
280
300
320
340
360
380
400
CH
WS
BKF
RTB
LTB
P3
P4

UT2 Profile
RIVERMORPH PROFILE SUMMARY

River Name: UT2
Reach Name: Reach 1
Profile Name: UT2 Profile
Survey Date: 11/09/09

Survey Data

DIST	CH	WS	BKF	RTB	LTB
0	418.541	418.641		420.706	420.828
5.096	417.925	418.225			
6.559			419.606		
11.411				420.083	
15.808			419.541		
16.223	417.526	418.166			
19.027					420.031
21.815				420.357	
29.804			419.14		
30.615	417.661	418.161			
32.458				420.457	
43.475				420.082	
43.905					419.531
44.571			419.323		
44.617	417.41	417.93			
51.719				419.953	
53.649					419.759
54.485	417.301	417.871			
57.623			418.807		
59.325				419.682	
64.406	417.157	417.857			
64.442				419.605	
67.627			418.891		
68.379					419.492
70.104				419.595	
73.861	417.606	417.806			
76.981			418.813		
84.615					419.236
86.346	416.482	416.792			
88.388				418.974	
91.738			418.208		
93.519	416.305	416.705			
97.603					419.043
99.46				419.19	
106.719	416.219	416.619			
106.719			417.936		
107.998					418.712
111.361				419.002	
116.359			417.537		
119.599	415.886	416.566			
122.334					418.182
122.485				418.845	
129.83					418.29
133.211	416.311	416.611			
133.977			417.611		
135.807				418.312	
151.411					417.837

UT2 Profile

151.479				418.288	
155.608	415.854	416.154			
156.62			417.104		
160.552				417.896	
168.784	415.782	416.002			
171.32			417.233		
174.616				417.631	
175.894					417.171
184.007	415.372	415.622			
184.495				417.535	
184.538			416.948		
198.264					416.813
198.995				417.353	
201.684			416.555		
202.563	414.945	415.595			
210.992	414.766	415.466			
213.711			416.413		
215.787				416.965	
216.585	415.199	415.469			
222.102					416.437
226.109			416.287		
226.59	414.787	414.987			
232.665				416.976	
237.989					416.194
244.737	413.893	414.273			
246.573			415.59		
248.28				416.889	
251.894					416.122
255.232	413.742	413.972			
257.345			415.272		
262.314				416.944	
267.258					415.723
269.933				416.512	
273.402			415.106		
275.537	413.414	413.824			
277.087				416.645	
281.757		413.68	415.045		
282.626					415.374
283.655	413.311	413.67			
285.026				416.48	
295.796			414.753		
298.877	413.112	413.332			
303.51					415.4
304.895				416.108	
315.117	412.872	413.122			
316.897			414.415		
317.642					415.018
321.246				415.661	
332.886					415.385
335.933	412.42	412.78			
336.628			413.694		
343.425					415.117
349.18	412.143	412.373			
349.443			413.527		
351.647					414.676
352.399				414.16	
362.673			413.282		
363.038	411.69	412.07			

Cross Section Locations

Cross Section Name	Type	Profile Station

UT2 Profile

UT2 X11 Pool	Pool	210.99
UT2 X12 Riffle	Riffle	240.88

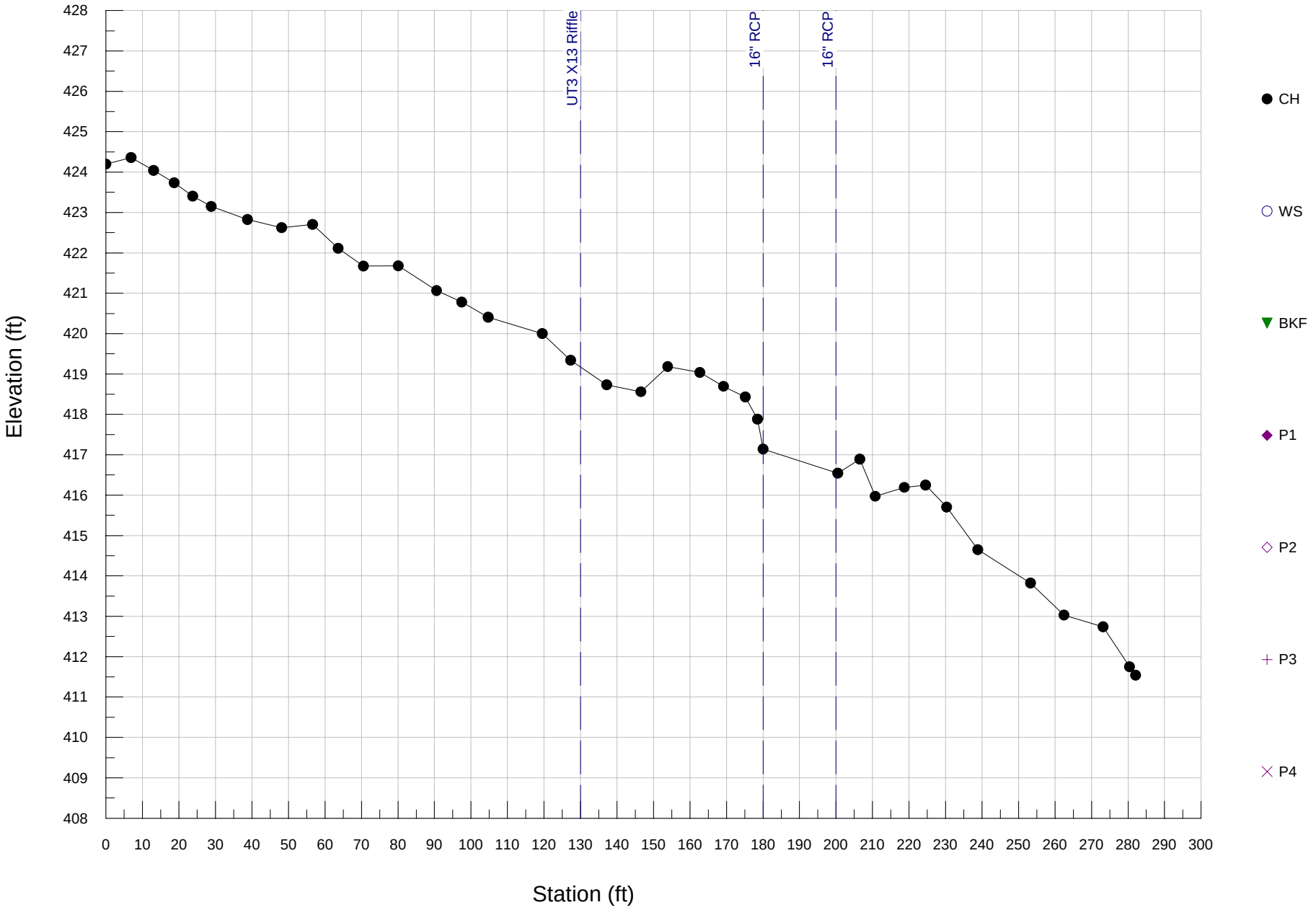
Measurements from Graph

Bankfull Slope: 0.01767

Variable	Min	Avg	Max
S riffle	0.0191	0.04486	0.07678
S pool	0.00156	0.00286	0.00479
S run	0.0032	0.00889	0.0202
S glide	0.0014	0.00254	0.00338
P - P	48.45	64.99	90.31
P length	18.22	31.3	40.31
Dmax riffle	1.29	1.47	1.73
Dmax pool	1.71	1.84	2.07
Dmax run	1.31	1.59	1.73
Dmax glide	1.54	1.57	1.58
Low Bank Ht	1.33	2.21	2.91

Length and depth measurements in feet, slopes in ft/ft.

UT3 Profile


Elevation (ft)
428
427
426
425
424
423
422
421
420
419
418
417
416
415
414
413
412
411
410
409
408
UT3 X13 Riffle
16" RCP
16" RCP
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150 160 170 180 190 200 210 220 230 240 250 260 270 280 290 300
Station (ft)
CH
WS
BKF
P1
P2
P3
P4

UT3 TWG Profile
RIVERMORPH PROFILE SUMMARY

River Name: UT3
Reach Name: Reach 1
Profile Name: UT3 Profile
Survey Date: 11/09/09

Survey Data

DIST	CH	WS	BKF	P1	P2
0	424.195				
6.888	424.357				
13.052	424.042				
18.729	423.733				
23.765	423.403				
28.849	423.15				
38.801	422.823				
48.123	422.624				
56.592	422.705				
63.623	422.113				
70.543	421.674				
80.092	421.681				
90.58	421.063				
97.462	420.784				
104.743	420.403				
119.557	420				
127.285	419.339				
137.181	418.734				
146.551	418.561				
153.89	419.184				
162.722	419.041				
169.18	418.694				
175.133	418.433				
178.507	417.882				
180.05	417.14				
200.49	416.541				
206.521	416.89				
210.766	415.973				
218.703	416.193				
224.543	416.246				
230.322	415.703				
238.855	414.651				
253.283	413.82				
262.429	413.028				
273.184	412.742				
280.392	411.75				
282.059	411.541				

Cross Section Locations

Cross Section Name	Type	Profile Station
UT3 X13 Riffle	Riffle	130
16" RCP	Riffle	180.05
16" RCP	Riffle	200.49

UT3 TWG Profile

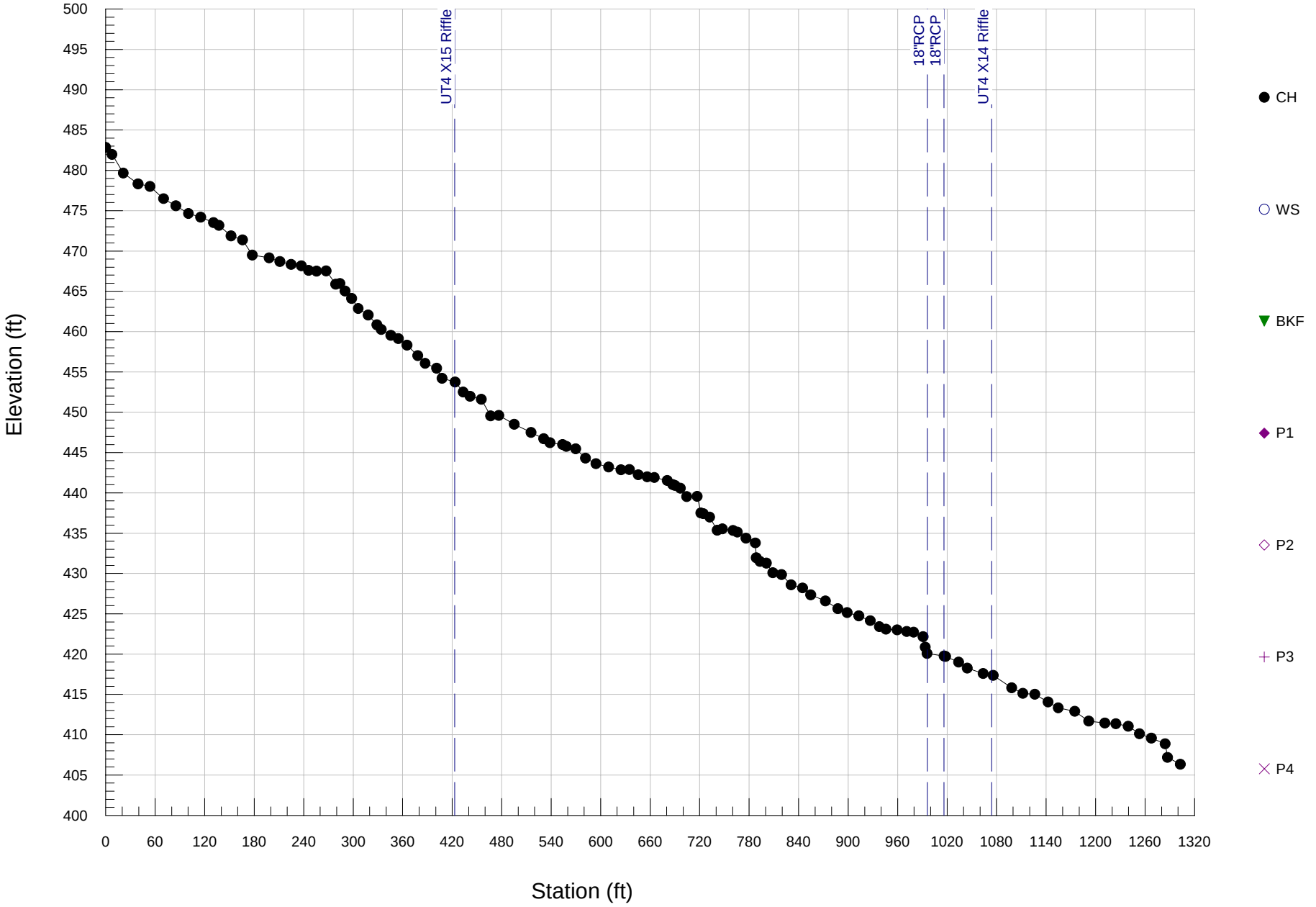
Measurements from Graph

Bankfull Slope: 0

Variable	Min	Avg	Max
S riffle	0.05138	0.10514	0.23582
S pool	0.00475	0.00742	0.00913
S run	0.02651	0.10867	0.2795
S glide	0.00529	0.03262	0.08398
P - P	22.35	52.69	71.42
P length	13.35	17.42	23.22
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low Bank Ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.

UT4 Profile


Elevation (ft)
500
495
490
485
480
475
470
465
460
455
450
445
440
435
430
425
420
415
410
405
400
0
60
120
180
240
300
360
420
480
540
600
660
720
780
840
900
960
1020
1080
1140
1200
1260
1320
Station (ft)
UT4 X15 Riffle
18"RCP
18"RCP
UT4 X14 Riffle
CH
WS
BKF
P1
P2
P3
P4

UT4 TWG Profile
RIVERMORPH PROFILE SUMMARY

River Name: UT4
Reach Name: Reach 1
Profile Name: UT4 Profile
Survey Date: 04/06/10

Survey Data

DIST	CH	WS	BKF	P1	P2
0	482.852				
7.677	481.975				
21.277	479.645				
39.369	478.33				
53.641	478.007				
70.057	476.484				
85.258	475.595				
100.291	474.659				
115.193	474.172				
130.816	473.514				
137.172	473.176				
151.949	471.856				
165.795	471.383				
177.783	469.488				
198.222	469.134				
211.091	468.685				
224.871	468.336				
237.351	468.15				
245.968	467.581				
255.553	467.485				
267.16	467.535				
278.883	465.871				
284.089	465.977				
290.27	465.044				
298.148	464.105				
306.207	462.864				
318.358	462.052				
328.769	460.837				
334.196	460.27				
345.731	459.534				
354.753	459.138				
365.388	458.322				
378.163	457.021				
387.21	456.067				
401.316	455.462				
407.81	454.211				
423.499	453.739				
433.381	452.502				
441.609	451.979				
455.389	451.591				
466.677	449.536				
476.598	449.596				
495.348	448.512				
515.579	447.49				
530.894	446.702				
538.657	446.218				
553.764	445.996				

558.46	445.757
569.67	445.48
581.689	444.314
594.319	443.618
609.623	443.215
624.577	442.856
634.772	442.902
645.591	442.238
656.478	441.984
665.056	441.909
680.667	441.535
687.16	441.03
690.08	440.912
696.679	440.573
704.379	439.535
716.946	439.56
721.43	437.5
724.474	437.42
732.19	436.975
741.327	435.352
747.582	435.543
760.51	435.325
765.778	435.128
776.108	434.381
787.687	433.786
788.815	431.953
793.194	431.483
800.783	431.288
808.869	430.107
819.348	429.863
830.889	428.602
844.811	428.198
854.756	427.358
872.501	426.585
887.451	425.642
898.869	425.139
913.051	424.734
926.882	424.146
937.809	423.416
945.939	423.101
959.375	422.994
971.084	422.79
979.465	422.716
990.919	422.151
993.486	420.864
995.799	420.086
1016.474	419.758
1018.084	419.695
1034.014	419.02
1044.434	418.252
1063.717	417.58
1075.965	417.355
1098.225	415.828
1111.869	415.13
1126.31	415.011
1142.458	414.05
1154.776	413.323
1174.668	412.908
1191.83	411.674
1211.357	411.452
1224.595	411.354
1239.616	411.052
1253.164	410.13

1267.555 409.564
1284.359 408.877
1287.295 407.183
1302.768 406.327

Cross Section Locations

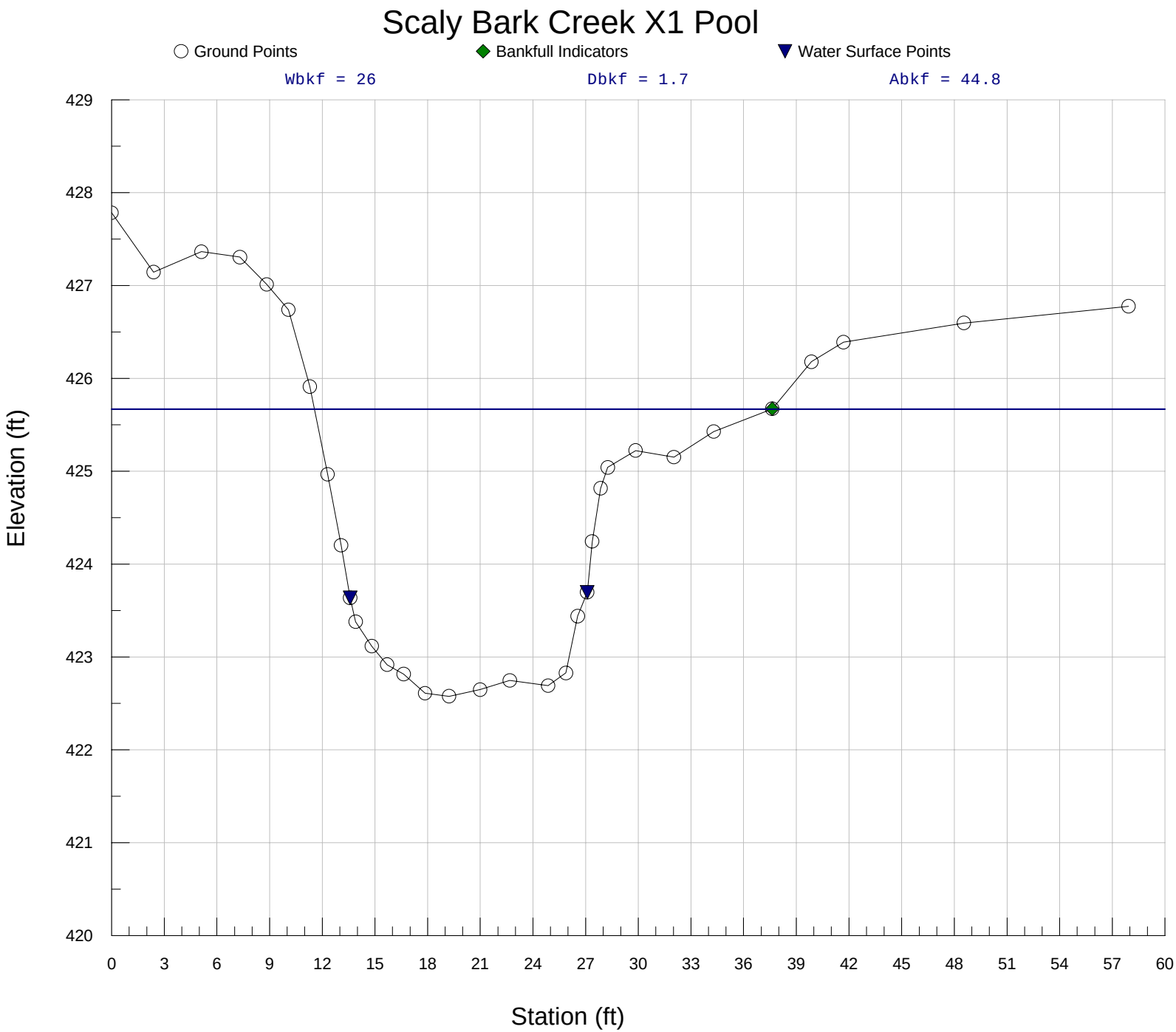
Cross Section Name	Type	Profile Station
UT4 X14 Riffle	Riffle	1073.92
UT4 X15 Riffle	Riffle	423.46
18" RCP	Riffle	995.799
18" RCP	Riffle	1016.474

Measurements from Graph

Bankfull Slope: 0

Variable	Min	Avg	Max
S riffle	0.04833	0.12267	0.17756
S pool	0.00577	0.02768	0.05722
S run	0	0	0
S glide	0	0	0
P - P	34.83	58.9	92.89
P length	12.77	18.95	25.54
Dmax riffle	0	0	0
Dmax pool	0	0	0
Dmax run	0	0	0
Dmax glide	0	0	0
Low Bank Ht	0	0	0

Length and depth measurements in feet, slopes in ft/ft.


Scaly Bark Creek X1 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 26
Dbkf = 1.7
Abkf = 44.8
Elevation (ft)
Station (ft)
429
428
427
426
425
424
423
422
421
420
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
48
51
54
57
60

X1 Pool US Scaly Bark
RIVERMORPH CROSS SECTION SUMMARY

River Name: Scaly Bark Creek
Reach Name: Reach 1
Cross Section Name: Scaly Bark X1 Pool
Survey Date: 11/10/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	427.785357	POOL
2.39	0	427.145703	
5.12	0	427.36529	
7.31	0	427.306229	
8.84	0	427.011656	
10.07	0	426.739282	LTB
11.29	0	425.912842	
12.3	0	424.967224	
13.07	0	424.203249	
13.59	0	423.637432	LEW
13.9	0	423.380358	
14.82	0	423.116795	
15.7	0	422.917321	
16.64	0	422.816151	
17.85	0	422.609499	
19.22	0	422.577362	
20.99	0	422.648328	
22.68	0	422.747043	
24.86	0	422.691508	
25.88	0	422.827785	
26.55	0	423.440366	
27.09	0	423.697303	REW
27.37	0	424.245434	
27.85	0	424.816413	-
28.26	0	425.041793	
29.85	0	425.223862	
32.03	0	425.151808	
34.3	0	425.427253	
37.63	0	425.673376	BKF
39.86	0	426.17966	
41.69	0	426.39031	RTB
48.55	0	426.597389	
57.93	0	426.777159	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	428.76	428.76	428.76
Bankfull Elevation (ft)	425.67	425.67	425.67
Floodprone Width (ft)	57.93	-----	-----
Bankfull Width (ft)	26.03	8.6	17.43
Entrenchment Ratio	2.23	-----	-----
Mean Depth (ft)	1.72	2.39	1.39

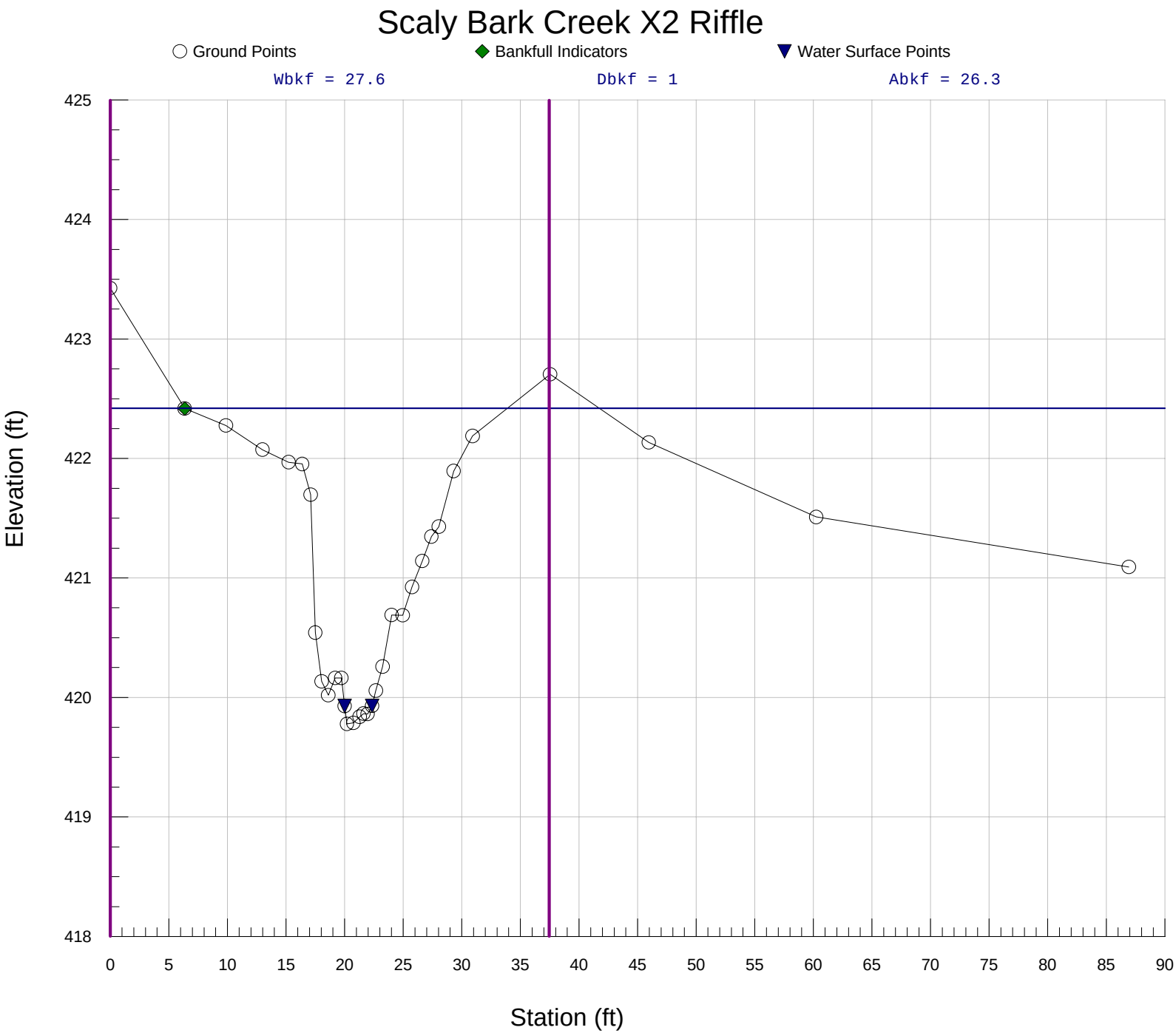
X1 Pool US Scaly Bark

Maximum Depth (ft)	3.09	3.09	3.06
Width/Depth Ratio	15.12	3.6	12.5
Bankfull Area (sq ft)	44.83	20.53	24.3
Wetted Perimeter (ft)	28.06	12.67	21.49
Hydraulic Radius (ft)	1.6	1.62	1.13
Begin BKF Station	11.55	11.55	20.15
End BKF Station	37.58	20.15	37.58

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Scaly Bark Creek X2 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 27.6
Dbkf = 1
Abkf = 26.3
Elevation (ft)
Station (ft)
425
424
423
422
421
420
419
418
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90

X2 Riffle US Scaly Bark
RIVERMORPH CROSS SECTION SUMMARY

River Name: Scaly Bark Creek
Reach Name: Reach 1
Cross Section Name: Scaly Bark X2 Riffle
Survey Date: 11/10/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	423.425755	RIFFLE
6.35	0	422.41844	BKF
9.87	0	422.275971	
12.99	0	422.073861	
15.22	0	421.969192	
16.38	0	421.954089	
17.1	0	421.69778	
17.5	0	420.542547	
18.04	0	420.134873	
18.6	0	420.01892	
19.19	0	420.163223	
19.72	0	420.163038	
19.99	0	419.928263	LEW
20.2	0	419.778376	
20.74	0	419.788005	
21.28	0	419.838692	
21.6	0	419.864582	
21.96	0	419.862169	
22.34	0	419.929735	REW
22.66	0	420.056823	
23.24	0	420.25842	
24.01	0	420.689771	
24.96	0	420.688095	
25.75	0	420.925071	
26.62	0	421.142731	
27.41	0	421.346572	-
28.04	0	421.42922	
29.3	0	421.89452	
30.92	0	422.187945	RTB
37.53	0	422.703986	
45.95	0	422.134352	
60.24	0	421.510418	
86.92	0	421.091397	

Cross Sectional Geometry

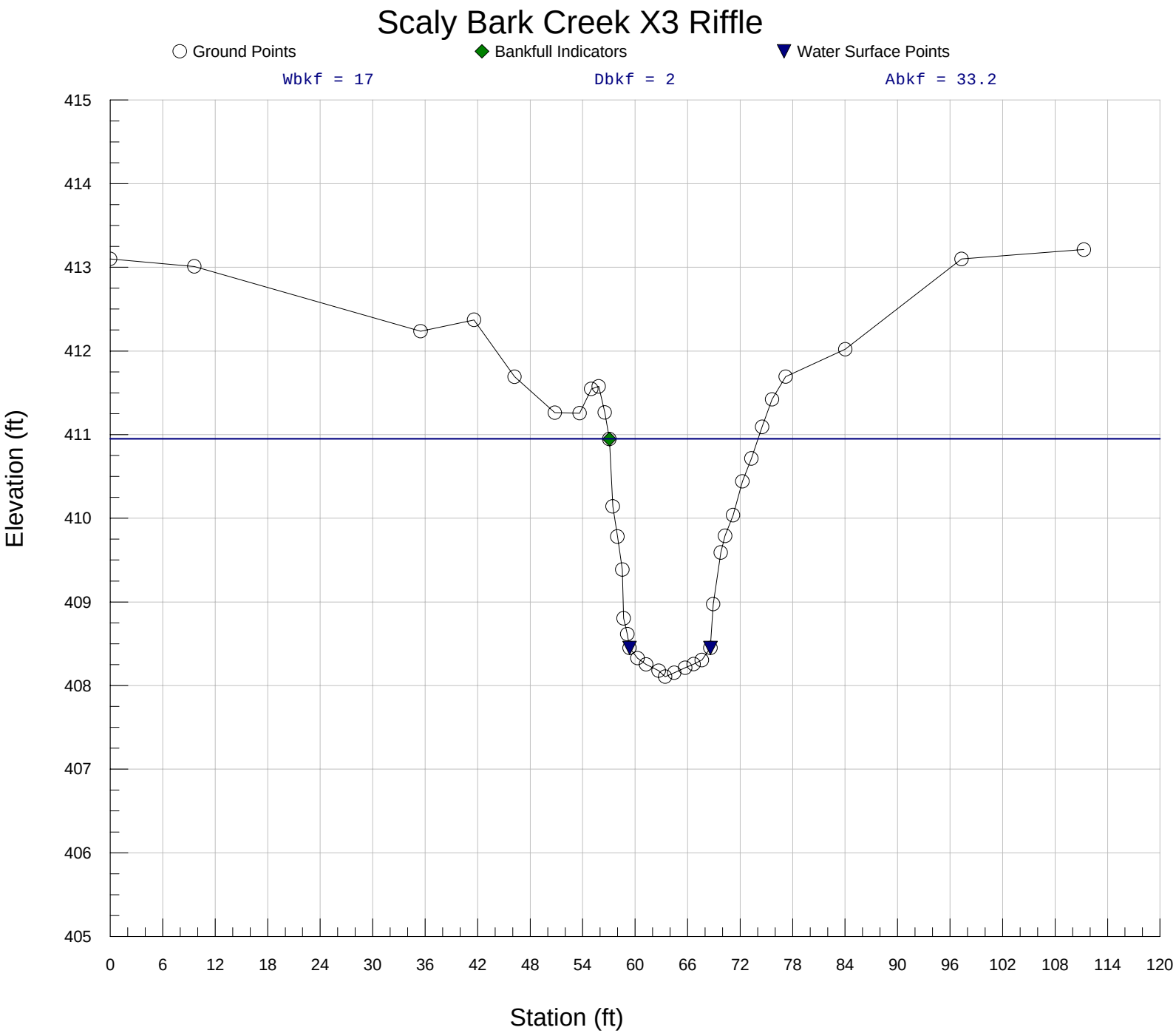
	Channel	Left	Right
Floodprone Elevation (ft)	425.06	425.06	425.06
Bankfull Elevation (ft)	422.42	422.42	422.42
Floodprone Width (ft)	86.92	-----	-----
Bankfull Width (ft)	27.55	24.22	3.33
Entrenchment Ratio	3.15	-----	-----
Mean Depth (ft)	0.96	1.07	0.13

	X2 Riffle US Scaly Bark		
Maximum Depth (ft)	2.64	2.64	0.3
Width/Depth Ratio	28.85	22.67	25.19
Bankfull Area (sq ft)	26.31	25.87	0.44
Wetted Perimeter (ft)	29.12	26.07	3.64
Hydraulic Radius (ft)	0.9	0.99	0.12
Begin BKF Station	6.34	6.34	30.56
End BKF Station	33.89	30.56	33.89

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Scaly Bark Creek X3 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 17
Dbkf = 2
Abkf = 33.2
Elevation (ft)
415
414
413
412
411
410
409
408
407
406
405
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
102
108
114
120
Station (ft)

X3 Riffle MS Scaly Bark
RIVERMORPH CROSS SECTION SUMMARY

River Name: Scaly Bark Creek
Reach Name: Reach 2
Cross Section Name: Scaly Bark X3 Riffle
Survey Date: 11/10/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	413.101069	RIFFLE
9.61	0	413.011377	
35.48	0	412.235658	
41.58	0	412.371324	
46.22	0	411.691538	
50.82	0	411.2613	
53.65	0	411.255359	
54.99	0	411.545808	
55.84	0	411.575842	LTB
56.53	0	411.265367	
57.05	0	410.947005	BKF
57.44	0	410.141922	
57.98	0	409.780236	
58.54	0	409.385135	
58.69	0	408.804215	
59.11	0	408.615049	
59.36	0	408.449009	LEW
60.27	0	408.328292	
61.26	0	408.253464	
62.69	0	408.177895	
63.43	0	408.106368	
64.48	0	408.152298	
65.71	0	408.211898	
66.69	0	408.256407	
67.63	0	408.304788	
68.61	0	408.449588	REW
68.92	0	408.974441	
69.8	0	409.590204	
70.28	0	409.789383	-
71.19	0	410.036593	
72.26	0	410.440386	
73.28	0	410.714399	
74.51	0	411.092086	
75.65	0	411.421024	
77.2	0	411.69232	RTB
84.02	0	412.021099	
97.31	0	413.099295	
111.29	0	413.211973	

Cross Sectional Geometry

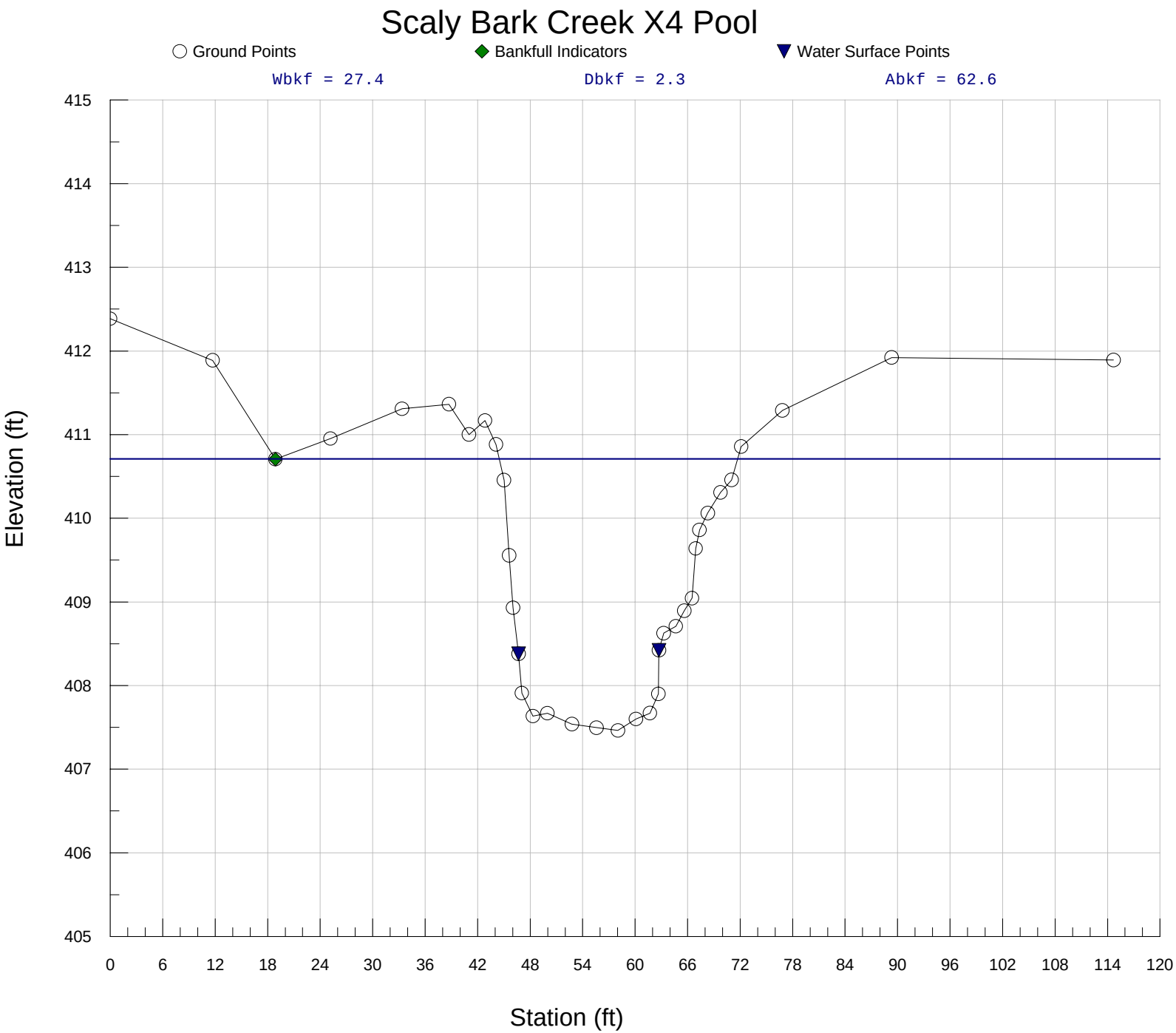
	Channel	Left	Right
Floodprone Elevation (ft)	413.79	413.79	413.79

	X3 Riffle MS Scaly Bark		
Bankfull Elevation (ft)	410.95	410.95	410.95
Floodprone Width (ft)	111.29	-----	-----
Bankfull Width (ft)	17	7.07	9.93
Entrenchment Ratio	6.55	-----	-----
Mean Depth (ft)	1.95	2.29	1.72
Maximum Depth (ft)	2.84	2.84	2.81
Width/Depth Ratio	8.7	3.09	5.78
Bankfull Area (sq ft)	33.23	16.18	17.05
Wetted Perimeter (ft)	19.03	11.19	13.47
Hydraulic Radius (ft)	1.75	1.45	1.27
Begin BKF Station	57.05	57.05	64.12
End BKF Station	74.05	64.12	74.05

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Scaly Bark Creek X4 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 27.4
Dbkf = 2.3
Abkf = 62.6
Elevation (ft)
415
414
413
412
411
410
409
408
407
406
405
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
102
108
114
120
Station (ft)

X4 Pool MS Scaly Bark
RIVERMORPH CROSS SECTION SUMMARY

River Name: Scaly Bark Creek
Reach Name: Reach 2
Cross Section Name: Scaly Bark X4 Pool
Survey Date: 11/10/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	412.385887	POOL
11.7	0	411.887494	
18.87	0	410.707057	BKF
25.19	0	410.952712	
33.36	0	411.308512	
38.72	0	411.362925	
41.01	0	411.000658	
42.84	0	411.16841	
44.09	0	410.882199	LTB
45.01	0	410.454697	
45.6	0	409.555311	
46.05	0	408.93053	
46.68	0	408.379209	LEW
47.06	0	407.909915	
48.32	0	407.634772	
49.97	0	407.668485	
52.77	0	407.538799	
55.59	0	407.496243	
58.03	0	407.463079	
60.1	0	407.599558	
61.69	0	407.67017	
62.66	0	407.899606	
62.72	0	408.421426	REW
63.27	0	408.626406	
64.65	0	408.707646	
65.62	0	408.893508	
66.51	0	409.044057	
66.93	0	409.638596	
67.36	0	409.860405	-
68.31	0	410.06232	
69.76	0	410.308894	
71.03	0	410.457491	
72.12	0	410.857175	RTB
76.83	0	411.289081	
89.32	0	411.921991	
114.68	0	411.890929	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	413.96	413.96	413.96
Bankfull Elevation (ft)	410.71	410.71	410.71
Floodprone Width (ft)	114.68	-----	-----

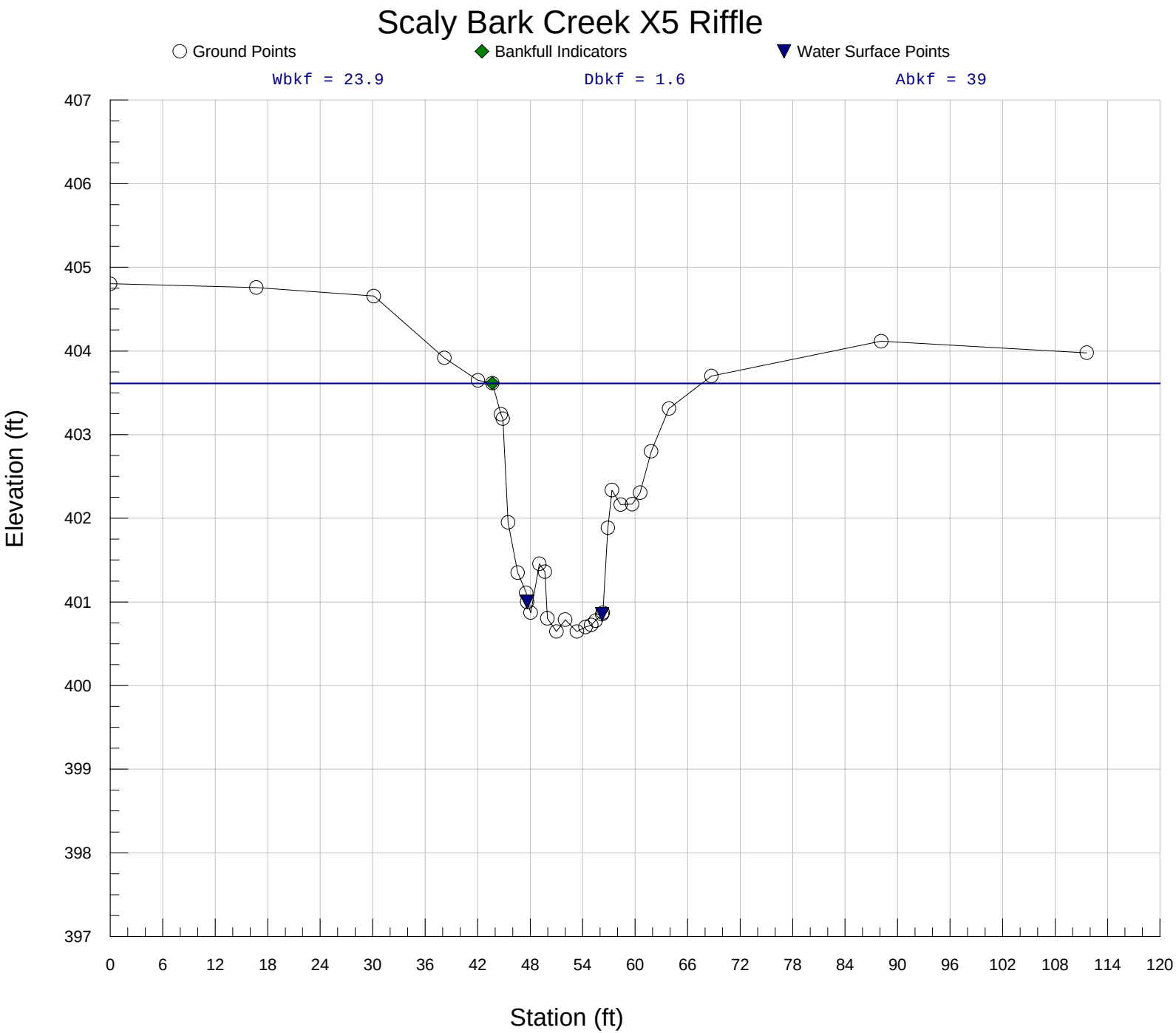
X4 Pool MS Scaly Bark

Bankfull Width (ft)	27.35	37.53	15.34
Entrenchment Ratio	4.19	-----	-----
Mean Depth (ft)	2.29	2.7	1.97
Maximum Depth (ft)	3.25	3.22	3.25
Width/Depth Ratio	11.95	4.45	7.79
Bankfull Area (sq ft)	62.59	32.41	30.18
Wetted Perimeter (ft)	29.7	16.56	19.59
Hydraulic Radius (ft)	2.11	1.96	1.54
Begin BKF Station	18.85	18.85	56.38
End BKF Station	71.72	56.38	71.72

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


Scaly Bark Creek X5 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 23.9
Dbkf = 1.6
Abkf = 39
Elevation (ft)
Station (ft)
407
406
405
404
403
402
401
400
399
398
397
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
102
108
114
120

X5 Riffle DS Scaly Bark
RIVERMORPH CROSS SECTION SUMMARY

River Name: Scaly Bark Creek
Reach Name: Reach 3
Cross Section Name: Scaly Bark X5 Riffle
Survey Date: 11/10/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	404.803021	RIFFLE
16.7	0	404.758389	
30.13	0	404.656231	
38.19	0	403.91767	
42.04	0	403.647428	
43.67	0	403.614873	BKF
44.67	0	403.243732	
44.88	0	403.190144	
45.48	0	401.951149	
46.58	0	401.350411	
47.55	0	401.106893	
47.65	0	400.999793	LEW
48.06	0	400.870184	
49.05	0	401.455702	
49.69	0	401.36033	
49.97	0	400.803249	
51.01	0	400.646272	TW
52	0	400.787846	
53.34	0	400.646601	
54.33	0	400.698855	
54.99	0	400.724415	
55.48	0	400.776222	
56.22	0	400.852371	REW
56.32	0	400.869993	
56.88	0	401.885509	
57.35	0	402.3357	-
58.35	0	402.162349	
59.67	0	402.16783	
60.57	0	402.304541	
61.83	0	402.800102	
63.88	0	403.311343	
68.72	0	403.699961	
88.12	0	404.115798	
111.62	0	403.977965	

Cross Sectional Geometry

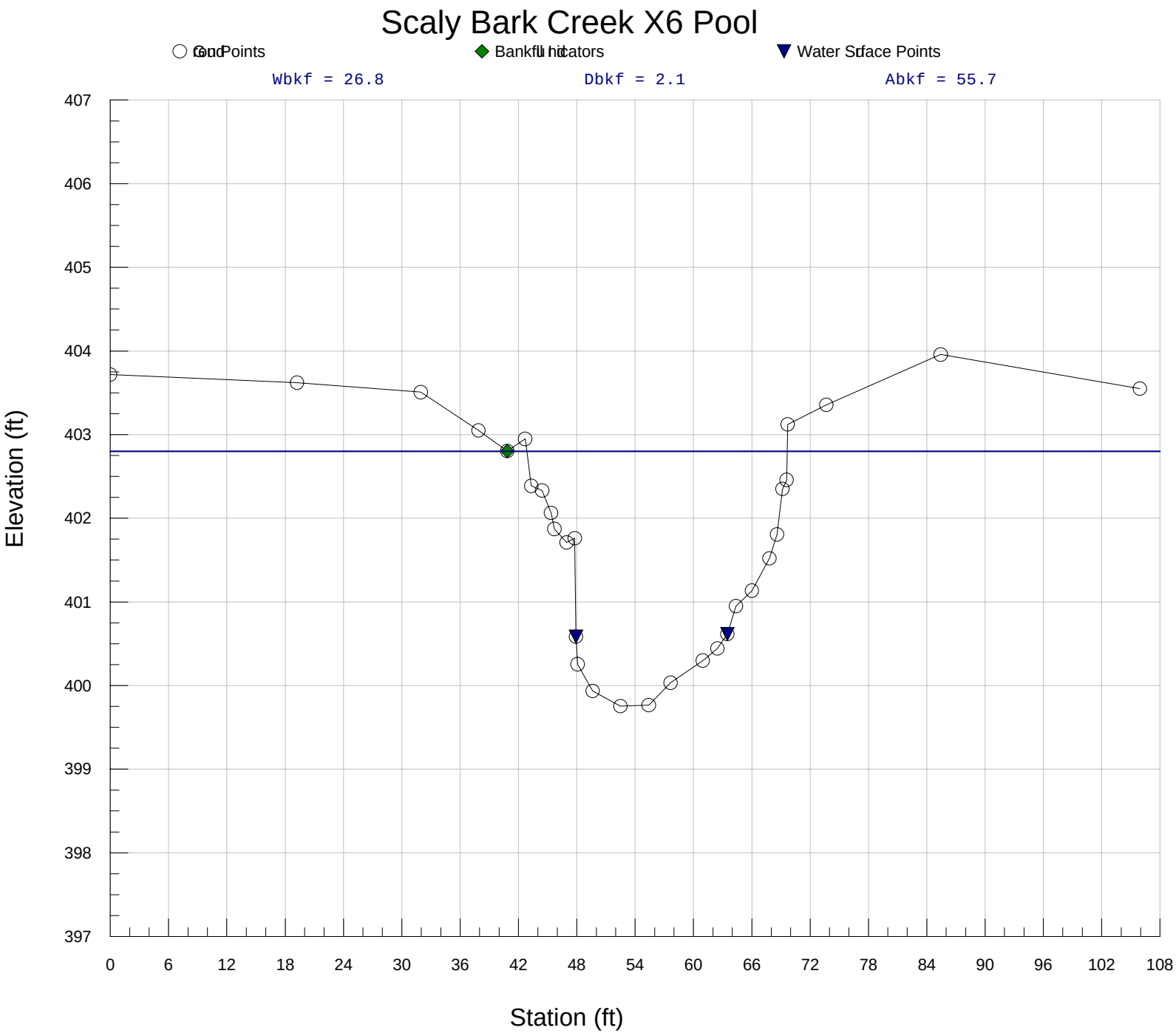
	Channel	Left	Right
Floodprone Elevation (ft)	406.57	406.57	406.57
Bankfull Elevation (ft)	403.61	403.61	403.61
Floodprone Width (ft)	111.62	-----	-----
Bankfull Width (ft)	23.92	9.3	14.62
Entrenchment Ratio	4.67	-----	-----

	X5 Riffle DS Scaly Bark		
Mean Depth (ft)	1.63	2.14	1.31
Maximum Depth (ft)	2.96	2.96	2.96
Width/Depth Ratio	14.65	4.34	11.18
Bankfull Area (sqft)	39.03	19.93	19.11
Wetted Perimeter (ft)	26.54	13.86	18.53
Hydraulic Radius (ft)	1.47	1.44	1.03
Begin BKF Station	43.68	43.68	52.98
End BKF Station	67.6	52.98	67.6

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sqft)			
Movable Particle (mm)			


Scaly Bark Creek X6 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 26.8
Dbkf = 2.1
Abkf = 55.7
Elevation (ft)
Station (ft)
407
406
405
404
403
402
401
400
399
398
397
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
102
108

X6 Pool DS Scaly Bark
RIVERMORPH CROSS SECTION SUMMARY

River Name: Scaly Bark Creek
Reach Name: Reach 3
Cross Section Name: Scaly Bark X6 Pool
Survey Date: 11/10/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	403.717794	POOL
19.22	0	403.61956	
31.95	0	403.507382	
37.88	0	403.049966	
40.85	0	402.803442	BKF
42.69	0	402.948179	
43.32	0	402.386947	
44.43	0	402.331923	
45.35	0	402.063202	-
45.7	0	401.870895	
46.96	0	401.711043	
47.79	0	401.759886	
47.92	0	400.584073	LEW
48.09	0	400.254208	
49.64	0	399.933661	
52.48	0	399.752462	
55.41	0	399.765195	
57.65	0	400.03282	
60.96	0	400.297783	
62.47	0	400.442495	
63.49	0	400.614145	REW
64.38	0	400.948461	
66.02	0	401.134452	
67.82	0	401.519544	
68.6	0	401.805243	
69.16	0	402.350477	
69.59	0	402.458022	
69.7	0	403.121076	
73.68	0	403.355037	
85.44	0	403.956688	
105.92	0	403.549483	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	405.85	405.85	405.85
Bankfull Elevation (ft)	402.8	402.8	402.8
Floodprone Width (ft)	105.92	-----	-----
Bankfull Width (ft)	26.79	14.25	12.54
Entrenchment Ratio	3.95	-----	-----
Mean Depth (ft)	2.08	2.15	2
Maximum Depth (ft)	3.05	3.05	2.83
Width/Depth Ratio	12.88	6.62	6.28

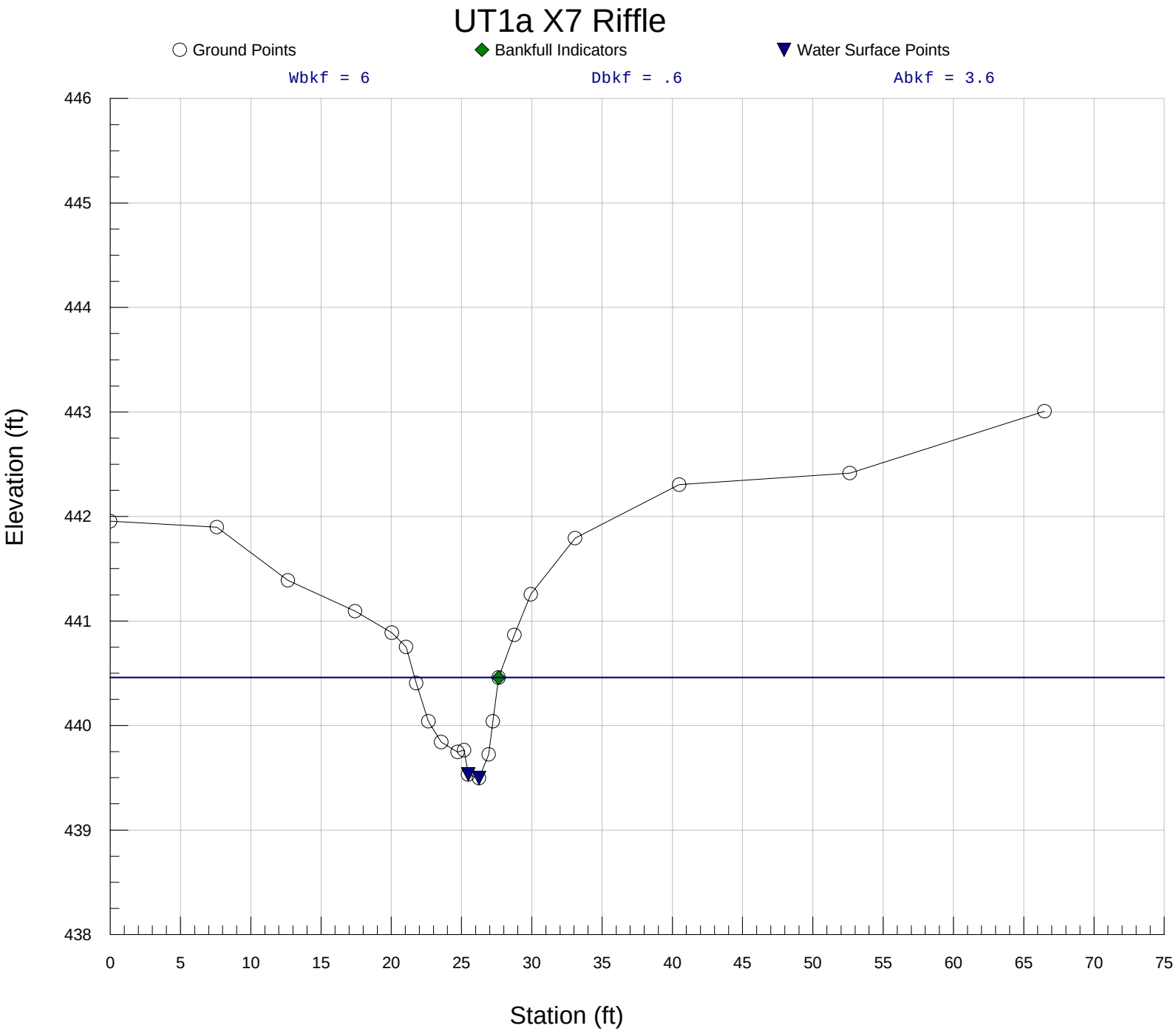
X6 Pool DS Scaly Bark

Bankfull Area (sq ft)	55.71	30.69	25.02
Wetted Perimeter (ft)	29.08	18.65	16.09
Hydraulic Radius (ft)	1.92	1.65	1.56
Begin BKF Station	42.86	42.86	57.11
End BKF Station	69.65	57.11	69.65

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT1a X7 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6
Dbkf = .6
Abkf = 3.6
Elevation (ft)
446
445
444
443
442
441
440
439
438
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
Station (ft)

X7 Riffle UT1a
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT1
Reach Name: UT1a
Cross Section Name: UT1a X7 Riffle
Survey Date: 11/05/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	441.954589	RIFFLE
7.59	0	441.898183	
12.64	0	441.388983	
17.42	0	441.093569	
20.04	0	440.88789	
21.05	0	440.752039	
21.78	0	440.405715	
22.64	0	440.040811	
23.55	0	439.841837	
24.72	0	439.746507	
25.18	0	439.764505	
25.47	0	439.531592	LEW
26.24	0	439.496663	REW
26.93	0	439.72331	
27.23	0	440.040081	
27.64	0	440.458166	BKF
28.76	0	440.867425	
29.92	0	441.255724	
33.08	0	441.793212	
40.49	0	442.304563	
52.63	0	442.414504	
66.48	0	443.007127	

Cross Sectional Geometry

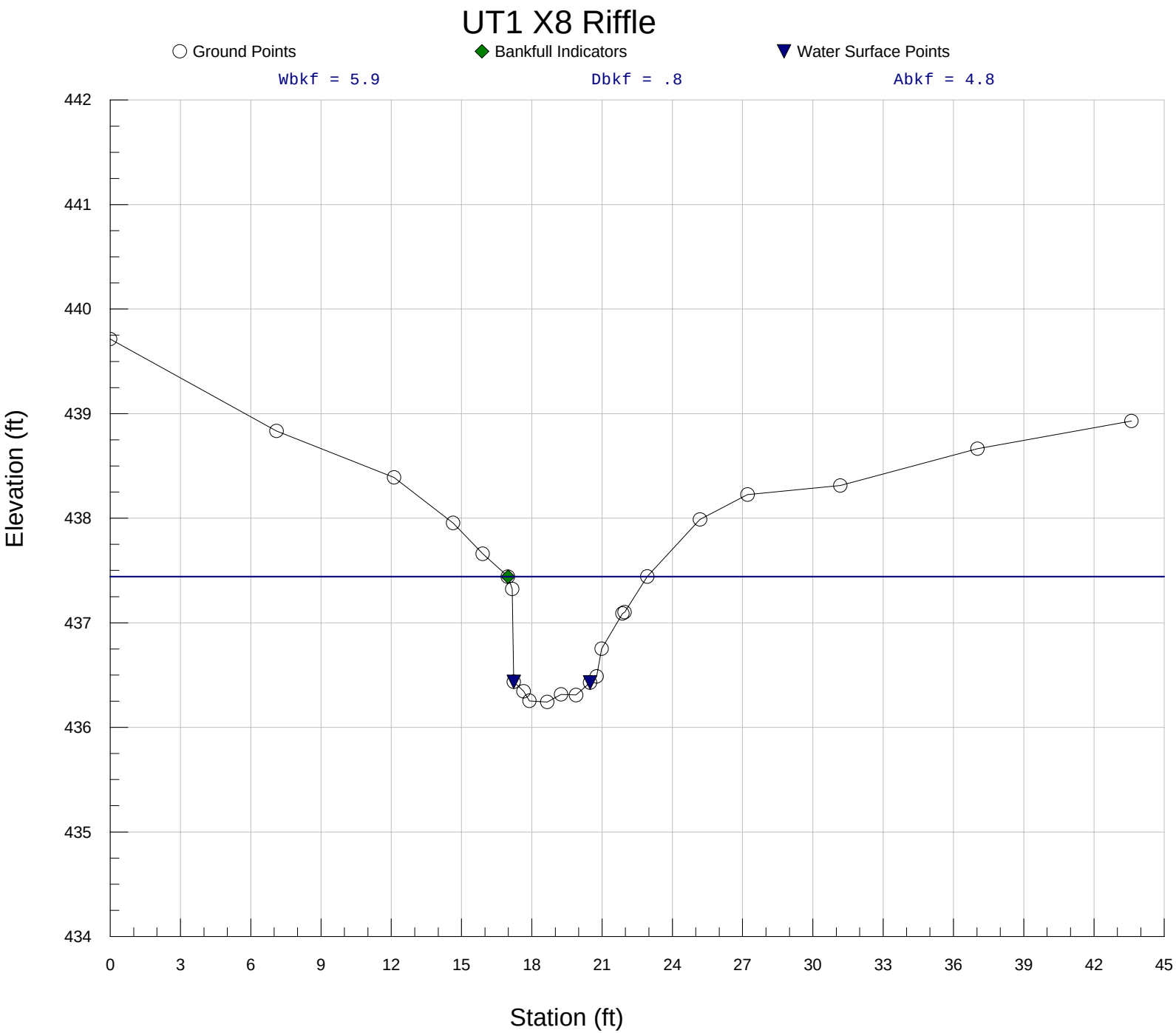
	Channel	Left	Right
Floodprone Elevation (ft)	441.42	441.42	441.42
Bankfull Elevation (ft)	440.46	440.46	440.46
Floodprone Width (ft)	18.61	-----	-----
Bankfull Width (ft)	5.98	2.99	2.99
Entrenchment Ratio	3.11	-----	-----
Mean Depth (ft)	0.6	0.47	0.73
Maximum Depth (ft)	0.96	0.71	0.96
Width/Depth Ratio	9.95	6.34	4.09
Bankfull Area (sq ft)	3.59	1.42	2.18
Wetted Perimeter (ft)	6.52	3.81	4.13
Hydraulic Radius (ft)	0.55	0.37	0.53
Begin BKF Station	21.67	21.67	24.66
End BKF Station	27.65	24.66	27.65

Entrainment Calculations

X7 Riffle UT1a

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT1 X8 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 5.9
Dbkf = .8
Abkf = 4.8
Elevation (ft)
442
441
440
439
438
437
436
435
434
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
Station (ft)

X8 Riffle US UT1
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT1
Reach Name: Reach 1 (Enhancement)
Cross Section Name: UT1 X8 Riffle
Survey Date: 11/09/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	439.713098	RIFFLE
7.1	0	438.834672	
12.12	0	438.390548	
14.64	0	437.954004	
15.9	0	437.660228	
16.98	0	437.440609	BKF
17.16	0	437.323547	
17.23	0	436.435283	LEW
17.65	0	436.34532	
17.9	0	436.253645	
18.66	0	436.243122	
19.25	0	436.314286	
19.89	0	436.309133	
20.49	0	436.428225	REW
20.77	0	436.487079	
20.98	0	436.752088	
21.87	0	437.08961	
21.96	0	437.101257	-
22.93	0	437.442662	
25.18	0	437.988789	
27.21	0	438.226136	
31.17	0	438.313056	
37.03	0	438.665388	
43.6	0	438.929149	

Cross Sectional Geometry

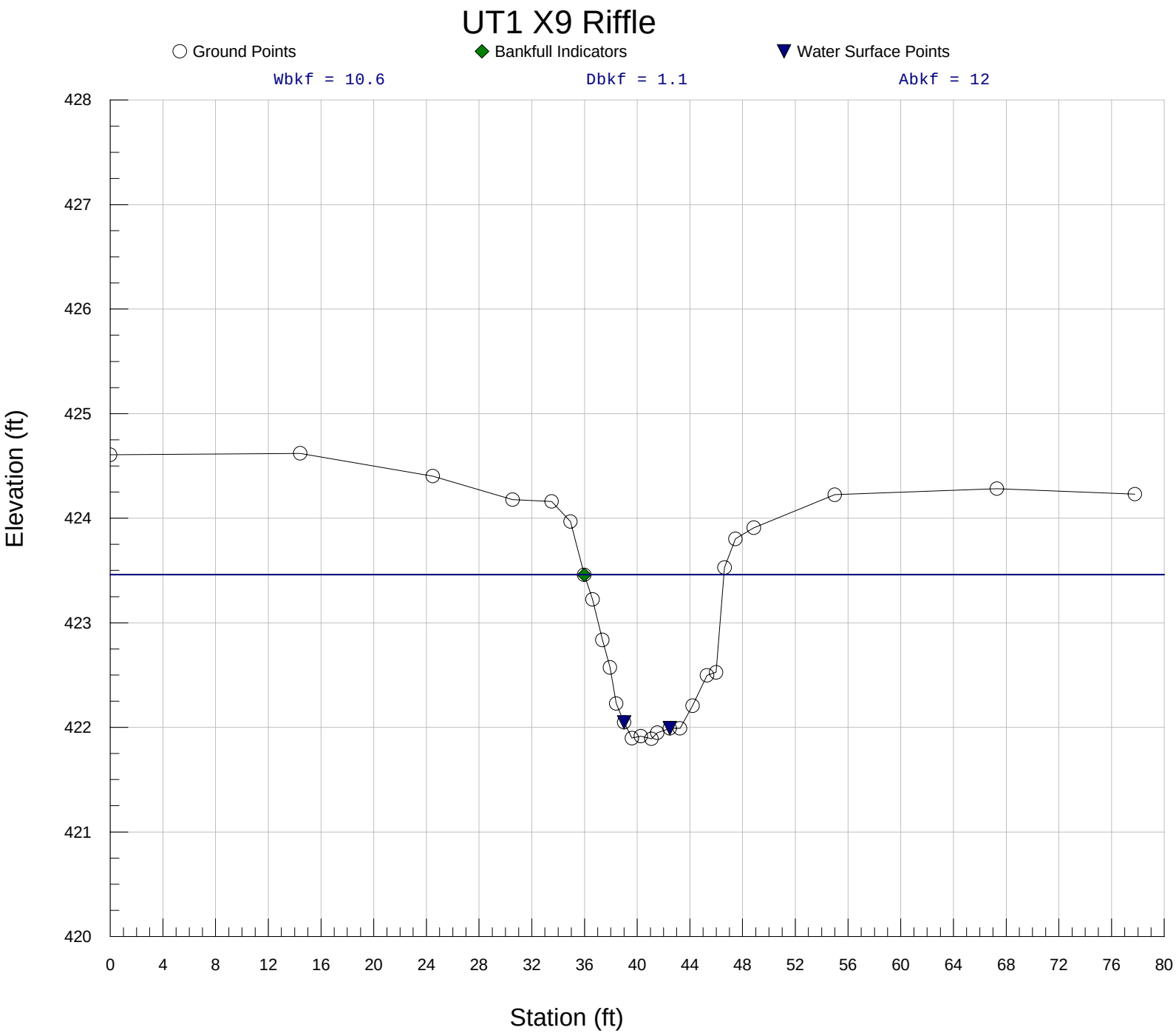
	Channel	Left	Right
Floodprone Elevation (ft)	438.64	438.64	438.64
Bankfull Elevation (ft)	437.44	437.44	437.44
Floodprone Width (ft)	27.22	-----	-----
Bankfull Width (ft)	5.94	2.58	3.36
Entrenchment Ratio	4.58	-----	-----
Mean Depth (ft)	0.81	1.05	0.63
Maximum Depth (ft)	1.2	1.2	1.13
Width/Depth Ratio	7.3	2.45	5.33
Bankfull Area (sq ft)	4.83	2.72	2.12
Wetted Perimeter (ft)	7.09	4.59	4.76
Hydraulic Radius (ft)	0.68	0.59	0.45
Begin BKF Station	16.98	16.98	19.56
End BKF Station	22.92	19.56	22.92

X8 Riffle US UT1

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT1 X9 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 10.6
Dbkf = 1.1
Abkf = 12
Elevation (ft)
428
427
426
425
424
423
422
421
420
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
Station (ft)

X9 Riffle DS UT1
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT1
Reach Name: Reach 2 (Restoration)
Cross Section Name: UT1 X9 Riffle
Survey Date: 11/09/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	424.606748	RIFFLE
14.42	0	424.620901	
24.48	0	424.403158	
30.54	0	424.177648	
33.51	0	424.16085	LTB
34.93	0	423.9679	
35.98	0	423.458049	BKF
36.61	0	423.223312	
37.36	0	422.835928	
37.93	0	422.573472	
38.41	0	422.227361	
39	0	422.048323	LEW
39.6	0	421.897001	
40.27	0	421.914894	
41.08	0	421.890203	
41.52	0	421.948903	
42.47	0	421.991044	REW
43.24	0	421.989641	
44.2	0	422.20676	
45.3	0	422.496924	
45.99	0	422.526487	
46.63	0	423.528169	
47.46	0	423.802533	
48.85	0	423.909134	RTB
54.99	0	424.224402	
67.3	0	424.283233	
77.77	0	424.230486	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	425.03	425.03	425.03
Bankfull Elevation (ft)	423.46	423.46	423.46
Floodprone Width (ft)	77.77	-----	-----
Bankfull Width (ft)	10.61	5.3	5.31
Entrenchment Ratio	7.33	-----	-----
Mean Depth (ft)	1.13	1.06	1.2
Maximum Depth (ft)	1.57	1.57	1.54
Width/Depth Ratio	9.38	5	4.42
Bankfull Area (sq ft)	12	5.62	6.37
Wetted Perimeter (ft)	11.54	7.2	7.43
Hydraulic Radius (ft)	1.04	0.78	0.86
Begin BKF Station	35.98	35.98	41.28

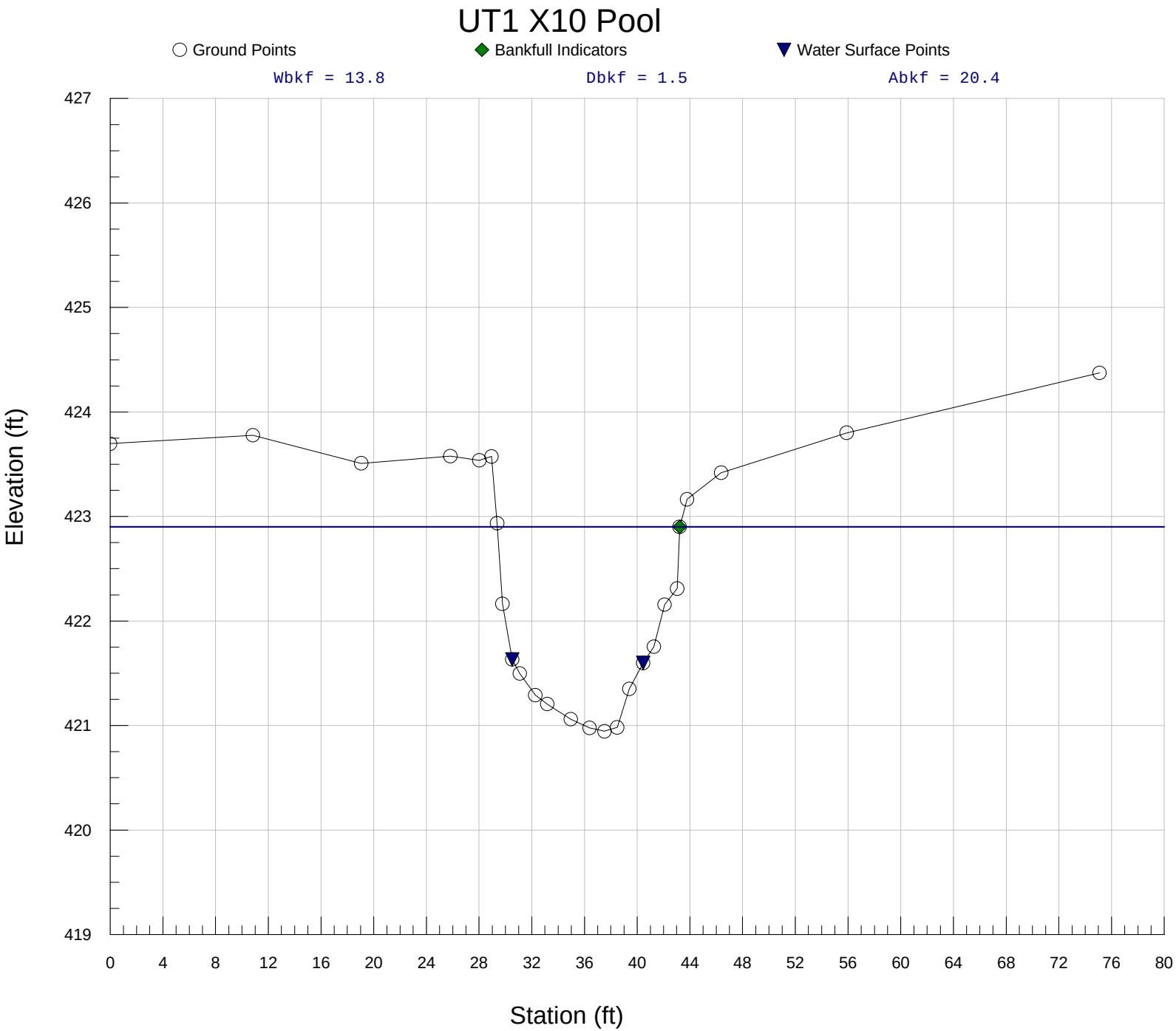
X9 Riffle DS UT1

End BKF Station	46.59	41.28	46.59

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT1 X10 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 13.8
Dbkf = 1.5
Abkf = 20.4
Elevation (ft)
427
426
425
424
423
422
421
420
419
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
Station (ft)

X10 Pool DS UT1
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT1
Reach Name: Reach 2 (Restoration)
Cross Section Name: UT1 X10 Pool
Survey Date: 11/09/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	423.696199	POOL
10.83	0	423.777329	
19.05	0	423.508325	
25.82	0	423.577329	
28.02	0	423.53775	
28.94	0	423.573847	LTB
29.37	0	422.935494	
29.77	0	422.16438	
30.51	0	421.63268	LEW
31.09	0	421.497042	
32.27	0	421.290279	
33.17	0	421.20522	
34.95	0	421.060358	
36.38	0	420.977101	
37.51	0	420.94468	
38.48	0	420.981791	
39.4	0	421.350265	
40.45	0	421.598181	REW
41.27	0	421.754675	
42.08	0	422.157127	
43.04	0	422.310194	
43.22	0	422.900453	BKF
43.78	0	423.164659	RTB
46.37	0	423.418884	
55.9	0	423.800615	
75.09	0	424.374618	

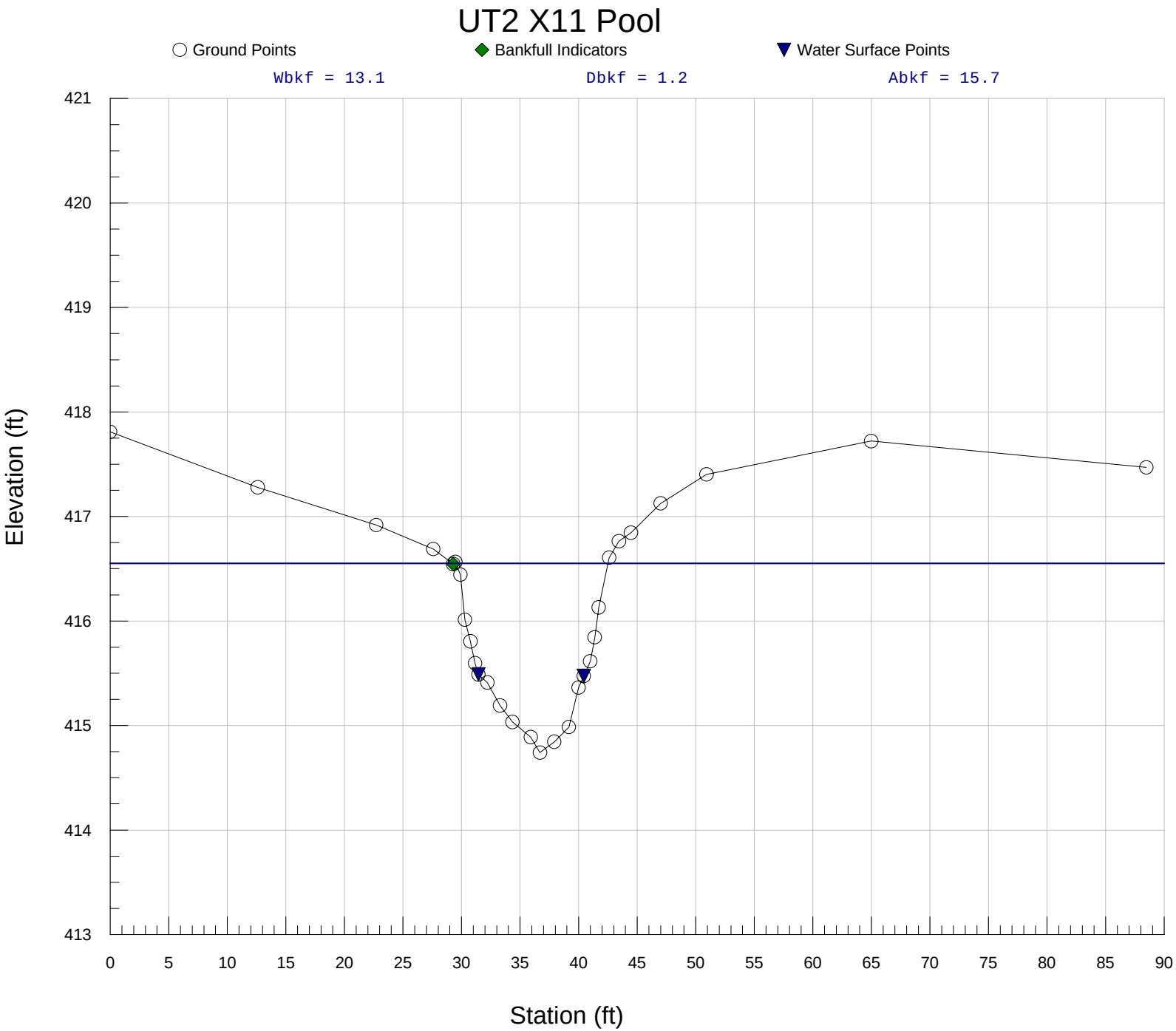
Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	424.86	424.86	424.86
Bankfull Elevation (ft)	422.9	422.9	422.9
Floodprone Width (ft)	75.09	-----	-----
Bankfull Width (ft)	13.83	6.91	6.92
Entrenchment Ratio	5.43	-----	-----
Mean Depth (ft)	1.47	1.53	1.41
Maximum Depth (ft)	1.96	1.92	1.96
Width/Depth Ratio	9.39	4.51	4.9
Bankfull Area (sq ft)	20.38	10.6	9.78
Wetted Perimeter (ft)	15.15	9.49	9.5
Hydraulic Radius (ft)	1.34	1.12	1.03
Begin BKF Station	29.39	29.39	36.3
End BKF Station	43.22	36.3	43.22

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT2 X11 Pool
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 13.1
Dbkf = 1.2
Abkf = 15.7
Elevation (ft)
421
420
419
418
417
416
415
414
413
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
Station (ft)

X11 Pool UT2
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Reach 1
Cross Section Name: UT2 X11 Pool
Survey Date: 11/10/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	417.809351	POOL
12.6	0	417.278617	
22.72	0	416.918558	
27.59	0	416.688178	
29.29	0	416.545165	BKF
29.47	0	416.56458	
29.9	0	416.443793	
30.29	0	416.011191	
30.76	0	415.80591	
31.15	0	415.595655	
31.45	0	415.488298	LEW
32.2	0	415.410903	
33.29	0	415.190935	
34.35	0	415.034286	
35.91	0	414.888702	
36.7	0	414.740019	
37.92	0	414.843885	
39.17	0	414.985532	
40	0	415.36294	
40.44	0	415.473968	REW
40.99	0	415.61476	
41.37	0	415.844337	
41.71	0	416.130306	
42.61	0	416.606497	
43.44	0	416.763082	
44.47	0	416.844661	
47	0	417.125235	
50.92	0	417.402319	
64.98	0	417.721575	
88.48	0	417.470586	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	418.36	418.36	418.36
Bankfull Elevation (ft)	416.55	416.55	416.55
Floodprone Width (ft)	88.48	-----	-----
Bankfull Width (ft)	13.08	6.87	6.4
Entrenchment Ratio	6.76	-----	-----
Mean Depth (ft)	1.2	1.14	1.27
Maximum Depth (ft)	1.81	1.7	1.81
Width/Depth Ratio	10.91	5.88	5.05
Bankfull Area (sq ft)	15.69	7.59	8.1

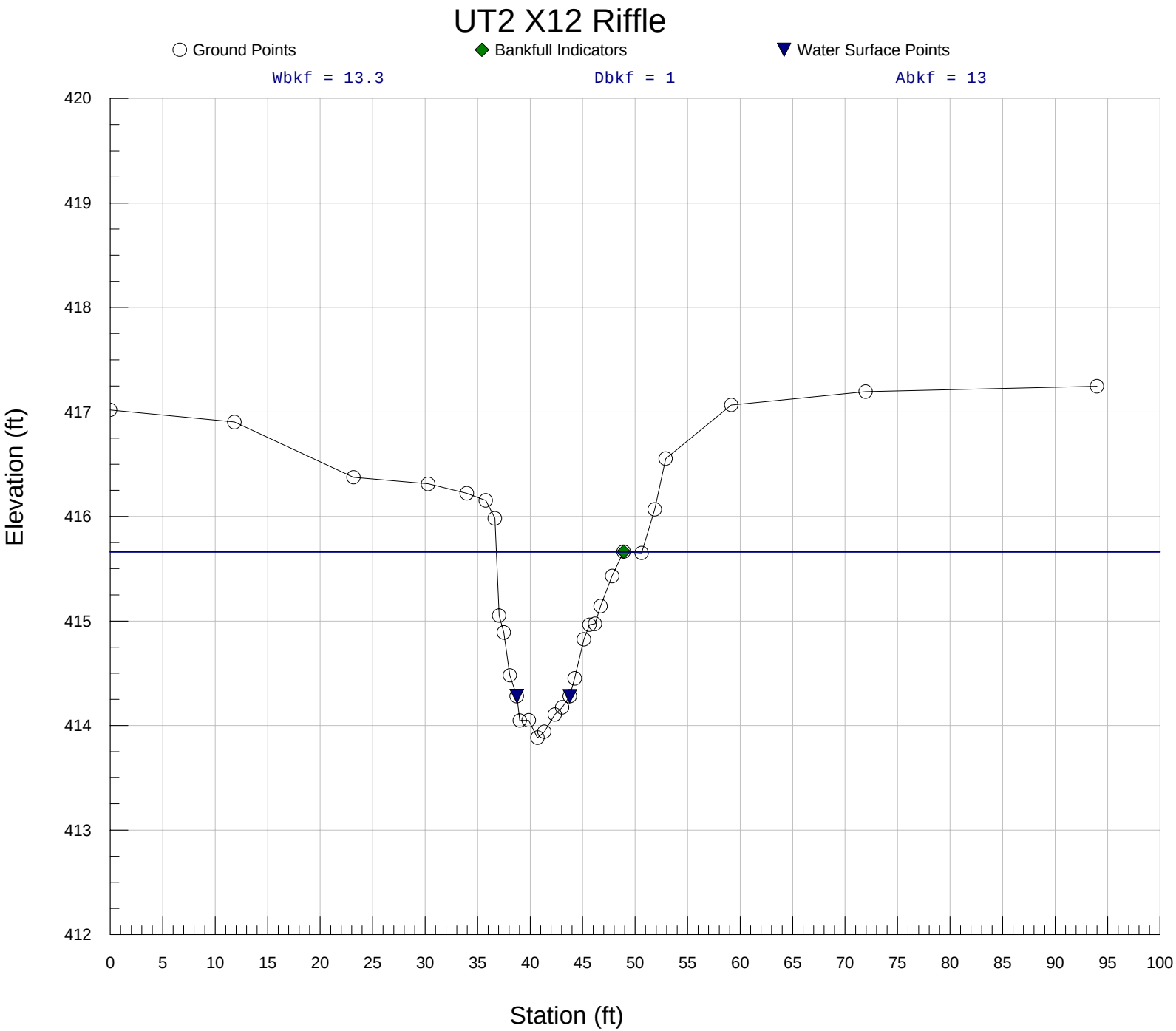
X11 Pool UT2

Wetted Perimeter (ft)	13.86	8.75	8.51
Hydraulic Radius (ft)	1.13	0.87	0.95
Begin BKF Station	29.23	29.23	36.1
End BKF Station	42.5	36.1	42.5

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT2 X12 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 13.3
Dbkf = 1
Abkf = 13
Elevation (ft)
Station (ft)
420
419
418
417
416
415
414
413
412
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

X12 Riffle UT2
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT2
Reach Name: Reach 1
Cross Section Name: UT2 X12 Riffle
Survey Date: 11/10/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	417.019472	RIFFLE
11.83	0	416.903419	
23.17	0	416.374636	
30.29	0	416.311974	
33.97	0	416.221638	
35.77	0	416.154008	
36.64	0	415.982214	
37.04	0	415.051552	
37.49	0	414.891108	
38.07	0	414.479967	
38.73	0	414.280899	LEW
39.01	0	414.048469	
39.87	0	414.049585	
40.71	0	413.883803	
41.36	0	413.939709	
42.35	0	414.105808	
43.04	0	414.173633	
43.78	0	414.280457	REW
44.25	0	414.451353	
45.12	0	414.824212	
45.65	0	414.964924	
46.19	0	414.973538	-
46.7	0	415.142801	
47.81	0	415.430284	
48.91	0	415.663858	BKF
50.62	0	415.650912	
51.87	0	416.068596	
52.91	0	416.553525	
59.16	0	417.066689	
71.95	0	417.195498	
93.99	0	417.24568	

Cross Sectional Geometry

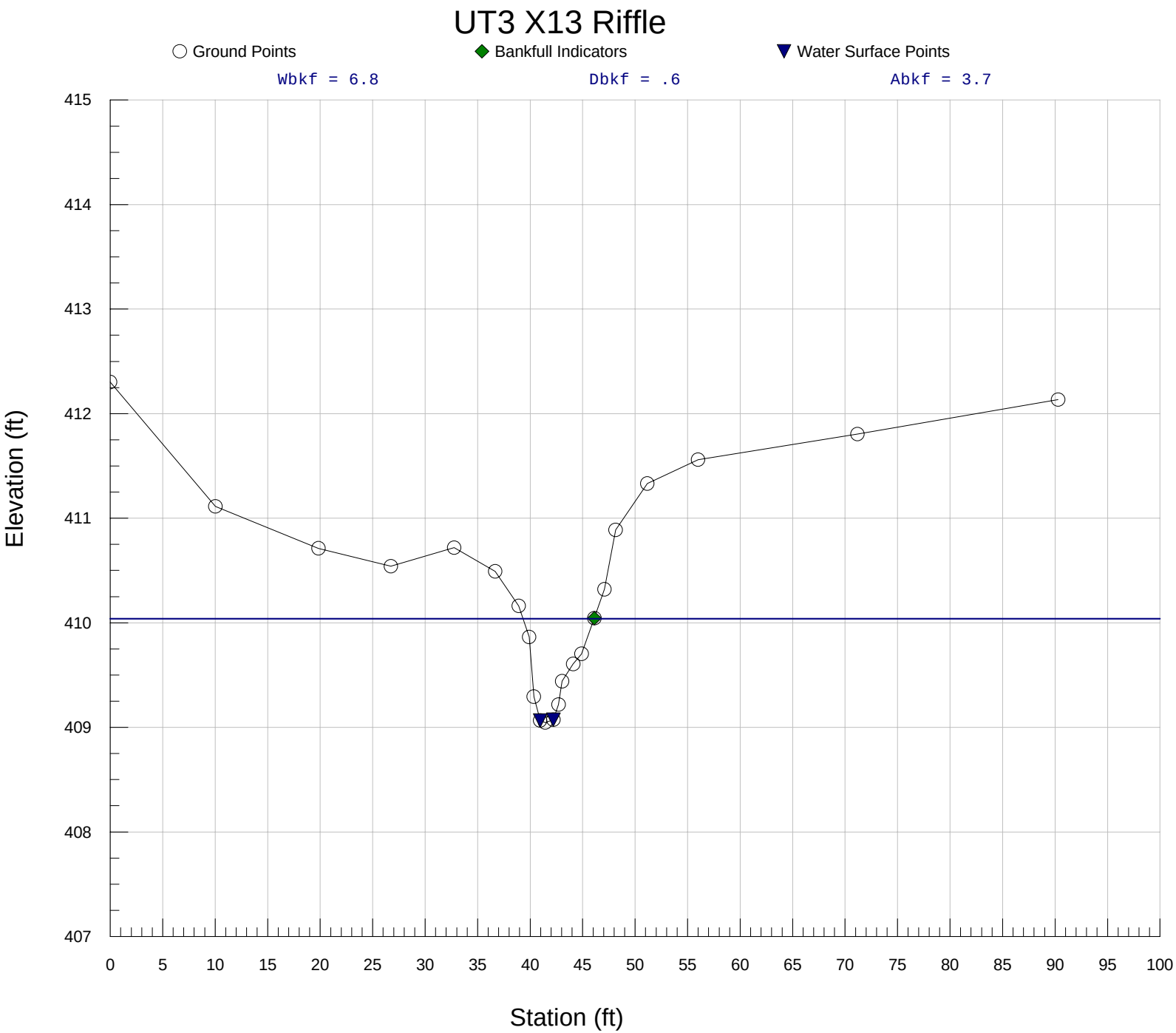
	Channel	Left	Right
Floodprone Elevation (ft)	417.44	417.44	417.44
Bankfull Elevation (ft)	415.66	415.66	415.66
Floodprone Width (ft)	93.99	-----	-----
Bankfull Width (ft)	13.34	4.84	9.03
Entrenchment Ratio	7.05	-----	-----
Mean Depth (ft)	0.98	1.36	0.75
Maximum Depth (ft)	1.78	1.78	1.68
Width/Depth Ratio	13.67	3.55	11.26

	X12 Riffle UT2		
Bankfull Area (sq ft)	13.02	6.6	6.42
Wetted Perimeter (ft)	14.27	7.21	10.41
Hydraulic Radius (ft)	0.91	0.92	0.62
Begin BKF Station	36.78	36.78	41.62
End BKF Station	50.65	41.62	50.65

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT3 X13 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6.8
Dbkf = .6
Abkf = 3.7
Elevation (ft)
Station (ft)
415
414
413
412
411
410
409
408
407
0
5
10
15
20
25
30
35
40
45
50
55
60
65
70
75
80
85
90
95
100

X13 Riffle UT3
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT3
Reach Name: Reach 1
Cross Section Name: UT3 X13 Riffle
Survey Date: 11/09/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	412.302637	RIFFLE
10.02	0	411.11311	
19.84	0	410.711669	
26.74	0	410.54156	
32.76	0	410.718152	
36.67	0	410.491905	
38.92	0	410.161812	
39.91	0	409.864555	
40.35	0	409.293412	
40.95	0	409.06539	LEW
41.44	0	409.044853	
42.21	0	409.072421	REW
42.71	0	409.217504	
43.04	0	409.441163	
44.1	0	409.606317	
44.9	0	409.702996	
46.12	0	410.044273	BKF
47.08	0	410.320497	
48.14	0	410.888419	
51.17	0	411.331628	
56	0	411.560162	
71.18	0	411.80415	
90.29	0	412.133776	

Cross Sectional Geometry

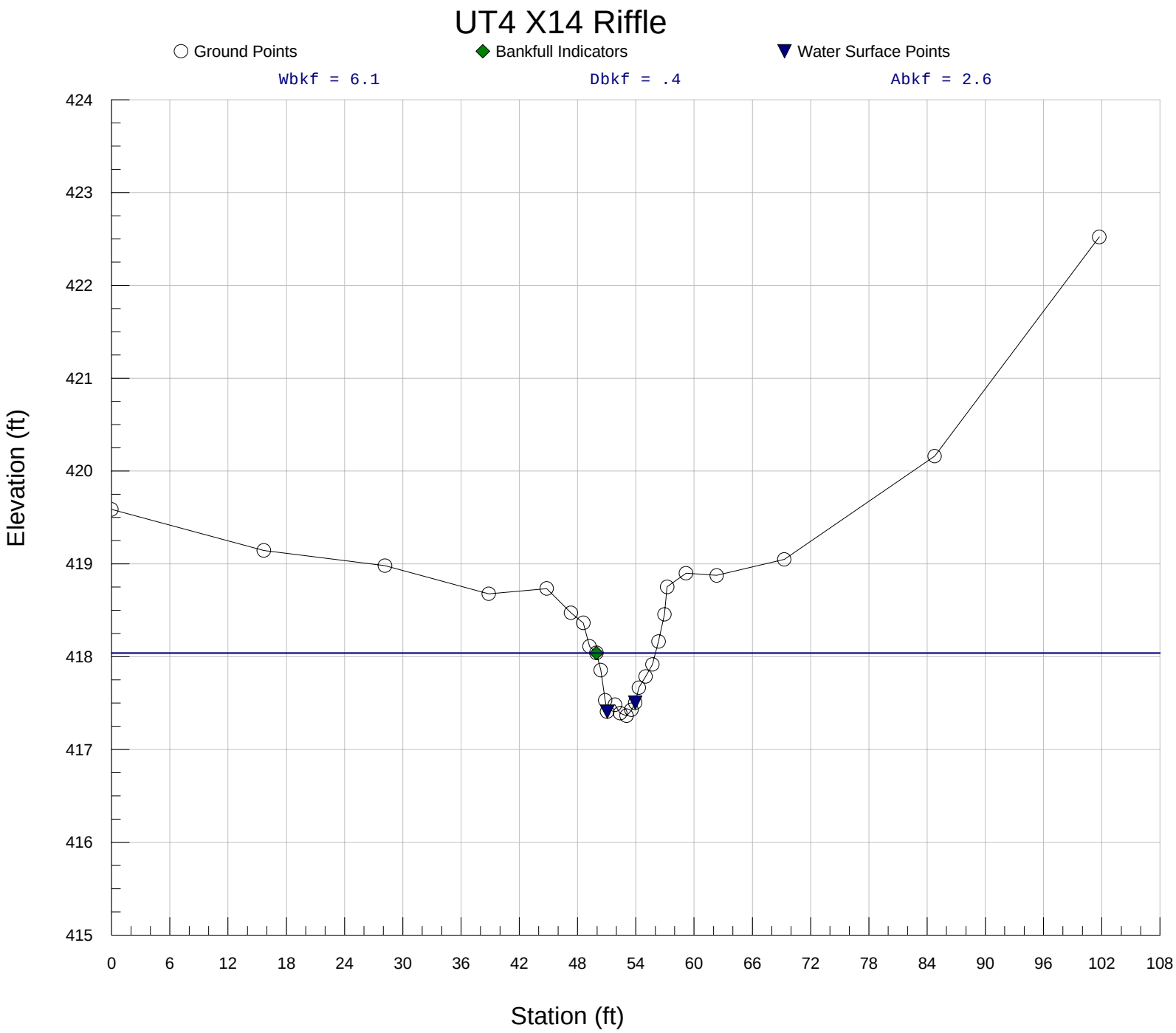
	Channel	Left	Right
Floodprone Elevation (ft)	411.04	411.04	411.04
Bankfull Elevation (ft)	410.04	410.04	410.04
Floodprone Width (ft)	37.22	-----	-----
Bankfull Width (ft)	6.78	3.38	3.39
Entrenchment Ratio	5.49	-----	-----
Mean Depth (ft)	0.55	0.73	0.38
Maximum Depth (ft)	1	1	0.82
Width/Depth Ratio	12.26	4.66	8.89
Bankfull Area (sq ft)	3.75	2.46	1.29
Wetted Perimeter (ft)	7.28	4.58	4.35
Hydraulic Radius (ft)	0.51	0.54	0.3
Begin BKF Station	39.33	39.33	42.71
End BKF Station	46.1	42.71	46.1

Entrainment Calculations

X13 Riffle UT3

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT4 X14 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6.1
Dbkf = .4
Abkf = 2.6
Elevation (ft)
424
423
422
421
420
419
418
417
416
415
0
6
12
18
24
30
36
42
48
54
60
66
72
78
84
90
96
102
108
Station (ft)

X14 Riffle DS UT4
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT4
Reach Name: Reach 1
Cross Section Name: UT4 X14 Riffle
Survey Date: 11/09/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	419.586866	RIFFLE
15.69	0	419.145176	
28.16	0	418.980624	
38.86	0	418.678284	
44.83	0	418.734914	
47.32	0	418.472701	
48.6	0	418.363727	
49.24	0	418.110979	
49.94	0	418.041024	BKF
50.39	0	417.855818	
50.85	0	417.529597	
51.05	0	417.408214	LEW
51.85	0	417.482534	
52.39	0	417.390219	
53.05	0	417.363742	
53.55	0	417.428075	
53.94	0	417.504335	REW
54.32	0	417.666151	
55.02	0	417.78684	
55.72	0	417.916528	
56.34	0	418.162883	
56.95	0	418.455234	
57.23	0	418.752137	
59.17	0	418.899553	
62.33	0	418.875754	
69.29	0	419.048091	
84.78	0	420.160311	
101.74	0	422.522549	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	418.72	418.72	418.72
Bankfull Elevation (ft)	418.04	418.04	418.04
Floodprone Width (ft)	17.54	-----	-----
Bankfull Width (ft)	6.09	3.04	3.05
Entrenchment Ratio	2.88	-----	-----
Mean Depth (ft)	0.43	0.5	0.37
Maximum Depth (ft)	0.68	0.67	0.68
Width/Depth Ratio	14.02	6.12	8.19
Bankfull Area (sq ft)	2.64	1.51	1.14
Wetted Perimeter (ft)	6.36	3.9	3.81
Hydraulic Radius (ft)	0.42	0.39	0.3

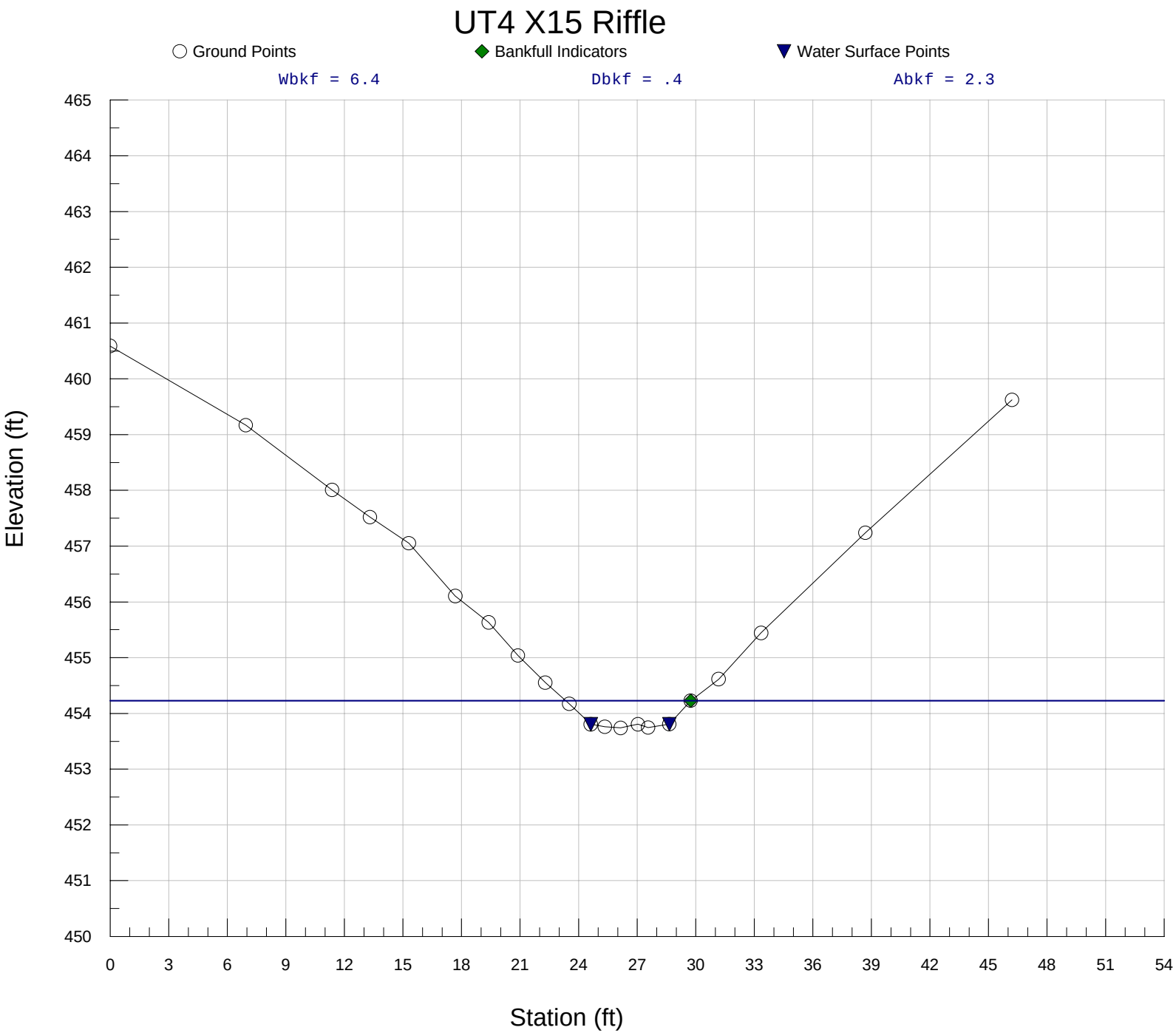
X14 Riffle DS UT4

Begin BKF Station	49.94	49.94	52.98
End BKF Station	56.03	52.98	56.03

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT4 X15 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 6.4
Dbkf = .4
Abkf = 2.3
Elevation (ft)
Station (ft)
465
464
463
462
461
460
459
458
457
456
455
454
453
452
451
450
0
3
6
9
12
15
18
21
24
27
30
33
36
39
42
45
48
51
54

X15 Riffle US UT4
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT4
Reach Name: Reach 1
Cross Section Name: UT4 X15 Riffle
Survey Date: 11/09/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	460.589086	RIFFLE
6.95	0	459.168853	
11.37	0	458.008068	
13.31	0	457.521044	
15.3	0	457.050504	
17.68	0	456.103913	
19.39	0	455.631421	
20.89	0	455.03711	
22.29	0	454.551403	
23.52	0	454.171753	
24.62	0	453.804668	LEW
25.34	0	453.760488	
26.15	0	453.739877	
27.04	0	453.804876	
27.56	0	453.746972	
28.64	0	453.806626	REW
29.74	0	454.229353	BKF
31.17	0	454.613646	
33.35	0	455.443812	
38.69	0	457.238754	
46.2	0	459.621123	

Cross Sectional Geometry

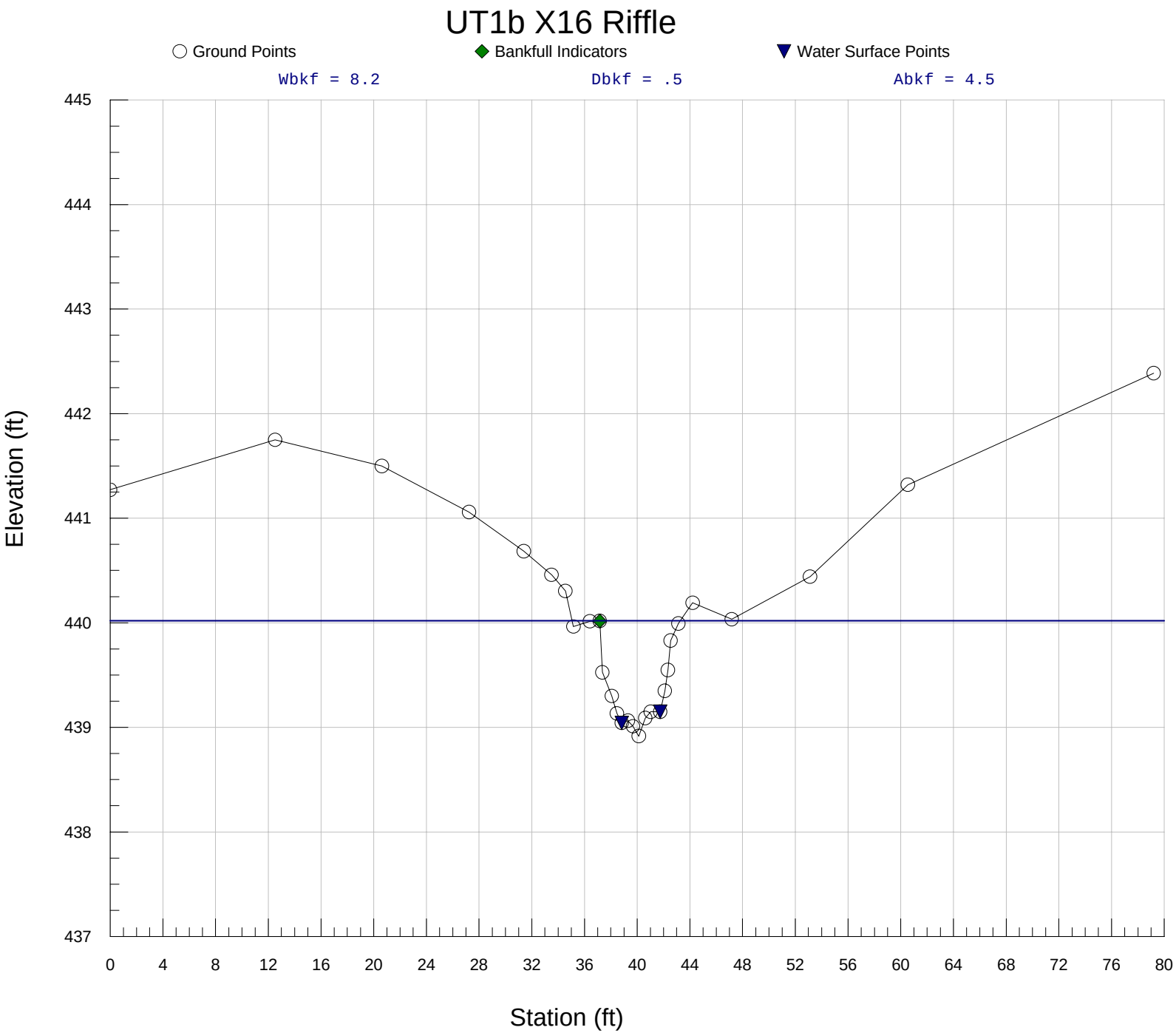
	Channel	Left	Right
Floodprone Elevation (ft)	454.72	454.72	454.72
Bankfull Elevation (ft)	454.23	454.23	454.23
Floodprone Width (ft)	9.65	-----	-----
Bankfull Width (ft)	6.41	3.21	3.2
Entrenchment Ratio	1.5	-----	-----
Mean Depth (ft)	0.37	0.36	0.37
Maximum Depth (ft)	0.49	0.49	0.48
Width/Depth Ratio	17.5	8.82	8.67
Bankfull Area (sq ft)	2.35	1.17	1.18
Wetted Perimeter (ft)	6.57	3.74	3.75
Hydraulic Radius (ft)	0.36	0.31	0.32
Begin BKF Station	23.33	23.33	26.54
End BKF Station	29.74	26.54	29.74

Entrainment Calculations

X15 Riffle US UT4

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			


UT1b X16 Riffle
Ground Points
Bankfull Indicators
Water Surface Points
Wbkf = 8.2
Dbkf = .5
Abkf = 4.5
Elevation (ft)
445
444
443
442
441
440
439
438
437
0
4
8
12
16
20
24
28
32
36
40
44
48
52
56
60
64
68
72
76
80
Station (ft)

X16 Riffle UT1b
RIVERMORPH CROSS SECTION SUMMARY

River Name: UT1
Reach Name: UT1b
Cross Section Name: UT1b X16 Riffle
Survey Date: 10/29/09

Cross Section Data Entry

BM Elevation: 0 ft
Backsight Rod Reading: 0 ft

TAPE	FS	ELEV	NOTE
0	0	441.271908	RIFFLE
12.52	0	441.749647	
20.62	0	441.499164	
27.24	0	441.059147	
31.39	0	440.684712	
33.5	0	440.458414	
34.55	0	440.304416	LTB
35.16	0	439.964228	
36.41	0	440.014579	
37.16	0	440.017843	BKF
37.36	0	439.526394	
38.07	0	439.299854	
38.46	0	439.132078	
38.82	0	439.042502	LEW
39.3	0	439.063781	
39.68	0	439.009952	
40.12	0	438.916328	
40.61	0	439.088898	
41.03	0	439.149046	
41.74	0	439.148409	REW
42.1	0	439.34839	
42.33	0	439.548003	
42.53	0	439.830188	-
43.13	0	439.993493	
44.21	0	440.190834	RTB
47.18	0	440.034656	
53.12	0	440.44194	
60.54	0	441.320919	
79.2	0	442.387766	

Cross Sectional Geometry

	Channel	Left	Right
Floodprone Elevation (ft)	441.12	441.12	441.12
Bankfull Elevation (ft)	440.02	440.02	440.02
Floodprone Width (ft)	32.61	-----	-----
Bankfull Width (ft)	8.22	4.82	3.4
Entrenchment Ratio	3.97	-----	-----
Mean Depth (ft)	0.55	0.46	0.68
Maximum Depth (ft)	1.1	1.05	1.1
Width/Depth Ratio	14.95	10.48	5.02
Bankfull Area (sq ft)	4.51	2.22	2.3
Wetted Perimeter (ft)	8.99	6.31	4.78

X16 Riffle UT1b

Hydraulic Radius (ft)	0.5	0.35	0.48
Begin BKF Station	35.06	35.06	39.88
End BKF Station	43.28	39.88	43.28

Entrainment Calculations

Entrainment Formula: Rosgen Modified Shields Curve

	Channel	Left Side	Right Side
Slope			
Shear Stress (lb/sq ft)			
Movable Particle (mm)			

PEBBLE COUNT ANALYSIS WORKSHEET

Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ, JK
Location:	Scaly Bark Creek - Reach 1	**Data Collected On:**	10/29/2009
Job #:	005-02122	**Reach:**	Reach 1
Date:	11/2/2009	**Cross Section #:**	X2

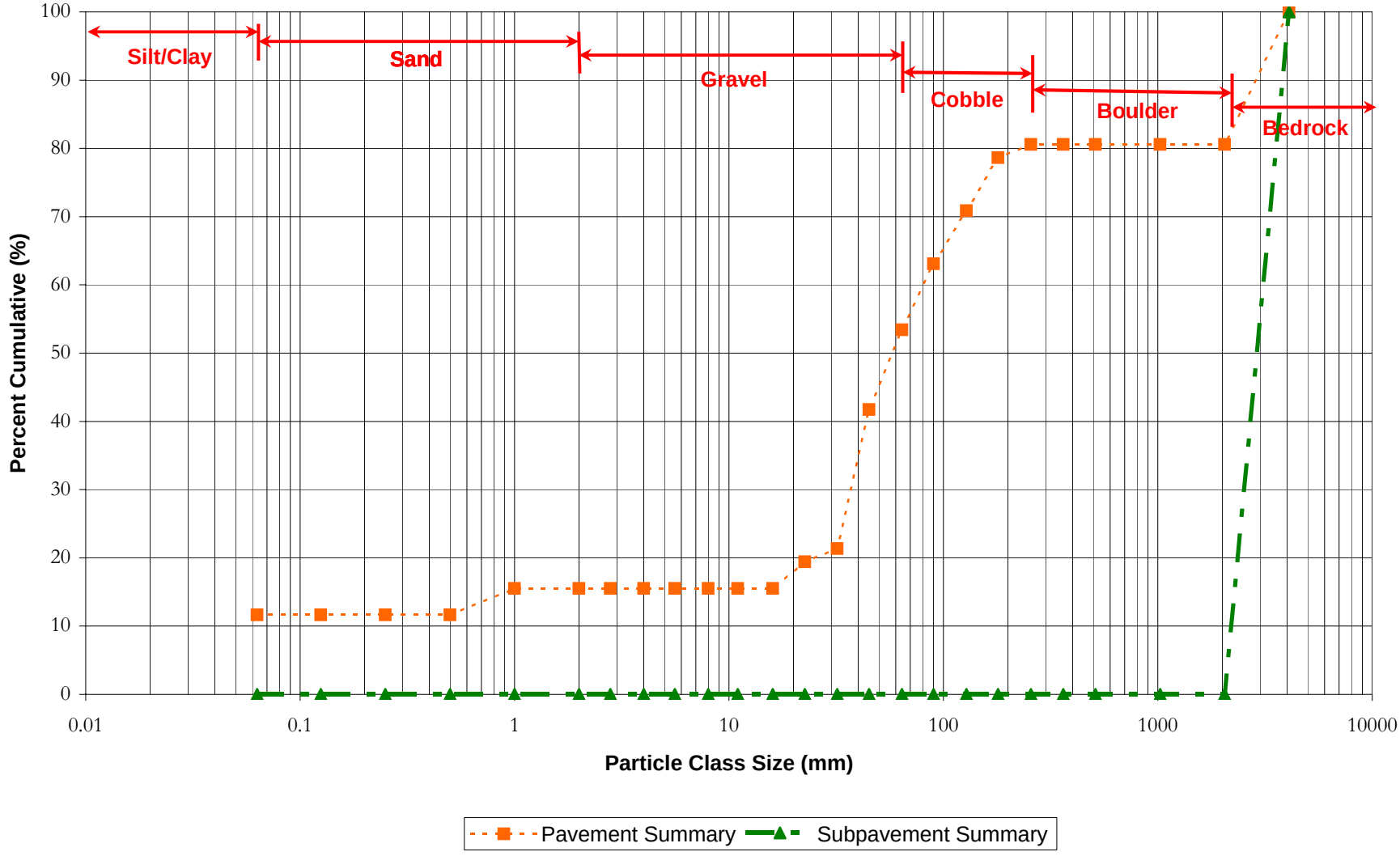
Particle Class		Diameter (mm)		Particle Count			Pavement Summary		Subpavement Summary		Reach Summary	
		min	max	Pavement	Subpavement	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	12		12	11.7	12		0	6	6
SAND	Very fine	0.062	0.125					12		0		6
	Fine	0.125	0.250					12		0		6
	Medium	0.250	0.500					12		0		6
	Coarse	0.5	1.0	4		4	3.9	16		0	2	8
	Very Coarse	1.0	2.0					16		0		8
GRAVEL	Very Fine	2.0	2.8					16		0		8
	Very Fine	2.8	4.0					16		0		8
	Fine	4.0	5.7					16		0		8
	Fine	5.7	8.0					16		0		8
	Medium	8.0	11.3					16		0		8
	Medium	11.3	16.0					16		0		8
	Coarse	16.0	22.6	4		4	3.9	19		0	2	10
	Coarse	22.6	32	2		2	1.9	21		0	1	11
	Very Coarse	32	45	21		21	20.4	42		0	10	21
	Very Coarse	45	64	12		12	11.7	53		0	6	27
COBBLE	Small	64	90	10		10	9.7	63		0	5	32
	Small	90	128	8		8	7.8	71		0	4	36
	Large	128	180	8		8	7.8	79		0	4	40
	Large	180	256	2		2	1.9	81		0	1	41
BOULDER	Small	256	362					81		0		41
	Small	362	512					81		0		41
	Medium	512	1024					81		0		41
	Large/Very Large	1024	2048					81		0		41
BEDROCK	Bedrock	2048	>2048	20	100	120	19.42	100	100	100	59	100
			Total	**103**	**100**	**203**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Pavement Channel materials (mm)		Subpavement Channel materials	
D_{16} =	16.68	D_{16} =	2288.20
D_{35} =	40.20	D_{35} =	2610.30
D_{50} =	57.75	D_{50} =	2896.31
D_{84} =	2313.72	D_{84} =	3666.02
D_{95} =	3426.45	D_{95} =	3956.48
D_{100} =	>2048	D_{99} =	>2048

Subpavement
Bedrock

Scaly Bark Creek - X2 Riffle
Pavement & Subpavement Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

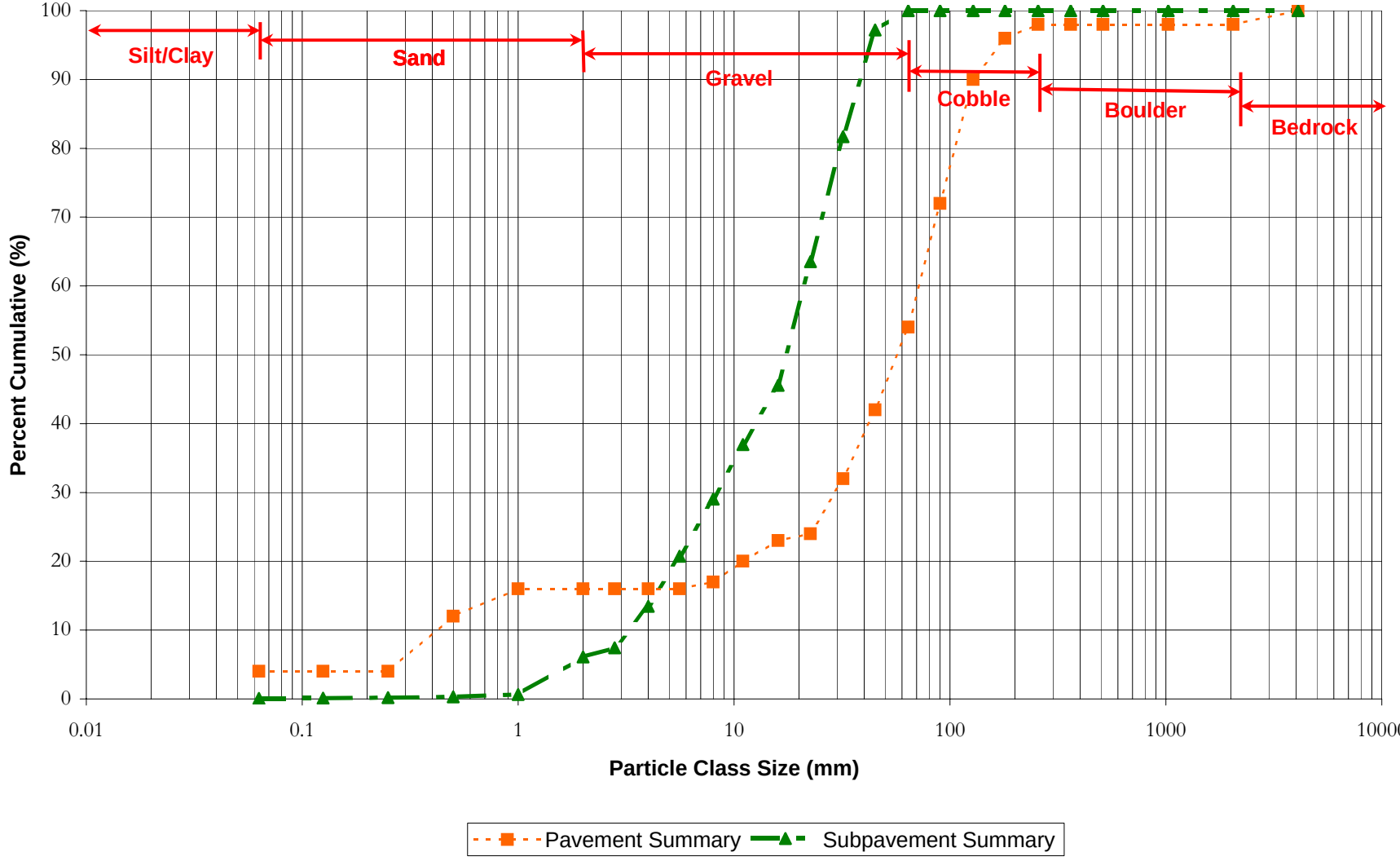
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ, JK
Location:	Scaly Bark Creek - Reach 2	**Data Collected On:**	10/29/2009
Job #:	005-02122	**Reach:**	Reach 2
Date:	11/2/2009	**Cross Section #:**	X3

Particle Class		Diameter (mm)		Particle Count			Pavement Summary		Subpavement Summary		Reach Summary	
		min	max	Pavement	Subpavement	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4	1.5	6	4.0	4	0	0	0	0
SAND	Very fine	0.062	0.125		1.4	1		4	0	0	0	0
	Fine	0.125	0.250		1.7	2		4	0	0	0	0
	Medium	0.250	0.500	8	3.1	11	8.0	12	0	0	0	1
	Coarse	0.5	1.0	4	9.5	14	4.0	16	0	1	0	1
	Very Coarse	1.0	2.0		143.5	144		16	5	6	5	6
GRAVEL	Very Fine	2.0	2.8		35.1	35		16	1	7	1	8
	Very Fine	2.8	4.0		158.8	159		16	6	13	6	14
	Fine	4.0	5.7		191.2	191		16	7	21	7	21
	Fine	5.7	8.0	1	218.6	220	1.0	17	8	29	8	29
	Medium	8.0	11.3	3	208.7	212	3.0	20	8	37	8	36
	Medium	11.3	16.0	3	225.9	229	3.0	23	9	46	8	45
	Coarse	16.0	22.6	1	473.3	474	1.0	24	18	64	17	62
	Coarse	22.6	32	8	478.3	486	8.0	32	18	82	18	80
	Very Coarse	32	45	10	407.9	418	10.0	42	15	97	15	95
	Very Coarse	45	64	12	74.0	86	12.0	54	3	100	3	98
COBBLE	Small	64	90	18		18	18.0	72		100	1	99
	Small	90	128	18		18	18.0	90		100	1	100
	Large	128	180	6		6	6.0	96		100	0	100
	Large	180	256	2		2	2.0	98		100	0	100
BOULDER	Small	256	362					98		100		100
	Small	362	512					98		100		100
	Medium	512	1024					98		100		100
	Large/Very Large	1024	2048					98		100		100
BEDROCK	Bedrock	2048	>2048	2		2	2.00	100		100	0	100
			Total	**100**	**2632.5**	**2732.5**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Pavement Channel materials (mm)		Subpavement Channel materials	
D_{16} =	5.60	D_{16} =	4.50
D_{35} =	35.45	D_{35} =	10.17
D_{50} =	56.91	D_{50} =	17.43
D_{84} =	113.82	D_{84} =	33.67
D_{95} =	170.06	D_{95} =	42.88
D_{100} =	>2048	D_{99} =	64

Scaly Bark Creek - X3 Riffle
Pavement & Subpavement Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

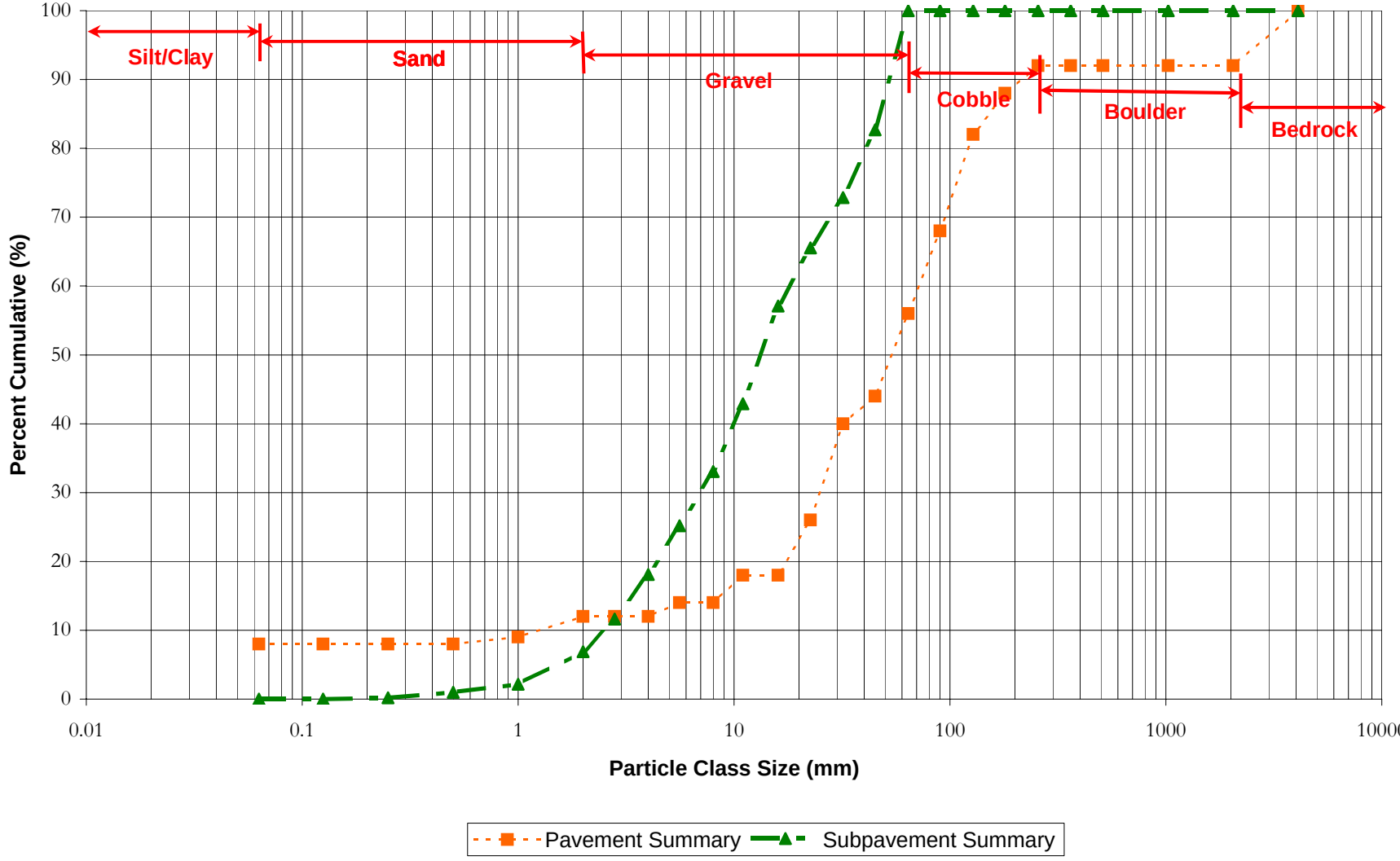
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ, JK
Location:	Scaly Bark Creek - Reach 2	**Data Collected On:**	10/29/2009
Job #:	005-02122	**Reach:**	Reach 2
Date:	11/2/2009	**Cross Section #:**	X5

Particle Class		Diameter (mm)		Particle Count			Pavement Summary		Subpavement Summary		Reach Summary	
		min	max	Pavement	Subpavement	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	8		8	8.0	8		0	0	0
SAND	Very fine	0.062	0.125					8		0		0
	Fine	0.125	0.250		5.0	5		8	0	0	0	0
	Medium	0.250	0.500		20.0	20		8	1	1	1	1
	Coarse	0.5	1.0	1	30.0	31	1.0	9	1	2	1	2
	Very Coarse	1.0	2.0	3	120.0	123	3.0	12	5	7	5	7
GRAVEL	Very Fine	2.0	2.8		120.0	120		12	5	12	5	12
	Very Fine	2.8	4.0		165.0	165		12	6	18	6	18
	Fine	4.0	5.7	2	180.0	182	2.0	14	7	25	7	25
	Fine	5.7	8.0		200.0	200		14	8	33	8	32
	Medium	8.0	11.3	4	250.0	254	4.0	18	10	43	10	42
	Medium	11.3	16.0		360.0	360		18	14	57	14	56
	Coarse	16.0	22.6	8	215.0	223	8.0	26	8	66	8	64
	Coarse	22.6	32	14	185.0	199	14.0	40	7	73	8	72
	Very Coarse	32	45	4	250.0	254	4.0	44	10	83	10	81
	Very Coarse	45	64	12	440.0	452	12.0	56	17	100	17	98
COBBLE	Small	64	90	12		12	12.0	68		100	0	99
	Small	90	128	14		14	14.0	82		100	1	99
	Large	128	180	6		6	6.0	88		100	0	100
	Large	180	256	4		4	4.0	92		100	0	100
BOULDER	Small	256	362					92		100		100
	Small	362	512					92		100		100
	Medium	512	1024					92		100		100
	Large/Very Large	1024	2048					92		100		100
BEDROCK	Bedrock	2048	>2048	8		8	8.00	100		100	0	100
			Total	**100**	**2540**	**2640**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): 48

Pavement Channel materials (mm)		Subpavement Channel materials	
D_{16} =	9.38	D_{16} =	3.56
D_{35} =	28.26	D_{35} =	8.52
D_{50} =	53.67	D_{50} =	13.27
D_{84} =	143.40	D_{84} =	46.23
D_{95} =	2655.93	D_{95} =	57.81
D_{100} =	>2048	D_{99} =	64

Scaly Bark Creek - X5 Riffle
Pavement & Subpavement Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

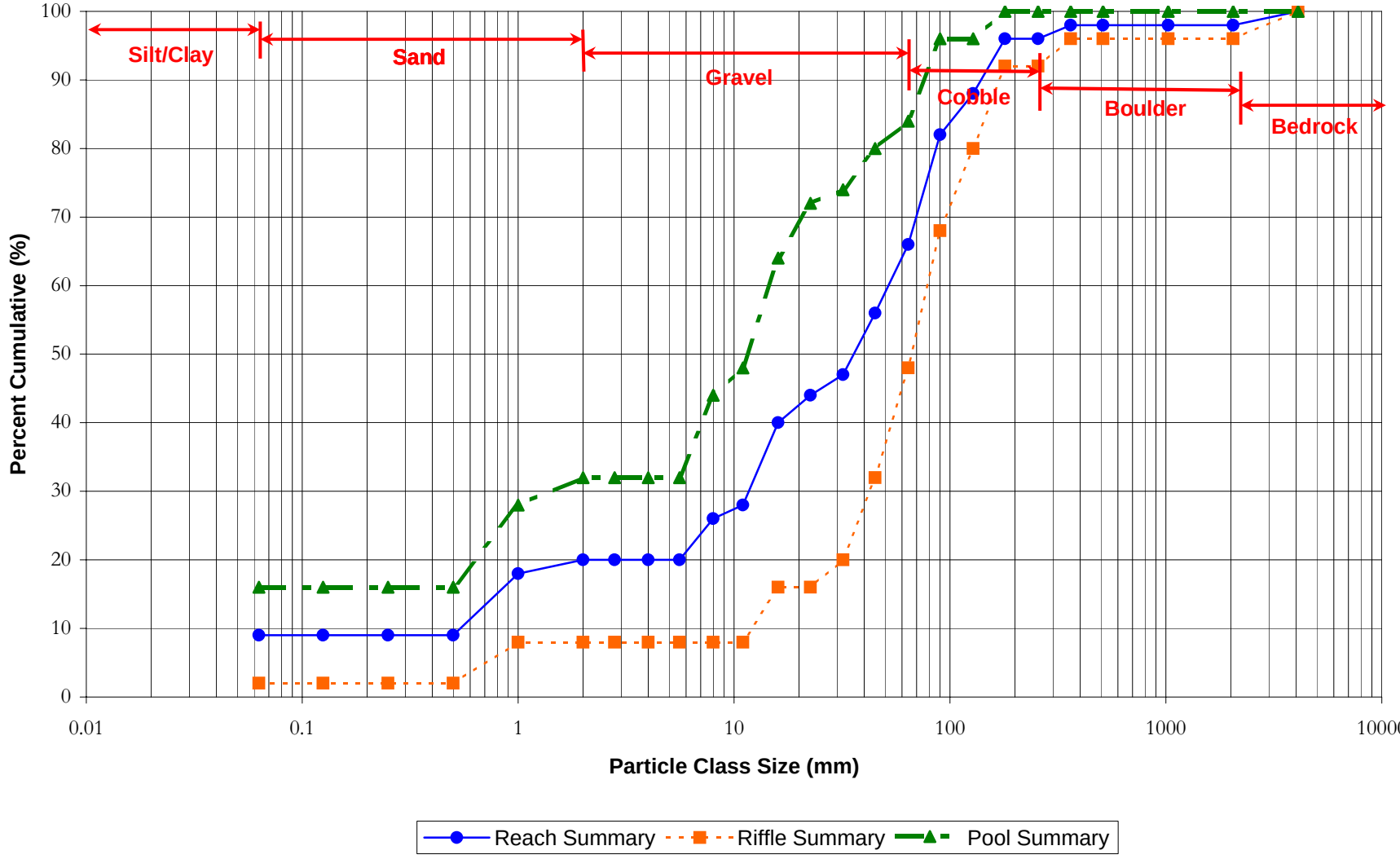
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ, JK
Location:	Scaly Bark Creek Reach-Wide	**Data Collected On:**	10/29/2009
Job #:	005-02122	**Reach:**	Reach Wide
Date:	11/3/2009	**Cross Section #:**	n/a

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	1	8	9	2.0	2	16	16	9	9
SAND	Very fine	0.062	0.125					2		16		9
	Fine	0.125	0.250					2		16		9
	Medium	0.250	0.500					2		16		9
	Coarse	0.5	1.0	3	6	9	6.0	8	12	28	9	18
	Very Coarse	1.0	2.0		2	2		8	4	32	2	20
GRAVEL	Very Fine	2.0	2.8					8		32		20
	Very Fine	2.8	4.0					8		32		20
	Fine	4.0	5.7					8		32		20
	Fine	5.7	8.0		6	6		8	12	44	6	26
	Medium	8.0	11.3		2	2		8	4	48	2	28
	Medium	11.3	16.0	4	8	12	8.0	16	16	64	12	40
	Coarse	16.0	22.6		4	4		16	8	72	4	44
	Coarse	22.6	32	2	1	3	4.0	20	2	74	3	47
	Very Coarse	32	45	6	3	9	12.0	32	6	80	9	56
	Very Coarse	45	64	8	2	10	16.0	48	4	84	10	66
COBBLE	Small	64	90	10	6	16	20.0	68	12	96	16	82
	Small	90	128	6		6	12.0	80		96	6	88
	Large	128	180	6	2	8	12.0	92	4	100	8	96
	Large	180	256					92		100		96
BOULDER	Small	256	362	2		2	4.0	96		100	2	98
	Small	362	512					96		100		98
	Medium	512	1024					96		100		98
	Large/Very Large	1024	2048					96		100		98
BEDROCK	Bedrock	2048	>2048	2		2	4.00	100		100	2	100
			Total	**50**	**50**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	22.60	D_{16} =	0.50	D_{16} =	0.86
D_{35} =	48.07	D_{35} =	6.12	D_{35} =	13.69
D_{50} =	66.22	D_{50} =	11.53	D_{50} =	35.85
D_{84} =	143.40	D_{84} =	64.00	D_{84} =	101.21
D_{95} =	331.96	D_{95} =	87.48	D_{95} =	172.49
D_{100} =	>2048	D_{99} =	180	D_{99} =	>2048

Scaly Bark Creek
Reach-Wide Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

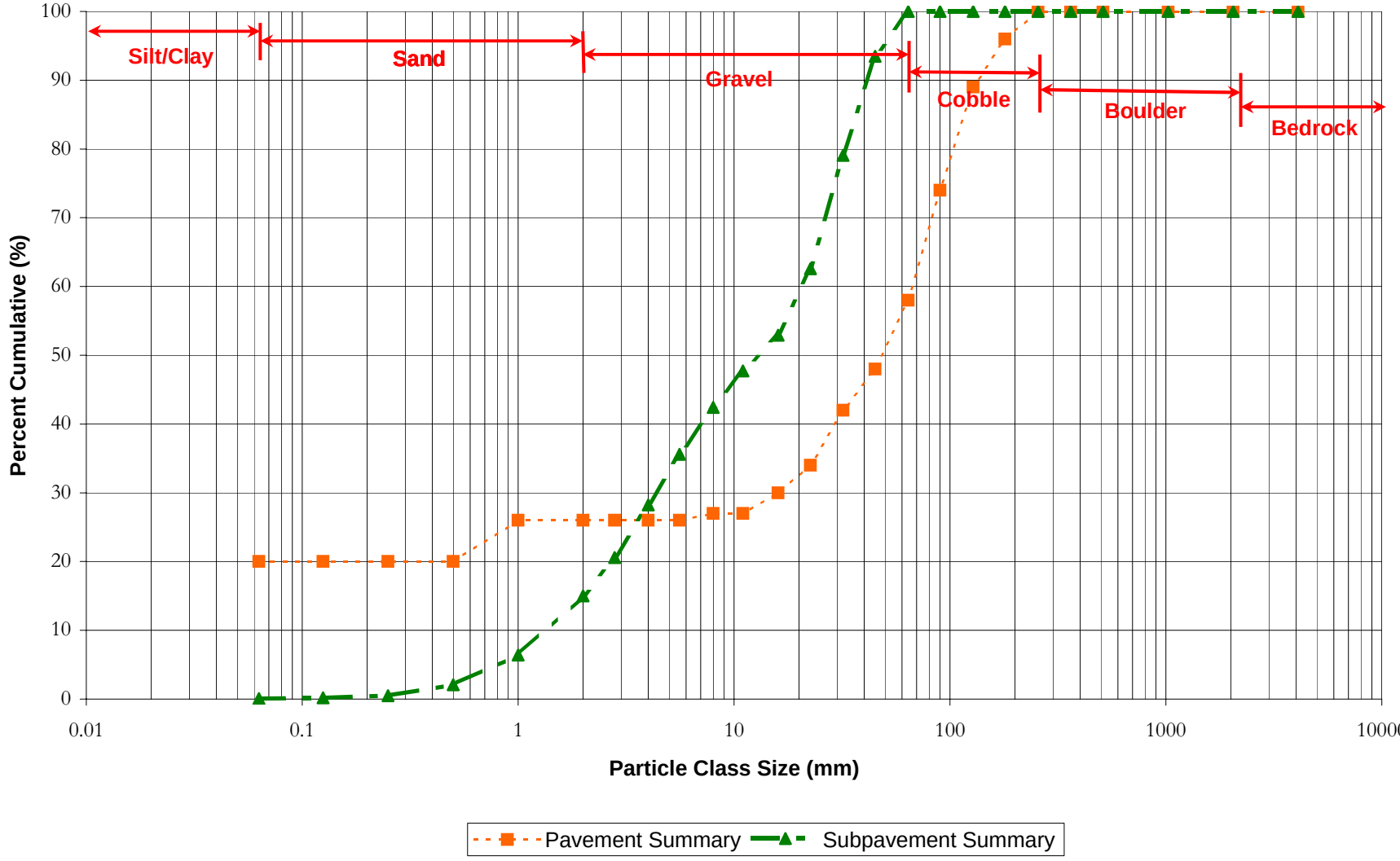
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ
Location:	UT1 - Downstream Reach	**Data Collected On:**	10/26/2009
Job #:	005-02122	**Reach:**	UT1 Downstream
Date:	11/2/2009	**Cross Section #:**	X9

Particle Class		Diameter (mm)		Particle Count			Pavement Summary		Subpavement Summary		Reach Summary	
		min	max	Pavement	Subpavement	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	20	2.8	23	20.0	20	0	0	0	0
SAND	Very fine	0.062	0.125		5.7	6		20	0	0	0	1
	Fine	0.125	0.250		14.0	14		20	0	0	0	1
	Medium	0.250	0.500		72.9	73		20	2	2	2	2
	Coarse	0.5	1.0	6	200.5	207	6.0	26	4	6	4	7
	Very Coarse	1.0	2.0		395.7	396		26	9	15	8	15
GRAVEL	Very Fine	2.0	2.8		256.8	257		26	6	21	5	21
	Very Fine	2.8	4.0		352.5	353		26	8	28	7	28
	Fine	4.0	5.7		340.0	340		26	7	36	7	35
	Fine	5.7	8.0	1	314.1	315	1.0	27	7	42	7	42
	Medium	8.0	11.3		245.0	245		27	5	48	5	47
	Medium	11.3	16.0	3	239.6	243	3.0	30	5	53	5	52
	Coarse	16.0	22.6	4	445.4	449	4.0	34	10	63	10	62
	Coarse	22.6	32	8	758.9	767	8.0	42	16	79	16	78
	Very Coarse	32	45	6	664.6	671	6.0	48	14	93	14	93
	Very Coarse	45	64	10	300.3	310	10.0	58	7	100	7	99
COBBLE	Small	64	90	16		16	16.0	74		100	0	99
	Small	90	128	15		15	15.0	89		100	0	100
	Large	128	180	7		7	7.0	96		100	0	100
	Large	180	256	4		4	4.0	100		100	0	100
BOULDER	Small	256	362					100		100		100
	Small	362	512					100		100		100
	Medium	512	1024					100		100		100
	Large/Very Large	1024	2048					100		100		100
BEDROCK	Bedrock	2048	>2048					100		100		100
			Total	**100**	**4608.8**	**4708.8**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Pavement Channel materials (mm)		Subpavement Channel materials	
D_{16} =	#N/A	D_{16} =	2.12
D_{35} =	23.60	D_{35} =	5.45
D_{50} =	48.28	D_{50} =	12.95
D_{84} =	113.82	D_{84} =	35.96
D_{95} =	171.44	D_{95} =	48.84
D_{100} =	256	D_{99} =	64

UT1 - X9 Riffle
Pavement & Subpavement Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

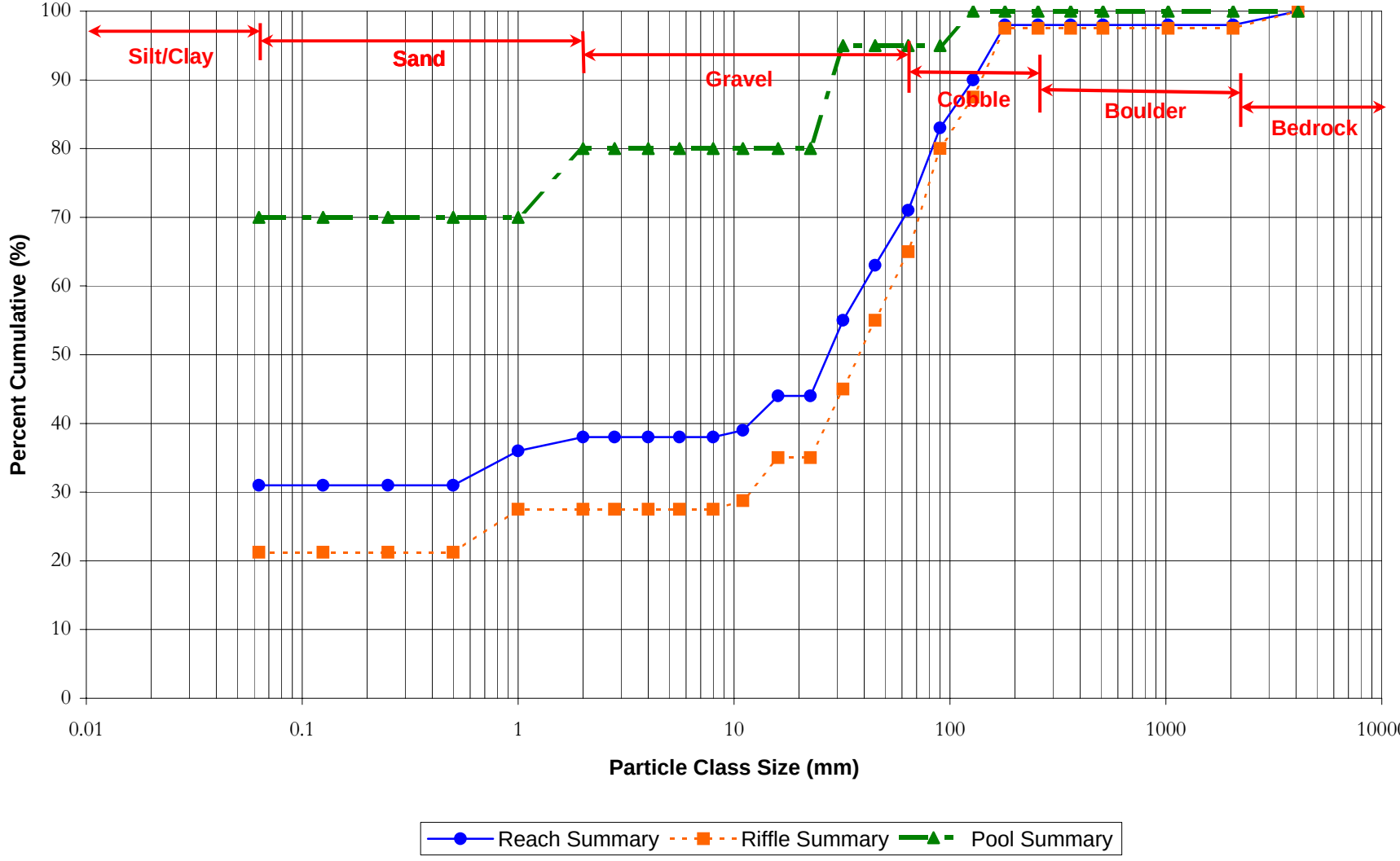
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ
Location:	UT1 Reach 2	**Data Collected On:**	10/26/2009
Job #:	005-02122	**Reach:**	Reach 2
Date:	11/3/2009	**Cross Section #:**	n/a

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	17	14	31	21.3	21	70	70	31	31
SAND	Very fine	0.062	0.125					21		70		31
	Fine	0.125	0.250					21		70		31
	Medium	0.250	0.500					21		70		31
	Coarse	0.5	1.0	5		5	6.3	28		70	5	36
	Very Coarse	1.0	2.0		2	2		28	10	80	2	38
GRAVEL	Very Fine	2.0	2.8					28		80		38
	Very Fine	2.8	4.0					28		80		38
	Fine	4.0	5.7					28		80		38
	Fine	5.7	8.0					28		80		38
	Medium	8.0	11.3	1		1	1.3	29		80	1	39
	Medium	11.3	16.0	5		5	6.3	35		80	5	44
	Coarse	16.0	22.6					35		80		44
	Coarse	22.6	32	8	3	11	10.0	45	15	95	11	55
	Very Coarse	32	45	8		8	10.0	55		95	8	63
	Very Coarse	45	64	8		8	10.0	65		95	8	71
COBBLE	Small	64	90	12		12	15.0	80		95	12	83
	Small	90	128	6	1	7	7.5	88	5	100	7	90
	Large	128	180	8		8	10.0	98		100	8	98
	Large	180	256					98		100		98
BOULDER	Small	256	362					98		100		98
	Small	362	512					98		100		98
	Medium	512	1024					98		100		98
	Large/Very Large	1024	2048					98		100		98
BEDROCK	Bedrock	2048	>2048	2		2	2.50	100		100	2	100
			Total	**80**	**20**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	#N/A	D_{16} =	#N/A	D_{16} =	#N/A
D_{35} =	22.60	D_{35} =	#N/A	D_{35} =	0.87
D_{50} =	37.95	D_{50} =	#N/A	D_{50} =	27.32
D_{84} =	108.60	D_{84} =	24.80	D_{84} =	94.64
D_{95} =	165.29	D_{95} =	90.00	D_{95} =	158.40
D_{100} =	>2048	D_{99} =	128	D_{99} =	>2048

UT1 - Reach 2
Reach-Wide Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

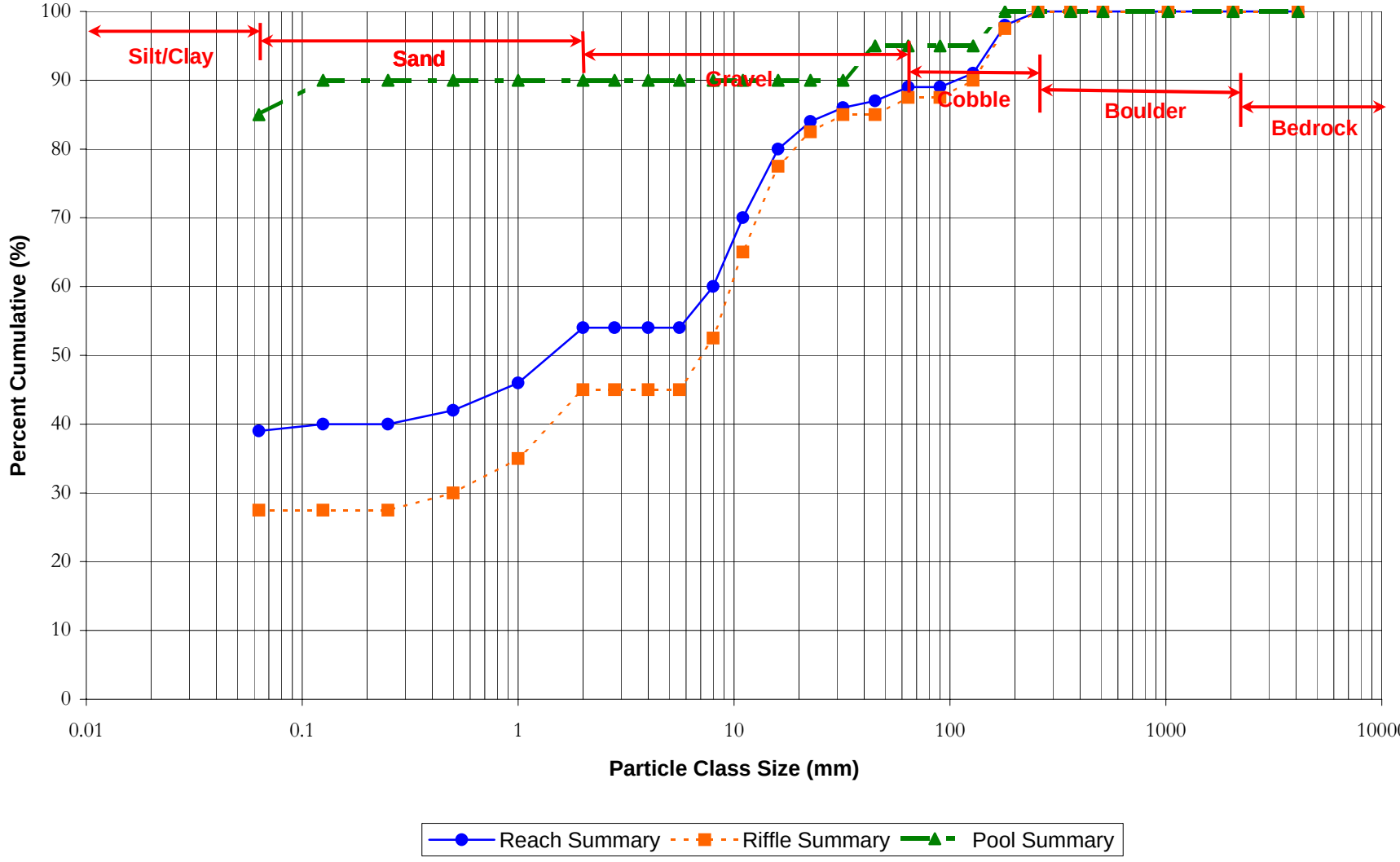
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ
Location:	UT1a Reach-Wide	**Data Collected On:**	10/26/2009
Job #:	005-02122	**Reach:**	UT1a
Date:	11/3/2009	**Cross Section #:**	n/a

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	22	17	39	27.5	28	85	85	39	39
SAND	Very fine	0.062	0.125		1	1		28	5	90	1	40
	Fine	0.125	0.250					28		90		40
	Medium	0.250	0.500	2		2	2.5	30		90	2	42
	Coarse	0.5	1.0	4		4	5.0	35		90	4	46
	Very Coarse	1.0	2.0	8		8	10.0	45		90	8	54
GRAVEL	Very Fine	2.0	2.8					45		90		54
	Very Fine	2.8	4.0					45		90		54
	Fine	4.0	5.7					45		90		54
	Fine	5.7	8.0	6		6	7.5	53		90	6	60
	Medium	8.0	11.3	10		10	12.5	65		90	10	70
	Medium	11.3	16.0	10		10	12.5	78		90	10	80
	Coarse	16.0	22.6	4		4	5.0	83		90	4	84
	Coarse	22.6	32	2		2	2.5	85		90	2	86
	Very Coarse	32	45		1	1		85	5	95	1	87
	Very Coarse	45	64	2		2	2.5	88		95	2	89
COBBLE	Small	64	90					88		95		89
	Small	90	128	2		2	2.5	90		95	2	91
	Large	128	180	6	1	7	7.5	98	5	100	7	98
	Large	180	256	2		2	2.5	100		100	2	100
BOULDER	Small	256	362					100		100		100
	Small	362	512					100		100		100
	Medium	512	1024					100		100		100
	Large/Very Large	1024	2048					100		100		100
BEDROCK	Bedrock	2048	>2048					100		100		100
			Total	**80**	**20**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	#N/A	D_{16} =	#N/A	D_{16} =	#N/A
D_{35} =	1.00	D_{35} =	#N/A	D_{35} =	#N/A
D_{50} =	7.10	D_{50} =	#N/A	D_{50} =	1.41
D_{84} =	27.84	D_{84} =	#N/A	D_{84} =	22.60
D_{95} =	160.66	D_{95} =	128.00	D_{95} =	155.53
D_{100} =	256	D_{99} =	180	D_{99} =	256

UT1a
Reach-Wide Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

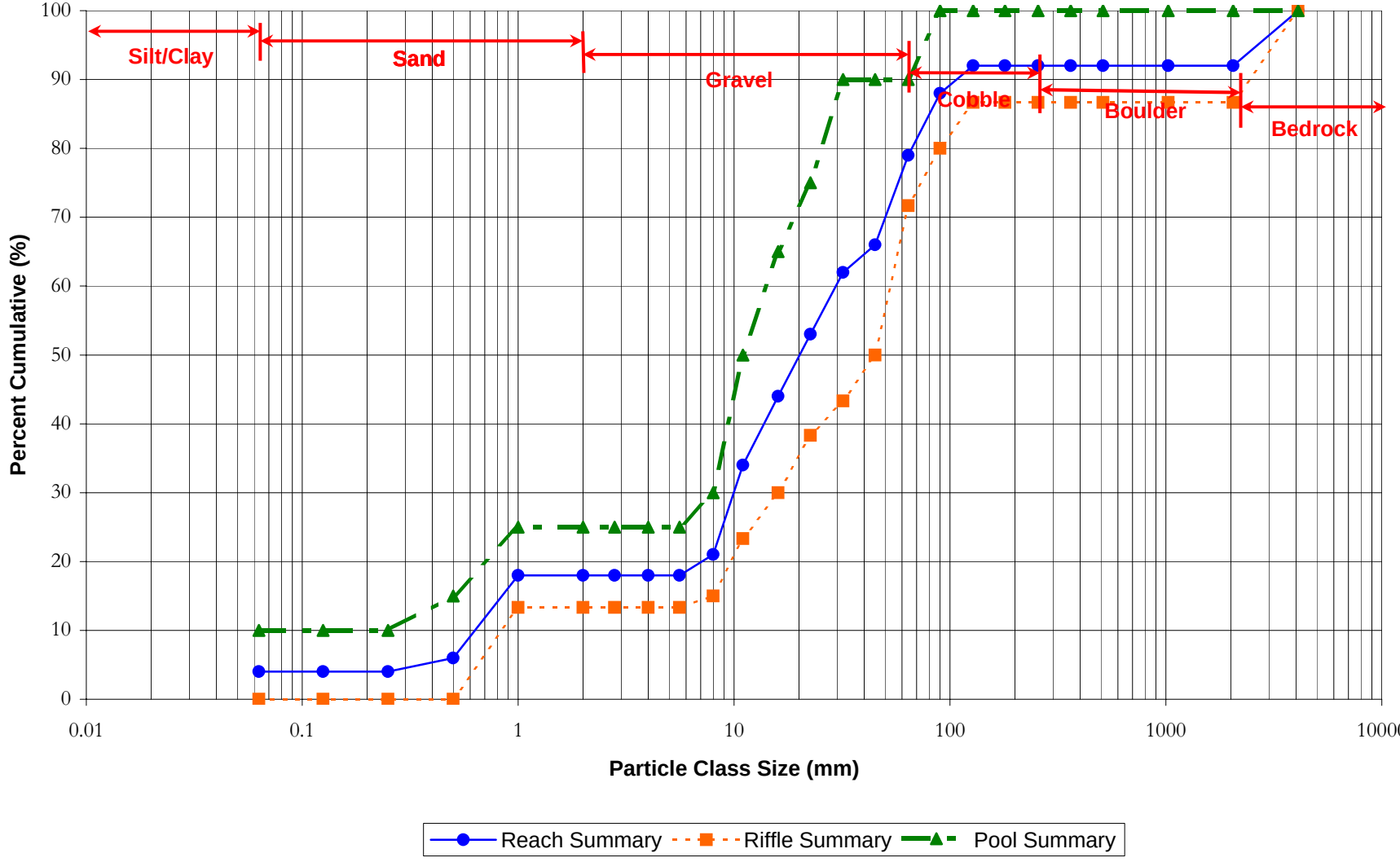
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ
Location:	UT1b Reach-Wide	**Data Collected On:**	10/26/2009
Job #:	005-02122	**Reach:**	UT1b
Date:	11/3/2009	**Cross Section #:**	n/a

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062		4	4		0	10	10	4	4
SAND	Very fine	0.062	0.125					0		10		4
	Fine	0.125	0.250					0		10		4
	Medium	0.250	0.500		2	2		0	5	15	2	6
	Coarse	0.5	1.0	8	4	12	13.3	13	10	25	12	18
	Very Coarse	1.0	2.0					13		25		18
GRAVEL	Very Fine	2.0	2.8					13		25		18
	Very Fine	2.8	4.0					13		25		18
	Fine	4.0	5.7					13		25		18
	Fine	5.7	8.0	1	2	3	1.7	15	5	30	3	21
	Medium	8.0	11.3	5	8	13	8.3	23	20	50	13	34
	Medium	11.3	16.0	4	6	10	6.7	30	15	65	10	44
	Coarse	16.0	22.6	5	4	9	8.3	38	10	75	9	53
	Coarse	22.6	32	3	6	9	5.0	43	15	90	9	62
	Very Coarse	32	45	4		4	6.7	50		90	4	66
	Very Coarse	45	64	13		13	21.7	72		90	13	79
COBBLE	Small	64	90	5	4	9	8.3	80	10	100	9	88
	Small	90	128	4		4	6.7	87		100	4	92
	Large	128	180					87		100		92
	Large	180	256					87		100		92
BOULDER	Small	256	362					87		100		92
	Small	362	512					87		100		92
	Medium	512	1024					87		100		92
	Large/Very Large	1024	2048					87		100		92
BEDROCK	Bedrock	2048	>2048	8		8	13.33	100		100	8	100
			Total	**60**	**40**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	8.31	D_{16} =	0.54	D_{16} =	0.89
D_{35} =	19.68	D_{35} =	8.66	D_{35} =	11.42
D_{50} =	45.00	D_{50} =	11.00	D_{50} =	20.14
D_{84} =	111.18	D_{84} =	27.84	D_{84} =	77.35
D_{95} =	3158.45	D_{95} =	75.89	D_{95} =	2655.93
D_{100} =	>2048	D_{99} =	90	D_{99} =	>2048

UT1b
Reach-Wide Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

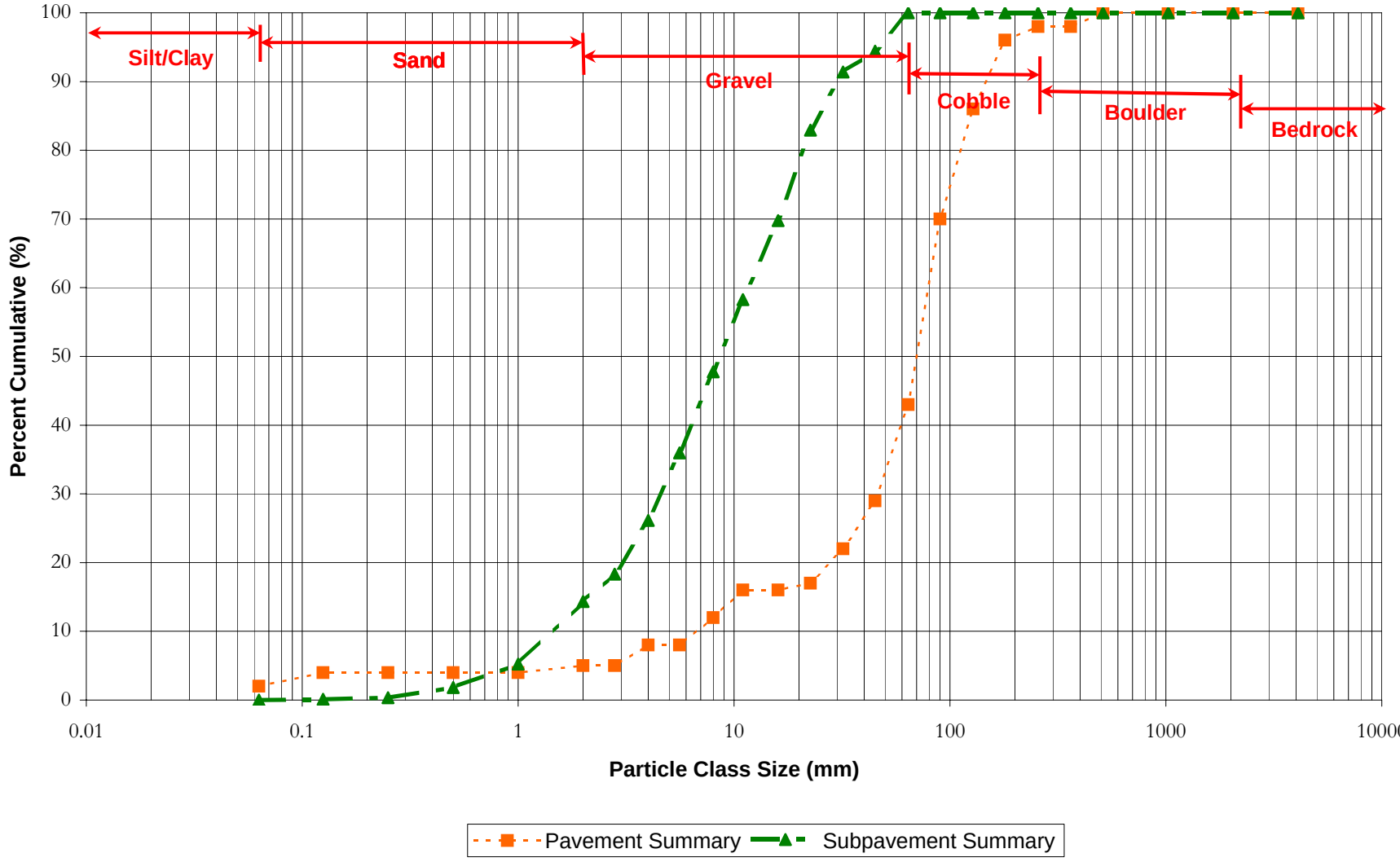
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ
Location:	UT2	**Data Collected On:**	10/26/2009
Job #:	005-02122	**Reach:**	UT2
Date:	11/2/2009	**Cross Section #:**	X12

Particle Class		Diameter (mm)		Particle Count			Pavement Summary		Subpavement Summary		Reach Summary	
		min	max	Pavement	Subpavement	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2	0.4	2	2.0	2	0	0	0	0
SAND	Very fine	0.062	0.125	2	2.1	4	2.0	4	0	0	0	0
	Fine	0.125	0.250		6.1	6		4	0	0	0	0
	Medium	0.250	0.500		36.7	37		4	1	2	1	2
	Coarse	0.5	1.0		84.3	84		4	3	5	3	5
	Very Coarse	1.0	2.0	1	223.8	225	1.0	5	9	14	9	14
GRAVEL	Very Fine	2.0	2.8		99.0	99		5	4	18	4	18
	Very Fine	2.8	4.0	3	192.0	195	3.0	8	8	26	8	25
	Fine	4.0	5.7		243.3	243		8	10	36	9	35
	Fine	5.7	8.0	4	290.3	294	4.0	12	12	48	11	46
	Medium	8.0	11.3	4	259.4	263	4.0	16	11	58	10	57
	Medium	11.3	16.0		283.3	283		16	11	70	11	68
	Coarse	16.0	22.6	1	325.1	326	1.0	17	13	83	13	80
	Coarse	22.6	32	5	209.3	214	5.0	22	8	91	8	89
	Very Coarse	32	45	7	74.2	81	7.0	29	3	94	3	92
	Very Coarse	45	64	14	137.8	152	14.0	43	6	100	6	98
COBBLE	Small	64	90	27		27	27.0	70		100	1	99
	Small	90	128	16		16	16.0	86		100	1	99
	Large	128	180	10		10	10.0	96		100	0	100
	Large	180	256	2		2	2.0	98		100	0	100
BOULDER	Small	256	362					98		100		100
	Small	362	512	2		2	2.0	100		100	0	100
	Medium	512	1024					100		100		100
	Large/Very Large	1024	2048					100		100		100
BEDROCK	Bedrock	2048	>2048					100		100		100
			Total	**100**	**2467.1**	**2567.1**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Pavement Channel materials (mm)		Subpavement Channel materials	
D_{16} =	16.00	D_{16} =	2.30
D_{35} =	52.33	D_{35} =	5.42
D_{50} =	69.91	D_{50} =	8.56
D_{84} =	122.49	D_{84} =	23.62
D_{95} =	173.97	D_{95} =	46.69
D_{100} =	512	D_{99} =	64

UT2 - X12 Riffle
Pavement & Subpavement Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

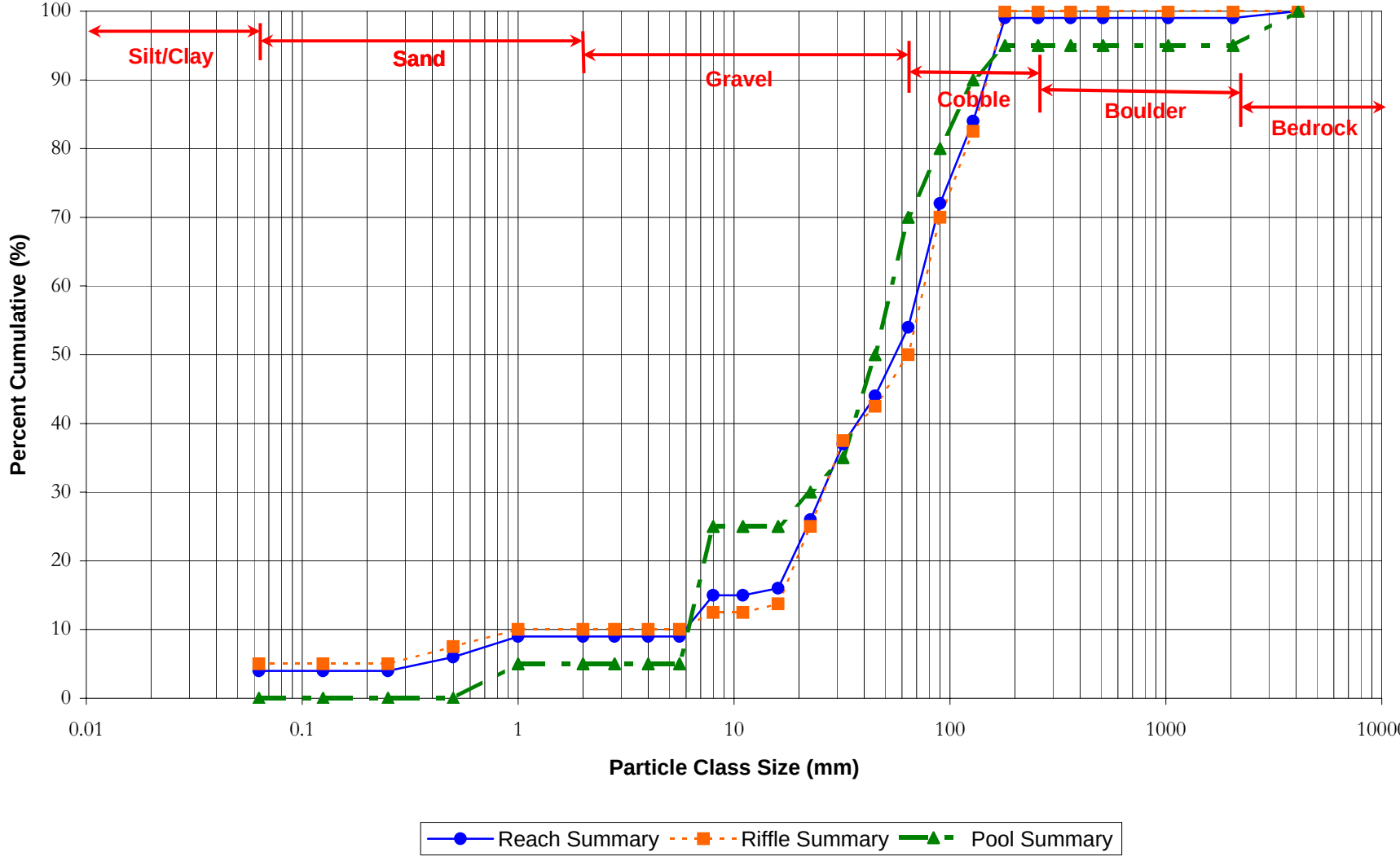
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ
Location:	UT2 Reach-Wide	**Data Collected On:**	10/26/2009
Job #:	005-02122	**Reach:**	UT2
Date:	11/3/2009	**Cross Section #:**	n/a

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4		4	5.0	5		0	4	4
SAND	Very fine	0.062	0.125					5		0		4
	Fine	0.125	0.250					5		0		4
	Medium	0.250	0.500	2		2	2.5	8		0	2	6
	Coarse	0.5	1.0	2	1	3	2.5	10	5	5	3	9
	Very Coarse	1.0	2.0					10		5		9
GRAVEL	Very Fine	2.0	2.8					10		5		9
	Very Fine	2.8	4.0					10		5		9
	Fine	4.0	5.7					10		5		9
	Fine	5.7	8.0	2	4	6	2.5	13	20	25	6	15
	Medium	8.0	11.3					13		25		15
	Medium	11.3	16.0	1		1	1.3	14		25	1	16
	Coarse	16.0	22.6	9	1	10	11.3	25	5	30	10	26
	Coarse	22.6	32	10	1	11	12.5	38	5	35	11	37
	Very Coarse	32	45	4	3	7	5.0	43	15	50	7	44
	Very Coarse	45	64	6	4	10	7.5	50	20	70	10	54
COBBLE	Small	64	90	16	2	18	20.0	70	10	80	18	72
	Small	90	128	10	2	12	12.5	83	10	90	12	84
	Large	128	180	14	1	15	17.5	100	5	95	15	99
	Large	180	256					100		95		99
BOULDER	Small	256	362					100		95		99
	Small	362	512					100		95		99
	Medium	512	1024					100		95		99
	Large/Very Large	1024	2048					100		95		99
BEDROCK	Bedrock	2048	>2048		1	1		100	5	100	1	100
			Total	**80**	**20**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	17.14	D_{16} =	6.81	D_{16} =	16.00
D_{35} =	29.85	D_{35} =	32.00	D_{35} =	30.04
D_{50} =	64.00	D_{50} =	45.00	D_{50} =	55.59
D_{84} =	131.80	D_{84} =	103.62	D_{84} =	128.00
D_{95} =	163.29	D_{95} =	2048.00	D_{95} =	164.36
D_{100} =	180	D_{99} =	>2048	D_{99} =	>2048

UT2
Reach-Wide Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

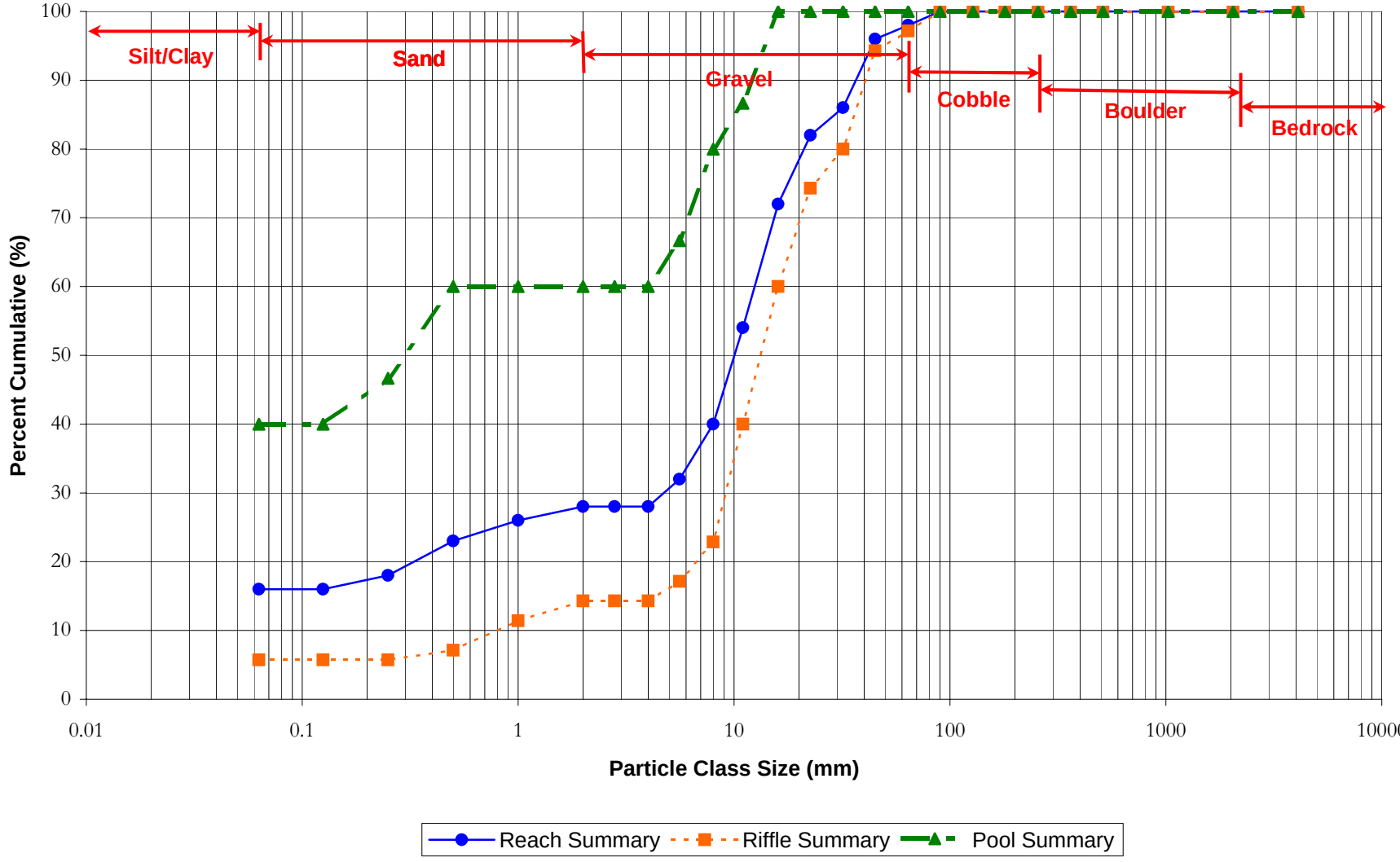
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ
Location:	UT3 Reach-Wide	**Data Collected On:**	10/26/2009
Job #:	005-02122	**Reach:**	UT3
Date:	11/3/2009	**Cross Section #:**	n/a

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	4	12	16	5.7	6	40	40	16	16
SAND	Very fine	0.062	0.125					6		40		16
	Fine	0.125	0.250		2	2		6	7	47	2	18
	Medium	0.250	0.500	1	4	5	1.4	7	13	60	5	23
	Coarse	0.5	1.0	3		3	4.3	11		60	3	26
	Very Coarse	1.0	2.0	2		2	2.9	14		60	2	28
GRAVEL	Very Fine	2.0	2.8					14		60		28
	Very Fine	2.8	4.0					14		60		28
	Fine	4.0	5.7	2	2	4	2.9	17	7	67	4	32
	Fine	5.7	8.0	4	4	8	5.7	23	13	80	8	40
	Medium	8.0	11.3	12	2	14	17.1	40	7	87	14	54
	Medium	11.3	16.0	14	4	18	20.0	60	13	100	18	72
	Coarse	16.0	22.6	10		10	14.3	74		100	10	82
	Coarse	22.6	32	4		4	5.7	80		100	4	86
	Very Coarse	32	45	10		10	14.3	94		100	10	96
	Very Coarse	45	64	2		2	2.9	97		100	2	98
COBBLE	Small	64	90	2		2	2.9	100		100	2	100
	Small	90	128					100		100		100
	Large	128	180					100		100		100
	Large	180	256					100		100		100
BOULDER	Small	256	362					100		100		100
	Small	362	512					100		100		100
	Medium	512	1024					100		100		100
	Large/Very Large	1024	2048					100		100		100
BEDROCK	Bedrock	2048	>2048					100		100		100
			Total	**70**	**30**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	4.89	D_{16} =	#N/A	D_{16} =	0.13
D_{35} =	10.02	D_{35} =	#N/A	D_{35} =	6.40
D_{50} =	13.27	D_{50} =	0.30	D_{50} =	10.04
D_{84} =	35.21	D_{84} =	9.68	D_{84} =	26.89
D_{95} =	49.14	D_{95} =	13.90	D_{95} =	43.49
D_{100} =	90	D_{99} =	16	D_{99} =	90

UT3
Reach-Wide Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

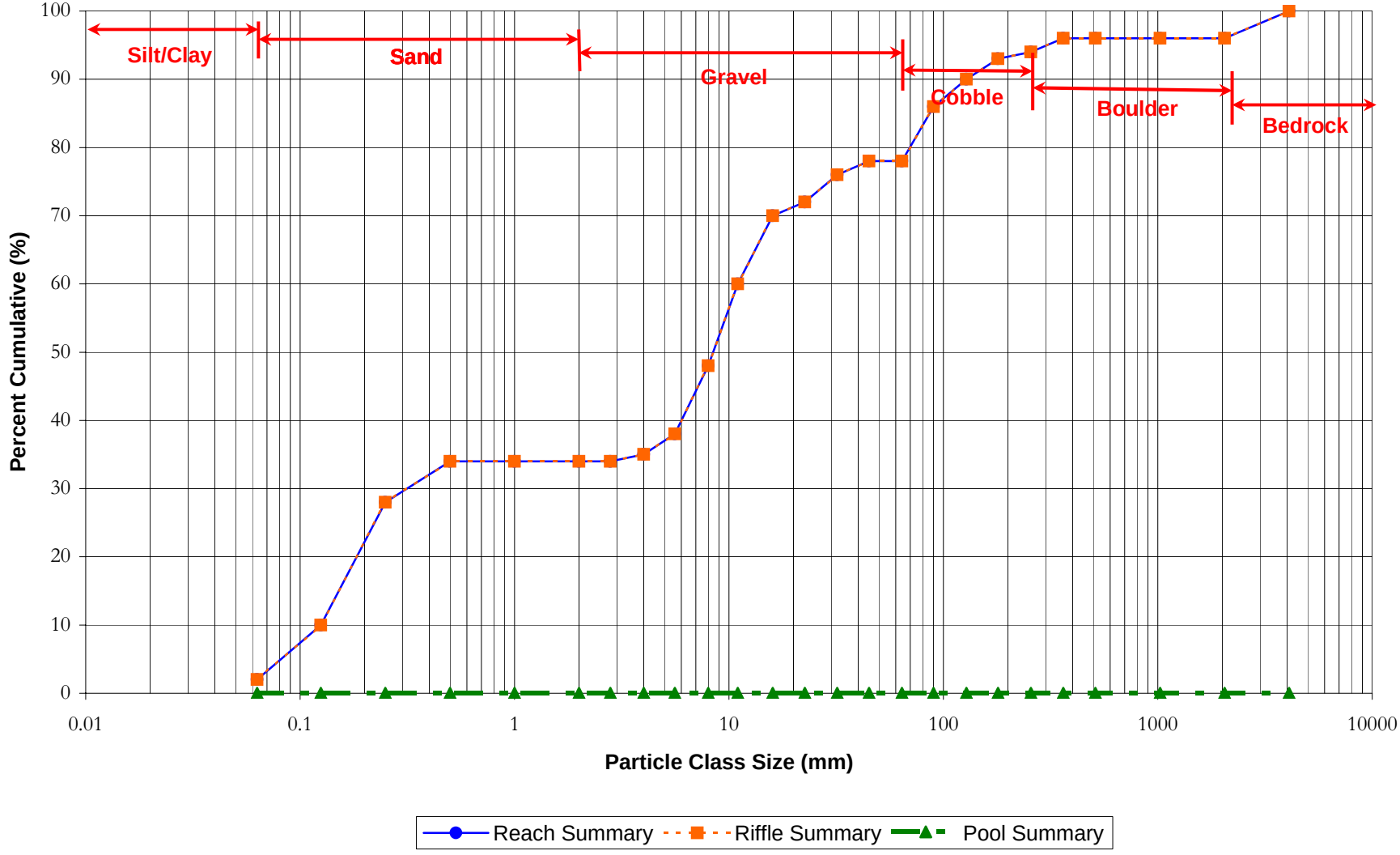
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ, JK
Location:	UT4 Reach 1	**Data Collected On:**	10/29/2009
Job #:	005-02122	**Reach:**	Reach 1
Date:	11/3/2009	**Cross Section #:**	n/a

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	2		2	2.0	2		#DIV/0!	2	2
SAND	Very fine	0.062	0.125	8		8	8.0	10		#DIV/0!	8	10
	Fine	0.125	0.250	18		18	18.0	28		#DIV/0!	18	28
	Medium	0.250	0.500	6		6	6.0	34		#DIV/0!	6	34
	Coarse	0.5	1.0					34		#DIV/0!		34
	Very Coarse	1.0	2.0					34		#DIV/0!		34
GRAVEL	Very Fine	2.0	2.8					34		#DIV/0!		34
	Very Fine	2.8	4.0	1		1	1.0	35		#DIV/0!	1	35
	Fine	4.0	5.7	3		3	3.0	38		#DIV/0!	3	38
	Fine	5.7	8.0	10		10	10.0	48		#DIV/0!	10	48
	Medium	8.0	11.3	12		12	12.0	60		#DIV/0!	12	60
	Medium	11.3	16.0	10		10	10.0	70		#DIV/0!	10	70
	Coarse	16.0	22.6	2		2	2.0	72		#DIV/0!	2	72
	Coarse	22.6	32	4		4	4.0	76		#DIV/0!	4	76
	Very Coarse	32	45	2		2	2.0	78		#DIV/0!	2	78
	Very Coarse	45	64					78		#DIV/0!		78
COBBLE	Small	64	90	8		8	8.0	86		#DIV/0!	8	86
	Small	90	128	4		4	4.0	90		#DIV/0!	4	90
	Large	128	180	3		3	3.0	93		#DIV/0!	3	93
	Large	180	256	1		1	1.0	94		#DIV/0!	1	94
BOULDER	Small	256	362	2		2	2.0	96		#DIV/0!	2	96
	Small	362	512					96		#DIV/0!		96
	Medium	512	1024					96		#DIV/0!		96
	Large/Very Large	1024	2048					96		#DIV/0!		96
BEDROCK	Bedrock	2048	>2048	4		4	4.00	100		#DIV/0!	4	100
			Total	**100**	**0**	**100**	**100**	**100**	**0**	**#DIV/0!**	**100**	**100**

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	0.16	D_{16} =	#N/A	D_{16} =	0.16
D_{35} =	4.00	D_{35} =	#N/A	D_{35} =	4.00
D_{50} =	8.44	D_{50} =	#N/A	D_{50} =	8.44
D_{84} =	82.65	D_{84} =	#N/A	D_{84} =	82.65
D_{95} =	304.42	D_{95} =	#N/A	D_{95} =	304.42
D_{100} =	2048	D_{99} =	#N/A	D_{99} =	2048

UT4 - Reach 1
Reach-Wide Pebble Count Particle Distribution



PEBBLE COUNT ANALYSIS WORKSHEET

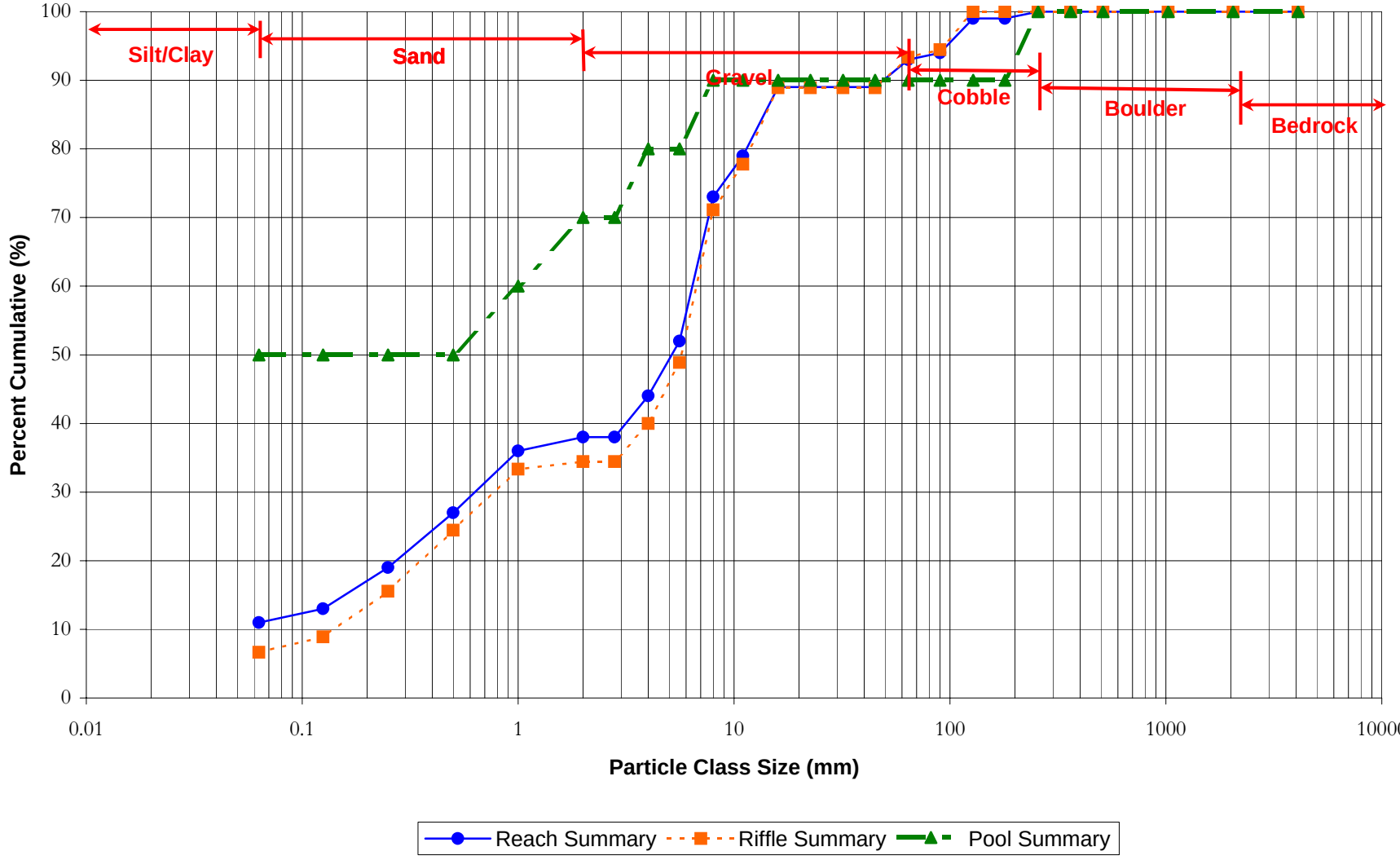
Project Name:	Scaly Bark Creek Mitigation Project	**Data Collected By:**	MJ, JK
Location:	UT4 Reach 2	**Data Collected On:**	10/29/2009
Job #:	005-02122	**Reach:**	Reach 2
Date:	11/3/2009	**Cross Section #:**	n/a

Particle Class		Diameter (mm)		Particle Count			Riffle Summary		Pool Summary		Reach Summary	
		min	max	Riffle	Pool	Total	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative	Class Percentage	Percent Cumulative
SILT/CLAY	Silt/Clay	0.000	0.062	6	5	11	6.7	7	50	50	11	11
SAND	Very fine	0.062	0.125	2		2	2.2	9		50	2	13
	Fine	0.125	0.250	6		6	6.7	16		50	6	19
	Medium	0.250	0.500	8		8	8.9	24		50	8	27
	Coarse	0.5	1.0	8	1	9	8.9	33	10	60	9	36
	Very Coarse	1.0	2.0	1	1	2	1.1	34	10	70	2	38
GRAVEL	Very Fine	2.0	2.8					34		70		38
	Very Fine	2.8	4.0	5	1	6	5.6	40	10	80	6	44
	Fine	4.0	5.7	8		8	8.9	49		80	8	52
	Fine	5.7	8.0	20	1	21	22.2	71	10	90	21	73
	Medium	8.0	11.3	6		6	6.7	78		90	6	79
	Medium	11.3	16.0	10		10	11.1	89		90	10	89
	Coarse	16.0	22.6					89		90		89
	Coarse	22.6	32					89		90		89
	Very Coarse	32	45					89		90		89
	Very Coarse	45	64	4		4	4.4	93		90	4	93
COBBLE	Small	64	90	1		1	1.1	94		90	1	94
	Small	90	128	5		5	5.6	100		90	5	99
	Large	128	180					100		90		99
	Large	180	256		1	1		100	10	100	1	100
BOULDER	Small	256	362					100		100		100
	Small	362	512					100		100		100
	Medium	512	1024					100		100		100
	Large/Very Large	1024	2048					100		100		100
BEDROCK	Bedrock	2048	>2048					100		100		100
			Total	**90**	**10**	**100**	**100**	**100**	**100**	**100**	**100**	**100**

Largest Particle (mm): _____

Riffle Channel materials (mm)		Pool Channel materials		Cumulative Channel materials	
D_{16} =	0.26	D_{16} =	#N/A	D_{16} =	0.18
D_{35} =	2.90	D_{35} =	#N/A	D_{35} =	0.93
D_{50} =	5.70	D_{50} =	0.50	D_{50} =	5.15
D_{84} =	13.57	D_{84} =	6.46	D_{84} =	13.27
D_{95} =	93.23	D_{95} =	214.66	D_{95} =	96.57
D_{100} =	128	D_{99} =	256	D_{99} =	256

UT4 - Reach 2
Reach-Wide Pebble Count Particle Distribution



Location: Scaly Bark Creek Restoration Project

Reach: Scaly Bark Creek

Field Crew: MLJ

Date: 10/26/09

SEDIMENT LOADING ASSESSMENT SHEET

LEFT BANK

A	B	C	D	E	F
BEHI	NBS	BK HEIGHT	FEET/YR (from curve)	DISTANCE(note station for detailed design needs)	TOTAL FT³/yr =(C×D×E)
Mod	Low	4.0	0.09	282	101.52
High	Mod	2.5	0.3	197	147.75
Mod	Low	2.5	0.09	37	8.325
High	Mod	2.5	0.3	114	85.5
Mod	Mod	4.0	0.18	157	113.04
Mod	Low	4.0	0.09	168	60.48
Mod	Mod	4.0	0.18	199	143.28
Mod	High	4.0	0.38	59	89.68
Mod	Mod	4.0	0.18	95	68.4
Low	Low	4.0	0.034	69	9.384
Mod	Mod	4.0	0.18	102	73.44
Low	Low	4.0	0.034	136	18.496
Mod	Mod	4.0	0.18	177	127.44
High	Mod	3.0	0.3	32	28.8
High	High	3.0	0.5	99	148.5
High	Mod	3.0	0.3	26	23.4
Mod	Low	3.0	0.09	62	16.74
High	Mod	3.0	0.3	375	337.5
Low	Low	4.0	0.034	78	10.608
Mod	Mod	4.0	0.18	70	50.4
Low	Low	4.0	0.034	67	9.112
Mod	Mod	4.0	0.18	256	184.32
Mod	High	4.0	0.38	65	98.8
Mod	Mod	4.0	0.18	61	43.92
Low	Low	4.0	0.034	92	12.512
High	Mod	4.0	0.3	393	471.6
				TOTAL FT³/YR	2482.95
Divide FT³/yr by 27				TOTAL YD³/YR	91.96
Multiply YD³/yr by 1.3				**TOTAL TONS/YR**	119.55

RIGHT BANK

A	B	C	D	E	F
BEHI	NBS	BK HEIGHT	FEET/YR (from curve)	DISTANCE(note station for detailed design needs)	TOTAL FT³/yr =(C×D×E)
High	Low	2.5	0.18	282	126.9
High	Mod	2.5	0.3	197	147.75
High	High	2.5	0.5	37	46.25
High	Mod	2.5	0.3	114	85.5
Mod	Mod	4.0	0.18	157	113.04
Mod	High	4.0	0.38	168	255.36
Mod	Mod	4.0	0.18	199	143.28
Low	Low	4.0	0.034	59	8.024
Mod	Mod	4.0	0.18	95	68.4
Mod	High	4.0	0.38	69	104.88
Mod	Mod	4.0	0.18	102	73.44
Mod	High	4.0	0.38	136	206.72
Mod	Mod	4.0	0.18	177	127.44
High	Mod	3.0	0.3	32	28.8
Mod	Low	3.0	0.09	99	26.73
High	Mod	3.0	0.3	26	23.4
High	High	3.0	0.5	62	93
High	Mod	3.0	0.3	375	337.5
Mod	Mod	4.0	0.18	78	56.16
Mod	Mod	4.0	0.18	70	50.4
Mod	High	4.0	0.38	67	101.84
Mod	Mod	4.0	0.18	256	184.32
Low	Low	4.0	0.034	65	8.84
Mod	Mod	4.0	0.18	61	43.92
Low	Low	4.0	0.034	92	12.512
High	Mod	4.0	0.3	393	471.6
				TOTAL FT³/YR	2946.01
				TOTAL YD³/YR	109.11
				TOTAL TONS/YR	141.84

TOTAL REACH TONS/YR	**261.39**

Location: Scaly Bark Creek Restoration Project

Reach: UT1 Reach 2

Field Crew: MLJ

Date: 10/26/09

SEDIMENT LOADING ASSESSMENT SHEET

LEFT BANK

A	B	C	D	E	F
BEHI	NBS	BK HEIGHT	FEET/YR (from curve)	DISTANCE (note station for detailed design needs)	TOTAL FT^3/yr =(C×D×E)
Mod	Low	2.0	0.09	97	17.46
High	Mod	2.0	0.3	153	91.8
Extreme	Mod	3.0	1.1	118	389.4
				TOTAL FT^3/YR	498.66
Divide FT^3/yr by 27				TOTAL YD^3/YR	18.47
Multiply YD^3/yr by 1.3				**TOTAL TONS/YR**	24.01

RIGHT BANK

A	B	C	D	E	F
BEHI	NBS	BK HEIGHT	FEET/YR (from curve)	DISTANCE (note station for detailed design needs)	TOTAL FT^3/yr =(C×D×E)
Mod	Low	2.0	0.09	97	17.46
High	Mod	2.0	0.3	153	91.8
High	Mod	3.0	0.3	118	106.2
				TOTAL FT^3/YR	215.46
				TOTAL YD^3/YR	7.98
				TOTAL TONS/YR	10.37

TOTAL REACH TONS/YR	**34.38**

Location: Scaly Bark Creek Restoration Project

Reach: UT2

Field Crew: MLJ

Date: 10/26/09

SEDIMENT LOADING ASSESSMENT SHEET

LEFT BANK

A	B	C	D	E	F
BEHI	NBS	BK HEIGHT	FEET/YR (from curve)	DISTANCE (note station for detailed design needs)	TOTAL FT³/yr =(C×D×E)
Mod	Low	3.0	0.09	81	21.87
Low	Low	3.0	0.034	111	11.322
Mod	Mod	3.0	0.18	175	94.5
				TOTAL FT³/YR	127.69
Divide FT³/yr by 27				TOTAL YD³/YR	4.73
Multiply YD³/yr by 1.3				**TOTAL TONS/YR**	6.15

RIGHT BANK

A	B	C	D	E	F
BEHI	NBS	BK HEIGHT	FEET/YR (from curve)	DISTANCE (note station for detailed design needs)	TOTAL FT³/yr =(C×D×E)
High	Mod	3.0	0.3	81	72.9
V. High	V. High	3.0	0.8	111	266.4
Mod	Mod	3.0	0.18	175	94.5
				TOTAL FT³/YR	433.80
				TOTAL YD³/YR	16.07
				TOTAL TONS/YR	20.89

TOTAL REACH TONS/YR	**27.03**

Appendix 6:
Reference Reach Photographs

Photo 1-UT to Rocky Creek riffle structure.

Photo 2-UT to Rocky Creek riffle-pool sequence.

Photo 3-UT to Rocky Creek natural sill structure.

Photo 4-Spencer Creek riffle-pool sequence and meander pattern.

Photo 5-Spencer Creek riffle-pool sequence.

Photo 6-Spencer Creek riffle structures.

Appendix 7:
EEP Floodplain Requirements Checklist

EEP Floodplain Requirements Checklist

This form was developed by the National Flood Insurance program, NC Floodplain Mapping program and Ecosystem Enhancement Program to be filled for all EEP projects. The form is intended to summarize the floodplain requirements during the design phase of the projects. The form should be submitted to the Local Floodplain Administrator with three copies submitted to NFIP (attn. Edward Curtis), NC Floodplain Mapping Unit (attn. John Gerber) and NC Ecosystem Enhancement Program.

Project Location

Name of project:	Scaly Bark Creek Stream Restoration
Name of stream or feature:	Scaly Bark Creek (downstream portion is FEMA mapped) and several unnamed tributaries (UTs) to Scaly Bark Creek (not FEMA-mapped)
County:	Stanly
Name of river basin:	Yadkin
Is project urban or rural?	rural
Name of Jurisdictional municipality/county:	Stanly County
DFIRM panel number for entire site:	Community: Stanly County (Unincorporated) Community No. 370361 FIRM Panel: 6537 Map Number: 3710653700J Effective Date: September 3, 2008
Consultant name:	Wildlands Engineering, Inc. Emily Reinicker, PE, CFM
Phone number:	704-332-7754
Address:	1430 S. Mint Street, Suite 104 Charlotte, NC 28203

Design Information

Provide a general description of project (one paragraph). Include project limits on a reference orthophotograph at a scale of 1" = 500'.
Please see attached Figure 6 FEMA Flood Map and Figure 10 Proposed Stream Restoration Design from the Restoration Plan report.

Summarize stream reaches or wetland areas according to their restoration priority.
The construction on Scaly Bark Creek will be comprised of Rosgen Priority 1 restoration of dimension, pattern, and profile. A stable cross-section will be designed to flood onto the surrounding topography at flows greater than the 1.5-year bankfull event. A meandering pattern will be restored, and the channel profile elevation will be raised approximately 6" to 12" to connect the channel to the surrounding floodplain topography. Low profile in-stream habitat structures comprised of logs and rocks will be used to help stabilize the channel. Native vegetation will be planted within the conservation easement boudary to establish a riparian buffer. The unnamed tributaries (UTs) to Scaly Bark Creek will also be restored to meandering channels or enhanced in place by laying bak banks, adding in-stream habitat structures, and planting riparian buffers. No wetland work for mitigation credit is proposed.

Reach	**Length**	**Priority**
SFHA mapped channel		
Scaly Bark Creek Reach 2	**2,300 LF**	**Priority 1 Restoration**
non-SFHA mapped channels		
Scaly Bark Creek Reach 1	1,850 LF	Priority 1 Restoration
UT1	1,700 LF	Priority 1 Restoration and Enhancement
UT1a (intermittent)	400 LF	Enhancement
UT1b (intermittient)	1,200 LF	Enhancement
UT2	400 LF	Priority 1 Restoration
UT3 (intermittent)	300 LF	Enhancement
UT4 (intermittent)	1,250 LF	Enhancement and Preservation

Floodplain Information

Is project located in a Special Flood Hazard Area (SFHA)?

YES- Scaly Bark Creek Reach 2 only; Reach 1 of Scaly Bark Creek on the upstream portion of the project site is not located in SFHA. The Unnamed tributaries (UTs) do not have associated SFHA.

If project is located in a SFHA, check how it was determined:

- ☐ Redelineation
- ☐ Detailed Study
- ☐ Limited Detail Study
- ☐ Approximate Study
- ☐ Don't know

List flood zone designation:

Check if applies:

- ☑ AE Zone
  - ☐ Floodway
  - ☐ Non-Encroachment
- ☐ A Zone
  - ☐ Local Setbacks Required
  - ☐ No Local Setbacks Required

If local setbacks are required, list how many feet: n/a

Does proposed channel boundary encroach outside floodway/non-encroachment/setbacks?

☑ Yes ☐ No

Land Acquisition (Check)

- ☐ State owned (fee simple)
- ☐ Conservation easment (Design Bid Build)
- ☐ Conservation Easement (Full Delivery Project)

Note: if the project property is state-owned, then all requirements should be addressed to the Department of Administration, State Construction Office (attn: Herbert Neily, (919) 807-4101)

Is community/county participating in the NFIP program?

☑ Yes ☐ No

Name of Local Floodplain Administrator: Mr. Michael M. Sandy, AICP, CZO
Planning Director - Stanly County
Phone Number: 704 986-3665

Floodplain Requirements

This section to be filled by designer/applicant following verification with the LFPA

- ☐ No Action
- ☐ No Rise
- ☐ Letter of Map Revision
- ☐ Conditional Letter of Map Revision
- ☐ Other Requirements

List other requirements:

Comments:

Name: Emily G. Reinicker, PE, CFM Signature: E. Reinicker

Title: Senior Water Resources Engineer Date: 5/14/2010