East Buffalo Creek Mitigation Project

Year 5 Monitoring Report
Graham County, North Carolina

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EXECUTIVE SUMMARY

The East Buffalo Creek site was restored through a full delivery contract with the NCDEQ – Division of Mitigation Services (DMS). This report documents the completion of the project and presents Year 5 monitoring data for the five-year monitoring period. The goals for the restoration project were as follows:

- To create geomorphically stable conditions on the East Buffalo Creek project site;
- The reduction of sediment loading through restoration of riparian areas and streambanks;
- To improve and restore hydrologic connections between the creek and floodplain;
- The restoration, enhancement and preservation of headwater tributaries draining into East Buffalo Creek (and Lake Santeetlah); and
- To improve aquatic and terrestrial habitat along the project corridor.

To accomplish these goals, the following objectives were implemented:

- Restoration of incised, eroding, and channelized streams by creating a stable channel that has access to its floodplain;
- Relocate the perched stream channel from the side slope ditch to the low point of the valley to restore natural hydrology and geomorphic form;
- Improve water quality by establishing buffers for nutrient removal from runoff; relocating an eroded, unpaved driveway away from the stream channel and out of the riparian buffer to minimize the sediment supply to the stream; and by stabilizing stream banks to reduce bank erosion;
- Improve in-stream habitat by providing a more diverse bedform with riffles and pools, creating deeper pools, developing areas that increase oxygenation, providing woody debris for habitat, and reducing bank erosion; and
- Improve terrestrial habitat by removing invasive species, planting riparian areas with native vegetation and protecting these areas with a permanent conservation easement.
- Improve storm water runoff filtering capacity, bank stability, and provide shading to decrease water temperature and improve wildlife habitat by planting a native riparian buffer.

Three vegetation monitoring plots, 100 square meters (m^2) (10m x 10m) in size, were used to estimate survival of the woody vegetation planted on-site. The Year 5 vegetation monitoring indicated an average survival of 674 planted stems per acre and an average of 850 volunteer stems per acre were enumerated in plots, for an average density in monitoring plots of 1,524 woody stems per acre. The data shows that the Site has met the final the success criteria of 260 trees per acre by the end of Year 5.

The design implemented at the East Buffalo Creek mitigation project site involved Priority Level 1 Restoration, and Enhancement Levels I and II approaches, as well as preservation of many stream reaches. The resulting design has yielded a stable A or B type channel for UT2 to East Buffalo Creek and a B-type channel on Reach 3 of UT6 to East Buffalo Creek. Restoration and enhancement work was completed in accordance with the approved design provided in the mitigation plan for East Buffalo Creek and its tributaries. Longitudinal profile and cross-section data indicate that the project streams have remained stable since baseline monitoring data were collected in February 2011. Additionally, as the photo logs included in this report show, the herbaceous and woody vegetation at the project site is flourishing and promoting stability, shading and improved habitat. Based on geomorphic data presented in Appendix B and D, this Site is currently on track to meet the hydrologic and stream success criteria specified in the East Buffalo Creek Mitigation Plan.

One issue at the site is that flow through the restored UT2 reach does not flow at the surface of the channel over part of the reach during most of the year. The length of channel with surface flow had increased annually through the 2013 monitoring period; however, only small increases have occurred during the past two years. We have made efforts to fill the interstitial space in the channel bed, but this has not corrected the issue to date. Surface flow was observed for over half of the reach. It was obvious that flow had extended further down the channel than previously observed during a high water event based on the disturbed channel bed. The contractor

who was assisting us with the channel, mowed a path up the left floodplain that passes through the easement in a number of locations. This happened without Baker's knowledge and will not happen again. At one location of this mowing, it actually crossed one corner of a veg plot; however, the veg plot still exceeded the required stems per acre.

The only other issue is the presence of invasive vegetation, specifically Multiflora Rose and Chinese Privet, along portions of Reaches 2 of UT2, UT5, UT6, and East Buffalo Creek. These areas have been treated a number of times since the project began, including during this year. Treatment appears to have significantly reduced the density of invasive vegetation in many of these areas. The remaining invasives have persisted after previous treatments or new growth began from an existing seed bank; however, treatment of invasives in the project easement will continue this spring.

Summary information and statistics related to performance of various project and monitoring elements can be found in the tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly Restoration Plan) documents available on DMS's website. All raw data supporting the tables and figures in the appendices is available from DMS upon request.

1.0 PROJECT BACKGROUND AND ATTRIBUTES

The East Buffalo Creek mitigation site is located approximately three miles north of Robbinsville in Graham County, North Carolina (Figure 1, Appendix A). The project site is situated in the Little Tennessee River Basin, within North Carolina Division of Water Quality (NCDWQ) sub-basin 04-04-04 and United States Geologic Survey (USGS) hydrologic unit 06010204020030. The East Buffalo Creek mitigation project is located in a watershed that is predominantly forested but also contains a small number of residences near East Buffalo Creek and its tributaries. The vast majority of the watershed is in forested cover, with less than one percent of land being in open grassland. Over the past 100 years, various parcels of property on the lower slopes and valley bottom have been developed for residential and agricultural use including the hillside where UT2 is located.

The majority of the project site consists of forested uplands with a smaller proportion devoted to an abandoned pasture. Although the project watershed has been impacted by logging activity and pasture development 100 or more years ago, most of the watershed has returned to a more natural state. The present landowners currently maintain several acres as grassland. However, since the beginning of the project some of this area has not been mowed. There are three single-family residences located in the vicinity of the project streams.

During development of the land for agricultural and residential use, the lower reaches of East Buffalo Creek and three of its tributaries (UT2, UT5 and UT6), were impacted by channel relocation, channelization, and pasture conversion. The project area has also been impacted by the development of a long driveway that provides access to one of the homes and property, riparian vegetation removal, and the installation of culverts on portions of East Buffalo Creek and its tributaries. The effects of these practices over time led to a decrease of in-stream habitat quality from a combination of changes, including channel incision, channel aggradation and embeddedness, proliferation of invasive species within the riparian buffer, and reduced channel shading. Widespread or systemic channel incision has been limited by a combination of grade control features like exposed bedrock, large cobble and boulder substrate that is frequently found throughout these stream systems. Existing woody vegetation along stream banks has kept portions of the banks from eroding although some channel erosion was present where woody vegetation had been removed.

The project involved restoration or enhancement of 2,987 linear feet (LF) of four streams: East Buffalo Creek and three smaller unnamed tributaries (UT2, UT5 and UT6). In addition, 8,558 LF of East Buffalo Creek and other headwater tributaries were preserved. The restoration, enhancement, and preservation of 11,545 LF of stream within this project site has generated 3,311 stream mitigation units (SMUs); 535 SMUs, or 16 percent of the total generated, were derived from intermittent streams, which is well within the 20 percent threshold required by DMS. Other general information about the project is provided in Tables 1-4 (Appendix A).

1.1 Location and Setting

The East Buffalo Creek mitigation site is located approximately three miles north of Robbinsville in Graham County, North Carolina. To reach the project site from Robbinsville, take U.S. Highway 129 north for approximately three miles and turn right on to East Buffalo Circle (SR1144). Continue on East Buffalo Circle for about a half mile and turn right on East Buffalo Road (SR1254) and continue to the end. East Buffalo Road transitions to a gravel road; the site is accessible from a gated private driveway located .18 miles past where the road becomes gravel and just past the driveway to a brick home.

2.0 METHODOLOGY AND RESULTS

The five-year monitoring plan for the East Buffalo Creek mitigation project includes criteria to evaluate the success of the vegetation and stream components of the project. The specific locations of vegetation plots, permanent cross-sections, reference photo stations and crest gauges are shown on the Year 5 current condition plan view (CCPV) submitted with this report.

2.1 Stream Assessment

2.1.1 Morphologic Parameters and Channel Stability

Geomorphic monitoring of restored stream reaches is being conducted over a five year period to evaluate the effectiveness of the restoration practices installed. Monitored stream parameters include channel dimension (cross-sections), profile (longitudinal survey), pattern (to a lesser degree for reasons noted below), bed composition, bank stability, bankfull flows, and stability of reference sites documented by photographs (USACE 2003). Crest gauges, as well as high flow marks, will be used to document the occurrence of bankfull events. The methods used and any related success criteria are described below for each parameter. For monitoring stream success criteria, eight permanent cross-sections, two longitudinal profile sections, multiple photo points and two crest gauges were installed.

2.1.1.1 Dimension

Eight permanent cross-sections were installed to help evaluate the success of the mitigation project. Permanent cross-sections were established throughout the project site as follows: four cross-sections were located on UT2, and four cross-sections were located on Reach 3 of UT6. Cross-sections selected for monitoring were located in representative riffle and pool reaches and each cross-section was marked on both banks with permanent pins to establish the exact transect used. A common benchmark will be used for cross-sections and consistently referenced to facilitate comparison of year-to-year data. The cross-sectional surveys will include points measured at all breaks in slope, including top of bank, bankfull, inner berm, edge of water, and thalweg, if the features are present. Riffle cross-sections were classified using the Rosgen Stream Classification System.

There should be little change in the as-built cross-sections. If changes do take place, they will be evaluated to determine if they represent movement toward a more unstable condition (e.g., down-cutting or erosion) or movement toward increased stability (e.g., settling, vegetative changes, or deposition along the banks).

2.1.1.1.1 Results

As-built, cross-section monitoring data for stream stability was collected in April 2011. The eight permanent cross-sections: four along the restored channel and four along the enhanced reach of UT6, were re-surveyed to document any changes to stream dimension during Monitoring Year 5. Cross-sectional data is presented in Exhibit 3 and Table 8 of Appendix D. The location of cross-sections is shown on the current condition plan view submitted with this report.

The cross-sections show that there has been little adjustment to stream dimension across the project reaches since construction. Cross-section 1 on UT2 indicates a small change in depth occurred after the first two years of the project, whereas the other cross-sections indicate little change. At this time, cross-sectional measurements do not indicate any streambank or channel stability issues.

As noted in the Stream Reach Morphology Data Table for Reach 3 of UT6 in Appendix D (Table 9), average bank height ratios for cross-sections along this reach are approximately twice as high as that specified for design; the average bank height ratio from the as-built and monitoring surveys was 1.7 to 2.1 compared to 1.0 from design. The design originally proposed isolated flood plain benching along the left bank where the top of bank would have coincided with the bankfull bench elevation thereby resulting in the proposed design bank height ratio of 1.0. However, to conform

to the channel shape or geometry of pre-existing stable portions of the reach both upstream and downstream of the enhancement reach, banks were sloped back accordingly during construction and stabilized with boulders for toe protection. A bank height ratio of 2.0 tends to be an indicator of an incised channel but the average entrenchment ratio reported for Reach 3 is 1.8, which fulfills the stable design specifications of a B-type Rosgen channel classification. The inflated bank height ratio of 2.1 along this reach is due to the steepness associated with the stream and the existing top of road embankment and valley wall, which serve to function as the top of left and right banks of Reach 3 respectively.

2.1.1.2 Pattern and Longitudinal Profile

Longitudinal profiles for Year 5 were surveyed during November 2015; profiles of the various project reaches are provided in Appendix D. A longitudinal profile was conducted for the entire project length on UT2 and Reach 3 of UT6. Longitudinal profiles have been replicated annually during the five year monitoring period.

Measurements taken along longitudinal profiles include thalweg, water surface, and top of low bank. The pools should remain relatively deep with flat water surface slopes, and the riffles should remain steeper and shallower than the pools. Bed form observations should be consistent with those observed for channels of the design stream type. Profile data taken during YR5 monitoring reflect stable channel bedform and a diverse range of riffle and pool complexes.

All measurements were taken at the head of each feature (e.g., riffle, run, pool, glide) and the maximum pool depth. Elevations of grade control structures were also included in the longitudinal profiles surveyed. Surveys were tied to a permanent benchmark. Although pattern adjustments were made on UT2 for channel alignment considerations such as following the low point of the valley, pattern adjustments were not made with the intent to increase sinuosity. East Buffalo Creek and its tributaries are A and B-type streams primarily characterized by step-pool sequences. Consequently, pattern information is not provided in Appendix D as the parameters present are generally associated with meandering, riffle-pool channels.

2.1.1.2.1 Results

The longitudinal profiles show that the bed features are stable; closely-spaced grade control structures continue to help maintain the overall profile desired. As noted in the Stream Reach Morphology Data Tables in Appendix D (Table 9), riffle and pool characteristics do not appear to have significantly changed since construction; the measurements obtained for Year 5 are acceptable when compared to reference reach and design data provided for the project reaches. Step-pools and riffles appear to have adjusted slightly in some areas of UT6-Reach 3, but such adjustments are considered to be acceptable and expected given the natural steepness of the channel in this location and the amount of large cobbles and small boulders moving in the stream. The Enhancement Level 1 approach which included adding grade control to increase pool habitat has also enhanced the vertical stability of this reach.

There was also little to no change in the profile of UT2 to East Buffalo Creek. Although the profile appears stable, there is a section of UT2 where the stream flow goes subsurface; this section is illustrated on the current condition plan view and documented in Tables 11 and 12 in Appendix F. Given the steepness in slope and the relatively large riffle material used to construct the step-pool channel system, it is likely that the flow will remain subsurface until interstitial spaces between the stones of the constructed channel bed become filled by smaller particles and organic material. Baker has taken efforts to add sediment materials to the channel in the upstream area where flow begins to go subsurface to promote the filling interstitial space in the channel bed. While this has made some minor improvements and flow has progressed to approximately station 2+00, the channel area shown to have subsurface flow in the CCPV has, except on storm flows, remained dry. Particle sorting was observed in the channel during the Year 3, 4 and 5 surveys, indicating that there is flow in the channel at times. During the Fall of 2015 this evidence of flow

during a high water event was seen throughout the channel. However, the presence of rooted plant material indicates that the baseflow remains under the bed material most of the time. There have been many observations during the monitoring period that surface flow has been continuous over approximately half of the restored reach. This was also observed during visits for Year 5 monitoring. No areas of instability were noted during Year 5 monitoring.

2.1.1.3 Substrate and Sediment Transport

Bed material analysis consists of a pebble count taken in the same constructed riffle during annual geomorphic surveys of the project site. This sample, combined with evidence provided by changes in cross-section and profile data will reveal changes in sediment gradation that occur over time as the stream adjusts to upstream sediment loads. Significant changes in sediment gradation will be evaluated with respect to stream stability and watershed changes.

2.1.1.3.1 Results

For this project, a pebble count was collected on UT6. Visual observations of UT6 and a review of pebble count data collected during Year 5 monitoring did not yield any signs that sediment transport functions have been hampered by the mitigation project; specifically, no significant areas of aggradation or degradation within the project area were observed. The pebble count data (Table 9, Appendix D) indicates that the stream is moving fines through the system and larger particle size classes continue to make up a greater percentage of the bed material.

2.1.2 Hydrology

2.1.2.1 Streams

The occurrence of bankfull events within the monitoring period will be documented by the use of crest gauges and photographs. Crest gauges were installed on the floodplain at the bankfull elevation. One crest gauge was placed on UT2 while another gauge was set up near the end of the project area on Reach 3 of UT6. The crest gauges record the highest watermark between site visits and are checked at each site visit to determine if a bankfull event has occurred. Photographs are used to document the occurrence of debris lines and sediment deposition on the floodplain during monitoring site visits.

Two bankfull flow events must be documented within the 5-year monitoring period. The two bankfull events must occur in separate years; otherwise, the stream monitoring will continue until two bankfull events have been documented in separate years. If two bankfull events have not been documented at the end of 5 years the IRT will have to decide on an appropriate course of action.

2.1.2.1.1 Results

During the Year 5 monitoring period, the site was found to have had at least one bankfull event based on the crest gauge reading obtained on UT2. A reading was not taken from the crest gauge on UT6 because the measuring staff in the gauge was broken and a reading could not be obtained. Since project completion, UT2 has had four recorded bankfull events, and UT6 has had four recorded bankfull events during different years for each gauge. Information on these events is provided in Table 10 of Appendix E. At this point more than two bankfull flow events have been documented on each crest gauge within the 5-year monitoring period. The hydrology success criterion has been met.

2.1.3 Photographic Documentation of Site

Photographs will be used to document restoration success visually. Reference stations were photographed during the as-built survey; this will be repeated for at least five years following construction. Reference photos are taken once a year, from a height of approximately five to six feet. Permanent markers will ensure that the same locations (and view directions) are utilized during each monitoring period. Selected site photographs from established photo points are shown in Appendix B.

2.1.3.1 Lateral Reference Photos

Reference photo transects were taken of the right and left banks at each permanent cross-section. A survey tape was captured in most photographs which represents the cross-section line located perpendicular to the channel flow. The water line was located in the lower edge of the frame in order to document bank and riparian conditions. Photographers will make an effort to consistently maintain the same area in each photo over time.

2.1.3.2 Structure Photos

Photographs of primary grade control structures (i.e. vanes and weirs), along the restored streams are included within the photographs taken at reference photo stations. Photographers will make every effort to consistently maintain the same area in each photo over time.

Lateral and structure photographs are used to evaluate channel aggradation or degradation, bank erosion, success of riparian vegetation, structure function, and stability, and effectiveness of erosion control measures subjectively. Lateral photos should not indicate excessive erosion or degradation of the banks. A series of photos over time should indicate successive maturation of riparian vegetation and consistent structure function.

2.1.3.2.1 Results

Photographs of the restoration project were taken in December 2015. The photographs illustrate stable conditions across the project site. Vegetative growth along the restored and enhanced streambanks and riparian buffers has become dense since construction was completed in 2011. Structures are functioning as designed. Photographs from the preservation reaches show that no encroachment or unnatural disturbance has occurred since the project was established. Photo documentation of the site during Year 5 monitoring reflects stable site conditions in restored, enhanced and preserved areas as well as a healthy stand of herbaceous and woody vegetation in the riparian corridors.

2.1.4 Stream Stability Assessment

In-stream structures installed within the restored stream (UT2) included log drops, rock drops, log/rock drop sequences, boulders, and boulder steps. The Year 5 visual observations of these structures indicate that little or no changes have occurred since the baseline survey was performed; structures are functioning as designed and are holding their elevation and grade. Structures located in Reach 3 of UT6 are also functioning as intended to provide supplemental grade control while enhancing pool habitat. Table 11 in Appendix F provides a comprehensive visual assessment of morphological stability throughout both UT2 and Reach 3 of UT6.

Quantitative reference reach and design data used to determine the restoration approach, as well as the Year 5 data collected during the project's post-construction monitoring period are summarized in Appendix D.

2.2 Vegetation Assessment

2.2.1 Vegetation

Successful restoration of the vegetation on a site is dependent upon hydrologic restoration, active planting of preferred canopy species, and volunteer regeneration of the native plant community. In order to determine if the success criteria are achieved, three vegetation monitoring plots were installed at the restoration site. The restoration plan for the East Buffalo Creek Stream Restoration Site specifies that the number of vegetation monitoring quadrants required will be based on the species/area curve method (Peet 1998 and Lee 2007), as described in NCDMS monitoring guidance documents. The size of individual quadrants varies from 100 square meters for tree species to 1 square meter for herbaceous

vegetation. Level 1 CVS vegetation monitoring has occurred after the growing season for the year being evaluated. At the end of the first growing season during baseline surveys, species composition, density, and survival were evaluated. Individual quadrant data provided during subsequent monitoring events has included diameter (dbh), height, density, and coverage quantities. Individual seedlings were marked to ensure that they could be found in succeeding monitoring years. Mortality has been determined from the difference between the previous year's living, planted trees and the current year's living, planted trees.

Photographs are used to visually document vegetation success in sample plots. Reference photos of tree and herbaceous condition within plots have been taken at least once per year. Photos of the plots are included in Appendix B of this report.

The interim measure of vegetative success for the site is the survival of at least 320, 3-year old, planted trees per acre at the end of Year 3 of the monitoring period. The final vegetative success criteria is the survival of 260, planted trees per acre at the end of monitoring Year 5.

Native riparian herbaceous vegetation was applied to streambanks beneath the erosion matting and has provided excellent ground coverage. Planted live stakes and bare root trees are flourishing and increasingly contribute to streambank stability, shading and improved habitat. Bare-root trees were planted throughout the conservation easement with the exception of the preservation reach. A minimum 30-foot buffer was established along all restored stream reaches. In general, bare-root vegetation was planted at a target density of 680 stems per acre, in an 8-foot by 8-foot grid pattern. Planting of bare-root trees was completed in late March-early April 2011. Species planted are listed below.

Proposed Bare-Root and Live Stake Species (may also include seed or container species)				
East Buffalo Creek Mitigation Plan-DMS Project #92763				
Common Name	**Scientific Name**	**% Trees Planted by Species**	**Planting Density**	**Wetness Tolerance**
Riparian Buffer Plantings				
Trees Overstory				
Sycamore	*Platanus occidentalis*	8	54	FACW-
River Birch	*Betula nigra*	7	48	FACW
White Oak	*Quercus alba*	5	34	FACU
Red Maple	*Acer rubrum*	5	34	FAC
Tulip Poplar	*Liriodendron tulipifera*	5	34	FAC
Yellow Birch	*Betula alleghaniensis (lutea)*	5	34	FACU+
Black (Sweet) Birch	*Betula lenta*	5	34	FACU
Northern Red Oak	*Quercus rubra*	5	34	FACU
Yellow Buckeye	*Aesculus octandra*	5	34	N/A
Mockernut Hickory	*Carya alba (tomentosa)*	3	20	N/A
Scarlet Oak	*Quercus coccinea*	2	14	N/A
Trees Understory				
Highland Doghobble	*Leucothoe fontanesiana (axilarris var. editorum)*	5	34	N/A
Mountain Laurel	*Kalmia latifolia*	5	34	FACU
Flame Azalea	*Rhododendron calendulaceum*	5	34	N/A
Black Willow	*Salix nigra*	5	34	OBL
Ironwood	*Carpinus caroliniana*	3	20	FAC

Proposed Bare-Root and Live Stake Species (may also include seed or container species)				
East Buffalo Creek Mitigation Plan-DMS Project #92763				
Common Name	**Scientific Name**	**% Trees Planted by Species**	**Planting Density**	**Wetness Tolerance**
Witch Hazel	*Hamamelis virginiana*	2	14	FACU
Sourwood	*Oxydendrum arboreum*	5	34	FACU
Flowering Dogwood	*Cornus florida*	5	34	FACU
Tag Alder	*Alnus serrulata*	5	34	FACW+ or OBL
Redbud	*Cercis canadensis*	5	34	FACU
Shrubs				
Spicebush	*Lindera benzoin*	15	102	FACW
Deerberry	*Vaccinium stamineum*	15	102	FACU
Eastern Sweetshrub, Sweetshrub	*Calycanthus floridus, Calycanthus spp.*	15	102	FACU
Sweetpepperbush	*Clethra spp.*	15	102	N/A
Winterberry	*Ilex verticillata*	15	102	FACW
Virginia Sweetspire	*Itea virginica*	15	102	FACW+
Chokeberry	*Photinia*	10	68	N/A
Riparian Livestake Plantings				
Ninebark	*Physocarpus opulifolius*	15	102	FAC-
Elderberry	*Sambucus canadensis*	20	136	FACW-
Buttonbush	*Cephalanthus occidentalis*	15	102	OBL
Silky Willow	*Salix sericea*	25	170	OBL
Silky Dogwood	*Cornus amomum*	25	170	FACW+
Note: Species selection may have changed due to refinement or availability at the time of planting.				

The mitigation plan for the East Buffalo Creek Site specifies that the number of quadrants required will be based on the species/area curve method, as described in DMS monitoring guidance. The size of individual quadrants is 100 square meters for woody tree species, and 1 square meter for herbaceous vegetation. Three vegetation plots, each 10 by 10 meters, were established along the restored (2) and enhanced (1) reaches.

2.2.1.1.1 Results

Tables 5 through 7b in Appendix C presents information on plots meeting the vegetation success criteria, vegetation metadata, and stem counts for each of the vegetation monitoring plots. Data from the Year 5 monitoring shows a range of 567 to 809 stems per acre, with approximately 87% of the stems being in good to excellent condition. The average density of planted stems, based on data collected from the three monitoring plots during Year 5 monitoring, is 675 stems per acre, or about 17 stems per plot. The site was originally planted at an average density of approximately 1,039 bare root stems per acre after construction (as cited in the Baseline Monitoring Document), or about 26 stems per plot. The average number of volunteers, based on counts within the plots, is estimated to be 850 stems per acre. When planted and volunteer stems are combined plots supported an average of 1,524 stems per acre. With an average density of 675 planted stems per acre, the site has met the final success criteria of 260 trees per acre by the end of Year 5. The location of the vegetation plots are shown on the Year 5 current condition plan view (Figure 3 of Appendix F).

There were four vegetation problem areas identified during Year 5 monitoring that related to the presence of invasive vegetation along Reaches 2 of UT5, UT6, UT2 and East Buffalo Creek. The VPA 4 was added this year as a thick stand of Multiflora rose has developed along the lower right bank of UT2. Multiflora rose and Chinese Privet found along portions of these reaches appear to be primarily a result of invasives that have persisted after prior treatment. We have retained the same areas of concern that were reported in previous years in this year's report; however, a significant reduction in the density of invasives has been made in these areas as evidenced by the photo that is presented (Appendix F). The large area of withered and dead multiflora rose and Chinese Privet observed along these reaches, especially along UT5 Reach 2, is indicative of the success of prior herbicide treatment. However, the current extent of persistent invasives (CCPV in Appendix F) warrants follow-up treatment to limit continued growth and treatment will be scheduled in the spring of 2016.

Another vegetation issue resulted when a contractor that was working with Baker mowed a path into the easement along the left buffer of UT2. This contractor was assisting Baker to add materials to the UT2 channel in an effort to fill interstitial space in the bed and move flow to the surface. Without Baker's knowledge or approval, he mowed a path in order to drive his truck up slope to deliver materials. This mowing was a onetime encroachment, not associated with the landowner and will not happen again in the future. It was also observed that many of the mowed trees were resprouting and a vegetation plot in this area met requirements.

Although the density of herbaceous cover varies across the site, conditions observed on-site during the Year 5 monitoring survey found ground cover in the easement area to be sufficient for stabilizing the site and for providing good terrestrial habitat. Survival rates of planted woody stems in the vegetation plots indicate that plantings across the easement area are of sufficient density to meet regulatory requirements, site stabilization and habitat enhancement goals originally set forth in the mitigation plan.

2.3 Areas of Concern

At this time, the only items that are being monitored beyond the success criteria noted in this report is the dry segment of UT2 and the invasive vegetation problem areas documented on Reaches 2 of UT5, UT6, UT2 and East Buffalo Creek. As noted in Section 2.1.1.2 of the Baseline Monitoring Report, we believe that the surface flow of UT2 is presently flowing beneath and through the channel bed material along the lower half of the restored reach. This is not unusual for steep, rocky, low flow channels in this area. The flow along UT2 should surface as organic material and fine particles reduce interstitial spaces in the constructed channel; however, it does not appear that this will happen before he project is scheduled for closeout. We will continue to monitor the flow condition of UT2 and the presence of invasives on Reaches 2 of UT5, UT6, UT2 and East Buffalo Creek up until project closeout, and manage these reaches as seems most appropriate.

3.0 REFERENCES

Lee, M., Peet R., Roberts, S., Wentworth, T. CVS-NCEEP Protocol for Recording Vegetation, Version 4.1, 2007.

Peet, R.K., T.R. Wentworth and P.S. White. 1998. "A flexible, multipurpose method for recording vegetation composition and structure." Castanea 63:262-274.

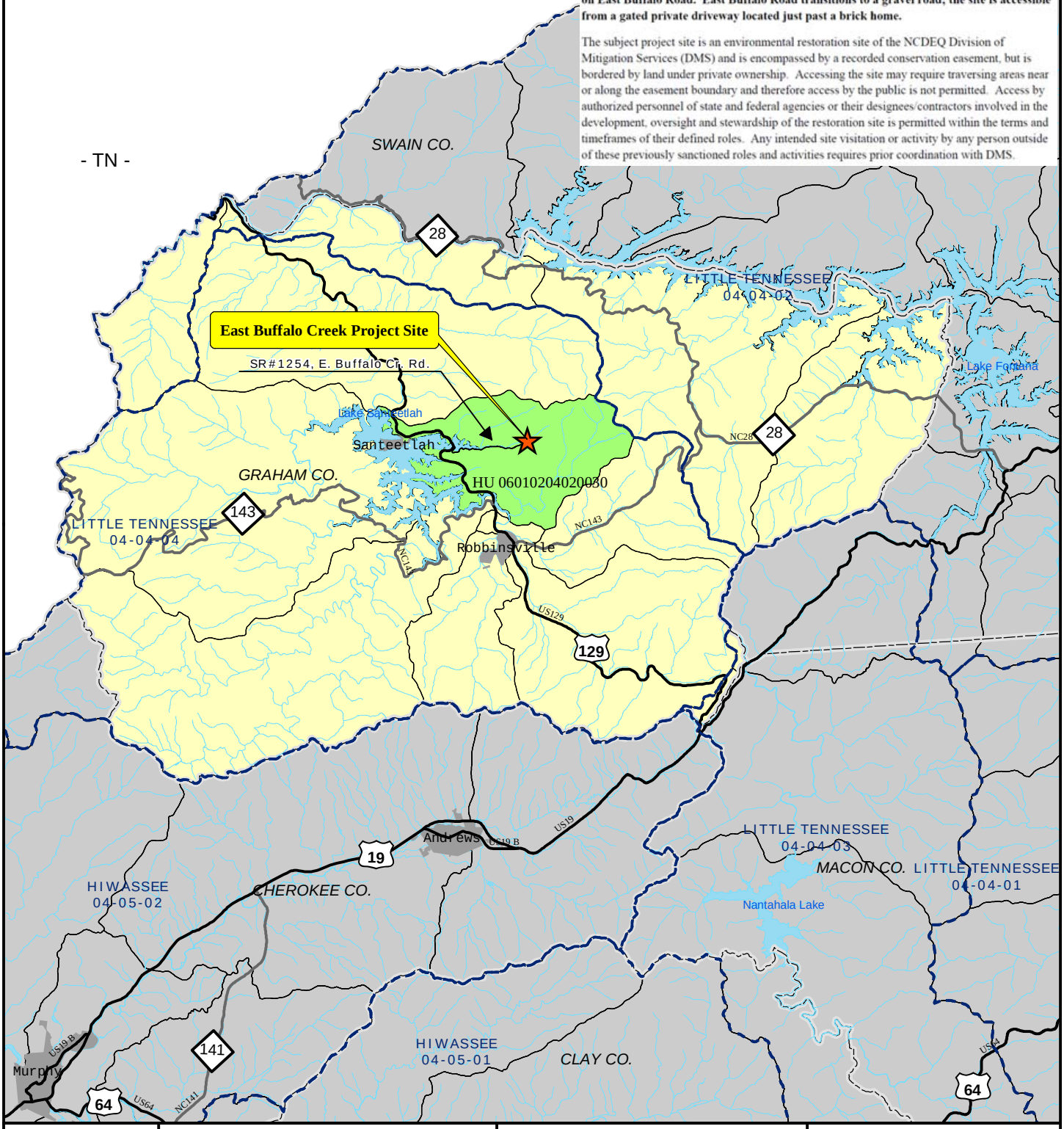
United States Army Corps of Engineers. 2003. Stream Mitigation Guidelines, April 2003, U.S. Army Corps of Engineers. Wilmington District.

APPENDIX A
FIGURE & GENERAL TABLES

LOCATION MAP
TABLES 1-4

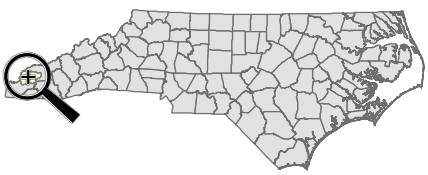
The East Buffalo Creek mitigation site is located approximately three miles north of Robbinsville in Graham County, North Carolina. To reach the project site from Robbinsville, take U.S. Highway 129 north for approximately three miles and turn right on to East Buffalo Circle. Continue on East Buffalo Circle for about a half mile and turn right on East Buffalo Road. East Buffalo Road transitions to a gravel road; the site is accessible from a gated private driveway located just past a brick home.

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



NORTH CAROLINA DIVISION OF MITIGATION SERVICES

Map Inset



Graham County, NC

LEGEND:

- NCDWR Sub-basin
- Counties
- USGS Hydrologic Unit
- Project Hydrologic Unit
- Graham County

0 1 2 4 Miles

Figure 1. Project Vicinity Map

East Buffalo Restoration Project
Graham County, NC

Michael Baker INTERNATIONAL

Table 1. Project Components
East Buffalo Creek Mitigation Project-NCDMS Project #92763

Project Segment or Reach ID	Existing Feet/ Acres	Mitigation Type	Approach	Target Stream Type	Footage or Acreage	Mitigation Ratio	Mitigation Units	Stationing	Comment
East Buffalo Creek									
Reach 1	919 LF	P	-	-	919 LF	5:1	184	-	No channel alteration (preservation).
Reach 2A/2B	932 LF	EII	-	Aa^+	932 LF	2.5:1	373	-	Improve riparian buffer by removing invasive/exotic vegetation and replanting with native vegetation where applicable.
UT2	226 LF	R	P1	Aa^+ Ba	509 LF	1:1	509	0+29-6+34	Restore natural hydrology and geomorphic form by relocating a perched channel to the low point of the valley.
UT3*	1,615 LF	P	-	-	1,629 LF	5:1	326	-	No channel alteration (preservation).
UT4	921 LF	P	-	-	921 LF	5:1	184	-	No channel alteration (preservation).
UT5									
Reach 1*	809 LF	P		-	866 LF	5:1	173	-	No channel alteration (preservation).
Reach 2*	598 LF	EII	-	Aa	607 LF	2.5:1	243	-	Improve riparian buffer by removing invasive/exotic vegetation and replanting with native vegetation where applicable.
UT 6									
Reach 1*	1,145 LF	P	-	Aa+ Aa	1,146 LF	5:1	229	-	No channel alteration (preservation).
Reach 2A/2B*	401 LF	EII	-	Aa+ Aa	565 LF	2.5:1	226	-	Improve riparian buffer by removing invasive/exotic vegetation and replanting with native vegetation where applicable; increase buffer width (filtering capacity) by relocating unpaved road away from the left streambank.
Reach 3	524 LF	EI	P3	Fb Ba	374 LF	1.5:1	249	0+00-3+74	Restore stable channel dimension and profile via bank grading/ flood benching along the left bank and installation of grade control. Pattern will be addressed with the relocation of a portion of channel away from the valley wall to minimize further bank erosion. Improve riparian buffer by removing invasive/exotic vegetation and replanting with native vegetation where applicable; increase buffer width (filtering capacity) by relocating unpaved road away from the left streambank.
UT7*	940 LF	P	-	-	947 LF	5:1	189	-	No channel alteration (preservation).
UT8*	361 LF	P	-	-	365 LF	5:1	73	-	No channel alteration (preservation).
UT9	1,179 LF	P	-	-	1,179 LF	5:1	236	-	No channel alteration (preservation).
UT10	536 LF	P	-	-	536 LF	5:1	107	-	No channel alteration (preservation).
UT11	50 LF	P	-	-	50 LF	5:1	10	-	No channel alteration (preservation).

Mitigation Unit Summations

Stream (LF)	Riparian Wetland (Ac)	Nonriparian Wetland (Ac)	Total Wetland (Ac)	Buffer (Ac)	Comment
11,545	NA	NA	NA	15.27	
Total MUs	3,311				

*Notes: Additional stream length was acquired during post-processing and re-mapping of surveyed stream data

Table 2. Project Activity and Reporting History
East Buffalo Creek Mitigation Project-NCDMS Project #92763

Activity or Report	Data Collection Complete	Completion or Delivery
Restoration Plan	-	April 2010
Final Design-90%	-	June 2010
Construction	-	September 2010
Temporary S&E mix applied to entire project area	-	September 2010
Permanent seed mix applied to project site	-	September 2010
Containerized and B&B plantings set out	-	April 2011
Installation of crest gauges	-	January 2011
Mitigation Plan / As-built (Year 0 Monitoring – baseline)	April 2011	September 2011 (last of plantings completed in April)
Year 1 Monitoring	December 2011	March 2012
Year 2 Monitoring	March 2013	April 2013
Year 3 Monitoring	March 2014	April 2014
Year 4 Monitoring	March 2015	March 2015
Year 5 Monitoring	December 2015	January 2016

Table 3. Project Contacts
East Buffalo Creek Mitigation Project - NCDMS Project #92763

Designer	
Michael Baker Engineering, Inc.	797 Haywood Rd Suite 201, Asheville, NC 28806 Contact: Micky Clemmons, Tel. 828.412.6100
Construction Contractor	
River Works, Inc.	6105 Chapel Hill Road, Greensboro, NC 27406 Contact: Bill Wright, Tel. 919.582-3574
Planting & Seeding Contractor	
River Works, Inc.	6105 Chapel Hill Road, Greensboro, NC 27406 Contact: George Morris, Tel. 919.582-3574
Seed Mix Sources	Green Resources
Nursery Stock Suppliers	Arborgen and Hillis Nursery
Monitoring	
Michael Baker Engineering, Inc.	797 Haywood Rd Suite 201, Asheville, NC 28806 Contact: Micky Clemmons, Tel. 828.412.6100

Table 4. Project Attributes **East Buffalo Creek Mitigation Project-NCDMS Project #92763**	
Project County	Graham County, NC
Physiograhic Region	Blue Ridge
Ecoregion	Blue Ridge Mountains-Southern Metasedimentary Mountains
Project River Basin	Little Tennessee
USGS HUC for Project	06010204020030
NCDWQ Sub-basin for Project	04-04-04
Within extent of DMS Watershed Plan?	No local or targeted watershed plans currently available
WRC Class	Cold; Non-trout waters
% of Project Easement Fenced or Demarcated	0% (post-construction)
Beaver Activity Observed During Design Phase?	No
Drainage Area (Square Miles)	
East Buffalo Creek Reach 1	.12 mi^2
East Buffalo Creek Reach 2	.32 mi^2
UT2	.04 mi^2
UT3	.08 mi^2
UT4	.03 mi^2
UT5 Reach 1	.06 mi^2
UT5 Reach 2	.07 mi^2
UT6 Reach 1	.04 mi^2
UT6 Reach 2	.17 mi^2
UT6 Reach 3	.15 mi^2
UT7	.09 mi^2
UT8	.06 mi^2
UT9	.03 mi^2
UT10	.01 mi^2
UT11	.03 mi^2
Stream Order	
East Buffalo Creek Reach 1	1^{st} to 2^{nd} (Perennial)
East Buffalo Creek Reach 2	2^{nd} to 3^{rd} (Perennial)
UT2	1^{st} (Perennial)
UT3	2^{nd} (Intermittent/Perennial)
UT4	1^{st} (Intermittent/Perennial)

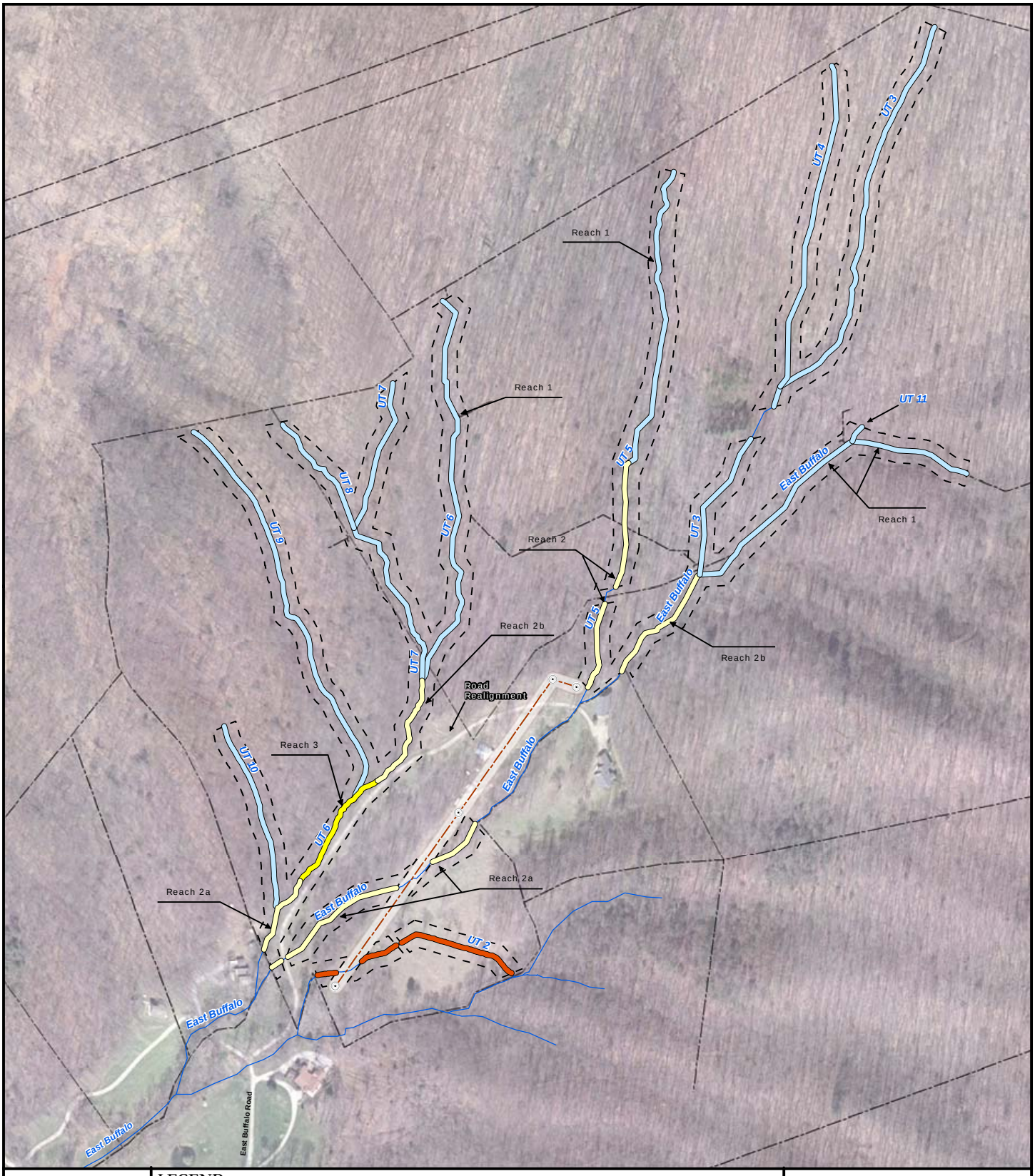
Table 4. Project Attributes **East Buffalo Creek Mitigation Project-NCDMS Project #92763**	
UT5 Reach 1	1st (Intermittent/Perennial)
UT5 Reach 2	1st (Perennial)
UT6 Reach 1	1st (Perennial)
UT6 Reach 2	2nd (Perennial)
UT6 Reach 3	2nd (Perennial)
UT7	2nd (Perennial)
UT8	1st (Intermittent)
UT9	1st (Perennial)
UT10	1st (Intermittent/Perennial)
UT11	1st (Intermittent)
Restored Length	
East Buffalo Creek Reach 1	919 LF
East Buffalo Creek Reach 2A/2B	932 LF
UT2	509 LF
UT3	1,629 LF
UT4	921 LF
UT5 Reach 1	866 LF
UT5 Reach 2	607 LF
UT6 Reach 1	1,146 LF
UT6 Reach 2A/2B	565 LF
UT6 Reach 3	374 LF
UT7	947 LF
UT8	365 LF
UT9	1,179 LF
UT10	536 LF
UT11	50 LF
Watershed Type	Rural (Predominantly Forested)
Watershed LULC Distribution (Percent area)	
Forest	99.26%
Grasslands/Herbaceous	0.46%
Pasture Lands/Hay	.33%
Drainage Impervious Cover Estimate (%)	<10%
NCDWQ AU/Index #	2-190-16
303d Listed	No

Table 4. Project Attributes **East Buffalo Creek Mitigation Project-NCDMS Project #92763**				
Upstream of 303d Listed Segment	No			
Reasons for 303d Listing or Stressor	-			
Total Acreage of Easement	17.87			
Total Vegetated Acreage w/in Easement	n/a (Easement vegetated with exception of stream channel)			
Total Planted Acreage within the Easement	~2 Acres			
Rosgen Classification (Pre-existing)/As-Built				
East Buffalo Creek Reach 1	Aa^+ / Aa^+			
East Buffalo Creek Reach 2	Aa^+ / Aa^+			
UT2	Aa^+ / Ba			
UT3	Aa^+ / Aa^+			
UT4	Aa^+ / Aa^+			
UT5 Reach 1	Aa^+ / Aa^+			
UT5 Reach 2	Aa^+ / Aa^+			
UT6 Reach 1	Aa^+ / Aa^+			
UT6 Reach 2	Aa^+ / Aa^+			
UT6 Reach 3	Fb / Ba			
UT7	Ba / Ba			
UT8	Aa^+ / Aa^+			
UT9	Fb / Fb			
UT10	Aa^+ / Aa^+			
UT11	Ba / Ba			
Valley Type	II			
Valley Slope	.14-.19 (East Buffalo), .2 (UT2), .25 (UT3), .3 (UT4), .2-.23 (UT5), .12-.33(UT6), .35 (UT7), .33 (UT8), .22 (UT9), .31 (UT 10), .26 (UT11)			
Valley Side Slope Range	n/a			
Valley Toe Slope Range	n/a			
Trout Waters Designation	No			
Species of Concern	No			
Dominant Soil Series and Characteristics	Spivey-Santeetlah/ Soco-Stecoah/ Spivey-Whiteoak			
	Depth (in.)	% Clay	K Factor	T Factor
East Buffalo Creek Reach 1	>80”	5-29	.02-.24	5
East Buffalo Creek Reach 2	>80”	5-29	.02-.24	5
UT2	~80”	5-29	.02-.24	5

Table 4. Project Attributes **East Buffalo Creek Mitigation Project-NCDMS Project #92763**				
UT3	>80”	5-29	.02-.24	5
UT4	>80”	5-29	.02-.24	5
UT5 Reach 1	>80”	5-18	.1-.28	2-3
UT5 Reach 2	>80”	5-29	.02-.24	5
UT6 Reach 1	>80”	5-29	.02-.1	5
UT6 Reach 2	>80”	5-29	.02-.1	5
UT6 Reach 3	~80”	5-29	.02-.1	5
UT7	>80”	5-29	.02-.1	5
UT8	>80”	5-29	.02-.1	5
UT9	>80”	5-18	.1-.28	2-3
UT10	>80”	5-18	.1-.28	2-3
UT11	>80”	5-29	.02-.1	5

APPENDIX B
PROJECT REACH FIGURE AND REFERENCE PHOTOGRAPHS

FIGURE 2 PROJECT COMPONENT MAP
EXHIBIT 1-2 REFERENCE STATION AND VEGETATION PLOT PHOTOLOGS



North Carolina Division of Mitigation Services

LEGEND:

Project Component
- Preservation
- Enhancement II
- Enhancement I
- Priority I Restoration

- Parcels
- Conservation Easement Boundary
- 40' Powerline Easement
- Powerline
- Power poles

- Streams

0 100 200 400 Feet

Figure 2. Restoration Summary Map

East Buffalo Creek Restoration Project

Graham County, NC

Michael Baker INTERNATIONAL

East Buffalo Creek
Photo Log – Preservation Reference Photo Points

Notes: Photos for East Buffalo Creek were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

East Buffalo Creek
Photo Log - Reference Photo Points

Notes: Photos for East Buffalo Creek were taken in December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 4: looking downstream

Photo Point 4: looking upstream

Photo Point 5: looking downstream

Photo Point 5: looking upstream

Photo Point 6: looking downstream

Photo Point 6: looking upstream

Photo Point 7: looking downstream

Photo Point 7: looking upstream

Photo Point 8: looking downstream

Photo Point 8: looking upstream

East Buffalo Creek – UT2
Photo Log - Reference Photo Points

Notes: Photos for UT2 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with a wooden stake and flagging tape. For channel points, the stake is set up on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

Photo Point 4: looking downstream

Photo Point 4: looking upstream

Photo Point 5: looking downstream

Photo Point 5: looking upstream

Photo Point 6: looking downstream

Photo Point 6: looking upstream

Photo Point 7: looking downstream

Photo Point 7: looking upstream

East Buffalo Creek – UT 3
Photo Log – Preservation Reference Photo Points

Notes: Photos for UT 3 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

Photo Point 4: looking downstream

Photo Point 4: looking upstream

Photo Point 5: looking downstream

Photo Point 5: looking upstream

Photo Point 6: looking downstream

Photo Point 6: looking upstream

East Buffalo Creek – UT 4
Photo Log – Preservation Reference Photo Points

Notes: Photos for UT 4 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

East Buffalo Creek – UT 5
Photo Log – Preservation Reference Photo Points

Notes: Photos for UT 5 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.
3. Photo points 4 and 5 are located in the Enhancement II reach.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

Photo Point 4: looking downstream

Photo Point 4: looking upstream

Photo Point 5: looking downstream

Photo Point 5: looking upstream

East Buffalo Creek – UT6
Photo Log – Enhancement Reference Photo Points

Notes: Photos for UT6-Enhancement I and Enhancement II Reaches were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with a wooden stake and flagging tape. For channel points, the stake is set up on an adjacent bank.

Enhancement I Reach

Photo Point 1: looking downstream

Enhancement I Reach

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

Photo Point 4: looking downstream

Photo Point 4: looking upstream

Enhancement II Reach

Enhancement II Reach

Photo Point 4: looking downstream

Photo Point 4: looking upstream

East Buffalo Creek – UT 6
Photo Log – Preservation Reference Photo Points

Notes: Photos for UT 6 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

East Buffalo Creek – UT 7
Photo Log – Preservation Reference Photo Points

Notes: Photos for UT 7 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

East Buffalo Creek – UT 8
Photo Log – Preservation Reference Photo Points

Notes: Photos for UT 8 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with tape and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

East Buffalo Creek – UT 9
Photo Log – Preservation Reference Photo Points

Notes: Photos for UT 9 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

Photo Point 4: looking downstream

Photo Point 4: looking upstream

East Buffalo Creek – UT 10
Photo Log – Preservation Reference Photo Points

Notes: Photos for UT 10 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

Photo Point 2: looking downstream

Photo Point 2: looking upstream

Photo Point 3: looking downstream

Photo Point 3: looking upstream

East Buffalo Creek – UT 11
Photo Log – Preservation Reference Photo Points

Notes: Photos for UT 11 were taken December 2015.

1. Photo point locations are shown on the plan sheets in the actual location the picture was taken.
2. All points are marked with flagging and recorded with GPS points. For channel points, the flagging is tied on an adjacent bank.

Photo Point 1: looking downstream

Photo Point 1: looking upstream

East Buffalo Creek Mitigation Project
Photo Log - Vegetation Plot Photos

Notes: Photos for Vegetation Plots were taken December 2015.

1. Vegetation plots marked by t-posts at corners; herbaceous plot marked by stake within larger plot.
2. Planted vegetation flagged and tagged for future identification.

Photo 1: Veg Plot 1

Photo 2: Veg Plot 1-Herbaceous Plot

Photo 3: Veg Plot 2

Photo 4: Veg Plot 2-Herbaceous Plot

Photo 5: Veg Plot 3

Photo 6: Veg Plot 3-Herbaceous Plot

APPENDIX C
VEGETATION SUMMARY DATA
TABLES 5-7b

Table 5. Vegetation Plot Criteria Attainment				
East Buffalo Creek Mitigation Project-#92763				
Stream Vegetation Totals (per acre)				
Plot #	**Stream Stems[1]**	**Volunteers[2]**	**Total[3]**	**Success Criteria Met?**
0001	809	1497	2307	Yes
0002	567	850	1416	Yes
0003	647	202	850	Yes
Project Avg	674	850	1524	

[1]Stream/ Wetland Stems: Native planted woody stems. Includes shrubs, does NOT include live stakes. No vines

[2]Volunteers: Native woody stems. Not planted. No vines.

[3]Total: Planted and volunteer native woody stems. Excl. exotics. Excl. vines.

Table 6. Vegetation Metadata **East Buffalo Creek Mitigation Project-#92763**	
Report Prepared By	Micky Clemmons
Date Prepared	1/8/2016 12:25
database name	cvs-eep-entrytool-v2.3.1_EBuffalo_YR5.mdb
database location	L:\projects\113102 East Buffalo\Monitoring\YEAR 5\Veg\CVS tool
computer name	ASHELMCLEMMONS
file size	47128576
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and	A matrix of the count of
ALL Stems by Plot and spp	A matrix of the count of total
PROJECT SUMMARY----------	
Project Code	92763
project Name	East Buffalo Creek
Description	Restoration: 508 LF, Enhancement I: 524, Enhancement II: 1931 LF, Preservation: 8475 LF
River Basin	Little Tennessee
length(ft)	1032
stream-to-edge width (ft)	30
area (sq m)	5751.97
Required Plots (calculated)	3
Sampled Plots	3

Table 7. Stem Count Arranged by Plot - Year 5
Project Name: East Buffalo Creek Mitigation Project, DMS Project Code #92763.

			Current Plot Data (MY5 2015)									Annual Means																	
			E92663-01-0001			E92663-01-0002			E92663-01-0003			MY5 (2015)			MY4 (2014)			MY3 (2013)			MY2 (2012)			MY1 (2011)			MY0 (2010)		
Scientific Name	Common Name	Species Type	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T	P	V	T
Acer rubrum	red maple	Tree	3		3				3		3	6		6	7		7	4		4	11		11	11		11	10		10
Aesculus flava[1]	yellow buckeye	Tree													3		3	3		3	3		3	3		3	3		3
Asimina triloba[2]	pawpaw	Tree													6		6	5		5	8	4	12	8		8	8		8
Betula lenta	sweet birch	Tree		1	1								1	1		10	10					1	1				1		1
Calycanthus floridus	eastern sweetshrub	Shrub	1		1				1		1	2		2	1		1						1	2		2	2		2
Carpinus caroliniana	American hornbeam	Tree	2		2	2		2	1		1	5		5															
Carya alba	mockernut hickory	Tree													2		2	2		2	2		2	2		2	2		2
Cercis canadensis	eastern redbud	Tree							2		2	2		2	2		2				2		2	2		2	3		3
Clethra[3]	sweetpepperbush	Shrub													4		4	2		2	4		4	4		4	4		4
Cornus florida[4]	flowering dogwood	Tree													2		2	2		2	2		2	2		2	2		2
Fraxinus pennsylvanica	green ash	Tree		2	2								2	2															
Hamamelis virginiana[5]	American witchhazel	Tree													2		2				2		2	2		2	2		2
Juglans nigra	black walnut	Tree	5		5	1	2	3				6	2	8	5	10	15	5		5	5	1	6	4	1	5	4		4
Liriodendron tulipifera	tuliptree	Tree	2	20	22	3	18	21	4	5	9	9	43	52	11	26	37	6	27	33	10	25	35	10	20	30	14		14
Nyssa sylvatica	blackgum	Tree	2		2				1		1	3		3															
Pinus strobus	eastern white pine	Tree					1	1					1	1															
Platanus occidentalis	American sycamore	Tree	2		2				2		2	4		4	5		5	3		3	5		5	5		5	5		5
Prunus serotina	black cherry	Tree		1	1	3		3				3	1	4															
Quercus alba	white oak	Tree																			1		1	1		1	1		1
Quercus michauxii	swamp chestnut oak	Tree				1		1				1		1															
Quercus rubra	northern red oak	Tree				3		3				3		3	5		5	6		6	9		9	10		10	10		10
Robinia pseudoacacia	black locust	Tree		6	6								6	6		6	6					2	2						
Salix sericea[6]	silky willow	Tree													4		4	4		4	4		4	4		4	4		4
Sassafras albidum	sassafras	Tree		7	7								7	7								1	1		11	11			
Vaccinium stamineum	deerberry	Shrub													1		1				1		1	1		1	2		2
Viburnum dentatum	southern arrowwood	shrub	3		3	1		1	2		2	6		6															
	Stem count		20	37	57	14	21	35	16	5	21	50	63	113	60	52	112	42	27	69	70	34	104	71	32	103	77	0	77
	size (ares)		1			1			1			3			3			3			3			3			3		
	size (ACRES)		0.02			0.02			0.02			0.07			0.07			0.07			0.07			0.07			0.07		
	Species count		8	6	13	7	3	8	8	1	8	12	8	17	15	4	17	11	1	11	16	6	19	16	3	17	17	0	17
	Stems per ACRE		809	1497	2307	567	850	1416	647	202	850	674	850	1524	809	701	1511	567	364	931	944	459	1403	958	432	1389	1039	0	1039

P = Planted
V = Volunteer
T = Total

Exceeds requirements by 10%
Includes volunteer stems

Notes: Asbuilt data is not in the CVS tool because the tool was not used at the time this project began however, the correct data has been entered into this table for MY0.
Information on volunteer vegetation has not been treated correctly in the CVS tool for past reports, but has been corrected for MY5 and the above information is correct.

1. Determined that these stems were misidentified in previous years: All are now identified as Viburnum dentatum - southern arrowwood.
2. Determined that these stems were misidentified in previous years: All are now identified as Carpinus caroliniana - American hornbeam or Ironwood..
3. Determined that these stems were misidentified in previous years: All are now identified as Nyssa sylvatica - blackgum.
4. Determined that these stems were misidentified in previous years: One is now identified as Calycanthus floridus - eastern sweetshrub and one is identified as Viburnum dentatum - southern arrowwood.
5. Determined that these stems were misidentified in previous years: All are now identified as Viburnum dentatum - southern arrowwood.
6. Determined that these stems were misidentified in previous years: All are now identified as Prunus serotina - black cherry.

APPENDIX D
MORPHOLOGICAL SUMMARY DATA

EXHIBIT 3-CROSS-SECTIONS (WITH ANNUAL OVERLAYS)

EXHIBIT 4- LONGITUDINAL PROFILES (WITH ANNUAL OVERLAYS)

EXHIBIT 5 - RIFFLE PEBBLE COUNT SIZE CLASS DISTRIBUTIONS

TABLE 8- CROSS-SECTION MORPHOLOGY DATA TABLE

TABLE 9- STREAM REACH MORPHOLOGY DATA TABLE

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool	B3a	3.6	5.03	0.71	0.82	7.1	1	5.1	2373	2371.46

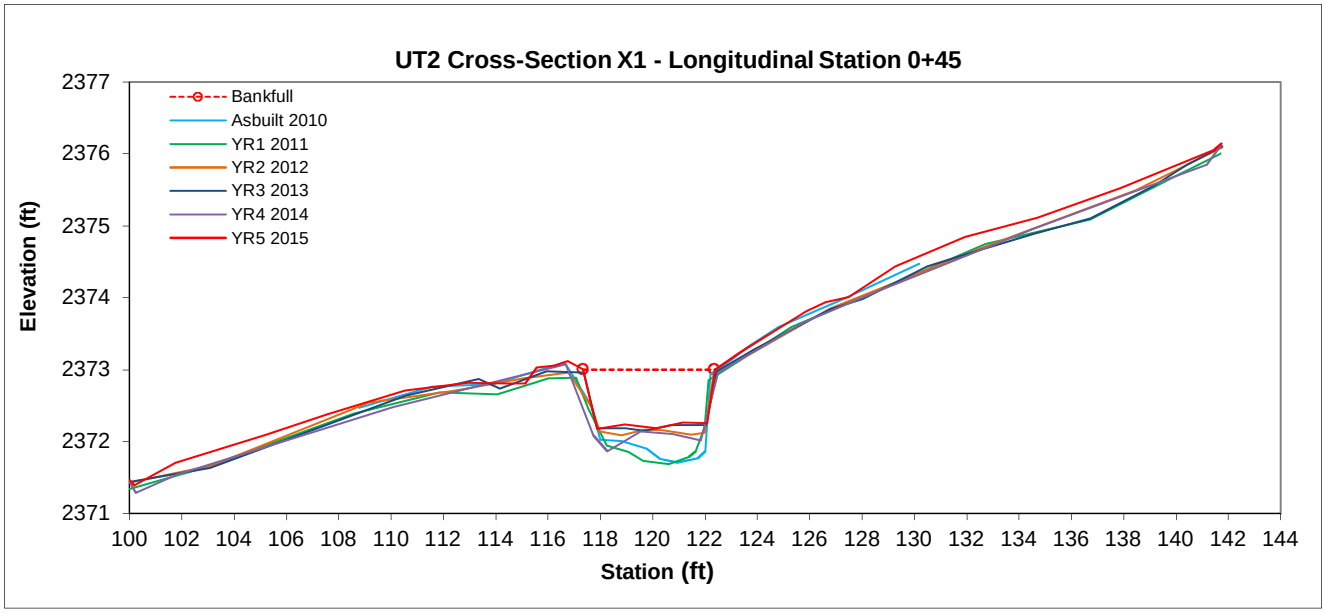


Photo 1: XS-1 facing right bank

Photo 2: XS-1 facing left bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B2a	2.5	7.03	0.35	0.59	19.91	1.2	4.9	2346.87	2346.11

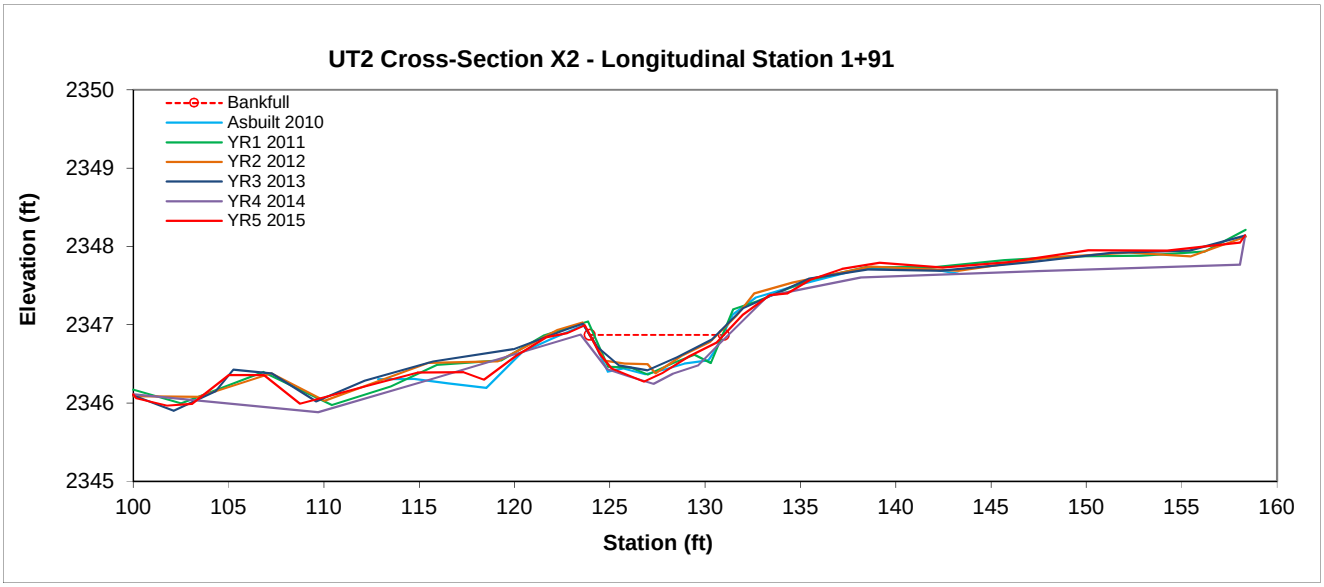


Photo 1: XS-2 facing right bank

Photo 2: XS-2 facing left bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B3a	2.1	7.07	0.3	0.48	23.63	1	3.7	2313.86	2313.88

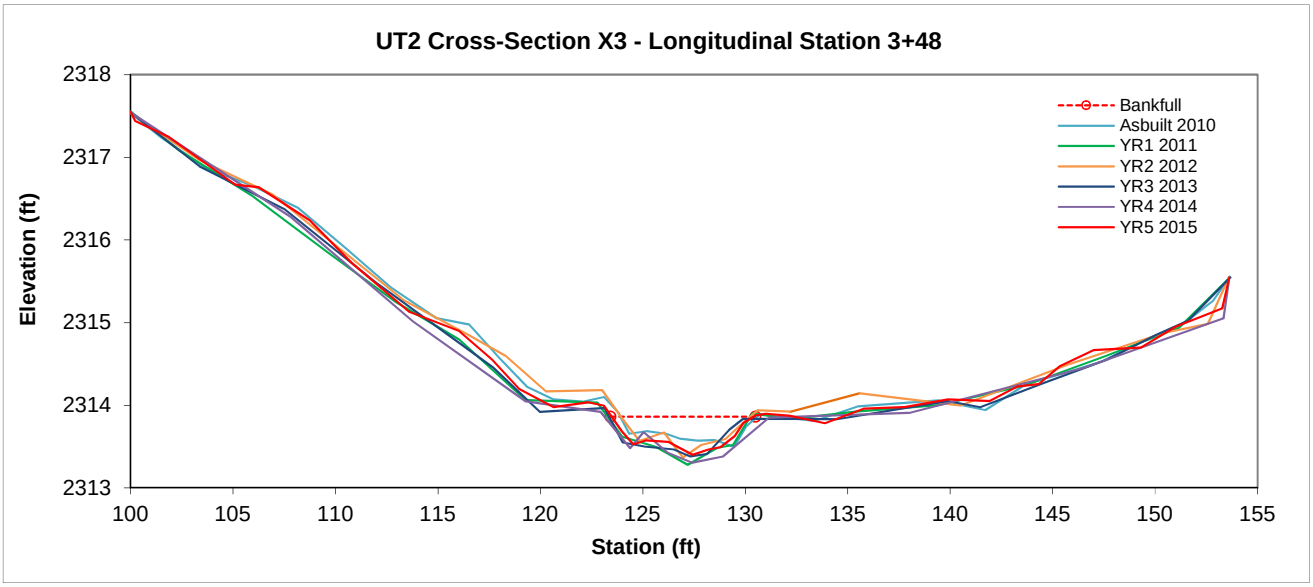


Photo 1: XS-3 facing right bank

Photo 2: XS-3 facing left bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B3a	3.3	8.65	0.38	0.59	23	1	3.8	2285.55	2284.65

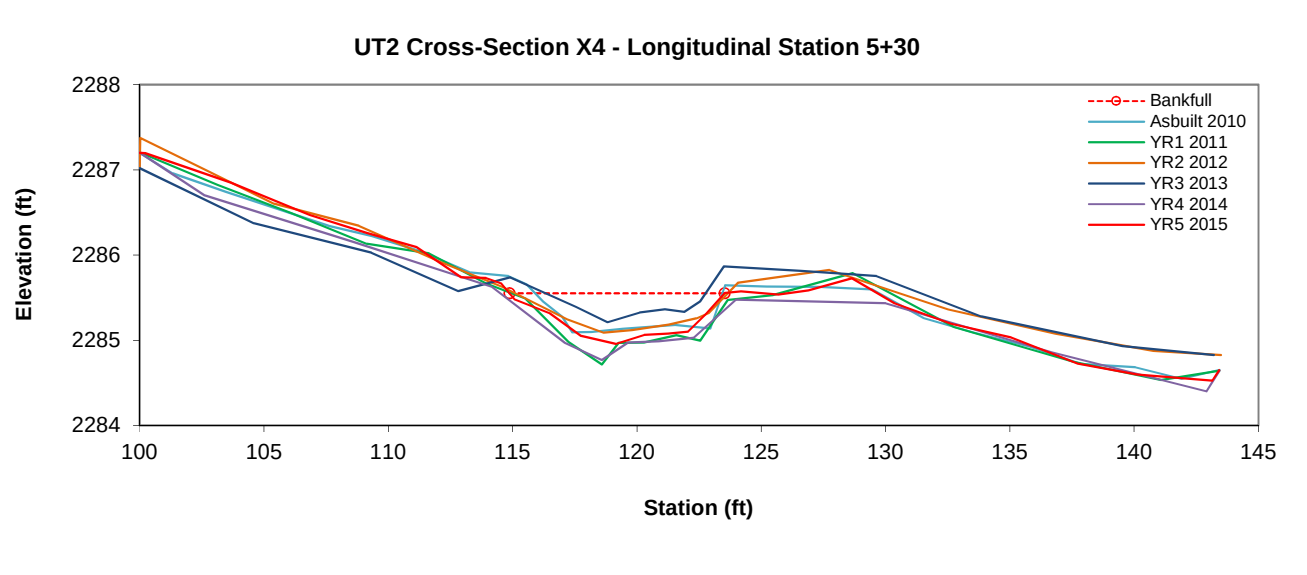


Photo 1: XS-4 facing right bank

Photo 2: XS-4 facing left bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B4a	7.8	7.32	1.06	1.74	6.9	1.9	1.7	2358.62	2360.21

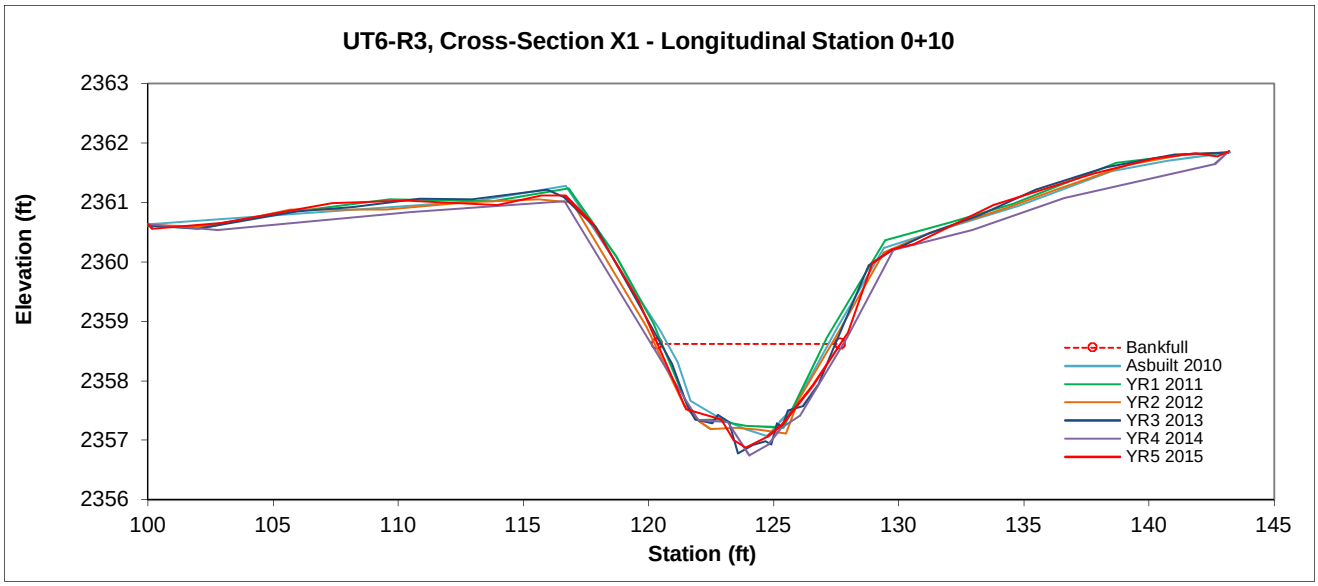


Photo 1: XS-1 facing right bank

Photo 2: XS-1 facing left bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Pool		10.5	7.91	1.32	1.79	5.98	2.9	1.6	2325.39	2328.87

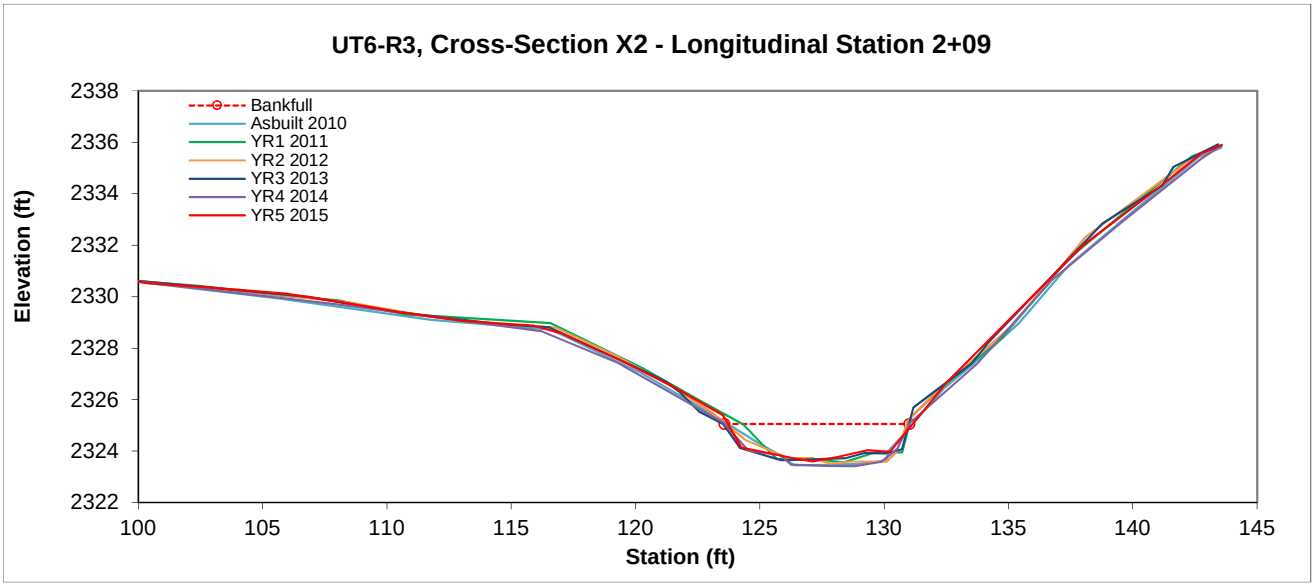


Photo 1: XS-2 facing right bank

Photo 2: XS-2 facing left bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B4a	9.1	9.29	0.98	1.56	9.47	2.3	1.6	2319.51	2321.48

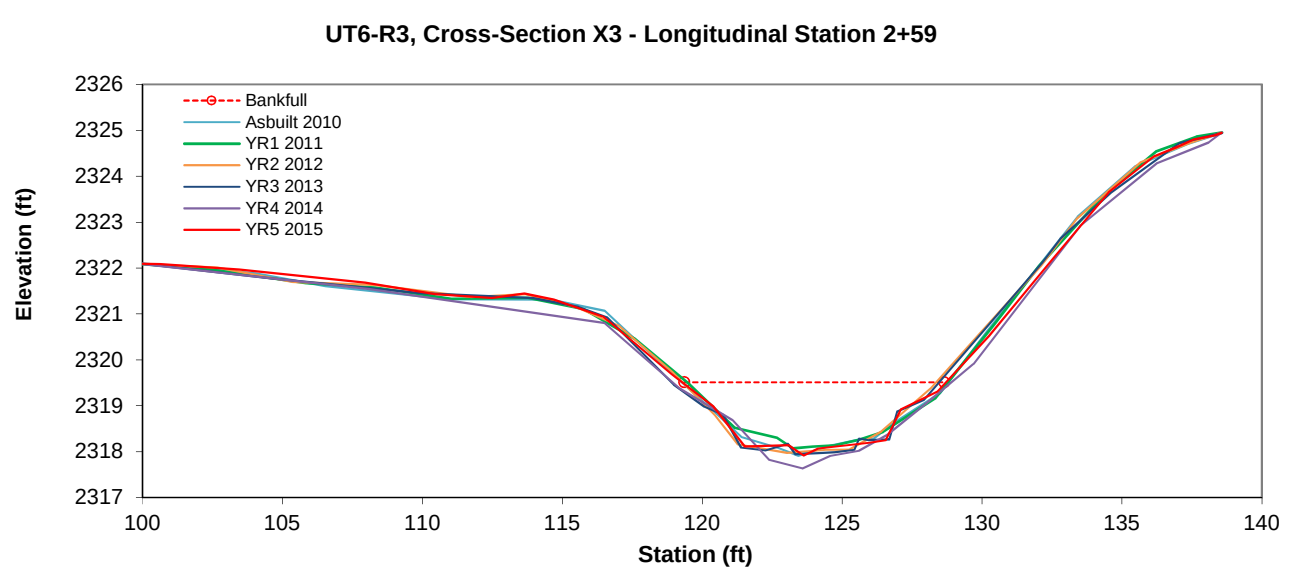


Photo 1: XS-3 facing right bank

Photo 2: XS-3 facing left bank

Feature	Stream Type	BKF Area	BKF Width	BKF Depth	Max BKF Depth	W/D	BH Ratio	ER	BKF Elev	TOB Elev
Riffle	B4a	9.3	9.44	0.99	1.32	9.55	2	3	2307.09	2308.35

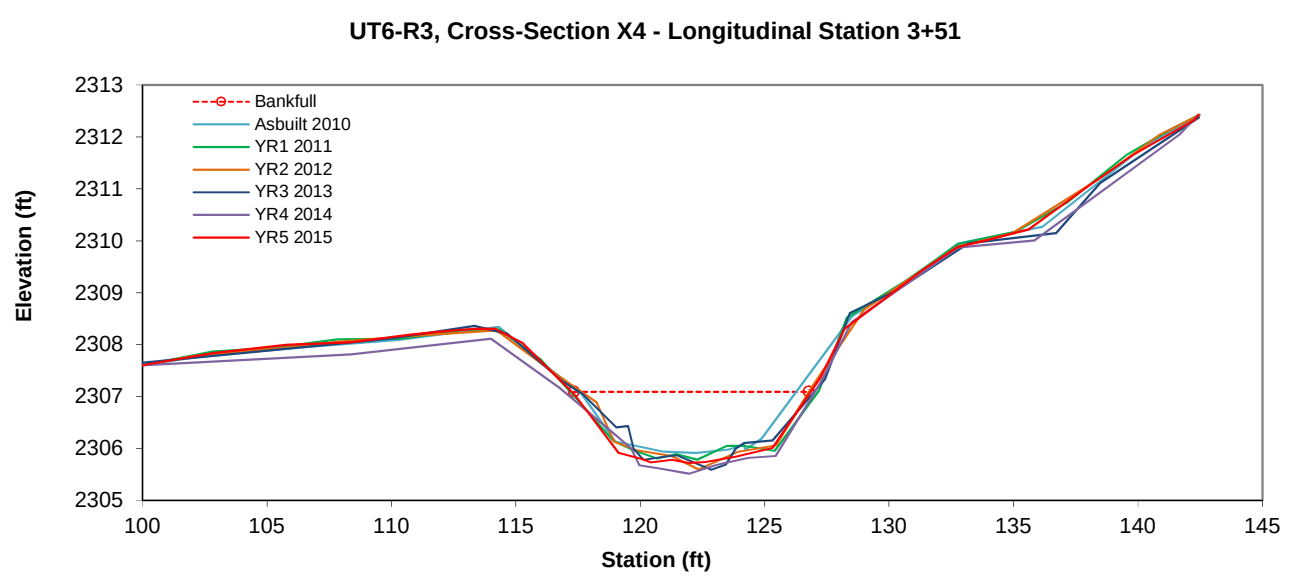
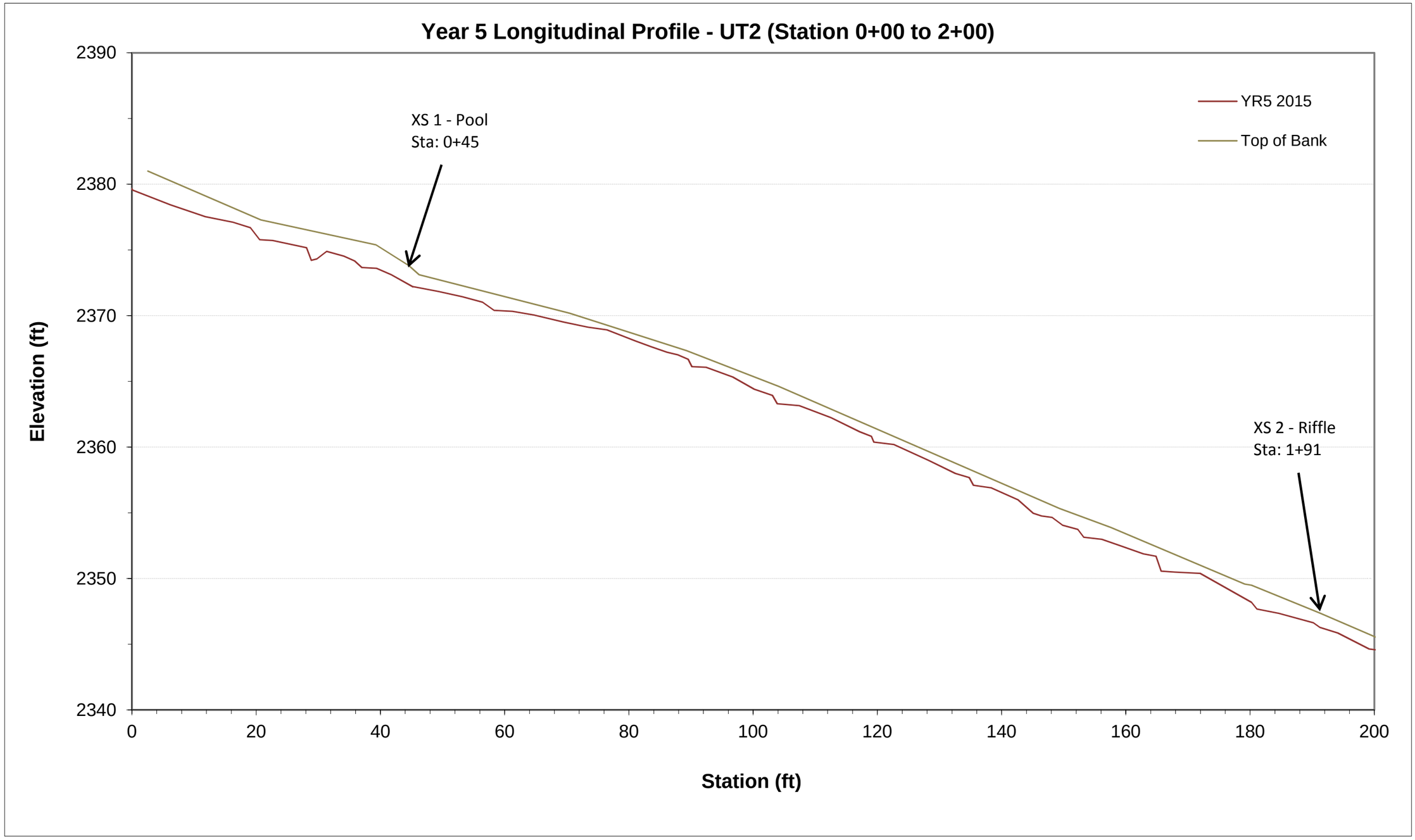
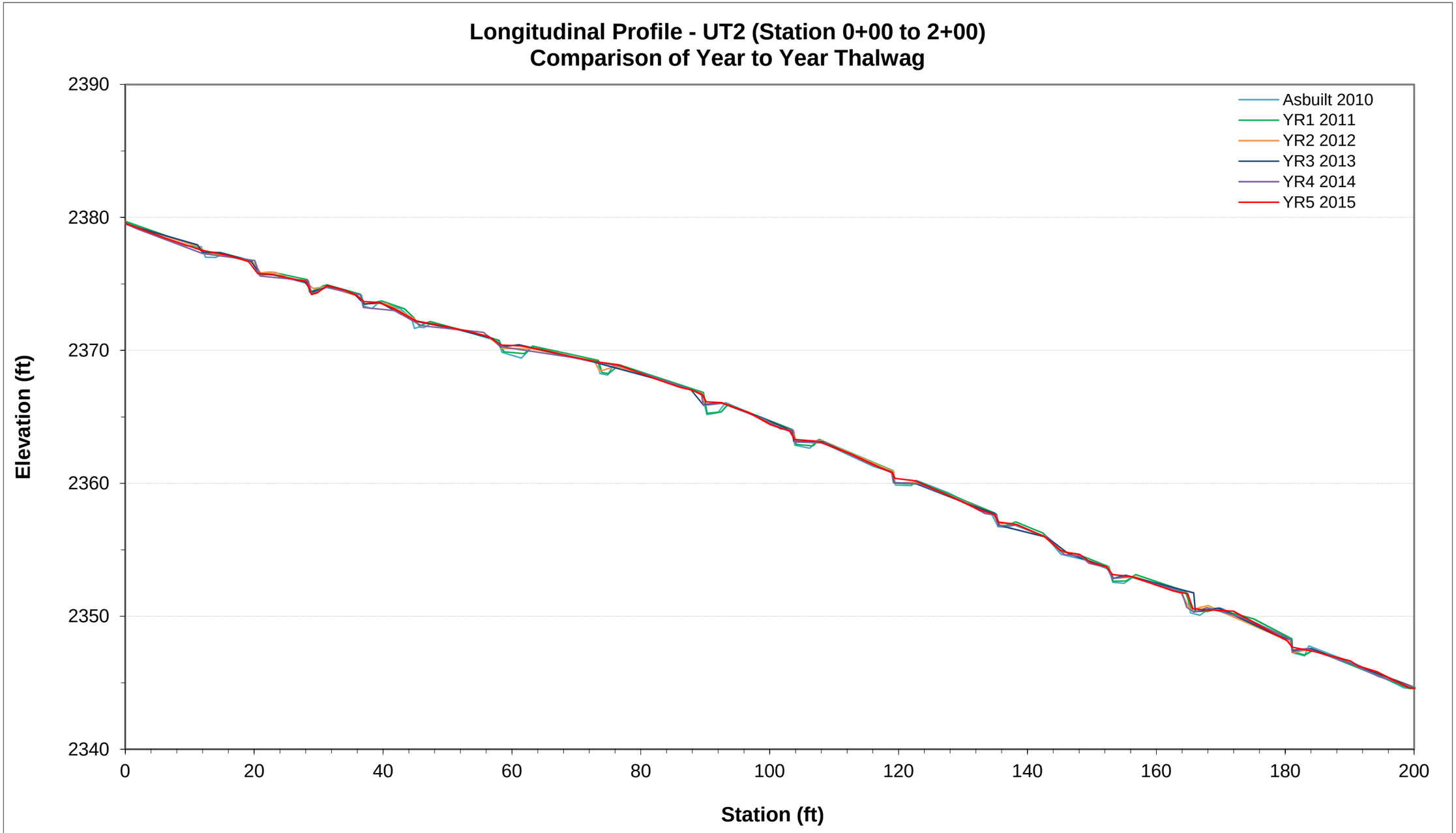


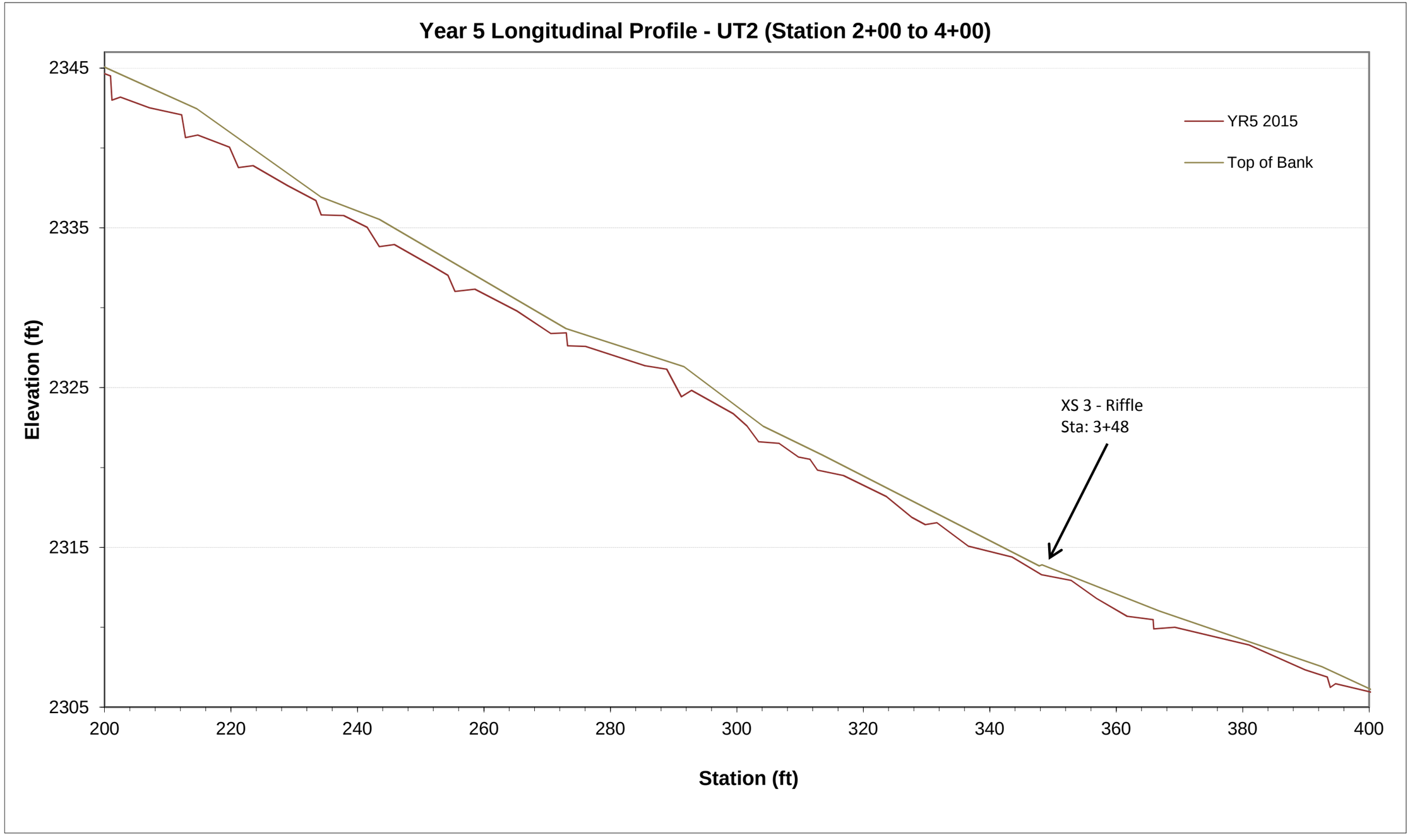
Photo 1: XS-4 facing right bank

Photo 2: XS-4 facing left bank

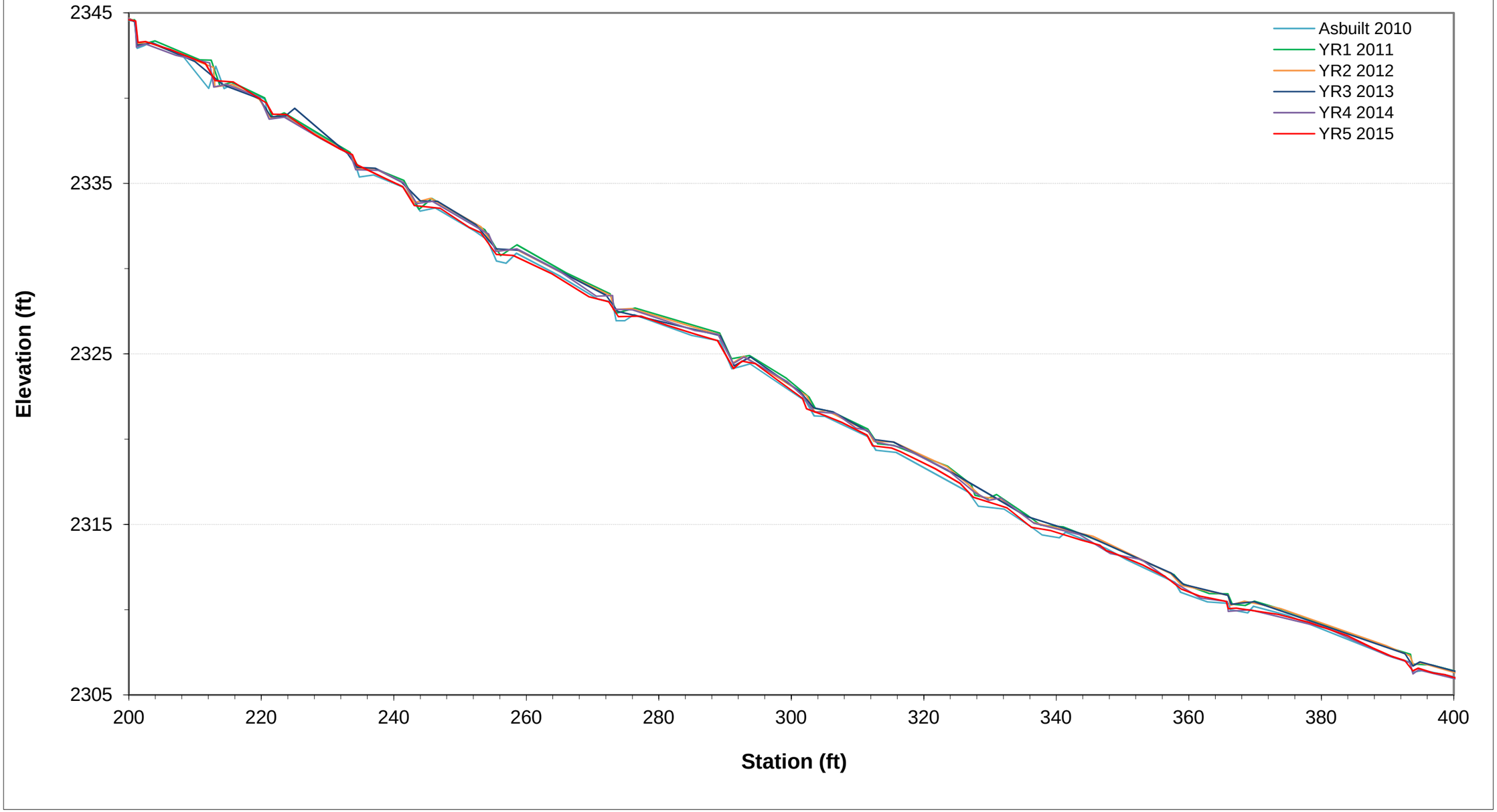

Year 5 Longitudinal Profile - UT2 (Station 0+00 to 2+00)
Elevation (ft)
2390
2380
2370
2360
2350
2340
0
20
40
60
80
100
120
140
160
180
200
Station (ft)
YR5 2015
Top of Bank
XS 1 - Pool
Sta: 0+45
XS 2 - Riffle
Sta: 1+91

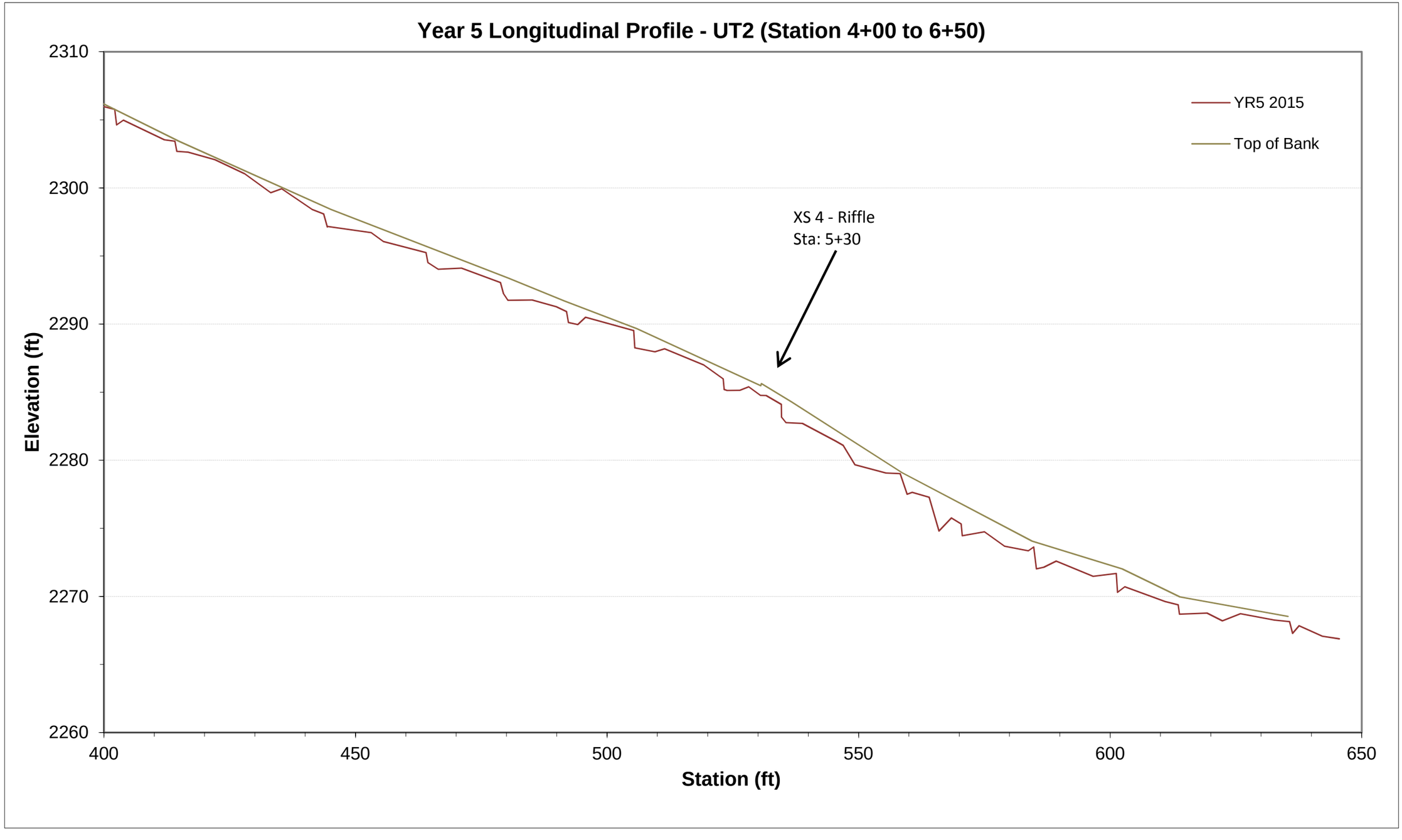
Longitudinal Profile - UT2 (Station 0+00 to 2+00)
Comparison of Year to Year Thalwag



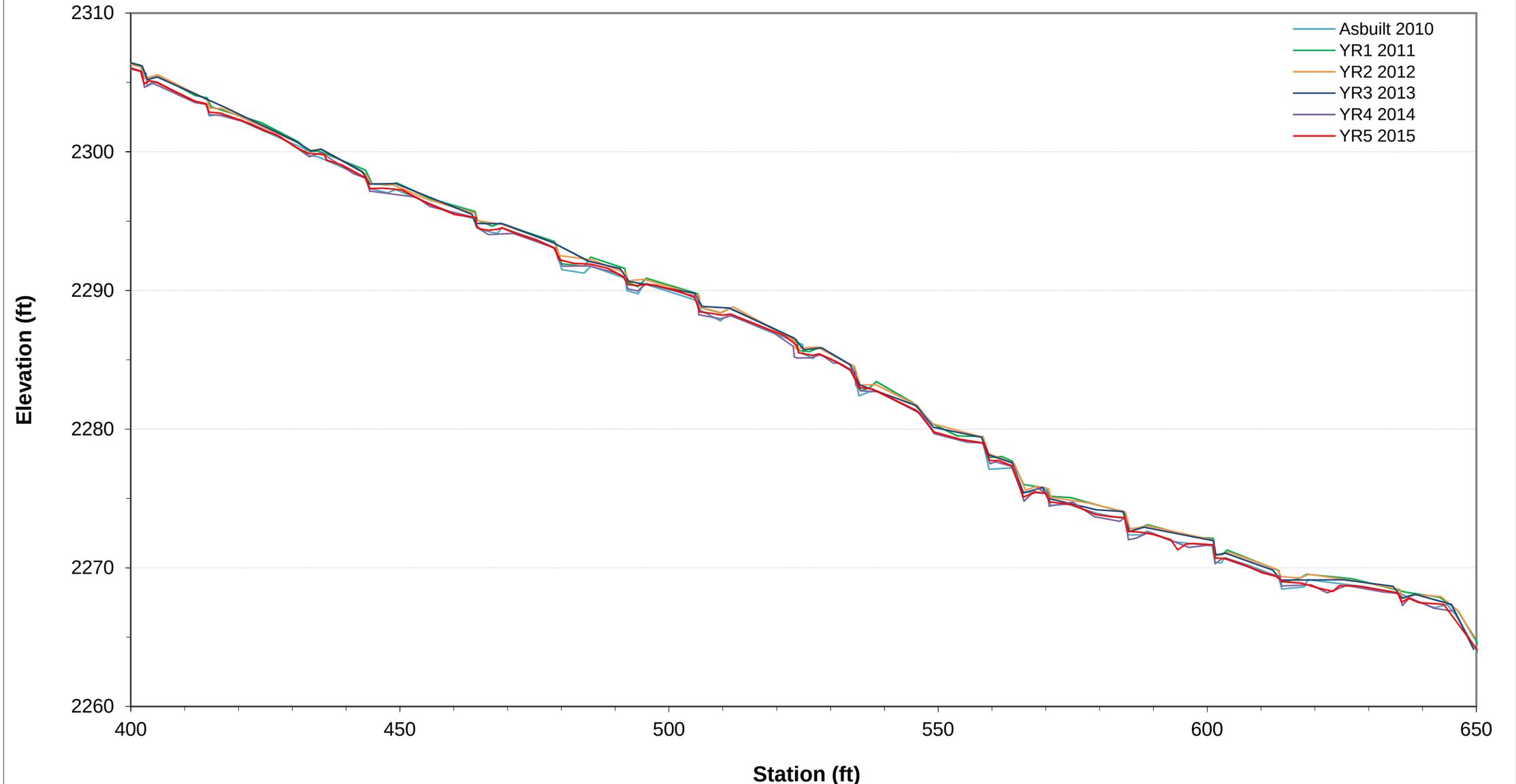

Year 5 Longitudinal Profile - UT2 (Station 2+00 to 4+00)
Elevation (ft)
2345
2335
2325
2315
2305
200
220
240
260
280
300
320
340
360
380
400
Station (ft)
YR5 2015
Top of Bank
XS 3 - Riffle
Sta: 3+48

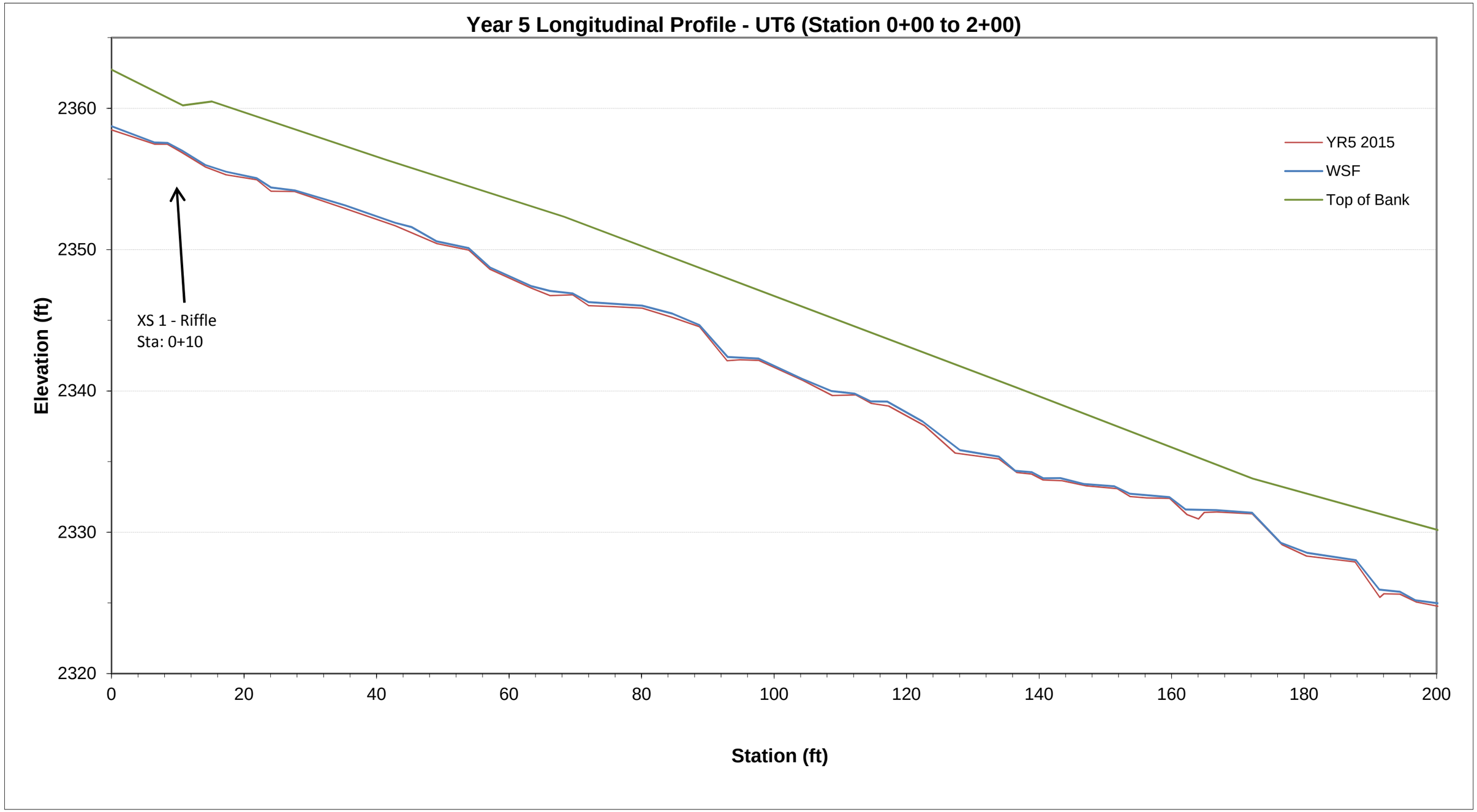
Longitudinal Profile - UT2 (Station 2+00 to 4+00)
Comparison of Year to Year Thalwag



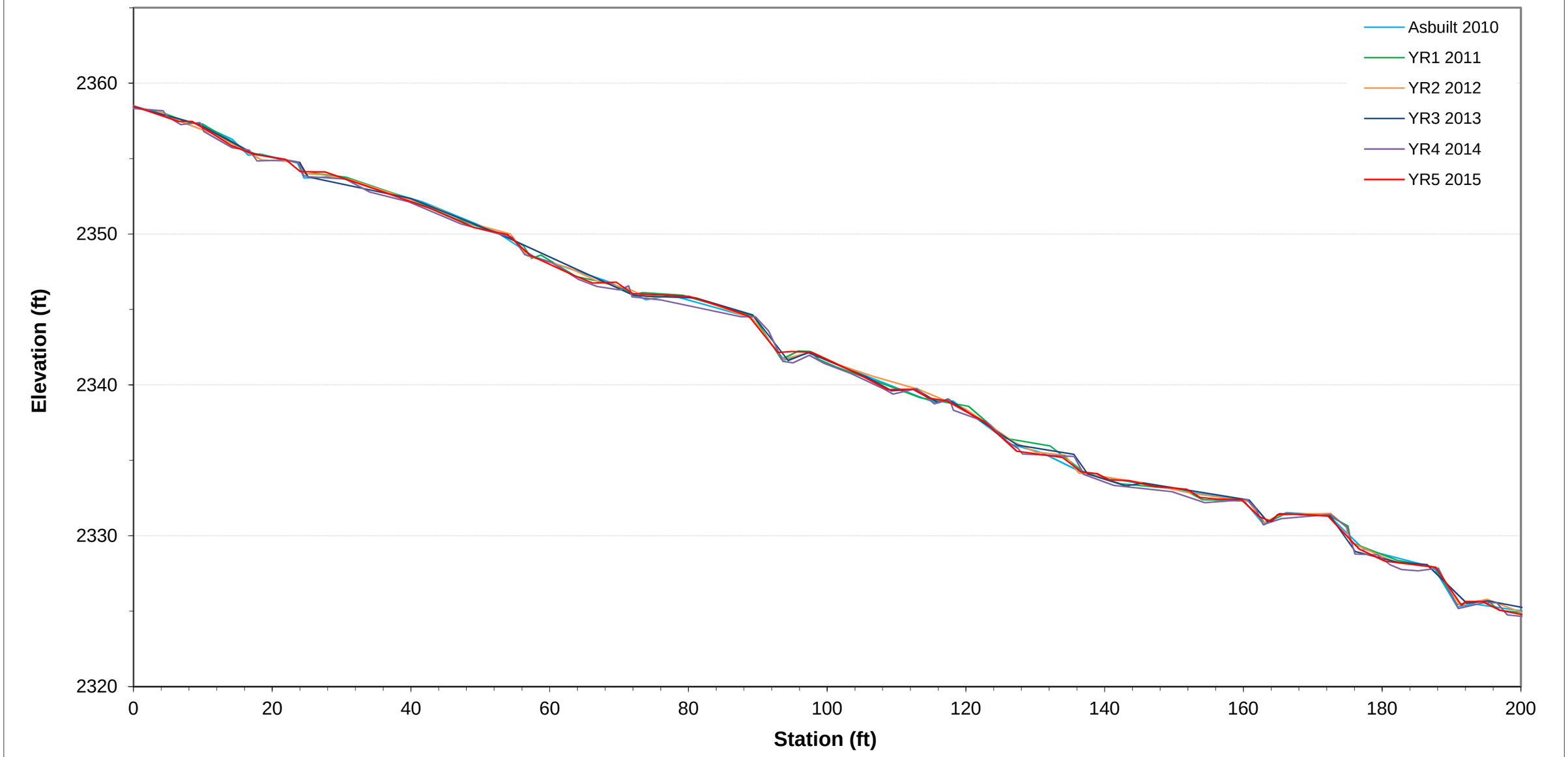

Year 5 Longitudinal Profile - UT2 (Station 4+00 to 6+50)
2310
2300
2290
2280
2270
2260
Elevation (ft)
400
450
500
550
600
650
Station (ft)
YR5 2015
Top of Bank
XS 4 - Riffle
Sta: 5+30

Longitudinal Profile - UT2 (Station 4+00 to 6+50)
Comparison of Year to Year Thalwag

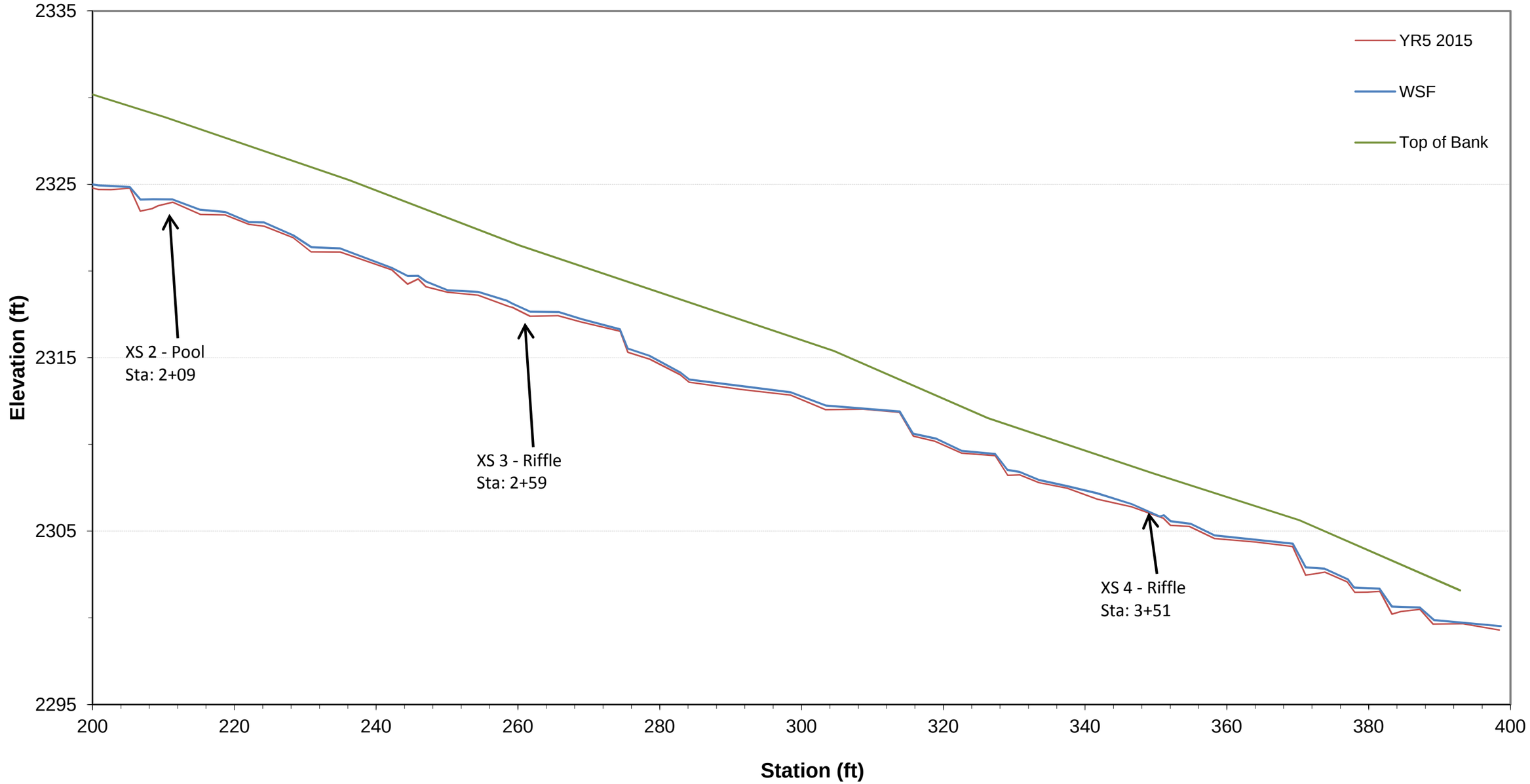



Year 5 Longitudinal Profile - UT6 (Station 0+00 to 2+00)
Elevation (ft)
2360
2350
2340
2330
2320
0
20
40
60
80
100
120
140
160
180
200
Station (ft)
YR5 2015
WSF
Top of Bank
XS 1 - Riffle
Sta: 0+10

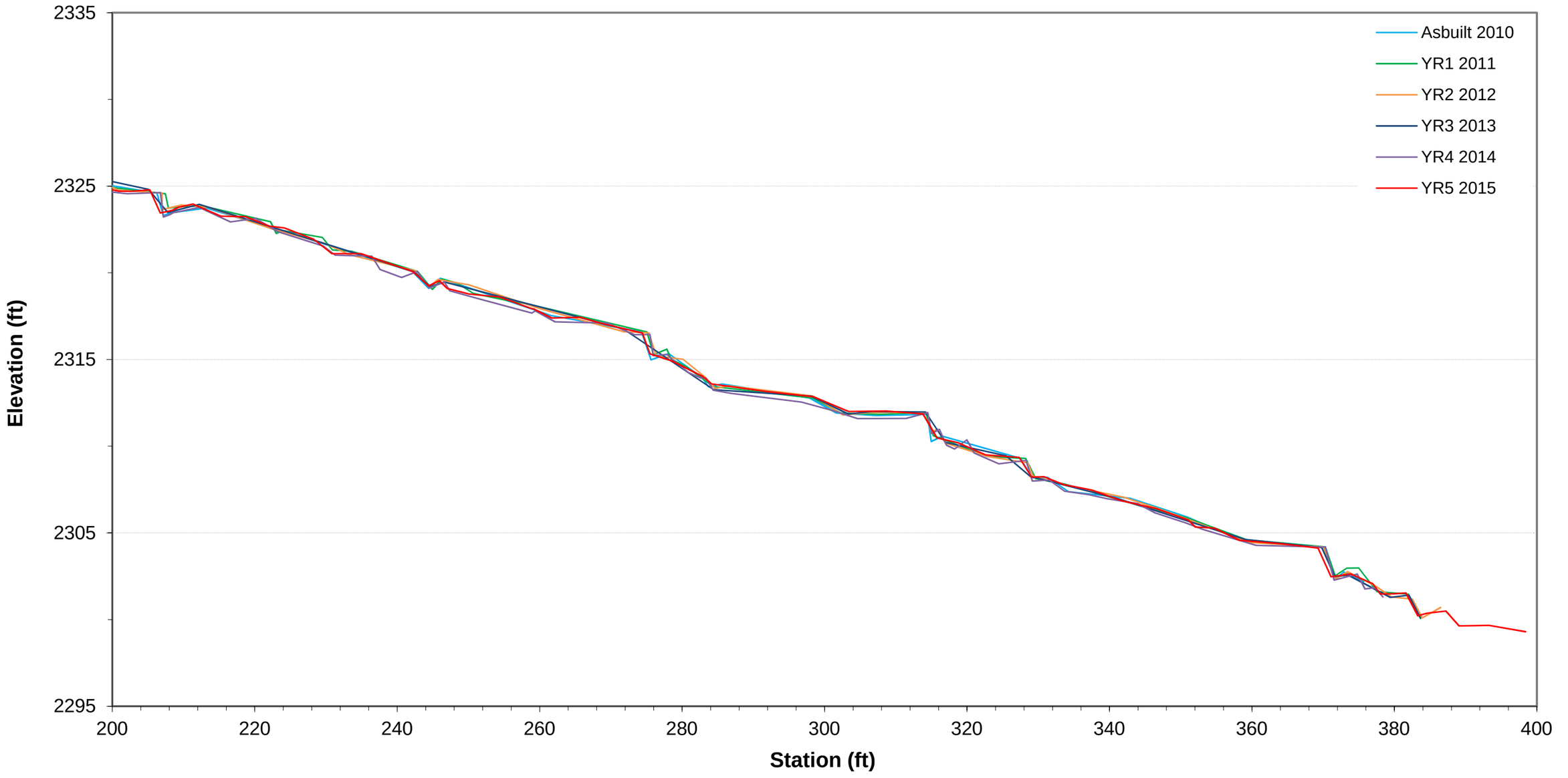
Longitudinal Profile - UT6 (Station 0+00 to 2+00)
Comparison of Year to Year Thalwag



Year 5 Longitudinal Profile - UT6 (Station 2+00 to 4+00)



Longitudinal Profile - UT6 (Station 2+00 to 4+00)
Comparison of Year to Year Thalwag

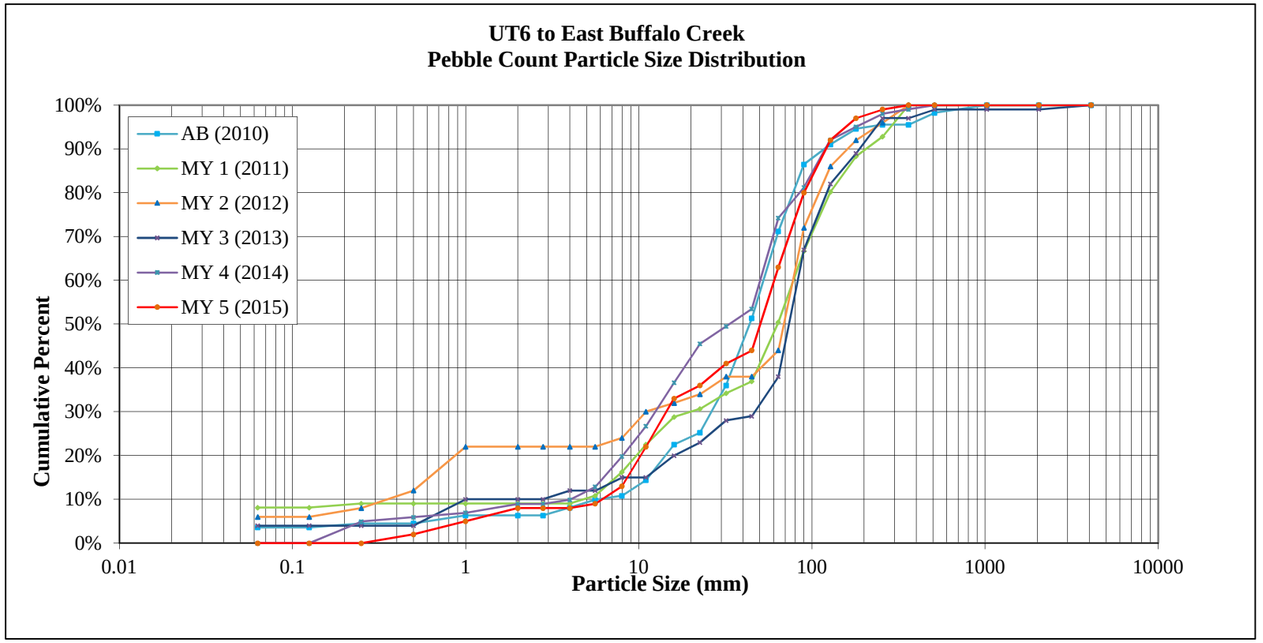


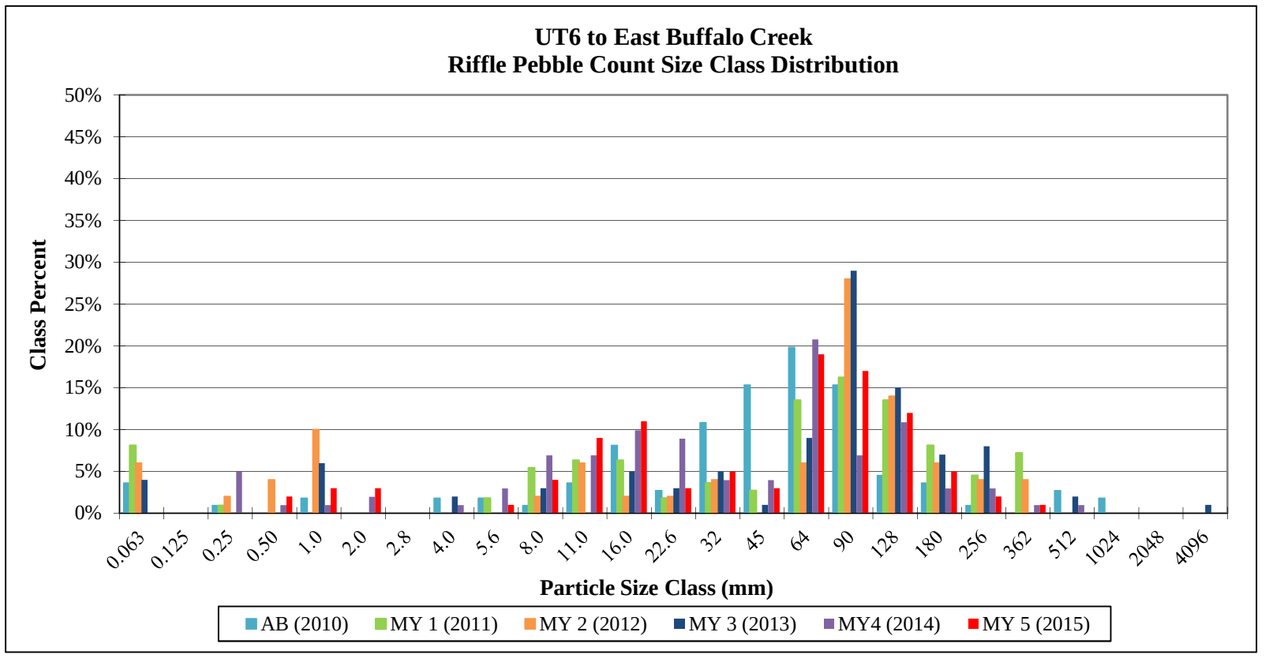
Cross-Section Pebble Count (East Buffalo Creek-UT6)
East Buffalo Creek Mitigation Project, EEP# 92763

SITE OR PROJECT:	East Buffalo Creek
REACH/LOCATION:	UT6 near 1st PPT downstream
FEATURE:	Riffle

				2014		
SIZE (mm)	MATERIAL	PARTICLE	SIZE (mm)	Total	Class %	% Cum
0.063	Silt/Clay	Silt / Clay	< .063			0%
0.125	Sand	Very Fine	.063 - .125			0%
0.25		Fine	.125 - .25			0%
0.50		Medium	.25 - .50	2	2%	2%
1.0		Coarse	.50 - 1.0	3	3%	5%
2.0		Very Coarse	1.0 - 2.0	3	3%	8%
2.8	Gravel	Very Fine	2.0 - 2.8	0	0%	8%
4.0		Very Fine	2.8 - 4.0	0	0%	8%
5.6		Fine	4.0 - 5.6	1	1%	9%
8.0		Fine	5.6 - 8.0	4	4%	13%
11.0		Medium	8.0 - 11.0	9	9%	22%
16.0		Medium	11.0 - 16.0	11	11%	33%
22.6		Coarse	16 - 22.6	3	3%	36%
32		Coarse	22.6 - 32	5	5%	41%
45		Very Coarse	32 - 45	3	3%	44%
64		Very Coarse	45 - 64	19	19%	63%
90	Cobble	Small	64 - 90	17	17%	80%
128		Small	90 - 128	12	12%	92%
180		Large	128 - 180	5	5%	97%
256		Large	180 - 256	2	2%	99%
362	Boulder	Small	256 - 362	1	1%	100%
512		Small	362 - 512			100%
1024		Medium	512 - 1024			100%
2048		rge-Very Lar	1024 - 2048			100%
4096	Bedrock	Bedrock	> 2048			100%
	Total % of whole count			100	100%	100%

Summary Data			
Channel materials			
D16 =	8.9	D84 =	101.21
D35 =	20.14	D95 =	157.05
D50 =	50.29	D100 =	256-362





LEGEND

- CE — CE — CONSERVATION EASEMENT
- DESIGNED CENTERLINE
- DESIGNED STREAM BANK
- FENCE
- CROSS SECTION
- PHOTO POINT

PROJECT CONDITION

- VEG PLOT CRITERIA MET
- VEG PLOT CRITERIA UNMET (NO PLOTS CURRENTLY MEETING THIS CRITERIA)
- STREAM PROBLEM AREAS
- VEGETATION PROBLEM AREA (VPA) (INVASIVE SPECIES PRESENT)

IMAGE SOURCE: NC STATEWIDE ORTHOIMAGERY, 2010

EAST BUFFALO–UT2
CURRENT CONDITION
PLAN VIEW
YEAR 5 MONITORING

Michael Baker Engineering Inc.
NC Engineering License F-1084
797 Haywood Road, Suite 201
Asheville, North Carolina 28806
Phone: 828.350.1408
Fax: 828.350.1409

EAST BUFFALO CREEK MITIGATION PROJECT
GRAHAM COUNTY, NORTH CAROLINA

CURRENT CONDITION PLAN VIEW

Ecosystem Enhancement Program

Prepared for:
Division of Mitigation Services
217 West Jones St, Suite 3000A
Raleigh, NC 27603
Phone: 919-707-8976
Fax: 828-232-4420

DMS Project No.	92763
Baker Project No.	113102
Date:	12/22/15
DESIGNED:	SEG
DRAWN:	MDR
APPROVED:	MMC
Monitoring Year:	5 of 5

LEGEND

- CE — CE — CONSERVATION EASEMENT
- DESIGNED CENTERLINE
- DESIGNED STREAM BANK
- FENCE
- CROSS SECTION
- PHOTO POINT

PROJECT CONDITION

- VEG PLOT CRITERIA MET
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- STREAM PROBLEM AREAS
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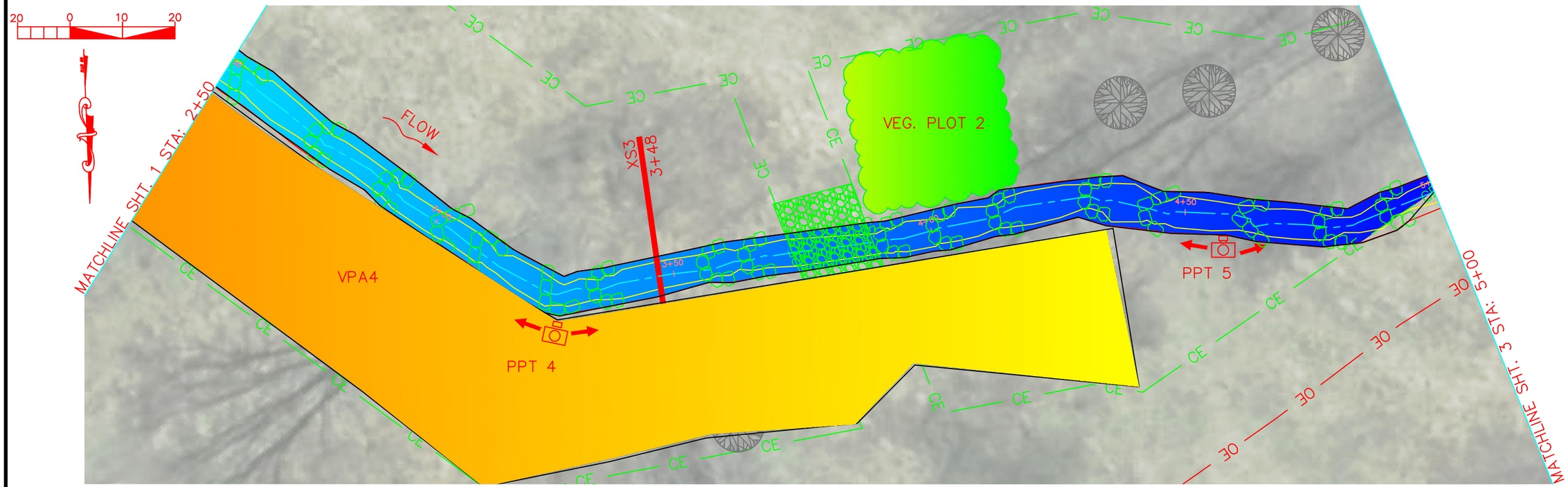

IMAGE SOURCE: NC STATEWIDE ORTHOIMAGERY, 2010

EAST BUFFALO–UT2
CURRENT CONDITION
PLAN VIEW
YEAR 5 MONITORING

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EAST BUFFALO CREEK MITIGATION PROJECT
GRAHAM COUNTY, NORTH CAROLINA
CURRENT CONDITION PLAN VIEW

Ecosystem Enhancement Program

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217 West Jones St, Suite 3000A
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Fax: 828-232-4420

DMS Project No. 92763
Baker Project No. 113102
Date: 12/22/15
DESIGNED: SEG
DRAWN: MDR
APPROVED: MMC
Monitoring Year: 5 of 5

LEGEND

- CE — CE — CONSERVATION EASEMENT
- DESIGNED CENTERLINE
- DESIGNED STREAM BANK
- FENCE
- CROSS SECTION
- PHOTO POINT

PROJECT CONDITION

- VEG PLOT CRITERIA MET
- VEG PLOT CRITERIA UNMET (NO PLOTS CURRENTLY MEETING THIS CRITERIA)
- STREAM PROBLEM AREAS

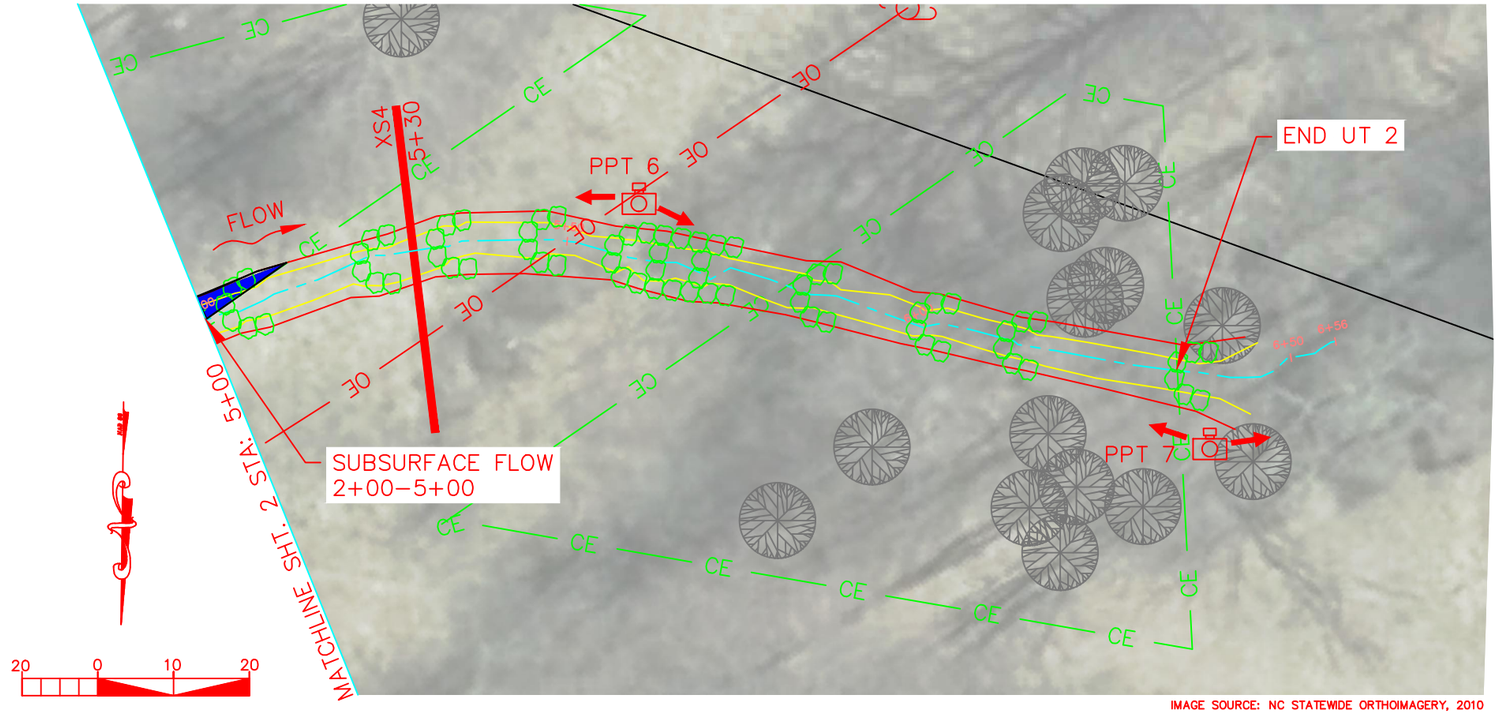

IMAGE SOURCE: NC STATEWIDE ORTHOIMAGERY, 2010

EAST BUFFALO–UT2
CURRENT CONDITION
PLAN VIEW
YEAR 5 MONITORING

Michael Baker Engineering Inc.
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Asheville, North Carolina 28806
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EAST BUFFALO CREEK MITIGATION PROJECT
GRAHAM COUNTY, NORTH CAROLINA

CURRENT CONDITION PLAN VIEW

Ecosystem Enhancement Program

Prepared for:
Division of Mitigation Services
217 West Jones St, Suite 3000A
Raleigh, NC 27603
Phone: 919-707-8976
Fax: 828-232-4420

DMS Project No. 92763
Baker Project No. 113102
Date: 12/22/15

DESIGNED:	SEG
DRAWN:	MDR
APPROVED:	MMC

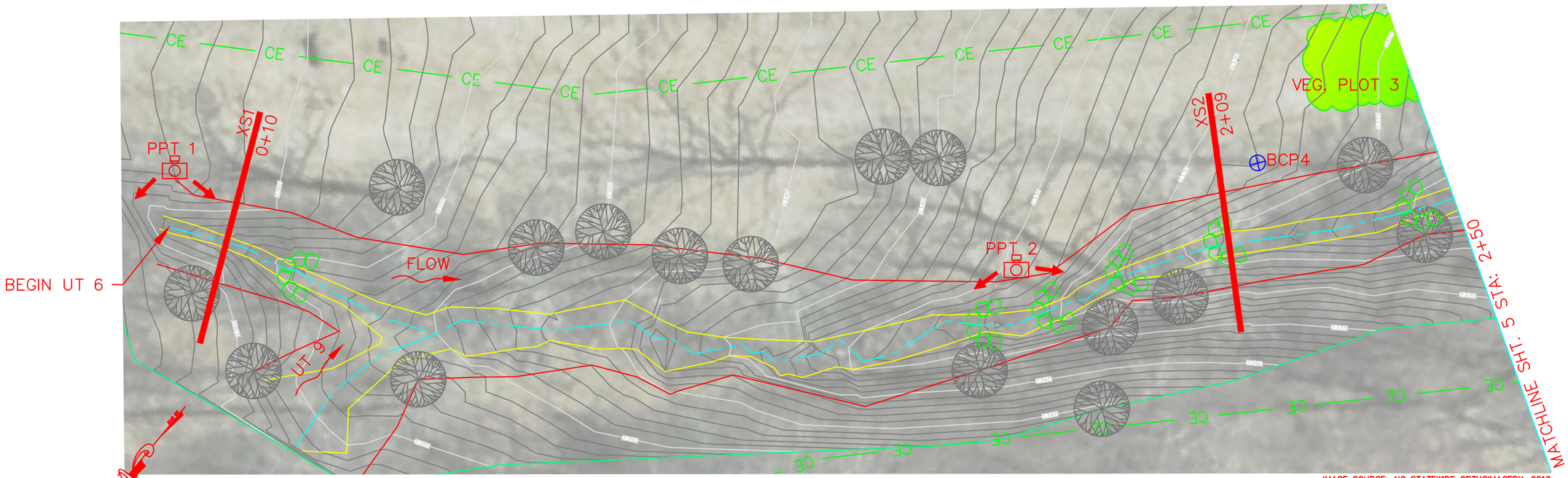
Monitoring Year: 5 of 5

LEGEND

- CONSERVATION EASEMENT (CE)
- DESIGNED CENTERLINE
- DESIGNED STREAM BANK
- FENCE
- CROSS SECTION
- PHOTO POINT

PROJECT CONDITION

- VEG PLOT CRITERIA MET
- VEG PLOT CRITERIA UNMET (NO PLOTS CURRENTLY MEETING THIS CRITERIA)
- STREAM PROBLEM AREAS



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EAST BUFFALO–UT6
CURRENT CONDITION
PLAN VIEW
YEAR 5 MONITORING

Michael Baker Engineering Inc.
NC Engineering License F-1084
797 Haywood Road, Suite 201
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Fax: 828.350.1409

EAST BUFFALO CREEK MITIGATION PROJECT
GRAHAM COUNTY, NORTH CAROLINA

CURRENT CONDITION PLAN VIEW

Ecosystem Enhancement

Prepared for:
Division of Mitigation Services
217 West Jones St, Suite 3000A
Raleigh, NC 27603
Phone 919-707-8976
Fax: 828-232-4420

DMS Project No.
92763

Baker Project No.
113102

Date:
12/22/15

DESIGNED: SEG
DRAWN: MDR
APPROVED: MMC

Monitoring Year:
5 of 5

LEGEND

- CONSERVATION EASEMENT (CE — CE)
- DESIGNED CENTERLINE
- DESIGNED STREAM BANK
- FENCE
- CROSS SECTION
- PHOTO POINT

PROJECT CONDITION

- VEG PLOT CRITERIA MET
- VEG PLOT CRITERIA UNMET (NO PLOTS CURRENTLY MEETING THIS CRITERIA)
- STREAM PROBLEM AREAS

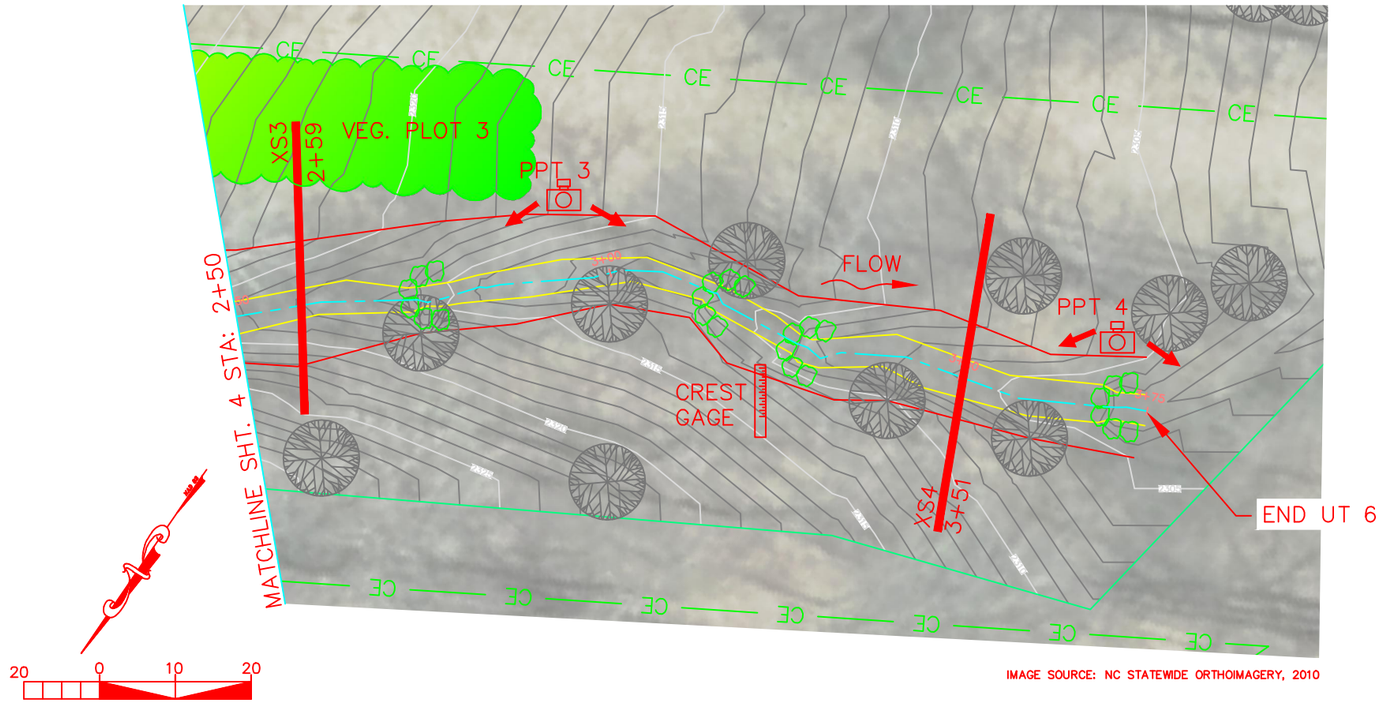

IMAGE SOURCE: NC STATEWIDE ORTHOIMAGERY, 2010

EAST BUFFALO–UT6
CURRENT CONDITION
PLAN VIEW
YEAR 5 MONITORING

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EAST BUFFALO CREEK MITIGATION PROJECT
GRAHAM COUNTY, NORTH CAROLINA

CURRENT CONDITION PLAN VIEW

Ecosystem Enhancement Program

Prepared for:
Division of Mitigation Services
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Fax: 828-232-4420

DMS Project No.	92763
Baker Project No.	113102
Date:	12/22/15
DESIGNED:	SEG
DRAWN:	MDR
APPROVED:	MMC
Monitoring Year:	5 of 5

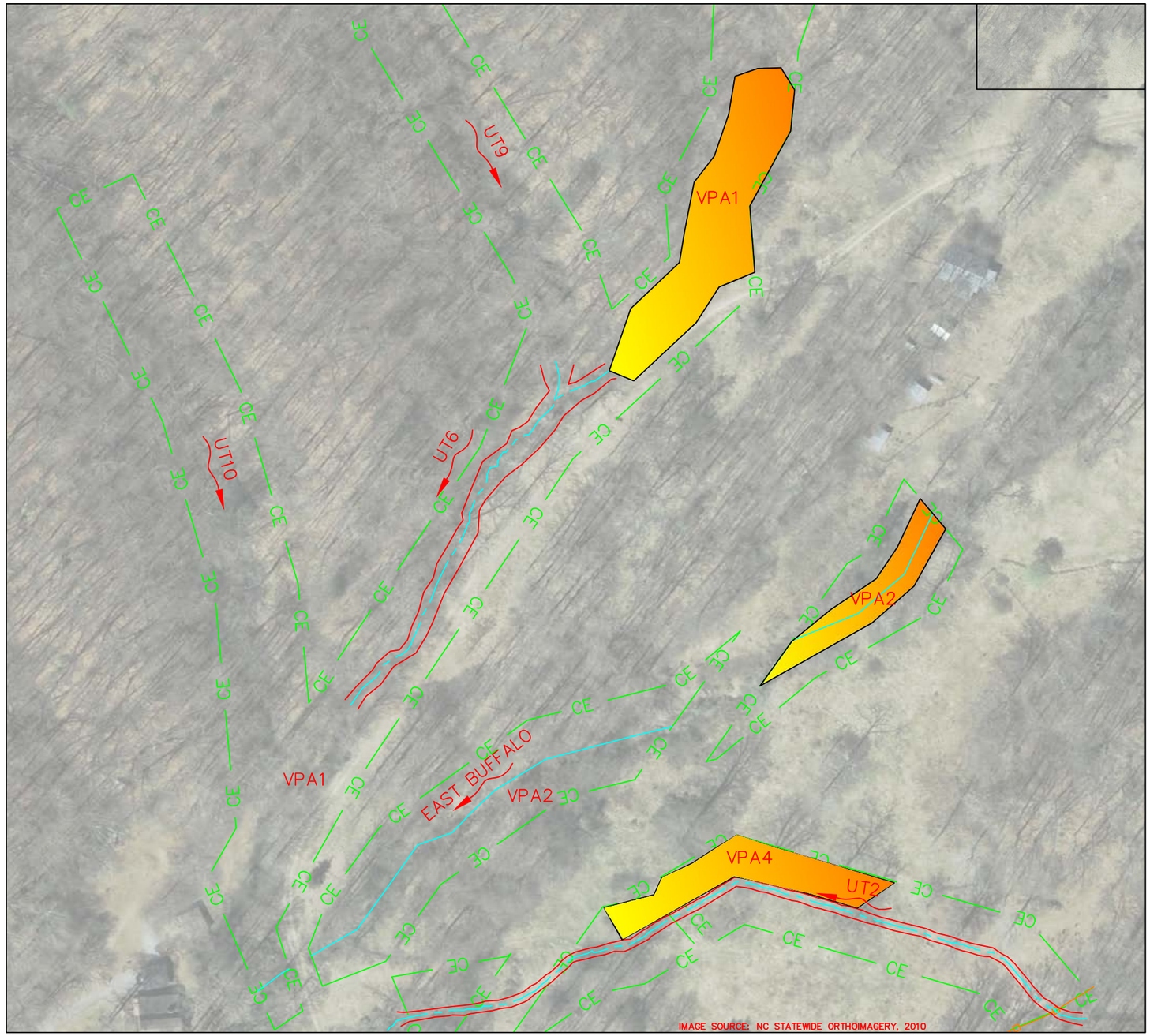
CROSS SECTION

LEGEND

- CE — CE — CONSERVATION EASEMENT
- DESIGNED CENTERLINE
- DESIGNED STREAM BANK
- FENCE

PROJECT CONDITION

VEGETATION PROBLEM AREA (VPA)
(INVASIVE SPECIES PRESENT)



EAST BUFFALO
CURRENT CONDITION
PLAN VIEW
YEAR 5 MONITORING

50 0 50 100

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EAST BUFFALO CREEK MITIGATION PROJECT
GRAHAM COUNTY, NORTH CAROLINA

CURRENT CONDITION PLAN VIEW

Ecosystem Enhancement Program

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DMS Project No.	92763
Baker Project No.	113102
Date:	12/22/15
DESIGNED:	SEG
DRAWN:	MDR
APPROVED:	MMC
Monitoring Year:	5 of 5

LEGEND

- CE — CE — CONSERVATION EASEMENT
- DESIGNED CENTERLINE
- DESIGNED STREAM BANK
- FENCE

PROJECT CONDITION

- VEGETATION PROBLEM AREA (VPA) (INVASIVE SPECIES PRESENT)

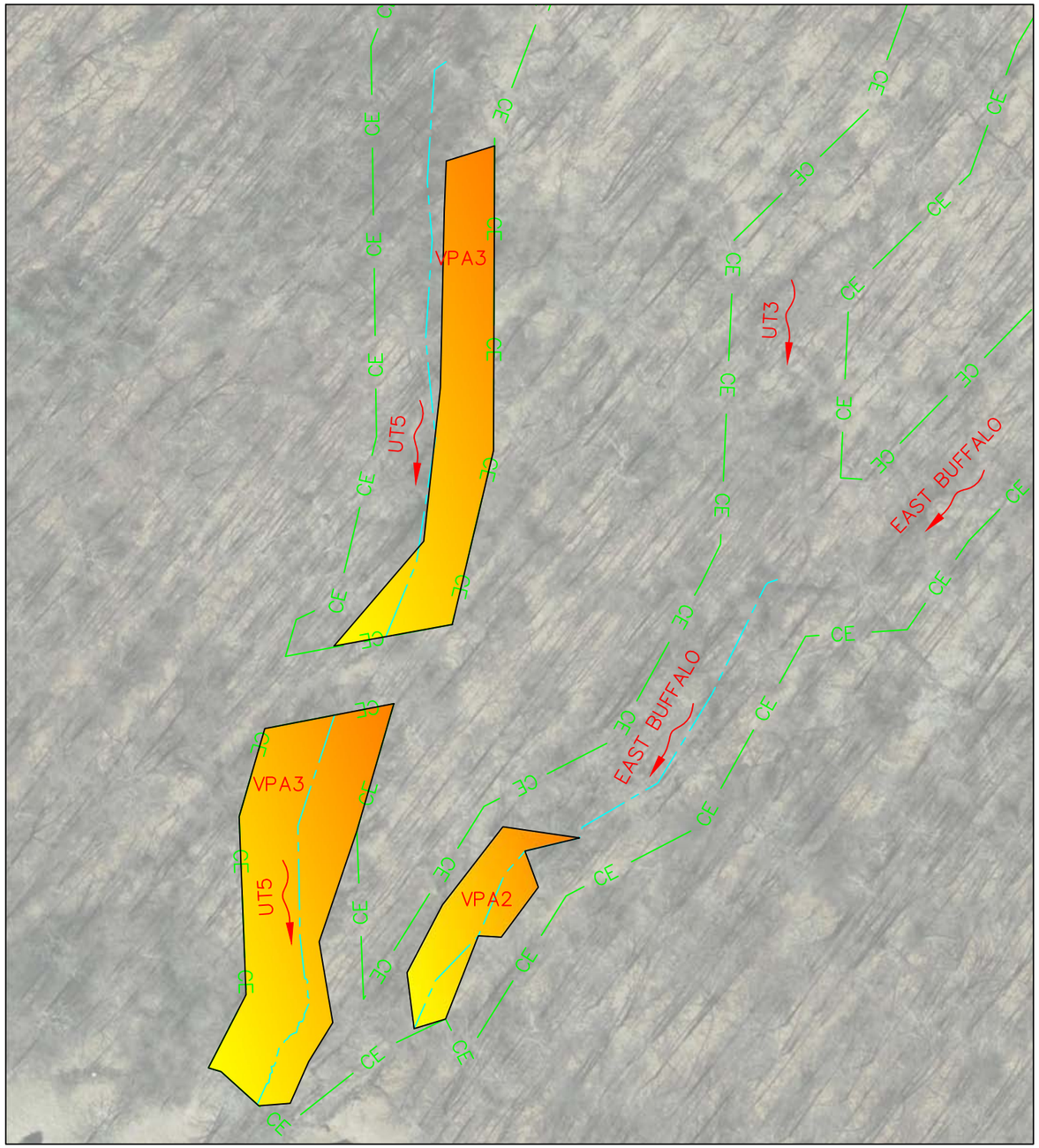

IMAGE SOURCE: NC STATEWIDE ORTHOIMAGERY, 2010

EAST BUFFALO–UT5
CURRENT CONDITION
PLAN VIEW
YEAR 5 MONITORING

40 0 40 80

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EAST BUFFALO CREEK MITIGATION PROJECT
GRAHAM COUNTY, NORTH CAROLINA

CURRENT CONDITION PLAN VIEW

Ecosystem Enhancement Program

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DMS Project No. 92763

Baker Project No. 113102

Date: 12/22/15

DESIGNED: SEG
DRAWN: MDR
APPROVED: MMC

Monitoring Year: 5 of 5

Table 8. Cross-Section Morphology Data Table

East Buffalo Creek Mitigation Project #92763

UT2

Parameter	Cross Section 1 Pool						Cross Section 2 Riffle						Cross Section 3 Riffle						Cross Section 4 Riffle					
	AB	MY1	MY2	MY3	MY4	MY5	AB	MY1	MY2	MY3	MY4	MY5	AB	MY1	MY2	MY3	MY4	MY5	AB	MY1	MY2	MY3	MY4	MY5
Dimension																								
BF Width (ft)	6.3	5.2	5.5	5.1	5.8	5.0	7.6	7.4	7.7	7.6	7.8	7.0	6.8	7.2	6.9	6.5	7.7	7.1	7.9	8.1	9.9	8.3	9.1	8.7
Floodprone Width (ft)	30.4	28.6	26.5	26.3	28.5	25.9	36.8	38.2	37.4	36.0	36.0	34.8	24.6	29.5	27.2	26.3	26.8	26.4	33.8	35.1	34.0	36.8	35.1	32.9
BF Cross Sectional Area (ft2)	5.8	4.7	3.8	3.5	4.5	3.6	3.5	3.6	3.1	2.9	3.1	2.5	1.6	2.7	2.1	1.9	2.3	2.1	3.4	3.5	3.7	2.8	3.7	3.3
BF Mean Depth (ft)	0.9	0.9	0.7	0.7	0.8	0.7	0.5	0.5	0.4	0.4	0.4	0.4	0.2	0.4	0.3	0.3	0.3	0.3	0.4	0.4	0.4	0.2	0.4	0.4
BF Max Depth (ft)	1.4	1.2	0.9	0.8	1.1	0.8	0.6	0.7	0.7	0.6	0.6	0.6	0.4	0.6	0.6	0.5	0.5	0.5	0.6	0.8	0.6	0.5	0.7	0.6
Width/Depth Ratio	6.8	5.9	8.1	7.4	7.4	7.1	16.3	15.2	19.5	20.1	19.7	19.9	28.6	18.9	22.2	21.6	25.3	23.6	18.4	18.9	26.3	34.4	22.4	23.0
Entrenchment Ratio	4.9	5.5	4.8	5.2	4.9	5.1	4.9	5.2	4.8	4.7	4.6	4.9	3.6	4.1	3.9	4.1	3.5	3.7	4.3	4.3	3.4	3.2	3.8	3.8
Wetted Perimeter (ft)	8.1	7.0	6.9	6.4	7.3	6.5	8.5	8.3	8.5	8.4	8.5	7.7	7.3	7.9	7.5	7.1	8.3	7.7	8.8	8.9	10.6	8.7	9.9	9.4
Hydraulic Radius (ft)	0.7	0.7	0.6	0.5	0.6	0.6	0.4	0.4	0.4	0.3	0.4	0.3	0.2	0.3	0.3	0.3	0.3	0.3	0.4	0.4	0.3	0.3	0.4	0.4
Substrate																								
d50 (mm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
d84 (mm)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Parameter	AB (2010)			MY-1 (2011)			MY-2 (2012)			MY-3 (2013)			MY-4 (2014)			MY-5 (2015)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern																		
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Profile																		
Riffle length (ft)	8.7	16.0	12.0	9.6	14.0	11.4	10.1	13.6	11.1	8.7	13.1	11.5	3.7	17.6	9.7	3.7	28.3	10.7
Riffle Slope (ft/ft)	0.099	0.214	0.175	0.131	0.235	0.188	0.139	0.222	0.202	0.142	0.274	0.186	0.104	0.250	0.184	0.083	0.267	0.177
Pool Length (ft)	2.7	5.4	3.2	3.2	5.3	3.8	3.0	6.1	4.2	3.3	6.6	4.4	1.3	9.4	4.0	1.3	11.6	4.3
Pool Spacing (ft)	11.8	20.1	16.3	13.5	20.1	16.0	12.8	20.0	15.9	12.4	20.4	15.6	6.4	28.8	13.9	6.3	31.8	13.2
Substrate																		
d50 (mm)		28			-			-			-			-			-	
d84 (mm)		88			-			-			-			-			-	
Additional Reach Parameters																		
Valley Length (ft)		585			579*			585			579*			585			585	
Channel Length (ft)		658			650*			658			652*			658			658	
Sinuosity		1.12			1.12			1.12			1.13*			1.12			1.12	
Water Surface Slope (ft/ft)		-			-			-			-			-				
BF Slope (ft/ft)		0.174			0.175			0.175			0.175			0.175			0.176	
Rosgen Classification		B3a			B3a			B3a			B3a			B3a			B3a	

Notes: WSF not provided for UT2 due to section of subsurface flow at time of survey.

* Data has been corrected from what was shown in past reports.

Table 8. Cross-Section Morphology Data Table

East Buffalo Creek Mitigation Project #92763

UT6 Reach 3

Parameter	Cross Section 1						Cross Section 2						Cross Section 3						Cross Section 4					
	Riffle						Pool						Riffle						Riffle					
	AB	MY1	MY2	MY3	MY4	MY5	AB	MY1	MY2	MY3	MY4	MY5	AB	MY1	MY2	MY3	MY4	MY5	AB	MY1	MY2	MY3	MY4	MY5
Dimension																								
BF Width (ft)	7.1	6.8	6.8	6.9	7.7	7.3	8.4	7.4	7.5	7.5	7.4	7.3	8.8	9.6	8.7	9.4	9.8	9.3	8.6	9.8	9.4	9.3	9.9	9.4
Floodprone Width (ft)	15.3	11.2	11.3	13.0	15.2	12.7	14.2	12.7	11.9	10.7	12.3	12.7	12.9	15.1	13.4	14.2	20.6	14.9	13.3	13.8	14.2	14.9	28.9	28.4
BF Cross Sectional Area (ft2)	8.3	7.8	7.8	7.7	8.3	7.8	11.4	9.8	9.2	8.5	9.4	7.8	7.3	9.6	8.5	9.4	10.2	9.1	7.5	8.7	9.8	8.3	10.1	9.3
BF Mean Depth (ft)	1.2	1.2	1.2	1.1	1.1	1.1	1.4	1.3	1.2	1.2	1.3	1.1	0.8	1.0	1.0	1.0	1.0	1.0	0.9	0.9	1.0	0.9	1.0	1.0
BF Max Depth (ft)	1.8	1.6	1.6	1.8	1.9	1.7	2.0	1.8	1.7	1.4	1.6	1.7	1.4	1.5	1.4	1.5	1.8	1.6	1.2	1.3	1.6	1.5	1.5	1.3
Width/Depth Ratio	6.1	6.0	5.9	6.2	7.1	6.9	6.2	5.6	6.0	6.5	5.9	6.9	10.6	9.5	8.9	9.4	9.4	9.5	9.9	10.9	9.2	10.3	9.7	9.6
Entrenchment Ratio	2.1	1.6	2.0	1.9	2.0	1.7	1.7	1.7	1.6	1.4	1.7	1.7	1.5	1.6	2.2	1.5	2.1	1.6	1.6	1.4	1.5	1.6	2.9	3.0
Wetted Perimeter (ft)	9.5	9.1	9.1	9.1	9.8	9.4	11.1	10.0	9.9	9.8	10.0	9.4	10.5	11.6	10.6	11.4	11.9	11.3	10.3	11.5	11.5	11.1	11.9	11.4
Hydraulic Radius (ft)	0.9	0.9	0.9	0.8	0.8	0.8	1.0	1.0	0.9	0.9	0.9	0.8	0.7	0.8	0.8	0.8	0.9	0.8	0.7	0.8	0.9	0.8	0.8	0.8
Substrate																								
d50 (mm)																								
d84 (mm)																								

Parameter	AB (2010)			MY-1 (2011)			MY-2 (2012)			MY-3 (2013)			MY-4 (2014)			MY-5 (2015)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern																		
Channel Beltwidth (ft)	-	-	-	-	-	-	-	-	-	-	-	-						
Radius of Curvature (ft)	-	-	-	-	-	-	-	-	-	-	-	-						
Meander Wavelength (ft)	-	-	-	-	-	-	-	-	-	-	-	-						
Meander Width Ratio	-	-	-	-	-	-	-	-	-	-	-	-						
Profile																		
Riffle length (ft)	11.0	28.9	13.0	9.3	29.4	12.5	8.6	29.5	11.9	8.2	28.3	9.7	12.3	38.8	25.6	7.3	35.2	18.6
Riffle Slope (ft/ft)	0.068	0.160	0.127	0.096	0.165	0.125	0.100	0.167	0.105	0.093	0.146	0.108	0.043	0.176	0.101	0.079	0.180	0.122
Pool Length (ft)	1.7	6.0	3.3	1.8	8.9	4.5	3.8	9.7	4.1	2.9	8.9	3.3	4.7	17.8	5.8	1.8	8.1	4.2
Pool Spacing (ft)	14.2	37.3	19.9	15.9	31.6	21.3	15.5	32.0	19.7	15.4	28.6	20.5	7.5	45.2	35.3	5.8	42.0	15.9
Substrate																		
d50 (mm)		44			63			69			74			33			50	
d84 (mm)		85			150			122			141			99			101	
Additional Reach Parameters																		
Valley Length (ft)		353			364*			353			353			353			353	
Channel Length (ft)		376			389*			376			376			376			376	
Sinuosity		1.06			1.07			1.06*			1.06*			1.06*			1.06	
Water Surface Slope (ft/ft)		0.150			0.152			0.152			0.151*			0.152			0.150	
BF Slope (ft/ft)		0.159*			0.162*			0.161*			0.160*			0.162*			0.159	
Rosgen Classification		B4a			B4a			B4a			B4a			B4a			B4a	

Notes: * Data has been corrected from what was shown in past reports.

Table 9. Stream Reach Morphology Data Table
East Buffalo Creek Mitigation Project #92763

Stream Reach Data Summary
UT2

Parameter	Regional Curve Equation	Reference Reach(es) Data			Design			(As-Built)			Yr 1			Yr 2			Yr 3			Yr 4*			Yr 5		
Dimension - Riffle	Eq.	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Bankfull Width (ft)	5.8	4.6	5.1	5.6	-----	7.7	-----	6.8	7.4	7.9	7.2	7.5	8.1	6.9	8.2	9.9	6.5	7.4	8.3	7.7	8.2	9.1	7.0	7.6	8.7
Floodprone Width (ft)	-----	5.8	10.0	14.1	-----	>20	-----	24.6	31.7	36.8	29.5	34.3	38.2	27.2	32.9	37.4	26.3	31.4	36.8	26.8	32.6	36.0	26.4	31.4	34.8
Bankfull Mean Depth (ft)	0.4	0.5	0.6	0.7	-----	0.4	-----	0.2	0.4	0.5	0.4	0.4	0.5	0.3	0.4	0.4	0.2	0.3	0.4	0.3	0.4	0.4	0.3	0.3	0.4
Bankfull Max Depth (ft)	-----	0.8	1.0	1.1	-----	0.5	-----	0.4	0.5	0.6	0.6	0.7	0.8	0.6	0.6	0.7	0.5	0.5	0.6	0.5	0.6	0.7	0.5	0.6	0.6
Bankfull Cross Sectional Area (ft2)	3.0	3.0	3.2	3.4	-----	3.0	-----	1.6	2.9	3.5	2.7	3.2	3.6	2.1	3.0	3.7	1.9	2.5	2.9	2.3	3.0	3.7	2.1	2.6	3.3
Width/Depth Ratio	-----	7.1	8.9	10.7	-----	20.0	-----	16.3	21.1	28.6	15.2	17.7	18.9	19.5	22.7	26.3	20.1	25.4	34.4	19.7	22.5	25.3	19.9	22.2	23.6
Entrenchment Ratio	-----	1.3	1.9	2.5	-----	>2	-----	3.6	4.2	4.9	4.1	4.6	5.2	3.4	4.0	4.8	3.2	4.0	4.7	3.5	4.0	4.6	3.7	4.1	4.9
Bank Height Ratio	-----	1.0	1.3	1.6	-----	1.0	-----	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.1	1.0	1.1	1.2
Bankfull Velocity (fps)	-----	2.6	2.8	3.0	-----	3.0	-----	----	3.2	----	----	2.8	----	----	3.0	----	----	3.6	----	----	3.0	----	----	3.5	----
Pattern																									
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																									
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	8.7	12.0	16.0	9.6	11.5	14.0	10.1	11.5	13.6	8.8	11.2	13.1	3.7	9.7	17.6	3.7	11.4	28.3
Riffle Slope (ft/ft)	-----	-----	-----	-----	0.090	0.165	0.240	0.099	0.168	0.214	0.131	0.185	0.235	0.139	0.189	0.222	0.142	0.189	0.274	0.104	0.184	0.250	0.083	0.174	0.267
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	2.7	3.6	5.4	2.7	4.0	5.3	3.0	4.2	6.1	3.3	4.6	6.6	1.3	4.0	9.4	1.3	4.6	11.6
Pool Spacing (ft)	-----	11.1	16.1	21.0	11.6	17.4	23.2	11.8	16.0	20.1	13.5	16.2	20.1	12.8	15.8	20.0	12.4	16.5	20.4	6.4	13.9	28.8	6.3	14.7	31.8
Substrate and Transport Parameters																									
d16 / d35 / d50 / d84 / d95	-----	0.7/50/75/150/280			-----	-----	-----	3.5/22/27/88/138			-----			-----			-----			-----			-----		
Reach Shear Stress (competency) lb/ft2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																									
Channel length (ft)	-----	-----	-----	-----	-----	508	-----	-----	658	-----	-----	650**	-----	-----	658	-----	-----	652**	-----	-----	658	-----	-----	658	-----
Drainage Area (SM)	-----	-----	0.04	-----	-----	0.04	-----	-----	0.04	-----	-----	0.04	-----	-----	0.04	-----	-----	0.04	-----	-----	0.04	-----	-----	0.04	-----
Rosgen Classification	-----	-----	A3a+	-----	-----	B3a	-----	-----	B3a	-----	-----	B3a	-----	-----	B3a	-----	-----	B3a	-----	-----	B3a	-----	-----	B3a	-----
Bankfull Discharge (cfs)	9	-----	16	-----	-----	9	-----	-----	9	-----	-----	9	-----	-----	9	-----	-----	9	-----	-----	9	-----	-----	9	-----
Sinuosity	-----	1.0	1.1	1.1	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	0.174	-----	-----	0.175	-----	-----	0.175	-----	-----	0.175	-----	-----	0.175	-----	-----	0.175	-----

* Dimensional data for YR4 have been corrected and should replace data in the YR4 report.
** Data has been corrected from what was shown in past reports.

Table 9. Stream Reach Data Summary
East Buffalo Creek Mitigation Project #92763

Stream Reach Data Summary
UT6: Reach 3

Parameter	Regional Curve Equation	Reference Reach(es) Data			Design			(As-Built)			Yr 1			Yr 2			Yr 3			Yr 4*			Yr 5		
Dimension - Riffle	Eq.	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max	Min	Mean	Max
Bankfull Width (ft)	9.7	7.4	9.4	11.4	-----	9.0	-----	7.1	8.2	8.8	6.8	8.7	9.8	6.8	8.3	9.4	7.0	8.5	9.4	7.7	9.1	9.9	7.3	8.7	9.4
Floodprone Width (ft)	-----	10.6	13.2	15.7	-----	15.5	-----	12.9	13.8	15.3	11.2	13.4	15.1	11.3	13.0	14.2	13.0	14.1	15.0	15.2	21.5	28.9	12.7	18.7	28.4
Bankfull Mean Depth (ft)	0.6	0.6	0.8	1.0	-----	0.5	-----	0.8	1.0	1.2	0.9	1.0	1.2	1.0	1.1	1.2	0.9	1.0	1.1	1.0	1.0	1.1	1.0	1.0	1.1
Bankfull Max Depth (ft)	-----	0.9	1.2	1.4	-----	0.7	-----	1.2	1.4	1.8	1.3	1.4	1.6	1.4	1.5	1.6	1.5	1.6	1.8	1.5	1.7	1.9	1.3	1.5	1.7
Bankfull Cross Sectional Area (ft2)	6.2	6.3	6.8	7.2	-----	6.5	-----	7.3	7.7	8.3	7.8	8.7	9.6	7.8	8.7	9.6	7.7	8.5	9.4	8.3	9.5	10.2	7.8	8.7	9.3
Width/Depth Ratio	-----	7.6	13.7	19.7	-----	12.5	-----	6.1	8.9	10.6	6.0	8.8	10.9	5.9	8.0	9.2	6.2	8.7	10.3	7.1	8.7	9.7	6.9	8.6	9.6
Entrenchment Ratio	-----	1.1	1.6	2.0	-----	1.7	-----	1.5	1.7	2.1	1.4	1.5	1.6	1.5	1.6	1.7	1.5	1.7	1.9	2.0	2.3	2.9	1.6	2.1	3.0
Bank Height Ratio	-----	1.1	3.4	5.7	-----	1.0	-----	1.7	1.9	2.1	2.0	2.0	2.0	1.7	2.0	2.2	1.9	2.1	2.4	1.7	1.7	1.8	1.9	2.1	2.3
Bankfull Velocity (fps)	-----	3.7	3.8	3.8	-----	3.7	-----	----	3.1	----	----	2.8	----	----	2.8	----	----	2.8	----	----	2.5	----	----	2.8	----
Pattern																									
Channel Beltwidth (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Radius of Curvature (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Wavelength (ft)	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Meander Width Ratio	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Profile																									
Riffle Length (ft)	-----	-----	-----	-----	-----	-----	-----	11.0	17.5	28.9	9.3	17.6	29.4	8.6	17.3	29.5	8.2	16.0	28.3	12.3	25.6	38.8	7.3	18.6	35.2
Riffle Slope (ft/ft)	-----	0.050	0.135	0.220	0.050	0.105	0.160	0.068	0.120	0.160	0.096	0.126	0.165	0.100	0.123	0.167	0.0930	0.116	0.146	0.043	0.101	0.176	0.079	0.124	0.180
Pool Length (ft)	-----	-----	-----	-----	-----	-----	-----	1.7	3.4	6.0	1.8	4.9	8.9	3.8	5.6	9.7	2.9	4.6	8.9	4.7	5.8	17.8	1.8	4.3	8.1
Pool Spacing (ft)	-----	7.0	27.5	48.0	7.0	27.5	48.0	14.2	23.8	37.3	15.9	22.8	31.6	15.5	22.3	32.0	15.4	21.2	28.6	7.5	35.3	45.2	5.8	20.1	42.0
Substrate and Transport Parameters																									
d16 / d35 / d50 / d84 / d95	-----	5.6/9.5/11/100/200			-----			12/31/44/85/211			7.9/35/63/150/285			.66/25/69/122/234			12/57/74/141/234			6.6/15/33.4/98.6/179			8.9/20.1/50.3/101.2/157.1		
Reach Shear Stress (competency) lb/ft2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Stream Power (transport capacity) W/m2	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
Additional Reach Parameters																									
Channel length (ft)	-----	-----	-----	-----	-----	524	-----	-----	376	-----	-----	389**	-----	-----	376	-----	-----	376	-----	-----	376	-----	-----	376	-----
Drainage Area (SM)	-----	0.13	0.15	0.16	-----	0.16	-----	-----	0.16	-----	-----	0.16	-----	-----	0.16	-----	-----	0.16	-----	-----	0.16	-----	-----	0.16	-----
Rosgen Classification	-----	-----	Fb/A4a+	-----	-----	B4a	-----	-----	B4a	-----	-----	B4a	-----	-----	B4a	-----	-----	B4a	-----	-----	B4a	-----	-----	B4a	-----
Bankfull Discharge (cfs)	24	-----	-----	-----	----	24	----	----	24	----	----	24	----	----	24	----	----	24	----	----	24	----	----	24	----
Sinuosity	-----	-----	1.1	-----	----	1.1	----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----	-----	1.1	-----
BF slope (ft/ft)	-----	-----	-----	-----	-----	-----	-----	-----	0.152	-----	-----	0.151	-----	-----	0.151	-----	-----	0.151	-----	-----	0.151	-----	-----	0.151	-----

* Dimensional data for YR4 have been corrected and should replace data in the YR4 report.
** Data has been corrected from what was shown in past reports.

APPENDIX E

TABLE 10-VERIFICATION OF BANKFULL EVENTS

Table 10. Verification of Bankfull or Greater than Bankfull Events
East Buffalo Creek Restoration Project - NCDMS #92763

Date of Data Collection	Date of Event	Method of Data Collection	Gauge Watermark Height (inches above bankfull)	
			UT2	UT6
Dec-11	April – December 2011	Crest Gauge Measurement	2.18	2.25; 1.75 (2)
Oct-12	December 2011- October 2012	Crest Gauge Measurement	---	2.75
Mar-14	October 2012- March 2014	Crest Gauge Measurement	1.5	0.5
Mar-15	March 2014 to Mar-15	Crest Gauge measurement	3.25	4
Dec-15	March 2015 to Dec-15	Crest Gauge Measurement	2.25	---

Photo of staff and cork at 2.25 inches above bankfull, from UT2 crest gauge.

Staff in UT6 gauge was broken and we did not get a reading.

APPENDIX F

PROJECT PROBLEM AREAS

FIGURE 3 – STREAM/VEGETATION PROBLEM AREAS CCPV

TABLE 11 – VISUAL MORPHOLOGICAL STABILITY ASSESSMENT

TABLE 11a – STREAM PROBLEM AREAS

TABLE 12 – VEGETATION PROBLEM AREAS

Table 11. Visual Morphological Stability Assessment
East Buffalo Creek Mitigation Project: NCDMS Project No. 92763

UT2 (509 LF)

Feature Category	Metric (per As-Built and reference baselines)	(# Stable) Number Performing as Intended	Total number per As-Built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Perfomance Mean or Total
A. Riffles	1. Present?	45	45	N/A	100	
	2. Armor stable (e.g. no displacement)?	45	45	N/A	100	
	3. Facet grades appears stable?	45	45	N/A	100	
	4. Minimal evidence of embedding/fining?	45	45	N/A	100	
	5. Length appropriate?	45	45	N/A	100	**100%**
B. Pools	1. Present? (e.g. not subject to severe aggradation or migration?)	48	48	N/A	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf >1.6?)	48	48	N/A	100	
	3. Length appropriate?	48	48	N/A	100	**100%**
C. Thalweg[1]	1. Upstream of pool (structure) centering?	91	91	N/A	100	
	2. Downstream of pool (structure) centering?	91	91	N/A	100	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	N/A	N/A	N/A	N/A	
	2. Of those eroding, # w/concomitant point bar formation?	N/A	N/A	N/A	N/A	
	3. Apparent Rc within spec?	N/A	N/A	N/A	N/A	
	4. Sufficient floodplain access and relief?	N/A	N/A	N/A	N/A	**N/A**
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/0	100	
	2. Channel bed degradation - areas of increasing down-cutting or head cutting?	N/A	N/A	0/0	100	**100%**
F. Bank	1. Actively eroding, wasting, or slumping bank	N/A	N/A	0/0	100	**100%**
G. Rock/Log Drop Structures[2&3]	1. Free of back or arm scour?	47	47	N/A	100	
	2. Height appropriate?	47	47	N/A	100	
	3. Angle and geometry appear appropriate?	47	47	N/A	100	
	4. Free of piping or other structural failures?	47	47	N/A	100	**100%** [3]
H. Wads/ Boulders	1. Free of scour?	N/A	N/A	N/A	N/A	
	2. Footing stable?	N/A	N/A	N/A	N/A	**N/A**

UT6 Reach 3 (374 LF)

Feature Category	Metric (per As-Built and reference baselines)	(# Stable) Number Performing as Intended	Total number per As-Built[1]	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Perfomance Mean or Total
A. Riffles	1. Present?	10	10	N/A	100	
	2. Armor stable (e.g. no displacement)?	10	10	N/A	100	
	3. Facet grades appears stable?	10	10	N/A	100	
	4. Minimal evidence of embedding/fining?	10	10	N/A	100	
	5. Length appropriate?	10	10	N/A	100	**100%**
B. Pools	1. Present? (e.g. not subject to severe aggradation or migration?)	10	10	N/A	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf >1.6?)	10	10	N/A	100	
	3. Length appropriate?	10	10	N/A	100	**100%**
C. Thalweg[1]	1. Upstream of pool (structure) centering?	20	20	N/A	100	
	2. Downstream of pool (structure) centering?	20	20	N/A	100	**100%**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	N/A	N/A	N/A	N/A	
	2. Of those eroding, # w/concomitant point bar formation?	N/A	N/A	N/A	N/A	
	3. Apparent Rc within spec?	N/A	N/A	N/A	N/A	
	4. Sufficient floodplain access and relief?	N/A	N/A	N/A	N/A	**N/A**
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/0	100	
	2. Channel bed degradation - areas of increasing down-cutting or head cutting?	N/A	N/A	0/0	100	**100%**
F. Bank	1. Actively eroding, wasting, or slumping bank	N/A	N/A	0/0	100	**100%**
G. Rock/Log Drop Structures[2]	1. Free of back or arm scour?	10	10	N/A	100	
	2. Height appropriate?	10	10	N/A	100	
	3. Angle and geometry appear appropriate?	10	10	N/A	100	
	4. Free of piping or other structural failures?	10	10	N/A	100	**100%**
H. Wads/ Boulders	1. Free of scour?	N/A	N/A	N/A	N/A	
	2. Footing stable?	N/A	N/A	N/A	N/A	**N/A**

[1] Thalweg feature is scored according to the centering of the thalweg over inverts of drop structures above pools and through the constructed riffle below pools since this reach is a step-pool channel without meander bends.

[2] Vane feature category was replaced with rock/log drop structures since there are no vanes present on this reach.

[3] While all structures that had surface flow were funtioning well, flow over much of the channel is still subsurface. During the survey of the channel this and many other area channels were dry; however, during later visits to the site we discovered flow extended to approximately the same point as it had in winter 2015 and then went subsurface, resurfacing at the lower end of the reach, as it had in the past.

Table 11a. Stream Problem Areas East Buffalo Creek Mitigation Project: Project No. 92763			
UT2 (509 LF)			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Other	1+56 to 5+64*	Flow is subsurface	----

* Note that 5+00 to 5+64 are outside of the conservation easement.

Table 12. Vegetation Problem Areas East Buffalo Creek Mitigation Project: Project No. 92763			
VPA1 - UT6 Reach 2 (565 LF)			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Invasive/Exotic Populations	See Plan View	*Rosa multiflora,* and *Ligustrum sinense:* significantly reduced but still persisting after treatment in some areas. We are continuing to show these areas and will treat these areas again in the spring to kill surviving invasives.	Photo 1
VPA2 - East Buffalo Reach 2 (932 LF)			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Invasive/Exotic Populations	See Plan View	*Rosa multiflora, and Ligustrum sinense: significantly reduced but still persisting after treatment in some areas. We are continuing to show these areas and will treat these areas again in the spring to kill surviving invasives.*	---
VPA3 - UT5 Reach 2 (607 LF)			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Invasive/Exotic Populations	See Plan View	*Rosa multiflora, and Ligustrum sinense: significantly reduced but still persisting after treatment in some areas. We are continuing to show these areas and will treat these areas again in the spring to kill surviving invasives.*	---
VPA4 - UT2 Reach 2 (200 LF)			
Feature Issue	**Station No.**	**Suspected Cause**	**Photo Number**
Invasive/Exotic Populations	See Plan View	*Rosa multiflora: while treating other areas of the project site, this area was missed. Now rose is fairly thick. This area will be treated this spring.*	---

Photo 1. Dead multiflora above driveway in VPA2.