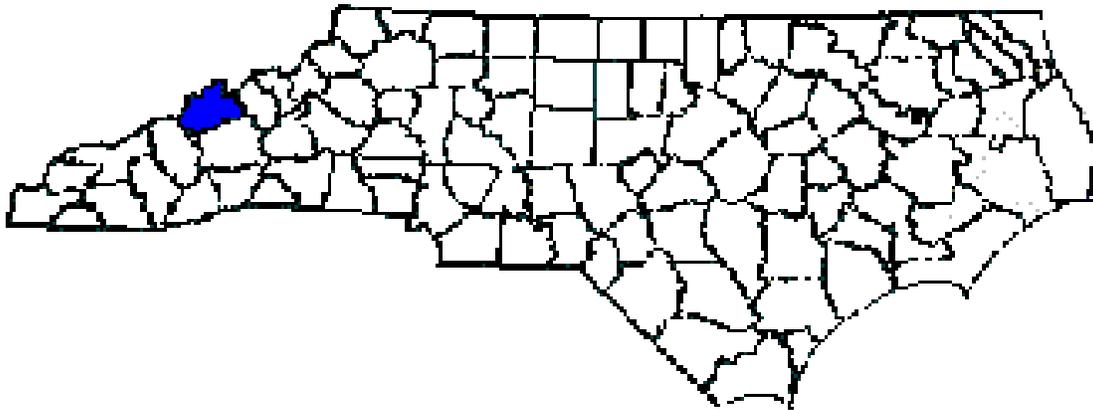


ANNUAL REPORT FOR 2013



**Middle Fork Creek Site E Mitigation Site
Madison County
TIP No. R-2518A
COE Action ID: SAW-2007-2197-357/300
DWR #: 20071134**



Prepared By:
Natural Environment Section & Roadside Environmental Unit
North Carolina Department of Transportation
November 2013

TABLE OF CONTENTS

SUMMARY	1
1.0 INTRODUCTION:.....	2
.1 Project Description	2
.2 Purpose	2
.3 Project History	2
.4 Debit Ledger.....	2
2.0 STREAM ASSESSMENT:	7
.1 Success Criteria	7
.2 Stream Description.....	7
.2.1 Post Construction Conditions.....	7
.2.2 Monitoring Conditions	7
.3 Results of Stream Monitoring	8
.3.1 Site Data	8
3.0 VEGETATION.....	9
.1 Description of Species.....	9
.2 Results of Vegetation Monitoring.....	9
.3 Conclusions	9
4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS	9
5.0 REFERENCES:	10

FIGURES

Figure 1 – Vicinity Map	3
Figure 2 – Site E Map	4
Figure 3 – Site E Map	5
Figure 4 – Site E Map	6

TABLES

Table 1 – Site E Morphological Summary	8
--	---

APPENDICES

Appendix A – Cross Sections and Longitudinal Profile	
Appendix B – Site Photographs	

SUMMARY

The following report summarizes the stream monitoring activities that have occurred during the Year 2013 at the Middle Fork Creek Site E Mitigation Site in Madison County. The North Carolina Department of Transportation (NCDOT) completed this project in November 2008 and water was turned in May 2009. This report provides the monitoring results for the fourth formal year of monitoring (Year 2013). The Year 2013 monitoring period was the fourth of five scheduled years of monitoring on the Middle Fork Creek Site E Mitigation Site (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring at the Middle Fork Creek Site E, it has not met the required monitoring protocols for the fourth formal year of monitoring on the stream but has met the required monitoring protocols for the second formal year of monitoring on the planted vegetation. The channel is experiencing some instability along the left streambank at longitudinal profile Stations 395+00, 500+00, and 720+00. NCDOT live staked the eroded banks on February 12, 2013 to help stabilize these areas but NCDOT plans to repair these eroded areas by the Spring of 2014. Any disturbed areas during the repair work will be replanted. The streambank and buffer area were originally planted in March 2012 with live stakes and bareroot seedlings. The planted vegetation is surviving at this time.

NCDOT will continue stream monitoring at the Middle Fork Creek Site E Mitigation Site in 2014.

1.0 INTRODUCTION

1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during the Year 2013 at the Middle Fork Creek Site E Mitigation Site. Site E is located on US 19 in Madison County at Sta. 33+80 Rt. and Sta. 33+80 to 38+00 Lt. -L- (Figure 1). The Middle Fork Creek Site E was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2518A in Madison County.

The mitigation site provided approximately 833 linear feet of stream restoration and 820 linear feet of stream preservation. Construction was completed during November 2008 and water was turned in May 2009 by the NCDOT. Stream restoration involved backfilling a portion of the existing channel so the roadway could be extended. A new floodplain and channel were excavated and several in-stream structures such as crossvanes and j-hooks were installed. The riparian buffer will also be planted.

1.2 Purpose

In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2013 at the Middle Fork Creek Site E Mitigation Site. Hydrologic monitoring was not required for this site.

1.3 Project History

November 2008	Construction Completed
May 2009	Water Turned Into Stream
March 2009	Site Planted (Type I only)
October 2009	As-Built Survey Completed
November 2010	Stream Channel Monitoring (Year 1)
November 2011	Stream Channel Monitoring (Year 2)
March 2012	Site Planted (Type I and II)
September 2012	Vegetation Monitoring (Year 1)
November 2012	Stream Channel Monitoring (Year 3)
February 2013	Live Staked Eroded Banks
March 2013	Bankfull Monitoring Gauge Installed
August 2013	Vegetation Monitoring (Year 2)
November 2013	Stream Channel Monitoring (Year 4)

1.4 Debit Ledger

The entire Middle Fork Creek Site E stream mitigation site was used for the R-2518A project to compensate for unavoidable stream impacts.

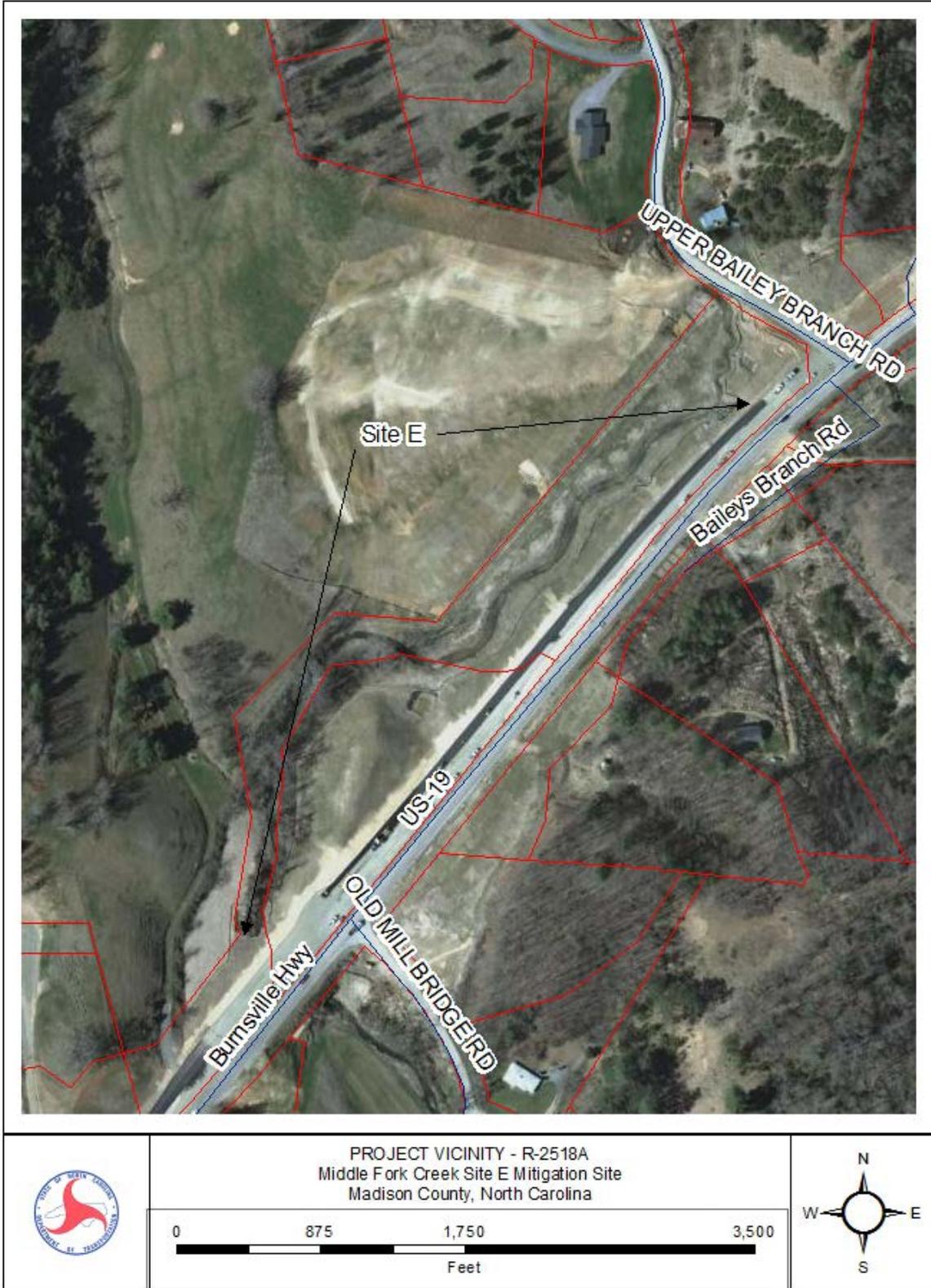
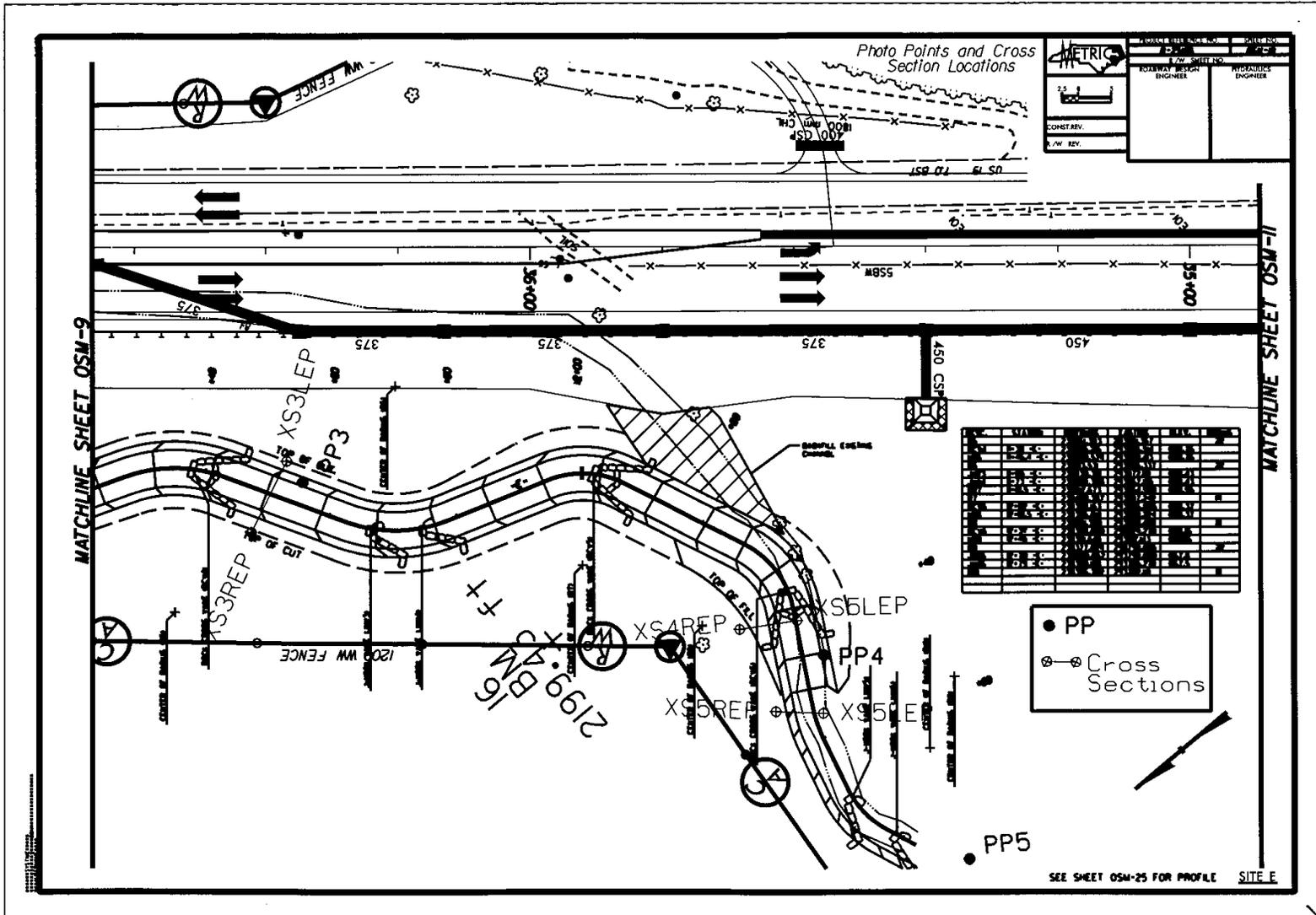


Figure 1. Vicinity Map



r2518a_pdea_psh10_as-built.dgn 12/21/2010 9:36:38 AM

Figure 3. Site E Map

2.0 STREAM ASSESSMENT

2.1 Success Criteria

The permittee shall monitor the restoration and enhancement mitigation sites following the Level 1 protocols outlined in the "Stream Mitigation Guidelines," dated April 2003 with the following exceptions:

1. Pebble counts shall not be conducted.
2. Two cross sections shall be conducted for streams less than 500 linear feet and five (5) cross sections shall be conducted for streams greater than 500 linear feet.
3. Riparian success shall be by visual inspection of plant survival. Photos will be taken and comments noted on plant survival.

The permittee shall monitor the preservation sites by visual inspection. Photos will be taken and comments noted on plant survival. The monitoring shall be conducted annually for a minimum of five (5) years after final planting. The monitoring results shall be submitted to DWR in a final report within sixty (60) days after completing monitoring. After 5 years the NCDOT shall contact the DWR to schedule a site visit to "close out" the mitigation site.

2.2 Stream Description

2.2.1 Post-Construction Conditions

The restoration of the Middle Fork Creek Site E Mitigation Site involved backfilling a portion of the existing channel so the roadway could be extended. A new floodplain and channel were excavated and several in-stream structures such as cross vanes and j-hooks were installed. The riparian buffer will also be planted.

2.2.2 Monitoring Conditions

The objective of the Middle Fork Creek Site E stream restoration was to restore a B4c stream as identified in Rosgen's Applied River Morphology. A total of five cross sections (three in a riffle and two in a pool) were surveyed. For this report, only cross sections containing riffles were used in the comparison of channel morphology presented below in Table 1 (Site E).

Table 1. Abbreviated Morphological Summary (Middle Fork Creek Site E)

Variable	Proposed	Cross-Section #1 (Riffle)	Cross-Section #3 (Riffle)	Cross-Section #5 (Riffle)	Min – Max Values (Riffle Sections only)
		2013	2013	2013	2013
Drainage Area (mi ²)	10.4	10.4	10.4	10.4	10.4
Bankfull Cross Sectional Area (ft ²)	61.9	46.83	61.27	39.91	39.91 – 61.27
Maximum Bankfull Depth (ft.)	2.7-3.4	3.26	2.76	2.63	2.63 – 3.26
Width of the Floodprone Area (ft.)	46	45	45.8	36	36 – 45.8
Bankfull Mean Depth (ft)	2.27	1.76	1.83	1.71	1.71 – 1.83
Width/Depth Ratio	12	15.15	18.32	13.63	13.63 – 18.32
Entrenchment Ratio	1.7	1.69	1.37	1.54	1.37 – 1.69
Bankfull Width (ft.)	27.3	26.67	33.52	23.31	23.31 – 33.52

* Riffle values are used for classification purposes, pool values are shown in Appendix A.

2.3 Results of the Stream Assessment

2.3.1 Site Data

The assessment included the survey of five cross sections and the longitudinal profile of the Middle Fork Creek Site E established by NCDOT after construction. The length of the profile along the Middle Fork Creek Site E was approximately 900 linear feet. Five cross sections were established during the as-built monitoring year. Cross section locations were subsequently based on the stationing of the longitudinal profile and are presented below. The location of the cross sections and longitudinal profile are shown in Appendix A.

Middle Fork Creek Site E Cross-Sections:

- ◆ Cross-Section #1: Middle Fork Creek Site E, Station 102+00, midpoint of riffle
- ◆ Cross-Section #2: Middle Fork Creek Site E, Station 316+00, midpoint of pool
- ◆ Cross-Section #3: Middle Fork Creek Site E, Station 500+00, midpoint of riffle
- ◆ Cross-Section #4: Middle Fork Creek Site E, Station 805+00, midpoint of pool
- ◆ Cross-Section #5: Middle Fork Creek Site E, Station 853+00, midpoint of riffle

Based on comparisons of the As-Built to the monitoring data, all of the cross sections appear stable with little or no active bank erosion, except for, Cross Section #3 at Sta. 500+00 which has significant left bank erosion. Graphs of the cross sections are presented in Appendix A. Future survey data will vary depending on actual location of rod placement and alignment; however, this information should remain similar in appearance. The longitudinal profile showed that the channel bed was stable for the 2013 monitoring evaluation but is experiencing left bank erosion at Stations 395+00, 500+00 (XS#3), and 720+00. These areas of bank erosion were live staked on February 12, 2013 to help stabilize these areas. Pebble counts were not required per the permit conditions and therefore were not completed. Multiple bankfull events were documented at Site E during the 2013 monitoring year.

3.0 VEGETATION: MIDDLE FORK CREEK SITE E

3.1 Description of Species

The following tree species were planted on the streambank:

Salix nigra, Black Willow

Cornus amomum, Silky Dogwood

The following tree species were planted in the buffer area:

Liriodendron tulipifera, Yellow Poplar

Platanus occidentalis, Sycamore

Fraxinus pennsylvanica, Green Ash

Quercus alba, White Oak

3.2 Results of Vegetation Monitoring

Streambank & Buffer Vegetation: The streambank reforestation was completed in March 2012. The Year 2 vegetation monitoring evaluation noted: Type I: Black Willow, Silky Dogwood, and Type II: Sycamore, Green Ash, Tulip Poplar and White Oak were surviving at the time of the monitoring evaluation.

3.3 Conclusions

NCDOT will continue to monitor the planted vegetation in 2014.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The Middle Fork Creek Site E Mitigation Site has not met the required monitoring protocols for the fourth formal year of monitoring on the stream but has met the required monitoring protocols for the second formal year of monitoring on the planted vegetation. NCDOT plans to repair the eroded banks by the Spring of 2014 and replant any disturbed areas from the stream repairs at Site E. NCDOT will continue monitoring the Middle Fork Creek Site E Mitigation Site in 2014.

5.0 REFERENCES

Stream Mitigation Plan, US Highway 19, R-2518A On-Site Mitigation
Madison County, North Carolina, August 2006.

Design Plans for R-2518A, US 19 from I-26 to 0.8 KM east of the Yancey Co.
Line, Stream Mitigation (Preservation, Enhancement, and Restoration),
HSMM.

North Carolina Department of Transportation (NCDOT), April 29, 2008. 404 and
401 Individual Permits for R-2518A and R-2518B (ACOE Permit No. 2007-
2197-357/300 and DWR Project No. 20071134, Individual Certification No.
3706).

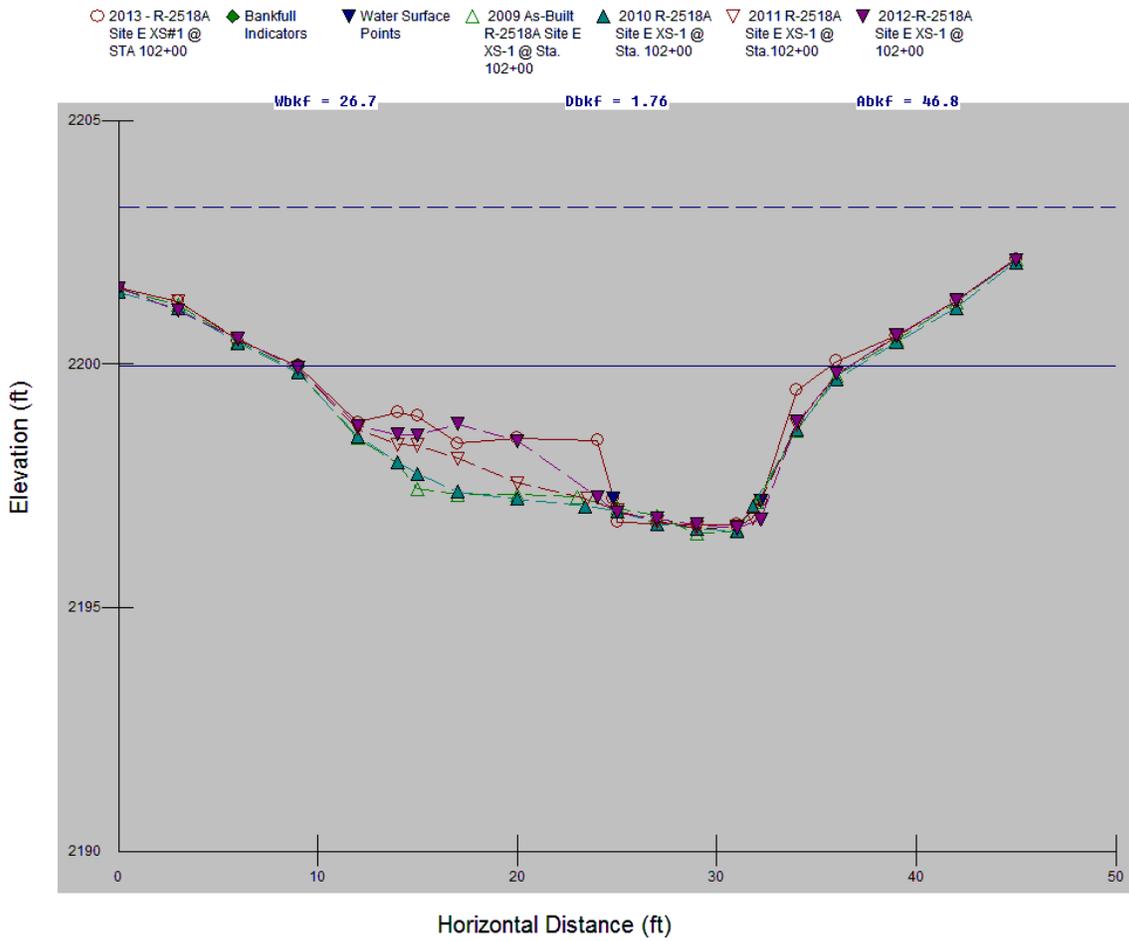
Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa
Springs, Colorado.

US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines.
Prepared with cooperation from the US Environmental Protection Agency,
NC Wildlife Resources Commission, and the NC Division of Water
Resources.

APPENDIX A

CROSS SECTIONS AND LONGITUDINAL PROFILE

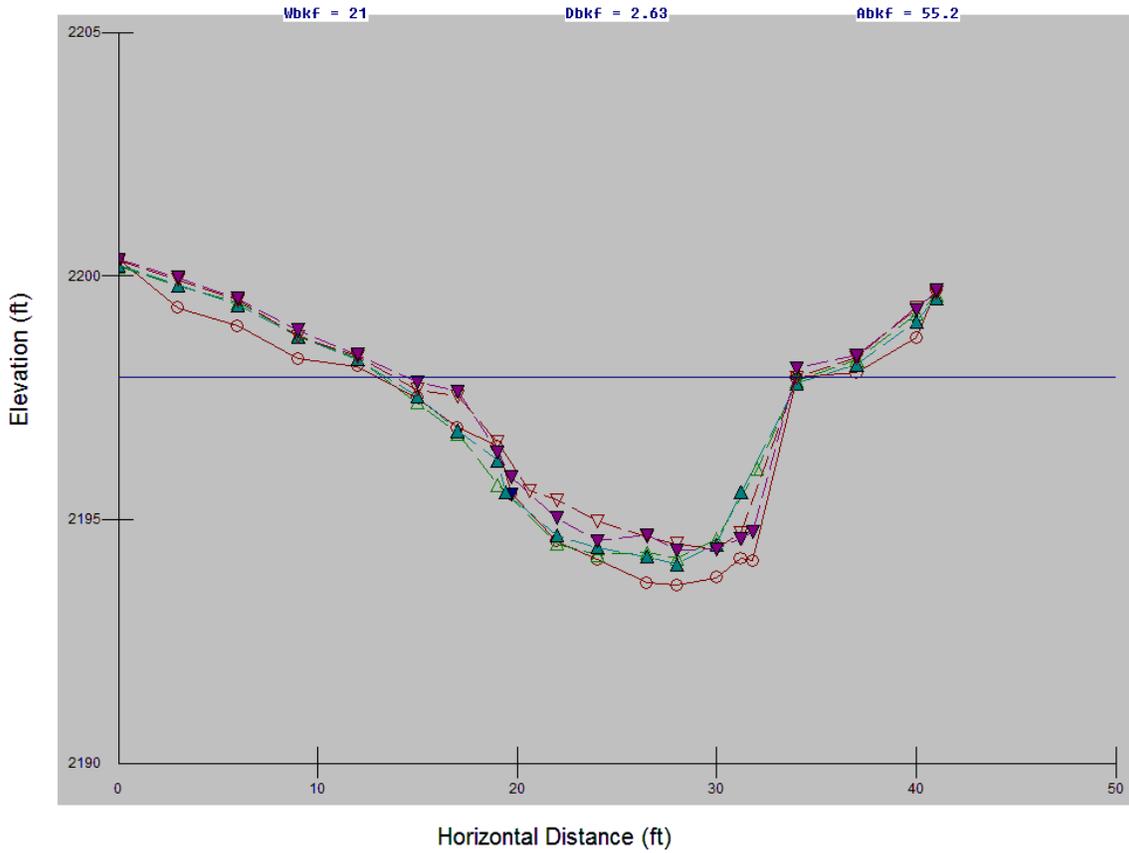
R-2518A Site E XS#1 @ STA 102+00



Site E: Cross-Section #1 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	59.32	56.44	50.89	46.83	
Maximum Bankfull Depth (ft.)	3.26	3.28	3.28	3.26	
Width of the Floodprone Area (ft.)	45	45	45	45	
Bankfull Mean Depth (ft.)	2.16	2.06	1.86	1.76	
Width/Depth Ratio	12.74	13.32	14.74	15.15	
Entrenchment Ratio	1.64	1.64	1.64	1.69	
Bankfull Width (ft.)	27.51	27.43	27.42	26.67	

R-2518A Site E XS#2 @ STA 316+00

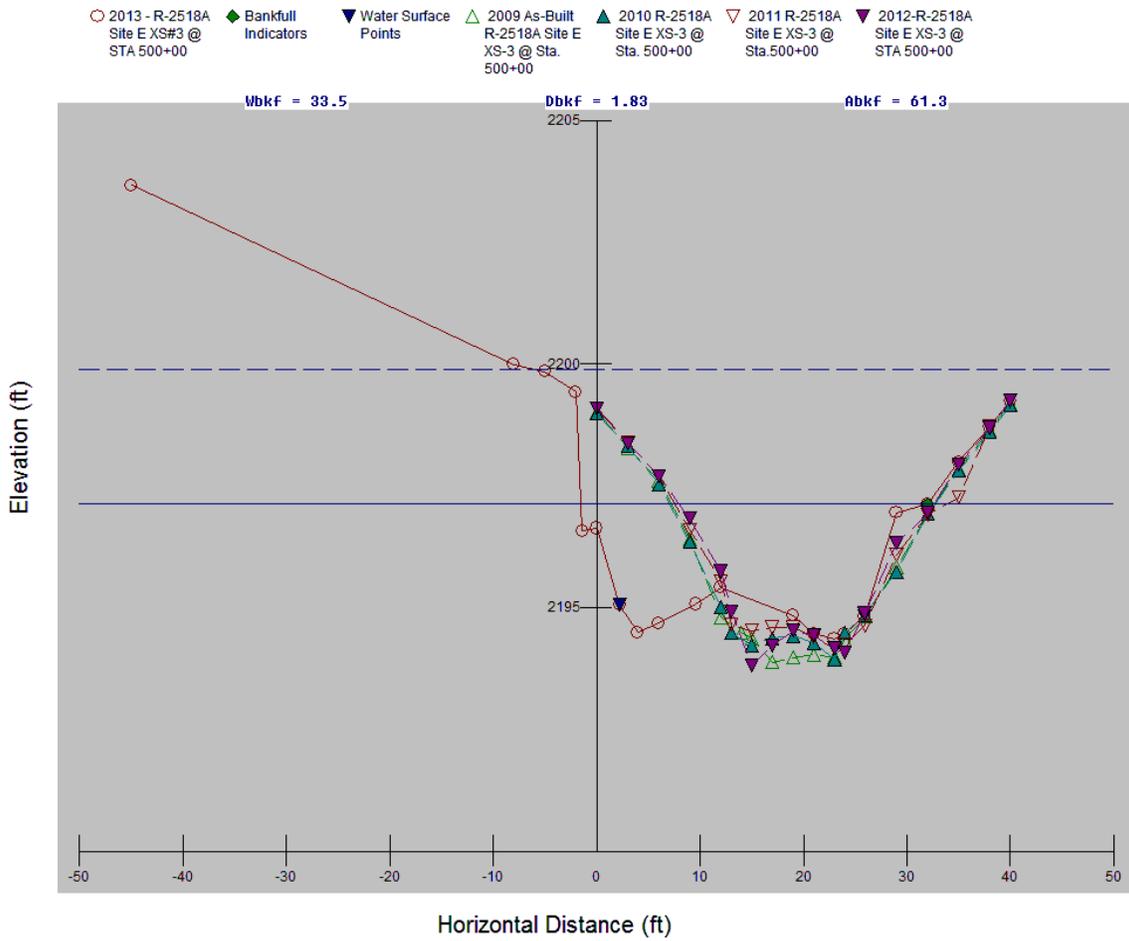
○ 2013 - R-2518A Site E XS#2 @ STA 316+00
 ◆ Bankfull Indicators
 ▼ Water Surface Points
 △ 2009 As-Built R-2518A Site E XS-2 @ Sta. 316+00
 ▲ 2010 R-2518A Site E XS-2 @ Sta. 316+00
 ▽ 2011 R-2518A Site E XS-2 @ Sta. 316+00
 ▼ 2012-R-2518A Site E XS-2 @ 316+00



Site E: Cross-Section #2 (Pool) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	45.83	42.38	49.01	55.21	
Maximum Bankfull Depth (ft.)	3.72	3.52	3.74	4.27	
Bankfull Mean Depth (ft.)	2.28	2.11	2.38	2.63	
Bankfull Width (ft.)	20.07	20.07	20.55	20.97	

*According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.

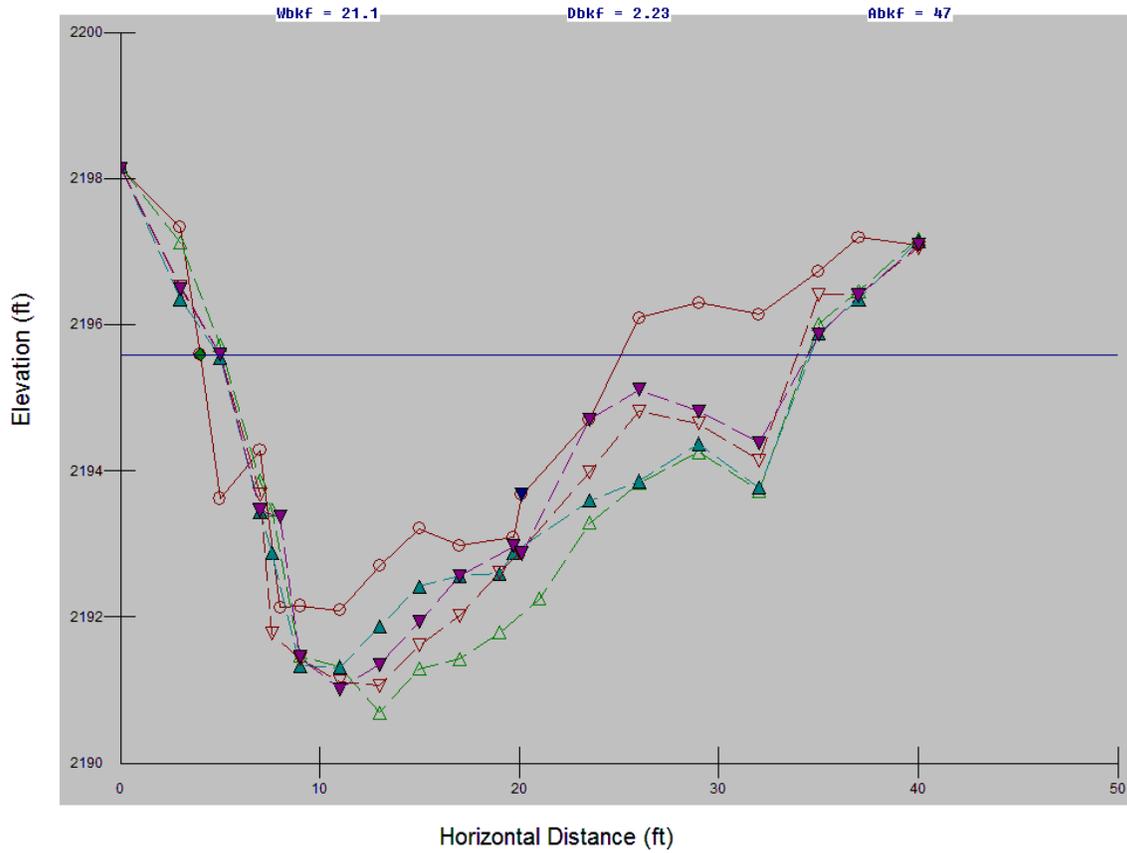
R-2518A Site E XS#3 @ STA 500+00



Site E: Cross-Section #3 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	62.4	63.57	62.14	61.27	
Maximum Bankfull Depth (ft.)	3.59	3.53	3.89	2.76	
Width of the Floodprone Area (ft.)	40	40	40	45.8	
Bankfull Mean Depth (ft.)	2.22	2.13	2.2	1.83	
Width/Depth Ratio	12.64	14.03	12.86	18.32	
Entrenchment Ratio	1.43	1.34	1.41	1.37	
Bankfull Width (ft.)	28.06	29.89	28.3	33.52	

R-2518A Site E XS#4 @ STA 805+00

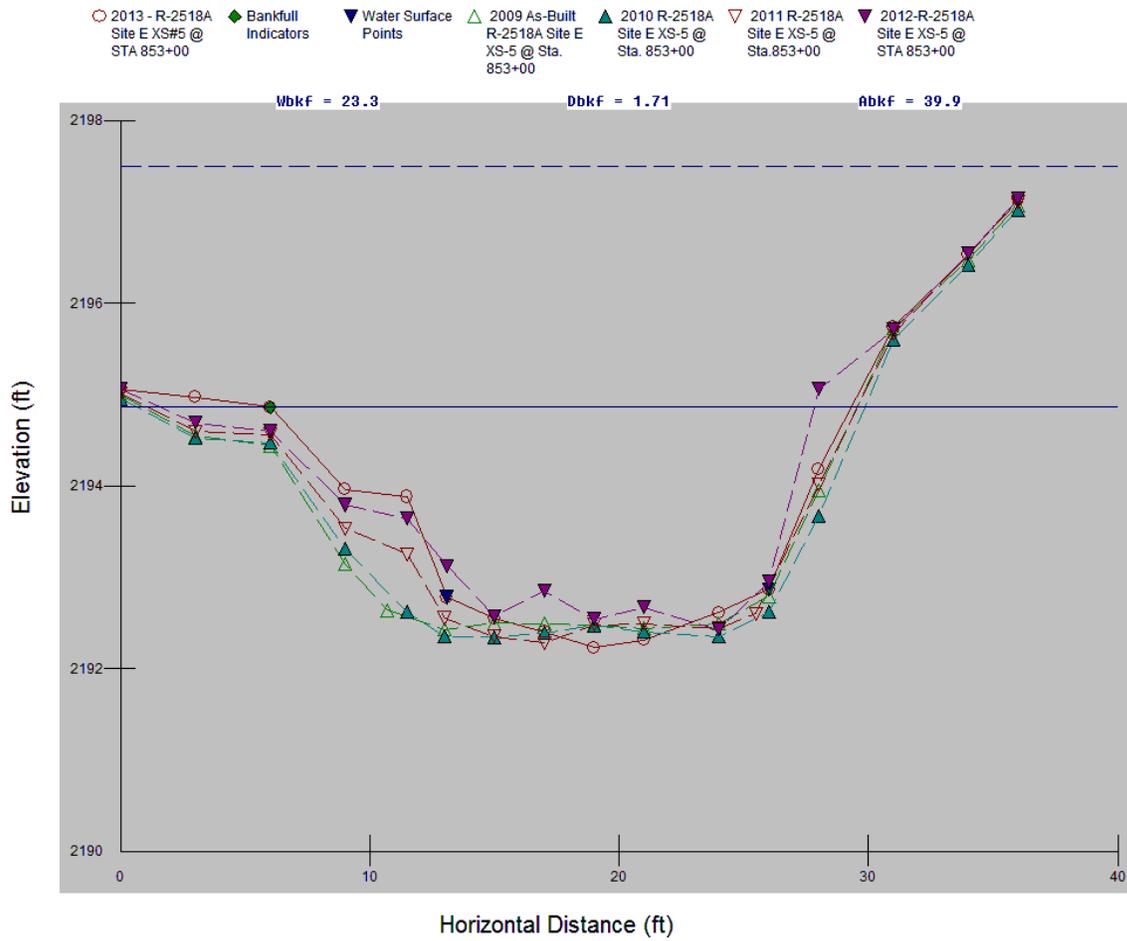
- 2013 - R-2518A Site E XS#4 @ STA 805+00
- ◆ Bankfull Indicators
- ▼ Water Surface Points
- △ 2009 As-Built R-2518A Site E XS-4 @ Sta. 805+00
- ▲ 2010 R-2518A Site E XS-4 @ Sta. 805+00
- ▽ 2011 R-2518A Site E XS-4 @ Sta. 805+00
- ▼ 2012-R-2518A Site E XS-4 @ STA 805+00



Site E: Cross-Section #4 (Pool) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	69.95	70.4	62.52	46.96	
Maximum Bankfull Depth (ft.)	4.24	4.53	4.58	3.5	
Bankfull Mean Depth (ft.)	2.37	2.43	2.12	2.23	
Bankfull Width (ft.)	29.53	28.92	29.45	21.1	

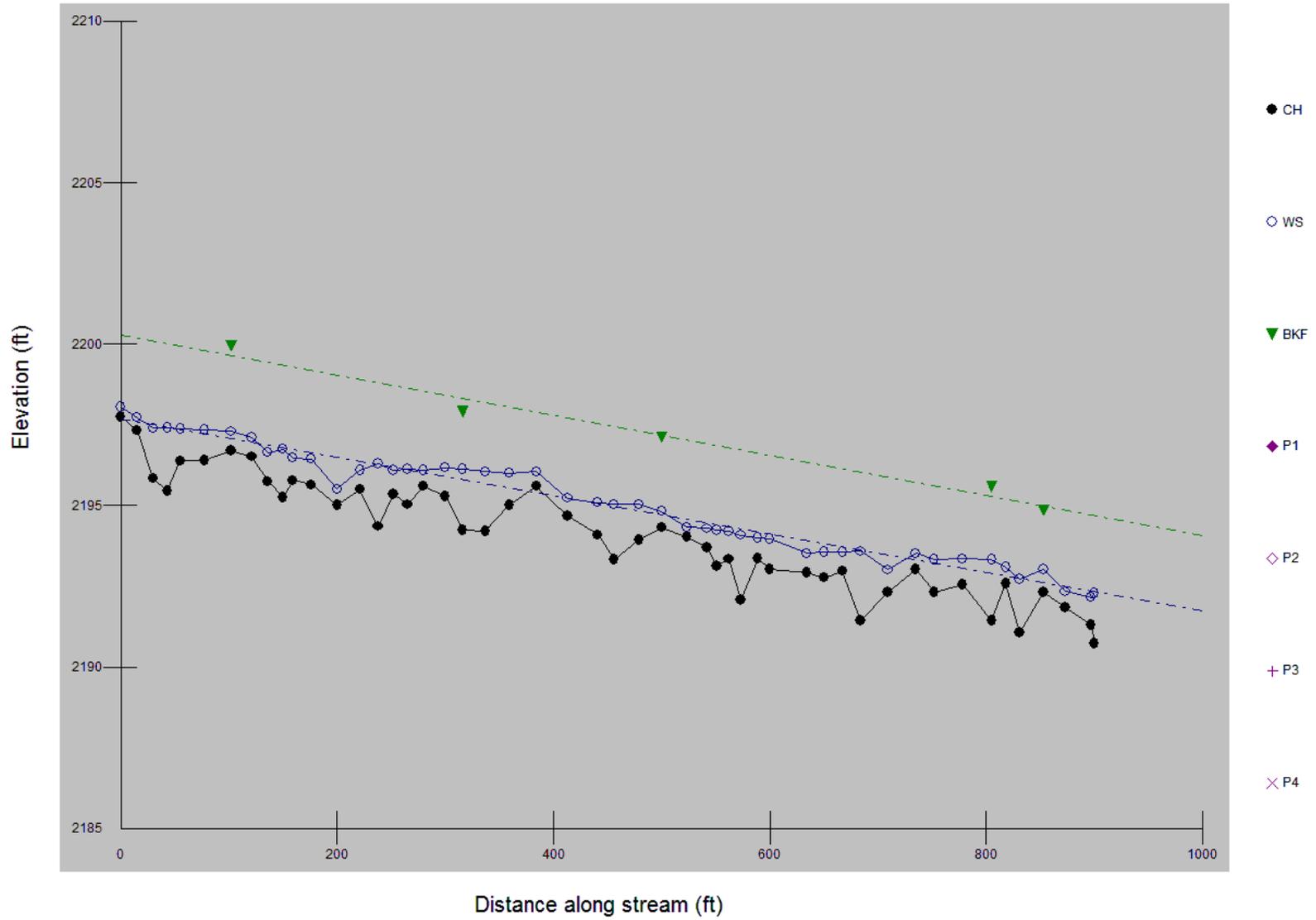
*According to the Rosgen Classification of Natural Rivers floodprone width, entrenchment ratio, and width depth ratio are not measured in pool, glide, or run features.

R-2518A Site E XS#5 @ STA 853+00



Site E: Cross-Section #5 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft ²)	38.49	36.94	31.55	39.91	
Maximum Bankfull Depth (ft.)	2.13	2.28	2.17	2.63	
Width of the Floodprone Area (ft.)	34.6	35.05	34.77	36	
Bankfull Mean Depth (ft.)	1.66	1.61	1.46	1.71	
Width/Depth Ratio	14	14.28	14.77	13.63	
Entrenchment Ratio	1.49	1.52	1.61	1.54	
Bankfull Width (ft.)	23.24	22.99	21.56	23.31	

2013 R-2518A Site E Profile



APPENDIX B
SITE PHOTOGRAPHS

Middle Fork Creek Site E



Photo Point #1 (Upstream)



Photo Point #1 (Downstream)



Photo Point #2 (Upstream)



Photo Point #2 (Downstream)



Photo Point #3 (Upstream)
Left bank erosion @ long. profile Sta. 500+00
November 2013



Photo Point #3 (Downstream)

Middle Fork Creek Site E



Photo Point #4 (Upstream)



Photo Point #4 (Downstream)



Left bank erosion @ long. profile Sta. 395+00



Left bank erosion @ long. profile Sta. 720+00

November 2013

Middle Fork Creek Site E



Vegetation Overview Photo (Looking Upstream)



Vegetation Overview Photo (Looking Downstream)

August 2013

Middle Fork Creek Site E



Vegetation Overview Photo (Right Buffer)

August 2013