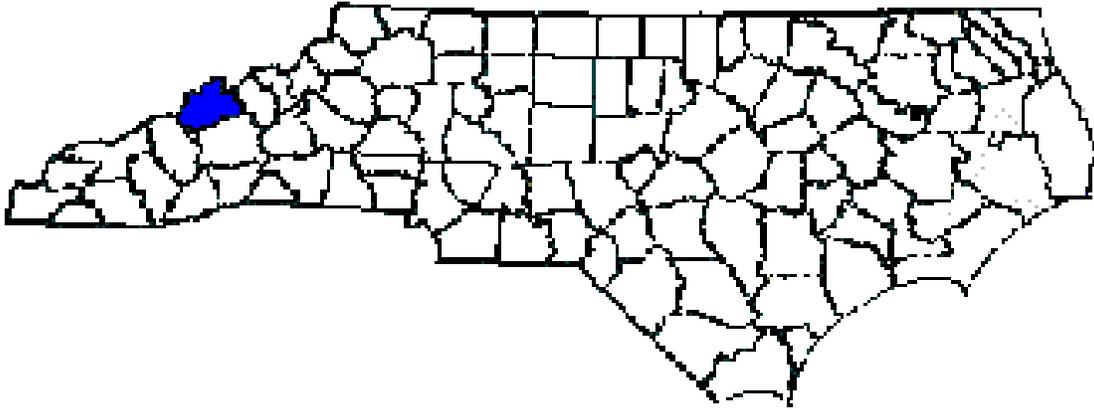


# ANNUAL REPORT FOR 2012



**Holland Creek Site M Mitigation Site**  
**Madison County**  
**TIP No. R-2518A**  
**COE Action ID: SAW-2007-2197-357/300**  
**DWQ #: 20071134**



Prepared By:  
Natural Environment Section & Roadside Environmental Unit  
North Carolina Department of Transportation  
December 2012

# 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: .....	5
.1 Success Criteria .....	5
.2 Stream Description.....	5
.2.1 Post Construction Conditions.....	5
.2.2 Monitoring Conditions .....	5
.3 Results of Stream Assessment .....	6
.3.1 Site Data .....	6
3.0 VEGETATION .....	7
.1 Description of Species.....	7
.2 Results of Vegetation Monitoring.....	7
.3 Conclusions .....	7
4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS .....	7
5.0 REFERENCES: .....	8

## FIGURES

Figure 1 – Vicinity Map .....	3
Figure 2 – Site M Map .....	4

## TABLES

Table 1 – Site M Morphological Summary .....	6
--	---

## 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 2012 at the Holland Creek Site M Mitigation Site in Madison County. The North Carolina Department of Transportation (NCDOT) completed this project and water was turned in December 2008. This report provides the monitoring results for the third formal year of monitoring (Year 2012). The Year 2012 monitoring period was the third of five scheduled years of monitoring on the Holland Creek Site M Mitigation Site (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring at the Holland Creek Site M, it has met the required monitoring protocols for the third formal year of monitoring on the stream but has not met the required monitoring protocols for the first formal year of monitoring on the planted vegetation. The channel throughout the stream restoration site is stable at this time. The streambank and buffer area were planted in March 2012 with live stakes and bareroot seedlings. The planted vegetation has a limited number of trees surviving. NCDOT plans to complete a supplemental planting at the site by March 2013. NCDOT will continue stream monitoring at the Holland Creek Site M Mitigation Site in 2013.

## 1.0 INTRODUCTION

### 1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during the Year 2012 at the Holland Creek Site M Mitigation Site. Site M is located on US 19 in Madison County at Sta. 81+80 to 82+20 Lt. and Sta. 81+30 Rt. –L- (Figure 1). The Holland Creek Site M 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 276 linear feet of stream restoration. Construction was completed and water was turned in December 2008 by the NCDOT. Stream restoration involved installing several in-stream cross vane structures and planting the riparian buffer zone.

### 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 2012 at the Holland Creek Site M Mitigation Site. Hydrologic monitoring was not required for this site.

### 1.3 Project History

December 2008	Construction Completed
December 2008	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)

### 1.4 Debit Ledger

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

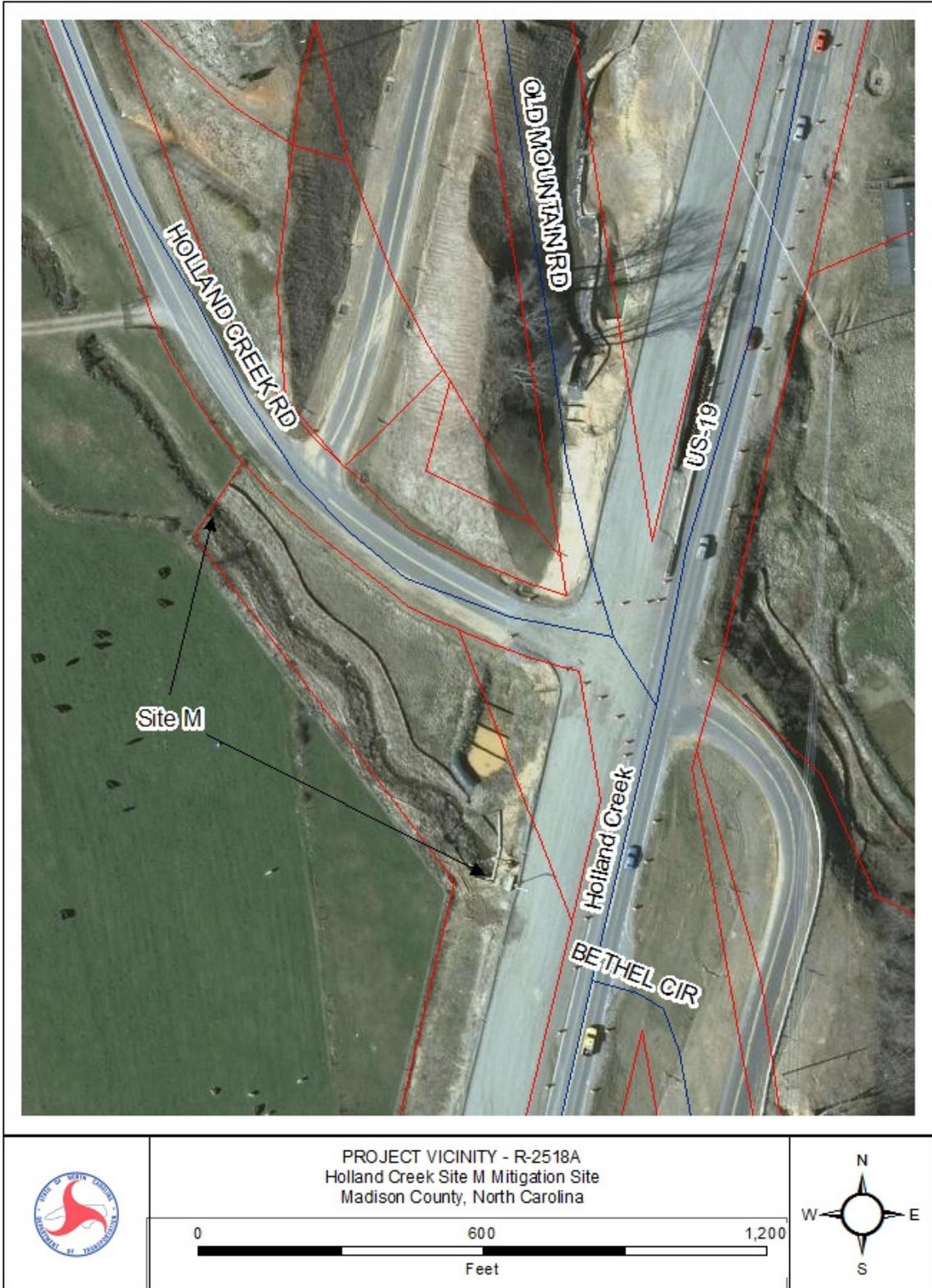
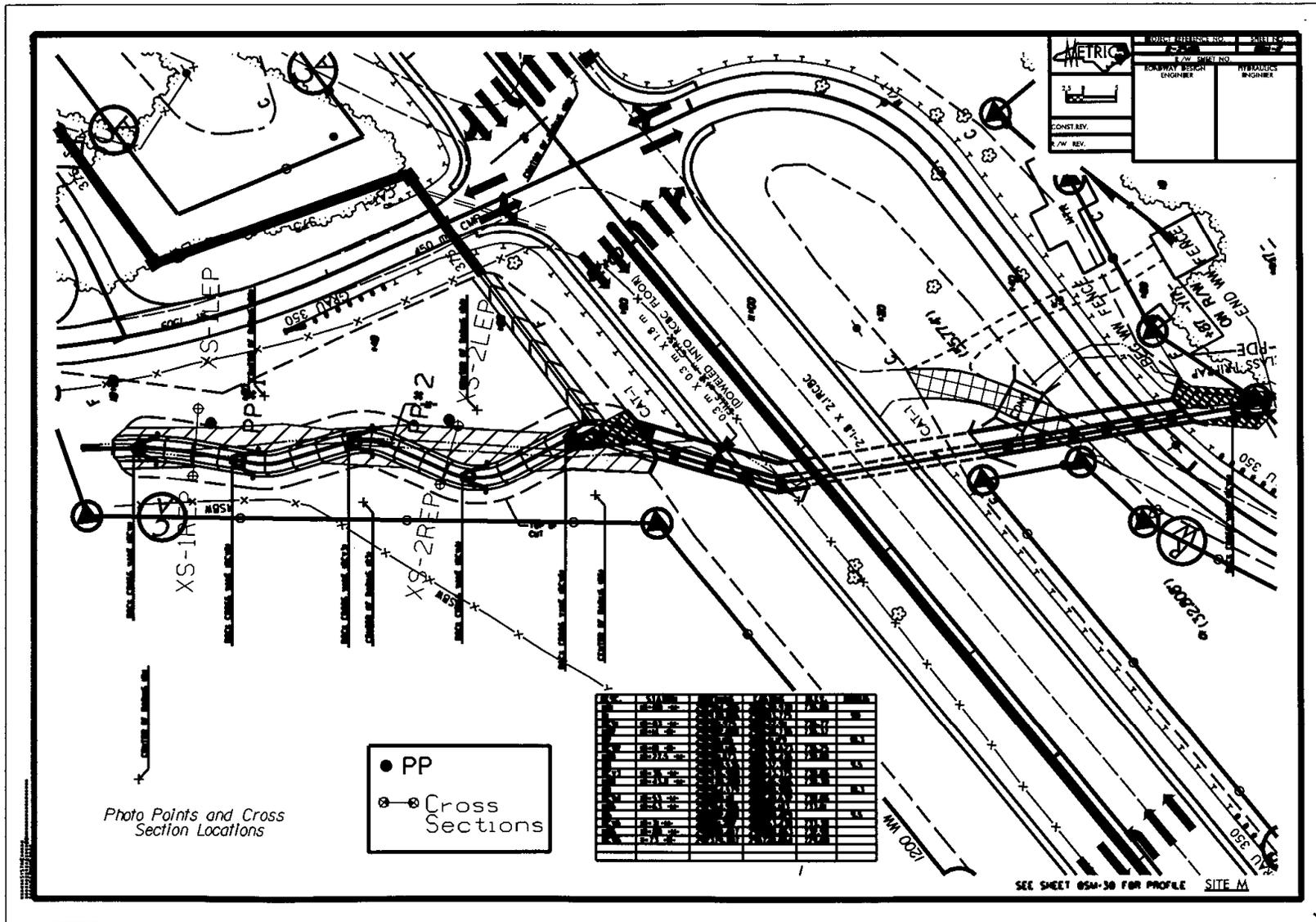


Figure 1. Vicinity Map



r2518a\_pdea\_psh17\_as-built.dgn 12/21/2010 9:46:02 AM

Figure 2. Site M 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 DWQ in a final report within sixty (60) days after completing monitoring. After 5 years the NCDOT shall contact the DWQ to schedule a site visit to "close out" the mitigation site.

### **2.2 Stream Description**

#### ***2.2.1 Post-Construction Conditions***

The restoration/relocation of the Holland Creek Site M Mitigation Site involved installing several in-stream cross vane structures and planting the riparian buffer zone.

#### ***2.2.2 Monitoring Conditions***

The objective of the Holland Creek Site M stream restoration was to restore a B4c stream as identified in Rosgen's Applied River Morphology. A total of two cross sections (one in a riffle and one 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 M).

**Table 1. Abbreviated Morphological Summary (Holland Creek Site M)**

Variable	Proposed	Cross-Section #1 (Riffle)				
		2010	2011	2012	2013	2014
Drainage Area (mi <sup>2</sup> )	1.3	1.3	1.3	1.3		
Bankfull Cross Sectional Area (ft <sup>2</sup> )	14.02	13.82	9.46	10.61		
Maximum Bankfull Depth (ft.)	1.3 – 1.6	1.59	1.27	1.84		
Width of the Floodprone Area (ft.)	22	21.42	18.84	23.17		
Bankfull Mean Depth (ft.)	1.08	1.04	0.77	0.82		
Width/Depth Ratio	12	12.73	16.03	15.73		
Entrenchment Ratio	1.7	1.62	1.53	1.8		
Bankfull Width (ft.)	13.0	13.24	12.34	12.9		

\* 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 two cross sections and the longitudinal profile of the Holland Creek Site M established by NCDOT after construction. The length of the profile along the Holland Creek Site M was approximately 300 linear feet. Two 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.

Holland Creek Site M Cross-Sections:

- ◆ Cross-Section #1: Holland Creek Site M, Station 62+00, midpoint of riffle
- ◆ Cross-Section #2: Holland Creek Site M, Station 198+50, midpoint of pool

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. 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 was stable for the 2012 monitoring evaluation. Pebble counts were not required per the permit conditions and therefore were not completed.

### **3.0 VEGETATION: HOLLAND CREEK SITE M**

#### **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 1 vegetation monitoring evaluation noted: Type I: Black Willow, Silky Dogwood and Type II: Sycamore, Green Ash, and Tulip Poplar were surviving with limited numbers at the time of monitoring evaluation.

#### **3.3 Conclusions**

NCDOT plans to complete a supplemental planting at the site by March 2013. NCDOT will continue to monitor the planted vegetation in 2013.

### **4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS**

The Holland Creek Site M Mitigation Site has met the required monitoring protocols for the third formal year of monitoring on the stream but has not met the required monitoring protocols for the first formal year of monitoring on the planted vegetation. The channel throughout the stream restoration site is stable. NCDOT plans to complete a supplemental planting by March 2013 to increase plant survivability. NCDOT will continue monitoring the Holland Creek Site M Mitigation Site in 2013.

## 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 DWQ Project No. 20071134, Individual Certification No.  
3706).

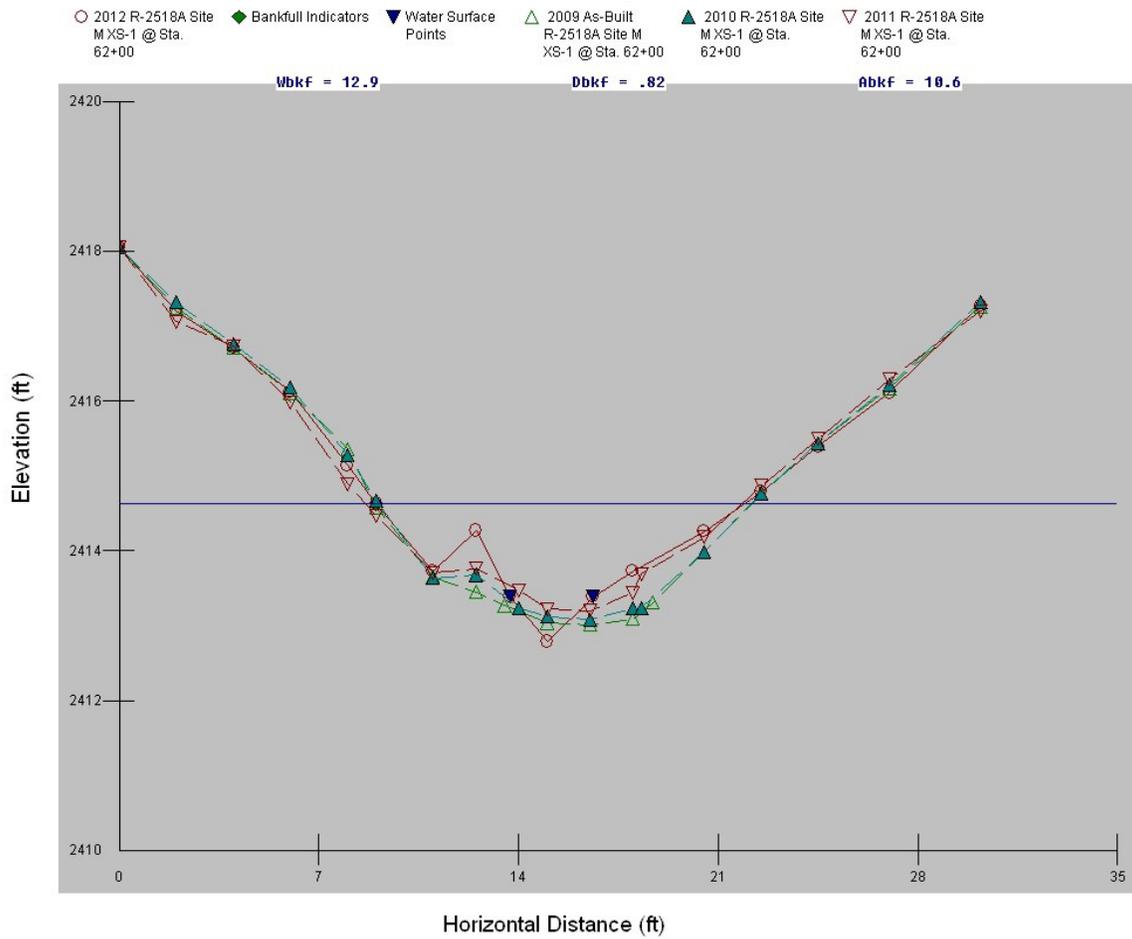
Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa  
Springs, Colorado.

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 Quality.

## **APPENDIX A**

### **CROSS SECTIONS AND LONGITUDINAL PROFILE**

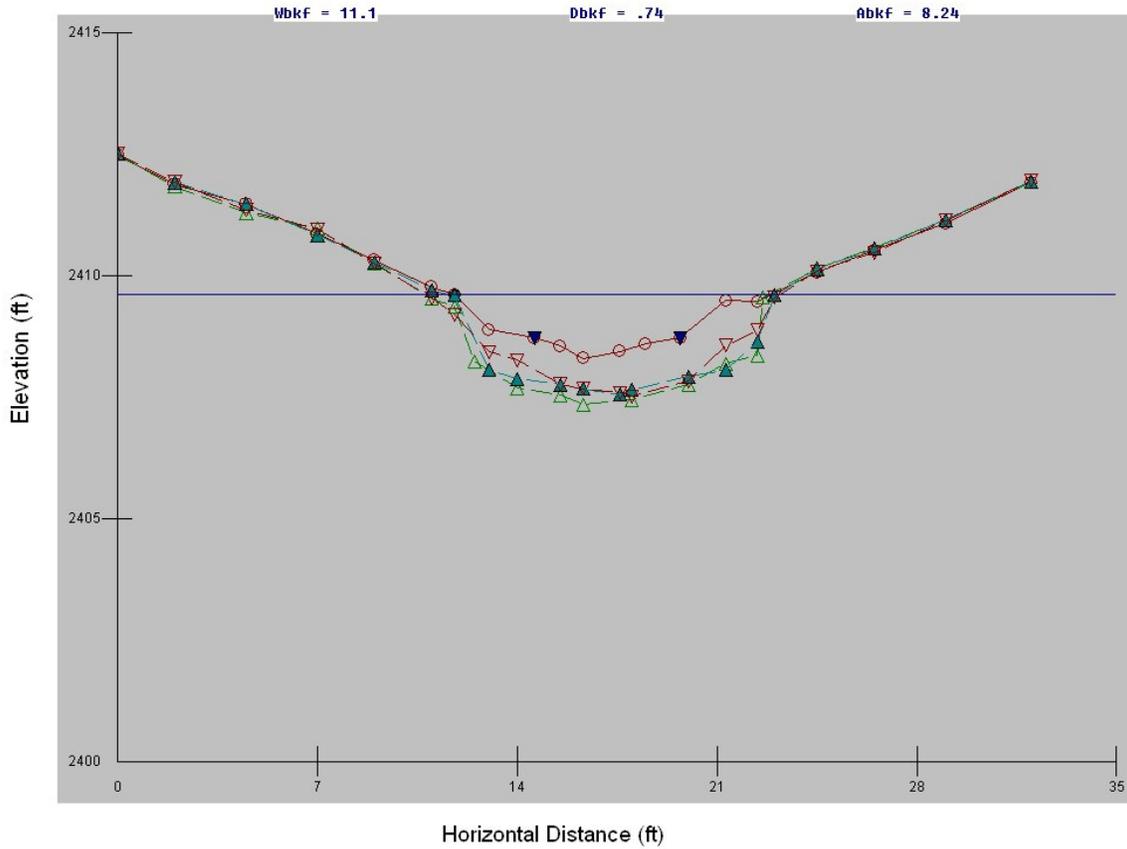
### R-2518A Site M XS-1 @ Sta. 62+00



Site M: Cross-Section #1 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	13.82	9.46	10.61		
Maximum Bankfull Depth (ft.)	1.59	1.27	1.84		
Width of the Floodprone Area (ft.)	21.42	18.84	23.17		
Bankfull Mean Depth (ft.)	1.04	0.77	0.82		
Width/Depth Ratio	12.73	16.03	15.73		
Entrenchment Ratio	1.62	1.53	1.8		
Bankfull Width (ft.)	13.24	12.34	12.9		

### R-2518A Site M XS-2 @ Sta. 198+50

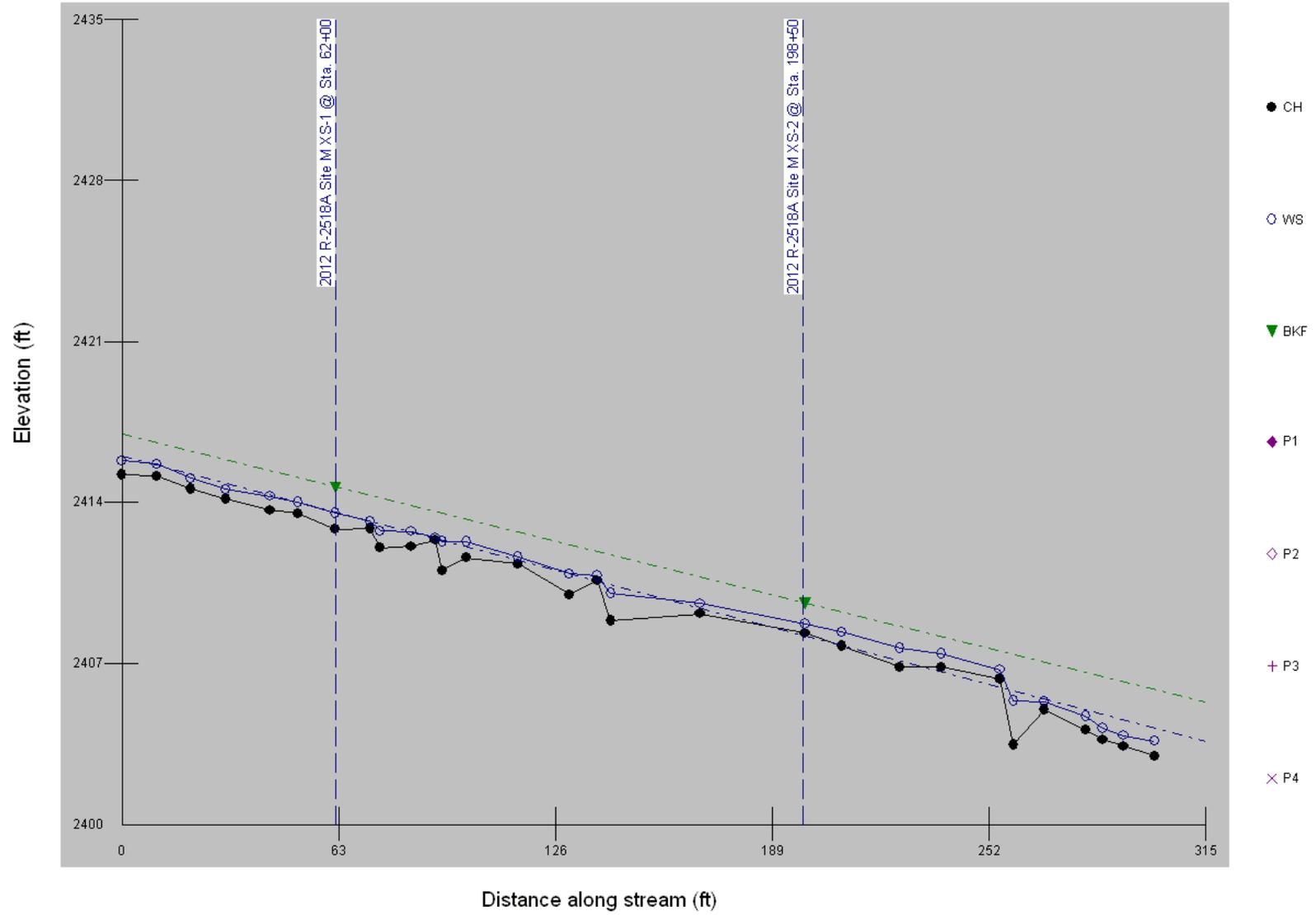
○ 2012 R-2518A Site M XS-2 @ Sta. 198+50    
 ◆ Bankfull Indicators    
 ▼ Water Surface Points    
 △ 2009 As-Built R-2518A Site M XS-2 @ Sta. 198+50    
 ▲ 2010 R-2518A Site M XS-2 @ Sta. 198+50    
 ▽ 2011 R-2518A Site M XS-2 @ Sta. 198+50



Site M: Cross-Section #2 (Pool) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
<b>Bankfull Cross Sectional Area (ft<sup>2</sup>)</b>	17.46	15.98	8.24		
<b>Maximum Bankfull Depth (ft.)</b>	2.04	2.03	1.31		
<b>Bankfull Mean Depth (ft.)</b>	1.56	1.33	0.74		
<b>Bankfull Width (ft.)</b>	11.2	12.06	11.09		

\*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 M Profile



**APPENDIX B**  
**SITE PHOTOGRAPHS**

# Holland Creek Site M



Photo Point #1 (Upstream)



Photo Point #1 (Downstream)



Photo Point #2 (Upstream)



Photo Point #2 (Downstream)

November 2012

# Holland Creek Site M



Vegetation Overview Photo

September 2012