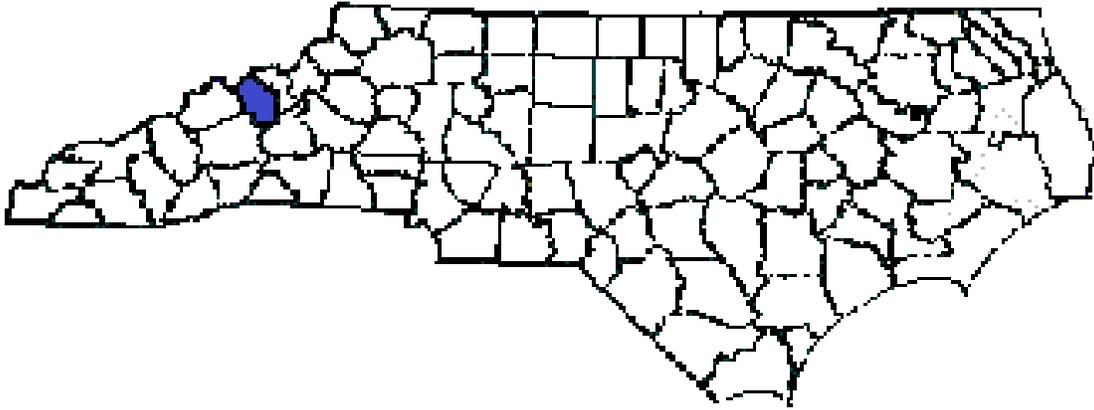


# ANNUAL REPORT FOR 2015



**Plum Branch Tributary Site #32 Mitigation Site  
Yancey County  
TIP No. R-2519A  
COE Action ID: SAW-2007-2197-357/300  
DWR #: 2007-1134V.4**



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North Carolina Department of Transportation  
December 2015

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## **SUMMARY**

The following report summarizes the stream monitoring activities that have occurred during the Year 2015 at the Plum Branch Tributary Site #32 Mitigation Site in Yancey County. The North Carolina Department of Transportation (NCDOT) completed this project in the spring of 2014. This report provides the monitoring results for the second formal year of monitoring (Year 2015). The Year 2015 monitoring period was the second of five scheduled years of monitoring on the Plum Branch Tributary Site #32 Mitigation Site (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring at the Plum Branch Tributary Site #32, it has met the required monitoring protocols for the second formal year of monitoring on the stream and the first formal year of monitoring on the planted vegetation. The channel throughout the stream site is stable at this time, except for, a headcut and bank scouring that were noted at longitudinal profile Sta. 140+00 and Sta. 179+00, respectively. NCDOT plans to repair this area in the future. The streambank and buffer area were planted in March 2015. Only the upper half of the streambank reforestation was completed due to the stream repairs that are scheduled to be made. NCDOT will complete the streambank reforestation once stream repairs are made.

NCDOT will continue stream and vegetation monitoring at the Plum Branch Tributary Site #32 Mitigation Site in 2016.

## 1.0 INTRODUCTION

### 1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during the Year 2015 at the Plum Branch Tributary Site #32 Mitigation Site. Site #32 is located at the intersection of US 19 and Griffith Mine Road in Yancey County at Sta. 9+86 to 10+40 -Y33- Rt. (Figure 1). The Plum Branch Tributary Site #32 was constructed to provide mitigation for stream impacts associated with Transportation Improvement Program (TIP) number R-2519A in Yancey County.

The mitigation site provided approximately 210 linear feet of stream restoration. Construction was completed during spring 2014 by the NCDOT. The restoration of the Plum Branch Tributary Site #32 Mitigation Site involved backfilling the existing channel so the roadway could be extended. A new floodplain and channel were excavated and cross vanes were installed. The riparian buffer zone will also be planted.

### 1.2 Purpose

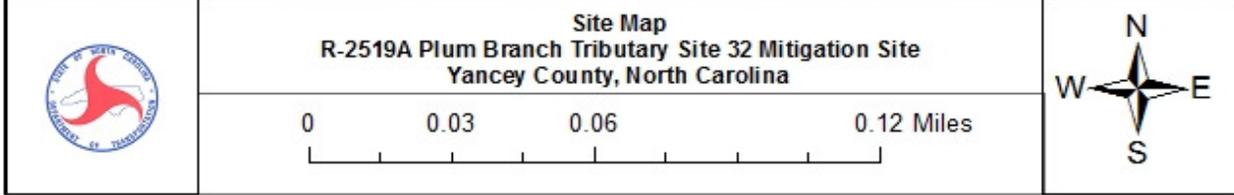
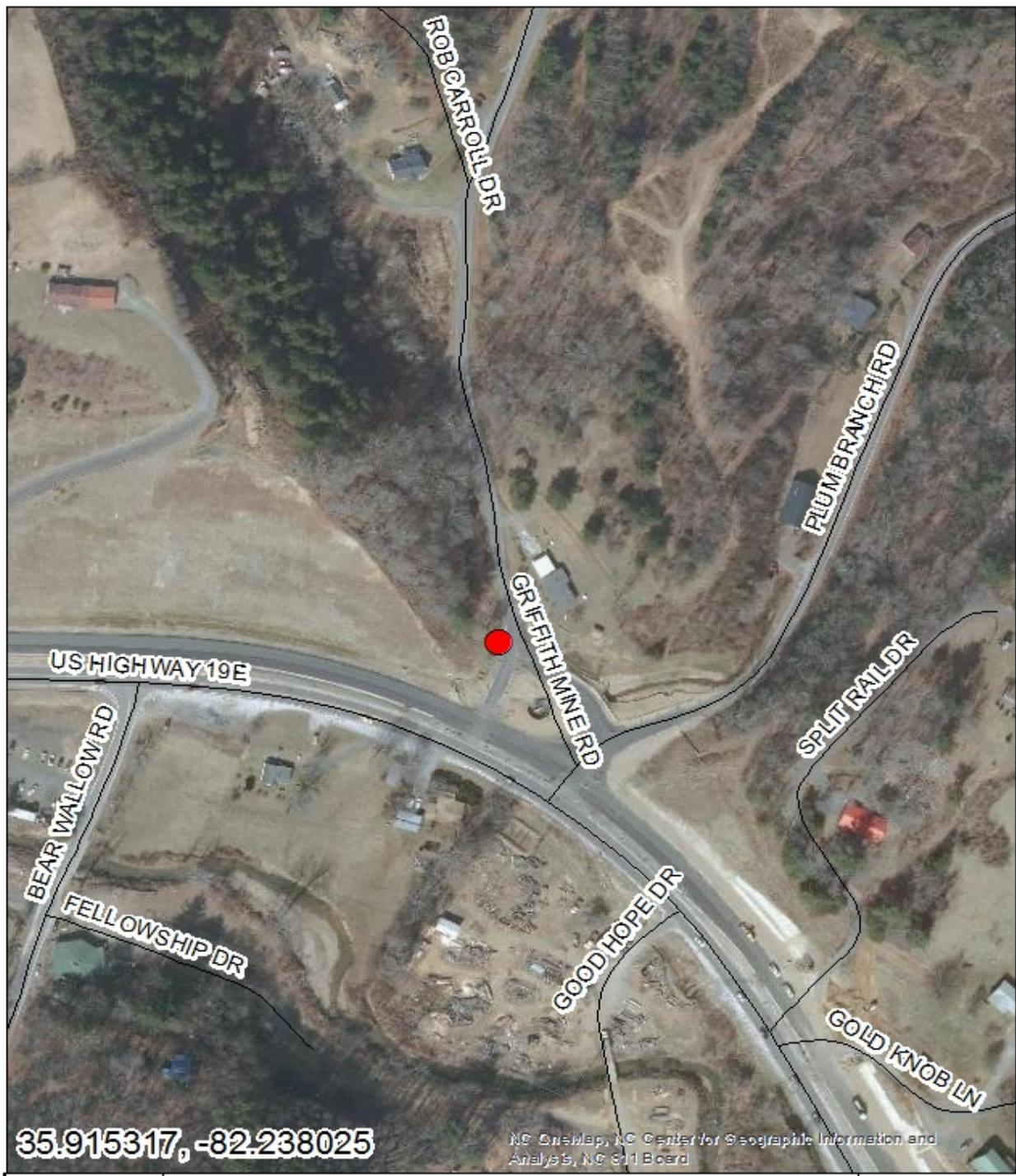
In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2015 at the Plum Branch Tributary Site #32 Mitigation Site. Hydrologic monitoring was not required for this site.

### 1.3 Project History

Spring 2014	Construction Completed
May 2014	Sprayed Japanese Knotweed
June 2014	As-Built Survey Completed
June 2014	Sprayed Japanese Knotweed
November 2014	Stream Channel Monitoring (Year 1)
March 2015	Upper Half of Site Planted
July 2015	Vegetation Monitoring (Year 1)
July 2015	Sprayed Japanese Knotweed
November 2015	Stream Channel Monitoring (Year 2)

### 1.4 Debit Ledger

The entire Plum Branch Tributary Site #32 stream mitigation site was used for the R-2519A project to compensate for unavoidable stream impacts.



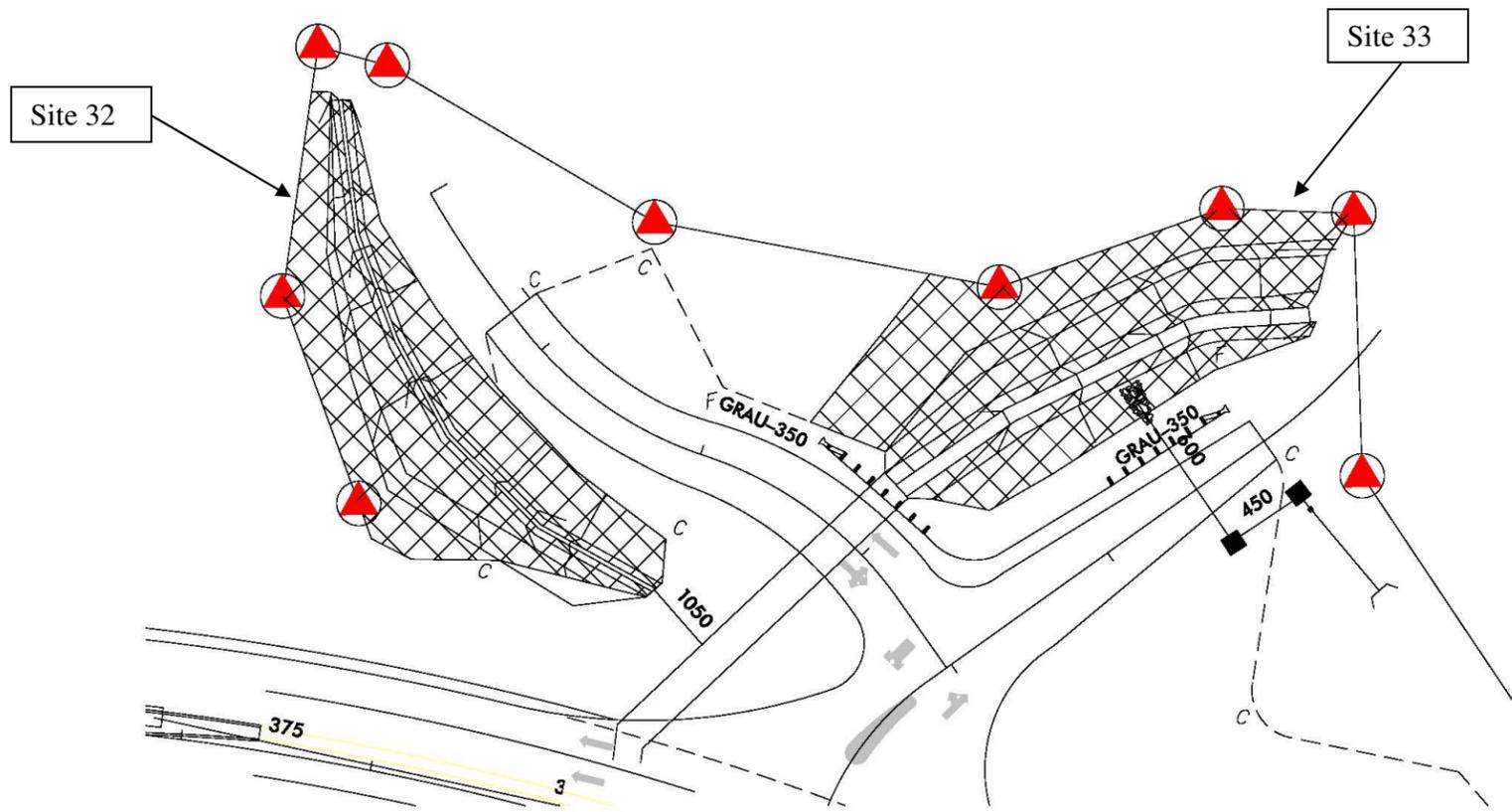
**Figure 1. Vicinity Map**



# 0.16 HECTARE STREAMBANK REFORESTATION



PROJECT REFERENCE NO. R-25/9A	SHEET NO. EC-99/CONST-34
R/W SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER



SEE RF-2, RF-3 AND PROJECT SPECIAL PROVISIONS

Figure 3. Site #32 Reforestation Plan

## **2.0 STREAM ASSESSMENT**

### **2.1 Success Criteria**

The permittee shall monitor the stream relocation sites following the Level 1 protocols outlined in the Stream Mitigation Guidelines date 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 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 Plum Branch Tributary Site #32 Mitigation Site involved backfilling the existing channel so the roadway could be extended. A new floodplain and channel were excavated and cross vanes were installed. The riparian buffer zone was also planted.

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

The objective of the Plum Branch Tributary Site #32 stream restoration was to restore a B4 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 #32).

**Table 1. Abbreviated Morphological Summary (Site #32 – Plum Branch Tributary Mitigation Site)**

Variable	Proposed	Cross-Section #1 (Riffle)				
		2014	2015	2016	2017	2018
Drainage Area (mi <sup>2</sup> )	0.17	0.17	0.17			
Bankfull Cross Sectional Area (ft <sup>2</sup> )	3.88	4.36	2.98			
Maximum Bankfull Depth (ft.)	1	1.23	1.05			
Width of the Floodprone Area (ft.)	12 – 30	30	30			
Bankfull Mean Depth (ft.)	0.66	0.65	0.45			
Width/Depth Ratio	8.9	10.38	14.58			
Entrenchment Ratio	1.7 - 5.1	4.45	4.57			
Bankfull Width (ft.)	5.9	6.75	6.56			

\* 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 Plum Branch Tributary Site #32 Mitigation Site established by NCDOT after construction. The length of the profile along the Plum Branch Tributary Site #32 Mitigation Site was approximately 210 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.

Plum Branch Tributary Site #32 Cross-Sections:

- ◆ Cross-Section #1: Plum Branch Tributary Site #32, Station 85+00, midpoint of riffle
- ◆ Cross-Section #2: Plum Branch Tributary Site #32, Station 164+00, 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. Some sediment deposition was noted within the upstream portion of the site as seen in Cross Section #1. 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 had formed a headcut at longitudinal profile Sta. 140+00. The right bank at longitudinal profile Sta. 179+00 is scouring causing an undercut bank. NCDOT plans to repair the stream. Pebble counts were not required per the permit conditions and therefore were not completed. One bankfull event was documented visually by a noted wrack line at Site #32 during the 2014 monitoring year but none were visually noted in 2015.

### **3.0 VEGETATION: PLUM BRANCH TRIBUTARY SITE #32**

#### **3.1 Description of Species**

The following tree species were planted on the streambank:

*Salix sericea*, Silky 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 2015. Approximately half of the streambank reforestation was completed due to stream repairs scheduled to be made in the future. The Year 1 vegetation monitoring evaluation noted Type I: Silky Willow and Silky Dogwood and Type II: Green Ash and Tulip Poplar were surviving at the time of the monitoring evaluation. Majority of the northeast buffer had been mowed after planting took place.

#### **3.3 Conclusions**

NCDOT will replant the entire site after the stream repairs are made. NCDOT will also sign the perimeter of the site to prevent further encroachments.

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

The Plum Branch Tributary Site #32 Mitigation Site has met the required monitoring protocols for the second formal year of monitoring on the stream and the first formal year of monitoring on the planted vegetation. A headcut and bank scouring that were noted will be repaired in the future. NCDOT will replant the site once stream repairs are made.

NCDOT will continue stream and vegetation monitoring the Plum Branch Tributary Site #32 Mitigation Site in 2016.

## 5.0 REFERENCES

R-2519A, US 19 from East of SR 1336 (Jacks Creek Road) to SR 1186 (Old US 19), Yancey County, Division 13: Natural Stream Design For: Site 32, Plum Branch Tributary Sta. 9+86 to 10+40 -Y33- Rt.

Permit Mod. R-2519A, Yancey County from SR 1336 (Jacks Creek Road) to SR 1186 (Old US 19) west of Micaville, Action ID No. SAW-2007-2197-357/300 and DWQ Project No. 2007-1134V.4, February 4, 2010

As-Built Report for Stream Relocations on R-2519A, Yancey County, TIP Project No. R-2519A, USACE Permit No. 2007-2197-357/300, WQC#3706, DWQ Project #20071134V.4

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

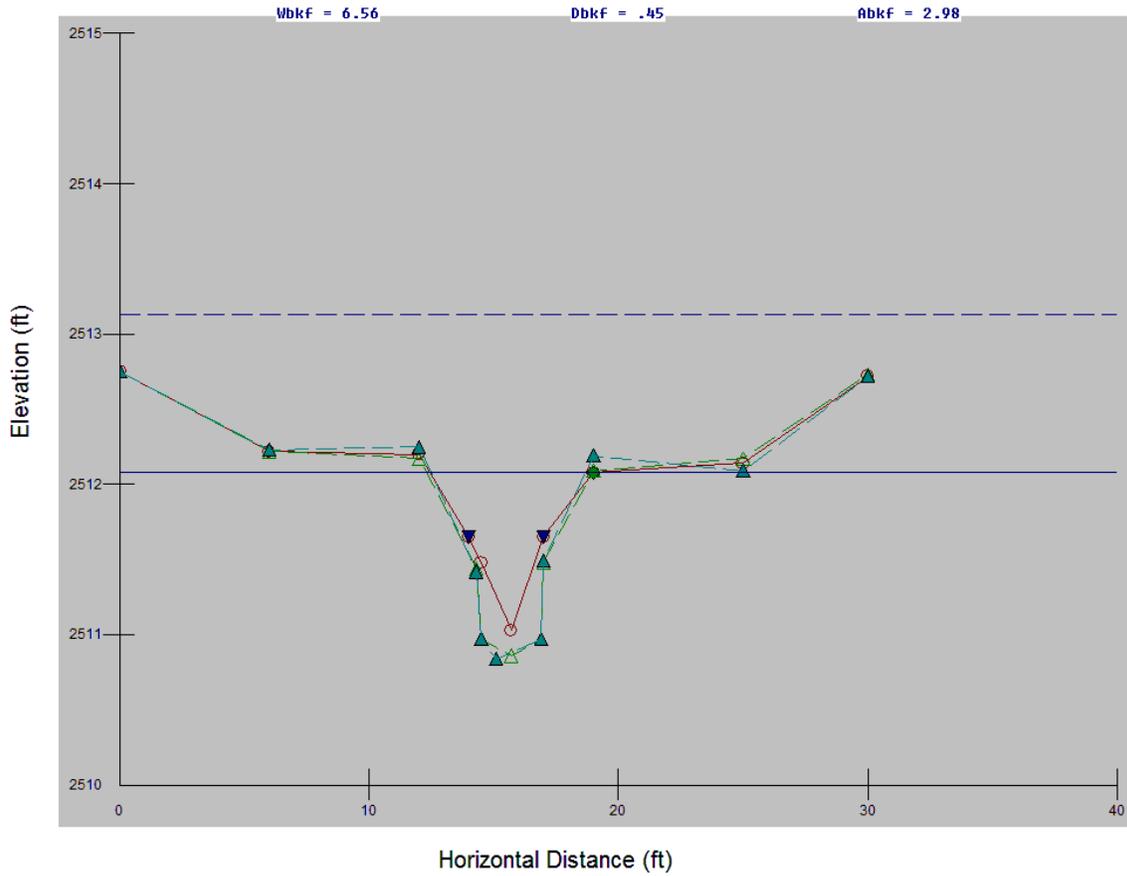
US Army Corps of Engineers (USACE), 2003. Stream Mitigation Guidelines. Prepared with cooperation from the US Environmental Protection Agency, NC Wildlife Resources Commission, and the NC Division of Water Resources.

## **APPENDIX A**

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

### R-2519A Site 32 XS#1 @ STA 85+00

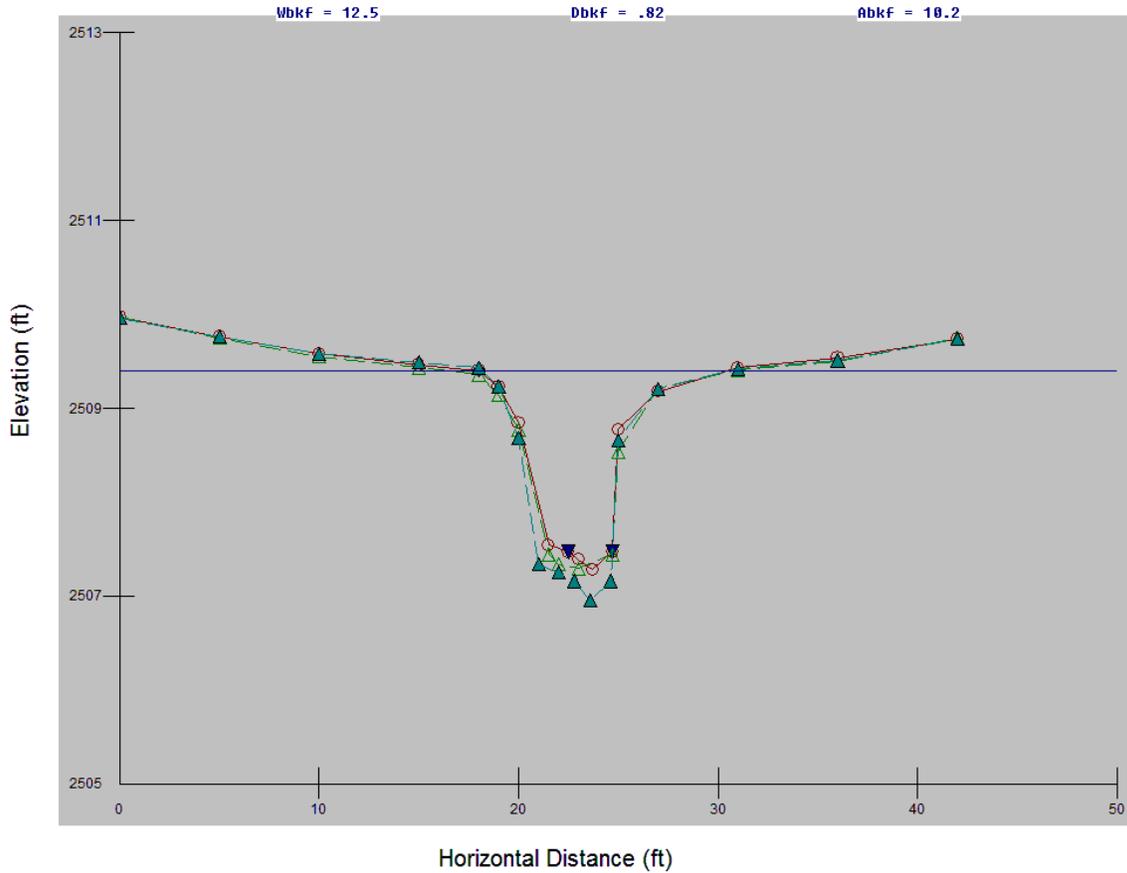
○ 2015 Year 2 R-2519A Site 32 XS#1 @ STA 85+00    
 ◆ Bankfull Indicators    
 ▼ Water Surface Points    
 △ 2014 Year 1 R-2519A Site 32 XS#1 @ Sta. 85+00    
 ▲ As Built XS#1 Riffle @ Sta. 85+00 Site 32



Site #32: Cross-Section #1 (Riffle) Abbreviated Morphological Summary					
	2014	2015	2016	2017	2018
Bankfull Cross Sectional Area (ft <sup>2</sup> )	4.36	2.98			
Maximum Bankfull Depth (ft.)	1.23	1.05			
Width of the Floodprone Area (ft.)	30	30			
Bankfull Mean Depth (ft.)	0.65	0.45			
Width/Depth Ratio	10.38	14.58			
Entrenchment Ratio	4.45	4.57			
Bankfull Width (ft.)	6.75	6.56			

### R-2519A Site 32 XS# 2 @ STA 164+00

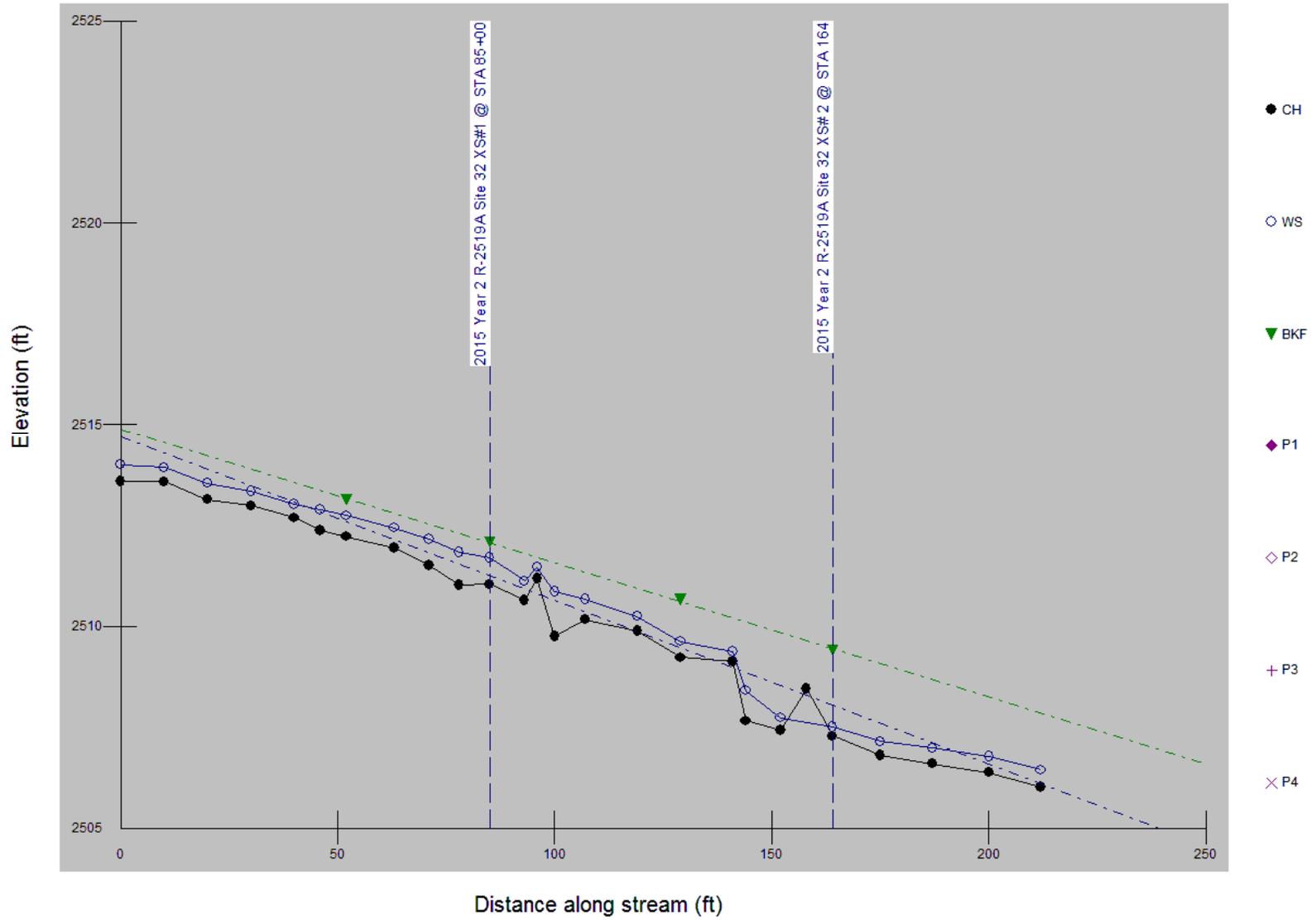
○ 2015 Year 2 R-2519A Site 32 XS# 2 @ STA 164  
◆ Bankfull Indicators  
▼ Water Surface Points  
△ 2014 Year 1 R-2519A Site 32 XS#2 @ Sta. 164+00  
▲ As Built XS#2 Pool @ Sta. 164+00 Site 32



Site #32: Cross-Section #2 (Pool) Abbreviated Morphological Summary					
	2014	2015	2016	2017	2018
Bankfull Cross Sectional Area (ft <sup>2</sup> )	10.43	10.22			
Maximum Bankfull Depth (ft.)	2.07	2.12			
Bankfull Mean Depth (ft.)	0.87	0.82			
Bankfull Width (ft.)	12	12.52			

\*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.

2015 Year 2 R-2519A Site 32 Profile



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

# Plum Branch Tributary Site #32



Photo Point #1 (Upstream)



Photo Point #1 (Downstream)



Photo Point #2 (Upstream)



Photo Point #2 (Downstream)

November 2015

# Plum Branch Tributary Site #32



Vegetation Overview Photo

July 2015