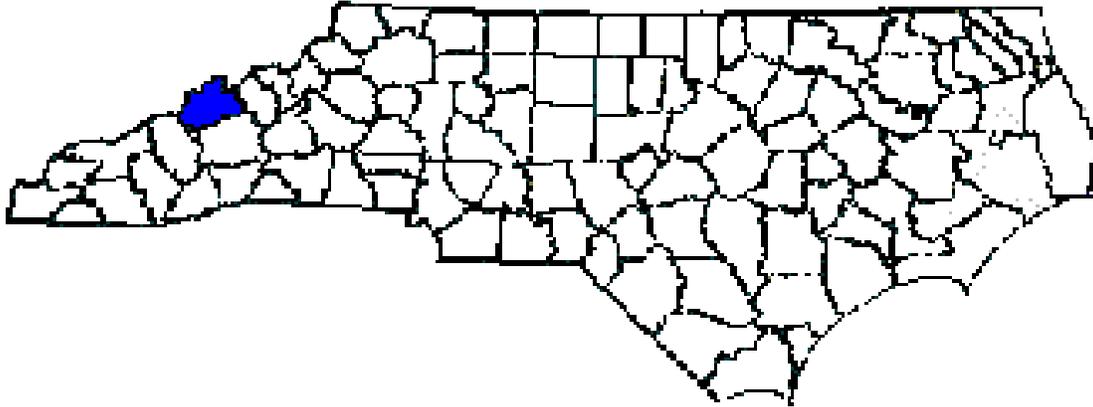


# ANNUAL REPORT FOR 2014



**Turkey Branch Site J 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  
December 2014

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## **SUMMARY**

The following report summarizes the stream monitoring activities that have occurred during the Year 2014 at the Turkey Branch Site J Mitigation Site in Madison County. The North Carolina Department of Transportation (NCDOT) completed this project in December 2008 and water was turned in June 2009. This report provides the monitoring results for the fifth formal year of monitoring (Year 2014). The Year 2014 monitoring period was the fifth of five scheduled years of monitoring on the Turkey Branch Site J Mitigation Site (See Success Criteria Section 2.1).

Based on the overall conclusions of monitoring at the Turkey Branch Site J, it has met the required monitoring protocols for the fifth formal year of monitoring on the stream and third formal year of monitoring on the planted vegetation. It was agreed by the Regulatory Agencies and NCDOT during the March 25, 2014 Annual Monitoring Meeting that the longitudinal profile could be discontinued for the remainder of the five year monitoring period due to heavy vegetation within the channel. In lieu of doing the longitudinal profile, visual inspection of the channel stability throughout the stream and photo documentation at the permanent photo point locations would be completed. All other monitoring activities will continue to be completed throughout the five year monitoring period. The channel throughout the stream relocation 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 is surviving at this time.

NCDOT proposes to discontinue stream monitoring but will continue vegetation monitoring at the Turkey Branch Site J Mitigation Site until 2016.

## 1.0 INTRODUCTION

### 1.1 Project Description

The following report summarizes the stream monitoring activities that have occurred during the Year 2014 at the Turkey Branch Site J Mitigation Site. Site J is located on US 19 in Madison County at Sta. 56+20 to 57+70 Rt. -L- (Figure 1). The Turkey Branch Site J 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 692 linear feet of stream relocation. Construction was completed during December 2008 and water was turned in June 2009 by the NCDOT. Stream relocation involved excavation of a new floodplain and channel, installing several in-stream cross vane structures and planting the riparian buffer zone.

### 1.2 Purpose

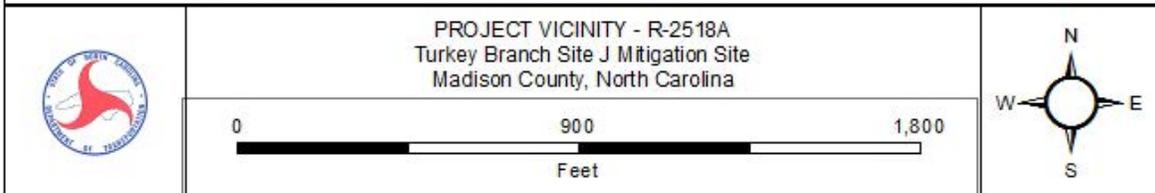
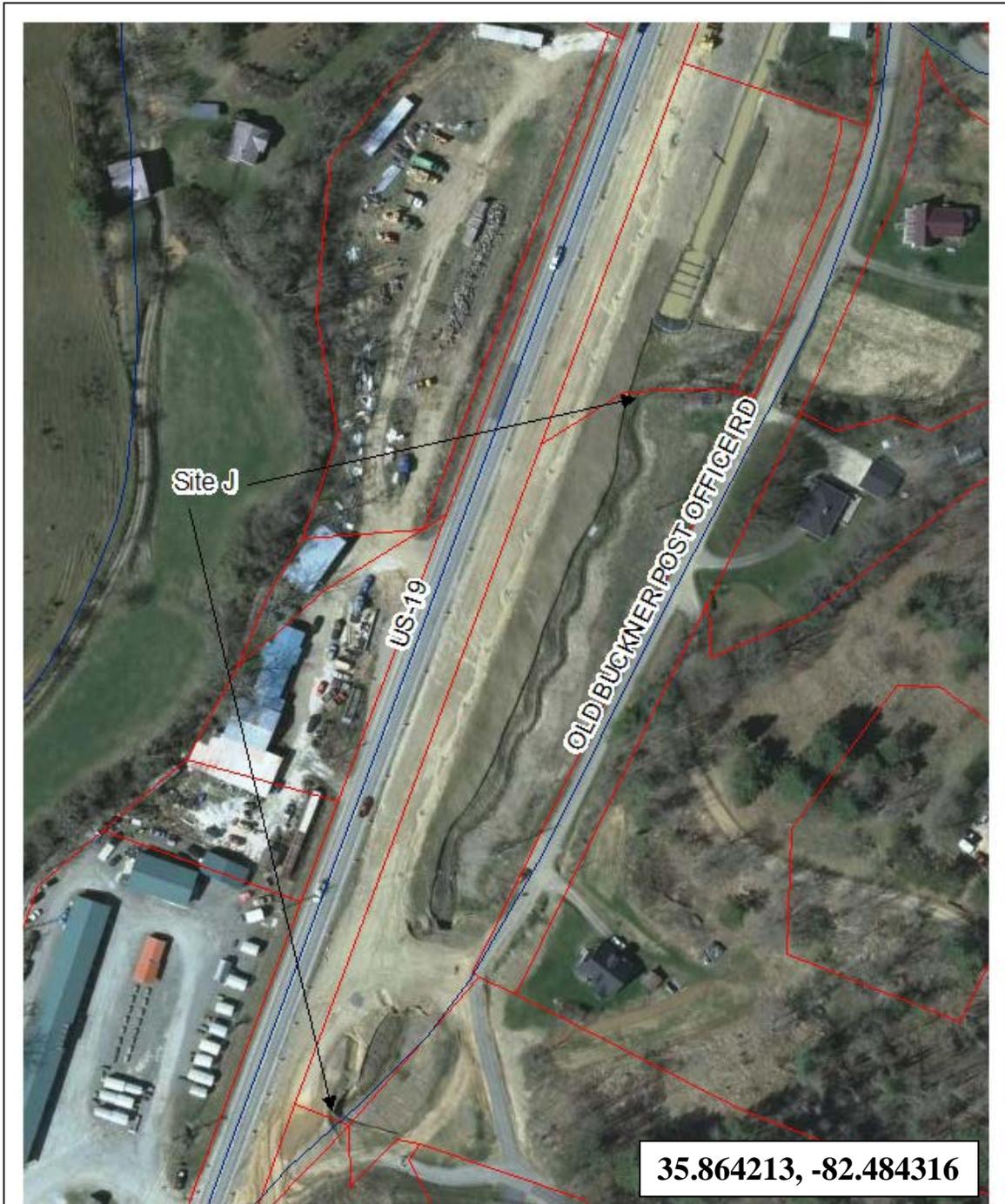
In order for a mitigation site to be considered successful, the site must meet the success criteria. This report details the monitoring in 2014 at the Turkey Branch Site J Mitigation Site. Hydrologic monitoring was not required for this site.

### 1.3 Project History

December 2008	Construction Completed
March 2009	Site Planted (Type I only)
June 2009	Water Turned Into Stream
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)
March 2013	Bankfull Monitoring Gauge Installed
August 2013	Vegetation Monitoring (Year 2)
November 2013	Stream Channel Monitoring (Year 4)
July 2014	Vegetation Monitoring (Year 3)
November 2014	Stream Channel Monitoring (Year 5)

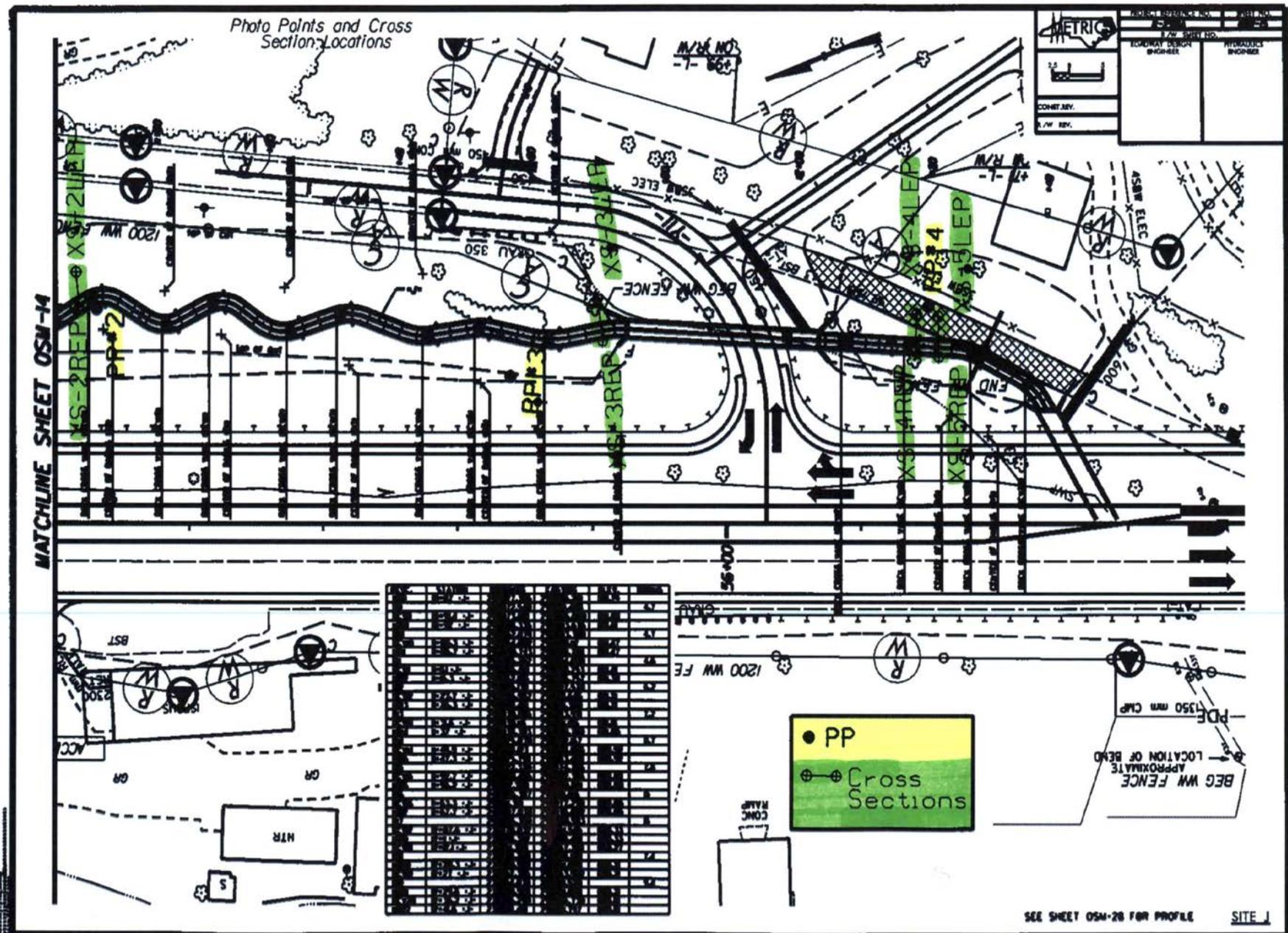
### 1.4 Debit Ledger

The entire Turkey Branch Site J stream mitigation site was used for the R-2518A project to compensate for unavoidable stream impacts.

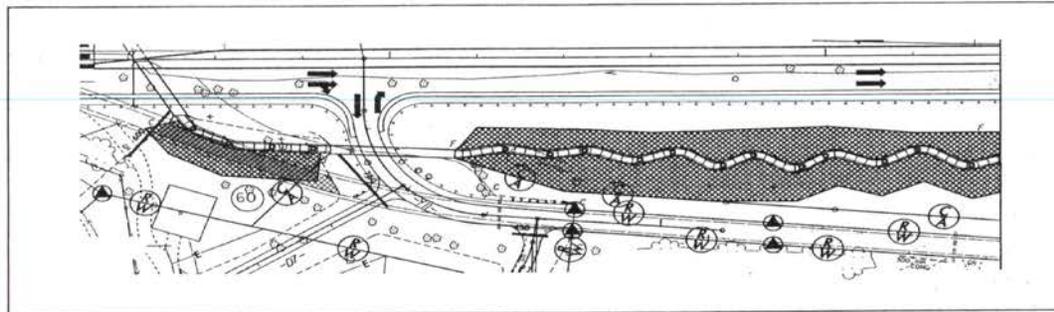


**Figure 1. Vicinity Map**





## 0.22 HECTARE STREAMBANK REFORESTATION



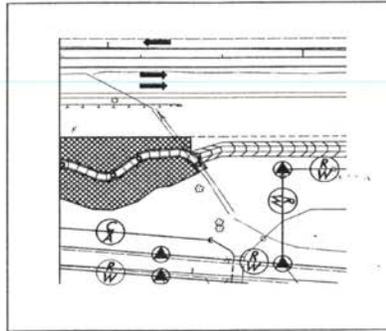
SEE RF-2, RF-3 AND PROJECT SPECIAL PROVISIONS

Figure 4. Site J Reforestation Map



PROJECT REFERENCE NO.	SHEET NO.
11-0100A	11-72 (CONV) #
2 OF SHEET NO.	
ROADWAY DESIGN ENGINEER	HYDRAULICS ENGINEER

## 0.05 HECTARE STREAMBANK REFORESTATION



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

Figure 5. Site J Reforestation 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 relocation of the Turkey Branch Site J Mitigation Site involved excavation of a new floodplain and channel, installing several in-stream cross vane structures and planting the riparian buffer zone.

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

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

**Table 1. Abbreviated Morphological Summary (Turkey Branch Site J)**

Variable	Proposed	Cross-Section #1 (Riffle)	Cross-Section #3 (Riffle)	Cross-Section #4 (Riffle)	Min. – Max Values (Riffle Sections Only)
		2014	2014	2014	2014
Drainage Area (mi <sup>2</sup> )	0.37	0.37	0.37	0.37	0.37
Bankfull Cross Sectional Area (ft <sup>2</sup> )	5.71	0.8	5.96	5.04	0.8 – 5.96
Maximum Bankfull Depth (ft.)	0.83 – 1.04	0.84	1.28	1.18	0.84 – 1.28
Width of the Floodprone Area (ft.)	14	16	16.53	16.11	16 – 16.53
Bankfull Mean Depth (ft.)	0.69	0.19	0.67	0.49	0.19 – 0.67
Width/Depth Ratio	12	21.63	13.39	20.92	13.39 – 21.63
Entrenchment Ratio	1.7	3.89	1.84	1.57	1.57 – 3.89
Bankfull Width (ft.)	8.3	4.11	8.97	10.25	4.11 – 10.25

\* 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 Turkey Branch Site J established by NCDOT after construction. The length of the profile along the Turkey Branch Site J was approximately 600 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.

Turkey Branch Site J Cross-Sections:

- ◆ Cross-Section #1: Turkey Branch Site J, Station 53+07, midpoint of riffle
- ◆ Cross-Section #2: Turkey Branch Site J, Station 297+00, midpoint of pool
- ◆ Cross-Section #3: Turkey Branch Site J, Station 567+00, midpoint of riffle
- ◆ Cross-Section #4: Turkey Branch Site J, Station 737+00, midpoint of riffle
- ◆ Cross-Section #5: Turkey Branch Site J, Station 748+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. 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.

It was agreed by the Regulatory Agencies and NCDOT during the March 25, 2014 Annual Monitoring Meeting that the longitudinal profile could be discontinued for the remainder of the five year monitoring period due to heavy vegetation within the channel. In lieu of doing the longitudinal profile, visual inspection of the channel stability throughout the stream and photo documentation at the permanent photo point locations would be completed. All other monitoring activities will continue to be completed throughout the five year monitoring period. Photo Point 1 showed an extensive growth of herbaceous and woody vegetation. Cross Section #1 continues to show aggradation within this area but this area remains stable. The channel bed is stable throughout the stream site at this time. Pebble counts were not required per the permit conditions and therefore were not completed. A beaver dam was noted downstream of Cross Section #5. USDA has been contacted to remove the beavers and dams from Site J. Two bankfull events were documented by a surface water gauge at Site J during the 2014 monitoring year.

### **3.0 VEGETATION: TURKEY BRANCH SITE J**

#### **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 3 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. The powerline easement was noted during the 2014 monitoring evaluation as having been sprayed.

#### **3.3 Conclusions**

NCDOT will continue to monitor the planted vegetation in 2015.

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

The Turkey Branch Site J Mitigation Site has met the required monitoring protocols for the fifth formal year of monitoring on the stream and the third formal year of monitoring on the planted vegetation. The channel throughout the stream site is stable and the planted vegetation is surviving at this time. NCDOT proposes to discontinue stream monitoring but will continue vegetation monitoring at the Turkey Branch Site J Mitigation Site until 2016.

## 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).

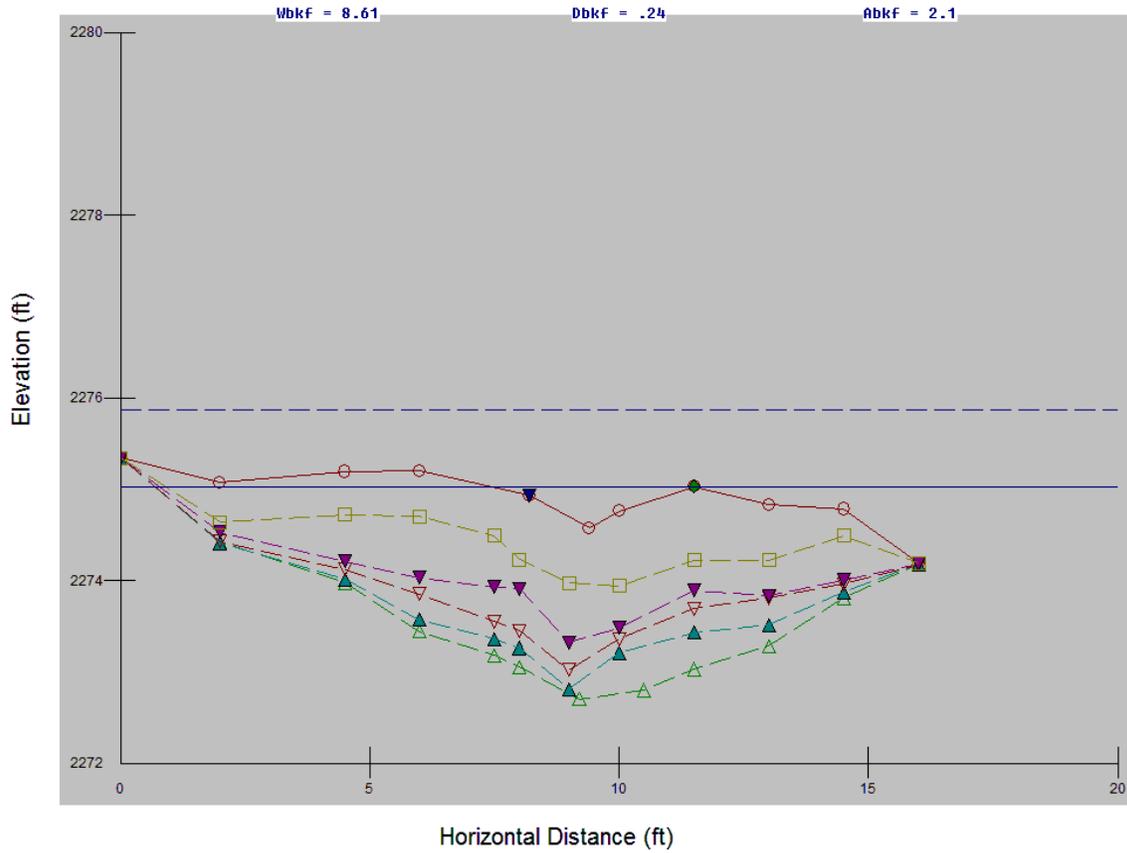
Rosgen, D.L, 1996. Applied River Morphology. Wildland Hydrology, Pagosa  
Springs, Colorado.

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**

### R-2518A Site J XS#1 @ STA 53+07

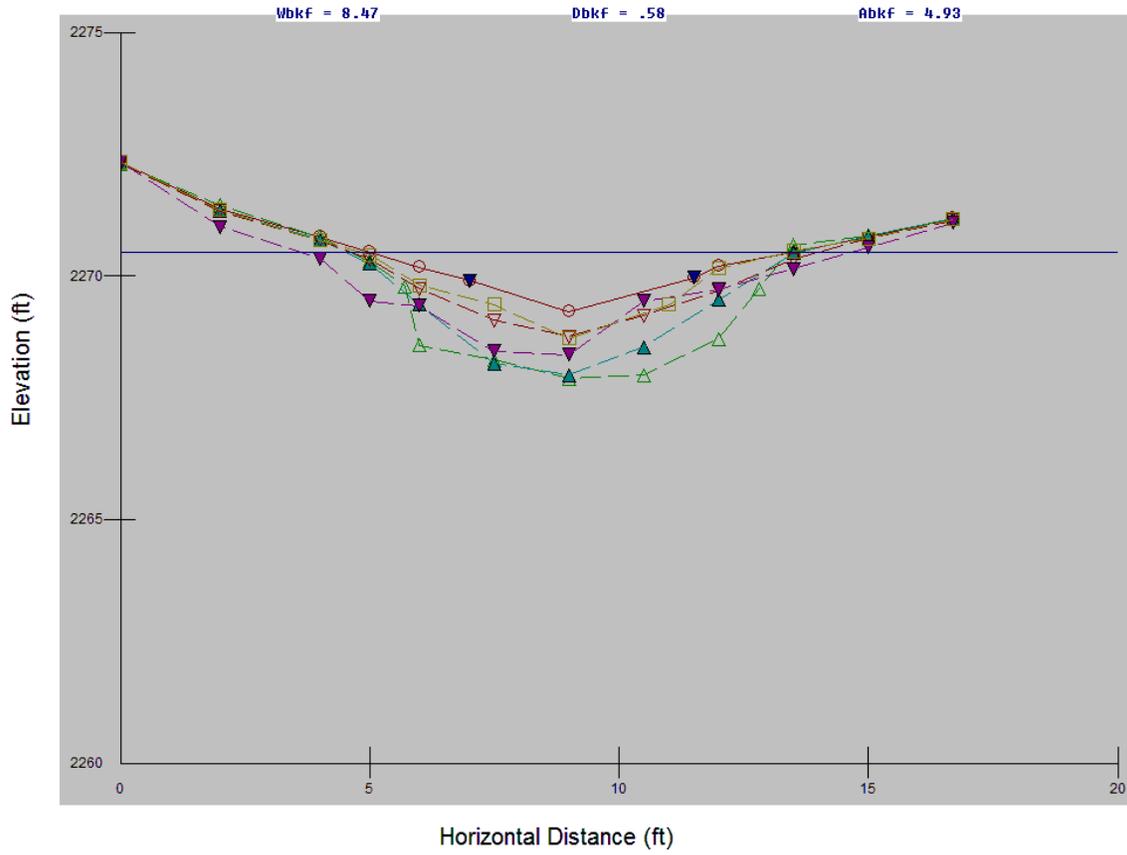
- 2014 - R-2518A Site J XS#1 @ STA 53+07
- ◆ Bankfull Indicators
- ▼ Water Surface Points
- △ 2009 As-Built R-2518A Site J XS-1 @ Sta. 53+07
- ▲ 2010 R-2518A Site J XS-1 @ Sta. 53+07
- ▽ 2011 R-2518A Site J XS-1 @ Sta. 53+07
- ▼ 2012 - R-2518A Site J XS-1 @ Sta. 53+07
- 2013 - R-2518A Site J XS#1 @ STA 53+07



Site J: Cross-Section #1 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	5.84	1.35	1.07	0.6	0.8
Maximum Bankfull Depth (ft.)	1.2	0.67	0.57	0.28	0.84
Width of the Floodprone Area (ft.)	15.72	13.44	13.45	8.57	16
Bankfull Mean Depth (ft.)	0.55	0.29	0.31	0.17	0.19
Width/Depth Ratio	19.42	16.21	11.19	21.24	21.63
Entrenchment Ratio	1.47	2.86	3.88	2.37	3.89
Bankfull Width (ft.)	10.68	4.7	3.47	3.61	4.11

### R-2518A Site J XS#2 @ STA 297+00

- 2014 - R-2518A Site J XS#2 @ STA 297+00
- ◆ Bankfull Indicators
- ▼ Water Surface Points
- △ 2009 As-Built R-2518A Site J XS-2 @ Sta. 297+00
- ▲ 2010 R-2518A Site J XS-2 @ Sta. 297+00
- ▽ 2011 R-2518A Site J XS-2 @ Sta. 297+00
- ▼ 2012 - R-2518A Site J XS-2 @ Sta. 297+00
- 2013 - R-2518A Site J XS#2 @ STA 297+00

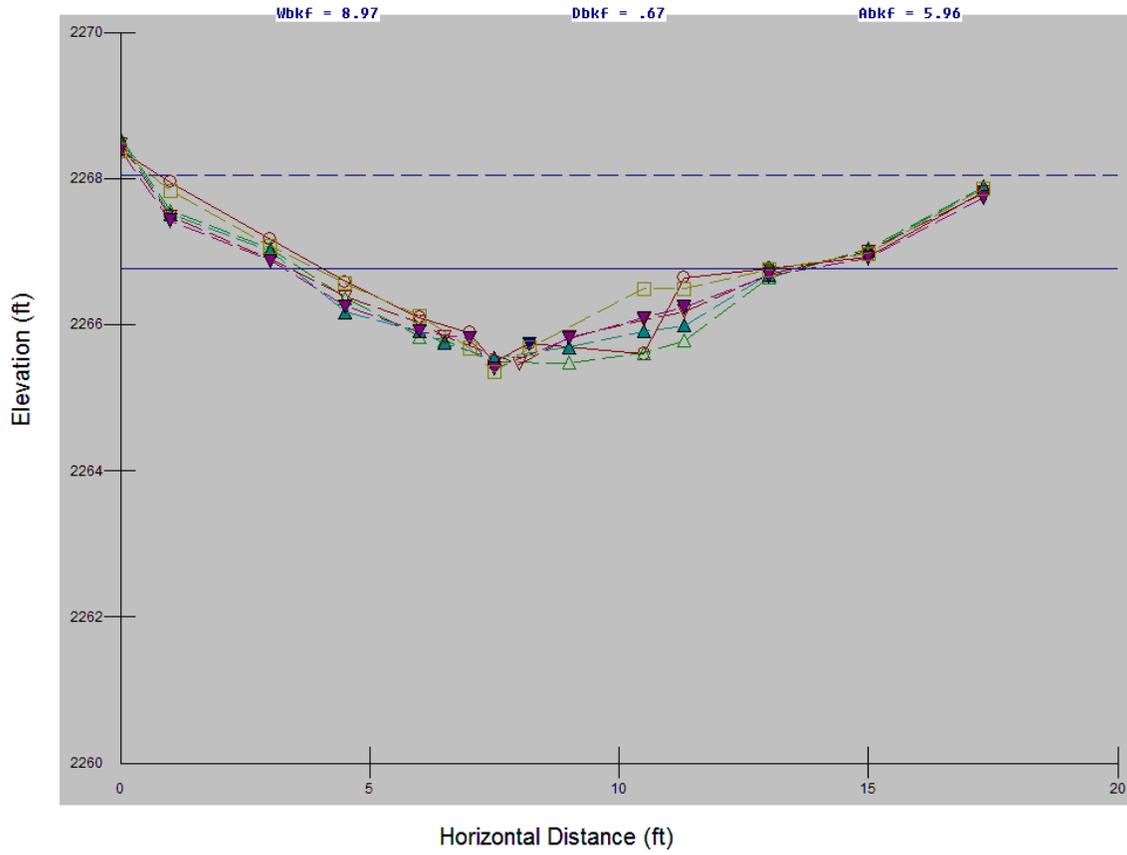


Site J: Cross-Section #2 (Pool) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	12.96	7.63	8.29	7.77	4.93
Maximum Bankfull Depth (ft.)	2.51	1.57	1.76	1.79	1.21
Bankfull Mean Depth (ft.)	1.45	0.9	0.9	0.89	0.58
Bankfull Width (ft.)	8.95	8.48	9.25	8.77	8.47

\*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 J XS#3 @ STA 567+00

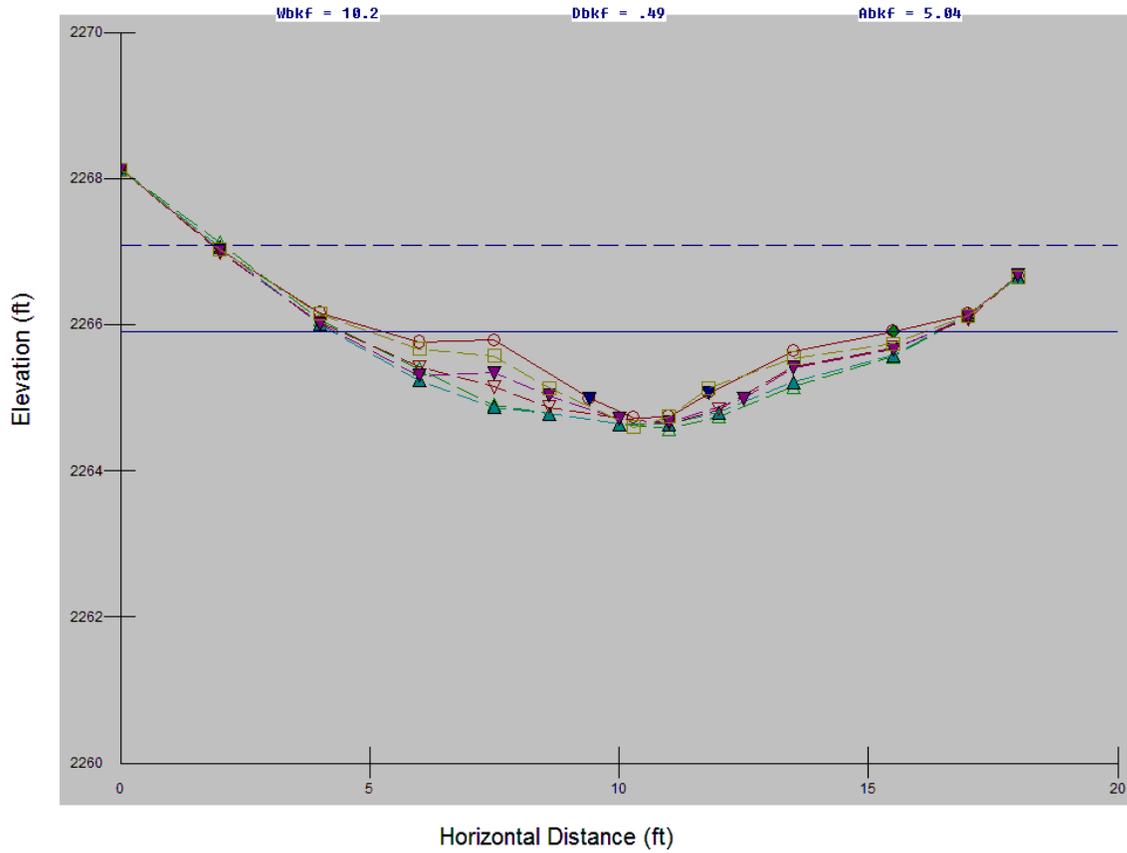
- 2014 - R-2518A Site J XS#3 @ STA 567+00
- ◆ Bankfull Indicators
- ▼ Water Surface Points
- △ 2009 As-Built R-2518A Site J XS-3 @ Sta. 567+00
- ▲ 2010 R-2518A Site J XS-3 @ Sta. 567+00
- ▽ 2011 R-2518A Site J XS-3 @ Sta. 567+00
- ▼ 2012 - R-2518A Site J XS-3 @ Sta. 567+00
- 2013 - R-2518A Site J XS#3 @ STA 567+00



Site J: Cross-Section #3 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	6.74	5.84	5.89	4.96	5.96
Maximum Bankfull Depth (ft.)	1.14	1.23	1.27	1.4	1.28
Width of the Floodprone Area (ft.)	16.42	16.74	16.84	16.88	16.53
Bankfull Mean Depth (ft.)	0.72	0.62	0.62	0.55	0.67
Width/Depth Ratio	13.07	15.18	15.35	16.47	13.39
Entrenchment Ratio	1.75	1.78	1.77	1.86	1.84
Bankfull Width (ft.)	9.41	9.41	9.52	9.06	8.97

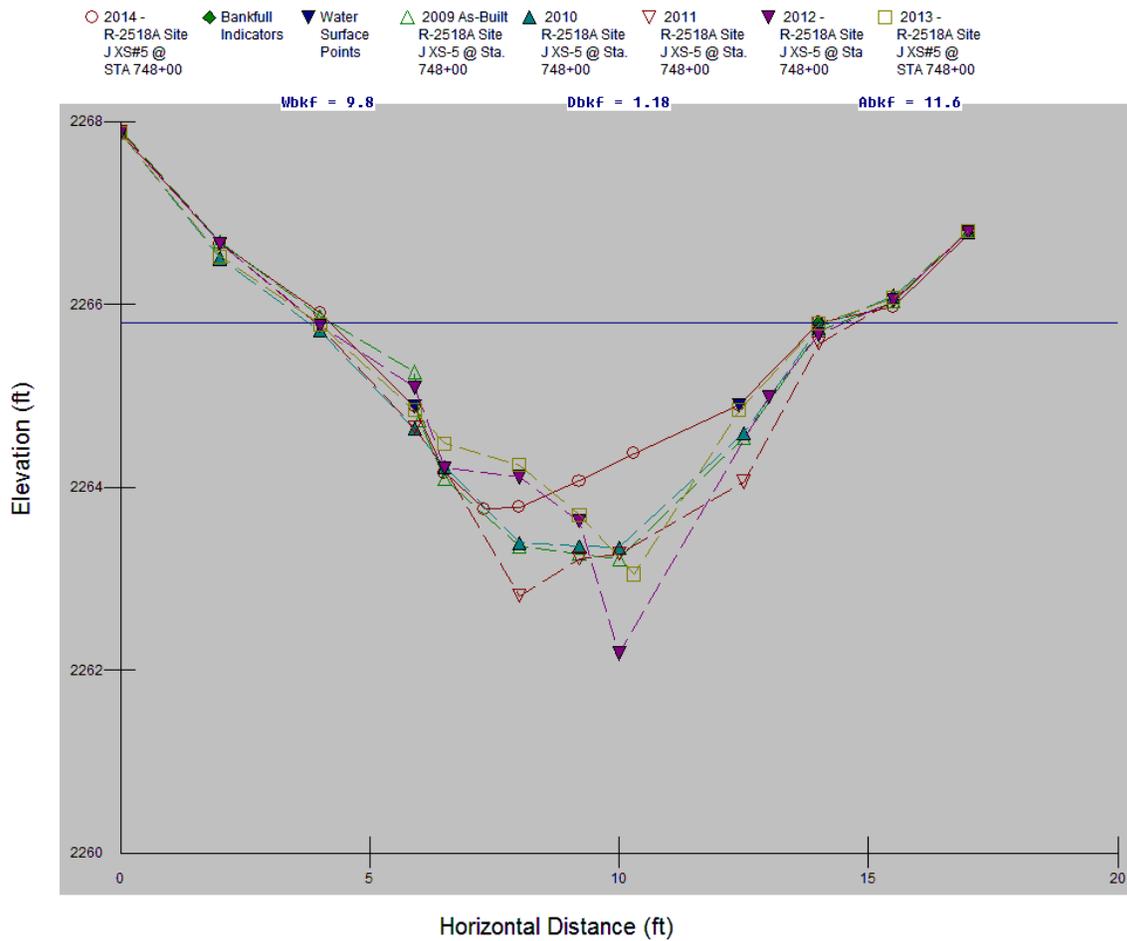
### R-2518A Site J XS#4 @ STA 737+00

- 2014 - R-2518A Site J XS#4 @ STA 737+00
- ◆ Bankfull Indicators
- ▼ Water Surface Points
- △ 2009 As-Built R-2518A Site J XS-4 @ Sta. 737+00
- ▲ 2010 R-2518A Site J XS-4 @ Sta. 737+00
- ▽ 2011 R-2518A Site J XS-4 @ Sta. 737+00
- ▼ 2012 - R-2518A Site J XS-4 @ Sta. 737+00
- 2013 - R-2518A Site J XS#4 @ STA 737+00



Site J: Cross-Section #4 (Riffle) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	6.02	3.37	5.26	4.39	5.04
Maximum Bankfull Depth (ft.)	0.94	0.77	1	1.14	1.18
Width of the Floodprone Area (ft.)	14.74	13.52	15.28	15.66	16.11
Bankfull Mean Depth (ft.)	0.58	0.45	0.5	0.45	0.49
Width/Depth Ratio	17.91	16.67	21.02	21.76	20.92
Entrenchment Ratio	1.42	1.8	1.45	1.6	1.57
Bankfull Width (ft.)	10.39	7.5	10.51	9.79	10.25

### R-2518A Site J XS#5 @ STA 748+00



Site J: Cross-Section #5 (Pool) Abbreviated Morphological Summary					
	2010	2011	2012	2013	2014
Bankfull Cross Sectional Area (ft <sup>2</sup> )	14.82	15.33	14.33	13.21	11.6
Maximum Bankfull Depth (ft.)	2.4	2.76	3.49	2.74	2.04
Bankfull Mean Depth (ft.)	1.47	1.58	1.47	1.32	1.18
Bankfull Width (ft.)	10.08	9.67	9.72	10.03	9.8

\*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.

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

# Turkey Branch Site J



Photo Point #1 (Upstream)



Photo Point #1 (Downstream)



Photo Point #2 (Upstream)



Photo Point #2 (Downstream)



Photo Point #3 (Upstream)  
November 2014



Photo Point #3 (Downstream)

# Turkey Branch Site J



Photo Point #4 (Upstream)  
November 2014



Photo Point #4 (Downstream)

# Turkey Branch Site J



Vegetation Overview Photo (Looking Downstream)



Vegetation Overview Photo (Looking Upstream)



Beaver dam downstream of Cross Section #5

July 2014