

Lick Creek Stream Restoration Site MONITORING REPORT 2010 (Year 5)

Cataloging Unit: 0303004 EEP Contract #: D04013-1



Submitted to:



North Carolina Department of Environment and Natural Resources
North Carolina Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699-1652

Submitted by:



Restoration Systems, LLC
1101 Haynes Street, Suite 211
Raleigh, North Carolina 27604

October 21, 2010

Lick Creek Stream Restoration Site MONITORING REPORT 2010 (Year 5)

Prepared for:



Restoration Systems, LLC
1101 Haynes Street, Suite 211
Raleigh, North Carolina 27604

Prepared by:



Wolf Creek Engineering, PLLC
51 North Knob Lane
Weaverville, NC 28787

TABLE OF CONTENTS

1.0 PROJECT BACKGROUND.....	1
1.1 LOCATION AND SETTING.....	1
1.2 PROJECT STRUCTURE AND OBJECTIVES	1
1.3 PROJECT BACKGROUND	2
2.0 PROJECT CONDITION AND MONITORING RESULTS	13
2.1 VEGETATION ASSESSMENT	13
2.1.1 Vegetative Problem.....	13
2.1.2 Stem Counts	14
2.1.3 Vegetation Plot Photos.....	15
2.2 STREAM ASSESSMENT	15
2.2.1 Hydrology	16
2.2.2 Geomorphology	16
2.2.3 Problem Areas.....	17
2.2.4 Photo Reference Stations	18
Stability Assessment Table.....	19
2.2.6 Quantitative Measure Summary Tables.....	19

LIST OF TABLES

Table 1. Project Structure and Objectives.....	2
Table 2. Project Activity and Reporting History	2
Table 3. Project Contact Information.....	3
Table 4. Project Background Information	4
Table 5. Vegetative Problem Areas	14
Table 6. Stem Counts.....	15
Table 7. Verification of Bankfull Events.....	16
Table 8. BEHI and Sediment Export Estimates	17
Table 9. Problem Areas.....	18

LIST OF FIGURES

- Figure 1. Vicinity Map
- Figure 2. Monitoring Plans

LIST OF APPENDICES

- Appendix A: Vegetation Data
- Appendix B: Geomorphic Data

EXECUTIVE SUMMARY

The Lick Creek Stream Restoration Site, located within the Cape Fear River Basin, consists of approximately 9,568 linear feet of Priority 1 stream restoration of portions of Lick Creek and Wallace Branch. These reaches consist of perennial, second and third order streams that have historically been impacted by riparian and bank vegetation removal, the introduction of agricultural ditch inputs, channel straightening, and unrestricted livestock access. The constructed stream channels have restored appropriate morphology including riffle-pool bed form and channel pattern. Cross-vanes, J-Hook vanes, and in-stream log structures have been integrated into the channel to provide grade control, maintain stable stream banks while the riparian vegetation reestablishes, and provide in-stream habitat.

Hydrology

Following completion of construction in March of 2006, the site has been subjected to at least five greater-than-bankfull events and several near bankfull events. The most extensive flooding occurred shortly after the completion of construction, when in June of 2006, Hurricane Alberto crossed central North Carolina resulting in five inches of rainfall on-site and water elevations three feet above bankfull. At least one greater-than-bankfull event was recorded by crest gauges during the fifth year of monitoring. It should be noted that the summers of 2007 and 2008 were some of the most severe droughts on record for the state of North Carolina and drought conditions have been an ongoing concern throughout the monitoring phase of the project. Additionally, base flow was completely absent in all three monitoring reaches during the September 2010 collection of monitoring data.

Stream

Most of the stream reaches have managed the extreme flow events of the first five years. Several areas of minor bank scour were observed during Monitoring Year 3 for which repairs were recommended. Repairs were completed in January of 2009 which consisted of the installation of brush toes in several meander bends exhibiting bank erosion. The repaired areas were inspected in September of 2010 as a part of this monitoring period and observed to be stable, in a sound condition, and are supporting vigorous vegetative cover. Cross section and profile surveys indicate that the channel form is consistent with the Year 4 surveys.

Vegetation

Native woody and herbaceous species were used to establish at minimum a fifty foot wide riparian buffer on each side of the restored reach. Planted herbaceous species have successfully established throughout the majority of the site along with volunteer species from upstream seed sources. In areas of weak bank vegetation, additional live-stakes were installed in 2007 and are becoming well established.

It was observed during the Monitoring Year 4 survey that cattle had accessed and heavily browsed portions of the project upstream of Lower Moncure Road. Woody and herbaceous vegetation was severely damaged but appears to have recovered during

Monitoring Year 5. In September of 2010, evidence was observed which suggests that a small number of cattle had accessed the area but their impact appears to have been minimal.

The riparian buffer planting had an overall survival rate of 61% with additional volunteer species taking root. The average stem density for the Site is 481 trees per acre. A number of Chinese privet (*Ligustrum sinense*) stems are emerging in areas where invasive species removal previously occurred.

1.0 PROJECT BACKGROUND

1.1 LOCATION AND SETTING

The Lick Creek Stream Restoration Site is located approximately 2.6 miles northeast of the City of Sanford in rural Lee County, North Carolina. From Raleigh, NC take US-1 south, take Colon Rd exit, turn left onto Colon Road, turn left on Riddle Road, turn right on Lower Moncure Road and the site is approximately ¼ mile on the left and right side of the road. The project reach is located in the Lick Creek watershed of the Cape Fear River Basin (United States Geological Survey (USGS) 14-digit Hydrologic Unit 03030004010010) within North Carolina Division of Water Quality (NCDWQ) sub-basin 03-06-07. The 03-06-07 sub-basin contains all of the Lick Creek drainage area as well as all other drainages to the 25-river miles of the Cape Fear River extending from near the confluence at Lick Creek in Lee County to near Buies Creek in Harnett County. This sub-basin is primarily forested, although agriculture accounts for a significant portion of the land-use.

1.2 PROJECT STRUCTURE AND OBJECTIVES

The pre-construction site consisted of approximately 51 acres of floodplain, 5,371 linear feet of stream designated as Lick Creek, and 3,512 linear feet of stream designated as Wallace Branch. These reaches consist of perennial, second and third order streams that have historically been impacted by riparian and bank vegetation removal, the introduction of agricultural ditch inputs, channel straightening, unrestricted livestock access, and the increasing development of the contributing drainage area. Prior land use within the site consists of forested areas and pasture.

The primary goals and objectives of the project were to improve local water quality, enhance flood attenuation and restore aquatic and riparian habitat. The overall mitigation strategy consisted of reconstruction of the stream channels to restore stable channel morphology, construction of in-stream habitat and grade/bank stabilization structures, exclusion of livestock, and reestablishment of native riparian buffers greater than 50 feet in width.

The project is divided into three distinct mitigation elements: Reach 1 consists of Wallace Branch from the upstream end of the site to its confluence with Lick Creek. Reach 2 consists of Lick Creek from the upstream end of the site to its confluence with Wallace Branch. Reach 3 consists of Lick Creek from the confluence with Wallace Branch to the downstream end of the site.

Table 1. Project Structure and Objectives – Lick Creek Stream Restoration Site (D04013-1)

Reach ID	Mitigation Type	Priority Level	Linear Footage	Stationing	Description
1	Restoration	P1	3,690 ft	10+00 – 46+90	3,690 ft of channel relocation of Wallace Branch
2	Restoration	P1	1,870 ft	10+00 – 28+70	1,870 ft of channel relocation of Upper Lick Creek
3	Restoration	P1	4,008 ft	28+70 – 65+20	3,650 ft of channel relocation of Lower Lick Creek and 358 ft of channel relocation of an Unnamed Tributary
Total			9,568 ft		

1.3 PROJECT BACKGROUND

Table 2. Project Activity and Reporting History – Lick Creek Stream Restoration Site (D04013-1)

Activity or Report	Scheduled Completion	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	Oct-04	N/A	Apr-05
Final Design – (at least 90% complete)	Oct-04	N/A	Apr-05
Construction	Mar-05	N/A	Mar-06
Temporary S&E mix applied to entire project area	Mar-05	N/A	Apr-06
Permanent seed mix applied to entire project area	Mar-05	N/A	Apr-06
Live stakes planting	Mar-05	N/A	Apr-06
Bare root trees planting	Mar-05	N/A	Apr-06
Mitigation Plan / As-built (Year 0 Monitoring-baseline)	Mar-05	May-06	Jun-06
Maintenance following Hurricane Alberto (Log vanes added and bank repairs)	N/A	N/A	Nov-06
Year 1 Monitoring	Nov-06	Dec-06	Dec-06
Year 2 Monitoring	Nov-07	Nov-07	Dec-07
Year 3 Monitoring	Nov-08	Oct-08	Nov-08
Maintenance (Brush toes added to stabilize scoured banks)	N/A	N/A	Jan-09
Year 4 Monitoring	Nov-09	Oct-09	Dec-09
Year 5 Monitoring	Nov-10	Sep-10	Oct-10

Table 3. Project Contact Information – Lick Creek Stream Restoration Site (D04013-1)

<p>Designer URS Corporation</p>	<p>1600 Perimeter Park Drive, Suite 400 Morrisville, NC 27560</p>
<p>Construction Contractor North State Environmental, Inc.</p>	<p>2889 Lowery Street, Suite B Winston-Salem, NC 27101 <u>Contact:</u> Darrell Westmoreland, Tel. 336-725-2010</p>
<p>Planting Contractor H & J Forestry Services</p>	<p>910-264-1612</p>
<p>Seeding Contractor North State Environmental, Inc.</p>	<p>2889 Lowery Street, Suite B Winston-Salem, NC 27101 <u>Contact:</u> Darrell Westmoreland, Tel. 336-725-2010</p>
<p>Nursery Stock Suppliers</p>	<p>S.C. Supertree Nursery, Tel 800-222-1290</p>
<p>Monitoring Performer Wolf Creek Engineering</p>	<p>51 North Knob Lane Weaverville, NC 28787 <u>Contact:</u> Grant Ginn, Tel. 828-658-3649</p>

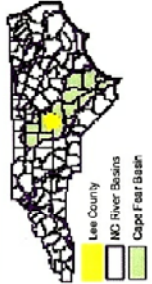
Table 4. Project Background Information – Lick Creek Stream Restoration Site (D04013-1)

Project County:	Lee County, NC
Drainage Area:	
Reach 1: Wallace Branch	4.94 mi ²
Reach 2: Lick Creek	8.86 mi ²
Reach 3: Lick Creek	13.9 mi ²
Estimated Drainage % Impervious Cover:	
Reach 1: Wallace Branch	<5%
Reach 2: Lick Creek	5%
Reach 3: Lick Creek	5%
Stream Order:	
Reach 1: Wallace Branch	2
Reach 2: Lick Creek	2
Reach 3: Lick Creek	3
Physiographic Region	Piedmont
Ecoregion	Triassic Basin
Rosgen Classification of As-Built	E5
Cowardin Classification	Piedmont/Mountain Bottomland Forrest
Dominant Soil Types	
Reach 1: Wallace Branch	Congaree Silt Loam (Cp)
Reach 2: Lick Creek	Congaree Silt Loam (Cp)
Reach 3: Lick Creek	Congaree Silt Loam (Cp)
Reference site ID	UT to Reedy Creek
USGS HUC for Project and Reference sites	03030004
NCDWQ Sub-basin for Project and Reference	03-06-07
NCDWQ classification for Project and Reference	WS-IV
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor?	N/A
% of project easement fenced	100%



Restoration Systems, LLC
Natural Resources
Restoration & Conservation

Lick Creek Stream Restoration Full Delivery Project



- Legend**
- Cape Fear River Basin
 - HUC 03030004
 - Municipal Boundaries
 - NC Counties
 - Project Contributing Watershed
 - Hydrology
 - Lick Creek Project Reach
 - Primary Roads

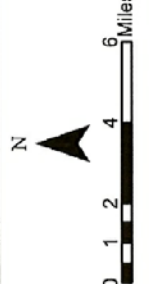
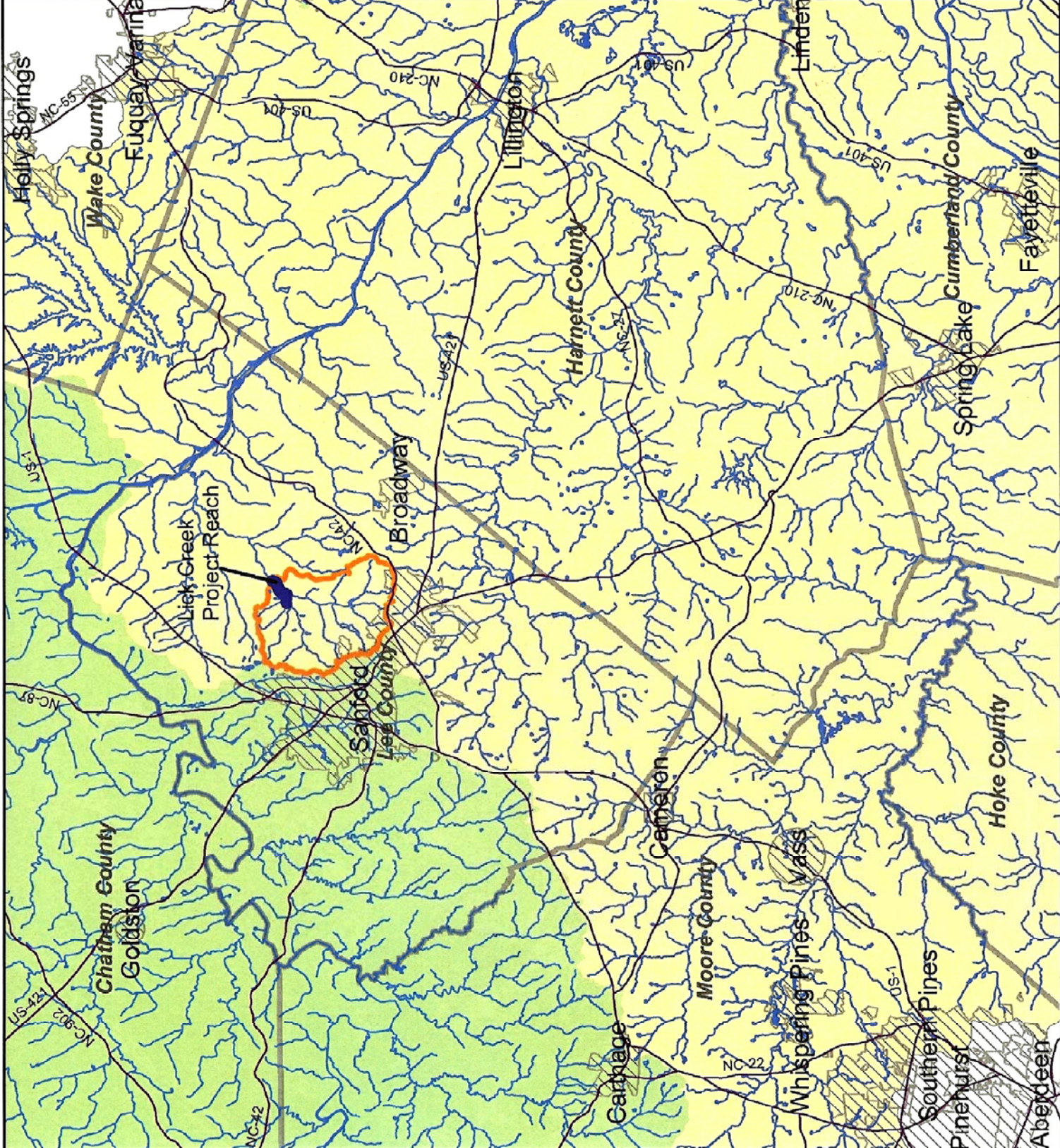


FIGURE 1
Vicinity Map



Wolf Creek Engineering
 61 BROADWAY & BENTONVILLE AVENUE
 BENTONVILLE, AR 72716
 PHONE: (479) 624-9648
 FAX: (479) 624-9649
 WWW.WOLFCKEENGINEERING.COM

PROJECT: WALLACE CREEK RESTORATION
 SHEET: NORTH CAROLINA TRIP
 AS-BUILT PLAN

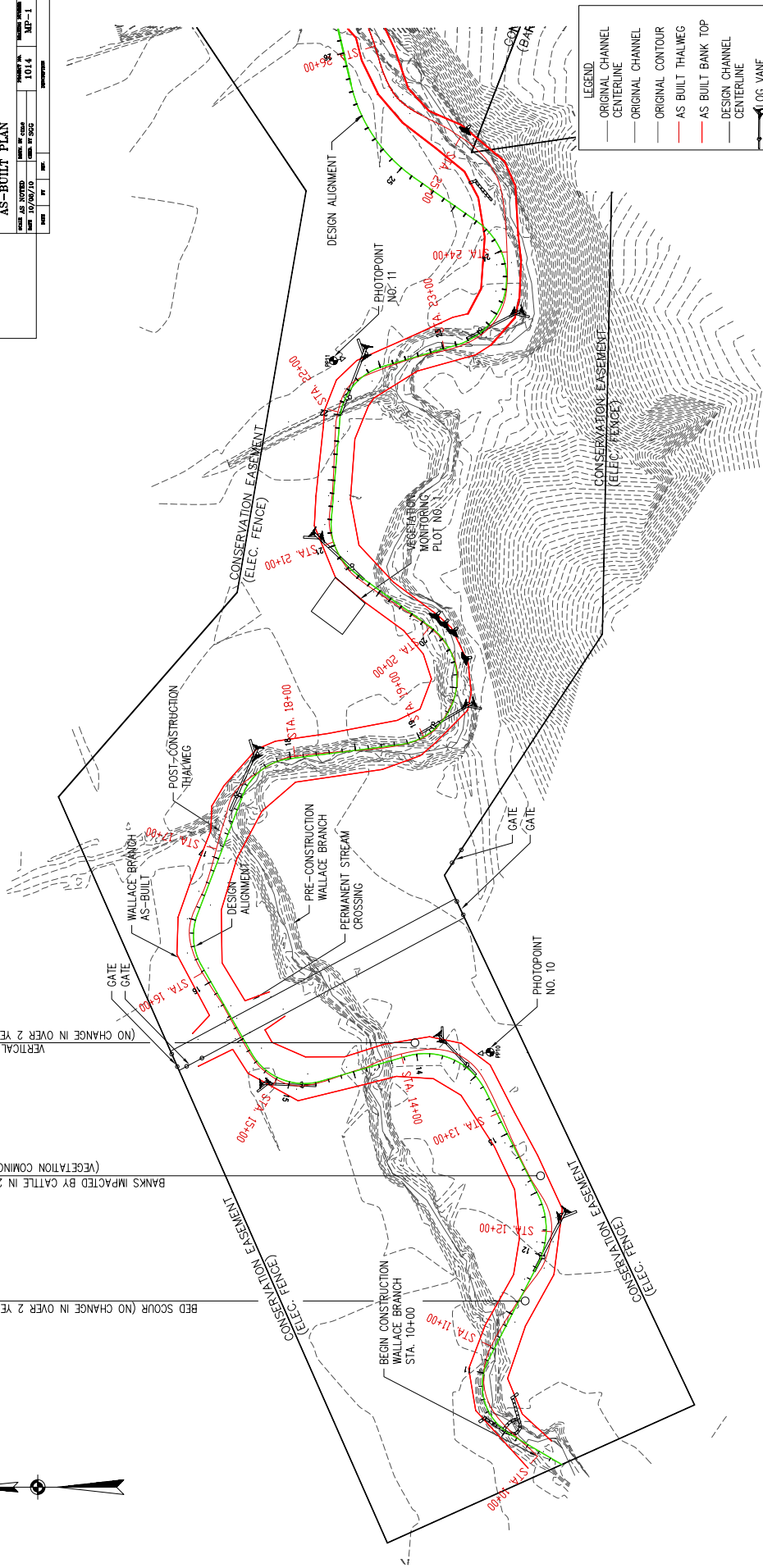
DATE: 10/14/10
 DRAWN BY: JAC
 CHECKED BY: JAC
 SCALE: AS SHOWN
 SHEET NO. OF 502
 1014
 MP-1



BED SCOUR (NO CHANGE IN OVER 2 YEARS)

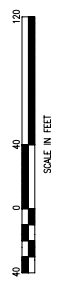
BANKS IMPACTED BY CATTLE IN 2009
 (VEGETATION COMING IN)

VERTICAL TOE
 (NO CHANGE IN OVER 2 YEARS)



LEGEND

- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL
- ORIGINAL CONTOUR
- AS BUILT THALWEG
- AS BUILT BANK TOP CENTERLINE
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- ROOTWAD
- CROSS VANE
- ROCK VANE
- ROCK VANE ADDED NOVEMBER 2006
- LOG VANE ADDED NOVEMBER 2006
- LOW CONCERN
- MEDIUM CONCERN
- HIGH CONCERN
- STABLE
- ⊕ IRON ROD
- ⊕ GAUGE



POINT DESCRIPTION	NORTHING	EASTING	ELEVATION
PP10	641991.11	1962981.27	216.08
PP11	64210.51	1963508.24	214.29

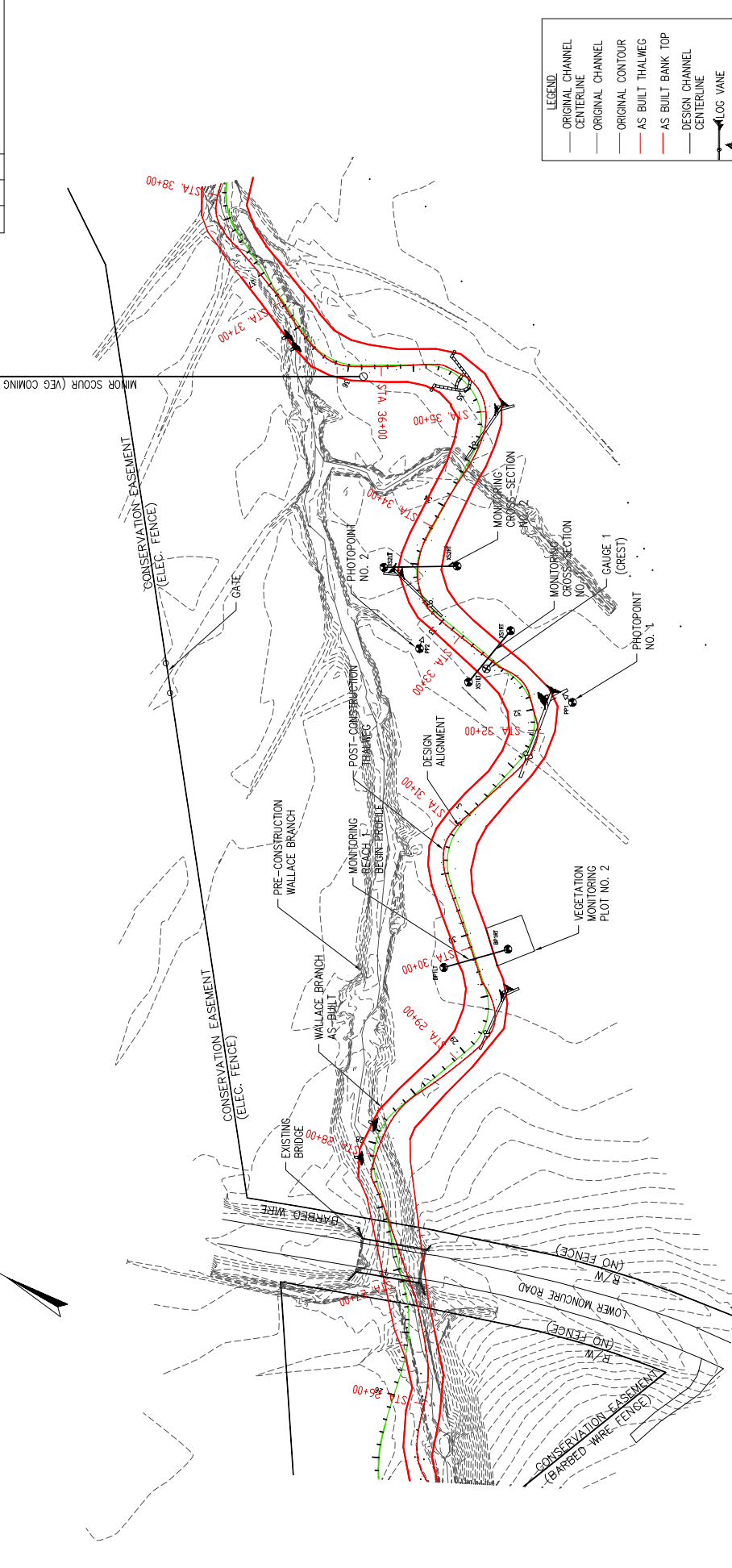
Wolf Creek Engineering
 PROFESSIONAL & ENVIRONMENTAL CONSULTING
 411 S. WILSON ST. SUITE 100
 FLORENCE, SC 29502
 PHONE: (803) 685-8448
 FAX: (803) 685-8449
 WWW.WOLFCKEENGINEERING.COM

WALLACE CREEK RESTORATION
 NORTH CAROLINA DEP

AS-BUILT PLAN

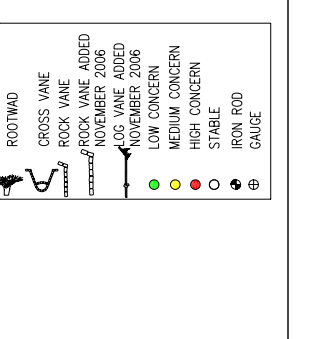
DATE	BY	CHK	APP
10/20/10	1014		
10/20/10			
10/20/10			

PROJECT NO: 1014
 SHEET NO: MP-2



LEGEND

—	ORIGINAL CHANNEL CENTERLINE
—	ORIGINAL CHANNEL
—	ORIGINAL CONTOUR
—	AS BUILT THALWEG
—	AS BUILT BANK TOP
—	DESIGN CHANNEL CENTERLINE
—	LOC VANE
—	ROOTWAD
—	CROSS VANE
—	ROCK VANE
—	ROCK VANE ADDED NOVEMBER 2006
—	LOC VANE ADDED NOVEMBER 2006
●	LOW CONCERN
●	MEDIUM CONCERN
●	HIGH CONCERN
○	STABLE
⊕	IRON ROD
⊕	GAUGE

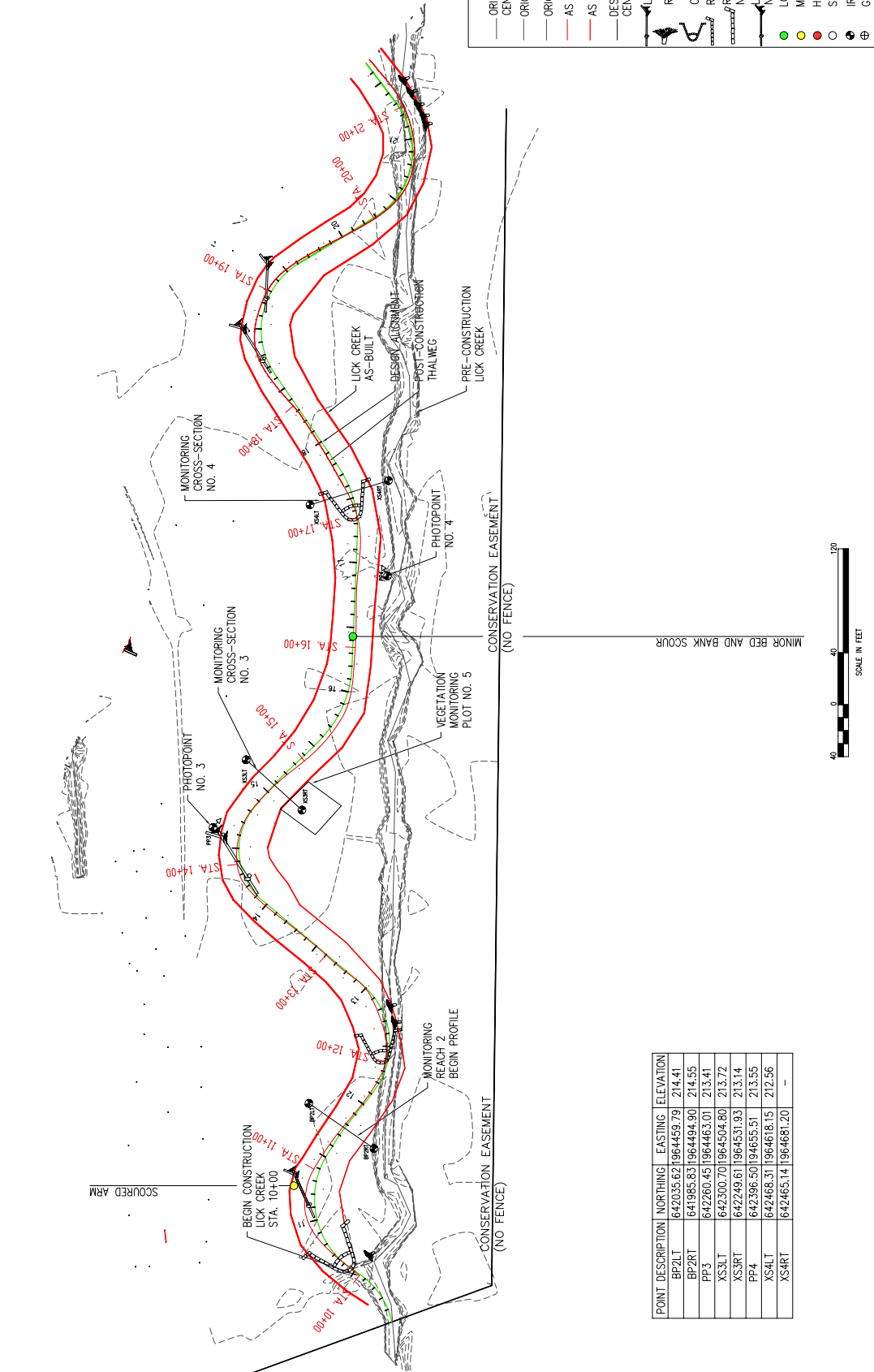


POINT DESCRIPTION	NORTHING	EASTING	ELEVATION
BP1LT	642234.97	1964018.74	213.76
BP1RT	642199.00	1964085.84	213.95
PP1	642251.23	1964276.46	213.69
XS1LT	642328.91	1964249.75	213.24
XS1RT	642320.55	1964300.86	213.46
PP2	642374.80	1964263.35	213.03
XS2LT	642430.25	1964293.98	215.08
XS2RT	642351.47	1964323.23	213.05

Wolf Creek Engineering
 PROFESSIONAL & ENVIRONMENTAL CONSULTING
 4110 W. STATE STREET
 PHOENIX, ARIZONA 85041
 PHONE: (602) 945-8848
 FAX: (602) 945-8849
 WWW.WOLFCREEKENG.COM

PROJECT: LICK CREEK RESTORATION
 LOCATION: NORTH CAROLINA, DEEP
 DRAWING: AS-BUILT PLAN

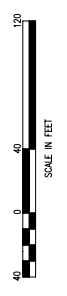
DATE: 10/20/10
 DRAWN BY: JMM
 CHECKED BY: JMM
 PROJECT NO.: 1014
 DRAWING NO.: MP-3



LEGEND

- ORIGINAL CHANNEL
- CENTERLINE
- ORIGINAL CONTOUR
- AS BUILT THALWEG
- AS BUILT BANK TOP
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- ROOTMAD
- CROSS VANE
- ROCK VANE
- ROCK VANE ADDED NOVEMBER 2006
- LOG VANE ADDED NOVEMBER 2006
- LOW CONCERN
- MEDIUM CONCERN
- HIGH CONCERN
- STABLE
- IRON ROD
- GAUGE

POINT DESCRIPTION	NORTHING	EASTING	ELEVATION
BP2LT	642035.62	1964459.79	214.41
BP2RT	641985.83	1964494.90	214.55
PP3	642260.45	1964463.01	213.41
XS3LT	642300.70	1964504.80	213.72
XS3RT	642249.61	1964531.93	213.14
PP4	642396.50	1964655.51	213.55
XS4LT	642468.31	1964618.15	212.56
XS4RT	642465.14	1964681.20	—



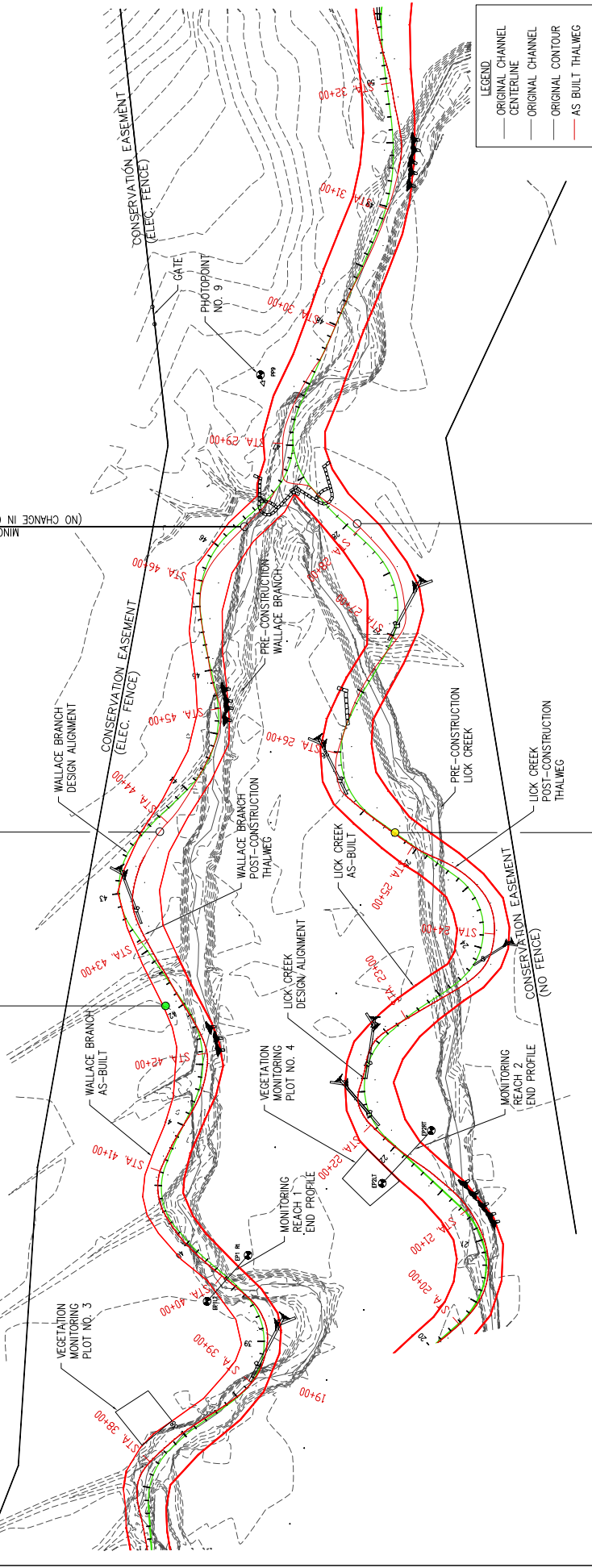
Wolf Creek Engineering
 PROFESSIONAL & ENVIRONMENTAL CONSULTING
 4110 W. WOLF CREEK ROAD
 PHOENIX, ARIZONA 85044
 PHONE: (602) 955-8888
 WWW.WOLFCREEKENGINEERING.COM

PROJECT: LICK CREEK RESTORATION
 CLIENT: NORTH CAROLINA DEP
 DRAWING: AS-BUILT PLAN

DATE: 10/20/10
 DRAWN BY: JMM
 CHECKED BY: JMM
 PROJECT NO: 1014
 SHEET NO: MP-4

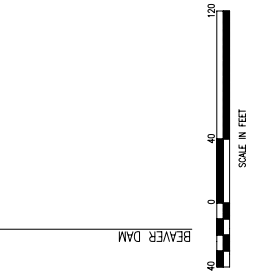
WEAK BANK VEGETATION
 BED SCOUR (NO CHANGE IN OVER 2 YEARS)
 BEAVER DAM
 BED SCOUR (NO CHANGE IN OVER 2 YEARS)
 MINOR BED SCOUR (NO CHANGE IN OVER 2 YEARS)

VEGETATION MONITORING PLOT NO. 3
 VEGETATION MONITORING PLOT NO. 4
 MONITORING REACH 1 END PROFILE
 MONITORING REACH 2 END PROFILE



LEGEND:

- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CHANNEL CENTERLINE
- ORIGINAL CONTOUR
- AS BUILT THALWEG
- AS BUILT BANK TOP
- DESIGN CHANNEL CENTERLINE
- LOG VANE
- ROOTWAD
- CROSS VANE
- ROCK VANE
- ROCK VANE ADDED NOVEMBER 2006
- LOG VANE ADDED NOVEMBER 2006
- LOW CONCERN
- MEDIUM CONCERN
- HIGH CONCERN
- STABLE
- ⊙ IRON ROD
- ⊕ GAUGE

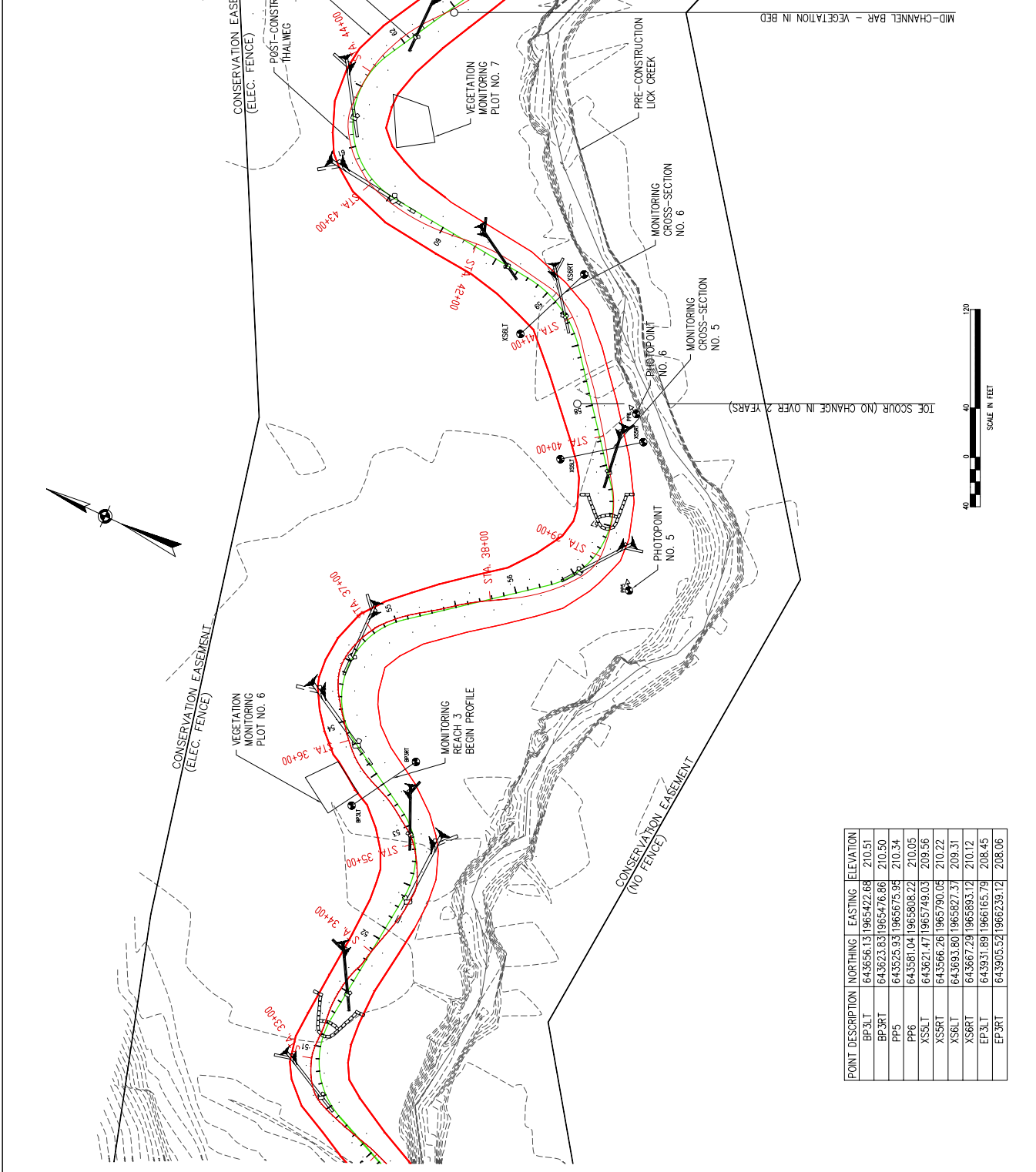


POINT DESCRIPTION	NORTHING	EASTING	ELEVATION
EP2LT	642782.65	1964742.86	211.95
EP2RT	642799.25	1964796.16	212.44
EP1LT	642771.53	1964579.57	212.07
EP1RT	642786.65	1964624.93	211.83
PP9	643372.57	1964974.33	211.30

Wolf Creek Engineering
 PROFESSIONAL & ENVIRONMENTAL CONSULTING
 411 W. 10TH ST. SUITE 200
 FORT WORTH, TEXAS 76102
 PHONE: (817) 852-8848
 FAX: (817) 852-8849
 WWW.WOLFCKEENR.COM

PROJECT: LICK CREEK RESTORATION
CLIENT: NORTH CAROLINA DEP
AS-BUILT PLAN

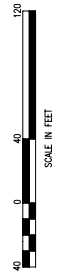
DATE: 10/20/10
 DRAWN BY: []
 CHECKED BY: []
 PROJECT NO.: 1014
 SHEET NO.: MP-5



LEGEND:

- ORIGINAL CHANNEL CENTERLINE
- - - ORIGINAL CHANNEL CENTERLINE
- - - ORIGINAL CONTOUR
- AS BUILT THALWEG
- AS BUILT BANK TOP
- - - DESIGN CHANNEL CENTERLINE
- LOG VANE
- ROOTWAD
- ROCK VANE
- ROCK VANE
- ROCK VANE ADDED NOVEMBER 2006
- LOG VANE ADDED NOVEMBER 2006
- LOW CONCERN
- MEDIUM CONCERN
- HIGH CONCERN
- STABLE
- IRON ROD
- GAUGE

POINT DESCRIPTION	NORTHING	EASTING	ELEVATION
BP-3LT	643656.13	1965422.68	210.51
BP-3RT	643623.83	1965476.86	210.50
PPS	643525.93	1965675.95	210.34
PP6	643561.04	1965608.22	210.05
XSSLT	643621.47	1965749.03	209.56
XSSRT	643566.26	1965790.05	210.22
XSSLT	643693.80	1965807.37	209.31
XSSRT	643667.29	1965893.12	210.12
EP-3LT	643931.89	1966165.79	208.45
EP-3RT	643905.52	1966239.12	208.06

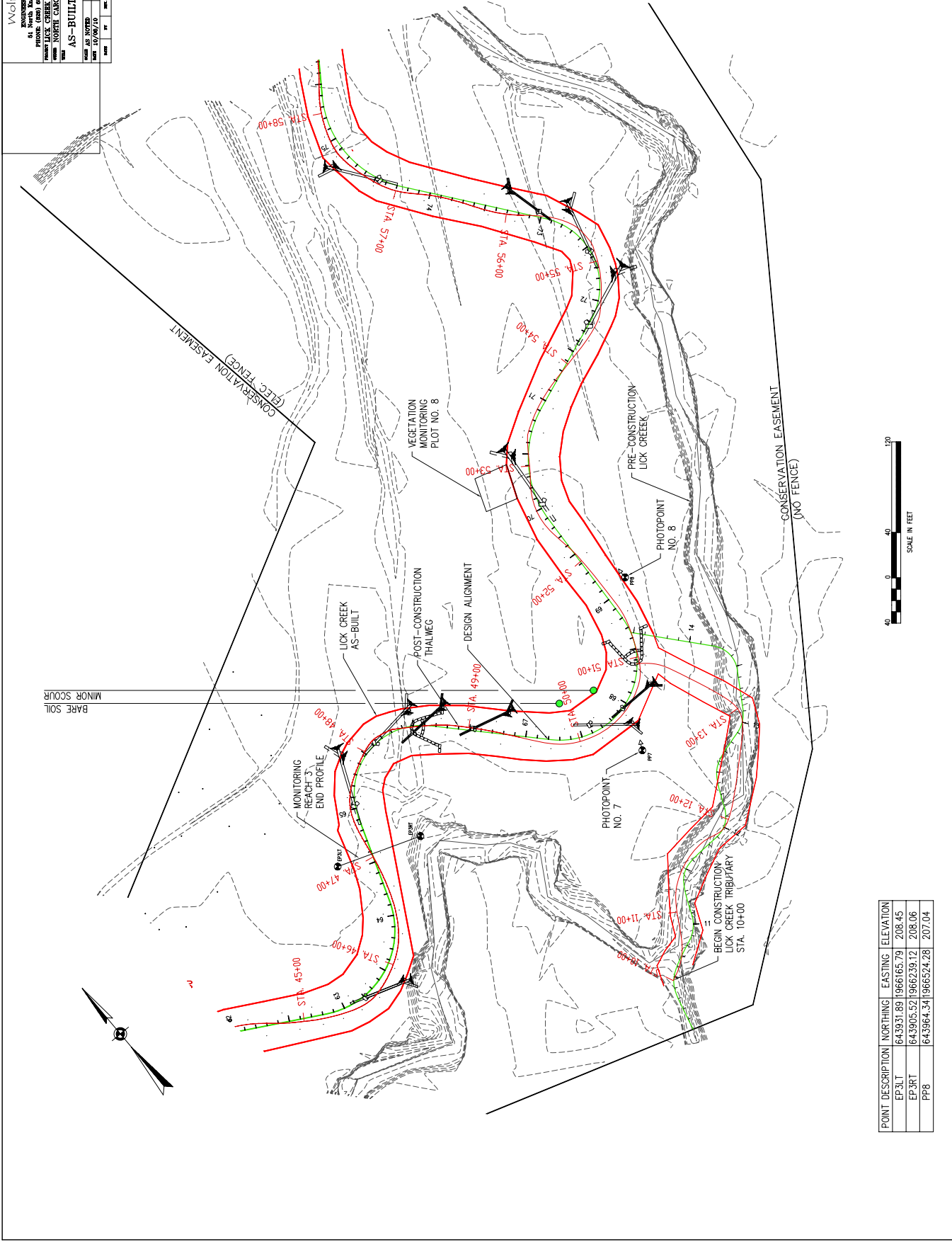


Wolf Creek Engineering
 PROFESSIONAL & ENVIRONMENTAL CONSULTING
 4110 W. 10TH AVENUE
 FORT COLLINS, CO 80501
 PHONE: (970) 485-8848
 WWW.WOLFCKEENG.COM

PROJECT: LICK CREEK RESTORATION
 CLIENT: NORTH CAROLINA DEP
 DRAWING: AS-BUILT PLAN

DATE: 10/20/10
 DRAWN BY: JMM
 CHECKED BY: JMM
 PROJECT NO: 1014
 SHEET NO: MP-6

- LEGEND:
- ORIGINAL CHANNEL CENTERLINE
 - ORIGINAL CHANNEL
 - ORIGINAL CONTOUR
 - AS BUILT THALWEG
 - AS BUILT BANK TOP CENTERLINE
 - DESIGN CHANNEL CENTERLINE
 - LOG VANE
 - ROOTWAD
 - CROSS VANE
 - ROCK VANE
 - ROCK VANE ADDED NOVEMBER 2006
 - LOG VANE ADDED NOVEMBER 2006
 - LOW CONCERN
 - MEDIUM CONCERN
 - HIGH CONCERN
 - STABLE
 - IRON ROD
 - GAUGE

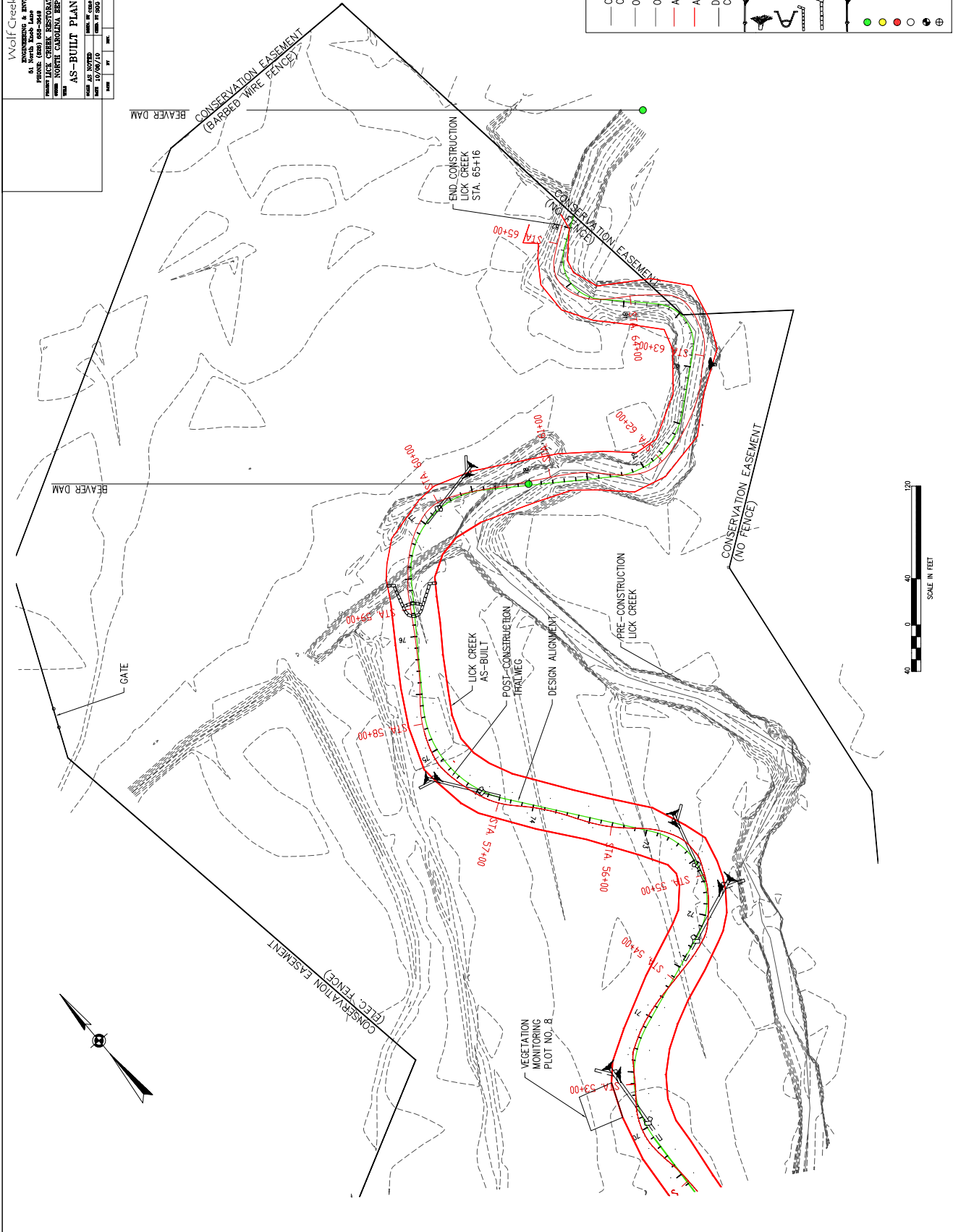


POINT DESCRIPTION	NORTHING	EASTING	ELEVATION
EP3LT	643931.89	1966165.79	208.45
EP3RT	643905.52	1966239.12	208.06
PP8	643964.34	1966524.28	207.04

Wolf Creek Engineering
 PROFESSIONAL & ENVIRONMENTAL CONSULTING
 PROJECT: LICK CREEK RESTORATION
 LOCATION: NORTH CAROLINA, REP
 DRAWING: AS-BUILT PLAN

DATE	BY	CHK	APP
10/14	MP-7		
10/14	MP-7		
10/14	MP-7		

LEGEND	
—	ORIGINAL CHANNEL CENTERLINE
—	ORIGINAL CHANNEL
—	ORIGINAL CONTOUR
—	AS BUILT THALWEG
—	AS BUILT BANK TOP
—	DESIGN CHANNEL CENTERLINE
—	LOG VANE
—	ROOTWAD
—	CROSS VANE
—	ROCK VANE
—	ROCK VANE ADDED NOVEMBER 2006
—	LOG VANE ADDED NOVEMBER 2006
●	LOW CONCERN
●	MEDIUM CONCERN
●	HIGH CONCERN
○	STABLE
⊕	IRON ROD
⊕	GAUGE



2.0 PROJECT CONDITION AND MONITORING RESULTS

2.1 VEGETATION ASSESSMENT

The survivability of the riparian buffer plantings is evaluated using eight (8) randomly placed 10 meter by 10 meter vegetative sampling plots providing combined sample coverage of two percent of the replanted area. The corners of each monitoring plot have been marked in the field and their position documented by GPS survey. The monitoring consists of a physical inventory within each plot in order to determine the composition and number of surviving species and the total number of stems per acre. To the extent possible, differentiation between planted and volunteer stems was accomplished. The presence of non-native, exotic, and undesirable species was noted. Additionally, sequential photographs are taken from the upstream corner located closest to the stream of each monitoring plot.

Planted herbaceous species have successfully established throughout the majority of the site along with volunteer species from upstream seed sources. Due to favorable growing conditions during the fourth and fifth monitoring years, willow and dogwood live stakes used for bank stabilization have successfully establish themselves along the stream banks. The riparian buffer planting had an overall survival rate of 61% with additional volunteer species taking root.

2.1.1 Vegetative Problem

During performance of the Year 4 monitoring survey, it was observed that an agricultural gate was open allowing unrestricted livestock access to the planted buffer at the upstream end of Wallace Branch. Woody and herbaceous vegetation was severely impacted by over-grazing. The livestock were removed from the easement and the gate has been secured.

During the performance of the Year 5 monitoring survey, it was confirmed by the landowner that a few cattle occasionally breach the fence and access the upper portions of Wallace Branch. The vegetation appears, however, to have recovered from the severe grazing which was noted the previous year. The woody and herbaceous vegetation in this location appears to be healthy and robust.

A number of non-native Chinese privet (*Ligustrum sinense*) stems were recorded emerging in areas where invasive species removal previously occurred. These areas were treated successfully in 2009 with application of herbicide to individual plants. There were several instances noted during the monitoring of new sprouts of Chinese privet.

There are a few isolated areas where herbaceous species are only sparsely established on the floodplain and channel banks.

Table 5. Vegetative Problem Areas – Lick Creek Stream Restoration Site (D04013-1)

Feature / Issue	Station # / Range	Problem Cause
Invasive / Exotic Populations	Various	Several Chinese privet re-sprouting in areas where it was removed
Bare Bank or Toe	Wallace Branch 42+50	Drought at time of seeding/poor soil
	Lick Creek 49+90	Local scour

Proposed Actions

Restoration Systems will perform a follow-up treatment on the new sprouts of Chinese privet and over-seed the areas of sparse vegetation with permanent seed mix.

2.1.2 Stem Counts

Table 6 presents stem counts of surviving individuals found at each of the monitoring plots at the end of Year 5 of the post-construction monitoring period. Trees within each monitoring plot are flagged regularly to prevent the occurrence of unmarked trees due to flag degradation. Volunteer individuals found within the plots are also flagged during this process. The average stem density for the Site is 481 trees per acre and with an overall survival rate of 61%.

All herbaceous species seeded throughout the site after construction were found onsite at the end of Year 5. In addition, native species such as Switch grass (*Panicum virgatum*), soft rush (*Juncus effuses*), fennel (*Eupatorium* sp.), goldenrod (*Solidago* spp.), sedge (*Carex* spp.), buttercup (*Ranunculus* spp.), plantain (*Plantago* spp.), fescue (*Festuca* spp.), crabgrass (*Digitaria* spp.), smartweed (*Polygonum* spp.), nightshade (*Solanum* spp.), poison ivy (*Toxicodendron radicans*), *Rumex* spp., and species of Aster (*Aster* spp.), were found to have colonized throughout the project’s riparian area.

Table 6. Stem Counts – Lick Creek Stream Restoration Site (D04013-1)

Species	Plots - Year 5								Initial Totals	Year 5 Totals
	1	2	3	4	5	6	7	8		
Trees										
<i>Asimina triloba</i>				3	1	1		1	27	6
<i>Betula nigra</i>	1	2	5+	2		5	2	2	10	19
<i>Callicarpa americana</i>	1	2	2		1		1		11	7
<i>Cephalanthus occidentalis</i>	4			4	2	3			19	13
<i>Corylus americana</i>							4	3	17	0
<i>Diospyros virginiana</i>									6	0
<i>Fraxinus pennsylvanica</i>	2								6	2
<i>Liriodendron tulipifera</i>		2	1		1	1			6	5
<i>Myrica cerifera</i>	1	1	1	1		1	2	1	10	8
<i>Nyssa sylvatica</i>									2	0
<i>Platanus occidentalis</i>	1		1	1		1		1	7	5
<i>Quercus michauxii</i>	1		1	1				1	10	4
<i>Quercus nigra</i>			1						5	1
<i>Quercus phellos</i>		4	4			1	2	1	13	11
<i>Ulmus Americana</i>	4	1					1		14	6
Initial Totals:	18	22	17	23	26	22	20	15		
Year 5 Totals:	15	12	16	12	5	13	12	10	Average Stem Survival %	
Stem Survival %	83.3	54.5	94.1	52.2	19.2	59.1	60	66.7	61.1	
Density (trees/acre)	607	486	647	486	202	526	486	405	481	

2.1.3 Vegetation Plot Photos

A photo point was established in each vegetation plot. Photo points are positioned at the upstream plot corner located closest to the stream bank and oriented in order to capture the entire vegetation plot. The photographs were captured on the same day as the vegetation plot surveys (Appendix A).

2.2 STREAM ASSESSMENT

Monitoring protocol follows that outlined within the EEP Site Specific Mitigation Plan and detailed in the U.S. Army Corps of Engineers (USACE) Stream Mitigation Guidelines for Monitoring Level I. Specifically, stream monitoring included measurements of stream dimension, profile, pattern, bed materials, photo documentation, and stream bankfull return interval.

Most of the stream reaches have managed the high flow events of the first five years and repairs made in January, 2009 appear to be stable and in good condition. The bed profile

appears to be stabilizing while bed material has remained consistent over the five year monitoring period.

2.2.1 Hydrology

Since completion of construction in March of 2006, the site has been subjected to at least five greater-than-bankfull events and several near bankfull events. In June of 2006, Hurricane Alberto crossed central North Carolina resulting in five inches of rainfall on-site and water elevations three feet above bankfull on Reaches 1 and 2 and almost two feet above bankfull on Reach 3. Additionally, Lower Moncure Road was overtopped by Wallace Branch. It is estimated that this storm was approximately a fifty-year event. In November of 2006, heavy rainfall resulted in water elevations up to two feet above bankfull. The severity of this storm resulted in a malfunction of the rain gauge so that the quantity of rainfall was not recorded. Heavy rainfall associated with remnants of Tropical Storm Fay and Hurricane Hannah produced two more events in August and September of 2008 which resulted in water elevations one to three feet above bankfull. Another bankfull event occurred during the summer of 2009 due to locally heavy rainfall. At least one greater-than-bankfull event was recorded between November, 2009 and September, 2010, which resulted in peak water elevations, confirmed by crest gauge data approximately, two feet above bankfull on the Wallace Branch monitoring reach. Five additional events including Hurricane Ernesto resulted in water elevations within one to two feet below bankfull. It should be noted that the summers of 2007 and 2008 have been some of the most severe droughts on record for the state of North Carolina and that base flow was completely absent in all three monitoring reaches during the September, 2010 collection of monitoring data.

Table 7. Verification of Bankfull Events – Lick Creek Stream Restoration Site (D04013-1)

Date of Data Collection	Date of Occurrence of Bankfull Event	Method of Data Collection
7/24/06	6/14/06	Crest Gauge and Pressure Transducer
12/1/06	11/22/06	Crest Gauge and Pressure Transducer
11/27/07	10/27/07	Crest Gauge
10/24/08	Summer '08	Crest Gauge
10/26/09	Summer '09	Consistent Debris Lines & Crest Gauge
9/13/10	Summer '10	Crest Gauge

2.2.2 Geomorphology

Following the procedures established in the USDA Forest Service Manual (Harrelson et al 1994) and the methodologies utilized in the Rosgen stream assessment and classification system (Rosgen 1994, 1996), data collected consisted of detailed dimension and pattern measurements, longitudinal profiles, and bed materials sampling.

Re-survey of the permanent cross sections and profile reaches have shown some alterations in local bed elevations with the bed form and the channel pattern remaining consistent with the Year 4 condition. The riffle in monitoring Reach 1 shows nearly the same dimensions as Year 4. The riffle in monitoring Reach 2 is lower than the Year 4

bed elevation. Inspection of the bed profile indicates that this is a local bed feature and that the overall grade of the riffle is consistent with Year 4. The riffle in monitoring reach 3 indicates a shift in the thalweg but the max depth is consistent with Year 4. Inspection of the riffle profiles immediately downstream of these sections indicates that the riffle grade is stable. The pools were generally found to be deeper than the Year 4 condition which is probably related to the increase bank vegetation found throughout the Site and subsequent reduction in erosion. The pool locations relative to the pattern are consistent with previous surveys.

Pebble counts were conducted at each cross-section, as well as across the overall study reach. Pebble count data was plotted by size distribution in order to assess the D₅₀ and D₈₄ size class. In Reach 1, the material size decreased slightly from the fourth year survey with the D₈₄ decreasing from 10 mm to 8 mm, the D₅₀ remaining the same at 0.1mm, and the percent of gravel decreased slightly from 36% to 33%. In Reach 2, the D₈₄ decreased in size from 11 mm to 9 mm, the D₅₀ decreased from 1.4mm to 0.8mm, and the percent of gravel decreased slightly from 45% to 43%. In Reach 3 the D₈₄ increased from 12mm to 19 mm, the D₅₀ increased from 4.2mm to 7.9mm, and percent of gravel increased from 54% to 63%. Given the slight changes in absolute particle size, these variations could be due to the sampling techniques of the monitoring observers or the result of sediment pulses migrating through the Site.

Table 8. BEHI and Sediment Export Estimates - Lick Creek Stream Restoration Site (D04013-1)

Time Point	Reach	Approximate Linear Footage*	Extreme	High	Moderate	Low	Very Low	Sediment Export (Tons/Year) Year 5 (2010)
			Linear Footage (% of Total Linear Footage on Site)					
Year 5 (2010)	Wallace 1	3700	--	--	345 (3.7%)	--	3355 (36.3%)	30.7
	Lick 2	2000	--	--	40 (0.04%)	--	1960 (21.2%)	3.5
	Lick 3	3540	--	304** (3.3%)	--	3236 (35.0%)	--	52.9
	TOTAL	9240	--	304	385	3236	5315	87.1

*The total length/linear footage for each stream reach in approximate.

**77% of this length represents work at the downstream end of the project reach where restoration occurred only on the bed and left bank. The naturally forested right bank was left intact.

2.2.3 Problem Areas

The Year 4 monitoring report identified several problem areas as part of the stream assessment. Of these areas, thirteen (13) are no longer areas of concern as they have been repaired and twelve (12) have stabilized through natural channel process or vegetation growth. While most areas impacted by livestock access and beaver activity appear to have stabilized, the root cause for concern remains. Livestock continue to have occasional access to the upstream portion of Wallace Branch, although the vegetation is making a strong recovery from the condition observed during the performance of the

Year 4 monitoring survey. Of the two beaver dams observed at the downstream end of Lick Creek (Sta 61+00 and 63+00), the one at Sta 61+00 was removed during the winter of 2009-2010. This dam has since been rebuilt and both dams continue to have a backwater effect on the site when base flow is present. A new, third beaver dam was documented in the middle portion of Lick Creek at station 25+00 during the collection of Year 5 monitoring data.

One new area of bank scour has developed along the arm of a log vane at Sta 10+90 on Lick Creek. This appears to be an isolated occurrence related to the structure that can easily be repaired.

Plan drawings of the Lick Creek Stream Restoration Site detailing stream problem areas can be seen in Figures MP-1 through MP-7. Representative photos of these areas can be found in Appendix B.

Table 9. Problem Areas – Lick Creek Stream Restoration Site (D04013-1)

Location	Issue	Status	Recommended Response
Wallace Branch			
42+40	Bed & Bank Scour	Repaired/Stable	Additional seeding
43+90	Bed Scour	No Change	
Lick Creek			
10+90	Log Vane	Arm Scour	Repair
16+10	Bed & Bank Scour	Minor Scour	
25+30	Beaver Dam	Newly Constructed	
49+80	Bare Bank	Recovering	
61+00	Beaver Dam	Rebuilt	

Proposed Actions

Restoration Systems will repair the scoured log vane arm, remove the on-site beaver dams, and over-see areas of sparse vegetation.

2.2.4 Photo Reference Stations

Photograph reference Stations (PRSs) have been established to assist in characterizing the site and to allow qualitative evaluation of the site conditions. The location of each photo station has been permanently marked in the field and the bearing/orientation of the photograph is indicated on the As-built plans to allow for consistent repetition. A total of eleven (11) PRSs have been established along the restored stream (Appendix B). Six of these PRSs have been located upstream of the permanent monitoring cross sections. These photographs are taken facing downstream looking at the section, and show as much of the banks and channel as possible.

2.2.5 Stability Assessment Table

Feature	Performance Percentage Reach 1: Wallace Branch (3,690 ft)					
	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	100%	100%	100%	100%	100%
Pools	100%	100%	100%	100%	100%	100%
Thalweg	100%	100%	100%	100%	100%	100%
Meanders	100%	99%	99%	95%	95%	99%
Bed General	100%	98%	98%	99%	100%	100%
Vanes / J Hooks etc.	100%	94%	94%	96%	100%	100%
Wads and Boulders	100%	100%	100%	100%	100%	100%

Feature	Performance Percentage Reach 2: Lick Creek (1,870 ft)					
	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	89%	95%	82%	89%	100%
Pools	100%	82%	91%	91%	91%	100%
Thalweg	100%	100%	100%	100%	100%	100%
Meanders	100%	100%	98%	82%	100%	100%
Bed General	100%	97%	98%	98%	100%	100%
Vanes / J Hooks etc.	100%	96%	96%	90%	98%	96%
Wads and Boulders	100%	100%	100%	100%	100%	100%

Feature	Performance Percentage Reach 3: Lick Creek (4,008 ft)					
	Initial	MY-01	MY-02	MY-03	MY-04	MY-05
Riffles	100%	98%	98%	96%	99%	100%
Pools	100%	100%	100%	100%	100%	100%
Thalweg	100%	100%	100%	100%	100%	100%
Meanders	100%	100%	100%	96%	100%	99%
Bed General	100%	100%	100%	99%	100%	100%
Vanes / J Hooks etc.	100%	95%	97%	96%	100%	100%
Wads and Boulders	100%	97%	99%	100%	100%	100%

2.2.6 Quantitative Measure Summary Tables

The following three tables provide a summary of the morphologic parameters over the five years of monitoring (Year 1 through Year 5).

Morphology and Hydraulic Monitoring Summary
Lick Creek Stream Restoration Site (D04013-1)
Reach 1: Wallace Branch

Parameter	Cross Section 1 Riffle						Cross Section 2 Pool						Cross Section					
	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Dimension																		
Bkf Width (ft)	27	27	27.3	27.3	27.9	27.9	25.7	26.2	26.2	29.8	28.9							
Floodprone Width (ft)	>100	>100	>100	>100	>100	>100												
Bkf Cross Sectional Area (ft ²)	63.8	62.7	64.2	64.2	62.1		72.3	83.5	88.1	91.6	98.9							
Bkf Mean Depth (ft)	2.4	2.3	2.3	2.4	2.2		2.8	3.2	3.4	3.1	3.4							
Bkf Max Depth (ft)	4.3	4.4	4.3	4.3	4.5		5.2	5.9	6.1	6.3	6.5							
Width/Depth Ratio	11.4	11.6	11.6	11.6	12.5													
Entrenchment Ratio	>3	>3	>3	>3	>3													
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D ₅₀ (mm)	0.1	1.2	1.4	0.1	0.1	0.1												
D ₈₄ (mm)	2	10	12	10	8	8												

Parameter	MY-1 (2006)			MY-2 (2007)			MY-3 (2008)			MY-4 (2009)			MY-5 (2010)			MY+ (2011)		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Pattern																		
Beltwidth (ft)	110	130	120	110	130	120	110	130	120	110	130	120	110	130	120			
Radius of Curvature (ft)	48	60	54	48	60	54	48	60	54	48	60	54	48	60	54			
Meander Wavelength (ft)	200	260	230	200	260	230	200	260	230	200	260	230	200	260	230			
Profile																		
Riffle Length (ft)	54	77	65.5	38	65	52	30	75	53	33	83	63	54	75.3	63.9			
Riffle Slope (%)	0.09	0.4	0.245	0.13	0.45	0.29	0.07	0.881	0.48	0.13	0.55	0.42	0.8	1.3	0.8			
Pool length (ft)	40	68	54	42	56	49	30	82	56	39	63	50	24.5	81.5	30.4			
Pool Spacing (ft)	128	157	142.5	134	149	142	130	144	137	153	155	154						
Additional Reach Parameters																		
Valley Length (ft)	774		774	774		774	774		774	774		774			774			
Channel Length (ft)	1010		1010	1010		1010	1010		1010	1010		1010			1010			
Sinuosity	1.3		1.3	1.3		1.3	1.3		1.3	1.3		1.3			1.3			
Water Surface Slope (%)	0.17		0.17	0.16		0.16	0.15		0.15	0.15		0.17			-			
Bkf Slope (%)	0.17		0.17	0.16		0.16	0.15		0.15	0.15		0.12			0.08			
Rosgen Classification	E5		E5	E5		E5	E5		E5	E5		E5			E5			
Habitat Index																		
Macrobenthos																		

Morphology and Hydraulic Monitoring Summary
Lick Creek Stream Restoration Site (D04013-1)
Reach 2: Lick Creek

Parameter	Cross Section 3 Riffle					Cross Section 4 Pool					Cross Section							
	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Dimension																		
Bkf Width (ft)	27	26.4	26.4	29.6	30.1		38.1	36	36	36	33							
Floodprone Width (ft)	>100	>100	>100	>100	>100													
Bkf Cross Sectional Area (ft ²)	68	69.8	69.4	75.4	83.4		109.7	102.9	96.2	100	97.8							
Bkf Mean Depth (ft)	2.5	2.6	2.6	2.5	2.8		2.9	2.9	2.7	2.8	3.0							
Bkf Max Depth (ft)	4.5	4.5	4.8	5.2	6.3		5.7	5.4	4.9	5.9	6.7							
Width/Depth Ratio	10.7	10	10	11.6	10.9													
Entrenchment Ratio	>3	>3	>3	>3	>3													
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D ₅₀ (mm)	0.7	0.8	6.6	1.4	0.8													
D ₈₄ (mm)	6	7	16	11	9													

Parameter	MY-1 (2006)					MY-2 (2007)					MY-3 (2008)					MY-4 (2009)					MY-5 (2010)					MY+ (2011)					
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med				
Pattern																															
Beltwidth (ft)	120	150	135	120	150	135	120	150	135	120	150	135	120	150	135	120	150	135	120	150	135	120	150	135	120	150	135	120	150	135	
Radius of Curvature (ft)	50	90	70	50	90	70	50	90	70	50	90	70	50	90	70	50	90	70	50	90	70	50	90	70	50	90	70	50	90	70	
Meander Wavelength (ft)	260	290	275	260	290	275	260	290	275	260	290	275	260	290	275	260	290	275	260	290	275	260	290	275	260	290	275	260	290	275	
Profile																															
Riffle Length (ft)	86	142	114	80	100	90	60	88	74	46	73	67	36.6	87.8	79.5																
Riffle Slope (%)	0.19	0.26	0.225	0.2	0.47	0.34	0.03	0.437	0.23	0.11	0.4	0.16	0.2	0.77	0.26																
Pool length (ft)	28	75	51.5	32	80	56	30	82	56	13	60	28	29.3	69.3	51.1																
Pool Spacing (ft)	180	250	215	152	220	186	157	284	220	138	284	202	187	252.1	216.7																
Additional Reach Parameters																															
Valley Length (ft)	810		810	810		810	810		810		810	810		810		810		810		810		810		810		810		810		810	
Channel Length (ft)	1041		1041	1041		1041	1041		1041		1041	1041		1041		1041		1041		1041		1041		1041		1041		1041		1041	
Sinuosity	1.3		1.3	1.3		1.3	1.3		1.3		1.3	1.3		1.3		1.3		1.3		1.3		1.3		1.3		1.3		1.3		1.3	
Water Surface Slope (%)	0.298		0.298	0.31		0.31	0.27		0.27		0.27	0.24		0.25		0.25		0.25		0.25		0.25		0.25		0.25		0.25		0.25	
Bkf Slope (%)	0.298		0.298	0.31		0.31	0.27		0.27		0.27	0.24		0.25		0.25		0.25		0.25		0.25		0.25		0.25		0.25		0.25	
Rosgen Classification	E5		E5	E5		E5	E5		E5		E5	E5		E5		E5		E5		E5		E5		E5		E5		E5		E5	
Habitat Index																															
Macrobenthos																															

Morphology and Hydraulic Monitoring Summary
Lick Creek Stream Restoration Site (D04013-1)
Reach 3: Lick Creek

Parameter	Cross Section 5 Riffle					Cross Section 6 Pool					Cross Section							
	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Dimension																		
Bkf Width (ft)	43.4	44.5	44.5	44.3	47.4		45	43	42.7	43	42.7							
Floodprone Width (ft)	>150	>150	>150	>150	>150													
Bkf Cross Sectional Area (ft ²)	162.1	160.2	164	146.8	170.7		164.1	170.9	172.4	186.1	176							
Bkf Mean Depth (ft)	3.7	3.6	3.7	3.3	3.6		3.6	4	4	4.3	4.1							
Bkf Max Depth (ft)	6.8	7	8.3	8	8.2		7.8	8.3	7.7	9.6	8.3							
Width/Depth Ratio	11.6	12.4	12.1	13.4	13.2													
Entrenchment Ratio	>3	>3	>3	>3	>3													
Wetted Perimeter (ft)																		
Hydraulic Radius (ft)																		
Substrate																		
D ₅₀ (mm)	0.8	0.4	1.8	4.2	7.9													
D ₈₄ (mm)	13	8	15	12	19													

Parameter	MY-1 (2006)					MY-2 (2007)					MY-3 (2008)					MY-4 (2009)					MY-5 (2010)					MY+ (2011)				
	Min	Max	Med	Min	Max	Min	Max	Med	Min	Max	Min	Max	Med	Min	Max	Min	Max	Med	Min	Max	Min	Max	Med	Min	Max	Min	Max	Med	Min	Max
Pattern																														
Beltwidth (ft)	180	250	215	180	250	180	250	215	180	250	180	250	215	180	250	180	250	215	180	250	180	250	215	180	250	180	250	215	180	250
Radius of Curvature (ft)	70	100	85	70	100	70	100	85	70	100	70	100	85	70	100	70	100	85	70	100	70	100	85	70	100	70	100	85	70	100
Meander Wavelength (ft)	300	340	320	300	340	300	340	320	300	340	300	340	320	300	340	300	340	320	300	340	300	340	320	300	340	300	340	320	300	340
Profile																														
Riffle Length (ft)	93	138	115.5	69	104	69	104	87	78	90	78	90	84	75	130	75	130	78	46	118.6	46	118.6	-							
Riffle Slope (%)	0.062	0.145	0.104	0.14	0.53	0.14	0.53	0.33	0.051	0.367	0.209	0.367	0.209	0.11	0.31	0.11	0.31	0.21	0.39	0.66	0.66	-	-							
Pool length (ft)	47	110	78.5	80	112	96	112	96	45	91	68	91	68	16	43	16	43	23	55.2	105.5	105.5	96.5	96.5							
Pool Spacing (ft)	200	240	220	180	265	223	265	223	195	223	209	223	209	187	278	187	278	214	195.9	276.4	276.4	214.9	214.9							
Additional Reach Parameters																														
Valley Length (ft)	794		794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794	794
Channel Length (ft)	1167		1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167	1167
Sinuosity	1.5		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Water Surface Slope (%)	0.16		0.16	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Bkf Slope (%)	0.16		0.16	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13
Rosgen Classification	E5		E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5	E5
Habitat Index																														
Macrobenthos																														

APPENDIX A

1. Vegetation Monitoring Plot Photos

Vegetation Plot No. 1



Year 4

Photo No. 1



Year 5

Photo No. 2

Vegetation Plot No. 2



Year 4

Photo No. 3



Year 5

Photo No. 4

Vegetation Plot No. 3



Year 4

Photo No. 5



Year 5

Photo No. 6

Vegetation Plot No. 4



Year 4

Photo No. 7



Year 5

Photo No. 8

Vegetation Plot No. 5



Year 4

Photo No. 9



Year 5

Photo No. 10

Vegetation Plot No. 6



Year 4

Photo No. 11



Year 5

Photo No. 12

Vegetation Plot No. 7



Year 4

Photo No. 13



Year 5

Photo No. 14

Vegetation Plot No. 8



Year 4

Photo No. 15



Year 5

Photo No. 16

APPENDIX B

Stream Raw Data

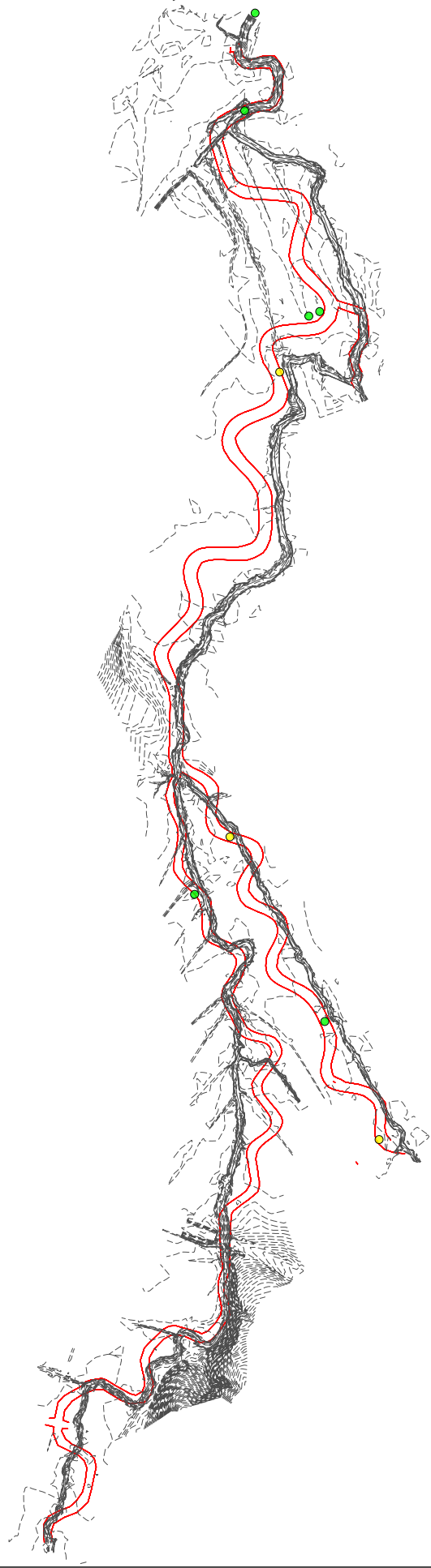
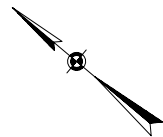
1. Exhibit Problem Areas Plan View (Stream)
2. Representative Stream Problem Area Photos
3. Stream Photo-points
4. Exhibit Table B.1. Qualitative Visual Stability Assessment
5. Cross section Plots and Raw Data Tables
6. Longitudinal Plots and Raw Data Tables
7. Pebble Count Plots and Raw Data Tables

Wolf Creek Engineering
 54 North Main Street
 Raleigh, NC 27601
 PHONE: (919) 855-3648
 WWW.WOLFENGINEERING.COM

PROJECT: WOLF CREEK MONITORING
 CLIENT: RESTORATION SYSTEMS

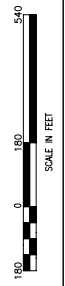
MONITORING PLAN

DATE	BY	REV.	DESCRIPTION
17/09/10		1014	ISSUE FOR CONSTRUCTION



LEGEND

- AS-BUILT TOP OF BANK
- LOW CONCERN
- MEDIUM CONCERN
- HIGH CONCERN





Weak Bank Vegetation on Wallace Branch, Sta 42+40
Photo No. 17

9/13/10



Scoured Log Vane Arm, Lick Creek, Sta 10+80
Photo No. 18

9/13/10



Beaver Dam, Lick Creek, Sta 25+25

9/13/10

Photo No. 19



Minor Toe Scour, Lick Creek, Sta 50+30

9/13/10

Photo No. 20

Photo Station 1



Year 3 - 25' offset from PP1

Photo No. 21



Year 4 - 25' offset from PP1

Photo No. 22



Year 5 - 25' offset from PP1

Photo No. 23

Photo Station 2



Year 3 - 10' offset from PP2

Photo No. 24



Year 4 - 10' offset from PP2

Photo No. 25



Year 5 - 10' offset from PP2

Photo No. 26

Photo Station 3



Year 3 - 10' offset from PP3 Photo No. 27



Year 4 - 10' offset from PP3 Photo No. 28



Year 5 - 10' offset from PP3 Photo No. 29

Photo Station 4



Year 3 - 10' offset from PP4 Photo No. 30



Year 4 - 10' offset from PP4 Photo No. 31



Year 5 - 10' offset from PP4 Photo No. 32

Photo Station 5



Year 3 - 10' offset from PP5

Photo No. 33



Year 4 - 10' offset from PP5

Photo No. 34



Year 5 - 10' offset from PP5

Photo No. 35

Photo Station 6



Year 3 - 10' offset from PP6

Photo No. 36



Year 4 - 10' offset from PP6

Photo No. 37



Year 5 - 10' offset from PP6

Photo No. 38

Photo Station 7



Year 3

Photo No. 39



Year 4 – 10' offset from PP7

Photo No. 40



Year 5 – 10' offset from PP7

Photo No. 41

Photo Station 8



Year 3 - 10' offset from PP8

Photo No. 42



Year 4 - 10' offset from PP8

Photo No. 43

Photo Station 9



Year 3 - 10' offset from PP9

Photo No. 44



Year 4 - 10' offset from PP9

Photo No. 45



Year 5 - 10' offset from PP9

Photo No. 46

Photo Station 10



Year 3

Photo No. 47



Year 4

Photo No. 48



Year 5 – 10' offset from PP1

Photo No. 49

Photo Station 11



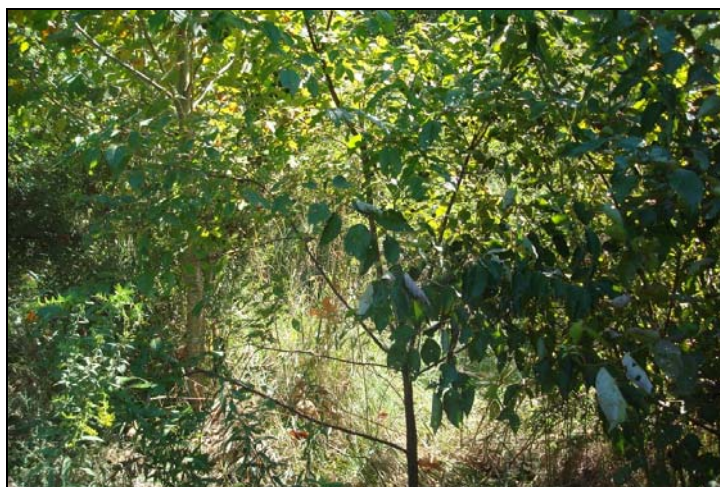
Year 3 - 10' offset from PP11

Photo No. 50



Year 4 - 10' offset from PP11

Photo No. 51



Year 5 - PP11

Photo No. 52

Table B1. Visual Morphological Stability Assessment						
Lick Creek Stream Restoration Site (D04013-1)						
Wallace Branch: Reach 1 3,690 ft						
Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	25	25	N/A	100%	
	2. Armor stable	1	1	N/A	100%	
	3. Facet grade appears stable	25	25	N/A	100%	
	4. Minimal evidence of embedding/fining	25	25	N/A	100%	
	5. Length appropriate	25	25	N/A	100%	100%
B. Pools	1. Present	26	26	N/A	100%	
	2. Sufficiently deep	26	26	N/A	100%	
	3. Length appropriate	26	26	N/A	100%	100%
C. Thalweg	1. Upstream of meander bend centered	13	13	N/A	100%	
	2. Downstream of meander bend centered	13	13	N/A	100%	100%
D. Meanders	1. Outer bend in state of limited erosion	25	26	N/A	96%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	26	26	N/A	100%	
	4. Sufficient floodplain access and relief	25	26	N/A	96%	99%
E. Bed General	1. General channel bed aggradation areas	N/A	N/A	0/50	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	0/50	100%	100%
F. Vanes	1. Free of back or arm scour	17	17	N/A	100%	
	2. Height appropriate	17	17	N/A	100%	
	3. Angle and geometry appear appropriate	17	17	N/A	100%	
	4. Free of piping or other structural failures	17	17	N/A	100%	100%
G. Wads/Boulders	1. Free of scour	33	33	N/A	100%	
	2. Footing stable	33	33	N/A	100%	100%

Table B1. Visual Morphological Stability Assessment						
Lick Creek Stream Restoration Site (D04013-1)						
Lick Creek: Reach 2 1,870 ft						
Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	11	11	N/A	100%	
	2. Armor stable	2	2	N/A	100%	
	3. Facet grade appears stable	11	11	N/A	100%	
	4. Minimal evidence of embedding/fining	11	11	N/A	100%	
	5. Length appropriate	11	11	N/A	100%	100%
B. Pools	1. Present	11	11	N/A	100%	
	2. Sufficiently deep	11	11	N/A	100%	
	3. Length appropriate	11	11	N/A	100%	100%
C. Thalweg	1. Upstream of meander bend centered	5	5	N/A	100%	
	2. Downstream of meander bend centered	6	6	N/A	100%	100%
D. Meanders	1. Outer bend in state of limited erosion	11	11	N/A	100%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	11	11	N/A	100%	
	4. Sufficient floodplain access and relief	11	11	N/A	100%	100%
E. Bed General	1. General channel bed aggradation areas	N/A	N/A	0/40	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	0/60	100%	100%
F. Vanes	1. Free of back or arm scour	12	13	N/A	92%	
	2. Height appropriate	13	13	N/A	100%	
	3. Angle and geometry appear appropriate	13	13	N/A	100%	
	4. Free of piping or other structural failures	12	13	N/A	92%	96%
G. Wads/Boulders	1. Free of scour	22	22	N/A	100%	
	2. Footing stable	22	22	N/A	100%	100%

Table B1. Visual Morphological Stability Assessment

Lick Creek Stream Restoration Site (D04013-1)

Lick Creek: Reach 3 4,008 ft

Feature Category	Metric	(# Stable) Number Performing as Intended	Total Number per As-built	Total Number / feet in unstable state	% Performing in Stable Condition	Feature Performing Mean or Total
A. Riffles	1. Present	17	17	N/A	100%	
	2. Armor stable	1	1	N/A	100%	
	3. Facet grade appears stable	17	17	N/A	100%	
	4. Minimal evidence of embedding/fining	17	17	N/A	100%	
	5. Length appropriate	17	17	N/A	100%	100%
B. Pools	1. Present	18	18	N/A	100%	
	2. Sufficiently deep	18	18	N/A	100%	
	3. Length appropriate	18	18	N/A	100%	100%
C. Thalweg	1. Upstream of meander bend centered	9	9	N/A	100%	
	2. Downstream of meander bend centered	9	9	N/A	100%	100%
D. Meanders	1. Outer bend in state of limited erosion	17	18	N/A	94%	
	2. Of those eroding, # w/ concomitant point bar formation	0	N/A	N/A	100%	
	3. Apparent Rc within specification	18	18	N/A	100%	
	4. Sufficient floodplain access and relief	18	18	N/A	100%	99%
E. Bed General	1. General channel bed aggradation areas	N/A	N/A	0/50	100%	
	2. Channel bed degradation - areas of increasing down-cutting or head-cutting	N/A	N/A	0/5	100%	100%
F. Vanes	1. Free of back or arm scour	30	30	N/A	100%	
	2. Height appropriate	30	30	N/A	100%	
	3. Angle and geometry appear appropriate	30	30	N/A	100%	
	4. Free of piping or other structural failures	30	30	N/A	100%	100%
G. Wads/Boulders	1. Free of scour	35	35	N/A	100%	
	2. Footing stable	36	36	N/A	100%	100%

Lick Creek Stream Restoration Site

Lee County, NC

Cross Section No. 1

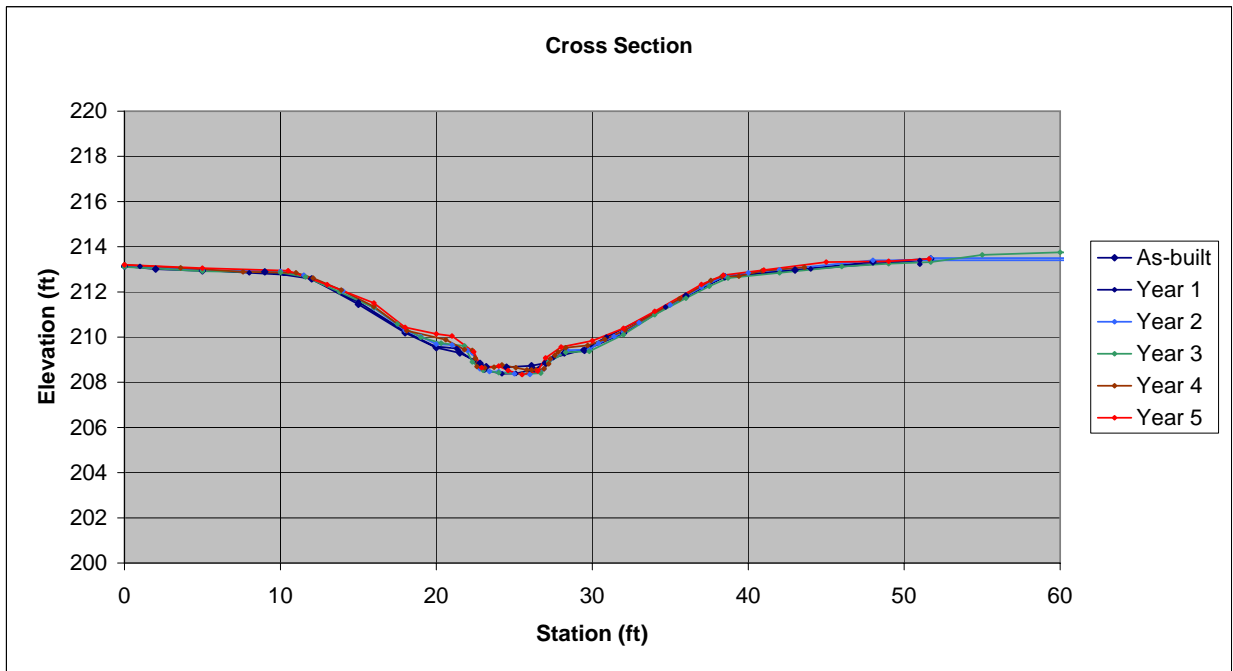
Reach 1 - Wallace Branch - Sta 12+80.7



Year 4

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	5/4/06	Date	11/17/06	Date	11/26/07	Date	10/23/08	Date	10/26/09	Date	9/13/10
Area	60.5	Area	63.8	Area	62.7	Area	64.2	Area	64.2	Area	62.1
Bkf W	26.5	Bkf W	27	Bkf W	27	Bkf W	27.3	Bkf W	27.3	Bkf W	27.9
Dmean	2.3	Dmean	2.4	Dmean	2.3	Dmean	2.3	Dmean	2.4	Dmean	2.2
Dmax	3.9	Dmax	4.3	Dmax	4.4	Dmax	4.3	Dmax	4.3	Dmax	4.5
W/d	11.6	W/d	11.4	W/d	11.6	W/d	11.6	W/d	11.6	W/d	12.5

Lick Creek Stream Restoration Site
 Lee County, NC
 Cross Section No. 1
 Reach 1 - Wallace Branch - Sta 12+80.7

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM	4.65	213.24	IR Lt	BM	5.54	213.24	IR Lt	BM	5.01	213.24	IR Lt
HI		217.89		HI		218.78		HI		218.25	
0	4.75	213.14	GRND	1	5.65	213.13		0	5.07	213.18	
2	4.88	213.01		8	5.93	212.85	ToB	5	5.30	212.95	
5	4.96	212.93		11.5	6.06	212.72	BKF	10	5.34	212.91	
9	5.00	212.89		15	7.22	211.56		11.5	5.51	212.74	
12	5.31	212.58	TOB	18	8.53	210.25		14	6.20	212.05	
15	6.44	211.45		19.9	9.19	209.59		16	6.96	211.29	
18	7.70	210.19		21.3	9.28	209.50	LEW	18	7.95	210.30	
20	8.36	209.53		21.4	9.36	209.42		19	8.22	210.03	
21.5	8.59	209.30		22.4	9.82	208.96	TOE	20	8.56	209.69	
22.8	9.05	208.84	EOW	23.1	10.24	208.54		21	8.60	209.65	
23.2	9.20	208.69		24.2	10.40	208.38		22	8.84	209.41	
24.5	9.22	208.67		25.1	10.39	208.39		22.3	8.95	209.30	
26.1	9.16	208.73		26	10.25	208.53	TOE	22.8	9.65	208.60	EOW
27	9.04	208.85	EOW	26.3	10.22	208.56		23.4	9.77	208.48	
28.2	8.59	209.30		27.5	9.69	209.09	REW	24	9.78	208.47	
29.5	8.48	209.41		29.4	9.35	209.43		25	9.87	208.38	
32	7.71	210.18		30.9	8.78	210.00	BKF	26	9.90	208.35	
36	6.07	211.82	HW	34.7	7.45	211.33	ToB	26.9	9.66	208.59	EOW
38.5	5.22	212.67	TOB	38.5	6.07	212.71		27.3	9.25	209.00	
43	4.92	212.97		44	5.76	213.02		28.4	8.83	209.42	
48	4.56	213.33		51	5.39	213.39	IR Rt	29.8	8.80	209.45	
51.7	4.43	213.46	IP	51	5.55	213.23		30.4	8.52	209.73	
								31.4	8.22	210.03	
								32	8.03	210.22	
								33	7.61	210.64	
								35	6.83	211.42	
								37	6.04	212.21	
								38.5	5.54	212.71	
								40	5.40	212.85	
								42	5.27	212.98	
								48	4.85	213.40	
								5136	4.80	213.45	
								51.7	4.75	213.50	IR Rt

Year 3			
Station	FS/BS	Elev.	Desc.
BM	5.02	213.71	IR Lt
HI		218.73	
-20	6.05	212.68	
-10	5.94	212.79	
0	5.62	213.11	GRND
5	5.81	212.92	
10	5.87	212.86	TOB
11.6	6.07	212.66	
13.8	6.73	212.00	
16	7.43	211.30	
17.5	8.15	210.58	
19	8.74	209.99	
20.3	9	209.73	
21.8	9.12	209.61	
22.3	9.83	208.90	EOW
23	10.2	208.53	
24	10.3	208.43	
25.5	10.37	208.36	
26.7	10.32	208.41	
27.2	9.83	208.90	EOW
28.3	9.4	209.33	
29.8	9.36	209.37	
32	8.62	210.11	
34	7.74	210.99	
36	7.01	211.72	
37.5	6.48	212.25	
38.7	6.12	212.61	
42	5.88	212.85	TOB
46	5.61	213.12	
49	5.48	213.25	
51.7	5.41	213.32	GRND
55	5.09	213.64	
60	4.98	213.75	
70	5.16	213.57	

Year 4			
Station	FS/BS	Elev.	Desc.
BM	4.87	213.24	XS-1 IR Lt
HI		218.11	
0	4.91	213.20	GRND
3.6	5.04	213.07	GRND
7.6	5.22	212.89	GRND
11	5.26	212.85	GRND
12.1	5.50	212.61	BKF
13.9	6.03	212.08	BNK
16	6.76	211.35	BNK
18.1	7.83	210.28	BNK
20.6	8.22	209.89	BNK
21.8	8.66	209.45	BNK
22.3	8.70	209.41	BNK
22.5	9.05	209.06	EOW
22.6	9.41	208.70	BED
23.1	9.47	208.64	BED
23.7	9.44	208.67	BED
24.2	9.34	208.77	BED
25.1	9.46	208.65	BED
25.8	9.56	208.55	BED
26.1	9.56	208.55	BED
26.4	9.56	208.55	BED
26.9	9.51	208.60	BED
27.2	9.29	208.82	BED
27.3	9.07	209.04	EOW
27.6	8.92	209.19	BNK
27.8	8.77	209.34	BNK
28.3	8.58	209.53	BNK
29.7	8.48	209.63	BNK
30.8	8.21	209.90	BNK
32.1	7.8	210.31	BNK
35.6	6.41	211.70	BNK
37.6	5.6	212.51	BNK
38.3	5.43	212.68	BKF
39.4	5.41	212.70	GRND
40.9	5.18	212.93	GRND
43.6	5.02	213.09	GRND
47.6	4.72	213.39	GRND
51.6	4.66	213.45	GRND

Year 5			
Station	FS/BS	Elev.	Desc.
BM	10.04	208.64	TP1
HI		218.68	
0	5.48	213.20	GRND
5	5.63	213.05	GRND
10.5	5.74	212.94	TOB
13	6.36	212.32	BNK
16	7.17	211.51	BNK
18	8.25	210.43	BNK
20	8.54	210.14	BNK
21	8.63	210.05	BNK
22.4	9.33	209.35	BNK
22.9	10.03	208.65	BNK
24	9.96	208.72	BED
24.6	10.16	208.52	THL
25.5	10.34	208.34	BED
26.5	10.18	208.50	BED
27	9.60	209.08	BED
28	9.12	209.56	BNK
30	8.84	209.84	BNK
32	8.29	210.39	BNK
34	7.54	211.14	BNK
37	6.35	212.33	BNK
38.4	5.94	212.74	TOB
41	5.71	212.97	TERR
45	5.36	213.32	TERR
49	5.32	213.36	TERR
51.6	5.22	213.46	GRND

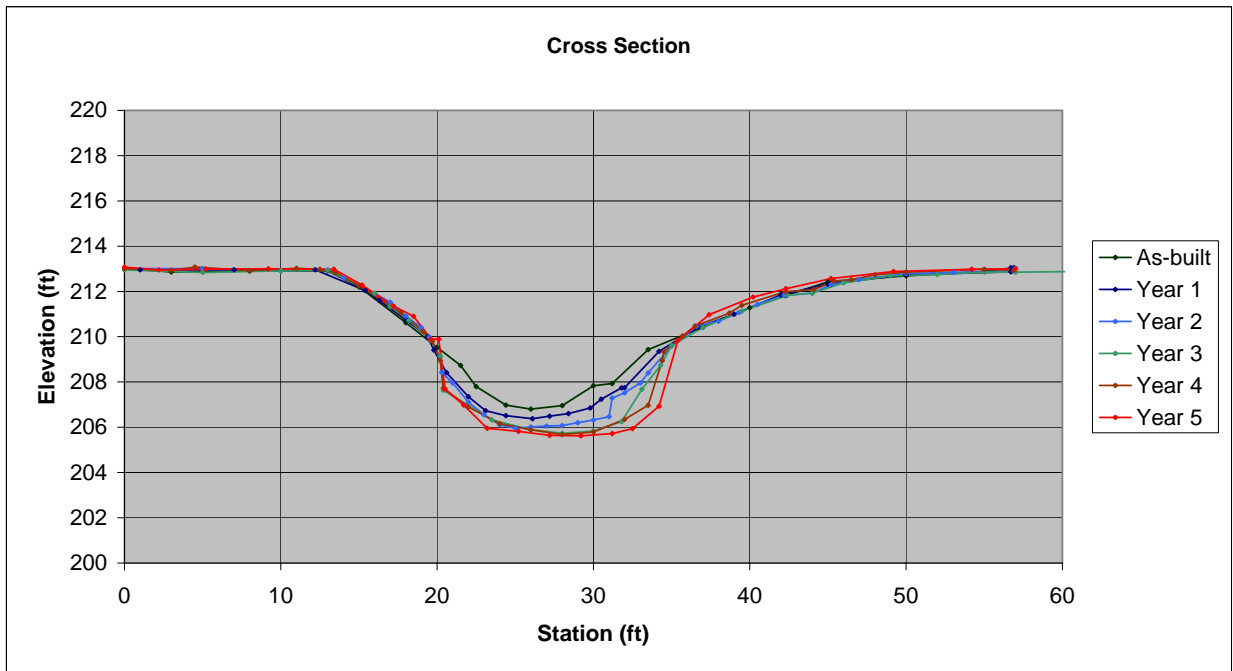
Lick Creek Stream Restoration Site
 Lee County, NC
 Cross Section No. 2 - Pool
 Reach 1 - Wallace Branch - Sta 13+74.5



Year 4

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	5/4/06	Date	11/17/06	Date	11/26/07	Date	10/23/08	Date	10/26/09	Date	9/13/10
Area	69.2	Area	72.3	Area	83.5	Area	88.1	Area	91.6	Area	98.9
Bkf W	27.3	Bkf W	25.7	Bkf W	26.2	Bkf W	26.2	Bkf W	29.8	Bkf W	28.9
Dmean	2.5	Dmean	2.8	Dmean	3.2	Dmean	3.4	Dmean	3.1	Dmean	3.4
Dmax	5.0	Dmax	5.2	Dmax	5.9	Dmax	6.1	Dmax	6.3	Dmax	6.5
W/d	10.8	W/d	9.1	W/d	8.2	W/d	7.8	W/d	9.7	W/d	8.4

Lick Creek Stream Restoration Site

Lee County, NC

Cross Section No. 2 - Pool

Reach 1 - Wallace Branch - Sta 13+74.5

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM	4.81	213.08	IR Lt	BM	4.87	213.08	IR Lt	BM	5.07	213.08	IR Lt
HI		217.89		HI		217.95		HI		218.15	
0	4.87	213.02	GRND	1	4.99	212.96		0	5.14	213.01	
3	5.03	212.86		7	4.99	212.96		5	5.14	213.01	
8	4.99	212.90		12.2	4.99	212.96	ToB	10	5.24	212.91	
13	4.98	212.91	TOB	15.4	5.91	212.04		13	5.19	212.96	
15	5.69	212.20		16.3	6.35	211.60	BKF	14	5.54	212.61	
18	7.27	210.62		18	7.21	210.74		16	6.23	211.92	
20	8.36	209.53		19.4	7.95	210.00		17	6.63	211.52	
21.5	9.16	208.73	EOW	19.8	8.54	209.41	LEW	18	7.24	210.91	
22.5	10.09	207.80		20.6	9.54	208.41		19	7.75	210.40	
24.4	10.91	206.98		22	10.60	207.35		19.5	8.16	209.99	
26	11.09	206.80		23.1	11.22	206.73		20.2	9.02	209.13	
28	10.93	206.96		24.4	11.44	206.51		20.3	9.73	208.42	EOW
30	10.06	207.83		26.1	11.57	206.38		21	10.20	207.95	
31.2	9.96	207.93		27.2	11.46	206.49		22	11.04	207.11	
33.5	8.46	209.43		28.4	11.35	206.60		23	11.60	206.55	
37	7.47	210.42		29.8	11.10	206.85		24	12.04	206.11	
40	6.61	211.28		30.5	10.71	207.24		25	12.20	205.95	
42.3	6.08	211.81	TOB	31.8	10.21	207.74		26	12.14	206.01	
45	5.46	212.43		32	10.20	207.75	TOE	27	12.10	206.05	
50	5.20	212.69		34.2	8.60	209.35	REW	28	12.08	206.07	
55	5.01	212.88		36.7	7.53	210.42		29	11.95	206.20	
56.9	4.84	213.05		39	6.96	210.99	BKF	30	11.83	206.32	
				42	6.10	211.85		31	11.68	206.47	
				45	5.62	212.33	ToB	31.2	10.86	207.29	
				50	5.21	212.74		32	10.63	207.52	
				56.7	5.08	212.87		33	10.20	207.95	
				56.7	4.90	213.05	IR Rt	33.5	9.75	208.40	EOW
								35	8.56	209.59	
								36.6	7.69	210.46	
								38	7.47	210.68	
								39.3	7.08	211.07	
								40.5	6.72	211.43	
								42.2	6.32	211.83	
								44	6.22	211.93	
								45.2	5.85	212.30	
								47	5.62	212.53	
								50	5.36	212.79	
								53	5.31	212.84	
								56.9	5.25	212.90	
								57	5.13	213.02	IR Rt

Year 3				Year 4				Year 5			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM	5.02	213.71	IR Lt	BM	5.30	213.08	XS-2 IR Lt	BM	10.00	207.81	TP2
HI		218.73		HI		218.38		HI		217.81	
-20	5.77	212.96		0	5.37	213.01	GRND	0	4.74	213.07	GRND
-10	6.03	212.70		3	5.45	212.93	GRND	2.2	4.86	212.95	GRND
0	5.78	212.95	GRND	4.5	5.30	213.08	GRND	5.2	4.82	212.99	GRND
5	5.89	212.84		8	5.46	212.92	GRND	9.2	4.81	213.00	GRND
10	5.82	212.91		11	5.36	213.02	GRND	13.4	4.83	212.98	TOB
13	5.8	212.93		12.5	5.40	212.98	BKF	15.2	5.53	212.28	BNK
16	6.81	211.92	TOB	13.5	5.54	212.84	BKF	17.2	6.45	211.36	BNK
17	7.39	211.34		15	6.12	212.26	BNK	18.5	6.91	210.90	BNK
18.2	8.01	210.72		17.7	7.33	211.05	BNK	19.6	7.91	209.90	BNK
19.6	8.89	209.84		19.1	8.14	210.24	BNK	20.1	7.92	209.89	BNK
20.2	9.6	209.13		19.7	8.58	209.80	BNK	20.5	10.12	207.69	BNK
20.4	11.1	207.63		20.2	9.44	208.94	EOW	21.7	10.83	206.98	EOW
23.5	12.4	206.33		20.4	10.65	207.73	BED	23.2	11.86	205.95	BED
26	12.84	205.89		22	11.48	206.90	BED	25.2	11.99	205.82	BED
28	13	205.73		24	12.22	206.16	BED	27.2	12.17	205.64	BED
30	12.9	205.83		26	12.49	205.89	BED	29.2	12.19	205.62	BED
31.8	12.48	206.25		28	12.70	205.68	BED	31.2	12.09	205.72	BED
33.1	11.05	207.68		30	12.59	205.79	BED	32.5	11.87	205.94	BED
34.3	9.99	208.74	EOW	32	12.03	206.35	BED	34.2	10.88	206.93	EOW
35	9.12	209.61		33.5	11.41	206.97	BED	35.4	7.97	209.84	BNK
37	8.32	210.41		34.4	9.44	208.94	EOW	37.4	6.84	210.97	BNK
39.5	7.6	211.13		34.5	9.04	209.34	BNK	40.2	6.06	211.75	BNK
42.4	6.9	211.83	TOB	35.7	8.35	210.03	BNK	42.3	5.69	212.12	TOB
44	6.8	211.93		36.5	7.91	210.47	BNK	45.2	5.24	212.57	GRND
46	6.35	212.38		38.7	7.34	211.04	BNK	49.2	4.93	212.88	GRND
49	6.05	212.68		39.5	6.99	211.39	BNK	54.2	4.83	212.98	GRND
52	5.98	212.75		42.3	6.39	211.99	BKF	57	4.81	213.00	GRND
55	5.88	212.85		44.1	6.3	212.08	GRND				
57	5.88	212.85	GRND	45.4	5.92	212.46	GRND				
61	5.85	212.88		46.5	5.86	212.52	GRND				
70	5.85	212.88		48	5.65	212.73	GRND				
				50	5.53	212.85	GRND				
				55	5.4	212.98	GRND				
				56.9	5.44	212.94	GRND				

Lick Creek Stream Restoration Site

Lee County, NC

Cross Section No. 3 - Riffle

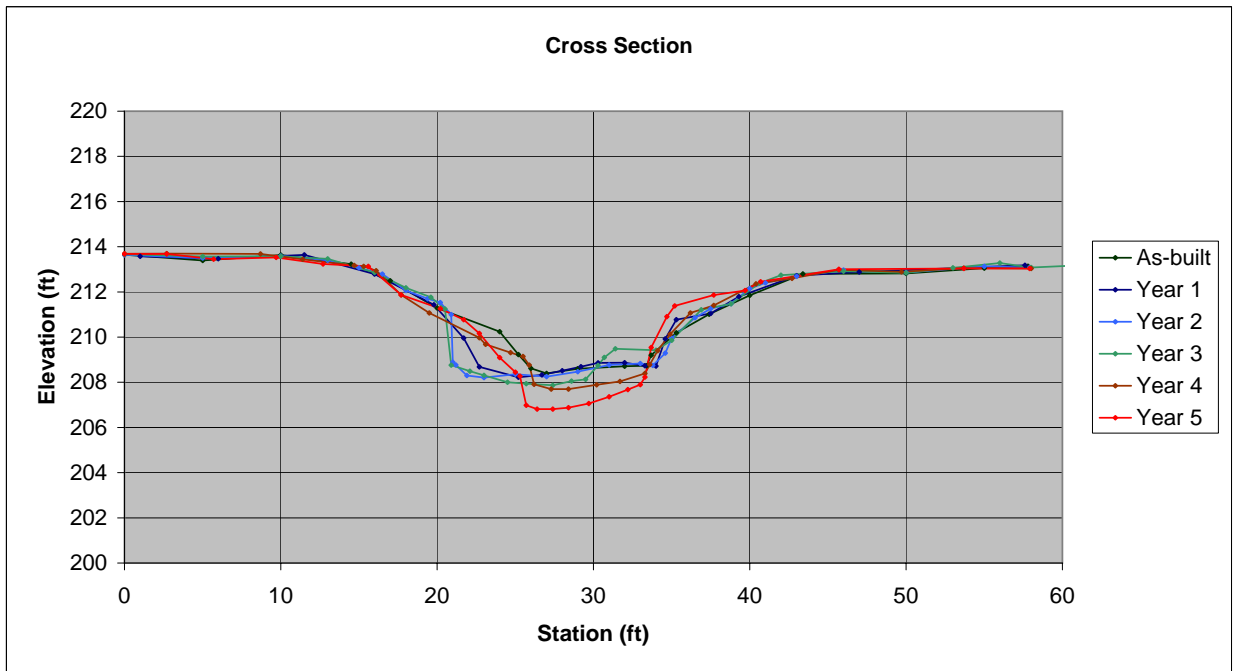
Reach 2 - Lick Creek - Sta 13+25.7



Year 4

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	5/5/06	Date	11/17/06	Date	11/26/07	Date	10/23/08	Date	10/26/09	Date	9/13/10
Area	64.5	Area	68.0	Area	69.8	Area	69.4	Area	75.4	Area	83.4
Bkf W	28.9	Bkf W	27	Bkf W	26.4	Bkf W	26.4	Bkf W	29.6	Bkf W	30.1
Dmean	2.2	Dmean	2.5	Dmean	2.6	Dmean	2.6	Dmean	2.5	Dmean	2.8
Dmax	4.4	Dmax	4.5	Dmax	4.5	Dmax	4.8	Dmax	5.2	Dmax	6.3
W/d	13.0	W/d	10.7	W/d	10.0	W/d	10.0	W/d	11.6	W/d	10.9

Lick Creek Stream Restoration Site

Lee County, NC

Cross Section No. 3 - Riffle

Reach 2 - Lick Creek - Sta 13+25.7

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM		213.72	IR Lt	BM		213.72	IR Lt	BM		213.72	IR Lt
HI	4.77	218.49		HI	4.56	218.28		HI	5.16	218.88	
0	4.84	213.65		1	4.70	213.58		0	5.24	213.64	
5	5.10	213.39		6	4.81	213.47		5	5.38	213.50	
10	4.86	213.63		11.5	4.64	213.64	ToB	10	5.29	213.59	
14.5	5.26	213.23	TOB	16	5.49	212.79		13	5.48	213.40	
17	6.00	212.49		19.8	6.85	211.43	BKF	15	5.81	213.07	
20	7.20	211.29		21.7	8.32	209.96	LEW	16.5	6.09	212.79	
24	8.25	210.24		22.7	9.60	208.68	TOE	18	6.82	212.06	
25.2	9.26	209.23	EOW	25.2	10.06	208.22	THL	19.4	7.18	211.70	
26	9.87	208.62		26.7	9.95	208.33		20.2	7.35	211.53	
27	10.10	208.39		28	9.77	208.51		20.9	7.88	211.00	
29	9.89	208.60		29.2	9.59	208.69		21	9.99	208.89	
32	9.78	208.71		30.3	9.42	208.86		21.2	10.11	208.77	EOW
33.4	9.76	208.73		32	9.41	208.87		21.9	10.58	208.30	
33.7	9.29	209.20	EW	33.3	9.55	208.73		23	10.67	208.21	
35.3	8.30	210.19		34	9.56	208.72	TOE	25	10.52	208.36	
37.4	7.48	211.01	HW	34.6	8.36	209.92	REW	27	10.63	208.25	
40	6.64	211.85		35.3	7.51	210.77		29	10.41	208.47	
43.4	5.69	212.80	TOB	37.5	7.23	211.05		31	10.11	208.77	EOW
50	5.67	212.82		39.3	6.49	211.79	BKF	33	10.05	208.83	
55	5.44	213.05		43	5.56	212.72	ToB	33.8	10.13	208.75	
57.8	5.35	213.14	IP	47	5.40	212.88		34.6	9.59	209.29	
				57.6	5.10	213.18	Stake Rt	35	8.93	209.95	
								36.5	8.02	210.86	
								37.5	7.62	211.26	
								38.8	7.40	211.48	
								40	6.73	212.15	
								41	6.48	212.40	
								43	6.19	212.69	
								46	5.91	212.97	
								50	6.02	212.86	
								55	5.75	213.13	
								57.9	5.80	213.08	GROUND

Year 3			
Station	FS/BS	Elev.	Desc.
BM		209.81	IR Lt
HI	9.05	218.86	
-20	5.55	213.31	
-10	5.17	213.69	
0	5.19	213.67	GRND
5	5.29	213.57	
10	5.28	213.58	
13	5.40	213.46	
16	6.00	212.86	TOB
18	6.68	212.18	
19.6	7.10	211.76	
20.5	7.61	211.25	
20.9	10.10	208.76	EOW
22.1	10.37	208.49	
23	10.55	208.31	
24.5	10.86	208.00	
25.7	10.92	207.94	
27.4	10.99	207.87	
28.6	10.81	208.05	
29.5	10.73	208.13	
30.3	10.11	208.75	EOW
30.7	9.76	209.10	
31.4	9.38	209.48	
34	9.44	209.42	
35	9.00	209.86	
36.9	7.65	211.21	
38.8	7.39	211.47	
40.6	6.48	212.38	
42	6.12	212.74	TOB
46	5.94	212.92	
50	6.01	212.85	
53	5.79	213.07	
56	5.58	213.28	
58	5.78	213.08	GRND
63	5.62	213.24	
67	5.83	213.03	
72	5.99	212.87	

Year 4			
Station	FS/BS	Elev.	Desc.
BM		213.72	IR Lt
HI	4.78	218.50	
0	4.81	213.69	GRND
2.7	4.80	213.70	GRND
8.7	4.82	213.68	GRND
11.4	5.06	213.44	GRND
14.7	5.33	213.17	GRND
15.3	5.37	213.13	GRND
16.1	5.56	212.94	BKF
17.7	6.63	211.87	BNK
19.5	7.43	211.07	BNK
22.7	8.53	209.97	BNK
23.1	8.82	209.68	BNK
24.7	9.19	209.31	BNK
25.5	9.36	209.14	BNK
25.9	9.74	208.76	EOW
26.2	10.59	207.91	BED
27.3	10.80	207.70	BED
28.4	10.80	207.70	BED
30.2	10.61	207.89	BED
31.7	10.46	208.04	BED
33.3	10.11	208.39	BED
33.6	9.72	208.78	EOW
34.1	9.10	209.40	BNK
34.9	8.37	210.13	BNK
36.2	7.43	211.07	BNK
37.7	7.10	211.40	BNK
40.4	6.14	212.36	BNK
42.7	5.90	212.60	BNK
45.7	5.52	212.98	BKF
49.7	5.61	212.89	GRND
53.7	5.45	213.05	GRND
58	5.46	213.04	GRND

Year 5			
Station	FS/BS	Elev.	Desc.
BM		213.72	IR Lt
HI	4.42	218.14	
0	4.46	213.68	GRND
2.7	4.46	213.68	
5.7	4.69	213.45	
9.7	4.61	213.53	
12.7	4.90	213.24	
15.6	5.01	213.13	TOB
17.7	6.27	211.87	BNK
20.2	6.88	211.26	
21.7	7.37	210.77	
22.7	7.98	210.16	
24	9.05	209.09	
25	9.69	208.45	
25.3	9.87	208.27	EOW
25.7	11.16	206.98	BED
26.4	11.33	206.81	
27.4	11.33	206.81	
28.4	11.26	206.88	
29.7	11.08	207.06	
31	10.78	207.36	
32.2	10.46	207.68	
33	10.24	207.90	
33.3	9.91	208.23	EOW
33.7	8.60	209.54	BNK
34.7	7.23	210.91	
35.2	6.76	211.38	TOB
37.7	6.28	211.86	
39.7	6.08	212.06	
40.7	5.69	212.45	
45.7	5.14	213.00	
53.7	5.1	213.04	
57.9	5.1	213.04	

Lick Creek Stream Restoration Site

Lee County, NC

Cross Section No. 4 - Pool

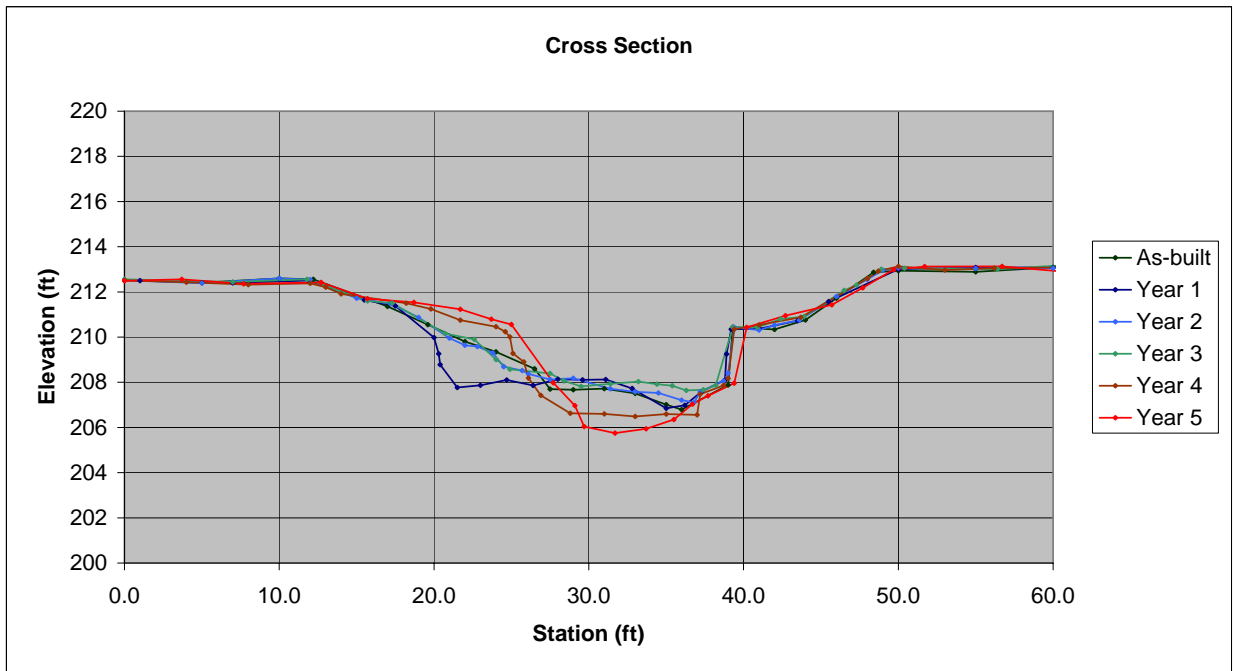
Reach 2 - Lick Creek - Sta 15+79.4



Year 4

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	5/5/06	Date	11/17/06	Date	11/26/07	Date	10/23/08	Date	10/26/09	Date	9/13/10
Area	105.2	Area	109.7	Area	102.9	Area	96.2	Area	100.0	Area	100.1
Bkf W	36.2	Bkf W	38.1	Bkf W	36	Bkf W	36	Bkf W	36	Bkf W	35
Dmean	2.9	Dmean	2.9	Dmean	2.9	Dmean	2.7	Dmean	2.8	Dmean	2.9
Dmax	5.8	Dmax	5.7	Dmax	5.4	Dmax	4.9	Dmax	5.9	Dmax	6.7
W/d	12.5	W/d	13.2	W/d	12.6	W/d	13.5	W/d	13.0	W/d	12.2

Lick Creek Stream Restoration Site

Lee County, NC

Cross Section No. 4 - Pool

Reach 2 - Lick Creek - Sta 15+79.4

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM		212.56	IR Lt	BM	5.80	212.56	IR Lt	BM	6.00	212.56	IR Lt
HI		217.83		HI		218.36		HI		218.56	
0.0	5.31	212.52		1.0	5.86	212.50		0	6.04	212.52	
5.0	5.42	212.41		7.0	5.96	212.40		5	6.17	212.39	
10.0	5.23	212.60		11.9	5.85	212.51	ToB	10	5.96	212.60	
12.2	5.27	212.56	TOB	15.5	6.72	211.64	BKF	12	6.02	212.54	
17.0	6.47	211.36		17.5	6.98	211.38		15	6.84	211.72	
19.6	7.28	210.55	HW	20.0	8.38	209.98		17.2	7.09	211.47	
22.0	8.03	209.80		20.3	9.10	209.26	LEW	19	7.69	210.87	
24.0	8.48	209.35		20.4	9.58	208.78	TOE	21	8.60	209.96	
26.5	9.23	208.60	EW	21.5	10.59	207.77		22	8.92	209.64	
27.5	10.13	207.70		23.0	10.49	207.87		22.8	8.98	209.58	
29.0	10.16	207.67		24.7	10.26	208.10		23.8	9.26	209.30	
31.0	10.11	207.72		26.4	10.50	207.86		24.5	9.87	208.69	
33.0	10.32	207.51		28.0	10.22	208.14		25.7	10.04	208.52	
35.0	10.82	207.01		29.6	10.25	208.11		26.1	10.19	208.37	EOW
36.0	11.04	206.79		31.1	10.24	208.12		27.5	10.44	208.12	
39.0	9.95	207.88		32.8	10.63	207.73		29	10.38	208.18	
39.3	7.39	210.44		35.0	11.51	206.85		31.4	10.85	207.71	
42.0	7.49	210.34		36.2	11.38	206.98		33	10.98	207.58	
44.0	7.07	210.76		37.3	10.77	207.59		34.5	11.03	207.53	
46.0	6.11	211.72		38.8	10.26	208.10	TOE	36	11.35	207.21	
48.4	4.96	212.87	TOB	38.9	9.11	209.25	REW	36.8	11.45	207.11	
50.0	4.89	212.94		39.2	8.01	210.35		37.2	10.99	207.57	
55.0	4.94	212.89		41.0	7.99	210.37		38.7	10.50	208.06	
60.0	4.74	213.09		43.5	7.63	210.73		39	10.15	208.41	EOW
63.2	4.61	213.22	IP RT	45.5	6.79	211.57	BKF	39.4	8.13	210.43	
				50.0	5.35	213.01	ToB	41	8.25	210.31	
				55.0	5.28	213.08		42	8.03	210.53	
				61.0	5.28	213.08		43.6	7.81	210.75	
				63.0	5.25	213.11		46	6.76	211.80	
				63.0	5.16	213.20	IR Rt	48	6.00	212.56	
								49	5.60	212.96	
								50	5.50	213.06	
								55	5.52	213.04	
								60	5.51	213.05	
								63.3	5.49	213.07	GROUND

Year 3			
Station	FS/BS	Elev.	Desc.
BM	8.72	209.63	IR Lt
HI		218.35	
-20	5.43	212.92	
-10	5.73	212.62	
0	5.79	212.56	GRND
7	5.91	212.44	
11.8	5.79	212.56	TOB
15.7	6.75	211.60	
17.3	6.84	211.51	
20.7	8.19	210.16	
22.6	8.45	209.90	
24	9.34	209.01	
24.9	9.77	208.58	
27.5	9.96	208.39	
28.4	10.29	208.06	EOW
29.5	10.53	207.82	
31.4	10.42	207.93	
33.2	10.32	208.03	
34.4	10.43	207.92	
35.4	10.50	207.85	
36.3	10.71	207.64	
37.4	10.68	207.67	
38.2	10.49	207.86	
39.3	7.91	210.44	
40.9	7.92	210.43	
42.4	7.55	210.80	
43.9	7.44	210.91	
46.5	6.28	212.07	
47.3	6.05	212.30	
48.9	5.35	213	TOB
50.4	5.3	213.05	
56.4	5.34	213.01	
62	5.12	213.23	
63.3	5.25	213.1	GRND
68	5.26	213.09	
71	5.16	213.19	

Year 4			
Station	FS/BS	Elev.	Desc.
BM	5.29	212.56	IR Lt
HI		217.85	
0	5.34	212.51	GRND
4	5.42	212.43	GRND
8	5.53	212.32	GRND
12	5.47	212.38	BKF
13	5.64	212.21	BNK
14	5.94	211.91	BNK
18.2	6.35	211.50	BNK
19.8	6.60	211.25	BNK
21.7	7.10	210.75	BNK
24	7.39	210.46	BNK
24.6	7.61	210.24	BNK
24.9	7.84	210.01	BNK
25.1	8.57	209.28	BR TOE
25.8	8.95	208.90	BR TOE
26.1	9.66	208.19	EOW
26.9	10.43	207.42	BED
28.8	11.22	206.63	BED
31	11.25	206.60	BED
33	11.36	206.49	BED
35	11.26	206.59	BED
37	11.29	206.56	BED
37.2	10.38	207.47	BLDR
38.7	9.99	207.86	BLDR
39	9.68	208.17	EOW
39.4	7.50	210.35	BLDR
41	7.31	210.54	BNK
43.7	6.97	210.88	BNK
48	5.26	212.59	BKF
48.7	4.93	212.92	GRND
50	4.72	213.13	GRND
53	4.88	212.97	GRND
56.2	4.8	213.05	GRND
63.6	4.74	213.11	GRND

Year 5			
Station	FS/BS	Elev.	Desc.
BM	5.44	212.54	IR Lt
HI		217.98	
0	5.49	212.49	GRND
3.7	5.42	212.56	
7.7	5.62	212.36	
12.7	5.56	212.42	TOB
15.7	6.28	211.70	BNK
18.7	6.44	211.54	
21.7	6.75	211.23	
23.7	7.19	210.79	
25	7.42	210.56	
27.7	10.00	207.98	
29.1	11.01	206.97	
29.7	11.94	206.04	BED
31.7	12.23	205.75	
33.7	12.04	205.94	
35.5	11.63	206.35	
36.7	10.95	207.03	
37.7	10.58	207.40	BLDR
39.4	10.02	207.96	
40.2	7.55	210.43	
42.7	7.03	210.95	
45.7	6.55	211.43	TERR
47.7	5.80	212.18	
49.7	4.99	212.99	
51.7	4.86	213.12	
56.7	4.85	213.13	
61.7	5.14	212.84	
64.5	4.86	213.12	GRND

Lick Creek Stream Restoration Site

Lee County, NC

Cross Section No. 5 - Riffle

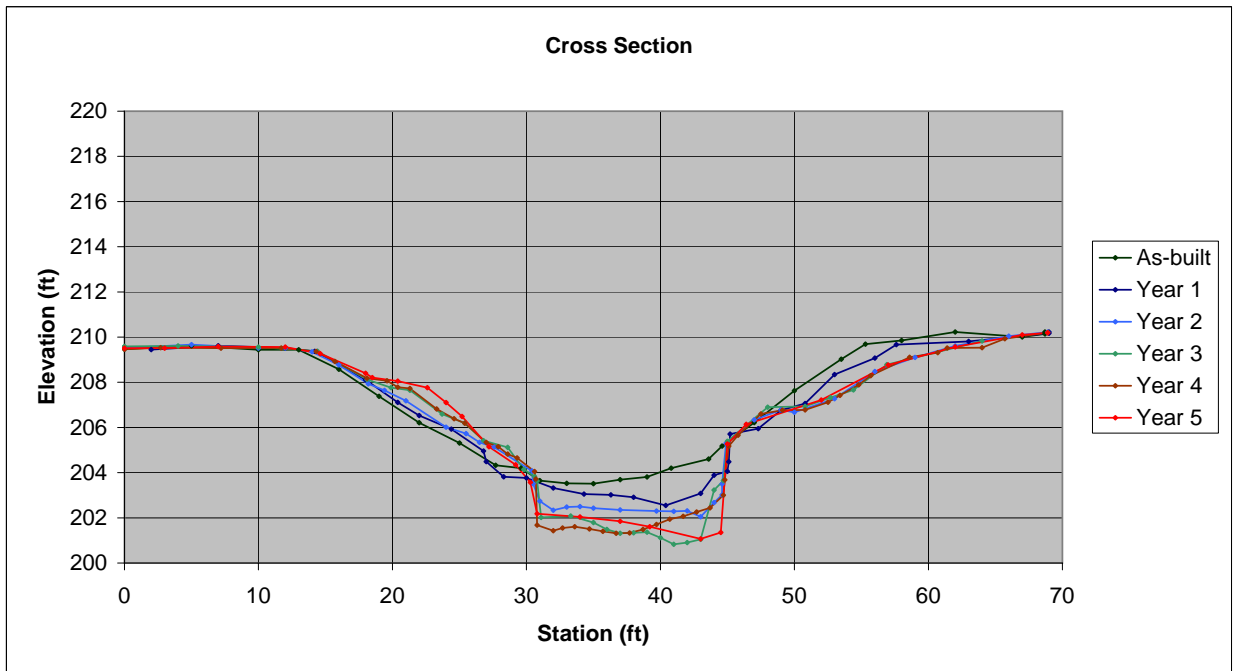
Reach 3 - Lick Creek - Sta 14+24.6



Year 4

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	5/5/06	Date	11/17/06	Date	11/26/07	Date	10/24/08	Date	10/27/09	Date	9/14/10
Area	150.3	Area	162.1	Area	160.2	Area	164.0	Area	146.8	Area	170.7
Bkf W	42.3	Bkf W	43.4	Bkf W	44.5	Bkf W	44.5	Bkf W	44.3	Bkf W	47.4
Dmean	3.6	Dmean	3.7	Dmean	3.6	Dmean	3.7	Dmean	3.3	Dmean	3.6
Dmax	5.9	Dmax	6.8	Dmax	7.0	Dmax	8.3	Dmax	8.0	Dmax	8.2
W/d	11.9	W/d	11.6	W/d	12.4	W/d	12.1	W/d	13.4	W/d	13.2

Lick Creek Stream Restoration Site

Lee County, NC
Cross Section No. 5 - Riffle
Reach 3 - Lick Creek - Sta 14+24.6

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM HI	5.13	209.56 214.69	IR Lt	BM HI	4.72	209.56 214.28	IR Lt	BM HI	5.18	209.56 214.74	IR Lt
0.0	5.22	209.47	GRND	2.0	4.83	209.45		0	5.22	209.52	
5.0	5.07	209.62		7.0	4.66	209.62		5	5.07	209.67	
10.0	5.25	209.44		12.0	4.76	209.52		10	5.23	209.51	
13.0	5.25	209.44	TOB	14.2	4.91	209.37	ToB	12	5.22	209.52	
16.0	6.11	208.58		18.0	6.17	208.11		14	5.39	209.35	
19.0	7.31	207.38		20.4	7.17	207.11	BKF	16	5.97	208.77	
22.0	8.48	206.21		22.0	7.75	206.53		18.2	6.81	207.93	
25.0	9.38	205.31		24.4	8.35	205.93		19.4	7.10	207.64	
27.7	10.36	204.33		26.8	9.32	204.96		21	7.56	207.18	
29.6	10.49	204.20	EOW	27.0	9.79	204.49	LEW	24	8.73	206.01	
31.0	11.04	203.65		28.3	10.46	203.82	TOE	25.5	9.01	205.73	
33.0	11.16	203.53		30.0	10.51	203.77		26.5	9.40	205.34	
35.0	11.18	203.51		32.0	10.96	203.32		27.6	9.61	205.13	
37.0	11.00	203.69		34.3	11.23	203.05		30.4	10.66	204.08	
39.0	10.88	203.81		36.3	11.26	203.02		30.5	11.23	203.51	EOW
40.8	10.49	204.20	EOW	38.0	11.37	202.91		31	12.00	202.74	
43.6	10.09	204.60		40.4	11.73	202.55		32	12.40	202.34	
44.6	9.51	205.18		43.0	11.20	203.08		33	12.26	202.48	
47.0	8.47	206.22		44.0	10.39	203.89		34	12.24	202.50	
50.0	7.06	207.63		45.0	10.22	204.06		35	12.31	202.43	
53.5	5.67	209.02		45.1	9.80	204.48	REW	37	12.39	202.35	
55.3	5.00	209.69	TOB	45.2	8.57	205.71	BOULDER	39.7	12.44	202.30	
58.0	4.84	209.85		47.3	8.33	205.95		41	12.45	202.29	
62.0	4.46	210.23		49.0	7.52	206.76		42	12.43	202.31	
67.0	4.68	210.01		50.8	7.22	207.06		43	12.69	202.05	
68.7	4.55	210.14	IR RT	53.0	5.94	208.34	BKF	44	12.06	202.68	
68.7	4.46	210.23		56.0	5.21	209.07		44.6	11.72	203.02	EOW
				57.6	4.61	209.67	ToB	44.6	11.24	203.50	ROCK
				63.0	4.47	209.81		44.9	9.44	205.30	
				69.0	4.11	210.17		47	8.40	206.34	
				69.0	4.05	210.23	IR Rt	49	7.96	206.78	
								50	8.07	206.67	
								53	7.47	207.27	
								56	6.26	208.48	
								59	5.64	209.10	
								62	5.13	209.61	
								66	4.70	210.04	
								68.9	4.52	210.22	IR Rt

Year 3			
Station	FS/BS	Elev.	Desc.
BM HI	10.57	204.58 215.15	IR Lt
-17	5.47	209.68	
-9	5.80	209.35	
0	5.56	209.59	GRND
4	5.54	209.61	
10	5.59	209.56	
14.4	5.77	209.38	TOB
18.1	7.03	208.12	
19.9	7.39	207.76	
21.3	7.50	207.65	
23.7	8.56	206.59	
25.4	8.96	206.19	
26.8	9.73	205.42	
28.6	10.03	205.12	
29.8	11.01	204.14	
30.6	11.32	203.83	
30.8	11.52	203.63	EOW
31.1	13.13	202.02	
33.3	13.07	202.08	
35	13.36	201.79	
36	13.66	201.49	
37	13.83	201.32	
38	13.81	201.34	
39	13.78	201.37	
40	14.03	201.12	
41	14.32	200.83	
42	14.24	200.91	
43	14.1	201.05	
44	11.92	203.23	
44.7	11.5	203.65	EOW
45	9.76	205.39	ROCK
48	8.25	206.9	
50.8	8.22	206.93	
52.7	7.83	207.32	
54.4	7.49	207.66	
56.9	6.37	208.78	
64	5.32	209.83	TOB
66.5	4.97	210.18	
68.9	4.91	210.24	GRND
72	5.09	210.06	
77.6	5.59	209.56	
85	5.88	209.27	
90	6.11	209.04	

Year 4			
Station	FS/BS	Elev.	Desc.
BM HI	5.17	209.56 214.73	IR Lt
0	5.27	209.46	GRND
2.7	5.20	209.53	GRND
7.2	5.22	209.51	GRND
11.7	5.21	209.52	GRND
14.3	5.37	209.36	BKF
15.7	5.81	208.92	BNK
18.1	6.55	208.18	BNK
19.6	6.66	208.07	BNK
20.4	6.95	207.78	BNK
21.3	7.00	207.73	BNK
23.3	7.91	206.82	BNK
24.6	8.34	206.39	BNK
25.4	8.54	206.19	BNK
27	9.39	205.34	BNK
27.9	9.58	205.15	BNK
28.6	9.91	204.82	BNK
29.3	10.08	204.65	BNK
30.6	10.68	204.05	BNK
30.7	11.01	203.72	EOW
30.8	13.05	201.68	BED
32	13.30	201.43	BED
32.7	13.18	201.55	BED
33.6	13.12	201.61	BED
34.7	13.22	201.51	BED
35.7	13.33	201.40	BED
36.7	13.41	201.32	BED
37.7	13.40	201.33	BED
38.7	13.24	201.49	BED
39.7	13.02	201.71	BED
40.7	12.79	201.94	BED
41.7	12.66	202.07	BED
42.7	12.47	202.26	BED
43.7	12.29	202.44	BED
44.7	11.73	203.00	BED
44.8	11.05	203.68	EOW
45.1	9.55	205.18	BLDR
45.8	9.07	205.66	BLDR
47.5	8.13	206.60	BNK
49.1	7.97	206.76	BNK
50.8	7.95	206.78	BNK
52.5	7.61	207.12	BNK
53.4	7.31	207.42	BNK
54.8	6.84	207.89	BNK
55.7	6.44	208.29	BNK
58.6	5.62	209.11	BKF
60.7	5.42	209.31	GRND
61.4	5.21	209.52	GRND
64	5.2	209.53	GRND
65.7	4.8	209.93	GRND
68.9	4.53	210.20	GRND

Year 5			
Station	FS/BS	Elev.	Desc.
BM HI	11.30	204.05 215.35	IR Lt
0	5.84	209.51	GRND
3	5.84	209.51	GRND
7	5.77	209.58	GRND
12	5.79	209.56	GRND
14.6	6.08	209.27	TOB
18	6.95	208.40	BNK
18.5	7.14	208.21	BNK
20.4	7.30	208.05	BNK
22.6	7.59	207.76	BNK
24	8.25	207.10	BNK
25.2	8.86	206.49	BNK
27.2	10.20	205.15	BNK
29.2	11.00	204.35	BNK
30.3	11.78	203.57	BED
30.8	13.17	202.18	BED
34	13.31	202.04	BED
37	13.50	201.85	BED
39.2	13.74	201.61	BED
43	14.28	201.07	BED
44.5	14.00	201.35	TOE
45	10.08	205.27	BLDR
46.4	9.21	206.14	BNK
52	8.13	207.22	BNK
57	6.58	208.77	BNK
62	5.78	209.57	BNK
67	5.25	210.10	BNK
68.9	5.16	210.19	GRND

Lick Creek Stream Restoration Site

Lee County, NC

Cross Section No. 6 - Pool

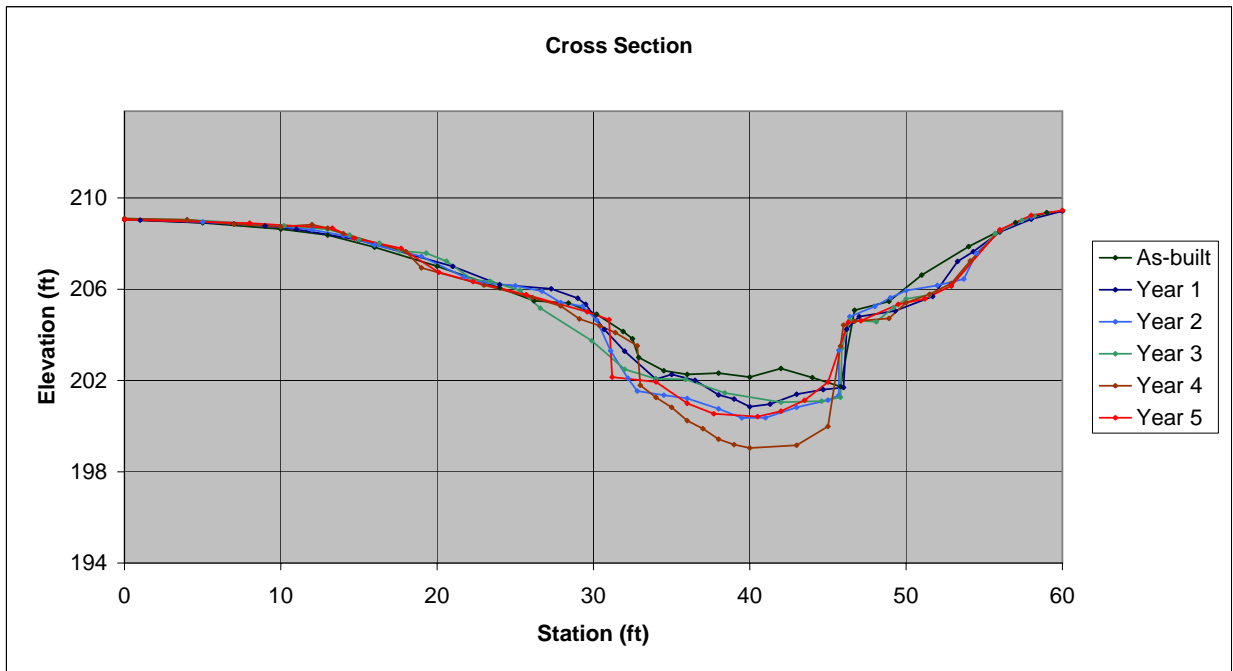
Reach 3 - Lick Creek - Sta 15+53.8



Year 4

Year 5

Facing Downstream



As-Built		Year 1		Year 2		Year 3		Year 4		Year 5	
Date	5/5/06	Date	11/17/06	Date	11/26/07	Date	10/24/08	Date	10/27/09	Date	9/14/10
Area	140.7	Area	164.1	Area	170.9	Area	169.4	Area	186.1	Area	176.0
Bkf W	43	Bkf W	45	Bkf W	43	Bkf W	43	Bkf W	43	Bkf W	42.7
Dmean	3.3	Dmean	3.6	Dmean	4.0	Dmean	3.9	Dmean	4.3	Dmean	4.1
Dmax	6.7	Dmax	7.8	Dmax	8.3	Dmax	7.6	Dmax	9.6	Dmax	8.3
W/d	13.1	W/d	12.3	W/d	10.8	W/d	10.9	W/d	9.9	W/d	10.4

Lick Creek Stream Restoration Site

Lee County, NC

Cross Section No. 6 - Pool

Reach 3 - Lick Creek - Sta 15+53.8

As-Built				Year 1				Year 2			
Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.	Station	FS/BS	Elev.	Desc.
BM HI	5.40	209.31 214.71	IR Lt	BM HI	4.77	209.31 214.08	IR Lt	BM HI	5.87	209.31 215.18	IR Lt
0.0	5.51	209.20	GRND	1.0	4.90	209.18		0	5.95	209.23	
5.0	5.65	209.06		7.0	5.07	209.01		5	6.08	209.10	
10.0	5.93	208.78		9.0	5.16	208.92	ToB	10	6.29	208.89	
13.0	6.19	208.52	TOB	11.0	5.31	208.77		12	6.43	208.75	
16.0	6.73	207.98		15.0	5.78	208.30		14	6.68	208.50	
20.0	7.57	207.14		21.0	6.95	207.13	BKF	16	7.10	208.08	
24.0	8.53	206.18		24.0	7.76	206.32		19	7.61	207.57	
26.2	9.10	205.61		27.3	7.94	206.14		21.7	8.51	206.67	
28.4	9.20	205.51		29.0	8.36	205.72		23	8.77	206.41	
30.2	9.70	205.01		29.5	8.63	205.45		25	8.91	206.27	
31.9	10.46	204.25		30.7	9.74	204.34	LEW	26.7	9.15	206.03	
32.5	10.78	203.93	EOW	32.0	10.70	203.38		27.9	9.65	205.53	
32.9	11.61	203.10		34.0	11.94	202.14	TOE	29.3	9.81	205.37	
34.5	12.20	202.51		35.0	11.73	202.35		30.2	10.42	204.76	
36.0	12.36	202.35		36.5	11.99	202.09		31.1	11.78	203.40	EOW
38.0	12.30	202.41		38.0	12.64	201.44		32.2	13.00	202.18	
40.0	12.48	202.23		39.0	12.82	201.26		32.8	13.57	201.61	
42.0	12.10	202.61		40.0	13.16	200.92		34.5	13.75	201.43	
44.0	12.50	202.21		41.3	13.05	201.03		36	13.89	201.29	
45.8	12.90	201.81		43.0	12.61	201.47		38	14.35	200.83	
46.7	9.52	205.19		44.7	12.40	201.68		39.5	14.76	200.42	
48.9	9.13	205.58		46.0	12.31	201.77	REW	41	14.75	200.43	
51.0	7.96	206.75		46.2	9.73	204.35		43	14.29	200.89	
54.0	6.70	208.01		47.0	9.17	204.91		45	13.97	201.21	
56.0	6.00	208.71		49.3	8.92	205.16		45.7	13.75	201.43	
57.0	5.64	209.07	TOB	51.7	8.28	205.80		45.7	11.76	203.42	EOW LOG
59.0	5.20	209.51		53.3	6.73	207.35		46.4	10.27	204.91	
62.0	5.06	209.65		54.3	6.30	207.78	BKF	48	9.82	205.36	
66.0	4.72	209.99		56.0	5.43	208.65		49	9.44	205.74	
70.9	4.68	210.03		58.0	4.86	209.22	ToB	50	9.12	206.06	
70.9	4.56	210.15	IR RT	60.0	4.50	209.58		52	8.89	206.29	
				64.0	4.43	209.65		53.7	8.61	206.57	
				68.0	3.96	210.12	IR Rt	54.5	7.47	207.71	
				71.0	4.12	209.96		56	6.48	208.70	
								58	5.87	209.31	
								60	5.59	209.59	
								61.3	5.59	209.59	
								62	5.94	209.24	
								65	5.96	209.22	
								67	5.38	209.80	
								70.9	5.23	209.95	GROUND

Year 3			
Station	FS/BS	Elev.	Desc.
BM HI	10.57	204.58 215.15	IR Lt
-18	6.33	208.82	
-15	5.99	209.16	
-5	6.02	209.13	
0	5.90	209.25	GRND
4	5.95	209.20	
10.2	6.22	208.93	
13	6.38	208.77	TOB
14.4	6.63	208.52	
15	6.84	208.31	
16.3	6.99	208.16	
17.6	7.33	207.82	
19.3	7.43	207.72	
20.6	7.79	207.36	
22.3	8.62	206.53	
23.4	8.68	206.47	
25.3	9.08	206.07	
26.6	9.87	205.28	
29.9	11.31	203.84	EOW
32	12.57	202.58	
34	13.00	202.15	
35.9	13.02	202.13	
38.4	13.62	201.53	
42	14.03	201.12	
44.6	13.98	201.17	
45.8	13.81	201.34	
45.9	11.64	203.51	EOW LOG
46.4	10.40	204.75	
48.1	10.47	204.68	
49.2	9.84	205.31	
50	9.46	205.69	
51.5	9.28	205.87	
52.9	8.9	206.25	
55.7	6.56	208.59	TOB
57.4	5.99	209.16	
58.2	5.79	209.36	
60.5	5.49	209.66	
62	5.92	209.23	
65	5.92	209.23	
68.9	5.39	209.76	
70.9	5.21	209.94	GRND
72	5.15	210	
76	6.03	209.12	
79	6.22	208.93	

Year 4			
Station	FS/BS	Elev.	Desc.
BM HI	4.78	209.31 214.09	IR Lt
0	4.84	209.25	GRND
4	4.90	209.19	GRND
7	5.09	209.00	GRND
10	5.20	208.89	GRND
12	5.11	208.98	GRND
13	5.27	208.82	BKF
14	5.51	208.58	BNK
18	6.31	207.78	BNK
19	7.02	207.07	BNK
23	7.79	206.30	BNK
26.1	8.34	205.75	BNK
27.9	8.71	205.38	BNK
29.1	9.28	204.81	BNK
30.4	9.59	204.50	BNK
31.4	9.89	204.20	BNK
32.8	10.47	203.62	EOW
33	12.22	201.87	BED
34	12.76	201.33	BED
35	13.20	200.89	BED
36	13.79	200.30	BED
37	14.14	199.95	BED
38	14.61	199.48	BED
39	14.85	199.24	BED
40	15.00	199.09	BED
43	14.88	199.21	BED
45	14.04	200.05	BED
45.8	10.49	203.60	EOW
46	9.56	204.53	LOG
46.7	9.39	204.70	LOG
48.9	9.26	204.83	BNK
50	8.57	205.52	BNK
51.5	8.19	205.90	BNK
52.9	7.71	206.38	BNK
54.1	6.72	207.37	BNK
56	5.4	208.69	BKF
57.3	4.99	209.10	GRND
58	4.76	209.33	GRND
60	4.52	209.57	GRND
61	4.44	209.65	GRND
62.5	5.09	209.00	GRND
65.3	4.8	209.29	GRND
66.7	4.41	209.68	GRND
69	4.33	209.76	GRND
70.9	4.19	209.90	GRND

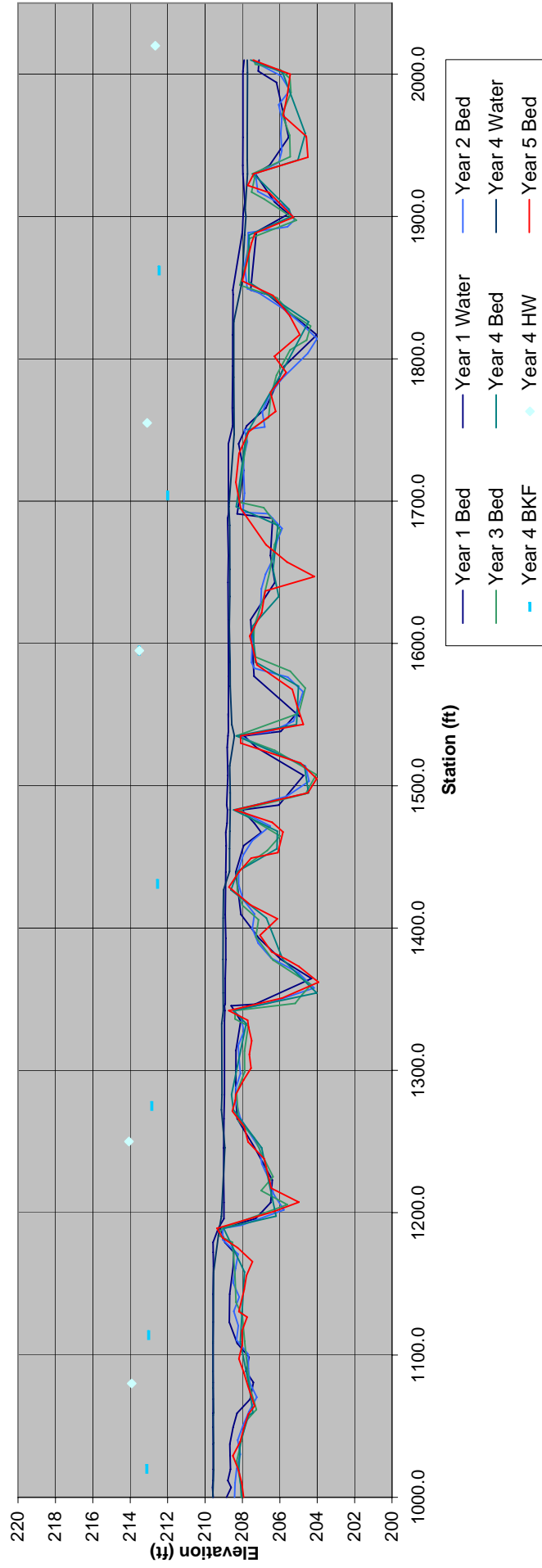
Year 5			
Station	FS/BS	Elev.	Desc.
BM HI	11.30	204.05 215.35	IR Lt
0	6.15	209.20	GRND
8	6.31	209.04	GRND
13.3	6.53	208.82	TOB
14.7	6.97	208.38	BNK
17.7	7.42	207.93	BNK
20.1	8.48	206.87	BNK
22.3	8.89	206.46	BNK
25.7	9.47	205.88	BNK
29.6	10.23	205.12	BNK
31	10.58	204.77	BNK
31.2	13.12	202.23	TOE
34	13.33	202.02	EOW
36	14.28	201.07	BED
37.7	14.74	200.61	BED
40.5	14.87	200.48	BED
42	14.63	200.72	BED
43.5	14.15	201.20	BED
45	13.34	202.01	EOW
46.3	10.69	204.66	LOG
47.1	10.63	204.72	BNK
49.5	9.90	205.45	BNK
51.2	9.66	205.69	BNK
52.9	9.08	206.27	BNK
56	6.60	208.75	TOB
58	5.96	209.39	GRND
60	5.74	209.61	GRND
67	5.62	209.73	GRND
70.9	5.44	209.91	GRND

Lick Creek Stream Restoration Site

Lee County, NC

Profile Reach 1 - Wallace Branch

Profile



Lick Creek Stream Restoration Site

Lee County, NC

Profile Reach 1 - Wallace Branch

Year 5

HI	Station	Bed FS	Bed Elev.	Water Depth	Water Elev.	Bankfull FS	Bankfull Elev.	Description
218.80	1000	10.86	207.94					
218.80	1010	10.77	208.03					
218.80	1020	10.58	208.22					
218.80	1030	10.29	208.51					
218.80	1040	10.68	208.12					
218.80	1050	10.88	207.92					
218.80	1060	11.12	207.68					
218.80	1066	11.45	207.35					
218.80	1080	11.10	207.70					
218.80	1090	10.88	207.92					
218.80	1100	10.61	208.19					
218.80	1110	10.79	208.01					
218.80	1120	10.78	208.02					
218.80	1130	11.05	207.75					
218.68	1134	10.49	208.19					
218.68	1150	10.78	207.90					
218.68	1160	10.90	207.78					
218.68	1170	11.22	207.46					
218.68	1180	10.43	208.25					
218.68	1187	9.63	209.05					
218.68	1194	9.32	209.36					
218.68	1205	12.39	206.29					
218.68	1211	13.70	204.98					
218.68	1220	12.23	206.45					
218.68	1239	11.85	206.83					
218.68	1250	10.98	207.70					
218.68	1260	10.77	207.91					
218.68	1270	10.14	208.54					
218.68	1277	10.30	208.38					
218.68	1280.7	10.32	208.36					
218.68	1291.3	10.74	207.94					
218.68	1300	11.14	207.54					
218.68	1310	11.05	207.63					
218.68	1320	11.18	207.50					
218.68	1330	11.01	207.67					
218.68	1335	10.96	207.72					
218.68	1342	9.95	208.73					
218.68	1350	12.81	205.87					
218.68	1360	14.75	203.93					
218.68	1370	13.70	204.98					
218.68	1374.5	13.04	205.64					
218.68	1380	12.24	206.44					
218.68	1392	11.62	207.06					
212.17	1404	6.04	206.13					
212.17	1414	4.61	207.56					
212.17	1427	3.45	208.72					
212.17	1438	3.99	208.18					
212.17	1448	4.64	207.53					
212.17	1452	6.07	206.10					
212.17	1467	6.34	205.83					
212.17	1474	5.77	206.40					
212.17	1483	3.78	208.39					
212.17	1495	7.67	204.50					
212.17	1505	8.15	204.03					
212.17	1516	7.28	204.89					
212.17	1530	4.08	208.09					
212.17	1535	4.07	208.10					
214.81	1543	10.07	204.74					
214.81	1555	9.75	205.06					
214.81	1567	9.48	205.33					
214.81	1584	7.59	207.22					
214.81	1604	7.20	207.61					
217.56	1620	10.59	206.97					
217.56	1635	10.78	206.78					
217.56	1645	13.41	204.15					
217.56	1655	11.95	205.61					
217.56	1667	10.82	206.74					

Lick Creek Stream Restoration Site

Lee County, NC

Profile Reach 1 - Wallace Branch

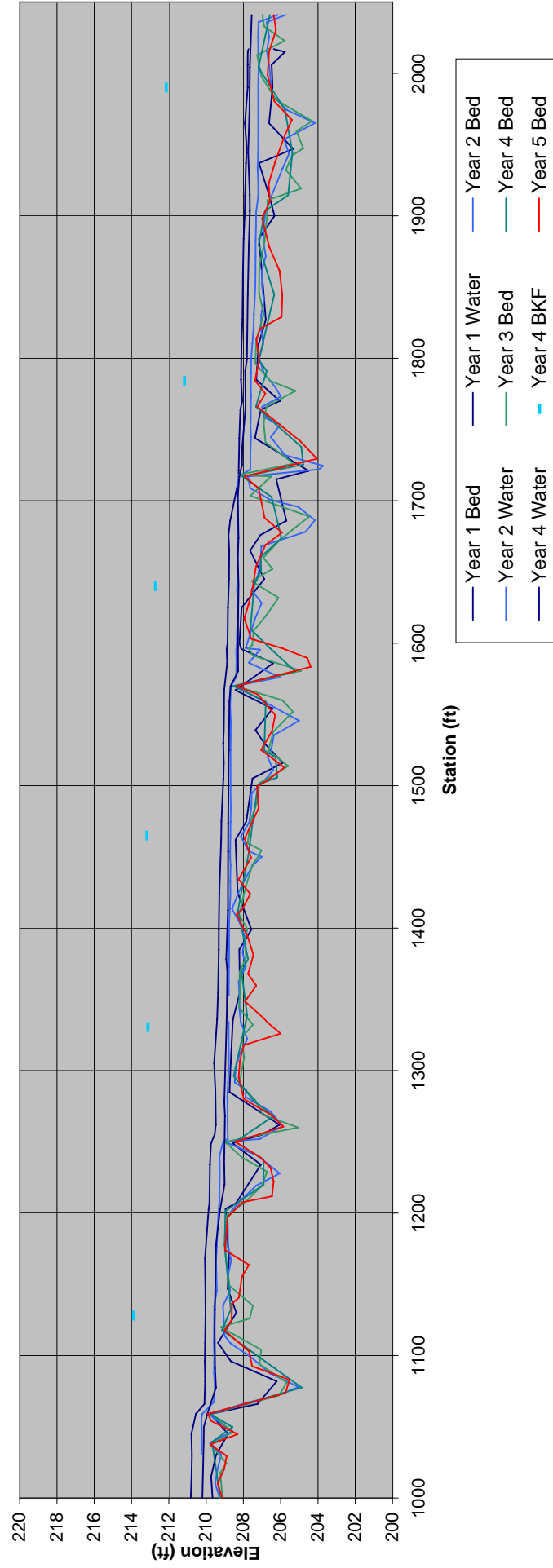
Year 5

HI	Station	Bed FS	Bed Elev.	Water Depth	Water Elev.	Bankfull FS	Bankfull Elev.	Description
217.56	1692	9.47	208.09					
217.56	1710	9.21	208.35					
217.56	1730	9.38	208.18					
217.56	1745	9.90	207.66					
217.56	1759	11.34	206.22					
217.56	1772	11.06	206.50					
217.56	1786	11.90	205.66					
215.94	1797	9.65	206.29					
215.94	1812	11.01	204.93					
215.94	1825	10.47	205.47					
215.94	1839	9.57	206.37					
215.94	1849	7.94	208.00					
215.94	1875	8.42	207.52					
215.94	1882	8.61	207.33					
215.94	1893	10.67	205.27					
216.91	1910	10.34	206.57					
216.91	1915	9.20	207.71					
216.91	1923	9.51	207.40					
216.91	1935	12.41	204.50					
216.91	1950	12.33	204.58					
216.91	1965	11.09	205.82					
216.91	1980	11.31	205.60					
216.91	1995	11.47	205.44					
216.91	2005.3	9.48	207.43					

Lick Creek Stream Restoration Site

Lee County, NC
Profile Reach 2 - Lick Creek

Profile



Lick Creek Stream Restoration Site

Lee County, NC

Profile Reach 2 - Lick Creek

Year 5

HI	Station	Bed FS	Bed Elev.	Water Depth	Water Elev.	Bankfull FS	Bankfull Elev.	Description
219.98	1000	10.85	209.13					
219.98	1010	10.6	209.38					
219.98	1020	10.95	209.03					
219.98	1029	11.08	208.90					
219.98	1037	10.2	209.78					
219.98	1044	11.67	208.31					
219.98	1053	10.27	209.71					
219.98	1058	10.07	209.91					
219.98	1072	14.24	205.74					
219.98	1081	14.45	205.53					
219.98	1090	12.45	207.53					
219.98	1100	12.29	207.69					
219.98	1114	10.98	209.00					
219.98	1121	11.35	208.63					
219.98	1132	11.37	208.61					
219.98	1136	11.74	208.24					
219.98	1150	11.9	208.08					
219.98	1158	12.28	207.70					
219.98	1168	10.99	208.99					
219.98	1176	11.05	208.93					
219.98	1190	11.14	208.84					
219.98	1200	11.92	208.06					
219.98	1204	13.52	206.46					
219.98	1214	13.6	206.38					
219.98	1223	13.44	206.54					
219.98	1230	12.9	207.08					
219.98	1240.5	11.55	208.43					
219.98	1251	14.13	205.85					
219.98	1259	13.48	206.50					
219.98	1270	12	207.98					
219.98	1285	11.73	208.25					
218.83	1296	10.65	208.18					
218.83	1307	10.85	207.98					
218.83	1315	12.83	206.00					
218.83	1322	12.18	206.65					
218.83	1325.7	11.9	206.93					
218.83	1337	10.92	207.91					
218.83	1348	11.52	207.31					
218.83	1356	11.08	207.75					
218.83	1369	11.37	207.46					
218.83	1381	11.08	207.75					
218.83	1397	10.47	208.36					
218.83	1400	10.75	208.08					
218.83	1411	11.2	207.63					
218.83	1421	10.58	208.25					
218.83	1436	11.24	207.59					
218.83	1449	10.9	207.93					
218.83	1470	11.65	207.18					
218.83	1485	11.57	207.26					
218.83	1489	12.13	206.70					
218.83	1498	13.03	205.80					
218.83	1510	11.78	207.05					
218.83	1523	12.37	206.46					
218.83	1534	12.54	206.29					
218.83	1548	11.62	207.21					
218.83	1554	10.47	208.36					
218.83	1567	14.44	204.39					
218.83	1573	14.26	204.57					
218.83	1579.4	12.94	205.89					
218.83	1586	11.25	207.58					
216.91	1600	8.96	207.95					
216.91	1609	9.18	207.73					
216.91	1621	9.41	207.50					
216.91	1635	9.59	207.32					
211.56	1649.5	4.74	206.82					
211.56	1658	5.63	205.93					
211.56	1668	4.7	206.86					

Lick Creek Stream Restoration Site

Lee County, NC

Profile Reach 2 - Lick Creek

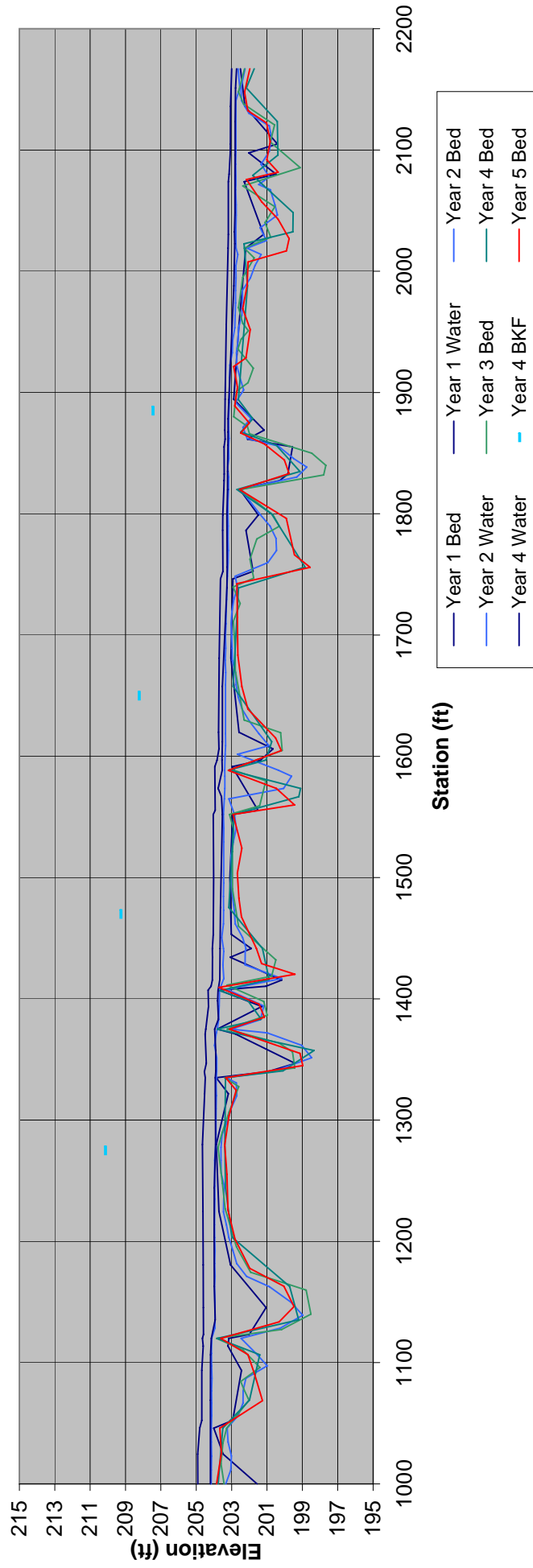
Year 5

HI	Station	Bed FS	Bed Elev.	Water Depth	Water Elev.	Bankfull FS	Bankfull Elev.	Description
211.56	1688	4.38	207.18					
211.56	1696	3.63	207.93					
211.56	1708	7.51	204.05					
211.56	1720	6.6	204.96					
217.84	1743	10.59	207.25					
217.84	1752	11.02	206.82					
217.84	1761	10.47	207.37					
217.84	1775	10.68	207.16					
217.84	1790	10.54	207.30					
217.84	1797	10.75	207.09					
217.84	1805	11.89	205.95					
217.84	1820	11.93	205.91					
217.84	1837	11.78	206.06					
217.84	1853	11.24	206.60					
217.84	1873	10.85	206.99					
217.84	1885	11.27	206.57					
217.84	1897	11.2	206.64					
217.84	1912	11.55	206.29					
216.15	1930	10.36	205.79					
216.15	1941	10.75	205.40					
216.15	1954	9.81	206.34					
216.15	1972	9.45	206.70					
216.15	1988	9.53	206.62					
216.15	2003	9.9	206.25					
217.41	2013.5	11.03	206.38					

Lick Creek Stream Restoration Site

Lee County, NC
Profile Reach 3 - Lick Creek

Profile



Lick Creek Stream Restoration Site

Lee County, NC

Profile Reach 3 - Lick Creek

Year 5

HI	Station	Bed FS	Bed Elev.	Water Depth	Water Elev.	Bankfull FS	Bankfull Elev.	Description
215.00	1000	11.15	203.85					
215.00	1020	11.42	203.58					
215.00	1036	11.33	203.67					
215.00	1058	13.74	201.26					
215.00	1079	13.31	201.69					
215.00	1095	12.92	202.08					
215.00	1108	11.39	203.61					
215.00	1121	14.68	200.32					
215.00	1133	15.53	199.47					
215.00	1149	14.95	200.05					
215.00	1163	13.03	201.97					
215.00	1186	12.19	202.81					
215.00	1209	11.79	203.21					
215.00	1237	11.73	203.27					
215.00	1260	11.61	203.39					
215.00	1283	11.85	203.15					
215.00	1303	12.26	202.74					
215.00	1313	11.67	203.33					
215.00	1324	16.02	198.98					
215.00	1335	15.86	199.14					
215.35	1357	12.23	203.12					
215.35	1367	14.20	201.15					
215.35	1378	13.90	201.45					
215.35	1392	11.63	203.72					
215.35	1403	15.93	199.42					
215.35	1412	14.04	201.31					
215.35	1424.6	13.75	201.60					
215.35	1450	12.91	202.44					
215.35	1465	12.76	202.59					
215.35	1485	12.67	202.68					
215.35	1505	12.93	202.42					
215.35	1532	12.43	202.92					
215.35	1540	15.91	199.44					
215.35	1553.8	14.88	200.47					
215.35	1568.2	12.16	203.19					
215.35	1584	15.16	200.19					
215.35	1594	14.84	200.51					
215.35	1617	13.27	202.08					
215.35	1635	12.93	202.42					
215.35	1660	12.70	202.65					
215.35	1690	12.67	202.68					
215.35	1717	12.65	202.70					
215.35	1730	16.79	198.56					
215.35	1740	15.90	199.45					
215.35	1769	15.44	199.91					
215.35	1792	12.80	202.55					
215.35	1805	15.60	199.75					
213.72	1816	13.70	200.02					
213.72	1829	12.58	201.14					
213.72	1838	11.23	202.49					
213.72	1846	11.72	202.00					
213.72	1860	10.90	202.82					
213.72	1875	11.05	202.67					
213.72	1892	10.84	202.88					
213.72	1899	11.53	202.19					
213.72	1922	11.77	201.95					
213.72	1939	11.35	202.37					
213.72	1958	11.60	202.12					
213.72	1977	11.65	202.07					
213.72	1986	13.82	199.90					
213.72	1996	13.97	199.75					
213.72	2012	13.34	200.38					
213.72	2026	12.41	201.31					
213.72	2044	11.56	202.16					
213.72	2050	13.35	200.37					
213.72	2060	12.71	201.01					
213.72	2075	12.90	200.82					

Lick Creek Stream Restoration Site

Lee County, NC

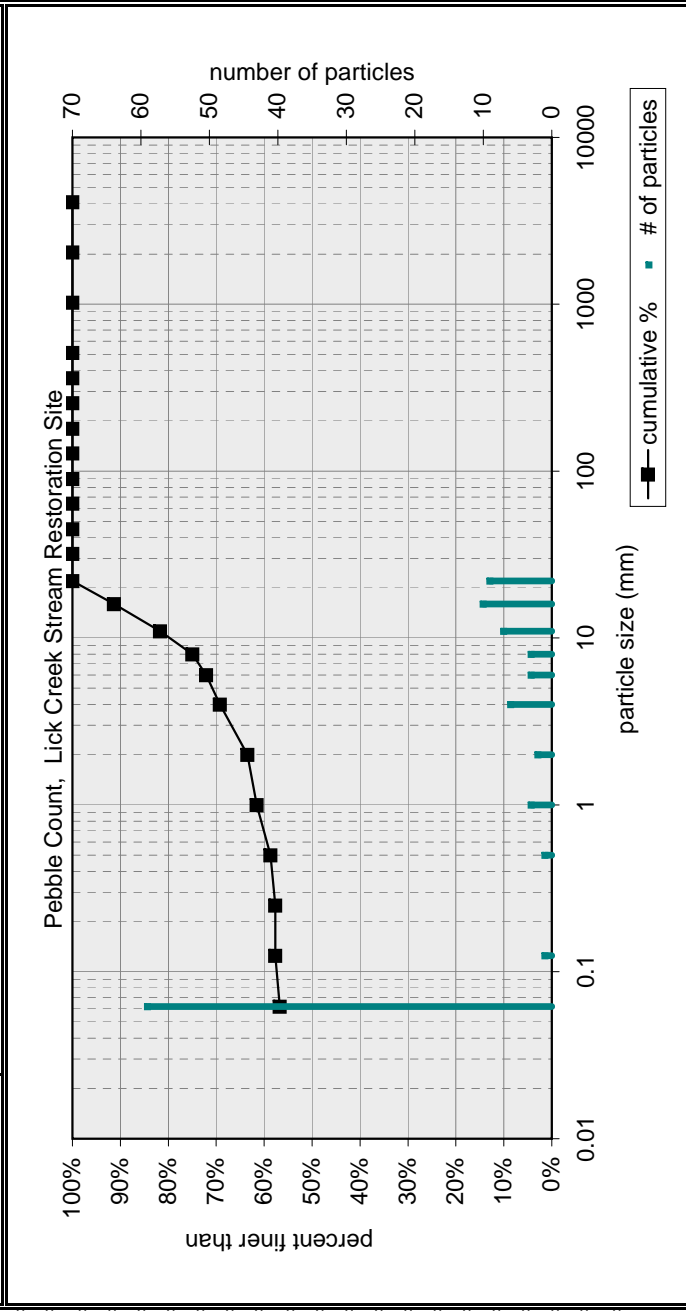
Profile Reach 3 - Lick Creek

Year 5

HI	Station	Bed FS	Bed Elev.	Water Depth	Water Elev.	Bankfull FS	Bankfull Elev.	Description
213.72	2090	12.70	201.02					
213.72	2100	11.63	202.09					
213.72	2115	11.45	202.27					
213.72	2134.1	11.75	201.97					

Pebble Count of Channel Reach

Pebble Count,
Lick Creek Stream Restoration Site
Lee County, NC
Year 5
Note: **Reach 1 - Wallace Branch**



based on sediment particles only	size percent less than (mm)				particle size distribution			
	D16	D35	D50	D84	D95	gradation	geo mean	std dev
	0.062	0.06	0.1	2	12	18	0.9	13.9
based on total count	percent by substrate type				hardpan	bedrock	wood/det	artificial
	silt/clay	sand	gravel	cobble	boulder	bedrock	wood/det	artificial
	57%	7%	37%	0%	0%	0%	0%	0%

Material	Size Range (mm)	Count
silt/clay	0	59
very fine sand	0.062	1
fine sand	0.13	
medium sand	0.25	1
coarse sand	0.5	3
very coarse sand	1	2
very fine gravel	2	6
fine gravel	4	3
fine gravel	6	3
medium gravel	8	7
medium gravel	11	10
coarse gravel	16	9
coarse gravel	22	
coarse gravel	32	
very coarse gravel	45	
very coarse gravel	64	
small cobble	90	
medium cobble	128	
large cobble	180	
very large cobble	256	
small boulder	362	
small boulder	512	
medium boulder	1024	
large boulder	2048	
very large boulder	4096	
total particle count:		104

bedrock	
clay hardpan	
debris/wood	
artificial	
total count:	104

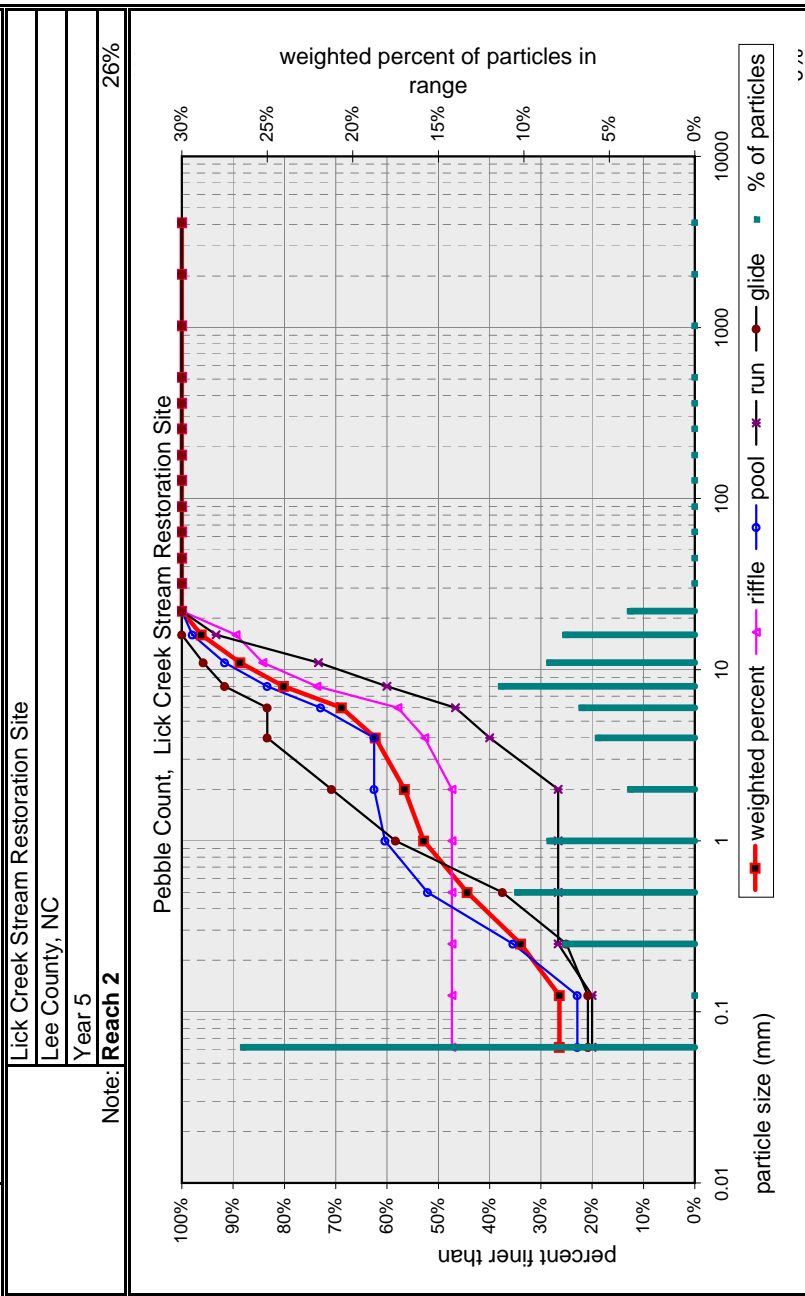
Pebble Count Weighted by Channel Feature

Percent Riffle:	17.9	Percent Run:	14.2
Percent Pool:	45.3	Percent Glide:	22.6

Material	Size Range (mm)	weighted
silt/clay	0	26.4
very fine sand	0.062	0.0
fine sand	0.13	0.0
medium sand	0.25	7.6
coarse sand	0.5	10.4
very coarse sand	1	8.5
	2	3.8
very fine gravel	4	5.7
fine gravel	6	6.6
fine gravel	8	11.3
medium gravel	11	8.5
medium gravel	16	7.6
coarse gravel	22	3.8
coarse gravel	32	0.0
very coarse gravel	45	0.0
very coarse gravel	64	0.0
small cobble	90	0.0
medium cobble	128	0.0
large cobble	180	0.0
very large cobble	256	0.0
small boulder	362	0.0
small boulder	512	0.0
medium boulder	1024	0.0
large boulder	2048	0.0
very large boulder	4096	0.0
weighted particle count:		100.0

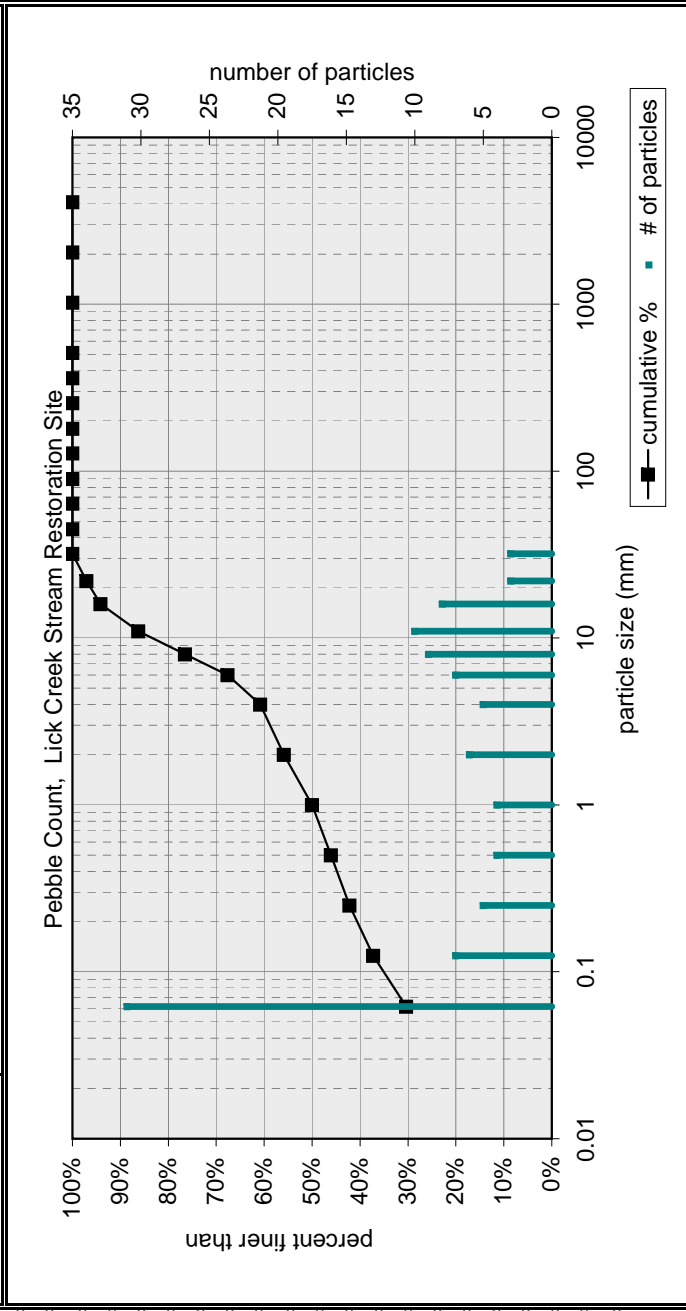
bedrock	0.0
clay hardpan	0.0
detritus/wood	0.0
artificial	0.0
weighted total count: 100	

Pebble Count,	
Lick Creek Stream Restoration Site	
Lee County, NC	
Year 5	
Note: Reach 2	
26%	



based on sediment particles only	size percent less than (mm)					particle size distribution			
	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
	0.062	0.27	0.8	5	9	15	12.2	0.8	12.2
based on total count	percent by substrate type								
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial
	26%	30%	43%	0%	0%	0%	0%	0%	0%

Pebble Count of Channel Reach	
Material	Size Range (mm)
silt/clay	0 0.062
very fine sand	0.062 0.13
fine sand	0.13 0.25
medium sand	0.25 0.5
coarse sand	0.5 1
very coarse sand	1 2
very fine gravel	2 4
fine gravel	4 6
fine gravel	6 8
medium gravel	8 11
medium gravel	11 16
coarse gravel	16 22
coarse gravel	22 32
very coarse gravel	32 45
very coarse gravel	45 64
small cobble	64 90
medium cobble	90 128
large cobble	128 180
very large cobble	180 256
small boulder	256 362
small boulder	362 512
medium boulder	512 1024
large boulder	1024 2048
very large boulder	2048 4096
total particle count: 102	



based on sediment particles only	
D16	0.062
D35	0.10
D50	1.0
D65	5
D84	10
D95	18
based on total count	
total count: 102	

Pebble Count, Lick Creek Stream Restoration Site	
Lee County, NC	
Year 5	
Note: Reach 2 - Lick Creek	
percent finer than	
number of particles	
—■— cumulative % ■ # of particles	
particle size (mm)	
size percent less than (mm)	
percent by substrate type	
based on sediment particles only	
based on total count	
total count: 102	

Pebble Count Weighted by Channel Feature

Percent Riffle:	31.9	Percent Run:	21.9
Percent Pool:	31.9	Percent Glide:	14.3

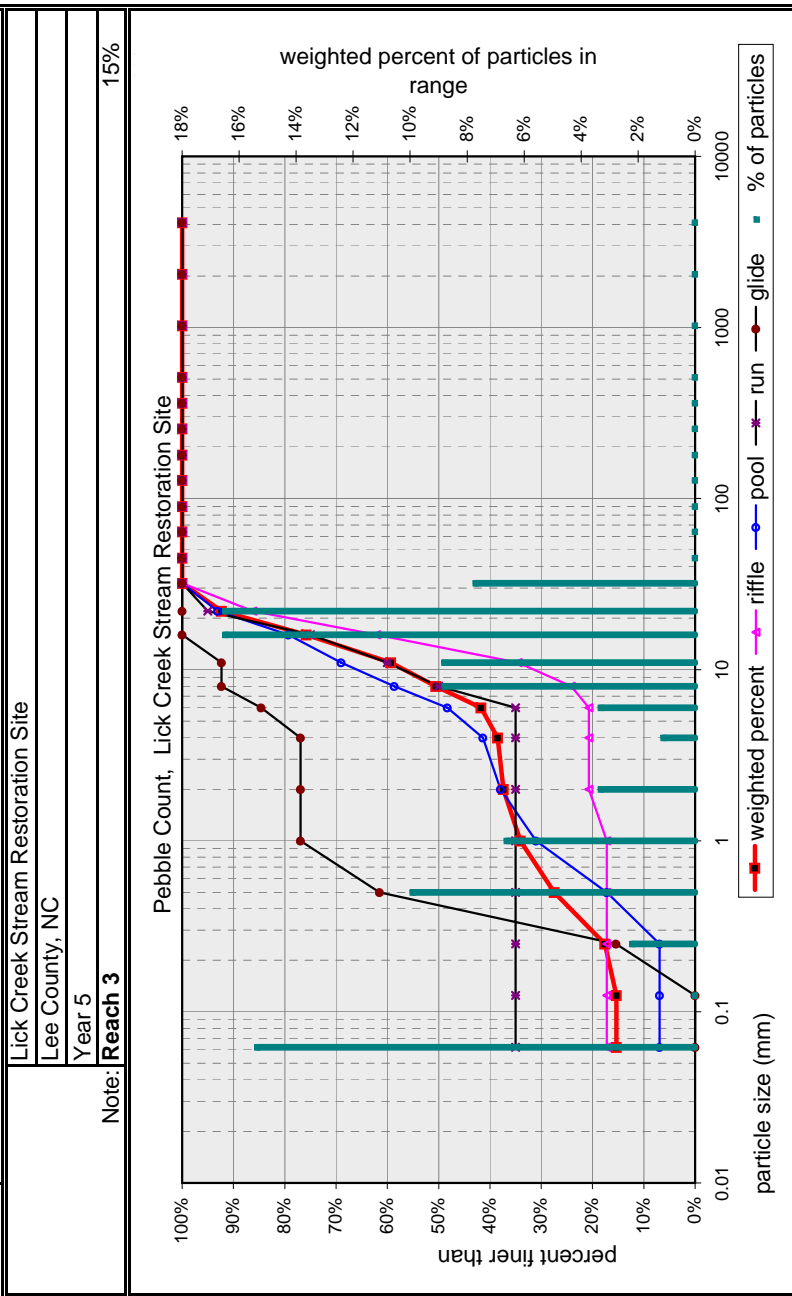
Material	Size Range (mm)	weighted
silt/clay	0	15.4
very fine sand	0.062	0.0
fine sand	0.13	0.0
medium sand	0.25	2.2
coarse sand	0.5	9.9
very coarse sand	1	6.6
	2	3.3
very fine gravel	4	1.1
fine gravel	6	3.3
fine gravel	8	8.8
medium gravel	11	8.8
medium gravel	16	16.5
coarse gravel	22	16.5
coarse gravel	32	7.7
very coarse gravel	45	0.0
very coarse gravel	64	0.0
small cobble	90	0.0
medium cobble	128	0.0
large cobble	180	0.0
very large cobble	256	0.0
small boulder	362	0.0
small boulder	512	0.0
medium boulder	1024	0.0
large boulder	2048	0.0
very large boulder	4096	0.0

weighted particle count: 100.0

bedrock	0.0
clay hardpan	0.0
detritus/wood	0.0
artificial	0.0

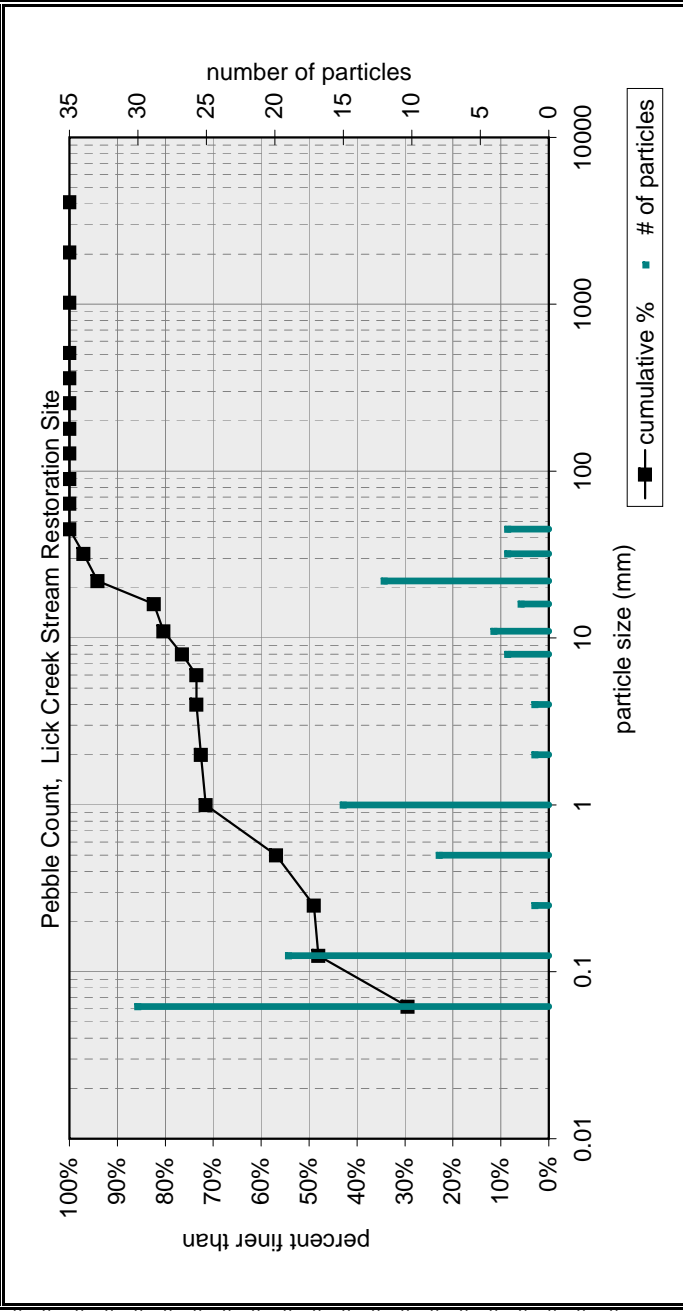
weighted total count: 100

Pebble Count, Lick Creek Stream Restoration Site	
Lee County, NC	
Year 5	
Note: Reach 3	
15%	



based on sediment particles only	size percent less than (mm)	D16	D35	D50	D65	D84	D95	gradation	geo mean	std dev
based on total count	percent by substrate type	0.153	1.22	7.9	13	19	25	26.9	1.7	11.1
	silt/clay	15%	sand	22%	gravel	63%	cobble	0%	boulder	0%
	bedrock	0%	hardpan	0%	wood/det	0%	artificial	0%		0%

Pebble Count, Lick Creek Stream Restoration Site
 Lee County, NC
 Year 5
 Note: Reach 3 - Lick Creek



based on sediment particles only	D16	D35	D50	D65	D84	D95	particle size distribution gradation	geo mean	std dev	
	0.062	0.08	0.3	1	17	25	32.9	1.0	16.4	
based on total count	percent by substrate type									
	silt/clay	sand	gravel	cobble	boulder	bedrock	hardpan	wood/det	artificial	
	29%	43%	27%	0%	0%	0%	0%	0%	0%	0%

Pebble Count of Channel Reach			Count
Material	Size Range (mm)		
silt/clay	0	0.062	30
very fine sand	0.062	0.13	19
fine sand	0.13	0.25	1
medium sand	0.25	0.5	8
coarse sand	0.5	1	15
very coarse sand	1	2	1
very fine gravel	2	4	1
fine gravel	4	6	
fine gravel	6	8	3
medium gravel	8	11	4
medium gravel	11	16	2
coarse gravel	16	22	12
coarse gravel	22	32	3
very coarse gravel	32	45	3
very coarse gravel	45	64	
small cobble	64	90	
medium cobble	90	128	
large cobble	128	180	
very large cobble	180	256	
small boulder	256	362	
small boulder	362	512	
medium boulder	512	1024	
large boulder	1024	2048	
very large boulder	2048	4096	
total particle count:			102

bedrock	
clay hardpan	
debris/wood	
artificial	
total count:	102