BRUSH CREEK – PROJECT NO. 54

MONITORING YEAR 9

2010 Monitoring Report

Submitted to:

NCDENR Ecosystem Enhancement Program
1652 Mail Service Center
Raleigh, NC 27699

April 14, 2011

Prepared By:

Fish and Wildlife Associates, Inc.

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Charles Lawson

Table of Contents

Executive Summary

Brush Creek and its tributary, Little Pine Creek, were restored, enhanced and preserved in 2001 and 2006. The original goals and objectives stated in the Restoration Plan were as follows:

- To restore Little Pine Creek from the bridge on Big Oak Road down to the confluence with Brush Creek. The stream restoration proposal was to replace 600 feet of altered Little Pine Creek stream channel with a new, 950 foot meandering channel reconnected to the floodplain and designed to maintain stable dimension, pattern, and profile while effectively transporting anticipated stream flow and sediment load.
- To restore a vegetated riparian corridor along the new, proposed reach of Little Pine Creek, in order to improve water quality and increase available aquatic and terrestrial habitat resources. This would be accomplished by creating a conservation easement along both sides of the creek and fencing to prevent livestock access to Little Pine Creek.
- To restore stable channel dimensions and stable stream bank conditions to 340 feet of Brush Creek currently experiencing severe bank collapse, thereby improving downstream water quality through sedimentation reduction and enhancing aquatic habitat. This was accomplished through the construction of one major rock vane structure and grading of the adjacent banks, replanting of trees and shrubs, and removal of the pasture grass species in the reach.
- To preserve and enhance 2,400 feet of degraded Brush Creek riparian corridor. This proposal included the installation of bioengineering structures to stabilize the unstable stream banks and to provide in-stream aquatic habitat improvements. The goal of the enhancement was to increase riparian buffer vegetation along the full Brush Creek reach through a conservation easement on the buffer and removal of pasture species by fencing along the reach.
- To improve overall terrestrial habitat connectivity through the restoration of riparian corridors along both streams, and improve overall aquatic habitat through the creation of increased habitat complexity.

Vegetation Success Evaluation

Survival of planted woody species through MY9 (fourth year after repair and replanting in 2006) in the monitoring plots ranged from 445 and 486 stems in the Little Pine Creek plots and up to 688 stems in the Brush Creek plot. This is well over the required success criteria of 288 planted stems for MY4 as per the interagency *Stream Mitigation Guidelines* (April 2003). Supplemental planting in April 2009 included the addition of collars to protect individual trees from beaver damage. The additional plantings have increased woody stem density to well above the success criteria of 288 stems per acre. The total number of stems per acre decreased in MY9 to 987 from a high of 1246 stems per acre in MY8. Planted stems were lost due to beaver and insect damage. Additionally, the hard winter of 2009-2010 and the return of drier regional conditions in the summer of MY9 lead to further losses. Within the planted easement area, vegetation survival and growth of trees and shrubs were observed to be progressing well except for one area close to the newly constructed beaver dam (1' high in October 2010). This was the second beaver dam in

two years observed on the Little Pine Creek reach; this reach has required ongoing beaver control efforts to provide protection to the growth and establishment of trees and shrubs.

There are two areas of pasture grasses expanding into the Little Pine Creek easement area, but they are not impacting the established woody stems. These two areas encompass approximately 0.09 acres.

Fencing appears to have allowed natural tree and shrub re-establishment within the buffer area along Brush Creek reach below the confluence of Little Pine Creek. There are areas of pasture grasses in the reach, but they are currently not impacting the established vegetation. The largest area of pasture grass was located at station 18+00 and was approximately 0.19 acres in size.

Stream Success Evaluation

Little Pine Creek has become established in its pattern in the new reach. There has been increased sinuosity within channel that has increased the length of the reach over the as-built length. A section of shifting stream channel was noted for 18' (1% of length). Vegetation is helping to stabilize the stream banks. The stream has been stable in profile with some scour occurring at pools and at beaver dams. No headcutting or incision of the streambed has been observed. Pools remain largely unchanged from MY8. One of the nine remaining pools was noted as length inappropriate in MY9. The profile has remained stable except at the beaver dams and the resulting changes in stream profiles at the dams. Riffles have disappeared, shortened, or lengthened due to the beaver impoundments and other natural adjustments within the channel. Nine of the 11 constructed riffles (82%) are present and performing sufficiently. Six of those riffles (55%) are length appropriate. The remaining riffles have been impacted by a combination of beaver activity, structural failure or sedimentation. Four of the original 11 constructed riffles (36%) have been impacted directly by beaver activity. The old beaver dam has disintegrated and the submerged riffles were beginning to reestablish a stable channel. The current beaver dam (2010) was impacting one constructed riffle (Station 9+00). Continued beaver control efforts were planned during this year.

Stream dimension remains the major areas of concern for stream channel stability. Five of 14 bends (35%) are showing signs of instability, with vertical exposures due to slumping banks. Undercutting was present at 33% of the bends. This is equivalent to 8% of the total Little Pine Creek stream bank length being impacted by active eroding or slumping banks. Replanting of stems and the removal of beavers from the project are assisting in stabilizing these areas. Because adequate bed slope is still present, functioning riffles are expected to return after the removal of the beaver dams. The bedload sediment is showing an increase in particle size, probably due to the flushing of fines during the increased stream flow in MY8-MY9. Overbank events during the winter have resulted in sediment deposition throughout the reach.

In total, 50 structures were present on Little Pine Creek in the as-built surveys. Thirty-eight of these structures were identified on Little Pine Creek during MY9. Forty structures were identified during the MY8 survey. Two rock sills, labeled "failed" during or prior to MY8, were present and functioning in MY9. Two digger logs and two root wads have been labeled as

"failed" since the MY8 survey. To date, 12 structures have been labeled as "failed" on the Little Pine Creek reach.

All of the previously assessed structures on Brush Creek were present and functioning. The lower Brush Creek reach features mainly consisted of logs cabled to the banks approximately 10 years ago. A total of 15 rock vanes, six log vanes, and 10 root wads were originally located in the Brush Creek reach. One change was noted from MY8 to MY9. Four of the six log vanes previously noted as "failed" were upgraded to "to be watched". These four vanes were missing during the two previous initial assessments (MY8-MY9). These log vanes were presumed intact and presently buried within the banks. Additional scour was noted between rock vanes and along banks. This was due to the high water levels between the MY8 and MY9 surveys (Stations 14+30, 18+00, 27+60). Scour noted in MY8 near Station 12+00 was stabilizing in MY9.

Bankfull events within this project were determined using visual observations, personal communication from onsite representatives, and regional raingage data. There was one bankfull event recorded during November 10-11, 2009. This was the only event documented from November 2009-to November 2010. Wrack lines, debris deposits and sandy deposits were observed and shown in Fixed Station Photographs, Appendix B.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in tables and figures in the report appendices. Narrative background and supporting information formerly found in these reports can be found in the Baseline Monitoring Report (formerly Mitigation Plan) and in the Mitigation Plan (formerly the Restoration Plan) documents available on EEP's website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

II. Methodology

Methods used follow the US Army Corp of Engineers *Stream Mitigation Guidelines* and the Carolina Vegetation Survey, Ecosystem Enhancement Program's Level 2 *CVS-EEP Protocol for Recording Vegetation Version 4.0* (Lee et al. 2006, http://cvs.bio.unc.edu/methods.htm). Cross-sectional and longitudinal surveys were conducted via total station with each survey point with three-dimensional coordinates and is georeferenced NAD83-State Plane feet. Longitudinal stationing was provided by NCEEP and shown on GIS map as an overlay. Particle size distribution protocol involved using the modified Wentworth scale to determine the total and cumulative size distribution. CVS vegetation plot methodology was performed at Level 1-2.

III. References

Fish and Wildlife Associates, Inc. 2008. Brush Creek – Project No. 54, Monitoring Year 7, 2008. Prepared for: NCDENR Ecosystem Enhancement Program, Raleigh, NC.

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HDR Engineering, Inc. 2002. Little Pine Creek/Brush Creek Monitoring Methodology Report. Prepared for: Wetlands Restoration Program, NC Department of Environment and Natural Resources, Raleigh, NC.

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Lee, Michael T., Robert K. Peet, Steven D. Roberts, and Thomas R. Wentworth. 2006. *CVS-EEP Protocol for Recording Vegetation*: *All Levels of Plot Sampling, Version 4.0*. Available at http://cvs.bio.unc.edu/methods.htm

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NC Wildlife Resources Commission. 2007. Brush Creek/Little Pine Creek Maintenance, As Built Survey. Prepared for: Ecosystem Enhancement Program, NC Department of Environment and Natural Resources, Raleigh, NC.

Rosgen, D.L. 1996. *Applied River Morphology*. Wildland Hydrology Books, Pagosa Springs, CO.

US Army Corp of Engineers. 2003. *Stream Mitigation Guidelines*. US Army Corp of Engineers, US Environmental Protection Agency, NC Wildlife Resources Commission, and NC Department of Natural Resources Division of Water Quality.

Weakley, Alan S. 2006. *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas.* UNC Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, NC. Available at <http://www.herbarium.unc.edu/FloraArchives/WeakleyFlora_2006-Jan.pdf>

Project Condition
and
Monitoring Data Appendices

APPENDIX A

GENERAL FIGURES AND PLAN VIEWS

Figure 1. Vicinity Map and Directions
Table 1. Project Restoration Components
Table 2. Project Activity and Reporting History
Table 3. Project Contacts Table
Table 4. Project Attribute Table

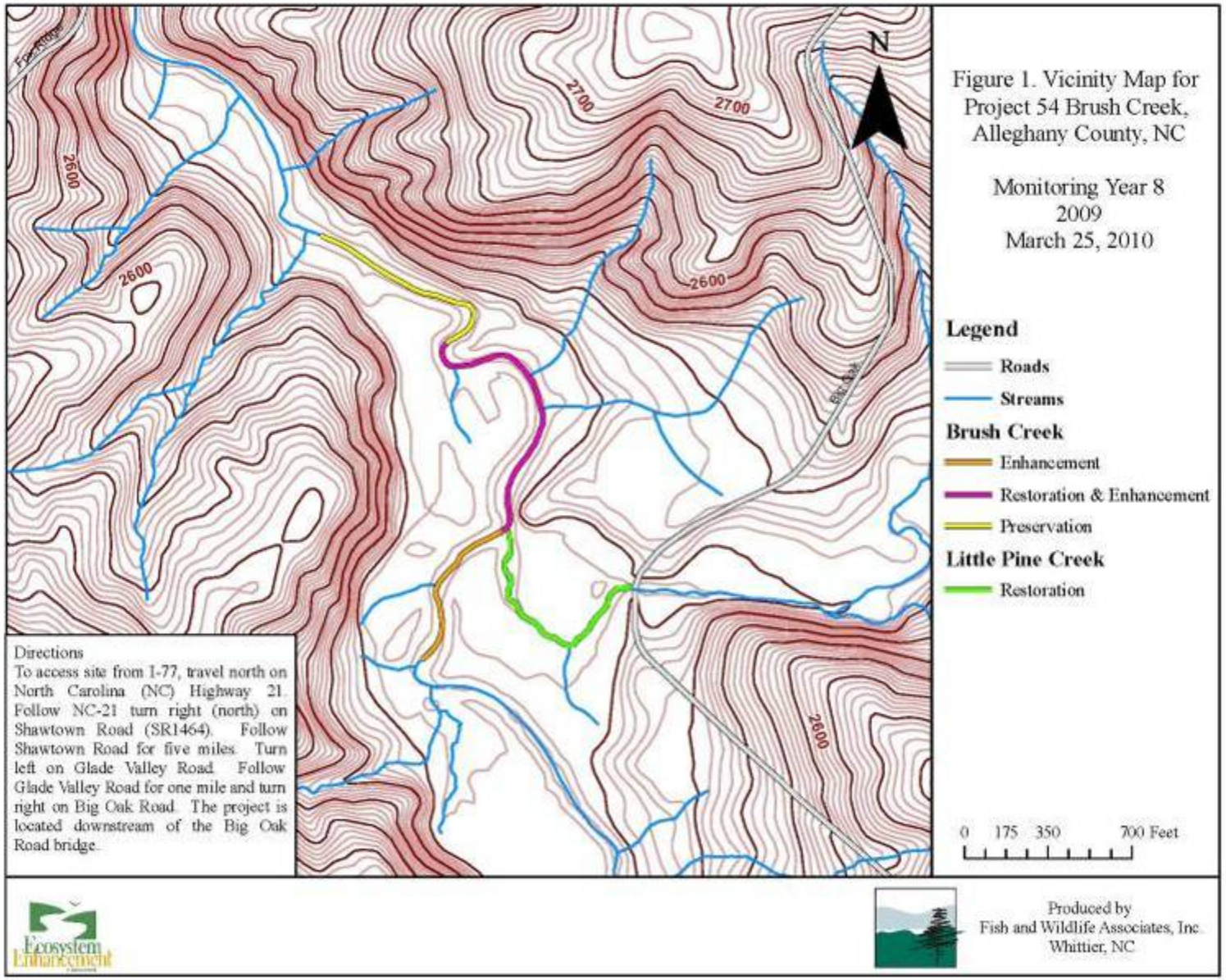
Figure 1. Vicinity Map for Project 54 Brush Creek, Alleghany County, NC
Monitoring Year 8
2009
March 25, 2010
N
2700
2600
Legend
Roads
Streams
Brush Creek
Enhancement
Restoration & Enhancement
Preservation
Little Pine Creek
Restoration
0 175 350 700 Feet
Directions
To access site from I-77, travel north on North Carolina (NC) Highway 21. Follow NC-21 turn right (north) on Shawtown Road (SR1464). Follow Shawtown Road for five miles. Turn left on Glade Valley Road. Follow Glade Valley Road for one mile and turn right on Big Oak Road. The project is located downstream of the Big Oak Road bridge.
Ecosystem Enhancement
Produced by
Fish and Wildlife Associates, Inc.
Whittier, NC

Table 1. Project Restoration Components Brush Creek—Project #54					
Project Segment or Reach ID	**Type**	**Approach**	**Restored Length (Lf)**	**Stationing**	**Comment**
Brush Creek - Reach 1	E	P2	700	0+00 -07+00	Channel relocation; Rock Sills; Point Bar construction; Re-vegetated
Brush Creek - Reach 2	E and R	E2	1,200	07+00 - 19+00	Log vanes, rock vanes, and root wads
Brush Creek - Reach 3	P		900	19+00 - 28+00	Riparian buffer
Little Pine Creek	R	P2	950	0+00 - 10+00	Relocation of channel; new pattern, profile, dimension, and structures

Table 2. Project Activity and Reporting History Brush Creek - Project #54		
Activity or Report	**Calendar Year of Completion or Planned Completion**	**Actual Completion Date**
Restoration Plan		Oct-00
Mitigation Plan/As-built Report	*	Jun-02
Temporary S&E mix applied to entire project area	*	*
Permanent seed mix applied to reach	*	*
Year 1 Monitoring	Jan-02	Jun-02
Year 2 Monitoring	Nov-03	Jan-04
Year 3 Monitoring	Nov-04	Dec-04
Year 4 Monitoring	Nov-05	Not completed
Year 5 Monitoring	no monitoring due to assessment and implementation	
Structural maintenance (Bank repair and revegetation)	Oct-06	Jan-07
As-Built 2	Dec-06	Jan-07
Year 6 Monitoring	Nov-07	Dec-07
Herbicide Application		Jun-08
Year 7 Monitoring	Nov-08	Nov-08
Additional Plantings and Protection to Woody Vegetation		Apr-09
Year 8 Monitoring	Nov-09	Mar-10
Year 9 Monitoring	Oct-10	Nov-10
Year 10 Monitoring	Nov-11	

Table 3. Project Contact Table Brush Creek - Project # 54	
Designer	HDR Engineering, Inc. of the Carolinas.
	128 South Tryon St, Suite 1400
	Charlotte, North Carolina 28202
Primary project design POC	*
Construction Contractor	A&D Environmental & Industrial Services
Construction contractor POC	*
Planting Contractor	Shamrock Environmental
Planting contractor POC	Mr. Bill Wright (336) 375-1989
Seeding Contractor	*
Planting contractor point of contact	
Seed Mix Sources	*
Nursery Stock Suppliers	*
Repair Designer	HDR Engineering, Inc. of the Carolinas.
	128 South Tryon St, Suite 1400
	Charlotte, North Carolina 28202
Primary project design POC	*
Repair Construction Contractor	North Carolina Wildlife Resources Commission
	Watershed Enhancement Group
	P.O. Box 387
	Elkin, NC 28621
Primary project design POC	*
Monitoring Performers	
MY7-MY10	Fish and Wildlife Associates, Inc.
	P.O. Box 241
	Whittier, NC 28789
	(828)497-6505
Stream Monitoring POC	Barbara Wiggins
Vegetation Monitoring POC	Barbara Wiggins
MY6	MACTEC Engineering and Consulting, Inc.
	3301 Atlantic Avenue
	Raleigh, NC 27604
	(919)876-0416
Stream Monitoring POC	Robert Sain (828)252-8130
Vegetation Monitoring POC	Admin Davis (919)876-0416
MY5	No annual monitoring conducted due to repair assessment and implementation
MY4	EcoLogic Associates
	4321 A. South Elm-Eugene Street
	Greensboro, NC 27406

Table 3 cont.. Project Contact Table Brush Creek - Project # 54	
MY2/MY3	Biological and Agricultural Engineering
	Water Resources Research Institute
	North Carolina State University
	Campus Box 7625
	Raleigh, NC 27695
MY1	HDR Engineering, Inc. of the Carolinas
	128 South Tryon Street, Suite 1400
	Charlotte, NC 28202

Table 4. Project Baseline Information and Attributes Brush Creek-Project 54			
Project Information			
Project Name	Brush Creek - Project #54		
Project County	Alleghany, North Carolina		
Project Area (acres)			
Project Coordinates (latitude and longitude)	36.50613, -81.00764		
Project Watershed Summary Information			
Physiographic Region	Mountains		
River Basin	New River		
USGS 05050001	USGS Hydrologic Unit 14-	5050001050703	
NCDWQ Sub-basin	05-07-03		
Drainage Area (acres)	19,584		
Project Drainage Area Percentage of	Estimated at <5%		
CGIA Land Use Classification	Forest and Pasture		
Reach Summary Information			
Parameters	**Little Pine**	**Brush Creek**	
Length of Reach (linear feet)	1000	2400	
Stream Order	2nd Order	3rd Order	
Valley classification			
Drainage area (acres)	2,752	16,832	
NCDWQ stream identification score	--	--	
NCDWQ Water Quality Classification	C; Tr	C; Tr	
Morphological Description (stream type)	E4	B3	
Evolutionary Trend	Degrading	Degrading	
Underlying mapped soils	Codorus complex, Chester loam, Nikwasi, Comus.	Codorus complex, Chester loam, Nikwasi, Comus.	
Drainage Class	Nikwasi very poorly drained, Comus and Chester well	Nikwasi very poorly drained, Comus and Chester well	
Soil Hydric Status	Codorus partially hydric, Nikwasi hydric, Chester	Codorus partially hydric, Nikwasi hydric, Chester loam	
Slope	0.5%	--	
FEMA Classification	N/A	N/A	
Native vegetation community	Montane Alluvial Forest	Montane Alluvial Forest	
Percent composition of exotic invasive	3.6%	2.3%	
% of project easement fenced	100%	91%	

APPENDIX B

VISUAL ASSESSMENT DATA

Figure 2. Current Condition Plan View (CCPV)
Table 5. Visual Stream Morphology Stability Assessment Table
Table 6. Vegetation Condition Assessment Table
Photos. Stream Station Photos
Photos. Vegetation Plot Photos

Figure 2.
Current Condition
Plan View

Project 54 Brush Creek
2010 Monitoring Year
Alleghany County, NC
April 14, 2011

Map 11 of 11
Map 10 of 11
Map 9 of 11
Map 8 of 11
Map 7 of 11
Map 6 of 11
Map 5 of 11
Map 4 of 11
Map 3 of 11
Map 2 of 11
Map 1 of 11
Match Line

Legend
- Bankfull
- Centerline Stations
- Thalweg
- Top of Bank
- Waters Edge

Centerline and stationing for Brush Creek was obtained from recent aerial photography.

Centerline and stationing for for Little Pine Creek came from MY8 survey data.

N

0 100 200 400 Feet

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
054-01-LPV2 36.50580894 81.00908181
054-01-LPV3 36.50628667 81.00924745
054-01-LPV4 36.50554587 81.00827233

Cross Sections:
lp-xs-1-lb 36.50591981 81.00758077
lp-xs-1-bkf 36.50595858 81.00771178
lp-xs-1-rb 36.50602071 81.00791864
lp-xs-2-lb 36.50574429 81.00920903
lp-xs-2-bkf 36.50586082 81.00903444
lp-xs-2-rb 36.50596233 81.00887254
lp-xs-3-lb 36.50617149 81.00944020
lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
begin survey 36.50614744 81.00742900
end survey 36.50671371 81.00917776

Photo Stations:
PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
PS-3 36.50595799 81.00770895
PS-4 36.50548606 81.00811273
PS-5 36.50554358 81.00858985
PS-6 36.50570996 81.00884450
PS-7 36.50586088 81.00903451
PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
bc-xs-4-bkf 36.50580545 81.01000965
bc-xs-4-rb 36.50582344 81.00989429

Photo Stations:
PS-11 36.50560838 81.01004210
PS-12 36.50682348 81.00989432
PS-13 36.50596754 81.01008668
PS-14 36.50608395 81.01009412
PS-15 36.50716885 81.00925196
PS-16 36.50515 81.01038
PS-17 36.50644 81.00980
PS-18 36.50658 81.00951
PS-19 36.50690 81.00927
PS-20 36.50786 81.00890
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PS-23 36.50872 81.00928
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PS-25 36.50877 81.01008
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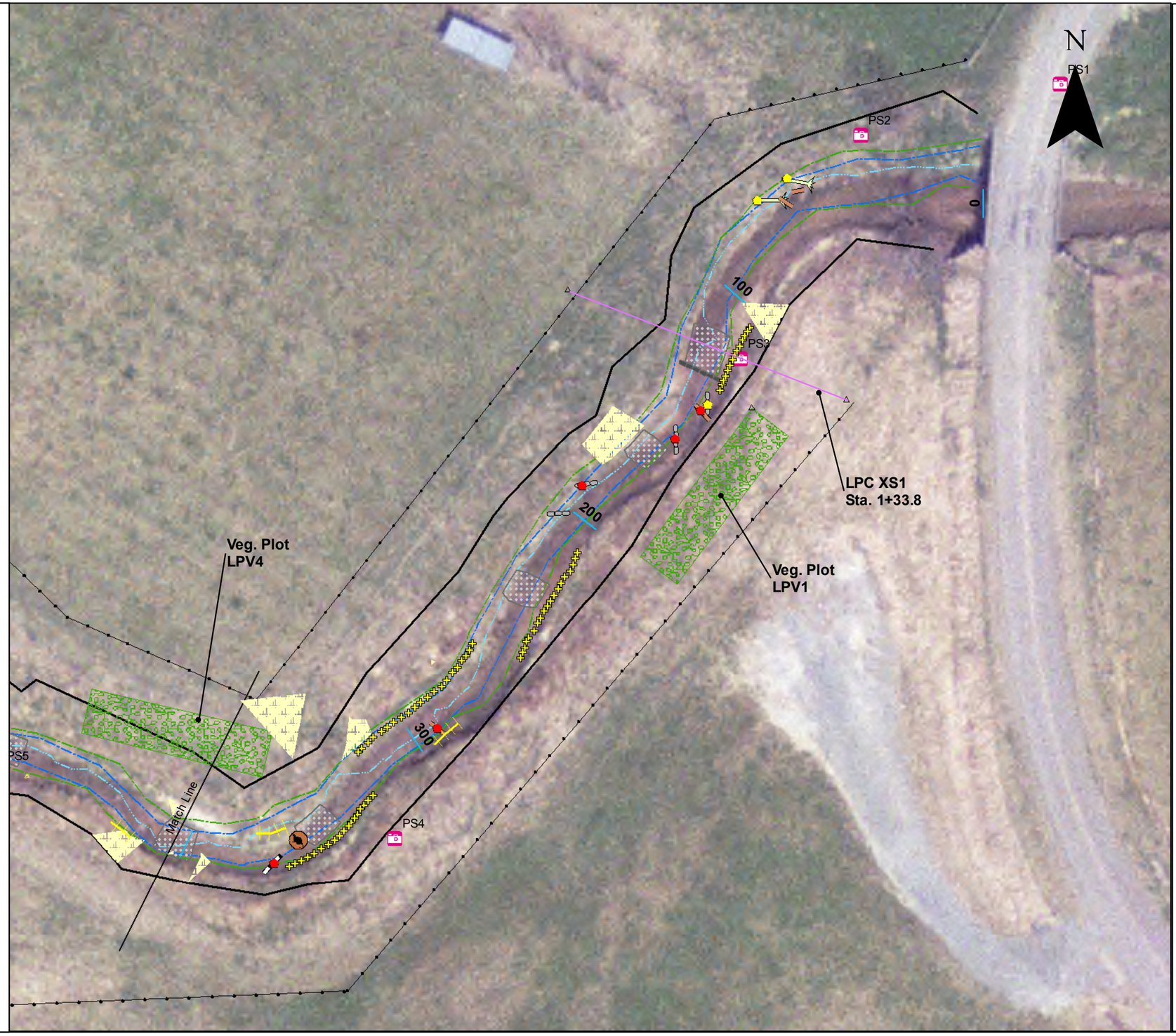

Current Condition
Plan View

Project 54 Brush Creek
Monitoring Year 9
Alleghany County, NC
April 14, 2011

Repair As-built Data (AB2)
- Cross Section
- Photo Stations
- Centerline stations
- Digger Log
- Log Vane
- Fence Line
- Match Line
- Augmented Riffle
- Rock Sill
- Rock Vane
- Root Wad
- Rebar Pin Set
- Vegetation Plot
- Thalweg
- Waters Edge
- Bankfull
- Top of Bank

Vegetation Problem Areas
Bare Bank
- To be watched

Invasive Population
- To be watched

Beaver Damage
- To be watched

Stream Problem Areas
Beaver Dam
- Active
- Abandoned

Engineered Structures Grade
- Failed

Engineered Structures Other
- To be watched
- Failed

Aggradation/Bar Formation
- To be watched

Bank Scour
- Failed
- To be watched

0 15 30 60 Feet

Figure 2.
Map 1 of 11

Brush Creek - Project #54
Fish and Wildfire Associates, Inc.

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Fish and Wildlife Associates, Inc.
Whittier, NC

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
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054-01-LPV4 36.50554587 81.00827233

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lp-xs-2-lb 36.50574429 81.00920903
lp-xs-2-bkf 36.50586082 81.00903444
lp-xs-2-rb 36.50596233 81.00887254
lp-xs-3-lb 36.50617149 81.00944020
lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
begin survey 36.50614744 81.00742900
end survey 36.50671371 81.00917776

Photo Stations:
PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
PS-3 36.50595799 81.00770895
PS-4 36.50548606 81.00811273
PS-5 36.50554358 81.00858985
PS-6 36.50570996 81.00884450
PS-7 36.50586088 81.00903451
PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
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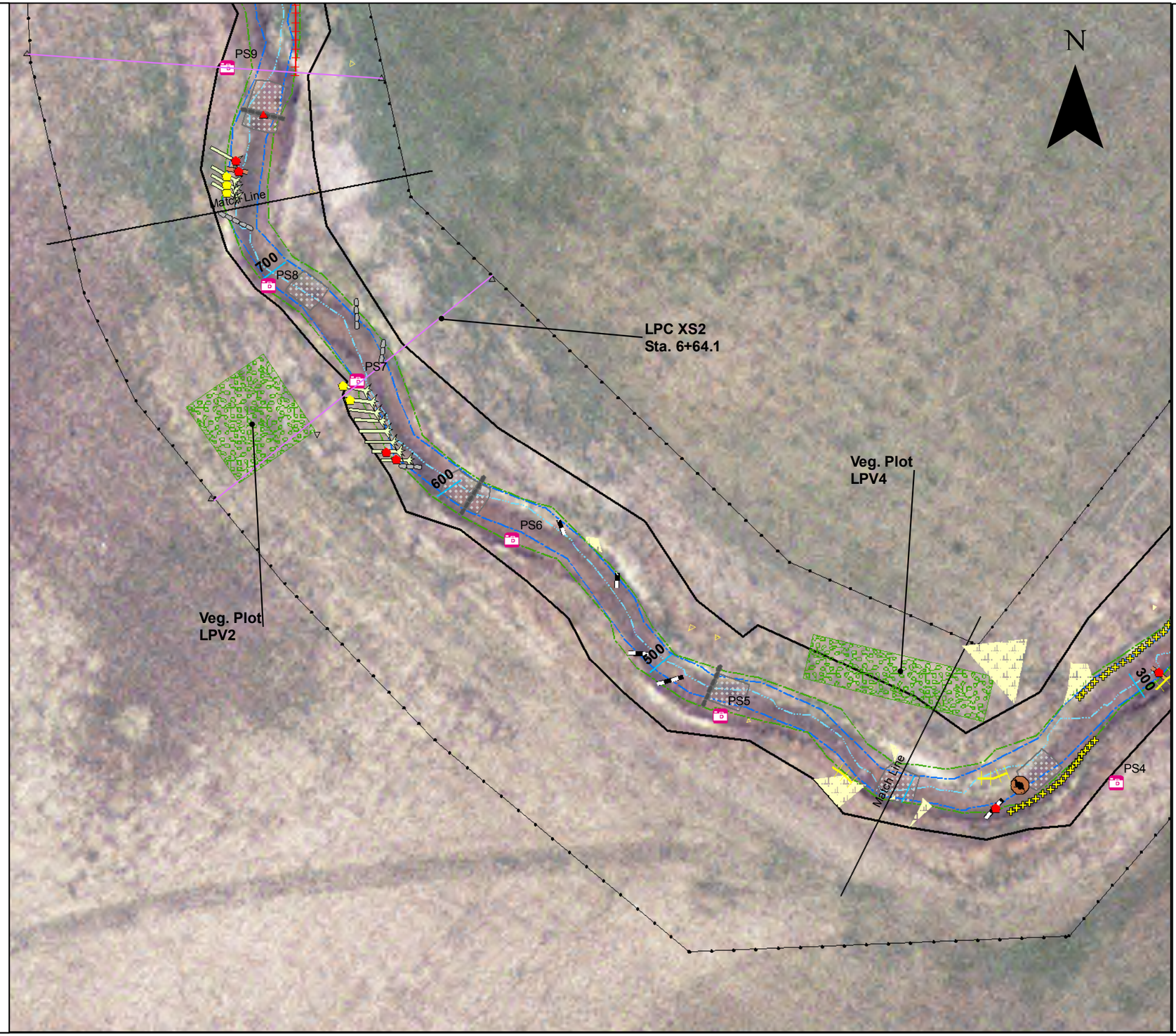
PS-15 36.50716885 81.00925196
PS-16 36.50515 81.01038
PS-17 36.50644 81.00980
PS-18 36.50658 81.00951
PS-19 36.50690 81.00927
PS-20 36.50786 81.00890
PS-21 36.50816 81.00874
PS-22 36.50830 81.00889
PS-23 36.50872 81.00928
PS-24 36.50874 81.00977
PS-25 36.50877 81.01008
PS-26 36.50868 81.01022
PS-27 36.50941 81.01042
PS-28 36.50999 81.01145
PS-29 36.51015 81.01211



Current Condition
Plan View

Project 54 Brush Creek
Monitoring Year 9
Alleghany County, NC
April 14, 2011

Repair As-built Data (AB2)
- Cross Section
- Photo Stations
- Centerline stations
- Digger Log
- Log Vane
- Fence Line
- Match Line
- Augmented Riffle
- Rock Sill
- Rock Vane
- Root Wad
- Rebar Pin Set
- Vegetation Plot
- Thalweg
- Waters Edge
- Bankfull
- Top of Bank

Vegetation Problem Areas

Bare Bank
- To be watched

Invasive Population
- To be watched

Beaver Damage
- To be watched

Stream Problem Areas

Beaver Dam
- Active
- Abandoned

Engineered Structures Grade
- Failed

Engineered Structures Other
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Aggradation/Bar Formation
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Bank Scour
- Failed
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0 15 30 60 Feet

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lp-xs-2-lb 36.50574429 81.00920903
lp-xs-2-bkf 36.50586082 81.00903444
lp-xs-2-rb 36.50596233 81.00887254
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lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
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end survey 36.50671371 81.00917776

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PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
PS-3 36.50595799 81.00770895
PS-4 36.50548606 81.00811273
PS-5 36.50554358 81.00858985
PS-6 36.50570996 81.00884450
PS-7 36.50586088 81.00903451
PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
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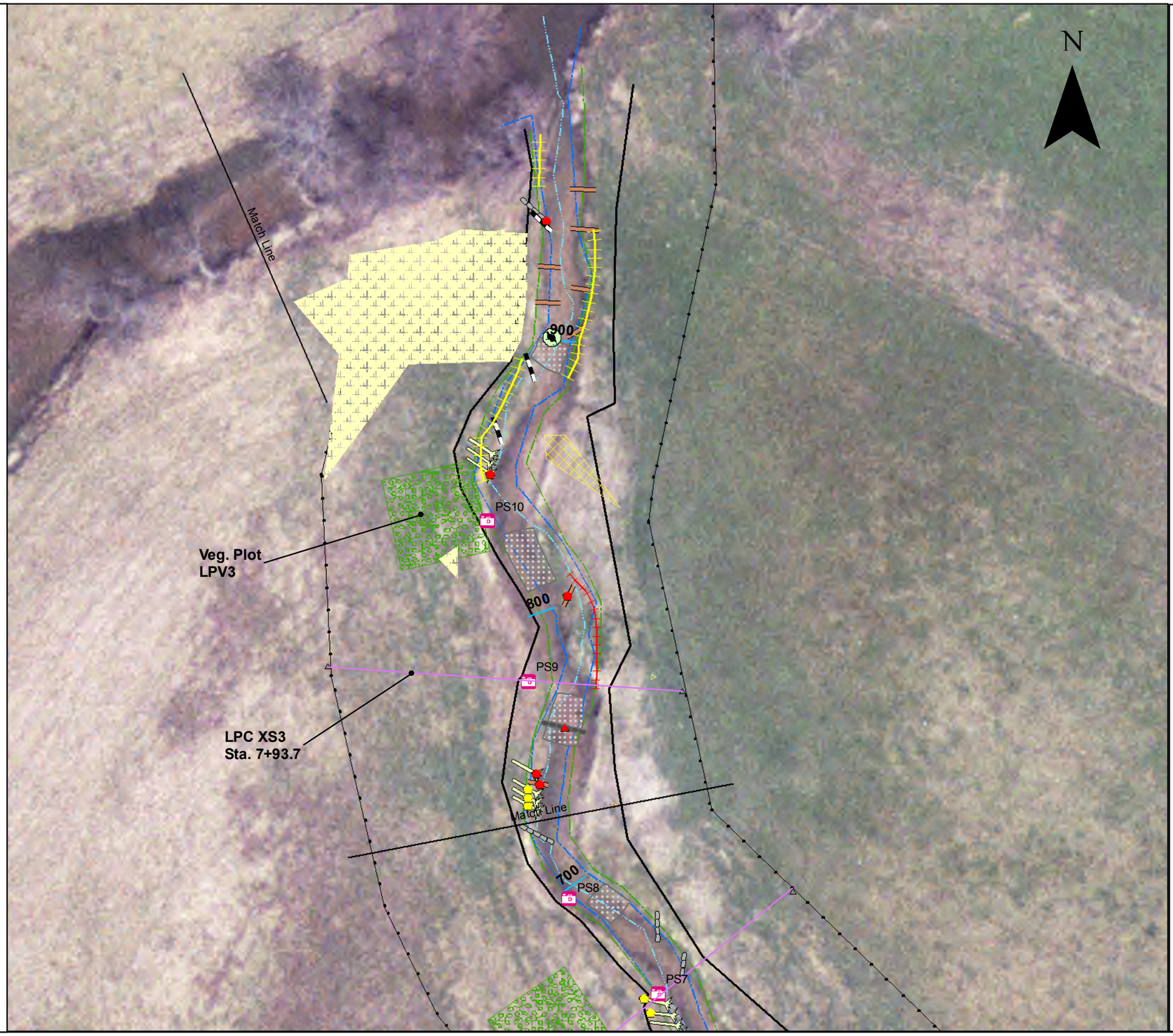
PS-11 36.50560838 81.01004210
PS-12 36.50682348 81.00989432
PS-13 36.50596754 81.01008668
PS-14 36.50608395 81.01009412
PS-15 36.50716885 81.00925196
PS-16 36.50515 81.01038
PS-17 36.50644 81.00980
PS-18 36.50658 81.00951
PS-19 36.50690 81.00927
PS-20 36.50786 81.00890
PS-21 36.50816 81.00874
PS-22 36.50830 81.00889
PS-23 36.50872 81.00928
PS-24 36.50874 81.00977
PS-25 36.50877 81.01008
PS-26 36.50868 81.01022
PS-27 36.50941 81.01042
PS-28 36.50999 81.01145
PS-29 36.51015 81.01211



Current Condition
Plan View

Project 54 Brush Creek
Monitoring Year 9
Alleghany County, NC
April 14, 2011

Repair As-built Data (AB2)
- Cross Section
- Photo Stations
- Centerline stations
- Digger Log
- Log Vane
- Fence Line
- Match Line
- Augmented Riffle
- Rock Sill
- Rock Vane
- Root Wad
- Rebar Pin Set
- Vegetation Plot
- Thalweg
- Waters Edge
- Bankfull
- Top of Bank

Vegetation Problem Areas
- **Bare Bank**
  - To be watched
- **Invasive Population**
  - To be watched
- **Beaver Damage**
  - To be watched

Stream Problem Areas
- **Beaver Dam**
  - Active
  - Abandoned
- **Engineered Structures Grade**
  - Failed
- **Engineered Structures Other**
  - To be watched
  - Failed
- **Aggradation/Bar Formation**
  - To be watched
- **Bank Scour**
  - Failed
  - To be watched

0 15 30 60 Feet

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
054-01-LPV2 36.50580894 81.00908181
054-01-LPV3 36.50628667 81.00924745
054-01-LPV4 36.50554587 81.00827233

Cross Sections:
lp-xs-1-lb 36.50591981 81.00758077
lp-xs-1-bkf 36.50595858 81.00771178
lp-xs-1-rb 36.50602071 81.00791864
lp-xs-2-lb 36.50574429 81.00920903
lp-xs-2-bkf 36.50586082 81.00903444
lp-xs-2-rb 36.50596233 81.00887254
lp-xs-3-lb 36.50617149 81.00944020
lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
begin survey 36.50614744 81.00742900
end survey 36.50671371 81.00917776

Photo Stations:
PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
PS-3 36.50595799 81.00770895
PS-4 36.50548606 81.00811273
PS-5 36.50554358 81.00858985
PS-6 36.50570996 81.00884450
PS-7 36.50586088 81.00903451
PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
bc-xs-4-bkf 36.50580545 81.01000965
bc-xs-4-rb 36.50582344 81.00989429

Photo Stations:
PS-11 36.50560838 81.01004210
PS-12 36.50682348 81.00989432
PS-13 36.50596754 81.01008668
PS-14 36.50608395 81.01009412
PS-15 36.50716885 81.00925196
PS-16 36.50515 81.01038
PS-17 36.50644 81.00980
PS-18 36.50658 81.00951
PS-19 36.50690 81.00927
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PS-22 36.50830 81.00889
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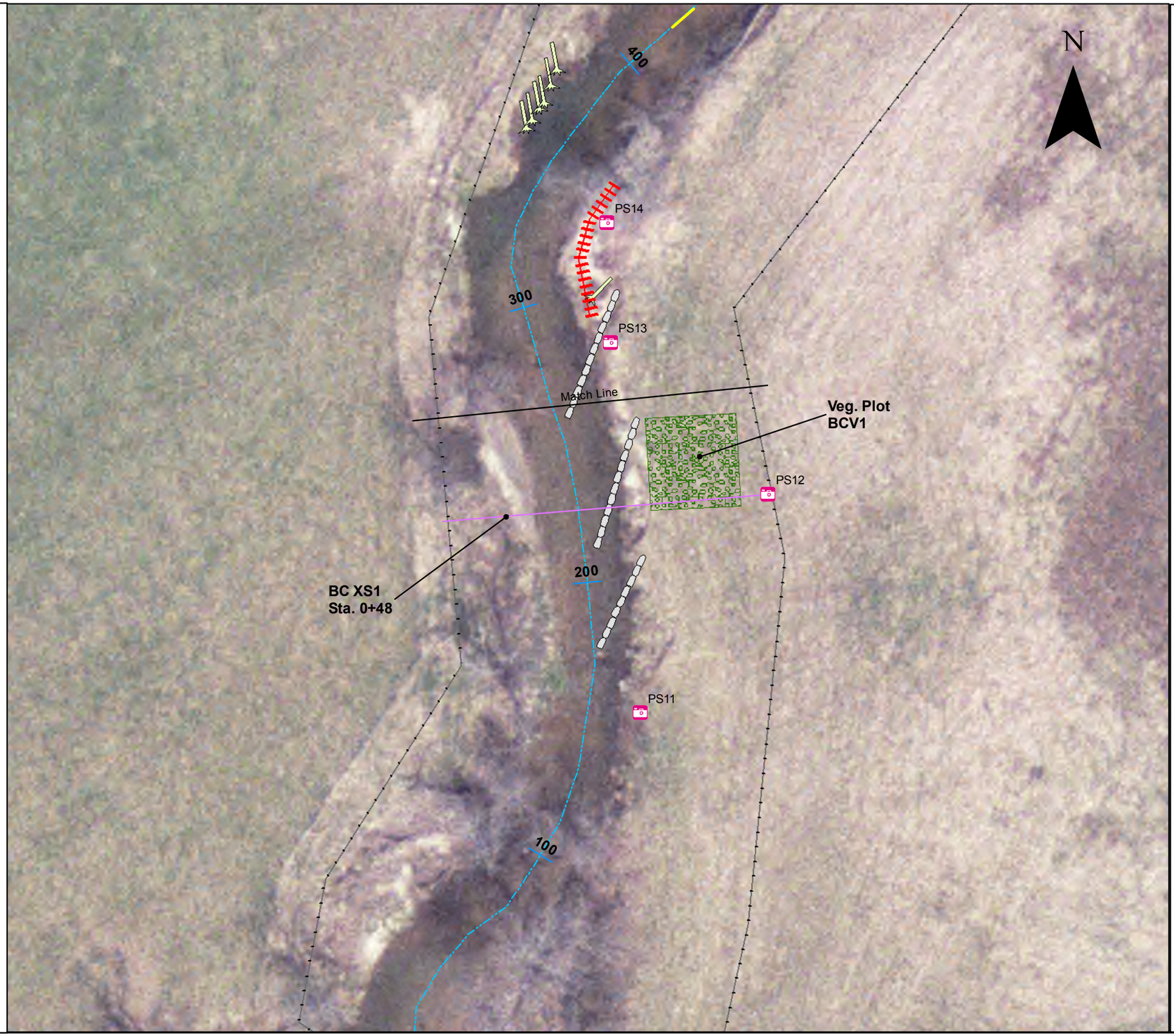
PS-26 36.50868 81.01022
PS-27 36.50941 81.01042
PS-28 36.50999 81.01145
PS-29 36.51015 81.01211



Current Condition Plan View

Project 54 Brush Creek
Monitoring Year 9
Alleghany County, NC
April 14, 2011

Repair As-built Data (AB2)
- Photo stations
- Cross section
- Centerline stations
- Log Vane
- Thalweg
- Match line
- Rock Vane
- Root Wad
- Vegetation Plot
- Conservation Easement

Vegetation Problem Areas
Invasive population
- To be watched

Stream Problem Areas
Engineered structures
- To Be Watched
- Failed

Aggradation/Bar Formation
- To be watched

Bank Scour
- To Be Watched
- Failed

0 15 30 60 Feet

Figure 2.
Map 4 of 11

Brush Creek - Project #54
Fish and Wildlife Associates, Inc.

Produced by
Fish and Wildlife Associates, Inc.
Whittier, NC

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
054-01-LPV2 36.50580894 81.00908181
054-01-LPV3 36.50628667 81.00924745
054-01-LPV4 36.50554587 81.00827233

Cross Sections:
lp-xs-1-lb 36.50591981 81.00758077
lp-xs-1-bkf 36.50595858 81.00771178
lp-xs-1-rb 36.50602071 81.00791864
lp-xs-2-lb 36.50574429 81.00920903
lp-xs-2-bkf 36.50586082 81.00903444
lp-xs-2-rb 36.50596233 81.00887254
lp-xs-3-lb 36.50617149 81.00944020
lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
begin survey 36.50614744 81.00742900
end survey 36.50671371 81.00917776

Photo Stations:
PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
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PS-5 36.50554358 81.00858985
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PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
bc-xs-4-bkf 36.50580545 81.01000965
bc-xs-4-rb 36.50582344 81.00989429

Photo Stations:
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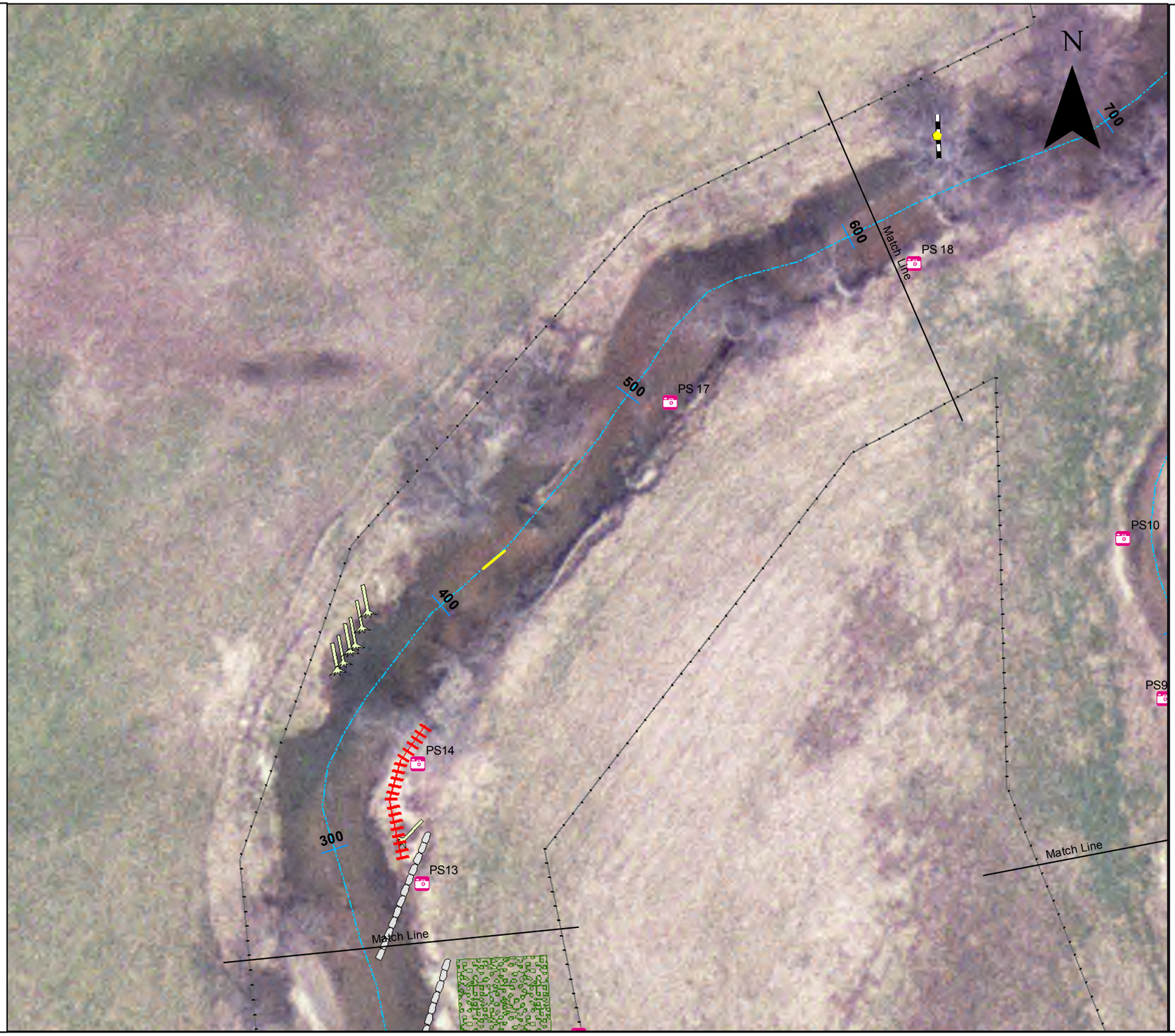
PS-28 36.50999 81.01145
PS-29 36.51015 81.01211



Current Condition
Plan View

Project 54 Brush Creek
Monitoring Year 9
Alleghany County, NC
April 14, 2011

Repair As-built Data (AB2)
- Photo stations
- Cross section
- Centerline stations
- Log Vane
- Thalweg
- Match line
- Rock Vane
- Root Wad
- Vegetation Plot
- Conservation Easement

Vegetation Problem Areas
Invasive population
- To be watched

Stream Problem Areas
Engineered structures
- To Be Watched
- Failed

Aggradation/Bar Formation
- To be watched

Bank Scour
- To Be Watched
- Failed

0 15 30 60 Feet

Figure 2.
Map 5 of 11

Brush Creek - Project #54
Fish and Wildlife Associates, Inc.

Produced by
Fish and Wildlife Associates, Inc.
Whittier, NC

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
054-01-LPV2 36.50580894 81.00908181
054-01-LPV3 36.50628667 81.00924745
054-01-LPV4 36.50554587 81.00827233

Cross Sections:
lp-xs-1-lb 36.50591981 81.00758077
lp-xs-1-bkf 36.50595858 81.00771178
lp-xs-1-rb 36.50602071 81.00791864
lp-xs-2-lb 36.50574429 81.00920903
lp-xs-2-bkf 36.50586082 81.00903444
lp-xs-2-rb 36.50596233 81.00887254
lp-xs-3-lb 36.50617149 81.00944020
lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
begin survey 36.50614744 81.00742900
end survey 36.50671371 81.00917776

Photo Stations:
PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
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PS-4 36.50548606 81.00811273
PS-5 36.50554358 81.00858985
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PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
bc-xs-4-bkf 36.50580545 81.01000965
bc-xs-4-rb 36.50582344 81.00989429

Photo Stations:
PS-11 36.50560838 81.01004210
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PS-25 36.50877 81.01008
PS-26 36.50868 81.01022
PS-27 36.50941 81.01042
PS-28 36.50999 81.01145
PS-29 36.51015 81.01211

Current Condition Plan View

Project 54 Brush Creek Monitoring Year 9 Alleghany County, NC April 14, 2011

Repair As-built Data (AB2)
- Photo stations
- Cross section
- Centerline stations
- Log Vane
- Thalweg
- Match line
- Rock Vane
- Root Wad
- Vegetation Plot
- Conservation Easement

Vegetation Problem Areas
Invasive population
- To be watched

Stream Problem Areas
Engineered structures
- To Be Watched
- Failed

Aggradation/Bar Formation
- To be watched

Bank Scour
- To Be Watched
- Failed

0 15 30 60 Feet

Figure 2.
Map 6 of 11

Brush Creek - Project #54
Fish and Wildlife Associates, Inc.

Produced by
Fish and Wildlife Associates, Inc.
Whittier, NC

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
054-01-LPV2 36.50580894 81.00908181
054-01-LPV3 36.50628667 81.00924745
054-01-LPV4 36.50554587 81.00827233

Cross Sections:
lp-xs-1-lb 36.50591981 81.00758077
lp-xs-1-bkf 36.50595858 81.00771178
lp-xs-1-rb 36.50602071 81.00791864
lp-xs-2-lb 36.50574429 81.00920903
lp-xs-2-bkf 36.50586082 81.00903444
lp-xs-2-rb 36.50596233 81.00887254
lp-xs-3-lb 36.50617149 81.00944020
lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
begin survey 36.50614744 81.00742900
end survey 36.50671371 81.00917776

Photo Stations:
PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
PS-3 36.50595799 81.00770895
PS-4 36.50548606 81.00811273
PS-5 36.50554358 81.00858985
PS-6 36.50570996 81.00884450
PS-7 36.50586088 81.00903451
PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
bc-xs-4-bkf 36.50580545 81.01000965
bc-xs-4-rb 36.50582344 81.00989429

Photo Stations:
PS-11 36.50560838 81.01004210
PS-12 36.50682348 81.00989432
PS-13 36.50596754 81.01008668
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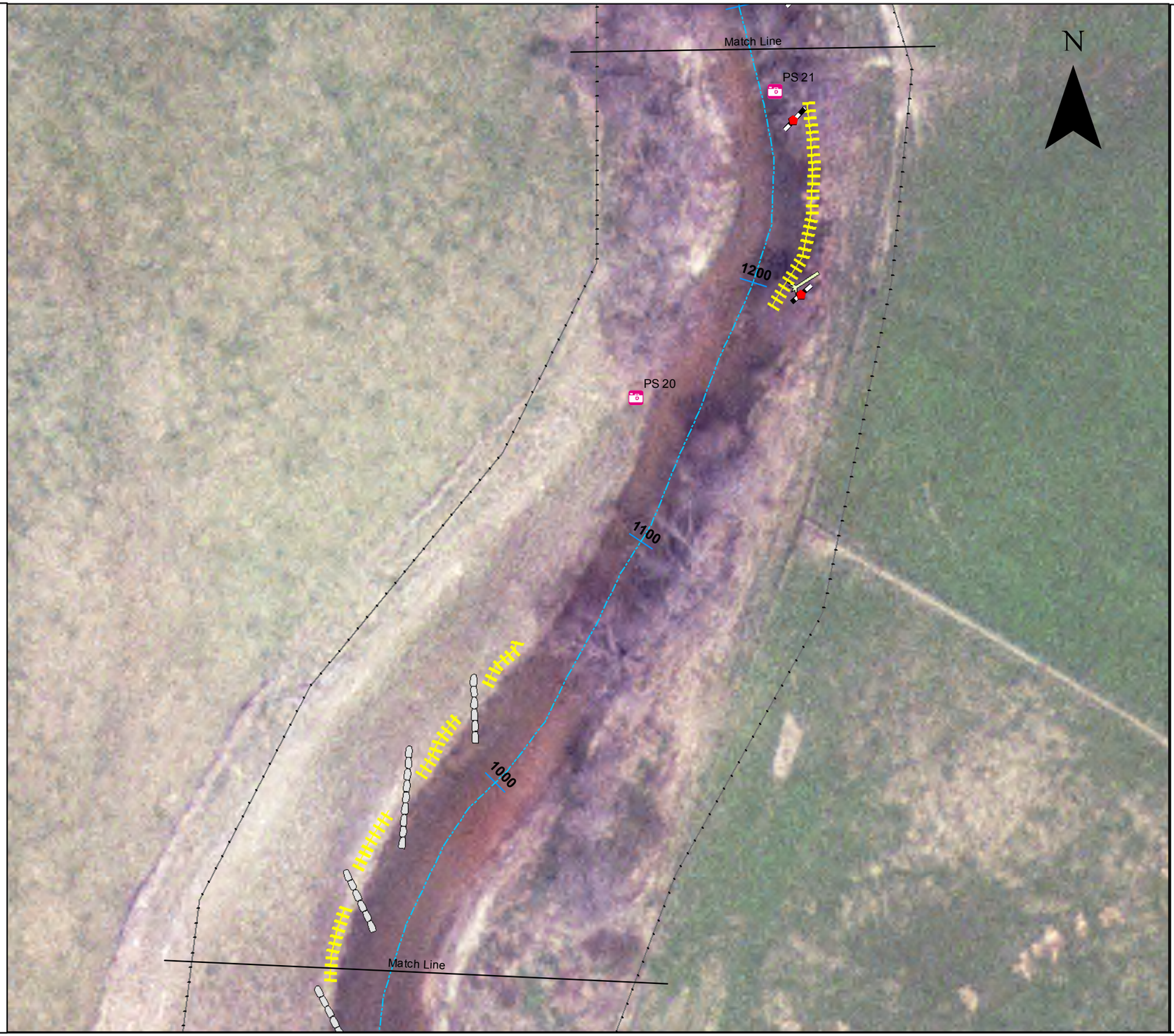
PS-29 36.51015 81.01211



Current Condition Plan View

Project 54 Brush Creek Monitoring Year 9 Alleghany County, NC April 14, 2011

Repair As-built Data (AB2)
- Photo stations
- Cross section
- Centerline stations
- Log Vane
- Thalweg
- Match line
- Rock Vane
- Root Wad
- Vegetation Plot
- Conservation Easement

Vegetation Problem Areas
Invasive population
- To be watched

Stream Problem Areas
Engineered structures
- To Be Watched
- Failed

Aggradation/Bar Formation
- To be watched

Bank Scour
- To Be Watched
- Failed

0 15 30 60 Feet

Figure 2.
Map 7 of 11

Brush Creek - Project #54
Fish and Wildlife Associates, Inc.

Produced by
Fish and Wildlife Associates, Inc.
Whittier, NC

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
054-01-LPV2 36.50580894 81.00908181
054-01-LPV3 36.50628667 81.00924745
054-01-LPV4 36.50554587 81.00827233

Cross Sections:
lp-xs-1-lb 36.50591981 81.00758077
lp-xs-1-bkf 36.50595858 81.00771178
lp-xs-1-rb 36.50602071 81.00791864
lp-xs-2-lb 36.50574429 81.00920903
lp-xs-2-bkf 36.50586082 81.00903444
lp-xs-2-rb 36.50596233 81.00887254
lp-xs-3-lb 36.50617149 81.00944020
lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
begin survey 36.50614744 81.00742900
end survey 36.50671371 81.00917776

Photo Stations:
PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
PS-3 36.50595799 81.00770895
PS-4 36.50548606 81.00811273
PS-5 36.50554358 81.00858985
PS-6 36.50570996 81.00884450
PS-7 36.50586088 81.00903451
PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
bc-xs-4-bkf 36.50580545 81.01000965
bc-xs-4-rb 36.50582344 81.00989429

Photo Stations:
PS-11 36.50560838 81.01004210
PS-12 36.50682348 81.00989432
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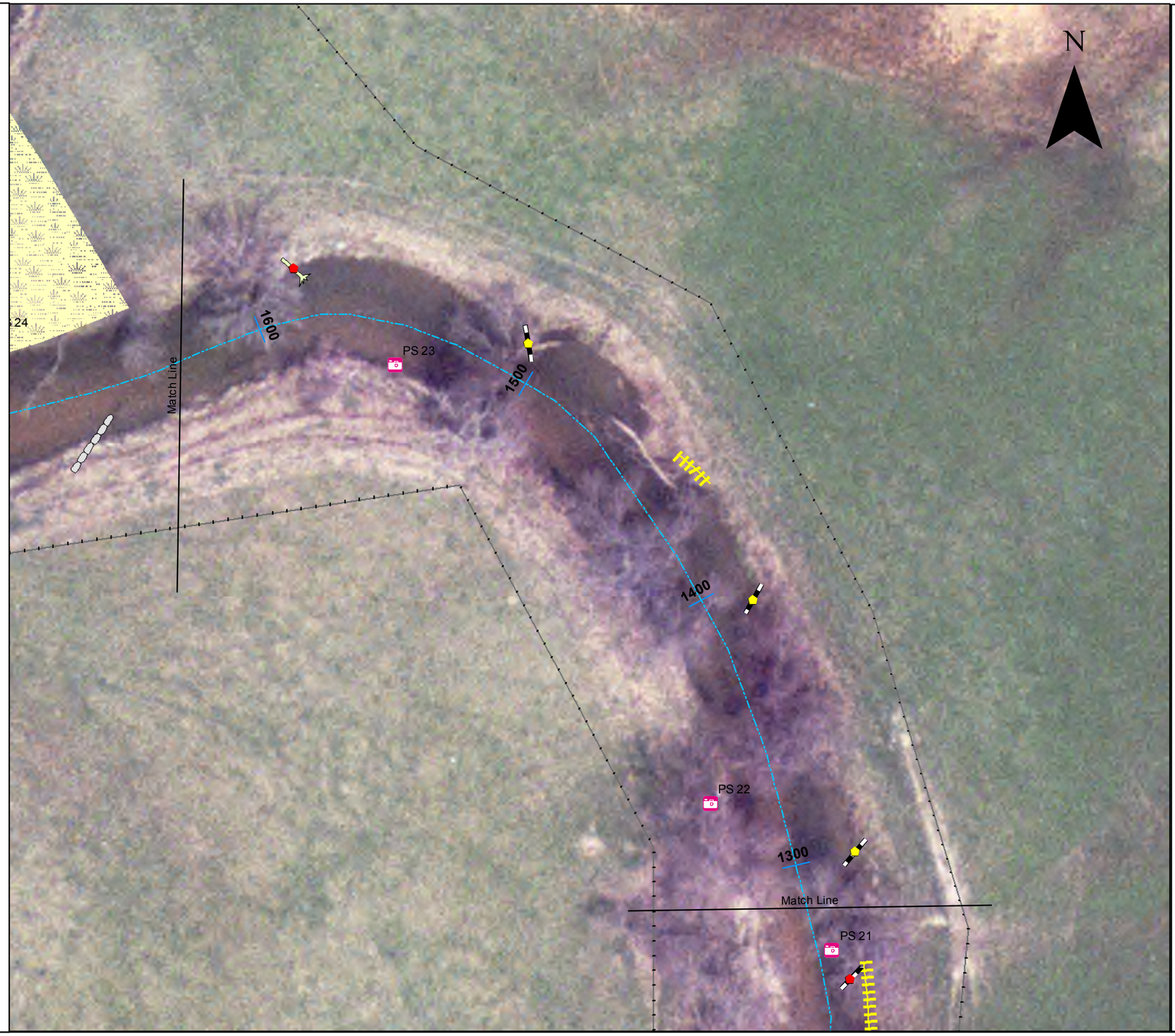
PS-29 36.51015 81.01211



Current Condition
Plan View

Project 54 Brush Creek
Monitoring Year 9
April 14, 2011

Repair As-built Data (AB2)
- Photo stations
- Cross section
- Centerline stations
- Log Vane
- Thalweg
- Match line
- Rock Vane
- Root Wad
- Vegetation Plot
- Conservation Easement

Vegetation Problem Areas
Invasive population
- To be watched

Stream Problem Areas
Engineered structures
- To Be Watched
- Failed

Aggradation/Bar Formation
- To be watched

Bank Scour
- To Be Watched
- Failed

0 15 30 60 Feet

Figure 2.
Map 8 of 11

Brush Creek - Project #54
Fish and Wildlife Associates, Inc.

Produced by
Fish and Wildlife Associates, Inc.
Whittier, NC

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
054-01-LPV2 36.50580894 81.00908181
054-01-LPV3 36.50628667 81.00924745
054-01-LPV4 36.50554587 81.00827233

Cross Sections:
lp-xs-1-lb 36.50591981 81.00758077
lp-xs-1-bkf 36.50595858 81.00771178
lp-xs-1-rb 36.50602071 81.00791864
lp-xs-2-lb 36.50574429 81.00920903
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lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
begin survey 36.50614744 81.00742900
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Photo Stations:
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PS-3 36.50595799 81.00770895
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PS-6 36.50570996 81.00884450
PS-7 36.50586088 81.00903451
PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
bc-xs-4-bkf 36.50580545 81.01000965
bc-xs-4-rb 36.50582344 81.00989429

Photo Stations:
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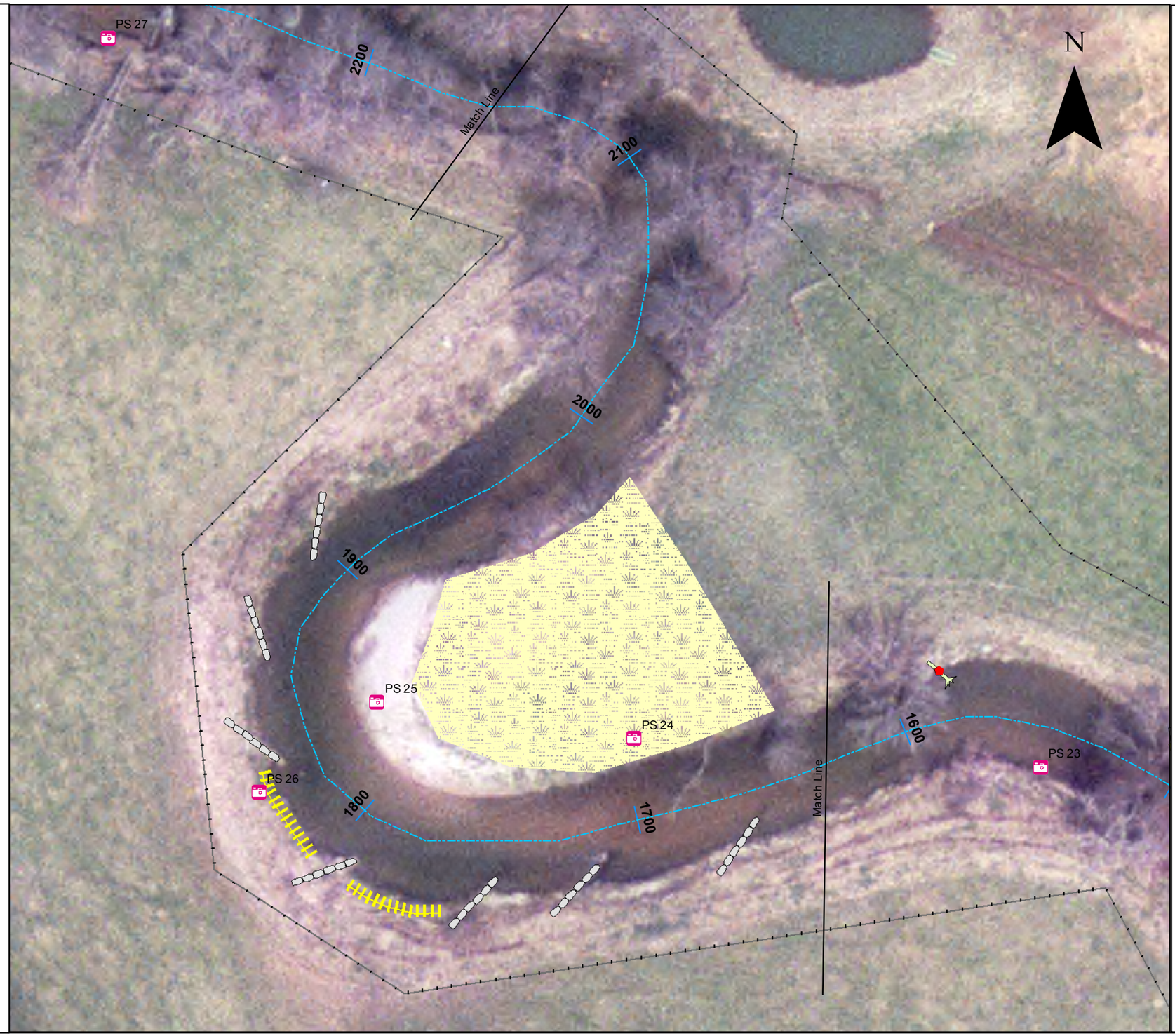

Current Condition Plan View

Project 54 Brush Creek
Monitoring Year 9
Alleghany County, NC
April 14, 2011

Repair As-built Data (AB2)
- Photo stations
- Cross section
- Centerline stations
- Log Vane
- Thalweg
- Match line
- Rock Vane
- Root Wad
- Vegetation Plot
- Conservation Easement

Vegetation Problem Areas
Invasive population
- To be watched

Stream Problem Areas
Engineered structures
- To Be Watched
- Failed

Aggradation/Bar Formation
- To be watched

Bank Scour
- To Be Watched
- Failed

Figure 2.
Map 9 of 11

Brush Creek - Project #54
Fish and Wildlife Associates, Inc.

Produced by
Fish and Wildlife Associates, Inc.
Whittier, NC

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
054-01-LPV2 36.50580894 81.00908181
054-01-LPV3 36.50628667 81.00924745
054-01-LPV4 36.50554587 81.00827233

Cross Sections:
lp-xs-1-lb 36.50591981 81.00758077
lp-xs-1-bkf 36.50595858 81.00771178
lp-xs-1-rb 36.50602071 81.00791864
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lp-xs-3-bkf 36.50616173 81.00919816
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Longitudinal Profile (As-built data):
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end survey 36.50671371 81.00917776

Photo Stations:
PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
PS-3 36.50595799 81.00770895
PS-4 36.50548606 81.00811273
PS-5 36.50554358 81.00858985
PS-6 36.50570996 81.00884450
PS-7 36.50586088 81.00903451
PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
bc-xs-4-bkf 36.50580545 81.01000965
bc-xs-4-rb 36.50582344 81.00989429

Photo Stations:
PS-11 36.50560838 81.01004210
PS-12 36.50682348 81.00989432
PS-13 36.50596754 81.01008668
PS-14 36.50608395 81.01009412
PS-15 36.50716885 81.00925196
PS-16 36.50515 81.01038
PS-17 36.50644 81.00980
PS-18 36.50658 81.00951
PS-19 36.50690 81.00927
PS-20 36.50786 81.00890
PS-21 36.50816 81.00874
PS-22 36.50830 81.00889
PS-23 36.50872 81.00928
PS-24 36.50874 81.00977
PS-25 36.50877 81.01008
PS-26 36.50868 81.01022
PS-27 36.50941 81.01042
PS-28 36.50999 81.01145
PS-29 36.51015 81.01211

Current Condition Plan View

Project 54 Brush Creek
Monitoring Year 9
Alleghany County, NC
April 14, 2011

Repair As-built Data (AB2)
- Photo stations
- Cross section
- Centerline stations
- Log Vane
- Thalweg
- Match line
- Rock Vane
- Root Wad
- Vegetation Plot
- Conservation Easement

Vegetation Problem Areas
Invasive population
- To be watched

Stream Problem Areas
Engineered structures
- To Be Watched
- Failed

Aggradation/Bar Formation
- To be watched

Bank Scour
- To Be Watched
- Failed

0 15 30 60 Feet

Figure 2.
Map 10 of 11

Brush Creek - Project #54
Fish and Wildlife Associates, Inc.

Produced by
Fish and Wildlife Associates, Inc.
Whittier, NC

Monitoring Pin Coordinates:
Location Latitude (N) Longitude (W)

Little Pine Creek
Veg Plots:
054-01-LPV1 36.50591020 81.00769455
054-01-LPV2 36.50580894 81.00908181
054-01-LPV3 36.50628667 81.00924745
054-01-LPV4 36.50554587 81.00827233

Cross Sections:
lp-xs-1-lb 36.50591981 81.00758077
lp-xs-1-bkf 36.50595858 81.00771178
lp-xs-1-rb 36.50602071 81.00791864
lp-xs-2-lb 36.50574429 81.00920903
lp-xs-2-bkf 36.50586082 81.00903444
lp-xs-2-rb 36.50596233 81.00887254
lp-xs-3-lb 36.50617149 81.00944020
lp-xs-3-bkf 36.50616173 81.00919816
lp-xs-3-rb 36.50615447 81.00901317

Longitudinal Profile (As-built data):
begin survey 36.50614744 81.00742900
end survey 36.50671371 81.00917776

Photo Stations:
PS-1 36.50623056 81.00733122
PS-2 36.50617709 81.00756979
PS-3 36.50595799 81.00770895
PS-4 36.50548606 81.00811273
PS-5 36.50554358 81.00858985
PS-6 36.50570996 81.00884450
PS-7 36.50586088 81.00903451
PS-8 36.50595143 81.00914380
PS-9 36.50616173 81.00919818
PS-10 36.50631667 81.00925134

Brush Creek
Veg Plots:
054-01-BCV1 36.50589788 81.00993449

Cross Sections:
bc-xs-4-lb 36.50578678 81.01028959
bc-xs-4-bkf 36.50580545 81.01000965
bc-xs-4-rb 36.50582344 81.00989429

Photo Stations:
PS-11 36.50560838 81.01004210
PS-12 36.50682348 81.00989432
PS-13 36.50596754 81.01008668
PS-14 36.50608395 81.01009412
PS-15 36.50716885 81.00925196
PS-16 36.50515 81.01038
PS-17 36.50644 81.00980
PS-18 36.50658 81.00951
PS-19 36.50690 81.00927
PS-20 36.50786 81.00890
PS-21 36.50816 81.00874
PS-22 36.50830 81.00889
PS-23 36.50872 81.00928
PS-24 36.50874 81.00977
PS-25 36.50877 81.01008
PS-26 36.50868 81.01022
PS-27 36.50941 81.01042
PS-28 36.50999 81.01145
PS-29 36.51015 81.01211

Current Condition Plan View

Project 54 Brush Creek
Monitoring Year 9
Alleghany County, NC
April 14, 2011

Repair As-built Data (AB2)
- Photo stations
- Cross section
- Centerline stations
- Log Vane
- Thalweg
- Match line
- Rock Vane
- Root Wad
- Vegetation Plot
- Conservation Easement

Vegetation Problem Areas
Invasive population
- To be watched

Stream Problem Areas
Engineered structures
- To Be Watched
- Failed

Aggradation/Bar Formation
- To be watched

Bank Scour
- To Be Watched
- Failed

0 15 30 60 Feet

Figure 2.
Map 11 of 11

Brush Creek - Project #54
Fish and Wildlife Associates, Inc.

Produced by
Fish and Wildlife Associates, Inc.
Whittier, NC

Table 5. Visual Stream Morphological Stability Assesment Table Brush Creek - Project # 54 Segment/Reach: Little Pine Creek (1000 ft)						
Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	9	11	NA	82	
	2. Armor stable (e.g. no displacement)?	10	11	NA	91	
	3. Facet grade appears stable?	7	11	NA	64	
	4. Minimal evidence of embedding/ fining?	9	11	NA	82	
	5. Length Appropriate?	6	11	NA	55	**75**
B. Pools	1. Present? (e.g not subject to severe aggradation or migration?)	9	13	NA	69	
	2. Sufficiently deep (Max Pool D:Mean Bkf >1.6?)	9	13	NA	69	
	3. Length Appropriate?	7	13	NA	54	**64**
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	12	13	NA	92	
	2. Downstream of meander (glide/inflection) centering?	12	13	NA	92	**92**
Meanders	1. Outer bend in state of limited/controlled erosion?	10	15	NA	67	
	2. Of those eroding, # w/concomitant point bar formation?	1	NA	NA	NA	
	3. Apparent Rc within spec?	14	15	NA	93	
	4. Sufficient floodplain access and relief?	14	15	NA	93	**84**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	1/15	99	
	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	NA	NA	NA	100	**99**
F. Banks	1. Actively eroding, wasting, or slumping bank	NA	NA	5/165	92	**92**
G. Vanes	1. Free of back or arm scour?	13	16	NA	81	
	2. Height appropriate?	14	16	NA	88	
	3. Angle and geometry appear appropriate?	14	16	NA	88	
	4. Free of piping or other structural failures?	11	16	NA	69	**81**
H. Wads/ Boulders	1. Free of scour?	3	4	NA	75	
	2. Footing stable?	2	4	NA	50	**63**

Table 5. Visual Stream Morphological Stability Assesment Table Brush Creek - Project # 54 Segment/Reach: Brush Creek (2800 ft)						
Feature Category	Metric (per As-built and reference baselines)	(# Stable) Number Performing as Intended	Total number per As-built	Total Number / feet in unstable state	% Perform in Stable Condition	Feature Perform. Mean or Total
A. Riffles	1. Present?	*	*	*	*	*
	2. Armor stable (e.g. no displacement)?	*	*	*	*	*
	3. Facet grade appears stable?	*	*	*	*	*
	4. Minimal evidence of embedding/ fining?	*	*	*	*	*
	5. Length Appropriate?	*	*	*	*	*
B. Pools	1. Present? (e.g not subject to severe aggradation or migration?)	*	*	*	*	*
	2. Sufficiently deep (Max Pool D:Mean Bkf >1.6?)	*	*	*	*	*
	3. Length Appropriate?	*	*	*	*	*
C. Thalweg	1. Upstream of meander bend (run/inflection) centering?	7	7	NA	100	
	2. Downstream of meander (glide/inflection) centering?	7	7	NA	100	**100**
D. Meanders	1. Outer bend in state of limited/controlled erosion?	7	7	NA	100	
	2. Of those eroding, # w/concomitant point bar formation?	NA	NA	NA	NA	
	3. Apparent Rc within spec?	7	7	NA	100	
	4. Sufficient floodplain access and relief?	7	7	NA	100	**100**
E. Bed General	1. General channel bed aggradation areas (bar formation)	NA	NA	1/25	99	
	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	NA	NA	NA	100	**100**
F. Banks	1. Actively eroding, wasting, or slumping bank	NA	NA	5/300	94	**94**
G. Vanes	1. Free of back or arm scour?	9	21	NA	43	
	2. Height appropriate?	15	21	NA	71	
	3. Angle and geometry appear appropriate?	15	21	NA	71	
	4. Free of piping or other structural failures?	15	21	NA	71	**64**
H. Wads/ Boulders	1. Free of scour?	3	4	NA	75	
	2. Footing stable?	3	4	NA	75	**75**
*A longitudinal survey was not conducted; therefore, this data is not available.						

Table 6. Vegetation Condition Assessment Brush Creek-Project 54 Segment - Little Pine Creek (1052 ft)						
Planted Acreage	**2.48**					
Vegetation Category	**Definitions**	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very Limited cover of both woody and herbaceous material	0.1 acres		0	0	0
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY6, 7 or 8 stem count criteria	0.1 acres		6*	0.005	0.19
			Total	0	0.005	0.189
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year	0.25 acres		0	0	0
			Cumulative Total	0	0.005	0.189
Easement Acreage						
Vegetation Category	**Definitions**	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Area
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale)	1000 SF		12	0.09	3.6
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	None		0	0.0	0.0

* areas of beaver damage to planted stems

Table 6. Vegetation Condition Assessment Brush Creek-Project 54 Segment - Brush Creek (2800 ft)						
Planted Acreage	**10.6**					
Vegetation Category	**Definitions**	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very Limited cover of both woody and herbaceous material	0.1 acres		0	0	0
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY6, 7 or 8 stem count criteria	0.1 acres		0	0	0
			Total	0	0	0
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year	0.25 acres		0	0	0
			Cumulative Total	0	0	0
Easement Acreage						
Vegetation Category	**Definitions**	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Easement Area
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale)	1000 SF		1	0.19	2.3
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale)	None		0	0	0

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 1
Date: November 2007
Photographed by: R. Sain
Description: Taken 100 degrees from north.

Site: Little Pine Creek
Project No: 54
Photo Station: 1
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 100 degrees from north.

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 1
Date: November 2007
Photographed by: R. Sain
Description: Taken 225 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 1
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 225 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 2
Date: November 2007
Photographed by: R. Sain
Description: Taken 70 degrees from north, facing upstream.

Site: Little Pine Creek
Project No: 54
Photo Station: 2
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 70 degrees from north, facing upstream.

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 2
Date: November 2007
Photographed by: R. Sain
Description: Taken 200 degrees from north.

Site: Little Pine Creek
Project No: 54
Photo Station: 2
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 200 degrees from north. Facing downstream towards riffle cross section 1.

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 3
Date: November 2007
Photographed by: R. Sain
Description: Taken 25 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 3
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 25 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 3
Date: November 2007
Photographed by: R. Sain
Description: Taken 228 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 3
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 228 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 4
Date: November 2007
Photographed by: R. Sain
Description: Taken 45 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 4
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 45 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 4
Date: November 2007
Photographed by: R .Sain
Description: Taken 270 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 4
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 270 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 5
Date: November 2007
Photographed by: R. Sain
Description: Taken 90 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 5
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 90 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 5
Date: November 2007
Photographed by: R. Sain
Description: Taken 300 degrees from north.

Site: Little Pine Creek
Project No: 54
Photo Station: 5
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 300 degrees from north, facing downstream towards breached rock sill.

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 6
Date: November 2007
Photographed by: R. Sain
Description: Taken 115 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 6
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 115 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 6
Date: November 2007
Photographed by: R. Sain
Description: Taken 332 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 6
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 332 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 7
Date: November 2007
Photographed by: R. Sain
Description: Taken 115 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 7
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 115 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 7
Date: November 2007
Photographed by: R. Sain
Description: Taken 352 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 7
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 352 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 8
Date: November 2007
Photographed by: R. Sain
Description: Taken 100 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 8
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 100 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 8
Date: November 2007
Photographed by: R. Sain
Description: Taken 350 degrees from north.

Site: Little Pine Creek
Project No: 54
Photo Station: 8
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 350 degrees from north, muskrat holes along the left descending bank.

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 9
Date: November 2007
Photographed by: R. Sain
Description: Taken 20 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 9
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 20 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 9
Date: November 2007
Photographed by: R. Sain
Description: Taken 170 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 9
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 170 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 10
Date: November 2007
Photographed by: R. Sain
Description: Taken 20 degrees from north.

Site: Little Pine Creek
Project No: 54
Photo Station: 10
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 20 degrees from north, water flowing under root wads along left descending bank.

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Little Pine Creek
Project No: 54
Photo Station: 10
Date: November 2007
Photographed by: R
Description: Taken 160 degrees from north

Site: Little Pine Creek
Project No: 54
Photo Station: 10
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 160 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 11
Date: November 2007
Photographed by: R. Sain
Description: Taken 226 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 11
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 226 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 11
Date: November 2007
Photographed by: R. Sain
Description: Taken 350 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 11
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 350 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 12
Date: November 2007
Photographed by: R. Sain
Description: Taken 224 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 12
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 224 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 12
Date: November 2007
Photographed by: R. Sain
Description: Taken 270 degrees from north.

Site: Brush Creek
Project No: 54
Photo Station: 12
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 270 degrees from north, showing a portion of the Brush Creek Vegetation Plot.

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 13
Date: November 2007
Photographed by: R. Sain
Description: Taken 195 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 13
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 195 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 13
Date: November 2007
Photographed by: R. Sain
Description: Taken 345 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 13
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 345 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 14
Date: November 2007
Photographed by: R. Sain
Description: Taken 190 degrees from north, facing upstream.

Site: Brush Creek
Project No: 54
Photo Station: 14
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 190 degrees from north, facing upstream, bank scour is visible along the right descending bank.

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 14
Date: November 2007
Photographed by: R. Sain
Description: Taken 330 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 14
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 330 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 15
Date: November 2007
Photographed by: R. Sain
Description: Taken 35 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 15
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 35 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 15
Date: November 2007
Photographed by: R. Sain
Description: Taken 160 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 15
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 160 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 16
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 28 degrees from north

*Photo station established in 2009

Site: Brush Creek
Project No: 54
Photo Station: 16
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 28 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 17
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 235 degrees from north

*Photo station established in 2009

Site: Brush Creek
Project No: 54
Photo Station: 17
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 235 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 18
Date: January 2003
Photographed by: Unknown
Description: Taken 330 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 18
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 300 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 18
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 43 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 18
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 43 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 19
Date: January 2003
Photographed by: Unknown
Description: Taken 160 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 19
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 160 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 19
Date: January 2003
Photographed by: Unknown
Description: Taken 120 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 19
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 120 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 20
Date: January 2003
Photographed by: Unknown
Description: Taken 55 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 20
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 60 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 20
Date: January 2003
Photographed by: Unknown
Description: Taken 145 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 20
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 176 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 21
Date: January 2003
Photographed by: Unknown
Description: Taken 8 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 21
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 8 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 21
Date: January 2003
Photographed by: Unknown
Description: Taken 122 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 21
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 122 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 22
Date: January 2003
Photographed by: Unknown
Description: Taken 150 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 22
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 150 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 22
Date: January 2003
Photographed by: Un known
Description: Taken 115 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 22
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 115 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 22
Date: January 2003
Photographed by: Unknown
Description: Taken 55 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 22
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 55 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 23
Date: January 2003
Photographed by: Unknown
Description: Taken 310 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 23
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 310 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 23
Date: January 2003
Photographed by: Unknown
Description: Taken 118 degrees from north

*No representative photo point was available, used PS 23, 90 degrees.

Site: Brush Creek
Project No: 54
Photo Station: 23
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 118 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 23
Date: January 2003
Photographed by: Unknown
Description: Taken 90 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 23
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 90 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 24
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 104 degrees from north

*No representative photo prior to 2009

Site: Brush Creek
Project No: 54
Photo Station: 24
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 104 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 24
Date: January 2003
Photographed by: Unknown
Description: Taken 140 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 24
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 140 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 24
Date: January 2003
Photographed by: Unknown
Description: Taken 180 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 24
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 180 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 24
Date: January 2003
Photographed by: Unknown
Description: Taken 220 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 24
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 220 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: January 2003
Photographed by: Unknown
Description: Taken 200 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 200 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: January 2003
Photographed by: Unknown
Description: Taken 270 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 270 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: January 2003
Photographed by: Unknown
Description: Taken 310 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 310 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: January 2003
Photographed by: Unknown
Description: Taken 335 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 335 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 30 degrees from north

*No representative photo prior to 2009

Site: Brush Creek
Project No: 54
Photo Station: 25
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 30 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 26
Date: January 2003
Photographed by: Unknown
Description: Taken 10 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 26
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 10 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 26
Date: January 2003
Photographed by: Unknown
Description: Taken 85 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 26
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 85 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 26
Date: January 2003
Photographed by: Unknown
Description: Taken 120 degrees from north

Site: Brush Creek
Project No: 54
Photo Station: 26
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 120 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 27
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 83 degrees from north

*Photo station was established in 2009

Site: Brush Creek
Project No: 54
Photo Station: 27
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 83 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 27
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 316 degrees from north

*Photo station was established in 2009

Site: Brush Creek
Project No: 54
Photo Station: 27
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 316 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 28
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 144 degrees from north

*Photo station was established in 2009

Site: Brush Creek
Project No: 54
Photo Station: 28
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 144 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 28
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 293 degrees from north

*Photo station was established in 2009

Site: Brush Creek
Project No: 54
Photo Station: 28
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 293 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 29
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 108 degrees from north

*Photo station was established in 2009

Site: Brush Creek
Project No: 54
Photo Station: 29
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 108 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Stream Fixed Station Photos
Brush Creek – Project # 54

Site: Brush Creek
Project No: 54
Photo Station: 29
Date: March 12, 2009
Photographed by: C. Lawson
Description: Taken 326 degrees from north

*Photo station was established in 2009

Site: Brush Creek
Project No: 54
Photo Station: 29
Date: March 31, 2010
Photographed by: C. Lawson
Description: Taken 326 degrees from north

North Carolina Ecosystem Enhancement Program (NC EEP)
Vegetation Monitoring Plot Photos
Brush Creek– Project # 54

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01-LPV1
Date: October 8, 2007
Photo No: LPV1
Photographed by: D.A. Mora
Description: Taken from plot origin toward diagonally opposite corner.

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01-LPV1
Date: August 25, 2010
Photo No: LPV1
Photographed by: C. Lawson
Description: Taken from plot origin toward diagonally opposite corner.

North Carolina Ecosystem Enhancement Program (NC EEP)
Vegetation Monitoring Plot Photos
Brush Creek– Project # 54

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01-LPV2
Date: October 8, 2007
Photo No: LPV2
Photographed by: D.A. Mora
Description: Taken from plot origin toward diagonally opposite corner.

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01-LPV2
Date: August 25, 2010
Photo No: LPV2
Photographed by: C. Lawson
Description: Taken from plot origin toward diagonally opposite corner.

North Carolina Ecosystem Enhancement Program (NC EEP)
Vegetation Monitoring Plot Photos
Brush Creek– Project # 54

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01-LPV3
Date: October 8, 2007
Photo No: LPV3
Photographed by: L.B. Saal
Description: Taken from southwestern corner toward diagonally opposite corner.

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01-LPV3
Date: August 25, 2010
Photo No: LPV3
Photographed by: C. Lawson
Description: Taken from southwestern corner toward diagonally opposite corner.

North Carolina Ecosystem Enhancement Program (NC EEP)
Vegetation Monitoring Plot Photos
Brush Creek– Project # 54

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01-LPV4
Date: October 8, 2007
Photo No: LPV4
Photographed by: D.A. Mora
Description: Taken from plot origin toward diagonally opposite corner.

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01-LPV4
Date: August 25, 2010
Photo No: LPV4
Photographed by: C. Lawson
Description: Taken from plot origin toward diagonally opposite corner.

North Carolina Ecosystem Enhancement Program (NC EEP)
Vegetation Monitoring Plot Photos
Brush Creek– Project # 54

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01BCV1
Date: October 8, 2007
Photo No: BCV1
Photographed by: L.B. Saal
Description: Taken from lower downstream corner towards diagonally opposite corner.

Alleghany County, NC
Site: Little Pine Creek Plot ID: 054-01BCV1
Date: August 25, 2010
Photo No: BCV1
Photographed by: C. Lawson
Description: Taken from plot origin toward diagonally opposite corner.

APPENDIX C

VEGETATION PLOT DATA

Table 7. Vegetation Plot Mitigation Success Summary Table
Table 8. CVS Vegetation Metadata Table
Table 9. CVS Stem Count Total and Planted by Plot and Species

Table 7. Vegetation Plot Mitigation Success Summary Table Brush Creek - Project # 54			
Vegetation Plot ID	**Total Planted Stems Per Acre**	**Vegetation Survival Threshold Met?***	**Tract Mean**
054-01-BCV1-year:4	687.9655914	Yes	n/a
054-01-LPV1-year:4	445.1542062	Yes	n/a
054-01-LPV2-year:4	445.1542062	Yes	n/a
054-01-LPV3-year:4	445.1542062	Yes	n/a
054-01-LPV4-year:4	485.6227704	Yes	n/a

*Survival Threshold is 288 stems/acre

Table 8. Vegetation Metadata Table Brush Creek - Project #54	
Report Prepared By	Charles Lawson
Date Prepared	10/1/2010 11:15
Database name	FishandWildlifeAssociates-2010-A.mdb
Database location	C:\Users\Leslie\Desktop
Computer name	LESLIE-PC
File size	30027776
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY----------	
Project Code	54
Project Name	Brush Creek
Description	Stream repair on Brush and Little Pine Creeks in Alleghany County NC.
River Basin	New River
Length(ft)	1000
Stream-to-edge width (ft)	50
Area (sq m)	9289.36
Required Plots (calculated)	4
Sampled Plots	5

Table 9. Stem Count Total and Planted Plot by Species
Project # 54 - Brush Creek

			Current Plot Data (MY9 2010)															Annual Means											
			054-01-BCV1			054-01-LPV1			054-01-LPV2			054-01-LPV3			054-01-LPV4			MY9 (2010)			MY8 (2009)			MY7 (2008)			MY6 (2007)			AB2 (2007)		
Scientific Name	Common Name	Species Type	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T	P-LS	P-all	T
Acer rubrum	red maple	Tree		2	2		1	1		1	1								4	4		5	6		2	2		2	2		2	2
Acer saccharum	sugar maple	Shrub Tree					1	1					1	1					2	2												
Alnus serrulata	hazel alder	Shrub Tree																							1	1		1	1		1	1
Asimina triloba	pawpaw	Shrub Tree																				2	3		6	6		9	9		12	12
Betula nigra	river birch	Tree		2	7		2	2		2	2					2	2		8	13		5	6		2	3		6	6		9	9
Carpinus caroliniana	American hornbeam	Shrub Tree		3	3								1	1					4	4		5	5		3	5		2	2		8	8
Cornus amomum	silky dogwood	Shrub						3						1		1	2		1	6		1	11		1	9		1	1		1	1
Diospyros virginiana	common persimmon	Tree																										1	1		2	2
Fraxinus americana	white ash	Tree																						1	1	1	1	1	1			
Fraxinus pennsylvanica	green ash	Tree		2	2		1	1		3	3					1	1		7	7		5	5		4	4		3	3		5	5
Hamamelis virginiana	American witchhazel	Shrub Tree		2	2		2	2		1	1					3	3		8	8		6	7		9	11		10	10		10	10
Ilex opaca	American holly	Shrub Tree					1	1											1	1		1	1									
Juglans nigra	black walnut	Tree		1	1								1	2					2	3		3	3		2	5		2	2		4	4
Liriodendron tulipifera	tuliptree	Tree																				1	1		1	1		1	1		1	1
Physocarpus opulifolius	common ninebark	Shrub	1	3	3								1	1				1	4	4	1	4	4	1	4	4	1	3	3	1	6	6
Pinus strobus	eastern white pine	Tree														1	1		1	1		2	2		2	2		2	2		2	2
Platanus occidentalis	American sycamore	Tree								1	1		1	1		2	2		4	4		2	2									
Prunus pensylvanica	pin cherry	Shrub Tree		1	1														1	1												
Prunus serotina	black cherry	Shrub Tree					1	1		1	1		4	4		1	1		7	7		8	12		9	18		8	8		12	12
Quercus alba	white oak	Tree					1	1		2	2								3	3		3	3		3	3		3	3		4	4
Quercus rubra	northern red oak	Tree					1	1											1	1		2	2									
Rhododendron calendulaceum	flame azalea	Shrub																							1	1		1	1		3	3
Rhododendron viscosum	swamp azalea	Shrub																													1	1
Salix nigra	black willow	Tree	1	1	1													1	1	1	2	3	6	5	5	7	3	4	4	3	3	3
Salix sericea	silky willow	Shrub Tree															8			8												
Sambucus canadensis	Common Elderberry	Shrub Tree									1	1	1	15		1	27	1	2	43	1	3	74	2	7	65	3	6	6	3	13	13
Tsuga canadensis	eastern hemlock	Tree																										1	1		1	1
Tsuga caroliniana	Carolina hemlock	Tree											1	1					1	1												
Uknown																						1	1			1	2	2	2		12	12
Stem count			2	17	22	0	11	14	0	11	12	1	11	27	0	12	47	3	62	122	4	62	154	9	63	149	10	69	69	7	112	112
size (ares)			1			1			1			1			1			5			5			5			5			5		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.12			0.12			0.12			0.12			0.12		
Species count			2	9	9	0	9	10	0	7	8	1	8	9	0	8	9	3	19	20	3	19	19	4	18	19	5	21	21	3	21	21
Stems per ACRE			80.9	688	890	0	445	567	0	445	486	40.5	445	1093	0	486	1902	24.3	502	987	32.4	502	1246	72.8	510	1206	80.9	558	558	56.7	906	906

*Shaded boxes indicate a difference in the number of planted stems and total stems. The difference is due to the presence of natural stems.

APPENDIX D

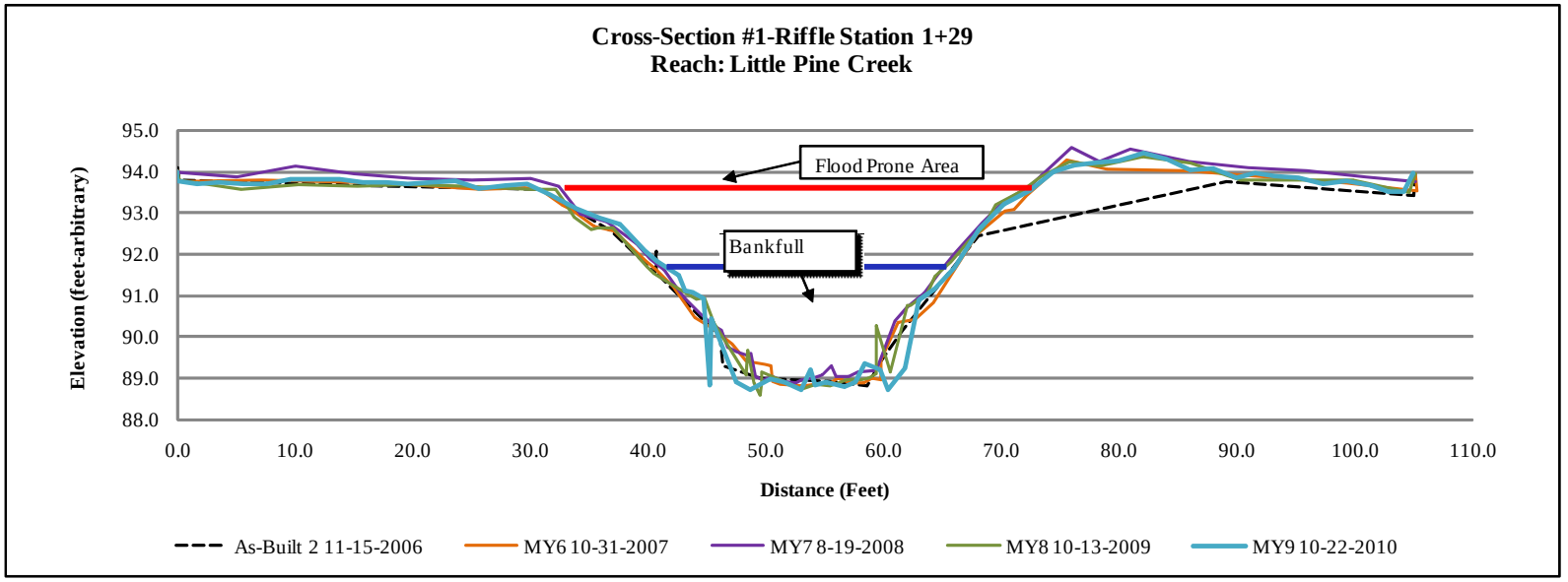
STREAM SURVEY DATA

Cross-sections with Annual Overlays
Longitudinal Profile with Annual Overlay
Pebble Count plots with annual overlays
Table 10. Baseline-Stream Data Summary table
Table 11a. Monitoring-Cross Section Morphology Data
Table 11b. Monitoring- Stream Reach Morphology Data Table

River Basin	New
Watershed	Brush Creek, MY9
Project Name	Brush Creek Project 54
Cross Section	Little Pine Creek 1 of 3
Feature	Riffle
Date Surveyed	10/22/2010
Crew	Lawson, C., Laseter, B.

Bankfull Area					
	AB2	MY6	MY7	MY8	MY9
Area	45.3	44.4	47.9	31.3	36.5
Width	24.9	25.4	25.4	20.4	20.8
Mean Depth	1.8	1.7	1.9	1.5	1.8
Max Depth	2.8	2.8	3.0	2.5	2.4
w/d ratio	13.7	14.5	13.5	13.4	11.9
FPW	105.1	>100	171.0	39.6	40.7
ER	4.2	3.9	6.7	1.9	2.0

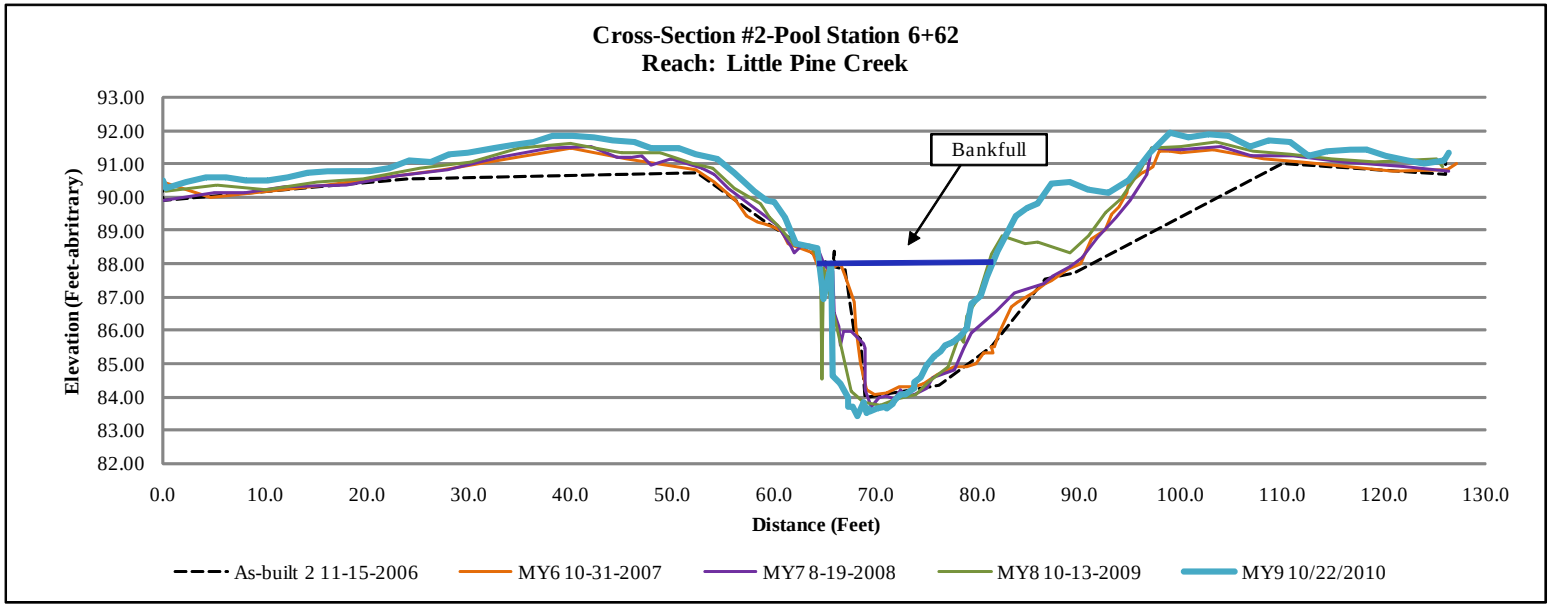
Facing downstream x-section #1



River Basin	New
Watershed	Brush Creek, MY9
Project Name	Brush Creek Project 54
Cross Section	Little Pine Creek 2 of 3
Feature	Pool
Date Surveyed	10/22/2010
Crew	Lawson, C., Laseter, B.

Bankfull Area					
	AB2	MY6	MY7	MY8	MY9
Area	54.4	51.9	40.2	50.8	49.8
Width	24.7	26.4	20.6	16.5	17
Mean Depth	2.2	2.0	1.9	3.1	2.9
Max Depth	3.9	3.8	3.7	4.4	4.6
w/d ratio	11.2	13.4	n/a	n/a	n/a
FPW	126.1	>100	n/a	n/a	n/a
ER	5.1	3.8	n/a	n/a	n/a

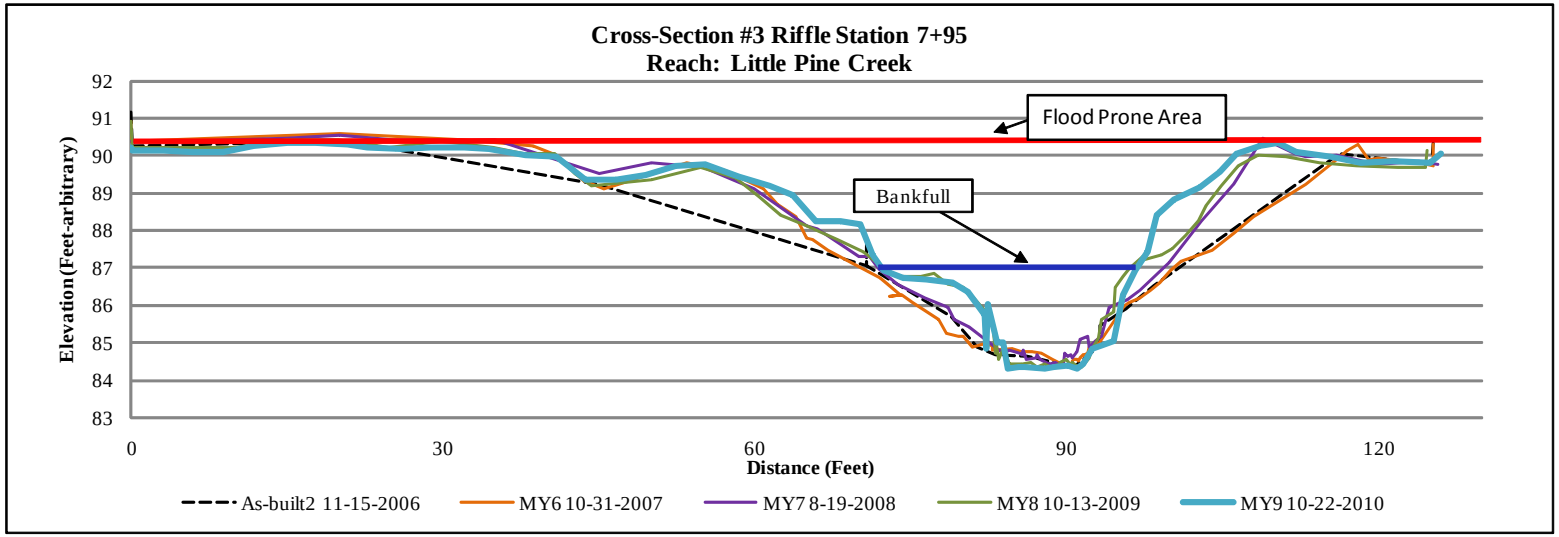
Facing down stream x-section #2



River Basin	New
Watershed	Brush Creek, MY9
Project Name	Brush Creek Project 54
Cross Section	Little Pine Creek 3 of 3
Feature	Riffle
Date Surveyed	10/22/2010
Crew	Lawson, C., Laseter, B.

Bankfull Area					
	AB2	MY6	MY7	MY8	MY9
Area	45.1	45.97	48.3	37.8	44.3
Width	30.3	34.0	30.3	26.0	26.3
Mean Depth	1.8	1.4	1.6	1.5	1.7
Max Depth	2.8	2.8	3.0	2.9	3.0
w/d ratio	20.3	25.1	19.1	17.9	15.6
FPW	110.0	>100	73.9	79.2	110.0
ER	2.7	2.9	2.4	3.0	4.2

Facing down stream x-section #3

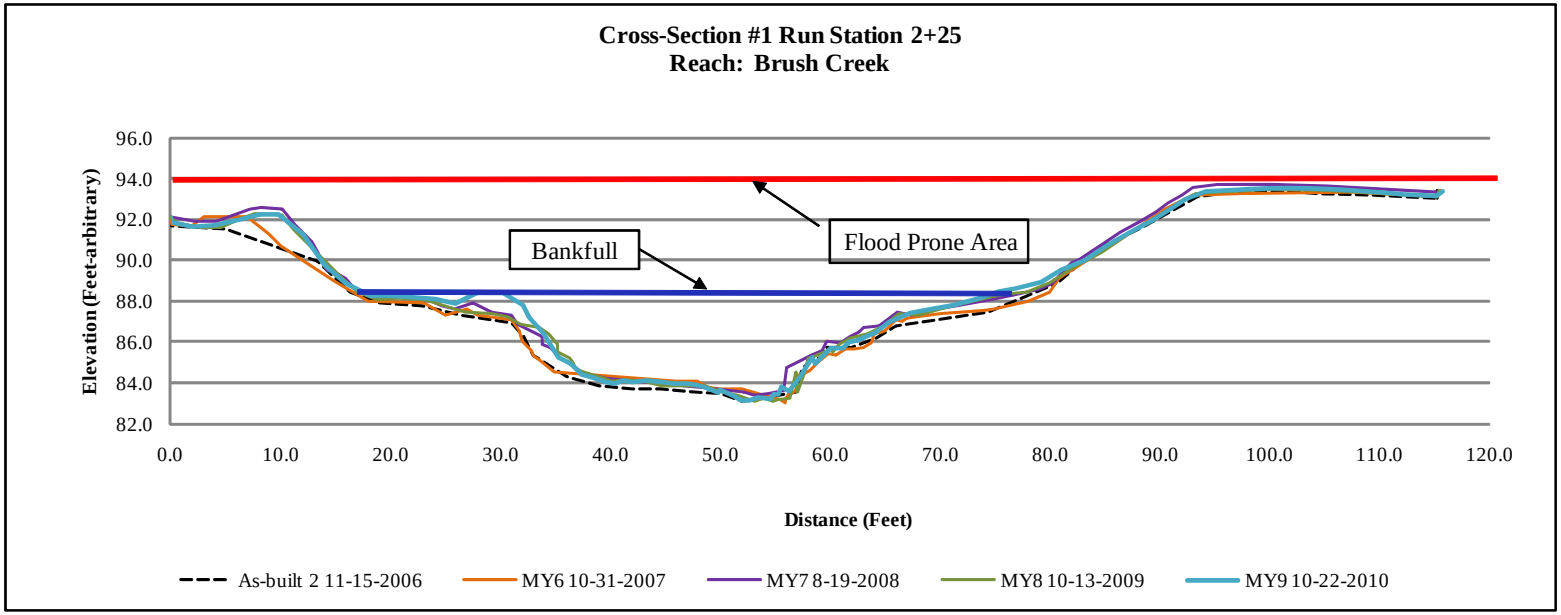


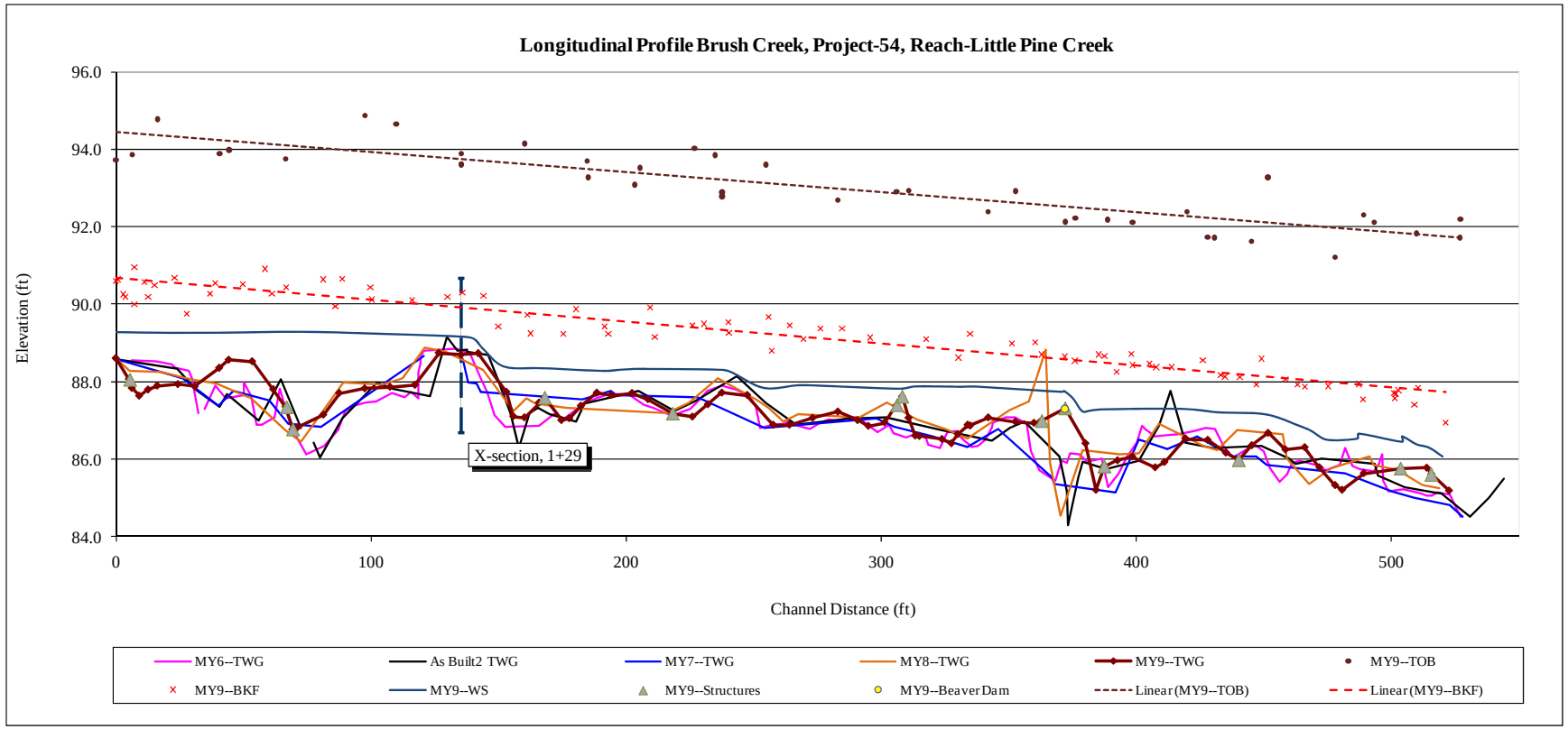
* Left pin was reset Oct-2010.

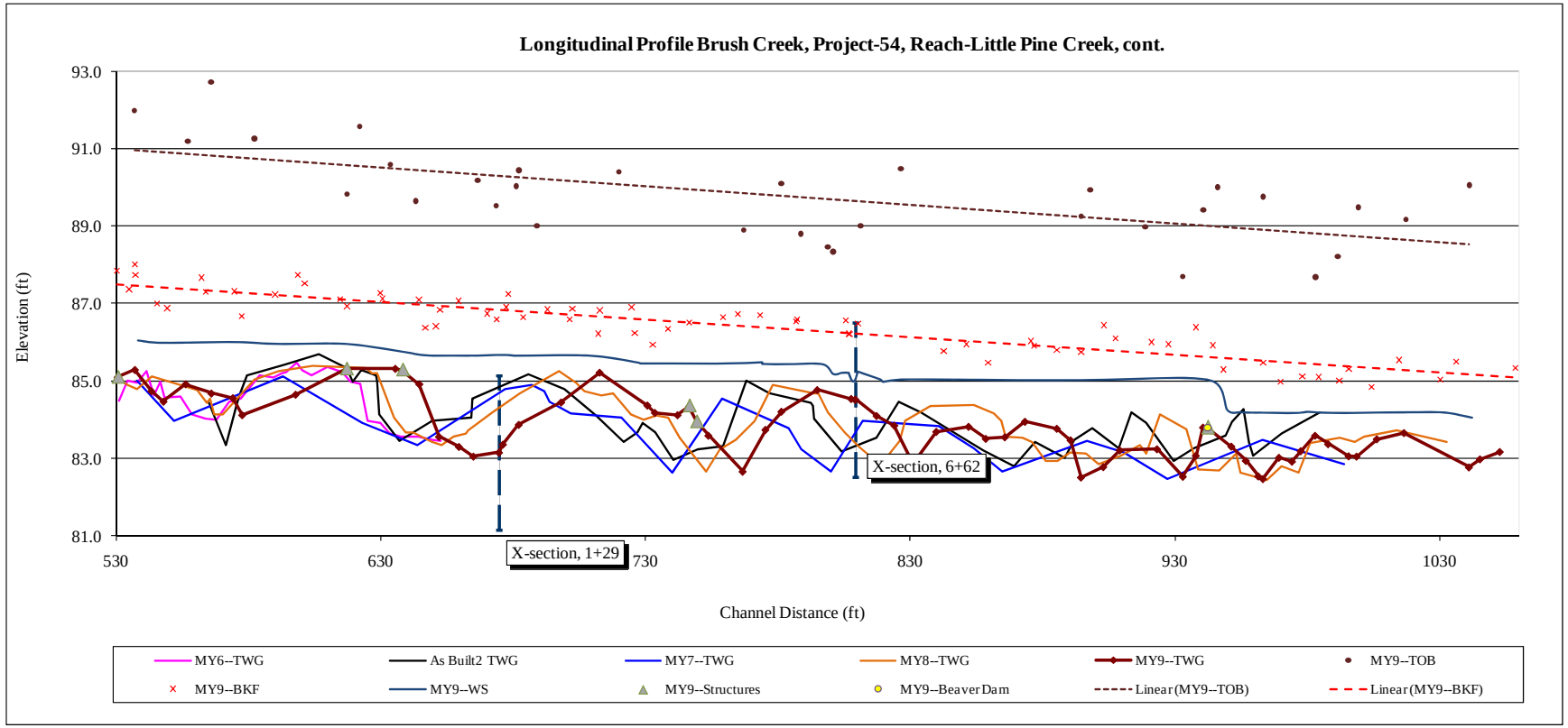
River Basin	New
Watershed	Brush Creek, MY9
Project Name	Brush Creek Project 54
Cross Section	Brush Creek 1 of 1
Feature	Run
Date Surveyed	10/22/2010
Crew	Lawson, C., Laseter, B.

Bankfull Area					
	AB2	MY6	MY7	MY8	MY9
Area	177.5	146.00	128.8	170.8	163.7
Width	63.5	65.0	56.6	63.8	62.7
Mean Depth	2.8	2.2	2.3	2.7	2.6
Max Depth	5.5	3.3	4.8	5.8	5.7
w/d ratio	22.8	28.9	24.9	23.8	24.0
FPW	181.8	>100	225.0	225.0	225.0
ER	2.9	2.9	4.0	3.5	3.6

Facing downstream x-section #1




Longitudinal Profile Brush Creek, Project-54, Reach-Little Pine Creek
Elevation (ft)
96.0
94.0
92.0
90.0
88.0
86.0
84.0
0
100
200
300
400
500
Channel Distance (ft)
X-section, 1+29
MY6--TWG
As Built2 TWG
MY7--TWG
MY8--TWG
MY9--TWG
MY9--TOB
MY9--BKF
MY9--WS
MY9--Structures
MY9--Beaver Dam
Linear (MY9--TOB)
Linear (MY9--BKF)

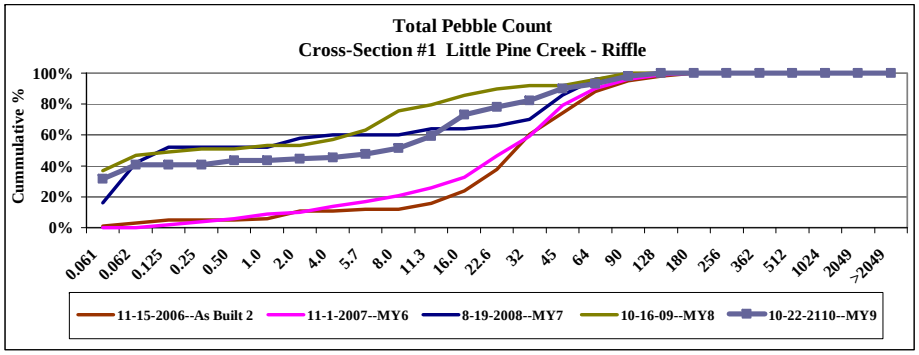

Longitudinal Profile Brush Creek, Project-54, Reach-Little Pine Creek, cont.
93.0
91.0
89.0
87.0
85.0
83.0
81.0
Elevation (ft)
530
630
730
830
930
1030
Channel Distance (ft)
X-section, 1+29
X-section, 6+62
MY6--TWG
As Built2 TWG
MY7--TWG
MY8--TWG
MY9--TWG
MY9--TOB
MY9--BKF
MY9--WS
MY9--Structures
MY9--Beaver Dam
Linear (MY9--TOB)
Linear (MY9--BKF)

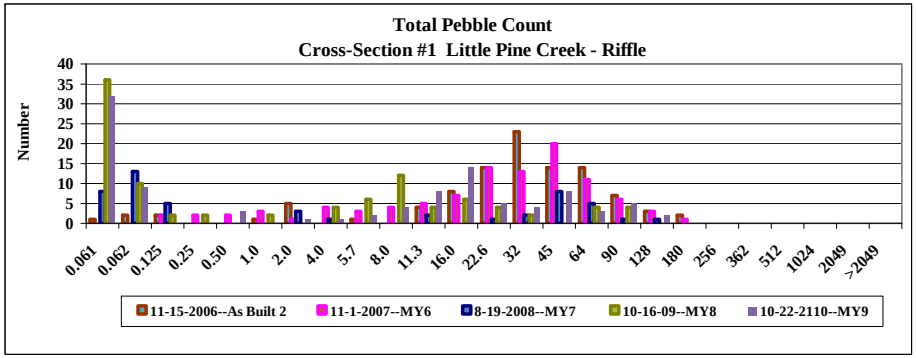
Project Name	Brush Creek Poject 54
Cross Section	#1
Feature	Riffle
Date	10/22/10
Crew	Lawson, C., Laseter, B.
Notes	Pebble count data from As Built 2 to MY9

	d16	d35	d50	d84	d95
As Built	*	*	*	*	*
MY1	*	*	*	*	*
MY2	*	*	*	*	*
MY3	*	*	*	*	*
As Built 2	13.76	25.79	33.39	70.31	108.77
MY6	6.29	20.64	30.32	64.40	103.40
MY7	0.06	0.08	0.17	52.50	74.75
MY8	--	0.061	0.281	17.72	71.94
MY9	--	0.073	8.6	42.18	89.48

* Data collected prior to As-Built 2, not applicable because in different location

Description	Material	Size (mm)	Riffle - Bed	%	Cum %
Silt/Clay	silt/clay	0.061	32	31.7%	31.7%
Sand	very fine sand	0.062	9	8.9%	40.6%
	fine sand	0.125		0.0%	40.6%
	medium sand	0.25		0.0%	40.6%
	course sand	0.50	3	3.0%	43.6%
	very course sand	1.0		0.0%	43.6%
G r a v e l	very fine gravel	2.0	1	1.0%	44.6%
	fine gravel	4.0	1	1.0%	45.5%
	fine gravel	5.7	2	2.0%	47.5%
	medium gravel	8.0	4	4.0%	51.5%
	medium gravel	11.3	8	7.9%	59.4%
	course gravel	16.0	14	13.9%	73.3%
	course gravel	22.6	5	5.0%	78.2%
	very course gravel	32	4	4.0%	82.2%
	very course gravel	45	8	7.9%	90.1%
Cobble	small cobble	64	3	3.0%	93.1%
	medium cobble	90	5	5.0%	98.0%
	large cobble	128	2	2.0%	100.0%
	very large cobble	180		0.0%	100.0%
Boulder	small boulder	256		0.0%	100.0%
	small boulder	362		0.0%	100.0%
	medium boulder	512		0.0%	100.0%
	large boulder	1024		0.0%	100.0%
	very large boulder	2049		0.0%	100.0%
Bedrock	bedrock	>2049		0.0%	100.0%
TOTAL / %of whole count			101	100.0%	



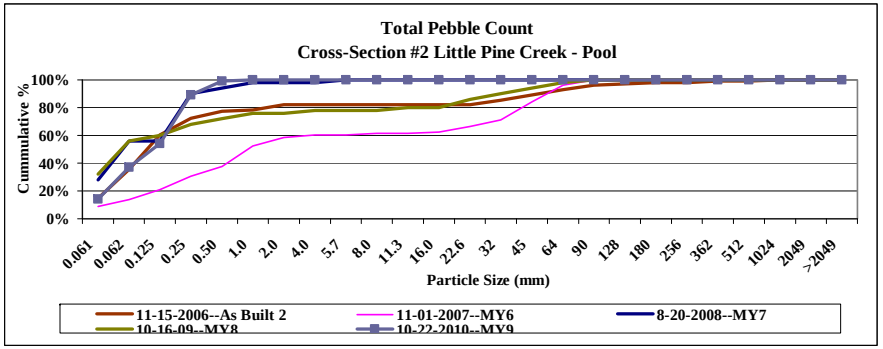


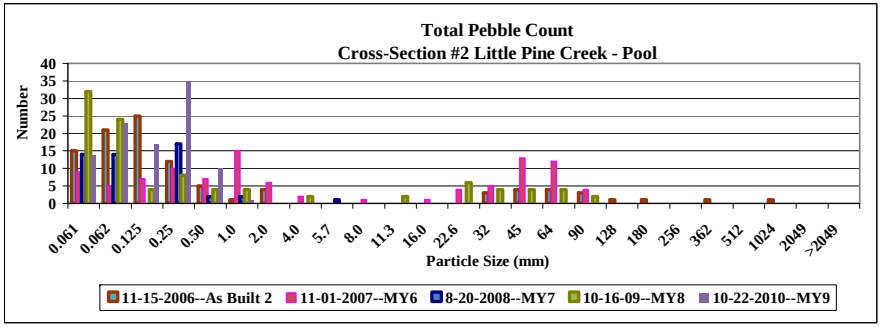
Project Name	Brush Creek Poject 54
Cross Section	#2
Feature	Pool
Date	10/22/10
Crew	Lawson, C., Laseter, B.
Notes	Pebble count data from As Built 2 to MY9

	d16	d35	d50	d84	d95
As Built	*	*	*	*	*
MY1	*	*	*	*	*
MY2	*	*	*	*	*
MY3	*	*	*	*	*
As Built 2	0.06	0.09	0.15	34.17	97.80
MY6	0.12	0.61	1.38	54.30	75.03
MY7	--	0.07	0.09	0.34	0.94
MY8	--	0.07	0.09	24.63	60.12
MY9	0.06	0.06	0.09	0.17	0.3

* Data collected prior to As-Built 2, not applicable because in different location

Description	Material	Size (mm)	Pool - Bed	%	Cum %
Silt/Clay	silt/clay	0.061	14	14.0%	14.0%
Sand	very fine sand	0.062	23	23.0%	37.0%
	fine sand	0.125	17	17.0%	54.0%
	medium sand	0.25	35	35.0%	89.0%
	course sand	0.50	10	10.0%	99.0%
	very course sand	1.0	1	1.0%	100.0%
Gravel	very fine gravel	2.0		0.0%	100.0%
	fine gravel	4.0		0.0%	100.0%
	fine gravel	5.7		0.0%	100.0%
	medium gravel	8.0		0.0%	100.0%
	medium gravel	11.3		0.0%	100.0%
	course gravel	16.0		0.0%	100.0%
	course gravel	22.6		0.0%	100.0%
	very course gravel	32		0.0%	100.0%
	very course gravel	45		0.0%	100.0%
Cobble	small cobble	64		0.0%	100.0%
	medium cobble	90		0.0%	100.0%
	large cobble	128		0.0%	100.0%
	very large cobble	180		0.0%	100.0%
Boulder	small boulder	256		0.0%	100.0%
	small boulder	362		0.0%	100.0%
	medium boulder	512		0.0%	100.0%
	large boulder	1024		0.0%	100.0%
	very large boulder	2049		0.0%	100.0%
Bedrock	bedrock	>2049		0.0%	100.0%
TOTAL / %of whole count			100	100.0%	



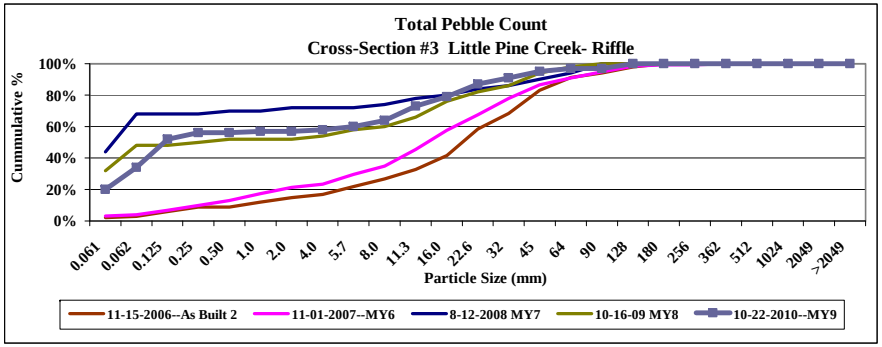


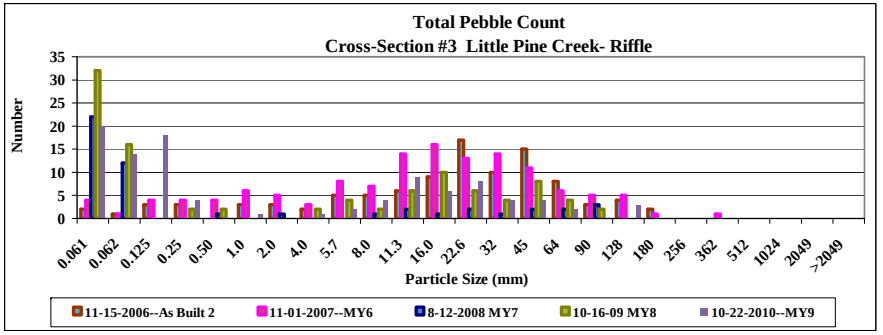
Project Name	Brush Creek Poject 54
Cross Section	#3
Feature	Riffle
Date	10/22/10
Crew	Lawson, C., Laseter, B.
Notes	Pebble count data from As Built 2 to MY9

	d16	d35	d50	d84	d95
As Built	*	*	*	*	*
MY1	*	*	*	*	*
MY2	*	*	*	*	*
MY3	*	*	*	*	*
As Built 2	4.07	15.13	23.30	56.86	119.69
MY6	1.27	9.71	15.77	49.96	112.60
MY7	--	--	0.07	27.30	82.33
MY8	--	0.068	0.375	32.9	60.12
MY9	0.79	1.42	0.375	68.56	154

* Data collected prior to As-Built 2, not applicable because in different location

Description	Material	Size (mm)	Riffle - Bed	%	Cum %
Silt/Clay	silt/clay	0.061	20	20.0%	20.0%
Sand	very fine sand	0.062	14	14.0%	34.0%
	fine sand	0.125	18	18.0%	52.0%
	medium sand	0.25	4	4.0%	56.0%
	course sand	0.50		0.0%	56.0%
	very course sand	1.0	1	1.0%	57.0%
Gravel	very fine gravel	2.0		0.0%	57.0%
	fine gravel	4.0	1	1.0%	58.0%
	fine gravel	5.7	2	2.0%	60.0%
	medium gravel	8.0	4	4.0%	64.0%
	medium gravel	11.3	9	9.0%	73.0%
	course gravel	16.0	6	6.0%	79.0%
	course gravel	22.6	8	8.0%	87.0%
	very course gravel	32	4	4.0%	91.0%
	very course gravel	45	4	4.0%	95.0%
Cobble	small cobble	64	2	2.0%	97.0%
	medium cobble	90		0.0%	97.0%
	large cobble	128	3	3.0%	100.0%
	very large cobble	180		0.0%	100.0%
Boulder	small boulder	256		0.0%	100.0%
	small boulder	362		0.0%	100.0%
	medium boulder	512		0.0%	100.0%
	large boulder	1024		0.0%	100.0%
	very large boulder	2049		0.0%	100.0%
Bedrock	bedrock	>2049		0.0%	100.0%
TOTAL / %of whole count			100.0	100.0%	



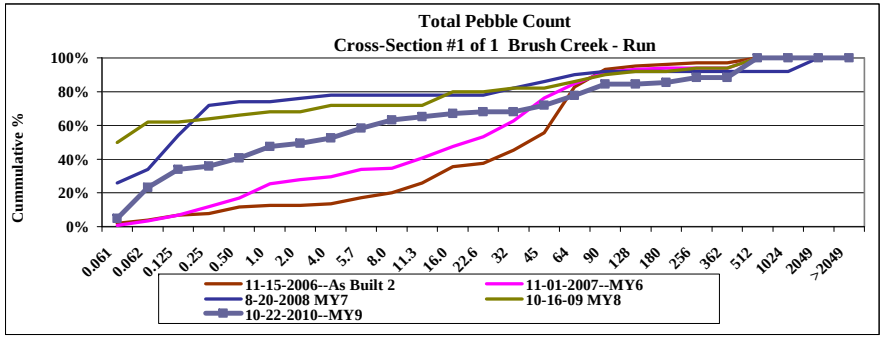


Project Name	Brush Creek Poject 54
Cross Section	#1 of 1
Feature	Run
Date	10/22/10
Crew	Lawson, C., Laseter, B.
Notes	Pebble count data from As Built 2 to MY9

	d16	d35	d50	d84	d95
As Built	*	*	*	*	*
MY1	*	*	*	*	*
MY2	*	*	*	*	*
MY3	*	*	*	*	*
As Built 2	6.17	18.96	45.77	80.96	149.50
MY6	0.68	9.82	22.73	75.02	489.01
MY7	--	0.10	0.17	46.50	1728.69
MY8	--	--	0.061	65.75	492.17
MY9	0.15	0.57	5.18	150.91	1206.69

* Data collected prior to As-Built 2, not available. This is a new cross-section

Description	Material	Size (mm)	Run - Bed	%	Cum %
Silt/Clay	silt/clay	0.061	5	4.9%	4.9%
Sand	very fine sand	0.062	19	18.4%	23.3%
	fine sand	0.125	11	10.7%	34.0%
	medium sand	0.25	2	1.9%	35.9%
	course sand	0.50	5	4.9%	40.8%
	very course sand	1.0	7	6.8%	47.6%
Gravel	very fine gravel	2.0	2	1.9%	49.5%
	fine gravel	4.0	3	2.9%	52.4%
	fine gravel	5.7	6	5.8%	58.3%
	medium gravel	8.0	5	4.9%	63.1%
	medium gravel	11.3	2	1.9%	65.0%
	course gravel	16.0	2	1.9%	67.0%
	course gravel	22.6	1	1.0%	68.0%
	very course gravel	32		0.0%	68.0%
	very course gravel	45	4	3.9%	71.8%
Cobble	small cobble	64	6	5.8%	77.7%
	medium cobble	90	7	6.8%	84.5%
	large cobble	128		0.0%	84.5%
	very large cobble	180	1	1.0%	85.4%
Boulder	small boulder	256	3	2.9%	88.3%
	small boulder	362		0.0%	88.3%
	medium boulder	512	12	11.7%	100.0%
	large boulder	1024		0.0%	100.0%
	very large boulder	2049		0.0%	100.0%
Bedrock	bedrock	>2049		0.0%	100.0%
TOTAL / %of whole count			103	100.0%	



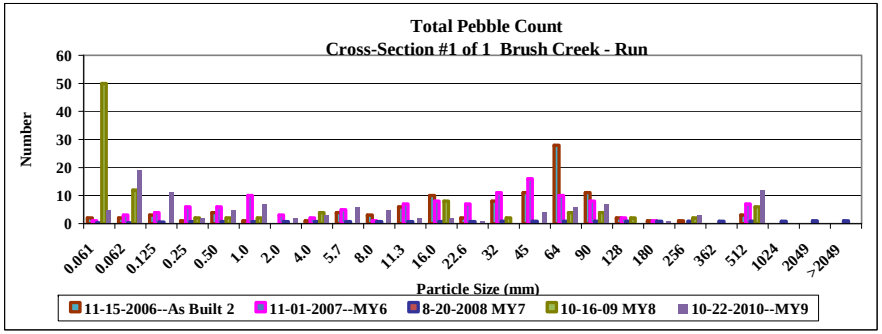


Table 10. Baseline Morphology and Hydraulic Summary
Brush Creek - Project 54
Segment/Reach Little Pine Creek (1000 ft)

Parameter	Regional Curve Interval			Pre-Existing Condition			Project Reference Reach			Design			As-built 2002			As-built 2006		
Dimension	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
BF Width (ft)						19			18			20	31.5	33.7	32.6	24.7	24.91	24.8
Floodprone Width (ft)						22.7			334			82	>100	>100	>100	105.1	126.1	115.6
BF Cross-Sectional Area (ft^2)			56.27			27.7			34.6			41.1	86.7	88.7	87.7	45.07	45.29	45.2
BF Mean Depth (ft)						1.2			2.5			2.3	2.6	2.8	2.7	1.49	1.82	1.7
BF Max Depth (ft)						2			4.1			4	4.8	5	4.9	2.69	2.76	2.7
Width/Depth Ratio						16.34			7.17			8.81	11.3	13	12.15	13.69	20.72	17.2
Entrenchment Ratio						1.2			18.6			4.1	3.2	3.0	3.1	2.66	4.22	3.4
Bank Height Ratio													*	*	*	1.32	2.12	1.7
Wetted Perimeter (ft)													*	*	*	26.18	31.24	28.7
Hydraulic Radius (ft)													*	*	*	1.44	1.73	1.6
Pattern																		
Channel Beltwidth (ft)						41.7			39			50	24	50	33	24.9	45.3	35.38
Radius of Curvature (ft)									23			25	39	62	50.5	40.3	60.5	47.66
Meander Wavelength (ft)						125			1.105			110	90	125	110	89.2	124	108.4
Meander Width Ratio						6.6			5.6			5.5	0.76	1.48	1.01	0.9	1.64	1.28
Profile																		
Riffle Length (ft)													6	47	18	10.36	46.34	20.53
Riffle Slope (ft/ft)													0.003	0.0634	0.0309	0.0029	0.0188	0.0122
Pool Length (ft)													34	112	45	10.25	89.95	31.95
Pool Spacing (ft)						150.5			66.8			62.5	51	150	73	60.32	176.81	112.97
Substrate																		
D_{50} (mm)						11			40			50.00	*	*	*	27.30	39.10	33.20
D_{84} (mm)						60			110			100	*	*	*	40	66.7	53.35
Additional Reach Parameters																		
Valley Length (ft)																		571
Channel Length (ft)															950			1013
Sinuosity						1			1.7			1.6			1.7			1.77
Water Surface Slope (ft/ft)															0.0057			0.0067
BF Slope (ft/ft)						0.007			0.009			0.006			0.0058			0.0057
Rosgen Classification						F4			E4			E4			C4			C4

Table 11a. Monitoring Data-Dimentional Morphology Summary (Dimetional Parameter-Cross Sections) Brush Creek - Project 54																								
Parameter	**Little Pine Creek Reach (1000ft)**																		**Brush Creek (cross-section only)**					
	Little Pine Creek Cross-section # 1 - Riffle						Little Pine Creek Cross-section # 2 - Pool						Little Pine Creek Cross-section # 3 - Riffle						Brush Creek Cross-section # 1 - Run					
Dimension	AB2	MY6	MY7	MY8	MY9	MY10	AB2	MY6	MY7	MY8	MY9	MY10	AB2	MY6	MY7	MY8	MY9	MY10	AB2	MY6	MY7	MY8	MY9	MY10
BF Width (ft)	24.9	25.4	25.4	20.4	20.8		24.7	26.4	20.6	29.7	17		30.3	34	30.3	26	26.3		63.5	65.0	56.6	63.8	62.7	
Floodprone Width (ft)	105.1	>100	171	39.6	40.7		126.1	>100	n/a	n/a	n/a		110	>100	73.9	79.2	110		181.8	>100	225	225	225	
BF Cross-sectional Area (ft^2)	45.3	44.39	47.9	31.3	36.5		54.4	51.85	40.2	67.1	49.8		45.1	45.97	48.3	37.8	44.3		177.5	146.0	128.8	171	163.7	
BF Mean Depth (ft)	1.8	1.7	1.9	1.5	1.8		2.2	2	1.9	2.3	2.9		1.8	1.4	1.6	1.5	1.7		2.8	2.2	2.3	2.7	2.6	
BF Max Depth (ft)	2.8	2.8	3	2.5	2.4		3.9	3.8	3.7	5.1	4.6		2.8	2.8	3	2.9	3.0		5.5	3.3	4.8	5.8	5.7	
Width/Depth Ratio	13.7	14.5	13.5	13.4	11.9		11.2	13.4	n/a	n/a	n/a		20.3	25.1	19.1	17.9	15.6		22.8	28.9	24.9	23.8	24.0	
Entrenchment Ratio	4.2	3.9	6.7	1.9	2.0		5.1	5.1	n/a	n/a	n/a		2.7	2.7	2.4	3.0	4.2		2.9	2.9	4	3.5	3.6	
Bank Height Ratio	1.3	1.3	1.9	0.9	2.1		1.7	1.1	2.1	1.0	1.8		2.1	2.1	2.1	0.9	1.3		1.6	1.4	2.1	1	1.5	
Wetted Perimenter (ft)	26.2	26.0	26.9	24.8	26.1		28.0	28.0	24.5	40.4	23.7		31.2	31.2	32.6	29.4	30.2		66.1	66.1	59.1	68.4	65.9	
Hydraulic Radius (ft)	1.7	1.7	1.8	1.3	1.4		1.9	1.9	1.6	1.7	2.1		1.4	1.5	1.5	1.3	1.5		2.7	2.2	2.2	2.5	2.5	
Substrate																								
D_{50} (mm)	39.1	30.3	0.2	0.3	8.6		0.2	1.4	0.1	0.1	0.1		27.3	15.8	0.1	0.4	0.4		55.4	22.7	0.2	<0.06	5.18	
D_{84} (mm)	82.3	64.4	53.0	18.0	42.2		40.0	54.3	0.3	24.6	0.2		66.7	50.0	27.3	32.9	68.6		95.8	75.0	46.5	65	150.9	

* It is uncertain if the monitoring datum has been consistent over the monitoring history, which may influence calculated values

Table 11b. Monitoring Data-Stream Reach Data Summary
BrushCreek-Project 54

Little Pine Creek

Parameter	AB2 (2006)					MY-06 (2007)					MY-07 (2008)					MY-08 (2009)					MY-09 (2010)				
Pattern	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n
Bankfull Width (ft)	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**				**	**
Floodprone width (ft)	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**				**	**
Bankfull Mean Depth (ft)	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**				**	**
Bankfull Max Depth (ft)	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**				**	**
Bankfull Cross sectional Area (ft^2)	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**				**	**
Width Depth Ratio	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**				**	**
Entrenchment Ratio	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**				**	**
Bank Height Ratio	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**	-	-	-	**	**				**	**
Profile																									
Riffle Length (ft)	10.4	46.3	20.5	-	-	10.8	88.3	23.1	-	-	7.0	30.0	20.6	-	-	9.4	48.5	25	-	-	5.8	37.4	17.6	9.32	10
Riffle Slope (ft/ft)	0.0029	0.0188	0.0122	-	-	0.0035	0.0201	0.0111	-	-	0.0008	0.0420	0.0205	-	-	0.0043	0.0223	0.0122	-	-	0.003	0.113	0.044	0.03	10
Pool Length (ft)	10.3	90.0	32.0	-	-	15.0	110.0	40.0	-	-	16.0	37.0	24.1	-	-	14.7	92	53.1	-	-	6.4	50.1	19.2	11.93	13
Pool Spacing (ft)	60.3	176.8	113.0	-	-	55.0	250.0	126.0	-	-	40.4	253.6	110.9	-	-	62.5	220.5	98	-	-	52.6	251.7	105.8	63.45	13
Pattern																									
Channel Beltwidth (ft)	33.0	45.3	35.4	-	-	33.0	45.3	35.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Radius of Curvature (ft)	40.3	60.5	47.7	-	-	40.3	60.5	47.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meander Wavelength (ft)	89.2	111.4	108.4	-	-	89.2	111.4	108.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Meander Width Ratio	1.3	1.7	1.3	-	-	1.3	1.7	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Additional Reach Parameters																									
Valley Length (ft)	*	*	571.0	-	-	*	*	600.0	-	-	*	*	571.0	-	-	*	*	571.0	-	-	*	*	571.0	-	-
Channel Length (ft)	*	*	1013.0	-	-	*	*	1013.0	-	-	*	*	994.0	-	-	*	*	1032.0	-	-	*	*	1052.8	-	-
Sinuosity	*	*	1.8	-	-	*	*	1.7	-	-	*	*	1.7	-	-	*	*	1.8	-	-	*	*	1.8	-	-
Water Surface Slope (ft/ft)	*	*	0.0057	-	-	*	*	0.0048	-	-	*	*	0.0054	-	-	*	*	0.0046	-	-	*	*	0.0053	-	-
BF Slope (ft/ft)	*	*	0.0058	-	-	*	*	0.0057	-	-	*	*	0.0051	-	-	*	*	0.0050	-	-	*	*	0.0054	-	-
Rosgen Classification	*	*	C4	-	-	*	*	C4	-	-	*	*	C5	-	-	*	*	C5	-	-	*	*	C5	-	-
Habitat Index*	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Macrobenthos*	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-

* Inclusion will be project specific and determined by As-built monitoring /plan success criteria.

Brush Creek

Parameter	AB2 2006					MY-06 2007					MY-07 2008					MY-08 (2009)					MY-09 (2010)				
Pattern	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n	Min	Max	Mean	SD	n
Riffle Length (ft)	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Riffle Slope (ft/ft)	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Pool Length (ft)	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Pool Spacing (ft)	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Channel Beltwidth (ft)	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Radius of Curvature (ft)	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Meander Wavelength (ft)	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Meander Width Ratio	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Additional Reach Parameters																									
Valley Length (ft)	-	-	-	-	-	*	*	*	-	-	*	*	*	-	-	*	*	571.0	-	-	*	*	571.0	-	-
Channel Length (ft)	-	-	-	-	-	*	*	*	-	-	*	*	*	-	-	*	*	1032.0	-	-	*	*	1052.8	-	-
Sinuosity	-	-	-	-	-	*	*	*	-	-	*	*	*	-	-	*	*	1.8	-	-	*	*	1.8	-	-
Water Surface Slope (ft/ft)	-	-	-	-	-	*	*	*	-	-	*	*	*	-	-	*	*	0.0046	-	-	*	*	0.0053	-	-
BF Slope (ft/ft)	-	-	-	-	-	*	*	*	-	-	*	*	*	-	-	*	*	0.0050	-	-	*	*	0.0054	-	-
Rosgen Classification	-	-	-	-	-	*	*	*	-	-	*	*	*	-	-	*	*	C5	-	-	*	*	C5	-	-
Habitat Index*	-	-	-	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-
Macrobenthos*	-	-	-	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-	*	*	*	-	-

[a]A longitudinal profile survey was not conducted for AB2 2006.

** Data for only two riffle cross-sections are available for analysis, no SD was calculated

APPENDIX E

HYDROLOGIC DATA

Table 12. Verification of Bankfull Events

Table 12. Verification of Bankfull Events Brush Creek - Project 54			
Date of Data Collection	**Date of Occurrence**	**Method**	**Photograph Number (if available)**
3/24/2010	11/10/09-11/11/09	Visual and photographic documentation of sandy, sediment deposits indicating an event over bankfull. Sediment deposits and wrack lines were observed at the top of banks. Approximately 4 inches of rainfall was documented during a 24-hour period, November 10-11, 2009 (data collected from National Oceanic and Atmospheric Administration)	see MY9 Fixed Station Photos
5/12/2009	unknown	Visual and photographic documentation of sandy, sediment deposits indicating bankfull event.	3, 20, 22
8/26/08 10/16/2008	8/25/08-8/27/08	Visual documentation of over bank event, Land Manager, Bobby Irwin; rain gauge for Ennice, NC equaled 3.46 inches of rain; visual documentation of sediment deposits, debris deposits, and wrack lines.	Not included in MY8 report
11/01/07	10/23/07	On-site observation and high water indicators observed.	Not available
12/08/06	12/08/06	On-site observation and high water indicators observed.	Not Available