

**CUTAWHISKIE CREEK STREAM AND WETLAND RESTORATION SITE  
2008 ANNUAL MONITORING REPORT (YEAR-1)**

**HERTFORD COUNTY, NORTH CAROLINA  
NCEEP CONTRACT NO. D06066-A**



**PREPARED FOR:  
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## TABLE OF CONTENTS

1.0	EXECUTIVE SUMMARY .....	1
2.0	PROJECT BACKGROUND .....	3
2.1	Project Objectives .....	3
2.2	Project Structure, Restoration Type, and Approach .....	3
2.3	Location and Setting .....	4
2.4	History and Background .....	5
3.0	PROJECT MONITORING AND RESULTS .....	7
3.1	Vegetation Assessment .....	7
3.2	Stream Assessment .....	8
3.3	Wetland Assessment .....	12
4.0	METHODOLOGY .....	12
5.0	REFERENCES .....	12
	APPENDICES .....	13

## LIST OF TABLES

Table I	Project Mitigation Objectives and Structure .....	4
Table II	Project Activity and Reporting History .....	5
Table III	Project Contacts.....	6
Table IV	Project Background .....	7
Table V	Vegetation Plot Summary .....	8
Table VI	Hydrological (Bankfull) Verification.....	8
Table VII	Categorical Stream Feature Visual Stability Assessment.....	8
Table VIII	Baseline Morphology and Hydraulic Summary .....	9
Table IX	Morphology and Hydrologic Monitoring Summary .....	10
Table X	Wetland Criteria Attainment .....	12

## LIST OF FIGURES

Figure 1: Site Location.....	2
Figure 2A, 2B: Integrated Problem Area Plan View .....	Appendix D
Figure 3: 2008 Precipitation Graph.....	Appendix C
Figure 4: N.C. Drought Monitor Data.....	Appendix C

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**APPENDIX A: VEGETATION RAW DATA**

Vegetation Survey Data Tables  
Site Vegetation Photo Stations  
Vegetation Monitoring Plot Photos

**APPENDIX B: GEOMORPHOLOGIC RAW DATA**

Table B2. Visual Morphological Stability Assessment  
Cross-Section Plots: B-1 to B-6 and Stream Photos  
Longitudinal Profile Plot

**APPENDIX C: WETLAND RAW DATA**

Monitoring Gauge Hydrographs

**APPENDIX D: INTEGRATED PROBLEM AREA PLAN VIEW**

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## 1.0 EXECUTIVE SUMMARY

The Cutawhiskie Creek Restoration Site (hereafter referred to as the “Site”) was constructed for the North Carolina Ecosystem Enhancement Program (EEP) to provide compensatory stream and wetland mitigation in the Chowan River Basin. This restoration project is located on an unnamed tributary to Cutawhiskie Creek on a 23.9 acre Site located in Hertford County (Figure 1). The project includes stream restoration (Priority 1) and preservation, as well as riparian wetland restoration and enhancement.

The following report summarizes the monitoring activities that have occurred in the past year (the first year of project monitoring) at the Site. Site construction began and was completed in November 2007. As-built surveys for the Site were performed in February 2008. First year monitoring was conducted throughout the growing season of 2008. The Site must demonstrate vegetative and hydrologic success criteria and a stable restored stream channel for a minimum of five years or until the Site is deemed successful. The following paragraphs summarize the results of the 2008 year monitoring.

### **Vegetation Monitoring**

Vegetation monitoring for Year 1 was performed based on the Carolina Vegetation Survey (CVS) Levels 1 and 2 (Lee et al. 2006). CVS methodology determines density and survival of planted species, and individuals resulting from natural regeneration. Plot locations are shown in Figures 2A and 2b (Appendix D) and are 10m x 10m each. The taxonomic standard for vegetation follows *Flora of the Carolinas, Virginia, Georgia, and surrounding areas* (Weakley, 2007).

Vegetative monitoring success will be achieved by plot data indicating an average number of planted stems per acre exceeding 320 stems/acre after the third year of monitoring and 260 stems/acre after the fifth and final year of project monitoring. Based on Year-1 surveys, the average count of the surviving planted species is 672 stems per acre. If volunteer species are included, the total number of stems increases to 1246 stems per acre. The Site meets and exceeds the established success criteria for vegetation based on the survival of the planted species.

### **Stream Monitoring**

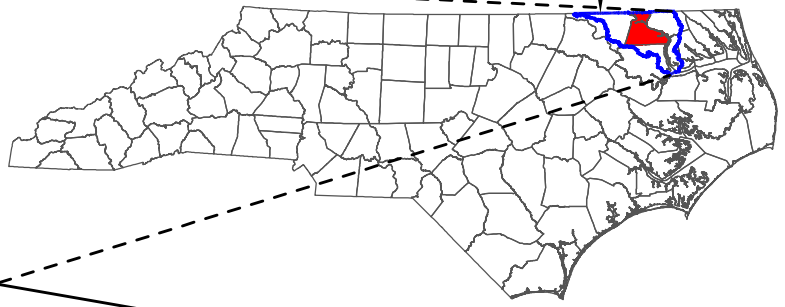
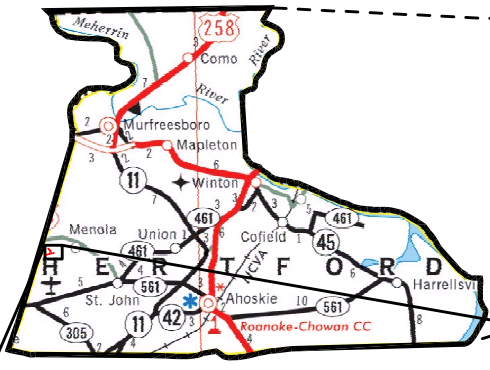
Success criteria for the restored stream reach has been established to confirm that no significant changes have occurred to the dimension, pattern, profile, and bed material over the 5-year monitoring period. Location surveys of the constructed features were conducted to verify the performance of the stream. A total station survey was performed to describe the stream longitudinal profile and six permanent stream cross-sections (3 riffles and 3 pools). Overall, the stream channel bed form and banks are stable. Based on the cross-sections, longitudinal profile and visual observations, the channel dimensions have not changed compared to as-built conditions.

### **Wetland Hydrology Monitoring**

The 2008 hydrologic monitoring results indicate moderate hydrologic success within the Site. Two of the on-Site gauges (Gauges 3 and 4) exhibited saturation within 12 inches of the ground surface for at least 12.5 percent (consecutive days) of the growing season (March 28 – November 7 or 225 days). Gauges 1, 2, and 5 exhibited saturation within 12 inches of the ground surface for 5 to 12.5 percent of the growing

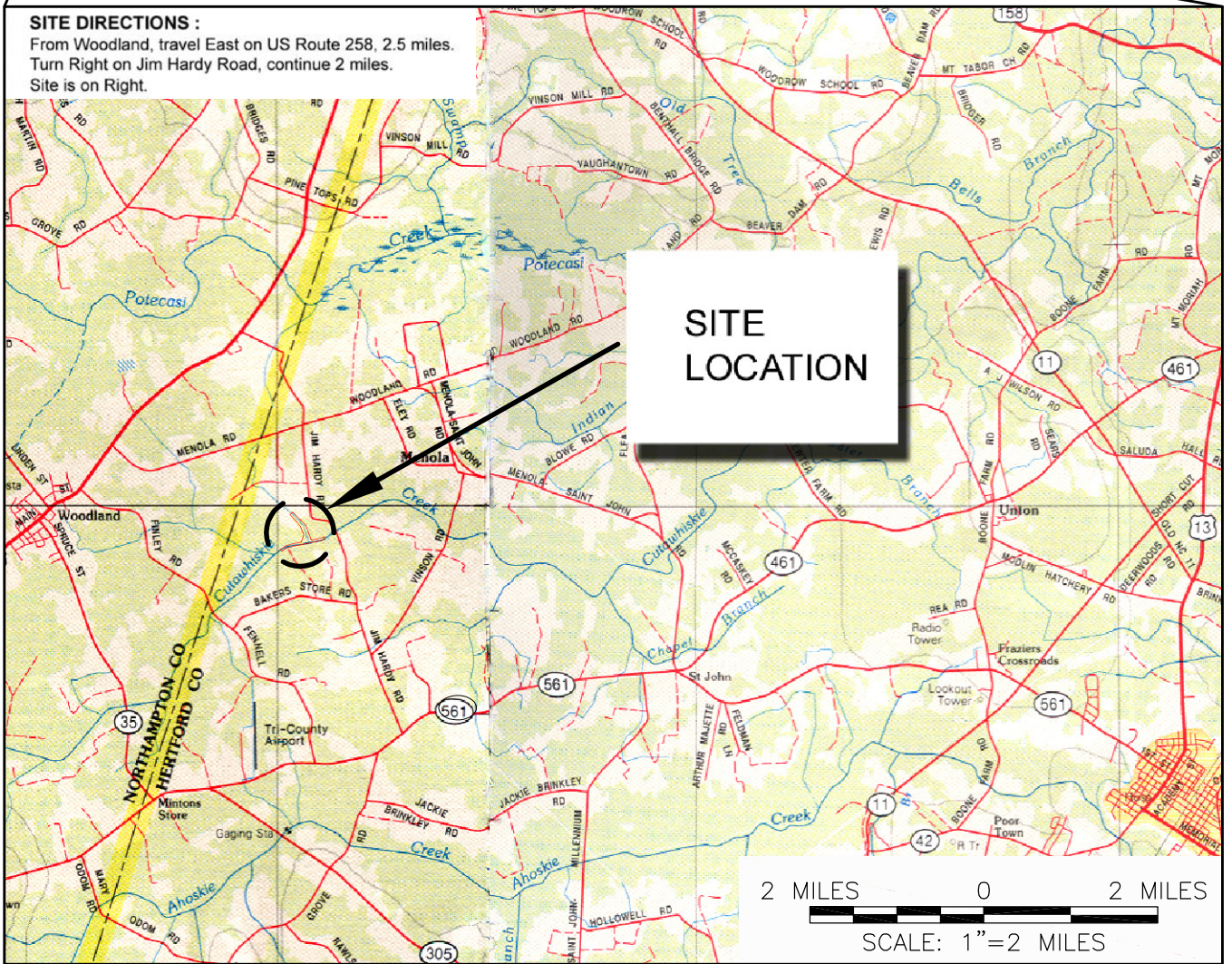


CHOWAN RIVER BASIN  
(CU03010204)



**SITE DIRECTIONS :**

From Woodland, travel East on US Route 258, 2.5 miles.  
Turn Right on Jim Hardy Road, continue 2 miles.  
Site is on Right.



Prepared by:

Project:

**SITE LOCATION  
CUTAWHISKIE CREEK  
RESTORATION SITE  
MONITORING REPORT  
YEAR-1**

Hertford County, North Carolina

Dwn. By:

Ckd By:

FIGURE

TAL

JWG

Date:

NOV 2008

Scale:

AS SHOWN

ESC Project No.:

06-306

**1**



EcoScience

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season. Drought conditions throughout the monitoring period likely contributed to the lower than expected hydrologic saturation periods. Data obtained from the North Carolina Drought Management Advisory Council indicates that drought conditions have persisted within Hertford County almost continuously since on-Site construction in November 2007. Figure 3 (Appendix C) shows the monthly precipitation in Hertford County during 2008 compared to the historic monthly rainfall. Figure 4 (Appendix C) displays drought conditions in North Carolina during Year-1 monitoring and shows the progression of drought intensity in the Cutawhiskie Creek watershed.

## **2.0 PROJECT BACKGROUND**

### **2.1 Project Objectives**

Site restoration activities included the excavation of a new stream channel, limited floodplain excavation, removal of stumps and debris, existing channel backfilling, on-Site drainage ditch removal, and final grading and soil preparation within the adjacent floodplain. These activities were proposed to reintroduce surface water flood hydrodynamics from a 0.9-square mile watershed along the newly restored length of stream and floodplain. The new channel was constructed to reflect regional stream characteristics and accommodate bankfull flows. Characteristic wetland soil features, groundwater wetland hydrology, and hydrophytic vegetation communities are expected develop in areas adjacent to the constructed channel. Wetland and adjacent slope soil surfaces were restored and the Site reforested to riparian and upland slope hardwood communities. Plant community associations were designed to mimic various communities described by Schafale and Weakley (1990), including Coastal Plain Levee Forest, Cypress-Gum Swamp, Mesic-Mixed Hardwood Forest, and Coastal Plain Small Stream Swamp.

Specific ecological benefits anticipated as a result of on-Site restoration activities are as follows:

- Stream channel restoration will reintroduce stable bankfull dimension, pattern, and profile along restored stream reaches, which is expected to greatly enhance lotic habitat quality and stream function.
- Floodplain excavation adjacent to restored streams will restore the characteristic flood regime as well as provide a lateral hydrologic input to restored wetland areas adjacent to the UT and within the greater Cutawhiskie Creek floodplain.
- Restored and enhanced wetland areas will help to improve water quality via nutrient removal, increase local vegetative biodiversity, provide wildlife habitat, and serve as a forested corridor, linking the Site with adjacent forested areas.

### **2.2 Project Structure, Restoration Type, and Approach**

The primary restoration features within the Site include the UT to Cutawhiskie Creek and approximately 12.9 acres of drained, hydric soils. The UT has been dredged and straightened, such that it no longer retained stable dimension, pattern, and profile. Side-cast material (spoil piles) from dredging was deposited along the west bank of the channel. A moderate headcut (approximately 2 foot drop in elevation over 20 linear feet of stream channel) was observed near the upstream (north) extent of the Site boundary, indicating vertical instability. Due to its high level of entrenchment because of dredging/incision, large flooding events were confined within the channel at its current dimension.

On-Site restoration activities provide the following project mitigation units:

<b>Table I: Project Restoration Components Cutawhiskie Creek Restoration Site – EEP Contract No. D06066-A</b>					
<b>Project Segment or Reach ID</b>	<b>Mitigation Type</b>	<b>Approach</b>	<b>Mitigation Units Linear Footage (LF) or Acreage (AC)</b>	<b>Stationing</b>	<b>Comment</b>
UT to Cutawhiskie Creek (active restoration)	R	P1	2,540 LF	0+00 – 25+40	
UT to Cutawhiskie Creek (passive restoration)	R	NA	359 LF	NA	Passive restoration through floodplain not stationed. Braided reach measured as straight line distance
Stream Preservation (Cutawhiskie Creek)	P	NA	519 LF	NA	2593 LF actual design units, however only 20 percent is available for SMU
Riparian Wetland Restoration	R	NA	11.9 AC	NA	
Riparian Wetland Enhancement	WE	NA	0.6 AC	NA	1.1 AC actual design units, however only 0.6 LF available as WMU
<i>R = Restoration</i>			<i>P1 = Priority 1</i>		
<i>P = Preservation</i>			<i>NA = Not applicable</i>		
<i>WE = Wetland Enhancement</i>					

### 2.3 Location and Setting

Land uses in the vicinity of the Site consist primarily of agriculture, forest, pastureland, roadside shoulders, and residential lots. Row crops including soybeans, cotton, and corn were actively cultivated on the Site and surrounding areas. The Site is immediately adjacent to a farm and timberland. There is no livestock or poultry production in the vicinity. Timber is actively harvested from adjacent forested areas. A large, contiguous bottomland hardwood stand was harvested just west of the Site along the Cutawhiskie floodplain in the spring of 2006. The Site encompasses approximately 23.9 acres of primary and secondary floodplain associated with Cutawhiskie Creek. The Site includes a UT that flows into Cutawhiskie Creek from the north (Figure 1). Portions of the Site had been logged prior to restoration activities, while other areas within the Site were actively managed for timber or agricultural production. Prior to restoration, the Site vegetation was generally characterized by bottomland hardwood forests along un-logged areas on the Cutawhiskie Creek floodplain and low terraces, row crops including soybeans and corn, and successional communities associated with cut-over timberland.

## 2.4 History and Background

<b>Table II. Project Activity and Reporting History Cutawhiskie Creek Restoration Site – EEP Contract No. D06066-A</b>			
<b>Activity Report</b>	<b>Scheduled Completion</b>	<b>Data Collection Complete</b>	<b>Actual Completion or Delivery</b>
Restoration Plan	N/A*	December 2007	January 2007
Final Design (90%)	N/A*	December 2007	January 2007
Construction	N/A*	N/A*	November 2007
Temporary S&E mix applied to entire project area	November 2007	N/A*	November 2007
Permanent seed mix applied to reach/segments	November 2007	N/A*	November 2007
Bare Root Seedling Installation	February 2008	N/A*	February 2008
Mitigation Plan	April 2008	February 2008	April 2008
Minor repairs made filling small washed out areas	N/A*	N/A*	N/A*
Final Report	N/A*	N/A*	N/A*
Year 1 Vegetation Monitoring	November 2008	August 2008	November 2008
Year 1 Stream Monitoring	November 2008	September 2008	November 2008

\*N/A- Activities and reporting history for these items are not applicable to this restoration project



<b>Table III. Project Contacts</b> <b>Cutawhiskie Creek Restoration Site – EEP Contract No. D06066-A</b>	
<b>Designer</b>	EcoScience Corporation 1101 Haynes Street, Suite 101 Raleigh, NC 27604 (919) 828-3433
<b>Construction Contractor</b>	Anderson Farms 179 NC 97 East Tarboro, NC 27886 (252) 823-4730
<b>Planting Contractor</b>	Carolina Sylvics 908 Indian Trail Road Edenton, NC 27932 (919) 523-4375
<b>Seeding Contactor</b>	Anderson Farms 179 NC 97 East Tarboro, NC 27886 (252) 823-4730
<b>Seed Mix Sources</b>	Erosion Supply Company 8817 Midway West Rd Raleigh, NC 27617 (919) 787-0334
<b>Nursery Stock Suppliers</b>	South Carolina Super Tree Nursery Company 5594 Highway 38 South Blenheim, SC 29516 (800) 222-1290
<b>Monitoring Performers</b>	EcoScience: A Division of PBS&J 1101 Haynes Street, Suite 101 Raleigh, NC 27604 (919) 828-3433
<b>Stream Monitoring POC</b>	Jens Geratz
<b>Vegetation Monitoring POC</b>	Elizabeth Scherrer

<b>Table IV. Project Background</b> <b>Cutawhiskie Creek Restoration Site – EEP Contract No. D06066-A</b>	
Project County	Hertford
Drainage Area	0.9 square miles
Impervious cover estimate (%)	<1 percent
Stream Order	1st order
Physiographic Region	Coastal Plain
Ecoregion (Griffith and Omernik)	Mid-Atlantic Flatwood
Rosgen Classification of As-built	E5
Cowardin Classification	Stream (R3UB2)
Dominant soil types	Craven fine sandy loam ( <i>Aquic Hapludults</i> )
	Leaf loam ( <i>Typic Albaquults</i> )
	Wilbanks silty clay loam ( <i>Cumulic Humaquepts</i> )
Reference Site ID	Black Branch, Bullard Branch, UT to Town Creek
USGS HUC for Project	03010204
NCDWQ Sub-basin for Project	03-01-02
NCDWQ classification for Project	C-NSW
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	N/A
Percent of project easement fenced	N/A

### 3.0 PROJECT MONITORING AND RESULTS

#### 3.1 Vegetation Assessment

Vegetation monitoring (10 X 10m<sup>2</sup>) plots have been established to monitor planted vegetation within Site restoration and enhancement areas. Site vegetation was monitored in accordance with the guidelines and procedures developed by the Carolina Vegetation Survey (CVS) (CVS-EEP Protocol for Recording Vegetation, Level 1-2 Plot Sampling Only, Version 4.0, 2006). Established vegetation monitoring plot locations are displayed on the Integrated Problem Area Plan View (Appendix D). Vegetative monitoring success will be achieved by plot data indicating an average number of planted stems per acre exceeding 320 stems/acre after the third year of monitoring and 260 stems/acre after the fifth and final year of project monitoring. During Year-1 monitoring, the Site met vegetation success criteria with an average of 672 planted stems per acre. The following Table V summarizes vegetation plot density for Year-1 monitoring. Refer to Appendix A for vegetation data collected during Year-1 Monitoring. No vegetation problem areas were identified during Year-1 monitoring.

<b>Table V. Vegetation Plot Summary</b>					
<b>Planted Stems per Acre</b>					
<b>Cutawhiskie Creek Restoration Site – EEPContract No. D06066-A</b>					
<b>Plot</b>	<b>MY-01</b>	<b>MY-02</b>	<b>MY-03</b>	<b>MY-04</b>	<b>MY-05</b>
1	728				
2	688				
3	688				
4	688				
5	567				
<b>MEAN</b>	<b>672</b>				

### 3.2 Stream Assessment

<b>Table VI Hydrological (Bankfull) Verifications</b>			
<b>Cutawhiskie Creek Restoration Site – EEPContract No. D06066-A</b>			
<b>Date of Data Collection</b>	<b>Date of Occurrence</b>	<b>Method</b>	<b>Photo Number</b>
No bankfull events recorded during Year-1 monitoring	NA	NA	NA

<b>Table VII. Categorical Stream Feature Visual Stability Assessment</b>						
<b>Cutawhiskie Creek Restoration Site – EEPContract No. D06066-A</b>						
<b>Segment/Reach: 2,540 feet</b>						
<b>Feature</b>	<b>Initial</b>	<b>MY-01</b>	<b>MY-02</b>	<b>MY-03</b>	<b>MY-04</b>	<b>MY-05</b>
A. Riffles	100%	100%				
B. Pools	100%	100%				
C. Thalweg	100%	100%				
D. Meanders	100%	100%				
E. Bed General	100%	100%				
F. Bank Condition	100%	100%				
G. Rock Vanes	N/A	N/A				
H. Root Wads	N/A	N/A				

To ensure stable bankfull dimension, pattern, and profile along the restored channel, annual stream assessment surveys were undertaken. A longitudinal profile along the entirety of the UT and six stream channel cross-sections were established and surveyed to monitor any potential instability and adverse changes in channel geometry (Integrated Problem Area Plan View [Appendix D] for cross-section locations). Profile and cross-section plots are located in Appendix C. Channel geomorphic data is summarized on Tables VIII and IX. Success criteria for stream restoration and Level 1 enhancement will include 1) successful classification of the reach as a functioning system (Rosgen 1996) and 2) channel stability indicative of a stable stream system. No stream problem areas were identified during Year-1 monitoring.

**Table VIII. Baseline Morphology and Hydraulic Summary  
Cutawhiskie Creek Restoration Site – EEPContract No. D06066-A**

Parameter	USGS Gage Data			Regional Curve Interval			Pre-Existing Condition			Project Reference Stream			Design			As-built		
	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med
Dimension																		
BF Width (ft)	N/A	N/A	N/A	N/A	N/A	9.0	8.4	9.6	9.1	7.2	9.8	8.7	6.0	8.0	7.0	6.4	7.5	7.0
Floodprone Width (ft)	N/A	N/A	N/A	N/A	N/A	N/A	12	13	12.5	175	225	200	150+	150+	150+	150+	150+	150+
BF Cross Sectional Area (ft <sup>2</sup> )	N/A	N/A	N/A	N/A	N/A	9.5	64	137	100.5	9	11.5	10.2	7.0	11.0	9.0	6.6	10.4	8.7
BF Mean Depth (ft)	N/A	N/A	N/A	N/A	N/A	0.9	0.9	1.1	1.0	1.1	1.3	1.2	0.7	1.4	1.3	1.0	1.4	1.2
BF Max Depth (ft)	N/A	N/A	N/A	N/A	N/A	N/A	1.5	1.7	1.6	1.5	1.9	1.7	1.5	3.5	1.8	1.5	3.1	2.4
Width/Depth Ratio	N/A	N/A	N/A	N/A	N/A	10.0	8.7	9.3	9.0	5.5	8.4	7.4	4	5.7	5.4	6.4	5.4	5.8
Entrenchment Ratio	N/A	N/A	N/A	N/A	N/A	N/A	1.3	1.4	1.35	20.3	23.1	21.4	1.2	5.9	>18.0	1.2	5.9	4.3
Wetted Perimeter(ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	7.6	35.6	17.6
Bank Height Ratio							3.4	5.0	4.2	1.1	1.3	1.2	1.0	1.1	1.0	1.0	1.1	1.0
Hydraulic radius (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	0.7	1.2	0.9	0.7	1.2	0.9
Pattern																		
Channel Beltwidth (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A*	N/A*	N/A*	12.0	113.0	38.3	28.0	49.0	40.0	28.0	49.0	40.0
Radius of Curvature (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A*	N/A*	N/A*	7.0	58.0	19.4	9.0	14.0	11.0	9.0	14.0	11.0
Meander Wavelength (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A*	N/A*	N/A*	28.0	175.0	75.7	40.0	60.0	50.0	40.0	60.0	50.0
Meander Width ratio	N/A	N/A	N/A	N/A	N/A	N/A	N/A*	N/A*	N/A*	2.1	21.6	8.1	5.7	10	7.9	5.7	10	7.9
Profile																		
Riffle length (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A*	N/A*	N/A*	N/A	N/A	N/A	3.0	25.0	12.0	3.2	21.3	11.1
Riffle slope (ft/ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A*	N/A*	N/A*	N/A	N/A	N/A	0.00	0.050	0.001	0.000	0.082	0.013
Pool length (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A*	N/A*	N/A*	5.0	84.0	29.8	4.0	25.0	12.0	4.1	25.6	13.4
Pool spacing (ft)	N/A	N/A	N/A	N/A	N/A	N/A	N/A*	N/A*	N/A*	19.0	113.0	52.6	8.0	30.0	20.0	10.4	36.3	20.0
Substrate																		
d50 (mm)	N/A	N/A	N/A	N/A	N/A	N/A	NA	NA	NA	1.5	1.5	1.5	N/A	N/A	N/A	NA	NA	NA
d84 (mm)	N/A	N/A	N/A	N/A	N/A	N/A	NA	NA	NA	1.9	1.9	1.9	N/A	N/A	N/A	NA	NA	NA
Additional Reach Parameters																		
Valley Length (ft)		N/A			N/A			2,200			N/A			1,775			1,775	
Channel Length (ft)		N/A			N/A			2,200			N/A			2,540			2,540	
Sinuosity		N/A			N/A			1.0			1.4-1.6			1.4			1.4	
Water Surface Slope (ft/ft)		N/A			N/A			0.0031			0.002			N/A			0.0004	
BF slope (ft/ft)		N/A			N/A			N/A			0.004			N/A			0.0005	
Rosgen Classification		N/A			N/A			G5			E5			E5			E5	
Habitat Index / Macroinvertebrates		NA			N/A			N/A			N/A			N/A			N/A	

\* No Distinct Riffles and Pools or Repetitive Channel Pattern due to Dredging and Straightening

**Table IX. Morphology and Hydraulic Monitoring Summary  
Cutawhiskie Creek Restoration Site – EEPContract No. D06066-A**

Parameter	Cross-Section 1 Pool						Cross-Section 2 Riffle						Cross-Section 3 Pool						Cross-Section 4 Riffle					
	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY	MY1	MY2	MY3	MY4	MY5	MY
BF Width (ft)	17.4						9.1						26.9						7.9					
Floodprone Width (ft)	150+						150+						150+						150+					
BF Cross Sectional Area (ft <sup>2</sup> )	18.9						9.0						26.4						9.4					
BF Mean Depth (ft)	1.1						1.0						1.0						1.2					
BF Max Depth (ft)	2.7						1.9						3.1						1.8					
Width/Depth Ratio	15.9						9.2						27.5						6.6					
Entrenchment Ratio	8.6						16.5						5.6						19.0					
Wetted Perimeter(ft)	20.8						10.7						28.8						9.0					
Hydraulic radius (ft)	0.9						0.8						0.9						1.0					
<b>Substrate</b>																								
d50 (mm)	Silt						Silt						Silt						Silt					
d84 (mm)	Silt						Silt						Silt						Silt					
<b>Parameter</b>	MY-01 (2008)			MY-02 (2009)			MY-03 (2010)			MY-04 (2011)			MY-05 (2012)			MY+								
<b>Pattern</b>	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med	Min	Max	Med						
Channel Beltwidth (ft)	28.0	49.0	40.0																					
Radius of Curvature (ft)	9.0	14.0	11.0																					
Meander Wavelength (ft)	40.0	60.0	50.0																					
Meander Width ratio	5.7	10	7.9																					
<b>Profile</b>																								
Riffle length (ft)	4.0	21.0	11.5																					
Riffle slope (ft/ft)	0.000	0.074	0.007																					
Pool length (ft)	1.0	23.8	12.5																					
Pool spacing (ft)	9.6	36.0	20.6																					
<b>Additional Reach Parameters</b>																								
Valley Length (ft)	1,775																							
Channel Length (ft)	2,540																							
Sinuosity	1.4																							
Water Surface Slope (ft/ft)	0.0004																							
BF slope (ft/ft)	0.0005																							
Rosgen Classification	E5																							

**Table IX. cont. Morphology and Hydraulic Monitoring Summary  
Cutawhiskie Creek Restoration Site – EEPContract No. D06066-A**

Parameter	Cross Section 5 Riffle						Cross Section 6 Pool																	
	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+	MY1	MY2	MY3	MY4	MY5	MY+
Dimension																								
BF Width (ft)	7.0						15.1																	
Floodprone Width (ft)	150+						150+																	
BF Cross Sectional Area (ft <sup>2</sup> )	6.7						16.8																	
BF Mean Depth (ft)	1.0						1.1																	
BF Max Depth (ft)	1.4						2.7																	
Width/Depth Ratio	7.4						13.5																	
Entrenchment Ratio	21.5						10.0																	
Wetted Perimeter(ft)	7.8						17.1																	
Hydraulic radius (ft)	0.9						1.0																	
Substrate																								
d50 (mm)	Silt						Silt																	
d84 (mm)	Silt						Silt																	



### 3.3 Wetland Assessment

Success criteria for wetland hydrology require that restored areas be inundated or saturated by groundwater within 12-inches of the ground surface for a period of 12.5% of the growing season. The growing season in Hertford County begins on March 28 and ends on November 17 (225 days). In order to achieve hydrologic success, saturation within 12 inches of the ground surface is required for 29 consecutive days. The results of the Year-1 hydrologic monitoring indicate moderate success within the Site. Two of the on-Site gauges (Gauges 3 and 4) exhibited saturation within 12 inches of the ground surface for at least 12.5 percent (consecutive days) of the growing season while gauges 1, 2, and 5 exhibited saturation within 12 inches of the ground surface for 5 to 12.5 percent of the growing season. Drought conditions throughout the monitoring period likely contributed to the lower than expected hydrologic saturation periods. Figure 3 shows the monthly precipitation for Hertford County in 2008 with the 30<sup>th</sup> and 70<sup>th</sup> percentile rainfall amounts. Monthly rainfall amounts were below the 30<sup>th</sup> percentile in five out of the nine months in the growing season. Figure 4 displays the nearly continuous drought conditions in Hertford County in 2008 as recorded by the NC Drought Management Advisory Council. Table X summarizes wetland hydrology criteria for Year-1 monitoring.

Tract	Gauge ID	Gauge Hydrology Threshold Met?	Tract Mean	Vegetation Plot ID	Vegetation Density Met (320 stems/acre)	Tract Mean
1	1	No	40%	1	Yes	100%
1	2	No		2	Yes	
1	3	Yes		3	Yes	
1	4	Yes		4	Yes	
1	5	No		5	Yes	

### 4.0 METHODOLOGY

No unavoidable deviations from initially prescribed methodologies were implemented as part of Year-1 monitoring activities.

### 5.0 REFERENCES

- Lee, Michael T., R. K. Peet, S. D. Roberts, and T. R. Wentworth. 2006 CVS-EEP Protocol for Recording Vegetation, Version 4.0 (<http://cvs.bio.unc.edu/methods.htm>)
- Rosgen, D. 1996. Applied River Morphology. Wildland Hydrology (Publisher). Pagosa Springs, Colorado.
- Weakley, A.S. 2007. Flora of the Carolinas, Virginia, Georgia, and surrounding areas. Working draft of January 2007. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina. 1015pp.

**APPENDIX A: VEGETATIVE DATA**

**Table 1. Vegetation Metadata**

<b>Report Prepared By</b>	Jeffrey Siceloff
<b>Date Prepared</b>	11/19/2008 8:58
<b>database name</b>	cvs-eep-entrytool-v2.2.6.mdb
<b>database location</b>	C:\Documents and Settings\23508\My Documents
<b>computer name</b>	RAL5Z0DXF1
<b>file size</b>	40464384
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT</b>	
<b>Metadata</b>	Description of database file, the report worksheets, and a summary of project(s) and project data.
<b>Proj, planted</b>	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
<b>Proj, total stems</b>	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.
<b>Plots</b>	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
<b>Vigor</b>	Frequency distribution of vigor classes for stems for all plots.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage</b>	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>ALL Stems by Plot and spp</b>	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.
<b>PROJECT SUMMARY</b>	
<b>Project Code</b>	D04020
<b>project Name</b>	Cutawhiskie Stream Restoration
<b>Description</b>	restoration monitoring
<b>River Basin</b>	Chowan
<b>length(ft)</b>	2,540
<b>stream-to-edge width (ft)</b>	
<b>area (sq m)</b>	
<b>Required Plots (calculated)</b>	
<b>Sampled Plots</b>	5

**Table 2 Vegetation Vigor by Species**

	<b>Species</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>Missing</b>	<b>Unknown</b>
	Liquidambar styraciflua	1						
	Nyssa biflora	1	15	11	2	10		
	Quercus lyrata		18			1		
	Quercus michauxii		3					
	Quercus pagoda		4					
	Quercus phellos		7					
	Taxodium distichum	1	15	4	1	1		
<b>TOT:</b>	<b>7</b>	<b>3</b>	<b>62</b>	<b>15</b>	<b>3</b>	<b>12</b>		

**Table 3. Vegetation Damage by Species**

	<b>Species</b>	<b>All Damage Categories</b>	<b>(no damage)</b>
	Liquidambar styraciflua	1	1
	Nyssa biflora	39	39
	Quercus lyrata	19	19
	Quercus michauxii	3	3
	Quercus pagoda	4	4
	Quercus phellos	7	7
	Taxodium distichum	22	22
<b>TOT:</b>	<b>7</b>	<b>95</b>	<b>95</b>

**Table 4. Vegetation Damage by Plot**

	<b>plot</b>	<b>All Damage Categories</b>	<b>(no damage)</b>
	D06066a-12345-0001-year:1	19	19
	D06066a-12345-0002-year:1	22	22
	D06066a-12345-0003-year:1	22	22
	D06066a-12345-0004-year:1	17	17
	D06066a-12345-0005-year:1	15	15
<b>TOT:</b>	<b>5</b>	<b>95</b>	<b>95</b>

**Table 5. Stem Count by Plot and Species**

<b>Species</b>	<b>Total Planted Stems</b>	<b># plots</b>	<b>avg# stems</b>	<b>plot D06066a- 12345- 0001- year:1</b>	<b>plot D06066a- 12345- 0002- year:1</b>	<b>plot D06066a- 12345- 0003- year:1</b>	<b>plot D06066a- 12345- 0004- year:1</b>	<b>plot D06066a- 12345- 0005- year:1</b>
Liquidambar styraciflua	1	1	1				1	
Nyssa biflora	29	4	7.25	4	10	10	5	
Quercus lyrata	18	4	4.5		1	3	7	7
Quercus michauxii	3	1	3	3				
Quercus pagoda	4	2	2		2			2
Quercus phellos	7	1	7	7				
Taxodium distichum	21	5	4.2	4	4	4	4	5
<b>Total</b>	<b>83</b>	<b>7</b>		<b>18</b>	<b>17</b>	<b>17</b>	<b>17</b>	<b>14</b>

**Photo Stations**



Photo Station 1



Photo Station 2



Photo Station 3



## Vegetation Plots



Vegetation Plot 1



Vegetation Plot 2



Vegetation Plot 3



Vegetation Plot 4



Vegetation Plot 5

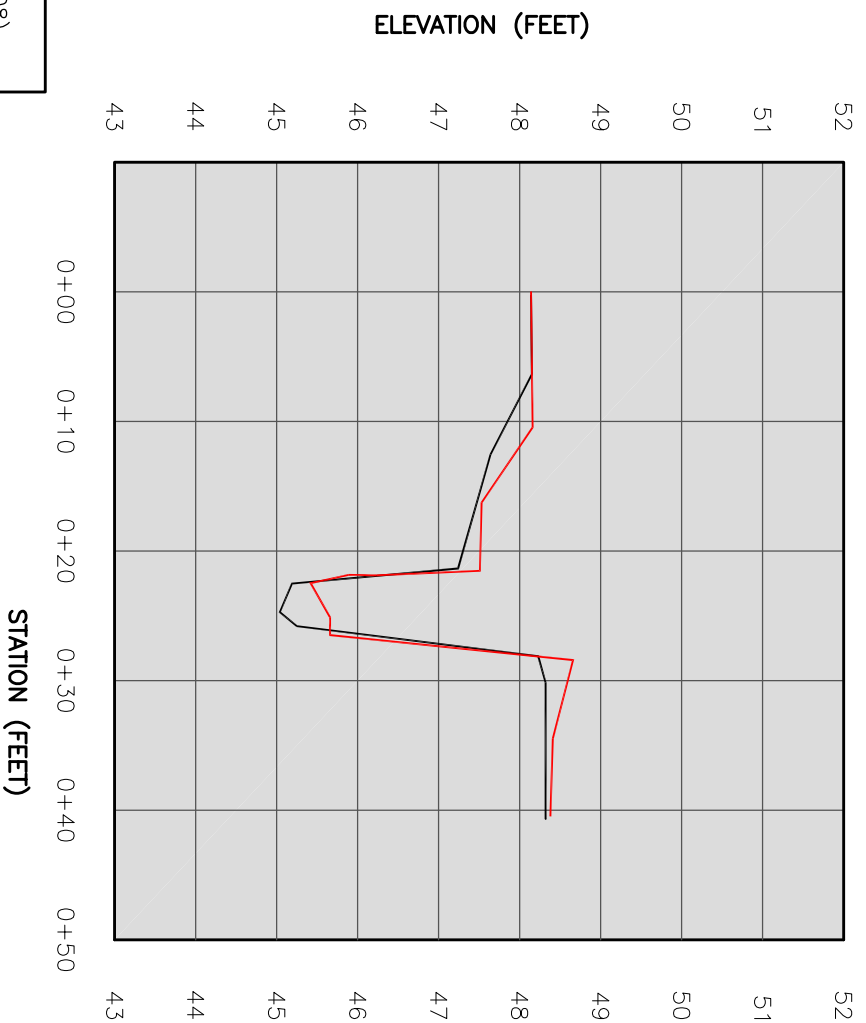
## **APPENDIX B: GEOMORPHOLOGIC DATA**

**Table B2. Visual Morphological Stability Assessment**  
**Cutawhiskie Creek Restoration Site – EEPContract No. D06066-A**  
**2,540 linear feet**

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?	77	77	N/A	100	
	2. Armor stable (e.g. no displacement)?	77	77	N/A	100	
	3. Facet grade appears stable?	77	77	N/A	100	
	4. Minimal evidence of embedding/fining?	77	77	N/A	100	
	5. Length appropriate?	77	77	N/A	100	<b>100%</b>
B. Pools	1. Present? (e.g not subject to severe aggrad. or migrat.?)	76	76	N/A	100	
	2. Sufficiently deep (Max Pool D:Mean Bkf >1.6?)	76	76	N/A	100	
	3. Length appropriate?	76	76	N/A	100	<b>100%</b>
C. Thalweg	1. Upstream of meander bend (run/inflexion) centering?	N/A	N/A	N/A	100	
	2. Downstream of meander (glide/inflexion) centering?	N/A	N/A	N/A	100	<b>100%</b>
D. Meanders	1. Outer bend in state of limited/controlled erosion?	N/A	N/A	N/A	100	
	2. Of those eroding, # w/concomitant point bar formation?	N/A	N/A	N/A	100	
	3. Apparent Rc within spec?	N/A	N/A	N/A	100	
	4. Sufficient floodplain access and relief?	N/A	N/A	N/A	100	<b>100%</b>
E. Bed General	1. General channel bed aggradation areas (bar formation)	N/A	N/A	0/2540	100	
	2. Channel bed degradation – areas of increasing down-cutting or head cutting?	N/A	N/A	0/2540	100	<b>100%</b>
F. Bank	1. Actively eroding, wasting, or slumping	N/A	N/A	0/2540	100	<b>100%</b>
G. Vanes	1. Free of back or arm scour?	N/A	N/A	N/A	N/A	
	2. Height appropriate?	N/A	N/A	N/A	N/A	
	3. Angle and geometry appear appropriate?	N/A	N/A	N/A	N/A	
	4. Free of piping or other structural failures? <sup>3</sup>	N/A	N/A	N/A	N/A	<b>N/A</b>
H. Wads/ Boulders	1. Free of scour?	N/A	N/A	N/A	N/A	
	2. Footing stable?	N/A	N/A	N/A	N/A	<b>N/A</b>



**XS1 (Pool)**



AS-BUILT SURVEY  
YEAR-1 SURVEY (2008)



XS1 LEFT BANK LOOKING RIGHT BANK



XS1 LOOKING DOWNSTREAM

**SURVEY DATA**

STATION	ELEVATION	FEATURE	STATION	ELEVATION	FEATURE
0.35	48.2	LPIN			
0.35	48.1				
12.01	48.15				
16.10	47.56				
21.2	47.54				
21.37	46.25				
21.47	45.65				
24.86	45.68				
27.85	48.72				
34.49	48.46				
40.48	48.42	RPIN			

**SUMMARY DATA**

BANKFULL CROSS SECTIONAL AREA	18.9 SQ. FT.
BANKFULL WIDTH	17.4 FT.
BANKFULL MEAN DEPTH	1.1 FT.
BANKFULL MAX DEPTH	2.7 FT.
WIDTH-DEPTH RATIO	15.9
ENTRENCHMENT RATIO	8.6
CLASSIFICATION	N/A

**NOTES:**  
1. All cross-sections facing the downstream direction

Survey Date	OCT. 2007
Survey Weather	Sunny
Field Team	Wright, Gloden
Location	XS1



REVISIONS

Client:



Natural Resources  
Restoration & Conservation

Project:  
**CUTAWHISKIE  
CREEK  
RESTORATION  
SITE**

**YEAR-1  
MONITORING  
REPORT**

HERTFORD COUNTY, NC

Title:

**CROSS SECTION  
XS1-PPOOL**

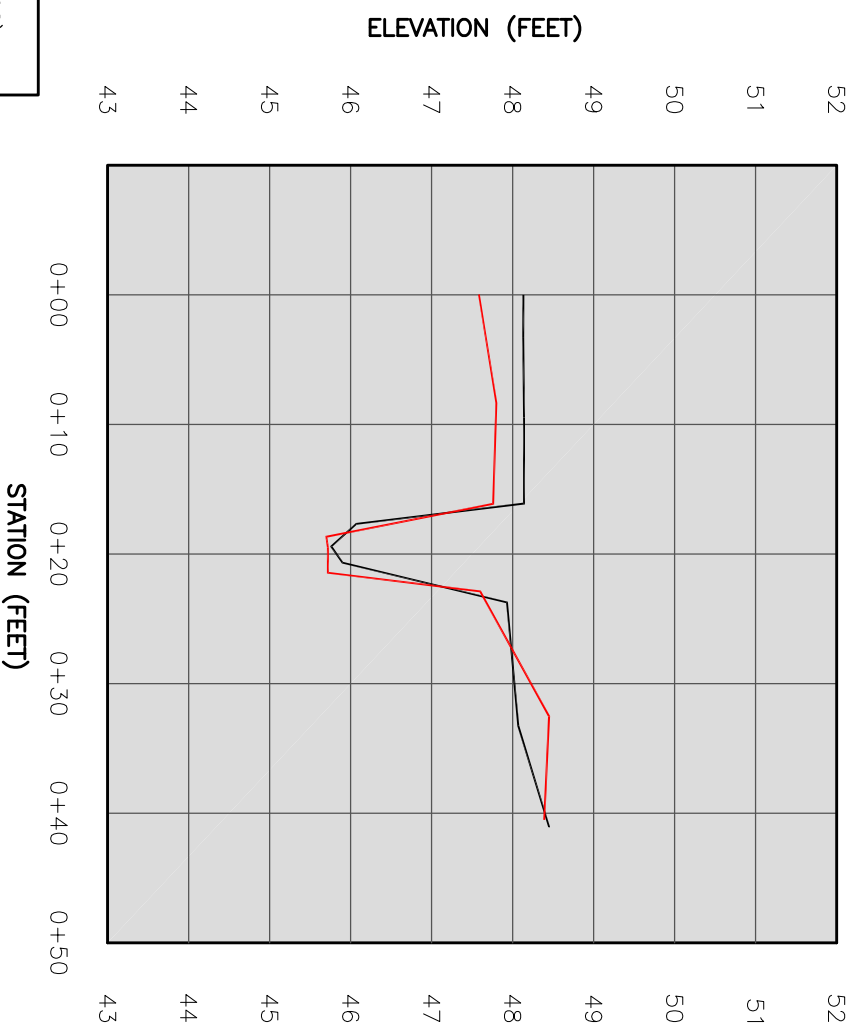
Dwn. By: TAL Dwn. By: TAL  
Ckd. By: MCG Date: NOV 2008  
Scale: NO SCALE  
ESC Project No.: 06-306

SHEET

**B1**



**XS2 (Riffle)**



AS-BUILT SURVEY  
YEAR-1 SURVEY (2008)



XS2 LEFT BANK LOOKING RIGHT BANK



XS2 LOOKING DOWNSTREAM

**SURVEY DATA**

STATION	ELEVATION	FEATURE	STATION	ELEVATION	FEATURE
0.00	47.63	LPIN			
0.33	47.51				
8.35	47.80				
16.13	47.76				
18.67	45.70				
19.49	45.72				
21.45	45.72				
22.89	47.60				
32.53	48.45				
40.32	48.39	RPIN			

**SUMMARY DATA**

BANKFULL CROSS SECTIONAL AREA	9.0 SQ. FT.
BANKFULL WIDTH	9.1 FT.
BANKFULL MEAN DEPTH	1.0 FT
BANKFULL MAX DEPTH	1.9 FT
WIDTH-DEPTH RATIO	9.2
ENTRENCHMENT RATIO	16.5
CLASSIFICATION	E5

**NOTES:**  
1. All cross-sections facing the downstream direction

Survey Date	OCT. 2007
Survey Weather	Sunny
Field Team	Wright, Gloden
Location	XS2



REVISIONS

Client:



Natural Resources  
Restoration & Conservation

Project:  
**CUTAWHISKIE  
CREEK  
RESTORATION  
SITE**

**YEAR-1  
MONITORING  
REPORT**

HERTFORD COUNTY, NC

Title:

**CROSS SECTION  
XS2-RIFFLE**

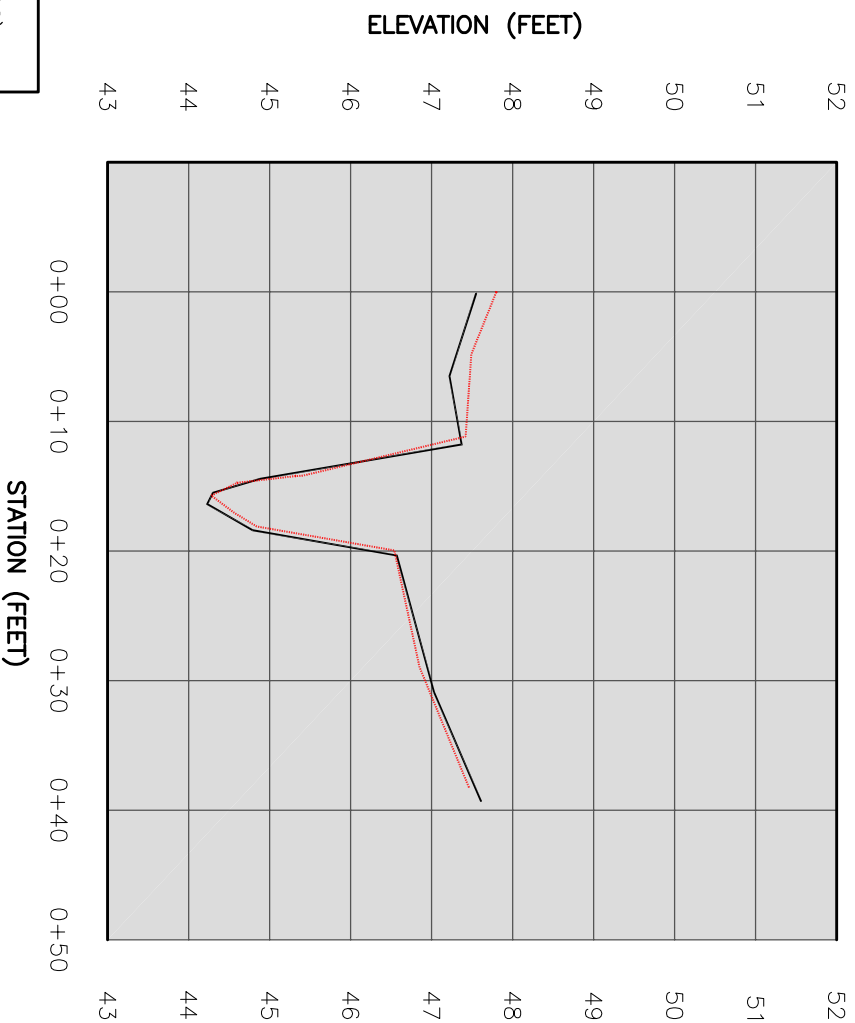
Desn. By:	TAL	Dwn. By:	TAL
Ckd. By:	MCG	Date:	NOV 2008
Scale:	NO SCALE		
ESC Project No.:	06-306		

SHEET

**B2**



**XS3 (Pool)**



AS-BUILT SURVEY  
YEAR-1 SURVEY (2008)

**SURVEY DATA**

STATION	ELEVATION	FEATURE	STATION	ELEVATION	FEATURE
0.00	47.80	LPIN			
9.29	47.49				
18.28	47.42				
20.13	45.41				
21.20	45.32				
22.51	44.60				
23.50	44.28				
24.02	44.56				
24.05	44.84				
27.07	46.54				
35.42	46.85				
38.24	47.46	RPIN			

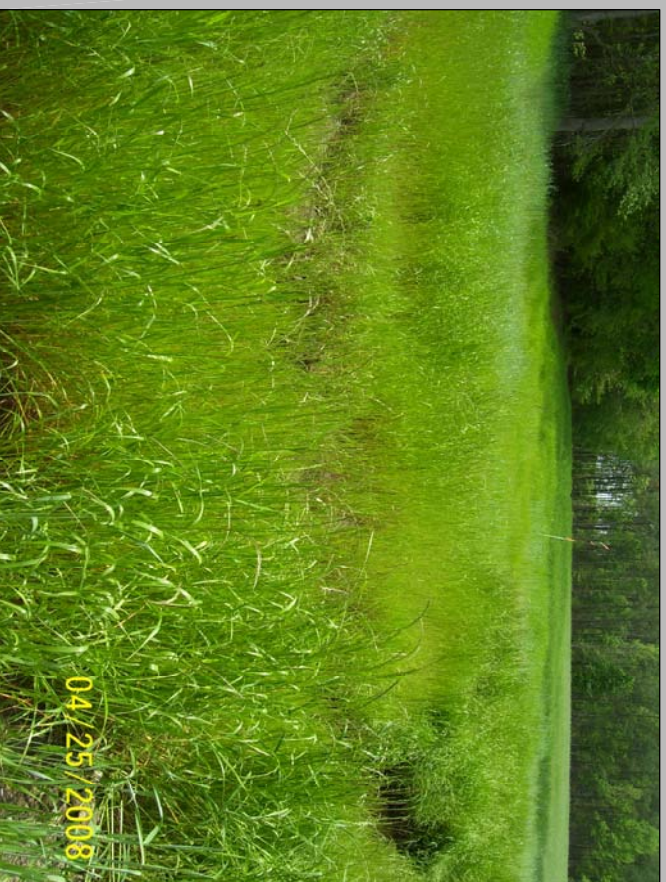
**SUMMARY DATA**

BANKFULL CROSS SECTIONAL AREA	26.4 SQ. FT.
BANKFULL WIDTH	26.9 FT.
BANKFULL MEAN DEPTH	1.0 FT.
BANKFULL MAX DEPTH	3.1 FT.
WIDTH-DEPTH RATIO	27.5
ENTRENCHMENT RATIO	5.6
CLASSIFICATION	N/A

**NOTES:**

- All cross-sections facing the downstream direction

Survey Date	OCT. 2007
Survey Weather	Sunny
Field Team	Wright, Gloden
Location	XS3



XS3 LEFT BANK LOOKING RIGHT BANK



XS3 LOOKING DOWNSTREAM



REVISIONS

Client:



Natural Resources  
Restoration & Conservation

Project:  
**CUTAWHISKIE  
CREEK  
RESTORATION  
SITE**

**YEAR-1  
MONITORING  
REPORT**

HERTFORD COUNTY, NC

Title:

**CROSS SECTION  
XS3-POOL**

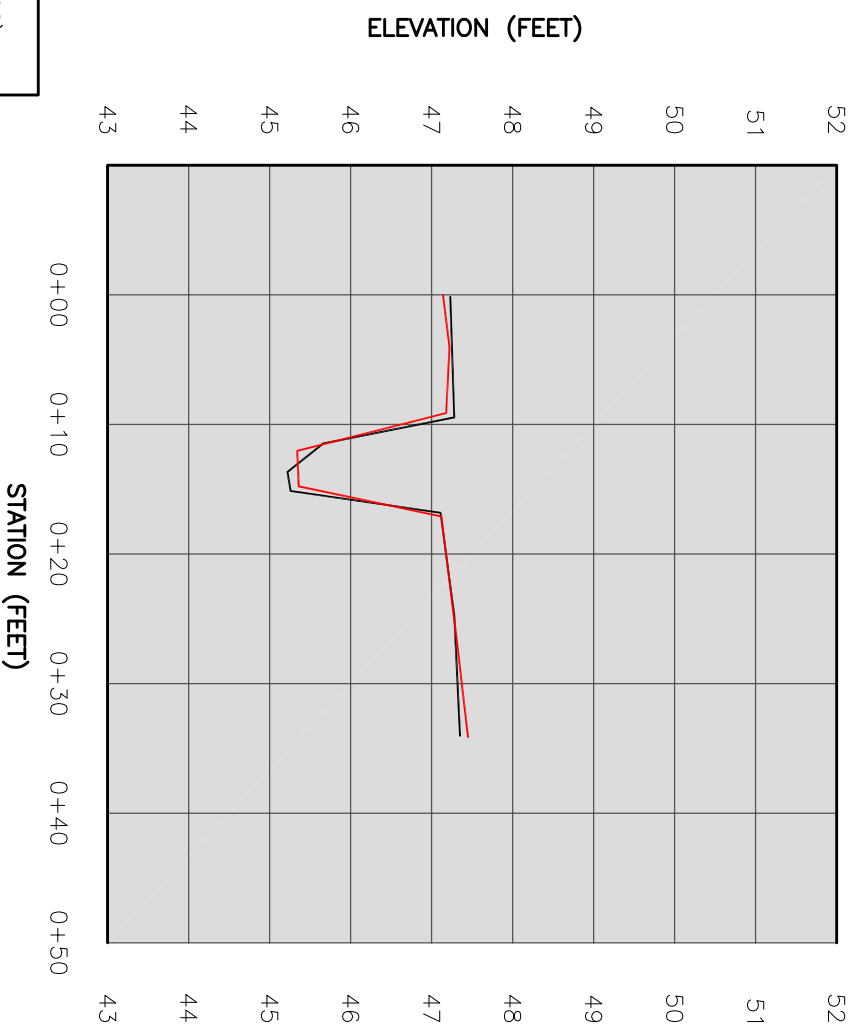
Desn. By:	TAL	Dwn. By:	TAL
Ckd. By:	MCG	Date:	NOV 2008
Scale:	NO SCALE		
ESC Project No.:	06-306		

SHEET

**B3**



**XS4 (Riffle)**



AS-BUILT SURVEY  
YEAR-1 SURVEY (2008)



XS4 LEFT BANK LOOKING RIGHT BANK



XS4 LOOKING DOWNSTREAM

**SURVEY DATA**

STATION	ELEVATION	FEATURE	STATION	ELEVATION	FEATURE
0.00	47.30	LPIN			
0.16	47.58				
4.18	47.38				
9.28	47.34				
12.21	45.50				
13.56	45.51				
14.94	45.52				
17.26	47.28				
26.24	47.46				
34.30	47.61				
34.35	47.61	RPIN			

**SUMMARY DATA**

BANKFULL CROSS SECTIONAL AREA	9.4 SQ. FT.
BANKFULL WIDTH	7.9 FT.
BANKFULL MEAN DEPTH	1.2 FT.
BANKFULL MAX DEPTH	1.8 FT.
WIDTH-DEPTH RATIO	6.6
ENTRENCHMENT RATIO	19.0
CLASSIFICATION	E5

**NOTES:**  
1. All cross-sections facing the downstream direction

Survey Date	OCT. 2007
Survey Weather	Sunny
Field Team	Wright, Gloden
Location	XS4



REVISIONS

Client:



Natural Resources  
Restoration & Conservation

Project:  
**CUTAWHISKIE CREEK RESTORATION SITE**

**YEAR-1 MONITORING REPORT**

HERTFORD COUNTY, NC

Title:

**CROSS SECTION XS4-RIFFLE**

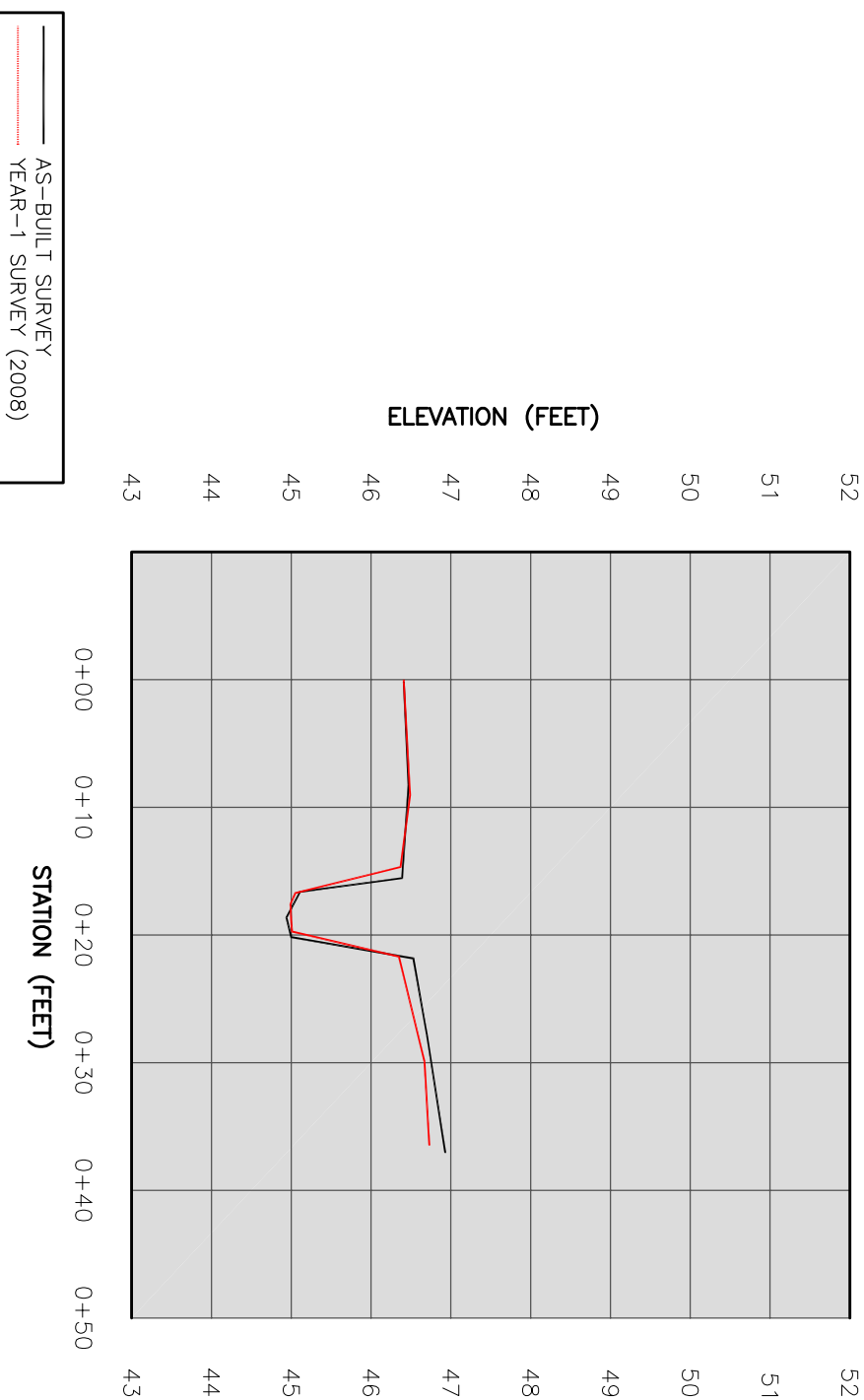
Dwn. By:	TAL	Dwn. By:	TAL
Ckd. By:	MCG	Date:	NOV 2008
Scale:	NO SCALE		
ESC Project No.:	06-306		

SHEET

**B4**



**XS5 (Riffle)**



STATION	ELEVATION	FEATURE	STATION	ELEVATION	FEATURE
0.00	46.36	LPIN			
0.28	46.36				
9.13	46.44				
14.77	46.32				
16.81	45.00				
17.69	44.94				
19.01	44.95				
19.82	44.96				
21.79	46.30				
29.99	46.62				
36.35	46.68				
36.98	46.83	RPIN			

**SUMMARY DATA**

BANKFULL CROSS SECTIONAL AREA	6.7 SQ. FT.
BANKFULL WIDTH	7.0 FT.
BANKFULL MEAN DEPTH	1.0 FT.
BANKFULL MAX DEPTH	1.4 FT.
WIDTH-DEPTH RATIO	7.4
ENTRENCHMENT RATIO	21.5
CLASSIFICATION	E5

**NOTES:**  
1. All cross-sections facing the downstream direction

Survey Date	OCT. 2007
Survey Weather	Sunny
Field Team	Wright, Gloden
Location	XS5



XS5 LEFT BANK LOOKING RIGHT BANK



XS5 LOOKING DOWNSTREAM



REVISIONS

Client:



Natural Resources Restoration & Conservation

**Project:**  
CUTAWHISKIE CREEK RESTORATION SITE

**YEAR-1 MONITORING REPORT**

HERTFORD COUNTY, NC

Title:

**CROSS SECTION XS5-RIFFLE**

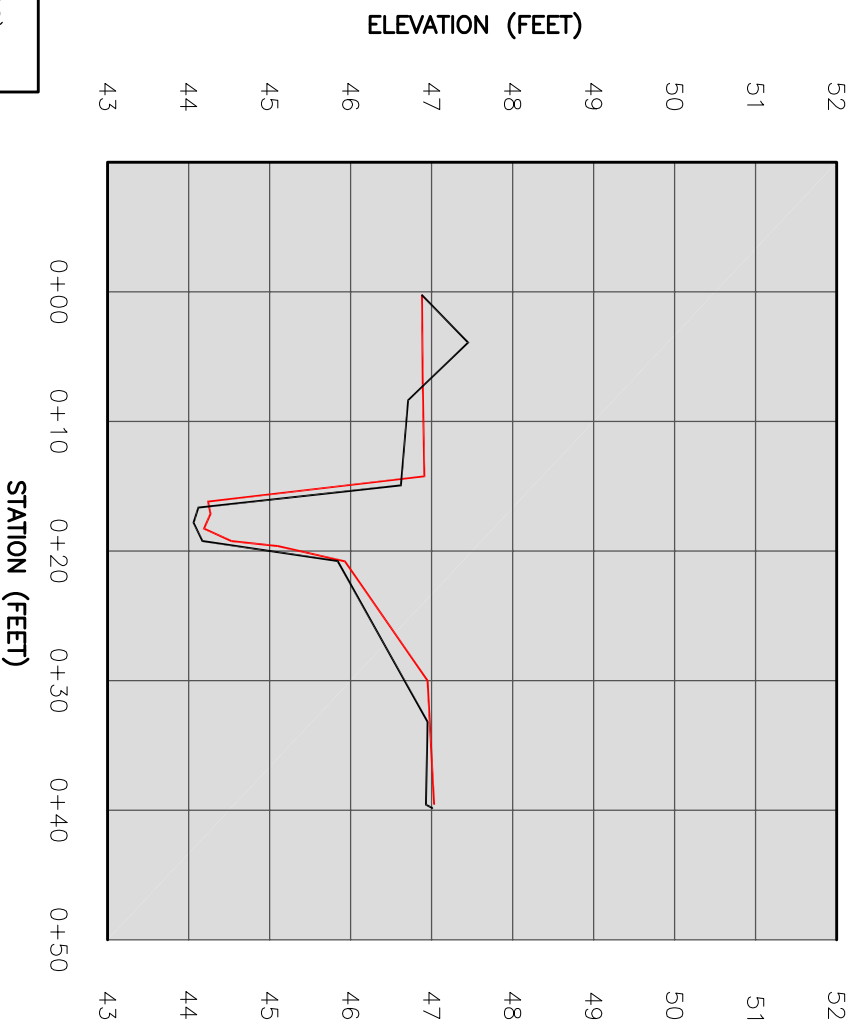
Desn. By:	TAL	Dwn. By:	TAL
Ckd. By:	MCG	Date:	NOV 2008
Scale:	NO SCALE		
ESC Project No.:	06-306		

SHEET

**B5**



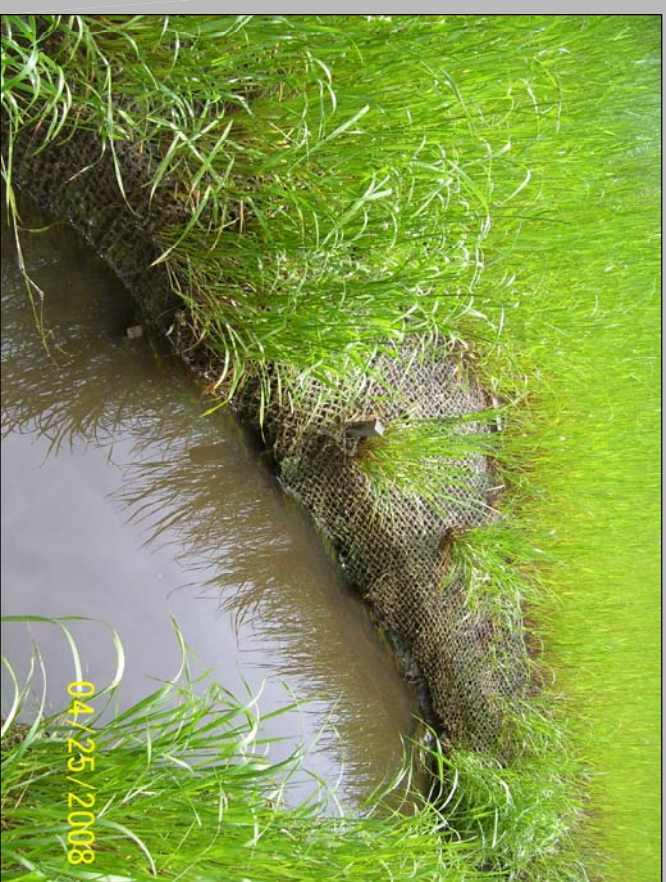
**XS6 (Pool)**



AS-BUILT SURVEY  
YEAR-1 SURVEY (2008)



XS6 LEFT BANK LOOKING RIGHT BANK



XS6 LOOKING DOWNSTREAM

**SURVEY DATA**

STATION	ELEVATION	FEATURE	STATION	ELEVATION	FEATURE
0.47	46.70	LPIN			
10.01	46.62				
19.22	45.60				
20.40	44.77				
20.78	44.20				
21.74	43.86				
22.89	43.94				
23.83	43.91				
25.78	46.58				
32.87	46.56				
39.77	46.85				
39.76	47.12	RPIN			

**SUMMARY DATA**

BANKFULL CROSS SECTIONAL AREA	16.8 SQ. FT.
BANKFULL WIDTH	15.1 FT.
BANKFULL MEAN DEPTH	1.1 FT.
BANKFULL MAX DEPTH	2.7 FT.
WIDTH-DEPTH RATIO	13.5
ENTRENCHMENT RATIO	10.0
CLASSIFICATION	N/A

**NOTES:**  
1. All cross-sections facing the downstream direction

Survey Date	OCT. 2007
Survey Weather	Sunny
Field Team	Wright, Gloden
Location	XS6



REVISIONS

Client:



Natural Resources  
Restoration & Conservation

Project:  
**CUTAWHISKIE  
CREEK  
RESTORATION  
SITE**

**YEAR-1  
MONITORING  
REPORT**

HERTFORD COUNTY, NC

Title:

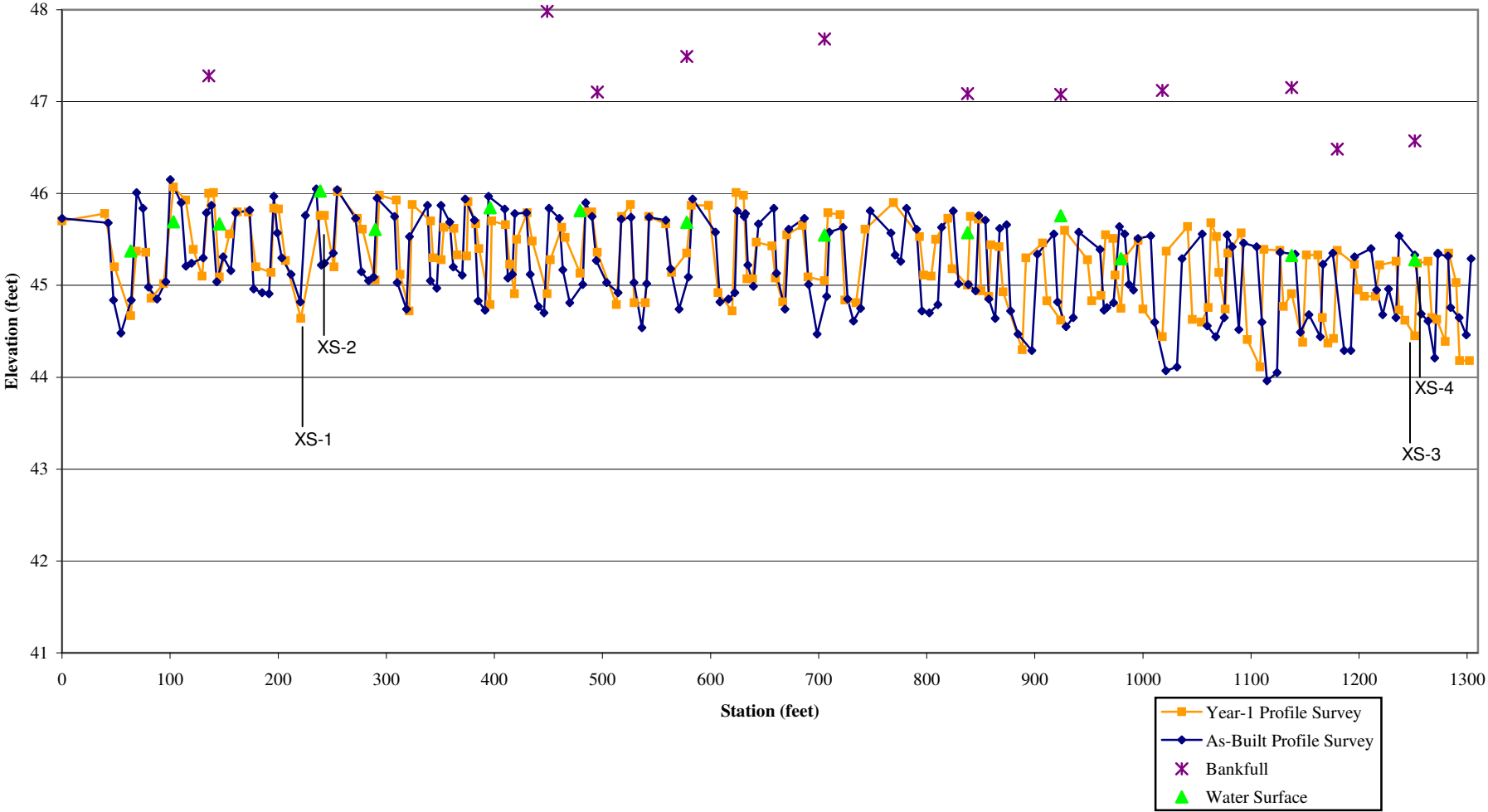
**CROSS SECTION  
XS6-POOL**

Desn. By:	TAL	Dwn. By:	TAL
Ckd. By:	MCG	Date:	NOV 2008
Scale:	NO SCALE		
ESC Project No.:	06-306		

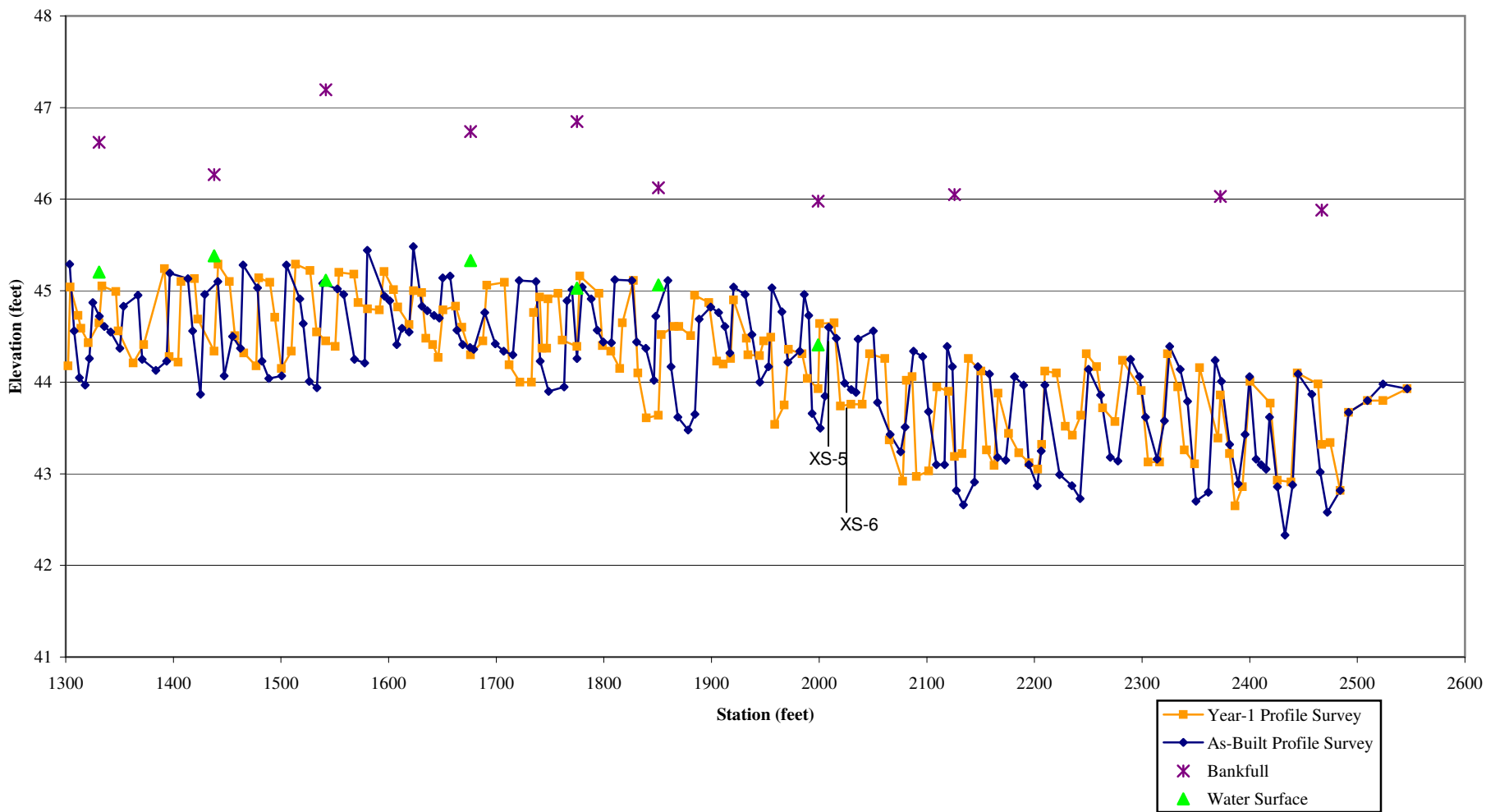
SHEET

**B6**

### Longitudinal Profile- Cutawhiskie Creek Year-1 Monitoring

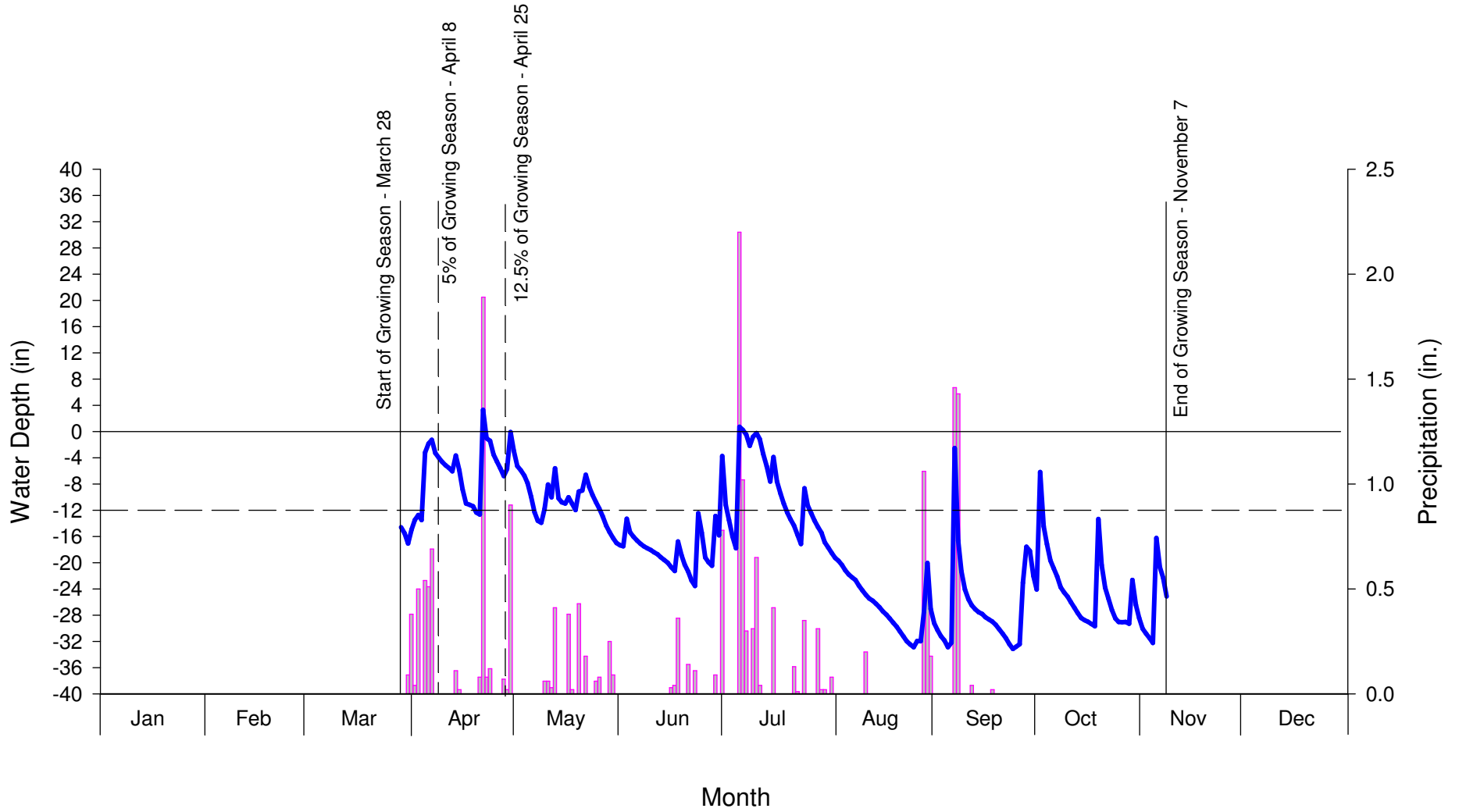


Longitudinal Profile (cont.)- Cutawhiskie Creek Year-1 Monitoring

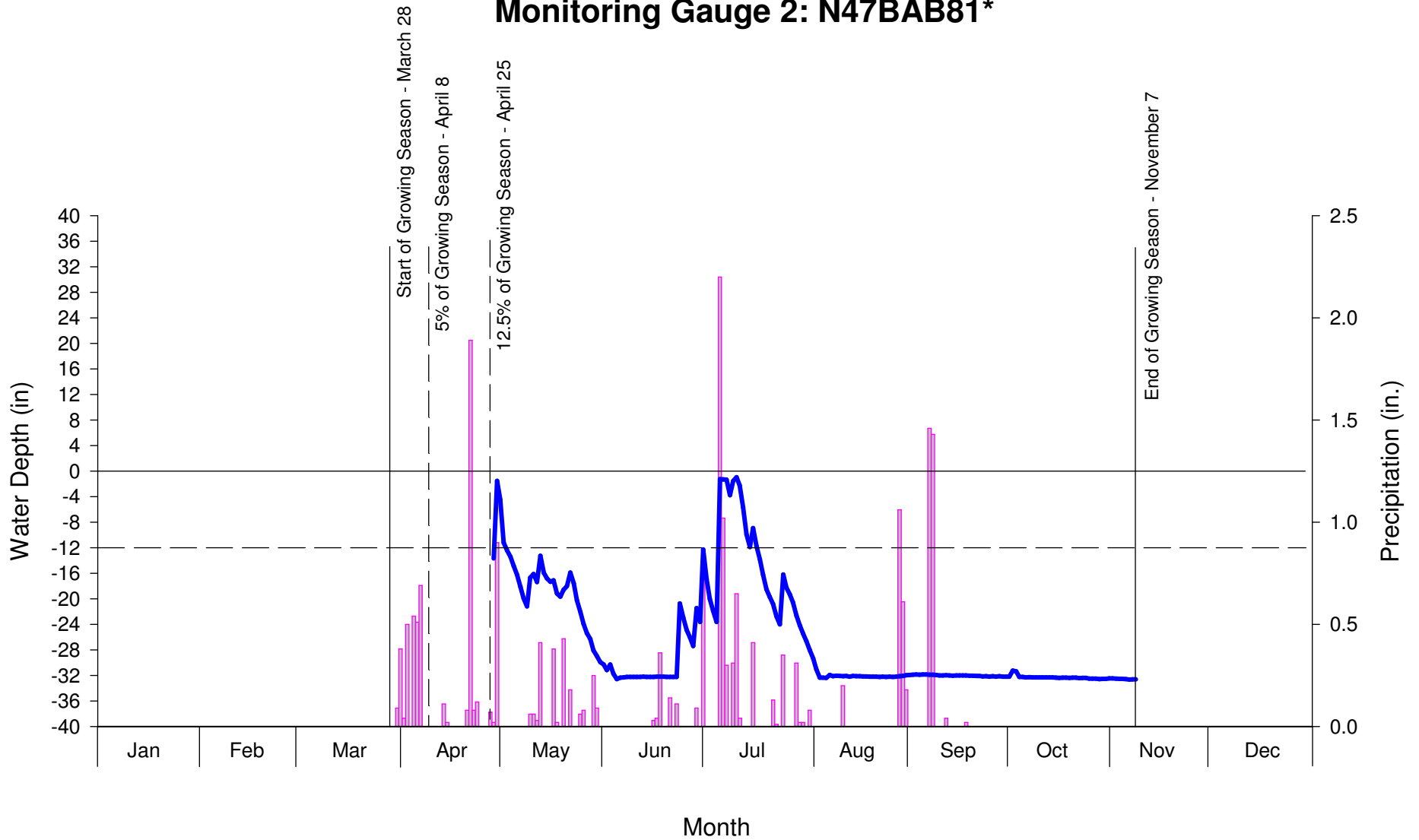


**APPENDIX C: WETLAND DATA**

# Cutawhiskie Creek Year-1 Monitoring - 2008 Monitoring Gauge 1: N47BAC28



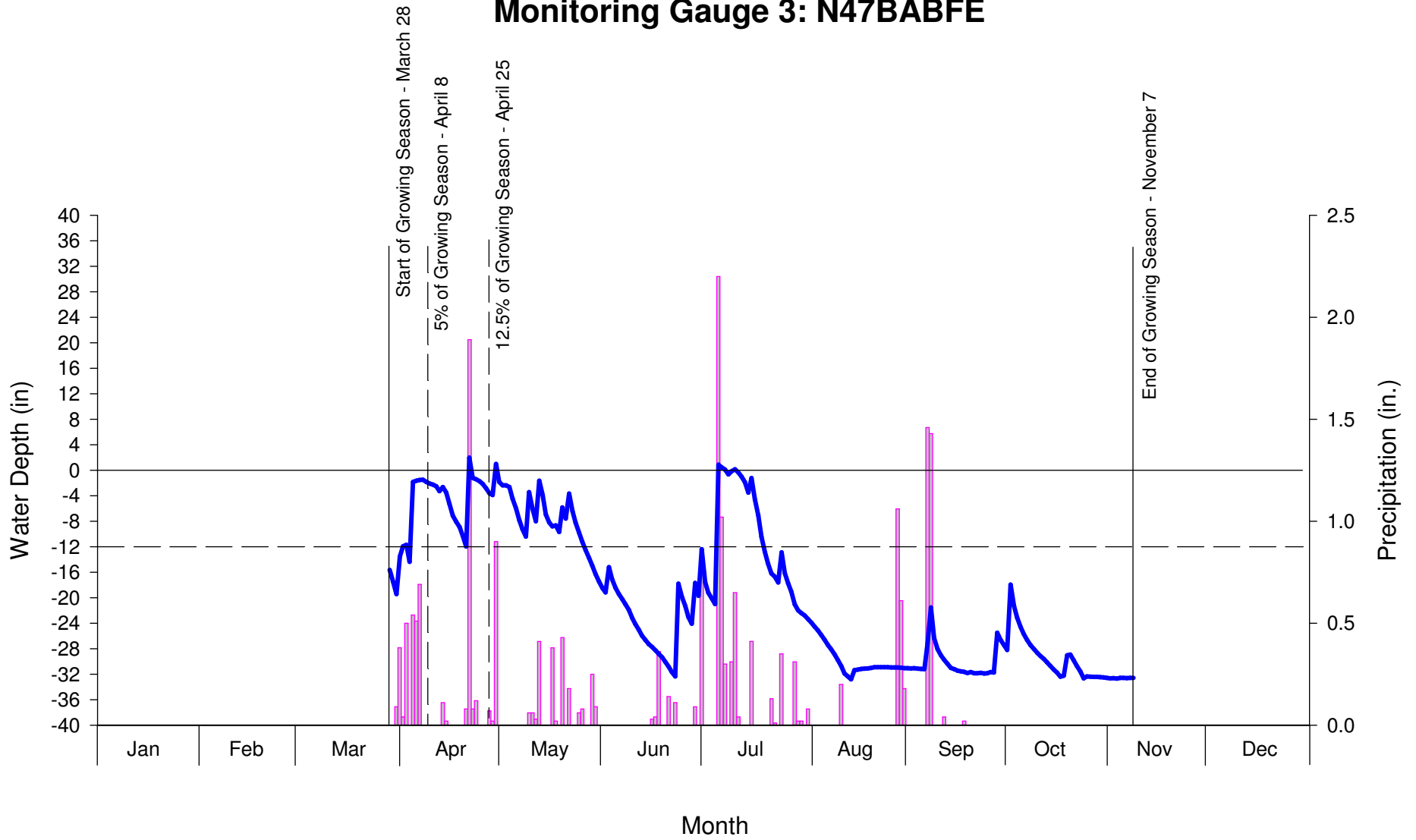
# Cutawhiskie Creek Year-1 Monitoring - 2008 Monitoring Gauge 2: N47BAB81\*



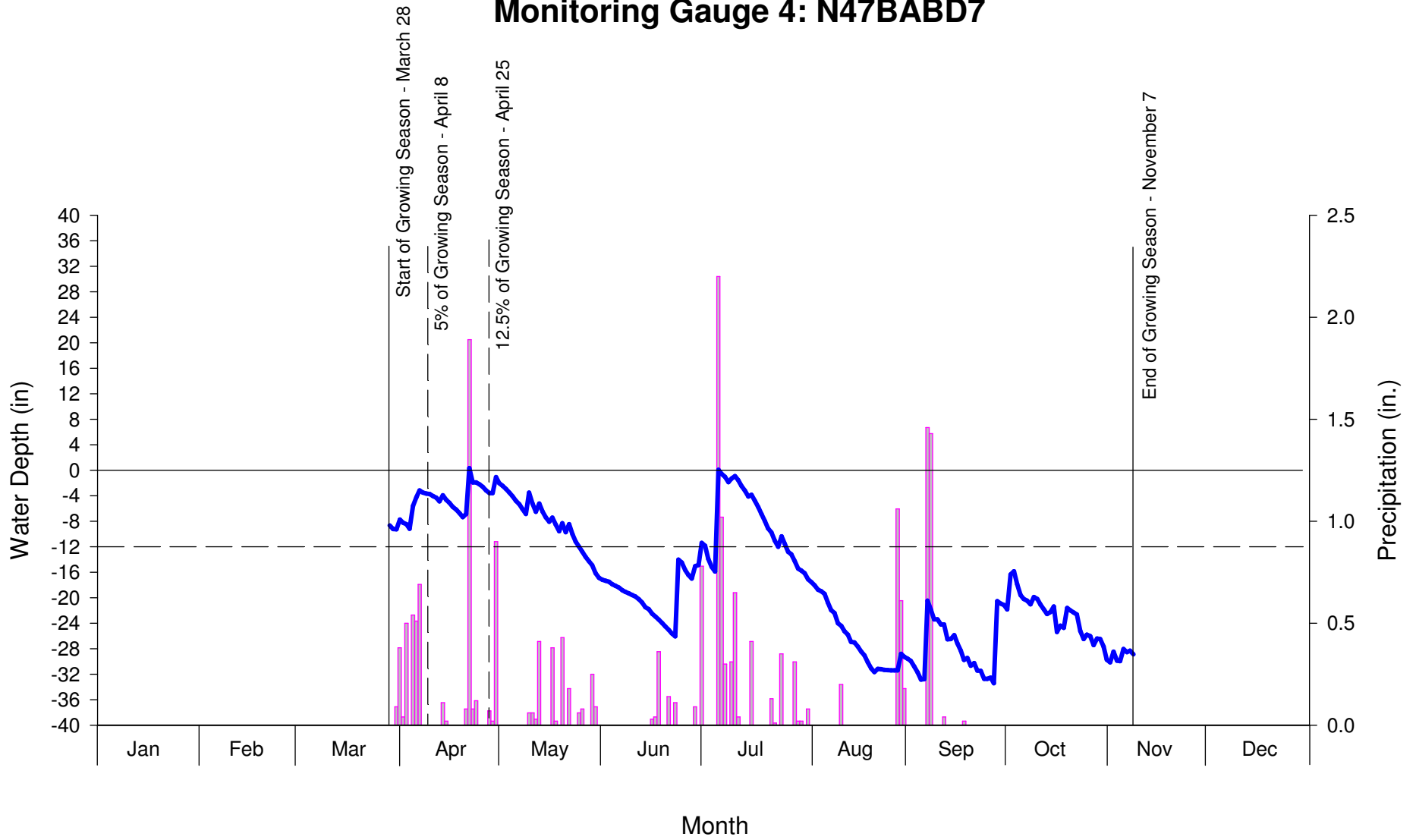
\* Gauge installed April 28, 2008



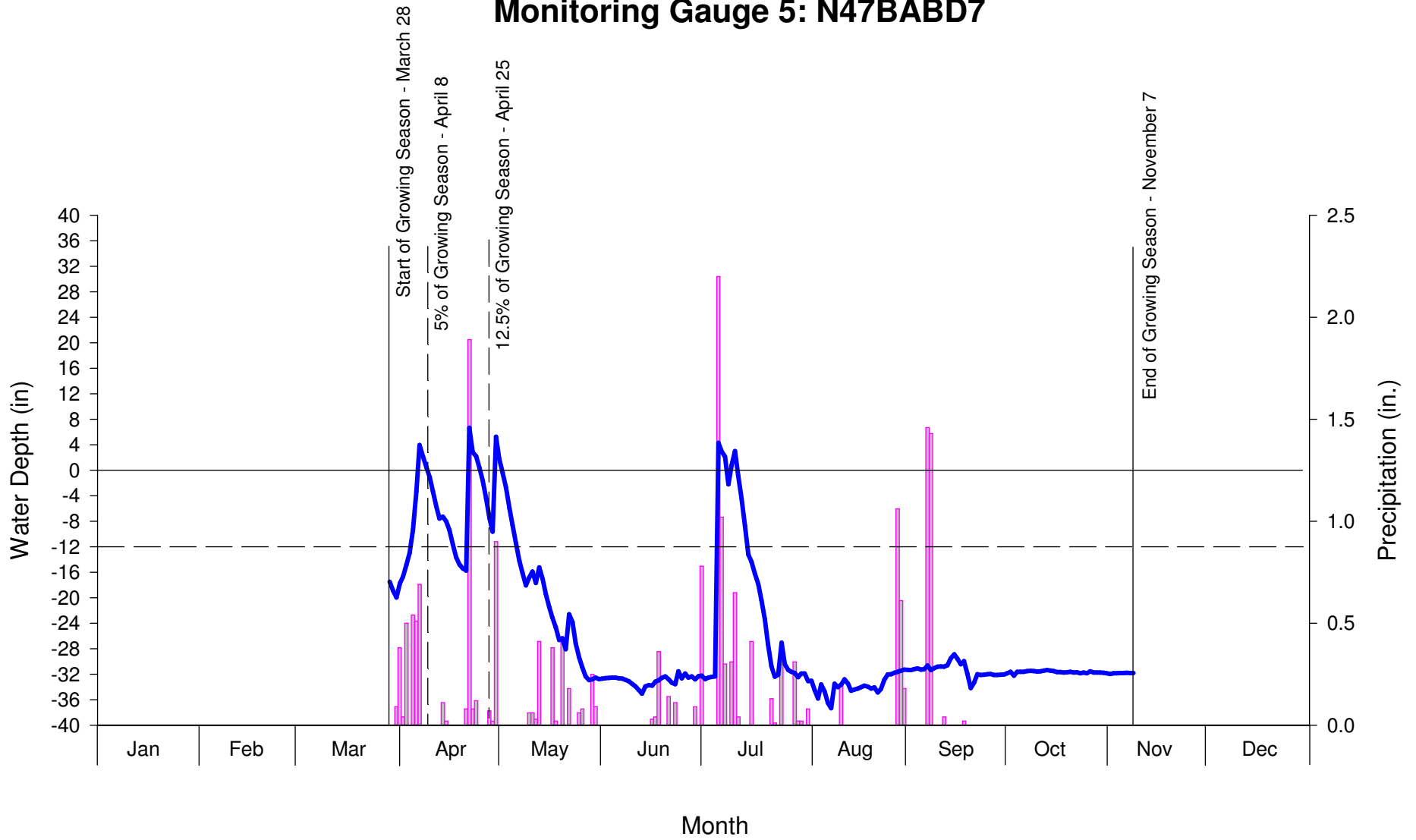
# Cutawhiskie Creek Year-1 Monitoring - 2008 Monitoring Gauge 3: N47BABFE



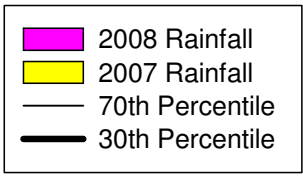
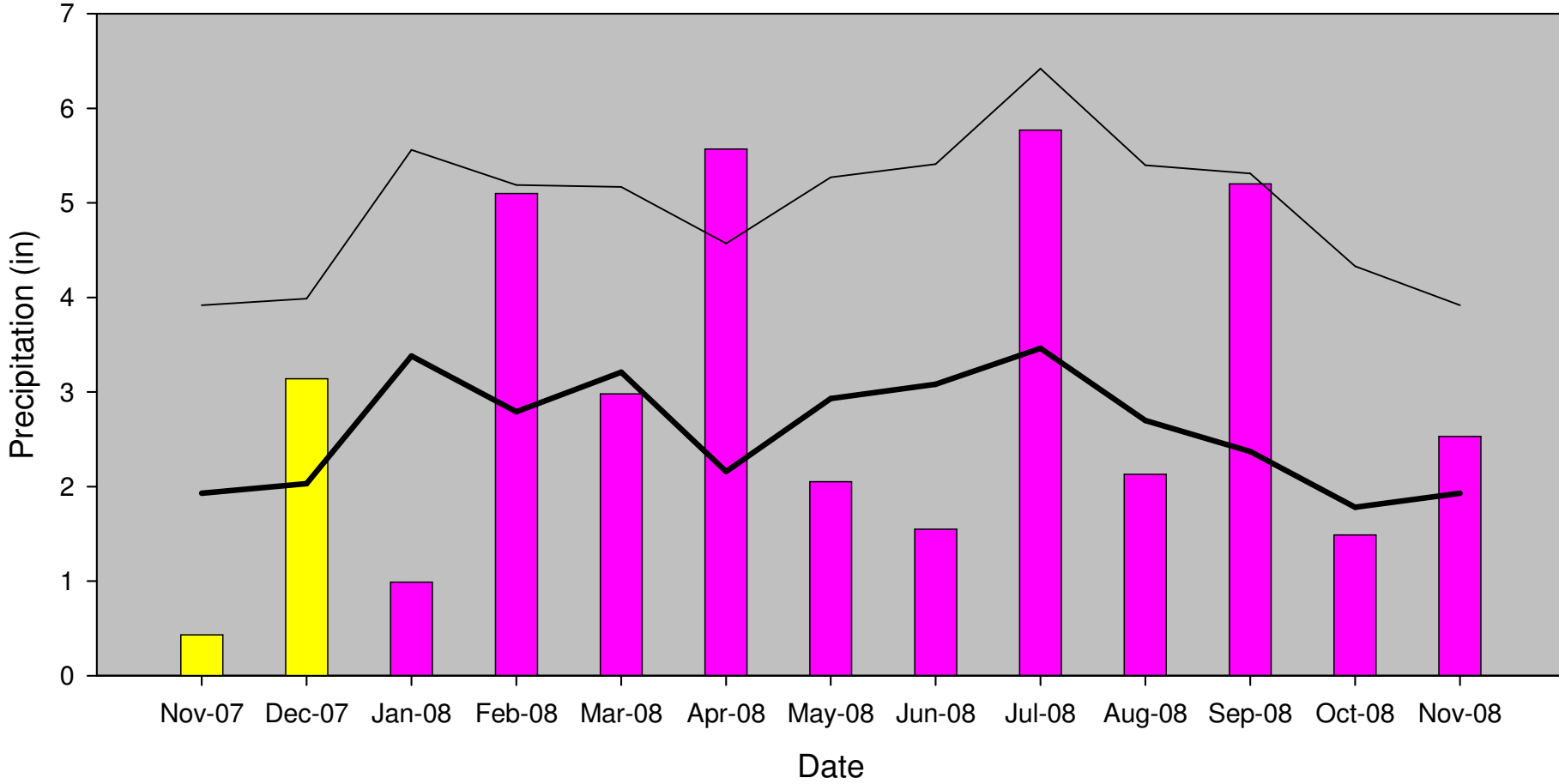
# Cutawhiskie Creek Year-1 Monitoring - 2008 Monitoring Gauge 4: N47BABD7



# Cutawhiskie Creek Year-1 Monitoring - 2008 Monitoring Gauge 5: N47BABD7



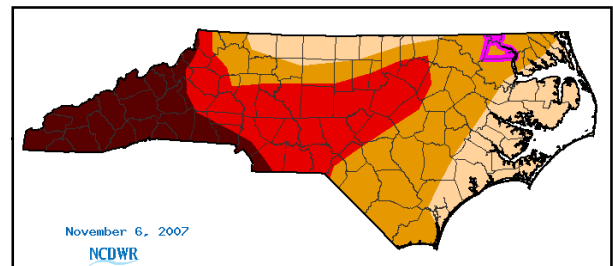
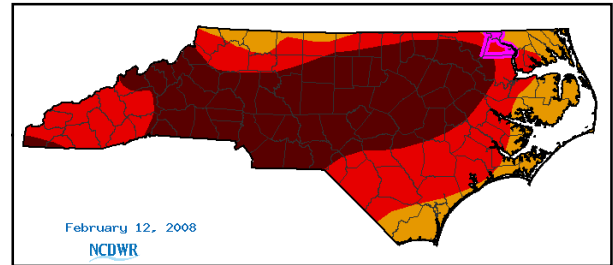
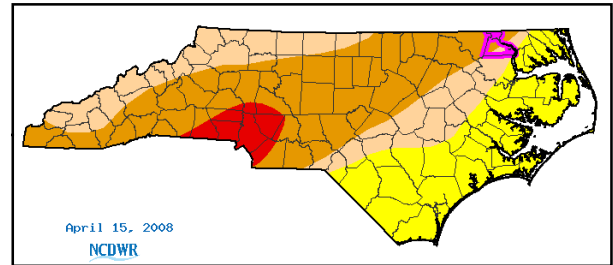
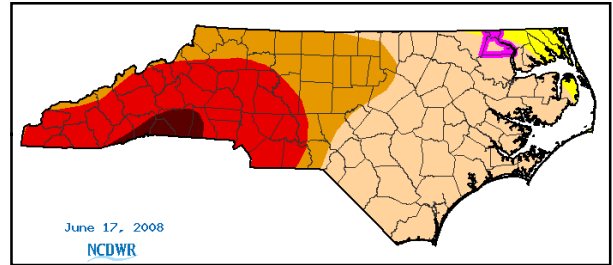
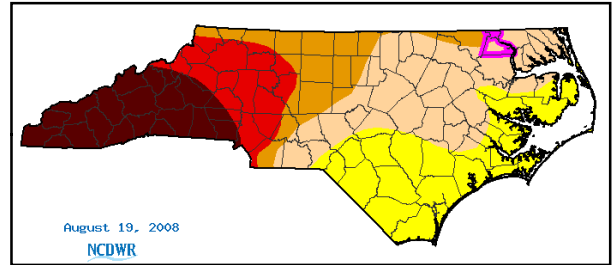
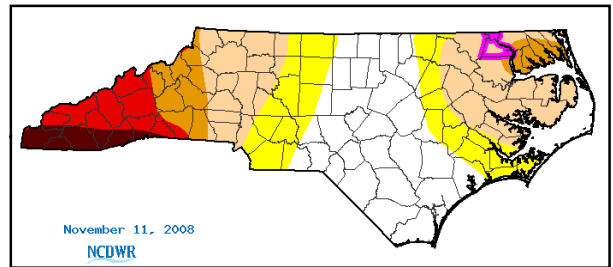
### Figure 3. Cutawhiskie Creek 2008 Precipitation Graph Hertford County, NC



Data Sources:  
Monthly Precipitation- State Climate Office of NC (CRONOS database [online])  
30-70 Percentile-NRCS National Water and Climate Center (online)

### Hertford County Drought Data

Date	DM Level	Drought Level Description	Drought Conditions by Percent Area					
			None	D0	D1	D2	D3	D4
11/11/2008	D1	Moderate Drought	0.00	0.00	85.92	14.08	0.00	0.00
11/4/2008	D1	Moderate Drought	0.00	0.00	85.92	14.08	0.00	0.00
10/28/2008	D1	Moderate Drought	0.00	0.00	85.92	14.08	0.00	0.00
10/21/2008	D1	Moderate Drought	0.00	0.00	84.97	15.03	0.00	0.00
10/14/2008	D1	Moderate Drought	0.00	0.00	84.97	15.03	0.00	0.00
10/7/2008	D1	Moderate Drought	0.00	0.00	86.35	13.65	0.00	0.00
9/30/2008	D1	Moderate Drought	0.00	0.00	86.35	13.65	0.00	0.00
9/23/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
9/16/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
9/9/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
9/2/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
8/26/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
8/19/2008	D1	Moderate Drought	0.00	0.00	76.26	23.74	0.00	0.00
8/12/2008	D1	Moderate Drought	0.00	0.00	100.00	0.00	0.00	0.00
8/5/2008	D0	Abnormally Dry	0.00	100.00	0.00	0.00	0.00	0.00
7/29/2008	D0	Abnormally Dry	0.00	100.00	0.00	0.00	0.00	0.00
7/22/2008	D0	Abnormally Dry	0.00	100.00	0.00	0.00	0.00	0.00
7/15/2008	D0	Abnormally Dry	0.00	100.00	0.00	0.00	0.00	0.00
7/8/2008	D0	Abnormally Dry	0.00	100.00	0.00	0.00	0.00	0.00
7/1/2008	D1	Moderate Drought	0.00	5.44	94.56	0.00	0.00	0.00
6/24/2008	D1	Moderate Drought	0.00	15.40	84.60	0.00	0.00	0.00
6/17/2008	D1	Moderate Drought	0.00	15.40	84.60	0.00	0.00	0.00
6/10/2008	D0	Abnormally Dry	2.87	97.13	0.00	0.00	0.00	0.00
6/3/2008		Normal	100.00	0.00	0.00	0.00	0.00	0.00
5/27/2008		Normal	100.00	0.00	0.00	0.00	0.00	0.00
5/20/2008		Normal	100.00	0.00	0.00	0.00	0.00	0.00
5/13/2008		Normal	100.00	0.00	0.00	0.00	0.00	0.00
5/6/2008	D0	Abnormally Dry	0.00	100.00	0.00	0.00	0.00	0.00
4/29/2008	D0	Abnormally Dry	0.00	100.00	0.00	0.00	0.00	0.00
4/22/2008	D1	Moderate Drought	0.00	28.94	71.06	0.00	0.00	0.00
4/15/2008	D2	Severe Drought	0.00	2.20	41.66	56.15	0.00	0.00
4/8/2008	D2	Severe Drought	0.00	2.20	41.66	56.15	0.00	0.00
4/1/2008	D2	Severe Drought	0.00	0.00	1.96	98.04	0.00	0.00
3/25/2008	D2	Severe Drought	0.00	0.00	1.96	98.04	0.00	0.00
3/18/2008	D2	Severe Drought	0.00	0.00	1.96	98.04	0.00	0.00
3/11/2008	D2	Severe Drought	0.00	0.00	1.96	98.04	0.00	0.00
3/4/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
2/26/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
2/19/2008		Extreme Drought	0.00	0.00	0.00	52.60	47.40	0.00
2/12/2008		Extreme Drought	0.00	0.00	0.00	26.78	67.67	5.54
2/5/2008		Extreme Drought	0.00	0.00	0.00	26.78	67.67	5.54
1/29/2008		Extreme Drought	0.00	0.00	0.00	26.78	67.67	5.54
1/22/2008	D2	Severe Drought	0.00	0.00	0.00	99.44	0.56	0.00
1/15/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
1/8/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
1/1/2008	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
12/25/2007	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
12/18/2007	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
12/11/2007	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
12/4/2007	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
11/27/2007	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
11/20/2007	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
11/13/2007	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
11/6/2007	D2	Severe Drought	0.00	0.00	0.00	100.00	0.00	0.00
10/30/2007	D1	Moderate Drought	0.00	0.00	91.59	8.41	0.00	0.00

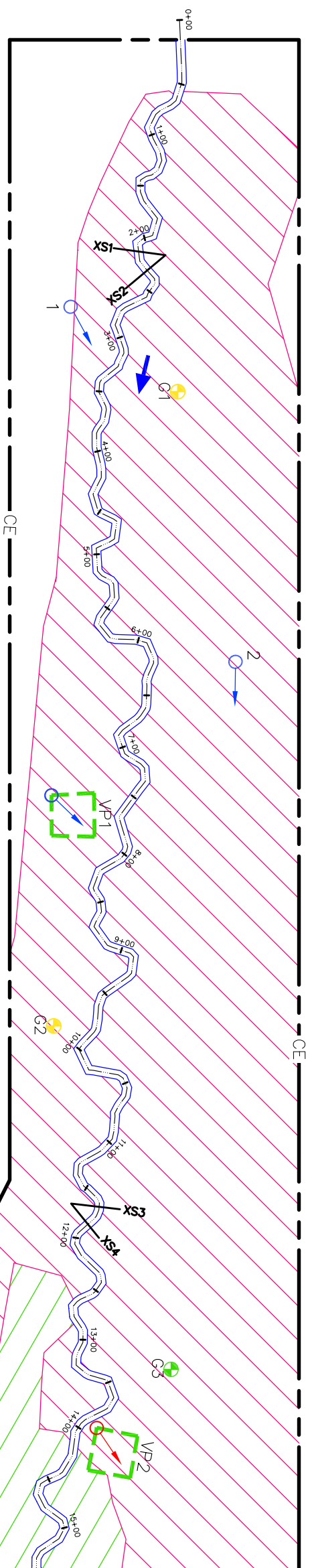
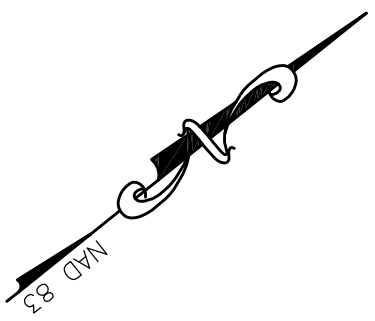


**North Carolina  
Drought Monitor Data**  
Cutawhiskie Creek Stream  
and Wetland Restoration Site  
Hertford County, North Carolina

Dwn By:	MCG	Ckd By:	JWG
Date:	DEC 2008		
Scale:	N/A		
ESC Project No.	06-306		

FIGURE  
**4**







**APPENDIX D: INTEGRATED PROBLEM AREA PLAN VIEW**










**LEGEND:**

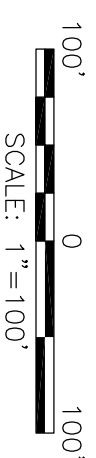
— CE — CONSERVATION EASEMENT BOUNDARY 22.9± acres

**RESTORATION DESIGN UNITS**

 STREAM RESTORATION 2540 ln. ft.  
 BRAIDED STREAM RESTORATION 359 ln. ft.  
 THALWEG  
 STREAM PRESERVATION 2593 ln. ft.  
 WETLAND RESTORATION 11.9± acres  
 WETLAND ENHANCEMENT 1.1± acres

**MONITORING SETUP:**

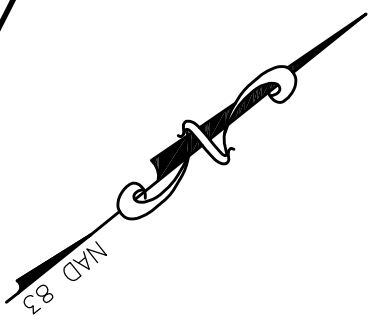
 VP1 VEGETATIVE MONITORING PLOT (5) (SUCCESS CRITERIA MET)  
 GROUNDWATER MONITORING GAUGE (5)  
 HYDROLOGY 5-12.5% OF GROWING SEASON  
 HYDROLOGY >12.5% OF GROWING SEASON  
 PERMANENT CROSS-SECTIONS (6)  
 PERMANENT PHOTO STATION (8)  
 STREAM FLOW DIRECTION



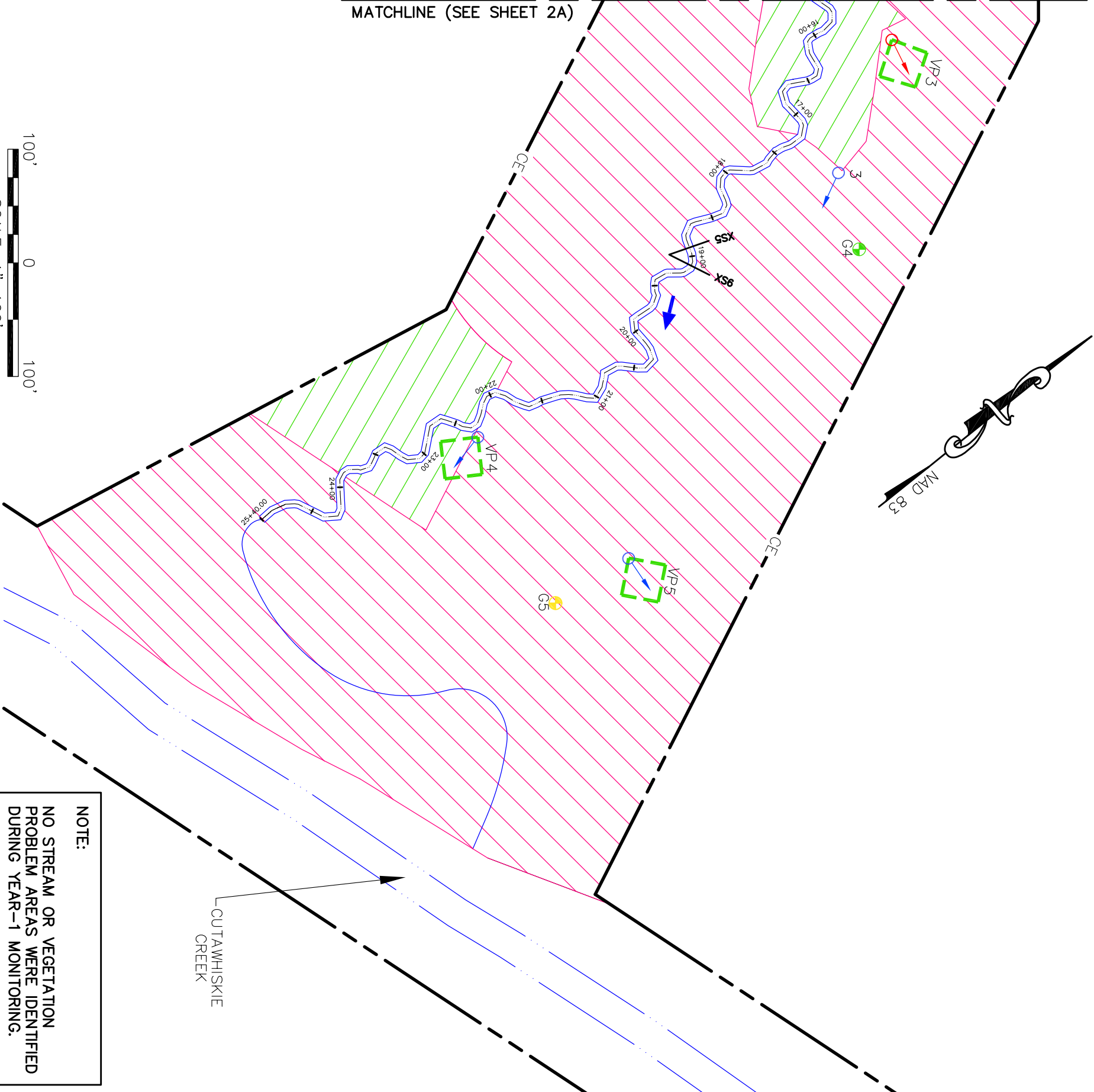
**NOTE:**  
NO STREAM OR VEGETATION PROBLEM AREAS WERE IDENTIFIED DURING YEAR-1 MONITORING.

MATCHLINE (SEE SHEET 2B)

 EcoScience A Division of <b>PBS&amp;J</b>		<b>REVISIONS</b> <table border="1"> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> <tr><td> </td><td> </td><td> </td><td> </td></tr> </table>																																	
<b>Client:</b> Natural Resources Restoration & Conservation 		<b>Project:</b> CUTAWHISKIE CREEK RESTORATION SITE																																	
<b>Title:</b> INTEGRATED PROBLEM AREA PLAN VIEW		<b>Year-1 Monitoring Report</b> HERTFORD COUNTY, NC																																	
<b>Dwn. By:</b> TAL	<b>Ckd. By:</b> JWG	<b>Date:</b> NOV 2008	<b>Scale:</b> AS SHOWN																																
<b>ESC Project No.:</b> 06-306		<b>FIGURE</b> 2A																																	



MATCHLINE (SEE SHEET 2A)



**MONITORING SETUP:**

- VEGETATIVE MONITORING PLOT (5)  
(SUCCESS CRITERIA MET)
- GROUNDWATER MONITORING GAUGE (5)  
HYDROLOGY 5–12.5% OF GROWING SEASON  
HYDROLOGY >12.5% OF GROWING SEASON
- PERMANENT PHOTO STATIONS (8)
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- STREAM FLOW DIRECTION

**LEGEND:**

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**RESTORATION DESIGN UNITS**

- STREAM RESTORATION 2540 ln. ft.
- BRAIDED STREAM RESTORATION 359 ln. ft.
- THALWEG
- STREAM PRESERVATION 2593 ln. ft.
- WETLAND RESTORATION 11.9± acres
- WETLAND ENHANCEMENT 1.1± acres

A Division of **PBS&J**

REVISIONS

Client:

Natural Resources  
Restoration & Conservation

Project:

**CUTAWHISKIE CREEK RESTORATION SITE**

Year-1 Monitoring Report  
HERTFORD COUNTY, NC

Title:

**INTEGRATED PROBLEM AREA PLAN VIEW**

Dwn. By: TAL  
Cld. By: JWG

Date: NOV 2008  
Scale: AS SHOWN

ESC Project No.: 06-306

FIGURE  
**2B**