

St. Clair Creek Restoration Project Year 1 Final Monitoring Report

Beaufort County, North Carolina

EEP Project ID No. 95015

Tar-Pamlico River Basin: 03020104-040040



Project Info: Monitoring Year: 1 of 7
 Year of Data Collection: 2014
 Year of Completed Construction: 2014
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Report Prepared and Submitted by Michael Baker International

NC Professional Engineering License # F-1084



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1.0 EXECUTIVE SUMMARY

Michael Baker Engineering, Inc. (Baker) restored 3,926 linear feet (LF) of perennial and intermittent stream, 2.8 acres (AC) of riparian wetlands, and planted 17.5 acres (AC) of native riparian vegetation within the entire conservation easement along two unnamed tributaries (UT2 and UT3) to St. Clair Creek in Beaufort County, North Carolina (NC) (Figure 1). The St. Clair Creek Restoration Project (Site) is located in Beaufort County, approximately five miles east of the Town of Bath. The Site is located in the NC Division of Water Resources (NCDWR) subbasin 03-03-07 and the Targeted Local Watershed (TLW) 03020104-040040 of the Tar-Pamlico River Basin. The project involved the restoration of a Coastal Plain Headwater Small Stream Swamp system (NC WAM 2010, Schafale and Weakley 1990) from impairments within the project area due to past agricultural conversion and silviculture.

The primary restoration goals of the project were to improve ecological functions to the impaired areas within the Tar-Pamlico River Basin as described below:

- Create geomorphically stable conditions along the unnamed tributaries across the project,
- Implement agricultural BMPs to reduce nonpoint source inputs to the downstream estuary,
- Protect and improve water quality by reducing nutrient and sediment inputs,
- Restore stream and wetland hydrology by connecting historic flow paths and promoting natural flood processes, and
- Restore and protect riparian buffer functions and corridor habitat in perpetuity by establishing a permanent conservation easement.

To accomplish these goals, the following objectives were identified:

- Restore existing channelized streams by restoring the relic headwater valley and allowing diffuse flow, providing the streams access to their floodplains,
- Increase aquatic habitat value by allowing natural microtopography to form,
- Plant native species riparian buffer vegetation within the headwater valley and floodplain areas, and within the wetland areas, protected by a permanent conservation easement, to increase stormwater runoff filtering capacity, decrease erosion, and shade the stream to decrease water temperature,
- Improve aquatic and terrestrial habitat through improved substrate and in-stream cover, addition of woody debris, and reduction of water temperature, and
- Control invasive species vegetation within the project area and if necessary continue treatments during the monitoring period.

The project as-built condition closely mimics that proposed by the design. Differences are outlined below:

- No emergency overflow was constructed along UT3 due to the capacity of the proposed culverts.
- A ford crossing was constructed outside of the conservation easement boundary along UT2 at approximate station 35+75 at the landowner's request.
- Due to bare-root shrub availability, some species proposed in the Mitigation Plan differ from shrub species actually planted within the buffer area following construction. The understory species Titi (*Cyrilla racemiflora*), swamp doghobble (*Leucothoe racemosa*), Fetterbush (*Lyonia lucida*) and Virginia sweetspire (*Itea virginica*) were not planted on the Site. Instead, the aforementioned species were substituted with these understory species: beautyberry (*Callicarpa americana*), swamp dogwood (*Cornus foemina*), wax myrtle (*Morella cerifera*), Blueberry (*Vaccinium corymbosum*),

Arrowwood (*Viburnum dentatum*), swamp rose (*Rosa palustris*), inkberry (*Ilex glabra*) and Chokeberry (*Aronia arbutifolia*). Sixty-one percent of the riparian buffer species are overstory trees. The remaining thirty-nine percent of species are understory shrubs and twenty-one percent of these species were substituted with species of similar quantities for the riparian wetland planting areas.

During Year 1 monitoring, the planted acreage performance categories were functioning at 100 percent with no bare areas or low stem density areas to report. The average density of total planted stems, based on data collected from the nine monitoring plots during Year 1 monitoring, is 676 stems per acre. The Year 1 data demonstrate that the Site is on track for meeting the minimum success interim criteria of 320 trees per acre by the end of Year 3.

No areas of invasive species or vegetation areas of concern were observed during Year 1 monitoring.

Year 1 wetland groundwater monitoring demonstrated that 0 of 4 groundwater monitoring wells located along UT2 and UT3 exhibited water levels within 12 inches of the ground surface that was greater than 12 percent of the growing season. The four on-site wetland monitoring wells demonstrated consecutive hydroperiods which ranged from 1.0 to 7.8 percent of the growing season. It is also noted that the monitoring wells were not installed until March 21, 2014 immediately following construction of the Site. The growing season for Beaufort County is from February 28 to December 6. Therefore, Year 1 monitoring of the wetland groundwater levels did not record the first 21 days of March in 2014. Also, during Year 1 monitoring, the on-site wetland reference wells demonstrated consecutive hydroperiods which ranged from 24.8 to 27.0 percent of the growing season.

On-site flow through the restored headwater valleys of UT2 and UT3 was recorded periodically throughout 2014 by the use of pressure transducers. Of the six flow gauges installed on the Site, all gauges recorded flow in 2014. The flow gauges documented flow through the headwater valleys during Year 1 which ranged from 4.6 to 71.0 days in from March 21 to December 4. It is noted that the gauges demonstrated similar patterns relative to rainfall events in the vicinity of the Site.

Summary information/data related to the Site and statistics related to performance of various project and monitoring elements can be found in the 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 and in the Mitigation Plan available on the North Carolina Ecosystem Enhancement Program (NCEEP) website. All raw data supporting the tables and figures in the Appendices are available from NCEEP upon request.

2.0 METHODOLOGY

The seven-year monitoring plan for the Site includes criteria to evaluate the success of the stream, wetland and vegetation components of the project. The methodology and report template used to evaluate these components adheres to the NCEEP monitoring guidance document dated November 7, 2011, which will continue to serve as the template for subsequent monitoring years. The specific locations of monitoring features, such as vegetation plots, flow gauges and wells are shown on the CCPV sheets found in Appendix B.

The majority of Year 1 monitoring data were collected in November and December 2014. All visual site assessment data contained in Appendix B were collected in November and December 2014.

2.1 Stream Assessment – Reaches UT2 and UT3

The UT2 and UT3 mitigation approach involved the restoration of historic flow patterns and flooding functions in a multi-thread headwater stream system, monitoring efforts will focus on visual observations to document stability and the use of water level monitoring gauges to document saturation and flooding functions. The methods used and any related success criteria are described below for each parameter. Monitoring efforts focus on visual observations and in-channel flow gauges/pressure transducers to document stream success. As-built stream survey data were collected conventionally using a Nikon DM-522 total station unit and is georeferenced used NAD83-State Plane Feet-FIPS3200. This survey system collects point data with an accuracy of less than one tenth of a foot.

2.1.1 Hydrology

Total observed area rainfall for the period of January 2014 through November 2014 was 47.46 inches, as compared to the Beaufort County WETS table for the same time period of 50.03 inches annually.

Four automated flow gauges (pressure transducers) were installed in the UT2 channel as well as two flow gauges installed in the UT3 channel. The gauges were installed approximately 500 feet apart within the restored systems to document flow duration. The automated loggers were programmed to collect data at every 15 minutes to document flow frequency and duration. The flow data summary and the observed rainfall graph are located in Appendix D.

2.1.2 Photographic Documentation

The reaches were photographed longitudinally beginning at the downstream end of both reaches, moving upstream to the beginning of each reach. Photographs were taken looking upstream at delineated locations throughout the restored stream valley. Points were close enough together to provide an overall view of the reach lengths and valley crenulations. Photographs of photo points, wetland wells and flow gauges are located in Appendix B.

2.2 Wetland Assessment

Wetland monitoring is assessed by the use of four automated groundwater-monitoring stations that are installed in the UT2 and UT3 wetland restoration areas, as well as two additional reference wells installed in the downstream portion of the UT3 wetland restoration area. Installation of these groundwater monitoring stations follow Corps of Engineers Wetlands Research Program Technical Note VN-rs-4.1 (USACE 1997).

The automated loggers are programmed to collect data every 6 hours to document groundwater levels in the restored wetland areas. The four restoration wells are compared to the two on-site reference wells. Groundwater data collected during Year 1 monitoring are located in Appendix D.

2.3 Vegetation Assessment

In order to determine if the criteria are achieved, vegetation-monitoring quadrants were installed and are monitored across the restoration site in accordance with the CVS-NCEEP Protocol for Recording Vegetation, Version 4.1 (2007) and the CVS-NCEEP data entry tool v 2.3.1 (2012). The vegetation monitoring plots are a minimum of 2 percent of the planted portion of the Site with nine plots established randomly within the Site's planted riparian buffer areas per Monitoring Levels 1. The sizes of individual quadrants are 100 square meters for woody tree species.

Year 1 vegetation assessment information is provided in Appendix B and C.

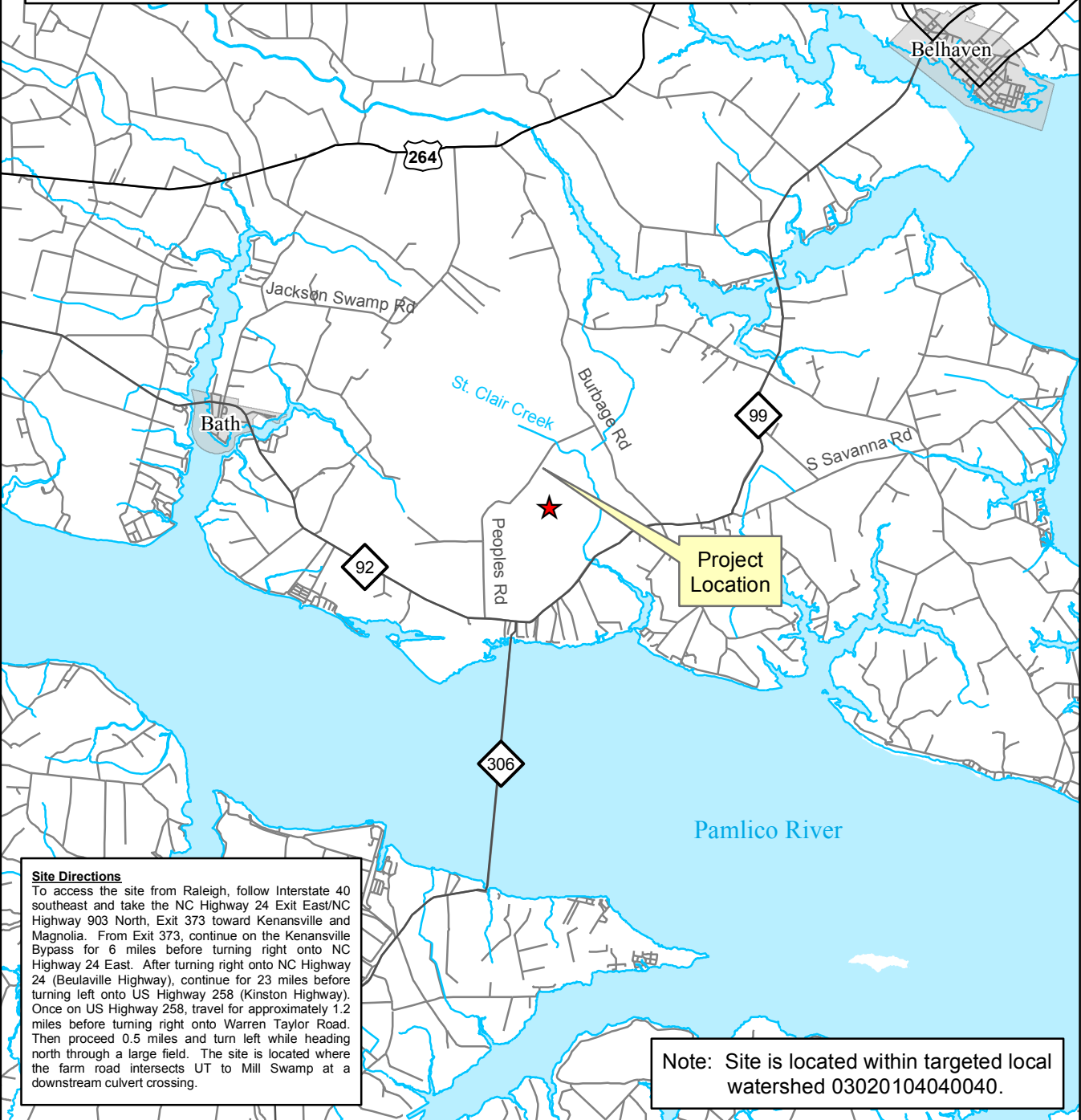
3.0 REFERENCES

- Carolina Vegetation Survey (CVS) and NC Ecosystem Enhancement Program (NCEEP). 2007. CVS-NCEEP Data Entry Tool v. 2.3.1. University of North Carolina, Raleigh, NC.
- Lee, M., Peet R., Roberts, S., Wentworth, T. 2007. CVS-NCEEP Protocol for Recording Vegetation, Version 4.1.
- North Carolina Ecosystem Enhancement Program. 2011. Monitoring Requirements and Performance Standards for Stream and/or Wetland Mitigation. November 7, 2011.
- Rosgen, D. L. 1994. A Classification of Natural Rivers. *Catena* 22:169-199.
- Schafale, M. P., and A. S. Weakley. 1990. Classification of the natural communities of North Carolina, third approximation. North Carolina Natural Heritage Program. Division of Parks and Recreation, NCDENR. Raleigh, NC.
- United States Army Corps of Engineers. 1997. Corps of Engineers Wetlands Research Program. Technical Note VN-rs-4.1. Environmental Laboratory. U.S. Army Engineer Waterways Experiment Station. Vicksburg, MS.
- _____. 2005. "Technical Standard for Water-Table Monitoring of Potential Wetland Sites," WRAP Technical Notes Collection (ERDC TN-WRAP-05-2), U.S. Army Engineer Research and Development Center. Vicksburg, MS.
- _____. 2003. Stream Mitigation Guidelines, April 2003, U.S. Army Corps of Engineers. Wilmington District.

Appendix A

Project Vicinity Map and Background Tables

The subject project site is an environmental restoration site of the NCDENR Ecosystem Enhancement Program (EEP) and is encompassed by a recorded conservation easement, but is bordered by land under private ownership. Accessing the site may require traversing areas near or along the easement boundary and therefore access by the general public is not permitted. Access by authorized personnel of state and federal agencies or their designees/contractors involved in the development, oversight and stewardship of the restoration site is permitted within the terms and timeframes of their defined roles. Any intended site visitation or activity by any person outside of these previously sanctioned roles and activities requires prior coordination with EEP.



Site Directions
 To access the site from Raleigh, follow Interstate 40 southeast and take the NC Highway 24 Exit East/NC Highway 903 North, Exit 373 toward Kenansville and Magnolia. From Exit 373, continue on the Kenansville Bypass for 6 miles before turning right onto NC Highway 24 East. After turning right onto NC Highway 24 (Beulaville Highway), continue for 23 miles before turning left onto US Highway 258 (Kinston Highway). Once on US Highway 258, travel for approximately 1.2 miles before turning right onto Warren Taylor Road. Then proceed 0.5 miles and turn left while heading north through a large field. The site is located where the farm road intersects UT to Mill Swamp at a downstream culvert crossing.

Note: Site is located within targeted local watershed 03020104040040.

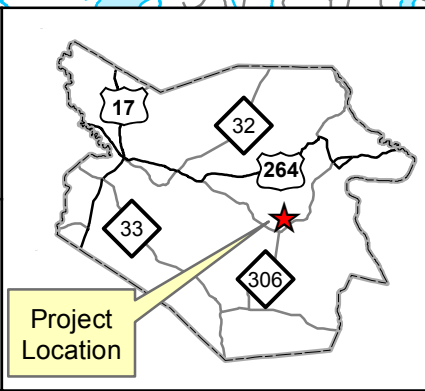
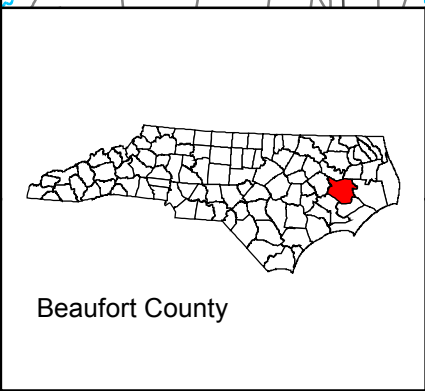


Figure 1
Project Vicinity Map
St. Clair Creek Restoration Site

Michael Baker
 INTERNATIONAL

0 0.5 1 2 3 Miles

Table 1. Project Components and Mitigation Credits							
St. Clair Creek Restoration Project: EEP Project No ID. 95015							
Mitigation Credits							
	Stream	Riparian Wetland		Non-riparian Wetland		Nitrogen Nutrient Offset	Phosphorus Nutrient Offset
Type	R	R	RE				
Totals	3,274 SMU	2.8 WMU	0				
Project Components							
Project Component or Reach ID	Stationing/ Location	Existing Footage/ Acreage		Approach	Restoration/ Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
UT2	12+64 – 34+00	2,660 LF		Headwater Restoration	2,133 SMU	2,133 LF	1:1
UT3	10+66 – 22+82	1,075 LF		Headwater Restoration	1,141 SMU	1,141 LF	1:1
UT2 Wetland	See plan sheets	0.0 AC		Restoration	1.1 WMU	1.1 WMU	1:1
UT3 Wetland	See plan sheets	0.0 AC		Restoration	1.7 WMU	1.7 WMU	1:1
Component Summation							
Restoration Level	Stream (LF)	Riparian Wetland (AC)		Non-riparian Wetland (AC)	Buffer (SF)	Upland (AC)	
		Riverine	Non-Riverine				
Restoration	3,274	2.8					
Enhancement I							
Enhancement II							
Creation							
Preservation							
High Quality Preservation							
BMP Elements							
Element	Location	Purpose/Function		Notes			
BMP Elements: BR= Bioretention Cell; SF= Sand Filter; SW= Stormwater Wetland; WDP= Wet Detention Pond; DDP= Dry Detention Pond; FS= Filter Strip; S= Grassed Swale; LS= Level Spreader; NI=Natural Infiltration Area							

Table 2. Project Activity and Reporting History			
St. Clair Creek Restoration Project: EEP Project No ID. 95015			
Activity or Report	Scheduled Completion	Data Collection Complete	Actual Completion or Delivery
Mitigation Plan Prepared	N/A	N/A	Jul-13
Mitigation Plan Amended	N/A	N/A	Sep-13
Mitigation Plan Approved	N/A	N/A	Oct-13
Final Design – (at least 90% complete)	N/A	N/A	Nov-13
Construction Begins	N/A	N/A	Dec-13
Temporary S&E mix applied to entire project area	N/A	N/A	N/A
Permanent seed mix applied to entire project area	N/A	N/A	Mar-14
Planting of live stakes	N/A	N/A	N/A
Planting of bare root trees	N/A	N/A	Apr-14
End of Construction	N/A	N/A	Apr-14
Survey of As-built conditions (Year 0 Monitoring-baseline)	N/A	May-14	Jun-14
Year 1 Monitoring	Dec-14	Dec-14	Dec-14
Year 2 Monitoring	Dec-15	N/A	N/A
Year 3 Monitoring	Dec-16	N/A	N/A
Year 4 Monitoring	Dec-17	N/A	N/A
Year 5 Monitoring	Dec-18	N/A	N/A
Year 6 Monitoring	Dec-19	N/A	N/A
Year 7 Monitoring	Dec-20	N/A	N/A

Table 3. Project Contacts Table	
St. Clair Creek Restoration Project: EEP Project ID No. 95015	
Designer	
Michael Baker International	797 Haywood Road, Suite 201 Asheville, NC 28806 <u>Contact:</u> Jacob Byers, Tel. 919-259-4814
Construction Contractor	
River Works, Inc.	6105 Chapel Hill Road Raleigh, NC 27607 <u>Contact:</u> Phillip Todd, Tel. 919-582-3575
Planting Contractor	
River Works, Inc.	6105 Chapel Hill Road Raleigh, NC 27607 <u>Contact:</u> Phillip Todd, Tel. 919-582-3575
Seeding Contractor	
River Works, Inc.	6105 Chapel Hill Road Raleigh, NC 27607 <u>Contact:</u> Phillip Todd, Tel. 919-582-3575
Seed Mix Sources	Green Resources, Tel. 336-855-6363
Nursery Stock Suppliers	Mellow Marsh Farm, 919-742-1200 ArborGen, 843-528-3204 Superior Tree, 850-971-5159
Monitoring Performers	
Michael Baker International	8000 Regency Parkway, Suite 600 Cary, NC 27518 <u>Contact:</u>
Stream Monitoring Point of Contact	Dwayne Huneycutt, Tel. 919-481-5745
Vegetation Monitoring Point of Contact	Dwayne Huneycutt, Tel. 919-481-5745
Wetland Monitoring Point of Contact	Dwayne Huneycutt, Tel. 919-481-5745

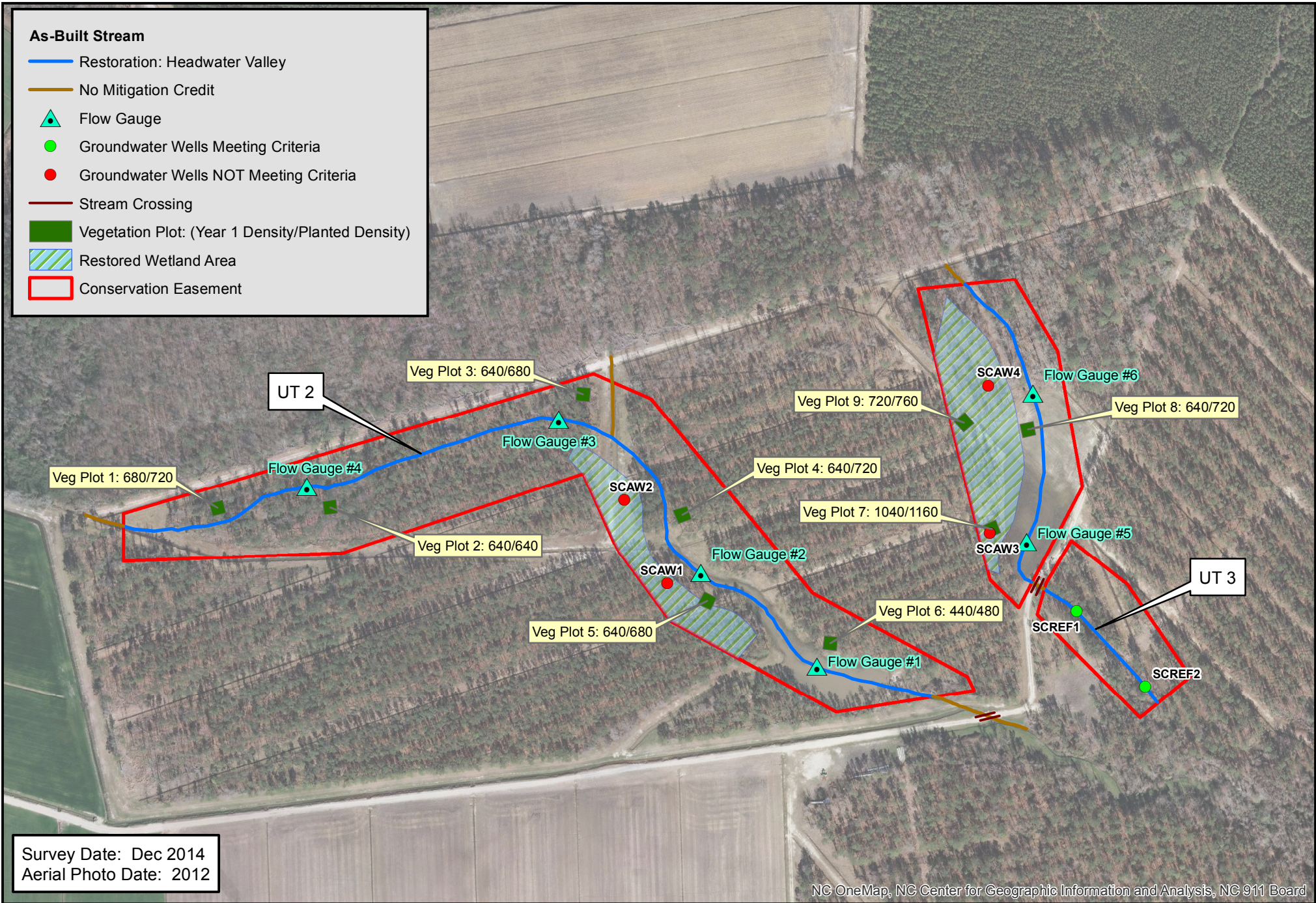
Table 4. Project Attributes			
St. Clair Creek Restoration Project: EEP Project ID No. 95015			
Project Information			
Project Name	St. Clair Creek Restoration Project		
County	Beaufort		
Project Area (acres)	17.5		
Project Coordinates (latitude and longitude)	35.452835 N, -76.76726215 W		
Watershed Summary Information			
Physiographic Province	Outer Coastal Plain		
River Basin	Tar-Pamlico		
USGS Hydrologic Unit 8-digit and 14-digit	03020104 / 03020104040040		
DWQ Sub-basin	03 03 07		
Project Drainage Area (AC)	89 (UT2), 30 (UT3)		
Project Drainage Area Percentage of Impervious Area	<1%		
CGIA Land Use Classification	3.02, Passively Managed Forest Stands, 2.01.01.07, Annual Row Crop Rotation;		
Stream Reach Summary Information			
Parameters	Reach UT2		Reach UT3
Length of Reach (LF)	2,133 (proposed) 2,660 (existing)		1,141 (proposed) 1,075 (existing)
Valley Classification (Rosgen)	X		X
Drainage Area (AC)	89		30
NCDWQ Stream Identification Score	36		20
NCDWQ Water Quality Classification	C; Sw, NSW		C; Sw, NSW
Morphological Description (Rosgen stream type)*	Channelized Headwater System (Perennial)		Channelized Headwater System (Intermittent)
Evolutionary Trend **	Restored G		Restored G
Underlying Mapped Soils	To, Hy, Ro		To, At
Drainage Class	Very poorly drained, poorly drained		Poorly drained, somewhat poorly drained
Soil Hydric Status	Hydric		Hydric
Average Channel Slope (ft/ft)	0.0006		0.0009
FEMA Classification	SFHA, AE		SFHA, AE
Native Vegetation Community	Coastal Plain Small Stream Swamp		Coastal Plain Small Stream Swamp
Percent Composition of Exotic/Invasive Vegetation	<5%		<5%
Wetland Summary Information			
Parameters	Wetland Along UT2		
Size of Wetland (AC)	1.1		
Wetland Type	Riparian Riverine		
Mapped Soil Series	To – Tomotley fine sandy loam		
Drainage Class	Poorly drained		
Soil Hydric Status	Hydric		
Source of Hydrology	Groundwater		
Hydrologic Impairment	Disconnected floodplain from ditches, lowered water table		
Native Vegetation Community	Coastal Plain Small Stream Swamp		
Percent Composition of Exotic/Invasive Vegetation	<5%		
Parameters	Wetland Along UT3		
Size of Wetland (AC)	1.7		
Wetland Type	Riparian Riverine		
Mapped Soil Series	To – Tomotley fine sandy loam		
Drainage Class	Poorly drained		
Soil Hydric Status	Hydric		
Source of Hydrology	Groundwater		
Hydrologic Impairment	Disconnected floodplain from ditches, lowered water table		
Native Vegetation Community	Coastal Plain Small Stream Swamp		
Percent Composition of Exotic/Invasive Vegetation	<5%		
Regulatory Considerations			
Regulation	Applicable	Resolved	Supporting Documentation**
Waters of the United States – Section 404	Yes	Yes	(Appendix B)
Waters of the United States – Section 401	Yes	Yes	(Appendix B)
Endangered Species Act	No	N/A	Categorical Exclusion (Appendix B)
Historic Preservation Act	No	N/A	Categorical Exclusion (Appendix B)
Coastal Zone Management Act (CZMA)/ Coastal Area Management Act (CAMA)	No	N/A	Categorical Exclusion (Appendix B)
FEMA Floodplain Compliance	Yes	Yes	(Appendix B)
Essential Fisheries Habitat	No	N/A	Categorical Exclusion (Appendix B)
Notes:			
* Due to its channelized nature, the stream would most appropriately be classified as a Rosgen G stream type but use of this classification system on this channel is questionable due to its highly altered state. ** Supporting documentation is including in the approved Final Mitigation Plan.			

Appendix B

Visual Assessment Data

As-Built Stream

- Restoration: Headwater Valley
- No Mitigation Credit
- ▲ Flow Gauge
- Groundwater Wells Meeting Criteria
- Groundwater Wells NOT Meeting Criteria
- Stream Crossing
- Vegetation Plot: (Year 1 Density/Planted Density)
- Restored Wetland Area
- Conservation Easement



Survey Date: Dec 2014
Aerial Photo Date: 2012

NC OneMap, NC Center for Geographic Information and Analysis, NC 911 Board

Table 5a. Visual Stream Morphology Stability Assessment										
St. Clair Creek Restoration Project: EEP Project ID No. 95015										
Reach ID: UT2										
Assessed Length (LF): 2,133										
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.
1. Bed	1. Vertical Stability	1. Aggradation			0	0	100%			
		2. Degradation			0	0	100%			
	2. Riffle Condition	1. Texture Substrate	0	0						
	3. Meander Pool Condition	1. Depth	0	0						
		2. Length	0	0						
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	0	0						
2. Thalweg centering at downstream of meander bend (Glide)		0	0							
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%
	2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely			0	0	100%	0	0	100%
	3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%	0	0	100%
	Totals					0	0	100%	0	0
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	0	0						
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	0	0						
	2a. Piping	Structures lacking any substantial flow underneath sill or arms	0	0						
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	0	0						
	4. Habitat	Pool forming structures maintaining - Max Pool Depth	0	0						

Table 5a. Visual Stream Morphology Stability Assessment											
St. Clair Creek Restoration Project: EEP Project ID No. 95015											
Reach ID: UT3											
Assessed Length (LF): 1,141											
Major Channel Category	Channel Sub-Category	Metric	Number Stable, Performing as Intended	Total Number per As-built	Number of Unstable Segments	Amount of Unstable Footage	% Stable, Performing as Intended	Number with Stabilizing Woody Veg.	Footage with Stabilizing Woody Veg.	Adjusted % for Stabilizing Woody Veg.	
1. Bed	1. Vertical Stability	1. Aggradation			0	0	100%				
		2. Degradation			0	0	100%				
	2. Riffle Condition	1. Texture Substrate	0	0							
		3. Meander Pool Condition	1. Depth	0	0						
		2. Length	0	0							
	4. Thalweg Position	1. Thalweg centering at upstream of meander bend (Run)	0	0							
2. Thalweg centering at downstream of meander bend (Glide)		0	0								
2. Bank	1. Scoured/Eroding	Bank lacking vegetative cover resulting simply from poor growth and/or scour and erosion			0	0	100%	0	0	100%	
		2. Undercut	Banks undercut/overhanging to the extent that mass wasting appears likely			0	0	100%	0	0	100%
		3. Mass Wasting	Banks slumping, caving or collapse			0	0	100%	0	0	100%
		Totals				0	0	100%	0	0	100%
3. Engineering Structures	1. Overall Integrity	Structures physically intact with no dislodged boulders or logs	0	0							
	2. Grade Control	Grade control structures exhibiting maintenance of grade across the sill	0	0							
	2a. Piping	Structures lacking any substantial flow underneath sill or arms	0	0							
	3. Bank Position	Bank erosion within the structures extent of influence does not exceed 15%	0	0							
	4. Habitat	Pool forming structures maintaining - Max Pool Depth	0	0							

Table 5b. Stream Problem Areas			
St. Clair Creek Restoration Project: EEP Project ID No. 95015			
Feature Issue	Station Number	Suspected Cause	Photo Number
None Observed	--	--	--

Table 6a. Vegetation Conditions Assessment						
St. Clair Creek Restoration Project: EEP Project ID No. 95015						
Reach ID: UT2						
Planted Acreage: 11.6						
Vegetation Category	Defintions	Mapping Threshold (acres)	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover both woody and herbaceous material.	0.1	NA	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4 or 5 stem count criteria.	0.1	NA	0	0.00	0.0%
Total				0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems or a size class that are obviously small given the monitoring year.	0.25	NA	0	0.00	0.0%
Cumulative Total				0	0.00	0.0%
Easement Acreage:						
Vegetation Category	Defintions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
5. Invasive Areas of Concern	Areas of points (if too small to render as p	1000 ft ²	NA	0	0.00	0.0%
6. Easement Encroachment Areas	Areas of points (if too small to render as p	none	NA	0	0.00	0.0%

Table 6a. Vegetation Conditions Assessment						
St. Clair Restoration Project: EEP Project ID No. 95015						
Reach ID: UT3						
Planted Acreage: 5.9						
Vegetation Category	Defintions	Mapping Threshold (acres)	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover both woody and herbaceous material.	0.1	NA	0	0.00	0.0%
2. Low Stem Density Areas	Woody stem densities clearly below target levels based on MY3, 4 or 5 stem count criteria.	0.1	NA	0	0.00	0.0%
Total				0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems or a size class that are obviously small given the monitoring year.	0.25	NA	0	0.00	0.0%
Cumulative Total				0	0.00	0.0%
Easement Acreage:						
Vegetation Category	Defintions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
5. Invasive Areas of Concern	Areas of points (if too small to render as p	1000 ft ²	NA	0	0.00	0.0%
6. Easement Encroachment Areas	Areas of points (if too small to render as p	none	NA	0	0.00	0.0%

Table 6b. Vegetation Problem Areas			
St. Clair Creek Restoration Project: EEP Project ID No. 95015			
Feature Issue	Station Number	Suspected Cause	Photo Number
None Observed	--	--	--



Photo Point 1 – UT2



Photo Point 2 – UT2



Photo Point 3 – UT2

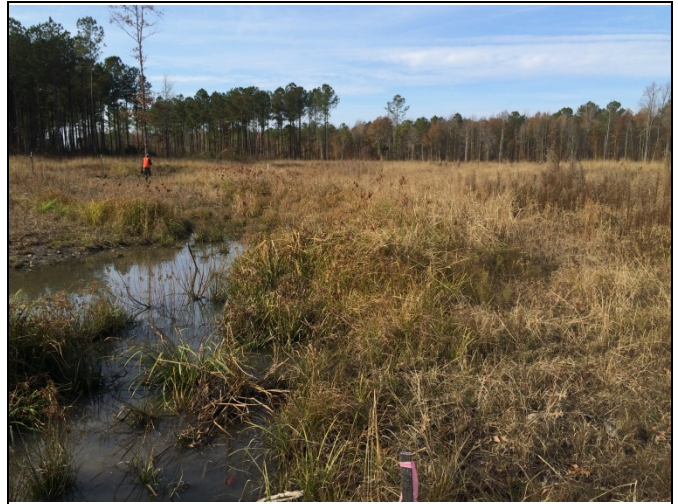


Photo Point 4 – UT2



Photo Point 5 – UT2



Photo Point 6 – UT2



Photo Point 7 – UT2



Photo Point 8 – UT2



Photo Point 9 – UT2



Photo Point 10 – UT2



Photo Point 11 – UT2



Photo Point 12 – UT2



Photo Point 13 – UT2



Photo Point 14 – UT2



Photo Point 15 – UT2



Photo Point 16 – UT3



Photo Point 17 – UT3



Photo Point 18 – UT3

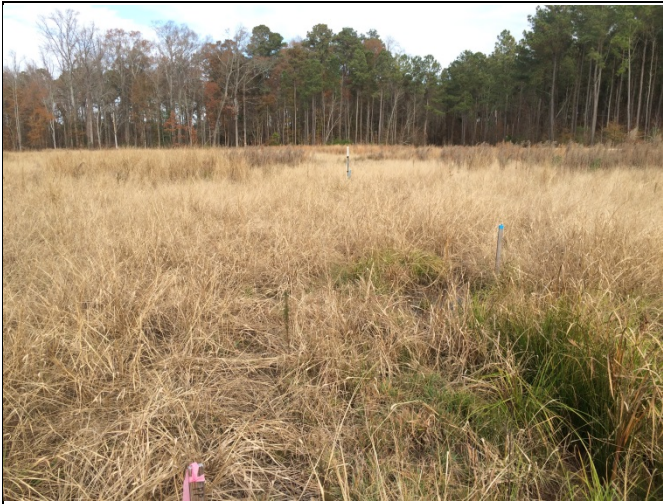


Photo Point 19 – UT3



Photo Point 20 – UT3



Photo Point 21 – UT3



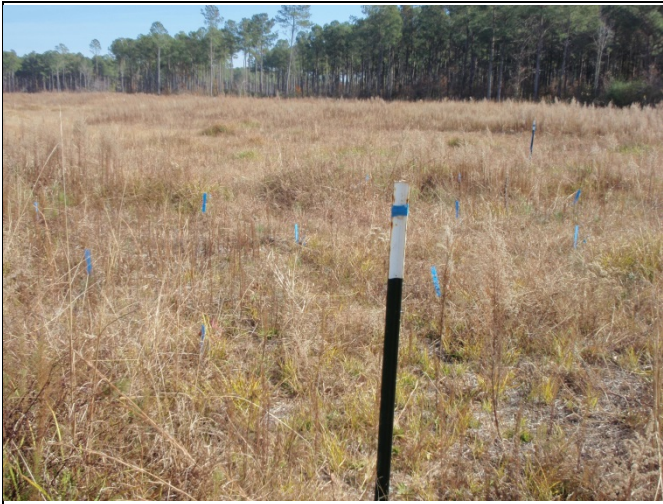
Photo Point 22 – UT3



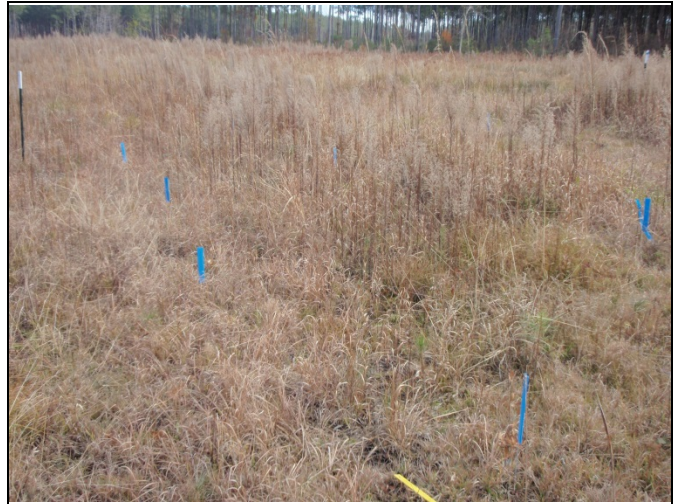
Photo Point 23 – UT3



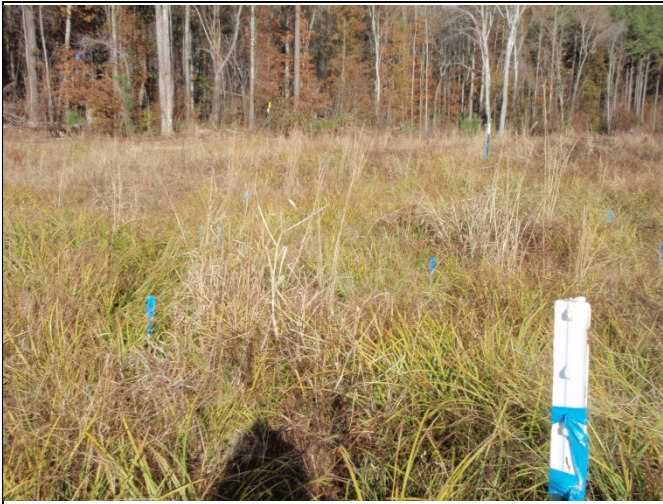
Photo Point 24 – UT3



Vegetation Plot 1



Vegetation Plot 2



Vegetation Plot 3



Vegetation Plot 4



Vegetation Plot 5



Vegetation Plot 6



Vegetation Plot 7



Vegetation Plot 8



Vegetation Plot 9



AUTO WELL – SCAW1



AUTO WELL – SCAW2



AUTO WELL – SCAW3



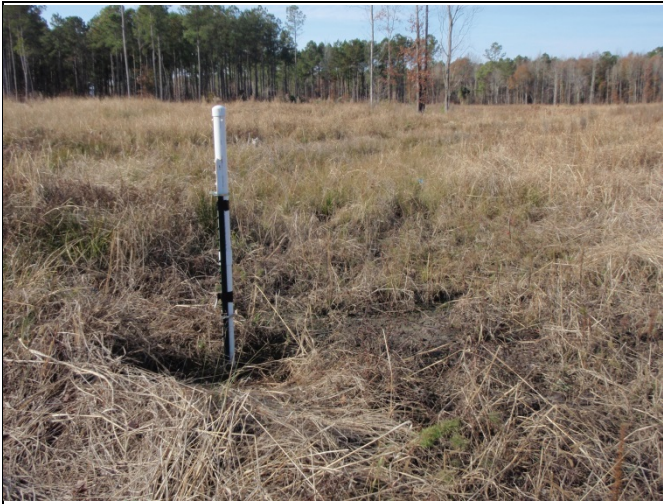
AUTO WELL – SCAW4



AUTO WELL – SCREF1



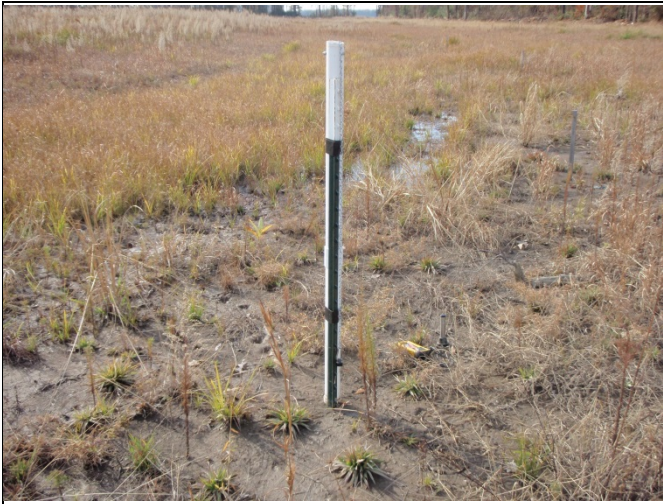
AUTO WELL – SCREF2



FLOW LOGGER – SCFL1



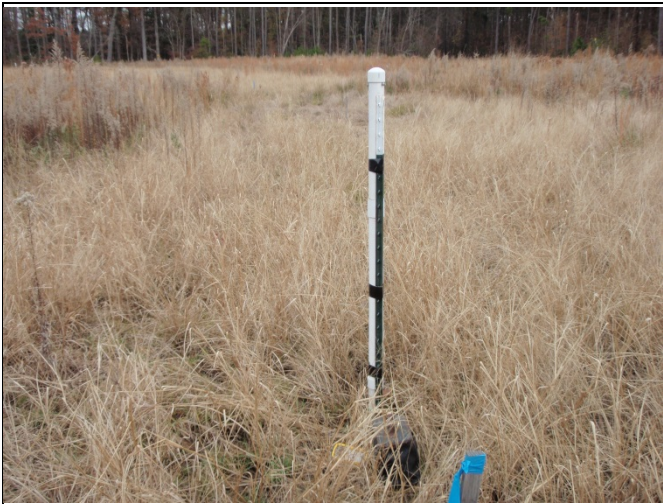
FLOW LOGGER – SCFL2



FLOW LOGGER – SCFL3



FLOW LOGGER – SCFL4



FLOW LOGGER – SCFL5



FLOW LOGGER – SCFL6

Appendix C

Vegetation Plot Data

Table 7. Vegetation Plot Criteria Attainment			
St. Clair Creek Restoration Project: EEP Project ID No. 95015			
Plot ID	Vegetation Survival Threshold Met?	Total/Planted Stem Count*	Tract Mean
1	Y	680/720	676
2	Y	640/640	
3	Y	640/680	
4	Y	640/720	
5	Y	640/680	
6	Y	440/480	
7	Y	1040/1160	
8	Y	640/720	
9	Y	720/760	
Note: *Total/Planted Stem Count reflects the changes in stem density based on the density of stems at the time of the As-Built Survey (Planted) and the current total density of planted stems (Total)			

Table 8. Vegetation Metadata

St. Clair Creek Restoration Project: EEP Project ID No. 95015

Report Prepared By Dwayne Huneycutt

Date Prepared 12/8/2014 13:50

database name cvs-eeep-entrytool-v2.3.1.mdb

database location L:\Monitoring\Veg Plot Info\CVS Data Tool\St Clair and UT to Cane Crk

computer name CARYLDHUNEYCUTT

file size 45842432

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 I A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.

PROJECT SUMMARY-----

Project Code 95015

project Name St Clair Creek Restoration Project

Description

River Basin Tar-Pamlico

length(ft)

stream-to-edge width (ft)

area (sq m)

Required Plots (calculated)

Sampled Plots 9

Table 9a. Planted Stems by Plot and Species
St. Clair Creek Restoration Project: EEP Project ID No. 95015

Comment	Species	Species Type	Common Name	Total Planted Stems		avg# stems	Plot									
				# plots			plot 95015-01-0001-year:1	plot 95015-01-0002-year:1	plot 95015-01-0003-year:1	plot 95015-01-0004-year:1	plot 95015-01-0005-year:1	plot 95015-01-0006-year:1	plot 95015-01-0007-year:1	plot 95015-01-0008-year:1	plot 95015-01-0009-year:1	
	<i>Aronia arbutifolia</i>	Shrub	Red Chokeberry	6	3	2		4						1		1
	<i>Carpinus caroliniana</i>	Shrub Tree	American hornbeam	3	2	1.5		1								2
	<i>Clethra alnifolia</i>	Shrub	coastal sweetpepperbush	1	1	1									1	
	<i>Cornus foemina</i>	Shrub Tree	stiff dogwood	2	2	1	1						1			
	<i>Fraxinus pennsylvanica</i>	Tree	green ash	4	3	1.33	2			1				1		
	<i>Morella cerifera</i>	Shrub Tree	wax myrtle	1	1	1							1		1	
	<i>Nyssa sylvatica</i>	Tree	blackgum	6	3	2	2	1						3		
	<i>Persea palustris</i>	Tree	swamp bay	6	2	3									2	4
	<i>Quercus laurifolia</i>	Tree	laurel oak	14	5	2.8			4	1	7				1	1
	<i>Quercus lyrata</i>	Tree	overcup oak	17	7	2.43	4	2	2		3			3	1	2
	<i>Quercus michauxii</i>	Tree	swamp chestnut oak	25	6	4.17	1	2		4	5	5		8		
	<i>Quercus phellos</i>	Tree	willow oak	11	5	2.2			2		1	1		4	3	
	<i>Taxodium distichum</i>	Tree	bald cypress	19	4	4.75		6	4	8		1				
	<i>Ulmus americana</i>	Tree	American elm	21	6	3.5	3		4	1		1		5		7
	Unknown	unknown		5	4	1.25	2					1		1	1	
	<i>Vaccinium corymbosum</i>	Shrub	highbush blueberry	5	3	1.67	1					1			3	
	<i>Viburnum dentatum</i>	Shrub Tree	southern arrowwood	6	4	1.5	1			1					3	1
TOT:	0	17	17	16	17		17	16	16	16	16	11	26	16	18	

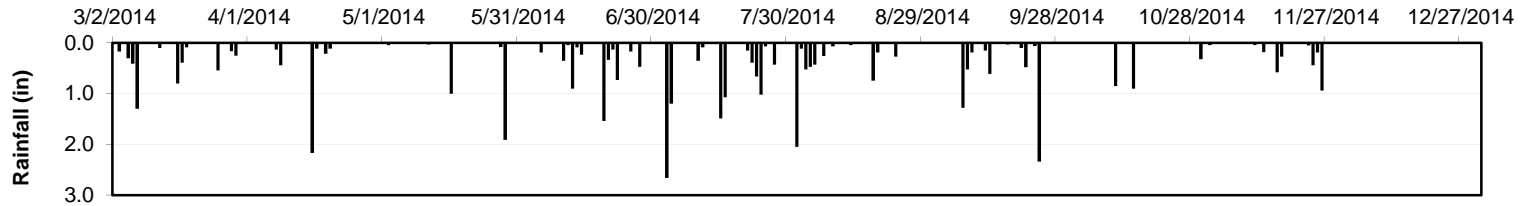
Table 9b. Yearly Denisty Per Plot																																
St. Clair Creek Restoration Project: EEP Project ID No. 95015																																
Scientific Name	Common Name	Species Type	Current Plot Data (MY1 2014)																								Annual Means					
			95015-01-0001			95015-01-0002			95015-01-0003			95015-01-0004			95015-01-0005			95015-01-0006			95015-01-0007			95015-01-0008			95015-01-0009			MY1 (2014)		
			PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Aronia arbutifolia	Red Chokeberry	Shrub				4	4	4													1	1	1				1	1	1	6	6	6
Carpinus caroliniana	American hornbeam	Tree				1	1	1																			2	2	2	3	3	3
Clethra alnifolia	coastal sweetpepperbush	Shrub																					1	1	1				1	1	1	
Cornus foemina	swamp dogwood	Shrub Tree	1	1	1													1	1	1									2	2	2	
Fraxinus pennsylvanica	green ash	Tree	2	2	2							1	1	1							1	1	1						4	4	4	
Morella cerifera	wax myrtle	shrub																					1	1	1				1	1	1	
Nyssa sylvatica	blackgum	Tree	2	2	2	1	1	1													3	3	3						6	6	6	
Persea palustris	swamp bay	tree																					2	2	2	4	4	4	6	6	6	
Quercus laurifolia	laurel oak	Tree							4	4	4	1	1	1	7	7	7						1	1	1	1	1	1	14	14	14	
Quercus lyrata	overcup oak	Tree	4	4	4	2	2	2	2	2	2				3	3	3				3	3	3	1	1	1	2	2	2	17	17	17
Quercus michauxii	swamp chestnut oak	Tree	1	1	1	2	2	2				4	4	4	5	5	5	5	5	5	8	8	8						25	25	25	
Quercus phellos	willow oak	Tree							2	2	2				1	1	1	1	1	1	4	4	4	3	3	3			11	11	11	
Taxodium distichum	bald cypress	Tree				6	6	6	4	4	4	8	8	8				1	1	1								19	19	19		
Ulmus americana	American elm	Tree	3	3	3				4	4	4	1	1	1				1	1	1	5	5	5				7	7	7	21	21	21
Unknown		Shrub or Tree	2	2	2													1	1	1	1	1	1	1	1	1			5	5	5	
Vaccinium corymbosum	highbush blueberry	Shrub	1	1	1													1	1	1				3	3	3			5	5	5	
Viburnum dentatum	southern arrowwood	Shrub	1	1	1							1	1	1									3	3	3	1	1	1	6	6	6	
Stem count			17	17	17	16	16	16	16	16	16	16	16	16	16	16	16	11	11	11	26	26	26	16	16	16	18	18	18	152	152	152
size (ares)			1			1			1			1			1			1			1			1			1			9		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.22		
Species count			9	9	9	6	6	6	5	5	5	6	6	6	4	4	4	7	7	7	8	8	8	9	9	9	7	7	7	17	17	17
Stems per ACRE			687.966	687.966	687.966	647.497	647.497	647.497	647.497	647.497	647.497	647.497	647.497	647.497	647.497	647.497	647.497	445.154	445.154	445.154	1052.18	1052.18	1052.18	647.497	647.497	647.497	728.434	728.434	728.434	683.469	683.469	683.469
Color for Density																																
Exceeds requirements by 10%																																
Exceeds requirements, but by less than 10%																																
Fails to meet requirements, by less than 10%																																
Fails to meet requirements by more than 10%																																

Table 9c. Stem Count for Each Species Arranged by Plot										
St. Clair Creek Restoration Project: EEP Project ID No. 95015										
Botanical Name	Common Name	Plots								
		1	2	3	4	5	6	7	8	9
Tree Species										
<i>Fraxinus pennsylvanica</i>	green ash	2			1			1		
<i>Nyssa sylvatica</i>	swamp tupelo	2	1					3		
<i>Quercus michauxii</i>	swamp chestnut oak	1	2		4	5	5	8		
<i>Quercus laurifolia</i>	laurel oak			4	1	7			1	1
<i>Quercus lyrata</i>	overcup oak	4	2	2		3		3	1	2
<i>Quercus phellos</i>	willow oak			2		1	1	4	3	
<i>Taxodium distichium</i>	bald cypress		6	4	8		1			
<i>Ulmus americana</i>	American elm	3		4	1		1	5		7
Shrub Species										
<i>Clethra alnifolia</i>	sweet pepperbush								1	
<i>Carpinus caroliniana</i>	ironwood		1							2
<i>Magnolia virginiana</i>	sweetbay magnolia									
<i>Persea palustris</i>	swamp bay							2		4
<i>Callicarpa americana</i>	beautyberry									
<i>Cornus foemina</i>	swamp dogwood	1					1			
<i>Morella cerifera</i>	wax Myrtle								1	
<i>Vaccinium corymbosum</i>	blueberry	1			1		1		3	
<i>Viburnum dentatum</i>	arrowwood	1							3	1
<i>Rosa palustris</i>	swamp rose									
<i>Ilex glabra</i>	inkberry									
<i>Aronia arbutifolia</i>	chokeberry		4					1		1
<i>Unknown</i>	N/A	2					1	1	1	
Volunteer Species										
<i>Unknown</i>	N/A									
Stems/plot		17	16	16	16	16	11	26	16	18
Stems/acre		688.0	647.5	647.5	647.5	647.5	445.2	1052.2	647.5	728.5
Total Stems/ Acre for Year 1 (Fall 2014)		683								
Total Stems/ Acre for Year 0 As-Built (Baseline Data)		729								

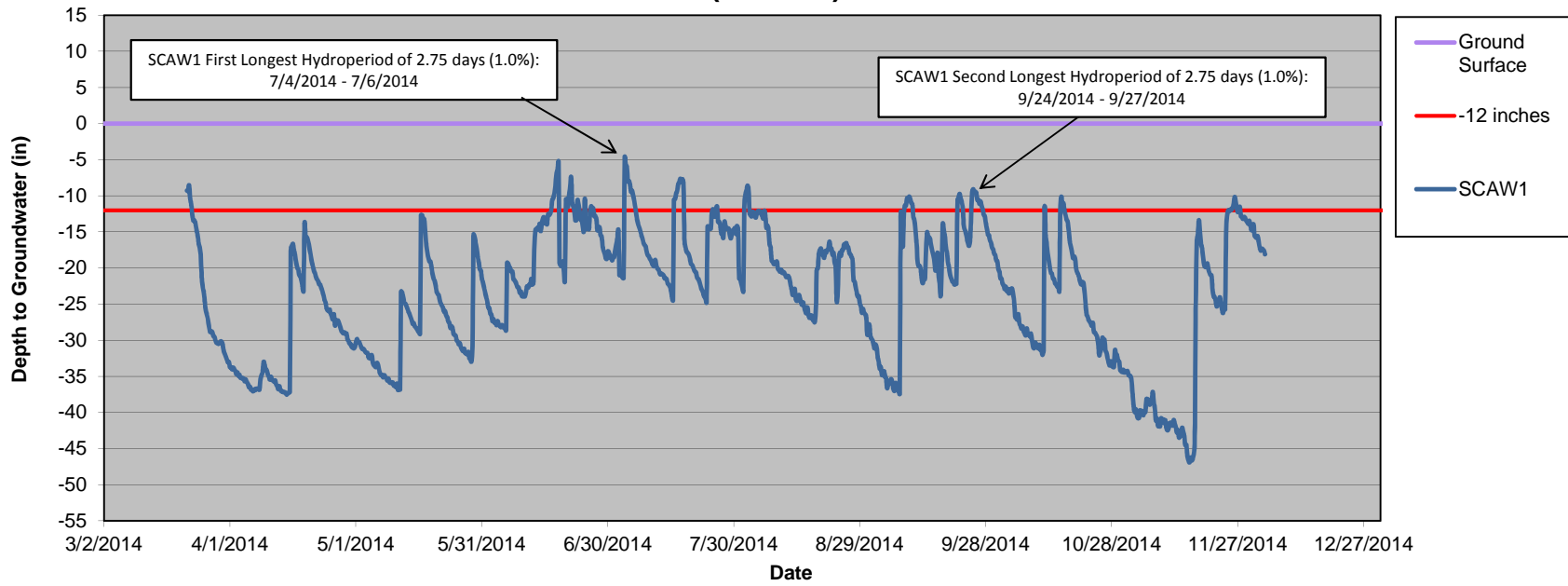
Appendix D

Hydrologic Data

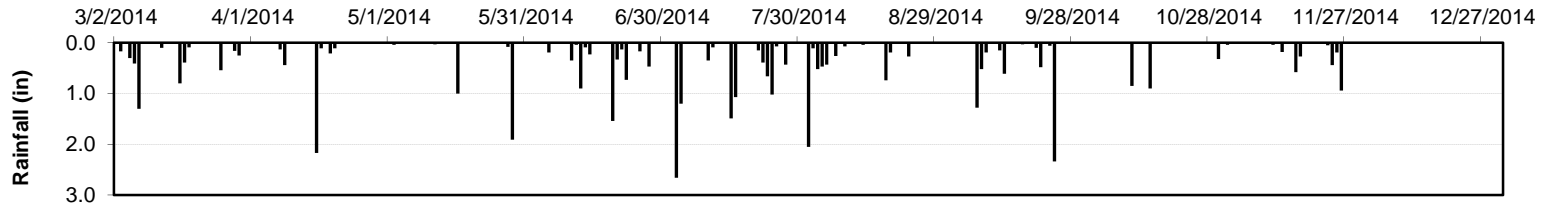
St. Clair Creek Rain (2014)



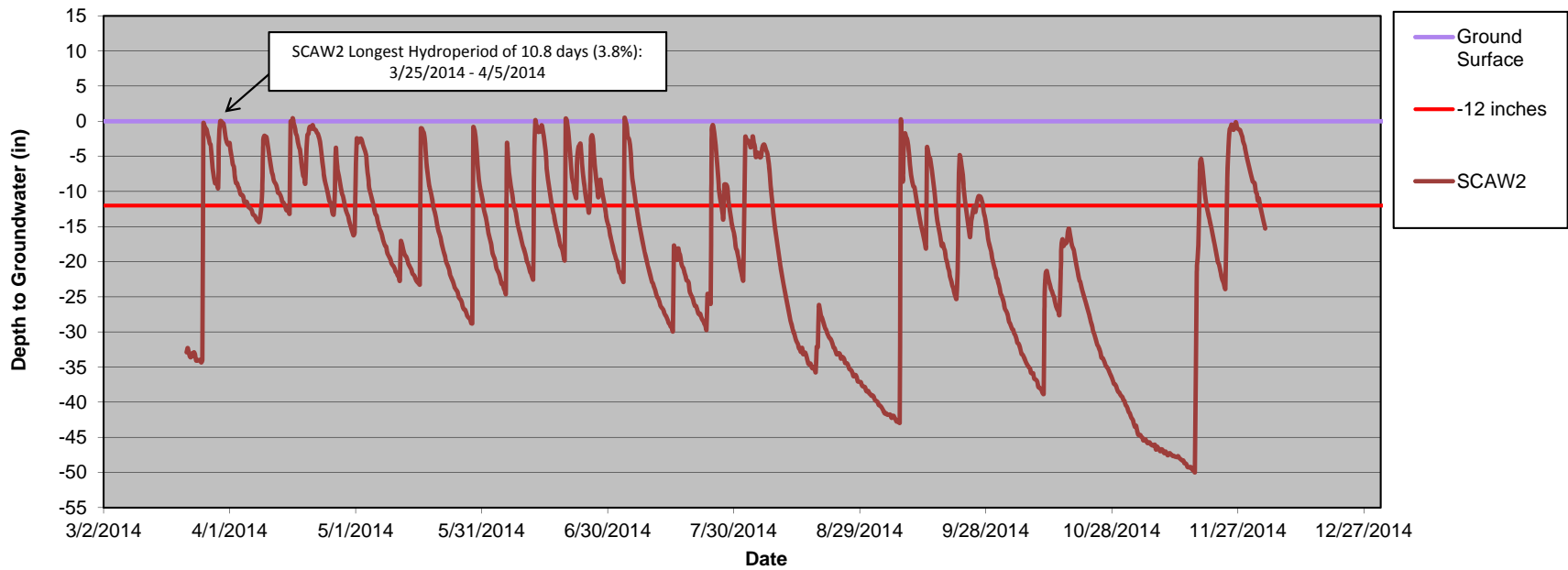
St. Clair Creek UT2 Well (SCAW1)



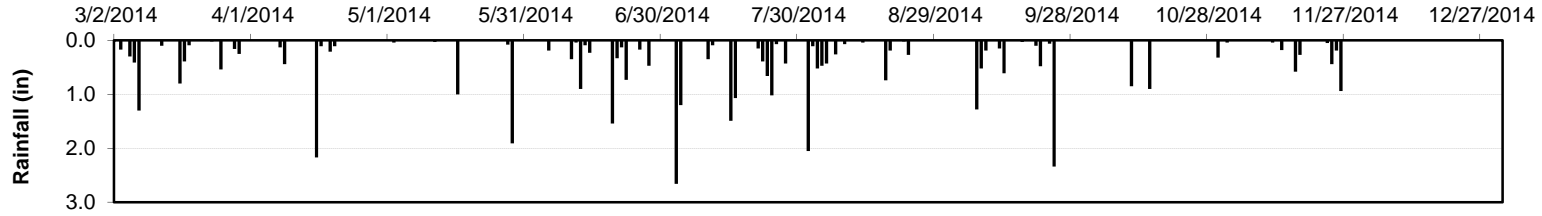
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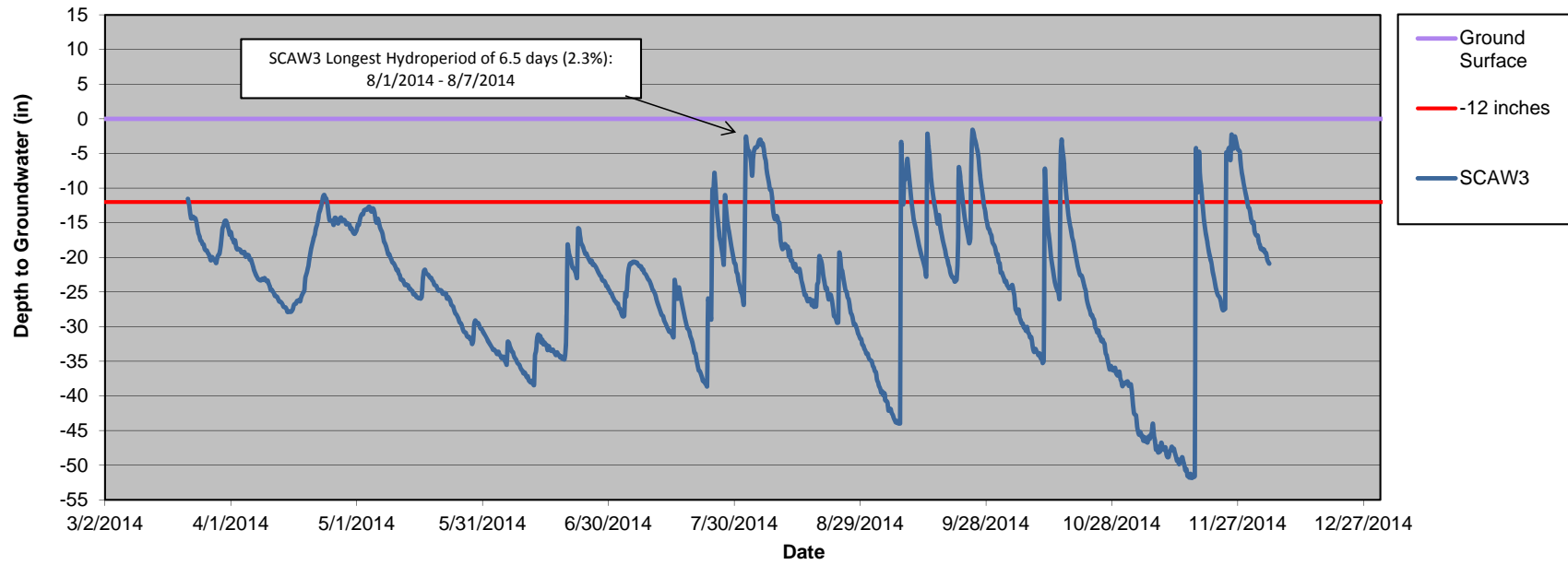
St. Clair Creek UT2 Well (SCAW2)



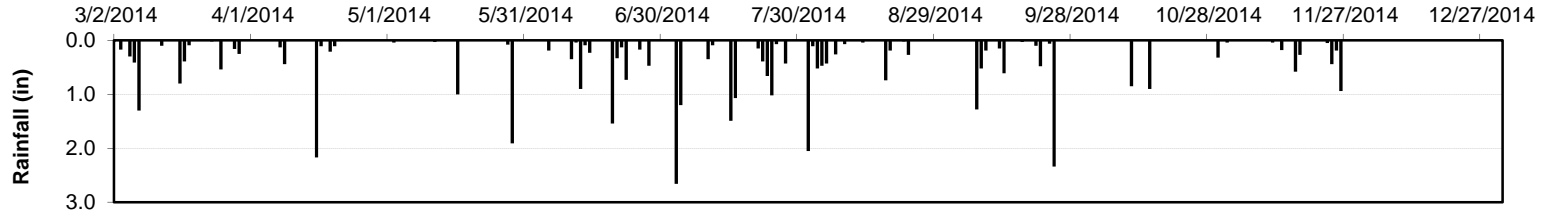
St. Clair Creek Rain (2014)



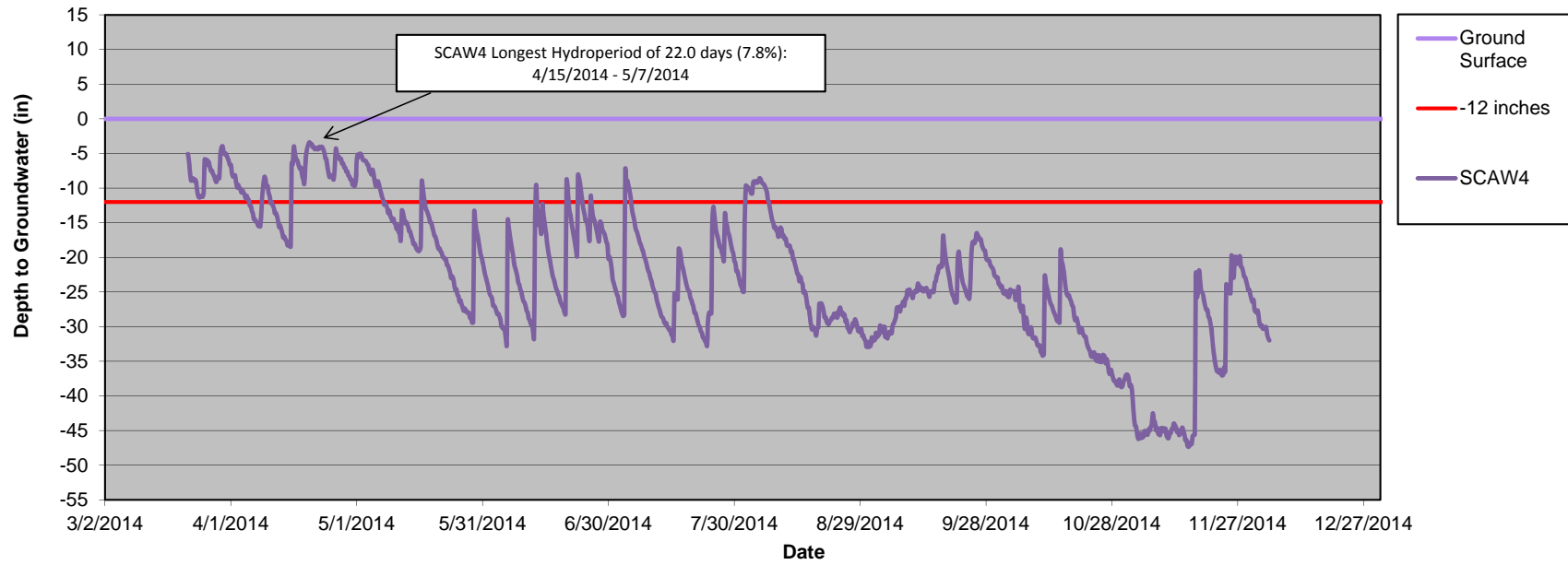
St. Clair Creek UT3 Well (SCAW3)



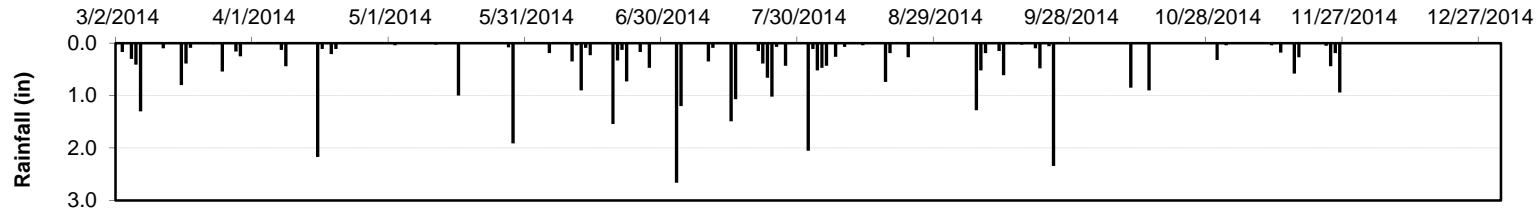
St. Clair Creek Rain (2014)



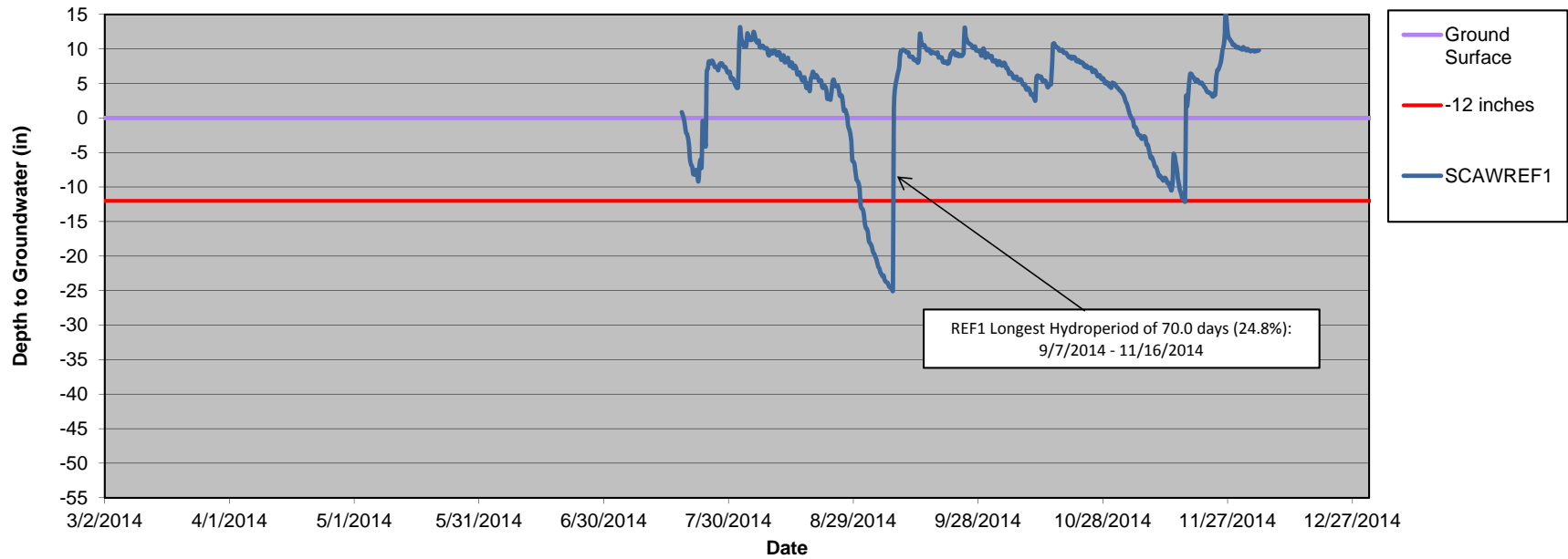
St. Clair Creek UT3 Well (SCAW4)



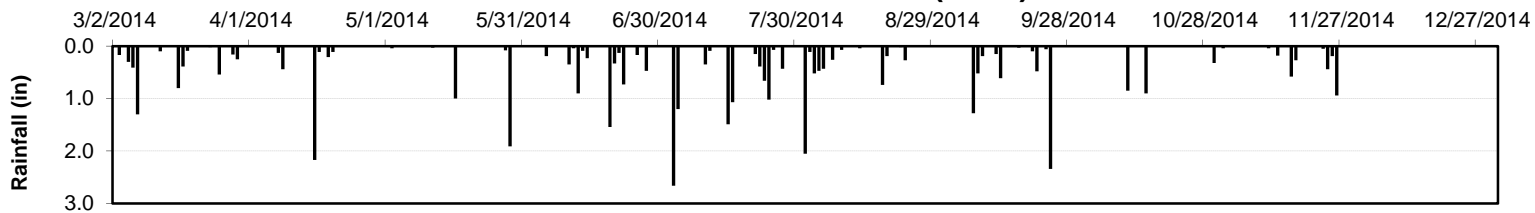
St. Clair Creek Rain (2014)



St. Clair Creek UT3 Reference Well (REF1)



St. Clair Creek Rain (2014)



St. Clair Creek UT3 Reference Well (REF2)

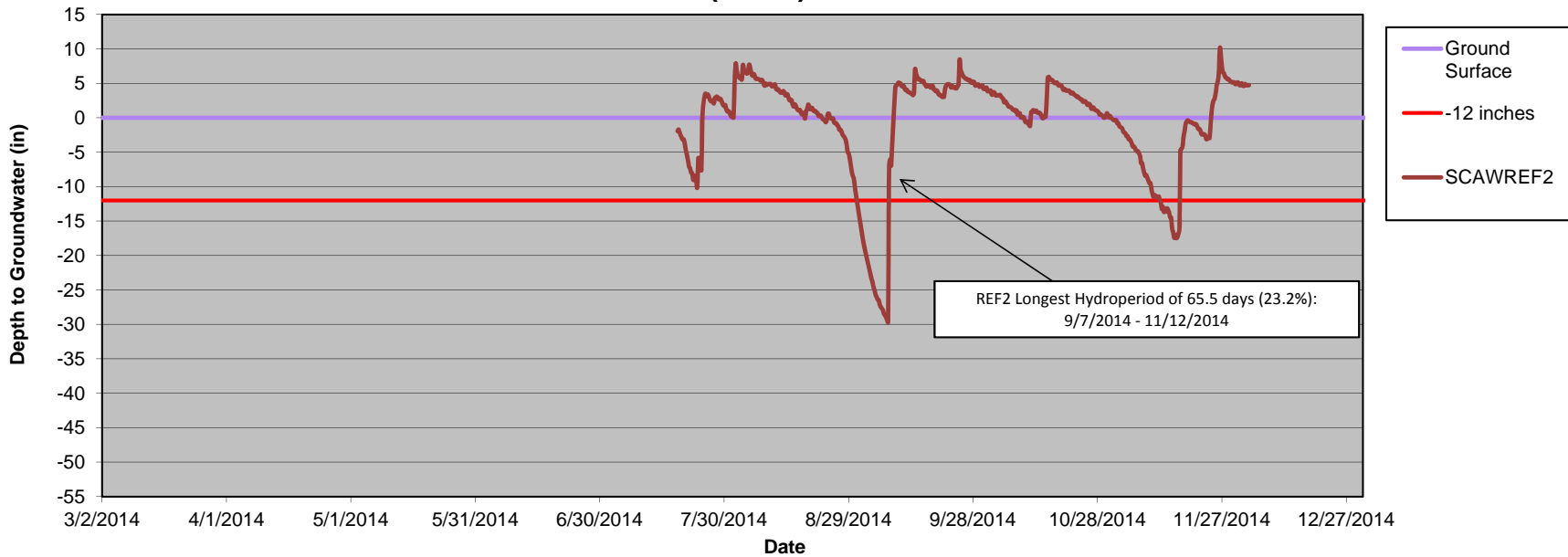
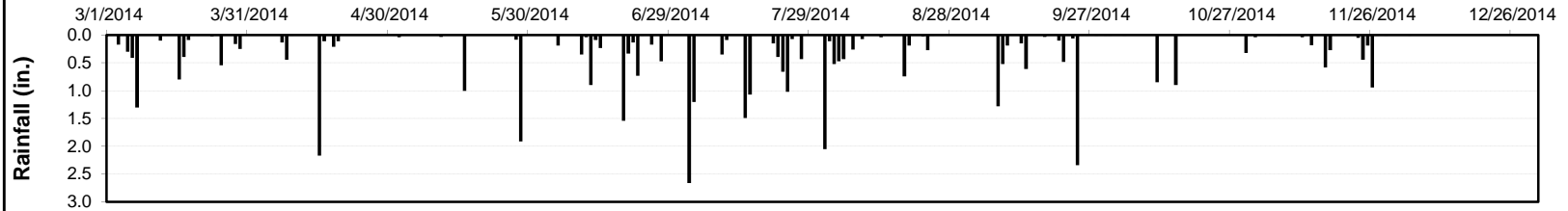
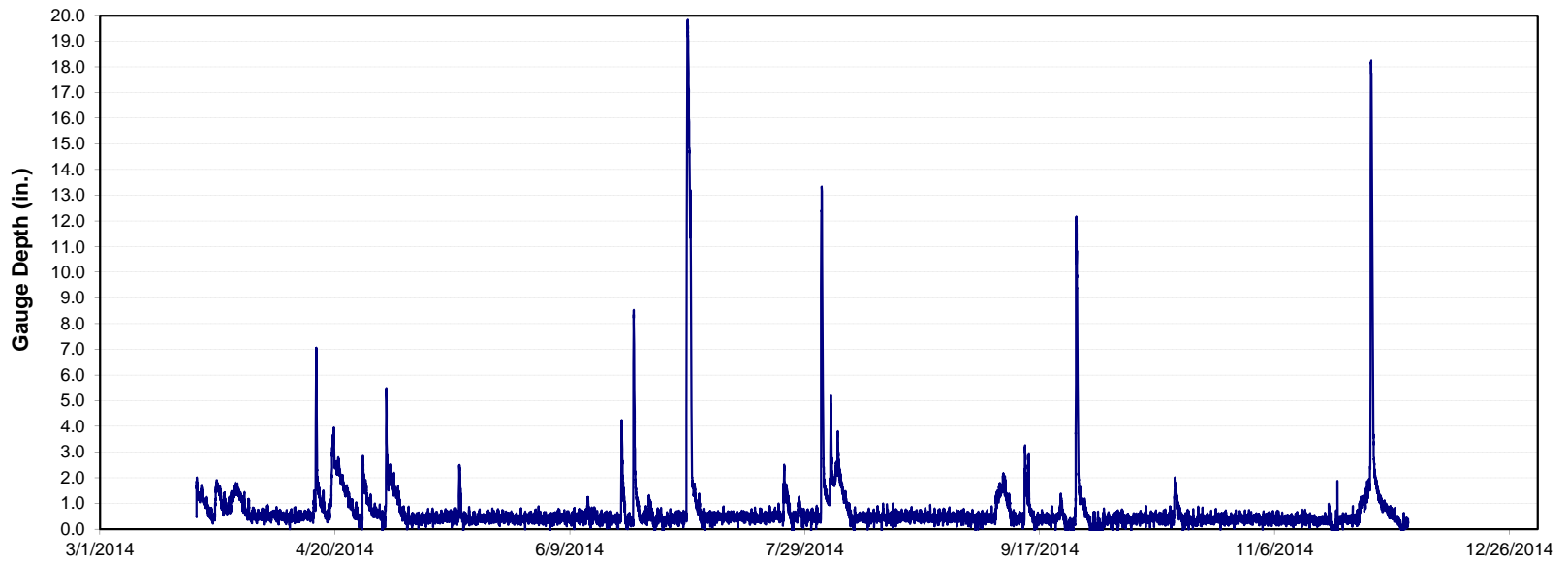


Table 10. Wetland Restoration Well Success					
St. Clair Creek Restoration Project: EEP Project ID No. 95015					
Well ID	Percentage of Consecutive Days <12 inches from Ground Surface¹	Consecutive Days Meeting Criteria²	Percentage of Cumulative Days <12 inches from Ground Surface³	Cumulative Days Meeting Criteria⁴	Number of Consecutive Instances Meeting Criteria⁵
Wetland Wells					
SCAW1	1.0	2.8	8.5	24.0	11.0
SCAW2	3.8	10.8	30.6	86.3	21.0
SCAW3	2.3	6.5	9.4	26.5	10.0
SCAW4	7.8	22.0	17.3	48.8	6.0
Reference Wells					
SCAWREF1	24.8	70.0	46.4	130.8	3.0
SCAWREF2	27.0	65.5	44.5	125.5	3.0
Notes:					
¹ Indicates the percentage of consecutive number of days within the monitored growing season with a water table 12 inches or less from the soil surface.					
² Indicates the consecutive number of days within the monitored growing season with a water table 12 inches or less from the soil surface.					
³ Indicates the percentage of cumulative number of days within the monitored growing season with a water table 12 inches or less from the soil surface.					
⁴ Indicates the cumulative number of days within the monitored growing season with a water table 12 inches or less from the soil surface.					
⁵ Indicates the number of consecutive instances within the monitored growing season when the water table rose to 12 inches or less from the soil surface.					
Growing season for Beaufort County is from February 28 to December 6 and is 282 days long.					
HIGHLIGHTED indicates wells that <i>did not</i> to meet the success criteria of 12% of the growing season within the monitored growing season with a water 12 inches or less from the soil surface. Wells that did not meet success criteria of 12% will be closely observed throughout the Year 2 (2015) growing season for any changes or conditions that could affect success.					
All In-Situ wetland monitoring dataloggers were installed on 3/21/2014. Reference wells installed on 7/17/2014.					

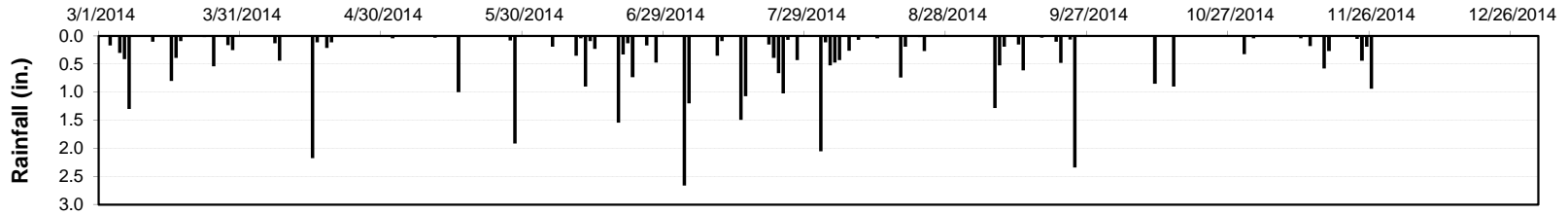
St. Clair Rain (2014)



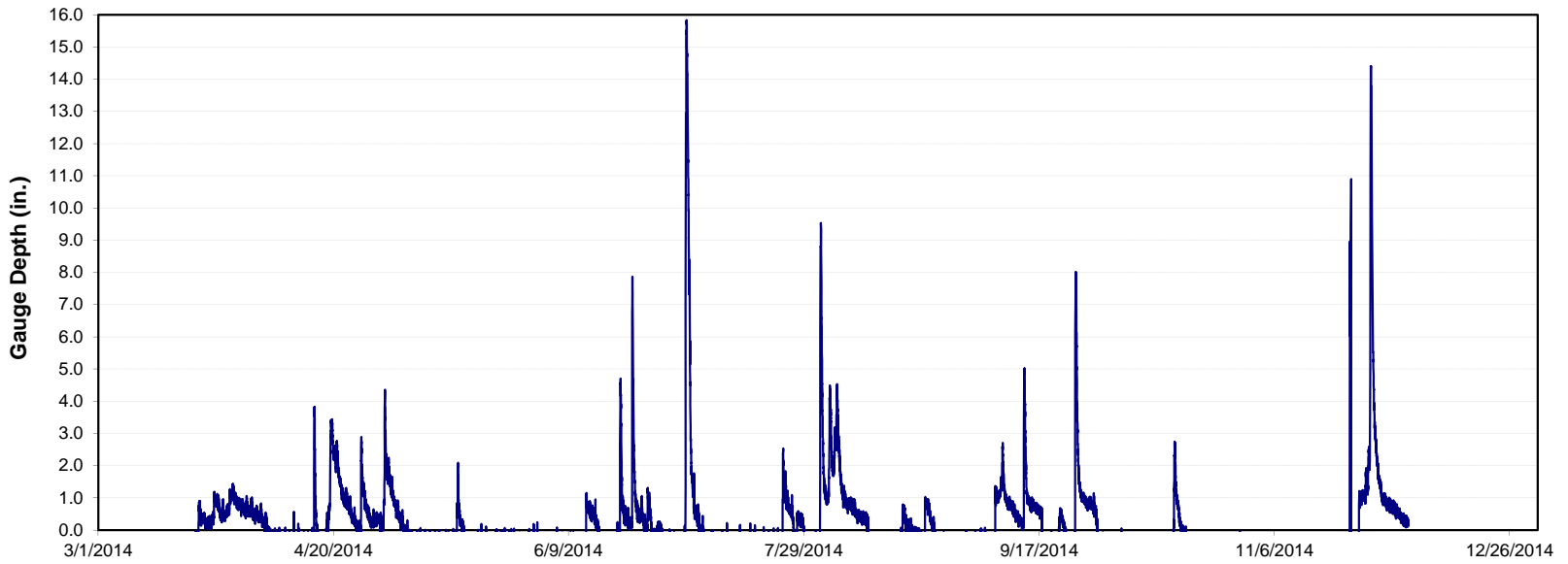
St. Clair Creek Flow Gauge SCFL1 (Downstream UT2)



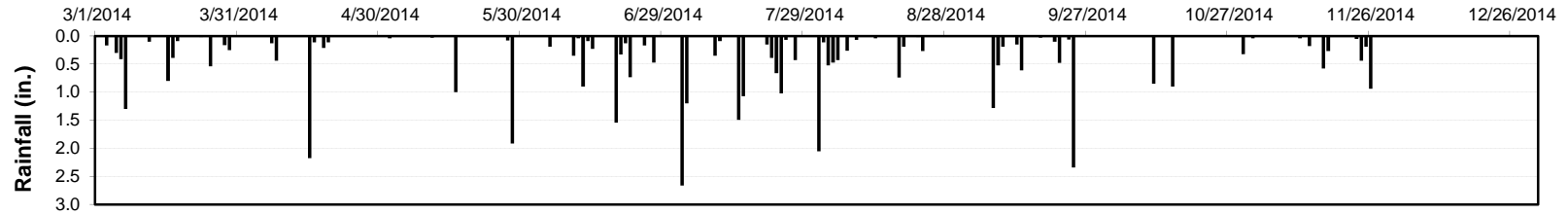
St. Clair Rain (2014)



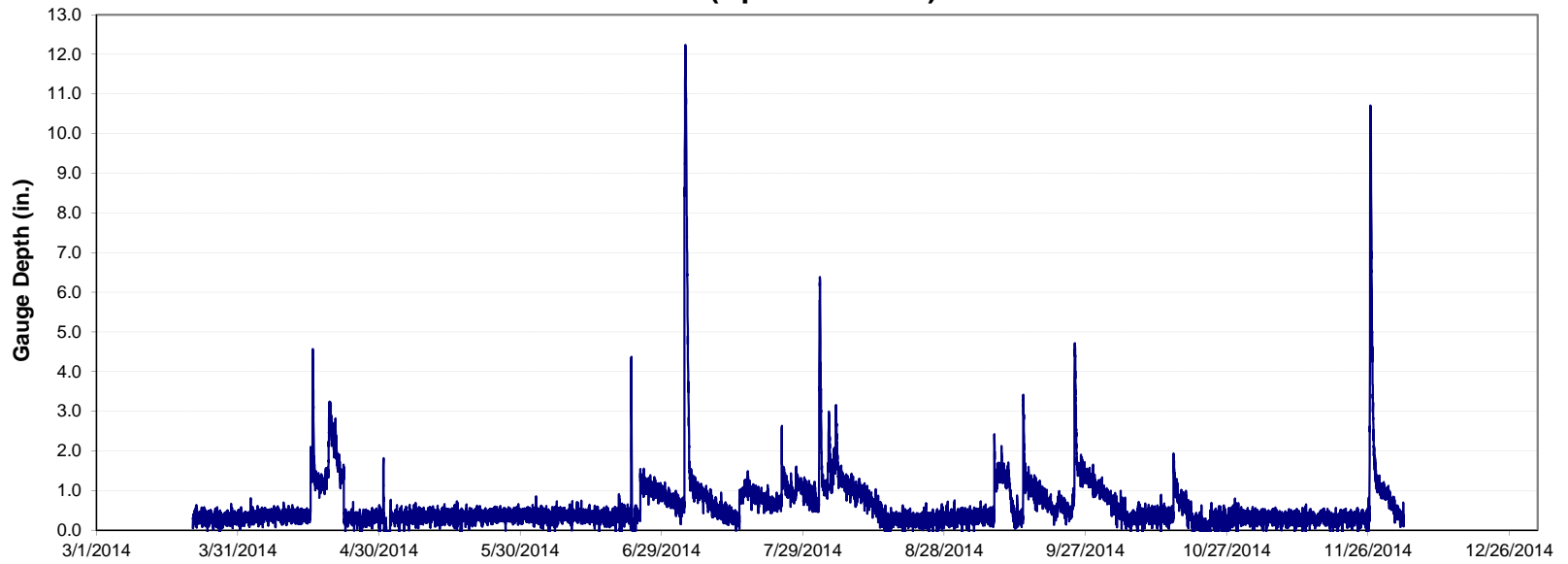
St. Clair Creek Flow Gauge SCFL2 (Downstream UT2)



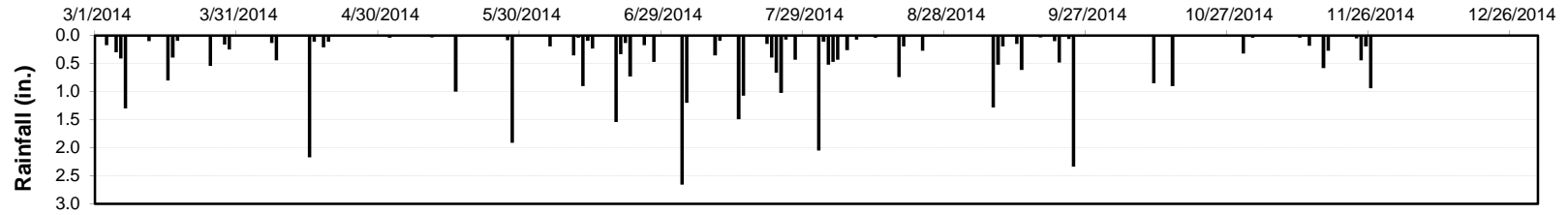
St. Clair Rain (2014)



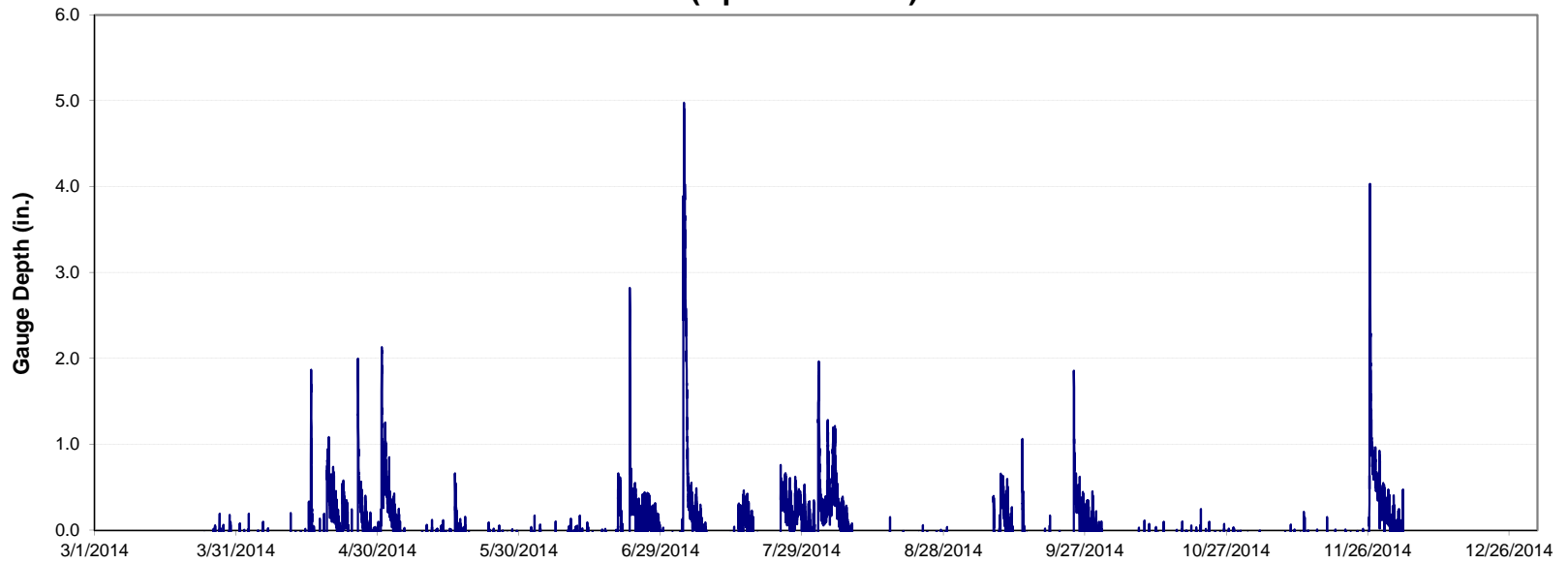
St. Clair Creek Flow Gauge SCFL3 (Upstream UT2)



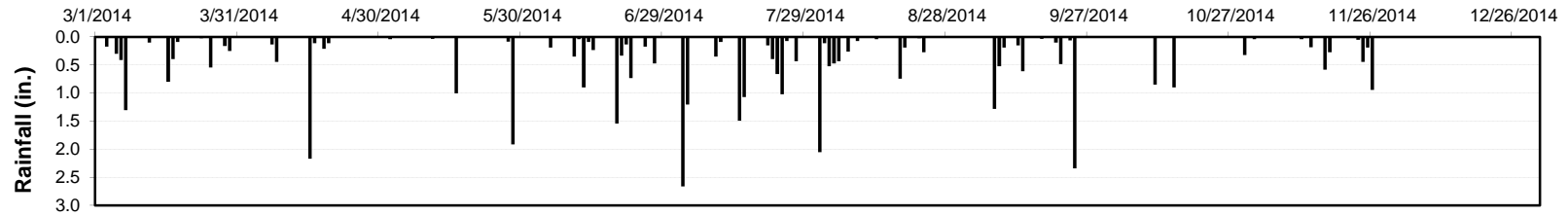
St. Clair Rain (2014)



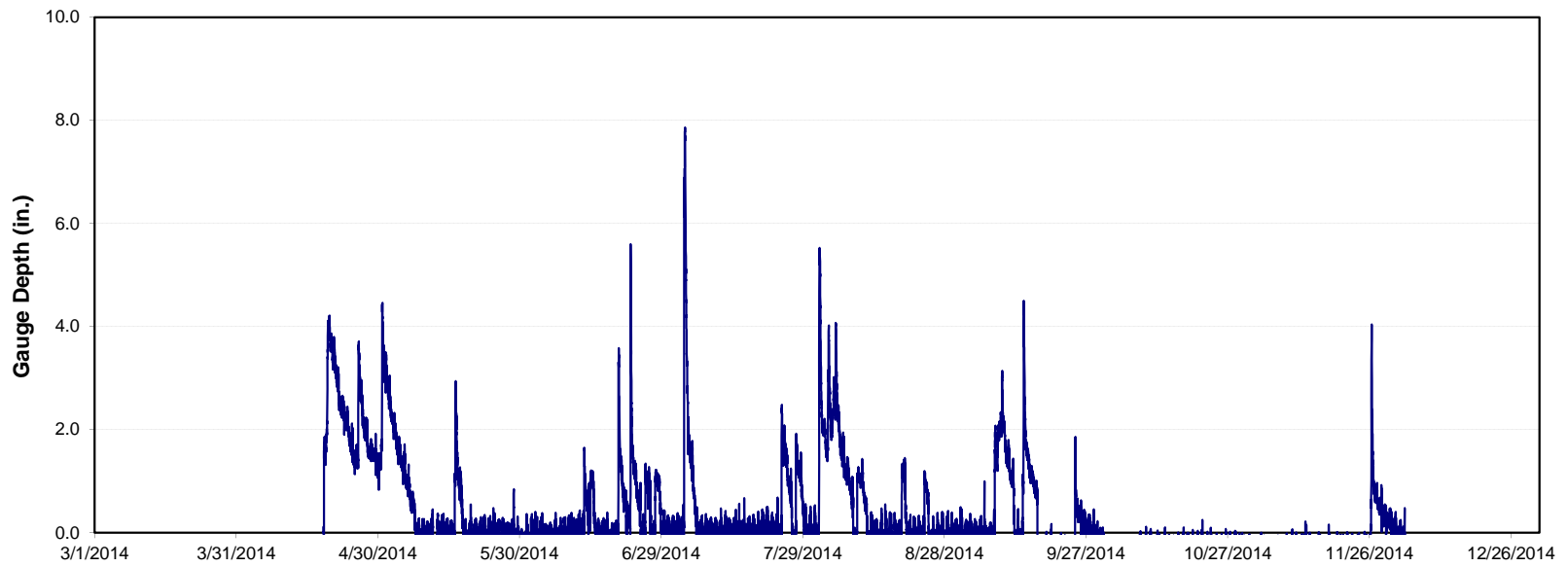
St. Clair Creek Flow Gauge SCFL4 (Upstream UT2)



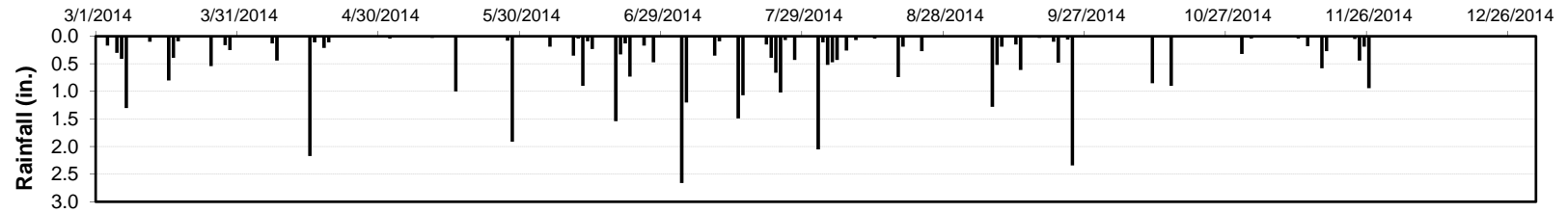
St. Clair Rain (2014)



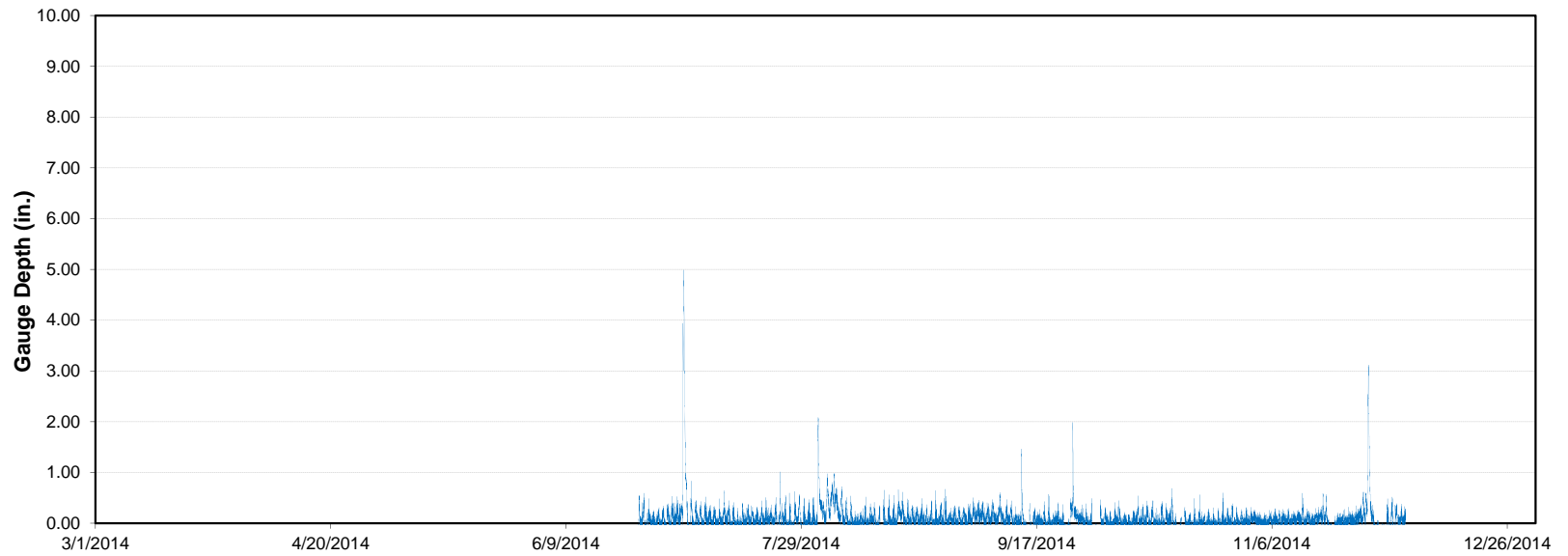
St. Clair Creek Flow Gauge SCFL5 (Downstream UT3)



St. Clair Rain (2014)



St. Clair Creek Site Groundwater Gauge Station SCFL6 (Downstream UT2)



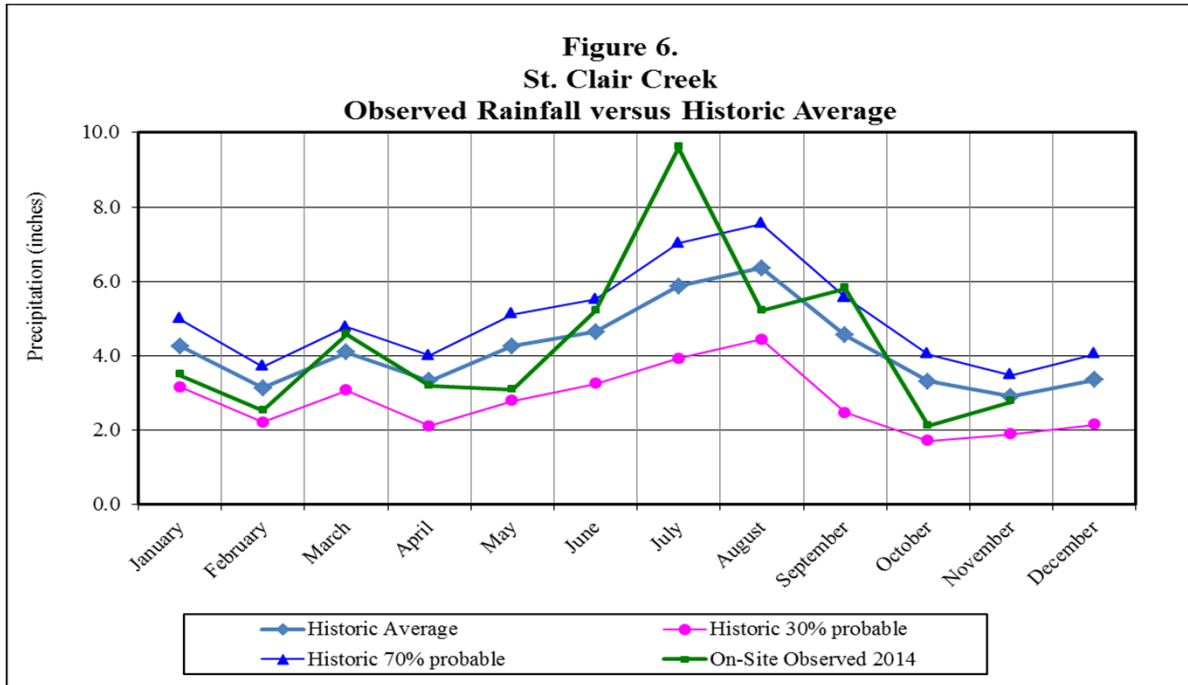


Table 11. St. Clair Creek Flow Gauge Success	
St. Clair Creek Restoration Project: Project ID No. 95019	
Well ID	Cumulative Days Meeting Criteria¹
UT2 Flow Gauges	
SCFL1	71.0
SCFL2	63.7
SCFL3	60.8
SCFL4	23.7
UT3 Flow Gauges	
SCFL5	56.8
SCFL6	4.6
Notes:	
¹ Indicates the percentage of cumulative number of days within the monitoring year where flow was measured.	

