

**Buffalo Flats Restoration Site
Monitoring Report MY03
EEP Project # 94647
EEP Contract # 003273**



Submitted to:



NCEEP, 1652 Mail Service Center, Raleigh, NC 27699-1652

**Construction Completed: October 2011
Data Collection: June 2014
Submitted: January 2015**

Monitoring and Design Firm



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1.0 EXECUTIVE SUMMARY / PROJECT ABSTRACT

The Buffalo Flats Restoration Site (BFRS) is a full-delivery project that was developed for the North Carolina Ecosystem Enhancement Program (EEP). Construction was completed in October 2011. The site is within the 03040105 Watershed Cataloging Unit (8-digit HUC) and the Local Watershed Unit (14-digit HUC) 03040105020050. In EEP's most recent publication of excluded and Targeted Local Watersheds/Hydrologic Units, this 14-digit HUC has been identified as a Targeted Local Watershed.

The project goals and objectives are listed below.

Project Goals

- Create diverse bottomland hardwood and low elevation seep communities that are integrated into the Dutch Buffalo Creek Corridor.
- Buffer nutrient and sediment impacts to Dutch Buffalo Creek from adjacent grazing practices.

Project Objectives

- Fill field ditches and ponds to slow the removal of hydrology from the site.
- Redevelop wetland microtopography to capture surface hydrology and slow subsurface drainage.
- Plant the mitigation area with species native to bottomland riparian forest and low elevation seep communities.
- Install livestock exclusion fencing.

The project site, which is protected by a 20.2-acre permanent conservation easement held by the State of North Carolina, is situated in Cabarrus County in the Southern Outer Piedmont ecoregion of the Piedmont physiographic province. The site is located on a single parcel located off of Gold Hill Road approximately six miles northeast of Concord, North Carolina.

An additional 2.6 acre permanent conservation easement located adjacent and contiguous with the project site is held by KCI Technologies and contains 1.6 acres of restored riparian wetlands. This site is monitored as an additional, non-creditable component of the site that is available to make up for any portions of the BFRS that do not achieve the target success criteria.

The BFRS provided mitigation for wetland impacts within Hydrologic Unit 03040105 by restoring, preserving, and creating 20.2 acres of wetland, generating 11.6 riparian wetland mitigation units (WMU's) and 3.4 non-riparian WMU's.

The BFRS will be monitored to determine if the project is on-track to meeting jurisdictional wetland status. In the restoration areas, the wetland site will be deemed successful once hydrology is established and vegetation success criteria are met. In the creation area, success will be achieved if wetland hydrology and vegetation are present along with indicators of hydric soils.

1.1 Vegetation Success Criteria

The wetland mitigation is comprised of four areas that combine preservation, creation, and restoration. The site will be monitored for at least seven years or until the success criteria are achieved. The success criteria for the planted species in mitigation areas will be based on density measured from monitoring plots. The site will demonstrate the re-establishment of targeted vegetative communities based on survival of planted species and volunteer colonization, with an average stem density of 320 stems/acre after three years, 288 stems/acre after four years, 260 stems/acre after five years, and 210 stems/acre after 7 years. To determine the success of the planted mitigation area, thirteen permanent vegetation monitoring plots

(10 by 10 meters) have been established in the wetland restoration and creation areas at a density that statistically represents the total mitigation acreage. Three of these plots are located in Wetland Area 1, nine of these plots are located in Wetland Area 2, and one plot is located in Wetland Area 3. The average density of these plots will determine whether the site meets the success criterion. Non-target species must not constitute more than 20% of the woody vegetation based on permanent monitoring plots.

The third-year vegetation monitoring was based on the Level 2 CVS-EEP vegetation monitoring protocol. The site's average density for this monitoring period was 607 planted stems/acre. Twelve of the thirteen plots had greater than 320 planted stems/acre. Including volunteers, the site averaged 1,806 total stems/acre. The site received supplemental planting in January 2013. During the second-year vegetation monitoring, some of the supplemental planted species may have been recorded as volunteers. During the 2014 monitoring season, KCI mapped the location of these species and recorded them as planted stems. Additionally an extra vegetation monitoring plot was installed in an adjacent restored wetland, which is described in Section 1.2. This vegetation plot was found to have a planted and total stem density of 1,052 total stems/acre.

1.2 Hydrology Success Criteria

Due to the inherent variability in the site's features and its geomorphic position, it is unlikely that the project will homogeneously exhibit common hydrologic conditions across the site, making a single hydrologic performance criterion unrepresentative of the sites performance. As such, the gauge data will be evaluated as a spatial average with each gauge representing the area half the distance to adjacent gauges or wetland type boundaries. The spatial average by wetland type will be the calculated value for comparison with the performance standard for credit validation. Gauges not achieving a minimum of 5% saturation will be considered non-attaining even if the spatial average exceeds the credit validation performance standard (5% for non-riparian and 10% for riparian).

The water table of the restored wetlands must be within 12" of the soils surface continuously for at least 5% (12 days) in the non-riparian wetland area (3.4 acres) and 10% (25 days) in the riparian wetland area (11.6 acres), (50% probability of reoccurrence) of the growing season during normal weather conditions. A "normal" year is based on NRCS climatological data for Cabarrus County, and using the 30th to 70th percentile thresholds as the range of normal, as documented in the USACE Technical Report "Assessing and Using Meteorological Data to Evaluate Wetland Hydrology" (Sprecher, 2000).

The growing season for Cabarrus County extends from March 23 to November 11 for a total of 233 days (NRCS 1995). An automatic recording gauge was installed on the site on May 23, 2013 to record the soil temperature at 30 cm below the ground surface. If these data demonstrate the soil temperature is above biological zero (43°F) beyond the 233 day range, it can be used to document the extended growing season (Skaggs, 2012). In the interest of being conservative, this data was used to define the beginning of the growing season and the Cabarrus County Soil Survey was used to define the end of it. For 2014 this resulted in a growing season of 249 days, beginning on March 8 and ending on November 11.

The daily rainfall data was obtained from a local weather station in Kannapolis, NC; provided by the NC State Climate Office. For the 2014-year, the months of March and April experienced above average rainfall, while May, August, and November experienced average rainfall. The months of June, July, September, and October recorded below average rainfall for the site. Overall, the area experienced below average rainfall during the 2014 growing season.

In addition to the wetlands that have been monitored at this site so far, there is also a small 1.2 acre riparian wetland that is contiguous to and was restored at the same time as this site. This additional wetland area is within an adjacent 2.6 acre conservation easement held by KCI Technologies, but is not included in the creditable assets for this site. One additional wetland gauge was installed in this restored riparian wetland on March 20, 2014. This wetland will be monitored as an additional component of the site that is not creditable, but is considered an ancillary benefit/feature of the site. During the site's third growing season, all eight wells in the riparian areas met the success criterion of having saturated soil conditions occurring within 12 inches of the ground surface for a minimum continuous period of 10% (23 days) of the growing season during average climatic conditions. All three wells in the non-riparian areas met the success criterion of 5% (12 days) of the growing season. Additionally, the extra well met the hydrology success criteria with 46 consecutive days of saturated soil conditions. Overall, wetland hydrology was achieved at all eleven groundwater monitoring gauges in the riparian and non-riparian restoration areas.

1.3 Soil Success Criteria

Beginning in Monitoring Year 2, soils were monitored within the 1.2 acre wetland creation area on site. Two permanent monitoring plots were established adjacent to Well 6 and Well 7 and soil profiles will be monitored yearly for evidence of the development of redoximorphic features by a licensed soil scientist. Soil profiles will be compared from year to year and changes will be documented in the yearly monitoring reports. Although several studies exist in the scientific literature that investigate temporal changes in soils resulting from wetland creation projects, there are no studies that suggest that jurisdictional hydric soils will develop under the appropriate hydrology conditions within the seven-year monitoring period. As such, KCI will monitor the soils for changes in chroma, organic matter content and document other indications that the soil is subject to low oxygen conditions. These indicators would include oxidized root channels, concretions, mottles and other observations that suggest the soil is subject to low oxygen conditions etc.

A detailed soils profile description was conducted at two permanent monitoring plots by a licensed soil scientist (# 187) on July 14, 2014. Both soil plots met the hydric soil criteria with an indicator of redox depressions (F8). Additionally, evidence that the seasonal high water table has continued to develop more fully can be seen in the increased mottling present in the soil this year. No mottles were reported within either soil profile during MY-02, but during the current year, mottles ranging from 5 – 20% of their respective soil horizons were reported, especially within the upper 12 inches of the soil. This indicates the continuation of anaerobic conditions in the soil caused by saturated conditions. See Appendix E for both soil profile descriptions.

Summary information/data related to the occurrence of items such as beaver or encroachment and statistics related to performance of various project and monitoring elements can be found in 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 documents available on the EEPs website. All raw data supporting the tables and figures in the appendices are available from EEP upon request.

2.0 METHODOLOGY

The CVS-EEP protocol, Level 2 (<http://cvs.bio.unc.edu/methods.htm>) was used to collect vegetation data from the site. The vegetation monitoring was completed on June 23, 2014.

3.0 REFERENCES

Lee, M.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>)

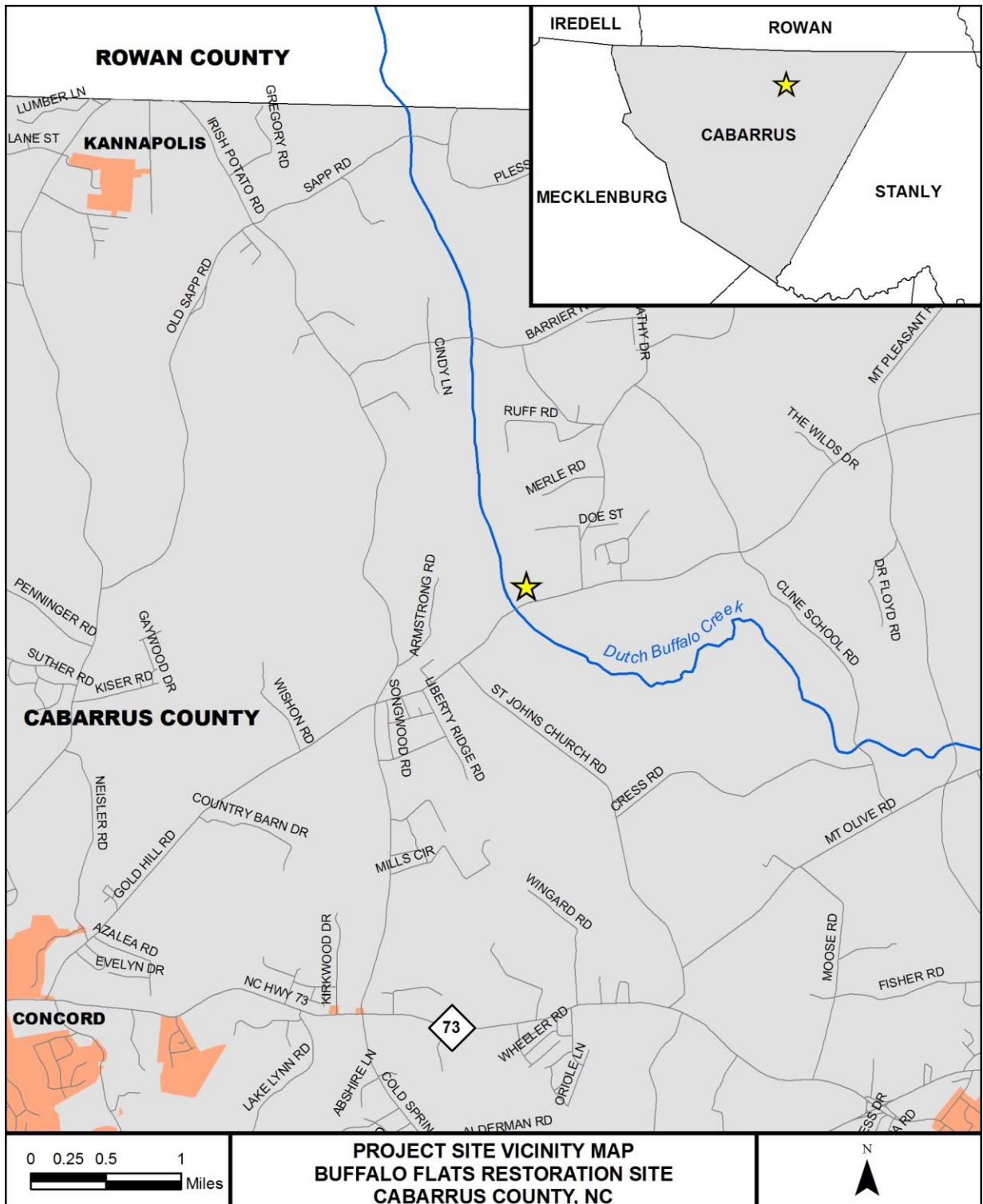
USACE. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

Skaggs, R. Wayne. 2012. Effect of Growing Season on the Criterion for Wetland Hydrology. Society of Wetland Scientists. Wetlands 32:1135–1147

Sprecher, S. W. and Warne, A. G. 2000. "Accessing and Using Meteorological Data to Evaluate Wetland Hydrology," ERDC/EL TR-WRAP-00-01, U.S. Army Engineer Research and Development Center, Vicksburg, MS.

Appendix A

Project Vicinity Map and Background Tables



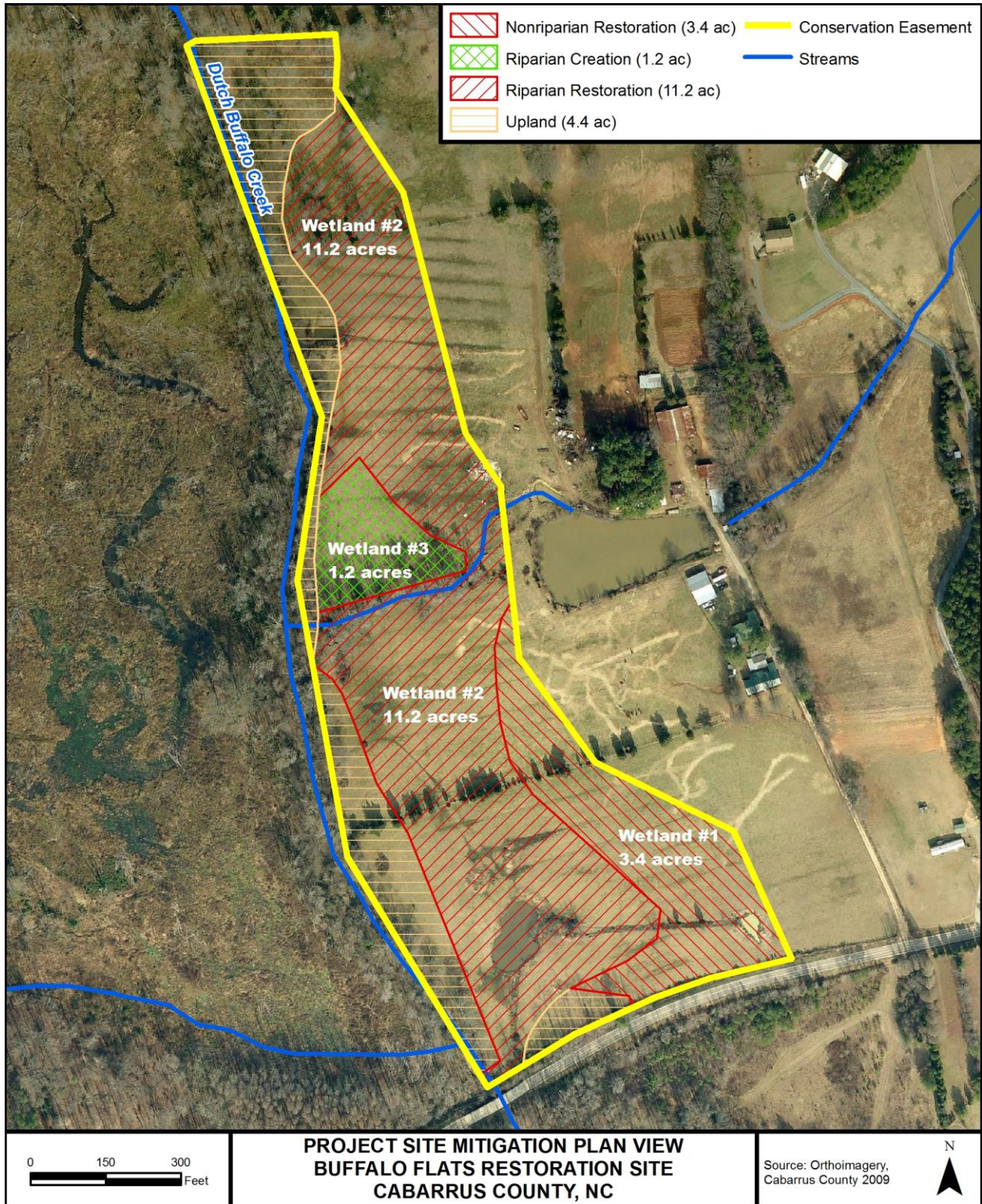


Table 1. Project Components									
Project Number and Name: 94647 - Buffalo Flats Restoration Site									
Mitigation Credits									
	Stream		Riparian Wetland		Non-riparian Wetland		Buffer	Nitrogen Nutrient Offset	Phosphorous Nutrient Offset
Type	R	RE	R	RE	R	RE			
Acres	-	-	11.2	1.2	3.4	-			
Credits	-	-	11.2	0.4	3.4	-	-	-	-
TOTAL CREDITS			11.6		3.4				
Project Components									
Project Component -or- Reach ID	Stationing/ Location		Existing Footage/ Acreage		Approach (PI, PII etc.)		Restoration -or- Restoration Equivalent	Restoration Footage or Acreage	Mitigation Ratio
Wetland Area 1	Southeastern corner of project		3.4 acres		-		Restoration	3.4 acres	1:1
Wetland Area 2	North to south throughout the center of project		11.2 acres		-		Restoration	11.2 acres	1:1
Wetland Area 3	West-central portion of the project		1.2 acres		-		Creation	1.2 acres	3:1
Component Summation									
Restoration Level	Stream (linear feet)		Riparian Wetland (acres)		Non-riparian Wetland (acres)		Buffer (square feet)	Upland (acres)	
			Riverine	Non-Riverine					
Restoration	-		11.2 acres	-	3.4 acres		-	-	
Enhancement			-	-			-	-	
Enhancement I	-								
Enhancement II	-								
Creation			1.2 acres	-	-			-	
Preservation	-		-	-	-			4.4 acres	
High Quality Preservation	-		-	-	-			-	
TOTAL			12.4 acres	-	3.4 acres			4.4 acres	

Table 2. Project Activity & Reporting History		
Project Number and Name: 94647 - Buffalo Flats Restoration Site		
Elapsed Time Since Grading Complete: 3 yr 2 months		
Elapsed Time Since Planting Complete: 2 yr 9 months		
Number of Reporting Years: 3		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
Mitigation Plan		Dec 10
Final Design - Construction Plans		Dec 10
Construction		Oct 11
Planting		Feb 12
Baseline Monitoring/Report	Feb/March 12	July 12
Year 1 Monitoring	Oct 12	Dec 12
Supplemental Planting		Jan 13
Soil temperature gauge installed		May 13
Invasive Species Maintenance		Aug13
Year 2 Monitoring	Oct 13	Dec 13
Year 3 Monitoring	June 14	Nov 14

Table 3. Project Contacts	
Project Number and Name: 94647 - Buffalo Flats Restoration Site	
Design Firm	KCI Associates of North Carolina, PA Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
Construction Contractor	KCI Environmental Technologies and Construction, Inc. Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
Planting Contractor	Bruton Nurseries and Landscapes PO Box 1197 Freemont, NC 27830 Contact: Mr. Charlie Bruton Phone: (919) 242-6555
Monitoring Performers	
MY00-MY03	KCI Associates of North Carolina, PA Landmark Center II, Suite 220 4601 Six Forks Rd. Raleigh, NC 27609 Contact: Mr. Adam Spiller Phone: (919) 278-2514 Fax: (919) 783-9266

Table 4. Project Attribute Table
Project Number and Name: 94647 – Buffalo Flats Restoration Site

County	Cabarrus County		
Project Area (acres)	20.20 acres		
Project Coordinates (lat. and long.)	35.456988 N , -80.496325 W		
Project Watershed Summary Information			
Physiographic Province	Piedmont		
River Basin	Yadkin-Pee Dee		
USGS Hydrologic Unit 8-digit	03040105	USGS Hydrologic Unit 14-digit	03040105020050
DWQ Sub-basin	03-07-12		
Project Drainage Area (acres)	106 acres		
Project Drainage Area Percentage of Impervious Area	1%		
CGIA Land Use Classification	3.6% Cultivated, 54.1% Managed Herbaceous Cover, 32.5% Mixed Upland Hardwoods, 5.2% Southern Yellow Pine, and 4.6% Water Bodies		
Wetland Summary Information			
Parameters	Wetland Area 1	Wetland Area 2	Wetland Area 3
Size of Wetland (acres)	3.4 acres	11.2 acres	1.2 acres
Wetland Type (non-riparian, riparian riverine or riparian non-riverine)	Non-riparian	Riparian non-riverine	Riparian non-riverine
Mapped Soil Series	Chewacla (Wehadkee and Armenia by detailed soil investigation)	Chewacla (Wehadkee and Armenia by detailed soil investigation)	Chewacla
Drainage class	Poorly drained	Poorly drained	Somewhat poorly drained
Soil Hydric Status	Drained Hydric	Drained Hydric	Non hydric
Source of Hydrology	Hillside seepage	Surface/Overbank Flow	Surface/Overbank Flow
Hydrologic Impairment	Ditching and Pasture	Ditching and Pasture	Ditching and Pasture
Native vegetation community	Pasture	Pasture	Pasture

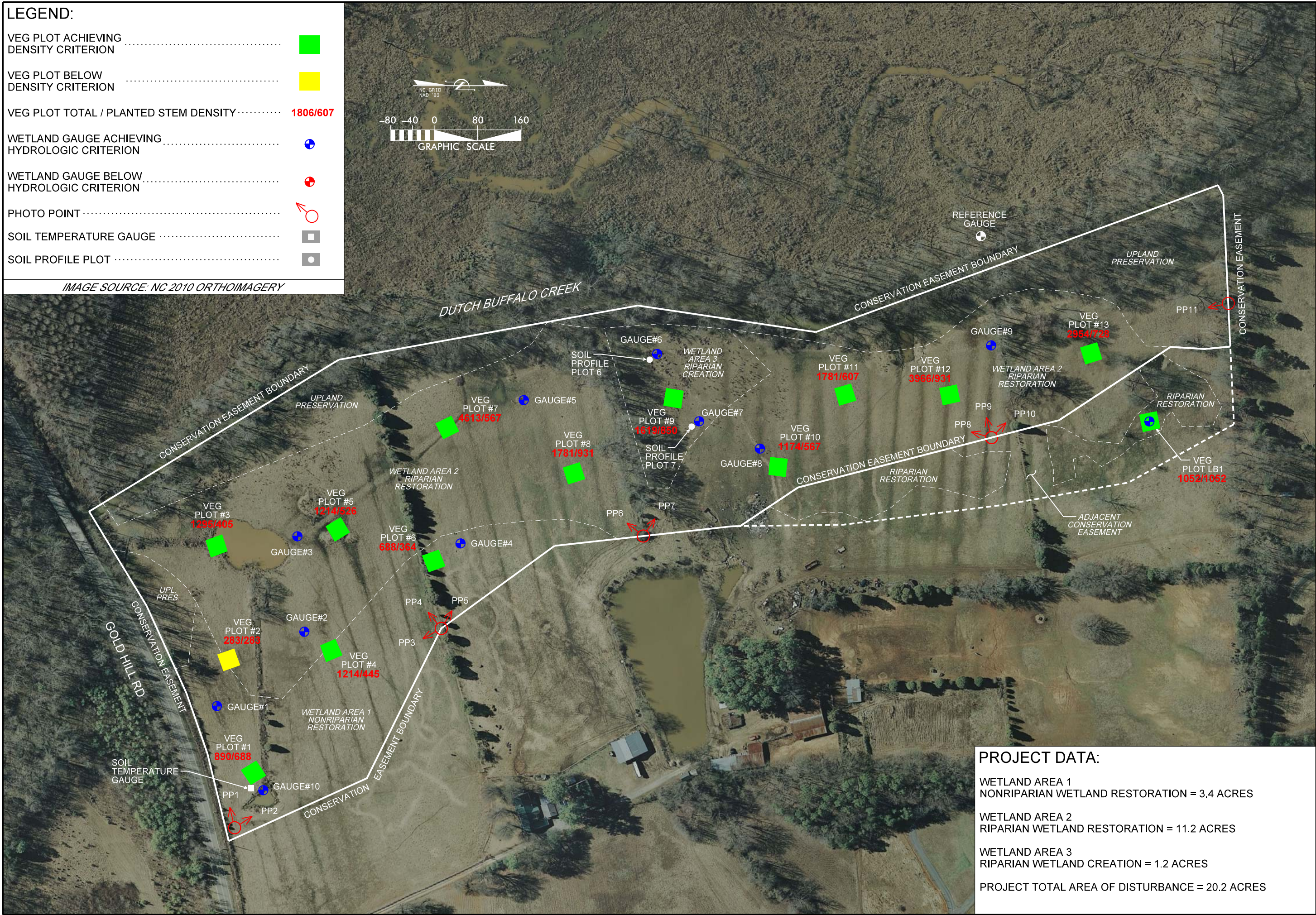
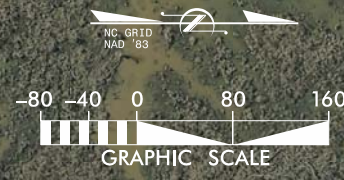
Appendix B

Visual Assessment Data

LEGEND:

- VEG PLOT ACHIEVING DENSITY CRITERION ■
- VEG PLOT BELOW DENSITY CRITERION ■
- VEG PLOT TOTAL / PLANTED STEM DENSITY 1806/607
- WETLAND GAUGE ACHIEVING HYDROLOGIC CRITERION ⊕
- WETLAND GAUGE BELOW HYDROLOGIC CRITERION ⊕
- PHOTO POINT ♂
- SOIL TEMPERATURE GAUGE
- SOIL PROFILE PLOT

IMAGE SOURCE: NC 2010 ORTHOIMAGERY



PROJECT DATA:

WETLAND AREA 1
NONRIPARIAN WETLAND RESTORATION = 3.4 ACRES

WETLAND AREA 2
RIPARIAN WETLAND RESTORATION = 11.2 ACRES

WETLAND AREA 3
RIPARIAN WETLAND CREATION = 1.2 ACRES

PROJECT TOTAL AREA OF DISTURBANCE = 20.2 ACRES

REV	DESCRIPTION	DATE	APPROVED



KCI
ASSOCIATES OF NC
ENGINEERS • PLANNERS • SCIENTISTS

4601 SIX FORKS ROAD
RALEIGH, NORTH CAROLINA 27609

BUFFALO FLATS
RESTORATION SITE
EEP PROJECT #94647
CABARRUS COUNTY, NORTH CAROLINA
MONITORING YEAR 03

DATE: NOV 2014
SCALE: 1" = 160'
CURRENT CONDITION PLAN VIEW
SHEET 1 OF 1

Table 5. Vegetation Condition Assessment						
Project Number and Name: 94647 – Buffalo Flats Restoration Site						
Planted Acreage 15.8			Easement Acreage 20.2			
Vegetation Category	Definitions	Mapping Threshold	CCPV Depiction	Number of Polygons	Combined Acreage	% of Planted Acreage
1. Bare Areas	Very limited cover of both woody and herbaceous material.	0.1 acres	Pattern and Color	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 acres	Not Depicted, Covers Most of Restoration Area	0	0.00	0.0%
Total				0	0.00	0.0%
3. Areas of Poor Growth Rates or Vigor	Areas with woody stems of a size class that are obviously small given the monitoring year.	0.25 acres	Pattern and Color	0	0.00	0.0%
Cumulative Total				0	0.00	0.0%
4. Invasive Areas of Concern	Areas or points (if too small to render as polygons at map scale).	1000 SF	Pattern and Color	0	0.00	0.0%
5. Easement Encroachment Areas	Areas or points (if too small to render as polygons at map scale).	none	Pattern and Color	0	0.00	0.0%

Photo Point Photos



Photo Point 1: View looking west, from the southeastern corner of the project site. 3/1/2012– Baseline



Photo Point 1: View looking west, from the southeastern corner of the project site. 7/14/2014 - MY03



Photo Point 2: View looking north, from the southeastern corner of the project site. 3/1/2012– Baseline



Photo Point 2: View looking north, from the southeastern corner of the project site. 7/14/2014 - MY03



Photo Point 3: View looking south, from the eastern easement boundary. 3/1/2012– Baseline



Photo Point 3: View looking south, from the eastern easement boundary. 7/14/2014 - MY03



Photo Point 4: View looking west, from the eastern easement boundary. 3/1/2012– Baseline



Photo Point 4: View looking west, from the eastern easement boundary. 7/14/2014 - MY03



Photo Point 5: View looking north, from the eastern easement boundary. 3/1/2012– Baseline



Photo Point 5: View looking north, from the eastern easement boundary. 7/14/2014 - MY03



Photo Point 6: View looking southwest, from the eastern easement boundary. 3/1/2012– Baseline



Photo Point 6: View looking southwest, from the eastern easement boundary. 7/14/2014 - MY03



Photo Point 7: View looking northwest, from the eastern easement boundary. 3/1/2012– Baseline



Photo Point 7: View looking northwest, from the eastern easement boundary. 7/14/2014 - MY03



Photo Point 8: View looking southwest, from the eastern easement boundary. 3/1/2012– Baseline



Photo Point 8: View looking southwest, from the eastern easement boundary. 7/14/2014 - MY03



Photo Point 9: View looking west, from the eastern easement boundary. 3/1/2012– Baseline



Photo Point 9: View looking west, from the eastern easement boundary. 7/14/2014 - MY03



Photo Point 10: View looking north, from the eastern easement boundary. 3/1/2012– Baseline



Photo Point 10: View looking north, from the eastern easement boundary. 7/14/2014 - MY03



Photo Point 11: View looking south, from the north eastern corner of the project site. 3/1/2012– Baseline



Photo Point 11: View looking south, from the north eastern corner of the project site. 7/14/2014 - MY03

Vegetation Plot Photos



Vegetation Plot 1: 6/18/14 – MY-03



Vegetation Plot 2: 6/18/14 – MY-03



Vegetation Plot 3: 6/18/14 – MY-03



Vegetation Plot 4: 6/18/14 – MY-03



Vegetation Plot 5: 6/18/14 – MY-03



Vegetation Plot 6: 6/19/14 – MY-03



Vegetation Plot 7: 6/19/14 – MY-03



Vegetation Plot 8: 6/19/14 – MY-03



Vegetation Plot 9: 6/19/14 – MY-03



Vegetation Plot 10: 6/19/14 – MY-03



Vegetation Plot 11: 6/19/14 – MY-03



Vegetation Plot 12: 6/19/14 – MY-03



Vegetation Plot 13: 6/19/14 – MY-03

Appendix C

Vegetation Plot Data

Table 6. Vegetation Plot Criteria Attainment**Project Number and Name: 94647 - Buffalo Flats Restoration Site**

Vegetation Plot ID	Vegetation Survival Threshold Met? (320 planted stems/acre)	Monitoring Year 03 Planted Stem Density (stems/acre)	Monitoring Year 03 Total Stem Density (stems/acre)
1	Yes	688	890
2	No	283	283
3	Yes	405	1,295
4	Yes	445	1,214
5	Yes	526	1,214
6	Yes	364	688
7	Yes	567	4,613
8	Yes	931	1,781
9	Yes	850	1,619
10	Yes	567	1,174
11	Yes	607	1,781
12	Yes	931	3,966
13	Yes	728	2,954

Table 7. CVS Vegetation Plot Metadata	
Project Number and Name: 94647 - Buffalo Flats Restoration Site	
Report Prepared By	Dale Prihoda
Date Prepared	6/23/2014 10:00
database name	KCI-2013-B.mdb
database location	M:\2010\20100798_Buffalo_Flats\Vegetation
computer name	12-3ZV4FP1
file size	61321216
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	Description of database file, the report worksheets, and a summary of project(s) and project data.
Proj, planted	Each project is listed with its PLANTED stems per acre, for each year. This excludes live stakes.
Proj, total stems	Each project is listed with its TOTAL stems per acre, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems.
Plots	List of plots surveyed with location and summary data (live stems, dead stems, missing, etc.).
Vigor	Frequency distribution of vigor classes for stems for all plots.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
Planted Stems by Plot and Spp	A matrix of the count of PLANTED living stems of each species for each plot; dead and missing stems are excluded.
ALL Stems by Plot and spp	A matrix of the count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	94647
project Name	Buffalo Flats Restoration Site
Description	Wetland Restoration Site
River Basin	Yadkin River Basin
Sampled Plots	13

Table 8. CVS Stem Count Total and Planted by Plot and Species
Project Number and Name: 94647 - Buffalo Flats Restoration Site

			Current Plot Data (MY3-2014)																							
Scientific Name	Common Name	Species Type	E94647-EEP-1			E94647-EEP-2			E94647-EEP-3			E94647-EEP-4			E94647-EEP-5			E94647-EEP-6			E94647-EEP-7			E94647-EEP-8		
			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
<i>Acer negundo</i>	boxelder	Tree			2								4			8						7			11	
<i>Acer rubrum</i>	red maple	Tree											4			4			2			73				
<i>Baccharis halimifolia</i>	eastern baccharis	Shrub																				1				
<i>Betula nigra</i>	river birch	Tree				1	1	1	3	3	3									1	1	1	2	2	2	
<i>Diospyros virginiana</i>	common persimmon	Tree														1										
<i>Fraxinus pennsylvanica</i>	green ash	Tree				3	3	3			14			2		1				1	1	1			1	
<i>Juniperus virginiana</i>	eastern redcedar	Tree																							1	
<i>Liquidambar styraciflua</i>	sweetgum	Tree			2								6			2						7			8	
<i>Liriodendron tulipifera</i>	tuliptree	Tree																		2	2	2				
<i>Nyssa aquatica</i>	water tupelo	Tree												2	2	2				1	1	1				
<i>Pinus taeda</i>	loblolly pine	Tree			1																					
<i>Platanus occidentalis</i>	American sycamore	Tree	2	2	2				1	1	7			3	1	1	1	2	2	8	1	1	12			
<i>Populus deltoides</i>	eastern cottonwood	Tree																								
<i>Quercus</i>	oak	Tree																								
<i>Quercus laurifolia</i>	laurel oak	Tree	4	4	4								1	1	1			1	1	1						
<i>Quercus lyrata</i>	overcup oak	Tree																								
<i>Quercus michauxii</i>	swamp chestnut oak	Tree	2	2	2				3	3	3						1	1	1	3	3	3	4	4	4	
<i>Quercus pagoda</i>	cherrybark oak	Tree	5	5	5	1	1	1	1	1	1				4	4	4	4	4	4	2	2	3	7	7	7
<i>Quercus palustris</i>	pin oak	Tree	4	4	4									2	2	2							1	1	1	
<i>Quercus phellos</i>	willow oak	Tree				2	2	2	2	2	2	8	8	8	6	6	6	1	1	1	3	3	3	9	9	9
<i>Ulmus americana</i>	American elm	Tree														1										
Unknown																										
Stem count			17	17	22	7	7	7	10	10	32	11	11	30	13	13	30	9	9	17	14	14	114	23	23	44
size (ares)			1			1			1			1			1			1			1			1		
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.02			0.02			0.02		
Species count			5	5	8	4	4	4	5	5	7	3	3	8	4	4	10	5	5	6	8	8	12	5	5	9
Stems per ACRE			688	688	890	283	283	283	405	405	1295	445	445	1214	526	526	1214	364	364	688	567	567	4613	931	931	1781

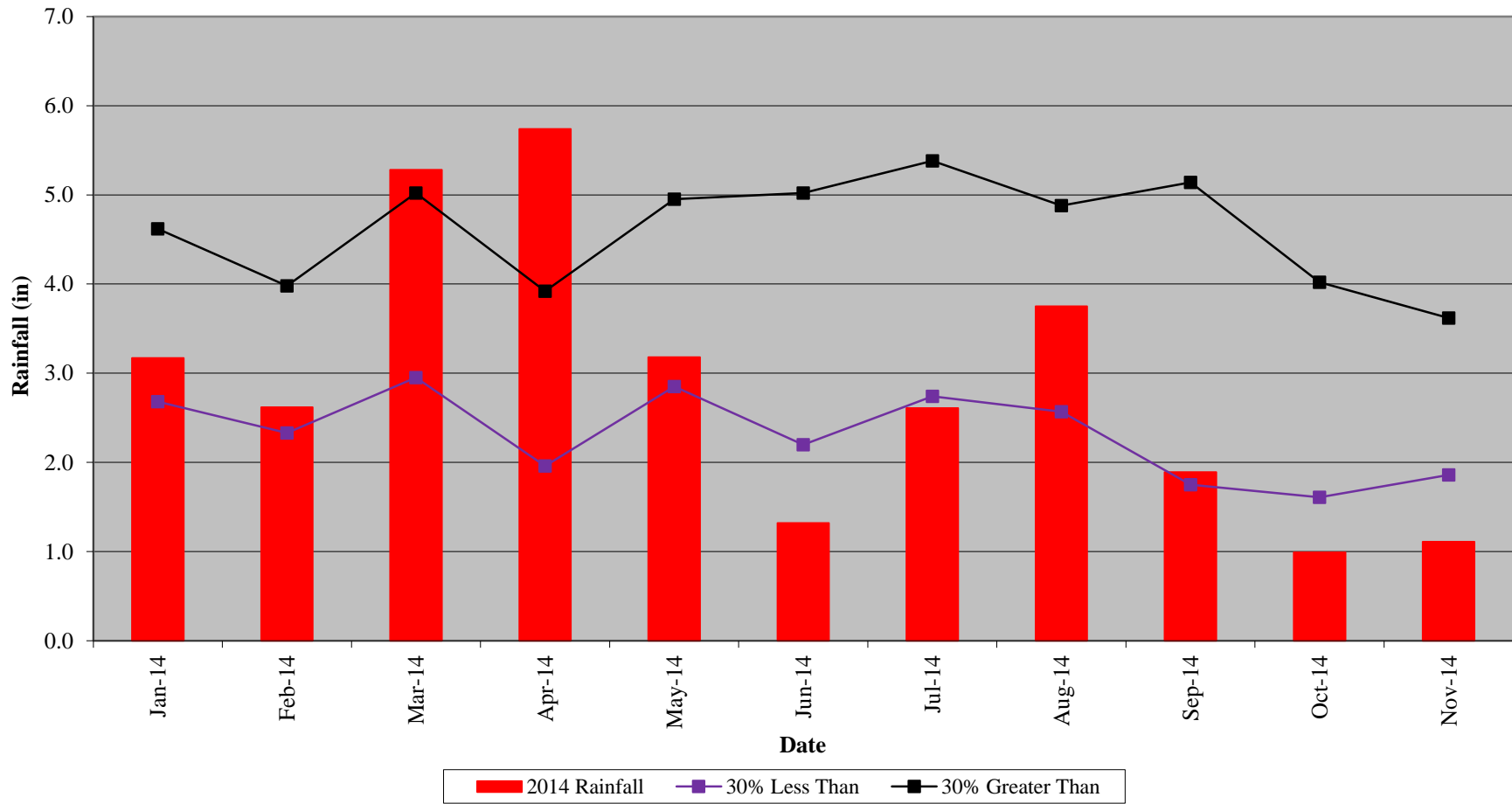
Table 8. CVS Stem Count Total and Planted by Plot and Species Cont.
Project Number and Name: 94647 - Buffalo Flats Restoration Site

			Current Plot Data (MY3-2014)															Annual Means														
Scientific Name	Common Name	Species Type	E94647-EEP-0009			E94647-EEP-10			E94647-EEP-11			E94647-EEP-12			E94647-EEP-13			MY3 (2014)			MY2 (2013)			MY1 (2012)			MY0 (2012)					
			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			
<i>Acer negundo</i>	boxelder	Tree										9			9			11			61			41			16					
<i>Acer rubrum</i>	red maple	Tree			4			8			2			1			3			101			53			5						
<i>Baccharis halimifolia</i>	eastern baccharis	Shrub									1			1					3													
<i>Betula nigra</i>	river birch	Tree	3	3	3	2	2	2	3	3	3	6	6	6	1	1	1	22	22	22	25	25	25	27	27	27	47	47	47			
<i>Diospyros virginiana</i>	common persimmon	Tree			1								2			1			5			5			4							
<i>Fraxinus pennsylvanica</i>	green ash	Tree	3	3	12			3			5	4	4	35	6	6	41	17	17	118			30			14						
<i>Juniperus virginiana</i>	eastern redcedar	Tree											3						4													
<i>Liquidambar styraciflua</i>	sweetgum	Tree			2			1			3			2					35						25			7				
<i>Liriodendron tulipifera</i>	tuliptree	Tree				1	1	1	1	1	1						1	4	4	5	4	4	7	4	4	4						
<i>Nyssa aquatica</i>	water tupelo	Tree	2	2	2	4	4	4	1	1	1	3	3	3	5	5	5	18	18	18	18	18	18	16	16	16	6	6	6			
<i>Pinus taeda</i>	loblolly pine	Tree																	1													
<i>Platanus occidentalis</i>	American sycamore	Tree	3	3	6	1	1	4	4	4	13	8	8	32	1	1	5	24	24	93	3	3	84	3	3	33						
<i>Populus deltoides</i>	eastern cottonwood	Tree																							2							
<i>Quercus</i>	oak	Tree																		4	4	11	1	1	1	3	3	3				
<i>Quercus laurifolia</i>	laurel oak	Tree															6	6	6	7	7	7	10	10	10	19	19	19				
<i>Quercus lyrata</i>	overcup oak	Tree													1	1	1	1	1	1	1	1	1	1	1	1						
<i>Quercus michauxii</i>	swamp chestnut oak	Tree																	13	13	13			15								
<i>Quercus pagoda</i>	cherrybark oak	Tree	4	4	4	4	4	4	5	5	5	2	2	2				39	39	40	36	36	39	42	42	43	24	24	24			
<i>Quercus palustris</i>	pin oak	Tree																7	7	7	7	7	7	8	8	8						
<i>Quercus phellos</i>	willow oak	Tree	6	6	6	2	2	2	1	1	1			2	4	4	4	44	44	46	34	34	37	29	29	29	14	14	14			
<i>Ulmus americana</i>	American elm	Tree																	1													
Unknown																				3	3	3	11	11	11	124	124	124				
Stem count			21	21	40	14	14	29	15	15	44	23	23	98	18	18	73	195	195	580	142	142	410	152	152	231	237	237	237			
size (ares)			1			1			1			1			1			13			13			13			13					
size (ACRES)			0.02			0.02			0.02			0.02			0.02			0.32			0.32			0.32			0.32					
Species count			6	6	9	6	6	9	6	6	11	5	5	12	6	6	10	11	11	19	11	11	18	11	11	17	7	7	7			
Stems per ACRE			850	850	1619	567	567	1174	607	607	1781	931	931	3966	728	728	2954	607	607	1806	442	442	1,276	473	473	719	738	738	738			

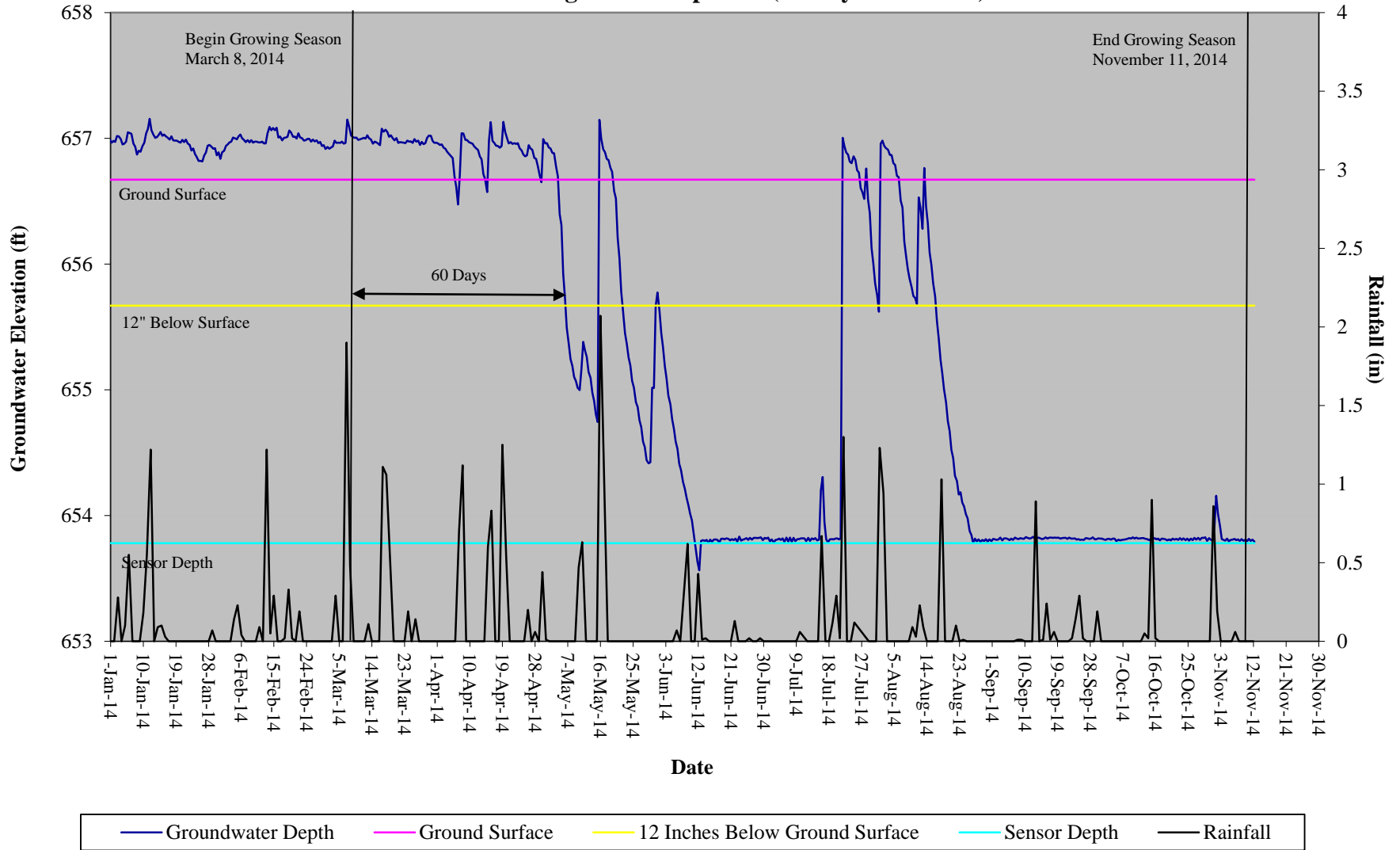
Appendix D

Hydrologic Data

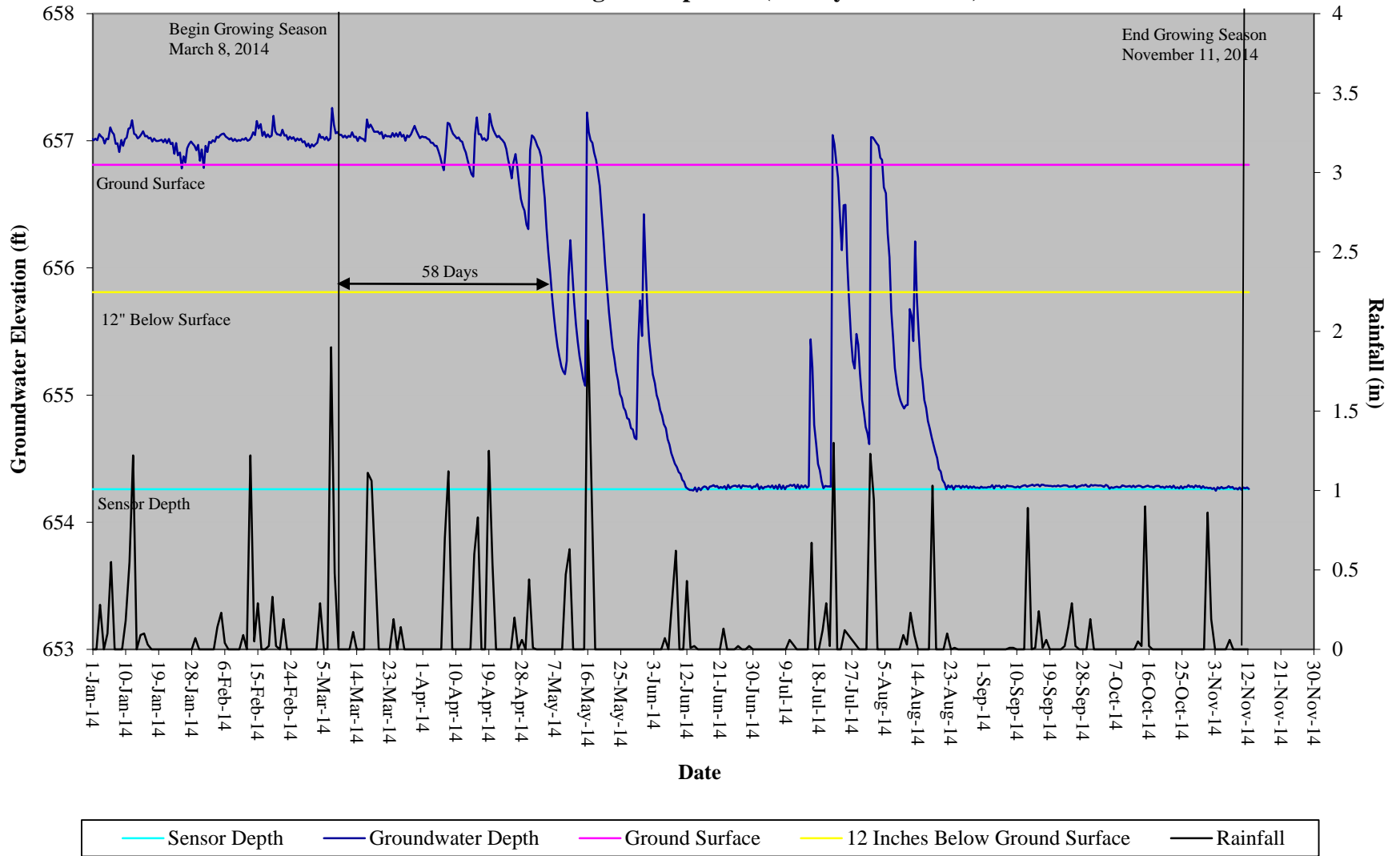
**Buffalo Flats Restoration Site
30-70 Percentile Graph
WETS Station Name: Burlington Fire Stn #5**



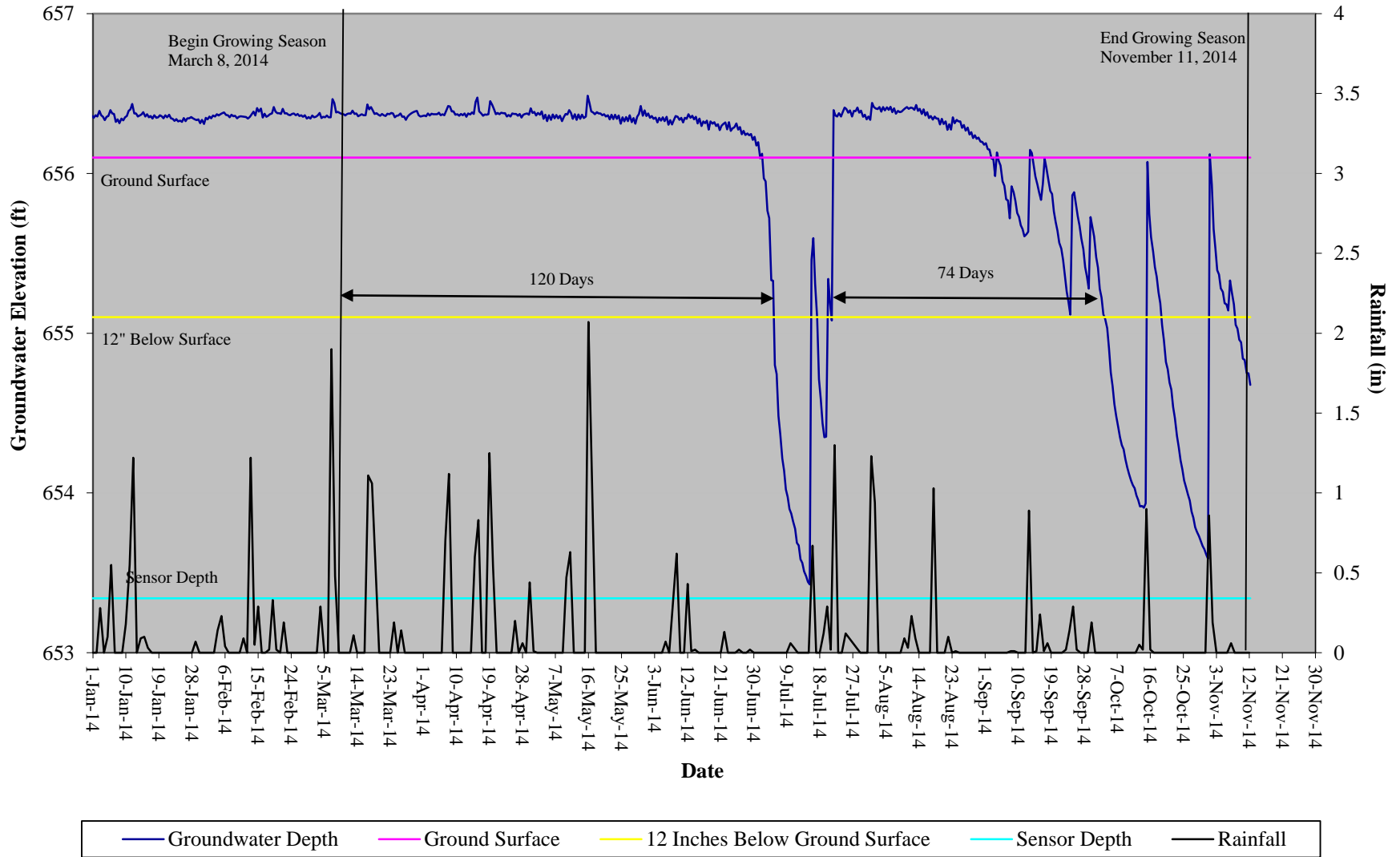
Buffalo Flats Restoration Site Hydrograph Wetland Gauge 1 - Nonriparian (12 Days Minimum)



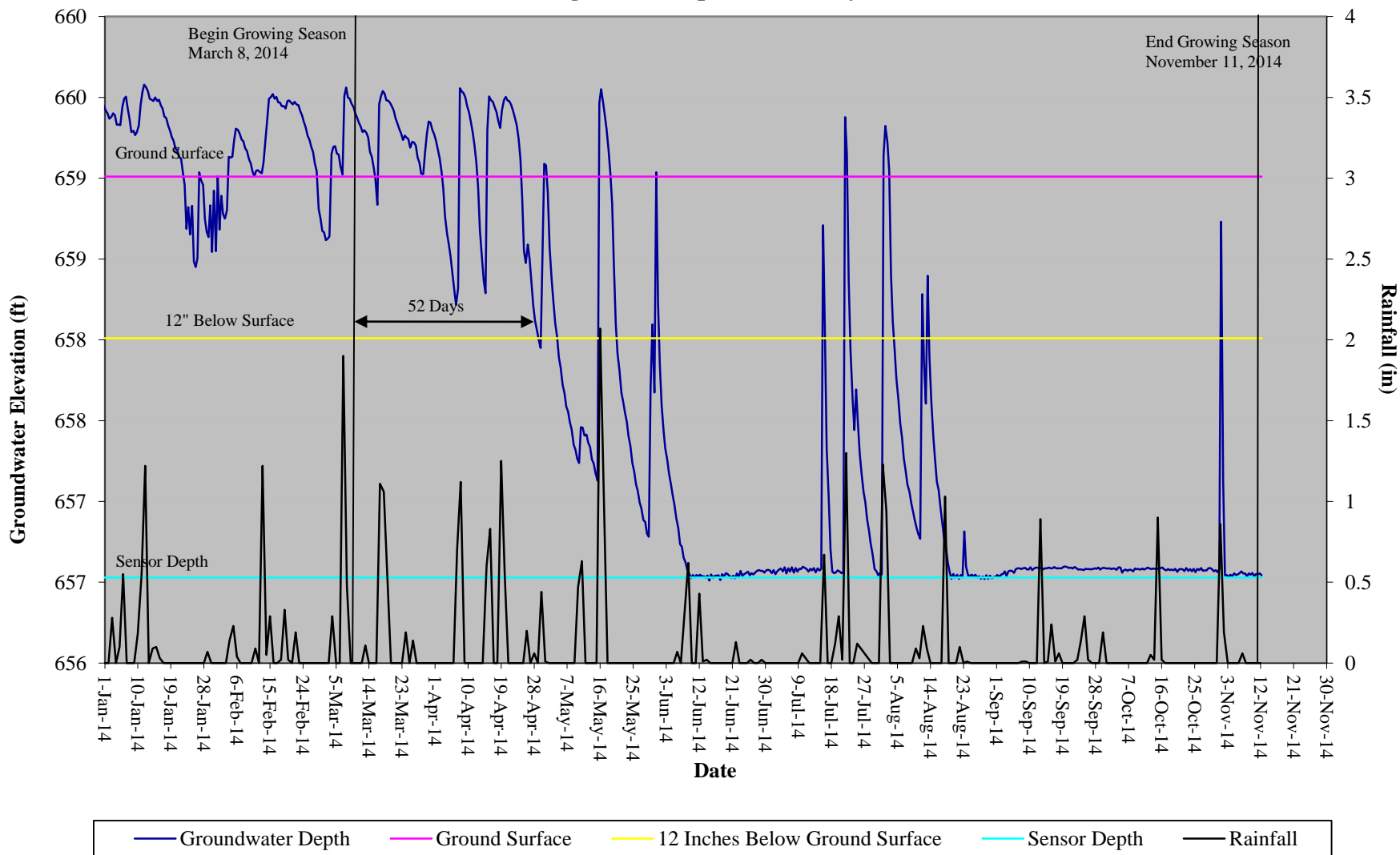
Buffalo Flats Restoration Site Hydrograph Wetland Gauge 2 - Riparian (25 Days Minimum)



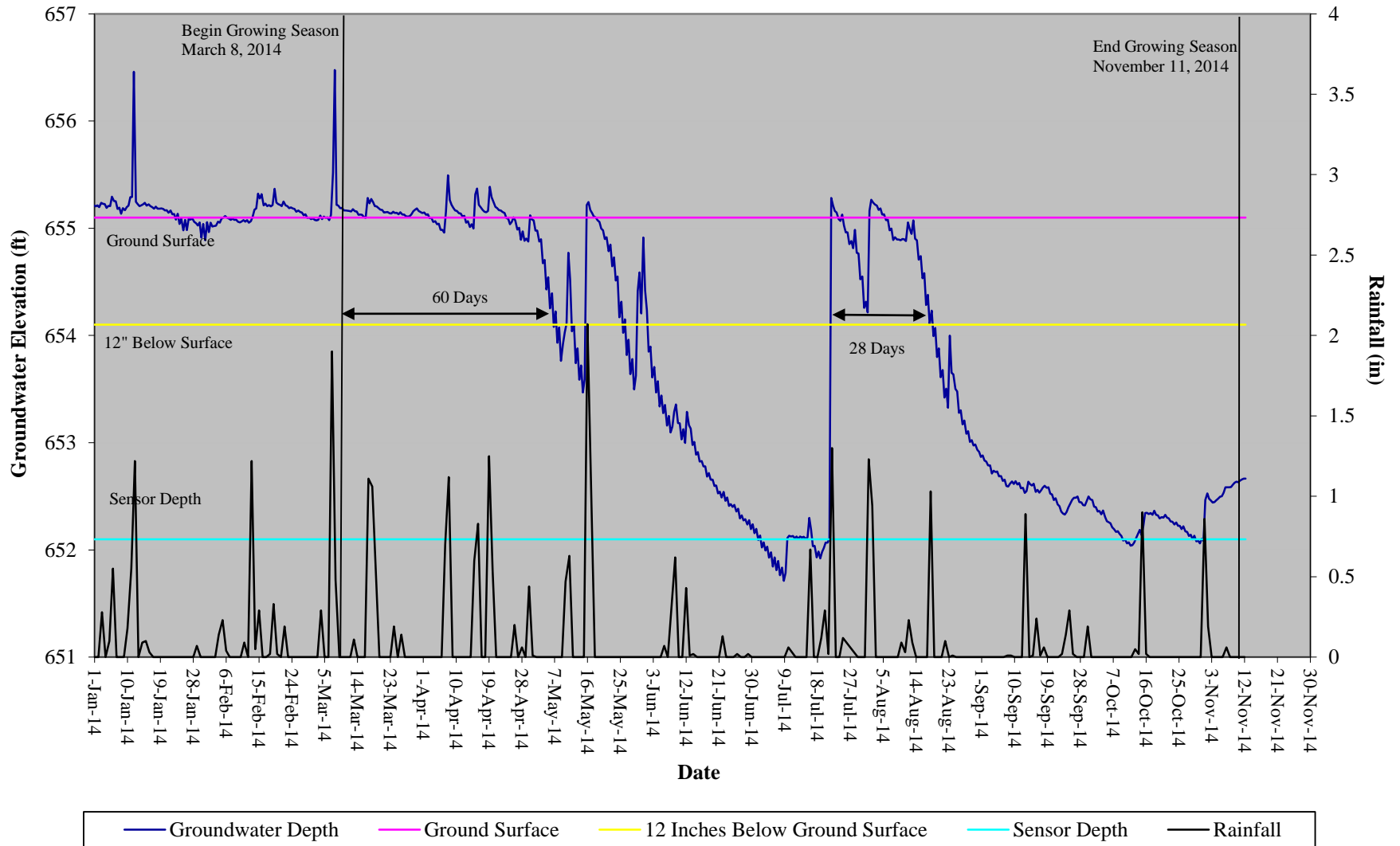
Buffalo Flats Restoration Site Hydrograph Wetland Gauge 3 - Riparian (25 Days Minimum)



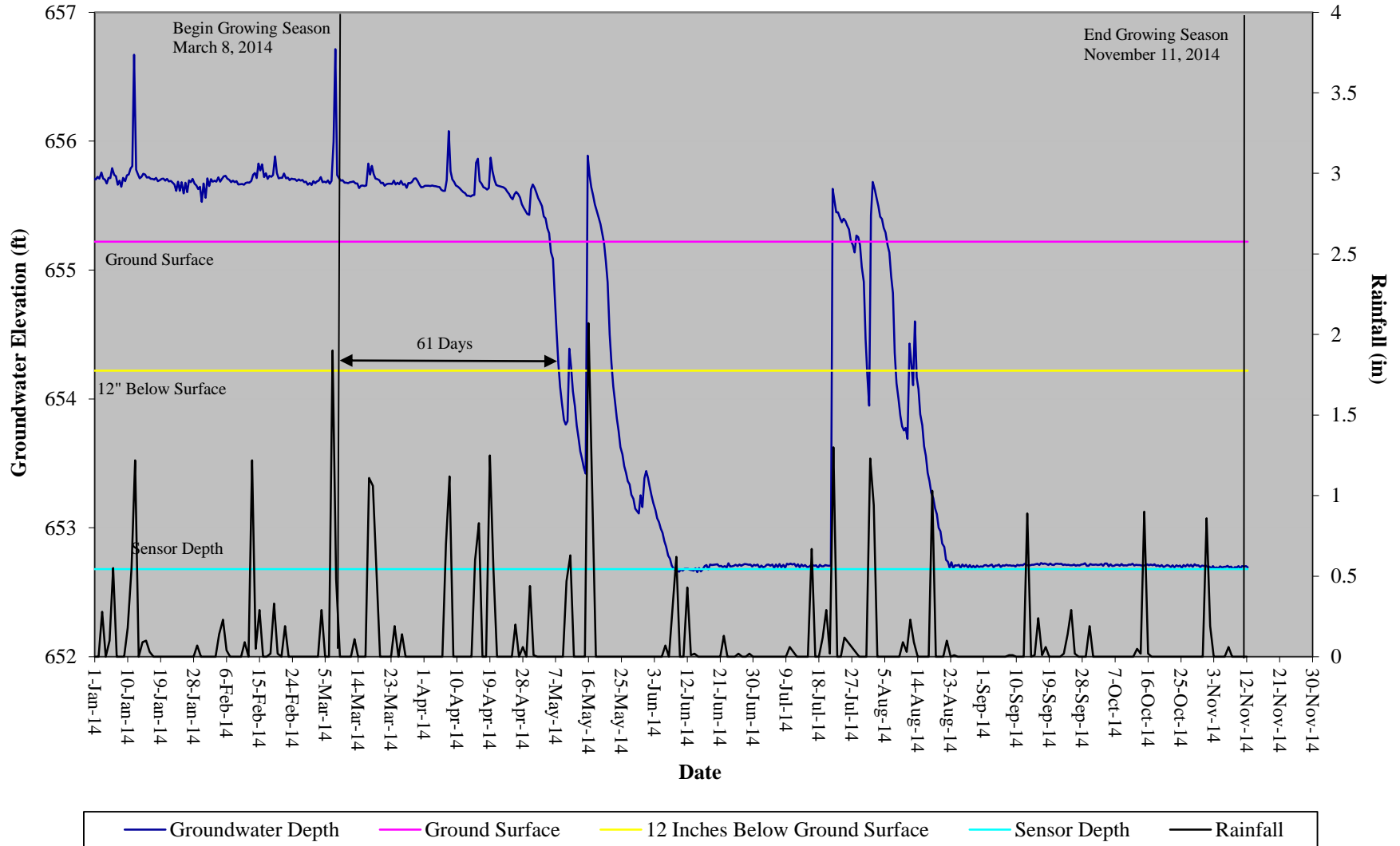
Buffalo Flats Restoration Site Hydrograph Wetland Gauge 4 - Nonriparian (12 Days Minimum)



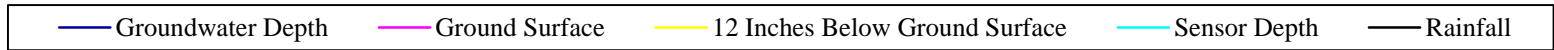
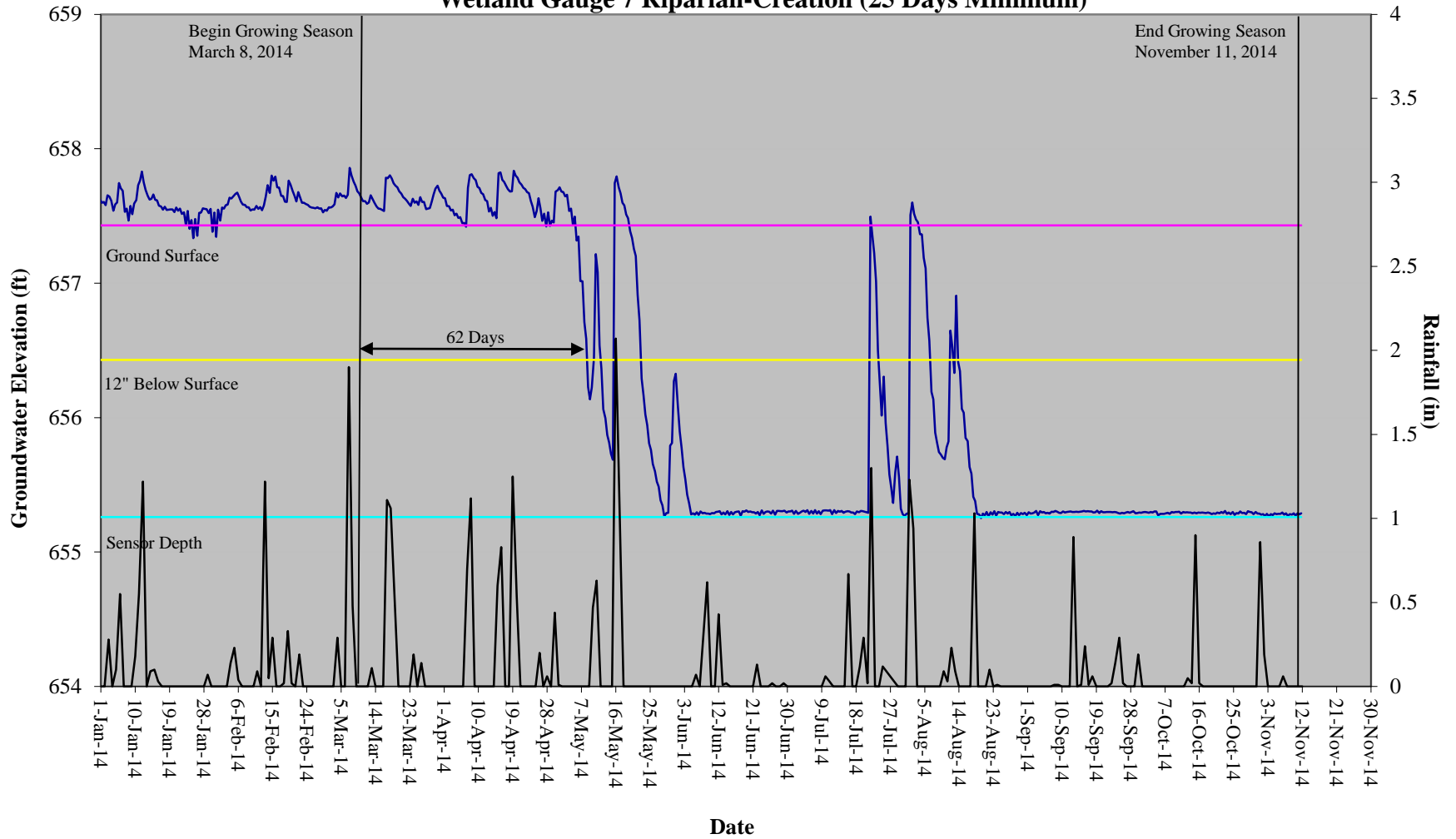
Buffalo Flats Restoration Site Hydrograph Wetland Gauge 5 - Riparian (25 Days Minimum)



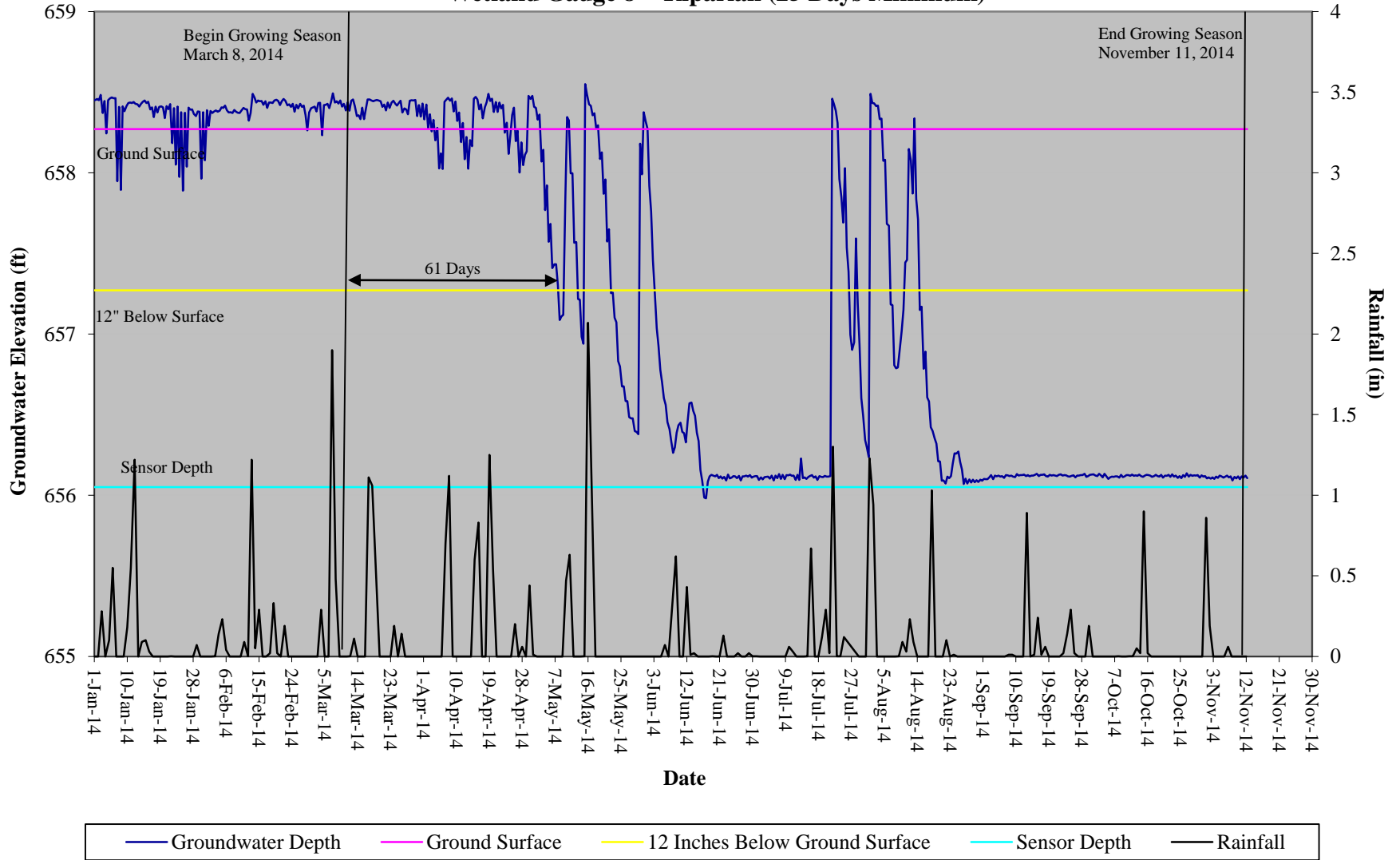
Buffalo Flats Restoration Site Hydrograph Wetland Gauge 6 - Riparian-Creation (25 Days Minimum)



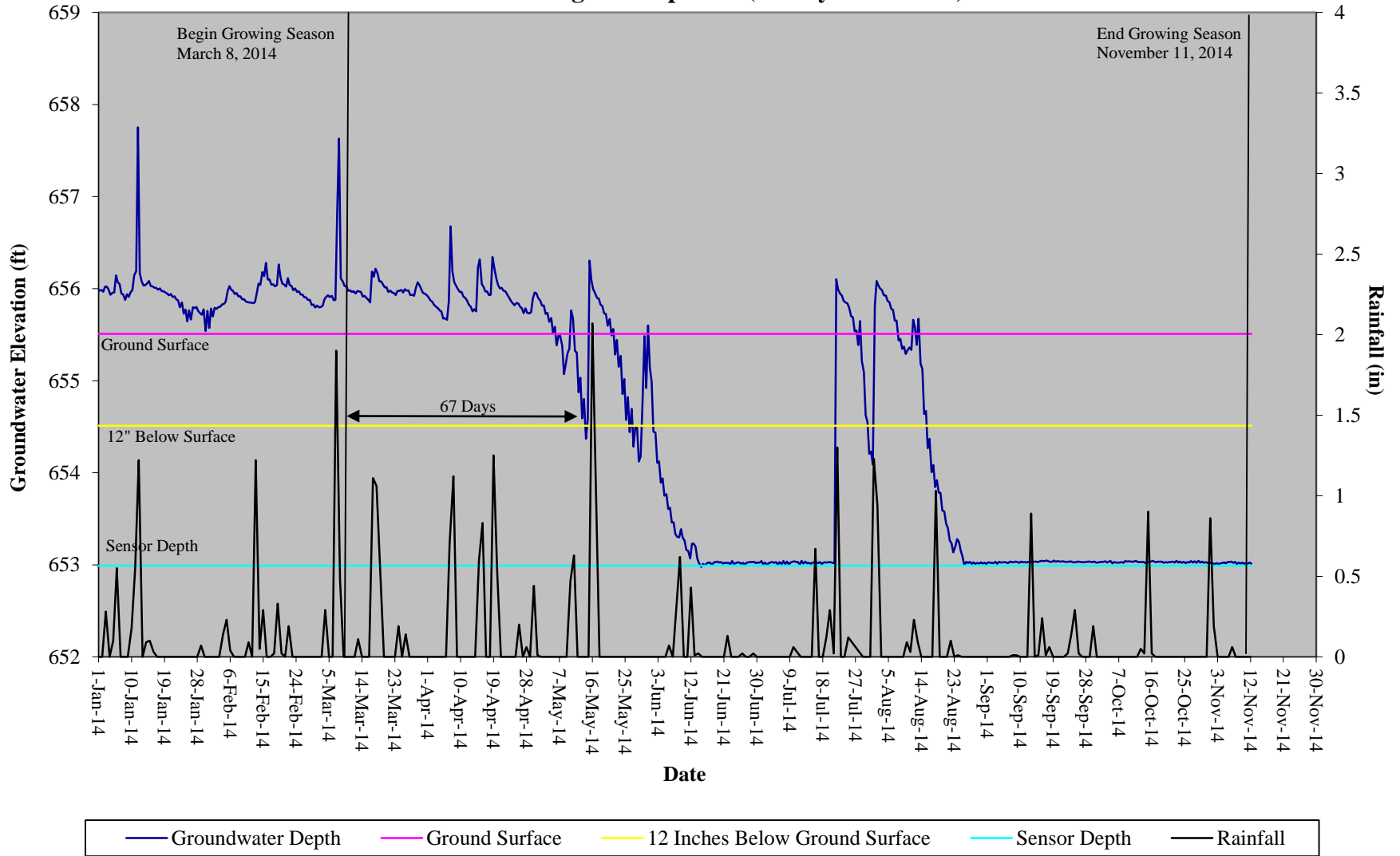
Buffalo Restoration Site Hydrograph Wetland Gauge 7 Riparian-Creation (25 Days Minimum)



**Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 8 - Riparian (25 Days Minimum)**



**Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 9 - Riparian (23 Days Minimum)**



Buffalo Flats Restoration Site Hydrograph Wetland Gauge 10 - Nonriparian (12 Days Minimum)

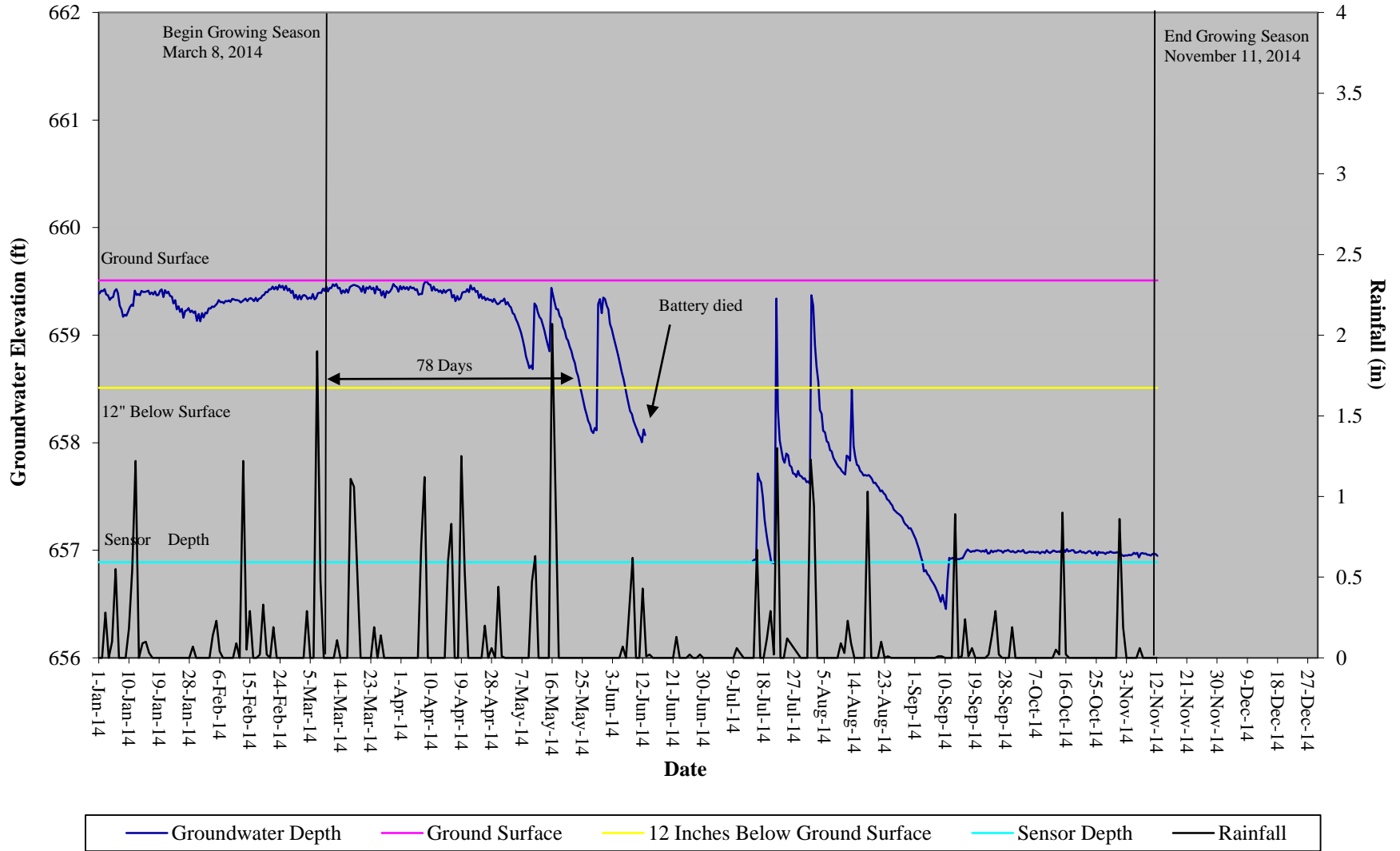


Table 9. Wetland Hydrology Criteria Attainment Table						
Project Number and Name: 94647 - Buffalo Flats Restoration Site						
	Success Criteria Achieved / Max Consecutive Days During Growing Season (Percentage)					
Wetland Area 1						
Success Criteria days (5%)	12	MY-01 2012	MY-02 2013	MY-03 2014	MY-04	MY-05
Well 1		Yes/23 (9.7%)	Yes/64 (27.5%)	Yes/60 (23.9%)		
Well 4		No/6 (2.4%)	Yes/33 (14.2%)	Yes/52 (20.9%)		
Well 10 (Installed May 23, 2012)		No/0 (0%)	No/1 (0.4%)	Yes/78 (31.1%)		
Wetland Area 2						
Success Criteria days (10%)	25	MY-01 2012	MY-02 2013	MY-03 2014	MY-04	MY-05
Well 2		No/20 (8.6%)	Yes/36 (15.2%)	Yes/58 (23.3%)		
Well 3		Yes/134 (57.3%)	Yes/236 (100%)	Yes/120 (48.0%)		
Well 5		Yes/28 (11.8%)	Yes/172 (73.6%)	Yes/60 (23.9%)		
Well 8		No/19 (7.9%)	Yes/98 (42.0%)	Yes/61 (24.5%)		
Well 9		Yes/23 (10.0%)	Yes/103 (44.2%)	Yes/67 (26.9%)		
Wetland Area 3						
Success Criteria 25 days (10%)		MY-01 2012	MY-02 2013	MY-03 2014	MY-04	MY-05
Well 6 (Creation Area)		Yes/25 (10.7%)	Yes/71 (30.5%)	Yes/61 (24.5%)		
Well 7 (Creation Area)		No/18 (7.5%)	Yes/70 (30.0%)	Yes/62 (24.7%)		

Appendix E

Soil Data



SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** July 14, 2014
Project: Buffalo Flats Wetland Restoration Site **Project #:** 20100798 6MO.Y3
County: Cabarrus **State:** NC
Location: 4939 Gold Hill Road **Site/Lot:** MW# 6
Soil Series: Chewacla Variant
Soil Classification: Fine-loamy, mixed, active, thermic Fluvaquentic Dystrochrepts
AWT: 54" **SHWT:** 8-12" **Slope:** 0-1% **Aspect:** _____
Elevation: ~655 **Drainage:** Poorly Drained **Permeability:** Moderate to Moderately slow
Vegetation: Herbaceous: Predominantly Virginia Wildrye with planted River Birch, Green Ash, American Sycamore
Borings terminated at 62 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-3	10YR 5/3	5YR 4/6c2p	l	lfgr	dl	cs	5YR mottles 5%
			7.5YR 5/8f1p					
AB	3-8	10YR 5/3	5YR 4/6c2p	l	2mabk	dsh	cs	
			10YR 6/2c1d					10% mottles
Bg1	8-14	10YR 4/2	10YR 2/1f1f	l	2msbk	dsh	cs	10mm concretions & Mn masses
Bg2	14-18	10YR 4/2	7.5YR 5/8f1d	l	2msbk	dsh	gs	
Bg3	18-34	10YR 4/2	10YR 4/1c2f	sl	1csbk	mfr	gw	moist soil conditions
			10YR 4/3c2f					few 5-25mm concretions
Bg4	34-37	5/10Y	10YR 4/6c2p	scl	1csbk	mfr	gw	few fine Mn masses
			10YR 3/1f1f					
Cg1	37-47	5/10Y	10YR 3/1f1f	c	massive	mfi	gw	few 2-5mm gravel/Mn concretions
								Mn masses
Cg2	47-56		10YR 4/1f2f	c	massive	mfi	gw	
			5/N					
			3/10Y					
			7.5YR 3/2					
Cg3	56-62	10YR 7/1	10YR 4/1c2p	sc	massive	mfi		10% mottles, 10-15mm concretions
			5/Nc2p					10% mottles
			10YR 5/8c2d					20% mottles

COMMENTS:

No surface water present.
 Very dry conditions.
 Meets hydric soil criteria F8: Redox Depressions
 using Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)
 Meets hydric soil criteria for 1987 Corps of Engineers Wetlands Delineation Manual: paragraph 44 (f2).

DESCRIBED BY: SFS DATE: 7/14/2014

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: BUFFALO FLAKS City/County: Concord/Cabarrus Sampling Date: 7-14-14
 Applicant/Owner: KCI Associates of NC State: NC Sampling Point: MW#6
 Investigator(s): Steven F. Stokes Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1
 Subregion (LRR or MLRA): LRR P Lat: 35° 27' 26.2507" Long: -080° 29' 49.1797" Datum: NAD 83
 Soil Map Unit Name: Chewacla Variant NWI classification: PSS1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: <p style="margin-left: 20px;"><i>Seasonally High Water Table is 8-12 inches. Wetland creation site - 3rd year monitoring.</i></p>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) <input checked="" type="checkbox"/> Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) <input checked="" type="checkbox"/> Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> <input checked="" type="checkbox"/> Surface Soil Cracks (B6) <input checked="" type="checkbox"/> Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) ___ Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
--	--

Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? (includes capillary fringe) Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
--	---

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: mwa#6

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____

Dominance Test worksheet:
 Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)
 Total Number of Dominant Species Across All Strata: 1 (B)
 Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

_____ = Total Cover
 50% of total cover: _____ 20% of total cover: _____

Prevalence Index worksheet:
 Total % Cover of: _____ Multiply by:
 OBL species _____ x 1 = _____
 FACW species _____ x 2 = _____
 FAC species _____ x 3 = _____
 FACU species _____ x 4 = _____
 UPL species _____ x 5 = _____
 Column Totals: _____ (A) _____ (B)
 Prevalence Index = B/A = _____

Sapling/Shrub Stratum (Plot size: _____)

1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____

Hydrophytic Vegetation Indicators:
 1 - Rapid Test for Hydrophytic Vegetation
 2 - Dominance Test is >50%
 3 - Prevalence Index is $\leq 3.0^1$
 4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)
 Problematic Hydrophytic Vegetation¹ (Explain)
¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

_____ = Total Cover
 50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30')

1. <u>Elymus virginicus</u>	<u>50</u>	_____	<u>FAC</u>
2. <u>Betula nigra</u>	<u>10</u>	_____	<u>FACW</u>
3. <u>Platanus occidentalis</u>	<u>10</u>	_____	<u>FACW</u>
4. <u>Fraxinus pennsylvanica</u>	<u>10</u>	_____	<u>FACW</u>
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____

Definitions of Four Vegetation Strata:
Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.
Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.
Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.
Woody vine – All woody vines greater than 3.28 ft in height.

80 = Total Cover
 50% of total cover: 40 20% of total cover: 16

Woody Vine Stratum (Plot size: _____)

1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____

_____ = Total Cover
 50% of total cover: _____ 20% of total cover: _____

Hydrophytic Vegetation Present? Yes No _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: MW#6

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-3	10YR 5/3	94	5YR 4/6 c2p	5	C	m, PL	loam	
			7.5YR 5/8 f1p	1	C	PL		
3-8	10YR 5/3	85	5YR 4/6 c2p	5			loam	
			10YR 4/2 cid	10	D	m, PL		
8-14	10YR 4/2	98	10YR 2/1 f1p	2	C	m	loam	10mm concretions & Mn masses
14-18	10YR 4/2		7.5YR 5/8 f1d	2	C	m	loam	
18-34	10YR 4/2	95	10YR 4/1 c2p	5	D	m	sandy loam	few 5-25mm concretions
			10YR 4/3 c2p	20	C	m		
34-37	5/10Y		10YR 4/6 c2p	20	C	m	sel	gleyed matrix
			10YR 3/1 f1f	2	D	m, PL		

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) (LRR N)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) (MLRA 147, 148)
- Thin Dark Surface (S9) (MLRA 147, 148)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) (LRR N, MLRA 136)
- Umbric Surface (F13) (MLRA 136, 122)
- Piedmont Floodplain Soils (F19) (MLRA 148)
- Red Parent Material (F21) (MLRA 127, 147)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) (MLRA 147)
- Coast Prairie Redox (A16) (MLRA 147, 148)
- Piedmont Floodplain Soils (F19) (MLRA 136, 147)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____
 Depth (inches): _____

Hydric Soil Present? Yes No

Remarks:

Meets hydric soil criteria F8: Redox Depressions
Meets hydric soil criteria for 1987 Corps of Engineers Wetlands Delineation Manual: paragraph 44 (a).

WETLAND DETERMINATION DATA FORM – Eastern Mountains and Piedmont Region

Project/Site: BUFFALO FLATS City/County: Concord/Cabarrus Sampling Date: 7-14-14
 Applicant/Owner: KCI Associates of NC State: NC Sampling Point: MW#7
 Investigator(s): Steven F Stokes Section, Township, Range: _____
 Landform (hillslope, terrace, etc.): Floodplain Local relief (concave, convex, none): Concave Slope (%): 0-1
 Subregion (LRR or MLRA): LRR P Lat: 35°27.0212" Long: -080°29'47.7051" Datum: NAD 83
 Soil Map Unit Name: Chewacla Variant NWI classification: PSS1A

Are climatic / hydrologic conditions on the site typical for this time of year? Yes No _____ (If no, explain in Remarks.)
 Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes No _____
 Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present? Yes <input checked="" type="checkbox"/> No _____ Hydric Soil Present? Yes <input checked="" type="checkbox"/> No _____ Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____	Is the Sampled Area within a Wetland? Yes <input checked="" type="checkbox"/> No _____
Remarks: <i>Rainfall below normal soils very dry. Wetland Quackon site-3rd year monitoring water table greater than 51 inches. Seasonally high water table in 0-14 inches</i>	

HYDROLOGY

Wetland Hydrology Indicators: <u>Primary Indicators (minimum of one is required; check all that apply)</u> ___ Surface Water (A1) ___ True Aquatic Plants (B14) ___ High Water Table (A2) ___ Hydrogen Sulfide Odor (C1) ___ Saturation (A3) ___ Oxidized Rhizospheres on Living Roots (C3) ___ Water Marks (B1) ___ Presence of Reduced Iron (C4) ___ Sediment Deposits (B2) ___ Recent Iron Reduction in Tilled Soils (C6) ___ Drift Deposits (B3) ___ Thin Muck Surface (C7) ___ Algal Mat or Crust (B4) ___ Other (Explain in Remarks) ___ Iron Deposits (B5) ___ ___ Inundation Visible on Aerial Imagery (B7) ___ Water-Stained Leaves (B9) ___ Aquatic Fauna (B13)	<u>Secondary Indicators (minimum of two required)</u> ___ Surface Soil Cracks (B6) <input checked="" type="checkbox"/> Sparsely Vegetated Concave Surface (B8) ___ Drainage Patterns (B10) ___ Moss Trim Lines (B16) ___ Dry-Season Water Table (C2) ___ Crayfish Burrows (C8) ___ Saturation Visible on Aerial Imagery (C9) ___ Stunted or Stressed Plants (D1) <input checked="" type="checkbox"/> Geomorphic Position (D2) ___ Shallow Aquitard (D3) ___ Microtopographic Relief (D4) ___ FAC-Neutral Test (D5)
Field Observations: Surface Water Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Water Table Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ Saturation Present? Yes _____ No <input checked="" type="checkbox"/> Depth (inches): _____ (includes capillary fringe)	Wetland Hydrology Present? Yes <input checked="" type="checkbox"/> No _____
Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available: Remarks:	

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: MW#7

Tree Stratum (Plot size: _____)	Absolute % Cover	Dominant Species?	Indicator Status
1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

_____ = Total Cover
 50% of total cover: _____ 20% of total cover: _____

Prevalence Index worksheet:

Total % Cover of: _____ Multiply by:

OBL species _____ x 1 = _____

FACW species _____ x 2 = _____

FAC species _____ x 3 = _____

FACU species _____ x 4 = _____

UPL species _____ x 5 = _____

Column Totals: _____ (A) _____ (B)

Prevalence Index = B/A = _____

Sapling/Shrub Stratum (Plot size: _____)

1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____

Hydrophytic Vegetation Indicators:

1 - Rapid Test for Hydrophytic Vegetation

2 - Dominance Test is >50%

3 - Prevalence Index is $\leq 3.0^1$

4 - Morphological Adaptations¹ (Provide supporting data in Remarks or on a separate sheet)

Problematic Hydrophytic Vegetation¹ (Explain)

¹Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

_____ = Total Cover
 50% of total cover: _____ 20% of total cover: _____

Herb Stratum (Plot size: 30)

1. <i>Elymus virginicus</i>	<u>70</u>	<input checked="" type="checkbox"/>	<u>FAC</u>
2. <i>Quercus falcata</i>	<u>10</u>		<u>FAC⁺</u>
3. <i>Acer rubrum</i>	<u>10</u>		<u>FAC</u>
4. <i>Eupatorium capillifolium</i>	<u>5</u>		<u>FACU</u>
5. _____	_____	_____	_____
6. _____	_____	_____	_____
7. _____	_____	_____	_____
8. _____	_____	_____	_____
9. _____	_____	_____	_____
10. _____	_____	_____	_____
11. _____	_____	_____	_____

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than or equal to 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

_____ = Total Cover
 50% of total cover: 47.5 20% of total cover: 19

Woody Vine Stratum (Plot size: _____)

1. _____	_____	_____	_____
2. _____	_____	_____	_____
3. _____	_____	_____	_____
4. _____	_____	_____	_____
5. _____	_____	_____	_____

_____ = Total Cover
 50% of total cover: _____ 20% of total cover: _____

Hydrophytic Vegetation Present? Yes No _____

Remarks: (Include photo numbers here or on a separate sheet.)

*Mixture of Mounds & Tussocks
 No vegetation in depressions. All vegetation is on mounds.*

SOIL

Sampling Point: MW# 67

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix		Redox Features				Texture	Remarks
	Color (moist)	%	Color (moist)	%	Type ¹	Loc ²		
0-2	10YR 4/2	98	5YR 4/4 c2d	2	C	m, PL	loam	
2-5	10YR 6/2	85	10YR 5/3 c2p	10	C	m	loam	
			5YR 4/6 c2p	5	C	pl		
5-8	10YR 4/2	80	5YR 5/8 c2p	20	C	m	sandy loam	
8-11	10YR 4/3		10YR 2/1 c2p	5	C	m	sandy loam	
			5YR 5/8 Af	2	C	m		
11-14	10YR 5/3	90	7.5YR 5/6 c2d	10	C	m	loam	
14-17	10YR 5/2	95	10YR 5/8 c2d	5	C	m	loam	
17-23			10YR 2/1	90	-		Rock	Iron & Mn Concentrations
			10YR 5/8	10				Extremely Hard & Auger Resistant

¹Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains.

²Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- Histosol (A1)
- Histic Epipedon (A2)
- Black Histic (A3)
- Hydrogen Sulfide (A4)
- Stratified Layers (A5)
- 2 cm Muck (A10) (LRR N)
- Depleted Below Dark Surface (A11)
- Thick Dark Surface (A12)
- Sandy Mucky Mineral (S1) (LRR N, MLRA 147, 148)
- Sandy Gleyed Matrix (S4)
- Sandy Redox (S5)
- Stripped Matrix (S6)

- Dark Surface (S7)
- Polyvalue Below Surface (S8) (MLRA 147, 148)
- Thin Dark Surface (S9) (MLRA 147, 148)
- Loamy Gleyed Matrix (F2)
- Depleted Matrix (F3)
- Redox Dark Surface (F6)
- Depleted Dark Surface (F7)
- Redox Depressions (F8)
- Iron-Manganese Masses (F12) (LRR N, MLRA 136)
- Umbric Surface (F13) (MLRA 136, 122)
- Piedmont Floodplain Soils (F19) (MLRA 148)
- Red Parent Material (F21) (MLRA 127, 147)

Indicators for Problematic Hydric Soils³:

- 2 cm Muck (A10) (MLRA 147)
- Coast Prairie Redox (A16) (MLRA 147, 148)
- Piedmont Floodplain Soils (F19) (MLRA 136, 147)
- Very Shallow Dark Surface (TF12)
- Other (Explain in Remarks)

³Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: Concentrations of Iron & Mn
 Depth (inches): 6" (17-23 in layer)

Hydric Soil Present? Yes No

Remarks: