Buffalo Flats Restoration Site
Monitoring Report MY05
DMS Project # 94647
DMS Contract # 003273

Submitted to:

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

Construction Completed: October 2011
Data Collection: July 2016
Submitted: December 2016

Monitoring and Design Firm

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Project No: 20100798

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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 Division of Mitigation Services (DMS). 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 DMS'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 five 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, and 260 stems/acre after five 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 fifth-year vegetation monitoring was based on the Level 2 CVS-EEP vegetation monitoring protocol. The site's average density for this monitoring period was 738 planted stems/acre. All thirteen plots had greater than 260 planted stems/acre. Including volunteers, the site averaged 2,512 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. Another supplemental planting of 1 gallon containerized trees and bare root trees occurred in April 2016 to address areas of low stem density due to prolonged inundation in the southern portion of the site. 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 stem density of 1,052 stems/acre and a total stem density of 1,781 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% (24 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 "Accessing 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 234 days (NRCS 1995).

The daily rainfall data was obtained from a local weather station in Kannapolis, NC; provided by the NC State Climate Office. For the 2016-year, May experienced above average rainfall, while February, June, September, and October experienced average rainfall. The months of January, March, April, July, August, and November recorded below average rainfall for the site. Overall, the area experienced below average rainfall during the 2016 growing season.

In addition to the wetlands that have been monitored at this site so far, there is also a 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 fifth growing season, six of the seven 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% (24 days) of

the growing season during average climatic conditions. Two of the three wells in the non-riparian areas met the success criterion of 5% (12 days) of the growing season. The well in the wetland adjacent to the site had 19 consecutive days (9.4%) of saturated soil conditions. Overall, wetland hydrology was achieved at eight of the ten 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 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 December 20, 2016. Both soil plots met the hydric soil criteria with an indicator of depleted matrix (F3) and 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, and during the MY-03, mottles ranging from 5 – 10% of their respective soil horizons were reported within the upper 12 inches of the soil. In MY-04, mottling accounted for 10 – 30% of the upper 12 inches in each soil plot. This year mottling accounted for 10 – 40% of the upper 12 inches in both plots. 2-3 mm concretions were also found within the upper 12 inches in Plot #7 this year. This indicates the continuation of anaerobic conditions in the soil caused by surface saturation from precipitation, overbank flooding and inundation and is maintained due to the very slow permeability of the compacted, angular structured subsurface horizons. 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 DMS website. All raw data supporting the tables and figures in the appendices are available from DMS 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 July 19, 2016.

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)

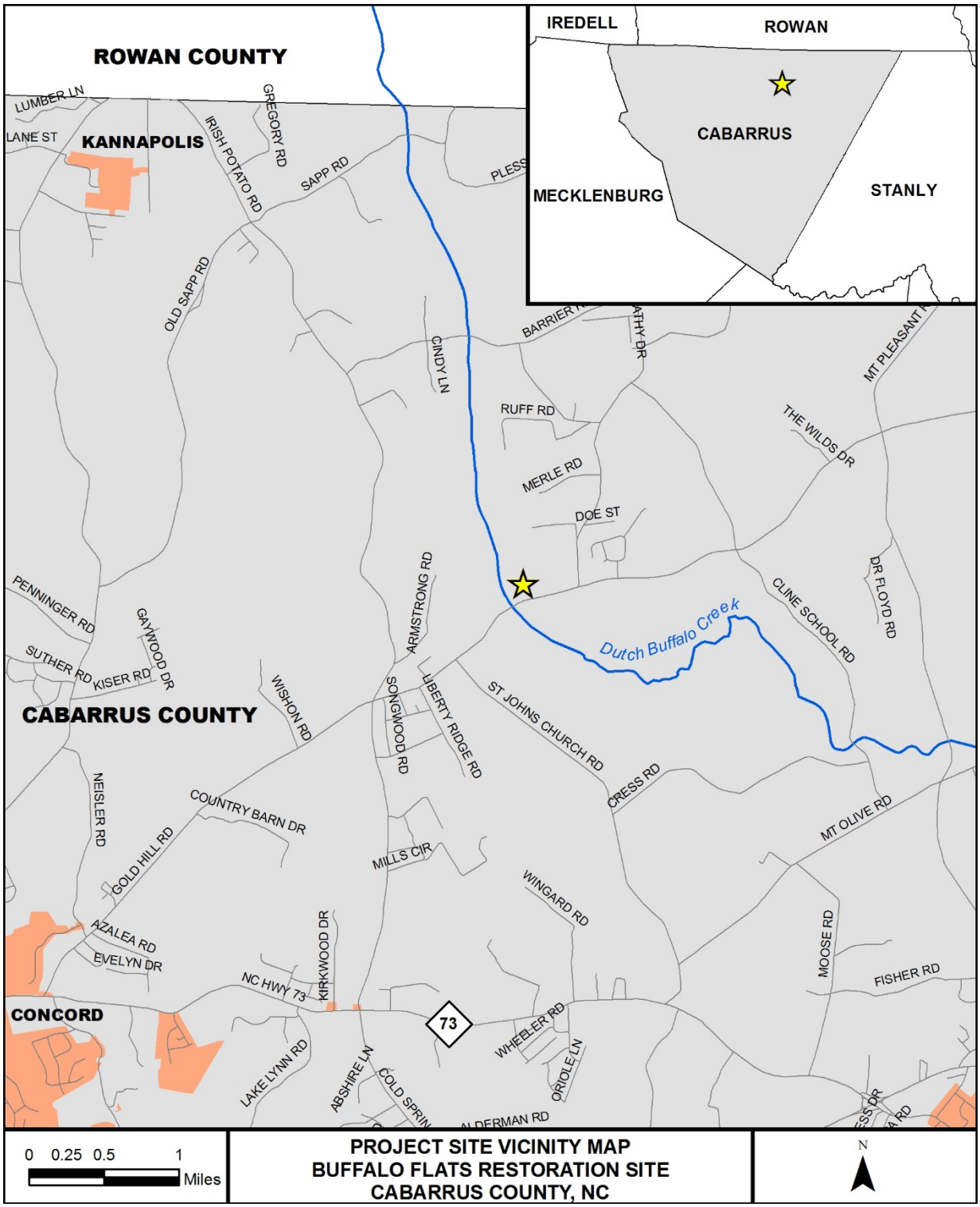
USACE. 2003. Stream Mitigation Guidelines. USACE, NCDENR-DWQ, USEPA, NCWRC.

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


ROWAN COUNTY
IREDELL
ROWAN
CABARRUS
MECKLENBURG
STANLY
KANNAPOLIS
CONCORD
CABARRUS COUNTY
LUMBER LN
LANE ST
GREGORY RD
IRISH POTATO RD
SAPP RD
OLD SAPP RD
CINDY LN
BARRIER
RUFF RD
MERLE RD
DOE ST
THE WILDS DR
MT PLEASANT
DR FLOYD RD
CLINE SCHOOL RD
Dutch Buffalo Creek
ARMSTRONG RD
PENNINGER RD
GAYWOOD DR
SUTHER RD
KISER RD
WISHON RD
SONGWOOD RD
LIBERTY RIDGE RD
ST JOHNS CHURCH RD
CRESS RD
MT OLIVE RD
NEISLER RD
COUNTRY BARN DR
GOLD HILL RD
MILLS CIR
WINGARD RD
AZALEA RD
EVELYN DR
KIRKWOOD DR
NC HWY 73
73
WHEELER RD
ORIOLE LN
MOOSE RD
FISHER RD
LAKE LYNN RD
ABSHIRE LN
ALDERMAN RD
0 0.25 0.5 1
Miles
PROJECT SITE VICINITY MAP
BUFFALO FLATS RESTORATION SITE
CABARRUS COUNTY, NC
N

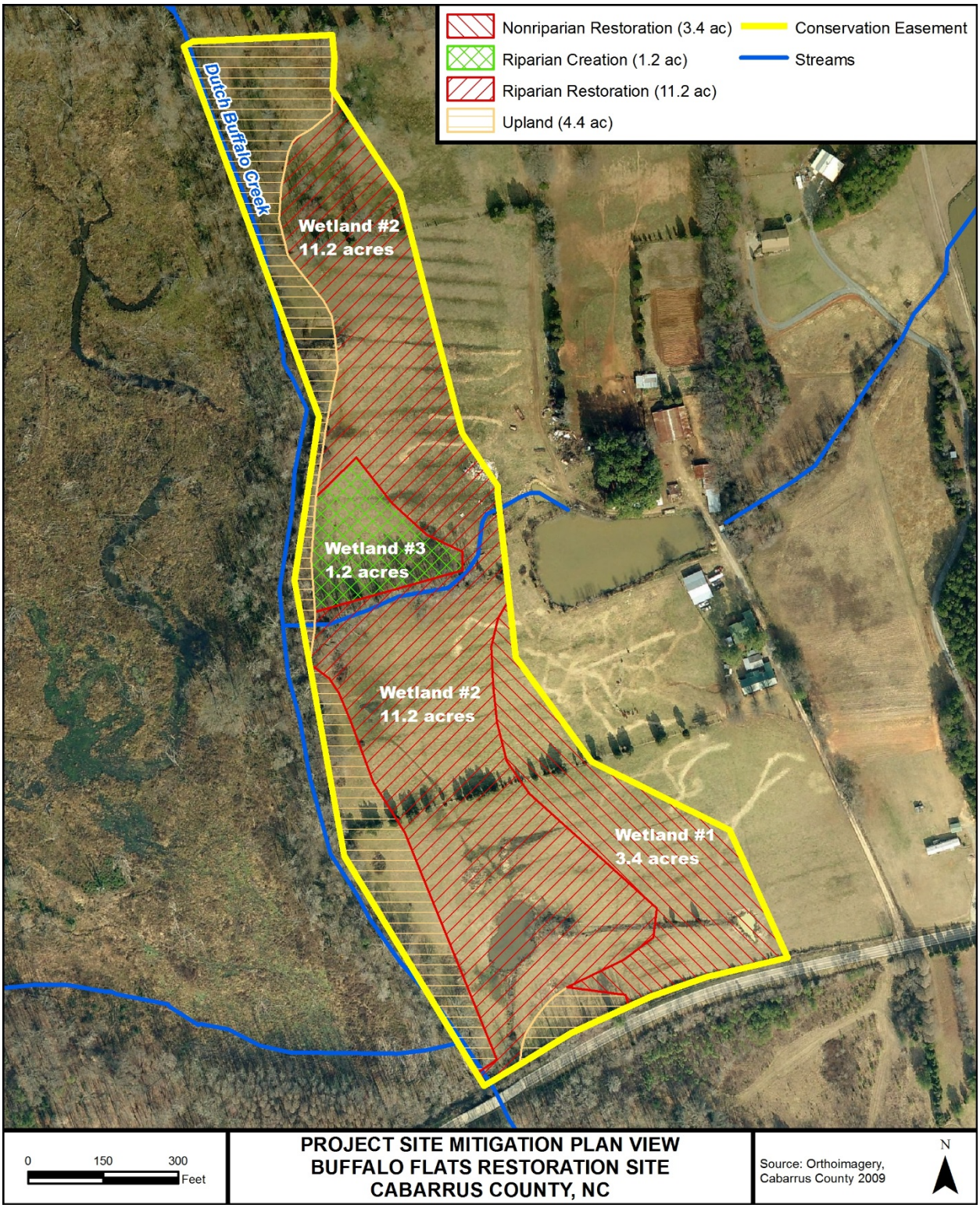

Nonriparian Restoration (3.4 ac)
Riparian Creation (1.2 ac)
Riparian Restoration (11.2 ac)
Upland (4.4 ac)
Conservation Easement
Streams
Dutch Buffalo Creek
Wetland #2
11.2 acres
Wetland #3
1.2 acres
Wetland #2
11.2 acres
Wetland #1
3.4 acres
0
150
300
Feet
PROJECT SITE MITIGATION PLAN VIEW
BUFFALO FLATS RESTORATION SITE
CABARRUS COUNTY, NC
Source: Orthoimagery,
Cabarrus County 2009
N

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: 5 yr 2 months **Elapsed Time Since Planting Complete: 4 yr 10 months** **Number of Reporting Years: 5**		
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
Year 4 Monitoring	July 15	Dec 15
Supplemental Planting		April 16
Year 5 Monitoring	July 16	Dec 16

Table 3. Project Contacts **Project Number and Name: 94647 - Buffalo Flats Restoration Site**	
Design Firm	KCI Associates of North Carolina, PA 4505 Falls of Neuse Road Suite 400 Raleigh, NC 27609 Contact: Mr. Tim Morris Phone: (919) 278-2512 Fax: (919) 783-9266
Construction Contractor	KCI Environmental Technologies and Construction, Inc. 4505 Falls of Neuse Road Suite 400 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-MY05	KCI Associates of North Carolina, PA 4505 Falls of Neuse Road Suite 400 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 — 2512/738
- WETLAND GAUGE ACHIEVING HYDROLOGIC CRITERION
- WETLAND GAUGE BELOW HYDROLOGIC CRITERION
- PHOTO POINT
- SOIL PROFILE PLOT

IMAGE SOURCE: NC 2010 ORTHOIMAGERY

NC GRID NAD '83

-80 -40 0 80 160

GRAPHIC SCALE

DUTCH BUFFALO CREEK

CONSERVATION EASEMENT BOUNDARY

CONSERVATION EASEMENT

REFERENCE GAUGE

UPLAND PRESERVATION

PP11

VEG PLOT #13 4168/647

GAUGE#9

GAUGE#6

SOIL PROFILE PLOT 6

WETLAND AREA 3 RIPARIAN CREATION

VEG PLOT #11 2307/567

VEG PLOT #12 4411/931

WETLAND AREA 2 RIPARIAN RESTORATION

RIPARIAN RESTORATION

PP9

PP10

PP8

VEG PLOT #7 3585/647

GAUGE#5

VEG PLOT #9 2266/809

GAUGE#7

SOIL PROFILE PLOT 7

VEG PLOT #10 1052/486

GAUGE#8

VEG PLOT #8 2469/1133

VEG PLOT LB1 1781/1052

ADJACENT CONSERVATION EASEMENT

VEG PLOT #5 1035/567

VEG PLOT #3 2508/486

GAUGE#3

VEG PLOT #6 1052/526

GAUGE#4

PP6

PP7

UPL. PRES.

PP4

PP5

PP3

GAUGE#2

VEG PLOT #2 1942/1093

VEG PLOT #4 2104/971

GOLD HILL RD

GAUGE#1

WETLAND AREA 1 NONRIPARIAN RESTORATION

VEG PLOT #1 1457/728

GAUGE#10

PP1

PP2

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 EASEMENT= 20.2 ACRES

SYM.	DESCRIPTION	DATE	APPROVED

REVISIONS

NCDEQ DIVISION OF MITIGATION SERVICES

KCI ASSOCIATES OF NC
ENGINEERS• PLANNERS• SCIENTISTS
4505 FALLS OF NEUSE ROAD
RALEIGH, NORTH CAROLINA 27609

BUFFALO FLATS RESTORATION SITE

DMS PROJECT #94647
CABARRUS COUNTY, NORTH CAROLINA
MONITORING YEAR 05

DATE: DEC 2015
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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

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. 7/19/2016 - MY05

Vegetation Plot Photos

Vegetation Plot 1: 7/18/2016 - MY05

Vegetation Plot 2: 7/18/2016 - MY05

Vegetation Plot 3: 7/18/2016 - MY05

Vegetation Plot 4: 7/18/2016 - MY05

Vegetation Plot 5: 7/18/2016 - MY05

Vegetation Plot 6: 7/18/2016 - MY05

Vegetation Plot 7: 7/18/2016 - MY05

Vegetation Plot 8: 7/19/2016 - MY05

Vegetation Plot 9: 7/19/2016 - MY05

Vegetation Plot 10: 7/19/2016 - MY05

Vegetation Plot 11: 7/19/2016 - MY05

Vegetation Plot 12: 7/19/2016 - MY05

Vegetation Plot 13: 7/19/2016 - MY05

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? (260 planted stems/acre)	Monitoring Year 05 Planted Stem Density (stems/acre)	Monitoring Year 05 Total Stem Density (stems/acre)
1	Yes	728	1,457
2	Yes	1,093	1,942
3	Yes	486	2,509
4	Yes	971	2,104
5	Yes	567	1,335
6	Yes	526	1,052
7	Yes	648	5,585
8	Yes	1,133	2,469
9	Yes	809	2,266
10	Yes	486	1,052
11	Yes	567	2,307
12	Yes	931	4,411
13	Yes	648	4,168

Table 7. CVS Vegetation Plot Metadata Project Number and Name: 94647 - Buffalo Flats Restoration Site	
Report Prepared By	Randall Jones
Date Prepared	8/17/2016 14:37
database name	KCI-2015-B-96467.mdb
database location	M:\2010\20100798_Buffalo_Flats\Vegetation
computer name	12-3ZV4FP1
file size	62402560
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

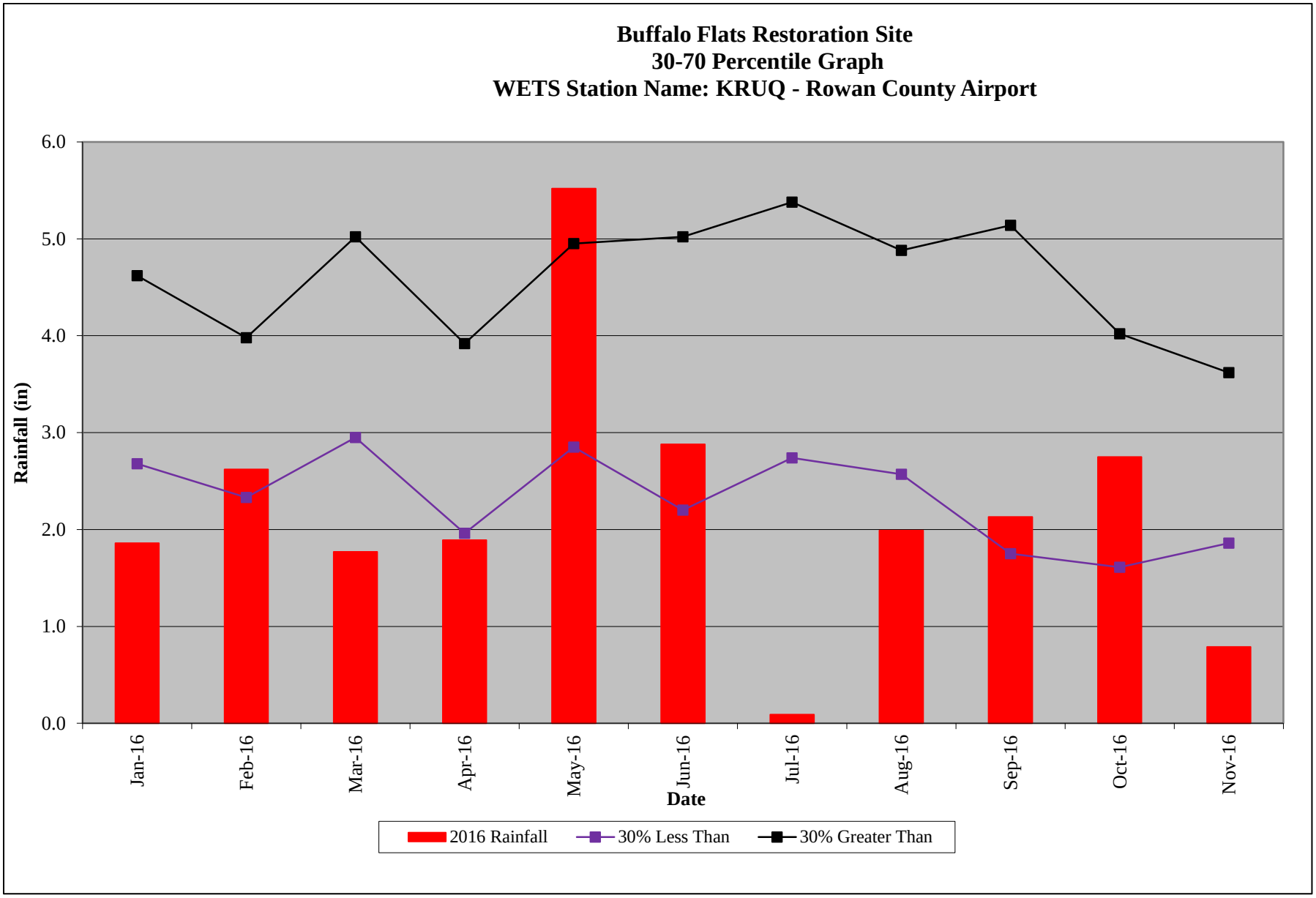
			Current Plot Data (MY5-2016)																									
			E94647-EEP-0001			E94647-EEP-0002			E94647-EEP-0003			E94647-EEP-0004			E94647-EEP-0005			E94647-EEP-0006			E94647-EEP-0007			E94647-EEP-0008			E94647-EEP-0009		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	T
Acer negundo	boxelder	Tree			2						1			3			6						5			1			
Acer rubrum	red maple	Tree												3			3			4			73						4
Baccharis	baccharis	Shrub												2												1			
Baccharis halimifolia	eastern baccharis	Shrub																											
Betula nigra	river birch	Tree				1	1	1	1	1	1										1	1	1	3	3	3	3	3	3
Diospyros virginiana	common persimmon	Tree															1												1
Fraxinus pennsylvanic	green ash	Tree				3	3	4			42			7			4			2	1	1	2				3	3	28
Juglans nigra	black walnut	Tree																					1						
Juniperus virginiana	eastern redcedar	Tree									1									1									
Liquidambar styraciflu	sweetgum	Tree			7						1			10			4			2			30			31			1
Liriodendron tulipifera	tuliptree	Tree																			2	2	2						
Nyssa aquatica	water tupelo	Tree				6	6	6	2	2	2	1	1	1	1	1	1										1	1	1
Pinus taeda	loblolly pine	Tree			8															1									
Platanus occidentalis	American sycamore	Tree	2	2	3				1	1	4			3	1	1	2	2	2	5	1	1	13				3	3	7
Populus	cottonwood							7																					
Populus deltoides	eastern cottonwood	Tree																											
Quercus	oak	Tree																											
Quercus laurifolia	laurel oak	Tree	4	4	4							1	1	1				1	1	1	2	2	2						
Quercus lyrata	overcup oak	Tree																											
Quercus michauxii	swamp chestnut oak	Tree	2	2	2				2	2	2							3	3	3	4	4	4	5	5	5			1
Quercus pagoda	cherrybark oak	Tree							1	1	1				4	4	4	4	4	4	2	2	2	8	8	8	4	4	4
Quercus palustris	pin oak	Tree	9	9	9	1	1	1				2	2	2										1	1	1			
Quercus phellos	willow oak	Tree	1	1	1	1	1	1	1	1	1	8	8	8	6	6	6	1	1	1	3	3	3	11	11	11	6	6	6
Salix nigra	black willow	Tree						13			2																		
Taxodium distichum	bald cypress	Tree				15	15	15	4	4	4	12	12	12	2	2	2	2	2	2									
Ulmus americana	American elm	Tree																											
Unknown		Shrub or Tree																											
Stem count			18	18	36	27	27	48	12	12	62	24	24	52	14	14	33	13	13	26	16	16	138	28	28	61	20	20	56
size (ares)			1			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			0.02		
Species count			5	5	8	6	6	8	7	7	12	5	5	11	5	5	10	6	6	11	8	8	12	5	5	8	6	6	10
Stems per ACRE			728	728	1457	1093	1093	1942	486	486	2509	971	971	2104	567	567	1335	526	526	1052	647	647	5585	1133	1133	2469	809	809	2266

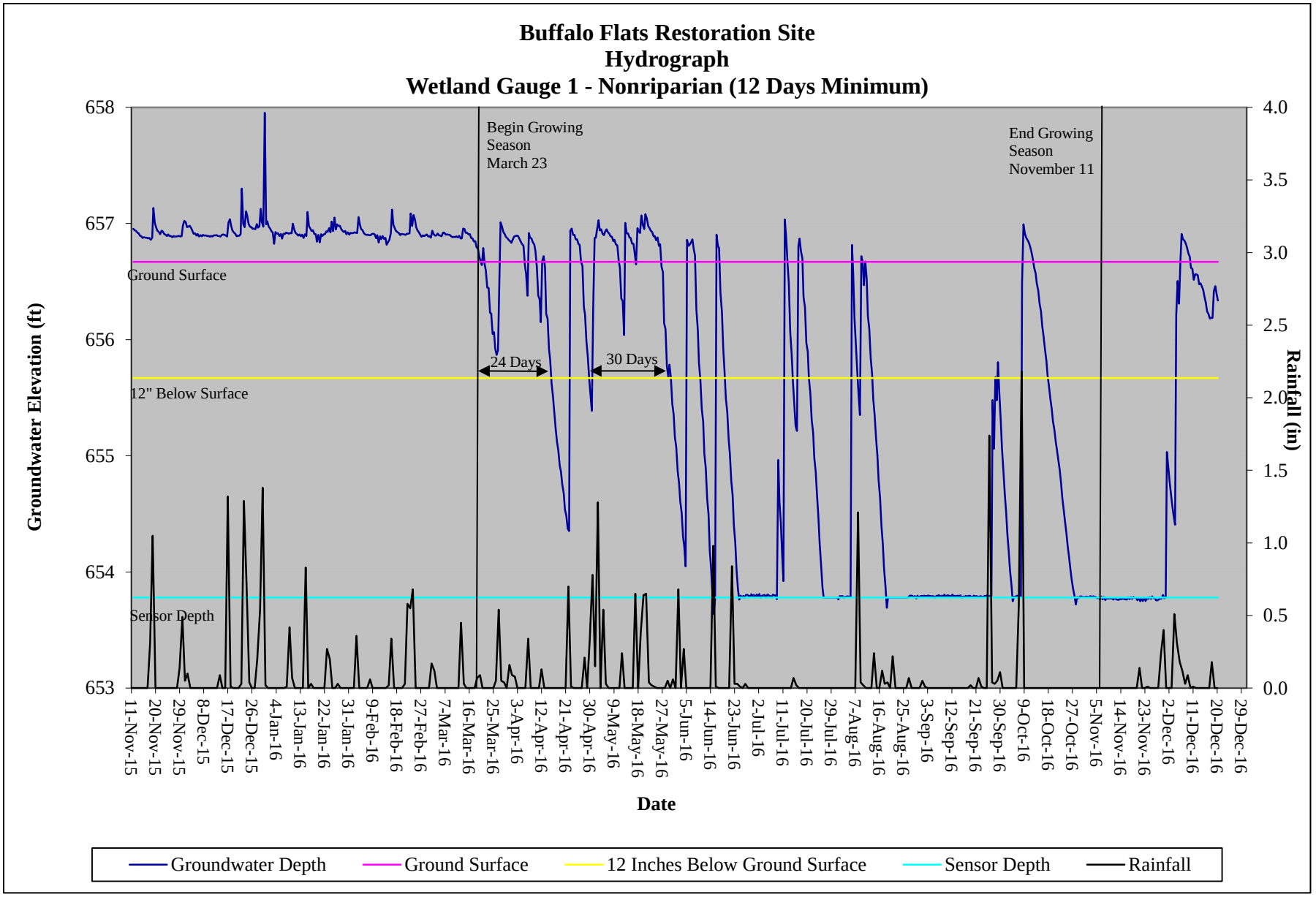
Table 8. CVS Stem Count Total and Planted by Plot and Species Cont.
Project Number and Name: 94647 - Buffalo Flats Restoration Site

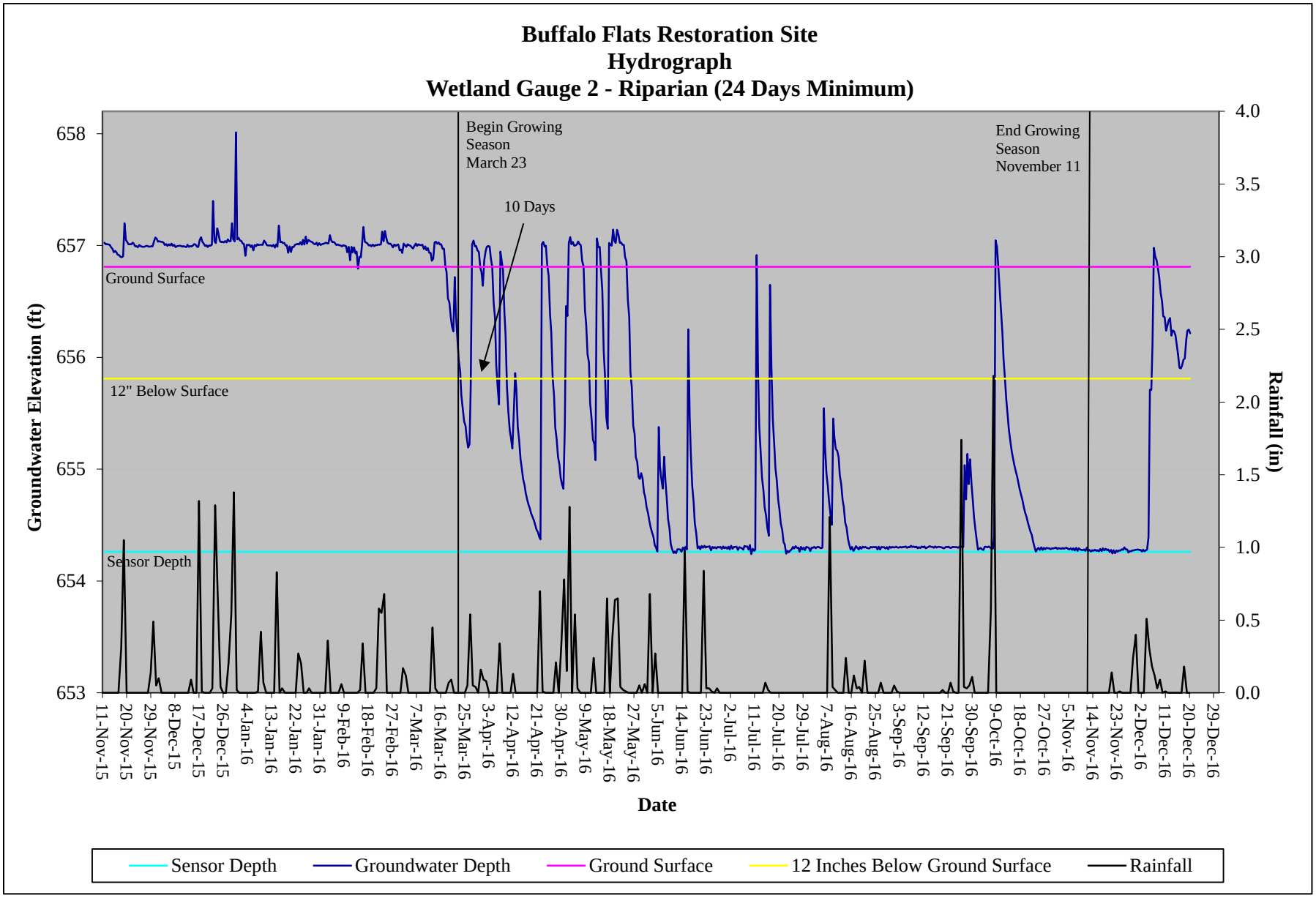
			Current Plot Data (MY5-2016)												Annual Means																	
			E94647-EEP-0010			E94647-EEP-0011			E94647-EEP-0012			E94647-EEP-0013			MY5 (2016)			MY4 (2015)			MY3 (2014)			MY2 (2013)			MY1 (2012)			MY0 (2012)		
Scientific Name	Common Name	Species Type	PnoLS	P-all	T	PnoLS	P-all	T	PnoLS	P-all	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
Acer negundo	boxelder	Tree						7			6			9			40			46			61			41			16			
Acer rubrum	red maple	Tree			5			2			1			3			98			121			101			53			5			
Baccharis	baccharis	Shrub						1			3						7															
Baccharis halimifolia	eastern baccharis	Shrub																		9			3									
Betula nigra	river birch	Tree	2	2	2	3	3	3	6	6	6	1	1	1	21	21	21	18	18	18	22	22	22	25	25	25	27	27	27	47	47	47
Diospyros virginiana	common persimm	Tree												2			4			12			5			5			4			
Fraxinus pennsylvanica	green ash	Tree			3			20	4	4	43	6	6	71	17	17	226	17	17	235	17	17	118			30			14			
Juglans nigra	black walnut	Tree												1			2															
Juniperus virginiana	eastern redcedar	Tree									8						10			9			4									
Liquidambar styraciflua	sweetgum	Tree			2			4			2						94			79			35			25			7			
Liriodendron tulipifera	tuliptree	Tree	1	1	1	1	1	1						1	4	4	5	4	4	5	4	4	5	4	4	7	4	4	4			
Nyssa aquatica	water tupelo	Tree	1	1	1				3	3	3	3	3	3	18	18	18	15	15	15	18	18	18	18	18	18	16	16	16	6	6	6
Pinus taeda	loblolly pine	Tree															9			2			1									
Platanus occidentalis	American sycamor	Tree	1	1	5	4	4	12	8	8	30	1	1	7	24	24	91	24	24	111	24	24	93	3	3	84	3	3	33			
Populus	cottonwood																7															
Populus deltoides	eastern cottonwoo	Tree																		4						2			2			
Quercus	oak	Tree																						4	4	11	1	1	1	3	3	3
Quercus laurifolia	laurel oak	Tree													8	8	8	8	8	8	6	6	6	7	7	7	10	10	10	19	19	19
Quercus lyrata	overcup oak	Tree										1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1			
Quercus michauxii	swamp chestnut o	Tree													16	16	17	13	13	15	13	13	13			15						
Quercus pagoda	cherrybark oak	Tree	4	4	4	4	4	4	2	2	2				33	33	33	39	39	40	39	39	40	36	36	39	42	42	43	24	24	24
Quercus palustris	pin oak	Tree													13	13	13	7	7	8	7	7	7	7	7	7	8	8	8			
Quercus phellos	willow oak	Tree	3	3	3	2	2	2				4	4	4	47	47	47	43	43	49	44	44	46	34	34	37	29	29	29	14	14	14
Salix nigra	black willow	Tree						1			5						21			11												
Taxodium distichum	bald cypress	Tree													35	35	35															
Ulmus americana	American elm	Tree																		2			1									
Unknown		Shrub or Tree																						3	3	3	11	11	11	124	124	124
	Stem count		12	12	26	14	14	57	23	23	109	16	16	103	237	237	807	189	189	800	195	195	580	142	142	410	152	152	231	237	237	237
	size (ares)		1			1			1			1			13			13			13			13			13			13		
	size (ACRES)		0.02			0.02			0.02			0.02			0.32			0.32			0.32			0.32			0.32			0.32		
	Species count		6	6	9	5	5	11	5	5	11	6	6	11	12	12	22	11	11	21	11	11	19	11	11	18	11	11	17	7	7	7
	Stems per ACRE		486	486	1052	567	567	2307	931	931	4411	647	647	4168	738	738	2512	588	588	2490	607	607	1806	442	442	1276	473	473	719	738	738	738

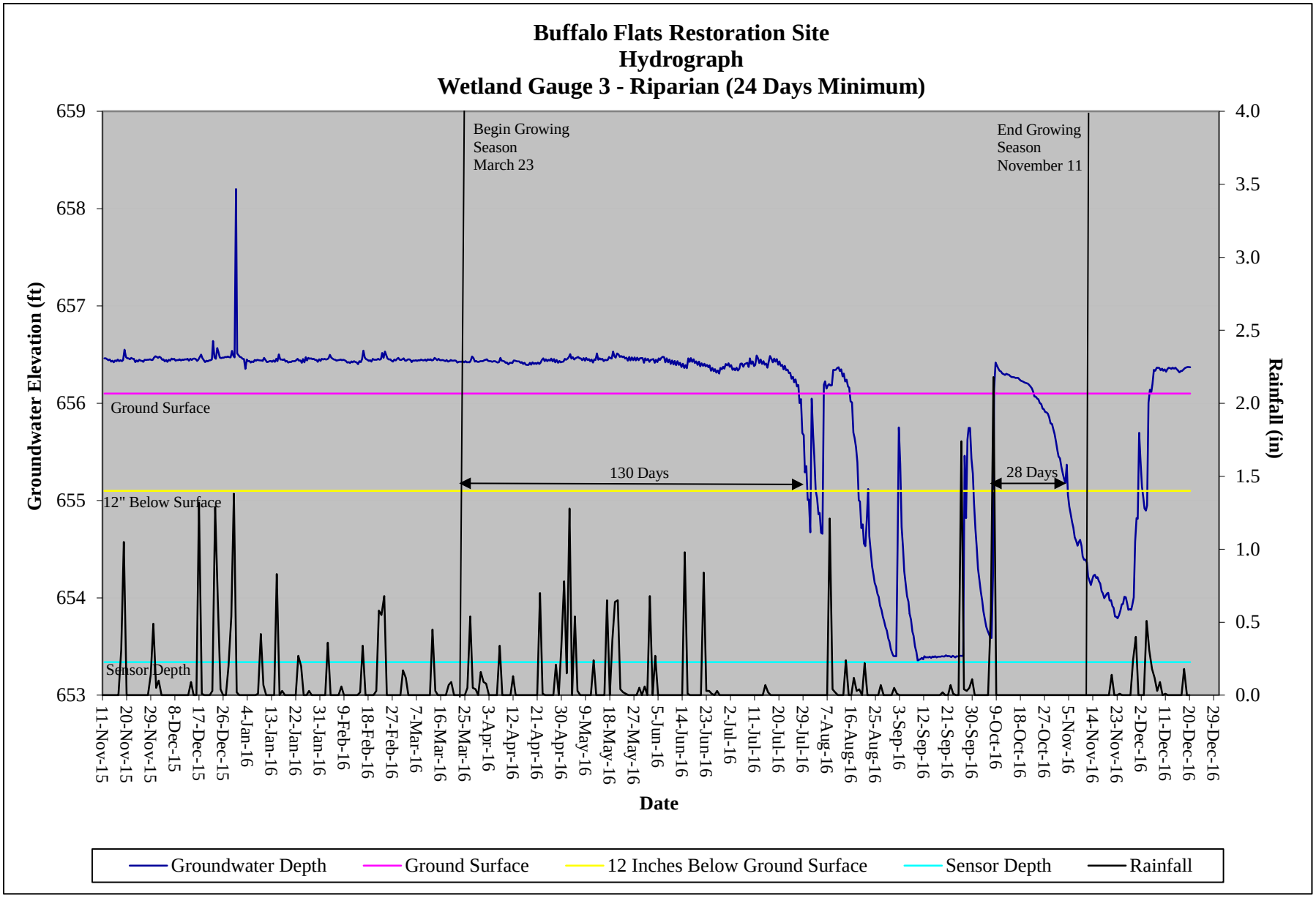
Appendix D

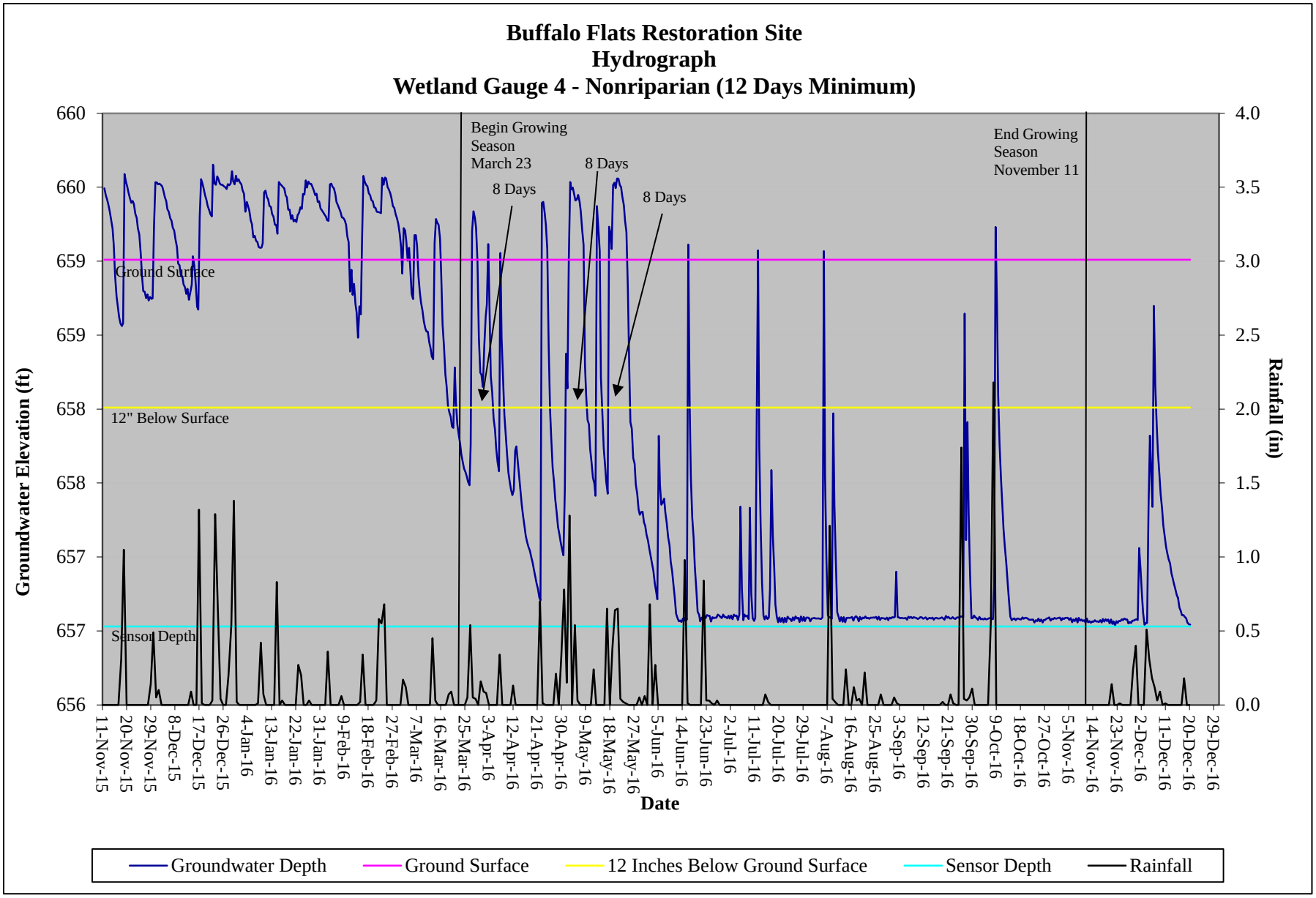
Hydrologic Data

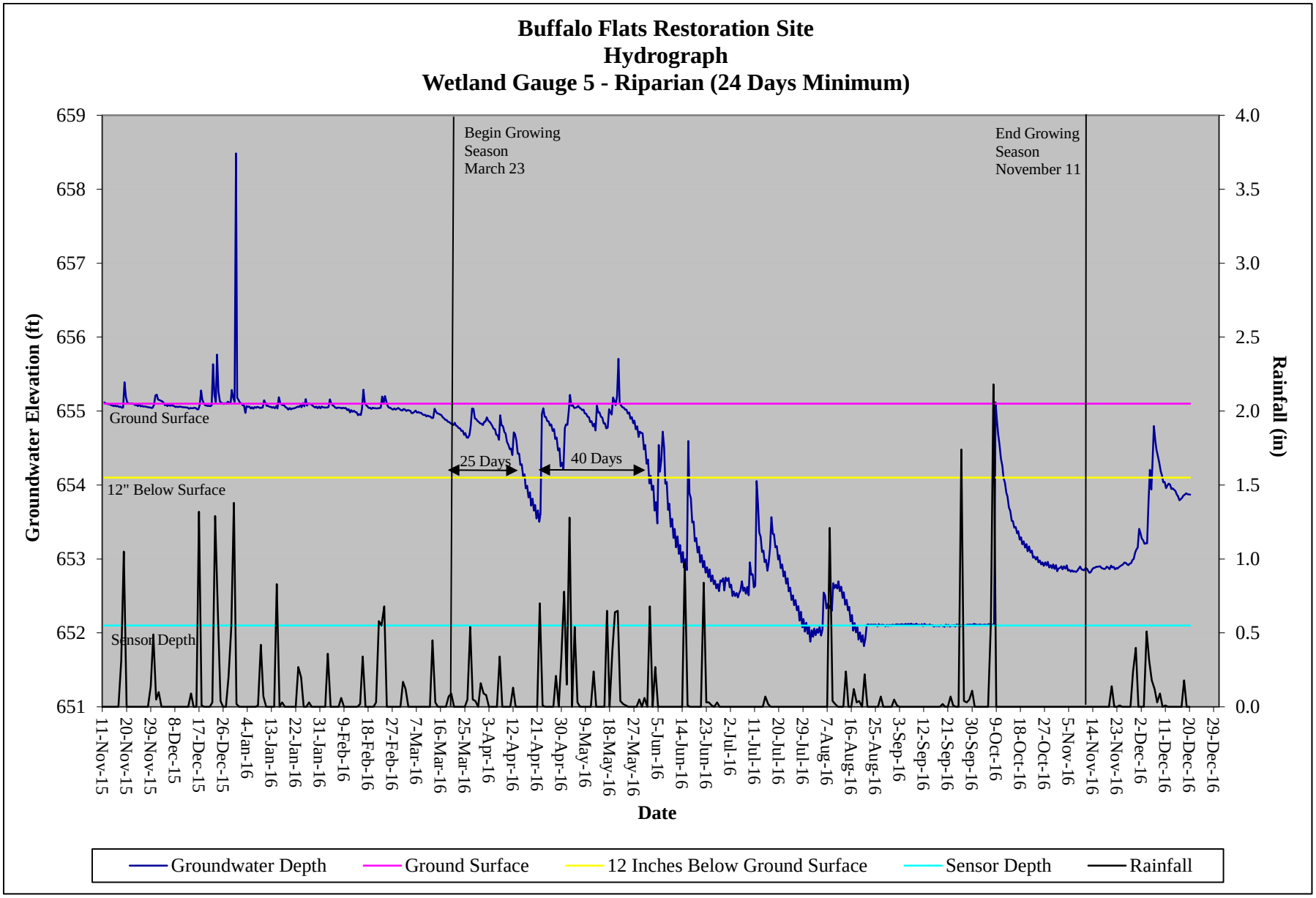

Buffalo Flats Restoration Site
30-70 Percentile Graph
WETS Station Name: KRUQ - Rowan County Airport
Rainfall (in)
6.0
5.0
4.0
3.0
2.0
1.0
0.0
Jan-16
Feb-16
Mar-16
Apr-16
May-16
Jun-16
Jul-16
Aug-16
Sep-16
Oct-16
Nov-16
Date
2016 Rainfall
30% Less Than
30% Greater Than

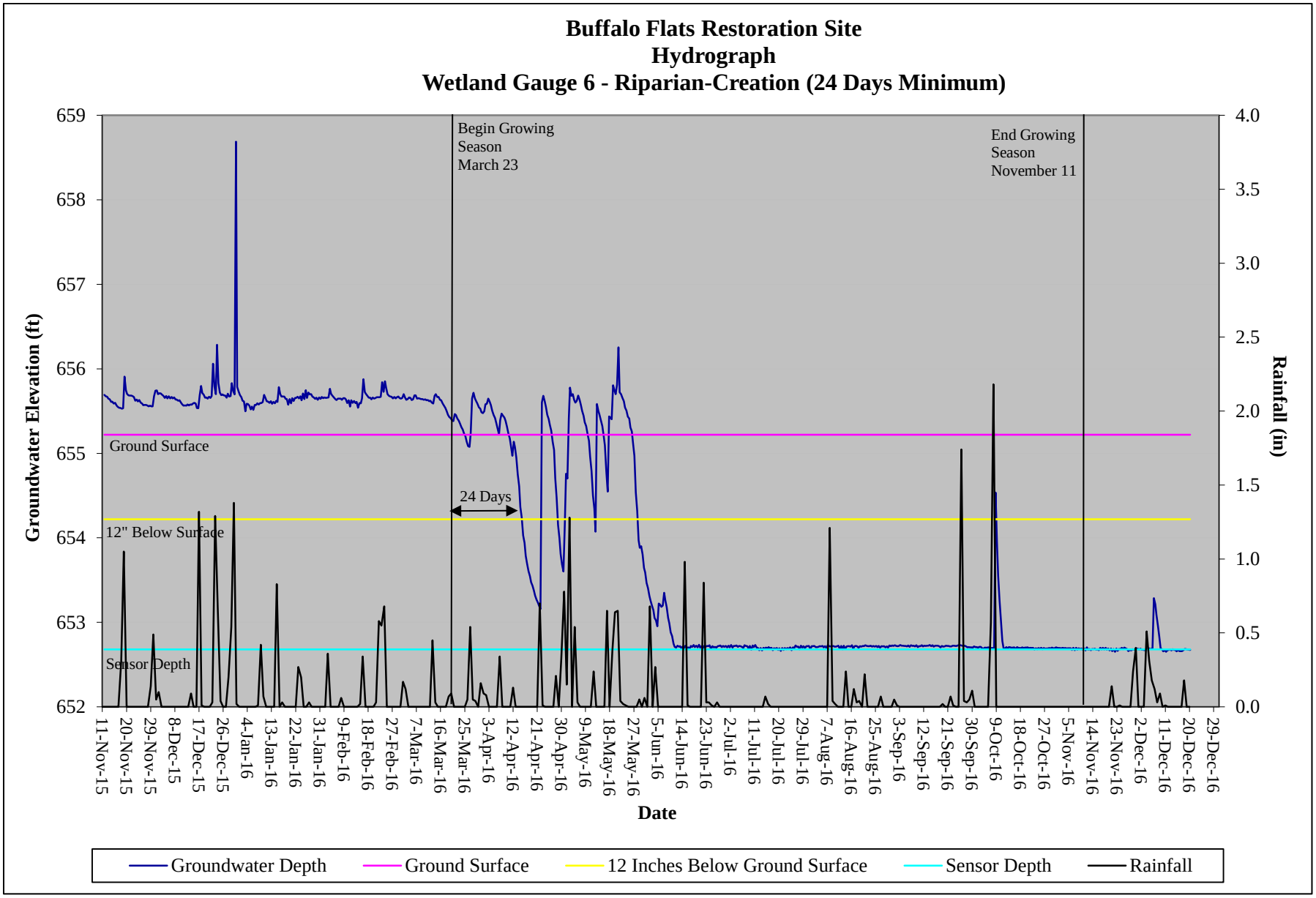

Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 1 - Nonriparian (12 Days Minimum)
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season March 23
End Growing Season November 11
Ground Surface
12" Below Surface
Sensor Depth
24 Days
30 Days
658
657
656
655
654
653
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11-Nov-15
20-Nov-15
29-Nov-15
8-Dec-15
17-Dec-15
26-Dec-15
4-Jan-16
13-Jan-16
22-Jan-16
31-Jan-16
9-Feb-16
18-Feb-16
27-Feb-16
7-Mar-16
16-Mar-16
25-Mar-16
3-Apr-16
12-Apr-16
21-Apr-16
30-Apr-16
9-May-16
18-May-16
27-May-16
5-Jun-16
14-Jun-16
23-Jun-16
2-Jul-16
11-Jul-16
20-Jul-16
29-Jul-16
7-Aug-16
16-Aug-16
25-Aug-16
3-Sep-16
12-Sep-16
21-Sep-16
30-Sep-16
9-Oct-16
18-Oct-16
27-Oct-16
5-Nov-16
14-Nov-16
23-Nov-16
2-Dec-16
11-Dec-16
20-Dec-16
29-Dec-16
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall

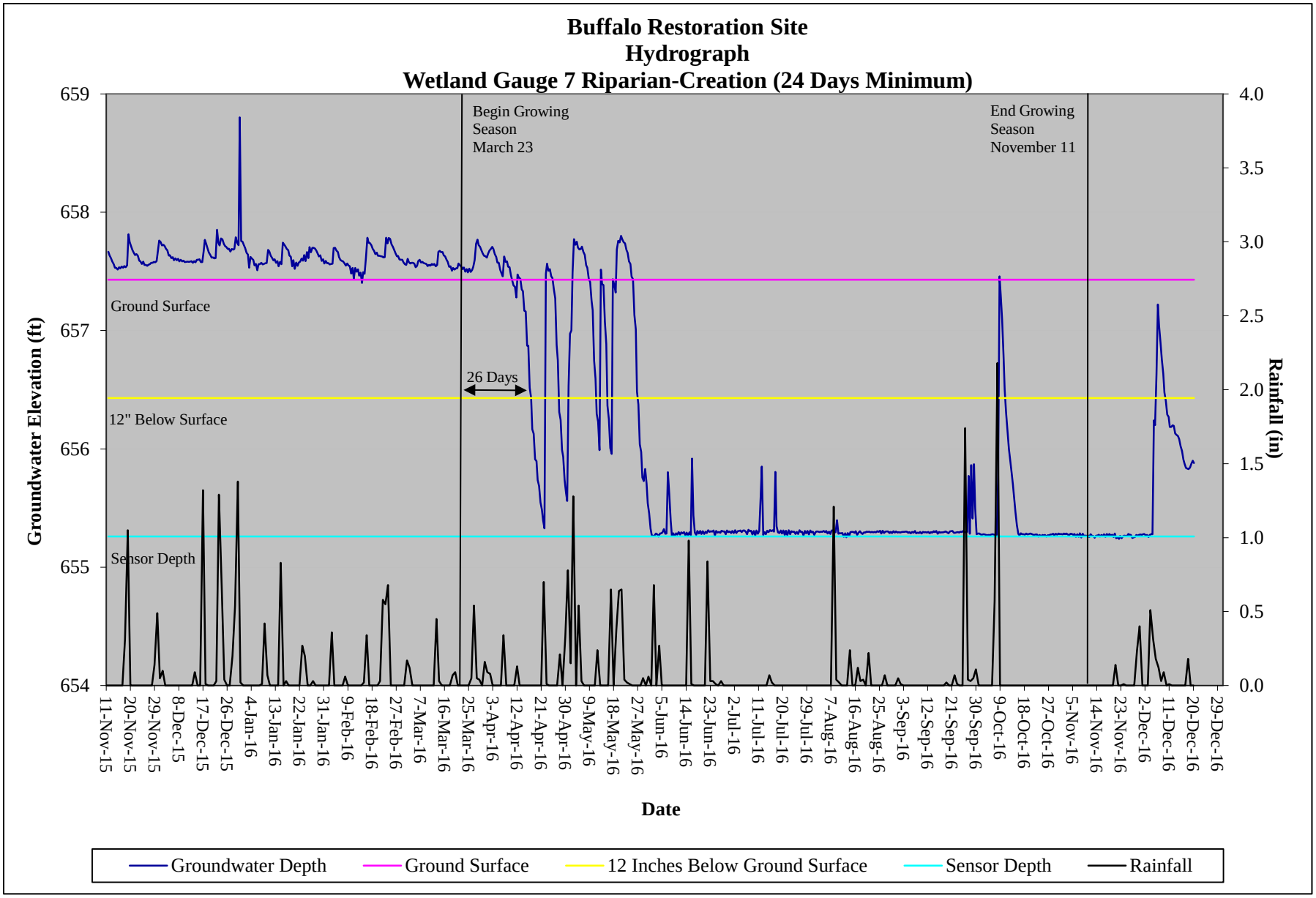

Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 2 - Riparian (24 Days Minimum)
Begin Growing Season March 23
End Growing Season November 11
10 Days
Ground Surface
12" Below Surface
Sensor Depth
Groundwater Elevation (ft)
Rainfall (in)
Date
Sensor Depth
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Rainfall

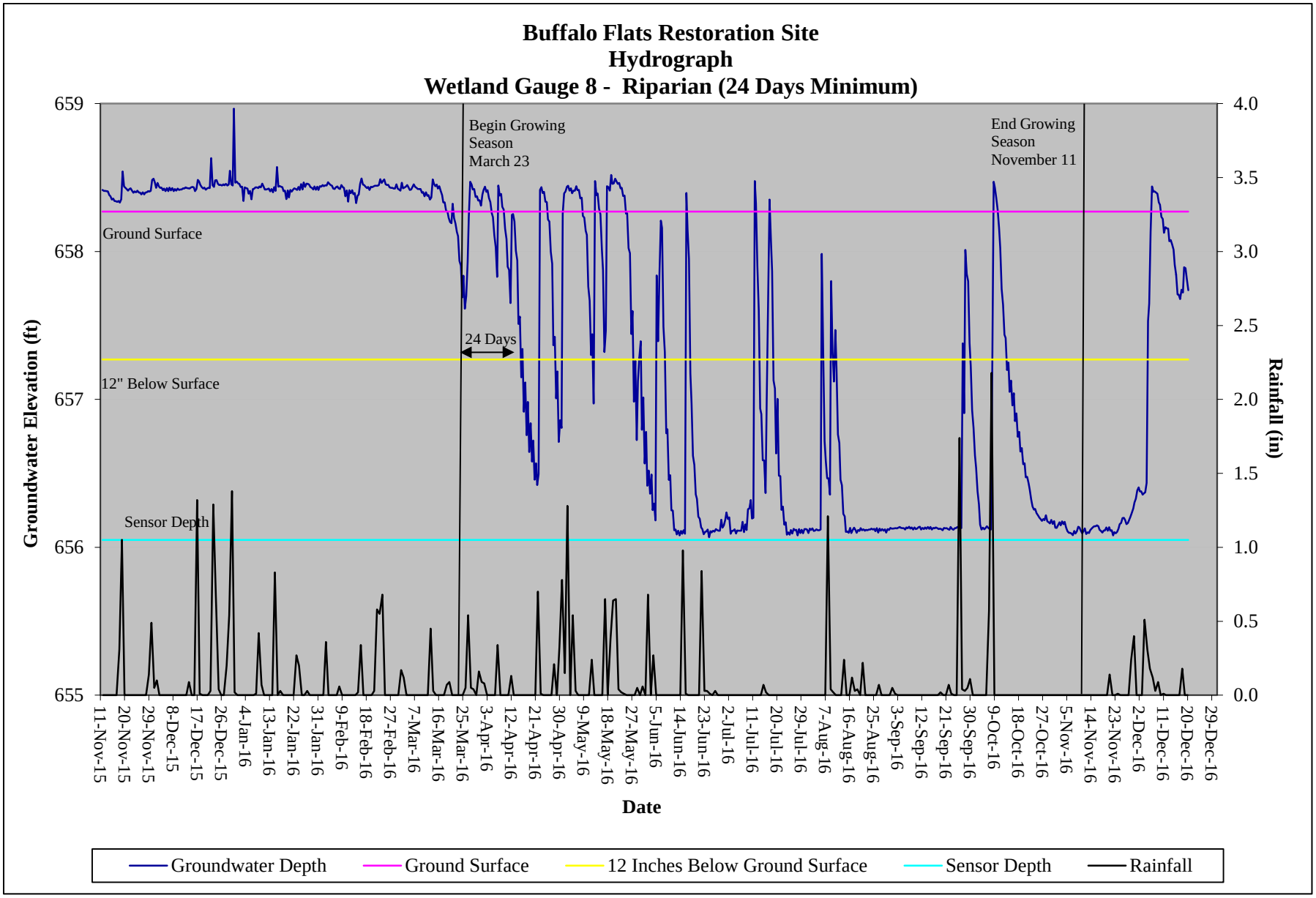

Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 3 - Riparian (24 Days Minimum)
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season March 23
End Growing Season November 11
130 Days
28 Days
Ground Surface
12" Below Surface
Sensor Depth
659
658
657
656
655
654
653
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11-Nov-15
20-Nov-15
29-Nov-15
8-Dec-15
17-Dec-15
26-Dec-15
4-Jan-16
13-Jan-16
22-Jan-16
31-Jan-16
9-Feb-16
18-Feb-16
27-Feb-16
7-Mar-16
16-Mar-16
25-Mar-16
3-Apr-16
12-Apr-16
21-Apr-16
30-Apr-16
9-May-16
18-May-16
27-May-16
5-Jun-16
14-Jun-16
23-Jun-16
2-Jul-16
11-Jul-16
20-Jul-16
29-Jul-16
7-Aug-16
16-Aug-16
25-Aug-16
3-Sep-16
12-Sep-16
21-Sep-16
30-Sep-16
9-Oct-16
18-Oct-16
27-Oct-16
5-Nov-16
14-Nov-16
23-Nov-16
2-Dec-16
11-Dec-16
20-Dec-16
29-Dec-16
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall

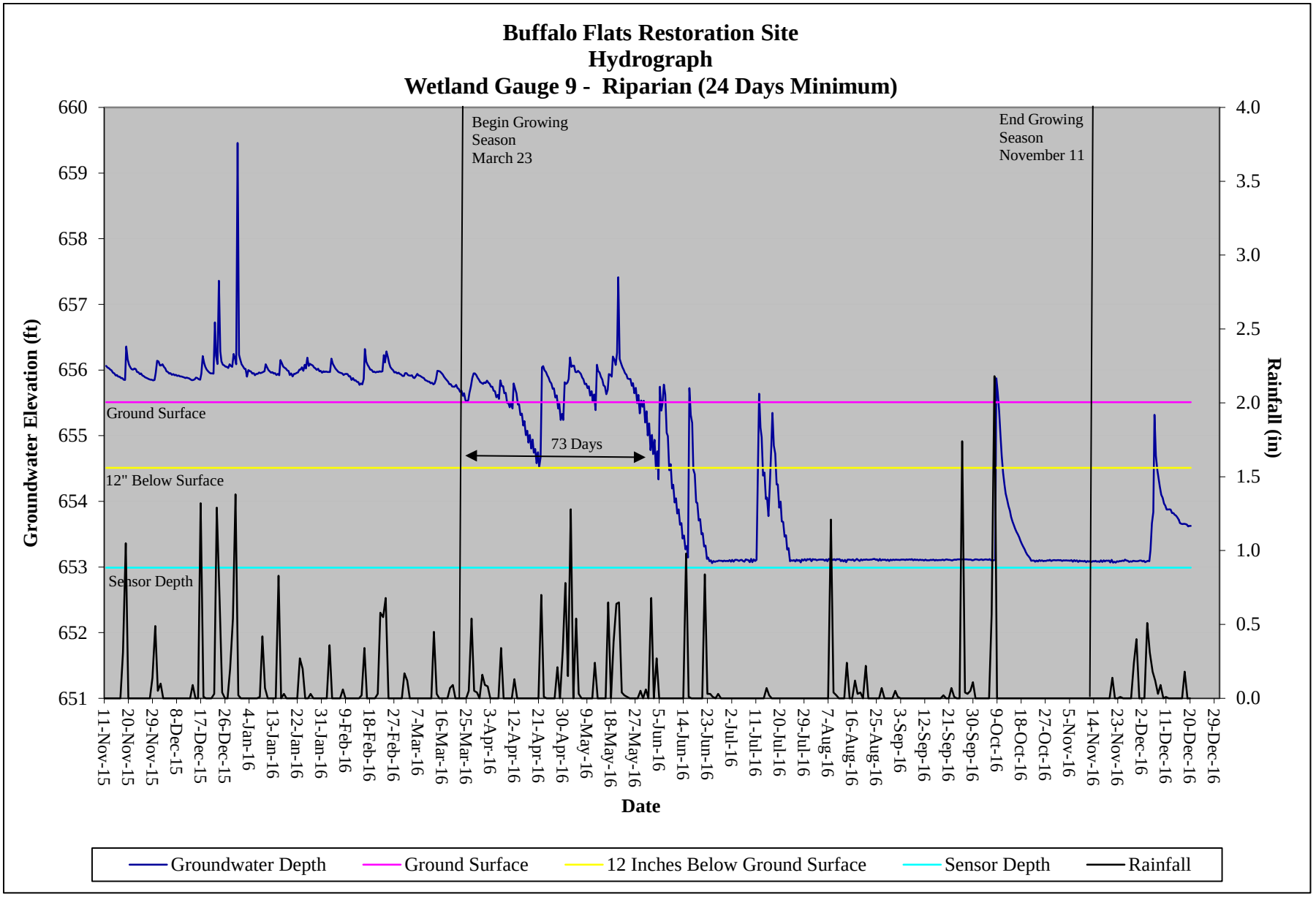

Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 4 - Nonriparian (12 Days Minimum)
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season March 23
End Growing Season November 11
8 Days
8 Days
8 Days
Ground Surface
12" Below Surface
Sensor Depth
660
659
658
657
656
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11-Nov-15
20-Nov-15
29-Nov-15
8-Dec-15
17-Dec-15
26-Dec-15
4-Jan-16
13-Jan-16
22-Jan-16
31-Jan-16
9-Feb-16
18-Feb-16
27-Feb-16
7-Mar-16
16-Mar-16
25-Mar-16
3-Apr-16
12-Apr-16
21-Apr-16
30-Apr-16
9-May-16
18-May-16
27-May-16
5-Jun-16
14-Jun-16
23-Jun-16
2-Jul-16
11-Jul-16
20-Jul-16
29-Jul-16
7-Aug-16
16-Aug-16
25-Aug-16
3-Sep-16
12-Sep-16
21-Sep-16
30-Sep-16
9-Oct-16
18-Oct-16
27-Oct-16
5-Nov-16
14-Nov-16
23-Nov-16
2-Dec-16
11-Dec-16
20-Dec-16
29-Dec-16
Date
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall

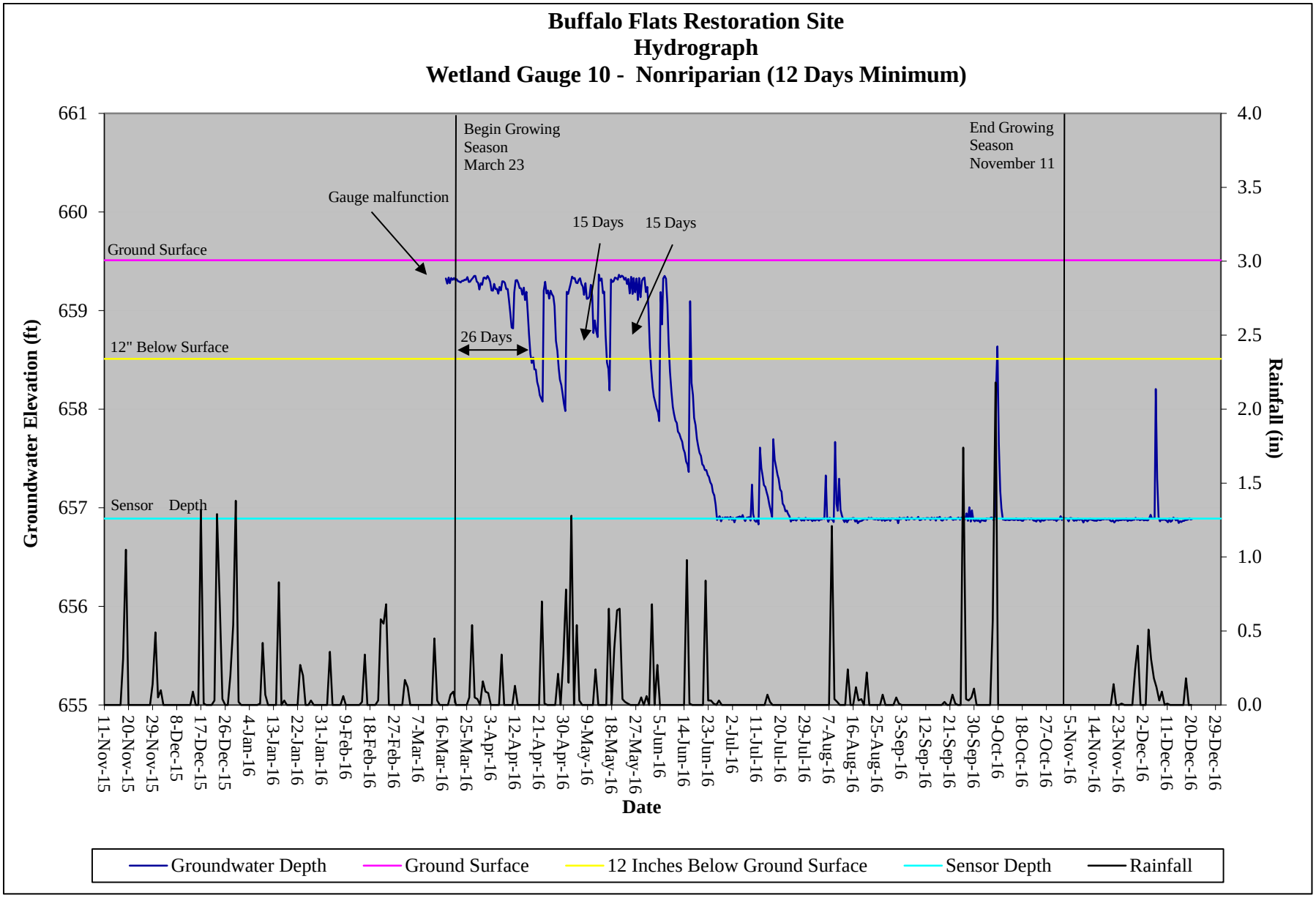

Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 5 - Riparian (24 Days Minimum)
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season March 23
End Growing Season November 11
Ground Surface
12" Below Surface
Sensor Depth
25 Days
40 Days
Date
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall


Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 6 - Riparian-Creation (24 Days Minimum)
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season March 23
End Growing Season November 11
Ground Surface
12" Below Surface
24 Days
Sensor Depth
Date
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall


Buffalo Restoration Site
Hydrograph
Wetland Gauge 7 Riparian-Creation (24 Days Minimum)
Begin Growing Season March 23
End Growing Season November 11
Ground Surface
26 Days
12" Below Surface
Sensor Depth
Groundwater Elevation (ft)
Rainfall (in)
Date
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall


Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 8 - Riparian (24 Days Minimum)
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season March 23
End Growing Season November 11
Ground Surface
12" Below Surface
Sensor Depth
24 Days
659
658
657
656
655
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11-Nov-15
20-Nov-15
29-Nov-15
8-Dec-15
17-Dec-15
26-Dec-15
4-Jan-16
13-Jan-16
22-Jan-16
31-Jan-16
9-Feb-16
18-Feb-16
27-Feb-16
7-Mar-16
16-Mar-16
25-Mar-16
3-Apr-16
12-Apr-16
21-Apr-16
30-Apr-16
9-May-16
18-May-16
27-May-16
5-Jun-16
14-Jun-16
23-Jun-16
2-Jul-16
11-Jul-16
20-Jul-16
29-Jul-16
7-Aug-16
16-Aug-16
25-Aug-16
3-Sep-16
12-Sep-16
21-Sep-16
30-Sep-16
9-Oct-16
18-Oct-16
27-Oct-16
5-Nov-16
14-Nov-16
23-Nov-16
2-Dec-16
11-Dec-16
20-Dec-16
29-Dec-16
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall


Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 9 - Riparian (24 Days Minimum)
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season March 23
End Growing Season November 11
Ground Surface
12" Below Surface
Sensor Depth
73 Days
Date
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall


Buffalo Flats Restoration Site
Hydrograph
Wetland Gauge 10 - Nonriparian (12 Days Minimum)
Groundwater Elevation (ft)
Rainfall (in)
Begin Growing Season March 23
End Growing Season November 11
Gauge malfunction
15 Days
15 Days
26 Days
Ground Surface
12" Below Surface
Sensor Depth
Date
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall

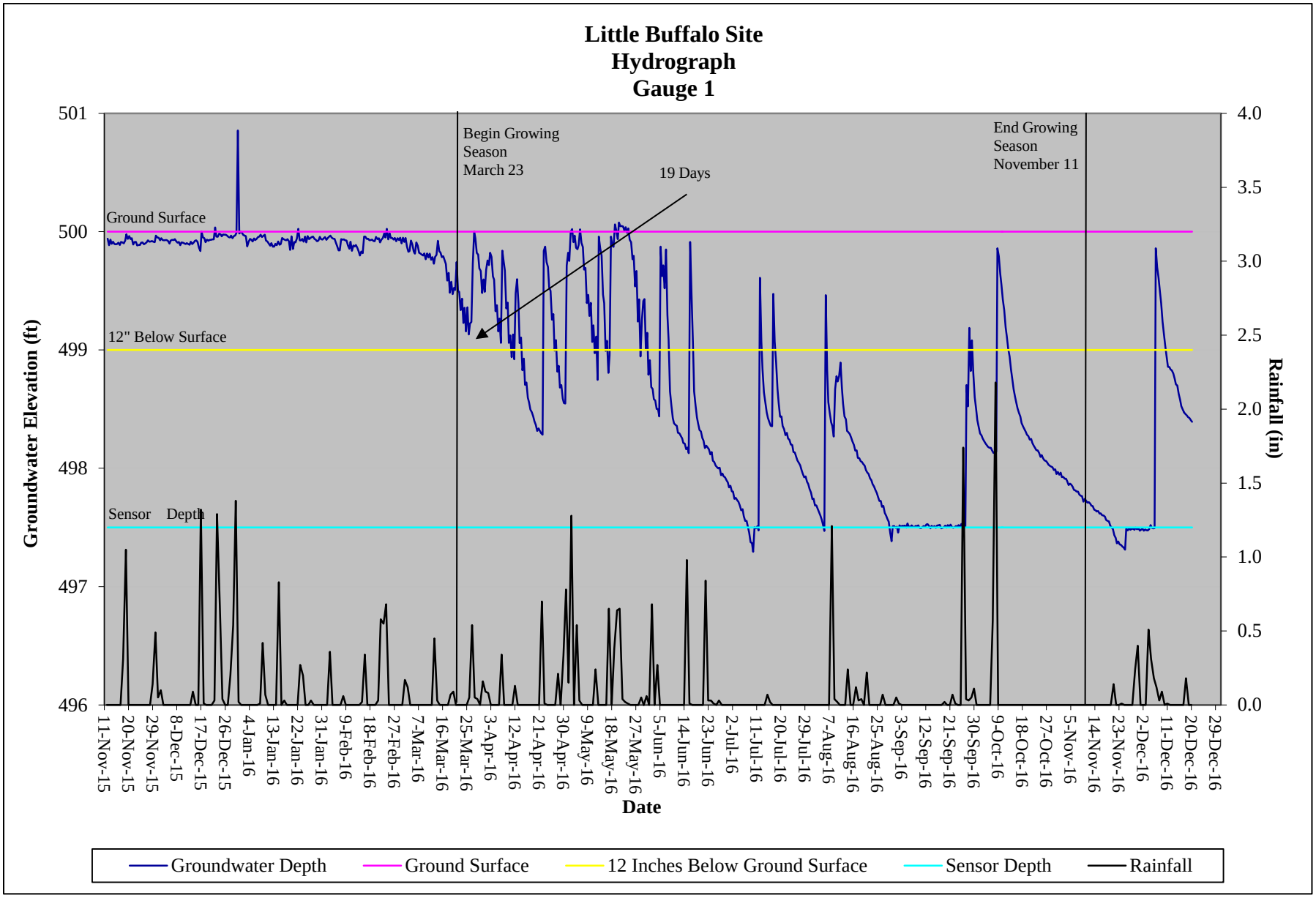

Little Buffalo Site
Hydrograph
Gauge 1
Groundwater Elevation (ft)
Rainfall (in)
Date
Begin Growing Season March 23
End Growing Season November 11
19 Days
Ground Surface
12" Below Surface
Sensor Depth
501
500
499
498
497
496
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
11-Nov-15
20-Nov-15
29-Nov-15
8-Dec-15
17-Dec-15
26-Dec-15
4-Jan-16
13-Jan-16
22-Jan-16
31-Jan-16
9-Feb-16
18-Feb-16
27-Feb-16
7-Mar-16
16-Mar-16
25-Mar-16
3-Apr-16
12-Apr-16
21-Apr-16
30-Apr-16
9-May-16
18-May-16
27-May-16
5-Jun-16
14-Jun-16
23-Jun-16
2-Jul-16
11-Jul-16
20-Jul-16
29-Jul-16
7-Aug-16
16-Aug-16
25-Aug-16
3-Sep-16
12-Sep-16
21-Sep-16
30-Sep-16
9-Oct-16
18-Oct-16
27-Oct-16
5-Nov-16
14-Nov-16
23-Nov-16
2-Dec-16
11-Dec-16
20-Dec-16
29-Dec-16
Groundwater Depth
Ground Surface
12 Inches Below Ground Surface
Sensor Depth
Rainfall

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 12 days (5%)	**MY-01 2012**	**MY-02 2013**	**MY-03 2014**	**MY-04 2015**	**MY-05 2016**
Well 1	Yes/23 (9.7%)	Yes/64 (27.5%)	Yes/60 (23.9%)	Yes/44 (17.7%)	Yes/30 (12.8%)
Well 4	No/6 (2.4%)	Yes/33 (14.2%)	Yes/52 (20.9%)	Yes/21 (8.2%)	No/8 (3.4%)
Well 10 (Installed May 23, 2012)	No/0 (0%)	No/1 (0.4%)	Yes/78 (31.1%)	Yes/44* (17.7%)	Yes/26 (11.1%)
Wetland Area 2					
Success Criteria 24 days (10%)	**MY-01 2012**	**MY-02 2013**	**MY-03 2014**	**MY-04 2015**	**MY-05 2016**
Well 2	No/20 (8.6%)	Yes/36 (15.2%)	Yes/58 (23.3%)	Yes/43 (17.3%)	No/10 (4.3%)
Well 3	Yes/134 (57.3%)	Yes/236 (100%)	Yes/120 (48.0%)	Yes/90 (35.9%)	Yes/130 (55.6%)
Well 5	Yes/28 (11.8%)	Yes/172 (73.6%)	Yes/60 (23.9%)	Yes/48 (19.1%)	Yes/40 (17.1%)
Well 8	No/19 (7.9%)	Yes/98 (42.0%)	Yes/61 (24.5%)	Yes/45 (17.9%)	Yes/24 (10.3%)
Well 9	No/23 (9.8%)	Yes/103 (44.2%)	Yes/67 (26.9%)	Yes/51 (20.3%)	Yes/73 (31.0%)
Wetland Area 3					
Success Criteria 24 days (10%)	**MY-01 2012**	**MY-02 2013**	**MY-03 2014**	**MY-04 2015**	**MY-05 2016**
Well 6 (Creation Area)	Yes/25 (10.7%)	Yes/71 (30.5%)	Yes/61 (24.5%)	Yes/42 (16.7%)	Yes/24 (10.3%)
Well 7 (Creation Area)	No/18 (7.5%)	Yes/70 (30.0%)	Yes/62 (24.7%)	Yes/45 (17.9%)	Yes/26 (11.1%)
Adjacent Wetland Area					
Success Criteria 24 days (10%)	**MY-01 2012**	**MY-02 2013**	**MY-03 2014**	**MY-04 2015**	**MY-05 2016**
Little Buffalo 1 (Installed March 20, 2014)			Yes/44 (18.7%)	Yes/46 (19.7%)	No/19 (8.1%)

*=gauge malfunction, data only recorded for 106 out of 233 days during MY04 growing season

Appendix E

Soil Data

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** December 20, 2016
Project: Buffalo Flats Wetland Restoration Site **Project #:** 20100798 6MO.Y5
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: >58" **SHWT:** 6-12" **Slope:** 0-1% **Aspect:**
Elevation: ~655 **Drainage:** Poorly Drained **Permeabilit** Moderate to Moderately slow
Vegetation: Herbaceous: Predominantly Virginia Wildrye with planted River Birch, Green Ash, American Sycamore
Borings terminated at 58 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap1	0-3	2.5Y5/2	5YR4/6m2p	l	1msbk	mfr	cs	30% concentrations in pore linings and matrix
Ap2	3-7		5YR5/4	l	1msbk	mfr	cs	15% concentrations in matrix
			5YR3/2					10% concentrations in matrix
			10YR5/1					10% concentrations in matrix
			5YR5/2					40% concentrations in matrix
			10YR5/3					25% concentrations in matrix
Bw1	7-11	2.5Y6/2	10YR5/4c2d	l	1msbk	mfr	cs	20% concentrations in matrix
			5YR2.5/2c2d					5% concentrations in matrix
			7.5YR6/2c2p					15% concentrations in pore linings
Bw2	11-13	2.5Y6/2	7.5YR4/6m2p	scl	1csbk	mfr	cs	30% concentrations in matrix
			10YR 6/1c2d					10% concentrations in matrix
Bw3	13-17	2.5Y6/1	7.5YR4/6c2p	c	2msbk	mfi	gw	40% concentrations in matrix
Bw4	17-36	10YR5/1	5YR2.5/1m2p	c	2msbk	mfi	gw	many pea sized concretions
			7.5YR4/6m2d					40% concentrations in matrix
Bw5	36-48	10YR5/1	7.5YR4/6m3d	sc	1f&msbk	mfi	gw	40% concentrations in matrix
			5YR2.5/1c2d					few pea sized concretions
Cg	48-58	10YR5/1	7.5YR4/6m3d	sc	massive	mfi		40% concentrations in matrix

COMMENTS:

No surface water present.
The SHWT develops more fully each year from surface saturation from precipitation, overbank flooding and inundation and is maintained due to the very slow permeability of the compacted, angular structured subsurface horizons.
Meets hydric soil criteria F3: Depleted Matrix and F8: Redox Depressions
using Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)

DESCRIBED BY: SFS DATE: 12/20/2016

LICENSED SOIL SCIENTIST
STEVEN F. STOKES
THE GREAT SEAL OF THE STATE OF NORTH CAROLINA
1087
STATE OF NORTH CAROLINA

KCI ASSOCIATES OF NORTH CAROLINA, PA

SOIL PROFILE DESCRIPTION

Client: KCI Associates of North Carolina, P.A. **Date:** December 20, 2016
Project: Buffalo Flats Wetland Restoration Site **Project #:** 20100798 6MO.Y5
County: Cabarrus **State:** NC
Location: 4939 Gold Hill Road **Site/Lot:** MW# 7
Soil Series: Chewacla Variant
Soil Classification: Fine-loamy, mixed, active, thermic Fluvaquentic Dystrochrepts
AWT: >40" **SHWT:** 0-12 **Slope:** 0-1% **Aspect:**
Elevation: ~657 **Drainage:** Poorly Drained **Permeabilit** slow
Vegetation: Herbaceous: Predominantly Virginia Wildrye with Cherry-bark Oak, Red Maple
Borings terminated at 40 **Inches**

HORIZON	DEPTH (IN)	MATRIX	MOTTLES	TEXTURE	STRUCTURE	CONSISTENCE	BOUNDARY	NOTES
Ap	0-5	10YR5/2	5YR 3/4c2p	l	1msbk	mfr	cs	20% redox concentrations in pore linings, oxidized root channels present
Ap2	5-7	10YR6/2	10YR5/4c2d	fsl	1msbk	mfr	cs	15% redox concentrations in matrix
			10YR6/1c2d					10% redox concentrations in matrix
			5YR3/3c2p					5% BB sized concretions
Bw1	7-12		10YR5/1	c	1msbk	mfi	gw	50% concentrations in matrix
			10YR5/6					50% concentrations in matrix
Bw2	12-15	10YR5/1	10YR5/4c2d	c	1msbk	mfi	gw	10% concentrations in the matrix
			10YR 2/1c2d					10% Mn masses
Cg1	15-34	10YR4/1	10YR5/4c2d	c	massive	mfi	gw	10%
			10YR2/1c2f					many common concretions, very restrictive layer from 15-17"
Cg2	34-38	2.5Y7/2	2.5Y7/4c2f	sl	massive	mfr	cs	1"gravel
Cg3	38-40		10YR4/3	l	massive	mfr	cs	saprolite
			10YR6/2					
			5YR4/6					

COMMENTS:

No surface water present.
The SHWT develops more fully each year from surface saturation from precipitation, overbank flooding and inundation and is maintained due to the very slow permeability of the compacted, angular structured subsurface horizons.
Meets hydric soil criteria F3: Depleted Matrix and F8: Redox Depressions
using Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Eastern Mountains and Piedmont Region (Version 2.0)

DESCRIBED BY: SFS DATE: 12/20/2016

LICENSED SOIL SCIENTIST STEVEN F. STOKES 1087 STATE OF NORTH CAROLINA