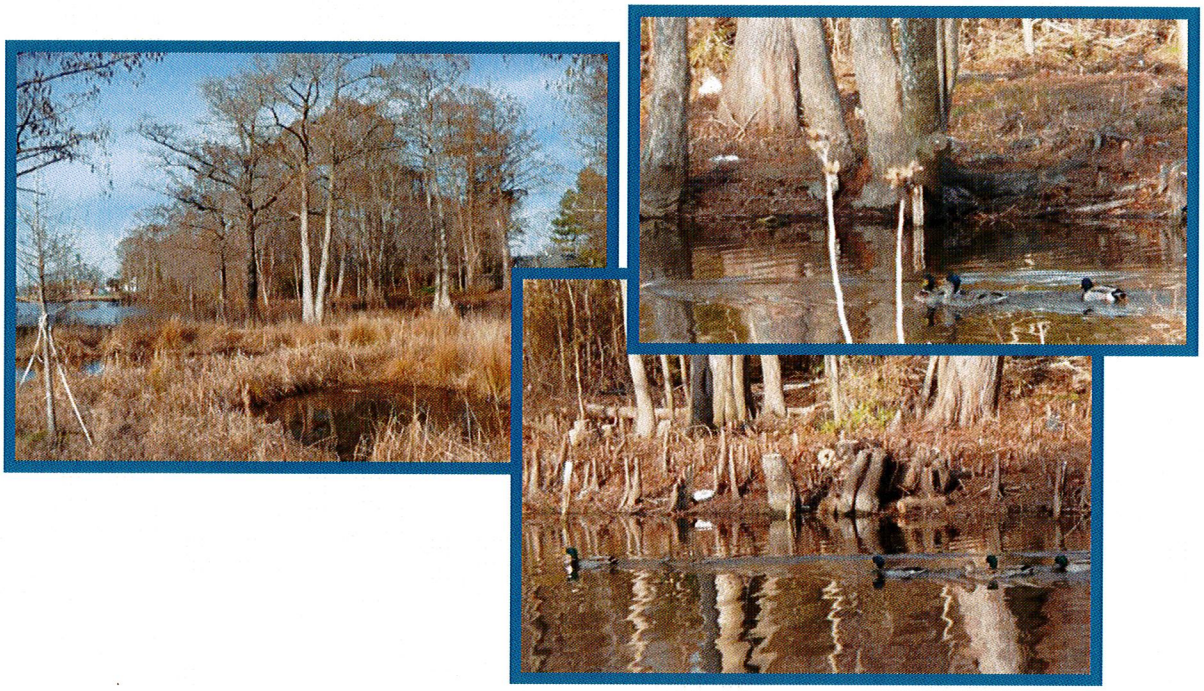
ANNUAL MONITORING REPORT
CHARLES CREEK PARK

WETLAND RESTORATION
PASQUOTANK COUNTY, NORTH CAROLINA
(EEP Project Number 79)

Monitoring Year 3 of 5 (2009)



Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina

Ecosystem Enhancement PROGRAM

November 2009

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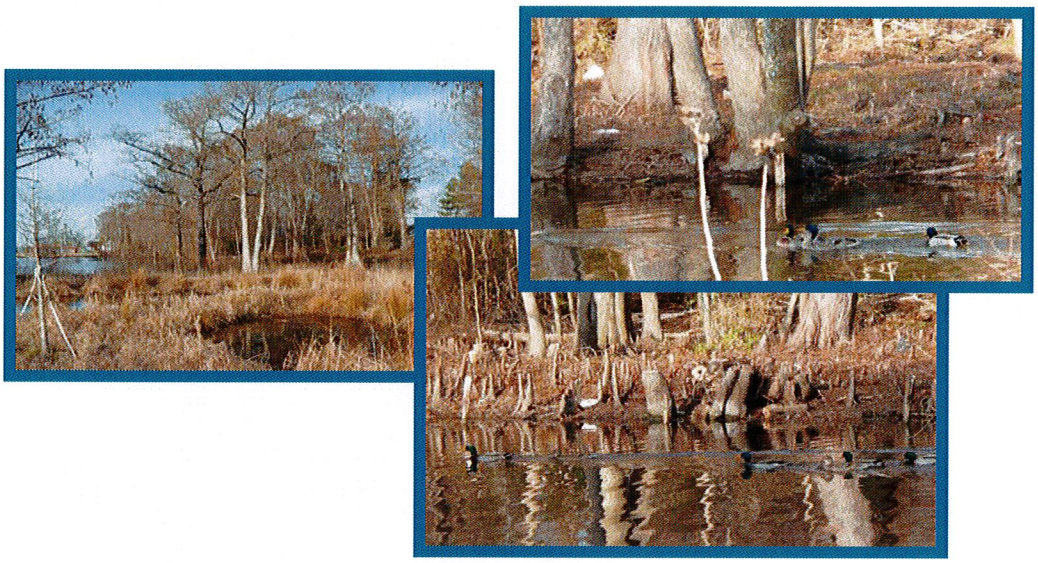

Submitted to:
North Carolina Department of Environment and Natural Resources
Ecosystem Enhancement Program
Raleigh, North Carolina

Prepared by:
Axiom Environmental, Inc.
20 Enterprise Street, Suite 7
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Raleigh, North Carolina 27614

Axiom Environmental, Inc.

Ecosystem Enhancement PROGRAM

November 2009

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1.0 EXECUTIVE SUMMARY

The Charles Creek Park Wetland Restoration Site (Site) is located within the United States Geological Survey Hydrologic Unit 03010205 (North Carolina Division of Water Quality subbasin 03-01-50) of the Pasquotank River Basin. The Site includes 2.13 acres along the southeast bank of Charles Creek near its confluence with the Pasquotank River, located within Charles Creek Park in downtown Elizabeth City, North Carolina in Pasquotank County. A total of 1.93 acres of the Site is comprised of restored and enhanced wetlands, and open water areas. The Site is currently owned by the City of Elizabeth City with the conservation easement owned by the North Carolina Ecosystem Enhancement Program. This report summarizes data for year 3 (2009) monitoring.

The primary goals and objectives of the project included the following.

1. Restore and enhance wetland function, vegetative structure, and wildlife habitat to the Site.
2. Improve the aesthetics of the Site similar to that of surrounding natural cypress-gum swamplands.
3. Retain natural onsite assets such as large existing bald cypress trees.
4. Incorporate the Site into Elizabeth City in such a manner to foster public interests in wetland restoration.

Vegetation success criteria dictates that an average density of 320 stems per acre must be surviving in the first three monitoring years. Subsequently, 290 stems per acre must be surviving in year 4 and 260 stems per acre in year 5. Stem counts will be based on an average of the evaluated vegetation plots. Based on the number of stems counted, average densities were measured at 648 stems per acre surviving in year 3 (2009). The dominant species identified at the Site were planted stems of bald cypress (*Taxodium distichum*), swamp blackgum (*Nyssa aquatica*), and buttonbush (*Cephalanthus occidentalis*). In addition, each individual vegetation plot met success criteria.

Success criteria for wetland groundwater hydrology at the Site require inundation or saturation within 12 inches of the ground surface for a consecutive period of 8.5 percent of the growing season or approximately 18 consecutive days (the growing season in Pasquotank County begins April 7 and ends November 1 [209 days]). This duration has been selected as the mean desired percentage; however, an individual gauge will be deemed successful if it falls within the range of 5 to 12 percent of the growing season or approximately 10 to 26 days. Groundwater hydrology occurred within 12 inches of the soil surface for greater than 8.5 percent of the growing season at two of the four groundwater gauges for the year 3 (2009) growing season.

In summary, the Site is stable, and vegetation and groundwater hydrology at two of the four gauges were successful for the year 3 (2009) growing season. Summary information and 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 table and figures within this report's appendices. Narrative background and supporting information formerly found in these reports can be found in the mitigation and restoration plan documents available on EEPs website. All raw data supporting the tables and figures in the appendices is available from EEP upon request.

2.0 METHODOLOGY

2.1 Vegetation Assessment

Four vegetation plots were established and marked after construction with a groundwater gauge at one corner and PVC at the remaining corners as depicted on Figure 2 (Current Conditions Plan View) in

Appendix A. The plots are 10 meters square and are located randomly within the Site. These plots were surveyed in July for the 2009 (year 3) monitoring season using the *CVS-EEP Protocol for Recording Vegetation, Version 4.0* (Lee et al. 2006) (http://cvs.bio.unc.edu/methods.htm); results are included in Appendix C. The taxonomic standard for vegetation used for this document was *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* (Weakley 2007).

2.2 Wetland Assessment

Four groundwater monitoring gauges and one rain gauge have been maintained and monitored throughout the year 3 (2009) growing season. The graphs of groundwater hydrology and precipitation are included in Appendix D.

3.0 REFERENCES

Lee, Michael T., R.K. Peet, S.D. Roberts, and T.R. Wentworth. 2006. CVS-EEP Protocol for Recording Vegetation, Version 4.0. (online). Available: http://cvs.bio.unc.edu/methods.htm.

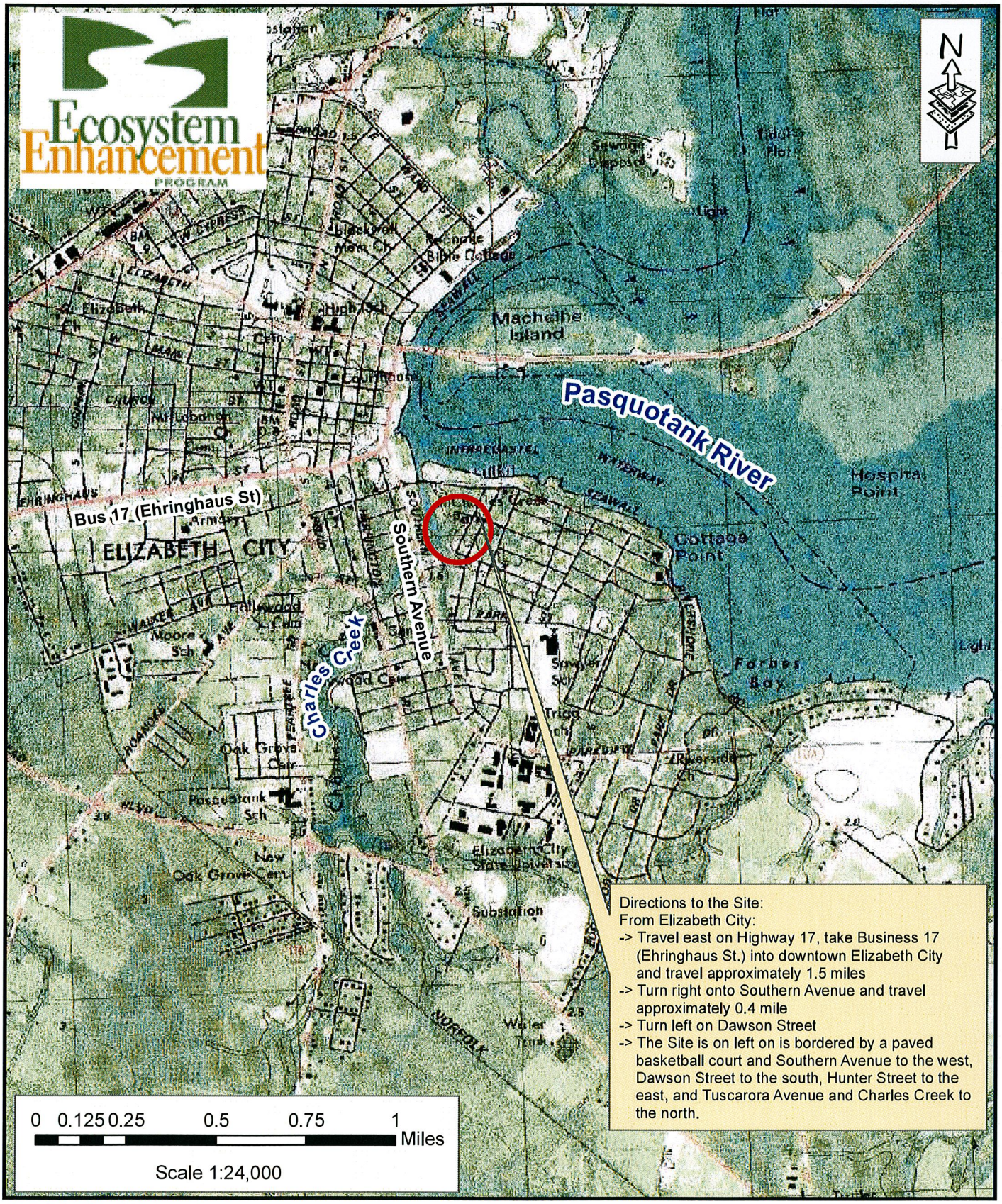
Weakley, Alan S. 2007. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas (online). Available: http://www.herbarium.unc.edu/WeakleysFlora.pdf [February 1, 2008]. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina, Chapel Hill, North Carolina.

APPENDIX A

FIGURES AND PLAN VIEWS

Figure 1. Site Location

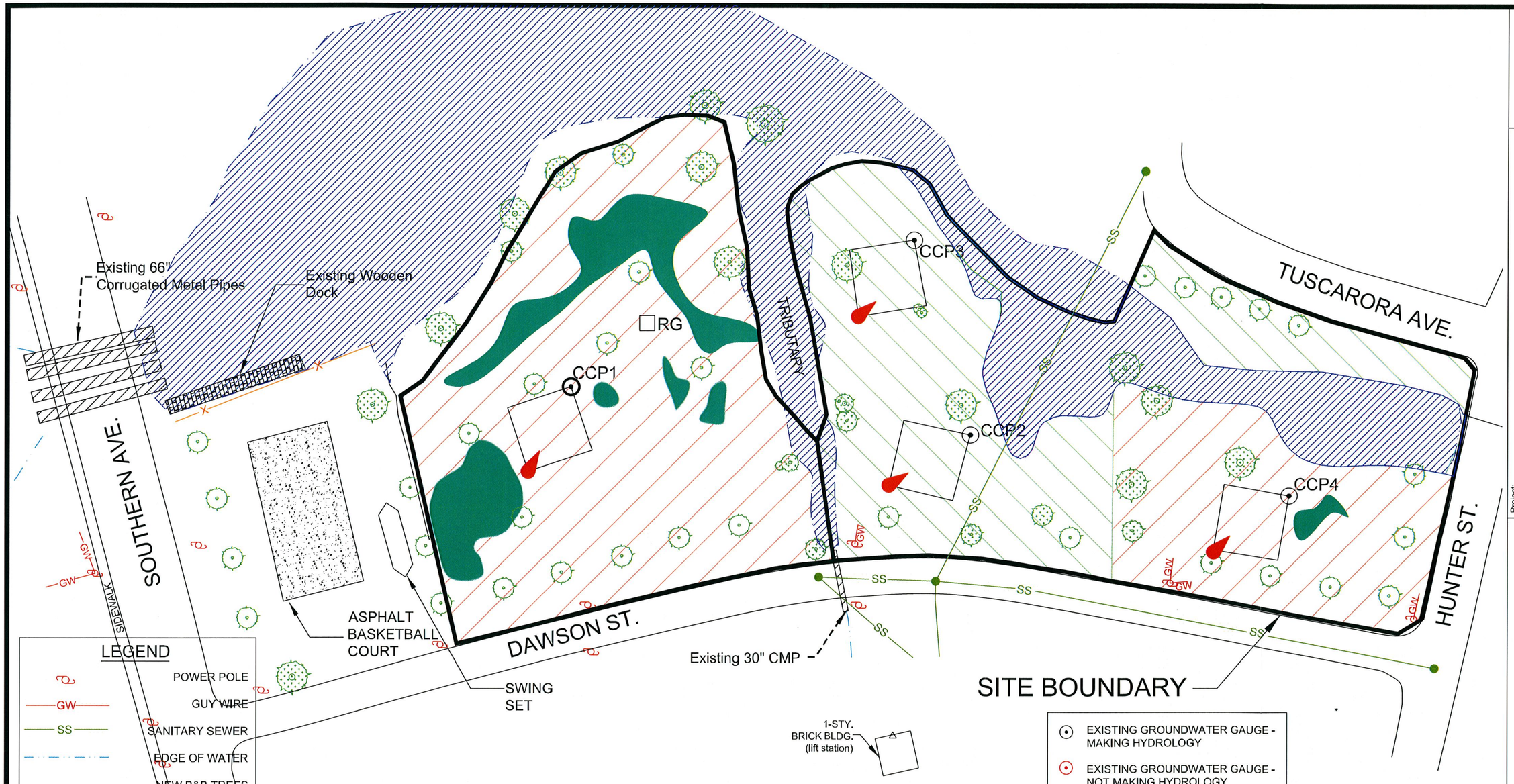
Figure 2. Monitoring Plan View



Axiom Environmental, Inc.
2126 Rowland Pond Drive
Willow Spring, NC 27592
(919) 215-1693
(919) 341-3839 fax

SITE LOCATION
CHARLES CREEK PARK RESTORATION SITE
EEP Project Number 79
Pasquotank County, North Carolina

Dwn. by.	FIGURE
CLF	1
Date: Oct 2008	
Project: 08-001	



NOTES:

1) SITE FEATURES SHOWN WERE FIELD IDENTIFIED BY LIMITED ENGINEERING SURVEY USING TOTAL STATION EQUIPMENT PERFORMED ON AUGUST 9, 2006.

2) THE LOCATION OF SITE FEATURES IS APPROXIMATE.

SCALE

50 25 0 50

CURRENT CONDITION PLAN VIEW

File: S:\ec\Jobs7-9k\7281.02\Monitoring Data\Drawings\Year 1 - 2007.dwg

Project No.: 7281.02
Designed: JMO, PKS
Drawn: NMM
Scale: 1" = 50'
Sheet No.: 2 OF 2

Project: CHARLES CREEK PARK WETLAND RESTORATION
Location: PASQUOTANK CO., NC
Client: NORTH CAROLINA ECOSYSTEM ENHANCEMENT PROGRAM
Sheet Title: CURRENT CONDITION PLAN VIEW

Soil & Environmental Consultants, PA
11010 Raven Ridge Road • Raleigh, North Carolina 27614 • Phone: (919) 846-5900 • Fax: (919) 846-9467
www.SandEC.com

REV.	DESCRIPTION	DATE	APPROVED
0	Issued for Construction	07-26-04	JMO

APPENDIX B

GENERAL PROJECT TABLES

Table 1. Site Restoration Structures and Objectives

Table 2. Project Activity and Reporting History

Table 3. Project Contacts Table

Table 4. Project Attributes Table

Table 1. Project Restoration Components
Charles Creek Park Wetland Restoration (EEP Project Number 79)

Project Segment or Reach ID	Existing Acreage	Mitigation Type	Approach	Acreage	Mitigation Ratio	Mitigation Units	Stationing	Comment
Restoration	1.16	Restoration	--	1.16	1	1.16	--	--
Enhancement	0.60	Enhancement	--	0.60	2	0.30	--	--
Open Water	0.17	Preservation	--	0.17	5	0.03	--	--

Mitigation Unit Summations

Stream	Riparian Wetland	Nonriparian Wetland	Total Wetland	Buffer	Comment
0	1.49	0	1.49	0	--

Table 2. Project Activity and Reporting History
Charles Creek Park Wetland Restoration (EEP Project Number 79)

Activity or Report	Data Collection Completion	Actual Completion or Delivery
Restoration Plan	---	March 2005
Construction	---	July 2006
Planting/Permanent Seed Mix Applied	---	July 2006
Mitigation Plan/As-built Report (Year 0 Monitoring – baseline)	---	March 2007
Year 1 Monitoring (2007)	November 2007	December 2007
Year 2 Monitoring (2008)	November 2008	December 2008
Year 3 Monitoring (2009)	November 2009	November 2009

Table 3. Project Contacts Table
Charles Creek Park Wetland Restoration (EEP Project Number 79)

Designer and Year 1 (2007) Monitoring Performers	Soil & Environmental Consultants, PA 11010 Raven Ridge Rd. Raleigh, NC 27614 Patrick K. Smith (919) 846-5900
Construction Contractor	North State Environmental, Inc. 2889 Lowery St. Winston-Salem, NC 27101 Darrell Westmoreland (336) 725-2010
Construction, Planting, and Seeding Contractor	Trader Construction Company 2500 Highway 70 East New Bern, North Carolina 28560 Carl Huddle (252) 633-2424
Year 2-3 (2008-2009) Monitoring Performers	Axiom Environmental, Inc. 20 Enterprise Street, Suite 7 Raleigh, North Carolina 27607 Grant Lewis (919) 215-1693

Table 4. Project Background Table Charles Creek Park Wetland Restoration (EEP Project Number 79)	
Project County	Pasquotank County, North Carolina
Drainage Area	21.3 acres
Drainage impervious cover estimate (%)	< 20 percent
Stream Order	Not Applicable
Physiographic Region	Coastal Plain
Ecoregion	Middle Atlantic Coastal Plain
Rosgen Classification of As-built	Not Applicable
Cowardin Classification	Estaurine
Dominant Soil Types	Mattapex, Bibb, "Swamp"
Reference Site ID	Charles Creek
USGS HUC for Project and Reference	03010205
NCDWQ Subbasin for Project and Reference	03-01-50
NCDWQ Classification for Project and Reference	C Sw
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	Not Applicable
% of project easement fenced	None

APPENDIX C

VEGETATION ASSESSMENT DATA

Table 5. Vegetation Plot Mitigation Success Summary

Vegetation Monitoring Plot Photos

CVS Summary Data Tables

Table 6. Vegetation Metadata Table

Table 7. Total and Planted Stems by Plot and Species

Table 5. Vegetation Plot Mitigation Success Summary Table
Charles Creek Restoration Site (EEP Project Number 79)

Vegetation Plot ID	Vegetation Survival Threshold Met?	Tract Mean
1	Yes	100%
2	Yes	
3	Yes	
4	Yes	

Vegetation Monitoring Photographs
Taken July 2009

Table 6. Vegetation Metadata Table
Charles Creek Restoration Site (EEP Project Number 79)

Report Prepared By	Corri Faquin
Date Prepared	8/4/2009 10:45
database name	Axiom-2009-A-v2.2.7.mdb
database location	C:\Axiom\Business\CVS database
computer name	CORRILAPTOP
file size	62021632
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.
ALL 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.
PROJECT SUMMARY----------	
Project Code	10561201
project Name	Charles Creek
Description	Wetland Mitigation Site
River Basin	Pasquotank
length(ft)	
stream-to-edge width (ft)	
area (sq m)	7810
Required Plots (calculated)	3
Sampled Plots	4

Table 7. Total and Planted Stems by Plot and Species
Charles Creek Restoration Site (EEP Project Number 79)

		Current Data (MY3 2009)								Annual Totals					
		plot 1		plot 2		plot 3		plot 4		Current Mean MY3 (2009)		MY2 (2008)		MY1 (2007) & Asbuilt	
Species	CommonName	Total	Planted	Total	Planted	Total	Planted	Total	Planted	Total stems	Planted stems	Total stems	Planted stems	Total stems	Planted stems
Acer negundo	box elder											3			
Acer rubrum	red maple			2						2					
Baccharis halimifolia	eastern baccharis	76		10		2		14		102		1			
Betula nigra	river birch											7	3		
Carya illinoinensis	pecan			4						4					
Celtis laevigata	hackberry											6	6		
Cephalanthus occidentalis	common buttonbush	3	3	2	2			3	2	8	7			14	14
Clethra alnifolia	coastal sweetpepperbush	1	1					3	2	4	3			14	14
Cornus amomum	silky dogwood			3	1			3	3	6	4	5	5		
Cyrilla racemiflora	swamp titi	2	2			1		3	3	6	5			5	5
Fraxinus pennsylvanica	green ash	2	2	1	1			3	2	6	5	56	45	5	5
Juglans nigra	black walnut											3	3		
Liquidambar styraciflua	sweetgum											3			
Liriodendron tulipifera	tulip poplar											10	8		
Lyonia lucida	fetterbush													7	7
Magnolia virginiana	sweetbay	2	2					1	1	3	3			1	1
Morella cerifera	wax myrtle	3		9						12					
Nyssa	tupelo							1	1	1	1				
Nyssa aquatica	water tupelo			3	3	3	3	3	2	9	8			9	9
Nyssa sylvatica	blackgum			1	1					1	1				
Persea borbonia	red bay													9	9
Persea palustris	swamp bay	1	1	2	1			2	2	5	4				
Pinus	pine											9			
Platanus occidentalis	American sycamore											30	16		
Prunus serotina	black cherry			1						1		1			
Quercus lyrata	overcup oak											18	18		
Quercus michauxii	swamp chestnut oak											13	13		
Quercus pagoda	cherrybark oak											25	25		
Quercus phellos	willow oak	1	1							1	1	28	28	3	3
Salix nigra	black willow											9	9		
Salix sericea	silky willow											8	8		
Sambucus canadensis	elderberry											1	1		
Taxodium distichum	bald cypress	3	1	3	2	6	4	7	4	19	11			13	13
Ulmus sp.	elm											4	1		
Ulmus americana	American elm											1	1		
Ulmus rubra	slippery elm			7						7		1	1		
Unknown		1	1					2		3	1				
Vaccinium	blueberry							1	1	1	1				
Vaccinium corymbosum	highbush blueberry													3	3
Viburnum dentatum	southern arrowwood	3	3	1		1	1	1		6	4			6	6
Viburnum nudum	possumhaw					1	1	4	4	5	5			17	17
Plot area (acres)		**0.0247**		**0.0247**		**0.0247**		**0.0247**							
Species Count		**12**	**10**	**14**	**7**	**6**	**4**	**15**	**12**	**22**	**16**	**22**	**17**	**13**	**13**
Stem Count		**98**	**17**	**49**	**11**	**14**	**9**	**51**	**27**	**212**	**64**	**242**	**191**	**106**	**106**
Stems per acre		**3968**	**688**	**1984**	**445**	**567**	**364**	**2065**	**1093**	**8583**	**2591**	**9798**	**7733**	**4291**	**4291**

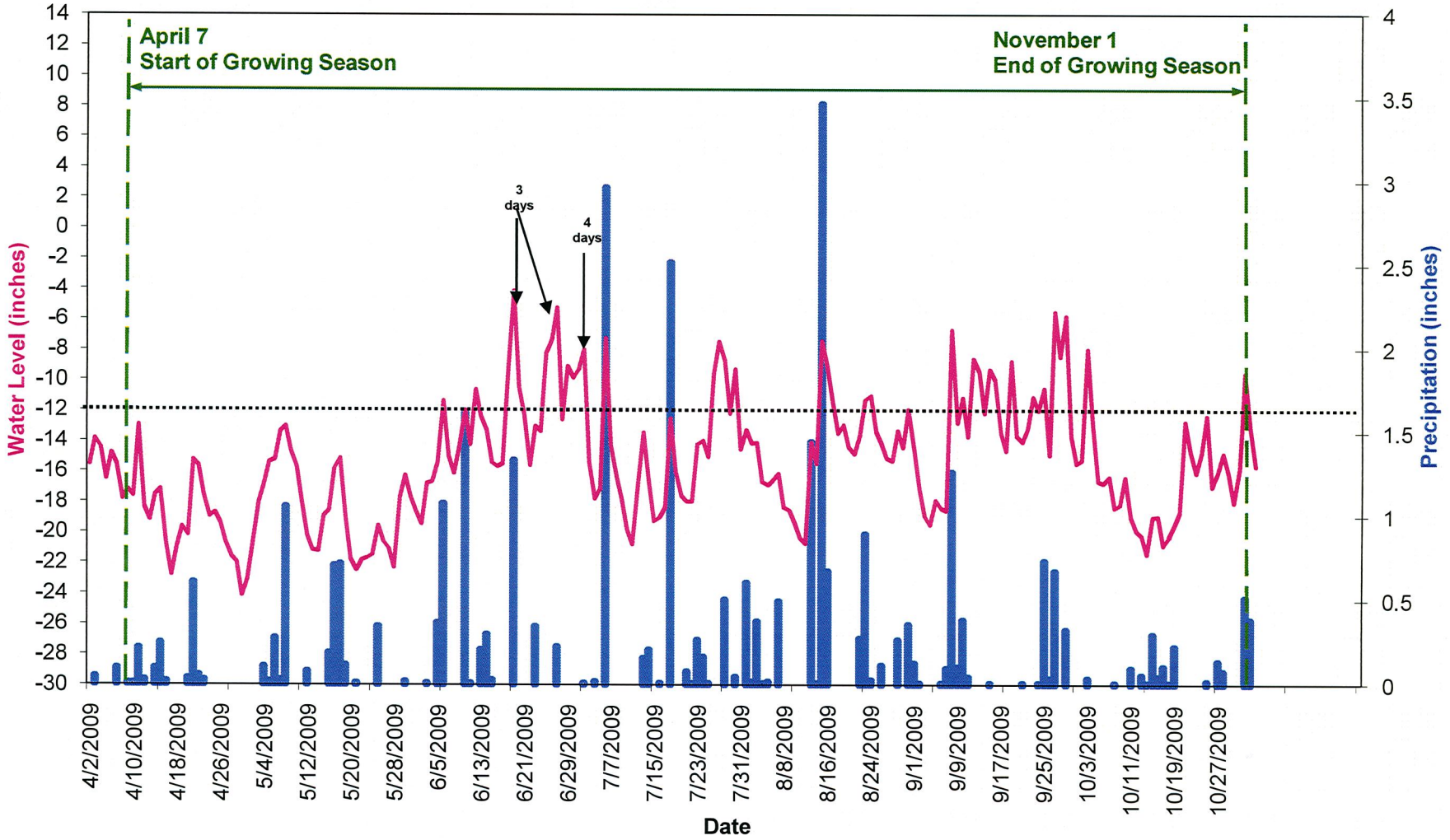
APPENDIX D

WETLAND DATA

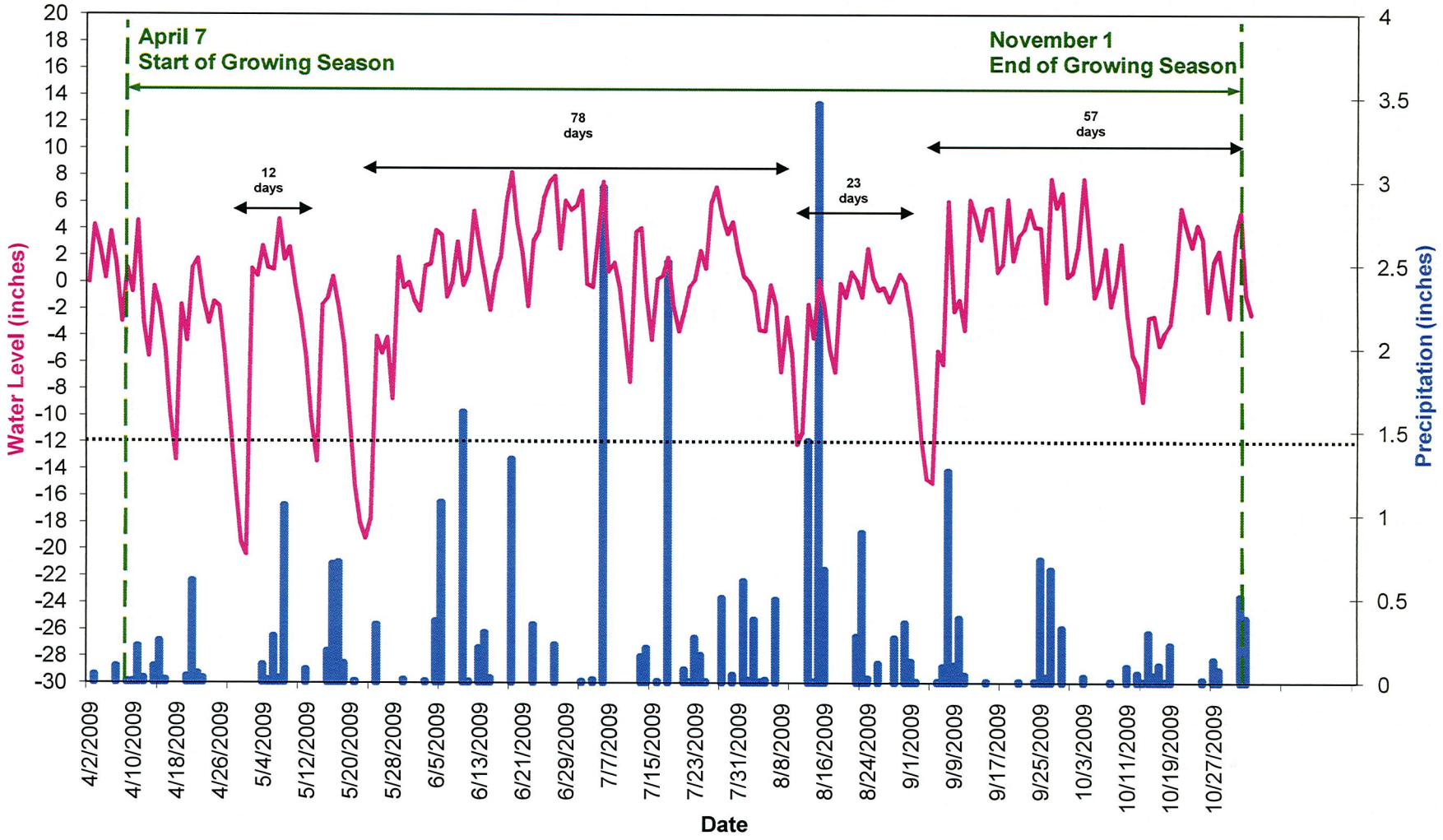
2009 (Year 3) Groundwater Gauge Graphs

Table 8. Wetland Hydrology Criteria Attainment

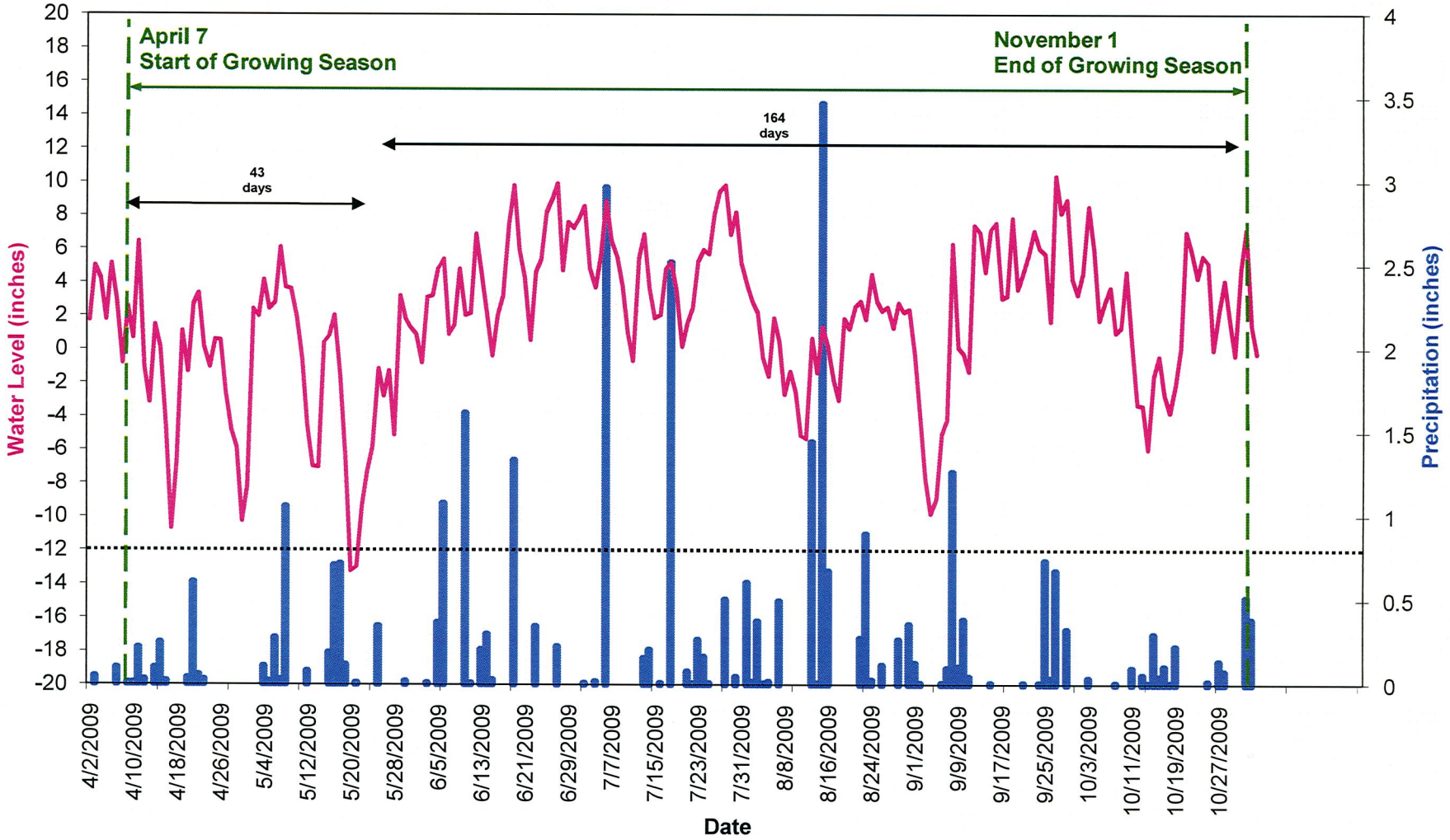
Gauge 1
Charles Creek Park Year 3 (2009 Gauge Data)



Gauge 2
Charles Creek Park Year 3 (2009 Gauge Data)



Gauge 3
Charles Creek Park Year 3 (2009 Gauge Data)



Gauge 4
Charles Creek Park Year 3 (2009 Gauge Data)

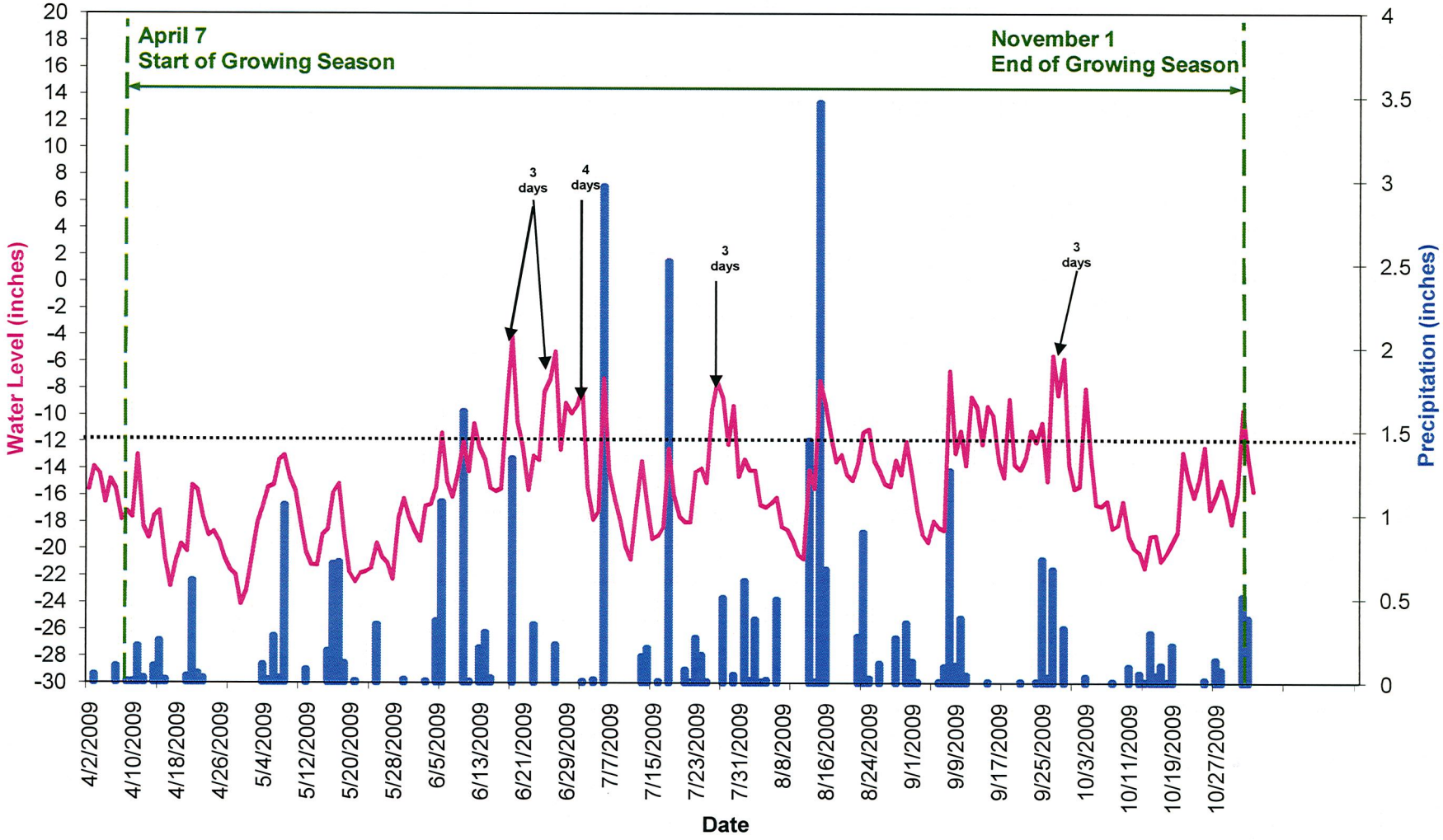


Table 8. Wetland Hydrology Criteria Attainment Summary
Charles Creek Restoration Site (EEP Project Number 79)

Gauge	Success Criteria Achieved/Max Consecutive Days During Growing Season (Percentage)				
	Year 1 (2007)	Year 2 (2008)	Year 3 (2009)	Year 4 (2010)	Year 5 (2011)
1	No/4 days (1.9%)	Yes/34 days (16.3%)	No/4 days (1.9%)		
2	Yes/50 days (23.9%)	Yes/50 days (23.9%)	Yes/78 days (37.3%)		
3	Yes/51 days (24.4%)	Yes/141 days (67.5%)	Yes/164 days (78.5%)		
4	No/7 days (3.3%)	Yes/40 days (19.1%)	No/4 days (1.9%)		