YEAR 2 (2008)
ANNUAL MONITORING REPORT
ANDERSON SWAMP WETLAND RESTORATION SITE
EDGECOMBE COUNTY, NORTH CAROLINA

(CONTRACT D06048)
FULL DELIVERY PROJECT
TAR-PAMLICO RIVER BASIN
CATALOGING UNIT 03020102

Prepared for:

NORTH CAROLINA DEPARTMENT OF ENVIRONMENT AND NATURAL RESOURCES
RALEIGH, NORTH CAROLINA

Prepared by:

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And

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November 2008

EXECUTIVE SUMMARY

Restoration Systems has completed the restoration of nonriverine wetlands at the Anderson Swamp Wetland Restoration Site to assist the North Carolina Ecosystem Enhancement Program in fulfilling restoration goals in the region. The Site is located approximately 6 miles north of Tarboro, in northern Edgecombe County. The Site encompasses approximately 25 acres of land that was used for agricultural row crop production and land application of hog lagoon effluent. The project provides 21.3 acres of restored or enhanced non-riverine forested wetlands and 3.7 acres of nonriverine upland flats, with benefits to water quality and wildlife in a watershed that is highly dissected for agriculture and timber production.

Primary activities at the Site were designed to restore agricultural fields that had been ditched, drained, and cleared for row crop production. Prior to implementation, the 25-acre Site was characterized by row crops and was underlain by approximately 12.9 acres of hydric soil that had been effectively drained and 8.4 acres of hydric soil with jurisdictional wetland hydrology. Restoration activities included (1) ditch cleaning prior to backfill, (2) ditch rerouting, (3) depression construction, (4) impervious ditch plug construction, (5) ditch backfilling, (6) wetland soil surface scarification, and (7) plant community restoration.

As constructed, the 25-acre Site provides 12.9 acres of nonriverine wetland restoration, 8.4 acres of nonriverine wetland enhancement, and 3.7 acres of forested upland buffer for a total of 17.1 Nonriverine Wetland Mitigation Units.

Nine vegetation plots (10 meters by 10 meters size) were surveyed in August 2008 for the Year 2 (2008) monitoring season. Based on the number of stems counted, average densities were measured at 630 planted stems per acre surviving in Year 2 (2008). The dominant species identified at the Site were planted stems of cherrybark oak (*Quercus pagoda*) and willow oak (*Quercus phellos*), and natural recruits of pine (*Pinus* sp.) and sweetgum (*Liquidambar styraciflua*). No vegetation problem areas were noted during the Year 2 (2008) monitoring season.

Three of the five monitored gauges within restoration areas were inundated/saturated within 12 inches of the surface for greater than 5 percent of the growing season. However, rain fall for the Year 2 (2008) growing season was below normal with 26 inches of rain occurring from March to October 2008 compared to the 30-year historic mean rainfall of 32 inches occurring from March to October. Since the Year 2 (2008) monitoring season rainfall was below normal, comparisons to reference groundwater gauges were made. Four of the five groundwater gauges should be considered successful for the Year 2 (2008) monitoring period; the only gauge that fell below the success criteria was Gauge 2. No wetland problem areas were noted during the Year 2 (2008) monitoring season.

In summary, the restoration site achieved success criteria for vegetation and most of the hydrology attributes in the Second Monitoring Year (2008).

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1.0 PROJECT BACKGROUND

1.1 Location and Setting

Restoration Systems, L.L.C. (Restoration Systems) has completed restoration of nonriverine wetlands at the Anderson Swamp Wetland Restoration Site (hereafter referred to as the "Site") to assist the North Carolina Ecosystem Enhancement Program (EEP) in fulfilling wetland mitigation goals in the region. The Site, located approximately 6 miles north of Tarboro in northern Edgecombe County, will provide a 17.1 nonriverine wetland mitigation units (Figure 1). The Site is located in United States Geological Survey (USGS) Catologing Unit (CU) 03020102060010 (North Carolina Division of Water Quality [NCDWQ] Subbasin 03-03-04) of the Tar Pamlico River Basin and will service the USGS 8-digit CU 03020102.

Directions to the Site from Tarboo, North Carolina, are as follows:

- Travel north on NC Route 44 for approximately 5 miles
- At Leggett, turn right on Draughn Road and travel approximately 4 miles
- Turn right on Bethleham Church Road and travel approximately 1 mile
- The Site is on the right

1.2 Project Objectives

The primary components of the restoration project included 1) ditch cleaning prior to backfill, 2) ditch rerouting, 3) depression construction, 4) impervious ditch plug construction, 5) ditch backfilling, 6) floodplain soil scarification, and 7) plant community restoration.

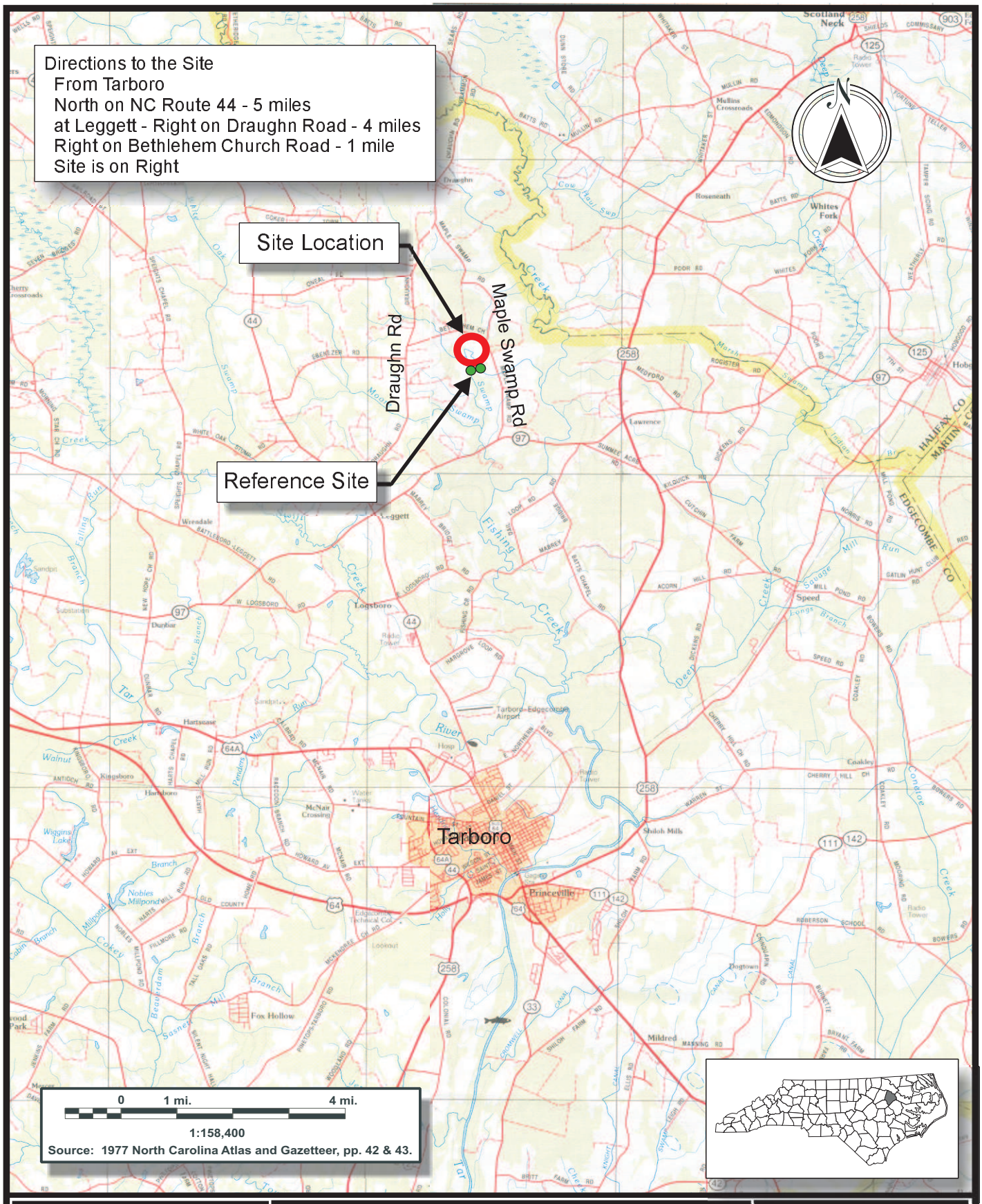
1.3 Project Structure, Restoration Type, and Approach

A conservation easement has been placed on the Site to incorporate all restoration activities. The Site contains 21.3 acres of hydric soils within an interstream flat and an additional 3.7 acres of upland slopes. The purpose of this project was to restore and enhance nonriverine wetlands within the Site, in addition planting the Site with native woody vegetation.

Prior to construction, the entire tract was utilized for agricultural row crop production and land application of hog lagoon effluent. The Site is situated within a terrace on the western rim of the Fishing Creek floodplain between a headwater tributary to Maple Swamp and an Unnamed Tributary (UT) to Fishing Creek . The landowner regularly dredged the channel in preparation for agricultural practices and an extensive ditch system had been excavated to drain the Site. Site agricultural practices contributed to degraded water quality, decreased wetland function, and decreased headwater storage benefits to Maple Swamp and Fishing Creek.

The primary goals of the nonriverine wetland restoration project focused on improving water quality, enhancing flood attenuation, and restoring wildlife habitat and were accomplished by the following.

1. Removing nonpoint sources of pollution associated with agricultural row crop production including a) cessation of broadcasting fertilizer, pesticides, and other agricultural chemicals into and adjacent to Site drainage ditches, b) cessation of land application of area hog lagoon effluent, and c) preemption and treatment of agricultural runoff by providing a vegetative buffer adjacent to headwater streams and wetlands.
2. Restoring wetland hydroperiods that satisfy wetland jurisdictional requirements and approximate the Site's natural range of variation.
3. Promoting floodwater attenuation through removal of interfield ditches and enhancing groundwater storage capacity.



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

SITE LOCATION
ANDERSON SWAMP RESTORATION SITE
Edgecombe County, North Carolina

Dwn. by:	WGL
Ckd by:	WGL
Date:	April 2007
Project:	06-017

FIGURE 1

4. Restoring and reestablishing natural community structure, habitat diversity, and functional continuity.
5. Enhancing and protecting of the Site's full potential of wetland functions and values in perpetuity.

Primary activities at the Site included 1) wetland restoration, 2) wetland enhancement, 3) soil scarification, and 4) plant community restoration. Table 1 describes the Site restoration structures and objectives, which have provided 17.1 Nonriverine Wetland Mitigation Units by the following.

- Restoring approximately 12.9 acres of wetland through filling agricultural ditches, removal of spoil castings, eliminating row crop production activities, and planting with native forest vegetation.
- Enhancing approximately 8.4 acres of wetland through eliminating row crop production activities and planting with native forest vegetation.
- Reforesting the entire floodplain with native forest species.

Table 1. Site Restoration Structures and Objectives

Restoration Segment/ Reach ID	Station Range	Restoration Type/Approach*	Acreage	Mitigation Ratio	WMUs
Nonriverine Wetlands	--	Restoration	12.9	1:1	12.9
Nonriverine Wetlands	--	Enhancement	8.4	2:1	4.2
Mitigation Unit Summations					
Nonriverine Wetland					
17.1 WMU					

1.4 Project History and Background

Completed project activities, reporting history, completion dates, project contacts, and background information are summarized in Tables 2-4.

Table 2. Project Activity and Reporting History

Activity or Report	Actual Completion or Delivery
Restoration Plan	November 2006
Final Design	February 2007
Construction	March 2007
Planting	March 2007
Mitigation Plan / As-Built	April 2007
Year 1 monitoring	November 2007

Table 3. Project Contacts Table

Full Delivery Provider	Restoration Systems 1101 Haynes Street, Suite 211 Raleigh, North Carolina 27604 George Howard and John Preyer (919) 755-9490
Designer and Year 2 (2008) Monitoring Performers	Axiom Environmental, Inc. 2126 Rowland Pond Drive Willow Spring, NC 27592 W. Grant Lewis (919) 215-1693

Table 3. Project Contacts Table (continued)

Construction Contractor	Anderson Farms 179 NC 97 East Tarboro, NC 27886 Gary Wilkerson and Richard Anderson (252) 823-4730
Planting Contractor	Carolina Silvics 908 Indian Trail Road Edenton, NC 27932 Dwight McKinney (919) 523-4375
Year 1 (2007) Monitoring Performers	ARACDIS G&M of North Carolina, Inc. 801 Corporate Center Drive, Suite 300 Raleigh, NC 27607 Ben Furr and Keven Duerr (919) 854-1282

Table 4. Project Background Table

Project County	Edgecombe County, North Carolina
Physiographic Region	Coastal Plain
Ecoregion	Southeastern Plains
Cowardin Classification	PFO1B
Dominant Soil Types	Roanoke loam, Wickham sandy loam
Reference Site ID	Immediately south of Site
USGS HUC	03020102
NCDWQ Subbasin	03-03-04
NCDWQ Classification	WS-IV NSW
Any portion of any project segment 303d listed?	No
Any portion of project upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor	Not Applicable
% of project easement fenced	0%

1.5 Monitoring Plan View

Monitoring activities for the Site, including relevant structures and utilities, project features, specific project structures, and monitoring features are detailed in the monitoring plan view in Appendix C. Site features including vegetation, wetland hydrology, and photographic documentation were monitored in Year 2 (2008).

2.0 PROJECT CONDITION AND MONITORING RESULTS

2.1 Vegetation Assessment

Nine vegetation plots (10 meters by 10 meters in size) were sampled in August 2008 for Year 2 (2008) monitoring as outlined in 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 A. The taxonomic standard for vegetation used for this document was *Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas* (Weakley 2007). The locations of vegetation monitoring plots were placed to accurately represent the entire Site and are depicted on the monitoring plan view in Appendix C.

2.1.1 Vegetation Success Criteria

Success criteria have been established to verify that the vegetation component supports community elements necessary for floodplain forest development. Success criteria are dependent upon the density and growth of characteristic forest species. Additional success criteria are dependent upon density and growth

of "Characteristic Tree Species." Characteristic Tree Species include planted species and species identified through inventory of a reference (relatively undisturbed) forest community used to orient the planting plan. All canopy tree species planted and identified in the reference forest will be utilized to define "Characteristic Tree Species" as termed in the success criteria. Table 5 below outlines planted and reference forest species.

Table 5. Planted Species and Reference Forest Ecosystem

Planted Species	Reference Species
Swamp Black Gum (*Nyssa biflora*)	Willow Oak (*Quercus phellos*)
Laurel Oak (*Quercus laurifolia*)	Swamp Chestnut Oak (*Quercus michauxii*)
Swamp Chestnut Oak (*Quercus michauxii*)	Water Oak (*Quercus nigra*)
Cherrybark Oak (*Quercus pagodaefolia*)	Sweet Gum (*Liquidambar styraciflua*)
Water Oak (*Quercus nigra*)	Loblolly Pine (*Pinus taeda*)
Willow Oak (*Quercus phellos*)	Red Maple (*Acer rubrum*)
Sweetbay (*Magnolia virginiana*)	River Birch (*Betula nigra*)
	Swamp Black Gum (*Nyssa biflora*)
	Highbush Blueberry (*Vaccinium corymbosum*)
	Elderberry (*Sambucus canadensis*)
	Sweetbay (*Magnolia virginiana*)
	Horse Sugar (*Symplocos tinctoria*)
	Sweet Pepperbush (*Clethra alnifolia*)
	Ironwood (*Carpinus caroliniana*)
	Spicebush (*Lindera benzoin*)
	American Holly (*Ilex opaca*)

Success criteria dictate that an average density of 320 stems per acre of Character Tree Species must be surviving in the first three monitoring years. Subsequently, 290 Character Tree Species per acre must be surviving in year 4 and 260 Character Tree Species per acre in year 5.

2.1.2 Vegetative Problem Areas

Vegetation sampling across the Site was well-above the required average density with 630 planted stems per acre. No vegetation problem areas were noted during the Year 2 (2008) monitoring season.

2.2 Wetland Assessment

Five groundwater monitoring gauges and two reference groundwater gauge were maintained and monitored throughout the Year 2 (2008) growing season. Graphs of groundwater hydrology and precipitation from a nearby rain station in Tarboro (Weather Underground 2008) are included in Appendix B.

2.2.1 Wetland Success Criteria

Target hydrological characteristics include saturation or inundation for at least 5 percent of the growing season, during average climatic conditions. This value is based on DRAINMOD simulations for 60 years of rainfall data in an old field stage. These areas are expected to support hydrophytic vegetation. If wetland parameters are marginal as indicated by vegetation and/or hydrology monitoring, a jurisdictional determination will be performed in these areas.

In atypical dry years, the hydroperiod must exceed 75 percent of the hydroperiod exhibited by the reference gauges. Reference gauge data will be used to compare wetland hydroperiods between the restoration areas

and relatively undisturbed reference wetlands. This data will supplement regulatory evaluation of success criteria and also provide information that shall allow interpretation of mitigation success in years not supporting "normal" rainfall conditions.

2.2.2 Wetland Problem Areas

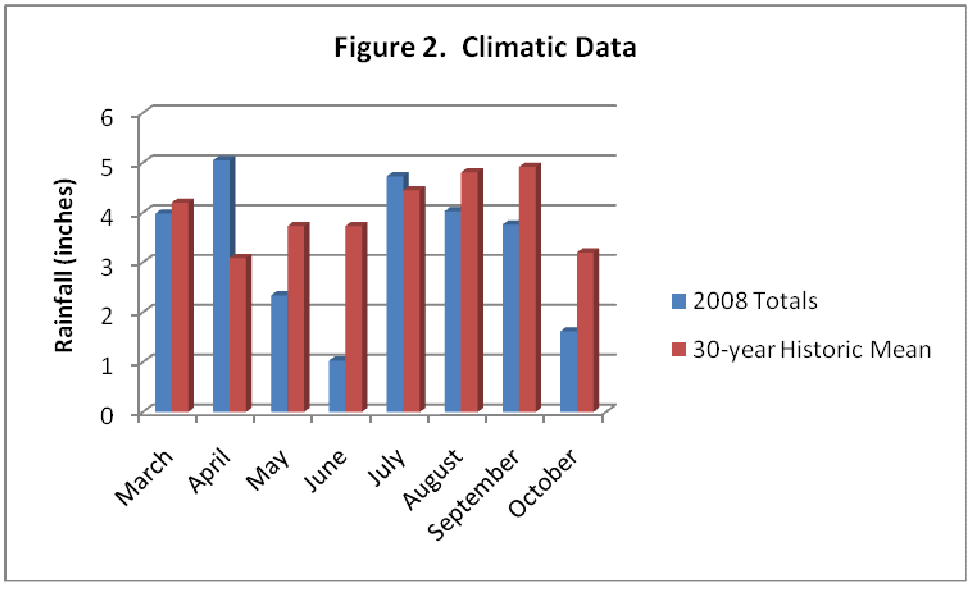
No wetland problem areas were identified within the Site during Year 2 (2008) monitoring.

2.2.3 Wetland Criteria Attainment

Three of the five monitored gauges within restoration areas were inundated/saturated within 12 inches of the surface for greater than 5 percent of the growing season, which extends from March 21 to November 10 (235 days) (Table 6). However, rain fall for the Year 2 (2008) growing season was below normal with 26 inches of rain occurring from March to October 2008 compared to the 30-year historic mean rainfall of 32 inches occurring from March to October (NOAA 2004) (Figure 2). Since the Year 2 (2008) monitoring season rainfall was below normal, comparisons to reference groundwater gauges were made. Four of the five groundwater gauges should be considered successful for the Year 2 (2008) monitoring period; the only gauge that fell below the success criteria was Gauge 2. Hydrographs containing groundwater and precipitation data for each gauge can be found in Appendix B.

Table 6. Wetland Criteria Attainment for Year 2 (2008)

Gauge ID	Hydrology Threshold Met?	Hydrophytic Vegetation Criteria Met?	Site Mean	Vegetation Plot ID	Vegetation Survival Threshold Met?	Site Mean
1	Yes	Yes	80 %	1	Yes	100 %
2	No	Yes		2	Yes	
3	Yes	Yes		3	Yes	
4	Yes	Yes		4	Yes	
5	Yes	Yes		5	Yes	
				6	Yes	
				7	Yes	
				8	Yes	
				9	Yes	



3.0 CONCLUSIONS

The Site achieved the defined (or targeted) success criteria during a year with less than normal rainfall, with saturation (free water) within one foot of the soil surface for a minimum of 75 percent of the period the reference gauges were saturated during the growing season, for four of the five Site groundwater gauges in the Second Monitoring Year (Year 2008). A summary of groundwater gauge data for the entire monitoring period is included in Table 7. Also, all vegetation plots across the Site were above the required 320 stems per acre with an average of 630 tree stems per acre in the Second Monitoring Year (Year 2008) (Table 8).

Table 7. Summary of Groundwater Gauge Results

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	Yes/15 days (6 percent)	Yes/60 days (26 percent)			
2	Yes/1 days (0.4 percent)	No/2 days (0.8 percent)			
3	Yes/15 days (6 percent)	Yes/38 days (16 percent)			
4	Yes/6 days (3 percent)	Yes/31 days (13 percent)			
5	Yes/7 days (3 percent)	Yes/5 days (2 percent)			
Ref 1	Yes/7 days (percent)	Yes/5 days (2 percent)			
Ref 1	Yes/7 days (percent)	Yes/5 days (2 percent)			

*Rainfall was below normal; therefore, Site gauges were compared to reference gauges for success.

Table 8. Summary of Planted Vegetation Plot Results

Plot	Planted Stems/Acre Counting Towards Success Criteria				
	Year 1 (2007)	Year 2 (2008)	Year 3 (2009)	Year 4 (2010)	Year 5 (2011)
1	607	445			
2	931	931			
3	607	607			
4	647	769			
5	324	486			
6	688	728			
7	364	526			
8	324	647			
9	405	526			
Average of All Plots (1-9)	**544**	**630**			

4.0 REFERENCES

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Weather Underground. 2008. Station in Tarboro, North Carolina. (online). Available: http://www.wunderground.com/weatherstation/WXDailyHistory.asp?ID=KNCTARBO2&graphspan=custom&month=3&day=1&year=2008&monthend=10&dayend=31&yearend=2008 [November 11, 2008]. Weather Underground.

APPENDIX A
VEGETATION DATA

1. **Vegetation Survey Data Tables**
2. **Vegetation Monitoring Plot Photos**

Report Prepared By	Corri Faquin
Date Prepared	10/22/2008 9:54

database name	RestorationSystems-2008-Al-v2.2.5.mdb
database location	C:\Business\CVS database
computer name	AXIOM-0A9116A70

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 total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.

PROJECT SUMMARY----------

Project Code	Anderson
project Name	Anderson Swamp
Description	Wetland Restoration Site in Edgecombe County
River Basin	Tar-Pamlico

Total stems, including planted stems of all kinds (including live stakes) and natural/volunteer stems:

Project Code	Project Name	River Basin	Year 2008
Anderson	Anderson Swamp	Tar-Pamlico	630

plot	Plot Level	Latitude/ Northing	Longitude/ Easting	Datum	Date Sampled	Planted Living Stems	Dead/Missing Stems	Planted Living Stems per ACRE	# species
Anderson-KD-ASV1	2	36º 02.066'	77º 33.040'	NAD83/WGS84	8/7/2008	11	5	445	3
Anderson-KD-ASV2	2	36º 02.042'	77º 33.022'	NAD83/WGS84	8/7/2008	23	2	931	2
Anderson-KD-ASV3	2	36º 01.992'	77º 33.002'	NAD83/WGS84	8/7/2008	15	0	607	4
Anderson-KD-ASV4	2	36º 01.958'	77º 33.046'	NAD83/WGS84	8/7/2008	19	1	769	2
Anderson-KD-ASV5	2	36º 01.906'	77º 32.978'	NAD83/WGS84	8/6/2008	12	4	486	5
Anderson-KD-ASV6	2	36º 01.869'	77º 32.951'	NAD83/WGS84	8/6/2008	18	4	728	4
Anderson-KD-ASV7	2	36º 01.839'	77º 33.008'	NAD83/WGS84	8/7/2008	13	0	526	6
Anderson-KD-ASV8	2	36º 01.777'	77º 32.948'	NAD83/WGS84	8/6/2008	16	0	647	4
Anderson-KD-ASV9	2	36º 01.817'	77º 32.959'	NAD83/WGS84	8/6/2008	13	0	526	4

Vigor

vigor	Count	Percent
2	40	25.6
3	75	48.1
4	25	16
Missing	16	10.3

Damage

Damage	Count	Percent Of Stems
(no damage)	106	67.9
Deer	20	12.8
Unknown	18	11.5
Drought	9	5.8
Insects	2	1.3
(other damage)	1	0.6

Vigor by Species

	Species	4	3	2	1	0	Missing	Unknown
	Nyssa biflora			3				
	Quercus laurifolia		1					
	Quercus michauxii	1	11	15			2	
	Quercus nigra	6	7	8				
	Quercus pagoda	8	21	5				
	Quercus phellos	9	21	2			11	
	Quercus						1	
	Quercus rubra						2	
	Magnolia virginiana	1	4	6				
	Nyssa		5	1				
	Ulmus		5					
TOT:	**11**	**25**	**75**	**40**			**16**	

Damage by Species

	Species	All Damage Categories	(no damage)	Deer	Drought	Insects	Unknown	(other damage)
	Magnolia virginiana	11	5		5		1	
	Nyssa	6	2	4				
	Nyssa biflora	3		2	1			
	Quercus	1	1					
	Quercus laurifolia	1	1					
	Quercus michauxii	29	10	9	1		9	
	Quercus nigra	21	12	2	1	2	3	1
	Quercus pagoda	34	30		1		3	
	Quercus phellos	43	40	1			2	
	Quercus rubra	2	2					
	Ulmus	5	3	2				
TOT:	**11**	**156**	**106**	**20**	**9**	**2**	**18**	**1**

Damage by Plot

	plot	All Damage Categories	(no damage)	Deer	Drought	Insects	Unknown	(other damage)
	Anderson-KD-ASV1-	16	12		1	1	2	
	Anderson-KD-ASV2-	25	13	9			3	
	Anderson-KD-ASV3-	15	7				8	
	Anderson-KD-ASV4-	20	16				4	
	Anderson-KD-ASV5-	16	12	2	2			
	Anderson-KD-ASV6-	22	13	2	5	1		1
	Anderson-KD-ASV7-	13	12		1			
	Anderson-KD-ASV8-	16	11	4			1	
	Anderson-KD-ASV9-	13	10	3				
TOT:	**9**	**156**	**106**	**20**	**9**	**2**	**18**	**1**

Planted Stems by Plot

	Species	Total Planted Stems	# plots	avg# stems	plot Anderson-KD-ASV1-	plot Anderson-KD-ASV2-	plot Anderson-KD-ASV3-	plot Anderson-KD-ASV4-	plot Anderson-KD-ASV5-	plot Anderson-KD-ASV6-	plot Anderson-KD-ASV7-	plot Anderson-KD-ASV8-	plot Anderson-KD-ASV9-
	Magnolia virginiana	11	3	3.67					5	4		2	
	Nyssa	6	1	6								6	
	Nyssa biflora	3	1	3					3				
	Quercus laurifolia	1	1	1							1		
	Quercus michauxii	27	3	9		17	8				2		
	Quercus nigra	21	6	3.5	6		3		2	8	1		1
	Quercus pagoda	34	8	4.25	4		2	14	1	3	1	5	4
	Quercus phellos	32	9	3.56	1	6	2	5	1	3	5	3	6
	Ulmus	5	2	2.5							3		2
TOT:	**9**	**140**	**9**		**11**	**23**	**15**	**19**	**12**	**18**	**13**	**16**	**13**

All Stems by Plot and Species

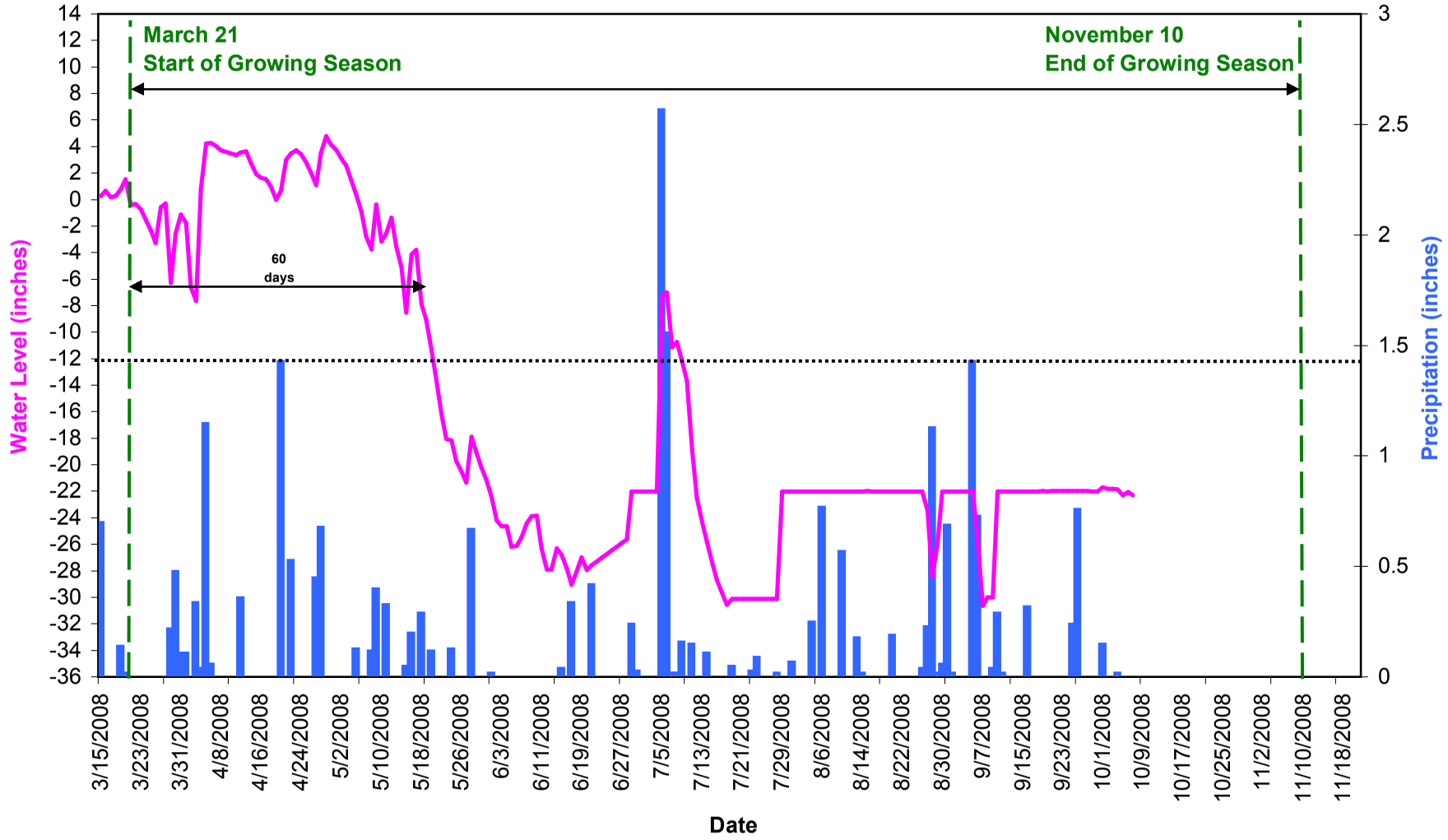
	Species	Total Planted Stems	# plots	avg# stems	plot Anderson-KD-ASV1-	plot Anderson-KD-ASV2-	plot Anderson-KD-ASV3-	plot Anderson-KD-ASV4-	plot Anderson-KD-ASV5-	plot Anderson-KD-ASV6-	plot Anderson-KD-ASV7-	plot Anderson-KD-ASV8-	plot Anderson-KD-ASV9-
	Baccharis halimifolia	6	3	2	1	2			3				
	Betula nigra	1	1	1							1		
	Liquidambar styraciflua	339	8	42.38	2	8	7	108	11		137	13	53
	Nyssa biflora	3	1	3					3				
	Pinus taeda	6	2	3						5			1
	Quercus laurifolia	1	1	1							1		
	Quercus michauxii	27	3	9		17	8				2		
	Quercus nigra	21	6	3.5	6		3		2	8	1		1
	Quercus pagoda	36	8	4.5	4		4	14	1	3	1	5	4
	Quercus phellos	32	9	3.56	1	6	2	5	1	3	5	3	6
	Salix nigra	2	1	2								2	
	Magnolia virginiana	11	3	3.67					5	4		2	
	Nyssa	6	1	6								6	
	Pinus	260	4	65				140	90		20	10	
	Acer rubrum	46	4	11.5		1					1	30	14
	Ulmus	6	3	2				1			3		2
TOT:	**16**	**803**	**16**		**14**	**34**	**24**	**268**	**116**	**23**	**172**	**71**	**81**

Anderson Swamp Wetland Restoration Site
Year 2 (2008) Annual Monitoring
Vegetation Plot Photos
Taken August 2008

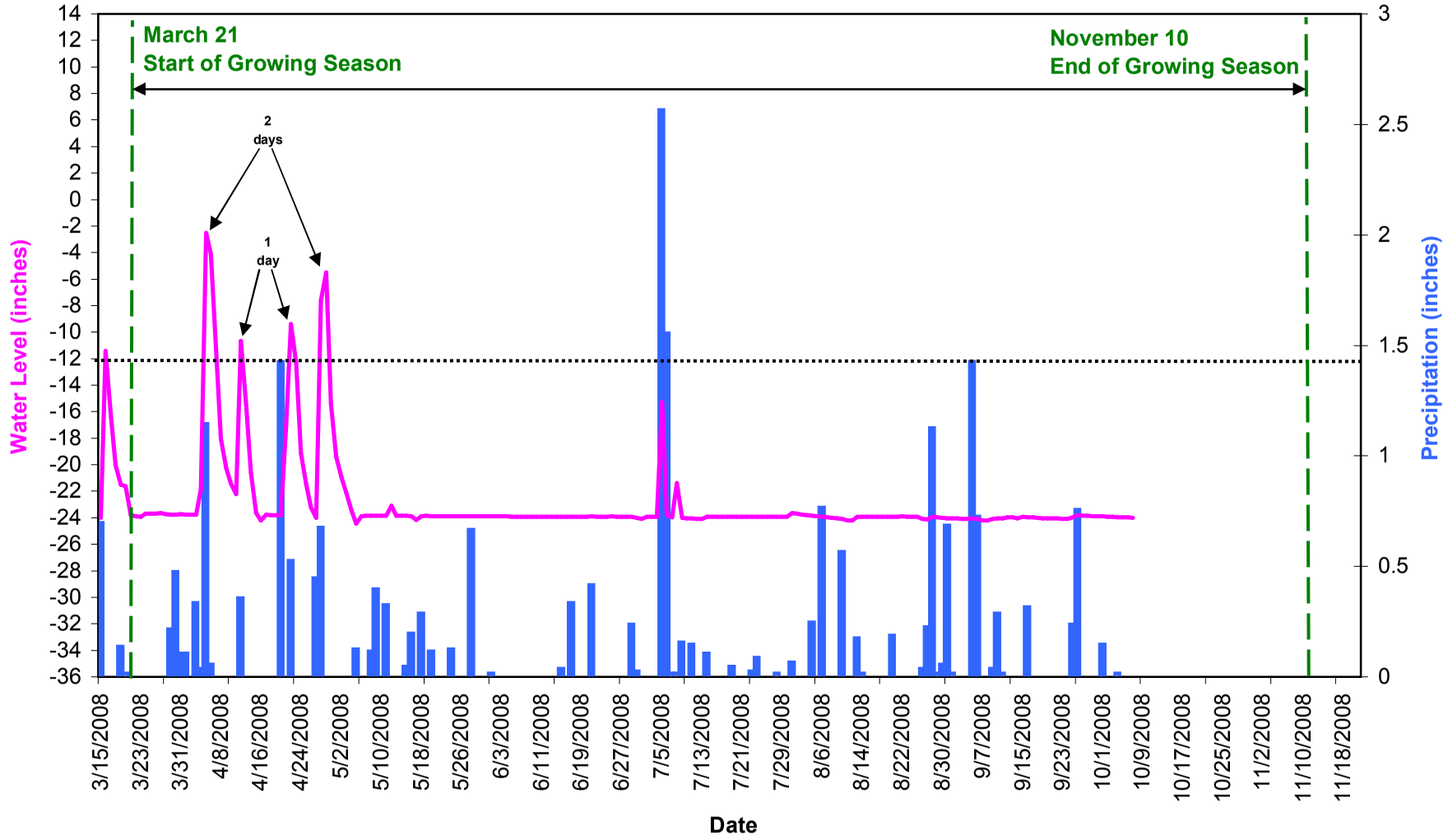
Anderson Swamp Wetland Restoration Site
Year 2 (2008) Annual Monitoring
Vegetation Plot Photos
Taken August 2008
(continued)

APPENDIX B
HYDROLOGY DATA
2008 Groundwater Gauge Graphs

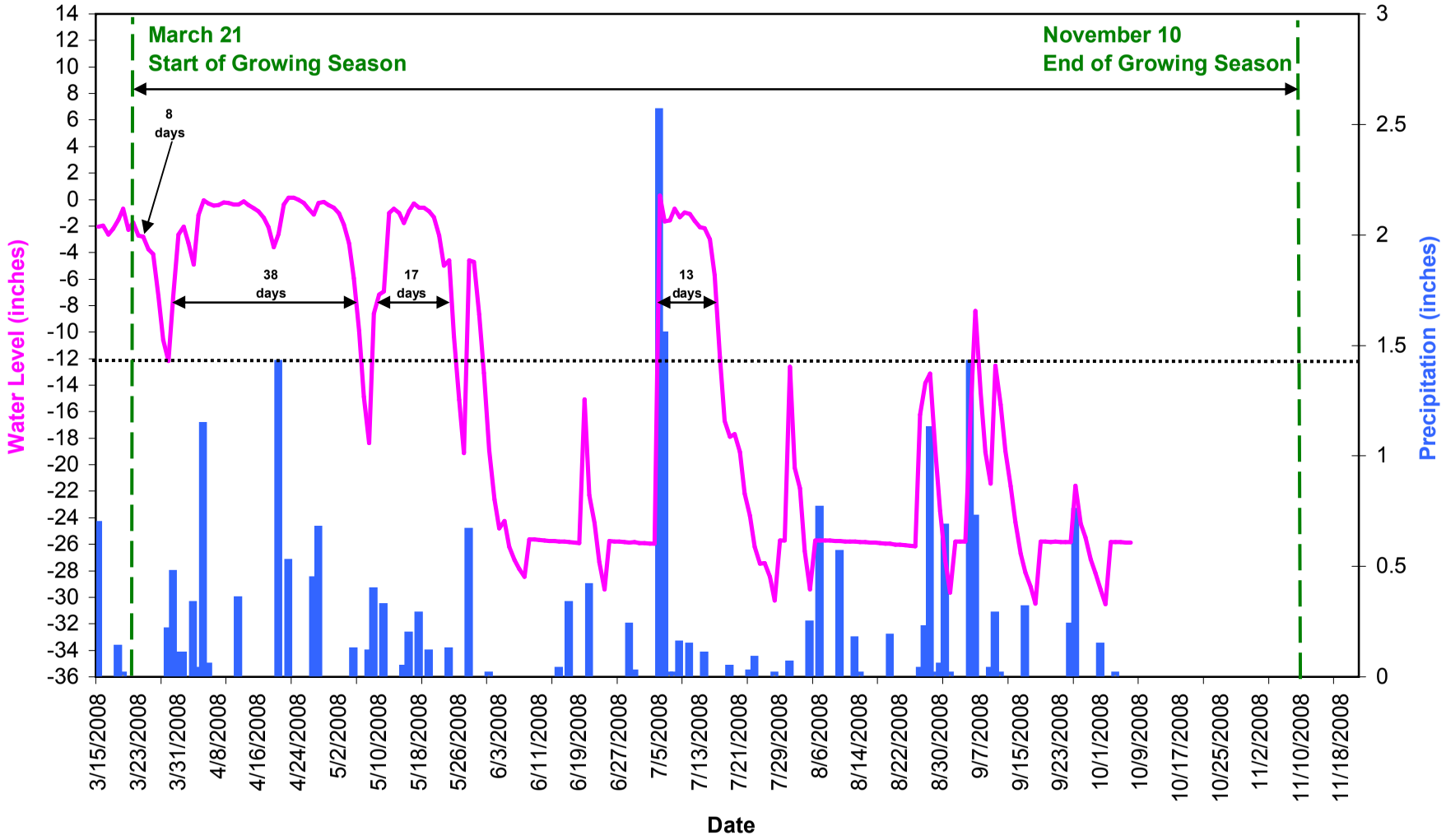
Anderson Swamp Groundwater Gauge 1
Year 2 (2008 Gauge Data)

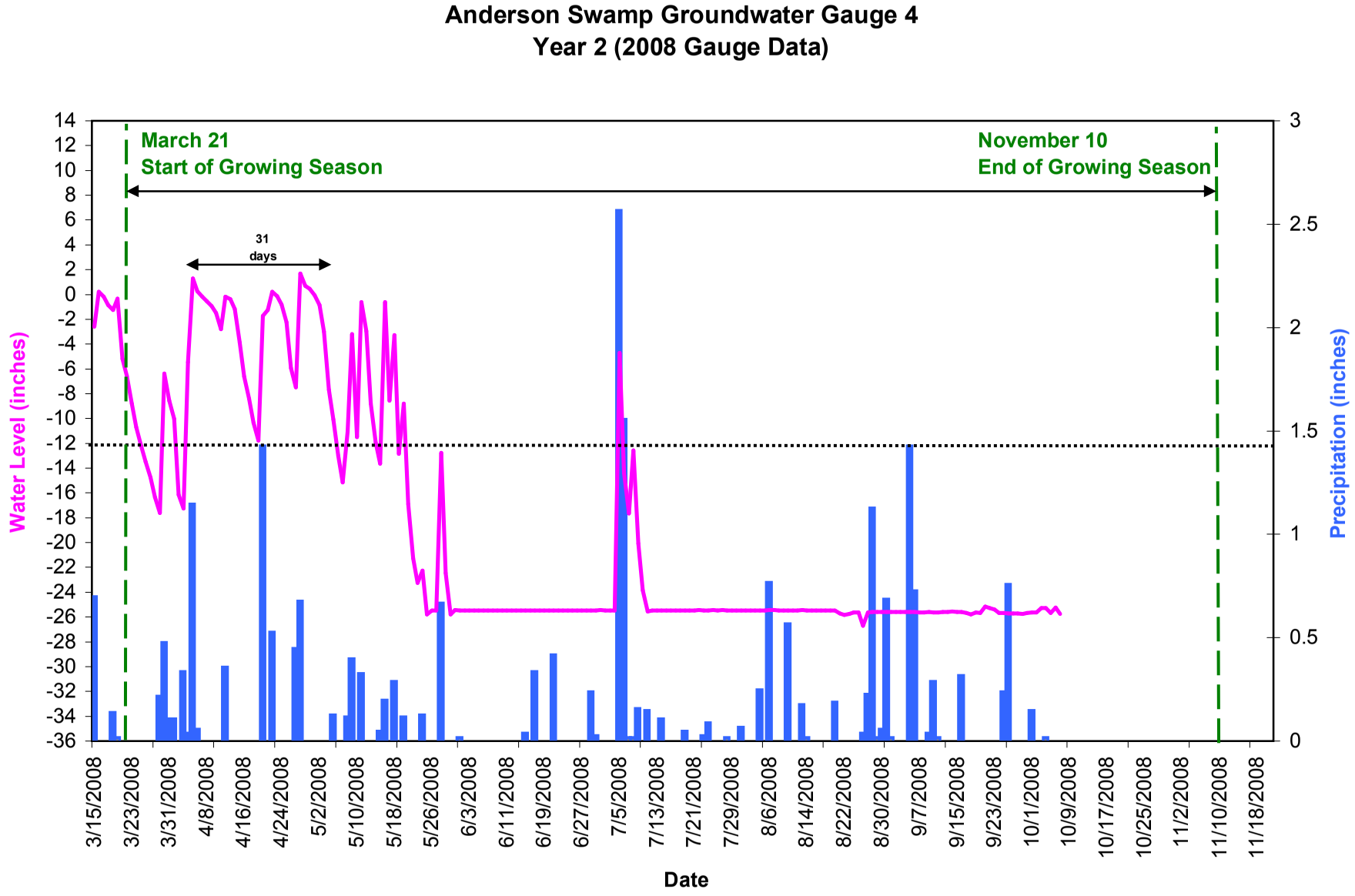


Anderson Swamp Groundwater Gauge 2
Year 2 (2008 Gauge Data)

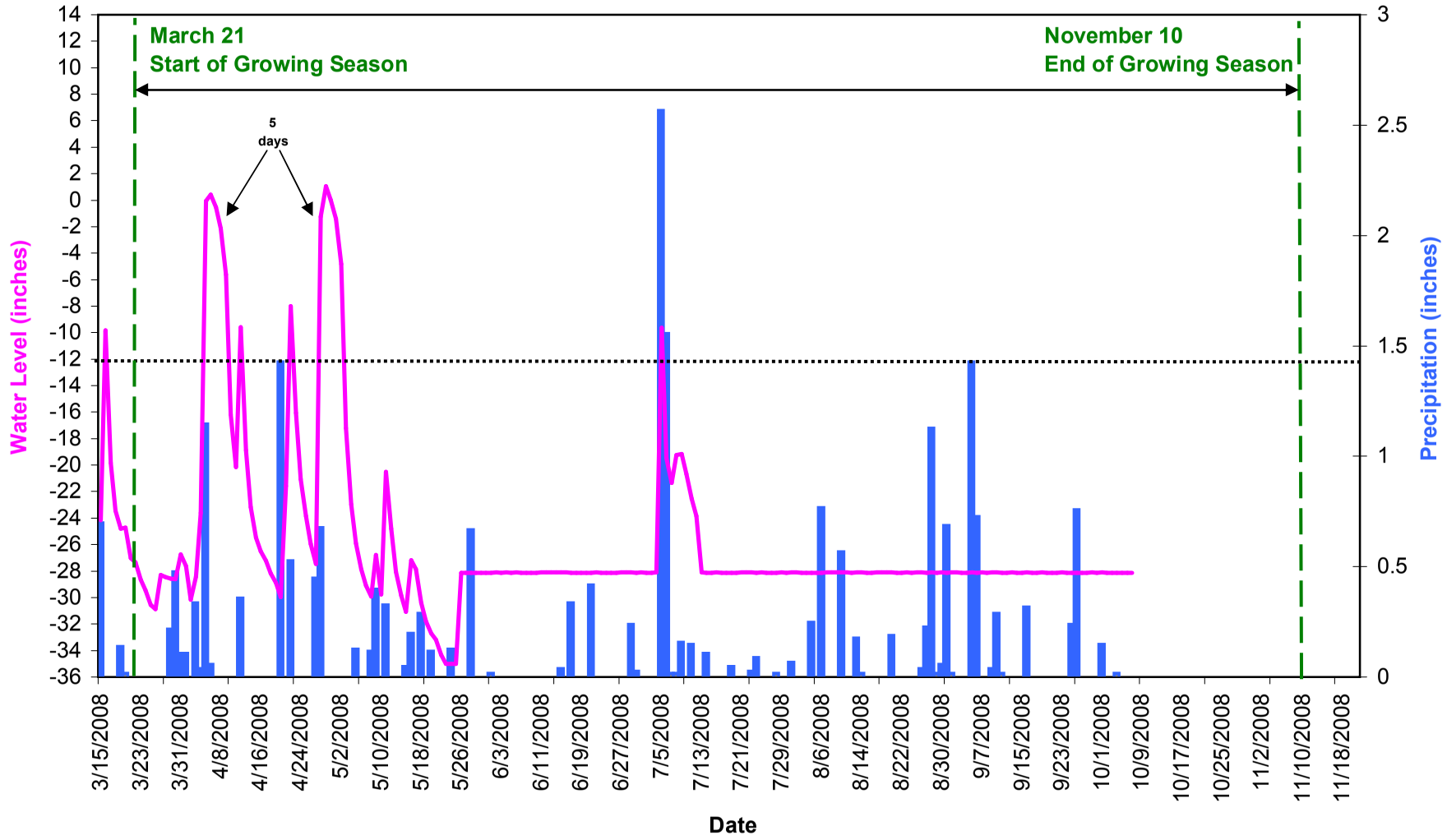


Anderson Swamp Groundwater Gauge 3
Year 2 (2008 Gauge Data)

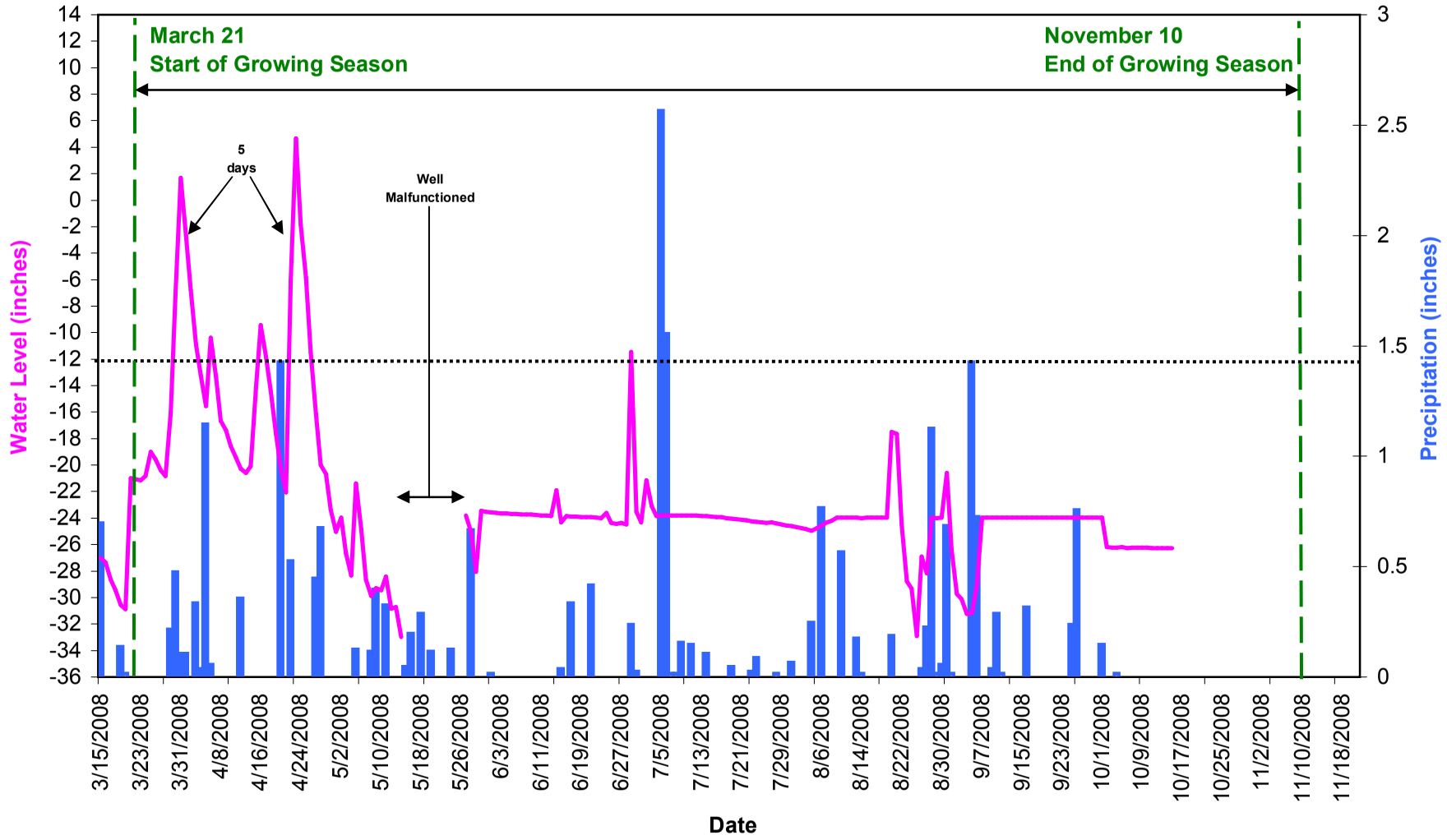



Anderson Swamp Groundwater Gauge 4
Year 2 (2008 Gauge Data)
March 21
Start of Growing Season
November 10
End of Growing Season
31
days
Water Level (inches)
Precipitation (inches)
Date
14
12
10
8
6
4
2
0
-2
-4
-6
-8
-10
-12
-14
-16
-18
-20
-22
-24
-26
-28
-30
-32
-34
-36
3
2.5
2
1.5
1
0.5
0
3/15/2008
3/23/2008
3/31/2008
4/8/2008
4/16/2008
4/24/2008
5/2/2008
5/10/2008
5/18/2008
5/26/2008
6/3/2008
6/11/2008
6/19/2008
6/27/2008
7/5/2008
7/13/2008
7/21/2008
7/29/2008
8/6/2008
8/14/2008
8/22/2008
8/30/2008
9/7/2008
9/15/2008
9/23/2008
10/1/2008
10/9/2008
10/17/2008
10/25/2008
11/2/2008
11/10/2008
11/18/2008

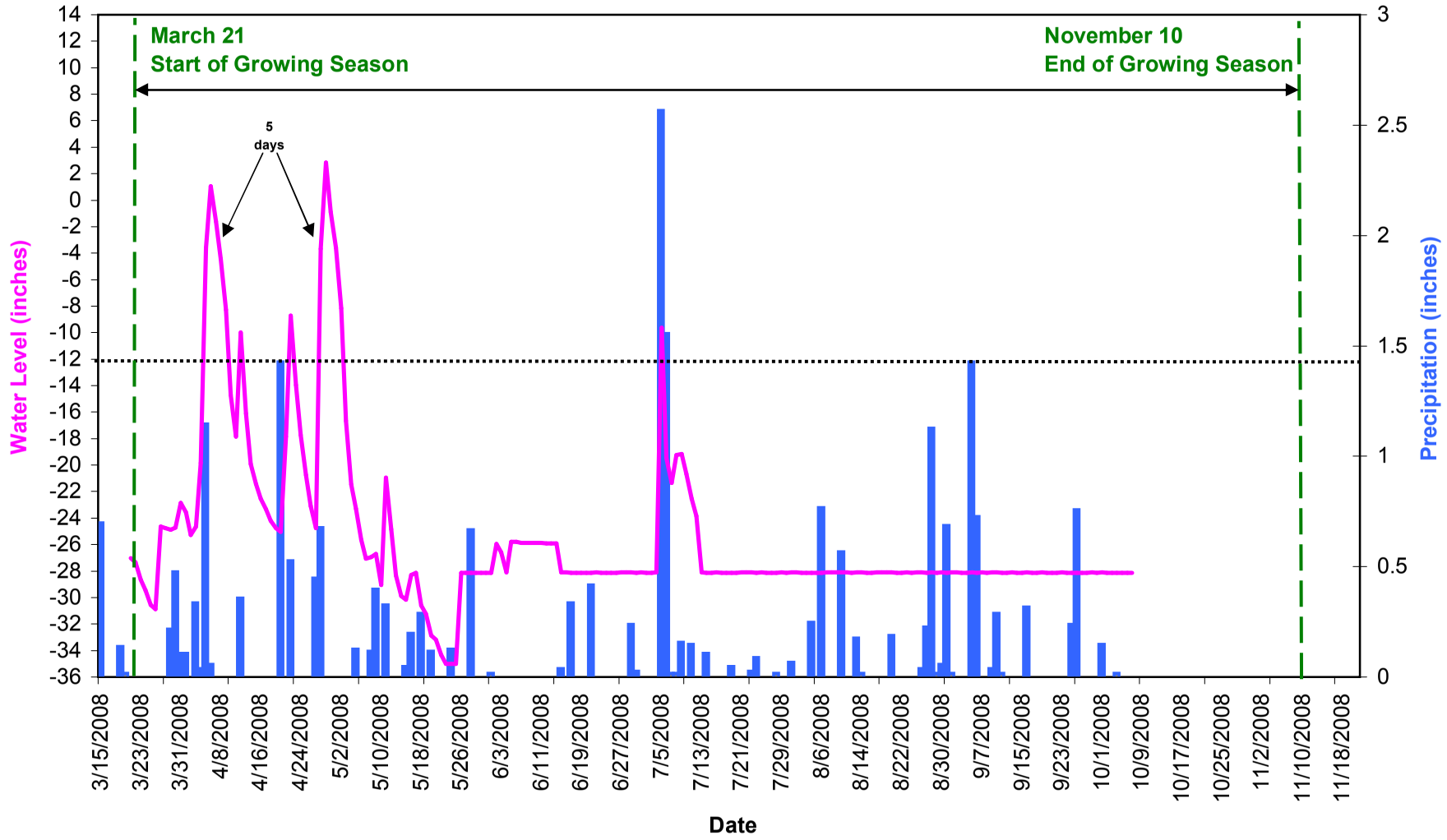
Anderson Swamp Groundwater Gauge 5
Year 2 (2008 Gauge Data)



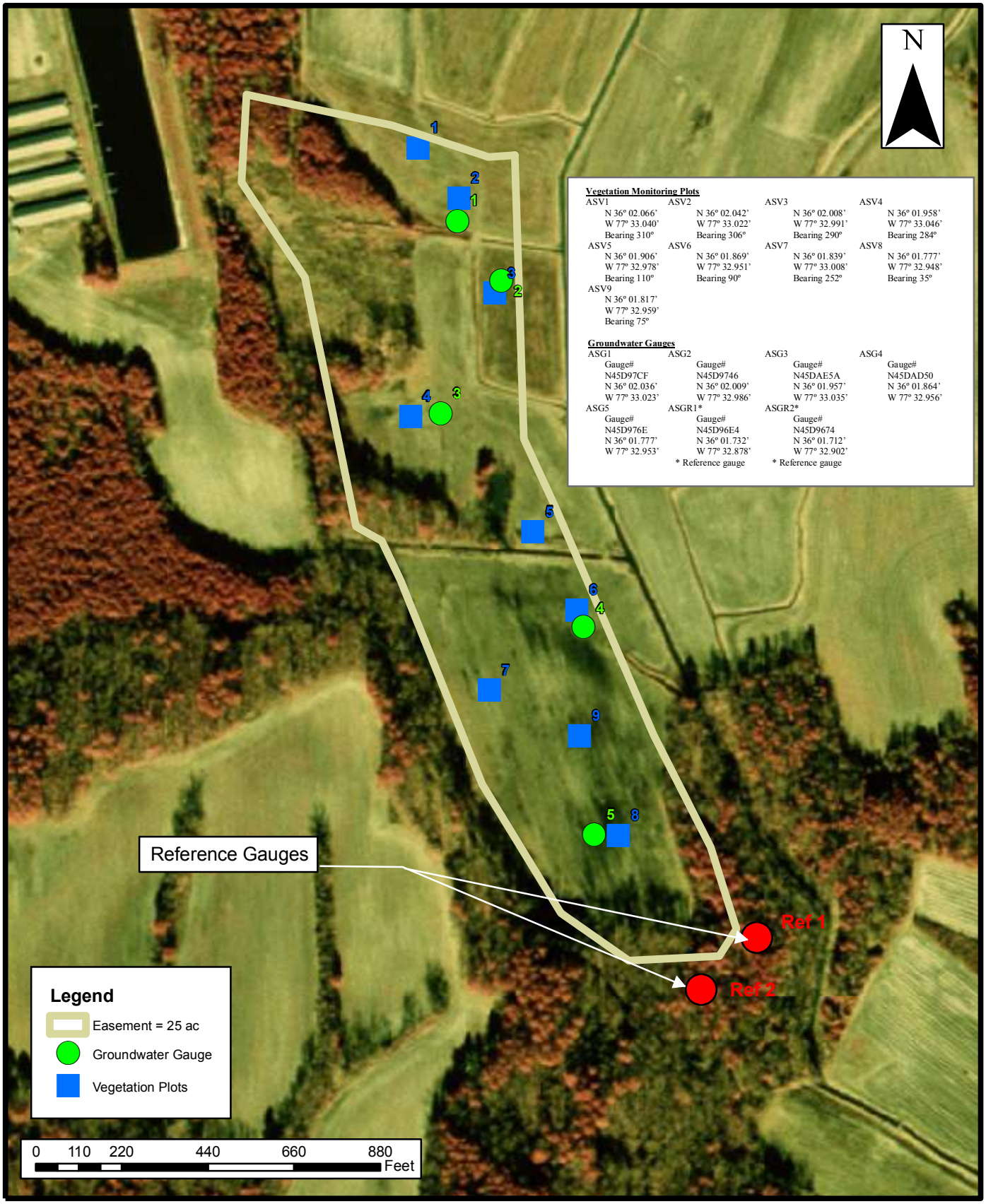
Anderson Swamp Groundwater Reference Gauge 1
Year 2 (2008 Gauge Data)



Anderson Swamp Groundwater Reference Gauge 2
Year 2 (2008 Gauge Data)



APPENDIX C
MONITORING PLAN VIEW



Vegetation Monitoring Plots

ASV1 N 36° 02.066' W 77° 33.040' Bearing 310°	ASV2 N 36° 02.042' W 77° 33.022' Bearing 306°	ASV3 N 36° 02.008' W 77° 32.991' Bearing 290°	ASV4 N 36° 01.958' W 77° 33.046' Bearing 284°
ASV5 N 36° 01.906' W 77° 32.978' Bearing 110°	ASV6 N 36° 01.869' W 77° 32.951' Bearing 90°	ASV7 N 36° 01.839' W 77° 33.008' Bearing 252°	ASV8 N 36° 01.777' W 77° 32.948' Bearing 35°
ASV9 N 36° 01.817' W 77° 32.959' Bearing 75°			

Groundwater Gauges

ASG1 Gauge# N45D97CF N 36° 02.036' W 77° 33.023'	ASG2 Gauge# N45D9746 N 36° 02.009' W 77° 32.986'	ASG3 Gauge# N45DAE5A N 36° 01.957' W 77° 33.035'	ASG4 Gauge# N45DAD50 N 36° 01.864' W 77° 32.956'
ASG5 Gauge# N45D976E N 36° 01.777' W 77° 32.953'	ASGR1* Gauge# N45D96E4 N 36° 01.732' W 77° 32.878' * Reference gauge	ASGR2* Gauge# N45D9674 N 36° 01.712' W 77° 32.902' * Reference gauge	

Axiom Environmental, Inc.
2126 Rowalnd Pond Dr.
Willow Spring, NC 27592
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(919) 341-3839 (fax)

MONITORING PLAN VIEW
ANDERSON SWAMP RESTORATION SITE
Edgecombe County, North Carolina

Dwn. By: CLF
Date: Nov 2008
Project: 08-007

FIGURE
C-1