

ANNUAL REPORT FOR 2006 (Year 6)



Sandy Creek Mitigation Site
Randolph County
EEP Project No. 321

Submitted to:

NCDENR EEP
1619 Mail Service Center
Raleigh, NC 27699-1619



February 2007

Table of Contents

1.0	EXECUTIVE SUMMARY	2
2.0	INTRODUCTION.....	3
2.1	Project Description	3
2.2	Project Objectives.....	3
2.3	Project History and Background.....	3
3.0	HYDROLOGY	8
3.1	Success Criteria	8
3.2	Description of Hydrologic Efforts.....	8
3.3	Results of Hydrologic Monitoring.....	8
4.0	VEGETATION	18
4.1	Success Criteria	18
4.2	Description of Vegetation Monitoring	18
4.3	Results of Vegetation Monitoring	18
5.0	OVERALL CONCLUSIONS AND RECOMMENDATIONS	20

List of Figures

Figure 1	Sandy Creek Vicinity Map.....	7
Figure 2	Sandy Creek Site Plan.....	9
Figure 3	2006 Sandy Creek Groundwater Hydrograph.....	11
Figure 4	2006 Sandy Creek Precipitation.....	16

List of Tables

Table 1	Project Mitigation Structure and Objectives	3
Table 2	Project Activity and Reporting History	4
Table 3	Project Contact Table	5
Table 4	Project Background Table	5
Table 5	Hydrologic Monitoring Results for 2006 (Year 5).....	10
Table 6	Comparison of Average Rainfall to Observed Rainfall.....	17
Table 7	2006 Vegetation Monitoring Plot Species Composition	18
Table 8	Stem Counts for Each Species Arranged by Plot	19

APPENDICES

Appendix A	2006 Site Photos
Appendix B	Integrated Project Problem Areas Plan View

1.0 EXECUTIVE SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Sandy Creek Mitigation Site. This site was constructed in 2000. Monitoring activities in 2006 represent the sixth year of monitoring following construction in 2000 with trees planted in 2001 and the fifth year following the supplemental planting of the site in 2002. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the project is deemed successful. The site has demonstrated success for a fifth consecutive year and therefore 2006 is the final year of monitoring for the site.

The site is monitored with six groundwater-monitoring gauges, one rain gauge, and three vegetation plots. One groundwater-monitoring gauge malfunctioned and no data was recorded. Rainfall data has been collected and recorded by an onsite rain gauge. On-site rainfall data was compared to daily rainfall data recorded from a weather station maintained by the NC State Climate Office in Asheboro, NC (weather station 310286-Asheboro 2 W).

Hydrologic monitoring indicated that four of the five monitoring gauges from which data was available exceeded the jurisdictional wetland criteria of saturation within twelve inches of the surface for 12.5 percent of the growing season. One gauge recorded saturation for 5.7 percent of the growing season. According to daily rainfall data recorded from a rain gauge maintained by the NC State Climate Office in Asheboro, NC and an onsite rain gauge, below average rainfall was experienced during the 2006-monitoring year.

The three vegetation-monitoring plots revealed an average density of 314 trees per acre. This average is above the minimum success criteria of 260 trees per acre. Volunteer woody stems are dense and herbaceous vegetation has good coverage throughout.

This site was initially managed by NCDOT. Per the letter from the Ecosystem Enhancement Program (EEP) to NCDOT dated August 25, 2004, the EEP has accepted the transfer of all off-site mitigation projects. The EEP will be responsible for fulfilling the remaining monitoring requirements and future remediation for this project.

2.0 INTRODUCTION

2.1 Project Description

The Sandy Creek Mitigation Site is located in the Cape Fear River Basin approximately four miles southwest of Liberty in Randolph County upstream from the Ramseur water supply (Figure 1). It is situated on the south and east side of Sandy Creek in the 100-year floodplain /floodway, 1.5 miles upstream of Ramseur-Julian Road (SR 2442) and on the west side of Bower Meadow Road (SR 2440). Prior to construction, the site was a nearly level floodplain used for hay production. The site was drained by ditching and raised beds.

The site encompasses 12.9 acres, of which 10 acres were restored and planted, and the remaining 2.9 acres were credited with preservation. Originally, it was designed as a mitigation site for the Greensboro Outer Loop (I-2402). However, it is now intended to provide mitigation for the Sanford Bypass (R-2417, COE Action I.D. No. 199502036).

2.2 Objectives

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until the success criteria are fulfilled. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during 2006 at the Sandy Creek Mitigation Site. Table I discusses the project mitigation structure and objectives.

Table I. Project Mitigation Structure and Objectives

Project Segment	Mitigation Type	Approach	Linear Footage or Acreage	Stationing	Comment
Bottomland Hardwood Wetlands	Restoration	--	10 ac	N/A	
Bottomland Hardwood Wetlands	Preservation	--	2.9 ac	N/A	

Activities in 2006 reflect the sixth year of monitoring following the construction and the fifth year of monitoring vegetation since the supplemental planting. Included in this report are analyses of both hydrologic and vegetative monitoring results, as well as local climate conditions throughout the growing season.

2.3 Project History and Background

The following project background information was extracted from the 2005 Monitoring Report dated February 2005. The Sandy Creek Mitigation Site consists of an approximately 12.9 acre tract within the floodplain of Sandy Creek. Ten acres of the site lie in the floodplain of Sandy Creek and were previously used for hay production. This ten acres constitutes the restoration project. Soils in the farm field had been heavily disturbed in the past by bedding and ditching prior to the 1950s. This site was formerly part of a larger 33.5 acre farm. The remaining 2.9 acres of the site consist of an alluvial forest that extends along portions of the creek.

*Sandy Creek Wetland Mitigation Site
FINAL Annual Monitoring Report for 2006 (Year 6)*

The Sandy Creek Mitigation Site was identified as part of a mitigation site search for the Greensboro Bypass Southern Loop (I-2402). Initial field surveys and the initiation of continuous preliminary groundwater data collection occurred in August 1998. Construction of the wetland mitigation site was completed in June 2000 and trees were planted in March 2001. A supplemental planting of the site was done in March 2002. It is assumed for this report that the same initial species were planted. The first annual hydrologic and vegetative monitoring took place in 2001 and has been continued annually through the monitoring year 2006. The results of the 2006 monitoring are presented in this report. Table II below shows project history and activities, table III shows project contacts, and table IV shows project background.

Table II. Project Activity and Reporting History

Activity or Report	Scheduled Completion	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	N/A*	N/A*	April 1999
Final Design-90%	N/A*	N/A*	December 1999
Construction	N/A*	N/A*	June 2000
Temporary S&E mix applied	N/A*	N/A*	N/A*
Bare root plantings of trees	N/A*	N/A*	March 2001
Mitigation Plan/As-built (Year 0 Monitoring – baseline)	N/A*	N/A*	N/A*
Year 1 Monitoring-Vegetation	N/A*	N/A*	July 2001
Supplemental Planting	N/A	N/A	March 2002
Year 2 Monitoring-Vegetation	N/A	N/A	June 2002
Year 3 Monitoring-Vegetation	N/A	N/A	June 2003
Year 4 Monitoring-Vegetation	N/A	N/A	July 2004
Year 5 Monitoring-Vegetation	December 2005	November 2005	December 2005
Year 6 Monitoring-Vegetation	December 2006	November 2006	December 2006

*Historical documents necessary to provide this data were unavailable at the time of this report submission

Table III. Project Contact Table

Designer	Earth Tech of North Carolina 701 Corporate Center Drive, Suite 475 Raleigh, NC 27607
Primary project design POC	Mr. Ron Johnson (919) 854-6210
Construction Contractor Construction Contractor POC	N/A*
Planting Contractor Planting Contractor POC	N/A*
Seeding Contractor Planting Contractor POC	N/A*
Seed Mix Sources	N/A*
Nursery Stock Suppliers	NC Dept of Forestry
Monitoring POC-2000-2004	Firm information/address NCDOT
Monitoring POC-2005	Earth Tech of North Carolina 701 Corporate Center Drive, Suite 475 Raleigh, NC 27607 Mr. Ron Johnson (919) 854-6210
Monitoring POC-2006	WK Dickson and Co., Inc. Raleigh, NC 27612 Mr. Daniel Ingram (919) 782-0495

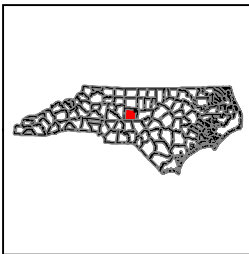
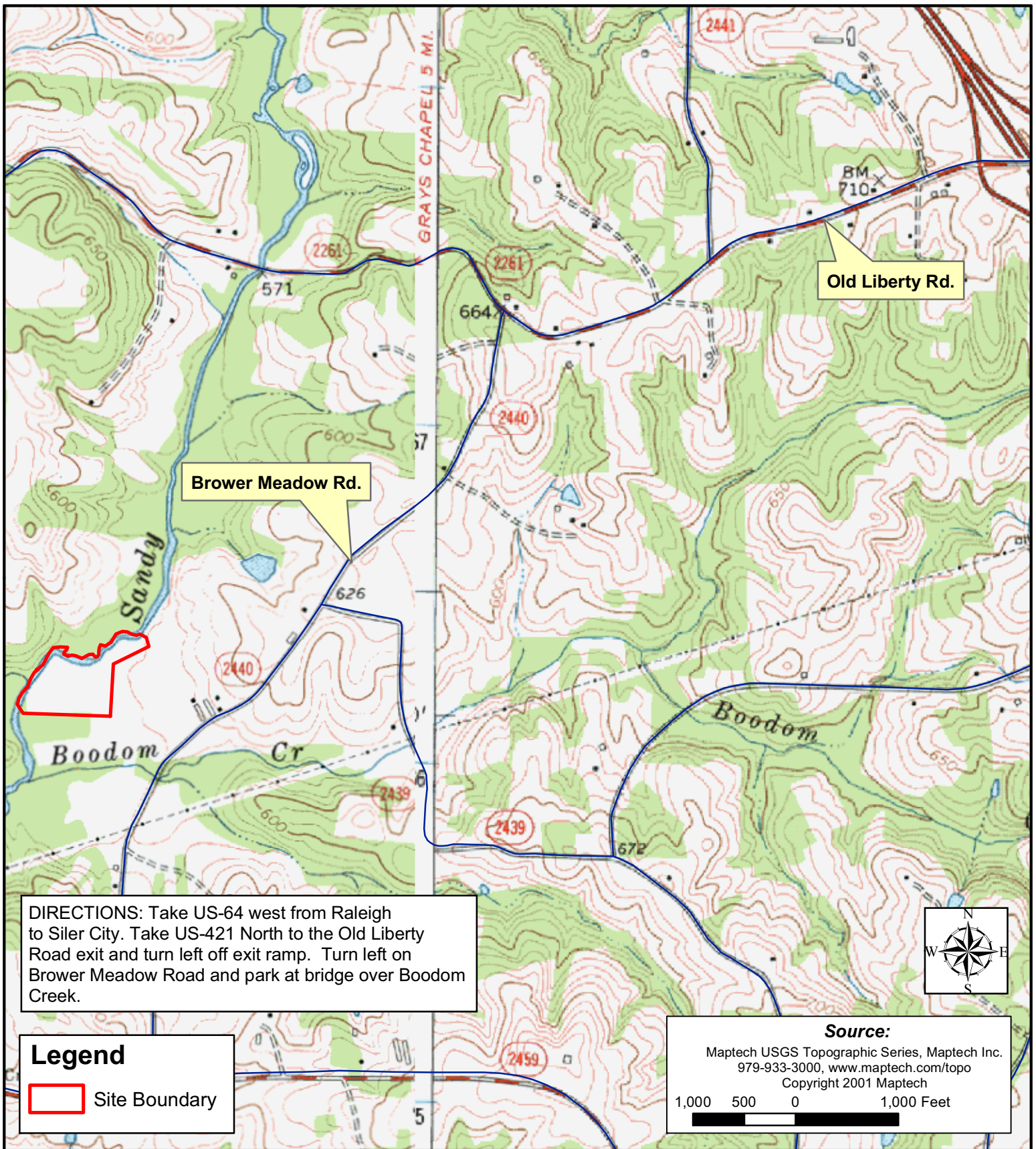
* Historical documents necessary to provide this data were unavailable at the time of this report submission

Table IV. Project Background Table

Project County	Randolph
Drainage Area	N/A
Drainage impervious cover estimate (%)	N/A
Stream order	N/A
Physiographic region	Piedmont
Ecoregion	Carolina Slate Belt (45c)
Rosgen classification of As-built	N/A
Cowardin classification	PFO1A – Palustrine Forested Wetland
Dominant soil types	Chewacla loam
Reference site ID	N/A
USGS HUC for Project	Deep River - HUC 03030003
NCDWQ sub-basin for project and reference	03-06-09
NCDWQ classification for project and reference	N/A
Any portion of project segment upstream of a 303d listed segment	No

*Sandy Creek Wetland Mitigation Site
FINAL Annual Monitoring Report for 2006 (Year 6)*

Table IV (Continued)	
Reasons for 303d listing or stressor	N/A
% of project easement fenced	25%



**FIGURE 01
VICINITY MAP**

Sandy's Creek Wetland Mitigation Site
 Randolph County, North Carolina

Map Produced: January 2006

3.0 HYDROLOGY

3.1 Success Criteria

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology state that the area must be inundated or saturated (within 12" of the surface) by surface or ground water for at least 12.5 percent of the growing season during years having normal rainfall. Areas inundated less than 5 percent of the growing season are always classified as non-wetlands. Areas inundated between 5 percent - 12.5 percent of the growing season can be classified as wetlands depending upon factors such as the presence of hydrophytic vegetation and hydric soils.

There was no published soil survey for Randolph County at the time of the mitigation plan. The growing season for Moore County (directly southeast of Randolph County) was determined to be the best comparison to the Randolph County growing season. The Moore County growing season begins March 23rd and ends November 7th. The dates correspond to a 50 percent probability that temperatures will drop to 28° F or lower after March 23rd and before November 7th. The growing season is 228 days; therefore, the optimum duration for wetland hydrology is 29 days. Local climate must represent normal or below normal conditions for the area.

3.2 Description of Hydrologic Efforts

Historically, wetlands on the tract were fed by a combination of rainfall, runoff, and groundwater seepage from up-gradient areas. After an extensive study of the site's hydrology, it was concluded that the placement of impermeable plugs along drainage features would raise the groundwater level and removal of the raised beds would allow for the saturation of soils within twelve inches of the surface. It was predicted that construction of the plug and the addition of surface water and runoff, would be sufficient to restore wetland hydrology.

Six groundwater-monitoring gauges were installed in February 2001 (Figure 2). The automatic monitoring gauges record daily readings of groundwater depth. Rainfall data was collected by an onsite rain gauge. Also, daily rainfall data recorded from a rain gauge maintained by the NC State Climate Office in Asheboro, NC was used for comparison. Appendix C contains the hydrologic data collected for the site.

3.3 Results of Hydrologic Monitoring

Site Data

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 228-day growing season. Table V presents the 2006 results. Gauge SC-2 malfunctioned during the period and no data was recorded for this gauge. However, observations during monthly site visits indicated extended periods of inundation and saturation at SC-2. Based on these observations it is assumed that SC-2 met the hydrologic success criteria. Gauge SC-1 did not meet the success criteria for consecutive days of groundwater within twelve inches of the surface (less than 5 percent of the growing season). The remaining gauges SC-2, SC04, SC-5, and SC-6 met the success criteria at least once during the growing season. It is unknown why SC-1 did not meet the success criteria although much of the growing season received below normal rainfall (see Climate Data below). A hydrograph of the groundwater depth for each monitoring gauge is shown in Figure 3. Local precipitation events are included on the graphs as bars.

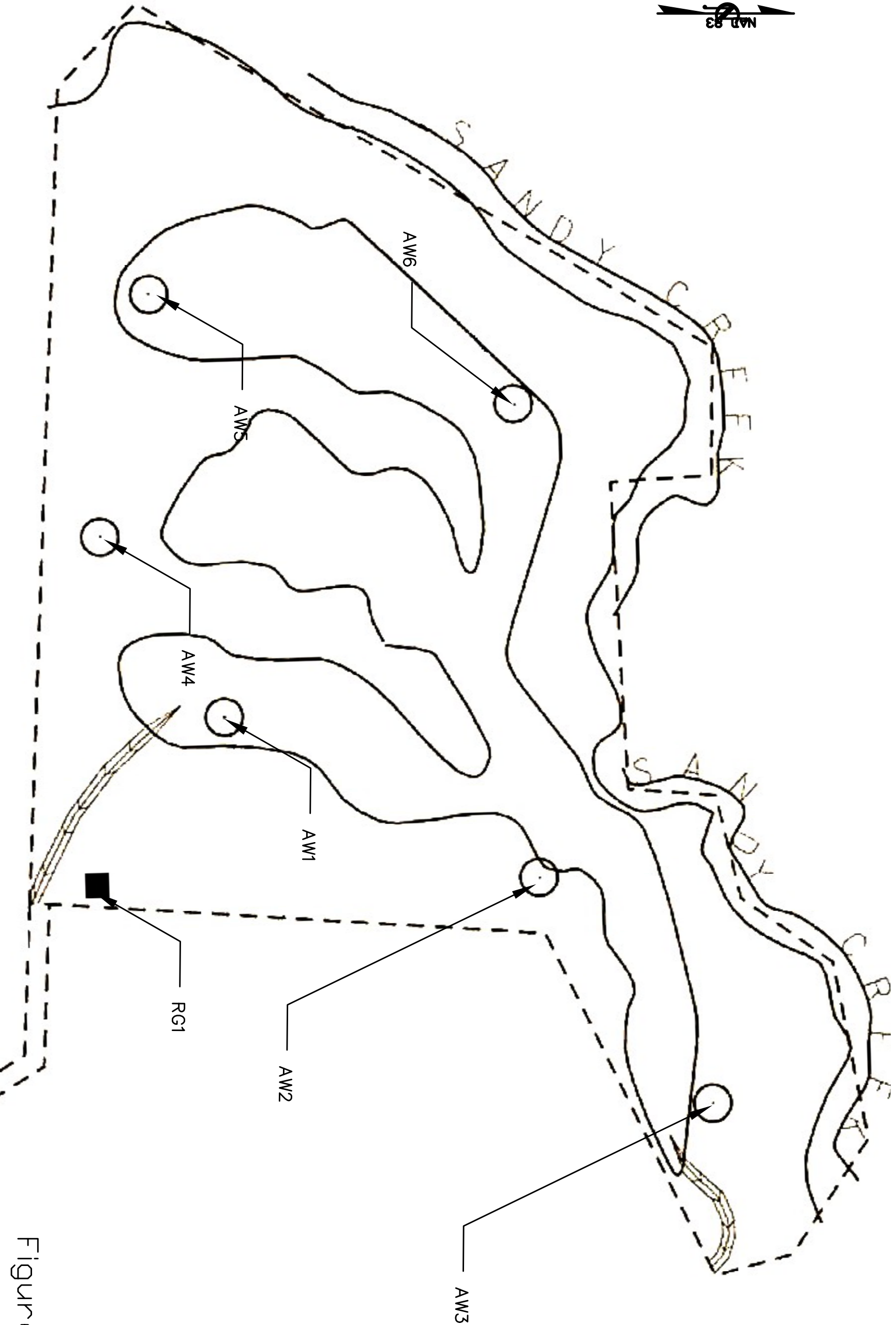


Figure 2

PROJECT NUMBER: 5045700RA
DRAWING SCALE: 1"=100'
DRAWN BY: TRS
SURVEY DATE: [blank]
APPROVED BY: [blank]
MAP DATE: [blank]



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PREPARED FOR:
NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

TITLE:
YEAR 5 MONITORING
SANDY CREEK MITIGATION SITE
RANDOLPH COUNTY
NORTH CAROLINA

Table V. Hydrologic Monitoring Results for 2006 (Year 4)

Gauge	<5 percent	5-8 percent	8-12 percent	>12.5 percent	Cumulative percent	Dates Meeting Success
SC-1	X				5.7	
SC-2				X*		*
SC-3				X	81.1	Mar 23- Jul 12
SC-4				X	68.8	Aug 30- Oct 4
SC-5				X	60.0	Mar 23- May 29
SC-6				X	46.9	Mar 23- May 20

Notes:

Percentage indicates percent of the growing season water table is less 12 inches below ground surface.

*Gauge SC-2 malfunctioned during the period. Success is based on monthly observations of inundation and saturation

Climatic Data

The historical rainfall data was collected from 1971 through 2000 (30 years). All rainfall data used in this analysis was obtained from the NC State Climate Office using the Asheboro weather station (Data from WETS Station: Asheboro 2 W, NC0286). Rainfall on the mitigation site correlated very closely to data collected at the weather station in Asheboro (Figure 4). A comparison with historical rainfall data shows much of 2006 was below normal in terms of precipitation (Table VI). Normal rainfall is based on between 30 percent and 70 percent of rainfall over a 30 year period (1971 to 2001). Seven of the eleven months with complete rainfall data are below normal. All of the remaining months have experienced above normal rainfall. Overall, 2006 experienced a below average rainfall year.

Figure 3
2006 Sandy Creek Groundwater Hydrograph

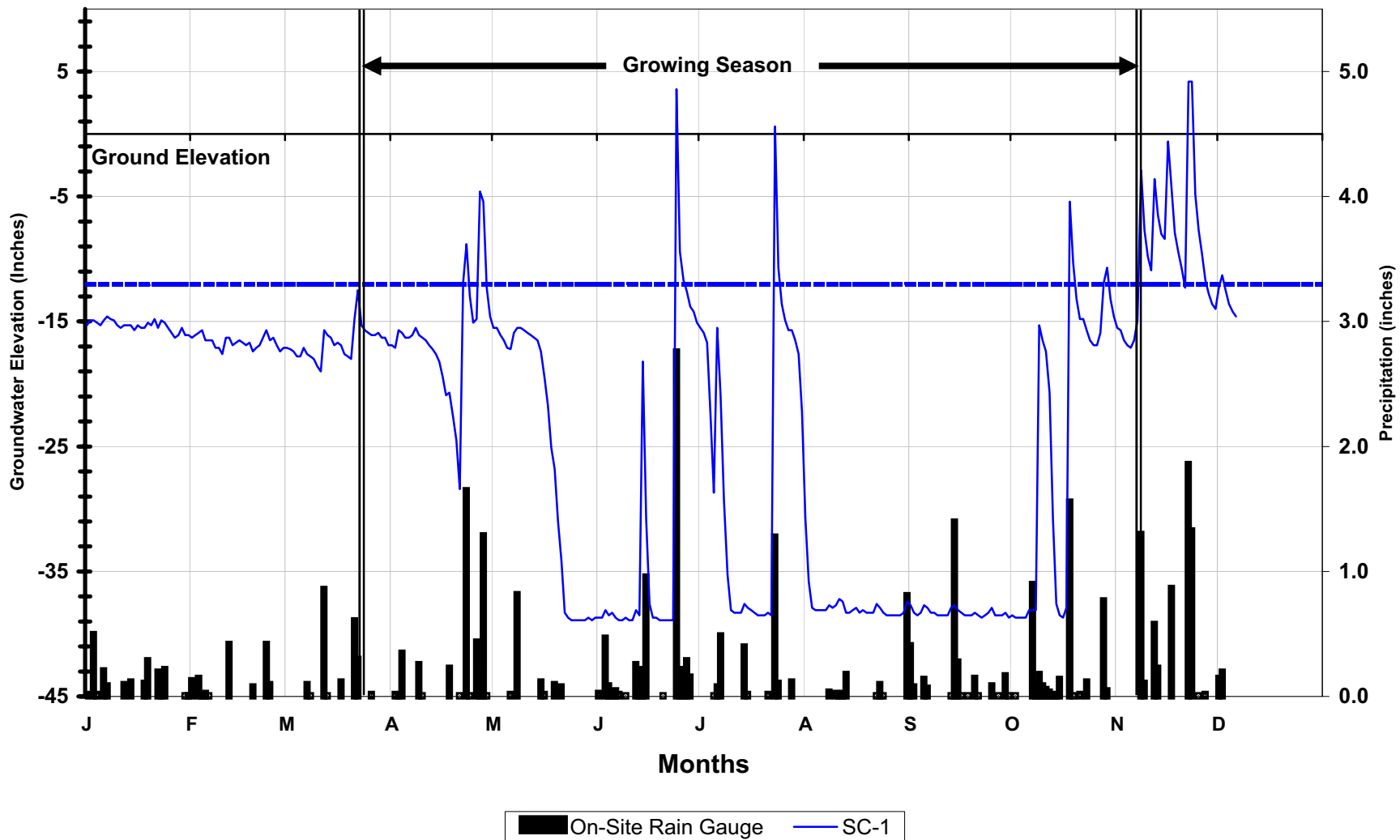


Figure 3
2006 Sandy Creek Groundwater Hydrograph

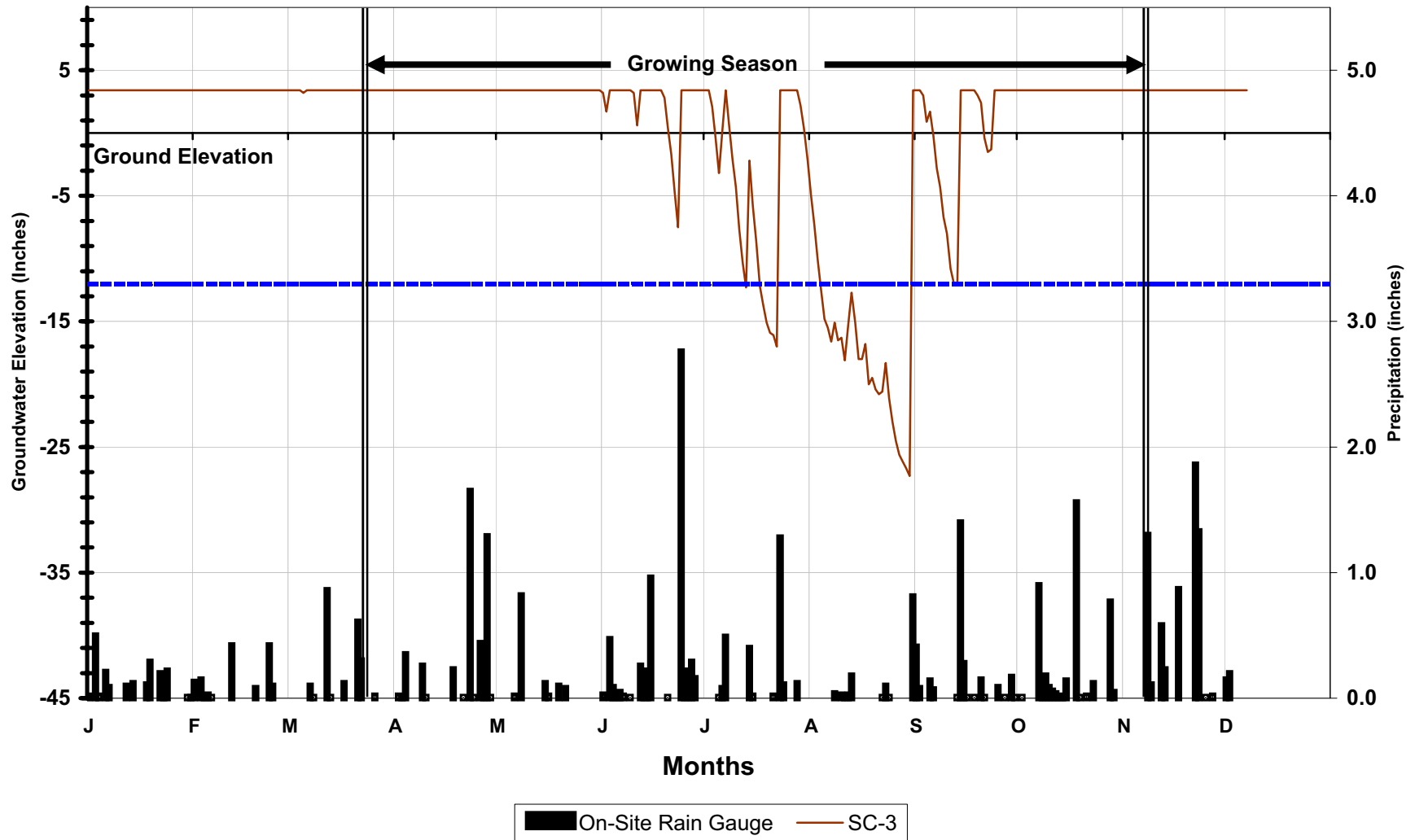


Figure 3
2006 Sandy Creek Groundwater Hydrograph

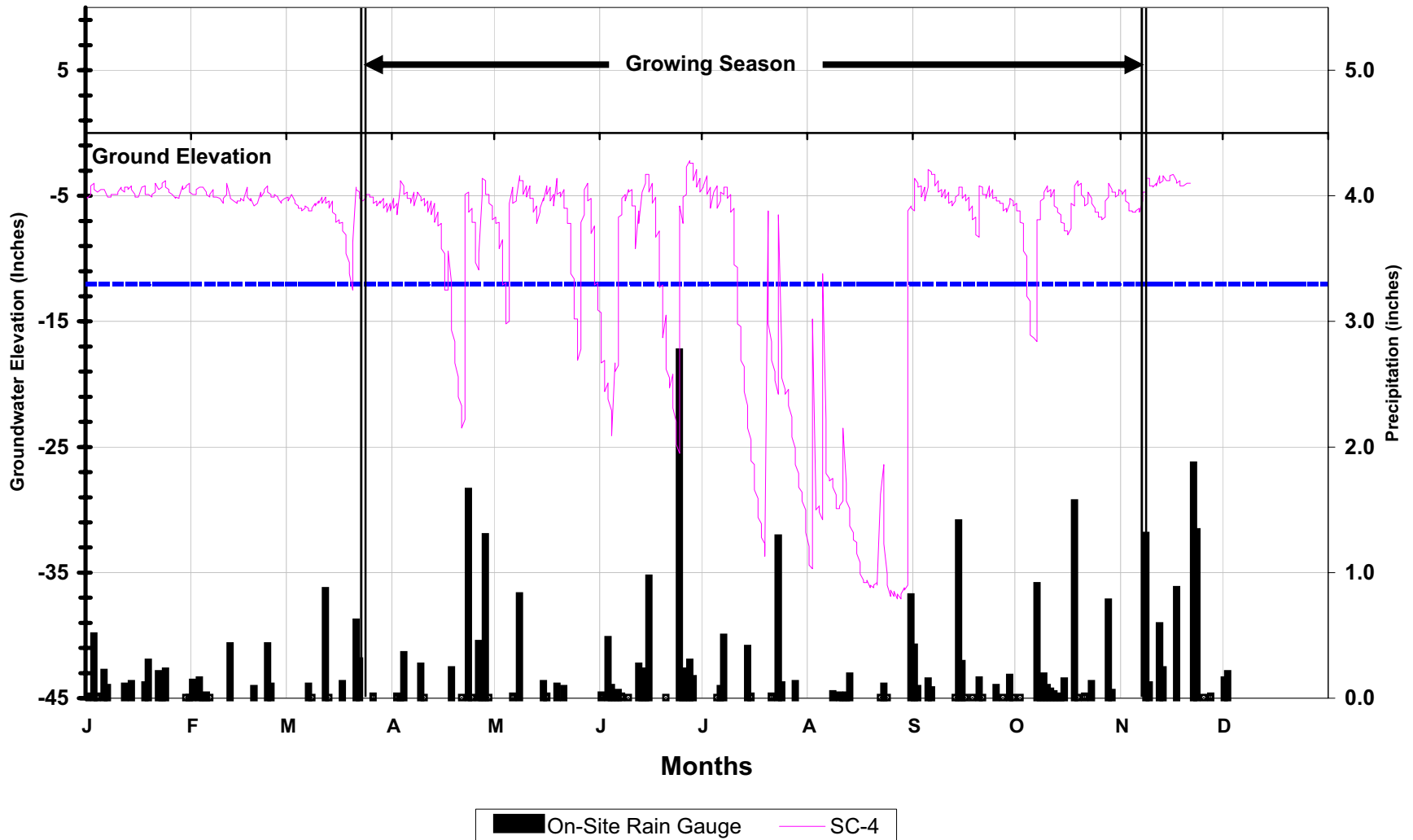


Figure 3
2006 Sandy Creek Groundwater Hydrograph

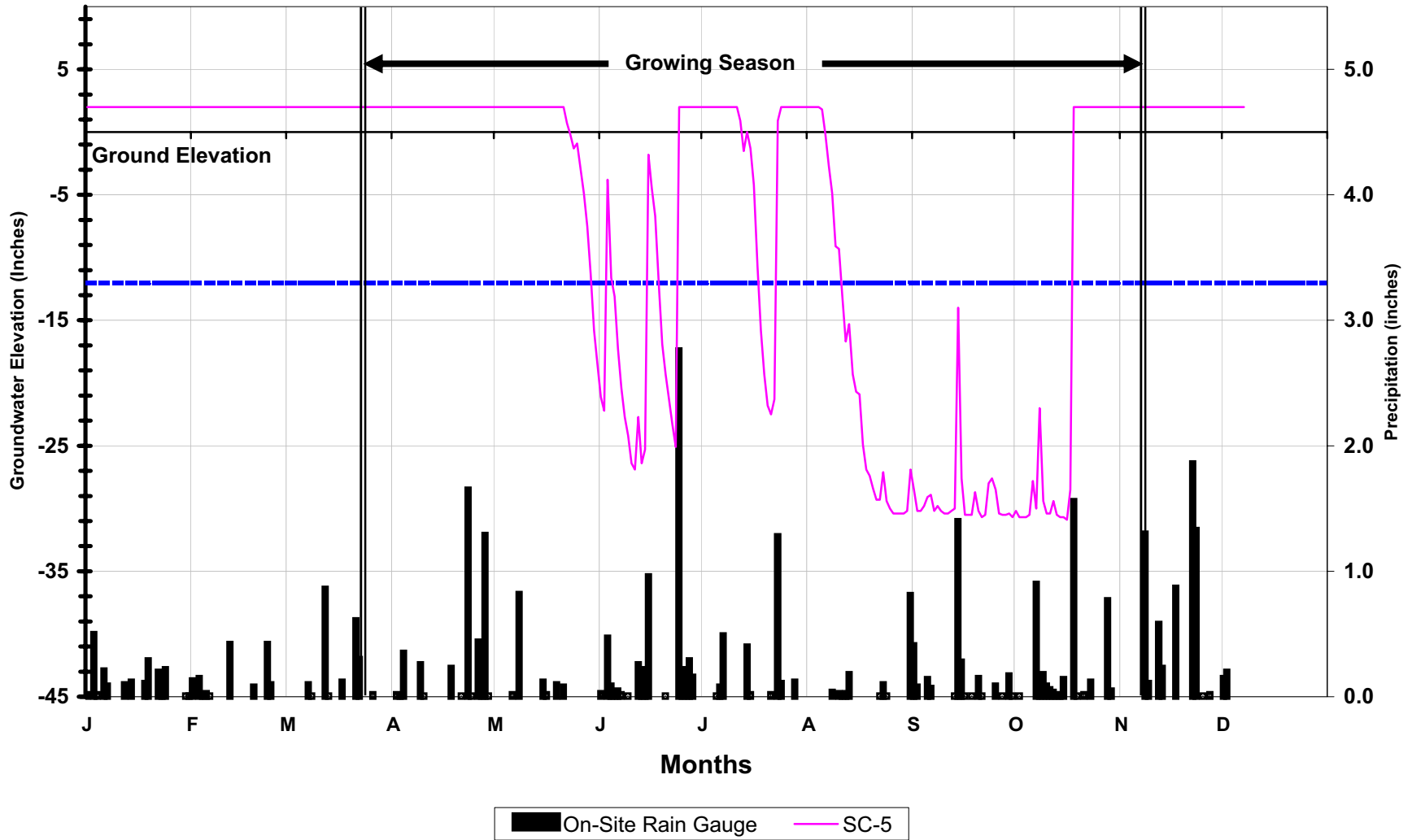


Figure 3
2006 Sandy Creek Groundwater Hydrograph

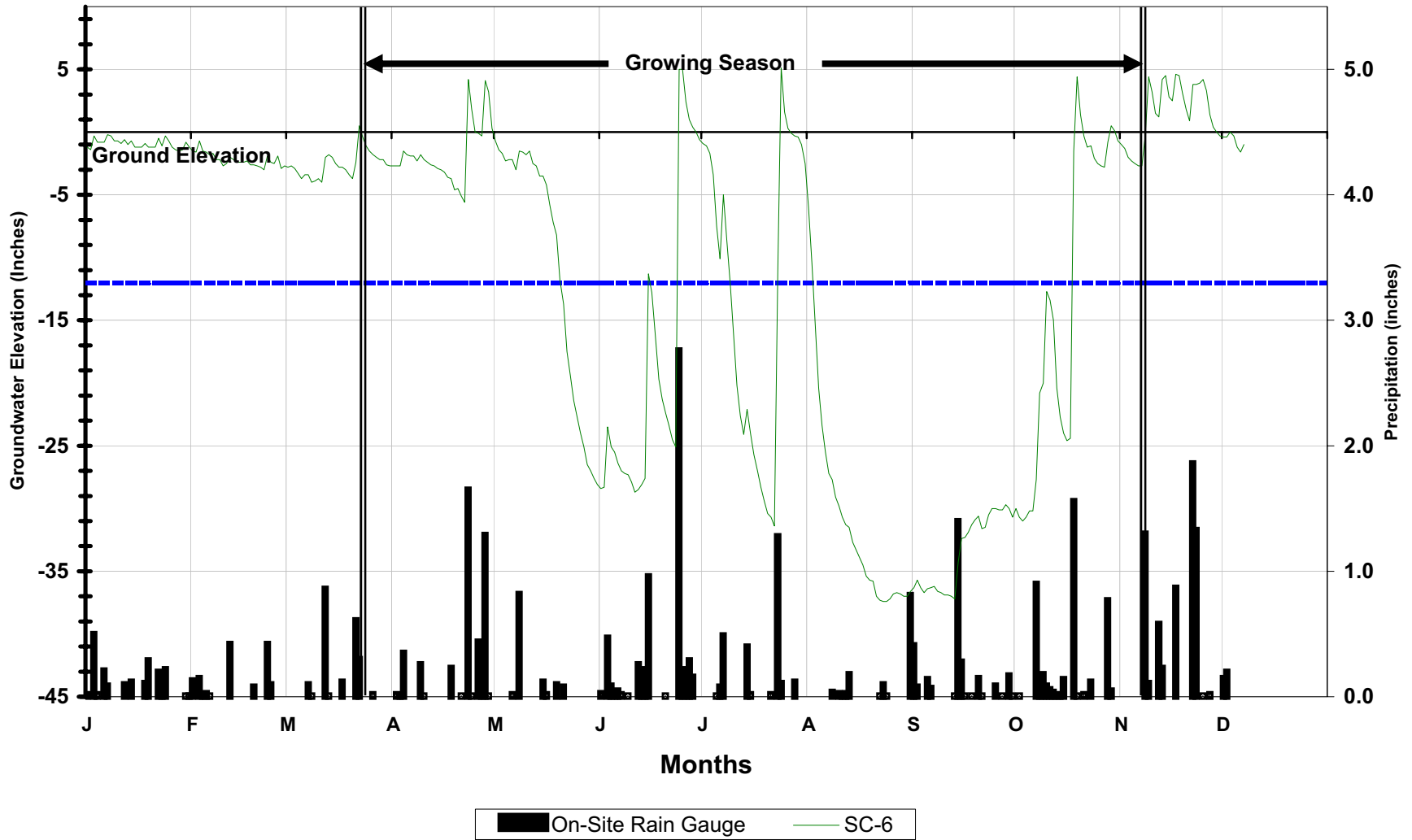
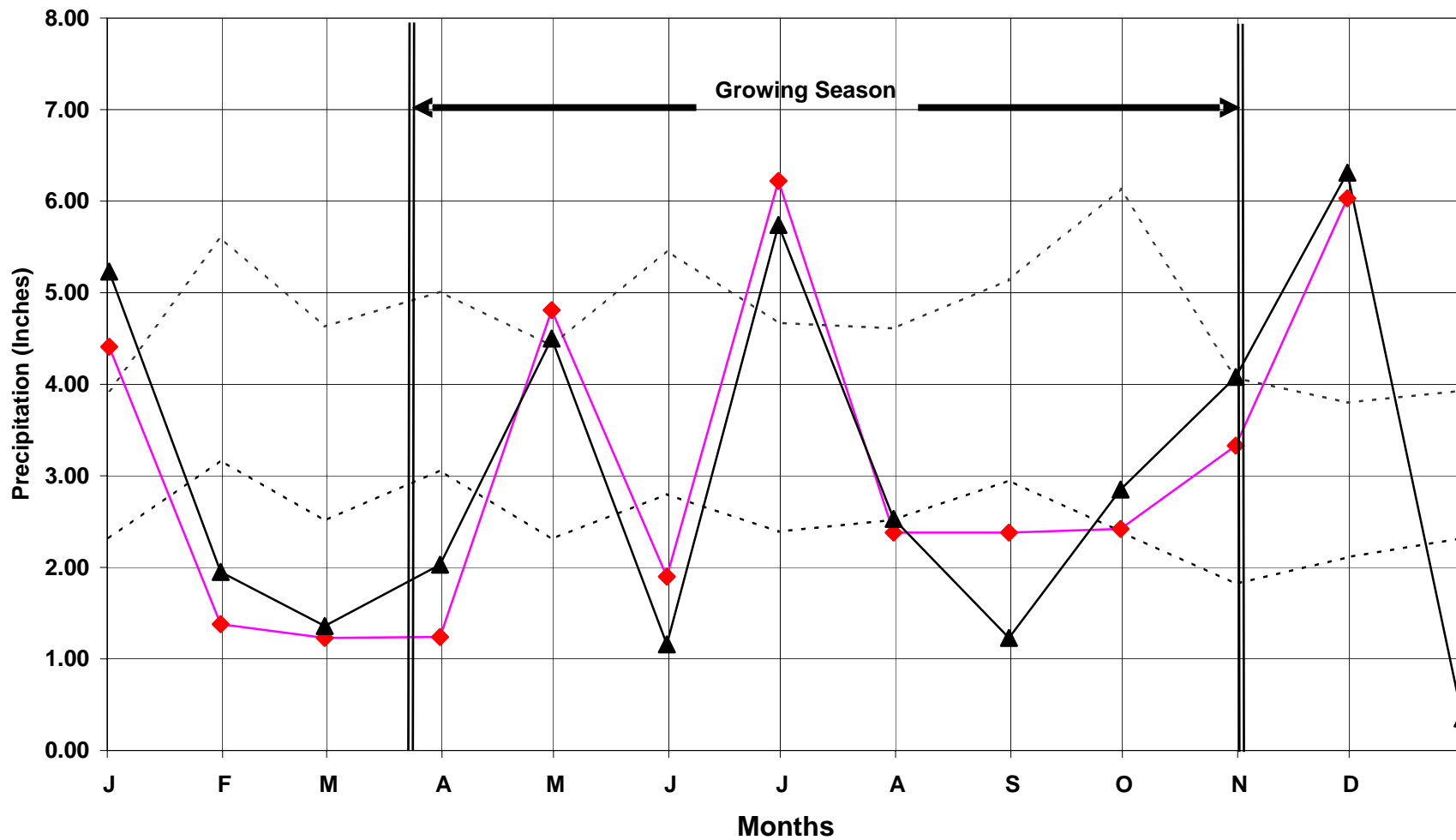


Figure 4
2006 Sandy Creek Precipitation



—◆— Asheboro Monthly Total - - - - - 30th Percentile - - - - - 70th Percentile —▲— Montly On-site

Table VI. Comparison of Average Rainfall to Observed Rainfall

Month	Average	30 percent	70 percent	Observed Precipitation (P), inches		
				Month	Asheboro	On-site
January	4.44	3.17	5.60	January 2006	1.38	1.95
February	3.71	2.51	4.63	February 2006	1.23	1.36
March	4.27	3.06	5.01	March 2006	1.24	2.03
April	3.49	2.31	4.42	April 2006	4.81	4.50
May	4.25	2.80	5.46	May 2006	1.90	1.16
June	3.97	2.39	4.67	June 2006	6.22	5.74
July	4.12	2.52	4.61	July 2006	2.38	2.53
August	4.26	2.95	5.14	August 2006	2.38	1.23
September	4.31	2.39	6.13	September 2006	2.42	2.85
October	3.59	1.82	4.07	October 2006	3.33	4.08
November	3.16	2.11	3.80	November 2006	6.03	6.31
December	3.26	2.32	3.93	December 2006*	0.27	0.35
Notes: * Current rainfall data for December is only Asheboro-16 percent complete and On-site-22 percent complete.						

4.0 VEGETATION

4.1 Success Criteria

The success criteria state that there must be a minimum of 260 trees per acre living for at least five consecutive years.

4.2 Description of Vegetation Monitoring

Tree planting occurred on approximately 10 of the 12.9 acres. The site was planted initially in March of 2001 and a supplemental planting was completed in March 2002. Three 2,500 (50x50) square foot vegetation plots had been established by the NCDOT. The tree species reportedly planted are shown in Table VII and within the plots planted trees were flagged.

The three plots were surveyed for the 2006 monitoring season. The identification of individual flagged stems was difficult due to deterioration of flagging. Flagging was replaced on all stems identified with previous flagging. A significant number of volunteers are present. No reference area was studied; therefore no comparisons could be made to reference conditions. The previous 2004 and 2005 monitoring surveys did not find any black gum, southern red oak, or tulip poplar, within the plots. Water oak was not found in the 2005 survey. In addition to the planted stems, all stems in each plot were counted. Due to the high density in plot 3, green ash was subsampled at 10 percent.

Table VII. 2006 Vegetation Monitoring Plot Species Composition

Common Name	Scientific Name
Blackgum	<i>Nyssa sylvatica</i> var. <i>sylvatica</i>
Cherrybark Oak	<i>Quercus falcata</i> var. <i>pagodaefolia</i>
Green Ash	<i>Fraxinus pennsylvanica</i>
River Birch	<i>Betula nigra</i>
Southern Red Oak	<i>Quercus falcata</i> var. <i>falcata</i>
Tulip Poplar	<i>Liriodendron tulipifera</i>
Water Oak	<i>Quercus nigra</i>
Willow Oak	<i>Quercus phellos</i>

4.3 Results of Vegetation Monitoring

The average for all plots is 314 stems per acre (Table VIII). Only plot 2 has less than 240 planted stems per acre, only 11 stems were recorded (192 stems per acre). It is possible that some of the remaining volunteers were planted but the flagging had deteriorated and was not found. Beaver activity has also been noted in previous years and may also have accounted for a loss of planted stems. Total woody stems for each of the plots were also counted. All three have a high density of stems that is expected to naturally decline. Volunteer woody species recorded include box elder, green ash, tag alder, eastern baccharis, sweet gum, sycamore, slippery elm, tulip poplar, and willow oak. Although shrubs were not planted a few are now present.

The herbaceous vegetation is dense in plots 1 and 2 with plot 3 having poor herbaceous coverage due to the dense overstory. Smart weed and tear thumb are the dominant species within the plots, but overall the site appears to have a moderately high diversity of herbaceous wetland vegetation. Other species noted: dog fennel, jewelweed, sedges, three species of smartweed, and various grasses.

Table VIII. Stem Counts for Each Species Arranged by Plot

Species	Plots			Initial Totals	Year 1 Totals	Year 2 Totals	Year 3 Totals	Year 4 Totals	*Year 5 Totals	Year 6 Totals	** Survival percent
	1	2	3								
Black gum	0	0	0	NA	14	9	7	0	0	0	0
Green ash	11	9	23	NA	12	47	47	47	1180	43	91
Willow oak	2	0	2	NA	20	32	25	6	7	4	13
River birch	2	2	3	NA	21	28	34	14	15	7	25
Cherrybark oak	0	0	0	NA	12	13	10	2	2	0	0
Water oak	0	0	0	NA	0	9	7	2	0	0	0
Tulip poplar	0	0	0	NA	***	***	0	0	0	0	NA
Southern red oak	0	0	0	NA	1	1	0	0	0	0	0
Total Planted Stems	15	11	28	130	80	139	130	71	1204	54	39
Stems per acre	261	192	488	755	465	807	755	412	6993	314	--
All Stems	149	147	793								
Stems per acre	2,596	2,561	13,817								
*Year 5 totals used planted and volunteer stems.											
** Survival based on Year 2 Totals after supplemental planting											
***Historical project documents necessary to provide this data were unavailable at the time of this report submission.											

5.0 OVERALL CONCLUSIONS AND RECOMMENDATIONS

- This is the sixth monitoring year and fifth year since supplemental planting at the site.
- Hydrologic monitoring indicated that four of the five monitoring gauges with data exceeded the jurisdictional wetland criteria of saturation within twelve inches of the surface for 12.5 percent of the growing season.
- One gauge recorded saturation for 5.7 percent of the monitoring period.
- The 2006 vegetation monitoring of the site revealed an average tree density of 314 trees per acre. This average is above the minimum success criteria of 260 trees per acre.
- Herbaceous vegetation coverage is good throughout the mitigation site.
- Volunteer tree density is high.
- The hydrologic and vegetative success criteria have been met. No further monitoring of the Sandy Creek Site is necessary.

APPENDIX A

Site Photos



Sandy Creek 2006, Photo Point 1



Sandy Creek 2006, Photo Point 2



Sandy Creek 2006, Photo Point 3



Sandy Creek 2006, Photo Point 4



Sandy Creek 2006, Photo Point 5



Sandy Creek 2006, Photo Point 6



Sandy Creek 2006, Veg Plot 1



Sandy Creek 2006, Veg Plot 2



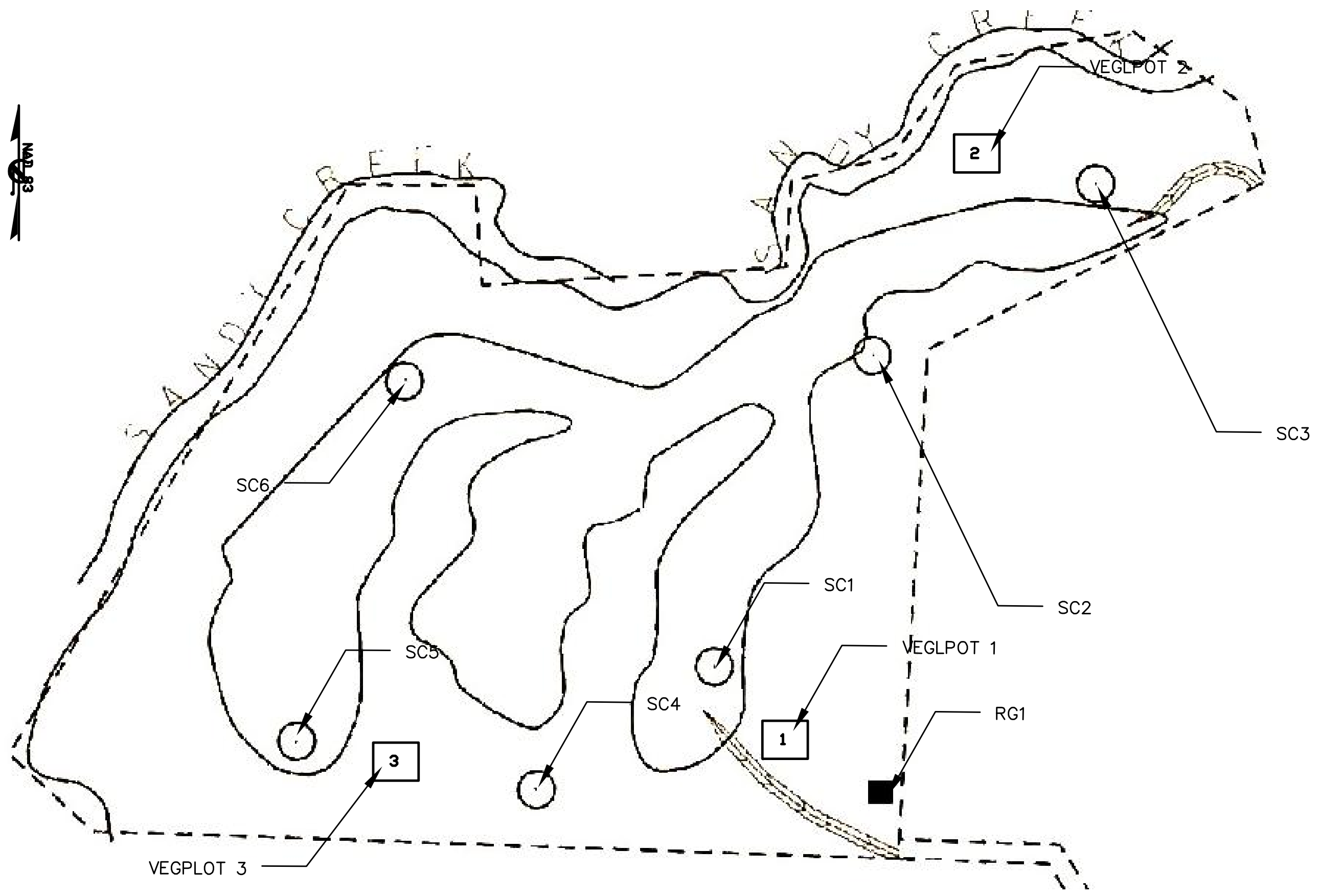
Sandy Creek 2006, Veg Plot 3

APPENDIX B

Integrated Project Problem Areas Plan View

Integrated Project Problem Areas Plan View

No vegetative problem areas are present in Sandy Creek. Previous reports have identified beaver activity and inundation as potential vegetative problems. 2006 site visits have not recorded large scale herbivory or inundation sufficient to warrant re-planting or other remedial actions.



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MAP DATE
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NORTH CAROLINA
ECOSYSTEM ENHANCEMENT PROGRAM

TITLE:
FIGURE 2—YEAR 5 MONITORING
SANDY CREEK MITIGATION SITE
RANDOLPH COUNTY
NORTH CAROLINA