Dale Tract
Year Four Monitoring Report

Brunswick County, NC

Prepared for:
ECOBANK
Winter Park, FL

Prepared by:
Land Management Group, Inc.
Wilmington, NC

December 2004

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1.0 Introduction

As part of mitigation for unavoidable wetland impacts associated with the construction of the Wilmington Bypass by the North Carolina Department of Transportation, ECOBANK proposed to restore 220 acres and enhance an additional 18 acres of wet pine flats at the Dale Tract in Brunswick County, North Carolina (Figure 1) as described in the Revised Compensatory Mitigation Plan for the Dale Tract dated July 21, 2000. This 238-acre tract historically consisted almost entirely of wet pine flats. However, several large ditches were installed the length of the property in order to drain soils and harvest trees from the area. These ditches altered hydrology, yet vegetation typical of a wet pine flat still persists at the site. Based on pre-project groundwater data collected at the Eagle Brunswick Tract (located approximately 4 miles from Dale), it was determined that ditches had a 300' drainage effect, which was used to establish restoration and enhancement boundaries. The mitigation plan did not require the collection or analysis of pre-project hydrologic data from the Dale Tract.

In order to restore wetland hydrology at the Dale tract, all on-site ditches were filled in December of 1999. Automated groundwater monitoring gauges were then placed in transects throughout the site to collect hydrology data. Although the mitigation efforts did not include planting wetland vegetation, six monitoring plots were located within the site and existing vegetation was analyzed to verify that the ditch-filling has not negatively affected species composition or numbers.

The hydrology and vegetation data collected in 2004 are presented in this document. It should be noted that the three previous monitoring reports for this site determined that the Dale site has achieved both the vegetative and hydrological success criteria and the site is thus far a mitigation success. This site will be monitored for at least a total of five years, or until the project is deemed successful.

2.0 Hydrology

2.1 Success Criteria

According to the Dale Tract Mitigation Plan, the wetland hydrology success criterion for this site is the establishment of a static water table at or within 12" of the soil surface, ponded or flooded for 12.5% of the growing season during normal precipitation conditions. The growing season in Brunswick County extends 265 days, between March 7 and November 28. Normal precipitation is defined as total monthly precipitation falling within the 30th and 70th percentiles of a 30-year period. Therefore, to meet the success criterion, the water table should remain at or within 12" of the soil surface for at least 33 consecutive days between March 7 and November 28. However, because of awareness in the scientific community that undisturbed pocosin/pine flat wetlands do not always meet this 12.5% threshold, this criterion is subject to redefinition based on groundwater results from the reference gauges, as stated on page 12 of the mitigation plan. A redefinition of the hydrological success criterion is not requested in this monitoring report.

2.2 Methods

In December of 1999, 4.4 miles of ditches within the Dale Tract were filled to restore wetland hydrology to the site. In accordance with the Dale Tract Mitigation Plan, a total of twelve automated groundwater monitoring gauges were installed throughout the site in 1999 and 2000 to monitor groundwater hydrology for at least five years. Nine of these gauges were located in restored wetlands and the remaining three gauges were installed in enhanced wetlands (Figure 2). Hydrology data from these gauges were to be compared to two gauges located in reference wetlands at the Eagle Brunswick Tract.

2.2 Results

Eleven of the twelve gauges at the Dale Tract met the 12.5% hydrology criterion for 2004, which is a water table within 12" of the soil surface for 12.5% of the growing season (33 days). Most of the gauges greatly exceeded this minimum. The one gauge that did not achieve this criterion (B1) stopped functioning during the growing season. As shown in Appendix A, most of the gauges documented wetland hydrology during late summer. The reference gauges (R1 and R2) located within the Eagle Brunswick tract reflected the same patterns as the gauges located at Dale, and documented wetland hydrology for 62 and 80 days, respectively (Table 2).

The 30-day running total for 2004 shows normal to slightly below normal rainfall for most of the year, except for late summer, which documented above normal rainfall (Appendix A). Several hurricanes passed through the region during this time period. It was during this time period that most gauges achieved wetland hydrology.

Table 1. Groundwater monitoring results for gauges located within the Dale Tract in 2001, 2002, 2003 and 2004.

Type	Gauge Number	Serial Number	# of Consecutive Days above 12" 2001	# of Consecutive Days above 12" 2002	# of Consecutive Days above 12" 2003	# of Consecutive Days above 12" 2004
Restoration	A1	S448917	35	35	65	44
	A2	S213AB6	45	4*	68*	58
	A3	S44882F	37	*	45	66*
	B1	S55F8B6	45	*	75	22*
	B2	S562513	38	37	113*	97
	B3	S353B58	41	37	68	57
	B4	S328B05	7*	14	65	54
	C1	S127197	57	35	120*	139
	C2	S560A5D	22*	*	193	139
Enhancement	E1	S213F49	51	36	121	105
	E2	S126F8B	68	36	151*	71*
	E3	S353A6E	45	missing	27*	48

* Gauges stopped reading during the growing season.

Table 2. Groundwater monitoring results for reference gauges located within the Eagle Brunswick Tract in 2001, 2002, 2003, and 2004.

Type	Gauge Number	Serial Number	# of Consecutive Days above 12" 2001	# of Consecutive Days above 12" 2002	# of Consecutive Days above 12" 2003	# of Consecutive Days above 12" 2004
Reference	R1	S378395	9	36	124	62
	R2	S3174D3	11	35	75	80

3.0 Vegetation

3.1 Success Criteria

As established in the mitigation plan, the vegetation criterion for the Dale site was a minimum of 320 trees per acre, specifically of pond pine (*Pinus serotina*) and loblolly bay (*Gordonia lasianthus*).

3.2 Methods

Although no wetland vegetation was planted within the Dale Tract, vegetation monitoring was included as a part of the mitigation plan in order to evaluate whether the ditch-filling activities had any negative consequences on existing vegetation. Six circular plots, each with a 10' radius, were located within restoration and enhancement areas throughout the site (Figure 3). The number and species of trees were noted and then compared to the vegetation within the wet pine flat reference area at the Eagle Brunswick tract (Table 3).

Table 3. Dominant vegetation at the pine flat reference area of Eagle Brunswick.

Dominant Overstory	**Dominant Shrub/Sapling**	**Dominant Herbaceous**
Pinus serotina	*Gordonia lasianthus* *Lyonia lucida* *Cyrilla racemiflora* *Ilex glabra*	*Ilex glabra* *Lyonia lucida*

3.3 Results

Each plot surveyed had a 10' radius and, therefore, contained 314 ft^2. Because six plots were counted, the total area surveyed was 1884 ft^2. To extrapolate the vegetation to one acre, the total number of pond pines and loblolly bays found in the six plots was multiplied by 23.1.

The Dale site contained an average of 1409.1 of these species per acre (Table 4). This was similar to the results from 2001 (1433.5 trees/acre), 2002 (1386 trees/acre), and 2003 (1455.3 trees/acre) and well above the 320 trees per acre criterion established in the mitigation plan. Therefore, the vegetation criterion for year four monitoring was fulfilled.

Table 4. Number of pond pine and loblolly bay trees found in each plot at the Dale Tract in 2004.

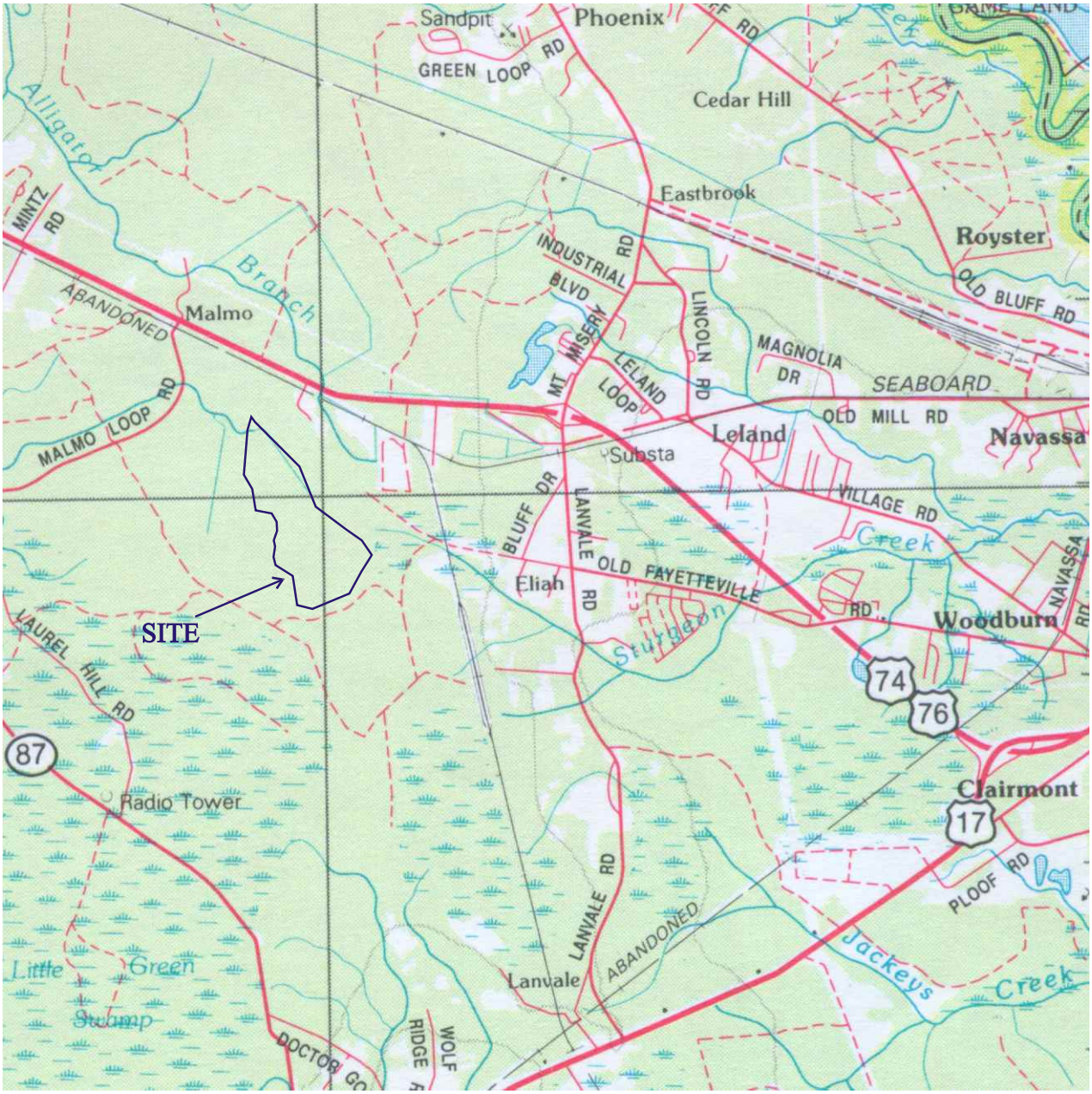
Plot #	**Pond Pine** *(Pinus serotina)*	**Loblolly Bay** *(Gordonia lasianthus)*
1	1	6
2	3	10
3	3	5
4	5	9
5	3	7
6	1	8
Total	**16**	**45**

As in previous years, other vegetation observed at Dale included titi (*Cyrilla racemiflora*), sweet pepperbush (*Clethra alnifolia*), fetterbush (*Lyonia lucida*), gallberry (*Ilex glabra*), and bracken fern (*Pteridium aquilinum*), which were mainly found in the shrub and herbaceous layers (Appendix B). The filled ditches were vegetated with herbaceous species such as broomsedge, (*Andropogon glomeratus*), soft rush (*Juncus effusus*), and goldenrod (*Solidago spp*). Some woody species like fetterbush and sweet pepperbush are beginning to fill in the old ditch lines. Exact counts of these species were not conducted since they did not factor into the vegetation criterion.

4.0 Conclusions

Hydrology data from 2004 revealed that eleven of the twelve monitoring gauges throughout the restored and enhanced areas of the Dale tract met the 12.5% wetland hydrology criterion established in the mitigation plan. Most of the gauges greatly exceeded this minimum. The one gauge that did not achieve this criterion (B1) stopped functioning during the growing season.

Vegetation monitoring found the Dale Tract to contain dense stands of wet pine flat plant species such as gallberry, fetterbush, and sweet pepperbush. In addition, an average of 1409.1 trees per acre of pond pine and loblolly bay were observed in the canopy and shrub layer throughout the tract. This greatly exceeded the vegetation criterion of 320 trees per acre of these two species. Because both hydrology and vegetation criteria have been achieved during the past four years, the wetland mitigation at the Dale site can be considered a success thus far.



N

0 0.5 1 2

SCALE 1" = 1 MILE

Figure 1. Vicinity map.

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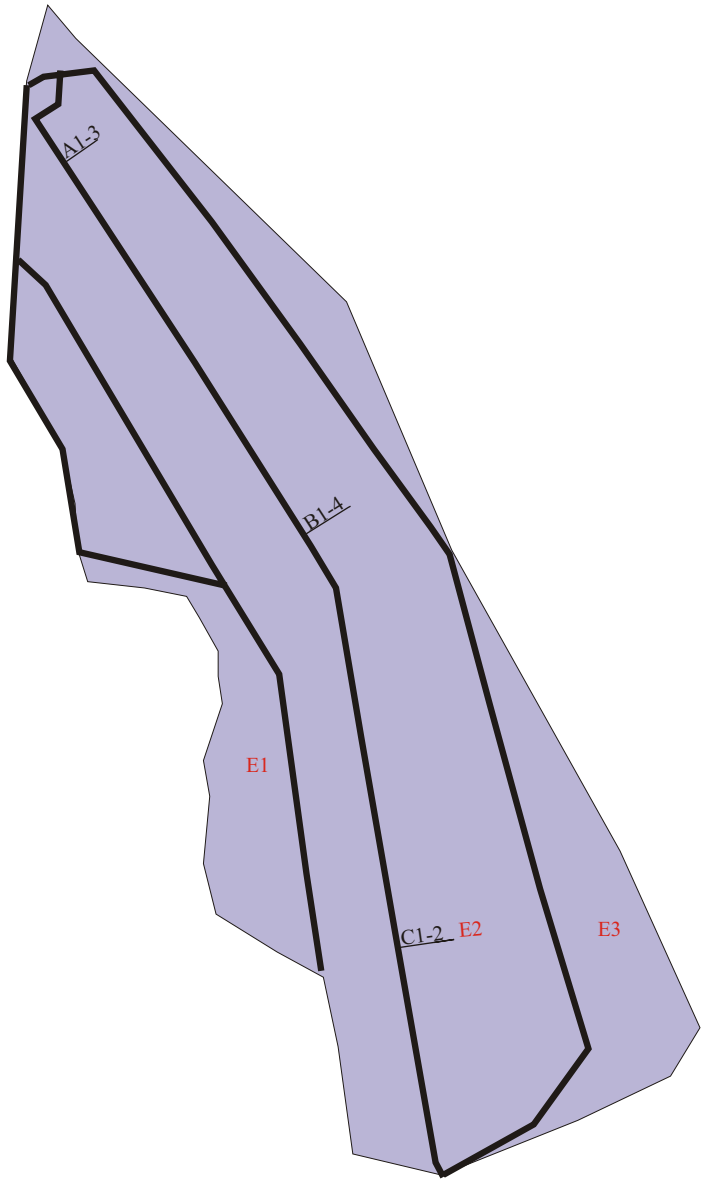

Restoration
Enhancement

N

0 500 1000 2000

SCALE 1" = 1000'

Figure 2. Monitoring gauge locations.

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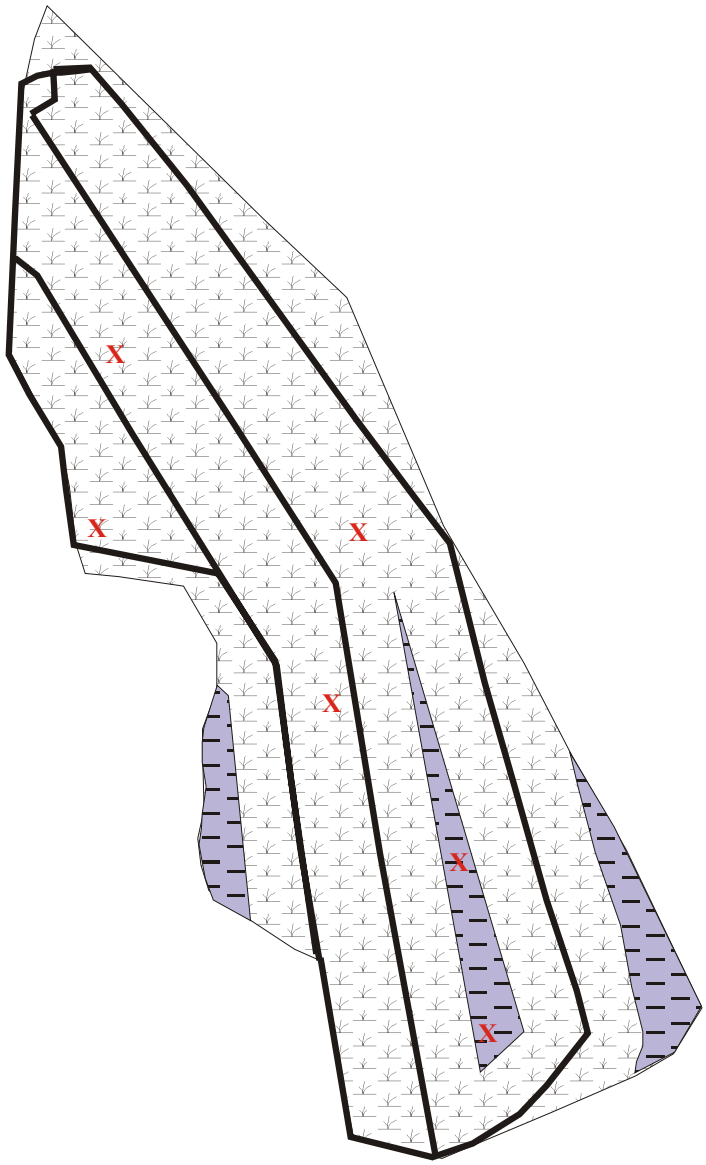

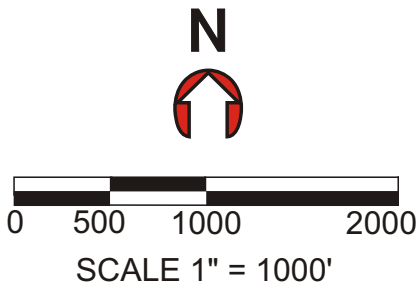

Pine Flat Restoration (220.1 acres)

Pine Flat Enhancement (17.9 acres)

X Vegetation Monitoring Plot (314 ft^2)

Figure 3. Location of vegetation monitoring plots.

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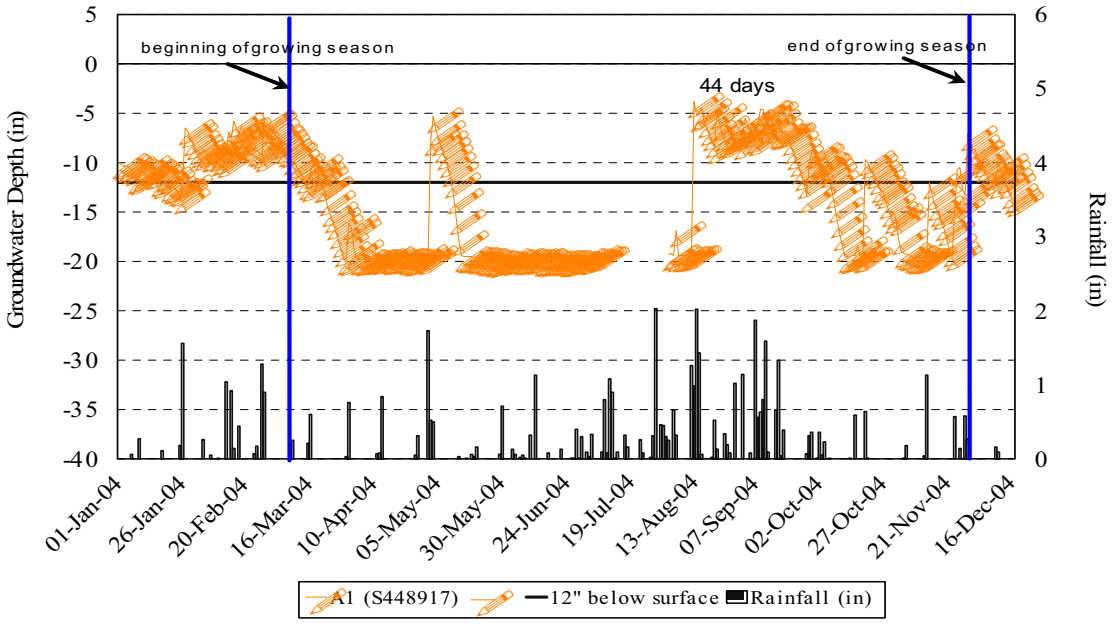
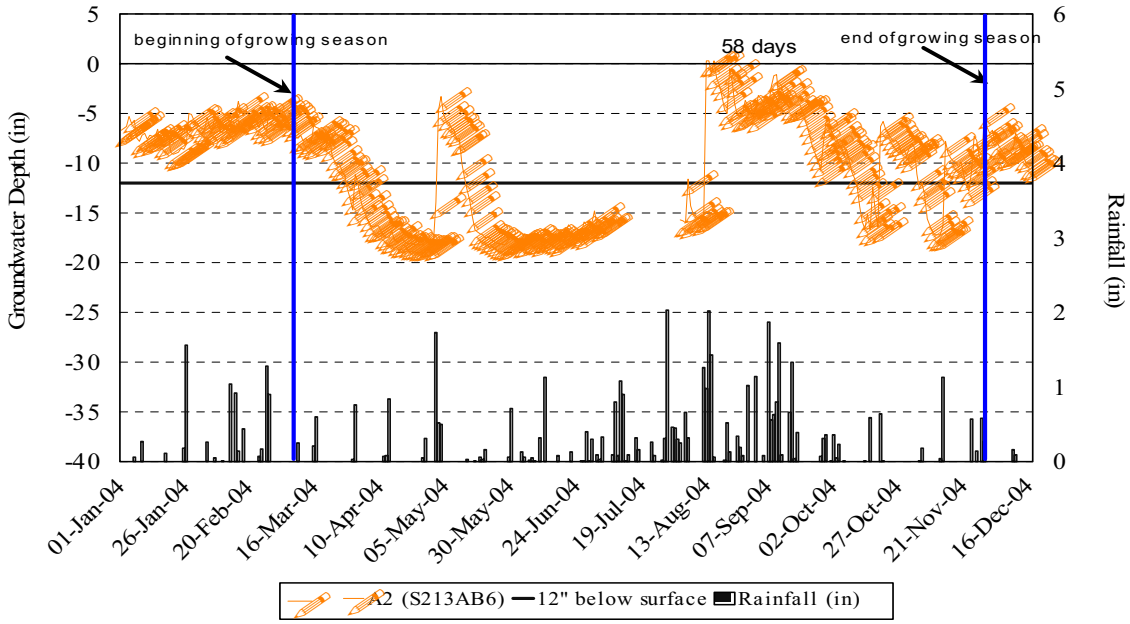
Figure 1. Hydrology Monitoring, Gauge A1
Dale Tract; Restoration
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

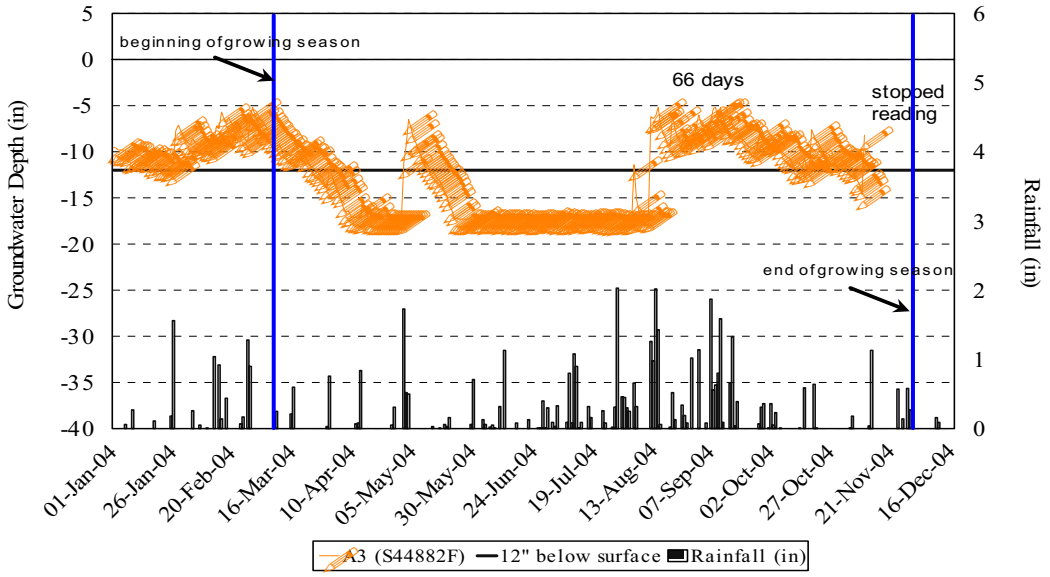
Figure 2. Hydrology Monitoring, Gauge A2
Dale Tract; Restoration
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

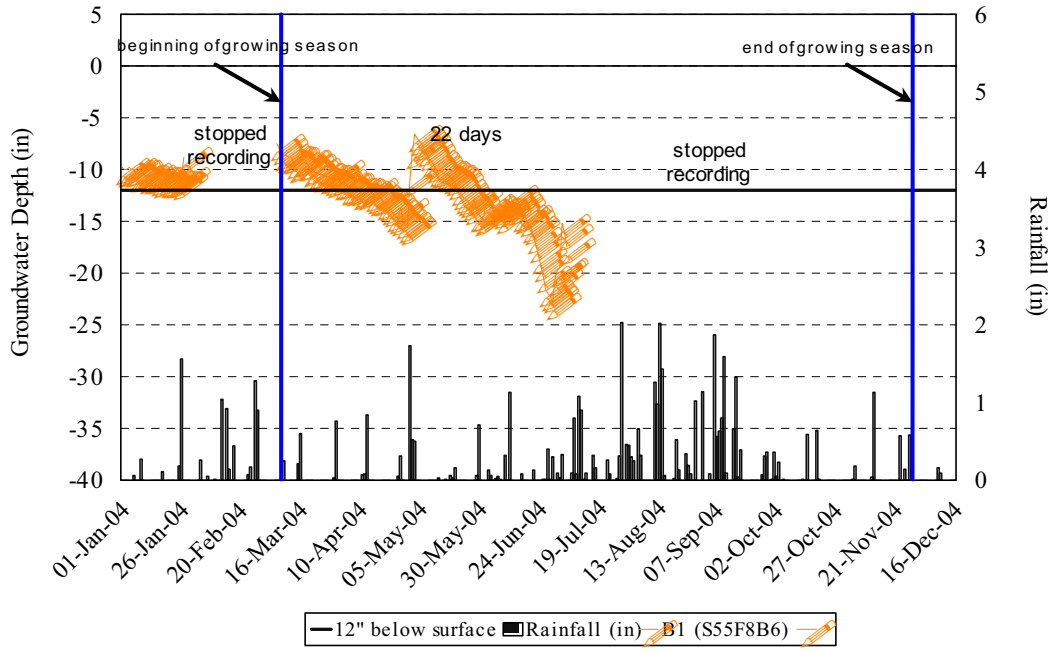
Figure 3. Hydrology Monitoring, Gauge A3
Dale Tract; Restoration
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

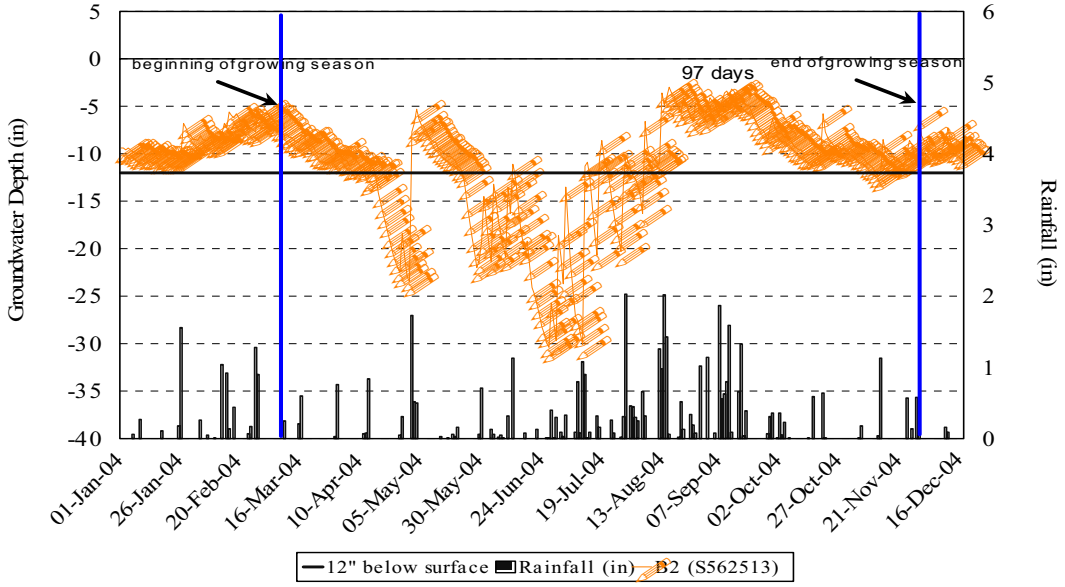
Figure 4. Hydrology Monitoring, Gauge B1
Dale Tract; Restoration
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

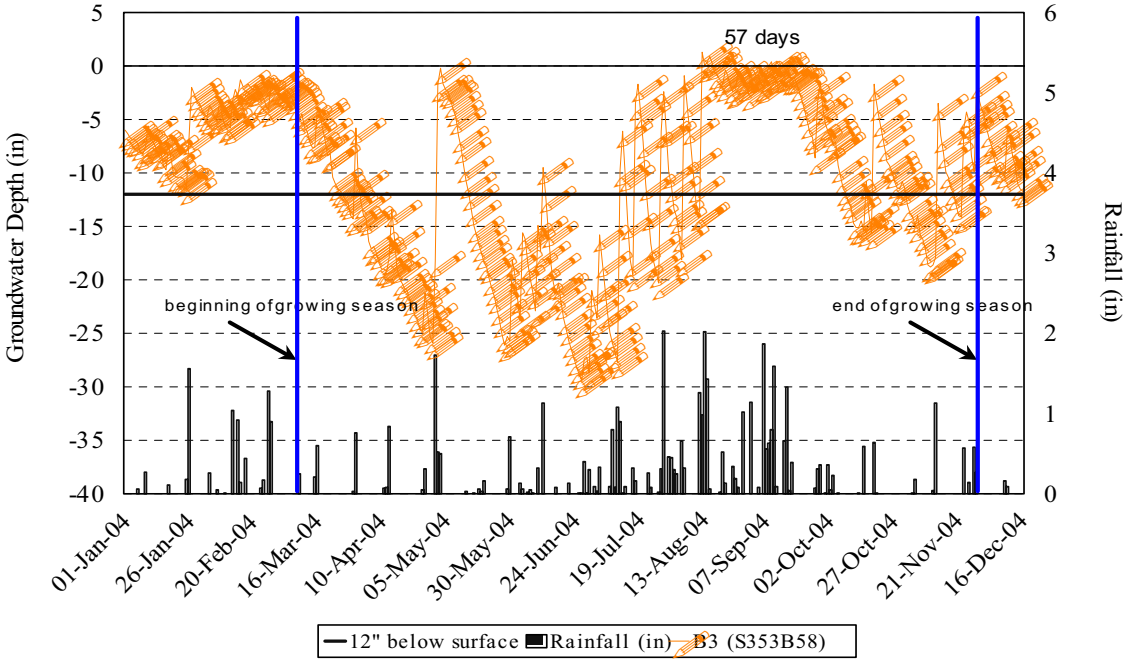
Figure 5. Hydrology Monitoring, Gauge B2
Dale Tract; Restoration
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

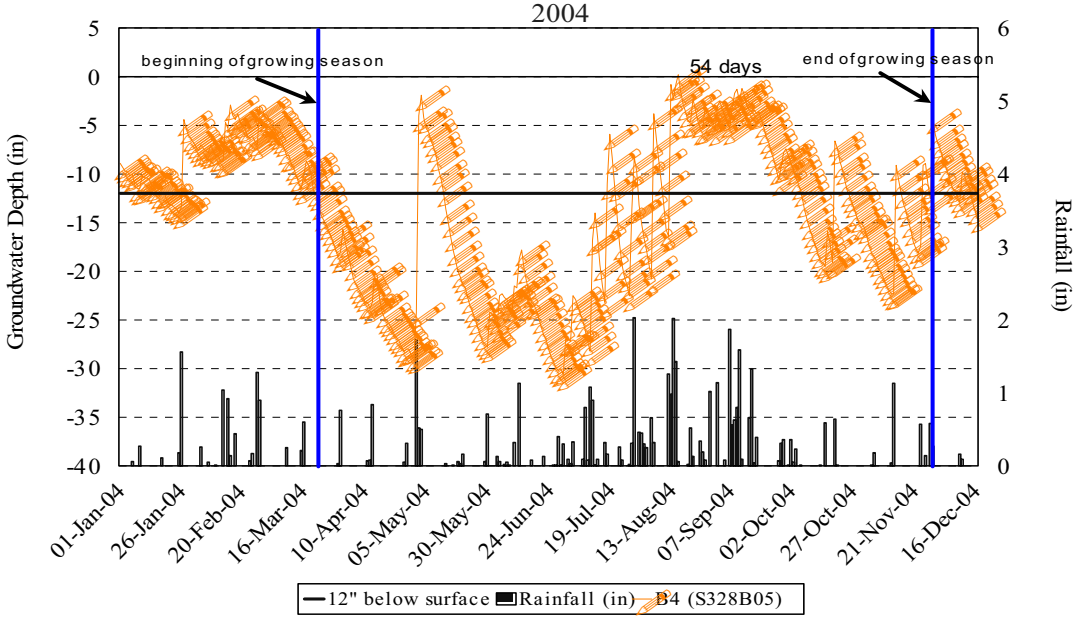
Figure 6. Hydrology Monitoring, Gauge B3
Dale Tract; Restoration
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

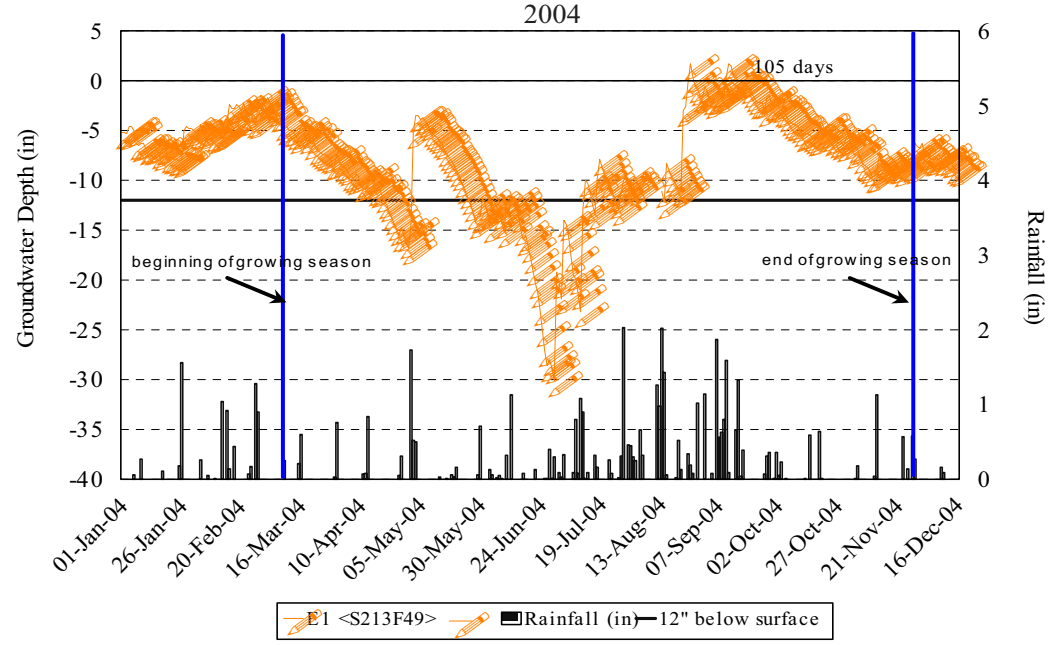
Figure 7. Hydrology Monitoring, Gauge B4
Dale Tract; Restoration
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

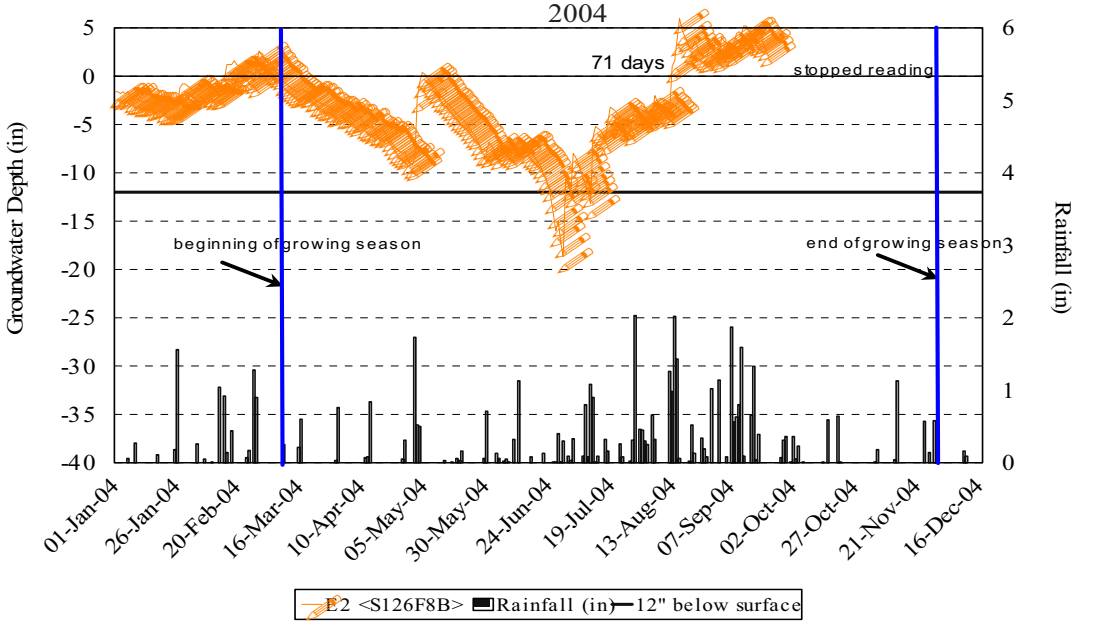
Figure 8. Hydrology Monitoring, Gauge E1
Dale Tract; Enhancement
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

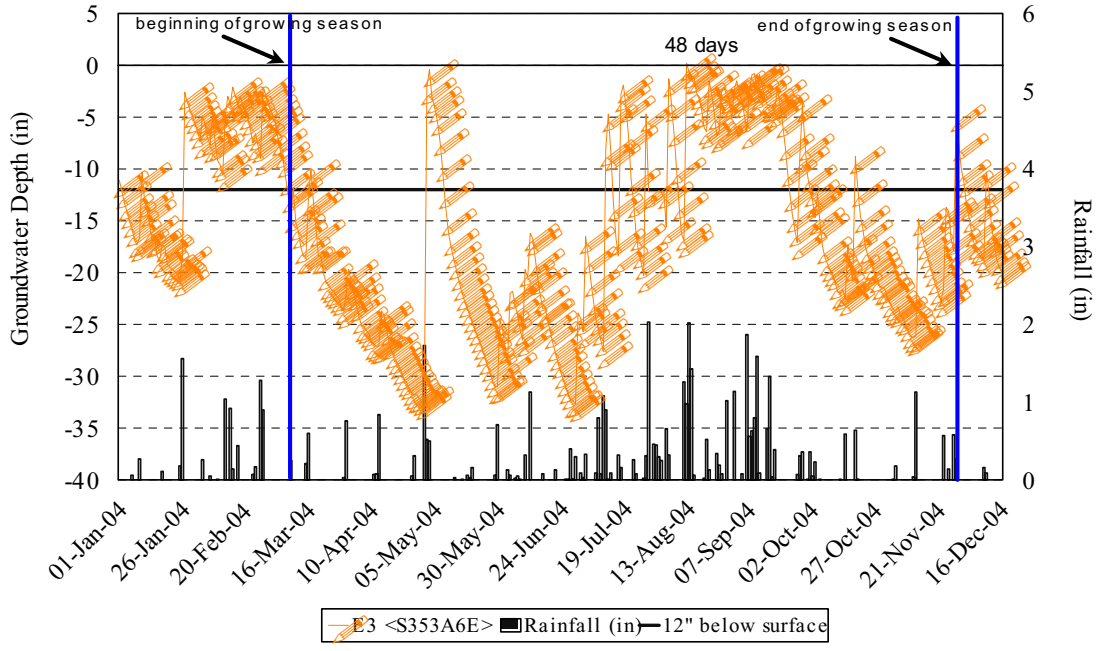
Figure 9. Hydrology Monitoring, Gauge E2
Dale Tract; Enhancement
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

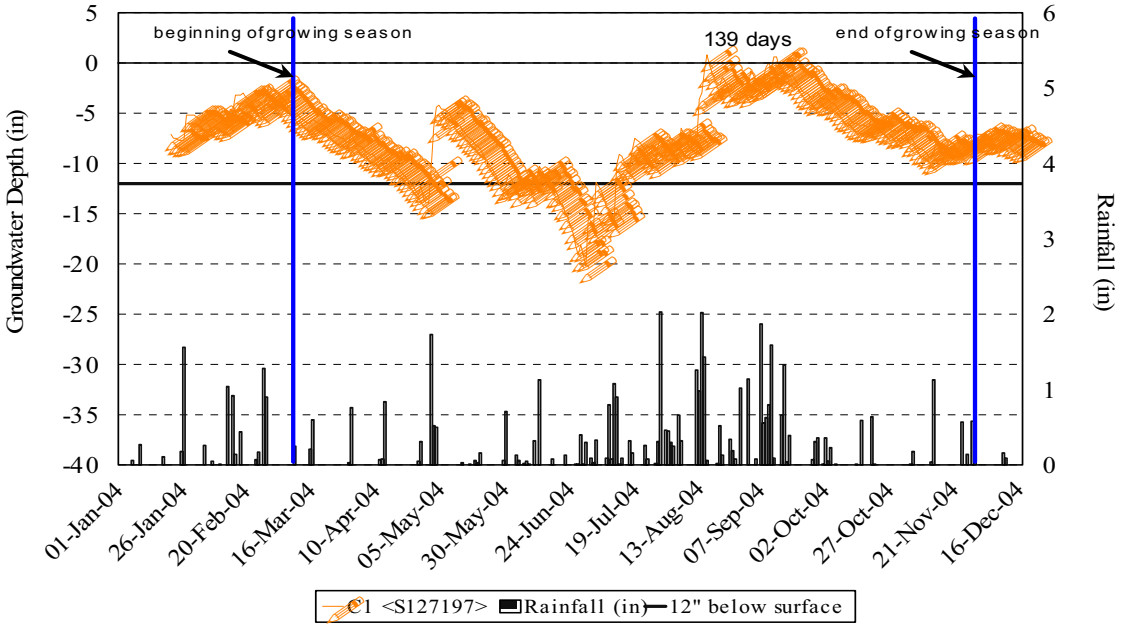
Figure 10. Hydrology Monitoring, Gauge E3
Dale Tract; Enhancement
2004



Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day

Figure 11. Hydrology Monitoring, Gauge C1
Dale Tract; Restoration
2004



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Note: 1 reading/day

Figure 12. Hydrology Monitoring, Gauge C2
Dale Tract; Restoration
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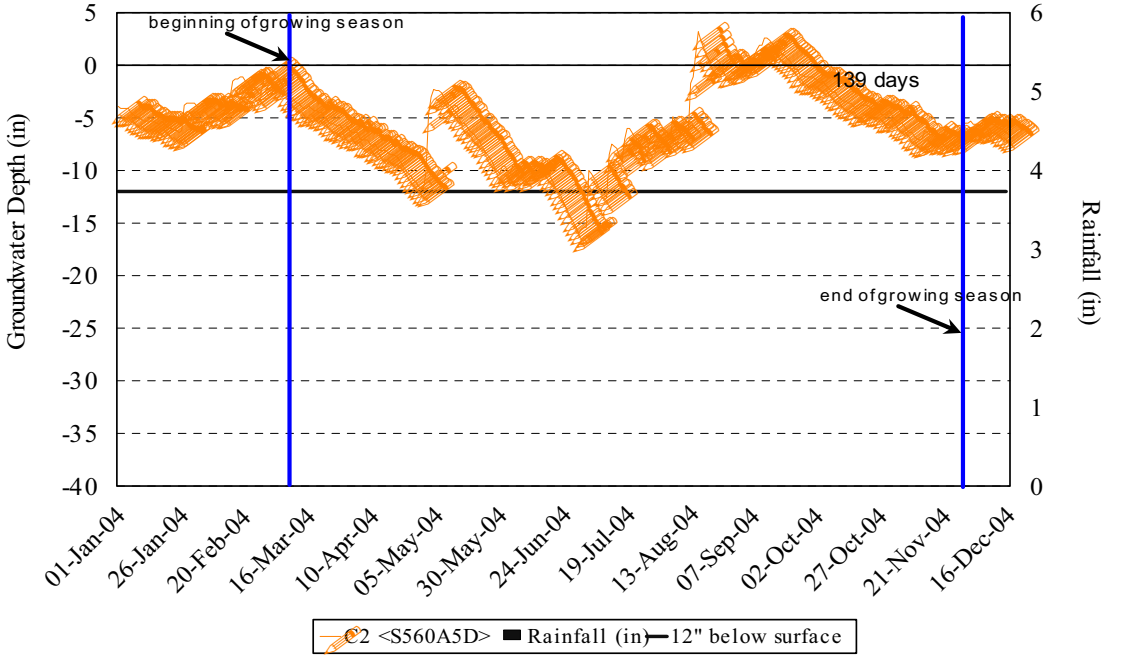

Rainfall information provided by the National Climatic Data Center; Wilmington International Airport station.

Note: 1 reading/day