

ANNUAL REPORT FOR 2001



Dismal Swamp Mitigation Site
Gates / Perquimans County
Project No. 6.129003T
TIP No. R-2208 WM



Prepared By:
Natural Systems Unit & Roadside Environmental Unit
North Carolina Department of Transportation
December 2001

TABLE OF CONTENTS

2001 REPORT – EXECUTIVE SUMMARY	1
1.0 INTRODUCTION	2
1.1 Project Description	2
1.2 Purpose	2
1.3 Project History	2
1.4 Debit Ledger	4
1.5 Permit Related Requirements	4
2.0 HYDROLOGY.....	5
2.1 Success Criteria	5
2.2 Hydrologic Description	5
2.3 Results of Hydrologic Monitoring.....	7
2.3.1 Site Data.....	7
2.3.2 Climatic Data	9
2.4 Conclusions	10
3.0 VEGETATION: DISMAL SWAMP MITIGATION SITE	12
3.1 Success Criteria	12
3.2 Description of Species.....	12
3.3 Results of Vegetation Monitoring	14
3.4 Conclusions.....	16
4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS	16

TABLES

Figure 1. SITE LOCATION MAP3
Figure 2. GAUGE LOCATION MAP6
Figure 3. 2001 HYDROLOGIC MONITORING RESULTS.....8
Figure 4. DISMAL SWAMP 30-70 PERCENTILE GRAPH 11

FIGURES

Table 1. DISMAL SWAMP DEBIT LEDGER4
Table 2. EXPECTED SITE CONDITIONS.....5
Table 3. 2001 HYDROLOGIC MONITORING RESULTS.....7
Table 4. VEGETATION MONITORING RESULTS..... 14

APPENDICES

APPENDIX A. DEPTH TO GROUNDWATER GRAPHS
APPENDIX B. SITE PHOTOS
APPENDIX C. VEGETATIVE MONITORING PLAN

DISMAL SWAMP MITIGATION SITE

2001 REPORT – EXECUTIVE SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Dismal Swamp Mitigation Site. Phase 1 of this site was constructed in 1996 and Phase 2 was constructed in 1998. Monitoring activities in 2001 represent the third year of monitoring. The site must demonstrate vegetation and hydrological success for a minimum of three years.

The site is monitored with forty-eight vegetation plots, twenty six groundwater gauges, one surface gauge and two rain gauges. Data recorded by the rain gauge will be used for comparison to the daily groundwater readings. Daily rainfall recorded at a rain gauge in Elizabeth City, maintained by the NC State Climate Office, was obtained to produce the 30-70 percentile graph.

Hydrologic monitoring indicates that less than half of the entire site has met success criteria during the 2001 monitoring year. Nine of the twenty-six monitoring gauges met the hydrologic criteria. The surface water gauge has shown surface water throughout the entire growing season. The 30-70 percentile graph indicates below average rainfall for the 2001 growing season.

Vegetation monitoring yielded a successful total average tree density of 502 trees per acre across the four planted zones, which is well above the success criteria of 320 trees per acre.

Based on the inconclusive monitoring results from the 2001 season due to below average rainfall, NCDOT recommends that monitoring continue for the 2002 season.

1.0 INTRODUCTION

1.1 Project Description

The Dismal Swamp Mitigation Site is located along the Gates and Perquimans County line (COE ID # 199401492). It is 1.2 miles east of Sandycross on SR 1002 (Folly Road) (Figure 1). The site encompasses approximately 612 acres of farm and forest communities.

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of three years. The following report details the results of hydrologic and vegetative monitoring during 2001 at the Dismal Swamp Mitigation Site.

1.3 Project History

Summer 1996	Grading Construction - Majority of Ditches Filled; Mowing; Discing (Phase 1)
January -February 1997	Tree Planting
February 1997	Monitoring Gauges Installed
March – November 1997	Hydrologic Monitoring (1 yr.)
July 1997	Stake Test Plots & Initial Vegetation Monitoring
November 1997	Vegetation Monitoring (1 yr.)
March – November 1998	Hydrologic Monitoring (2 yr.)
October 1998	Vegetation Monitoring (2 yr.)
November 1998	Grading Construction - Main Canal Ditch (Phase 2)
February 1999	Tree Planting (Phase 2)
March – November 1999	Hydrologic Monitoring (Restart 1 yr.)
November 1999	Vegetation Monitoring (Restart 1 yr.)
March 2000	Herbicide Treatment
March – November 2000	Hydrologic Monitoring (2 yr.)
October 2000	Vegetation Monitoring (2 yr.)
March – November 2001	Hydrologic Monitoring (3 yr.)
September 2001	Vegetation Monitoring (3 yr.)

Figure 1. SITE LOCATION MAP

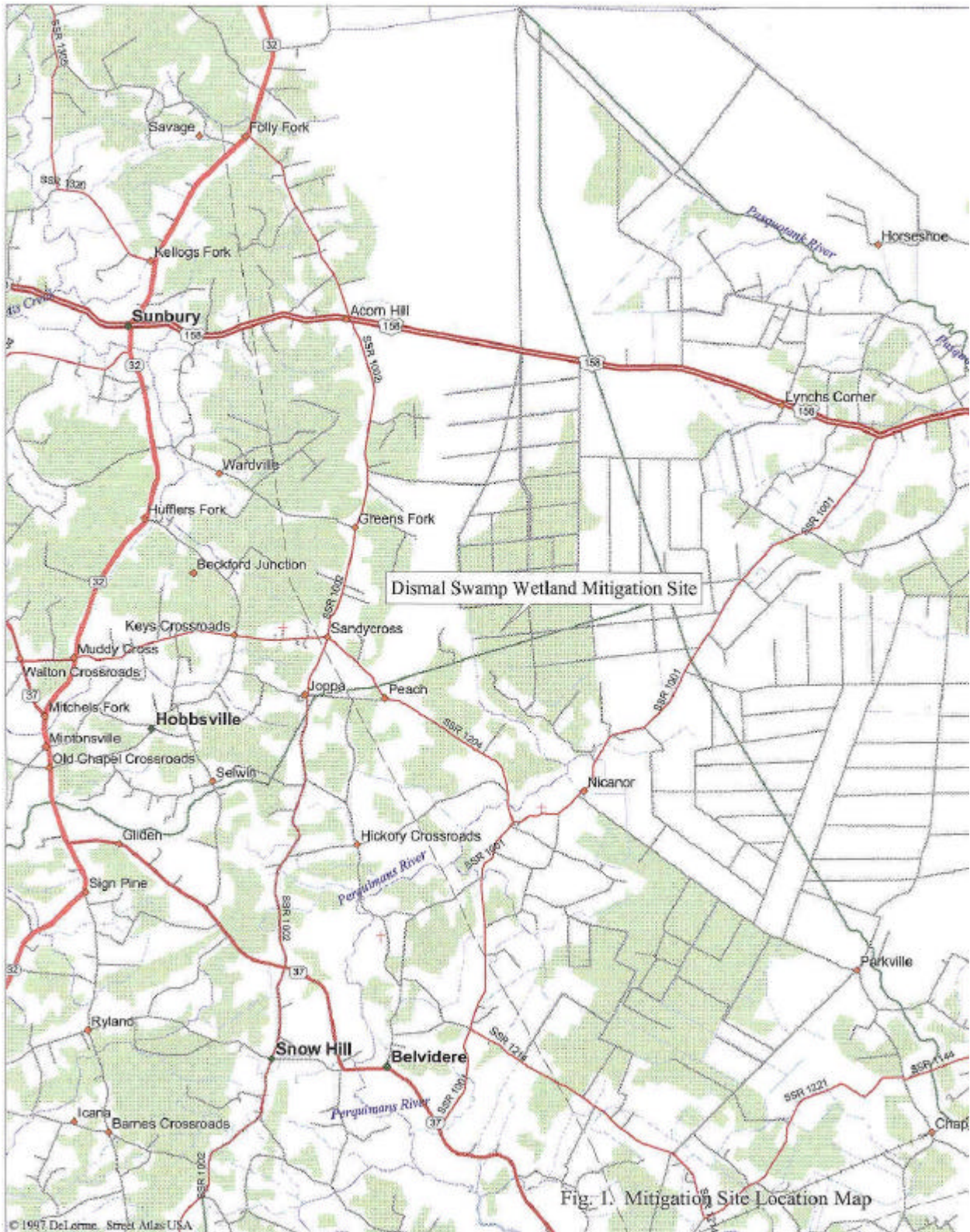


Fig. 1. Mitigation Site Location Map

1.4 Debit Ledger

Because of its size, Dismal Swamp Mitigation Site will provide mitigation for several highway projects. Table 1 shows the projects that this site is providing mitigation for through November 2001.

Table 1. DISMAL SWAMP DEBIT LEDGER

	BLH Non-Riverine	SPH Riverine	Total Acres
Total Acres at Site	485	58	543
TIP Project Debits			
R-2208A	39.71	6.09	45.8
R-2512A&B	2.69	8.06	10.75
R-2515A	20.6	-	20.6
R-2228A	-	0.88	0.88
R-2512A&B	1.93	-	1.93
R-2404B&C	52.66	4.26	56.92
R-2208A mod	14.93	-	14.93
R-2512B mod	2.39	-	2.39
R-2512A/B mod	3.89	-	3.89
R-2551	-	1.5	1.5
R-2515A	0.46	-	0.46
Division Project Debits			
Unnamed project	0.34	-	0.34
SR-1180	0.22	-	0.22
SR-1135	1.4	-	1.4
Remaining Acres at Site	343.78	37.21	380.99

1.5 Permit Related Requirements

There are no additional permit special conditions pertaining to the success criteria of the site that must be met in order for the site to be deemed successful.

2.0 HYDROLOGY

2.1 Success Criteria

Target hydrological characteristics include saturation or inundation within 12 inches of the surface for at least 12.5% of the growing season at lower landscape positions, during average climatic conditions. Upper landscape reaches and areas near perimeter canals may exhibit surface saturation/inundation for between 5% and 12.5% of the growing season based on gauge data. These 5%-12.5% areas are expected to support hydrophytic vegetation within organic soils of low permeability. If wetland parameters are marginal as indicated by vegetation and hydrology monitoring, consultation with COE personnel will be undertaken to determine jurisdictional extent in these transitional areas. One gauge was placed in an upland area where saturation is expected to be less than 5% of the growing season, in order to aid future delineation of true wetland area. Table 1 summarizes the wetland criteria expected for each monitoring gauge.

Table 2. EXPECTED SITE CONDITIONS

Expected Percent of the Growing Season with Saturated Conditions	Monitoring Well Number
≥ 12.5%	2, 3, 4, 5, 6, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 26
5% to 12.5%	7, 12, 27
0% to 5%	25

The growing season in Gates County begins March 25 and ends November 11. The dates correspond to a 50% probability that temperatures will drop to 28° F or lower after March 25 and before November 11.¹ The growing season is 232 days; the optimum duration for wetland hydrology is 29 consecutive days. Local climate must represent average conditions for the area in order for the hydrologic data to be considered valid.

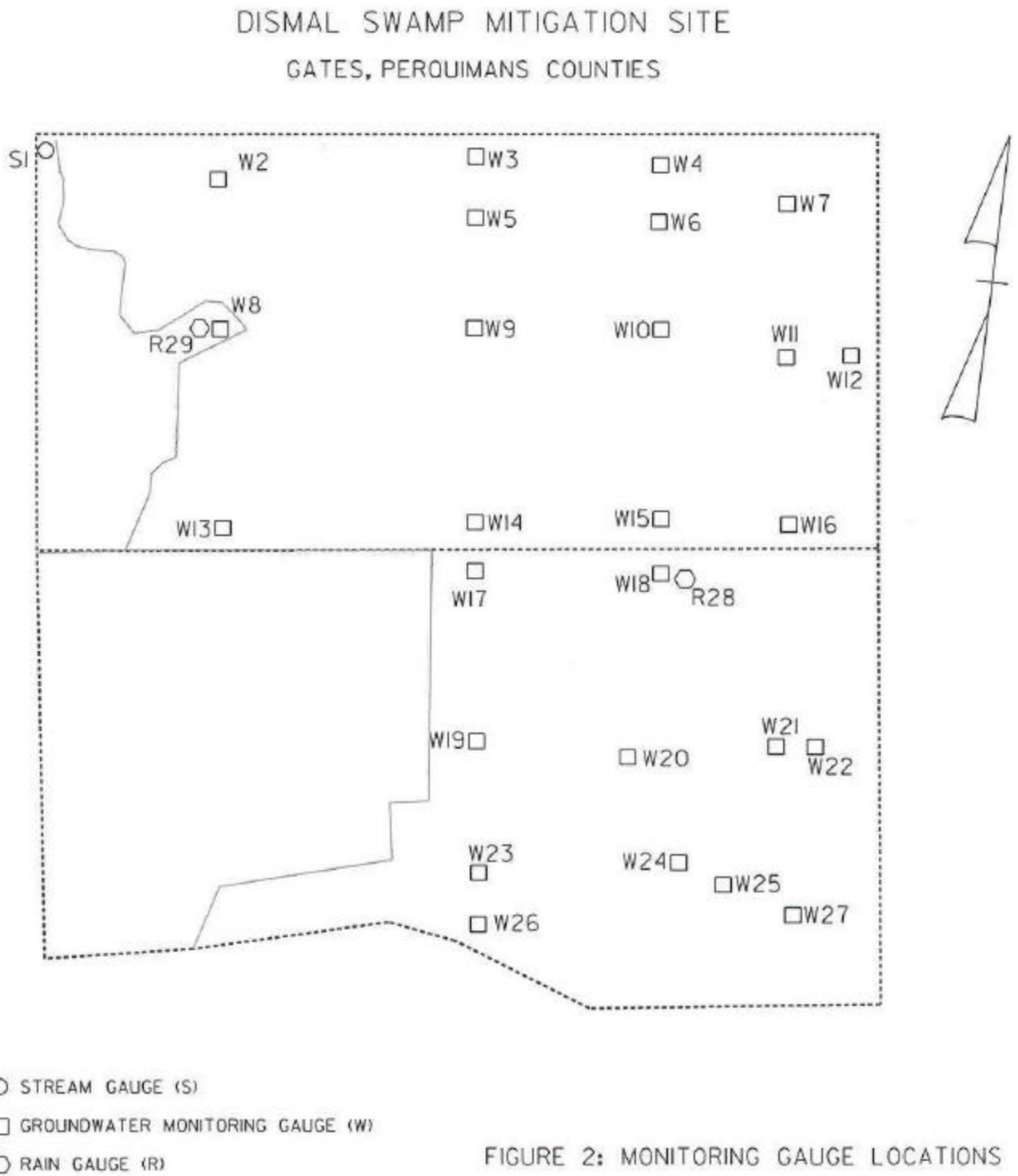
2.2 Hydrologic Description

Twenty-six groundwater monitoring gauges, two rain gauges, and one surface water gauge were installed on site in 1997 (Figure 2). The monitoring gauges record daily readings of groundwater depth. The rain gauges were replaced in spring 2000 with Infinity rain gauges.

Appendix A contains a plot of the groundwater depth for each monitoring gauge. Data determined to be erroneous was omitted; therefore, some gaps appear in the plots.

¹ Soil Survey of Gates County, North Carolina, Soil Conservation Service, p.93.

Figure 2. GAUGE LOCATION MAP



Precipitation events are included on each graph as bars. The rainfall plotted was obtained from the on-site infinity rain gauge.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The largest 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 232 day growing season. Table 2 shows the hydrologic results for the 2001 growing season.

Table 3. 2001 HYDROLOGIC MONITORING RESULTS

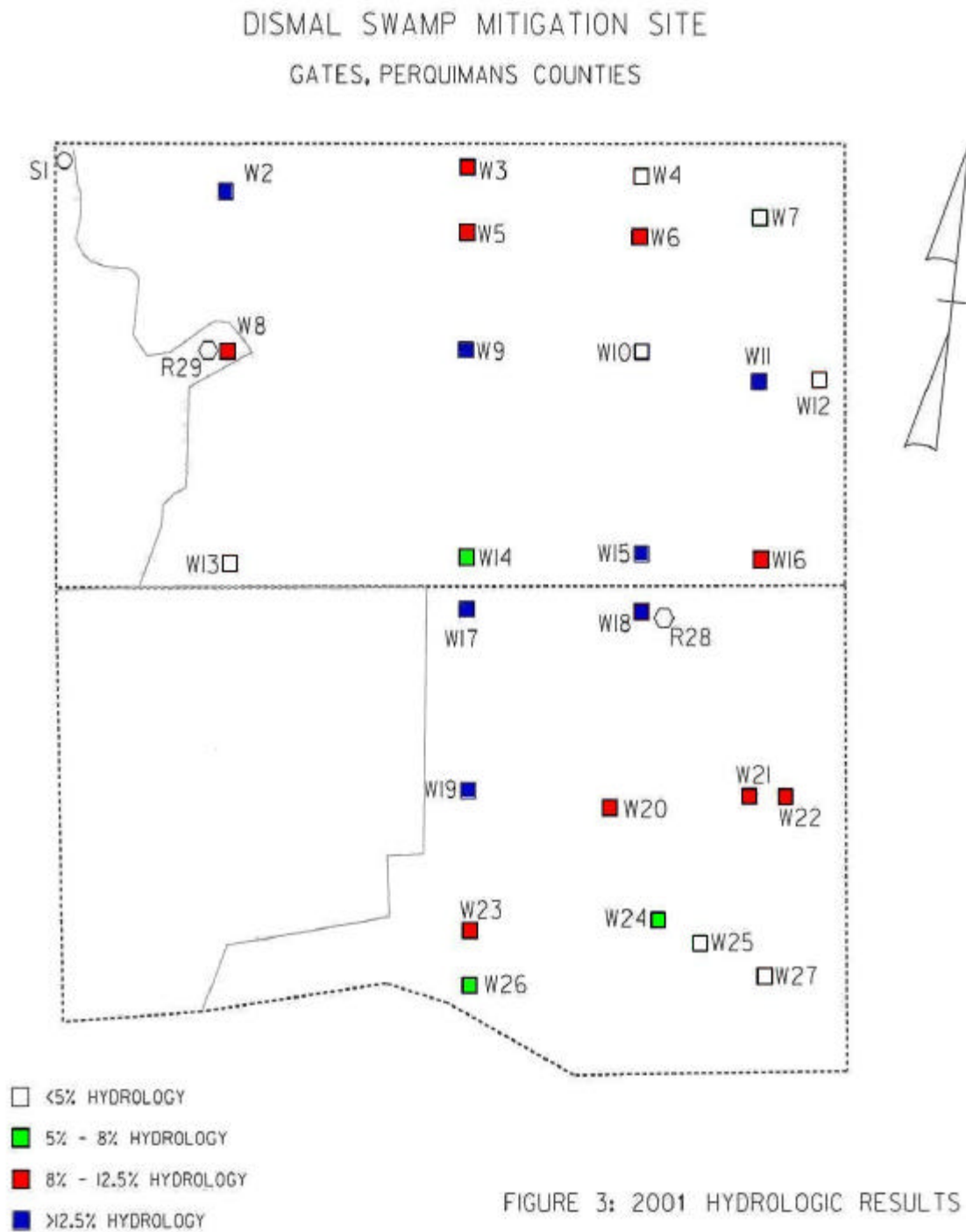
Monitoring Gauge	< 5%	5% - 8%	8% - 12.5%	≥ 12.5%	Actual %	Date
DS-2				✓	15.5	Mar. 25 – Apr. 29
DS-3			✓		8.6	Mar. 25 – Apr. 13
DS-4	✓				4.7	Mar. 30 – Apr. 9
DS-5			✓		10.8	Mar. 25 – Apr. 18
DS-6			✓		9.9	Mar. 25 – Apr. 16
DS-7 [^]	✓				2.6	Mar. 30 – Apr. 4
DS-8				✓	12.5	Mar. 25 – Apr. 22
DS-9				✓	12.9	Mar. 25 – Apr. 23
DS-10*	✓				2.2	Mar. 25 – Mar. 29
DS-11				✓	15.1	Mar. 25 – Apr. 28
DS-12 [^]	✓				3.0	Jun. 16 – Jun. 22
DS-13	✓				4.7	Mar. 30 – Apr. 9
DS-14		✓			6.0	Jun. 16 – Jun. 29
DS-15				✓	16.8	Mar. 25 – May 2
DS-16			✓		9.1	Mar. 25 – Apr. 14
DS-17				✓	18.1	Mar. 25 – May 5
DS-18				✓	17.2	Mar. 25 – May 3
DS-19				✓	15.9	Mar. 25 – Apr. 30
DS-20			✓		9.1	Mar. 25 – Apr. 14
DS-21				✓	12.5	Mar. 25 – Apr. 22
DS-22			✓		12.1	Mar. 25 – Apr. 21
DS-23			✓		8.6	Mar. 25 – Apr. 13
DS-24		✓			7.3	Mar. 25 – Apr. 10
DS-25**	✓				2.6	Mar. 30 – Apr. 4
DS-26		✓			7.3	Mar. 25 – Apr. 7
DS-27 [^]	✓				3.9	Mar. 30 – Apr. 7

*Gauge DS-10 only had 6 days of data collected due to continuous gauge problems. The percentage does not reflect data from the entire growing season.

**Indicates a gauge with a success requirement of 0-5%.

[^]Indicates a gauge with a success requirement of 5-12.5%.

Figure 3. 2001 HYDROLOGIC MONITORING RESULTS



Several gauges experienced difficulties during the growing season due to dead batteries or a malfunctioning gauge. Gauge 1, the surface water gauge, was replaced in May after data could not be retrieved. There is a gap of data from May 2nd to May 24th due to the replacement of that gauge. Gauge 3 has a missing gap of data from July 24th to October 4th due to a gauge malfunction. Gauge 8 stopped recording in September and was replaced in October, therefore, a gap of data from September 10th to October 4th is missing for this gauge. Gauge 10 had continuous problems throughout the growing season. The gauge was replaced twice and reset twice, and the batteries replaced once, however almost no data was collected for the growing season with a gap of data from March 30th to November 11th. Due to dead batteries, there is a gap in data from October 5th to November 11th for Gauge 13. There is also a gap data from October 5th to November 11th for Gauge 22 due to dead batteries. Gauge 24 also stopped recording in September due to dead batteries, which were replaced in October. Due to battery problems, data was determined to be erroneous from August 9th to October 4th.

Figure 3 is a illustration of the 2001 hydrologic results. A blue square indicates hydrology for greater than 12.5% of the growing season; a red square means the gauge showed between 8% and 12.5%. A green square indicates hydrology between 5% and 8% of the season. It is this hydrologic data which will determine the success of the site. The surface water gauge has recorded appreciable surface water throughout the growing season. Refer to Appendix A for graphed data for all 27 gauges.

2.3.2 Climatic Data

Figure 4 is a comparison of 2000 and 2001 monthly rainfall to historical precipitation for the area. The two lines represent the 30th and 70th percentiles of monthly precipitation for Elizabeth City, NC. These percentiles represent monthly rainfall data collected between 1931 and 1998 from a National Climatic Data Center rain gauge. The 1998 through 2001 monthly rainfall data was provided by the State Climate Office of North Carolina at NC State University. Because of data availability, the 2001 rainfall encompasses precipitation through November 26, 2001. The 2002 annual report will include a 30-70 percentile graph with the monthly rainfall for December of 2001.

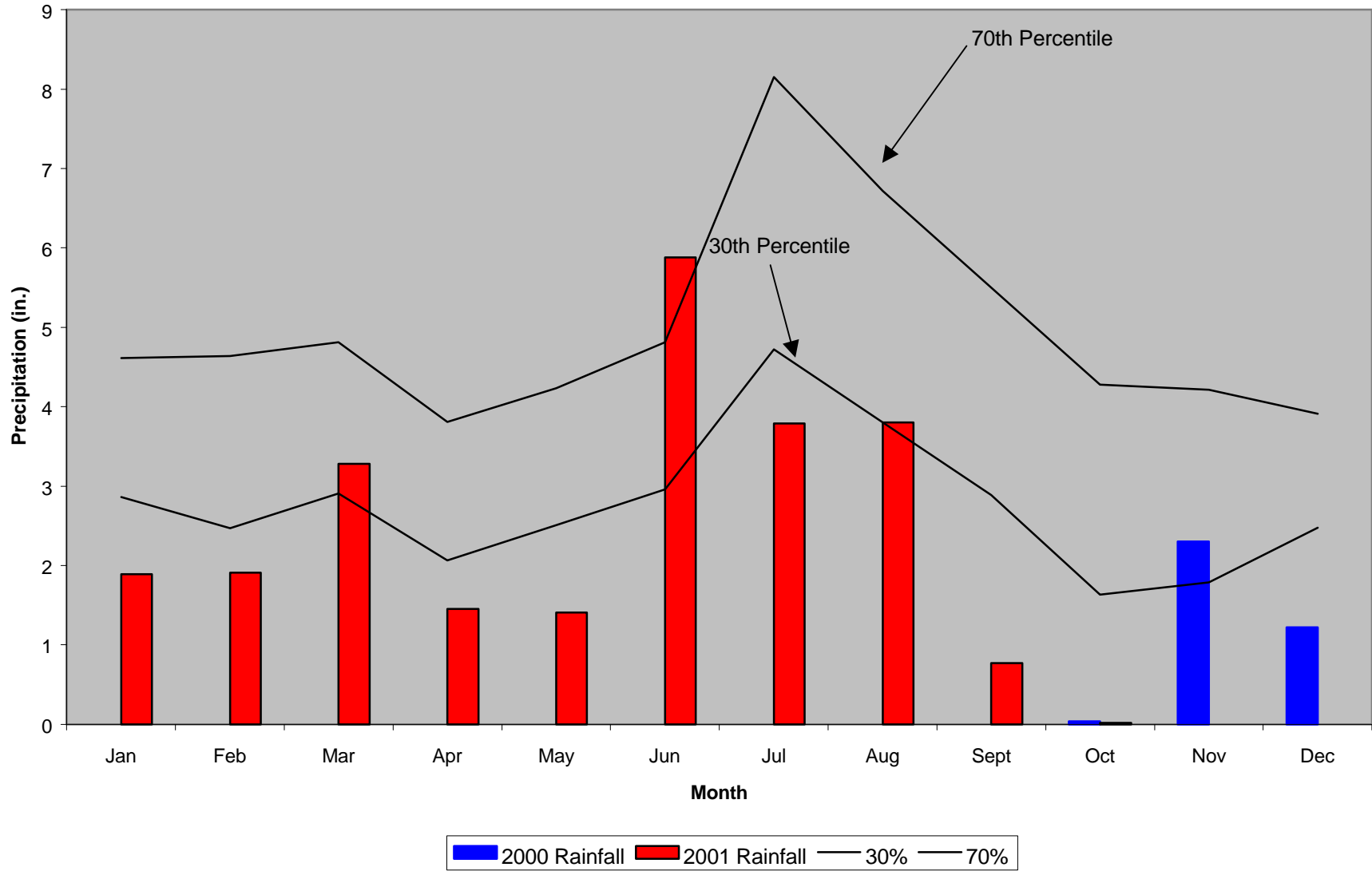
Rainfall for the Elizabeth City vicinity in the past two years ranges from below average to above average. In 2001, 8 of the 11 months of data fell below the 30 - 70 percentile range with only 1 month, June, being above the range. The gauges that met the success criteria did not meet only during an above average period of rainfall. Overall, rainfall was below average for 2001.

2.4 Conclusions

The data for the 2001 growing season indicates that nine of the twenty-six monitoring gauges met the success criteria for at least 12.5% of the growing season. Fifteen gauges met the success criteria for at least 8.0 % of the 2001 growing season. Gauges 3, 4, 5, 6, 7, 8, 10, 12, 13, 14, 16, 20, 21, 22, 23, 24, 25, 26, and 27 did not meet their expected hydrologic criteria. Gauges 4, 7, 10, 12, 13, 14, 24, 25, 26, and 27 did not meet the success criteria for even 8.0 % of the 2001 growing season. These gauges, with the exception of gauges 13, and 14, are located on the perimeter of the site. All nine sites that met the success criteria did so in average or below average rainfall based on the 30-70 graph (Figure 4). The rainfall did not occur in one large rainfall event, but over a period of time based on the rainfall gauge data collected. The nine sites that did meet the success criteria were at a much lower percentage than the 2000 growing season data. For example, Gauge 17 met the success criteria 18.1% of the growing season, the largest percentage of all the gauges for 2001. This same gauge met the success criteria 99.6 % of the 2000 growing season. Gauge 12, which was only marginal in 2000, meeting 12.1% of the growing season, only met 3.0% of the 2001 growing season. The lack of success for this year overall can be attributed to the below average rainfall for the majority of the growing season.

In the June 13, 2001 Corps of Engineers comments concerning the subject "Mitigation Monitoring Reports," the statement "it appears that the site may still be under the influence of artificial drainage" was included regarding the Dismal Swamp Mitigation Site. NCDOT reviewed the site and did not identify any areas where artificial drainage was occurring other than the perimeter ditches. These ditches remain in place in order to prevent hydrologic trespass. NCDOT will further investigate Gauges 13 and 14 to determine why those areas continue to not be successful, however, based on field observations, NCDOT does not believe it can be attributed to artificial drainage.

Figure 4. DISMAL SWAMP 30-70 PERCENTILE GRAPH



3.0 VEGETATION: DISMAL SWAMP MITIGATION SITE (YEAR 3 MONITORING)

3.1 Success Criteria

NCDOT will monitor the site for five years. A 320 stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4, and 260 stems per acre for year 5). The number of plants of one species will not exceed 20% of the total number of plants of all species planted.

3.2 Description of Species

The following species were planted in the Wetland Restoration Area:

Zone 1: Non-riverine Swamp Forest / Atlantic White Cedar (136 acres)

Taxodium distichum, Baldcypress
Nyssa aquatica, Tupelo Gum
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Chamaecyparis thyoides, Atlantic White Cedar
Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Quercus lyrata, Overcup Oak

Zone 2: Coastal Fringe Sandhill Forest (12 acres)

Nyssa sylvatica, Blackgum
Quercus marilandica, Blackjack Oak
Quercus virginiana, Live Oak
Pinus palustris, Longleaf Pine
Quercus coccinea, Scarlet Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus laevis, Turkey Oak
Quercus laurifolia, Laurel Oak
Quercus phellos, Willow Oak

**Zone 3: Non-riverine Swamp Forest Mineral Soil Subtype
(315 acres)**

Taxodium distichum, Baldcypress
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Chamaecyparis thyoides, Atlantic White Cedar
Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak
Quercus falcata var. *pagodaefolia*, Cherrybark Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus phellos, Willow Oak
Liriodendron tulipifera, Yellow Poplar

Nyssa sylvatica, Blackgum

Quercus falcata, Southern Red Oak

Zone 4: Riverine Swamp Forest (34 acres)

Taxodium distichum, Baldcypress
Nyssa aquatica, Tupelo Gum
Nyssa sylvatica var. *biflora*, Swamp Blackgum
Quercus lyrata, Overcup Oak
Chamaecyparis thyoides, Atlantic White Cedar
Fraxinus pennsylvanica, Green Ash
Quercus laurifolia, Laurel Oak

Quercus falcata var. *pagodaefolia*, Cherrybark Oak

3.3 Results of Vegetation Monitoring

Table 4. VEGETATION MONITORING RESULTS

	Plot #	Green Ash	Willow Oak	Laurel Oak	Cherrybark Oak	Tulip Poplar	Baldcypress	Tupelo Gum	Atlantic White Cedar	Swamp Blackgum	Southern Red Oak	Swp. Chestnut Oak	Longleaf Pine	Scarlet Oak	Blackgum	Turkey Oak	Overcup Oak	Blackjack Oak	Live Oak	Total (3 year)	Total (at planting)	Density (Trees/Acre)	
ZONE 1	13	6		3	1		11		2	3		1								27	34	540	
	14		1	2			8	1				6								18	30	408	
	15	2	1	10	1		6		5											25	35	486	
	16	5	4	6	1		8		4	2										30	37	551	
	23	5		3			10		2											20	28	486	
	24	3	5	1			11		4	6										30	32	638	
	26	1	1		2		15	2	4			2								27	28	656	
	31	2	3				14			3										22	34	440	
	32						21	2		2		2								27	41	448	
	33	2	1	3	2		7		12	1								2		30	33	618	
	42	7		6	2		4		2	4										25	28	607	
	43	9					18													27	38	483	
	47	5		9	1				2											17	25	462	
	ZONE 1 AVERAGE DENSITY																						
ZONE 2	12												17	3		2		1		23	24	652	
	29		1	6								1	3			3			1	15	24	425	
ZONE 2 AVERAGE DENSITY																							538

Table 4. VEGETATION MONITORING RESULTS (Continued)

4		1	8			9											18	24	510
5	6		4	9		1			1	2							23	31	505
6			2			3			1	1							7	28	170
7	3	6	8	2		5											24	31	526
8	4	3	3	1		21			1								33	39	575
9				2		3			1								6	20	204
10		1	5	2	1	4			1								14	28	340
11				8													8	19	286
17	1	13	1		1	8											25	29	586
18		2	2	14		7											31	35	602
19		2	1	8		5		2									19	32	404
20	2	5	5	4		3											20	25	544
21	3	4	7			15											29	34	580
22	2		2	5		11											20	34	400
25	3	6		8	2	2											22	23	650
27	3	3	2	4		3		4									19	25	517
28		1			2	8		1									12	22	371
30	1	4		6		3		10	1								25	27	630
34		2	1	1		2		3									9	36	170
35		2	10	12		1		1									26	27	655
36		6	2	8		15											33	42	534
37	5		4	5	2	22											38	38	680
38		5	8	5		9											28	30	635
39	4	4	1	1		5											19	22	587
40		7		10		1									2		20	30	453
41	3	4	9	1		2		7									26	30	589
48	5	5	2	11	1												24	30	544

ZONE 3 AVERAGE DENSITY 498

ZONE 4	44					24											24	40	408
	45			1		17	5								2		25	36	472
	46		1			19	2										22	39	384

ZONE 4 AVERAGE DENSITY 421

TOTAL AVERAGE DENSITY 502

Site Notes:

Zone 1: Other species noted: smartweed, fennel, foxtail, ragweed, goldenrod, red maple, *Juncus* sp., switchgrass, cattail, volunteer pine, and bermuda grass. Evidence of deer browsing.

Zone 2: Other species noted: sweetgum, goldenrod, and volunteer pine. Evidence of deer browsing.

Zone 3: Other species noted: volunteer pine, fennel, broomsedge, sweet gum, *Carex* sp., woolgrass, goldenrod, smartweed, foxtail, red maple, ragweed, various grasses,

Baccharis halimifolia, *Panicum* sp., *Juncus* sp., switchgrass, *Aster* sp., pokeberry, panic grass, bermuda grass, and grapevine. Evidence of deer browsing.

Zone 4: Other species noted: switchgrass and smartweed. Evidence of deer browsing.

3.4 Conclusions

Of the 612 acres on this site, approximately 576 involved tree planting. There were 48 plots established throughout the planting areas, encompassing all plant communities. The 2001 vegetation monitoring revealed average densities of 525 trees per acre for Zone 1, 538 trees per acre for Zone 2, 498 trees per acre for Zone 3, and 421 trees per acre for Zone 4. The total density average is 502 trees per acre, which is well above the success criteria of 320 trees per acre. There was heavy competition noted throughout the site, which made it difficult to locate the trees.

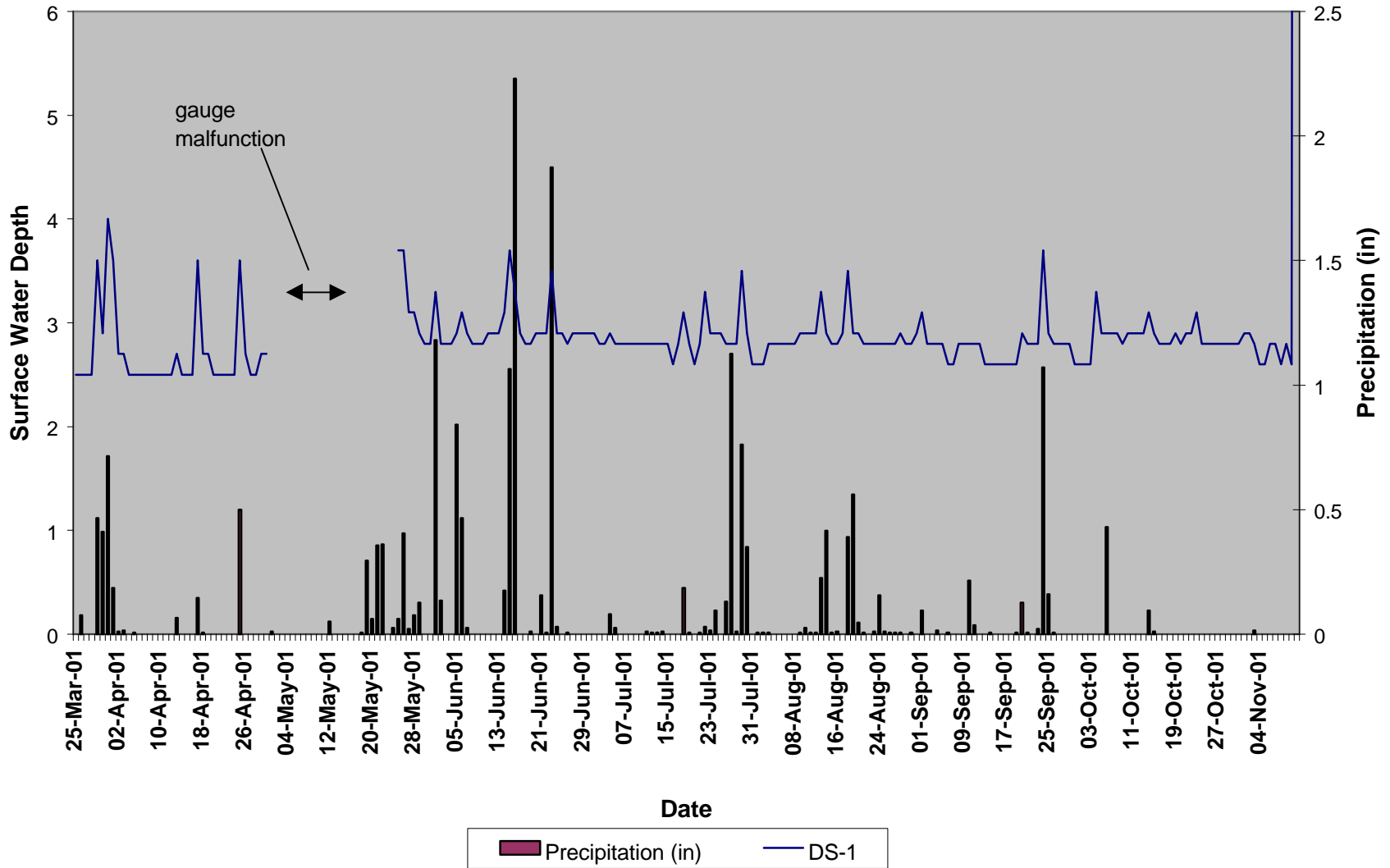
4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

This site has not shown success for the 2001 growing season. However, the data presented is based on below average rainfall conditions. Because of the continued improvement this site has shown in the past, NCDOT believes that the below average rainfall conditions are the reason this site is not showing hydrological success for the 2001 growing season. Vegetation Plots located in both phases of the planting show high tree survival.

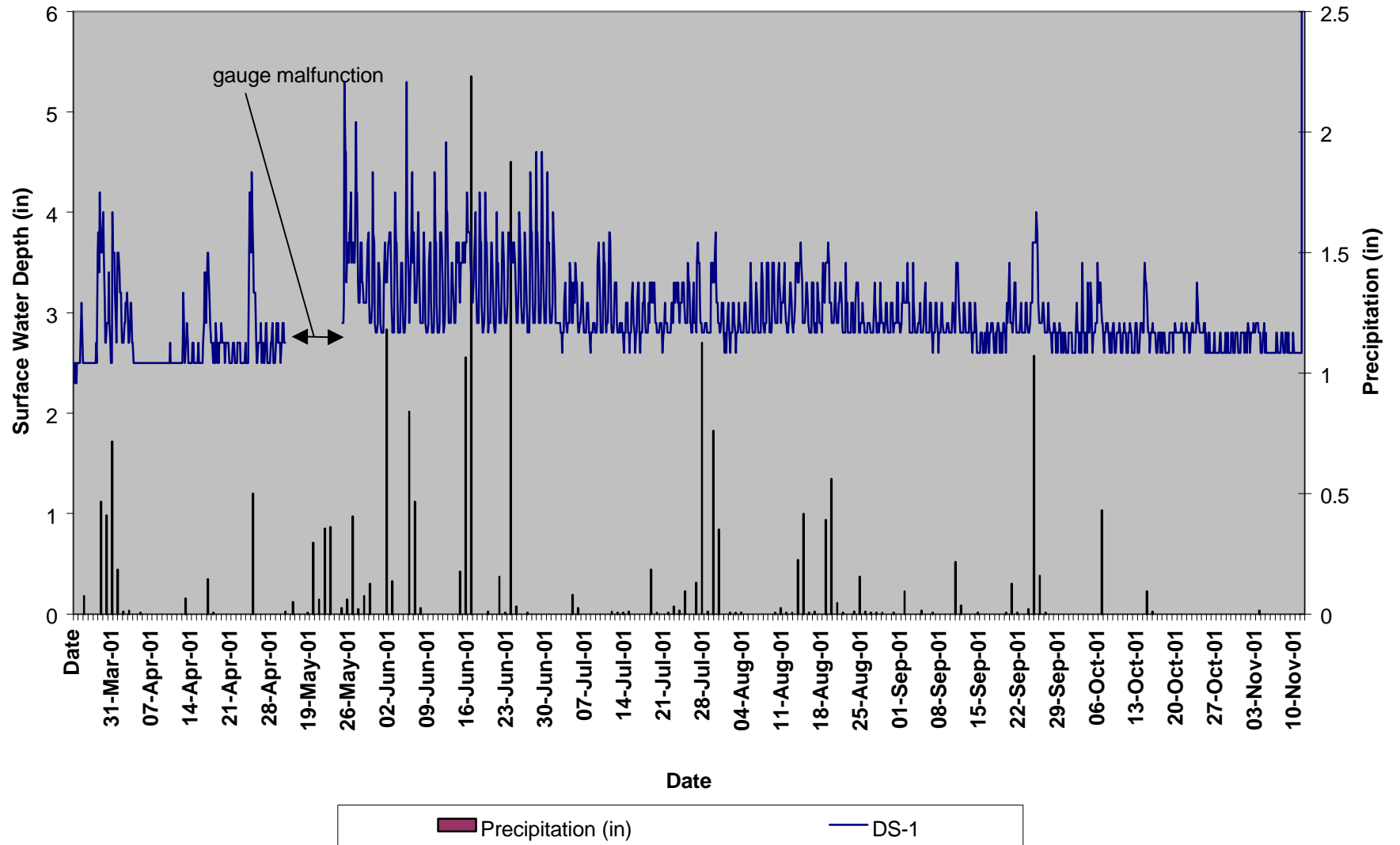
At this time, NCDOT proposes to continue hydrologic and vegetation monitoring of the site for the 2002 growing season.

APPENDIX A: DEPTH TO GROUNDWATER GRAPHS

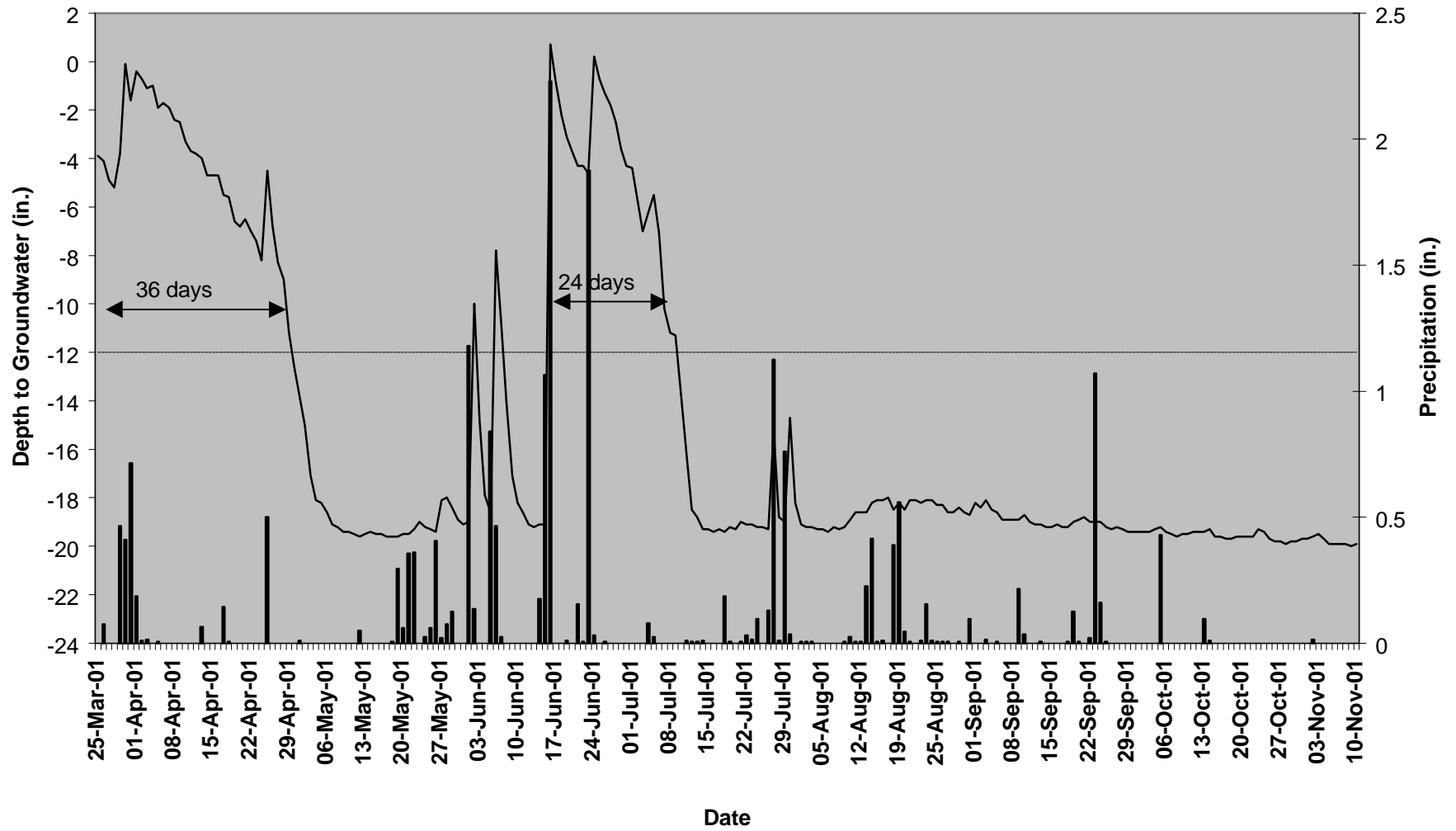
Dismal Swamp- Surface Gauge DS-1 (Showing 1 download / day)



Dismal Swamp - Surface Gauge DS-1 (Showing 8 downloads / day)

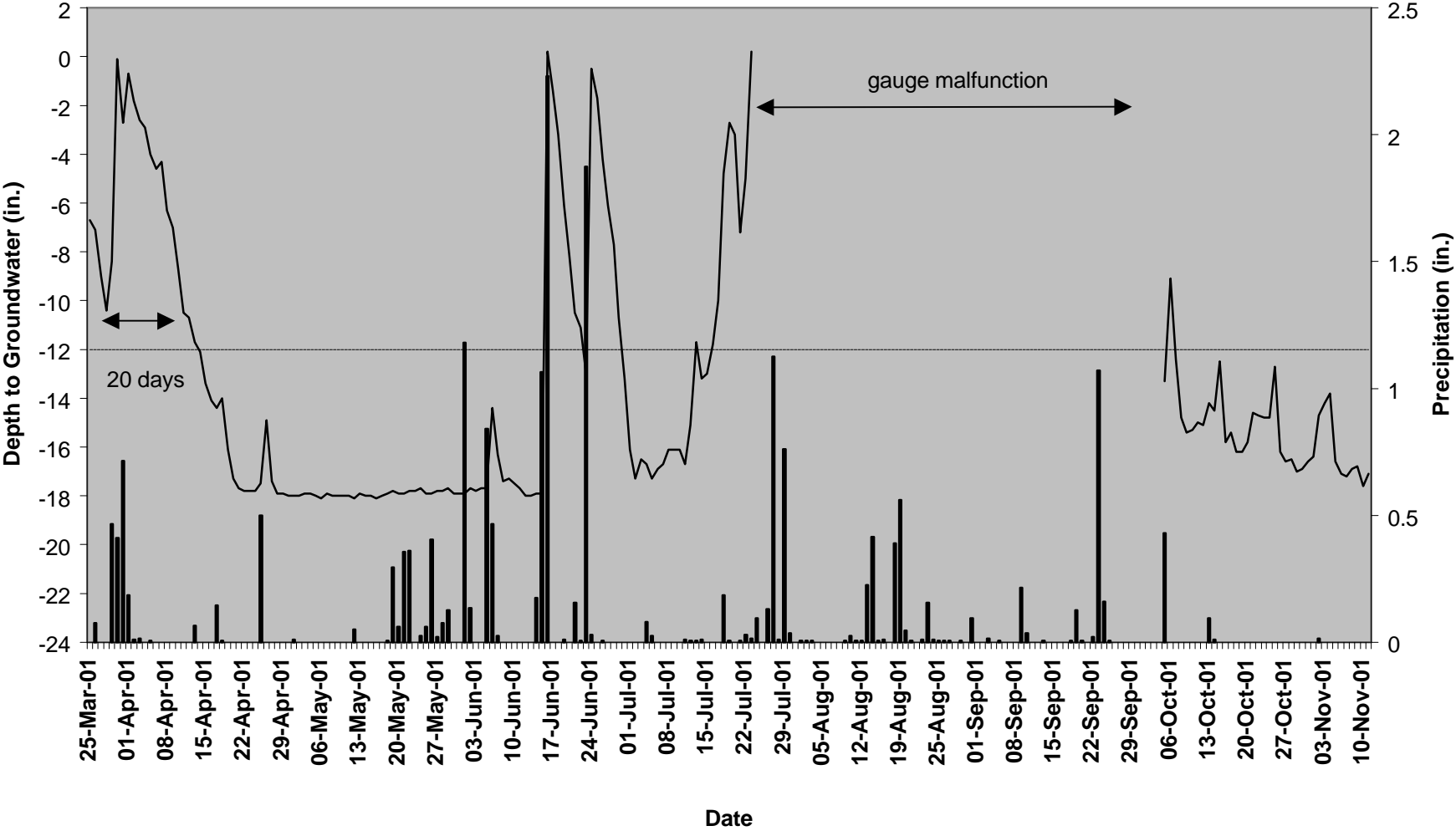


Dismal Swamp-G2



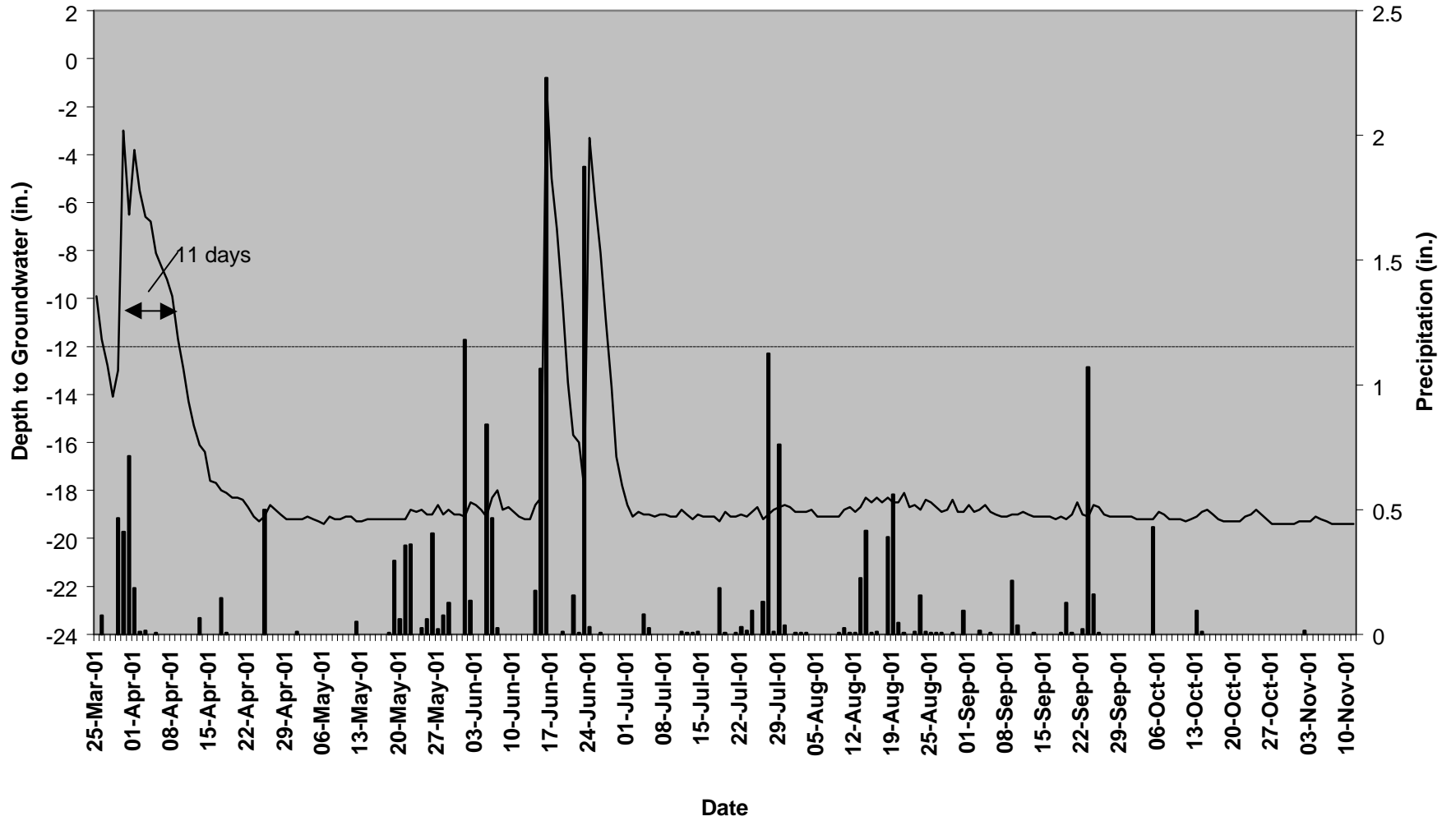
■ Rainfall Required Depth — S213941 DS-2

Dismal Swamp-G3

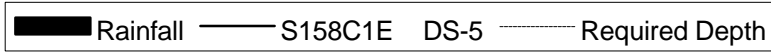
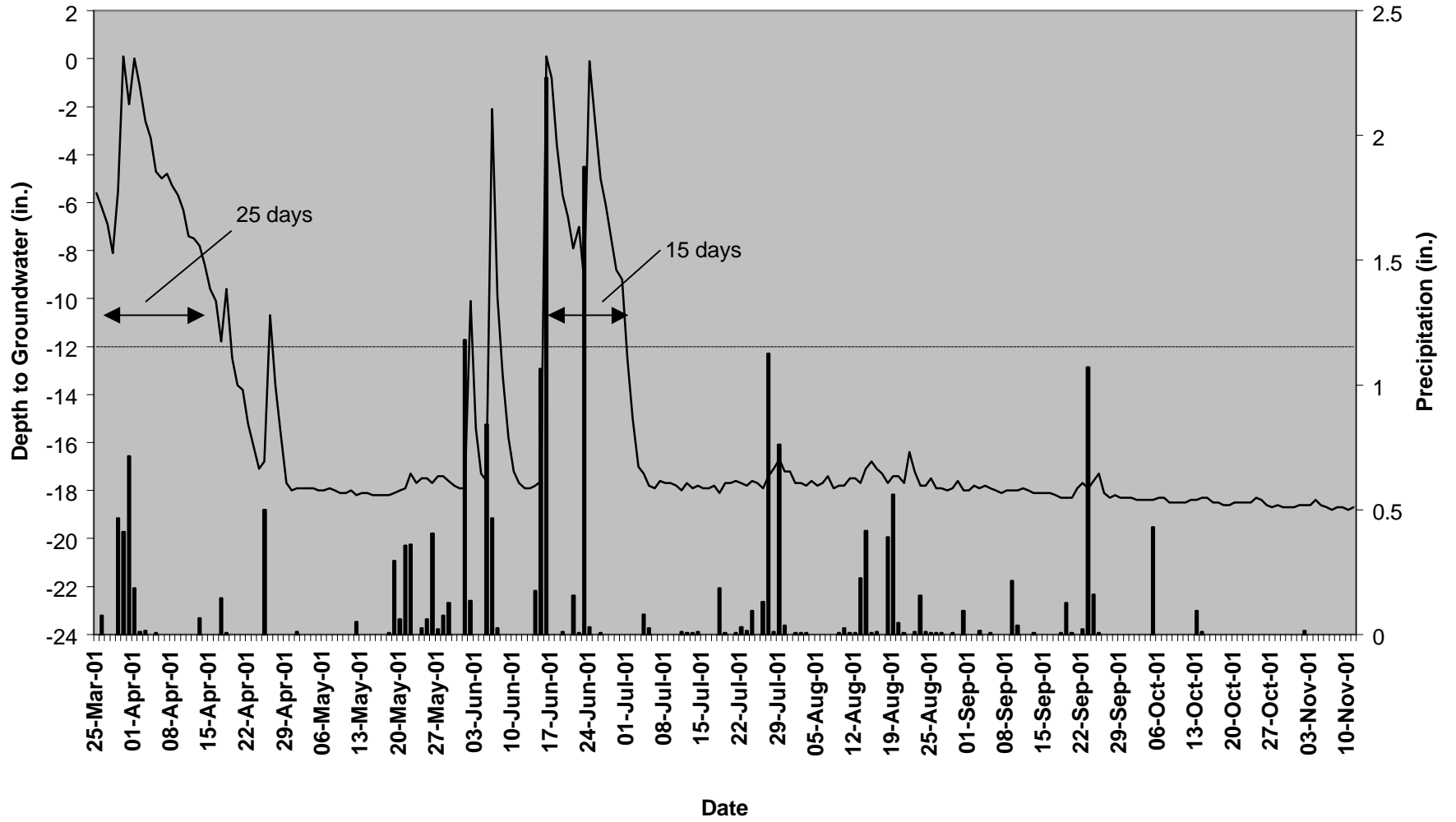


Rainfall
 S158AD4
 DS-3
 Required Depth

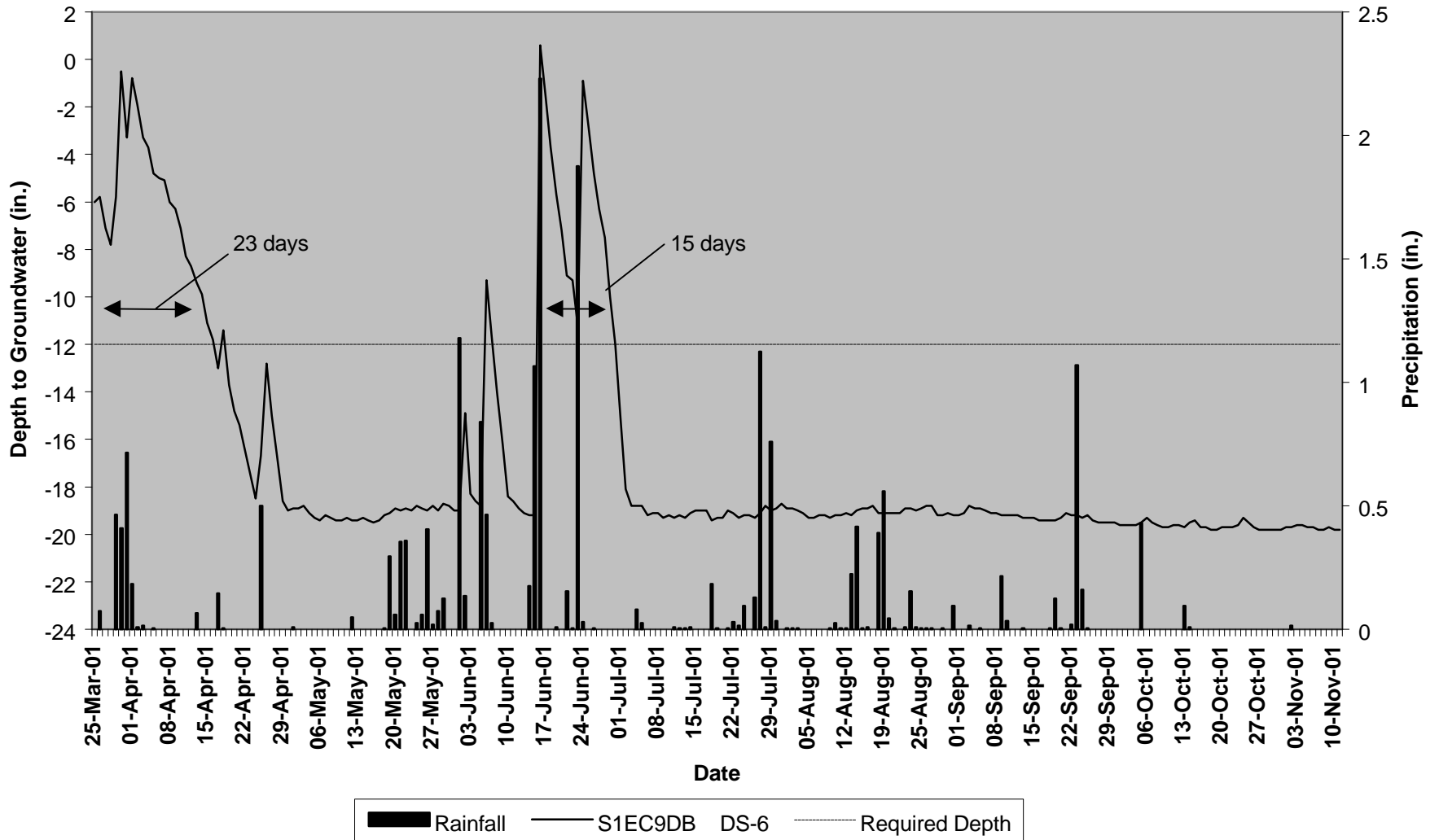
Dismal Swamp-G4



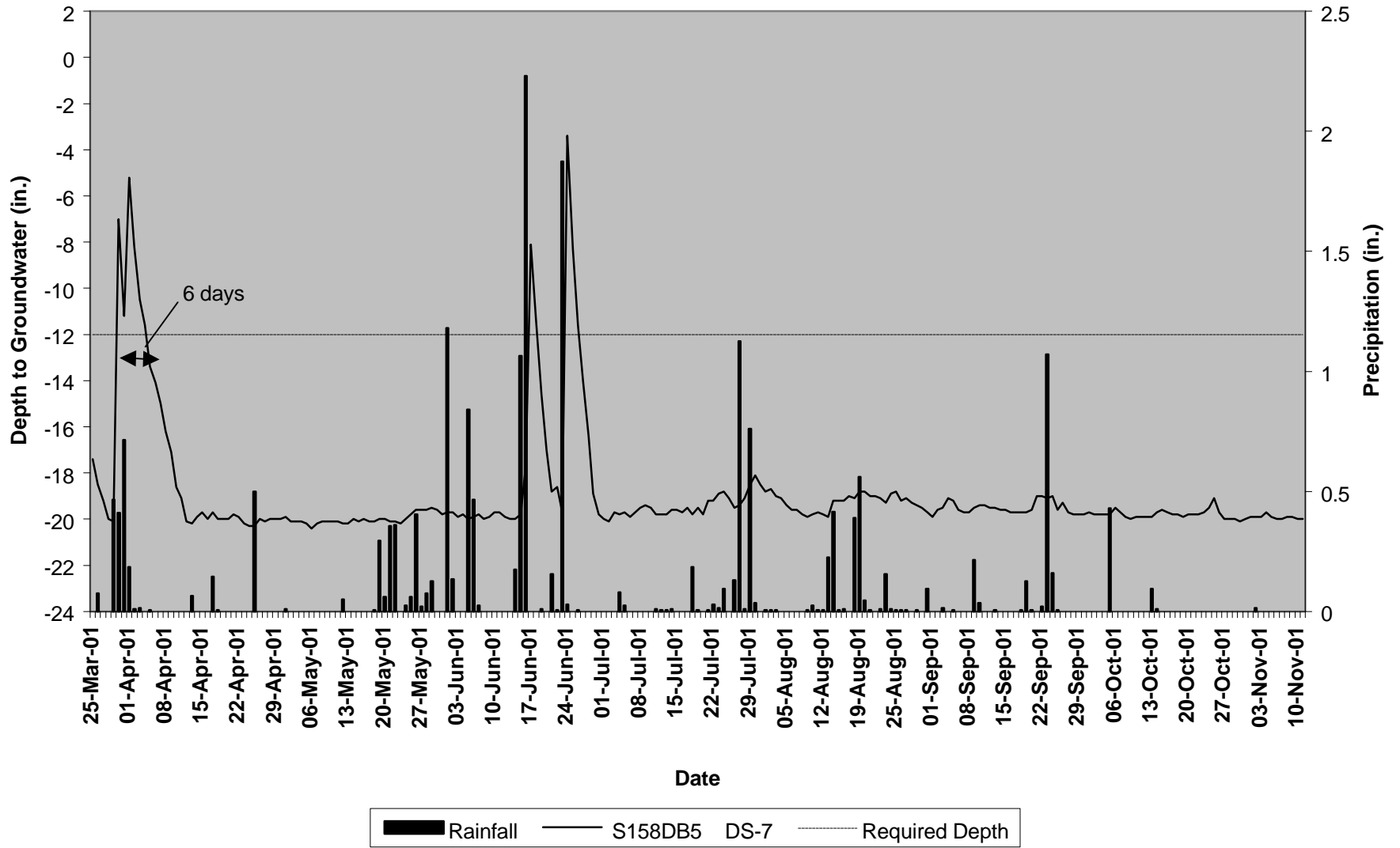
Dismal Swamp-G5



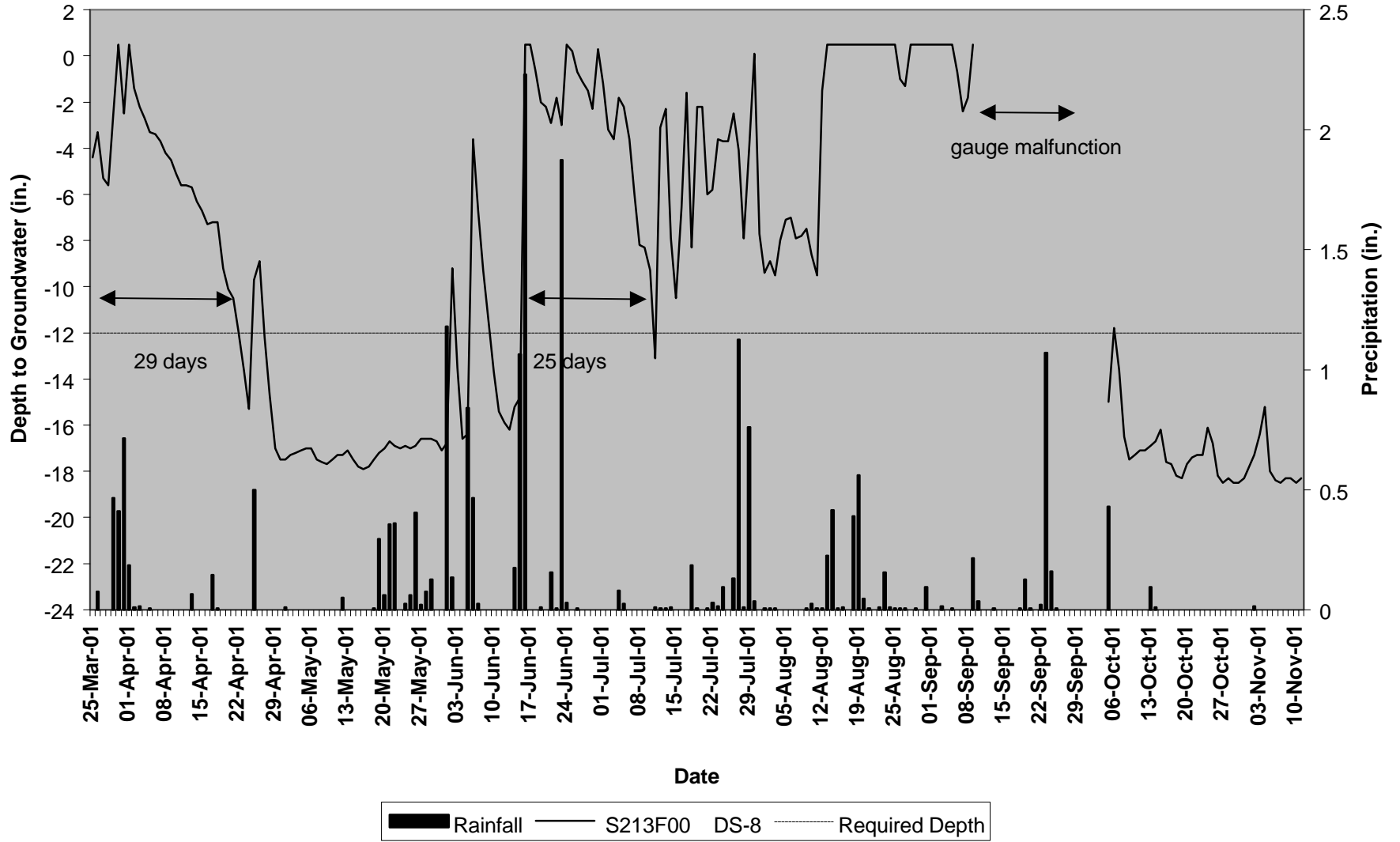
Dismal Swamp-G6



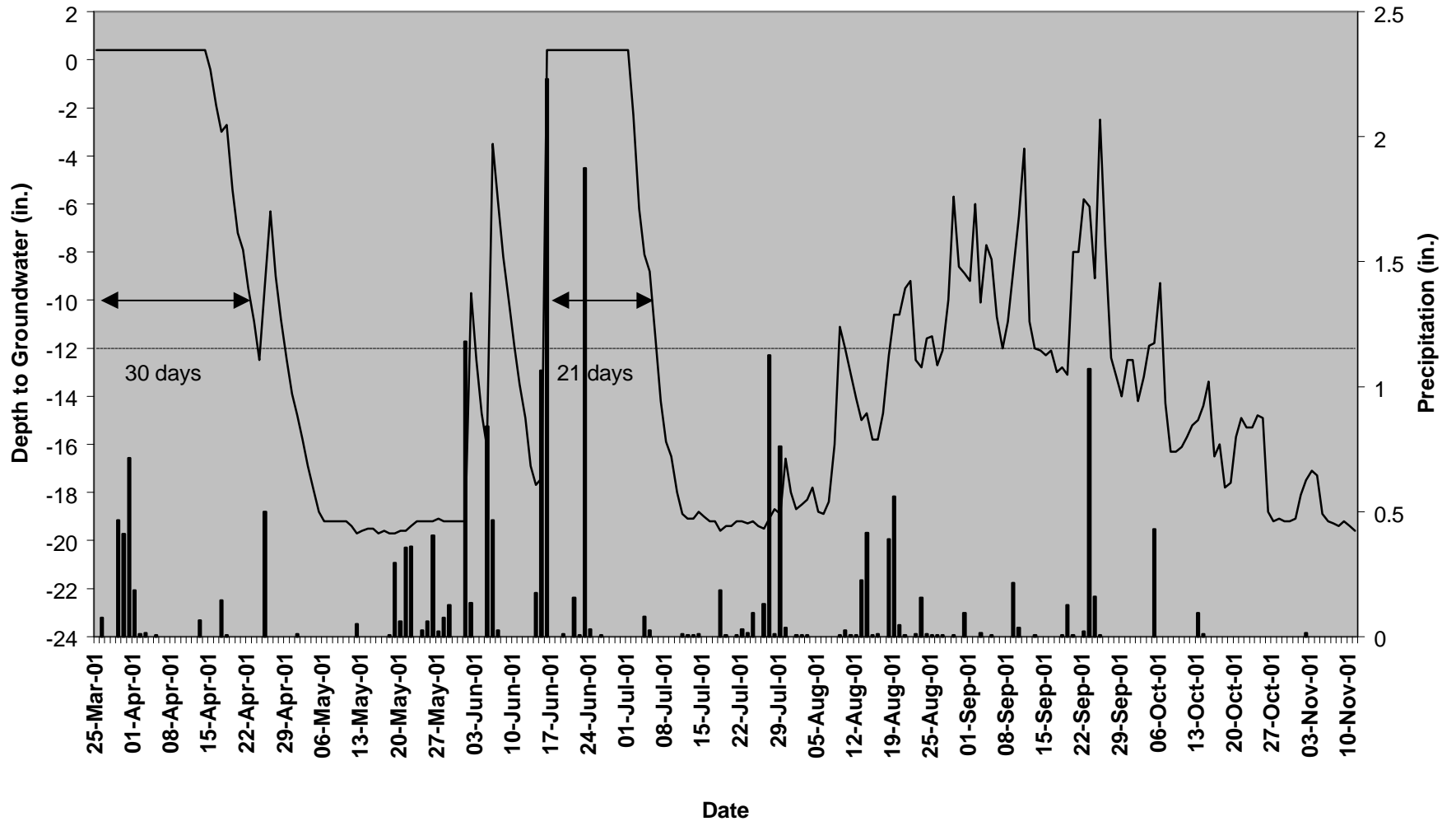
Dismal Swamp-G7



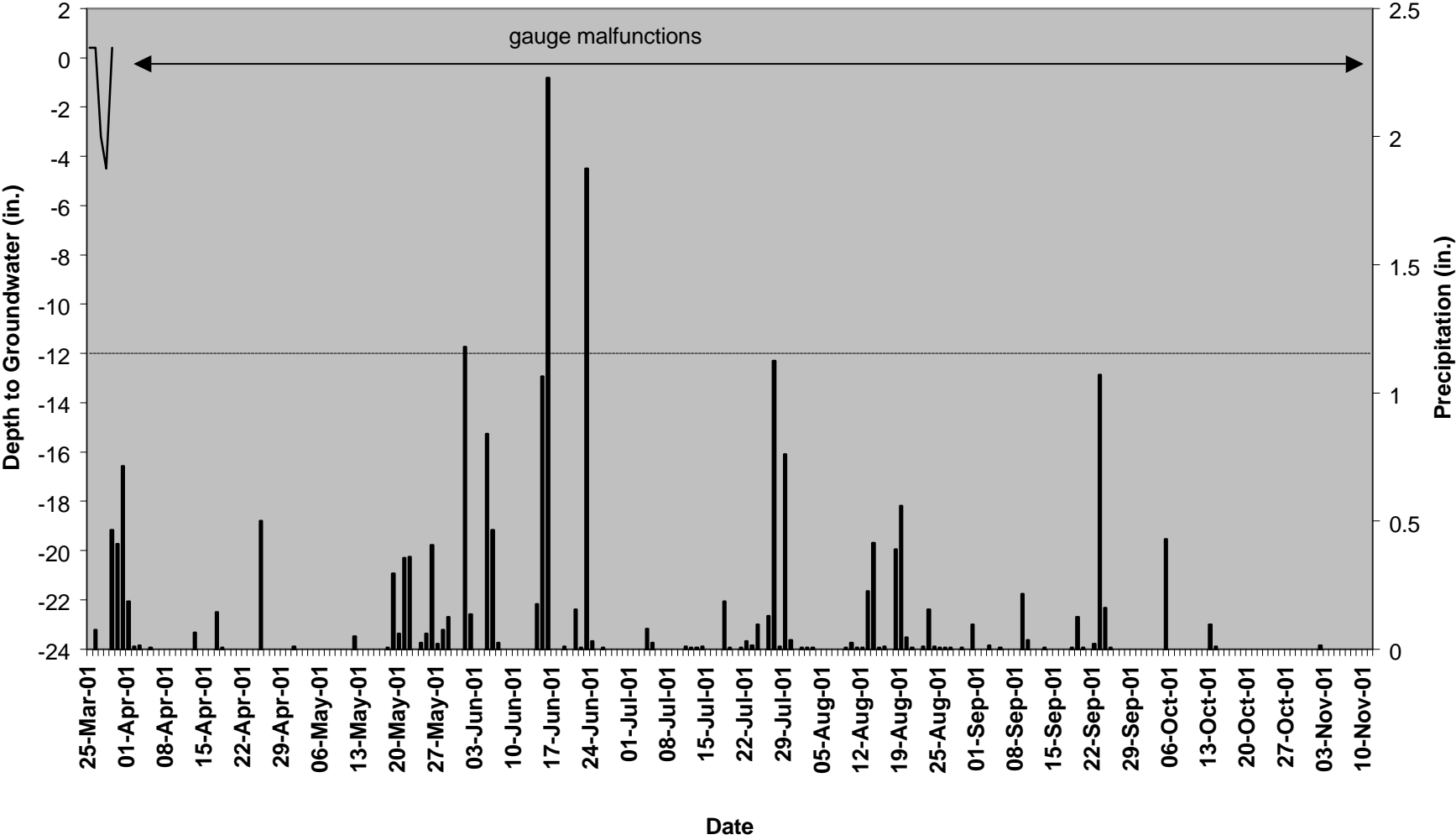
Dismal Swamp-G8



Dismal Swamp-G9

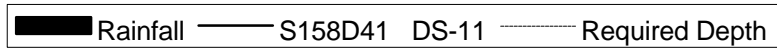
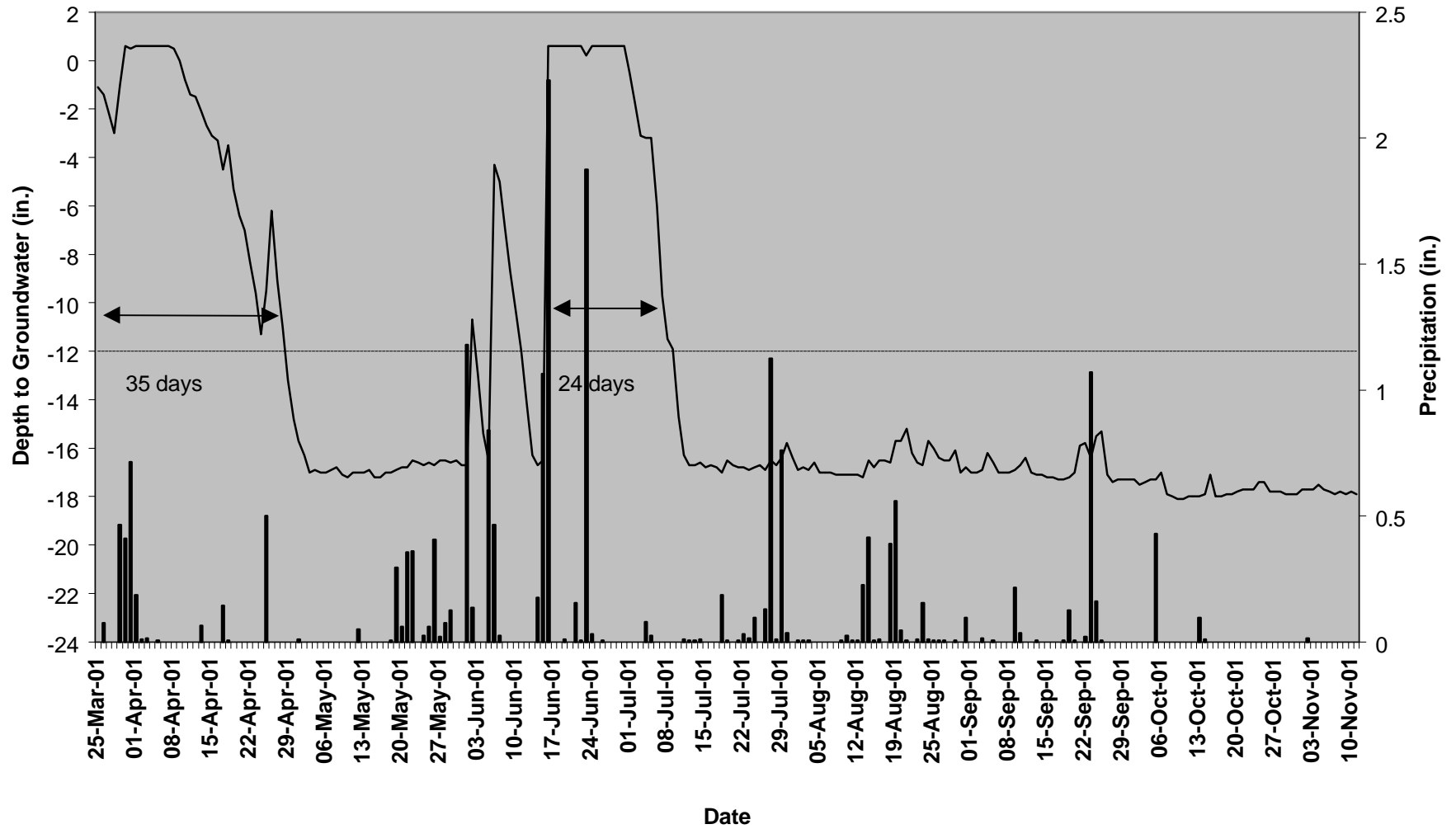


Dismal Swamp-G10

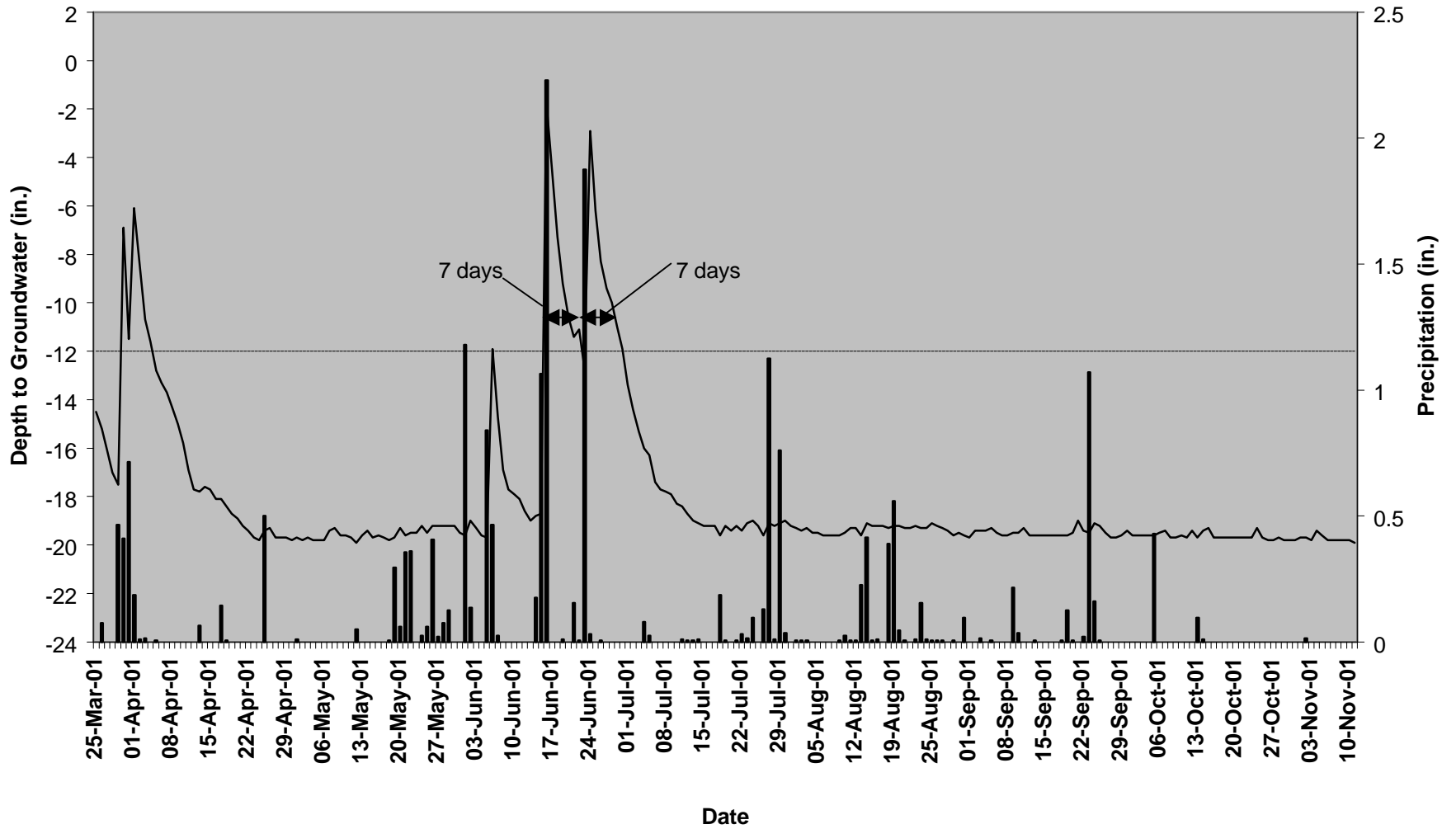


Rainfall
 S158B14
 DS-10
 Required Depth

Dismal Swamp-G11

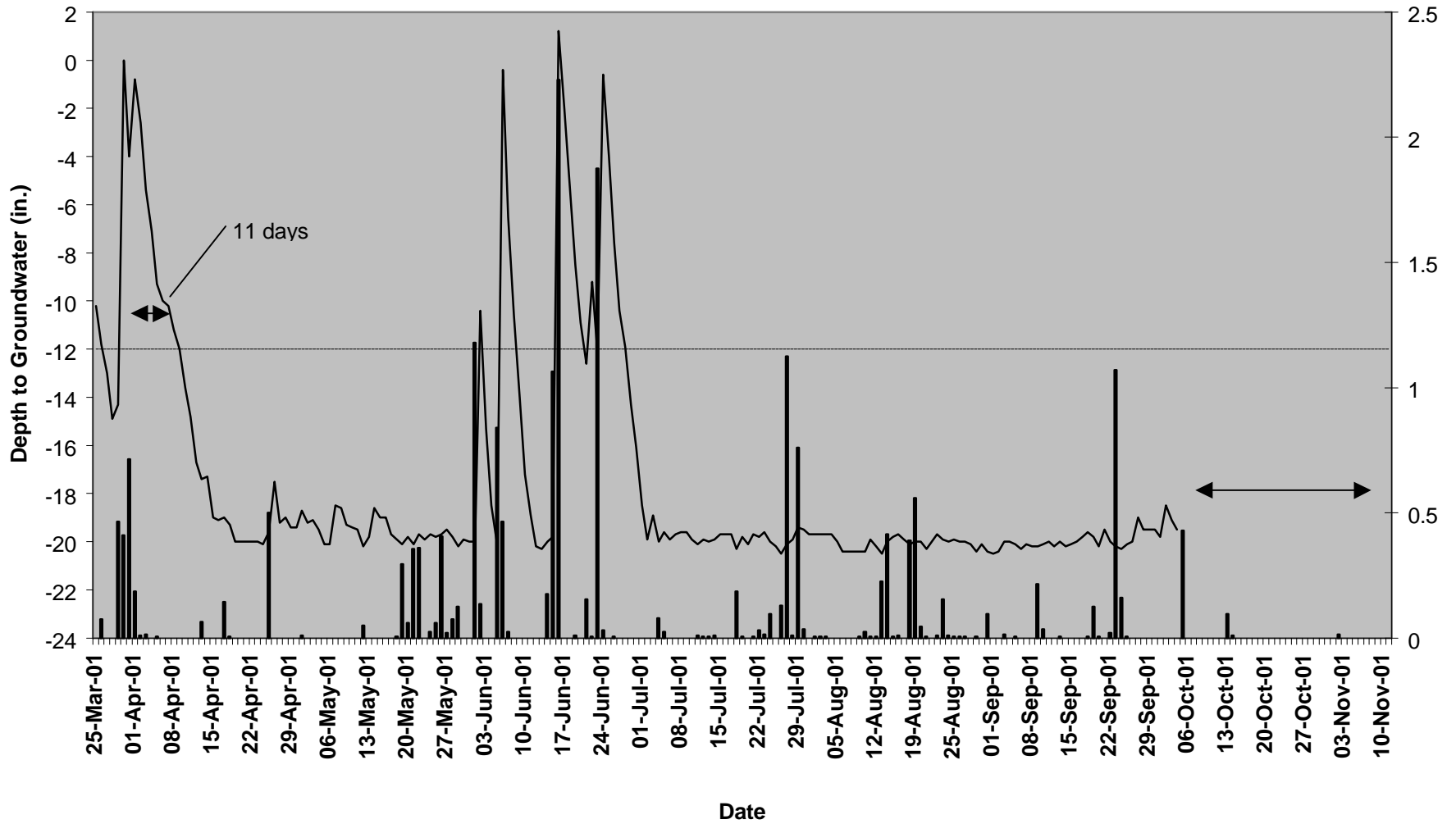


Dismal Swamp-G12



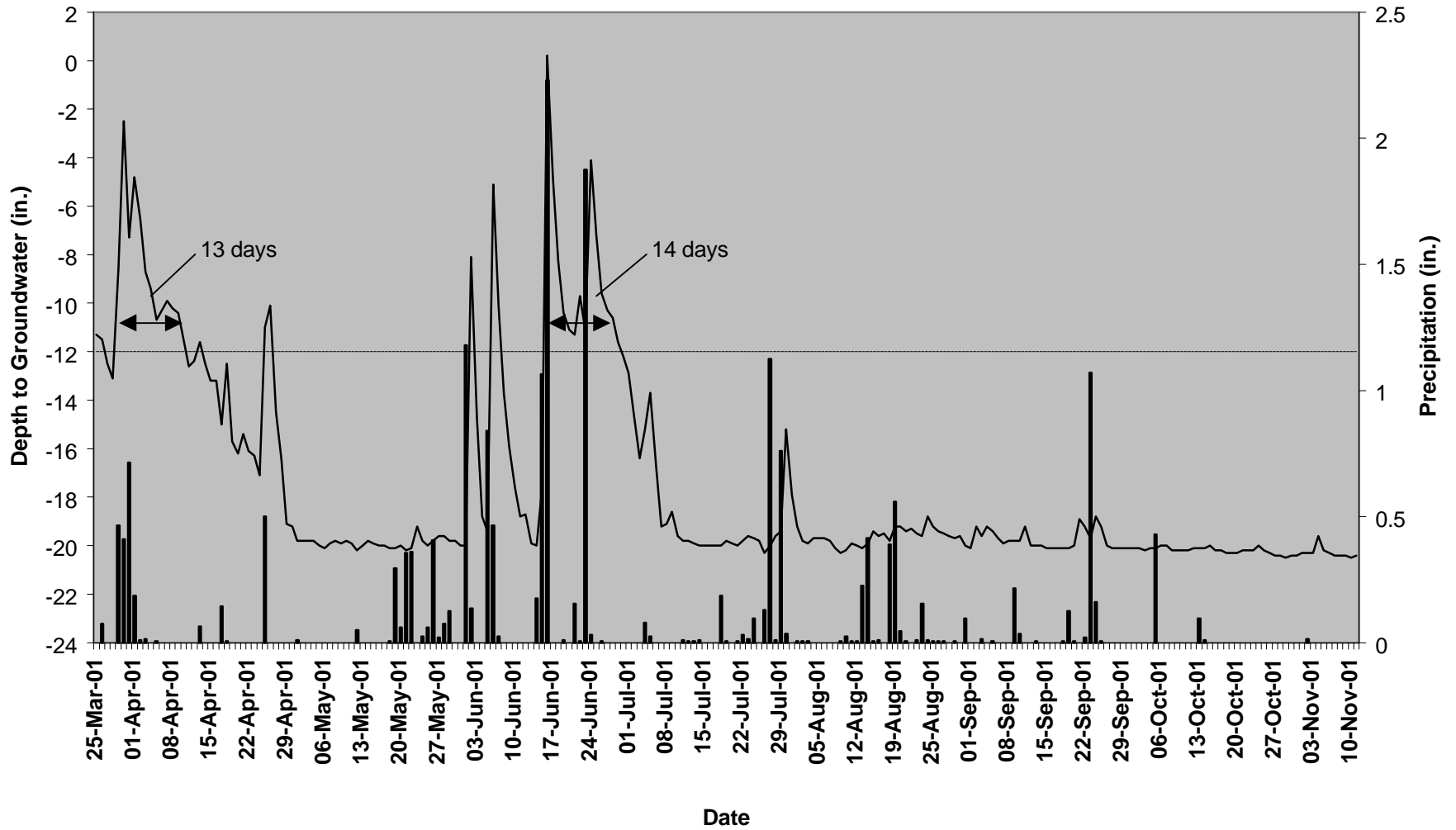
■ Rainfall — S158B4C DS-12 - - - - Required Depth

Dismal Swamp-G13



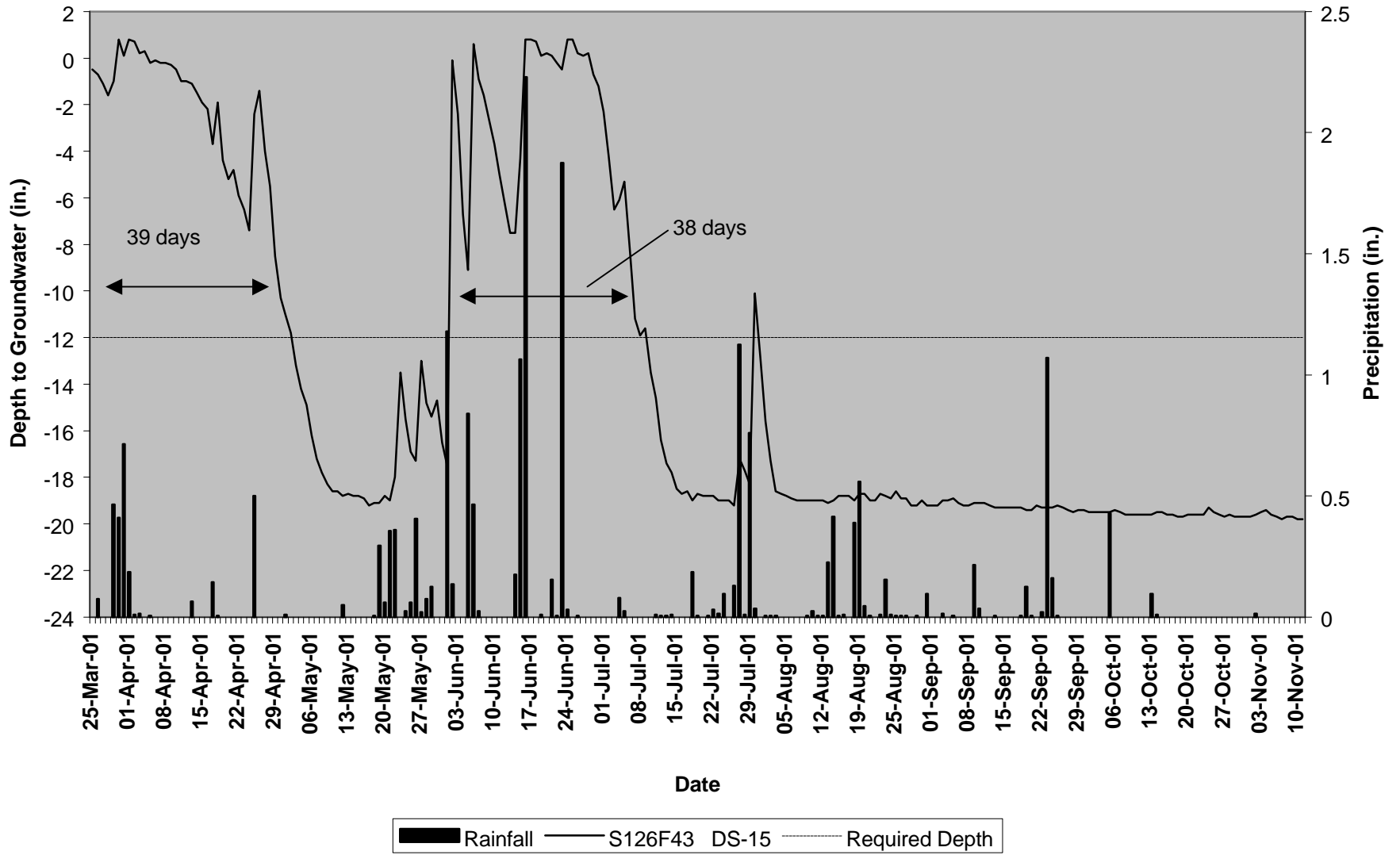
■ Rainfall — S158B86 DS-13 - - - Required Depth

Dismal Swamp-G14

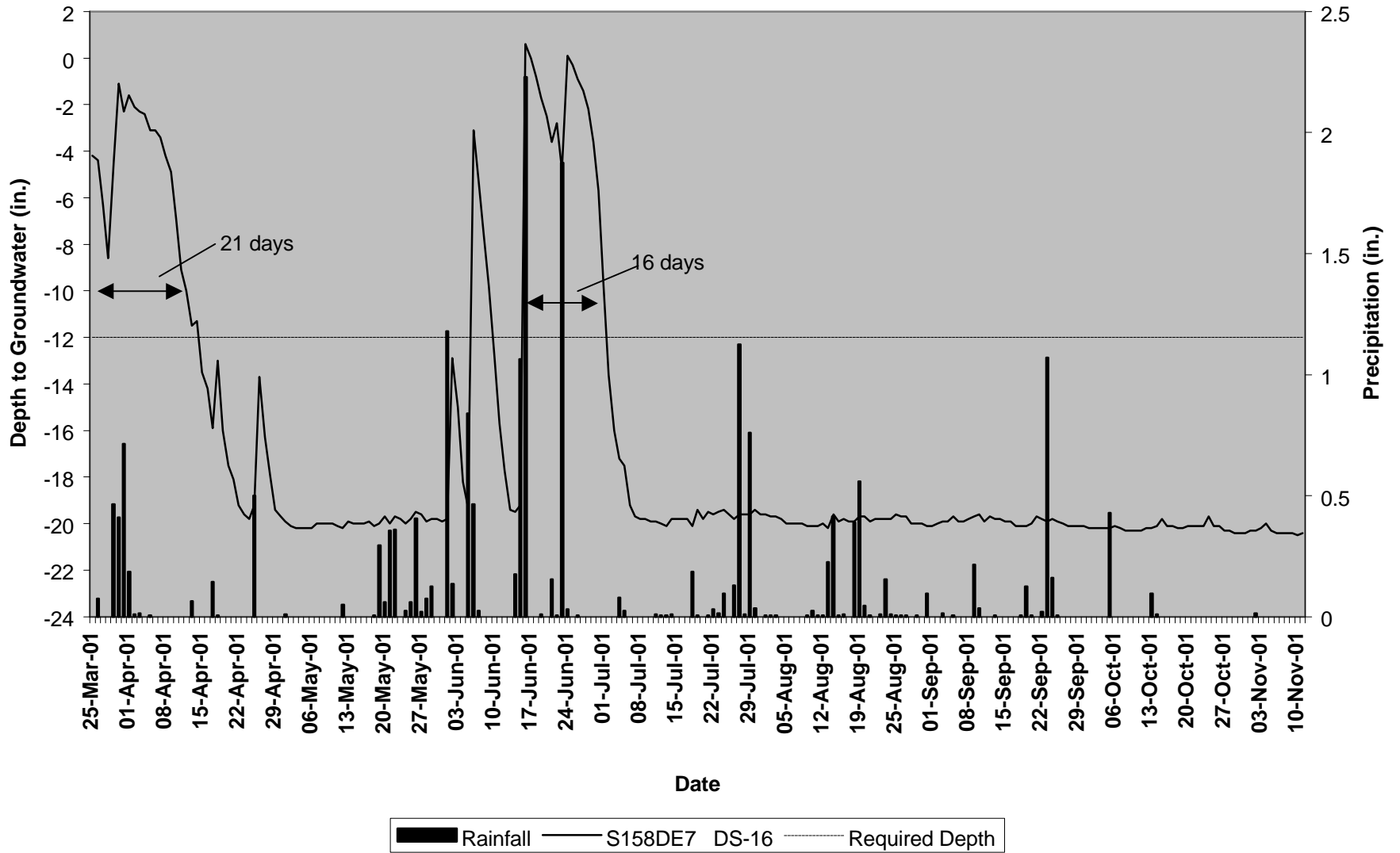


■ Rainfall — S158CCF DS-14 - - - Required Depth

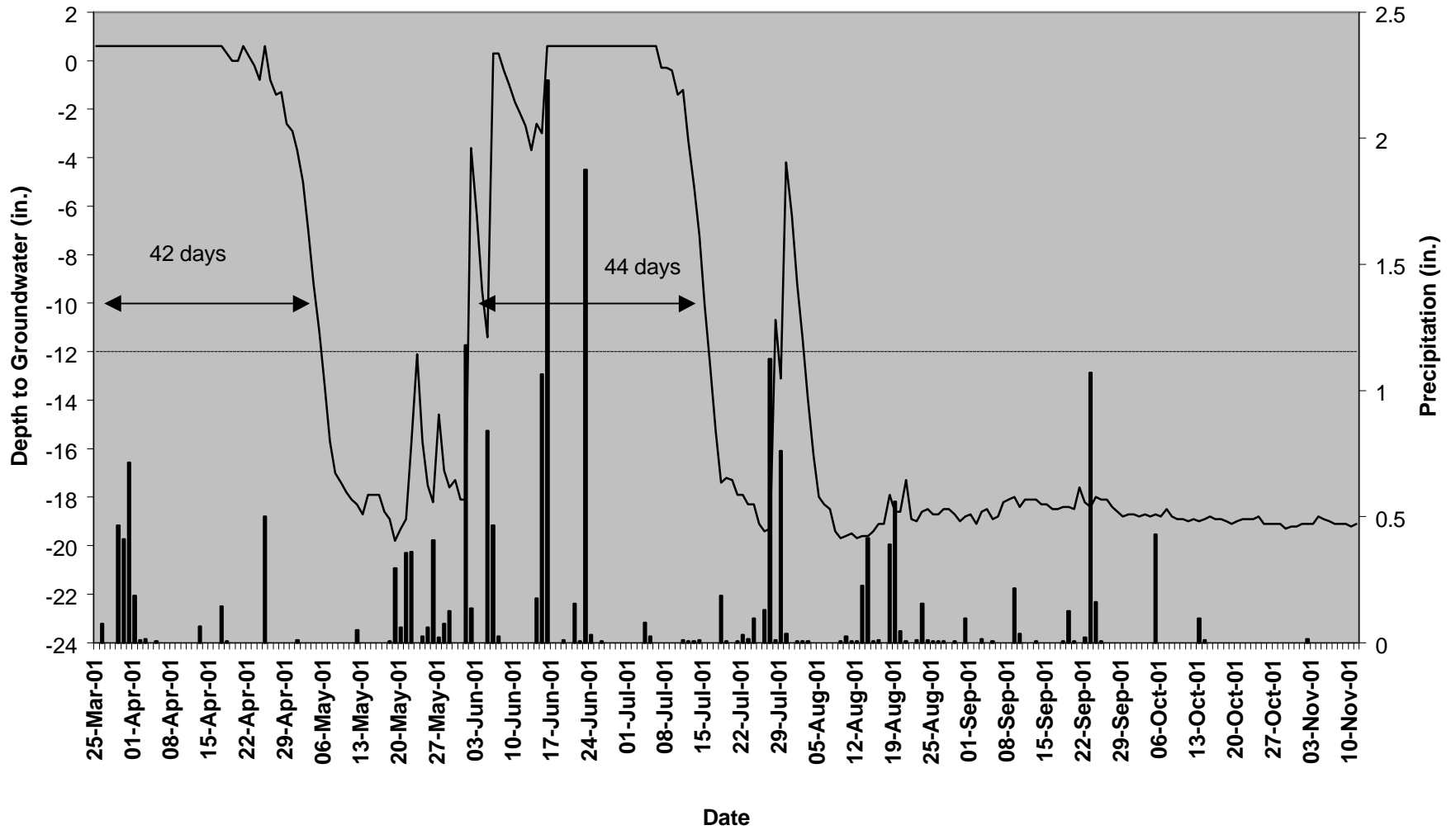
Dismal Swamp-G15



Dismal Swamp-G16

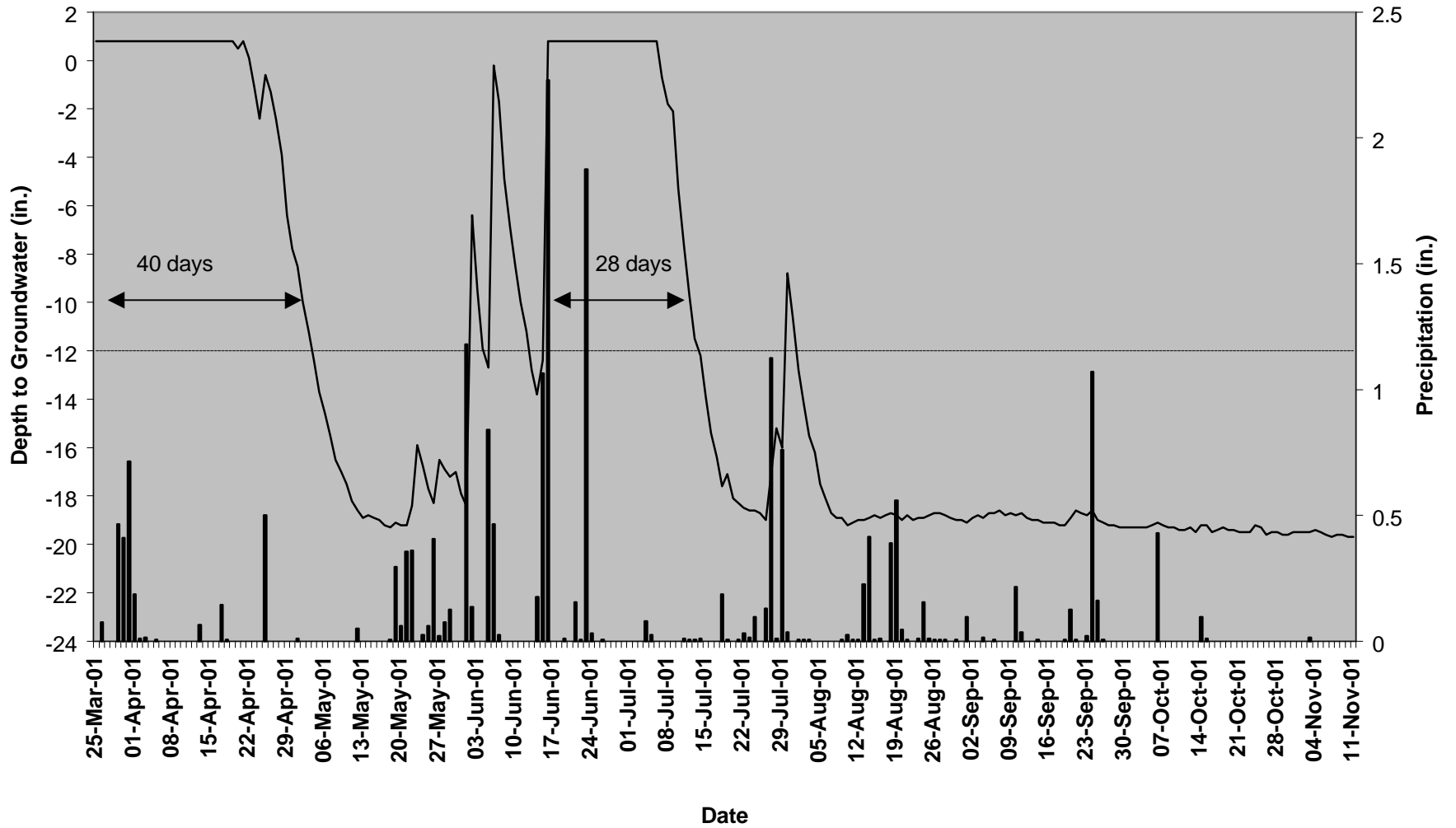


Dismal Swamp-G17



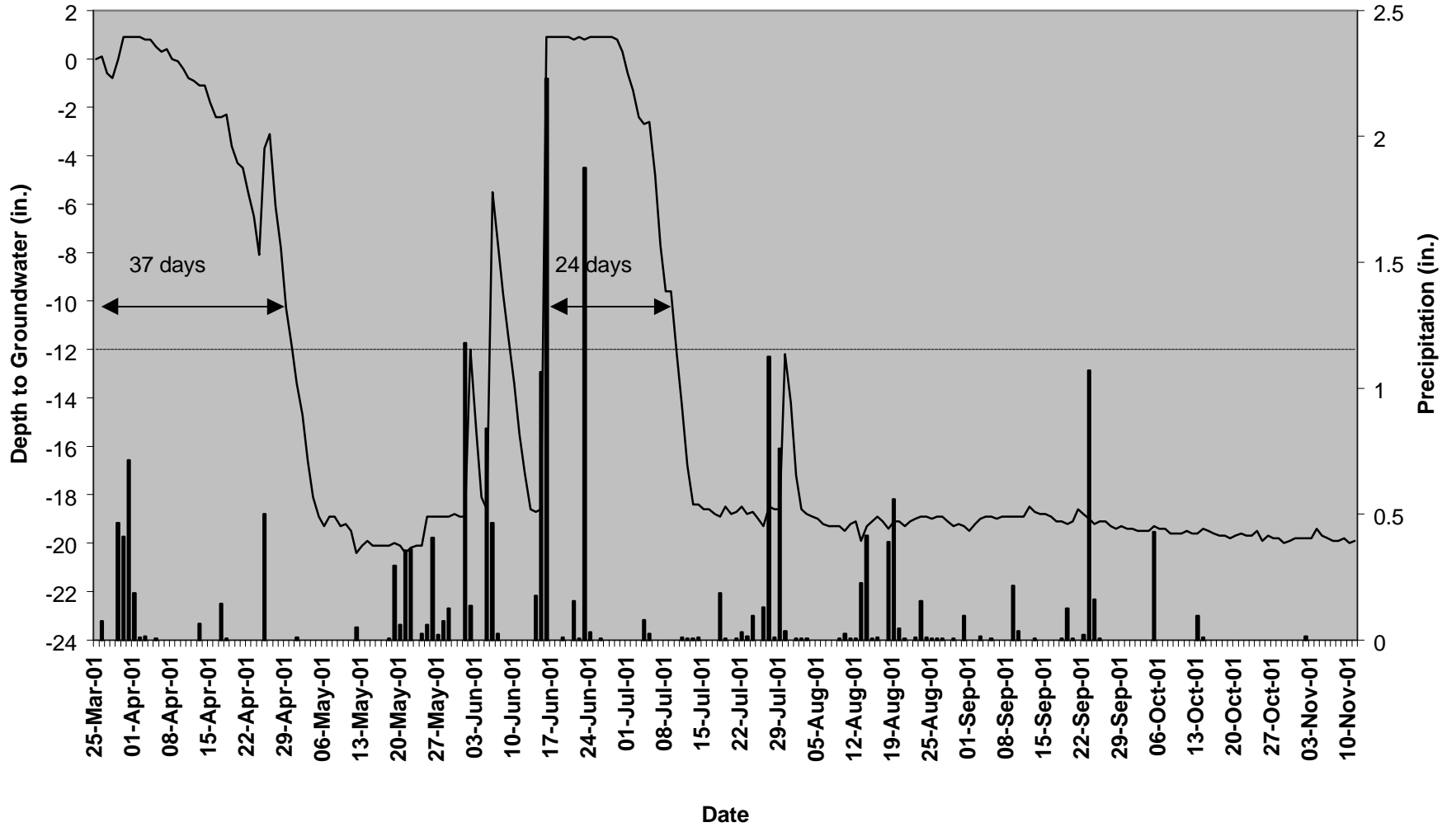
■ Rainfall — S158C28 DS-17 - - - - Required Depth

Dismal Swamp-G18



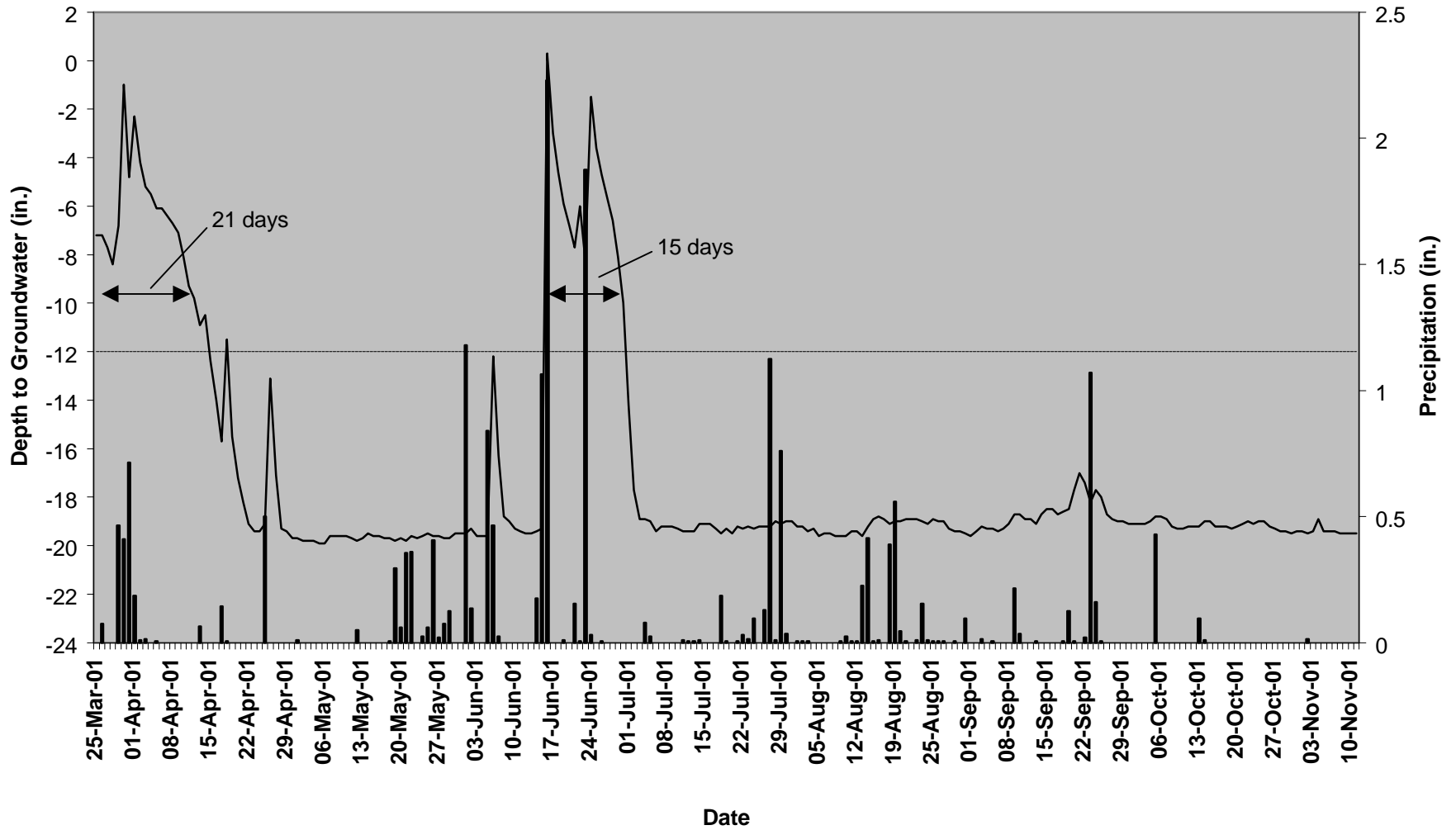
■ Rainfall — S213D73 DS-18 - - - Required Depth

Dismal Swamp-G19



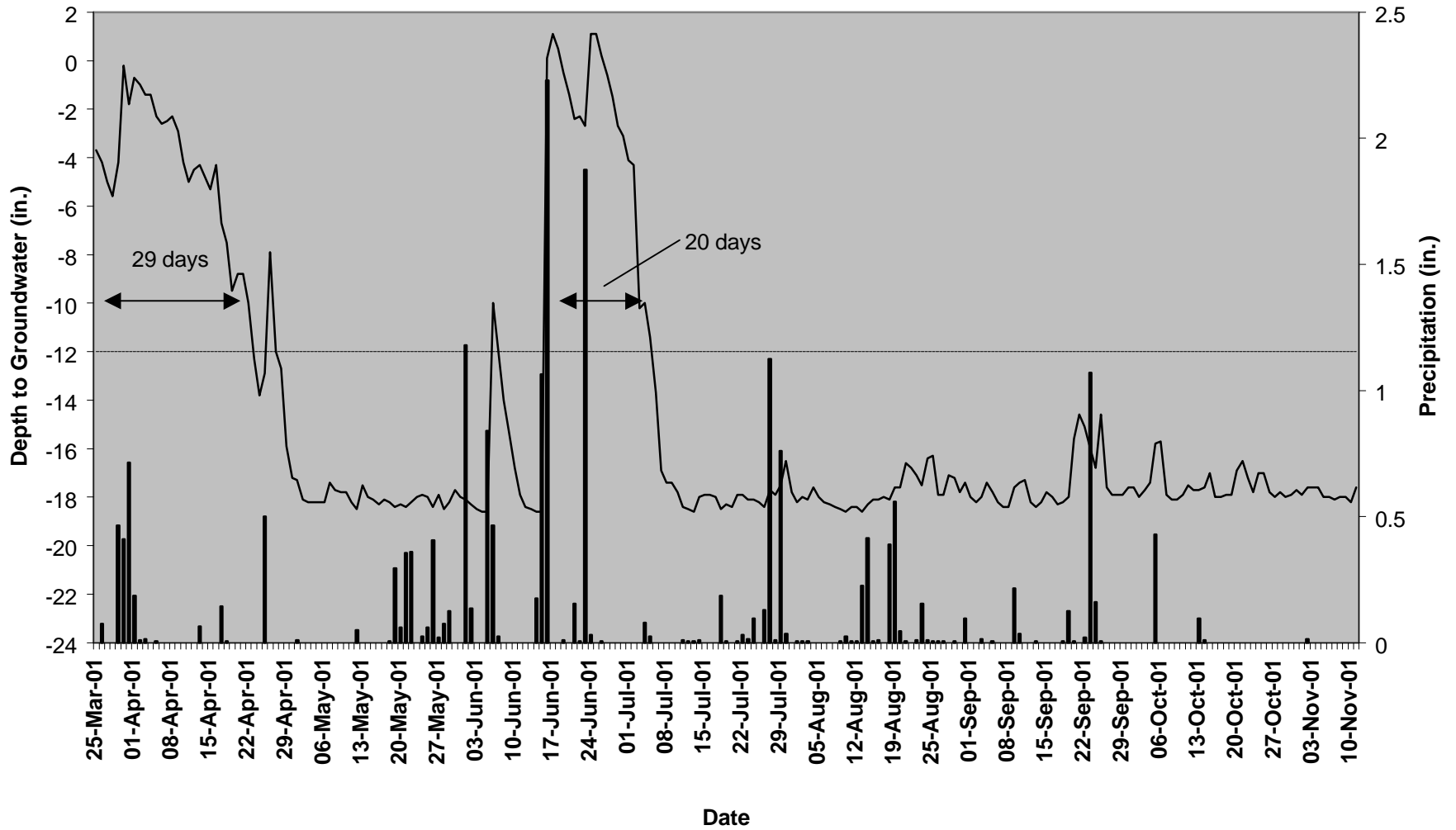
■ Rainfall — S126FF5 DS-19 - - - Required Depth

Dismal Swamp-G20



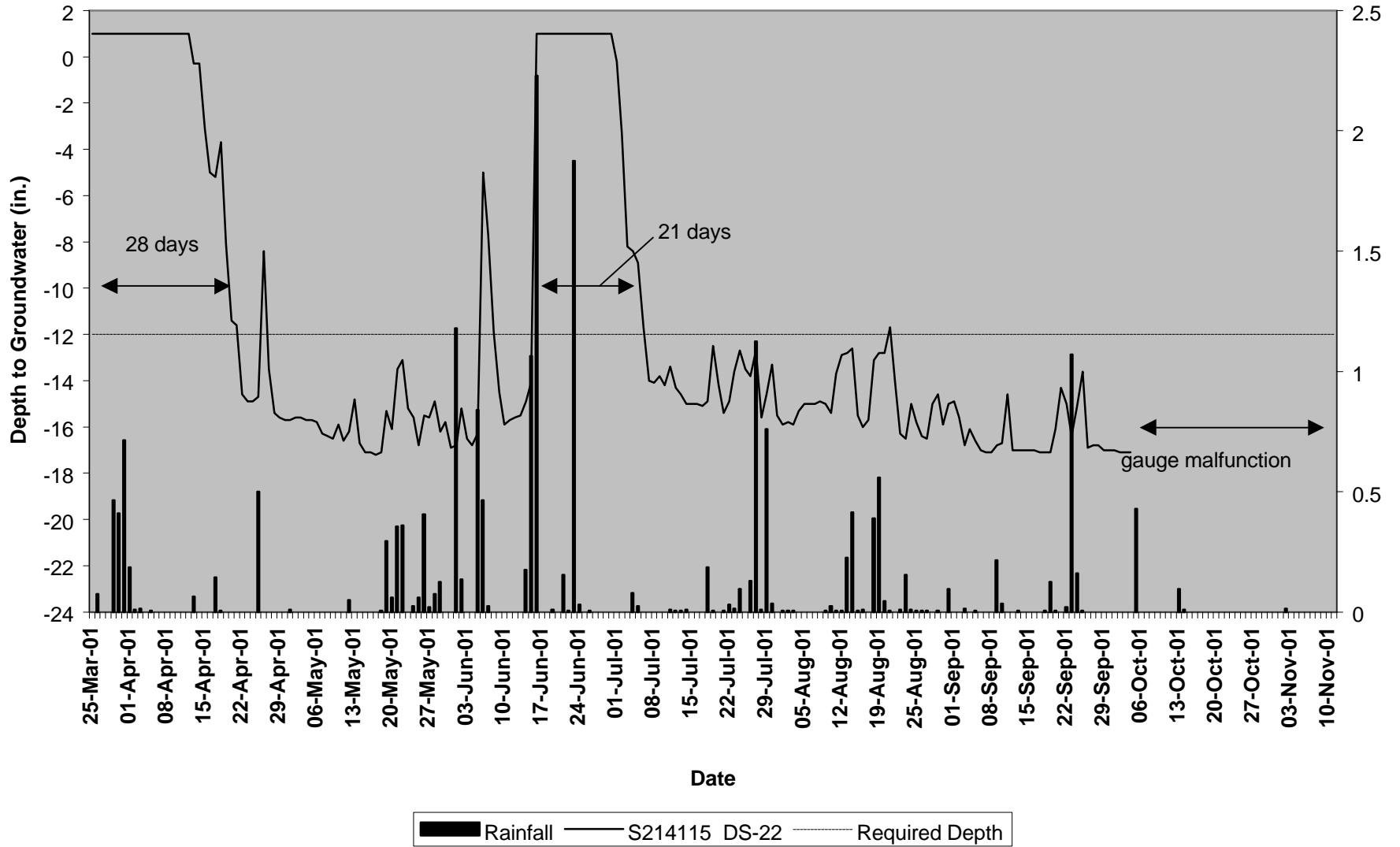
■ Rainfall — S126FBD DS-20 Required Depth

Dismal Swamp-G21

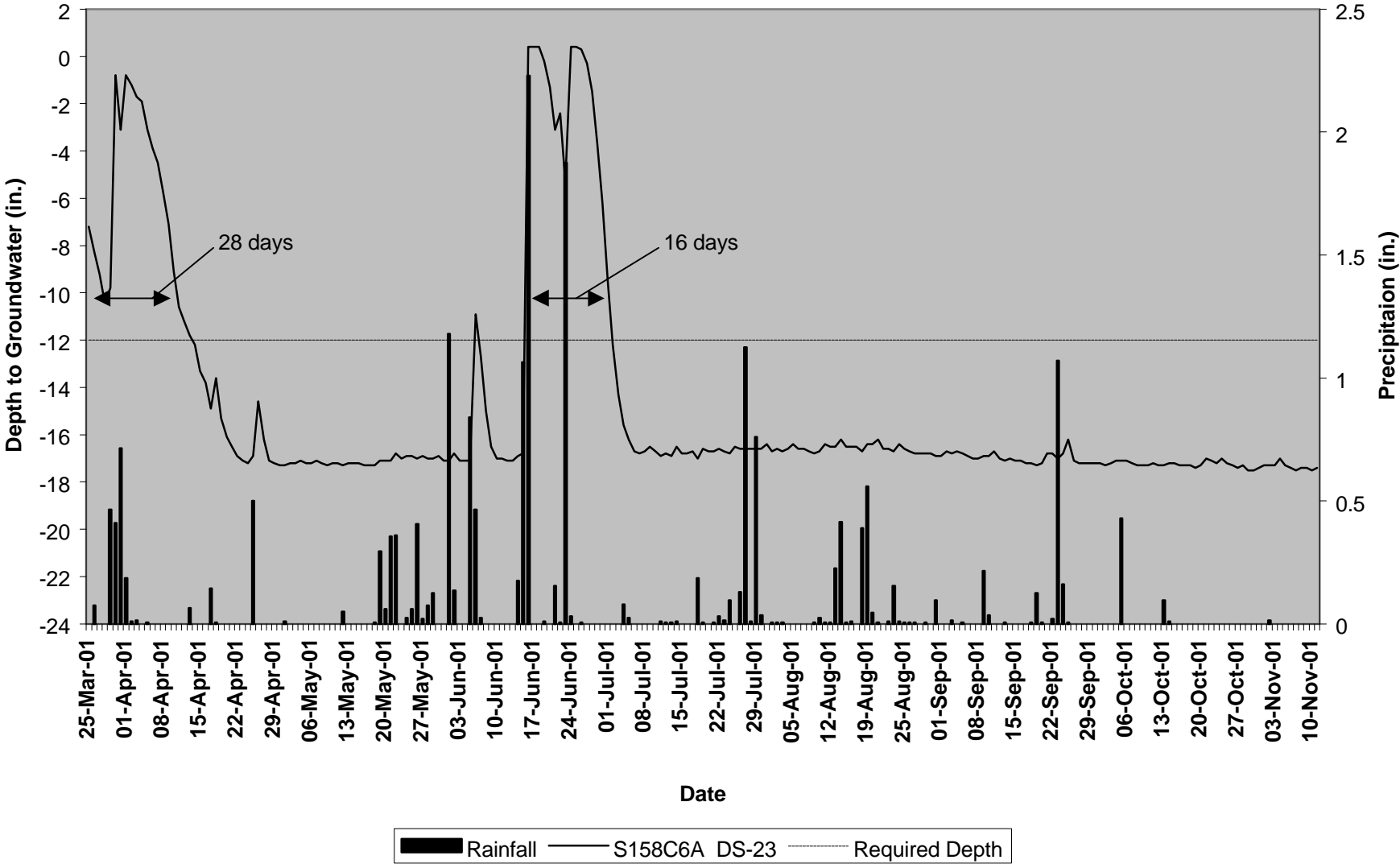


■ Rainfall — S1EC6ED DS-21 - - - - Required Depth

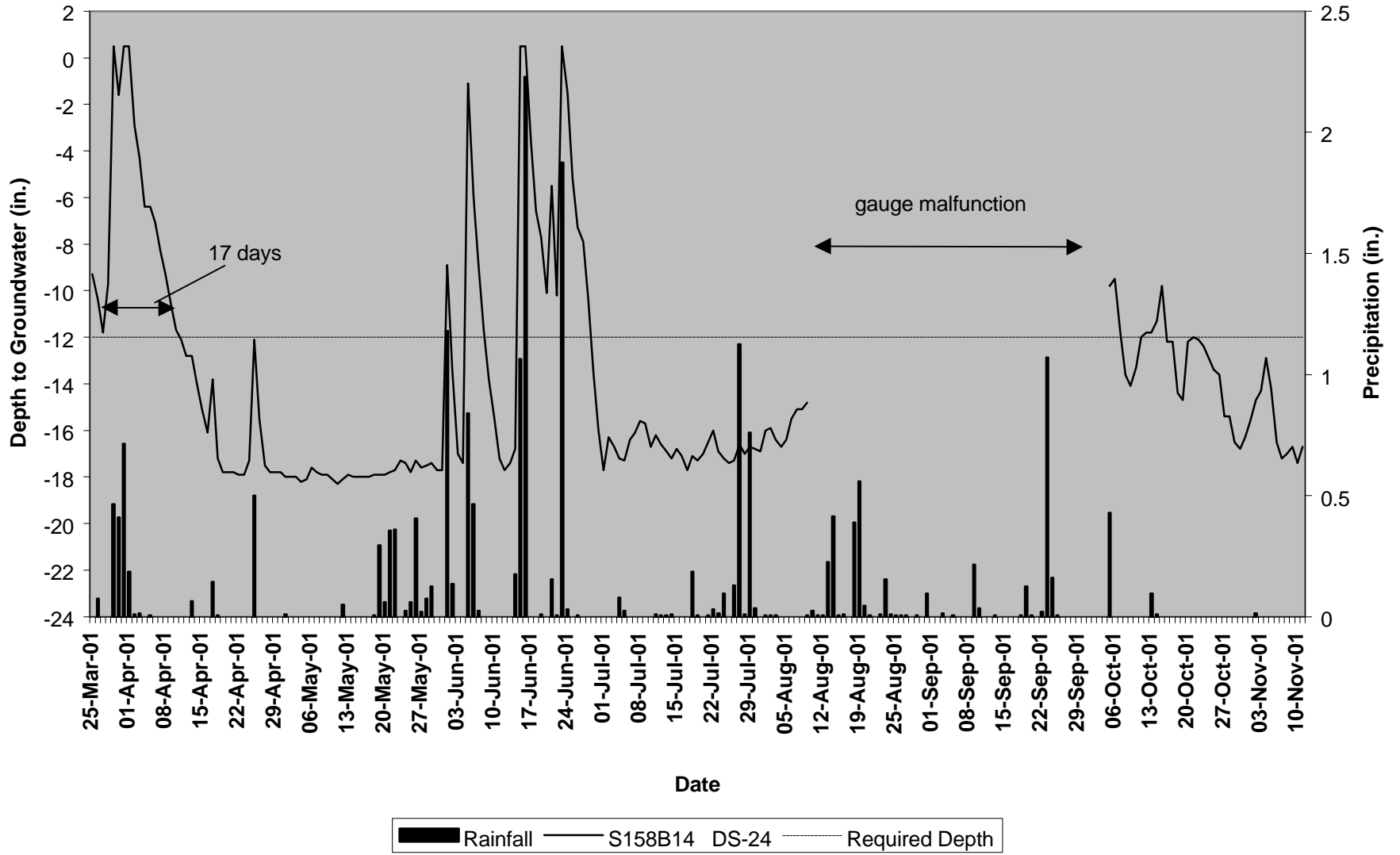
Dismal Swamp-G22



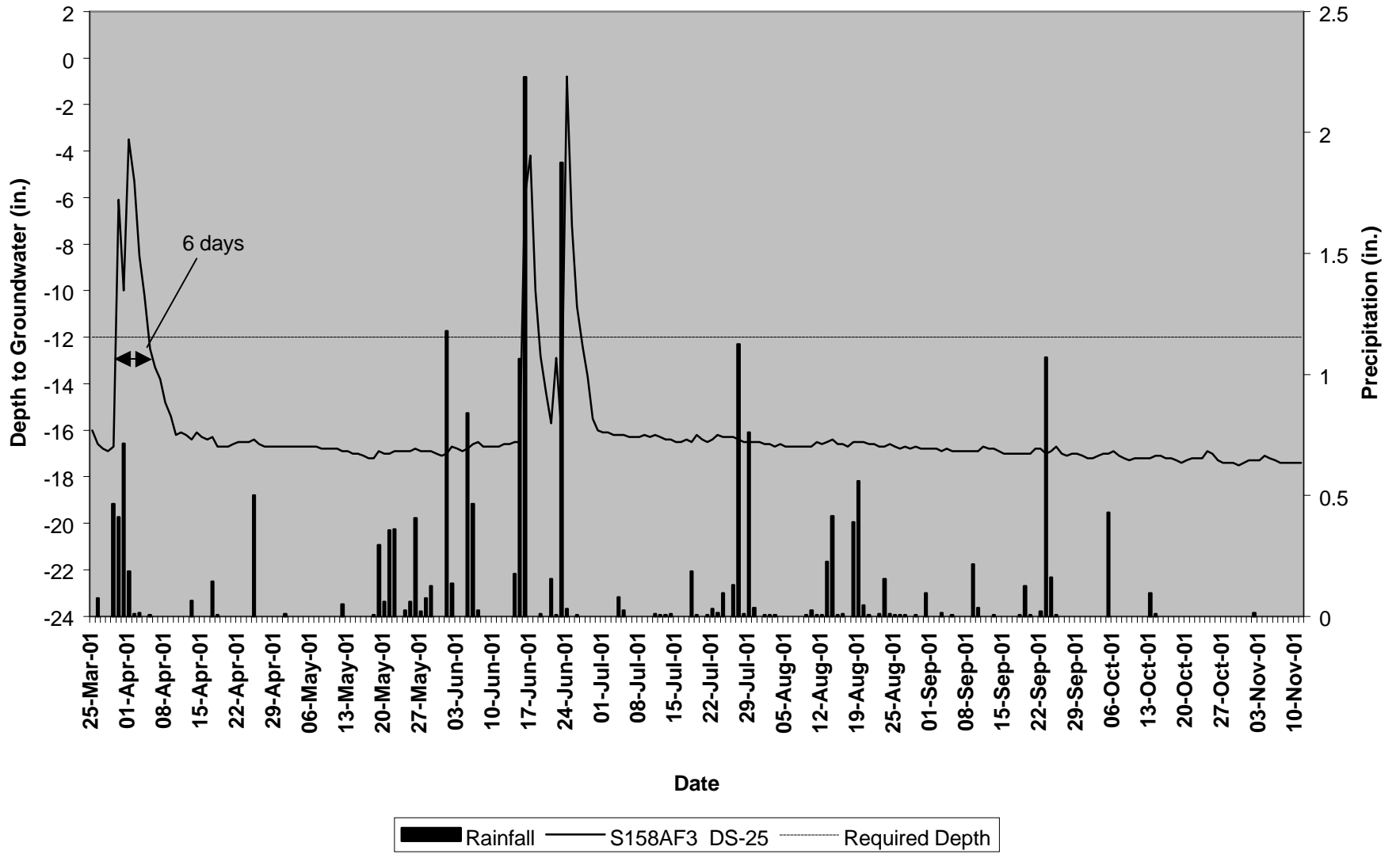
Dismal Swamp-G23



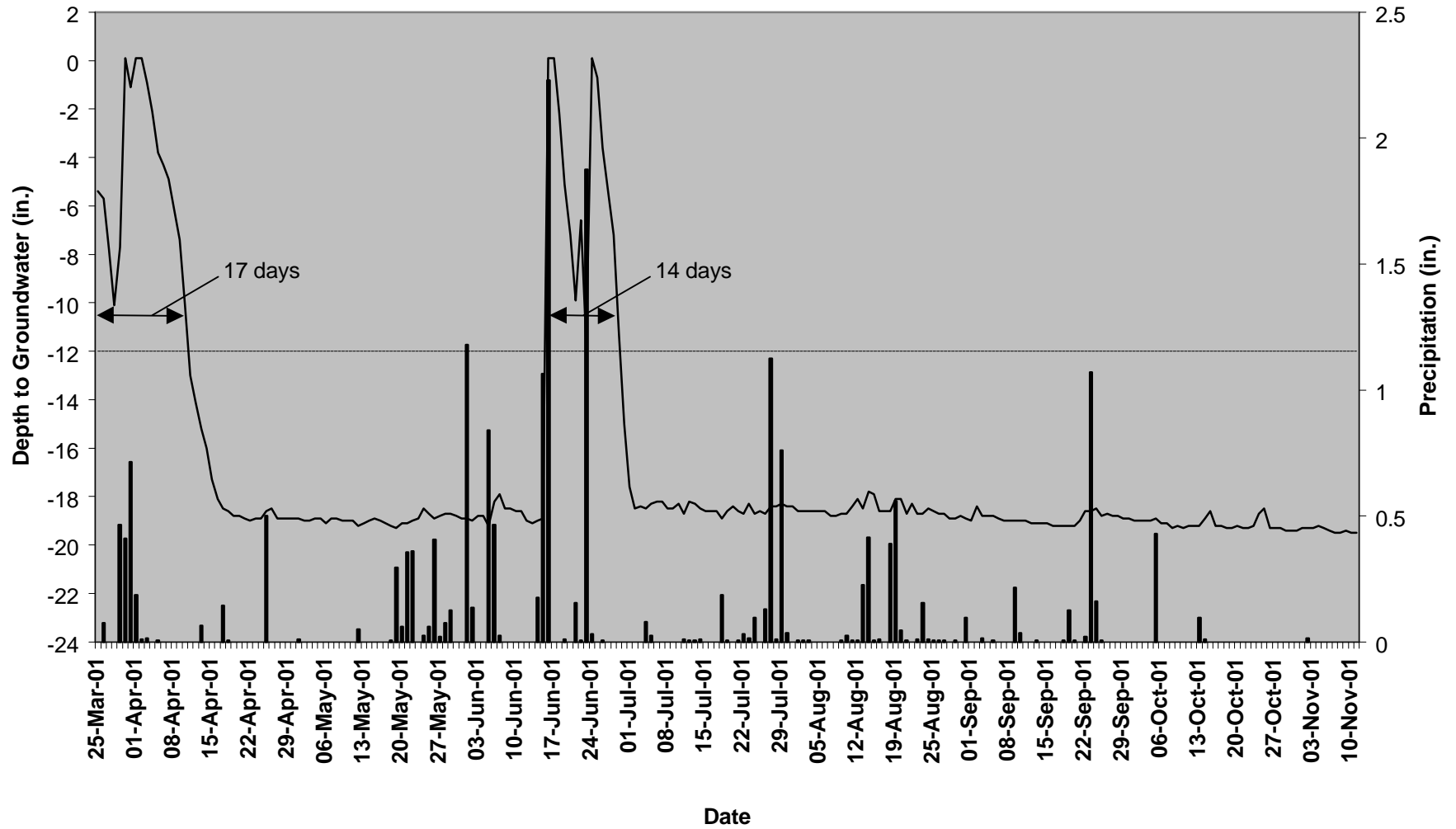
Dismal Swamp-G24



Dismal Swamp-G25

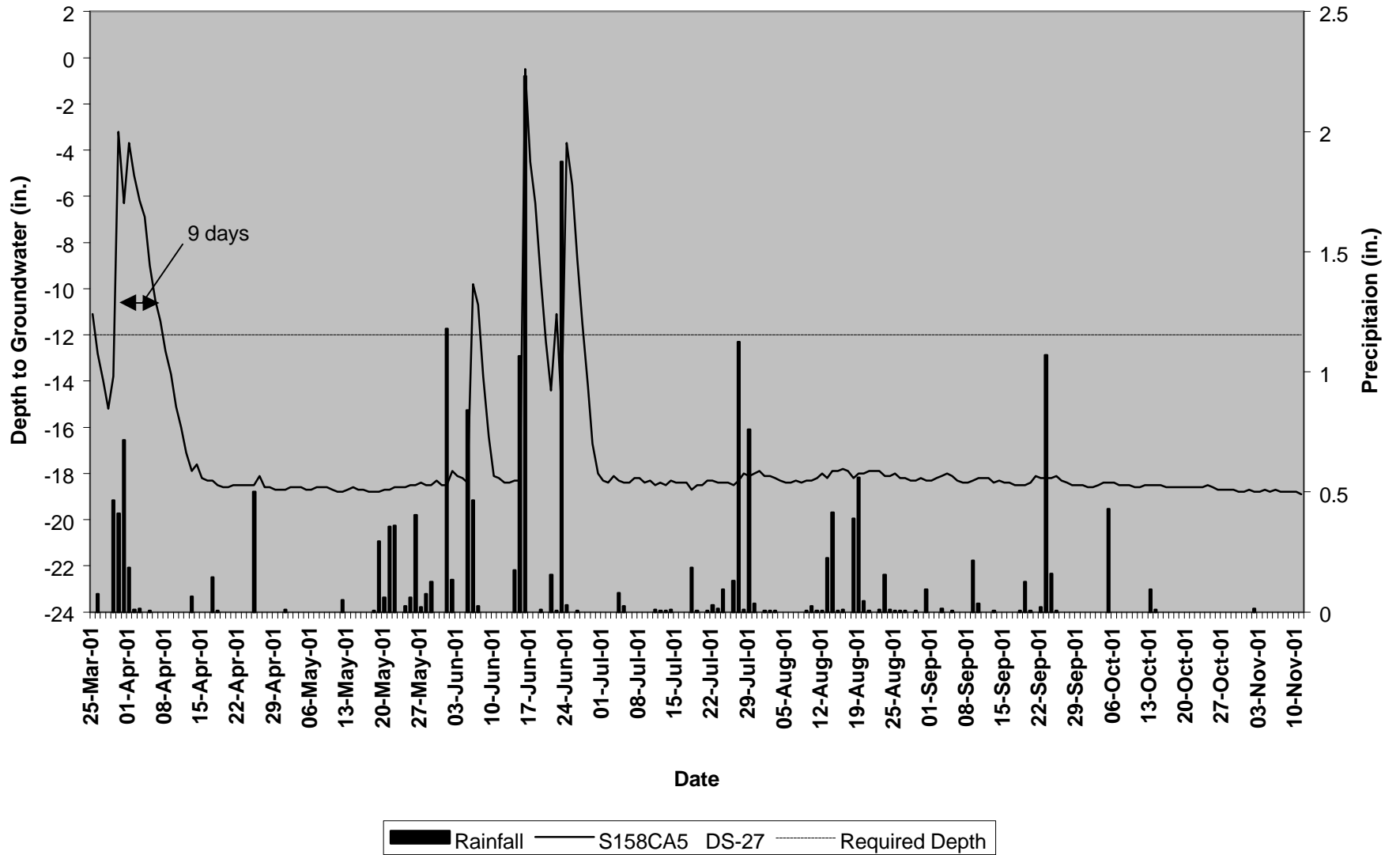


Dismal Swamp-G26



■ Rainfall — S213FB6 DS-26 - - - Required Depth

Dismal Swamp-G27



APPENDIX B: SITE PHOTOS

Dismal Swamp



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

Dismal Swamp



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11

APPENDIX C: VEGETATIVE MONITORING PLAN

DISMAL SWAMP MITIGATION SITE PHOTO AND PLOT LOCATIONS

2001 MONITORING

