

Key Branch Wetland and Stream Restoration Site Year-5 Annual Monitoring Report (2008)

**Anson County, North Carolina
WBS Element 34398.4.1
TIP No. R-2239WM**



Submitted to:

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



Submitted by:

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EXECUTIVE SUMMARY

The 118 acre Key Branch Wetland and Stream Restoration Site (hereafter referred to as the "Site") was constructed in Anson County in 2003. The Site must meet jurisdictional success criteria for both wetland hydrology and vegetation for five consecutive years or until the Site is deemed successful. The following report details the Year-5 monitoring of wetland hydrology and vegetation during the 2008 growing season. Wetland restoration is monitored with thirteen groundwater gauges and eight vegetation plots located throughout the Site. Stream monitoring was not undertaken during Year-5 monitoring at the request of the North Carolina Ecosystem Enhancement Program (EEP).

Thirteen groundwater gauges were monitored in 2008, of which eight met the success criteria for jurisdictional hydrology (saturation within 12" of the surface for greater than 12.5 percent of the growing season). An additional five gauges partially met criteria, maintaining saturation at the surface for between 5 percent and 12.5 percent of the growing season. This result far exceeds Monitoring Year 3 and 4 in which only two of fourteen groundwater gauges met the wetland criteria in those years.

Four vegetation plots established under North Carolina Department of Transportation (NCDOT) protocol, and four riparian vegetation plots established following replanting in 2005 were monitored to measure woody stem density. In Monitoring Year 5, the Site revealed an average tree density of 609 trees per acre within the wetland restoration acreage (wetland vegetation plots) and an average tree density of 198 trees per acre for the stream restoration acreage (riparian vegetation plots). This leads to an overall average of 403 trees per acre which is significantly higher than the minimum success criteria of 260 trees per acre for Year 5. Vegetation success is partially due to replanting that was completed in February 2005.

1. INTRODUCTION

1.1. Project Description

The Key Branch Wetland and Stream Restoration Site is located in Anson County and encompasses approximately 118 acres. It is situated between Lower White Store Road (SR 1252) and Mineral Springs Church Road (SR 1240) (Figure 1).

1.2. Purpose

In order to demonstrate successful mitigation, the Site must be monitored for a minimum of five years or until success criteria are achieved. Success criteria are based on federal guidelines for wetland mitigation. Criteria for hydrologic conditions and vegetation survival are included in these documents. The following report describes the results of the hydrologic and vegetation monitoring during the 2008 growing season at the Key Branch Mitigation Site. During the 2008 monitoring season, EEP has instructed its monitoring contractors to suspend further stream surveys of Key Branch. Drought conditions experienced in 2007 has resulted in lower than average channel flow, with significant periods of no-flow. The presence of several beaver impoundments has further interrupted normal fluvial conditions. These channel conditions persisted through the 2008 monitoring period, and wetland vegetation has established throughout the constructed channel.

1.3. Project History

Fall 2003	Construction
November 2003	Site Planted
March-November 2004	Hydrologic Monitoring (Year 1)
July 2004	Vegetation Monitoring (Year 1)
February 2005	Site Replanted
March-November 2005	Hydrologic Monitoring (Year 2)
August 2005	Vegetation Monitoring (Year 2)
March-November 2006	Hydrologic Monitoring (Year 3)
September 2006	Vegetation Monitoring (Year 3)
March-November 2007	Hydrologic Monitoring (Year 4)
September 2007	Vegetation Monitoring (Year 4)
October 2008	Hydrologic Monitoring (Year 5)
October 2008	Vegetation Monitoring (Year 5)

2. HYDROLOGY

2.1. Success Criteria

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology requires that these areas be inundated or saturated (within 12 inches of the surface) by surface or groundwater for at least a consecutive 12.5 percent of the growing season. Areas inundated for less than 5 percent of the growing season are classified as non-wetlands. Areas inundated between 5 percent and 12.5 percent of the growing season can be classified as wetlands depending upon such factors as the presence of wetland vegetation and hydric soils.

The growing season in Anson County begins March 11 and ends November 23 (258 days). These dates correspond to a 50 percent probability that air temperatures will not drop below 28°F or lower after March 22 and before November 15. Minimum wetland hydrology is required for at least 12.5 percent of this growing season; for Anson County, 12.5 percent equals 30 consecutive days. Local climate must represent average conditions for the area.

2.2. Hydrologic Description

On-Site hydrologic monitoring is facilitated by thirteen groundwater gauges located throughout the wetland restoration (Figure 2). During the 2008 monitoring season, groundwater data was collected from all monitoring gauges with the exception of gauge KBMG13, which could not be located.

2.3. Results of Hydrologic Monitoring

2.3.1. Site Data

The maximum number of consecutive days that groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 258-day growing season. The results are summarized in Table 1.

Appendix B contains hydrographs of the water depth for each groundwater gauge. In general, groundwater levels show a typical pattern of flooding or high water table during the winter to early spring, followed by a summer and early fall drawdown period, punctuated by peaks of associated precipitation events. The hydrologic monitoring results of the groundwater gauges are illustrated in Figure 2.

Table 1. Key Branch Tract Hydrologic Monitoring Results

Monitoring Gauge*	<5%	5-12.5%	>12.5%	Actual %	Success Dates	Number of Days Gauges met Success Criteria
KBMG1			✓	30	March 11 – May 24	75
KBMG2		✓		9.2	August 26 – September 17	23
KBMG3			✓	21.6	March 11 – May 3	54
KBMG4			✓	22	March 11 – May 4	55
KBMG5		✓		8	August 27 – September 15	20
KBMG6			✓	39.2	August 14 – November 19	98
KBMG7			✓	39.2	August 14 – November 19	98
KBMG8			✓	39.2	August 14 – November 19	98
KBMG9	✓			0		0
KBMG10		✓		7.6	March 11 – March 29	19
KBMG11			✓	15.6	March 11 – April 18	39
KBMG12			✓	39.6	August 13 – November 19	99
KBMG14		✓		7.2	March 11 – March 28	18

2.3.2. Climatic Data

Figure 3 shows a comparison of 2008 monthly rainfall to historical precipitation for the area. This comparison indicates whether 2008 was “average” in terms of climate conditions by comparing the 2008 monthly rainfall to that of historical monthly rainfall. The figure averages all rainfall data collected between 1948 and 2008 and compares the monthly amounts below which 30 percent and 70 percent of all observations may be found with the actual 2007 monthly rainfall amount.

The Site experienced four months of above average rainfall: December 2007, and February, April, August, and September 2008. March 2008 was within one inch of the March average. The rest of the months experienced above-average rainfall ranging from 0.23 to 8.75 inches above normal. Overall, 2008 averaged 3.94 inches above average rainfall for the year.

2.4. Conclusions

Eight of the thirteen groundwater-gauges monitored in 2008 met the success criteria for jurisdictional hydrology (saturation within 12" of the surface for greater than 12.5 percent of the growing season). An additional four gauges measured saturation within 12" of the surface between 5 percent and 12.5 percent of the growing season. Only one gauge, KBMG9, never recorded surface saturation during the growing season.

3. VEGETATION: KEY BRANCH MITIGATION SITE MONITORING YEAR 5

3.1. Success Criteria

According to the 2003 USACE Stream Mitigation Guidelines, the success criteria for vegetation requires that at least 320 stems per acre must survive after the completion of the third growing season. The required survival criterion will decrease by 10 percent 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). NCDOT Stem Counting Protocol was used as the standard sampling methodology.

3.2. Description of Species

Based on the mitigation plan, the wetland restoration area and the riparian restoration area were to be planted with the following species:

Wetland

Quercus pagoda, Cherrybark Oak
Quercus phellos, Willow Oak
Quercus michauxii, Swamp Chestnut Oak
Quercus lyrata, Overcup Oak
Quercus nigra, Water Oak
Ulmus americana, American Elm
Fraxinus pennsylvanica, Green Ash
Betula nigra, River Birch

Riparian

Betula nigra, River Birch
Salix nigra, Black Willow
Cephalanthus occidentalis, Buttonbush
Cornus amomum, Silky dogwood

A detailed as-built planting plan was not available for the Site.

3.3. Results of Vegetation Monitoring

Stem counts were low in Riparian Plots 5 and 6. Within the plots, herbaceous cover was 100 percent, and generally a monoculture existed with little to no diversity (plot photos are provided in Appendix B). There was no observed reason for the low stem counts other than aggressive herbaceous growth. The average stem density for the

riparian plots were less than the 260 stems per acre needed for the success criteria; however, the overall average for the Site was 404 stems per acre, significantly over the criteria needed for success.

Table 2. Results of Riparian Vegetation Plots Monitoring

Riparian Plots	Betula nigra	Fraxinus pennsylvanica	Quercus laurifolia	Quercus lyrata	Quercus michauxii	Quercus nigra	Salix nigra	Total (Year 5)	Density (Trees/acre)
R1	5	12	2	5	0	0	10	34	340
R5	4	0	0	2	1	0	1	8	80
R6	3	3	0	2	2	1	0	11	110
R10	1	12	0	7	6	0	0	26	260
TOTAL	13	27	2	16	9	1	11	79	790
Average Tree Density: 198									

Table 3. Results of Wetland Vegetation Plots Monitoring

Wetland Plots	Acer negundo	Acer rubrum	Betula nigra	Diospyros virginiana	Fraxinus pennsylvanica	Liquidambar styraciflua	Quercus laurifolia	Quercus lyrata	Quercus michauxii	Quercus nigra	Sambucus canadensis	Ulmus alata	Total Stems	Density (trees/acre)
D2	0	0	2	0	6	0	1	14	2	6	1	0	32	561
D3	0	0	4	0	33	0	1	11	0	0	0	5	54	947
D5	1	1	3	2	10	2	3	4	8	1	0	0	35	350
D8	1	2	1	0	3	0	0	19	5	2	0	0	33	579
Totals	2	3	10	2	52	2	5	48	15	9	1	5	154	2438

**Average Tree
Density 609**

Summary tables of the stem count sampling results for monitoring years 2 through 5 are provided below for Riparian and Wetland plots.

Table 4. Riparian Plot Vegetation Summary Data

Species	Riparian Plot Numbers																		
	2005*	26	21	22	20	19	18	17	16	15	13	14	12	11	10	9	23	24	25
	2006*	26	21	22	20	19	18	17	16	15	13	14	12	11	10	9	23	24	25
	2007	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
	2008	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
<i>Betula nigra</i> (River birch)	2005	2	0	0	0	1	0	0	0	1	0	0	0	0	1	3	5	0	1
	2006	2	0	0	0	1	0	2	0	1	0	0	0	1	1	3	6	0	1
	2007	1	0	0	0	1	0	1	0	2	0	0	0	1	3	3	ns	ns	ns
	2008	5	ns**	ns	ns	4	3	ns	ns	ns	1	ns	ns	ns	ns	ns	ns	ns	ns
<i>Fraxinus pennsylvanica</i> (Green ash)	2005	0	3	0	1	1	1	0	0	0	1	0	1	0	0	0	0	1	0
	2006	1	5	0	4	1	3	0	0	0	3	4	1	0	0	0	1	1	2
	2007	0	4	4	7	1	2	0	0	0	3	5	1	0	0	0	ns	ns	ns
	2008	12	ns	ns	ns	0	3	ns	ns	ns	12	ns	ns	ns	ns	ns	ns	ns	ns
<i>Quercus laurifolia</i> (Laurel oak)	2005	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2006	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
	2007	0	0	0	0	0	1	0	0	0	1	0	0	0	0	0	ns	ns	ns
	2008	2	ns	ns	ns	0	0	ns	ns	ns	0	ns	ns	ns	ns	ns	ns	ns	ns
<i>Quercus lyrata</i> (Overcup oak)	2005	1	1	1	1	1	4	0	0	2	0	0	0	1	0	0	0	0	0
	2006	0	1	0	1	0	4	0	0	3	0	0	0	0	0	0	0	0	1
	2007	0	1	1	1	1	3	0	0	3	0	0	0	0	0	0	ns	ns	ns
	2008	5	ns	ns	ns	2	2	ns	ns	ns	7	ns	ns	ns	ns	ns	ns	ns	ns
<i>Quercus michauxii</i> (Swamp chestnut oak)	2005	0	0	0	0	0	0	0	0	1	1	1	1	0	0	0	0	1	1
	2006	0	1	0	0	0	0	0	0	0	0	1	1	0	0	0	0	1	1
	2007	0	1	0	0	0	0	0	0	0	2	1	1	0	0	0	ns	ns	ns
	2008	0	ns	ns	ns	1	2	ns	ns	ns	6	ns	ns	ns	ns	ns	ns	ns	ns
<i>Salix nigra</i> (Black willow)	2005	1	2	3	1	1	7	2	0	0	0	0	0	0	0	6	3	0	0
	2006	1	2	0	2	3	7	0	2	0	0	0	0	0	0	6	9	0	0
	2007	1	2	3	0	3	5	0	2	0	0	0	0	0	0	10	ns	ns	ns
	2008	10	ns	ns	ns	1	0	ns	ns	ns	0	ns	ns	ns	ns	ns	ns	ns	ns

*Old plot numbers are given for 2005 - 2006

**ns = "not sampled" per NCEP instructions (a reduction in the number of riparian plots from 15 plots to 4)

Table 5. Wetland Plot Vegetation Summary Data

	Wetland Plot Numbers								
	Year	1	2	3	4	5	6	7	8
<i>Betula nigra</i> (River birch)	2005	6	0	3	1	0	0	0	1
	2006	4	0	3	1	1	0	0	1
	2007	6	1	4	4	4	1	2	2
	2008	ns*	2	4	ns	3	ns	ns	1
<i>Fraxinus pennsylvanica</i> (Green ash)	2005	10	3	11	1	0	10	1	4
	2006	4	2	16	1	0	16	5	4
	2007	10	4	32	4	6	10	8	11
	2008	ns	6	33	ns	10	ns	ns	3
<i>Quercus laurifolia</i> (Laurel oak)	2005	0	7	0	0	0	2	15	0
	2006	0	3	0	0	2	2	7	0
	2007	0	8	2	0	4	2	3	4
	2008	ns	1	1	ns	3	ns	ns	0
<i>Quercus lyrata</i> (Overcup oak)	2005	4	14	11	0	4	28	10	0
	2006	0	5	11	0	4	23	8	3
	2007	2	8	8	0	10	26	9	15
	2008	ns	14	11	ns	4	ns	ns	19
<i>Quercus michauxii</i> (Swamp chestnut oak)	2005	11	2	0	0	2	0	3	4
	2006	5	2	0	0	1	0	1	4
	2007	11	2	0	0	6	0	4	6
	2008	ns	2	0	ns	8	ns	ns	5
<i>Quercus pagoda</i> (Cherrybark oak)	2005	1	0	0	0	8	0	0	7
	2006	2	3	0	0	1	1	0	0
	2007	0	0	0	0	0	3	0	1
	2008	ns	0	0	ns	0	ns	ns	0
<i>Quercus phellos</i> (Willow oak)	2005	2	2	1	0	0	4	7	0
	2006	0	0	2	0	0	4	9	0
	2007	1	1	1	0	0	6	11	0
	2008	ns	0	0	ns	0	ns	ns	0
<i>Salix nigra</i> (Black willow)	2005	0	0	0	0	0	0	0	0
	2006	1	0	0	1	0	0	0	0
	2007	0	0	0	2	0	0	0	0
	2008	ns	0	0	ns	0	ns	ns	0

* ns = not sampled

3.4. Conclusions

Of the 118 acres on-Site, approximately 70.2 acres involved tree planting. There were eight vegetation monitoring plots established by NCDOT throughout the wetland planting areas in 2004 (Year 1), with an average stem density of 680 stems/acre. When below-average densities were found, the Site was replanted in February 2005. In subsequent monitoring events, the average density for wetland plots increased from

521 stems per acre in Monitoring Year 2 (2005) to 535 stems per acre in Monitoring Year 3 (2006) to 733 stems per acre in Monitoring Year 4 (2007). In Monitoring Year 5 (2008), four of the eight DOT plots were selected for sampling (D2, D3, D5 and D8). The average density for the four plots in wetland planting areas exceeded the minimum success criteria at 609 stems per acre.

In Monitoring Year 2, 130 new plots were added within wetland planting areas. Monitoring results from 2005 (443 stems per acre) and 2006 (486 stems per acre) revealed that average densities across the Site exceeded the minimum success criteria of 320 stems per acre, and were reasonably consistent with the results from the eight NCDOT wetland plots.

Eighteen of the 130 new plots were riparian plots that were incorporated into the sampling methodology in 2005. Monitoring results from the riparian plots indicated that average densities in 2005 (326 stems per acre), 2006 (362 stems per acre) and 2007 (542 stems per acre) exceeded minimum success criteria of 320 stems per acre. In 2008, four of the eighteen riparian plots were selected for sampling. The average density for these four plots in 2008 was 198 stems per acre. The smaller sample size may be responsible for the lowered average density; nonetheless, these plots cannot be said to meet the success criteria of 260 stems per acre at Year 5. However, when averaged with the NCDOT wetland plots, the overall stem density is 404 stems per acre.

4. OVERALL CONCLUSIONS/RECOMMENDATIONS

Monitoring Year 5 (2008) resulted in an average density of 609 trees per acre based on sampling results for four of the original eight NCDOT wetland plots, and an average density of 198 trees per acre for four of the original fifteen riparian plots. The average of the two groups exceeded the minimum success criteria of 260 trees per acre for Year 5.

Eight of the thirteen groundwater gauges sampled in 2008 met the success criteria for jurisdictional hydrology (saturation within 12 inches of the surface for greater than 12.5 percent of the growing season). An additional five gauges were saturated for between 5 percent and 12.5 percent of the growing season.

Although stream measurements of Key Branch were not collected during the current monitoring year, a visual assessment can be summarized. A cursory review of Key Branch indicates overall stability and very few areas exhibiting scour or erosion. Flow within the channel has diminished due to the presence of beaver dams, and water levels remain at bankfull elevation, likely due to persistent beaver activity. Additionally, anglestem primrose-willow (*Ludwigia leptocarpa*) was found growing densely throughout the entire channel, in both riffles and pools.

5. REFERENCES

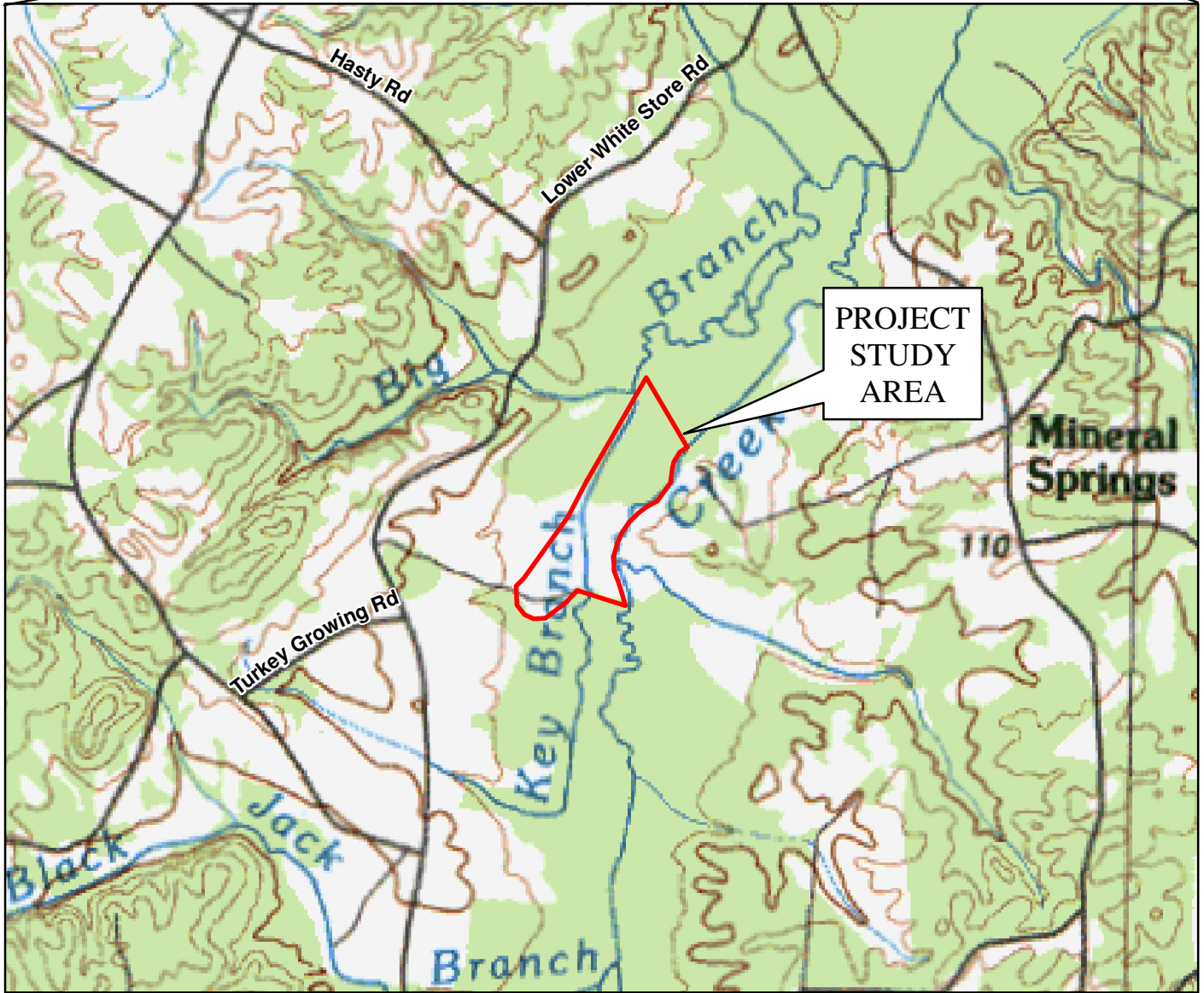
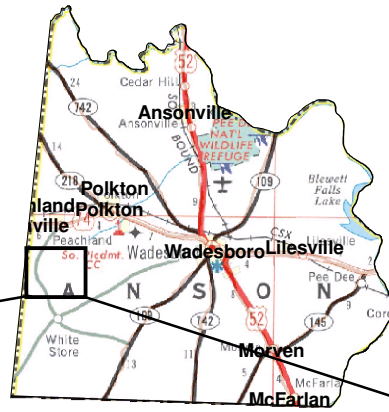
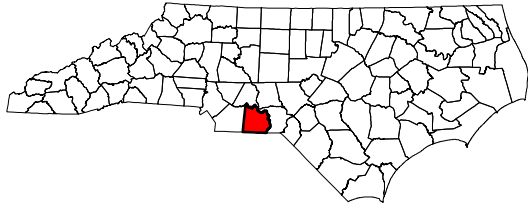
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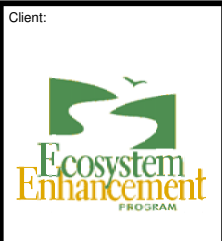
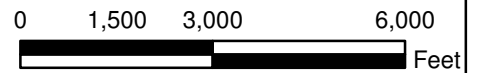
Stream Mitigation Guidelines, April 2003. Authored by a workgroup consisting of USACE (Wilmington District, USEPA, NCWRC and NCDWQ). Riparian Restoration pg. 18.

APPENDIX A

FIGURES



Directions:
 Go west on Hwy 74 from Wadesboro in Anson County to Peachland.
 Turn left onto Mineral Springs Church Rd. and then right onto Lower White Store Road.
 Pass Hasty Rd. and then just before Turkey Growing Rd, turn left into Key Branch Site on a gravel road.



SITE LOCATION
KEY BRANCH STREAM & WETLAND RESTORATION SITE
 Anson County, North Carolina

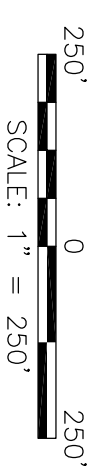
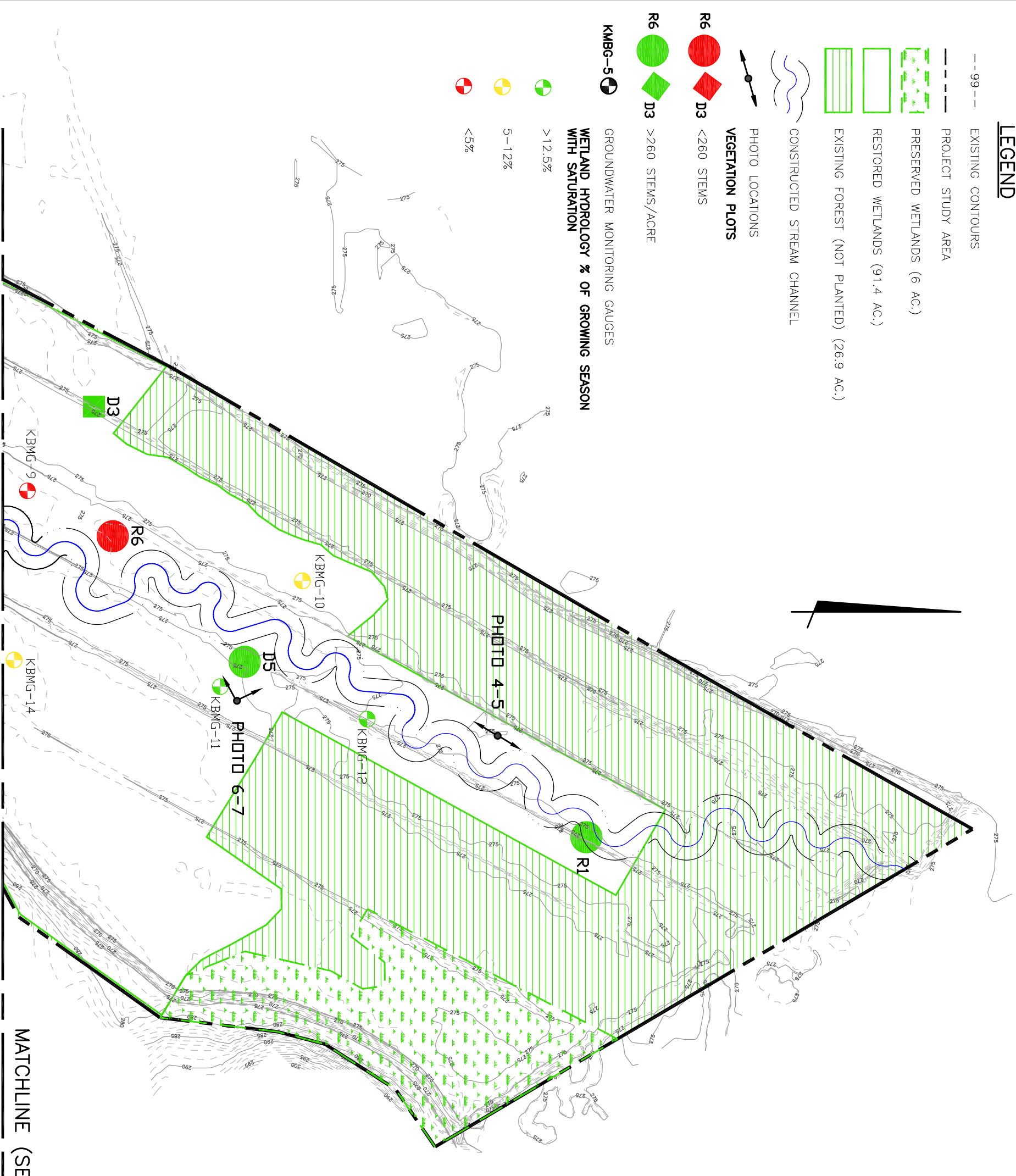
Dwn By:	TAL	Ckd By:	MCG
Date:	NOV 2008		
Scale:	AS SHOWN		
ESC Project No.	08-414		

FIGURE

1

LEGEND

- 99--- EXISTING CONTOURS
- - - - - PROJECT STUDY AREA
- PRESERVED WETLANDS (6 AC.)
- RESTORED WETLANDS (91.4 AC.)
- EXISTING FOREST (NOT PLANTED) (26.9 AC.)
- CONSTRUCTED STREAM CHANNEL
- PHOTO LOCATIONS
- VEGETATION PLOTS**
- R6 <260 STEMS
- D3 <260 STEMS
- R6 >260 STEMS/ACRE
- D3 >260 STEMS/ACRE
- KMBG-5 GROUNDWATER MONITORING GAUGES
- WETLAND HYDROLOGY % OF GROWING SEASON WITH SATURATION**
- >12.5%
- 5-12%
- <5%



MATCHLINE (SEE SHEET 2)



A Division of **PBS&I**

REVISIONS

Client:



Project:

**KEY BRANCH
STREAM &
WETLAND
MONITORING
SITE**

ANSON COUNTY,
NORTH CAROLINA

Title:

**INTEGRATED
PROBLEM
AREA
PLAN VIEW**

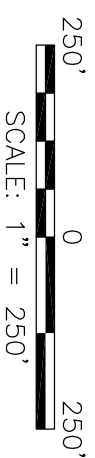
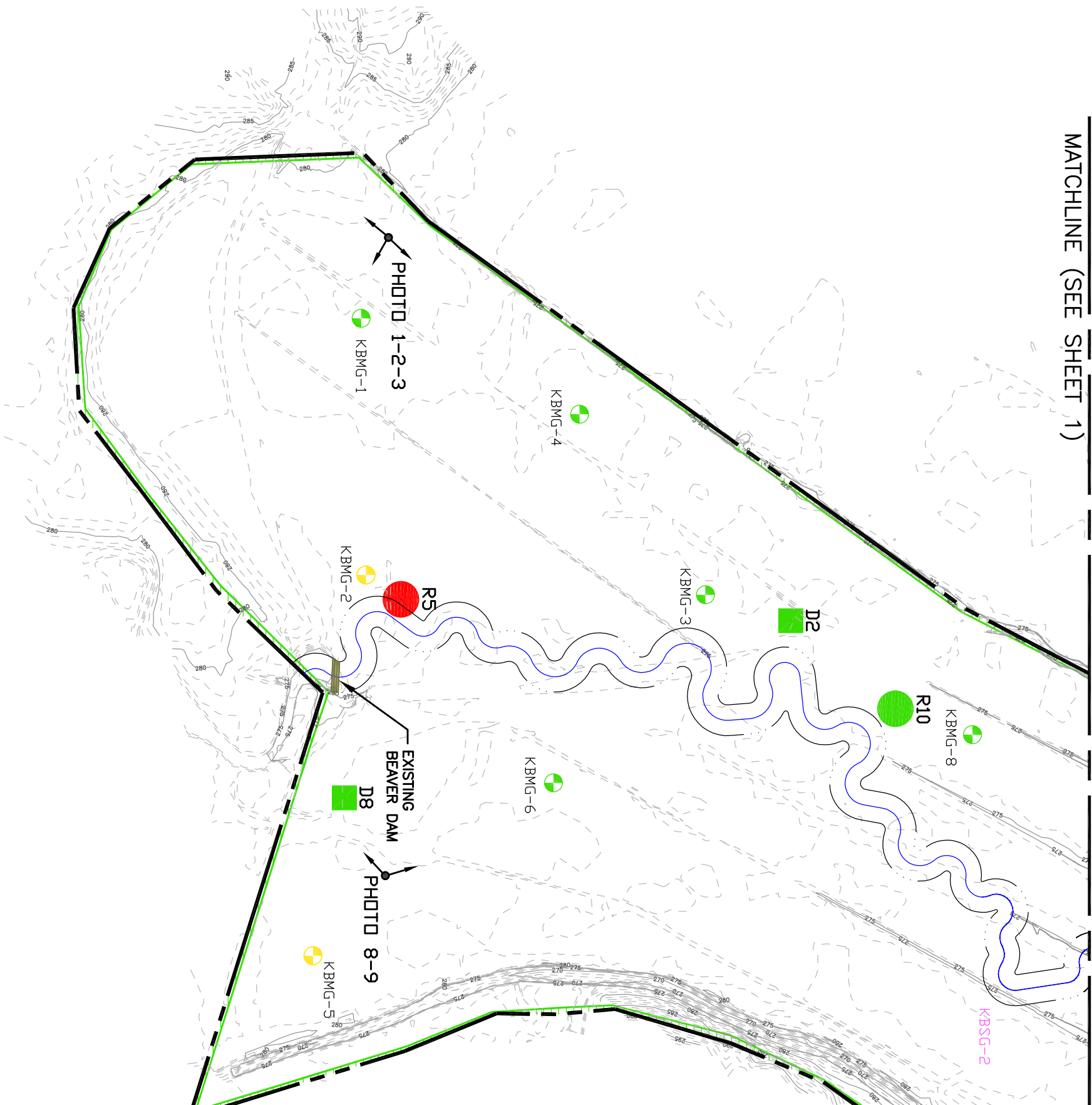
Dwn. By: TAL
Ckd. By: MCG

Date: NOV 2008
Scale: 1"=250'

Project No.: 08-414

FIGURE
2A

MATCHLINE (SEE SHEET 1)



LEGEND

- 99--- EXISTING CONTOURS
- - - - - PROJECT STUDY AREA
- [Green dashed pattern] PRESERVED WETLANDS (6 AC.)
- [Green solid pattern] RESTORED WETLANDS (91.4 AC.)
- [Green horizontal lines] EXISTING FOREST (NOT PLANTED) (26.9 AC.)
- [Blue wavy line] CONSTRUCTED STREAM CHANNEL
- [Black arrow] PHOTO LOCATIONS
- [Green circle] VEGETATION PLOTS
- [Red diamond] R6 <260 STEMS
- [Green diamond] R5 >260 STEMS/ACRE
- [Black circle with dot] KBMG-5 GROUNDWATER MONITORING GAUGES
- [Green circle with dot] WETLAND HYDROLOGY % OF GROWING SEASON WITH SATURATION
 - [Green circle with dot] > 12.5%
 - [Yellow circle with dot] 5 - 12%
 - [Red circle with dot] < 5%



REVISIONS

Client:



Project:

**KEY BRANCH
STREAM &
WETLAND
MONITORING
SITE**

ANSON COUNTY,
NORTH CAROLINA

Title:

**INTEGRATED
PROBLEM
AREA
PLAN VIEW**

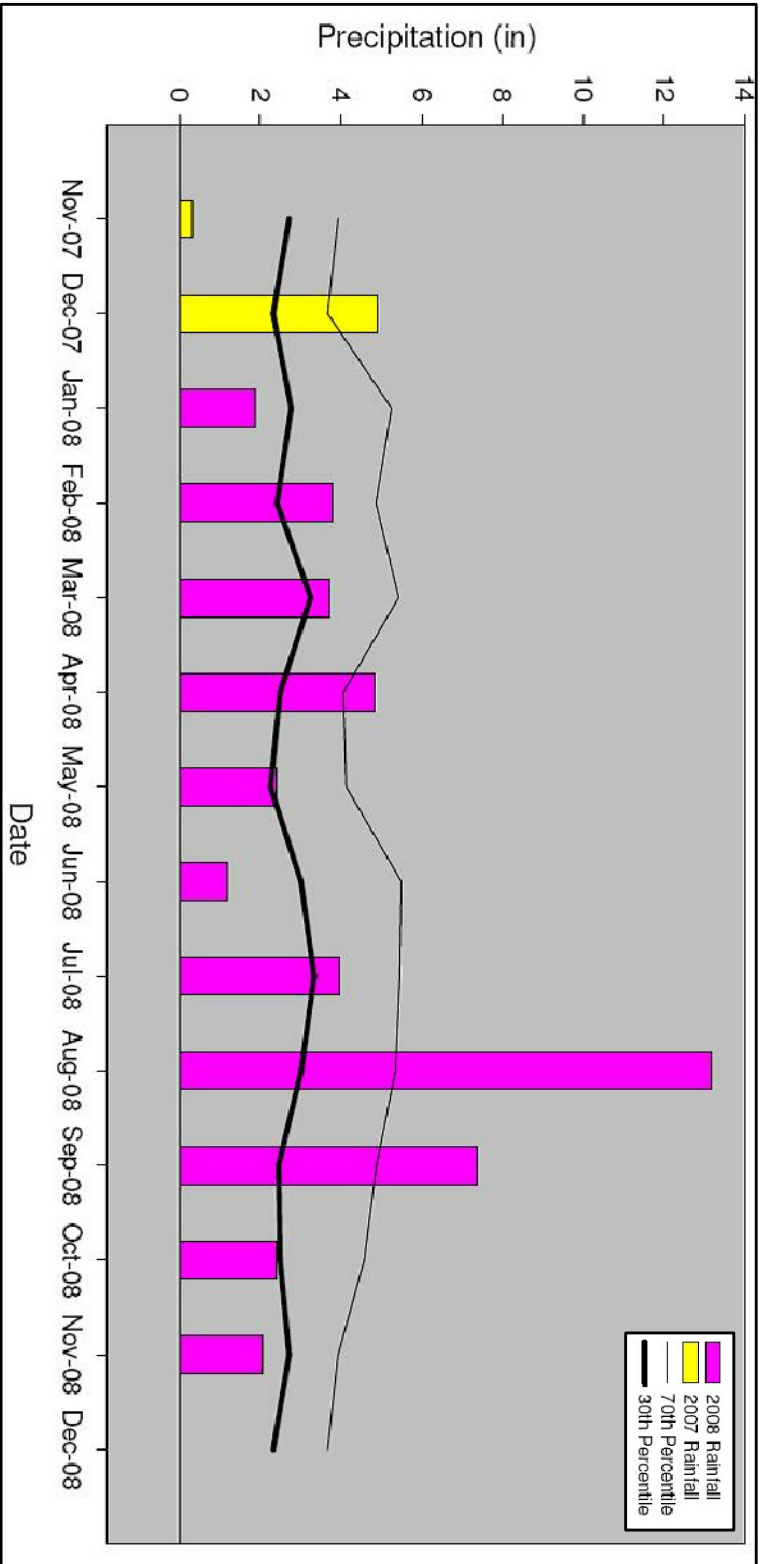
Dwn. By: TAL
Ckd. By: MCG

Date: NOV 2008
Scale: 1"=250'

Project No.: 08-414

FIGURE
2B

NOTE:
 RAINFALL DATA COLLECTED
 IN PEACHLAND, NC



Data Sources:
 Monthly Precipitation- State Climate Office of NC (CRONOS database [online])
 30-70 Percentile-NRCS National Water and Climate Center (online)

KEY BRANCH STREAM & WETLAND MONITORING SITE
 30-70 PERCENTILE RAINFALL DATA

ANSON COUNTY, NORTH CAROLINA



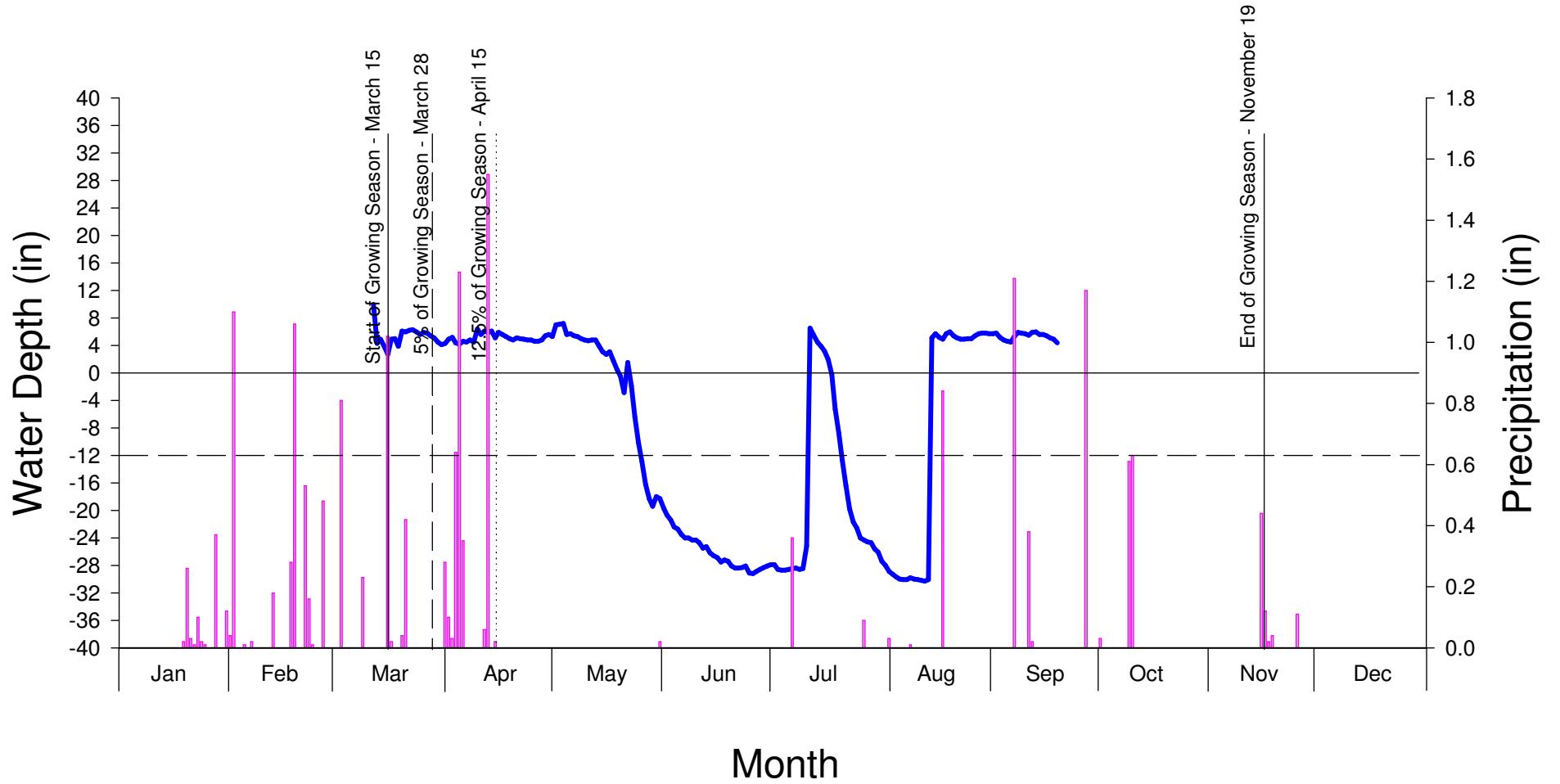
Dwn. By:	TAL	Date:	NOV 2008
Ckd. By:	MCG	Scale:	NO SCALE
ESC Project No.:		08-414	

SHEET
 3

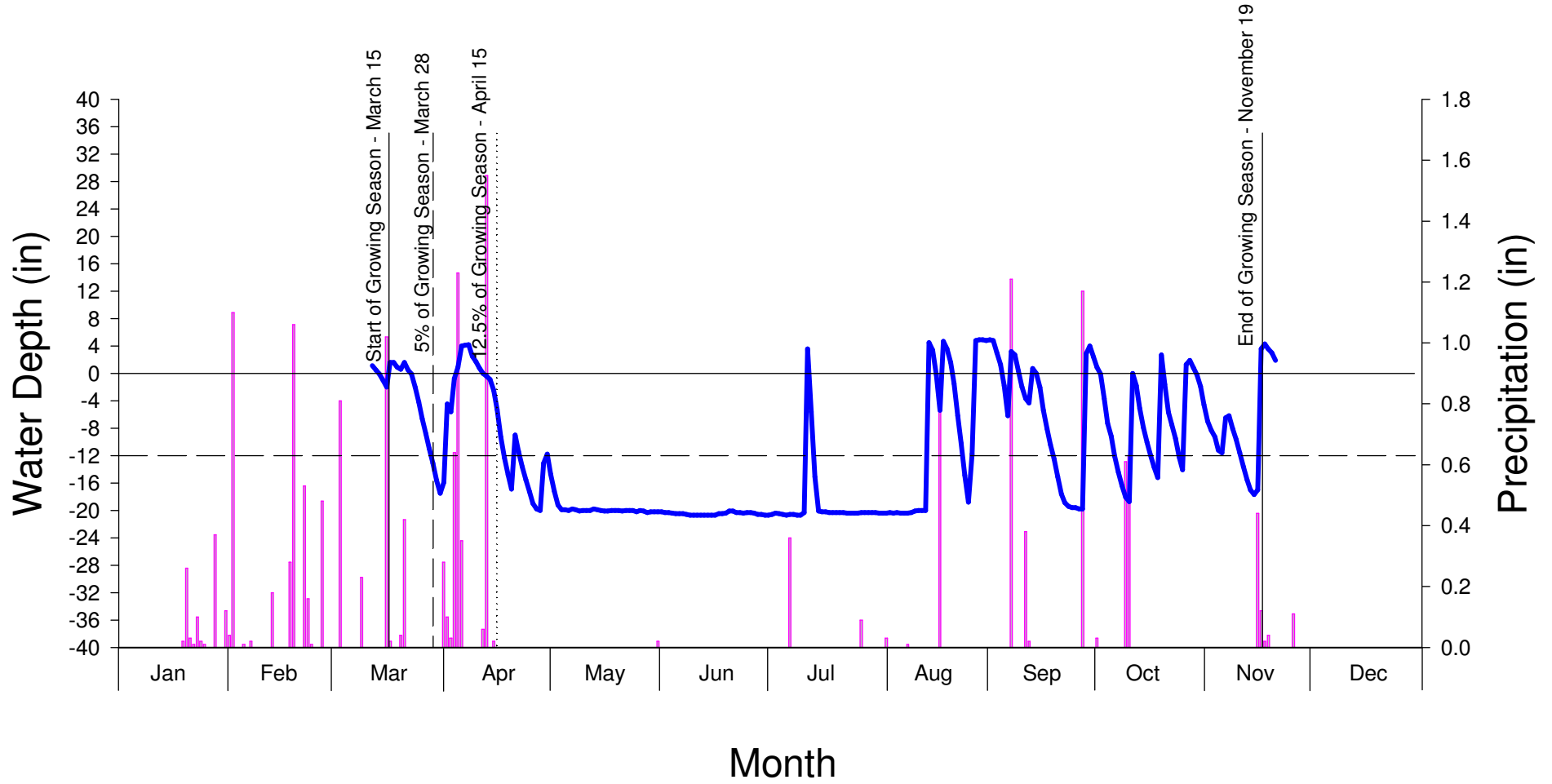
APPENDIX B

GROUNDWATER GAUGE HYDROGRAPHS

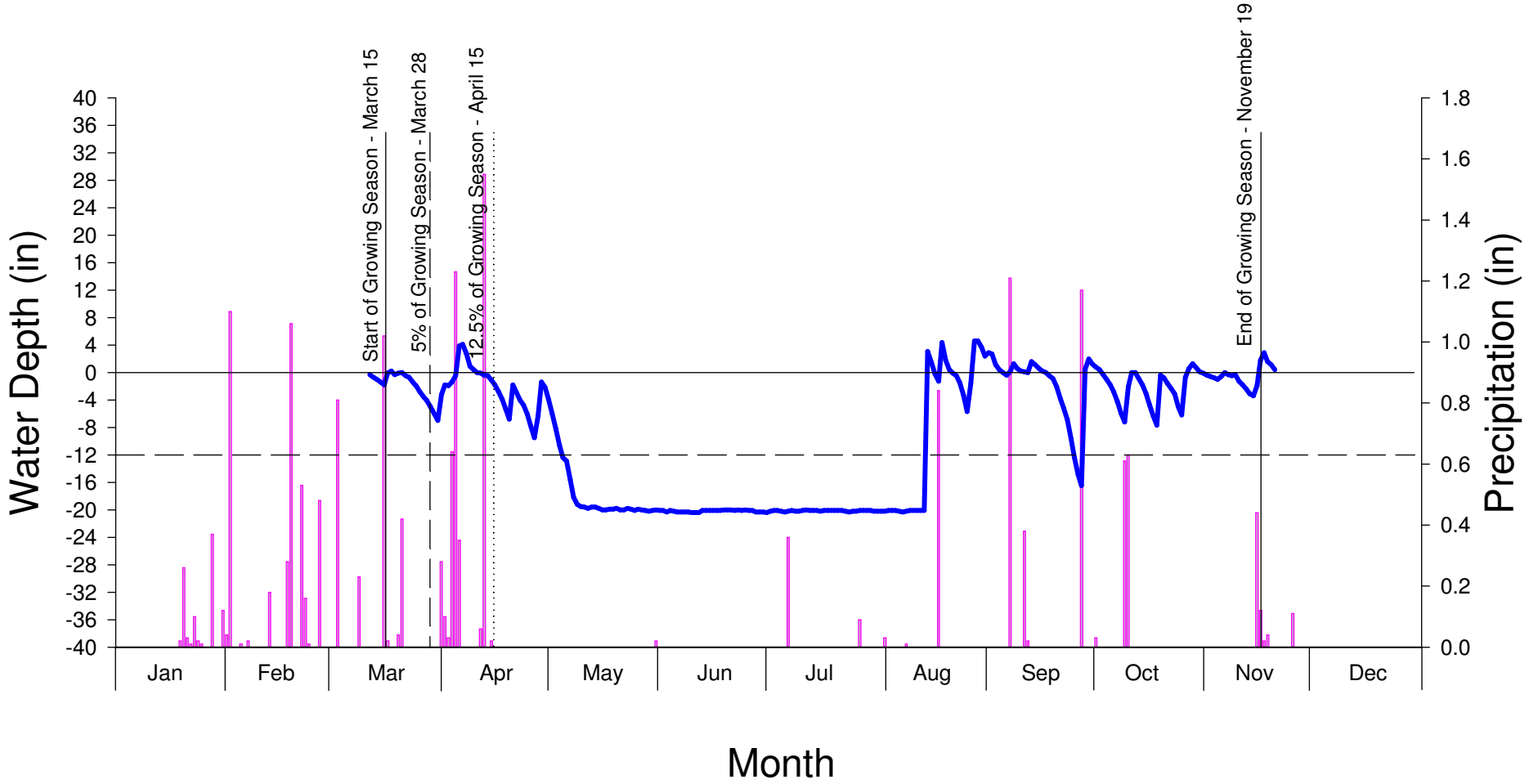
Key Branch 2008 Monitoring Gauge 1 - EBD3F00



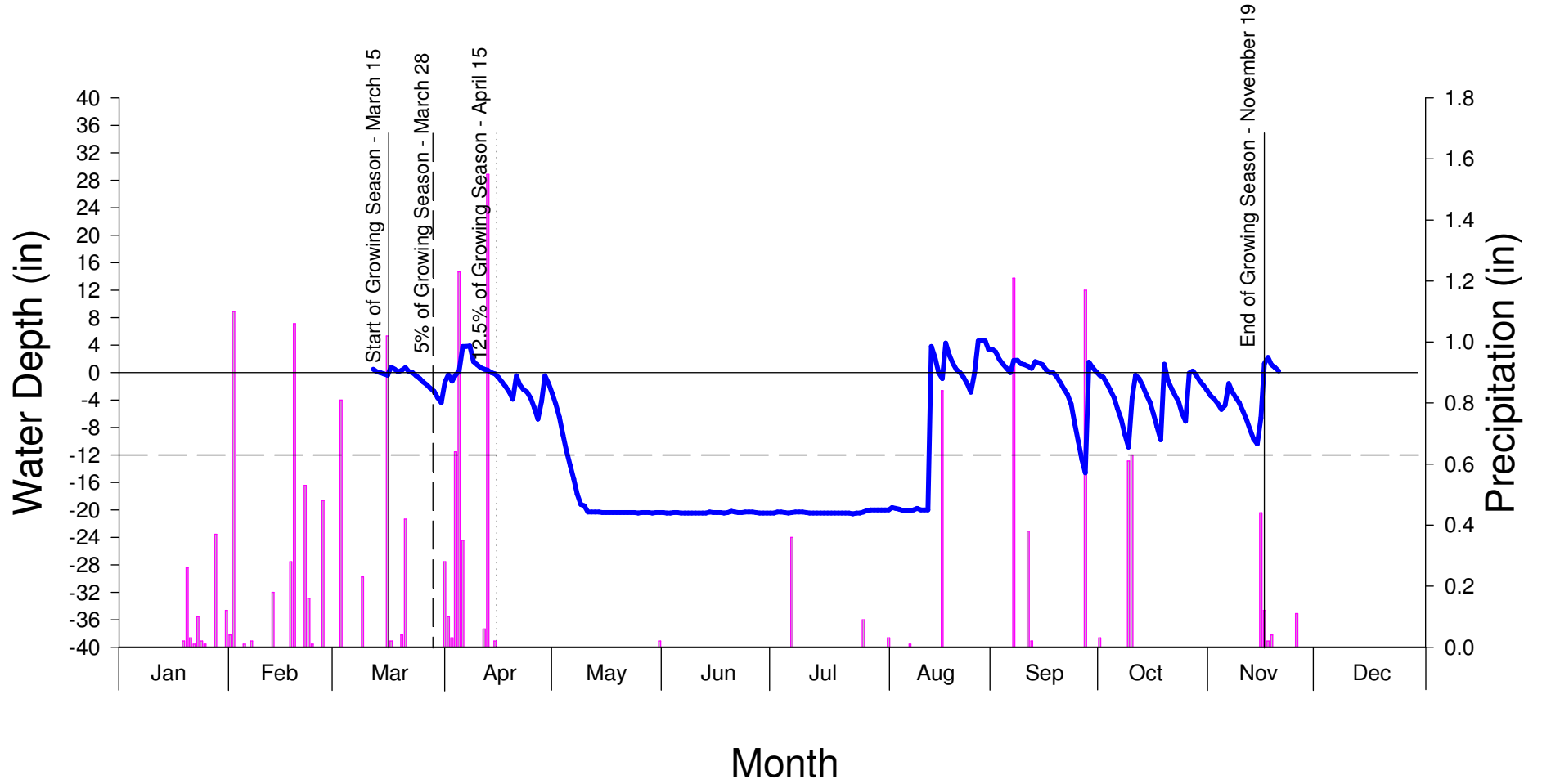
Key Branch 2008 Monitoring Gauge 2 - AB35E52



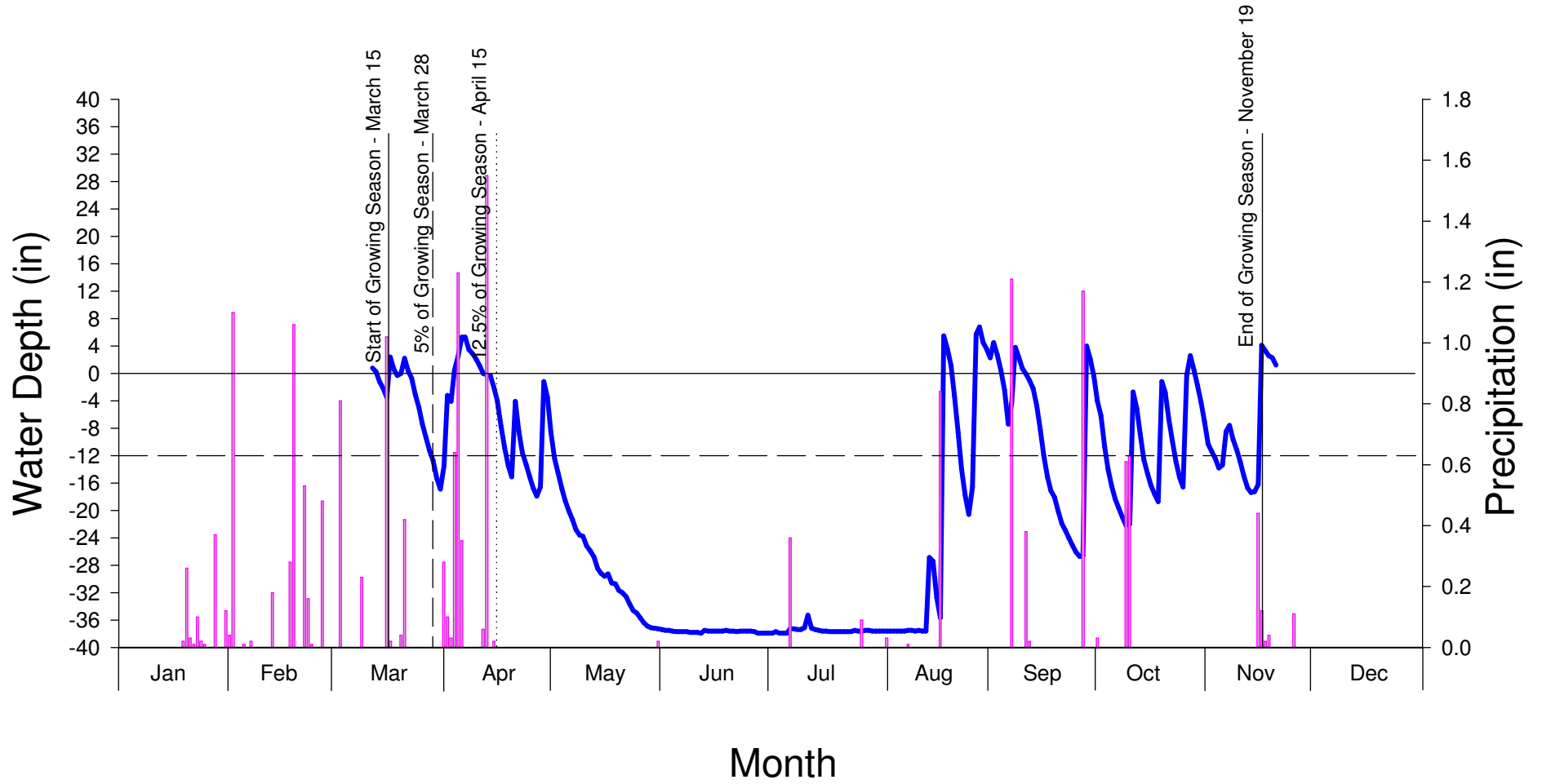
Key Branch 2008 Monitoring Gauge 3 - A28C2B0



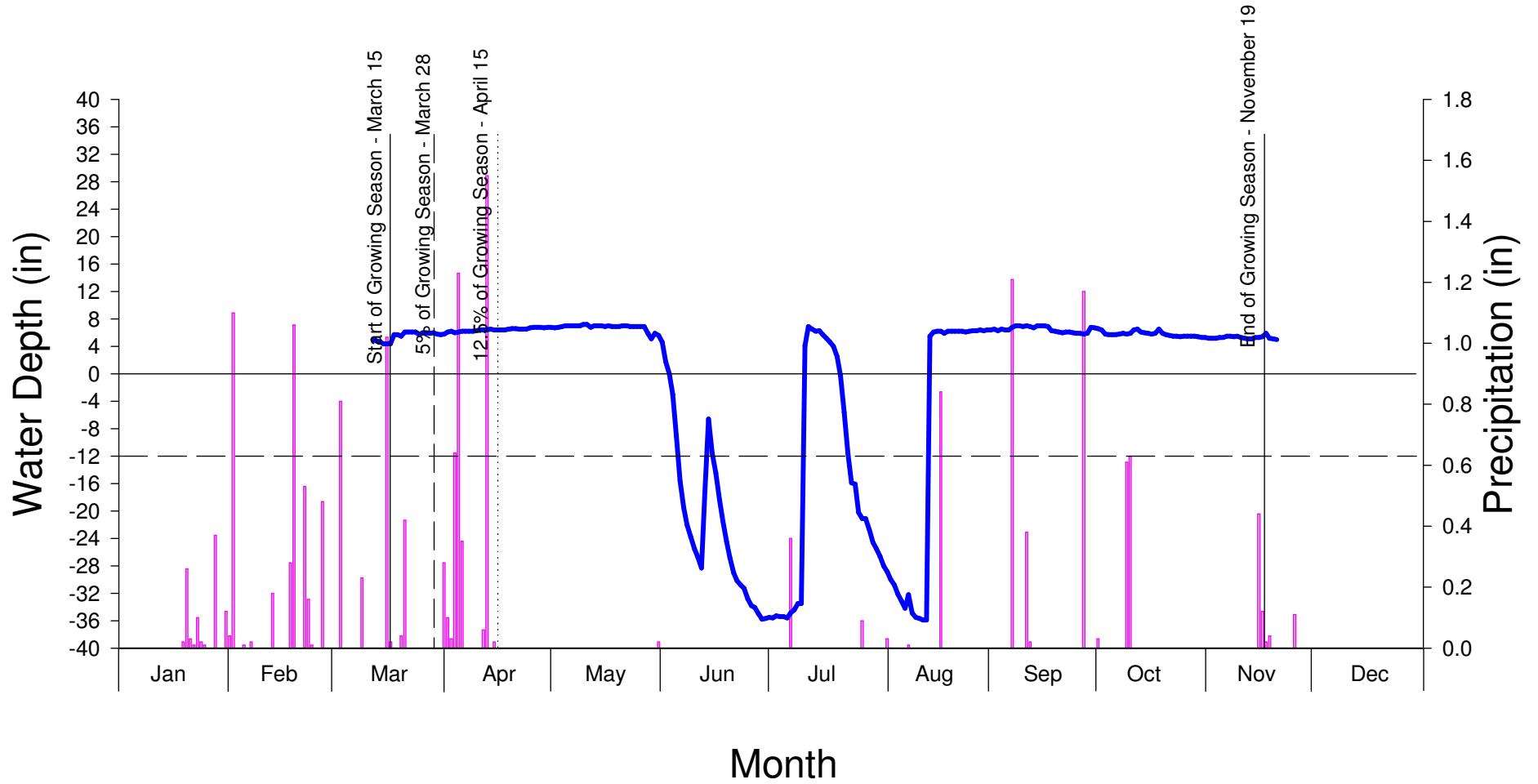
Key Branch 2008 Monitoring Gauge 4 - 9DE7A19



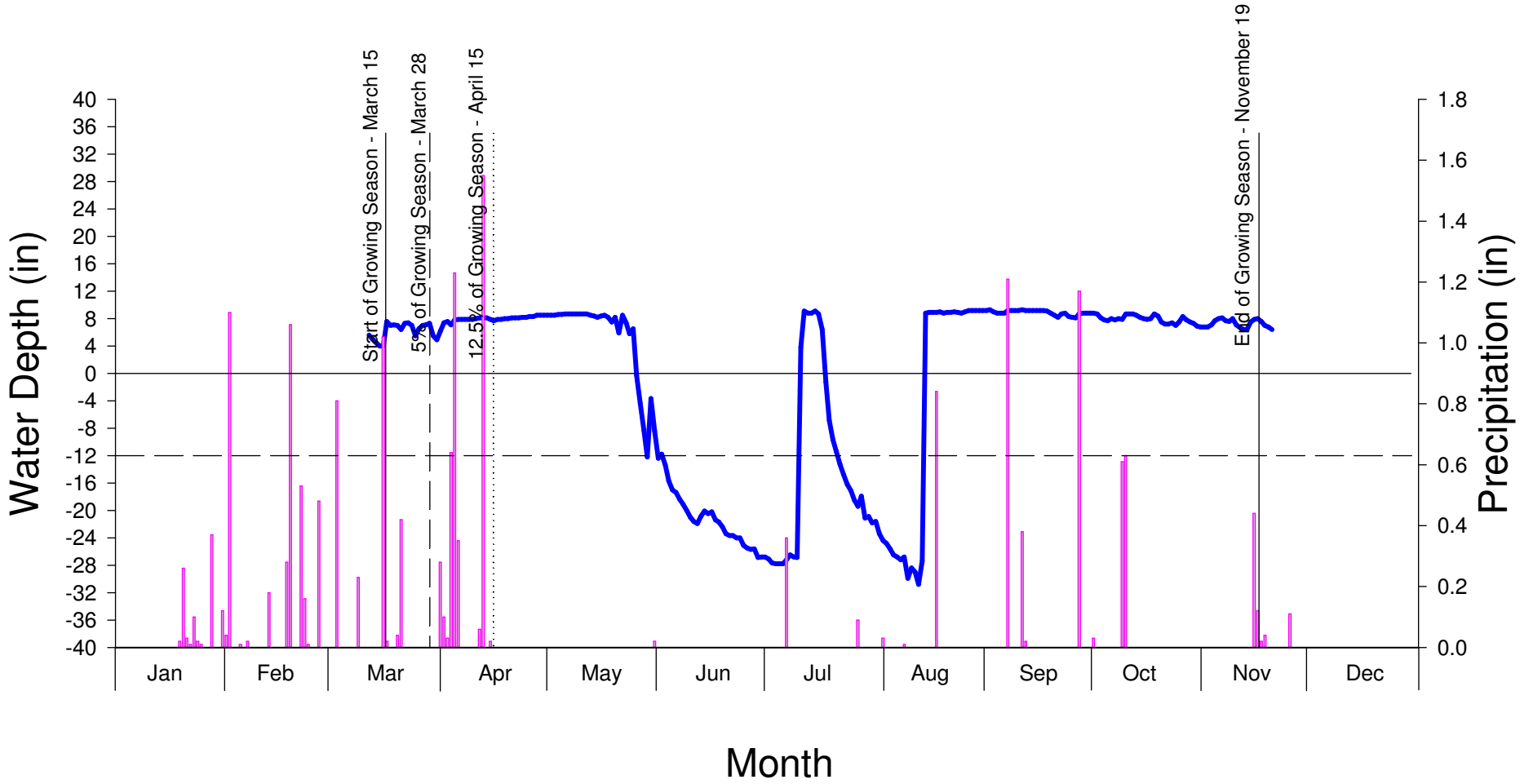
Key Branch 2008 Monitoring Gauge 5 - A287DCE



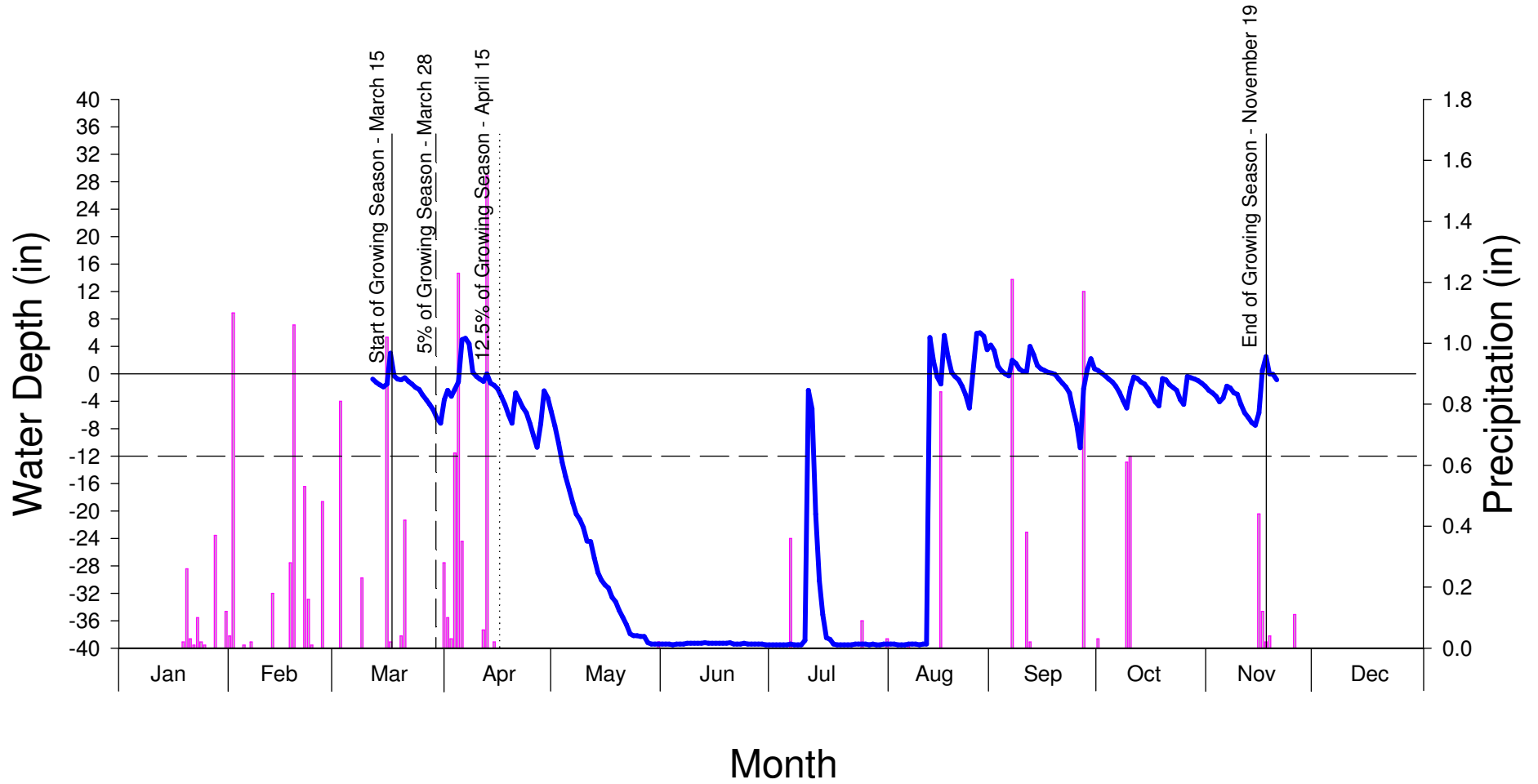
Key Branch 2008 Monitoring Gauge 6 - AB36D1B



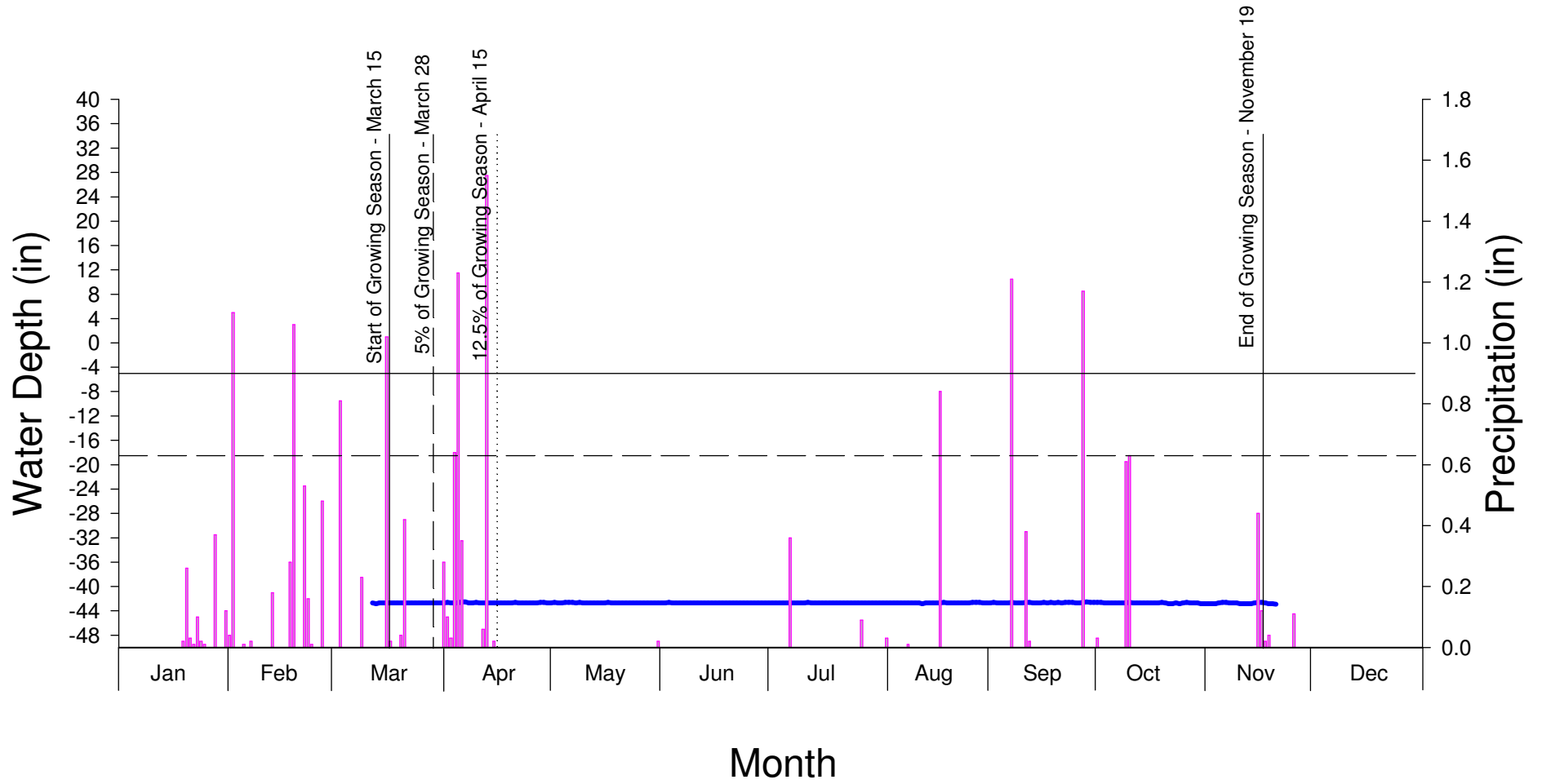
Key Branch 2008 Monitoring Gauge 7 - 9DE535B



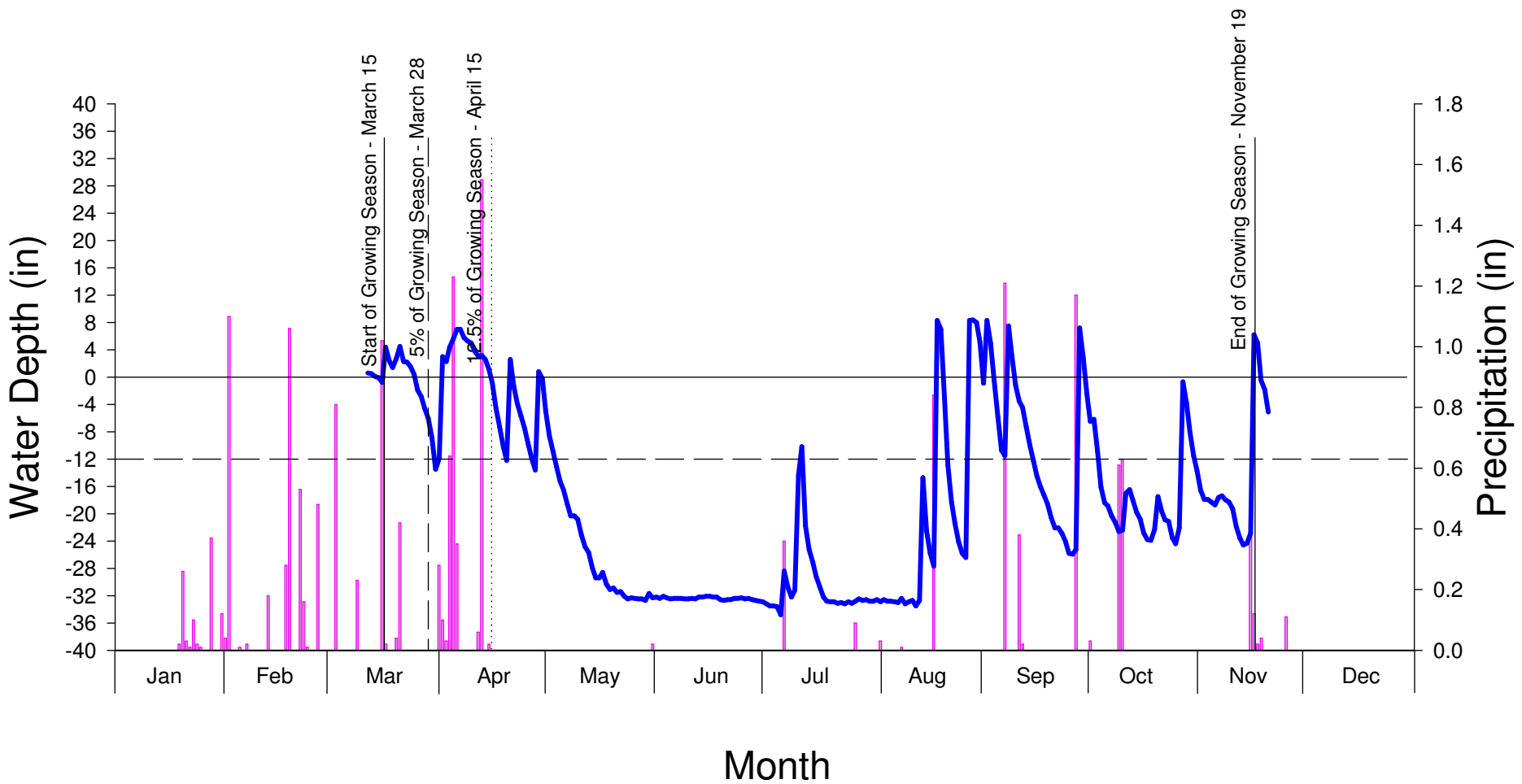
Key Branch 2008 Monitoring Gauge 8 - A28A565



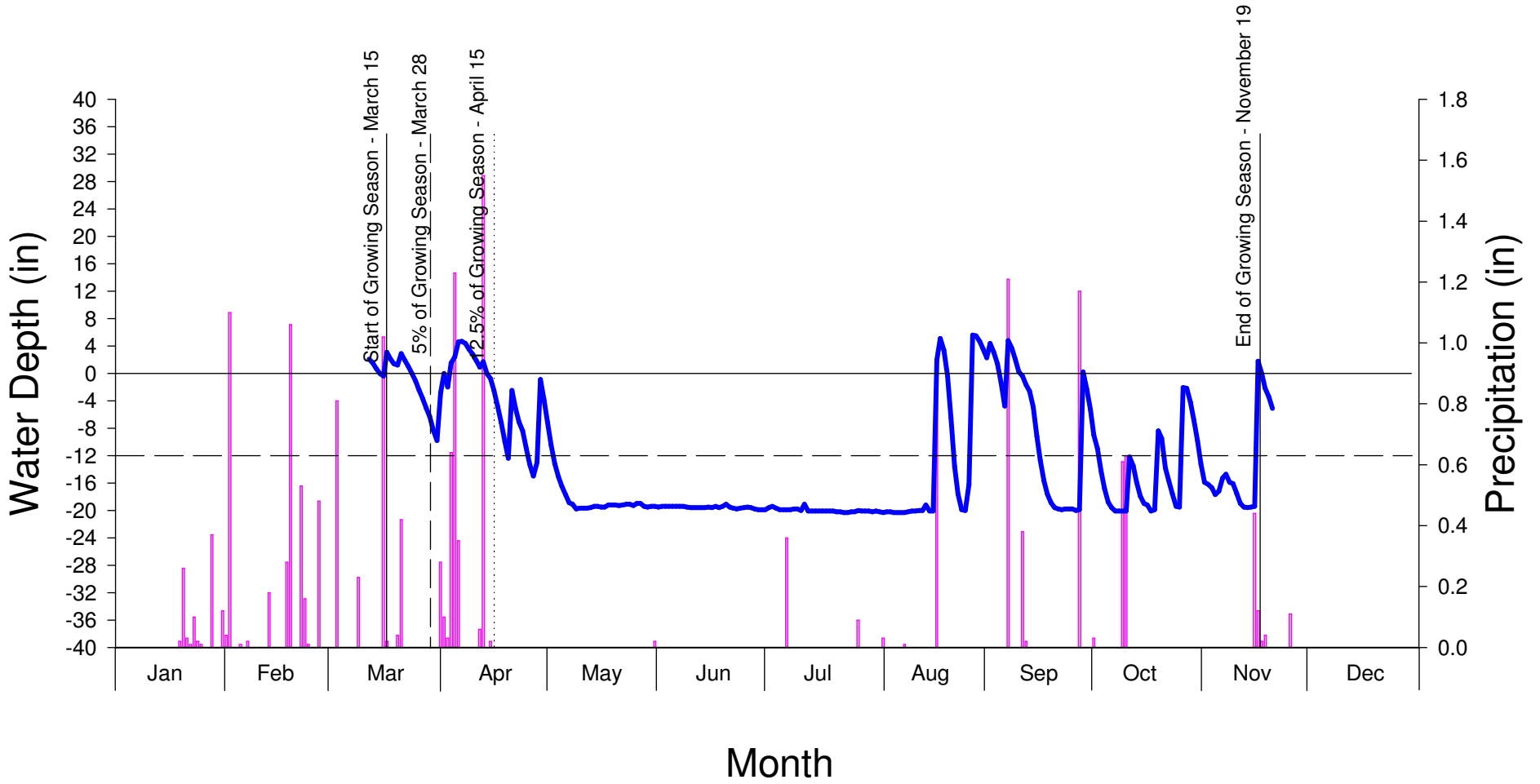
Key Branch 2008 Monitoring Gauge 9 - A28A3CC



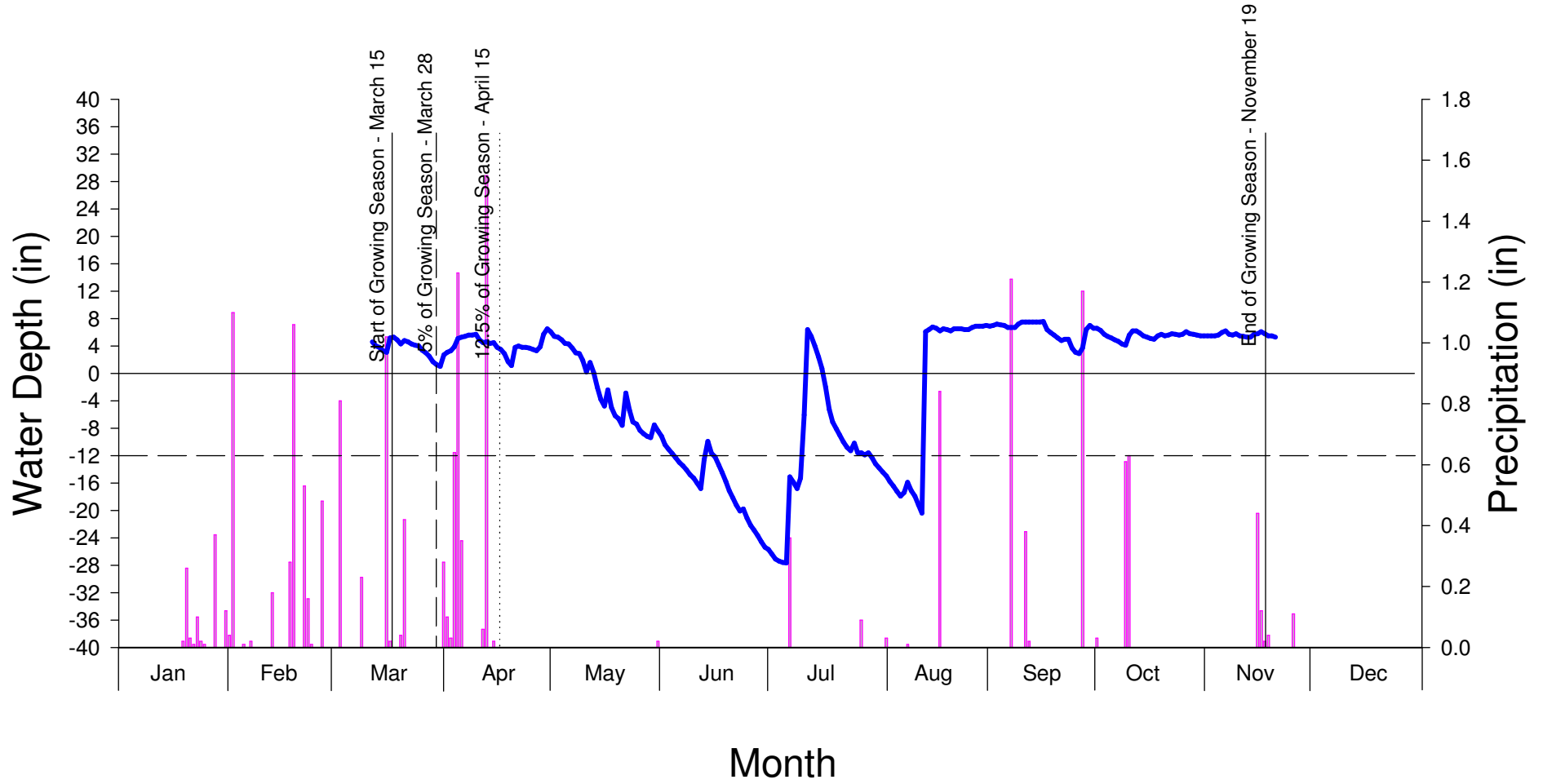
Key Branch 2008 Monitoring Gauge 10 - AB36D1B



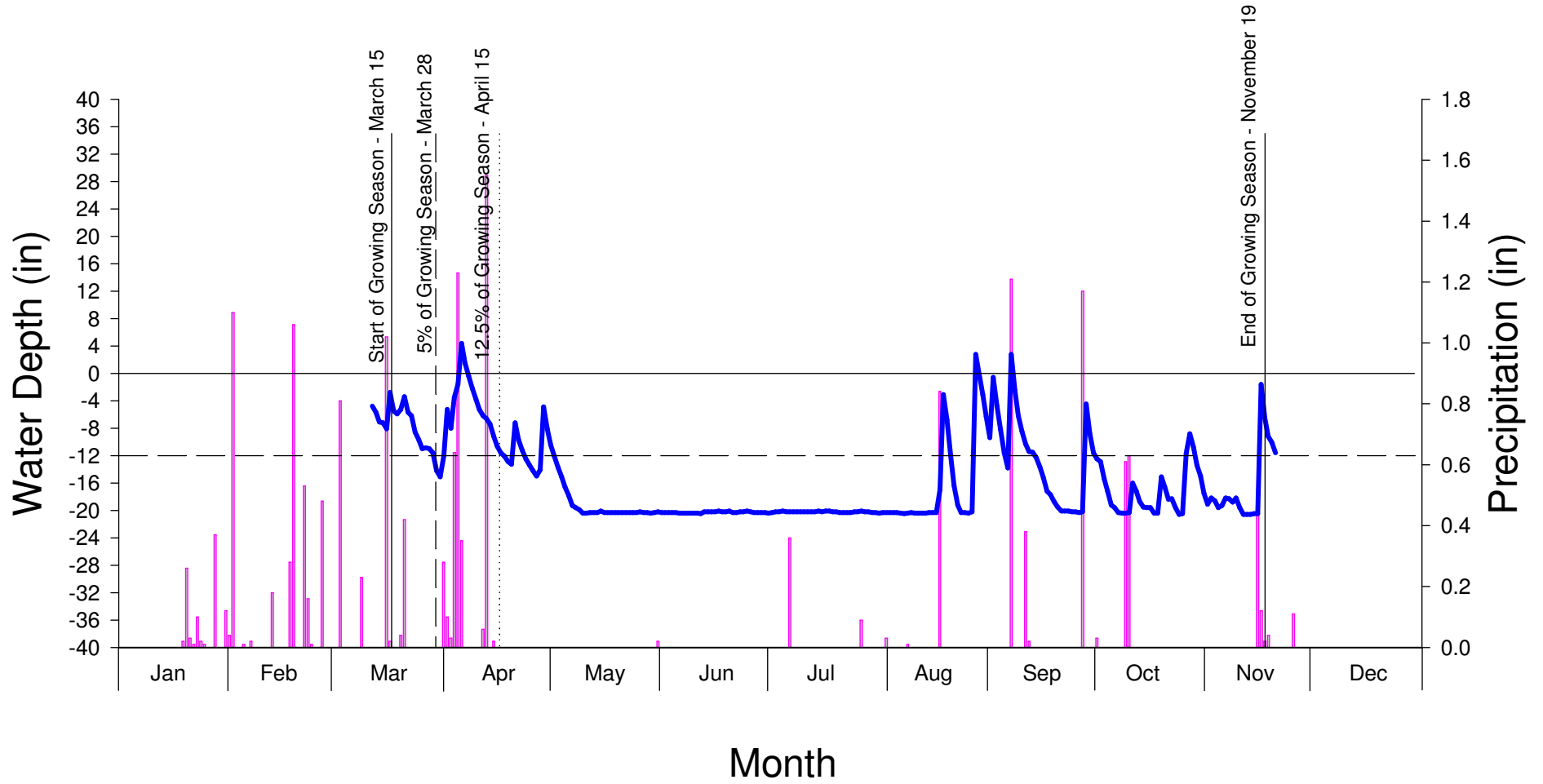
Key Branch 2008 Monitoring Gauge 11 - A279BD0



Key Branch 2008 Monitoring Gauge 12 - A287DCE



Key Branch 2008 Monitoring Gauge 14 - A28BFDE



APPENDIX C
SITE PHOTOS



Photo Station 1, facing north. October 8, 2008.



Photo Station 2, facing east. October 8, 2008.



Photo Station 3, facing south. October 8, 2008.



Photo Station 4, facing north. October 8, 2008.



Photo Station 5, facing south. October 8, 2008.



Photo Station 6, facing northeast. October 8, 2008.



Photo Station 7, facing southwest. October 8, 2008.



Photo Station 8, facing north. October 8, 2008.



Photo Station 9, facing southwest. October 8, 2008.