

**Modlin Property Wetland Mitigation Site
Martin County, NC**

**2007 Annual Monitoring Report
Year 1, Baseline**



NCEEP Project Number D050241

Submitted to
NCDENR/Ecosystem Enhancement Program
2728 Capital Blvd.
Raleigh, NC 27604

Date: December, 2007

Monitoring:
Albemarle Restorations, LLC
404 Court Street
Gatesville, NC 27938



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Executive Summary

The Modlin Property Wetland Mitigation Site is a riverine wetland project located on Poplar Chapel Road near Jamesville, in Martin County, North Carolina. It was constructed by Albemarle Restorations, LLC, under contract with EEP to provide compensatory wetland mitigation credits in the Roanoke River Basin. Construction activities, in accordance with the approved restoration plan, began October 13, 2006, and were completed on March 12, 2007. Tree and shrub planting on the project site occurred between April 1st and 4th, 2007. An emergent wetland seed mixture was sown at the end of April, 2007. The planting plan produced three distinct plant communities. The lowest, wettest zone which surrounds the drainage course is an emergent wetland community dominated by hydrophytic herbaceous species. The next step up in the flood plain is a shrub/scrub zone planted with woody shrubs and trees. The highest and largest community is a forested wetland ecosystem consisting of both trees and woody shrubs. All planting was done in accordance with the approved restoration plan.

Four water level monitoring wells were installed on April 23, 2007 at varying elevations throughout the site to measure subsurface water elevations. Three additional backup wells were installed in September of 2007, two onsite and one offsite. The three backup wells were installed upon recommendations of EEP personnel in case of failure of one of the primary wells. None of the monitoring wells met the hydrologic success criterion of maintained groundwater levels within 12 inches of the soil surface for 21 consecutive days during the growing season. Groundwater levels responded rapidly to precipitation, but were not maintained for any length of time due to the severely drought conditions experienced in 2007.

Four vegetative monitoring plots were installed and permanently monumented, one coincident with each of the original monitoring wells, such that both forested and shrub/scrub vegetative communities are represented. Each plot is a 10m X 10m square, as recommended by the CVS-EEP Protocol for recording vegetation sampling. One plot met the year 3 success criterion of 320 living planted stems per acre, a success rate of 25%. The poor survival rate is directly attributable to the drought conditions during the peak of the growing season. As a result, replacement planting will occur in 2008 to bring stocking up to the necessary level to meet the success criterion in year 3.

I. Project Background

1.0 Project Objectives

The goal of the Modlin Property Mitigation Project was to create a riverine wetland system typically found in the middle to upper reaches of first or zero order tributary systems. The project is to serve as compensation for wetland loss in the Roanoke River Basin. The mitigation plan was developed and implemented to eliminate pattern drainage and restore topography and hydrology that more closely resembled that of similar undisturbed land. Construction resulted in the development of a broad, frequently flooded swamp run following the historical path as evidenced by aerial photographs and signature topography. Subsequent planting was designed to restore a wetland forest ecosystem that is typically found in the immediate area characteristic of similar soils, topography and hydrology.

The specific project goals and objectives include:

- 1) Provide floodflow attenuation.
- 2) Water quality improvement through sediment, toxicant, and nutrient retention and reduction .
- 3) Slow over bank flow rates and provide storage and desynchronization of flood waters.
- 4) Alleviate downstream flooding issues by lessening the effect of pulse or flashy flows.
- 5) Provide shading through forest cover to reduce algae growth and associated low dissolved oxygen levels in surface water moving through the site.
- 6) The production and export of food sources.
- 7) The creation of wildlife habitat and recreational opportunities.

2.0 Project Structure, Restoration Type, and Approach

Table I lists the estimated wetland acreage to be restored on the Modlin Property. The mitigation plan provides for the restoration of 40.0 acres of riverine wetlands. Prior to construction, the 40.0 acre easement area was used entirely for row crop agriculture, primarily soy beans and cotton. A drainage ditch, built in the 1970's, divided the project area and provided drainage of the seasonally high water table to allow the agricultural uses. Construction activities, in accordance with the approved restoration plan, began in October, 2006 with the removal of existing hedgerows from within the project area. Some of the whole trees found in the hedgerows were placed along the length of the restored swamp run to facilitate water retention and to provide wildlife habitat. Also included as part of the water retention strategy is a low berm, approximately three quarters of the way down the swamp run. This berm functions like a natural ridge within a swamp by creating a "pinch-point", which helps create back-flooding across the restored floodplain. In its entirety, the project functions as a broad, channelized hardwood flat that is subject to seasonal periodic flooding. The lower end of the swamp run retains water for longer periods which contributes to the vegetation diversity, as does the increase in site elevation moving laterally away from the run. Other topographical features include vernal pools that remain flooded or wet for most of the year.

Table I. Project Restoration Components				
Modlin Property Wetland Mitigation Site/EEP #D050241				
Restoration Type	Pre-Existing Acreage	Post Construction Acreage	Credit Ratio WMU	Wetland Mitigation Units
Riverine Wetland	0.0	40.0	1:1	40.0
			Total	40.0

3.0 Location and Setting

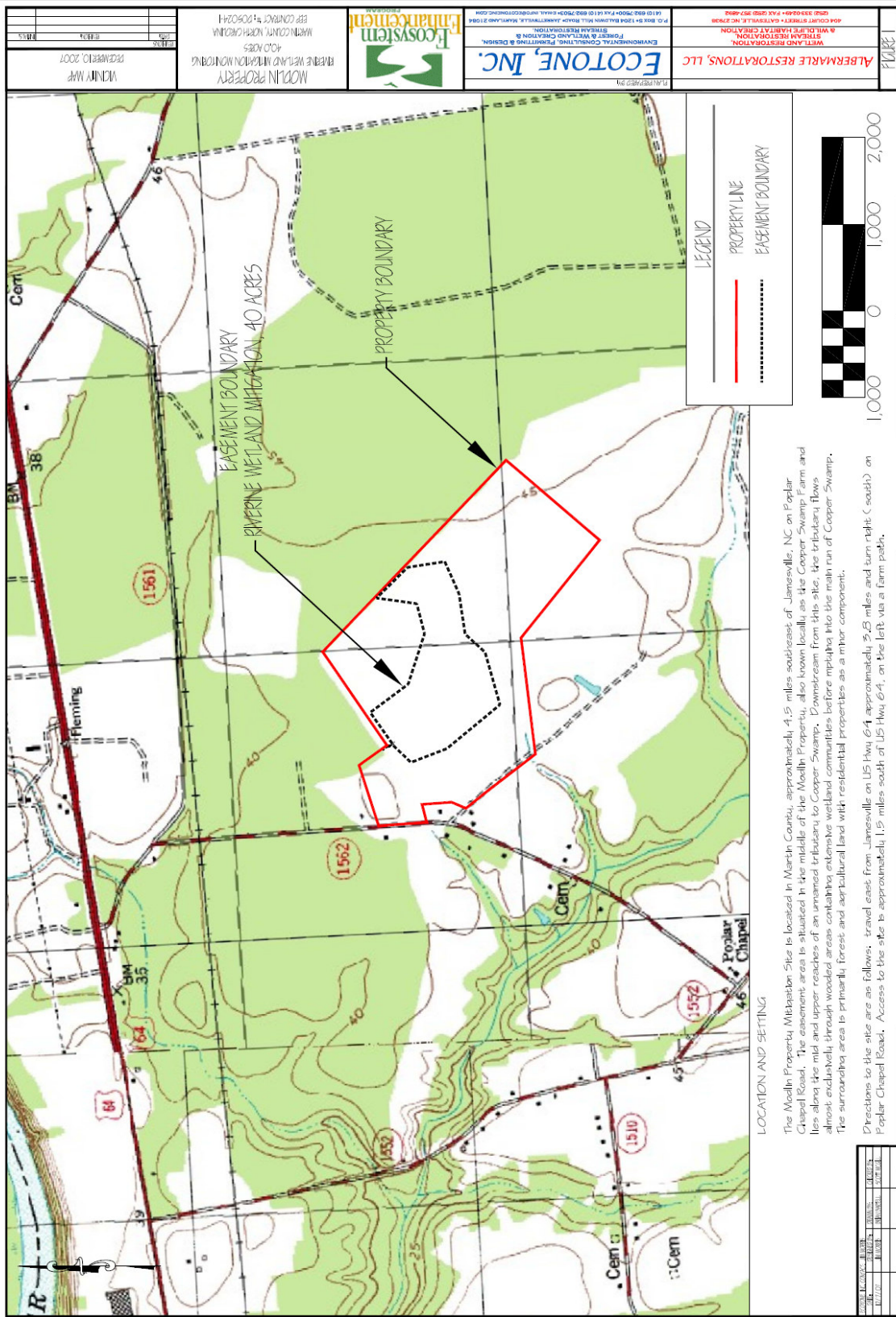
The Modlin Property Mitigation Site is located in Martin County, approximately 4.5 miles southeast of Jamesville, NC on Poplar Chapel Road. The easement area is situated in the middle of the Modlin property, also known locally as the Cooper Swamp Farm and lies along the mid and upper reaches of an unnamed tributary to Cooper Swamp. Downstream from this site, the tributary flows almost exclusively through wooded areas containing extensive wetland communities before emptying into the main run of Cooper Swamp. The surrounding area is primarily forest and agricultural land with residential properties as a minor component.

Figure 1 is a location map for the project site. Directions to the site are as follows: travel east from Jamesville on US Hwy 64 approximately 3.8 miles and turn right (south) on Poplar Chapel Rd. Access to the site is approximately 1.5 miles south of US Hwy 64, on the left via a farm path.

4.0 Project History and Background

Table II provides the history of data collection and actual completion of various milestones of the Modlin Property Wetland Mitigation Site.

Table II. Project Activity and Reporting History Modlin Property Wetland Mitigation Project/EEP#D050241		
Activity or Report	Data Collection Complete	Actual Completion or Delivery
Restoration Plan	Feb. 2006	June 2006
Final Design -90%	Feb. 2006	June 2006
Construction	N/A	March 2007
Temporary S & E mix applied to entire project area	N/A	April 2007
Permanent seed mix applied to entire project area	N/A	April 2007
Containerized and Bare Root Planting	N/A	April 2007
Mitigation Plan/As-built (Year 0 monitoring - baseline)	Oct. 2007	
Year 1 monitoring		
Year 2 monitoring		
Year 3 monitoring		
Year 4 monitoring		
Year 5 monitoring		



<p>WETLAND RESTORATION, MITIGATION & MONITORING</p> <p>ALBEMARLE RESTORATIONS, LLC</p> <p>1410 HUNTERS LANE, SUITE 200 WASHINGTON, NC 27888 (800) 333-0444 FAX (800) 333-0444</p>	<p>ECOTONE, INC.</p> <p>ENVIRONMENTAL CONSULTING, PERMITTING & DESIGN PLANNING & WETLAND RESTORATION & STREAM RESTORATION</p> <p>1410 HUNTERS LANE, SUITE 200 WASHINGTON, NC 27888 (800) 333-0444 FAX (800) 333-0444</p>	<p>Ecosystem Enhancement</p> <p>HEALTHY WETLAND MONITORING 402 ACRES WETLAND PROPERTY WETLAND MONITORING PROJECT WETLAND MONITORING</p>	<p>DATE: 07/15/08</p> <p>BY: [Signature]</p> <p>REVISION: [Signature]</p>
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Points of contact for the various phases of the MPWMS are provided in Table III.

Table III. Project Contacts Modlin Property Wetland Mitigation Site/EEP #D050241	
Designer Primary Project design POC	Ecotone, Inc. 1204 Baldwin Mill Road Jarrettsville, MD 21804 Scott McGill (410-692-7500)
Construction Contractor Construction contractor POC	Armstrong, Inc. P. O. Box 96 25852 US Hwy 64 Pantego, NC 27860 Tink Armstrong (252-943-2082)
Planting Contractor Planting contractor POC	Williams Forestry Service, Inc. P. O. Box 189 Millville, PA 17846 Christian Duffy (570-458-0766)
Seeding Contractor Seed planting contractor POC	Carolina Silvics, Inc. 908 Indian Trail Road Edenton, NC 27932 Mary-Margaret McKinney (252-482-8491)
Seed mix sources	Earnst Conservation Seeds, LLP, Meadville, PA
Nursery stock suppliers	Williams Forestry Service, Inc., International Paper, Inc.
Monitoring Performers Wetland and Vegetation POC	Woods, Water and Wildlife, Inc. P. O. Box 394 Gatesville, NC 27938 Ashby Brown (252-357-0700)

Project background information for the MPWMS is provided in Table IV.

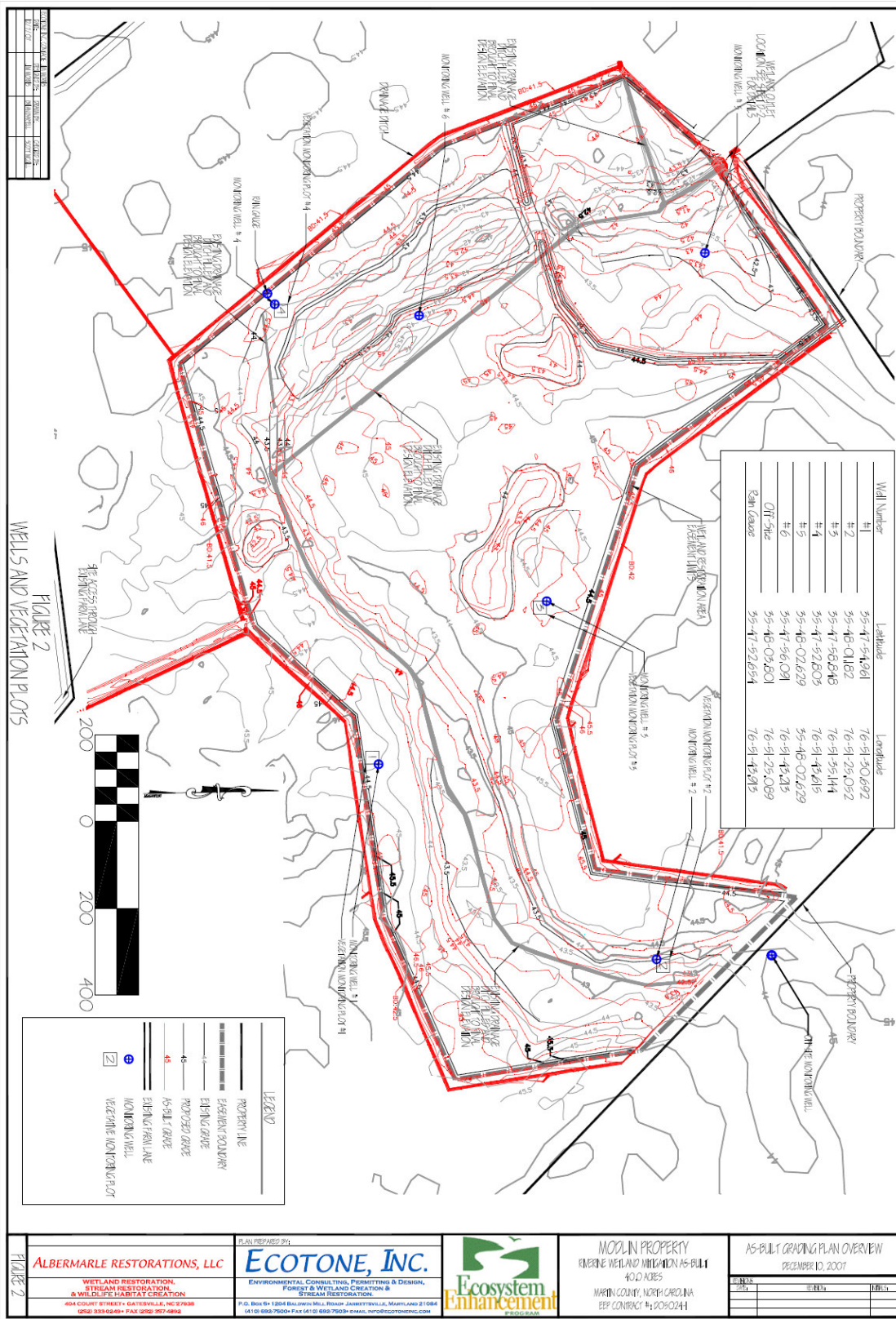
Table IV. Project Background Modlin Property Wetland Mitigation Site/EEP #D050241	
Project County	Martin County
Drainage Area	40.0 acres within easement boundary
Drainage impervious cover estimate (%)	0
Physiographic Region	Coastal Plain
Ecoregion	8.5.1 Middle Atlantic Coastal Plain
Rosgen Classification of As-built	N/A
Cowardin Classification	PEM, PSS, PFO
Dominant Soil Types	Bethera loam, Lenoir loam
Reference site ID	Cooper Swamp, Martin County, NC
USGS HUC for Project and Reference	03010107
NCDWQ Sub-basin for Project and Reference	03-02-09
NCDWQ classification for Project and Reference	C
Any portion of any project segment 303d listed?	No
Any portion of any project segment upstream of a 303d listed segment?	No
Reasons for 303d listing or stressor?	N/A
% of project easement fenced	Gate at access path

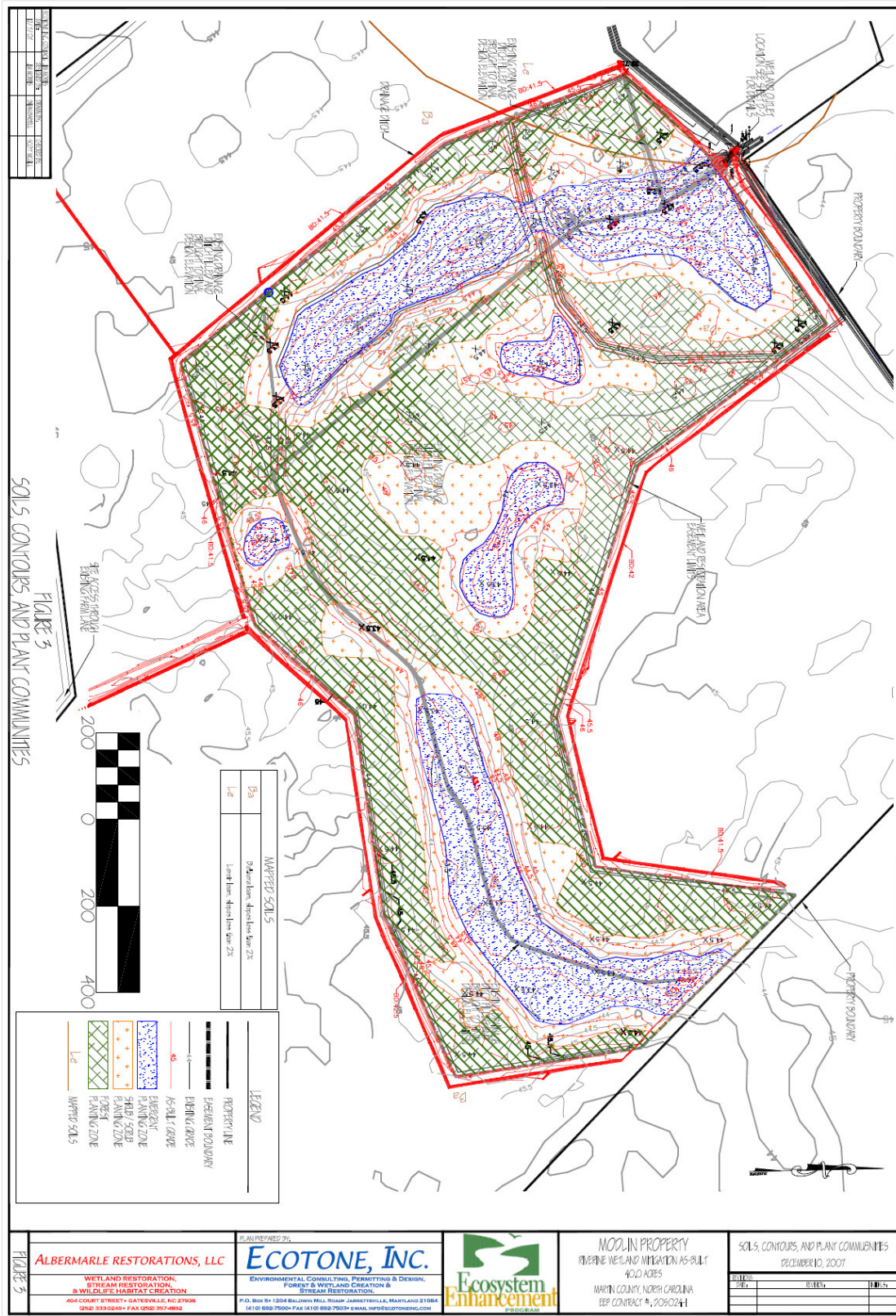
5.0 Monitoring Plan View

In April of 2007, four water level monitors were installed at key locations across the property. These loggers are suspended in two-inch pvc pipe that is set approximately four feet vertically into the ground. The wells have been located to assess the groundwater levels throughout the year at various elevations and topographies within the site. In September, three additional loggers were deployed, two on-site as backups in the case of failure of any of the primary loggers and one at the reference site. In addition, a rain gauge was installed to capture and record on-site precipitation.

Vegetation monitoring is accomplished by the installation of four permanent sampling plots. Each plot is referenced by one of the first four monitoring wells which serve as the plot origin and as a photo station for that plot. The plots are ten meters square and are situated to give an accurate sample of the planted and natural woody vegetation. For each site, the data recorded matches that required of the *CVS-EEP Protocol for Recording Vegetation, v 4.0, 2006*, level 1-2.

Figures 2 and 3 provide plan views of the site showing all monitoring features including wells, sampling plots and the rain gauge.





II. Project Condition and Monitoring Results

1.0 Vegetation Assessment

The vegetation success criterion was developed in accordance with the CVS-EEP protocol. The Modlin project was planned to include various plant communities. The emergent wetland zone immediately adjacent to the drainage course and other isolated depressions are populated by vegetation consisting primarily of herbaceous material, grasses, sedges and other hydrophytic plants. The photos in Appendix A show both the colonization of this area by appropriate vegetation and the frequent, almost constant ponding of surface water over much of the zone. Beyond the emergent zone is the shrub/scrub community consisting of a mixture of woody shrubs interspersed with trees. The emphasis in this zone is on the shorter, scrubby vegetation typical of lower areas of native branch bottoms and poorly drained, broad hardwood flats. The outer, largest zone was planted to a mixture of trees and shrubs, but with the emphasis on trees. The species mix was based on the vegetation noted at the two reference sites and all species are classified from FAC to OBL (Table V). The site was planted at a rate of 350 stems per acre in the spring of 2007.

Table V. Species by Community Type		
Modlin Property Wetland Mitigation Project/EEP #D050241		
Forested Wetland 18.5 Acres		
Common Name	Scientific Name	Wetland Indicator Status
Bald Cypress	Taxodium distichum	OBL
Red Maple	Acer rubrum	FACW-
Water tupelo	Nyssa aquatica	OBL
Swamp Black Gum	Nyssa biflora	FAC
Willow Oak	Quercus phellos	FACW-
Swamp White Oak	Quercus bicolor	FACW+
Water Oak	Quercus nigra	FAC
Highbush Blueberry	Vaccinium corymbosum	FACW
Swamp Cyrilla	Cyrilla racemiflora	FACW
Sweet Pepperbush	Clethra alnifolia	FACW
Virginia Sweetspire	Itea virginica	FACW+
Button Bush	Cephalanthus occidentalis	OBL
Shrub/Scrub 11.85 Acres		
Common Name	Scientific Name	Wetland Indicator Status
Button Bush	Cephalanthus occidentalis	OBL
Tag Alder	Alnus serrulata	FACW
Wax Myrtle	Myrica cerifera	FAC+
Black Willow	Salix nigra	OBL
Gallberry	Ilex glabra	FACW
Swamp Cyrilla	Cyrilla racemiflora	FACW
Highbush Blueberry	Vaccinium corymbosum	FACW
Sweetbay	Magnolia virginiana	FACW+

1.1 Vegetative Problem Areas

Plot 1 met the Year 3 success criteria of a minimum of 320 stems per acre after the first growing season. Plots 3 and 4 met the Year 4 success criteria. Over the entire project, the survival rate averaged 243 live stems per acre, a survival rate of 69%. The site will be assessed in the spring of 2008 and those stems that did not survive will be replaced at that time, restoring the stocking at least to the original 350 stems per acre.

Rainfall data for the area show a significant lack of much needed precipitation for newly planted stock. For the period from April 1, 2007 through October 31, 2007, there was a rainfall deficit of 8.4 inches. This deficit occurred during when evapotranspiration rates were at their annual peak. The lack of water at a crucial time for root development obviously had a significant impact on plant survival. As can be seen in general site photos in Appendix A, the project area supports a complete and heavy ground cover of herbaceous material that may have contributed to the poor survival of planted woody material through competition for scarce soil moisture in the root zone of the very upper soil horizon.

There are no obvious micro scale problem areas. The droughty conditions severely affected both the shrub/scrub and the forested communities in a broad way. The emergent zone fared the best as it was able to retain moisture for longer periods after rainfall due to drainage patterns and its lower elevation. Despite the severely droughty conditions, volunteer tree species such as sweetgum (*Liquidambar styraciflua*) and sourwood (*Oxydendrum arboreum*) have begun to seed in. There is a sufficient seed wall on two sides of the project site that should continue to supply volunteer seed.

1.2 Problem Area Plan View (Integrated)

Figure 4 in Appendix D illustrates the general poor survival of planted stock due to severely drought conditions throughout the growing season. Although there was no planting of woody material in the emergent zone, it appears to have been fully colonized by hydrophytic species.

2.0 Wetland Assessment

The hydrologic success criterion is to achieve a minimum of 21 consecutive days where the groundwater level is within 12 inches of the soil surface during the growing season. The growing season for this site is from March 27 to November 4, a period of 223 days (the 29-year average determined from the NOAA station at Williamston, NC). Success for any particular monitoring location is to show soil saturation to within 12 inches of the surface for 21 consecutive days during that period.

Four continuous monitoring devices were originally deployed across the site and in September, per the advice of EEP personnel, three more devices were deployed as backup in case of device failure or well damage. A rain gauge was also installed on site in September, but due to time of deployment, the rainfall data for this report is from the NOAA site at Williamston, NC.

To further gauge the affect of seasonal and annual variations in precipitation in restored wetlands, hydrologic success of the site was assessed in relation to the reference wetland site. Well 7 was installed in the reference wetland site, but too late in the growing season to provide an accurate assessment, although it remained nearly dry for majority of its deployment.

2.1 Wetland Problem Areas

Rainfall in April and July was slightly above normal, but below normal for the remainder of the growing season. In addition, the average temperature for the period April to October 2007 was above normal. In particular, August through October of 2007 experienced a rainfall deficit of 7.37 inches of rain while temperatures averaged 3.8 degrees (F) above normal. The combined effect of these micro-climatic events created severely droughty conditions during the growing season on the Modlin project.

The wetland problem areas coincide with the vegetation problem areas. The lower areas of the emergent zone were able to retain water for longer periods, but the upper reaches of the flood plain were not. The hydrographs in Appendix C show the how the soil moisture levels responded to the sporadic rainfall. Although they reached the necessary level on numerous occasions, the soil saturation levels were not sustained for 21 consecutive days at any of the 7 well locations during the growing season.

2.2 Problem Areas Plan View

Figure 4 in Appendix D provides an overview of the hydrologic problem areas. Much of the emergent zone was ponded for some length during the growing season as evidenced by the site photos in Appendix A. In contrast, those areas higher in the flood plain remained very droughty for most of the summer and fall.

Well	Hydrology Success Met	Hydrology Mean	Vegetation Plot	Vegetation Success Met	Vegetation Mean
1	N	0%	1	Y	25%
2	N		2	N	
3	N		3	N	
4	N		4	N	
5	N/A *		N/A	N/A	
6	N/A *		N/A	N/A	
7	Reference Well		Reference Well	Reference Well	

* Due to late deployment of wells 5, 6 and 7, insufficient data was collected to determine hydrologic success.

III. Methodology Section

Year 1 (baseline) monitoring for the Modlin project occurred in 2007. Monitoring and vegetation sampling procedures were established in the mitigation plan for this project and no deviations were made.

Appendix A

Vegetation Data Tables

Vegetation Photos

1. Vegetation Data Tables

Table 1. Vegetation Metadata	
Report Prepared By	Ashby B. Brown
Date Prepared	11/19/2007 10:18
database name	CVS_EEP_EntryTool_v220.mdb
database location	C:\Documents and Settings\Ashby\My Documents\Albemarle Restorations\CVS-EEP
computer name	ABB01
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----	
Metadata	This worksheet, which is a summary of the project and the project data.
Proj, planted	Each project is listed with its PLANTED stems, for each year. This excludes live stakes and lists stems per acre.
Proj, total stems	Each project is listed with its TOTAL stems, for each year. This includes live stakes, all planted stems, and all natural/volunteer stems. Listed in stems per acre.
Plots	List of plots surveyed.
Vigor	Frequency distribution of vigor classes.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
Damage	List of most frequent damage classes with number of occurrences and percent of total stems impacted by each.
Damage by Spp	Damage values tallied by type for each species.
Damage by Plot	Damage values tallied by type for each plot.
ALL Stems by Plot and spp	Count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
PROJECT SUMMARY-----	
Project Code	D050241
Project Name	Modlin Riverine
Description	Modlin property Riverine Wetland mitigation project, Martin county, NC
River Basin	Roanoke
length(ft)	
stream-to-edge width (ft)	
area (sq m)	
Required Plots (calculated)	
Sampled Plots	4

Table 2. Vegetation Vigor by Species							
	Species	4	3	2	1	0	Missing
	Alnus serrulata		1				
	Nyssa biflora			1			
	Quercus bicolor		2	3	2	1	
	Quercus phellos		1		1		
	Salix nigra					1	
	Taxodium distichum			1			
	Vaccinium corymbosum		4	1			
	Acer rubrum		1	2		1	
	Unknown				2		1
	Myrica cerifera		2				
TOT:	10		11	8	5	3	1

Table 3. Vegetation Damage by Species					
	Species	All Damage Categories	(no damage)	Other/Unknown Animal	Site Too Dry
	Acer rubrum	4	4		
	Alnus serrulata	1	1		
	Myrica cerifera	2	2		
	Nyssa biflora	1		1	
	Quercus bicolor	8	4	2	2
	Quercus phellos	2	1		1
	Salix nigra	1	1		
	Taxodium distichum	1	1		
	Unknown	3	1		2
	Vaccinium corymbosum	5	5		
TOT:	10	28	20	3	5

Table 4. Vegetation Damage by Plot					
	plot	All Damage Categories	(no damage)	Other/Unknown Animal	Site Too Dry
	D050241-ABET-0001	8	5	3	
	D050241-ABET-0002	6	6		
	D050241-ABET-0003	7	2		5
	D050241-ABET-0004	7	7		
TOT:	4	28	20	3	5

Table 5. Stem Count by Plot and Species								
	Species	Total Planted Stems	# plots	avg# stems	plot D050241-ABET-0001	plot D050241-ABET-0002	plot D050241-ABET-0003	plot D050241-ABET-0004
	Acer rubrum	3	1	3	3			
	Alnus serrulata	1	1	1				1
	Myrica cerifera	2	1	2				2
	Nyssa biflora	1	1	1	1			
	Quercus bicolor	7	3	2.33	4	1	2	
	Quercus phellos	2	1	2			2	
	Taxodium distichum	1	1	1			1	
	Unknown	2	1	2			2	
	Vaccinium corymbosum	5	2	2.5		1		4
TOT:	9	24	9		8	2	7	7
Representative stem density (stems per acre) baseline					324	81	283	283

Table 6. Vegetation Problem Areas			
Feature/Issue	Plot	Probable Cause	Photo #
Herbaceous competition	All	Dense herbaceous cover	VPA 1, VPA 2
Poor overall stem development and survival	All	Competition and lack of moisture	VPA 3

2. Vegetation Problem Area Photos

VPA 1
Indicative of entire site



VPA 2
Indicative of entire site



VPA 3
Indicative of entire site



3. Vegetation Monitoring Plot Photos

Plot 1



Plot 2



Plot 3



Plot 4



Appendix B

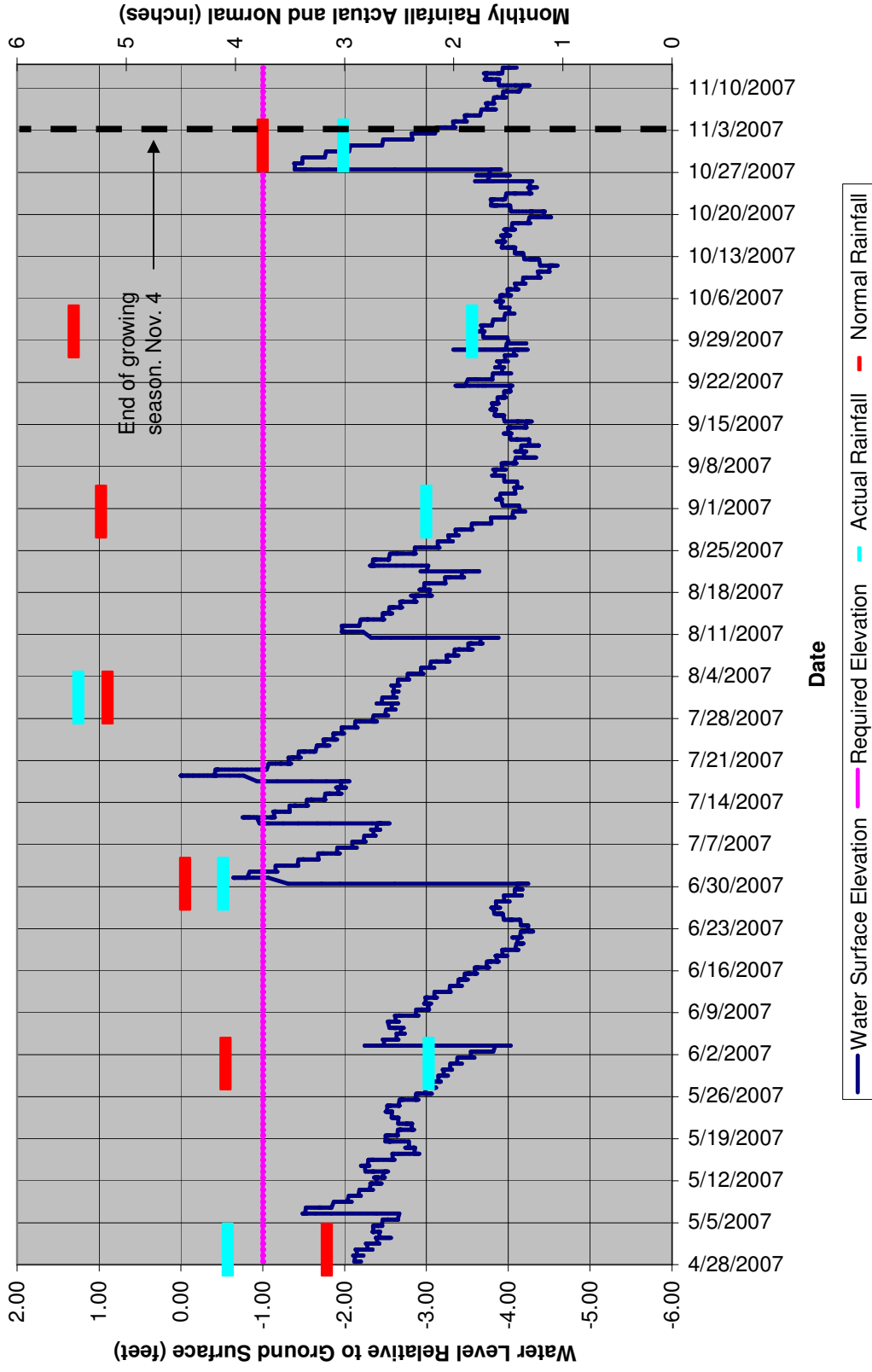
Geomorphologic Raw Data

Not used in this report

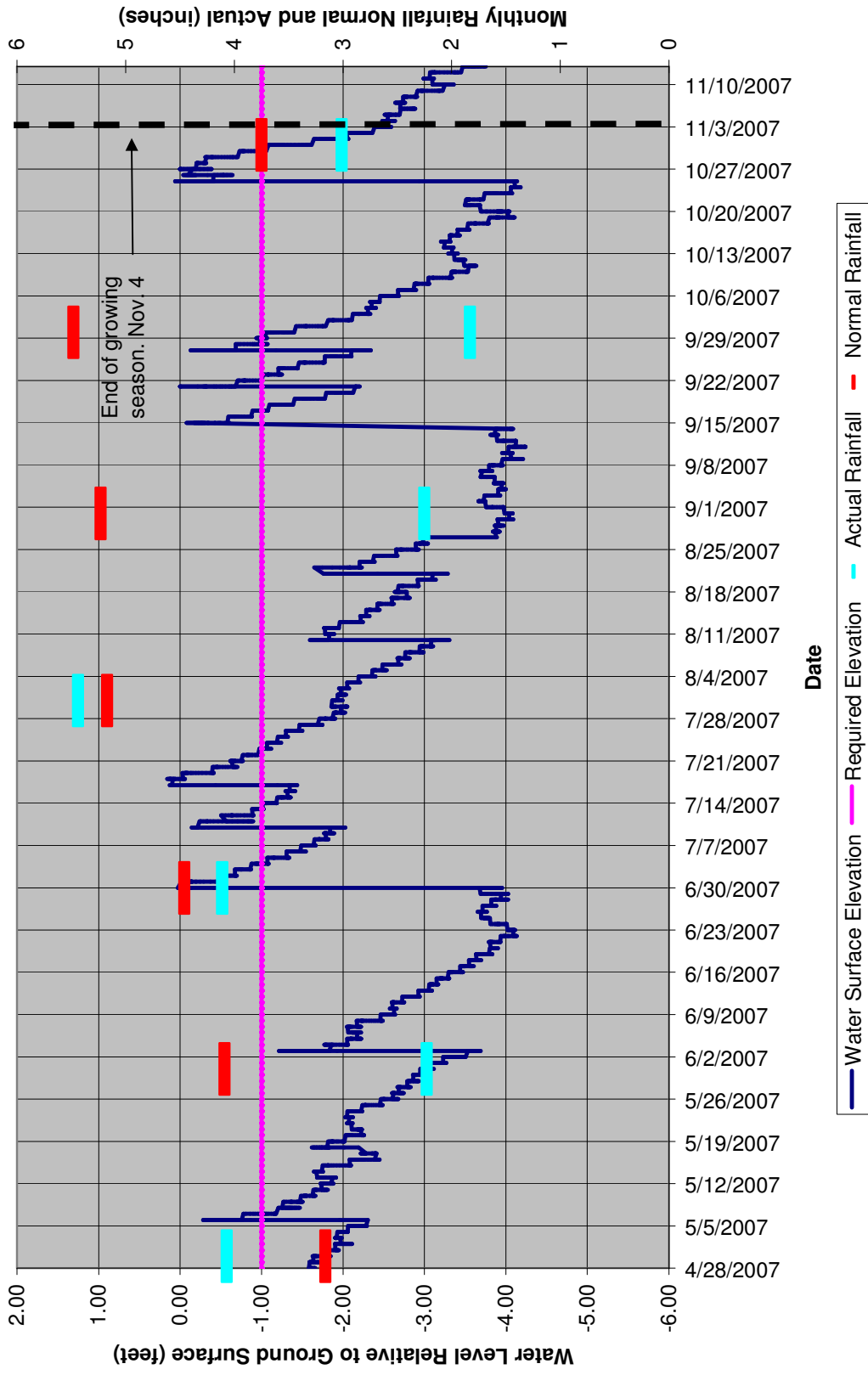
Appendix C

Hydrologic Data Tables

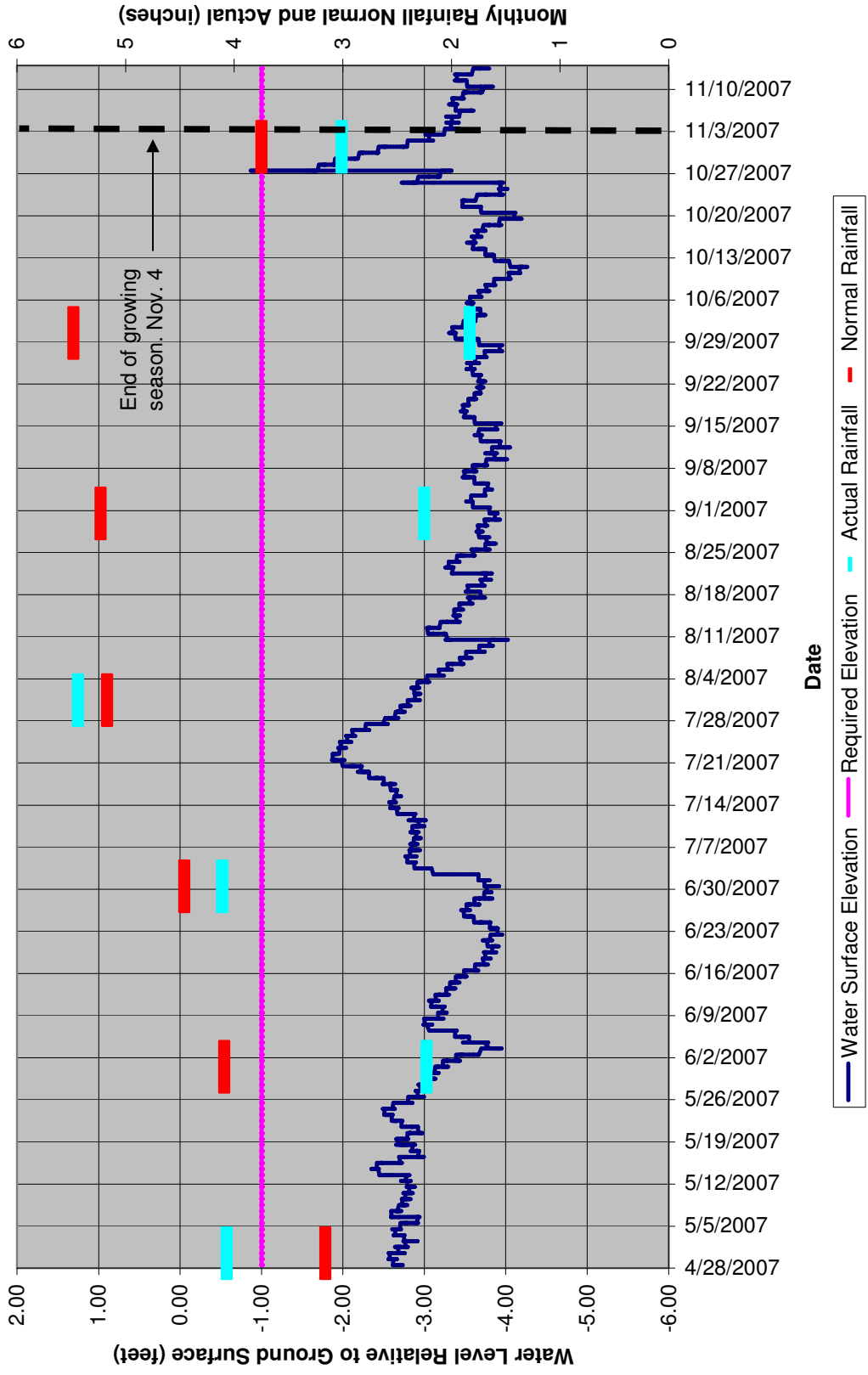
Modlin Monitoring Well #1 (1126654)



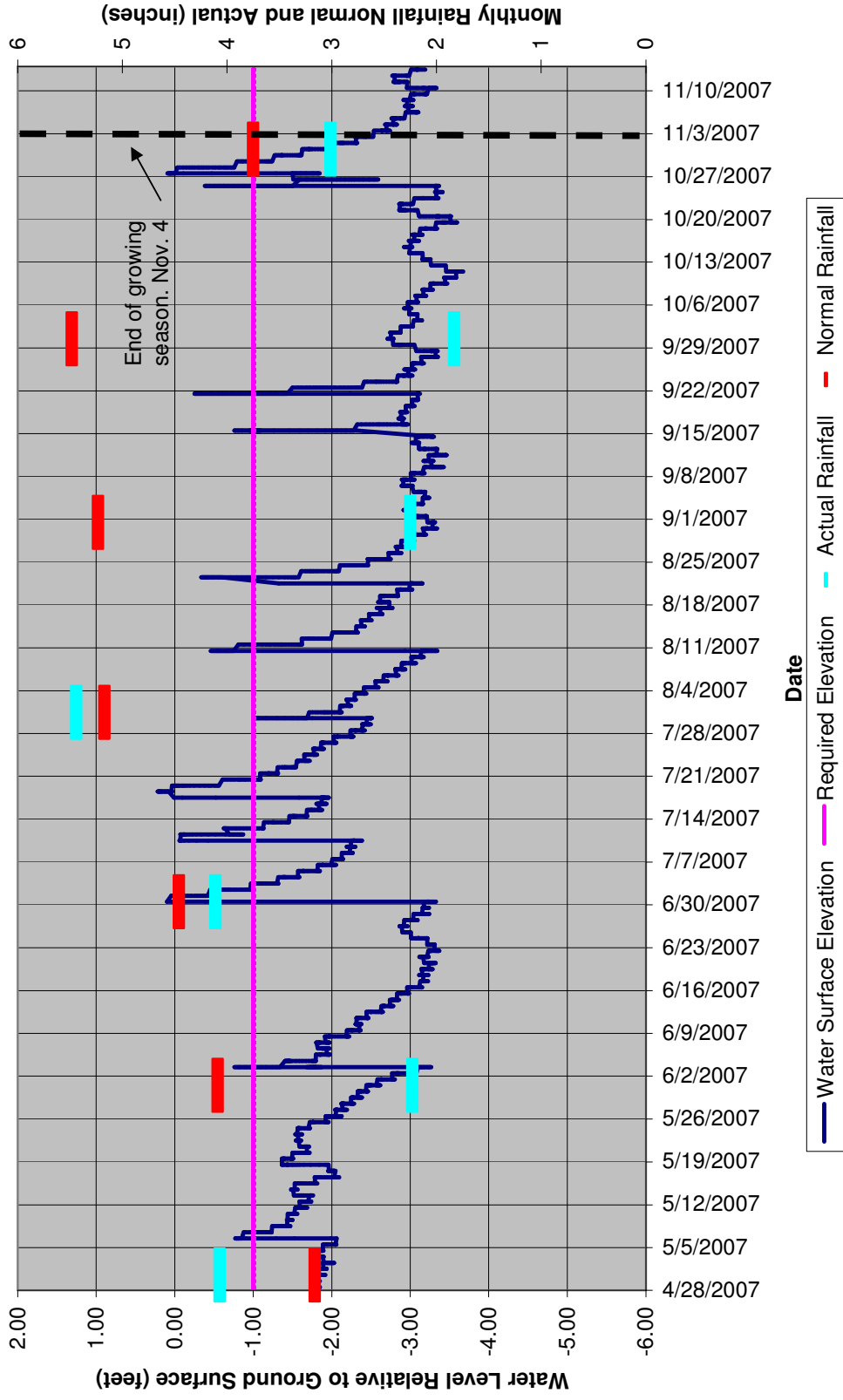
Modlin Monitoring Well #2 (1126653)



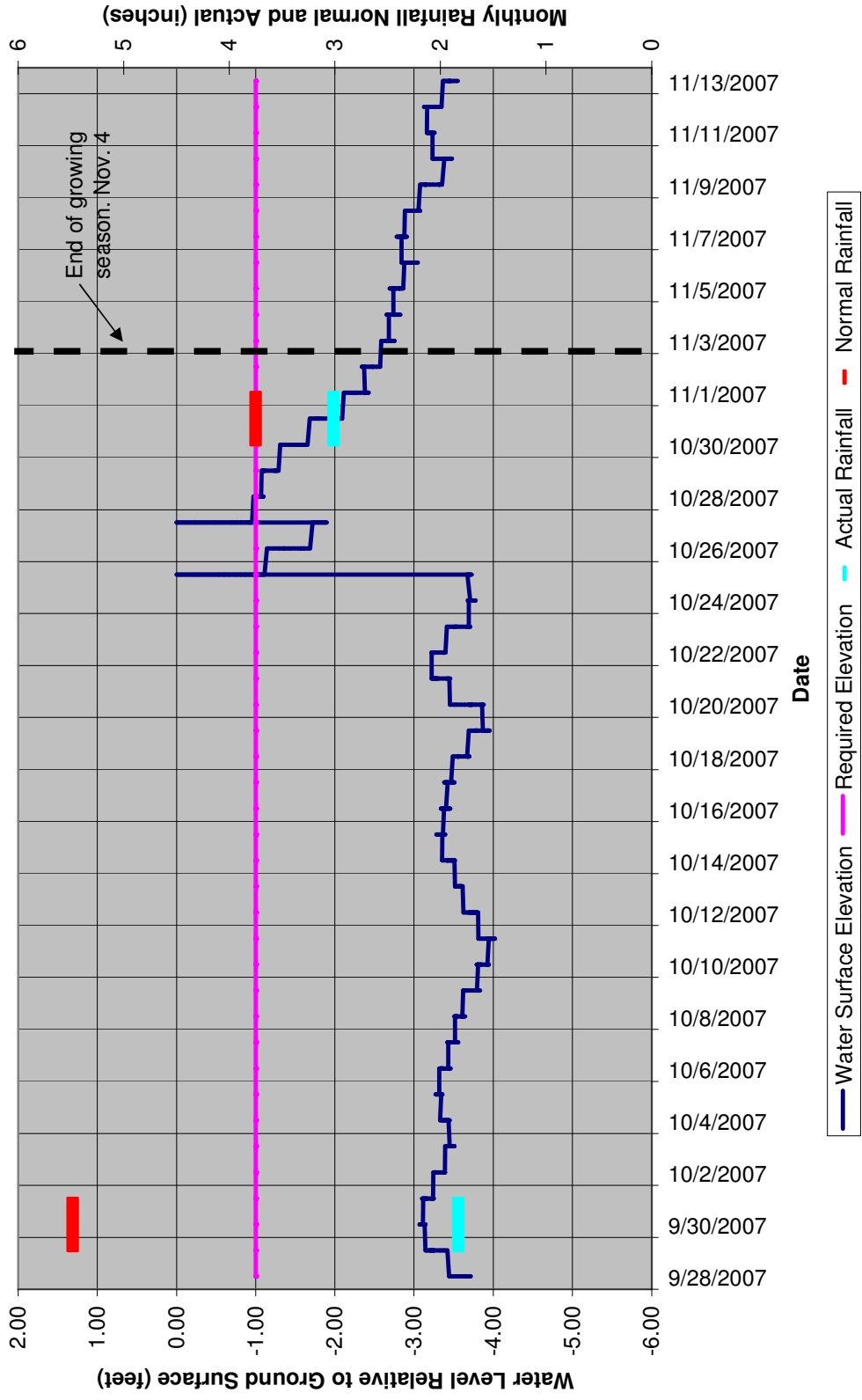
Modlin Monitoring Well #3 (1126651)



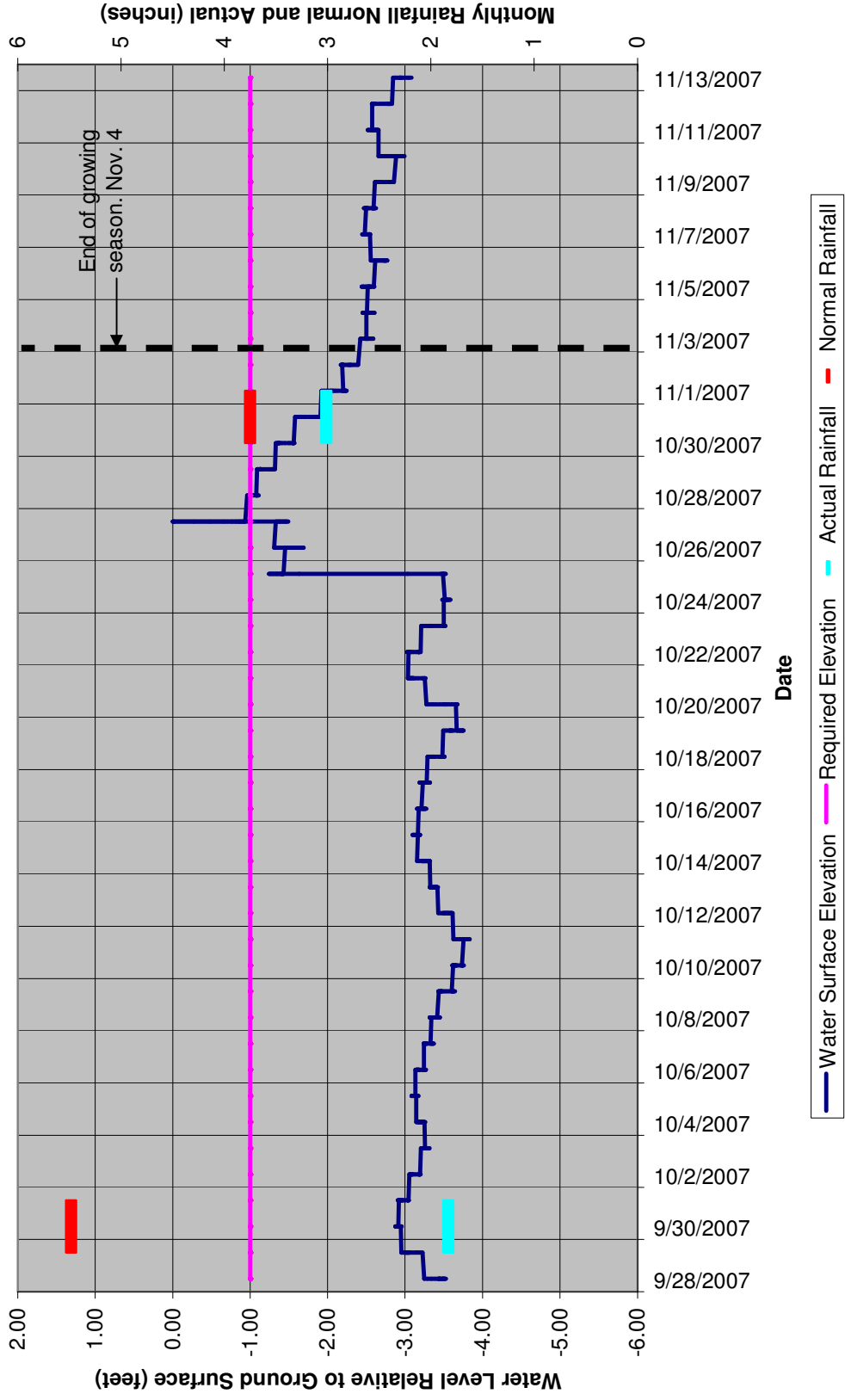
Modlin Monitoring Well #4 (1126650)



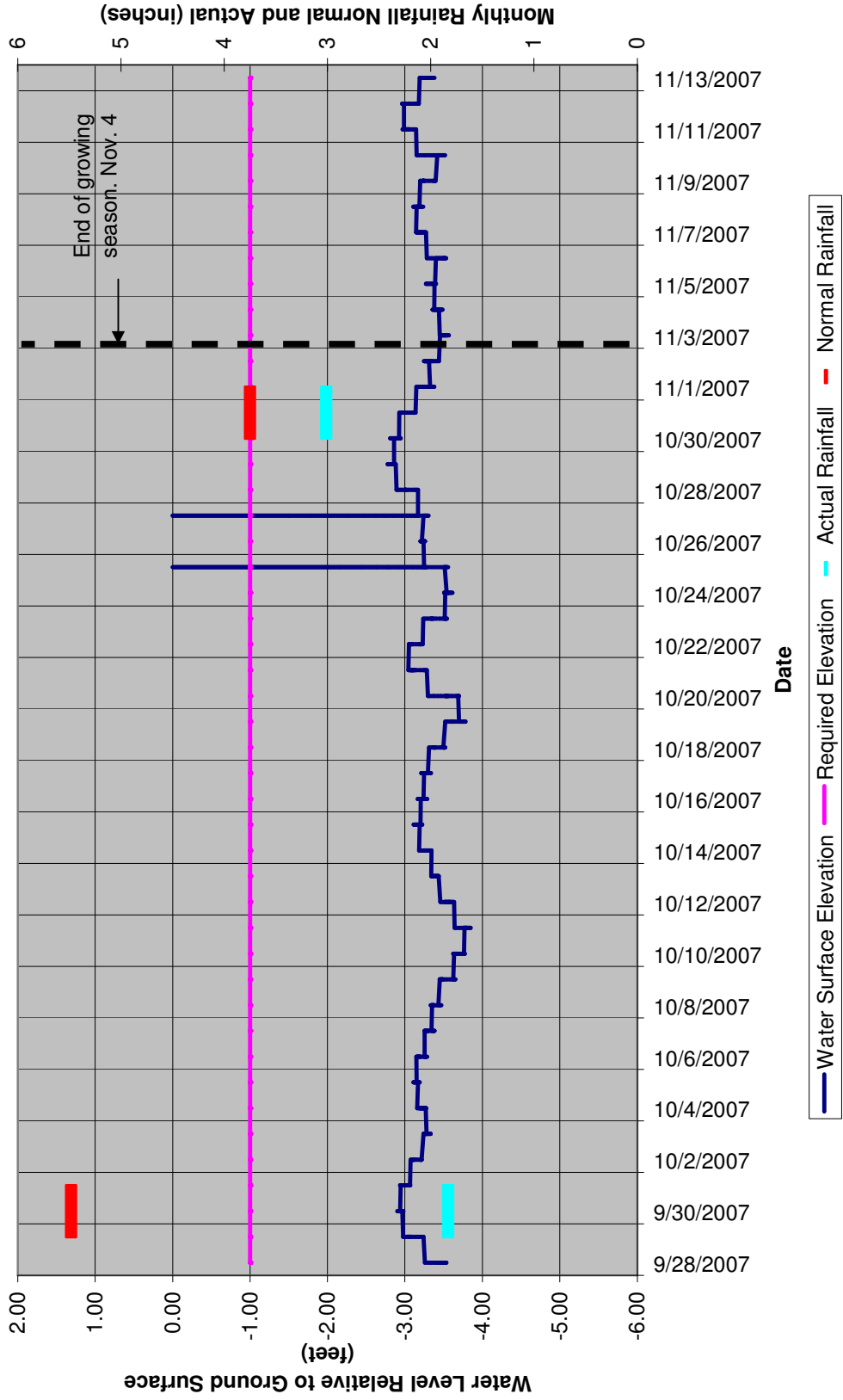
Modlin Monitoring Well #5 (1180987)



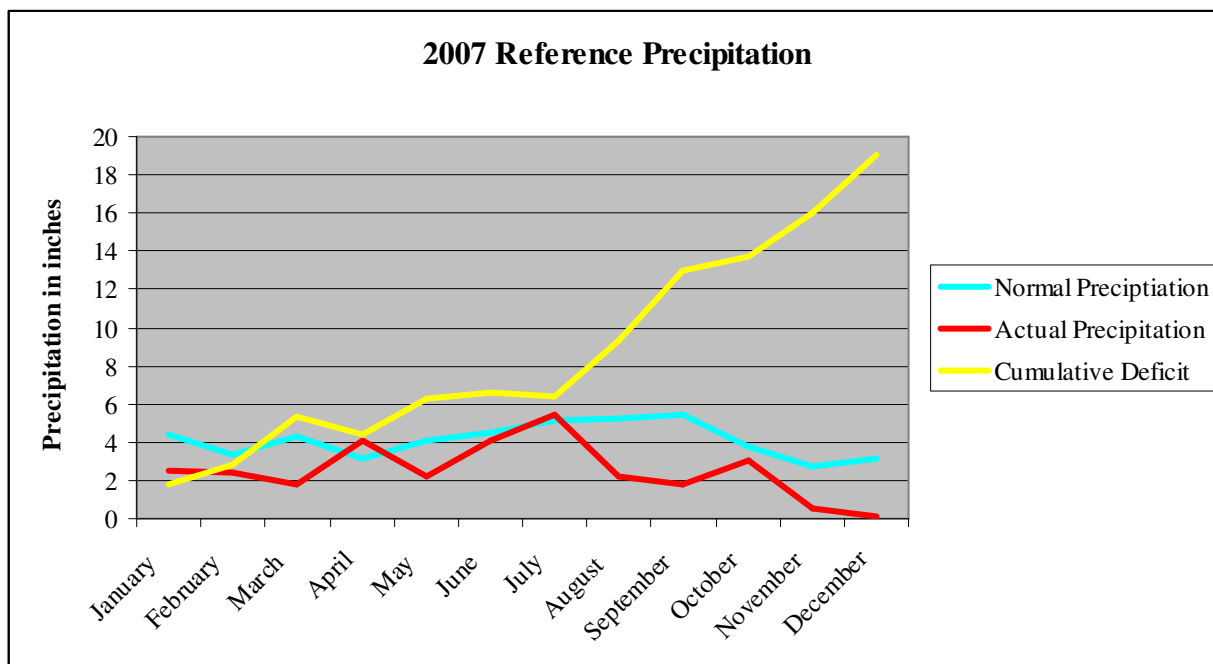
Modlin Monitoring Well #6 (1180994)



**Modlin Monitoring Well #7 (1180991)
Reference Site Well**

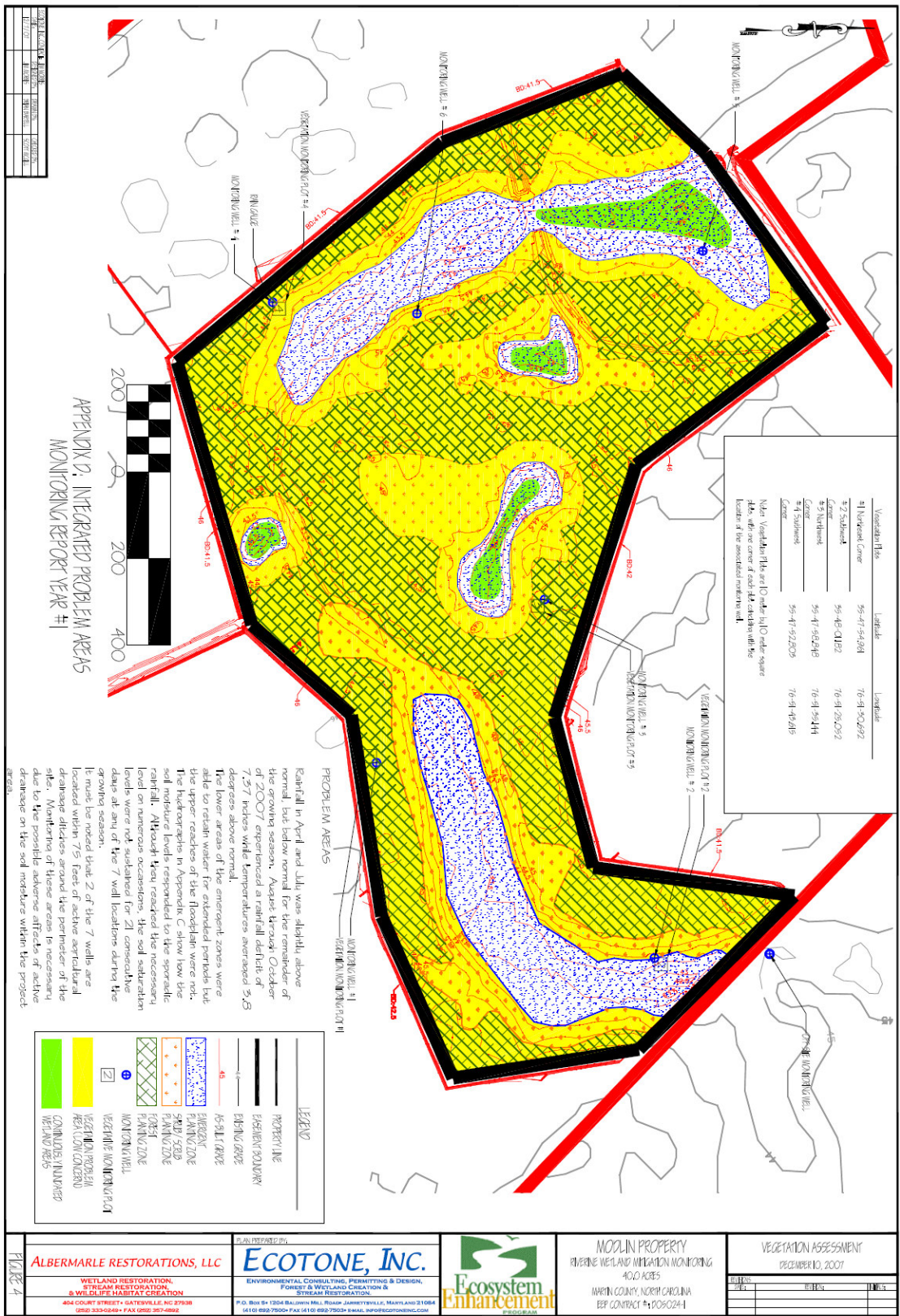


Well	# days within 12" (% of growing season)	# days within 12" (during growing season)	Hydrologic Success
1	2%	6	No
2	13%	32	No
3	1%	1	No
4	9%	22	No
5	N/A	N/A	N/A
6	N/A	N/A	N/A
7	N/A	N/A	Reference Well



Appendix D

Problem Areas Plan View (Integrated)



ALBERMARLE RESTORATIONS, LLC
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MODLIN PROPERTY
 PINEWETLAND MITIGATION MONITORING
 40.0 ACRES
 WATKINS COUNTY, NORTH CAROLINA
 EEP CONTRACT # 10502041

VEGETATION ASSESSMENT
 DECEMBER 10, 2007

DATE	BY	REVISION