

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

**2009 Annual Monitoring Report  
Year 3**



**NCEEP Project Number D050241  
Roanoke River Basin**

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

Date: December, 2009

Monitoring:  
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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 1<sup>st</sup> and 4<sup>th</sup>, 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 gauges were installed on April 23, 2007 at varying elevations throughout the site to measure subsurface water elevations. Three additional backup gauges were installed in September of 2007, two onsite and one offsite. The three backup gauges were installed upon recommendations of EEP personnel in case of failure of one of the primary gauges. Another gauge was added this year to help determine the localized effects perimeter ditches are having on the hydrology. This year (2009), only one of the original onsite gauges failed to meet the hydrologic success criterion of maintained groundwater levels within 12 inches of the soil surface for 21 consecutive days during the growing season. Precipitation patterns were more normal this year than in previous years and groundwater levels responded rapidly to rainfall. Evidence of active water and debris movement in and around the drainage course was observed during a site inspection in November of 2009.

Four vegetative monitoring plots were installed and permanently monumented, one coincident with each of the original monitoring gauges, 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. After poor survival in 2007, the site received both replacement and supplemental planting in the winter of 2008. All four plots met the year 3 success criterion of 320 living planted stems per acre this year, a success rate of 100%. Table ES-1 shows the levels of success attained by each of the water level monitoring gauges and the vegetation plots since monitoring began. Success criterion for hydrology is 8% of the growing season (21 days). Table C-1 in Appendix C has a detailed breakdown of hydrologic success. Success criterion for the vegetation plots is 320 live stems per acre (the year 3 level of survival).

Table ES-1. Project Success Summary													
	Gauge							Percent Success	Vegetation Plot				Percent Success
	1	1A	2	3	4	5	6		1	2	3	4	
<b>Year 1 (2007) Success</b>	N		N	N	N	N	N	0%	Y	N	N	N	25%
<b>Year 2 (2008) Success</b>	N		Y	N	N	Y	N	33%	Y	Y	Y	Y	100%
<b>Year 3 (2009) Success</b>	N	N	Y	Y	Y	Y	Y	71%	Y	Y	Y	Y	100%

## **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 that 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 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.

<b>Table I. Project Restoration Components</b>				
<b>Modlin Property Wetland Mitigation Site/EEP #D050241</b>				
<b>Restoration Type</b>	<b>Pre-Existing Acreage</b>	<b>Post Construction Acreage</b>	<b>Credit Ratio WMU</b>	<b>Wetland Mitigation Units</b>
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.

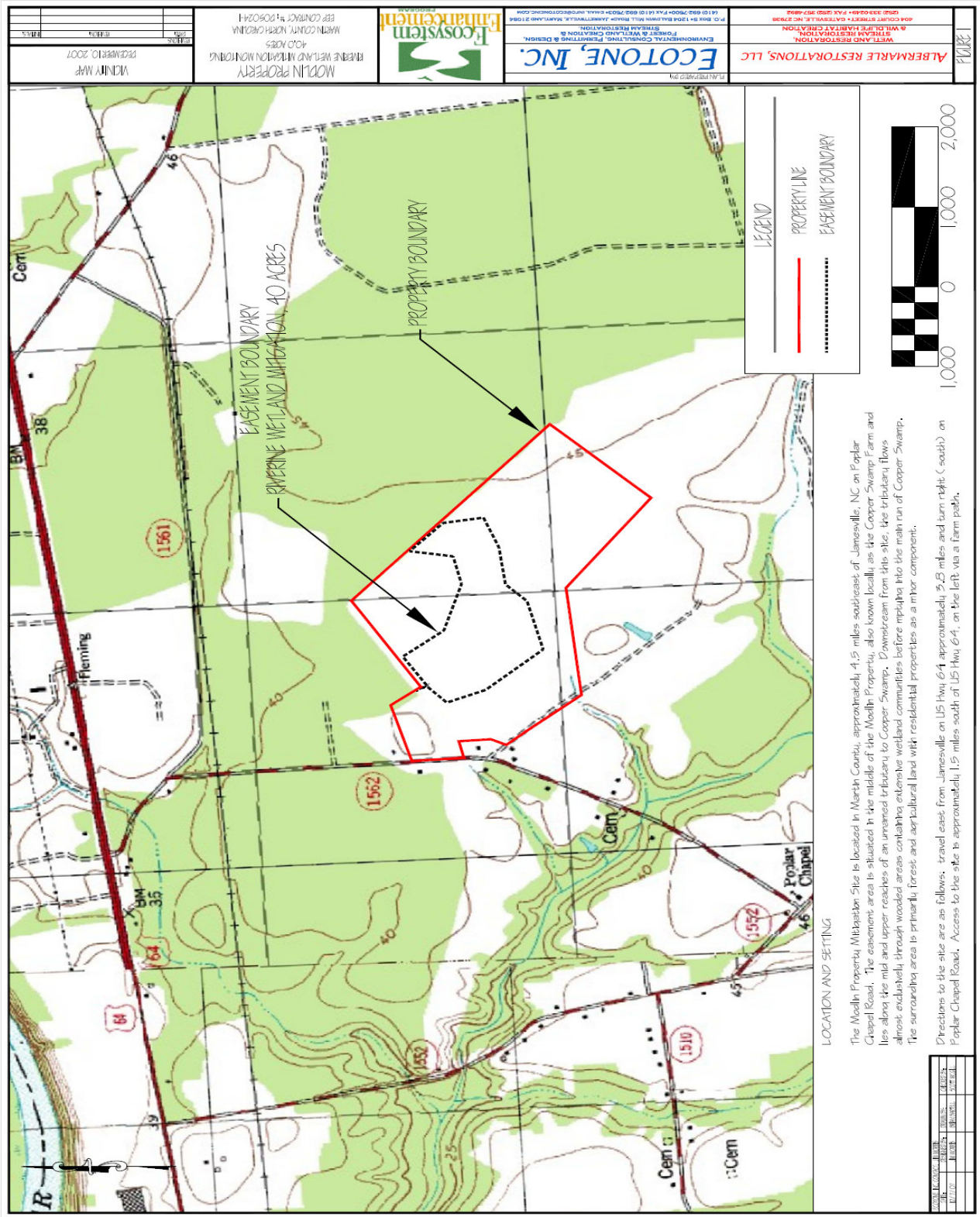
Figure 1 is a location map for the project site. Directions to the site are as follows: travel east from Jamesville on US Hwy 64 approximately 3.8 miles and turn right (south) on Poplar Chapel Rd. Access to the site is approximately 1.5 miles south of US Hwy 64, on the left via a farm path.

### **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**

<b>Activity or Report</b>	<b>Data Collection Complete</b>	<b>Actual Completion or Delivery</b>
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 1 monitoring - baseline)	Oct. 2007	December 2007
Year 2 monitoring	September 2008	December 2008
Year 3 monitoring	September 2009	December 2009
Year 4 monitoring		
Year 5 monitoring		



Points of contact for the various phases of the MPWMS are provided in Table III.

<b>Table III. Project Contacts</b> <b>Modlin Property Wetland Mitigation Site/EEP #D050241</b>	
<b>Designer</b> Primary Project design POC	Ecotone, Inc. 1204 Baldwin Mill Road Jarrettsville, MD 21804 Scott McGill (410-692-7500)
<b>Construction Contractor</b> Construction contractor POC	Armstrong, Inc. P. O. Box 96 25852 US Hwy 64 Pantego, NC 27860 Tink Armstrong (252-943-2082)
<b>Planting Contractor</b> Planting contractor POC	Williams Forestry Service, Inc. P. O. Box 189 Millville, PA 17846 Christian Duffy (570-458-0766)
<b>Seeding Contractor</b> 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.
<b>Monitoring Consultants</b> Wetland and Vegetation POC	Woods, Water and Wildlife, Inc. P. O. Box 176 Fairfield, NC 27826 Ashby Brown (800-509-0190)

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

<b>Table IV. Project Background</b> <b>Modlin Property Wetland Mitigation Site/EEP #D050241</b>	
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

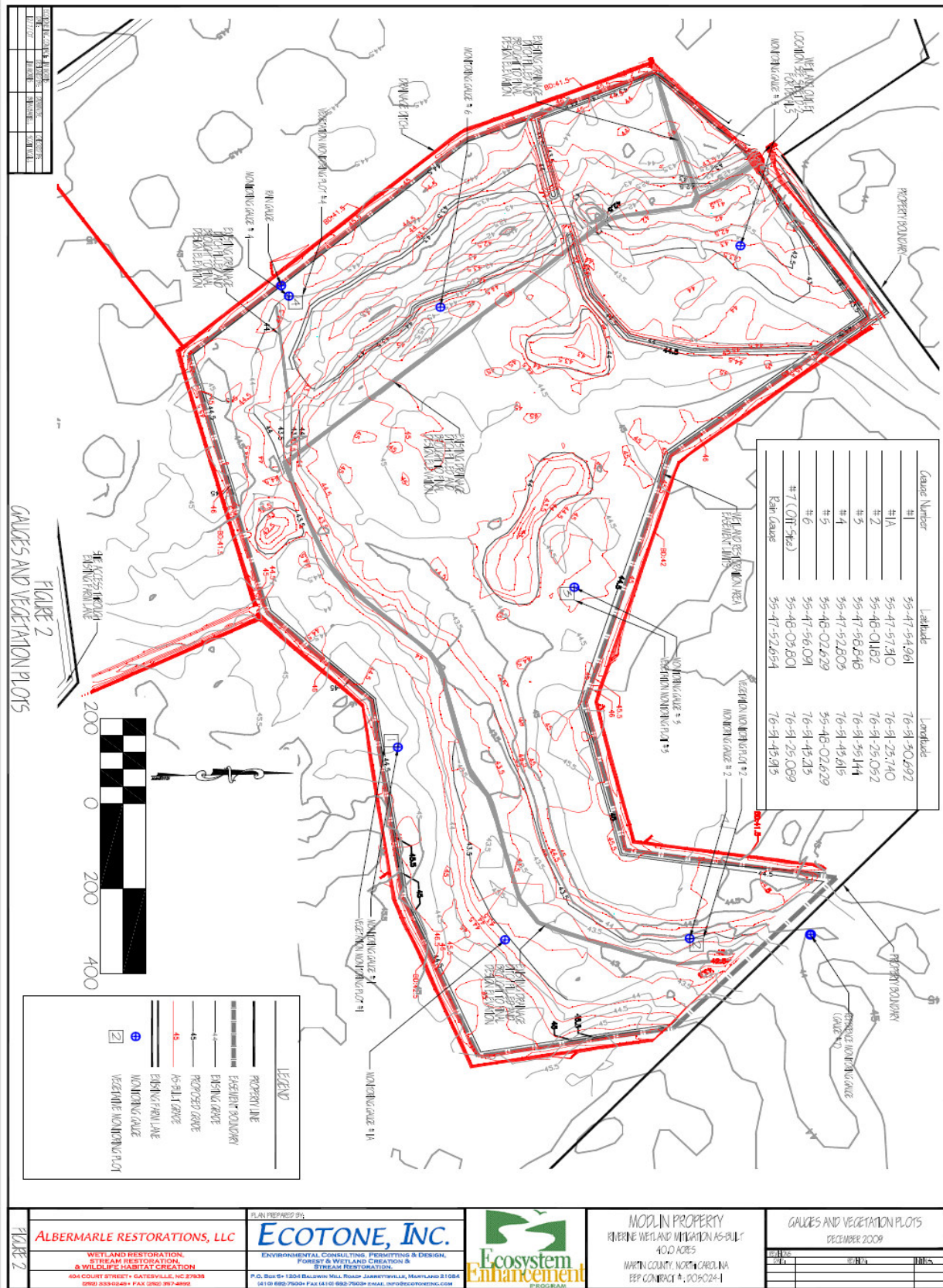


## **5.0 Monitoring Plan View**

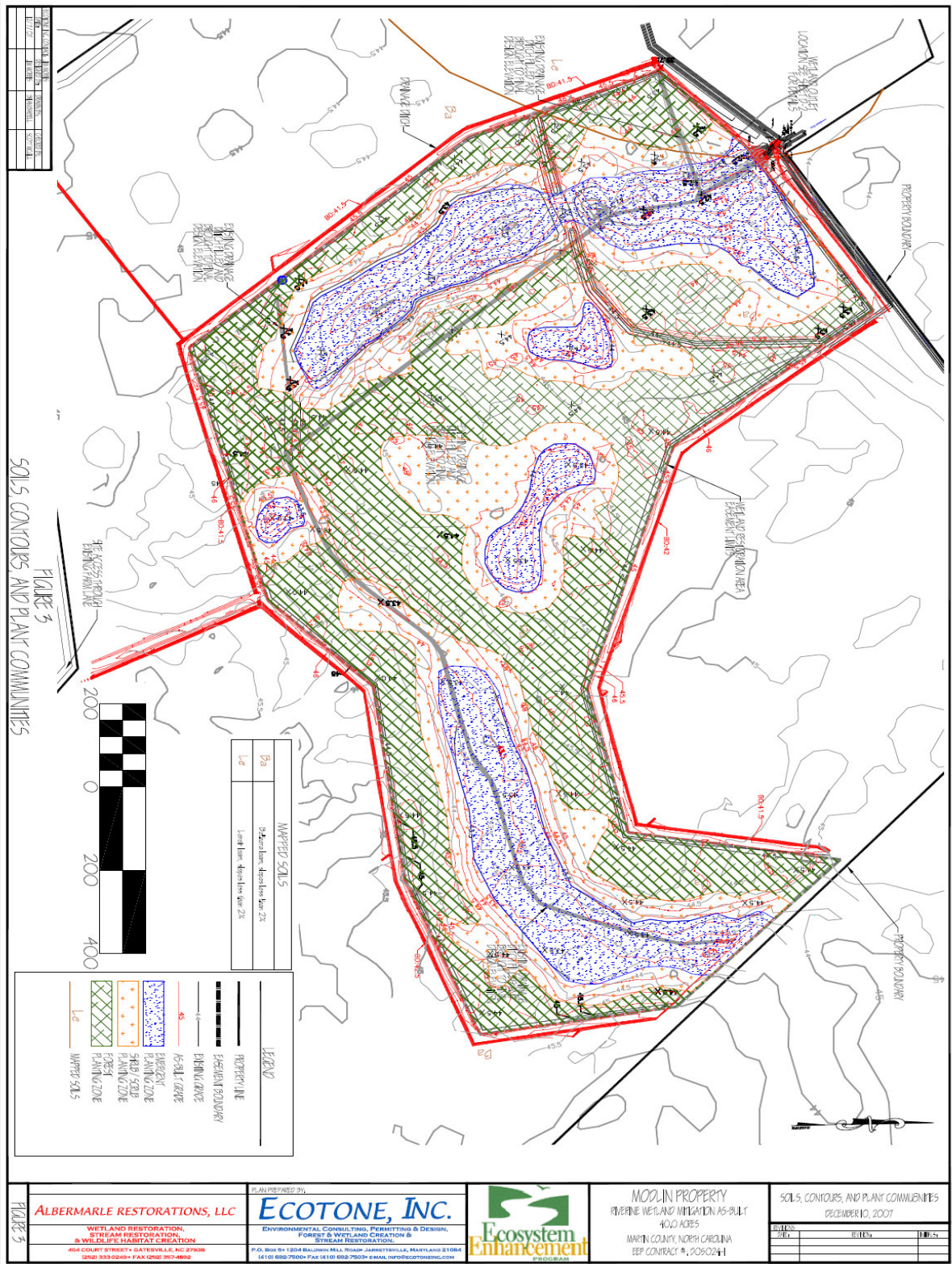
There are eight water level monitors installed at key locations across the property. These loggers are suspended in two-inch pvc pipe that is set approximately four feet vertically into the ground. The loggers have been located to assess the groundwater levels throughout the year at various elevations and topographies within the site. In addition, there is a rain gauge on site to capture and record onsite precipitation.

Vegetation monitoring is accomplished by resurveying the four permanent sampling plots. Each plot is referenced by a monitoring gauge which serves 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 gauges, sampling plots and the rain gauge.







PLAN PREPARED BY:  
**ECOTONE, INC.**  
 ENVIRONMENTAL CONSULTING, PERMITTING & DESIGN,  
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 STREAM RESTORATION.  
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MODLIN PROPERTY  
 RIVERINE WETLAND MITIGATION AS-BUILT  
 40-D ACRES  
 MARTIN COUNTY, NORTH CAROLINA  
 BEP CONTRACT # 2090241

SOILS, CONTOURS, AND PLANT COMMUNITIES DECEMBER 10, 2007		
DATE	BY	REVISION

## 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 Palustrine emergent (PEM) 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 Palustrine shrub/scrub (PSS) 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 Palustrine forested (PFO) 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. Due to poor survival attributed to the drought conditions experienced during the first growing season, replacement planting and supplemental planting took place in the winter of 2008. The species used were chosen from Table V.

<b>Table V. Species by Community Type</b>		
<b>Modlin Property Wetland Mitigation Project/EEP #D050241</b>		
<b>Forested Wetland 18.5 Acres</b>		
<b>Common Name</b>	<b>Scientific Name</b>	<b>Wetland Indicator Status</b>
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
<b>Shrub/Scrub 11.85 Acres</b>		
<b>Common Name</b>	<b>Scientific Name</b>	<b>Wetland Indicator Status</b>
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 Vegetation Discussion and Problem Areas**

All four plots met the Year 3 success criterion of a minimum of 320 stems per acre. Over the entire project, the survival rate averaged 567 live stems per acre. A total of 12 different species were tallied in September of 2009. Once again, Willow oak (*Q. phellos*) and Bald Cypress (*T. distichum*) showed the best survival rates.

Rainfall data for the site show total precipitation for March through November to be very close to normal with only a 0.54" deficit. Heavy rainfall during the late spring/early summer months and a late season storm in November helped boost total rainfall on the site. As can be seen in general site photos in Appendix A, the project area continues to support a complete and heavy ground cover of herbaceous material, but the planted stock appears to be well enough established that competition is only hindering growth, not survival.

There are no obvious micro scale problem areas. While walking the site, some volunteer tree species were observed such as sweetgum (*L. styraciflua*), FAC+ and red maple (*A. rubrum*), FAC. There is a sufficient seed wall on two sides of the project site that is supplying Loblolly pine seed and that species is becoming well established at the extreme ends of the project.

## **1.2 Vegetation Monitoring Plan View (Integrated)**

Figure 4 in Appendix D illustrates an area of the site where hydrology is a potential problem, but there are no apparent micro scale problems with vegetation.

## **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 10 to November 20, a period of 255 days (WETS Table for Williamston, Martin County, 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.

There are eight continuous water level monitoring devices deployed across the site (Gauges 1-6 and 1A) to monitor fluctuations in the water table within the project area. A rain gauge is also kept onsite and its data are compared to that collected at the NOAA cooperator site in 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 (Gauge 7).

## **2.1 Wetland Discussion and Problem Areas**

Rainfall for the months of March, April and May was very near normal which is the period when most of the gauges registered hydrology success. In July and August, rainfall was above average, and in general, hydrology appears to have responded accordingly. The pools and the lowest parts of the main run held water the entire year, even during the hottest months of the

summer. The data indicate quick recharge of groundwater after rainfall events followed by rapid dissipation. Again in November, a single heavy rainfall event caused groundwater levels to recharge and remain high as uptake and evaporation were minimal.

Photos from May show scouring and deposition of small woody debris at the pinch point of the internal berm near the outfall end of the project. The heavy extended rainfall event in November produced overbank flooding in the pools and the main run over the length of the project. Water was actively flowing through the pinch point toward the outfall end and the water level was very near the top of the rock plug at the outlet.

The wetland problem area this year is confined to an area where a perimeter ditch appears to be having an adverse effect on the hydrology. The perimeter ditch along the southeastern boundary is suspected of causing excessive drainage from the project site. Gauge 1 is closest to this ditch and has yet to achieve hydrology success. Gauge 2, at the extreme eastern end of the project has shown success for the past two years. So in order to assess this potential problem, Gauge 1A was added between the floodplain and the perimeter ditch and between Gauges 1 and 2. It was deployed in the middle of the growing season so it was not in place when the other gauges had already shown success. But a comparison of the charts for gauges 1 and 1A suggest better hydrology at gauge 1A which is farther from the perimeter ditch.

## 2.2 Wetland Monitoring Plan View (Integrated)

Figure 4 in Appendix D provides an overview of the site. The area shaded in yellow on the plan view indicates the problem area described above. Much of the emergent zone was inundated for some time during the growing season as evidenced by the site photos in Appendix A. There was evidence of surface water movement at the internal berm toward the outfall end of the project after the heavy rainfall event in November. This berm slows the movement of water offsite and appears to be functioning properly.

Well	Hydrology Success Met	Hydrology Mean	Vegetation Plot	Vegetation Success Met	Vegetation Mean
1	N	71%	1	Y	100%
1A	N		2	Y	
2	Y		3	Y	
3	Y		4	Y	
4	Y				
5	Y				
6	Y				
7	Y*				

\*Well 7 is on the reference site

### **3.0 Project Success Discussion**

During the first two year of monitoring on the Modlin site, the Jamesville area had been almost continuously classified as being in a moderate to severe rainfall drought according to the United States Drought Monitor. Because of the drought conditions, the groundwater table had been below normal, thereby hindering normal wetland hydrology from becoming established on the site. But in this, the third year of monitoring, with close to normal precipitation, hydrology appears to be responding appropriately. The site appears to be regaining wetland functions, showing rapid recharge of groundwater, and longer hydroperiods especially in the presence of normal precipitation.

Vegetation criteria have been met for monitoring year 3, with 100% of surveyed plant material being FAC or wetter. The survival of the planted species, colonization of the site by wetland pioneer species, the presence of herbaceous hydrophytes and greater hydrology success all points toward overall success for the site.

### **III. Methodology Section**

Year 3 monitoring for the Modlin project occurred in 2009. Monitoring and vegetation sampling procedures were established in the mitigation plan for this project and no deviations were made.

# **Appendix A**

Vegetation Data Tables

Site Photos



## 1. Vegetation Data Tables

Table 1. Project Metadata

<b>Report Prepared By</b>	Ashby B. Brown
<b>Date Prepared</b>	10/8/2009 11:37
<b>DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT-----</b>	
<b>Metadata</b>	This worksheet, which is a summary of the project and the project data.
<b>Vigor by Spp</b>	Frequency distribution of vigor classes listed by species.
<b>Damage by Spp</b>	Damage values tallied by type for each species.
<b>Damage by Plot</b>	Damage values tallied by type for each plot.
<b>ALL Stems by Plot and spp</b>	Count of total living stems of each species (planted and natural volunteers combined) for each plot; dead and missing stems are excluded.
<b>Problem Areas</b>	Vegetation problem areas in table form.
<b>PROJECT SUMMARY-----</b>	
<b>Project Code</b>	D050241
<b>project Name</b>	Modlin Riverine
<b>Description</b>	Modlin property Riverine Wetland mitigation project, Martin county, NC
<b>River Basin</b>	Roanoke
<b>Sampled Plots</b>	4

Table 2. Vegetation Vigor by Species

	<b>Species</b>	<b>4</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>Missing</b>
	Alnus serrulata		1				
	Clethra alnifolia		1				
	Cyrilla racemiflora		1				
	Ilex glabra			3			
	Nyssa biflora		1				
	Quercus bicolor			5			2
	Quercus phellos	2	10	6			4
	Salix nigra						1
	Taxodium distichum		11	1			2
	Vaccinium corymbosum		4	1			1
	Magnolia virginiana		1	3			1
	Acer rubrum			3			
	Unknown						1
	Myrica cerifera	2					
<b>TOT:</b>	<b>14</b>	<b>4</b>	<b>30</b>	<b>22</b>			<b>12</b>

Table 3. Vegetation Damage by Species

	<b>Species</b>	<b>All Damage Categories</b>	<b>(no damage)</b>
	Acer rubrum	3	3
	Alnus serrulata	1	1
	Clethra alnifolia	1	1
	Cyrilla racemiflora	1	1
	Ilex glabra	3	3
	Magnolia virginiana	5	5
	Myrica cerifera	2	2
	Nyssa biflora	1	1
	Quercus bicolor	7	7
	Quercus phellos	22	22
	Salix nigra	1	1
	Taxodium distichum	14	14
	Unknown	1	1
	Vaccinium corymbosum	6	6
<b>TOT:</b>	<b>14</b>	<b>68</b>	<b>68</b>

Table 4. Vegetation Damage by Plot

	<b>Plot</b>	<b>All Damage Categories</b>	<b>(no damage)</b>
	D050241-ABET-0001-year:3	15	15
	D050241-ABET-0002-year:3	20	20
	D050241-ABET-0003-year:3	18	18
	D050241-ABET-0004-year:3	15	15
<b>TOT:</b>	<b>4</b>	<b>68</b>	<b>68</b>

Table 5. Stem Count by Plot and Species

	Species	Total Planted Stems	# plots	avg# stems	plot D050241-ABET-0001-year:3	plot D050241-ABET-0002-year:3	plot D050241-ABET-0003-year:3	plot D050241-ABET-0004-year:3
	Acer rubrum	3	1	3	3			
	Alnus serrulata	1	1	1				1
	Clethra alnifolia	1	1	1		1		
	Cyrilla racemiflora	1	1	1				1
	Ilex glabra	3	2	1.5	2	1		
	Magnolia virginiana	4	2	2		2	2	
	Myrica cerifera	2	1	2				2
	Nyssa biflora	1	1	1	1			
	Quercus bicolor	5	3	1.67	3	1	1	
	Quercus phellos	18	3	6	3		8	7
	Taxodium distichum	12	3	4	2	7	3	
	Vaccinium corymbosum	5	3	1.67		1	1	3
<b>TOT:</b>	<b>12</b>	<b>56</b>	<b>12</b>		<b>14</b>	<b>13</b>	<b>15</b>	<b>14</b>
	Stems per acre				567	526	607	567
	Average stems per acre	567						

Table 6. Vegetation Problem Areas

Feature/Issue	Plot	Probable Cause	Photo #
Herbaceous competition	All, but a minor problem at this point. Most stems are well established.	Dense herbaceous cover	Visible in all plot and general photos

## Modlin Property Wetland Mitigation Project 2009 Herbaceous Vegetation Monitoring Summary

Sample Plot #1 10/21/09				
Vegetation: +/-80% Coverage	Common	Botanical	Density	Indicator Status
<b>Herbaceous</b>				
	Cypress Panicgrass	<i>Dichanthelium dichotomum</i>	50%	FAC
	Slender Goldenrod	<i>Euthamia caroliniana</i>	20%	FAC
	New York Aster	<i>Aster novi-belgii</i>	5%	OBL
	Dog Fennel	<i>Eupatorium cappillifolium</i>	2%	FACU
	Common Boneset	<i>Eupatorium perfoliatum</i>	2%	FACW+
	Seedbox	<i>Ludwigia alternifolia</i>	<2%	OBL
	Rough Leaved Goldenrod	<i>Solidago patula</i>	<2%	OBL
	Broomsedge Bluestem	<i>Andropogon virginicus</i>	<2%	FACU
	Green Foxtail	<i>Setaria viridis</i>	<2%	NI
	Velvet Panicum	<i>Panicum scoparium</i>	<2%	FACW
Sample Plot #2 10/21/09				
Vegetation: +/-95% Coverage	Common	Botanical	Density	Indicator Status
<b>Herbaceous</b>				
	Cypress Panicgrass	<i>Dichanthelium dichotomum</i>	80%	FAC
	Slender Goldenrod	<i>Euthamia caroliniana</i>	5%	FAC
	Switch Cane	<i>Arundinaria gigantea</i>	5%	FACW
	New York Aster	<i>Aster novi-belgii</i>	5%	OBL
	Dog Fennel	<i>Eupatorium cappillifolium</i>	2%	FACU
	Bristly Dewberry	<i>Brubus hispida</i>	2%	FACW
	Velvet Panicum	<i>Panicum scoparium</i>	<2%	FACW
	Path Rush	<i>Juncus tenuis</i>	<2%	FAC
	Tall Fescue	<i>Festuca arundinacea</i>	<2%	FAC-
	Broomsedge Bluestem	<i>Andropogon virginicus</i>	<2%	FACU
Sample Plot #2A (Upper Swamp Run) 10/21/09				
Vegetation: +/-95% Coverage	Common	Botanical	Density	Indicator Status
<b>Herbaceous</b>				
	Cypress Panicgrass	<i>Dichanthelium dichotomum</i>	30%	FACU
	Slender Goldenrod	<i>Euthamia caroliniana</i>	20%	FAC+
	Soft Rush	<i>Juncus effuses</i>	20%	FACW+
	Blunt Spikerush	<i>Eleocharis obtusa</i>	10%	OBL
	New York Aster	<i>Aster novi-belgii</i>	5%	OBL
	Broomsedge Bluestem	<i>Andropogon virginicus</i>	5%	FACU
	Common Boneset	<i>Eupatorium perfoliatum</i>	2%	FACW+
	Common Evening Primrose	<i>Oenothera biennis</i>	<2%	FACU
	Narrow Leaf Primrose	<i>Ludwigia linearis</i>	<2%	OBL
	Switch Cane	<i>Arundinaria gigantea</i>	<2%	FACW
	Woolgrass	<i>Scirpus cyperinus</i>	<2%	OBL
	Dog Fennel	<i>Eupatorium cappillifolium</i>	<2%	FACU
	Velvet Panicum	<i>Panicum scoparium</i>	<2%	FACW
	Smallfruit Spikerush	<i>Eleocharis microcarpa</i>	<2%	OBL
	Green Foxtail	<i>Setaria viridis</i>	<2%	NI
	Dallisgrass	<i>Paspalum dilatatum</i>	<2%	FAC+
	Silver Plumegrass	<i>Saccharum alopecuroides</i>	<2%	FAC

## Modlin Property Wetland Mitigation Project 2009 Herbaceous Vegetation Monitoring Summary

### Sample Plot #3 10/21/09

Vegetation: +/-100% Coverage	Common	Botanical	Density	Indicator Status
<b>Herbaceous</b>				
	Cypress Panicgrass	<i>Dichanthelium dichotomum</i>	50%	FAC
	Slender Goldenrod	<i>Euthamia caroliniana</i>	10%	FAC
	Dog Fennel	<i>Eupatorium cappilifolium</i>	5%	FACU
	Velvet Panicum	<i>Panicum scoparium</i>	5%	FACW
	Broomsedge Bluestem	<i>Andropogon virginicus</i>	5%	FACU
	Variable Panicgrass	<i>Panicum commutatum</i>	2%	OBL
	White Panicked Aster	<i>Aster simplex</i>	<2%	FACW
	Canada Rush	<i>Juncus effusus</i>	<2%	FACW
	Green Foxtail	<i>Setaria viridis</i>	<2%	NI
	Lesser Canadian St. Johnswort	<i>Hypericum canadense</i>	<2%	FACW
	Sedge	<i>Carex spp.</i>	<2%	NI
	Poison Ivy	<i>Toxicodendron radicans</i>	<2%	FAC
	Sawtooth Blackberry	<i>Rubus argutus</i>	<2%	FACU+

### Sample Plot #3A (Lake #1) 10/21/09

Vegetation: +/-30% Coverage +/- 80% inundated to 18"	Common	Botanical	Density	Indicator Status
<b>Herbaceous</b>				
	Lesser Canadian St. Johnswort	<i>Hypericum canadense</i>	20%	FACW
	Broadleaf Cattail	<i>Typha latifolia</i>	20%	OBL
	Woolgrass	<i>Scirpus cyperinus</i>	20%	OBL
	Soft Rush	<i>Juncus effuses</i>	10%	FACW+
	Smallfruit Spikerush	<i>Eleocharis microcarpa</i>	10%	OBL
	Slender Goldenrod	<i>Euthamia caroliniana</i>	5%	FAC
	Canada Rush	<i>Juncus canadensis</i>	5%	FACW
	Velvet Panicum	<i>Panicum scoparium</i>	2%	FACW
	Sedge	<i>Carex spp.</i>	2%	NI
	Marsh Seedbox	<i>Ludwigia palustris</i>	2%	OBL
	Blunt Spikerush	<i>Eleocharis obtusa</i>	<2%	OBL
	Cypress Panicgrass	<i>Dichanthelium dichotomum</i>	<2%	FAC
	Seedbox	<i>Ludwigia alternifolia</i>	<2%	OBL
	Dallisgrass	<i>Paspalum dilatatum</i>	<2%	FAC+
	Dog Fennel	<i>Eupatorium cappilifolium</i>	<2%	FACU
	Virginia Meadowbeauty	<i>Rhexia virginica</i>	<2%	FACW+

### Sample Plot #3B (Lake #2) 10/21/09

Vegetation: +/-95% Coverage 50% inundated to 18"	Common	Botanical	Density	Indicator Status
<b>Herbaceous</b>				
	Woolgrass	<i>Scirpus cyperinus</i>	60%	OBL
	Cattail	<i>Typha latifolia</i>	10%	OBL
	Soft Rush	<i>Juncus effuses</i>	10%	FACW+
	Softstem Bulrush	<i>Scirpus validus</i>	5%	OBL
	Lesser Canadian St. Johnswort	<i>Hypericum canadense</i>	2%	FACW
	Canada Rush	<i>Juncus canadensis</i>	2%	OBL
	Marsh Seedbox	<i>Ludwigia palustris</i>	<2%	OBL
	Smallfruit Spikerush	<i>Eleocharis microcarpa</i>	<2%	OBL
	Blunt Spikerush	<i>Eleocharis obtusa</i>	<2%	OBL
	Velvet Panicum	<i>Panicum scoparium</i>	<2%	FACW
	Slender Goldenrod	<i>Euthamia caroliniana</i>	<2%	FAC
	Sedge	<i>Carex spp.</i>	<2%	NI
	Cypress Panicgrass	<i>Dichanthelium dichotomum</i>	<2%	FAC
	Seedbox	<i>Ludwigia alternifolia</i>	<2%	OBL

## Modlin Property Wetland Mitigation Project 2009 Herbaceous Vegetation Monitoring Summary

### Sample Plot #3C (Lower Swamp Run) 10/22/09

Vegetation: +/-90% Coverage	Common	Botanical	Density	Indicator Status
<b>Herbaceous</b>				
	Soft Rush	<i>Juncus effusus</i>	20%	FACW+
	Blunt Spikerush	<i>Eleocharis obtusa</i>	20%	OBL
	Woolgrass	<i>Scirpus cyperinus</i>	10%	OBL
	Swamp Smartweed	<i>Polygonum hydropiperoides</i>	5%	FACW
	Dallisgrass	<i>Paspalum dilatatum</i>	5%	FAC+
	White Panicked Aster	<i>Aster simplex</i>	2%	FACW
	Slender Goldenrod	<i>Euthamia caroliniana</i>	2%	FAC
	Rough Leaved Goldenrod	<i>Solidago patula</i>	<2%	OBL
	Smallfruit Spikerush	<i>Eleocharis microcarpa</i>	<2%	OBL
	Seedbox	<i>Ludwigia alternifolia</i>	<2%	OBL
	Sedge	<i>Carex spp.</i>	<2%	NI
	Green Foxtail	<i>Setaria viridis</i>	<2%	NI
	Lesser Canadian St. Johnswort	<i>Hypericum canadense</i>	<2%	FACW
	Velvet Panicum	<i>Panicum scoparium</i>	<2%	FACW
	Silver Plumegrass	<i>Saccharum alopecuroides</i>	<2%	FAC
	Marsh Seedbox	<i>Ludwigia palustris</i>	<2%	OBL
	Barnyard Grass	<i>Echinochloa crus-galli</i>	<2%	FACW-
	Cypress Panicgrass	<i>Dichanthelium dichotomum</i>	<2%	FAC
	Olney's Bulrush	<i>Scirpus americanus</i>	<2%	OBL
	Broomsedge Bluestem	<i>Andropogon virginicus</i>	<2%	FACU
	New York Aster	<i>Aster novi-belgii</i>	<2%	OBL
	Beakrush	<i>Rhynchospora spp.</i>	<2%	NI

### Sample Plot #4 10/22/09

Vegetation: +/-90% Coverage	Common	Botanical	Density	Indicator Status
<b>Herbaceous</b>				
	Cypress Panicgrass	<i>Dichanthelium dichotomum</i>	50%	FAC
	Slender Goldenrod	<i>Euthamia caroliniana</i>	20%	FAC
	Green Foxtail	<i>Setaria viridis</i>	5%	NI
	Broomsedge Bluestem	<i>Andropogon virginicus</i>	2%	FACU
	Soft Rush	<i>Juncus effusus</i>	2%	FACW+
	Sedge	<i>Carex spp.</i>	<2%	NI
	Canada Rush	<i>Juncus canadensis</i>	<2%	FACW
	Dog Fennel	<i>Eupatorium cappillifolium</i>	2%	FACU
	White Panicked Aster	<i>Aster simplex</i>	2%	FACW

### Sample Plot #4A (Lake #3) 10/22/09

Vegetation: +/-50% Coverage 70% inundated to 12"	Common	Botanical	Density	Indicator Status
<b>Herbaceous</b>				
	Lesser Canadian St. Johnswort	<i>Hypericum canadense</i>	30%	FACW
	Blunt Spikerush	<i>Eleocharis obtusa</i>	20%	OBL
	Canada Rush	<i>Juncus canadensis</i>	10%	FACW
	Soft Rush	<i>Juncus effusus</i>	<2%	FACW+
	Slender Goldenrod	<i>Euthamia caroliniana</i>	5%	FAC
	Smallfruit Spikerush	<i>Eleocharis microcarpa</i>	5%	OBL
	Sedge	<i>Carex spp.</i>	<2%	NI
	Seedbox	<i>Ludwigia alternifolia</i>	<2%	OBL
	Woolgrass	<i>Scirpus cyperinus</i>	<2%	OBL
	Marsh Seedbox	<i>Ludwigia palustris</i>	<2%	OBL
	Velvet Panicum	<i>Panicum scoparium</i>	<2%	FACW
	Dallisgrass	<i>Paspalum dilatatum</i>	<2%	FAC+

## 2. Vegetation Problem Area Photos

### VPA 1

Area around Gauge 1 and perimeter ditch (May, 2009)



### VPA 2

Gauge 1 looking east toward Gauge 2 (Sept. 2009)





### 3. General Site Photos

Woody debris deposited at pinch point post flooding (May 2009)



Scouring – evidence of flooding at pinch point (May 2009)





Small pool flooded, evidence of overbank flooding (May 2009)



Large pool flooded (May 2009)



Large pool still flooded in summer (July 2009)



Small pool still flooded in summer (July 2009)





Main run near outfall end (Nov. 2009)



Main run near outfall end (Nov. 2009)





Water flowing across lowest part of pinch point (Nov. 2009)



Main run near its mid point in the project (Nov. 2009)





Large pool and surrounding area flooded (Nov. 2009)



Overbank flooding of large pool (Nov. 2009)





Top of check damn (left) and water level (right) (Nov. 2009)



Bird nest in a planted tag alder (Dec. 2009)



## **Appendix B**

Geomorphologic Raw Data

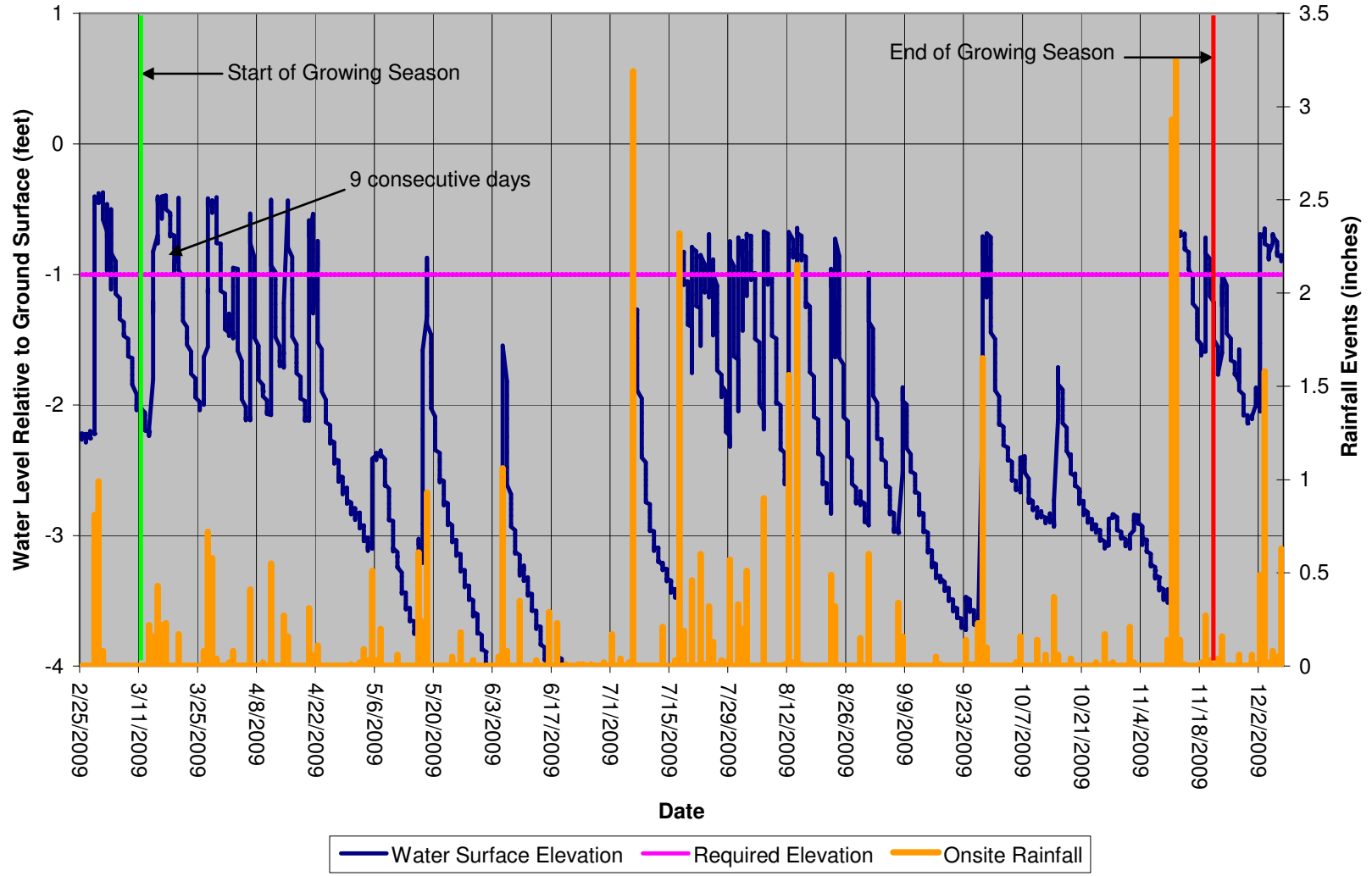
Not used in this report

# **Appendix C**

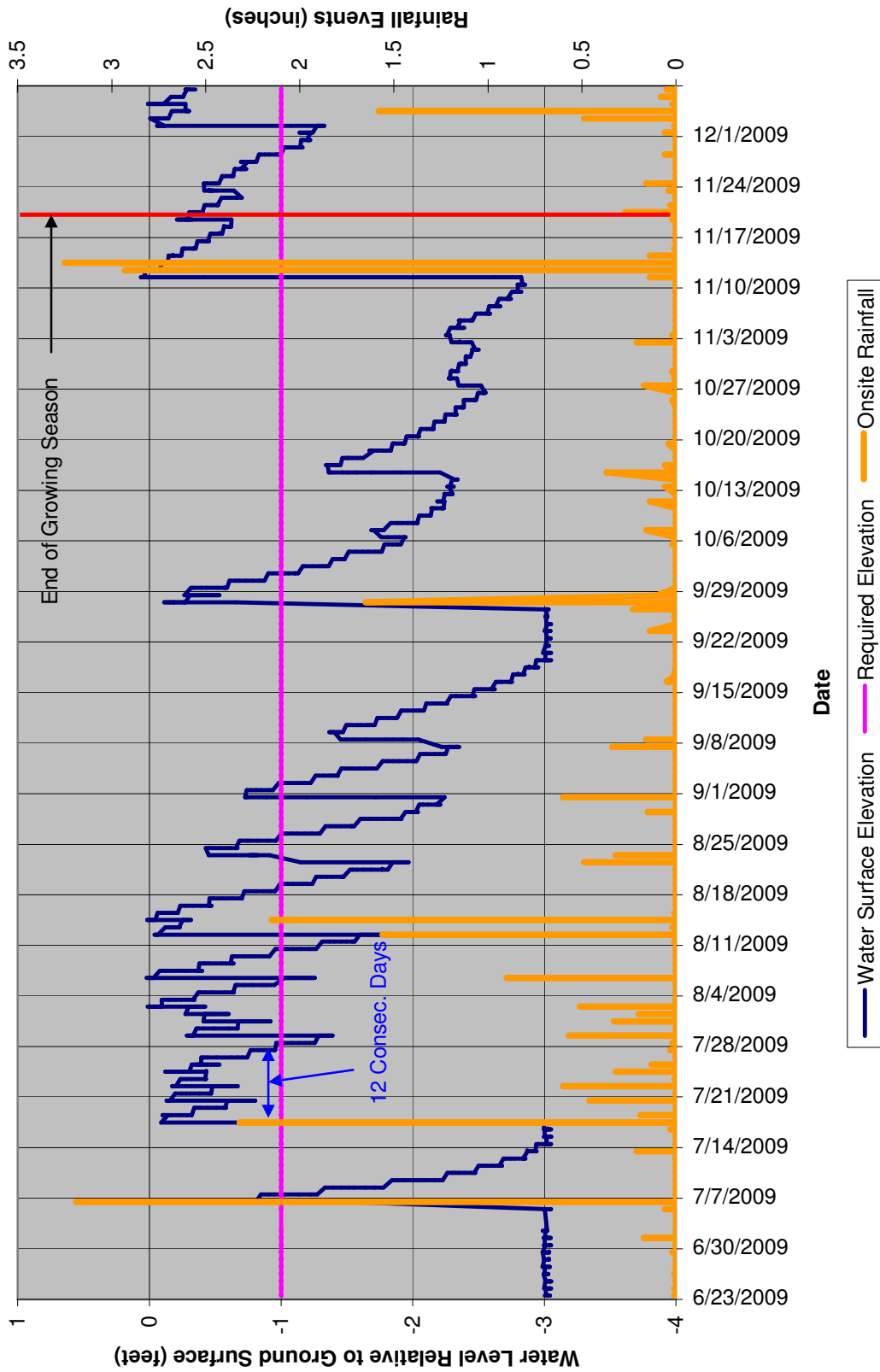
Hydrologic Data Tables



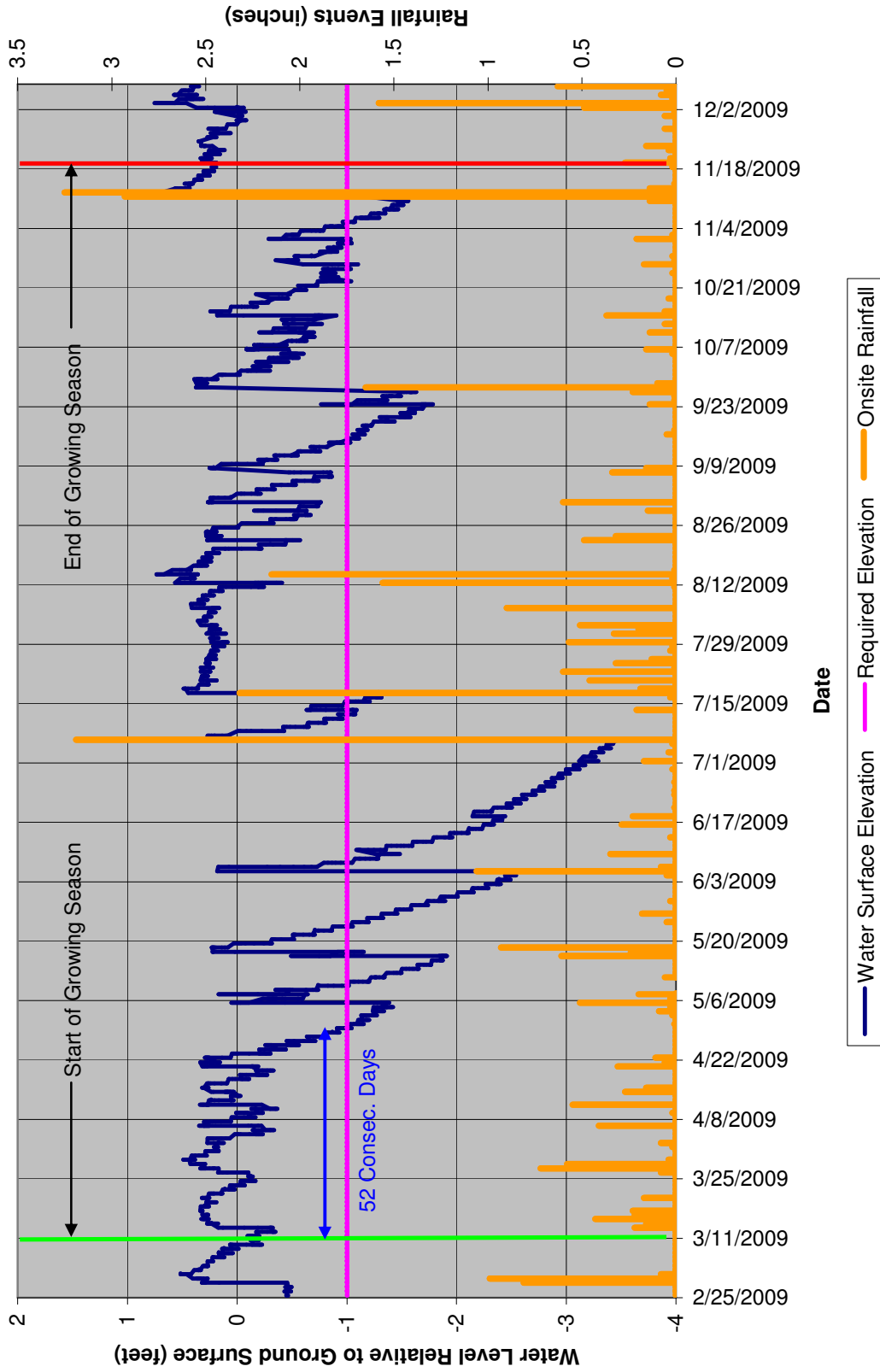
### Modlin Monitoring Gauge #1 (1126654)



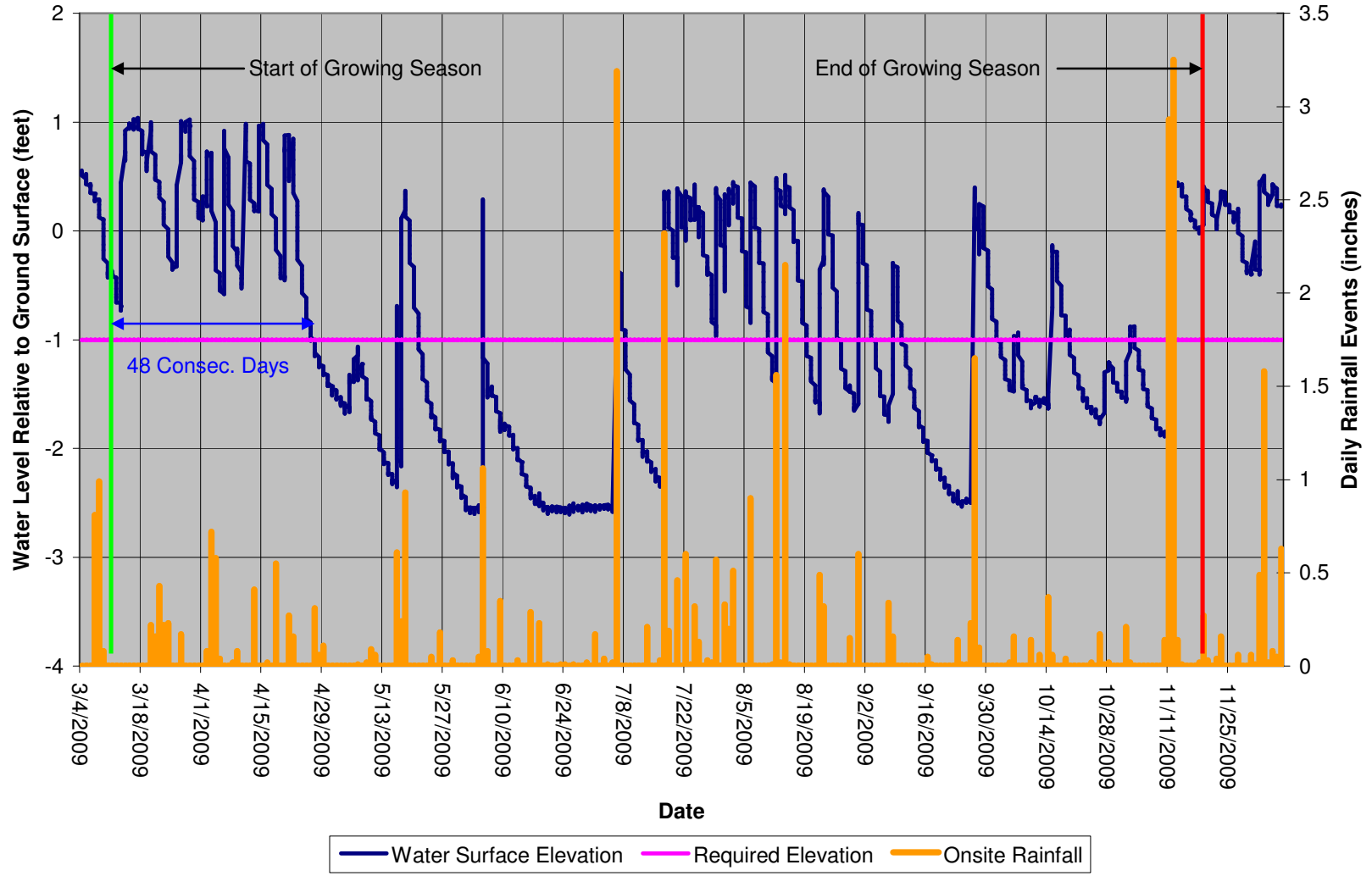
# Modlin Monitoring Gauge #1A (2342650)



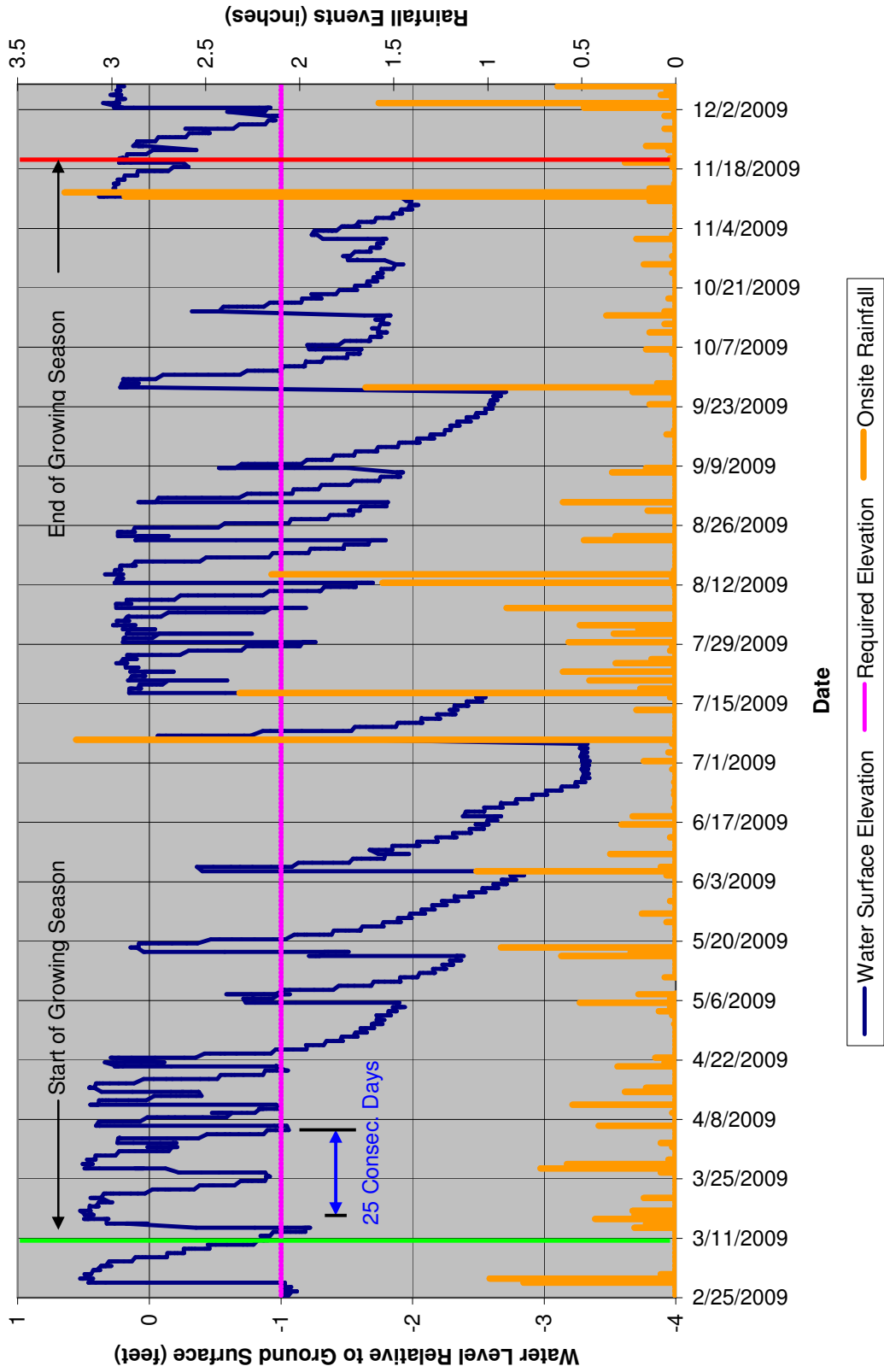
### Modlin Monitoring Gauge #2 (1126653)



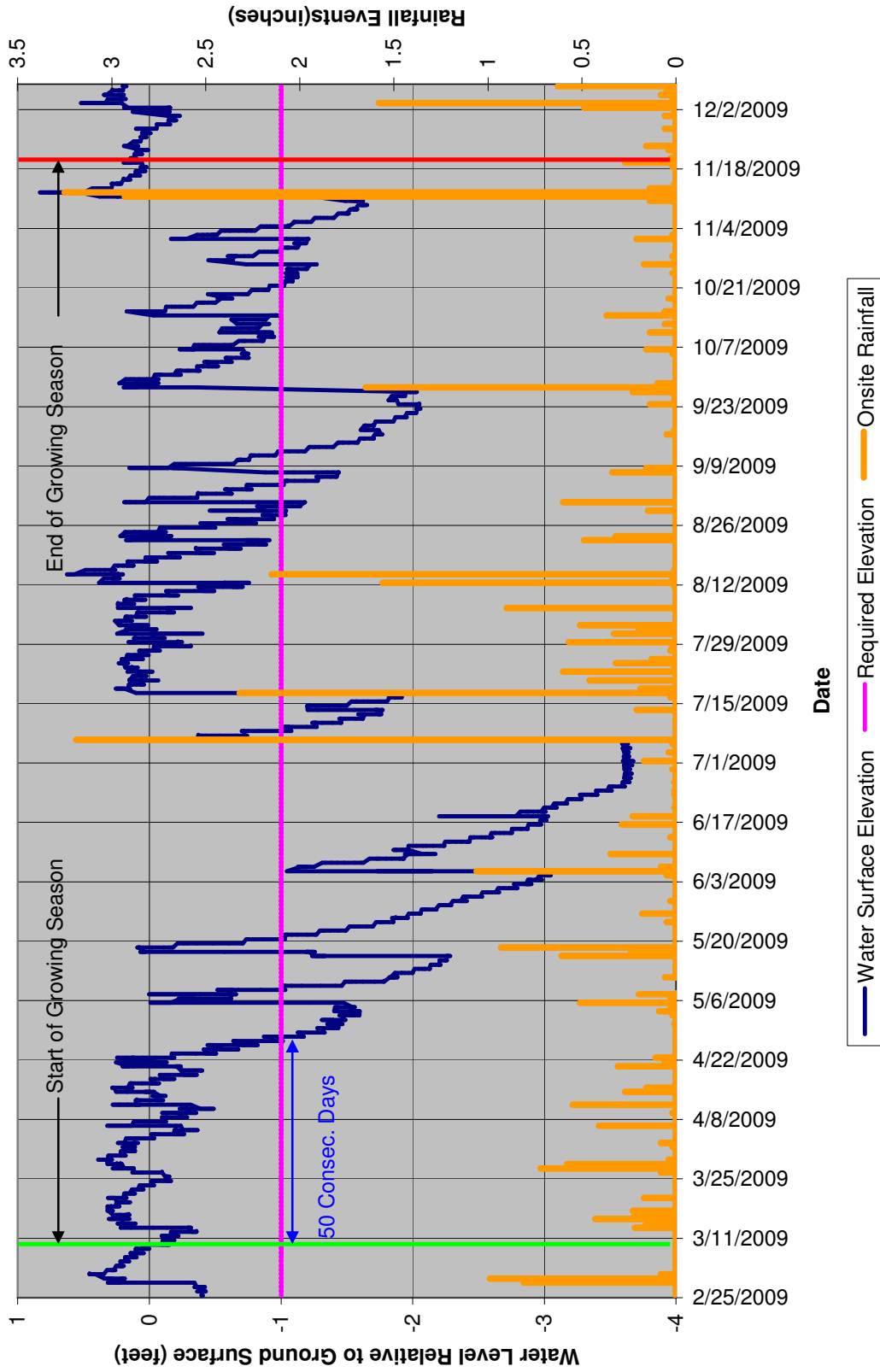
### Modlin Monitoring Gauge #3 (1126651)



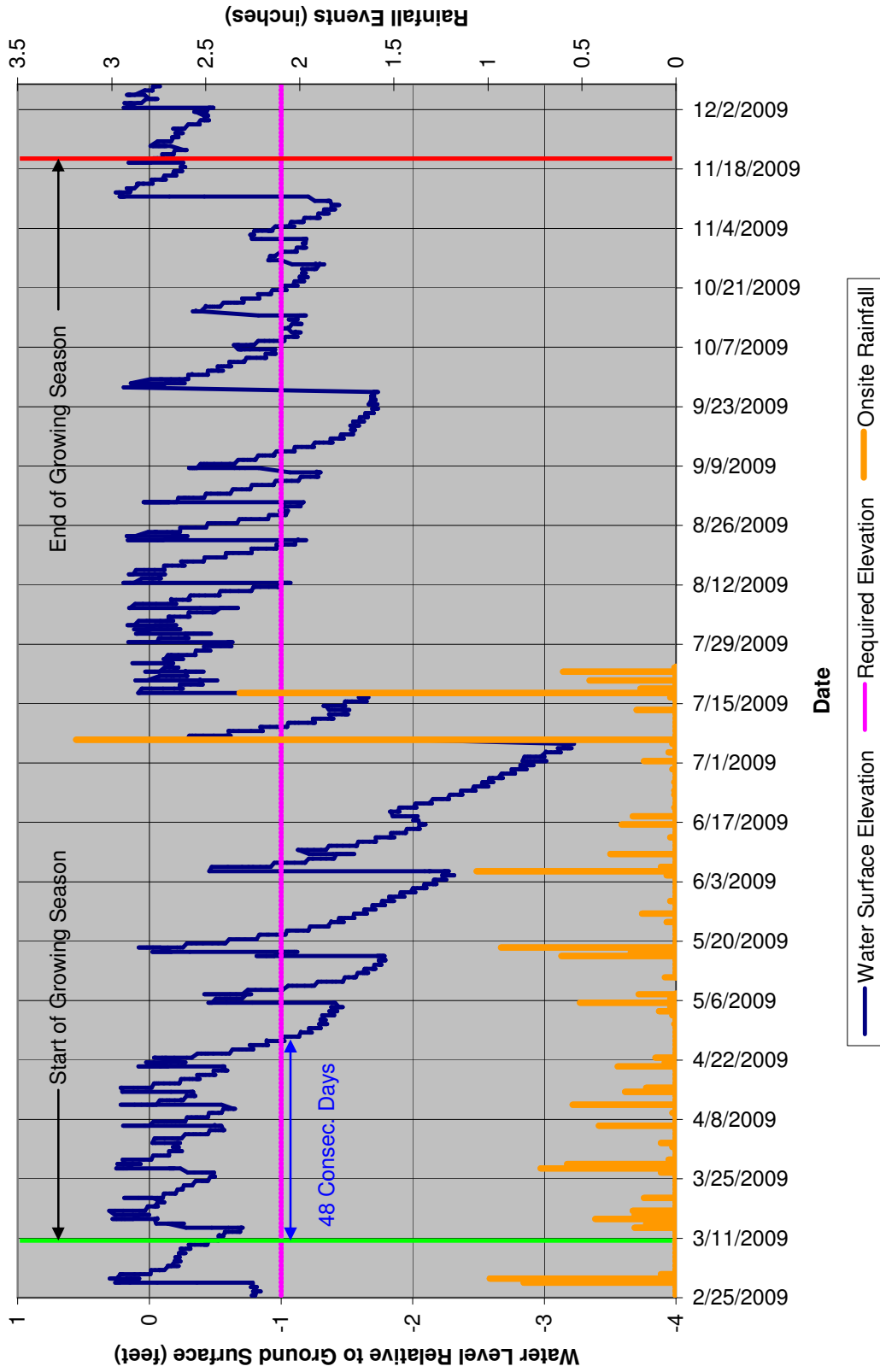
### Modlin Monitoring Gauge #4 (1126650)



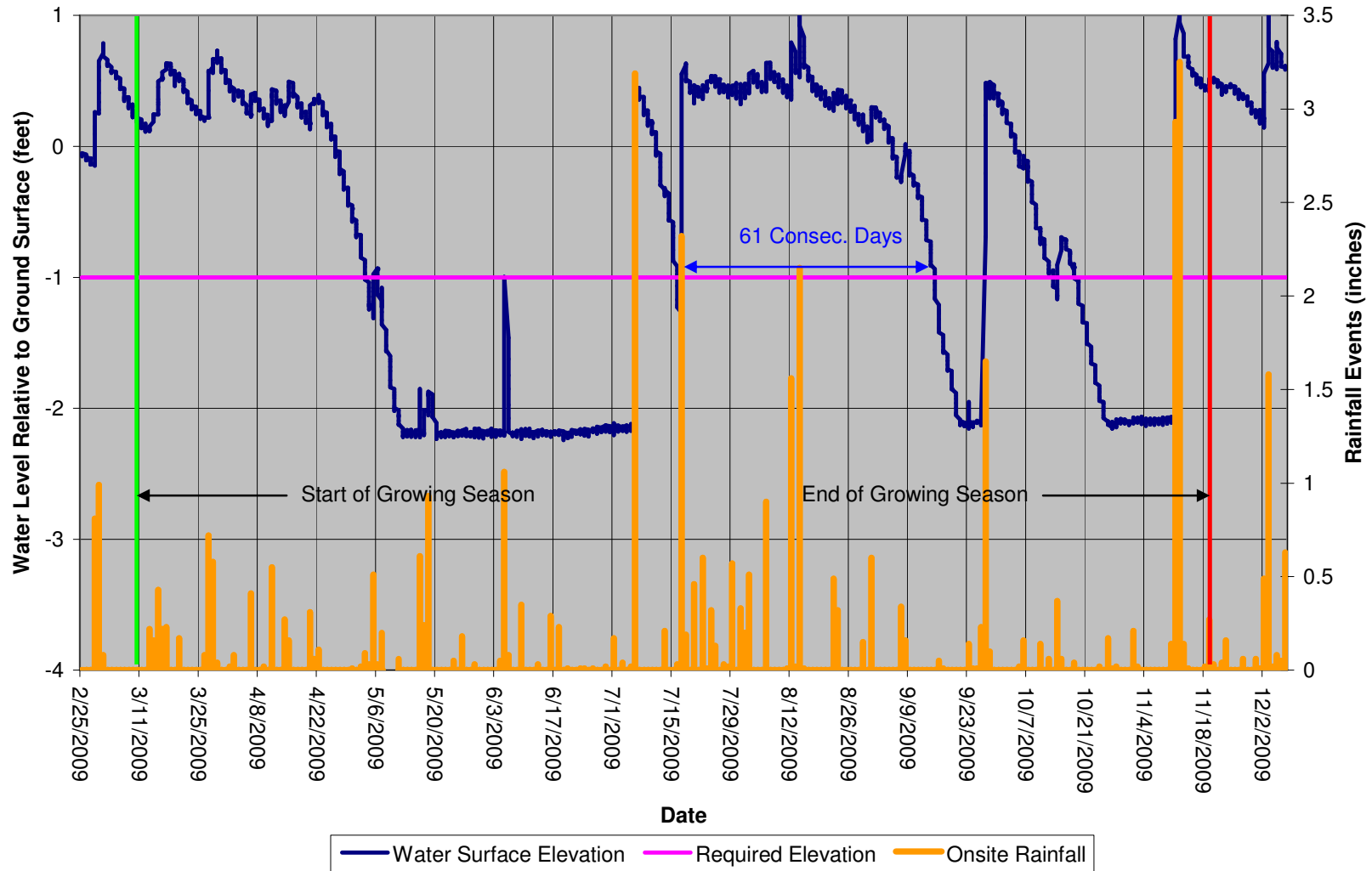
### Modlin Monitoring Gauge #5 (1180987)



### Modlin Monitoring Gauge #6 (1180994)



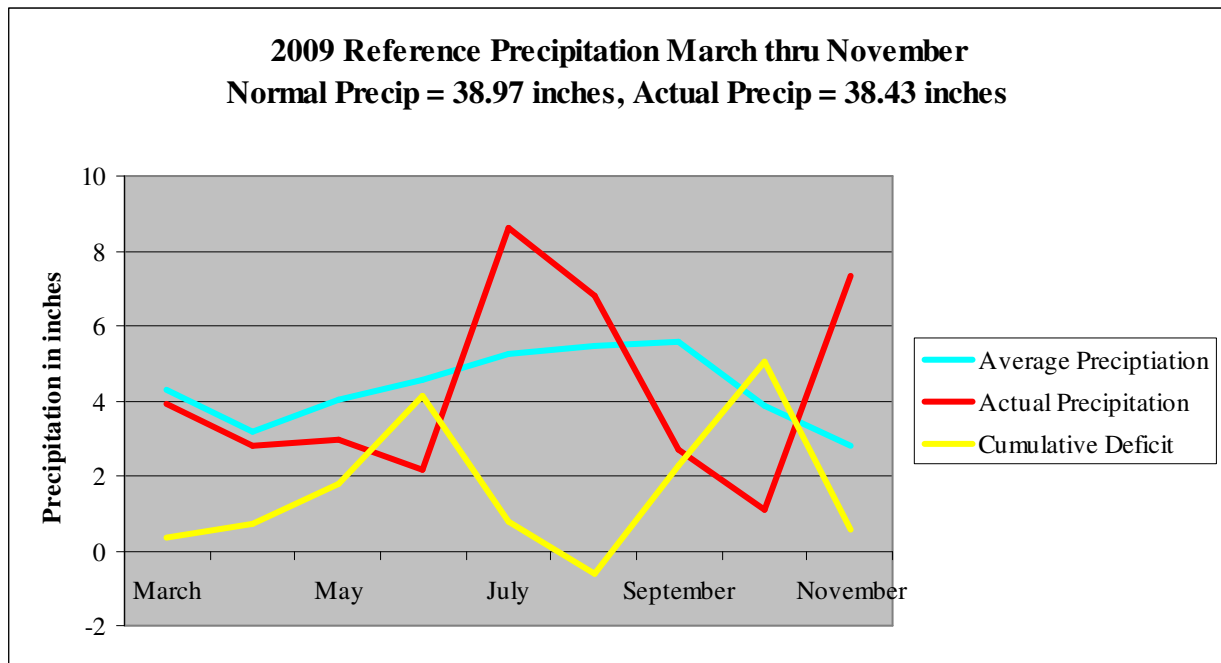
**Modlin Monitoring Gauge #7 (1180991)  
Reference Site Gauge**





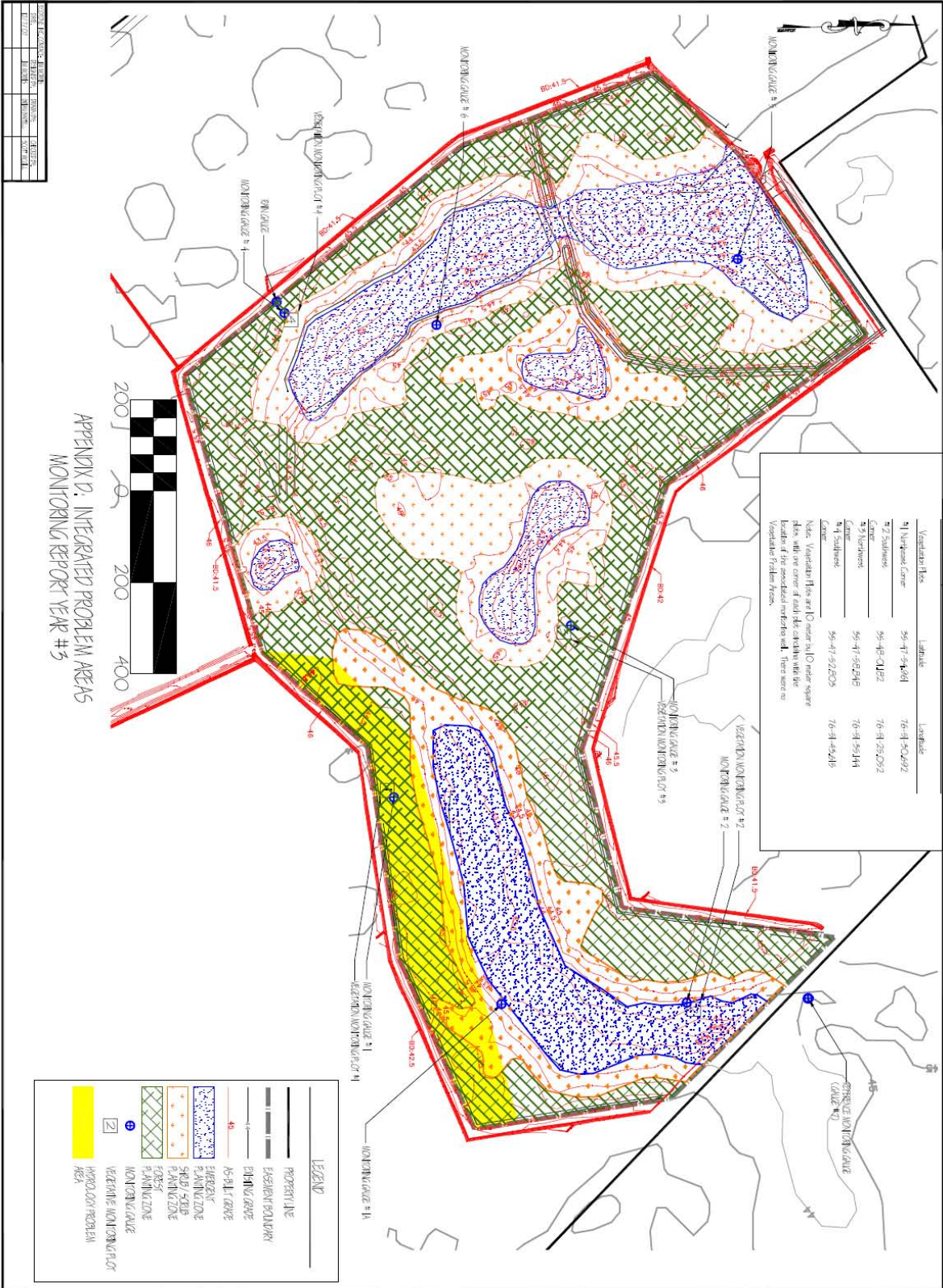
Tabel C-1															
Longest Consecutive Successful Hydrologic Period in Days and Success at 5% and 8% of Growing Season															
Gauge	Year 1			Year 2			Current Year			Year 4			Year 5		
	Days	5%	8%	Days	5%	8%	Days	5%	8%	Days	5%	8%	Days	5%	8%
1	4	N	N	6	N	N	9	N	N						
1A	N/A	---	---	N/A	---	---	12	N	N						
2	7	N	N	97	Y	Y	52	Y	Y						
3	1	N	N	15	Y	N	48	Y	Y						
4	4	N	N	16	Y	N	25	Y	Y						
5	2	N	N	61	Y	Y	59	Y	Y						
6	2	N	N	18	Y	Y	48	Y	Y						
7(Ref)	N/A	N		37	Y	Y	61	Y	Y						

Growing season is 255 days. 5% is 13 days, 8% is 21 days.



# **Appendix D**

Monitoring Plan View (Integrated)



APPENDIX D: INTEGRATED PROBLEM AREAS  
MONITORING REPORT YEAR #5

Vegetation Plot	Latitude	Longitude
#1 Vegetation Corner	35-47-54.664	76-41-50.692
#2 Sedge/Swamp	35-48-01.222	76-41-50.292
#3 Sedge/Swamp	35-47-58.248	76-41-55.144
#4 Sedge/Swamp	35-47-58.208	76-41-54.416

Note: Vegetation Plots #1 and #2 are the corner points of the monitoring area. Plots #3 and #4 are located within the monitoring area. The location of the monitoring area is shown on the Vegetation Problem Areas map.

LEGEND	
	PROPERTY LINE
	ESSENTIAL BOUNDARY
	AS-BUILT CORNER
	WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION
	VEGETATION NONCONFORMAL AREA
	SHRUB/SEDGE PLANTING ZONE
	FOREST PLANTING ZONE
	WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION
	MONITORING POINT

**ALBERMARLE RESTORATIONS, LLC**  
WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION  
404 COURT STREET • GATESVILLE, NC 27938  
800-333-6644 • FAX 800-367-4866

PLAN PREPARED BY  
**ECOTONE, INC.**  
ENVIRONMENTAL CONSULTING, PERMITTING & DESIGN, FOREST & WETLAND CREATION & STREAM RESTORATION  
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MODLIN PROPERTY  
RIVERINE WETLAND MITIGATION MONITORING  
40.0 ACRES  
WARREN COUNTY, NORTH CAROLINA  
EEP CONTRACT #: D090241

VEGETATION ASSESSMENT		
DECEMBER 2009		
DATE	BY	TO