Mason Property Wetland Mitigation Project

Hyde County, NC

2009 Annual Monitoring Report
Year 2

NCEEP Project Number D06001
Tar-Pamlico River Basin

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

Date: December, 2009

Monitoring:
Albemarle Restorations, LLC
P. O. Box 176
Fairfield, NC 27826

Table of Contents

List of Tables

List of Figures

Appendices

Executive Summary

The Mason Property Wetland Mitigation Site is a riverine and non-riverine wetland restoration project located on U. S. Rt. 264 at Rose Bay in Hyde County, North Carolina. It was constructed by Albemarle Restorations, LLC, under contract with EEP to provide compensatory wetland mitigation credits in the Tar-Pamlico River Basin. Construction activities, in accordance with the approved restoration plan, began March 14, 2007, and were completed on May 14, 2007. The resulting features include a main swamp run and adjacent areas of lower elevation that retain flood water for extended periods. Tree and shrub planting on the project site occurred in May, 2007 using bare-root seedlings and containerized stock from a species list that produced a diverse species mix across the site and throughout the various elevations. Due to insufficient planting in 2007, monitoring did not begin until 2008 after stocking levels were increased.

Six water level monitoring gauges were installed in May, 2007 at varying elevations throughout the site to measure subsurface water elevations. Two more gauges were installed at reference sites for hydrology comparison. In 2009, all of the monitoring gauges met the hydrologic success criterion of maintained groundwater levels within 12 inches of the soil surface for 21 consecutive days during the growing season.

Four vegetative monitoring plots were installed and permanently monumented, one coincident with each of four of the monitoring gauges. Their locations ensure an accurate sampling of the entire vegetative community. Each plot is a 10m X 10m square, as recommended by the CVS-EEP Protocol for recording vegetation sampling. In this second year of monitoring, all four plots met the Year 3 success criterion of 320 living planted stems per acre.

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	Vegetation Plot				Percent
	1	2	3	4	5	6	Success	1	2	3	4	Success
Year 1 (2008) Success	Y	Y	Y	Y	Y	Y	100%	Y	Y	N	N	50%
Year 2 (2009) Success	Y	Y	Y	Y	Y	Y	100%	Y	Y	Y	Y	100%

I. Project Background

1.0 Project Objectives

The goal of the Mason Property Mitigation Project was to create both riverine and non-riverine wetland systems that will accomplish several goals. Primary among those goals is the establishment of functioning wetlands that will aid in flood attenuation and improve water quality on site and downstream. The project is to serve as compensation for wetland loss in the Tar-Pamlico River Basin. The restoration 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

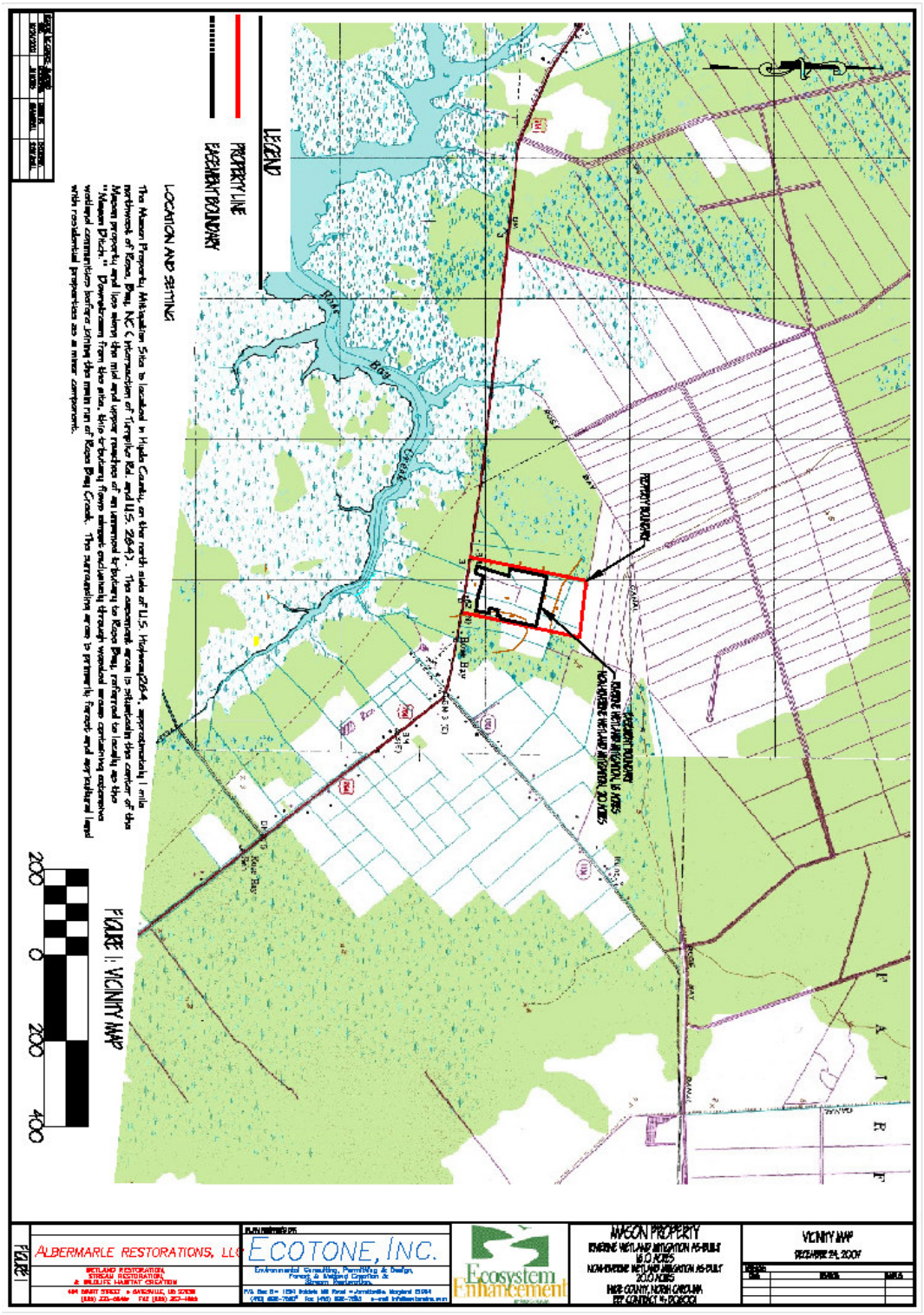
Table I lists the estimated wetland acreage by community type to be restored on the Mason Property. The mitigation plan provides for the restoration of 16.0 acres of riverine wetlands and 20.0 acres of non-riverine wetlands. The 36.0 acre easement area is located within the boundaries of the larger Mason farm which has been used for row crop production. The project area was bisected by a deep drainage ditch that acted as a stream that ran from north to south through the property. Degradation to the channel and surrounding areas by past agricultural activities, including channel straightening and planting of row crops up to the channel edges had eliminated any significant natural habitat on the site and allowed excessive nutrient and sediment accumulation in the channel. Construction, in accordance with the approved restoration plan, began in March of 2007 and was completed in May of 2007. The resulting features and topography allow for frequent over bank flooding of the newly created swamp run, which in turn allows for adjacent areas that are lower in elevation to retain water even after stream flow returns to normal.

Table I. Project Restoration Components Mason Property Wetland Mitigation Site/EEP #D06001				
Community Type	**Pre-Existing Acreage**	**Post Construction Acreage**	**Credit Ratio (Restoration WMU)**	**Mitigation Units**
Riverine Wetland	0.0	16.0	1:1	16.0
Non-Riverine Wetland	0.0	20.0	1:1	20.0
			Total	36.0

3.0 Location and Setting

The Mason Property Mitigation Site is located in Hyde County, on the north side of U.S. Highway 264, approximately 1 mile northwest of Rose Bay, NC (intersection of Turnpike Rd. and U.S. 264). The easement area is situated in the center of the Mason property and lies along the mid and upper reaches of an unnamed tributary to Rose Bay, referred to locally as the "Mason Ditch." Downstream from this site, the tributary flows almost exclusively through wooded areas containing extensive wetland communities before joining the main run of Rose Bay Creek. 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 area. Directions to the site are as follows: travel west from Rose Bay on U.S. Hwy. 264 approximately 1 mile and turn right (north) onto the property. Access to the site is via a farm path.


LEGEND
PROPERTY LINE
EASEMENT BOUNDARY
LOCATION AND SETTING
FIGURE 1: VICINITY MAP
ALBEMARLE RESTORATIONS, LLC
ECOTONE, INC.
Ecosystem Enhancement
MASON PROPERTY
VICINITY MAP

4.0 Project History and Background

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

Table II. Project Activity and Reporting History Mason Property Wetland Mitigation Project/EEP #D06001		
Activity or Report	**Data Collection Complete**	**Actual Completion or Delivery**
Restoration Plan	June 2006	Novermber 2006
Final Design -90%	June 2006	Novermber 2006
Construction	N/A	May 2007
Temporary S & E mix applied to entire project area	N/A	May 2007
Permanent seed mix applied to entire project area	N/A	May 2007
Containerized and Bare Root Planting	N/A	May 2007
Mitigation Plan/As-built (Year 1 monitoring - baseline)	Oct. 07/Sept. 08	December 2008
Year 2 monitoring	September 2009	January 2010
Year 3 monitoring		
Year 4 monitoring		
Year 5 monitoring		

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

Table III. Project Contacts Mason Property Wetland Mitigation Site/EEP #D06001	
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 Consultants 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.

Table IV. Project Background Mason Property Wetland Mitigation Site/EEP #D06001	
Project County	Hyde County
Drainage Area	36.0 acres within easement boundary
Drainage impervious cover estimate (%)	0
Physiographic Reion	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	Stockade sand loam, Hydeland silt loam, Brookman loam
Reference site ID	Rose Bay, Hyde county, NC
USGS HUC for Project and Reference	03020105
NCDWQ Sub-basin for Project and Reference	03-03-08
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?	Yes, Pamlico River
Reasons for 303d listing or stressor?	Ag, Urban Runoff, Septic
% of project easement fenced	None

5. Monitoring Plan View

In May of 2007, six water level monitoring gauges were installed at key locations across the property in order to assess the groundwater levels throughout the year at various elevations and topographies. These gauges are suspended in two-inch pvc pipe that is set approximately four feet vertically into the ground. Two reference gauges are also installed offsite to provide a means of comparison to naturally functioning wetlands. In addition, a rain gauge was installed to capture and record on-site precipitation.

Vegetation monitoring was accomplished by the installation of four permanent sampling plots. Each plot is referenced by one of four monitoring gauges 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 gauges, sampling plots and the rain gauge, soils, contours and plant communities.

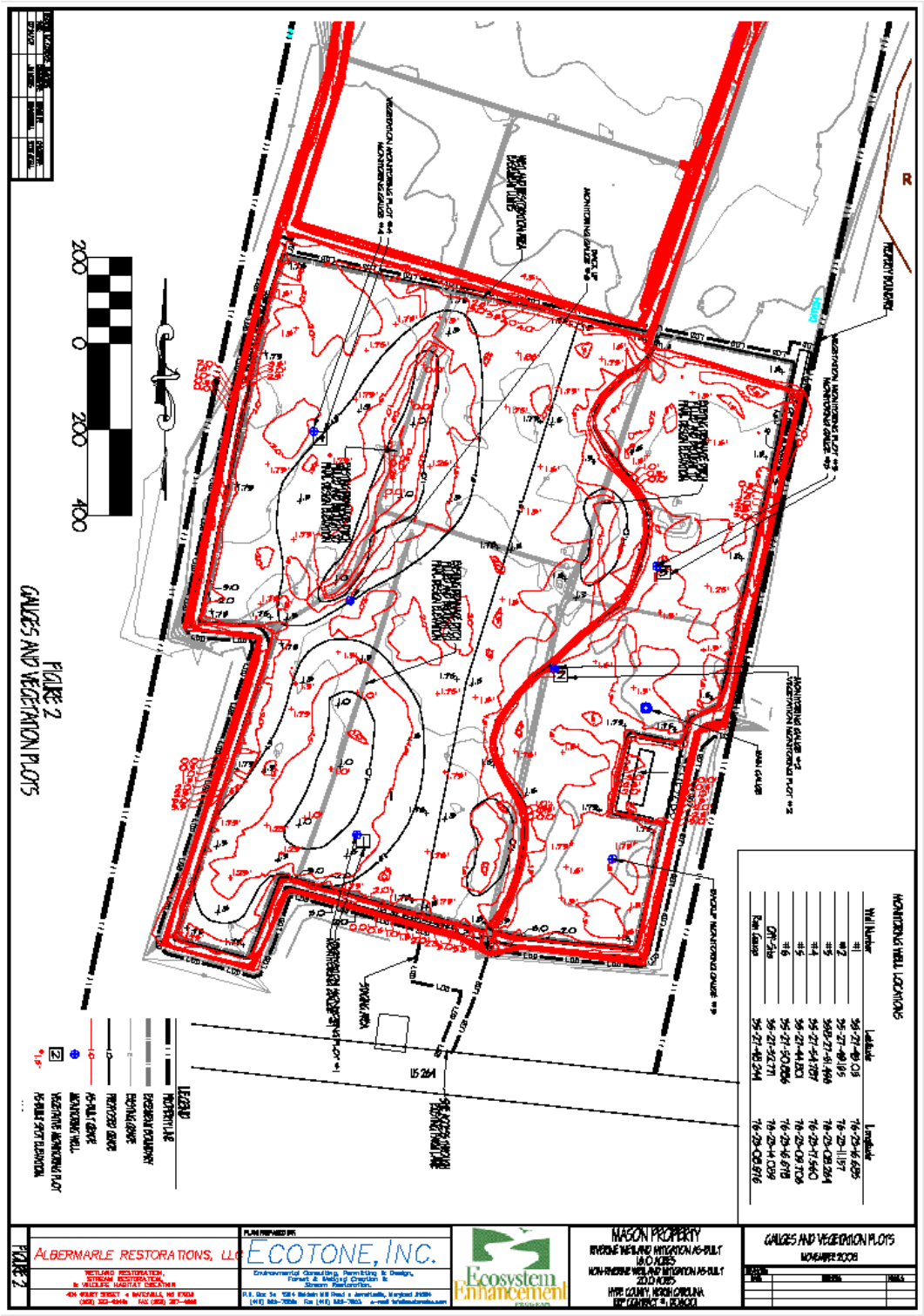
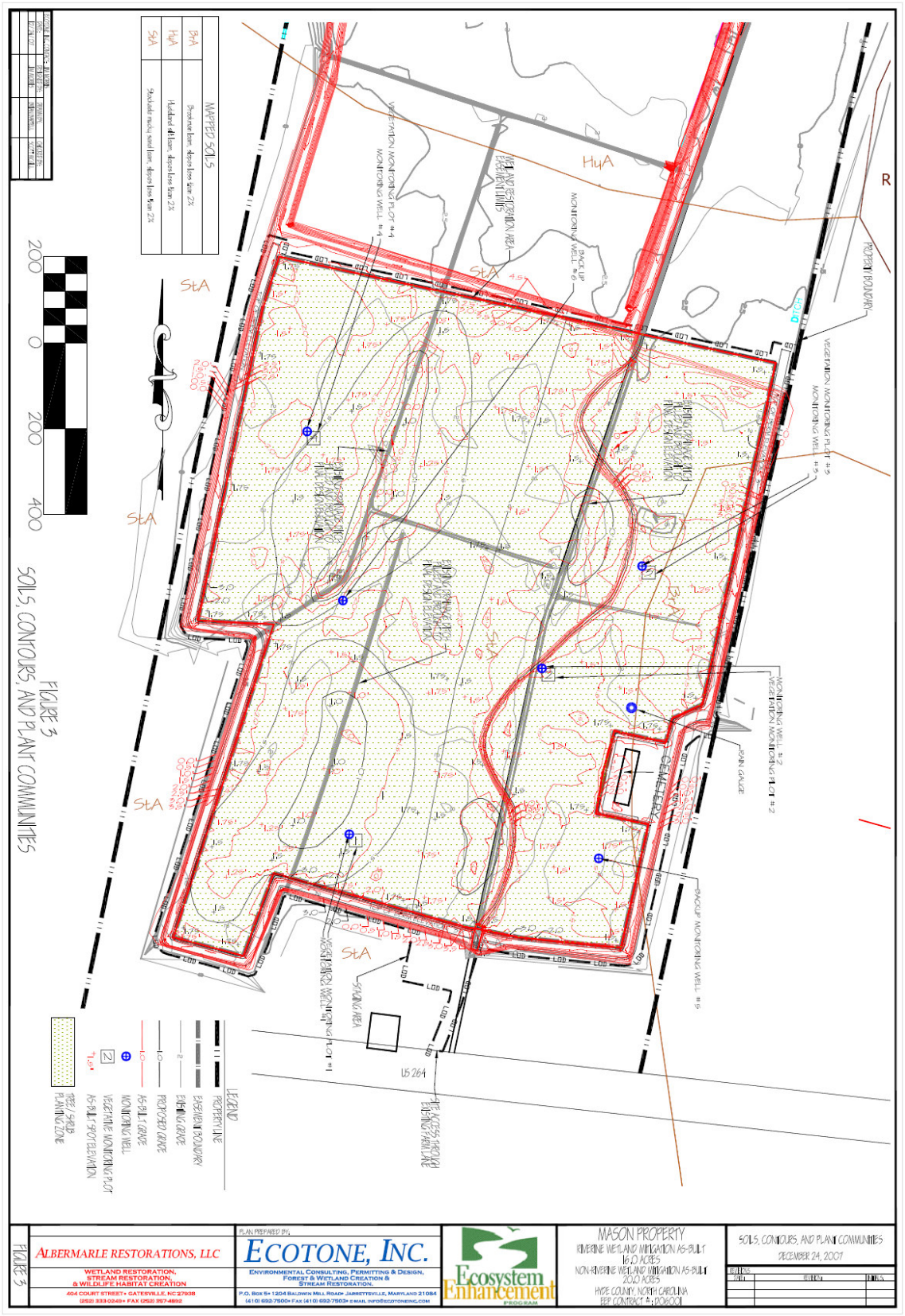


FIGURE 2
GAUGES AND VEGETATION PLOTS
200 0 200 400
MONITORING WELL LOCATIONS
Well Number
Latitude
Longitude
Rain Gauge
GW-Site
#1
#2
#3
#4
#5
#6
#7
#8
35-27-48.015
35-27-48.195
35-27-48.444
35-27-54.197
35-27-54.960
35-27-50.886
35-27-44.303
35-27-52.771
35-27-48.244
76-29-46.695
76-29-11.197
76-29-08.284
76-29-11.960
76-29-09.708
76-29-16.678
76-29-14.059
76-29-08.976
LEGEND
PROPERTY LINE
PROPOSED DITCH
PROPOSED GAUGE
AS-BUILT DITCH
MONITORING WELL
VEGETATION MONITORING PLOT
AS-BUILT SPOT ELEVATION
ALBEMARLE RESTORATIONS, LLC
WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION
ECOTONE, INC.
Environmental Consulting, Permitting & Design, Forest & Wetland Creation & Stream Restoration
Ecosystem Enhancement Program
MASON PROPERTY
RIVERINE WETLAND MITIGATION AS-BUILT 18.0 ACRES
NON-RIVERINE WETLAND MITIGATION AS-BUILT 20.0 ACRES
HYDE COUNTY, NORTH CAROLINA
GAUGES AND VEGETATION PLOTS
NOVEMBER 2009


MAPPED SOILS
BmA
HyA
StA
HyA
StA
StA
StA
StA
StA
200
0
200
400
SOILS, CONTOURS, AND PLANT COMMUNITIES
FIGURE 3
LEGEND
PROPERTY LINE
EASEMENT BOUNDARY
EXISTING GRADE
PROPOSED GRADE
AS-BUILT GRADE
MONITORING WELL
VEGETATIVE MONITORING PLOT
AS-BUILT SPOT ELEVATION
RIPARIAN / RIVERINE PLANTING ZONE
ALBEMARLE RESTORATIONS, LLC
WETLAND RESTORATION, STREAM RESTORATION, & WILDLIFE HABITAT CREATION
404 COURT STREET • GATESVILLE, NC 27938
(252) 333-0249 • FAX (252) 357-4892
PLAN PREPARED BY:
ECOTONE, INC.
ENVIRONMENTAL CONSULTING, PERMITTING & DESIGN, FOREST & WETLAND CREATION & STREAM RESTORATION.
P.O. BOX 5 • 1204 BALDWIN MILL ROAD JARRETTSVILLE, MARYLAND 21084
(410) 692-7500 • FAX (410) 692-7503 • EMAIL INFO@ECOTONEINC.COM
Ecosystem Enhancement PROGRAM
MASON PROPERTY
RIVERINE WETLAND MITIGATION AS-BUILT
16.0 ACRES
NON-RIVERINE WETLAND MITIGATION AS-BUILT
20.0 ACRES
HYDE COUNTY, NORTH CAROLINA
EEP CONTRACT #: 206001
SOILS, CONTOURS, AND PLANT COMMUNITIES
DECEMBER 24, 2007
FIGURE 3
CEMETERY
US 264
ACCESS ROAD
PROPERTY BOUNDARY
DITCH
MONITORING WELL #1
MONITORING WELL #2
MONITORING WELL #3
MONITORING WELL #4
MONITORING WELL #5
MONITORING WELL #6
BACK UP MONITORING WELL #5
VEGETATION MONITORING PLOT #1
VEGETATION MONITORING PLOT #2
VEGETATION MONITORING PLOT #3
VEGETATION MONITORING PLOT #4
VEGETATION MONITORING PLOT #5
RAIN GAUGE
STAGING AREA
WETLAND RESTORATION AREA
EASEMENT LIMITS
R

II. Project Condition and Monitoring Results

1.0 Vegetation Assessment

The vegetation success criterion was developed in accordance with the CVS-EEP protocol. The Mason project was planned to include various topographies and a contiguous plant community consistent with those found naturally occurring along swamp runs and associated broad hardwood flats. The species mix was based on the vegetation noted at the reference site and all species are classified from FAC to OBL (Table V). The site was planted at a rate of 275 stems per acre in May of 2007. In February of 2008, an additional 175 stems per acre were installed bringing the total stocking at the start of the 2008 growing season to 450 stems per acre.

Table V. Species by Vegetation Type		
Mason Property Wetland Mitigation Project/EEP #D06001		
Trees		
Common Name	**Scientific Name**	**Wetland Indicator Status**
Bald Cypress	Taxodium distichum	OBL
Red Maple	Acer rubrum var. Trilobum	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
Shrubs		
Common Name	**Scientific Name**	**Wetland Indicator Status**
High Tide Bush	Baccharis halimifolia	FAC
Swamp Cyrilla	Cyrilla racemiflora	FACW
Sweet Pepperbush	Clethra alnifolia	FACW
Virginia Sweetspire	Itea virginica	FACW+
Button Bush	Cephalanthus occidentalis	OBL
Tag Alder	Alnus serrulata	FACW
Wax Myrtle	Myrica cerifera	FAC+
Sweetbay	Magnolia virginiana	FACW+

1.1 Vegetation Discussion and Problem Areas

All four monitoring plots met the Year 3 success criterion of a minimum of 320 stems per acre after the first growing season. Over the entire project, the survival rate averaged 425 live stems per acre. Those stems that were planted in 2007 and did not survive were replaced in 2008. In addition, during the additional planting in 2008, the stocking level was raised to 450 stems per acre across the entire site, but due to almost constant inundation, survival was poor. Water oak (Q. phellos) and Bald Cypress (T. distichum) proved to be the hardiest species. During March of 2009, an additional 8,000 stems of water oak and bald cypress were planted to once again bring the density up to approximately 450 stems per acre. There are few options for site maintenance beyond herbaceous competition control to improve tree survival and herbaceous competition is thought to be a problem secondary to the length of constant inundation. Selecting the most

hydric species for replanting appears to be the best approach to maintaining the required stocking levels. The site was under an average of 6 inches of water when planting was done in 2009. In 2008, dense clumps of coffeeweed (*Sesbania herbacia)* began to appear on site. By mid-summer 2009, approximately 40% of the site had been colonized by very dense and apparently rapidly spreading stands of this invasive legume. Manual removal by hand chopping was deemed the only viable option and it was timed after flowering but prior to seed set to maximize the effects of control. Hopefully in 2010 the problem will be minor and maintenance will be a simple issue of hand chopping again before seed set. The vegetation problem area photos show the plant and its spread in 2008 and 2009.

1.2 Vegetation Monitoring Plan View (Integrated)

The figure in Appendix D illustrates the very wettest areas on the site that are inundated almost constantly during the year and show the poorest survival of planted stock. These areas were replanted both times along with the rest of the site but the constant deep water makes survival difficult for even the most tolerant 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 11 to November 27, a period of 261 days (WETS Table for Belhaven, Beaufort 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.

Six continuous monitoring gauges were deployed across the site and two more were installed in reference areas. All six gauges met the success criteria for the site in 2009 as did the two reference gauges. The hydrologic charts in Appendix C also show that the water level on site remained above the ground (the zero level on the charts) for extended periods both early and late in the growing season. The swamp run held water for most of the season as well, as evidenced by the photos in Appendix A.

2.1 Wetland Discussion and Problem Areas

Drainage from the project area can only occur during times when water levels onsite are high enough to overcome the level of the retaining structure at the outfall end of the project *and* the level of the water beyond the outfall end is low enough to accommodate additional flow which is dependant on daily tidal fluctuations. This combination causes the site to retain water for long periods and apparently even during seasons when rainfall is less than average.

A coastal storm in November dropped over eight inches of rain on the site and strong northeast winds not only kept the site from draining, but likely pushed additional water onto the site for nearly a week. The photos in Appendix A from the last site visit in December of 2009 show the severe flooding on site. Water levels were between six and twelve inches across the site.

2.2 Wetland Monitoring Plan View (Integrated)

As illustrated in Appendix D, the areas shown in yellow remained very wet or inundated for almost the entire growing season. While this is important for successful hydrology, it creates problems in establishing and maintaining woody vegetation. These were the only obvious micro-scale problems.

Table VI. Hydrology and Vegetation Criteria Success by Plot
Mason Property Wetland Mitigation Project/EEP #D06001

Well	Hydrology Success Met	Hydrology Mean	Vegetation Plot	Vegetation Success Met	Vegetation Mean
1	Y	100%	1	Y	100%
2	Y		2	Y	
3	Y		3	Y	
4	Y		4	Y	
5	Y		N/A	N/A	
6	Y		N/A	N/A	
7	Y (Ref)		Reference Well	Reference Well	
8	Y (Ref)		Reference Well	Reference Well	

3.0 Project Success Discussion

Construction and planting on the Mason project was completed early enough in 2007 so that the project was monitored in that year but due to insufficient planting an official report was not submitted to EEP. Additional planting was done in the winter of 2008 and replanting was done in the winter of 2009 to replace dead stems and bring the stocking level up to a minimum of 450 stems per acre. Survival was good in 2009 except in areas where the site is constantly flooded. Rainfall during the 2009 growing season was within a half inch of normal for the period. The monitoring gauges and visual inspections throughout the year confirm that wetland hydrology has been restored. In fact, the site remains flooded for longer periods than not and there is little that can be done to remedy that situation. The site was totally inundated for all but approximately two months of the growing season in 2009.

As mentioned, the result of this constant inundation continues to cause problems with seedling mortality, especially in three distinct areas (see Appendix D). The replacement planting done early this year appears to have stabilized stocking levels. As such, the coffeeweed was removed as a measure to give the planted trees every chance for survival and growth.

III. Methodology Section

Year 2 monitoring for the Mason 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 Summary	
Report Prepared By	Ashby Brown
Date Prepared	10/8/2009 11:34
DESCRIPTION OF WORKSHEETS IN THIS DOCUMENT----------	
Metadata	This worksheet, which is a summary of the project and the project data.
Vigor by Spp	Frequency distribution of vigor classes listed by species.
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	D06001
project Name	Mason Riverine
Description	Mason Riverine wetland project in Hyde county, NC
River Basin	Tar-Pamlico
Sampled Plots	4

Table 2. Vigor by Species							
	Species	**4**	**3**	**2**	**1**	**0**	**Missing**
	Cephalanthus occidentalis	1	2	1			
	Clethra alnifolia			1			
	Nyssa biflora			1			
	Quercus bicolor				1		
	Quercus phellos		1	4	1		
	Taxodium distichum	1	27				
	Unknown						2
	Myrica cerifera		1				1
TOT:	**8**	**2**	**31**	**7**	**2**		**3**

Table 3. Damage by Species			
	Species	**All Damage Categories**	**(no damage)**
	Cephalanthus occidentalis	4	4
	Clethra alnifolia	1	1
	Myrica cerifera	2	2
	Nyssa biflora	1	1
	Quercus bicolor	1	1
	Quercus phellos	6	6
	Taxodium distichum	28	28
	Unknown	2	2
TOT:	**8**	**45**	**45**

Table 4. Damage by Plot			
	plot	**All Damage Categories**	**(no damage)**
	D06001-ABET-0001-year:2	14	14
	D06001-ABET-0002-year:2	11	11
	D06001-ABET-0003-year:2	10	10
	D06001-ABET-0004-year:2	10	10
TOT:	**4**	**45**	**45**

Table 5. Stem Count by Plot and Species								
	Species	**Total Planted Stems**	**# plots**	**avg# stems**	**plot D06001-ABET-0001-year:2**	**plot D06001-ABET-0002-year:2**	**plot D06001-abet-0003-year:2**	**plot D06001-ABET-0004-year:2**
	Cephalanthus occidentalis	4	3	1.33	2		1	1
	Clethra alnifolia	1	1	1		1		
	Myrica cerifera	1	1	1		1		
	Nyssa biflora	1	1	1				1
	Quercus bicolor	1	1	1		1		
	Quercus phellos	6	2	3		5	1	
	Taxodium distichum	28	4	7	9	3	8	8
TOT:	**7**	**42**	**7**		**11**	**11**	**10**	**10**
	Average per acre	425			445	445	405	405

Table 6. Vegetation Problem Areas			
Feature/Issue	Plot	Probable Cause	Photo #
Site Colonization by Coffeeweed (*Sesbania herbacea)*	Entire Site	Plant is considered a noxious and/or invasive species on cropland	VPA 1 through 5

Mason Property Wetland Mitigation Project

2009 Herbaceous Vegetation Monitoring Summary

Sample Plot #1 10/23/09 (80% coverage, 100% inundated to 8")

Vegetation:	Common	Botannical	Density	Indicator Status
Herbaceous				
	Broadleaf Cattail	*Typha latifolia*	80%	OBL
	Water Purslane	*Ludwigia palustris*	10%	OBL
	Fall Panicgrass	*Panicum dichotomiflorum*	2%	FACW
	Curly Dock	*Rumex crispus*	<2%	FAC
	Camphorweed	*Pluchea camphorata*	<2%	FACW
	Common Spikerush	*Eleocharis palustris*	<2%	OBL
	Softstem Bullrush	*Scirpus validus*	<2%	OBL
	Barnyard Grass	*Echinochloa crus-galli*	<2%	FACW-
	Smallfruit Spikerush	*Eleocharis microcarpa*	<2%	OBL

Sample Plot #2 10/23/09 (+/-90% Coverage, 20% inundated to 4")

Vegetation:	Common	Botannical	Density	Indicator Status
Herbaceous				
	Fall Panicgrass	*Panicum dichotomiflorum*	30%	FACW
	Dallisgrass	*Paspalum dilatatum*	20%	FAC+
	Canada Rush	*Juncus canandensis*	10%	OBL
	Soft Rush	*Juncus effuses*	10%	FACW+
	Dog Fennel	*Eupatorium cappilifolium*	10%	FACU
	Beach False Foxglove	*Agalanis faciculata*	2%	FAC
	Camphorweed	*Pluchea camphorata*	2%	FACW
	Redtop	*Agrostis alba*	2%	NI
	Switchgrass	*Panicum virgatum*	2%	FAC+
	Pennsylvania Smartweed	*Polygonum pennsylvanica*	2%	FACW
	Smooth Goldenrod	*Solidago gigentea*	2%	FACW
	Barnyard Grass	*Echinochloa crus-galli*	<2%	FACW-
	Climbing Boneset	*Mikania scandens*	<2%	FACW
	Wisteria	*Wisteria sinensis*	<2%	NI
	Water Purslane	*Ludwigia palustris*	<2%	OBL
	Broadleaf Cattail	*Typha latifolia*	<2%	OBL

Mason Property Wetland Mitigation Project

2009 Herbaceous Vegetation Monitoring Summary

Sample Plot #3 10/23/09 (+/-90% Coverage, 95% inundated to 8")

Vegetation:	Common	Botannical	Density	Indicator Status
Herbaceous				
	Broadleaf Cattail	*Typha latifolia*	60%	OBL
	Fall Panicgrass	*Panicum dichotomiflorum*	20%	FACW
	Redtop	*Agrostis alba*	10%	NI
	Water Purslane	*Ludwigia palustris*	2%	OBL
	Camphorweed	*Pluchea camphorata*	2%	FACW
	Pennsylvania Smartweed	*Polygonum pennsylvanica*	2%	FACW
	Barnyard Grass	*Echinochloa crus-galli*	2%	FACW-
	Curly Dock	*Rumex crispus*	<2%	FAC
	Duckweed	*Mikania scandens*	<2%	FACW

Sample Plot #4 10/23/09 (70% coverage, 90% inundated to 6")

Vegetation:	Common	Botannical	Density	Indicator Status
Herbaceous				
	Fall Panicgrass	*Panicum dichotomiflorum*	40%	FACW
	Broadleaf Cattail	*Typha latifolia*	10%	OBL
	Beach False Foxglove	*Agalanis faciculata*	5%	FAC
	Soft Rush	*Juncus effuses*	5%	OBL
	Water Purslane	*Ludwigia palustris*	5%	OBL
	American Cupscale	*Sacciolepis striata*	5%	OBL
	Stawcolored Flatsedge	*Cyperus strigosus*	2%	OBL
	Marshpepper Knotweed	*Polygonum hydropiper*	2%	OBL
	Curly Dock	*Rumex crispus*	2%	FAC
	Camphorweed	*Pluchea camphorata*	2%	FACW
	Common Threesquare	*Schoenoplectus pungens*	2%	OBL
	Barnyard Grass	*Echinochloa crus-galli*	<2%	FACW-
	Canada Rush	*Juncus canadensis*	<2%	OBL
	Carolina Ponysfoot	*Dichondra carolinensis*	<2%	FACW-
	Dog Fennel	*Eupatorium Cappilifolium*	<2%	FACU
	Swamp Smartweed	*Polygonum hydropiperoides*	<2%	OBL

VPA 1

Immature specimen of Coffeeweed (*Sesbania herbacea*)

VPA 2

Clumps of Coffeeweed can be seen from Sept. 2008 photo

VPA 3

More extensive stands of Coffeeweed from Sept. 2008 photo

VPA 4

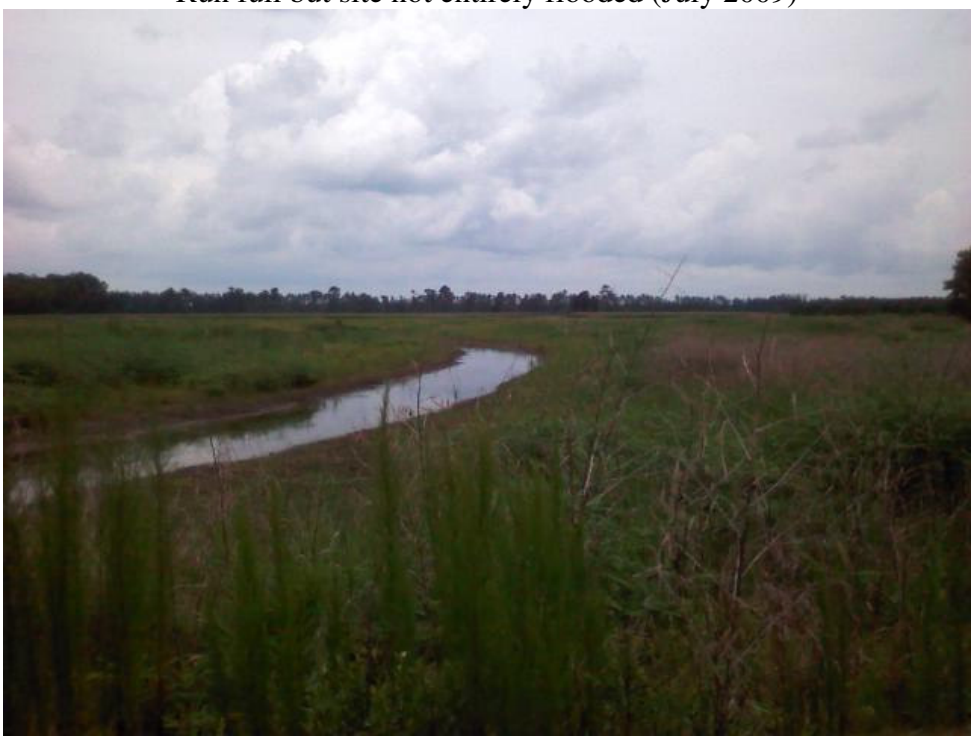
Coffeeweed on site, August 2009

VPA 5

Coffeeweed on site, August 2009

General Site Photos

Run full but site not entirely flooded (July 2009)



Run contained within its banks (July 2009)

Overbank flooding, overall site flooding (September 2009)

Overbank flooding and overall site flooding (September 2009)

Severe sight flooding (December 2009)

Severe sight flooding can be seen west of main run (December 2009)

Main run looking north. Water levels outside the run and across the site are generally greater than one foot deep (December 2009)

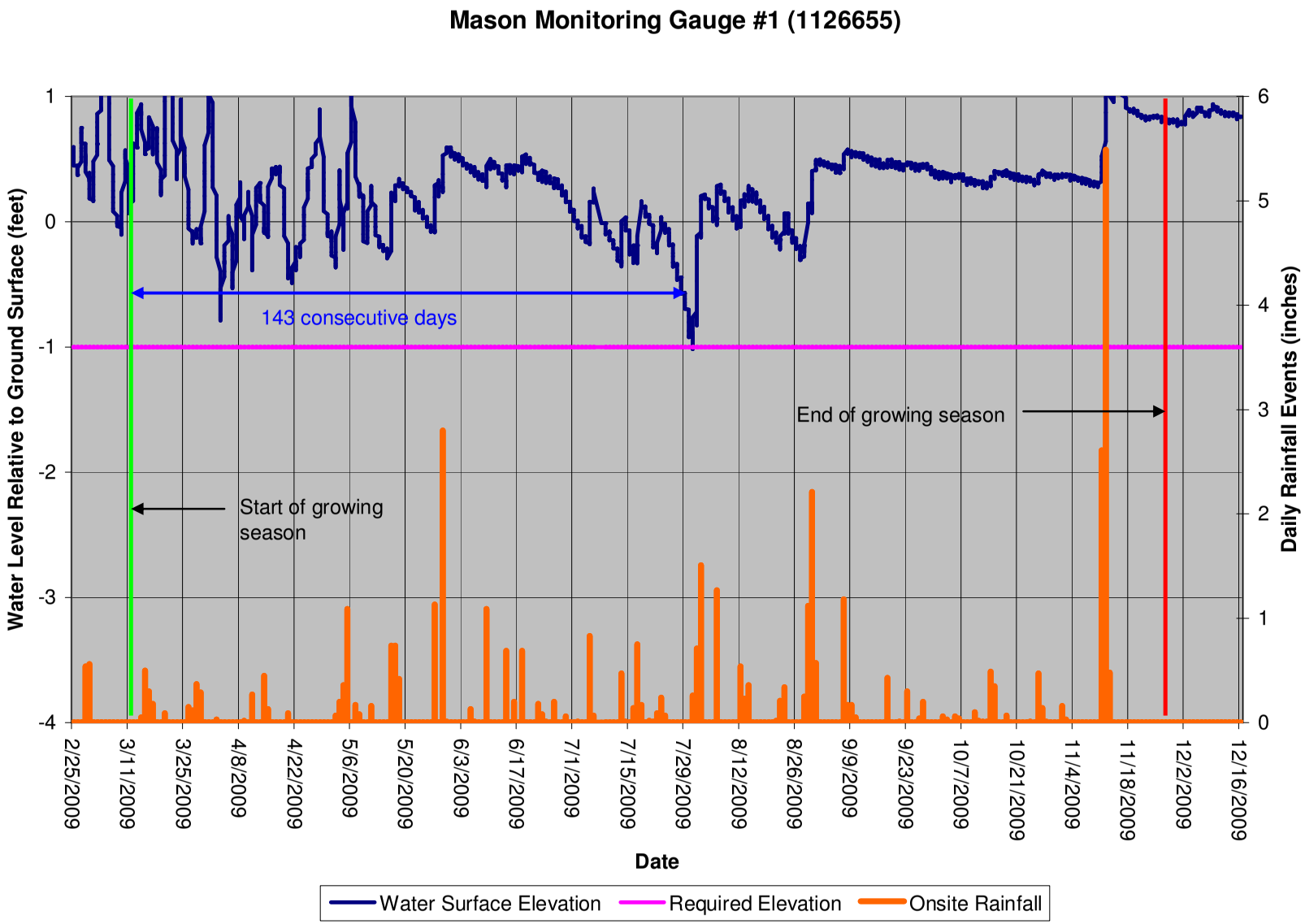
Appendix B

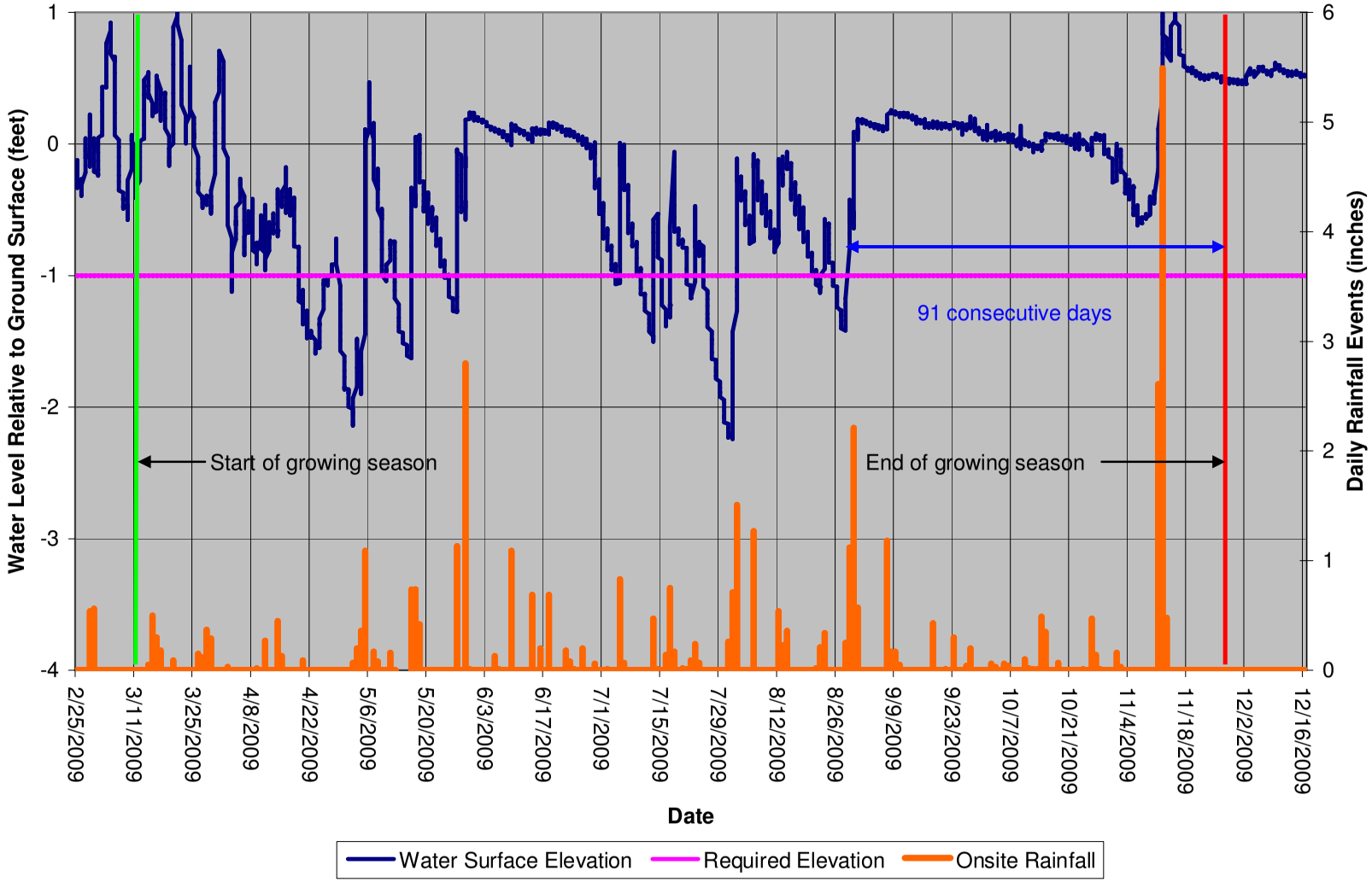
Geomorphologic Raw Data

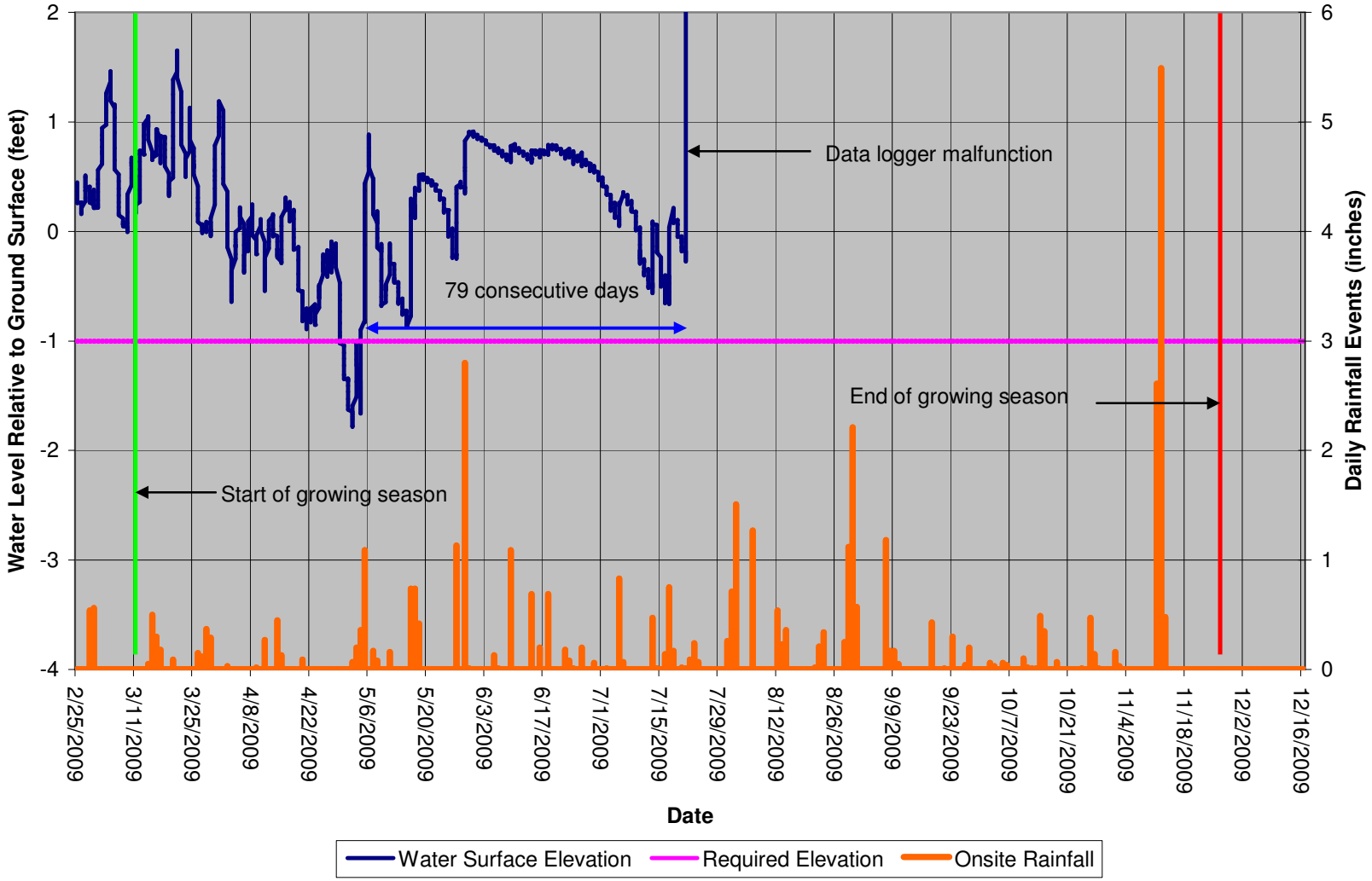
Not used in this report

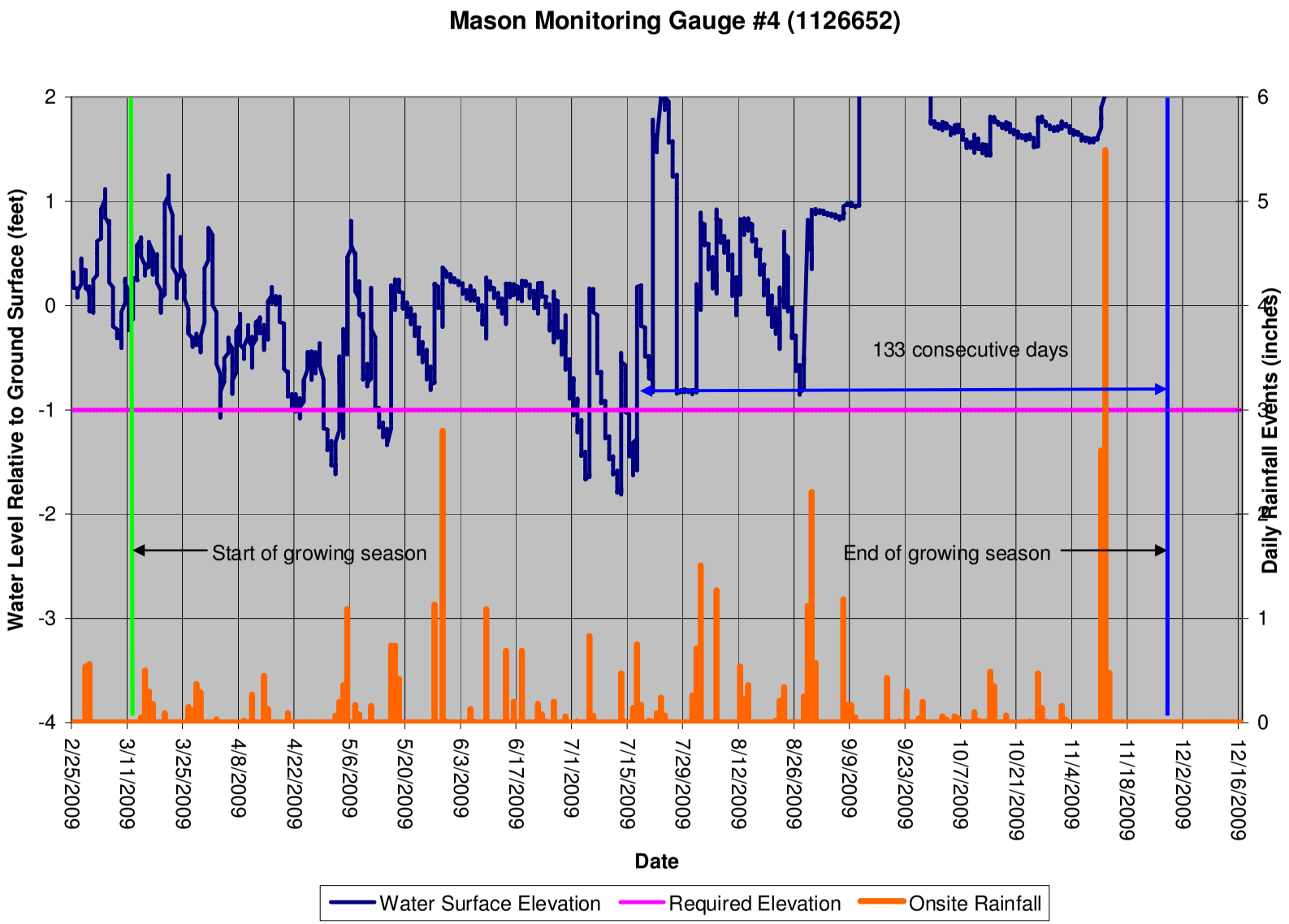
Appendix C

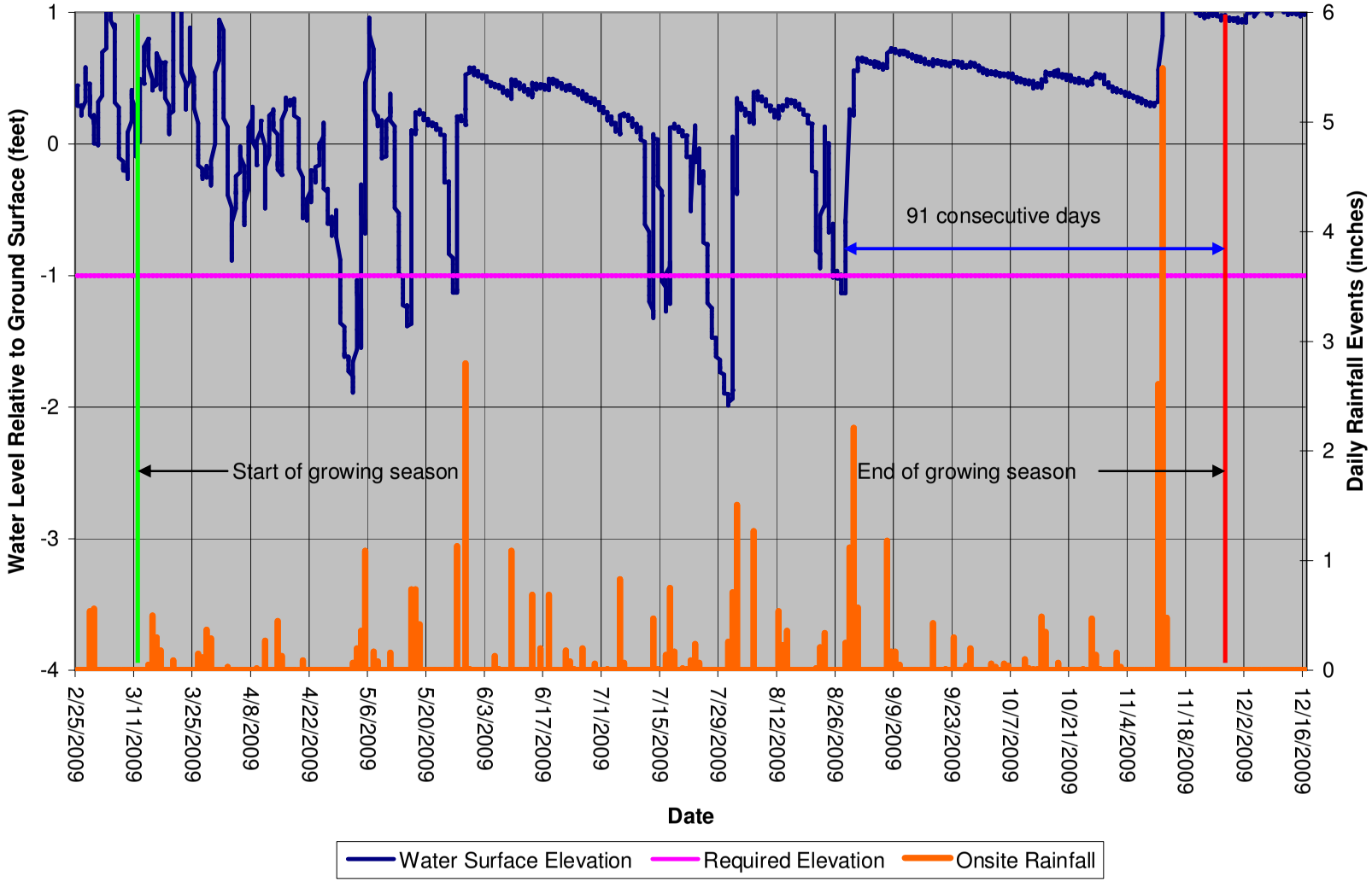
Hydrologic Data Tables

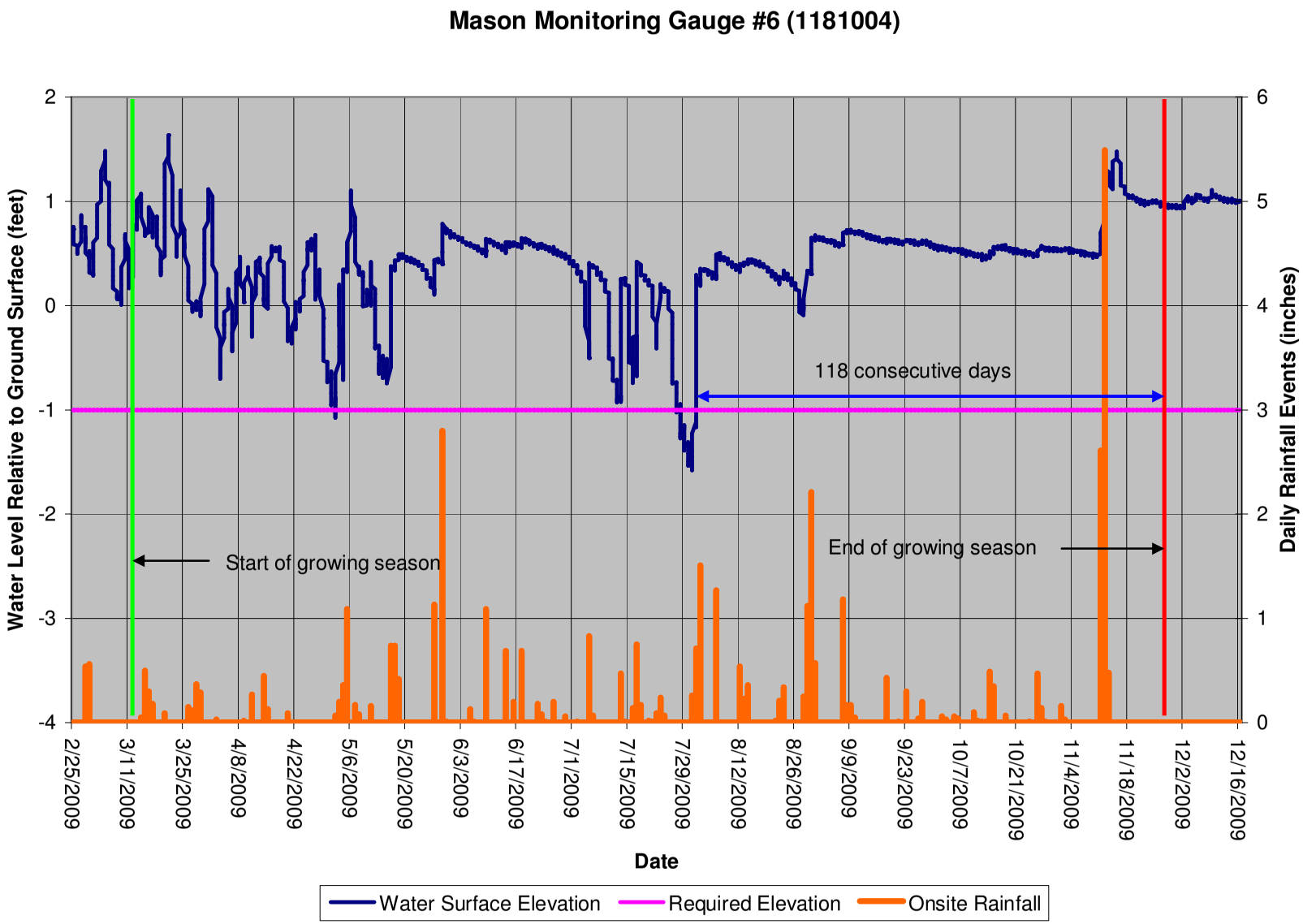

Mason Monitoring Gauge #1 (1126655)
Water Level Relative to Ground Surface (feet)
Daily Rainfall Events (inches)
1
0
-1
-2
-3
-4
6
5
4
3
2
1
0
143 consecutive days
End of growing season
Start of growing season
2/25/2009
3/11/2009
3/25/2009
4/8/2009
4/22/2009
5/6/2009
5/20/2009
6/3/2009
6/17/2009
7/1/2009
7/15/2009
7/29/2009
8/12/2009
8/26/2009
9/9/2009
9/23/2009
10/7/2009
10/21/2009
11/4/2009
11/18/2009
12/2/2009
12/16/2009
Date
Water Surface Elevation
Required Elevation
Onsite Rainfall

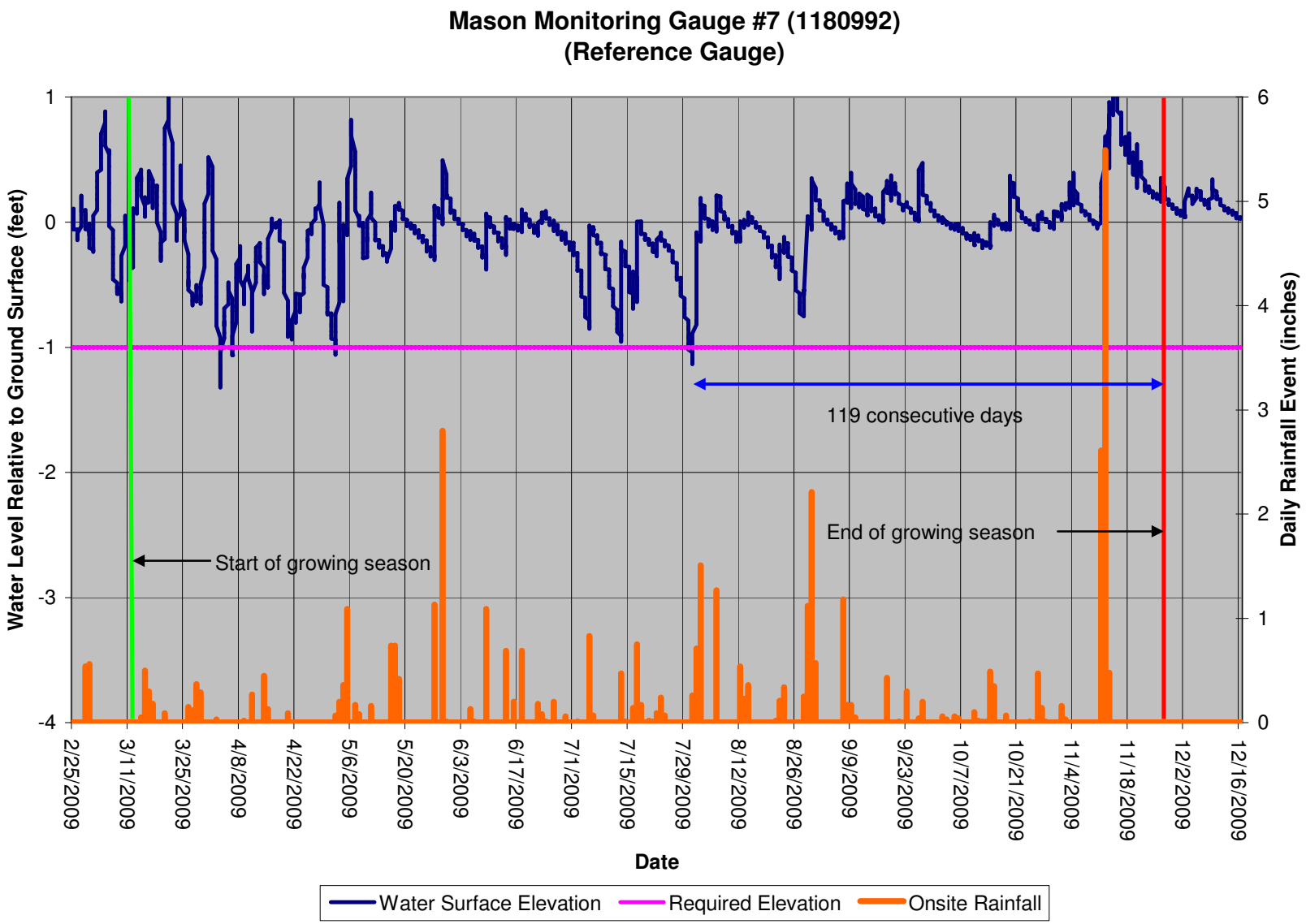

Mason Monitoring Gauge #2 (1126648)
Water Level Relative to Ground Surface (feet)
Daily Rainfall Events (inches)
1
0
-1
-2
-3
-4
6
5
4
3
2
1
0
91 consecutive days
Start of growing season
End of growing season
2/25/2009
3/11/2009
3/25/2009
4/8/2009
4/22/2009
5/6/2009
5/20/2009
6/3/2009
6/17/2009
7/1/2009
7/15/2009
7/29/2009
8/12/2009
8/26/2009
9/9/2009
9/23/2009
10/7/2009
10/21/2009
11/4/2009
11/18/2009
12/2/2009
12/16/2009
Date
Water Surface Elevation
Required Elevation
Onsite Rainfall


Mason Monitoring Gauge #3 (1126649)
Water Level Relative to Ground Surface (feet)
Daily Rainfall Events (inches)
Data logger malfunction
79 consecutive days
End of growing season
Start of growing season
Date
Water Surface Elevation
Required Elevation
Onsite Rainfall


Mason Monitoring Gauge #4 (1126652)
Water Level Relative to Ground Surface (feet)
Daily Rainfall Events (inches)
2
1
0
-1
-2
-3
-4
6
5
4
3
2
1
0
133 consecutive days
Start of growing season
End of growing season
2/25/2009
3/11/2009
3/25/2009
4/8/2009
4/22/2009
5/6/2009
5/20/2009
6/3/2009
6/17/2009
7/1/2009
7/15/2009
7/29/2009
8/12/2009
8/26/2009
9/9/2009
9/23/2009
10/7/2009
10/21/2009
11/4/2009
11/18/2009
12/2/2009
12/16/2009
Date
Water Surface Elevation
Required Elevation
Onsite Rainfall


Mason Monitoring Gauge #5 (1180996)
Water Level Relative to Ground Surface (feet)
Daily Rainfall Events (inches)
1
0
-1
-2
-3
-4
6
5
4
3
2
1
0
91 consecutive days
Start of growing season
End of growing season
2/25/2009
3/11/2009
3/25/2009
4/8/2009
4/22/2009
5/6/2009
5/20/2009
6/3/2009
6/17/2009
7/1/2009
7/15/2009
7/29/2009
8/12/2009
8/26/2009
9/9/2009
9/23/2009
10/7/2009
10/21/2009
11/4/2009
11/18/2009
12/2/2009
12/16/2009
Date
Water Surface Elevation
Required Elevation
Onsite Rainfall


Mason Monitoring Gauge #6 (1181004)
Water Level Relative to Ground Surface (feet)
Daily Rainfall Events (inches)
2
1
0
-1
-2
-3
-4
6
5
4
3
2
1
0
118 consecutive days
Start of growing season
End of growing season
2/25/2009
3/11/2009
3/25/2009
4/8/2009
4/22/2009
5/6/2009
5/20/2009
6/3/2009
6/17/2009
7/1/2009
7/15/2009
7/29/2009
8/12/2009
8/26/2009
9/9/2009
9/23/2009
10/7/2009
10/21/2009
11/4/2009
11/18/2009
12/2/2009
12/16/2009
Date
Water Surface Elevation
Required Elevation
Onsite Rainfall


Mason Monitoring Gauge #7 (1180992)
(Reference Gauge)
Water Level Relative to Ground Surface (feet)
Daily Rainfall Event (inches)
1
0
-1
-2
-3
-4
6
5
4
3
2
1
0
119 consecutive days
Start of growing season
End of growing season
2/25/2009
3/11/2009
3/25/2009
4/8/2009
4/22/2009
5/6/2009
5/20/2009
6/3/2009
6/17/2009
7/1/2009
7/15/2009
7/29/2009
8/12/2009
8/26/2009
9/9/2009
9/23/2009
10/7/2009
10/21/2009
11/4/2009
11/18/2009
12/2/2009
12/16/2009
Date
Water Surface Elevation
Required Elevation
Onsite Rainfall

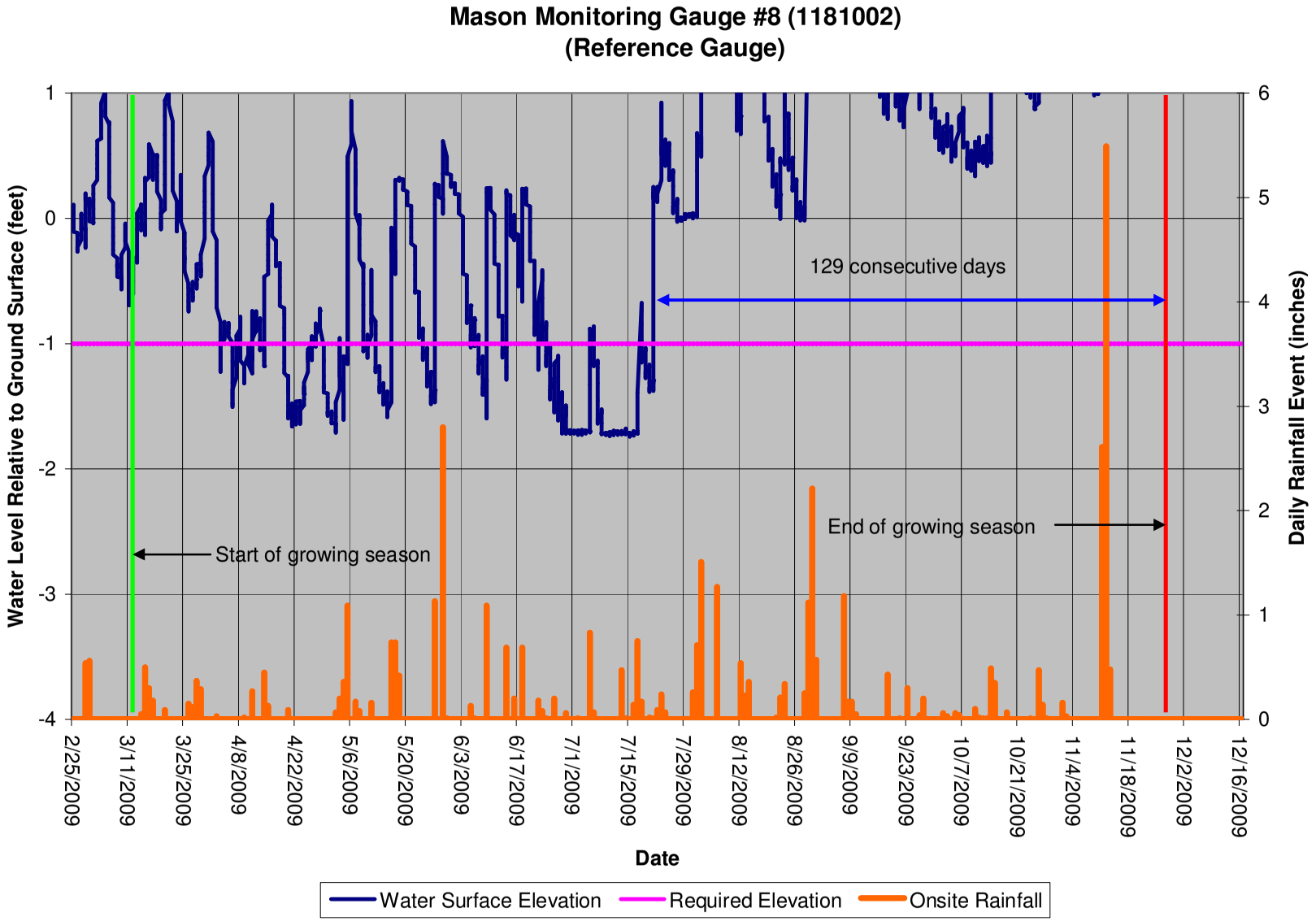
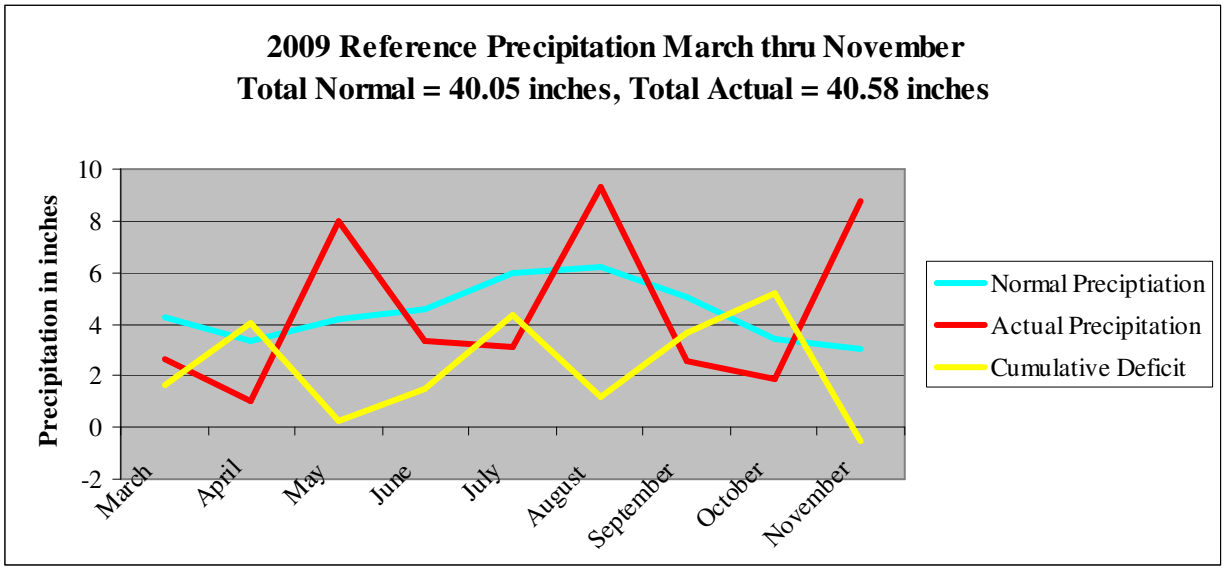

Mason Monitoring Gauge #8 (1181002)
(Reference Gauge)
Water Level Relative to Ground Surface (feet)
Daily Rainfall Event (inches)
1
0
-1
-2
-3
-4
6
5
4
3
2
1
0
129 consecutive days
Start of growing season
End of growing season
2/25/2009
3/11/2009
3/25/2009
4/8/2009
4/22/2009
5/6/2009
5/20/2009
6/3/2009
6/17/2009
7/1/2009
7/15/2009
7/29/2009
8/12/2009
8/26/2009
9/9/2009
9/23/2009
10/7/2009
10/21/2009
11/4/2009
11/18/2009
12/2/2009
12/16/2009
Date
Water Surface Elevation
Required Elevation
Onsite Rainfall

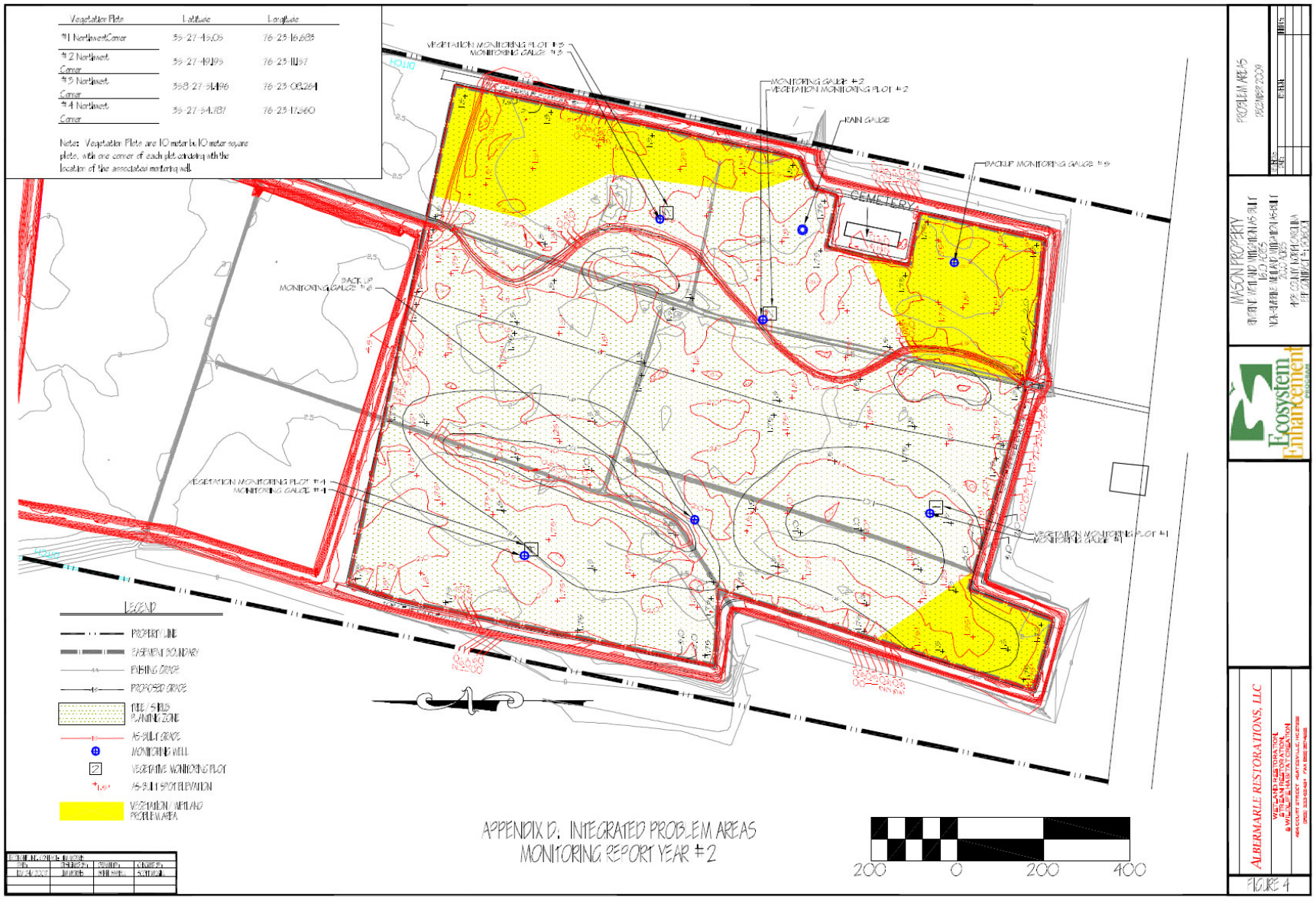
Table C-1															
Longest Consecutive Successful Hydrologic Period in Days and Success at 5% and 8% of Growing Season															
	Year 1			Current Year			Year 3			Year 4			Year 5		
Gauge	Days	5%	8%	Days	5%	8%	Days	5%	8%	Days	5%	8%	Days	5%	8%
1	99	Y	Y	143	Y	Y									
2	86	Y	Y	91	Y	Y									
3	95	Y	Y	79	Y	Y									
4	88	Y	Y	133	Y	Y									
5	92	Y	Y	91	Y	Y									
6	93	Y	Y	118	Y	Y									
7(Ref)	158	Y	Y	119	Y	Y									
8(Ref)	41	Y	Y	129	Y	Y									

5% of growing season is 13 days, 8% is 21 days



Appendix D

Problem Areas Plan View (Integrated)


Vegetation Plots
Latitude
Longitude
#1 Northwest Corner
35° 27' 49.05"
76° 23' 16.683"
#2 Northwest Corner
35° 27' 49.195"
76° 23' 11.197"
#3 Northwest Corner
35° 27' 51.496"
76° 23' 08.264"
#4 Northwest Corner
35° 27' 54.787"
76° 23' 17.560"
Notes: Vegetation Plots are 10 meter by 10 meter square plots, with one corner of each plot coinciding with the location of the associated monitoring well.
VEGETATION MONITORING PLOT #3
MONITORING GAUGE #3
MONITORING GAUGE #2
VEGETATION MONITORING PLOT #2
RAIN GAUGE
BACKUP MONITORING GAUGE #5
CEMETERY
BACK UP MONITORING GAUGE #6
VEGETATION MONITORING PLOT #1
MONITORING GAUGE #1
VEGETATION MONITORING PLOT #4
MONITORING GAUGE #4
DITCH
LEGEND
PROPERTY LINE
EASEMENT BOUNDARY
EXISTING GRADE
PROPOSED GRADE
RIPE / SHRUB PLANTING ZONE
AS-BUILT GRADE
MONITORING WELL
VEGETATIVE MONITORING PLOT
AS-BUILT SPOT ELEVATION
VEGETATION / WETLAND PROBLEM AREA
200
0
200
400
APPENDIX D. INTEGRATED PROBLEM AREAS
MONITORING REPORT YEAR #2
PROBLEM AREAS
DECEMBER 2009
MASON PROPERTY
Ecosystem Enhancement
ALBEMARLE RESTORATIONS, LLC
WETLAND RESTORATION
STREAM RESTORATION
& WILDLIFE HABITAT CREATION
FIGURE 4