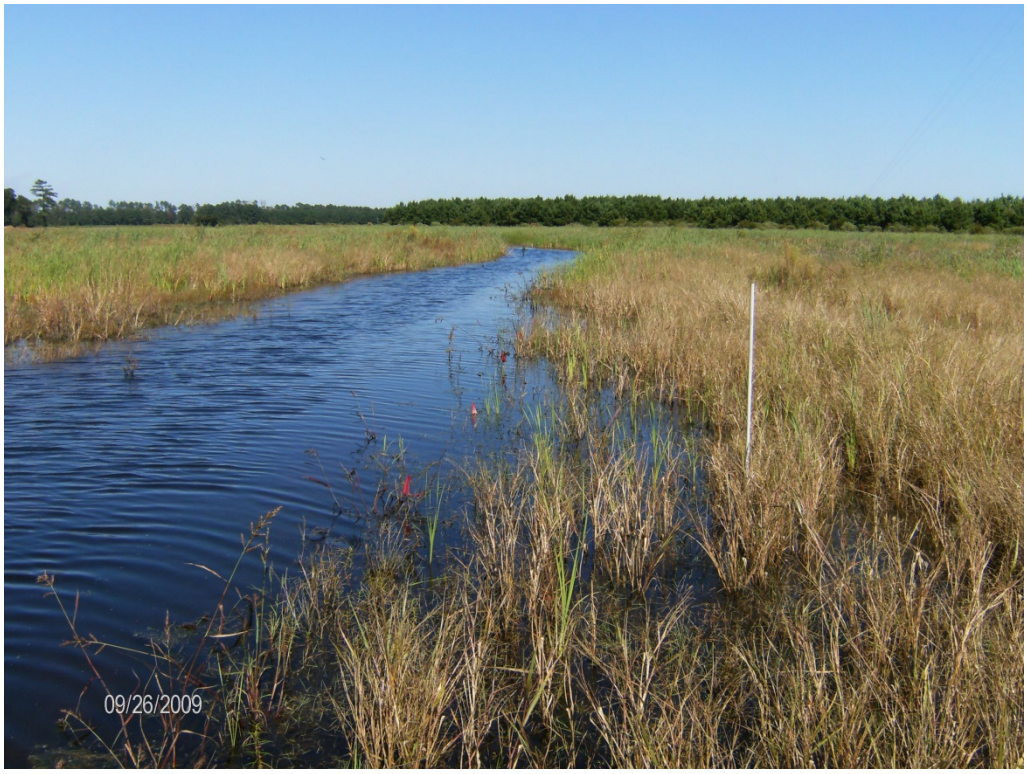
Mason Property Wetland Mitigation Project
EEP ID (IMS# 92328)
FDP Contract Number D06001
USACE Action ID # SAW-2007-59-148

Monitoring Year 5 (2012)

WETLAND



Project Setting and Classifications	
County	Hyde County
General Location	Rose Bay
Basin	Tar-Pamlico
Physiographic Region	Coastal Plain
Ecoregion	8.5.1 Middle Atlantic Coastal Plain
USGS Hydro Unit	03020105
NCDWQ Sub-basin	03-03-08
Cowardin Classification	PEM, PSS, PFO
Thermal Regime	Warm
Trout Water	No
Project Performers	
Source Agency	EEP
Provider	Albemarle Restorations, LLC
Designer	Ecotone, Inc.
Monitoring Firm	Woods, Water and Wildlife, Inc.
Channel Remediation	Woods, Water and Wildlife, Inc.
Plant Remediation	Carolina Silvics, Inc
Property Interest Holder	EEP

Project Activities and Timeline	
Activity or Report	**Date of Delivery**
Restoration Plan	June 2006
Final Design -90%	June 2006
Construction	May 2007
Temporary S & E mix applied	May 2007
Permanent seed mix applied	May 2007
Containerized and Bare Root Planting	May 2007
Mit. Plan/As-built/Year 1 monitoring	December 2008
Supplemental Planting	February 2008
Year 2 monitoring	January 2010
Supplemental Planting	March 2010
Year 3 monitoring	December 2010
Year 4 monitoring	September 2011
Year 5 monitoring	January 2013

Project Setting and Background 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. Supplemental planting was done in 2009 and again in 2010 in specific areas on the site to increase stocking levels that were suffering due to prolonged periods of inundation and salt water intrusion.

Hydrologic and vegetation monitoring began in 2008 after construction and tree planting was completed. Six water level monitoring gauges were located at varying elevations throughout the riverine and non-riverine wetland areas of the site to measure subsurface water elevations. Two additional gauges are located in the adjacent reference areas.

Although construction was completed in May of 2007 and tree planting occurred immediately after, initial stocking levels were inadequate which caused the baseline monitoring year to be put off until 2008. Supplemental planting done in February 2008 brought stocking up to an adequate level, so 2008 is the baseline year for monitoring. The site is subject to prolonged periods of relatively deep standing water, typically from November until May or June each season. It is also subject to salt water intrusion during wind-driven tidal surges like those seen in hurricanes and coastal storms. Both of these situations have been a serious problem for planted tree and shrub survival and growth.

Goals and Objectives:

The intent 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.

Success Criteria

Vegetation: 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. The site was originally 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. In March of 2010 an additional 2,700 containerized trees were added to bolster stocking levels in areas that appeared to be suffering from salt water damage caused by backflow over the outlet plug during periods of abnormally high tide. The success criterion in year 5 is to have a minimum of 260 live stems per acre.

Tree mortality was the most severe in 2012 following Hurricane Irene, but has been a constant problem requiring periodic supplemental planting, most of which did little to mitigate the problem. The non-riverine portion of the project in the northwest corner has suffered the least damage. Immediately prior to Irene though, the stem count and tree growth were actually very good and it appeared as though the planted stems might have finally successfully colonized the site. But the amount and duration of salt water put on the site by Irene proved to be very toxic to the planted stems.

Hydrology: 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.

Minimum hydrologic requirements have not been an issue on the Mason project. As previously stated, the site is prone to prolonged flooding and salt water intrusion caused by tidal surges. During Hurricane Irene in 2011, recorded water levels on the project site reached approximately four feet in above-ground depth. Although the flooding was very short lived, it was primarily salt water pushed in from nearby Rose Bay and lasted long enough to have caused substantial tree mortality on the project and reference site. Widespread salt damage was readily visible in the entire Rose Bay area. Further proof of the seriousness of the salt water problem is found in the following explanation of the failure of several sub-surface water level loggers that were sent back to the manufacturer for repair. From the manufacturer: *". . . both units leaked. The . . . loggers . . . appear to have been exposed to salt or brackish water. Both have crevice corrosion on the case and cannot reliably be rebuilt. The moment salt water gets into a crevice the water/metal interface results in oxidation of the metal which concentrates the hydrogen content of water, and turns the water into an acid, generating an electrical current that "dissolves" the metal involved. These crevices or closed cells can become dynamic, meaning that the process can perpetuate itself for a long time … continues until the metal is completely gone. Crevice corrosion will continue even after you have pulled your loggers from the salt water."*

Restoration Type	Pre-Construction Acres/Linear Feet	Mitigation Approach	Watershed Acreage	As Built Acres/ Linear Feet	Mitigation Ratio	Mitigation Units SMU/WMU
Riverine Wetland	0.0 acres	R		16.0 acres	1:1	16.0 WMUs
Non-Riverine Wetland	0.0 linear feet	R		20.0 Acres	1:1	20.0 WMUs

MITIGATION UNIT TOTALS

Stream Mitigation Units (SMU)	Riverine Wetland Units	Non-Riverine Wetland Units	Total Wetland (WMU)	Riparian Buffer	Nutrient Offset
0	16	20	36	0	0

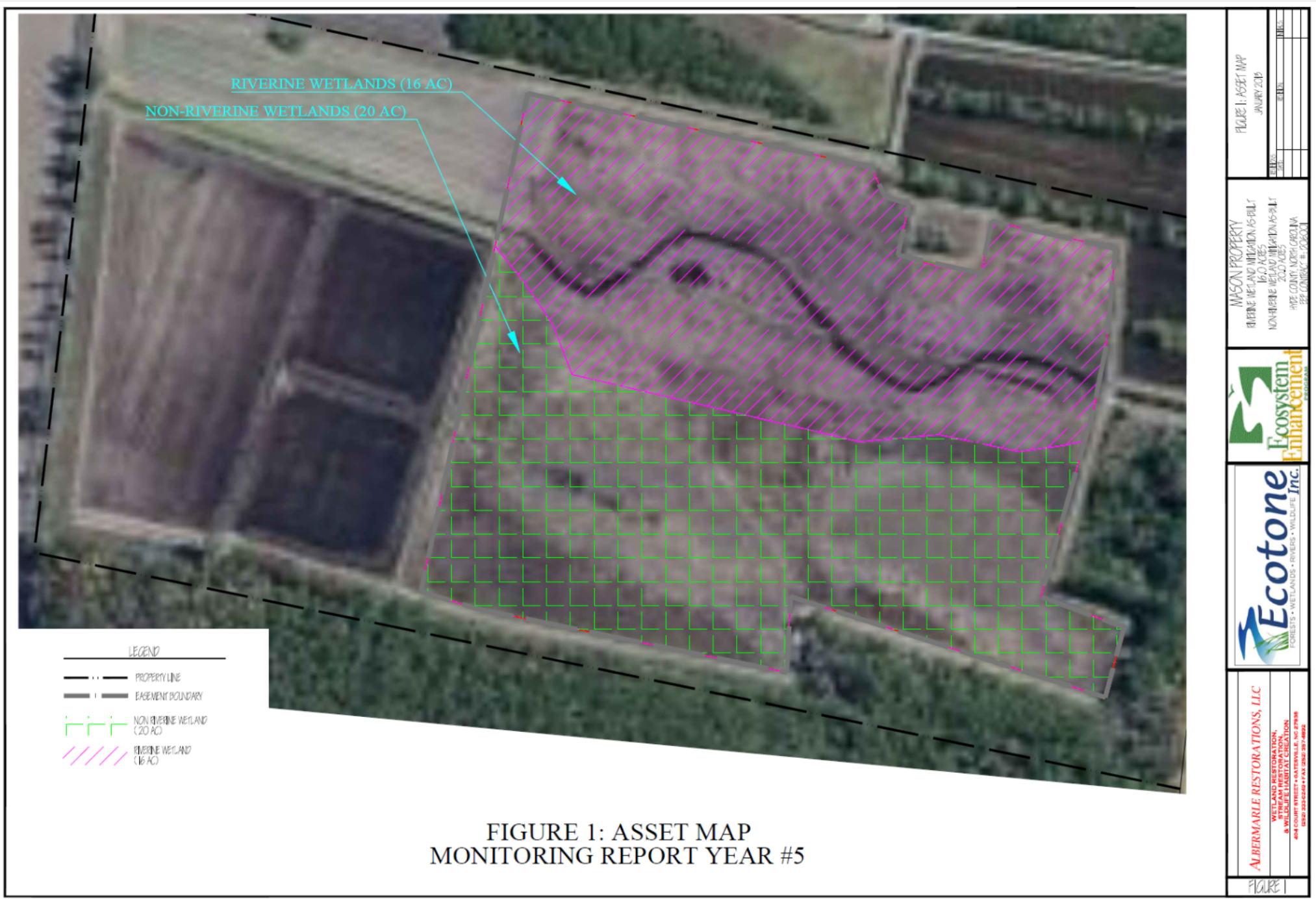
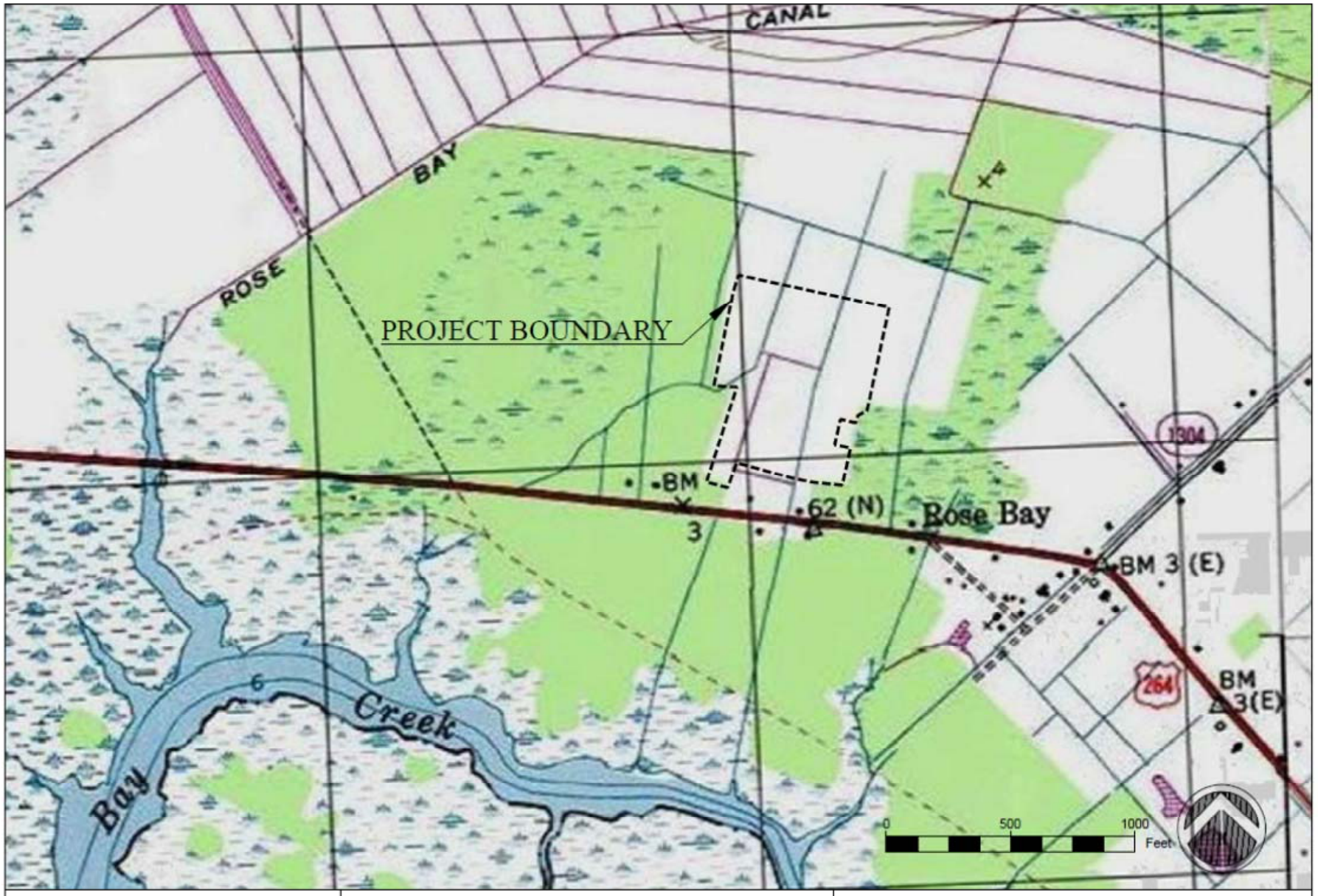


FIGURE 1: ASSET MAP
MONITORING REPORT YEAR #5



ALBERMARLE RESTORATIONS, LLC

WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION

404 COURT STREET GATESVILLE, NC 27938
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MASON SITE
FIGURE 2: VICINITY MAP

Scale: 1"=1000'

Project No. 0574
Date: 1/22/2013
Drawn By: CKA
Project Manager: AB

SHEET 1

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MASON SITE
FIGURE 3: SOIL SURVEY MAP

Scale: 1"=300' 0 150 300 Feet

Project No. 0574
Date: 1/22/2013
Drawn By: CKA
Project Manager: AB

SHEET 1

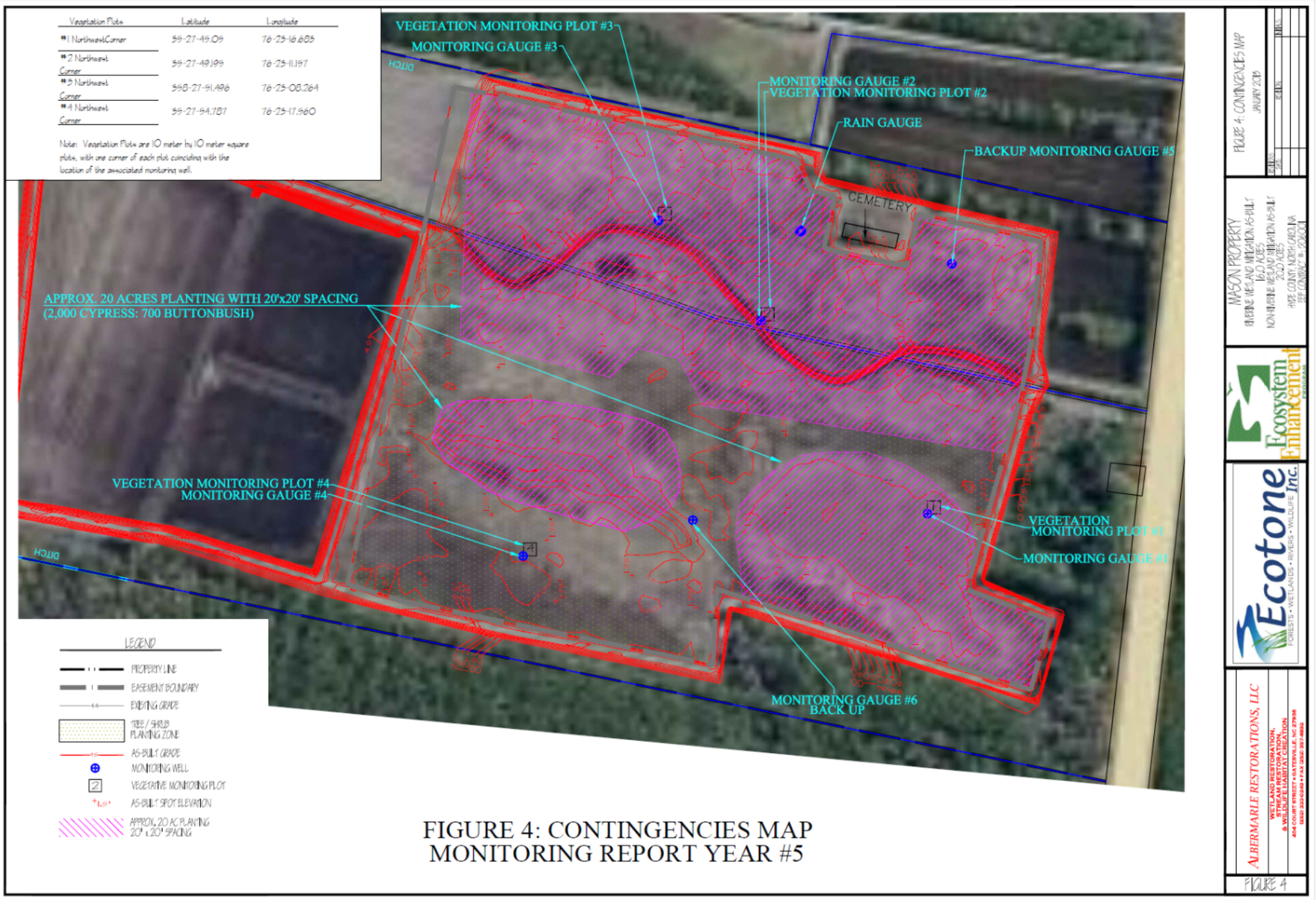
Vegetation Plots | Latitude | Longitude
#1 Northwest Corner | 59-27-49.09 | 76-25-16.605
#2 Northwest Corner | 59-27-49.199 | 76-25-11.157
#3 Northwest Corner | 558-27-51.496 | 76-25-08.264
#4 Northwest Corner | 59-27-54.787 | 76-25-17.560
Note: Vegetation Plots are 10 meter by 10 meter square plots, 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
APPROX. 20 ACRES PLANTING WITH 20'x20' SPACING
(2,000 CYPRESS: 700 BUTTONBUSH)
VEGETATION MONITORING PLOT #4
MONITORING GAUGE #4
VEGETATION MONITORING PLOT #1
MONITORING GAUGE #1
MONITORING GAUGE #6
BACK UP
DITCH
LEGEND
PROPERTY LINE
EASEMENT BOUNDARY
EXISTING GRADE
TREE / SHRUB PLANTING ZONE
AS-BUILT GRADE
MONITORING WELL
VEGETATIVE MONITORING PLOT
AS-BUILT SPOT ELEVATION
APPROX. 20 AC PLANTING 20' x 20' SPACING
FIGURE 4: CONTINGENCIES MAP
JANUARY 2016
MASON PROPERTY
RIVERINE WETLAND MITIGATION AS-BUILT
16.0 ACRES
NONRIVERINE WETLAND MITIGATION AS-BUILT
20.0 ACRES
HYDE COUNTY, NORTH CAROLINA
USGS CONTOUR MAP
Ecosystem Enhancement Program
Ecotone Inc.
FORESTS • WETLANDS • RIVERS • WILDLIFE
ALBERMARLE RESTORATIONS, LLC
WETLAND RESTORATION,
STREAM RESTORATION,
& WILDLIFE HABITAT CREATION
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FIGURE 4
FIGURE 4: CONTINGENCIES MAP
MONITORING REPORT YEAR #5

Figure 5. Historic average vs. observed rainfall

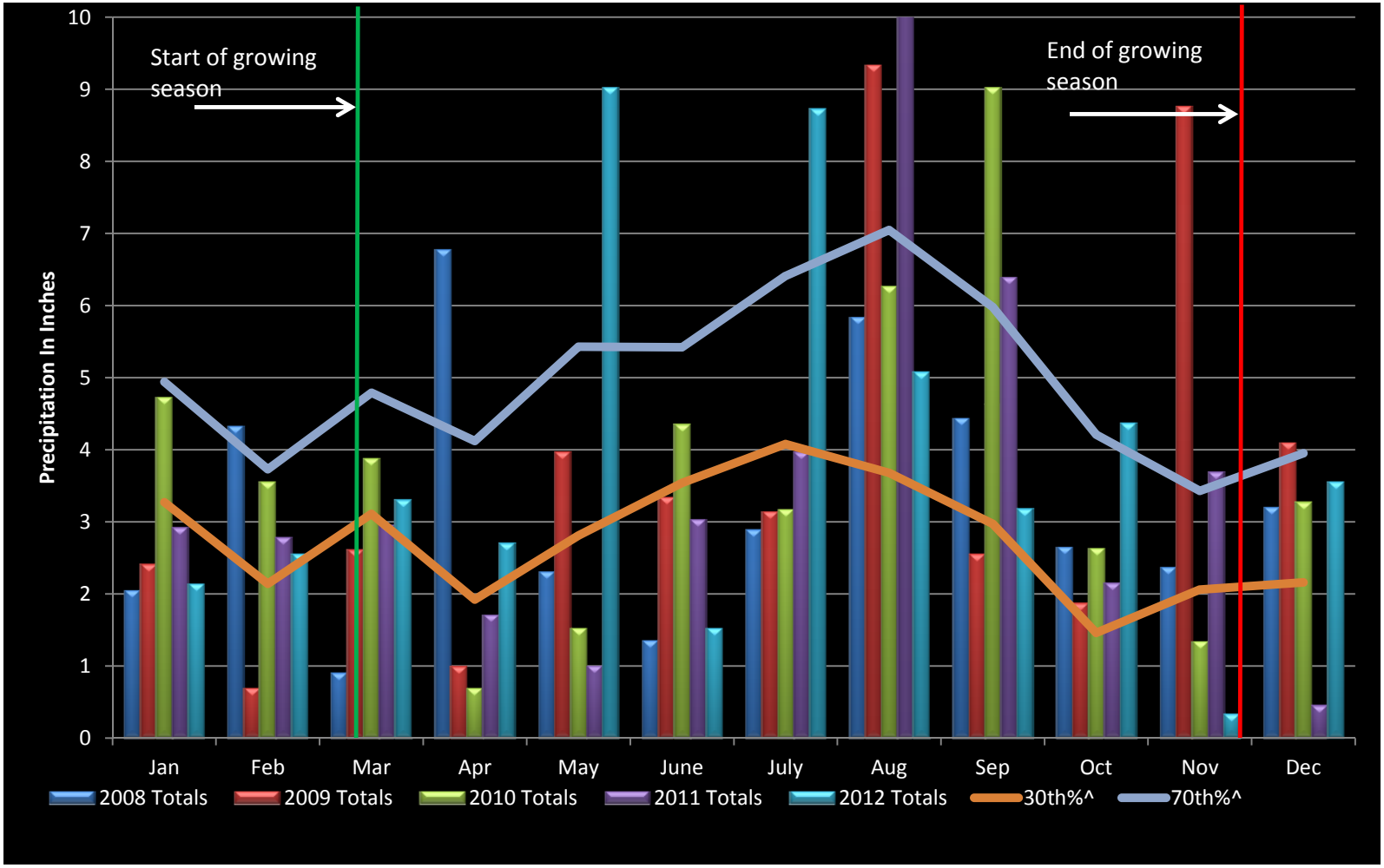

Figure 6. 5-year average of onsite rainfall vs. normal expected range of rainfall. Rainfall during the beginning of the growing season over the five years the project was monitored, was somewhat below normal though it had little, if any effect on the hydrology of the site.

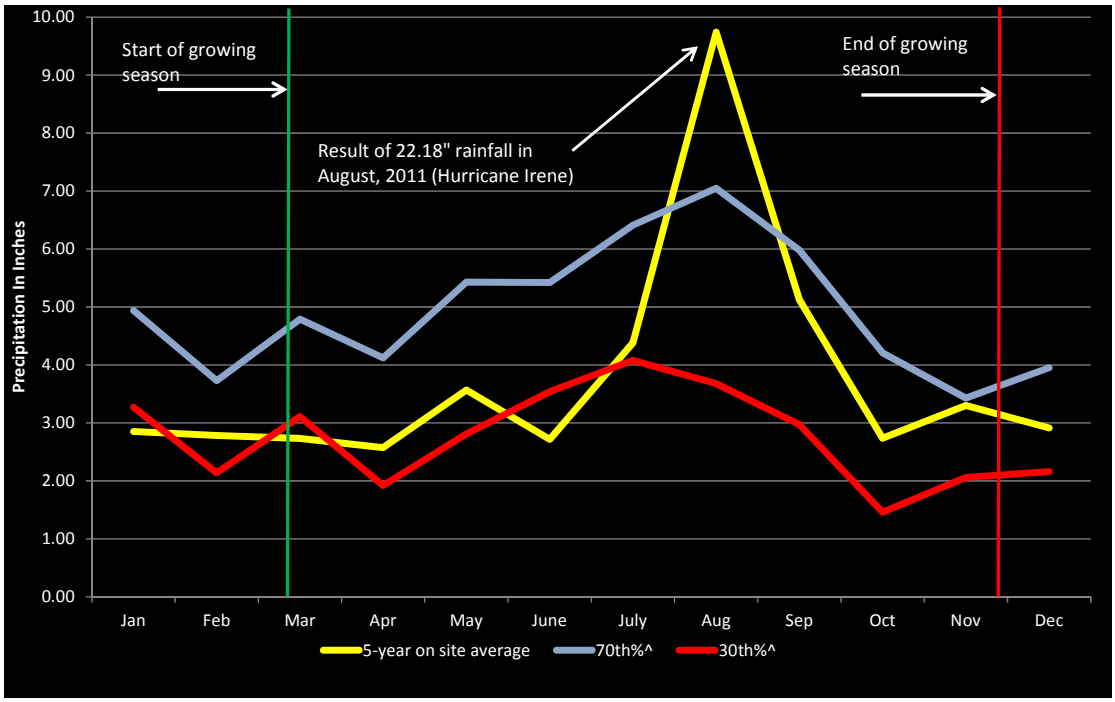

Table 1. 5-Year On-Site Precipitation vs. Historic Averages

	2008	2009	2010	2011	2012	5-yr avg	30%^	70%^
Jan	2.05	2.41	4.73	2.92	2.14	2.85	3.27	4.94
Feb	4.33	0.69	3.55	2.78	2.55	2.78	2.14	3.73
Mar	0.90	2.61	3.88	2.96	3.30	2.73	3.11	4.79
Apr	6.78	0.99	0.69	1.71	2.70	2.57	1.92	4.12
May	2.31	3.97	1.52	1.00	9.03	3.57	2.81	5.43
June	1.35	3.34	4.35	3.03	1.52	2.72	3.54	5.42
July	2.89	3.14	3.17	3.97	8.73	4.38	4.08	6.41
Aug	5.84	9.34	6.27	22.18	5.08	9.74	3.68	7.05
Sep	4.44	2.55	9.03	6.40	3.18	5.12	2.97	5.98
Oct	2.65	1.87	2.63	2.15	4.37	2.73	1.46	4.21
Nov	2.37	8.77	1.34	3.69	0.33	3.30	2.06	3.43
Dec	3.20	4.10	3.27	0.45	3.55	2.91	2.16	3.95

Table 2. Summary of Hydrologic Monitoring Data

Longest hydrologic period in days (and % of Growing Season)										
Gauge	Year 1 2008		Year 2 2009		Year 3 2010		Year 4 2011		Year 5 2012	
	Days	%	Days	%	Days	%	Days	%	Days	%
1	99	38	143	55	30	12	79	30	Note 1	
2	86	33	91	35	47	18	54	21	Note 2	
3	95	36	79	30	49	19	70	27	196	75
4	88	34	133	51	48	18	56	21	21	8 *
5	92	35	91	35	47	18	56	21	Note 1	
6	93	36	118	45	48	18	72	28	101	39
7 (Ref)	158	61	119	46	261	100	56	21	Note 3	
8 (Ref)	41	16	129	49	47	18	40	15	158	61

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

Note 1: Salt damage to data logger caused data to be unreliable

Note 2: Constant bear damage made data unreliable

Note 3: Data logger pulled due to excessive silting in gauge

Gauge 4* Bear damage made part of the data unreliable. Hydroperiod likely longer

Minimum hydrology on the Mason project has not been a problem. Since the first year of monitoring, the site has been subject to prolonged periods of flooding and is vulnerable to salt water intrusion during tidal surges caused by coastal and tropical storms. Standing water on the site has caused heavy tree mortality and limited the species composition to those species that can survive on frequently flooded sites such as cypress (*T. distichum*) and buttonbush (*C. occidentalis*).

The shortest hydroperiod recorded over the 5-year monitoring period was 30 days at Gauge 1 in 2009, which was 12% of the growing season (discounting the questionable data from Gauge 4 in 2012).

Over the monitoring period, four of the stainless steel water level data loggers were damaged due to exposure to salt water. Examination by the manufacturer verified the cause for the equipment failure. Some of the data was recovered and usable, some of it was not.

Table 3. Planting schedule

Quantity	Botanical Name	Common Name	Percent of Total
Trees			
5769	*Taxodium distichum*	Bald cypress	36
675	*Acer rubrum*	Red Maple	4
675	*Nyssa auquatica*	Water tupelo	4
675	*Nyssa biflora*	Swamp black gum	4
4419	*Quercus phellos*	Willow oak	27
675	*Quercus bicolor*	Swamp white oak	4
328	*Salix nigra*	Water oak	2
13216	Total tree stems		82
Shrubs			
328	*Alnus serrulata*		
328	*Cyrilla racemiflora*	Blueberry	2
328	*Clethra alnifolia*	Fetterbush	2
328	*Itea virginica*	Virginia sweetspire	2
328	*Myrica cerifera*	Wax myrtle	2
328	*Magnolia virginiana*	Sweet bay	2
982	*Baccharis halmifolia*	High tide bush	6
328	*Cephalanthus occidentalis*	Buttonbush	2
2950	Total shrub stems		25
16166	Total of all stems		

Table 4. Tree Survival

	Stems per acre for these years:				
Plot	2008	2009	2010	2011	2012
1	364	445	454	412	0
2	324	445	371	330	206
3	243	405	495	495	41
4	40	405	371	330	82

Table 3 shows the original planting schedule from 2008 and includes the first supplemental planting that brought the starting plant density up to 450 stems per acre. In 2010, an additional 150 stems per acre were added due to high mortality caused by excessive flooding and salt water damage. The poor survival numbers in Table 4 for 2012 are a direct result from Hurricane Irene in 2011. Most of the stems in the riverine and many in the non-riverine areas were so burned by salt that they simply could not survive. Plot 2 is the farthest from the outlet in the northwest corner of the project and is higher in the landscape than the other plots making it slightly less vulnerable to salt damage.

Pre-Construction Photos – 2007

Post-Construction Photos 2008