

# ANNUAL REPORT FOR 2010



**Little River Bridge Mitigation Site  
Moore County  
TIP No. R-0210A**



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## SUMMARY

The following report summarizes the monitoring activities that have occurred in 2010 at the Little River Bridge Mitigation Site. The 2010 monitoring year represents the fifth year of hydrologic and vegetation monitoring following construction. The site must demonstrate hydrologic and vegetation success for a minimum of five years or until the site is deemed successful. The site was constructed to serve as mitigation for impacts associated with the US 1 Bypass in Moore County.

In February 2006, groundwater monitoring gauges were installed to monitor hydrology on the site. Four groundwater gauges and one rain gauge were positioned on the restoration site. There are also three reference gauges that were installed prior to construction. The reference gauges are located directly adjacent to the constructed site within the preservation area.

Hydrologic success criteria are based on the approved mitigation plan and require that the site demonstrate saturation or inundation within 12 inches of the soil surface for a consecutive 12.5% of the growing season during years of normal rainfall.

The 2010 monitoring year represents the fifth year for hydrology monitoring. Three of the four groundwater restoration gauges met the success criteria for 2010 with one of the gauges recording hydrology for 5.7% of the growing season. The three reference gauges recorded jurisdictional hydrology above the required 12.5% of the growing season.

Vegetation monitoring in the restoration area yielded 470 trees/shrubs per acre. This average is above the minimum success criteria of 260 trees/shrubs per acre for year five.

The shrub area underneath the Progress Energy distribution line was mowed by a contractor who was not aware of the mitigation area in April 2010. NCDOT has since met with Progress Energy on-site in May 2010 and installed signs to make the mowing contractor aware of the mitigation area. The majority of the shrubs that were mowed have re-sprouted and it appears that no permanent damage has been done to the site. NCDOT met with the Resource Agencies on August 12<sup>th</sup>, 2010 to review and assess the mowed portion of the site. At that time it was agreed that NCDOT would continue to monitor the site through the final monitoring year to determine if any permanent damage had occurred.

Based on the results from the fifth year of monitoring, NCDOT proposes to discontinue all vegetation and hydrologic monitoring at the Little River Bridge Mitigation Site.

## 1.0 INTRODUCTION

### 1.1 Project Description

The Little River Bridge Mitigation Site serves as mitigation for T.I.P R-0210A, which constructed the US 1 Bypass in Moore County (Figure 1). The 14.8-acre site is located in Moore County 0.75 mile southeast of the town of Vass and is on either side of the Little River. The site can be accessed via US 1 Business South on the northeastern site boundary. The site includes 6.4 acres of restoration and 8.4 acres of preservation of bottomland hardwood forest. Reference areas onsite were utilized to provide reference data for restoration monitoring.

### 1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetation monitoring must be conducted for a minimum of five years or until the site is deemed successful. Vegetation success criteria states that at least 320 trees/acre must survive through year three. A ten percent mortality rate will be accepted in year four (288 trees/acre) and another ten percent in year five, resulting in a required survival rate of 260 trees/acre. Hydrologic success criteria are based on the approved mitigation plan and require that the site demonstrate saturation or inundation within 12 inches of the soil surface for a consecutive 12.5% of the growing season during years of normal rainfall. This report includes analyses of hydrologic and vegetation monitoring results, discussions of local climatic conditions throughout the growing season, and site photographs.

### 1.3 Project History

January 2006	Site Constructed
February 2006	Site Planted
February 2006	Monitoring Gauges Installed
March-November 2006	Hydrologic Monitoring (Year 1)
June 2006	Vegetation Monitoring (Year 1)
March-November 2007	Hydrologic Monitoring (Year 2)
June 2007	Vegetation Monitoring (Year 2)
March-November 2008	Hydrologic Monitoring (Year 3)
June 2008	Vegetation Monitoring (Year 3)
March-November 2009	Hydrologic Monitoring (Year 4)
June 2009	Vegetation Monitoring (Year 4)
March-November 2010	Hydrologic Monitoring (Year 5)
June 2010	Vegetation Monitoring (Year 5)

## 1.4 Debit Ledger

Table 1. Debit Ledger

Site name	Site TIP	HUC	River Basin	Division	County	Mitigation Type	As Built Quantity	Available	Debit	Debit	Debit
Little River Bridge	R-0210A	3030004	Cape Fear	8	Moore				R-0210A	U-3816	B-4584
						Riverine Wetland Preservation	8.4	0	8.4		
						Riverine Wetland Restoration	6.4	1.07	4.8	0.42	0.11

Note: Debit ledger information up to date as of December 14, 2010.

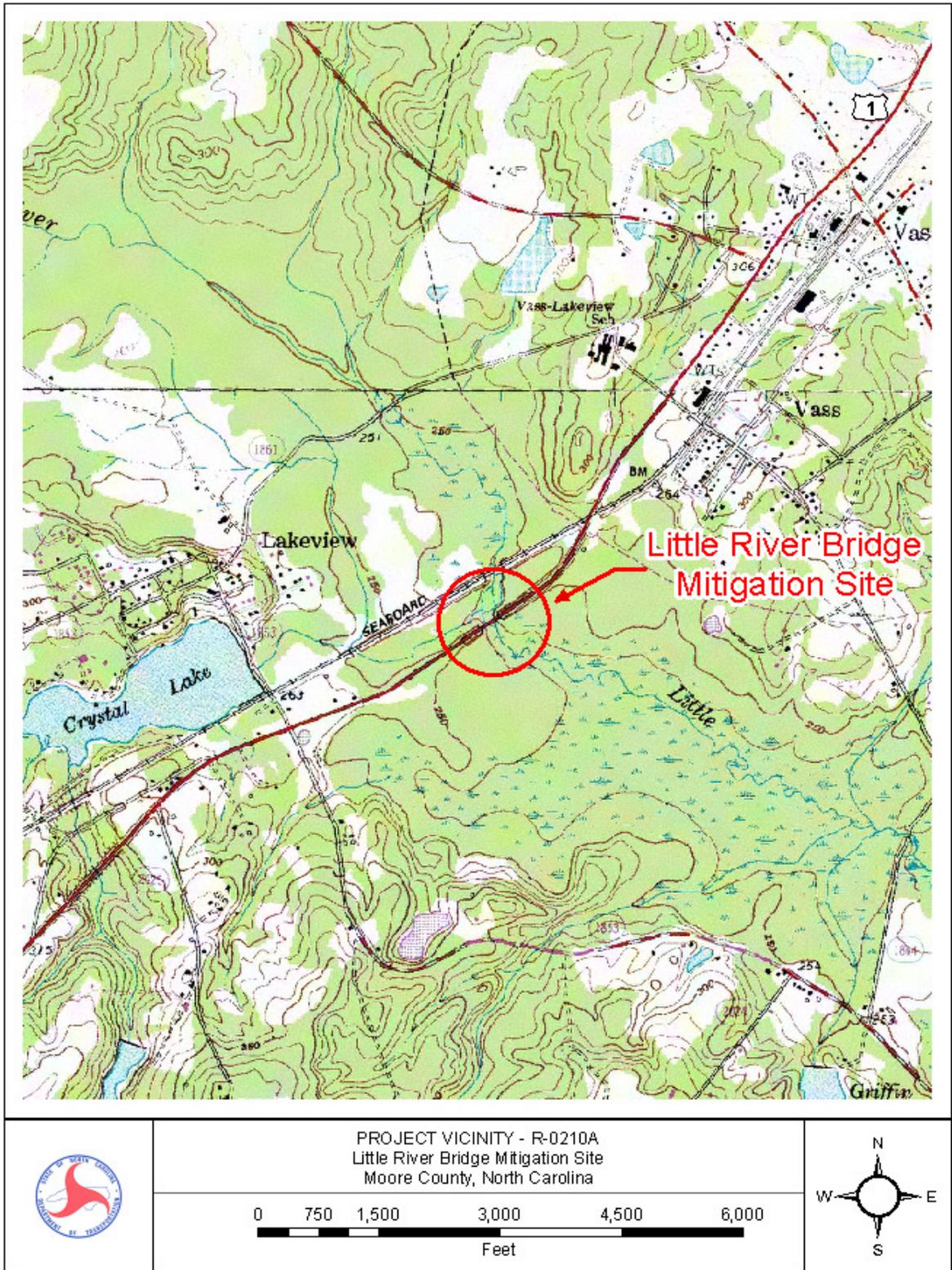


Figure 1. Site Location Map

## **2.0 HYDROLOGY**

### **2.1 Success Criteria**

The hydrologic success criteria established for the Little River Bridge Mitigation Site, as stipulated in the approved mitigation plan and subsequent revisions, require that the site demonstrate saturation or inundation within 12 inches of the soil surface for a consecutive 12.5% of the growing season during years of normal rainfall.

The growing season in Moore County begins on March 23 and ends November 7. These dates correspond to a 50% probability that air temperature will drop to 28° after March 23 and before November 7<sup>1</sup>; thus, the growing season is 230 days.

### **2.2 Hydrologic Description**

Four groundwater monitoring gauges were installed within the site's restoration area (Figure 2) in February 2006. There are also three reference gauges that were installed prior to construction in the existing wetlands that are adjacent to the constructed site. A rain gauge is also located on the site to assist in comparison of the rainfall data (supplied by the NC State Climate Office) from an official weather station in Carthage. The groundwater gauges record water levels on a daily basis.

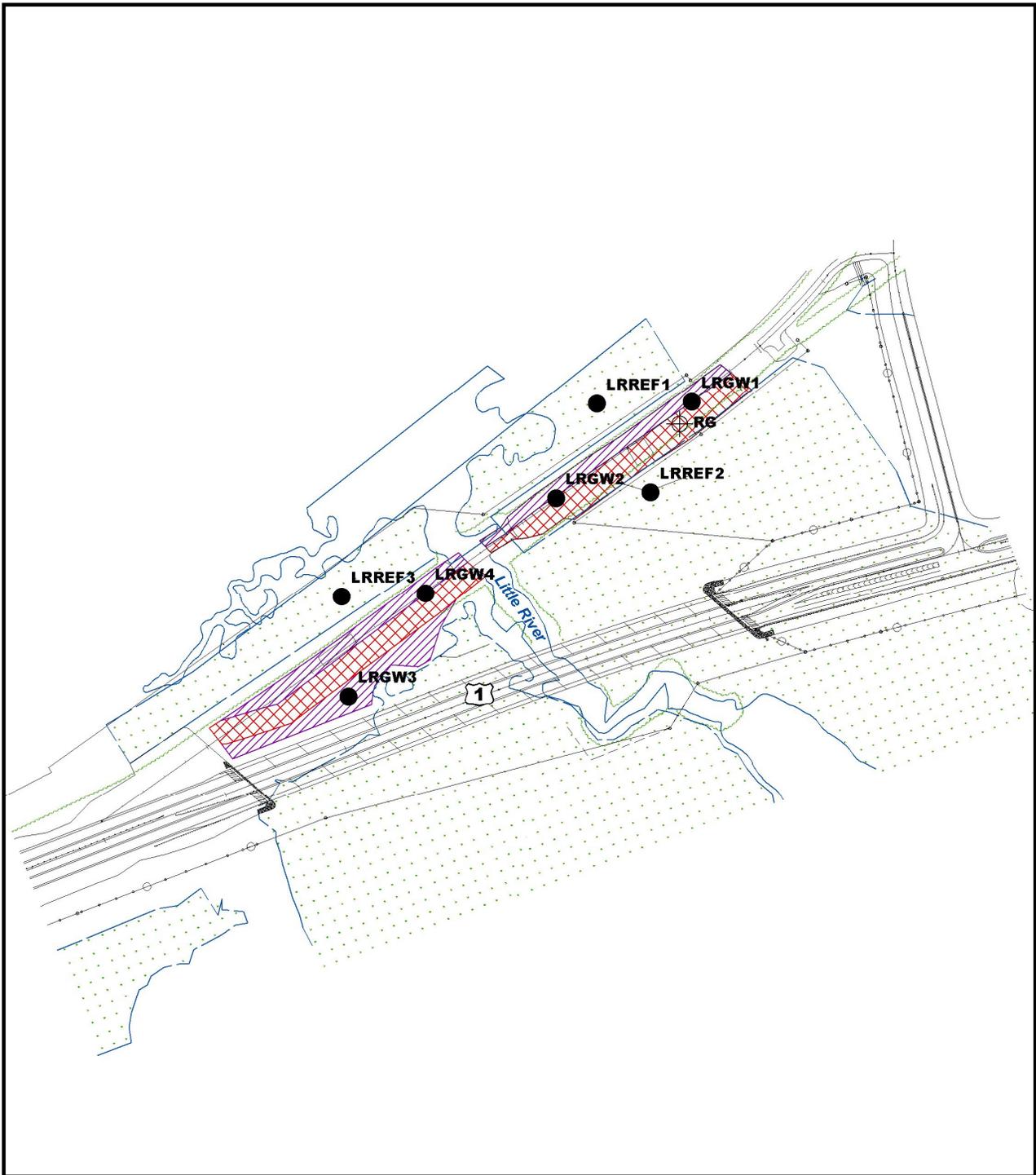
### **2.3 Results of Hydrologic Monitoring**

#### **2.3.1 Site Data**

The maximum number of consecutive days that saturation occurred within 12 inches of the ground surface was determined for each groundwater monitoring gauge. This number was converted into a percentage of the 230-day growing season (March 23 – November 7). Table 1 provides the 2010 hydrologic results; Figure 3 is a graphical representation of these results. Appendix A includes graphs of the data recorded at each groundwater gauge. Daily rainfall events recorded at the onsite rain gauge are included on each of the groundwater gauge plots.

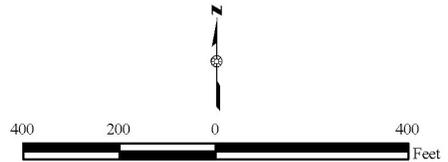
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<sup>1</sup> Soil Conservation Service, Soil Survey of Moore County, North Carolina, 1995.



**Figure 2. Gauge Location Map**

-  Bottomland Hardwood Area
-  Shrub Area
-  Groundwater Gauge
-  Rain Gauge



**Figure 2. Monitoring Gauge Location Map**

**Table 2.** Hydrologic Monitoring Results

Monitoring Gauge	< 5%	5-8%	8-12%	> 12.5%	Actual %	Success Dates
LR-GW1+				X	13.9	Mar 23-Apr 23
LR-GW2+				X	21.3	May 6-Jul 4
LR-GW3+				X	15.2	Mar 23-Apr 26
LR-GW4		X			5.7	
LR-REF1+				X	13.0	Mar 23-Apr 21
LR-REF2 +				X	16.1	Mar 23-Apr 28
LR-REF3+				X	13.5	Mar 23-Apr 22

Shaded gauges are reference gauges.

+Gauges met success during average rainfall months (January, May, and July).

Groundwater monitoring gauge four did not meet the success criterion in 2010. The close proximity to the Little River may be causing a drawdown effect on the gauge. NCDOT may need to delineate this area to determine whether or not wetland hydrology is present in this portion of the site. Hydrologic monitoring results from all five years of monitoring are presented in Table 3 below.

**Table 3.** Hydrologic Monitoring Results (2006-2010)

Monitoring Gauge	2006 Results	2007 Results	2008 Results	2009 Results	2010 Results
LR-GW1	15.4	18.7	27.0	14.8	13.9
LR-GW 2	16.2	7.4	20.9	15.2	21.3
LR-GW 3	14.0	19.6	26.5	15.7	15.2
LR-GW 4	3.9	5.7	7.0	5.7	5.7
LR-REF1	13.2	17.8	23.0	15.7	13.0
LR-REF2	29.4	24.3	27.4	17.8	16.1
LR-REF3	13.2	17.7	21.3	13.9	13.5
Climate Conditions	Average Rainfall	Average Rainfall	Average Rainfall	Avg./Below Average Rainfall	Average Rainfall

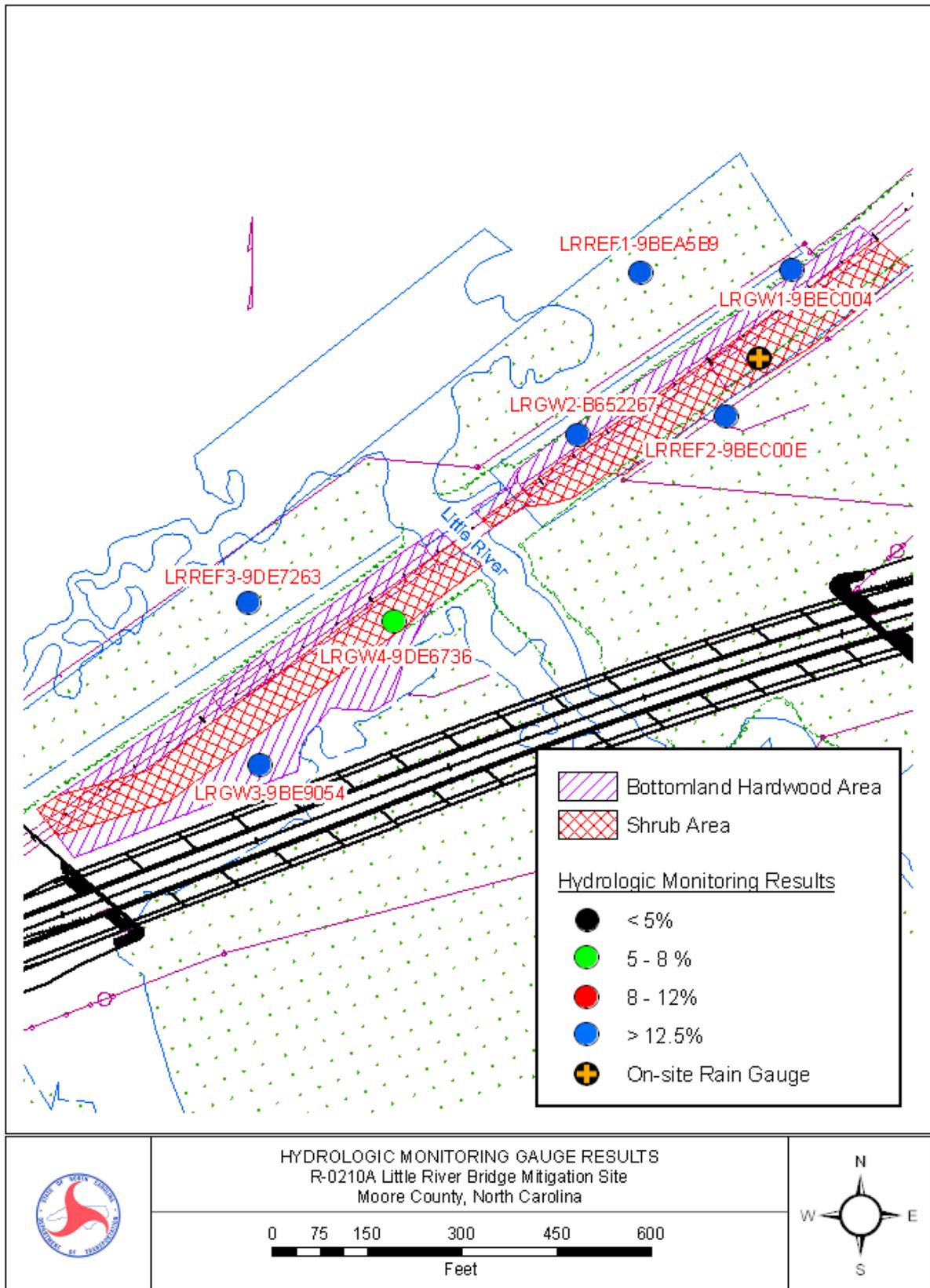
### **2.3.2 Climatic Data**

Figure 4 is a comparison of the 2010 monthly rainfall to the historical precipitation (collected between 1977 and 2009) for Carthage, North Carolina. This comparison gives an indication of how 2010 relates to historical data in terms of climate conditions. The NC State Climate Office provided all historical rainfall information. For 2010, March, April, October and November recorded below average rainfall. The months of January, May and July recorded average rainfall; while February, June, August and September recorded above average rainfall. Overall, 2010 was an average rainfall year.

## **2.4 CONCLUSIONS**

The 2010 monitoring year represents the fifth year of hydrologic monitoring for the Little River Bridge Mitigation Site. Three of the four groundwater restoration gauges met the success criteria for 2010 with one of the gauges recording hydrology for 5.7% of the growing season. The three reference gauges recorded jurisdictional hydrology above the required 12.5% of the growing season.

NCDOT proposes to discontinue hydrologic monitoring at the Little River Bridge Mitigation Site.



**Figure 3.** Hydrologic Monitoring Results

Little River Bridge Mitigation Site  
 Figure 4 (30-70 Percentile Graph)  
 Carthage, NC

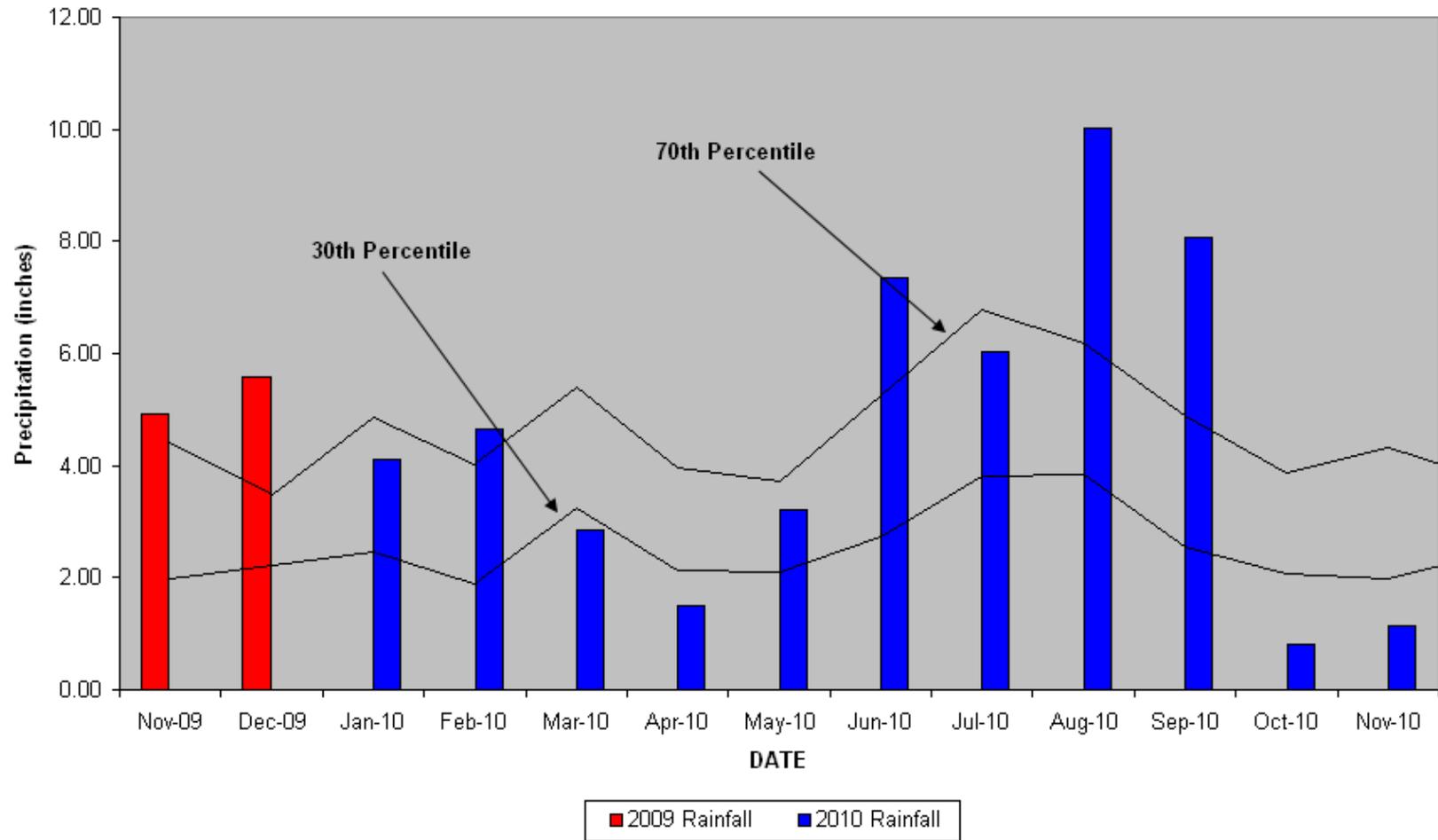


Figure 4. 30-70 Percentile Graph

### **3.0 VEGETATION: LITTLE RIVER BRIDGE MITIGATION SITE (YEAR 5 MONITORING)**

#### **3.1 Success Criteria**

The projects success criteria state that at least 320 trees/acre must survive through year three. A ten percent mortality rate will be accepted in year four (288 trees/acre) and another ten percent in year five, resulting in a required survival rate of 260 trees/acre.

#### **3.2 Description of Species**

The following tree and shrub species were planted in the Wetland Restoration Area:

##### **Tree Area:**

*Taxodium distichum*, Baldcypress

*Nyssa aquatica*, Water Tupelo

*Quercus phellos*, Willow Oak

*Quercus michauxii*, Swamp Chestnut Oak

##### **Shrub Area:**

*Cephalanthus occidentalis*, Buttonbush

*Aronia arbutifolia*, Red Chokeberry

*Cornus amomum*, Silky Dogwood

*Alnus serrulata*, Tag Alder

### 3.3 Results of Vegetation Monitoring

**Table 4.** Vegetation Monitoring Results (Hardwood Areas)

Plot #	Baldcypress	Water Tupelo	Willow Oak	Swamp Chestnut Oak	Buttonbush	Red Chokeberry	Silky Dogwood	Tag Alder	Total (5 year)	Total (at planting)	Density (Trees/Acre)
1 (Trees)	2	4	9	28					43	60	487
2 (Shrubs)					4	3	20	1	28	42	453
Average Density (Trees & Shrubs/Acre)											470

**Site Notes:** The shrub area underneath a Progress Energy distribution line was mowed by a contractor who was not aware of the mitigation area in April 2010. NCDOT met with Progress Energy on site in May 2010 and installed signs to make the mowing contractor aware of the mitigation area. The majority of the shrubs that were mowed have re-sprouted. Other species noted: *Juncus* sp., goldenrod, pokeberry, lespedeza, briars, pine, smartweed, sweetgum, fennel, kudzu, woolgrass, black willow, cattail, red maple, baccharis, wax myrtle, and various grasses.

### 3.3 Conclusions

There were two vegetation monitoring plots established throughout the 4.7 acre planting area. The 2010 vegetation monitoring of the site revealed an average tree density of 470 trees/shrubs per acre. This average is well above the minimum success criteria of 260 trees/shrubs per acre for year five. The Little River Mitigation Site has met the success criteria for 2010 monitoring year. NCDOT proposes to discontinue vegetation monitoring at the Little River Mitigation Site.

### 4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The 2010 monitoring year represents the fifth year of hydrologic monitoring for the Little River Bridge Mitigation Site. Three of the four groundwater restoration gauges met the success criteria for 2010. The three existing reference gauges recorded jurisdictional hydrology above the required 12.5% of the growing season.

Vegetation monitoring yielded 470 trees/shrubs per acre. This average is well above the minimum success criteria of 260 trees/shrubs per acre.

Based on the results from the fifth year of monitoring, NCDOT proposes to discontinue all vegetation and hydrologic monitoring at the Little River Bridge Mitigation Site.

## **APPENDIX A**

### **GAUGE DATA GRAPHS**

## **APPENDIX B**

### **PHOTO AND VEGETATION PLOT LOCATIONS AND SITE PHOTOS**

# Little River Bridge



Photo 1



Photo 2



Photo 3



Photo 4

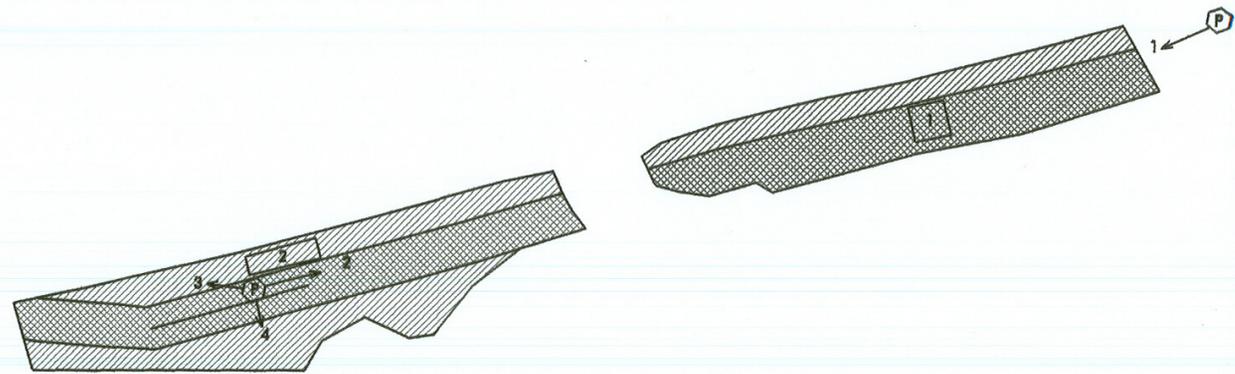


	Photo Point Locations
	Bottomland Hardwood Vegetation Plot
	Shrub Vegetation Plot
	Bottomland Hardwood Planting
	Shrub Planting

Vass Bypass – Little River Bridge