

# ANNUAL REPORT FOR 2004



**Smith Creek Mitigation Site**  
**New Hanover County**  
**Project No. 8.2250109**  
**TIP No. U-92 A/B**



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## **SUMMARY**

The following report summarizes the monitoring activities that have occurred in 2004 at the Smith Creek Mitigation Site. The 2004-year represents the first year of hydrology and vegetation monitoring following construction. The site must demonstrate 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 construction of U92-A/B for the Smith Creek Parkway.

A tidal gauge was installed at the Bridge Maintenance site in July 2000 and was used as a reference for the Smith Creek, Waste Water Treatment, and County Sites. Tidal data was collected from July 2000 to July 2004. These sites were graded to elevations based on this tidal data.

Hydrologic monitoring utilizes four surface water gauges located on the adjacent County Mitigation Site and a reference gauge located on the Bridge Maintenance Mitigation Site. These gauges monitor the tidal regime to confirm the site's flooding period.

An onsite agency meeting was held in July 2004. At this time, it was agreed to remove the surface water gauge at the Bridge Maintenance Site since there was sufficient past tidal data. The available tidal data for the Bridge Maintenance gauge revealed inundation for 25.6% from February to July (2004). The four surface water gauges at the County Site were compared to the reference gauge. Three of the four surface gauges indicated that the site was inundated 100% of the growing season (hourly readings), while one gauge revealed 94.8%. For the gauge data provided, all four surface water gauges satisfied the inundation criteria determined by the reference gauge.

Vegetation monitoring of the baldcypress area revealed an average tree density of 99 trees per acre. This average is above the minimum success criteria of 50 trees per acre. For the marsh grass area, the target species and scale values were 46.4% and 4.2, respectively. These results are on schedule for the first year of monitoring. Due to on-going construction of the Smith Creek Site, it was not planted in its entirety in 2004. The remainder of the site has now been built with planting scheduled for 2005.

During the July 2004 onsite agency meeting, it was agreed that NCDOT could propose to remove the four surface water gauges at the County Site if there was successful tidal data during the 2004-monitoring season. Based on the hydrology and vegetation success for the 2004-monitoring year, NCDOT proposes to remove the gauges and discontinue monitoring.

## 1.0 INTRODUCTION

### 1.1 Project Description

The Smith Creek Mitigation Site is located in New Hanover County, adjacent to Bridge Maintenance and the U-92B project in Wilmington (Figure 1). Totalling 27.7 acres in size, the site provides tidal swamp forest creation mitigation for a portion of the wetland impacts associated with U-92A/B (Figure 2).

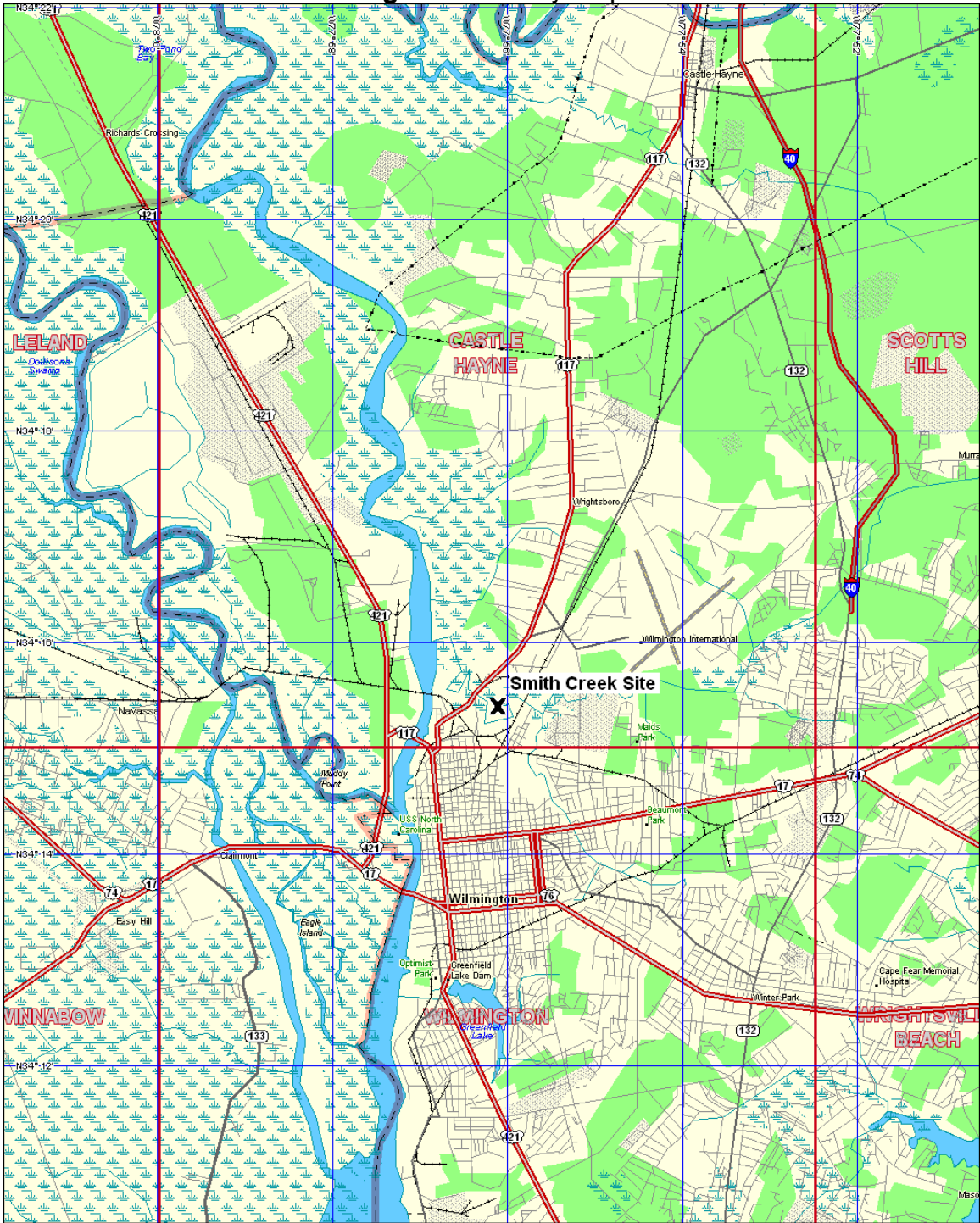
### 1.2 Purpose

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. The following report describes the results of both hydrologic and vegetation monitoring for the 2004-year (the first year of monitoring).

### 1.3 Project History

February 2003	3-Gallon Baldcypress Planted (Phase I)
April 2003	Marsh Grass Planted (Phase I)
February 2004	3-Gallon Baldcypress Planted (Phase II)
April 2004	Marsh Grass Planted (Phase II)
March-November 2004	Hydrology Monitoring (1 yr.)
September 2004	Vegetation Monitoring (1 yr.)

Figure 1. Vicinity Map



3-D TopoQuads Copyright © 1999 DeLorme Yarmouth, ME 04096 | 2500 ft Scale: 1 : 37,500 Detail: 11.2 Datum: WGS84



Figure 2. Site Location Map

## **2.0 HYDROLOGY**

### **2.1 Success Criteria**

Hydrology monitoring for the Smith Creek Mitigation Site is conducted at the adjacent County Mitigation Site. Data from an offsite tidal gauge located at the adjacent Bridge Maintenance Site (collected 02-27-04 through 07-14-04) was used as a baseline to estimate the percentage of time that the site should remain flooded, at specific elevations. A target elevation of 2.5 feet above mean sea level was selected for the Smith Creek Mitigation Site. Using the baseline data and the proposed elevation, the Smith Creek Site will be considered hydrologically successful if the adjacent County Site is inundated for 25.6% of the growing season, from February 27 to November 26 (271 days).

### **2.2 Hydrologic Description**

Appendix A contains a plot of the water depth for each surface gauge at the County Mitigation Site. Monitoring results are shown for the 2004-growing season. The actual average elevation across the site is 2.5'. It was calculated from the as-built drawings provided by Division Construction personnel.

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

#### **2.3.1 Site Data**

Appendix A includes graphs of the data recorded at each surface water gauge at the County Mitigation Site. Since the site is a tide-driven system, groundwater and rain gauges were not installed.

#### **2.3.2 Climatic Data**

Figure 3 examines the local climate in comparison with historical data in order to determine whether 2004 was "average" in terms of climate conditions. The two lines represent the 30<sup>th</sup> and 70<sup>th</sup> percentiles of monthly precipitation for Wilmington, NC. The bars are monthly rainfall totals for 2003 and 2004. The historical data was collected from the State Climate Office of North Carolina.

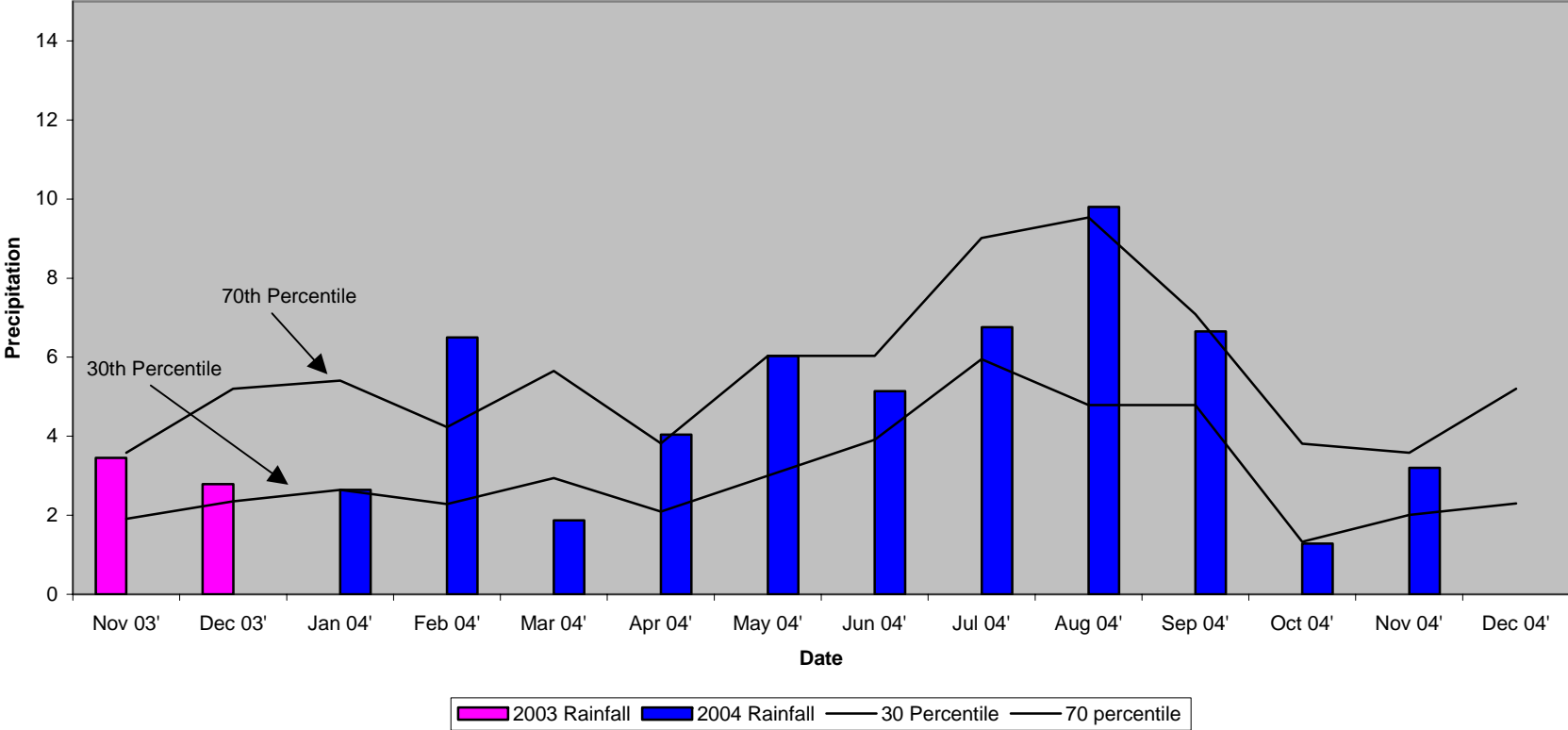
For the 2004-year, February and August experienced above average rainfall. The months of March and October recorded below average rainfall for the site. November (03'), December (03'), January, April, May, June, July, September, and November experienced average rainfall. Overall, 2004 was an average rainfall year at the Smith Creek Mitigation Site.

## **2.4 Conclusions**

The 2004-year represents the first year of hydrologic monitoring for the Smith Creek Mitigation Site. The four surface water gauges located at the County Mitigation Site were compared to the reference gauge located at the Bridge Maintenance Site. Three of the four surface gauges at the County Site indicated that the site was inundated for 100% of the growing season (hourly readings), while one gauge revealed 94.8%. For the data provided, all four surface water gauges satisfied the inundation criteria determined by the reference gauge.

**FIGURE 3: 2004 30-70 Percentile Graph**

**30-70 Percentile Graph  
Wilmington, NC Monthly Rainfall**



### **3.0 VEGETATION: U-92 SMITH CREEK MITIGATION SITE (YEAR 1 MONITORING)**

#### **3.1A Success Criteria (Baldcypress Area)**

Two 100' x 100' plots have been set and will be counted as part of the vegetation monitoring for the site.

The site will be considered a success for the baldcypress if there are 50 five-year old trees per acre after the end of the fifth growing season....changes in the hydrology of Smith Creek have caused the decline in natural baldcypress populations, and it is uncertain if the planted baldcypress trees will survive. If the baldcypress survivorship declines to below the success criteria, then the Department of Transportation will consult with the Corps of Engineers to determine appropriate action.

Establishment of cypress trees over the restoration area of the Smith Creek Site is proposed, although there is evidence that they may not survive because of increases in salinity, tidal amplitude, and sea level (Hackney and Yelverton, 1990). Consequently, if cypress mortality occurs and the area develops into an emergent marsh community, the vegetational success criteria will be based on emergent marsh vegetation.

#### **3.1B Success Criteria (Marsh Grass Area)**

The vegetative marsh success of the wetland site will be determined in accordance with NMFS Guidelines. Monitoring plots found to be located within the open water channel will not be evaluated, and will not count to the final count of plots. The vegetation component of the wetland site will be deemed successful if the following criteria are met:

1. At year five, the average of all plots should have a scale value of 5 (75% vegetative cover) consisting of wetland herbaceous species, not including any invasive species.
2. A minimum of 70% of the plots shall contain the target (planted) species.

### 3.2A & B Description of Planted Areas

The following plant communities were planted throughout the Smith Creek Site:

Approximately 10.44 acres

*Spartina cynosuroides*, Big Cordgrass

*Cladium jamaicense*, Sawgrass

*Taxodium distichum*, Baldcypress

### 3.3A Results of Vegetation Monitoring (Baldcypress Area)

Plot #	Baldcypress	Total (at planting)	Density (trees/acre)
1	27	27	108
2	25	30	90
AVG. DENSITY			99

### 3.3B Results of Vegetation Monitoring (Marsh Grass Area)

ZONE	Plot #	Scale Factor	<i>S. cynosuroides</i>	<i>C. jamaicensis</i>	Frequency	Notes
1	1	5.0				
	2	5.0	☐		☐	
	3	5.0				
	4	5.0	☐		☐	
	5	5.0				
	6	5.0	☐		☐	
	7	4.0		☐	☐	
	8	5.0				
	9	5.0	☐		☐	
	10	5.0				
	11					Open water
	12	3.0	☐		☐	
	13	3.0		☐	☐	
	14					Open water
	15	4.0	☐		☐	
	16	4.0				
	17					Open water
	18					Open water
	19	4.0	☐		☐	
	20	5.0				
	21	4.0	☐		☐	
	22	3.0		☐	☐	
	23	4.0				
	24	5.0				
	25	5.0	☐	☐	☐	
	26	3.0	☐		☐	
	27	3.0				
	28	5.0	☐		☐	
	29	4.0		☐	☐	
	30	5.0	☐		☐	
	31	5.0				
	32	5.0				
	33	5.0				
	34					Open water
	35	5.0				
	36	4.0	☐		☐	
	37	5.0				
	38	4.0				
	39	5.0				
	40	4.0		☐	☐	
	41	4.0				
	42	5.0	☐	☐	☐	
	43	5.0				
	44	5.0		☐	☐	

ZONE	Plot #	Scale Factor	<i>S. cynosuroides</i>	<i>C. jamaicensis</i>	Frequency	Notes
	45	5.0				
	46	4.0		☐	☐	
	47					Open water
	48	5.0				
	49	4.0	☐		☐	
	50	5.0				
	51	5.0				
	52	5.0	☐		☐	
	53	4.0				
	54	4.0		☐	☐	
	55					Open water
	56	5.0				
	57	4.0		☐	☐	
	58	0.0				Out of bounds
	59	3.0				
	60	5.0				
	61	3.0				
	62	1.0				
	63	3.0				
	64	3.0				
	65	4.0				
	66	4.0	☐		☐	
	67	4.0		☐	☐	
	68	4.0	☐		☐	
	69	5.0				
	70	4.0	☐		☐	
	71	3.0				
	72	3.0				
	73	4.0				
	74	4.0				
	75	4.0	☐		☐	
	76	3.0				
	77	5.0				
	78	4.0		☐	☐	
	79	4.0	☐		☐	
	80	4.0	☐		☐	
	81	4.0		☐	☐	
	82	3.0				
	83	5.0				
	84	3.0				
	85	5.0	☐	☐	☐	
	86	3.0	☐		☐	
	87	5.0				
	88	5.0				
	89	5.0				
	90	5.0	☐		☐	

ZONE	Plot #	Scale Factor	<i>S. cynosuroides</i>	<i>C. jamaicensis</i>	Frequency	Notes
	91	5.0				
	92	4.0				
	93	4.0				
	94	5.0				
	95	4.0				
	96	4.0				
	97	4.0				
	98	4.0				
	99	5.0				
	100	5.0				
	101	4.0				
	102	5.0				
	103	4.0				
	104	3.0				
	105	4.0				
	106	4.0				
	107	5.0				
	108	5.0				
	109	4.0				
	110	3.0				
	111	5.0				
	112	3.0				
	113	5.0				
	114	5.0				
	115	4.0				
	116	3.0				
	117	4.0				
	118	5.0				
	119	5.0				
	120	2.0				
<b>Frequency (Percentage of Plots with Desired Species)</b>			31.3%	20.5%	46.4%	
<b>Sum Scale Value</b>					474	
<b>Total Number of Plots Counted</b>					112	
<b>Vegetative Cover (Scale Value)</b>					4.2	

**Site Notes:** The following species were also noted in the monitoring plots. The percentage of plots the species were found in is following the species in parentheses (i.e. 98% of the plots contain cattails.) cattails (98), phragmites (15), *Echinochloa walteri* (91), water-hyssop (35), *Sesbania* sp. (12), nutsedge (1), and smartweed (1).

### 3.4A Conclusions (Baldcypress Area)

Baldcypress trees were planted on 20' centers throughout the approximately 10.44-acre site. Two 100' x 100' plots were established in the planting area. The vegetation monitoring of the planted area revealed an average of 99 baldcypress trees per acre.

### 3.4B Conclusions (Marsh Grass Area)

- Percent Frequency of Target Species (Big Cordgrass and Sawgrass)  
Frequency of 70% required. **46.4%**
- Vegetative Cover Scale Value  
Scale Value of 5 required for year 5. **4.2**

Approximately 10.44 acres of this site involve marsh grass plantings. Vegetation coverage is on schedule for the first year of monitoring. Due to the construction of the Smith Creek Mitigation Site, there were only 120 random plots taken. The remainder of the site has now been built with planting scheduled for 2005.

## 4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

An onsite agency meeting was held in July 2004. At this time, it was agreed to remove the surface water gauge at the Bridge Maintenance Site since there was sufficient past tidal data. The available tidal data for the Bridge Maintenance gauge revealed inundation for 25.6% from February to July (2004). The four surface water gauges at the County Site were compared to the reference gauge. Three of the four surface gauges indicated that the site was inundated 100% of the growing season (hourly readings), while one gauge revealed 94.8%. all four surface water gauges satisfied the inundation criteria determined by the reference gauge.

Baldcypress trees were planted on 20' centers throughout the approximately 10.44-acre site. Vegetation monitoring of the baldcypress area revealed an average tree density of 99 trees per acre. This average is above the minimum success criteria of 50 trees per acre. Approximately 10.44 acres of this site involve marsh grass plantings. For the marsh grass area, the target species and scale values were 46.4% and 4.2, respectively. These results are on schedule for the first year of monitoring. Due to on-going construction of the Smith Creek Site, the entire site was not planted in 2004. The remainder of the site has now been built with planting scheduled for 2005.

During the July 2004 onsite agency meeting, it was agreed that NCDOT could propose to remove the four surface water gauges at the County Site if there was successful tidal data during the 2004-monitoring season. Based on the hydrology and vegetation success for the 2004-monitoring year, NCDOT proposes to remove the gauges and discontinue monitoring.

**APPENDIX A**  
**GAUGE GRAPHS**

**APPENDIX B**  
**SITE PHOTOS**  
**&**  
**PLOT AND PHOTO LOCATIONS MAP**

# Smith Creek



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

# SMITH CREEK

