

ANNUAL REPORT FOR 2004



**Deer Creek Mitigation Site
Carteret County
Project No. 6.16901T
TIP No. R-2105 WM**



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SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Deer Creek Mitigation Site. Located in Carteret County, the Deer Creek Site serves as mitigation for impacts associated with the widening of NC 24. The site was originally designed to serve as integration between an onsite stormwater detention facility and the surrounding environment. The site was constructed and planted in Spring 2001; however, an initial vegetation failure led to a replanting of the site in the spring of 2002. Monitoring activities in 2004 represent the fourth year of hydrologic monitoring and the third year of vegetation monitoring.

The site must be monitored for five years following site construction or until success criteria are met. Monitoring criteria include the percent cover of planted herbaceous vegetation and the hydrologic conditions at the site. The site is monitored with thirty vegetation plots, three surface water gauges, and one rain gauge. Data analysis includes an examination of all recorded site data as well as an assessment of local climate conditions throughout the growing season.

Hydrologic monitoring was conducted for a fourth year. The three surface water-monitoring gauges on the site show consistent inundation throughout the growing season. An examination of the water levels over a two-day period illustrates that the site floods twice a day under average climatic conditions (as required in the permit conditions). The two days in the plot were chosen at random and represent typical conditions during the growing season.

For 2004, the vegetation monitoring revealed a frequency of target species at 79.3% and the vegetative coverage scale value at 3.70. The vegetation data for 2004 met the 70% required frequency of target species and is on track to meet the scale value of 5 for the vegetative coverage that is required in year five.

NCDOT will continue to monitor the Deer Creek Mitigation Site for hydrology and vegetation.

1.0 INTRODUCTION

1.1 Project Description

The Deer Creek Mitigation Site is located in Carteret County on the north side of NC 24 at the northeast quadrant of the crossing of Deer Creek (see Figure 1 Location Map). The mitigation site is approximately 4.25 acres in size. Approximately 1.5 acres of the site had previously been allocated as a stormwater detention facility designed for the NCDOT to treat runoff from the improvements associated with the widening of NC 24 (TIP No. R-2405AB). The existing Section 404 permit for widening NC 24 involves a commitment by NCDOT to better integrate the original 1.5-acre storm water detention basin into the existing natural environment. To accommodate this, the NCDOT purchased the remaining 2.75 acres of land with the intent of utilizing the area to provide compensatory mitigation for wetland impacts associated with this TIP project.

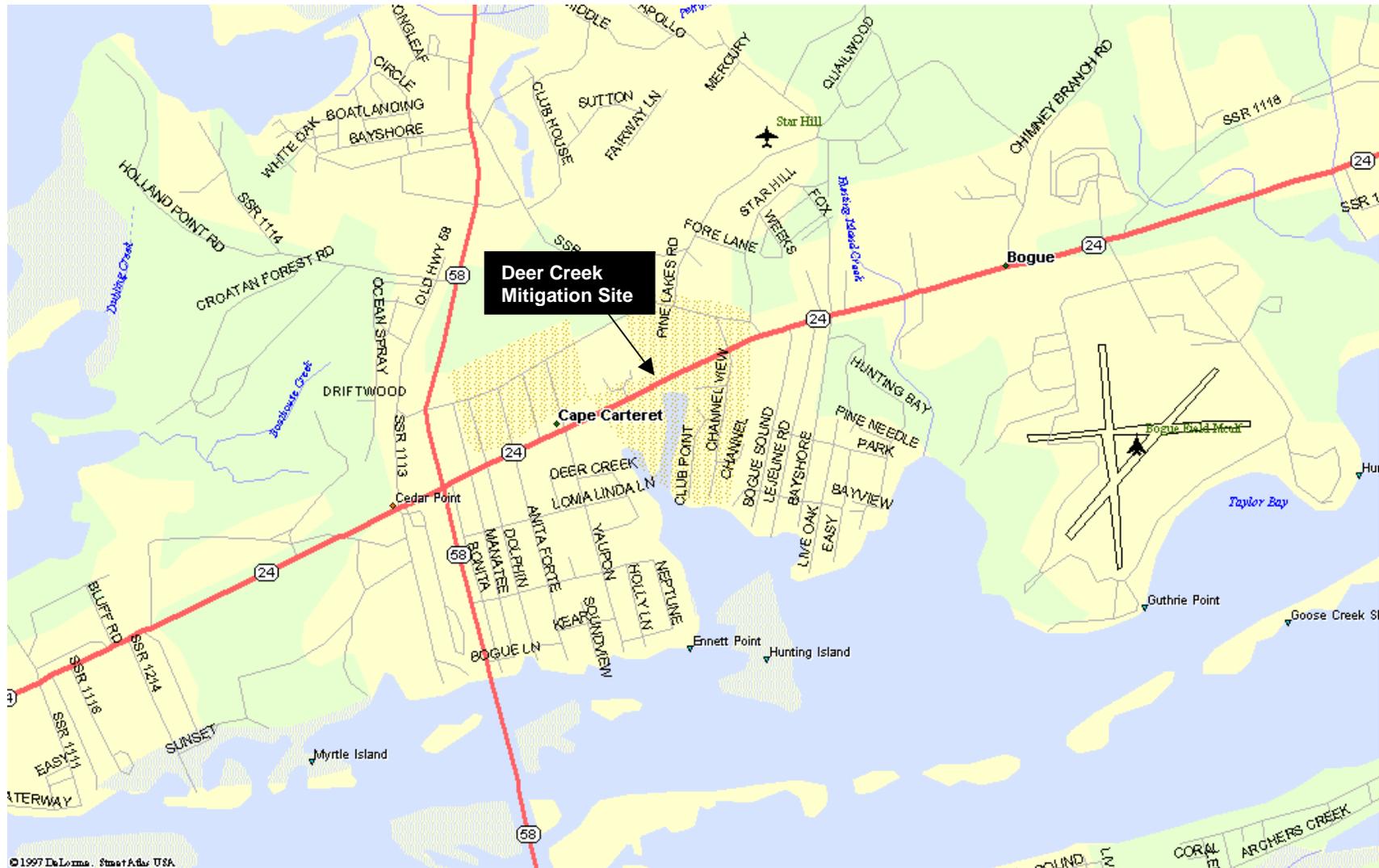
1.2 Purpose

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted. Vegetation will be monitored for five years following the completion of planting and vegetative marsh success is determined in accordance with NMFS guidelines. The site will be considered hydrologically successful when the hydrologic data shows that the site floods twice daily. The following report details the results of hydrologic and vegetative monitoring during 2004 at the Deer Creek Mitigation Site.

1.3 Project History

March 2001	Construction completed
May 2001	Site Planted
June 2001	Gauges Installed
June –November 2001	Hydrologic Monitoring (1 yr.)
August 2001	Vegetation Monitoring (1 yr.)
April 2002	Site Tilled and Replanted
February – November 2002	Hydrologic Monitoring (2 yr.)
August 2002	Vegetation Monitoring (Restart 1 yr.)
December 2002	Spillway Modifications
February – November 2003	Hydrologic Monitoring (3 yr.)
August 2003	Vegetation Monitoring (2 yr.)
February – November 2004	Hydrologic Monitoring (4 yr.)
July 2004	Vegetation Monitoring (3 yr.)

Figure 1. Site Location Map



2.0 HYDROLOGY

2.1 Success Criteria

The success of this site is correlated to the planting elevations and to planting success. If the plantings are successful, then the grading will have been correctly correlated to the tidal fluctuations. The hydrologic monitoring aspect will involve the use of surface water monitoring gauges. Groundwater monitoring is not required at this site since it is a tidal system. The site will be considered hydrologically successful when the site is flooded twice daily. Success is determined from data taken at the Gauge 1 location (SG-1), as the other gauges are located within channels and are used for comparison of tidal elevations. It is expected that the surface water flooding will be the same as that measured for the biological benchmarks for *Spartina alterniflora*, since the grading was done to an elevation that is known to be periodically flooded. Table 1 describes each gauge and the hydrologic expectations of each. See Figure 2 for the precise location of each gauge.

Table 1. Gauge Description and Expectations

Gauge	Elevation	Location	Hydrologic Expectation
SG-1	1.20 ft	Low marsh between channel and high marsh.	Flood twice daily
SG-2	-0.64 ft	Within constructed channel of site.	Remain flooded, daily fluctuations
SG-3	-0.54 ft	In Deer Creek adjacent to site.	Remain flooded, daily fluctuations

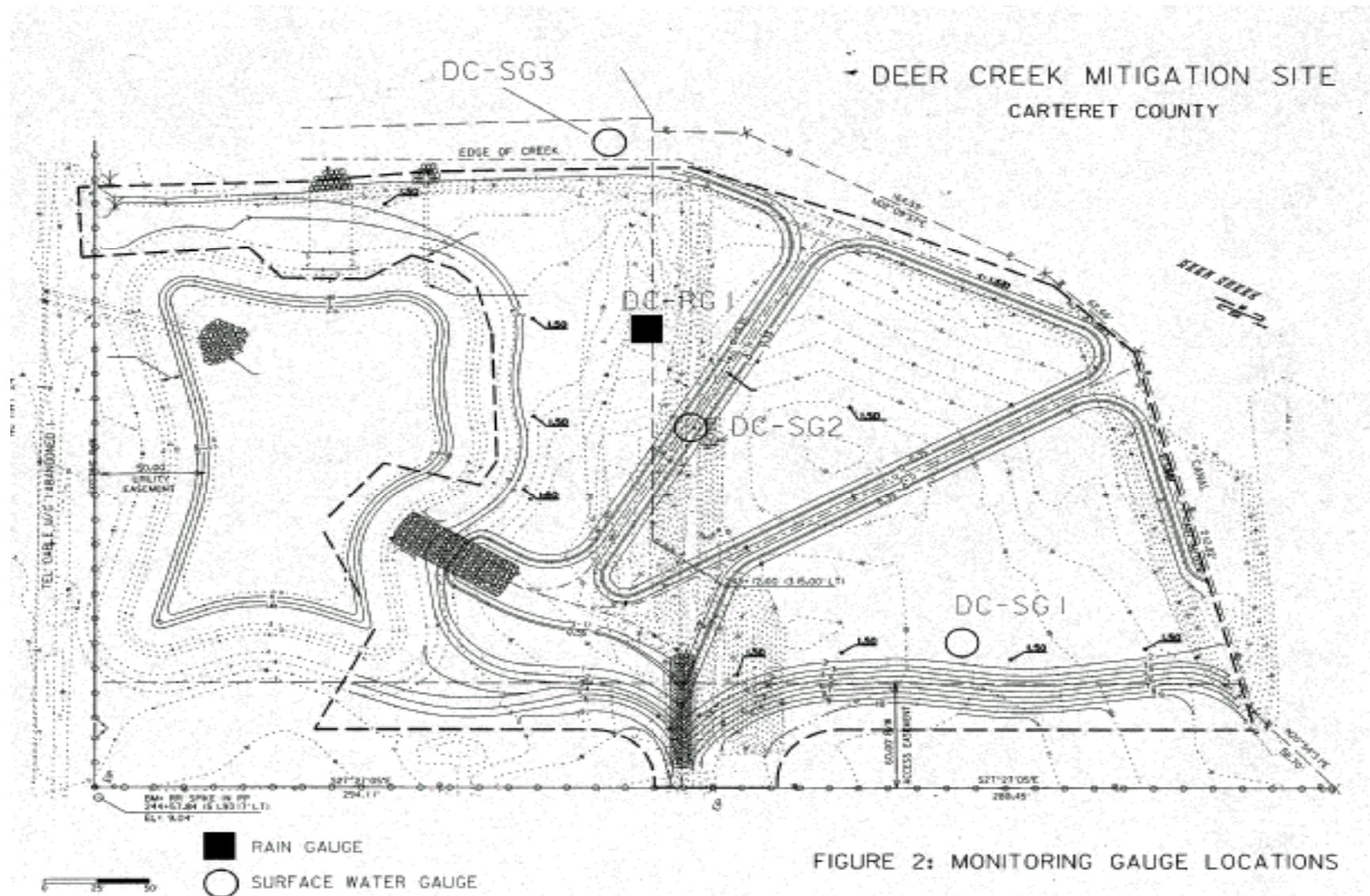
The site is monitored during the growing season. The growing season in Carteret County begins February 27 and ends November 29 (274 days). These dates correspond to a 50% probability that temperatures will drop to 28° F or lower after February 27 and before November 29.

2.2 Hydrologic Description

Three surface water monitoring gauges and one rain gauge were installed onsite in June 2001 (Figure 2). The surface water gauges record surface water readings every hour. The Infinities rain gauge records rainfall amounts on a daily basis.

Appendix A contains plots of the data at each surface gauge location. The set of plots shows the surface water recorded against the actual gauge elevation surveyed relative to mean sea level. Also included in Appendix A is a plot of two days of surface water data recorded at each gauge location; this plot is to illustrate that flooding occurs twice daily as required in the permit conditions. The two days in the plot were chosen at random and are representative of conditions throughout the growing season.

Figure 2. Gauge Location Map



2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

Gauge 1 was evaluated to determine if the site was being flooded twice daily. Tide data from Gauges 2 and 3 were evaluated for comparison.

Due to the relatively small size of the site, high tide elevations should be consistent between the three gauges. Appendix A shows both the true elevation plots for all three gauges, as well as an individual graph of Gauge 1 data that shows a two-day sample; this graph demonstrates the twice daily heightened water levels common throughout the growing season.

2.3.2 Climatic Data

Figure 3 is a comparison of monthly rainfall (November 2003- August 2004) to historical precipitation for the area. The rainfall data for the months of September-November 2004 were not included in the graph. The two lines represent the 30th and 70th percentiles of monthly precipitation for Morehead City, NC. These percentiles represent monthly rainfall data collected between 1973 and 2004 that was provided by the State Climate Office of North Carolina at NC State University.

For the 2004-year, December (03') and February experienced above average rainfall. The months of January, March and May recorded below average rainfall for the site and November (03'), April, June, July, and August experienced average rainfall. Overall, the site met the hydrologic criteria in a year of average climate conditions. However, precipitation is not the primary hydrologic input for the site; therefore, it is expected that the site would show the required flooding regardless of area rainfall totals.

2.4 Conclusions

Based on the hydrology analysis for Gauge 1, the data indicates that the gauge location is flooding twice daily for the majority of the growing season, as is required. The surface water elevations for Gauge 1 are comparable with Gauge 2 and Gauge 3.

NCDOT will continue to monitor the site for hydrology.

**30-70 Percentile Graph
Morehead City, NC**

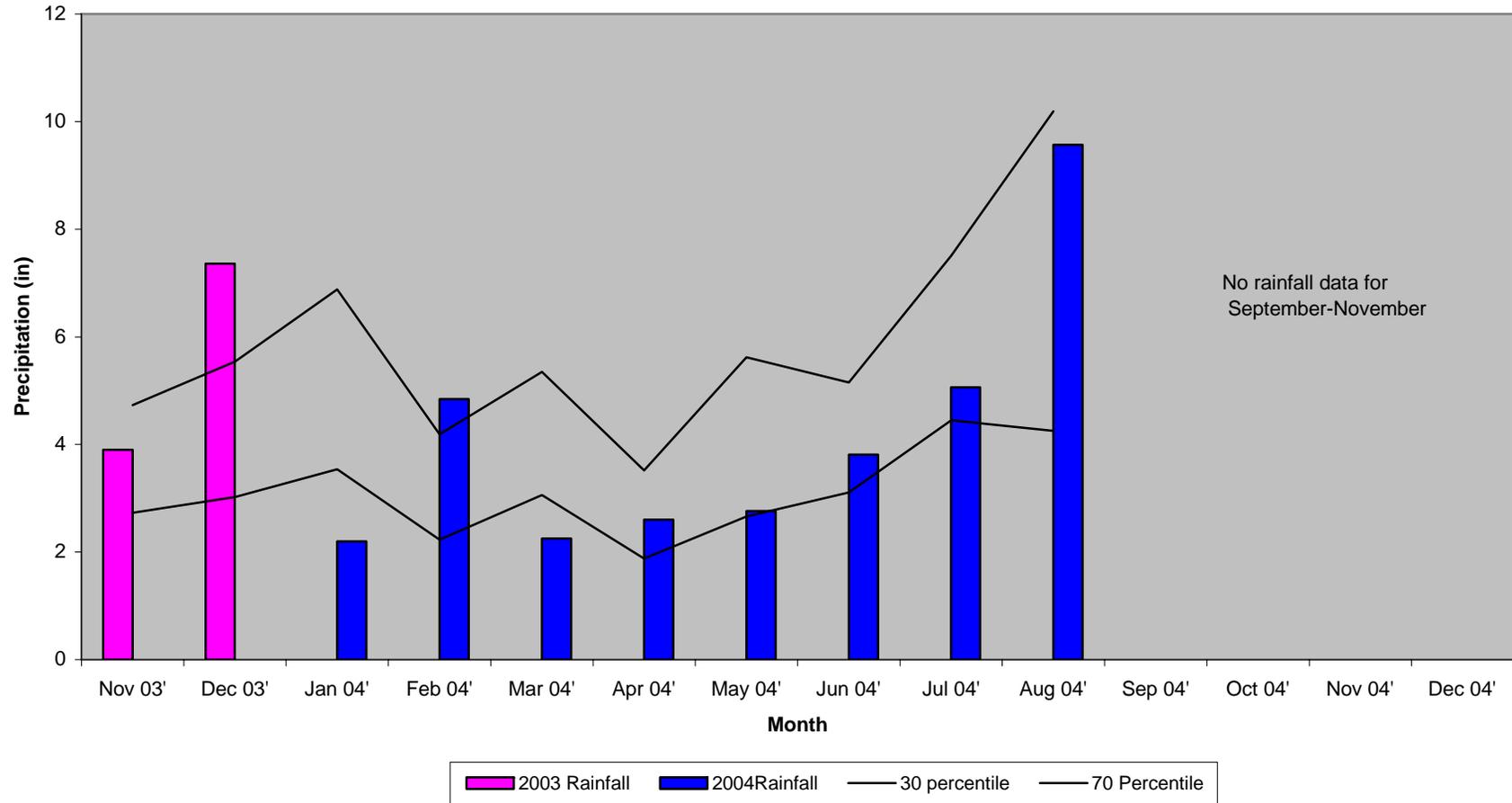


Figure 3. Deer Creek 30-70 Percentile Graph

3.0 VEGETATION: DEER CREEK (YEAR 3 MONITORING)

3.1 Success Criteria

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 toward 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.

3.2 Description of Species

The following marsh grass species were planted in the Wetland Restoration Area:

Spartina patens, Saltmeadow Cordgrass

Spartina alterniflora, Smooth Cordgrass

3.3 Results of Vegetation Monitoring

Table 2. Vegetation Monitoring Results

Plot #	Scale Factor	<i>Spartina patens</i>	<i>Spartina alterniflora</i>	Frequency	Comments
1	5.0		■	■	
2	5.0		■	■	
3	0.0				bare ground
4	0.0				bare ground
5	0.0				bare ground
6	5.0		■	■	
7	4.0	■	■	■	Cattails
8	0.0				bare ground
9	4.0		■	■	
10	5.0		■	■	
11	5.0		■	■	
12	5.0	■	■	■	Cattails
13	5.0		■	■	
14					open water
15	5.0		■	■	
16	5.0		■	■	<i>Scirpus americanus</i>
17	5.0		■	■	
18	0.0				bare ground
19	5.0	■		■	
20	4.0		■	■	<i>Polygonum sp.</i>
21	0.0				bare ground
22	2.0		■	■	
23	5.0		■	■	<i>Polygonum sp.</i>
24	5.0		■	■	<i>Polygonum sp.</i>
25	5.0	■	■	■	
26	4.0		■	■	
27	4.0		■	■	
28	5.0	■		■	
29	5.0		■	■	
30	5.0	■		■	<i>Scirpus sp.</i>
Frequency (Percentage of Plots with Desired Species)		20.7%	69.0%	79.3%	
Sum Scale Value				107.0	
Total Number of Plots				29	
Vegetative Cover (Scale Value)				3.7	

3.4 Conclusions

Percent Frequency of Target Species **79.3 %**
Frequency of 70% required.

Vegetative Cover Scale Value **3.70**
Scale Value of 5 required for year 5.

The site was tilled for compaction and replanted with 7,300 Smooth Cordgrass plants in April 2002. The vegetation on the site has improved greatly. Frequency and coverage are on track for year 3.

NCDOT will continue vegetation monitoring at the Deer Creek Mitigation Site.

4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS

The 2004-monitoring year represents the fourth year of hydrology monitoring and the third year of vegetation monitoring following replanting of the site.

Hydrologic monitoring of the three surface water gauges indicated that the site was consistently inundated, with surface water levels varying with the tides. Vegetation monitoring yielded a successful 79.3% frequency of target species and 3.70 vegetative coverage. Field observations have shown that the site floods regularly.

NCDOT will continue hydrology and vegetation monitoring on the Deer Creek Mitigation Site.

APPENDIX A
GAUGE DATA GRAPHS

APPENDIX B
SITE PHOTOGRAPHS

Deer Creek



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

2004



Photo 7

2004

APPENDIX C
VEGETATION PLANTING PLAN
&
RANDOM PLOT LOCATIONS

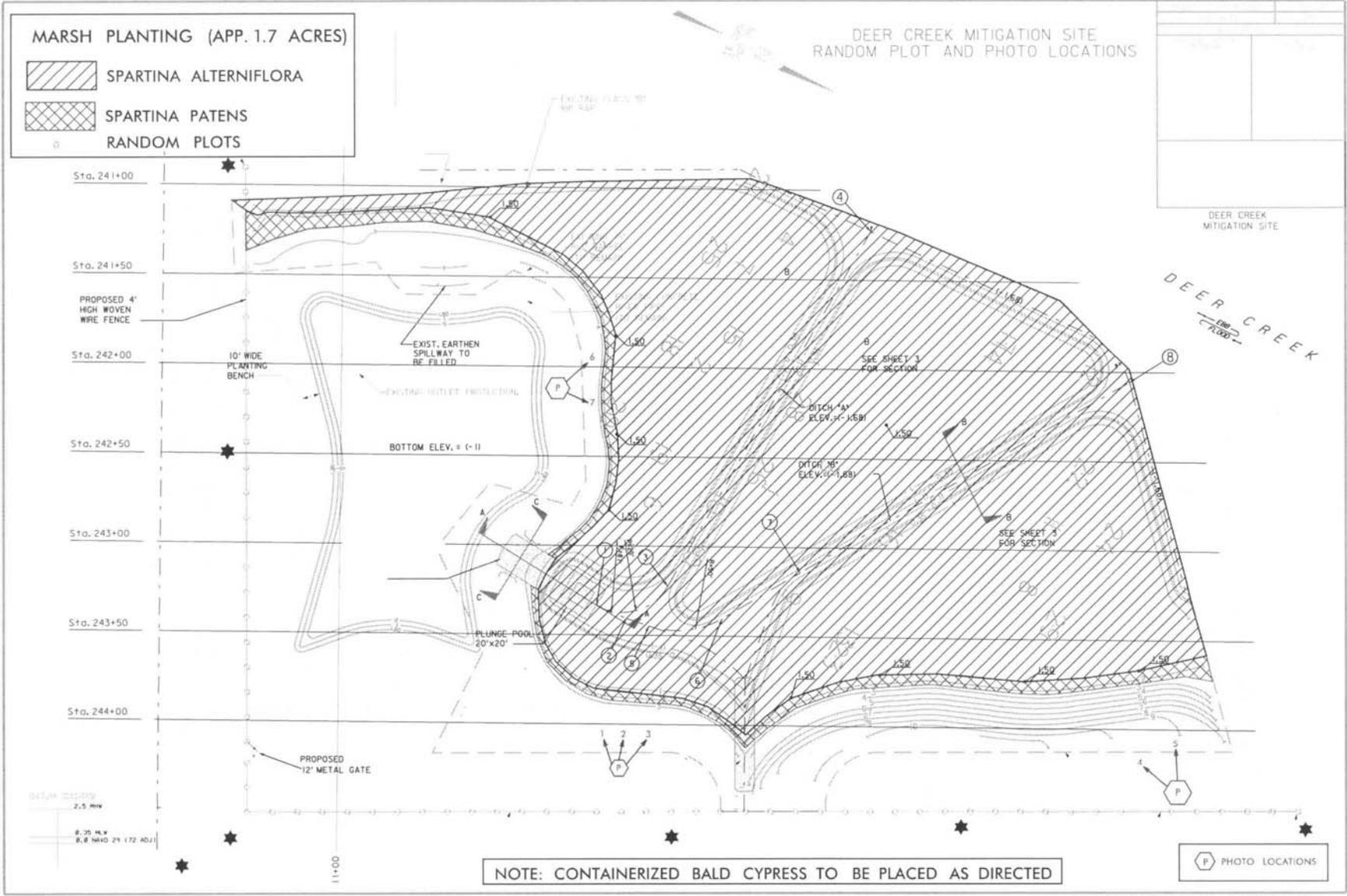
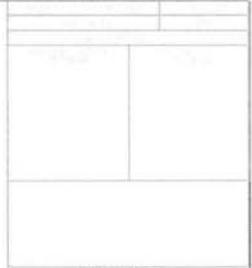
MARSH PLANTING (APP. 1.7 ACRES)

 SPARTINA ALTERNIFLORA

 SPARTINA PATENS

 RANDOM PLOTS

DEER CREEK MITIGATION SITE
RANDOM PLOT AND PHOTO LOCATIONS



DATE: 11/20/14
2.5 MW

9.25 MW
8.8 MW (21.72 ADJ)

Deer Creek
2004 Monitoring
Random Plot Locations

