

ANNUAL REPORT FOR 2004



**Friedburg Marsh Mitigation Site
Forsyth County
Project NO. 6.628001T
TIP No. R-2247**



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SUMMARY

The following report summarizes the monitoring activities that have occurred in 2004 at the Friedburg Marsh Mitigation Site. Friedburg Marsh was constructed in the winter of 1999 and spring of 2000. Monitoring activities in 2004 represent the fourth year following construction. The site must demonstrate hydrologic success during the five-year monitoring period or until the site is deemed successful.

Friedburg Marsh is composed of existing wetlands, upland buffer areas, wetland restoration areas, and wetland creation areas. A total of twelve groundwater-monitoring gauges were installed on the site. There was no planting of trees or herbaceous species at Friedburg, so vegetation monitoring is not required. Qualitative visual observations in conjunction with the hydrologic monitoring of the existing vegetation were made.

For the 2004 monitoring year, the data indicates that all twelve of the groundwater gauges met the hydrologic success criterion of saturation within twelve inches of the surface for more than 5% of the growing season. Three of the gauges reported saturation/inundation for the entire growing season. The vegetation in the restoration areas was dominated by wetland plant species and included a variety of other species, as well.

In November of 2004, approximately six acres of the site were hand cleared in order to improve the Bog Turtle habitat as recommended by Dennis Herman, the Coordinator of Living Collections with the North Carolina Museum of Natural Sciences.

Based on agency comments from the 2003 annual monitoring reports meeting, NCDOT proposes to discontinue hydrology and vegetation monitoring at the Friedburg Mitigation Site.

1.0 INTRODUCTION

1.1 Project Description

The Friedburg Marsh Mitigation Site, located in southern Forsyth County (Figure 1), is the easternmost known location (in North Carolina) for the bog turtle (*Clemmys muhlenbergii*). The southern population of bog turtle is federally listed as a Threatened Species due to Similarity of Appearance. Due to the diverse wetland communities at this marsh, the Piedmont Land Conservancy and the North Carolina Natural Heritage Program consider the site a regionally significant natural site. The Friedburg Marsh Mitigation Plan calls for the preservation and enhancement of the existing wetland habitat, as well as restoration and creation of additional bog turtle habitat.

The Friedburg Marsh Mitigation Site consists of existing wetlands (3.8 acres), upland buffer (38 acres), and wetland restoration/creation areas (5.7 acres). The restoration/creation areas were constructed in 1999/2000 to increase hydrology and improve bog turtle habitat. Construction activities involved filling ditches, constructing ditch plugs, grading to reflect groundwater profiles, removing invasive woody vegetation, and installing a new outlet for the upper pond area. No vegetation planting was conducted.

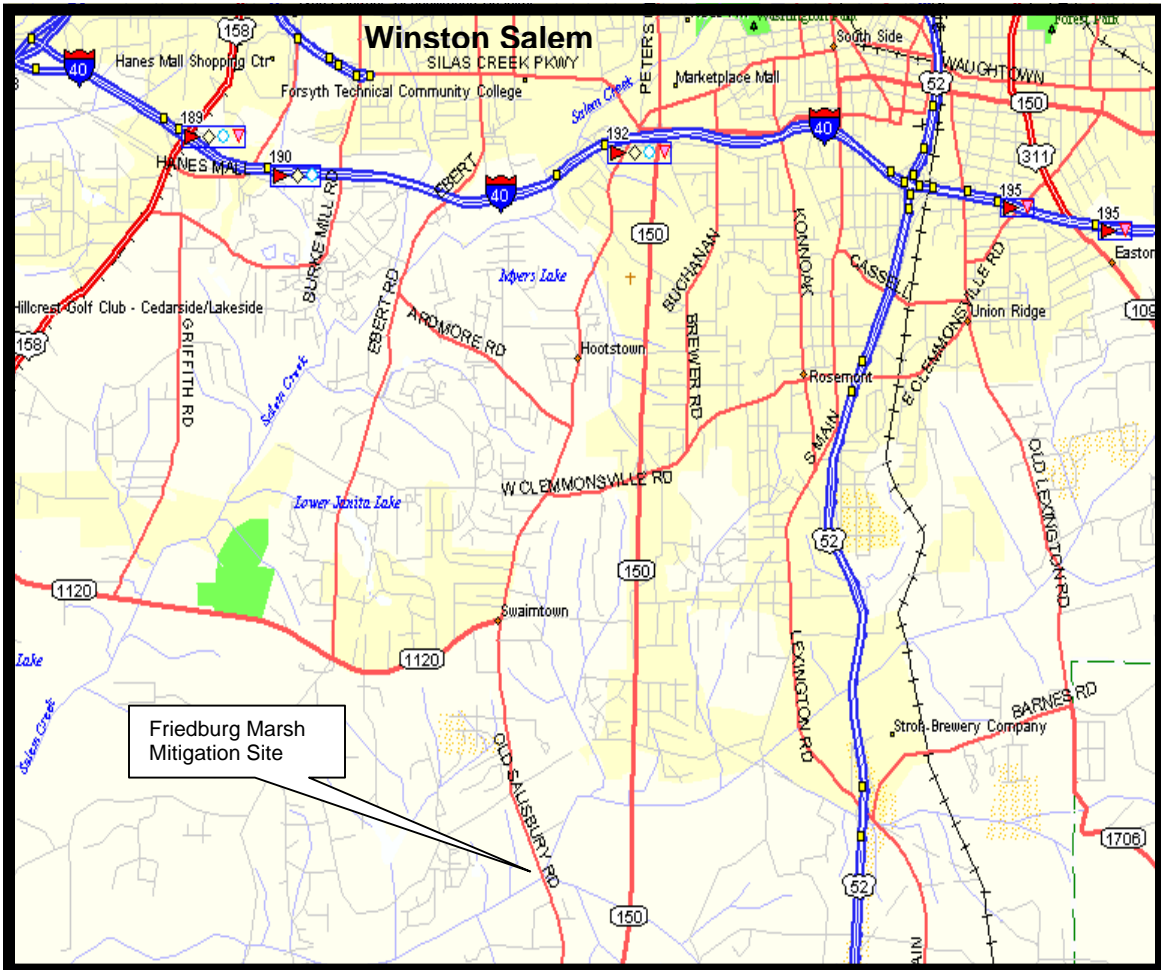
Friedburg Marsh is located in the Muddy Creek portion of the Yadkin River Basin. This site was created to offset wetland impacts associated with the Winston-Salem Outer Loop (TIP No. R-2247).

1.2 Purpose

In order to demonstrate successful mitigation, hydrologic criteria must be met during the five years of monitoring. The following report details the results of hydrologic monitoring during the 2004-year at the Friedburg Marsh Mitigation Site.

The 2004-year is the fourth monitoring year following site construction in 2000. Included in this report are analyses of hydrology and vegetation monitoring results, as well as local climate conditions throughout the growing season.

Figure 1. Friedburg Marsh Vicinity Map



1.3 Project History

May 1997	Feasibility Study Conducted
November 1997	Site Purchased by NCDOT, Initial Monitoring Wells Installed.
1999	Mitigation Plan Developed
Winter-Spring 2000	Grading and Construction
March 2000	Additional Monitoring Wells Installed
March-November 2001	Hydrology Monitoring (Year 1)
July 2001	Vegetation Monitoring (Year 1)
March-November 2002	Hydrology Monitoring (Year 2)
August 2002	Vegetation Monitoring (Year 2)
March-November 2003	Hydrology Monitoring (Year 3)
September 2003	Vegetation Monitoring (Year 3)
March-November 2004	Hydrology Monitoring (Year 4)
July 2004	Vegetation Monitoring (Year 4)
November 2004	Vegetation Removal – Habitat Improvement

2.0 HYDROLOGY

2.1 Success Criteria

The success criteria for hydrology states that wetland hydrology will be established when water inundates or saturates (within 12 inches of the surface) consecutively for 5.0 percent of the growing season.

The growing season in Forsyth County begins March 28th and ends November 10th (228 days). These dates correspond to a 50 percent probability that temperatures will drop to 28°F or lower after March 28 and before November 10 (Soil Survey of Forsyth County, 1976, p.63). Five percent of the growing season translates to twelve consecutive days of inundation or saturation. Local climate must also represent average conditions for the area.

2.2 Hydrologic Description

RDS WL40 and WL20 units record all groundwater and surface water data (Figure 2). The groundwater gauges record groundwater data daily. The gauges are downloaded in the field on a monthly basis. In November 1997, six groundwater gauges were installed at Friedburg Marsh to monitor pre-construction hydrology and develop a mitigation plan. Gauge 7 (DL9D90A70) was installed to record surface water and groundwater depths. Following construction, six additional groundwater gauges were installed, of which Gauge 6 (S4940BB) was installed to record surface water and groundwater depths.

2.3 Results of Hydrologic Monitoring

2.3.1 Site Data

The maximum number of days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was then converted into a percentage of the 228-day growing season (March 28 – November 10). The results are presented in Table 1 and Figure 3.

Appendix A contains a plot of the groundwater depth for each gauge. The maximum number of consecutive days and percentage of growing season of saturation/inundation is noted on each plot. The individual precipitation events, shown on the monitoring gauge graphs as bars, represent data provided by the NC State Climate Office.

Figure 3 provides a graphical representation of the hydrologic results. Gauges highlighted in blue indicate wetland hydrology for more than 12.5% of the growing season. Gauges highlighted in red show hydrology between 8% and 12.5% of the growing season, while those in green indicate hydrology between 5% and 8%. Gauges highlighted in black indicate no wetland hydrology (less than 5% of the growing season)

Figure 2. Friedburg Marsh Monitoring Gauge Location

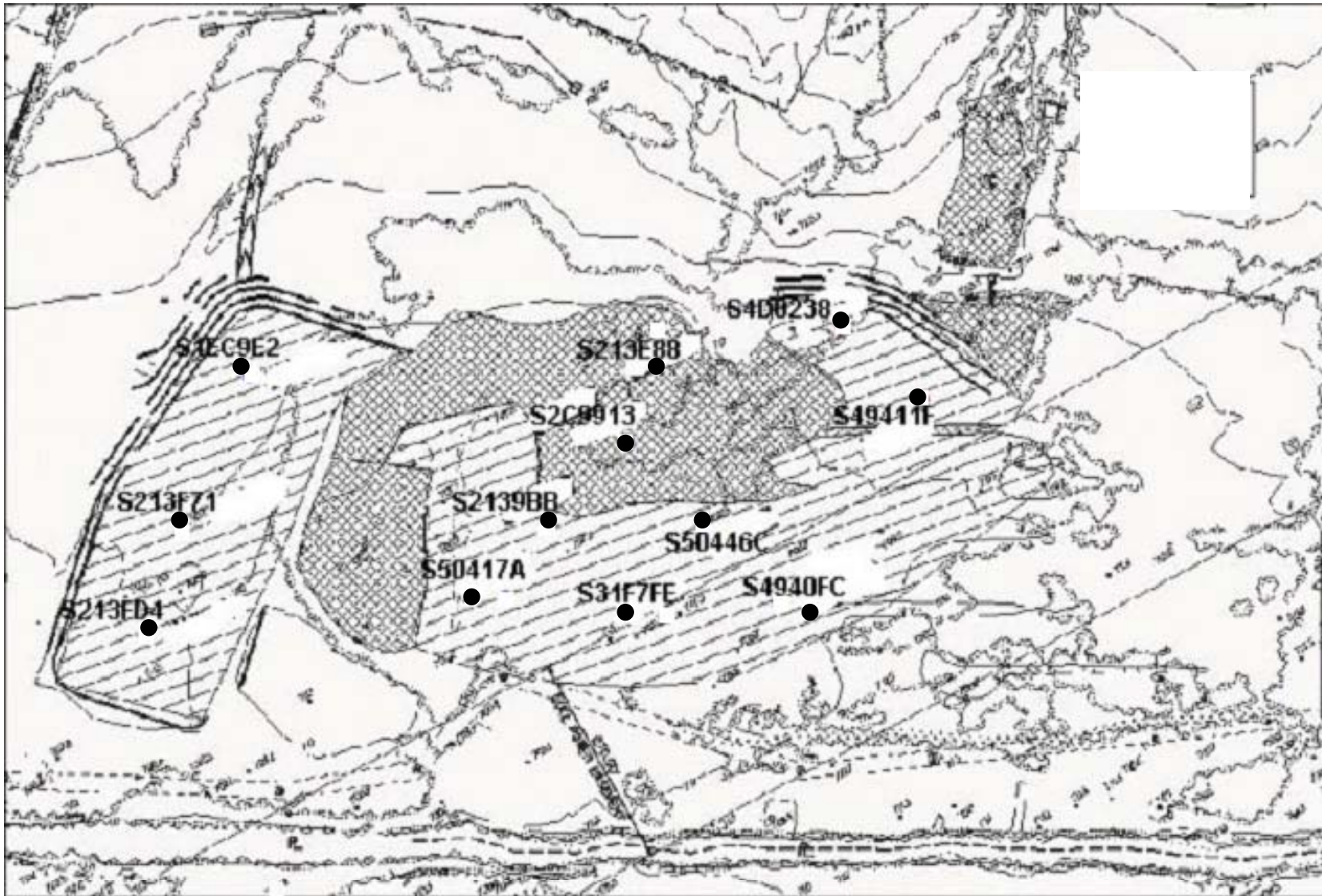
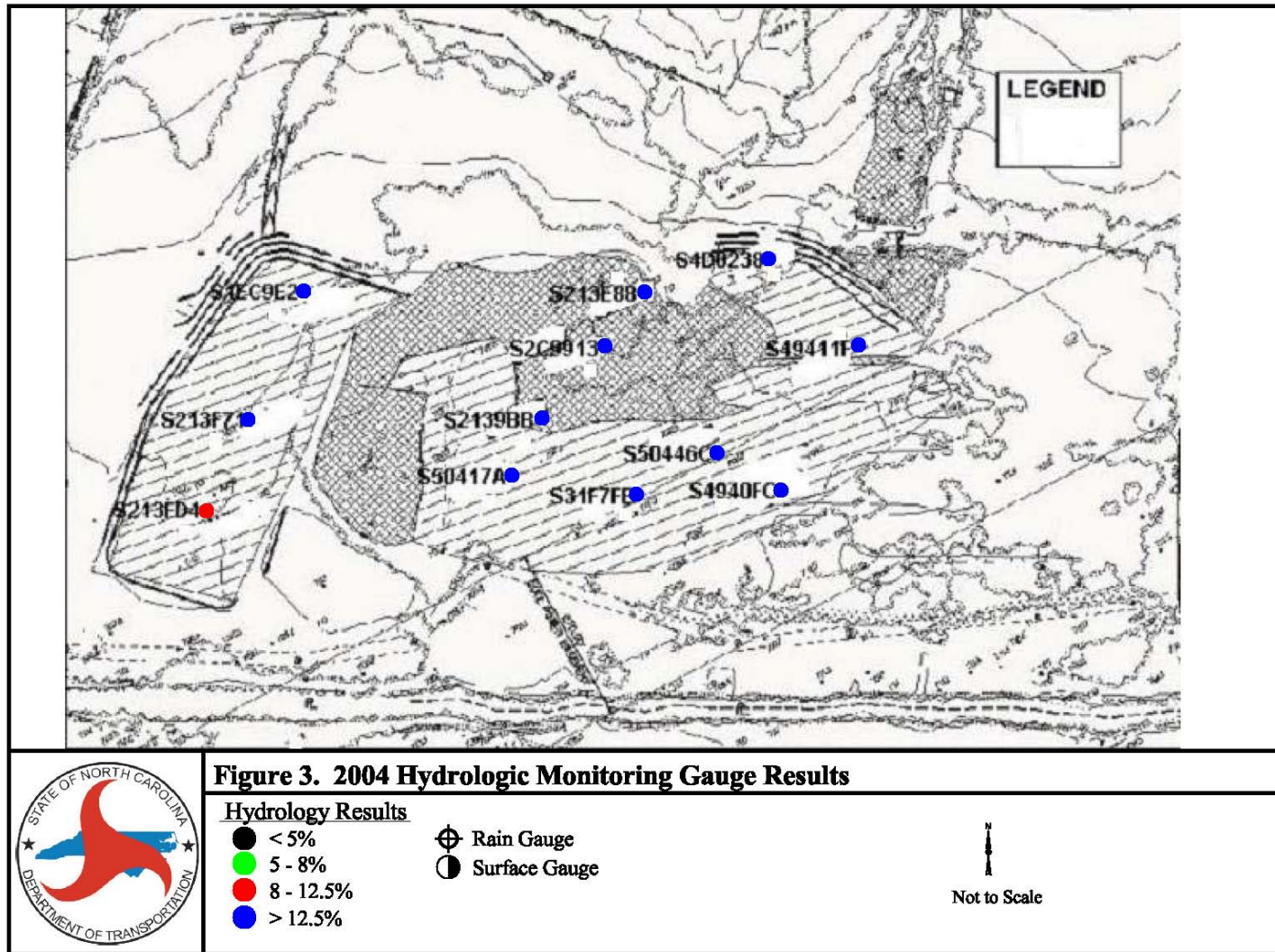


Table 1. 2004 Hydrologic Monitoring Results

Monitoring Gauge	<5%	5% - 8%	8% - 12.5%	>12.5%	Actual %	Success Dates
G-1 S4CFF78*				×	68.4	April 2-Sept 4 Sept 7-Nov 11
G-2 S31F7FE*				×	100	March 28-Nov 10
G-3 S50446C*				×	100	March 28-Nov 10
G-4 S49411F*				×	33.3	March 28-June 11 Sept 8-Nov 10
G-5 S50417A*				×	100	March 28-Nov 10
G-6 S4940BB*				×	48.7	April 2-July 1 July 23-Nov 10
G-7 DL9D90A70*				×	99.1	March 30-Nov 10
G-8 DL8E8CF62*				×	86.8	April 27-Nov 10
G-9 DL8E85A2*				×	50.0	March 30-July 21 Sept 28-Nov 10
G-10 S213FD4			×		10.1	Oct 19-Nov 10
G-11 S51C0EB*				×	28.1	March 28-May 13 Sept 8-Nov 10
G-12 S4940B9*				×	48.7	April 22-July 1 July 23-Nov 10

*Gauge met the hydrology criteria during an average rainfall month (February, April, May, July, and August).

Figure 3. Friedburg Marsh 2004 Hydrologic Results



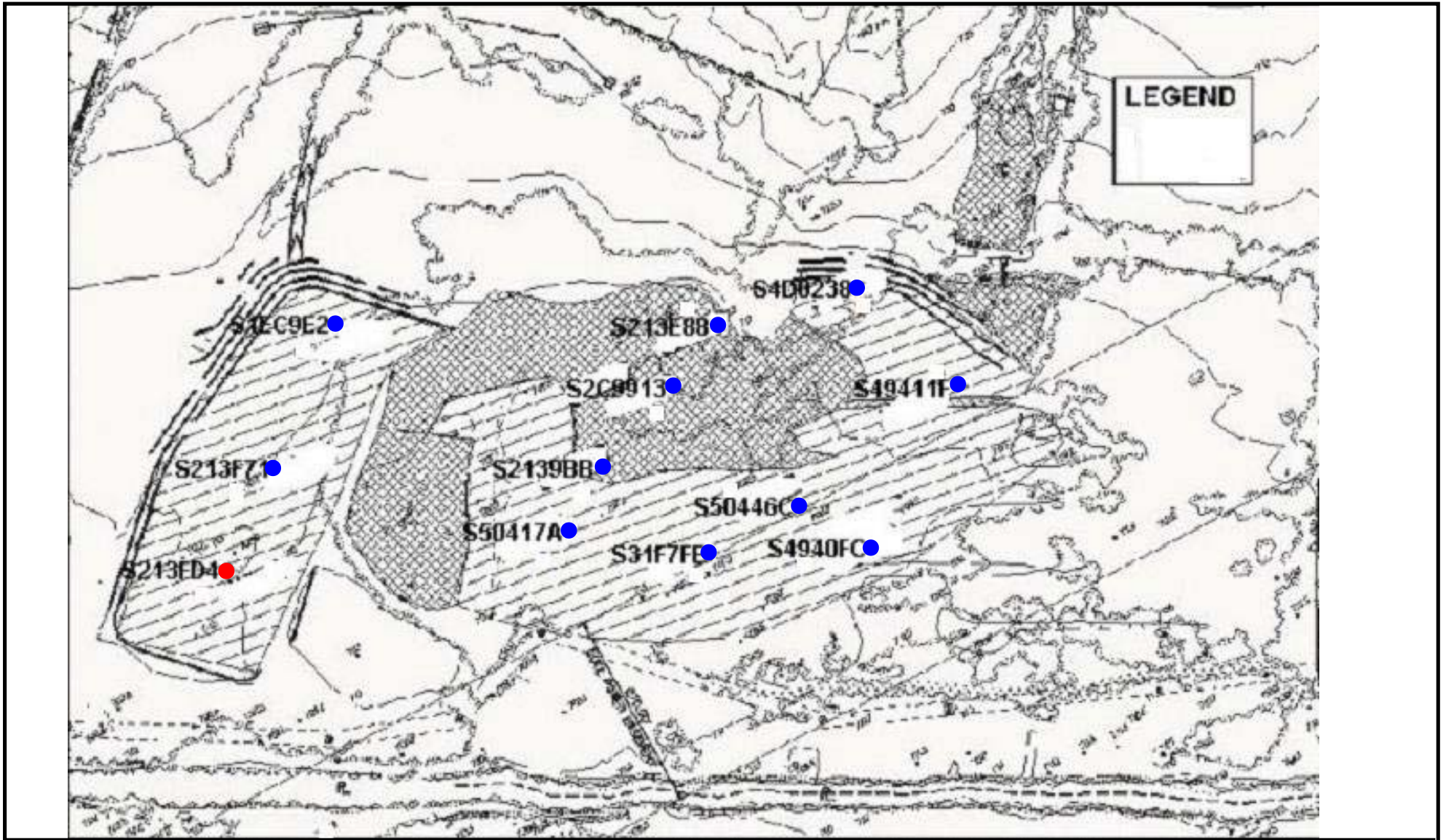


Figure 3. 2004 Hydrologic Monitoring Gauge Results

Hydrology Results

- < 5%
- 5 - 8%
- 8 - 12.5%
- > 12.5%

- ⊕ Rain Gauge
- Surface Gauge


 Not to Scale

2.3.2 Climatic Data

Figure 4 is a comparison of monthly rainfall for the period of November 2003 through November 2004 to historical precipitation (collected between 1973 and 2004) for Yadkinville, North Carolina. This comparison gives an indication of how 2004 relates to historical data in terms of climate conditions. The NC State Climate Office provided all local rainfall information.

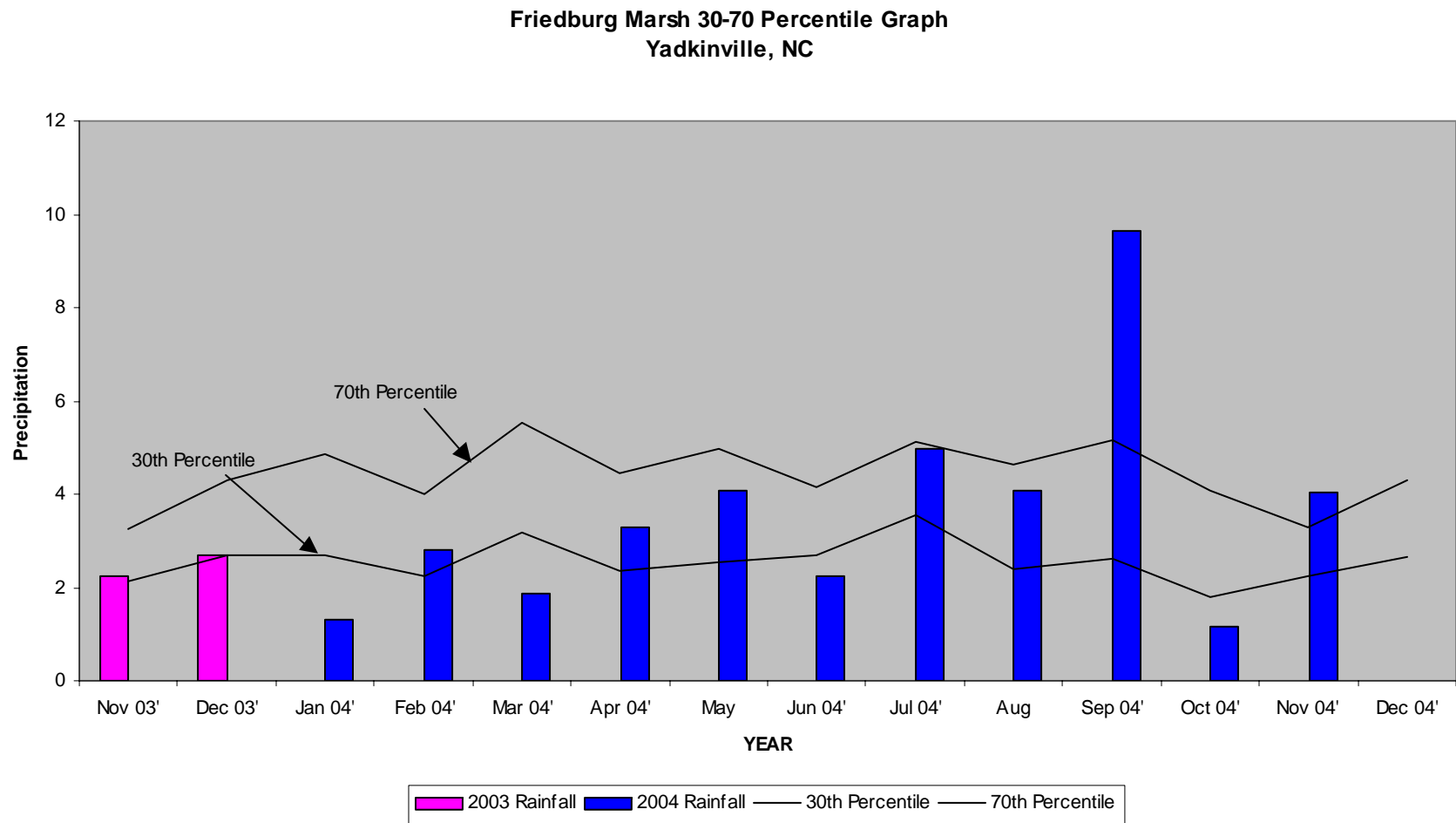
For the 2004-year, September and November experienced above average rainfall. The months of January, March, June, and October recorded below average rainfall for the site, while November ('03), December ('03), February, April, May, July, and August recorded average rainfall. Overall, 2004 experienced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

2.4 Conclusions

For the 2004 monitoring year, the data indicates that all twelve of the groundwater gauges met the hydrologic success criterion of saturation within twelve inches of the surface for more than 5% of the growing season. Three of the gauges reported saturation/inundation for the entire growing season.

NCDOT proposes to discontinue hydrology monitoring at the Friedburg Mitigation Site.

Figure 4. 30-70 Percentile Graph



3.0 VEGETATION: FRIEDBURG MARSH (YEAR 4 MONITORING)

3.1 Results of Vegetation Monitoring

No planting of trees or herbaceous species was undertaken as part of the Friedburg Marsh mitigation. Therefore, no quantitative vegetation monitoring was required. Qualitative observations of common species have been made in conjunction with hydrologic monitoring.

The following species are found in the creation/restoration area: spike rush, pickerel weed, bulrush, *Juncus* sp., cattail, poplar, and green ash are the more wet tolerant species. Also found were: foxtail, broomsedge, beggar's ticks, barnyard grass, goldenrod, sweetgum, and multi-flora rose. The presence of these species in these areas has not affected the overall quality of the bog turtle habitat at Friedburg Marsh.

3.2 Conclusions

The vegetation in the restoration areas is dominated by wetland plant species and includes a variety of other species, as well.

In November of 2004, approximately six acres of the site were hand cleared in order to improve the Bog Turtle habitat as recommended by Dennis Herman, the Coordinator of Living Collections with the North Carolina Museum of Natural Sciences.

NCDOT proposes to discontinue vegetation monitoring at the Friedburg Mitigation Site.

4.0 OVERALL CONCLUSIONS/RECOMMENDATIONS

The 2004-year is the fourth consecutive year that the Friedburg March Mitigation Site has been monitored.

For the 2004 monitoring year, the data indicates that all twelve of the groundwater gauges met the hydrologic success criteria of saturation within twelve inches of the surface for more than 5% of the growing season. Three of the gauges reported saturation/inundation for the entire growing season. The vegetation in the restoration areas was dominated by wetland plant species and includes a variety of other species, as well.

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APPENDIX A
GAUGE DATA GRAPHS

APPENDIX B
SITE PHOTOGRAPHS

Friedburg



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6

FRIEDBURG MARSH MITIGATION SITE

STATE	WATER CONTROL DISTRICT NO.	DATE	SCALE
N.C.	R-2247WM	REP-1	
DATE DRAWN	D.L. BROWN	DESCRIPTION	

