

# ANNUAL REPORT FOR 2003



**Dismal Swamp Mitigation Site  
Gates / Perquimans County  
Project No. 6.129003T  
TIP No. R-2208 WM**



Prepared By:  
Office of Natural Environment & Roadside Environmental Unit  
North Carolina Department of Transportation  
December 2003

# TABLE OF CONTENTS

<b>SUMMARY</b> .....	<b>1</b>
<b>1.0 INTRODUCTION</b> .....	<b>2</b>
1.1 Project Description .....	2
1.2 Purpose .....	2
1.3 Project History .....	4
1.4 Debit Ledger.....	5
1.5 Permit Related Requirements .....	5
<b>2.0 HYDROLOGY</b> .....	<b>6</b>
2.1 Success Criteria .....	6
2.2 Hydrologic Description .....	6
2.3 Results of Hydrologic Monitoring.....	8
2.3.1 Site Data.....	8
2.3.2 Climatic Data .....	11
2.4 Conclusions.....	11
<b>3.0 VEGETATION: DISMAL SWAMP MITIGATION SITE</b> .....	<b>14</b>
3.1 Success Criteria .....	14
3.2 Description of Species.....	14
3.3 Results of Vegetation Monitoring.....	16
3.4 Conclusions.....	18
<b>4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS</b> .....	<b>19</b>

**FIGURES**

Figure 1. SITE LOCATION MAP ..... 3  
Figure 2. GAUGE LOCATION MAP ..... 7  
Figure 3. 2003 HYDROLOGIC MONITORING RESULTS ..... 12  
Figure 4. DISMAL SWAMP 30-70 PERCENTILE GRAPH ..... 13

**TABLES**

Table 1. DISMAL SWAMP DEBIT LEDGER ..... 5  
Table 2. 2003 HYDROLOGIC MONITORING RESULTS..... 8  
Table 3. HYDROLOGIC MONITORING RESULTS (1999- 2002) ..... 10  
Table 4. VEGETATION MONITORING RESULTS..... 16

**APPENDICES**

APPENDIX A. GAUGE DATA GRAPHS  
APPENDIX B. SITE PHOTOS & VEGETATIVE MONITORING PLAN

## SUMMARY

The following report summarizes the monitoring activities that have occurred in the past year at the Dismal Swamp Mitigation Site. Phase 1 of this site was constructed in 1996 and Phase 2 was constructed in 1998. The site must demonstrate vegetation and hydrologic success for a minimum of five years or until the site is deemed successful.

Site hydrology was monitored using twenty-eight groundwater gauges, one surface gauge, five Infinity gauges and two rain gauges. Subsequently, five surface water gauges were installed in Spring 2002 to illustrate surface water levels in the riverine area. Two groundwater gauges (DS-28 and DS-29) were also installed adjacent to the surface gauges to show groundwater in the absence of surface water. Surface gauge (SG-1) was installed to record water levels from the ground up to the gauge's calibration line. Surface gauge (SG-2) was installed in the stream and records the water level fluctuations. This gauge (SG-2) reads from the streambed to the gauge calibration point. Surface gauges (SG-3, SG-4, SG-5, and SG-6) were installed to record groundwater saturation and/or surface inundation.

Hydrologic monitoring indicates that the majority of the site has met the success criteria during the 2003-monitoring year. Eighteen of the twenty-three groundwater gauges met or exceeded the expected 12.5% jurisdictional wetland criteria. All four gauges in the upper landscape position met the success criteria of 5% - 12.5%, while the gauge in the upland area reported saturation for less than 5% of the growing season, as expected.

Gauge (SG-2), which is located in the stream, revealed periodic flooding. This gauge (SG-2) experienced malfunctions and also could not be downloaded due to hurricane debris during portions of the growing season. Gauge (SG-6) also experienced malfunctions throughout the growing season; therefore, no data is available for this gauge. Groundwater gauge (DS-29) is installed adjacent to (SG-6) and meets the success criteria for 27.6% of the growing season. Groundwater gauges (DS-28) and (DS-8), which are installed in the riverine area, both met success for 22.8% of the growing season. These three groundwater gauges (DS-8, DS-28, and DS-29), as well as the available surface gauge data show periodic inundation, which indicates a riverine system.

Forty-eight plots were established to monitor vegetation. Vegetation monitoring yielded a successful total average density of 463 trees per acre across the four-planted zones. This density is above the success criteria of 260 trees per acre.

The 2003-monitoring year represents the fifth consecutive year that the site has been monitored for hydrology and vegetation. The monitoring results have shown that the site has succeeded in fulfilling the established success criteria, therefore NCDOT proposes to discontinue hydrology and vegetation monitoring on the Dismal Swamp Mitigation Site.

## **1.0 INTRODUCTION**

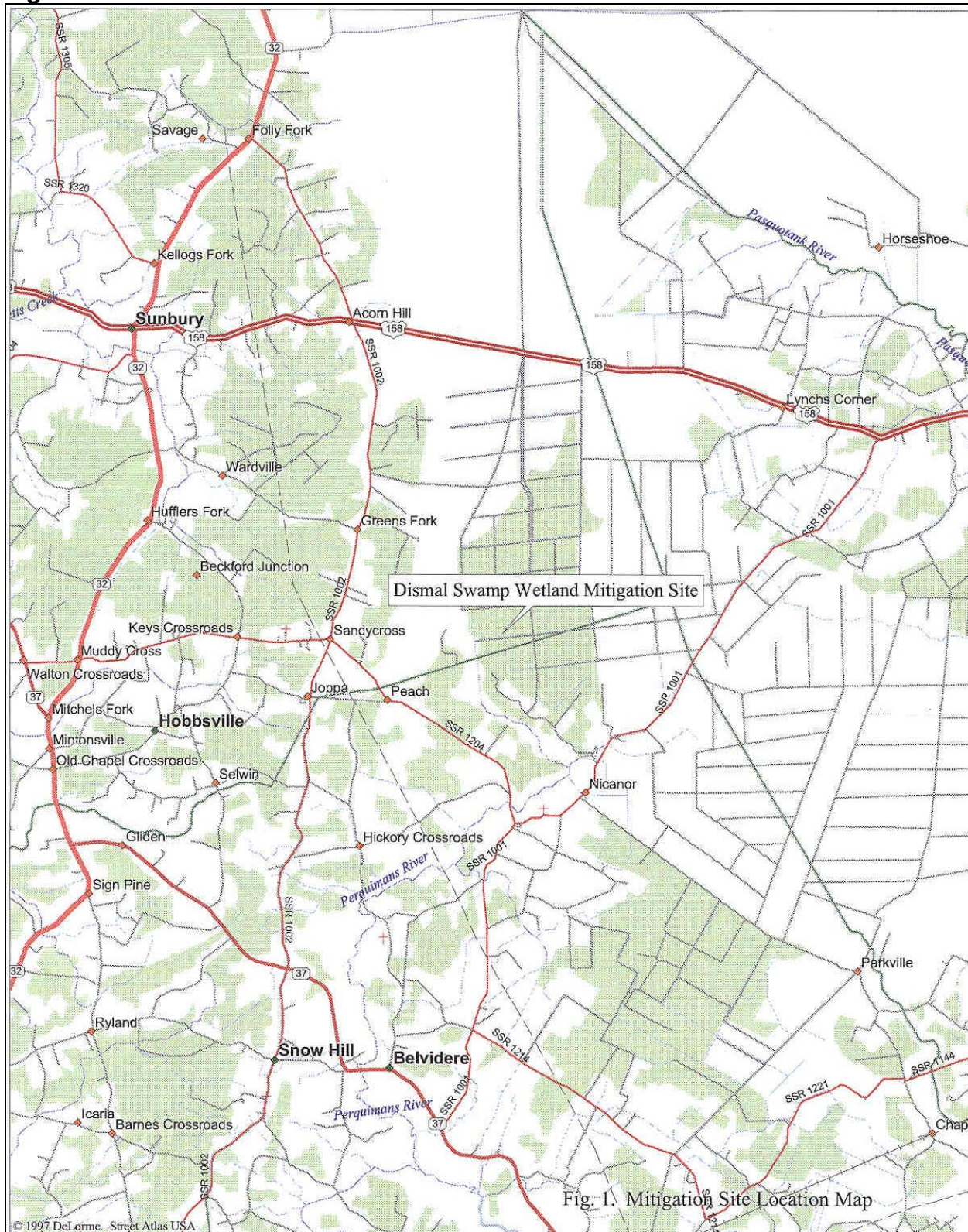
### **1.1 Project Description**

The Dismal Swamp Mitigation Site is located along the Gates and Perquimans County Line (COE ID # 199401492). It is 1.2 miles east of Sandycross on SR 1002 (Folly Road) (Figure 1). The site encompasses approximately 612 acres of farm and forest communities.

### **1.2 Purpose**

In order to demonstrate successful mitigation, hydrologic and vegetative monitoring must be conducted for a minimum of five years or until the site is deemed successful. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrologic conditions and vegetation survival. The following report details the results of hydrologic and vegetative monitoring during 2003, as well as local climate conditions throughout the growing season at the Dismal Swamp Mitigation Site.

**Figure 1. SITE LOCATION MAP**



### 1.3 Project History

Summer 1996	Grading Construction - Majority of Ditches Filled; Mowing; Discing (Phase 1)
January -February 1997	Tree Planting
February 1997	Monitoring Gauges Installed
March – November 1997	Hydrologic Monitoring (1 Year)
July 1997	Stake Test Plots & Initial Vegetation Monitoring
November 1997	Vegetation Monitoring (1 Year)
March – November 1998	Hydrologic Monitoring (2 Year)
October 1998	Vegetation Monitoring (2 Year)
November 1998	Grading Construction - Main Canal Ditch (Phase 2)
February 1999	Tree Planting (Phase 2)
March – November 1999	Hydrologic Monitoring (Restart 1 Year)
November 1999	Vegetation Monitoring (Restart 1 Year)
March 2000	Herbicide Treatment
March – November 2000	Hydrologic Monitoring (2 Year)
October 2000	Vegetation Monitoring (2 Year)
March – November 2001	Hydrologic Monitoring (3 Year)
September 2001	Vegetation Monitoring (3 Year)
Spring 2002	Additional Groundwater and Surface Gauges Installed in the Riverine Area.
March-November 2002	Hydrologic Monitoring (4 Year)
September 2002	Vegetation Monitoring (4 Year)
March-November 2003	Hydrologic Monitoring (5 Year)
September 2003	Vegetation Monitoring (5 Year)

## 1.4 Debit Ledger

Because of its size, the Dismal Swamp Mitigation Site will provide mitigation for several highway projects. Table 1 shows the projects that this site is providing mitigation for, as of November 2003.

**Table 1. DISMAL SWAMP DEBIT LEDGER**

	<b>BLH Non-Riverine</b>	<b>SPH Riverine</b>	<b>Total Acres</b>
<b>Total Acres at Site</b>	485	58	543
<b>TIP Project Debits</b>			
R-2208A	39.71	6.09	45.8
R-2512A&B	2.69	8.06	10.75
R-2515A	20.6	-	20.6
R-2228A	-	0.88	0.88
R-2512A&B	1.93	-	1.93
R-2404B&C	52.66	4.26	56.92
R-2208A mod	14.93	-	14.93
R-2512B mod	2.39	-	2.39
R-2512A/B mod	3.89	-	3.89
R-2551	-	1.5	1.5
R-2515A	0.46	-	0.46
<b>Division Project Debits</b>			
Unnamed project	0.34	-	0.34
SR-1180	0.22	-	0.22
SR-1135	1.4	-	1.4
SR Flat Branch	-	0.95	0.95
<b>Remaining Acres at Site</b>	343.78	36.26	380.04

\* 69 acres of upland not included on debit ledger.

## 1.5 Permit Related Requirements

There are no additional permit special conditions pertaining to the success criteria of the site that must be met in order for the site to be deemed successful.

## **2.0 HYDROLOGY**

### **2.1 Success Criteria**

Target hydrologic characteristics include saturation within 12" of the surface or inundation for at least 12.5% of the growing season at lower landscape positions, during average climatic conditions. Areas in the upper landscape position, near the perimeter canals, may exhibit surface saturation/inundation for between 5% and 12.5% of the growing season based on gauge data. These areas are expected to support hydrophytic vegetation within organic soils of low permeability. If wetland parameters are marginal as indicated by vegetation and hydrology monitoring, consultation with COE personnel will be undertaken to determine jurisdictional extent in these transitional areas. One gauge was placed in an upland area where saturation is expected to be less than 5% of the growing season.

The growing season in Gates County begins March 25 and ends November 11. The dates correspond to a 50% probability that temperatures will drop to 28° F or lower after March 25 and before November 11.<sup>1</sup> The growing season is 232 days; the optimum duration for wetland hydrology is 29 consecutive days. Local climate must represent average conditions for the area in order for the hydrologic data to be considered valid.

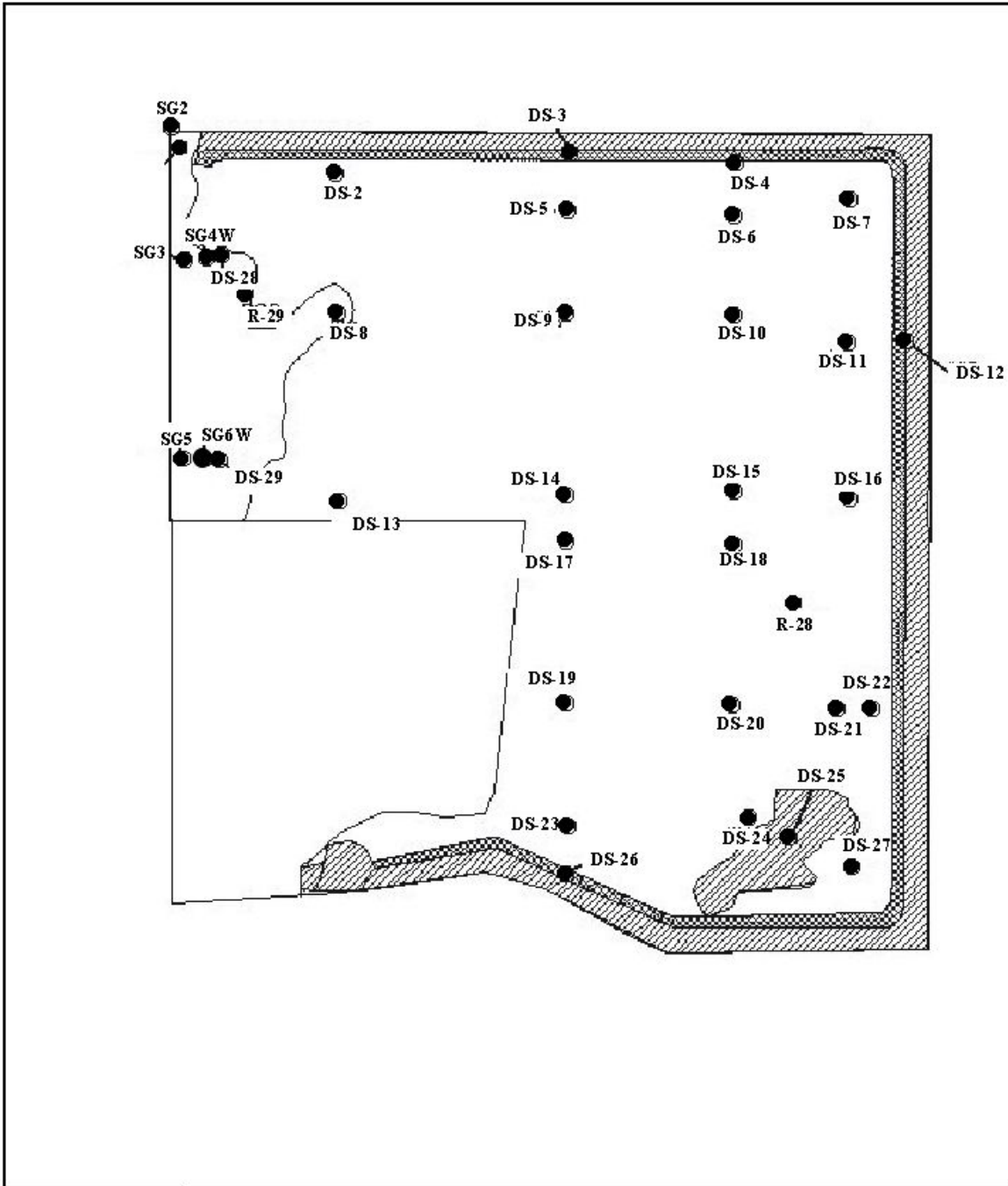
### **2.2 Hydrologic Description**

Site hydrology was monitored using twenty-eight groundwater gauges, one surface gauge, five Infinity gauges and two rain gauges. Subsequently, five surface water gauges were installed in Spring 2002 to illustrate surface water levels in the riverine area. Two groundwater gauges (DS-28 and DS-29) were also installed adjacent to the surface gauges to show groundwater in the absence of surface water. Surface gauge (SG-1) was installed to record water levels from the ground up to the gauge's calibration line. Surface gauge (SG-2) was installed in the stream and records the water level fluctuations. This gauge (SG-2) reads from the streambed to the gauge calibration point. Surface gauges (SG-3, SG-4, SG-5, and SG-6) were installed to record groundwater saturation and/or surface inundation.

The groundwater monitoring gauges record daily readings of groundwater depth. The rain gauges were replaced in Spring 2000 with Infinity rain gauges.

---

<sup>1</sup> Soil Survey of Gates County, North Carolina, Soil Conservation Service, p.93.



**Figure 2. Gauge Location Map**



  
 Not to Scale

## 2.3 Results of Hydrologic Monitoring

### 2.3.1 Site Data

Appendix A contains a plot of the groundwater depth for each monitoring gauge.

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).

The maximum number of consecutive days that the groundwater was within twelve inches of the surface was determined for each gauge. This number was converted into a percentage of the 232-day growing season. Table 2 shows the hydrologic results for the 2003-growing season, along with the expected success criteria for each gauge.

**Table 2. 2003 HYDROLOGIC MONITORING RESULTS**

Monitoring Gauge	Expected %	< 5%	5% - 12.5%	≥ 12.5%	Actual %	Date
<b>DS-2*</b>	> 12.5%			×	22.4	March 25-May 15 May 19-July 5 Sept. 19-Oct 22
<b>DS-3</b>	5%-12%			×	20.7	March 25-May 11
<b>DS-4*</b>	5%-12%		×		9.9	Aug 27-Sept 18
<b>DS-5</b>	> 12.5%		×		10.8	March 25-April 18
<b>DS-6</b>	> 12.5%			×	20.7	March 25-May 11
<b>DS-7</b>	> 12.5%		×		5.2	
<b>DS-8*</b>	> 12.5%			×	22.8	March 25-May 16 May 18-June 27 July 24-Aug 22 Sept 18-Oct 24
<b>DS-9*</b>	> 12.5%			×	15.1	July 24-Aug 22 Sept. 19-Oct 23
<b>DS-10</b>	> 12.5%			×	25	March 25-May 21
<b>DS-11</b>	> 12.5%			×	21.6	March 25-May 13 May 19-June 26
<b>DS-12</b>	5%-12%		×		6.5	April 8-April 22
<b>DS-13</b>	> 12.5%		×		5.6	
<b>DS-14</b>	> 12.5%			×	12.9	March 25-April 23
<b>DS-15*</b>	> 12.5%			×	44.8	March 25-July 6 July 24-Aug 23 Sept 13-Oct 23
<b>DS-16</b>	> 12.5%			×	20.7	March 25-May 11
<b>DS-17*</b>	> 12.5%			×	72.8	March 25-Sept 9

						Sept 13-Nov 11
<b>DS-18*</b>	> 12.5%			×	50.9	March 27-July 22 July 24-Aug 30 Sept. 12-Nov 11
<b>DS-19*</b>	> 12.5%			×	51.7	March 25-July 22 July 24-Aug 28 Sept 13-Nov 11
<b>DS-20</b>	> 12.5%		×		9.9	
<b>DS-21</b>	> 12.5%			×	40.5	March 25-June 26
<b>DS-22</b>	> 12.5%		×		8.2	
<b>DS-23*</b>	> 12.5%			×	45.3	March 25-July 7 July 24-Aug 23 Sept 13-Oct 19
<b>DS-24</b>	> 12.5%			×	12.9	March 25-April 23
<b>DS-25</b>	0%-5%	×			3.4	April 8-April 15
<b>DS-26</b>	5%-12%			×	12.9	March 25-April 23
<b>DS-27*</b>	> 12.5%			×	13.4	July 24-Aug 23
<b>DS-28*</b>	> 12.5%			×	22.8	March 25-May 16 May 19-July 6 July 24-Aug 22
<b>DS-29*</b>	> 12.5%			×	27.6	May 8-July 10 July 24-Aug 23 Sept 13-Nov 11

\* Gauge met the success criterion during an average rainfall month.

#### **Specific Gauge Problems:**

- DS-5 experienced battery failure three times during the growing season. These malfunctions prevented an effective evaluation of hydrologic success at this gauge.
- DS-9 experienced a malfunction at the beginning of the growing season (January 1-July 9), the data was considered to be corrupt.

**Table 3. HYDROLOGIC MONITORING RESULTS (1999- 2002)**

<b>Monitoring Gauge</b>	<b>Expected %</b>	<b>1999 Results</b>	<b>2000 Results</b>	<b>2001 Results</b>	<b>2002 Results</b>
DS-2	> 12.5%	19.0	91.4	15.5	25.0
DS-3	5%-12%	6.0	14.2	8.6	20.7
DS-4	5%-12%	2.6	12.1	4.7	6.5
DS-5	> 12.5%	12.9	21.5	10.8	23.7
DS-6	> 12.5%	29.0	21.5	9.9	21.1
DS-7	> 12.5%	0	5.2	2.6	.43
DS-8	> 12.5%	20.3	88.4	12.5	3.0
DS-9	> 12.5%	20.3	89.2	12.9	18.1
DS-10	> 12.5%	12.9	24.6	2.2	22.8
DS-11	> 12.5%	14.6	66.4	15.1	24.6
DS-12	5%-12%	0	12.1	3.0	6.5
DS-13	> 12.5%	1.3	8.2	4.7	15.6
DS-14	> 12.5%	2.1	12.1	6.0	20.3
DS-15	> 12.5%	19.8	90.1	16.8	27.2
DS-16	> 12.5%	3.0	25.9	9.1	20.7
DS-17	> 12.5%	27.1	99.6	18.1	31.0
DS-18	> 12.5%	25.4	94.8	17.2	30.2
DS-19	> 12.5%	26.3	61.2	15.9	27.6
DS-20	> 12.5%	12.5	13.4	9.1	21.1
DS-21	> 12.5%	12.9	90.1	12.5	24.1
DS-22	> 12.5%	6.5	62.1	12.1	10.3
DS-23	> 12.5%	22.4	37.5	8.6	25.4
DS-24	> 12.5%	6.5	12.5	7.3	9.5
DS-25	0%-5%	0	5.3	2.6	1.3
DS-26	5%-12%	0	12.9	7.3	15.5
DS-27	> 12.5%	1.3	12.1	3.9	12.5

<b>DS-28</b>	> 12.5%	Not Installed	Not Installed	Not Installed	23.3
<b>DS-29</b>	> 12.5%	Not Installed	Not Installed	Not Installed	25.4
		Average to Below Average	Average to Below Average	Below Average	Average to Below Average

Table 3 represents hydrologic data in percentages from previous years (1999-2002).

### **2.3.2 Climatic Data**

Figure 4 is a comparison of monthly rainfall for the period of November 2002 through November 2003 to historical precipitation (collected between 1972 and 2003) for Elizabeth City, North Carolina. This comparison gives an indication of how 2003 relates to historical data in terms of climate conditions. The NC State Climate Office provided all offsite data.

For the 2003-year, November (02'), February, March, April, May, June, and September experienced above average rainfall. The months of January and November recorded below average rainfall for the site. December (02'), July, August, and October, experienced average rainfall. Overall, 2003 experienced an average to above average rainfall year.

### **2.4 Conclusions**

For the 2003-year, eighteen of the twenty-three groundwater gauges met or exceeded the expected 12.5% jurisdictional wetland criteria. All four of the gauges in the upper landscape position met the success criteria of 5%-12.5%, while the gauge in the upland area reported saturation for less than 5% of the growing season, as expected.

The surface gauges in the riverine area demonstrated periods of inundation throughout the growing season. Gauge (SG-2), which is located in the stream, revealed periodic flooding. This gauge (SG-2) experienced malfunctions and also could not be downloaded due to hurricane debris during portions of the growing season. Gauge (SG-6) also experienced malfunctions throughout the growing season; therefore, no data is available for this gauge. Groundwater gauge (DS-29) is installed adjacent to (SG-6) and meets the success criteria for 27.6% of the growing season. Groundwater gauges (DS-28) and (DS-8), which are installed in the riverine area, both met success for 22.8% of the growing season. These three groundwater gauges (DS-8, DS-28, and DS-29), as well as the available surface gauge data show periodic inundation, which indicates a riverine system.

NCDOT proposes to discontinue hydrologic monitoring at the Dismal Swamp Mitigation Site.

Figure 3: 2003 Hydrologic Monitoring Results

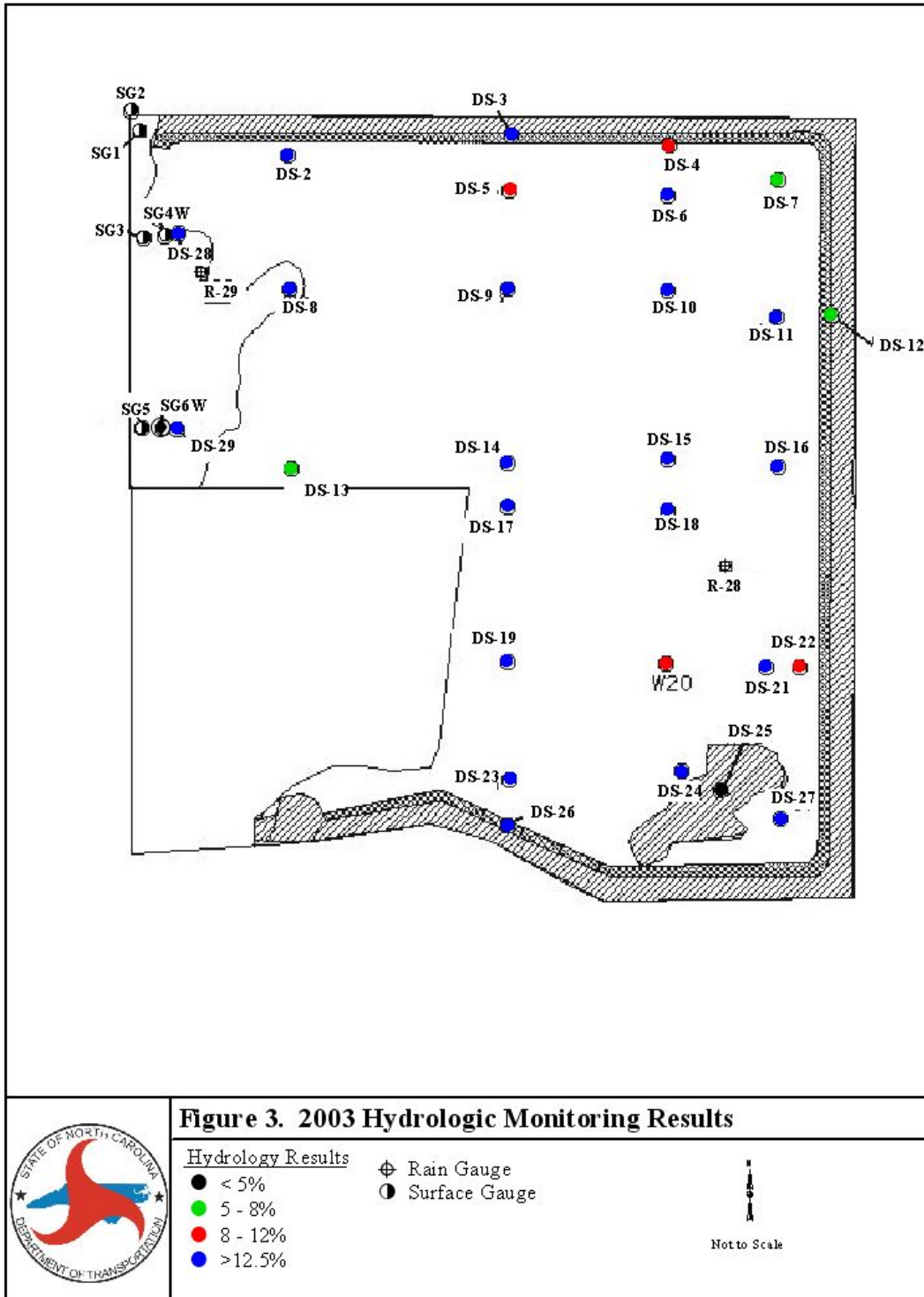
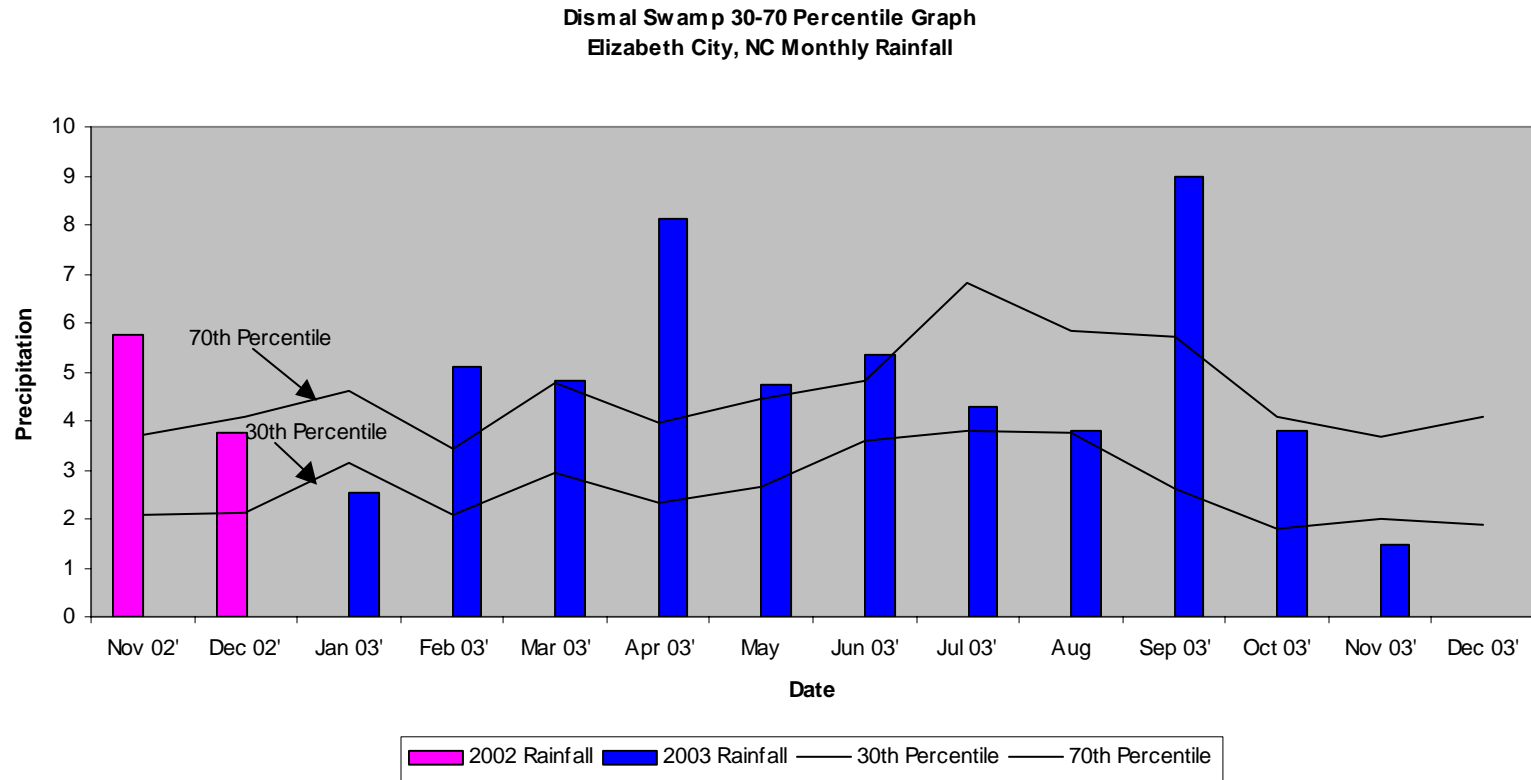


Figure 4. 30-70 Percentile Graph



### **3.0 VEGETATION: DISMAL SWAMP MITIGATION SITE (YEAR 5 MONITORING)**

#### **3.1 Success Criteria**

NCDOT will monitor the site for five years. A 320 stems per acre survival criterion for planted seedlings will be used to determine success for the first three years. The required survival criterion will decrease by 10% per year after the third year of vegetation monitoring (i.e., for an expected 290 stems per acre for year 4 and 260 stems per acre for year 5). The number of plants of one species will not exceed 20% of the total number of plants of all species planted.

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

The following species were planted in the Wetland Restoration Area:

##### **Zone 1: Non-Riverine Swamp Forest / Atlantic White Cedar (136 acres)**

*Taxodium distichum*, Baldcypress  
*Nyssa aquatica*, Tupelo Gum  
*Nyssa sylvatica* var. *biflora*, Swamp Blackgum  
*Chamaecyparis thyoides*, Atlantic White Cedar  
*Fraxinus pennsylvanica*, Green Ash  
*Quercus laurifolia*, Laurel Oak  
*Quercus falcata* var. *pagodaefolia*, Cherrybark Oak  
*Quercus michauxii*, Swamp Chestnut Oak  
*Quercus phellos*, Willow Oak  
*Quercus lyrata*, Overcup Oak

##### **Zone 2: Coastal Fringe Sandhill Forest (12 acres)**

*Nyssa sylvatica* var. *sylvatica*, Blackgum  
*Quercus marilandica*, Blackjack Oak  
*Quercus virginiana*, Live Oak  
*Pinus palustris*, Longleaf Pine  
*Quercus coccinea*, Scarlet Oak  
*Quercus michauxii*, Swamp Chestnut Oak  
*Quercus laevis*, Turkey Oak  
*Quercus laurifolia*, Laurel Oak  
*Quercus phellos*, Willow Oak

**Zone 3: Non-Riverine Swamp Forest Mineral Soil Subtype  
(315 acres)**

*Taxodium distichum*, Baldcypress  
*Nyssa sylvatica* var. *biflora*, Swamp Blackgum  
*Chamaecyparis thyoides*, Atlantic White Cedar  
*Fraxinus pennsylvanica*, Green Ash  
*Quercus laurifolia*, Laurel Oak  
*Quercus falcata* var. *pagodaefolia*, Cherrybark Oak  
*Quercus michauxii*, Swamp Chestnut Oak  
*Quercus phellos*, Willow Oak  
*Liriodendron tulipifera*, Yellow Poplar

**Zone 4: Riverine Swamp Forest (34 acres)**

*Taxodium distichum*, Baldcypress  
*Nyssa aquatica*, Tupelo Gum  
*Nyssa sylvatica* var. *biflora*, Swamp Blackgum  
*Quercus lyrata*, Overcup Oak  
*Chamaecyparis thyoides*, Atlantic White Cedar  
*Fraxinus pennsylvanica*, Green Ash  
*Quercus laurifolia*, Laurel Oak  
*Quercus falcata* var. *pagodaefolia*, Cherrybark Oak

### 3.3 RESULTS OF VEGETATION MONITORING

Table 4. VEGETATION MONITORING RESULTS

	Plot #	Green Ash	Willow Oak	Laurel Oak	Cherrybark Oak	Tulip Poplar	Baldcypress	Tupelo Gum	Atlantic White Cedar	Swamp Blackgum	Southern Red Oak	Swp. Chestnut Oak	Longleaf Pine	Scarlet Oak	Blackgum	Turkey Oak	Overcup Oak	Blackjack Oak	Live Oak	Total (5 year)	Total (at planting)	Density (Trees/Acre)	
ZONE 1	13	4		1	2		11		1	2										21	34	420	
	14		1	2			8	2				2								15	30	340	
	15	1		8	1		6		4											20	35	389	
	16	5	3	4	1		9		4											26	37	478	
	23	5		3			10		2			1								21	28	510	
	24		5				14		4	3										26	32	553	
	26	1	1		1		16		5				2							26	28	631	
	31	2	3				14	1												20	34	400	
	32	2					21	2		1		1						1		28	41	464	
	33	2	1	3	2		7		12	1								2		30	33	618	
	42	11		6			4		2	4										27	28	656	
	43	8					19													27	38	483	
	47	5		6																11	25	299	
	<b>ZONE 1 AVERAGE DENSITY</b>																						
ZONE 2	12	1										17	2		2		1		23	24	652		
	29		2	6								1	3		6			1	19	24	538		
<b>ZONE 2 AVERAGE DENSITY</b>																							<b>595</b>

### 3.3 RESULTS OF VEGETATION MONITORING (Continued)

	Plot #	Green Ash	Willow Oak	Laurel Oak	Cherrybark Oak	Tuip Poplar	Baldcypress	Tupelo Gum	Atlantic White Cedar	Swamp Blackgum	Southern Red Oak	Swp. Chestnut Oak	Longleaf Pine	Scarlet Oak	Blackgum	Turkey Oak	Overcup Oak	Blackjack Oak	Total (5 year)	Total (at planting)	Density (Trees/Acre)
<b>ZONE 3</b>	1	3	2	14			6			6									31	32	659
	2		2	3			12												17	29	399
	3		3	5			7												15	21	486
	4		2	5			8												15	24	425
	5	6		4	8		1			2	1	3							25	31	548
	6			1			3					2							6	28	146
	7	2	7	8	1		5												23	31	505
	8	4	2	1	1		22												30	39	523
	9				2		3												5	20	170
	10		1	4	3		4												12	28	291
	11				5														5	19	179
	17	1	11				8					1							21	29	492
	18		2	2	11		7					5							27	35	525
	19		3	1	8		5		2			1							20	32	425
	20	2	4	4	3		3												16	25	435
	21	3	4	5			16			1	3								32	34	640
	22	1	1	1	1		11			1									16	34	320
	25	3	6		8	1	2		1	1	1								23	23	680
	27	3	3	2	3		3		5										19	25	517
	28		1			1	6												8	22	247
	30		6		6		3		5	1									21	27	529
	34		2	1	1		1		3										8	36	151
	35		3	8	13		1		1	1									27	27	680
	36		5	1	4		14					2							26	42	421
	37	5		2	5	2	22												36	38	644
	38		4	7	7		9												27	30	612
	39	4	4	1			5			1	3								18	22	556
	40		7		8		1			1									17	30	385
	41	3	5	10			2		6										26	30	589
	48	5	4	2	11														22	30	499
<b>ZONE 3 AVERAGE DENSITY</b>																					<b>456</b>
<b>ZONE 4</b>	44					24													24	40	408
	45				1	17	1										1		20	36	378
	46			1		19													20	39	349
<b>ZONE 4 AVERAGE DENSITY</b>																					<b>378</b>
<b>TOTAL AVERAGE DENSITY</b>																					<b>463</b>

**Site Notes:**

Zone 1: Other species noted: smartweed, fennel, foxtail, ragweed, goldenrod, red maple, *Juncus* sp., switchgrass, cattail, pine, and Bermuda grass. Evidence of deer browsing.

Zone 2: Other species noted: sweetgum, goldenrod, and pine. Evidence of deer browsing.

Zone 3: Other species noted: pine, fennel, broomsedge, sweet gum, woolgrass, goldenrod, smartweed, foxtail, red maple, ragweed, various grasses, *Baccharis halimifolia*, *Panicum* sp., *Juncus* sp., switchgrass, *Aster* sp., pokeberry, Bermuda grass, and grapevine. Evidence of deer browsing.

Zone 4: Other species noted: switchgrass and smartweed. Evidence of deer browsing.

**3.4 Conclusions**

Of the 612 acres on this site, approximately 576 involved tree planting. There were forty-eight plots established throughout the planting areas, encompassing all plant communities. The 2003 vegetation monitoring revealed an average total density of 463 trees per acre, which is well above the minimum success criteria of 260 trees per acre.

NCDOT proposes to discontinue vegetation monitoring on the Dismal Swamp Mitigation Site.

## **4.0 OVERALL CONCLUSIONS/ RECOMMENDATIONS**

The Dismal Swamp Mitigation Site has shown success for the fifth consecutive monitoring year. Vegetation plots located in both phases reveal high tree survival. The total density average is 463 trees per acre, which is well above the success criteria of 260 trees per acre.

For the 2003 year, hydrology monitoring resulted in twenty-three of the twenty-eight gauges having met or exceeded their expected jurisdictional wetland criteria for the growing season.

The surface gauges in the riverine area demonstrated periods of inundation throughout the growing season. Gauge (SG-2), which is located in the stream, revealed periodic flooding. This gauge (SG-2) experienced malfunctions and also could not be downloaded due to hurricane debris during portions of the growing season. Gauge (SG-6) also experienced malfunctions throughout the growing season; therefore, no data is available for this gauge. Groundwater gauge (DS-29) is installed adjacent to (SG-6) and meets the success criteria for 27.6% of the growing season. Groundwater gauges (DS-28) and (DS-8), which are installed in the riverine area, both met success for 22.8% of the growing season. These three groundwater gauges (DS-8, DS-28, and DS-29), as well as the available surface gauge data show periodic inundation, which indicates a riverine system.

The 2003-monitoring year represents the fifth consecutive year that the site has been monitored for hydrology and vegetation. The monitoring results have shown that the site has succeeded in meeting the established success criteria, therefore NCDOT proposes to discontinue hydrology and vegetation monitoring on the Dismal Swamp Mitigation Site.

**APPENDIX A:**  
**GAUGE DATA GRAPHS**

**APPENDIX B**  
**SITE PHOTOS & VEGETATIVE MONITORING PLAN**

# Dismal Swamp



Photo 1



Photo 2



Photo 3



Photo 4



Photo 5



Photo 6



Photo 7



Photo 8



Photo 9



Photo 10



Photo 11

# DISMAL SWAMP MITIGATION SITE PHOTO AND PLOT LOCATIONS

