# ANNUAL REPORT FOR 2008 Monitoring Year 3



# **SALT Mitigation Site**

Cape Fear River Basin, Moore County, North Carolina

Submitted to: North Carolina Department of Environment and Natural Resources Ecosystem Enhancement Program Raleigh, North Carolina



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#### SALT TRACT MITIGATION SITE 2008 Annual Monitoring Report (Year 3)

#### SUMMARY

The 327 acre Sandhills Area Land Trust (SALT) Wetland Mitigation Site (Site) in Moore County, North Carolina was established by the North Carolina Department of Transportation (NCDOT) as mitigation for the R-210 (US Bypass) in 1998 and designated as permanent conservation status. Through an agreement with the North Carolina Ecosystem Enhancement Program (EEP) and NCDOT, EEP has accepted the transfer of all off-site mitigation projects. Therefore, EEP will be responsible for fulfilling the remaining requirements and future remediation for the Site. The NCDOT monitoring report format has been retained for clarity and continuity.

The following report summarizes the monitoring activities that have occurred in the past year at the Site. Monitoring Year 1 data were collected in 2006 by NCDOT – Roadside Environmental Unit. In Monitoring Year 2 (2007) monitoring was conducted by The Louis Berger Group, Inc. The 2008 monitoring report represents the third year of vegetation and hydrological monitoring. The Site must demonstrate both hydrologic and vegetation success for a minimum of five years or until the Site is deemed successful.

The Site contains a total of 13 hydrologic monitoring gauges. The 2008 hydrologic monitoring results revealed that 12 of the 13 monitoring gauges within restoration areas met the success criteria (groundwater within 12 inches of the surface for at least 12.5 percent of the growing season). The remaining monitoring gauge indicated groundwater within 12 inches of the surface for 1 to 5 percent of the growing season.

Approximately 15.9 of the 24.5 acres of the on-site reforestation effort were planted to approximate the bottomland hardwood community type. Approximately 8.6 acres of upland buffer were planted with longleaf pine. The 2008 vegetation monitoring results revealed an average density of 490 trees per acre of planted species. This average is above the minimum success criteria of 320 trees per acre after the third growing season.

#### 1.0 INTRODUCTION

#### 1.1 **PROJECT DESCRIPTION**

The Site is located in southern Moore County, immediately north of Lakebay Road (SR 2023) along the Little River, approximately 0.5 miles west of the town of Lobelia (Figure 1, Appendix A). It is located in hydrologic unit 03020201110040 (USGS). The Site is bordered to the north and west by forested land, to the east by agriculture, and to the south by SR 2023. The Site comprises 327 acres and includes restoration of both riverine hardwood and swamp forest wetlands.

# 1.2 PURPOSE

In order to demonstrate successful wetland mitigation, hydrological and vegetative monitoring must be conducted for a minimum of five consecutive years. Success criteria are based on federal guidelines for wetland mitigation. These guidelines stipulate criteria for both hydrological conditions and vegetation survival. The following report details the results of hydrological and vegetative monitoring at the Site during the 2008 growing season.

Included in this report are analyses of both hydrologic and vegetative monitoring results, as well as local climate conditions throughout the growing season, and site photographs.

#### 1.3 **PROJECT HISTORY**

December 2001	Site KG Sheared and Drum Chopped
July 2002	Site Sprayed
February 2003	Site Planted
January 2006	Ditches Plugged
January 2006	Monitoring Gauges reprogrammed
March-November 2006	Hydrologic Monitoring (Year 1)
February 2007	Vegetation Monitoring (Year 1)
April-October 2007	Hydrologic Monitoring (Year 2)
August 2007	Vegetation Monitoring (Year 2)
March-November 2008	Hydrologic Monitoring (Year 3)
October 2008	Vegetation Monitoring (Year 3)

#### 2.0 HYDROLOGY

#### 2.1 SUCCESS CRITERIA

In accordance with federal guidelines for wetland mitigation, the success criteria for hydrology state that the restoration areas must be inundated or saturated (within 12 inches of the surface) by surface water or groundwater for at least 12.5 percent of the growing season (consecutive days) during a normal precipitation year. Areas that have between 5 and 12.5 percent of the growing season may be considered wetlands under certain conditions. Areas inundated for less than 5 percent of the growing season are always classified as non-wetlands.

The growing season in Moore County begins March 23 and ends November 7. These dates correspond to a 50 percent probability that temperatures will not drop to 28 degrees Fahrenheit or lower after March 23 and before November 7 (NRCS, 1995). The growing season is 230 days.

# 2.2 HYDROLOGIC DESCRIPTION

In January 2006, 13 Remote Data Systems (RDS) continuous logging groundwater gauges were installed. The on-site gauge locations are shown on Figure 2 (Appendix A). The monitoring gauges record daily readings of depth to groundwater. This year's data represents the third growing season that the gauges have been monitored. The Site was designed to receive hydrologic inputs from rainfall, groundwater, and surface water from overbanking events. Biologists first visited the Site for Year-3 monitoring in July 2008. During the visit, Gauges 1, 2, and 3 were found to be submerged underwater due to beaver activity and remained underwater during all subsequent site visits. As a result, there is no recorded data for these three gauges. Visual observations during Site visits confirm that this area of the Site stays inundated for 100 percent of the growing season, as evidenced by photos in Appendix C. Gauges 6 and 9 were found to be non-functional, and were replaced on July 22, 2008. Gauge 7 was not found, and no reference to its status was made in the Year-2 Annual Monitoring Report. All other gauges were found in working order. Rainfall data was recorded by an on-site tipping bucket rain gauge.

# 2.3 RESULTS OF HYDROLOGIC MONITORING

#### 2.3.1 Site Data

The maximum number of consecutive days that groundwater was within 12 inches of the surface was calculated for each monitoring gauge and converted into a percentage of the 230-day growing season (March 23-November 7). The results are presented in Table 1.

Appendix B contains the hydrographs for each monitoring gauge for the current monitoring year. The corresponding rain data collected from the on-site rain gauge is also provided on each hydrograph.

Figure 2 provides the hydrologic results for the current monitoring year. Gauges highlighted in green indicate wetland hydrology for more than 12.5 percent of the growing season. Gauges highlighted in yellow are those that had wetland hydrology between 5 and 12.5 percent of the growing season. Gauges highlighted in red are those that had wetland hydrology less than 5 percent of the growing season.

Monitoring Gauge*	<5%	5-12.5%	>12.5%	Actual %	Success Dates	Number of Days Gauges met Success Criteria
STGW1*			~	100	March 23 – November 7	100
STGW2*			~	100	March 23 – November 7	100
STGW3*			~	100	March 23 – November 7	100
STGW4			~	40	August 8 – November 7	92
STGW5			~	54	July 7 – November 7	124
STGW6**			~	40	August 8 – November 7	92
STGW8			~	27	September 9 – November 7	63
STGW9**	~			4	September 9 – November 7	9
STGW10			~	27	March 23 – May 24	63
STGW11			~	33	March 23 – June 5	75
STGW12			~	31	August 28 – November 7	72
STGW13			~	33	March 23 – June 5	75
STGW14			~	32	March 23 – June 3	73

**Table 1**. SALT Tract Hydrologic Monitoring Results

\* - Gauge found inundated for 100% of the growing season due to beaver activity.

\*\* – Gauge installed on August 8, 2008

#### 2.3.2 Climatic Data

Figure 3 (Appendix A) provides an evaluation of the local climate in comparison with historical data in order to determine whether 2008 was a year with "average" rainfall. The bars are the monthly rainfall totals for the 2008 hydrologic year collected from the on-site rain gauge. Also represented on the figure are the 30<sup>th</sup> and 70<sup>th</sup> percentiles of monthly precipitation for the Clayton weather station. The historical data and monthly data were collected by the Natural Resources Conservation Service (Online NRCS, accessed 21 November, 2008).

A normal yearly rainfall in the area is approximately 48.9 inches. The total rainfall measured from November 2007 through November 2008 was approximately 49.4 inches. Months with below average rainfall include: November of 2007 and January, June, and October of 2008. August and September of 2008 received above average rainfall. All other months during this period fell within the 30<sup>th</sup> and 70<sup>th</sup> percentiles.

#### 2.4 CONCLUSION

The 2008 year represents the third year of hydrologic monitoring of the Site. In general, water levels showed a typical pattern of flooding during the spring, followed by a late summer and fall draw down period, punctuated by peaks associated with precipitation events. Overall, 9 of the 13 on-site monitoring gauges met the success criteria (groundwater within 12 inches of the surface for at least 12.5 percent of the growing season), and another three were permanently underwater. The remaining on-site monitoring gauge indicated groundwater within 12 inches of the surface for 4 percent of the growing season. It should be noted, however, that this gauge was not installed until August 8, 2008, and will continued to be monitored for future success.

#### 3.0 VEGETATION

# 3.1 SUCCESS CRITERIA

The success criteria state that at least 320 stems per acre must survive after the completion of the third growing season. The required survival criterion will decrease by 10 percent each year after the third year of vegetation monitoring. The 2008 monitoring report represents the third year of vegetation monitoring and requires a minimum survival of 320 stems per acre in order to meet success criteria. The number of plants of one species is not to exceed 20 percent of the total number of plants of all species planted. Vegetation monitoring followed methods described in the EEP Stem Counting Protocol. The taxonomic standard for vegetation follows Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas (Weakley, 2007). Photograph locations are shown in Figure 4 (Appendix A). Site photographs are provided in Appendix C.

# 3.2 DESCRIPTION OF SPECIES

The following tree species were planted in the wetland areas:

*Chamaecyparis thyoides*, Atlantic White Cedar *Taxodium distichum*, Baldcypress *Quercus laurifolia*, Laurel Oak *Nyssa sylvatica* var. *biflora*, Swamp Tupelo *Quercus nigra*, Water Oak *Quercus phellos*, Willow Oak

# 3.3 RESULTS OF VEGETATION MONITORING

The following table lists the densities of planted tree species recorded in each established 0.06acre (50-foot by 50-foot) plot marked with yellow fiberglass NCDOT stakes. (Figure 4, Appendix A). All 4 vegetation plots exceeded the minimum density requirements during Year 3 monitoring. An inventory of planted species is listed in Table 2.

Plot Number	1	2	3	4	Total
Atlantic White Cedar					
Charmaecyparis thyroides	7	22	3	16	48
Bald Cypress					
Taxodium distichum	1	2	1	8	12
Laurel Oak					
Quercus laurifolia	2	2	0	3	7
Swamp Blackgum					
Nyssa sylvatica var. biflora	6	1	9	12	28
Water Oak					
Quercus nigra	24	10	31	22	87
Willow Oak					
Quercus phellos	10	2	1	1	14
Total (2008, Year 3)	50	39	45	62	196
Total (2007, Year 2)	21	13	33	54	121
Total (2006, Year 1)	22	11	28	44	105
Total (2006, at Planting)	27	39	46	50	162
Density (Trees/Acre)	500	390	450	620	1960
Average Tree Density					490

T/	ABL	E 2:	Vegetation	Monitorina	Statistics
					0.000000

#### 3.4 CONCLUSION

Of the 327 acres on the Site, approximately 15.9 acres involved wetland tree planting. An upland area that consisted of 8.6 acres of longleaf pine was also planted. The 2008 vegetation monitoring results revealed an average density of 490 trees per acre of planted species. This average is above the minimum success criteria of 320 trees per acre after the third growing season. However, the total number of planted stems at each plot is comprised of more than 20 percent of one species, and water oak comprises 44 percent of the total number of remaining planted stems in all of the vegetation plots. Because of a lack of diversity, all four plots only partially meet established success criteria.

#### 4.0 **REFERENCES**

- NRCS. 1995. Soil Survey of Moore County, North Carolina. United States Department of Agriculture. 146pp.
- NRCS. National Water and Climate Center Climate Wetlands Information. (<u>http://www.wcc.nrcs.usda.gov/cgibin/getwetco.pl?state=nc</u>). 21 November, 2008
- Weakley, A.S. 2007. Flora of the Carolinas, Virginia, Georgia, and Surrounding Areas. Working draft of January 2007. University of North Carolina Herbarium, North Carolina Botanical Garden, University of North Carolina. 1015pp.

# APPENDIX A

#### FIGURES







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# **APPENDIX B**

# **GROUNDWATER GAUGE HYDROGRAPHS**



**SALT Tract** 

Month



Month

EEP Project No. 92675



Month

\*Gauge installed 7/22/08



Month



SALT Tract 2008 Monitoring Gauge 9\* - 1130EA3C

Month

\*Gauge installed 8/22/08



Month



**SALT Tract** 

Month

EEP Project No. 92675

B-7

SALT Tract Mitigation Site

![](_page_21_Figure_0.jpeg)

Month

![](_page_22_Figure_0.jpeg)

Month

![](_page_23_Figure_0.jpeg)

**SALT Tract** 

Month

EEP Project No. 92675

**APPENDIX C** 

SITE PHOTOS

![](_page_25_Picture_0.jpeg)

Photo Station 1, looking at inundation in vicinity of Gauges 1, 2, and 3. July 2008

![](_page_25_Picture_2.jpeg)

Photo Station 1 in August 2008

![](_page_26_Picture_0.jpeg)

Vegetation Plot 1

![](_page_26_Picture_2.jpeg)

Vegetation Plot 2

![](_page_27_Picture_0.jpeg)

Vegetation Plot 3

![](_page_27_Picture_2.jpeg)

Vegetation Plot 4