# DANIELS FARM I
# WETLAND RESTORATION
# MITIGATION PLAN
# AUGUST 2004

FULL DELIVERY PROJECT

CONSULTANT: KCI

## 1.0 INTRODUCTION

The Daniels Farm Wetland Restoration Project restored 31.72 acres of non-riverine wetland in the Tar-Pamlico River Basin. The project was initiated in spring of 2003 and construction was completed in the spring of 2004. The goals of the project are to restore ecosystem processes, structure, and composition to mitigate for wetland functions and values that have been lost as a result of anthropogenic disturbances in this region of the Tar-Pamlico River Basin. Functions that will be restored as a result of the restoration include:

- Aquatic/Terrestrial Wildlife Habitat
- Water Quality
- Ground water Recharge
- Nutrient Cycling
- Low Elevation Seep and non-riverine Wet Hardwood Communities

## 2.0 SUMMARY

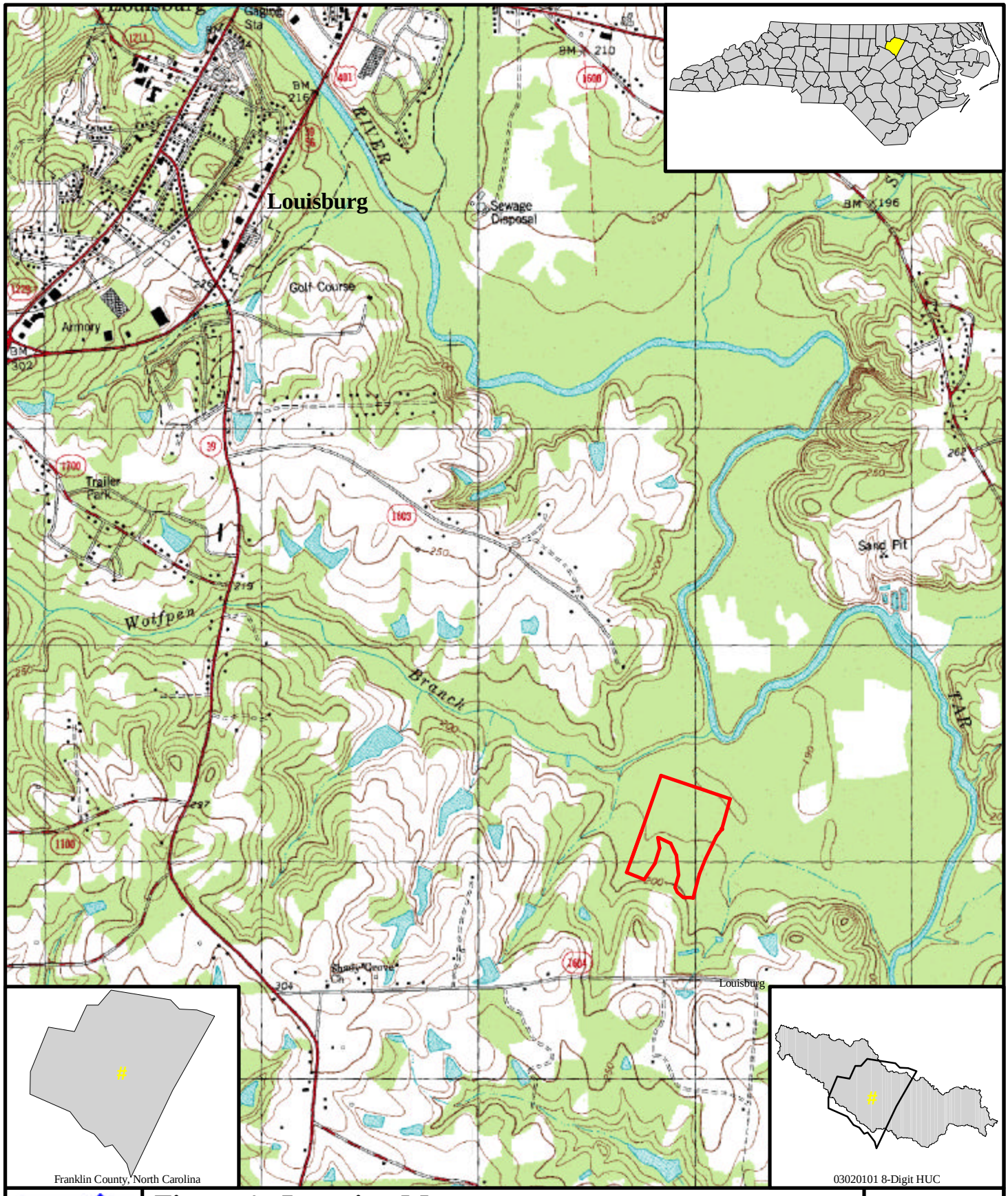
The Daniels Farm Wetland Restoration Site is located within the Tar-Pamlico River Watershed (USGS Hydrologic Unit 03020101 and North Carolina Division of Water Quality (NCDWQ) sub-basin 04-00-70 (Figure 1). The watershed is located in the Raleigh Belt of the Piedmont physiographic region. The local watershed drains approximately 101 acres consisting of 56 acres of agriculture, 39 acres of forest and 6 acres of urban land uses.

The site is located approximately 1260 feet north of Egypt Church Road (SR 1604) along the western property line of the Clyde Daniels Farm, south-southeast of Louisburg in Franklin County, North Carolina. The 33.93 acres that comprise the site are situated on portions of NRCS Farm Tract T3792, Field 13 (25.4 acres) and Farm Tract T3791, Field 1 (20.6 acres). Current land use/land cover is agriculture, with mixed deciduous and evergreen forest around the perimeter to the west and east, and agricultural farm fields adjacent to the site to the north and south.

Historical site conditions were reviewed to understand the chronology of land use at the site and to assist in the development of an appropriate restoration strategy. Aerial photographs of the site were obtained from the U.S. Department of Agriculture, Natural Resources Conservation Service District Office in Franklin County for the years 1938, 1955, 1973, 1982, and 2000. Based on the historical aerial photographs reviewed, it appears that the Daniels Farm Wetland Restoration Site was forested until 1982, when it was cleared and utilized for agriculture. There is no visible evidence of other mass disturbance such as filling or mining on the site in any of the reviewed photographs.

A detailed soils investigation was conducted to determine the extent and distribution of the hydric soils on the site. KCI soil scientists identified the following primary soil series on the property: Altavista (Fine-loamy, mixed, semiactive, thermic Aquic Hapludults), Augusta (Fine-loamy, mixed, semiactive, thermic Aeric Endoaquults), Roanoke (Fine, mixed, semiactive, thermic Typic Endoaquults), and Toisnot (Coarse-loamy, siliceous, semiactive, thermic Typic Fragiaquults). The Roanoke and Toisnot soil series are listed as hydric soils in Franklin County because of saturation for a significant period during the growing season. Altavista and Augusta soils are not considered hydric but have inclusions of hydric soils within the soil mapping unit. The Roanoke and Toisnot hydric soils comprise approximately 89 percent of the site, while Altavista, Augusta and other non-hydric inclusions cover approximately 11 percent of the site.

Site hydrology was evaluated during field investigations and by applying a water budget analysis to the site. The hydrologic source for the site is based on high groundwater, overland surface flow, and groundwater seeps and springs; no natural streams are found in the proposed restoration area. An apparent topographic divide near the southern end of the site directs water to the western and northern sides of the site to existing drainage ditches that flow east. Water directed to the other side of the topographic divide flows toward the eastern and northern sides of the site, where there are smaller drainage features (grassed waterways) that direct water downslope to the north and offsite toward constructed ponds to the east.




# Figure 1. Location Map

Site Boundary

N

1000 0 1000 Feet

*Source: 7.5' USGS Topographic Quadrangle - Lousiburg*

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Much of the water on the site is attributed to a relatively high water table and numerous groundwater seeps located in the central and eastern portions of the site. Several seeps or springs are found upslope of the project area, indicating groundwater discharge is prominent in the local vicinity seasonally from November to March. The site groundwater was evaluated by monitoring the water level with eight on-site Solinst Level logger gages, a barometric control gage, and a Level logger gage.

Both surface water and groundwater were removed from the site via grassed waterways and ditches. A significant portion of the surface water draining to the site was diverted around and away from the site via a ditched channel and a farm drainage ditch, which ran parallel to each other along the western edge of the site, and eventually drained to the Tar River north of the site. Additionally, grassed waterways were constructed to channel water away from groundwater seeps, draining the central and eastern parts of the site. The farm drainage ditch flowed north then east into a lateral drainage ditch that bisected the site. The lateral ditch flowed from the western site boundary to the eastern boundary, and then continued offsite.

Site hydrology was modeled by developing an annual water budget that calculates water inputs and outputs, and the change in storage on a monthly time step. The hydrographs for the average, dry, and wet years show a similar pattern of seasonal water table levels. Water table recharge occurs during the late fall and winter months until a rapid water table draw down occurs as PET rates increase in the spring. During the summer, the water budget model showed the site was unsaturated within the upper 36 inches of soil. The proposed conditions water budget showed the annual hydrographs for the same three climatic years, reflecting dry, average, and wet conditions. Without the estimated groundwater loss from the ditch/drainage network, the water table recharges earlier in the fall, maintains a shallower soil depth for a greater duration, and remains within 12 inches of the soil surface for a greater proportion of the growing season.

The clearing, draining, and conversion of the site to agriculture altered its natural wetland ecological function and diminished its capacity for natural biological productivity, biogeochemical cycling, nutrient cycling, and water quality enhancement. Lateral drains, grassed waterways and the ditching effectively altered the hydrology of the site, decreasing the amount of water available for soil saturation and extended periods of inundation.

Restoration of the site focused on the removal of hydrologic alterations and reforestation of the site with species common to Low Elevation Seeps and Non-riverine Wet Hardwood Forests. The restoration activities resulted in substantial enhancement of the existing water quality and habitat functions onsite. Elimination of channelized flow from agricultural ditches that drain in two different directions to the Tar River reduced nutrient, pesticide and sediment runoff from the site and improved downstream water quality in the Tar River. Ditch plugging and filling resulted in increased short-term surface and subsurface water storage, and a subsequent increase in the duration and elevation of the seasonally high water table.

Specific actions conducted to achieve the goals and objectives of the project included:

- Filling the primary drainage ditch along the western site boundary
- Filling the farm drainage ditch along the western site boundary
- Plugging the lateral ditch with a ditch plug
- Filling the grassed waterways
- Removing ditch spoil from wooded areas to restore natural seepage patterns
- Placing water diversion features, where appropriate, to redistribute the surface hydrology
- Placing restrictive berms, where appropriate, to reduce runoff and enhance infiltration
- Recreating microtopography across the site to enhance surface water retention and storage
- Ripping the ground surface to reduce compaction from pastured cattle
- Re-vegetating the site with Low Elevation Seep and Non-riverine Wet Hardwood Forest species

Designed/Monitoring by; KCI Associates of North Carolina, PA

Construction by; KCI Environmental Technologies and Construction Inc.

## 3.0 SUCCESS CRITERIA

### 3.1 Hydrology

Groundwater elevations will be monitored to demonstrate the attainment of jurisdictional hydrology. Wetland hydrology will be considered established if well data from the site indicates that the water table is within 12 inches of the soil surface for 5% of the growing season (NRCS published or locally calculated) during normal weather conditions. A "normal" year was based on NRCS climatological data for Franklin County, and using the 30$^{th}$ to 70$^{th}$ percentile thresholds as the range of normal, as documented in the USACOE Technical Report "Accessing and Using Meterological Data to Evaluate Wetland Hydrology, April 2000." According to the USDA, NRCS Franklin County Soil Survey, the growing season is considered to extend from March 20 to November 11, yielding 235 days. Therefore, success will be achieved if the water table is within 12 inches of the soil surface for 12 days during the growing season.

### 3.2 Vegetation

The success criteria for the planted species in the restoration areas will be based on survival and growth. Survival of planted species must be 260 stems/acre at the end of five years of monitoring. Non-target species must not constitute more than 20 percent of the woody vegetation based on permanent monitoring plots.

### 3.3 Soils

Soils in the restoration portion of the site have been determined to be Roanoke and Toisnot, both hydric soils on the state and federal hydric soils lists. NRCS verified the limits of hydric soils and confirmed there status as Prior Converted wetland. As soils are already considered hydric, no success criteria or monitoring is required.

## 4.0 MONITORING SCHEDULE

The site will be monitored for a period of five years beginning in 2004 through 2009 or until success criteria are achieved. Reports will be submitted to EEP in December of each year. Monitoring will include collection of vegetative and hydrologic data, photo documentation and an annual site walk through (see "As-Built Plans" for locations). Annual reports will be submitted to the EEP, documenting the monitored components i.e. hydrology, vegetation, and will include all collected data, analysis and photographs.

### 4.1 Hydrology

Groundwater elevations will be monitored to demonstrate the attainment of jurisdictional hydrology. Verification of wetland hydrology will be determined by automatic recording well data, collected within the project area. Automatic recording wells will be established within restoration areas at a density of one automatic well per four acres (8 wells total). Daily data will be collected from automatic wells over the 5-year monitoring period following implementation.

### 4.2 Vegetation

The success criteria for the planted species in the restoration areas will be based on survival and growth. Permanent monitoring plots have been established in wetland restoration areas at a density of one plot (100 square meters) per four acres (eight plots total) and systematically located to ensure even coverage. Data will be collected at each plot for: total number of stems, species, percent survival, height, estimated percent cover of all species, and evidence of insects, disease and browsing.

## 5.0 MITIGATION

Mitigation for wetland impacts will be achieved through the restoration of Prior Converted wetlands on the site. The site is 33.93 acres of land 31.72 of which has been classified as Prior Converted wetland due to artificial drainage on the site (PC Wetland per NRCS) (Figure 2). The restoration of the site removed artificial drainages and re-vegetated 10.29 acres of Low Elevation Seep and 21.43 acres of Non-riverine Wet Hardwood Forest that historically occupied this landscape position. The restoration of these wetlands will result in 31.72 wetland credits to offset un-avoidable wetland impacts in the Tar-Pam River Basin.

# Figure 2. Restoration Type and Extent

Site Boundary
Wetland Restoration
Upland Preservation/Enhancement

N

200 0 200 Feet

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*Source: March 2000 Aerial Photographs, Franklin County GIS*

## 6.0 MAINTENANCE AND CONTINGENCY PLANS

Activities will be conducted throughout the year and may include: invasive control, debris or trash removal, etc. If the monitoring of the site thereafter identifies a failure to attain specific success criteria, a remedial action plan will be developed which investigates the cause of the failure and proposes actions to rectify the problem.

Contingency and maintenance plans were developed to help ensure the proper maintenance of the restored wetlands, in order to promote the long-term success of the restoration project. Corrective actions, as detailed in Table 1, will be taken to rectify identified site problems as well as to address monitoring findings that indicate a failure to meet established success criteria.

**Table 1 - Contingency Plans.**

| | ***Identified Problem*** | ***Corrective Action*** | ***Timeframe*** |
|---|---|---|---|
| **WDT's** | 1. Localized erosion | Reestablish eroded section reseed with appropriate mix, and apply coir matting to stabilize. | Immediate. |
| | 2. Excessive debris creating obstruction or diversion of flow. | Remove obstruction, by hand if possible. If needed, correct erosion problem. | Immediate. |
| | | | |
| | | | |
| **Vegetation** | 3. Woody vegetation not meeting success criteria | Determine reason for failure, determine quantity of plantings required to replant, develop list of species to be utilized, and install in accordance with original design specifications. | Seasonally (during dormancy) |
| | 4. Barren areas void of herbaceous vegetation. | Determine reason for failure, prepare area applying topsoil and amendments as necessary, and reseed with appropriate mix. | Immediate. |
| | 5. Invasive Species | Hand removal of or herbicide application to invasive plants. | Immediate. |

Guidance related to the approved seed mixture to be used in the event any reseeding activities are necessary is provided in Table 1.

**Table 2 - Re-seeding Specifications.**

**Riparian Buffer (All areas outside top of stream banks):**

Summer Mix (April 15 – October 15)

| Species | | Application Rate (in Mix) % of Mix | lbs./acre |
|---|---|---|---|
| Redtop | *Agrostis alba* | 5 | 1.5 |
| Purple Lovegrass | *Eragrostis spectabilis* | 5 | 1.5 |
| Gama grass | *Tripsacum dactyloides* | 35 | 10.5 |
| Switchgrass | *Panicum virgatum* | 30 | 9.0 |
| Brown Top Millet | *Pennisetum glaucoma* | 25 | 7.5 |
| | TOTALS | 100 | 30.0 |

Winter Mix (October 15 – April 15)

Same as above except substitute Rye Grain (*Secale cereale*) for Brown Top Millet.