

# Cow Swamp Watershed Plan Summary

## About the Watershed Plan

The Ecosystem Enhancement Program (EEP), a non-regulatory program within the NC Department of Environment and Natural Resources, sponsored a local watershed planning project in four watersheds in the middle Tar-Pamlico River Basin. These watersheds drain to Green Mill Run, Cow Swamp, Crisp Creek, and Hendricks Creek. The Watershed plans were completed in 2005.

The watershed plans were developed through a collaborative effort with local governments, resource professionals, and other local stakeholders. This group, called the Tar-Pam Local Watersheds Advisory Group, reviewed the

technical work and provided suggestions and feedback throughout the planning process.

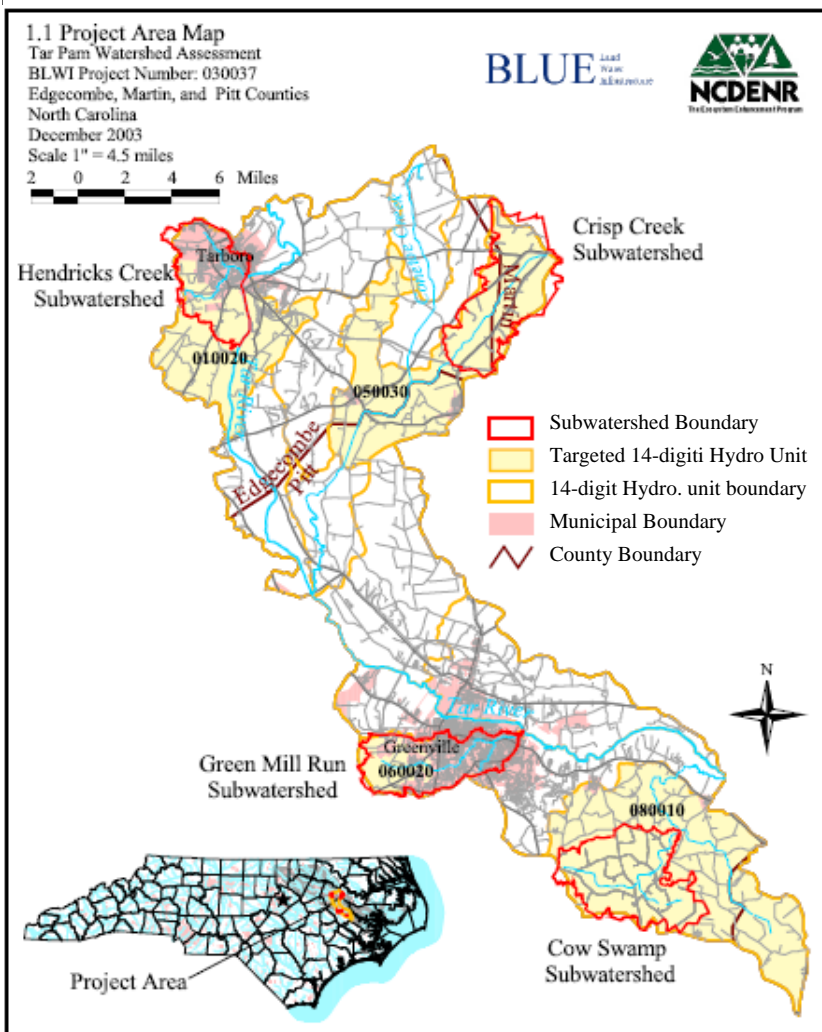
The purpose of the planning process was to assess the health of the watersheds, identify issues that can be addressed through a watershed plan, set priorities, identify watershed protection and restoration projects and eventually secure funding and implement projects in the communities. The recommendations are reflected in reports for each watershed titled **Rehabilitation Plans**, with potential projects identified in the **Site Atlases**. These 2 documents comprise the watershed plans.

BLUE: Land, Water, Infrastructure (BLWI) conducted the technical watershed assessments and developed the Rehabilitation Plans and Site Atlases. Watershed Education for Communities and Local Officials (WECO) at NC State University coordinated public involvement during the process.

This Fact Sheet summarizes the results of this work for the Cow Swamp watershed.

### The Cow Swamp watershed is:

- a tributary to Chicod Creek, which flows into the Tar River.
- located in Pitt County.
- 17.9 square miles (11,456 acres)
- although not in a municipality, contains the crossroads communities: Hudsons Crossroads, Black Jack, and Hams Crossroads.
- within the Chicod Creek legal drainage district
- primarily cultivated and wooded, at 52% and 47% respectively. Less than one percent of the area was developed in 1992, but since growth has occurred along most of the roads. Proximity to Greenville makes increased growth likely.
- subject to several environmental regulations, including the Tar-Pamlico Nutrient and Buffer Rules, and the EPA Clean Water Act Phase II Stormwater Rules.



## Why Cow Swamp?

EEP is charged with finding stream and wetland restoration sites to mitigate for future NCDOT road impacts, as well as mitigating for Tar-Pamlico Riparian Buffer offset payments. The EEP selects areas for local watershed planning that meet the following criteria: NCDOT projects will impact wetlands and streams in the river basin (here it is the Tar-Pamlico River Basin); water bodies in the watersheds are degraded; potential opportunities for improving watershed functions exist; opportunities for achieving mitigation credits through qualifying restoration projects exist; and local citizens express interest in participating.



## The Watershed Characterization

The first step of the watershed assessment was a characterization of the watershed using existing data and information, such as that found in land use plans, water quality reports, floodplain maps. Much of the work involved using Geographic Information System (GIS) mapping techniques. Cow Swamp was divided into 6 drainage catchments for analysis.

The analysis looked at:

- Sediment and nutrient movement in the watersheds
- State of stream buffers
- Wetlands- existing and altered
- Land use/land cover
- Population
- Water quality and flooding
- Regulations

The report outlined general subwatershed statistics; historical trends; watershed functions; water quality characteristics and recommended sampling schemes; initial screening level water quantity and water quality modeling; as well as possible solutions to the problems identified by the analysis.

The following stressors that impact the watershed were found:

- Deeply channelized/unbuffered streams

- Agriculture crops in the riparian zones
- Drained wetlands
- 303d listed streams (streams on the state’s list of impaired waters)

As BLWI completed the characterization, WECO interviewed local stakeholders to learn issues of concern and identify who would want to participate on the Tar-Pamlico Local Watersheds Advisory Group. The Group’s first task was to review the characterization, and then to review a map of the watershed to indicate areas of concern or interest. This information was used to determine where to further investigate watershed conditions and select project sites.

The Team also discussed how they wanted the watershed to function. Their concerns were considered in the goals and objectives of the watershed plan. Overall, the goal is to improve the functions of the watershed while considering development and agriculture. The plan aims to protect and improve water quality, aquatic habitat, terrestrial habitat, and baseflow and flood prevention.

With this information in hand, BLWI conducted the next phase of the watershed assessment.

**A HEALTHY WATERSHED NATURALLY PROVIDES MANY FUNCTIONS, INCLUDING WILDLIFE HABITAT, MAINTAINING BASE WATER FLOWS IN STREAMS, FLOOD CONTROL, AND PROCESSING POTENTIAL POLLUTANTS TO PROVIDE CLEAN WATER.**

## Gathering Information for the Rehabilitation Plan

The next step of the watershed assessment involved the following tasks to gather and analyze information for the Rehabilitation Plan. The results of these tasks were analyzed to determine the projects that would help with rehabilitation in each of the six catchments. These projects are summarized on page four.

**Land Use Trending:** Land use / land cover (LULC) has a major influence on watershed function. Areas of land use change can cause watershed function degradation. Goals were to establish a growth pattern to predict future growth areas so that steps can be taken now to alleviate future growth-related impacts to watershed health, and to quantify the amount of impervious surface (IS) in

the watershed.

As the percent IS increases in a watershed, the level of stream quality decreases (although degradation can still occur with low IS). Geographic Information System (GIS) mapping using satellite imagery was used to conduct the trending analysis. All catchments in Cow Swamp had small percentages of impervious surface, with increases expected.

## Gathering Information for the Rehabilitation Plan

**Coastal plain stream assessment:** The condition of each stream reach was evaluated relative to unaltered reaches of the same type. Riparian (streamside) ecosystem functioning depends upon the condition of the stream itself, which incorporates onsite and upstream influences, and upon the condition of its adjacent riparian zone. The condition of the riparian zone and the stream channel were evaluated using 8-9 indicators of riparian condition for each reach.

Each stream reach was provided a score, higher scores indicating better condition. The possible conditions, with the percentage of each type found in Cow Swamp watershed include:

- relatively unaltered (85-100):* none
- somewhat altered (55-84):* 15%
- altered (25-54):* 35%
- severely altered (0-24):* 50%

Overall the watershed scored an average of 35 out of 100.

**Habitat analysis:** Habitat was analyzed using NCCREWS (North Carolina Coastal Region Evaluation of Wetland Significance) and comparing to the LULC data. The majority of the land area is used for agriculture, managed pine plantations or residential housing. The natural communities in these areas have been destroyed or degraded. Forests provide a less altered habitat, although are subject to harvesting. The best habitat is likely found in wetlands, particularly those not altered. A maximum of 968 acres is estimated as potentially high quality habitat (8% of watershed). Drained wetlands and pine plantations may provide shelter and some food but are not considered high quality habitat.

**Watershed modeling:** The “MUSIC” model (Model for Urban Stormwater Improvement Conceptualization) provided a mathematical representation of land uses and impacts on water quality in the watershed. The goal was to assess the relative pollutant removal performance of proposed structural stormwater Best Management Practices (BMPs) and restoration projects. Inputs into the model include local water quality data, percentages of impervious surface, properties of soil, infiltration, and other parameters.

BLWI calculated pollutant removal for two scenarios, to estimate the impacts of targeting different projects:

1. Implement all projects with 3 or fewer landowners
2. Implement all projects.

Scenario (2) produced the most substantial water quality improvement while the other scenario showed a much lesser degree of improvement.

Pollutant	1. ≤ 3 owners	2. All Projects
Total Suspended solids	22%	73%
Phosphorus	18%	54%
Nitrogen	23%	71%

Table 1: Pollution Removal for proposed projects

## Rehabilitation Plan Conclusions

Cow Swamp is an urbanizing agricultural watershed with an immense network of unbuffered ditches and channels. This lack of streamside vegetation is one of the primary problems in the watershed. Buffers are recommended for all of the unbuffered streams. Any stream reach should be analyzed before installing buffers to determine if a grass or woody buffer is more appropriate. Buffers and other BMPs should also be installed along secondary ditches. Widespread creation of buffers along surface water drainage features (canals, ditches, streams, swamps, etc.) is directly related to higher pollutant removal. The beaver activity on the downstream portion of Cow Swamp has created a large flooded wetland area that is important to the watershed as it provides unique habitat, water quality improvement and flood water retention.

The presence of the drainage district limits opportunities for traditional restoration of the non-flooded high order streams. Alternative ways to improve water quality and hydrology should be evaluated. Open space throughout the watershed, particularly wet flats and riparian corridors, should be set aside during development. Various types of urban BMPs, including bioretention, constructed wetland, and vegetated swales, should be implemented as future development comes in. Projects in the headwaters, as well as the large beaver wetland area, could treat the water before it gets to Cow Swamp and lessen the downstream inputs to the 303-d listed Chicod Creek.

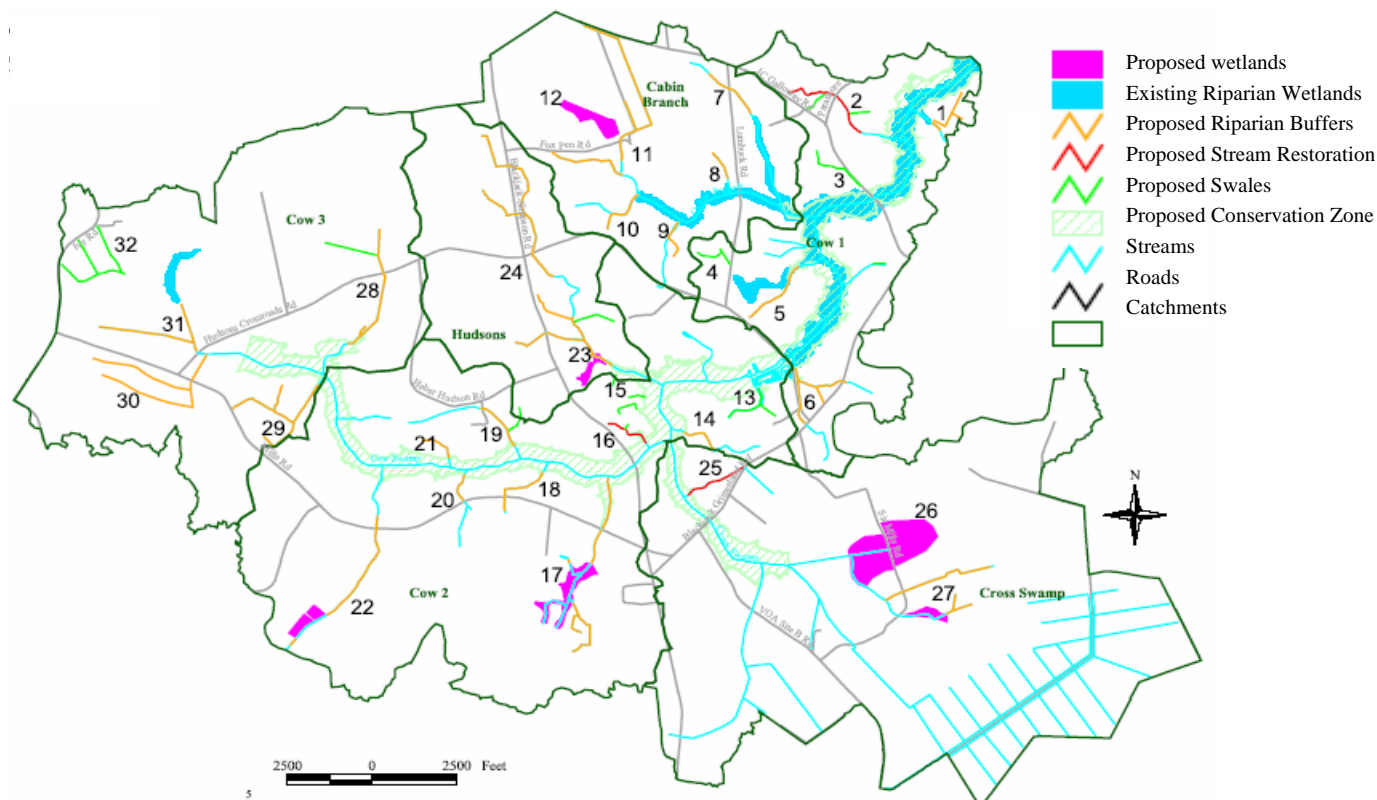


## The Site Atlas: A catalogue of potential restoration projects

The watershed assessment results were analyzed to determine potential projects that could help rehabilitate each catchment. The list of potential projects is not exhaustive, but represents the projects found with the techniques and resources available. The projects identified are based on ideal conditions for meeting the watershed goals. They will be implemented if the land-

owners choose to participate.

The 32 projects identified include swales, stream restoration, riparian buffer planting, and wetland restoration. The projects are indicated by numbers on the map below. Full details of each project are available in the Cow Swamp Site Atlas.



## Putting the Plans Into Actions

EEP can fund many of the projects identified in the Site Atlas. However, some of the projects may not meet EEP's funding criteria and would have to be implemented by other parties using other funding sources. Other possible projects that could help the watershed may still be identified. EEP will work with Watershed Group members to meet with landowners and discuss possibilities for participating in projects.

A CD containing the complete set of watershed plan documents is available from the EEP. The following documents are included:

- Watershed Characterization Report (Jan 2004)
- Watershed Rehabilitation Plan (June 2005)
- Site Atlas (May 2005)

To contact the NC Ecosystem Enhancement Program, call **(919) 715-0476** or visit **www.nceep.net**

For more information about the planning project, visit the Project Website: **www.ces.ncsu.edu/WECO/Tar-Pamlico**

The following organizations had representatives participate on the Tar-Pam Local Watersheds Team:

- City of Greenville Public Works Dept.*
- Edgecombe County Drainage District*
- Edgecombe Soil & Water Conservation District, and NRCS*
- Edgecombe Cooperative Extension Service*
- Edgecombe County Planning Department*
- Martin County Natural Resources Conservation Service*
- NC Cooperative Extension Service (Edgecombe and Pitt County Centers)*
- NC Division of Forest Resources*
- NC Division of Water Quality*
- NC Wildlife Resources Commission*
- Pitt County Planning Dept.*
- Southeastern Drainage Office*
- Town of Tarboro (Planning, Parks & Recreation, Public Works Depts.)*
- Upper Coastal Plain Council of Governments*