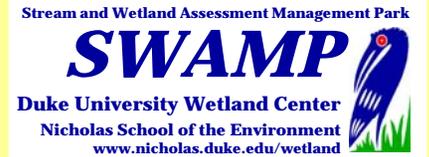


Welcome to SWAMP

The Stream and Wetland Assessment Management Park

Established 2007



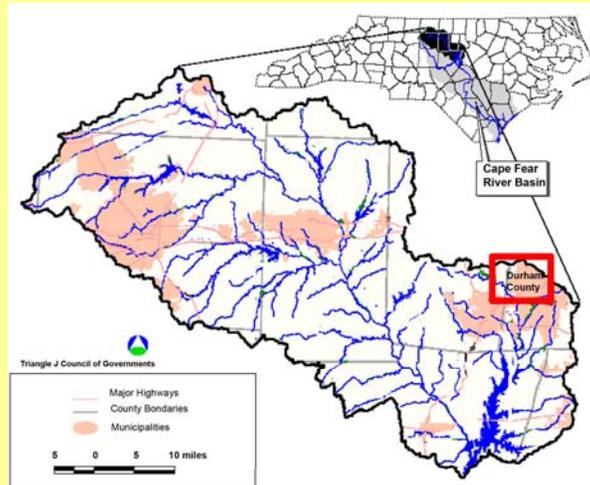
SWAMP'S PURPOSE:

Improve Water Quality

Better Habitat for Wetland Species

Outdoor Research Facility

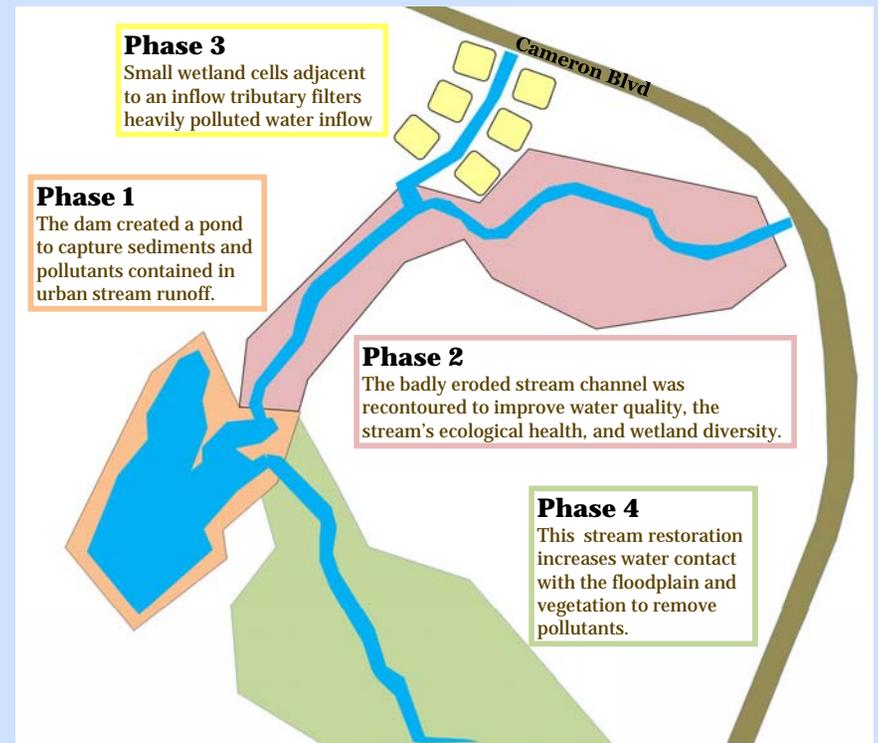
Education



Where does the Water Go?

When rain falls on Duke University's West Campus and other parts of the City of Durham (area outlined in red), the water picks up lawn fertilizer, auto petrochemical residue, and sediment. It then runs off into Sandy Creek, which flows into New Hope Creek and ultimately into Jordan Lake. Jordan Lake is an important drinking water supply for much of the Triangle Area.

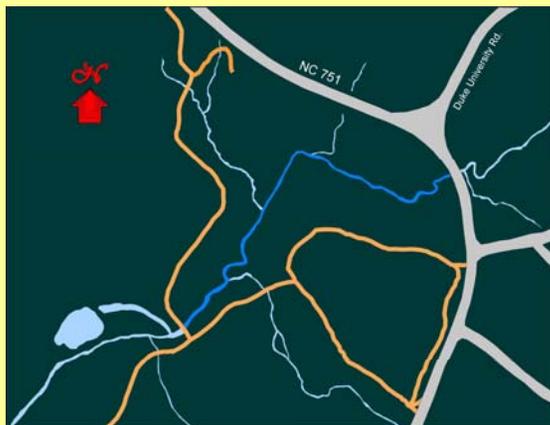
Sandy Creek Restoration Project



Go with the Flow

The Sandy Creek Stream Channel Restoration

Before



What Changed?

Physical Changes

Creation of New Stream: A new stream channel (photo lower right) was created near the old degraded stream.

- Instead of being straight (Before map upper left, channel in dark blue), the new channel has meanders, bends and turns that slow down water flow and help to reduce erosion (After map upper right, channel in dark blue).
- Channel depth was decreased to reestablish the stream's connection with its floodplain.
- A structure called a rock cross vane was installed just upstream of the viewing platform to stabilize the new creek channel (photo lower right) and control water levels.

Removal of Old Stream: The old channel (photo lower left) was partially filled in to prevent the stream from moving back to its original location, but parts remained unfilled to provide reptile and amphibian habitat.

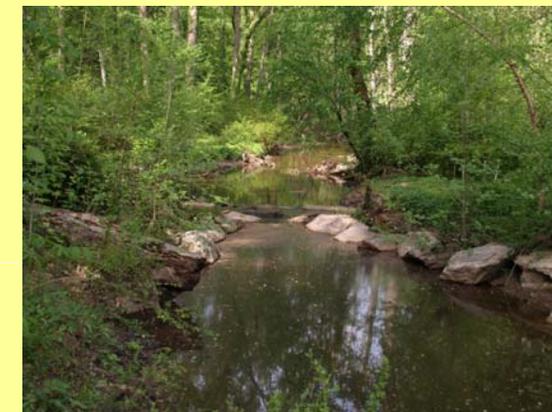
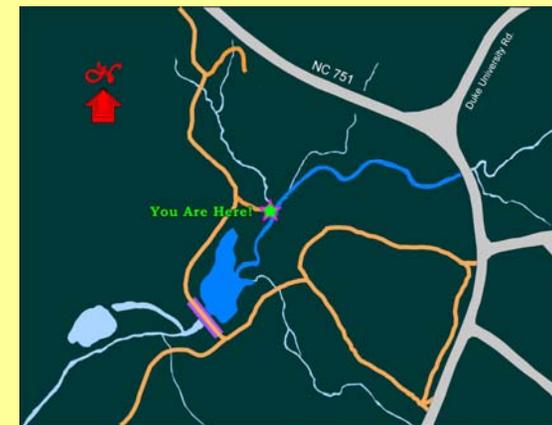
Ecological Changes

Water Quality Improvements: When the water makes longer contact with the ground and plants, many harmful pollutants (such as chemicals, fertilizers, and bacteria) are removed.

Planting of Wetland Vegetation: The removal of some invasive species and the planting of new native species that are well adapted to wetland conditions improves habitat and provides food and shelter for wetland animals.

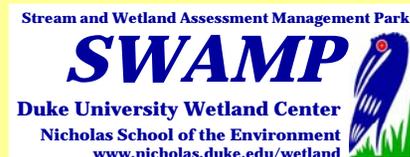
Habitat Variety in Streams: Pools (deep and slow parts) and riffles (fast and shallow parts) provide more areas for water invertebrates, fish, amphibians, and reptiles to live.

After



Wetlands are for the Birds!

Birds in the Duke Forest Wetland



Water Birds



Belted Kingfisher



Mallard



Great Blue Heron



Green Heron

Does restoration affect native bird species?

The effect of stream and wetland restoration can vary depending on the bird species and their habitat requirements.

Positive Effects: In this restoration project, a retention pond was created that provided a more suitable habitat for some water bird species that would not have been able to use this area previously. Additionally, increasing the quality of the ecosystem through improvements in water quality and riparian vegetation can positively impact higher levels of the food web, including birds.

Negative Effects: During the restoration process, heavy machinery is often used that can disrupt the existing vegetation. Additionally, large trees may need to be removed in the process of reshaping the stream channel. These processes can have a negative effect on species that require large trees and dense overstories until the vegetation has had time to redevelop.

Song Birds



Carolina Wren



Northern Cardinal



Eastern Bluebird



Song Sparrow

Raptors



Red-Shouldered Hawk



Red-Tailed Hawk

What did you see?

Nearly 100 bird species have been seen along the SWAMP trails and by the bird blind here at the pond. You can contribute to citizen science by reporting the bird species you see at SWAMP. For more information, visit

www.nicholas.duke.edu/wetland/swampbird.html

SWAMP is listed as a birding hotspot on eBird.org.

Woodpeckers



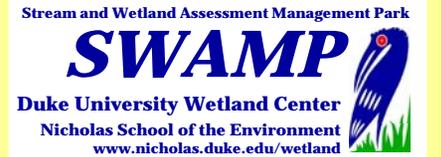
Red-bellied Woodpecker



Downy Woodpecker

Stormwater Retention Pond

Damming Sandy Creek to Retain and Treat Urban Stream Water



Creating the Wetland Retention Pond



Trees were cleared, and the land was sculpted to make room for the pond.

A dam was built to control water levels in the pond and upstream wetland.



The pond was filled, and water quality and wetland habitat improved.

Functions of the Retention Pond

Slower Water Flow

Water moves more slowly through the entire stream system as it backs up behind the dam, reducing the potential for stream bank erosion. Nearly 500 tons of sediment are retained annually by the pond and wetlands.

Improved Water Quality

The slower water flow provides more time for sediment and pollutants to settle out before flowing downstream to Jordan Lake, a drinking water source for the Triangle area.

New Habitat

New aquatic habitat for a variety of wetland plants and animals was created in the pond and at its edges.



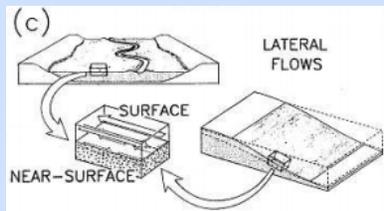
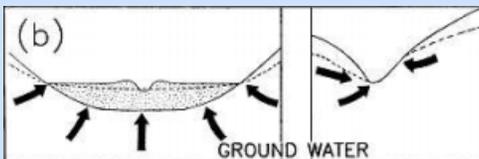
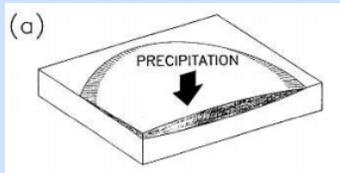
What do You Need for a Wetland?

Three Characteristics of Wetland Ecosystems

Water

Water must be at the ground's surface, or just below it, for at least several weeks when plants are growing. These wet conditions must occur in most years.

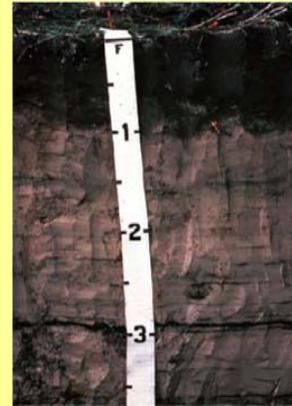
Sources of Water to Wetlands



Wetland Soil

When soil is saturated with water for a long time and soil oxygen levels drop, bacteria must use other compounds such as nitrate-nitrogen and iron oxides to help digest organic matter for energy. This causes the soil to change color and smell musty. Wetland soils appear gray, with iron rust stains, or black because they have high levels of organic matter, which breaks down slowly in the low-oxygen conditions found in wetlands.

Wetland Soil Looks Like This...



Wetland Plants

Many plants are not suited to living in soils with low oxygen levels. Wetland plants have adapted to having their roots in water some or all of the time by developing unique structures.

Adaptations of Wetland Plants



Adventitious roots are new roots that develop just at or below the water line to aid in oxygen uptake in species such as willow.

Hollowed stems encourage gas exchange between the roots and the part of the plant above water.



Roots above ground like the cypress knees in the photo at left provide structural support and stability.

