

# Stormwater Wetland Installation at The North Carolina Arboretum, Asheville, NC



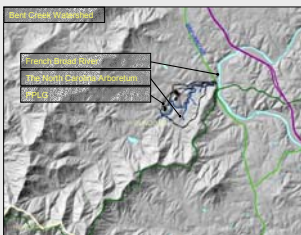
## Introduction

In the summer of 2002, a stormwater wetland was installed at the Plant Professional Landscape Garden (PPLG) located at The North Carolina Arboretum (TNCA) in Asheville, NC. The stormwater wetland is an example of an end of the pipe, best management practice (BMP) retrofit. It treats pollutants carried in stormwater from a roof top, parking lot and lawn area and also reduces peak discharge, minimizing erosion downstream. This project was designed by the Water Quality Group at North Carolina State University (NCSU), implemented by The North Carolina Arboretum Grounds Crew. Funding was provided by the Environmental Protection Agency's Section 319 grant program, which is administered through the North Carolina Department of Environment and Natural Resources.



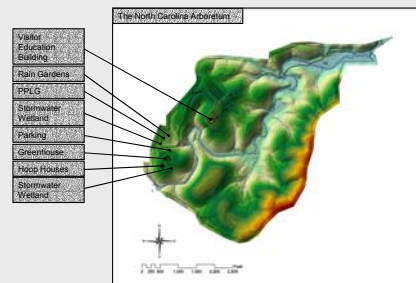
## Existing Condition

Prior to the installation of the stormwater wetland, stormwater from a roof top, parking lot and lawn area was released without treatment, causing erosion and degrading water quality. Stormwater was directed into a culvert, which was daylighted near the entrance of the Plant Professional Landscape Garden. Rip-rap had been placed to dissipate the velocity at the end of the culvert. Shortly after exiting the culvert, water recollected into an eroded swale, a portion of which was armored with river stone and geotextile fabric to minimize additional erosion. The stormwater flows into a small, jurisdictional wetland, into Bent Creek, and then to the French Broad River.



## Planning

TNCA expressed a desire to address the unsightly culvert outfall at the entrance of the newly installed Plant Professional Landscape Garden (PPLG). The PPLG is a demonstration garden that also serves as a testing site for green industry professional training and certification. Design opportunities were sought to make the area attractive and improve water quality. Several design options were considered, including retrofitting BMP's higher in the watershed to minimize the erosive flows and armoring the existing swale up to the culvert outfall. However, a stormwater wetland was the most cost-effective option providing the maximum water quality benefit. The stormwater wetland would also serve as an aesthetically pleasing entrance to the PPLG and demonstrate the use of indigenous plant materials.



## Stormwater Wetland

The stormwater wetland is designed to improve water quality by removing or reducing pollutants carried by stormwater. Pollutants such as sediment, phosphorous, nitrogen, heavy metals, and bacteria are carried by stormwater directly from rooftops, parking lots, and yards into swales or culverts, and eventually into streams and wetlands. These pollutants can have detrimental effects on aquatic habitat and wildlife. However, stormwater wetlands can reduce sediment, phosphorous, nitrogen, heavy metals, and bacteria in stormwater by slowing the stormwater down and allowing treatment by plants and soils. This stormwater wetland can lessen scour and erosion of receiving streams by reducing storm flow energy. Stormwater wetlands also create wildlife habitat and provide enjoyable gardening opportunities.



## Site Design

Since the project is highly visible, the design included elements that reveal a sense of time and place by utilizing indigenous plants and local materials. A stacked stone headwall was built around the shortened culvert and several large boulders were placed for visual interest. Twelve indigenous plant species were planted at elevations according to their ability to remain saturated for long periods of time. For example, *Juncus effusus* (soft rush) and *Iris versicolor* (blue iris) were placed at the lowest elevation, and *Sporobolus heterolepis* (dropseed) -- an upland species -- was placed around the rim at the highest elevation where it would be infrequently overtopped by water. Engineering considerations included determining the maximum footprint and volume. A stormwater routing model was used to predict the volume needed to detain the design storm for almost three days. The wetland was perched above the water table by compacting *in situ* clay.

## Implementation

The stormwater wetland installation began in August 2002 and lasted approximately two weeks. The Department of Corrections, TNCA's staff and volunteers and NCSU Extension provided the labor. The construction sequence included: installing erosion control practices, cutting the existing culvert back to increase the footprint, clearing and grubbing and rough grading which included the removal of approximately forty yards of soil. Grading equipment included a track hoe excavator, dump truck, and skid loader. Next, stacked stone walls were constructed around the headwall and boulders were placed. The existing clay soil was topped with a manufactured soil, composed of part compost and part siltstone, about two inches deep throughout the stormwater wetland. Biodegradable, erosion control fabric was placed on steeper slopes and then plants and mulch were installed. Hours after the stormwater wetland was finished, droughty weather conditions were reversed and it rained!



## French Broad Training Center

The French Broad Training Center (FBTC) was established in the spring of 2001 as a partnership between TNCA and NCSU to address water quality and quantity issues in Western North Carolina and to provide educational programming for landowners, concerned citizens, natural resource managers, and public officials in Western North Carolina. The training center is one of the four NCSU Soil and Water Environmental Technology Centers. Educational programs offered through the Training Center include topics such as environmental planning, conservation easements, agricultural and urban stormwater runoff management, and erosion control. In addition, technical assistance is provided for agricultural BMP's, vegetated riparian buffers, streambank stabilization, natural channel design, livestock exclusion and watering systems, and pasture management. The Training Center is located at TNCA in Asheville, NC. TNCA is a 428-acre public garden located within the Bent Creek Research and Demonstration Forest of the Pisgah National Forest. A center for education, research, conservation and economic development, and garden demonstration, the Arboretum offers a wide range of activities for visitors of all ages. TNCA is a public institution -- integrating education, landscape, and research -- that elevates the aesthetic, cultural, and economic quality of life in North Carolina. The Arboretum, through conversion of the traditional values, environmental resourcefulness, and botanical mystique of the Southern Appalachian region, broadens contemporary expressions of landscape stewardship. For more information please refer to: <http://www.ncsu.edu/waterquality/>

