



## Section 319

# NONPOINT SOURCE PROGRAM SUCCESS STORY

# North Carolina

## Implementing Urban Best Management Practices Improves Water Quality

### Waterbodies Improved

Polluted runoff from increased development in western North Carolina had degraded water quality in the Swannanoa River watershed. As a result, the North Carolina Division of Water Quality (NC DWQ) placed two Swannanoa River segments (totaling 14 miles) on the Clean Water Act (CWA) section 303(d) list of impaired waters in 2006 and 2008. Both segments were listed for impaired biological integrity attributed to urban development, and one segment was also listed for turbidity. Implementing best management practices (BMPs) led to improved water quality, prompting NC DWQ to remove the two segments of the Swannanoa River from the CWA section 303(d) list of impaired waters in 2008 and 2010.

### Problem

The Swannanoa River watershed drains a mountainous region of western North Carolina within the French Broad River Basin. Residential and commercial development contributed high volumes of sediment-laden runoff, which degraded the Swannanoa River watershed (Figure 1). Water quality issues were identified in the Swannanoa River beginning in 1998. The NC DWQ added segments 6-78c (2.6 miles long) and 6-78d (11.5 miles long) of the Swannanoa River to the CWA section 303(d) list of impaired waters in 2006 and 2008. The two river segments run through the town of Black Mountain, just outside the city of Asheville in Buncombe County. Both segments were listed because of impaired biological integrity linked to urban development; segment 6-78d was also listed as impaired by turbidity.

The 2005 French Broad Basin Plan identified habitat degradation, poor-quality riparian buffer zones, nutrient enrichment, sedimentation, channelization and toxicity as water quality problems in the Swannanoa River watershed. To address the problems, the 2005 Plan recommended increasing water quality monitoring, local ordinance development and natural resource protection throughout the watershed.

### Project Highlights

RiverLink, a regional nonprofit organization dedicated to revitalizing the French Broad River watershed, received CWA section 319 project funds from the NC DWQ in 2000. Its project goals were to implement BMPs in the Swannanoa River watershed that



Figure 1. Project partners restored streambanks along a developed portion of Haw Creek, a tributary of the Swannanoa River.

would restore the river's biological integrity and serve as education and outreach tools for citizens and businesses in the Black Mountain community.

With section 319 funding, RiverLink created a technical staff position for outreach to landowners, elected and appointed officials, and planning and stormwater management staff. The group built community partnerships with the goal of developing local ordinances to prevent nonpoint source pollution in the entire Swannanoa River watershed.

RiverLink worked with members of the watershed community to implement various BMPs (Table 1). For example, landowners established two conservation easements that provided extended protection of the river—a 150-linear-foot buffer on both sides

of a 1.3-mile segment of the river and an easement on a 7-acre natural wetland. Along the same 1.3-mile segment, partners restored and stabilized the streambanks and replanted the riparian area. In other areas of the watershed, partners restored streambanks and installed structural BMPs designed to capture and treat stormwater runoff, including rain gardens, bioswales and stormwater wetlands (Figures 2 and 3). Those combined efforts have all contributed to improved water quality in the Swannanoa.

**Table 1. Swannanoa River Project BMPs**

BMP Installed	Location	Total Number Completed	Area/Size
Riparian Plantings	Haw Creek, Swannanoa River	2 projects	8,814 feet
Invasive Exotic Plant Removal	Haw Creek	3 projects	1,950 feet
Streambank Restoration	Haw Creek, Swannanoa River	4 projects	8,814 feet
Conservation Easements	Azalea Park	300-foot buffer along 1.3 stream miles (~25 acres) and a 7-acre wetland	32 acres
Bioretention Cells	Black Mountain	2 projects	< 0.5 acres
Rain Gardens	Haw Creek, Black Mountain	3 projects	< 0.3 acres



Figure 2. A rain garden collects and treats residential runoff in Black Mountain.

Figure 3. A rain garden at Evergreen Community Charter School captures parking lot runoff.



## Results

The Swannanoa River BMP implementation project exceeded its intended goals. Partners estimate that the restoration efforts have reduced the annual sediment load to the river by more than 500 tons. In 2000 and 2005, NC DWQ Environmental Sciences Section staff members performed biological monitoring on the Swannanoa River, using established protocols to collect and assess multiple grab samples and kick net samples. They determined the EPT (short for the orders Ephemeroptera, Plecoptera and Trichoptera) taxa richness index, which is a measure of pollution-sensitive aquatic insects inhabiting a waterbody. A stream showing high EPT richness is less likely to be polluted than one with low richness in the same geographic region.

Data show that the macroinvertebrate rating on a small 2.6-mile segment (6-78c) of the Swannanoa River from Beetree Creek to Bull Creek improved from “fair” (in 1987) to “good-fair” (in 2007), which meets the biological integrity standard. As a result, NC DWQ removed the segment from the CWA section 303(d) list in 2008.

In addition, data show that the macroinvertebrate rating on an 11.5-mile segment (6-78d) of the Swannanoa River from Bull Creek to the French Broad River improved from “poor” (in 1988) to “good-fair” (in 2007), which meets the biological integrity standard. Segment 6-78d also no longer violates the state’s turbidity standard of 50 nephelometric turbidity units. NC DWQ therefore removed the segment from the CWA section 303(d) list in 2010.

## Partners and Funding

A total of \$547,563 in CWA section 319 grant funds supported this project. The City of Asheville, Town of Black Mountain, Warren Wilson College, Biltmore Estate, Buncombe County Government, Land of Sky, Evergreen Community Charter School, Buncombe County Soil and Water Conservation District, Montreat College, the Mountain Valley Resource Conservation and Development program, NC DENR DWQ (Asheville), Quality Forward, Rindt-McDuff Associates, Trout Unlimited—Land of Sky Chapter, University of North Carolina—Asheville Environmental Quality Institute, Buncombe County Metropolitan Sewerage District, Pigeon River Fund, North Carolina Clean Water Management Trust Fund, and Resource Data, Inc., provided an additional \$365,043 in matching funds.



U.S. Environmental Protection Agency  
Office of Water  
Washington, DC

EPA 841-F-11-001Z  
April 2011

## For additional information contact:

**Nancy Hodges**

RiverLink  
828-252-8474 • Nancy@riverlink.org

**Heather Jennings**

NC Division of Water Quality  
919-807-6437 • Heather.B.Jennings@ncdenr.gov