



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

North Carolina

Using Best Management Practices Restores Aquatic Habitat

Waterbody Improved

Low dissolved oxygen levels and poor biological integrity scores in Smith Creek prompted North Carolina to add a segment of the creek to its 2004 Clean Water Act (CWA) section 303(d) list of impaired waters. Using CWA section 319 and state funding, the Warren County Soil and Water Conservation District worked with landowners to install best management practices (BMPs) along Smith Creek, including conservation tillage, livestock exclusion fencing, heavy-use area protection and cropland conversion. Such nonpoint source pollution control efforts restored aquatic habitat along Smith Creek, allowing North Carolina to remove the 1.6-mile segment from its CWA section 303(d) list of impaired waters in 2008.

Problem

Smith Creek, a tributary to the Roanoke River, flows through Warren County in the central piedmont region of North Carolina. After monitoring showed that biological impairment and low dissolved oxygen prevented Smith Creek from meeting its aquatic life designated use, North Carolina added a 1.6-mile creek segment (from Cabin Branch to SR1208) to the state's 2004 CWA section 303(d) list of impaired waters. North Carolina identified the pollution source as erosion and sedimentation from livestock grazing practices, which allow direct stream access, and agricultural crop production without proper management plans in place.



Figure 1. Livestock-exclusion fencing protects Smith Creek.

Project Highlights

Warren County Soil and Water Conservation District wrote and implemented 24 BMP contracts between July 2005 and September 2008, which helped improve a total of 753 acres in the watershed. BMPs included converting 43 acres of cropland to grassland; stabilizing 3,000 feet of roadway; installing 24,000 feet of livestock-exclusion fencing that prevents stream access and provides a buffer between pastureland and Smith Creek (Figure 1); and adding more than 18 water troughs (alternative watering facilities) that provide drinking water to cattle. Farmers also constructed stream crossings and stock trails that support alternative grazing practices. The trails provide a means for moving cattle from one pasture to another, which allows grasses to regenerate and pastures to stabilize when not in use (Table 1).

Table 1. BMPs installed in the Smith Creek watershed

BMP installed	Size/unit
Farm Road Stabilization	3,000 ft
Livestock Exclusion Fencing	24,000 ft
Water Troughs	18 units
Wells	7 units
Heavy-use Area	4 units
Stream Crossings	2 units
Stock Trail	2 units
Cropland Conversion	43 ac

Results

The North Carolina Division of Water Quality Environmental Sciences Section routinely monitors watersheds across the state using ambient stations, as well as macroinvertebrate and fish sampling. The agency collected biological monitoring data that showed water quality markedly improved between May 2002 (rated *fair*) and June 2007 (rated *good-fair*) (see Table 2). The principal metrics used to denote water quality improvement include increases in the total macroinvertebrate families (or genera) and the increased species richness of mayflies, stoneflies and caddisflies (collectively referred to as EPT—short for the order names Ephemeroptera, Plecoptera and Trichoptera). Because the three EPT taxa are particularly sensitive to pollutants, evidence of increased species richness indicates improving water quality and biological integrity. On the basis of the data, North Carolina removed a 1.6-mile segment of Smith Creek from the 2008 CWA section 303(d) list of impaired waters.

Partners and Funding

The North Carolina Division of Soil and Water Conservation, in partnership with Warren County Soil and Water Conservation District, wrote a thorough nine-element watershed management plan outlining management measures for the continued success of the Smith Creek watershed. The partners submitted the watershed management plan (dated October 2007) to the U.S. Environmental Protection Agency Region 4.

Approximately \$180,000 in CWA section 319 grant funds supported water quality improvement projects in Smith Creek. The North Carolina Agricultural Cost Share Program provided an additional \$121,000 in match contribution, for a total of \$300,000 applied in the Smith Creek watershed.

Table 2. Benthic sampling data for Smith Creek

Assessment unit	Date	EPT sample	Bioclassification
23-10C	08/15/1984	12	Fair
23-10C	07/18/1986	10	Fair
23-10C	07/12/1989	12	Fair
23-10C	08/22/1994	6	Fair
23-10C	07/16/1999	12	Fair
23-10C	04/23/2004	10	Fair
23-10B	04/26/2004	22	Good-Fair*

*A more intense study covering a larger watershed showed significant improvement.



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

EPA 841-F-09-001Z
September 2009

For additional information contact:

Heather Jennings

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

Julie Henshaw

North Carolina Department of Environment
and Natural Resources
919-715-9630 • julie.henshaw@ncdenr.gov