



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

South Carolina

Implementing a Total Maximum Daily Load Reduces Bacteria

Waterbody Improved

Data from four monitoring sites within South Carolina's Rocky Creek watershed showed that the creek was impaired by fecal coliform bacteria from agricultural practices, failing septic systems, forest runoff and other sources. As a result, the South Carolina Department of Health and Environmental Control (SCDHEC) added four sites to the 2000 Clean Water Act (CWA) section 303(d) list of impaired waters. Landowners implemented agricultural best management practices (BMPs) and upgraded septic systems, significantly reducing fecal coliform levels. The four impaired Rocky Creek sites are showing progress toward attaining water quality criteria.

Problem

The Rocky Creek watershed covers an area of approximately 127,872 acres in Chester and Fairfield counties in northern South Carolina. SCDHEC identified four sites within the watershed (CW-002, CW-174, CW-175, and CW-236) as impaired by fecal coliform bacteria and consequently added them to the 2000 CWA section 303(d) list of impaired waters.

South Carolina derived its standards for primary contact recreation from public health data used in estimating humans' potential risks of contracting waterborne illnesses after swimming due to exposure to sewage-related pathogens. The degree to which Rocky Creek supports its recreational use is based on how often fecal coliform bacteria levels exceed standards (number of excursions). For fecal coliform bacteria, an excursion is an occurrence of a concentration greater than 400 colony-forming units (cfu) per 100 milliliters (mL) for all classes. If 10 percent or less of the samples are greater than 400 cfu/100 mL, recreational uses are said to be fully supported; a 10 to 25 percent excursion is considered partial support of the criterion unless exceedances are due to natural conditions; and a 25 percent excursion rate or more indicates that the standard is not supported.

Although the watershed is primarily forested, a significant amount of land is in agricultural use, particularly cattle pasture (Figure 1). Other fecal coliform sources include runoff from wildlife in forested areas, land application of manure, failing septic systems, urban runoff, and leaking or overflowing sewer systems. To address these sources, the SCDHEC used water quality data collected at the monitoring sites to develop a total maximum daily load (TMDL) for the watershed and begin the restoration process. As the TMDL was developed, preliminary studies identified sources of fecal



Figure 1. A site in the Rocky Creek watershed before (top) and after (bottom) the landowner installed livestock exclusion fencing.

coliform in the watershed and developed appropriate BMPs for mitigating the sources.

Project Highlights

In 2004 South Carolina initiated a three-year project to improve water quality in the Rocky Creek watershed by reducing fecal coliform concentrations and implementing a TMDL. The project was developed in cooperation with landowners to design appropriate site-specific BMPs that would benefit

both water quality and farm operations. The project targeted seven farms for participation on the basis of affordability and the greatest potential for benefit to the SCDHEC's water quality program. The BMPs implemented included building fences along streams and creeks to exclude livestock; installing cross-fencing to reduce pasture size and better control grazing; using no-till planting to reduce erosion; adding vegetation buffers and filter strips; installing water well/watering systems (Figure 2); establishing stream crossings; and building manure sheds and covered composters. Each participating landowner implemented at least four and as many as six BMPs.



Figure 2. This alternative watering source, underlain by geotextile pad and crushed gravel to prevent erosion, serves two cattle pastures.

In addition to implementing BMPs on the seven selected farms to control agricultural fecal coliform sources, the project addressed residential fecal coliform sources. The project partners identified homeowners in the Rocky Creek watershed who had failing septic systems

and then designed and implemented septic system improvements for those willing to participate.

Results

The data collected indicate water quality improvement at three of the four monitoring sites in the Rocky Creek watershed after placing BMPs on participating farms and repairing homeowners' septic tanks. A comparison of data from 2004 and 2006 indicates that the three sites have all improved from *not supporting* to *partially supporting* the creek's recreational use. Table 1 shows the improvement at each station.

In addition, fecal coliform levels have dropped since the installation of BMPs. Table 2 shows the geometric mean of fecal coliform values at the four monitoring sites before and after BMP installation.

TMDL implementation efforts have continued in the watershed. The state's goal is to improve water quality until data from all four stations fully meet water quality standards for fecal coliform. Water quality improvements to date were accomplished thanks to farmers installing nearly 50,000 feet of animal exclusion fencing and more than 65 other individual

Table 1. Exceedance Percentages for Fecal Coliform Standard and Use Support Classification (Based on 2004 and 2006 Data Assessments)

Site ID	2004 FC Levels	2006 FC Levels
CW-002	26.09% exceedance (Not supporting)	19.44% exceedance (Partial support)
CW-175	28.57% exceedance (Not supporting)	20.69% exceedance (Partial support)
CW-236	31.04% exceedance (Not supporting)	23.91% exceedance (Partial support)
CW-174	10.71% exceedance (Partial support)	11.77% exceedance (Partial support)

Table 2. Fecal Coliform Geometric Mean Values Before and After BMP Installation

Site ID	FC Levels Before (cfu/100 mL)	FC Levels After (cfu/100 mL)
CW-002	343.66	296.22
CW-175	248.59	37.02
CW-236	281.15	216.67
CW-174	60.03	16.50

BMPs, including alternative watering systems, heavy-use areas, septic system repairs, and vegetated buffer zones with the secondary benefit of providing habitat for wildlife.

Participating landowners expressed satisfaction with the benefits received from the CWA section 319 program, noting improved health of their cattle, increased property values, and improved water quality in local creeks and streams. Implementing selected BMPs has reduced fecal coliform bacteria levels and increased participation in nonpoint source control measures by watershed landowners. The waterbody is showing progress toward attainment of water quality criteria, and monitoring will continue in order to measure success.

Partners and Funding

The project partners were SCDHEC; Research Planning, Inc. (RPI), a science technology firm; the City of Columbia; and the Clemson University Cooperative Extension Service. The project was funded by \$243,427 in CWA section 319 grant funds and a nonfederal match of \$173,454. The nonfederal component consisted of financial and labor contributions by the landowners, as well as other selected expenses covered by RPI and its associates.



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