



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

North Carolina

Implementing Agricultural Best Management Practices Reduces Bacteria and Turbidity Levels

Waterbodies Improved

Erosion due to grazing and other agricultural activities on poorly managed livestock pasture near Fourth Creek led to increases in turbidity and fecal coliform levels in the stream. As a result, the North Carolina Division of Water Quality (NC DWQ) added three segments of Fourth Creek to the state’s 1998 Clean Water Act (CWA) section 303(d) list of impaired waters. Local partners installed agricultural best management practices (BMPs) including alternative watering facilities and pastureland management. Water quality improved, prompting NC DWQ to remove the three segments from the state’s 2010 CWA section 303(d) list for various impairments, including fecal coliform and turbidity.

Problem

Fourth Creek (Figure 1) flows through Iredell and Rowan counties in the western piedmont region of North Carolina. Water quality monitoring showed that three segments of Fourth Creek violated the state’s fecal coliform water quality standard, which requires that fecal coliforms (1) not exceed a geometric mean of 200 colonies (col) per 100 milliliters (mL), based on at least five consecutive samples examined during any 30-day period, and (2) not exceed 400 col/100 mL in more than 20 percent of the samples examined during that period. North Carolina identified the source of fecal coliform as livestock grazing practices that allowed direct stream access.

Water quality monitoring data collected by the North Carolina Department of Environment and Natural Resources (NCDENR) also showed occasional violations of the water quality standard for turbidity, which requires that turbidity be below 50 nephelometric turbidity units (NTUs). NCDENR identified soil erosion on agricultural areas, particularly row crops and livestock grazing areas, as the most common source of turbidity in the Fourth Creek watershed.

On the basis of data showing violations of water quality standards, the NC DWQ added a total of 23.8 miles of Fourth Creek to the state’s 1998 CWA section 303(d) list for fecal coliform (three segments) and turbidity (two segments) impairments. In 2008 NC DWQ added two additional impairments—biological integrity and fish community—to some of Fourth Creek’s impaired waters listings. Table 1 lists the segments and associated impairments included on the state’s 2008 list of impaired waters.



Figure 1. Fences exclude livestock from the riparian area along Fourth Creek.

Table 1. North Carolina’s 2008 CWA section 303(d) list of impaired waters for Fourth Creek (Note: Listings are based on data from 2002–2006.)

Assessment Units	DWQ Sub-basin	Length (miles)	Violation (Impairment)
12-108-20a1	03-07-06	10.2	biological integrity, fecal coliform
12-108-20a2	03-07-06	5.8	fecal coliform, turbidity
12-108-20a3	03-07-06	7.8	biological integrity, fish community, turbidity, fecal coliform

NC DWQ completed total maximum daily load (TMDL) studies on Fourth Creek for fecal coliform and turbidity. The U.S. Environmental Protection Agency approved the fecal coliform TMDL in 2001 and the turbidity TMDL in 2004. The TMDLs identify poorly managed livestock grazing areas and agricultural activities as the primary sources of the creek’s impairment and consequent loss of biological integrity. Most notable in this study was the widespread finding of stream bank erosion and habitat degradation.

Project Highlights

Project partners worked together to implement BMPs to reduce the amount of sediment and fecal coliform bacteria entering Fourth Creek. The Carolina Land and Lakes Resource Conservation and Development (RC&D) office used CWA section 319 funds to implement BMPs that would help achieve the goals outlined in the approved turbidity and fecal coliform TMDLs. The project began in July 2003 and continued through July 2006.

Landowners installed 18,328 feet of livestock exclusion fencing, which reduced cattle's access to stream banks and allowed riparian buffer areas to become revegetated (see Figure 1). Landowners planted 2.18 acres of critical area and installed one stream crossing to limit stream access and allow the rotation of pastureland grazing. In addition, landowners installed 18 watering facilities (Figure 2), three manure pumping tanks, and one waste irrigation reel system.



Figure 2. An alternative watering tank offers livestock a water source away from the creek.

Field days played a large role in public outreach, conveying the importance of installing agricultural BMPs and their positive effects on water quality. Project partners held five field days at BMP demonstration sites throughout the Fourth Creek watershed. All the field days were open to the public, public officials and the media.

Results

The BMPs implemented through this project have improved water quality in Fourth Creek. As Table 2 shows, turbidity levels in two previously impaired segments now meet the water quality standard for turbidity (no more than 10 percent of samples may exceed 50 NTU). On the basis of these data, NC DWQ removed both the 5.8- and 7.8-mile segments of Fourth Creek from the state's 2010 CWA section 303(d) list for turbidity.

Table 2. Percentage of samples that exceeded the turbidity standard, post-project

Assessment Units	Length (miles)	Percent Exceedance (%)
12-108-20a2	5.8	6.7
12-108-20a3	7.8	3.3

Implementing pasture grazing BMPs significantly reduced the fecal coliform counts in Fourth Creek. As Table 3 shows, fecal coliform levels in two segments now meet the fecal coliform standard (no more than 20 percent of samples may exceed 400 col/100 mL). On the basis of these data, NC DWQ removed both the 5.8- and 10.2-mile segments of Fourth Creek from the 2010 CWA section 303(d) list for fecal coliform.

Table 3. Percentage of samples that exceeded the fecal coliform standard, post-project

Assessment Units	Length (miles)	Percent Exceedance (%)
12-108-20a1	10.2	< 20
12-108-20a2	5.8	< 20

In summary, project efforts in the Fourth Creek watershed resulted in the full restoration of the 5.8-mile segment (which has attained both fecal coliform and turbidity standards) and partial restoration of the 7.8- and 10.2-mile segments (which have attained only the turbidity standard and fecal coliform standard, respectively). The 10.2-mile and 7.8-mile segments remain on the 2010 CWA section 303(d) list because of biological integrity impairments. The 7.8-mile segment also remains listed for fecal coliform and fish community impairments.

The active partnerships in the area continue to implement agricultural cost-share BMPs with the objective of obtaining full restoration of these remaining Fourth Creek segments and removing them from the state's CWA section 303(d) list in the future.

Partners and Funding

A total of \$97,214 in CWA section 319 grant funds, supplemented by an additional \$133,000 in matching funds, supported this project. Partners included North Carolina Agricultural Cost Share Program, Iredell and Rowan Soil and Water Conservation Districts, and Carolina Land and Lakes RC&D, Inc.



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