



# NONPOINT SOURCE SUCCESS STORY

## North Carolina

### Upgrading Wastewater Treatment and Installing Best Management Practices Improves Crowders Creek

#### Waterbodies Improved

Agricultural practices, failing septic systems, and urban development led to high fecal coliform and degraded biological conditions in Crowders Creek. As a result, multiple segments of the creek were added to the Clean Water Act (CWA) section 303(d) impaired waters list for fecal coliform and biological impairment in 2002 and 2008, respectively. Watershed partners implemented numerous agricultural and stormwater best management practices (BMPs) and improved wastewater infrastructure from 2005 to 2013. These efforts have led to the improvement in water quality of four stream segments, which were removed from the state's list of impaired waters in 2014.

#### Problem

Crowders Creek runs through the cities of Kings Mountain and Gastonia, approximately 23 miles west of Charlotte, North Carolina. The 26,524-acre Crowders Creek watershed (HUC 030501011501), within the Catawba River Basin, flows 12.5 miles before crossing the South Carolina border (Figure 1). The watershed comprises a mixture of forested, agricultural, residential, commercial and industrial land cover. The majority of residential, commercial and industrial development occurs within the city limits of Kings Mountain and Gastonia (combined population of approximately 83,000 residents).

Monitoring conducted by the North Carolina Division of Water Resources (DWR) in 1989, 1992 and 2002 found *fair* biological integrity ratings in the macroinvertebrate EPT (short for the order names Ephemeroptera, Plecoptera and Trichoptera) index in two Crowder Creek segments—assessment unit (AU) 11-135c and AU 11-135d. In addition, fish community sampling conducted in 2002 in these segments indicated decreased diversity and numbers of species when compared to sampling conducted in 1989. As a result of these data, North Carolina added these waterbodies to the CWA section 303(d) list in 2002.

DWR monitoring also showed that Crowders Creek segments AU 11-135e and AU 11-135f had high fecal coliform (FC) bacteria counts, prompting the state to add these two segments to the 2008 CWA

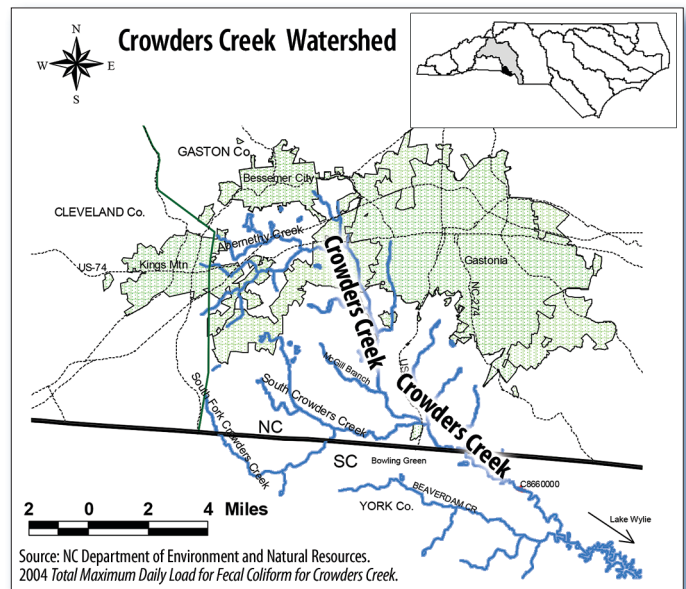


Figure 1. The 26,524-acre Crowder Creek watershed is on the North Carolina/South Carolina border.

section 303(d) list of impaired waters for bacteria. The state's FC water quality standard requires that fecal coliform: (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.

Total maximum daily load (TMDL) reports generated for Crowders Creek (in 1996 and 2004) indicated that low dissolved oxygen, a leaking sanitary sewer and failing septic tanks were to blame for water quality impairments in the stream. The 2010 Catawba River Basin Plan, prepared by DWR, outlined recommendations for restoring Crowders Creek, including: (1) decommission a failing septic sand-filtration package treatment system and providing sanitary sewer extension to three communities of concern, (2) survey stormwater outfalls to identify dry weather flows due to illicit discharges, groundwater seepage and exfiltration, (3) assess FC input from stream sediments and in-line sewer deposits as a secondary cause of bacteria loads following runoff events, and (4) develop a spatial decision support system with field and GIS data to support a comprehensive watershed and infrastructure improvement program throughout the watershed.

## Project Highlights

Using the Crowders Creek Watershed Plan and existing TMDL for FC, the city of Gastonia, in partnership with the Gaston County Natural Resources Department and the Gaston Soil and Water Conservation District (SWCD), planned a complete overhaul of the existing sewer system. Gastonia and Gaston County installed a wastewater collection system connecting homes to



Figure 2. Partners installed sanitary sewer line to replace failing onsite systems.

sanitary sewer, eliminating straight pipes and decommissioning and demolishing failing on-site sand filter systems (Figure 2). Over 6,470 linear feet of sewer line was laid during phase I of the process, connecting 93 homes to sanitary sewer systems and eliminating 16 straight pipes to the creek. Additional work in phase II added 8,630 linear feet of sewer line and decommissioned and demolished an outdated failing sand filter system fed by a mobile home community.

The SWCD and Gaston Natural Resources Department implemented BMPs on county-owned properties to address stormwater runoff. Over 100 acres of land are now treated by bioretention areas

that allow infiltration of rainwater and prevent sheet flow runoff. A stream protection system was installed to prevent 30 beef cattle from entering the stream, 102 acres of agricultural land were put under long-term no-till management, 71 acres of land were planted for critical area buffers and an additional 20 acres of land were converted to grassland.

From 2005 to 2013, Gaston County worked to incorporate a stormwater ordinance to protect and restore the watershed. Sand filters treating 6 acres were installed, 2 acres of land were installed with bioretention systems, and an underground inline stormwater treatment system was installed.

## Results

After years of *fair* benthic data, water quality in AUs 11-135c and 11-135d began to improve (Table 1). On the basis of these data, AUs 11-135c and 11-135d were rated as *good* for aquatic life on the 2014 integrated report.

Table 1. Crowders Creek benthic data (1989–2013)

Waterbody	AU	Date	Rating
Crowders Creek	1-135d	10/09/2013	Good*
Crowders Creek	1-135d	7/10/2007	Good-Fair
Crowders Creek	1-135d	5/20/2002	Fair
Crowders Creek	1-135d	08/20/1997	Fair
Crowders Creek	1-135c	01/7/2014	Good*
Crowders Creek	1-135c	05/21/2002	Good-Fair
Crowders Creek	1-135c	09/21/1989	Fair

\*Fully support designated uses

FC numbers also declined. Data collected from 2011 to 2013 in AU 11-135e and AU 11-135f showed FC levels of 200 cfu/100mL, indicating that these segments are safe for recreation. As a result, these AUs were delisted for their FC impairment in 2014.

## Partners and Funding

The water quality improvement in Crowders Creek can be attributed to many stakeholders active in the restoration effort throughout the watershed, including the U.S. Environmental Protection Agency (EPA), North Carolina DWR, the city of Gastonia, Gaston County, University of North Carolina–Charlotte and the Gaston County Natural Resources Department/SWCD. A combined total of \$2,415,338 has been invested in the watershed since 2003, with a small portion of EPA CWA section 319 funding (\$181,133) directed towards plan development and failing septic tanks.



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