



# NONPOINT SOURCE SUCCESS STORY

# Alabama

## Adding Riparian Buffers Decreases Pollutant Loading, Increases Dissolved Oxygen, and Improves Habitat in Crowabout Creek

### Waterbody Improved

Changing land use—from forest cover to cropland, pastures and residential development—contributed to increased siltation and organic enrichment and a decrease in dissolved oxygen levels in Crowabout Creek. In 1996, Alabama placed the creek on the state's Clean Water Act (CWA) section 303(d) list of impaired waters for failing to support its Propagation of Fish, Wildlife and Aquatic Life designated use because of biological community and habitat impairment. Implementing agricultural best management practices (BMPs) resulted in decreased siltation and nutrient runoff, increased dissolved oxygen, and improved biological and in-stream aquatic habitat conditions. Crowabout Creek was listed as attaining water quality standards for nitrogen, phosphorus, sedimentation/siltation and CBOD for all uses in 2014.

### Problem

The Crowabout Creek subwatershed (HUC 06030002-1006) is in the Tennessee River Basin near the town of Falkville in Morgan County, Alabama (Figure 1). It is 15 miles long and comprises about 31,150 acres of the Flint Creek watershed. Agricultural practices associated with crop production and animal husbandry were identified as primary sources of water quality impairments. Major sections of the stream channel were historically straightened with direct livestock access, streambank erosion, and very small or no riparian buffers.

The Geological Survey of Alabama (GSA) collected water quality data from 1995 to 1997. Of the 49 samples taken, 16 violated the dissolved oxygen standard. In addition, biological assessments conducted by the Tennessee Valley Authority in the mid-1990s determined biological health ratings of *poor* (macroinvertebrate) and *poor/fair* (fish). Water chemistry data collected by the Alabama Department of Environmental Management (ADEM) from 1992 to 1995 led to the placement of Crowabout Creek and other Flint Creek tributaries on the state's CWA section 303(d) list of impaired waters in 1996. Total maximum daily loads (TMDLs) for siltation, nutrients, organic enrichment/low-dissolved oxygen (OE/DO), and pathogens for the Flint Creek watershed were approved to help ensure water quality standards are attained in the Crowabout Creek subwatershed.

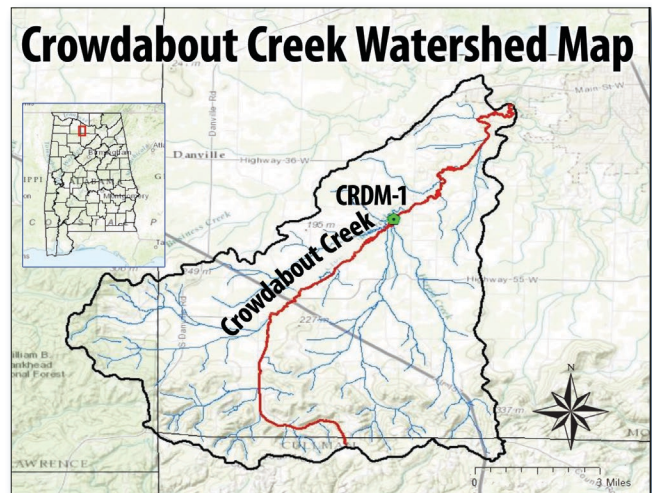


Figure 1. Crowabout Creek is in northern Alabama.

### Project Highlights

The Flint Creek Watershed Conservancy District (FC-WCD) developed a Crowabout Creek Watershed Management Plan (WMP). U.S. Environmental Protection Agency and ADEM provided CWA section 319(h) nonpoint source grant funding to the FC-WCD to facilitate implementation of watershed management workplans from 2003 to 2007. The WMP includes the recommendations found in the 2002 Siltation TMDL and the 2003 OE/DO, Nutrient, and Pathogens TMDLs. Project resources were leveraged in cooperation with the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS), the

Morgan County Soil and Water Conservation District (SWCD), agricultural producers, and private landowners. Between December 2005 and March 2009, 1,372 acres of riparian forest buffers were planted in the watershed. Additional management practices included planting 132.4 acres of grassed waterways and nearly 90 acres of hardwood vegetation. Riparian buffers were enrolled in the USDA Farm Service Agency's (FSA) Conservation Reserve Program (CRP) to enhance long-term protection and maintenance. Other practices implemented included pasture planting, exclusion fencing, cross-fencing, and stream crossings for cattle.

## Results

In 2009, a comparison of water quality data collected by GSA (in 1996) and by ADEM (in 2009) indicated much improved dissolved oxygen levels as well as reductions in turbidity, specific conductance, and median concentrations of total dissolved solids, total suspended solids, ammonia nitrogen, nitrate+nitrite nitrogen, and carbonaceous biochemical oxygen demand (CBOD5) (Table 1). By 2014, nitrogen, phosphorus, sedimentation/siltation, and CBOD were listed as being attained for all uses as a result of the improvements in the watershed.

In 2009 ADEM collected physical characteristic and habitat assessment data. When compared to past bioassessments and with fully supporting ecoregion reference sampling site information, Crowabout Creek showed reduced siltation and increases in substrate organic matter and canopy cover. In addition, instream habitat quality, sinuosity, bank and vegetative stability, riparian buffer, and habitat assessment scores all improved (Figure 2). The overall habitat assessment rating improved from *poor* in 1996 to *fair* in 2009.



Figure 2. Riparian restoration efforts in Crowabout Creek have improved water quality and habitat.

**Table 1. Summary of GSA (1996) and ADEM (2009) water quality data for Crowabout Creek.**

Parameter	Measure	GSA (1996) <sup>a</sup>	ADEM (2009)
Temperature (°C)	Maximum	25.0	24.3
Turbidity (NTU)	Maximum	130.0	71.4
Total Dissolved Solids (mg/L)	Median	187.0	140.0
Total Suspended Solids (mg/L)	Median	37.0	13.5
Specific Conductance (µmhos)	Median	262.0	238.0
Stream Flow	Minimum	1.0	2.4
Dissolved Oxygen (mg/L)	Minimum	0.7	6.0
Ammonia Nitrogen (mg/L)	Median	0.12	0.003
Nitrate+Nitrite Nitrogen (mg/L)	Median	0.513	0.213
Total Kjeldahl Nitrogen (mg/L)	Median	0.74	1.134
CBOD-5 (mg/L)	Median	1.3	0.05
Total Phosphorus (mg/L)	Median	0.04	0.275

Notes: °C = degrees Celsius; NTU = nephelometric turbidity units; mg/L = milligrams per liter

<sup>a</sup> GSA 1996 sampling site was approximately 0.6 stream miles upstream of the ADEM sampling site (CRDM-1).

Monitoring in 2013 continued to show improving trends in water quality as the new riparian forests and other BMPs became more established. Calculations using the Spreadsheet Tool for Estimating Pollutant Loads (STEPL) model estimated that installed BMPs reduced 3,035.1 pounds of nitrogen; 3,537.2 pounds of phosphorus; and 344.2 tons of sediment annually.

## Partners and Funding

Project cooperators included ADEM, the FC-WCD, NRCS, FSA, Morgan County SWCD, Alabama Cooperative Extension System, Morgan County Commission, Tennessee Basin Clean Water Partnership, Alabama Mountains Rivers and Valleys Resource Conservation and Development Council, and local agricultural producers and landowners. The project was primarily funded by two CWA section 319(h) grants from fiscal years 2002 and 2003, which provided \$393,000 in federal funding. The Morgan County SWCD, farmers, landowners, and volunteers provided \$291,533 in nonfederal project match. Total project cost was \$684,533. The 1,594.5 acres of riparian buffers were entered into the CRP; these contracts extend from 2005 until 2020 and are expected to provide about \$1.2 million in incentive and annual payments.



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