



NONPOINT SOURCE SUCCESS STORY

Kentucky

Implementing Management Practices Reduces Bacteria in Dix River

Waterbody Improved

A 3-mile segment of the Dix River was listed on the 2008 Clean Water Act (CWA) section 303(d) list/Integrated Report as impaired for primary contact recreation due to *Escherichia coli* bacteria. The Dix River Watershed Council developed a watershed plan for the Dix River/Hanging Fork Creek watersheds in 2009, which led to the hiring of a watershed coordinator, cooperation between partners and implementation of best management practices (BMPs). Due to positive agency relationships and effective on-the-ground projects, the ambient water quality improved. Monitoring data from 2010–2013 indicated that the Dix River segment was meeting its water quality standards (WQS) for primary contact recreation use for bacteria; therefore, it was removed from the impaired waters list in 2016.

Problem

The Dix River watershed, which drains portions of Garrard, Lincoln, and Boyle counties, is a primary tributary of the Kentucky River (Figure 1). It contains two HUC12s that are the focus of this project: Boone Creek–Dix River (051002050504) and Lower Hanging Fork Creek (051002050503). The watershed is part of the Outer Bluegrass physiographic region of central Kentucky, which is characterized by rolling hills, moderate-to-rapid surface runoff, and moderate rates of subsurface drainage. This watershed is dominated by agricultural land and includes fragmented forest along stream and river corridors. Rural residences are primarily served by septic systems that are often situated in soils that are not best suited for on-site wastewater treatment systems.

Data collected on the Dix River in 2006 showed that *E. coli* bacteria levels exceeded the WQS and therefore did not support the river's primary contact recreation designated use. Monitoring for total maximum daily load (TMDL) development in 2006 also lent evidence that the Dix River segment was impaired for primary contact recreation due to high levels of *E. coli*. As a result, the Kentucky Division of Water (DOW) added the segment (river miles 33.1 to 36.1) to the 2008 CWA section 303(d) list. An inventory of the watershed indicated that sources of the impairment included animal feeding operations, livestock grazing, unrestricted cattle access and on-site treatment systems. A TMDL was completed in 2010 for this impaired segment of the Dix River.

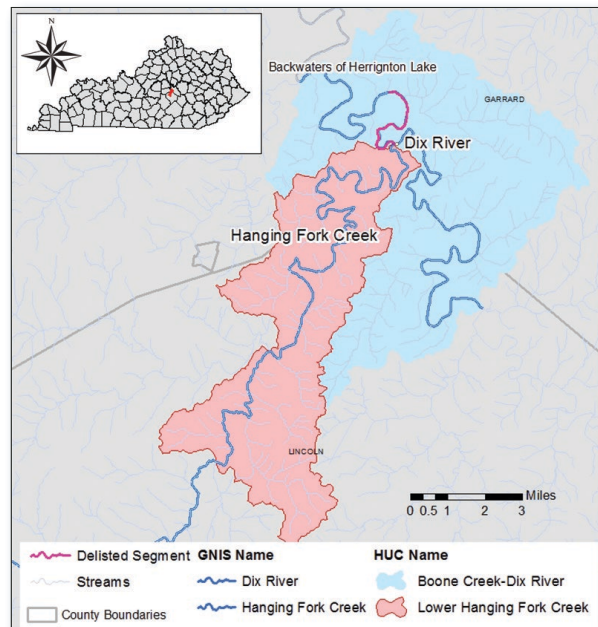


Figure 1. The Dix River and Hanging Fork Creek watersheds are in central Kentucky.

Story Highlights

The 77-square-mile project area includes the Lower Hanging Fork Creek and Dix River watersheds. The Natural Resource Conservation Service (NRCS) and the Kentucky Division of Water (DOW) identified the need for a water quality Clean Water Action Plan in the Dix River watershed. A watershed plan was developed in 2009 for the Hanging Fork Creek watershed (a tributary to the Dix River). The Dix River Watershed Council



Figure 2. Partners installed stream fencing in the watershed to restrict livestock access.

drove much of the planning and implementation of the watershed plan, provided input into the TMDL development, helped to identify funding opportunities to install BMPs, and encouraged implementation of remediation efforts identified in the watershed plan.

A CWA section 319(h) grant was awarded in 2011 to the Lincoln County Conservation District to implement agriculture BMPs in the Hanging Fork watershed and to promote educational activities to inform local citizens and governments of the importance of water quality. The partners installed winter feeding areas, prepared new and revised nutrient management plans for farm management, excluded cattle from streams and planted riparian corridors along stream banks (Figure 2). These grant funds were also used to hire a watershed coordinator to serve as a project technical adviser and to coordinate farm field days highlighting effective BMPs throughout the watershed.

In 2012 a CWA section 319(h) grant was awarded to Bluegrass Greensource to install and repair onsite wastewater systems, and to hold workshops to educate school managers and homeowners about the relationship between septic systems and water quality. Bacterial source tracking was conducted that identified human waste from wastewater contributions. Targeted activities included educating septic system owners about maintaining and replacing septic systems as needed. Over the course of the restoration effort, partners completed 17 heavy use area protection projects, 7,920 feet of fencing, and multiple onsite wastewater treatment system projects (18 pump-outs, 325 repairs/maintenance, and 1,250 units converted to centralized systems).

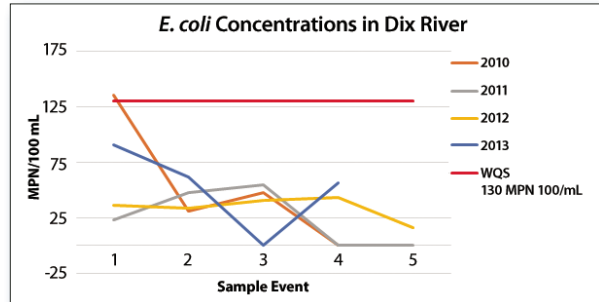


Figure 3. Ambient monitoring results for *E. coli* in 2010–2013 shows improvement.

Results

Water quality improved due to bacteria loading reductions achieved through implementation of agricultural, onsite wastewater management, and educational practices. Water quality results collected from the ambient monitoring station from 2010–2013 (Figure 3) showed full support of the designated use over four consecutive years, with a geometric mean below the standard of 130 most probable number per 100 milliliters. Based on water quality assessments of *E. coli* from 2010 to 2013, the Dix River segment downstream of Hanging Fork Creek now fully supports its designated use for primary contact recreation; as a result, DOW removed it from the impaired waters list in the 2016 Integrated Report.

Partners and Funding

Key partners in this watershed effort included the NRCS, the Dix River Watershed Council, the city of Danville, Bluegrass Greensource, the Kentucky Water Resources Research Institute, Third Rock Consultants, the Lincoln and Boyle county health departments and conservation districts, the Herrington Lake Conservation League, the Kentucky Division of Conservation, and local producers and farmers.

Grants were awarded in 2011 and 2012 for project work in the Dix River Watershed for a total of \$556,035 in CWA section 319(h) funds. Other funding provided by partners totaled \$247,757. From 2009 to 2016, the NRCS provided cost assistance through the Environmental Quality Incentives Program to farmers for implementing agricultural BMPs for a total of \$192,779 in the two project watersheds.



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

EPA 841-F-18-001QQ
November 2018

For additional information contact:

Lisa Hicks
Kentucky Division of Water
502-782-6972 • lisa.hicks@ky.gov