



NONPOINT SOURCE SUCCESS STORY

South Dakota Focused Implementation Reduces Bacteria in Butte County's Horse Creek

Waterbody Improved

Bacteria from agricultural nonpoint source pollution degraded Horse and Indian creeks in Butte County, South Dakota. As a result, the South Dakota Department of Agriculture and Natural Resources (DANR) placed Horse Creek on South Dakota's 2016 Clean Water Act (CWA) section 303(d) list due to an *Escherichia coli* bacteria impairment. Focused implementation of best management practices (BMPs), including riparian area management, grazing management, and the conversion of flood irrigation to sprinkler systems in the Horse Creek watershed, has reduced bacteria and lowered pollution to a level that allowed DANR to remove Horse Creek from the 303(d) list of impaired waters in 2022.

Problem

Horse Creek flows through Butte County in western South Dakota and drains 323,866 acres before merging with the Belle Fourche River (Figure 1). Indian Creek begins in Carter County, Montana, and merges with Horse Creek west of Newell, South Dakota. Horse and Indian creeks receive agricultural runoff, as the watershed is 84% herbaceous rangeland and 15% cropland, irrigated land, or pastureland. The remaining 1% of land includes a confined feeding area, some reservoirs, and municipalities and transportation.

To meet water quality standards for *E. coli*, no sample can exceed 1,178 colony-forming units (cfu) per 100 milliliters (mL); also, the geometric mean of a minimum of five samples must not exceed 630 cfu/100 mL during a 30-day period. Horse Creek impairments were identified during the Belle Fourche Watershed Implementation Project (2012–2022). As a result, DANR added Horse Creek to the CWA section 303(d) list of impaired waters in 2016 for failing to attain its beneficial uses for limited contact recreation due to elevated *E. coli*. Sources determined to have the most impact on *E. coli* levels were grazing areas where livestock had direct access to the stream and flood irrigation events following winter-grazed cropland.

Story Highlights

Discussions between DANR and the Belle Fourche River Watershed Partnership (BFRWP)—the sponsor of the Belle Fourche River Watershed Implementation Project—identified the Horse Creek watershed as a good place to focus implementation projects. The data showed that it could be improved enough to

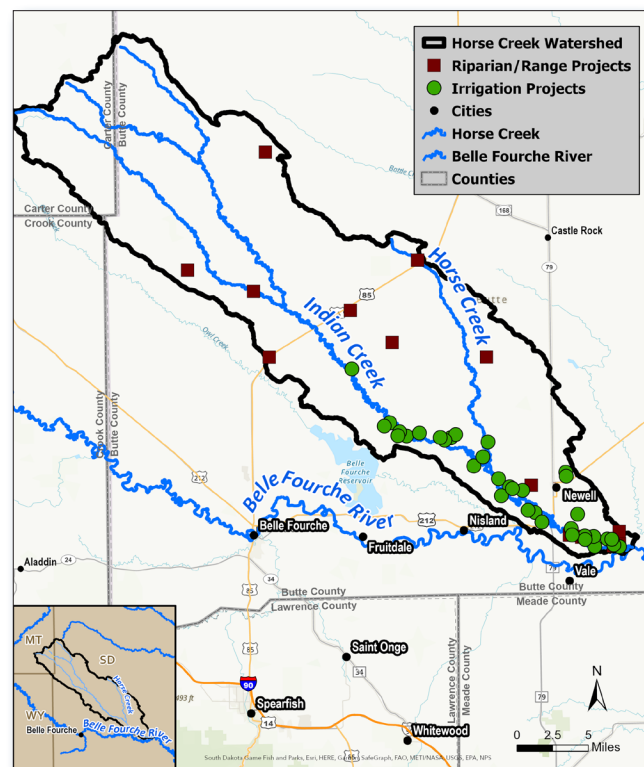


Figure 1. Horse Creek is in western South Dakota.

meet water quality criteria. More than 50 producers in the watershed implemented BMPs (see Figure 1 for locations). Focused implementation in Horse Creek started in Segment 8 of the Belle Fourche Watershed Implementation Project in 2017 to address the *E. coli* listing. Watershed partners implemented various BMPs, including grazing management, riparian restoration and protection, and irrigation water management (Figures 2, 3, and 4).



Figure 2. Alternative water source



Figure 3. Sprinkler system



Figure 4. Exclusion fencing

Producers implemented 68,667 acres of grazing management and 184 acres of managed riparian grazing in the Horse Creek watershed (2007–2022). Also, producers installed 29,140 linear feet of livestock exclusion fencing, which created a riparian buffer along Horse Creek, and another 6,080 linear feet of pasture cross fencing to better manage livestock distribution. Agricultural producers installed approximately 76,630 linear feet of buried pipelines, supplying water to 43 water tanks/troughs to provide alternate watering sources and support improved grazing management. Most of the livestock water pipelines were connected to rural water systems, but two water wells and pumps were installed to provide alternate water sources.

In addition to the riparian and grazing management practices, the project helped producers implement irrigation water management by converting 2,411 acres of flood-irrigated fields to more efficient sprinkler irrigation and converting earthen irrigation ditches to buried pipelines in the Horse Creek watershed. Agricultural producers replaced approximately 83,560 linear feet of earthen irrigation ditches by installing 21,156 linear feet of buried irrigation pipelines supplying water to 35 pivot sprinkler systems to reduce sediment and bacteria runoff within the watershed.

Results

Implementing improved grazing management along the stream corridor, excluding livestock from accessing the stream, and converting flood-irrigated fields to sprinkler systems led to reduced *E. coli* levels. Samples before the focused implementation had exceedances in seven of 55 samples (12.7%). Samples after BMP implementation had exceedances in six of 85 samples (7%). According to STEPL modeling, BMP

implementation also reduced loadings of nitrogen by 3,962 pounds; phosphorus by 2,791 pounds; and sediment by 6,009 tons in Horse Creek. As of 2022, Horse Creek *E. coli* levels no longer violate water quality standards, and the creek has been removed from the 2022 CWA section 305(b)/303(d) list of impaired waters.

Partners and Funding

CWA section 319 funds specifically were used for installing livestock water pipelines and water tanks, adding fencing to exclude livestock from direct access to Horse Creek, converting irrigation systems from flood to sprinkler systems, and burying irrigation pipelines. Through several project segments over 15 years, CWA section 319 funds contributed \$1,346,912 toward BMPs in the Horse Creek watershed. Other federal sources provided funding for BMPs (\$358,087), including the U.S. Department of Agriculture Natural Resource Conservation Service (NRCS) Environmental Quality Incentives Program, the U.S. Bureau of Reclamation (USBR), and the U.S. Fish and Wildlife Service (USFWS). Local sources, mainly landowners and producers, contributed \$2,408,919 for BMPs.

The local project sponsor is the Belle Fourche River Watershed Partnership, which includes many partners: participating landowners, the Butte, Lawrence, and Elk Creek conservation districts; the Belle Fourche Irrigation District; DANR; the South Dakota Conservation Commission; South Dakota Game, Fish, and Parks; the South Dakota Grasslands Coalition; the South Dakota School of Mines and Technology; South Dakota State University; U.S. Army Corps of Engineers; USBR; USFWS; NRCS; U.S. Environmental Protection Agency; U.S. Geological Survey; and the Wyoming Department of Environmental Quality.



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

EPA 841-F-24-001A
January 2024

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