



NONPOINT SOURCE SUCCESS STORY

South Dakota

Monoslope Barn and Grazing Management Improve Bacteria Levels in Pierre Creek

Waterbody Improved

Bacteria from agricultural nonpoint source pollution degraded Pierre Creek in Hanson County, South Dakota. As a result, the South Dakota Department of Environment and Natural Resources (DENR) placed Pierre Creek on South Dakota's 2010 Clean Water Act (CWA) section 303(d) list due to an *Escherichia coli* bacteria impairment. Natural resource agency partners collaborated to implement riparian restoration and grazing management and to install one of the first monoslope barns in South Dakota. Bacteria levels declined after these improvements, and DENR reclassified Pierre Creek in 2020 as meeting its beneficial uses for limited contact recreation and removed it from South Dakota's CWA section 303(d) list.

Problem

Pierre Creek drains 78 square miles of land before merging with the James River in Hanson County (Figure 1). The impaired segment of Pierre Creek also flows through Lake Hanson, a shallow, 60-acre recreational reservoir near the town of Alexandria. Pierre Creek receives runoff from agricultural operations, as its watershed is composed of 54% cropland and 37% pastures/hay ground. To meet water quality standards for *E. coli*, no sample can exceed 1,178 colony-forming units per 100 milliliters (cfu/100 mL), and during a 30-day period the geometric mean of a minimum of five samples must not exceed 630 cfu/100 mL.

Pierre Creek impairments were identified during the Lake Hanson Watershed Assessment (2001–2002) and the Lower James River Watershed Assessment (2006–2007) projects. As a result, DENR added Pierre Creek to the state's list of impaired waters in 2010 for failure to attain beneficial uses for limited contact recreation due to elevated *E. coli* numbers. In 2011, a total maximum daily load (TMDL) was completed for Pierre Creek. The sources determined to have the most impact on *E. coli* levels were livestock feeding areas and lots, as well as livestock grazing areas with direct access to the stream.

Both the Lake Hanson Watershed Assessment Final Report and the Pierre Creek *E. coli* TMDL document recommended improving animal feeding operations, improving grazing management along the stream

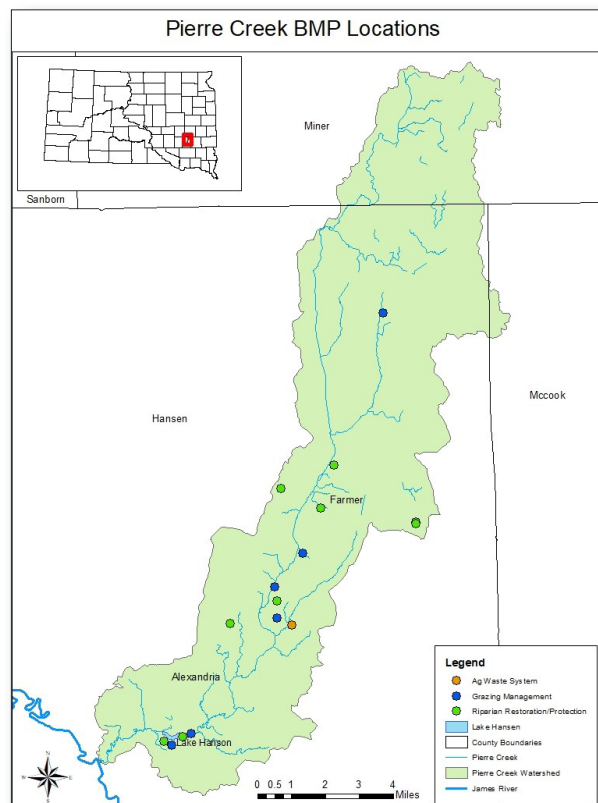


Figure 1. Pierre Creek is in southeastern South Dakota.

corridor and excluding livestock from accessing the stream. A septic system survey was also completed during the Lake Hanson Watershed Assessment because there are several residences around the lake that could have been sources of bacteria.

A load reduction was calculated for the Pierre Creek *E. coli* TMDL. During high flows, a 73% reduction was needed to meet the water quality standards. Also, in the mid flow and base flow zones in Pierre Creek, reductions of 43% and 63%, respectively, were needed to meet the water quality standard.

Story Highlights

Watershed partners implemented a variety of best management practices (BMPs), including agricultural waste systems, grazing management, and riparian restoration and protection (Figure 2). In 2014, a 433-foot long monoslope barn was installed over an open lot to reduce the amount of polluted runoff from livestock. A monoslope barn is designed with a roof with a single slant to one side. The monoslope barn is oriented from east to west with the slanted roof lower on the north side and higher on the south side. The orientation is beneficial because it takes advantage of shade and airflow through the barn in the summer and captures more warmth from sunlight during the winter months. The monoslope barn was designed to house 999 cows and includes a 12-foot deep pit to store a year's worth of manure from the cattle. The manure will be used as fertilizer on fields close to the facility.

Along with the monoslope barn, almost 550 acres of riparian restoration/protection and over 1,800 acres of grazing management have been implemented in the watershed (see Figure 1 for BMP locations). One example of grazing management included working with a producer to implement the use of a portable offsite watering system and temporary fencing to maximize grazing potential. These practices reduced the access and amount of time livestock could be in riparian areas and improved the grazing throughout the watershed, while also increasing biodiversity, increasing water infiltration and reducing surface runoff.

Results

As of 2020, Pierre Creek *E. coli* levels no longer violate water quality standards, and Pierre Creek was removed from the CWA section 303(d) list of impaired waters. Sampling prior to implementation



Figure 2. BMPs installed included (clockwise from the top left): a monoslope barn, temporary fencing, portable water sources and grazing management.

had exceedances in 12 of 41 samples (29%). Sampling following implementation of BMPs had exceedances in 2 of 51 samples (4%). According to STEPL modeling, BMP implementation also reduced loadings of nitrogen by 23,266 pounds, phosphorus by 8,809 pounds, and sediment by 768 tons for Pierre Creek.

Partners and Funding

CWA section 319 funds were used for agricultural waste systems, riparian restoration and grazing management practices. Through several project segments and over 15 years of implementation, CWA section 319 funds contributed \$257,772 toward BMPs. Other federal sources, including the U.S. Department of Agriculture (USDA) Environmental Quality Incentives Program, provided \$202,700 to support BMPs. Local sources, including landowners, Hanson County Conservation District, Lake Hanson Association, and the James River Water Development District contributed \$1,018,386. The local project sponsor has included the Hanson County Conservation District and is currently the James River Water Development District. Other local partners include participating landowners and the city of Alexandria. State partners include South Dakota DENR. Federal partners include the U.S. Environmental Protection Agency and the USDA Natural Resources Conservation Service.



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

EPA 841-F-20-001TT
December 2020

For additional information contact:

Kristopher Dozark

South Dakota Department of Environment and Natural Resources
605-773-4254 • kris.dozark@state.sd.us