



# Section 319

# NONPOINT SOURCE PROGRAM SUCCESS STORY

# South Dakota

## Watershed Partnership Restores River

### Waterbody Improved

Stream entrenchment and bank failure caused excess sediment to enter the Belle Fourche River, prompting South Dakota to add a 17-mile-long segment of the river to its 1998 and 2002 Clean Water Act section 303(d) lists of impaired waters for elevated total suspended solids (TSS). The Belle Fourche River Watershed Partnership (BFRWP) led efforts to restore riparian grazing areas and reduce the volume of unused irrigation water returning to the river, both of which reduced the amount of sediment entering the river. Water quality improved, and South Dakota removed this segment of the Belle Fourche River from the 2008 303(d) list for TSS.

### Problem

The Belle Fourche River drains parts of Butte, Lawrence and Meade counties in western South Dakota. The river flows into the Cheyenne River and, ultimately, to the Missouri River. Land use in the watershed is primarily livestock grazing with some cropland and a few urban and suburban areas. Data show that elevated levels of sediment in the river were causing TSS levels to exceed the water quality standard of 158 milligrams per liter (mg/L) TSS daily maximum. Therefore, South Dakota added the 17-mile-long Whitewood Creek to Willow Creek segment (Figure 1) of Belle Fourche River to the 1998 section 303(d) list of impaired waters because of elevated TSS.

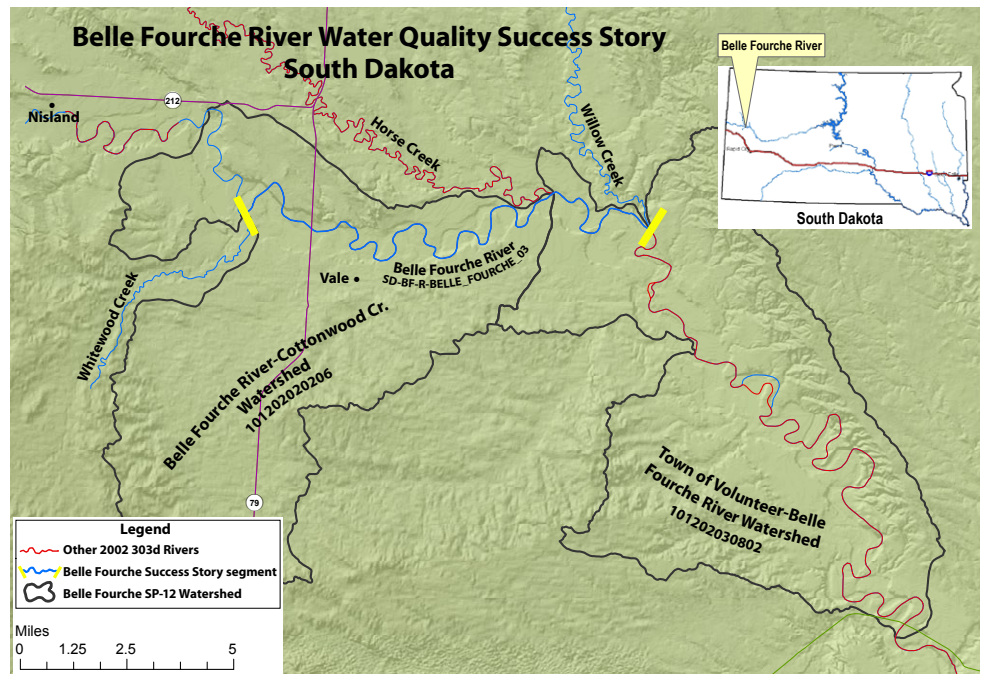


Figure 1. Map of the impaired portion of the Belle Fourche River.

In April 2001 BFRWP launched an assessment project to determine the TSS total maximum daily load (TMDL) for the Belle Fourche River. The U.S. Environmental Protection Agency (EPA) approved the final TMDL in 2005. The primary contributors of TSS, as defined by the TMDL, included the large volume of unused irrigation water that was discharged to the natural waterways, natural bank sloughing and impaired riparian habitat.

The TMDL indicated that irrigation and the return flow of unused irrigation water were responsible for

approximately 20 percent of the TSS in the Belle Fourche River system. As unused irrigation flows return to the river, the increased water volumes erode the river channel, causing parts of the river bank to slump into the channel and create increased TSS levels. Much of the irrigation in the watershed is flood irrigation. This type of irrigation mobilizes sediments by three processes: (1) tail water/runoff crossing fields, (2) water flowing in the canals and laterals, and (3) flows in the intermittent streams carrying tail water/runoff to the perennial streams in the watershed.

According to the TMDL, stream entrenchment and bank failure were responsible for another 75 percent of the TSS in the river. Stream energy caused natural bank failure, particularly in the eastern portion of the watershed. These areas are dominated by high banks composed of primarily clay soils that supply suspended solids to the channel. Increased quantities of water resulting from the unused irrigation return flows caused additional channel erosion, which in turn led to additional bank failures.

Finally, the TMDL estimates that rangeland and riparian area erosion contributed the remaining 5 percent of the TSS load to the river.

## Project Highlights

In 2004 BFRWP adopted a watershed approach to implement the best management practices (BMPs) recommended in the Belle Fourche River TMDL. To help implement the TMDL, BFRWP developed the *Ten-Year Belle Fourche River Watershed Strategic Implementation Plan* and the *Five-Year Belle Fourche Irrigation District Water Conservation Plan*.

The projects focused on addressing how irrigation was conveyed within the Belle Fourche Irrigation District (BFID), including the on-farm delivery of irrigation waters. Other projects included restoring riparian rangeland areas and increasing public outreach. BFRWP collaborated with six different producers to complete the riparian grazing rehabilitation projects and eight separate producers to complete the irrigation improvement projects.

The project partners implemented a canal automation project, a canal operational model and an updated water card/billing system within the BFID. These projects dramatically increased irrigation delivery efficiency while improving the understanding of how the system operates as a whole. Providing off-stream water supply and managed grazing alternatives has improved the health of both riparian and upland habitat by trapping sediments before they can enter the stream.

## Results

Recent quarterly sampling performed by the South Dakota Department of Environment and Natural Resources indicates a drop in TSS concentrations below the standard of 158 mg/L daily maximum (see Table 1). As a result of these improvements, South Dakota removed this 17-mile segment from its 2008 303(d) list for TSS.

**Table 1. TSS statistics (mg/L) for the Belle Fourche River at Vale**

Statistic	Pre-BMP data (June 1977– April 2005)	Post-BMP data (June 2005– August 2006)
Mean	76.8	18.3
Median	34.5	15
Standard Deviation	153	12.3
Maximum	885	32
Number of Samples	106	3

## Partners and Funding

The success of the project is largely a result of the participation of the following local, state and federal agencies and organizations: Butte and Lawrence County Conservation District, Elk Creek Conservation District, South Dakota Conservation Commission, South Dakota Department of Agriculture, South Dakota Department of Environment and Natural Resources, South Dakota Game Fish and Parks, South Dakota Grassland Coalition, South Dakota School of Mines and Technology, South Dakota State University, U.S. Bureau of Reclamation, EPA, U.S. Geological Survey, U.S. Fish and Wildlife Service and the Wyoming Department of Environmental Quality.

More than \$9.1 million secured from several local, state and federal sources funded the watershed's rehabilitation, including \$2.5 million from EPA section 319 funds, \$3.7 million from local participants and \$2.9 million from other federal sources.



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