



NONPOINT SOURCE SUCCESS STORY

Kansas

Soil Health Practices Reduce Sediment in Black Vermillion River

Waterbody Improved

Nonpoint source pollution from agricultural land affected water quality in the Black Vermillion River watershed, prompting the Kansas Department of Health and Environment (KDHE) to add the river to the state's 2008 Clean Water Act (CWA) section 303(d) list of impaired waters for high levels of total suspended solids (TSS). In cooperation with the local Kansas Watershed Restoration and Protection Strategy (WRAPS) Tuttle Creek project, project partners in Marshall, Pottawatomie, and Nemaha counties implemented several agricultural best management practices (BMPs) throughout the watershed. River monitoring data collected between 2008 and 2019 show that waterbodies in the Black Vermillion River watershed now meet the TSS criteria required to protect the aquatic life support designated use. As a result, KDHE removed four segments of the Black Vermillion River from the 2020 CWA section 303(d) list of impaired waters for the TSS impairment.

Problem

The Black Vermillion River drains approximately 500 square miles in Marshall, Pottawatomie, and Nemaha counties in northeast Kansas. The river flows for 52 miles before joining the Big Blue River and flowing into the Tuttle Creek Reservoir (Figure 1). Nearly 52% of the watershed is covered in cultivated crops, and just over 35% is grassland. Developed land accounts for 4.5% of land use, and forests cover 7%. The remainder is open water and wetlands.

The Black Vermillion River originally appeared on Kansas' CWA section 303(d) list of impaired waters in 2008 for an impairment to aquatic life use attributed to high TSS based on sampling from station SC505 near Frankfort, Kansas. According to the state's narrative standard, suspended solids added to surface waters by artificial sources shall not interfere with the behavior, reproduction, physical habitat, or other factors related to the survival and propagation of aquatic or semi-aquatic life or terrestrial wildlife. The impairment was classified as a Category 5, in need of a total maximum daily load (TMDL). The key contributing factor for high TSS levels is erosion of sediment from agricultural land.

Story Highlights

Following the U.S. Environmental Protection Agency's (EPA's) approval of the 2008 CWA section 303(d) list, Tuttle Creek WRAPS began working with local

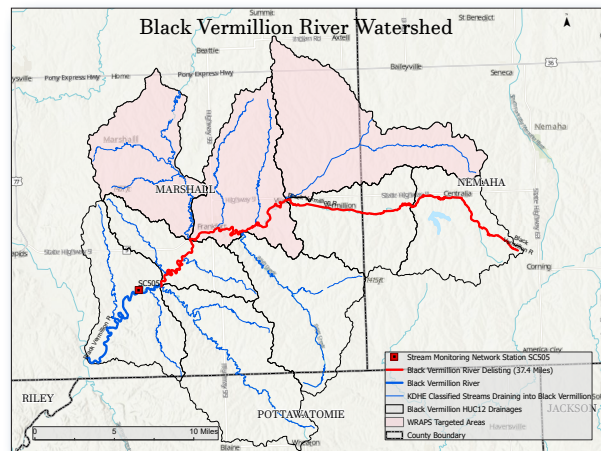


Figure 1. The Black Vermillion watershed is in northeast Kansas.

producers to implement soil health initiatives, including seasonal cover crops (Figure 2). In total, 14,300 acres of cover crops were planted when the fields would normally be fallow and susceptible to erosion. The presence of a living root in the ground helped to hold soil in place, reducing the amount of sediment entering the river. Cover crops also help build soil organic matter, which results in better infiltration of water into the soil and less runoff into the stream.

To trap sediment before it reaches the river, partners implemented many vegetative practices including 71 acres of grassed waterways, 15 acres of field borders,

44 acres permanent vegetation and 10 acres of riparian forest buffer. Grassed waterways are grassed strips used as outlets to drain and filter runoff from cropland. Field borders are edges of a field maintained in permanent vegetation to help reduce nutrient and sediment loss. Converting cropland back to permanent vegetation and planting forest buffers along the river's edge are other BMPs that reduce sediment and nutrient loss.

Partners implemented 2,654 acres of no-till practices, which prevented erosion from carrying sediment to the river. No-till is a cropland management system in which the soil surface is not disturbed except for planting or drilling operations. No-till keeps a vegetative residue on the ground, preventing erosion. No-till also prevents soil structure from being destroyed, allowing for better water infiltration.

Results

Between 2008 and 2019, KDHE collected 45 water quality samples at the sampling station SC505 near Frankfort. The current TSS value for the Black Vermillion is 42 milligrams per liter (mg/L) with an overall decreasing trend since 2008, and only one sample in excess of 50 mg/L since 2013 (Figure 3). As Kansas uses narrative criteria for TSS impairments, it has been deemed a significant enough improvement to move the Black Vermillion River TSS impairment to Category 2. As a result, a 39-mile segment of the Black Vermillion River was moved to a Category 2 in the 2020 state Integrated Report, indicating that a TMDL does not currently need to be developed for this impairment due to continued decreases in concentration of TSS.

Partners and Funding

The success of the delisting and water quality improvements can be attributed to several local, state and federal partners, including local producers, Tuttle Creek WRAPS, Glacial Hills Resource Conservation and Development, KDHE, the Kansas Water Office, EPA Region 7, Marshall County Conservation District, Pottawatomie County Conservation District, Nemaha County Conservation District, Kansas Department of Wildlife and Parks, Kansas Forest Service, and the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS).



Figure 2. Cover crops interseeded into corn.



Figure 3. Total suspended solid levels in Black Vermillion River (1990–2020).

The project was supported by CWA section 319 funds, specifically Tuttle Creek WRAPS grants annually from 2009 to 2016, and a 3-year grant for 2017–2019 (\$893,068). CWA section 106 funds were also used (\$89,875) along with funds from the Kansas State Water Plan (\$587,700). Additional support was provided by the Kansas Department of Agriculture's Division of Conservation, NRCS, the Kansas Water Office and local landowners.

The WRAPS program continues to work with local producers to implement greater change in farming practices in the Tuttle Creek watershed to achieve greater adoption rates and adherence to the soil health principles to continue to improve water quality.



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