



NONPOINT SOURCE SUCCESS STORY

Kansas

Adding Agricultural Best Management Practices Reduced Sediment Loads and Decreases Suspended Solids in Soldier Creek

Waterbody Improved

Soldier Creek, in northeast Kansas, was historically affected by excessive sedimentation caused by erosion from conventional farming practices in the watershed. Full-tillage row cropping on highly erodible lands, cattle with unfettered access to streams, and winter feeding of cattle near streams were common. The resulting sedimentation negatively affected aquatic life in Soldier Creek. Surveys conducted by Kansas Department of Health and Environment (KDHE) biologists documented losses in the diversity and abundance of stream-dwelling insects and mollusks. In 1998, KDHE determined the upper portion of Soldier Creek was impaired for aquatic life use due to excessive sedimentation, and the stream was listed as impaired under section 303(d) of the Clean Water Act (CWA). Since then, suites of agricultural conservation and soil health practices have been installed in the watershed, resulting in decreased total suspended solids (TSS) levels in Soldier Creek.

Problem

The Soldier Creek watershed is in the Western Corn Belt Plains ecoregion of northeast Kansas and is a tributary of the Kansas River. Most of the Prairie Band Potawatomi Nation reservation and the town of Soldier, Kansas, lie within the watershed. Soldier Creek flows north to south and empties into the Kansas River at Topeka, Kansas (Figure 1). The watershed is characterized by rolling hills with a 3%–6% slope. Soils are generally glacial till, highly erodible, and exhibit a high clay content. Land use is primarily native and nonnative grass pasture, hay lands, and bottomland crop fields. The watershed is interspersed with mature oak-hickory forest areas hugging steeper hillsides and along creek bottoms.

Conventional farming practices within the Soldier Creek watershed have decreased the ability of soils to infiltrate water, thus increasing runoff and soil erosion from row crop fields during rain events. In some areas, farming to the edge of stream banks has also contributed to Soldier Creek receiving heavy sediment loads during moderate-to-heavy rain events. As these sediment loads settle, they can reduce the quality of aquatic habitats and even smother aquatic organisms.



Figure 1. Water quality monitoring station on Soldier Creek in the Kansas River watershed.

In 1998, the upper portion of Soldier Creek was listed on the CWA section 303(d) list for failing to meet its aquatic life use due to excessive sedimentation. KDHE developed a total maximum daily load (TMDL) for TSS, which was approved by the U.S. Environmental Protection Agency in 2005.



Figure 2. Herbaceous cover planting water quality buffer strips were added in the Soldier Creek watershed.

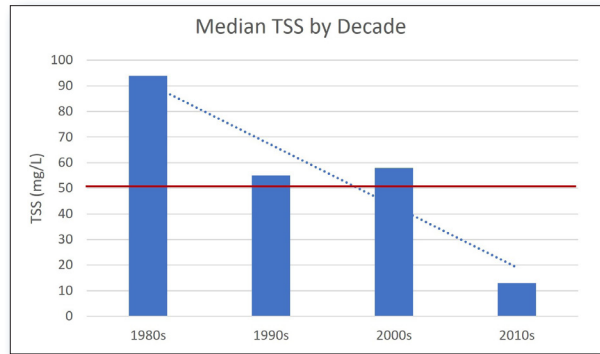


Figure 3. Soldier Creek TSS concentrations by decade. The 2010s data bar includes 2010–2021.

Story Highlights

Ninety-nine sediment-reducing best management practice (BMP) projects were implemented in the Soldier Creek watershed between 2012 and 2022. This included 64 cover crop projects on 4,656 acres of cropland. Cover crops between rows of cash crops improve soil health and aggregation by covering the soil with foliage and anchoring the soil with living roots. Cover crop foliage provides shade to buffer soil temperatures and reduces the impact of raindrops. Living roots physically hold soils in place, and their exudates encourage the growth and proliferation of beneficial soil organisms. Other sediment-reducing BMPs included one riparian herbaceous cover planting, one critical area planting, one sediment basin, one diversion, nine grassed waterways, and 21 terraces (Figure 2). Together, these practices are estimated to have prevented nearly 7,590 tons of sediment from entering Soldier Creek.

Results

Sediment loading rates in Soldier Creek are evaluated using a water quality test that measures TSS. This test measures the amount of solid materials, such as soil and clay particles, that are carried in the water column of a lake or stream. Data collected between 1980 and 2021 show a marked decrease in TSS levels in Soldier

Creek near Delia, Kansas. Average TSS levels at stream flows less than 1,000 cubic feet/second (cfs) decreased 75% from the 1980s to the post-2010s—from 204 milligrams/liter (mg/L) to 50 mg/L. The desired endpoint stated in the 2005 TMDL was average TSS levels below 100 mg/L at flows less than 1,000 cfs. The available data would suggest that this endpoint has been achieved. However, KDHE TMDLs currently consider median TSS values less than 50 mg/L as a desired endpoint. Median TSS decreased 86% from the 1980s to the post 2010s—from 94 mg/L to 13 mg/L (Figure 3). This long-term improvement in TSS will ultimately benefit aquatic life in Soldier Creek and could eventually return it to supporting status.

Partners and Funding

This improvement in water quality has been a result of a partnership between the Kansas Alliance for Wetlands and Stream's Middle Kansas River Watershed Restoration Protection Strategy (WRAPS), Prairie Band Potawatomi Nation, Jackson County Conservation District, Farmer-to-Farmer coaches, and KDHE's Kansas WRAPS program. Since 2006, Middle Kansas WRAPS has used \$1,534,430 in section 319 funds; \$197,977 in state/in-kind funds; and \$977,590 in local in-kind funds to address water quality impairments in the middle Kansas River watershed, including Soldier Creek.



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