



## Section 319

# NONPOINT SOURCE PROGRAM SUCCESS STORY

# Missouri

## Stakeholders Reduce Sediment Loads in Popular Missouri State Park

### Waterbodies Improved

Off-road vehicle (ORV) use in a popular state park contributed nonpoint source pollution to Missouri's Kelley Branch and Rocky Fork. As a result, the Missouri Department of Natural Resources (MDNR) added these two waterbodies to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 1998 for habitat loss and sediment, respectively. Stakeholders reduced sedimentation and restored Kelley Branch and Rocky Fork by reclaiming abandoned mine lands, implementing management changes on state park land, and installing agricultural best management practices (BMPs). Data collected in 2004 showed that the streams complied with applicable water quality standards. As a result, MDNR removed both streams from the state's list of impaired waters in 2010.

### Problem

Kelley Branch begins in Finger Lakes State Park in central Missouri (Figure 1). It empties into Rocky Fork south of the park. The 1,128-acre state park was once the site of a coal strip-mining operation. Between June 1964 and October 1967, the Peabody Coal Company removed more than 1.2 million tons of coal from the Boone County site, known as Mark Twain Mine, leaving barren piles of earth and numerous large pits filled with water. Shortly after mining operations ceased, Peabody replanted and reseeded much of the mined acreage and stocked the water-filled pits with fish. The rugged terrain created by the mining was not altered. In 1974, Peabody donated the land to the MDNR for development as a state park. Using a U.S. Department of the Interior grant, MDNR converted the land to useable recreational areas. The small, steep-sided hills with many small ponds in between made the area a favorite spot for ORV use. Many of the popular ORV trails cross the stream channel of Kelley Branch, causing erosion and sedimentation in Kelley Branch and extending downstream into Rocky Fork.

Missouri water quality standards require that all classified state waters provide habitat and water quality suitable to protect aquatic life. Deposition of sand and other fine materials in the bottom of a stream can bury aquatic habitat and smother aquatic organisms or fish eggs. In the late 1990s the Missouri Department of Conservation (MDC) found that the aquatic habitat in Kelley Branch was negatively affected by sedimentation. The majority of the stream was highly embedded with sand/fine sediments (87.4 percent), with some fine-to-coarse gravel present. Available fish cover (rocks and

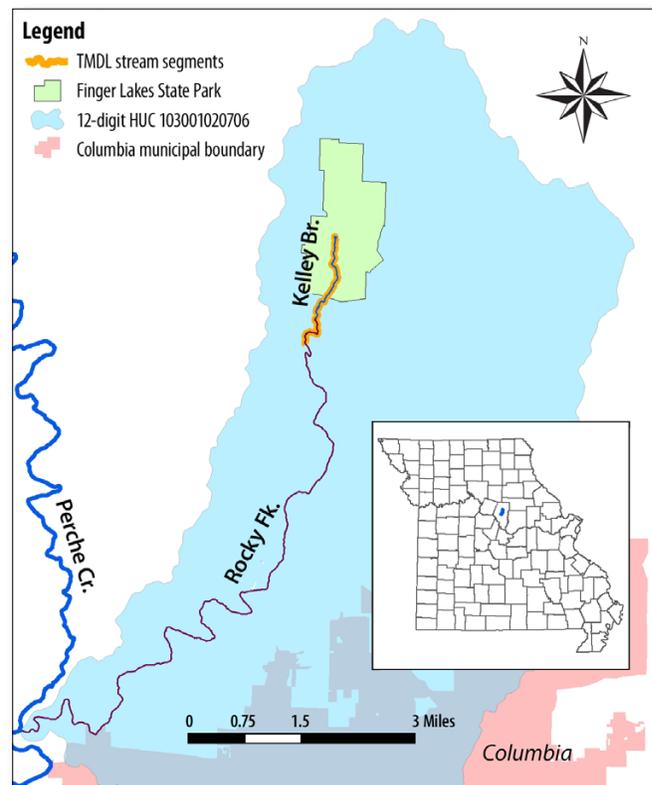


Figure 1. Missouri's Kelley Branch and Rocky Fork.

woody debris) was virtually non-existent because sediment had filled in the pools. Excess sedimentation and habitat degradation caused the streams to violate Missouri's narrative criteria for the protection of the warm water aquatic life designated use. As a result, MDNR added a 1-mile segment of Kelley Branch (waterbody ID 1016) and a 0.5-mile segment

of Rocky Fork (waterbody ID 1014) to the state's 1998 CWA section 303(d) list of impaired waters for habitat loss and sediment, respectively. Total maximum daily loads (TMDLs) were approved for both streams in December 2003.

## Project Highlights

Finger Lakes State Park is popular for its trails and motocross-track recreation areas. To address the water quality problem, MDNR's Division of State Parks amended the park's conceptual plan to restore and protect the stream and its riparian borders. Beginning in 2002, MDNR established new trails with lower erosion potential, added barriers to prevent access to the stream channel (using guardrails donated by the Missouri Department of Transportation, fences, and natural materials such as rocks and logs), constructed three hardened stream crossings (using gravel to minimize erosion) and one bridge in a high-traffic area, added signs to direct traffic to designated trails and stream crossings, developed educational literature for ORV riders, and committed to stricter enforcement of park policies prohibiting ORVs from being ridden in the stream. MDNR closed 90 acres of the park to ORVs and rerouted many trails. MDNR also completed erosion repair work, helped to restore vegetation, and replaced an ORV area with a 2.25-mile mountain bike trail.

While ORV activities contributed the majority of sediment, agricultural lands contributed some additional sediment to Kelley Branch and Rocky Fork. Between 2002 and 2007, MDNR's Soil and Water Conservation Program, through the Boone County Soil and Water Conservation District (SWCD), worked with landowners to implement BMPs such as permanent vegetative cover, terrace systems, and water impoundment practices. These practices are estimated to have prevented 6,338 tons of soil from eroding. In 2007 MDNR's Land Reclamation Program completed a multi-year, 40-acre mine reclamation project in the Rocky Fork area, which should further reduce sedimentation.

## Results

To demonstrate aquatic habitat and designated use improvement, MDNR completed a sediment and macroinvertebrate study of the two streams in 2004. An unimpaired portion of upper Rocky Fork was used as the reference-quality reach for the study. Reduction in sedimentation also translated into visual improvements to the stream substrate and reduction in narrative criteria violations. The available biological data suggested improved conditions or no biological impairment due to sediment. Table 1 illustrates that the biotic indices for impaired reaches of upper Kelley Branch, lower Kelley Branch, and lower Rocky Fork have been restored to levels similar to those of the upper Rocky Fork reference reach (i.e., these waters have improved to levels that support the warm water aquatic life use). On the basis of these data, Kelley Branch and Rocky Fork were determined to be in compliance with applicable water quality standards and removed from the state's list of impaired waters in 2010. MDNR conducted a follow-up visual survey in October 2010 that indicated additional improvement in aquatic habitat due to measures taken at the park.

## Partners and Funding

CWA section 319 grant-funded staff and state-supported activities were instrumental in conducting water quality monitoring and assessment, as well as TMDL development, TMDL implementation, and coordination and outreach. Major funding for improvements within the park was provided by the state through a one-tenth-of-one-percent Parks and Soils Sales Tax passed by Missourians to support state parks and soil and water conservation efforts. The SWCD provided 75 percent cost share for agricultural BMPs (\$78,333). The U.S. Office of Surface Mining Enforcement and Reclamation provided funding for the 40-acre mine reclamation project in the Rocky Fork area (\$934,000).

**Table 1. Sediment and Biological Data for Kelley Branch and Rocky Fork**

	Reference Reach—Upper Rocky Fork: Coarse Flow	Reference Reach—Upper Rocky Fork	Upper Kelley Branch: Coarse Flow	Upper Kelley Branch: Non-flow	Lower Kelley Branch: Coarse Flow	Lower Kelley Branch: Non-flow	Lower Rocky Fork: Coarse Flow	Lower Rocky Fork: Non-flow
Biotic Index Score	5.11	6.66	5.97	7.13	6.33	6.82	5.61	6.72



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