NONPOINT SOURCE SUCCESS STORY

Missouri

Land Reclamation Activities Improve Water Quality in the Upper Drywood Creek Watershed

Waterbodies Improved

Drywood Creek and Second Nicolson Creek (an upstream tributary) were impacted by historic coal mining activities. Both creeks were placed on the Clean Water Act (CWA) section 303(d) list of impaired waters for exceeding the acute water quality criteria for sulfate plus chloride. The Missouri Department of Natural Resources (MoDNR) wrote a total maximum daily load (TMDL) which was approved in 2004 for Second Nicolson Creek to address the sulfate plus chloride and to support the aquatic life designation. Multiple land reclamation projects within the headwaters of the Drywood Creek watershed resulted in a downward trend for sulfate and chloride concentrations in both streams. Both Drywood Creek and Second Nicolson Creek comply with Missouri's water quality criteria. Drywood Creek was removed from the impaired waters list in 2016 for sulfate plus chloride; Second Nicolson Creek is proposed for removal in 2018.

Problem

Early in the 20th century, the Drywood Creek watershed in Barton County, Missouri, was heavily mined for coal (surface and underground). Mining activities ceased in the 1930s and 1940s, and the land was abandoned. During the 1980s, Missouri's Land Reclamation Program completed several environmental assessments in Barton County and documented health and safety concerns along with environmental concerns. Unsafe highwalls, acid pits, spoil piles, barren soils and acid seeps were observed. During the late 1980s and 1990s, water quality monitoring collected from several sites in the upper Drywood Creek watershed confirmed instream impacts from historical mining. This resulted in both Second Nicolson Creek (waterbody MO_1319.00; 3.0 miles long) and Drywood Creek (waterbody MO_1314_R; 29.9 miles long) being placed on the CWA section 303(d) list of impaired waters due to acute exceedances of sulfate plus chloride (Nicolson Creek in 1994; Drywood Creek in 2012) (Figure 1). The 2004 TMDL for Second Nicolson Creek recommended a maximum sulfate plus chloride loading equivalent of 970 milligrams per liter (mg/L) for the protection of aquatic life.

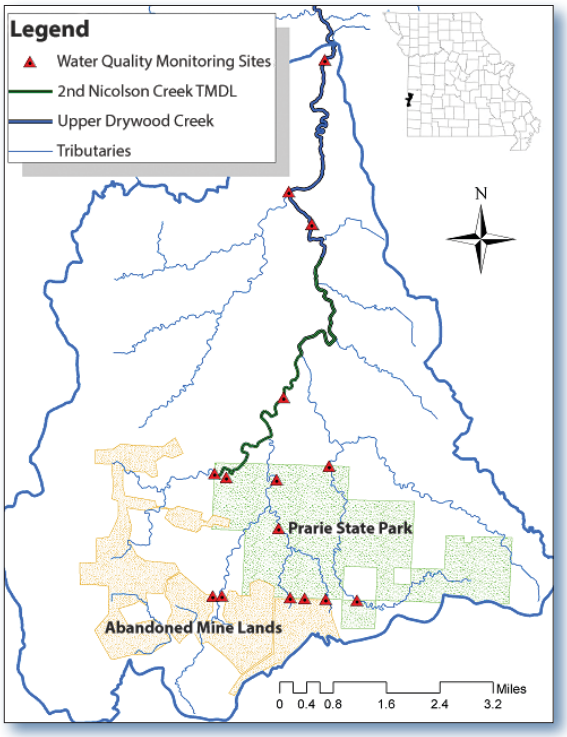

Figure 1. The Upper Drywood Creek watershed is in southwestern Missouri.

Project Highlights

Multiple abandoned mine reclamation projects have been completed within the headwater reaches of the Drywood Creek watershed since the 1980s. A total of 286 acres of abandoned mine lands were treated, contributing to water quality improvements that resulted in Drywood Creek being delisted for sulfate plus chloride. Numerous highwalls and steep embankments were eliminated, two collapsed mine shafts were closed, several acid impoundments and seeps were neutralized, and spoil piles were regraded and revegetated

Figure 2. The Lester Davis Project land reclamation site before (left) and after (right) a highwall was removed and the land regraded and revegetated.

to reduce/eliminate migration of mine waste runoff. Land reclamation projects in the Second Nicolson Creek subwatershed reclaimed 15 acres (total costs not available). Other projects in the watershed, the Bison Reclamation Project and the Prairie State Park Project reclaimed 160 acres ($821,195) and 47 acres ($933,996), respectively. Another project completed in 2012, the Lester Davis Project, treated 50 acres of historical mine land at a cost of $460,553 (Figure 2). Funding from numerous sources (U.S. Office of Surface Mining and CWA sections 319(h), 106 and 604(b)) was used to complete restoration projects, evaluate water quality, and conduct biological monitoring. Progress will continue to be tracked by monitoring surface water quality.

Results

Water quality conditions continue to improve in the headwaters of the Drywood Creek watershed, a direct result of reclamation activities. Sulfate and chloride levels show declining trends. No occurrences of toxicity events for either pollutant have occurred in Drywood Creek since 2001, or in Second Nicolson since 2013 (Figure 3). Second Nicolson Creek's pollutant loading is now less than the loading target established in the TMDL. As a result of these improvements, Drywood Creek was removed from the impaired waters list in 2016; Second Nicolson is proposed for removal from the impaired waters list in 2018.

Data have also shown that specific conductance—a measure of how effectively water can conduct an electrical current—has declined in Drywood Creek and Second Nicolson Creek. Recent data collected are similar to typical readings seen in other streams in this area of the state. An assessment of the biological community indicates the aquatic macroinvertebrate communities in both creeks are comparable to the control stream; therefore, the creeks are considered fully attaining for the aquatic life designated use.

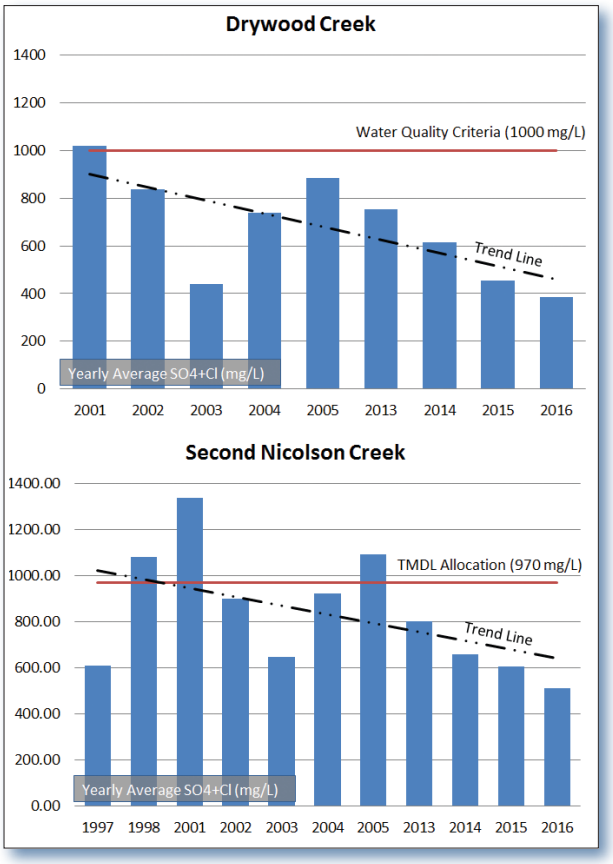

Figure 3. Water quality data show Drywood Creek (top) and Second Nicolson Creek (bottom) are meeting the water quality criteria (1,000 mg/L) and the more-stringent TMDL allocation (970 mg/L), respectively.

Partners and Funding

Over $2 million were provided from federal and state sources to complete projects in the watershed. MoDNR's Land Reclamation Program worked with numerous partners, including Missouri Department of Conservation, MoDNR's Division of State Parks, MoDNR's Geological Survey, MoDNR's Historic Preservation Office, U.S. Office of Surface Mining; and U.S. Fish and Wildlife. Approximately $38,760 used for water quality monitoring to track water quality improvements in Drywood Creek was provided by CWA section 319(h) funding, while over $34,000 was provided by CWA sections 106 and 604(b) funding to complete additional chemical and biological monitoring.

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For additional information contact:

Mike Mueller
Missouri DNR, Land Reclamation Program
573-526-5887 • mike.mueller@dnr.mo.gov
Trish Rielly
Missouri DNR - 319 Nonpoint Source Program
573-526-4662 • trish.rielly@dnr.mo.gov