



Section 319

NONPOINT SOURCE PROGRAM SUCCESS STORY

Wyoming

Coordinated Resource Management and Riparian Restoration Improves Creek

Waterbody Improved

Historical livestock grazing practices resulted in damaged riparian areas and eroding streambanks along Whitelaw Creek, leading to poor water quality and degraded fisheries. Local landowners, the U.S. Forest Service (USFS), and other partners worked through a process known as Coordinated Resource Management (CRM) to implement improved grazing management practices. After two decades of improved management, monitoring data indicate improved water quality, restored riparian areas, and improved fisheries.

Problem

Whitelaw Creek is a 2.4-mile-long tributary to Beaver Creek, approximately 8 miles north of the town of Sundance in the Belle Fourche River Basin of northeast Wyoming (Figure 1). The creek's headwaters originate at an elevation of approximately 6,100 feet near Warren Peak in the Black Hills National Forest. Whitelaw Creek is protected by the Wyoming Department of Environmental Quality (WDEQ) for drinking water, cold-water game and non-game fisheries, fish consumption, aquatic life (other than fish), recreation, wildlife, industry, agriculture, and scenic value uses. For the purposes of this project and its ongoing evaluation, WDEQ divides Whitelaw Creek into upper and lower segments, which are separated by USFS road 851.

Season-long historical livestock grazing practices in the mid- to late 20th century resulted in damaged upland and riparian areas and degraded stream banks, which consequently led to increased sediment loading, elevated water temperatures, and reduced dissolved oxygen in Whitelaw Creek. Biological information collected in the 1980s indicated the cold-water game fishery consisted entirely of brook trout in low densities.

In 1988 the USFS implemented a two-pasture, deferred-rotation livestock grazing system along Whitelaw Creek. Unfortunately, poor water distribution and a lack of late-season water limited the opportunities to implement the new grazing system, and thus the resource received minimal benefits.

Project Highlights

In 1992 WDEQ partnered with local landowners and grazing permittees, USFS, the Natural Resources Conservation Service, the Wyoming

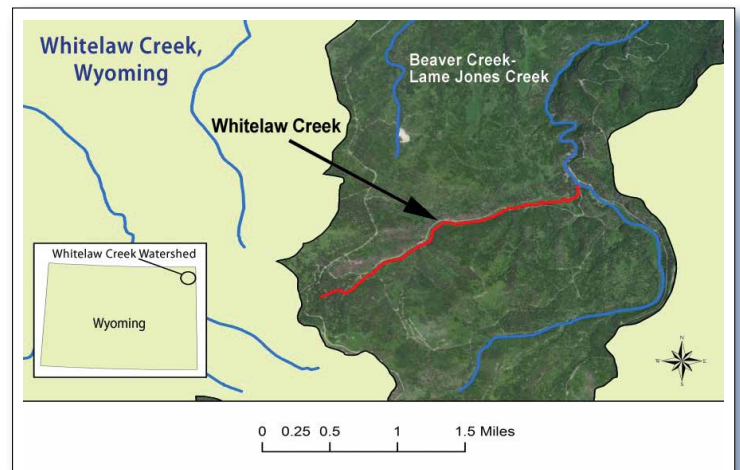


Figure 1. Whitelaw Creek is in northeastern Wyoming.

Riparian Association, the Wyoming Game and Fish Department, the Crook County Natural Resource District, and the Wyoming Department of Agriculture to initiate CRM in the Whitelaw Creek watershed to address the known water quality issues, including water quality problems from overgrazing. As part of the CRM, the collaborators managed a Clean Water Act section 319 project, known as the Whitelaw Riparian Improvement Project, in the early to mid-1990s. The partners implemented numerous agricultural best management practices (BMPs) that focused on improving riparian conditions, stabilizing stream banks, and enhancing water quality through short-duration, multi-pasture rotational grazing, the development of off-channel water sources, and cross-fencing (adding fences to limit pasture access for rotational grazing purposes). Project partners installed signs and conducted tours of the project area to offer opportunities for the public to learn about time-controlled grazing management and improvements in the resource that benefit multiple uses. Project partners monitored



Figure 2. Whitelaw Creek before (1995, left) and after (2013, right) riparian recovery efforts.

the effectiveness of the BMPs from 1992 to 2012 by periodically collecting fish and macroinvertebrate data, conducting vegetative surveys, and gathering chemical and physical water quality data.

Results

The Whitelaw Riparian Improvement Project has successfully improved riparian and water quality conditions throughout the length of Whitelaw Creek. Monitoring data collected from 1992 through 2012 show that the combination of improved water distribution and short-duration rotational grazing has improved riparian conditions. Assessments of four riparian vegetation transects distributed throughout the upper and lower segments all show an appreciable increase in desirable species, specifically sedges in the *Carex* and *Scirpus* genera. The increased density and diversity of riparian vegetation have stabilized segments of streambanks by allowing the channel to narrow and deepen and to become more sinuous. Approximately 20 percent of streambanks experienced improved stability and increased riparian vegetative cover between 1992 and 2012; nearly all stream banks are now at optimal stability and cover conditions (Figure 2). These enhancements have significantly reduced the sediment loading to the stream. The reduction is most apparent within the lower segment of Whitelaw Creek, which had been the segment most negatively affected by excess sediment. Data show that mean embeddedness (percent of coarse substrate covered or surrounded by sand and silt) in riffle substrates in this lower segment declined by approximately 30 percent between 1992 and 2012. Reductions in fine sediment corresponded to coarsening of the riffles, with 35 to 45 percent increases in gravel composition throughout Whitelaw Creek (though most notably in the lower segment) during the same period.

The in-stream and riparian changes, combined with reductions in sediment loading, have translated to cooler instantaneous water temperatures (a reduction of approximately 5 to 8°C) and improved instantaneous dissolved oxygen concentrations (an increase of approximately 1 milligram per liter) during early autumn over the 20-year monitoring period. Temperature and dissolved oxygen levels now meet WDEQ's water quality standards.

The biological condition of Whitelaw Creek has improved with the decreases in sediment loading and water temperature and the increase in dissolved oxygen. WDEQ's Wyoming River InVertebrate Prediction and Classification System (WYRIVPACS) indicated a significant (31 percent) increase in biological condition from 1992 to 2012 within lower Whitelaw Creek with respect to the taxa expected to occur under reference conditions. Moreover, increases in macroinvertebrate community density (from 833 to 2,047 individuals per square meter), percent EPT (Ephemeroptera, Plecoptera, Trichoptera) taxa (a 22 percent increase), and the ratio of EPT to Chironomidae taxa (from a ratio of 5.3 to a ratio of 12.3) were also evident in the lower segment. The percentage of pollutant-tolerant non-insects (e.g., aquatic worms, leeches, etc.) decreased 13 percent within the lower Whitelaw Creek segment from 1992 to 2012.

In the upper segment of Whitelaw Creek, the percentage of sensitive mayflies increased by 10 percent, while the percentage of tolerant organisms and number of burrower taxa decreased by 11 percent and seven taxa, respectively, over the same evaluation period. Both WDEQ's WYRIVPACS and the multimetric Wyoming Stream Integrity Index (WSII) show that the current biological condition throughout the creek is comparable to reference expectations.

Partners and Funding

The Whitelaw Riparian Improvement Project addressed water quality issues on nearly 3,400 acres of federal and private lands. The project received a total of \$9,635 of Clean Water Act section 319 funds and used \$10,839 of non-federal matching funds. Funding supported BMP implementation, educational deliverables, and effectiveness monitoring of the management changes. The project was a cooperative effort involving local landowners, grazing permittees, USFS, U.S. Department of Agriculture–Natural Resource Conservation Service, Wyoming Riparian Association, Wyoming Game and Fish Department, Crook County Natural Resource District, Wyoming Department of Agriculture, Wyoming Game and Fish Department, and WDEQ.



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