NONPOINT SOURCE SUCCESS STORY

Wyoming

Implementing Agricultural Best Management Practices Restores Aquatic Life Uses in a Segment of North Fork Crazy Woman Creek

Waterbody Improved

Livestock grazing and irrigation practices dating back to the 1880s contributed to high sediment and nutrient loads that degraded biological conditions in Wyoming's North Fork Crazy Woman Creek (NFCWC). As a result, in 1996 the Wyoming Department of Environmental Quality (WDEQ) added a segment of NFCWC to the state's Clean Water Act (CWA) section 303(d) list of impaired and threatened waters for threats to aquatic life uses due to habitat degradation (sediment) and nutrient enrichment. The Lake DeSmet Conservation District (LDCD) led watershed restoration efforts and worked with private landowners to implement agricultural best management practices (BMPs). Recent monitoring indicates that aquatic life uses are now supported. WDEQ anticipates this segment of NFCWC will be removed from the 2014 CWA section 303(d) list of impaired waters.

Problem

NFCWC originates at an approximate elevation of 8,800 feet in the Big Horn Mountains and flows southeast to its confluence with the Middle and South Forks of Crazy Woman Creek near the town of Buffalo, Wyoming (Figure 1). Designated uses for NFCWC include drinking water, cold water fisheries, fish consumption, nongame fisheries, aquatic life other than fish, recreation, wildlife, agriculture, industry and scenic value. Major land uses in the watershed include irrigated and nonirrigated cropland, livestock grazing and logging operations.

In the early 1990s, LDCD personnel indicated that significant watershed degradation had occurred since the area was homesteaded in the 1880s. Intense rangeland livestock grazing, concentration of livestock in riparian areas, and inefficient irrigation systems had resulted in water loss, erosion, and subsequent sediment and nutrient loading to NFCWC. This degradation resulted in deterioration of the NFCWC fishery, which, according to Wyoming Game and Fish Department (WGFD), was originally classified as a trout fishery of regional importance. High water temperatures, low flows related to stream diversion, limited productivity due to turbidity, and limited salmonid reproduction due to lack of suitable substrate were problems identified by WGFD.

Baseline chemical, physical and biological monitoring was conducted by WDEQ in 1991 and 1992. Data indicated a general trend of decreasing water quality

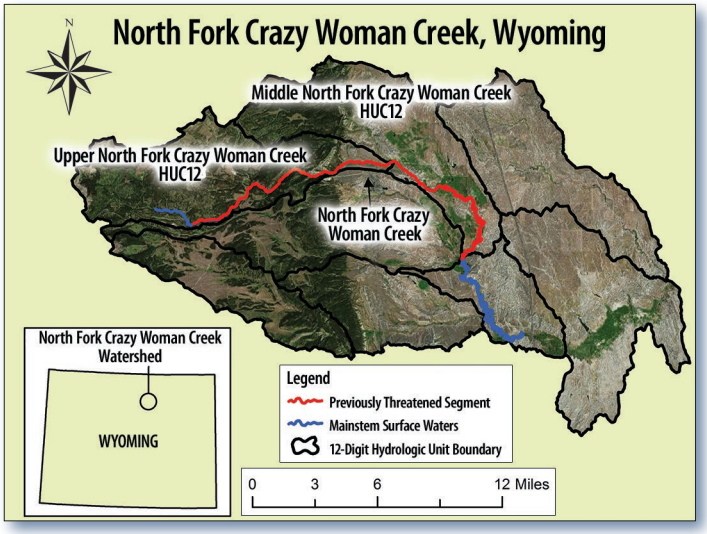

Figure 1. The North Fork Crazy Woman Creek watershed is in northern Wyoming.

in a downstream direction when transitioning from the mostly forested mountains/foothills of the upper watershed to areas of high agricultural development in the plains of the lower watershed. Nutrients, as evidenced by the relative occurrence of periphyton and filamentous algae, increased from foothills locations to plains locations, as did conductivity levels, while habitat assessment scores decreased. The shift from a fish community dominated by trout at foothills locations to a fish community dominated by suckers and other nongame species at lower plains locations further indicated that water quality and

Figure 2. A staff member collects water quality data at a riffle monitoring site on North Fork Crazy Woman Creek.

habitat degraded with distance downstream. WDEQ placed a 28-mile segment of NFCWC (segment WYPR100902050100_01) on the 1996 CWA section 303(d) list of impaired and threatened waters due to threats to aquatic life uses from habitat degradation and nutrient enrichment.

Project Highlights

LDCD and landowners proactively initiated restoration efforts on private lands in the watershed. In 1990 LDCD was awarded CWA section 319 funding to improve the cold water fishery, restore degraded riparian areas and reduce sediment and nutrient loading to the creek. BMPs to achieve these goals were implemented between 1992 and 1996. Critical areas were stabilized through a re-seeding project to mitigate erosion, and over 1 mile of riparian fence was installed to protect the sensitive riparian zone from livestock grazing. In addition, a livestock corral was relocated away from the riparian zone and the former site was revegetated. Irrigation pipeline projects eliminated ditch and canal erosion and reduced seepage losses. More efficient sprinkler systems further decreased erosion caused by irrigation return flows. Lastly, an irrigation diversion was stabilized to also reduce erosion.

Results

LDCD continued monitoring water quality in NFCWC until 1997. NFCWC data collected between 1991 and 1997 were summarized in a 2001 report in which the data were deemed inconclusive due to several factors, including climatic variability and an incomplete dataset. WDEQ completed additional BMP effectiveness monitoring in 2003 and 2008 (Figure 2). Results of the 2008 monitoring indicated that aquatic life uses in NFCWC were no longer threatened by habitat degradation (sediment) and nutrient enrichment. Concentrations of total nitrogen, total phosphorus and chlorophyll *a* were low at sites within the threatened segment, and no manifestation of excess periphyton or aquatic macrophytes was observed at any site. Stream banks, including those affected by past incision, were moderately to highly stable and covered with riparian vegetation. Temperature, dissolved oxygen, pH and chloride levels all met water quality criteria. Macroinvertebrate samples at sites within the threatened segment indicated that aquatic life uses were fully supported. Based on the evidence summarized above, WDEQ intends to remove this threatened segment from the 2014 CWA section 303(d) list of impaired waters.

Partners and Funding

A total of $578,933 of CWA section 319 funds supported watershed restoration efforts. Nonfederal matching funds totaling $1,867,344 were also invested into watershed restoration, along with approximately $220,000 of U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) program funding. Numerous state and federal resource management agencies supported the project by providing guidance and technical assistance. LDCD's major partners included numerous private landowners, Crazy Woman Improvement District, U.S. Forest Service, Bureau of Land Management, NRCS, Wyoming State Forestry Division, Farm Service Agency, University of Wyoming Cooperative Extension Service, Wyoming Land Commission, State Board of Water Control, WGFD, North Fork Crazy Woman Irrigation District, Farm Loan Board, Wyoming Water Development Commission and county commissioners.

U.S. Environmental Protection Agency
Office of Water
Washington, DC

EPA 841-F-15-001PP
September 2015

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