NONPOINT SOURCE SUCCESS STORY

Arkansas

Restoration Projects Reduce Sediment in the West Fork White River

Waterbody Improved

The Arkansas Department of Agriculture's Natural Resources Division's (ANRD) Nonpoint Source (NPS) Pollution Program first identified the West Fork White River (WFWR) watershed as a priority for reducing NPS pollution in 1991. The waterbody was added to the state Clean Water Act (CWA) section 303(d) list of impaired waters in 1998 for failing to meet state turbidity standards. Streambank restoration projects have been completed over the last 20+ years in response to water quality and flooding concerns in the WFWR watershed. Post-project monitoring shows a reduction in sediment loading to the WFWR, as well as increased protection from pollutant loading and damage during high-flow events. In the EPA-approved 2018 Arkansas CWA section 303(d) list, the upper 16.5 miles of the WFWR showed attainment of the turbidity criterion for the first time since being listed as impaired in 1998.

Problem

The WFWR originates south of the city of Winslow in northwest Arkansas (Figure 1). It joins the Middle Fork of the White River and the White River mainstem just below Lake Sequoyah; together, these waters flow for about 13 miles to the upper reaches of Beaver Lake. The upper WFWR is known for its good water quality and its smallmouth bass and rock bass populations, but the water quality deteriorates quickly as the river nears Fayetteville. The Arkansas Department of Environmental Quality assessed a 33.4-mile section of the WFWR east of Fayetteville and north to the upper reaches of Beaver Lake "as not supportive" of aquatic life. The major cause is high turbidity and excessive silt loads from three primary sources: (1) agriculture land clearing; (2) road construction and maintenance; and (3) gravel removal from streambeds.

Early water quality monitoring efforts indicated that the entire WFWR (27.2 miles) was exceeding the state's turbidity criterion and it was subsequently placed on Arkansas's 1998 CWA section 303(d) list. In 1999, the Upper White River was designated as the states' highest-priority watershed in the Unified Watershed Assessment. In the same year, the ANRD NPS Program funded the first watershed assessment of sediment sources, and this has served as a foundational piece for subsequent restoration projects. The assessment shows the majority of the sedimentation in the WFWR is due to streambank erosion (66%). Other key sources include erosion from roadways and ditches (17.1%) and urban areas/construction (10.9%).

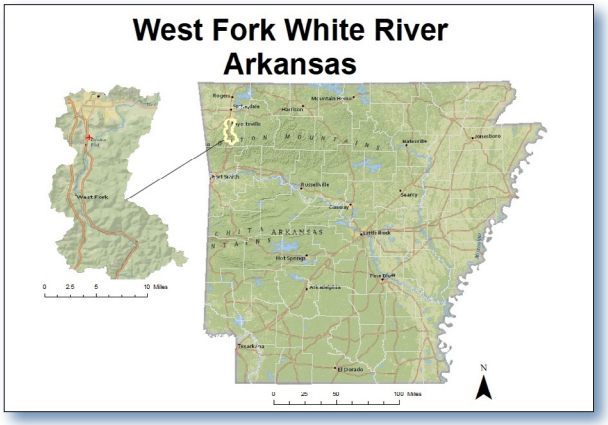

Figure 1. The WFWR is in northwest Arkansas.

Story Highlights

Since 1998, ANRD has funded 18 NPS projects addressing water quality monitoring and streambank stabilization in the watershed. In 2003, Audubon Arkansas started an outreach and demonstration project with ANRD, helping to create the White River Watershed Group to continue the conservation and demonstration work in the watershed. Audubon Arkansas also posted watershed signs and worked with local landowners to create conservation easements for a little over 3 acres. Another monitoring project with the Ecological Conservation Organization (ECO) was started in 2006 to establish two water quality monitoring stations on the WFWR to provide a continuous sample collection frequency that emphasized both base flow and storm flows.

Figure 2. Streambank erosion and conditions on the WFWR near the Fayetteville Airport before (top) and after (bottom) a restoration project was completed.

In 2007, partners conducted a restoration project with the Watershed Conservation Resource Center (WCRC) to plan and implement a natural channel design that would reduce lateral meander formation and associated erosion of streambanks. Approximately 800 linear feet of new channel and the river plug were constructed, and a total of six large structures were built, including one low-water crossing rock structure, one log/rock combination J-hook vane, and four rock J-hook vanes. Several small rock vanes and habitat rock were also installed. A 1-acre wetland area with four ponds was created where the old channel previously existed. The WCRC hosted or assisted with a series of outreach events during the project's construction phase through its completion in September 2010.

WCRC secured additional funds from the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) to restore streambanks (Figure 2). From 2007 to 2014, the two-phase West Fork Stream Restoration at Fayetteville Airport Project began stabilizing the streambank (adding toe wood, soil mattresses, and slope fortification), enhancing native vegetation, and removing invasive species.

The project included installing two boulder cluster riffles and repairing two grade control structures. The restoration was completed before a catastrophic flood event occurred in December 2015 and at least 12 other events occurred that had peak flows approaching or exceeding bankfull conditions.

Results

The 2006 WFWR total maximum daily load prescribed a 53% and 58% reduction of base flow and storm flow turbidity, respectively. Estimated loadings show that slightly greater amounts of pollutants pass at the West Fork (WF) downstream station, WF2. Although total suspended solids (TSS), soluble reactive phosphorus, and sulphate decreased in loading values from year 1 to year 3, other parameters such as nitrate, ammonia, and chloride increased. On average, for all parameters at both sites, storm events contribute approximately 71% of the pollutant loads. For TSS at WF1 and WF2, storm events contributed 94% and 91% of the calculated loading, respectively. Bank erosion data was collected at the West Fork Stream Restoration at Fayetteville Airport Project site before restoration, and flow data was collected from the U.S. Geological Survey WFWR gage station. During an 8-month period, the project has prevented pollutants from entering the WFWR system, including: (1) 15,000–20,000 tons of sediment, (2) 5,000–10,000 pounds of total phosphorus, and (3) 20,000–25,000 pounds of total nitrogen. The project protected a county road, utility infrastructure, and landowner properties by preventing as much as 60 feet of lateral streambank erosion and subsequent loss of more than 25 mature trees in an established forested riparian area. Due to the observed decrease in TSS loading to the waterbody, the upper 16.5 miles of the WFWR were determined to be attaining the state standard for turbidity and were removed from the list of impaired waters in 2018.

Partners and Funding

Collaborative partnership efforts over the last 25 years included ANRD, WCRC, Beaver Watershed Alliance, the City of Fayetteville, ECO, Audubon Arkansas, Beaver Watershed District, and the University of Arkansas. In 2016 WCRC was awarded a $4.3 million NRCS Regional Conservation Partnership Program grant with an additional $4.4 million of match provided by local partners to improve conditions in the watershed.

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