Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Minnesota

Managing Agricultural Drainage Reduces Bacteria in Clearwater River

Waterbody Improved

Nonpoint sources of pollution, such as livestock operations, wildlife, and drainage from wild rice paddies, contributed high levels of bacteria in Minnesota's Clearwater River that violated water quality standards. As a result, the Minnesota Pollution Control Agency (MPCA) added a 58-mile segment of the Clearwater River to the state's Clean Water Act (CWA) section 303(d) list of impaired waters in 2002 for pathogens impairment. Project partners implemented a number of restoration projects, including planting buffer strips, stabilizing streambanks and improving the drainage of wild rice paddies. These efforts have reduced bacteria levels; as a result, MPCA removed the 58-mile segment of Clearwater River from the state's 2010 list of impaired waters for bacteria.

Problem

The 886,600-acre Clearwater River watershed (Figure 1) drains portion of Clearwater, Mahnomen, Polk and Red Lake counties in northern Minnesota's Red River Basin. Major land uses in the watershed include agriculture (54 percent), forest (24 percent) and wetlands (14 percent). The watershed has a poorly defined floodplain and low gradient, and it has been altered by extensive drainage, widespread conversion of tallgrass prairie to farmland, and urban/suburban development. As a result, the basin is subject to frequent floods that affect urban and rural infrastructure, as well as agricultural production. Between 1948 and 1958, the U.S. Army Corps of Engineers channelized approximately 38 miles of the Clearwater River to reduce flood damage to agricultural interests in the surrounding area. This channelization has exacerbated upstream streambank erosion problems, leading to increased sediment loading in the river.

The "Clearwater River Nonpoint Study," completed in the early 1990s, found that the monthly geometric mean fecal coliform bacteria concentrations exceeded the state's water quality standard in June, August and September. As a result, the MPCA added a 58-mile segment of Clearwater River (from its confluence with Ruffy Brook to its confluence with the Lost River) to Minnesota's CWA section 303(d) list of impaired waters in 2002; the reason given was failure to meet the state's bacteria water quality standards to protect the waterbody's aquatic recreation designated use.

Figure 1. Northwestern Minnesota's Clearwater River is in the Red Lake River basin, a tributary of the Red River of the North.

Nonpoint sources of fecal coliform included livestock operations, wildlife, and drainage from wild rice paddies along the river. Hydrologic modification also contributed to pollution problems. This segment was also listed in 2002 as impaired for dissolved oxygen.

Figure 2. Farmers restored streambanks and installed vegetated buffer strips along the river.

Project Highlights

Numerous studies and implementation activities led to the improved water quality of Clearwater River. The Clearwater County and Red Lake County soil and water conservation districts worked with farmers to implement best management practices (BMPs) throughout the watershed. The BMPs included residue management, grazing management, nutrient management, grade control structures, side water inlets, streambank protection and grassed waterways. The soil and water conservation districts worked with local farmers with lands adjacent to the river to install vegetated buffer strips along the river to minimize erosion and intercept and filter runoff (Figure 2). Farmers also modified stretches of ditches to function as sediment traps. In 2001, farmers used CWA section 319 grant funds to install erosion control and streambank stabilization BMPs at key sites in the watershed. A number of wild rice growers along the Clearwater River installed tile drainage in their paddies, which reduced the amount of sediment and waterfowl manure leaving the paddies.

Results

The Red Lake Watershed District, with support from the MPCA, conducted a total maximum daily load (TMDL) study from 2007 to 2009 to assess impairments, define sources and loads of pollutants, estimate the reductions in pollutants needed to meet water quality standards, and propose strategies to achieve the desired reductions. During the course of the TMDL study, Minnesota's aquatic recreation water quality standard transitioned from a fecal coliform bacteria-based standard to an *Escherichia coli* bacteria standard of a maximum monthly mean of 126 colony-forming units (CFU) per 100 mL.

Throughout the two-year study, at least five water samples were collected monthly from several locations along the Clearwater River. All samples collected within the two-year monitoring period met the state's *E. coli* water quality standard to protect the waterbody's aquatic recreation designated use (Figure 3). Based on these results, the MPCA confirmed that the Clearwater River segment no longer required a TMDL to address the bacteria impairment and removed the 58-mile segment from the state's list of impaired waters in 2010 for bacteria. Stakeholders continue to set pollution reduction goals to further improve water quality and are developing a Clearwater River Protection Plan to coordinate these efforts. The segment remains listed as impaired for dissolved oxygen.

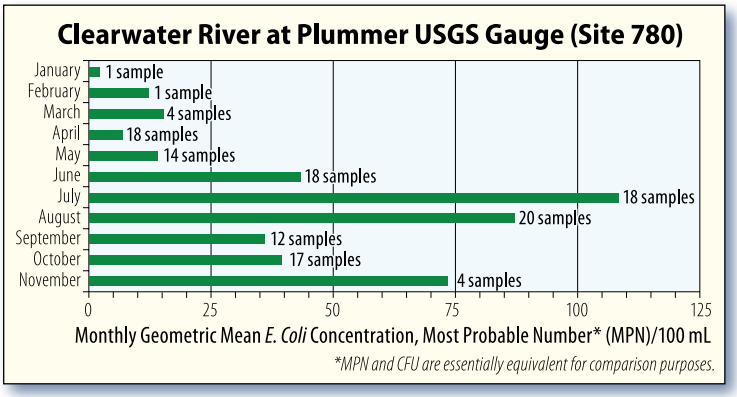

Figure 3. Clearwater River monthly geometric mean *E. coli* data (2007–2009).

Partners and Funding

The success of the Clearwater River Nonpoint Project was the result of coordination between local, state and federal agencies. The Phase I (study) portion of the project was completed by the Red Lake Watershed District (RLWD) and HDR Engineering and was sponsored by the RLWD and local soil and water conservation districts. Phase II of the project (implementation) was also administered and implemented by the RLWD. In 2001, a $134,500 CWA section 319 grant funded stream bank stabilization projects in the watershed. CWA section 319 funds also supported the MPCA staff who served in an advisory role throughout the life of this project. State funding provided additional support, including an $852,541 loan from Minnesota's Clean Water Partnership in 1996 and 2001, and a grant of $100,000 from the 2007 Clean Water Legacy state appropriation.

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