Section 319
NONPOINT SOURCE PROGRAM SUCCESS STORY
Delaware

Restoring Stream and Creating Wetlands Improves Aquatic Habitat

Waterbody Improved

The Delaware Department of Natural Resources and Environmental Control (DNREC) completed a 5,000-foot stream restoration project in the fall of 2005 along Pike Creek. In honor of an adjacent landowner's overwhelming support of the effort, the restoration activity is referred to as the Three Little Bakers stream restoration project. The DNREC restored the stream channel and adjacent banks using a host of restoration techniques, planted approximately 5 acres of vegetation within the riparian zone, and created 3 acres of wetlands. Preliminary results indicate that habitat has improved and populations of macroinvertebrates and fish have increased significantly. DNREC anticipates that the state will remove the restored section of Pike Creek from its 303(d) list of impaired waters after a few years of monitoring.

Problem

Pike Creek is in northern New Castle County, Delaware. It is a tributary of White Clay Creek, which is part of the National Wild and Scenic River system. White Clay Creek is a subbasin of the Christina River Basin and is part of the Piedmont ecoregion. The 4.7-mile segment of Pike Creek that includes the Three Little Bakers restoration project is listed on the 303(d) list of impaired waters as having an unknown pollutant or stressor affecting both habitat and biology.

A Riparian Corridor Stream Inventory Study conducted by the DNREC's Whole Basin Piedmont Team in 1998–1999, and a Christina River Watershed Restoration Study conducted in 1999 identified the upper Pike Creek as a segment in need of restoration. The studies showed that the stream had significant bank erosion, which contributed to heavy sediment loads and degraded aquatic habitat. Deep entrenchment with nearly vertical eroding banks was evident in several segments, and numerous mid-channel bars had formed from the heavy sedimentation (Figure 1).

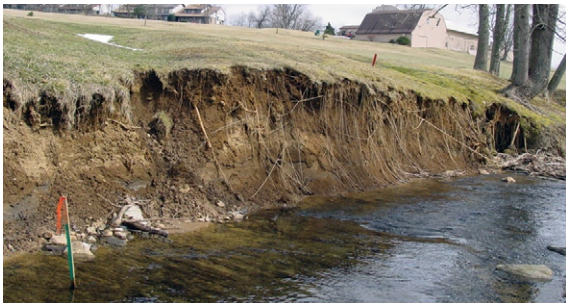

Figure 1. Pre-restoration: Severe bank erosion along the Pike Creek mainstem at the Three Little Bakers Golf Course. (Source: DNREC 2002)

Project Highlights

Construction at the Three Little Bakers site began in early March 2005 and was completed in mid-October 2006. The restoration project implemented many best management practices (BMPs), including stabilizing stream banks to reduce erosion, creating in-stream habitat by building sequences of riffles and pools in the stream channel, creating 3 acres of forested wetlands in the floodplain area, and planting approximately 5 acres of riparian area with 3,500 native trees and shrubs (Figures 2, 3 and 4). Once implemented, these practices reduced the number of out-of-bank flooding events and maintained the natural look of the stream.

Figure 2. Post-restoration: Rock toe and vane, cross vane, and rootwad installed for bank stabilization, hydrologic direction, and grade control. (Source: DNREC 2005)

Word of the project's success has spread. The site serves as an excellent outdoor classroom—students, garden clubs, members of the general public, and a wide array of environmental professionals from the tri-state region have explored it. The project was highlighted during the Red Clay Valley Association's 2006 annual meeting and was featured in a series of

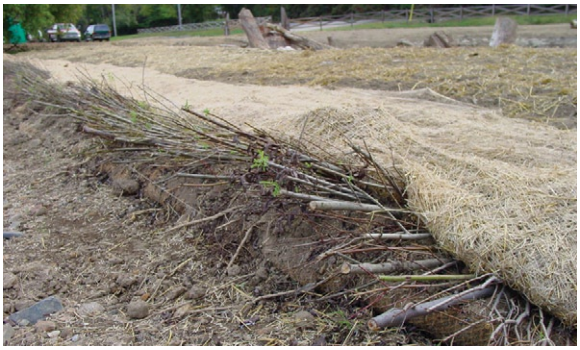

Figure 3. Post-restoration: Live riparian willow sprigs (*Salix* sp.) and coir matting installed for bank stabilization and to establish a riparian buffer.
(Source: DNREC 2005)

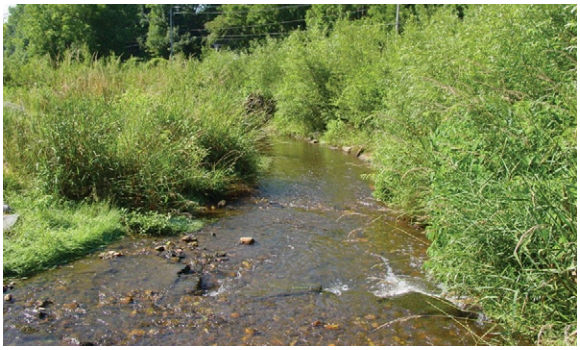

Figure 4. Post-restoration: Willow plantings one year after restoration (same area pictured in Fig. 3).
(Source: J. Meyer 2006)

environmental short-courses offered by the Delaware Nature Society.

In October 2006, 4-H leader John VanStan and his 4-H group adopted the created wetland site at Three Little Bakers. Sponsored by the University of Delaware's Cooperative Extension, the group will monitor the stream through the Stream Watch Program overseen by the Delaware Nature Society.

Results

DNREC collected benthic macroinvertebrate samples in 2006 using U.S. Environmental Protection Agency's (EPA's) Rapid Bioassessment Protocols along the 5,000-linear-foot restored reach at the Three Little Bakers. Scientists from the DNREC, Division of Water Resources, Environmental Laboratory Section compared the 2006 data to baseline data collected from the same reach before the restoration in 2002. The scientists also collected samples from a regional reference stream (Middle Run) in the same watershed.

Results from field data indicate that overall habitat quality in the restored reach has improved. In fact, the habitat quality improved from pre-restoration, low-habitat conditions with only 70 percent resembling conditions comparable to a reference stream, to moderately degraded conditions with habitat conditions as high as 99 percent comparable to the reference stream, ranging from moderately degraded to good conditions. In conjunction with reestablishing more natural hydrology and morphology, the ecological functions provided by a mature riparian zone will further contribute to the success of the restoration and increase potential for colonization by a more diverse assemblage of benthic organisms. As these habitat quality improvements continue, DNREC anticipates that this stream segment will warrant removal from Delaware's 303(d) list of impaired waterbodies.

Partners and Funding

Several state and federal agencies contributed funding to this project. DNREC administered $368,230 of section 319 funding for implementing the BMPs listed above. The Delaware Department of Transportation contributed $50,000. The New Castle Conservation District provided $10,000. EPA's Christiania Basin Watershed Initiative Grant and the U.S. Department of Agriculture's Natural Resources Conservation Service contributed $55,700 and $100,000, respectively. The private landowner—Three Little Bakers Golf Course—donated $50,000 for the restoration of Pike Creek.

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