



NONPOINT SOURCE SUCCESS STORY

Pennsylvania

Partners Collaborate to Improve the Turtle Creek Stream Corridor

Waterbody Improved

In 2004, excess sediment from eroding streambanks, over-widened channels, livestock access, and lack of tree canopy caused the impairment of Pennsylvania's Turtle Creek. The Pennsylvania Department of Environmental Protection (PA DEP) added 8.79 miles of stream to the state's 2004 Clean Water Act (CWA) section 303(d) list of impaired waters. From 2012 through 2020, the Northcentral Stream Restoration Partnership (Partnership) worked with 14 landowners along 5.3 miles of Turtle Creek. Together, they implemented best management practices (BMPs) including streambank fencing, streambank stabilization, and riparian buffers. As a result of the Partnership and landowners' efforts, water quality and aquatic habitat have significantly improved.

Problem

Turtle Creek is a tributary to the West Branch Susquehanna River in central Pennsylvania's Union County (Figure 1). An 8.79-mile segment of Turtle Creek was listed as impaired for siltation in 2004. The creek flows from forested headwaters into an agricultural landscape and a large-lot residential area before its confluence with the West Branch Susquehanna River. The 12.7-square-mile watershed includes the following land uses: forest (47.1%), agriculture (45.6%), and developed land (7.3%). A total maximum daily load (TMDL) developed in 2013 identified excess siltation as the cause of aquatic life impairment in the basin. The largest pollutant load allocations and reductions were identified for cropland, pasture, hay, and streambanks. Project partners conducted ground-truthing and bank pins surveys in 2013 that showed lateral erosion rates of 0.5–1 foot/year, which confirmed that streambank erosion was a significant sediment source. The TMDL developed for Turtle Creek established a 37.2% reduction goal from the 2013 sediment loading.

Story Highlights

The Partnership was formed in 2007 to help reduce sediment and nutrient inputs by restoring stream corridor stability. Partnership members included Northcentral Pennsylvania Conservancy (NPC), PA DEP's Northcentral Regional Office, Pennsylvania Fish and Boat Commission's (PFBC's) Stream Habitat Section, and Union County Conservation District, among others. Before 2012, several landowners installed streambank fencing, planted riparian buffers,

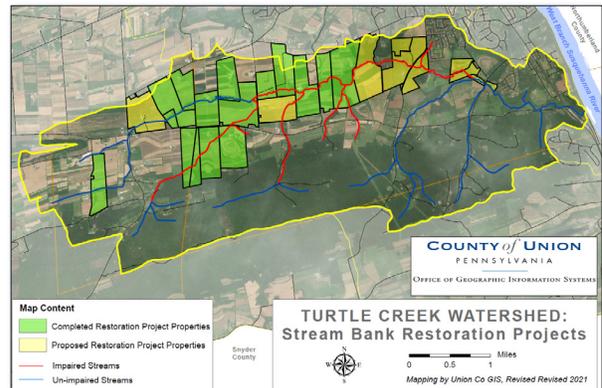


Figure 1. Map of the Turtle Creek watershed and streambank restoration project locations.

excluded livestock from stream corridors, converted cropland to permanent hay, and constructed manure storage areas. However, the stream corridor still had incised, vertical, and eroded streambanks; livestock-trampled streambanks; and limited tree canopy. Landowners in the Turtle Creek watershed quickly saw the results of the first riparian planting (2012) and streambank stabilization (2013) projects, which were led by the Partnership (Figure 2). The partners, focusing on restoration outreach, saw an increase in community interest and a waiting list of willing landowners rapidly developed. In 2014, the partners implemented six projects on adjacent farms—the single largest implementation effort to date. The Partnership completed restoration projects on 14 parcels in 2013–2020 and has additional projects scheduled (see Figure 1).



Figure 2. Implementing BMPs improved the creek.

Turtle Creek BMP implementation to date includes 5.3 miles of stream restoration with reconnection to channel floodplain (log structures that both stabilize and provide habitat using vanes, cross vanes, and muddills); 10,900 feet of exclusionary fencing, including 19 livestock and equipment crossings; 1,500 log and rock structures for streambank stabilization; 21.1 acres of riparian area plantings; and 6.5 acres of grassed buffers with incorporated pollinator plantings.

Results

Water quality has improved. The stream channel stabilization and floodplain reconnection work eliminated vertical, eroded banks while promoting the flushing of fine sediments from the channel substrate. Stream reaches that had been widened over time by cattle access were narrowed using habitat structures, thereby improving sediment transport, lowering thermal gain, raising dissolved oxygen, and eliminating

excessive algal mats. Electrofishing survey data from one stream reach site shows the number of lithophilic fish (fish species that need clean gravels to spawn) dramatically increased after restoration (Figure 3). Index of biological integrity (IBI) scores and habitat scores also increased between 2014 and 2018 at multiple monitoring sites (Figures 4 and 5). By 2018, habitat scores, representing 1.5 miles of stabilization, reached attaining status due to the changes in substrate, bank stability, and increased vegetation.

Partners and Funding

Several key agencies and regional universities partnered with local landowners to provide monetary funding and project support and assistance. The Northcentral Pennsylvania Conservancy administered \$403,853 of PA DEP's Growing Greener Environmental Stewardship funding through multiple grant awards since 2010. PFBC's Save our Susquehanna program provided \$34,297. Landowners provided project support, which included lending and operating equipment; moving and temporarily housing livestock; providing seed, mulch, and other necessary materials; hosting multiple outreach events; and performing yearly sampling of macroinvertebrates and fish. Susquehanna University's Freshwater Research Institute conducted electrofishing and macroinvertebrate surveys over multiple years to analyze changes in fish populations. Bucknell University conducted detailed cross-sections and longitudinal profile assessments at select sites.

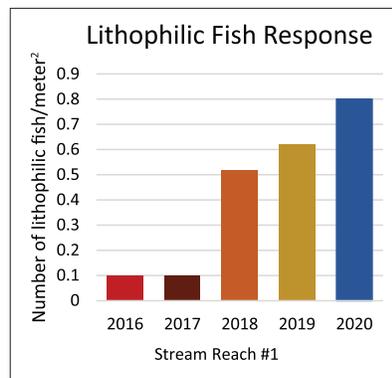


Figure 3. Fish numbers increased after a 2016 restoration project on a portion of Turtle Creek.

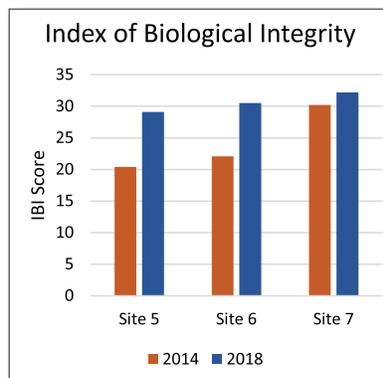


Figure 4. Turtle Creek IBI scores increased between 2014 and 2018 at multiple sites.

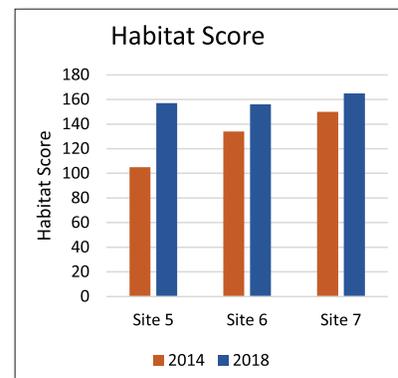


Figure 5. Habitat scores increased between 2014 and 2018 at multiple sites along Turtle Creek.



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

EPA 841-F-22-001H
April 2022

For additional information contact:

Jason Fellon
PA DEP, Northcentral Region
570-327-3593 • jfellon@pa.gov

Renee Carey
Northcentral Pennsylvania Conservancy
570-323-6222 • rcarey@npcweb.org

Shanon Stamm
Union County Conservation District
570-524-3860 • sbstamm@unionco.org

Cameron Englehart
Pennsylvania Fish and Boat Commission
814-359-5245 • cenglehart@pa.gov