NONPOINT SOURCE SUCCESS STORY

North Carolina

Countering the Effects of Rapid Urbanization on Smith Creek

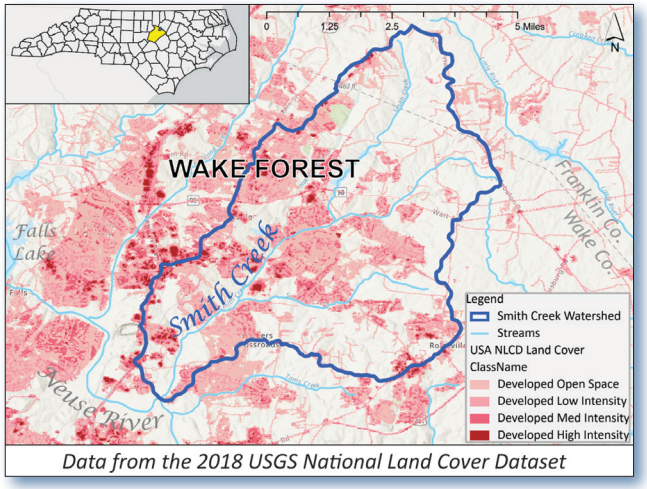
Waterbody Improved

The population of Wake Forest has more than tripled since 2000, dramatically increasing impervious cover and degrading aquatic communities in Smith Creek, which was added to North Carolina's Clean Water Act (CWA) section 303(d) impaired waters list. Since 2008, Smith Creek has remained impaired for either fish community or benthos as a result of habitat loss. In 2012, CWA section 319 funding was used to create a Watershed Restoration Plan for Smith Creek, sparking significant investment in stream restoration, land conservation, erosion controls and public education. Through these efforts, the town has mitigated some urbanization impacts on the creek, resulting in removal of a four-mile segment from the 303(d) list in 2018. Additional related projects are underway or planned, and further improvements in Smith Creek's fish community are anticipated.

Problem

The Smith Creek watershed lies mostly within the town of Wake Forest, about 20 miles northeast of Raleigh in the Piedmont ecoregion (Figure 1). Smith Creek empties directly into the Neuse River just below Falls Lake in Wake County. Since the turn of the century, Wake Forest has rapidly transitioned from rural to suburban. Now with more than 35 percent developed land, the Smith Creek watershed experiences higher peak flows, resulting in stream instability, increased sediment and nutrient loading, as well as diminished and degraded aquatic habitat. A 5.8-mile segment of Smith Creek from the Wake Forest Reservoir dam to the Neuse River was added to the CWA section 303(d) list in 2008 for impairments to fish community and remained listed from 2012 to 2016 for benthic impairments.

Map created by Kelsey Rowland



Data from the 2018 USGS National Land Cover Dataset

Figure 1. Smith Creek flows through the town of Wake Forest in central North Carolina.

Story Highlights

In 2012, the Town of Wake Forest received CWA section 319 funds to create and implement a watershed restoration plan to address the benthos impairment in Smith Creek. The plan evaluated watershed characteristics and identified and prioritized locations of potential stream restorations, stormwater control measures, and land conservation/preservation. To improve local stewardship of the creek, the town launched outreach/education initiatives (totaling over 62,000 contact hours) including backyard stream repair workshops, stream tours, and an Adopt-a-Stream (AoS) program.

The nearly 50 AoS volunteers collected water quality data, conducted quarterly stream cleanups, and learned about watershed ecology and nonpoint source pollution. The 3-year project also included a benthos study to collect information from additional monitoring sites to supplement the state's recurring sampling. The study found habitat degradation to be the primary limiting factor for benthic diversity. Subsequently, the town added benthic habitat structures to Smith Creek tributary and relocated benthos from upstream. The transfer of organisms was successful, and the project, headed by a local Eagle Scout, won an American Council of Engineering Companies Engineering Excellence Award in 2016.

To implement the restoration plan described above, the Town of Wake Forest has worked closely with state and federal agencies to improve stormwater infrastructure, install stormwater control measures, create greenways and improve riparian buffers. Additionally, the town has taken over erosion control responsibility from the county, and has developed an erosion and sediment control land disturbance permitting program that is more stringent than the minimum state requirements. This program won the Large Local Program Award from the North Carolina (NC) Division of Energy, Mineral, and Land Resources in 2016.

In addition to land-based activities, the restoration plan identified 10 priority stream restoration/stabilization projects, including the Ailey Young Park Dam Project, which is currently underway with funding from a CWA section 319 grant, a NC Water Resources Development Grant (WRDG), and a NC Department of Justice Ecosystem Enhancement grant. The project will remove a failing dam, repair a head cut, re-establish a stable stream morphology, and provide two pocket wetlands for fish and wildlife passage (Figure 2). The project is designed to reduce total nitrogen by 15 percent, total phosphorus by 30 percent, and total suspended solids by 77 percent.

Land conservation was also highlighted as a priority for stemming further stream degradation. So far, the NC Clean Water Management Trust Fund has provided over $1.3 million worth of land acquisitions for conservation. This includes 28 acres for the Smith Creek greenway, which helps to maintain riparian buffer zones and connect the community with the creek.

Results

The NC Division of Water resources regularly collects benthic and fish samples from surface waters and uses information gathered about the diversity, abundance, and pollution sensitivity of the organisms to determine one of five bioclassifications for the water body: *excellent, good, good-fair, fair,* or *poor.* These bioclassifications, which have been developed for each major ecoregion, are used to assess the impacts of both point source discharges and nonpoint source runoff. The presence of more diverse, populous, and pollution-sensitive benthic and fish communities indicate better overall water quality.

Photo: Town of Wake Forest

Figure 2. Partners completed an intermittent channel restoration project in the watershed.

Smith Creek benthic and fish bioclassifications have been variable over time. With recent sampling, the lower segment of the creek received an unimpaired bioclassification of *good-fair* for both benthic and fish communities. As a result, a 4-mile segment of Smith Creek (Assessment Unit 27-23-(2)b: 0.3 miles downstream of Hatters Branch to Neuse River) was removed from the CWA section 303(d) list of impaired waters in 2018, marking incremental water quality improvements in this rapidly urbanizing watershed. The ongoing restoration work described here should lead to further water quality improvements in this section of Smith Creek as well as upstream.

Partners and Funding

Numerous groups have contributed to the restoration of Smith Creek. The CWA section 319 program has funded two projects totaling $356,455 in the Smith Creek watershed. The Clean Water Management Trust Fund, NC Division of Water Resources, and the NC Department of Justice have also contributed substantial grant funds. Other partners contributing services and funds include Wake County Soil and Water Conservation District, Franklin County Soil and Water Conservation District, Wake County Open Space, NC Cooperative Extension, NC Watershed Stewardship Network, NC State University Restoration Program, Southeast Environmental Educators Alliance, Neuse River Foundation, Boy Scouts of America, Girl Scouts of the USA, Duke Energy and Moffat Pipe.

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For additional information contact:

Rishi R Bastakoti, PhD
NC Division of Water Resources
919-707-3623 • rishi.bastakoti@ncdenr.gov
Kelsey Rowland
NC Division of Water Resources
919-707-3679 • kelsey.rowland@ncdenr.gov