Wetland Removal of Nutrients and Pollution from a Mixed Sewer and Karst Spring System in Nashville, Tennessee

By Carlton Cobb[1,3], Jameka Johnson[1,3], Brandon Cobb[1,3], Patrice Armstrong[2,3], Lonnie Sharpe[1],and Tom Byl[1,3]

[1]College of Engineering, Technology and Computer Science, Tennessee State University, 3500 John A. Merritt Blvd., Nashville, TN 37209

[2]Biology Dept., Tennessee State University, 3500 John A. Merritt Blvd., Nashville, TN 37209 .

[3]U.S. Geological Survey, 640 Grassmere Park, Suite 100, Nashville, TN 37211

Abstract

Wetlands have been shown to attenuate suspended sediments and agricultural pollution in rural areas but little work has been conducted regarding the benefits of the wetlands in mitigating urban non-point source pollution (NPS). The objective of this project was to determine if an 80 acre natural wetland located down gradient of bedrock springs, parking lots, city streets and leaky sewer systems in Nashville, Tennessee helped to mitigate urban NPS runoff. Sampling points were selected by reconnaissance during rainfall events to determine general flow paths. Water samples were collected at these sampling points during base-flow and rain runoff events. Water-quality monitors were also placed in the springs and along the flow path during the 12 month period of study. Water samples were analyzed within 48 hours for turbidity, specific conductance, pH, and volatile organic compounds (VOC). Additional analyses were performed for sulfate (SO_4), nitrate (NO_3) ammonia (NH3) and chemical oxygen demand (COD). It was found that runoff from parking lots and roads during winter storms had relatively high VOC levels (62 μg/L benzene, 132 μg/L toluene, 106 μg/L xylenes, and a number of unidentified compounds). Water samples collected downstream of the wetland, however, had VOC concentrations below detection levels. Water samples collected at the most downstream site also had significantly lower levels of turbidity (90 % lower), NH_3 (99% lower), COD (95% lower), NO_3, (90% lower), and SO_4 (63% lower) on average for the year. The results indicated that routing water through the urban wetland resulted in significant water-quality improvements during the study period.