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BMP structures supported urban watershed water quality improvement analysis using ArcSWAT

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Abstract

The Flat Creek Watershed is a 7300+ acre watershed located in central Hall County, Georgia is considered impaired because of both historic and current watershed impacts such as fecal coliform and biological criteria. Flat Creek, a 6 mile long eastern tributary to Lake Sydney Lanier, is on the 2010 EPA 303(d) list of impaired streams. The upper reaches of the watershed end in downtown Gainesville, Georgia. While watershed management efforts have been implemented to prevent further degradation, watershed improvement projects should be undertaken, both to restore Flat Creek to a more natural state and to prevent further degradation. The City of Gainesville and Hall County cooperatively identified and prioritized potential watershed improvement projects to stabilize and restore specific reaches of Flat Creek. The Flat Creek Watershed Improvement Plan (WIP), which summarizes this effort, was developed to meet two major goals. One goal is to develop a restoration plan for the Flat Creek Watershed, in accordance with Section 319(h) funding, which will improve water quality and channel stability in Flat Creek and will enhance aquatic habitat and ecosystem integrity. The other goal is to comply with Metropolitan North Georgia Water Planning District (District) guidelines for watershed improvement activities, as enforced by GAEPD as a component of the National Pollutant Discharge Elimination System (NPDES) permitting process. The goal of this project is to develop a calibrated SWAT (Soil and Water Assessment Tool) model using ArcSWAT that will predict future watershed conditions and allow for updating as restoration projects are completed in the watershed. This will allow officials to see the benefit of the projects to the watershed. Two models were developed in ArcSWAT. One with the previous land-use/land cover data before the stream restoration project taken up, high resolution DEM developed from LiDAR data, and high resolution SSURGO data and other using the same elevation and soil data but the latest land-use of the watershed after the stream restoration project completion. Water quality and quantity results were compared and validated with the water samples collected since 2000. Decrease in water impairment was observed through the models as well as the actual sampled data. The important aspect of the study was to develop the high-end ArcSWAT model in a small watershed with highest possible resolution spatial data with the inclusion of best management practice (BMP) land-uses. The study will help future researchers to develop ArcSWAT water management models in small size watersheds with BMP applications.

Key words: SWAT, watershed, water quality, stream restoration, BMP, geospatial technology.