Public Abstract

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Title:A Multi-Configuration of the Soil and Water Assessment Tool (SWAT) in a Mixed Land Use Watershed in the Central U.S.A.

Freshwater is a critical and irreplaceable natural resource necessary for human health, agriculture, industry, recreation, and ecosystem integrity. Watershed-scale distributed hydrologic/water quality (H/WQ) models such as the Soil and Water Assessment Tool (SWAT) have become increasingly important tools for water resource management. Though substantial progress in development of H/WQ modeling has been made, there remain major impediments to practical implementation of H/WQ models by agencies and practitioners for use in watershed management. Impediments include (1) a general lack of availability of high quality distributed data that is necessary for model implementation (configuration, calibration, and validation), (2) practical limits on human and computer resources for watershed modeling, and (3) a general lack of agreement and consistency in the scientific literature regarding appropriate methods for model statistical evaluation.This study presents a practical framework for use of the Soil and Water Assessment Tool (SWAT). The SWAT model was tested using data collected in an urbanizing watershed, the Hinkson Creek Watershed (HCW) in Boone County, central Missouri, U.S.A. Results show variable accuracy across scales and evaluation methods using 20 model configurations based on two watershed subdivisions, two soil datasets, and five climate datasets. Nine goodness-of-fit indicators were tested, including four new indices (R-RMSE, R-MAE, R-NSE, and R-NSE1) designed to quantify model fit with flow distribution. Sixteen of 20 configurations achieved satisfactory monthly streamflow fit (NSE > 0.5, PBIAS < 25%) without calibration. Watershed and soil resolution had negligible impact; climate input had considerable impact. Single climate station input is best used for applications requiring monthly predictions; distributed climate station input is needed for daily predictions. SWAT multi-objective auto-calibration better predicted monthly flow (PBIAS=1%, NSE=0.8) than single-objective calibration (PBIAS=16%, NSE=0.5). SWAT performs well in Central U.S. urbanizing watersheds. Accuracy can improve with auto-calibration as presented and continued model development.