Enhancing Site Scale Bioretention Modeling to Investigate Watershed Scale Restoration

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Introduction

Bioretention is a widely used green infrastructure that replicates natural hydrology in urban environments.

Bioretention promotes infiltration and reduces runoff volume and peak flow of stormwater.

Methods

Study Area

Nashville, NC, USA

Prepare input files for DRAINMOD-Urban

Split the data into calibration and validation period

Calibrate the model using the most sensitive parameters

Validate the model output using goodness of fit

Calibration Parameters

Soil parameter

Lateral saturated hydraulic conductivity

Design parameters

Drainage coefficient

Seepage parameters

Thickness of restrictive layer

Model Goodness of fit

Nash-Sutcliffe Efficiency (NSE)

Percent Bias (PBIAS)

Results

Evaluation

NSE ≥ 0.40 → Acceptable
NSE ≥ 0.60 → Good
NSE ≥ 0.75 → Excellent
PBIAS ≤ 25% → Acceptable

Hydrographs

Volume

Peak Flow

DRAINMOD-Urban showed strong performance for modeling bioretention outflow hydrographs and volumes, accurately matching measured data.

DRAINMOD-Urban is well-suited for bioretention application for different sites and varying conditions.

Conclusion

References
