Estimation of runoff curve numbers using a physically-based approach of preferential flow modelling

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Abstract The Runoff Curve Number (CN) technique of the NRCS is the most widely used methodology for the computation of storm runoff. In this study colour dye-tracing experiments were used to derive soil macroporosity parameters from 11 common land use and land cover (LULC) classes of northeast India. The eco-hydrological model SWAP was calibrated using the soil macropore parameters and daily observed soil moisture contents for different LULC classes. Using 30 years of meteorological data, the calibrated SWAP model was run to obtain daily runoff from the 11 LULC classes. The scatter plot between the SWAP simulated runoff and observed rainfall clearly depicted upper and lower boundaries representing wet and dry antecedent runoff conditions, respectively. Following the NRCS-CN rainfall–runoff relationship, an optimization technique was used to fit the upper and lower boundaries of the scatter plot to different CN values. The derived CN values accounted for the effect of preferential flow characteristics.

Key words curve number; land use and land cover; rainfall–runoff relationship; macropores; preferential flow; SWAP model