

Modelling the Hydrological Response of Connected Blue-Green Roofs by HYDRUS-1D

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Abstract : Connected blue-green roofs are novel vegetative roof systems that include a moisture-storage component (soil substrate) and an additional transient storage component (detention-retention layer) underneath, contributing to the roofs' total water detention and retention capacity. Hydrological models aid in assessing the vegetative roofs' response under various climates and sizing them appropriately. Despite their potential, few studies have modelled the blue-green roofs' hydrological performance. In the present study, collected data from a blue-green roof module, located in Vancouver, BC, from January 2020 until August 2021 is used to fill the modelling knowledge gap of these roofs. HYDRUS-1D, as a physics-based model, was successfully adapted to model blue-green roofs. The accuracy of the model was confirmed after calibration and validation procedures, resulting in simulated runoff and soil moisture content during short-term simulations. Even though the accuracy of the soil water content model predictions was low, the error in the predicted runoff flow rates was acceptable. The predicted flow rates were more accurate in the dry seasons than in the rainy seasons. Further studies are needed to improve the accuracy of the models to support their design and integration into the urban rainwater infrastructure.

Keywords : connected blue-green roofs, hydrological models, HYDRUS-1D model, runoff simulation, soil moisture content prediction, green infrastructure

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