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### ASSESSMENT OF CLIMATE CHANGE IMPACT ON THE SUBSURFACE DRAINAGE FLOW IN THE PIKE RIVER WATERSHED USING THE SWAT MODEL

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**ABSTRACT** Climate change can significantly affect the design of drainage systems and the management of water resources. Hydrologic models are essential to conceptualize the relationships between climate and water management as well as for the protection of the natural environment. The objective of this study was to assess the impact of climate change on subsurface drainage flow in the Pike river watershed using the SWAT-Q (Soil and Water Assessment Tool – Quebec) model. Three climate change scenarios projected by Canadian Regional Climate Model (CRCM) based on SRES (Special Report on Emissions Scenarios) A2 were applied. The daily precipitation and temperature projections were used for the periods of 1971-2000 and 2041-2070. The SWAT-Q was calibrated and validated using six years (2001-2006) and validated a second time by using measured data from 1979 to 2000. The performance of SWAT-Q was evaluated by comparing the observed and the model-predicted values. The results indicated that SWAT-Q performed satisfactorily for predicting total water yield in cold climatic conditions, with a coefficient of determination ( $R^2$ ) and Nash-Sutcliffe efficiency ranging from 0.67 to 0.85 and 0.61 to 0.84, respectively, during the calibration and validation periods. The CRCM projected that average annual precipitation during 2041-2070 would increase by 9 to 22%. Simulation results indicated that the changes in climate influenced the subsurface drainage flow more significantly than the land use. The predicted annual subsurface drainage flow varied from 30 % to 57 % of the total precipitation. However, the subsurface drainage flow would be increased by 10-90% compared with the present climate. The expected increases in tile drainage outflow require that more attention be given to soil and water conservation practices.

**Keywords:** Climate change; SWAT, hydrology, modeling, subsurface drainage flow, Quebec