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Comparing watershed management strategies at different spatial scales under future climate scenarios using SWAT

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ABSTRACT

It is essential that water resource management plans require explicit links across different spatial scales in a single watershed. This study aimed to identify existing gaps between sub-basin and watershed management strategies using a watershed simulation model soil and water assessment tool (SWAT). The SWAT was calibrated and validated at the upper and middle regions of the Yeongsan River in Korea using past weather inputs from 2012 to 2014. The simulation outputs from 2014 used as a reference were compared to those with future weather scenarios in 2032 produced from a regional climate model (RCM) such as RCM 2.6, 4.5, 6.0, and 8.5. We found that the calibration and validation results agreed well with the observed data, yielding Nash–Sutcliffe efficiency values more than 0.72 for daily streamflow as well as for monthly sediment and total phosphorus (TP) loads at the final watershed outlet. However, all projected weather data led to a significant difference in streamflow only at the sub-basin level, while all three variables at the watershed level varied significantly from scenario to scenario. These imply that water resource management plans determined at the watershed scale may not be suitable for those at the sub-basin scale, calling for a more refined search that harmonizes both management decisions.

Keywords: SWAT; Regional Climate Model; Future weather scenarios; Climate change; Watershed management plans

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