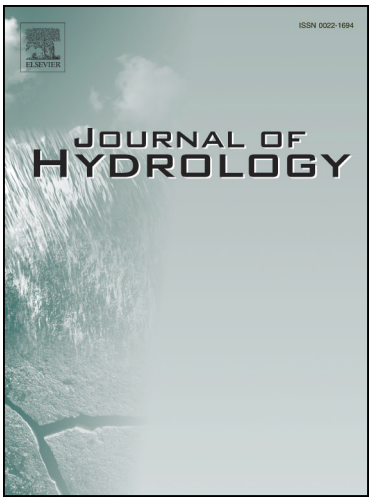

Research papers

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Han Li, Bingcheng Si, Min Li

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Rooting depth controls potential groundwater recharge on hillslopes

Han Li[a], Bingcheng Si [a,b,]*, Min Li[a,]*

*Corresponding author.

E-mail address: Bing.Si@usask.ca (Bingcheng Si); limin2016@nwafu.edu.cn (Min Li)

[a] College of Water Resources and Architectural Engineering, Northwest A&F University, Yangling 712100, China

[b] Department of Soil Science, University of Saskatchewan, Saskatoon SK S7N 5A8, Canada

Abstract

Land use changes may modify ecohydrological processes in soil, altering groundwater quantity and quality in arid and semi-arid regions. The effects of land use change were well documented on flatlands, but the effect of rooting depth on groundwater recharge is poorly understood. This study is to evaluate how conversion of shallow-rooted to deep-rooted vegetation affects groundwater recharge at different landscape positions (i.e. tableland, upslope, midslope, and downslope). Two adjacent transects were selected for a paired plot design: one was covered with shallow-rooted perennial grasses and the other was planted with deep-rooted apple trees or apricot trees in 1990's. Soil cores (as deep as 13 to 25 m) were collected at each of the four landscape positions along the two transects for the determination of soil water contents, root distributions, and soil tritium contents. Groundwater recharge rates beneath shallow-rooted vegetation were determined from the tritium peak method, and that beneath deep-rooted vegetation were calculated by subtracting the annual soil water deficit from recharge rates beneath shallow-rooted vegetation. Results show that, there is no significant difference in groundwater recharge between the four landscape positions under shallow-rooted vegetation ($p > 0.05$); however, there is a substantial difference between different slope positions along the other transect ($p < 0.05$). Cross comparison between the two transects show