

Evaluation of Forest Water Storage by changing Land Cover in Korea Peninsula

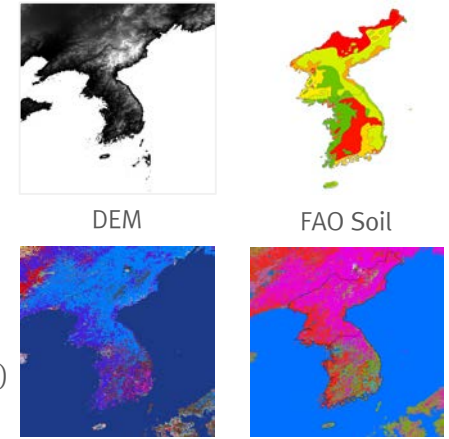
Youngjin Ko¹, Hyun-Woo Jo¹, Sujong Lee¹, Halim Lee¹, Chul-Hee Lim², Joon Kim¹, and Woo-Kyun Lee¹
¹Department of Environmental Science and Ecological Engineering, Korea university, Seoul, Republic of Korea (ko871004@gmail.com)
²Institute of Life Science and Natural Resource, Korea University, Seoul, Republic of Korea

Introduction

Water security depends on forests. Forest return less water to soil compared with grasslands or cultivation land because of their higher contribution to atmospheric moisture content via evapotranspiration. Water infiltration and retention are encouraged in forest soil by root systems. They are vital for reducing soil erosion and reducing drought by capturing fog water, reducing surface water run-off and promoting groundwater recharge. Deforestation and Afforestation in Korea Peninsula may cause change of water yield on precipitation storage and erosion control. This study is focus on how much water is contented in the changing land cover, especially forests. SWAT (Soil and Water Assessment Tool) model needs some data for simulation of water yield for example DEM, climatic data, land cover, soil data, etc. In this study, evaluation of water yield was performed at two time, 2014 and 2018 using SWAT model.

Methodology

Some input data are needed to simulate SWAT model such as DEM, climatic data, land cover, soil data. The sources are as follows.
DEM : Tile size 5*5 degree; Shuttle Rada Topography Mission (SRTM)
Climatic data : temperature (min; max); precipitation; wind; humidity; solar radiation; 5 years from 2014 to 2018; Korea Meteorological Administration (KMA)
Land cover: 2014 year; 2018 year; European Space Agency (ESA)
Soil data and slope: FAO Digital soil Map of the World (DSMW)
HRU definition in ArcSWAT : land use threshold 20%; soil threshold 10%; slope threshold 20%; (Michael et al., 2015)



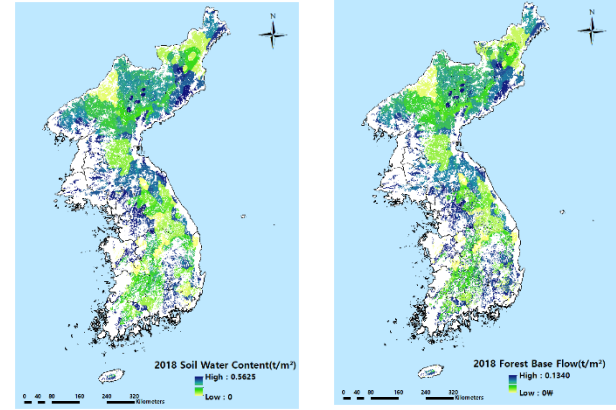
Land cover; **2014**
 Forest : 56.84%
 Urban : 2.53%
 Agriculture : 40.62%

Land cover; **2018**
 Forest : 56.81%
 Urban : 2.75%
 Agriculture : 40.44%



Result & Conclusion

We performed calibration and validation trough the annual report of Korea annual hydrological report. According to result of land cover map for 2014 and 2018, forest area in 2014 is more larger than forest area of 2018. Likewise, Forest in 2014 retained more water than 2018. It shows forest plays an important role in including water. In addition, forest retains lots of water than urban and agriculture. We multiplied the forest water storage by the baseflow rate of forest, which is used by National Institute of Forest Science, to check how much water forest provide for providing water to prevent disaster related to water such as drought. The overall value of forest water storage is high around the ridge of the Baekdudaegan Mountain Range on the Korean Peninsula. The pattern of forest water storage through SWAT model is similar to land cover and soil patterns, so it maybe the effect of land and soil cover is greatly reflected.to water storage.



Forest Water storage (2018) Baseflow from Forest (2018)

	Baseflow (%)
Decideous	26.5
Coniferous	14.7
Mixed	20.6

We simulated not pre-delineation but the automatic delineation depending DEM in SWAT model. So, when we have a process for calibration and validation, it exists difficulty and inaccuracy in the step. There are some limitation about data for calibration though SWAT model can simulate lots of information about each watershed. We try to simulate the function for pre-delineation to get the high precise result.

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