



Evaluating the Land use/cover Dynamics and its impact on Low Stream Flow of Gumara watershed, upper Blue Nile basin, Ethiopia.

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Abstract

Land cover and Climate change are very important issues in terms of global context and their responses to environmental and socio-economic drivers. The dynamic of these two factors is currently affecting the environment in unbalanced way including watershed hydrology. From observed values of stream flow, it is difficult to evaluate the effects of land use /cover change without using of hydrological models because it is the effect of combined changes of climate and land use land cover of the catchment. In this paper the impact of land use / cover change on low flow of Gumara watershed, Upper Blue Nile basin, Ethiopia were evaluated through application of the model Soil and Water Assessment Tool (SWAT). The land use/cover data were obtained from Land Sat image and processed by ERDAS IMAGINE 2010 software. Three land use land cover data; 1973, 1986, and 2013 were prepared and these data were used for base map, model calibration and change study respectively. So as to evaluate the effect of land use/cover change on low flow of the catchment, the stream flow was simulated by changing 1973 and 2013 LULC but the climate data, which is 1973-1982, was used and it was constant. The low flow of the catchment for these two decades was extracted in simulated flows by Seven Day Sustained (SSD) low flow identification method. The model was calibrated by 1986-1991 climate data and 1986 land use land cover data by using 11 important model parameters selected by sensitivity analysis process. The values of those calibrated parameters were also validated by 1992-1995 climate and with the same land use land cover data. The efficiency of the model was determined by Nash-Sutcliffe (NS) and Relative Volume error (RVE) and their values were 0.66 and 0.72% for calibration and 0.64 and 1.23% for validation respectively. Based on the result, the extreme low flow of Gumara watershed has been decreasing from 0.53m³/s to 0.43m³/s which showed decreasing by 0.1m³/s that is 18.87%. From the overall results of the study, it is possible to conclude that land use land cover change has been influencing the low flow or dry season flow of the catchment.

Key words: Climate, LULC, Low Flow, SWAT, Gumara, Blue Nile, Ethiopia.