

Abstract

Drought events across the world are increasingly becoming a critical problem owing to its negative effects on water resources. There is need to understand on-site drought characteristics for the purpose of planning mitigation measures. In this paper, meteorological drought episodes on spatial, temporal and trend domains were detected using Standardized Precipitation Index (SPI) and Effective Drought Index (EDI) in the upper Tana River basin. 41 years (1980-2016) monthly precipitation data from eight meteorological stations were used in the study. The SPI and EDI were used for reconstruction of the drought events and used to characterize the spatial, temporal and trend distribution of drought occurrence. Drought frequency was estimated as the ratio of a defined severity to its total number of events. The change in drought events was detected using a non-parametric man-Kendall trend test. The main drought conditions detected by SPI and EDI are severe drought, moderate drought, near normal, moderate wet, very wet and extremely wet conditions. From the results the average drought frequency between 1970 and 2010 for the south-eastern and north-western areas ranged from 12.16 to 14.93 and 3.82 to 6.63 percent respectively. The Mann-Kendall trend test show that drought trend increased in the south-eastern parts of the basin at 90% and 95% significant levels. However, there was no significant trend that was detected in the North-western areas. This is an indication that the south-eastern parts are more drought-prone areas compared to the North-western areas of the upper Tana River basin. Both the SPI and the EDI were effective in detecting the on-set of drought, description of the temporal variability, severity and spatial extent across the basin. It is recommended that the findings be adopted for decision making for drought-early warning systems in the river basin.