

Abstract

Drought occurrence, frequency and severity in the Upper Tana River basin (UTaRB) have critically affected water resource systems. To minimize the undesirable effects of drought, there is a need to quantify and project the drought trend. In this research, the drought was estimated and projected using Standardized Supply-Demand-Water Index (SSDI) and an Artificial Neural Network (ANN). Field meteorological data was used in which interpolated was conducted using kriging interpolation technique within ArcGIS environment. The results indicate those moderate, severe and extreme droughts at varying magnitudes as detected by the SSDI during 1972-2010 at different meteorological stations, with SSDI values equal or less than -2.0. In a spatial domain, the areas in south-eastern parts of the UTaRB exhibit the highest drought severity. Time-series forecasts and projection show that the best networks for SSDI exhibit respective ANNs architecture. The projected extreme droughts (values less than -2.00) and abundant water availability (SSDI values ≥ 2.00) were estimated using Recursive Multi-Step Neural Networks (RMSNN). The findings can be integrated into planning the drought-mitigation-adaptation and early-warning systems in the UTaRB.