Abstract

Drought is a critical stochastic natural disaster that adversely affects water resources, ecosystems and people. Drought is a condition characterized by scarcity of precipitation and/or water quantity that negatively affects the global, regional and local land-scales. At both global and regional scales, drought frequency and severity have been increasing leading to direct and indirect decline in water resources. Increase in drought severity and frequency in the upper Tana River basin, Kenya, water resources systems have been adversely affected. Timely detection and forecasting of drought is crucial in planning and management of water resources. The main objective of this research was to formulate the most appropriate models for assessment and forecasting of drought using Indices and Artificial Neural Networks (ANNs) for the basin. Hydro-meteorlogical data for the period 1970-2010 at sixteen hydrometric stations was used to test the performance of the indices in forecasting of the future drought at 1, 3, 6, 9, 12, 18 and 24-months lead times, by constructing ANN models with different time delays. Drought conditions at monthly temporal resolution were evaluated using selected drought indices. The occurrence of drought was investigated using non-parametric Man-kendall trend test. Spatial distribution of drought severity was determined using Kriging interpolation techinique. In addition, a standard Nonlinear-Integrated Drought Index (NDI), for drought forecasting in the basin was developed using hydro-meteoroogical data for the river basin. The results of spaial drought show that the south-eastern parts of the basin are more prone to drought risks than the north-western areas.