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Drought Indicator Assessment In Lake Management Using A Bayesian Network Model

Persistent and widespread drought conditions have raised serious water shortages in lakes throughout the world. Consequently, deficiencies in water availability in lakes have resulted in damaging economic and environmental assets. As impacts of drought have increased globally, risk management associated with lake level is crucial to reduce the vulnerability to drought. To implement more integrated and effective drought management under the consideration of uncertainties, it is essential to identify and assess the underlying interactions and impacts of drought indicators to the economic and ecological systems in a lake. In this study, a Bayesian network model was developed to facilitate the assessment and response of drought indicators in the context of economic and environmental utilities. To accomplish this as a decision support system, the Bayesian network consisted of series of nodes, including the decision and utility nodes. The interactions among nodes were used to address the diagnostic tasks as well as descriptive purposes in a given set of drought indicators. Particularly, the lake water availability was represented by four magnitudes of drought responses to assist in measuring the effects with regard to water quality, ecological habitat, and recreational use. The effects among variables of drought indicators and water conservation management were also examined with relation to the water levels in the lake. Finally, a sensitivity analysis was performed to assess the relevance of each node. With this technique, decision makers can accomplish better coordination and response to drought under scientific uncertainty for drought management in lakes.