

## **Improved Drought Management of Falls Lake Reservoir: Role of Multimodel Streamflow Forecasts in Setting up Restrictions**

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Droughts, resulting from natural variability in supply and from increased demand due to urbanization, have severe economic implications on local and regional water supply systems. In the context of short-term (monthly to seasonal) water management, predicting these supply variations well in advance are essential in advocating appropriate conservation measures before the onset of drought. In this study, we utilized 3-month ahead probabilistic multimodel streamflow forecasts developed using climatic information—sea surface temperature conditions in the tropical Pacific, tropical Atlantic and over North Carolina (NC) coast—for Falls Lake Reservoir in the Neuse River basin, NC. Multimodel streamflow forecasts and single model streamflow forecasts—ensembles from parametric regression model and semi-parametric resampling model—are forced with a reservoir management model that takes ensembles to estimate the reliabilities of meeting the water quality and water supply releases and the end of the season target storage by each model. The analyses shows that the entire seasonal releases for water supply and water quality uses are met purely based on the initial storages (100% reliability of supply) in July, thereby limiting the use of forecasts. However, constraining the allocation to ensure better storage conditions at the end of September, suggested the utility of streamflow forecasts in invoking restrictions during below-normal storage conditions. Further, multimodel forecasts performs better in detecting the below-normal inflow conditions in comparison to single model forecasts by reducing false alarms and missed targets which can improve public confidence in utilizing climate forecasts for developing proactive water management strategies.