Using multi-replicate source modelling to create a probabilistic storage forecasting tool

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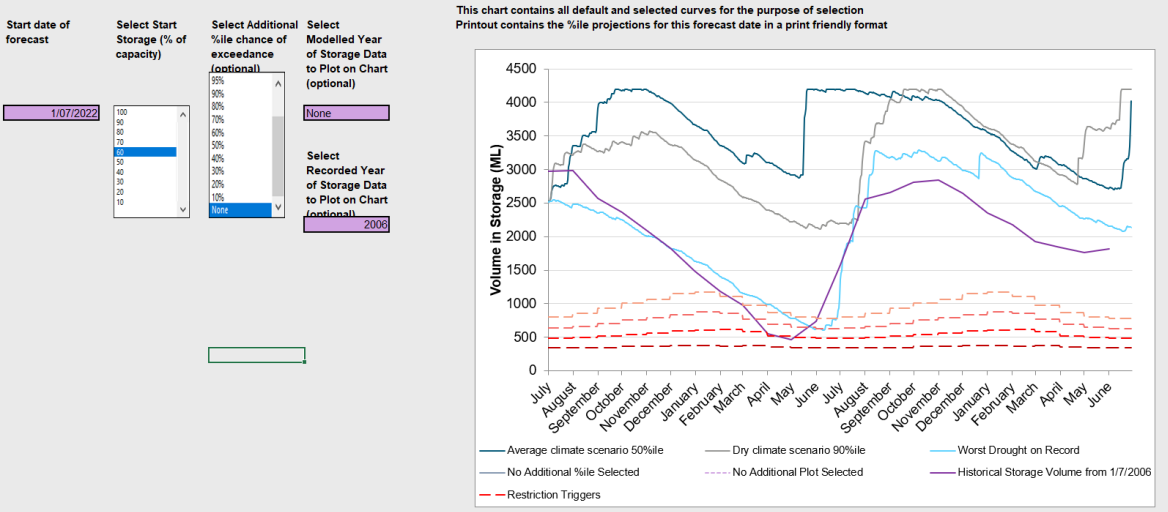
Abstract: Decision-making for operational urban water planning and drought response can be significantly enhanced via the use of a risk-based tool that projects a plausible range of future volume in storage and hence the risk of water restrictions under different climate outlooks. South Gippsland Water required an easy to use tool for forecasting storage behaviour that did not require water resources models to be re-run.

HARC used source hydrologic modelling software to undertake batched multireplicate runs of models of the Lance Creek, Leongatha and Fish Creek systems over a two year forecast period. This modelling process was used to construct storage forecast curves across all start months for various representative start storage volumes, thereby providing a reference library of possible storage behaviour over the 1–2 year outlook period. These modelling results were then input to a spreadsheet tool that allowed the user (not a source modeller) to plot storage forecast curves at any time of the year for any given current storage condition. Plots can also show historic storage volume and Stage 1 to 4 restriction triggers for that system.

A custom user interface was developed for each system to allow the required start month and start storage to be specified and the resulting storage traces to be plotted. By default, the plot shows the worst drought on record, 90th percentile and 50th percentile cases (based on minimum storage volume over the first 12 months of forecast), as well as restriction trigger levels for assessing water security risks. The user can also include additional forecast curves on the plot e.g., 95th or 99th percentile, as well as any particular modelled year or historic year of data.



Analysis was also undertaken into how results can be related to the latest Bureau of Meteorology (BoM) seasonal streamflow forecast. It was found that the BoM forecast likelihood of low/median/high inflows for Moe River can be used as an indicator of which percentiles are more likely for the Lance Creek, Leongatha and Fish Creek systems, noting that there is more uncertainty for the Lance Ck and Fish Ck systems, and more uncertainty in autumn and spring. The BoM tercile plot shows the likelihood that the next 1, 2 and 3 month flows will be in the highest third, middle third or lowest third of flows. These values can be used as an indicator of the likelihood of storage traces resulting from high, median and low flows.

In conclusion, it was found that batched source modelling is a flexible approach to enable the construction of short-term (1–2 year) probabilistic forecasts which in this case could be linked with a regional BoM seasonal streamflow forecast to assist with operational planning and drought response.

Keywords: *Multi-replicate source modelling, forecasting, BoM seasonal forecasts*