Simulator Evaluation Project

- AFAC and the NSW RFS engaged the BoM to assess fire spread simulators commonly used within Australia. The aim of the project was to assess the comparative suitability of the simulators for the purposes of operational fire spread prediction, bush fire risk planning and training.
- The project evaluated the three most widely used simulators within Australia: Phoenix, Australis and Prometheus. The simulator framework Spark was also included in the evaluation.
- The evaluation compared performance over 10 case studies from around Australia. The case studies covered a range of climates and vegetation types. Data for the evaluations was provided by all state fire agencies in Australia.
- The project report has been tabled at the AFAC Predictive Services Group which is now considering future directions and will provide advice to AFAC Council.
- The report will assist jurisdictions to determine how and when they use simulators and the assumptions and limitations that each may have in specific circumstances.
- New development continues to occur. This evaluation will guide future development investment directions, and promote collection of additional case studies for future evaluation.
- This was a good example of a successful collaborative project between the Commonwealth and state agencies

Summary of outcomes:

- No single simulator stands out overall as being superior to the others
- No simulator performed well for all case studies
- Prometheus produces reasonable simulations for environments for which there is appropriate fuel (Canadian system so local fuel types had to be mapped to Canadian fuel types) but it was only able to be tested for 1 out of the 10 case studies
- Australis appears to produce simulation outputs similar in quality to other simulators but could not be tested as fully due to software configuration requiring manual input of simulator parameters. This would make it difficult to adapt to larger scale use for running in ensembles.
- Phoenix performs relatively well in most case studies. Differences between versions of Phoenix were evident. The current software architecture is not easily configurable for model enhancements.
- The developmental framework Spark performed well against the more mature simulators. It is easily scalable and easily incorporates new models and is based around a more open architecture.

Things to note:

- Case studies were predominately major fire events. Partly due to there being a lack of data for non-major events.
- While the performance of each simulator varied, there is also significant uncertainty in the underpinning data inputs to each simulator (weather and fuels) as well as in the fire behaviour models that are used to generate fire spread

Summary of Report Recommendations

- Simulators should be executed using an ensemble based approach to account for uncertainty in fuel, ignition and weather inputs.
- The routine measurement of fire behaviour should be prioritised in order to improve simulator evaluation and hence performance.
- National standards for fire event data should be developed.
- The assessment framework developed for this project should be continued and extended.
- Simulators should be tested using case studies from Northern Australia.
- Evaluation framework should be extended to include additional relevant metrics (e.g. flame height, spotting distance).
- New simulator versions should be routinely tested with the assessment framework developed.
- A nationally sponsored hosting framework for holding case study data would be a valuable for resource for further evaluation and development of simulators.