New bushfire spread prediction model keeps firefighters ahead of the fire front

December 13 2021

Credit: CC0 Public Domain

Eucalypts make up more than 70 per cent of Australia's forests and some of Australia's most extreme fire events, such as the 2009 Black Saturday fires and the most severe of the 2019/20 bushfires, occurred in this type

of vegetation.

The Vesta Mark 2 model, a mathematical description of how a fire responds to environmental conditions, will be rolled out nationally this summer and help fire control rooms across the country to predict and suppress bushfires as they spread across the landscape, and to warn the public.

CSIRO bushfire behavior researcher Dr Andrew Sullivan said although much of eastern Australia was expecting a wetter than normal summer this year, bushfires were an ever-present danger throughout summer and were increasing in frequency and severity.

"Forests have critical ecological and socio-economic roles, and often connect to areas where large numbers of Australians live," he said.

"Forest fires are complex and difficult to control and extinguish, and firefighters often have to battle steep terrain and challenging conditions just to reach the fire," Dr Sullivan said.

"Critically, this model can accurately predict the speed that a fire front will advance across a landscape, which is essential to enable authorities to efficiently identify threats, issue bushfire warning messages, signal evacuations, and plan fire suppression actions."

Data inputs such as forecast weather and wind information come from the Bureau of Meteorology, while information on the state of fuels within the forest and existing behavior of a fire can come from vegetation databases and fireground reports. Fire behavior analysts in an incident management team, often stationed at an operations center near the fire, collate this information and then run the model to generate a prediction of the likely progression of the fire across the landscape.

CSIRO bushfire behavior researcher and leader of the project Dr Miguel Cruz said the model used the latest available science on bushfire behavior.

"This model was built using analysis of the most extensive set of data gathered from observations of large high intensity experimental fires and wildfires, collated from around the country over the past 40 years," Dr Cruz said.

"Our research and findings during the 2019/20 bushfire season were also instrumental in the development of this tool."

NSW RFS Deputy Commissioner Preparedness and Capability, Kyle Stewart, said the new model would be key to providing essential information about expected fire behavior to support decision making during bushfire outbreaks this fire season.

"Knowing with confidence where a bushfire will be ahead of time is critical to the safe and effective deployment of our fire crews and the safety of our communities," Mr Stewart said.

"This is an excellent example of science agencies and the Rural Fire Service working together to improve bushfire management in Australia. It is the latest in a long line of successful collaborations between the RFS and CSIRO."

The original 'Project Vesta' in the 1990s was the largest ever experimental program studying forest fire behavior in Australia.

Vesta Mk 2 has been incorporated into Spark, Australia's newest wildfire operational simulator being developed by CSIRO and the Australasian Fire and Emergency Service Authorities Council AFAC, and Amicus, which is CSIRO's bushfire knowledge support system to help support

future [bushfire](#) fighting efforts.

The research was published in *International Journal of Wildland Fire*.

More information: Miguel G. Cruz et al, An empirical-based model for predicting the forward spread rate of wildfires in eucalypt forests, *International Journal of Wildland Fire* (2021). [DOI: 10.1071/WF21068](#)

Vesta Mk 2 info: [research.csiro.au/vestamk2/](#)

Provided by CSIRO