COMMISSIONED RESEARCH

Key Topics:

- land management [1]
- modelling [2]
- soil moisture [3]

Landscape moisture modelling [4]
This project was commissioned and funded entirely by the Department of Environment, Land, Water and Planning, Victoria.

Project: detail Notabs

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[8]

Description

This project was commissioned and funded entirely by the Department of Environment, Land, Water and Planning, Victoria.

The moisture content of dead vegetation, including the litter layer and material suspended in the understory, is one of the main determinants of fuel combustibility and also a significant variable in predicting fire behaviour. Fuel moisture is driven by interactions between fuels, weather, and topography. This project developed the tools necessary to predict the combustibility of forest fuels in the Australian landscape as a result of changes in fuel moisture content through the drying and wetting of fuels via exposure to the weather and sun. In particular, existing point-based models were adapted for spatial applications and validated using experimental measurements in native forest landscapes in Victoria. These predictive tools formed the basis of operational tools for a new modular fire danger system and will be suitable for application in planning of prescribed burning operations.

The project achieved this objective by:

- Integration of existing fuel moisture models into an existing spatial modelling framework developed by CSIRO, the Dynamic Landscape Simulator (DLS) (Roxburgh et al 2010) to provide a platform for making high resolution predictions. The Koba moisture model was nested inside the DLS. The DLS simulated landscape scale soil, water, and forest processes, while Koba made moisture predictions. Koba and the DLS have previously been tested in Australian forests.
- Making experimental measurements of fuel moisture along transects in forests to examine seasonal wetting and drying patterns. Transect were established that cover a range of key forest environments (e.g. woodland on ridge tops through to rainforest gullies) to track seasonal variation in fuel availability. These measurements were used to test and develop representation of key physical processes in the fuel moisture models. Adequate representation of these processes is key to predicting landscape fuel availability and connectivity for spread of large fires. Measurements were made in Victoria to ensure that the resulting models are applicable in Victorian conditions. The team also worked in cooperation with land managers to collect additional data to broaden the reach of the model validation data set.
- Making experimental measurements of fuel moisture around local topography (e.g. north vs south facing slopes) in summer conditions to examine diurnal variation and validate solar radiation processes. Adequate representation of local variation in dry conditions is necessary for prediction of fire behaviour and local variation in fire threat. For example, variation in fuel moisture with aspect lead to unexpected fire behaviour and the deaths of fire crews conducting a prescribed fire in Kuringai National Park in 2000.
- Developing methods for application of fuel moisture predictions at a range of scales, from high resolution predictions for fire behaviour models to coarse fuel availability predictions for use with state-wide weather grids.

The project was divided into two phases, each lasting one year. The first performed the high resolution model integration and made initial field measurements for model testing. The second refined the models and developied methods to scale predictions from the high resolution model (10's of m) to the scale of operational forecasts grids (~ 6 km), made more extensive field measurements for model validation, and developed guidelines for model implementation and application. The major outputs of the project are predictive tools and guidelines for their operational application as well as data sets collected during the field campaigns.

Linked Projects

Bushfire climatology in Victoria [9]

BUSHFIRE PREDICTIVE SERVICES [10]

Dr Sarah Harris
Country Fire Authority [11]

[11]

Severe fire behaviour - improving planning responses [12]

BUSHFIRE PREDICTIVE SERVICES [10]

A/Prof Kevin Tolhurst
University of Melbourne [13]

[13]

2009 Black Saturday and other large fire events - moisture content project [14]

BUSHFIRE PREDICTIVE SERVICES [10]

Prof Ross Bradstock
University of Wollongong [15]

[15]

Analysis of RapidEye imagery to map fire severity and ground truthing [16]

BUSHFIRE PREDICTIVE SERVICES [10]

Dr Sarah Harris
Country Fire Authority [11]

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Smoke transportation and emissions modelling [17]

BUSHFIRE PREDICTIVE SERVICES [10]

Dr Martin Cope
CSIRO [18]

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Probability of fire ignition and escalation [19]

BUSHFIRE PREDICTIVE SERVICES [10]

Prof John Hearne
RMIT University [20]

[20]

Fire transitions across urban boundaries [21]

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Dr Andrew Sullivan
CSIRO [18]

[18]

https://www.bnhcrc.com.au/research/cluster/bushfire-predictive-services [11] https://www.bnhcrc.com.au/organisations/cfa [12] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1755 [13] https://www.bnhcrc.com.au/organisations/umelb [14] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1756 [15] https://www.bnhcrc.com.au/organisations/uow [16] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1765 [17] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1762 [18] https://www.bnhcrc.com.au/organisations/csiro [19] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1760 [20] https://www.bnhcrc.com.au/organisations/rmit [21] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1759