COMMISSIONED RESEARCH

Key Topics:
- fire [1]
- fuel reduction [2]

Probability of fire ignition and escalation [3]
This project was commissioned and funded entirely by the Department of Environment, Land, Water and Planning, Victoria.

Project: detail Notabs

Research team

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Description

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

The project began with a phase of consultation. This included discussions with those involved in the National Fire Danger Rating Review and research project and the Risk Assessment and Decision Making Toolbox (former Bushfire CRC project). The aim of these discussions was to insure that the proposed work complements that of current projects rather than overlaps. Also as part of the initial collaboration phase will be discussions with relevant authorities and government agencies on the strategic decisions and actions available for reducing risk of ignition and escalation. The research team will use the following three possible actions to illustrate the subsequent direction of the research:

- reducing fuel load in certain areas during winter;
- determine where to locate various firefighting resources (eg small trucks, large trucks, aircraft) in preparation for the fire season;
- acquire new or additional firefighting resources (within budget constraints)

Each one of these actions has a decision-making component. Given that reducing fuel loads throughout all of Victoria is unlikely, decisions need to be made as to which areas should be treated. Such decisions are likely to be complex. They will need to account for the probability of ignition and escalation in each area and include a priority rating system on the risks to life and property. These decisions will also be subject to constraints on the resources available to treat land and the accessibility of different areas. All of these factors can be solved by formulating a model that optimises the outcome, (i.e. minimises risk) subject to the various constraints.

Similar arguments can be made for the other two examples. In fact, for an optimal outcome the first two examples should be integrated into one problem. It might be more efficient to deploy more resources to some areas rather than reduce fuel load and vice versa.

The third example described above would involve decision-making around the optimal mix of resources to be acquired. In other words, it deals with the optimal investment problem. What acquisitions will have the greatest benefit per dollar in terms of reducing risk of loss due to fire?

The development of these risk-reducing models will lead to the identification of data needs. Much of this data is expected to be spatial and available from the GIS database of Victoria. Once the data has been obtained, it will be fed into the models. The model will result in a proposed suite of strategies for reducing the risks associated with fire. These strategies will then be fed into the GIS database to yield a modified landscape whereby various resources are optimally located. Simulating fire outbreaks on the modified landscape can then be used to test the efficacy of these strategies. This can be done using standard fire behaviour models. A risk probability model incorporating the fire danger index will be used to identify the most important possible ignition and escalation points. These high-risk points will then be tested.

It is anticipated that simulated fires under the model-proposed treatment and deployment scenarios will yield greater insight into the relationship between various landscape features. This includes the level of infrastructure, the risk of ignition and escalation and the consequent risk to life and property.

Publications

Year	Type	Citation
2016	Journal Article	Minas, J. P. [7] & Hearne, J. [4] **An optimization model for aggregation of prescribed burn units** [10]. *TOP* **24,** 180-195 (2016). DOI [11] Google Scholar [12] BibTeX [13] EndNote XML [14]

Linked Projects

Severe fire behaviour - improving planning responses [15]

BUSHFIRE PREDICTIVE SERVICES [16]

A/Prof Kevin Tolhurst
University of Melbourne [17]

[17]

Bushfire climatology in Victoria [18]

BUSHFIRE PREDICTIVE SERVICES [16]

Dr Sarah Harris
Country Fire Authority [19]

[19]

Fire transitions across urban boundaries [20]

BUSHFIRE PREDICTIVE SERVICES [16]

Dr Andrew Sullivan
CSIRO [21]

[21]

Smoke transportation and emissions modelling [22]

BUSHFIRE PREDICTIVE SERVICES [16]

Dr Martin Cope
CSIRO [21]

[21]

Analysis of RapidEye imagery to map fire severity and ground truthing [23]

BUSHFIRE PREDICTIVE SERVICES [16]

Dr Sarah Harris
Country Fire Authority [19]

[19]

Landscape moisture modelling [24]

BUSHFIRE PREDICTIVE SERVICES [16]

Dr Stuart Matthews
New South Wales Rural Fire Service [25]

[25]

2009 Black Saturday and other large fire events - moisture content project [26]

BUSHFIRE PREDICTIVE SERVICES [16]

Prof Ross Bradstock
University of Wollongong [27]

[27]

Links
[1] https://www.bnhcrc.com.au/research/topics/fire [2] https://www.bnhcrc.com.au/research/topics/fuel-reduction [3] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1760 [4] https://www.bnhcrc.com.au/people/jhearne [5] https://www.bnhcrc.com.au/organisations/rmit [6] https://www.bnhcrc.com.au/people/ctanasescu [7] https://www.bnhcrc.com.au/people/jminas [8] https://www.bnhcrc.com.au/people/lsturgess [9] https://www.bnhcrc.com.au/organisations/delwp [10] https://www.bnhcrc.com.au/publications/biblio/bnh-3426 [11] http://dx.doi.org/10.1007/s11750-015-0383-y [12] http://scholar.google.com/scholar?btnG=Search%2BScholar&as_q=%22An%2Boptimization%2Bmodel%2Bfor%2Baggregation%2Bof%2Bprescribed%2Bburn%2Bunits%22&as_sauthors=Minas&as_occt=any&as_epq=&as_oq=&as_eq= [13] https://www.bnhcrc.com.au/publications/biblio/export/bibtex/3426 [14] https://www.bnhcrc.com.au/publications/biblio/export/xml/3426 [15] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1755 [16] https://www.bnhcrc.com.au/research/cluster/bushfire-predictive-services [17] https://www.bnhcrc.com.au/organisations/umelb [18] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1754 [19] https://www.bnhcrc.com.au/organisations/cfa [20] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1759 [21] https://www.bnhcrc.com.au/organisations/csiro [22] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1762 [23] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1765 [24] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1757 [25] https://www.bnhcrc.com.au/organisations/nswrfs [26] https://www.bnhcrc.com.au/research/understanding-and-mitigating-hazards/1756 [27] https://www.bnhcrc.com.au/organisations/uow