

# FUTURE SCENARIOS FOR AUSTRALIAN BUSHFIRES

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“Providing insights into future fire regimes and their implications for people, property and the environment”

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## 1. A changing world

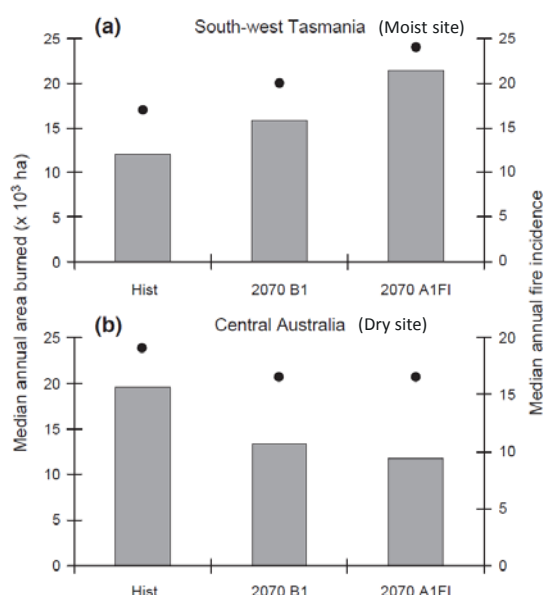
Anticipated changes in climate, fuel dynamics and ignition rates are expected to modify future fire regimes (Bradstock 2010; Cary *et al.* 2012a) with subsequent effects on key social and environmental assets (Gill *et al.* 2013).



Aftermath of Black Saturday 2009 bushfires in Victoria. The effects of fires on cars and the house as economic assets is apparent. Economic, biodiversity and carbon assets are also present in the form of impacted forests in the background (Source: Gill, Stephens and Cary 2013).

## 2. Shifts in fire regime depend on moisture

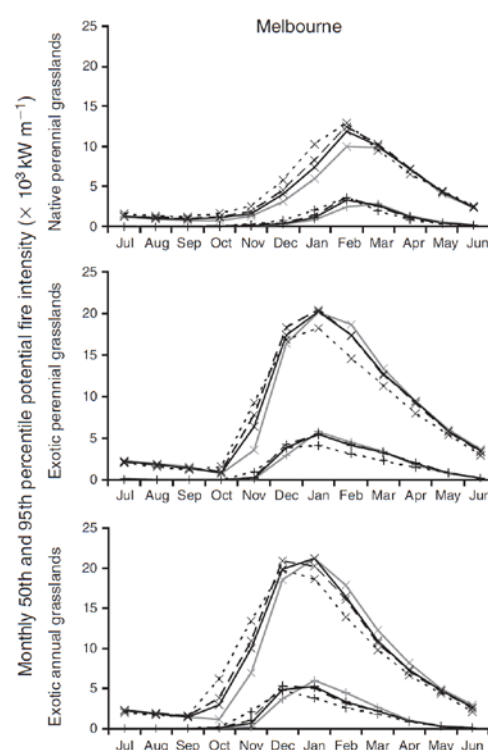
Climate change effects will depend on whether fire activity is limited by fuel amount (drier ecosystems), where fire activity is expected to decrease for a warmer-drier climate, or limited by the availability of fuel for burning (moister ecosystems), where fire activity may increase (King *et al.* 2013).



Simulated median annual unplanned fire incidence (circles) and area burned (histogram) for (a) south-west Tasmania and (b) central Australia, for three climate/emission combinations (Historical, 2070 B1 and 2070 A1FI) in the absence of prescribed burning (Source: King, Cary, Bradstock and Marsden-Smedley, 2013).

## 3. Combined consequences of climate & CO<sub>2</sub>

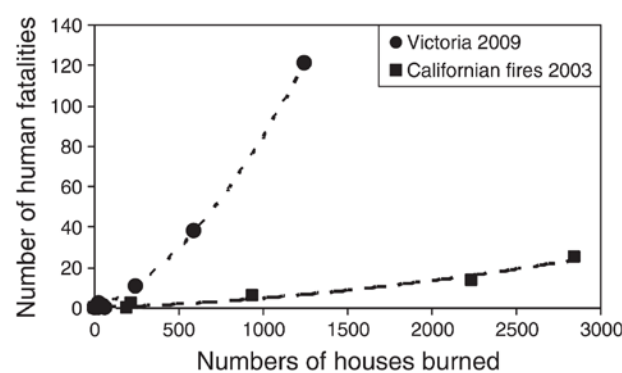
In SE Australia, the net effect of increased grass fuel productivity from higher atmospheric CO<sub>2</sub>, of higher fire danger, and decreased fuel load due to warmer-drier conditions, may result in only small changes in grass fire intensity distributions (King *et al.* 2012).



Simulated monthly 50<sup>th</sup> (+) and 95<sup>th</sup> (x) percentile potential fire intensity for Melbourne, for three grassland types and for all climates (historical, grey solid line; 2030 A1B, black solid line; 2070 B1, black dashed line; 2070 A1FI, black dotted line) (Source: King, Cary, Gill and Moore, 2012).

## 4. Implications for people

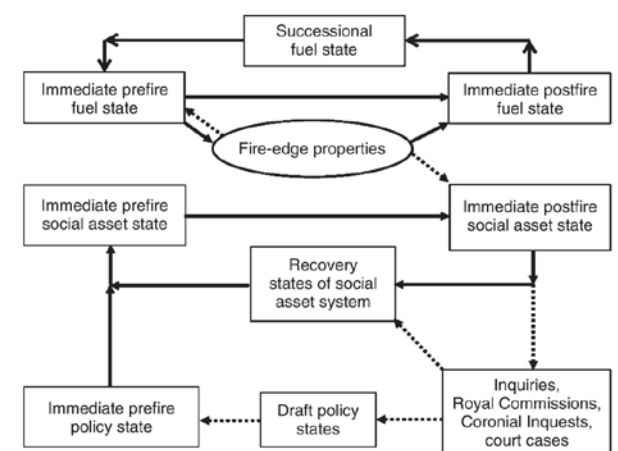
Outcomes for people and their assets will depend on shifts in fire frequency and intensity, fire management effectiveness (e.g. Gibbons *et al.* 2012), and high-level policies governing societal responses to major fire events. Contrasting outcomes are expected in different locations.



Number of human fatalities as a function of the number of houses burned in separate fires in California in 2003 (Blackwell and Tuttle 2003) and in major Victorian fires in 2009 (Teague *et al.* 2009). The differences in the curves need to be interpreted with caution (Source: Gill, Stephens and Cary 2013).

## 5. Mitigation and adaptation

Minimising adverse outcomes arising from future fire regimes includes increasing resistance of assets, locating or relocating assets away from the path of fires, assisting recovery and promoting adaptation (Gill *et al.* 2013). As is the case at present, a key aspect of policy responses to future fire regimes must recognise parallel cycles of fire occurrence and recovery states in social asset systems.



The effects of socially disastrous fires on aspects of the social system. Note that the post-fire social asset state (e.g., social disaster) is contingent on the fire circumstances and is, in part, ex situ. The indirect effects of policy and other aspects on fuel states are not shown (Source: Gill, Stephens and Cary 2013).

## 6. Selected references & reading

- Cary GJ, Bradstock RA, Gill AM and Williams RJ (2012a) Global change and fire regimes in Australia. In R.A. Bradstock, A.M. Gill and R.J. Williams (eds) *Flammable Australia: Fire Regimes, Biodiversity and Ecosystems in a Changing World*. pp. 149-169. CSIRO Publishing, Melbourne (**Peer-reviewed book chapter**).
- Cary G, Collett E, Gill, M, Clayton H, Dovers S (2012b) Future Scenarios for Australian Bushfires: Report on a Bushfire CRC Workshop. *Australian Journal of Emergency Management* **27** (3): 34-40 (**Journal article**).
- Gill AM (2012) Bushfires and biodiversity in southern Australian forests. In R.A. Bradstock, A.M. Gill and R.J. Williams (eds) *Flammable Australia: Fire Regimes, Biodiversity and Ecosystems in a Changing World*. pp. 235-252. CSIRO Publishing, Melbourne (**Peer-reviewed book chapter**).
- Gill AM, Cary GJ (2012) Socially Disastrous Landscape Fires in South-eastern Australia: Impacts, Responses, Implications. In (D. Paton and F. Tedim, Eds.) 'Wildfire and Community: Facilitating preparedness and resilience' pp. 14-32. Charles C. Thomas Publisher. Springfield, Ill. (**Peer-reviewed book chapter**).
- Gill AM, Stephens S, Cary GJ (2013) The world-wide 'wildfire' problem. *Ecological Applications* **23** (2): 438-454 (**Peer-reviewed journal article**).
- King KJ, Cary GJ, Gill AM, Moore AD (2012) Implications of changing climate and atmospheric CO<sub>2</sub> for grassland fire in south east Australia: Insights using the GRAZPLAN grassland simulation model. *International Journal of Wildland Fire* **21** (6): 695-708 (**Peer-reviewed journal article**).
- King KJ, Cary GJ, Bradstock RA, Marsden-Smedley J (2013) Contrasting fire responses to climate and management: insights from two Australian ecosystems. *Global Change Biology* **19** (4): 1223-1235 (**Peer-reviewed journal article**).

## Other references cited:

- Bradstock RA (2010) A biogeographic model of fire regimes in Australia: Contemporary and future implications. *Global Ecology and Biogeography* **19**, 145-158.
- Blackwell JA and Tuttle A (2003) California fire siege 2003. The story. [unknown publisher] 98p.
- Gibbons P, van Bommel L, Gill AM, Cary GJ *et al.* (2012) Land Management Practices Associated with House Loss in Wildfires. *PLoS ONE*, **7** (1): e29212
- Teague B, McLeod R and Pascoe S (2009) 2009 Victorian Bushfires Royal Commission interim report. Government Printer, Melbourne. 360p.