

# Future Scenarios for Australian Bushfires

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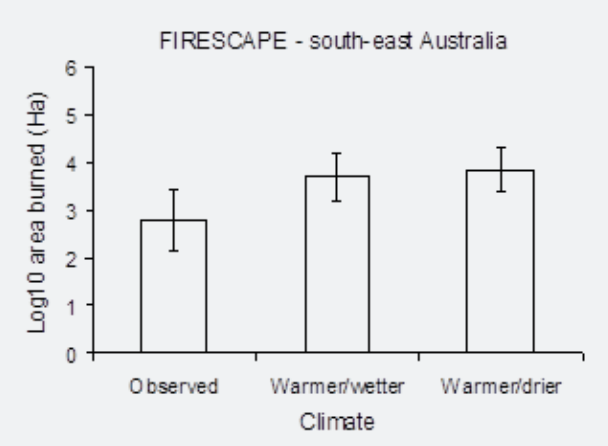
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## Global Change and Fire

Global change will affect factors that influence the key drivers of fire activity. These drivers can be conceptualized as switches that all need to be activated for a fire to occur (Figure 1). Changes in weather and climate may affect area burned (Figure 2). Fuel production is sensitive to rainfall; predictions indicate regional changes in rainfall patterns. Litter production and decomposition may be affected by increased levels of CO<sub>2</sub>. Introduced plant species can increase fuel loads and fire intensity (Image 1). Ignitions are likely to increase over much of Australia as lightning activity increases and population grows.

## Palaeoecological Records Change

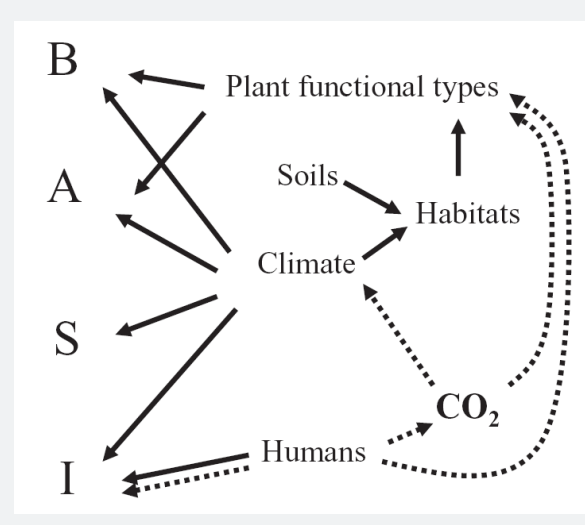
There is a long history of fire in Australia that encompasses changes in climate and human influence. Charcoal records indicate that fire activity is greatly influenced by global temperatures and associated vegetation changes (Mooney *et al.* 2011). Dry periods are generally associated with reduced fire activity in arid areas (Lynch *et al.* 2007). Peaks of charcoal often occur during periods of frequent ENSO activity where cycles of wet and dry lead to a build-up of fuel then drought and fire (Lynch *et al.* 2007). Human influence is less clear, with some localized evidence but little to suggest continental changes in fire regimes.



**Figure 2.** Area burned under climate scenarios (see Cary *et al.* 2006), using the model FIRESCAPE for south-eastern Australian Mountains. Warmer climates assume a 3.6°C temperature increase over observed climate. The wetter climate equates to a 20 per cent increase in precipitation and the drier climate assumes a 20 per cent precipitation decline. The model show increased area burned for warmer climates (drier, wetter, or both). (Source: Williams *et al.* 2009).

## Future Fire Scenarios

Based on current knowledge regarding future global change, fire activity is likely to decrease in drier environments, where fuel productivity limits bushfires. In wetter forest ecosystems, fire activity may increase as more fuel becomes available to burn as a result of drier conditions. Changes are likely to be unique to particular environments and reflect the influence of climate change on which ever of the key drivers of fire is limiting (Table 1). These changes are complex so that any predictions will contain considerable uncertainty (Cary *et al.* in press).



**Figure 1.** Influences of biogeographic factors (climate, soils, habitats, plant functional types) on fire regimes via four 'switches' (Biomass growth – B; Availability of fuel for burning – A; Ambient fire weather – S; and Ignitions – I). Potential effects of changing climate, human activity and atmospheric CO<sub>2</sub> are indicated by dashed lines. (Source: Bradstock 2010).



**Image 1.** Gamba Grass, NT. ( Geoff Cary)

## References

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**Table 1.** Global change scenarios in case studies in differing Australian ecosystems. (Modified from Bradstock 2010)

Global change attribute	Tropical open forest	Arid woodlands	Temperate grassy woodlands	Temperate dry sclerophyll forests	Cool temperate wet sclerophyll forests
Fire Danger	Increased	Increased	Greatly increased	Increased	Increased
Main fuel type	Annual grasses	Perennial grasses and annual herbs/grasses	Grasses and herbs	Woody plant litter and shrub crowns	Woody plant litter
The impact on productivity of:					
• Climate change	• Decrease	• Decrease	• Increase	• Decrease	• Decrease
• Elevated CO <sub>2</sub>	• Decrease	• Decrease	• Decrease	• Increase	• Increase
Introduced Plants	Gamba grass (Image 1)	Buffel Grass	Tree plantations	Exotic grasses	
Trend in ignitions		Increased anthropogenic	Decreased anthropogenic	Increased anthropogenic	Increased anthropogenic