

# Fire note

bushfire CRC



Background briefings on emerging issues for fire managers from AFAC and Bushfire CRC.

## The Use of Prescribed Fire in Bushfire Control

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The fire and land management agencies who are partners in the Bushfire CRC and the Australasian Fire Authorities Council have identified prescribed burning as one of the most important issues confronting them, both in a technical and scientific sense, and in terms of community perception and understanding of bushfire control and management.

At the same time, the use of prescribed fire is one of the more valuable tools available to agencies in their management of bushfire risk, and for conserving ecosystem biodiversity. Nationally coordinated research being undertaken by the Bushfire CRC will considerably enhance the science that underpins safe and effective use of prescribed fire. It is also designed to assist in improving community understanding of the issue. Related work being done by the Tropical Savannas CRC and by the Desert Knowledge CRC should also complement this important research.

### Background

The combination of topography, vegetation, and climate, in many areas of Australia, and in parts of New Zealand, combine to produce one of the most severe fire environments in the world. The bushfire threat posed each summer in these regions is potentially very serious.

Conversely, fire has been part of most of these environments for millions of years, largely shaping the composition and distribution of the native plants, animals and ecosystems that survive today. Indeed, a significant proportion of Australia's unique biota has become largely dependent on fire (and the attendant variety of fire regimes) for its continued existence and development.

With the movement of non-aboriginal people into these landscapes and the creation of built assets and infrastructure, uncontrolled fire can quickly become a destroyer of life and property. This annual threat of bushfire, over the last 200 years, has understandably led to a focus on protecting human lives and assets. The managers of areas of natural bushland have also, increasingly come to understand the importance of fire, and fire regimes, in the maintenance of biodiversity.

Since the early 1800s, communities in Australia and New Zealand have been developing a range of approaches to deal with bushfires. With few large natural water sources available in most bushfire-prone areas, particularly in Australia, techniques developed that are generally categorized as 'dry firefighting'. They primarily involve removing fuels from the path of the bushfire using hand tools and/or machinery. The lighting of 'backburns' ahead of the wildfire is also sometimes used in containing its 'head' or flanks.

### UNDERSTANDING THE TERMS

The use of fire as a land management tool has a number of different applications.

The term '**prescribed burning**' is used to describe the deliberate use of fire under specific fuel and weather conditions to achieve defined management objectives.

In parks and forests, the application of prescribed burning is usually done for three primary purposes, which are not always mutually exclusive:

- To manage the build-up of flammable fuel (live and dead vegetation) thus reducing the impact, and difficulty of suppression of wildfires. This is commonly referred to as hazard reduction or, more accurately, as **fuel reduction burning**.
- For the protection and **conservation of biodiversity** and other environmental values. Many Australian ecosystems have evolved in the presence of fire over thousands of years. They require fire at certain intervals, seasons and scales for their maintenance.
- In conjunction with the **re-establishment of forests** following commercial timber harvesting.

A **fire regime** describes the season, intensity and frequency of fire in a given area over a period of time.



This technique involves firefighters lighting fires, at times of the day or night when fire behaviour is more predictable, to burn fuels ahead of the main fire.

In an average year around 29 million hectares of Australia are burnt by bushfires. With seasonal fluctuations however, this area can vary to four times greater or less than this average. For example, in 1974/75, 115 million hectares or 15% of Australia was burnt.

Around 90% of the area of Australia burnt by fire each year is found north of the Tropic of Capricorn, with burning occurring during the 'dry season', generally between April and November. Most of the remaining three million hectares is found in the temperate, southern region of Australia with the highest fire danger generally occurring between December and March.

Significant differences feature in terms of the types of fires that occur in northern and in southern Australia. Northern Australian fires tend to occur in savannah woodlands and in hummock grasslands. The amount of fuel in these environments is generally limited and the weather conditions in the dry season are generally stable. Maximum fire intensities in these situations rarely exceed 20,000 kW/m. During bushfires in the mountain forests of southern Australia maximum intensities can reach up to 100,000 kW/m.

### Fuel Management and Bushfire Control

Fuel reduction burning is the controlled application of fire, under specified environmental conditions, to a predetermined area and at a time, intensity of heat, and 'rate of spread' to achieve planned resource management objectives. The aim of fuel reduction burning is to strategically reduce the fuel hazard to assist with subsequent bushfire suppression.

The severity of a bushfire depends on topography, weather and the condition of the available fuels. Fuel is the only one of these factors over which a land owner or a land manager can exert some control. 'Fuel reduction burning' is the only practical method of reducing fuel levels over large areas.

The strategic manipulation of the overall fuel hazard in an area, by careful burning in periods of reduced fire danger, reduces the potential for 'spotting' from an advancing bushfire, allows bushfire damage to be moderated and allows for safer bushfire control activities.

The management of 'prescribed fires' involves the skillful combination of lighting pattern, timing, use of topography, weather and fuel conditions. The control of these fires is achieved by the careful exploitation of the fire environment, rather than by overpowering the flaming fire front.

The effectiveness of a fuel reduced area on the behaviour of a subsequent bushfire depends on:

- The type, distribution and level of available fuels, which in turn depends on the fuel type, coverage and intensity of the previous prescribed burning operation and the time that has elapsed since the last fire event
- The width of the fuel reduced area in relation to the direction of the path of a bushfire
- The severity of the bushfire, and
- The topography and the weather conditions.

### Planning for the Use of Prescribed Fire

The use of prescribed fire by park, forest and fire agencies in Australia and New Zealand generally occurs in accordance with strategically developed bushfire prevention and preparedness plans. The preparation and subsequent review of these plans usually involves the opportunity for participation by the wider community.

In central and northern Australia pastoralist and aboriginal communities make considerable use of prescribed fire for a range of uses including fuel management and ecosystem maintenance, pasture rejuvenation and the control of pest plants, and for a range of culturally related reasons.

Most agency based Fire Protection Plans use a form of zoning to specify various fuel management objectives. These zones generally range along a continuum from relatively small areas where fuel management activity occurs regularly to strategically protect human life and built assets, through zones with reducing levels of fuel management being specified (and a sometimes associated higher concern for biodiversity values), to a 'burning exclusion zone' for at least the period of the plan i.e. these 'exclusion zones' often involve areas where a high potential for economic, ecological, or cultural loss exists should fire be allowed to occur. Such areas could include recently established vegetation, or fire intolerant vegetation such as rainforest.

In determining parameters upon which to base a zoning system, agencies generally consider:

- The assets or values to be protected: and
- The likely fire behaviour expected in the vicinity under adverse conditions.

Fire Danger Rating Systems used by agencies generally rate 'fire danger' using a number of climatic variables. The FDR, together with specific information on available fuel, topography and vegetation type, allow predictions to be made about likely fire behaviour. Such predictions generally include rate of spread, flame height (and scorch) and spotting distance.

In forests and woodlands, an assessment of the overall fuel hazard involves assessing the sum of the influences of the tree bark hazard, the elevated fuel hazard and the surface fuel hazard.

Zoning systems help set priorities for fuel reduction based on all the values at risk, the risk potential and the range of bushfire suppression options desired under most weather conditions. Economic and cultural values, the known preferred range of fire frequency and intensity for each vegetation type and the known recent fire history of each vegetation type involved are all matters that generally need to be considered.

Each individual burning operation also has specific 'burn objectives' which specify matters such as the percentage of the total area to be treated, maximum flame heights to be achieved, and the level of reduction of the various fuel hazard components in the area.

In many parts of Australia and New Zealand, and for the reasons set out above, fuel management by burning is a key component of bushfire preparedness strategies. Clearly however, the conduct of successful broad-scale fuel reduction operations is difficult given the often unpredictable constraints of suitable weather conditions, available resourcing levels and funding. The approach taken by most agencies in terms of the use of prescribed fire is therefore selective and strategic.



## Prescribed Fire and Biodiversity Maintenance

Community expectations in Australia and New Zealand, as in most fire-prone areas of the world, have seen major efforts in fire management being focused on the protection of human life and property from the adverse impacts of bushfire.

Over the last decade and a half however, the managers of Australasia's parks and forests, and indeed many others in the community, have come to more fully appreciate that the presence, frequency or absence of fire is a vital consideration in terms of the maintenance of the health of many ecosystems. Indeed fire is a complex phenomenon. On the one hand it must be controlled to protect human lives and assets. On the other, in many areas it must be used to meet important biodiversity objectives.

This apparent paradox, in terms of the management of natural areas, needs to be seen in the context that:

- All fire, and indeed the absence of fire, has an ecological dimension
- Prescribed fires undertaken for ecological purposes can also provide some asset protection, and
- Both rely on prescribed burning to attain planned resource management objectives.

Clearly all fire is not bad, and particularly in native bushland and grassland areas a balance needs to be reached through an evolving understanding of the role of fire in the environment, the legal requirements to protect life and property and the resources available to individual agencies and/or land managers. The challenge for bushland managers and researchers is not only to achieve this balance, but to also be flexible enough to incorporate new information and approaches into fire management as they arise. If this is to occur then clear 'objectives for management' for particular areas must be in place and managers and researchers must continue close communication, with lessons learnt from all fires becoming part of an 'adaptive management cycle'.

In the meanwhile, if prescribed fire is to be used to optimize outcomes for asset protection and/or ecological management, there is a need for an integrated, consistent and adaptive approach to its planning and implementation.

## The Bushfire CRC and the Use of Prescribed Fire

The Bushfire CRC is involved in a number of projects that are designed to improve the understanding of bushfire behaviour and the role of prescribed fire in bushfire management. These projects include:

- A1.1 Fire behaviour modelling
- A1.3 Fuel classification and availability
- A1.4 Improved assessment methods for grassland curing
- A2.1 Fire weather- fire danger
- A4.1 An improved fire management business model
- A5.1 Bushfire spread simulation
- B2.1 Smoke plume prediction

Apart from the important use of fire as a tool to reduce fuel levels, the presence, frequency or absence of fire is, as outlined above, a vital consideration in terms of the maintenance of the health of many ecosystems.

The Australian landscape has evolved with fire as a natural and integral part of the environment but inappropriate fire regimes can lead to changes in the biodiversity and the nature of the bush. They can also affect other related issues such as water supplies and air borne pollution.

Building on existing knowledge, the Bushfire CRC is involved in research to improve the understanding of the response of Australian ecosystems to fire. This research will lead to improved fire management strategies that reduce the potential for damaging wildfires whilst protecting biodiversity and other environmental values. The following Bushfire CRC projects, in different geographic areas, form part of this on-going work:

In southern Australia

- Managing fires in forested landscapes in South Western Australia (Project B1.1)
- Fire regimes and sustainable landscape risk management (B1.2)
- Ecological processes and biodiversity (B3.1)



- Multi-scale patterns in ecological processes and fire regime impacts (B4.2)

In northern Australia

- Prescribed fire and biodiversity in tropical savannas (B3.2)
- Burning for biodiversity in northern wetlands (B5.1)
- Multi-scale patterns in ecological processes and fire regime impacts (B4.2)

In time, results from the projects listed above will be synthesised in a Bushfire CRC sponsored book that will form a guide to prescribed burning practices in various landscapes.

Apart from increasing the knowledge base of the physical and biological sciences related to prescribed burning the Bushfire CRC is also involved in research relating to community understanding of bushfires.

Specific projects deal with:

- Community understanding;
- Effective communication of risk; and
- The economics of bushfires, including the potential savings and costs associated with them.

The integrated outputs from this prescribed fire related research will enable fire, and park and forest management agencies to further improve their policies and practices, and will assist in the development of improved community awareness and understanding of this important issue.

More details of specific CRC related research projects are available from the CRC, or can be found at [www.bushfirecrc.com](http://www.bushfirecrc.com)



## AFAC and the Use of Prescribed Fire

AFAC supports the use of prescribed fire by its member agencies to achieve stated management objectives:

- when the operation is in accordance with relevant legislation
- is thoroughly planned
- follows safe work practices
- is controlled and
- the outcomes are monitored and recorded.

Such use of prescribed fire provides a powerful strategic tool for both the bushfire and ecosystem manager. Clearly however, the conduct of successful broad-scale prescribed fire operations is difficult given the often unpredictable constraints of suitable weather conditions, available resourcing levels and funding. The approach taken by most agencies in terms of the use of prescribed fire is therefore, and understandably, selective and strategic.

Further, in the more settled areas of Australia and New Zealand in particular, the fact that the best way to protect life and property from bushfires is to maintain fire in the environment is not well understood in the wider community. This presents agencies with an additional challenge.

## Further Reading

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Bushfire CRC is a national research centre part of the Cooperative Research Centre (CRC) program, formed in partnership with fire and land management agencies in 2003 to undertake end-user focused research into bushfires in Australia.

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AFAC is the peak representative body for fire, emergency services and land management agencies in the Australasia region. It was established in 1993 and has 26 full and 10 affiliate members.

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