FIRE

BUSHFIRE DIVERSITY CAN PROMOTE BIODIVERSITY

Neil Burrows

Flammable vegetation and seasonal conditions of warm, dry weather have ensured that fire is a natural environmental factor, which together with climate, landform and soils, has operated over thousands of years to forge the remarkable biodiversity of south-west ecosystems. Plants, animals and ecosystems have evolved in this fire prone-environment and have developed a range of physical and behavioural traits that enable them to persist with, and in some cases, depend upon a variety of fire regimes.

Large and high intensity wildfires not only threaten life and property, but are environmentally damaging.

For many plant species, reproduction and regeneration are cued or enhanced by fire and for many plant communities, particular fire regimes are necessary for the maintenance of floristic and structural diversity. A particular sequence and scale of fires are necessary to provide habitat diversity and opportunity for animals to recover their populations. However, the way in which species and communities respond to fire is variable. Some assemblages are quite resilient to frequent fire and recover to their pre-fire state relatively quickly, while others are more sensitive to frequent fire, or severe wildfire, and can take many decades to recover. Thus, no fire regime, or history of fire interval, season, intensity, patchiness and scale is optimal for all species and communities. Thus although fire diversity can promote biodiversity, some extreme fire regimes - such as prolonged periods of high fire frequency, recurrent large and high intensity fires, or long periods of fire exclusion applied over large areas - can threaten biodiversity.

The damage potential and difficulty of suppression of a bushfire is determined by the amount of vegetation that burns, its moisture content and the weather conditions. Prior to European settlement, regular burning of parts of the landscape by Noongar people probably maintained a mosaic of vegetation at different stages of post-fire development (seral stages) – from recently burnt patches to infrequently burnt patches, although there is mounting evidence that much of the landscape was maintained in an early post-fire state. This fire mosaic contained the spread and intensity (severity) of wildfires. Very large and very intense wildfires were neither in the best interests of Aboriginal people, nor the environment generally, and were probably rare events.

On lands managed by CALM, the primary aim is to manage fire to conserve biodiversity and to ensure an acceptable level of protection to human life and property. Fire management is complex and potentially dangerous and requires the skilful combination of art, experience and science. Fire science, including fire behaviour and ecological effects of fire on natural ecosystems, has advanced as a result of ongoing research undertaken by a range of organizations over the last 40 years or so. Although our knowledge is incomplete, fire management is underpinned by current scientific understanding and is a process of continuous learning and adaptation.

With respect to the ecological effects of fire, several themes consistently emerge from the modern scientific literature, including a recent (2003) synthesis of fire ecology published in the book "Fire in ecosystems of south-west Western Australia: impacts and management". Firstly, no one fire regime, or combination of fire interval, season and intensity, suits all organisms. For example, some elements of the biota benefit from frequent fire (e.g. native grasses, annual herbs, some re-sprouters, large macropods, some fungi and some invertebrate groups), while others are disadvantaged (e.g. some late maturing obligate seeders, some mammals, some birds, some invertebrates). At the other end of the spectrum some elements benefit

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from longer intervals between fire and others are disadvantaged. A second emergent theme for conserving biodiversity at the landscape scale is that of spatial heterogeneity, or of a small-grained fire-induced habitat mosaic. A third theme to emerge is the need to protect ecosystems sensitive to fire from frequent fire or large intense fires. Examples of fire sensitive, or more correctly, fire regime specific ecosystems include some riverine, aquatic, wetland and heathland complexes and granite outcrops. However, even these require fire at some stage for their rejuvenation – an exception perhaps being peat swamps.

In south-west ecosystems, proactive fire management is an essential component of conservation and land management, simply because the region is fire-prone and most ecosystems are fire maintained. In the absence of proactive fire management, the 'default' regime will usually be one of reoccurrence of potentially damaging wildfires, started either by lightning or by people (accidentally or deliberately). The fire regime applied depends on the management objectives, and could include regimes that aim to;

o manage flammable fuel levels based on fuel accumulation rates,

o protect or promote specific threatened species or communities based on known life histories or habitat requirements,

o enhance biodiversity generally, based on vital attributes of key fire sensitive taxa,

o enhance and protect biodiversity at the landscape scale by using fire to create fine grain habitat mosaics, or interlocking patches of vegetation at different post-fire (seral) stages,

o advance scientific knowledge (including experimental fires and fire exclusion reference areas),

o regenerate specific species, such as silvicultural burning following timber harvesting.

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Managing fire in highly disturbed and fragmented landscapes, such as remnant bushland on the Swan Coastal Plain and in the Wheatbelt, is particularly challenging because of the potential for invasion by weeds and other introduced pests, and because fragmentation disrupts natural processes of dispersal and recolonisation. Small, recently burnt patches in a matrix such as cleared land or urbanisation, can also be subject to intense grazing pressure from large macropods and herbivorous insects. However, it may be necessary to introduce fire into patches of remnant vegetation to protect them from the ravages of wildfire, or to rejuvenate them – in the long absence of fire, some species and habitats will senesce and decline and vegetation structures will become simplified. After a fire, whether planned or unplanned, it may be necessary for follow-up work, such as weed or fox control.

Because we do not have complete knowledge of the ways in which all organisms and ecosystems respond to fire regimes, we can use diversity of fire regime as a surrogate for conservation of biodiversity based on the well-founded premise that in fire-prone environments, fire diversity can promote biodiversity. A good starting point for developing ecologically appropriate fire regimes is to apply the following test;

o Does fire management reduce the likelihood of large and intense wildfires?

o Does the fire regime maintain a mosaic of different post-fire (seral) stages at the appropriate scales?

o Does the fire regime include seasonal diversity?

o Does fire interval allow for replenishment of seed banks?

o Does the fire regime include a fire-free period to allow for maturation of special habitats?

o Does the fire regime protect fire sensitive ecosystems from frequent fire?

For further reading on this subject, see "Fire in ecosystems of south-west Western Australia: impacts and management", edited by Ian Abbott and Neil Burrows. Limited copies are available from Glenda Lindsey at CALM (08 9334 0463) at a cost of $79.00.

Dr Neil Burrows is the Director of Science Division at CALM.