FLAME GRILLED SPECIALS:

how Australian animals find food after bushfires

BY SKYE KAROLAK

Fire and food have a long and complicated relationship – especially in Australian bushland.

There's no heat – not yet, anyway – but the sound is like a jet-engine, an all-encompassing, overwhelming roar. This wall of sound is mostly wind but also includes the crackle of leaves and twigs consumed by flames. The smoke chokes and blinds, filling your lungs and blocking your vision. Then the actual fire front arrives and the heat hits you.

Bushfires are like living breathing creatures. They have their own behaviour and move over the landscape in their own ways. Meet one, and the memory will be etched in your mind forever.

Do you try to tame this animal, or work with it? That is the key question for biodiversity.

Light and fertility

After the fire, the forest canopy is opened up. Light penetrates further, sometimes all the way to the forest floor, which is now a fertile ash bed ready to nurture a new crop of seeds. Fire triggers flowering in grass trees (*Xanthorrhoea* spp) and their nectar-beaded spikes attract and feed hordes of bright butterflies. Christmas bells (*Blandfordia* spp) are also stimulated by fire, covering the burnt ground with banners of red and gold. *Banksia* and *Hakea* species release seeds from woody cases after a fire. Heat also activates the seeds of legume species such as wattles and pea flowers.

We are used to the idea of animals having territories. In fire-adapted vegetation communities, plants also need territorial strategies to hold their place and take advantage of the favourable conditions for seedling growth following a fire. 'Resprouters' send up new shoots from the base of the plant or from the bark. 'Obligate seeders' are more fire-sensitive than resprouters. The plants are actually killed by the flames and regrow from seeds that have been stored in the soil or in woody cases or blown in from unburnt areas.

Feast now or later

Animals also exhibit a range of strategies for maintaining their presence in fire-adapted communities. Some species are avoiders, staying alive by either moving out of the burning area, or by taking shelter underground or in hollow logs. Others lose substantial numbers of individuals in a fire and rely on recolonisation by populations from unburnt areas. As bushland goes through successional changes of recovery, many species exhibit a preference for a particular stage of post-fire regeneration, depending on their feeding and breeding needs.

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Immediately after a fire or even during a fire, insectivorous and carnivorous bird species such as raptors, kookaburras, ibis and crows may be attracted the area by dead or exposed invertebrate and vertebrate prey. The early post-fire years provide bountiful resources for granivorous and open country birds, feeding on dominant grass seeds. As vegetation changes to become denser, bird species composition changes. Such changes are evident in many communities; two examples are coastal heath and open forest and woodland communities. In coastal heath, the brown quail (*Coturnix australis*) and Richard's pipits (*Anthus novaehollandiae*) favour early regeneration. Honeyeaters and parrots may be attracted to plants with fire-stimulated flowering, notably *Xanthorrhoea*.

Larger herbivorous mammals such as the eastern grey kangaroo (*Macropus giganteus*) tend to prefer an open understorey with few shrubs and good grass cover, utilising the fresh grass that flourishes after a burn. The New Holland mouse (*Pseudomys novaehollandiae*) is likely to arrive in the early and middle stages of post-fire regeneration, recolonising burnt areas about one year after fire. It prefers open forests and heaths, decreasing in abundance when litter and understorey vegetation build up.

Habitat complexity increases with time as possibilities open up for specialist species that are not available in the years immediately after a fire. The lively skink (*Carlia vivax*) is common in intact bushland and fragments of dry sclerophyll habitats, preferring an understorey and ground layer which is not too dense. Fire may be required to maintain an optimum habitat for the continued survival of this species. Similarly, Burnett's skink (*Lygisaurus foliorum*) appears generally resilient to fire, occurring in similar numbers in annually burnt and unburnt forest areas.

Too much fire

The southern spotted gecko (*Oedura tryonisouthern*) is also common in dry sclerophyll forest, sheltering by day in crevices on the ground and in trees or between slabs of rock and feeding on small arthropods. However, too frequent fire may cause the decline of this species by burning bark from trees and reducing ground litter, thus reducing available shelter and short term arthropod abundances.

The ground parrot (*Pezoporus wallicus*), considered vulnerable to extinction, prefers the mid-stages of post-fire regeneration in coastal heaths, moving in at about 3 years post-fire and reaching a population peak at 8 to 10 years. This species depends on the increased levels of flowering and fruiting, as

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well as the need for relatively dense vegetation for nesting. Likewise, the yellow-tailed black cockatoo (*Calyptorhynchus funereus*) reaches its highest densities in areas that haven't been burned for over 10 years. The common dunnart (*Sminthopsis murina*) and brown antechinus (*Antechinus stuartii*) also prefer sites with thick undergrowth that develops some years after fire and do not benefit from frequent fires. On the other hand, changes to fire frequencies causing the undergrowth to thicken have resulted in a decline in whiptail wallaby (*Macropus parryi*) numbers from eucalyptus woodlands.

In tropical open forests and woodlands, the red-backed fairy wren (*Malurus melanocephalus*) and golden-headed cisticola (*sc name?*) feed and shelter in dense grass habitats which take time to develop. Hot fires may destroy hollow-bearing trees. Too frequent burning is also considered threatening to the black-breasted button-quail (*Turnix melanogaster*) as they inhabit long-unburnt dry sclerophyll forest where litter is thick.

Managing for biodiversity

Fire-adapted communities and their inhabitants are not adapted to fire *per se*, but to a particular fire regime characterised by *frequency*, *extent*, *intensity* and *season*. Where management is focused on a particular rare or vulnerable species, fire regimes can be tailored the species' specific needs. However that practice may not be compatible with retaining all components of the community in that local area. One species may thrive under quite frequent burning; another from the same community will do better when the intervals between fires are relatively long. How can fire regimes cater for the full range of species in the community?

Frequency and variability – While both too frequent and too infrequent burning can cause problems, there is some scope between these two extremes. Aim for a range of different intervals between burning in a particular area over time.

Fire extent – A patch-burning or mosaic approach is recommended. Fire managers can use weather conditions and time of day to vary fire intensity and spread. Unburnt patches provide a place for animals to shelter during a fire and a food source in the early months after fire.

Fire intensity – Some variability in intensity is recommended to enhance ecological preservation. Hotter fires, which are more destructive and will kill more individual animals, are necessary to release some seeds. Cool burns remove less litter, limit erosion and are generally more patchy.

Fire season – Variability in season of burn may also be appropriate here. Some factors to consider when deciding when to burn include breeding times, insect dormancy and the availability of seed. For example, fires during cooler months may threaten aggregations of the Common Crow butterfly (Eoploea core) that occur in autumn and winter.

Many of us have chosen to make our homes amongst the gum trees in fire prone environments, so the challenge in fire management is how to incorporate property management with ecological management and maximise biodiversity. However if we keep in mind the basic concepts outlined above, we can work towards using fire in a way which supports the conservation of Australia's amazing biological diversity.

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Fire and biodiversity in Australia

Urban expansion and clearing for agriculture and other purposes has reduced the areas in which natural ecosystems can thrive. In Australia, we are fortunate enough to have some large areas of bushland, containing a diverse range of native vegetation types, providing a wide array of animal habitats. However much of it is fragmented and particular care is required in order to retain conservation values, including remnants of bushland in private ownership.

Fire plays a vital role in many ecosystems throughout Australia, particularly the fire-adapted heathlands, grassy woodlands, shrubby forests and tall open forests. However there are limits to how often the species can tolerate fire; both too frequent and too infrequent fire can cause species to decline, or even become locally extinct. Likewise, excluding fire altogether or for extended periods can also lead to long-term changes in vegetation type and local extinctions of plants and animals. For example, tall eucalypt forests often have an understorey of rainforest species, which effectively prevent eucalypt regeneration. Without fire, the rainforest species would become dominant. Creatures like gliders that rely on eucalypt sap for nourishment would be lost from the area without fire.

Fire in bushland can be planned or unplanned. Bushland managers need to consider both. Sometimes unplanned fire, ie wildfire may fulfil ecological needs. At other times, active management may be required – either through planned burns, or strategies to lower fire frequency where for example there may be a high rate of arson. In order to practically manage the land to maximise species diversity, we must first consider the responses of plants to fire and how this in turn affects the composition of animals at different stages post-fire.

Recommended fire frequencies for vegetation types

(These guidelines will no doubt be refined as we learn more about our regional ecosystems and the plants and animals within them.)

Vegetation type	Suggested range of intervals between fires
Rainforests, scrubs	Manage to exclude fire.
Creekside vegetation	In general, don't burn.
Tall eucalypt forests	Needs an occasional hot fire to burn out rainforest understorey, possibly with some cooler understorey burns. Intervals between hot fires likely to range between 20 and 100 years.
Open eucalypt forests and woodlands with a shrubby understorey	Vary intervals between 7 and 25 years.
Melaleuca forests	Vary intervals between 15 and 30 years.
Coastal heath	Vary intervals between 7 and 20 years, (emphasis on 8 to 12 years).
Heaths of rocky areas	Depends on relationship to surrounding vegetation. Intervals are likely to range between 15 and 50 years.
Open eucalypt forests	Vary intervals between 3 and 6 years. and woodlands with a grassy understorey

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