

Fire and Fauna

This is the third Note in the Land for Wildlife fire series that looks at the complex topic of fire and wildlife. There are several strategies that wildlife use to help them survive fires and there are many different ways in which wildlife respond to post-fire conditions. Fire can either create, destroy or minimally affect habitat, depending on the animal in question. There are still many unknowns regarding wildlife responses to fire in Australia and this Note aims to provide up-to-date examples where possible.

Survival Strategies

It is generally recognised that animals are not adapted to fire per se, but some species do have characteristics and behaviour that better enable them to survive particular fire regimes or individual fires. For most animals, survival depends on three things: 1) their mobility, 2) the intensity, season and extent of the fire, and 3) the animal's ability to find suitable refuge.

Nearly all animals will die from direct exposure to fires so they instinctively behave in certain ways to avoid fire. Some animals flee, others burrow into the ground, and others seek shelter under logs, in gullies, near creeks or in crevices. Some animals also use torpor (a state of suspended physical activity, similar to hibernation) post-fire to save their energy and avoid exposure to predators. The long-term survival of a species in a certain area may be influenced by fire as well as other complex factors such as available food, water, breeding sites, refuge areas, grazing pressure, soil moisture, predators, infrastructure and other human influences.

Animals that survive fires may not be able to colonise adjacent areas, because these areas are already 'full' with wildlife. Survivors of fire may be faced with diminished resources, competition from other animals, unfamiliar habitat and predation.

Post-Fire Responses and Successional Preferences

Depending on the extent, intensity and season of the fire, a burnt environment will create different opportunities for wildlife. Recolonisation usually occurs in stages with many animals showing a preference for a particular stage of post-fire regeneration, referred to as their 'successional preference'.

During and immediately after fire, animals such as kites, goannas, crows, kookaburras and foxes can be found scanning burnt areas looking for prey that has been injured, flushed or killed by fire. Vegetation structure is simplified by fire, increasing the amount of bare ground and open habitat, as well as encouraging new growth of grasses, herbs and other plants. This early successional stage habitat favours some animals such as some wallabies, insectivorous birds and leaf-eating insects.

As time since fire increases, so does the vegetation structure and canopy. These provide shade and cover creating preferable conditions for a different suite of animals such as bandicoots and leaf-litter dependent skinks.

Depending on the ecosystem type, vegetation will eventually reach late successional stages and may eventually be considered as 'long unburnt'. This stage may be reached 7 years post-fire in a grassland ecosystem or 50 years post-fire in wet sclerophyll forest. Many species of wildlife require long unburnt vegetation with its dense vegetation, leaf-litter and fallen branches.



*Animals respond to fire in different ways depending on fire frequency, extent, season and intensity (see Land for Wildlife Note F1 for a more detailed explanation of these terms).
Photo by Robert Ashdown.*

Age and Gender Dependent Preferences

Whilst many animals show a successional preference, preferring either early successional habitat, or long unburnt areas, the habitat preference of some animals is based on their gender or age. For example, male and juvenile Bush Rats (*Rattus fuscipes*) will readily recolonise early successional habitat, while females prefer long unburnt areas. Female Bush Rats prefer habitats with breeding resources such as dense clumping grasses or fallen logs, which are found in long unburnt areas.

As there are so many variables in nature, successional preferences are not clear-cut. Examples provided in this Note aim to demonstrate the complexities regarding fire and fauna and it is acknowledged that other research may have found different conclusions.

Patchiness and Mosaics

Given the complexities of fire and wildlife, it is generally agreed that a mosaic pattern of time since fire is best to ensure that wildlife have as many habitat options available to them as possible. Ensuring that planned burns are patchy with some areas being left unburnt will help create a mosaic pattern across the landscape of recently burnt areas mixed with long unburnt areas. See *Land for Wildlife Notes F1* and *F2* for more information about mosaics and patchiness.

Birds

In general, birds are considered mobile as many species can fly away from fires, depending on the intensity and extent of the fire as well as other factors. However, some species are considered fire-sensitive. These birds (e.g. wrens, rails and bristlebirds) may be poor fliers, ground-dwelling and have low fertility rates. They require nearby and familiar refuges to survive fires.

Carnivorous and insectivorous birds such as raptors, kookaburras and crows may benefit from fire as they prey on animals that have been flushed or injured by the fire. Open country birds that feed on grass seeds (e.g. finches, doves and some quail) depend on fire-regenerated grass species and are often attracted to recently burnt areas¹.

Some birds prefer long unburnt vegetation such as Black-breasted Button-quails in dry rainforests and Yellow-tailed Black Cockatoos in heathlands. Some owls have also been shown to change their diet post-fire to accommodate a new suite of prey animals.

Pest Animals

As with native wildlife, pest animals also respond to fire depending on their mobility, their ability to find refuge and the fire's intensity, season and extent. Studies have found that feral cat numbers increase at a similar rate to that of bandicoots post-fire, indicating that bandicoots are an important prey source for feral cats².



Foxes have also been shown to prey on bandicoots and other medium-sized native mammals after fire.

Large Mammals

Large mammals such as kangaroos and wallabies are generally considered to be mobile as they can move away from small, low intensity fires. Likewise, Koalas can survive low intensity fires by moving up into the canopy and have been shown to survive a high intensity fire by sheltering near a creek³. It is unclear whether this behaviour was just luck, or maybe Koalas have a limited ability to move away from fires and seek refuge.



Research has shown that some Swamp Wallabies seek refuge along creek lines, whereas others flee from fire and have even been recorded moving through the fire front into burnt areas⁴.

Small Mammals

Small mammals generally have low mobility and need suitable refuges or unburnt areas to survive fires. They often have strong links to vegetation structure as many small mammals require a thick understorey for shelter. Some small, ground-dwelling mammals such as the introduced House Mouse can occupy early successional habitat, whereas other species such as Brown Antechinus prefer late stage successional habitat with a complex structure. Brown Antechinus have recently been shown to also use torpor as a post-fire survival strategy⁵. As with other animal groups, the successional preference of small mammals depends on habitat structure, the type of fire, abiotic factors such as nearby waterways and the animal's breeding requirements.



The number of Northern Brown Bandicoots decline immediately after fire and may increase again as the shrub layer increases. Photo by Lyle Radford, courtesy of Brisbane City Council.

Fire and Threatened Animals

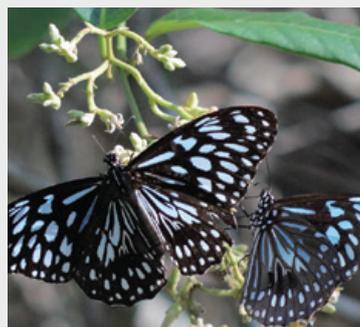
There are many rare and threatened animals in Southeast Queensland. Some animals are threatened by inappropriate fire regimes (either too much, or too little fire, or fire in the wrong season). Winter burns can be devastating to some insects and reptiles as they are in torpor or hibernation during this season. Some animals are predicted to become threatened by climate change related factors such as increased temperatures, more intense fires and longer fire seasons.



The nationally threatened Long-nosed Potoroo, shown above, prefers late successional habitat with a dense understorey that has not been burnt for at least ten years². Photo by Leo Berzins.

Invertebrates

Invertebrates respond to fire in complex ways depending on the type of fire, abiotic factors such as soil moisture and availability of suitable nearby refuges. Pollinators (e.g. bees, beetles, butterflies) and those that eat decomposing plants and animals (e.g. millipedes, slugs and some moths) are the least resilient to fire, whereas ants have showed the most resilience⁶. Spiders, crickets and centipedes may survive in familiar refuges or unburnt patches and may then recolonise burnt areas⁶. There are also 'fire-loving' insects (e.g. smoke flies) that breed in hot ash beds after fire.



Among invertebrates, pollinators such as butterflies show the least resilience to fire, whereas, ants show the most. This is probably due to the ability of some ant species to shelter underground.

Reptiles and Frogs

Reptiles and frogs are generally considered to have low mobility and require nearby gullies, damp leaf litter, swamps, logs, burrows, rocky outcrops or crevices as refuges from fire. As with other animals, common reptile species often have a preference for a specific post-fire successional stage⁷. Small reptiles often depend on vegetation structure for shade and protection, and although weedy, lantana thickets offer excellent habitat for some small reptiles⁸. Therefore, lantana should be cleared gradually, while encouraging regeneration of native plants with dense vegetative structure.



Research suggests that nocturnal, burrowing reptiles tend to prefer early successional stages of post-fire habitat, whereas reptiles that live in leaf litter, such as some skinks, prefer late successional stages⁷.

Habitat Trees and Logs

Habitat trees with hollows and fallen habitat logs are very important for Australian wildlife. Many invertebrate, bird, mammal and reptile species depend on habitat trees with hollows and habitat logs for nesting and shelter (see *Land for Wildlife Note V7 - The Value of Habitat Trees*). Hollows are formed in old trees when branches fall due to wind, lightning, fungi, decomposition or termite damage. Fire can also accelerate hollow-formation, but it can also cause trees to collapse⁹.

Studies have found more available hollows at sites that have been burnt at a low frequency. However, hollows that have had internal charring generally have a wider entrance than unburnt hollows¹⁰. This suggests that fire actually helps create large hollows, such as those required by large owls and cockatoos. Again, this supports the idea that a diversity of fire types creates a diversity of habitats.

References and Further Reading

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What you can do

- ✓ Develop an Individual Property Fire Management Plan by attending a SEQFBC fire and biodiversity workshop (see *Land for Wildlife Note F4 - Fire and Your Property*).
- ✓ Learn about the wildlife on your property and research their post-fire successional preferences, or ask your Land for Wildlife Officer about this.
- ✓ Before any planned burns remove fuel from around fallen hollow logs, the base of habitat trees and refuge areas (see photos in *Land for Wildlife Note F4*).
- ✓ Avoid burning creeks, gullies and rainforests.
- ✓ Avoid clearing or removing fallen timber from gullies.
- ✓ Avoid burning hilltops and ridgelines as these are important sites for wildlife, namely invertebrates, to gather and breed.
- ✓ Subscribe to South East Queensland Fire and Biodiversity (SEQFBC) free enews at www.fireandbiodiversity.org.au
- ✓ Visit www.fireandbiodiversity for more information.

Land for Wildlife is a voluntary program that encourages and assists landholders to provide habitat for wildlife on their properties. For more information about Land for Wildlife South East Queensland, or to download *Land for Wildlife Notes* free of charge, visit www.lfwseq.org.au

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