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FOREST FOCUS

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FIRE IN THE SOUTH-WEST FOREST ECOSYSTEMS

▲ *These massive banksia fruits* (Banksia attenuata) *protect the seeds during fires.*

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Front cover

Fire in typical dry sclerophyll forest.

Back cover

Fire of various intensities helps to provide a diversity of habitats. The open karri forest in this photograph encourages, among other species, kangaroos and emus.

FOCUS on The role of fire in the South-West forest ecosystems

by P. CHRISTENSEN

It is a measure of the incredible tenacity of established ideas and values that we Australians of European descent still doggedly cling to the belief that fire in nature creates only havoc and destruction. Fire we say is only good when it is used to heat our homes, or light our cigarettes. For two centuries we have fought and battled with fire on this continent, steadfastly refusing to accept the simple truth, well known to the indigenous inhabitants, that fire is a part of the environment. There can be no compromise on this point, fire is not a factor that the environment has to "put up with", it is an essential part of many Australian ecosystems. The maintenance of the *present* forest ecosystems in the South-West depends on fire.

In the heathlands and dry and wet sclerophyll forests of the South-West, fire is so much a part of the environment that were it possible to exclude it for an indefinite period, which it is not, we would see a complete change in the present plant and animal communities. Many species would disappear altogether, causing the present ecosystems to change for ever.

Fire dependence

Native plants and animals of this region have evolved with fire and not only have they adapted to it but in some instances they have come to depend on it for their continued survival. The eucalypts, for example, produce epicormic shoots to replace their scorched crowns after hot fires. The small seedlings of some species have lignotubers, or thick carrot-like roots enabling them to take advantage of fire conditions by sprouting strong, vigorous shoots following hot fires. Other species, like karri (*Eucalyptus diversicolor*) shed their seed from hard protective fruits, which open after fires, on to the ashbed where they germinate and flourish.

Most species of understorey vegetation are able to regenerate from underground rootstocks, bulbs, tubers or corms. Others such as the legumes have special hard seed which protects the endosperm from the heat of flames. Indeed these seeds require heat treatment in order to germinate at all.

Hard protective fruits have been developed by many of the proteaceae. A good example of this is displayed by a species of banksia whose large, hard fruits protect the seed during a fire and do not release it until after they have been wet by the first autumn rains.

Very few species appear to have no specific adaptations to fire. These species grow under conditions where they experience only infrequent fires.

▲ *Yellow robin* (above—P. Kimber) *and scarlet robin* (Alwyn Y. Pepper, E.F.I.A.P.) *are recorded in true karri forest only after severe fires.*

▲ *Burnt karri crowns regenerating by means of epicormic shoots.*

▼ *Karri understorey unburnt for 15 years; wildflower diversity is poor.*

▲ *Red-winged wren* (above) *and splended wren* (below) *prefer*
▼ *dense low understorey* (Alwyn Y. Pepper, E.F.I.A.P.)

▲ *Silky blue orchid flowering six months after a regeneration burn.*

This composite picture shows a few of the wide range of flowers in karri forest
▼ *about three years after a burn.* (Brian Stevenson and Dale Watkins)

An example of this is *Acacia cyclops*, a plant which is often found near the edge of coastal sand dunes or recently fixed dunes. This species, unlike most of the acacias in the forest, does not have hard seed. Its seed has to be able to germinate on wet sand after the autumn rains. The hard seed of other acacias is unable to do this without the heat treatment provided during a fire.

Fire aids greater species composition

Whole communities are adapted to fire conditions. The understorey scrub of the wet sclerophyll forest if not burnt for a long period becomes poorer in species composition. Many species of plants favour the early stages of succession immediately following fires. They germinate, grow, reproduce and die, leaving only their seed in the soil to perpetuate the species. Many of the leguminous plants come into this category and certain species are commonly referred to as "fire weeds" because of their fantastic proliferation immediately following fires.

The present south coastal communities are dependent on periodic fires for their continued survival. Following deposition of the coastal sand dunes there is a succession from small plants, grasses and sedges through larger shrubs and bushes to a peppermint (*Agonis flexuosa*) forest which is ultimately replaced by dry sclerophyll eucalypt forest. If it were possible to exclude fire the succession would undoubtedly progress towards the sclerophyll forest climax and this forest would extend much closer to the coast. However, periodic burning ensures the setback of the succession so that a wide coastal belt of heath and peppermint forest persists.

In recent times the ecology of this area has been disrupted by cattle grazing which has encouraged the introduction of grasses and herbs allowing more frequent burning, which in turn has destroyed much of the scrub, creating an open, very low vegetation.

Fauna

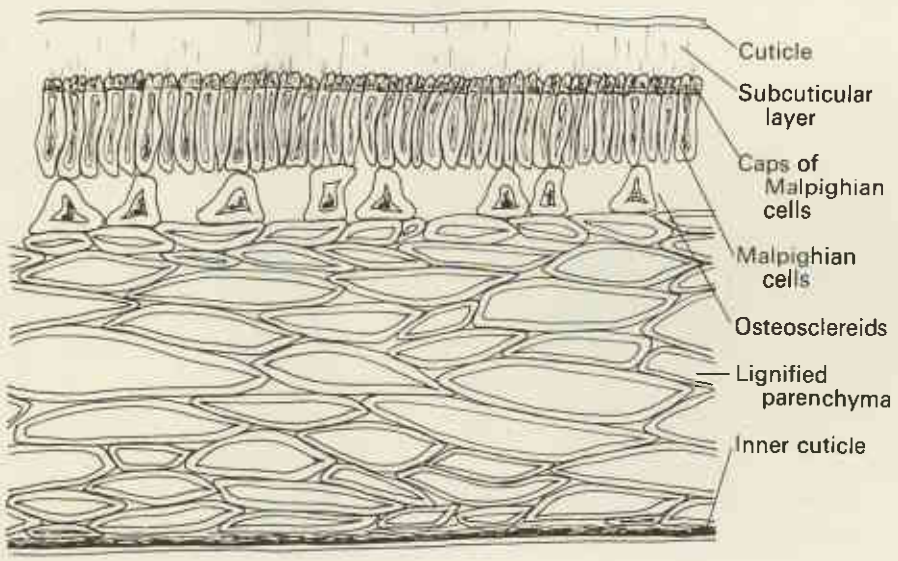
The forest fauna follows a succession dependent on the seral stages of the plant succession. Experimental work has shown that immediately following fire in the karri forest, conditions become favourable for the introduced house mouse which proliferates and spreads to colonise the area with incredible rapidity. After 12 to 18 months, when ground cover is almost complete, the southern bush rat (*Rattus fuscipes*) begins to re-establish itself and a little later small marsupials such as the mardo (*Antichinus flavipes*) and common dunnart (*Sminthopsis murina*) return to the area. The bird community undergoes similar successional changes, the very early seral stages with open undergrowth favouring birds such as robins and the shrike thrush, while later stages are preferred by species of wren.

The tammar (*Macropus eugenii*) lives in thickets of *Melaleuca* sp. or *Gastrolobium bilobum* (heart-leaved poison) in the eastern fringes of the dry sclerophyll forest. It prefers these thickets to be open underneath, but not too open. Periodic fires keep them this way. If they were allowed to grow protected from fire the habitat would eventually degenerate and become unsuitable for the tammar.

The wildflowers which the honey possum (*Tarsipes spencerae*) and many of the insect and nectar eating birds frequent depend on periodic burning to maintain the vigour of the community. The bronzewing pigeon feeds largely on acacia seeds which, as was mentioned earlier, are dependent on periodic fires.

These examples illustrate the important role of fire in the South-West forest communities. Without fire the forest ecosystems as we know it at present would change completely, some species would die and disappear for ever. The well-known case of leadbeaters possum in Victoria is perhaps a good example to illustrate this. The species was thought to be extinct until the "disastrous" fires

Seed coats of many legumes are very thick and impermeable to water. This is a section drawing of a highly magnified acacia seed coat.



in 1939 when it again became common in the resulting mountain ash regrowth stands. Had this fire not occurred it is possible that the species would have become extinct.

Major natural factor

Fire is the major natural factor responsible for maintaining plant and animal diversity within the forest ecosystem in Western Australia. Fires occur naturally during all seasons except winter, and they vary in intensity from very hot to very cool fires. The frequency of fire in any area also varies causing further diversity in the system.

For a long time foresters have recognised the need for protective burning. More recently the necessity of fire in the forest ecosystem has been generally accepted. Prescribed burning is carried out to reduce the fuel build-up, thereby preventing dangerous wildfires which may destroy or damage timber and are a danger to life and property. In practice it is possible to meet natural conditions only half-way due to the changed circumstances now that human habitations and pursuits are so inextricably woven into the fabric of the forest areas. Therefore, under present conditions it is only possible to burn during a fairly restricted season and most burns are mild so as to protect life, property and timber resources.

Variety of habitat

Even under these conditions the variation achieved is large. No burn is identical to any other, and within the prescribed burn areas themselves 20 to 40 per cent remains untouched by fire due to excess fuel moisture content, insufficient leaf litter and other causes. It is common for certain sectors, especially along creeks and gullies to remain unburnt for 15 to 20 years at a time. As our knowledge of fire behaviour and the fire ecology of the forest increases, it

▲ *The southern bush rat, an early coloniser of dense vegetation resulting from a fire.* (D. H. Perry)

▼ *The tammar prefers thickets with a particular structure—fires ensure the perpetuation of suitable habitats.* (B. Stevenson)

▲ *Infra-red aerial photograph showing the mozaic effect achieved with prescribed burning in dry sclerophyll forest.*

▲ *Cowslip and purple enamel orchids six months after a regeneration burn. Orchids start flowering the first winter after a fire and usually flower best in the first three years from the fire.*

seems likely that it will be possible to approach even closer to the natural conditions existing prior to European settlement.

The frequency and intensity of burns, in certain safe areas at least, can be varied so as to maintain the maximum possible habitat diversity.

Fire is a natural environmental tool which if used correctly and with adequate knowledge and restraint will ensure the future conservation of our fauna and flora. The necessary knowledge can be obtained by studying the basic ecology of the plants and animals in our forests. But first we must rid ourselves of those inbred fears and misunderstandings about fire which we have inherited from European ancestors living in a climate completely alien to our own.

Typical tammar habitat maintained by periodic fires. ▶