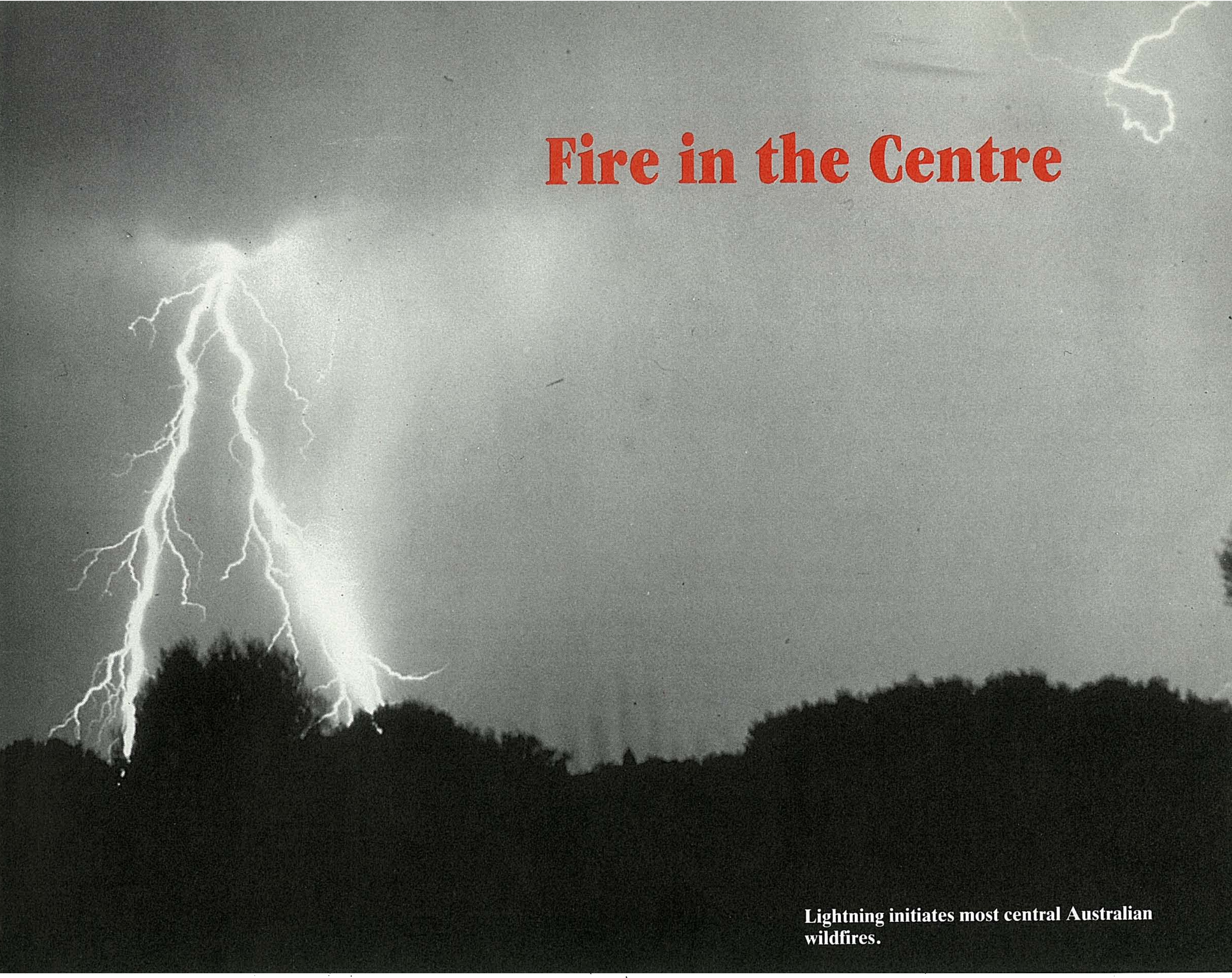
# Fire in the Centre



Lightning initiates most central Australian wildfires.

Harsh contrasts are the dominant feature of the central Australian landscape: freezing nights, searing days; the round mass of Ayers Rock set amid a flat red desert where the desolation of drought can be suddenly flushed away and replaced by massed blooms. The plant life with its fine, feathery foliage, built to resist drought, is soft and rounded, incongruously delicate when set against the bare and craggy ranges that cross the Centre.

Such contrasts are a major part of the appeal of the Centre and, while the first impression is of a hostile, often monotonous environment where survival of man, beast, or plant is always uncertain, the reality is vastly different.

The spinifex-dominated landscape supports a rich and varied flora — in the Simpson Desert, for example, 180 different species have been recorded. Kangaroos and emus roam the area, seeking out fresh green pick, and many other native animals eke out a more discreet ever-nomadic existence — nectar-feeding birds, for example, fly many miles to feed on flowering shrubs and trees.

One group of animals especially suited to the area is the reptiles. The clumps of spinifex (*Triodia* and *Plectrachne* spp.) provide an almost perfect environment — their prickly leaves give protection from predators, the sandy soil underneath is easy to burrow into, and the bare areas in between the clumps make ideal sunbaking spots. Because of these natural advantages the spinifex grasslands of Australia support the world's richest lizard fauna.

Europeans find it difficult to survive in central Australia, but the traditional Aborigines' skill and knowledge enabled them to live in greater numbers, with less effort, on land where Europeans, with all the benefits of modern technology, are still battling. Fire was the Aborigines' most important survival tool – it was the basic technology in their society.

**Fire as a tool**

The early explorers invariably observed fires or recently burnt ground in their travels. Thus the explorer P.E. Warburton, during 1875, travelled for 'twenty miles over a most desolate, burnt country'. In October 1873 W. Gosse, travelling through the Mann and Musgrave Ranges, noted that 'extending south to Mount Caroline, and from eight to ten miles to the north of course, large patches of this country have been lately burnt by the natives; some parts burnt less recently are beautifully green'.

From an analysis of their many journals and diaries, Mr Richard Kimber, a local historian, suggests that burning country, distant smoke, or recently burnt ground made an almost daily sighting for those explorers.

Fire, as a tool, was used for signalling, hunting, clearing the country for easy travel and viewing, and promoting feed for animals. Gosse's reference to the beautifully green areas suggests an obvious example of this last practice. Fire was also used to promote the growth of food plants that the Aborigines directly exploited.

Approximately 100 central Australian plant species provided food for the Aborigines, and many of these only appear in good numbers after a fire. In fact, post-fire plant regeneration in the spinifex communities appears to be more regular and orderly than the succession that occurs in other environments. Short-lived grasses and forbs dominate immediately after the fire, while the regenerating trees and shrubs take their time — sometimes a few years — before making up a significant part of the vegetation cover. Spinifex and woody plant cover slowly increase with time and rainfall until the country reaches its 'mature' state; depending on rainfall, this can take between 5 and 20 years.

In its mature state the spinifex country more closely approximates a desert — few animals can eat spinifex and there are few other food plants to be found. The Aborigines regarded this as neglected, untidy, unproductive country that needed 'cleaning-up'. Even today, those Aborigines with some link to the traditions of the past talk of 'cleaning up' such country in order to 'make the bush-tucker come up'. With the slow demise of the traditional life style of the central Australian Aborigines, a broad swath of the spinifex rangelands remains in an untidy condition.

In terms of proper land management we now face the crucial question of whether we should continue burning this neglected land. Why should we now burn land that has few of its original inhabitants and has always been a poor resource for the desert pastoralists?

*Tens of thousands of years of an Aborigine-imposed fire regime has resulted in a flora and fauna uniquely adapted to fire.*

### Conservation and protection

The first response has to be couched in terms of conservation. Tens of thousands of years of an Aborigine-imposed fire regime has resulted in a flora and fauna that are uniquely adapted to fire — and stale country, dominated by spinifex, mulga (*Acacia aneura*), and other shrubs, does not allow the regular appearance, reproduction, and continued survival of ephemerals and other short-lived plants.

With regard to the animals of the region, the Aborigines' practice of burning patches as small as a hectare provided a rich mosaic of plants in various stages of growth and reproduction. Such fires were usually low-intensity ones that allowed animals to flee and the more fire-sensitive plants to survive. Wildfires that can rage across the region either kill directly or burn out such large areas that animal refuges are destroyed and fresh green pick is not readily available.

Patch burns give the diversity that many animals can quickly exploit. As an example, for those lizards in an area adjoining a burnt patch the mature spinifex provides the perfect sanctuary, and the regenerating flora attracts the animals that go into the lizards' diet.

*Australian spinifex grasslands support the world's richest lizard fauna.*

Some animal species are known to have become extinct in recent times; others are recognized as being under threat. The rufous hare wallaby once roamed freely over the area, sheltering in the spinifex, picking over the recently burnt patches. However, with the demise of regular firing and the consequent build-up of the highly flammable spinifex, and the occasional devastating wildfire, it has retreated into the Tanami Desert region where the last colony of approximately 200 members now resides.

Obviously another large wildifre would not benefit these animals, and in recent years a group from the Northern Territory Conservation Commission, led by Dr Ken Johnson, has recognized that regular patch burns can help protect them from a calamitous fire and provide them with the readily available food that they need to thrive.

A second major consideration has to be the very real danger posed by the explosive wildfires that can occur among the spinifex. Depending on the seasons, a spinifex rangeland can carry as many as two fires every 3 years. And such fires can spill over into more productive areas — threatening man, beast, settlements, and tourist attractions.

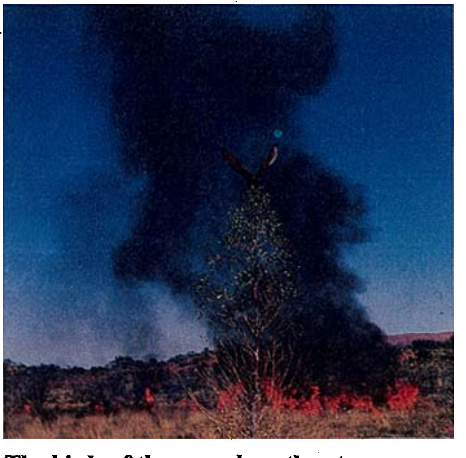
The decline in the traditional Aboriginal population began around the turn of the century. Confiscation of their lands — and the material and other-worldly attractions of the cattle stations, towns, and missions — were major contributors to the Aborigines' decline. Disease was another — because they had never been exposed to European diseases like smallpox and German measles, disease exacted a heavy toll when the two populations met.

### Wildfire

Wildfires did occasionally occur under Aboriginal practice, but their scale and severity over the last 70 years suggest that something is now severely awry out there in the spinifex.

In the 1920s, '50s, and '70s, wildfires scarred the landscape. Little is known about the fury and extent of the early fires, and we must rely on anecdotal evidence. Perhaps the most daunting example is the old tale of the fire that raged from Oodnadatta in South Australia to the Gulf of Carpentaria, during the 1920s.

In most-recent years, the 1975/76 fires centred around Alice Springs give an idea of the extent of the country that can be affected: up to 15 fires were reported each day during the bushfire season that year, and they burnt out more than a million square kilometres (that's 13% of the Australian continent). Around the Uluru National Park, which encompasses Ayers Rock, the fires were particularly severe and spread into the Park itself, burning out 80% of its area. Only the immediate surrounds of the Rock and a few other scattered areas away from the main fire path escaped its ravages.



**The birds of the area show they too are adapted to fire: a brown falcon waits for some fleeing prey.**

*It is not necessary to sacrifice fire-sensitive areas in order to install a system of fire baffles.*

An experimental fire near Ayers Rock.

Part of the rich lizard fauna — a thorny devil on the edge of a burnt patch.

Lighting up spinifex …

… and the result.

## Fire and plant survival

Fire is a natural environmental stress in the arid zone, but differs from other environmental stresses in that it occurs infrequently and plants are exposed to it for only a very short time — in grass fires the flame lasts only about 5 seconds. Fire is also a very extreme stress in that it can suddenly destroy all the above-ground parts of the plant. How do plants cope?

Two broad strategies can be followed by individual species — one involving resprouting ability, the other a collection of traits that facilitate reproduction from seed. A mix of these strategies can be employed and considerable variation occurs even within a particular genus — for example, mulga cannot resprout and relies on massive seed production for the continued existence of the species, while the related *Acacia murrayana*, found in similarly fire-prone environments, follows the resprouting strategy.

Resprouting depends on the ability of buds beneath bark, in stems or roots, to survive the fire. Dr Ken Hodgkinson, another member of the Division of Wildlife and Rangelands Research, has found that, while mulga resprouts readily if the stem is cut off at ground level, those buds are presumably too close to the soil surface to survive when fire passes over. A reasonable thickness of soil above the buds, or a good covering of bark, seems to be necessary to prevent buds being killed. In the spinifex country, shrubs and trees belonging to the *Hakea*, *Grevillea*, and *Casuarina* genera, and exposed to frequent fire, have such thick bark.

The seeding strategy can take a number of forms. A few species, notably blackboys (*Xanthorrhoea australis*) and the Western Australian Christmas tree (*Nuytsia floribunda*), respond to fire with prolific flowering in the following year.

Fire-enhanced flowering is a rare trait whose physiological basis is not understood. Most species following the seeding strategy have various combinations of early reproductive maturity, heavy seed production, and a long-lived seed store. Fire-stimulated seed release is also common among eucalypts and some species of *Banksia*, *Casuarina*, and *Hakea* — in these cases mature seed is usually held on the tree or shrub for a number of years, during which time it is slowly released. The passage of fire accelerates this release and aids in the establishment of the seedlings by reducing competition.

Fire can also stimulate the germination of seed in the soil store by cracking the hard seed coat common in many species, particularly mulga. Fire intensity, the depth and quantity of seed in the soil, and the occurrence of follow-up rains influence the extent of fire-promoted germination. According to Dr Hodgkinson, fire intensity is often the most important determinant — in burnt areas in western New South Wales the highest numbers of seedlings are often found surrounding burnt-out logs, and it is obvious that they have benefited from the exceptional heat those logs provided. The situation differs a little in the Centre — highest seedling numbers are usually found where the greatest tree canopy removal has occurred.

Although there are only limited data upon which to assess the evolutionary significance of these various strategies, it appears that fire frequency has the important role in determining which is favoured. Where fires are frequent, resprouting seems to be the most successful strategy since, in general, little time elapses between fires for seedlings to establish, mature, and replenish the soil seed store. Where the interval between fires is longer, the seed strategy could be just as successful as the resprouting path.

Since that time, members of the CSIRO Division of Wildlife and Rangelands Research, along with officers of the Conservation Commission and the Australian National Parks and Wildlife Service, have been exploring the area's fire history and the effects of fire on the flora and fauna of the region. Their aim has been to develop a fire management plan for the Uluru National Park that will make it the 'tidy' area that the Aborigines once knew.

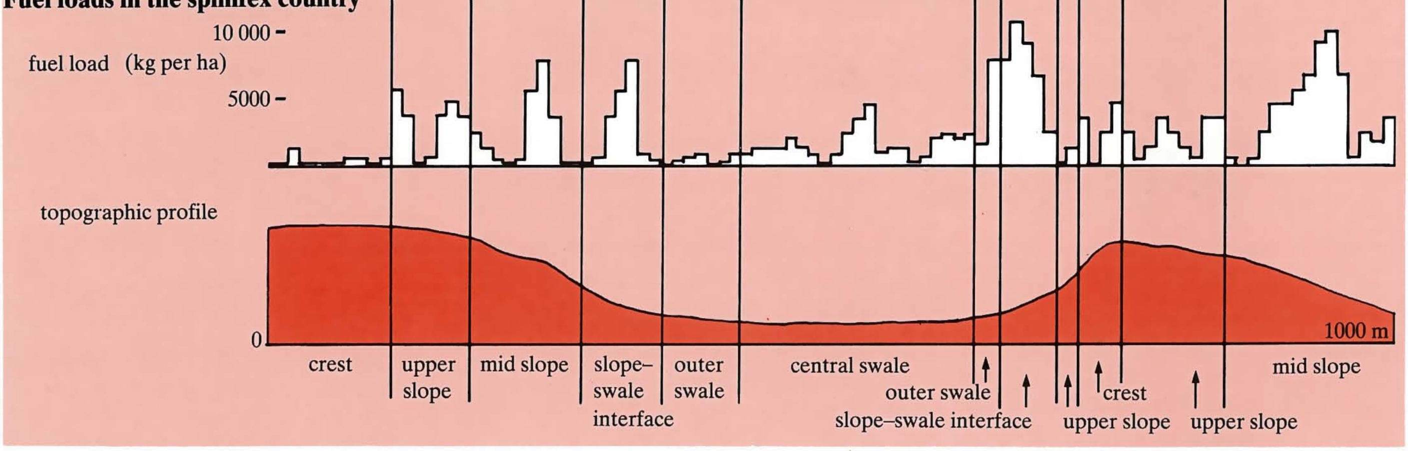
But of course it's not only for good housekeeping that fire needs to be managed within the Park; the conservation of a wide variety of plants and animals is a major consideration and so is the protection of the tourists and of the facilities in the area. Another big wildfire — like that in 1976 — has all the potential for a major disaster.

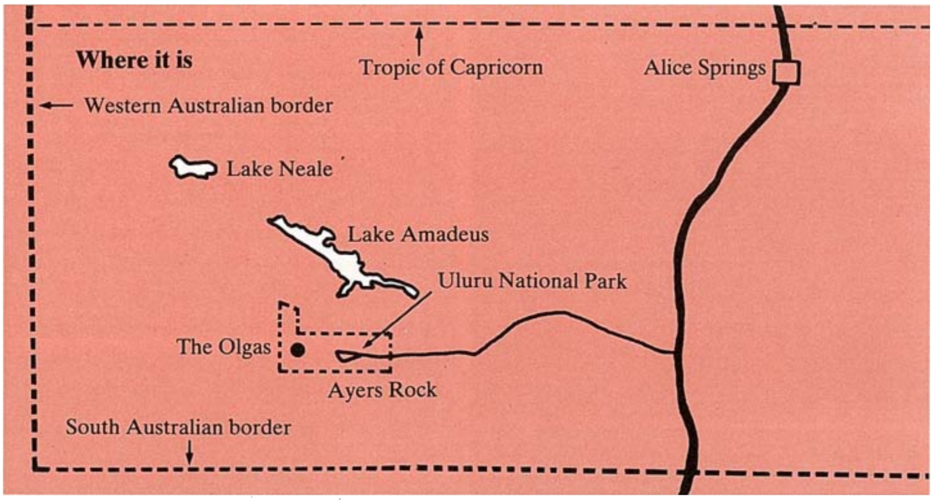
From an analysis of fire records for the period 1970 to 1980, Mr Graham Griffin of CSIRO, together with Mr Neil Price and Mr Harry Portlock, of the Conservation Commission, were able to reach some general conclusions about the incidence of wildfires. Mr Griffin and colleagues in the

*Patch burns give the diversity that many animals can quickly exploit.*

**Fuel loads are typically low on dune crests, as in this example, and the lack of fuel can block a low-intensity fire's passage. However, if the weather is right, a fire can be forced over the dune crest and burn a larger area.**

**Fuel loads in the spinifex country**






Division of Wildlife and Rangelands Research — Dr Earl Saxon, Dr Margaret Friedel, and Mr Grant Allan — have subsequently collected extensive field data and analysed fire paths on aerial maps and satellite images provided by the various LANDSAT spacecraft. From these diverse studies a comprehensive description of fire behaviour and its ecological effects emerges.

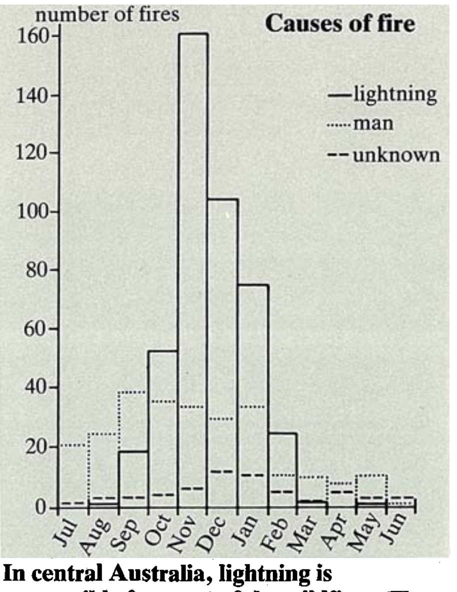
## 'Dry' storms

Most of the fires in central Australia are initiated by lightning (see the chart). Their numbers peak in November, when thunder cloud activity reaches its peak; however, those thunderstorms are usually 'dry' storms, and little rain falls — often only a few drops.

Also during this month, temperatures start to spiral upwards, humidity is still low, and wind speed increases. Because most of the Centre's rain falls during the late summer, with little falling during winter and spring, the vegetation is parched and highly flammable. Those classic ingredients for a wildfire — high temperatures, high winds, dry fuel, and a spark — come together during November.

This wildfire recipe for the Centre differs from that applying in the forests of south-eastern Australia. With more rainfall in the south, high fire risk develops after drought periods dry out the accumulated forest litter.

The vegetation of the Centre — particularly the spinifex grasses — is more of a perennial fire hazard; spinifex will go up with a 'whoosh' at any time of year. To make that fire rage over the desert plains you need rain, not drought. Three good years of above-average rainfall build up the fuel load; perhaps more importantly, the bare ground between clumps of plants fills in and the fuel is then evenly distributed. Come November of the fourth year and the situation is explosive.




**In central Australia, lightning is responsible for most of the wildfires. The chart gives the fire figures for 1970 to 1980.**

From start to finish, individual fires, burning uncontrollably, can devastate more than a million hectares of rangeland. But the damage doesn't end with the fire. Cattle, rabbit, and native animal numbers will have risen to a peak during the three good years and those that either miss or escape the fire can quickly move into the burnt area to graze whatever is available. Such intense grazing pressure aborts the normal recovery of the rangeland, and erosion and domination of the flora by unpalatable shrubs can result.

Further environmental damage can occur even in the absence of grazing. Mulga trees are very fire-sensitive and ensure their survival by prolific seeding and the suppression — through competition — of understorey plants. With few flammable plants around the mulga groves, low-intensity fires do not readily carry into them. However, wildfires can — a crown fire flares and destroys the mature trees while the high surface soil temperature cracks the hard coat of the mulga seeds and encourages massive germinations when the next rain falls.

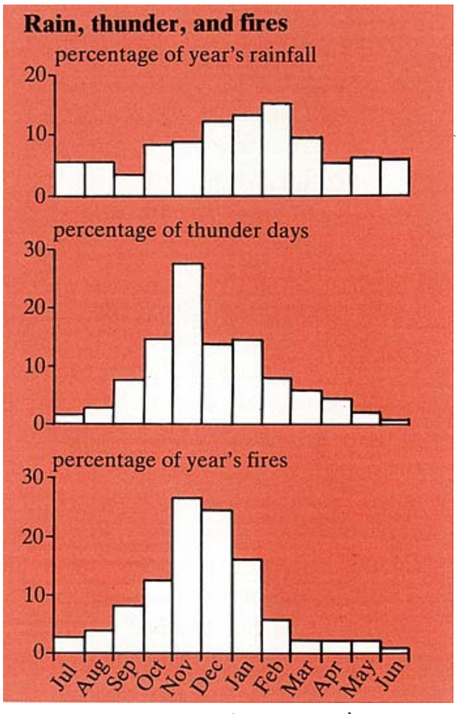
About 15 years must pass before those seedlings can make a fresh contribution to the soil seed store. Yet, since the ground under the now-dead mulgas has been opened up, a lot of forbs and grasses germinate and grow as well. If the seasons are good, fuel rapidly accumulates for another fire that, if it eventuates, will kill the seedling mulgas. A few cycles such as this and the mulga — a plant dominant over much of Australia's arid regions — may disappear from the landscape.

## Managing fire

Obviously, such massive environmental disruption cannot be tolerated, especially in a national park. The question then is, 'how can we integrate fire into the Uluru management plan?'

From their initial investigations, Mr Griffin and Dr Friedel concluded that trying to protect the Park from fire by constructing firebreaks would be a pointless exercise. Graders and bulldozers are costly and also disturb the area; and the 'breaks' they construct would only ensure that any wildfire occurring in the Park would stay within its confines. And, as described above, unburnt landscapes slowly progress into an over-mature state that doesn't have the floral diversity to support a rich animal life — again, an undesirable feature for a national park.

The facts are simple: the plants and animals of the spinifex-dominated country are adapted to fire and thrive on it. Mr Griffin




**Weather records for Alice Springs between 1970 and 1980 show the association between the 'dry' thunderstorms of November and the peak in fire numbers.**

believes that the essence of the problem in the Uluru National Park is that the wildfires have been too large to allow those species that need a mix of burnt and unburnt patches to survive, and too frequent to allow slowly maturing plant species to reproduce.

The logical step for the CSIRO scientists was to try to emulate the firing practices of the Aborigines. We have plenty of evidence that the Aborigines knew how to control their fires. Early explorers reported how the natives would run low-intensity fires up against rock faces, dune ridges, water-courses, or areas burnt previously. If no obvious means of control was available they would light their fire in the afternoon and allow it to die with the coming of the evening calm.

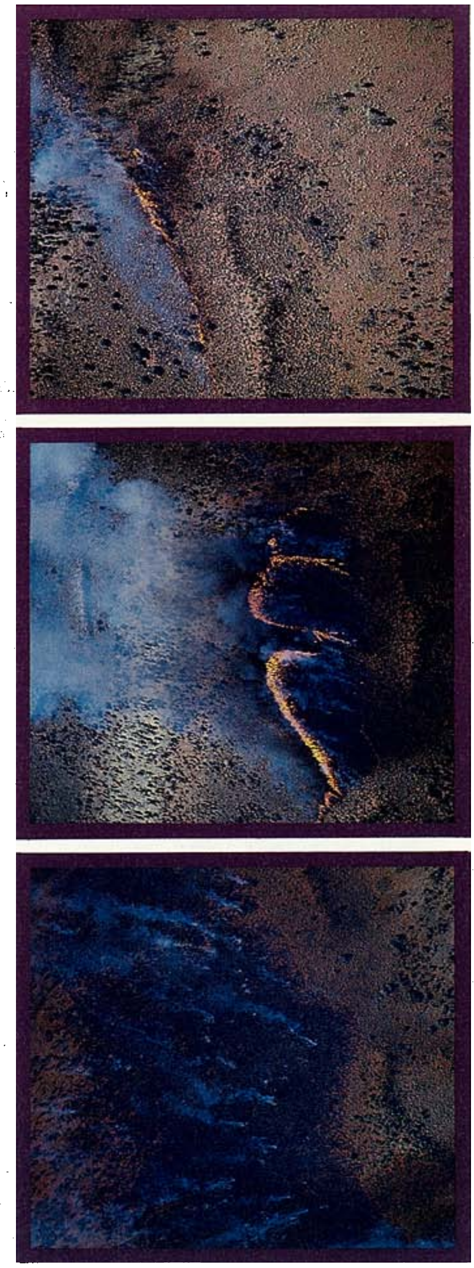
Yet such knowledge was the product of tens of thousands of years of experience that is not available to modern scientists. Indiscriminate burning was not an option to the CSIRO group, and to recapture some of that ancient knowledge and put it in a format that is compatible with proper park management the group had to go into the spinifex plains and run some experimental burns.

To get some idea of the fire histories of the various regions within the Park, Mr Allen used aerial photographs taken during the early 1950s and the 1970s to delineate areas burnt during the wildlfires of 1950 and 1976. The scientists thus had four major land groupings to work with: unburnt, burnt in 1950 only, burnt only in 1976, and burnt in both 1950 and 1976.

Using these maps they were able to survey the groups, noting the changes in the vegetation and making estimates of the fuel load and distribution and the location of particularly fire-sensitive areas. From such surveys the scientists identified three fire-sensitive segments of the Park that need protection from wildfires.

One — a large mulga community surrounding the Olgas — was burnt in 1976 and has not yet reached reproductive maturity. It would be severely degraded by another wildfire. The second is a similar mulga community surrounding Ayers Rock, along with the facilities associated with this major tourist attraction. The other area needing protection comprises communities of *Acacia ammobia* at the eastern edge of the Park. This area has escaped burning for more than 34 years and the plants are very susceptible to fire. It is also the only area where *A. ammobia* is known to occur — it is truly an endangered species

Dr Saxon proposed as a management strategy an arrangement of fire baffles — or small burnt patches – that would disrupt the normal flow of a wildfire into the sensitive areas. These baffles would act as a filter breaking up the main fire front, either completely stopping the fire or breaking it up to such an extent that only part of the sensitive area would be burnt (see the diagrams).



**Aerial photos showing the progress of an experimental fire between two dunes in spinifex country. The fire flares rapidly from its initiation — the middle photo shows its state after 6 minutes — but after 30 minutes it has run up against the low fuel load on the crest of the next dune and has burnt itself out.**

The siting of the baffles was one obvious problem; another was the question of whether the chosen areas would burn and whether they should be burnt. Obviously any area selected as a fire baffle would have to adjoin a sensitive area and would have to be able to sustain a fire and recover from it. A more important question was whether the scientists — and eventually the Park management — would be able to control a fire in the area selected as a baffle. To see if this was possible the CSIRO scientists conducted a series of experimental burns.

These fires are spectacular events — with the quick movements of the 'fireman', the rapid, crackling, rustling spread of the fire, and the thick black smoke rising from the exploding spinifex. At the fire front, lizards, snakes, and other small animals flee towards the dunes. Predatory birds also show that they are adapted to fire: as soon as the first smoke appears, far in the distance brown falcons, crows, and black kites can be seen winging their way towards it.

By contrast, the scientists' main interest in the scene is in following the course of the fire and measuring its rate of spread. They have now lit more than 70 fires and, by relating back the masses of data recorded during the burns to the weather and the vegetation in the pre-burn area, they have been able to construct a model of fire behaviour in the spinifex plains.

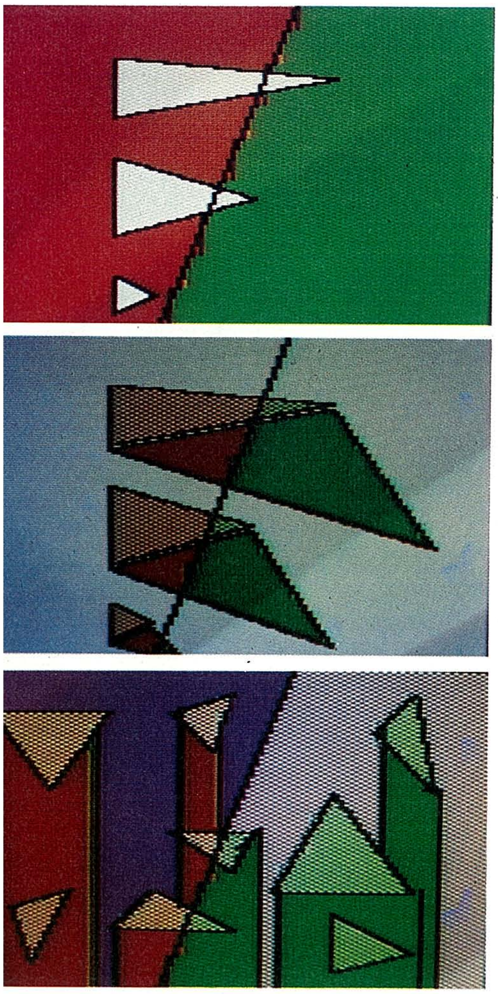
### Fire behaviour

The two major components of any fire model are the contribution made by the fuel — in both its quantity and quality — and the state of the weather.

From their many measurements the scientists were able to develop a mathematical relation between the most important fuel variables and the flammability of the vegetation. For example, the vegetation cover can be indirectly related to the total quantity of fuel, while its maturity can be assessed from its diversity and structure. The final measure of the fuel state depends on the 'patchiness' of the fuel and the total plant cover in the area.

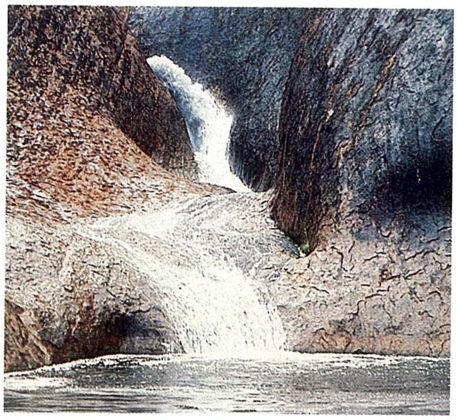
While traditionally the Aborigines might have been able to quickly assess the state of the fuel, it may be some while before park managers become so experienced. To fill that gap the scientists have settled upon the use of the 'wheelpoint' technique coupled with a hand-held computer. In practice, assessment of the fuel state involves a person rolling a wheel pointer across the area under consideration and, at 1-metre intervals, entering into the small computer the sort of cover encountered.

Over a 1-km transect, the operator records where the point strikes the ground — indicating whether it is bare or has plants or litter covering it; the plants, whether they be herbs, shrubs, or trees, are also noted. Continuity of plant cover or bare ground is recorded; for example, the plant struck at one point may be the same as that struck at the previous point.

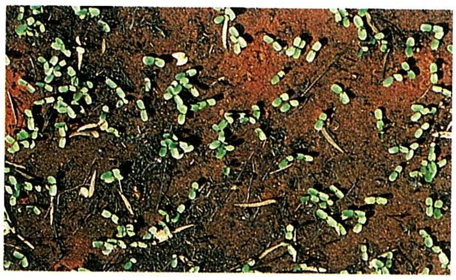


Controlled burns are used to create baffles (white) around the borders between spinifex (red) and mulga (green). A wildfire moving into the area from the north-west will have its front broken up by the baffles — protecting at least some of the mulga from devastation. The third diagram shows how an even more complex arrangement of baffles can break up a wildfire moving in from the north.


**A December 1982 view of approximately 300 000 sq. km of central Australia shows a large wildfire — the whitish patch between the two named lakes — burning out about 30 000 sq. km of desert country. The Macdonnell Ranges and Alice Springs are near the centre of the frame; Ayers Rock is just below Lake Amadeus.**



**One of the more picturesque areas on the Rock — Maggie Springs — being filled with fresh rain-water.**



**Mulga seeds germinate in great numbers after the parent trees have been destroyed by fire.**

The data recorded in the small computer can then be fed into a larger computer and used in the development of maps of the fire state in the Park, or the calculation of the fuel state can be performed on the spot.

Three factors are important in assessing the weather — wind speed, temperature, and relative humidity, in declining order of importance. A simple exponential equation is solved to give the weather index. Multiplying the weather index by the fuel state gives the final 'fire factor' — and this can be used to estimate how any fire will spread.

However, it is not only the fuel and weather conditions that influence fire movement. Topography, differences in fuel types and loads, and natural features all direct fire movement. As an example, the fuel-load profile along a 1-km transect of dune country presented in the diagram on page 6 shows that fuel can be very patchy on crests and upper slopes but heavy and continuous on the lower slopes. In this example, given cool, calm weather a fire could be run along the swale where the fuel load is heavy and continuous, to produce a relatively small patch burn. With stronger winds and higher temperatures, a fire could be made to travel over the dune crests and so burn a larger area.

In essence, the scientists are now confident that the model they have developed will allow a quick decision on a particular area's ability to tolerate fire and its flammability under any weather conditions.

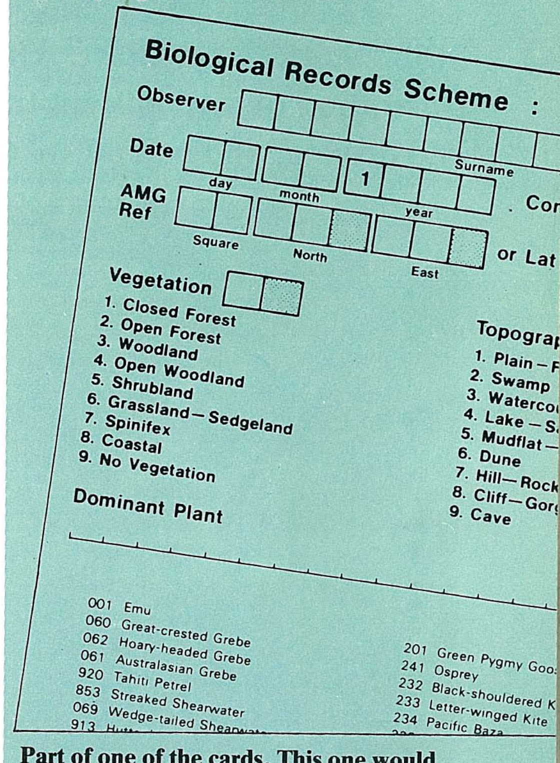
## Recording the Territory's wildlife

Many keen amateur naturalists visit the Northern Territory in pursuit of its often exotic fauna. Unfortunately, they usually take all details of their observations back home with them. Similarly, zoologists in the area, while they may be more attuned to recording details, frequently present them in a very obscure form. In both cases, professional and amateur, valuable information that could be very useful in defining the distribution and abundance of the local fauna — and aiding in their management — is lost.

To exploit the talents of our many enthusiastic naturalists, the Northern Territory Conservation Commission has introduced a biological records scheme — with separate data cards for birds, mammals, reptiles, and frogs — that can be used to record sightings. They will store the data in computer files and use the information in wildlife and biological research, management of the national parks in the Territory, and the preparation of environmental impact studies.

For those *Ecos* readers who are planning to visit the Northern Territory and would like to add to the records, cards and a detailed users' guide are available from:

Conservation Commission
P.O. Box 1046
Alice Springs, N.T. 5750



Biological Records Scheme :
Observer
Surname
Date
day month 1 year
AMG Ref
Square North East
. Co
or Lat
Vegetation
1. Closed Forest
2. Open Forest
3. Woodland
4. Open Woodland
5. Shrubland
6. Grassland—Sedgeland
7. Spinifex
8. Coastal
9. No Vegetation
Topograp
1. Plain – F
2. Swamp
3. Waterco
4. Lake – S
5. Mudflat –
6. Dune
7. Hill—Rock
8. Cliff—Gor
9. Cave
Dominant Plant

001 Emu
060 Great-crested Grebe
062 Hoary-headed Grebe
061 Australasian Grebe
920 Tahiti Petrel
853 Streaked Shearwater
069 Wedge-tailed Shearwater

201 Green Pygmy Goo
241 Osprey
232 Black-shouldered K
233 Letter-winged Kite
234 Pacific Baza

**Part of one of the cards. This one would interest bird-watchers — it lists 150 bird species.**

Weather data can be collected in the field and also fed into the computer. The manager is then in a position to determine whether the areas will carry a fire and to predict its likely behaviour and its limits if ignited at any time during that day.

## A plan

Using their model of fire behaviour, their survey of the vegetation of the Park, and a map summarizing the previous fire history, the scientists have developed a fire management plan for the Uluru National Park that utilizes patch burns to hinder the spread of wildfires into the vulnerable areas.

One example — referring to the protection of a group of mulga communities in the north-west — will give some idea of its approach.

Spinifex borders the downslope side, and on the upslope side woodlands dominated by mulga and a mix of low trees and shrubs fill the low hills and drainage lines. Neither of these areas was burnt in 1950, but the 1976 fire destroyed about half the mulga patches.

The proposed strategy is to burn patches adjacent to the recently burnt mulga communities. On the upslope side the management could use hill crests, creek lines, and the mulga edge itself as natural fire breaks. Amid the spinifex on the downslope side, patch burns would utilize dune crests and the mulga edge to stop any fire; the scientists point out that such fires would need to be carefully timed, because the currently high fuel loads create a risk that they could become very extensive.

There are also other possibilities for manipulating fire in the Park. Spinifex plains sometimes form continuous bands across the Park, and careful siting of fire baffles along these could be used to protect one side or the other from wildfire devastation. The fires usually run along a north-west–south-east axis, and the belts of fire-tolerant vegetation that run perpendicular to this axis give an opportunity to establish separate fire sectors.

More regular burns would add to the already considerable tourist allure of the Park. The wildflowers that form one of its more attractive features, as noted earlier, grow most abundantly in the years immediately after a fire. According to the scientists, areas in the Park could be set aside for regular burns that would encourage their numbers — in effect the park management could deliberately establish extensive wildflower gardens.

The fire strategy has been accepted by the authorities responsible for managing the Uluru National Park — the Northern Territory Conservation Commission and the Australian National Parks and Wildlife Service — and is expected to be put into action during 1984. Not only should the Park be safer and harbour more diverse animal and plant populations, but also the regular firing should help return the landscape to the traditional state imposed by its original owners over the past 40 000 years.

*Wayne Ralph*

## More about the topic


Wildfires in the central Australian rangelands. G.F. Griffin, N.F. Price, and H.F. Portlock. *Journal of Environmental Management*, 1983, **17** (in press).

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