# FOREST FOCUS

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- BUSH PASTURE IN THE SOUTH-WEST
- FIRE AND FOREST FAUNA
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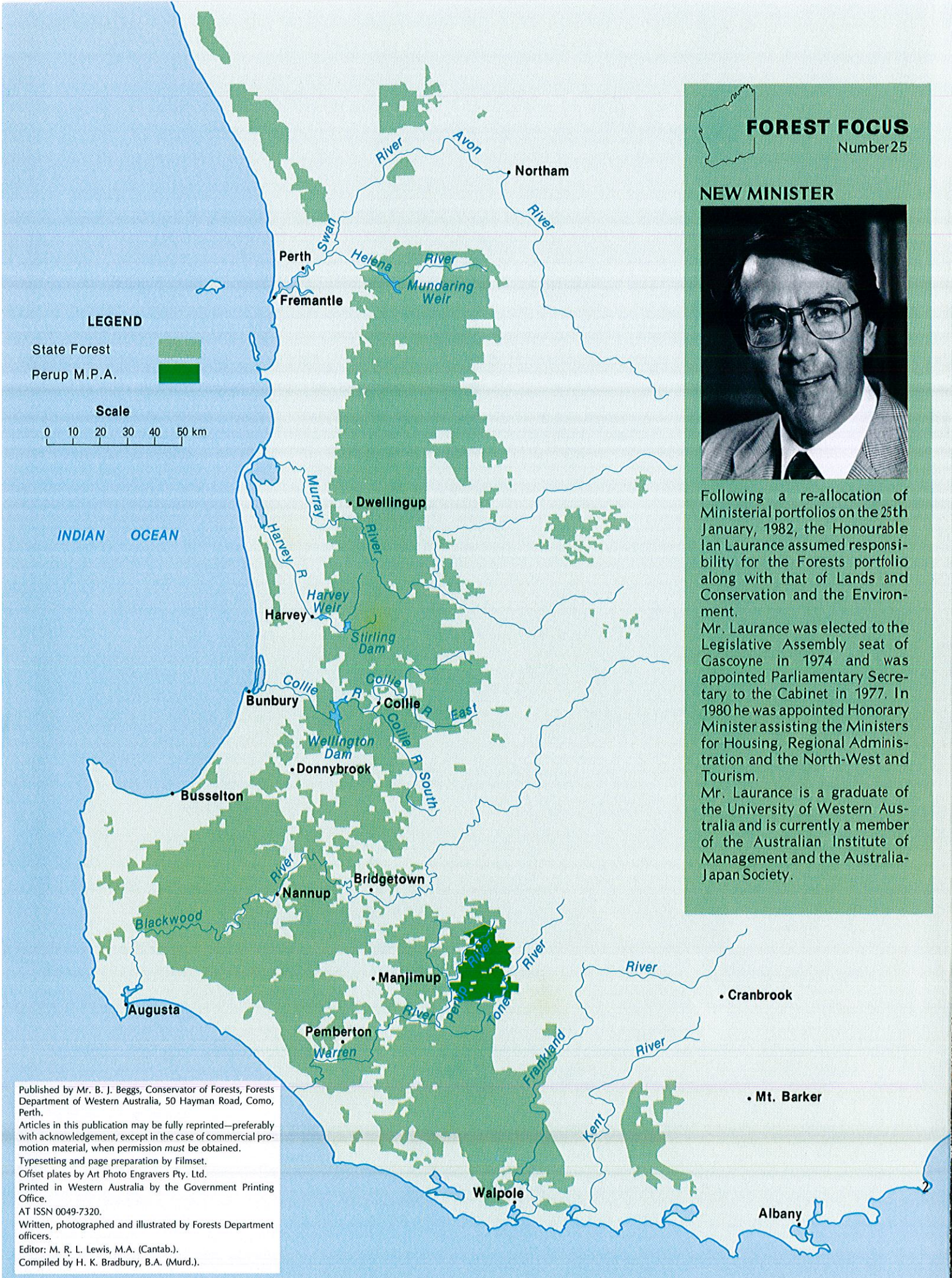


# FOREST FOCUS

Number 25

## NEW MINISTER



Following a re-allocation of Ministerial portfolios on the 25th January, 1982, the Honourable Ian Laurance assumed responsibility for the Forests portfolio along with that of Lands and Conservation and the Environment.

Mr. Laurance was elected to the Legislative Assembly seat of Gascoyne in 1974 and was appointed Parliamentary Secretary to the Cabinet in 1977. In 1980 he was appointed Honorary Minister assisting the Ministers for Housing, Regional Administration and the North-West and Tourism.

Mr. Laurance is a graduate of the University of Western Australia and is currently a member of the Australian Institute of Management and the Australia-Japan Society.

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# BUSH PASTURE IN THE SOUTH-WEST

Just outside Donnybrook in the south-west of Western Australia, John Hearman and his family run the 700 hectare property "Tanglewood". At present the farm is carrying approximately 200 Hereford cross breeding cows and a further 280 steers for fattening. Added to this, 2000 Merino sheep were purchased in 1980 for fattening because of the drought conditions experienced in the state during the last few years. The Donnybrook area is characterised by a landscape of steep hills and rich red-loam soil, and an average rainfall of 1000 mm. Once thickly forested with jarrah and marri, this highly productive country is now cleared extensively for agriculture. All of the Hearmans' farm has been cleared in the past, however, about fifty years ago forty per cent was allowed to regenerate, and it is this area of approximately 280 hectares that constitutes the Hearmans' bush pasture.

Seventeen years ago, when the cost of clearing was expensive compared with the cost of land, John Hearman decided to utilise the uncleared parts of his land without the expense of clearing. "I must point out that we started it purely for economic reasons, not for conservation," he says. The conservation of a jarrah woodlot, water quality and the prevention of soil erosion have been bonuses.

In many respects the Hearmans' forest/pasture is not a new concept, for grazing stock through the bush in all parts of Australia has been practised since early pioneering days. Certainly, way before European settlement, the Australian aborigine utilised the concept quite deliberately in the "fire-stick farming" method of burning the bush to allow grasses to regenerate and attract game.

Although not unique, the Hearmans' farm is interesting because it shows that in areas of adequate rainfall with continued fire and pasture management a cycle can be established wherein all parts—tree stock, pasture and live stock can be economically supported.

**"When you start off of course, you've got to have a hot burn if you can get one."**

The Hearmans burnt their forest understorey seventeen years ago in the early autumn, at a time when the vegetation and soil were very dry. This facilitated an intensive or "hot" burn which effectively reduced the understorey. The next step was to sow pelleted clover seed. This was done from a light aircraft, at the rate of 10 kg of clover to the hectare. Before sowing, the seed was mixed with superphosphate fertiliser applied at 170 kg per hectare.

By the following summer the clover had germinated and covered the burnt ground previously covered by the understorey. The trees themselves, being jarrah or marri, had survived the intense flames. Stock could then be grazed successfully on the clover under the trees during the spring and summer, when the fully exposed pasture of the other parts of the farm had been either grazed down or made into hay for the winter feed.

## MAINTAINING THE CYCLE

It was obvious that the original burning operation could not indefinitely hold back the native understorey from regenerating and providing too much competition for the regenerating clover. The wooded areas needed to be burnt again. Hence a burning cycle commenced that the Hearmans have continued since. Every two years in the autumn they deliberately burn their uncleared hectares.

Mr. John Hearman (right) has been using the bush pasture method for seventeen years. *(G. Pead)*

▲ One of the few improvements in the wooded section of "Tanglewood" has been the construction of this water tank holding approximately 50 000 litres. *(G. Pead)*

▼ Contrary to common belief, the clover grows right up to the base of the trees. Note the trunk of this jarrah tree blackened from burning. *(G. Pead)*

Burning every year is not necessary as the build-up of leaf-litter and new native understorey has not been sufficient to feed a fire after only twelve months. Fire also creates favourable conditions for clover seed germination.

**"I have seen clover sown in the bush for many many years," says John Hearman. "It's generally sown after a burn, then you don't have to worry about it again."**

Of the varieties available Woodgenellup was the sub-clover best suited to the rainfall of the area and the burning cycle. It buries deeply a relatively large seed and because of a hard seed casing survives the hottest fires. The fires actually stimulate or scarify the clover seed, which helps germination once the rains come. In comparison, grasses or thistles for example, suffer with burning.

Without exception the clover regenerates every year since the initial sowing. John Hearman attributes this not only to the characteristics of the clover but to the good conditions provided by the open canopy of his jarrah stands and the creation of ashbeds as ready sources of nutrients. There is plenty of light provided at the same time as shade, and the topsoil is more friable than on cleared ground, thus facilitating ready germination of the sub-clover seed.

The clover is re-fertilised every year with superphosphate, benefiting both pasture and jarrah. Every year the cattle are grazed in the uncleared paddocks from spring to late summer.

◀ Sheep grazing under the young jarrah re-growth. *(R. Fremlin)*

In order to keep stock grazing in the steepest country Mr. Hearman built a water tank on top of one of the highest hills. The water source entices the cattle up the hills and ensures that grazing is even throughout the high terrain. Sheep are let in after the cattle to graze the grasses more thoroughly. All stock are removed in the autumn when either a burn is conducted, or regeneration of the pasture commences. John Hearman agrees that the regular burning programme is vital in maintaining productive pasture.

## RETURNS

The carrying capacity of the Hearmans' forested area is two-thirds that of their cleared land. The advantages in this case outweigh the loss because the pasture lasts longer under the trees, clearing is not required, water quality is maintained and erosion is prevented. In this steep country erosion of the topsoil has been a problem in the past where all or most trees have been removed.

The "sick paddock" is the name used by the Hearmans for one uncleared paddock on their farm. They have found that some cattle grazed in the cleared paddocks suffer from a deficiency of trace elements, such as copper and molybdenum. The cure is to transfer the ailing cattle to the "sick paddock" for a season, where the deficiencies are corrected and the cattle become healthy again. The Hearmans attribute this to the high quality of feed in this paddock.

In terms of natural balance, water quality is maintained, as the turbidity of water run-off associated with extensive removal of vegetation is avoided. The Hearmans believe that the clover effectively replaces the native understorey in its capacity to use water. The high transpiration rates of jarrah and marri still remain the same. These factors become critical in drier areas where salination of the water supply caused by extensive agricultural clearing is common.

## LOWER RAINFALL

The test for the method would be in lower rainfall areas. Mr. and Mrs. Ray Ward of West Cranbrook are using this same bush pasture method on their 1300 hectare property within the catchment area of the Kent River. The average rainfall in the Cranbrook area is 600 mm, however the Wards chose a particularly exposed bush block as a trial under the driest conditions on their farm.

The first burn was conducted only two years ago in the 20 hectare block of open wandoo/jarrah woodland. The burn was slow to establish and keep going because of the very open nature of the understorey, and some debris was left. This is expected to clear up with further burns. Mr. Ward then aerial sowed with Esperance clover, a variety more suitable to the lighter rainfall. The seed germinated quite well immediately and in the following year when there was no burn.

The bush here cannot support a burn every alternate year, so the Wards plan to burn every third year. They are optimistic about the continued germination of their clover and the viability of the bush pasture method. It will be interesting to observe their progress in the ensuing seasons.

Bruce Hearman (second from left) ▲ shows Forests Department officers the soil in the "sick paddock" immediately after a burn. The clover had yet to germinate. *(G. Pead)*

Germination of the clover is some- ▼ times variable. This picture shows one shoot amid several burrs which failed to germinate during the year in which no burn was conducted. Note the build-up of leaf litter around the clover burrs. *(R. Fremlin)*

## PROBLEMS

It is important to assess some of the problems the Hearmans have encountered. In other regions different problems may arise, but in most instances the reduction in the potential carrying capacity of the land in the short term would be the biggest problem.

Mustering of sheep and cattle, particularly in steep, densely wooded country can be time consuming and difficult. Also, germination of the clover can be variable, particularly in the year in which no burning is conducted. Poor germination can result from too little sun during the winter combined with cold temperatures. Mr. Hearman stresses the need to burn to ensure consistent clover germination.

Some poisonous plants, for example, species of Gastrolobium, may also be encouraged by fire, although on the Hearmans' farm Gastrolobium is not present. Some species of native fauna are encouraged by the establishment of pasture under trees. Kangaroos and wallabies, for example, inhabit areas that offer the greatest grazing potential. The Hearmans don't regard the kangaroos on their property as serious competitors for the pasture. However, in other areas such as Cranbrook where the feed and shelter are generally less abundant, increased populations of kangaroos on farms could prove to be a problem.

## TREE FARMING

Although the Hearmans are working their bush pasture for the greatest agricultural return, they have not exploited the full potential of their forests. They use the jarrah/marri on their farm for domestic fencing and fuel supply. They do not use the forest produce commercially as all millable trees were cut with the initial clearing. The forest regrowth now is quite young and is not of high milling value at present, although it will improve with time.

Were they to be interested in commercial tree growing as well as farming, more attention would have had to have been paid in the past to the amount and rate of cutting carried out to ensure a continued supply of jarrah. Tree farming or tree management requires long-term thought beyond the farmer's life-time. The regrowth forest on the Hearmans' land is now about fifty years old.

Regeneration of the trees will definitely have to be managed because the stock naturally eat out the new growth, and the pasture competes with the germinants. One option is to fence off areas in the forest, perhaps with temporary electric fencing, which would protect new shoots from the stock.

The Hearmans and the Wards are practising agro-forestry. There are various combinations of methods and degrees of agro-forestry, whereby forested areas on farms are regarded as part of the farming enterprise. This is just one method, a method that has proven viable for the Hearmans. Perhaps it could be considered by farmers in the south-west where the rainfall is adequate and where total clearing is not an option.

*Helen Bradbury*

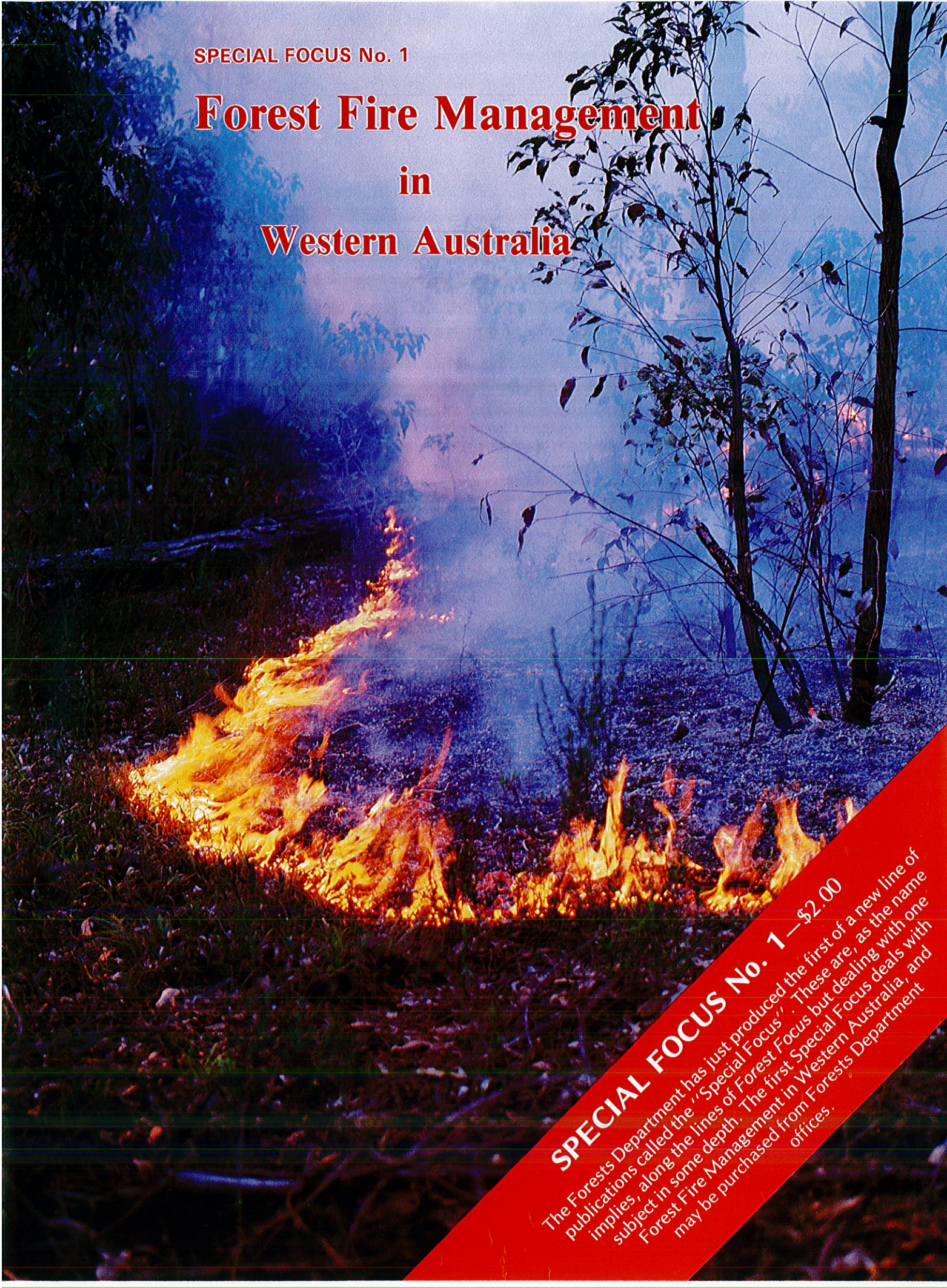
▼ The Ward's clover establishment trial at West Cranbrook has been successful. Note the older and more open forest type. *(H. Bradbury)*


### ACKNOWLEDGEMENTS

Thanks are due to the Hon. John Hearman, C.M.G., Mrs. Hearman and Mr. Bruce Hearman for their enthusiasm and co-operation, and to Mr. and Mrs. Ward for their help in the writing of this article. For their expertise and assistance thanks must also go to Richard Moore and Ray Fremlin from the Forests Department, Busselton, and Roger Edmiston from the Forests Department, Como.

SPECIAL FOCUS No. 1

# Forest Fire Management in Western Australia



## SPECIAL FOCUS No. 1—$2.00

The Forests Department has just produced the first of a new line of publications called the "Special Focus". These are, as the name implies, along the lines of *Forest Focus* but dealing with one subject in some depth. The first Special Focus deals with Forest Fire Management in Western Australia, and may be purchased from Forests Department offices.

▲ Profusions of wildflowers three years after a burn. A wide diversity of species are favoured by mild prescribed burns. Some species require special conditions. *(P. Skinner)*

▼ Ashbeds which are a feature of intense fires burning in dry fuels during summer or autumn provide favourable growing conditions for certain species of mosses and liverworts. *(G. Wardell-Johnson)*

# USING PRESCRIBED FIRE TO MANAGE FOREST FAUNA

by Dr. PER CHRISTENSEN

Initially established in September 1971, the Perup Fauna Management Priority Area was the first of the Department's fauna M.P.A.s. Indeed, it was here that the concept of Management Priority Areas, was first conceived (see *Forest Focus No. 10*). It is therefore fitting that the first fire management plan, designed primarily to conserve and enhance fauna rather than timber values, should have been developed for this area.

Areas of Management Priority have been established throughout the State Forest (see *Forest Focus Nos. 18* and *24*). The designation of areas of forest for a priority use is one of the methods by which the multiple use concept is being practised in forestry in Western Australia. By this means different areas may be designated to priority uses other than timber production, for example, watershed management, recreation, fauna, etc. Areas with priorities other than timber may benefit from management which is different to that of the rest of the forest. In order to optimise their potential, special management plans are being prepared for individual M.P.A.s. Such plans cover many different aspects of forest management, such as road building, dieback quarantine, timber harvesting, prescribed burning and other activities. One of the most significant of these management factors, in terms of the change it has the potential to cause, is prescribed burning or fire management.

Research throughout Australia, in recent years has shown that fire is an essential part of many forest ecosystems. Communities of plants and animals respond in different ways to fire. Some plant communities depend on certain fire regimes to maintain their present composition and structure and in some instances the continued survival of certain species may be linked to fire. For some plants infrequent fires provide the best conditions, for others frequent fire may be more suitable. In certain instances the intensity and the season of burning may be the most important factor.

Habitats created by plant associations generally are not long enduring. They are not static but dynamic and subject to continuing changes and fluctuations with time. Animals are frequently adapted not only to specific plant communities but in many instances to certain phases or stages in their development.

For these reasons it is not possible to achieve optimum conditions for all species of plants and animals in one area at any one point of time. Under more natural conditions which existed in the past before the arrival of both European and aboriginal man, periodic fires, started by lightning strikes in the vast areas of virgin forest

ensured a high degree of diversity of different types of burns and fuel ages. Optimum conditions would be created for each species of plant and animal somewhere in the forest at one time or another.

Today vast unbroken tracts of forest no longer exist in the south-west, the total area has been very much reduced and what is left is now broken up by farms and townships. Under these conditions natural wildfires can no longer be permitted to burn unimpeded since they are a threat to lives and property. Prescribed fires which can be controlled have to be substituted in place of the naturally occurring wildfires of former times.

Management Priority Areas which have been set aside for conservation of flora and fauna or for scientific values therefore require some form of prescribed fire treatment if diversity is to be maintained in the natural environment. Prescribed fire in these areas should favour the main priority or purpose for which the areas were set aside.

The Forests Department's broad-scale prescribed burning programme, designed primarily to provide protection for our timber resources, adjacent landholders and townships, is not necessarily the best for all the different M.P.A.s. The fire regime which has been adopted as the most suitable to achieve the protection aim, whilst not necessarily harmful, nevertheless may not always represent the optimum fire regime for

Certain grasses, including many exotic species, thrive under an annual burning ▲ cycle to the eventual exclusion of scrub species. (*T. Leftwich*)

The mardo or yellow-footed marsupial mouse (*Antechinus flavipes*), is often most common in areas of forest which have remained unburnt for long periods. ▼ (*A. G. Wells*)

Brush-tailed possum and young. Line ► trapping of fauna at regular intervals enables researchers to check on the effect of management practices.

(*T. Leftwich*)

▲ The tammar wallaby at night. Mainland populations of this species are becoming increasingly rare.
(*T. Leftwich*)

conservation of those values for which a particular M.P.A. was selected.

For this reason it may be necessary to develop special burning plans for individual M.P.A.s. The burning plan for the Perup area is the first of these which has been put into operation and it is interesting to examine some of the concepts and the reasoning behind them, as well as the problems involved in developing and executing such a plan.

Before the details of the burning plan could even be considered it had to be accepted that there must be a trade off between protection on the one hand and conservation on the other Long-term burning cycles with heavy fuel build up might in certain instances be desirable but they are unacceptable under today's conditions. If the whole area were to be burnt in one huge wildfire it could be disasterous for the fauna as well as other values. Compromises also have to be made between what is desirable and what is possible. It is neither feasible nor practical to mimic the natural wildfire situation within the relatively small areas now available.

Only a relatively few burns can be fitted into the area. There are very real problems relating to the size, practicability and cost of prescribed burns, particularly high intensity summer burns. And there is a minimum size to a burn which is dictated by ecological factors. Thus small burnt areas tend to be heavily grazed by kangaroos and wallabies, as well as many insects, which all flock on to the burn from nearby unburnt forest areas to graze the new growth. Their combined effect may markedly affect the post-fire plant succession. The nitrogen-rich legumes for example, much favoured by many grazers, often suffer to the extent that all the small germinating plants of certain species may be eliminated entirely on small burns.

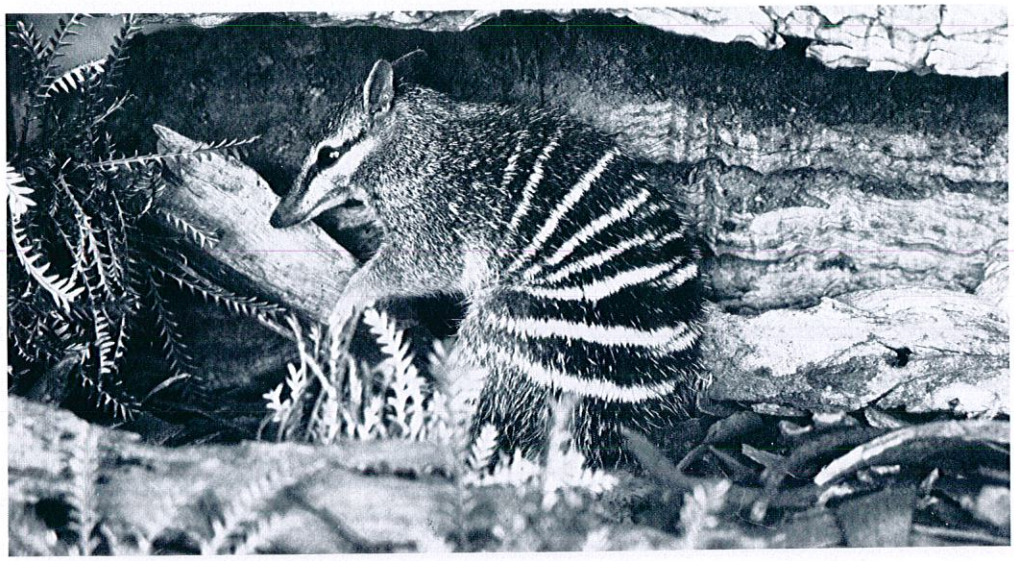
These are some of the factors which make any management plan designed to optimise conditions for every species in each and every M.P.A. a pipe dream, for instance an infinite mozaic of different small burns burnt on different rotations at different seasons. Something close to this fancied ideal may

**LANDSCAPE No. 2**
Flooded gums (*Eucalyptus rudis*) near the Blackwood River feature in this misty pastoral scene photographed by Cliff Winfield, Forests Department, Como.

perhaps become a reality in the future as more information becomes available. For the present a simpler approach is considered more realistic. Because of this, management aimed primarily at particular species, so called "selected species management" has been adopted as the basis for the Perup fire management plan.

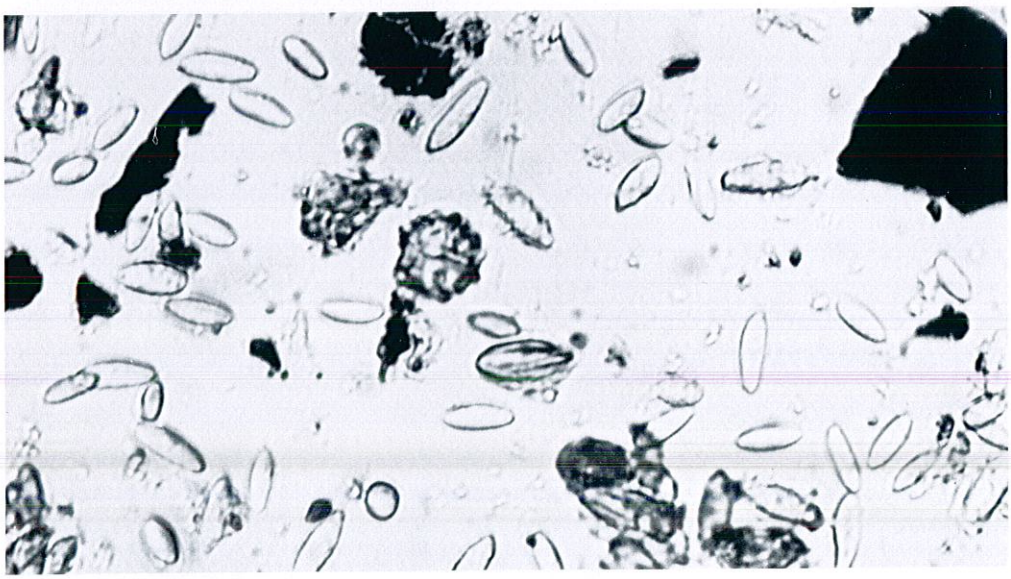
The species which have been selected are ones about which some knowledge of their biology is available and which are uncommon or rare. The woylie (*Bettongia penincillata*), an animal on the rare and endangered list, the tammar (*Macropus eugenii*), a species which is uncommon on the mainland, and the numbat (*Myrmecobius fasiatus*), are the species of primary concern in the Perup forest.

Selected species management does not infer that other species have been forgotten or are being ignored. No species exists alone and since each selected species depends on a whole suite of other species, particularly plants, management which is designed to favour these species will also ensure the perpetuation of many others besides. Data which has been collected over the last decade from experimental burns and biological surveys also suggest that,



The numbat—numbers have decreased alarmingly in recent years. The Perup ▲ forest is one of its remaining strongholds. (*L. Schick*)

The woylie—an animal on the rare and endangered species list is now almost ▼ entirely restricted to areas of State Forest. (*D. Watkins*)



Magnified several thousand times ▶ under the electron microscope fungal spores, found in the woylies' scats or droppings, can be identified. The fungi belong to a group of beneficial fungi which grows below the ground on the roots of trees and shrubs. The woylie and other animals have a role in spreading these fungi which in turn provide them with food under difficult conditions such as those following a fire. (*T. Leftwich*)

◀ Woylie nest well hidden beneath a branch. Woylies require adequate cover in which to conceal their nests.
(*T. Leftwich*)

▲ Understorey cover in the wandoo forest is frequently inadequate for the woylie
▼ to nest in (above). Adequate cover may be provided for a period by burning during the hot dry summer months which encourages thickets of *Acacia pulchella* providing cover for a period of about ten to twelve years (below).
(*T. Leftwich*)

while the fire regime proposed for the Perup forest may not be the absolute optimum for all species of plants and animals in the area, it will nevertheless maintain viable populations of each species. The burning rotation that is being imposed on the area is somewhat longer than the standard prescribed burning cycle. It is combined with variations in the season of burning and is likely to ensure the maintenance of a greater diversity of habitats than would generally be available elsewhere in the forest. This is expected to benefit many species, in particular perhaps the short-nosed bandicoot (*Isoodon obesulus*), the Western native cat (*Dasyurus geoffroii*) and the mardo (*Antechinus flavipes*).

One advantage in selected species management lies in having definite and quite specific management objectives. This means that the progress, success or failure, of any management strategy may be measured and evaluated quantitatively. A continuing programme of monitoring and checking in the Perup will record the effects of management, not only on the selected species but also on other components of the environment. Detailed research into the fire ecology of heartleaf as well as work on the fire ecology of the brush-tailed possum and bird communities is also in progress in addition to the work on selected species ecology.

Changes and alterations can be made to the present management plan depending on

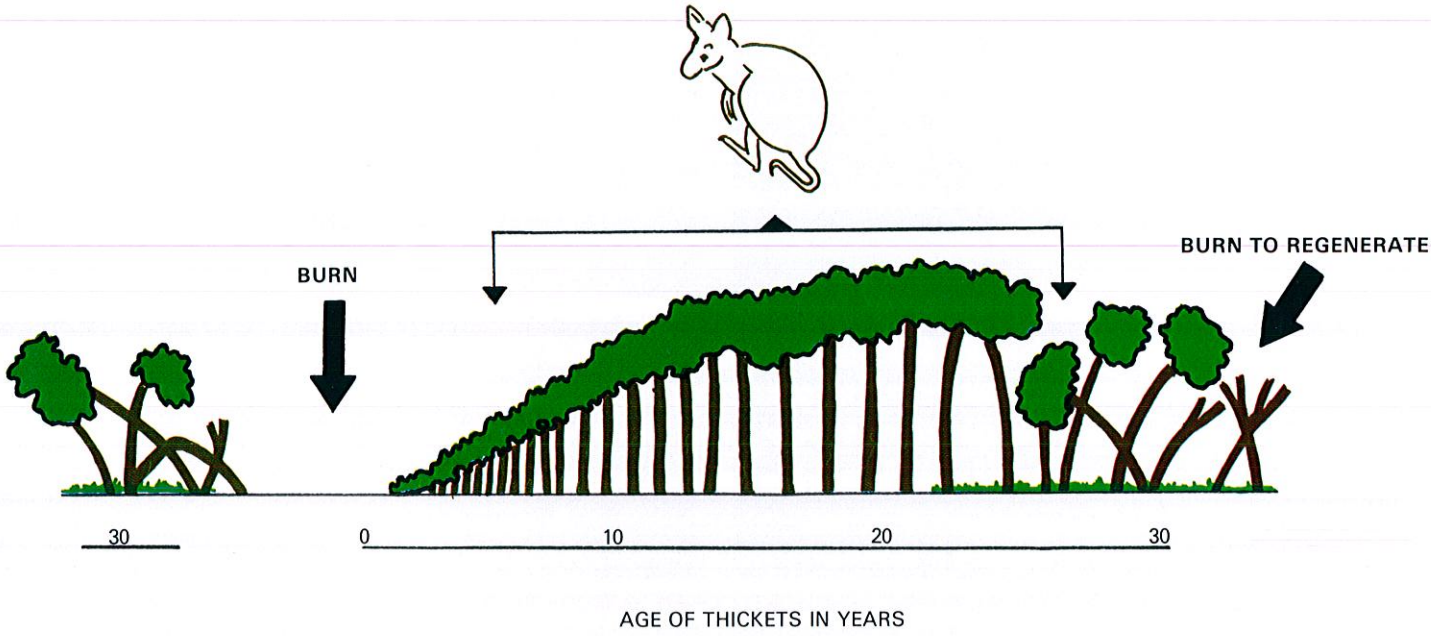
▲ A ringtail possum incinerated on the ground after being driven from its tree by the fire. Some animals survive and young possums soon move in to replace the casualties as the leaves on the trees regenerate.

Top, left: Intense autumn fires are ideal to regenerate tammar thickets but there is a price to be paid. This tammar wallaby was caught by the flames and incinerated. Others will replace it as the thickets regenerate.

Top, right: Although not selected for special management, other species in the Perup are receiving attention. A ringtail possum caught on a spotlight survey is held by a researcher.

Middle, right: Young joeys may be removed from their mother's pouch for measurements to be taken. Twins are rare. Only two pairs have been recorded from amongst several hundred joeys.

Bottom, right: The tammar wallaby lives in dense thickets with an open ground cover. Note the grass understorey on which the tammar feeds. *(T. Leftwich)*




▲ Fig. 2—Tammar thickets in the Perup develop after intense autumn or summer fires. For the first five to six years the thickets are too dense for the tammars. Competition between the plants thins them out and the tammar may live in the thickets till the plants die and the thickets collapse after 25-30 years.

the results of the monitoring programme and as further research data becomes available.

The main data on which the current burning plan is based has been obtained from studies of the woylie and tammar in the Perup over a ten year period. Amongst the factors which have been taken into consideration are the animals' food, cover, size and type of home range, breeding biology, life span, dispersal and movement pattern and mortality factors.

The woylie's major food item, underground fungi, is available at all times, even directly after a fire. Its cover in the Perup is largely clumped *Bossiaea ornata* scrub which takes three to four years to recover following fire. Woylies breed rapidly at a rate of three young per year and live to approximately four to five years of age. Dispersal is limited, although the woylie occupies comparatively large individual home range areas.

The tammar on the other hand eats grasses and other green forage which is not available for several months following a fire. Tammars are restricted to thickets of heartleaf poison (*Gastrolobium bilobum*) and *Melaleuca viminea* which die and degenerate at the age of twenty to thirty years and do not regenerate successfully in the absence of an intense summer or autumn fire. Following regeneration by fire, it takes five to six years before the thickets become suitable again for the tammar. Tammars are relatively slow breeders, one young per year, living to the age of approximately six or seven years. They occupy group territories, groups of the animals living together in different sections of the thickets. In addition to the data on these two species there is also limited data on the numbat, some of which has been obtained by radio tracking animals in the area. The numbat feeds on white ants, occupies large home ranges of up to a square kilometre in size, and needs many hollow logs in which to build nests and seek refuge from predators. They breed comparatively fast, having approximately four young once every year. The ideal burning regime for this species is still unknown but animals are known to be present in areas ranging in age from three to twelve years since burning.

Bearing in mind the need for fire protection, a burning plan has been conceived whereby large blocks are burnt on a nine to twelve year rotation, to cater for the numbats' and the woylies' large home range areas, and to make it possible to use the comparatively cheap aerial ignition techniques. This rotation allows for two to three generations of woylies between burns. It also means that tammar thickets can be included every second or third

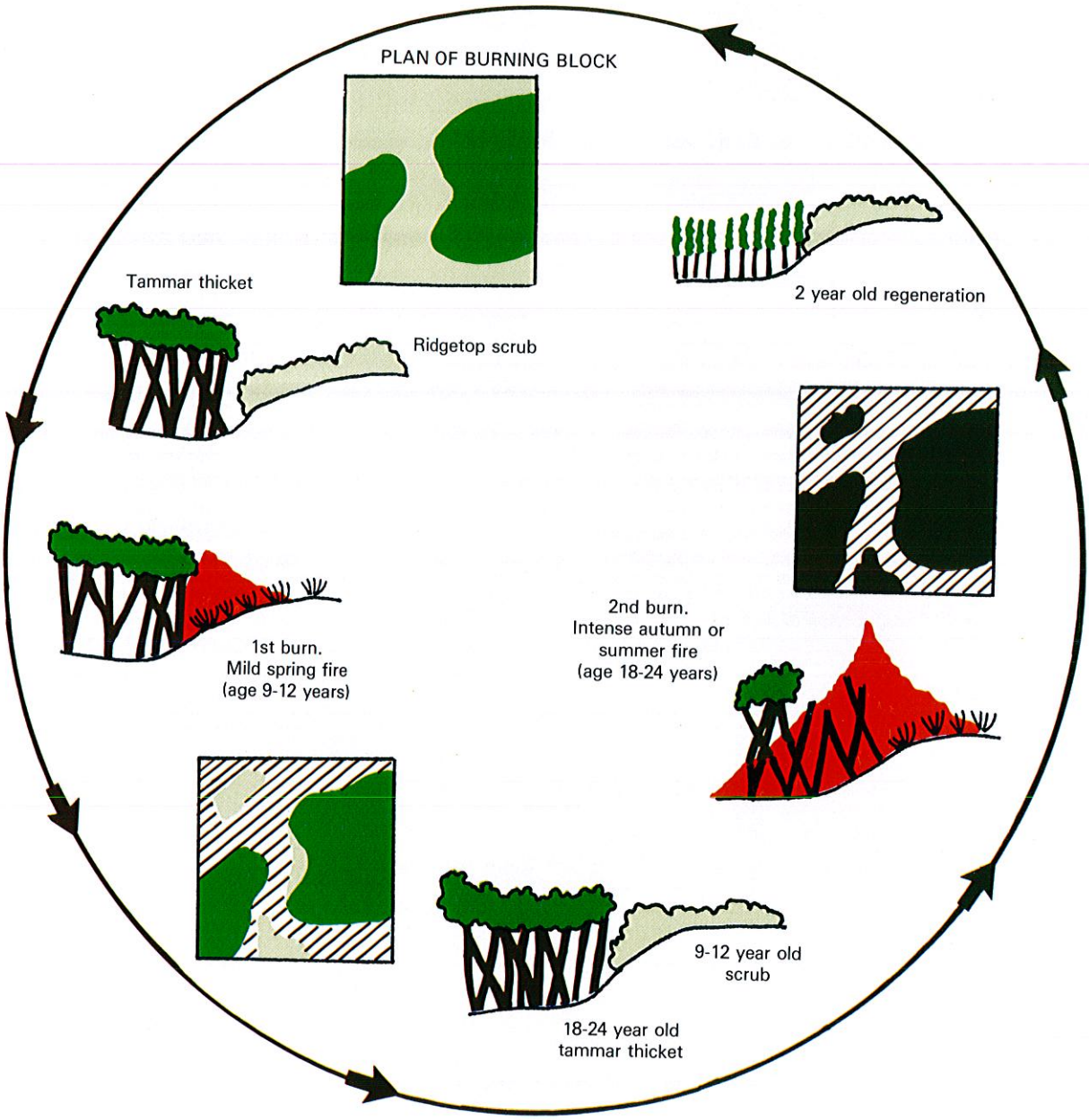



Fig. 3—Differences in structure, flammability and moisture content between the tall open tammar thickets in the valleys and the low dense scrub on the ridges are used as a natural firebreak. The diagram illustrates cyclic spring to summer/autumn burning of a block in the Perup. Tammar thickets may be regenerated every second (aged 18-24 years) or third (aged 27 plus years) burn depending on whether a spring or summer/autumn burn is prescribed.

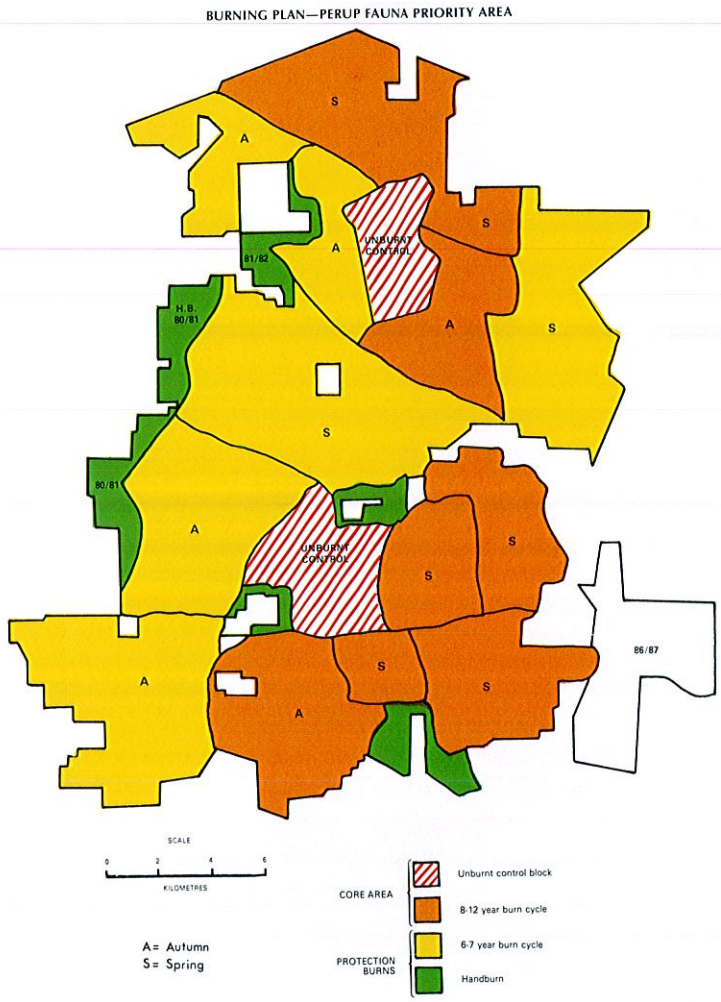
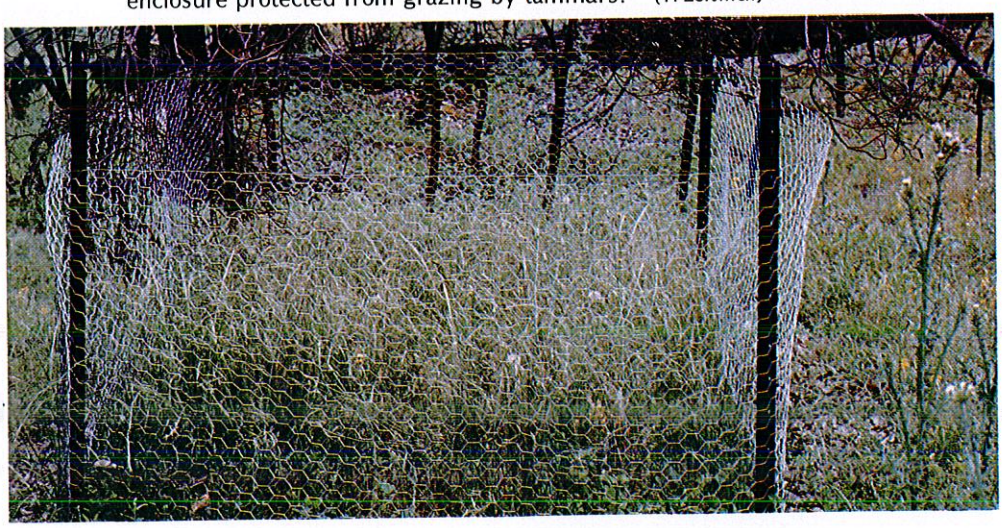



Fig. 4—Burning plan for the Perup. The two special ''core'' (high fauna value) areas, one in the north, the other in the south, form the basis of the plan. Protection is provided by the buffer zones which are burnt in a shorter rotation. In addition the blocks are burnt on rotation in different seasons which is designed to provide added protection and increases the habitat diversity (see text).

▼ Tammar thicket eight months after a fire. Note the height of the grass in the enclosure protected from grazing by tammars. (*T. Leftwich*)



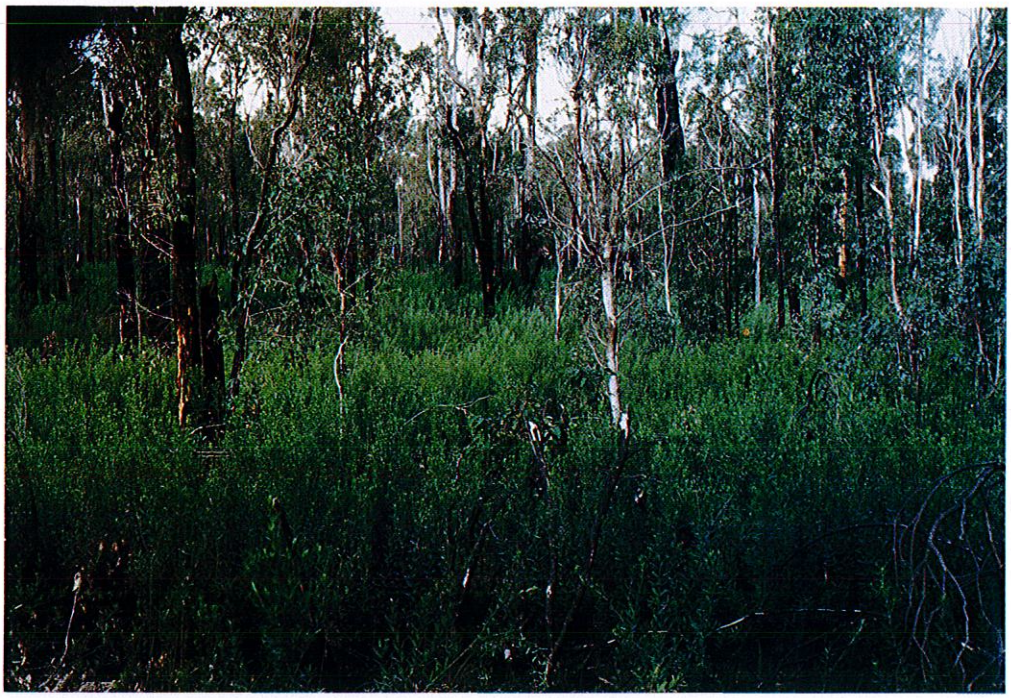
rotation, a period of eighteen to thirty years or more, which is suitable for their regeneration.

The scheme works as follows: the natural variation in structural composition, fuel moisture content and inflammability between the two different eco-types i.e. the low clumpy *Bossiaea ornata* on the ridges and the tall heartleaf and *Melaleuca* thickets with an open understorey in the valleys, is utilised to form a ''natural'' fire break. The first burns in the rotation are done in spring when the fuels in the valleys are still comparatively moist and will not burn. The fire burns only the understorey scrub in the ridges and dies out on the edge of the valleys, leaving the tammar thickets unburnt and intact (see Fig 3). The second or third burn in the rotation is carried out in summer or autumn under conditions of low fuel moisture and high fire danger, when the fire will burn the scrub on the ridges together with the valley thickets. Using such ecological gradients obviates the need for extra roads and tracks within the area, which break up the habitat.

The blocks are burnt in a pattern which will ensure that there is always a block of three- to four-year-old vegetation adjacent to the one being burnt. This is to ensure that there are always areas from which re-colonisation of the burn can take place. In addition to this two large blocks located centrally, have been left unburnt as future benchmark reference areas (see Fig. 4).

For safety reasons the longer burning rotations are located in two areas, one in the northern section, the other in the south. These are also the best fauna

areas. Burning has been planned so as to isolate these core areas with slightly more frequently burnt (safer) surrounds. The sections adjacent to farmland are also burnt more frequently for protection of both the fauna area and the farms. In addition, and as an extra safety precaution, the entire western and north-western sectors are burnt on a more frequent cycle designed for protection. Experience of fire managers over many years has shown that it is north-west winds during bad fire weather which contribute to the worst wildfire situations. The threat of wildfires which could cause problems for neighbouring farmers and for the animals in the area is very real.



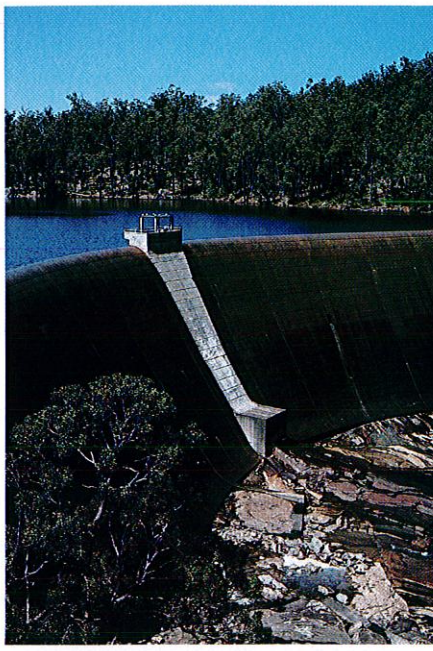
Tammar thicket three years after a fire. Note also the recovery of the tree crowns. There is a good population of both brush-tailed and ringtail possums in the area. (*T. Leftwich*) ▲

The first management plan was reviewed and changes were made following concern expressed by local farmers in the wake of the 1981 summer wildfires in the district. One of the fires originated on adjacent private property and spread into the Perup. Another was deliberately lit by persons unknown, and the third started from a lightning strike within the Perup area itself and spread to neighbouring farmland.

The preparation of burning plans for M.P.A.s with specific priorities is considered an important aspect of future planning. However, there are many M.P.A.s with a multitude of different priorities and it will take time to prepare detailed plans for them all. The management plans are reviewed on a regular basis because the data upon which they are based is constantly being added to. Burning plans are no exception, fire ecology is an active field of research and new information is constantly becoming available. Such new information may be incorporated in fire management plans and these can be altered as and where necessary.

The concept of ongoing research coupled with constant reviews and changes in plans is an important one. Nothing is static, there is constant change in all things, organisms must change in order to adapt. Scientific investigations are never complete, particularly in the field of ecology, no answer is ever final, there is always more to learn. This is no reason for managers to sit back and do nothing. It is preferable to act on the best available data, recording the results and being ready and willing to make changes when the situation demands. In many cases, doing nothing may ultimately lead to greater changes than a well planned action based on the best available knowledge. Under Western Australian conditions, with long dry summers, avoidance of prescribed burning may ultimately result in intense wildfire with widespread and severe ecological impact. In the unlikely event that an area would remain naturally free of fires for a very long period, changes in vegetation would still inevitably occur.

# SUMMER CANOEING? DAMMED GOOD!



The Wellington Dam and Collie River bed before irrigation waters are released. (*H. Bradbury*)

Many rivers in the south-west of Western Australia flow through State forest, and one way of experiencing the forest environment is to canoe along navigable water courses, such as the Blackwood, Murray, Warren, Frankland, Avon and Swan Rivers to name a few. Although canoeing is most enjoyable during warm weather, most canoeing in Western Australia is done in our winter months from May to October because the rivers usually dry up during the harsh Western Australian summers.

Some rivers are perennial and these are all in forested, high rainfall areas. The Blackwood, Murray, Warren and Frankland Rivers for example do flow throughout the summer, but are so restricted that canoeing becomes a portaging exercise, bumping and scraping over rocks and scrub which in winter are covered by high waters.

Under unusual conditions created by cyclonic activity in the north of the state, heavy inundation may occur along the rivers in the south-west. This happened in January of this year. River sports are not usually practised in these fluke conditions as the waters are extremely dangerous.

So the sort of canoeing available in summer is mainly touring on the flat open waters of estuaries and river mouths. However, many people in Western Australia belong to canoe clubs or groups who encourage slalom expertise and who gear their main activities to white-water canoeing. In winter, many of our rivers offer a variety of white-water canoeing in rapids that range over varying degrees of difficulty. Under normal summer conditions white-water canoeing is just about impossible on our free-flowing rivers.

The Harvey River and the Collie River are not free-flowing, however, surprisingly it is these two rivers that offer the only reliable white-water courses for advanced canoeing during the summer months. They are dammed by the Stirling and Wellington Dams respectively, and are used for irrigation.

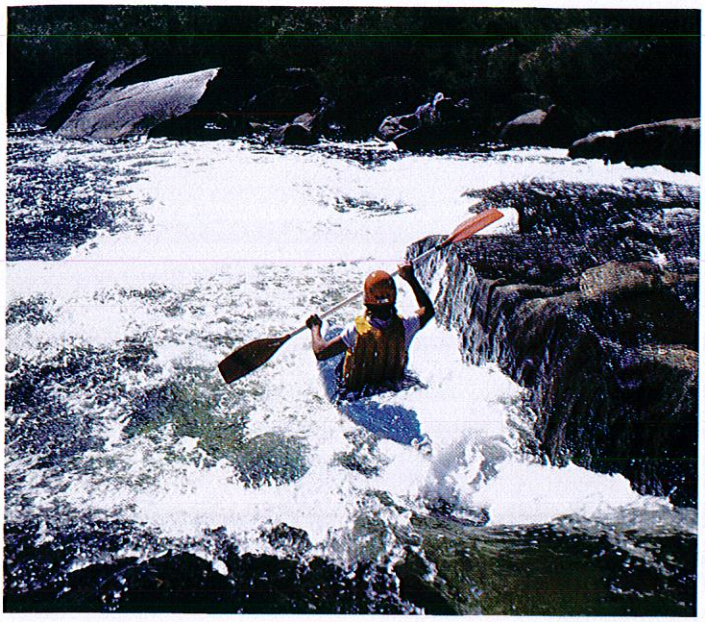
When the gates of the dams are open to release water to the holding weirs downstream, short water courses are created that offer exciting white-water canoeing. The hotter the weather, the greater the volume of water needed for irrigation, and the better the canoeing.

The Amateur Canoe Association of Western Australia has taken full advantage of the irrigation procedure on the Harvey River. Each summer the State Canoeing Championships are held on the irrigation waters of the Stirling Dam. Where the Harvey once flowed there is now a dry river bed for most of the year. On this bed boulders, rocks and logs have been strategically positioned to provide a demanding competition slalom course. In summer, the taps are turned on, the gates are opened and the water comes cascading out of the dam, which creates one of the ''best'' slalom courses in Australia.

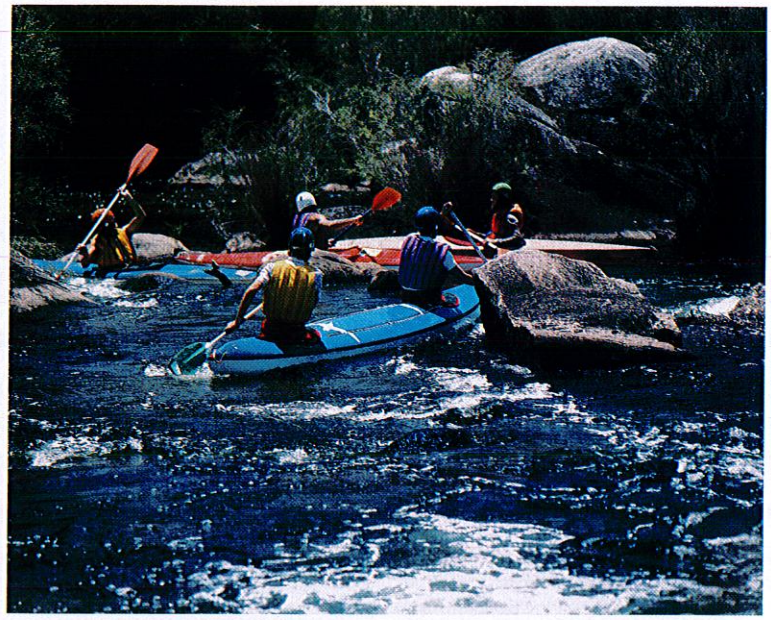
The Australian Championships have been held on this same course, which was in fact created for that event in 1978.

With the approach of winter the dams remain closed to re-fill. The free-flowing rivers in the south-west rise and the conventional white-water canoeing season starts. So, those who wish to continue slalom canoeing next summer, try the Harvey or the Collie Rivers. They may not be free-flowing, but the canoeing is dammed good!

*Helen Bradbury*



▲ Negotiating a chute on one of the rapids on the Collie River. (*L. Harman*)



Canoeing on the water courses made by the ▲ irrigation waters from the Wellington Dam. Note the safety helmets and life-jackets worn by all canoeists. (*L. Harman*)

▼ A view upstream of the Harvey River slalom course, set in the picturesque jarrah forest. Spectators have a good view of the competition from the banks or from the footbridge in the distance. (*L. Harman*)

The view downstream of the Harvey River as one of ▼ the doubles in a Canadian canoe successfully negotiates a competition gate. Points are awarded for the number of gates negotiated on the whole length of the course. (*L. Harman*)

**Front Cover.** Intense wild fires burning under extreme conditions in the hot summer months may have certain beneficial effects but they are difficult to control and can cause damage to life and property. In contrast, this issue shows how controlled fire practices are used in fauna management and farm management. *(T. Leftwich)*

**Back Cover.** Aerial view of the new Forests Department State Headquarters set in the Collier Pine Plantation, Como, Western Australia. *(C. Winfield)*