



# CONSERVATION IN THE **KARRI FOREST**



by Barney White and Roger Underwood



Department of Conservation and Land Management  
Reprinted from Landscape Magazine



**F**EW forests are as magnificent as the karri: it has great beauty and biological diversity, it produces exceptionally strong and versatile timber, and it is popular for recreation. Some people fear the karri forest is being destroyed; others feel that valuable resources and jobs are being foregone. What is really going on?

In the first article in this booklet on karri, **Barney White** and **Roger Underwood** look at:

# CONSERVATION RESERVES IN THE KARRI FOREST



Robert Garvey

A trout fisherman deep in the heart of the karri forest.  
Mt Frankland National Park (opposite).

**K**ARRI forest occurs only in the south-west of Western Australia.

Spanning the lower catchments of the Donnelly, Warren, Gardner, Shannon, Deep and Frankland Rivers, it grows mainly on red earth soils (karri loams) on lower slopes where rainfall exceeds 1100 mm. At its best karri grows in pure stands. Where the soils change, karri grows in association with other trees, chiefly marri.

There is a strong maritime influence on karri; most grows within 40 km of the sea. Many fine stands grow to the water's edge on inlets permanently open to the sea, and others are found in sheltered localities on brown sands derived from coastal limestone.

A line drawn on the map which links the west coast at Busselton to Nannup, Bridgetown, Lake Muir, Pardelup and then to the south coast at Denmark encompasses the main occurrence of the karri forest.

Within this area a comprehensive and secure conservation reserve

system needs to be, and indeed is now established.

## WHY CONSERVATION RESERVES? |||||

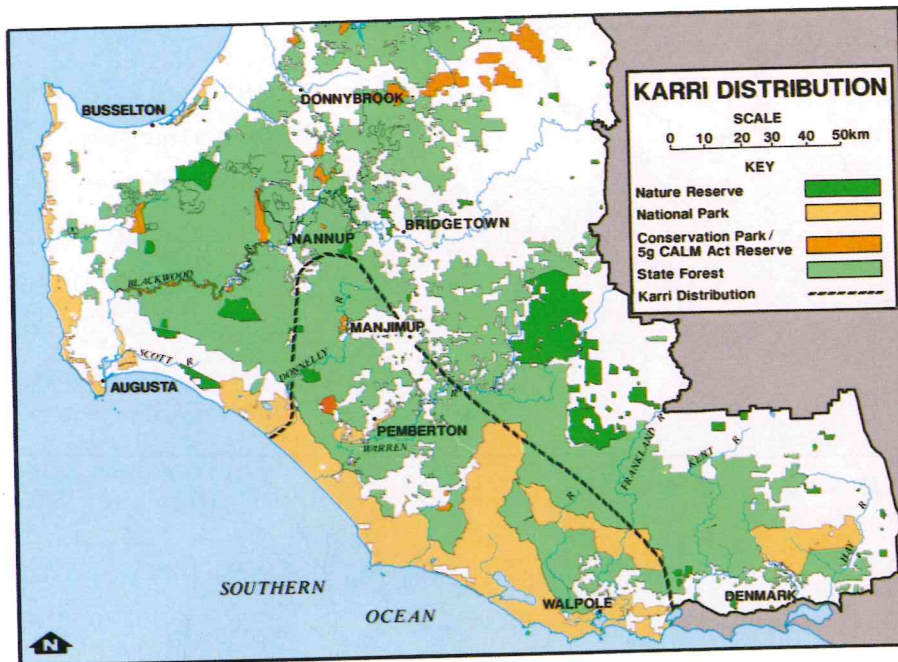
Conservation reserves, such as national parks, nature reserves or conservation parks, meet many demands. Most importantly, they provide a scientific baseline against which the effects of disturbance in other areas can be evaluated. They also provide examples of ecosystems as nature provided them and this has an intrinsic appeal to modern men and women. Furthermore, a reserve system provides security against inappropriate land use. For example it would be very unlikely that society would want to convert a karri forest national park into dairy farms or fell the trees for timber. Finally, stands of mature karri forest are beautiful and awe-inspiring, and reserves provide ideal places to protect such forests.

In the early 1970s a group of distinguished scientists from the Australian Academy of Science drew up specifications for the "perfect" conservation reserve system (see page 34).



## THE FORESTS DEPARTMENT

During the late 1960s and early 1970s the FD evolved a policy of multiple use for State forests. As no credible alternative reserve system existed in karri outside State forests at that time, the FD accepted the responsibility for all aspects of forest conservation. An essential component of this policy was the setting aside of a substantial area of State forest from timber cutting. It was hoped that reserves could be designed which were adequate, in recognised scientific terms, for the purpose of conservation, and to a lesser extent for recreation. This process was foreshadowed in the Department's General Working Plan (ie, forest management plan) of 1972.



## HISTORY

Prior to 1970 the area of karri forest set aside specifically for conservation was deficient. With the exception of the Walpole-Nornalup National Park, conservation was largely restricted to a handful of small national parks and reserves near Pemberton. Few of these met any recognised criteria for conservation reserves. The majority of the karri forest in public ownership was State forest, which had timber production as its primary purpose.

However, during the late 1960s a number of moves began which paved the way for a radical change in the State's conservation reserve system over the next 20 years. Two agencies were involved: the then-Forests Department (FD) (now incorporated into CALM) and the Environmental Protection Authority of W.A.

In seeking to establish a conservation reserve system in the karri forest, the two agencies took different paths. But in the end both approaches were implemented.

Multiple Use as described in the FD's forest management plans relied upon a system of zoning in which each zone was allocated a priority use. Other uses were encouraged, tolerated or forbidden depending upon the degree to which they conflicted with the priority use on each area. The zones were called Management Priority Areas (MPAs), and each had a specified priority use. Conservation took precedence in MPAs for Flora, Fauna and Landscape. MPAs for Recreation also had high incidental conservation value.

## CHARACTERISTICS OF A PERFECT RESERVE SYSTEM

### REPRESENTATIVENESS

The reserve system should sample the key biological communities intended for conservation, and contain the widest possible habitat, floristic and geomorphological diversity within those communities.

### SIZE AND STRUCTURE

Reserves should be large (20 000-50 000 ha), well proportioned or circular in shape and have natural boundaries such as coastlines, watershed, rivers, ridges or geomorphological changes. If smaller, reserves should be buffered by State forest or water reserves.

### NATURALNESS

Reserves should be in a natural undisturbed state, free of introduced species and pathogens.

### SECURITY

The tenure and purpose of management for the reserves should be secured by Act of

Parliament, requiring the agreement of that body to effect change.

### MANAGEMENT

Reserves should be managed and protected by a skilled and well funded organisation. It should contain, a core area which would remain inviolate from disturbance other than that for approved research, and which in turn is surrounded by a buffer area in which uses compatible with the continued existence of the population to be conserved, would be permitted.

### REPLICATION

Reserves should be replicated elsewhere and connected by a corridor(s) which would allow the migration of flora and fauna.



Karri forest in the Shannon

Cliff Winfield



Robert Garvey

The selection and mapping of the conservation MPAs in State forest was carried out in the early 1970s. The criteria used were those set out in the Australian Academy of Science Report "A Natural System of Ecological Reserves in Australia" and its authoritative addendum, the famous Specht Report. These reports summarised current international scientific opinion on conservation reserves, and placed it in the Australian context.

It was fortunate that at this time more than half the karri was still virgin forest. Although the timber industry had been cutting karri since the 1890s, harvesting had been largely restricted to the western half of the forest.

Foresters working on the establishment of the reserve system were able to consult a considerable body of biological knowledge about the forest.

The structure, density, floristic composition and general health of the upper-storey of the entire forest was well known and accurately mapped. The FD's forest type maps were derived from aerial photography, and presented information of a quality second-to-none for equivalent land management agencies in Australia. Other detail useful for natural land management such as the degree of fire damage, the presence of unusual tree species, rock outcrops, wetlands, reed swamps, riverine

The Porongorups with karri in the foreground.

*Crowea angustifolia* form part of the dense karri forest understorey.



Cliff Winfield

communities, lakes, rivers and streams were also accurately mapped on the Aerial Photographic Interpretation (API) plans.

The floristic composition of the understorey and shrub vegetation was also well known, although not formally surveyed or mapped. Experienced foresters working in karri country were able to distinguish and locate site variations dominated by a single species: viz Netic (*Bossiaea laidlawiana*) dominating in the Donnelly River Valley at the western extremity of the main karri occurrence; karri wattle (*Acacia pentadenia*) dominating in the eastern half; hazel (*Trymalium spathulatum*) often dominating where karri grew tallest; *Acacia urophylla* dominating on more fertile sites; and *Hovea elliptica* often dominating in mixed karri-marri stands. A herbarium collection of over 1000 karri forest plant species had been developed at Manjimup, and fauna surveys had commenced.

Other important variations in the karri were known to occur. In the west, centre and north, karri is typically restricted to the red earth and podsollic soils of the lower slopes in the main drainage systems. In the south and east it occurs more on granitic soils as well as on red earths, and in river alluvium. This difference coincides with a change in underlying geology from gneissic metamorphic rocks in the west to granite in the east. Outside the main forest, karri is found in smaller patches in soils derived from different parent material. On the Leeuwin-Naturaliste, ridge patches grow on brown sands derived from coastal limestone. Further small occurrences on similar soils occur along the south coast. The largest outlier is at the Porongurup Range 100 km to the north-east of Denmark where a large batholith of porphyritic granite with bare summits cradles the karri below. The Porongurups karri is almost entirely contained within a national park. Other outliers occur at

historical or cultural interest. These areas, together with the MPAs added up to nearly half the karri forest.

On the basis of the best information available, the FD was satisfied that this reserve system contained all the genetic diversity required and that it captured the magic and majesty unique to virgin karri. Together with the proposed d'Entrecasteaux National Park and other reserves covering jarrah and wandoo forest, such as the adjacent Perup Fauna Reserve, the view was taken that a very comprehensive reserve system had been developed for southern forests.

## THE EPA INITIATIVE

In December 1971 the Environmental Protection Authority was established. Part of its role was to 'consider and initiate the means of enhancing the quality of the environment'. The EPA recognised that the establishment of an adequate conservation reserve system throughout WA would be essential in achieving this objective. Accordingly, it established the Conservation Through Reserves Committee (CTRC) which first met in February 1972. The CTRC divided the State of WA into 12 natural areas called 'systems'. Systems 1 and 2 more or less covered the same area as that covered by the 'southern forests' of the FD. The CTRC, in looking into reservation for conservation in Systems 1 and 2 did not work with the FD, who had already commenced the same exercise. Thus two officially responsible and qualified organisations were evaluating the same area of forest simultaneously.

In August 1974 the CTRC published its report to the EPA, and revealed that it had taken a different approach to the FD. The CTRC did not examine the question of establishing a network of small reserves spanning the whole forest. Their brief was to look for large and significant areas. They therefore opted to create one large reserve

comprising the entire Shannon River Basin. This, added to the pre-existing national parks and other small reserves near Pemberton and Walpole was considered to meet the aim of the CTRC - 'to set aside sufficient native habitat to be preserved and managed both for the preservation of animals and plants, and for the enjoyment and education of the population'.



Broke Inlet at the mouth of the Shannon River.

*Cliff Winfield*

The CTRC was enthusiastic about the Shannon River watershed because it was a large contiguous area containing areas of virgin karri and karri-marri. This area was proposed so that it might act as a benchmark area for changes in biological, hydrological, pedological and sedimentological parameters which may take place elsewhere as a result of timber harvesting. The presence of the Broke Inlet in a largely intact natural state at the mouth of the Shannon, and the presence therein of a sedimentary delta of classic form, were seen to add to the value of the proposed reserve.

The CTRC's views were shared by many people in the community, who viewed the Shannon proposal as an opportunity to create a large karri forest national park of international value. Finally after some years of controversy, the new Labor Government in 1983 immediately implemented a pre-election promise to create a Shannon Park. The entire Shannon Basin was declared an MPA for Flora, Fauna and Landscape. More recently this area has been designated the Shannon National Park.

And so two independently derived reserve systems for the karri forest were amalgamated. Any argument about the biological superiority of one proposal compared to the other became unnecessary. Both were implemented.

## CALM'S CONTRIBUTION

Despite its biological adequacy, the reserve system inherited by CALM when it took over forest management in WA in 1985 still had one major deficiency: the reserves in State forest (Conservation and Recreation MPAs) had no security. Although State forest itself has the equivalent of A Class security, and the Department is bound by its management plans, the purposes for which areas of forest are managed may be changed at any time without reference to Parliament, by simple Ministerial decision.

CALM has now developed (and the Government has endorsed) a system for converting all the Conservation and Recreation MPAs from State forest to national parks, nature reserves or conservation parks. Once so classified, both the tenure and purpose of the reserved areas can only be changed with Parliamentary approval. A more secure situation is not possible.

No reservation system should be so inflexible that it cannot be refined in the light of insights gained from continuing research. CALM believes that the conservation system in its southern forests is now close to being right. Nevertheless, research has continued and it is interesting to examine the impact of recent studies.

The system of Conservation and Recreation Management Priority Areas in the karri forest was conceived in the early 1970s and has been in place since 1977. Timber cutting ceased in the Shannon Basin in 1983, prior to its conversion to a conservation



Cliff Winfield

reserve. The d'Entrecasteaux National Park has been managed as a reserve since about the same time. In the meantime, research work in biological, ecological and related (soils, geomorphology, hydrology, fire, silviculture and pathology) fields has continued.

Now, in 1988, how does the karri reserve system stand up in the light of increasing research and heightened practical insights?

For a start, nineteen detailed biological surveys have been completed by scientists in the southern forests. Noteworthy amongst the results is the finding that few plant species, apart from the dominant trees themselves (such as karri, yellow tingle and red tingle) are entirely restricted to the area. Likewise, no species of vertebrate fauna appears to be confined to the karri forest. Associated landforms such as the granite monadnocks and the lower catchments of the Hay and Mitchell Rivers, where the Darling, Stirling and Warren Botanical sub-districts join, are botanically far richer. Plains, lakes, swamps, riverine associations and coastal landforms (areas not subject to timber harvest and very largely not "counted" in the reserve system) also make a special contribution. These surveys



Robert Garvey

Mt Frankland National Park (above).  
Karri Valley (left).

did not recommend changes, or adjustments to the existing karri forest reserve system.

A concern in some quarters is that the reserve system should encompass all the genetic variability of karri itself. During 1986-87, geneticists studied this question using the protein electrophoresis technique. These studies showed that all the major genotypes of the species that occur on Crown lands are represented in the reserve system.

Finally, scientists have recently completed a detailed study of the dominant vascular perennial plants of the region, in their relation to site. (This approach had been developed in the early 1970s by forester Joe Havel for the northern jarrah forest and was used as a basis for designing the conservation reserve system now in place in that area.) All thirteen different site/

vegetation types distinguished in the karri forest region are represented in the existing reserve system.

## THE FUTURE

In any forest such as the karri, which combines beauty, utility and natural productivity in so propitious a manner, conflict about reservation and timber harvest is inevitable. There will always be those who advocate that a greater area be set aside in reserves, and those who feel a greater area should be made available for timber production.

There will also always be arguments about which areas should be reserved: people's views will be coloured by where they live and work, or recreate.

In the end, political decisions will largely decide the exact balance that is struck between areas.

**T**HE karri forest provides a classic dilemma for managers: it is an area of great beauty and biological interest, but it also has high economic value. An industry which has used timber from the forest for more than a century still thrives today. Is it possible to conserve such a forest? In this second article in a series, **Barney White and Roger Underwood** examine:

# KARRI FOR KEEPS



Roger Underwood

Farms and karri forest intermingle at Treen Brook (above).

## MANAGEMENT FOR MULTIPLE USE IN THE KARRI FOREST |||||

In world terms, the history of the interaction between humans and forests has too often been a sorry one. Over thousands of years, forests have been cleared for farmlands or urban development, or they have deteriorated as a result of uncontrolled grazing, bush fires or timber felling without subsequent regeneration.

In recent decades, these problems have intensified. The world's population has exploded and so

has the consequent demand for food, fibre, fuel and shelter. Such demands, if uncontrolled, can spell disaster for forests.

But this gloomy picture is not universal. The forest conservation situation in W.A. is far more optimistic. For example, after 150 years of agricultural and urban development in the south-west, more than 80 per cent of the original karri forest still remains and is firmly secured in public ownership. A clear vision for the conservation of this forest has emerged and a sound management policy is in place.

## THE KARRI FOREST DEBATE |||||

Controversy has surrounded W.A.'s karri forests since the early 1920s. First, foresters argued with farmers whether to keep the karri forest or clear it for dairy farms and orchards. This 30-year battle was not resolved until the 1950s when remaining Crown land karri forests were designated as State forest.

In the 1970s, controversy focused on forest conservation reserves:

how much of the karri forest, and which areas, should be set aside in parks and reserves? This issue, too, has now largely been resolved. About one-third of the karri forest has been, or is about to be, set aside in national parks or other secure conservation reserves. No timber will be cut in these areas. Another 15 per cent of the forest makes up special zones surrounding important ecological, historical or recreational areas, or along roads and rivers. The priority for management of these areas is also conservation and amenity.

The current debate centres mainly on forest areas outside the reserves - or those forests designated for multiple-use management. These karri forests are also being managed for conservation of flora and fauna, but they must also provide long-term sustained yields of timber, recreation and fresh water supplies.

How should the multiple-use forests be managed and protected to ensure that their many values can be sustained? Here is the story of the approach adopted in the karri forest.





Cliff Winfield

*Regrowth karri forest near Pemberton. This area was clearfelled and regenerated nearly 60 years ago.*

Jiri Lochman



## SUSTAINING THE FLORA AND FAUNA |||||

The native flora and fauna is the most important 'product' which must be sustained in a multiple-use native forest. These forests play two important roles in flora and fauna conservation: they adjoin and often surround parks and reserves and buffer them from outside influences; and they are themselves home to a multitude of species of native plants and animals.

The flora and fauna of the karri forest is well known. Nineteen scientific surveys have been carried out in southern forests over the last 15 years. Research has also been conducted into the effect of various activities (such as timber cutting and regeneration) on the plants and animals of the forest. The results of these studies are encouraging: over the past century, during which time a large timber industry and expanding tourism has flourished in the forest, not one species of plant or animal appears to have been lost as a result.

Animals disturbed by logging have been found to repopulate the new regrowth forests, while plants on the forest floor are largely unaffected by the age of the trees above them.

Jiri Lochman



Jiri Lochman



*A brilliant blue Fairy Wren goes in search of food (top) while a Looper Moth takes a close look at a Pimelea sylvestris (centre).*

*Looking like a giant rat, this Southern Brown Bandicoot is at home on the forest floor (above).*

Timber cutting and regeneration can, however, put at risk the animals which live in tree holes. Many birds and some small mammals use tree holes for nests and shelter. However, these species are accommodated in the extensive reserves and in the network of conservation zones along roads, rivers and streams. These areas provide extensive habitat for hole-nesting animals, and a resource for the recolonisation of new forests grown after timber harvest.

## FRESH WATER FROM THE FOREST |||||

The capacity to produce fresh water is one of the karri forest's priceless assets. So important is fresh water in W.A. that a massive, multidisciplinary research project was launched some years ago to discover which influences, such as clearing for agriculture, mining and timber cutting, had the potential to cause deterioration in our water supplies. This was done as part of the environmental study program upon which the Environmental Protection Authority was to base its approval for W.A.'s woodchip industry.

This research has established that the fresh water resource in the karri forest is very secure, provided careful forest management practices are followed. For example, it is important that zones of undisturbed forest are maintained along major rivers and streams. Where logging and regeneration occurs, measures need to be taken to prevent muddy water flowing from access roads into streams.

Protective measures such as these have been part of routine forest management in the karri forest for many years.

An important outcome of the water resource research in W.A.'s south-west was to confirm that after a century of logging, regeneration and recreational use, no river or stream in the karri forest has turned saline (other than where salty water has flowed in from agricultural areas). The research has highlighted a remarkable and fortunate compatibility between fresh water and other resource management in this forest.



Jiri Lochman



Jiri Lochman



Alan Sands

*Water: the liquid of life for the froglet and the purple Karri dampiera (top) along with the people who also use it for their favourite form of recreation (above).*

## SUSTAINING RECREATION |||||

Multiple-use forests are widely used for recreation. In most instances, this has little impact on the environment. But places of exceptional recreation value - such as good viewing points, shady nooks and unique groves of trees - can deteriorate quickly from overuse, particularly by human trampling which causes vegetation loss and soil compaction. In such cases, walkers must be channelled along surfaced or raised pathways, with facilities such as carparks and camping and picnic areas located away from the sensitive area and designed to blend in to the natural landscape. It is also essential that recreational use of the forest does not spread disease or start fires.

CALM's landscape architects and recreation specialists have designed and supervised the construction of dozens of recreation sites in the karri forest over the past 20 years. The aim is to ensure that the forest is enjoyed, but does not deteriorate from use by recreationists.

The new forests regrown after timber harvest contain numerous popular recreation spots. While people love to visit the mature forests in national parks, surveys have shown they also have a keen interest in multiple-use forests. A wider range of recreational activities are allowed in these areas. Firewood and craftwood can be collected, dogs and horses can be exercised, boats can be powered,

car rallies can be held, and rules regarding access and camping are more relaxed. In many places, old mill and forestry settlements within State forest have been developed for picnicking and camping, or as interpretive sites.

Within the karri forest, recreational opportunities in nature reserves, national parks and State forest complement one another.

A special value of State forest is that it has the capacity to absorb a wide range of popular recreational uses, thereby easing the pressure on national parks and nature reserves and enabling them to retain the undisturbed stands which cannot be maintained in areas where timber cutting and regeneration occur.

## SUSTAINING TIMBER PRODUCTION |||||

Karri is one of the finest timbers in the world. It is strong, can be produced in long lengths and can be used for heavy construction, furniture or paper pulp. The associated species, marri, also has a fine timber but its logs are of much lower quality, making sawn timber production less economical.

A large industry, based on the use of karri timber, has flourished since the late 19th century. Today, the industry employs thousands of West Australians and continues to draw karri and marri logs from the forest for timber and paper supplies.

For the forest to sustain long-term timber production, the rate of harvest and the rate of forest replenishment must be in equilibrium. Successful replenishment requires an understanding of forest growth and regeneration and the capacity to protect forests from damage. The scientific disciplines involved are known as Yield Regulation and Silviculture.

## YIELD REGULATION |||||

To keep the rate of harvest within the rate of natural replenishment, tree growth rates must first be determined. Then measures to restrict the rate of harvest to a calculated sustainable rate must be devised. Calculating a forest's 'permissible yield' is very complex. It involves factors which constantly change. For example, tree growth rates vary with age and seasons, and changing economic and market factors influence log marketability. So permissible yields must be continually recalculated, and the annual harvest level must be constantly under review.



Cliff Winfield



Cliff Winfield

*Karri is one of the world's strongest and toughest timbers (above).*

*A massive log truck thunders out of the forest (above).*

If the total volume of wood was the only consideration, the existing rate of harvest in the karri forest could be easily maintained. This is because growth each year in the forest greatly exceeds annual harvest. However, the present level of sawlog harvest (which is a component of the total harvest) is being progressively reduced over the next few years. This is because much of the present growth is on trees which are too young to be 'counted' as sawlog resource. Over the next 30 or 40 years, these trees will become large enough to yield valuable sawlogs. Consequently, by the year 2030, the permissible yield of sawlogs in the karri forest will greatly increase.

## SILVICULTURE |||||

A fundamental law of good forestry is that harvested areas must be regenerated. Silviculture is the science which deals with forest regeneration and regrowth. Almost every forest has different regeneration requirements and management must vary to suit these requirements.

There are a wide variety of systematic approaches to forest harvest and regeneration, called Silvicultural Systems. Although they have numerous names, all silvicultural systems are a variation on one simple theme: a single tree, or group of trees, is harvested for timber, and in the resultant gap, new trees are established and nurtured. When single tree or small gaps are established this is usually referred to as 'Selection Cutting'. When large gaps (up to many hectares in size) are made, the method is called 'Clearfelling'. Both approaches have the same end result: older trees are replaced by younger ones which in turn become old trees again, and so the cycle is repeated.

During the past century, karri forests have been regenerated by both clearfelling and selection methods and this experience has shown that both methods are feasible for regeneration. Each approach has its positive and negative aspects. For example, clearfelling is simpler, more economical, more reliable and produces higher yields of timber in the new forest. Management of the new even-aged forests is quite straightforward. This is the method which is currently favoured.

Selection cutting, on the other hand, is costly and difficult; much larger areas need to be cut over to produce the same volume of timber. This method is, however, more visibly acceptable. The sight

of a recently clearfelled area upsets most people, even when they understand that a new forest will soon grow. The temporary ugliness of clearfelling is a major factor responsible for public opposition to timber production in the karri forest.

Whichever system is used, the art and science of regenerating karri forest after timber cutting is well known and successfully practised. New forests, such as those at Boranup, Big Brook, Treen Brook, Diamond and Channybearup, are living examples of this success. These new forests also provide for flora and fauna conservation, recreation and water supply.



Cliff Wrinfield

## FIRE PROTECTION |||||

Since forests are living things, disease and injury are always potential problems. Fortunately, the karri forest is remarkably healthy and free from pests. However, bushfires pose a constant and serious threat.

Fires start each year in the forest. Intense summer wildfires can kill karri trees and threaten human lives in towns and on neighbouring farms.

After more than 70 years' experience, karri forest managers have found only one way to reduce the threat of wildfire. This is to reduce forest fuels by prescribed burning in times of low fire danger. Wildfires in recently burnt areas are less intense and can be readily brought under control.

Fire protection is achieved through the preparation and application of fire management plans for every section of the forest. These plans show the areas where fuel reduction burning is to be conducted, as well as areas where the aim is to exclude fire, or burn



Marie Lochman

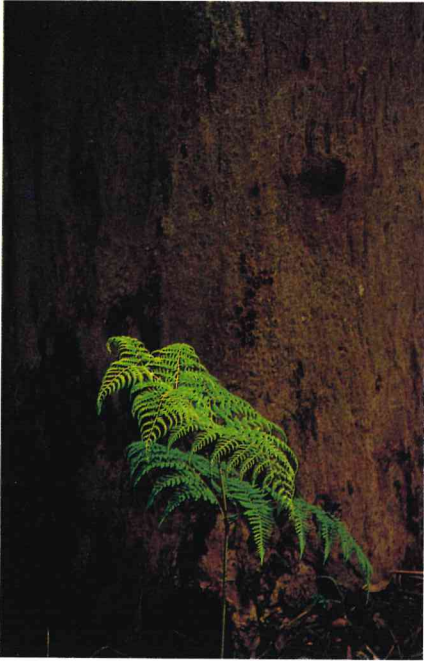
*New forest established after clearfelling at Boranup (top). This area is to be included in a national park .*

*Low intensity fires are used to reduce fuels and so minimise the damage from wildfires (above).*

only to promote regeneration. Months of work go into these fire protection measures every year. The burning itself is carried out under mild weather conditions so as to ensure low fire intensity. Consecutive burns on the same area occur only about every eight or nine years.

Some people oppose prescribed burning, claiming it causes undesirable ecological damage. However, scientific research has not been able to detect any major

ecological problems. For forest managers, the burning program is the only practical way to minimise the threat of bushfires and the undesirable social and economic damage they cause. Prescribed burning does not stop fires occurring, nor does it absolve CALM from the effort and expense of being vigilant, organised, trained and equipped to fight fires. What it does do, however, is give us the chance to win when a forest fire starts.

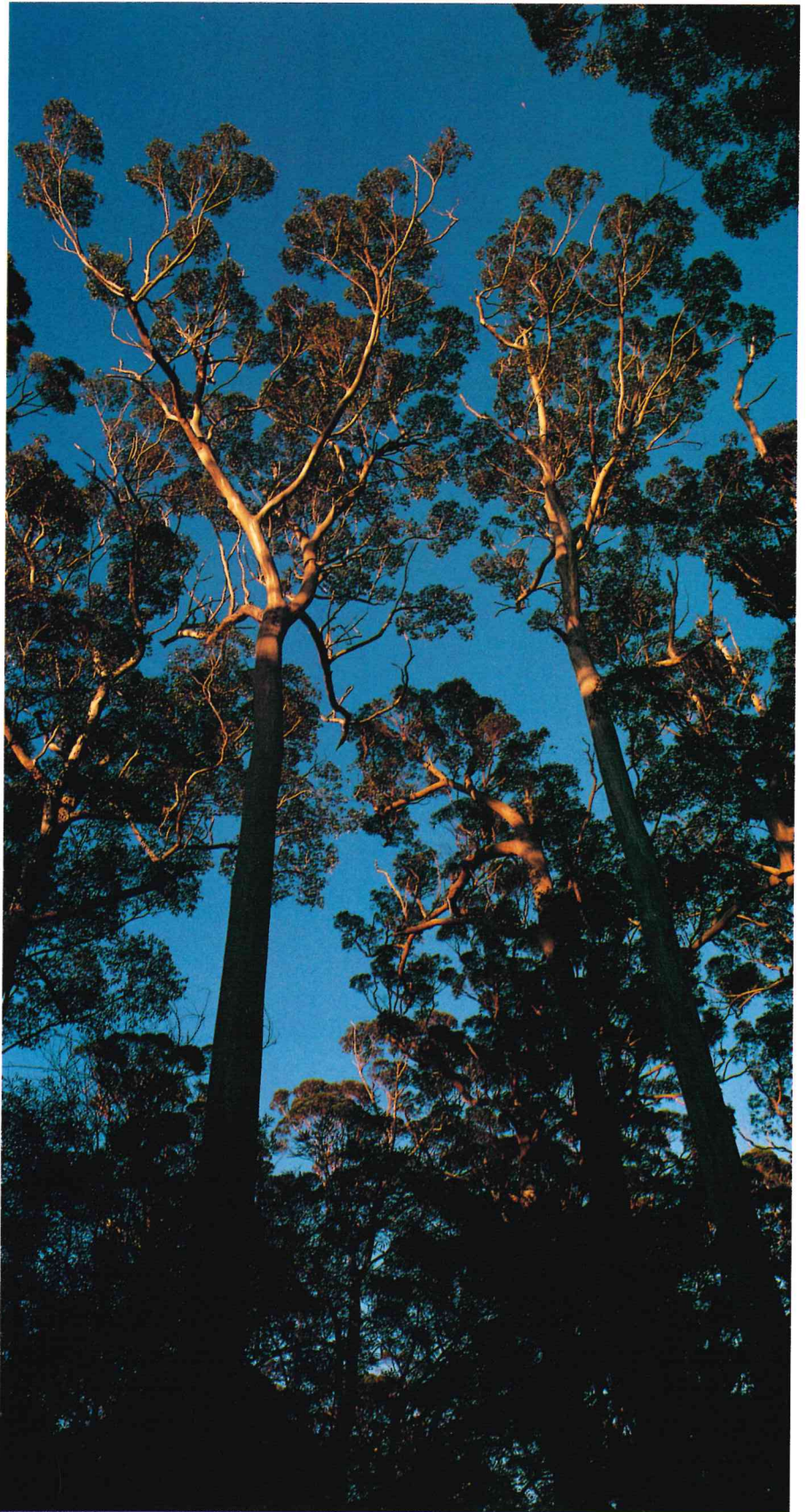


*Ferns, and many other plants in the understorey, create a colourful carpet on the forest floor.*

## LOOKING TO THE FUTURE

The management of karri forest to sustain its many values is a complex and demanding task. The system must cater for flora and fauna conservation, provide a range of recreational opportunities, and ensure that renewable resources of fresh water and timber are conserved.

CALM is determined that its approach to this complex job must be thoroughly professional and socially responsible. We accept that there will always be opportunities to further improve the quality of management. For example, although a reserve system has been established, there are still concerns about our ability to protect these reserves, particularly from fierce summer bushfires. We are also concerned about the visual impact of timber harvest and regeneration. Current research is providing new guidelines and checks for field officers planning and supervising this job.



Finally, there is a challenge outside State forests. About 20 per cent of the original karri forest is privately owned and most of this area has been cleared for agriculture. Given voluntary farmer participation in economic private tree growing schemes, there

is a good prospect that a proportion of the State's future timber needs could come from these private lands. Such schemes would have numerous ancillary environmental and social benefits for the south-west region.



Robert Garvey