

# Clear Felling and Native Fauna in South-West Forests

P. E. S. CHRISTENSEN

The eucalypt forests of south-eastern and south-western Australia and Tasmania probably form the single most important wildlife refuge in Australia. Some 35 per cent of native mammal species, for example, are confined to sclerophyll forest. This is in spite of the fact that less than five per cent of the continent is covered by sclerophyll forest. The forested area of Western Australia covers less than one per cent of the total area of the state.

Clear felling is a long established forestry practice for the utilisation and regeneration of certain tree species in many parts of the world. In recent years this practice has come under criticism from conservationists and others who are concerned, among other things, about the effects of clear felling on wildlife. What are the effects of this method of forest regeneration on the wildlife of our forests? Is the welfare of animal populations being taken into account in the planning of clear felling operations? To answer these and other questions clear felling needs to be viewed in perspective, as one of a range of forest activities which may disturb wildlife.



▲ Map 1. The relatively small area occupied by sclerophyll forest is home to 35 per cent of Australian native mammals.

Because of their close proximity to major population centres, forests are important for a variety of purposes, for example, timber production, water catchment protection, recreation and as a wildlife habitat. The demand for these resources is continually increasing and there is a need for management to be directed at multi-purpose objectives. Obviously then, the entire forest estate cannot be set aside solely for the purpose of fauna conservation.

In Western Australia, two basic strategies have therefore been employed with regard to the welfare of forest wildlife.

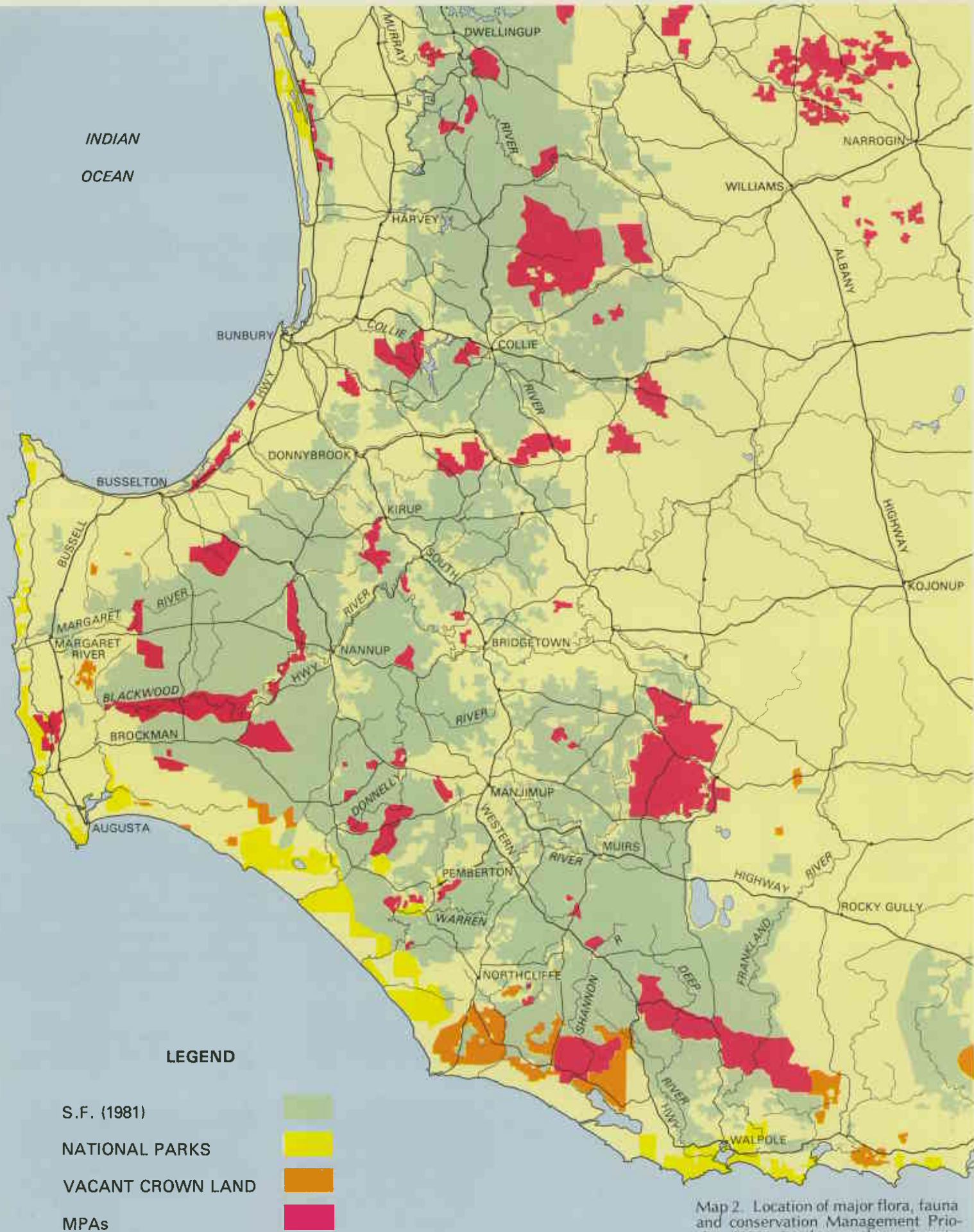
1. The setting aside of flora, fauna and landscape management priority areas (M.P.A.s). To date, 71 areas have been set aside (map 2), Dryandra and the Perup forest are examples (see *Forest Focus* Nos. 10, 18).
2. Research and monitoring aimed at a better understanding of the effects of the various forest uses on forest fauna.

## Biological Surveys

A necessary requirement before these two strategies can be put into practice is a knowledge of the occurrence and distribution of forest fauna. In 1970, when this work started, such basic information was fragmentary. Museum records were inadequate because no biological surveys had ever been carried out in any areas of state forests except Dryandra. The only information available was from specimens, mostly of mammals, sent to the museum by private individuals. Some bird lists did exist for certain areas where naturalists, as individuals or groups, had assembled them.

With this dearth of knowledge, the first task was to make up species lists for the vertebrate fauna of the forest. To accomplish this a continuing programme of biological surveys in

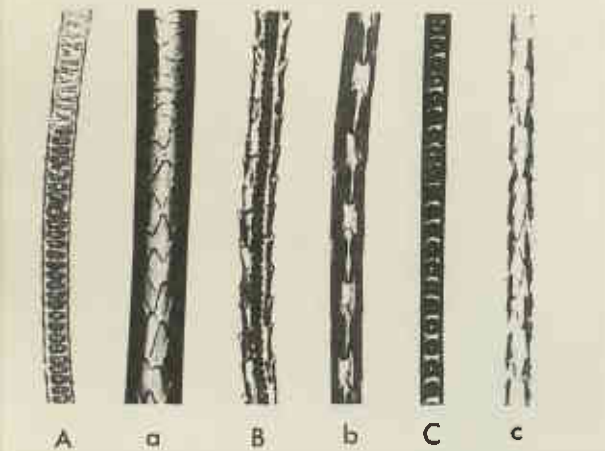
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Map 2. Location of major flora, fauna and conservation Management Priority Areas in the southern forests. These Management Priority Areas contain examples of most of the main vegetation formations in the area.

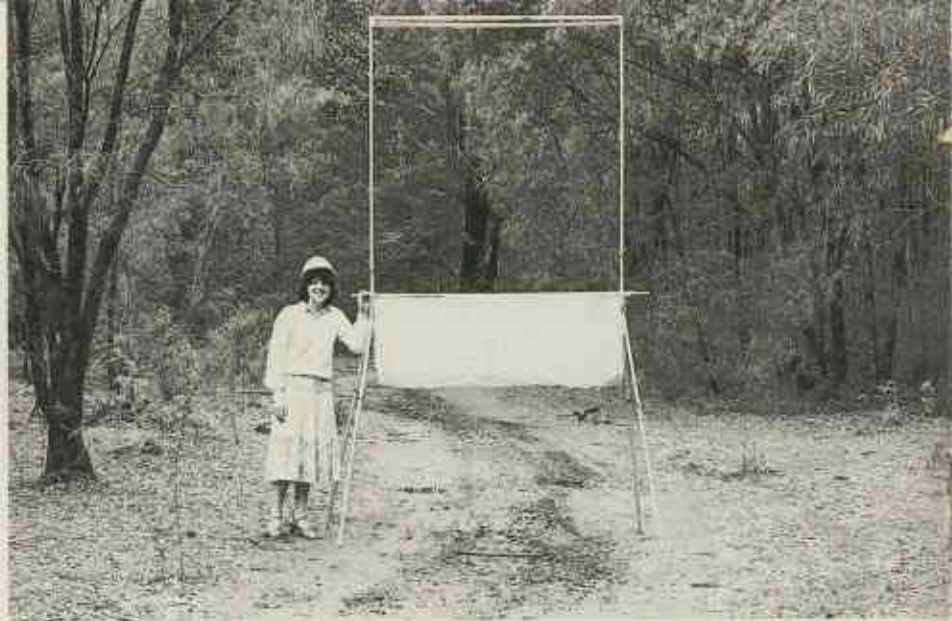




▲ Top: Forests Department biological survey team camped near Dombakup State Forest. (P. Skinner)

Centre: Collecting fish specimens in the southern flats. (T. Leftwich)

Bottom: Foxes often catch and eat some of the smaller, rarer species which are difficult to trap. It is possible to identify an animal from a single hair, and microscopic examination of hairs from foxes' scats collected on surveys yields valuable information. (T. Leftwich)



Bat trap. Bats fly into two sets of closely spaced nylon fishing lines strung on an aluminium frame. They fall into the sack below, crawl up underneath an overhang and settle down to sleep awaiting the arrival of the trapper in the morning. (T. Leftwich)

selected areas of state forest was initiated. Initially for the first few surveys the Forests Department contracted naturalist Harry Butler. He helped make up the first lists and, working in co-operation with departmental personnel, helped to establish the basic framework for future biological surveys.

Some 17 biological surveys have now been carried out in various parts of state forest. Teams of five to ten men camp in the area to be surveyed for a period of one to two weeks, working sometimes almost around the clock.

Areas to be surveyed are chosen on a priority basis, for example, areas where it is believed that forest operations may pose a threat to the fauna, fauna rich areas, or other places of interest being chosen first. Having selected an area, aerial photographs, maps, museum data and information from previous surveys, are all used in planning the survey. Specific forest communities most deserving of attention are selected and preliminary trips to the area are made to establish trap lines and to familiarise the survey team with the area.

The main object of the surveys is to collect and record all species of vertebrate fauna in the area but at

the same time a collection of plants is also made. To collect fauna, a variety of traps is used to catch animals, mist nets are used for birds and bats, spotlights are used at night and shooting is also used occasionally to collect specimens. Frogs, lizards and small mammals are also collected by turning over rocks and logs and inspecting other likely hiding places. Fish are caught using a small hand net. A few more exotic methods, such as hair identification in fox scats, are also employed.

To date some 30 species of native mammals including 9 bats; 166 birds; 42 reptiles; 11 frogs; and 15 fish have been recorded as occurring in forest areas in recent years.

The surveys provide some of the basic data on which decisions to set aside flora and fauna management priority areas are based. Thus species which have a restricted distribution may receive special attention, for example, the decision to reserve the Perup Fauna Priority Area was based to a large extent on the occurrence of the woylie and the numbat in the area.

## Fauna Research

In addition to the collection of basic information on occurrence and distribution of species, detailed



research projects are undertaken to gather data on the effects of forest activities on wildlife species.

Many of these projects are long term ones and mammals are most frequently chosen as the study species. This is because in general, mammals are more highly developed and may often be more sensitive to change than the lower forms. There are other requirements also in choosing study species, forest dependant species for example receive priority, likewise animals which live in areas in immediate danger of disturbance may be chosen. Not least of the requirements is "catchability", if an animal is difficult to capture or to observe it is often not possible to study it in detail.

Detailed studies have been carried out on the effect of fire on the woylie (*Bettongia penicillata*) and the tammar wallaby (*Macropus eugenii*). Information obtained from this study has been used to develop a special fire management plan for the Perup M.P.A. Known in certain areas as "featured species management", this concept of selecting groups or individual species as the specific objectives of management is also being developed by the U.S. Forest Service.

Studies have also been done on the effects of fire on small mammals, in particular the southern bush rat (*Rattus fuscipes*) and the yellow footed marsupial mouse (*Antechinus flavipes*). There are also research projects in progress involving the effect of clear felling on the quokka (*Setonix brachyurus*) and the mud minnow (*Lepidogalaxias salamandroides*). Studies on the effects of fire and clear felling operations on bird populations are also in progress.

Information from such studies, the biological surveys and other less intensive studies on other species, is all being used in relation to the clear



▲ This fearsome looking creature is a long-eared bat (*Nyctophilus geoffroyii*). The sharp teeth are used to kill insect prey, and the large ears to detect ultrasonic waves emitted by the bat itself for orientation purposes. (A. G. Wells)



▲ A biological survey team searches an area of coastal dunes and lakes for animals. (P. Skinner)

▼ The quokka (*Setonix brachyurus*) trapping and radio tracking study is in progress near Pemberton to determine the effect of clear felling on this species. (A. G. Wells)







▲ Powderbark wandoo (*E. accedens*) forest in the Dryandra fauna, flora and landscape management area (T. Leftwich)

Aerial view of uncut stream and roadside strips in clear felled experimental forest coupe. The bulge in the foreground is part of a road reserve which

▼ includes some uncommercial forest. (Neil Hamilton)



▼ Granite rock habitat in the southern forests, Mt. Lindesay (T. Leftwich)



felling which is taking place, particularly within the Woodchip Licence Area.

The biological surveys using fauna information indicate that the tall open forests of karri and marri, which are best for timber production, are the poorest habitat in terms of numbers of vertebrate species. Only 76 of the 141 species of birds listed within the Woodchip Licence Area were recorded in the karri forest. Likewise the karri forest *per se* is comparatively poor in species of mammals, frogs and fish and only a limited range of reptiles occur there. The highest diversity of species within the licence area is associated with the coastal strip of consolidated sand dune country, and the low open woodland and sedgeland communities of the south, and the jarrah and wandoo areas of the north-east Perup area.

All these communities are excluded from clear felling operations either by reason of there being no timber species or, as in the case of the Perup, through having been declared a flora and fauna M.P.A. In addition representative areas of all other major forest and non-forest communities have also been set aside for management as flora, fauna and landscape conservation M.P.A.s.

To complement these areas, strips of forest have been left along all major rivers and some minor rivers, and on selected roads within the Woodchip Licence Area. These strips to be left uncut are allocated prior to felling and mapped on a block by block basis (4000 ha at a time), in such a way as to create a network of uncut corridors of stream and road reserves which connect with the conservation M.P.A.s. Approximately 37 per cent of the area of state forest within the Woodchip Licence Area, where the clear felling technique is used most extensively has now been withdrawn from cutting on this system.



As a further safeguard, cutting proceeds in several different areas at any one time, and the longest possible lapse of time is allowed before felling occurs in adjacent cutting coupes. This allows re-invasion of fauna from uncut areas on to the regenerating coupes.

These measures are not all entirely for the benefit of the fauna, for example, stream-side strips also act as erosion and silt barriers and they have a recreation potential also.

## Restricted Species

In terms of their dependence on forests, animals may be classified as transients, marginal, non-dependent residents and dependent residents. Transients are those species which only occasionally use the forest for food or shelter, for example, some species of bats and birds. Marginal species may use the forest edges for shelter while feeding elsewhere—kangaroo for example. Non-dependent residents are those species which live in the forest but also occur in other areas, for example coastal shrub or savannah woodland. Dependent residents are those species for which the forest is essential.

True forest dependent species are those which occur only within the forest and include aboreal species such as the gliders and the mountain possum (*Trichosurus caninus*) of the eastern states. With the possible exception of the native squirrel (*Phascogale tapoatafa*) there are no true forest dependent mammals in south-western Australia.

However, several species, among them the numbat (*Myrmecobius fasciatus*) and the woylie have become forest dependent species as a result of agricultural clearing of their woodland areas of habitat. There are also species of birds, reptiles, amphibians and fish which occur only in forest areas.



▲ The "native squirrel" (*Phascogale tapoatafa*) probably the only true forest dependent mammal in south-western Australia. (T. Leftwich)



▲ The numbat (*Myrmecobius fasciatus*), a species which has become forest dependent as a result of agricultural clearing of much of its former habitat. (L. Schick)

▼ Small lake within the Frankland M.P.A. (T. Leftwich)



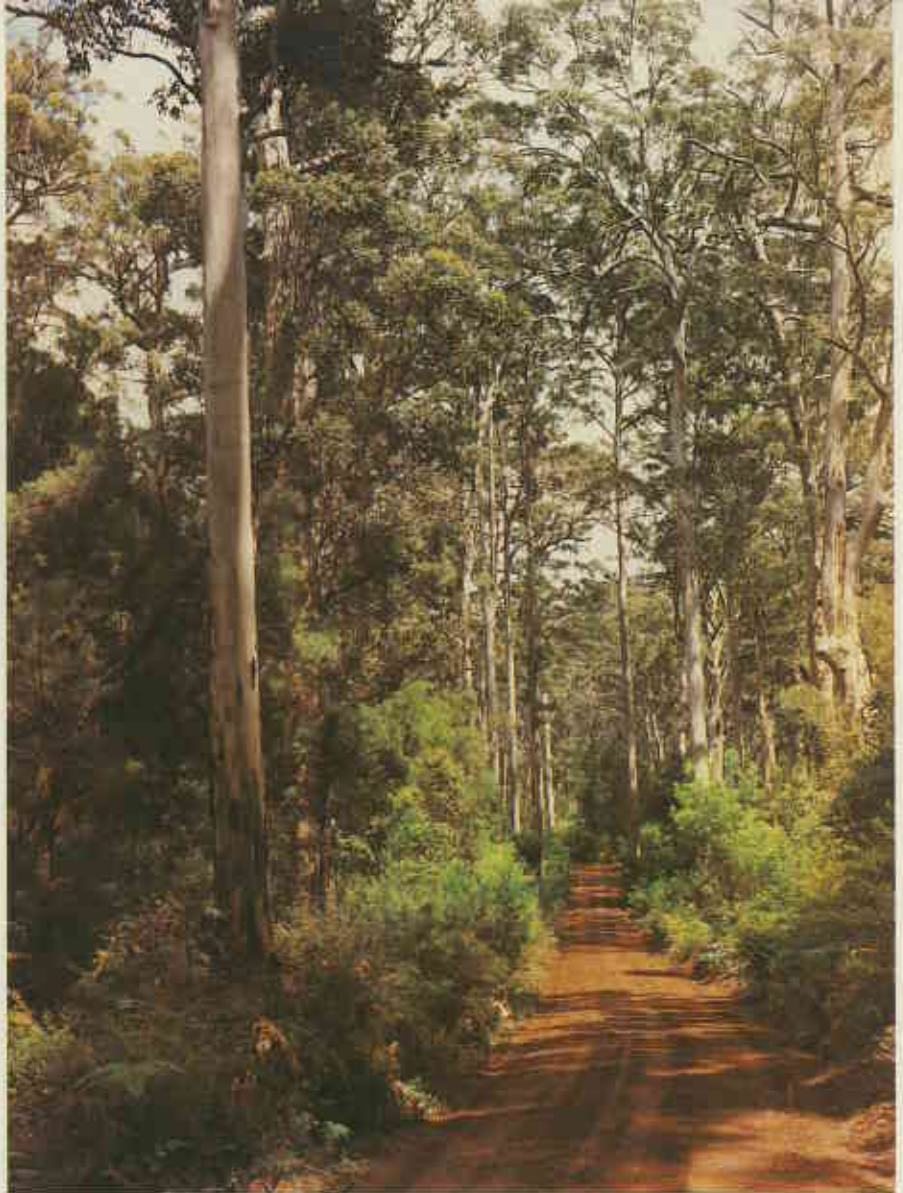


When the Manjimup woodchip agreement was drawn up, fauna lists were examined for possible forest dependent species and further survey work was done to check the area for species which might previously have been missed. Two mammal species, the numbat and the woylie, were nominated as forest dependent species in addition to being considered sensitive to clear felling. For this reason clear felling was excluded from the already established Perup Fauna Management Priority Area.

A search for vertebrate species restricted entirely to within the Woodchip Licence Area came up with three possible species, the little brown snake (*Elapognathus minor*) and two small frogs (*Crinea rosea* and *C. lutea*). There are three other species whose centres of occurrence are believed to lie within the licence area. But they occur outside the area as well. These are: Mueller's snake (*Rhino-plocephalus bicolor*), the small frog (*Metacrinea nicholsii*) and the Shannon mud minnow.

Very few specimens of the little brown snake have ever been collected. The three collected by the Forests Department in recent years have all come from a restricted woodland ecotype on grey sands near the south coast. Mueller's snake occurs in a similar ecotype. These forest types, although within the licence area are not affected by any logging activity. The Shannon mud minnow occurs primarily in the "brown water" streams, high in organic content, of the southern non-forested flats. These areas are not affected by clear felling operations and a number of the streams in which the minnow occurs are to the east of the Frankland River, outside the licence area.

Both frog species, *C. rosea* and *M. nicholsii* have been collected or recorded recently in karri sapling stands regenerated following clear felling and burning during the last ten years. This demonstrates their



▲ Virgin karri (*E. diversicolor*) forest areas such as this have been reserved from clear felling in M.P.A.s within the marri Chipwood Licence Area.

(Jack Bradshaw)

ability to cope with clear felling. The other small frog, *C. lutea*, is known only from nine specimens from Deep River within the Nornalup National Park.

## Direct Effects

Having covered the various safeguards which have been initiated before clear felling operations, we may now turn to examine the direct effects of clear felling on fauna actually living within the coupes.

Before attempting to understand the direct effects of clear felling on fauna, it is necessary first, to appreciate certain basic characteris-

tics of animal populations. Most animals are extremely adaptable and have evolved characteristics and behaviour patterns which allow them to cope with most situations.

Cruel and heartless as it may seem, in nature the welfare of the individual is not important in itself. The survival of individual birds or animals is only important when it affects the survival of the population. Thus, in most populations under natural conditions, only a very small proportion of the total number of young survive to adulthood. For example, approximately 15 of every 100 joeys born in woylie populations survive to live for more



than a few months after leaving their mothers. There simply is not room for them.

Nature produces enormous numbers of excess young as an insurance policy in order that these may be available to re-populate areas where natural disaster has reduced the population. Thus following fire, as the vegetation regenerates, the survival of young woylies in areas surrounding the burn may increase to 40 out of 100 joeys. This is because many of the young which would otherwise die, find a home on the regenerating area, from where the adults disappeared following the fire.

This pattern is typical of many animals, and what may be a disaster to the present population—a wildfire or clear felling—is a boon for later populations, provided the habitat is allowed to regenerate. It is the re-population of the regenerating habitat which is important, not the immediate disturbance, disastrous as it may appear to be to the individual. If these facts are appreciated, the apparent devastation of clear felling may be seen as a transitory phenomenon. The studies which have been done so far indicate that these characteristics of animal populations are allowing them to cope successfully with the clear felling system.

In a two-year study the flora and fauna of regenerated karri forests ranging in age from one to over 100 years, was compared to that of uncut virgin stands. The study showed that although the immediate effect on the individual animals living in an area which is clear felled is devastating, this effect is transitory. Further studies are in progress to confirm these findings.

At no stage, even directly following felling and regeneration burning, is there no fauna present. Individual small frogs and lizards survive and continue to live on the burnt area. Regeneration of plants and young



▲ *Crinea rosea*, male and female. This species lives in the dense reedbeds which are a feature of many water-courses in the karri forest (T. Leftwich)



Winter floods on the Frankland River. ▲ (K. Pentony)

The mud minnow (*Lepidogalaxias salamandroides*) ▶ a species of great scientific interest. It is the only known southern hemisphere species of an otherwise northern hemisphere group of fishes. (T. Leftwich)







▲ Low open woodland and sedgeland, an area rich in fauna including the diminutive honey possum (*Tarsipes spenceri*) (T. Leftwich)



▲ The honey possum (*Tarsipes spenceri*) (T. Leftwich)

Dusky wood swallow (*Artamus cyanopterus*) nesting in a broken and splintered tree on a recently burnt clear felled area (T. Leftwich)

▼ area (T. Leftwich)



A clear felled area recently burned for regeneration and still hazy with smoke. Even areas such as this still harbour a few species of animals which will live to reproduce as the forest regenerates (Government photographer)

▼ forest regenerates (Government photographer)



seedlings occurs rapidly and animals return and start to increase in numbers again.

The relative abundance of mammals, and to a certain extent also the insects, follows a pattern of change almost identical to that following fire in uncut forest. Thus species return to the area as suitable habitat regenerates, the greater proportion returning within the first few years following the regeneration burn.

Bird populations likewise, depend on the stage of succession or development of the new forest. As a particular niche or habitat develops it is occupied by species favouring that habitat. For example, wrens,

which favour dense low habitat, are early colonisers of the regenerated stands.

Birds are found in greatest numbers in virgin or mature karri forest. However, numbers of different bird species are highest in forest recently logged to seed trees, and in young regeneration. Lowest numbers of bird species were recorded in the pole stands, 30 to 50 years after regeneration.

For mammals and birds results appear to be fairly conclusive. The insect work is preliminary only and further work needs to be done to confirm and extend the results. However, indirect evidence in the form of the return of vertebrate

fauna to the area, many species of which feed on insects, suggest that the insects also return quickly.

Hole nesters form a group of special concern. Among the mammals, the bats are affected and several species of birds need hollow trees for nests. The numbers of hole nesting birds were not seriously affected, but it is presumed that they nested in surrounding uncut forest and only used the regenerated areas for feeding. The value for conservation of flora and fauna of M.P.A.s and the uncut strips is obvious in this regard.

Reptiles, amphibia and fish were not covered to any great extent in



this study but survey data indicates that the fish are unaffected by clear felling and that the other two groups follow a succession similar to that observed of mammals.

The effect of clear felling on fauna, like those of a wildfire are therefore temporary in nature. Areas of regenerated forest of different ages favour different species and groups of fauna. The mosaic or mixture of different aged forest created is capable of supporting the full range of species present in the virgin stand, providing a percentage of uncut forest is left in all areas. This is necessary in order to supply the full range of habitat and to provide nest sites for the hole nesters and other species requiring mature trees.

An important reason for having the uncut area left in a pattern of interconnecting strips and blocks is to provide mature trees in close proximity to all regenerated coupes. This is particularly important for the hole nesters. If the total area of uncut forest were to be left as one or two very large blocks, hole nesting species would only be able to live in those coupes close to the uncut areas. The rest of the regenerated forest would be too far away from their nesting sites to be of use to them.

The present system is based on the best available information and fulfils current needs. However, nothing is static and as needs change and the results of further research come to hand changes may be made to accommodate the new needs as they arise. A continued process of monitoring allows for the identification of problem areas which may develop in future.



▲ Vigorous young karri regrowth two years after regeneration. At this stage many species of animals and birds are already returning. (T. Leftwich)

▼ Five-year-old karri regeneration. Note the young trees starting to dominate the dense understorey. (T. Leftwich)



▼ Karri pole stand 50 years old. Such forests have a full complement of karri fauna, but some species are not yet as plentiful as in the mature virgin forest. (T. Leftwich)

▼ Karri forest at Boranup near Margaret River, clear felled and regenerated in the 1860s. Not yet as large as their fully mature predecessors, these trees nevertheless form a magnificent forest. (T. Leftwich)

