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# THE PERUP FOREST, WESTERN AUSTRALIA A CASE STUDY IN FOREST MANAGEMENT FOR CONSERVATION

P Christensen

## SUMMARY

The Perup forest is an area of forest which has been designated a fauna priority area. The primary land use in the area is conservation of flora and fauna. Other land uses such as timber production are not necesssarily excluded, provided they do not compromise the primary land use.

The major management objective is conservation of the rare and endangered mammals which occur in the area, 'selected species management'. The management strategy has been to use single silvicultural techniques, especially prescribed burning. Burning plans are drawn up using information which has been obtained from research into the biology of the species in the reserve.

The simple management objectives of the system make it easy to guage the effect of management practices. Simple monitoring indicates that population of rare mammals are high after 15 years of management.

The success of the programme is attributed to the close relationship which has been developed between researchers and managers. Information from continuing research and management is readily available to managers and plans are regularly revised, so that management is always based on the best available information. The accent has been on simplicity; why complicate anything if you can make it simple? Education is seen to be an integral part of the management process. The use of prescribed fire in conservation management needs to be explained to Departmental staff as well as the public.

## INTRODUCTION

In recent years there has been a scramble to set aside areas of natural lands for conservation purposes 'before it is too late'. Many areas previously set aside and managed for multiple use, including wood production, have been re-discovered and set aside for nature conservation.

There has been no lack of dedication of purpose by those who have set themselves the task of achieving reservation for conservation purposes for a particular tract of land.

All too often however the initial enthusiasm, dedication and clarity of purpose wanes and disappears once the initial goal of reservation is achieved. It seems almost as if the act of drawing a line around an area on the map and declaring it a nature reserve or national park is somehow magically supposed to assure its future.

Why is it that so often no further action takes place? Is it lack of money, lack of interest or is the task of managing for conservation purposes seen as being just too complex? There are possibly many reasons but two in particular seem to be the root of the problem.

The first of these is the perceived complexity of managing a forest ecosystem. There are simply too many factors to consider and too many unknowns to contemplate. I say perceived, because problems are essentially in the eye of the beholder.

For centuries foresters have successfully managed forests for wood production at the same time maintaining all or most of the forests conservation and amenity values. One has only to look at the many forests which are being proposed as parks and nature reserves to realise how successfully foresters have done this job. Management was achieved by selecting for management 'keystone species' the trees themselves. By looking after them properly the rest of the ecosystem pretty well looked after itself. Now as more information comes to hand and management techniques improve,

management is becoming more complex and many other factors, wildlife, water and so on are being taken into account.

Why can we not apply the same simple thinking to nature reserve and park management, i.e. pick out the major factors and start by managing these, increasing management complexity as more information comes to hand?

It is largely a matter of setting clear precise and simple management objectives and then getting on with it.

The second problem concerns the actual method of management. I believe that in forest areas some of the best and most practical techniques available for manipulating or managing the ecosystem or aspects of it, are well proven and tested silvicultural techniques like thinning and prescribed burning. These techniques are often regarded by non-foresters as being bad for the environment. Too often the negative rather than the positive effects of silvicultural techniques are highlighted and there is a reluctance to use them for conservation management purposes.

Fauna management in the Perup is about manipulative management, that is active management of populations and communities using simple silvicultural techniques to manipulate environmental factors so as to achieve desired conservation goals.

## BACKGROUND

The Perup Forest is a fauna management priority area (M.P.A.) located in jarrah forest east of Manjimup. An M.P.A. is a land management unit which is dedicated to a variety of demands under the multiple use system applied in State forests in Western Australia. Thus the primary management consideration in the Perup is the conservation of fauna and flora. Other land uses, such as timber production, are not necessarily excluded provided they do not compromise the primary land use.

The Perup was designated a fauna M.P.A. in 1972 following the recognition that populations of rare and restricted fauna existed in the area (Christensen 1974).

The concept of delineating areas of forest where fauna conservation is the priority was to my knowledge new at the time. The idea originated from a proposal by Peter Kimber (W.A. Forests Dept.) who proposed the delineation of areas of top quality jarrah forests for intensive management for wood production. The idea was to concentrate resources on these "intensive management units" (I.M.U.s) to gain the maximum benefit in wood production. The I.M.U. concept was extended by myself and Barney White and we proposed that the same could be done for fauna as for timber.

The setting aside of the Perup was deliberately approached in a pragmatic manner. At that time, conservation arguments on their own, however valid, were often not enough to achieve major changes to the purpose of management of a forest area. Thus although the preservation of populations of rare fauna was the primary reason for setting up the Perup I.M.U. for fauna, the case had to be strengthened with more basic arguments for reservation.

At the time portions of the Perup were under constant pressure from agricultural interests for release for farming purposes. There was little timber of any value to use as an argument to, retain the area within State Forest. The idea of using the area's faunal values to retain it within State Forest, was therefore given considerable emphasis in the case for fauna I.M.U. delineation. In addition to this it was pointed out that the creation of a fauna reserve within State forest would enhance the Departments conservation image.

The idea was accepted, further land release was successfully opposed as a result, and the area was set aside as a fauna I.M.U. Shortly afterwards the name was changed to fauna priority area and the concept was spelled out in a paper at the Monash Fire Symposium in 1973 (Christensen 1974). More recently in the Department of Conservation and Land Management's new Management Plans the area has been designated a forest park. The purpose of this new land use category is essentially the same

as the old M.P.A. viz. Wildlife conservation, with areas zoned for production of renewable resources, thus allowing for manipulative management for wildlife conservation.

## MANAGEMENT OBJECTIVE IN THE PERUP

The concept of a fauna priority area and that of the newly created management category of forest park, is essentially different from a fauna reserve or a National Park. It is an area where fauna have priority but where normal forestry activities may proceed so long as they are not detrimental to conservation of fauna. This is an important distinction between priority areas and forest parks as opposed to other forms of conservation reserves. It allows the forest manager greater flexibility in management of the area. Management practices such as logging and burning may be used as management tools. Where these silvicultural practices can be modified to enhance fauna values or to manage populations of fauna, the manager has a very cheap management tool.

It also allows true multiple use, on the same piece of land, where this is possible. Lastly and most importantly perhaps it allows experimental manipulative research to be carried out on the effects of fire and other management practices.

The management objectives which were specified for the area were quite explicit.

(i) Conservation of the rare and endangered fauna - maximise populations whilst at the same time attempting to cater for other species of fauna and flora.

(ii) Research - use of the Perup for biological research with particular emphasis on species biology and habitat requirements in relation to fire.

(iii) Education - use the area to educate land managers and the general public in forest ecology especially the role of fire in the forest ecosystem.

There has been some discussion and criticism of the primary aim, viz, management of the area for selected species. The advantages of selected species management are firstly that you have a clear and defined objective and secondly that the results are quantifiable i.e. you can measure the success of your management regimes in quantifiable terms.

An alternative management strategy often proposed by armchair land managers, is management for maximum diversity. The problem with this idealistic objective is firstly that it is probably unachievable, certainly with the current level of knowledge, and secondly it is extremely difficult to measure your level of success. In the Perup a simple more specific primary objective is preferred with the maintenance of the rest of the ecosystem being a secondary aim.

The second management objective is absolutely essential for the successful achievement of the primary objective. Too much ecological research is done on topics which have little immediate relevance and no management application. Research at the Perup is primarily practical ecology done in the field, directed at problems associated with the achievement of the management aims of the area. More basic research is not discouraged, providing it is relevant to the management objectives of the area.

Lastly, education is considered absolutely essential. There is great ignorance of practical ecology amongst the general public. This has lead to the misunderstanding of many forestry practices most especially of the role of fire in Australian forest ecosystems. These misunderstandings if not corrected could eventually lead to a situation where forest managers will no longer be allowed to use fire or other silvicultural methods for management purposes in reserves. Such a situation would be disastrous to the conservation of forest fauna.

## RESEARCH AND THE DEVELOPMENT OF MANAGEMENT TECHNIQUES

Fire is a natural and essential part of the forest environment (Christensen 1980b) and from the beginning fauna management in the Perup has been based primarily on a regime of prescribed fire. The

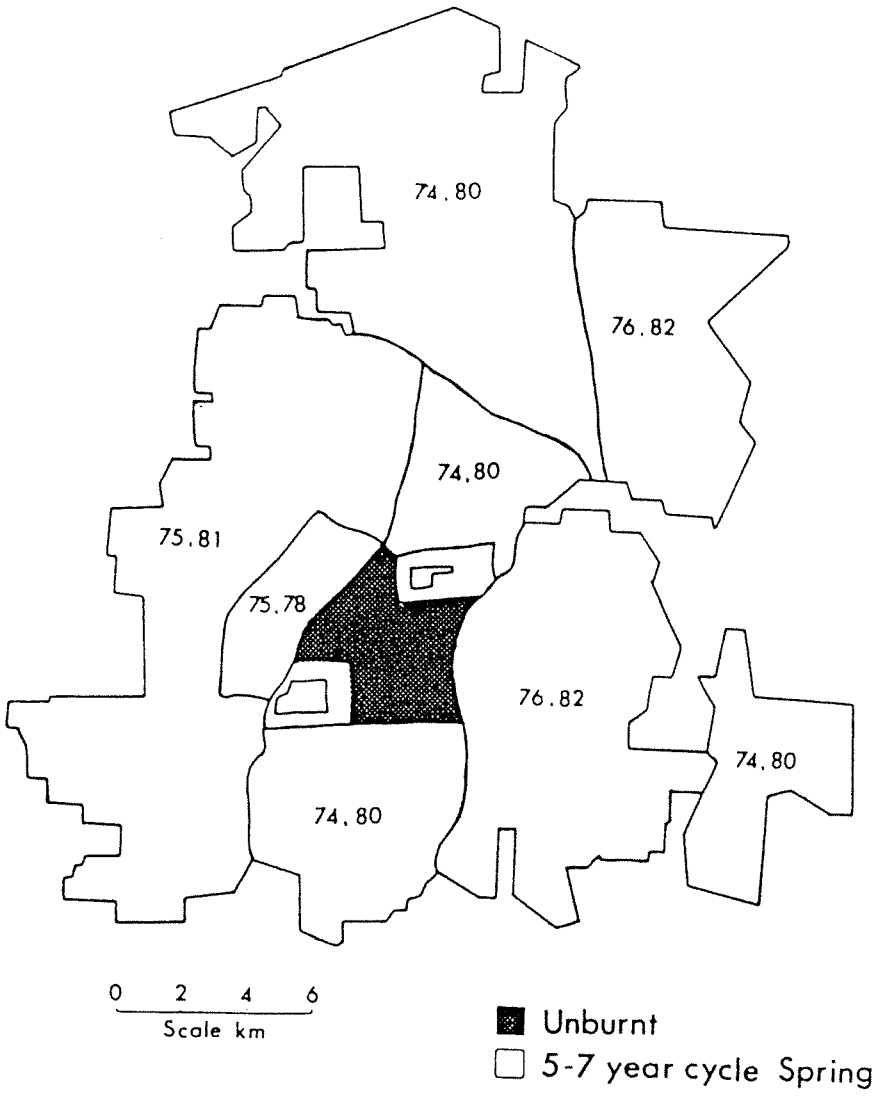


Figure 1: Perup - prescribed burning plan 1973. Large areas were burnt in spring on a 6 year cycle primarily for fuel reduction purposes.

regime started and has evolved since by considering the results of fauna studies together with fire behaviour studies as well as the protection requirements of the area.

To start with, the entire area was under a simple regime of spring burning carried out under mild weather conditions. The main object of this strategy was to reduce the fuel load for fire protection purposes. Burning was carried out in a few very large blocks in a manner designed primarily for protection of the timber values and the surrounding farmlands from wildfire. (Fig. 1) Prior to this the Perup had a recorded history of frequent fires going back some 20 years.

Initially, considering that good populations of rare and endangered fauna occurred in the area, indeed were the reason for the Perup existing, it was decided to make only limited changes to the protection fire regime. This situation was maintained until information on the ecology of the main species of fauna became available. The only immediate change made was to add unburnt control blocks to the area and one block was designated for burning in autumn. The unburnt area was designed to provide a benchmark against which every change could be measured. The autumn burn carried out under dry fuel conditions would burn at a higher intensity than the blocks burnt in spring and provide more density to the fire regime.

Research at the Perup has concentrated on fire effects with the aim of understanding the role of fire in the ecology of communities and selected individual species. Most of the work has concentrated on the rare and endangered mammals, the brush-tail bettong or woylie *Bettongia penicillata* (Christensen 1980 and Christensen and Leftwich 1980), the Tammar wallaby *Macropus eugenii* (Christensen 1980), the Numbat *Myrmecobius fasciatus* (Christensen *et al.* 1984, Christensen 1975), the Western ring-tailed possum *Pseudocheirus peregrinus* (Inions 1985) and limited work on the Western native cat or chuditch *Dasyurus geoffreii* (Godsell, J. *et al.* 1984). Work has also been done on bird communities in relation to fire (Christensen *et al.* 1986).

Surveys have been carried out on the distribution of vertebrate species in the area (Christensen *et al.* 1986). Work has also been carried out on the fire ecology of some of the flora of the area (Christensen and Kimber 1975, Christensen 1980b) in particular on the thicket forming legume heartleaf *Gastrolobium bilobum* the home of the tammar wallaby, (Christensen and Maisey 1987). The work on tammar Wallaby habitat forms the basis for the fire management plan (see later).

These studies have raised a number of issues which have stimulated studies on more basic research on woylie nutrition, Kinnear *et al.* 1979, the role of hypogenous fungi and mammals in the jarrah forest ecosystem, Ralph 1986, Stewart 1987, Lamont *et al.* 1985 and the role of the introduced fox as a predator, Christensen 1980a, King *et al.* 1981, Kinnear *et al.* 1984.

All of this work has focussed on the biology of species and communities in relation to fire.

## FIRE MANAGEMENT

How the information from these studies has been incorporated into a simple management plan is described in more detail by Christensen and Maisey (1987). The major change to management has been a more complex burning plan for the area (Fig. 2).

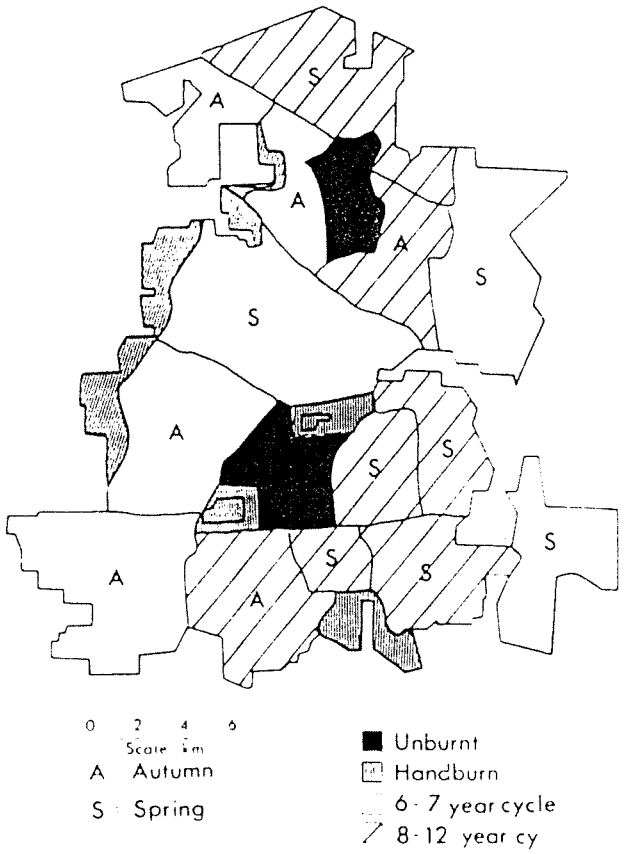


Figure 2: Perup - current burning plan. Smaller areas are burned alternately in spring and autumn on an 8-12 year cycle. A wide fuel reduced buffer protects the vulnerable west to north west side of the area.

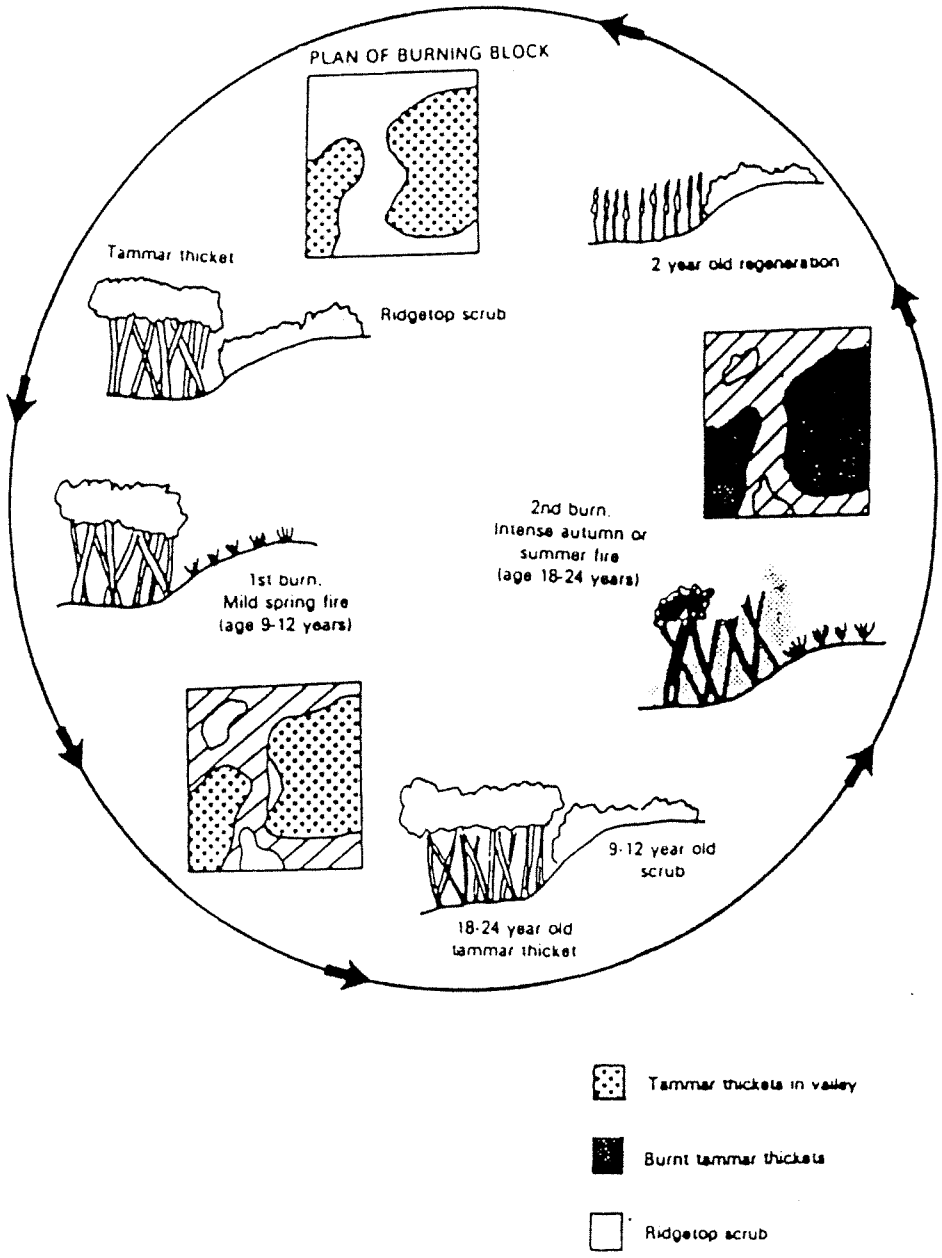


Figure 3: The tammar thicket fire cycle. Spring fires every 8-12 years burn the scrub on the ridges, the tammar thickets in the moist valleys remains unburnt. Every second or third rotation the area is burnt under dry conditions in summer or autumn when the scrub on the ridges and the valley thickets will burn. This cycle ensures regeneration of the tammar thickets every 20-30 years.

A major factor in the new burning plan is the requirements of one of the rare and endangered species in the area, the tammar wallaby (*Macropus eugenii*). The Tammar requires scrub thickets with certain structural characteristics, these thickets require periodic intense fires to regenerate successfully as tammar habitat. The scrub thickets in which the tammar lives have a limited life, approximately 20 - 30 years, and intense fire, burning under dry conditions, is needed to stimulate seed germination and initials the development of new thickets. (Christensen 1980b). The cycle of events is illustrated in Fig. 3 and is described in more detail elsewhere (Christensen and Maisey 1987).

The requirements of the tammar have been the dominant factor in the current burning plan for the area. The tammar has thus been identified as a keystone species which requires special management attention. Without special management, under the current system of broadscale frequent spring burning, the tammar would eventually disappear from the Perup. Conversely it would also disappear in the complete absence of fire. Evidence from the studies of other fauna in the Perup suggests that the other rare and endangered species, and as far as we can tell, the remaining fauna and flora are well served by the burning regime which has been largely planned for the tammar.

The fire regime together with the spatial distribution and size of the individual burns take into account the major known requirements of the selected species of the area and it is also acceptable in terms of fire safety to surroundin land holders, a major consideration. The current burning plan is simple in terms of both feasability and cost.

Further modification, involving the burning of only a portion of individual tammar thickets is being tested on an experimental basis at the present time.

The results of these trials may be incorporated into new management plans in due course.

A crucial factor in the management of the Perup is fox control. The role of the introduced european fox (*Vulpes vulpes*) as a major predator of medium sized marsupials in the south west was first identified as a result of work done in the Perup (Christensen 1980a). It is now believed that fox control may be necessary in some areas if certain species of native mammals are to survive (King *et al.* 1981).

## SOME BASIC MANAGEMENT PRINCIPLES

A feature of the research at the Perup has been the development of some basic principles of fire management for fauna which may be transferred to other reserves (see Christensen and Maisey 1987). Many of these principles are biological ones which do not concern us here, some however are basic management principles.

The first of these is simplicity: Simplicity should be a basic principle in reserve management. This may seem an obvious consideration and yet how often are simple issues needlessly complicated. Biological information can almost always be simplified, it has to be if it is to be of any use to the manager. A second principle is, use data as it becomes available. Whenever a new fact emerges, assess its usefulness and relevance and see if it should be used to modify the management in any way. Always use the best available knowledge and act on it now. Waiting for more precise data can often be more damaging to the environment than acting on incomplete data. A case in point is not burning where fire is a part of the natural system. Some species will disappear in the absence of fire and they may not always be able to return.

With this goes an important often overlooked factor, the need to record and monitor what you are doing. Continued monitoring of populations and communities is an essential part of both management and research:

Monitoring can take many forms, simple recording of sightings or trapping may provide an indication of population levels sufficient for management purposes (Figs 4 and 5). Activities such as the re-establishment of populations of animals need to be recorded in more detail. In an experiment with the woylie a record was kept of the animals spatial increase as well as their numbers (Fig 6).

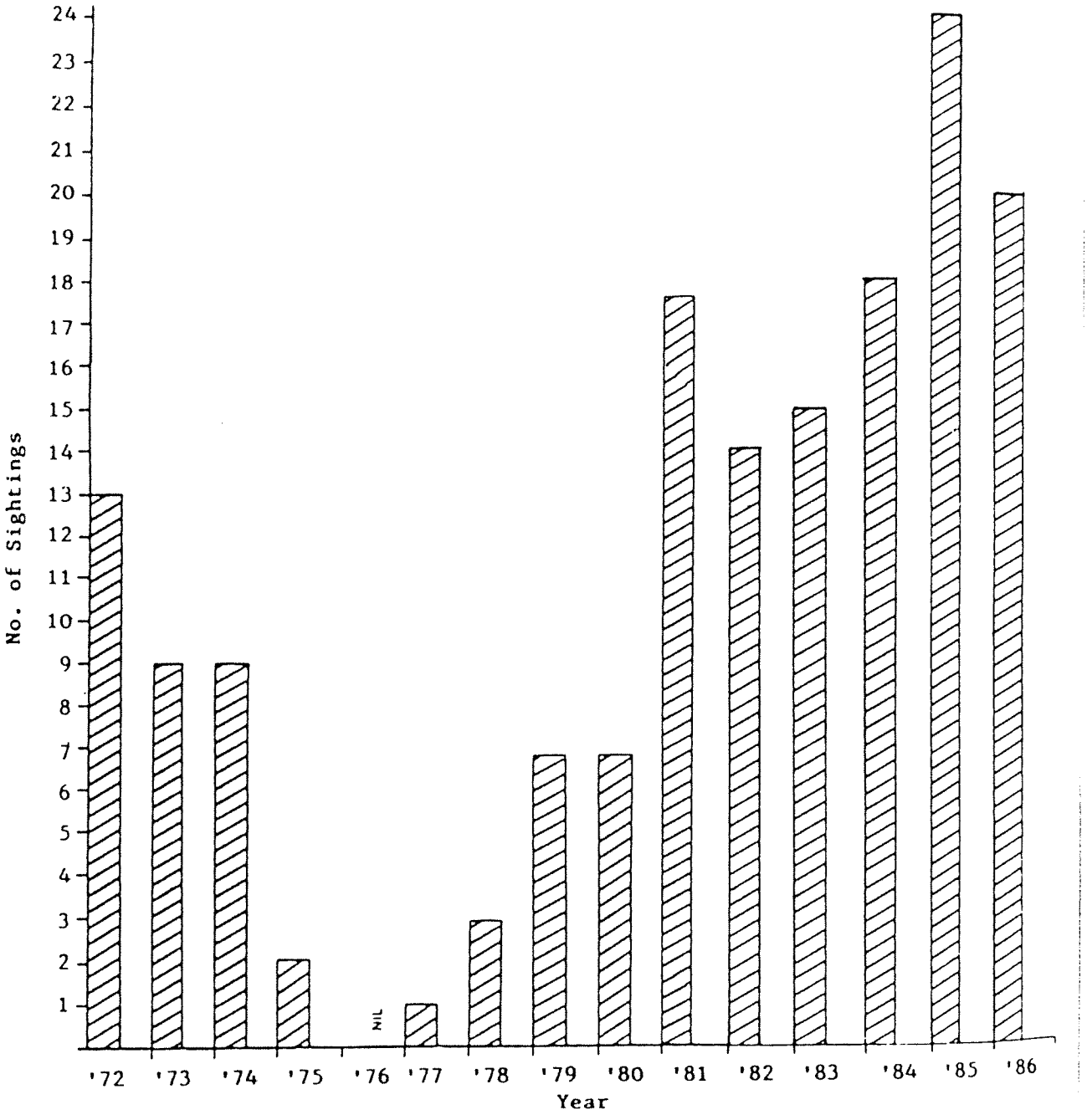


Figure 4: Incidental sightings of the Numbat (Myrmecobius fasciatus) in the Perup area.

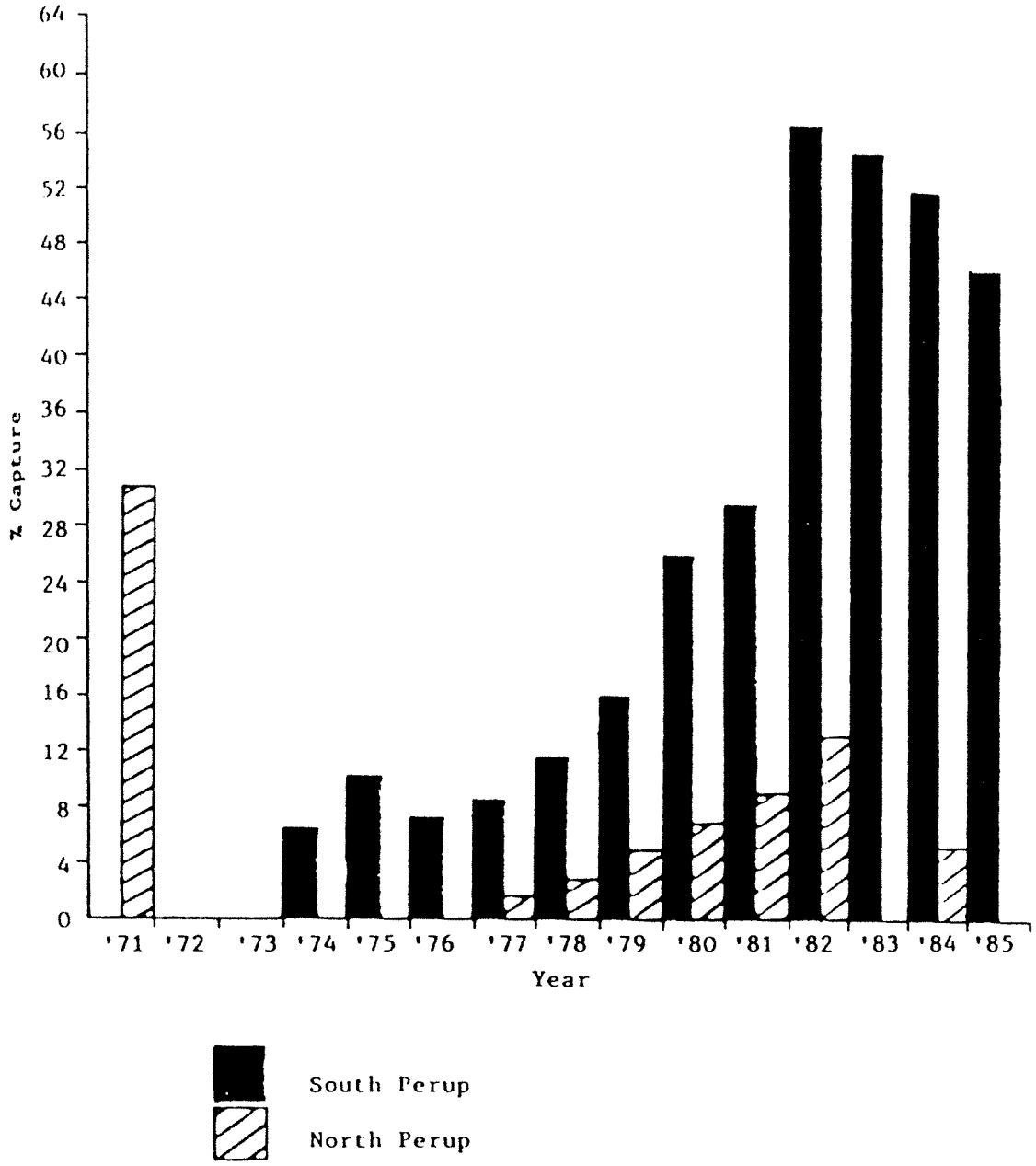


Figure 5: Capture percentages of the Brush-tailed Bettong (Bettongia penicillata) at two locations in the Perup forest.

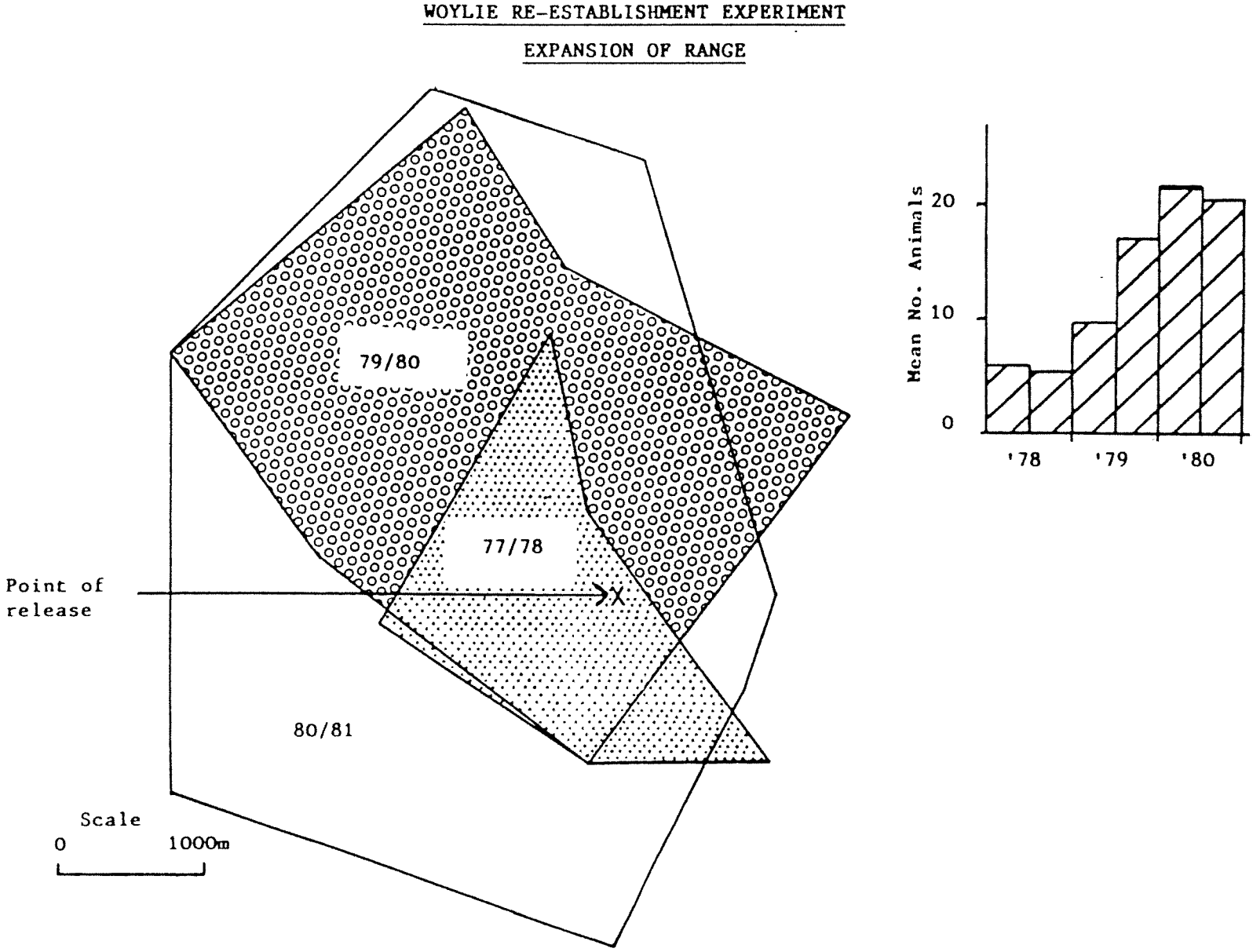


Figure 6: Spatial increase of woylies following their release.

A third, and once again too obvious principle of management, you must have definite well defined and achievable management objectives. Without such objectives it is not possible to draw up meaningful burning plans or other management plans. Nor is it possible to set up criteria by which to measure the success of the management strategy. Without well defined management objectives, research will lack direction and fall into the trap of so much ecological research, where studies are often unrelated and largely irrelevant to management. For a variety of reasons, these reserve management principles, obvious as they may be, are rarely observed in practice.

## EDUCATION

In recent years foresters have reaped the unfortunate benefits of our earlier compatriots lack of appreciation of the value of education, or perhaps it was just a failure to give it enough attention? Forestry and foresters all over Australia have been painted as the 'bad guys' in an unprecedented series of environmental "issues" involving forestry. This is a most unfortunate situation since foresters were amongst the first real practicing conservationists. More often than not it was foresters who were initially responsible for setting aside the areas of forest which all the arguments are now about.

The forests of the south west are one of the very few areas where virtually no vertebrate species have been lost since colonisation. In the Perup there are five species of rare and endangered mammals, animals which are on the rare list because they have all but disappeared from other areas of the south west (Christensen et al. 1985).

Field courses regularly held at the Perup, concentrating on forest ecology, rather than timber production, are helping to develop an understanding amongst the general public of foresters as practicing conservationists.

As a part of this campaign articles on the results of the work have been produced, and the media both newspapers and T.V. have visited the area from time to time. In addition students and other groups have been invited to work in the area.

Field ecology courses at the Perup have been one of the most successful approaches to education. The courses are conducted at regular intervals and are designed to teach basic field ecology methods and to foster an interest in ecology. They are run for Departmental employees and for W.A. school teachers, and have become so popular, we have been unable to keep up with the demand.

## CONCLUSION

The value of the Perup is that it is a forest where the environment, specifically the fauna, are being actively managed using research information as it comes to hand. There are many reserves and parks set aside for fauna and flora conservation, the vast majority of these may be said to be managed for conservation purposes, but few can demonstrate any action on the ground.

Woylies are now so abundant in the Perup that they are being re-located in other areas from where they have dissappeared in recent years.

Reserve management traditionally consists of people management, building access roads, making tracks, creating barbecue and picnic sites, keeping out dogs and cats, putting in firebreaks, fighting fires and so on. Only rarely is there any manipulative management of the environment to achieve defined conservation goals.

In the Perup a set of clear, simple conservation management objectives make it easy to ensure that research is largely problem oriented, directed to the achievement of the management objectives.

The use of prescribed fire in fauna conservation management demonstrates the value of silvicultural methods in nature conservation. A most important aspect is education, without education necessary active management of conservation reserves is not achievable.

The future of the Perup seems bright, it is now to be designated a Forest Park with security of purpose as well as tenure. Enshrined in this designation is the original concept other that forestry activities may be carried out so long as they do not interfere with the primary objective of fauna management, and essential feature of the Perup.

The Perup should remain and develop as a centre for research into forest ecology, and as a practical demonstration of the value and role of silvicultural techniques in nature reserve management.

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