
MANAGEMENT
CONFLICT
IN DRYANDRA FOREST

# MANAGEMENT CONFLICT IN

# DRYANDRA FOREST

JULY 1978

A report by P. Christensen

Photography by T. Leftwich

CONTENTS

ABSTRACT

Under the terms of General Working Plan 86, the concept of Management Priority Areas has been adopted as the most suitable system by which multiple use of the forest resource may be achieved. This concept entails the ranking of use priorities, and when two or more uses are in conflict the priority use will be favoured.

As a first step in the achievement of this the forest is divided into areas in which the dominant and secondary uses are specified and the priority ranking nominated. This has now to some extent been fairly well achieved by the Department. The next stage involves the protection implications. Here essentially four steps are recognized.

1. Establishment of priorities.
2. Examination of their protection requirements.
3. Identification of interactions.
4. Adjusting of protective requirements so that the primary land use is not unduly prejudiced.

(See Sect. 4.4 GWP 86)

Consciously or unconsciously, these steps have all been carried out within what might be termed the major timber production priority areas. Within these areas active management, regeneration and protective burning, takes place as a matter of course. This has been achieved through a sound knowledge of the silviculture of the major timber species together with an extensive knowledge of fire behviour, both of which have been available for a long time. Until recently the basic knowledge necessary to manage the 'new' M.P.A.'s, in which timber is not the priority, has not been available. Consequently in most of these areas we have not yet progressed beyond the first step, that of establishing basic priorities.

This situation need no longer apply, we are now in a position to be able to actively manage areas for priorities other than timber. For example more basic data now exists on some species of fauna than are available for certain of our major timber species. These data may be used to implement management plans designed to optimize the protective requirements for flora and fauna species in some of the more important conservation M.P.A.'s.

There are many flora and fauna M.P.A.'s and ultimately all will require detailed management plans.

However, before we can prepare meaningful management plans for these areas we must recognize and accept the need for a philosophy of forest management which is essentially different from that which has formed the basis of management in the past. There is a need for a real acceptance of forest values other than timber. This may in some cases involve a loss of timber values and expenditure with no obvious immediate or even long term return.

Many forest managers genuinely believe that they already accept such a philosophy and are in fact practicing it. Has this really been put to the test? How do we shape up when a 'minor' forest value which is designated priority status in an S.M.P.A., is threatened and demands action when this compromises precious timber values, 'difficult' fire regimes need to be imposed and money has to be spent with no obvious return?

This report presents such a case which is both challenging and provocative. It introduces a real and urgent management conflict problem of the type which will recur with increasing frequency in the future. It should stimulate thought and perhaps it will cause some of us to re-examine our basic philosophies.

## INTRODUCTION

The importance of Dryandra forest as a wildlife refuge is well known (see Burbidge 1977, Butler 1965 and Serventy 1970). The Environmental Protection Authority also recognizes the conservation value of the area and accepts the Forests Departments role as administrators*; quote: "the area be managed by the Forests Department as though it were a fauna and flora reserve and that if at any time the area is relinquished by the Forests Department it be made a Class A reserve for the purpose of Conservation of Flora and Fauna, vested in the W.A. Wildlife Authority" end quote.

The Forests Department classifies Dryandra as a Management Priority Area and lists it as an area ..... "in which flora and fauna and landscape are the Management Priority," and one in which some portion is likely to be managed as a Forest Park. (F.D. General Working Plan No. 86 of 1977).

The objectives of Management in Dryandra are defined in the Working Plan (1970 - currently under revision) quote: "The overall objective of the plan is to obtain proper management of the forest environment so as to provide maximum public benefit by the protection and multiple use of all available resources which include timber, flora and fauna, recreational and educational facilities". end quote.

This report has been prepared in order to draw attention to a conflict which exists between fauna conservation in Dryandra, and one of the other management objectives, namely timber production.

The woylie (Bettongia penicillata), a species on the rare and endangered list, and until recently common in the central forest block at Dryandra (Burbidge 1977) appears to have suffered a

* See "Conservation Reserves in Western Australia 1975", under system 4 - Wheatbelt. 4.2 Dryandra Forest.

3/....

drastic population decline over the last two to three years. Fluctuations in animal populations are a natural and recurring phenomen. However in Dryandra there may be cause for alarm. The area is a relatively small 'island' of forest, cut off from similar forest types by farmland. Thus fauna populations within the area are comparatively isolated from their counterparts in the main forest block. Hence, in the event of a total population crash, recovery without human interference would be impossible.

A similar decline has occured in the northern sector of the Perup Fauna Priority Area sometime between 1973 and 1975. Evidence obtained during attempts to re-populate this area, together with data from a study on the woylie (Christensen 1977), suggests that two major factors are responsible for the decline of the woylie in Dryandra.

(i) The degeneration of the shrub cover in the woylies feeding and nesting areas. This is largely due to the planting of large areas of mallet on the best sites, and to a lesser extent the prolonged exclusion of fire in some areas and cool spring burns in others.

(ii) A recent upsurge in the population of the introduced european fox (Vulpes vulpes), co-incident with the degeneration of the shrub cover in the area.

The Dryandra Working Plan, refered to above, does not allocate clear priorities to the stated Management objectives. However in view of the statements in G.W.P. No. 86 and by the E.P.A., it is assumed that fauna and flora conservation is the first priority in the area. If this assumption is correct, then two changes are necessary in order to resolve this conflict between management objectives.

(i) The priority of the various Management objectives in Dryandra

4/....

must be clearly defined.

(ii) A new fire management plan for the large central block must be formulated and implemented as soon as possible.

Both of these changes involve matters of policy. The first, a definite commitment to flora and fauna conservation at the expense of timber production; the second, the acceptance of a longer burning rotation and hotter burns.

Because changes in policy are involved this report examines the problem in some detail and presents a number of recommendations.

## BACKGROUND INFORMATION

### Major Site-vegetation Types.

One of the main reasons for the wide variety of fauna in Dryandra is the existence of a wide range of site-vegetation types within the area.

Certain of these site types are critical to the woylies needs for food and shelter and a percentage of them have been converted to mallet plantation. In order to understand the present plight of the woylie it is therefore necessary to have some understanding of the major site-vegetation types of the area.

The vegetation of Dryandra was mapped by the Department in the 1930's. There are four main categories:

1. Plateau Types

a) High lateritic plateau sometimes with sandy soils on it. Woodland of Powder bark, E. accendens, Jarrah E. marginata and Marri E. callophylla. Mixed scrub layer often dominated by Dryandra nobilis.

b) E. drummondii mallee association, dense stands of vegetation with no overstorey tree cover.

2. Slope Types

a) Open forest of Brown Mallet (E. astringens) usually just below breakaways.

b) Powder bark wandoo woodland, usually with sandplain poison (Gastrolobium microcarpum) understorey.

c) Wandoo woodland with sandplain poison understorey.

d) Casuarina (Casuarina heugeliana) thickets on granite outcrops.

3. Valley Types

a) Open wandoo woodland with ground cover of grasses and sedges.

b) Jam (Acacia accuminata) thickets on the heavier soils.

4. Alluvial Types

a) Marri woodland with dense scrub understorey on white sands.

b) Heath association, open heath with no overstorey on white sands.

Photographs of each site-vegetation type are included in Appendix 1.

Detailed calculations from old Departmental maps indicate the area occupied by each site-vegetation type before mallet was planted in the central blocks, (Table 1).

Table 1

Total Area Occupied by the Ten Different Site-vegetation Types in the Central Block at Dryandra.

| | Plateau types | | Slope types | | | | Valley Types | | Alluvial Types | | Not mapped |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | a | b | a | b | c | d | a | b | a | b | |
| Hectares | 2338 | 145 | 2101 | 631 | 2522 | 330 | 1510 | 89 | 15.2 | - | 3530 |
| % of total | 17.5 | 1.1 | 15.7 | 4.7 | 18.9 | 2.5 | 11.3 | 0.7 | 1.1 | - | 26.4 |
| Hectares | 2483 | | 5584 | | | | 1599 | | 152 | | 3530 |
| % of total | 18.7 | | 41.8 | | | | 12 | | 1.1 | | 26.4 |

7/....

Food and Shelter Requirements of the Woylie.

In order to fully appreciate the position of the woylie in Dryandra it is necessary first to outline certain basic facts regarding the species biology.

Woylies occupy large, 20 to 40 hectare, home ranges which include a nesting and a feeding area. They feed primarily on species of underground fungi but they also eat some bulbs, tubers and seed. Feeding areas occur on well drained, fertile, deep, sandy loam soils (Christensen 1977). In Dryandra such soils are found on the slopes and on the sandy alluvial marri association. The trapping and spotlight data of Burbidge (1977) confirms that the woylie feeds on these slopes, and along the edges of the flats.

Butler (1965) refering to the woylie, states; "Thirteen individual sightings were made by spotlight ..... All animals seen were in or on the edge of Brown Mallet country and although tracks and specimens occur in both Wandoo and Powderbark areas, I am of the opinion that it feeds mainly in Mallet".

This observation is most pertinent, particularly at a time, 14 years ago, when many of the mallet areas would have been comparatively young stands, recently planted and still with a dense ground cover of shrub present.

The woylie spends the daylight hours in nests well concealed under dense cover. Each animal has two to four separate nests in use at any one time. Old nests are abandoned and replaced with new ones at the rate of approximately one per month. For this purpose it requires a nesting area of approximately two to ten hectares in extent. This area has to have a dense ground cover suitable for concealment of the nests.

In Dryandra suitable nesting areas occur predominatly on the

8/....

plateau types and to a lesser extent on the slope, but always associated with areas of dense ground cover, (Burbidge 1977, Christensen 1977 and Samson 1971).

The Role of Fire in Relation to Habitat Requirements of the Woylie.

Fire is a factor of major importance to both the food and cover requirements of the woylie.

The precise relationship between fire and the woylies main food item, underground fungi, is not yet clear. However, the fungi are almost certainly mycorrhizal, probably on scrub species, and they are known to have a high nitrogen content.

A healthy vigorous shrub layer with a large component of nitrogen fixing leguminous plants, may therefore be assumed to be a vital factor in maintaining long term high production levels of fungi.

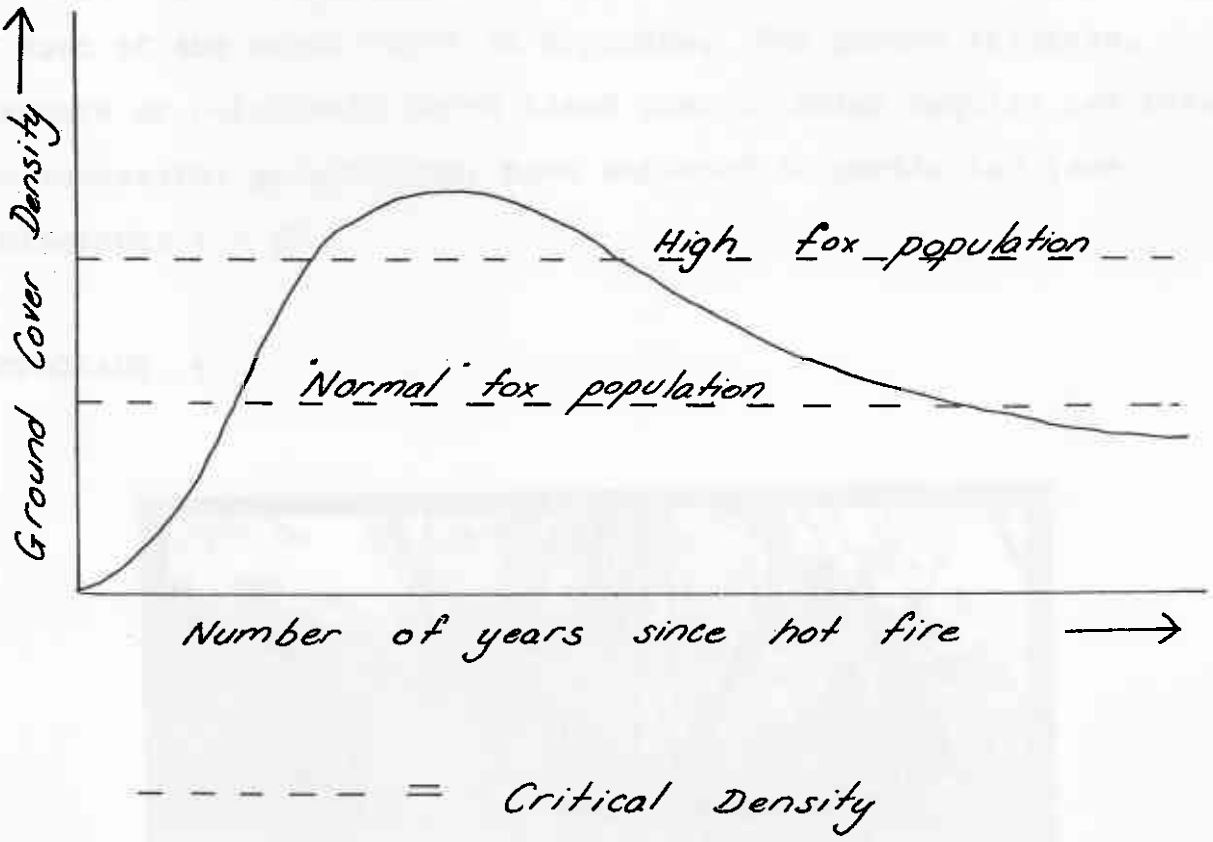
The role of fire, particularly hot fires, in maintaining a vigorous understorey community and in the germination of legumes is well established. In the absence of periodic hot fires the understorey community 'degenerates', nutrients become locked up in litter and wood, and dense stands of legumes disappear.

More pertinent to the present problem is the maintenance of suitable cover, both for nesting and as protection against predators. Since its introduction earlier this century, the european fox has become the woylies main predator. Cover density has become more critical for the woylie, since the fox is a more agile predator than its earlier foe the dingo. Ground cover in Dryandra is provided primarily by thickets of leguminous plants and species of Dryandra which depend on fire for successful regeneration. The postulated relationship between cover density, fire, the woylie and the fox is illustrated in Figure 1.

9/....

FIGURE 1

**Diagramatic representation of the relationship between ground cover density, fire, the fox, and the woylie.**




The critical ground cover density, below which woylie populations cannot exist, becomes higher during times of increased fox populations.

10/....

## THE PRESENT PROBLEM

Basically the problem is that the understorey is now too open to permit the woylie to feed on the slope types and there is insufficient cover to provide sufficient safe nesting areas.

Prolonged fire protection has resulted in the 'degeneration' of much of the scrub cover in Dryandra. The poison thickets, composed of relatively short lived plants, which require hot fires for successful germination, have suffered in particular (see photographs 1 - 3).

PHOTOGRAPH 1

Dense thicket of sandplain poison Gastrolobium microcarpum under wandoo E. wandoo on slope type. These thickets provide good cover for the woylie whilst feeding.

11/....

PHOTOGRAPH 2

'Degenerating' sandplain poison G. microcarpum thickets under off site mallet. Note the high numbers of dead bushes.

PHOTOGRAPH 3

Sandplain poison G. microcarpum Seedlings regenerating after fire. Note poor regeneration in background where most of the small twigs still remain on the old burnt bushes. ie. where fire was coolest.

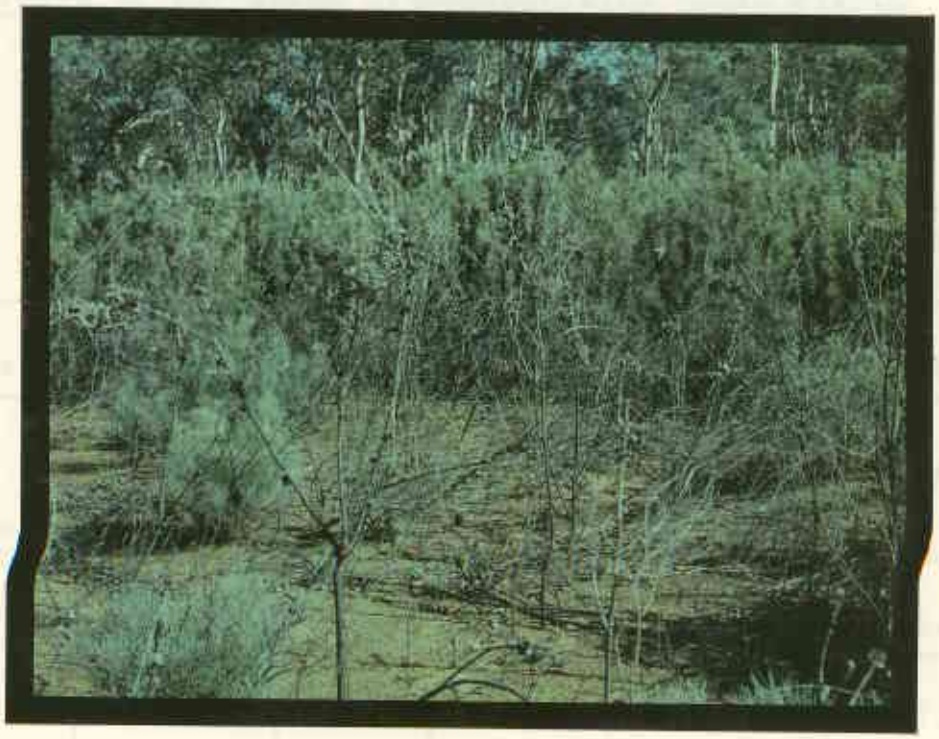
12/....

A number of attempts at cool prescribed burning have aggravated the situation. These fires, often lit in those areas with reasonable cover density as these were the easiest to burn, have further opened up the understorey. Cool spring fires only regenerate rootstock species, thickets of seed species disappear, (see photographs 4 and 5) and the understorey remains very open

PHOTOGRAPH 4

Rootstock species (Hakea cyclocarpa) regenerating two and a half years after cool burn in sandplain poison thicket. Note absence of poison seedlings on burnt area.

PHOTOGRAPH 5



Rootstock species (Banksia sphaerocarpa) regenerating two and a half years after cool burn in D. nobilis thicket. Note absence of Dryandra seedlings on burnt area.

Extensive plantings of brown mallet have created additional problems. Since 1927, a total of 7958 hectares have been planted in Dryandra, 5052 hectares of mallet exist in the Central block, the woylies stronghold. Much of this mallet was planted on the best soils on the slopes, previously the woylies most important feeding grounds. Data obtained from Departmental vegetation maps, indicate that a very high percentage of the woylies feeding and nesting area in the central block, i.e. slope and plateau types, have been planted with mallet, (see Table 2).

14/....

TABLE 2

Areas of Different Site-vegetation Types Within the Central Block planted to Mallet.

| | Plateau types | Slope types | Valley types | Alluvial types | Areas not mapped |
|---|---|---|---|---|---|
| Total hectares | 2483 | 5584 | 1599 | 152 | 3530 |
| Planted with Mallet (hectares) | 1015 | 2658 | 521 | 34 | 792 |
| % of total area | 18.7 | 41.8 | 12 | 1.1 | 26.4 |
| % planted with mallet | 40.9 | 47.6 | 32.6 | 22.4 | 22.4 |

Note the high percentages of Slope Types, the major site-vegetation type in the area, and the woylies main feeding area, planted with mallet.

Initially, the mallet areas continued to provide food since dense thickets, of 'poison' provide good cover for the woylie whilst feeding. There is in fact evidence that during this period there may have been an increase in some species of fauna in Dryandra (Serventy 1954). In recent years however, the thickets have disappeared and most of the mallet plantation area is now open and totally unsuitable as a feeding area, (see photographs 6 and 7). Fire is necessary in order to kill the mature mallet and to return it to an earlier and denser seral stage, and also to regenerate the poison thickets associated with it.

15/....

PHOTOGRAPH 6

Off site mallet showing understorey of sandplain poison in advanced stages of 'degeneration'. Such areas have insufficient cover for the woylie.

PHOTOGRAPH 7

Mallet plantation showing complete absence of understorey. Such areas are of little use to any fauna.

16/....

The basic situation regarding the fox as a predator was outlined earlier. Recently the situation has been aggravated by a sudden increase in fox numbers which probably explains the sudden drastic decline of the woylie over the last few years.

Normally, the fox population in Dryandra is low due to the presence of Sodium fluoracetate in the various common genera of Gastrolobium in the area (Burbidge 1977).

The introduced fox, which has a low tolerance level to the poison compared with the native woylie, suffers secondary poisoning after eating woylies which have fed on poison seeds.

In addition, the use of 10 80 (a sodium fluoracetate base poison) as a rabbit poison, appears to have been a factor of major importance. In the past, many foxes died from secondary poisoning resulting from eating rabbits poisoned with 10 80 by the A.P.B. Recently, because of reduced rabbit populations and the use of other eradication techniques, the poisoning programme has been drastically reduced.

Data supplied by the research section of the A.P.B. from a study of rabbit populations at Cape Naturalist, suggest that the recent increase in fox numbers may be related to reduced 10 80 poisoning for rabbits. The decline in woylie populations in the North Perup and Dryandra may be directly related to this increase in the fox population (see Table 3).

It is noteworthy that in the southern section of the Perup, where the understorey is denser, the woylie population remains high.

The evidence therefore suggests that a no burning policy in the Mallet, coupled with one of cool spring burns in some sections of Dryandra, has resulted in an open understorey over much of the woylies former feeding and nesting area.

17/....

TABLE 3

Data Showing the Correlation Between Reduced 10 80 Rabbit Poisoning, an Increase in the Fox Population and a Decrease in the Woylie Population.

| Cape Naturaliste Data | | | The Woylie - North Perup and Dryandra | | | |
|---|---|---|---|---|---|---|
| | | | Captures | | | Spotlight. |
| Year | Poisoning * | Spotlight. Foxes/ 100 Km. | Nos. | Trap nights | ** % Capture | Woylies/ 2 Km. |
| 1968 | 8066 | Nil | | | | |
| 1969 | 6800 | Nil | | | | |
| 1970 | 4900 | Nil | | | | |
| 1971 | 5500 | | 12(79) | 39(2840) | 30.7(2.8) | 2(1) |
| 1972 | 4600 | | 10 | 41 | 24.3 | .88 |
| 1973 | 2600 | | 53 | 244 | 21.7 | Nil |
| 1974 | 700 | 4.9 | | | | Nil |
| 1975 | 50 | 5.1 | (Nil) | (160) | (Nil) | Nil(Nil) |
| 1976 | 93 | 5.7 | | | | Nil |
| 1977 | | 3.8 | | | | Nil |
| 1978 | | 8.2 | (Nil) | (227) | (Nil) | Nil(Nil) |

Cape Naturaliste data after A.P.B. research, pers. comm.

* packets of 1 shot 10 80 poison laid in the shires of Margaret River, Busselton and Capel.

( ) = Dryandra data after Burbidge 1977.

** Capture percentages are very high due to the type of traps used at the time.

This has left the woylie open to predation, and the recent increase in fox population in the South-west has hastened the species decline.

Guidelines for future habitat management, designed to overcome these problems and to restore the woylies habitat so that the population will increase again, have been prepared. The guidelines

18/....

have been based on the evidence outlined here, detailed data from Christensen (1977), and the report prepared by Burbidge (1977).

19/....

## GUIDELINES FOR HABITAT MANAGEMENT IN DRYANDRA

1.

Work on rehabilitation of the habitat should be confined to the large central block, at least for the present, where interference from outside factors may be expected to be minimal.

2.

Mallet plantations occupy prime woylie feeding areas. In their present state these areas are denied the woylie because of the lack of ground cover. This situation may be remedied by rotational burning of the plantation areas using hot autumn fires to regenerate the poison thickets. Such fires will kill large mallet trees but seedlings should germinate to produce dense young sapling stands which will ensure perpetuation of the mallet, at least on the better sites. Some sort of rotation of the mallet on a 20 to 40 year rotation is visualized.

It is considered that past expenditure on mallet plantations should not be a factor in considering this proposal. The purpose for which the mallet was planted is no longer a valid reason for their existence. However it is recognized that they may have some future commercial value and it is suggested that the 3433 hectares existing within the smaller blocks, outside the main central area, may be kept in a more mature state for timber production.

Some 631 hectares in the central area were natural mallet area prior to planting. It is expected that these areas will regenerate naturally following fire, in addition considerable areas of 'off site' mallet may also regenerate. A reasonable mallet component will thus still be maintained in the central block, albeit at younger successional stages. This would more

20/....

closely resemble the natural situation.

3.

Accepting the above, the mallet plantations become part of the habitat, on a par with the other vegetation types, Wandoo slopes, plateau types, etc., and they receive no special fire protection.

A burning plan can then be prepared for the area, based on a number of fairly large blocks. Burning can be done so as to create a mozaic of burnt blocks of various ages using hot autumn fires on a 20 to 40 year rotation. Summer fires may also be considered if this becomes possible at some future date.

A system of spring burnt protection strips would be necessary on boundaries and along strategic Wandoo flats.

It is considered that there may not be enough time left in which to carry out more detailed research into the problem. Detailed information supporting this hypothesis is already available, (see Christensen 1977). It is therefore suggested that a fire management plan, based on the concepts outlined here, should be prepared and acted upon immediately. Initially action would involve the burning of perhaps no more than one or two large sectors since the rotation envisaged is a long term one.

Monitoring the changes following fire should be carried out concurrently with the programme. In this way the entire central block of Dryandra forest would become a part of a long term experiment. Alterations to the burning plan would be made, if necessary, as data comes to hand.

Two small burns are already planned and sampling has been carried out in these areas. It is suggested that these burns should be incorporated in a single large burn, to be a part of the new burning plan.

21/....

4.

Three additional factors may need consideration;

(i) Re-introduction of the woylie may be necessary if the population has declined too far already. Experimental seeding of woylies is being studied in the Perup area at present, and the results may make such a project feasible.

(ii) A reduction of kangaroo numbers may be necessary to ensure good seedling regeneration of the vegetation. Dryandra has a very large population of kangaroos associated with the adjoining farm areas. These animals will concentrate on fresh burns and are very destructive of young seedlings of many species. This is one reason why burning blocks must be fairly large.

(iii) Baiting foxes using 1080 poison may be carried out in conjunction with the A.P.B. Experimental baiting is being planned for the Northern Perup area at present. If it eventuates, the results of this trial will be applicable to the problems in Dryandra.

## CONCLUSIONS

The woylie population in Dryandra has declined almost to extinction over the last few years. The reason for this appears to be a deterioration in the understorey cover, particularly in the mallet areas, coupled with an increase in fox numbers.

In order to halt this trend and reverse it, a different fire regime is necessary. Hot fires at comparatively long intervals are needed to regenerate and rejuvinate the understorey thickets which provide the woylie with cover in its feeding and nesting areas. Since mallet plantations occupy a large percentage of the site-vegetation types in which the woylie nests and feeds, it is necessary to include these plantations in the burning programme.

One might well argue against any fire management prescription which is largely designed for the benefit of a single species. However on present knowledge, the indications are that a majority of the other species in Dryandra would also benefit from the suggested programme of management.

Thus, because of the importance of Dryandra to the woylie, a rare and endangered species, it is considered advisable to act now, on the best information available. An organized programme of burning such as that envisaged, may be monitored continually, and changes and alterations can be made as necessary as new data comes to hand.

If no action is taken the situation may worsen and become even more difficult to retrieve as the understorey in the Mallet degenerates further and it becomes more difficult to achieve a satisfactory burn.

23/....

## REFERENCES

1. Burbidge, A.A. (1977). The management of Dryandra forest for wildlife. (unpublished report).

2. Butler, W.H. (1965). Report of a survey of the vertebrate fauna of Contine Forestry Reserve, South West Australia. (unpublished report).

3. Christensen, P.E.S. (1977). The biology of Bettongia penicillata Gray 1837 and Macropus eugenii Desmorest 1804, in relation to fire. (Ph. D. Thesis Uni. of W.A.).

4. Sampson, J.C. (1971). The biology of Bettongia penicillata Gray 1837. Ph. D. Thesis Zoo. Dept. Uni. of W.A.

5. Serventy, D.L. (1954). The recent increase in the rarer native mammals, V. Dryandra Forestry Station. West. Aust. Nat. 4. 136-137.

6. Serventy, D.L. (1970). Dryandra. The story of a forest. Publ. A.H. and A.W. Reed.

24/....

APPENDIX 1

## Plateau Types

(a).

Woodland of Powderbark wandoo E. accendens, jarrah E. marginata and marri E. Callophylla with a dense understorey of Dryandra nobilis, on lateritic plateau

(b)

Open mallee association with E. drummondii and dense shrub. Note the absence of overstorey tree canopy.

APPENDIX 1

## Slope Types

(a)

Open forest of Brown mallet E. astringens. Note breakaway in background and the absence of understorey shrub.

(b)

Powder bark wandoo E. accendens woodland note, open understorey

26/....

APPENDIX 1

Slope Types

(c)

Wandoo E. wandoo woodland, note sparse understorey.

(d)

Casuarina C. heugeliana thicket, note the granite outcrop.

27/....

APPENDIX 1

## Valley Types

(a)

Open wandoo E. wandoo woodland with ground cover of grasses and sedges.

(b)

Jam Acacia accuminata thicket.

28/....

APPENDIX 1

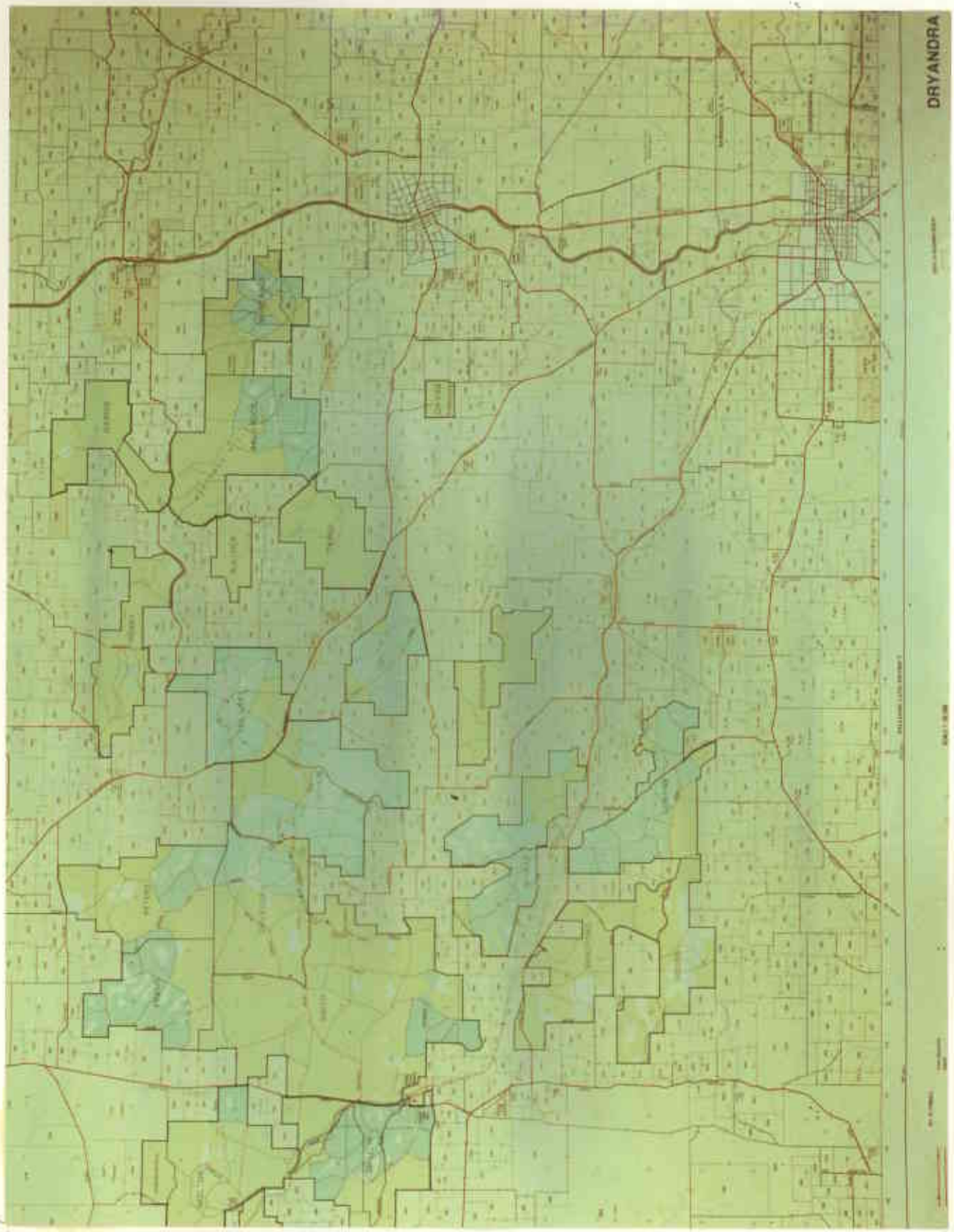
## Alluvial Types

(a)

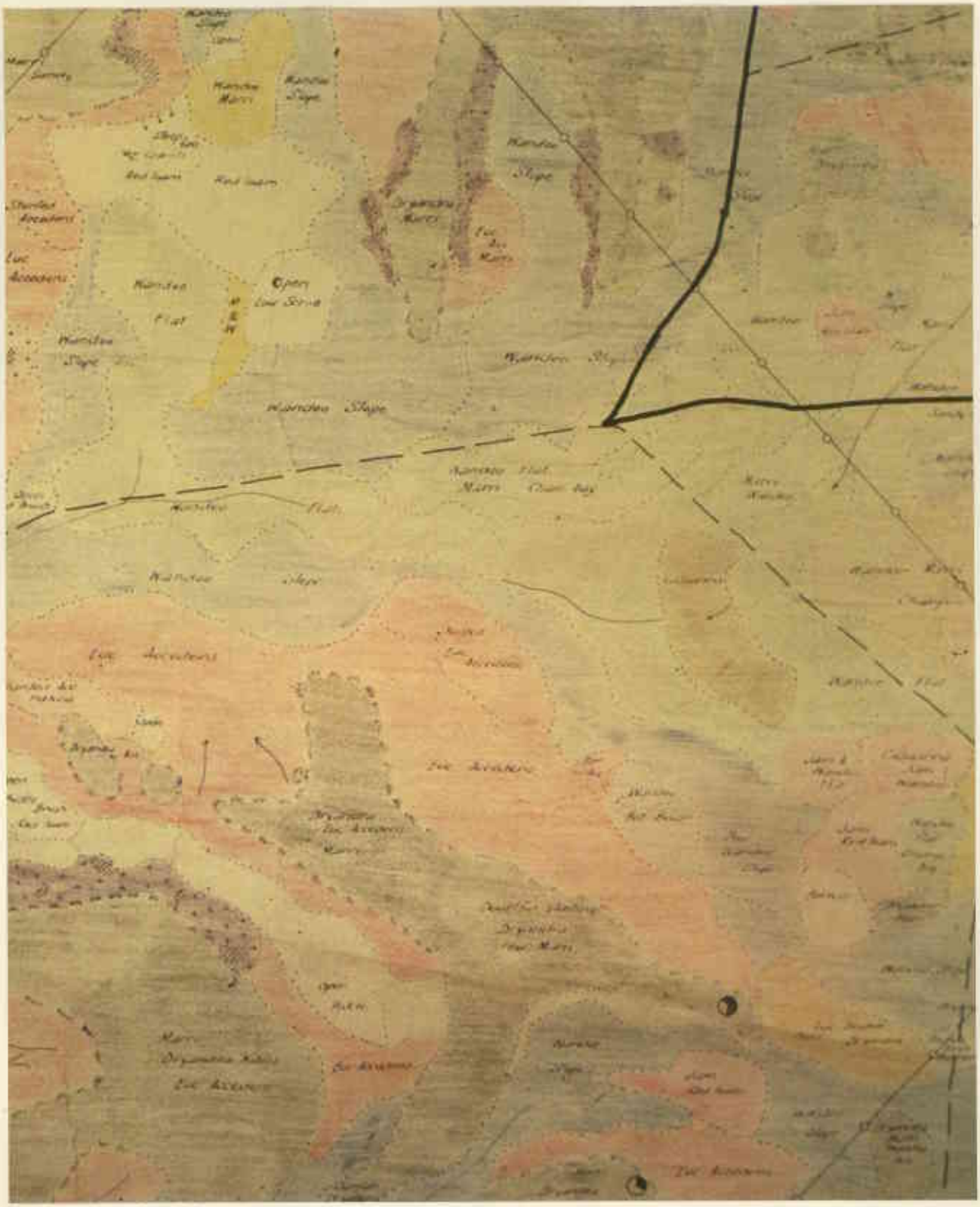
Marri E. callophylla woodland with dense shrub understorey on white sand.

(b)

Open heath association, with no overstorey, on white sand.




Map of Dryandra Forest showing most of the blocks The 'Central Block' refered to in the text includes, Frank, Peters, Lol Grey, Corakin, Smith, Congelin, Skelton and Miles Blocks. Light green areas = Mallet plantations.



Portion of Smith Block showing the major site-vegetation types in different colours. Areas and percentages used in tables and the text were calculated from such maps using an accurate dot grid.