The Concept Of Fauna Priority Areas

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If one studies the fauna of Western Australia it is evident that the various species of animals are not distributed uniformly. Groups of animals characteristic of one place are missing from another. This is because the distribution of animals results from the type of environment available to them, and this is not uniform from place to place. The relationship may be demonstrated by looking at the distribution of animals in relation to climatic factors, for example temperature and rainfall.

In Western Australia there are three main climatic regions; the North-West province with high rainfall during hot summers, the Central province receiving intermittent rainfall in varying amounts, and the South-West province with its regular high rainfall during cold winters.

The south-west region, although the smallest in area, contains a greater diversity of animals, birds and plants than either of the other two regions.

If one examines a land use map of the south-west region it is plain that in most areas there is very little of the original habitat left. Most of the land has been cleared for farming purposes leaving only isolated pockets of native bush. These pockets of otherwise useless land, usually situated on high rocky outcrops or low swampy areas — land too difficult to farm — have been designated as Flora and Fauna Reserves.

The majority of these reserves, especially in the more populated areas are very small and can serve only a limited purpose in conservation of flora and fauna. A land use map shows the extent of the major areas reserved as National Parks and Flora and Fauna Reserves, State Forest and unalienated Crown Land in the south-west.

By far the largest block of land available for both conservation and recreation is the area of State Forest. Although it represents less than one per cent of this State's total area, the forest areas contain at least 45 of the 126 or so species of mammals known to occur in this State.

Some of the richest fauna areas are the low rainfall temperate forest and woodland formation (ie. the wandoo forest) and the drier parts of the sclerophyll forest (i.e. jarrah forest). Much of this type of habitat has been destroyed and turned to pasture. Most of that which still exists occurs within State Forest.

Due to uncertainty of early records it is extremely difficult to judge but it seems that very few, if any, true forest animals have become extinct since settlement of the South-West. A possible exception is the potoroo *Potorous tridactylus*. Although most areas of State Forest have now been logged, the forest is by and large still in its natural state. In some areas of heavy cutting regrowth stands exist and the understorey may have become somewhat denser, but this has only created more diversity. It is therefore largely because the practice of forestry has only caused a minimal disturbance to the habitat that many species of fauna which would otherwise be extinct are still preserved within our forest areas.

State Forests thus occupy a position of some importance with regard to the protection and conservation of our fauna, and full responsibility for its continued welfare therefore rests with the forester.

After much field survey work in our Western Australian forests we have found that the distribution of fauna is such that whilst most areas of State Forest contain some species of fauna there are certain areas of exceptional fauna value. Such areas, especially any that contain species with a restricted distribution may be accorded special status within State Forest as

'Fauna Priority areas'. This means in effect that the welfare of the fauna receives highest priority above that of other forest values, such as timber, amenity, recreation, etc.

That is not to say that no other activities may take place within the area. Rather that production forestry and other activities in the area should take cognizance of the area's prime asset, the fauna, and adjust operations so as to be compatible with this aim. Forestry is a multiple use occupation and just as some areas with outstanding timber or recreational potential may be set aside for special treatment, so areas of outstanding fauna potential should be accorded special status.

A Fauna Priority area should be large because in order for any area to retain the flora and fauna representative of the region it should approximate 20,000 hectares in size (Main & Yadav, 1971).

At present two Fauna Priority areas are in existence within State Forest in W.A. One is the well known Dryandra forest (approx. 20,000 hectares). For a description of the fauna of the area see (Serventy, 1970). The other is a section of dry sclerophyll forest (approx. 40,000 hectares) situated between the Perup and Tone Rivers on the eastern edge of State Forest.

At least 27 species of mammals occur within the area as well as over 100 different species of birds, and it supports what is perhaps the largest population of brush-tailed bettong or woylie *Bettongia penicillata* anywhere. The comparatively rare numbat *Myrmecobius fasciatus* is also common within the area. On one night-time spotlight survey along a seven-mile route 109 animals were recorded. This included 49 ringtail possums, 31 grey kangaroos, 12 brush-tail possums, 7 brush-tail wallabies, 6 woylies, 1 native cat, 1 rabbit and 2 unidentified animals, probably possums.

The area is gently undulating country dissected by numerous small tributaries of the Perup and Tone Rivers. During the summer months there is little surface water available. Along the entire length of the area the Perup and Tone Rivers are bounded by cleared pasture, with access to the river at only three points. The majority of the swamps within the area are taken up by private property.

The predominant vegetation is jarrah forest, occurring on the lateritic ridges varying from poor class open forest in the east, to better class denser forest in the west. The understorey is low and open in the east, often dominated by *Bossiaea ornata*. In the western sector it is denser and *Bossiaea linophylla* is dominant.

On the sandy loams in the lower lying areas wandoo woodlands occur. Blackboy *Xanthorrhoea preissii* flats are common and there are a few granitic outcrops and some cladium *Cladium articulatum* swamps present in the southern sector.

Fire history

The fire history is interesting and shows that the area was burnt frequently in the past. Records dating back as far as 1938 indicate that the area suffered frequent wildfires during the hot dry summer and autumn months. It was common practice for farmers to burn the perimeter of their properties and fires often continued to burn uncontrolled for long periods.

In 1950 an exceptionally severe wildfire swept the entire area leaving the trees scorched and leafless. Prescribed spring burning was started in the late 1950's and the area has been burnt on a five to seven year cycle since then.

The entire area has been logged and this has opened up the canopy considerably and in some areas created a secondary canopy of saplings much appreciated by certain species of birds and also the ringtail possums. The more open canopy together with the burning has encouraged the development of scrub in certain areas. Heartleaf poison *Gastrolobium bilobium* forms dense thickets, especially in some of the lower lying areas, while *Acacia pulchella* forms thickets on the ridges.

These thickets are the refuge of the woylie and the tammar as well as other animals and they may play an important part in the fauna ecology of the area. It is probable that the poison thickets may be partly responsible for the continued existence of the rich fauna population in the area. They have ensured that otherwise suitable forest has not been used extensively for cattle grazing which would have meant a deterioration of the plant communities resulting in disappearance of the fauna.

The two major objectives in creating a fauna priority area are:

1 The conservation and management of the total forest environment with particular reference to the fauna.
2 To use the area as a centre of research aimed at establishing the basic principles for sound fauna management in forest areas.

Research is needed in order to fulfil the first objective of the Fauna Priority area. The primary aim of this research is to determine the fire ecology of the area. Fire is considered, in Western Australia forest ecosystems at least, to be the primary factor responsible for the maintenance of variety and diversity. Furthermore it is a natural management tool which is ideally suited to the management of large areas. The extreme importance of fire in natural Western Australian forest ecosystems has not always been fully appreciated.

Within any community there is a situation of constant change brought about by a multiplicity of factors. Any natural community is in a state of dynamic equilibrium with the physical environment surrounding it. There is continual change and the rate and direction of change is influenced by a multiplicity of factors, the most important of these in the West Australian forest ecosystem is fire.

It is well known that fire occurred naturally prior to the advent of western man on this continent (King 1963, Churchill 1968).

Early records indicate that fires lit by lightning strikes or by aborigines for hunting or other purposes burnt through the forest unchecked during the drier months of the year. Such fires, burning throughout the dry months would often cover vast tracts of country, being stopped only by natural barriers such as a river or by a change in the weather. Day by day changes together with changing weather conditions would result in a variety of burning intensities.

The total effect of this type of fire environment would be a mosaic of burnt and unburnt areas with different scrub communities at all stages of development. Fire is therefore a most important factor in the creation of diversity, and is probably a major factor in the existence of so varied a fauna in what is in reality a relatively uniform forest.

It is not surprising therefore that our research indicates that both the flora and fauna of the forest are adapted to a fire situation. Most species are capable of regenerating from rootstocks after fire and many possess hard protection fruits which shed their seed after fires, e.g. karri *Eucalyptus diversicolor* (Christensen 1971), *Banksia* sp. and others. The *Acacias* and other seed species possess 'hard' seed which requires heat treatment to germinate (see Fig. 1a and 1b). It can be demonstrated that plant communities long unburnt tend to stagnate, losing vigour and becoming poor in species composition. Introduce fire into the system, the community is re-vitalized and the species composition increases (Table 1), see also (Sprecht 1958).

The fauna is also adapted to a fire situation and bird numbers for example, are higher in frequently burned dry sclerophyll jarrah forest. In the wet sclerophyll karri forest bird numbers and species increased sharply after a very hot burn (see Figs. 2a and 2b). Some dry sclerophyll forest species can invade the wet sclerophyll forest for a short period following burning, e.g. the scarlet robin *Petroica multicolor* (see Fig. 3a). Other species decrease in numbers following burning only to increase again later when the seral stage favours them (see Fig. 3b) e.g. the red-winged wren *Malurus elegans*.

Similar data is becoming available for mammals. For example the tammar *Macropus eugenii* lives in thickets at a definite seral stage. The scrub canopy must be closed, but

underneath it must be open enough to allow the tammar good visibility, yet not too open so that a predator can easily pursue it.

The southern bush rat, *Rattus fuscipes*, prefers the earlier seral stages when the undergrowth is dense. The Mardo *Antechinus flavipes* and *Sminthopsis murina* are more abundant in the later seral stages. The woylie *Bettongia penicillata* appears best suited to fairly frequent burning in the wet southern forest areas and to less frequent burns in the drier northern areas where the understorey recovers more slowly. Kangaroos and wallabies thrive on the green fodder emerging soon after burning provided unburnt patches of vegetation remain for daytime refuge.

We may be certain therefore that fire is a necessary part of the ecosystem. What we do not know yet are the frequency, intensity and seasonal effects best suited to the natural system.

In West Australian forests regular prescribed burning is carried out to keep fuel accumulation to a minimum, thereby reducing the frequency of dangerous wildfires. This practice, in many respects, mimics the natural situation, and it appears that most species of both plants and animals are able to cope with it. However, it is not necessarily the ultimate in terms of maximum benefit to all species of fauna. For example the tammar's habitat, previously described, is best suited to periodic very hot fires rather than regular mild ones. This is due to the nature of the plant species that comprise the tammar thickets. In order to germinate and develop the seeds of these species, excessive heat treatment is required, along with the other micro-environmental conditions created by very hot fires. To achieve these conditions burning may have to be done outside of the presently accepted burning season. Such fires may also damage timber values.

This is one of the the major difficulties with fire ecology research. The Fauna Priority area, as an area where the fauna receive first consideration is therefore the ideal situation, it solves the old problem of conflicting values. With a minimum of restrictions regarding damage to timber values the necessary research can be carried out more readily and effectively. Fire management techniques may be developed taking into account primarily the values of the natural environment.

The Fauna Priority area is more than just an area set aside for special fire effects studies. It provides an area where other ecological studies may be done. For example, portions may be protected from fire more easily within such an area. It is ideal for long-term studies and as a demonstration and educational unit it has merit. In time the results of research work may be put into practice in the area so that it is managed with fire to the benefit of all the fauna.

In the past areas of high potential for timber production or recreation have been selected for special treatment to enhance and more fully utilize their values. These areas were demarcated and assessed so as to record their extent and full potential. Research was then carried out to determine the best possible management. Fauna has been added to the list of forest values for which positive and active management should be considered. The Fauna Priority area merely represents a new facet in the practical application of the multiple use concept already practised by Foresters.

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figure 1A **Acacia Pulchella — a dry sclerophyll forest legume adapted to a fire situation**

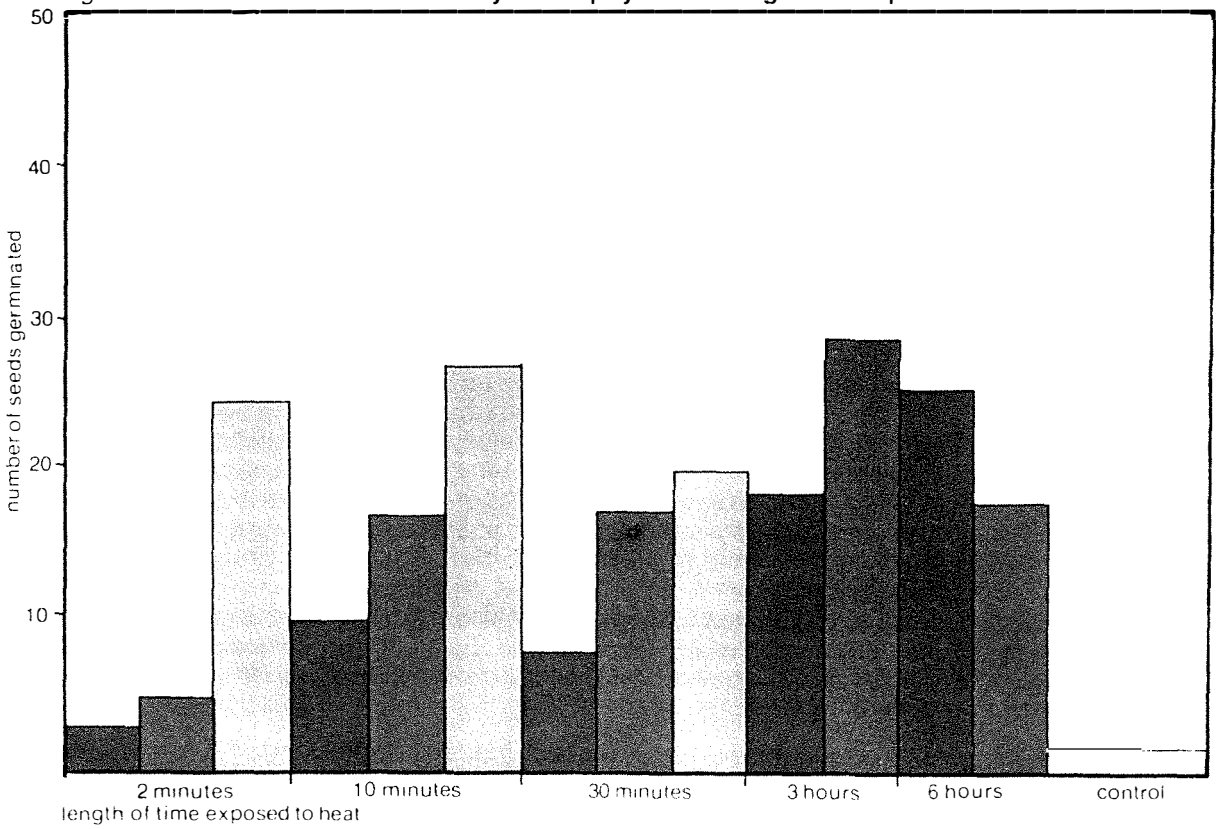


figure 1B **Acacia Cyclops — a sand dune legume not adapted to a fire situation**

figure 2A **Total bird numbers increased after burning**

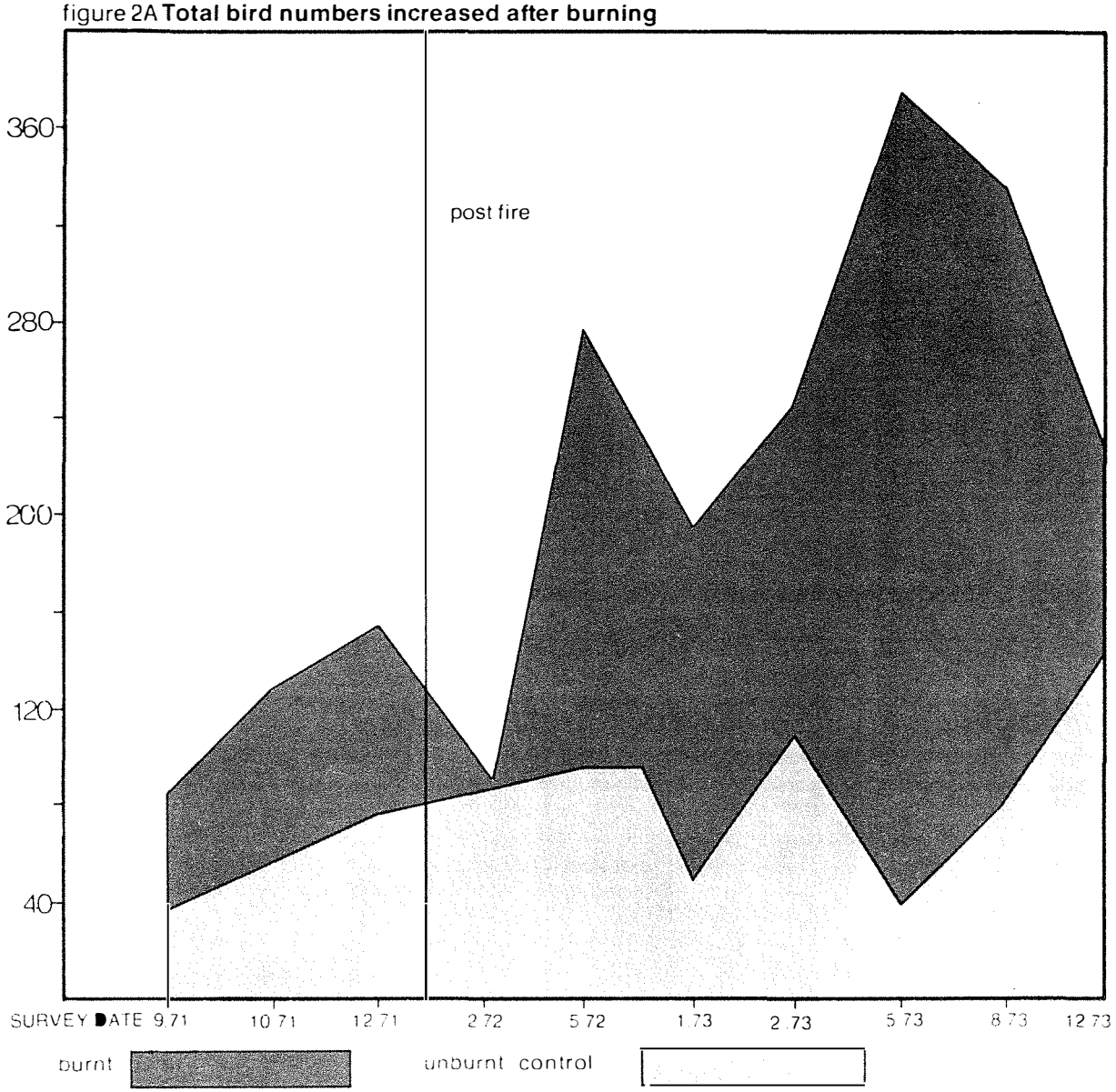


figure 2B **Total number of species increased after burning**

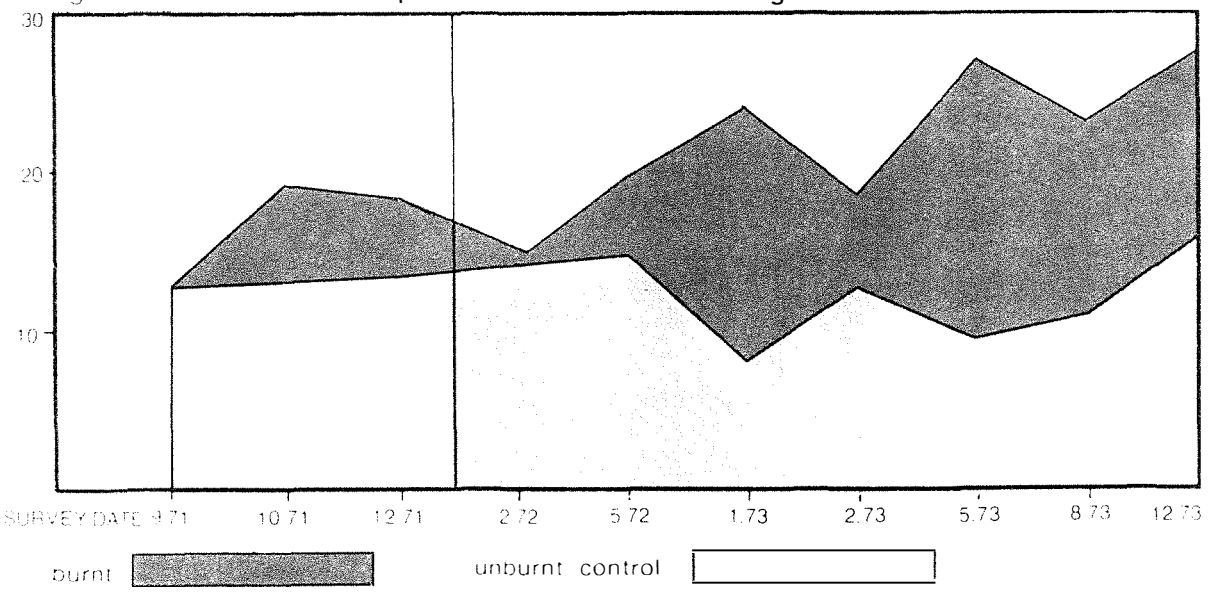


figure 3A **The Scarlet Robin appeared following burning**

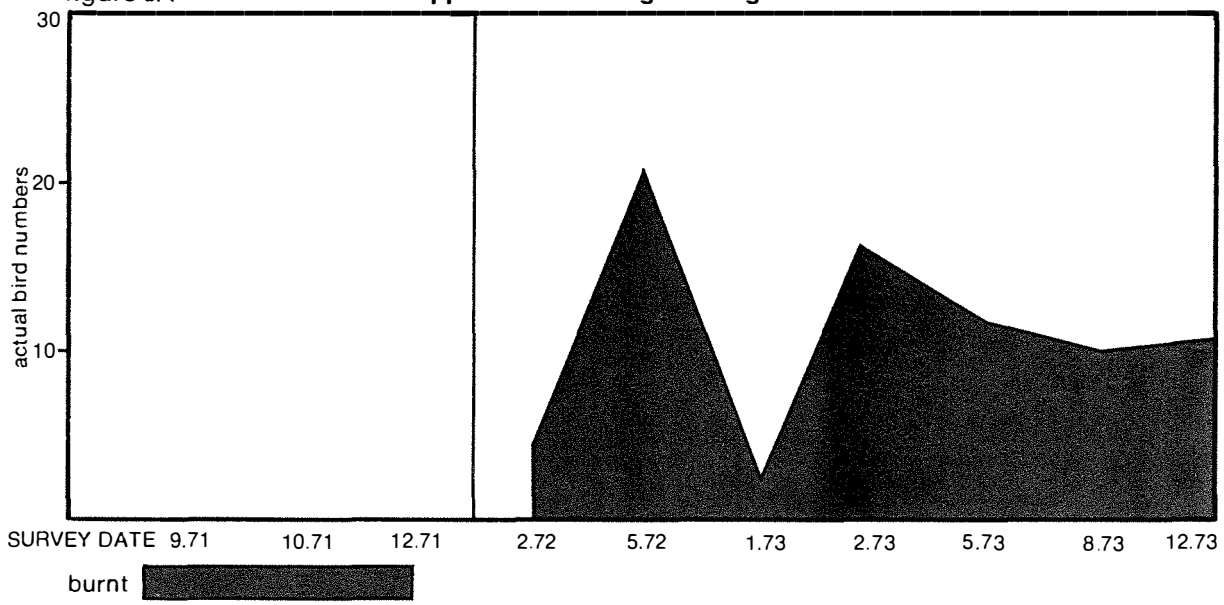
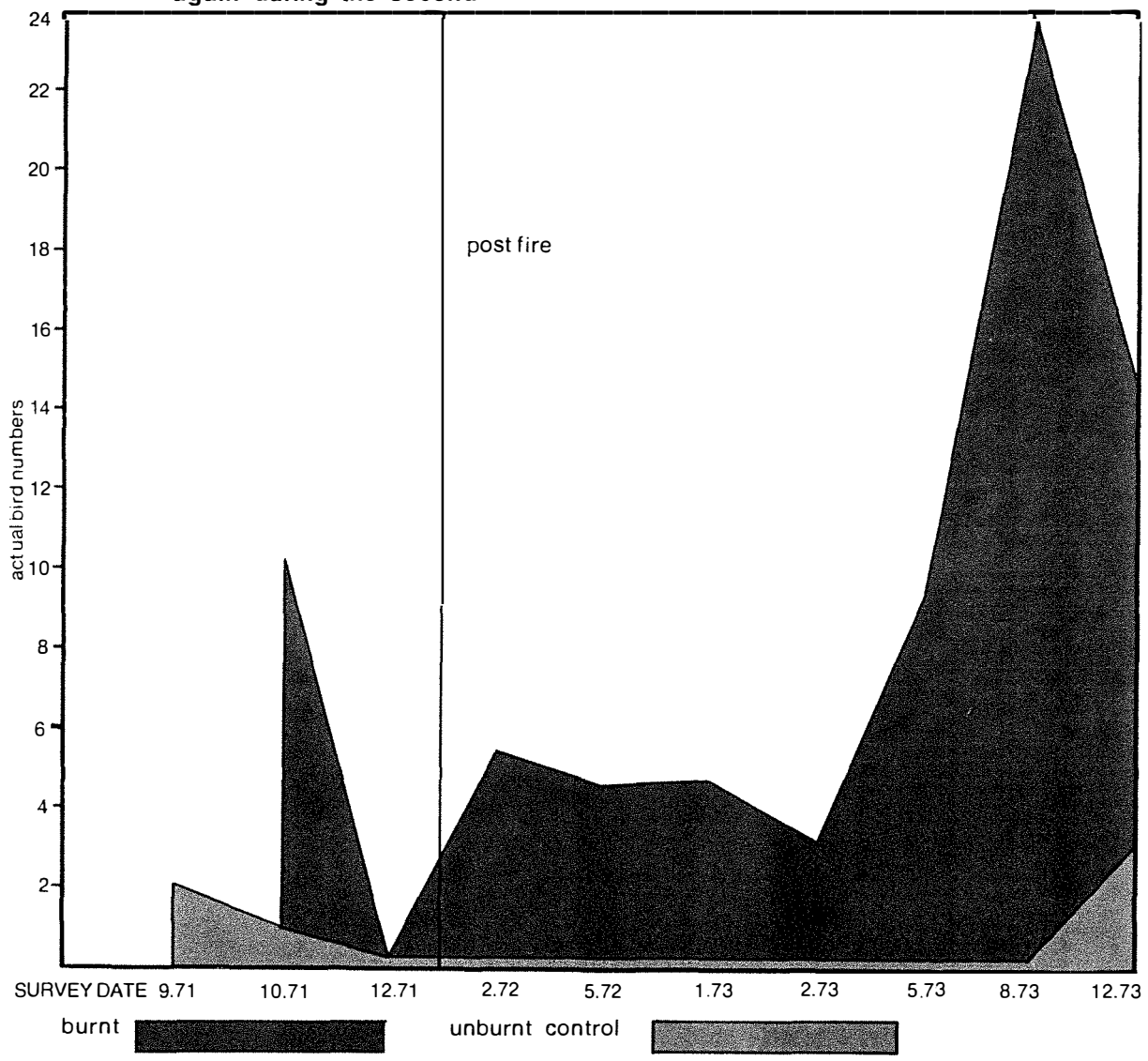


figure 3B **The Red Winged Wren decreased during the first season but increased again during the second**



An increase in plant species numbers occurred following burning in wet sclerophyll forest

plot number	burnt on three year cycle	burnt on three year cycle
	number of species present before second burn	number of species present after second burn
A	39	51
C	34	38
D	34	49
unburnt control	age 3 28 species	age 6 14 species

plot number	burnt on eight year cycle	burnt on eight year cycle
	number of species before first burn	number of species after first burn
A	22	39
C	17	34
D	18	34
unburnt control	age 8 17 species	age 11 7 species

Forests Commission, Victoria, in conjunction with Monash University Environmental Studies A Fire Ecology Seminar

Location: Zoology Lecture Theatre, S7, Monash University, Clayton.

Date: Saturday, 23rd March, 1974.

Theme: Fire in the Forest Environment.

Programme
Opening Address: The Hon. F. J. Granter, Minister of Forests.

Session 1. Session Chairman — Dr. F. R. Moulds, Chairman, Forests Commission, Victoria.

1 Control Burning and Conservation — Compatibility or Conflict? Prof. J. S. Turner.

2 Fire and its Place in Park and Wilderness Management. Dr. Malcolm Gill, C.S.I.R.O. Division of Plant Industry, Canberra.

Session 2. Session Chairman — A. G. McArthur, Director, Forest Research Institute, Canberra.

3 Wildfire in Mountain Forests. B. D. Dexter, Fire Research Officer, Forests Commission, Victoria.

4 The Role and Use of High Intensity Fire in Forest Management. Dr. R. J. Grose, Chief, Division of Forest Management, Forests Commission, Victoria.

5 The Properties and Nature of Smoke from Forest Fires. D. R. Packham, C.S.I.R.O. Division of Applied Chemistry.

Session 3. Session Chairman — Dr. E. H. M. Ealey, Environmental Studies, Monash University.

6 Effects of High Intensity Wildfire on Small Mammals at Nadgee Nature Reserve, N.S.W. Dr. H. Recher, Senior Research Scientist, Australian Museum.

7 Effects of Wildfire on Mammals of the Mixed Species Forest of West Central Victoria. A. Heislers, Fire Research Section, Forests Commission, Victoria.

8 Effects of Burning on Litter Fauna in Eucalypt Forest. B. Leonard. R.M.I.T. Biological Department.

Session 4. Session Chairman — Dr. D. Dorwood, Department of Zoology, Monash University.

9 Some Effects Of Prescribed Burning on Jarrah Forest Birds. P. Kimber, Forests Department, Western Australia.

10 Effects of Prescribed Burning on Birds of the Mixed Species Forests of West Central Victoria. R. Cowley, Research Officer, Land Conservation Council, Victoria.

11 The Concept of Fauna Priority Areas. P. Christensen, Forests Department, Western Australia.

Closing Address. Dr. E. H. M. Ealey.

Third

FIRE ECOLOGY SYMPOSIUM

PROCEEDINGS