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SURVIVAL OF SOME SEMI-ARID SHRUBS FOLLOWING WILDFIRE

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Introduction

In the summer of 1974-75 wildfires burnt 3.75 million ha of rangeland country in western New South Wales. Most of this was in woodland vegetation - mallee, belah or bimble box, where many of the shrubs form an inedible, undesirable component. In the bimble box and belah communities the density of shrubs has increased markedly in recent years and methods of control are now actively sought. One reason suggested for the increase in shrub density is a decreased fire incidence, so that it was of considerable interest to record the performance of these shrubs after a natural fire.

Study Sites and Methods

The study sites were selected within one or two weeks of the fires, mainly in December 1974 and January 1975, but also including isolated fires in April and August 1975. They covered a range of vegetation types and a wide geographical area from near Balranald in the south to Louth and Cobar in the north. Sites were chosen to give a variety of plant species, plant size and fire intensity. Within a defined area (300 to 1500 m^2) at each location, each shrub and tree was marked by a numbered metal tag and records taken of species, height, degree of burn, regrowth (if any) and the occurrence of seedlings. Similar observations were recorded on nearby unburnt areas, but these were not always available. Observations of shrub survival were made in May 1975 and February - March 1976.

Results

As may be expected only a few shrubs died in the control areas and these results are not included in this paper. Also excluded are results for all shrubs that retained any green leaves after the fires, as these, regardless of species, were similar to those of the controls.

Overall there was considerable difference between species in their recovery after fire. The order was white cypress pine (*Callitris columellaris*) 2% recovery, mulga (*Acacia aneura*) 16%, narrow-leaved hopbush (*Dodonaea attenuata*) 25%, punty (*Cassia eremophila* vars.) 40%, yarran (*Acacia homalophylla*) 87%, budda (*Eremophila mitchellii*) and turpentine (*E. sturtii*) both 89%.

Generally, the degree of burning had little effect on survival although the chances of recovery of the more susceptible shrubs, e.g. hop bush, were less when the plants were burnt down to the butt. However, this only occurred in isolated instances, when the shrub was adjacent to a source of prolonged heat, such as a burning log. The majority of the plants totally affected by fire fell into one of three categories - (1) all leaves scorched, (2) some leaves scorched, the rest burnt, (3) all leaves plus branchlets burnt.

Data are presented in Table 1 for three of the more common shrubs, turpentine, punty and hop bush, showing the survival of plants in two ranges of burnt/scorched ratio and three size classes. Results from plants in all three categories listed above are included.

In these observations the size of the plant also had little bearing on recovery, provided the plants were not seedlings. Regrowth occurred from the base of small (< 0-5 m high) plants to the same degree as in much larger plants, but the larger bushes had more sprouting along the branches, particularly in turpentine. On some occasions there was subsequent death of plants that had sprouted after the fire.

Seedling shrubs, which would have been completely burnt, were missed by these post-burn observations. At one site where the fire had been stopped at a break and an adequate control was available, counts of turpentine seedlings on transects covering 1470 m^2 which had emerged before the fire (approximately 1 yr old) showed a density of 21 plants/100 m^2 on the unburnt area, but only 8 plants/100 m^2 on the burnt area. This is a much higher proportion of deaths than for the mature bushes of this species.

Large differences in survival were recorded between sites, particularly with *Cassia* and *Dodonaea*. These differences could not be explained in terms of plant size or degree of burn.

Post-fire emergence of seedlings of both punty and hop bush was recorded. The incidence of these seedlings was erratic, varying between sites and across a site. The maximum density recorded was 4 plants/m^2 for hop bush, but the subsequent survival of these has not been followed.

Discussion

These results show that fire has a marked effect on the numbers of some woody species, notably white cypress pine, mulga, punty and hop bush, regardless of size. The use of fire to control punty and hop bush is possible, although further investigation is needed to determine the conditions that favour high mortality and the post-burn management that is needed to control seedling regeneration. This could involve particular grazing treatments, or further burning before the seedlings reach maturity. Other shrubs, notably turpentine and budda, are more fire resistant and burning would appear to be of little value in controlling established stands. Further investigation is needed of the effects of repeated fires as these may reduce the vigour of these shrubs and reduce their competitiveness with grasses. The results did

suggest that burning was more successful in reducing young seedlings of these shrubs. Unusually wet conditions are required for germination and establishment of these species, so that whenever they occur grass growth is good and suitable for subsequent burning. Hence burning may also have a place here for controlling the spread of shrubs such as turpentine and budda.

Table 1. Effect of degree of fire damage and of plant size on survival of three shrub species

	Degree of burn (burnt/scorched ratio)				Plant size					
	0/100 - 50/50		51/49 - 100/0		< 0.5 m		0.5 - 1.0 m		> 1.0 m	
	No. plants recorded	Mean survival (%)	No. plants recorded	Mean survival (%)	No. plants recorded	Mean survival (%)	No. plants recorded	Mean survival (%)	No. plants recorded	Mean survival (%)
Turpentine	342	90 ± 3*	234	82 ± 6	57	78 ± 9	301	94 ± 3	267	88 ± 5
Punty	211	36 ± 8	111	41 ± 18	150	48 ± 21	69	26 ± 10	170	47 ± 10
Hop bush	314	29 ± 6	257	26 ± 8	162	28 ± 9	175	40 ± 7	259	27 ± 7

* Standard error between sites