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FIRE IN MULGA COMMUNITIES OF EASTERN RANGELANDS - FRIEND OR FOE?

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INTRODUCTION

Fire occurs infrequently in Australia's most extensive plant community, the mulga lands (see map 3, Moore 1970). Under present management, the average interval between fires would be in the order of 20 to 50 years, that is, a once in a lifetime event for a manager. Before white settlement, fires occurred more frequently because of greater fuel buildup and deliberate lighting of fires by Aborigines. The community and its plant species have therefore evolved with fire as a major environmental factor shaping its characteristics (Hodgkinson and Griffin 1981).

Currently the value of fire, both wild and controlled, in mulga lands is a controversial issue. Everyone accepts that uncontrolled fires are undesirable because they may destroy stock, fences, buildings and forage, but are there any benefits accruing from fire in terms of enhanced carrying capacity resulting from a desirable change in community composition? In the mulga lands of N.S.W. and Queensland our experience leads us to advocate that there are benefits from controlled burning areas where shrubs have become or are likely to become a problem.

Endemic shrub species (belonging to the genera Acacia, Cassia, Dodonaea and Eremophila) have increased substantially in many parts of the eastern mulga lands to the stage of depressing forage production and making stock management very difficult. This reduction in grazing value of the land has been insidious but in some areas pronounced shrub increases occurred after the wet periods of the mid-1950s and 1970s. Interest in fire as a management for shrub control began in the late 1960s (Moore 1969, 1973) and further developed when the results of the 1974/75 wildfires were assessed (Walker and Green 1979; Wilson and Mulham 1979).

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LESSONS FROM THE 1974/75 WILDFIRES

During the summer of 1974/75 wildfires were rampant through the arid zone. Total area burned has been conservatively estimated at 120 million hectares with 5 million hectares being burnt in western N.S.W. Much of the area burnt were mulga lands. As an example of the effects of these wildfires we consider "Tundulya" station in western N.S.W. between Cobar and Louth.

The shrub problem on this station is acute. Shrubs regenerated after the wildfire of 1921 (which burnt a large area of western N.S.W.) and a further dramatic increase was experienced following the wet period 1950-56 (Anon. 1969). Many areas today are so shrub dominated that there is insufficient grass to carry fire except after very wet periods. The problem species are mulga (Acacia aneura), punty (Cassia nemophila), narrow-leaf hopbush (Dodonaea attenuata) and turpentine (Eremophila sturtii).

Another exceptionally wet period occurred during 1973/74 and there was excellent growth of annual and perennial grasses on most of the property. Common grasses were woollybutt (Eragrostis eriopoda), kerosene grass (Aristida contorta), no.9 wiregrass (A. jerichoensis) and speargrass (Stipa variabilis). By the late spring of 1974 the grass cover was up to 1 m high and yielding 14 000 kg/ha in many places.

Lightning started a wildfire several properties away on December 16, 1974 in the late afternoon. Every effort was made to halt the wildfire by local volunteer bush fire brigades because of likely damage to fences, stock and buildings. However several years later it became apparent to the owner and neighbouring managers that a high proportion of the shrubs over wide areas had been killed by the fire. However, in some restricted areas regeneration of the shrub species had been high.

The general experience of managers in other areas of the mulga lands was also similar with fire causing a general decrease in adult shrub populations whilst causing increased regeneration from seed and by suckering in some localities. The reasons for these differential effects are the subject of current research.

RESULTS FROM CSIRO EXPERIMENTAL BURNS

Over the last decade CSIRO has conducted a number of experimental burns in mulga lands in western N.S.W. The short term objective has been to study the effect of a single fire on the vegetation. In the longer term (10-15 years) the study of the effect of repeated fires (at different frequencies) is planned.

(a) The Efficacy of Fire in Killing Shrubs

The first attempt to study fire effects commenced in 1968 when an area of pulled mulga was fenced on "Tundulya" (between Cobar and Louth). The objective of this study was to burn the area whenever possible and record the effects on both the shrubs and the grass. To date there have been three occasions when sufficient fuel (mainly speargrass, Stipa variabilis and wiregrass, Aristida spp.) has built up to carry fire (1970, 1975 and 1977). Although two of the fires were quite patchy the result to date has been very encouraging. Overall the height and density of shrubs has been reduced at the site when compared with the unburnt surrounding areas. The density of all shrub species has been reduced except for emu-bush (Eremophila longifolia), which has suckered from the roots. Such an effect would not occur where stock were present as it is palatable and well controlled by stock.

More recently, further sites have been established; on "Tundulya", "Euroli" (between Wanaaring and the N.S.W./Qld border) and "Nil Desperandum" (near Yantabulla) where woollybutt (Eragrostis eriopoda) and wiregrass provided most of the fuel.

Single burns have killed from 45 to 80% of narrow-leaf hopbush and 80 to 90% of mulga (Fig. 1). Included in Fig. 1 is the proportion of shrubs that died in areas set aside as controls which were not burnt. Shrub death by natural causes was quite high (up to 30% in the case of mulga). This mortality mainly occurred amongst the recently established seedlings. Natural mortality was not high enough to prevent the shrub problem worsening at these sites during the last three years because the remaining shrubs have increased in size.

There was a strong tendency for young and old shrubs to be more susceptible to fire than middle aged shrubs (see Fig. 2 where age is assumed to be equivalent to height). At "Tundulya", where drought stress

was greater, this characteristic was not in evidence and this is an indication that soil moisture conditions both before and after any fire are likely to greatly affect the response of the shrubs.

(b) Fire-promoted germination of seed

When good rains follow a fire more shrub seedlings may appear on burnt areas than where it was unburnt. Such an occurrence resulted from summer rains in 1980-81 after the experimental burns at "Euroli" and "Nil Desperandum" in 1979 more than a year beforehand. Such occurrences are not known to be widespread and therefore the problem is minor, but a second burn as soon as possible would be advisable on affected areas.

(c) Resistance of grasses to fire

The 10 year study of the effect of three fires at "Tundulya" has provided a good opportunity to study changes in the density of a range of grass species that occur at the site. The short lived perennials, kerosene grass (Aristida contorta), speargrass, and purple love grass (Eragrostis lacunaria) have fluctuated in numbers but with no apparent long term change. New populations of all species have been regularly born. The long-lived wiregrass (Aristida jerichoensis var. subspinulifera), woollybutt, bandicoot grass (Monachather paradoxa) and finger panic grass (Digitaria coenicola) have generally survived the fires well. Droughts (especially during 1978-81) resulted in death of many plants and appear to be a greater cause of death of grass plants than fire damage.

The same may be concluded from studies of individual grass plants at "Euroli" and "Nil Desperandum". Most woollybutt plants survived the fires (Fig. 1) but they were always reduced in basal area with only one or a few tillers of the many original tillers being still alive. These surviving tillers grow back to their former stature when good rains occur. In contrast all the wiregrasses died on both burnt and unburnt sites but considerable germination from seed occurred after the summer rains in 1980-81.

Kangaroo grazing after the large scale paddock burns in 1979 totally suppressed the regrowth of woollybutt and the seedlings of bandicoot grass and wiregrass, which amounted to approximately 200 kg/ha on protected areas. The effects of such heavy grazing are bound to affect soil erosion, the subsequent grazing value of the area and the possibilities of follow-up

burns. Control of kangaroo grazing will probably be a vital part of any property fire management in the future.

CONCLUSIONS

The results of wildfires and controlled burns clearly indicate that fire is effective in reducing shrubs in mulga lands, whilst the grasses have shown their ability to recover after a fire. However the precise effect of a fire on shrubs and grasses in any particular area cannot be forecast because of two factors which are not under the control of the land-manager, namely post-burn rainfall and grazing by wildlife. It is the differential experience of these two factors, which is responsible for the disparity in opinions on whether fire is a useful management tool or not.

Opportunities to burn in the mulga lands are few and far between and only follow extremely wet periods. By the time the grass is dry enough to burn it is of extremely low grazing quality. Despite the hazards associated with uncontrolled grazing by wildlife and the possibility of a drought after the burn, it seems desirable for managers to burn shrub-invaded areas when they can, particularly if very young shrubs are present (which may not be apparent for some years after their establishment). Current studies on the interaction of the effects of rain and fire on shrubs and grasses and the movement of kangaroos to burnt areas should help to improve managerial control in the future.

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Fig. 1. Mortality and survival of dominant shrubs and grasses after controlled burns at four sites. Mortality of unburnt plants (controls) is also indicated on the pie diagrams.

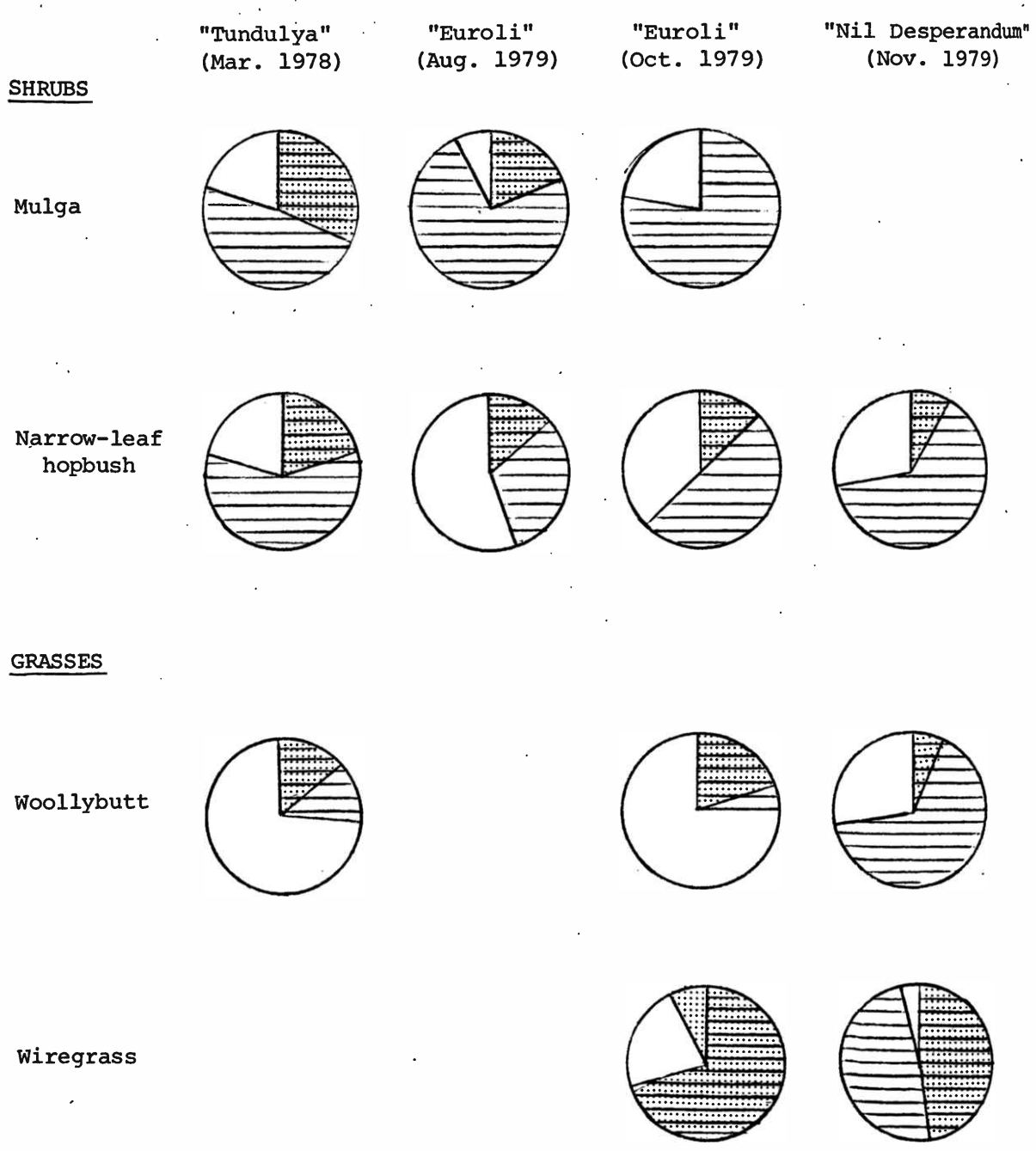
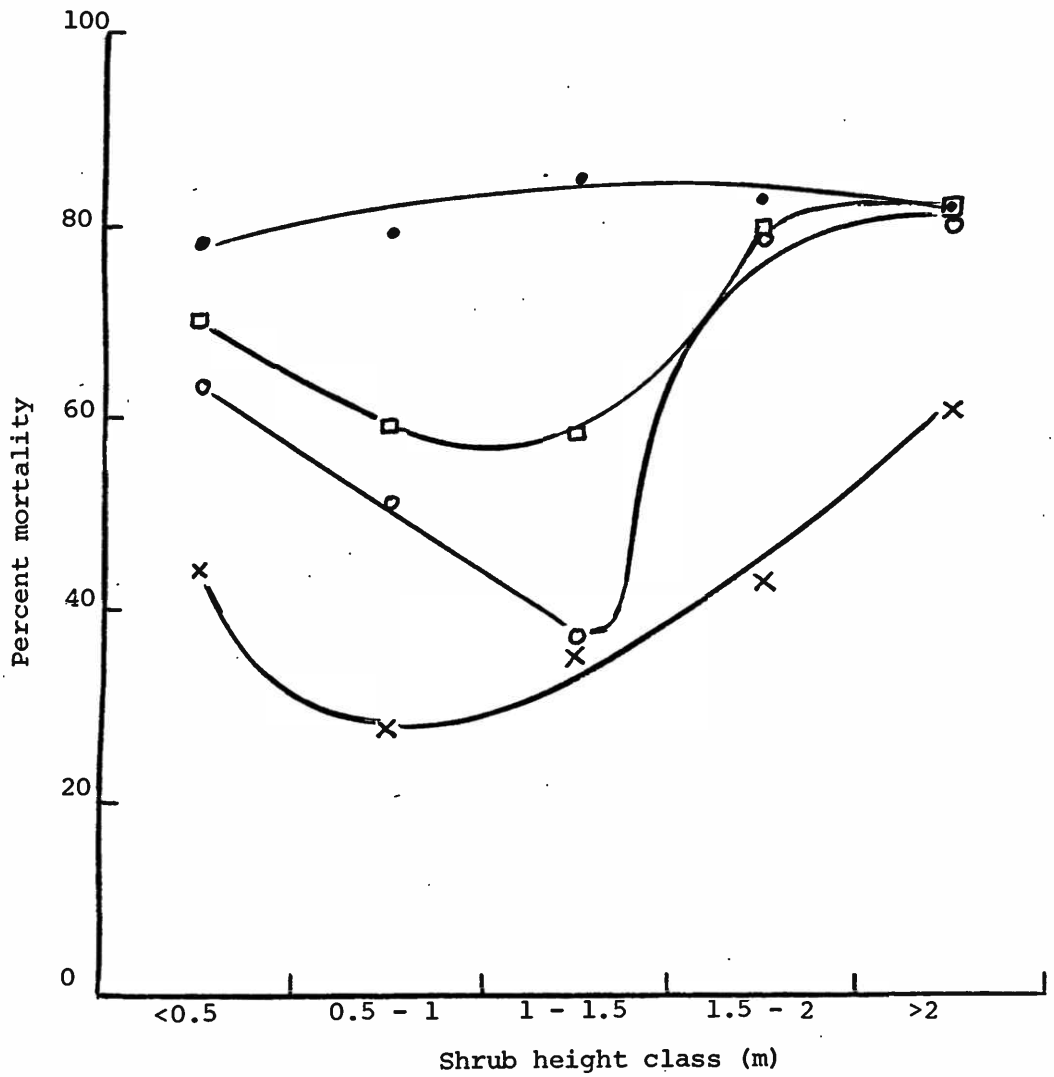


Fig. 2. Mortality of narrow-leaf hopbush shrubs of different heights after controlled burns at four sites.



Legend

- "Tundulya" (March 1978)
- "Euroli" (August 1979)
- "Euroli" (October 1979)
- "Nil Desperandum" (November 1979)