GRAZING, BURNING AND FERTILIZING EFFECTS ON THE REGROWTH OF SOME WOODY SPECIES IN CLEARED OPEN FOREST IN SOUTH-EAST QUEENSLAND

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ABSTRACT

In an area of grassy open forest vegetation in south-east Queensland which had been cleared of trees by ringbarking more than 50 years previously, grazing had a primary and annual burning a secondary effect on controlling woody regrowth of Eucalyptus maculata, E. intermedia *and* Acacia cunninghamii.

INTRODUCTION

Walker (unpublished), as a result of a survey of the extent and nature of the problems associated with woody regrowth in pastoral areas of eastern Queensland, has pointed to the fact that very little quantitative information is available even though regrowth is recognised as a problem of some magnitude in certain areas.

The observations reported here resulted from the unforeseen occurrence of regrowth of woody species on some of the treatments of an experiment set up to investigate the botanical changes in the herbaceous vegetation resulting from the effects of fire, fertilizer and grazing on native grassland dominated by black spear grass (*Heteropogon contortus*) and kangaroo grass (*Themeda australis*) at Gigoomgan (Tothill unpublished). Though meagre, the results are presented because they contribute to the small body of information available on the factors involved in regrowth of woody species, and because they pertain to some effects of burning native pastures (Tothill 1971).

MATERIALS AND METHOD

The study area was located on the property "Gigoomgan" approximately 30 miles south-west of Maryborough in south-east Queensland. The topography is gently rolling, the original vegetation cover of which ranged from grassy open forest to grassy woodland. In this area most of the timber had been cleared by ringbarking more than 50 years ago although small areas of trees had been left for shade. The tops of the knolls originally supported an open forest of mainly *Eucalyptus maculata* (spotted gum), *E. intermedia* (bloodwood), *E. crebra* (narrow-leaved ironbark) and *Acacia cunninghamii* (black wattle), the middle slopes a woodland of *E. melanophloia* (silver-leaved ironbark) and the drainage lines a woodland of scattered large *E. tereticornis* (blue gum). The experiment was sited in the first of these structural formations.

The experiment was set up as a randomised block with split plots in two replicates. The main treatments of six acres each were grazing and no grazing. These were split into six one-acre sub-plots to accommodate presence and absence of burning and these in turn were further split into half-acre plots for fertilizer treatments.

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The grazed area was open to uncontrolled grazing by steers running in the surrounding paddock. Burning was done annually in spring following at least one inch of rain. The fertilizer treatment was applied annually in spring after burning, and consisted of 300 lb N per acre as urea plus molybdenized superphosphate at 448 lb/ac in the first two years and normal superphosphate at 112 lb/ac subsequently. It was broadcast through the fertilizer box of a chisel plough seeder and in so doing occasionally regrowth stems were broken off rather than simply bent by the operation. Regrowth estimates were made each May over a four year period, commencing in 1965, by counting the individual saplings or clumps of stems (in the case of more than one stem arising from a single lignotuber or woody tissue mass) which had attained the height of 3 feet or more. This height was chosen because the stems were then clearly visible above the grass layer and, once having reached 3 feet, were the more likely to grow to adult proportions. No count was made prior to the application of the experimental treatments (1964) but there was no woody regrowth visible above the grass layer at that time, although from the other observations being carried out it was known that there were browsed woody plants scattered over the entire area.

RESULTS

The results are shown in Table 1. The species present are *E. maculata* (the most common), *A. cunninghamii* and *E. intermedia*, but because of the low frequency, the numbers of each of these were pooled for each treatment. Furthermore, the significance of the results rests largely on the presence or absence of woody regrowth in relation to the treatments. Attention to relative differences of individual species was considered of little or no relevance here. All of the regrowth represented regeneration from lignotubers or woody tissue masses which were already present at the commencement of the experiment. This regrowth must have been kept in check by the pastoral management system for at least 50 years.

TABLE 1

The effects of grazing, burning and fertilizing on regrowth of woody species at Gigoomgan. Values are means of numbers of stems or clumps taller than 3 ft per half acre plot. There were no stems taller than 3 ft at the commencement of the experiment

	1965	1966	1967	1968
Main Effects				
Ungrazed	16.2	12.9	26.3	27.5
Grazed	2.5	2.3	4.2*	2.0*
Unburnt	6.8	6.9	13.2	10.2
Burnt	5.1	4.8	9.1*	5.9*
Unfertilized	5.0	6.8	11.0	9.3
Fertilized	6.5	4.5*	9.8	5.8*
Interactions**				
Ungrazed				
Unburnt	25.1	15.5	40.7	45.7
Burnt	9.6*	11.8	21.4*	20.9*
Grazed				
Unfertilized	2.1	2.8	4.2	3.1
Fertilized	2.8	1.9	3.9	1.3*

** Due to the low number of trees in the grazed compared with the ungrazed treatments, the normal tests for interaction (additive or proportional) were considered of little value. Thus only these partial interactions were examined.

* represents significance at the 5% level.

Statistical analyses were carried out on values which had been transformed by $\log_{10}$.

There were very large differences between the grazing treatments in all years, but because significant differences are difficult to detect in the main plot treatments of a split plot design, significance was reached in only two of the four years. It is obvious, however, that as long as the treatments are grazed, regrowth of woody species is no problem. Burning caused a significant reduction in woody regrowth in 1967 and 1968 while fertilizing did so in 1966 and 1968.

In examining these effects in the absence of grazing, burning had a significant effect in 1965, 1967 and 1968, but fertilizing had no effect. Thus burning appears to be more effective in reducing woody regrowth when there is more fuel available, as in an ungrazed system. Fertilizing had a significant effect in checking woody regrowth in grazed areas in 1968. Ungrazed treatments generally showed an accumulation of regrowth over the four years of observations.

DISCUSSION

There is clear evidence from these results of the very significant role that grazing plays in the suppression of regrowth from several woody species in this type of open forest/woodland of this sub-coastal environment. Though also significant, the effect of burning is very much secondary to grazing in suppressing regrowth. However, this effect may be enhanced by increasing the body of fuel. Normally burning and grazing are confounded and it is not easy to separate their respective effects. Fertilizing appears only to have any effect where it may enhance the grazing effect.

The evidence supports the general conclusions of Walker (unpublished) that the regrowth problem is relatively unimportant on the open forests and woodlands where spear grass is the dominant grass species. He suggests that the relatively higher rainfall of the area allows a heavier grazing pressure to be maintained than on drier areas further inland where regrowth is a significant problem. This area also allows for a greater measure of pasture improvement which also leads to higher grazing pressure. Even so, there is considerable fluctuation between years in the amount of rainfall received and hence in the amount of grass which grows. Since stock numbers are not adjusted much between years, there is obviously a fluctuation in the grazing pressure. If this results in releasing the suppression of regrowth it may be compensated for by the greater body of fuel and the more intense fire of the succeeding spring burn, or it may simply result in occasional or cyclic occurrences of regrowth which are noted in this region. Once the saplings of eucalyptus have grown beyond the reach of the animals they become very difficult to kill by fire alone and a considerable accumulation of fuel is necessary to achieve a hot enough fire. Even so, most eucalyptus species, through their capacity to resprout from epicormic buds or lignotubers, are difficult to kill by burning alone. In most situations, where the ground is not cultivated, there will always be a fairly large reserve of lignotubers awaiting their opportunity to become established trees. For much of this area the normal course of pasture management has kept these plant suppressed more or less indefinitely.

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REFERENCE

TOTHILL, J. C. (1971)—A review of fire in the management of native pasture with particular reference to north-eastern Australia. *Tropical Grasslands* **5**: 1-10.