CHAINING OF BUFFER STRIPS IN NATIONAL PARKS AND NATURE RESERVES: AN ECOLOGICAL PERSPECTIVE.

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Introduction

Narrow perimeter buffers have been the favoured fire protection strategy for National Parks and Reserves containing heath and mallee vegetation. Burning the standing vegetation within these buffers has proved to be a difficult task that is often beyond the capacity of the available resources. One option for tackling this problem is to modify the vegetation structure by chaining or scrub rolling. Experience has shown that narrow buffers can be safely and effectively burnt in most shrubland types once the vegetation has been chained.

Recent chaining operations in perimeter buffers at the Stirling Range and Fitzgerald River National Parks have attracted adverse comments from conservation lobby groups, some elements of the rural community and the media. Much of the controversy has centred on the fact that chaining is an eyesore in the short term; the historical association of chaining with agricultural land clearing operations has not helped. For the record, these operations have been supported by Shires, the Bushfire Brigades and some local groups although their support has not proved newsworthy.

Whether chaining is controversial or not, there are valid reasons for studying the ecological effects if buffers in National Parks and Nature Reserves are to be treated in this manner. We need to understand the changes that take place in the structure and species composition of the vegetation, and the period for which they persist. We also need to investigate possible interactions with weeds, plant disease and soil erosion. In today's talk I will address some of these issues in the light of current research projects. I will concentrate on vegetation responses as these are of fundemental importance to the other elements (soil, mammals) and have been studied more extensively.

2. The Data Base

Vegetation reponses to chaining are being examined at a number of locations in heath mallee and woodland types (Table 1). In general, these studies have been established in reponse to ad-hoc requests from District or Protection Branch staff for particular operations to be monitored, rather than as part of an overall strategy. Nonetheless the studies span a wide range of vegetation structural types, species associations, soil types and climatic regions (Table 1).

Most studies are based on permanent quadrats (100-300m_2 in area) that have been assessed prior to, and at annual intervals since treatment. Assessment has taken the form of estimating cover for each species of vascular plant, measuring structure by point intercept sampling and photography. Comprehensive sets of voucher specimens have been collected for some of the studies. A variety of treatments have been investigated including chaining without follow-up burning, burning before and after chaining, and untreated (control) areas.

3. Plant response types.

Plants employ a range of mechanisms to persist and reestablish following disturbance. Heath and mallee communities tend to contain a large number of species, particularly in the lower strata. Complex data can be simplified by grouping together species which possess the same mechanisms for regenration; this is also useful for predictive purposes. A number of different classification schemes exist, with most recognising the following groups:

Seeders - plants which rely solely on seed for regeneration. This group is normally subdivided according to the location of the seed store -

- dispersed seed
- soil stored seed
- canopy stored seed

Sprouters - plants which possess dormant budus and are capable of vegetative regeneration following disturbance. A distinction is usually made according to the location of the buds, and whether regrowth is from basal sprouts, or epicormic stem sprouts.

More detailed study of post-fire response may be justified for some species:

- plants which dominate the structure or cover of a community eg. mallee eucalypts,
- plants which provide key resouces for animal species eg. nectar producing Banksias,

- plants which possess unusual mechanisms or which appear to rely on infrequent or episodic recruitment.

4. Results.

All species of plants recorded in quadrats prior to treatment have, with very few exceptions, reappeared within 2 years of burning. Thus local extinction of populations following a single chaining and burning treatment appears to be only a remote possibility.

Tall plants with woody stems experience greater degree of disturbance following chaining than do shorter, understorey plants with flexible stems: In most situations understorey species less than 1m in height spring back up following the passage of the chain and are therefore able to respond to fire as they normally would, either from seed or by resprouting. An important exception is the grass tree which has a rigid, woody stem and if completely uprooted will be unable to resprout.

For overstorey species, the impact of chaining and burning will primarily depend upon the regeneration mechanisms employed by the plant. Resprouting species such as mallee eucalypts will normally respond in a similar fashion to what they would following a fire that killed stems back to ground level. Lignotubers are occasionally uprooted and subsequently die, but this has not proved to be a major problem in the chaining operations undertaken to date during dry soil conditions.

Of the obligate seed regenerators, species with canopy stored seed are probably the most important as they are often well represented in the overstorey strata eg. mallee eucalyprs, some Banksias and Hakeas.

Some of these species may experience a decline in numbers following chaining and burning treatment, if their seed is not retained in capsules. The reason for this is that seed released on death of the plant after chaining may be consumed in the follow-up burn. Species vulnerable to decline in this situation can be identified in advance by observing their seed release characteristics. Burning as soon as possible after chaining will minimise the opportunity for seed loss.

Disturbance associated with chaining and burning creates oppportunities for regeneration, particularly by species with soil stored or dispersed seed. Species richness will be increased in the short to mid term (3-10 years) followinf either treatment, or a combination of the two. Quite dramatic increases in species richness have been observed at some sites (pre-burn 3 species: post burn 48 species in woodland at Ravensthorpe). In chained strips the response of soil stored seed may be enhanced because of the greater heat pulse close to the soil.

The length of time for which strips remain effective as a buffer will depend on the rate of regeneration, which in turn depends

on species composition and climatic conditions. Regeneration will tend to be more rapid if resprouting species predominate, or if fire has stimulated thickets from soil stored seed. In this situation the useful life of buffer strips may only be 4-6 years. Where slower growing seed species are dominant the effective life may be extended for 12-15 years.

5. Interactions

Interactions with other factors are of at least equal if not greater importance than the direct impacts of chaining itself.

Grazing pressure tend to be heavy on any buffer strip or small burnt area, whether chained or not. Heavy selective rabbit grazing of Actinostrobus seedlings has been observed on the experimental chained strips at Watheroo N.P. Perimeter buffer strips tend to be hit particularly hard because of their location at the interface between bush and cleared land. Rabbit control is desirable and would be supported unanimously; achieving consensus on kangaroo control may be a bit more difficult.

Invasion of weeds, particularly annual grasses, into perimeter buffer strips is highly undesirable. The situation in chained strips is probably little different to that in strips that are simply burnt. No major problems with weed invasion have been apparent at any of the sites so far, but there is no room for complacency. Retention of vegetated strips between burnt buffers and cleared land is highly desirable.

Any operation involving the movement of machinery has the potential to spread soil borne fungi, notably P. cinnamoni. Again, there is no evidence to suggest that this has been a problem so far. However, stringent hygeine procedures should apply to all chaining operations and known dieback areas should be demarcated and avoided.

6. Conclusion

Fuel modification treatments involving chaining and burning result in temporary changes in species composition and structure of the vegetation. These changes closely parallel the changes associated with burning of standing vegetation (Table 2). Important exceptions to this general principal apply to grass trees, and some obligate seeders with capsules that do not retain seed after the death of the plant; these groups may be reduced in numbers following chaining and burning.

Fire managers may decide that some longer term changes are acceptable within the confines of buffer strips in order to manage the regime of fire elsewhere in a reserve. In this situation chaining operations could still be excluded from vegetation types where major impacts were likely eg. mallee thickets, stands of native conifers.

Any adverse impacts of chaining are likely to be associated with weed invasion or spread of plant disease. Operational procedures to minimise these impact should be closely adhered to and where possible improved.

TABLE 1

Summary of vegetation response studies for chained strips in heath, mallee a woodland.

Location	Vegetation types	commence date	Responsibility for assessment	Current status	S
Ravensthorpe V.C.L.	Scrub-heath Low woodland	1980	Initially BFB Now CALM L. McCaw Mjp Research	Short term results being prepared for publication	C
Kalbarri N.P.	Heath Thicket Actinostrobus stands	1987	L. McCaw Manjimup	Ongoing	D
Lake Magenta N.R. clay	Mallee-heath	1987	Katanning Dist.	Ongoing	S
Watheroo N.P.	Banksia woodland Actinostrobus stands	1987	T. Griffin on contract to Moora	Ongoing	D
Stirling Range N.P.	Banksia woodland Malle heath	1989	L. McCaw Manjimup	Ongoing	S l

TABLE 2

Probable differences in plant responses following chaining/burning treatment and burning alone.

Symbol: - fewer plants after chaining/burning than after fire alone.

o similar plants after chaining/burning than after fire alone.

\+ increased numbers after chaining/burning than after fire alone.

Mode of Regeneration	Height Stratum		Comment
	Low (</m)	Canopy (>/m)	
Seeder			
- dispersed	o/+	o	
- soil stored	o/+	o/+	
- canopy on	o	-	Depends seed release from capsules
Sprouter if s ground.	o	o/-	Numbers maybe reduced rootstock torn out of

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Kalbarri N.P.	Heath Thicket Actinostrobus stands	1987	L.McCaw Manjimup	Ongoing	Deep Sand
Lake Magenta N.R.	Mallee-heath	1987	Katanning District	Ongoing	Sand overclay
Watherqo N.P.	Banksia woodland Actinostrobus stands	1987	T. Griffin on contract to Moora	Ongoing	Deep Sand
Stirling Range N.P.	Banksia woodland mallee heath	1989	L. McCaw Manjimup	Ongoing	Sand/ Laterite

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Sprouter	o	O/-	Numbers maybe reduced if rootstock is torn out of ground