

LONG-TERM CONTROL OF GORSE/BRACKEN MIXTURES FOR FOREST ESTABLISHMENT IN NELSON

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ABSTRACT

*Recent changes in weed control in the Nelson region involve better use of chemicals for desiccation of gorse prior to burning and a move away from post-plant spraying of bracken (*Pteridium aquilinum* var. *esculentum*) to pre-burn spraying with asulam and diesel. Results, although much improved, are such that bracken regrowth may preclude efforts to deal with gorse (*Ulex europaeus*) regrowth following burning, though this is not the case in the North Canterbury region. In the Nelson region better control of bracken is needed and it is suggested that the rate of asulam be increased and the use of glyphosate or hexazinone be investigated further.*

Based on present knowledge, a series of regimes to achieve either short-term or long-term control of gorse/bracken mixtures are described — e.g., roller crush November, spray with asulam and diesel in late February, and burn late April; six weeks following burning, spray gorse regrowth with 2,4,5-T/picloram and either plant and release spray or conduct a further kill spray of gorse regrowth the following spring or autumn and then plant.

Further subjects for investigation are also listed.

INTRODUCTION

The use of herbicides to control gorse and bracken mixtures in forestry was first discussed at a Forest Research Institute Symposium in 1975 (Wylie, 1976; Balneaves, 1976).

It has been noted (Balneaves, 1981) that the control of both weeds with herbicides has been necessary to establish fast growing exotic forests, especially in the Nelson region where these weeds are particularly vigorous. Many of the gorse/bracken sites are characterised by steep broken topography. Bracken fern is vigorous, up to 2 m tall, with gorse also up to 2 m tall. Gorse

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on these sites has so far proved impossible to eradicate even by using a double-kill spray regime (Balneaves, 1980). Thus, the current practice is only to control gorse and fern sufficiently to enable establishment of a radiata pine crop.

Over the past six years some changes to spray regimes have been made as a result of operational trials and from information available from the Forest Research Institute. This paper discusses changes in operational work in the Nelson region and the synthesis of practical regimes for the control of gorse/bracken mixtures in Nelson and North Canterbury.

RECENT PROGRAMME CHANGES IN NELSON

Pre-burn Spraying of Gorse

The objective of pre-burn spraying is to desiccate gorse sufficiently to carry a hot fire that will consume the maximum amount of gorse stick. In Nelson an application of 3.6 kg 2,4,5-T butyl ester in 300 litres of water per hectare is applied using the half overlap method. Application was made using a Llama SA 315 B helicopter; forward speed 74 km/h, flying height 10 m, pump pressure 275 kPa. The 12 m boom is fitted with 55 D8/46 nozzles giving an effective swath width of 21.3 metres. Droplet VMD is 560 microns.

The spraying is carried out in October/November after flowering is complete and the new season's growth averages 2.5 cm in length. Research work in North Canterbury (Balneaves, 1978) demonstrated that best results with mature gorse are achieved by spraying at this stage of seasonal development. In the Nelson region observations appear to confirm this.

It has been noted in Nelson that there is a substantial reduction in coppice regrowth after burning when sprayed areas are compared with unsprayed areas (observations only, no quantitative data). Better results are achieved if the desiccant spray is applied 15 months before burning to give a longer period for drying out of the gorse stem. The shorter period of 3 to 4 months between spraying and burning is no longer practised because the gorse stems tend to char rather than burn away.

In the past diquat has been added to 2,4,5-T in the belief that the rate and degree of desiccation were improved. Certainly brown-out is hastened, but the ultimate curing effect and burn are poor and prolific coppice regrowth follows burning. This practice has now ceased.

Post-burn Spraying of Gorse in Nelson

Single kill spray regimes have been used in the establishment of gorse areas burnt by wild fires. In this situation coppice regrowth from the base of the gorse bushes can be a major problem. A single pre-plant kill spray with 2.4-3 kg/ha 2,4,5-T iso-octyl ester and 0.6-0.75 kg/ha picloram as a potassium salt plus 30 litres diesel/ha has been used at Hira Forest. Six months after spraying 9% of the coppice regrowth was completely killed, 22% was yellow-green in colour but showing no signs of new growth, and 69% was exhibiting new growth. The main effect of the spray was to reduce the growth of the coppice regrowth to 15-20 cm compared with an unsprayed area where regrowth averaged 54 cm.

Release Spraying of Gorse

Release spraying with 1.08 kg/ha 2,4,5-T butyl ester in a total volume of 200 litres/ha has given good results at Motueka Forest. Application in November, when gorse seedlings are less than 6 cm high and still soft, reduces the vigour of the gorse seedlings, and releases trees planted the previous winter from major gorse competition.

Pre-burn Spraying of Bracken

The broken nature of much of the forestry land in Nelson results in uneven fern development on sunny and shady faces. This makes programming of post-plant asulam spraying operations difficult and gives uneven results. This has led recently to a change to pre-burn spraying with asulam at 4.8 kg plus 14 litres diesel and 750 ml of an emulsifier in 220-300 litres water/ha. This is applied to fully mature fronds in April, May, or September before burning in the following February/March. These applications are outside the recommended spraying time of January-February and followed by burning 4 to 10 weeks later because conditions for Class 2 burns from late March/April are generally unfavourable.

Although the results have generally been adequate, control has sometimes been poor, with up to 40 fronds/m² emerging after burning. The poor control noted could to some extent be related to the advanced date of treatment relative to planting. Nevertheless, in most areas the vigour of the fern has been reduced sufficiently to allow radiata pine (*Pinus radiata*) to grow without resorting to hand-releasing with slashers.

TABLE 1: REGIMES TESTED FOR CONTROL OF GORSE/BRACKEN MIXTURES

<i>Time</i>	<i>Regime 1</i>	<i>Regime 2</i>	<i>Regime 3</i>
<i>Motueka Forest</i>			
Nov. 1978	Pre-burn spray gorse with 3.6 kg 2,4,5-T butyl ester made up to 300 litres with water/ha.		
Sep. 1979	Spray bracken fern with 4.8 kg asulam + 14 litres diesel + 1 litre of emulsifier made up to 350 litres with water/ha.		
Mar. 1980	Burn	Burn	Burn
Jul. 1980	Spray gorse regrowth in R 1 & 2 with 3 kg 2,4,5-T iso-octyl ester + 0.75 kg picloram + 30 litres diesel made up to 300 litres with water/ha.		
Aug. 1980		Plant	Plant
Nov. 1980			Release spray with 1.08 kg 2,4,5-T iso-octyl ester made up to 300 litres with water/ha.
May 1981	Spray gorse regrowth with 3 kg 2,4,5-T iso-octyl ester + 0.75 kg picloram + 30 litres diesel made up to 300 litres with water/ha.		
Jul. 1981	Plant		
<i>Ashley Forest</i>			
Nov. 1979	Spray gorse with 3.4 kg 2,4,5-T iso-octyl ester + 0.85 kg picloram in 313 litres water/ha.		Roller crush
Late Feb. 1980		Spray bracken with 5.6 kg asulam + 20 litres diesel + 1 litre emulsifier in 295 litres water/ha on all three sites.	
Late Apr. 1980	Burn	Burn	Burn
May 1980	Spray gorse regrowth with 3.0 kg 2,4,5-T iso-octyl ester + 0.75 kg picloram in 315 litres water/ha.		
Jul. 1980		Plant	
Apr. 1981		Release spray with 2.16 kg 2,4,5-T iso-octyl ester in 214 litres water/ha.	
May 1981	Spray gorse regrowth with 6 kg 2,4,5-T iso-octyl ester in 313 litres water/ha.		Spray gorse regrowth with 6 kg 2,4,5-T iso-octyl ester in 313 litres water/ha.
July. 1981	Plant		Plant

Hexazinone is currently being investigated as an alternative chemical for either pre-plant or post-plant control of bracken and gorse seedling regrowth. Its potential is very promising.

ALTERNATIVE REGIMES

Operational scale trials at Motueka Forest (Nelson) and Ashley Forest (North Canterbury) have compared three regimes for dealing with gorse/bracken mixtures. They are outlined in Table 1. Assessments of 100 randomly located sampling points 0.25 m² within the trial areas at Motueka Forest indicated that 98 of the points contained actively growing gorse 15 months after planting Regimes 2 and 3. Interestingly, in the release spray treatment (Regime 3) the sample points contained a dense mat of fresh gorse seedling regrowth whereas in the single pre-plant spray treatment (Regime 2) gorse density was such that only 50% of the ground cover within each sampling point was occupied by gorse seedling regrowth. The post-burn double-kill spray (Regime 1) at Motueka reduced gorse seedling regrowth to the extent that only 38 of the 100 sampling points contained gorse seedling regrowth. However, each of these 38 sampling points generally contained only one gorse seedling and rarely 2 or 3 seedlings. The main obstacle in the relatively unsuccessful attempts to eliminate the gorse regrowth was the presence of fern regrowth after burning. Interception by the bracken of spray intended for the gorse regrowth both in the first and second post-burn kill sprays is thought to be a major factor for the continuing presence of a considerable quantity of gorse.

Thus, to achieve greater control of gorse, much improved fern control is needed in the Nelson region. This may be achieved by either increasing the rate of asulam or using other chemicals such as glyphosate or hexazinone.

In the Ashley Forest trial better fern control was achieved, possibly for two reasons: first, a higher rate of asulam, diesel, and emulsifier was used and, secondly, the bracken fern was not as vigorous as that encountered in the Motueka trial area. After burning, virtually no fern regrowth occurred, thus enabling increased effectiveness of post-burn gorse control. In this trial gorse re-establishment 15 months after planting occurred in 67% of the 200 sampling points in the single post-burn/release spray (Regime 2) option. Where the double-kill post-burn spray regime was applied (Regimes 1 and 3) gorse control was greatly improved.

Of the 200 sampling points only 6 and 9%, respectively, had gorse regrowth present.

It may be significant that a good sward of sweet vernal (*Anthoxanthum odoratum*) and browntop (*Agrostis tenuis*) became established on the Ashley sites. It seems likely that this aided fern and gorse control through competition.

It would appear, therefore, to be possible to achieve long-term gorse and bracken control to aid establishment of radiata pine. However, the regimes outlined could be improved upon and further trials are planned with the use of hexazinone as a post-burn spray to control fern and gorse seedling regrowth as the first phase of a multiple spray regime, thereby reducing the number of herbicide treatments from 4 to 3 where roller crushing is not possible or from 3 to 2 where roller crushing is undertaken as a fuel preparation technique.

RESEARCH NEEDS

Research is required on:

- (1) Further operational scale trials to investigate control of bracken fern in the Nelson-Marlborough region. These should include the use of asulam and other available chemicals.
- (2) A better understanding of the optimum conditions for bracken development and weather for spraying in the Nelson-Marlborough region.
- (3) Reducing the loss of chemical between the aircraft and the target. This would include the use of additives or changed formulations, changes in the type of equipment used, flight path control systems, and a better understanding of the effect of weather conditions. This refers again to problems of application in broken or steep terrain as encountered in the Nelson/Marlborough region.
- (4) The development of spray formulations to control both gorse and bracken at the same time.

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