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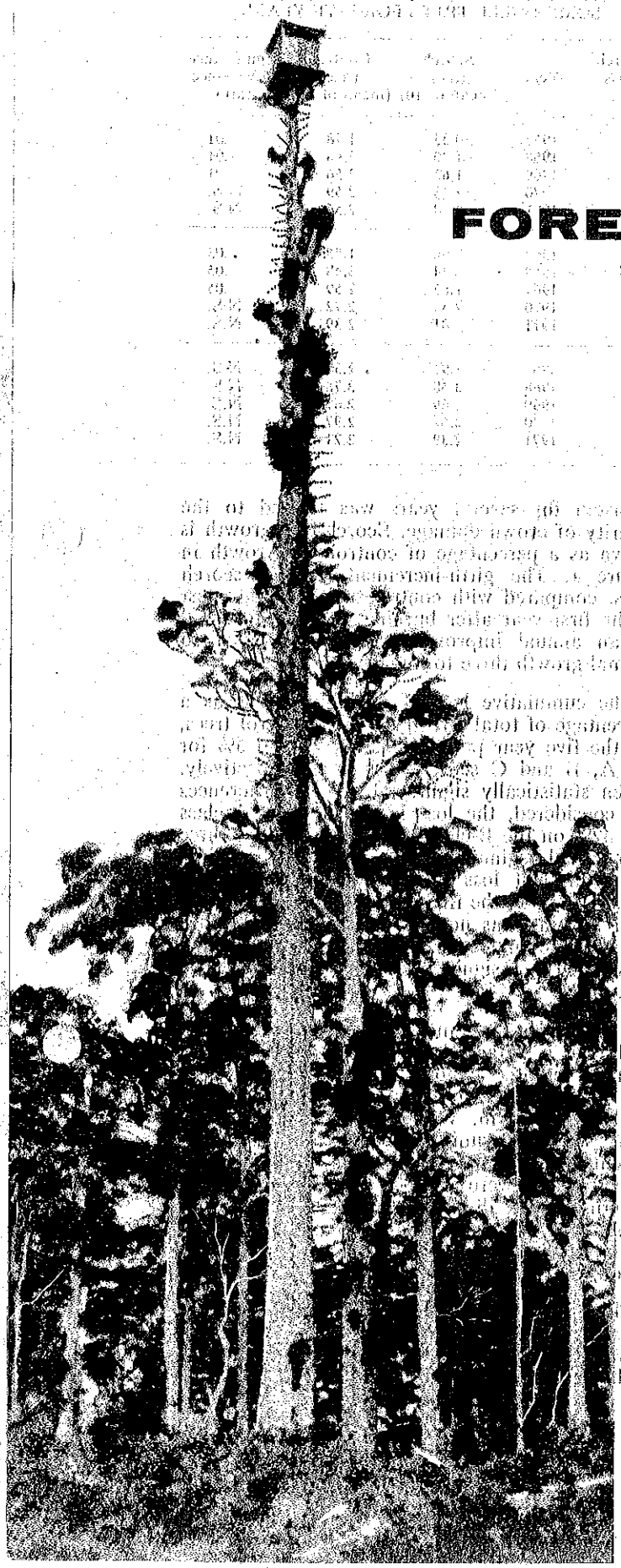

FORESTS DEPARTMENT

OF WESTERN AUSTRALIA

54 BARRACK ST., PERTH

RECOVERY OF MARITIME PINE *(Pinus pinaster)* AFTER SEVERE CROWN SCORCH

by

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SUMMARY

During prescribed burning operations on maritime pine (*Pinus pinaster* Ait.), two types of crown scorch may occur: light crown scorch in which only the foliage is affected; severe crown scorch in which branch-kill takes place resulting in reduction of green-crown height with a corresponding loss in girth increment. Growth trials give a recovery time for severely scorched trees.

INTRODUCTION

Thirty-eight and 19-year-old maritime pine were studied to find the effect of crown damage by fire on girth growth. Measurements of both size classes were maintained until the prolonged effect of crown damage on girth growth declined to an insignificant level.

METHOD

Somerville trial

Prescribed burning took place in 38-year-old 14 m high maritime pine in Somerville plantation during September 1966. In a stand which had been thinned to 6.4 m spacing prior to burning, a number of trees were severely scorched by the ignition of heaps of thinning slash 2.4 to 3 m high. Where the slash heaps lay almost directly beneath the standing-tree crowns, severe crown damage resulted. Although a number of tree crowns were considerably reduced in size, there was no visible sign of damage to the tree boles. The average bark thickness of the measured trees was 3.3 cm prior to burning.

From a 1.6 ha site on fairly level ground in the Somerville plantation 10 trees were selected in each of three scorch categories comprising trees with (A) 0.5 m, (B) 1.5 m and (C) 3.0 m green tip remaining. The damaged trees were matched by girth with burned but unscorched trees within the area. The average crown height of the control trees was 7.6 m. The 60 trees were fitted with aluminium girth growth bands at 1.30 m and measurements were taken at monthly intervals for five years commencing February 1967, six months after burning took place.

Gnangara trial

In a post-thinning burn carried out in 17-year-old 12.8 m high maritime pine in Gnangara plantation during September 1968, a small number of trees had their crown heights reduced by half to three-quarters. There was again no visible sign of bole damage. The average bark thickness of the trees was 2.3 cm and the final tree spacing was 4.3 m.

In this trial, 30 scorched trees, whose crown heights had been reduced by over half, were matched with 30 unscorched trees and both classes were girth banded at 1.30 m, as for the Somerville trees. Girth measurements were taken monthly for three years.

RESULTS

Somerville trial

Growth for each of the scorch and control trees was analysed yearly, beginning in February 1967 and ending in March 1972 (Table 1). A marked deterioration in growth rate which persisted for several years was related to the severity of crown damage. Scorch-tree growth is shown as a percentage of control-tree growth in Figure 1. The girth-increment loss of scorch trees, compared with control trees, was greatest in the first year after burning and was followed by an annual improvement until a return to normal growth three to four years later.

TABLE 1

AVERAGE GIRTH INCREMENT (cm) FOR SOMERVILLE TREES FOR FIVE YEARS

Scorch class	Year	Scorch trees (mean of 10)	Control trees (mean of 10)	Significance of variance ratio
A	1967	0.33	1.78	.01
0.5 m	1968	1.30	3.48	.01
green	1969	1.63	2.56	.01
tip	1970	2.13	2.59	N.S.
	1971	2.18	2.56	N.S.
B	1967	0.96	1.85	.05
1.5 m	1968	2.34	3.48	.05
green	1969	1.85	2.59	.05
tip	1970	2.34	2.72	N.S.
	1971	2.01	2.39	N.S.
C	1967	1.91	2.54	N.S.
3.0 m	1968	3.68	3.78	N.S.
green	1969	2.69	2.67	N.S.
tip	1970	2.62	2.97	N.S.
	1971	2.39	2.21	N.S.

The cumulative loss of girth increment as a percentage of total girth growth of control trees, for the five year period, was 42, 27 and 5% for the A, B and C scorch-class trees respectively. When statistically significant growth differences are considered, the loss is 65% on the A-class and 42% on the B-class trees for an initial three year period beginning six months after scorching. No significant loss took place on the C-class trees. However, the first six month growth period after burning was not accounted for, and, since the damage happened during the main annual growth surge, a significant if slight loss may have occurred.

Tree heights were measured at the start of the trial with a "Haga" altimeter and at the end, with a "Suunto" clinometer. The mean original tree height was 13.7 m and the mean final tree height was 15.2 m. With an expected 5% error from both instruments used and a height increment of barely 0.3 m per annum, the measurements were thought to be unreliable for detecting height differences between the damage classes but suitable for discriminating between green-crown height changes over a five year period.

The original green-crown height of the control trees was 7.6 m which increased to 8.2 m five years later. Crown heights for the damaged trees (Table 2) had not returned to normal even five and a half years after burning.

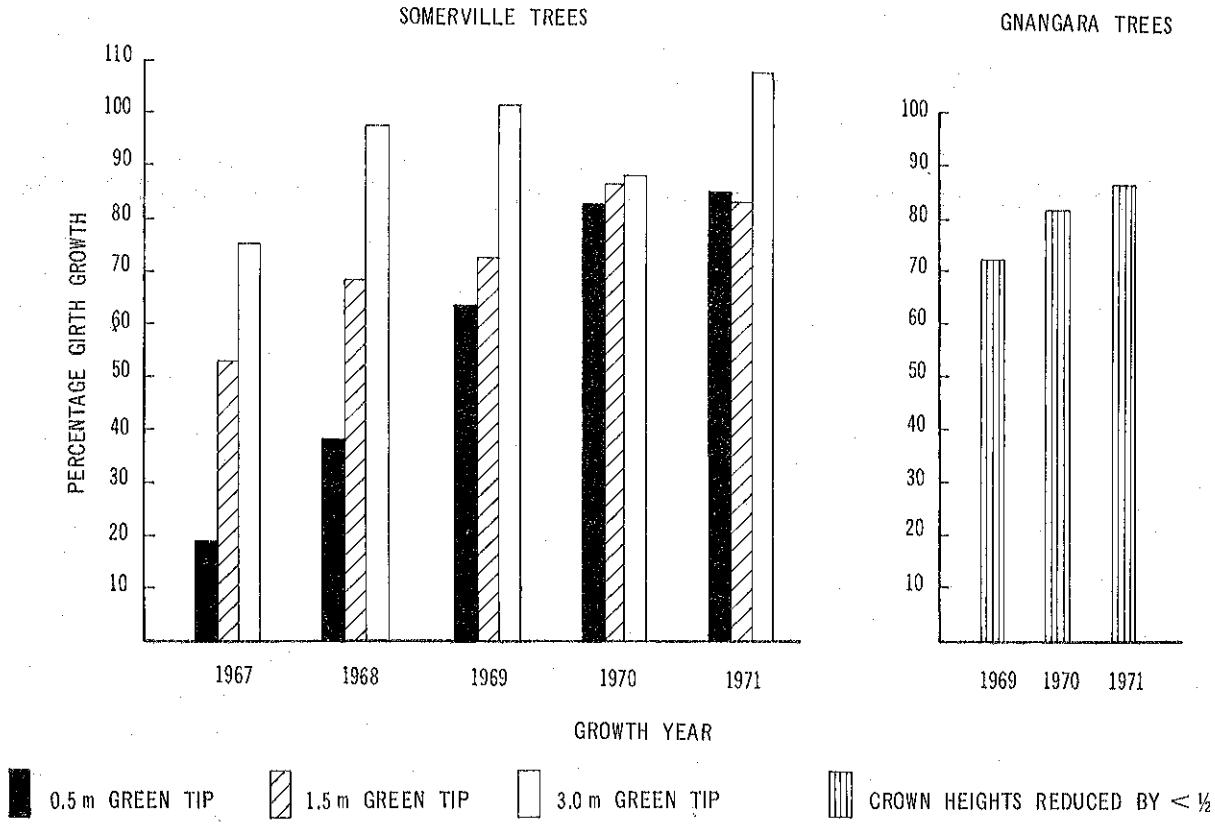

FIGURE 1: *Scorch-tree growth as a percentage of control-tree growth*

TABLE 2
RECOVERY OF GREEN-CROWN HEIGHT (m) FOR SOMERVILLE TREES 1967 TO 1972

Scorch class	Original (mean of 10)	Final (mean of 10)
A	0.46	5.83
B	1.52	5.83
C	3.04	6.52
Control	7.53	8.38

Gnangara trial

The girth increment loss due to depletion of the 17-year-old trees' crowns by burning (Table 3) resembled that of the 38-year-old Somerville trees in which the lower half of the crowns had been severely scorched. Measurement of the Gnangara trees began soon after scorching and stopped in October 1971. The cumulative loss of girth increment as a percentage of total girth growth of control trees, for the three year period, was 19%. The significant girth-increment loss during the first two years after burning was 23%.

TABLE 3
AVERAGE GIRTH INCREMENT (cm) FOR GNANGARA TREES FOR THREE YEARS

Scorch intensity	Year	Scorch trees (mean of 30)	Control trees (mean of 30)	Significance of variance ratio
50-70%	1969	1.35	1.85	.01
crown	1970	1.88	2.31	.05
scorch	1971	1.88	2.16	N.S.

CONCLUSION

Green-crown height reduction by burning in maritime pine is followed by several years reduction in girth increment, but where branch-kill is limited to the lower crown, the detrimental effect appears to be negligible. It is doubtful, therefore, whether light crown scorch in which no branches are killed can result in loss of tree growth.

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