ESTABLISHMENT OF A JARRAH

THINNING EXPERIMENT

MUNGALUP 22

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1963.

CONTENTS:

SUMMARY

The report is intended to cover the reasons, methods and primary results of an experiment in Jarrah pole thinning.

The thinning prescription primarily consisted of selecting the final crop trees according to their perfection, then spacing them out on the basis of a crown ratio per acre.

To measure the effects of the thinning on the growth rates of the trees a number of "Single Tree Comparisons" were set up between two similar sized trees, one in the thinned area and the other in the unthinned area. Also an area plot was established within the thinned area, to provide the experiment with a basal area measure.

Observations and results showed that the prescription was easily applied in practice. After one year, measurements showed a marked increase in the growth rates of trees in the thinned area.

OBJECTIVE

To thin a jarrah regrowth forest so that the effects of such a treatment can be studied.

METHOD

SELECTION OF THE AREA:

The factors considered when selecting an area for observation were as follows:

(a) Age and density: A young dense stand, with a co-dominant height between 60 and 70 feet and a basal area of 105 square feet per acre, was selected to be treated. Following treatment a good response in growth can be expected from this obviously overstocked regrowth stand.

(b) Quality of Stand: Sufficient healthy vigorous trees were found to be present, thus providing an adequate number of final crop trees.

(c) Isolation from general public: To prevent interference, the area selected was along an internal track within a compartment, and not along a main road.

(d) Recoupable project: An order was held for one hundred stockyard rails 20' in length and $3\frac{1}{2}$" minimum crown diameter. For economic reasons the area selected for treatment had to be of size to provide for this order.

(e) Fire damage: So that the expected growth response following thinning would not be hampered, an area which was free from serious fire damage was considered.

LOCATION:

Collie 80 reference square ET/64 (Appendix A).

HISTORY OF THE AREA:

The date of the maiden cut for the area is not definite. From the progress plans at the Divisional Office the first cut recorded is in 1933. A subsequent cut occurred in September 1954. Heavy regeneration, following the early trade cut, had led to the formation of the present stand.

The intensity of the past trade cuts could not be assessed because severe fire damage in the past had caused the burning out of most of the existing stumps. Because very few mature trees can be found in the area, it can be assumed that the cuts were very heavy.

In 1959 mining timber was cut from the regeneration at a rate of 39 square feet basal area per acre.

The latest control burn prior to thinning was carried out in spring 1961. This was done with the minimum of damage to the trees.

THINNING PRESCRIPTION:

Final crop trees were selected primarily for their crown condition; bole length and quality, these were then spaced out by the use of crown ratio as a basis for thinning.

A. PRIMARY FACTORS CONSIDERED

(a) Crown condition: Healthy, vigorous trees with dominant crowns were favoured for retention before the co-dominants. Similarly the co-dominants before the intermediates.

Overtopped trees with crowns entirely below the general forest canopy, together with dead and dying trees were removed from the stand. The stumps of overtopped trees, occurring in a gap were not poisoned but left to coppice for regeneration.

(b) Bole length and quality: Trees with longer and straighter boles free from defects were considered for retention before less perfect ones.

(c) Species: For crop tree selection jarrah was given preference to marri. However, where no jarrah regrowth was to be found then a vigorous marri, free from defects, was retained.

(d) Lateral Growth: Trees bordering gaps in the forest can extend their root and crown systems laterally, thus avoiding competition. In such an instance a departure from minimum spacing required between two stems was made and a closer spacing adopted. This distance was an arbitrary one, depending on the size of the gap and the number of trees bordering it.

(e) Mature trees: Because these could be removed in the next trade cut and therefore would not form the future stand, they were ignored in the treatment. i.e. The regrowth stand was thinned as though they did not exist.

B. GROWN RATIO AS A GUIDE TO THINNING

A crown ratio of 15 was used as the basis for thinning this stand to the spacing as per table 1. Dr. Jacobs in "Growth Habits of Eucalypts" suggests that a better volume growth should be obtained from eucalypts if the stocking and basal area is based on a crown ratio of 15. He says that a crown ratio of 15 is more common in eucalypts and is a conservative one to apply.

TABLE 1.

DBH Classes	DBH	Trees Per Acre	Thinned To
	6	788	
6-8	7	579	284
	8	443	
	9	350	
9-11	10	284	168
	11	234	
	12	197	
12-14	13	168	-
	14	145	

It was noticed that the diameters at breast height ranged from 6 to 12". Two three inch diameter classes were formed; 6"-8" and 9"-11". The 6"-8" class was thinned to the average "full stocking" for the diameter class 9-11", i.e. 284. The 9"-11" trees were thinned to 168 trees per acre.

Following thinning, the crowns of free grown trees can be expected to increase in proportion to their diameter at breast height increment multiplied by the crown ratio. Therefore depending on the annual increment crown closure can be expected after a period of years and the process of thinning will have to be repeated. i.e. The time to thin the stand again will depend on the time taken for the 6-8".

trees to grow into the 9-11" class conversely this will be the time of crown closure.

FURTHER TREATMENT TO STAND BESIDES THINNING:

(a) Treeless gaps were to be found even in this relatively dense regrowth stand. In these, all debris was removed within three feet of any "advanced growth" which was to be retained for regeneration.

The stumps of trees removed from such gaps (being below standard requirements for crop trees) were left unpoisoned to provide future regeneration for coppicing.

(b) In the case where the tree to be retained had a double leader, one of the leaders was removed, providing it could be reached from ground level.

(c) Stag trees were removed from the treated stand if by such action no damage was to be incurred to the crop trees.

(d) Removal of debris was carried out three feet around each crop tree.

(e) Coppicing from stumps of removed trees was prevented by the application of arsenic pentoxide. In this case, the pole was frilled carefully by means of successive and over-lapping axe cuts, as low to the ground as practicable. The solution (58% ArS) was then poured from a can into the frill, all around the stump.

COST OF TREATMENT TO STAND:

The treatment covered thinning and follow up treatment of 2 acres of the young pole stand. Gross expenditure cam e to £96.17.0. income for stockrails and telephone poles produced came to £59.12.6. therefore the nett expenditure for treatment amounted to £37.4.6. or approximately £18.10.0. an acre (Appendix B for detail). This figure could be reduced

if the treatment was applied on a larger scale.

GROWTH PLOT ESTABLISHMENT:

A. Single Tree Comparison

Because of varying soil, moisture, stand/age and stand density factor's within the area selected for treatment, two identical plots one in the treated area and the other in the untreated (to act as the control) could not be satisfactorily selected. However, by pairing trees inside the area to be treated with comparable ones (in as many characteristics as possible) just outside in the control area, the stand veriability effect will be reduced. Thus the following growth factor's would be measured and observed in the treated and the untreated areas.

1. Height.
2. DBHOB.
3. Bark thickness.
4. Crown diameter.

Twenty comparable trees were selected in both treated and untreated areas. Height, DBHOB, crown diameter and four bark thickness measurements were taken for each tree. From the comparison of these measurements ten trees, in each group, were selected which had a comparable counterpart in the other.

All trees were marked with a narrow band of bituminous aluminium paint at the point of measurement, 4'3" from the ground level. Copper tags with numbers were attached to each tree above the paint mark (Appendix C & D for measurements in 1962 and 1963 respectively).

B. Basal Area Plot

To provide the experiment with basal area and basal area increment figures a one tenth acre area plot was

established within the treated area.

Each tree was tagged with a number and marked at the point of measurement (4'3") with a narrow band of paint. Girth and four bark thickness measurements at 90° spacings were taken for each tree.

The dominant stand height was obtained by measuring the heights of the ten tallest trees in the plot.

RESULTS AND DISCUSSION

The implementation of the thinning prescription was found in practice to be workable. Following the initial selection of stems for the "primary factors" such as stem quality crown condition etc, the final crop trees were selected to the spacings as per next diameter class and thinned accordingly (Table 1 : shows full stocking for a range of diameters using crown ratio of 15).

By using "Single Tree Comparisons" (i.e. paired trees) in the treated and untreated (control) areas it is hoped the effect of stand variability will be minimised giving a more accurate indication to the growth response following treatment. Results from measurements twelve months later showed an average increase of .0188 square feet per tree increment difference between trees in the thinned and unthinned areas. An average basal area increment of .0227 square feet per tree was obtained from measurements on the 1/10th acre plot. Although an evident response to growth following thinning was measured after twelve months it is too early to draw any reliable conclusion from these results.

One interesting side effect noticed several days after the poisoning of the stumps in the treated area was that twelve trees had all or parts of their crown wilted. On inspection twelve months later it was found that three of the crop trees had died completely and the remaining nine had

parts of their crown dead. The explanation of the above phenomenon could be to "root fusion". Dr. Jacobs in Growth Habits of Eucalypts says, that should vigorously growing roots cross they are likely to fuse. When this happens one root may capture part of the root system of another tree, or the distal portion of another root from its own system. He says that it is known that poisons can pass from one eucalypt to another through root fusion.

Although a stump count after twelve months revealed 100% kill the use of arsenic pentoxide for coppice control can seriousily affect the stand retained by fusion. Also considering the extremely dangerous nature of arsenic poisons to animal life it must be recommended that some other poison be used for sucker prevention in the future.

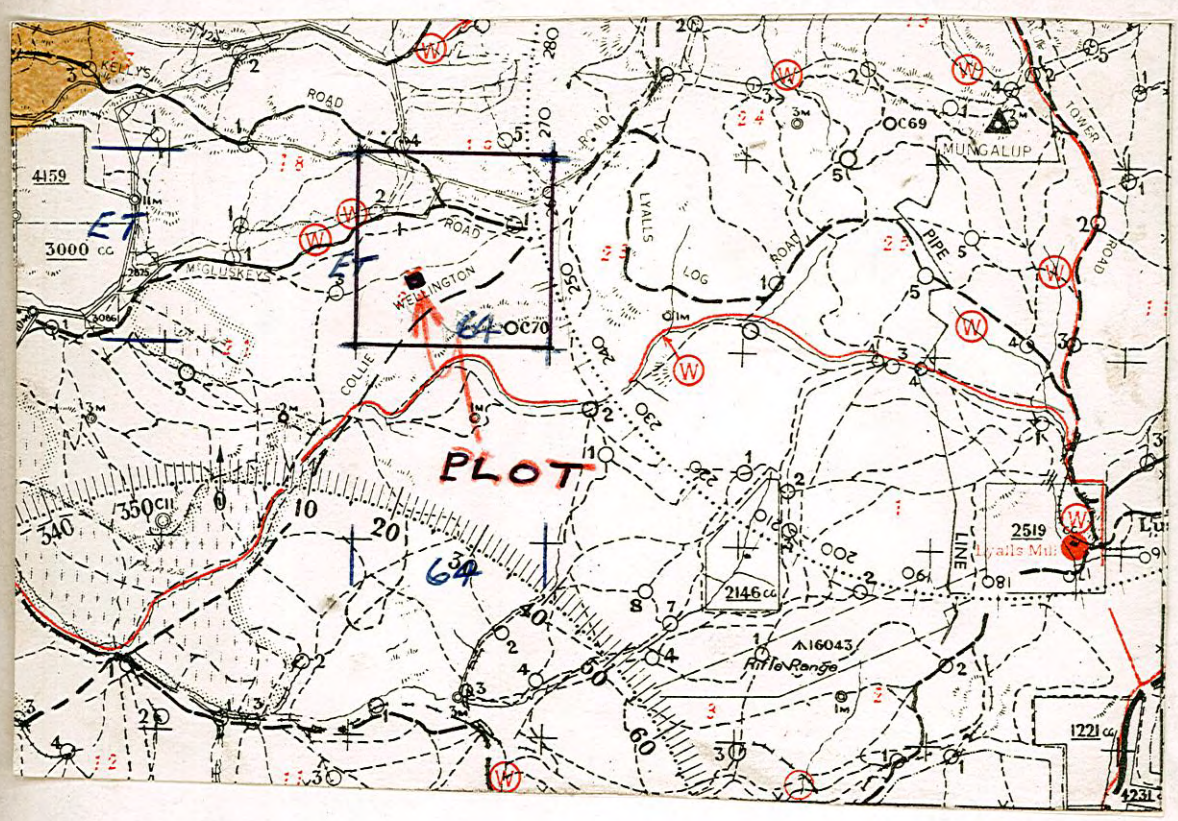
REFERENCES:

M.R. Jacobs - Growth Habits of the Eucalypts.

APPENDIX A

Location of Growth Plot

Collie 80



Reference Square ET/64

APPENDIX B

NETT COST OF TREATMENT TO STAND

(a) Gross Expenditure

Stockrail Production and delivery	£39.17. 0.
Telephone Pole Production for F.D.	5. 0. 0.
Wages for Thinning, Poisoning and Top Disposing	30. 0. 0.
Plant Cost for Thinning	
Chain Saw 20 hours @ 12/-	12. 0. 0.
Transport WAG 4599 48 miles @ 1/6	3.12. 0.
Poison Costs	1.16. 0.
Administration 5%	4.12. 0.
Gross Expenditure-	£96.17. 0.

(b) Income

Stockyard rails	£44.12. 6.
12 Telephone Poles	15. 0. 0.
Total Income	£59.12. 6.

(c) Nett Expenditure for Treatment

£96.17. 0.
59.12. 0.
£37. 4. 6.

Treatment covered thinning and poisoning 2 acres of the young pole stand. Therefore average cost was approximately £18.10.0. per acre.

APPENDIX C

SINGLE TREE COMPARISON - MEASURED APRIL 1962

THINNED							UNTHINNED					
Paired Trees.	Tree No.	G.B.H.O.B.	Bark Thickness	G.B.H.U.B.	B.A.U.B.	Height	Tree No.	G.B.H.U.B.	Bark Thickness	G.B.H.U.B.	B.A.U.B.	Height
52&57	52	2' 4"	0.4	2' 1½"	.3593	68' 7"	57	2' 4½"	0.45	2' 1¾"	.3664	64' 2"
22& 5	22	2' 4½"	0.4	2' 2"	.3736	69' 2"	5	2' 5½"	0.4	2' 3"	.4029	70' 10½"
34&21	34	1'10½"	0.4	1' 8"	.2210	54' 0"	21	1' 9½"	0.35	1' 7½"	.2048	60' 2"
28&26	28	2' 2"	0.35	1'11¾"	.3117	64' 6"	26	2' 1"	0.35	1'10¾"	.2860	65'10"
24&63	24	2' 0¾"	0;45	1'10"	.2675	62' 7"	63	2' 1"	0.35	1'10¾"	.2860	60' 3"
59&29	59	2' 4"	0.35	2' 1¾"	.3664	61' 7"	29	2'3"	0.45	1'11¾"	.3117	66'10"
40& 4	40	2' 5¾"	0.4	2' 3¼"	.4104	63' 3"	4	2' 6"	0.6	2' 2¼"	.3808	53' 2"
54&53	54	2' 1½"	0.3	1'11½"	.3052	68' 8"	53	2'2"	0.35	1'11¾"	.3117	70' 0"
2&58	2	2' 3¼"	0.3	2'1¼"	.3523	65' 7"	58	2' 3¼"	0.50	2' 0¼"	.3250	60' 2"
41&43	41	2' 2¼"	0.5	1'11¼"	.2987	71' 0"	43	2' 2½"	0.4	2' 0"	.3183	70' 8"

* How were heights measured so accurately?

APPENDIX D

SINGLE TREE COMPARISON MEASURED APRIL 1963

THINNED							UNTHINNED					
Paired Trees	Tree No.	G.B.H.O.B.	Bark Thickness	G.B.H.U.B.	B.A.U.B.	Height	Tree No.	G.B.H.O.B.	Bark Thickness	G.B.H.U.B.	B.A.U.B.	Height
52&57	52	2' 4¾"	0.4	2' 2½"	.3808	69' 3"	57	2' 4½"	0.4	2' 2"	.3736	64' 9"
22& 5	22	2' 5¾"	0.4	2' 3¼"	.4104	70' 0"	5	2' 6"	0.4	2' 3½"	.4179	71' 3"
34&21	34	1'11½"	0.4	1' 9"	.2437	55' 4"	21	1' 9½"	0.4	1' 7½"	.2048	60'10"
28&26	28	2' 3½"	0.4	2' 1"	.3454	64'11"	26	2' 1¾"	0.45	1'11"	.2923	66' 3"
24&63	24	2' 1½"	0.4	1'11½"	.3052	62'11"	63	2' 1¼"	0.5	1'10¾"	.2860	60'9"
59&29	59	2' 4¾"	0.3	2' 2"	.3736	61' 9"	29	2' 3"	0.6	1'11¾"	.3117	67' 3"
40& 4	40	2' 6¾"	0.55	2' 3¼"	.4104	63' 5"	4	2' 6"	0.6	2' 2¾"	.3808	54'
54&53	54	2' 3½"	0.4	2' 1"	.3454	68'10"	53	2' 3"	0.45	2' 0¼"	.3250	70' 9"
2&58	2	2' 5"	0.5	2' 2"	.3736	66' 6"	58	2' 3½"	0.5	2' 0½"	.3317	61' 0"
41&43	41	2' 3¾"	0.5	2' 0¾"	.3250	71'10"	43	2' 3"	0.45	2' 0¼"	.3250	70'10"

APPENDIX E

BASAL AREA PLOT (1/10th acre)
MEASURED APRIL 1962

Tree No.	G.B.H.O.B.	Bark Thickness Inches	G.B.H.U.B.	B.A.U.B. (Square feet)
99	1' 5¾"	.35	1' 3½"	.1328
98	1' 9½"	.50	1' 6½"	.1891
97	2' 0½"	.50	1' 9½"	.2554
96	1' 3"	.40	1' 0½"	.0863
95	1' 7½"	.40	1' 5"	.1597
94	1' 9½"	.45	1' 6¾"	.1947
93	1' 3½"	.40	1' 1"	.0945
92	1'10½"	.35	1' 8¼"	.2322
91	2' 8½"	.45	2' 5¾"	.4891
90	2' 4"	.70	1'11¾"	.3117
34	1'10½"	.40	1' 8"	.2210
89	1' 2½"	.50	11½"	.0731
88	1' 5"	.40	1' 2"	.1162
87	2' 0½"	.40	1'10"	.2675
86	2' 1½"	.50	1'10½"	.2798
85	2' 3¼"	.65	1'11¾"	.3117
84	2' 0½"	.50	2' 9½"	.6202
83	1'10"	.60	1' 6¼"	.1841
82	2' 6"	.50	2' 3"	.4029
41	2' 2¼"	.50	1'11¼"	.2987

1. Total b.a.u.b. per plot	4.9207 square feet
2. b.a.u.b. per acre	49.207 " "
3. Average b.a.u.b. per tree	.2460 " "
4. Average bark thickness per tree	.47"
5. Average co-dom. height	64'
6. Basal area removed by Mining timber	38.6 square ft. per acre.
7. " " " " Thinning Treatment	55.3 " " "

APPENDIX F

BASAL AREA PLOT (1/10th acre)

MEASURED APRIL 1963

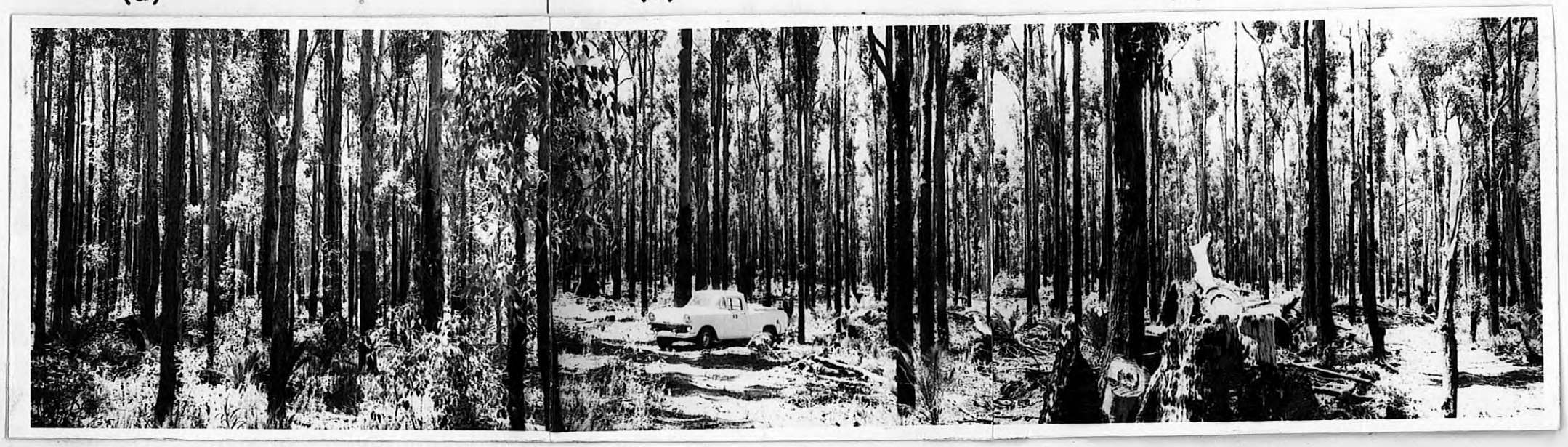
Tree No.	G.B.H.O.B.	Bark Thinning Inches	G.B.H.U.B.	B.A.U.B. (square feet)
99	1' 7¼"	.40	1' 4¾"	.1550
98	1'10¾"	.40	1' 8¼"	.2266
97	2' 1½"	.40	1'11"	.2923
96	1' 3½"	.30	1' 1½"	.1007
95	1' 8½"	.40	1' 6"	.1790
94	1'11"	.45	1' 8¼"	.2266
93	1' 4½"	.30	1' 2½"	.1162
92	2' 0"	.45	1' 9¼"	.2495
91	2'10¼"	.50	2' 7¼"	.5397
90	2' 6½"	.60	2' 2¾"	.3954
34	1'11½"	.40	1' 9"	.2437
89	1' 4¾"	.35	1' 2½"	.1162
88	1' 6¼"	.45	1' 3½"	.1328
87	2' 1½"	.50	1'10½"	.2798
86	2' 2"	.50	1'11"	.2923
85	2' 4¾"	.65	2' 0¾"	.3385
84	1'10¼"	.70	1' 6"	.1790
83	2' 1½"	.40	1'11"	.2923
82	2' 8½"	.50	2' 5½"	.4809
41	2' 3¾"	.50	2' 0¾"	.3385

1. Total b.a.u.b. per plot	5.3750	square feet
2. b.a.u.b. per acre	53.750	" "
3. Average b.a.u.b. per tree	.2687	" "
4. Average b.a.u.b. increment per tree	.0227	" "
5. Average bark thickness per tree	.47"	
6. Average co-dom height	66'	

PHOTOGRAPH NO. 1

Thinned ⟶

(a) (b) (c)



Date of photography	June 1962.
Location	Northern entrance to thinned plot Mungalup cpt. 22.
Details	General view of stand after thinning. (a) unthinned. (b) & (c) thinned.

PHOTOGRAPH NO. 2

Date of photography	June 1962
Location	Same as photograph No. 1.
Details	Close-up of photograph 1 (b).

PHOTOGRAPH NO. 3

Date of photography — June 1962.

Location — Within thinned plot.

Details — Shows opened-up condition of canopy immediately after thinning.