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Department of Conservation
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Wood Utilisation Research Centre

RECOVERY FROM REGROWTH JARRAH SAWLOGS

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W.U.R.C. Technical Report No. 20

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SUMMARY

The mean green sawn recoveries from logs of regrowth jarrah (*Eucalyptus marginata* Donn ex Sm.) from four different areas in the northern jarrah forest was 23.2 per cent. Recovery increased with increasing diameter, with a mean of 14.0 per cent for logs 10-14 cm small end diameter under bark (s.e.d.u.b.) to 34.9 per cent for logs 36-40 cm s.e.d.u.b. However, log length did not affect recovery.

INTRODUCTION

The State Forests of Western Australia are managed on a multiple land use basis. Land uses include wood production, water production, catchment protection, recreation, mining, scientific study and conservation. Wood production is compatible with most other uses and can proceed without adverse effects on the other management priorities.

The areas of jarrah (*Eucalyptus marginata* Donn ex Sm.) forest requiring thinning to increase growth on the better trees are in management priority areas where wood production is the primary land use, or is compatible with other land uses. The area thinned must be of good quality forest, with adequate stocking of regrowth trees suitable for retention as crop trees and substantially free of dieback (caused by *Phytophthora cinnamomi* Rand) and of mining constraints.

An area of about 15 000 ha of the jarrah resource is available for silvicultural treatment after the constraints of mining, dieback and incompatible land use are taken into account. This will provide wood for possible utilisation if markets are available for sawn timber and round products, creating employment opportunities. Most of the northern jarrah forest has been cut-over in the last eighty years and now carries dense growth stands (Stoneman 1986). These stands are slow growing because of intense competition and the slow process of self-thinning. Most of the northern jarrah forest is managed as water catchments for Perth's water supply and country irrigation. Consequently Shea *et al.* (1975) had suggested that thinning of dense regrowth jarrah stands could result in substantial increases in the production of both high quality water and merchantable timber.

Sawmilling studies of regrowth eucalypts have been conducted in eastern Australia, concentrating on the ash-type eucalypts. McKimm *et al.* (1988) assessed the utilisation potential of plantation-grown shining gum (*E. Nitens* Maiden) and found that recovery of green sawn timber was approximately 42 per cent of the green log volume, irrespective of whether the end product was 100 x 50 mm structural material or 25 mm thick boards. This recovery is similar to that obtained in many hardwood sawmills in south-eastern Australia, and supports the findings of Lhuede and Waugh (1980) that the recovery of structural products and the production rate for logs with 25 to 30 cm small end diameter are comparable to those for large logs derived from mature trees. Haslett (1988) reviewed the processing of plantation-grown eucalypts and concluded that the presence of central defects, particularly brittle heart, generally means that it is unwise to attempt to grade-saw eucalypts with a small end diameter of under 30 cm. Where a species requires quarter-sawing, the minimum small end diameter recommended for a sawlog rises to 40 cm.

When comparing volume recoveries between different sawmilling trials the value of the sawn product and availability of suitable markets must be considered. Milling small sawlogs into 28 mm or 30 mm boards, then value-adding through seasoning to produce top grade furniture timber, can give profitable returns.

In Western Australia a Small Eucalypt Processing Study (S.E.P.S.) started in 1986 at the Wood Utilisation Research Centre (W.U.R.C.) at Harvey. It investigated possible uses for thinning from the jarrah and karri forests and eastern states eucalypts grown in Western Australia. A major stockpiling study looking at reduced watering schedules (Brennan *et al.* 1990) and sawmilling studies on regrowth jarrah (White 1989b), regrowth karri (White 1989c) and regrowth marri (White 1989a) have been completed. In local timber industry research, Ray (1986) reported on a regrowth jarrah sawmilling trial using twin circular saws for log breakdown and conventional hardwood mill circular saws for resawing.

This report summaries the recoveries of 28 mm thick timber cut from small regrowth jarrah sawlogs from four different sites within the northern jarrah forest. These logs were required for stockpiling, sawmilling or seasoning trials, which have been reported separately (Brennan 1990; Brennan *et al.* 1990; White 1989b). Standard sawing patterns were used in the trials.

METHODS

Regrowth jarrah sawlogs were extracted from four different areas in the northern jarrah forest. Site history, stockpiling times and experimental methods for three of the sites are discussed in the references given:

> Banksiadale Road, Dwellingup District (Brennan 1990; White 1989a).
> Inglehope Plot, Dwellingup District.
> Kent Block, Harvey District (Clark and Brennan 1988 and Brennan *et al.* 1990), and
> Ross Block, Harvey District (Brennan *et al.* 1990).

The fourth site, the Inglehope Plots, has not been discussed previously. The stand regenerated following heavy cutting and fire in 1922, and plots were established by thinning to a range of stand densities in 1964. Logs for a sawmilling trial were obtained from a second thinning in 1986, from this high quality pole stand.

The specification for small sawlogs used in the trials is given in Appendix 1. The logs were transported to the W.U.R.C. at Harvey, where half were sawn fresh from the forest (within two weeks of falling), and the other half were stockpiled under continuous water spray before sawing.

All logs (except fifty per cent from Banksiadale Road) were sawn into 28 mm boards using the Waugh (1980) sawing pattern. The logs were broken down by two passes through a twin edger, to produce a centre cant. The cant and wings (if sawn timber could be recovered from the latter) were conveyed to the bandsaw or two-man circular saw for resawing.

The cant was cut through the middle with the bandsaw to produce two flitches which were then backsawn, commencing from the sapwood, to produce 28 mm thick boards with widths of 50, 75, 100, 125 or 150 mm. Any brittle heart was discarded from each piece. The wings were sawn on a two-man circular saw bench if they could not be fed through the bandsaw.

At the docking saw, boards were trimmed to 1.2, 1.5, 1.8, 2.1 or 2.2 m (the last specifically for timber to be dried in tunnel kilns). Board faults e.g. brittle heart, rot, excessive knots, gum and wane, were removed in the docking process. This report summarises the recoveries of regrowth jarrah timber from different log sources, which were extracted from stands of different cutting histories, site type and growth rate, and then stockpiled under different watering schedules.

RESULTS AND DISCUSSION

The recoveries of regrowth jarrah from four different areas are given in Table 1. The mean s.e.d.u.b. was 20.9 cm and mean log length was 3.8 m for all areas. Mean log diameter showed little variation for logs harvested from the different areas. However, differences in logging methods and equipment had a large influence on log length, and Clark and Brennan (1988) had shown that long length logging was most effective.

The mean green sawn recovery of regrowth jarrah from four different areas in the northern jarrah forest was 23.2 per cent and ranged from 21.4 to 26.4 per cent (Table 1), in comparison to the mean recovery of 20.2 per cent reported by White (1989b) for regrowth jarrah. The slightly larger logs from Ross Block, Harvey had the highest mean recovery and the smaller Kent Block logs had the lowest recovery. Log quality was not assessed.

Table 1
Recovery of regrowth jarrah from differen areas

Log source	S.e.d.u.b. (cm)			Length (m)			Recovery (%)		
	Mean	S.D.	Range	Mean	S.D.	Range	Mean	S.D.	Range
Banksiadale Rd	21.2	4.3	15-35	3.6	1.2	2.5-5.9	21.6	8.3	5.0-37.9
* Kent Block	19.3	3.9	12-31	3.3	0.8	1.2-5.4	21.2	8.4	0.0-41.0
Ross Block	20.9	3.6	15-32	5.0	1.0	2.2-7.8	26.4	8.2	12.550.7
Inglehope Plots (sawn fresh)	22.8	5.4	14-37	3.4	1.1	1.6-6.0	25.6	10.2	5.9-47.6
Inglehope Plots (stored for 3-4 months)	20.4	3.4	13-35	3.6	1.1	2.3-6.2	21.4	8.7	6.1-44.9
Mean	20.9	5.3	13-37	3.8	1.2	1.2-7.8	23.2	9.2	0.0-50.7

* Only half of the Kent Block logs were used for stockpiling and sawmilling research.

Lhuede and Waugh (1980), sawing regrowth ash eucalypts, had reported that profitability declined for logs less than 25 cm s.e.d.u.b., although recovery was still high due to increased production time, ranging from 30 per cent (logs 15 cm s.e.d.u.b.) to 53 per cent (logs 45 cm s.e.d.u.b.) for three sawmills studied.

In the present study, the combined recoveries for all areas by diameter and length classes (Table 2) showed that recovery increases with increasing diameter, ranging from a mean of 14.0 per cent for logs 10-14 cm s.e.d.u.b. to 34.9 per cent for logs 36-40 cm s.e.d.u.b. Length did not influence recovery. Waugh (1979), reporting on sawing regrowth ash-type eucalypts, had found log diameter was the major factor that affected either product value or production costs in a sawmill using a twin edger, and log length was not important.

Table 2
Recovery of regrowth jarrah for the combined areas by diameter and length class

S.e.d.u.b. Class (cm)	No of Samples	Recovery (%)		
		Mean	S.D.	Range
10-14	20	14.0	7.5	0-29.4
15-19	234	18.9	7.1	5.0-41.0
20-24	226	24.5	8.5	6.9-45.6
25-29	82	30.1	8.6	11.5-50.7
30-35	26	32.4	8.0	20.6-46.3
36-40	5	34.9	9.1	18.8-39.7
Length Class (m)				
0.5-1.5	2	24.2	5.7	20.1-28.2
1.6-2.5	97	24.1	10.1	0.0-47.6
2.6-3.5	172	23.3	9.4	5.0-47.6
3.6-4.5	151	22.2	9.0	0.0-46.3
4.6-5.5	120	22.8	8.7	7.0-50.7
5.6-6.5	49	24.4	8.7	6.3-41.9
6.6-7.5	1	24.5		

Although each sawmilling and stockpiling trial conducted at the W.U.R.C. has specified logs between 15 cm and 35 cm s.e.d.u.b. and length 2.4 to 6.0 m, a small percentage of logs outside this specification has been accepted. In addition, logs with excessive sweep required docking producing short length logs which were included in the trials.

Ray (1986) used a twin circular saw and a twin circular saw for log break down and conventional hardwood mill circular saws for resawing flitches, to produce 25 and 38 mm regrowth jarrah boards. A similar cutting pattern to the Waugh (1980) technique was used to equalise stress relief on either side of the log and keep cants and flitches straight. Ray reported green recoveries of 15.5 per cent for 15-19 cm s.e.d.u.b. logs and 24.4 per cent for 20-27.5 cm s.e.d.u.b. logs. The dried recoveries were 7.4 per cent and 19.6 per cent respectively, although details of appearance grades were not reported. These recoveries are similar to those found at the W.U.R.C. sawmill, when milling regrowth jarrah.

Recovery of logs greater than 25 cm s.e.d.u.b. is comparable with that from 'traditional' sawlogs cut from mature jarrah trees. Below 25 cm s.e.d.u.b. recovery begins to decline, although in the present study a recovery of 24.5 per cent was achieved in the 20-24 cm diameter class (Table 2).

Although log quality was not taken into account when determining recovery, observations during the trials indicate low recoveries are largely due to the common occurrence of brittle heart (particularly wandering brittle heart), which is normally discarded when sawing regrowth jarrah. Other factors such as knots, rot, gum, wane and insect damage all reduce recovery. Waugh (1980) believed that the two most critical factors affecting recovery are log sweep and the size of the knotty core. Again, little trouble should be encountered if the size of the knotty core is relatively small and a sweep of 1 cm in 10 cm of diameter is not exceeded in any 4 m length. This can result in only a few logs under 30 cm s.e.d.u.b. which could be cut in lengths of 4.8 m or longer.

Priest (1986) did a sawing trial of 12-year-old *E. grandis* from an over-grown mining timber stand in South Africa which had not been thinned or pruned. The majority of the logs fell into the 15-23 cm s.e.d.u.b. class. Without employing any silvicultural techniques to reduce the incidence of defects in the sawn timber, it is possible to obtain satisfactory yields (27 per cent) of high value sawn product, (dried and clear on one or both faces). In addition 19 per cent of the recovery was from the centre cant which contained pith and heartshakes, and was cut into 62 mm thick boards for mine wedges. Log end splitting was reported as a major problem when sawing fast grown *E. grandis* logs. Recoveries in this trial are greater than any of those recorded for regrowth jarrah cut at the W.U.R. C. sawmill.

Cutting regrowth jarrah into thinner boards can produce greater recoveries than achieved when cutting 28 mm boards. The VALWOOD® process developed at the W.U.R.C. involves sawing into 15 mm thick boards. Higher recoveries are obtained by using brittle heart and knotty core material in composite panels. Green-off-saw recoveries in the VALWOOD® system, using a 'Forestor 150' bandsaw horizontal to cut sapwood to sapwood and including the brittle heart, ranged from 60 to 70 per cent. Other advantages of sawing thinner boards are that drying time and degrade are substantially decreased. The VALWOOD® system of processing small regrowth jarrah, results in greater dry dressed recoveries than can be produced from 28 mm green boards. The system is applicable to other species, but is particularly useful for regrowth eucalypts.

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APPENDIX 1
Specification for small sawlogs.

1. Small end diameter under bark (s.e.d.u.b.)
   - Minimum 150 mm
   - Maximum 350 mm

2. Large end diameter under bark (l.e.d.u.b.)
   - Minimum 175 mm
   - Maximum 400 mm

3. Length
   Any of the following, aiming for long lengths:

   - 2.4, 3.6, 4.8, or 6.0 m

4. Quality
   - Straightness - maximum 30 mm sweep in any 2.1 m length
   - log ends at least 50 per cent solid wood
   - both log ends cut square
   - no deformities such as dry sides, bumps or protrusions

Notes: Some logs had dimensions outside this specification, however they were still included in the sawmilling and stockpiling trials.

Logs were docked to shorter length if sweep was excessive or short lengths were required.