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WOOD RESIDUES IN REGENERATED KARRI STANDS

by Robert H. Smith and John E. Neal.

Science and Information Division

Manjimup

Summary

The quantity of log debris remaining in a series of regenerated Karri stands was sampled using the line intersect technique to determine what effect the introduction of woodchipping and subsequent tightening of sawlog specifications have had on residue volumes left over after clearfelling and regeneration burning.

The total volume of wood residue declined from an average of 375 m^3/ha in coupes logged and burnt prior to 1976 to just over 200 m^3/ha in recently regenerated coupes, representing a 44% overall reduction. This presumably reflects the substantial improvements in log utilisation that have occurred during the past two decades. The volume of debris contained in logs >600 mm in diameter declined substantially but there was little change in the volume contributed by smaller size classes.

Introduction

After regeneration burning, the quantity of wood residue left in young, even aged Karri coupes has a marked effect on both the extent of fire damage during subsequent fires and the difficulty of access during thinning operations. Woody debris may also be important in providing habitat for some ground-dwelling species of fauna, both invertebrate and vertebrate.

The average size and numbers of logs left as residue in regenerated stands would be expected to have declined following the introduction of woodchipping operations and progressive tightening of sawlog specifications. Progressive tightening of both sawlog and chiplog specifications since 1985 should have reinforced this trend. This report presents the results of a post-burn wood residue survey examining residue volumes in stands regenerated pre-woodchipping, post-woodchipping up to 1983, and post-1989.

Methods

Data was collected from 19 coupes representing three distinct phases of Karri regeneration practice (Table 1). Nine of the sites had been logged prior to the introduction of woodchipping (pre-1976); data from Frankland 8 (two independent samples) and Weld 14 were collected immediately following regeneration burning by Jones (1978) while data for other coupes regenerated between 1968 and 1976 were collected in 1983, at which time the oldest of the stands was aged 15 years. Data from four coupes logged and regenerated following the advent of woodchipping (1977-1983) were also collected in 1983. A further six coupes regenerated since 1989 were surveyed in 1993.

To minimise the potential influence of variation in stand structure and species composition on residue volumes, coupes of similar A.P.I. type (K and KMA [M70]) were selected for the study; with the exception of Frankland 8 (shown as A75 on Fig. 1) and Weld 14 (B75) which were M70 KB, and Poole 4 (C93) which was M60 KB.

Log residue quantities were assessed using the line intersect method (Van Wagner 1968) where a line of known length is laid over a log debris area and the diameter of each piece is recorded. From these measurements, volume is calculated using the formula:

$$V = \frac{\pi^2 \quad \Sigma d^2}{8L}$$

where V = volume

d = piece diameter

L = line length

Within each coupe three survey lines, each 100 metres long, were laid out to form an equilateral triangle; this configuration was adopted to minimise orientation bias following the recommendation of Van Wagner (1968). Sample areas within coupes were selected randomly, avoiding edge effect and any mechanical disturbance such as pushing-in or ripping. The mean data from these lines was then applied to the equation to calculate residue in cubic metres per hectare. Individual residue pieces measured at each intercept were categorised in three diameter size classes: 75-300 mm, 300-600 mm and >600 mm. For each coupe surveyed, the number of intercepts in each size class was graphed (Fig. 1) and volumes in each size class were calculated, totalled and graphed (Fig. 2). Average volumes in each size class were determined for coupes regenerated pre 1976 (n=9), between 1977 and 1983 (n=4) and since 1989 (n=6) (Fig. 3).

Results and Discussion

The number of contacts for each sample line was greatest for pieces <300 mm in diameter, typically ranging between 30 and 60 per 300 m of transect, and least for pieces >600 mm in diameter, with generally less than 10 contacts per 300 m (Fig. 1). In terms of residue volume, however, logs >600 mm in diameter contributed most, followed by those 300-600 mm in diameter (Fig. 2).

As a result of improvements in sawlog and chiplog utilisation during the three phases examined between 1968 and 1993, the average total volume of wood residue exhibited a declining trend (Fig. 3) This reduction was most pronounced in the >600 mm diameter class where the average pre-woodchipping volume of 238 m^3/ha dropped to 83 m^3/ha. A slight reduction occurred from 80 to 75 m^3/ha in the 300-600 mm size class although the figure was weighted against the trend by a high in the sample from Dombakup 10 (A93, Fig. 2). As expected, no defined trend occurred in the 75-300 mm class which consisted predominantly of branchwood and crown material too short or bent to meet current utilisation standards.

To provide an indication of the effectiveness of the 300 m sampling lines used in this study, the running mean and standard error of the mean (SEM) were examined for successive 100 m transects surveyed at Frankland 8 in 1975, up to a total length of 700 m (Fig.4). For 300 metre lines, the standard errors were respectively 13%, 34% and 47% of the means for <300 mm, 300-600 mm and >600 mm size classes; for 700 m lines the corresponding figures were 20%, 24% and 33%. In each case the estimates of volume based on 300 m lines were higher than the estimates from 700 m lines. The high variability of volume estimates for logs >600 mm was due to the variable numbers of these logs encountered along the sampling lines, and also to the wide range of diameters for individual logs. However, these lines (from an earlier study) were not triangulated and therefore may have suffered from orientation bias as noted by van Wagner (1968). Shorter triangulated lines as used in the present study may estimate residue volumes as well as longer untriangulated lines. To estimate volumes of logs >600 mm in diameter more precisely the length of sample lines should in future be increased, with possibly nested sub-sampling on shorter lengths for smaller diameter pieces.

References

Van Wagner, C.E. (1968). The line intersect method in forest fuel sampling. Forest Science 14, 20-26.

Jones, P. (1978). Fuel removal, fuel conditions and seedbed preparation in Karri slash disposal burns. Forests Dept. of W.A. Research Paper 42.

TABLE 1: Location, year of regeneration burning and API type of 19 coupes surveyed for log residue. Data are presented in the same order as in Fig. 1 and 2.

PHASE	COUPE	REGENERATION YEAR	API TYPE	MAP REF.
Pre 75	Poole 3	1968	M70 KMA	HU 7912
	Poole 12	1968	M70 KMA	HV 7944
	Warren 2	1972	M70 KMA	HU 6124
	Poole 11	1973	M70 MKA	HW 7897
	Frankland 8	1975	M70 KB	JU 10497
	Frankland 8	1975	M70 KB	JU 10497
	Weld 14	1975	M70 KB	JG 8773
	Shannon 10	1975	M70 KMA	JA 8598
	Nairn 3	1975	M70 KA	HS 7439
Pre 83	Dombakup 17	1977	M70 KA	HX 6093
	Warren 6	1977	M70 KA	HV 6053
	Dombakup 19	1981	M70 KA	HY 6199
	Warren 2	1982	M70 KMA	HU 6259
Post 89	Poole 6	1989	M70 KMA	HY 5988
	Dombakup 16	1990	M70 KA	HV 7740
	Dombakup 12	1991	M60 KMA	HX 6352
	Dombakup 10	1993	M70 MKA	HX 6503
	Poole 15	1993	M70 JMA	HX 7428
	Poole 4	1993	M60 KMB	HW 7485

FIG. 1: NO. OF CONTACTS BY DIAMETER CLASS FOR 19 COUPES

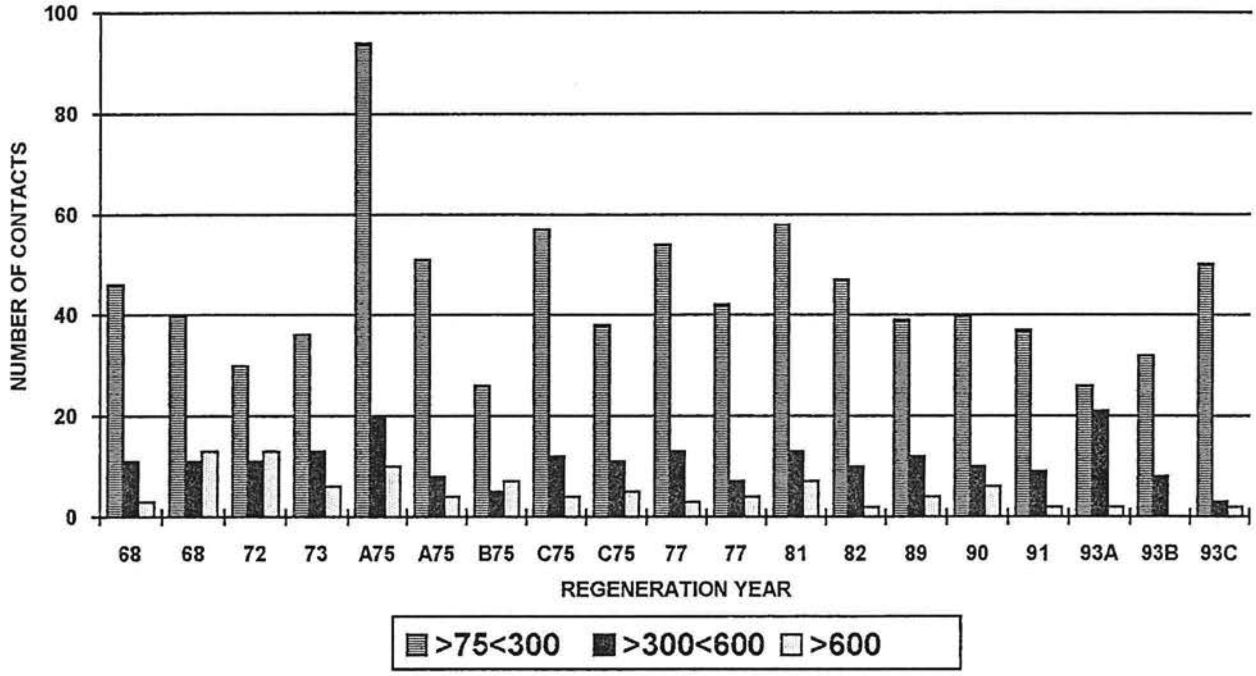


FIG. 2: LOG VOLUME BY DIAMETER CLASS FOR 19 COUPES

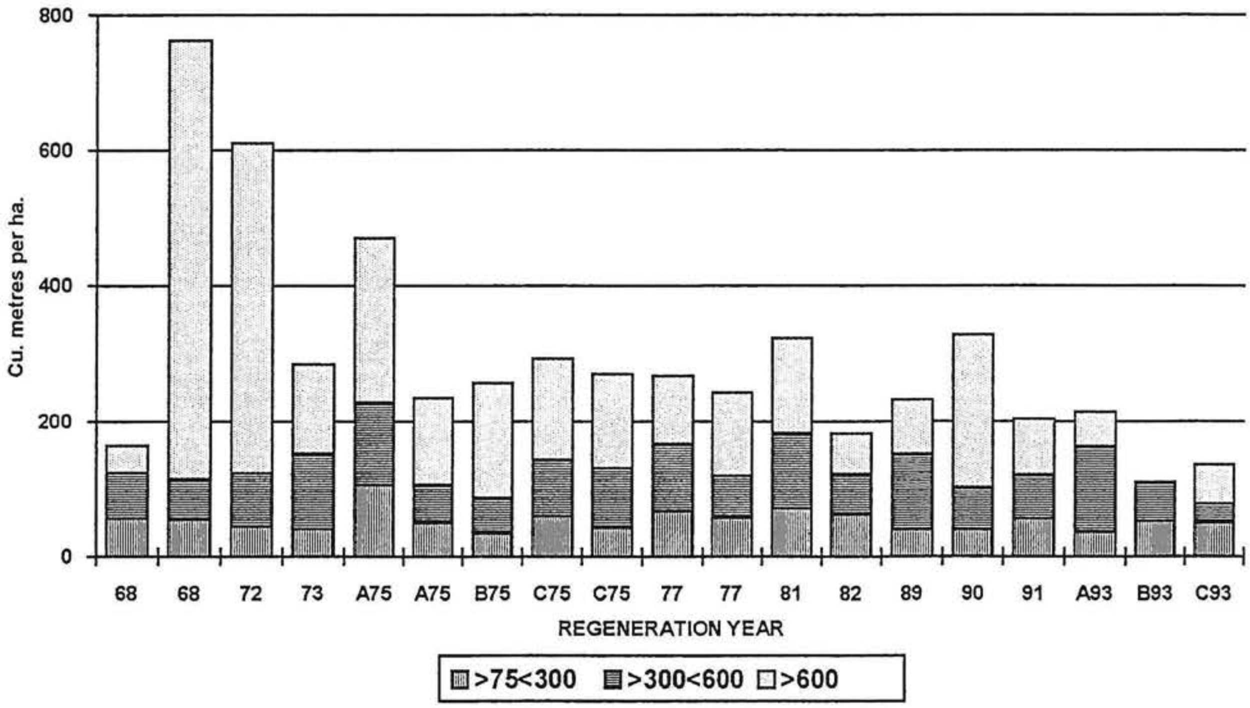


FIG. 3: **AVERAGE VOLUMES BY DIAMETER CLASS FOR 3 TIME PHASES**

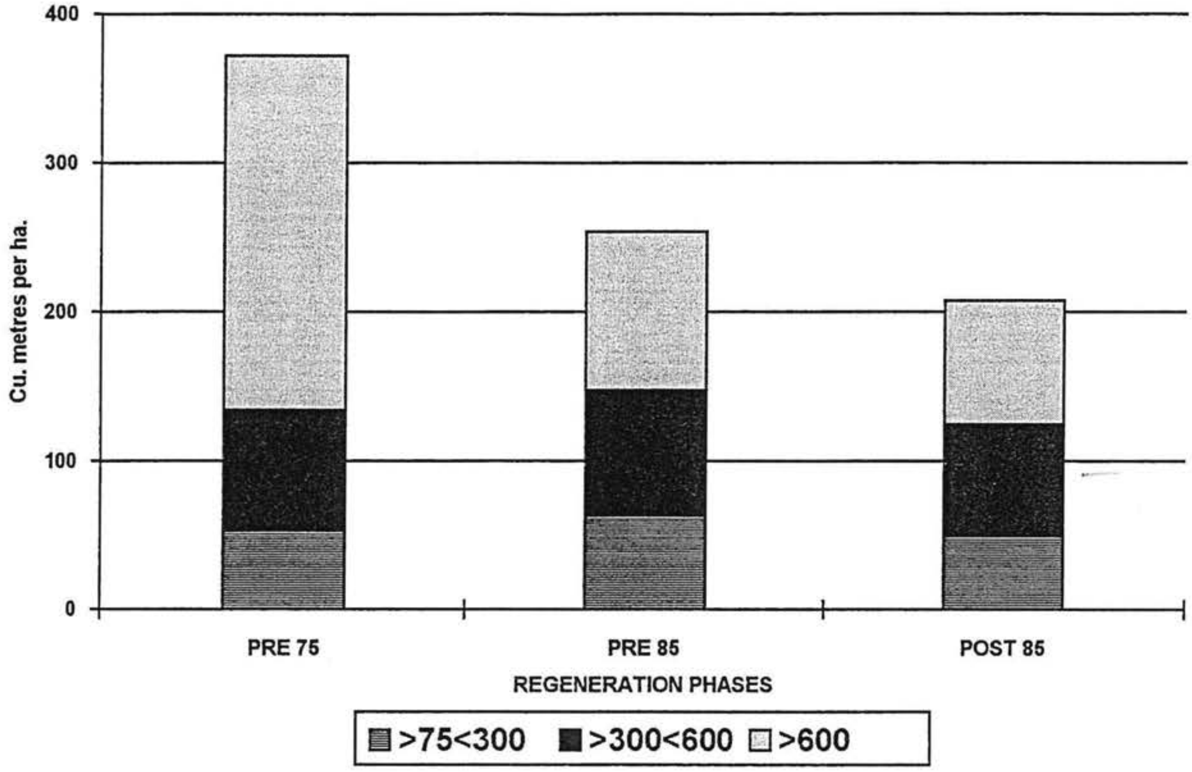
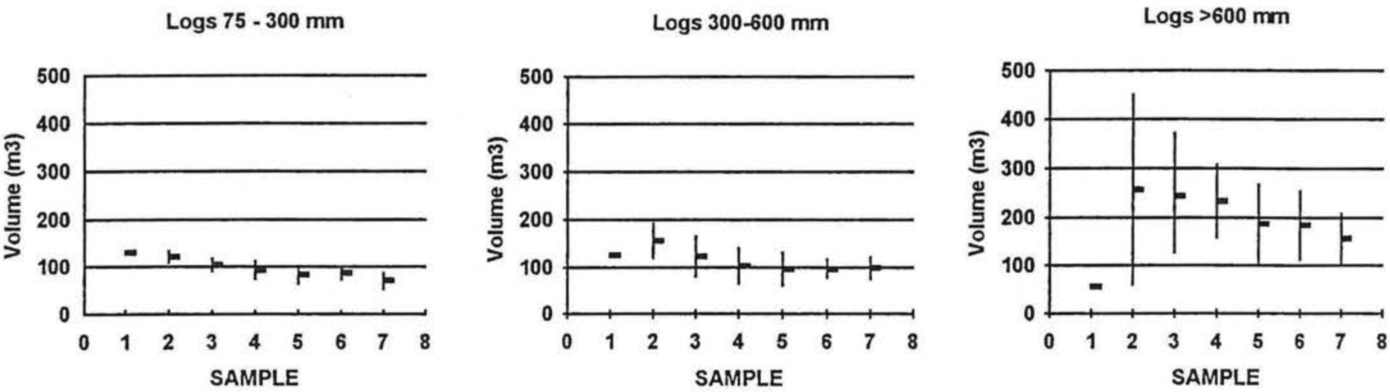


Fig4


Logs 75 - 300 mm
Logs 300-600 mm
Logs >600 mm
Volume (m3)
SAMPLE
500
400
300
200
100
0
0 1 2 3 4 5 6 7 8