JARRAHDALE JARRAH JOURNEY

OWEN LONERAGAN and IAN ABBOTT

Institute of Forest Research and Protection
Hayman Road, Como 6152 Western Australia

This brief journey is designed to introduce some historical and scientific information towards understanding the background to the science of forestry in Western Australia and of the nature of the Jarrah Forest near Jarrahdale.

Virgin Jarrah Forest

The virgin jarrah forest is an open forest of little more than 50 percent crown cover over a ground layer of shrubby, perennial lignotuberous advance growth. Scattered within the forest are small patches of understorey trees and occasional pockets of natural regeneration. This forest results from centuries of fire succession.

Most of the canopy is occupied by jarrah with stem sizes ranging from c 60 cm to 120 cm diameter, increasing to an occasional, really large tree over 200 cm diameter. During dying and death of the lone decadent old tree, replacement in the gap through the canopy takes place, with growth of many small stems from advance growth in that pocket. This advance growth survives and develops on seedbeds created by fire and seeded over scores of years from the virgin canopy. It is called advance growth because it establishes well in advance of the time when an old tree dies or is burnt down

The height of the forest canopy ranges for stands of trees from 20 m to 30 m, with some dominant trees c 6 m above the level of the mature codominant trees.

Most of the Jarrah Forest near Jarrahdale was logged since 1872.

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* Symbols in margin refer to stops in journey, see map attached.

FDHQ* Jarrahdale Division, Forests Department Headquarters (townsite)

VJ Virgin Jarrah, Reserve 990 Camping (West, opposite cemetery)

This forest is hardly virgin, as numerous small trees have been cut from around the edge. Nevertheless many good examples of large trees remain. Over hundreds of years only one or two trees of any group of small trees remain and mature, to reach co-dominance in the forest canopy. Even in a virgin forest, the density of large trees is always much less than the density of the smaller classes of regrowth jarrah forest.

As a result of the open crown cover which can be up to 70 percent, light is unlikely therefore to limit growth. The gravelly soils are low in nutrients. Water is believed to be a critical factor and the fungus, Phytophthora cinnamomi produces the jarrah dieback disease and death of native flora.

E. Educational Centre and Jarrah Centre

See separate notes about these centres and for more information on the Jarrah forest -

- the natural ecosystem (geology, climate, habitat interdependence and ecological change): see Appendix, climate and soils;
- the resource suite (flora, fauna, minerals, soils, landscape, recreation, water, timber);
- management of the resource system (Forests Act 1918-1976, Forest Focus 17, 1976; Working Plan 87, 1982);
- dieback disease, Phytophthora cinnamomi (Forest Focus 14, 21; Information sheets 4, 35, 37, 42).

Jarrahdale Sawmill Sites

1a In 1872 the first mechanical sawmill built for the Wanliss brothers and powered by steam began cutting timber from the Mundlimup forest east of Jarrahdale. Wooden tramway or railway lines were used initially for the rakes of wagons taking logs to the mill and timber from the mill to the port at Rockingham.

Due to rapid wear and costly upkeep of the line, these were soon replaced by iron. The mill was alongside the Cooralong Brook ford, now a bridge crossing.

In 1877, a second No. 1 Mill was built by A.C. Munro after the first No. 1 was burnt down. This second No. 1 also was burnt down in 1901 and was replaced by a second No. 2 mill on the Wungong Brook near Gleneagle. From 1890 to 1910 another five mills were built on the Wungong and Serpentine Rivers.

1b In 1912-13 an entirely new mill was built farther east, upstream on the Cooralong Brook, but this was closed down in the 1929 depression. It was rebuilt in 1949 and abandoned in 1968.

1c The present mill was built east again in the townsite in 1968.

J. King Jarrah 207 cm diameter (overbark) with hollow butt and dry side, height 30 m, north bank of Cooralong Brook, alongside Jarrahdale Road survey, 60 m NE of the bridge crossing at the dip in the road. **The average density of King Jarrahs (over 200 cm diameter) in this forest was 4 per 100 hectare. Those found today are mostly fire-damaged or dead.**

The long term effect of single high intensity fires, and the short term (10 year) and long term (30-50 yr) effect of frequent low intensity fires on growth rates, mortality and fire-scar formation in jarrah were investigated recently by the writers. High intensity fires increased mortality and fire-scar formation but had differing effects on growth rates. Rate of growth was significantly improved in two forest types, but in another it was significantly reduced. Frequent low intensity fires were neither detrimental nor beneficial to growth rate, survival of jarrah and incidence of fire-scars. Nevertheless every fire burns into fire-scars, increases hollow butt size and contributes to earlier falling-over of the old decadent tree during one of the fires.

Cooralong Brook Formation, south of King Jarrah, the first tramway shunt into Mundlimup compartment 1. All formations for the lines were built by hand by many men who did nothing else but set down lines in new areas and pull them up after logging. The lines for extracting the logs usually followed the valleys between the hills so as to acquire an easy grade for the steam locomotives. To keep the grade, the earth was cut from rising ground and used as fill in hollows, making the formation to carry the railway line.

The 1870 formation which was raised for crossing the Cooralong Brook has been washed away. The crossing probably was a boxed-in-drain, battered with laterite boulders. These boulders have ended up resting in the stream bed, below the truncated formation. From here the residual formation continues a short way eastwards alongside an adjacent log-landing at the bottom slope of the first compartment of the Mundlimup Block of forest. Logs, cut out from felled trees, were snigged out by teams of horses and bullocks to this landing. Here they were loaded on to the wagons presumably by a wire rope passing from round the log through a strong pulley wheel on a sturdy spar, to a drum of a stationary steam engine or donkey engine (as it was called).

Over 100-year old Jarrah Forest of High Quality from 1875 Regeneration

The forest at Mundlimup is the oldest second growth jarrah of known age in W.A. The first trade cut of jarrah for the sawmill, which commenced in 1872, was uncontrolled and extremely heavy. Wildfire soon followed, probably in summer 1875 in the heavy debris which accumulated from the logging. Regrowth commenced then in the first growing season of the same year from seed and advance growth.

Sheoak, jarrah, banksia and marri have regenerated from seed along the formation after it was no longer being used.

2. Pit-sawing before 1870 (Information sheet 9)

Before the steam-powered sawmill was operating at Jarrahdale in 1872, logs were sawn into boards and scantling for buildings, using a process called pitsawing. To use this method, a trench c 10-15 m long, 6 m deep and 1½ m wide was dug out near trees being felled in the forest. Large logs were positioned on small log-rollers placed across the trench and cut length-wise. The pit-sawyer standing in the pit pulled the saw and the leading sawyer (called the top-notcher) standing on the log guided the saw blade along the cutting line, which was marked along the top of the log.

1875 Regrowth and 1928 Regrowth Forest

Control of forestry operations began after the Forests Act 1918. A light trade cut in 1926 salvaged millable logs, which were left as unmillable in the early 1870s. The final burn for regeneration in this forest then was in 1928. Within one year of a jarrah tree being cut down, coppice (resprouts) grows from the side of the stump. Unlike jarrah growing from seed or small lignotubers, coppice has the advantage of using an extensive root system. Coppice provides information on the fastest growth rate possible in the absence of any thinning treatment. This rate is 45 cm diameter under bark at breast height in 110 years. The first 10 cm is reached in 10 years but each subsequent 10 cm is added in about 30 years.

Two ages of coppice from stumps are evident - coppice from 1875 is 53 years older than coppice from 1928. Regeneration from advance growth of the same age as these two populations is supplemented also by occasional pockets of natural regeneration. Whereas these two populations are quite distinct on the old stumps, the age of particular regeneration from advance growth is most

likely to be too difficult to establish with certainty, because rapid growing stems of one age of regeneration overlap the slower growing stems of an older age.

Regeneration Treatments

Compartments of about 200 ha in the forest form the units of working. These are grouped into named Blocks of c 3000 to 6000 ha. Subdivision into compartments is based on roads, tracks, ridges, creeks and tramway formations and the boundaries of Blocks are based mainly on topographical features. Perimeter strips 5- chains (100 m) wide, representing untreated firebreaks, adjoined the boundaries of compartments in preparation for the regeneration treatments.

The purpose of the treatments and sequence of operations included -

1. Advance burn, this preceded logging to prevent fires starting during logging;

2. Tree marking, in accordance with a Group Selection System, the tree marker retained vigorous immature trees and marked the base (or 'toe') of the mature and overmature marketable trees, in the direction in which felling would benefit the treatment of the forest;

3. Trade cutting, to supply timber requirements - logging was controlled in coupes, each coupe provided the weekly cut for a sawmill (or for sleeper hewers, until their operations declined and ceased by the second world war);

4. Improvement and cleaning for regeneration, this involved -

   a) retention of seed trees, ringbarking half way round the stems to encourage seeding where it was required for regeneration treatments;

b) ringbarking of the unmarketable trees of jarrah and of most other species, to create gaps for seeding or for release of advance growth.

Large marri would be ringbarked with the blade of the axe and the bark knocked off the smaller marri (under 15 cm diameter) with the back of the axe. Gaps for seeding would be more than 20 m wide and the understorey felled. All felled trees would have their limbs cut to lie on the ground, to reduce flare and to increase the ash for a seedbed when burnt. The tops of felled trees and other slash would be cleared 1- metre away from the boles of the immature tree crop. Each of the men, working under control of the overseer was allocated a separate coupe.

Thinning treatments deferred

Groups of good sheoak and of immature jarrah crop trees would be left intact, - until a thinning treatment later would be prescribed for the compartment. This was prescribed as a separate operation in particular for relief work when labour was available during the depression years of the 1930s. Tops of felled saplings were lopped back to 10 cm diameter, the stems were left on the ground and the lighter slash-debris was stacked up to 4 m^3 of 100 stacks per ha. Stacks were burnt then under cool conditions in spring and again late summer to autumn, especially at night during the early morning dews.

c) final burn and final ringbarking - burning for seeding and regeneration was delayed to coincide with seed years where stocking in advance growth was inadequate. Hot fires were prescribed to reduce the slash fuel and the competing undergrowth, to stimulate resprouting from the advance growth where present and to create ashbeds for seeding and regeneration in the gaps.

The partially ringbarked seed trees of the first operation were completely ringbarked after seedlings were established.

4. Mundlimup Thinnings Plots 1928 in 1875-Regeneration of High Quality Jarrah Forest

Trees grow at the fastest rate when competition is least. Thinning therefore is one of the important cultural treatments in regrowth stands. Foresters remove certain unwanted trees and retain the crop trees which respond to a desirable prescription. The crop trees then grow faster, with the additional growth equivalent to that removed, being distributed among, a much fewer number of trees than in the unthinned stands. It is observed that due to crowding in the unthinned stand, the same total growth potential of the site is distributed among many more trees than in the thinned stand.

At 53 years of age in regrowth jarrah of 20 m codominant height, a crown thinning, by removing trees with crowns which interfere with those of well spaced crop trees, was carried out by B.H. Bednall and C.V. Kinsella. Thinning to 198 stems per hectare (average spacing 7.1 m) was compared with 445 s ha^{-1} unthinned (average spacing 4.74 m). 28 years later in 1956, the thinned plot had produced more than twice the merchantable volume (72 m^3 ha^{-1} over 58 cm diameter compared with 30 $m^3 ha^{-1}$).

In 1957, the thinned plot was reduced to 148 s ha^{-1} (c half the original stocking of 318 s ha^{-1} before thinning in 1928). Also the coppice stems from the 1928 stumps were removed from one half of the thinned plot. These plots are small, 0.24 ha being left in the area untreated in 1928 and 0.24 ha being established for comparison in the adjacent thinned area, which was divided into the 0.12 ha plots to leave the 1928 coppice stems standing in one of these.

Remeasurement by the inventory and planning section over the 16 year period (1956-72) for the same number of largest crop trees for example 50 stems per hectare (or 14 m spacing) in these stands shows growth rate benefit of 18 mm per decade for thinning - the annual mean increment of 3.9 is almost twice that of 2.1 mm for the unthinned. Also twice as many crop trees (100) in the thinned stand have grown at the same rate almost as 50 crop trees in the unthinned stand of the same age of 81 years in 1956. (See Table 1 and Figure 1)

6. W6 - 1953 Inventory Assessment Line 1400 m ± 20 m south from SW corner of location 877 on Jarrahdale Road and 1955 Inventory Growth Plot tied to this 900 m peg of W6.

Among the requirements for management of the forests is appraisal of the timber resources. As it is impossible to count every tree in the forest, a forest inventory of areas of forest is made. Samples of stands are measured, and the data grouped and combined to build up information for the whole forest. The measurements are made to obtain the volume of standing timber (called the growing stock) and remeasurements provide the information of annual growth and annual drain.

The modern method is a combination of aerial survey, photo interpretation and ground sampling. Surveying is for delineation of positions on the ground, classifying is for stratification of the forest-site-vegetation types, mapping is for presentation of the classified patterns. These are sampled then on the ground, by measuring the trees in plots or lines through the forest. When established for this purpose, they are called inventory plots and assessment lines. Both have been established here, as features

stated above in the title of this section.

Along this assessment line, dumpy pegs (10 cm x 10 cm x 1 m) mark positions at 100 m intervals. Going south through Mundlimup compartment 1, these are located from 400 m to 1400 m. The positions of all the large trees (over 50 cm diameter, overbark), 20 m either side of the line were recorded and the trees were classified and measured initially in 1953.

In 1955, inventory and planning section established a growth plot of 0.4 ha. The survey tie to the position of this plot, for convenience and accuracy, is 295°/60 m from this 900 m dumpy of the assessment line. Measurements are taken from time to time, of all the trees over 10 cm diameter in these plots. The data is used as the basis for planning the work in the forest. Working plans are prepared and must be submitted to Parliament for approval at intervals not exceeding 10 years. Legislation with the Forests Act 1918 initiated this control of the forests. It is noted that the development of management of the forests is closely tied to the development of the State of Western Australia.

Now all sound planning relies upon the accuracy of the basic inventory. This commenced about 1920 in Western Australia on the old system of strip or grid survey at 800 m intervals. The earlier dedications of State Forest and the Working Plan determinations depended upon this assessment (Nunn 1957).

From about 1947, the use of war time air photos began to show that a more accurate forest inventory was possible and modern methods were introduced. The first attempt at a statement of the total forest capital was made in 1951 and improvements in scientific knowledge and techniques have been made since then.

9f(9g*) Havel site-vegetation plots 155 (156*)

Both of these plots were used by Havel (1975) in the design of an ecological study as a basis for the sound management of a forested region of 10 500 km^2 in the south-west of Western Australia. Data was collected from 320 observation plots capable of yielding ecological data and information relevant to forest management. Each observation plot involved a complete basal area enumeration of all tree species on 0.16 ha, an estimate of cover of all perennial shrub and herb species on sixteen, one-metre quadrats and a description of associated topographic and edaphic features. After a detailed analysis by computer, 55 species were chosen as indicator species. The continuum was broken up subjectively into 19 segments for the purpose of field mapping. Each segment was defined in terms of its component indicator species and the underlying environmental conditions. Strong relationships were found between the various parameters, so that both examination of the vegetation and classification of the landscape can be used for land-use planning on this ecological basis.

* 9g Inventory and planning section growth plot 85 with young coppice stems after logging c 1971 Mundlimup C2 ø

ø East of access track to growth plot 85, Mundlimup C2

Dead King Jarrah 202 cm diameter

Immature prince 91 cm diameter, c 107 years

West of access track -

Tall prince with 24 m bole; pre-dominant crown exposed to Cyclone Alby 4 April 1978, stripped leaves and twigs, deterioration in crown continued in competition with development of stand.

The growth rate of jarrah was measured in plots situated in high quality cut-over forest in a higher rainfall zone on relatively more fertile soils than low quality forest. Mean increments per decade for jarrah in high quality forest were:

Diameter, 1.7 cm (measured at 1.3 m above ground at its high point);

Basal Area, 1.9 m^2ha^{-1} (i.e. cross sectional area for the diameter);

Volume, 11.8 m^3ha^{-1} (from volume table for diameter and log length of each tree).

In high quality forest, diameter increment varied inversely with initial basal area whereas basal area and volume increment varied directly with initial density.

Diameter increments were averaged over all plots in relation to initial diameter. These data were used to calculate diameter growth curves.

After 400 years the average diameter reached in high quality forest is about 70 cm. When only trees with above average increments are considered, 70 cm diameter is attained after 250 years. If only the largest 25% of increments are considered, this figure is 200 years.

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TABLE 1 - MUNDLIMUP THINNING PLOTS SINCE 1956

Data for 12 and 24 largest trees in plots of 0.24 ha	1972 Plot Stem Numbers (over 10 cm)	Diameter underbark 81y 97y 1956 1972	Annual Increments since 1956 mean (since 1875) 1956 1972	current 16 years 1956-1972	periodic 6y +10y +9y
Treatment	(n) or (% of n)	(cm) (cm)	(mm) (mm)	(mm)	(mm) (mm) (mm)
Unthinned	123				
50 s ha^{-1} (as pc.n)	10%	46.9 50.3	5.8 5.2	2.1	3.2 1.5 0.9
100	20%	40.3 43.3	5.0 4.5	1.8	2.8 1.3 0.7
Thinned	80				
50 s ha^{-1} (as pc.n)	15%	ø51.9 58.2	6.4 6.0	3.9	4.6 3.5 2.8
100	30%	45.1 47.8	5.6 4.9	2.9	3.3 2.7 2.0
Split Plot (0.12 ha)					
Coppice retained	15%	51.9 58.4		ø	No difference
Coppice removed 1956	15%	51.9 58.0		ø	No difference

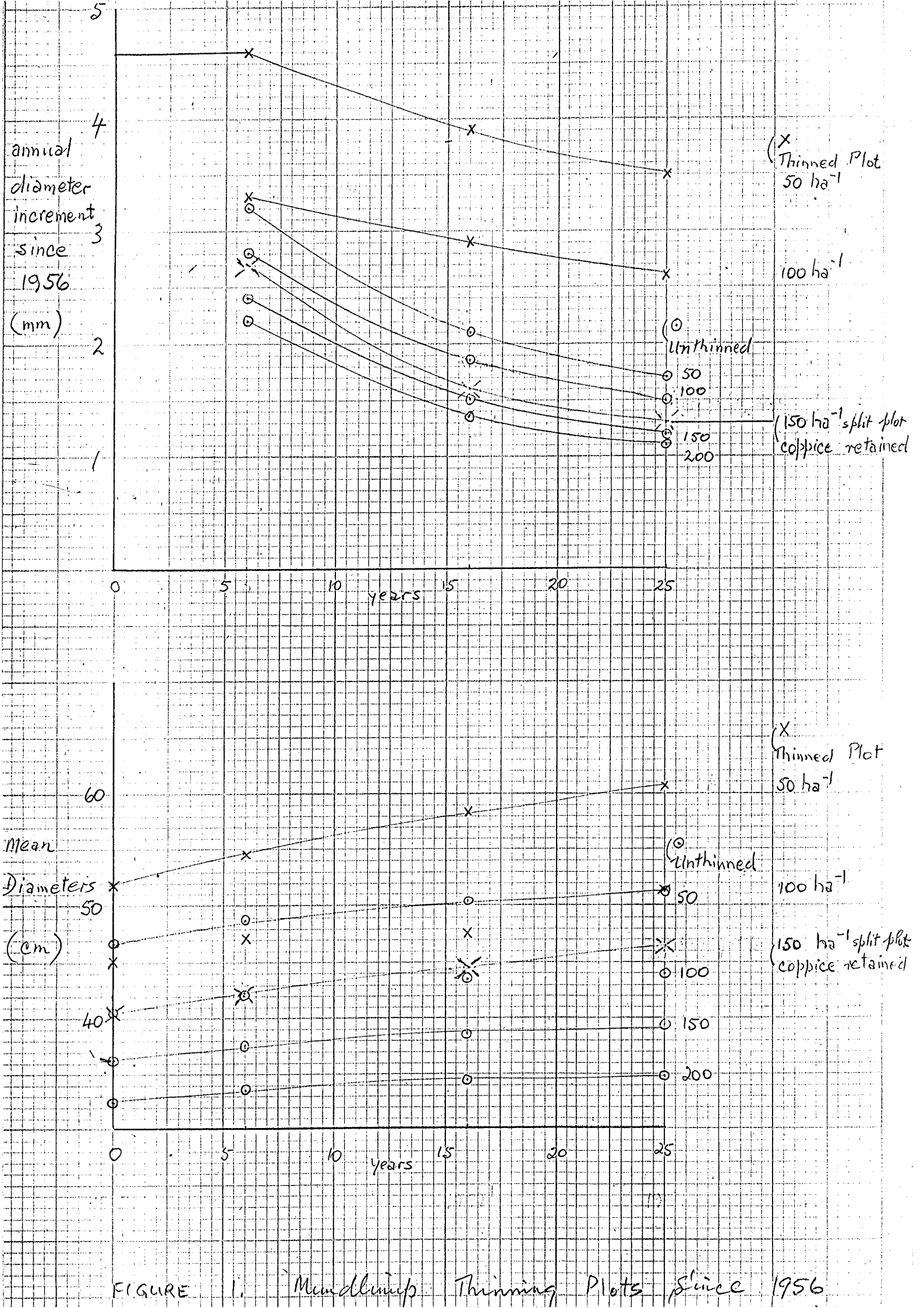


FIGURE 1. Mundulmup Thinning Plots since 1956

Appendix: Climate and Soils

Climate (Jarrahdale latitude c 32°20')

Having a Mediterranean climate, 92 percent of the annual rainfall of 1213 mm (81 years average) falls in the wettest 7 months April-October. The probability that the monthly rainfall will be equal to or exceed the effective rainfall for the 5 months May-September is from 97 to 100 percent. The growing season is 7 months, opening early April (15th on the average).

The mean isotherms for the four seasons from Autumn are 17°C (March-May), 11.5°C (June-Aug), 15.5°C (Sep-Nov) and 21°C Dec-Feb). About 38 days per year may be hotter than 32°C and 6 days hotter than 37.8°C (Kalamunda records at latitude c 32°00'), and frosts may occur on an average of six times a year.

Soils

The lateritic soils are extremely infertile with low nutrient content generally (nitrogen and phosphorus e.g. see *). The surface soil textures are sandy gravels to gravelly loamy sands, low in humus content of low moisture holding capacity and freely drained. The gravel is often as high as 80 percent.

Varying amounts of massive concretionary laterite, from large floaters to sheet laterite occur at depths of 0.5 m, over bauxite deposits to about 4 m over deep kaolinitic clays.

* Havel, J. J. (1975). Site-vegetation mapping in the northern jarrah forest. I. Definition of site-vegetation types. Bull. For. Dep. W. Aust. 86.

SOIL SEGMENT T

GENERAL: Orange to brown gravel with sandy loam to loam matrix, in a few marginal cases loam with medium gravel.

PHYSICAL PROPERTIES (TOPSOIL)

	RANGE	MEAN		RANGE	MEAN
GRAVEL %	3–84	44	FIELD CAPACITY (%)	11–23	16
SILT + CLAY (%)	9–46	25	WILTING POINT (%)	5–14	8
DEPTH TO WATER TABLE (cm)	Much greater than 90	....	AVAIL. MOISTURE (%)	5–11	8

CHEMICAL PROPERTIES (TOPSOIL)

	RANGE	MEAN		RANGE	MEAN
pH	5·8–6·9	6·1	EXCH. Ca(me%)	2·3–14·7	7·3
N%	0·06–0·30	0·14	EXCH. Mg(me%)	1·2–5·8	2·5
P (ppm)	10–188	89	C.E.C. (me%)	6·5–25·9	14·8
K (me%)	0·20–1·04	0·60	SATURATION (%)	45–80	70

SOIL SEGMENT S

GENERAL: Yellow to orange heavy lateritic gravel with loamy sand matrix.

PHYSICAL PROPERTIES (TOPSOIL)

	RANGE	MEAN		RANGE	MEAN
GRAVEL %	21–76	51	FIELD CAPACITY (%)	8–15	10
SILT + CLAY (%)	8–12	10	WILTING POINT (%)	3–6	4
DEPTH TO WATER TABLE (cm)	Much greater than 90	....	AVAIL. MOISTURE (%)	4–8	6

CHEMICAL PROPERTIES (TOPSOIL)

	RANGE	MEAN		RANGE	MEAN
pH	5·5–6·6	6·1	EXCH. Ca(me%)	1·3–4·0	2·9
N%	0·08–0·43	0·25	EXCH. Mg(me%)	0·4–1·1	0·8
p (ppm)	8–43	25	C.E.C. (me%)	3·9–12·2	6·9
K (me%)	0·08–0·74	0·35	SATURATION (%)	36–87	59

NOTICE BOARDS FOR JARRAHDALE JARRAH JOURNEY (see text)

(Jarrahdale to measure sizes)
and proceed with field requirements

Notice boards joined in a triangle around the base of King and Prince Jarrahs (see attached notice in routing in board for sandalwood) -

(1) Jarrahdale Road/Cooralong BK 60m NE
Notice on three faces (pp 3)

Notice boards

front board : OLD KING JARRAH 500+ YEARS+ pp 3

side board (left) : 1982 DIAMETER 207 cm

" " (right): HEIGHT 30 m

(2) East of access track to growth plot 85, Mundlimup C2. Notice on three faces (pp 11)

Notice boards

front board : PRINCE JARRAH 107+ YEARS pp 11

side board (left) : 1982 DIAMETER 91 cm

" " (right): HEIGHT m

(pp 4)*

Notice board

1870 FIRST FORMATION
WITH JARRAH RAILS

*Set up pit where 2-age coppice stand is obvious

Notice board

1870 PIT SAWING F.D. sheet 9
(set up pit as shown in information sheet 9 and surround with ranch fence)

Notice board

TWO-AGE COPPICE STAND ON STUMPS CUT 1870 AND 1925
DIAMETER 40 CM IN 100 YEARS *

pp 5

Notice board

MUNDLIMUP THINNING PLOTS

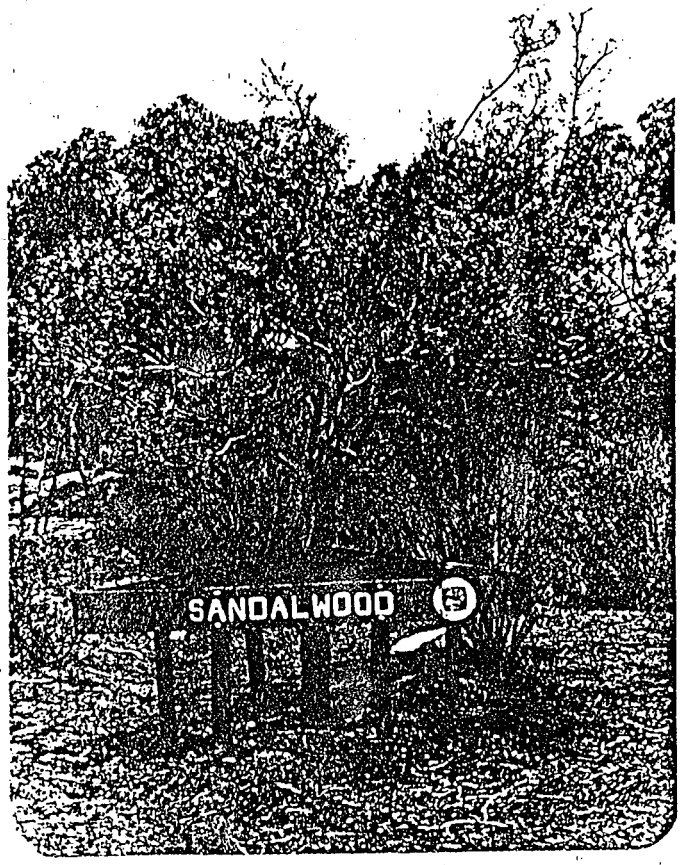
YEAR		UNTHINNED		THINNED	
1875	REGENERATION	PLOT 83		PLOT 84	
1928	STEMS	445	PER HECTARE	198	LEFT
				120	REMOVED
1957		533		148	LEFT *
				50	REMOVED
	VOLUMES	CUBIC METRES PER HA			
1957		235		158	LEFT
				85	TAKEN
1981		280		215	*
FOR TREES 50 CM +		90		160	
AVERAGE DIAMETER CM WOOD AT 1.3 M IN 50 CROP TREES					
1956		47		52	
1981		51		61	

pp 8.

Separate boards
(on posts)

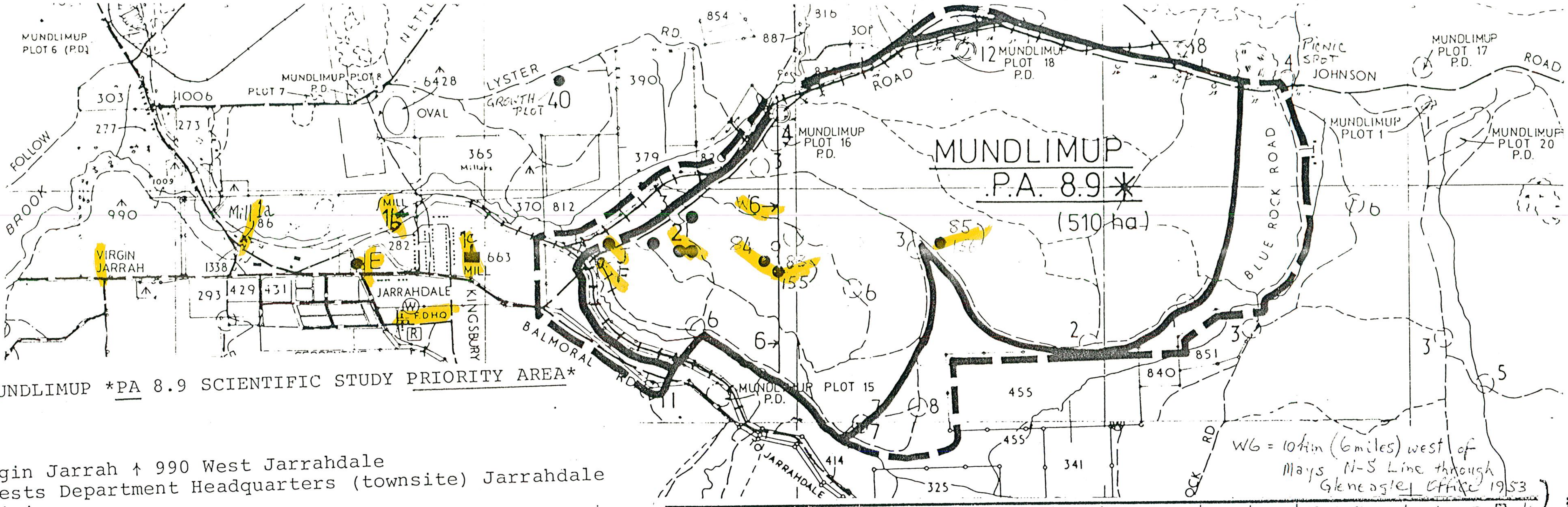
W6 - 900 M	PLOT 155
PLOT 83	PLOT 156
PLOT 84	DEAD KING 202 CM
PLOT 85	TALL PRINCE

see map legend and text pp 8, 11.



Example
notice boards joined in triangle around the tree for significant distinction, message and protection.

26/11/82.



LEGEND: MUNDLIMUP *PA 8.9 SCIENTIFIC STUDY PRIORITY AREA*

VJ	Virgin Jarrah ↑ 990 West Jarrahdale
FDHQ	Forests Department Headquarters (townsite) Jarrahdale Division
E	Education Centre (townsite)

JARRAHDALE SAWMILLS:

1a	1st No. 1 Mill	1870–1887	(1st No. 2 Mill Wungong BK 1880)
	2nd	1887–1901	2nd No. 2 Mill 1901–1920)
1b	3rd	1912–1949	3rd 1912–1943)
	4th	1949–1968	Jarrahdale sawmills)
1c	5th	1968–	
J	Old King Jarrah, Jarrahdale Road/Cooralong BK		

MUNDLIMUP Compartment 1 REGENERATION 1875

F	First tramway formation (with jarrah rails)
2	1870 Pit Sawing Two-age coppice on stumps cut 1870 and 1925
	SITE-VEGETATION, GROWTH and THINNING PLOTS and ASSESSMENT LINE
155	Site-vegetation plot (Segments TS)
83	Growth Plot, unthinned
84	Thinned Plot 1928 and 1957 and split thinned plot in 1957, coppice retained and removed.
W6	1953 Assessment Line at 900 m south of start

MUNDLIMUP Compartment 2 REGENERATION (1875)

85	Growth Plot last cut 1971 (coppice) Dead King Jarrah, 202 cm diameter at 1.3 m Prince Jarrah (from 1875 regeneration) Tall Prince Jarrah
156	Site-vegetation plot

ASSESSMENT LINE W6 — 13-8-53 — 1 1

Ch.	Dist.	Sp.	Class.	G.B.H.	Merch. Log.	Pot. Log.	Centre Girth. 24-60	Top Girth.	Piles and Poles. Length.	Piles and Poles. Top Diam.	Total Height.	Crown Spread.	Remarks.
4264	0	J	B1	6-3½	35								[illegible]
280	-60	J	(R1)	11-2	33		J//////	—					crown damaged.
281	0	J	C1 E	5-1½	36		//////						
255	-54	J	C1	5-1	34		///////						
255	-21	J	(R1)	7-9¾	18		M1						crown damaged
330	-27	J	C1	5-0	32								
405	+39	J	(R1)	9-2¾	39		(J25)	5-					
430	-3	J	C1	5-6¼	31								Good crown. One of the best 60'
460	0	J	(R1)	10-6	—		(M1)	—				3	no crown
450	-30	J	C1	5-9½	40								limb at 12 ft
465	+39	J	C1	5-8½	35								
499	+65	J	(R1)	13-	—			—				4	no crown
		4 4 1/2 leaves external track											
4500							J//////						900 metres
30	-6	J	C1	5-6	40		////////						
38	+23	J	C1	5-5½	30		////////						
30	-6	J	C1	5-2	40		///////						
38	+40	J	B1	6-1½	18		/....						
30	-6	J	C1	5-1	36								
90	+9	J	C1	5-6	36		(J41)						
164	0	J	(R1)	15-5½	39			9-3					
90	+12	J	C1	5-8½	15								
110	-66	J	A1	9-8¾	40								
115	+37	J	B1	6-5	36								
128	-18	J	B1	6-0½	13								
150	+60	J	(R1)	14-6½	39								crown damaged
130	-20	J	(R1)	7-9	30			6·0					
140	-18	J	C1	5-10½	30								gall at 3-3 [illegible]
130	+21	J	C1	5-2½	11								
250	+5	J	C1	5-5	30								
[illegible]	+115	J	(R1)	15-1	—			—				5	no crown

Metres 1000 500 0

CONSERVATOR OF FORESTS
STATE HEADQUARTERS

FOR ATTENTION: C.O.D. HAVEL

JARRAHDALE JARRAH JOURNEY

I enclose paper for approval as a public relations publication. As the subject is close to Perth, I recommend the best possible presentation should be made both in the field and in publication, with careful selection of sites and special effort in photography.

Consequently I should be pleased if this was combined with our other paper on Big Trees of the Northern Jarrah Forest in say, Forest Focus.

A preliminary discussion of the walk trail relating to this paper has been made in the field with Division and Extension Officers.

O. LONERAGAN
SENIOR SILVICULTURIST

OL/kc
Como Research
25th November 1982

Attach.

Distribution as discussed:

O.I.C. Extension Service
O.I.C. Jarrahdale