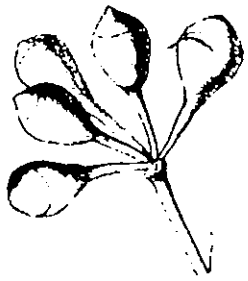
E. Calophylla Provenance Trial Harvey

1976-1985

BY A.J.HART



Conservation and
Land Management

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Results of a Marri (E. calophylla) Provenance Trial in the Harvey District (1976-85)

Introduction

With the implementation of revised rehabilitation methods in dieback affected areas of State Forest, particularly in the northern Jarrah forest, the performance of marri (E. calophylla) on such areas became the subject of close investigation.

The reason for this arose because although some affected areas had a residual stocking of marri trees which could be used as seed trees, other areas of severely diseased forest did not, and therefore required nursery seedling stock in order to restock such areas.

There was a need therefore to establish which provenance(s) of E. calophylla should be used on these types of sites (i.e. dieback graveyard sites typified by exposed black gravels).

The trial reported here was established and designed to indicate which provenance(s) of E. calophylla would give best survival and growth rates. A total of seven (7) provenances were used and E. haemotoxylon (Mountain Marri) was included as it frequently hybridizes with E. calophylla but results were not included in statistical analysis of results for the 7 Marri provenances.

Location of Trial

The trial was established adjacent to Clarke Road Harvey on 29 August 1976 at map reference DQ61.4.9 (see figure 1 for location and plot design)

The area of the trial is 0.65ha and was planted with 24 trees per provenance at 2m x 3m spacing.

Topography and Soils

The site selected was generally an upland area sloping to the N W. Soils are black gravel over broken lateritic ironstone.

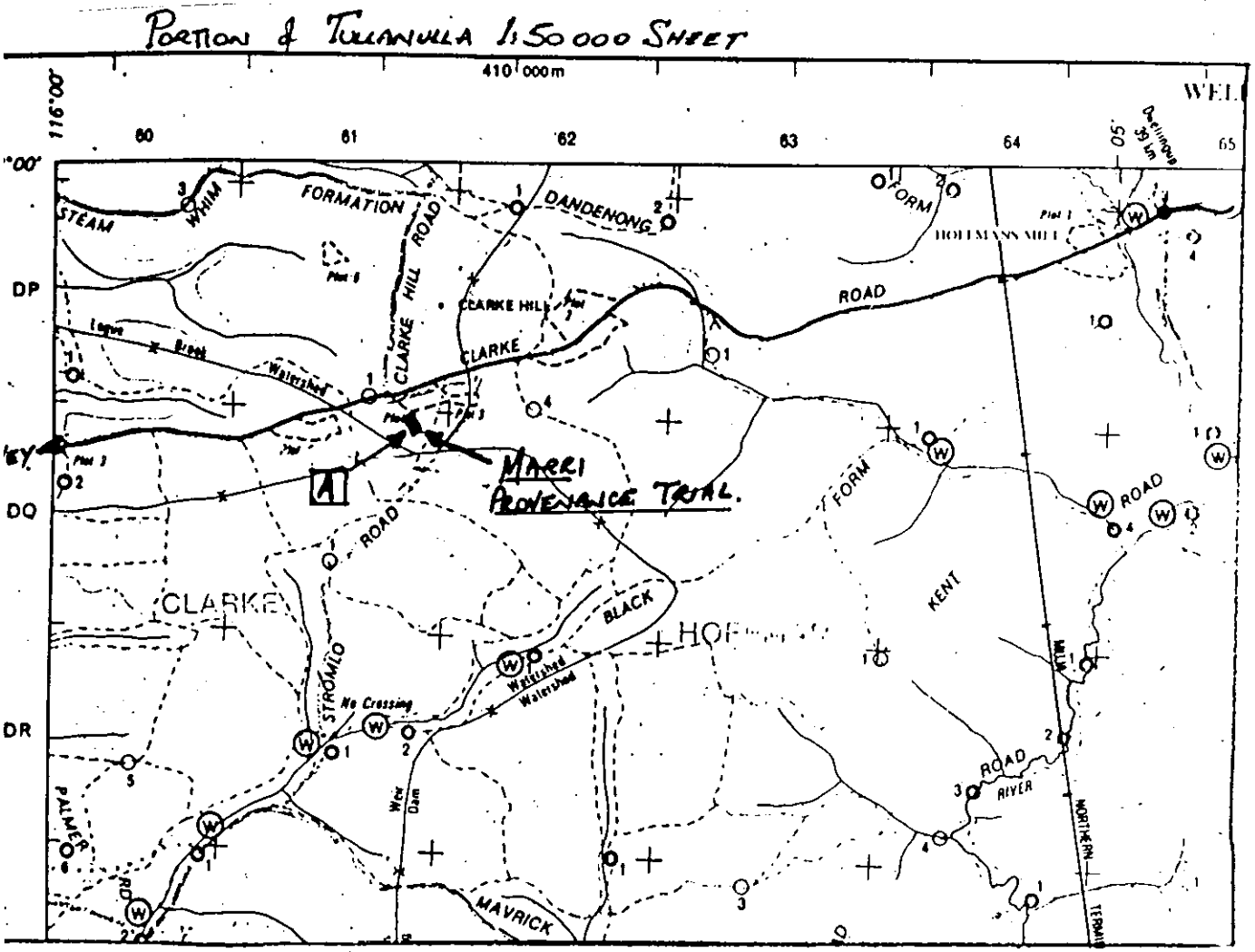
Trial Design

The design adopted was that of a Latin Square (modified) of 8 x 8 cell configuration (see fig 1).

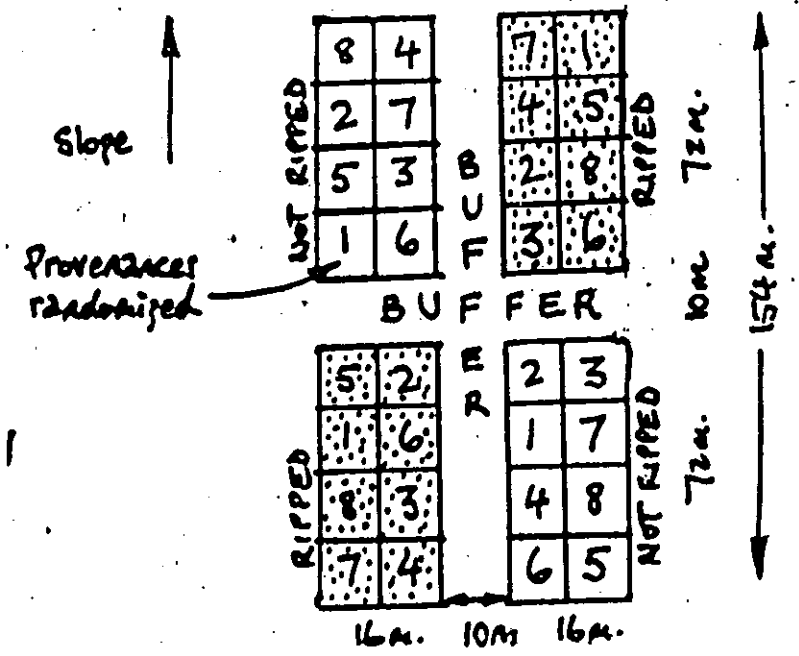
This allowed for eight (8) provenances to be tested with single replications on both upper and lower slopes and on ripped and unripped sites.

LAYOUT OF PROVENANCE TRIAL WITH LOCATION OF RIPPING

TREATMENTS AND TOPOGRAPHICAL POSITION.....HARVEY DISTRICT.



ENLARGEMENT AT 'A'



24 plants in each cell (2m. x 3m. spacing)

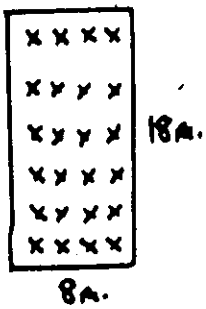
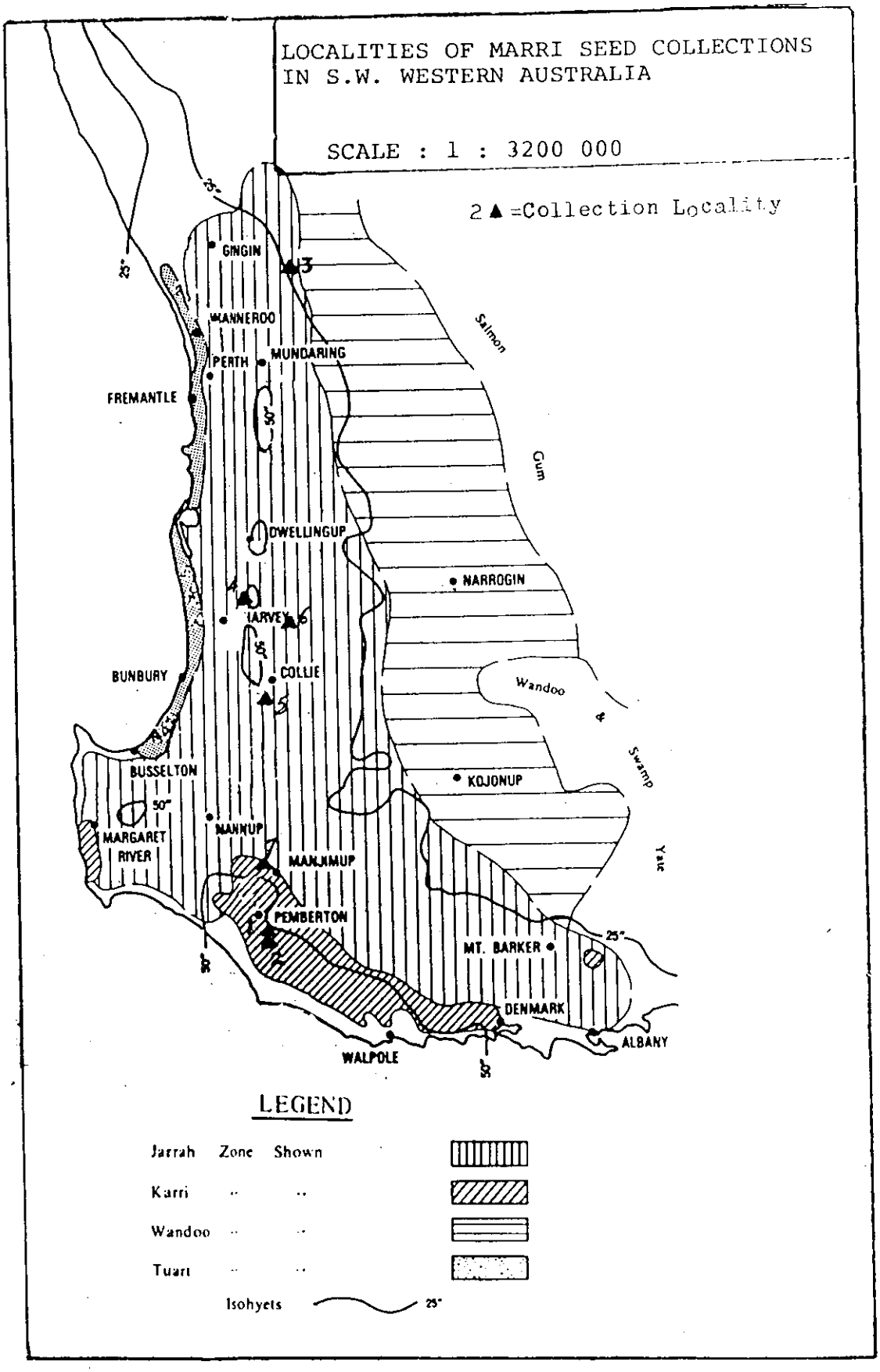


FIG. 2.


LOCALITIES OF MARRI SEED COLLECTIONS
IN S.W. WESTERN AUSTRALIA
SCALE : 1 : 3200 000
2 ▲ =Collection Locality
GINGIN
WANNEROO
PERTH
MUNDARING
FREMANTLE
DWELLINGUP
NARROGIN
HARVEY
BUNBURY
COLLIE
BUSSELTON
KOJONUP
MARGARET RIVER
MANNUP
MANJIMUP
PEMBERTON
MT. BARKER
DENMARK
ALBANY
WALPOLE
Salmon
Gum
Wandoo
Swamp
Yate
LEGEND
Jarrah Zone Shown
Karri
Wandoo
Tuart
Isohyets

Provenance Data

Marri seed was collected from seven localities within the marri forest areas in S W Western Australia over a range of 350 kilometres in a north-south direction and 40 kilometres in an east-west direction (see fig 2).

Seedlings were raised at Hamel nursery during the 1976/77 season and outplanted on 29 August 1976.

Seedlings

Observations were made of the main features of the seedlings of each provenance in the nursery. These are summarized in Table 2.

Provenances from Crowea and South Pemberton (Dombakup) were devoid of lignotubers in the seedling stage. However, seedlings from Julimar and Willowdale did exhibit lignotubers as did E haemotoxylon. An explanation for this difference is lacking at present.

ANALYSIS OF RESULTS OF GROWTH MEASUREMENTS AT AGE 9 YEARS

1985 Measurements

1. On the basis of height comparisons there were found to be statistically significant effects due to ripping only. Significant 2 & 3 way interactions between provenances, treatment (ripping) and topographical position were revealed which indicate a need for further trials to clarify the reasons for the interactions.

2. With regard to DBHOB, provenance only was significant but significant 2 & 3 interactions differences exist indicating more trials to clarify reasons for the interactions.

3. The mean height growth by provenances at 1985 and treatments is shown in table 4 and for diameters in Table 5.

Ripping Results

Results for provenance No 7 (Ex West Manjimup) on unripped sites with regard to height should be taken as a failure of this provenance to establish on unripped uphill sites.

Using height as the criteria (see table 4) the provenances can be ranked (in decreasing order of eminence) with and with out ripping for uphill sites as at 1985 as:

	HEIGHT	DBHOB
Prov.No.	Uphill/Ripped (Rank)	Uphill/Ripped (Rank)
1	1	1
2	2	2
3	7	7
4	4	3
5	3	4
6	5	6
7	6	5

Rankings are not shown for unripped treatments as almost without exception, ripping is better than unripped when survival is taken into consideration (See graph 6).

Site Results

As indicated ripping is essential for best results on uphill sites.

On downhill sites, results are somewhat variable in both ripped and unripped treatments (see tables 4 & 5).

Rankings of provenances by site and unripped are:

Prov.No.	Height Downhill/Unripped	DBHOB Downhill/Unripped
1	2	1
2	1	2
3	5	6
4	4	5
5	3	4
6	7	7
7	6	3

Statistical Results ("Anovars")

Graphs 1 & 2 indicates the statistical difference between treatments for each of the topographical sites for both height and diameter growth in 1980 and 1985 respectively (Diameter growth not included in 1980).

Height Growth "Anovar"

At the 0.05% of confidence level the ripped treatment is better than unripped on uphill site by a factor of 1.35. On downhill sites, the difference is 0.45 for all provenances in both cases.

Diameter Growth "Anovar"

At the 0.05% confidence level, the ripped treatment is better than unripped on uphill sites by a factor of 1.52 whilst on downhill sites unripped treatment is better than ripped by a factor of 0.45 for all seven provenances under test.

Foliar Analysis

Table 3 shows results of foliar chemical analysis from healthy and unhealthy trees in the experiment. The marked difference in potassium 'K' levels is considered of significance in relation to thrift of trees in this area.

Conclusions

1. From both trial rankings it is evident that provenances from Crowea and Yeagarup areas near Pemberton have given the best result for both height and diameter growth i.e. provenances 1 and 2 for both site and ripping treatments.

2. The provenance from Julimar S F has performed poorly on each site irrespective of treatment and is of doubtful value in higher rainfall, disease affected areas.

3. Provenances from Manjimup and east Harvey (No 6) areas have also performed rather poorly and probably reflect the current condition of marri in those areas.

4. Establishment practice on uphill sites particularly must include ripping of planting lines for best results. It is probable that compaction of soil profiles in the denuded condition from precipitation alone does not allow moisture access to lower levels of the soil profiles.

5. Seed of marri required for use in dieback affected areas should be collected in the Crowea and Dombakup areas in the Pemberton district.

ACKNOWLEDGEMENTS

The assistance of many personnel is acknowledged with thanks during the period of this study particularly Hamel Nursery staff at the time, Mr T Annels and Mr S Cave for seed collection and D Ward for his statistical skills.

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TABLE 1

EUC. CALOPHYLLA (MARRI) PROVENANCE TRIAL - HARVEY (1976-85) INCLUDING EUC. HAEMOTOXYLON (MOUNTAIN MARRI) - SEED DATA

PROVENANCE No./LOCALITY	MAP REFERENCE (CALM MAPPING)	WT OF SEED VESSELS (gms)	WT OF SEED VESSELS (gms)	TRASH WT. (gms)	TRASH AS % OF SEED	NO. SEED PER GRAM (AS PURE SEED)	COLOUR OF TRASH	CAPSULE SIZE	ESTD RAINFALL (MM)	LINEAR DISTANCE TO KNOWN MOUNTAIN MARRI (KMS)	PARENT TREE DATA
1 CROWEA BLK	HV651.8	872	-	-	-	12.26	Dark orange red	9.7gm/ vessel	1300	110	T/Ht: 57.5 GBH: 437c BOLE: 30m
2 SOUTH PEMBERTON	HV653.9	840	-	-	-	27.58	Pale orange red	8.08gm/ vessel		110	T/Ht: 55m GBH: 315c BOLE: 30m
3 JULIMAR	LF779.2	970	310	155	50	5.32	Pale straw	Large 17.38gm/ vessel	500-600	25	T/Ht: 10m GBH: 125c
4 WILLOWDALE	DK62	Details of seed not available							1125	10	- -
5 COLLIE - DAVIS BLK	ET564.7	900	18	10	55.5	12.7	Reddish colour	7.2gm/ vessel	1150	10	T/Ht: 30m GBH: 460c BOLE: 12m
6 CHALK BLK	DU762.2	Details not available				14.0	N/av	Small	875	30	T/Ht: 10-1 GBH: 120c
7 MANJIMUP RES.	GX668.8					14.72	N/av		1300	80	T/Ht: 33m REGROWTH C/ BOLE: 11m
8 NORTH DANDALUP (MT.MARRI)	CG579.1	N/av	56	N/av	N/av	23.5	Reddish	Small (Typical)	1000	0	T/Ht: 8.0m GBH: 25cm

TABLE 2

SUMMARY OF OBSERVATIONS OF MARRI SEEDLINGS IN HAMEL NURSERY

Provenance No.	Locality of Origin	Details of Seedlings
1	CROWEA Block Pemberton (Tree No.1	Stems and leaves hairy with a roughened feel. Purplish coloured delicate plants - no lignotubers present at 19/7/76 (approx 5 months old)
2	South Pemberton	6 leaf stage approx 5 months old. Hairy stems and roughened leaves. Peltate broadly apiculate leaves. Young leaves purplish colour rather more delicate framed plants. No lignotuber observed.
3	Julimar SF (Large seed)	Stems roughened and hairy near leaf petioles; peltate generally apiculate. Leaf mite not prolific but present. Lignotubers forming at 10 leaf stage (5 months old).
4	Willowdale	Leaves pointed, appear smaller than Chalk and Collie seedlings. Leaf mite incidence high - peltate leaves; lignotubers present.
5	Collie (Davis Block)	Stems fell hairier than others. Leaves peltate, pointed; little incidence of leaf mite attack.
6	Chalk Block	Rather high incidence of leaf mite attack on larger plants; markedly peltate leaf petiole junctions; tendency to pointed leaves. Stems faintly hairy.
7	W/Manjimup (Regrowth from earlier clearing)	Distorted leaves due to leaf mite. Leaves peltate, rather broad pointed to spadiculate.
8	Nth Dandalup Euc. haemotoxylon	Moderate incidence of leaf mite attack. Stems hairy pale yellow colour in contrast to purplish colour of marri. Leaves pointed rather ovate, leaves roughened on reverse side, paler green in total - erect straight form. Lignotubers present.

Note: The presence or absence of leaf mite is of unknown significance at present, if in fact it is. The occurrence is recorded for further investigation if necessary.

TABLE 3

MARRI LEAF ANALYSIS EX PROVENANCE TRIAL AREA HARVEY

(ca 9/10/85)

Chemical Element	Healthy Tree	Unhealthy Tree
N	0.77%	0.72%
P	0.039%	0.049%
K	1.06%	0.39% *
Zn	19ppm	14ppm
Mn	56ppm	61ppm
Cu	7ppm	7ppm

*This difference is regarded as of considerable importance

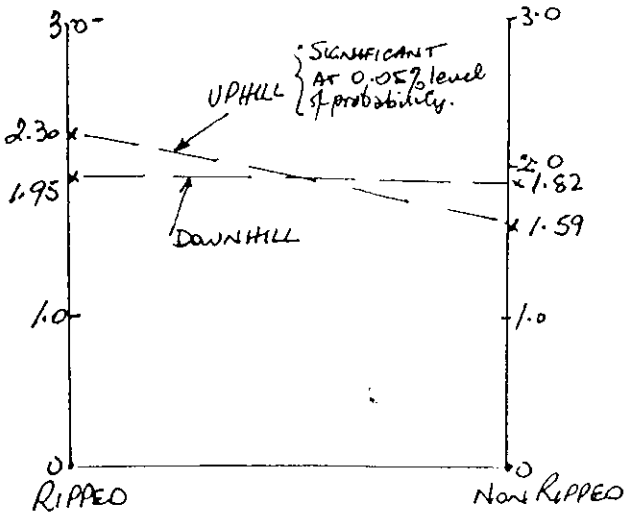
SUMMARY OF MEAN HEIGHT FOR MARRI PROVENANCES - HARVEY - AT AGE 9Yrs 2 months(1985) WITH STD DEVIATIONS

Provenance & Plot No.	Uphill				Down Hill			
	No.Obsns	Ripped(m)	No.Obsns	Unripped(m)	No.Obsns	Ripped(m)	No.Obsns	Unripped(m)
1	8	7.63 ± 2.36	7	5.14 ± 1.92	13	4.36 ± 2.53	8	5.63 ± 2.81
2	16	7.44 ± 2.61	12	4.45 ± 3.16	19	7.61 ± 2.27	10	5.94 ± 2.33
3	14	2.70 ± 1.43	8	2.48 ± 1.40	17	3.94 ± 2.40	14	3.28 ± 1.92
4	15	5.23 ± 2.23	12	4.23 ± 2.44	16	2.37 ± 1.79	9	3.97 ± 1.59
5	16	5.29 ± 2.55	13	4.16 ± 1.65	12	3.97 ± 1.70	7	4.78 ± 1.66
6	11	4.20 ± 1.57	12	4.25 ± 1.95	11	6.22 ± 3.28	6	2.00 ± 1.20
7	4	3.78 ± 2.79	1	0.50 ±	16	3.84 ± 2.12	11	3.27 ± 2.22
8	14	1.89 ± 0.57	5	0.41 ± 0.08	14	1.62 ± 0.50	3	0.75 ±

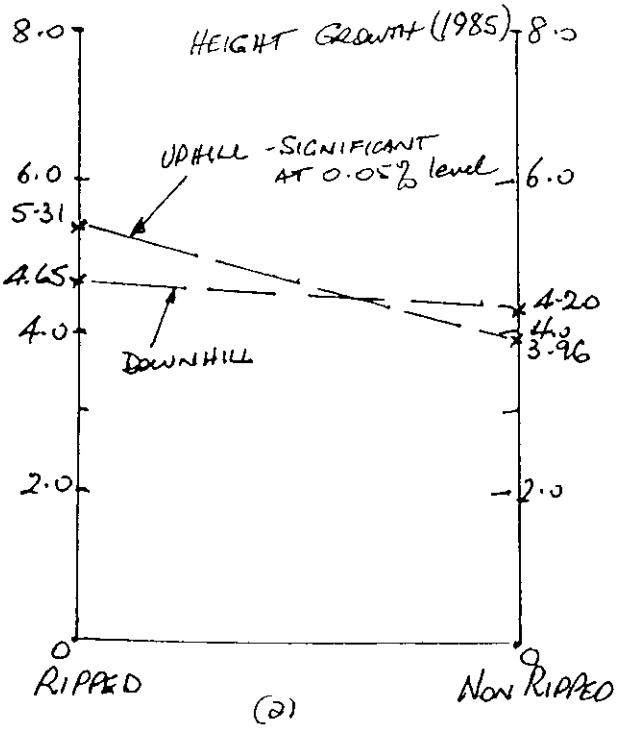
SUMMARY OF MEAN DIAMETER B.H.O.B. FOR MARRI PROVENANCE - HARVEY - AT AGE 9Yrs 2months(1985) WITH STD DEVIATIONS

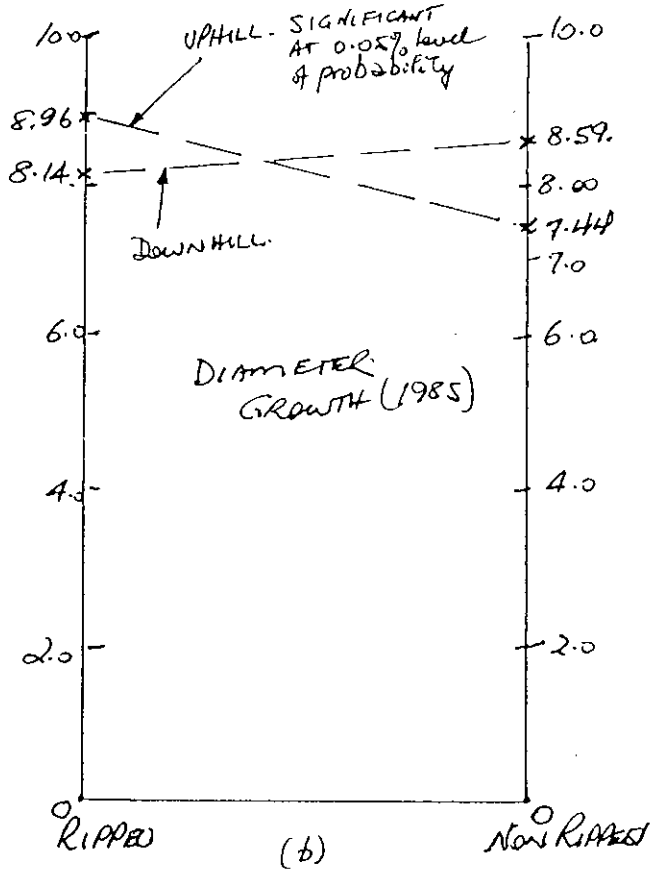
TABLE 5

Provenance & Plot No.	Uphill				Down Hill			
	No.Obsns	Ripped(cms)	No.Obsns	Unripped(cms)	No.Obsns	Ripped(cms)	No.Obsns	Unripped(cms)
1	11	11.31 ± 4.92	12	7.41 ± 2.34	18	7.29 ± 3.39	14	10.75 ± 3.72
2	21	11.14 ± 2.5	14	9.66 ± 3.39	22	10.05 ± 4.45	12	10.33 ± 4.34
3	13	5.86 ± 2.05	5	4.81 ± 3.28	22	7.27 ± 2.55	12	6.43 ± 3.13
4	24	8.9 ± 3.83	18	6.36 ± 4.18	11	6.75 ± 1.96	13	7.45 ± 2.14
5	26	8.16 ± 3.89	24	6.83 ± 3.09	14	6.59 ± 3.35	12	8.33 ± 3.58
6	13	7.27 ± 3.41	16	8.81 ± 3.55	14	9.04 ± 2.85	3	4.77 ± 1.43
7	6	8.11 ± 3.41	Too Small or Dead		13	8.21 ± 3.95	12	9.04 ± 4.85
8	12	3.35 ± 0.59	Too Small or Dead		9	2.17 ± 1.28	Too Small	



GRAPH 1: "ANOVAR" of HEIGHT GROWTHS IN 1980 BY TREATMENTS & SITE for ALL PROVENANCES (7).





GRAPH 2 (a & b) - Showing Statistical Differences Between TREATMENTS on Both Sites for ALL PROVENANCES (7), IN 1985.