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THE WANDOO (Eucalyptus redunca var. elata) FORMATION

SUMMARY

This paper briefly summarises the present knowledge and some theories on various aspects of the Wandoo areas of Western Australia, with a brief mention of its associated species, especially Powderback Wandoo (Euc. accedens).

Contents:

Section 1

INTRODUCTION

i There have been a few previous reports and papers of various kinds, describing the Wandoo forest or part thereof, and this paper has been written to comment on the earlier literature, and to provide a somewhat clearer picture of some aspects of the species.

ii In addition, it is hoped that this work will provide a background and, if necessary a form of starting point for future notes on the Wandoo formation.

iii The use of Wandoo timber has recently extended to new fields, an interesting one being the seating at Perry Lakes Stadium for the 1962 British Empire and Commonwealth Games. The extending usage plus a rapid improvement of fire control in the Wandoo forest suggest an increasing economic importance of the species.

Section 2

ECOLOGY

i. Distribution

As shown on Map I, the wandoo forest has a wide range of distribution, extending from near Geraldton on the NW. coast southwards to the Mt Barker area.

Throughout this area there are several distinctly different formations:-

(a) Coastal Plain & Western Scarp.

(b) On the granite outcrops of the western margin of the Darling scarp.

(c) The main zone, on the East and Northern extremities of main Jarrah Belt.

(d) In isolated patches through the Mallet forest on the inland or Eastern fringe of the Wandoo Forest Zone.

This paper does not aim to deal with the whole of the Wandoo forest zone, but rather with the zone of merchantable or managed Wandoo forest.

This area extends from Beverley, northwest to New Norcia, and a more detailed plan has been prepared to illustrate this. (See Maps 2,3 & 4).

A marked gradient from West to East is apparent, especially in the Helena Catchment Area with Wandoo occurrence expanding from valley bottoms as it progresses Eastwards.

ii Soils

The distribution of Wandoo is not directly controlled by edaphic factors, but they do have a secondary influence within climatic regions. Although a widespread impression is gained that Wandoo occurs in flats and valleys, it is never found on the extensive Kauring sand surface. (10). Most other distribution is a direct reflection of topography and aspect. No general rules can be determined but there is a tendence toward a distribution of species as shown on diagram 1 below.

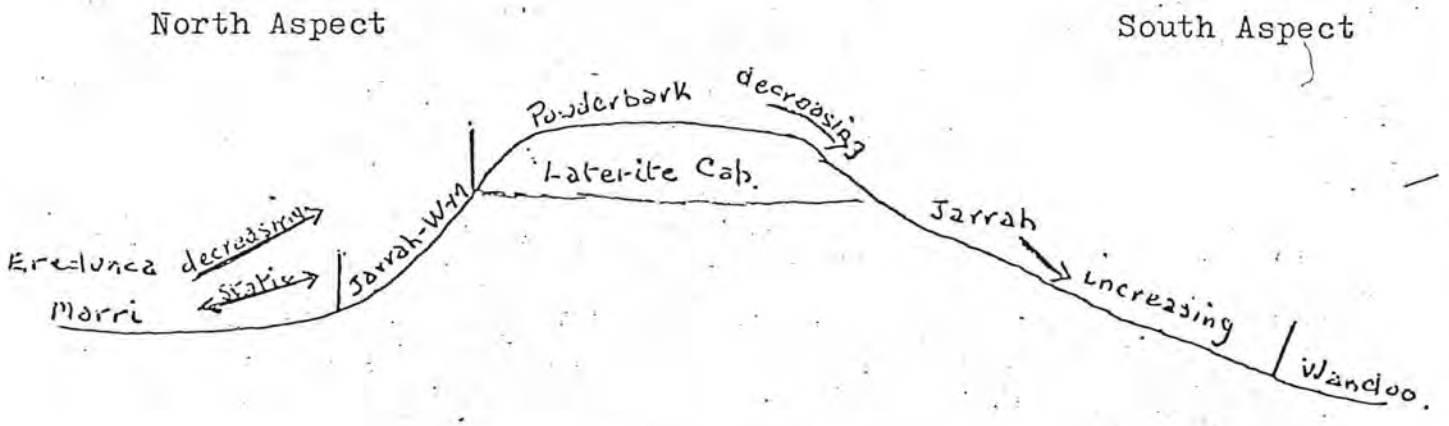

Diagram 1.

However, this distribution is more topographic than edaphic in character.

iii Association with other tree species

a. Indicative of Wandoo's independence of soil type, is the wide associations with other species. The following vegetative associations occur within the region under discussion

Wandoo - pure stand
Wandoo - Marri
Wandoo - Marri - Blackbutt
Wandoo - Marri - Jarrah
Wandoo - Jarrah
Wandoo - Powderbark
Wandoo - York Gum

b. Colonisation of the Jarrah Forest.

Although no conclusive evidence has been established, there are several features of the Wandoo forest which suggest that it is invading the Jarrah-Marri complex in parts of the subject area. Examples of this are:-

I Ring-barked country along Gorries Road (See Plan 4). Here, an area of total ring-barking in 1905 which then contained sparse Wandoo, now (1963) is a 50/50 mixture of even aged Wandoo and Jarrah, with Wandoo easily out growing the Jarrah in both height and girth.

II In the Julimar Forest (see Plan 3) near Coondle, Jarrah grows as an understorey to the Wandoo Forest.

III In the Jarrah-Wandoo transition zone, most fire killed trees are Jarrah, the Wandoo apparently can withstand greater fire damage. drought might have killed the jarrah?

IV Wandoo produces massive or wheatfield regeneration on ashbeds and in the Jarrah-Wandoo transition areas, the scarce Jarrah regeneration on ashbeds allows Wandoo to take over from Jarrah in these marginal areas.

V The early growth rate of Wandoo coppice is of the order of 6 metres in four years, and this again gives the species an advantage in mixed forest. Campbell claims that Wandoo coppice falls off at about 20 years, but the authors

V (cont) have measurements of much older coppice than this e.g. 35 years old and still growing vigorously.

c. Vegetative Formations.

Although frequent reference and popular usage nominate WANDOO FOREST, the Wandoo stand occurs in two main ecological groups:

a) A Savahhah woodland.

b) A Sclerophyll woodland.

In fact, the species seldom actually reaches a stand density which can be truly called a "Forest". The use of the term Woodland is further supported by crown cover classification from aerial photographs which reveal a crown cover of the upper strata which does not exceed 40%. However to conform with general practice the authors have used the term "Forest" throughout this paper.

d. Fire and its Effect.

The composition of the Wandoo Forest indicates that fire has always played a vital role in stand development, and regeneration from ashbeds appears to have been normal for over 100 years.

SILVICULTURE

i Flowering

Campbell has described in broad terms, the flowering of Wandoo in the main Wandoo zone. This involves the development of flowers in spring, twelve months after floral bud formation. The seed capsules contain mature seed twelve months later.

However, the Wandoo North of the Bindoon - Dewars Pool Road (Plan 2) which is known to apiarists as "Northern Wandoo" develops floral buds in the autumn of year 1 and flowers in the winter of year 2. This is of importance to the honey industry, but is of little significance in regeneration of the forest, as will be seen below. Although some wandoo flowers every year, widespread or general flowering has a periodicity of approximately 6 years. The 1957 MAST year brought one of the best honey flows known to the W.A. honey industry.

ii Seed Supply

Wandoo seed sets, and begins to shed 1 year after flowering. Fortunately, the crowns normally carry some of the seed vessels from the two previous flowering periods, which means that adequate seed is usually available in the crowns of standing trees. No quantitative information on seed supply is available.

iii Bark Characteristics

(a) Bark Thickness

Measurements of bark thickness of Wandoo shows very little variation with changes of girth - (see Graph 1), although general upward trend exists. Actual overbark girth measurements are subject of inaccuracies due to the irregularity of bark shedding which occurs in an erratic manner over a period of some months. For this reason measurement of plots should be at the same time of year.

(b) Decortication

The young sapling and pole has a semi-fibrous bark similar to peppermint on the butt, and is smooth at the top. The fibrous bark persists for some years before being replaced by the smooth, decorticating bark which is typical of the mature tree. It is thought that the change from rough to smooth bark depends on age of the tree, but further investigation is needed to clarify the position. Two other possibilities exist either that smooth bark is developed at a particular size, or that the initial change to smooth bark is brought about by a running fire.

At the mature stage, regular decortication of the bark occurs during the late summer and autumn. The winter colour of the new bark is generally a clear yellow, which mellows to mottled greys and whites by early spring.

iv Wandoo Coppice Forest

Wandoo coppices or "suckers" readily from stumps following falling operations, and has rapid early growth. Very low stumps are possible in mill falling operations because the majority of trees which produce mill logs are in the 150cm to 250cm girth class, and no great difficulty is presented in falling close to the ground. From the viewpoint of coppice

growth, this low stump is preferred since it assists the development of well-formed sapling boles, but even on high stumps, the majority of coppice shoots emerge at or near ground level.

Height growth of Wandoo coppice has been recorded at 0.6 metres in three months, 2.4 metres in twelve months, and observations of cut-over Jarrah-Wandoo forest show that Wandoo coppice develops faster than Jarrah on the same site.

Maintenance of rapid growth continues on good Wandoo sites for four or five years as shown by the following figures in first quality Wandoo forest.

Location	Flynn Cpt. 4	Flynn Cpt. 1
Age	4.5 yrs	5.5 yrs
Height	6.7 metres	7.5 metres
MAI height	1.5 metres	1.4 metres

This ability to reach 6 metres or more in four or five years provides one of the keys to the survival of Wandoo coppice. The Wandoo forest will seldom carry a fire at intervals of less than four years, which means that if coppice can reach 6 metres before facing a running fire, it has a good chance of surviving and its rough bark at this stage gives added protection.

FIRE

i Uncontrolled Fires

It is only since about 1954 that a concerted effort has been made to suppress bushfires in the Wandoo forest generally. Prior to this uncontrolled fires wandered virtually unchecked at regular intervals and the pattern of burnt country followed the changes in wind direction. Despite this fire history, most of the maiden Wandoo forest has an adequate stocking of all size classes, and it is this fact that has led to the use of autumn top disposal burning for this species, as will be discussed later.

ii Prescribed Burning

Regular prescribed burning can be performed on a four to five year cycle in Wandoo forest, and both Spring and

Autumn burning can be executed satisfactorily. In general, Autumn provides better conditions for a number of reasons.

a. Savannah woodland is the commonest ecological form of Wandoo and by the time grassy sections are dry enough to burn, the weather conditions generally in this 380 to 560mm rainfall are likely to be too warm for control of burning.

b. Most districts have large areas of Jarrah forest to burn in the Spring when the fire is not likely to burn Jarrah's rough bark. In the autumn Jarrah burns tend to be very hot but Wandoo does not create a crown fire by moving up the bole.

c. Restrictions on controlled burning of Wandoo areas, because they mainly adjoin Wheatbelt farms mean that the prohibited burning period begins in mid October, when farmers are very concerned about fires; the Autumn burning period opens early in February, by which time the farmer's fire risk (his crop) no longer exists. The nett effect of all this is that legally, and climatically there is more scope for protective burning of Wandoo forest in the Autumn than at any other time of the year.

iii Top Disposal Burning

Disposal of tops from mill falling operations is achieved by burning the crowns to create a seed bed of ash. Until 1958, the general practice was one of spring top disposal burning but as from Autumn 1958, the general procedure has been as follows;

a. Advance burning of Wandoo in year 1.

b. Mill falling in year 2

c. Top disposal burning in autumn two summers after mill falling.

The purpose of this schedule is to get a hot top burn before the bush will carry a hot running fire. If the tops have had up to two years drying, complete destruction of the crown is probable. This complete destruction appears to have been a significant feature of Wandoo seedling regeneration in the past, when most tops were burnt in a summer fire. The 1958 Autumn burns were very successful, with a general seedling

germination of up to 100,000 seedlings per single crown on a series of plots.

Plot No.1 of that series had been reduced from several thousand to about 200 by Autumn 1963, with seedlings up to 1 metre tall in five years.

Seedlings tend to stagnate at about 1 to 1.5 metres tall, and, in much the same way as Jarrah, a warm fire at this stage may only burn off the leading shoot and result in formation of a lignotuber. Dynamic growth occurs from this lignotuber at much the same rate as for coppice shoots.

Seedling density is usually high, because, as mentioned in the seed supply above, there is rarely a shortage of seed on standing trees. A series of seedling study plots were established on ashbeds in early 1963. Details of their location and so forth are included in Appendix but the stocking of seedlings can be summarized as follows:

Plot No.	No. of Quadrats	Age	Area of Crown (metres^2)	Total No. Seedlings
AR 1	2	4yrs	137	8880
AR 2	2	4yrs	100	1960
AR 3	2	4yrs	92	8100

MANAGEMENT AND YIELD

i Volume assessment

A considerable area of assessment has been done in both mixed and pure Wandoo stands, and although marketable volume can be used as a guide to potential volume of Wandoo forest in the future, because of the use of non-marketable mill logs and a proportion of the crown for the production of a tannin extract (formerly at Boddington Belmont and Toodyay, but now only at Toodyay) the gross bole volume and volume of utilisable crown must be considered.

Assessment at Julimar and at Mundaring has given figures as high as 50 cubic metres per hectare for gross bole volume, and mill logs have been assessed as high as

20 cubic metres/ha. However, the normal sawmilling operation yields above 8 cubic metres/ha of good mill logs.

ii Utilisation

Wandoo is a pale brown, durable timber with an interlocked grain and is in great demand for sleepers, building materials and joinery.

The tree is often faulty, with ring and star shakes being the most common defect. Although general appearance of bole and crown can indicate the potential quality of the bole, these guides are by no means absolute, and it is usually impossible to judge quality from external appearances. For this reason it is not normal practice to "tree mark" the Wandoo forest, and bush falling operations are worked on a girth limit basis, with the faller having the option of falling any trees millable over a designated Girth at breast height. For example, in the Mundaring and Julimar areas, this limit is 150cm G.B.H.O.B.

Falling is done with chain saws, and low stumps are usually obtainable, since it is uncommon for a good quality log to need long butting. Because of the scattered nature of mill logs in the open Wandoo savannah woodland, logs are yarded and loaded by a four wheel drive crane.

Most of the Wandoo country is flat or undulating, and access to harded temporary landings is seldom difficult in summer, but winter has its problems, and most mills try to operate in the Jarrah and Powderbark of the ironstone breakaways during the wetter part of the year from June to September.

Although the average volume of mill logs recovered per hectare varies from 1.5 to 10 cubic metres (true volume under bark) the recovery of logs from high quality areas may be much greater than this. James records an area shown on map 4, from which 46.0 cubic metres of mill logs were removed, leaving 17.0 cubic metres of marketable timber and 28.1 cubic metres of non-marketable timber per hectare. This is exceptional, but serves to show that gross bole volume in Wandoo areas can reach as high as 65 cubic metres of true volume under bark per hectare. It is important, in this same plot to consider the log lengths involved as follows:

Mill Log Cut (metres)	Mill Log Remain (metres)	Non-Marketable (metres)
2.7 to 5.7	3.6	5.5
6.4	6.1	6.1
7.0	6.7	8.5
7.3	7.6	9.1
	7.9	
	8.5	

The maximum log length obtained was 7.3 metres although there are some longer boles occasionally obtained up to 13.5 metres.

In practice however, most sawmills using Wandoo get these long logs so rarely that they lack the gear to handle them and so these lengths will normally be cut into shorter lengths for milling.

List of References Cited

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(c) Marr H.V. "Wandoo as a Source of Vegetable Tannin" Aust. Fore.Vol.VI No.1 (1941)

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(e) Boas I.H. "The Commercial Timbers of Australia" Melb.(1947)

(f) Campbell J.B. and Loneragan O.W. "Articles in Institute of Foresters Newsletter" No.16.

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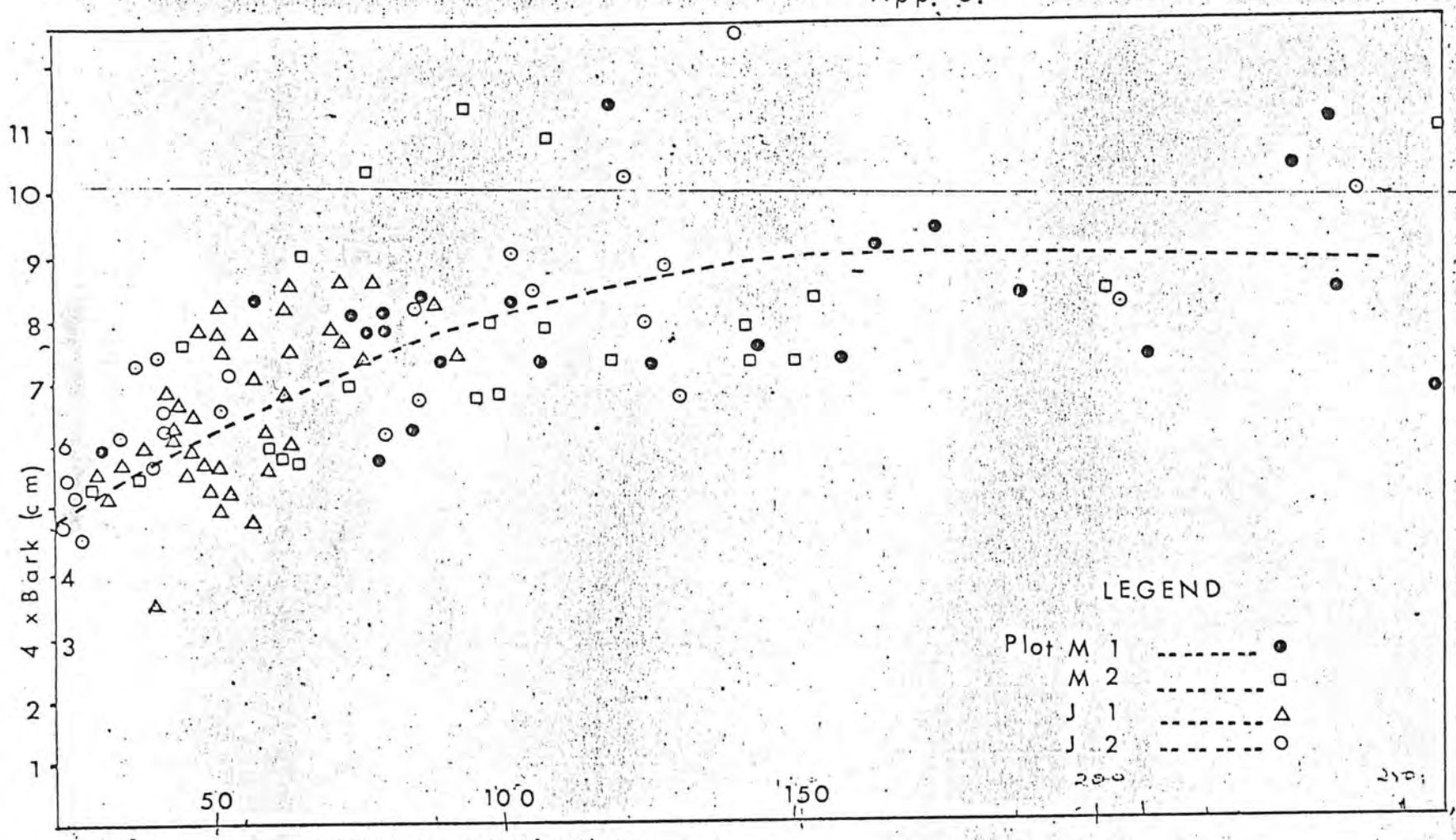
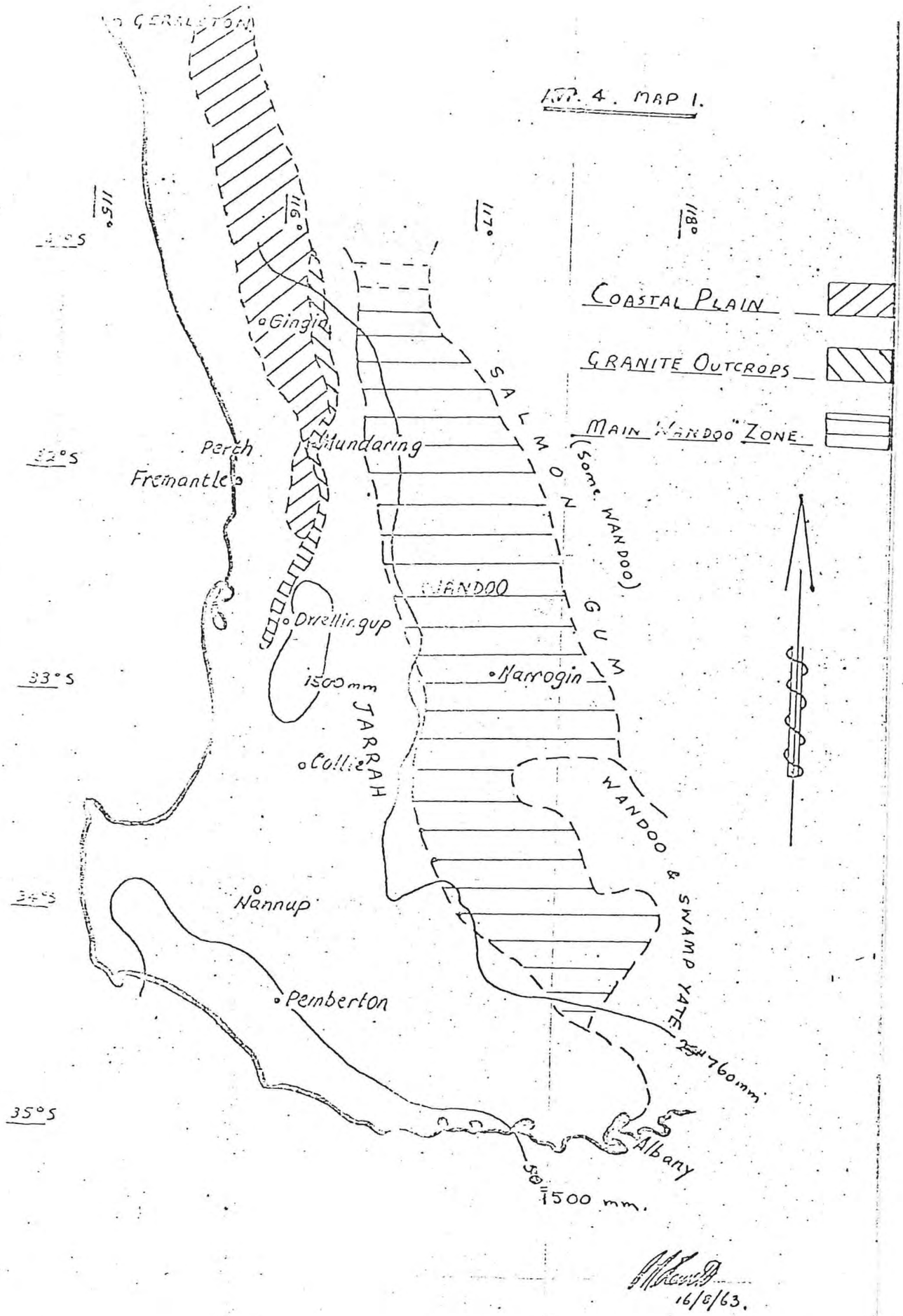
(h) James H.K. "Wandoo at its Best" Forest Notes No.3 (March 1962)

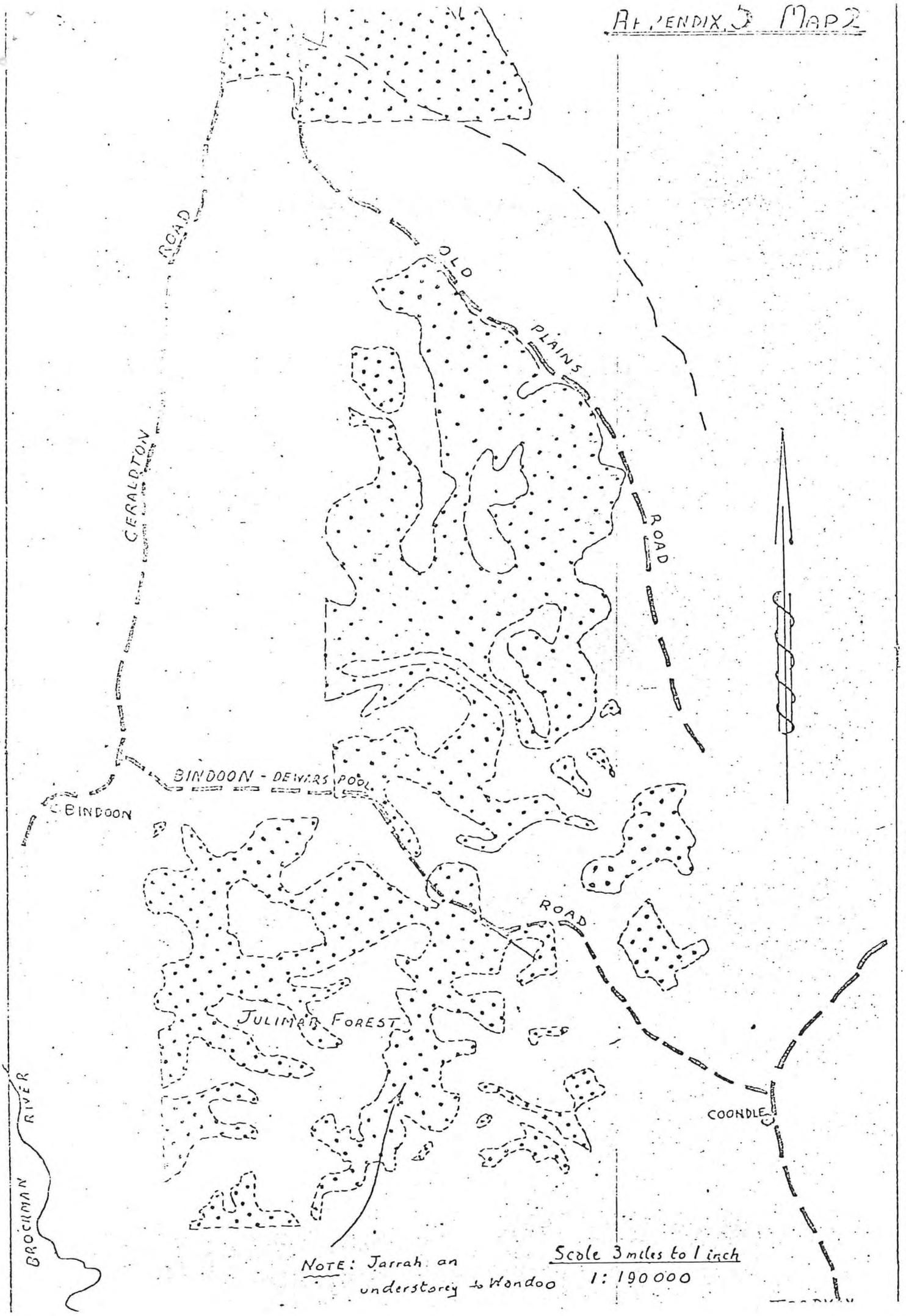
RATIO----- GBHOB: BARK

App. 3.



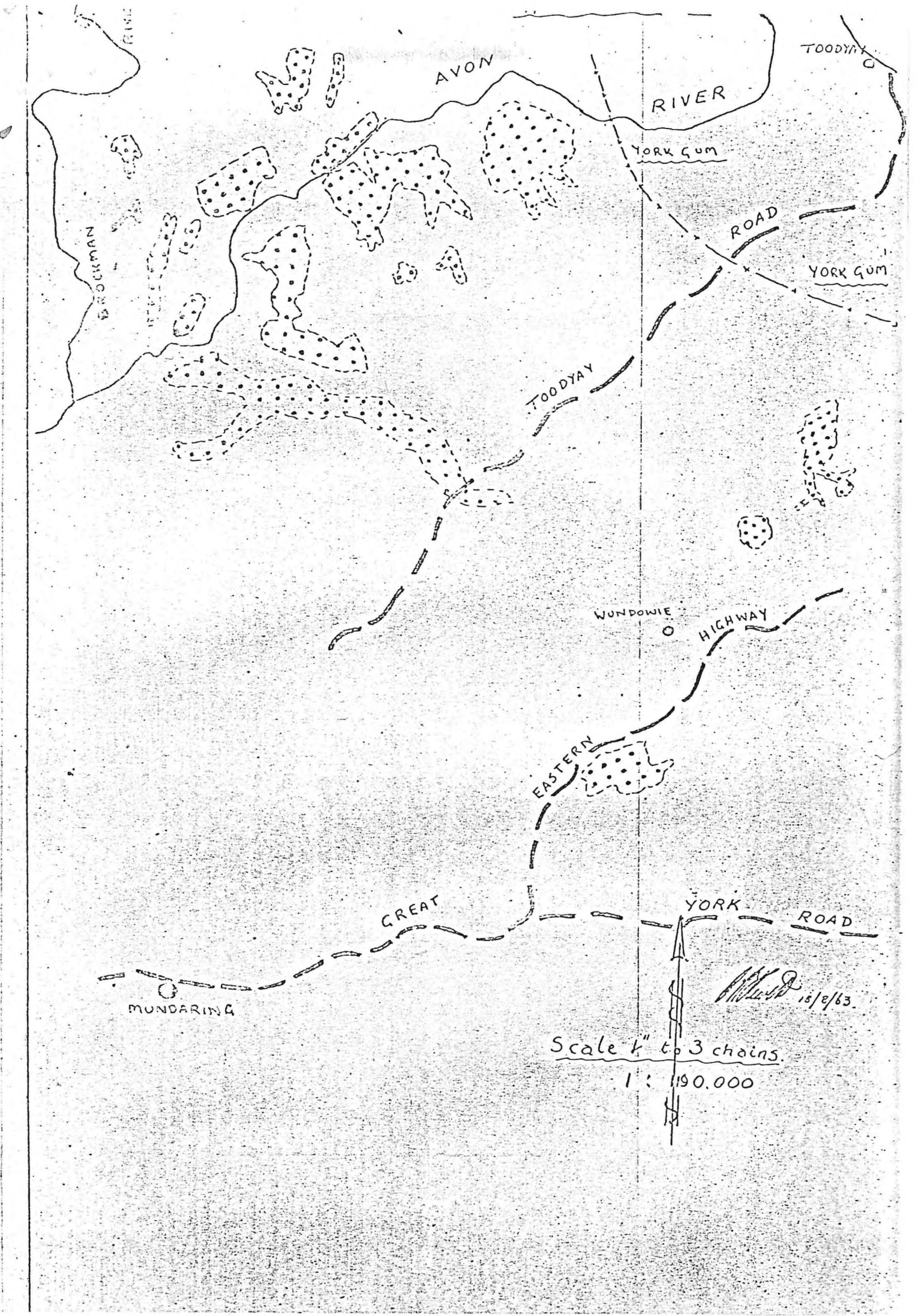

TO GERALDTON
FIG. 4. MAP 1.
115°
116°
117°
118°
31°S
32°S
33°S
34°S
35°S
COASTAL PLAIN
GRANITE OUTCROPS
MAIN WANDOO ZONE
Gingin
Perth
Fremantle
Mundaring
SALMON GUM (some WANDOO)
WANDOO
Dryellingup
1500 mm
JARRAH
Narrogin
Collie
WANDOO & SWAMP YATE
760mm
Nannup
Pemberton
Albany
1500 mm.
16/6/63.

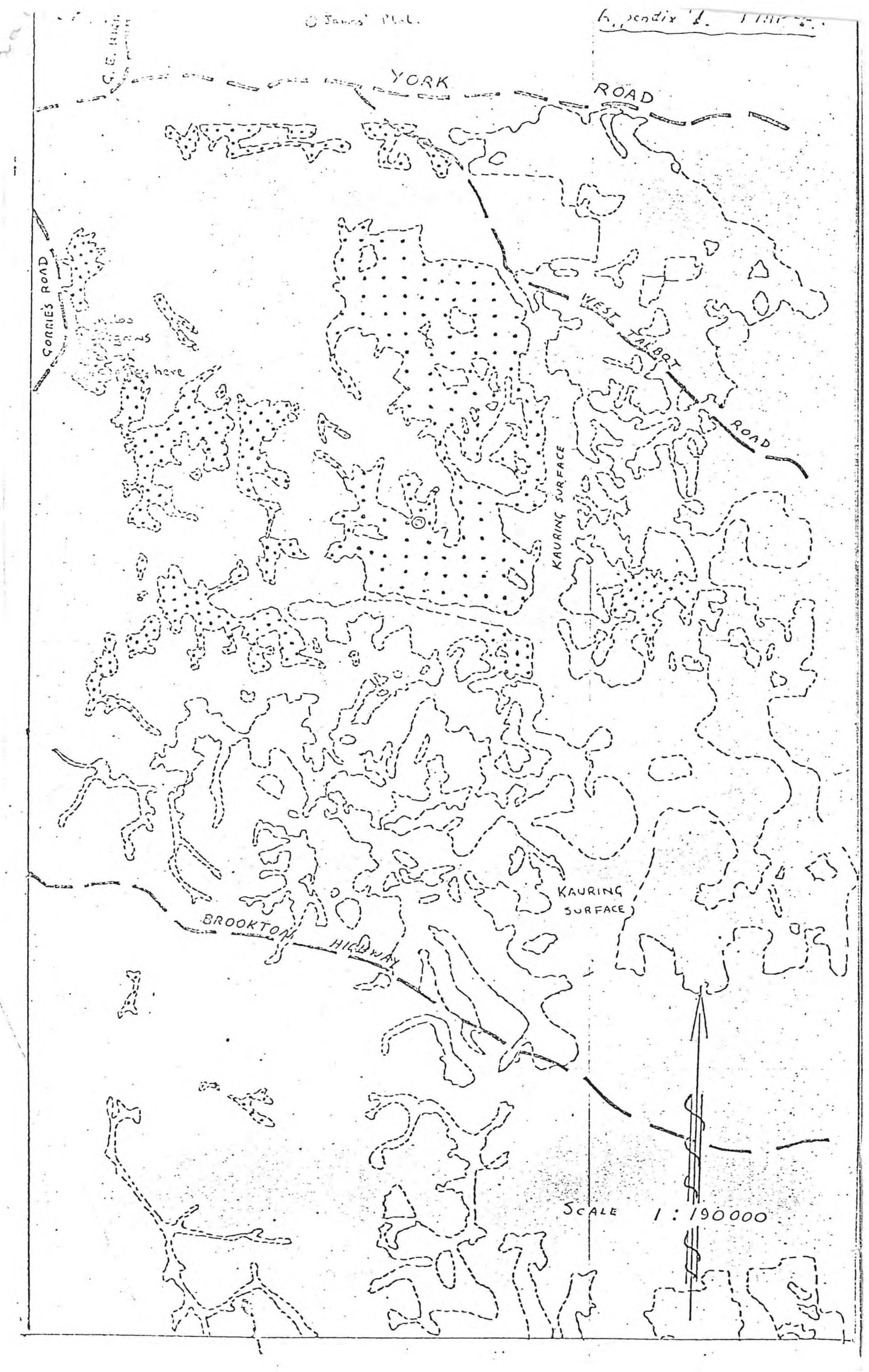
APPENDIX 3 MAP 2



NOTE: Jarrah an understorey to Wondoo

Scale 3 miles to 1 inch
1: 190000


AVON
RIVER
TOODYAY
YORK GUM
ROAD
YORK GUM
BROCKMAN
TOODYAY
WUNDOWIE
HIGHWAY
EASTERN
GREAT
YORK
ROAD
MUNDARING
15/8/63.
Scale 4" to 3 chains.
1 : 190.000


YORK
ROAD
CORNIES ROAD
WEST TALBOT
ROAD
KAURING SURFACE
KAURING
SURFACE
BROOKTON
HIGHWAY
SCALE 1 : 190000