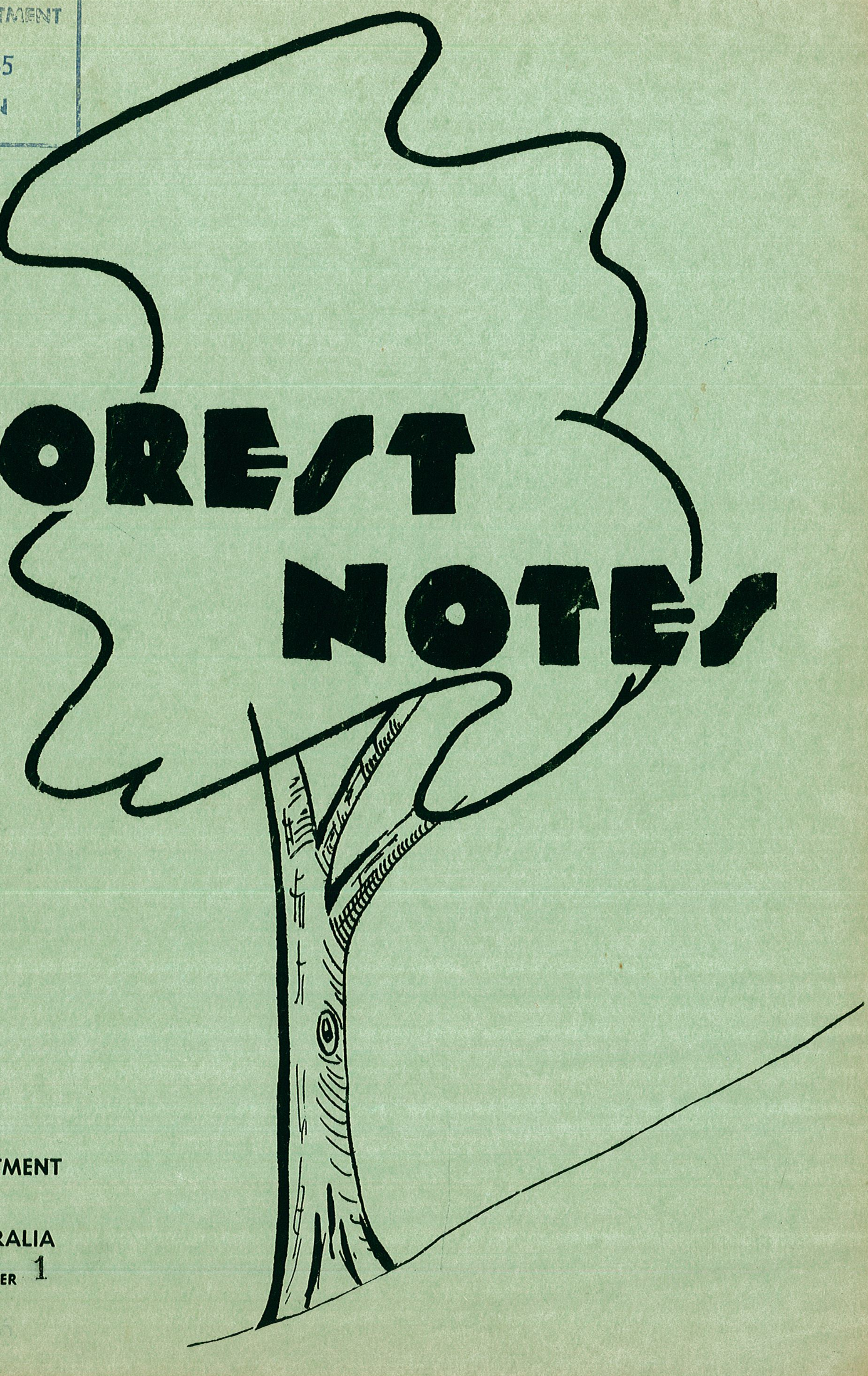
FOREST NOTES



FORESTS DEPARTMENT
PERTH
WESTERN AUSTRALIA
VOLUME 3 NUMBER 1

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Vol. 3 No. 1. EDITORS NOTE March 1965

With this issue we commence volume three of Forest Notes, and at the same time welcome in the New Year with the hope that it will prove a propitious one for Forest Notes.

Contributions continue to arrive at a fairly even, if not startling rate and so far we have not been faced with the necessity of producing a number with only an Editorial. However there is plenty of room for improvement, so what about it?

You will recall that in Vol. 2 No. 3, spurred on by what appeared to be an awakened interest in this publication, we promised a section reserved for "Letters to the Editors", which was to appear in Vol.2 No. 4. You will further recall that in Vol. 2 No. 4, letters to the Editors were most conspicuous by their absence. Is this because there is nothing to either condemn or applaud in the Editorial handling of "Forest Notes", nothing to be said for or against any contribution to "Forest Notes", or is it perhaps that although there is much to be said on both aspects, our readers have not quite got around to voicing their thoughts. This section is still open so crystalise your thoughts before the closing date of the next issue.

Remember, closing date for the next issue is 1st June, 1965.

P. N. Hewett C. J. Edwards

JOINT EDITORS

STOP PRESS

Mr. Edwards' resignation as co-editor has been reluctantly accepted. His place has been taken by A.D.F.O. John Robley who is stationed at Mundaring Weir. We take this opportunity to express our thanks to Jim for his part in producing a regular issue of this magazine.

P. N. Hewett J. A. W. Robley.

The Editors,

Dear Sirs,

Comment on BROWN WOOD in Karri.

Forester Thomson queried this wood in the early 50's when it was prevalent in Karri being milled at Denmark and Kent River.

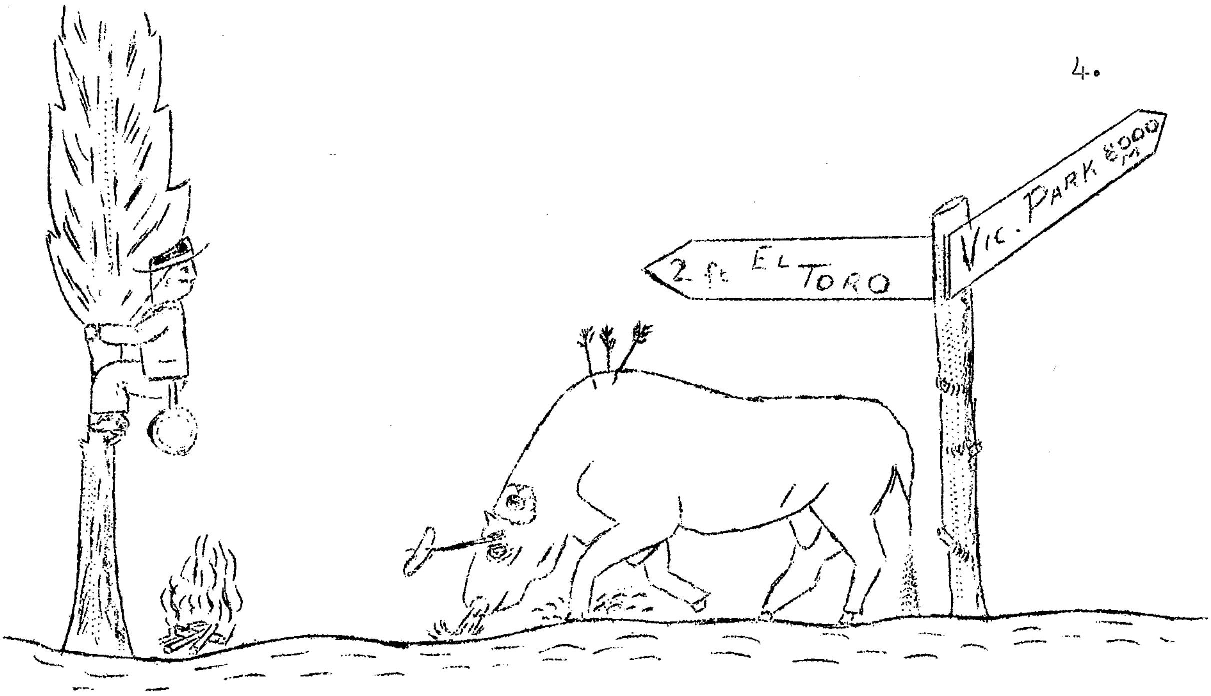
Lou Weston planted specimens in ground conducive to fungal development for a period of three years, and there was no fungal breakdown apparent at the end of this test. He considered it to be Fire Damage and not fungal attack, and NOT a defect.

In 1957, at Shannon River, a large proportion of logs, especially crown logs, had as much as 50% of their volume comprised of brown wood, with considerable decay and mycelium associated around the heart centre.

Samples were sent to Head Office for University and C.S.I.R.O. testing, these samples being cut as far from the heart centre as was possible. Cass-Smith reported that fungal attack was present in the specimens, but that he could not culture the causitive fungus. He considered that fungi contained would have no effect in further breaking down the sawn timber.

I have no record of any C.S.I.R.O. results ... samples may not have been sent.

Yours etc.,
A.R. KELLY.



TRADITION AT WORK IN THE FOREST IN PORTUGAL.

by D.H. PERRY.

Tradition is something we have very little of in Australia, but in an old country like Portugal there is lots of it, and one sees its effects everywhere. Its benefits and its handicaps are many. The great achievements of the past bind these people together into a proud and happy nation. Their many festivals and celebrations, the origins of which are lost in antiquity, their beautiful traditional costumes which they wear on such occasions, the lovely old buildings, monuments and castles, all help to remind them that they are Portuguese, and that Portugal has a long and glorious history.

On the other hand this same tradition makes it difficult to introduce new ideas and ways of doing things. Fathers have taught their sons for generations how to do what has to be done, and new ideas and methods can be sheer heresy.

An Australian forester on first examining the Forest of Leiria, would immediately be aware of the large areas showing symptons of phosphate deficiency, and also the very high tree densities per acre at all stages up to fifty or sixty years of age. For upwards of 500 years in this forest, Pinus pinaster has been grown in this dense manner, the underlying idea being that it improves form, reduces the size of the branches, and in retarding the growth rate, produces a denser and stronger wood. All of which goes to show how discerning and on the ball these old foresters were. In those days Portugal was not short of timber and the loss of merchantable increment did not matter, but today it is a very different story and this country needs all the timber it can grow.

The Forester in Charge at Leiria is a very able and competent man, and is working hard to change the order of things in his forest, but his greatest problem is to change the thinking and active opposition to new ideas, of his colleagues and workmen at all levels. Despite the fact that he is completely occupied with administrative work, he has made time to lay out fertiliser experiments and to carry out some thinning trials. Some very good responses to phosphate have been obtained with applications at time of sowing, but little or no work has yet been attempted to improve the poor growth of many older stands.

So much for the present position. Recently I was able to spend a day in the forest with the forester in charge, and amongst other things inspected a thinning experiment being given its first treatment. The stand was eight or nine years old and the stocking about 2,000 trees per acre, and this was being reduced to about 800 to 900 per acre, a revolutionary step at this age. The actual thinning was being done by girls and women, but mostly girls, and they were working under the direction of a Forest Guard.

The antagonism to this work, even although it is only being done on an experimental scale, is so great that considerable difficulty has been experienced in getting guards to take charge of it, and men to carry it out. The guards continually report sick, and fail to turn up for work on the flimsiest of excuses, and the workmen do not wish to have anything to do with it either. It is absolutely contrary to all they have been taught, and to the way it has been done for hundreds of years, and it almost seems that they are in real fear that the Gods will in some way punish them for doing it. Apparently women and expecially younger girls are not so inhibited and will do this work, but the older ones do not like it, as was evidenced when one was asked in my presence what she thought of what she was doing. Her reply was that she hoped it would be all right as the forest belonged to the State and the guard in charge would protect her, but if the forest was the property of a private man then the police would surely put her in goal.

Considerable criticism and condemnation of the work has also come from other foresters, who amongst other things claim that the balance of nature will be disturbed, the site will deteriorate, the quality of the timber will be lowered and the form of the trees ruined. All this despite the fact that the work is only being carried out on an experimental scale. Their worries about site deterioration are hard to reconcile with the fact that for centuries the peasants have been sapping the life blood of this forest by raking up and carting away the needles and debris for their fields.

Some readers of these notes may feel that it is not always easy to introduce new ideas in Australia, but at least it is considerably easier than in this country. Since the last World War great changes have taken place in Portugal which is quickly stepping out into the industrial age. This is having a profound effect on the rural economy as the workers drift to the cities and to the highly industrialised nearby countries, especially France and West Germany. Big changes are looming in Forest Management and Sylviculture and it is in these fields that the resistance to change is strongest

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SOME NOTES ON PLUS TREE SELECTION OF PINUS PINASTER WITH PARTICULAR REFERENCE TO AGE.

by D.H. Perry

It is apparent that considerable differences of opinion exist amongst foresters and tree breeders, as to the most desirable age at which plus phenotypes should be selected for breeding purposes with this species.

In breeding either plants or animals, it is essential that, in selecting stock, the individuals must have reached maturity. So many changes can and do take place between birth and maturity, some of them not being manifest until late, that serious mistakes could be made by using immature breeding stock. Especially does this apply to the selection of the initial plus phenotypes on which a breeding programme is to be based.

The protagonists of the theory that plus phenotypes should be selected before maturity, contend that some faults such as internodal variations in verticallity and nodal swellings at the union of branches and trunk, become hidden with age. With Pinus pinaster it can be accepted that early variations in verticallity between nodes do become hidden in later years, but nodal swellings can readily be detected in this species up to eighty years.

With Pinus pinaster the main aim at least initially is to improve the bole form and vigor of the tree. Bole form in this species is so poor that it is imperative that a high priority be given to improving this factor. Branch size and angle, crown shape and size, wood qualities, insect and fungal resistance, drought tolerance etc. are all important factors requiring attention, but should yield priority initially to the improvement of bole form and vigor. A straight, vertical bole that is round in section and has a low taper is extremely rare in this species, and once this has been corrected the other factors which go to make a perfect tree can be added.

Experience in Portugal indicates that many factors affect bole development after the tree is 30 years of age. Establishment is by broadcast sowing and the resulting stands are very dense. Thinning commences in the third year, and again at seven or eight years after which there are about 1800 trees per acre remaining. At 27 years this figure is down to 650 trees per acre. Form in these young stands is reasonably good although butt sweep is common. However the impression is of a young forest of reasonably straight boles. In viewing stands of seventy to eighty years of age the impression is more of a forest in which the trees bend and bow and lean every which way. And this, despite a thinning schedule directed towards the preservation and encouragement of the best form trees. The inference is that the bole form tends to deteriorate with age instead of improving, and this contention is supported by the fact that it is easier to find plus phenotypes in yound stands than it is in mature ones.

Experience in the forest of Leiria indicates that apart from any genetical influence environment also has a marked effect on form. For instance trees almost invariably lean down hill and on very steep slopes this lean can be as much as 45 degrees. They tend to lean away from the winter gales which blow from the north west, and in exposed positions butt sweep is very much accentuated. Poor form is always more noticeable on unsuitable sites for the species and it has not been possible to recognise a single plus tree on site qualities 4 & 5 and very few indeed on site quality 3.

To accentuate these influences sylvicultural practice also plays a part. Pinus pinaster is a very light demanding species and almost invariably tends to move towards any open space overhead. The crowns never interlace but remain separate entities for their entire life span. For instance if trees are left too close to one another, and there is an adjoining open space, they will grow away from each other and towards the opening. In addition the weight of the branches which develop on the unrestricted side cause the bole to bend or bow. Many instances of this can be seen in the forest.

On the other hand many trees which have unrestricted space in which to develop are bowed and bent which would appear to indicate the presence of a genetically controlled factor for an unstable bole. These trees tend to lean on to their neighbours and to force them also from a vertical position.

It can be postulated therefore that an inherent tendency in Pinus pinaster to bow and bend and to lean from the vertical can be aggravated by poor sylvicultural practice and also by an unfavourable environment. The bole form of this species can only be improved by sound breeding practice, and then must be encouraged to remain that way by attention to crown requirements in thinning.

Although the foregoing conclusions have been arrived at as a result of observation only it is considered that it would be unwise to select plus phenotypes, in this species, less than 50 years old.

We have based our work in Australia up to the present on plus phenotypes which were 30 years old at time of selection. This was unaviodable as trees of a greater age were not available to us. Fortunately it has been possible to locate some excellent trees in the Pinhal de Leiria, ranging in age from 50 to 90 years. It will be possible now to proceed with the improvement of this tree with much more confidence in the ultimate results.

It is assumed that the rotation age for Pinus pinaster in Western Australia in Western Australia will not be less than 50 years and may even approach the Portugese figure of 80 years. The closer the plus phenotypes are to the predetermined exploitation age for the species then the more reliable breeders they will prove to be.

NOTES ON AFFORESTATION IN PORTUGAL.

by D.W.R. Stewart

In view of the current Australian interest in tree breeding from the Leiria strain of Pinus pinaster, the following notes may be of interest: -

During last century Portugal commenced the afforestation of large areas of waste land comprised mainly of: -

a) Coastal sand dune areas.

b) Seriously degraded and eroded, over cleared and over grassed upland country.

In 1922, a prominent Swiss Forester, H. Knuckel was impressed with the extent of the work when he visited Portugal. Twenty five years later, after revisiting Portugal in 1947, he was still more impressed and wrote a glowing account of his visit from which the following information is extracted: -

In 60 years from 1874 to 1943 Portugal increased its forested area from 7.2% to 28.4% of the land surface and planned to reach 38.6% by 1970.

		Acres.
1.	Total land area (Continental Portugal) 34,207 square miles, i.e.	21,892,280
2.	Area forested in 1874 - 7.2%	1,576,244
3.	Area forested in 1934 - 28.4%	6,217,407
4.	Increase in forested area in 60 years, (i.e., in 60 years Portugal planted a greater area than the total a area of State Forests in Western Australia).	4,641,163
5.	The average area per year planted over 60 years	77,358
6.	Planned objective by 1970 - 38.6% (i.e. an average per year 1934 - 1970 - for 36 years)	8,012,574 49,866

In 1938, a law provided for the restocking of waste land north of the River Tagus within the ensuing 30 years (i.e. by 1968) of 430,000 hectares, i.e. 1,062,100

This would require an average planting per year of 35,437

The main species used was Pinus pinaster, and other important species were Pinus pinea, Eucalyptus globulus, Cork Oak and Olives.

Further figures on Portugal's mammoth afforestation effort are provided by the Food and Agriculture Organisation of the United Nations in its publication 'World Forest Inventory' as under: -

1954 Statement.

The increase in forest area in the 5 years, 1947-1952,	Acres.
was 42,000 hectares, i.e.	103,740
That is an annual average of 20,748 acres.	
The planned increase for the ensuing 5 years, 1953-1957	
was 40,000 hectares, i.e.	98,800
or an average per year of	19,760

1959 Statement.

The actual increase in the 5 years 1953 to 1957 was far	
in excess of the above figures, being 138,000 hectares, i.e.	340,000
or an average of 68,000 acres per year.	
The proposed increase for the 5 years 1958 to 1962	
inclusive was 160,000 hectares, i.e.	395,200
or an average per year of	79,040

Because of a poor seed crop, the estimated deficit of P. pinaster seed for Portugal's requirements for 1964 was 550 tons.

No doubt we would consider much of the forest created above to be of low grade, i.e. some Pine forests, Cork Oak, Live Oak, Olive groves etc., but nevertheless, the magnitude of the effort is most impressive.

THE LIFE OF A TREE

"Chronology of past events may not be of vital importance to the world today, but it is none the less a fascinating subject. Even the life history of a single pine as read by Mill in 1909 carried an interest not to be evaded. He completely dissected the tree - trunk, limbs and roots - and counted 1047 rings of growth at the base. It probably sprouted in 856 A.D. Then Mills chronicled an eventful life: at year 20 snow bent the tree; at year 135 it was stabbed by the dead limbs of another tree which fell against it; lightning struck it in 1301; two large limbs were lost in 1348; in 1486 two arrow heads were shot into the tree; in 1540 it felt steel and fire; in 1762, in 1804 and 1805 climatic stresses assailed the tree; in 1859 an axe left its mark; and in 1881 several rifle bullets penetrated the wood."

from "Tree Growth" by W.S. Glock,
The Botanical Review, vol. XXI, no.1, 1955.

VARIATION IN THE WEIGHT OF SAWN GREEN RADIATA PINE.

by P.H. Barrett

From time to time enquiries are received, mainly from timber merchants, as to the weight of sawn green pine. Many factors affect the weight at any one time. These include the time of the year sawing takes place, the sawn dimensions of the material, the method and length of time of stacking prior to despatch, and probably the vigour of the stand from which the sawlogs are obtained.

The average weight of sawn green *Pinus radiata* is given as 56 lb. per cubic foor* and most foresters are aware that there can be a considerable range on either side of this figure. To examine this variation and to see whether climate had any effect, figures for the average monthly green weight of sawn *P.radiata* from Grimwade and Pimelia have been extracted. The information was collated from delivery notes showing volumes despatched and the appropriate W.A.G.R. weights. During 1963-64, Grimwade railed over 605 tons of pine and Pimelia 320 tons - small parcels are not included in these figures. Railway truck lots were spread over 12 months for Grimwade and 11 months for Pimelia.

The accompanying graph clearly demonstrates the marked differences throughout the year of the weight of sawn pine from the two centres. At Grimwade the average weight was quite high in the spring months but dropped rapidly as summer conditions were experienced. Pimelia on the other hand showed only a small variation in the average weight during the year.

Possible explanations may be, briefly: -

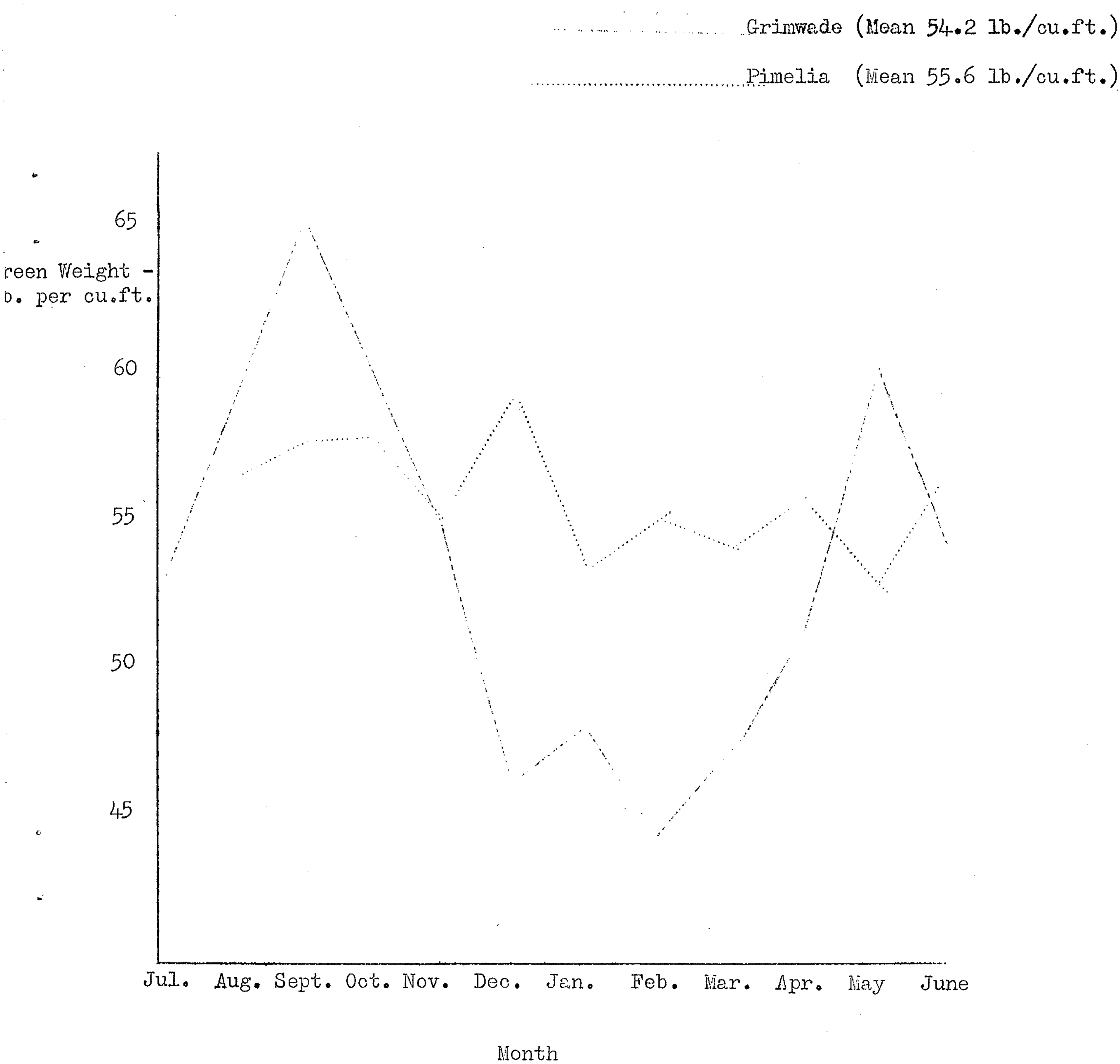
a) Climate: Climatic conditions at Pimelia are much milder than those at Grimwade particularly during the summer months. Rainfall is higher and more prolonged, temperatures much lower and relative humidity higher.

b) Tree Vigour: In general , stands of *P.radiata* at Grimwade are far more vigorous than those at Pimelia. It is reasonable to assume that Grimwade sawn pine is less dense and therefore more susceptible to wetting and drying.

* Cubic contents of logs and some associated table.

WEIGHT OF GREEN SAWN RADIATA PINE

1963-64



THE GNANGARA PRUNING SAW.

by H.E. Quicke

When I first used a pruning saw at Mundaring Weir some years ago, I was discouraged to find how hard they were to operate. This was partly due to lack of experience and partly due to the design of the saw. The old type saw was approximately 21" long and worked on the following principle.

The teeth are designed to cut on the downward stroke while the curve is to provide thrust as the tool is forced away from the limb on the cutting stroke. The curve also facilitates working at various distances from the tree. The section A, B, provides an easy start, while the saw gradually bites in as the curve develops, becoming most severe before D.

In practice however, something very different occurs. The blade is too short, and the curve is too great. If the operator begins his stroke at "A", the blade skips to point "B" without cutting. B - C cuts well but begins to bog in after point C. Changing the angle of the blade only changes the cutting stroke to A, B or C - D.

Either way the cutting stroke is very short and on all but very low limbs the operator must work in short jerky strokes. This makes the saw insecure in the cut, (causing bouncing) and is very tiring. The teeth are cut 5 points to the inch and are too small to clear sawdust and resin efficiently and take a long time to sharpen. Several different shaped blades were tried and it was decided to apply the old principle to a longer blade, and to increase the size of the teeth. These saws are now in wide use and have proven themselves to be a big improvement. The principle applied to the design of saw no. (1) functions well and the new saw is shown in Diagram 2.

The slope at A - B provides a smooth start, but is not steep enough to skip. B - C is very slightly curved and is the main cutting section, while C - D, a sharper curve, really bites in and is useful as a last strong stroke to remove the limb, or on fairly high limbs where pressure is difficult to apply.

$3\frac{1}{2}$ to 4 points per inch is ideal for pinaster, but owing to its softness, looser bark and more fibrous structure, radiata may require smaller teeth.

MANUFACTURE:

To date some 30 - 40 of the new saws have been made at Gnangara. The following stages are followed in the making of a saw: -

1) Suitable cross cut saws selected - The shapes marked and cut out with a fibre cutting disc attached to an electric hand grinder.

2) Shapes dressed to a fairly smooth edge with grindstone and file.

3) Teeth marked and cut out on thin gulleting stone.

4) Teeth given rough sharpening.

5) Teeth set and handle holes cut -

The blade is then ready for use but it takes another sharpening to produce a really fine pointed, properly shaped tooth.

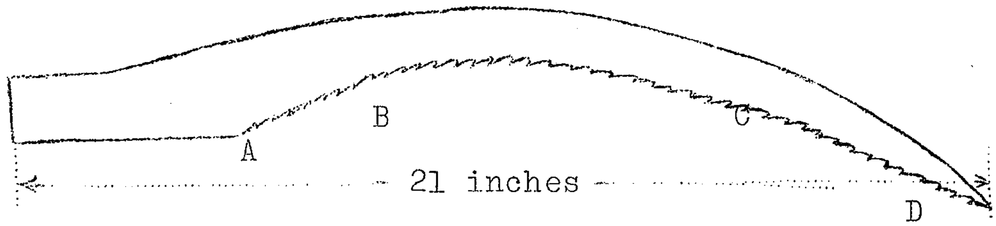
SHARPENING:

These blades are made in to a special shape, and special design of tooth. One is essential to the proper function of the other. If one is changed, this will upset the function of the other.

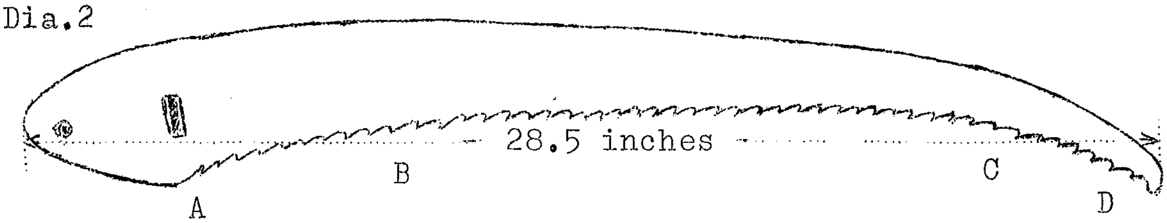
Diag. 3 shows the Gnangara saw blade shape and angle of teeth. The first few teeth "A & B" have no hook and allow for a smooth start in the cut. More hook would cause the blade to dig in before it is properly in motion. The teeth between B - C however must be maintained with the cutting edge at right angles to the face of the blade. If the hook is taken off these teeth the angle of the blade will have to be changed in the handle, and this will exaggerate the curve at C - D and cause it to jam at this point.

The teeth at C - D should be the same as A,B, but may have to be altered according to the wood being cut.

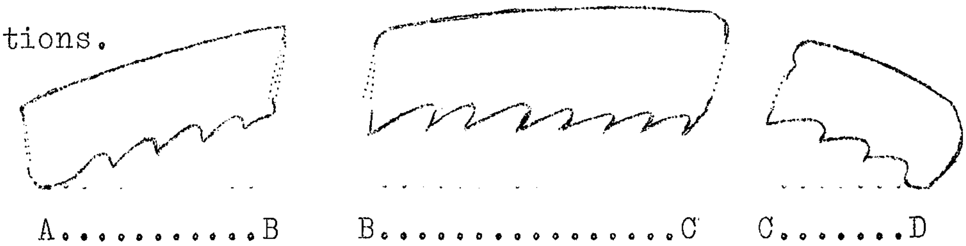
Dia.1



Dia.2



Dia 3.Sections.



As with an axe or any other cutting tool, the manner in which it is to be sharpened is the whole secret, and should never be allowed to fall in to untrained hands. The saws should be sharpened regularly by a man who uses the saw and understands the principles of saw sharpening.

FIELD DAY. GLENEAGLE GANG COMPETITION

by T. Ashcroft.

A field day was held on 24/12/64 for the three Divisional gangs at Gleneagle.

The day was organised to demonstrate which gang was the most efficient at fire suppression. Three events were held : - a) Hose run b) Small fire suppression c) A competition using the main equipment on the gang trucks.

a) The hose run consisted of running out 4 x 100 feet lengths of hose ending with a Y coupling to which were attached 2 x 25 foot lengths fitted with directors and nozzles.

Each gang started from their respective heavy duties with the pumper motors off; and then had to run out the hose, start the motor and have water coming out of both nozzles.

The fastest time was set by the Gleneagle Gang in 1 minute 18.5 secs. closely followed by Carinyah in 1 minute 19 secs.

b) Each gang had to put out a small fire using hand tools only. Points looked for in this event by the Judges were i) Correct dress. ii) Correct method of attack. iii) Correct reporting back to Headquarters by radio. iv) Speed and efficiency of the suppression. v) Thoroughness of the mopping up.

It was difficult to fault any of the gangs, although Jarrahdale lost a few points on i) and iv).

To ensure that the officers really entered into the spirit of the day a gang of officers with Forester Cowcher as Overseer also had a small fire to suppress under the critical eyes of the three Overseers.

The complete mopping up of these small fires took until well after lunch, and the final event was held back at Headquarters.

This event was designed to bring into use a) Delivery of water from gang truck units b) Draughting with the same unit c) Use of chain saw d) Use of pack sprays e) Use of a shovel.

The actual event took place as follows:- a) Start from point A on following sketch with all men in position on the gang truck; the truck stationary with motor off and drive to ½ 44 gallon drum approx. 100 yards off. Fill to first rung on the 44 gallon drum using the pumper unit on the gang truck from 25 feet away.

b) Drive back to canvas tank and replace water just used.
c) Drive approx. 50 yards and cut off a 10" dry log with the chain saw placed ½ chain from truck.
d) When the chain saw operator reaches the truck the no. 1 Pack Spray man runs ½ chain and fills a cut down 3 lb. sunshine milk tin using the pack spray from 10 feet away.

e) This procedure is repeated by the no. 2 Pack Spray man.
f) When the no. 2 Pack Spray man reaches the truck another gang member has to completely cover with soil a damaged 4 gallon water drum lying on its side and return to the truck.
g) The gang truck then travels to the finishing line marked B on the sketch with all gear correctly replaced on the truck and pack sprays filled.

One condition of the competition was that no skidding of the trucks would be allowed.

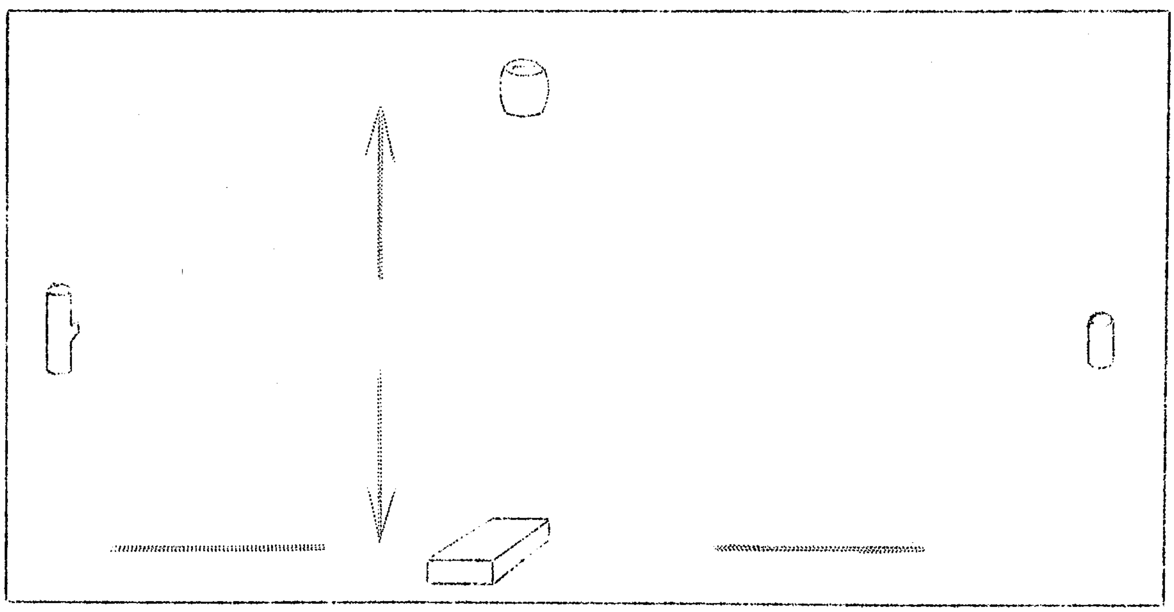
The time for each gang was as follows:-

Gleneagle	7	minutes	30	seconds
Carinyah	9	"	5	"
Jarrahdale	12	"	25	"

(The Jarrahdale gang truck unit has a poor priming system and they lost a lot of time because of this).

The Gleneagle gang gained the decision of being the best fire gang of the day.

The day's events worked up the required thirst that caused the keg to be dispatched with speed and efficiency.



THE ECONOMICS OF THINNING JARRAH POLE STANDS.

by P.C. Kimber

The decision to thin or not to thin young stands of trees when the produce of the thinning is unsaleable is a difficult one. Silviculture may dictate an unsaleable thinning but the deciding factor is always one of cost; is it economically sound in the long run, or would an early unsaleable thinning be a waste of money? A considerable outlay has been made in thinning to waste in Jarrah pole stands. As a matter of interest the economics of Jarrah management under regimes of both thinning to waste and delaying thinning until some saleable produce is available have been worked out with present available information. The details and methods of working are described below. The growth rates and stockings shown are applicable to only prime Jarrah forest and it is not suggested that such economics should be assumed for any but the A height quality sites.

1. An uneconomic first thinning at age 40 years.

For the purpose of estimating future yields and the economics of thinning the following assumptions are made: -

(i). The crop is a pure pole stand.

(ii). The first thinning, which produces no saleable produce, is made at age 40 years when the stocking per acre is likely to be between 130 and 180 square feet basal area/acre.

(iii). The mean annual basal area increment from age 40 to the end of the rotation is 3 square feet/acre.

The anticipated management and growth rate of the crop, expressed in figures per acre is as follows: -

Age 40 years.

The crop is thinned to 110 stems/acre and a basal area of 60 square feet/acre. The size of the mean tree after thinning is therefore (60/110) square feet or 0.5454 square feet basal area, $31\frac{1}{2}$" G.B.H.

The M.A.I. (basal area) is 3 square feet per acre so the M.A.I. (b.a.) per tree is 3/110 = 0.0273 sq. ft.

It is assumed that the next thinning will take place when all produce from the thinning will be saleable. The minimum size of stem to produce a saleable log is taken as 50" G.B.H., basal area 1.3815 square feet. The period between the first and second thinnings will therefore be ($\frac{1.3815 - 0.5454}{0.0273}$) years or 31 years. ?

Only mean tree - would those to be thinned be up to 50" GBH?

Age 71 years.

The total basal area of the crop will be (1.3815 x 110), or 152 sq.ft./acre. A thinning will probably reduce it to around 70 sq.ft./acre, and the amount to be removed in thinning is (152 - 70), 80 square feet, requiring the removal of

$\left(\frac{80}{1.3815}\right)$, 59 stems and leaving a basal area of 70.5 sq.ft./acre on 51 stems.

Each of the 59 stems removed will yield a 10' log with a mid girth of 49" and a volume of 12 cubic feet. The total saleable cut is therefore (12 x 59), 708 cubic feet. ?

As a 30 year cutting cycle is at present practised, a 30 year thinning cycle is assumed in crops below rotation age but of saleable size.

Age 101 years.

30 years have elapsed since the last thinning and the basal area of the crop has increased by 90 sq.ft./acre giving a total basal area of 160.5 sq.ft./acre. Each of the remaining 51 stems will have a basal area of 3.1470 sq.ft. and a G.B.H. of $75\frac{1}{2}$".

If the crop is again reduced to approximately 70 sq.ft./acre by thinning, 90.5 square feet will be removed, or a total of 28 stems. The actual basal area remaining is 72.4 sq.ft./acre.

Each of the 28 stems removed, of G.B.H. $75\frac{1}{2}$", is assumed to have a bole length of 40 feet and an individual volume of 65.5 cu.ft. giving a total saleable product of 1834 cubic feet.

The remaining 23 stems (basal area 72.4 sq.ft. G.B.H. $75\frac{1}{2}$") are to be felled when they reach a size of 108" G.B.H., basal area 7.0695 sq.ft. At this stage the stocking of the stand will be (7.0695 x 23) or 162.6 sq.ft./acre. The time taken to reach this size will be $\frac{(162.6 - 72.4)}{0.0273}$ or 30 years.

Age 131 years.

A final yield of 23 stems of 108" G.B.H. and bole length of 50' is now realized. The volume yield (from F.D. volume tables) is 3,910 cu.ft./acre.

Summary of expenditure and yields over rotation. 78 Cds/Ac ? ?

The following assumptions are made:-

(i). Value of land is 30/- an acre.
(ii). Timber is sold at 40/- a load.
(iii). Rotation period is rounded off to 130 years.

(a). Annual expenditure = $\frac{\text{Dept. budget (less pine planting grants)}}{\text{Area of State hardwood forest}}$

= (1963 figures) £0.215. 4/6/ac.

(b).	Year 40:-	Cost of marking thinning (per acre)	£0.6
		Cost of thinning	£5.0
(c).	Year 70:-	Cost of marking	£0.5
		Value of timber from thinning	£28

(d). Year 100:- Cost of marking £0.5
Value of timber from thinning £73

(e). Year 130:- Final yield value £156.8

BALANCE SHEET FOR EXPECTED PROFIT AT PRESENT DAY PRICES.

(All items are compounded at 4% per annum).

DR		£			£ CR
(i).	Land Value:- £1.5 x 1.04^{130}	= 245.7	(i).	Land at cost	1.5
(ii).	Cost of thinning at year 40 - £5.6 x 1.04^{90}	= 191.1	(ii).	Value of thinning at age 70 - £28 x 1.04^{60}	294.6
(iii).	Cost of marking at year 70 - £0.5 x 1.04^{60}	= 5.3	(iii).	Value of thinning at age 100 - £73 x 1.04^{30}	236.7
(iv).	Cost of marking at year 100 - £0.5 x 1.04^{30}	= 1.6	(iv).	Value of final yield	156.8
(v).	Annual charges:- £0.215 x $\frac{1.04^{130} - 1}{1.04}$	= 33.7			
	BALANCE	£212.2			
TOTAL		£689.6		TOTAL	£689.6

Thus under the thinning regime and assumed growth rates described above all invested money is both earning 4% C.I. and showing a profit of £212.2 per acre over a rotation of 130 years.

11. A first thinning at age 80 to break even.

Girth class distribution figures for an 80 year old unthinned pole stand are available from a series of thinning trials at Mundlimup. Analysis of these figures indicated that if a few of the larger stems of saleable size were sacrificed, a thinning would be possible in which the cost of thinning out saleable stems would be covered by the value of the larger stems removed. For the purposes of the present argument this is assumed to have been done. Thinning under these circumstances to a basal area of around 70 sq.ft./acre would leave 48 stems of a mean size of $51\frac{1}{2}$" G.B.H.

A 30 year thinning cycle is again assumed giving a basal area increment of

90 square feet in this period and a total basal area per acre of 160.5 sq.ft. at age 110 years.

At this age the mean tree will be of a size of $\left(\frac{160.5}{48}\right)$ or 3.3438 sq.ft. basal area; $77\frac{3}{4}$" G.B.H.

A further thinning reducing the crop to around 70 square feet/acre would necessitate the removal of $\left(\frac{90}{3.3438}\right)$ or 27 stems, but as a final crop of 23 stems is required for fair comparison with the previous example the removal of only 25 stems is assumed, leaving 77 sq.ft./acre carried on 23 stems.

Each of the 25 stems removed will have a G.B.H. of $77\frac{3}{4}$" and an estimated bole length of 40'. The total volume removed (from F.D. volume tables) will therefore be 1825 cu.ft. at age 110 years.

The remaining 23 stems are to be left until they reach 108" G.B.H., giving a total basal area stocking of 162.6 sq.ft./acre. The period required to reach this size is $\left(\frac{162.6 - 77}{3}\right)$ or 29 years. The total rotation is thus, rounded off, 140 years.

The final yield, as in the previous example, is 3910 cu.ft./acre.

BALANCE SHEET FOR EXPECTED PROFIT AT PRESENT DAY PRICES. 78

(All items are compounded at 4% per annum).

DR.		£	CR.		£
1.	Land Value $£1.5 \times 1.04^{140}$	363.7	1.	Land at cost	1.5
2.	Cost of marking at age 110 – $£0.5 \times 1.04^{30}$	1.6	2.	Value of thinning at age 110 – $£73 \times 1.04^{30}$	236.7
3.	Annual charges:- $£0.215 \times \frac{1.04^{140} - 1}{1.04}$	49.2	3.	Value of final crop	156.8
			Balance		19.5
Total		£ 414.5			£ 414.5

Money invested is therefore working at less than 4% compound interest under this thinning regime (c.f. 4% C.I. plus a profit of £212.2 under the previous example).

It may well be argued that land being a national asset under State forest, its value should be ignored in financial calculations. Excluding land costs and values the relative finances of the two thinning regimes are as follows (in addition to earning 4% C.I.) :-

1 - 1st thinning uneconomic at age 40 - Profit £478.6 in 130 years.
11 - 1st thinning breaks even at age 80 - Profit £342.6 in 140 years.

In either case, including or excluding land values, it would appear that a thinning to waste at age 40 is a sounder financial operation than leaving a Jarrah pole crop unthinned until enough trees of a saleable size are available to cover the cost of a thinning operation.

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THAT TREE AGAIN!!!

by R.J. Underwood

The March 1962 issue of "Forest Notes" contained two sets of measurements of the KING JARRAH at Nanga Brook, by F.G. Quicke (1958) and J. Williamson (1960). These figures revealed the disturbing fact that this tree had decreased in bole height by 5 feet and thus in volume by 1.2 loads, in the two years between measurements.

Those foresters who were mildly alarmed by this apparent decrement in a prime specimen of our major species may however, be reassured to hear of another set of measurements which were recently exhumed.

In the 1954 issue of "Australian Forestry" in an article entitled "Giants of the Forest" by B.H. Bednall and I.M. Hawkins, the measurements of this same tree were quoted. A comparison shows:

Measurers	Date	Total ht.	Bole ht.	GBHOB	Volume
Bednall-Hawkins	1945	182'	94'	20'4½"	40.0 lds.
Quicke	1958	not given	95'	22'1"	43.8 lds.
Williamson	1960	160'	90'	22'3"	42.6 lds.

While the increase in girth of 2 feet and in volume of approximately 3 loads over the 15 year period may not be cause for wild rejoicing, it is, INDISPUTABLY, growth in the right direction.

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THE USE OF HORMONE SPRAYS IN PINE PLANTATIONS.

by N.S. Casson

With the steadily rising costs of manpower and the possibility of increased planting acreages in the near future, it is becoming increasingly important to find some means of keeping down the costs of tending from the time of planting until the pines are fully established.

This is usually a period of from four to five years assuming satisfactory establishment is reached at first planting.

It is in this initial period that considerable expenditure can be incurred, in some cases on operations that are at best only partially effective. Until recently, hand slashing of the taller weeds, suckers of E. marginata, E. calophylla and Acacia pulchella etc. was carried out as a matter of course. The usual results of such work, apart from being immediately effective, were the regrowth of multiple stems from the slashed suckers. This entailed a repeat of the operation at least once, and in some cases twice, before establishment was satisfactorily achieved.

Many and varied methods of scrub control have been tried within recent years, bulldozing, ploughing, rotovating etc. between the rows of pines. Few if any have proved completely effective and all are relatively expensive.

In recent years the introduction of Hormone poisons into plantation work has provided a means of attaining satisfactory conditions for early establishment at a reasonable cost.

Several methods of applying Hormone poisons in plantations have been tried, some are still under investigation - basal spraying of suckers, foliar spraying of creeper etc.

These methods will, when fully tested, undoubtedly prove of value in plantations where a weed problem already exists and it is here that maximum care in application and treatment are essential to success and to prevent damage to the pine crop.

The following brief account of the use of Hormone poison as a foliar spray on suckers of E. marginata and E. calophylla in association with Ac. pulchella will serve to illustrate what can be accomplished in planted areas with these poisons.

The operation took place over three compartments of 1962 planting during the early summer of 1964. The area treated was steep with isolated patches of rock.

Equipment used consisted of a M.F. 65 tractor fitted with a carryall and 2 x 44 gallon drums, a rotoflo, power pump and two spray leads 15 ft. in length fitted with pressure release valves and standard packspray nozzles.

The Hormone was 2,4,5 T (80% Ester) in aqueous solution with Agrol L.N. as a spreader. The solution strength was varied during spraying; on hot cloudless days $\frac{1}{2}$ pint 2,4,5 T to 44 gallons of water 0.14%, during dull cloudy weather this was increased to $\frac{3}{4}$ pint 2,4,5 T to 44 gallons of water 0.21%.

No spraying took place on windy days; whilst on days with a light breeze, advantage was taken of sheltered positions to continue spraying.

Drums containing the solution were completely emptied before refilling to prevent any build up in concentration.

Complete spraying was stipulated of all foliage, ensuring thorough wetting of all accessible leaf surfaces.

Estimated kill three months after completion of spraying was in excess of 80%, E. marginata proved the most resistant and comprised almost 100% of the surviving suckers. Deaths took place over a period of some six weeks, usually a good indication of effective kill.

In almost every case the remaining live suckers appeared extremely weak. Shortly after spraying, repeated bifurcation of all growing tips took place resulting in a dwarfed bushy appearance.

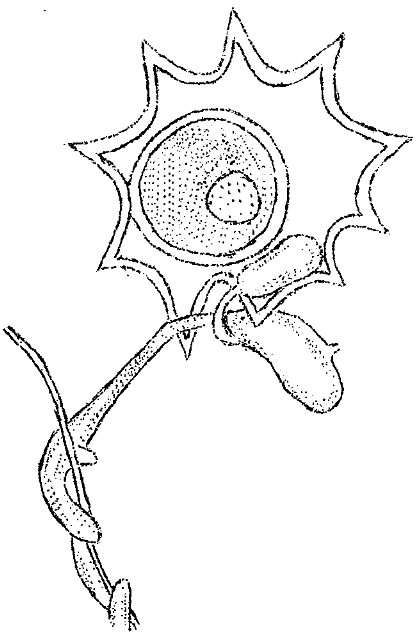
Slight 'scorch' of some pines occurred, this was however confined to pines overtopped by or in extremely close proximity to tall suckers.

A certain element of risk must always be present in operations such as the foregoing and they are also of necessity slow and expensive.

The most obvious solution to this problem of eliminating or controlling weed competition during the early years of establishment is to introduce control measures before planting takes place. Any form of weed control that takes place post-planting is at best a slow and expensive measure by comparison.

The main advantages of pre-planting control would be the considerable reduction in cost per acre treated due to quicker cover of the ground and more effective kill, the operator being able to concentrate solely on weed kill without the distraction of avoiding nearby pines.

To be fully effective large scale pre-planting treatment of future pine plantations would need careful consideration. An initial survey would be necessary at least two years prior to planting to determine the areas suitable for treatment. The actual application of the poison would probably be best carried out two growing seasons in advance of intended planting dates. This would allow time for a careful appraisal of the kill to be made and enable a follow - up operation to take place in the season prior to planting if considered necessary.



FOREST MYCOLOGY IN W.A.

by A.R. Kelly

Fungal attack with the resultant breakdown, or decay, of wood structure is conspicuous in all our hardwood forest and causes a considerable amount of damage in the bole of the living tree, and in converted timber.

The correct identification of the various rots, and a general understanding of the processes of decay, are necessary before accurate observations can be made and applied.

The main wood destroying fungi with the exception of Stemphylium belong to a large family called Basidiomycetes (Basidium means a little pedestal) which includes such familiar plants as mushrooms and toadstools. These structures which appear above ground are the fruit bodies containing the reproductive parts and correspond to the flowers and fruits of the higher plants.

It is known from extensive testing that some fungi attacking the living tree are sensitive to changed conditions and cause no further decay in converted timber; others are definitely capable of continued development providing moisture and other conditions are adequate, and a third class exists in which development of decay and also the rate of attack depend entirely on the conditions of service.

The results of investigations from 1935 onwards has enabled us to revise and modify our grading rules to allow for the acceptance of limited amounts of rot in most timbers and we refer to these as "minor pockets of primary rot".

Primary rots are those which attack the living tree and in general are not able to infect timber once it is converted.

Secondary rots are those which attack converted timber, stumps and old logs and which seldom cause decay in the living tree.

FUNGI (fungus is singular)

Fungi comprise a very large section of the vegetable kingdom.

A fungus is a vegetable growth, or plant, which draws its substance from other plants or waste materials containing cellulose, and cannot manufacture chlorophyll.

Being destitute of chlorophyll they are unable to utilise the carbon present in the atmosphere as carbon dioxide and are thus compelled to live a saprophytic or parasitic existence, deriving their supplies of carbon and other necessary substances from organic material which has been formed directly or indirectly from chlorophyll containing plants.

In order to understand the way in which fungi attack and destroy wood it is necessary to consider briefly the nature of the wood material.

The porous structure of wood is due to its being composed of minute tubular or fibrous elements. These are called cells and are tightly cemented together and it is their relative size and arrangement which give the characteristic grain and texture to different kinds of wood.

The wood substance, which forms the walls of the cells and the solid framework, is composed chiefly of cellulose and a complex substance called lignin; it is hygroscopic and becomes moister or drier according to the condition of the surrounding atmosphere.

In the standing tree and in freshly felled, or green, timber most of the cavities, or cells, in the wood contain free water and timber in this condition may have a moisture content of 100% or more of its oven dry weight.

The point at which all the free water has disappeared (the cell walls being still fully saturated) is known as the "fibre saturation point", and approximately 25% to 30% moisture content.

As the wood becomes drier the cell walls themselves begin to dry out.

Fungi which decay wood obtain their food supply by breaking down and digesting this cell wall substance, but they cannot do this if the moisture content of the wood is much below fibre saturation point.

Exceptions to this are fungi such as the Merulius and the Coniofera which introduce moisture through their hyphae, or produce moisture by chemically splitting the carbohydrates in the wood. Coniofera olivacea has been identified in this State, but no definite identification of Merulius.

Generally, the range of fungal activity is between 20% moisture content and a soaking wet condition in which all air is excluded.

If the wood is too dry for it to grow and spread, decay, will not occur.

If the wood is thoroughly saturated the fungus is "drowned out".

Conditions influencing the growth of fungi are :-

a) Suitable food material containing cellulose, obviously wood, but most can feed and live for a considerable period on materials having similar chemical composition such as paper, straw etc., and soil rich in humus.

b) A moisture content in the food, above 20% and below complete saturation - the optimum moisture content lies around 40%.

c) Sufficient air, as it requires oxygen for growth and respiration.

d) Suitable temperatures as few grow above 100° F. and growth stops entirely at, or a little above, freezing point. At 70° F it grows at least twice as fast as at 50° F. Ideal conditions are between 70° and 90° F.

e) And of course the presence of some infection in the form of spores or mycelium from which the fungus can develop.

Growth of fungi and the development of rot can only take place if each of the conditions mentioned above is satisfied.

Decay:- is really a chemical decomposition which is brought about by the ferments and acids (enzymes) secreted by fungi.

Hyphae:- is the vegetative part of a fungus and consists of a fine tube or hollow thread which grow in length by elongation of the tips, and combine to form mycelium.

Mycelium:- is formed from strands or cords of fungal hyphae, arranged loosely to form long strings or closely interwoven to form dense skins or sheets.

Sclerotium:- is a resting body or mass of fungal hyphae from which fruiting bodies may develop.

Sporophore:- is a fungal fruiting body (the under surface of which may be gilled or pored) containing the reproductive parts (spores).

Spore:- is the minute organism of a non-flowing plant which acts in place of a seed, and every one (or in some cases a pair) of these spores can give rise to a complete new fungus plant.

These spores are as fine as dust and approximate 2,000,000 to the square inch, and it is estimated that a 3" diameter mushroom would liberate 1,800 million.

These dust-like spores are widely dispersed by wind currents and if lodged in a suitable site continue their cycle.

To indicate the wide dispersal, spores of Fomes Annosus have been trapped 30 miles from land over the Irish Sea.

The most important fungi affecting our forests and products are:-

1. <u>Polyporous Portentosus</u> - Synonymous P. eucalyptorum.

The commonest and most important in our main jarrah forest where it does a tremendous amount of damage in the bole of the living tree.

The large conspicuous white fruiting bodies have been observed on jarrah, marri, blackbutt, tuart, wandoo, flooded gum and sheoak and will no doubt be found on other species.

This "column" or "heart rot" will attack the bole and limbs of a tree and may sometimes be found in the larger roots.

The rot occurs chiefly as a trunk and top rot, extending down the bole from the point of original infection which is usually a dead or broken limb.

The position of the fruiting body, which generally appear in early winter, approximately defines the lower limit of the rot column.

In the typical stage of decay in jarrah the rotted wood is brown in colour, soft, brittle and easily crumbled and has a slight tendency to crack cubically. The shrinkage cracks are filled with sheets of tough white mycelium which may reach a thickness of $\frac{3}{4}$" and are characteristic of this rot.

It is usually found that there is some discolouration of the wood outside the area of conspicuous rot.

This extension is due to the action of the hyphae and is the first stage of cell destruction.

Further deterioration generally ceases when the timber is cut, excepting in rare cases, where favourable moisture conditions may cause further development of complete decay.

The fruiting bodies often reach large size, 12" or more laterally, 9" wide and 6" deep at attachment. The upper surface is covered with a thin brownish or biscuit coloured cuticle and the underneath pored surface, when fresh, is canary yellow colour. The flesh is pure white, soft and tough becoming punky when dry.

2. <u>Polyporus Pelles</u>

This fungus causes the pocket rot which is common in jarrah. It occurs throughout the entire jarrah forest and is particularly common towards the drier northern and eastern fringes.

In the typical stage of decay the rotted wood is dark brown in colour and when dried out is brittle and easily powdered and is transversed by longitudinal and horizontal shrinkage cracks giving it a more or less cubical appearance.

The amount of mycelium is variable. It may be completely absent or present as a sparse downy white growth in the shrinkage cracks.

The rot does not take the form of a definite column but typically occurs as pockets, streaks, or irregularly shaped areas anywhere in the mature wood of the tree in apparent isolation from other pockets.

The fungus does not penetrate far in advance of the areas of visible decay and incipient decay generally shows as an area of bleached wood around the pocket.

It produces a bracket sporophore usually 3" to 4" across and 1" or more in thickness, and is pored on the underside. They have also been found on dead logs.

"Pelles" means the skin of a beast and the fungus is so named because the top of a fresh sporophore resembles a furry skin.

3. Polyporous australiensis

The commonest and most important rot in our karri forest and is also known to attack marri, tuart and yellow tingle and will no doubt be found on other species.

It produces a light brown cubical rot with a white mycelium.

The sporophores are usually 5" to 15" across and 5" to 6" thick, bright orange coloured on the underside, with similar coloured pigment inside and they have a strong musty smell.

They can be found during many months of the year, sometimes on the bole of a tree but more often on old logs and stumps.

This fungus is both "primary" and "secondary", attacking mature wood in the living tree as well as dead wood.

4. Trametes lilacino - gilva

This fungus (secondary) occurs over a good deal of Australia and attacks dead wood of many species.

It is severe on karri, and marri and has caused destruction in untreated sleepers of these species in under 7 years.

Causes a light brown cubical rot associated with whitish mycelium.

The sporophore is a thin leathery bracket 1" to 4" across and $\frac{1}{4}$" or so thick, is pale brownish on top and lilac coloured and pored underneath.

5. Stemphylium species (fungi imperfecti)

Decay and brittleness in jarrah associated with most distinctive microscopic features have been found in living trunks, old logs and timber in service.

It is extremely common in old timber in contact with the ground and occurs in many species of timber.

The fungus is an imperfect form allied to Stemphylium and hence does not form a fruiting body (sporophore) but bears its spores directly on the mycelium.

Fungi of this type generally have a short life cycle and can reproduce rapidly.

There appears little doubt that the surface layer of soil in the forest, or where decaying wood and chips are plentiful, must be thoroughly infected by spores of this fungus.

Fortunately the decay produced is slow but in the case of jarrah fence posts it is probably the principal factor limiting their service life, decay working from the outside towards the centre at groundline.

A condition very commonly seen in almost any old jarrah timber in contact with the ground is a general surface softening which may penetrate several inches. The wood is soft and brittle and has a somewhat bleached and lifeless look and is extremely brittle when dry and forms thin cubes.

QUOTABLE QUOTES

Apparently there are problems of greater magnitude than those which baffle Trainees in this State, and the following have been taken from final examinations for Forest Guards in NYASALAND.

....A spade is a spade-like thing shaped like a spade and is called a shovel.

....Peg-tooth is the same teeth that a raker tooth has not got.

....To lay out a right angle use the 3-4-5 method or a pathographic thumb.

....Wind is the friend of the forester; it nocks down the tips of the trees so they are easy to pick up.

....Wind mixes with air until you can't tell the difference.

....Diameter tape is used for measuring logs made of steel.

....Clay pots have no bottoms and so are unpopular in Malawi.

....Root pruning is not a good thing; I have personally root-pruned P.elliottii and the trees were shocked, shaken and looked very pale.

....Pretreatment of Seed. Sometimes we boil the seed, then burn the seed, then soak the seed, or sometimes we just soak, burn and boil the seed. Sometimes the seed does not germinate.

FIRE EFFECTS ON STAND STRUCTURE IN THE JARRAH FOREST.

by G.B. Peet

Introduction.

Recent Australian forestry literature and discussion has presented a diversity of opinion on forest damage and changes in stand structure introduced by periodic controlled burning. Opinions range from negligible damage, to forecasts of stand deterioration, but there appears to be little experimental evidence to support either contention.

To the author's knowledge the jarrah forest remains the only significant forest area in Australia, in which planned periodic area controlled burning has been implemented, and it is therefore pertinent to discuss possible changes in stand structure which may arise in this forest.

Harris and Wallace (1959) indicate that early settlers described the jarrah as an open forest with a generally sparse scrub cover. This paper concludes that it is probable that the jarrah forest received periodic light burning prior to European settlement. The advent of utilization resulted in dense accumulations of felling debris and accompanying damaging conflagrations, and these fires were of an intensity unusual in the earlier environment.

Admittedly there is only rudimentary information on stand structural changes resulting from fire, but some trends in current fire damage studies are likely to be indications of future developments.

If early observation was correct it could be expected that the dense pole stands in the prime jarrah forest will be noticeably thinned by repeated burning. It is also possible that the silvicultural benefits of repeated burning are greater than is now generally accepted.

Fire as a Thinning Mechanism

The concept of fire as a thinning mechanism was recognised by Lindemuth (1962), but his assessment indicated no benefit from a single large area burn under Ponderosa Pine.

The author is of the opinion that beneficial thinning may well accompany repeated burning in dense jarrah forest, and this opinion is based on trends in fire damage assessment of the Dwellingup fire area. The assessment is based on one acre randomly located plots, at an intensity defined by the accepted standard error of the mean.

Within the assessment results the recovery of the under 36" GBHOB class is of interest, because this size class represents the most fire susceptible trees considered in the study.

Within this class trees were divided into two groups.

a) Those considered to be potential future crop trees by their position in the stand.

b) Surplus trees of no significance to the fully stocked condition, being fully suppressed or surplus members of a coppice stool.

Within these groups trees were classed as those which had replaced their crowns after the fire, and those with fire killed crowns.

The results of assessment in the defoliated area of the Dwellingup Fire are shown in table 1 (forest damage stratum defined by Working Plans A.P.I. assessment).

Table 1. Number of trees per acre under 36" GBHOB

	Future Crop Trees	Surplus Trees
Crowns Replaced	44	24
Crowns Dead	58	167

The results show that 57% of the potential future crop trees, and 87% of the surplus trees, have failed to replace their crowns. The indications are that a potential crop tree has a higher fire resistance than a surplus tree, which could be expected as they have room to grow and are inherently more vigorous.

If this hypothesis is reasonable a lowering of fire intensity should result in a higher proportion of crop tree recovery than that which occurs in the surplus trees. To examine this contention the assessment figures for the fully browned area of the Dwellingup Fire are shown in Table 2.

Table 2. Number of trees per acre under 36" GBHOB.

	Future Crop Trees	Surplus Trees
Crowns Replaced	59	56
Crowns Dead	18	131

Comparing defoliation and fully browned it will be noted that the percentage of future crop trees which failed to replace a crown has dropped from 53% to 23%, a decrease of 60%. Similarly the surplus trees show a drop from 87% to 70% but the decrease is only 19%.

This difference in inherent fire resistance may produce marked benefits when extended to the fire intensities accepted for controlled burning. Providing reasonable height growth has been achieved properly planned controlled burning should result in minor damage to potential crop trees, while a significant proportion of the surplus trees are killed or damaged. With repeated burning the benefits should accrue and the stand gradually revert to a desirable spacing. In practise it is unlikely that the process will be entirely selective and a number of crop trees may be damaged, but the chances of surplus trees being damaged is much greater.

It was noted in the defoliation assessment that variation in fire resistance also appears in trees of merchantable size. Taking two utilization standards in large trees i.e. merchantable and cull or useless, trees were divided into those with crowns replaced and those completely fire killed. The results of this assessment are shown in Table 3.

Table 3. Volume per acre cubic ft.

	Merchantable	Cull
Crowns Replaced	645	69
Fire Killed	70	65

Merchantable trees have lost only 10% of the volume per acre by fire kill while cull trees have lost 48%.

It appears to the author that if fire intensity is lowered to an acceptable level, which is defined by the nature and type of stocking, then real benefits will accrue by removal of much of the stand rubbish. To have confidence in this contention it is necessary to know whether fire damage can be controlled by using the current controlled burning guide for the northern jarrah forest.

Control of Fire Damage.

As a check on the effectiveness of damage control by using the controlled burning guide three burns in 6 year old regeneration were carried out in the Gleneagle area. Trees had an average height of 10 ft., hence were susceptible to fire damage.

Three burns were conducted, using the normal strip method and at three different fire danger ratings. Within each area 150 saplings were selected as potential future crop trees. The scorch resulting on these trees is shown by the distribution on Graph 1.

From graph 1 it will be noted that Burn 1 carried out at a fire danger of Purple 0.8 ft./min., that 46 of the 150 saplings received no scorch while 32 were fully scorched. In Burn 2 (fire danger Green 1.2 ft./min.) the number of no scorch trees dropped to 12 while the number fully scorched rose to 100. In Burn 3 (fire danger Green 1.6) only 5 saplings escaped scorching while the number fully scorched was 112.

There seems little reason why effective damage control cannot be gained by attention to the correct fire danger rating, and when this is accepted the use of fire in silviculture has a far greater potential than is at present generally acknowledged.

References. Harris and Wallace. 1959. Controlled Burning in Western Australia.

Lindemuth. 1962. Effects on Fuels and Trees of a Large Intentional Burn in Ponderosa Pine. J.For. 60(11) 1962.

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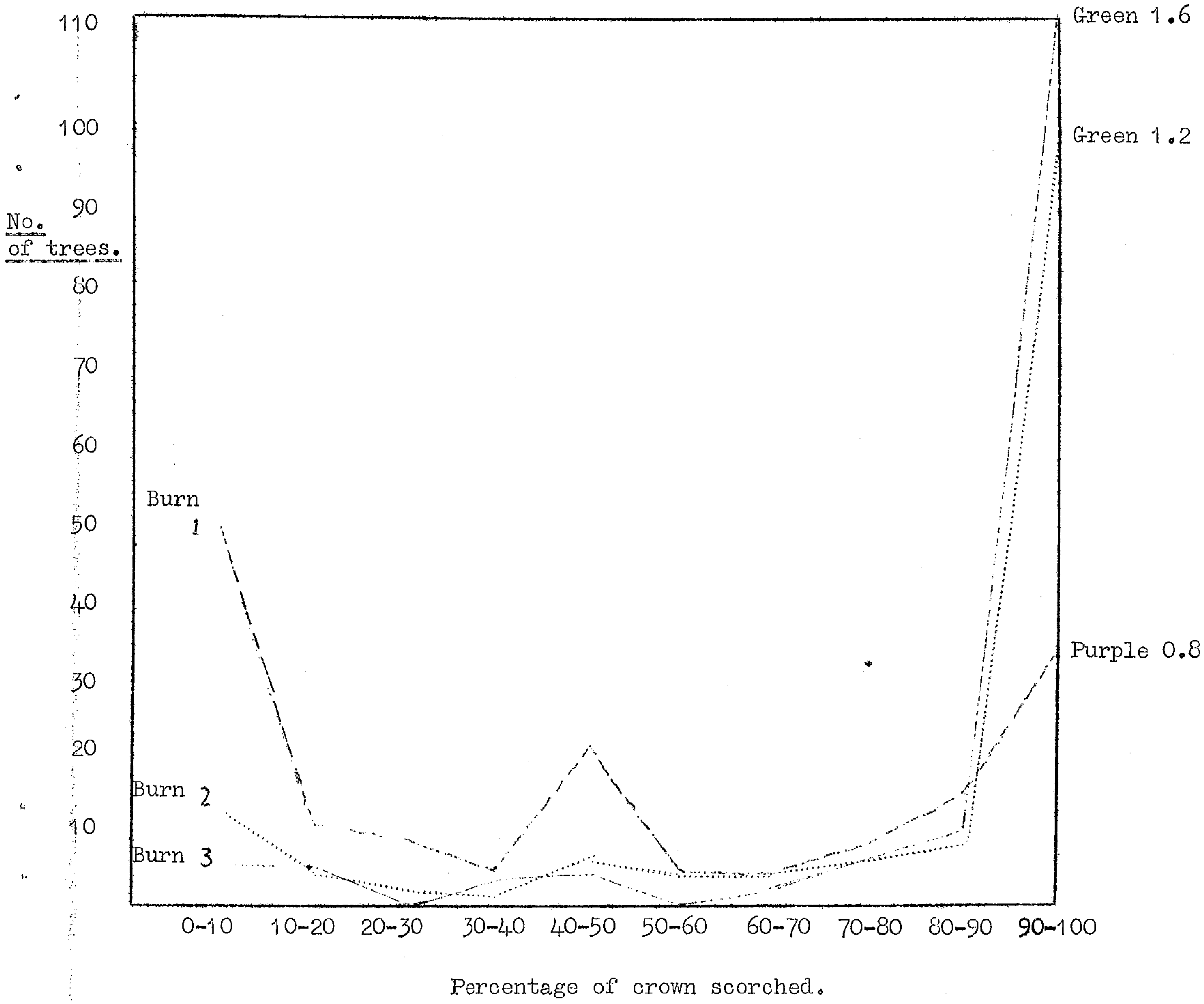
Graph 1. Scorch distribution from burns under 6 y.o. jarrah regen. - Gleneagle (150 trees assessed in each burn).



EXTRACT FROM THE COLLIE MAIL SPECIAL CHRISTMAS NUMBER, DECEMBER 14, 1939.

COLLIE WAS FAMED FOR ITS FORESTS.

In other days

1,000 sleeper cutters.

Over 30 years ago Collie was one of the most active timber centres in the South-West. There was a world-wide demand for jarrah and orders for both sleepers and milled timber poured into West Australia. The boom began in the initial years of the century and it lasted until 1914. At the peak of the boom over 1,000 men were engaged around Collie and Worsley cutting sleepers, while probably another 1,000 men were employed in the timber mills.

In those days Worsley, now an insignificant centre 11 miles from Collie, was almost as large and as important as the coal town. A huge mill operated by Millars' Timber and Trading Co. was working there and it had to employ men on both day and night shift in order to cope with the demand for timber. It gave employment to 250 men, while about 600 men were sleeper hewing in the bush around the mill.

Lucknow Concession

At Collie as much, if not more attention was being given to timber cutting as there was to coal mining. Over 400 men were cutting sleepers, many of them within a stone's throw of the town, and money was plentiful. Old timers recall that trees were felled on slopes which are now covered with houses. Many cutters had only to walk half a mile from their boarding house to where they were cutting and as there was no restriction on them they played havoc with the bush.

Big Tree

A Mighty Blackbutt

Wherever timbergetters gather they tell of mighty trees - trees of great height and girth, trees that took a day to fell, and trees from which a couple of hundred sleepers were cut without much trouble. While some of the tales that are told must be taken with a grain of salt, undoubtedly some mighty forest giants have been felled around Collie.

In the early days on the Lucknow reserve a hewer was credited with having cut 400 sleepers from one tree, while in another part of the district, so the story goes, a cutter over 6 ft. tall lay in the scarf chopped in a tree of enormous girth and his heels did not touch the furtherest side.

Then there was the cutter who felled a jarrah tree 150 ft. high.

Big trees are occasionally encountered in the bush today and one of the biggest fell to the axes of the Buckle brothers in the bush at Hamilton Creek not so long ago. It was a huge Blackbutt 140 feet high and 75 feet to the first limb. Straight as a gun barrel it was 15 feet 10 ins. at the centre girth. Props for use in the coalmines were cut from the tree.

A SUPERING EFFECT ON PINUS PINASTER.

by R.J. Underwood.

Following the inspection and measurement of six Pinus pinaster plots near Northcliffe and Pemberton recently, an interesting sidelight on the effect of superphosphate on the pines was noted.

The plots were planted in the winter of 1960 on the typical "flat" sites of this area, i.e., low-lying, highly leached grey sands which are waterlogged in the winter and bone dry in the summer. Four plots are located on the old Northcliffe Rifle Range (plots 1 to 4) and two on Willows Road, East of Pemberton (plots 5 & 6).

In each plot of 8 rows x 22 plants, four rows were given the normal super application of 2 ounces per tree at planting, and four were left unsupered. The data gathered in October, 1964 is summarized below;

Plot No.	Rows Supered		Rows Unsupered	
	% Survival	Mean Ht.	% Survival	Mean Ht.
1	63%	3'6"	86%	2'7"
2	30%	4'7"	41%	1'10"
3	38%	5'10"	70%	2'7"
4	39%	4'1"	65%	1'5½"
5	55%	3'1"	66%	2'4½"
6	85%	7'10"	97%	7'4½"
MEAN	51%	4'10"	71%	3'2½"

The implication of these figures is that while the application of Superphosphate at the time of planting gives the expected higher level of height growth, it is also possibly associated with a marked decrease in the survival of the pines.

It is interesting to note that Campbell (1) with Eastern States Eucalypts, and van Noort (2) with Jarrah, have both observed what appears to be a comparable result from seedlings planted and supered on poor soils.

A possible explanation in the case of the Northcliffe plots is that on these very poor sites, the immediate availability of phosphate to the young plant, reduces the necessity for the development of an efficient root system, with the result that the plant is unable to cope with the subsequent summer conditions.

If this is the case, then it may be better practice to carry out the super application during the winter of the second year, rather than at the time of planting. This would allow the plant to develop its root system during the first summer and autumn, before getting the necessary boost from fertilizer.

It must be remembered that these observations are based on the results of uncontrolled trial plots, and not on those of controlled experimentation. But the fact remains that they do point to what could be an important conclusion, and this suggests that further properly designed research may be of value, in assisting the effective establishment of Pinus pinaster in the Pemberton-Northcliffe area.

References cited.

1) Campbell, J.B....Eucalypts on dieback sites. Forest Notes 2(3) 1964

2) Van Noort, A.C....Jarrah seedling plots - Willowdale. Forest Notes 1(1) 1959.

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STAFF NOTES.

1. Mr. J.H. Jones, Chief Draftsman, who commenced duty with the Forests Department on 22nd August, 1924, has commenced leave prior to retirement after the close of business on 26th February, 1965.

2. Mr. Albert Charles Thomas has replaced Mr. R. J. Wilkinson as Sub-Accountant. Mr. Wilkinson has been transferred to the Public Service Commissioner's Office.

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