FORESTS DEPARTMENT OF WESTERN AUSTRALIA

FOREST NOTES

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FORESTS NOTES.

It is generally considered that a newsletter permitting free exchange of information between field staff would be of considerable value within the Department. The reason why such a circular has not been previously provided is due to the lack of staff to deal with the work and technicalities involved in providing such a publication.

"Forest Notes" has been instigated to fulfil in part this requirement. It is intended as a medium through which individual officers can pass on to field staff in general any interesting aspects of their work or progress reports on long term projects.

There is always a certain reluctance amongst people, particularly foresters, to write articles. "Forest Notes" will endeavour to assist such people by being kept as simple as possible and intended primarily for internal circulation within the Department. Formal editing will be discouraged, apart from the viewpoint of correcting policy infringements.

Articles will be printed in the form submitted, under the signature of the sender. This procedure, as well as permitting external follow-up correspondence on articles as required, will cut down the burden of central editing, rewriting and format arranging which is the main bugbear of publication procedure. It is necessary that articles forwarded should be written and set out to the satisfaction of the author. Each contributor, therefore, becomes his own editor. Endeavour to make your article clear, concise and constructive.

Any article from one paragraph to a full several page report will be considered. Material need not be original, but if extracted from literature, the source should be stated to permit readers to follow up as desired. The single criterion for inclusion is that an article is of general interest to field staff.

Initially it is hoped to issue "Forest Notes" twice yearly, but frequency will depend entirely on the amount and interest value of material received. All roneoing and stapling must, of necessity, at the present stage, be done within the Department. This simple, perhaps rough appearance which debars pictorial expression will not detract from the initial value of the publication and will be improved according to the success of circulation and co-operation. Suggestions to further this aspect of the newsletter would be appreciated.

It is emphasised that "Forest Notes" is mainly for distribution within the Department, but it is felt that some articles may have a wider appeal. These may be reproduced in the Newsletter of the Institute.

Nothing more need be said. The newsletter is presented for your use; its value and future depends entirely on your co-operation and enthusiasm. Constructive criticism would be appreciated, so do not hesitate to forward your comments and recommendations.

All correspondence relevant to "Forest Notes" should be referenced "Forest Notes. File 1077/58."

JARRAH SEEDLING PLOTS - WILLOWDALE.

by A. C. van Noort.

Some interesting facts and figures regarding the survival and development of Jarrah seedling regeneration have been obtained from three plots established in 1941 near Willowdale in an area of dense germination following an uncontrolled fire.

The main points are:-

1. A rapid reduction in the number of plants per acre in the first few years from upwards of 18,000 in the first year, to approximately 1,500 after five years.

2. A much slower reduction in numbers in the next 12 years down to the vicinity of 500 per acre at age 17.

3. Very slow development of the advance growth, and no development at 17 years, of dynamic saplings.

4. Somewhat accelerated growth on ash beds.

5. Indications of a short term effect of superphosphate dressings at age 4 years.

6. No serious loss due to a light burn at age 4 years, but almost complete destruction by a more severe burn at the same age.

7. Vigorous development of coppice from fire damaged stems.

The Area.

The plots are located in Samson Block, compartments 3 and 5, which carried good sapling regrowth prior to 1941. In 1941 the area was burnt by a severe uncontrolled fire which apparently killed most of the smaller sizes back to ground level and resulted in a dense germination of Jarrah seedlings the following autumn.

The Plots.

Three plots were laid out in May 1941. Two of them consisted of strips 5 chains x 10 links giving 50, 10 link quadrats per plot. The other was 5 chains x 5 links giving 100 5 link quadrats. Counts of the numbers of Jarrah seedlings in each quadrat were made in 1941 and recounts carried out in 1943, 1944, 1945, 1946, 1947 and 1958. The results of these counts are shown in Tables 1, 2 and 3.

Treatments.

In December 1945, at age 4 years, the plots were subjected to 5 treatments, as follows:-

1. Burn plus 2 cwts. superphosphate per acre.

2. Burn only.

3. Control - no treatment.

4. Two cwts. superphosphate per acre.

5. Eight cwts. superphosphate per acre.

One treatment was applied to each of the five one chain sections of each plot.

Survival figures, two years after the application of these treatments, were very variable, see Table 4, but some indications of effect of treatment were obtained, viz.:-

Superphosphate

There are indications from these plots that dressings of superphosphate have improved the percentage survival 2 years after the application. Due to the wide variation in the results and the lack of sufficient replication, these figures are not significant but suggest that further experimentation is required.

Burning.

On two of the plots which apparently received a mild burning treatment, survival was not significantly lower than the control. On the third plot the seedlings were almost completely destroyed by the burning treatment - See Table 3.

Recent treatment of the Plots.

The area has been control burnt twice since 1947, in the spring of 1954 and 1957. In addition to the burning treatments in 1945 all the plots have thus been subjected to two light fires at the ages of 13 and 16 years.

Logging operations in the area in 1957 have spoilt plot number 3. A snig track actually follows along the line of the plot for about 2 chains - Table 3.

Survival at seventeen years of age.

The high mortality rate in the first five years is shown in Tables 1, 2 and 3, where the numbers per acre are reduced from upwards of 18,000 down to the order of 1,500. Recruitment due to subsequent germination in these years was small.

Only plots 1 and 2 are suitable for comparison in 1958, the third being spoilt by the severe burning treatment in 1945 and the logging operations in 1957.

Examination of tables 1 and 2 shows that survival of the original regeneration amounts to 800 and 360 per acre respectively In addition, a further 840 and 720 per acre respectively have germinated and survived since the 47 measurement.

Development of regeneration after 17 years.

Subsequent growth of the seedling regeneration has been surprisingly slow. There has been no development of dynamic saplings and the tallest of the advance growth was only 2'6" high. Only about one fifth of the surviving seedlings have developed into strong advance growth. That is, over 12" high with a well developed lignotuber and numerous shoots. The remainder are 6"-12" high with a tuber about 1" diameter.

An explanation of this very slow growth of the seedling regeneration, lies in the vigorous development of coppice from the fire damaged stems. Undoubtedly, after the fire of 1941, this area was very open. It is now fairly well stocked with coppice growth 30'-40' high, in addition to dense patches of Banksia grandis. There are openings of reasonable size on the plots, where the regeneration should get away, but even here it is apparently suppressed, possibly by root competition from the vigorous coppice.

Conclusions.

1. The development of lignotuberous advance growth to the stage where it is ready to commence dynamic height increment, can take more than 17 years.

2. Some idea of the ability of the regeneration to withstand fire is gained from the survival figures following the burning treatment at 4 years of age.

3. The effects of superphosphate dressings and ashbeds suggest that some further investigation of the nutritional requirements of Jarrah regeneration, is warranted.

4. The stagnation of the advance growth on these plots indicates the need for a study of the effects of competition on the development of Jarrah regeneration.

PLOT NO. 1. TABLE 1.

JARRAH SEEDLING COUNTS.

5 chains x 5 lks. = 1/40th acre.

Chainage			0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	Recruitment	Total	No. per ac.
Initial Count May 1941		Total	283	50	53	12	73		471	18,840
Recount	1943	Total	163	36	45	6	28		276	11,040
"	1944	Total	54	18	26	3	10		111	4,440
"	13/7/45	Survivors	27	12	18	3	8		68	
		Recruits	-	7	2	4	4	17		
		Total	27	19	20	7	12		85	3,400
Treatment	21/2/45		Burn + 2 cwt. Super.	Burn	8 cwts. Super per ac.	Control	2 cwts. Super per ac.			
Recount	29/8/46	Survivors	8	9	16	6	4		43	
		Recruits	-	1	5	1	-	7		
		Total	8	10	21	7	4		50	2,000
Recount	25/9/47	Survivors	4	8	21	5	3		41	
		Recruits	1	-	-	-	-	1		
		Total	5	8	21	5	3		42	1,680
Recount	1/12/58	Survivors	3	3	9	4	1		20	800
		Recruits	12	-	5*	2	2	21		840
		Total	15	3	14	6	3		41	

* Well developed Advance Growth - Less than 11 y.o. - on an Ashbed.

** Regeneration over 11 y.o.

TABLE 2.

PLOT NO. 2.

JARRAH SEEDLING COUNTS.

5 chains x 10 links = 1/20th acre.

Chainage.			0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	Recruitment	Total	No. per ac.
Initial Count May 1941		Total	189	143	136	65	41		573	11,460
Recount	1943	Total	98	104	90	40	27		359	7,180
"	1944	Total	61	52	54	16	20		203	4,060
"	13/7/45	Survivors	35	28	40	12	12		127	
		Recruits	-	2	3	3	-	8		
		Total	35	30	43	15	12		135	2,700
Treatment	21/12/45	2 cwts. Super per ac.	Control	8 cwts. Super Per ac.	Burn	Burn + 2 cwt. Super.				
Recount	29/8/46	Survivors	28	13	34	5	7		87	
		Recruits	-	-	1	1	-	2		
		Total	28	13	35	6	7		89	1,780
Recount	25/9/47	Survivors	24	8	20	5	7		64	
		Recruits	-	-	-	-	-			
		Total	24	8	20	5	7		64	1,280
Recount	1/12/58	Survivors	10	1	1	3	3		18	360**
		Recruits	1	1	11	18	5	36		720
		Total	11	2	12	21	8		54	

** Regeneration over 11 y.o.

TABLE 3.

PLOT NO. 3.

JARRAH SEEDLING COUNTS.

5 chains x 10 links = 1/20th acre.

Chainage		0 - 1	1 - 2	2 - 3	3 - 4	4 - 5	Recruitment	Total	No. per ac.
Initial Count May 1941	Total	160	139	45	100	136		582	11,640
Recount 1943	Total	76	76	29	61	119		361	7,220
" 1944	Total	45	34	15	22	51		167	3,340
" 13/7/45	Survivors	32	26	10	9	42		119	
	Recruits	7	4	-	1	2	14		
	Total	39	30	10	10	44		133	2,660
Treatment 21/12/45		2 cwts. Super per ac.	Control	8 cwts. Super per ac.	Burn*	Burn* + 2 cwts. Super			
Recount 29/8/46	Survivors	34	18	7	0	2		61	
	Recruits	-	1	-	-	-	1		
	Total	34	19	7	-	2		62	1,240
" 25/9/47	Survivors	25	12	6	0	1		44	
	Recruits	-	3	-	-	-	3		
	Total	25	15	6	-	1		47	940
" 1/12/58	Survivors	3	0	0	0	0		3	60**
	Recruits ?	-	4	2	29?	2	37		740
	Total	3	4	2	29	2		40	

* Apparently a severe burn which destroyed practically all seedlings.
? New seedlings germinated on snig track.
** Regeneration over 11 y.o.
Note that recent logging operations 1957 have spoilt this plot.

TABLE 4.

JARRAH SEEDLING COUNTS.

SURVIVAL PERCENT AFTER 1945 TREATMENT.

COMPARING THE 1947 COUNT WITH THE 1945 COUNT.

Plot	Control	2 cwts. Super per ac.	8 cwts. Super per ac.	Burn	Burn + 2 cwts. Super per ac.
1	57	25	75	37	15
2	27	69	44	27	58
3	37	64	60	0	2

AN UNEXPLAINED DISORDER IN WANDOO.

by F. D. Podger.

Patches of dying Wandoo have been noticed recently in the Easternmost parts of the Gleneagle Division.

The disorder has been noted both in virgin and cut-over forest as well as close to settlement or well within the forest belt. The occurrences are usually small, but one of 10 acres was found near the Dale River. Separate occurrences have been noted as far apart as the 60 mile on the Albany Road, and the area mentioned above near the Dale-Brookton Road.

At first sight these patches look much like dying Jarrah areas. They differ markedly, however, in that the understorey does not always die and that dense vigorous Wandoo regeneration up to 15' in height occurs on most areas. The typical poor condition of surrounding crowns common to dying Jarrah is not seen. Generally the trees within a year die from an apparently healthy condition.

There is no macroscopic evidence of fungal attack, nor can the deaths be attributed to fire.

These areas are spreading and more trees die each year. The leaves die and all the bark is shed in the one year with individual deaths occurring at least from July to December and perhaps throughout the year. Most of the patches have been found to occur on the middle and lower slope, but rarely on the flats.

Any one or combination of a number of factors may be responsible, but a suggestion that they are salt toxicity deaths is difficult to credit since at least two important occurrences are within well stocked forest areas.

NURSERY SOIL FERTILITY STUDIES - HAMEL NURSERY.

by A. B. Hatch.

SUMMARY:

A chemical study has been made of several groups of surface soils at Hamel Nursery. These soils ranged from virgin grassland soil adjacent to the nursery, to the old pine nursery beds.

The chief differences observed in the soils were that the nursery cropping has caused a decline in soil organic matter (as measured by organic carbon and nitrogen values), and this decrease in soil organic matter is accompanied by a decrease in the cation exchange capacity of the soil.

INTRODUCTION:

During April, 1958, a series of composite surface soils (0-4½") were collected from Hamel Nursery.

The samples were collected from the following areas in the nursery -

(1) Old pine nursery beds North of the shadehouse.
(2) " " " " " "
(3) " " " South " "
(4) Old deciduous stock beds North of the shadehouse.
(5) New pine nursery neds South of the shadehouse.
(These had grown one crop of P. radiata).
(6) Virgin grassland soil adjacent to the nursery.

Three composite soil samples were collected from each area, each composite sample being the mean of nine individual samples collected with a constant volume soil sampler. All samples from West side of Samson Brook.

The samples were analysed at Dwellingup in an attempt to determine any changes in soil fertility which may have occurred as a result of the long term cropping for nursery stock.

The Soils.

The soils at Hamel are a black earth formed from alluvial deposits. Below the surface soil this sub-soil is very variable and ranges from a sand to an olive brown silty clay.

Analytical Data.

The analytical data for the six groups of soils is tabulated in Appendix (1).

(1) Mechanical Analysis.

The soils are moderately textured, being generally loams or silty loams. The main features of the mechanical analysis data is the high percentage of fine sand and silt, and this feature is usually characteristic of certain types of alluvial soils.

(2) Soil Reaction.

The soils are acid in reaction, with pH values ranging from 5.2-5.7. Apparently the nursery cropping has had no effect on soil acidity.

(3) Soluble Salts.

There are moderate amounts of soluble salts present in the soil, values ranging from 0.037% to 0.058%, but the nursery crops have had very little effect on the soluble salt concentration in the soil.

Water soluble chlorides (expressed as NaCl) are extremely low in all samples, being 0.001% in all samples.

(4) Organic Matter.

Organic matter, as measured by organic carbon and total nitrogen, is very high in these soils, even after long cropping. The organic carbon and nitrogen values range from 2.67 to 5.93% and 0.153 to 0.317% respectively.

There has been a marked change in soil organic matter as a result of the cropping rotations. Soil nitrogen has declined from 0.317% in the virgin soil to an average value of 0.186% in the old nursery beds. Similarly organic carbon values have decreased from 5.93% to 3.01% in the virgin soil and old nursery beds respectively.

This decline in organic matter is one of the biggest changes that have occurred as a result of the nursery cropping. Fortunately Hamel has a very big reserve of soil organic matter, but this loss of organic carbon could be a very important factor in forest nurseries where the original soil organic matter level is low.

(5) Exchangeable Cations.

The soils have a high cation exchange capacity (34.3 to 44.8 m.e.%), and are very largely base unsaturated.

Calcium is the dominant exchangeable cation, occupying 50 to 68% of the exchangeable metal ions. Magnesium is next in importance (16-39%), and this is followed by potassium (5-14%). Exchangeable sodium is very low in all soils.

The nursery cropping has caused a decline in the cation exchange capacity of these soils from 44.8 m.e.% in the virgin soil down to an average value of 37.2 m.e.% in the old beds. This decline in cation exchange capacity is considered to be due to the decline in soil organic matter, as this material has a very high exchange capacity.

The exchangeable cations show considerable changes, both in amounts and percent composition as a result of the various rotations. (Table 1.)

Exchangeable Cations. Table 1.

	Old Nursery Beds				Virgin Soil	
	Conifer		Deciduous			
Ex. Ca^{++} m.e.%	4.0	65	8.0	60	4.5	50
Ex. Mg^{++} "	1.4	23	1.5	22	3.6	39
Ex. K^{+} "	0.48	8	0.59	14	0.54	9
Ex. Na^{+} "	0.27	4	0.15	4	0.22	2
	6.15	100	10.24	100	8.86	100

The most noticeable changes are the increase in exchangeable calcium in the deciduous stock beds, and the decline in exchangeable magnesium in all beds as a result of cropping. From the data in Appendix (1) this decline in exchangeable magnesium appears to take place very early in the history of the beds.

It was also observed that there is an increase in total exchangeable cations under the conditions of cropping in the deciduous beds, but further sampling is required to verify this point.

Discussion.

From the chemical data it appears that the most important change in the Hamel Nursery soils due to the cropping rotations used has been a decline in the soil organic matter. This decline in organic matter represents a loss of some 2,000 lbs. of nitrogen per acre $4\frac{1}{2}$ inches.

In addition to the direct loss of organic matter which is the cause of the decline in cation exchange capacity, there are other effects which can be very important in the management of the nursery soil. The chief of these is the effect on soil structure, which has not been dealt with in this report. Soil organic matter plays a very important part in the maintenance of good soil structure, and the decline in organic matter may be one of the causes of the increased clod structure in the old nursery beds at Hamel. A further set of samples have been collected to investigate any changes in soil structure that may have occurred in the old nursery beds.

APPENDIX I.

HAMEL NURSERY

Mechanical and Chemical Analyses

Depth (ins).	Old Conifer Nursery Beds 1	Old Conifer Nursery Beds 2	Old Conifer Nursery Beds 3	Old Deciduous Nursery Bed	New Conifer Nursery Beds 1 crop	Virgin Soil Grass Land
	0 - 4½"	0 - 4½"	0 - 4½"	0 - 4½"	0 - 4½"	0 - 4½"
Physical Analysis.						
Gravel %	-	-	-	-	-	-
Coarse Sand %	25.4	22.9	16.2	25.3	18.0	25.3
Fine Sand %	30.1	30.5	39.7	32.3	37.8	27.1
Silt %	23.9	22.8	29.5	25.2	26.7	23.8
Clay %	20.6	23.7	14.6	17.3	17.4	23.8
Texture (Triangle)	S.L.-L.	S.L.-L	S.L.	S.L.-L.	S.L.	L.
Chemical Analysis.						
pH	5.3	5.4	5.4	5.7	5.2	5.6
Total Soluble Salts %	0.037	0.039	0.057	0.068	0.041	0.058
Chloride (NaCl) %	0.001	0.001	0.001	0.001	0.001	0.001
Loss on Ignition %	12.40	13.00	15.10	12.70	16.2	16.1
Air Dry Moisture %	4.50	4.60	5.40	4.60	5.0	5.6
Organic Carbon %	3.01	2.93	3.43	2.67	4.38	5.93
Nitrogen %	0.166	0.153	0.229	0.197	0.321	0.317
Exchangeable Cations.						
Calcium m.e.% & %	3.8 68	4.6 65	3.5 61	8.0 75	2.6 60	4.5 50
Magnesium m.e.% & %	1.2 21	1.9 26	1.2 21	1.5 16	1.0 22	3.6 39
Potassium m.e.% & %	0.36 7	0.37 5	0.70 12	0.54 6	0.59 14	0.54 9
Sodium m.e.% & %	0.20 4	0.28 4	0.33 6	0.26 3	0.15 4	0.22 2
Hydrogen m.e.%	28.7	27.7	36.1	27.3	37.7	35.7
Cation Exchange Capacity m.e.%	34.3	34.8	41.9	37.6	42.3	44.8
Saturation %	16	20	14	27	10	21

BLACKWOOD AS A KARRI FOREST UNDERSTOREY.

by J. C. Meachem.

Foresters in the Karri forest have long had in mind the introduction of an understorey or complementary species with special characteristics not found in our native hardwoods or recognised exotic softwoods. Trials of Redwood (S. sempervirens), Cypress Pine (C. cupressiformis), and Douglas Fir are interesting, but not yet promising of practical application. Recent inspections of Blackwood (Acacia melanoxylon), give cause for optimism. Spot sowings at Big Brook in 1928 under open virgin Karri and presumably on a recent burn, produced a number of trees of indifferent form which now measure up to 60 inches g.b.h. and 70 feet in height. At approximately 10 years of age the originals commenced regenerating and today each tree has colonised an area of up to half an acre in extent. The progeny are of good form, straight boles to 40 feet being not uncommon. Rate of growth varies considerably but some stems are developing rapidly. At least some of the young trees are root suckers which have gained an initial boost from the parent root system.

A colony of several acres has developed on Quinninup Brook from a few old trees on an adjacent farm. Here the progeny appear to be mainly seedlings and may be found in mixed Marri-Karri formation up to 8 chains from the stream.

Blackwood has for many years been highly valued as a veneer and cabinet wood. It seasons and bends well but in recent years it has not been readily available. As a timber tree in Tasmania it is found chiefly in prime Ash forests (40-60" rainfall) and the swamp forests of the North West. Competition is everywhere essential to achieve good form.

Trial areas are to be established on recently logged Karri forest in an endeavour to replace, in some measure at least, the fire weed Acacias. Experiments are in hand to test seedling and vegetative reproduction (root cuttings)in various forms. Seed is being secured from elite trees selected in the field by I. B. Thulen, geneticist, for work being carried out by the Forest Research Institute of New Zealand.

GERMINATION STIMULATION IN PINUS PINASTER.

by E. R. Hopkins.

SUMMARY.

Continued poor germination results with Pinus pinaster seed, of Portuguese origin, coupled with recent adverse nursery conditions have indicated the need to provide better germinating conditions for nursery management.

Trials were initiated in 1958 to test the effectiveness of germination stimulation procedures in overcoming the problem. Tests carried out covered treatments incorporating two different periods of seed soaking accompanied with a subsequent seven weeks' stratification period. The seed was sown with and without drying.

Treatments used in the trial were designed on the basis of earlier results obtained by the Department during the period 1940-1952, and a prescription outlined by David for Pinus pinaster seed in France.

The project was carried out on a large scale (150 lbs. of seed) with a view to developing a suitable technique for the bulk handling of the annual nursery requirements. A scheme of operations suggested for handling southern pine seed was modified for the present purposes.

Treatments were successful at all stages of testing over a germination period of 8½ weeks in both sand flats and nursery beds. Rate of germination and total germination percent were materially improved by treatments over this period.

The most successful and practical treatment tested consisted of an 8 day seed soaking in water at room temperature followed by a seven week stratification period at 36°F. Seed was dried before sowing. The following results were obtained:-

	Germination percent for time in days after sowing							
	7	14	21	28	35	42	49	56
Control	-	-	6%	28%	42%	51%	56%	61%
Treatment	-	1%	31%	55%	62%	70%	72%	74%

Results are significant at the 0.01 level of probability in all cases.

This performance should be increased appreciably by extending the stratification period to twelve weeks as was found optimum by David.[3]

INTRODUCTION:

Portuguese Pinus pinaster seed has consistently provided poor germination performance under State nursery procedures. This behaviour is not entirely local and has been reported from overseas sources familiar with pinaster handling.

The major problem withthe seed in nursery management is the slow and uneven rate of germination coupled with a general low germination percent. In the former case it is not unusual for the seed to be still germinating in the beds eight weeks after time of sowing and in exceptional seasons, germination periods up to twelve weeks have been recorded. Total germinations, as determined by sand flat tests at Collier, vary from 50% to 80% and generally average between 50% and 60%.

The main disadvantages experienced with slow and varied germination, apart from the resultant uneven planting stock obtained, is the difficulty of efficiently using a follow up mineral oil weedicide spray on the beds and the increased susceptibility of the seedlings to damping off. Seeds that remain in the soil for three to seven weeks prior to germinating are extremely susceptible to any soil pathogens present. Weak germination vigour can also increase the damage due to damping off pathogens. Both Hamel and Gnangara nurseries have experienced considerable losses in Pinus pinaster due to damping off and unknown causes in recent years. It is considered that these losses would be appreciably reduced by using improved seed.

Gibson[1] has also pointed out the possible increased damping off risks due to heavily sowing seed of poor germination to obtain reasonable emergent populations.

During the period 1940-1952 work was initiated by the Department in an attempt to provide a standard stimulation procedure to improve nursery germination performance. Numerous trials including hot and cold soaking, mechanical abrasion, chemical dipping and both moist and dry cold storage were carried out. Results were generally confusing and conflicting. The following main points did arise from this work -

(1) Stratification (cold, moist storage) was generally beneficial.

(2) Cold soaking may be beneficial.

(3) The problem with Pinus pinaster is not one of a true seed dormancy but largely the result of a high percentage of non-viable and weak seeds present in seed supplies.

In 1958 it was decided, in the face of the poorer nursery returns of recent years, to follow up this work with a bulk test in order to prescribe a general treatment for future sowings. Methods of handling large quantities of seed were adapted from a procedure outlined by P. C. Wakely for Southern pine seed.[2] Treatment techniques followed those outlined by David[3] working with Pinus pinaster seed in France.

Materials and Methods.

150 pounds of seed was soaked and placed into storage. Six treatments were tested -

(1) 8 days' water soaking at room temperature followed by 7 weeks' moist cold storage at 36°F. Seed sown moist.

(2) 1 day's water soaking at room temperature followed by 7 weeks' moist cold storage at 36°F. Seed sown moist.

(3) Seed soaked for three hours immediately prior to sowing. Seed sown moist.

(4) As for treatment (1) + seed dried prior to sowing.

(5) As for treatment (2) + seed dried prior to sowing.

(6) Normal storage seed sown as per normal prescription.

All seed used in the trial was of the single batch, serial number 2110. 10 pound of serial 2109 was included purely to add bulk to the trial and was not subsequently tested for treatment effects except under nursery conditions.

Prior to soaking, seed was weighed into 5 pound lots and stapled into 15" x 12" calico bags to form a dry pack approximately 12" x 12" x 1½" in size. Each bag was labelled with an aluminium permo-tab to show the serial number and treatment information.

Soaking was carried out in a large enamel bath, ensuring that the water volume was at least four times the seed volume. 110 pound of seed was soaked for 8 days and 40 pound soaked for 1 day.

To hold the seed during storage, six galvanised iron bins, each of internal dimensions 24" x 16" D. and fitted with a loose lid, were purchased. A slatted wooden false bottom 3 inches deep with a hessian cover was constructed for each drum to permit bottom drainage and aeration throughout the cold storage period. Hessian covers prevented the sawdust packing medium from draining away with the water.

Clean pine sawdust, thoroughly moistened by 24 hours' soaking, was used as the moist stratification medium. Prior to packing, the sawdust was drained for 2 hours to remove surplus water.

Bins were packed with approximately four times the volume of sawdust to seed volume. A 2 inch layer of packing at least, separated each seed bag enabling 25 pounds of dry weight seed to be stored per bin.

The six bins were placed in cold storage on June 24th and removed on August 11th, a period of seven weeks. Temperatures were maintained between 35°F. and 38°F. and on the two occasions tested were constant (inside the bins) at 36°F.

Slight surface drying out was noticed after three weeks and rectified by lightly spraying the sawdust surface with water.

On removal from cold storage, hand samples were taken from each bag to provide a group seed sample for both the 8 day and 1 day soaking lots. From these samples, and untreated seed, germination trials for treatments (1), (2), and (3) were commenced on a basis of 8 replications and a 100 seed unit.

The remainder of the samples together with the bulk of the stratified seed were dried for a period of 18 hours in an electric drying frame normally used for seed extraction.

Germination tests for treatments (4), (5) and (6) were set up from the dried group sample and an untreated seed control held in the seed store. These tests were based on six replications of a 100 seed unit.

All germination tests were carried out at Como in sand flats with bottom watering.

Nursery inspections and counts were also made for the treated bulk seed at the various nursery centres.

Results.

(a) Sand-flat tests.

Percentage germination figures for the six treatments as recorded by counts up to sixty days from commencement of test are set out in Table I. These values are expressed graphically as a continuous record in Graph I. (Not available in this report).

Table I.

Treatment	Percentage germination for time in days										
	18	20	22	24	28	32	37	42	46	53	59
1.	13	23	39	51	57	62	65	67	69	70	71
2.	5	11	24	37	57	64	69	72	74	75	76
3.	0.	0.	3	14	26	32	41	46	48	51	54
4.	10	23	40	50	55	60	64	70	71	73	74
5.	3	8	15	20	27	38	51	64	69	72	73
6.	0	3	9	16	28	37	45	51	54	59	63

Graph II shows the percentage germination in the various treatments at intervals of 3, 5, 7 and 8 weeks.(Not available in this report).

Table II sets out an analysis of the various results for 3,6 and 8½ week germination periods.

Analysis of Variance.

Treatment	3 weeks Mean	Diff. for Significance	F.	6 weeks Mean	Diff. for Significance	F.	8½ weeks Mean	Diff. for Significance	F.
1.	32.0			67.2			71.5		
2.	15.8	0.05=8.57		71.3	0.05=10.73		76.7	0.05=8.10	
3.	1.3		21.84	47.0		7.42	52.5		11.01
4.	32.5	0.01=11.56		69.3	0.01=14.48		74.1	0.01=10.96	
5.	12.2			63.2			73.5		
6.	2.3			51.5			62.3		
	F. at 0.01 = 3.86			F. at 0.01 = 3.86			F. at 0.01 = 3.86		

(b) Nursery Results.

Table III contains the results of nursery counts carried out at Gnangara for both stratified and unstratified seed. These are indicated graphically in Graph III. (Not available in this report)

Table 111.

Serial No.	Nursery Bed	Seed Treatment	Date sown	Count per foot of Nursery Line 5 Sept 1958	12 Sept 1958	19 Sept. 1958	26 Sept 1958	3 Oct 1958	10 Oct 1958	17 Oct 1958
1901	1	Unstrat.	8/8/58	0.8	4.0	7.6	11.1	11.0	10.5	11.6
1901	2	"	"	1.3	4.7	10.6	12.9	14.0	15.0	15.7
2110	2	Stratif.	13/8/58	3.8	9.7	13.0	14.2	13.7	15.0	14.5
2110	2	"	"	3.8	9.0	12.3	13.4	13.4	13.3	13.7
2109	3	"	"	2.8	7.7	12.7	14.6	14.0	13.3	14.5
2110	3	"	"	6.3	9.0	14.4	13.0	14.9	14.6	14.7
2109	3	Unstrat.	8/8/58	0.4	3.5	8.8	10.8	11.3	11.7	11.3
1901	2	"	"	-	6.0	9.9	13.8	15.0	16.1	16.1
1901	2	"	"	-	5.7	12.8	14.5	16.0	16.5	17.0

Discussion.

All treatments were of significant (0.01 level) advantage over all stages of the germination period. Eight days' cold soaking followed by the seven weeks' cold storage period and drying the seed proved to be the most satisfactory of the several combinations tested.

Total germination percentage was slightly increased by treatments over the period of counting. It is to be noted, however, that control seed was still germinating after 8½ weeks. The important point is that for a reasonable maximum germination period of 5 weeks, treated seed gives a more rapid and even germination than untreated seed.

The fact that results are consistent under both controlled and normal nursery conditions suggest that the treatment can be adapted as a general prescription for future P. pinaster seed handling.

Improved results are anticipated in future work. The method outlined by David states that a12 week cold storage period is optimum. This was not possible in the present trial but future trials will be designed to allow for a minimum cold storage period of three months.

Procedure as outlined is satisfactory with one exception. It was noted that the 5 lb. seed bags, when wetted, swelled considerably and it is considered that a four pound dry lot would be more suitable to ensure even treatment during the cold storage period. Smaller lots would also provide a further safety factor against seed "heating" during the storage period.

Conclusion.

(1) Stratification with Pinus pinaster seed of Portuguese origin is beneficial to the subsequent germination behaviour.

(2) Of several treatments tried, all were highly significant in increasing the germinative energy of seed lots tested and over the period of the trial, increased total germination percentage considerably.

(3) The most suitable treatment for practical application is an eight day soaking in water of room temperature plus at least 7 weeks' cold moist storage at 36°F. Seed should be dried prior to distributing to nurseries. Extending the cold storage period to 12 weeks would probably result in an optimum benefit.

(4) Nursery counts and observations indicate that stratification is of practical general value in the nursery handling of this seed and in general adoption would -

(i) Decrease the quantity of seed sown per annum.
(ii) Provide strong, rapid and even germination.
(iii) Offer through (ii) a counter to damping off, inclement season and a sound basis for the continued use of P.R. 46 weedicide.

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BUNNING BROS. OCCIDENTAL PLANTATION.

by F. D. Podger.

A further encouraging instance of an increased forest consciousness outside the profession can be seen on Bunning Bros. proposed plantation site near North Bannister some 3 miles West of the Albany Highway.

An exhaustive soil survey has located approximately 1,000 acres of soils considered suitable for P. radiata. Already 150 acres have been cleared, and a start with planting is planned for next winter.

The proposed plantation is near Boonerring Hill, and in a rainfall area of approximately 25"-30" per annum. This is nearing the limit for P. radiata, but the soils on the current clearing are very impressive and in some places carry Eucalyptus rudis amongst the Wandoo. This is generally regarded as an indication of favourable water relations.

The supervisor on the job is Wilf Dwyer, a former mill manager for Bunnings, who is now an enthusiastic convert to the growing side of timber production. The future of this enterprise will be followed with keen interest and good wishes for its success.

CUTTING OUT THE DEADWOOD.

by P. J. McNamara.

The Amount of Deadwood.

A casual glance at even the roughest assessment figures for "untreated" forest shows two salient points which foresters would do well to ponder -

(1) About 15% of standing volume is unmarketable.

(2) Between 10-25% (higher percentages in the South) of standing volume is Marri in some shape or form.

A minimum of 15% and more likely an average of 20-30% of basal area or cambial area of these stands is supporting material of little, or at best, extremely doubtful value. In other words, only three-quarters of the site is under effective utilisation and the present production from 4 million acres of State Forests is only equivalent to the potential production of 3 million acres of fully productive forest.

Efforts to reduce this dead weight of static volume depend on economics of log hauling and royalty, but there is no doubt that they can be successful, at least in near metropolitan divisions.

What can be done about it?

For the past few months regeneration felling has been in progress along the Kalamunda Road with objectives -

(1) To improve growth on standing trees, and to improve development of second growth by removing moribund and defective Jarrah and poor quality Marri.

(2) To enhance scenic values along a much used tourist road.

(3) To demonstrate that moves are afoot to tend the Eucalypt forest.

Results are encouraging.

The first trial area of 106 acres was felled and logs were prepared by daywork power-sawyer to marking by Forest Guard. Acceptable sawlogs contained in defective trees were assessed at 2 loads per acre standing and actually averaged 1.85 loads per acre felled without falling any of the true growing stock.

(1) Produce.

Jarrah Sawlogs.

194 loads sold by auction @ 66/- per load.	£659.
Jarrah Firewood.	
620 tons at estimated royalty of 5/- per ton	155.
Marri possible firewood.	
300 tons at estimated royalty of 2/6d. per ton	37.
	£851.

The firewood has not been sold as yet but will be removed in due course; the Marri presents another problem.

(2) Production costs.

Wages		£162.
Power saws	315 hrs.	96.
Sharpening		3.
Vehicles	323 miles	29.
Plus overheads 25% on wages		41.
		£331.

(3) Returns based on Jarrah sawlogs only.

Royalty as at auction		66/- per load
Less costs (194 lds. for £331).		34/- " "
Nett return	1.85 lds. per ac. @	32/- " "

= 58/6 per acre.

Allowing for the eventual sale of firewood, the return per acre would amount to 94/8d.

Financial success depends on -

(a) An adequate quantity of saleable logs to offset the total cost of falling and stand improvement. In this case cost per saleable load was 34/- as against 8/2d. per load taking into account all waste material fallen.

(b) A reasonable proportion of saleable logs to waste; in this case extremely large Marri were not fallen on account of prohibitive costs. These trees, possibly 1 or 2 per acre, remain as a challenge to Foresters' ingenuity.

(c) Complete recovery of marketable logs. At a royalty of 66/- per load, unless a faller recovers one load per day, he has not earned his keep, and even half a load missed by him is equivalent to the loss of another half day's work.

Further outlook.

Large amounts of timber reserved to the Crown await removal from alienated land and the time may not yet be ripe for widespread salvage falling. However, maximum production will be required from State Forests when timber from alienated land has been fully exploited.

More immediately, regeneration falling provides productive work for men retained primarily as fire fighters and where high royalties cannot be obtained it provides a means of paying at least part of their wages bill with some added increment on the side. Actually, once the sale is made and costs are recovered, the money could be used for further work and the operation would become virtually self-supporting.

As a practical demonstration of forestry, this work shows the public that they are getting something for their money.

EARLY THINNING AND PRUNING IN PINUS PINASTER.

by E. R. Hopkins.

In March 1958 a trial was carried out for early thinning and green pruning operations in Pinus pinaster.

The trial is part of a project designed to provide information regarding the adaptability of this species to early heavy thinnings and green pruning. These are necessary adoptions if quality pine timber is to be produced in the minimum rotation under a commercial system where sizes under 6" diameter are undesirable.

The project is established in $6\frac{1}{2}$ year old Leiria at North Kendall block, Gnangara. It was set out on a strip basis to cover all site qualities while permitting costing under conditions normal to gang working.

0.1 acre sample plots have been established outside the trial area to provide subsequent growth and thinnings data. For the present purpose these are only useful insofaras they define the stand characteristics and illustrate the efficiency of tree marking.

Procedure.

Procedure was designed to thin and prune the strip at a minimum cost. The method used was as follows:-

(1) The best trees were pruned and spaced using the Queensland selection system in which at least one tree in every four is green pruned to 8 ft.

(2) All unpruned trees were removed from the strip in a combined cleaning and thinning operation.

A crew of three, drawn from the normal pruning gang, were given one day's introduction to the system of marking prior to proceeding on the one acre strip.

Members of the crew worked along separate rows, selecting trees according to the best in 4 count and pruning these selected trees to 8 ft. with an axe. The time taken to completely prune over the trial area was recorded.

On completing the pruning, the three man crew worked back over the area, removing all unpruned trees and competing hardwood stems. The time taken to carry out this combined thinning and cleaning operation was also recorded.

The cost of the operation was calculated using a cost figure for one man hour based on the present wage rate for a pruning crew of six, including an overseer.

Results.

(a) Costing.

Pruning	=	£4. 7. 0 per acre
Thinning and clearing	=	£2. 3. 6 " "
Total for treatment	=	£6.10. 6 " "

For comparison an approximate cost for present pruning and clearing operations at Gnangara, as per Manual prescription, is £8.16. 6 per acre.

(b) Selection.

Planting number/acre	=	988 (7' x 6' approx.)
Number actually planted/acre	=	825
Number selected/acre	=	370 (11' x 11' approx.)

(c) Plot Data.

Plot No.	Number of Trees				Mean Diameter at B.H.			Predom. Ht. (ft)
	Total	Blanks	Planting No.	Selected	Total trees	Selected	Not selected	
1	91	17	108	46	4.2	4.5	3.9	27.5
2 *	81	15	96	35	3.8	4.1	3.7	26.0
3	81	13	94	46	3.6	3.7	3.4	25.5
4	74	19	93	41	3.6	3.7	3.3	26.5
5	79	15	94	41	3.9	4.3	3.4	27.5
6	78	17	95	39	3.5	3.8	3.1	25.0
7	88	8	96	42	3.2	3.5	2.9	24.0

* Plot 2 selected on the basis of 1 tree in every 5.

Plots 3, 4, 6 and 7 are representative of the trial costing strip.

Discussion.

The main point considered to arise from this trial is that by adapting the Queensland pruning system an easy and practical prescription for early thinning and pruning can be carried out. The system is mechanical, is readily picked up by gang members after a brief tuition period and leads to even spacing and good selection within the stand. This latter point, illustrated in the plot data, is readily observable in the field.

Cost figures are interesting and provide a lead but can by no means be considered as the final answer. Both the gang and trial area can be taken as average for future work of this type. The actual economics of the business however, cannot be stated until returns and costs for the first merchantable thinning (probably at age 15 years) are obtained.

It is felt that the system has merit on the following points:

(1) All marking is done by gang labour. This will be a definite advantage with large future areas requiring treatment under a shortage of skilled tree markers.

(2) The early cleaning and thinning offers a solution to producing quality wood for future markets.

(3) With P. pinaster which is planted at 7' x 7' spacing, malformed stems would be removed at an early age when major tree faults have expressed themselves. At present these trees are removed at the first merchantable thinnings.

The trial is being extended to five year old stands with a view to determining cost and selection possibilities at this age.

On observing the trial nine months after establishment, the degree of occlusion of axe pruning scars is surprising and subsequent development could exclude further doubts as to whether axe pruning is too severe on young trees of the size encountered during the trial.

Conclusions.

(1) Early unmerchantable thinning and green pruning trials have been commenced in Pinus pinaster.

(2) Data obtainable at present indicates that the prescription outlined for the trial offers a satisfactory method of treating young stands (under 8 years of age) to anticipate future log requirements.

(3) The merit of the Queensland pruning system as practiced generally in Queensland and Kenya is definite. It is considered that it offers a practical approach to marking large areas of pine with a minimum number of men.

(4) This type of trial needs to be carried out on younger pine with an endeavour to reduce costs. The minimum age to permit final tree selection and to bypass possibilities of scrub competition is the one to aim at.

(5) Axe pruning, permissible at age 7 years is probably too severe for trees younger than this.

EUCALYPTUS CREBRA PLANTINGS ON DIE-BACK.

by F. D. Podger.

In the winter of 1955 some 40 Eucalyptus crebra (Narrow-leafed Red Ironbark) seedlings were pit planted on ploughed die-back sandy gravels near Gleneagle. Each seedling was given super.

Generally survival has been good and some plants have made growth, but not one plant has yet become dynamic and leaf growth is poor in quantity and leaf size. It seems that these plants are going through an advance growth stage of some duration despite cultivation and fertilisation. The site is extremely harsh in summer and the water relations in these soils must be limiting.

Spot sown Eucalyptus calophylla Marri on the same area seems to be better adapted to the conditions since whilst development is slow, the leaf condition is generally good.

GANG MORALE.

by D. R. LeJeune.

Gangs of Government workers are often the butt of public criticism due to alleged inefficiency.

Do we give sufficient close attention to our overseers and gangs to avoid justification of this criticism?

I feel that our gangs compare very favourably with other labourers, because of the interesting and varied range of work. However, like any other humans, our men require "morale boosters" to keep them at their best.

In this Division (Kirup) we recently staged a hose running competition between two gangs at a local Agricultural Show and they performed very well. It was most encouraging to see the effect on the men. They were even enthusiastic to repeat the performance at another Show without pay.

Perhaps someone can give us some more ideas for boosting morale.

POLE THINNING IN JARRAH COPPICE REGROWTH.

by P. N. Hewett.

When the Mundaring weir was built, critics of the scheme and of the Engineer C. Y. O'Connor, raised doubts concerning the filling of the reservoir. They suggested that the trees on the catchment were using all the water, so large areas, about 20,000 acres in all, were ringbarked to increase the run off. The reservoir filled, but apparent silting caused considerable concern. This happened in 1903.

Some of the resulting coppice forest was crown thinned in the period 1930-1939, but large areas still exist in an unthinned state.

In an attempt to improve the quality and spacing of these pole stands, which are now between 30 feet and 50 feet in height, but which have been damaged by fire and have poor form, the following thinning procedure was adopted.

Pole stands were thinned to a spacing varying from 15 feet to 20 feet, by removing all inferior and suppressed trees, and then proceeding as a normal crown thinning.

Where stocking is poor, well formed understorey poles are retained to maintain the spacing at approximately 15-20 ft.

There were frequently five or more stems per coppice stool. These were thinned to a maximum of two poles per stool and side limbs which can be reached from the ground were removed.

Tree marking consisted of side blazing the trees to be removed and in this instance was done by an overseer and myself.

Owing to the shortage of experienced bushmen, all trees for removal had to be marked, and this made the marking cost rather high- approximately £1.10. 0 per acre, but with more experience, this can be largely eliminated.

Thinning was done by a 3 or 4 man gang with Overseer, using axes and one Tornado one-man chain saw. It was found that 3 axemen and one chain saw operator make an efficient unit, the chain saw being used for falling stems greater than 9" D.O.B. at ground level.

The fallen timber amounted to about 12 tons per acre which, when dry, will sell for 5/- per ton royalty.

Wages cost is £4. 3. 0 per acre, and potential recovery £3. 0. 0. per acre.

The operation is not self supporting but a well spaced forest of good form poles is being developed for less than £1. 5. 0 per acre. This can be subsidised from nett receipts from regeneration falling which is being carried out elsewhere in the Division for Wundowie and the two phases of improvement work can be combined into one self-supporting operation. In addition, the areas so far treated are bordering on main public roads, and have drawn favourable comment from the travelling public.

HIGH YIELD FROM PRIME KARRI FOREST.
by A. C. Harris.

An area of 1 acre of fine Karri forest on Big Brook 8 miles from Pemberton, felled in 1927 and measured at the time by the present Conservator of Forests, Mr. A. C. Harris, who was then surveying in the area, yielded 11 trees with the following measurements:-

No. tree	G.B.H.	Girth at top of log	Length of log	Height to top	Volume
6	28'4"	14'6"	128'	273'	4672 c.ft.
8	22'	13'2"	128'	232'	3149 "
2	25'9"	9'11"	115'	230'	2910 "
3	18'6"	12'4"	110'	275'	2103 "
1	17'	9'3"	92'	195'	1253 "
5	15'2"	6'5"	135'	195'	1241 "
10	19'9"	11'10"	59'	209'	1165 "
11	15'2"	9'11"	88'	209'	1094 "
7	18'1"	7'3"	72'	195'	919 "
4	13'2"	7'11"	88'	@ 150'	772 "
9	11'10"	4'7"	96'	232'	509 "
					19787 c.ft.

Volume per acre = 19,787 cu.ft. or 395¾ loads.
Average height of trees = 218 feet.

Has anyone any better record?

VISIT OF CONSERVATOR AND PARTY TO THE KIMBERLEYS.
by G. E. Brockway.

Period of visit.

From 8/8/58 (arrival at Derby by air), until 27/8/58 (departure from Wyndham by air).

Personnel.

Mr. A. C. Harris (Conservator of Forests)
Mr. G. E. Brockway (Regional Superintendent)
Mr. R. J.Donovan (District Forester, Goldfields)

Objects of the Visit.

The visit followed suggestions made by the local Parliamentary representative, and also was considered necessary in view of the information sought from this Department at various times on technical aspects of forest regeneration and utilisation in the region.

The objects may be summarised as follows:-

(1) To examine at first hand forest resources and forestry potential of the Kimberley area.

(2) The possibilities of [illegible] of

(2) To consider the possibilities of making fuller use of native timbers, particularly Callitris pine, and the practicability of regenerating this species and thereby providing gainful work for natives.

(3) To examine riverine vegetation and consider what protection should be afforded it in the event of more intense utilisation of the region for agricultural crops grown under irrigation.

(4) To examine the conditions of tree growth generally in the region in the light of the changes known to be taking place elsewhere in the pastoral areas of Australia.

(5) To consider indigenous or exotic species likely to be useful for arboriculture or forestry purposes and for planting in association with irrigated crops.

Route followed.

Derby via Liveringa, Fitzroy Crossing and Hall's Creek to Wyndham and westward of Forest River Mission.

Forest Resources in the Kimberleys.

Conflicting reports have been received of the forest resources of this region, and while these were generally acknowledged to be limited, the only first hand knowledge held by Departmental officers was that obtained by Brockway in the Fitzroy Basin and Hall's Creek region some 13 years ago.

Briefly, past utilisation of timber has been confined to limited quantities of Cypress Pine (Callitris intratropica) and a few of the species occurring on the river banks, particularly Cadjuput, Leichhardt Pine and some of the figs, which have been sawn for use in station buildings. Several of the Eucalypts have been used for stock yards and fencing. The Coolibah (Euc. microtheca) has proved a durable stockyard timber, while the Bloodwoods are normally used for fence posts.

Under present conditions, with the very limited population in the area, the forests cannot be considered of great significance from the timber point of view, and while they provide fuel for the local population, this demand is confined to areas in the immediate vicinity of towns and stations. However, with the more intense cultivation of the alluvial flats a much denser population of the area can be expected, when the local tree growth could assume a considerable measure of importance. Thus, in comparable areas of West Pakistan most woody vegetation has long since been utilised and every piece of wood fuel there has famine value, so that strenuous efforts are now being made to remedy the position.

Forest Potential.

The section of the Kimberleys visited has not, under present conditions, a great forestry potential, as some consideration of the climate of the region would indicate. With the exception of a 50 mile wide generally inaccessible coastal strip (which was not visited) which stretches for about 400 miles from a point on the coast about 100 miles North of Wyndham to a point on the Northern end of King's Sound North West of Derby, the climate of the region would by world standards be classified as Steppe. (Accepting Coppen's classification). This classification takes into account mean annual temperature, total rainfall and seasonal incidence of rainfall. Very broadly, in its relationship to the Humid Zone and the Desert Zone the region examined would be comparable to that portion of the Southern part of the State extending from Northam to Kalgoorlie with Hall's Creek comparable with Kalgoorlie. Within this region considerable deterioration of tree stands was noticeable.

The only trees which attain millable size are:-

(1) A few along the rivers, viz. River Gum, Leichhardt Pine, Chestnuts (Terminalia spp.) Figs (Ficus spp.), Cadjuput, but the low proportion of good quality logs, the scattered and attenuated nature of their distribution and the necessity to preserve these river species as an erosion control measure would make their exploitation uneconomic and undesirable.

(2) Native Pine (Callitris intratropica). This species is very fire tender and a large proportion of it has already been destroyed by fire, its growth rate is extremelyslow - about one-tenth of an inch in diameter per year - and it appears incapable of regenerating even on burnt areas under present conditions.

As the number of trees occurring per acre is low, increment in stands of this species would be negligible.

Fire protection of such low grade forest would be out of the question, hence the only thing that appears practicable, is to utilise, where possible, what timber is still available and dismiss all thoughts of attempting to regenerate it.

Forest Utilisation.

The only place visited where utilisation by sawing was taking place was at the Forrest River Mission. An examination of the product indicated that while it was not of high quality, it at least fulfilled some of the requirements for building at the Mission. Sawn timber production is difficult owing to rugged terrain, bad roads, long haulage, sparse stands, and small sized trees, and is only worthwhile in a locality where transport difficulties render the introduction of timber from the Southern part of the State even more expensive.

In view of the deterioration of the pine stands as a result of uncontrolled fires, the Mission Superintendent was advised to utilise the available timber as rapidly as possible and as far as possible to minimise damage to small trees remaining, by carrying out elementary top disposal.

Regeneration of Forest Species.

The most important forest species being the native pine, efforts were made to find evidence of its regeneration. This would be expected following the fires which have destroyed such a large proportion (about 75%) of the original stand. However, no trees less than about 20 ft. in height and about 25 years of age could be located. A quantity of pine seed was collected, and although this does not appear to be of very good quality, probably as a result of the unfavourable seasnn, efforts will be made to raise seedlings in our nurseries.

River Forests.

Despite the great fluctuations in stream flow throughout the year, the main water courses are remarkably stable. This favourable condition can be attributed to the lush tree and shrub growth which binds the banks. I have no doubt that if this were removed, rapid changes in the rivers' courses, comparable with those seen in the rivers of the Punjab, would result. Any scheme of land utilisation by irrigation of the river flats must undoubtedly contain adequate provisions for the preservation of this river strip.

Conditions of Existing Tree Growth.

Gardner, in his botanical notes on the Kimberleys, recognises eight main plant formations. Our journey through the Kimberleys

brought us into contact with five of these, including the coastal and estuarine mangrove formations. The four types with which we are primarily interested are the Savanna forest, the Pindan, the river forests (already dealt with) and the grass lands.

The Pindan is a sandy formation prominent in the vicinity of Broome and Derby and extending inland for many miles. This formation appears to have suffered least from the soil protection angle, as although there is some evidence of fires occurring with some frequency, the regeneration of inedible short-lived Acacias and coarse grass following such fires establishes soil cover again quite rapidly. Mr. K. Rose of Liveringa Station mentioned that during the wetter portion of the year it is necessary to remove sheep from the river flats into the Pindan, and that as a result of this stocking the pastoral value had appreciably deteriorated.

Savanna woodland occurs generally on the higher ground and was seen over extensive areas between Hall's Creek and Wyndham, and also West of Cambridge Gulf. This formation has suffered less from grazing than have the black soil river flats, and soil cover is much less disturbed. This condition can be attributed to distance from water, rugged terrain and coarse vegetation, making it unattractive to stock. Ultimately, with heavier population in the region, this formation could have value in providing fuel and possibly tanning material.

There is evidence of the occurrence of fires and this was of some significance to the West of Cambridge Gulf where the native pine had been very badly burnt, although associated Eucalypts were practically unaffected. An examination of this Pine-Eucalypt stand disclosed that about 75% of the pines had been killed, the damage in many cases taking place in stages. The start may consist of butt scarring, after this the tree may be killed by one fire, have its bark and small branches burnt off by the next, after which only blackened skeletons remained, which may take a number of years to ultimately disappear.

The Grass Land Formation.

The grass lands occupy the black soil alluvial flats along the rivers. These, because of their proximity to river water supplies, their flat nature which enables stock to move easily about them, and the palatable nature of their vegetation, are most subject to overgrazing and consequently water erosion. The greatest damage to the Kimberleys is undoubtedly taking place on these, the most valuable sections of the country. The concentration of grazing animals on these flats and the regular removal of these to the meat works season after season over a long period must represent a considerable removal of soil and nutrients, leading to site deterioration, quite apart from the actual physical destruction of edible species and mechanical removal of soil by water.

The most prominent shrub or small tree of these areas is the Bauhinia, which produces edible beans which are relished by stock. We were, however, unable to find any young regeneration of this or other edible species. Regeneration of Coolibah, however, which is presumably unpalatable to stock, was noticed at a number of points.

The black soil of these plains has been shown to be eminently suitable when irrigated for the growth of rice and other crops, so that any intensive development of the region would be largely concentrated on these. Their present over-grazed condition can only result in erosion in its various forms, a general soil deterioration and a silting of water ways.

While I visited the Kimberleys primarily as an officer of the Forests Department, I found it impossible to remain insensible to other aspects of the position. As the Forests Department [illegible] Section A

representative on the Soil Conservation Advisory Committee, I was naturally interested in the ecological changes taking place as a result of the biological upset to the natural balance through the introduction of great numbers of grazing animals. My recent observations, in a somewhat similar climatic environment overseas, of the long term effect of human activity, particularly in the pastoral field on such areas, do not give me grounds for much optimism as far as the Kimberley Region is concerned, if the present state of conditions continues for any length of time.

While the effect of uncontrolled grazing, including the selective removal of the more palatable species insofar as they apply to the annual grasses, etc. is primarily a pastoral problem, the effect of the removal of this protective soil cover also comes very much within the scope of soil conservation. When one considers that the rain falls in a comparatively short period after a considerable annual drought and that the clay soils cannot quickly absorb it and that 20" of rain represents over 2,000 tons of water falling on an acre, the magnitude of the forces at work can be realised. The most noticeable feature, however, from the ecological viewpoint is the complete absence of young regeneration of most of the trees and shrubs. Actually top feed is being browsed from the original tree population established prior to settlement, and as these die they are not being replaced. Briefly, the exploitation of the plant capital of the region is being carried out on a purely extractive basis, and from a long term point of view such land use cannot be anything but self-destructive.

Pastoral settlement in isolated regions far distant from markets is particularly prone to this self-destruction, as there is no satisfactory means of getting rid of surplus stock when seasons are bad, and considerable damage can be caused to the environment by retaining their numbers at a high level during such periods. To judge from the reports of the numbers of wild donkeys and scrub cattle which exist, one must assume that the control over actual stock numbers is, at the best, on many stations decidedly tenuous. Reference is sometimes made to the part played by the innumerable useless sacred cattle in India, which by their destructiveness add more misery to a poverty stricken country, but it seems that the failure to destroy useless animals in the Kimberleys could ultimately become equally serious.

Investigational work into the effects of controlled grazing and pasture establishment are being carried out by the Department of Agriculture, and while this undoubtedly points the way, we saw little evidence of any widespread application of the methods which they are developing. In fact, on one station visited, establishment of a fodder grass had taken place along furrows which they had ploughed, but instead of allowing the grass to extend, grazing was already taking place.

Broadcasting of the seed of Kapok bush is also being carried out, but in proportions which can only be regarded as tokens.

One pastoralist, Mr. K. Rose, of Liveringa, expressed his awareness of the damage pastoralists had done to the country, but unfortunately many of the stations are company owned and under such conditions immediate financial returns, rather than the ecological maintenance or the rehabilitation of the vegetation, can be the primary consideration. In other words, the land is being managed on the basis of economic expediency and in very general disregard of the physical and ecological laws to which it is subject.

While it may appear trite to refer to the history of soil deterioration and ultimate collapse of ancient civilizations following intense exploitation of the natural vegetation in the older settled parts of the world, I feel that we are heading in the same direction despite our greater scientific knowledge and with much less excuse for doing so. Older civilizations were forced along by their endeavours to feed their own people; we are doing it to sustain an export market.

Discussions with C.S.I.R.O. officers at the Kimberley Research Station indicated that they hold somewhat similar views to myself regarding the progressive deterioration of the natural vegetation.

Investigations in grazing control in various parts of the world indicate that when properly applied it does not necessarily mean a reduction in the number of stock carried. However, in order that such control could be ensured, considerable improvements in the way of fencing and water supplies would be essential.

While plans for the more intensive settlement of the Kimberleys envisage the ambitious construction of large and expensive dams, which with the present condition of the catchments would, in my opinion, quickly silt up, some consideration of methods used in the elevated plains in the foothills in West Pakistan and Northern India would appear warranted. Such methods entail -

(1) Terracing of sloping land and utilisation of the rainfall in situ.

(2) The damming and diversion of streams with cheap barrages of rocks mixed with brush wood.

(3) The diversion of water through inundation canals during periods of high stream flow.

Whether such methods would be economical under Australian conditions, or whether the physical discomforts of irrigation agriculture in a tropical climate will be acceptable to Australian nationals still remains to be determined.

My impressions of the Australian inland and Northern woody flora are that it is less able to withstand abuse by excessive grazing than the vegetation of similar areas in the Middle East and Southern Asia.

Our woody vegetation has never, under natural conditions, had to stand up to heavy browsing and consequently when subjected to it tends to collapse, whereas vegetation in such areas as Northern India which has developed in association with heavy grazing over countless centuries, is able somehow to continue to exist. This persistence of some of the overseas vegetation is, with many species connected with their extensive root systems and their ability to reproduce vegetatively by means of root suckers, layers, etc. I could not see any evidence of this with our own Northern species, but my observations were not sufficient to enable me to be definite on that point.

Trees for Shade, Shelter, Fodder, etc.

Several native species show promise for arboricultural use and fodder production. For shade and shelter purposes several of the Eucalypts warrant attention. Euc. camaldulensis is already wellknown in this connection. While Euc. miniata, Euc. papuana and possibly Euc. spenceriana and Euc. microtheca could also be considered.

Euc. papuana is the most attractive tree, but seed supplies were not available. Seeding, vide Mr. Langfield at Kimberley Research Station, is at infrequent intervals - twice in ten years to his knowledge.

The two Cadjuputs (Mel. leucadendron and Mel. argentea) are attractive trees and have some timber value, but require plentiful water supplies, as do other river species such as Leichhardt Pine, Ficus spp., Terminalia spp., etc.)

The Baobab has been used to some extent as an ornamental around towns, homesteads, etc. Its very grotesqueness attracts attention. Specimens of one of the local Owenias at the Kimberley

Research Station were attractive and showed the beneficial effects of extra water.

Also, what appeared to be a local Eremophila was prominent as small shade trees at the Camballin rice project.

The most universally occurring small tree of the region is Bauhinia, which is attractive both when flowering and fruiting. This appears to have some fodder value.

A number of introduced trees from various tropical regions, including Northern India, were seen. In making introductions it is essential to exclude those with undesirable characteristics. Two such undesirables which should have been excluded, were encountered, viz. Prosopis juliflora (Mesquite) and Parkinsonia aculeata (Jerusalem Thorn). The latter is becoming quite common in the Wyndham district, both near the town (at the 3 mile) and on the way to and near the Ord River. It was also seen at one station as an ornamental, and at the Forrest River Mission.

Introduced ornamentals seen included the following:-

Delonix regia (syn. Poinciana regia)	Flamboyant, Gold Mohr.
Poinciana gilliesii	Dwarf poinciana
*Cassia fistula	Golden shower, Amaltas Indian Laburnum
Cassia nodosa	
*Albizzia sp.	Siris (?)
Tamarindus indica	Tamarind
*Leucanea glauca	White popinac (undesirable)
Pithecellobium saman (syn. Samanea saman)	Rain tree
*Moringa pterigosperma	Chinese candle nut or Horse radish tree.
*Melia azederach	Cape lilac, White Cedar, Persian lilac, Bakain, etc.
Peltophorum	
*Manganifera indica	Mango
*Nerium oleanda	Oleander
*Lawsonia inermes	Mehndi, Henna Plant
*Calotropis procera	Ak.
*Tamarix articulata (syn. T. aphylla)	Athel tree, Farash.

The species indicated with an asterisk are common to the Punjab and other parts of India. Other species occur in other tropical regions. Most of these occur as ornamentals, but in view of their suitability for our Kimberley climate the introduction of more useful species from the same region would appear a practical proposition. These could include:-

Dalbergia sissoo	Shisham
Acacia arabic	Kikar or babul
Albizzia lebbeck	Siris
White mulberry	Morus alba
Azederchta indica	Nim tree
Bombax malabaricum	Simal

([illegible] without [illegible] of the Conservator of Fo[illegible] of W[illegible] Australia).

DISPLAY OF LOCAL TIMBERS AT HEAD OFFICE.

D.W.R. Stewart.

With the addition of several rooms at Head Office, opportunity was taken of having Western Australian timbers used for display and finished with a clear finish which showed to advantage their grain and characteristics. Five rooms and one passageway have been so treated. Four of the rooms are floored in parquetry of jarrah, karri, blackbutt and tuart and the passageway in wandoo, each floor being of a different parquetry design. The fifth floor is laid down in "Whitwood" which is a form of miniature parquetry made up of individual pieces $4\frac{1}{2}$" x $\frac{3}{4}$" x $\frac{3}{8}$". It is set down in alternate 9" x 9" squares of jarrah and wandoo and clear finished with "Synteko".

The partitions are of T. & G. Pinus pinaster dado up to 3'6" with frosted glass above in a jarrah framework

Built-in cupboards have sliding doors made of locally produced plywood, some being from rotary cut radiata veneer and some from sliced radiata veneer.

Two of the doors to the rooms are made up of sliced jarrah plywood and the other three are made up of Pinus radiata plywood, some being sliced and some rotary cut.

The dado, doors, cupboards and sliding cupboard doors are all clear finished with "Epitex" clear lacquer which is a product put up by Raffles Paints Pty. Ltd. of Fremantle. It is based on the use of one of the "epoxy" resins and is somewhat similar to "Bourne Plastic" in that it consists of a base lacquer and a hardener which are mixed immediately prior to application.

Officers visiting Perth are invited to inspect these floors and fittings if they are interested.

BOIL IT DOWN.

by W. R. Wallace.

Forest Notes mark a great step forward in the dissemination of interesting and informative items between the officers of this Department. The co-ordinating editor who thoroughly deserves our grateful thanks for his work in producing the first edition has advised me that the response from field officers has been so good that a second number is almost ready for the duplicator. This gives point to the theme note of the editorial - this publication is for your benefit; its future depends on your support.

It has been suggested that Forest Notes will accept anything from a "paragraph to a report of several pages". With this I cannot agree - it is my firm opinion that a publication named "Forest Notes" is not the place for a "report of several pages". Already we have too many publications and far more than it is possible to read and absorb. Let us therefore not have "several pages" of the reports, but a comprehensive summary of say, 500-600 words. The art of writing clearly and concisely is not given to everyone, and many of us can attain it only after much hard work and frequent rewriting. The result, however, is usually worth that effort, both to the writer and to the reader.

It has been said that Sir Winston Churchill does not make impromptu speeches. Never has pathos, gratitude and pride been expressed so well as in these memorable words -

"Never in the field of human conflict was so much owed by so many to so few!"

I wonder how much thought went into the precise wording of this simple sentence - a sentence containing only three words of more than one syllable.

In forestry we could well say - never has so much been written, by so many and read by so few.

Some 30 years ago John O'London published the following advice from an editor to his contributors. It may not apply to Forest Notes in its entirety but it is well worth reading.

"If you've got a thought that's happy -
Boil it down.
Make it short and crisp and snappy -
Boil it down.
When your brain its coin has minted,-
Down the page your pen has sprinted,
If you want your effort printed -
Boil it down.

Take out every surplus letter -
Boil it down
Fewer syllables the better -
Boil it down.
Make your meaning plain. Express it
So we'll know - not merely guess it;
Then, my friend, ere you address it -
Boil it down.

Cut out all the extra trimmings -
Boil it down.
Skim it well - then skim the skimmings -
Boil it down.
When you're sure 'twound be a sin to
Cut another sentence into,
Send it on, and we'll begin to
BOIL IT DOWN!"

Let us keep "Forest Notes" clear, crisp and concise, simple to read and easy to absorb. Remember, you are not only the writer, but also your own editor,, and from the reader's point of view the motto of these notes might well be "ipso dixit" - "He, himself, said it."
