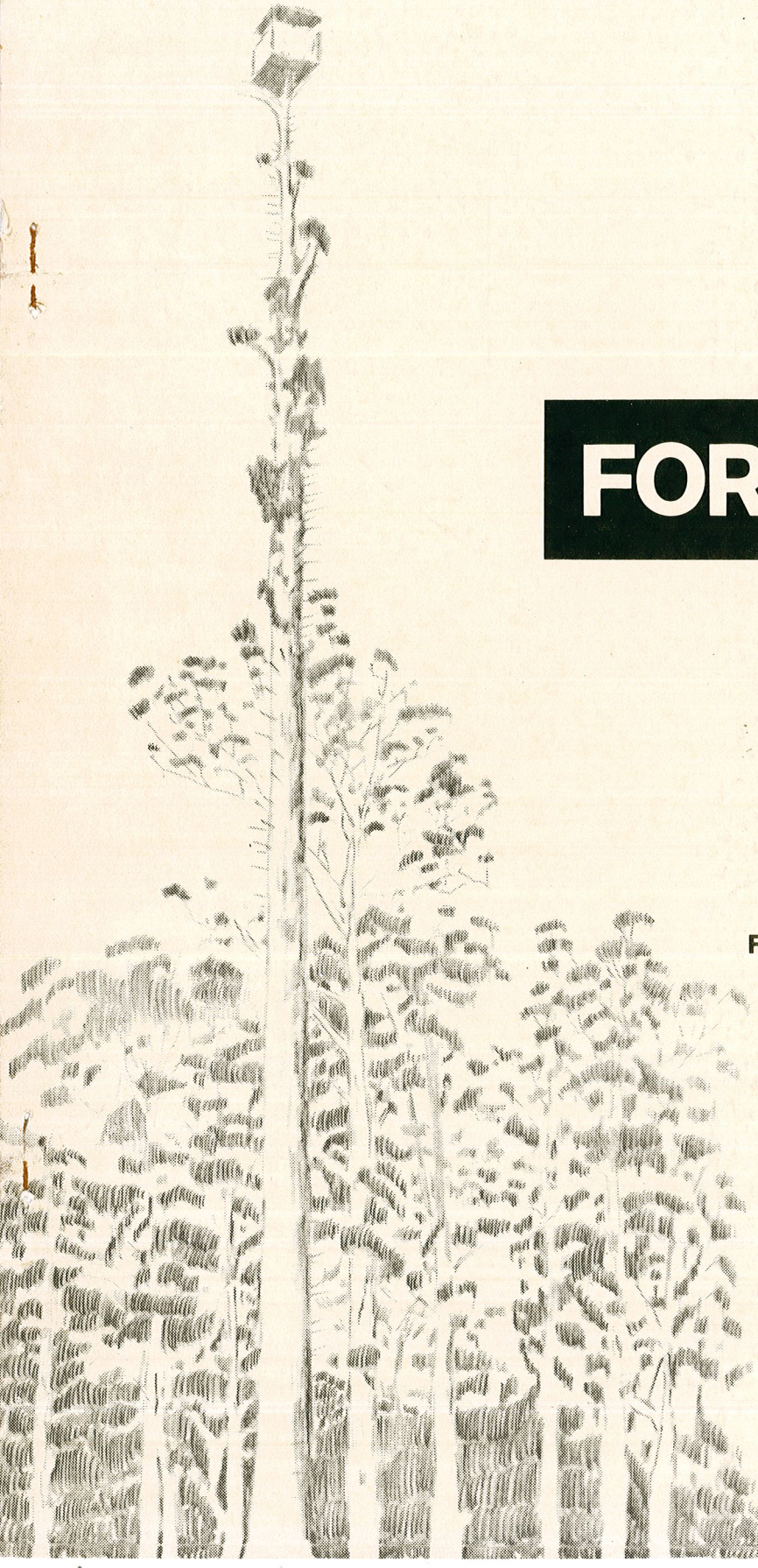

FOREST NOTES

Forests Department Perth Western Australia

VOL 12 NUMBER 3

FOREST NOTES

Volume 12 Number 3

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Editor: I.G. Lennon

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CONTENTS

Xvxn though our typxwritxr is an old modxl, it works quitx wxll xxcxpt for onx of thx kxys.

Wx havx wishxd many timxs that it workxd pxrfxctly. Thxrx arx 45 kxys that function wxll xnough, but just onx kxy not working makxs all thx diffxrxncx.

Somxtimxs it sxxms to us that Forxst Notxs is somxthing likx our typxwritxr - not all thx kxy pxoplx arx working propxrly. You may say to yoursxlf, "I am only onx pxrson, I will not makx or brxak a magazinx".

But it doxs makx a diffxrxncx bxcause a magazinx to bx xffxctivx, nxxds thx co-opxration of xvxry pxrson rxlatxd to that magazinx.

So thx nxxt timx you think you arx only onx pxrson and that your xfforts arx not nxxdxd, rxmxmbxr our typxwritxr and say to yoursxlf, "I am a kxy pxrson in our magazinx and nxxdxd vxry much."

XDITOR.

CONSERVATION COMPETITION

In order to establish more contact with our readers, we are inaugurating a series of competitions. We hope to be able to include photographic, drawing, painting, poetry and many more subjects if the series is a success. We might even find a "sponsor" to donate some prizes, but for the present the winners will have to be content with their products appearing in Forest Notes.

Conservation is a current issue attracting a great deal of attention. Our first competition, therefore, is a Conservation Competition.

We are all very quick to accuse governments and industry of lack of regard to conservation principles. But government and industry are only trying to provide what we require. If we require less, then the providers will have to provide less. We must, therefore, be careful to avoid hypocrisy when we are casting accusations. We must show that we are prepared to sacrifice our extravagances also.

And this brings us directly to the Conservation Competition. We want to hear <u>your</u> ideas on how we can help to conserve our environment. We do not want those ideas along the lines of "stop them drilling on the Barrier Reef", but rather those which we ourselves could implement immediately, such as ideas for conserving fuel.

To start the ball rolling, we will submit our idea. We hear a great deal about the paper shortage but do we personally do anything to combat this shortage? Forest Notes suggests that in future all issues should be printed on both sides of the leaves. In fact, to prove our sincerity in this idea we have done just that with this issue and will continue with future issues.

There must be many ideas along these lines which have never had the chance to be aired. <u>This</u> is your chance. Please send your contributions to the Editor, Forest Notes, Research Division, Como. Your ideas will be judged by a panel and the best will be published in a future edition of Forest Notes.

EDITOR.

A DOUBLE APPEAL

You will all have noticed that the September issue of Forest Notes was not published. In fact, it had to be abandoned through lack of contributions. We are appealing, therefore, for all those aspiring authors to put pen to paper and send us the result. We especially appeal to all those who made trips abroad, or to conferences, symposia etc, to write an account of their trip, or some aspect of it. A number of staff have returned from interesting places in the past year and readers of Forest Notes are, I can assure you, really keen to read about your experiences.

Regional Notes will again be appearing in the first issue of 1975. Our second appeal, therefore, is to Officers-in-Charge of Divisions to chase up their respective scribes and send us their contributions - as soon as possible please.

To us "no news is bad news".

EDITOR.

THE WILD COUNTRY - IV

R.J. Underwood

The interest many foresters have in the South Coast is evidenced not only by the numbers of them who visit the area regularly for exploration and recreation, but also by the series of articles printed in Forest Notes over the last few years and the now well-publicized "South Coast Report" written by a group of foresters in 1972. Reviews of the "South Coast Report" appeared in the West Australian and the Australian Conservation Foundation Newsletter during October 1974 and this publicity has stimulated a welter of enquiries and requests for copies of the report from various individuals, conservation groups and outdoor clubs and organizations.

Naturally, it is encouraging to find such widespread support for the concept of reservation and planned development of this area. Whilst we might expect to find a rapidly growing public awareness of the beauty, biological interest and rare, wilderness adventure to be found in such abundance in this section of the coast, it is a little surprising to discover that our rather stumbling attempts to describe the values of the area are pre-dated by over 50 years by the efforts of others, considerably more adventurous and far-sighted than present-day explorers and writers.

Consider for example the following extract, from such an unlikely journal as "The Western Australian Tourists' Guide and Hotel and Boarding House Directory". Written anonymously and printed 51 years ago in 1923, no better description of the south coast has ever been set down.

"THE INLETS AND RIVERS OF THE SOUTH COAST

A GREAT NATIONAL ASSET

> Between Cape Leeuwin and King George's Sound there looks out upon the great Southern Ocean a long stretch of coastland which, in a few years, is destined to become one of the great holiday resorts of Western Australia, if not, indeed, of the Commonwealth. There is nothing in Australia that in any degree resembles the region indicated. It is unique in every respect. In the first place,

it enjoys a climate with a lower average temperature than any other district in this island continent of anything like the same extent. Its latitude precludes high temperatures and its long sea-outlook tempers the cold of winter. Curiously enough, though only 400 miles from Perth, and with quite a number of populous centres, from 70 to a couple of hundred miles of it, the country of the inlets and the rivers is comparatively little known. The reason is not far to seek. Behind the coast and the inlets lie the great Karri forests for which Western Australia is famed. These forests have offered a bar to close settlement, and in them are to be found few besides those whose occupation is directly connected with forest exploitation. Again, although bush tracks are frequent, good roads suitable for vehicular traffic exist only to a comparatively small degree. Railways, too, are scarce at present. There is one from Albany to Denmark, and another from Manjimup to Pemberton, but neither of these reaches the inlet country. At present access can be gained best by car or buggy from Busselton, Pemberton, Manjimup or Denmark, according to the part of the coast which the visitor wishes to reach. At Augusta, five miles from Cape Leeuwin, there is good accommodation for tourists, and also at Denmark, but at other places on the coast, until the latter place is reached, the visitor must provide for himself. Proceeding Eastwards from Augusta there are in close succession a number of rivers entering the ocean. We find the Scott River, the Donnelly and the Warren, the Gardiner and the Shannon, the latter running into Brook's Inlet; then we have the famous Nornalup Inlet, into which the Deep and the Frankland Rivers run. Into Irwin Inlet run the Bow and the Kent Rivers, while the Denmark and Hay Rivers run into Wilson's Inlet; and still further to the East is King George's Sound, into which runs the Kalgan River, and upon which is situated the picturesque and attractive town of Albany.

In every inlet and river, and everywhere along the coast, the adventurous holiday-maker will find his time and attention full engaged. If he is a sportsman there is splended sea fishing, and for

duck shooting abundant opportunities are offered. The whole region is a succession of scenic beauties and desirable spots. Those who wish to make the best of the Inlet Country must camp out, and the only difficulty they are likely to experience is that of deciding where to pitch their tents in a district which presents so many favourable situations. Among the rivers and inlets one finds oneself in a country that is unhackneyed, for its delight can be enjoyed only by those who are prepared to camp out, and to put aside for a time the formalities of city life. But none can go there without benefit to his or her health. It is proposed that a big area adjoining Nornalup shall be reserved for all time as a National Park and tourist resort, and the proposal is, indeed, a wise one. Meantime, in that marvellous country nature is still primitive, and that alone is a powerful lure to many."

One of the interesting points arising from this 1923 description is the inclusion of the whole coastal strip between Cape Leeuwin and King George's Sound. By 1972, when the current "South Coast Report" was drawn up, less than 50% of this coastline remained available for reservation, almost the entire coastal strips between Augusta and Cape Beaufort to the west and Walpole and Albany to the east having now been alienated as private property. The "great karri forests" which "offered a bar to close settlement" have, of course also been decimated by alienation, mainly as a result of the Group Settlement Project, which was just starting at the time of our anonymous report.

Nevertheless, it is still wonderfully fortuitous that what remains inalienated today on the south coast is still largely unspoiled and the growing awareness and interest in the area promises to make any further alienation or disruptive activities unlikely. It is still indeed a "country that is unhackneyed" and a place to be enjoyed by those prepared to "put aside the formalities of city life".

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THE KARRI FLORAL CYCLE

P. Skinner

The Annual karri seed and floral sampling was completed in June. As three mills were cutting in either fire-damaged or jarrah areas that could not be sampled, sampling was done only in the areas being cut by the remaining six mills.

The crop initiated in 1972, which by now should have flowered, is in fact retarded. Only about a third has already flowered or formed capsules and of this third, a few could be mature capsules by spring 1974 or autumn 1975. The remainder are expected to flower over winter and spring 1974 and give a seed crop in spring 1975 to autumn 1976.

The crop initiated in 1973 has advanced in some areas and could catch up to the 1972 crop - i.e. begin flowering by spring 1974 and continue over the following summer and autumn. Some of these may be mature by spring 1975, the rest by spring 1976.

There are thus two overlapping crops, one a 3 year and the other a 4 year cycle, but the proportion of each is not consistent throughout the main karri area. Overall there is a likelihood of a fairly good seed crop in spring 1975/76, followed by a mediocre crop in spring 1976/77. In some localities, however, the position may be reversed, that is the best of the two crops may occur in spring 1976/77.

The Walpole area is roughly in phase with the main karri region and the seed crop is expected to be about the same. There is more likelihood of the best seed crop occurring in spring 1975/76, as the buds are generally more advanced.

At Boranup the crop is a year in advance of the main karri area and a good crop of capsules, which should be mature by spring 1974, is evident. Burning will be possible in either spring 1974 or autumn 1975, with a good chance of enough seed remaining for a successful spring 1975 regeneration burn.

EXTENSION SERVICES

by

Extension Services

During 1973, an attempt was made to record the degree of Departmental involvement with public enquiries. Several individuals, both commercial nurseries and all Divisions were asked to assist by recording enquiries onto a standard format. The co-operation received was excellent and the results obtained are summarised below.

In surveys of this kind, a full response is almost impossible to achieve. However, data were provided by 11 Divisions, 1 nursery, 9 individual officers, the library and registration branch.

The total number of enquiries recorded was 2986. In addition, it is estimated that a further 1500 should be added to compensate for both non-returns and partial-returns (where the data provided did not cover the full year). If a further 20% to 33% is added for enquiries which were not recorded, the revised estimates are as follows:

Actual number of enquiries/yr (recorded)	2986
probable number of enquiries/yr (estimated)	4500
likely number of enquiries/yr	5400-6000

The data show that 91% of requests were answered. The remaining 9% were referred to other agencies or were perhaps disposed of or lost in the "too hard" baskets. Some 44% of enquiries came from the Metropolitan Area, 40% from country centres and some 16% from the Eastern States and/or overseas.

The telephone was the most popular medium for enquiry (38%) the remainder being split evenly between letters and personal calls. In over 2/3 of the cases then, quite a personal contact was achieved between the caller and the officer who assisted. Some 70% of all requests were directed to, and answered by, staff in the Perth Metropolitan Area (see Table). A letter was the preferred form of reply (42%) followed by personal calls (34%) and telephone (24%).

Table

Replies to Public Enquiries.

SECTION	% OF TOTAL
Head Office - Registration Branch	28%
Head Office - Other	8%
Como Offices	22%
Divisions - Metropolitan Area (2)	12%
Divisions - Country Centres (9)	12%
Nurseries	18%

Of the requests, those concerning Western Australian eucalypts were the most popular (32%), followed by enquiries dealing with pines (24%), exotic eucalypts (21%), native species other than eucalypts (15%) and all other species (8%).

Printed material was in great demand and constituted the majority (60%) of all requests. A large proportion of these publications were despatched through the Registration Branch. Items such as Forestry in Western Australia and Selected Flowering Eucalypts of Western Australia (18%), various leaflets (18%), Forest Focus (12%) and material for school projects (12%) were popular. Of the other requests, advice on tree planting topped the list with 20% of all enquiries (and a 30:70, commercial: non commercial ratio). This was followed by species identification 3%, tree diseases 3%, careers 2% and utilisation problems 2%. A host of other requests accounted for the balance (10%) of enquiries.

Some points which are raised by this exercise are:

* the substantial number of requests received (requiring a total time in excess of one man year for adequate replies);

* the considerable opportunities which are available for personal contact with members of the public and the need to ensure that the best possible service is provided;

* the considerable demand for printed material; the necessity for a well written, comprehensive range of publications and the assistance that these provide to officers answering public queries;

* the major role played by Head Office registration branch in extension. The need to have members of this branch fully aware of the range and applicability of the publicity material which is available;

* the considerable number of requests that emanate from, and are answered by, personnel in the Perth Metropolitan Area (urban forestry?);

* the department should consider a five yearly re-assessment of trends. Sampling could be used in the future and this initial survey should provide a reasonable basis for an adequate sampling design;

* due to missing data, these values must not be taken as absolute but should provide a reasonable assessment of the demands being placed on this service.

A FERTILIZER TRIAL ON 3-YEAR-OLD *Pinus radiata* ON A MIXED MARRI/KARRI SITE

A.R. Annels

The planted area was approximately 8 ha on Connolly's Brook, Dombakup Block, map ref. HV 62 Pemberton 80. Soils were yellow-brown sandy loams, which originally carried MK to KM type forest. This area had been cut-over and cleared for conversion to pine. After planting there was evidence of poor drainage on some sections, although this was not obvious while the area was under natural forest. By 1969, 3 years after planting, growth of pine was very patchy, ranging from less than 30 cms to 180 cms total height on the better sections, i.e. an average of 60 cms/annum for the best plants.

It was decided to try a range of fertiliser treatments that could possibly be used to bring the area to a better standard.

Treatments were applied in spring 1969 as follows:

1 - control, no treatment;
2 - superphosphate 500 kg/ha;
3 - superphosphate, copper, zinc 500 kg/ha;
4 - superphosphate 500 kg/ha + urea 125 kg/ha, + urea 125 kg/ha applied 12 months later;
5 - Nutrifert 500 kg/ha.

Forty-five plots were selected for treatments and these were divided into Strata A, B and C by height growth, thus each treatment was replicated 3 times on 3 different strata. Plots were 20 metres square and 10 trees in the centre of each treatment square were marked for subsequent remeasurement. Measurements of height growth were made in 1969, 1970, 1971 and 1974, by which time trees were large enough for diameter measurement.

In the early measurements of height growth, variability between plots was too great to show responses to different treatments. A prelminiary analysis of 1974 height growth did show a response in stratum B that suggested that either

super, copper and zinc or super and urea had a beneficial effect, although this did not show in either Strata A or C. To have a more sensitive test, it was decided to use the five largest diameters in each plot and apply a preliminary analysis. The results of this showed a response in Stratum A to super, super and urea and to Nutrifert, although strangely not to super, copper and zinc. In stratum B a response was found to all fertilizer treatments. Stratum B figures also suggested that the super and urea treatment was much better than either of the others. In stratum C no treatment was found to be markedly superior to the control.

It is difficult to draw any firm conclusions from these trials but several trends do seem to show. Stratum C negative results suggest that unfavourable site drainage is more limiting than lack of nutrients. Stratum B results suggest that, providing drainage is adequate, N and P could appreciably increase growth. There is the possibility that this would also apply in stratum A, but the results may have been masked by ash-bed effects in plots in this stratum, which could have been one reason for the initial superior height growth.

NEW FOREST FLORA

P.N. Shedley

In the latest Bulletin of the Western Australian Herbarium, NUYTSIA, the following new species from the south-west were described.

Eucalyptus calcicola: a mallee to 2.5 m tall from Hamelin Bay. Among the collections recorded was one by P. Christensen in 1973. E. calcicola has a restricted distribution on the westerly aspect of massive calcarcous dunes near the coast of Hamelin Bay, to the south of Cape Freycinet. It occurs in dense clusters of mallees generally emergent above the surrounding sclerophyllous shrubs and frequently on outcropping limestone (the reason for the specific name).

Eucalyptus exilis: a mallee to 6 m tall with slender, erect stems. A specimen collected by D.H. Perry in 1952 is recorded from the 63 mile peg on the boundary of the Mundaring Weir Catchment area. Other locations are Boyagin Rock Reserve and Wickepin Reserve.

Eucalyptus brevistylis: a large tree to 40 m tall, it occurs in a small area of the Soho and London Blocks of the forest north-east of Walpole. B.J. White (1971) reports that the external appearance of the tree is that of E. jacksonii Maiden (red tingle), although the wood is similar to E. guilfoylei Maiden (yellow tingle).

A tribute must be made to the late Forester Rate, through whose collections and persistent efforts from the early 1950's these trees have been recognised as a distinct species. The species in my opinion (formed in 1954 with Forester Rate) warrants field trials subject to testing for dieback resistance. In any case, due to its extreme isolation it should be cultivated as a means of preservation of the species.

Grevillea ripicola: the specific epithet refers to the habitat, i.e. growing on river banks. This newly named species grows on the banks of the Collie River near Collie and it is a densely branched shrub to 3 m tall.

In my experience it only grows along those parts of the Collie River that flow through the coal basin and it forms a thick impenetrable barrier to would-be marron and perch fishermen. It is strange that Collie residents have been cursing it since last century but it was not until a wildflower society was formed there about 1965 that it was found to be a distinct species.

AN INVESTIGATION OF KARRI REGENERATION BURNS

P.M. Jones

In order to select suitable conditions for slash disposal burns following marri chip cutting, an investigation of past karri regeneration burns was made.

The investigation aimed to define each burn by its weather conditions, then rate the burn against these conditions according to:

(1) Success of burn.

(2) Ease of control.

(3) Lighting method.

Because of successful application in Tasmania, the weather conditions chosen were Adjusted Fire Hazard (A.F.H.) and Byram Drought Index (B.D.I.).

A total of 59 past burns were looked at, 26 from Pemberton, 29 from Walpole and 4 from Manjimup.

For the sake of this article, I will confine comment to the Pemberton burns because:

(a) the subjective nature of the information precludes realistic comparisons between divisions;

(b) many Walpole burns were small pockets in Tingle country;

(c) there were few Manjimup burns.

Nevertheless the trends in the Pemberton data were reflected in the Walpole fires.

RESULTS

Burn Quality

The burns were rated (subjectively) as either fair, good, or excellent, according to their intensity and degree of fuel removal (not according to the amount of regeneration they produced, which is mainly dependent on other factors). Each burn was then plotted against B.D.I. and A.F.H. (See figure 1).

A quick appraisal of Figure 1 shows that burn quality becomes consistently better as both B.D.I. and A.F.H. rise. However, it is noticeable that, despite the fact that less burns were carried out in the low ranges of B.D.I. and A.F.H., an excellent burn is still possible in these ranges. It is general practice to select weather at the high end of the scale for the burns, hence the bias.

Control Problems

Burns were rated, again subjectively, according to their control problems as either major, moderate, minor or none. They were, as before, plotted against B.D.I. and A.F.H. (see Figure 2).

Results show that ease of control was virtually dependent on B.D.I. and surprisingly independent of A.F.H. Hence:

B.D.I. Class	Total No. of Fires	No. with Suppression Problems	% of Total
0-300	6	1	16
300-500	10	5	50
500-700	16	14	87

As B.D.I. is a measure of moisture deficiency these results must be attributed to the increased intensity of the burn with drier, large wood sizes, plus drier fuel surrounding the burn. A.F.H. is a measure of fuel moisture content as well, so it is surprising that a correlation with this was not also present.

It must be remembered, however, that escapes and suppression difficulty are also dependent on factors not taken into account by B.D.I. and A.F.H.

Lighting Method

All burns were carried out using the Strip Technique, where a downwind edge is secured before the burn is stripped out into the wind. Consequently, different techniques cannot be compared and since they should affect burn quality and suppression difficulties markedly, they will have to be investigated before large-scale burning proceeds.

DISCUSSION

The investigation has revealed a conflict in that as B.D.I. and A.F.H. rise, burn quality improves, but so too does the likelihood of escapes and associated suppression difficulties. A compromise must be reached, so on the data I have indicated four sections of B.D.I. and A.F.H. (see Figure 3), which appear to have the following properties:

Section	Burn
1	Poor burn, no escape problems.
2	Good burn, little chance of escape.
3	Good to excellent burn, moderate to high escape and suppression problems.
4	Excellent burn, very high suppression problems likely.

Consequently it appears that section 2 would be the optimum compromise situation, providing for an adequate burn with minimum control problems.

The point now arises as to whether the limits of section 2 are too broad or not broad enough to accomplish the required number of burns. As an indication, data from Pemberton on the 1972-73 and 1973-74 fire season were collected. Each day was rated according to its A.F.H. and B.D.I. and plotted.

The number of days per section was then extracted:

1972-73

No. Days

Section	Spring	Prohibited	Autumn	Total
1	18	-	13	31
2	9	-	18	27
3	23	60	22	105
4	2	13	11	26
	52	73	64	189

1973-74

No. Days

Section	Spring	Prohibited	Autumn	Total
1	15	-	18	33
2	31	3	16	50
3	2	61	27	90
4	-	9	8	17
	48	73	69	190

This means that in 1972-73 there were 27 days available in section 2 and for 1973-74 there were 47. Thus, there is going to be a large variation from year to year, depending on the severity of the season. In the examples chosen it can be seen that 1972-73 was a "hotter" year than 1973-74

and this has caused an increase of days in section 3, to the detriment of section 2.

Not all days as listed, however, are going to be available for burning. For example, out of the 190 days, 55 fall on a weekend or a public holiday, whilst others are going to be unavailable because of adverse fuel moisture or climatic conditions. If we assume 60% of days will be available, that leaves us 16 days in 1972-73 and 28 in 1973-74.

The total area expected to be cut in KM forest per year is to be between 4000 and 5000 ha, which will be in 200 ha coupes. This means approximately 20-25 coupes to be burnt per year. If the coupe size is the burn size, it will mean probably at least one burn per day to get them all in. If the coupes are divided up for burning, which is more than likely, it will be necessary for several burns per day if they are to be burnt in section 2.

SUMMARY

The system of using B.D.I. and a measure of fire hazard to define suitable burning conditions has a proven record in other States and appears to relate well to karri slash disposal burns. Confidently designating the correct range will require further research, plus feedback from operational burns. Definition of a suitable range will also have to take into account the number of days likely to be available within that range, plus the number of burns to be conducted annually. Any discrepancies will have to be made up by either increasing the range by new lighting techniques, or physically widening the section. Conversely, the number of burns conducted per day could be lifted.

FIG. 1. B.D.I. AND A.F.H. Vs. BURN QUALITY

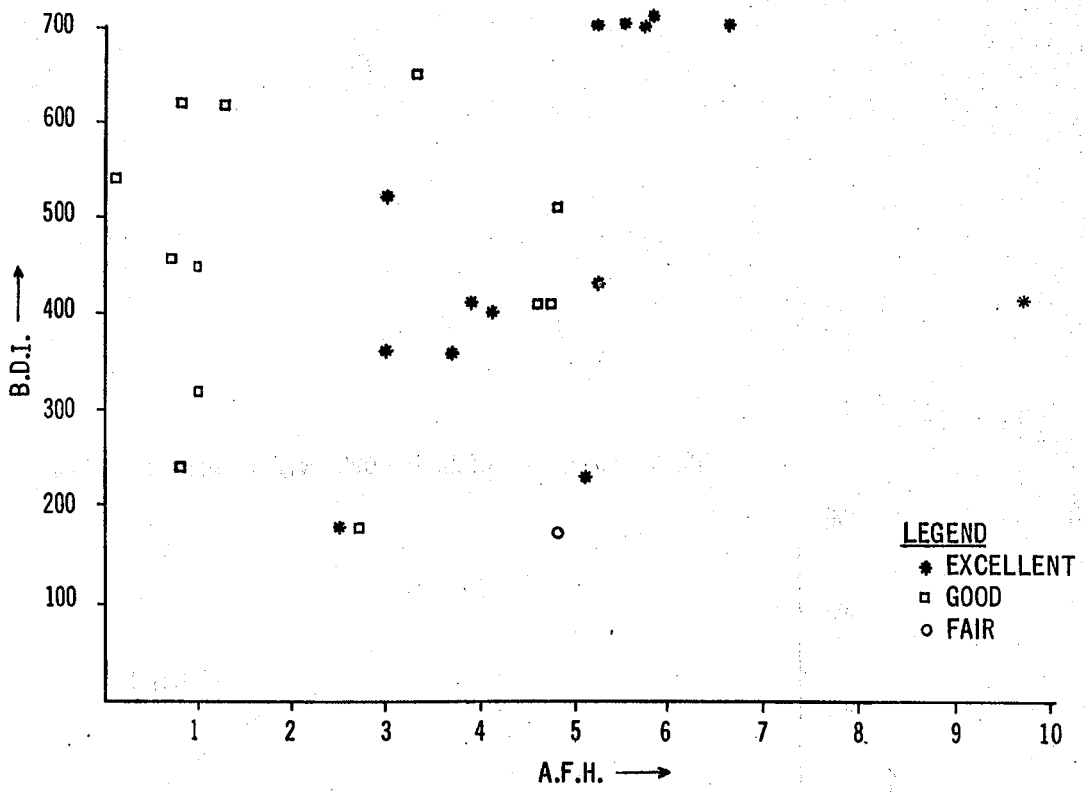


FIG. 2. B.D.I. AND A.F.H. Vs. SUPPRESSION PROBLEMS

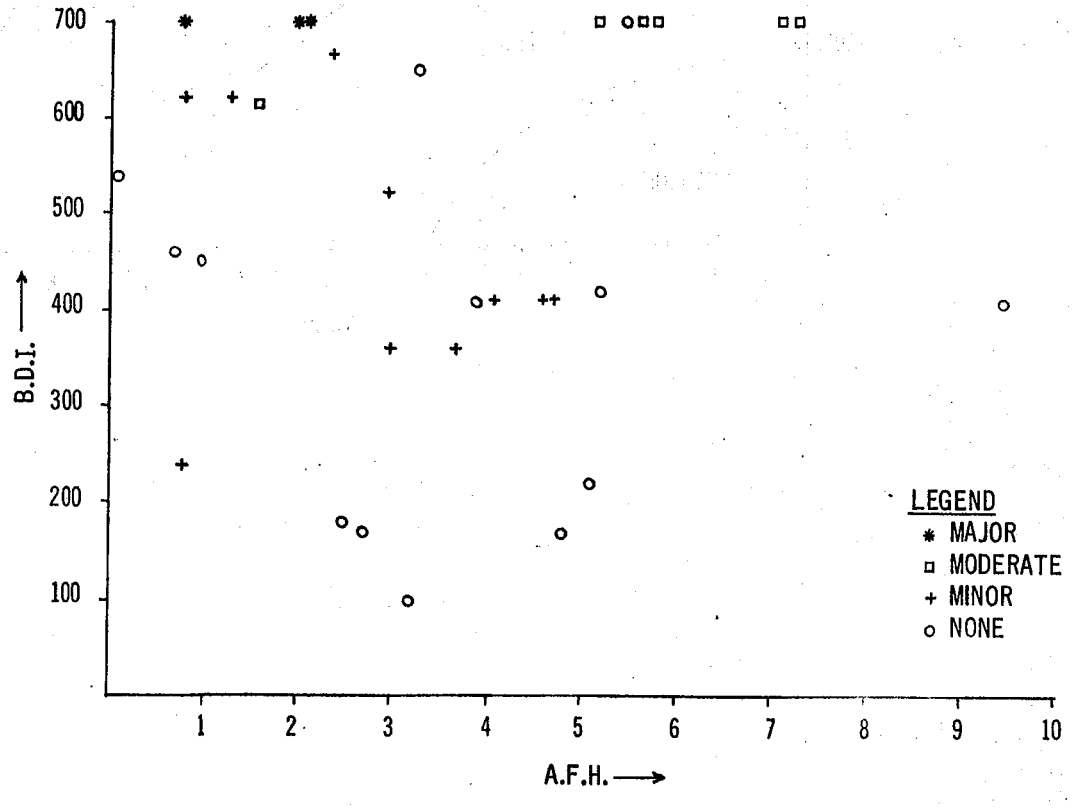
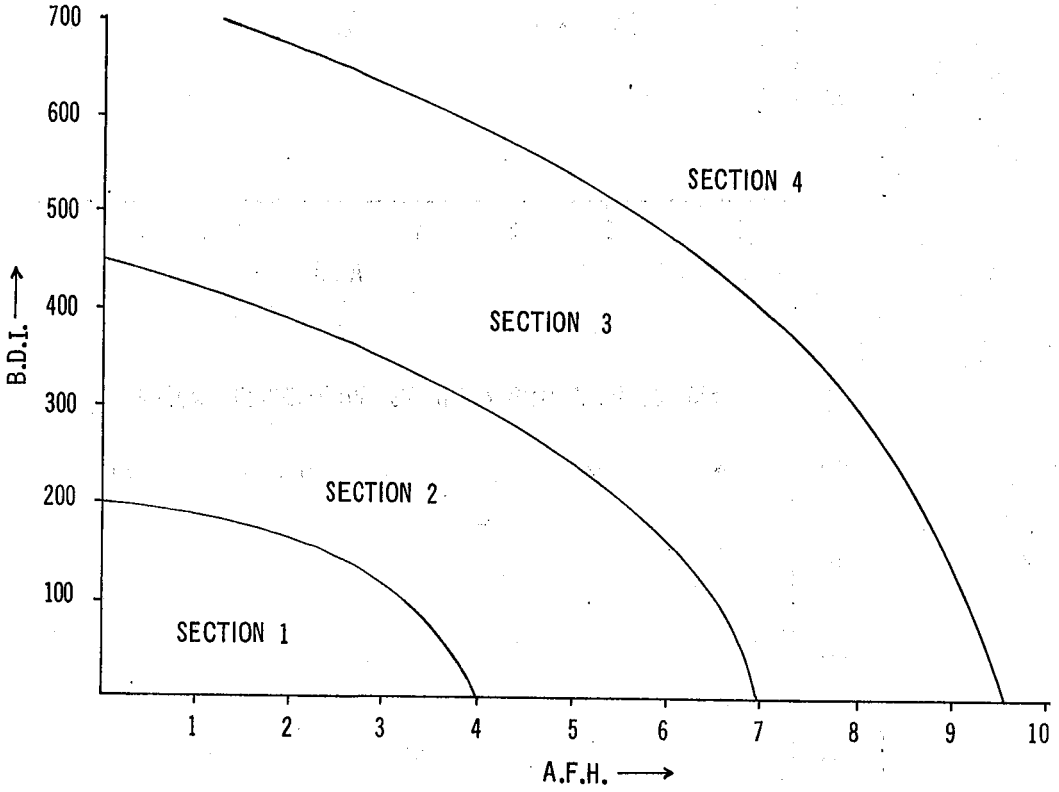


FIG. 3. B.D.I. Vs. A.F.H. DIVIDED INTO BURNING SECTIONS



SAFETY ANALYSIS

G. Barham

An analysis of Pemberton safety records shows that over a 3½ year period the personal accidents for which S.G.I.O. claims were made occurred to employees as follows:

35% to men whose surnames begin with letters from A - K;

65% to men whose surnames begin with letters from L - Z;

(adjusted to a common denominator, there being unequal numbers of men in each group).

Of these accidents:

44% occurred to men born in January, February, March;
11% occurred to men born in April, May, June;
28% occurred to meh born in July, August, September;
17% occurred to men born in October, November, December.

And the accidents occurred:

17% in the March quarter;
28% in the June quarter;
22% in the September quarter;
33% in the December quarter.

From the above figures, unless the bunyips peculiar to the magnificent karri forest have put their paws in, it must be concluded that the employment of men born in the June quarter, whose names fall in the A-K group and who can be persuaded to take A.R.L. in the December quarter would improve worker safety 'astrologically'.

NOTES ON HARDWOOD (EUCALYPT) ROYALTIES OVERSEAS

A.J. Hart

Information, which came to hand via an I.S.O. Conference in Portugal recently, regarding royalties overseas for harvested produce from established hardwood plantations, is quite enlightening - the more so since the data are dated 14 May 1968.

The data refer to a Eucalyptus globulus (mainly) plantation near Lisbon in Portugal, a land reputedly of peasant and 'cottage' type industries.

This particular plantation harvests trees at 7 years, selling timber and leaves for distilling of oils. Stumps remaining then give coppice shoots of 10-15 per stump, reduced to 1-4 stalks.

At age 17, these stems (1-4) are felled for 3 purposes:

1) leaf for distillation;

2) timber per se;

3) pulp and cellulose timber from small stems - probably not necessarily in that order.

This process is repeated at roughly 10 yearly intervals, sometimes eventually causing death of the stump.

The highlight that is considered worth noting is that in 1968 the price paid by cellulose and paper operators (for item 3 above) was 160 escudos or $5.00 Australian per cubic metre of timber. On converting this to local measures it seems the princely sum of approximately $7.20 per load was paid in 1968.

The total return per tree (after the initial 7 year harvest) must be considerable, as the $7.20 per load apparently does not include royalty paid for saw log timber or leaves used to produce oil. All this in a country commonly referred to as poverty stricken - perhaps this is the reason. It would be interesting to know what the total royalty per tree is.

SANDALWOOD

O.W. Loneragan

Santalum spicatum is the Western Australian sandalwood, which occurs also in South Australia. It is a small, stoutly-branched shrub or tree, usually growing to a height of 5 metres and a diameter of 200 mm; larger trees have been exploited. At one time it extended throughout the agricultural and arid lands of Western Australia, not in pure formations but as a root parasite scattered among the other species of shrubs and woodlands of Eucalyptus and Acacia.

Sandalwood was located in the well-drained soils along the main drainage lines over a wide area of the State (generally between latitudes 25° and 34° south) from the north-west islands near Carnarvon on the coast, south through Northampton and east of the Darling Range jarrah forest, bounded by the Nullabor Plain and longitude 126° east.

The common name is derived from the commercial sandalwood of fragrant timber of Arabian origin, and the botanical name from the latin spicatus for the spike-like tight arrangement of the flower buds. The sapwood is a pale yellow in colour and the truewood usually dark brown. The truewood contains strongly aromatic santolols; these are the principal alcohols of the sesquiterpenes and form over 90 percent of the distilled oil, equal in quality to the earlier oil of the East Indian sandalwood, Santalum album. Work on the structure or chemistry of this oil still may be incomplete. The oil was used in medicine prior to penicillin and is valued for use in cosmetics, soaps and perfumes. The distillation of the oil from roots and dead pieces ceased in 1967 and exports from stock ceased in 1971 (W.A.F.D. Annual Reports).

The Chinese have valued the use of sandalwood highly in ceremonies for hundreds of years. The common joss stick is a slip of bamboo 1 mm x 300-600 mm long. Approximately two-thirds is smeared with paste and sandalwood-flour. After lighting this tip and blowing out the flame, the coated bamboo smoulders down towards the uncoated portion, giving off smoke and incense for the portrayal of a ritual. Sandalwood also is highly esteemed in ornaments and the fine arts by Chinese. Kessell (Conservator from 1921-1941) reported that sandalwood grew originally in quantity

in various Asian countries, notably China and India. As exploitation led to the exhaustion of supplies in China, Chinese junks obtained supplies from the Pacific Islands. This source was nearing exhaustion when white settlement commenced in Western Australia in 1829. This led to the opening up of a new source of supply, which by the late 1800's supplied the greater part of the sandalwood consumed in China.

The story of sandalwood is the story of people who sought new land for agriculture, of how they used this land and of how they lived. Sixteen years were to pass, from the beginning of settlement, before the first consignment of four tonnes in 1845 demonstrated that the fragrant wood of this small tree could be traded to the Chinese. The export value in the 1860's reached one sixth of the State's total export income, second only to wool. The export value of 3 016 tonnes of sandalwood in 1868 was $104 180 (or 27% of the State's export value for that year). The export value of other timber in 1868 was only $2 552.

Demand, through manipulation by oriental traders, fluctuated tremendously and exports ranged from 400 to 14 200 tonnes per year. More than three quarters of the total resource was exploited before regulation through legislation was accomplished by the passing of the Sandalwood Act in 1929.

The average quantity of 3 450 tonnes exported annually during 128 years (440 000 tonnes from 1845 to 1973) has now fallen to 1 200 tonnes. Nevertheless, this is the highest since World War II and it is being exported mainly to expatriate Chinese. Present supply is from Meekatharra and Cundeelee, where trees previously too small have now grown into commercial size of 105 mm diameter overbark.

A survey is being made to determine the influence of drought, of over-use and of the pulling quota on this resource. Both short term and long term aims of this project are:

1. to examine the influence of the sandalwood pulling quota on the vegetation;

2. to define the place for sandalwood in the restoration of site capacity in relation to these agencies,

   (i) following drought,

   (ii) in the grazing system.

An information sheet on Sandalwood, written by P. Richmond, is currently in press and, as mentioned in the last edition of Forest Notes, a future edition of Forest Focus will also be dealing with the subject.

FARM - FORESTRY

R.R.A. Fremlin

Pine plantations in Western Australia have until recently been managed for maximum volume production rather than maximum financial return. This has meant close spacings with frequent light thinnings resulting in large volumes of small-diameter material. For economical and silvicultural reasons, this practice has been replaced by a system aimed at producing high quality, large-diameter logs grown over a short rotation. This involves fewer but heavier thinnings, enabling pasture to be grown in conjunction with our exotic forests for a large part of the rotation.

Farm-Forestry as it Benefits the Forester

1. The extra phosphate fertilisers required for pasture maintenance will also benefit the trees.

2. The development of leguminous pasture improves soil fertility and provides a slow-release form of nitrogen to the trees.

3. Access, scrub control and fire protection are greatly improved.

4. Diversification of land use results in earlier financial returns from grazing fees.

Benefits to the Farmer

1. Diversification of land use.

2. Improved hydrological relations within the soil. A possibility of reduced salt movement (this is especially so in catchment areas).

3. Improved land values.

Farm-Forestry Research in New Zealand

Investigations into the farm-forestry concept have been in progress in New Zealand for a number of years. As a result, there is some information available regarding pasture

composition as it effects sheep's attraction to young pines. Initial results indicate that clover-dominant pastures are preferable when the pines are very young. Investigations to find the optimum initial spacing to ensure satisfactory tree form are also being undertaken and specific consideration, such as mowing between rows for hay production and the relative merits of different sheep breeds and age groups, are being studied. Cattle are considered unsuitable for introduction to plantation areas until the pines are aged three years or more (4m in height).

Farm-Forestry Research in Western Australia

For several years in the early 1960's, sheep were run in young plantations at Nannup as a fuel reduction measure but the practice seems to have gradually died out.

The first research trial was initiated in October 1972, with the aim of testing the effect of sheep grazing as an alternative scrub and grass control method. Two sites were chosen, one previously cleared from forest at Collie and the other on old pasture land at Kirup. Both areas had been planted to pines, which at Kirup were one year old and at Collie were two years old.

From the results at Collie, it seems that the cross-bred strains of sheep are better adapted to scrub conditions than merinos. Mature full-mouthed animals are certainly more suitable than their younger counterparts. Damage to the pines only became apparent when other available feed had been totally browsed; the two-toothed sheep of both strains damaged the pines from the start.

It did appear that when the full-mouthed merinos had reduced their plot to a comparable level, pine damage was more severe. It was also evident that scrub types were less palatable when flowering.

The stocking rate was equivalent to 49 sheep per hectare for 28 days. On a relative basis therefore, it can be assumed that scrub-land can support between two and four sheep per hectare for a period of one year, without significant damage to the pines. There is evidence to suggest that seasons will effect the suitability of grazing amongst pines.

The Kirup replicate was a failure for two reasons. Firstly, the sheep caused immediate and considerable damage to the pines, with the result that they had to be withdrawn. Secondly, the grass was not reduced to an acceptable level. The commencement of this trial was left too late in the season, the grass having reached maturity prior to the sheep's introduction.

As this experiment was specifically aimed at competition control, the Kirup replicate was considered a failure. The rankness and composition of the pasture influenced the result. Further work dealing with these and other aspects is programmed.

Current Investigations

Two trials using cattle are currently in progress in older pine plantations at Ludlow. One is situated in six-year-old pines and the other in four-year-old pines. The P.68 area received its first silvicultural treatment under the "Prescription '74" regime, prior to the introduction of cattle. The area had been under lease before conversion to plantation and annual grasses and clover were present but the pasture was of poor quality. A broadcast application of superphosphate was applied at a rate of 400/kg/ha in July 1974, followed by a urea treatment at 200 kg/ha in August, to promote pasture growth.

The four-year-old area under investigation received identical treatment, with the exception of low pruning. The trees were judged to be too small and will be pruned in 1975. Further attempts at pasture improvement will be undertaken in the autumn of 1975. Between-row cultivation and re-seeding is envisaged, prior to the 1975 growing season. This area will be used as a demonstration and to compare with open pasture the level of grass production under pines of different ages.

Cattle were introduced into each area separately and removed only when the grass had been totally grazed. By introducing cattle to plantations directly after initial pruning and thinning (under the current regime, litter almost entirely covers the ground), the processes of decomposition may be hastened, allowing relatively quick regeneration of pasture. Mechanical means of crushing the litter will also be investigated. To date, there has been no evidence of the cattle damaging the pines in either of the two areas.

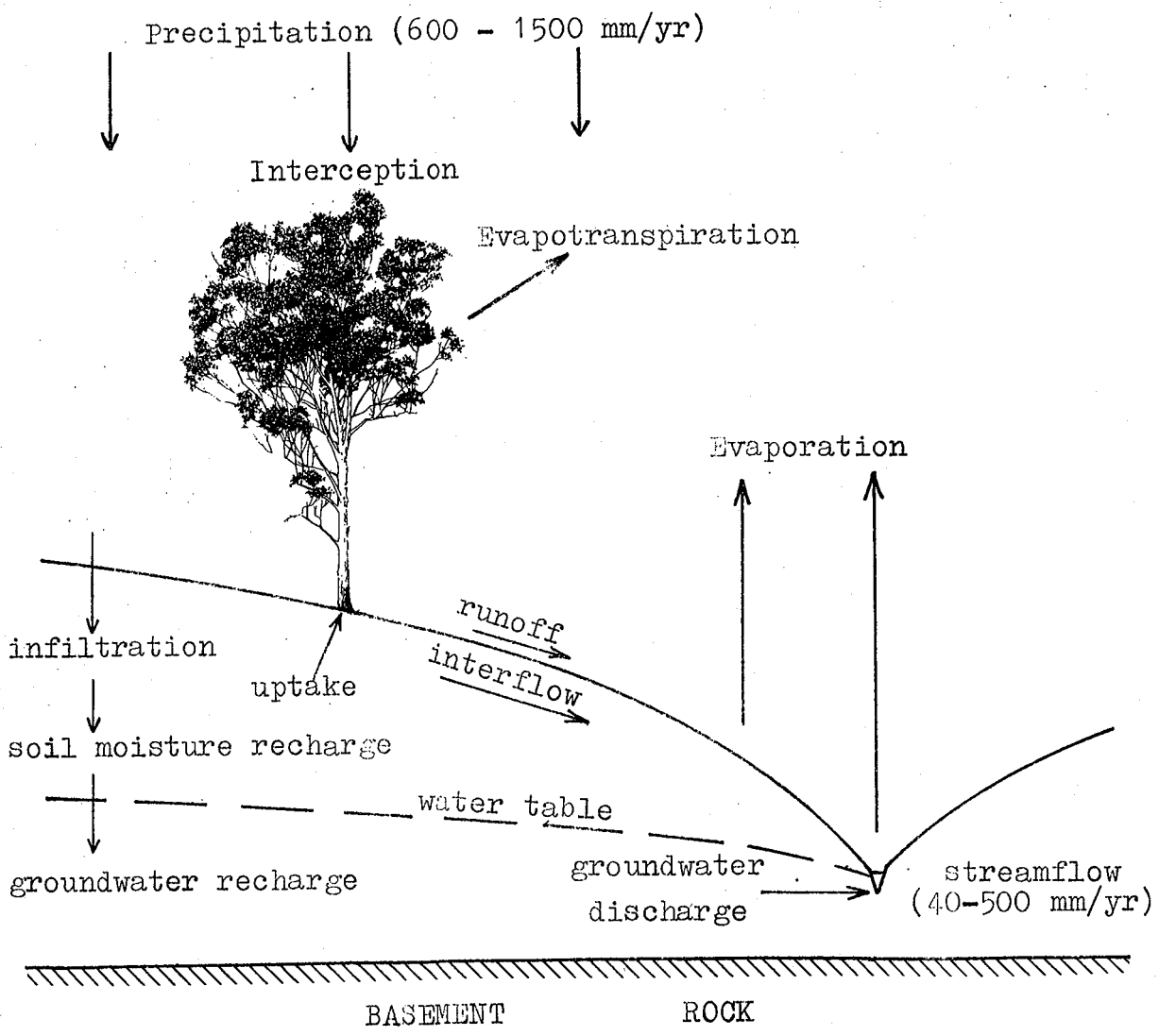
Three hectares of recently-cleared land in the sunklands has also been planted to pasture. This will be planted with pines in 1976 and sheep introduced in that year. It is on these soil types that the benefits of farm-forestry will probably become most noticeable. The inherently poor nutritional status of these soils is almost certainly going to mean the multiple application of fertilisers during the pine rotation. By diversifying land use, the economic impact of this necessity will be greatly reduced. Assuming that grazing rights within plantation areas will be granted to pastoralists for reasonably extended periods (with the onus on the leasee for fertilisation and fencing), the economics of producing timber on poor soils becomes more attractive.

SALINITY - A NEW LOOK AT AN OLD PROBLEM

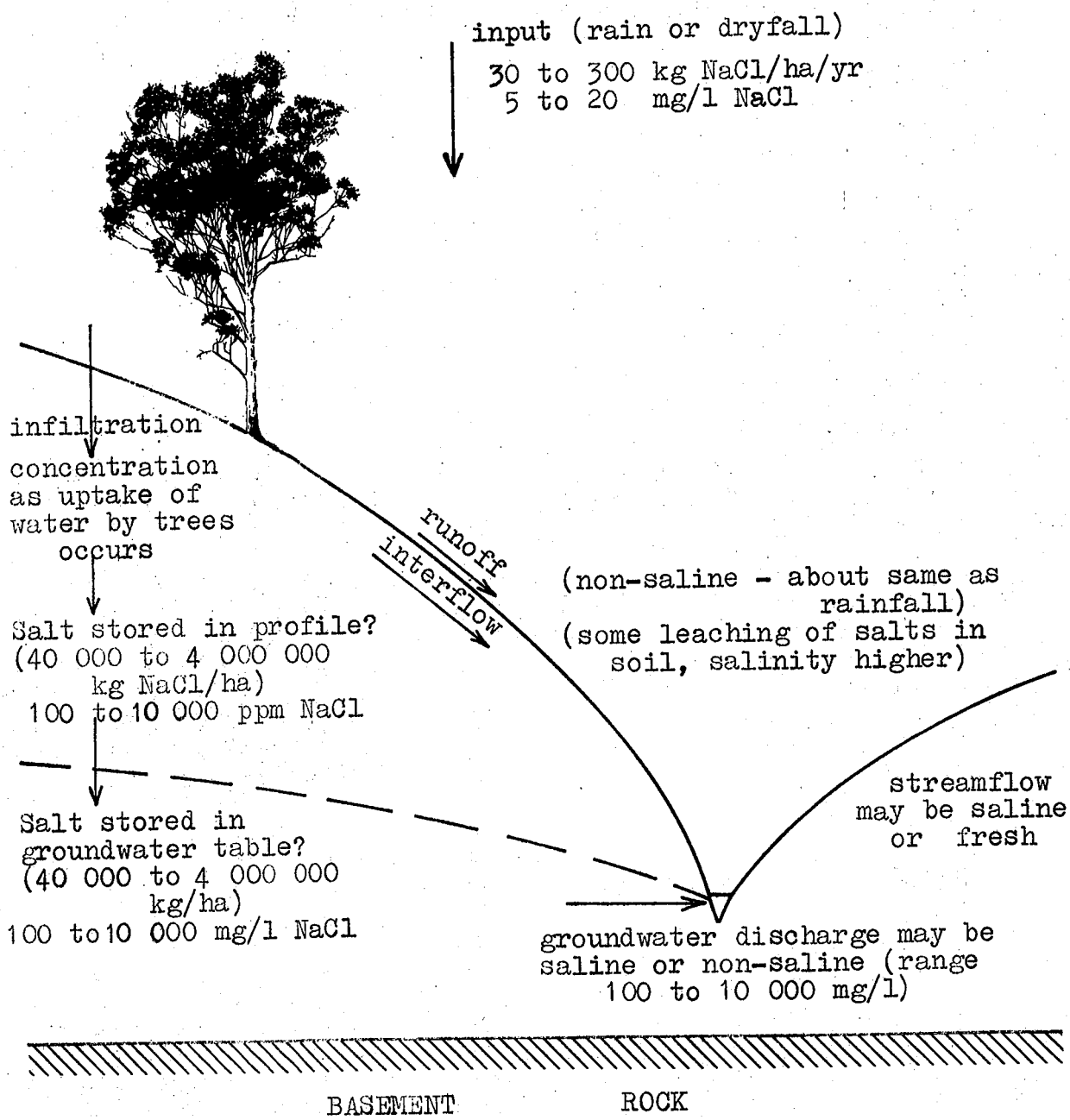
The Research Branch

During August 1974, many officers attended a lecture on the cause and effects of the salinity problem in Western Australia. These brief notes may be a useful resume of the talks.

Hydrological cycle



Salt cycle


input (rain or dryfall)
30 to 300 kg NaCl/ha/yr
5 to 20 mg/l NaCl
infiltration
concentration as uptake of water by trees occurs
Salt stored in profile?
(40 000 to 4 000 000 kg NaCl/ha)
100 to 10 000 ppm NaCl
runoff
interflow
(non-saline - about same as rainfall)
(some leaching of salts in soil, salinity higher)
streamflow may be saline or fresh
Salt stored in groundwater table?
(40 000 to 4 000 000 kg/ha)
100 to 10 000 mg/l NaCl
groundwater discharge may be saline or non-saline (range 100 to 10 000 mg/l)
BASEMENT ROCK

When an area is cleared or its existing vegetation reduced (by agriculture, mining, dieback, establishment of pine plantations or sawmilling operations etc.), then:

a. the evapotranspiration is reduced, at least for a time;

b. the runoff may increase;

c. the interflow may increase;

d. the groundwater recharge may increase and the water table may rise;

e. the groundwater discharge may increase;

f. seeps may appear.

If the groundwater is not saline and little salt is stored in the profile, then the additional yield of potable water may be beneficial. If however the groundwater table is highly saline and additional salt is stored in the profile, then the increased discharge of groundwater into the stream may have a detrimental effect.

Studies by CSIRO show that, in forested catchments, the output of salt nearly balances the inputs (ie. output/input is in the range 1.1 to 1.6). In catchments where 30% or more of the area has been cleared for agriculture, the output greatly exceeds input (output/input is in the range 3.1 to 21). In the latter case the salt store is slowly being reduced. The time to leach out these salts and achieve a balance has been estimated to range between 30 and 400 years.

Many of the major streams in the South-west are already brackish (Murray, Frankland and Blackwood); others (Collie, Warren) are in the marginal range.

Measurement

Salinity can be measured by titration, evaporation or electrical conductivity. It is expressed in milligrams/litre (mg/l) or parts per million (ppm). Total Dissolved Solids (TDS) and/or Sodium Chloride may be used as the standard. Arbitrarily selected ranges which are used to define potability are as follows:

< 500 mg/l	TDS	(fresh)
500-1000 mg/l	TDS	(marginal)
1000-3000 mg/l	TDS	(brackish)
> 3000 mg/l	TDS	(saline)

Research

Several agencies are involved in the study of salinity. Some of the projects being carried out are listed below.

Forests Department

1. Sampling of streams to estimate base flow and groundwater salinity (Dwellingup, Mundaring, Busselton and Manjimup).

2. Study of the effects of catchment management on water yield and quality (Yarragil).

3. Paired catchment study (effects of pine establishment on salinity, Mundaring).

4. Mathematical analysis of input/output for the Helena catchment. Relating dam salinity to changes in vegetation and rainfall.

5. Root studies of various species on different sites.

6. Detailed studies of soil, groundwater and stream salinity at Del Park and Jarrahdale. (Increases in elevation of groundwater table after mining have exceeded 7m to date).

7. Modelling approach using Peck's model.

8. Revegetation of mined sites.

C.S.I.R.O.

1. Paired catchment studies at Yallanbie and Collie.

2. Catchment study in an area to be mined (Del Park).

3. Use of deep bores to assess groundwater salinity and salts stored in the profile.

4. Transpiration studies using various species.

P.W.D.

1. Salinity sampling - Murray catchment.

2. Stream gauging and stream salinity records.

3. Detailed study of Collie catchment.

Department of Agriculture

1. Salinity sampling (Collie and Manjimup).

2. Detailed study of Collie catchment.

3. Analysis of production losses due to salinity in irrigation districts.

4. Salinity "Role Play" game.

Solution

There are several ways of dealing with the salinity problem and we leave it to the reader to decide the likely political, economic or technical limitations of the various alternatives, which include -

1. A ban on further alienation in salt-prone catchments.

2. A ban on further clearing of private land on salt-prone catchments.

3. Repurchase of uncleared, private-owned land.

4. Repurchase of cleared farmland and replanting of same with a tree cover.

5. Encouragement of changes to agricultural practices:

   a. mixed grazing - forestry;

   b. tree paddocks in strips to transpire excess groundwater;

   c. wide buffers of salt-tolerant trees along streams;

   d. changes in agricultural practices to increase water use (different species, varieties, cultural and fertiliser practices).

6. Building more dams to trap only non-saline streams.

7. "Shandying" brackish supplies with fresh supplies.

8. Building pipehead dams in the eastern parts of catchments and directing saline flows around the main dam.

9. Desalination.

10. Stricter control on operations such as sawmilling, bauxite mining, roads and S.E.C. lines.

11. Replanting of dieback-affected areas with tolerant species.

12. Forest hygiene and quarantine.

NEW ANIMAL IN DRYANDRA FOREST

J. Humphreys

On Monday 9 September 1974, evidence of a new type of animal was found at two or three locations in Dryandra Forest.

From the intense activity at its selected sites, which are crossroads or sharp corners, the animal appears to be gregarious and have an omnivorous diet. Evidence also suggests it camps for several hours at a time.

Analysis of its droppings shows that it is unable to digest beer bottles, cool drink cans, aluminium foil and used toilet tissues. The rude disturbance of soil around the area of the droppings is similar to the habits of the giant forest hog of East Africa. The new animal is temporarily named Hoggus auto-rallyensis.

Unhappily this new forest creature wasn't seen and a precise description is not available.

Hoggus auto-rallyensis is obviously exotic and at present not compatible with this environment. Consequently, it may have to be hunted out of its temporary shelter before it becomes a great nuisance. However, it may change its habits and be allowed to become a facet of its selected ecosystem.

Tree Valuation is one of those nebulous subjects that have been avoided by most people up to now. The value placed on a tree naturally varies from person to person and place to place. The current interest in conservation necessitates the placing of monetary values on items that until now have been regarded mainly for their aesthetic value. Bearing this in mind, it was felt that the article following, which appeared in "Australian Parks", August 1974, was worth reprinting. It is included in Forest Notes with the kind permission of the Australian Institute of Parks and Recreation.

TREE VALUATION

A Formula for Assessing the Economic Value of Ornamental Trees in Public Open Spaces Under the Control of the Parks, Gardens and Recreations Committee of the Melbourne City Council.

A. Throughout the world in recent years, various systems have been developed in order to evaluate trees which have been established, or retained for their aesthetic values, or for other conservation purposes. Any such system is rather difficult to formulate and must be interpreted wisely. However, it is logical that such trees do have an economic value, for apart from the pure aesthetics concerned, they have actually cost a considerable amount of money over many years in such things as the cost of production, watering, pruning, removing dead wood and repairing wounds, fertilising and spraying for pests and diseases and in the protection of roots, etc. Methods for the valuation of such trees have been developed in various countries, and today we have such systems known as German, Swiss, American, Swedish and recently, Scottish.

There are many instances when the value of a tree is required, not only to have a tangible financial figure in order to claim against complete destruction, but to be able to assess the partial reduction of value to the community when actions which inhibit the health of trees occur. The best example of such in Melbourne is that of the trees in the east or "top" end of Collins Street. Over the past thirty years, these trees have decreased in

health by at least 70% due to the cutting of roots, the removal of moisture because of modern street and building techniques, the removal of light by tall building, the increase of wind turbulence and the concentration of polluted air by increased motor traffic.

There are many other reasons why it is desirable to place an economic value on such trees. These include:

1. Vandalism
2. Motor and other accidents
3. Installation of underground utility services
4. Installation of overhead wires
5. Construction of new roads, footpaths, freeways etc.
6. Construction of new buildings
7. Crossings to new or existing buildings
8. Effects by specific pollutants including plant poisons
9. Other related reasons.

The actual figures included in the various systems have been developed as a result of close study of the economics related to city park systems in the associated countries, and all arrive at similar conclusions. The system set out in (B) is based on the Maurer Hoffman System, developed in Germany and it is believed that this system is the most applicable to Melbourne. The basic value of a tree under this system (T) is similar to the cost of a young tree having like trunk diameter, and available on the open market in this State.

B. The following are adaptions of the Maurer-Hoffman method made to suit local conditions in Melbourne.

T = Trunk diameter, measured at 1 metre above the ground level

S = Tree species, which are divided into four groups.

A = Aesthetic value of tree.

H = Health of tree.

L = Locality of tree.

The estimated total value of the tree is obtained as follows:

T x S x L x H x A

The individual values of the above factors are:

T = Trunk Size

Commencing at 15 cm in diameter size.

CM	Inches	Value ($A)
15	(5.9)	100
20	(7.9)	150
25	(9.8)	210
30	(11.8)	280

Plus $80 for every extra 5 cm in diameter.

S = Tree Species

Below are examples of the value of "S" in the four groups.

GROUP I. 0.2 - 0.4

Virgilia capensis
Acacia elata
Acacia decurrens
Populus nigra 'Italica'

GROUP II. 0.4 - 0.6

Fraxinus oxycarpa
Acacia saligna
Eugenia smithii
Populus alba

GROUP III. 0.6 - 0.8

Fraxinus raywoodii
Quereus palustris
Eucalyptus maculata
Eugenia ventenati

GROUP IV. 0.8 - 1.0

Agonis flexuosa variegata
Ulmus campestris
Quercus rubra
Tristania conferta variegata

A = Aesthetic value of the tree

0.5 Trees of little importance
0.6 Closely planted trees (groups)
0.7 Plantings having reasonable space between trees
0.8 Wide plantings
0.9 Avenue plantings
1.0 Solitary planting (specimen tree)

H = Health of tree

0.5 Tree of poor form and little life expectancy
0.6 Tree of reasonable form but of limited life expectancy
0.7 Tree of reasonable health but of poor form
0.8 Reasonable health and form
0.9 Average health and form
1.0 Healthy and vigorous tree

L = Locality of tree

GROUP

(a) 0.25 Growing in undeveloped country
(b) 0.75 Rural area
(c) 1.50 Suburban area
(d) 2.50 City park
(e) 3.00 City street or plaza
(f) 3.50 City garden

References

1. Proceedings of the 6th International Congress of Park and Recreation Administration in Canberra 1970. (Paper by A. Raad - Rotterdam).

2. "Australian Parks" Volume 8, No. 4.

SAFETY NEWSLETTER

During the year 1973/74 the departmental workforce of 919 officers and employees sustained 45 Disabling Injury Accidents. In addition there were a further 119 Serious Injury Accidents necessitating medical attention and resulting in no other lost time.

The Disabling Injury Frequency Rate, expressed in terms of accidents sustained per million manhours worked, was 27 and the mandays lost due to these accidents totalled 279. However, an additional 80 mandays were lost through re-occurrence of previous injuries that necessitated further medical treatment, bringing the total for the year to 359.

The Accident Summary shown on page 43 covers the past eight years and illustrates the success that has been achieved in reducing the incidence and severity of work-caused injury following the implementation of the accident prevention programme. It also reveals that although success has been achieved during the past three years in maintaining overall accident experience at a reasonable level, each year the task of further improving the safety record is proving more difficult.

By comparison with the figures for 1972/73, namely 45 D.I.A., 112 S.I.A. and 414 mandays lost, it can be seen that although there has been an increase in compensable injury accidents during the year under review, there has been a significant reduction in mandays lost. This indicates continuing success in reducing the severity of D.I. Accidents.

Whilst all divisions and specialist sections have contributed to the overall success of the safety programme, a number have excelled in producing outstanding reductions in accident rates and it would appear that much of their success was due to the keenness and active participation of the divisional officers and men.

Intensified safety training for staff supervisors and employees has been programmed for the ensuing twelve months to revitalise individual safety awareness and acceptance of responsibility, which is necessary if the present safety record is to be maintained or improved upon.

Accident Details

D.I.A. 45

The Agencies causing the greatest number of accidents were "Persons Falling or Striking Against", and "Manual Handling", both contributing to 9 accidents and a time loss of 53 and 61 mandays respectively.

The next most prolific cause was "Tools Power" with a total of 8 accidents for 75 mandays lost, followed by "Objects Falling and Flying" and "Vehicles", both contributing to 5 accidents for a time loss of 21 and 36 mandays respectively. Then followed the categories of "Machinery in Operation" (with 3 accidents and 17 mandays), "Tools Hand", "Harmful Contacts" and "Miscellaneous" (each accounting for 2 accidents and a time loss of 6, 5 and 5 mandays respectively).

Of the above accidents, 35 occurred in the field, 8 in mills and 2 in workshops.

It is interesting to note that of the total of 35 D.I.A. sustained in the field, 22 (or approximately 60%) resulted in injury to the trunk, for a total of 139 mandays lost. Under the Agency of "Tools Power", chainsaws accounted for all accidents: 6 occurred during piece-work pine felling, one during piece-work pine pruning and one during non-commercial pine thinning. All mill accidents sustained were under piece-work conditions and resulted in the following injuries: strained trunk muscles 6, jarred arm 1, fractured ribs 1.

Of the 45 Disabling Accidents recorded, 16 occurred whilst working under piece-work conditions, accounting for 113 mandays lost. The distribution was piece-work pine felling 7, pine milling 8, and piece-work pruning 1.

The additional time loss of 80 mandays due to recurring injury, not being the result of accidents sustained during the current year, has not been included in the above figures but is included in the tabular analysis on page 44.

Accident Summary.

YEAR	M.H.W.	D.I.A.	S.I.A.	Total Accidents	F.R.			Man Days Lost	Duration rate	Severity rate
					D.I.A.	S.I.A.	D.I.A. + S.I.A.			
1967/68	1 895 600	124	312	436	65	164	230	1701	14	900
1968/69	2 019 568	96	155	251	48	76	124	1738	18	860
1969/70	1 901 020	70	129	199	37	67	104	721	10	379
1970/71	1 808 406	48	158	206	27	87	110	458	9	253
1971/72	1 759 888	40	128	168	23	72	95	275	6	156
1972/73	1 728 577	45	112	157	26	64	90	414	9	239
1973/74	1 651 621	45	119	164	27	72	99	359	8	217

M.H.W. = Manhours worked

D.I.A. = An accident resulting in loss of at least a full day or shift following that on which the accident occurred.

S.I.A. = An accident necessitating medical attention only and resulting in no other lost time.

F.R. = No. of D.I.A. per million manhours worked.

DURATION RATE = Average days lost per D.I.A.

SEVERITY RATE = Total days charged per million manhours worked.

ACCIDENT ANALYSIS 1973-1974

	FIELD				WORKSHOP				SAWMILLS			
	No. of Accidents		Days Lost	Duration Rate	No. of Accidents		Days Lost	Duration Rate	No. of Accidents		Days Lost	Duration Rate
	S.I.A.	D.I.A.			S.I.A.	D.I.A.			S.I.A.	D.I.A.		
Machinery in Operation	2	2	12	6					3	1	5	5
Vehicles & Moving Plant	4	4	33	8.2		1	3	3				
Tools Hand	13	2	6	3	2				3			
Tools Power	3	8	75	9.3								
Manual Handling	11	4	35	8.7	2				9	5	26	5.5
Harmful Contacts	2	2	5	2.5	2				1			
Persons Falling or Striking Against	16	7	42	6	1				4	2	11	2.5
Objects Falling or Flying	20	4	18	4.5	3	1	3	3	8			
Miscellaneous - Insect Bites etc	9	2	5	2.5	1							
TOTALS	80	35	231		11	2	6		28	8	42	

VEHICLE SAFETY REPORT 1973/74

During the twelve months period ended June 1974, 121 accidents involving departmental vehicles were recorded as compared with 117 in the previous year. Eight of these accidents were collisions with other vehicles, three of which resulted in three employees losing 59 mandays and four employees sustaining injuries that necessitated medical attention only.

A perusal of the accident summary on page 49 shows that if those accidents involving broken windscreens caused by flying stones are ignored, reversing was the major cause of accidents, as has been the case in previous years. This was closely followed by damage sustained through "Driving into Objects".

Investigation has proved that a marked reduction in these and other types of vehicle accidents can be achieved if all drivers would comply at all times with the following simple, basic, defensive driving techniques.

DEFENSIVE DRIVING TECHNIQUES

1. Always use safety belt where provided.

2. Drive with both hands correctly positioned on the steering wheel, at the 10 minutes to 2 o'clock position. Do not cross arms or "knit" with arms while turning a corner. Learn the "push/pull" steering method.

3. Do not attempt to light a cigarette or pipe while driving - stop the vehicle first.

4. Use gears as part of your braking system, particularly on bad roads or in steep country.

5. Do not follow too closely behind another vehicle. Always leave a vehicle length (approximately 6 m) for each 15 km/h. Much more than this is necessary if travelling in smoky or dusty conditions.

6. Do not drive with arms or elbows out of windows. Have windows wound up when travelling on narrow tracks.

7. Keep within stated speed limits at all times and observe traffic codes. Do not speed, even if running late - better to arrive late than dead on time.

8. Remember that fatigue and tiredness lowers the level of concentration. If you are weary and have no relief driver, stop and have a rest.

9. When you are driving, do not drink alcohol. When you are drinking, don't drive. Loss of your license could affect your livelihood.

10. Ensure safe parking. Do not park on bends, near falling operations, under burning trees, etc. Shut all doors and leave vehicle in gear with handbrake on.

11. Take extreme care when reversing or turning on narrow tracks. Nominate one guide and concentrate only on his instructions. If on your own, get out of vehicle to make sure where the obstructions are.

12. It is obligatory to report all accidents without delay.

DEFENSIVE DRIVING IN "BUSH" CONDITIONS

1. When driving on forest tracks, take care when crossing bridges and culverts. If within your own division, check their conditions periodically.

2. Forest road intersections are often difficult to see until you are actually on them. Always drive with this in mind.

3. Always avoid, as far as is possible, driving on current log-hauling roads.

4. When dodging pot-holes, do so with caution. Other sections of the road may be in a more dangerous condition. Bad pot-holes can often be recognised by standing water.

5. Where a green branch has been placed across the road, proceed with extreme caution. It may have been put there as a warning of some danger ahead.

6. If a limb, tree or scrub has fallen onto the road, get out and remove it. If unable to do so, place signs (green branches) some distance either side of the obstacle to warn other traffic.

7. After travelling through water, pump your brake pedal several times and in the next few chains test your brakes for grabbing or pulling to one side.

8. Reduce speed for loose gravel, narrow overgrown tracks, bad corners and mud patches. On loose gravel roads or in mud, braking power is reduced almost 75%. This danger is doubled again by bad visibility on forest tracks. Speed limits are maximum speeds and the condition of the road governs your speed. Remember also that your passengers in the back of your truck cannot see hazards coming up.

9. When negotiating boggy patches in a four-wheel-drive vehicle, engage four-wheel-drive before entering the bad section, not after you get stuck.

10. Kangaroos do not obey traffic regulations. Watch for them at all times, especially at dawn, dusk and after heavy rain when they move about a lot. Always watch out for the second one to cross the road.

DEFENSIVE DRIVING AND SAFETY OF PASSENGERS AND CARE OF LOADS.

(a) 1. When carrying passengers, make sure they are properly seated and that doors are secured and locked before moving off. If driving a truck, see that adequate and secure seating is afforded any passengers travelling on the back of the truck.

2. Restrict the number in the cab of any vehicle to ensure that the driver has plenty of room.

3. Do not carry loose items of equipment in the cab or on the truck. They could in emergency cause injury.

4. Do not look at your passengers if conversing while driving. Keep your eyes on the road.

5. If as a passenger you have better local knowledge of the road conditions than the driver, give him the benefit of your knowledge. If he is driving in an unsafe manner, point this out to him.

(b) 1. When driving a loaded truck, check the security of your load at regular intervals during the trip.

2. When transporting heavy equipment, i.e. bulldozers etc., ensure the vehicle to be used has sufficient capacity to handle the load. Check also regarding the necessity for a pilot vehicle and overwidth or overlength signs etc.

3. If you are driving an obstructive vehicle, be courteous to other road users. Pull aside to let them pass.

4. Travel with care when transporting explosives. Where possible, use the better class road for the job. Detonators and explosives material should never be carried on the same vehicle.

DEFENSIVE DRIVING AT FIRES AND CONTROLLED BURNS

1. When driving in smoke, always have headlights switched on. If conditions are very bad, sound horn at intervals.

2. Always be alert for falling limbs and trees.

3. When parking at the scene of a fire or controlled burn, always park on bare earth or cold burnt ground.

4. Do not obstruct control points, roads or turning areas when parking.

5. Always park at a fire facing the escape route, with keys left in ignition switch.

6. Keep tray of truck clean of all inflammable material. Place spare clothing in locker or in cab.

7. Always shut cab doors and wind up windows before leaving vehicle near burning operations.

8. On vehicle patrol at a fire, the driver is not the observer. Small fires can be patrolled on foot with greater efficiency.

9. Do not speed or take any unnecessary risks when driving to a fire. It is most important that the fire truck get to the fire fully operational with a full complement of crew and not delayed or rendered unserviceable by irresponsible driving.

SUMMARY OF VEHICLE ACCIDENTS 1973-74.

DIVISION	BURNT VEHICLES	MACHINES - GRADERS, ETC.	REVERSING	TURNING INCUED	LOSS OF CONTROL	COLLISION - VEHICLE	COLLISION - ANIMAL	FLYING OBJECTS	FALLING OBJECTS	PROTRUDING-LIMBS-LOGS	WINDSCREENS-STONES	COLLISION PRIVATE VEHICLE	VEHICLE-STOLEN-DAMAGED	DRIVING PARTS STOLEN	DAMAGE INTO OBJECTS	STOLEN	INSECURE LOADS	PARKING	FALLING TREE	TOTAL ACCIDENTS	OFFICER	EXCLUDING WINDSCREENS O/SEER	EMPLOYEE	UNKNOWN
BUSSELTON				2				1	2											5	3		2	
KIRUP			2		1		1		1					1		1				7	5		1	1
MANJIMUP			1		1	2	2			4				1	1					12	6		2	
PEMBERTON			1		1		1			3									1	7	4			
NANNUP		1	2			1	1											1		6	1		5	
WALPOLE							1													1	1			
MUNDARING						1				3				1						5	1		1	
DWELLINGUP			4			1	1	1	2	7	1			3						20	3	1	9	
COLLIE										4				2						6	1	1		
NARROGIN										2				1						3	1			
KELMSCOTT			2	1	1					2				3			1			10	5		3	
METRO			3			2	2			3						1		2		13	3	1	5	1
WANNEROO			3				1			2							1			7	2		3	
HARVEY					2		1		1	2				1						7	4		1	
CADETS																								
KALGOORLIE																								
RESEARCH						1		1		1	4	1								8	4			
W/PLANS								1			1									2	1			
											2									2				
TOTALS	1	1	18	1	8	8	11	3	3	5	39	2			13	1	2	2	3	1	121	45	3	32	2

	ACCIDENTS		WINDSCREENS		SUB-TOTAL		OFFCR	O/S	EMP.	UNKNOWN
1972/73	117	-	39	=	78.		43	7	26	2

RECIPE FOR EMULSION REPELLENT

Half pint of Dibutyl Pthalate
One gallon of water
5 oz soap.

METHOD

Cut soap into small pieces and boil in half gallon of water until soap is melted.

Add the other half gallon of water and the half pint of Dibutyle Pthalate.

Clothes which have been washed clean should be dipped in this emulsion, wrung out and dried.

The emulsion can be kept for further use.

One treatment of emulsion establishes repellent effects which survive four boilings, so that the clothes need to be treated in this way only once in five weeks.

Another method of using the repellent Dibutyle Pthalate is as follows:-

Rub Dibutyl Pthalate, with the hands, on to the outside surface of trousers and socks. Rub also on exposed skin surfaces.