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FORESTS DEPARTMENT WESTERN AUSTRALIA

ANNUAL REPORT 1974

Forests Department,
PERTH,
30th September, 1974

TO THE HONOURABLE THE MINISTER FOR FORESTS

Sir,

I have the honour to transmit herewith my report on the operations of the Department for the year ended 30th June, 1974.

Yours faithfully,
B. J. BEGGS,
Conservator of Forests.

Front cover :
Good marri regeneration about 40 years old, west of Manjimup.

Back cover :
Mature karri/marri forest west of Pemberton, photographed at 5 o'clock on a midsummer morning. In the background is a 100-year-old pure karri stand regenerated after a fire in what was once a farmer's paddock.

PRINCIPAL OFFICERS *

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Chief of Division	E. R. Hopkins, B.Sc. (W.A.), Dip. For. (Canb.), PhD. (Melb.)
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Superintendent (Extension Services)	P. N. Hewett, B.A. (W. A.), B.Sc. (Adel.), Dip. For. (Canb.)
Superintendent (Plantation)	A. C. van Noort, B.Sc. (For.), Dip. For. (Canb.)
Chief Draftsman	R. M. Davis, E.D.
Secretary	R. K. Reid
Accountant	R. H. Wilson, B.A. (Econ.), A.A.S.A.
Registrar	B. M. Smith, B.A.

*At 30th June, 1974.

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STATISTICAL SUMMARY OF MAJOR OPERATIONS

Sawnwood Production

Total Production of Sawn Timber .... 401 433 m³

Trends in Production and Consumption

Year Ended 30 June	Production (cubic metres)				Total Export	Local Availability	Number of Sawmills	Monthly Average No. of Employees
	Hardwood	Softwood	Hewn Hardwood	Total				
1926	411 283	....	177 792	589 075	339 879	249 196	....	....
1938	331 928	....	72 883	404 811	213 695	191 116	134	3 112
1946	251 194	....	398	251 592	95 524	156 068	128	2 876
1951	356 029	....	33	356 062	66 339	289 723	256	4 047
1956	544 134	....	150	544 284	129 367	414 917	274	5 804
1960	470 833	....	....	470 833	174 643	296 180	265	5 037
1965	460 246	22 667	....	482 913	133 565	349 348	206	3 615
1966	475 642	16 499	....	492 141	68 885	423 256	203	3 518
1967	461 176	17 085	....	478 261	138 723	339 537	202	3 173
1968	469 818	16 531	....	486 349	84 569	401 779	188	3 209
1969	413 666	19 643	....	433 309	86 455	346 854	191	3 233
1970	425 295	16 893	....	442 188	96 275	345 914	163	2 869
1971	420 777	21 595	....	442 372	79 437	362 935	150	2 401
1972	379 006	21 733	....	400 739	101 191	299 548	154	2 533
1973	375 135	23 283	....	398 418	111 547	286 871	145	2 825
1974	374 899	26 534	....	401 433	N/A	N/A	140	2 215

Log Production* (m³)

	1974	1973
Jarrah	706 835	732 968
Karri	300 673	276 823
Wandoo	14 008	28 577
Pine	123 393	101 434
Other	31 438	23 548
	1 176 347	1 163 350

* Includes sawlogs and logs for plywood, veneer and reconstituted wood (particle board etc.)

Forest Area

Additions to State Forest	3 869 ha
Excisions from State Forest	73 ha
Land purchased for Pine Planting	Nil
Total Area of State Forest	1 829 634 ha

Reforestation ....

Cut-over areas treated for regeneration	78 682 ha

Afforestation

Area planted with pines 1973		2 451 ha
Pinus radiata	1 465 hectares	
Pinus pinaster	984 hectares	
Other species	2 hectares	
Total area of pine plantation established		34 799 ha
Pinus radiata	14 959 hectares	
Pinus pinaster	19 563 hectares	
Other species	277 hectares	
Total experimental areas (additional)		314 ha

Management

Survey—	
Topographical mapping	20 900 ha
Area of Assessment	842 200 ha
Engineering, new works—	
Roads and tracks	344 km
Houses	Nil

Protection—

Prescribed buring area	342 617 ha
Fire outbreaks—	
Number of fires	266
Area burnt	1 036 ha

Nurseries (Hamel and Narrogin)

Trees produced for—	
Private buyers	186 519 plants
Forests Department	1 053 618 plants

Sandalwood

Quantity exported	1 350 tonnes

Source and Application of Funds

	1973/4 $	1972/3 $
Source—		
Royalties on timber etc.	3 301 607	2 816 154
Departmental fees, sale of logs etc.	2 699 294	2 223 550
Sub Total	6 000 901	5 039 704
General Loan Fund	1 700 000	1 900 000
Commonwealth Aid Road Grant	227 428	270 244
Rents	140 728	127 270
Commonwealth Softwood Forestry Agreement	415 714	558 000
Increase or decrease in unexpended balance	185 176	—682 747
Aboriginal Training Scheme Advance	7 000	14 000
Mining Compensation Grants	5 162	7 899
	8 682 109	7 234 370
Application—		
1. Expended from Consolidated Revenue Fund—		
Pine Hardwood Conversion	1 634 876	1 340 356
Adminstration and general expenses	1 363 055	1 130 267
Transfer to Treasury	276 260	321 556
2. Expenditure under Reforestation Fund—		
Division—Direct Operating Costs	2 240 391	2 018 204
Head Office and General Expenses	3 167 527	2 423 987
	8 682 109	7 234 370

REVENUE AND EXPENDITURE

Revenue for the year from all sources amounted to $6 000 901 compared with $5 039 704 in the previous year.

After deduction of specified expenses, the nett revenue transferred to the Reforestation Fund was $2 762 710 ($2 239 636). Figures in brackets refer to the previous year. During the year this fund also received $1 700 000 ($1 900 000) from the General Loan Fund, advances totalling $415 714 ($558 000) under the Commonwealth Softwood Forestry Agreement and Commonwealth Aid Road Grants of $227 428 ($270 244).

Expenditure from the Reforestation Fund for the year amounted to $5 407 918 ($4 643 257).

THE FOREST AREA

State Forests (Forests Act 1918–1972)

The total area of State Forest at 30th June, 1974, was 1 829 634 hectares, which is an increase of 3 796 hectares compared with the total area at 30th June, 1973.

	June, 1973 hectares	June, 1974 hectares
Jarrah	1 309 761	1 312 767
Karri	75 120	75 174
Jarrah & Karri (mixed)	267 164	267 823
Jarrah & Wandoo (mixed)	66 297	66 297
Tuart	2 880	2 880
Tingle Tingle	4 424	4 424
Karri & Tingle (mixed)	4 229	4 229
Sandalwood	781	781
Pine Planting	72 921	72 997
Mallet	22 200	22 200
Miscellaneous	61	62
	1 825 838	1 829 634

Timber Reserves (Forests Act, 1918–1972)

The total area held under Timber Reserves at 30th June, 1974, was 72 153 hectares, which is an increase of 858 hectares compared with the total area at 30th June, 1973.

	June, 1973 hectares	June, 1974 hectares
Jarrah	38 809	39 668
Wandoo and Jarrah (mixed)	29 052	29 051
Jarrah and Karri (mixed)	1 748	1 748
Pine Planting	1 682	1 682
Mallet	4	4
	71 295	72 153

Land Alienations, etc.

During the year ended 30th June, 1974, 111 applications for land and road provisions and closures were received covering a total of 27 601 hectares.

The Department agreed to release as follows:

Alienations			Leases (Pastoral—Grazing etc.)		
Timber Zone		Outside Timber Zone	Timber Zone		Outside Timber Zone
State Forest	Crown Land		State Forest	Crown Land	
hectares	hectares	hectares	hectares	hectares	hectares
73	22 587	1 191	388	1	....

No. of alienations approved 54
No. of leases approved 13

The total freehold land held at 30th June, 1974, in the name of The Conservator of Forests was 24 091 hectares.

SAWMILLING, TIMBER INSPECTION AND FOREST PRODUCE

Timber Production

The production of 401 433m³ of sawn timber was an increase of 3 015 m³ on last year's figure. Of the total output 31 356 m³ came from private property, a decrease of 4 502 m³ on the 1972/73 figure.

At December 31, 1973, there were 140 sawmills registered of which 85 operated on Crown Land and 55 on private property. This represents a decrease of five on last year's registration. Details of the annual intake of mill logs and production of sawn timber are given in accompanying tables.

The annual intake of logs (1829–1974) is given in Appendix 5.

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Roundwood production from Departmental pine plantations totalled 123 393 m³, an increase of 22 974 m³ on the figure for 1972/73 (see Afforestation).

Local plywood factories obtained the following quantities of peeler logs—

	m³
Karri	6 462
Jarrah	2 043
Pine	2 462
	10 967

Timber Inspection

The total quantity of timber inspected during the year was 77 181 m³ made up as follows—

	m³
Railway Sleepers	54 354
Ex Crown Land	44 179
Ex private Property	9 288
Re-inspected	887
Other Sawn Timber	22 827

All railway sleepers produced were inspected.

PRODUCTION OF TIMBER FOR YEAR ENDED JUNE 30, 1974
EXCLUSIVE OF HARDWOOD, MINING TIMBER, FIREWOOD, POLES AND PILES

Tenure	Log Volumes by Species (1)								Totals	
	Jarrah	Karri	Wandoo	Yarri	Sheoak	Marri	Pine (2)	Other	In Log	Recovery Of Sawn Timber
Crown Land—m³	657 367	273 687	6 048	2 967	500	18 389	123 393	2 112	1 084 463	370 077
Private Property m³	65 085	11 369	7 961	7 365	44	51	1 167	10	93 052	31 356
Total—m³	722 452	285 056	14 009	10 332	544	18 440	124 560	2 122	1 177 515	401 433

(1) Includes sawlogs and logs used in the production of plywood veneer and reconstituted wood (particle board etc.)
(2) For log categories see Afforestation.

QUANTITY OF SAWN TIMBER PRODUCED FROM CROWN LANDS
AND PRIVATE PROPERTY FOR THE PAST TWO YEARS

Year Ended June 30	From Crown Lands		From Private Property		Total Quantity
	Sawn Timber other than Sleepers	Sawn Sleepers	Sawn Timber other than Sleepers	Sawn Sleepers	
1973 m³	317 651	44 190	18 979	16 879	398 418
1974 m³	325 898	44 179	22 068	9 288	401 433

Sandalwood

The demand for Sandalwood increased during the year but it was only possible to supply 1 350 tonnes compared with 1 452 tonnes for the previous year.

Sandalwood received at Spearwood during the year totalled 1 442 tonnes compared with 1 166 tonnes for the year 1972/73.

	Tonnes
Logwood (including Roots and Butts)	1 098
Pieces	344
Private Property	Nil
	1 442

No orders were placed by distillers for supplies for oil distillation.

Timber Industry Regulation Act 1926–1969

The number of mills registered under the provisions of the Act as at December 31, 1973 totalled 140 (85 Crown Land and 55 Private Property).

The average number of persons employed in the timber mills each month throughout the year was 2 215, a decrease of 55 on last year's corrected figure of 2 270.

The District and Workmen's Inspectors made 970 inspections of timber holdings.

There were 146 notifiable accidents for the year ending June 30, 1974, two being fatal. The number of accidents per 100 persons employed was 6·59, a very slight increase on last year's figures of 6·52.

The cost of administering the Timber Industry Regulation Act for the year ending June 30, 1974, was :—

Salaries	15 046
Mileage, Allowances, Office Rent, Plant Cost and Sundries	9 203
	$24 249

Forest Offences

Twenty-nine breaches of the Forests Act and Regulations were reported during the year. Legal proceedings were instituted in three cases and four cases were dealt with by charging royalty, forfeiture of deposits, collection of damages or confiscation and sale of timber illegally cut. The amount received by the Department in this way totalled $1 240·28. Warnings were issued in all other cases.

Employment in Forestry and the Timber Industry.

The number of wage earners directly employed in Forestry and the Timber Industry was estimated at 3 507 made up as follows :—

Forestry—		
Professional officers	60	
General field staff	271	
Clerical and drafting	82	
Wages employees	550	
Contractors and employees (estimated)	25	
		988
Timber Industry—		
Sawmill employees including bush workers	2 215 *	
Firewood cutters and pole getters working under permits	126	
Sandalwood workers	63	
Apiarists, estimated (1415 sites registered)	115	
		2 519
		3 507

* Includes employees of registered sawmills only and excludes persons employed in associated yards in the Metropolitan area,

Firewood Production

	Crown Land Tonnes	Private Property Tonnes	Total Tonnes
Sawmills			
G.P. and Sleeper			
For sale	60 246	....	60 246
Own use	22 681	....	22 681
P.P. Annual			
For sale	....	5 809	5 809
Own use	....	10	10
Domestic			
L.F.	13 811	....	13 811
F.P. Licence	13 855	....	13 855
Bartons	138	....	138
Kalgoorlie	2 400	....	2 400
Industry			
Wundowie	102 332	....	102 332
Kalgoorlie			
Mines	469	....	469
Industrial	3 904	....	3 904
	219 836	5 819	225 655

Other Forest Produce

Poles and piles obtained from Crown Land during the year amounted to 391 576 metres, compared with 304 433 metres for the previous year. Supplies of piles and poles from private property are dwindling and accurate figures are not available.

Fence posts and strainers cut from Crown Lands totalled 268 874. Records received show that 4 950 posts and strainers were obtained from private property, but this was only a small percentage of the total production from this source.

FOREST PRODUCE NOT ELSEWHERE INCLUDED IN PRODUCTION TABLES

Description	South-west Division and Agricultural Areas			Goldfields Area	Total
	Supplied by Department	Other Crown Land	Private Property		
Mining Timber South-West .... m^3	....	2 087	....	....	2 087
Mining Timber Goldfields Areas .... m	....	....	....	251 258	251 258
Piles, Poles and Bridge Timber .... m	....	391 576	....	3 158	394 734
Fence Posts and Rails .... No.	....	194 052	4 950	49 599	248 601
Strainers .... No.	....	20 309	....	4 914	25 223
Beansticks .... No.	....	5 600	....	600	6 200
Boronia .... kg	....	1 196	208	....	1 404
Gravel and Stone .... m^3	....	80 275	....	....	80 275
Sand .... m^3	....	28 460	....	....	28 460
Sawdust as fuel .... Tonnes	....	55 001	....	....	55 001

FOREST MANAGEMENT AND CONSERVATION

Unemployment Relief

The Department continued to participate in the Commonwealth Non-Metropolitan Unemployment Relief Scheme until its termination towards the end of September. During this period approximately $27 000 was made available from the Commonwealth Government through the State Treasury to subsidise the employment of 45 men at a time when jobs were difficult to acquire.

As was the case in the preceding year, the additional funds enabled worthwhile work to be done which because of financial constraints, would not have otherwise been possible. In these closing three months of the scheme, gangs operated only from the Divisions of Narrogin, Collie, Kirup and Nannup.

Aboriginal Affairs

A grant of $16 000 from the Aboriginal Affairs Planning Authority was used for a special work project for Aborigines in the Narrogin Division. The aim of the project was to assist Aborigines with the provision of meaningful work containing an element of job training.

The grant provided several Aborigines with training in the use and maintenance of hand tools, chain saws, vehicles and light logging equipment, the recognition and selection of various timbers and basic fire protection procedures including the use of maps, hand tools and light pumper equipment.

In the course of training the men, a long term public benefit was provided in that it enabled the mallet plantation to receive worthwhile silvicultural treatment which could not be supported from Departmental funds.

Working Plans

Hardwood Inventory

Information about sawmill permit life, hardwood growth, assessment standards and intensive management units was obtained from 834 plots on 274 hectares covering 172 000 hectares in Mundaring, Kelmscott, Dwellingup, Harvey, Kirup, Manjimup and Pemberton Divisions. On 620 000 hectares from Collie north, S.E.C. pole resources were investigated using 234 plots with a total area of 189 hectares.

In the marri chipwood licence area, assessment has been concentrated on a management level inventory of those cutting coupes expected to be involved in the first 5 years operations. Nine hundred and ten strip lines measuring 580 hectares provided information about 50 200 hectares. Detailed management planning for areas expected to be involved in the first two years' operations, has reached an advanced stage.

Softwood inventory

Three hundred and sixty-five plots were measured in plantations in Wanneroo, Harvey, Busselton, Kirup and Nannup Divisions. Information about pure stands—stands with the same age, site quality and recent thinning treatment—was obtained in the development of a pine thinning operations scheduling system.

Projects

Dieback mapping was extended to cover the southern region so that all of state forest has now been mapped for dieback. Some 170 000 hectares, or 9·2 per cent of the 1·83 million hectares of state forest, are considered to be dieback or suspect dieback. The increase in the area of dieback compared to earlier figures is due to the inclusion of the " suspect dieback " category as well as to the natural and artificial spread of the disease.

Working plans staff were closely involved in the provision of mapping and inventory data for the task force set up to review dieback management.

Special assessments were carried out to estimate karri and seed trees in certain areas in Pemberton Division ; to measure the chip volume of sample areas from which marri and karri logs were sent to Japan ; to measure the optimum width of management level strip lines in chipwood cutting coupes.

Several hundred hardwood logs have been measured each month, from twenty-two sawmill permits throughout state forest, to monitor the change to metric volume measurement. These data will also enable the possibility of using a " small end diameter/log length " method of measuring hardwood volume to be investigated.

Management Research and Automatic Data Processing

Stochastic stand models have been developed for trees growing in single species stands. The models have been used to update inventory data for *Pinus radiata* stands, and this application will soon be extended to *Pinus pinaster Leiria*. The models may also be used to predict the growth of stands over a whole rotation.

Thinning simulators have been developed to simulate row thinning, thinning from below, thinning from above and other alternatives. The intensity of thinning operations may be controlled by residual basal area, residual total stems or residual dominants. The timing of thinning operations may be controlled by age, top height, basal area or mean stand diameter. The simulators operate on stand data classified by diameter.

Computer programs have been prepared to assist in the scheduling of thinning operations within pine forests. Thinnings may be scheduled on the basis of a strict silvicultural regime. Alternatively, thinnings can be scheduled so that timber yields within three size classes are smoothed simultaneously to meet market requirements over a five year period.

Mapping

The significantly increased demand for standard maps both from within the Department and from external sources has resulted in an abnormal depletion of stocks requiring that emphasis be given to the revision and republication of the majority of map sheets. During the year, five maps were revised and reprinted, while a further eight are in course of preparation. The new map sheet Augusta 80 was published and Black Point 80 is awaiting printing.

The metric conversion of the API map series is well advanced and 186 maps were converted during the year to the scales 1 : 25 000 and 1 : 50 000. Priority has been given to the marri wood chip license area of which 90 per cent is now available at the new scales. Because of lack of basic control and higher priority projects, the conversion of the standard map series has made only token progress. Four map sheets covering part of Mt. Barker 1 : 250 000 map sheet are in progress.

Plantation maps were revised from large-scale photography by mapping new clearing, roading and areas planted to pine. Harvey Weir plantation was remapped and Esperance plantation is being completed.

A considerable part of Branch resources was directed towards providing mapping support for the investigation and planning for the marri wood chip industry, the study and mapping of jarrah dieback spread and research of salinity and other ecological problems connected with multiple-use management of forested land.

Forest Engineering

During the year, 344 kilometres of roads, tracks and firelines were constructed and 6 220 kilometres of existing roads were maintained.

Plant and Equipment

All items of vehicles and field equipment were maintained in good condition by a total of 65 workshop wages employees.

Experiments over the past two years have resulted in the design and construction in the Gnangara workshop of a device for automatically metering and depositing a predetermined quantity of superphosphate at or near the roots of pine seedlings at the time of planting.

A second engineering development was the design and construction of a hydraulically operated tractor mounted saw for pine thinning. Although only 12 hectares have been treated to date, there are encouraging indications that this mechanical aid will greatly reduce the number of men needed for this work.

Five apprentices completed their training during the year. Six were appointed, with the total number employed being seventeen.

Thirty-three major items were fabricated including three two-wheel trailers, fourteen automatic superphosphate metering devices, one flame thrower, one furrow liner, one fire-line plough, three cultivators, one folding boom-spray, one fire-break scraper, one fire tank, one set of timber-loading forks, one crane-grapple, two tractor carryalls, one fire unit, two pine-planting machines and other small items for field and research use.

Departmental Buildings

A new transportable-type office building was erected to replace part of the Mundaring Divisiona Office to provide more adequate office accommodation.

At Yanchep, a new five-bay vehicle shed was completed.

Extensions were made to the Wanneroo Divisional Office to alleviate to some extent, problems of inadequate space at that centre.

The Department purchased a house at Northcliffe to provide additional staff housing.

Installation of fly screens proceeded on all Departmental houses that as yet do not have this amenity.

Extension of sewerage mains to the boundary of the Narrogin Headquarters was completed, which will enable connection to the office, nursery and houses to proceed.

Two old houses and a small number of other old buildings were sold during the year.

Communications

Updating of Radio Equipment : Towards the close of the year, tenders were called and an offer accepted for the supply of replacement V.H.F. sets for offices and vehicles. An offer was also accepted for replacement repeater equipment. It is hoped to take delivery of these replacements in sufficient time to allow changeover prior to the 1974 fire season.

Radio Telephones : Radio telephones were installed at Dickson and Stewart fire lookout towers. A V.H.F. repeater station was also installed in Stewart tower, which provides the Blackwood Valley with a much improved service.

Vehicle Wiring : During the 1973 spring, an inspection was made of 249 vehicles wired for V.H.F. radio.

Aircraft and Aircraft Control Beacons : In addition to using two radio-equipped aircraft on aerial ignition during the prescribed burning season, a small aircraft fitted with radio was used with good results for fire-spotting purposes. It is planned to continue the use of small aircraft on fire-spotting in the coming fire season. Each will be fitted with two radio sets. One of the sets will be a radio telephone used for reporting smokes to Divisional Headquarters. The second set will be a V.H.F. radio enabling direct communication between the aircraft and vehicles engaged in smoke location or fire control.

General : The fourth channel was added to the V.H.F. Repeater network. The extra channel decreases the chances of interdivisional interference and helps to reduce channel congestion.

Extended control of V.H.F. and R/T was fitted at Harvey, Nannup and Kelmscott Divisional Headquarters. The Gloucester Tree re-installation was completed and became operative in January.

Mundaring Divisional Headquarters was licensed to operate on the Avon Valley Bush Fires Board frequency for co-operative fire control purposes.

Dryandra Forest Youth Camp

The former Dryandra settlement, now held under Forest Lease by Lions International and operated under joint management with this Department, was well occupied throughout the year.

Some 28 organisations, in addition to local people, used the facilities, and amongst others the camp catered for under-privileged children, school groups, youth organisations and scientific groups.

Considerable progress was made with the maintenance and restoration of the building for which the Lions are responsible and control over the use of the site has been of a high order.

Use of the camp and its immediate surrounds is controlled under a Departmental Working Plan covering the broader aspects of multiple use management for the whole Dryandra forest and has provided a good illustration of the proper integration of recreation with other forest values.

Conservation

The Department continues to play an active role in conservation of natural resources particularly with management of long term timber supply and protection of all major water supply catchment areas in the south-west division.

Other activities of interest include :

Flora Protection: The Department is responsible for adminstration of the Native Flora Protection Act and appoints honorary wardens to assist salaried staff who are "ex officio" wardens.

In keeping with the recommendations of the Road Verges Committee Report, proposals for amendments to the current Act were submitted to Cabinet. Pressure of other legislation has precluded further action.

Methods of controlling commercial picking of native flora in general, and of *Boronia megastigma* in particular, are proving effective while also providing new statistical data on which to base future flora management plans. Formal patrol by forest officers was continued during the year and served the dual purpose of confirming the low level of illegal picking, and of gaining closer co-operation with the wildflower industry.

Unique Ecotypes: Within the past five years the need for special ecological reserve areas has become more urgent as more and more crown land has been converted to mining or to farms. Small areas of virgin jarrah forest retained by previous administrators, with the advent of dieback, are now found to be inadequate.

In the past few years, parts of Russell Block (wandoo), Chariup and Perup Blocks (fauna), Soho Block (tingle), Asquith (virgin jarrah), Johnston and O'Donnell Blocks (karri, marri, jarrah, fauna), Melaleuca Park (Bassendean Dune) Milyeannup (virgin jarrah) and other areas have been allocated special management priorities or are under investigation for such purposes. Six goldfields areas have been proposed for inclusion in State Forest, and a plan to reserve the south coast as National Park has been strongly supported and promoted. An area adjacent to Boranup Forest has been requested to preserve a new species (*Eucalyptus calcicola*).

Fire Ecology : Details are reported in the Research section of this report, but the practice of prescribed burning in native vegetation is being continually investigated with respect to the effects on species viability and composition of both flora and fauna. Information and suggested methods of treatment are regularly made available to other Departments.

Recreation

The demand for recreation in the forest continues to intensify as a consequence of a mobile public with gradually increasing leisure time.

Investigation: Further visitor surveys were conducted during the year in both the Dwellingup and Manjimup regions. The Dwellingup study is mentioned in more detail in the Research section of this report, and was concerned with fishing intensity and catches for the freshwater crustacean, the Marron (*Cherax Tenuimanus*) in the Murray River.

Liaison: There was increased dialogue with representatives of the Community Recreation Council and with representatives of the active recreation groups, such as mini-bikes, trail bikes, beach buggies, trail horse riders, bushwalking, canoeists and Y.H.A. One officer represented the Scout Association at a National Conservation Seminar in Canberra.

Nature Trails: The existing self-guiding nature trials have been added to, and some of the older ones are being so heavily used that they are now being relocated. An innovation was the construction of display signs along one of the trails with coloured photographs of an array of wildflowers to aid identification in the season and to show what visitors miss in the off season. The initial examples are being tested for fading, damages and vandal risk prior to extending the range and supply of such aids.

Treasury Grant: For the first time since its inception in 1969, a special Treasury grant for tourist projects was doubled from $10 000 to $20 000. As a result of past endeavours and inflation, the situation had been reached where the former grant was being fully used in the maintenance of existing facilities. Doubling the size of the grant provided for adequate maintenance, completion of work in hand at the commencement of the financial year and for limited new works. Areas involved ranged from Melaleuca Park in Wanneroo Division to the Valley of the Giants near Walpole.

In the latter half of the year approximately $13 500 was spent on a major recreation project within the Dwellingup Division.

Bibbulmun Bush-walking Track: Some additional planning for the Bibbulmun Bush-walking Track was carried out during the year, including adjustment to the alignment to remove the track from important watersheds, to avoid areas proposed for Phytophthora quarantine and to confine it generally to areas that provide greater interest and variety of landscape for the user. The track will not be opened for general use until agreement is reached with all authorities concerned with use of the forests through which the track passes.

REFORESTATION

Hardwood Logging

During the year, 78 682 hectares of hardwood forest were logged and treated for regeneration. This was made up as follows—

Forest Type	Maiden Bush	Cut-over Bush	Total Area
	hectares	hectares	hectares
Jarrah	7 767	65 011	72 778
Karri	1 758	2 252	4 010
Marri	280	15	295
Wandoo	1 003	460	1 463
Blackbutt	32	17	49
Yellow Tingle	31	56	87
Total	10 871	67 811	78 682

Jarrah Forest

Dieback Hygiene: The main activity in this area has been to expand courses of instruction to forest use industries and to carry out a Task Force "in depth" study of the whole hygiene problem. This study is reported more fully in the Research section.

Reforestation after Mining Bauxite

In May and June 1974, a total of 88 hectares in sixteen separate bauxite pits in Alcoa's Jarrahdale and Pinjarra operations was replanted with trees raised in Forests Department and Alcoa nurseries. Seven Western Australian and eight Eastern States species were used.

An arboretum of seven Western Australian eucalypts was established in Coronation Block, and another fertiliser time trial has been established nearby.

Four hectares of an area mined by Cockburn Cement Ltd. for bauxite have been replanted with eucalypts by the Forests Department.

A rehabilitated pit near Jarrahdale has been developed by Alcoa as a picnic and barbecue area now known as Langford Park, and was officially opened to the public on 5 December, 1973.

Erosion and water pollution continue to pose problems in all mining areas and co-operative research is continuing with the involvement of Alcoa staff, officers of the Forests Department, the Soil Conservation Service, and the Metropolitan Water Board along with other interested parties.

Reforestation after Mining Gravel.

Rehabilitation of disused Main Roads Department gravel pits, visible from well-used public roads or tourist vantage points, continued during the year.

This year, rehabilitation was carried out over 30 pits in the Busselton, Manjimup and Pemberton Divisions. Tree development on pits planted in 1971, the first year of the scheme, is rapidly improving the appearance of these sites.

AFFORESTATION

Annual Programme

During the year, the annual planting target of 2 430 hectares was exceeded when 2 462 hectares were planted.

In past years, the Department has constantly mentioned the need to expand its planting programme. A recent reappraisal of the future demand for, and the likely availability of, timber supplies in Western Australia indicates that the current pine planting programme is far from adequate.

New estimates of the future hardwood yield from native forests, which were prepared for the Forwood Conference in April, 1974, show a drastic reduction in the future availability of hardwood timber in Western Australia. This is due to a number of factors including the inroads being made into the forest area by mining and public utilities such as water reservoirs and power transmission lines. "Jarrah Dieback" (*Phytophthora cinnamomi*) is another major contributing cause of this reduction in yield.

Estimates of demand for sawn timber based on a range of projections of population and per capita consumption indicates a serious shortfall in supply within twenty years. Pine plantations provide a means of meeting this deficit and the indications from the above calculations are that a planting programme of the order of 4 000 hectares per year will be required to provide self sufficiency. The current planting programme is approximately 2 400 hectares per annum.

Two major obstacles impeding the planting rate in the past have been availability of suitable land and availability of finance. Indications are that sufficient suitable land can now be found by converting poor quality and diseased jarrah forest to pine forest. Results of several years intensive research into the nutritional and drainage problems of these areas are promising and foresters are hopeful that large areas of sandy soil in the vicinity of Busselton and Collie can be successfully converted to pine forests. Environmental aspects of such a conversion are being carefully considered.

While jarrah dieback is affecting the future availability of natural hardwood, it is encouraging that to date *P. radiata* and *P. pinaster* appear much more resistant to this disease.

Current Plantation Areas

The distribution of plantation areas by Divisions as at December, 1973, was as follows—

AREAS OF PLANTATION (HECTARES)

Division	*P. radiata*	*P. pinaster*	Other species	Total
Wanneroo	319·0	13 490·0	82·7	13 891·7
Metropolitan	14·1	783·2	16·4	813·7
Mundaring	753·0	700·3	29·4	1 482·7
Kelmscott	366·7	1 111·3	9·0	1 487·0
Dwellingup	569·3	57·4	6·9	633·6
Harvey Coast	556·2	2 009·9	29·2	2 595·3
Harvey Hills	1 913·1	19·9	1·4	1 934·4
Collie	2 017·4	76·8	8·5	2 102·7
Kirup	3 577·5	78·7	5·2	3 661·4
Nannup	3 700·2	93·8	12·9	3 806·9
Busselton	690·9	1 124·6	47·7	1 863·2
Manjimup	212·7	....	....	212·7
Pemberton	269·3	17·5	27·1	313·9
Totals	14 959·4	19 563·4	276·4	34 799·2
Experimental Planting	219·3	17·5	27·1	263·9
Grand Total	15 178·7	19 580·9	303·5	35 063·1

Areas planted in 1973 totalling 2 462·8 hectares are shown below.

1973 PLANTING (HECTARES)

Division	*P. radiata*	*P. pinaster*	Other Species	Total
Wanneroo	194·3	806·9	....	1 001·2
Mundaring*	49·7	....	....	49·7*
Kelmscott	44·4	86·7	....	131·1
Harvey Hills	161·3	....	....	161·3
Harvey Coast	59·0	90·5	1·6	151·1
Collie	131·3	....	....	131·3
Kirup	403·6	....	....	403·6
Nannup	404·7	....	....	404·7
Busselton	17·3	....	....	17·3
Totals	1 465·6	984·1	1·6	2 451·3
Experimental Planting		11·5		11·5
Grand Totals	1 465·6	995·6	1·6	2 462·8

*Second rotation planting.

Private Forestry

Approximately 1 110 hectares of pine were planted by private interests in Western Australia in 1973, increasing the area of privately planted pine forest in the State to approximately 5 770 hectares.

In 1973/74 the Forests Department's information service for private planters answered 102 queries, and carried out 18 site inspections.

As a result of a number of enquiries concerning claims made by private forestry investment companies, the Forests Department is co-operating with the Consumer Protection Bureau in discussions with representatives of the various investment firms.

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Roundwood Production

Roundwood production from Departmental plantations, mainly in the form of thinnings amounted, to 123 393 m³, which was an increase of 22 973 m³ or 22·88 per cent on last year's figure. The following figures show the trend in pine log removals in recent years:

Year Ended June 30	m³ (U.B.)
1950	8 440
1955	20 131
1960	28 394
1965	48 766
1970	81 281
1971	86 245
1972	90 761
1973	100 420
1974	123 393

Removals by category and by species were as follows:—

Category	Total m³
Sawlogs	61 327
Chipwood	54 653
Peeler logs	2 462
Fence Posts and Rails	4 089
Miscellaneous	862
	123 393

Roundwood removals from the various plantations were as follows:—

Wanneroo (Gnangara)	24 556
Metropolitan (Collier and Somerville)	17 121
Mundaring	10 613
Gleneagle	195
Harvey	16 815
Collie	303
Kirup (Grimwade)	17 791
Nannup	11 557
Busselton—	7 922
Ludlow	2 891
Keenan	7 162
Pemberton	6 216
Miscellaneous	251
	123 393

Sawn production from all sources was 26 534 m³ which is an increase of 3 251 m³, on 1972/73 production.

Tree Nurseries

Hamel and Narrogin nurseries continued to supply trees to rural areas for farm and town improvement.

Increasing numbers of eucalpyt seedlings are being raised for rehabilitation planting on mined areas and on dieback affected areas in the jarrah forest.

The most popular eucalypt species sold were:—

River Gum	*Eucalyptus camaldulensis*
Tuart	*Eucalyptus gomphocephala*
Tasmanian Blue Gum	*Eucalyptus globulus*
Dwarf Sugar Gum	*Eucalyptus cladocaly xar nana*
Bald Island Marlock	*Eucalyptus lehmannii*

Departmental nurseries raised approximately five million pine seedlings in 1973 for the Departmental afforestation programme.

Approximately 150 000 pine seedlings were also sold for private planting projects.

Nursery	No. of Plants Sold				Departmental Use				Total Plants	
	Pots	Trays	Open Rooted	Total	Pines	Euca-lypts	Other	Total	No. of Species	Total
Hamel	36 839	13 379	70 179	120 397	704 398	338 235	9 710	1 052 343	230	1 172 740
Narrogin	62 672	3 450	....	66 122	....	....	1 275	1 275	105	67 397
Total	99 511	16 829	70 179	186 519	704 398	338 235	10 985	1 053 618	....	1 240 137

Mallet Plantations at Dryandra

The mallet plantations and other native forest areas in this vicinity provide a valuable haven for native fauna and flora. Protection of these areas from wildfires is essential. The Department this year carried out research work into fire behaviour and techniques for prescribed burning in the adjacent wandoo forests. A considerable area was successfully treated by prescribed burning to protect the mallet plantations and associated flora and fauna.

A useful project carried out in conjunction with the Aboriginal Affairs Department resulted in the silvicultural thinning of some 460 hectares of mallet plantation. Some 392 tonnes of mallet timber produced were delivered to a tool handle factory in the Narrogin District.

Esperance Roadside Planting

Under the guidance of a local management committee comprised of representatives of the Esperance Shire and Departments of Agriculture, Lands and Surveys, and Forests, planting proceeded in the 1973 winter for the second consecutive year since the re-introduction of the scheme. Participants planting in 1973 were given the option of planting pines or eucalypts with a levy of 10 cents per tree on the latter to subsidise the greater cost of eucalypt seedlings.

Survival rates varied from poor to very good depending upon the standard of seedbed preparation and subsequent maintenance, particularly in regard to weed and grass control.

Further discussions were held with the Shire of Ravensthorpe regarding a proposal for tree planting within that Shire. Subsequently it was agreed to implement a scheme for a period of three years with the prime objective of generating interest in tree planting and the demonstrating of species and techniques for the Shire and landowners to continue. The Ravensthorpe scheme is to be managed jointly by the Shire and Forests Department with the Department providing technical guidance in species and site selection and limited assistance with the provision of planting stock.

Inland Arboreta

Maintenance of the 56 arboreta established throughout the farming areas was continued and a new system for collating the results of regular inspections was initiated.

A system for effective and durable labelling of key species was evolved using a plastic laminate and a small engraving machine.

PROTECTION: FIRE

Area Protected

	hectares
State Forest Under Protection	1 829 634
Indigenous Forest	1 787 781
Pine Plantations	33 853
Mallet Plantations	8 000

A further 800 000 hectares of crown land and private property were indirectly protected due to their strategic importance relative to state forest or their forest value.

The Fire Season

Winter rains were above average for jarrah forest and slightly below average in karri. Spring was cool and wet with Dwellingup for example recording 17 wet days and 90 mm of rain between mid October and mid November. Summer and autumn were particularly dry with mild temperatures except for a period of exceptionally hot weather in January.

The data below were recorded for forest weather stations at Dwellingup (jarrah) and Pemberton (karri).

	Jarrah		Karri	
	Average	1973/74	Average	1973/74
Rainfall—				
Annual (mm)	1 283	1 523	1 356	1 237
October to April inclusive (mm)	273	135	295	307
Number of Wet Days—				
Annual	127	117	194	186
October to April inclusive	44	19	83	69
Temperature—				
Mean Maximum October to April °C	25·1	24·4	22·8	22·4
Days of 38° C or over (No.)	4	2	2	0
Days of 32° C or over (No.)	27	30	14	17
Relative Humidity—				
Days of 10% or less (No.)	3	1	1	0
Days between 11% and 15% (No.)	7	8	3	0
Days between 16% and 25% (No.)	25	33	8	3
Fire Hazard—				
Number of Dangerous Days	12	7	2	1
Number of Severe Days	23	18	5	7
Mean Hazard	5·4	5·7	4·4	5·6

Prescribed Burning

Indigenous Forest		
Hand burning	74 716 ha	
Aircraft burning	253 699 ha	
		328 415 ha
Advance, Top Disposal and Regeneration burning		12 035 ha
Plantations—		
Clearing burns	1 139 ha	
Burning under pine canopy	1 028 ha	
		2 167 ha
Total Prescribed Burning		342 617 ha

Despite wet conditions in early spring, an exceptionally large area of burning from aircraft was completed in late November and December, totalling 60 000 hectares more than aerial burning in 1972/73. Since its inception in 1965, aerial burning has steadily increased and now covers approximately 80 per cent of the total burning programme in indigenous forest.

Burning techniques under pine canopy were improved, resulting in a 340 hectares increase in area covered compared to 1972.

Aerial burns were completed over 19 000 hectares of crown land and state forest north of Denmark in co-operation with local Shires and the Bushfires Board. An 8 000 hectares aerial burn was undertaken in the Bindoon Training Area on behalf of the Army.

A number of flights were made with staff from the Bureau of Meteorology to evaluate weather measurements from aircraft for improving forecasts over the forest area.

Fire studies in heath fuels at Stirling National Park provided useful spread rate relationships with the jarrah forest fire behaviour tables and information on fire behaviour in scrub fuels and on steep topography. Further studies are planned in this park for 1974 in woodland fuels, on behalf of the National Parks Board.

Assistance was given to C.S.I.R.O. officers in a study of the properties of bushfire smoke. Current results indicate bushfire smoke is dissimilar to photochemical smog and unlikely to create health hazards.

Detection

Thirty-one lookout towers were manned during the fire season. The period of watch for pine plantations was, as usual, longer than for jarrah or karri forest.

	Karri	Jarrah	Pine
First Watch	23/11/73	13/11/73	12/10/73
Last Watch	18/3/74	21/4/74	3/5/74

One aircraft was used for fire spotting, replacing towers in the Pemberton area. This trial showed aircraft are more efficient in detecting small smokes and provide the additional advantages of rapid reconnaissance and reporting of fire behaviour and surrounding fuels. Improved fire spotting from aircraft was instrumental in reducing the number of damaging fires in the Pemberton area. For the 1974/75 summer, increased use will be made of aircraft for fire spotting and four aircraft will be operating between Harvey and Walpole.

Wildfire

Departmental forces attended 266 fires of which 86 were burning in private property or crown land adjacent to state forest.

Indigenous forest	104 fires burnt	1 017 ha
Pines	76 fires burnt	18·8 ha

Comparing these statistics with those of the 1972/73 summer, it is notable that in indigenous forest the number of fires was reduced by 50 per cent and the area burnt by 87 per cent. A decrease was also achieved in burnt area of pine plantation although there was an increase in the number of fires in the metropolitan plantations. Increased prescribed burning during winter within the metropolitan plantations has assisted in reducing the area burnt by summer fires.

The primary causes of uncontrolled fires were escapes from burning off and deliberate lighting. The Department's forces were instrumental in significant saves of private property from fires at Kelmscott, Dwellingup, Harvey, Collie, Manjimup and Nannup.

General

A prototype 3 000 litres fire tanker incorporating a number of new design features in the tank, pumping equipment and mountings was built in a Departmental workshop. Trials with this tanker have been successful and four more will be constructed during 1974/75.

The effectiveness of phosphate fire retardants was tested for pine and eucalypt fuels. The most positive results were obtained with mopping up operations in karri forest. The addition of retardant considerably reduced the volume of water required to douse burning logs. For *P. pinaster* plantations further work is necessary using thickening additives before retardants can be classified as fully effective. New facilities were constructed at Collie for testing and maintenance of canvas hose. These facilities will improve the servicing of hose stocks.

A new cabin and visitors' platform were erected on Gloucester tree lookout.

With assistance from officers of the Bureau of Meteorology a two day course on fire weather was conducted for forest officers.

Departmental participants at recent Victorian fire schools organised a two-day advanced fire course for senior field staff and a practical course covering fire fighting techniques was given to newly recruited officers.

Fire staff participated in regional seminars organised by the Bushfires Board at Albany and Bunbury and assisted with training courses for the Board's liaison officers.

PROTECTION : FOREST DISEASE

Jarrah Dieback

The association between the fungal pathogen, *Phytophthora cinnamomi*, and dying jarrah forest was confirmed in 1965. Since that time, research and operational procedures have been modified in an endeavour to minimise spread of the disease.

The disease presents a very serious problem and in November 1973 a departmental task force was appointed to review research findings and operational practices designed to restrict extension of the diseased area. The task force consisted of representatives of the operations, research, planning and management sections of the Department.

The major findings of the task force were—

- Though the pathogen is probably present in karri, wandoo and tuart forests, its impact in these is not significant.
- In the jarrah forest there is evidence of differential susceptibility to the disease on various landforms and the terminal impact varies from minor to severe. Mapping is required to define the location of each dieback susceptibility class and to identify protectable areas.
- In Western Australia there is little doubt that spread of the disease is dependent on both artificial and environmental factors.
- Initial infection is most commonly caused by transportation of infected soil on vehicles and heavy machinery. Natural spread of the disease is initially fairly rapid downhill from a new infection but then becomes quite slow, as the means of spread is by movement of water-borne swimming spores.
- There is a time-lag between infection and the appearance of visible symptoms, and areas which have been exposed to infection, yet appear to be disease free, need to be quarantined for a period that allows visible expression of the symptoms.

The location and boundaries of diseased areas can then be accurately mapped. Further artificial spread can be minimised by controlling vehicular movement from diseased to uninfected sites and by implementing appropriate machine cleaning procedures before entry into healthy forest.

- During the period of quarantine on apparently uninfected areas, activity in the forest should be restricted to diseased areas and to essential access along selected roads.
- Conditions favouring the activity of *Phytophthora* are moist soils with temperatures in excess of 15° C. Whilst these conditions are necessary for active growth of the fungus, it can persist in the soil for long periods irrespective of summer drought or winter cold. During summer, dry soil is less likely to be picked up by a vehicle. There is evidence that the fungus seldom survives in small quantities of soil that are dropped in positions where they will be subject to high summer temperatures and rapid desiccation.
- The disease occurs world-wide and has been the subject of intensive research for some years, but there is no known way to eliminate it on an operational scale in the field. It is possible to kill the fungus in small samples of soil by steam or chemical sterilisation. The only appropriate field control measures are those aimed at minimising artificial spread.
- The disease attacks a wide range of plants, including shrubs, herbs and trees, causing deterioration of the root system, which may kill the plant. In the south-west of Western Australia the pathogen is favoured by the susceptibility of major genera, the generally old infertile soils and the marked seasonal rainfall. This rainfall pattern causes waterlogging of lowland areas in winter and spring, followed by high moisture stress in summer. As a result, whole plant communities can be destroyed.
- The most recent estimate indicates that an area of approximately 170 000 hectares of State Forest is affected by the disease—markedly higher than previous figures. Part of the increase is due to natural and artificial spread and part to improved mapping technique. A similar area of State Forest that is not protectable from infection is believed to exist. It consists of highly susceptible sites located downslope from known infections.

Intensive research projects, which it is hoped will lead to control of spread of the disease, are continuing. Until a means of control is discovered, the disease presents a fourfold threat. It threatens forest productivity, flora reserves such as National Parks, the survival of some indigenous plant species, and through extensive loss of vegetation cover there is a serious risk within the eastern half of State Forest of increased salinity in streams feeding the major reservoirs of the south-west.

RESEARCH : SOFTWOOD SILVICULTURE

Pinus pinaster

Seed Orchard

Various combinations and levels of superphosphate, urea and vigran 9–9–9 fertilizer were applied to unreplicated blocks at Joondalup Orchard in July 1972. Immediate effects of this were apparent from the 1973 maturing crop where cone size and seed size were increased. Higher nitrogen levels were responsible for this improvement. The obvious effects of fertilizer were shown in the 1974 collection. Overall cone collection was increased by 50 per cent above the 1972 and 1973 collections. Cone sizes were larger, and a larger seed is expected. The precise merit of individual fertilizer treatments will be determined at seed extraction.

Genotype-Environment Interaction

In the past, most of the plantation area for *Pinus pinaster* has been established on the north coastal plain, where two soil types are common. Smaller areas in the south of the state have been planted, generally on soil marginal for the *Pinus pinaster* species. The importance of genotype-environment interaction and its effect on the afforestation programme have been tested. It has been found that *Pinus pinaster* families are stable and highly adaptable to environment. Only the single production population is required for the afforestation of this species in Western Australia.

Tending

Immediate past practice in the establishment of *Pinus pinaster* has been the planting of 2 250 seedlings per hectare. This was necessary to achieve a commercial crop of 750 stems. Competition for soil moisture becomes critical in the pines from age 6 to 8 years, and it is at this time that the stand is reduced by thinning to the desired number.

The full benefit from this release can only be achieved in the absence of competing, native plants, and regrowth from thinned pine stumps. A stand, recently thinned, was treated in varying degrees to remove regrowth pine coppice, and native scrub vegetation. Native plants included *Jacksonia hakeoides*, *Eucalyptus todtiana*, *Eremaea pauciflora*, *Melaleuca scabra*, *Thryptomene racemulosa* and *Stirlingia latifolia*. The effect has been tested by the monitoring of soil moisture depletion, using a neutron probe, and by measurement of pine radial increase.

The first of the following figures illustrates periodic diameter growth of nine-year-old *Pinus pinaster*, as affected by degree of site competition. Twenty-two per cent growth depression can result when severe competition is present.

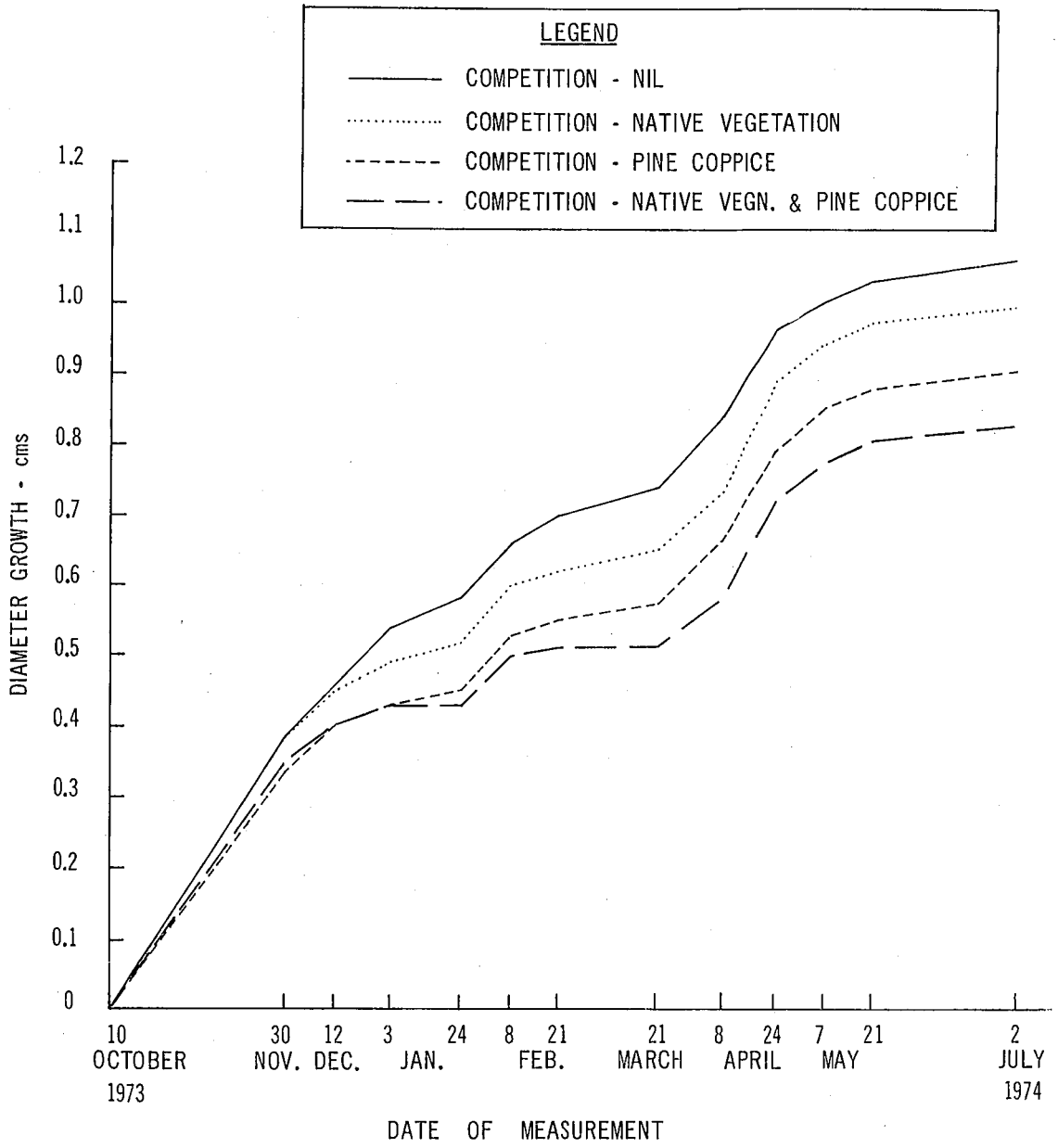


Figure 1. Diameter growth of nine year old Pinus pinaster as influenced by degree of competition from native vegetation and pine coppice.

The second figure depicts soil moisture profiles, under 4 plots on December 12, 1973. As site competition increases, less soil moisture is available to the pine stand. Adequate control of competing native vegetation, and careful attention to thinning to minimize pine regrowth, are essential to the success of this silvicultural operation. Freedom from competition is also needed to realise full benefit from fertilization.

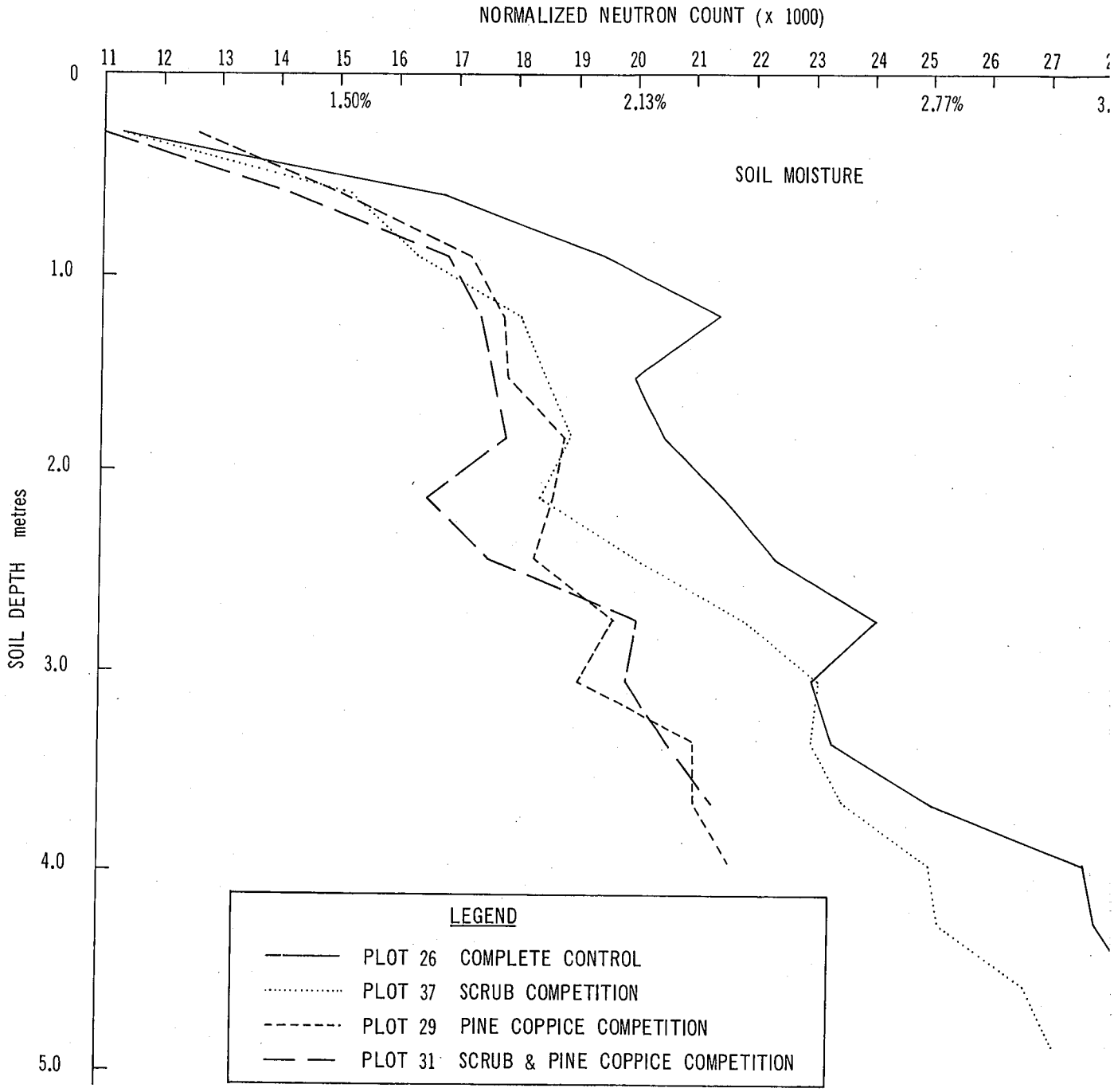


Figure 2. Soil moisture profiles on 12.12.73, illustrated for four plots.

Pinus radiata

Site Amelioration

Early growth of *Pinus radiata* on most trial plots in the "Sunkland" area south of Busselton continues to be very good. The excess soil moisture characteristic of the area appears now to be no problem except on the relatively small area of heavy-textured soils. Site preparation trials have been established to evaluate methods of overcoming this.

It is now evident that spot application of superphosphate at the time of planting is able to maintain adequate phosphorus availability for only 12–18 months and that a broadcast application of phosphate is required in the second year after planting.

Early minor element problems on most sites are posed by deficiencies in zinc and manganese, with copper being important on certain restricted soil types. A combined foliar spray of the sulphate salts of these elements in spring 1973 resulted in a marked improvement in the foliar colour of the plots planted in 1972. However, it appears from analyses of foliar nutrient contents of the 1971 plots that more than one such foliar spray will be required.

Further work on the nutrition of P. *radiata* on west coastal sands has confirmed earlier indications that the current single foliar spray plus zinc solids at planting does not provide sufficient zinc to maintain foliar zinc contents above the critical level until the nutrient recycling system stabilises. Most older stands of radiata pine on the coast are still deficient in zinc for this reason.

Fertilizer trials in pines aged from 5 to 14 years have shown that, in the short term at least, growth responses to nitrogen can be obtained but not to any other major nutrient. It would seem, therefore, that future work should concentrate on "charging up" the nutrient capital of the ecosystem during the critical first five years of the rotation.

The responses to nitrogen pose a difficult problem in management, since the responses seem to be ephemeral due to rapid leaching of the very soluble commercial nitrogen fertilisers. A more reliable slow-acting source of nitrogen would be a leguminous understorey plant. A start has been made on growing lupins under both *P. radiata* and *P. pinaster* at Myalup but there have been some establishment problems. Narrow-leafed lupins (*Lupinus angustifolius* var. "Uniwhite") have been used to provide for the possibility of the later introduction of grazing to the plantations. The first sowings in 1973 were successful but the 1974 sowings were prematurely grazed by the Western Grey Kangaroo (*Macropus fuliginosus*) and the Western Brush Wallaby (*Macropus irma*), both of which are present in these plantations in large numbers.

Integration of Pine Silviculture and Livestock Grazing

The potential of pine plantations in grassland areas for livestock grazing was further investigated by the establishment of an operational trial near Ludlow. This trial uses cattle in an area of *P. radiata* recently thinned to waste at age 6. The aim is to demonstrate their value for reducing the fire hazard through consumption of grass and trampling of the slash. Other benefits of such a management regime are expected to be:

increased early financial returns from grazing fees;

improved access for marking and pruning operations, hence lower operational costs;

more complete use of the site and therefore greater overall productivity;

some benefit to pine growth through control of grass competition and improved accession of nutrients to the site, especially if the pasture is improved.

RESEARCH : HARDWOOD SILVICULTURE

Jarrah

In view of the threat posed to the better quality jarrah forest by the dieback disease and bauxite mining, the emphasis has shifted from production aspects to rehabilitation of affected forest. In addition, major accent has been put on forest hydrology, in particular the effect of disease, mining and forest operations on quantity and quality of water yield from forested catchments.

Bauxite Mining Rehabilitation Research

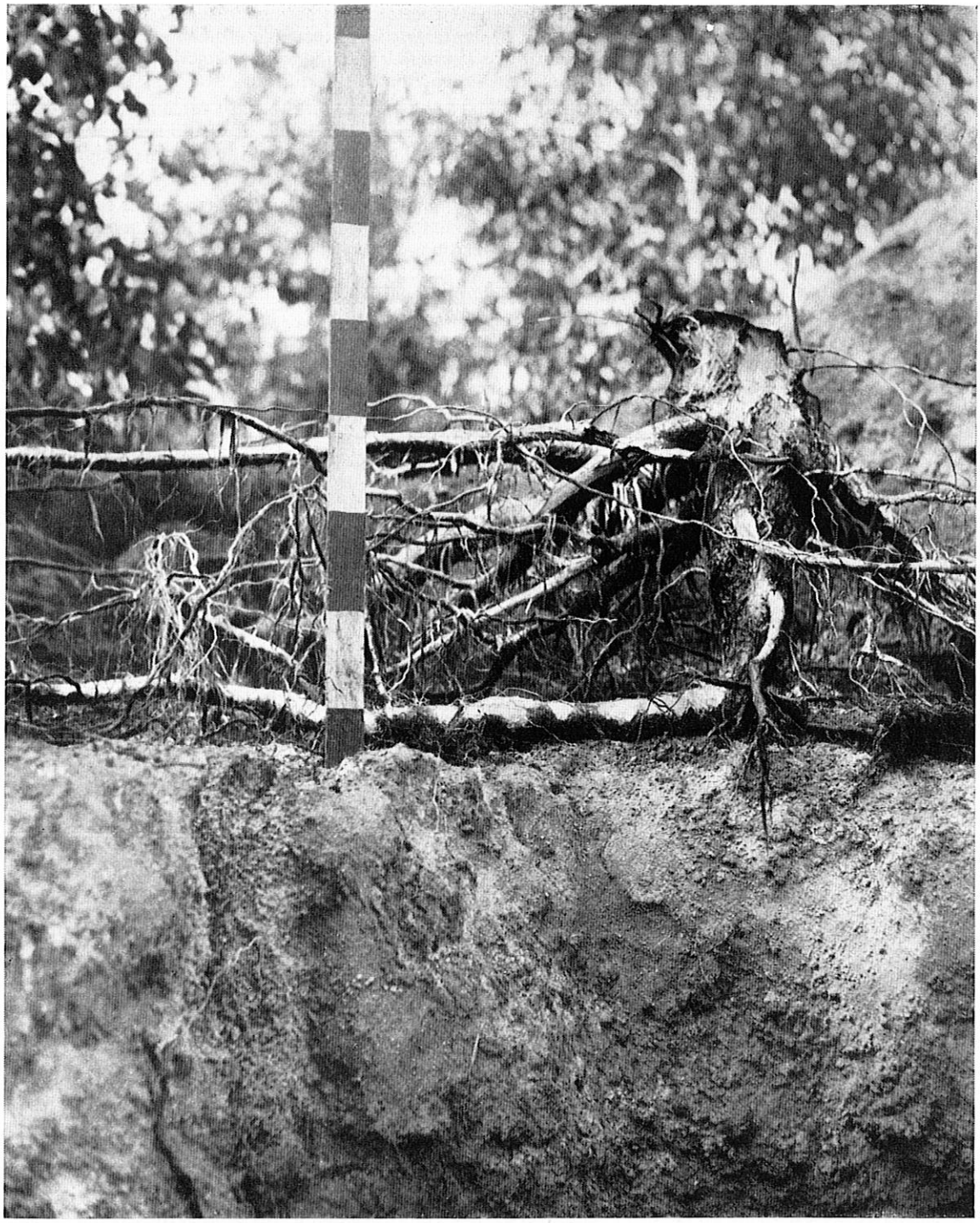
Mine Floor Stabilisation

During the period 1969–1972, annual precipitation in the Northern Jarrah Forest was abnormally low, but even under these conditions there has been considerable movement of overburden soil. Above average rainfall during the autumn of 1974 has resulted in severe erosion at the Del Park mine site. An essential prerequisite to the re-establishment of tree cover on bauxite mined sites and the maintenance of water purity is the stabilisation of the mine floor surface.

Regrowth of native shrub species in the overburden soil replaced on the mine surface is negligible. Trials have been carried out at the Del Park mine site to determine if native shrub species and introduced grasses, established by direct seeding techniques, will reduce erosion of the overburden soil. Preliminary results indicate that native legumes can be established readily on the mined-over sites. These species should greatly reduce erosion in the second year after seeding but it is unlikely that any plant cover, either native species or introduced grasses, will prevent erosion when heavy rain falls in autumn. Emphasis is being placed on native legumes as their seed is readily available, their growth rates rapid, they are adapted to fire and will improve soil fertility by their ability to incorporate nitrogen and organic matter into the soil.

Growth and Development of Tree Species on Bauxite Mined sites

Detailed growth analysis of the oldest tree species planted on mined forest areas at Jarrahdale suggests that their vigorous early growth is not being sustained. Excavation of the root systems of these trees indicate that the vigorous above-ground growth has not been balanced by an equivalent development of their root systems. Vertical root penetration varies with species and site preparation. In all situations, however, the vertical root development of the species used in rehabilitation was poor compared to that of jarrah (*E. marginata*). These studies indicate that long-term survival of the species currently being planted on bauxite pits is questionable and that they are unlikely to prevent the flow of salt into streams in areas where there is a salt store deep in the soil profile.



Root system of *E. microcorys* planted at the Jarrahdale No. 1 bauxite pit.

Jarrah Dieback

Detailed measurements of the soil micro-environment under dense stands of a native legume species have shown that the soil environment in these situations is unsuitable for the fungus causing dieback (*Phytophthora cinnamomi*). Complementary investigations of the effect of fire intensity on germination of legume seed occurring naturally in jarrah forest soils have shown that a hot autumn burn will cause germination of legumes in dense patches in forest areas previously devoid of these species. The results of these studies suggest that it may be possible to reduce *Phytophthora cinnamomi* activity in the jarrah forest by changing fire frequency and intensity.

Hydrology

Surface Salinity Sampling

The total soluble salt content of a number of streams feeding the South Dandalup reservoir and the Murray River has been determined at weekly intervals over a 12 months period. There is a progressive increase of stream salinity with increasing distance from the Darling Scarp. The data from this study have been used to delineate forest areas that are likely to yield saline water as the vegetation is removed.

Yarragil Basin Study

The catchment of the Yarragil, a stream feeding the Murray River, has been selected as a study area for detailed investigations of the relationship between vegetation, site and water quality and quantity. Preliminary sampling of stream salinity has shown a marked variation in the salt content of streams originating from different subcatchments within the basin. The long-term objective of this study is to devise practical forest management techniques that will maximise water flow and minimise salt flow from forested catchments.

Karri and Marri

Seed Forecasting

Seed sampling by telescope and by shooting down branches was done in the Walpole and Boranup area in late summer. Routine annual inspection and sampling from the crowns of recently fallen trees were completed in nearly all logging areas in June.

Some localities at Boranup and Walpole should yield ripe seed for early summer 1974/75. The present indication is for an abundant seed crop in 1975/76 followed by a medium crop in 1976/77.

Seed Collection

Plans are being made for karri seed collection in the expected heavy crop year of 1975/76. Large quantities of seed will be required over the next few years for raising planting stock and for direct seeding.

Direct Seeding

A trial of direct seeding was made on two 1·3 hectares plots near Pemberton and on a 3·7 hectares plot near Manjimup. Sowing rates of 0·4, 0·6 and 1·0 kg seed per hectare were tested. The seed was pelleted with Kaolin to 4 times its original weight for ease of handling. A fungicide and an insecticide were incorporated in the pellet. Seeding was done with hand-operated seeders. Any large-scale application of the techniques will require the use of aircraft for seeding.

The Regeneration of Karri/Marri Stands

Demonstration plots were established on March Road in 1969 to show the flexibility that can be achieved with regard to species composition when regenerating mixtures of karri and marri. These plots were reassessed in March 1974 and the results are summarised in the following table.

Object of Regeneration	Result at 5 years			
	Species	Per cent Stocking	Stems per hectare	Dominant height (m)
Karri	Karri	91	13 200	5·8
	Marri	12	360	6·2
	Total	92	13 560	
Karri/Marri Mixture	Karri	68	6 700	5·0
	Marri	38	1 090	5·9
	Total	80	7 790	

Per cent stocking is based on the percentage of ·0025 hectare sub plots containing at least one tree. This estimate includes a component of evenness of distribution of the young trees on the ground, as well as the number. A per cent stocking level of 30 per cent has been found to be adequate.

The stocking level of karri in the karri plot is more than adequate, while marri is present in very low numbers. When a mixture of the two species was aimed at, an adequate stocking was achieved. At this stage the crop can be manipulated to give any desired species ratio of karri/marri.

Although the dominant height of marri at present slightly exceeds that of karri, this situation can be expected to change rapidly.

Environmental Monitoring, Chipwood Project

Monitoring of the ecological and environmental impacts of integrated forest harvesting for timber and chipwood has been planned for the chipwood project based on Manjimup. The monitoring project encompasses a wide range of values, including stream purity, aquatic life, animals, reptiles, birds, insects and plants.

Among these values, water purity measurements have been taken over the past year and will continue. Cutting has not yet started in the chipwood project, but some indication of likely impacts on animal populations is being studied in karri forest areas that have been subjected in the past to treatment akin to chipwood cutting.

These studies have only recently been initiated and are described below.

Stream Sampling

The main creeks and rivers draining the first 15 years cutting area of the chipwood project have been sampled at 153 points during the year. Water samples were collected at fortnightly intervals and their salt content determined by the conductivity method. The data have permitted the identification of areas likely to be salt sensitive. Most are in portions of State Forest excluded from the chipwood project. Catchment studies will follow to determine the rate of salt release from the soil profile following timber harvesting.

Vertebrate Fauna

A preliminary study of the ecological effect of clear falling is being carried out in pure karri stands west of Manjimup. It is a short-term study based on a survey-type appraisal of presence or absence of fauna and will include a detailed study of vegetation species and structure. Trap success* will give a comparative idea of fauna population sizes in the different aged stands. Eight even-aged karri stands were chosen to represent the range of age classes from clear fallen coupes to virgin forest.

The areas were trapped for small mammals in May 1974. Traps were placed on an L-shaped transect, one line running along the creek and the other running at right angles to the contour lines. Elliot and breakback traps were used in a ratio of 1:3.

The results indicate the presence of the mardo (*Antechinus flavipes*) in areas of deep litter or logging trash. High trap success was achieved in the cutover, unburnt coupes, forty-year-old stands that had not been control burnt and virgin forest with no known fire history. This ties in well with research carried out in Dwellingup, where mardo populations are highest in unburnt jarrah forest and in older swamps where the ground litter is deep.

Mice (*Mus musculus*) were trapped in areas that had recently been burnt. Relatively high trap percentages were attained on the one and two-year-old regenerated areas and on the forty-year-old stand that had been control burnt about sixteen months previous to trapping.

The southern bush rat (*Rattus fuscipes*) was trapped in all areas but was restricted to the stream reserve in the one-year-old regenerated area.

The one wambenger (*Phascogale tapoatafa*) caught in the twenty-year-old stand is the only one that has been trapped by the Forests Department due to the difficulty of trapping this species.

A preliminary survey for quokkas (*Setonix brachyurus*) in an extensive area of 2-year-old karri regeneration indicated that this species is present in the riverine vegetation of drainage lines.

Insects

A system of light traps, to catch night-flying insects, and tent-type traps for day-flying insects has been tested in preparation for a study of insect populations in karri forest at various stages of regeneration.

RESEARCH : FIRE ECOLOGY

Flora Studies

Trials to relate seed production of major scrub species to site conditions and season were continued by collecting falling seed in trays. Yields were considerably smaller than in the previous year. *Acacia urophylla*, the most prolific species, yielded 12·3 million seeds/hectare (of which half were non-viable) compared with 118·6 million seeds/hectare in the previous year.

The effect of site on seed production continued to show and the range of collections on various sites were (seed in millions per hectare),

Acacia urophylla	0 — 12·30
Acacia pulchella	0·01 — 1·0
Bossiaea linophylla	0·06 — 0·43

Seed yield from an 8-year-old plot of *Acacia strigosa* was nil due to mortality and suppression by *Bossiaea laidlawiana*.

Laboratory trials testing heat treatment effects on the germination of scrub species seeds were maintained.

Fauna

Ecological Studies

Monthly surveys of the grey kangaroo and the brush and ringtailed possums were continued in the Perup Priority area. Possum numbers have shown a marked decline over the past two years.

*Trap success is measured as the number of animals caught per 100 trap nights.

More studies were made of the ecology of the woylie and tammar wallaby. Radio tracking techniques were used to supplement trapping and marking animals as an aid in the determination of territory and range. Over 100 woylie nests were located by searching. Nest building by an individual seems to be a continuous process and for each new or occupied nest found, there are up to 12 or more abandoned nests in the vicinity.

Surveys

Three exploratory fauna surveys were conducted in the Nannup pine plantations, the sunklands area near Jarrahwood, and in south-east Harvey Division and north-east Collie Division. Surveys lasted one week only at each locality and further work is required in all three to enable the preparation of a comprehensive list.

RESEARCH : PROTECTION

Southern Forests

For reasons of safety, a new area ("Sandy Hill Road") adjacent to Strickland Road was prepared for high intensity fires during summer 1973/74.

Thirteen plots of approximately one hectare each were constructed in a fuel age of approximately six years consisting mainly of netic, *Bossiaea laidlawiana*.

However, conditions for high intensity fires did not present themselves and only six fires in four plots were conducted. Of these fires, the fastest rate of spread recorded was 210 metres/hour on a 20° slope. However, the other fires did not approach this, ranging from 30 to 60 metres/hour. The search for high intensity fires to add to the karri tables is consequently not complete.

A further study to evaluate the effect of lighting intensity on fire intensity and burn-out time also remains incomplete. For reasons of space this experiment had to be conducted in Strickland Road under mild conditions prior to the close of the season. One lighting was attempted, however the fire was too wet and poor ignition was the result. The close of the burning season prevented any further work on this.

Stirling Range

Twenty-nine fires were conducted in the health-type vegetation in the Stirling Range during spring. These fires indicated a good correlation with the jarrah rate of spread index. A further analysis of results using actual fuel moisture contents and wind velocities underlined the importance of fuel moisture content on the rate of spread.

e.g. for a wind velocity of 9 km/hr

Fuel M.C. %	Rate of Spread metre/Hour
20	20
15	45
10	100
5	215

That is, for every drop of 5 per cent in the moisture content of the fuel, the rate of spread is doubled.

Because of the difficulty of predicting actual moisture contents it was considered a rainfall correction factor of the jarrah tables was a more practical approach.

The first part of a trial to calculate wetting and drying rates has been accomplished and results are being calculated now. The second part of the trial will be conducted from winter to spring.

The results from these will be used to formulate a rainfall correction factor applicable to the Stirling Ranges to be used in conjunction with the jarrah tables.

Nine fires were burnt in autumn for ecological studies.

Logging Slash Disposal

Work has commenced on investigation into conditions suitable for, and techniques required for, adequate disposal of logging slash by fire. Initial work is confined to looking at past records of karri regeneration burns from Pemberton, Walpole and Manjimup. All burns are being rated according to the adjusted fire hazard and Byram Drought Index for the day with the aim of obtaining an indication of the range of conditions in which satisfactory burns may be carried out.

No results are available to date.

Karri Fire Damage Studies—4 Mile Road

A further assessment was carried out this year.

Results indicate the stand crowns are recovering well, although the ratio of dominants to suppressed has dropped from 1:6 to 1:9. This is thought to be due to normal stand competition aided by the effect of the fire on weaker individuals.

Bark recovery following the burn is proceeding at a slow rate. On average the trees have increased bark thickness by only 2 mm for the past twelve months. At this rate it will be another 2 years before the trees reach the level they were before the burn.

Prescribed Burning: Effect on Small Sized Karri

The girth measurement analysis for the period April 1973 to April 1974 indicated no significant difference in growth between autumn burnt and control. However, a significant difference was evident between the effect of spring fires and control.

Problems have been experienced in measuring the effects of fires on trees, due to callousing, bark shed, and changes in dominance of the stand.

Enumeration of trees by size classes indicates that smaller trees are more affected, and that the fire thus has a thinning effect.

RESEARCH : SOILS AND NUTRITION

Hydrology

A major project concerned with hydrology under forest conditions commenced during the year. As a preliminary step, a detailed stream sampling programme was commenced in the Dwellingup Division to study the variations in water quality throughout the year. Weekly water samples were collected from Allan's Road, Davies, Howse and Marrinup Brooks, the Murray River, Swamp Oak and Yarragil Brooks.

Considerable variations were encountered in the quality of the water in the tributaries of the above streams.

This preliminary study has indicated which tributaries of the streams are from catchments that have sub-soil reserves of salt. Further work is in progress to attempt to relate this data to the vegetation, cutting history and geomorphology of the micro-catchments.

Following the early work at Dwellingup, the sampling programme was extended to the Manjimup Woodchip Licence area.

This area was sub-divided into three sub-regions, Donnelly-Pine Creek, Perup and Pemberton-Shannon. A routine sampling programme was carried out during the spring and summer months, and from the data the potentially highly saline areas have been identified.

A third set of samples has been collected from the "Sunkland" area of the Busselton Division Generally the quality of the water in this area is good, but two streams that contain a considerable amount of total dissolved solids have been identified.

Towards the end of the year an additional programme was commenced in the Mundaring Division and the preliminary data from this area have indicated that considerable reserves of salt are present in some of the sample areas.

Pine Nutrition

The analysis of foliar samples of *P. radiata* from the Sunkland Coastal Plain trial plots was a major project during the year.

The data from a range of plots indicate that the major deficiencies likely to be encountered in these areas would be due to phosphorus, copper, zinc and manganese.

RESEARCH : INTERDEPARTMENTAL ACTIVITY

At the instigation of the Director, Department of Environmental Protection, interdepartmental advisory committees and working groups have been created to deal with the complexities of hydrological values and land uses such as bauxite mining and the Manjimup woodchip project. Organisations involved include C.S.I.R.O., Department of Agriculture, Public Works Department (Country water supply), Metropolitan Water Supply, Government Chemical Laboratories, Geological Survey of W.A. and the Forests Department of W.A.

Recommendations have been made to the Government of W.A. concerning joint activity into both the monitoring of, and further research into, ground and stream water quality in areas subject to the land uses in question. Considerable sums of money are involved.

DWELLINGUP STREAMS

Total Dissolved Solids—mg/l

Locality	Allans Rd	Davies Brook	Marrinup Brook	Murray River	South Dandalup		Swamp Oak Brook		Yarragil Brook	
Month	6	14	2	1	1	16a	5	10	4f	4h
1973—										
July	....	131	....	1 727	43	....	....	....	....	....
August	156	118	78	1 555	74	156	157	263	120	Not Sampled
September	143	146	76	1 719	71	153	164	302	126	
October	170	165	89	1 827	80	230	177	409	151	
November	216	175	110	2 237	99	373	207	603	209	
December	273	263	113	1 868	106	491	213	888	284	179
1974—										
January	285	313	116	1 343	106	701	220	1 150	346	253
February	302	346	113	1 001	112	894	241	1 348	325	255
March	283	362	110	864	106	1 022	231	1 499	404	261
April	320	309	161	755	121	990	227	1 246	376	256
May	Not	238	139	3 448	97	694	202	1 032	235	188
June	Sampled	170	87	2 346	70	175	158	389	125	112

A text entitled "Report on a Study of Land Use and Salinity in the Manjimup Area" has been submitted by a working group to the parent committee.

Recognition that the maintenance of fresh streamflow is a complex problem involving the whole range of land uses and their appropriate authorities is most welcome.

UTILISATION

Timber Seasoning

Investigations have been continued into the problems of high temperature (120°C) kiln drying of juvenile pine wood. Basic design procedures for determination of process details have been established in consultation with Forest Products Laboratory, Division of Building Research, C.S.I.R.O. and these have been circulated to the industry. Inspection of several high temperature kilns in the Eastern States has shown that the major problem is that of providing an economical, heat efficient and durable structure. No commercial or experimental plant in Australia can yet be regarded as meeting an acceptable specification.

Basic evaluation of the problem suggested that Nervi's *ferro cimenti* as used industrially in Italy, and now commonly in boat building, offered all the required features. A ferro cement model with walls 19mm thick, stiffening ribs and radiused arrises was therefore made and tested for three weeks in a Besser brick autoclave used for daily charges of concrete blocks. At each heating the temperature reached 185°C. At the end of the treatment, alternating expansion and contraction had not caused any apparent degrade and the cement had been improved by steaming.

A suitable full-scale structure can be designed to be self-supporting or it can be slung from external metal or wooden framing. Fibreglass or other insulation can be readily attached outside.

Final analysis was made of a test on 125 x 75 mm jarrah joinery stock aimed at assessing the merits of several sawing and stacking procedures in control of checking during seasoning. This is the last of the seasoning tests started in collaboration with C.S.I.R.O. Forest Products Laboratory to reduce degrade in seasoned jarrah, particularly of wood from *Phytophthora*-affected trees. Conclusions from testing are that standard practice remains the best, namely:

- Sawing of dieback-affected trees should as far as practicable be carried out in late autumn, winter and spring.
- Normal sawing and stripping practice should be followed.
- Effective cover from sun and rain must be provided at all times.
- On completion of seasoning, timber should be block stacked under shed cover.

Timber Preservation

The testing of timber treated against *Mastotermes darwiniensis* was advanced by the installation late in 1973 of plots adjacent to the Pilbara iron ore railways and in Darwin. This second stage has been designed to test several termiticides to determine that most economical and effective. It also exposes to attack pine treated with dieldrin and copper-chrome-arsenic. All the plots, including Stage I plots in Darwin and Port Hedland, were examined in June this year by members of the W.A. Sleeper Technical Group.

It begins to appear from the Stage I test that the plot at the Mt. Newman 16 km yard has been in effect a forced feeding test because of earlier build up of population in large stacks of old sleepers (since removed), and that the Darwin site offers a more normal exposure, which must still, however, present a vastly greater termite hazard than the high cut and fill situations typical of the sites carrying

most of the sleepers in the Pilbara. Whilst not perfect, a simple dieldrin-creosote-oil impregnant in karri and jarrah in Darwin is doing an effective job, suggesting that control of *Mastotermes* in the iron ore railways may not be as difficult as was earlier thought. It already appears from the Stage 2 test, young though it is, that *Matotermes* has little respect for arsenic at the test concentrations used. As suggested in the 1973 Annual Report, weathering and mechanical breakdown remain the major enemies that can be resisted by oil treatments (including a termiticide).

Many treated karri and some jarrah sleepers were dissected during the year to determine depth and uniformity of oil-creosote treatment achieved in commercial practice. It was found that when the outer black skin of ½ to 1½ mm had been removed by a thicknessing machine from tangential or radial surfaces, there was very little penetration indeed, and the area available for termite invasion was large. Bleeding of free oil from surface checks and incisions over the clear area was very rapid and this is no doubt a most important feature contributing to the fairly creditable performance in the Stage 1 test.

The dissections made it apparent that any specification that calls for "uniform penetration to a depth of —" is unrealistic for these species when treated at 1:4 M Pa. Kiln-dried karri crossarms treated at 7 M Pa showed much better end penetration but side penetration was quite often no better than at the lower pressure.

Railway Sleepers

An offshoot from the C.S.I.R.O. Forest Products Conference, namely the W.A. Sleeper Technical Group, met several times during the year to decide details for testing procedures and formal examination of tests. Details for test against *Mastotermes* were also worked out and agreements reached regarding public statements in those fields that could affect the interests of railway, mining and timber organisations.

West Australian representatives took part for the first time in inspection of the two sleeper test plots in the Trans Australia Railway. The test, now twenty-two years old, is the oldest in Australia and contains creosote and oil treated karri (*E. diversicolor*) as well as untreated wandoo, blackbutt and jarrah. Of the untreated species, wandoo (*E. wandoo*) is best, then blackbutt (*E. patens*), then jarrah (*E. marginata*). The karri was treated at 7 M Pa with creosote and also creosote/fuel oil 30/70 and it is in excellent condition, apparently likely to last as long as the wandoo. An estimate for its average life is about 2 000 million tonne years.

Engineering

An interesting design requirement arose this year from the need for steel reinforcing to the top of the Gloucester Tree fire lookout. The cause of gradual deterioration in karri lookout trees is that moisture sometimes seeps into the drilled holes into which ladder rungs are driven, starting decay of inner heartwood. The tendency of sapwood to die downwards from the crown on which the lookout cabin is built increases the possibility of rot commencing. Regular inspections are made and early remedial measures taken to maintain safety. When beyond remedial action, the tree is abandoned, as at Beard Lookout, which was felled and replaced with a 65 metre steel tower. Dissection of the felled tree showed that a considerable margin of safety had existed.

Other interesting structures were pine roof trusses for Bunbury Council band room and nail-laminated bowstring trusses for Busselton Tourist Welcome display.

Numerous minor design projects included apple bins for the Department of Agriculture, fibreglass fire-fighting tanks, steel portal frame sheds and pine box beams for domestic architecture. Usual assistance in matters of timber technology was given to other Departments, industry and the public.

Departmental Sawmills

All Departmental Sawmills were maintained in continuous operation. A power feed resaw with push-button fence setting was designed to improve recovery at Busselton. Fully detailed workshop drawings of this machine, as of all our other mechanical and structural designs, are available at nominal prices.

Other additions during the year were a moulding knife copy grinder at Ludlow and a log yard winch at Grimwade.

Committees and Conferences

The Australian Standard for the Preservative Treatment of Sawn Timber, Veneer and Plywood was published during the year. A meeting to define the limits for the extension of the Light Timber Framing Code was attended.

EDUCATION AND PUBLICITY

Publicity

A new Information Sheet series for general distribution was initiated during the year, and by June, 1974, the first twelve Information Sheets had been published. Ranging in size from one to five pages, the sheets included subjects as varied as : Tall Trees, Bushfire Survival, Jarrah Root Rot, Pine Plantations of W.A., and Mammals and Birds of W.A. Forests.

A further three issues of the Department's magazine Forest Focus were published, the feature articles being : Land use Conflicts in the Northern Jarrah Forest (11), Marri Woodchip Project (12), Fire in the South-West Forest Ecosystems (13).

Detailed reports for limited external distribution were compiled : Marri Woodchip Project—Environment Impact Statement, Proposals for the Reservation of some Inland Ecotypes, and Landscape Plan for the Blackwood Valley area.

The Department participated in numerous displays during the year. One of the main display themes used was a 4·5 metres forest fauna and fire ecology display unit produced originally for the 1973 ANZAAS Conference and Wild Life Show. The unit provided back-up material for the Perth Royal Show and was subsequently used at other metropolitan and country displays.

Education

Departmental Officers were committed to a number of relatively formal educational duties during the year, including Cadets at Mt. Lawley Technical School, a new intake at both Mt. Lawley and for the first time at Bunbury Technical School.

A University Extension course entitled Forests and the Natural Environment was conducted early in 1974 at the University of W.A.

Several officers attended short courses in management or computer programming and there were a number of in-service courses conducted at Dwellingup and other south-west centres.

Public Enquiries

Continued growth occurred in the number of enquiries from the general public, from other Government Departments and from organisations or special interest groups.

Display material was mounted at the Royal Show and at centres as divergent as Dowerin and Jerramungup.

Over 50 talks were given to various professional bodies, interest groups and schools.

Library

During the year the book stock was re-organised to facilitate easy and more effective use of the material. This was made possible by the addition of a further 9·14 m of jarrah-veneered shelving.

With the gradually changing patterns of library use and administration, some previously utilised statistical systems will need modification to continue to provide meaningful analyses of current library activities. An indication of the demand for library services follows.

Journal circulation	9 415
Requests from accession lists	1 755
Loans	2 386
Queries	784
Accessions	426
Loans from other libraries	430

ACCIDENT PREVENTION (SAFETY)

During the year, the average workforce of 919 officers and employees sustained 45 disabling injury accidents and a further 119 serious injury accidents necessitating medical attention resulting in no other lost time.

The *frequency rate*, expressed as accidents sustained per million man-hours worked, was 27 and the man-days lost due to these accidents totalled 279. An additional 80 man-days were lost through re-occurrence of previous injuries needing further medical treatment, bringing the annual total to 359 days.

The eight year accident summary that follows illustrates the success achieved in reducing the incidence and severity of work-caused injury by implementation of the accident prevention programme. It also indicates 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.

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	1 701	14	900
1968/69	2 019 568	96	155	251	48	76	124	1 738	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	155
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. —Man-hours worked.
D.I.A. —An accident resulting in loss of 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. —Frequency rate.
DURATION RATE—Average days lost per D.I.A.
SEVERITY RATE —Total days charged per million manhours worked.

By comparison with the figures for 1972/73 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 man-days lost, indicating continuing success in reducing the severity of D.I. Accidents.

STAFF MATTERS

Public Service Act

Mr. P. J. McNamara was promoted to the new position of Assistant Conservator.

Mr. F. J. Campbell was promoted to replace Mr. McNamara as Chief of Division.

The following officers were promoted to Senior Divisional Forest Officers :

F. Batini, D. J. Keene, F. J. Bradshaw and R. J. Underwood.

The following officers were promoted to Divisional Forest Officers :

G. W. Heberle and I. D. Scambler.

The following were appointed as Assistant Divisional Forest Officers :

P. Ritson, P. Stirling, R. Chandler and Miss K. Pentony.

Assistant Divisional Forest Officer A. R. Gobby resigned to take up an appointment with the South Australian National Parks and Wildlife Service.

Ken Godwin was awarded the W. J. Kirkby Memorial Award by the Australian Institute of Cartographers W.A. Division for the most outstanding Cadet of his year.

Forests Act

Mr. F. H. Pridham was reclassified as Senior Forester.

Mr. J. A. Dearle was promoted to District Forester.

District Forester A. Hancock and Forester T. Mavric retired during the year.

Appointments to the permanent staff included 12 Technical Assistants, 3 Forest Assistants, 4 Laboratory Assistants and 6 Clerical Assistants.

The following resignations were received during the year—1 Forest Officer, 1 Technical Officer, 8 Technical Assistants, 7 Clerical Assistants, 2 Forest Rangers, 3 Laboratory Assistants and 1 Forest Assistant.

Visits

Eleven officers attended a combined total of 14 interstate and 3 overseas conferences, courses and study meetings during the year, involving such subjects as woodchips, rail sleepers, fire ecology, softwoods, forest protection, and Australian Forestry Council meetings.

APPENDIX 1A

Statement of Revenue and Expenditure of the Consolidated Revenue Fund for the year ended 30th June, 1974

1972/73	Revenue	1973/74	1972/73	Expenditure	1973/74
	Royalties				
2 545 107	Logs	3 048 698	769 509	Salaries	910 172
54 037	Sleepers	40 130	120 571	Incidentals	145 038
2 167	Sawn Timber	860	6 047	Timber Industry Regulations Act	9 203
136 996	Poles and Piles	131 152	197 581	Hardwood Conversion	208 465
5 894	Mining Timber	5 183	1 142 775	Pine Conversion	1 426 411
19 959	Firewood	18 588	150 258	Recoupable Projects	171 136
22 948	Posts	21 462	61 601	Tree Nurseries	47 770
20 642	Sandalwood	26 636	9 974	Arboreta	20 003
8 404	Miscellaneous	8 898	8 000	Printing and Stationery	12 000
			4 307	Metric Conversion	9 605
2 816 154		3 301 607	7 899	Transfer of Mining Compensation	5 162
			....	Road Verges Committee	955
	Pine Conversion		....	Timber Industry Promotion	27 001
548 834	Pine Logs	705 110	....	Share of Revenue from Somerville Plantation Paid to University	5 010
657 402	Sawn Pine	885 344			
1 206 236		1 590 454		*Excess of Revenue over Expenditure distributed as follows*	
			2 239 626	9/10 to Reforestation Fund	2 726 710
	Hardwood conversion		321 556	Transferred to Treasury	276 273
101 935	Sawn Hardwood	154 601			
133 036	Logs	157 520			
862	Posts, Poles and Piles	2 473			
235 833		314 594			
	Other Sales and Fees				
43 245	Seeds and Trees	57 165			
57 102	Inspections Fee	56 280			
23 490	Rents and Leases	23 288			
398 248	Miscellaneous	436 277			
78 988	Compensation—Mining and other	51 625			
601 073		624 635			
	Recoupable Projects				
83 409	Specific Roads	76 588			
96 999	Other	93 036			
180 408		169 624			
5 039 704		6 000 914	5 039 704		6 000 914

APPENDIX 1B

Forest Improvement and Reforestation Fund Account and General Loan Funds for the year ended 30th June, 1974

1972/73	Source of Funds	1973/74	1972/73	Expenditure	1973/74
				Divisional	
916 010	Balance as at 1st July	1 598 757	2 018 204	Wages, materials, etc. excluding Plant	2 240 391
2 239 626	9/10 Revenue	2 726 710		*Head Office*	
127 270	Rents	140 728	1 570 347	Salaries and Allowances	1 872 913
270 244	Commonwealth Aid Road Grant	227 428	84 419	Incidentals	88 873
558 000	Commonwealth Government Softwood Forestry Agreement	415 714	221 652	Plant and Vehicles	270 460
			636 711	Plant Operations	777 791
1 900 000	General Loan Fund	1 700 000	132 544	Purchase of Land	7 566
14 000	Aboriginal Training Scheme Advance	7 000	80 016	Fire Equipment	147 557
7 899	Mining Compensation Grant	5 162	25 447	Head office Housing and Building	79 560
			34 586	Como Headquarters	55 815
			29 646	Communications	25 820
			39 431	Research	44 563
			12 868	Drafting	14 382
			10 029	Surveys	12 675
			3 695	Training of Staff	17 702
			146 387	Insurances	127 341
			131 910	Pay Roll Tax	196 085
			11 625	Utilisation	15 114
			8 880	Special Projects	....
			....	Aboriginal Training Scheme	17 649
			3 180 193		3 771 866
			5 198 397	TOTAL	6 012 257
			764 105	*Less* Recoups	604 339
			4 434 292		5 407 918
			1 598 757	Balance working account	1 413 581
6 033 049		6 821 499	6 033 049		6 821 499

APPENDIX IC

Statement showing distribution of Forests Department Expenditure

	$
Consolidated Revenue Fund	2 997 931
Reforestation Fund	3 707 918
General Loan Fund	1 700 000
	$8 405 849

Distribution of Expenditure	$
1 Busselton	643 891
2 Mundaring	364 300
3 Dwellingup	711 936
4 Collie	431 278
5 Kirup	702 473
6 Manjimup	635 016
7 Narrogin	86 432
8 Kelmscott	242 618
9 Collier	17 750
10 Harvey	870 067
11 Pemberton	465 991
12 Nannup	413 650
13 Walpole	229 805
14 Kalgoorlie, Esperance	45 461
15 Wanneroo	709 988
16 Somerville	206 302
Head Office	1 628 891
	$8 405 849

APPENDIX 2A

Exports *from Western Australia of Timber, Tanning Substances and Essential Oils for the Year ended June 30, 1973*

	Item and Destination	Quantity	Value
		m^3	$
1	Sawlogs and Veneer Logs, in the rough or roughly squared—conifer	....	....
2	Sawlogs and Veneer Logs, in the rough or roughly squared, non-conifer (including poles, piling, posts and other wood in the rough)		
	Interstate—		
	Victoria	87	3 573
	South Australia	21	965
		108	4 538
3	Sleepers—		
	Interstate—		
	South Australia	7 283	436 936
	Northern Territory	30	1 812
		7 313	438 748
	Overseas—		
	Germany, Federal Republic	31	2 206
	Hong Kong	747	54 063
	Israel	2 662	213 755
	South Africa, Republic of	285	20 188
	United Kingdom	26 634	2 190 368
		30 359	2 480 580
	Timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm—non-conifer		
4	Jarrah (*a*)—		
	Interstate—		
	New South Wales	1 298	84 490
	Victoria	5 660	297 085
	Queensland	22	2 250
	South Australia	18 269	864 707
	Northern Territory	429	32 331
		25 678	1 280 863
	Overseas—....		
	Bahrain	5	1 189
	Canada	5	598
	Christmas Islands	6	764
	Germany, Federal Republic of	405	32 380
	Iran	50	5 880
	Italy	80	5 985
	Japan	23	1 621
	Mauritius	22	2 166
	New Zealand	492	30 658
	South Africa, Republic of	1 204	86 726
	South West Africa	4	366
	United Kingdom	2 674	221 832
	U.S.A.	45	4 890
		5 015	395 057
5	Karri (*a*)—		
	Interstate—		
	New South Wales	9 021	404 071
	Victoria	159	9 849
	South Australia	17 316	817 916
	Northern Territory	1 877	135 532
		28 373	1 367 368
	Overseas—		
	Belgium-Luxemburg	179	14 044
	Canada	133	10 828
	Germany, Federal Republic of	651	51 403
	Greece	145	9 507
	Japan	119	9 367
	Mozambique	5	480
	Netherlands	70	5 392
	New Zealand	2 702	177 227
	South Africa, Republic of	985	71 444
	South West Africa	15	1 280
	United Kingdom	691	48 991
	U.S.A.	337	31 731
		6 032	431 694
6	Other—		
	Interstate—		
	South Australia	6	844
		6	844
	Overseas—		
	Japan	4	62
	New Zealand	1	330
		5	392

	Item and Destination	Quantity	Value
		m^3	$
	Timber (including blocks, strips and friezes for parquet or wood block flooring, not assembled), planed, tongued, grooved, rebated, chamfered, V-jointed, beaded, centre beaded or the like, but not further manufactured—		
7	Flooring—		
	Interstate (*b*)—		
	New South Wales	3 382	240 303
	Victoria	1 830	166 153
	South Australia	1 938	117 877
	Northern Territory	916	123 990
		8 066	648 323
	Overseas (*c*)—		
	United Kingdom	14	2 348
		14	2 348
8	Other (*d*)—		
	Interstate		
	New South Wales	70	5 072
	Northern Territory	15	3 215
		85	8 287
	Overseas—		
	Canada	....	40
	Greece	86	8 992
	Israel	....	40
	Maritius	....	40
	Netherlands	....	40
	New Zealand	....	200
	South Africa, Republic of	....	160
	United Kingdom	402	17 593
	U.S.A.	5	490
		493	27 595
	Total Timber Items 1-8	111 547	7 086 637
		m^2	
9	Wood, sawn lengthwise, sliced or peeled, but not further prepared, veneer sheets and sheets for plywood, of a thickness not exceeding 5mm—plywood, blockboard laminboard and the like ; inlaid wood, cellular wood panels, whether or not faced with base metal—		
	Overseas—		
	Cocos Island	21	75
	Norway	74	156
	United Kingdom	469	1 902
	U.S.A.	15	248
		579	2 381
10	Reconstituted wood (also known as particle board, chipboard, sliver board, shaving board, flake board, residue board and wood waste board).		
	Overseas—		
	Hong Kong	20 770	22 931
	Indonesia	2	170
	Singapore	86 548	112 914
	United Kingdom	1	5
		107 321	136 020
	Total Timber Exports on this Return	....	7 225 038
11	Casks, Vats, Barrels, etc, Empty (*e*)—		
	Overseas—		
	United Kingdom	....	8 833
		....	8 833
12	Manufactures of Wood (except furniture), N.E.I. —		
	Interstate—		
	New South Wales	....	548 058
	Victoria	....	1 077 183
	Queensland	....	16 762
	South Australia	....	617 331
	Tasmania....	....	30 022
	Northern Territory	....	125 301
		....	2 450 657

APPENDIX 2A—*continued*

Exports *from Western Australia of Timber, Tanning Substances and Essential Oils for the year ended June* 30, 1973

	Item and Destination	Quantity	Value
	Overseas—		
	Iceland	....	6
	Iran	....	619
	Japan	....	614
	Kuwait	....	266
	Sweden	....	3 994
	Union of Arab Emirates	....	11
	United Kingdom	....	4 608
	U.S.A.	....	4 960
		....	15 078
13	Tanning Substances of Natural origin	N.R.S.	N.R.S.
14	Essential Oils ; concretes and absolutes, resinoids—	kg	
	Interstate—		
	New South Wales	6 022	17 765
	Victoria	23 849	58 650
	Queensland	45	124
	South Australia	7 854	21 301
	Northern Territory	65	68
		37 835	97 908

Item and Destination	Quantity	Value
	kg	$
Overseas—		
France	837	14 603
Germany, Federal Republic of	12 930	24 091
Hong Kong	339	5 369
Italy	8 590	71 552
Japan	1	1 380
Malaysia	243	1 305
Netherlands	2 642	3 257
Singapore	12 882	26 769
Sri Lanka	5	80
Switzerland	4 229	5 268
United Kingdom	21 704	61 907
U.S.A.	16 819	64 247
	81 221	279 828
Total value of exports on this return	....	**10 077 342**

(*a*) Excludes timber cut to size for making boxes or staves (included in Item 6).
(*b*) Relates to interstate exports or non-conifer flooring only; interstate exports or conifer flooring included in Item 8.
(*c*) Relates to overseas exports of conifer flooring only; overseas exports of non-conifer flooring included in Item 8.
(*d*) See footnotes (*b*); item also includes conifer timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm.
(e) Interstate exports included in item 12.

" N.E.I. " means " not elsewhere included ".
" N.R.S. " means " not recorded separately "
Basis of value—F.O.B. at point of final shipment.
(Information supplied by the Australian Bureau of Statistics)

APPENDIX 2B

Imports *into Western Australia of Timber, Timber Products, Tanning Substances, Essential Oils and Paper Products for the Year ended June 30, 1973*

	Item and Origin	Quantity	Value
		m^3	$
1	Sawlogs and veneer logs, in the rough or roughly squared, non-conifer, (including poles, piling, posts and other wood in the rough) (*a*)—		
	Overseas—		
	Timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm—	(b)	(b)
	Conifer (*c*)—		
2	Redwood—		
	Overseas—		
	U.S.A.	103	13 007
		103	13 007
3	Douglas Fir (*d*)—		
	Overseas—		
	New Zealand	9	511
	U.S.A.	920	79 782
		929	80 293
4	Other—		
	Interstate—		
	Victoria	3	722
	South Australia	356	26 985
		359	27 707
	Overseas—		
	Germany, Federal Republic of	....	176
	U.S.A.	149	18 232
		149	18 408
5	Timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm—		
	Non-conifer (*c*)—		
	Interstate—		
	Tasmania	26	1 910
		26	1 910
	Overseas—		
	France	7	152
	Germany	....	6
	Indonesia	3 173	141 453
	Ivory Coast	78	6 876
	Malaysia	20 473	1 320 009
	New Zealand	49	3 848
	Phillipines	42	3 174
	Singapore	180	12 946
	Thailand	239	44 244
	Yugoslavia	11	1 482
		24 257	1 534 190
6	Shooks and staves, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm (*f*)—		
	Overseas	....	....
7	Wooden Beadings and Mouldings (including moulded skirting and other moulded boards) (*g*)—		
	Overseas—		
	Italy	....	307
	Malaysia	....	4 184
	Singapore	....	3 183
	Taiwan	....	604
	United Kingdom	....	22 958
		....	31 236
	Timber (including blocks, strips and friezes for parquet or wood block flooring, not assembled), planed, tongued, grooved, rebated, chamfered, V-jointed, beaded, centre-beaded or the like, but not further manufactured—		
8	Flooring (*h*)—		
	Overseas—		
	Sweden	42	2 906
		42	2 906
9	Other—		
	Overseas—		
	Malaysia	411	49 945
	New Zealand	19	6 233
	Singapore	48	7 260
	U.S.A.	....	202
		478	63 640
	Interstate (*i*)	....	....
	Total Timber Items 2-9	....	**1 773 121**

	Item and Origin	Quantity	Value
		m^2	$
10	Wood, sawn lengthwise, sliced or peeled, but not further prepared, veneer sheets and sheets for plywood of a thickness not exceeding 5 mm ; plywood, blockboard, laminboard and the like ; inlaid wood, cellular wood panels, whether or not faced with base metal—		
	Interstate—		
	New South Wales	96 985	179 577
	Victoria	59 135	115 959
	Queensland	234 286	522 472
	South Australia	21 067	14 315
	Tasmania	161	451
		411 634	832 774
	Overseas—		
	China, People's Republic	1 884	795
	Denmark	2 212	712
	Fiji	329 035	44 532
	Germany, Federal Republic of	64	593
	Japan	11 441	16 388
	Malaysia	7 936	9 231
	Netherlands	8 610	2 703
	Phillipines	3 519	1 648
	Singapore	89 720	63 238
	South Africa, Republic of	92 142	17 768
	Sweden	353	502
	Taiwan	131 776	78 060
	Thailand	576	755
	United Kingdom	10 920	4 836
	U.S.A.	1 769	1 664
		691 957	243 446
11	Reconstituted wood (also known as particle board, chip board, sliver board, shaving board, flake board, residue board and wood paste board)—		
	Interstate—	712 356	1 420 508
		712 356	1 420 508
	Overseas—		
	Finland	196	170
		196	170
	Total Timber Items 10, 11	**1 816 143**	**2 496 898**
12	Match Splints (G)—		
	Overseas—		
	Finland	....	72 390
		....	72 390
13	Rulers, Wooden (*a*)—	No.	
	Overseas—		
	China, People's Republic	16 800	1 217
	Germany, Federal Republic of	280	89
	Hong Kong	600	182
	India	526	117
	Italy	540	313
	Japan	642	360
	Netherlands	2 160	715
	Sweden	260	26
	United Kingdom	7 595	7 355
		29 403	10 374
14	Table Mats, Wooden	N.R.S.	N.R.S.
15	Wood Flour (*j*)	....	....
16	Manufactures of Wood (except furniture), N.E.I. (*k*)—		
	Interstate—		
	New South Wales	....	747 435
	Victoria	....	444 891
	Queensland	....	9 457
	South Australia	....	112 121
	Tasmania	....	54 376
		....	1 368 280
	Overseas—		
	Austria	....	55
	Canada	....	729
	China, People's Republic of	....	8 266
	Czechoslovakia	....	929
	Denmark	....	1 417
	Finland	....	4 680
	France	....	536
	Germany, Federal Republic of	....	10 509
	Greece	....	11
	Hong Kong	....	11 138
	India	....	15 278
	Indonesia	....	1 417
	Israel	....	578
	Italy	....	4 178
	Japan	....	15 484
	Kenya	....	8
	Malaysia	....	2
	Mexico	....	556
	Netherlands	....	118
	New Zealand	....	6 523
	Norway	....	702
	Pakistan	....	37

APPENDIX 5

SUMMARY OF LOG VOLUMES PRODUCED IN WESTERN AUSTRALIA SINCE 1829

Year	Crown Land* m³	Private Property m³	Totals m³
1829–1916†	....	....	18 783 746
1917 (*a*)	547 513	60 732	608 245
1918 (*b*)	217 088	14 300	231 388
1919 (*c*)	566 033	96 018	662 051
1920	801 235	163 205	964 440
1921	830 029	198 763	1 028,792
1922	1 022 986	442 929	1 465 915
1923	759 183	279 435	1 038 618
1924	1 189 566	264 588	1 454 154
1925	1 241 348	513 789	1 755 137
1926	1 382 689	709 065	2 091 754
1927	1 327 857	888 005	2 215 862
1928	1 211 565	660 832	1 872 397
1929	914 446	314 322	1 228 768
1930	896 446	330 030	1 226 476
1931	533 056	344 046	877 102
1932	332 558	116 564	449 122
1933	372 851	69 572	442 423
1934	602 171	179 277	781 448
1935	777 618	324 314	1 101 932
1936	889 265	380 512	1 269 777
1937	897 853	450 350	1 348 203
1938	898 805	451 108	1 349 913
1939	828 293	313 956	1 142,249
1940	783 334	258 832	1 042 166
1941	795 486	291 384	1 086 870
1942	754 350	159 538	913 888
1943	668 491	122 426	790 917
1944	630 191	126 200	756 391
1945	622 190	122 046	744 236
1946	598 302	155 260	753 562
1947	621 583	221 801	843 384
1948	630 158	251 252	881 410
1949	573 814	277 941	851 755
1950	597 018	281¡293	878 311
1951	719 086	303 394	1 022 480
1952	819 653	338 093	1 157 746
1953	969 207	368 766	1 337 973
1954	1 061 602	384 076	1 445 678
1955	1 061 084	430 335	1 491 419
1956	1 127 457	390 061	1 517 518
1957	1 116 547	328 097	1 444 644
1958	1 106 448	351 096	1 457 544
1959	1 147 908	389 576	1 537 484
1960	1 101 140	340 337	1 441 477
1961	1 069 159	306 388	1 375 547
1962	1 111 377	277 232	1 388 609
1963	1 095 183	278 430	1 373 613
1964	1 116 688	289 430	1 406 118
1965	1 173 320	277 985	1 451 305
1966	1 195 807	286 196	1 482 003
1967	1 159 464	282 291	1 441 755
1968	1 231 517	228 281	1 459 798
1969	1 143 705	160 771	1 304 476
1970	1 121 396	175 686	1 297 082
1971	1 145 161	161 990	1 307 151
1972	1 096 236	106 993	1 203 229
1973	1 060 359	102 992	1 163 351
1974	1 084 463	91 884	1 176 347
Total	....	....	87 617 149

* Includes State Forest, Timber Reserves, Crown Land and Private Property (Timber Reserved).
† Estimated.
(*a*) Year Ended 31st December.
(*b*) Six months ended 30th June.
(*c*) Year ended 30th June—from 1919 onwards.

26407/8/74—750

WILLIAM C. BROWN, Government Printer, Western Australia

Imports *into Western Australia of Timber, Timber Products, Tanning Substances, Essential Oils and Paper Products for the Year ended June 30, 1973*

	Item and Origin	Quantity	Value
		No	$
	Phillipines		54 591
	Poland		201
	Portugal		1 217
	Singapore		3 008
	Spain		7 451
	Sri Lanka		77
	Sweden		32 409
	Switzerland		74
	Taiwan		93 483
	Thailand		31 978
	United Kingdom		11 727
	U.S.A.		3 562
	U.S.S.R.		125
	Yugoslavia		714
	Orgin Unknown		12
		....	323 780
17	Furniture, wood or wooden frames (*l*)—		
	Interstate—		
	New South Wales		285 515
	Victoria		610 495
	Queensland		1 777
	South Australia		909 866
		....	1 807 653
	Overseas—		
	China, People's Republic of		1 349
	Denmark		268
	Finland		1 619
	Germany, Federal Republic of		235
	Greece		132
	Hong Kong		39 880
	India		10 036
	Indonesia		11
	Italy		16 610
	Japan		60 901
	Malaysia		4 094
	Netherlands		253
	New Zealand		90 019
	Norway		3 260
	Pakistan, Islamic Republic of		198
	Phillipines		9 312
	Poland		59
	Singapore		66 169
	Spain		4 145
	Taiwan		50 070
	Thailand		456
	United Kingdom		57 896
	U.S.A.		1 195
	Yugoslavia		2 045
	Origin Unknown		2
		....	420 714
18	Clothes Pegs, Wooden—	N.R.S.	N.R.S.
19	Tool Handles, Wooden—		
	Interstate (*m*)—		
	New South Wales		8 695
	Victoria		4 948
	Queensland		38 714
	South Australia		2
	Tasmania		199
		....	52 558
		Dozen	
	Overseas—		
	China, People's Republic	333	89
	Japan	1	6
	Switzerland	3	10
	United Kingdom	26	37
	U.S.A.	133	1 029
		496	1 171

	Item and Origin	Quantity	Value
		kg	$
20	Tanning Extracts of Vegetable Origin (*n*)—		
	Wattle Bark Extracts—		
	Overseas—		
	Brazil	24 500	4 788
	Kenya	9 975	1 752
	South Africa, Republic of	531 985	108 531
		566 460	115 071
21	Other—		
	Overseas—		
	United Kingdom	3 400	3 232
		3 400	3 232
22	Synthetic tanning substances, Artificial Bates for pre-tanning ; tanning (tannic acids) and their salts, esters and other derivatives—		
	Interstate—		
	New South Wales	7 438	6 134
	Victoria	71 131	24 964
	Queensland	668	620
	South Australia	1 000	550
		80 237	32 268
	Overseas—		
	France	6 100	15 801
	Germany, Federal Republic of	151 800	35 205
	United Kingdom	21 306	23 886
		179 206	74 892
23	Essential Oils, concretes and absolutes ; resinoids—Interstate—		
	New South Wale	3 633	2 232
	Victoria	2 830	14 624
	South Australia	277	228
		6 740	17 084
	Overseas—		
	Brazil	24 120	75 120
	China, People's Republic of	5 400	6 525
	Germany, Federal Republic of	700	1 597
	Indonesia	22 362	77 168
	Swaziland	93 494	105 096
	Switzerland	13 251	14 498
	Taiwan	5 082	25 886
	United Kingdom	3	51
	U.S.A.	3 948	43 781
		168 360	349 702
	Total value of Imports on this Return	....	**$8 919 188**
		$ 1971–72	$ 1972–73
24	Paper Products—		
	Interstate Imports—		
	Newsprint	281 569	19 703
	Other Printing and Writing paper	1 926 660	2 118 080
	Tissues and Wrapping Paper	1 034 093	1 150 182
	Other Paper and Paperboard	3 096 984	3 270 855
	Articles of Paper Pulp, Paper or Paperboard	8 626 999	9 506 707
		14 966 305	16 065 527
	Overseas Imports—		
	Paper, Paperboard and manufactures thereof	5 692 951	6 207 118
		5 692 951	6 207 118
		$20 659 256	$22 272 645

(*a*) Interstate imports are not recorded separately.
(*b*) Not available for publication,
(*c*) Overseas imports exclude shooks and staves—see Item 6.
(*d*) Interstate imports included in Item 4.
(*e*) See footnote (*d*). Item also includes imports of conifer timber, planed, tongued, grooved or the like.
(*f*) Interstate imports included in Item 4 (conifer) and Item 5 (non-conifer).
(*g*) Interstate imports included in Item 16.
(*h*) Figures relate to overseas imports of conifer flooring only, interstate imports of flooring included in Item 4 (conifer) and Item 9 (non-conifer).
(*i*) Relates to non-conifer timber only. All conifer timber, planed, tongued, grooved etc., included in Item 4.
(*j*) Interstate imports included in Item 11.
(*k*) Includes imports of wooden packing cases, casks, domestic articles of wood and similar products.
(*l*) Excludes imports, if any, of wooden medical, dental, surgical or veterinary furniture, non-domestic wooden chairs, and wooden legs imported separately as parts.
(*m*) Includes brush and broom handles and the like.
(*n*) Interstate imports included in Item 22.

"N.E.I." means "not elsewhere included".
"N.R.S." means "not recorded separately".
Basis of value : Overseas—F.O.B. at the point of final shipment.
Interstate—landed cost in Western Australia.
(Information supplied by the Australian Bureau of Statistics)

APPENDIX 3

Summary of Exports of Forest Produce since 1836

Year	Timber		Year	Timber		Wood Manufactures	Tanning Materials	Essential Oils
	m³	Value		m³	Value	Value	Value	Value
		£			£	£	£	£
1836 (a)	283	2 500	1901	202 505	572 354	....	....	....
1837	....	....	1902	177 191	500 533	....	....	....
1838	....	....	1903	219 436	619 705	....	....	....
1839	....	....	1904	228 608	654 949	....	859	....
1840	....	....	1905	246 653	689 943	....	32 876	....
1841	....	....	1906	(c) 250 085	708 993	....	154 087	....
1842	....	....	1907	(c) 181 518	511 923	....	140 720	....
1843	....	....	1908	(c) 279 504	813 591	....	98 773	....
1844	....	....	1909	(c) 306 718	867 419	....	79 934	....
1845	(b)	163	1910	(c) 341 939	972 698	....	59 633	....
1846	....	....				....	93 733	....
1847	72	255	1911	(c) 352 570	986 341	....	83 470	....
1848	346	1 120	1912	(c) 319 934	903 396	....	49 004	....
1849	95	333	1913	(c) 385 714	1 089 481	....	47 377	....
1850	....	....	1914 (d)	(c) 177 843	502 153	....	18 197	5
	297	1 048	1915 (e)	(c) 282 308	808 392	....	6 127	381
1851	35	268	1916	153 837	441 991	....	10 208	1 102
1852	200	806	1917	110 183	310 893	....	18 959	2 060
1853	1 478	5 220	1918	97 315	274 141	....	16 886	3 995
1854	1 657	7 023	1919	117 124	332 584	11 535	18 875	3 987
1855	2 178	12 076	1920	143 449	465 731	21 935	22 121	3 704
1856	1 997	9 671	1921	277 996	1 137 819	24 916	23 073	10 107
1857	1 960	9 449	1922	235 332	1 041 047	22 428	13 328	6 878
1858	828	2 340	1923	224 048	997 454	12 377	21 161	20 075
1859	1 905	6 051	1924	315 113	1 367 517	11 505	29 606	39 877
1860	1 552	4 932	1925	335 431	1 477 997	13 928	40 136	42 057
1861	786	2 497	1926	339 879	1 522 958	10 072	15 056	47 819
1862	1 948	7 151	1927	356 273	1 651 149	8 727	15 818	26 454
1863	932	2 963	1928	294 097	1 265 383	7 783	27 662	39 131
1864	1 651	5 508	1929	216 230	960 435	6 603	35 850	63 307
1865	5 209	15 693	1930	186 338	807 425	4 687	40 628	77 510
1866	2 426	6 849	1931	116 901	507 382	26 615	35 333	56 170
1867	1 607	4 541	1932	86 735	361 700	85 488	42 016	59 301
1868	227	638	1933	63 310	262 617	80 332	33 352	26 331
1869	5 095	14 273	1934	115 003	487 248	76 107	20 904	26 720
1870	4 452	17 551	1935	150 836	636 466	65 494	15 284	35 363
1871	6 188	15 304	1936	158 540	679 522	50 665	12 237	27 526
1872	1 048	2 590	1937	160 685	699 684	52 338	14 491	38 185
1873	1 930	4 771	1938	213 695	932 420	47 934	13 865	35 128
1874	9 787	24 192	1939	161 544	722 310	43 518	17 842	25 550
1875	9 695	23 965	1940	143 004	634 859	62 796	19 485	47 736
1876	6 203	23 743	1941	172 502	790 876	74 935	13 686	59 867
1877	9 520	36 979	1942	148 528	700 474	64 454	6 986	74 904
1878	16 451	63 902	1943	99 589	605 327	32 426	1 598	70 253
1879	17 764	69 742	1944	103 236	613 994	25 324	1 294	72 704
1880	18 763	66 252	1945	80 754	570 028	27 307	2 795	103 055
1881	22 451	79 277	1946	95 524	722 061	(f) 2 616	4 872	128 050
1882	26 522	93 650	1947	97 948	865 255	13 118	12 056	151 768
1883	28 235	79 760	1948	101 510	1 099 073	6 572	9 556	116 465
1884	24 403	68 936	1949	90 573	993 152	6 639	5 112	75 395
1885	24 020	67 850	1950	80 937	974 493	13 525	8 243	78 550
1886	17 733	50 092	1951	66 339	(g) 918 485	25 101	16 581	125 833
1887	10 048	28 384	1952	67 219	1 032 909	47 689	19 120	119 109
1888	14 889	42 060	1953	112 294	2 074 421	120 095	34 136	70 852
1889	22 330	63 080	1954	109 286	2 248 320	59 360	80 248	55 273
1890	33 197	82 052	1955	98 476	1 935 019	79 893	37 338	80 822
1891	36 078	89 179	1956	129 367	2 818 716	119 459	554 760	90 928
1892	30 661	78 419	1957	132 651	3 256 719	78 934	588 544	58 993
1893	14 527	33 888	1958	157 818	3 875 705	39 762	337 655	101 814
1894	30 124	74 804	1959	182 991	4 373 218	41 612	259 046	52 843
1895	35 549	88 146	1960	173 693	4 160 354	20 549	366 606	63 905
1896	43 771	116 420	1961	156 719	3 838 387	25 305	201 957	95 475
1897	67 778	192 451	1962	160 318	3 993 663	194 380	281 364	81 506
1898	115 720	326 195	1963	155 314	3 966 697	255 190	254 726	70 402
1899	195 792	553 198	1964	149 142	3 686 732	272 187	322 916	88 666
1900	162 143	458 461	1965	133 566	3 545 627	523 596	326 156	76 019
....					$	$	$	$
			1966	63 853	4 361 278	1 365 441	289 841	314 817
			1967	138 723	7 467 696	1 335 872	262 808	269 044
			1968	84 569	4 947 595	3 016 850	N.r.s.	280 806
			1969	86 455	4 984 098	3 802 927	N.r.s.	267 565
			1970	96 275	5 661 547	3 906 699	N.r.s.	317 553
			1971	79 362	4 803 842	2 110 802	N.r.s.	343 512
			1972	101 191	6 439 732	2 369 541	N.r.s.	348 762
			1973	111 547	7 086 637	2 604 116	N.r.s.	377 736
			1974‡	....	....	....	....	....
			Total	13 641 229	221 710 363	26 347 870	10 925 283	8 379 615

(a) The exports up to the year 1834 consisted only of supplies to shipping of which no record is kept.
(b) Not available
(c) Approximate figures only.
(d) Six months ended 30th June.
(e) Year ended 30th June from 1915 onwards.
(f) Excludes casks (principally empty returns) previously recorded in this item from 1946–1966 inclusive.
(g) From 1951 onwards. Includes items for which the quantity in m³ is not available.
N.r.s.—Not recorded separately.
‡ Not available at time of printing.

APPENDIX 4

Summary of Imports of Timber, Furniture, Tanning Materials and Essential Oils, since 1848

Year	Timber, Woodware, etc.	Tanning Materials	Essential Oils
	£	£	£
1848	464	....	....
1849	....	....	....
1850	189	....	....
1851	3,216	....	....
1852	2,479	....	....
1853	790	....	....
1854	831	....	....
1855	1,464	....	....
1856	1,124	....	....
1857	774	....	....
1858	1,528	....	....
1859	690	....	....
1860	2,095	....	....
1861	1,459	....	....
1862	1,920	....	....
1863	1,568	....	....
1864	894	....	....
1865	548	....	....
1866	1,442	....	....
1867	1,727	....	....
1868	1,451	....	....
1869	1,408	....	....
1870	1,518	....	....
1871	736	....	....
1872	1,660	....	....
1873	1,008	....	....
1874	1,774	....	....
1875	2,707	....	....
1876	3,098	....	....
1877	2,036	....	....
1878	2,947	....	....
1879	2,340	....	....
1880	3,061	....	....
1881	3,639	....	....
1882	3,692	....	....
1883	6,667	....	....
1884	2,930	....	....
1885	11,479	....	....
1886	17,888	....	....
1887	8,136	....	....
1888	4,461	....	....
1889	7,686	....	....
1890	14,979	....	....
1891	18,406	....	....
1892	26,713	....	....
1893	14,493	....	....
1894	17,964	....	....
1895	47,128	....	....
1896	5,381	....	....
1897	164,552	....	....
1898	55,566	....	....
1899	45,689	....	....
1900	56,266	1,416	1,105
1901	80,134	1,740	1,546
1902	97,810	3,418	1,751
1903	102,383	3,556	1,348
1904	157,856	1,322	2,122
1905	98,494	582	1,592
1906	95,229	1,412	1,915
1907	122,016	2,767	1,549
1908	93,205	2,392	4,584
1909	90,502	4,129	4,003
1910	171,280	3,531	3,686
1911	152,133	2,912	4,938
1912	167,244	3,089	4,598
1913	202,640	2,651	5,392
1914	78,736	629	2,823
1914–15	107,763	2,082	4,988
1915–16	76,849	3,313	4,788
1916–17	75,681	2,848	3,484
1917–18	58,305	2,020	4,358
1918–19	62,824	1,181	4,168
1919–20	100,083	3,748	10,043
1920–21	171,654	*4,899	6,106
1921–22	92,448	5,865	6,577
1922–23	109,428	6,991	4,033
1923–24	133,893	2,790	3,301
1924–25	161,898	2,670	4,429
1925–26	144,989	5,826	4,449
1926–27	162,193	8,971	4,254
1927–28	183,196	9,648	6,955
1928–29	241,601	6,894	4,413
1929–30	197,532	10,825	3,980
1930–31	76,533	4,145	3,160
1931–32	164,496	4,705	3,505
1932–33	197,916	4,903	3,421
1933–34	183,944	4,310	3,888
1934–35	211,056	4,076	5,040
1935–36	228,451	5,401	3,921
1936–37	257,164	5,267	4,810
1937–38	270,126	4,777	6,560
1938–39	254,315	3,974	7,014
1939–40	259,399	6,802	23,027
1940–41	249,111	3,798	32,399
1941–42	283,611	15,846	33,828
1942–43	163,480	6,250	47,718
1943–44	149,928	7,883	68,871
1944–45	148,838	9,264	75,449
1945–46	†219,466	19,573	56,295
1946–47	386,465	12,395	78,091
1947–48	345,508	8,019	96,769
1948–49	570,755	8,662	42,926
1949–50	521,815	24,923	51,197
1950–51	640,059	21,147	161,358
1951–52	1,037,499	18,494	167,697
1952–53	509,667	21,493	69,804
1953–54	923,367	45,202	58,019
1954–55	816,052	27,395	76,464
1955–56	839,581	27,315	131,758
1956–57	830,700	35,403	99,863
1957–58	873,520	28,310	101,680
1958–59	815,300	9,365	62,983
1959–60	895,845	14,608	74,199
1960–61	1,203,641	12,621	60,942
1961–62	1,236,106	13,853	130,876
1962–63	1,978,937	9,868	63,739
1963–64	1,903,772	19,412	37,494
1964–65	2,289,999	21,677	69,741
	$	$	$
1965–66	4,856,090	60,963	132,862
1966–67	6,458,909	68,928	191,796
1967–68	8,135,532	75,657	143,696
1968–69	8,731,114	109,905	206,309
1969–70	10,968,170	153,169	293,845
1970–71	6,761,806	103,857	175,331
1971–72	5 578 819	144 219	227 530
1972–73	8 326 939	225 463	366 786
1973–74‡	....	....	....
Total	112 439 543	2 156 667	6 013 723

* This and subsequent years include tanning extracts, not previously recorded.
† This and subsequent years include values for furniture, bamboo, cane, etc., not previously included.
‡ Not available at time of printing.