

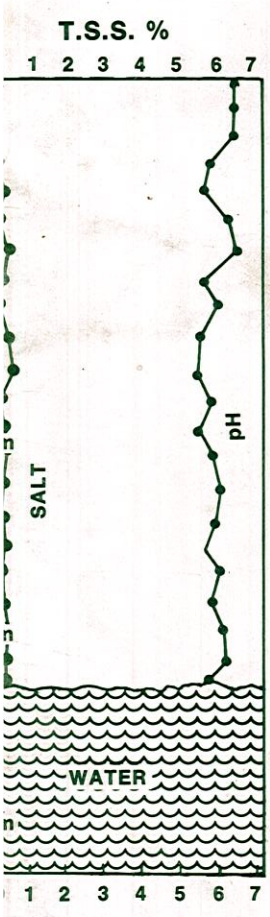
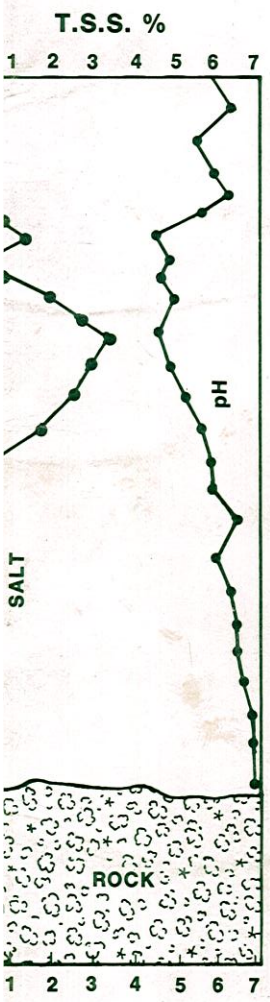


FORESTS DEPARTMENT
- 5 DEC 1975
ANNUAL REPORT 1975

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FORESTS DEPARTMENT OF W.A.



Forests Department,
PERTH,
30th September, 1975

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, 1975.

Yours faithfully,

B. J. BEGGS,

Conservator of Forests.

Front cover:

Drilling rig in the Dwellingup Division, part of the programme to measure underground water salinity.

PRINCIPAL OFFICERS *

Conservator of Forests	....	....	....	....	....	B. J. Beggs, B.Sc. (For.) Dip. For. (Canb.)
Deputy Conservator of Forests	....	....	....	....	....	W. H. Eastman, B.Sc. (For.), Dip. For. (Canb.), Dip. For. (Oxon.)
Assistant Conservator of Forests	....	....	....	....	....	P. J. McNamara, M.A. (Oxon.)
Chief of Division	....	....	....	....	....	J. C. Meachem, D.F.C., B.Sc. (For.), Dip. For. (Canb.)
Chief of Division	....	....	....	....	....	J. B. Campbell, B.Sc. (For.), Dip. For. (Canb.)
Chief of Division	....	....	....	....	....	E. R. Hopkins, B.Sc. (W.A.), Dip. For. (Canb.), PhD. (Melb.)
Chief of Division	....	....	....	....	....	F. J. Campbell, B.Sc. (For.), Dip. For. (Canb.)
Superintendent	....	....	....	....	....	D. E. Grace, B.Sc. (For.), Dip. For. (Canb.)
Superintendent	....	....	....	....	....	S. J. Quain, B.Sc. (For.), Dip. For. (Canb.)
Superintendent (Research)	....	....	....	....	....	J. J. Havel, M.Sc. (Q.), Dip. Ed. (W.A.), Dip. For. (Canb.)
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. H. Wilson, B.A. (Econ.), A.A.S.A.
Accountant	V. K. Combs, A.A.S.A., A.P.A.A., A.A.I.M.
Registrar	Vacant

*At 30th June, 1975.

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STATISTICAL SUMMARY OF MAJOR OPERATIONS

Sawnwood Production

Total Production of Sawn Timber 395 930 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	98 200	303 233	140	2 215
1975	368 844	27 086	.....	395 930	N/A	N/A	129	2 228

Log Production* (m³)

	1975	1974
Jarrah	756 269	706 835
Karri	273 997	300 673
Wandoo	8 402	14 008
Pine	129 149	123 393
Other	16 496	31 438
	<u>1 184 313</u>	<u>1 176 347</u>

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

Forest Area

Additions to State Forest	2 421 ha
Excisions from State Forest	69 ha
Land purchased for Pine Planting	Nil
Total Area of State Forest	1 832 124 ha

Reforestation

Cut-over areas treated for regeneration	42 898 ha
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Afforestation

Area planted with pines 1974	2 218 ha
<i>Pinus radiata</i>	1 603 hectares
<i>Pinus pinaster</i>	610 hectares
Other species	5 hectares
Total area of pine plantation established	36 746 ha
<i>Pinus radiata</i>	16 320 hectares
<i>Pinus pinaster</i> and Other species	20 426 hectares
Total experimental areas (additional)	264 ha

Management

Area of assessment	218 000 ha
Engineering, new works—	
Roads and tracks	270 km
Houses	Nil

Protection—

Prescribed burning area	....	....	....	....	....	....	....	....	374 571 ha
Fire outbreaks—									
Number of fires	....	....	....	....	....	....	....	....	254
Area burnt	....	....	....	....	....	....	....	....	8 890 ha

Nurseries (Hamel and Narrogin)

Trees produced for private buyers	....	....	....	....	....	....	....	....	197 013 (No.)
Trees produced for Forests Department	344 056 (No.)

Sandalwood

Quantity exported	1 051 tonnes
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Source and Application of Funds

	1974/5	1973/4
Source—	\$	\$
Royalties on timber, etc.	3 919 840	3 301 607
Departmental fees, sale of logs, etc.	3 230 991	2 699 294
Sub Total	7 150 831	6 000 901
General Loan Fund	3 000 000	1 700 000
Commonwealth Aid Road Grant	339 514	227 428
Rents	145 356	140 728
Commonwealth Softwood Forestry Agreement	684 663	415 714
Increase or decrease in unexpended balance	360 176	185 176
Aboriginal Training Scheme Advance	Nil	7 000
Mining Compensation Grants	11 177	5 162
Employment Relief Schemes	69 596	....
	11 761 313	8 682 109
Application—		
1. Expended from Consolidated Revenue Fund—		
Pine Hardwood Conversion	2 162 072	1 634 876
Administration and general expenses	1 764 412	1 363 055
Transfer to Treasury	312 685	276 260
2. Expenditure under Reforestation Fund—		
Division—Direct Operating Costs	3 156 311	2 240 391
Head Office and General Expenses	4 365 833	3 167 527
	11 761 313	8 682 109

REVENUE AND EXPENDITURE

Revenue for the year from all sources amounted to \$7 150 831 compared with \$6 000 901 in the previous year.

After deduction of specified expenses, the nett revenue transferred to the Reforestation Fund was \$2 911 662 (\$2 726 710). Figures in brackets refer to the previous year. During the year this fund also received \$3 000 000 (\$1 700 000) from the General Loan Fund, advances totalling \$684 663 (\$415 714) under the Commonwealth Softwood Forestry Agreement and Commonwealth Aid Road Grants of \$339 514 (\$227 428).

Expenditure from the Reforestation Fund for the year amounted to \$7 522 144 (\$5 407 918).

THE FOREST AREA**State Forests (Forests Act 1918–1974)**

The total area of State Forest at 30th June, 1975 was 1 832 124 hectares which is an increase of 2 490 hectares compared with the total area at 30th June, 1974.

Timber Reserves (Forests Act, 1918–1974)

The total area held under Timber Reserves at 30th June, 1975 was 82 684 hectares which is an increase of 10 531 hectares compared with the total area at 30th June, 1974.

Land Alienation, etc.

During the year 100 applications concerning forest land were received covering a total of 62 735 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
69	1 376	52 720	118	....	....

No. of alienations approved 34.

No. of leases approved 7.

The total freehold land held at 30th June, 1975 in the name of The Conservator of Forests was 24 117 hectares.

SAWMILLING, TIMBER INSPECTION AND FOREST PRODUCE

PRODUCTION OF TIMBER FOR YEAR ENDED JUNE 30, 1975
EXCLUSIVE OF 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 m ³	699 258	250 803	2 957	2 647	306	9 485	129 086	1 804	1 096 356	366 512
Private Property m ³	57 011	23 194	5 445	1 792	....	415	63	37	87 957	29 418
Total m ³	756 269	273 997	8 402	4 439	306	9 910	129 149	1 841	1 184 313	395 930

(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	
1974 m ³	325 898	44 179	22 068	9 288	401 433
1975 m ³	306 095	60 417	20 747	8 671	395 930

Timber Production

The production of 395 930 m³ of sawn timber was a decrease of 5 503 m³ on last year's figure. Of the total output 29 418 m³ came from private property, a decrease of 1 938 m³ on the 1973/74 figure.

At December 31, 1974 there were 129 sawmills registered of which 83 operated on Crown Land and 46 on private property. This represents a decrease of 11 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 (1968-1975) is given in Appendix 5.

Roundwood production from Departmental pine plantations totalled 129 086 m³, an increase of 5 693 m³ on the figure for 1973/74 (see Afforestation).

Local plywood factories obtained the following quantities of peeler logs—

Karri	....	....	....	....	....	....	....	....	m ³
Jarrah	....	....	....	....	....	....	....	....	2 245
Pine	....	....	....	....	....	....	....	....	1 397
									1 292
									<u>4 934</u>

Timber Inspection

The total quantity of timber inspected during the year was 97 376 m³ made up as follows—

	m ³
<i>Railway Sleepers</i>	
Ex Crown Land	60 417
Ex private property	8 671
Re-inspected	201
	69 289
Other Sawn Timber	28 087

Sandalwood

The demand for Sandalwood increased during the year but it was only possible to supply 1 051 tonnes compared with 1 350 tonnes for the previous year.

Sandalwood received at Spearwood during the year totalled 1 163 tonnes compared with 1 442 tonnes for the year 1973/74.

	Tonnes
Logwood (including Roots and Butts)	961
Pieces	202
Private Property	Nil
	1 163

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, 1974 totalled 129 (83 Crown Land and 46 Private Property).

The average number of persons employed in the timber mills each month throughout the year was 2 228, an increase of 13 on last year's figure of 2 215.

The District and Workmen's Inspectors made 870 inspections of timber holdings.

There were 192 notifiable accidents for the year ending June 30, 1975, none fatal. The number of accidents per 100 persons employed was 8.61, an increase on last year's figures of 6.59.

The cost of administering the Timber Industry Regulation Act for the year ending June 30, 1975 was:

Salaries	\$18 438
Mileage, Allowances, Office Rent, Plant Cost and Sundries	\$8 717

Forest Offences

Eighteen breaches of the Forests Act and Regulations were reported during the year. Legal proceedings were instituted in one case 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 \$963.22. 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 3 487 made up as follows:—

Forestry—		
Professional officers	60	
General field staff	286	
Clerical and drafting	93	
Wages employees	505	
Contractors and employees (estimated)	25	
	969	
Timber Industry—		
*Sawmill employees including bush workers	2 228	
Firewood cutters and pole getters working under permits	119	
Sandalwood workers	49	
Apiarists, estimated (1 468 sites registered)	122	
	2 518	
		3 487

* 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
<i>Sawmills</i>			
G.P. and Sleeper			
For sale	53 231	....	53 231
Own use	20 984	....	20 984
P.P. Annual			
For sale	....	11 561	11 561
Own use	....	62	62
<i>Domestic</i>			
L.F.	8 459	....	8 459
F.P. License	6 793	....	6 793
Bartons	153	....	153
Kalgoorlie	2 000	....	2 000
<i>Industry</i>			
Wundowie	101 594	....	101 594
<i>Kalgoorlie</i>			
Mines	230	....	230
Industrial	3 933	....	3 933
	<u>197 377</u>	<u>11 623</u>	<u>209 000</u>

Other Forest Produce

Poles and piles obtained from Crown Land during the year amounted to 391 721 metres, compared with 394 734 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 218 244. Records received show that 11 305 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	2 374	....	....	2 374
Mining Timber Goldfields Areas	263 612	263 612
Piles, Poles and Bridge Timber	391 121	....	600	391 721
Fence Posts and Rails	156 713	11 305	44 160	212 178
Strainers	13 302	....	4 069	17 371
Beansticks	3 100	....	250	3 350
Boronia	3 394	278	....	3 672
Gravel and Stone	411 631	....	....	411 631
Sand	6 283	....	....	6 283
Sawdust as fuel	51 943	....	....	51 943
Scout Staves	100	....	....	100

FOREST MANAGEMENT AND CONSERVATION

Unemployment Relief

Participation in the Regional Employment Development scheme from January 1975 and in the Commonwealth Non-Metropolitan Relief Scheme from March 1975 resulted in the employment of 69 men at the Busselton, Collie, Kirup, Harvey and Wanneroo Divisions.

Approximately \$186 000 was used from the former and a further \$15 380 from the latter scheme to subsidise employment at a time when jobs were difficult to acquire.

As was the case in preceding years, these additional funds enabled worthwhile work to be done which otherwise could not have been funded, including silvicultural treatment, roadside improvement fellings, and recreation projects.

Aboriginal Affairs

The Department continued to participate in a special work project for Aborigines in the Narrogin Division until the project terminated in September. The project was financed by the Aboriginal Affairs Planning Authority and achieved its aim of providing meaningful work containing an element of job training.

Working Plans

Hardwood Inventory

Although broad scale resources work is still being carried out (258 hectares were measured by 227 plots and provided information for 160 000 hectares of forest in Kelmscott, Harvey, Kirup, Busselton and Nannup divisions), emphasis is changing to the acquisition of information for more detailed management planning. In this regard 1 000 strip lines totalling 1 430 kilometres and covering 770 hectares were measured in the marri woodchip area to provide information for 58 000 hectares of cutting coupes, at a sampling intensity of 1.3 per cent. This enabled detailed management planning to be completed for the areas involved in the first 5 years operation of the marri woodchip project.

One hundred and twenty-three plots were established for both broadscale and detailed management purposes to relate assessors' estimates to actual log recoveries from the forests.

Softwood Inventory

Over 600 permanent plots were established and over 1 500 were re-measured to provide information for calculating growth and yield of our pine plantations in 10 of the 12 administrative divisions.

Thirty-three plots were measured to monitor the progress of stands non-commercially thinned according to the silvicultural prescription adopted in 1970. The measured values for volume production were exceptionally close to the predicted values.

Projects

Export Wood Chip Project

Advance planning for the Manjimup wood chip operation, due to start later in 1975, was brought to a forward stage. Detailed plans were prepared for the first three years of the integrated logging operation, as the basis of the Environmental Impact Statement and with the objective of maintaining log supplies to the existing sawmilling industry as well as providing for those of the proposed wood chip industry.

These plans are the basis for control of the operation and give full consideration to the environmental constraints involved, the need to allow for seasonal logging conditions and for future roading and fire control requirements.

Supply of Softwoods for Particle Board

With the ratification of the Wesply (Dardanup) Agreement in May 1975, detailed planning for the future supply of particle board material was commenced.

This operation, due to start in the second half of 1976, will provide a hitherto non-existent outlet for small sized thinnings from departmental plantations and, subsequently, from private plantations also.

The planning task is very complex as it must take into account the efficient supply of both particle board material and sawlogs at prescribed levels of intake from the various plantations in the South West within the overall framework of environmental considerations and seasonal working conditions.

Regrowth Thinnings

Important relationships between karri regrowth parameters and thinnings yield have been established in 35 to 40 year old regrowth developed from uniform systems with seed trees in Treen Brook in the 1930's. This information will help refine estimates of future hardwood yield. Similar studies have been commenced for marri.

Photodendrometer

Further work has been carried out using ground level photographs to measure upper stem diameters.

Aerial Photography

Trials have continued on the practical application of colour and colour infra-red film and a Vinten 70 mm camera with a custom built intervalometer, to the detection of karri regeneration, severity of fire damage, dieback understorey indicator species, and the extent of logging operations.

Metric hardwood log volume measurements

Monthly measurements from twenty-two sawmill permits confirmed that the metric system currently in use for hardwood royalty purposes is satisfactory compared to the earlier Imperial system.

Data from the same monthly measurements were analysed to see if a satisfactory method of relating volume to small-end diameter and log length measurements existed. However the data indicated that the variation in these parameters is too great to provide a useful relationship.

Dieback Mapping

All State Forest has now been mapped for dieback risk categories. Four categories are recognised:

- Dieback or suspect dieback.
- Not protectable from dieback. These areas are susceptible to dieback and downslope from existing infections.
- Protectable from dieback. These areas are susceptible to dieback but upslope from existing infections.
- Resistant to dieback. These areas consist of jarrah on good soil or steep topography, or resistant species such as karri and pines.

Mapping for dieback risk categories consists of the following stages:

- Dieback extent is mapped using air photos and field checks.
- Dieback susceptibility, based on landform and species, is mapped using air photos and field checks.
- Dieback extent and susceptibility are combined on one plan.
- Areas protectable from dieback and areas not protectable from dieback are defined using contour plans or air photos.

The approximate area of dieback risk categories in areas under Forests Department control is shown in the table below*:

Category	Hectares	Percentage of Total Area
Dieback or suspect dieback	183 000	9.4
Not protectable from dieback	287 000	14.8
Protectable from dieback	1 102 000	56.9
Resistant to dieback:—		
Jarrah	76 000	3.9
Wandoo	103 000	5.3
Mallet	11 000	0.6
Karri	140 000	7.2
Pines	37 000	1.9
Total Area under Forest Dept. control	1 939 000	100.0%

* It should be noted that these areas will be subject to revision as figures for dieback extent, land form and forest types are themselves revised.

Management Research and Automatic Data Processing

A visual display terminal has recently been installed and linked to the CYBER 73 computer at the Western Australian Regional Computing Centre. The major benefits expected to be derived from the equipment are: improved job turn around, rapid programme development, and rapid model development by interactive processing.

The Automatic Data Processing section has continued to work closely with the Working Plans branch, the Research branch and with several working groups in the development of hydrological models, fire behaviour models, the presentation of assessment and forest growth information and the preparation of logging plans.

The pine thinning schedule system, a suite of computer programmes developed by the section in 1974, is now being used to prepare integrated logging plans for pine plantations on a regional basis. The system provides the yield data necessary for the preparation of a specific plan, predicts the yields by size classes produced by the plan and determines the long term effects of the plan on the total resource.

Mapping

Further progress was made in the conversion to metric scales of Departmental maps. A total of 225 API maps were revised and converted to scales 1 : 25 000 and 1 : 50 000. The remainder of the series is in course of preparation and the project will be completed during the next half-year. Material is becoming available for the metric coverage of map sheet Collie 1 : 250 000 and six 1 : 50 000 sheets in Collie Division are being prepared for publication. A further four in the eastern area of Walpole Division will be published shortly.

The maintenance of imperial scale standard maps is continuing pending the availability of metric scales and nine map sheets were republished, while six are in course of revision. Additional cover was provided by the completion of two temporary maps.

Full use was made of stereoplottting instruments for the mapping from aerial photographs of plantations, settlements and recreation areas. A total of 46 750 ha of plantation development and surrounds were mapped. Detailed maps were prepared of Ludlow Settlement and recreation areas Somerset Grove and Southampton. Other projects necessitating interpretation and mapping from aerial photographs included the revision of the API map series, definition of micro-catchments in Dwellingup Division and the delineation of dieback infected forest.

Special projects completed or in the course of preparation include map support for dieback quarantine proposals, plans for aerial prescribed burns, aerial surveillance maps and Divisional co-ordination and tower maps.

Forest Engineering

During the year, 270 kilometres of roads, tracks and firelines were constructed and 6 230 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 70 workshop wages employees.

Two apprentices completed their training during the year. Six were appointed, with the total number employed being twenty-one.

Twelve major items of fabrication were completed: two peat moss shredders, a tandem trailer, two car type trailers, a pine planter, crane grapple, and five fire units.

Two items developed last year in Departmental Workshops, a tractor mounted saw and an automatic superphosphate metering device, won an Industrial Design Award for Plant Inspector Jack Reynolds who developed them.



Tractor mounted circular saw which won an Award for its designer, Plant Inspector J. Reynolds, in 1974-75.

Departmental Buildings

The Department's contractors were engaged for much of the year on the re-siting and re-building of seven houses within the Manjimup Divisional Headquarters. Provision of these houses was necessary for staff who will be working in the karri region and associated with the woodchip industry.

Re-routing of the Bunbury-Yallingup road by the Main Roads Department necessitated the shifting of two houses from the Ludlow settlement. Two residential blocks upon which these two houses will be re-sited, were purchased in the Busselton townsite.

Communications

The wiring of 70 new vehicles and conversions of a further 153 was completed during the year, and facilitated installation of 156 new V.H.F. mobiles. Conversion to the new units included fitting of 11 repeater stations and the change-over to these sets will be completed in time for the 1975/76 fire season. This will complete the replacement of the original V.H.F. system installed in 1963.

Communication with spotter aircraft used for fire detection has been provided by installation of radio-telephones in divisional offices.

Two aircraft used in the aerial ignition programme were fitted with a combined radio and intercom system designed and built within the Branch, and five spotter aircraft were provided with V.H.F. and radio telephone. These facilities, together with an additional radio-telephone frequency allocation, will provide an improved ground-to-air reporting system.

The Gloucester tree radio equipment was re-installed after construction of a new lookout cabin.

Recreation

Forest Youth Camps

The Lions Club lease of Dryandra settlement continued to be a valuable facility for a variety of organisations and during the year was used by over twenty groups. Two other former settlements at Wellington (near Collie) and Pimelea (near Pemberton) have been leased to the Community Recreation Council, and the former is now regularly used as a youth and family group centre.

Catchment Recreation: The Department is taking part in an inter-departmental investigation of controlled recreation in water supply catchment areas.

New Developments: In addition to the upkeep and limited expansion of traditional forest picnic areas, approval has been given for the establishment of a trail-bike area near Dwellingup subject to enforcement of strict forest disease hygiene—and for a recreation zone in Gnangara plantation which will cater for bush-walking, motor cycling and horse riding. An assessment of existing facilities at Mundaring, Kelmscott and Wanneroo is in preparation as a basis for future development.

Bibbulmun Track: Further realignment has been undertaken and the booklet is expected to be available for distribution in the near future.

REFORESTATION

Hardwood Logging

During the year 42 898 hectares of hardwood forest were logged and treated for regeneration.

Forest Type	Maiden Bush	Cut-over Bush	Total Area
	hectares	hectares	hectares
Jarrah	6 121	29 370	35 491
Karri	2 183	1 104	3 287
Marri	221	.....	221
Wandoo	.....	38	38
Blackbutt	.....	.....	.....
Yellow Tingle	.....	33	33
Jarrah and Wandoo	894	2 934	3 828
Total	9 419	33 479	42 898

Jarrah Forest

Silvicultural treatment of the jarrah forest was minimised during the year while efforts were concentrated on preparing for the proclamation of forest disease risk areas, and for subsequent establishment of quarantine. These proposals are explained in the section of this report titled, Protection, Forest Disease.

Reforestation after Mining Bauxite

During May and June 1975 125 hectares of bauxite mined areas in Alcoa's Jarrahdale and Pinjarra operations were replanted with trees raised in the Alcoa nursery at Jarrahdale. Two Western Australian and five Eastern States species were used.

Fifty hectares were planted by Alcoa employees and the balance by the Forests Department.

A working group consisting of officers from the Forests Department, Soil Conservation Service and Metropolitan Water Board assisted by staff from Alcoa visited the two mine sites during the year to determine methods of erosion control and re-vegetation.

Due to the steeper terrain and probably more intense rainfall, erosion was a problem in the Pinjarra areas during the 1974 winter. To prevent a similar occurrence, rehabilitated areas are now subdivided by large contour banks into small sub-catchments with the aim of encouraging infiltration and to retain excess water should the ripped lines overflow.

Reforestation after Mining Gravel

Rehabilitation was carried out in 22 disused Main Roads Department pits adjoining well used public roads in the Walpole, Kirup, Collie, Dwellingup and Kelmscott Divisions.

Subject to continuation of the annual M.R.D. grant, it is proposed over the next few years to rehabilitate pits close to or adjoining public roads in the Kelmscott and Mundaring Divisions.

The Metropolitan Water Board has shown interest in the proposed programme in these Divisions, and discussions have been held as to the possibility of the scheme being extended to pits which are located well away from public roads, but on catchment areas.

AFFORESTATION

Softwood Planting Programme

The need for a continuing softwood planting programme in Australia has been questioned by people who feel it is detrimental to the environment and is unnecessary because of over estimates in the future demands for timber.

The House of Representatives Standing Committee on Environment and Conservation conducted an inquiry into the operation of the Softwood Forestry Agreement Acts with reference to the environmental, social and economic impact of pine plantations and this report was released in May 1975. This Department presented evidence and in its report the Committee concluded that the isolation of Western Australia justifies a softwood programme and because of the problem of salinity experienced in this State, the planting of softwoods can serve the dual purpose of catchment rehabilitation and timber production.

The existing programme of plantation establishment is needed to provide a resource base for current industrial development and to provide a portion of the likely timber requirements of the future. Because of the need to reduce the cut on the State's limited natural eucalypt forests, the expectation that for the next thirty years the population of Western Australia will continue to increase at up to twice the average rate for the rest of Australia and the lack of a reliable external source of supply, there is an urgent need to increase the softwood planting in the south of the State from the 3 000 hectares (approx.) currently planted to a minimum of 4 000 hectares per annum.

It must be stressed that any over planting can be adjusted by a future reduction in programme if the present population predictions and estimates of per capita useage fail to materialise. On the other hand a short fall can only be met by imports, the future availability of which is open to grave doubt and anticipated world competition will predictably result in the cost of any imports being well in excess of locally produced material.

The limited area of land suitable for pine planting and available to the Forests Department, has been a major restriction on the pine planting programme. The Department's policy has been to use repurchased farmland as far as possible rather than convert high quality native forest to pines, but the possibilities of repurchasing any further significant areas of suitable farmland are remote. Few properties are being offered for sale and the prices asked have become unrealistically high. The situation is so critical that to maintain a *Pinus radiata* planting programme beyond 1980, the Forests Department must look to the conversion of selected areas of poor quality native forest to pine forest.

Selected parts of the large area of poor quality forest between Nannup and Busselton, known as the Donnybrook Sunkland, have been shown by trial and experiment, to be suitable for commercial pine production under appropriate nutritional regimes. This forest is badly degraded by jarrah dieback and a large proportion will inevitably be killed by this disease. Intensive research has shown that *Pinus radiata* can be grown successfully on selected sites here, even where the original forest has been killed by the root rot fungus *Phytophthora cinnamomi*. There are no other large areas of proven, suitable soil with adequate rainfall, available to the Department for planting *Pinus radiata*. The Department has considered the environmental aspects of the conversion to pine plantation of some 60 000 hectares of the 283 000 hectare Sunkland, and can see no valid reasons against the proposal on these grounds. Conversion to pine forest is seen as the best form of land use for these degraded areas. Investigations show that the proposals carry few negative environmental effects and will have considerable positive benefits in fulfilling a need to rehabilitate dieback devastated areas, in protecting valuable water resources and in promoting and stabilising a rural economy which is currently declining.

The present state of the Department's knowledge and the reasoning on these aspects has been set out in detail in a document entitled, "Afforestation with Pines in the Donnybrook Sunkland—Statement of Intent". This document has been circulated to various agencies likely to be concerned with this development for comments and is now available for public study.

Current Departmental Plantation Areas

The distribution of plantation areas by Divisions as at December 1974 was as follows:

AREAS OF PLANTATIONS (Hectares)

Division	<i>P. radiata</i>	<i>P. pinaster</i> and other species	Total
Wanneroo	653.0	14 167.9	14 820.9
Metropolitan	10.6	628.9	639.5
Mundaring	718.4	735.2	1 453.6
Kelmscott	384.4	1 136.5	1 520.9
Dwellingup	576.5	67.5	644.0
Harvey Hills	1 904.8	25.9	1 930.7
Harvey Coast	624.3	2 114.0	2 738.3
Collie	2 148.1	85.3	2 233.4
Kirup	4 080.2	85.3	4 165.5
Nannup	4 083.6	110.2	4 193.8
Busseton	695.5	1 224.5	1 920.0
Manjimup	207.9	.....	207.9
Pemberton	233.5	44.5	278.0
Totals	16 320.8	20 425.7	36 746.5
Experimental Plantings	219.3	44.6	263.9
Grand Total	16 540.1	20 470.3	37 010.4

Areas planted in 1974 totalling 2 218 hectares are shown below:

1974 PLANTING (Hectares)

Division	<i>P. radiata</i>	<i>P. pinaster</i>	Other Species	Total
Wanneroo	333.5	509.1	.....	842.6
Mundaring	21.3	.....	0.9	22.2
Kelmscott	17.4	13.1	1.1	31.6
Harvey Hills	102.0	.....	.....	102.0
Harvey Coast	58.2	87.6	.....	145.8
Busseton	42.0	.....	.....	42.0
Collie	131.1	.....	.....	131.1
Kirup	508.0	.....	.....	508.0
Nannup	389.2	.....	3.5	392.7
	1 602.7	609.8	5.5	2 218.0

Private Forestry

Private interests advised they planted some 900 hectares of pine in 1974, and that the area of privately owned pine forest in the State is now approximately 6 670 hectares.

During the year the Department answered 55 queries on commercial planting and carried out 8 site inspections.

Roundwood Production

Roundwood production from Departmental plantations, mainly in the form of thinnings amounted to 129 086 m³, which was an increase of 5 693 m³ or 4.6 per cent. on last year's figure. The following figures show the trend in pine log removals in recent years:

Year Ended June 30	m ³ (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
1975	129 086

Removals by category and by species were as follows:—

Category	Total m ³
Sawlogs	70 400
Chipwood	49 918
Peeler logs	1 292
Fence Posts and Rails	4 336
Miscellaneous	3 140
	<hr/>
	129 086

Roundwood removals from the various plantations were as follows:—

	m ³
Wanneroo (Gnangara)	17 753
Metropolitan (Collier and Somerville)	19 684
Mundaring	6 162
Gleneagle	175
Harvey	22 229
Collie	534
Kirup (Grimwade)	26 378
Nannup	5 559
Busselton—	10 806
Ludlow	3 621
Keenan	7 808
Pemberton	7 851
Miscellaneous	526
	<hr/>
	129 086

Sawn production from all sources was 27 086 m³ which is an increase of 552 m³ on 1973/74 production.

Tree Nurseries

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

The most popular eucalypt species sold were:—

- River Gum (*Eucalyptus camaldulensis*)
- Tuart (*Eucalyptus gomphocephala*)
- Tasmanian Blue Gum (*Eucalyptus globulus*)
- Dwarf Sugar Gum (*Eucalyptus cladacolyx* var. *nana*)
- Bald Island Marlock (*Eucalyptus lehmannii*)

Other departmental nurseries raised 3.2 million pines for the afforestation programme, 108 000 being sold for private projects.

Nursery	Number of Plants Sold				Departmental Use				Total Plants	
	Pots	Trays	Open Rooted	Total	Pines	Eucalypts	Other	Total	No. of Species	Total
Hamel	48 977	12 700	47 056	108 733	84 000	241 536	10 220	335 756	210	444 489
Narrogin	85 230	3 050	....	88 280	....	8 300	....	8 300	104	96 580
Total	134 207	15 750	47 056	197 013	84 000	249 836	10 220	334 056	....	541 069

Seed Supplies

Renewed interest in tree planting programmes in a number of Middle East countries and in Brazil resulted in some large orders for seed this year. Species required were mainly dry area eucalypts from the inland forests of the State. The value of seed sales exceeded \$6 000.

The Departmental Seed Store is fulfilling an important role in world forestry as it is the only reliable source of seed of many of these unique trees.

Mallet Plantations at Dryandra

The research into fire behaviour in wandoo forests adjoining mallet plantations was reported last year and was applied successfully in the current year with a correspondingly greater achievement in burning.

With the assistance of funds provided by the Aboriginal Affairs Planning Authority, a further 77.5 tonnes of mallet timber was supplied for the nearby tool-handle factory.

PROTECTION: FIRE

Area Protected

	hectares
State Forest under protection	1 832 124
Indigenous forest	1 787 114
Pine plantation	37 010
Mallet plantation	8 000

A further 800 000 ha of other public lands and private property were afforded some measure of protection due to their strategic importance relative to State Forest or their forest value.

The Fire Season

Winter rains were below average for both jarrah and karri forest. Spring months were generally cool and damp but protracted dry spells were experienced in autumn.

The fire season was notable for a record drought period in January and February and above average temperatures in February.

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

	Jarrah		Karri	
	Average	1974/75	Average	1974/75
Rainfall:				
Annual mm	1 267	1 063	1 487	1 285
October to April inclusive mm	268	199	426	304
Number of Wet Days:				
Annual	139	117	187	187
October to April inclusive	38	45	75	78
Temperature:				
Mean Maximum October to April °C	25.1	24.8	22.6	22.5
Days of 38°C or higher (No.)	2.8	3	1.2	3
Days of 32°C or higher (No.)	29	27	13	12
Relative Humidity:				
Days of 10% or less (No.)	1.5	1	0.3	0
Days between 11% and 15% (No.)	5.1	4	1.3	0
Days between 16% and 25% (No.)	24.3	16	5.9	5
Fire Hazard:				
Number of Dangerous Days	8.6	6	1.7	1
Number of Severe Days	19.4	16	5.3	3
Mean Hazard	5.8	5.6	4.9	5.6

Prescribed Burning

The area of prescribed burning for the past five fire seasons is shown in the table below:—

	Season				
	1970/71	1971/72	1972/73	1973/74	1974/75
	hectares	hectares	hectares	hectares	hectares
Indigenous Forest—					
Hand burning	168 396	88 743	114 822	74 716	78 686
Aircraft burning	203 968	137 562	190 438	253 699	287 925
Total	372 364	226 305	305 260	328 415	366 611
Advance Top Disposal and Regeneration Burns	4 209	9 583	5 314	12 035	2 378
Plantations—					
Clearing burns	2 746	2 569	2 520	1 139	3 088
Burning under pine canopy	1 174	1 168	687	1 028	2 494
Total	3 910	3 737	3 207	2 167	5 582

Since 1970 there has been a significant increase in the proportion of prescribed burnt area covered by aircraft: from approximately 55 per cent. in 1970/71 to 78 per cent. in 1974/75.

In 1974/75 there was a notable increase in prescribed burning under pine canopy, mainly in coastal *Pinus pinaster* plantations. Results indicate significant improvement can be achieved in developing techniques to increase area of burning at reduced costs with negligible damage. Experience of summer wildfires suggests that regularly burnt buffers under pine canopy will be more effective for fire suppression than conventional, wide, cleared firebreaks.

Aerial burning was completed for 12 000 ha of vacant Crown land near Northcliffe and 7 300 ha near Nornalup, on behalf of the Bushfires Board. A further 3 300 ha of Crown lands were burnt in the Avon Valley for the Avon Valley Protection Committee.

Studies of the properties of smoke from prescribed burning in indigenous forests were continued last spring by scientists from the C.S.I.R.O. and the Forests Department. Smoke samples were collected by aircraft over several large prescribed burns in the south-west. Results showed particulate matter in this smoke varied between 1.5 and 2.0 per cent. and had a typical analyses of 55 per cent. tar, 25 per cent. soot and 20 per cent. ash. Toxic gases, such as carbon monoxide, ammonia and carbon dioxide were in such low concentrations they caused no noticeable contamination. The results suggest bush-fire smoke is relatively free of the contaminants that would cause photochemical smog.

Detection

The period between first and last watch for wildfires was longer for pine plantations than indigenous forest.

	Karri	Jarrah	Pine
First watch	6/11/74	9/11/74	5/11/74
Last watch	31/3/75	14/4/75	1/5/75

Considerable changes were made to the forest fire detection system during 1974/75. Four light aircraft replaced 13 towers covering forest areas south of Harvey. Each aircraft was assigned a pre-determined route covering the whole forest but concentrating on high value areas. Flying schedules were based on daily fire danger.

The introduction of aerial detection has resulted in marked improvements in early spotting of small smokes, accurate location of smokes, and both rapid and early reconnaissance information on wildfires. This improved reporting resulted in more effective fire suppression.

The value of aerial detection was fully illustrated during extreme weather and fire emergencies on 20/12/74 when numerous fires occurred and again on 5/2/75 when a large number of fires were lit by lightning. In each emergency period the Department's suppression forces were faced with more than 20 potentially dangerous fires. Reconnaissance information from aircraft was a significant factor in planning successful suppression and minimising areas of fire damage.

Wildfire

The table below shows number of fires attended and area burnt during the past five fire seasons:

	Season				
	1970/71	1971/72	1972/73	1973/74	1974/75
Number of fires attended:					
Indigenous State Forest	118	134	211	104	139
Adjacent private property and Crown land	42	59	105	86	79
Pine plantation	53	56	61	76	36
Total number	213	249	377	266	254
Area of State Forest fires (hectares):					
Indigenous forest	3 485	5 140	7 684	1 017	8 850
Pine plantation	12	3	21	19	40
Total hectares	3 497	5 143	7 705	1 036	8 890

A record summer drought and two fire emergencies resulted in a larger area burnt by wildfire in 1974/75 than in any of the previous four fire seasons.

An unusually large number of fires was lit by lightning strikes but the number of deliberately lit fires was less than in 1973/74.

The Department's forces participated in fire suppression on adjoining private property, on a neighbour assisting neighbour basis, and several significant saves were achieved.

General

Kalgoorlie Divisional staff provided assistance to officers of the Bush Fires Board and to Local Government during the wildfires in the Eastern Goldfields. Assistance included advice at the fire control centre, administration in the field and personnel to assist in aerial reconnaissance.

New maintenance facilities for fire equipment were constructed at Collie and several improvements made in design for individual equipment items, e.g. hose couplings.

Further research was undertaken into the effectiveness of fire retardents. Considerable improvements were achieved in mopping up as well as in fire suppression using commercial brands of imported retardent. It appears likely an equally satisfactory and much cheaper retardent can be mixed from locally produced ingredients.

A five day fire training course was conducted for selected field staff, and fire control staff participated in a number of other fire training programmes within the Department and at external seminars organised by the Bushfires Board.

Australian participants in a Fire Study Tour of the United States in 1971, recommended that an exchange scheme be continued in future years. As a result the Australian Forestry Council invited fire control foresters from Federal and State authorities of the United States to visit Australia in 1975. The group spent a week in Western Australia, which both visitors and local officers considered most productive.

The visitors collectively represented a wide range of experience and expertise. Those who attended the tour were Henry W. De Bruin, Director of Fire Management, U.S. Forest Service, Dr. Charles Philpot, Forest Fire & Atmospheric Services Research U.S. Forest Service, Douglas H. Baker, Assistant Director, Co-operative Forest Fire Control, U.S. Forest Service, Paul L. Sjoblom, Utah State Forester, Howard L. Stolaas, Deputy Supervisor, Department of Natural Resources, State of Washington, Dave Roten, Regional Forester, North Carolina Forest Service.

PROTECTION : DISEASE

Quarantine Proposals

The serious forest disorder commonly called jarrah dieback is caused by the fungal pathogen, *Phytophthora cinnamomi* which is microscopic and difficult to detect. The disease is detected by observation of visual symptoms such as the death of highly susceptible species, e.g. *Banksia grandis*, which may then be confirmed by laboratory culturing—a slow and expensive method.

Detection through observation of symptoms has limitations in that it inevitably lags behind infection, by months or even years. In field research involving deliberate infection, the lag between time of infection and initial display of visual symptoms has varied from about 6 to 18 months or more.

This lag means that in the operational situation, even though hygiene measures are conscientiously applied, there is no certainty that areas apparently unaffected are, in fact, free of the pathogen. To overcome this problem it is necessary to quarantine apparently unaffected areas from sources of infection for sufficient time to allow development of visible symptoms. It should then be possible to accurately identify diseased localities and the boundaries of infection and to control artificial spread by appropriate hygiene techniques.

In August 1974, Cabinet agreed in principle to the quarantining of substantial forest areas. This was necessary to provide an effective basis for hygiene measures adopted in protectable forest. Implementation of these proposals required special powers which have been provided under the Forests Act Amendment Act, No. 77 of 1974. Large sections of State Forest are the subject of current proposals. Within the quarantine area unrestricted vehicular access is limited to the main public highways and entry to private property.

Limited access under permit along specified routes will be available for essential services. Access on foot will not be restricted.

Before these proposals are finalised and the areas officially proclaimed, the impact on organisations that require access to the forest is being determined. Contact with over 50 organisations has been made and negotiations begun.

The table of dieback risk categories on page 11 shows that some 76 per cent. of the forest is protectable from or resistant to, dieback infection. This is most encouraging and provides added justification for the decision to quarantine substantial areas of forest as a basis for on-going hygiene.

Logging Hygiene

To test their feasibility and effectiveness in preventing the spread of dieback, operational trials of different logging methods were commenced during the year. Trials include:

- Logging of non-infected forest during all seasons of the year by normal methods with particular attention being given to exact demarcation of risk categories, summer construction of all access roads and cessation of operations following heavy rainfall.
- Separation of the snagging and loading phase in logging. This is the next logical step if the first method proves to be unsuccessful in preventing introduction of dieback to healthy areas.
- Summer stockpiling. If all the dieback hygiene logging methods tested indicate that introduction of dieback cannot be controlled during winter, restriction of operations to the dry summer months, and stockpiling of logs, must be considered.

- Road stabilisation. Different methods of stabilising gravel logging roads are being investigated. The aim is to maintain the surface of haulage roads in a stable condition throughout the winter, thus obviating the need to carry out winter maintenance grading with its associated risk of causing further dieback spread.

It is also proposed to closely examine and map a large sample of areas logged within the last 3 years, which were believed to be non-infected at the time of logging. Mapping after a further 3 years could give a useful guide of the influence of different logging methods and season of logging on dieback spread.

RESEARCH : SPECIES PRESERVATION

The overall need for conservation of unique ecotypes in the Northern Jarrah Region has been reviewed in preparation for the consideration of the area by the Conservation Through Reserves Committee. The adequacy of existing special management areas to cover the full range of ecotypes has been examined, and the setting aside of several additional areas for this purpose has been recommended.

Proposals have been also submitted regarding the reservation of inland ecotypes considered inadequately represented in existing National Parks and Reserves.

RESEARCH : SOFTWOOD SILVICULTURE

Pinus pinaster

The main accent in the current year has been on tree breeding.

Seed Orchards

This year's harvest is anticipated to be 136 kg and is comparable with the previous year's collection. It will be adequate for all planting of *Pinus pinaster* in this State.

The older orchard at Joondalup has been upgraded by reducing the original 16 parents to 9 parents, on the basis of progeny growth and form data, and on flowering patterns.

Seed collection also commenced at the younger Mullaloo orchard, which has a broader genetic base with a minimum of 80 parents, the majority of which were imported from Portugal.

Progeny Trials

Wild seed, from parents selected in Portugal and now represented in seed orchards, has been progeny tested. The assessment was based on measurement of height and diameter increment, and on subjective rating of stem form at age 8 years. All of the 39 parents tested proved markedly superior in form to the unimproved plantation seed source.

This improvement has made it possible to reduce the number of seedlings planted per hectare from 2 240 to 1 120. The effect of this is reduced cost of planting and of non-commercial thinning.

The first control-pollinated progeny test was remeasured at age 9 years. This trial included six pedigree families, as well as an unimproved seed source, and was planted as a Latin Square on a gradient of sites within the Bassendean Dune System ranging from average to very poor. The results are given below:

	Mean Family	Routine	Difference
Mean Tree Volume (m ³)	0.0342	0.0203	68%
Mean Tree B.A.O.B. (m ²)	0.0080	0.0054	48%
Mean Tree Height (m)	6.46	5.20	24%

In addition to the above gains in growth rates, marked improvement in tree form and branching was also recorded.

As the emphasis in afforestation is shifting towards the Donnybrook Sunkland, characterised by wetter, heavier textured soils with a high incidence of *Phytophthora cinnamomi*, a comprehensive progeny trial has been established at that location.

Pinus radiata

Site Amelioration

Most soils available for future planting of pines in Western Australia are sandy in nature and of extremely low fertility. The primary deficiencies of these soils for the growth of *Pinus radiata* are phosphorus and zinc, although manganese, copper and nitrogen are also in marginal supply. Research since 1971 has yielded techniques for successful establishment of pine on such poor soils, especially in the Donnybrook Sunkland.

Early work concentrated on the use of superphosphate, but recent drastic price increases have eroded its competitive advantage over the main alternative commercial source of phosphorus, rock phosphate. Recent work has examined the use of rock phosphate as a means of raising soil fertility in the long term. Field trials show distinct promise, although it is unlikely that superphosphate will be entirely superseded because rock phosphate cannot make sufficient phosphorus available for the initial burst of pine growth. A combination of broadcast rock phosphate to provide a slowly available source of phosphorus, and spot applications of superphosphate at planting is likely to be employed.

The initial spot application of superphosphate need be only a modest one. Data from a large field trial replicated on several sites indicate there is no worthwhile gain in growth from the use of more than about 120 gm per tree at planting. On some sites there is even a detrimental effect from high levels of fertilisation, as the table shows:

Mean Height (centimetres) at Age 3 years, *P. radiata* McLarty Plantation

Soil Type	Superphosphate level at planting gm/tree				
	57	114	228	454	908
Spearwood sand	133	114	137	138	140
Bassendean sand	137	123	128	114	107

Remeasurements of trials established in 1971 confirmed previous indications that on zinc deficient soils there is no advantage in using the more expensive super-copper-zinc mixtures instead of straight superphosphate. The minor elements can be more efficiently provided by a foliar spray of a mixture of the sulphate salts of zinc, manganese and copper. This technique was successfully tested in 1974 on a pilot-scale plantation near Jarrahwood.

Useful responses have been obtained to refertilisation of young *P. radiata* with nitrogen, especially in combination with phosphate, (see table below) but the use of mineral nitrogen fertilisers presents practical problems due to their high cost and rapid leaching in sandy soils. For these reasons the possibility of incorporating biologically-fixed nitrogen into the ecosystems by the means of legumes is being actively investigated. The principal legumes being used in field trials are subterranean clover *Trifolium subterraneum* and sandplain lupin *Lupinus consentini*.

Growth Response for *P. radiata* Planted 1970, Refertilised 1973

Treatment	Diameter (BH) Increment 1973/74 (cm)
No fertiliser	1.29
NP 0.25 kg/tree	2.03
NP 0.50 kg/tree	2.26
NP 1.00 kg/tree	2.61

NOTE: NP was commercial fertiliser containing 24 per cent. N, 20 per cent. P.

Integration of Grazing and Pine Silviculture

The experimental grazing of cattle under young pines at Ludlow referred to in the previous annual report proved very successful. The grazing capacity of the planted site was shown to be approximately half that of adjacent open farmland on similar soils. Research is continuing into integration of grazing into routine plantation operations in the Blackwood Valley.

Environmental Monitoring—Donnybrook Sunkland

An extensive network of stream sampling was maintained for the second year, confirming that stream salinity levels in the Sunkland are low. Preliminary studies indicate that neither severe dieback, nor conversion to pine result in significant changes in salinity levels. A much more comprehensive environmental monitoring experiment, involving the construction of four notch weirs and the sinking of a number of test bores, was initiated during the year at Jarrahwood.

RESEARCH : HARDWOOD SILVICULTURE

Jarrah

Research in the northern jarrah forest has been primarily concerned with hydrology, bauxite mining rehabilitation and jarrah dieback. Extensive studies of dieback rehabilitation procedures have been delayed pending the results of a broadscale survey of existing trials. Jarrah silviculture trials have been maintained but no new trials have been initiated.

Hydrology

Surface Salinity

The existing sampling programme in the Murray and South Dandalup catchments has been intensified. A broadscale surface salinity programme in the Serpentine, North Dandalup and Little Dandalup catchments has been completed. Preliminary analysis indicates that there is a general increase in base flow salinity levels with increase in distance from the Darling Scarp. However, within the central region of the forested zone there is a mosaic of saline and non-saline areas.

On this basis it may be possible to increase fresh water yield of some non-saline catchments by reduction of stand density, whereas in saline catchments it may be necessary to increase the density of cover by revegetation.

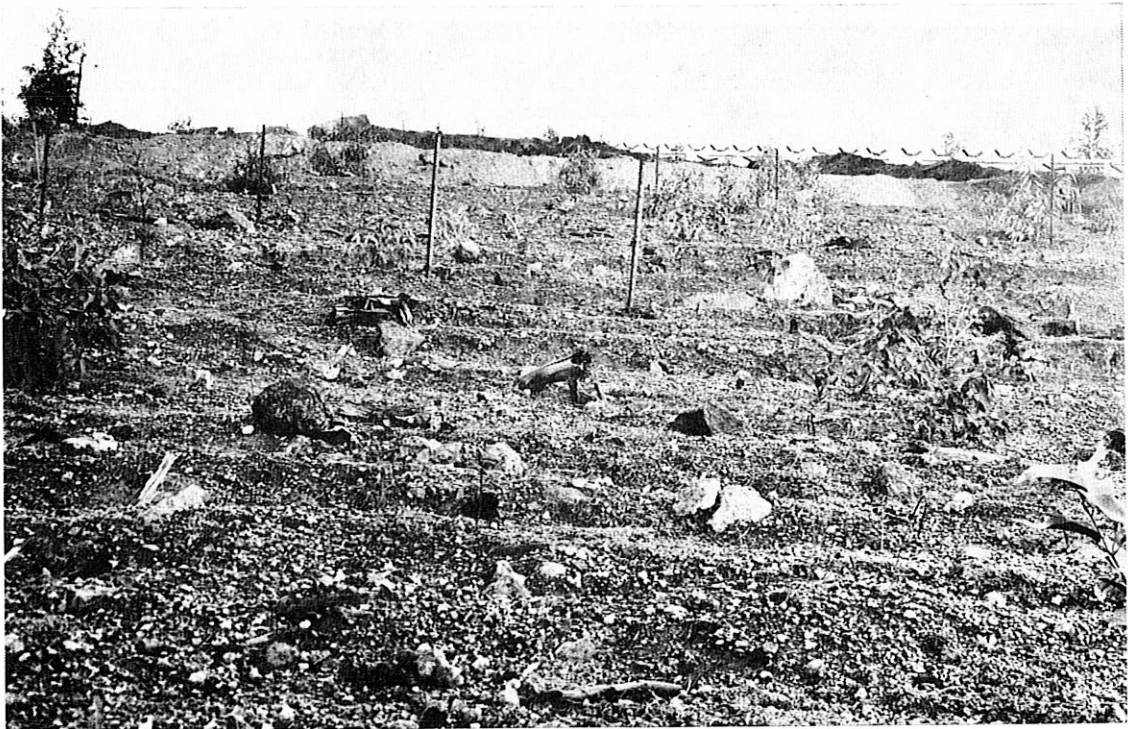
Yarragil Basin Study

Detailed studies in the catchment of Yarragil, which are aimed at devising practical management techniques to increase water yield and decrease salt flow, continued. In addition to detailed surface salinity measurements, measurements of flow in 12 sub-catchments were carried out. Twenty-two additional "V" notch weirs were installed so that water and salt yields from every sub-catchment within the major catchment are now monitored.

In order to determine salt levels in the soil profile and water table, coring was carried out in 27 locations within the catchment area. Salt levels varied markedly within and between core sites. In some sites there was a distinct accumulation of salt within the pallid zone above the water table. The results of the study support the hypothesis that there is a mosaic of saline and non-saline areas in the central forest zone. Measurements of the salinity of groundwater in the cored holes indicated that groundwater salinities were significantly higher than the salinities of adjacent streams during periods of base flow.

Bauxite Mining Rehabilitation

Initial trials aimed at determining species most suitable for establishment on bauxite mine sites to increase mine floor soil stabilisation, have been completed. A number of native legume species, grasses and clover were tested. Excellent germination of native species occurred and some species produced complete groundcover one year after planting. Where native species were planted in combination with clover, their survival and growth were markedly reduced. Native wildflower species are unable to survive in the presence of clover, as shown in photographs. No species, including grasses and clover, were able to grow rapidly enough to prevent erosion during the autumn and early winter period.



Direct seeding of bauxite mine area with native species and clover.



Direct seeding of bauxite mine area with mixture of native species only.

Further trials involving mulching and broadscale treatments of discrete catchment areas within the mine site have been initiated.

Sediment load, turbidity and chemical content of water are being monitored in a number of locations at the Del Park mine site.

Jarrah Dieback

Laboratory and field studies carried out in collaboration with C.S.I.R.O. research officers indicate that the physical and microbiological environment in soils with a dense native legume understorey is unfavourable for *Phytophthora cinnamomi* activity. Recent studies indicate that micro-organisms associated with particular legume roots may be preventing *P. cinnamomi* from attacking susceptible species.

This suggests that it may be possible to develop a practical method of controlling the disease. A recent field trial demonstrated that it is possible to induce widespread regeneration of legumes by fires, of sufficient intensity to scorch the crowns of the trees without causing significant damage to the boles.

Karri and Marri

The emphasis of silvicultural research has been on developing regeneration techniques in order to allow a larger degree of flexibility in reforestation programmes. The standard method using seed trees limits regeneration to seed years, while large-scale planting creates logistic problems. Direct seeding techniques are being tested for possible operational use.

Seed Forecasting

The annual sampling of karri branches from felled trees and branches shot from standing trees was completed in May. Most of the heavy bud crop found in 1974 failed to develop further in that year and fairly heavy flowering was delayed until early winter 1975 over most of the karri forest area. Good seed crops are forecast for 1976, starting to ripen in autumn and lasting until at least the following autumn.

A narrow belt on the fringe of the karri forest to the south west of Pemberton was found to be out of cycle with the main forest block. This belt flowered in winter 1974 and had produced a heavy seed crop by winter 1975.

Other seed forecasting surveys were made on seed trees in ten areas scheduled for regeneration burns in the current season.

Direct Seeding

Direct seeding trials using pelleted seed distributed from hand spreaders were reported last year. Assessments were made in May 1975, twelve months after seeding.

Rate of Seeding kg/ha	Stocking Level* Percent	Seedlings per ha (estimated)
0.4	51.6	950
0.6	69.5	1 850
1.0	85.0	3 800

* The percentage of assessed plots, each 0.001 ha in area, which contain at least one karri seedling. The minimum acceptable level is 65 per cent.

The results are promising and suggest that a seeding rate of 0.5-0.6 kg/ha should give an acceptable level of stocking.

In May 1975 a further 10 ha was hand seeded experimentally at rates varying between 0.5 and 1.0 kg/ha.

Nursery Investigations

Two fields of investigation into the raising of karri seedlings in the nursery were undertaken. The first, designed to determine the maximum density of seedlings in terms of numbers per metre of row, involved testing spacings of between 1.25 cm and 4.00 cm within rows of plants. The results indicated that a maximum of 25 usable plants per metre can be achieved, equivalent to a 4 cm spacing. At closer spacings many plants were suppressed and failed to reach usable size.

The second investigation involved control of growth rate by root pruning. Root pruning at monthly intervals yielded plants that were shorter, and had a heavier root system than unpruned plants. The amount of lateral root on pruned plants was twice that on unpruned.

Characteristic	Root pruned	Not pruned
Shoot length (mm)	470	673
Root collar diameter (mm)	4.65	5.21
Weight of tap root (gm)	1.11	1.04
Weight of lateral roots (gm)	0.40	0.20

On the whole, the root-pruned planting stock was thus significantly better than the unpruned control.

Environmental monitoring

The main task of the research team has been the establishment of base lines for the monitoring of the impact of the chipwood cutting.

Hydrology

Stream sampling

The sampling of salt levels in a wide range of streams in order to locate areas potentially sensitive to disturbance, and hence salination, was continued throughout the year. Enough data has been collected in the two-year study for the broad-scale prediction of the salination potential throughout the chipwood license area. Deep drilling, soil coring and analysis were carried out on a representative range of geomorphological and soil types by the C.S.I.R.O. Division of Land Resources Management in an attempt to define salt sensitivity variations more closely within the broad predictions gained from the Forests Department stream sampling.

Coupe monitoring

Five logging coupes, scheduled for cutting in summer 1976/77, were prepared for monitoring groundwater hydrology and stream flow before and after cutting. The coupes cover the range of the main forest types and rainfall combinations represented in the chipwood license area. In each coupe, which enclosed a stream catchment, 10 lined bores, laid out in a grid, were drilled to the ground water table. Three pairs of 50 mm stainless steel lined bores, each six metres deep, were sunk for neutron probe access for soil moisture measurements. Two ground water bores and two neutron probe access bores were also sunk in an area adjacent to each coupe. These will be used as controls. Two-weekly measurements are being taken of soil moisture, and of height and salinity level of the ground water table.

Deep bores in the coupe monitoring project, a total of 60 in all, were cored at metre intervals and the cores analysed for bulk density, pH, moisture content, electrical conductivity, total soluble salts and sodium chloride.

Concrete streamflow measuring weirs were constructed in three of the coupes. Stream flow measurements are made three times weekly, when samples for estimation of sediment load and turbidity are also taken from the streams. Automatic sediment samplers are being constructed for installation in the future.

Assistance has been given to the Water Resources Section of the Public Works Department in selecting similar (paired) catchments in the area. These will also be used in hydrological studies.

Flora and Fauna

Research has continued into the ecological effect of clear felling pure karri stands. The study is concerned with both flora and fauna and is based on a comparison of populations in six different aged stands of karri. These range from cutover areas not yet regenerated, to virgin forest. Field work is nearing completion and the data are being analysed. The following topics are under investigation.

Insects

Airborne insects were trapped by battery operated light traps during the night and a tent-like trap during the day. In each area, trapping sites were positioned on the hill top and near a creek.

Birds

Studies of bird populations were confined to a three hundred square metre area centrally located in each stand. Species numbers were mapped on four census days during the breeding season. Birds were located by sight or sound using an Audoban bird caller.

Rabbits and Foxes

Animal scats were used to compare population sizes in the various regeneration stands. Counts were made along roads and tracks through the areas and fox scats were collected and analysed for hair and bones. The aim is to assess the influx of feral animals and their effect on indigenous species.

Flora

In the karri region, the density and composition of vegetation is determined to a considerable degree by past fire history of the area. In order that this will not confound the effect of the logging and regeneration operations, all studies were duplicated on areas previously regularly prescribed-burnt, and areas from which fire has been excluded in the past. In each area, a large set of 120 one-metre quadrats was set out on a systematic grid. In addition to assessing the density of the understorey, the structure of the overstorey was recorded by profile diagrams, and a comprehensive list of plant species was prepared.

RESEARCH : PROTECTION

Karri Fuel Moisture Prediction

A system for predicting fuel moisture contents of the major fuel types within the southern forests has been completed. Tests on the accuracy of the predictions have shown the system to be reliable except where local variation of rainfall is excessive. To cover such situations, direct reading moisture meters can provide instant checks on the predictions.

The moisture prediction system contains five tables, which provide estimates of fuel moisture changes during the day and night and after rainfall. These estimates permit prediction of the day's maximum and minimum moisture contents of the surface and profile fractions of the fuel bed.

To assist management even further, a computer programme has been written up which can be incorporated in the Department's new computer terminal facilities. This will provide instant estimates of the fuel moisture contents for fuels in all Divisions.

The surface moisture content levels provide direct measures of the ignition potential of the fine forest fuels. Surface moisture also affects fire spread, and as such is an important parameter of the new karri fire behaviour tables.

The reliability of the system to predict the ignition potential was demonstrated in a study in which the ignition performance of prescribed burns conducted last fire season in southern forest was compared with the surface moisture content prediction. This study showed that about 75 per cent. of a total of 48 separate lightings in a wide variety of fuels were predicted correctly.

The system will be brought into operation this year and should provide a useful tool in prescribed burning management and fire control operations.

Karri Fire Danger Tables

A simple fire behaviour prediction system has been developed for karri forest fuels. It contains three tables which use the slope, the wind velocity, the surface moisture content prediction, the fraction of fuel bed available for burning, the fuel quantity, and the fuel structural type to predict the headfire rate of spread and the maximum scorch height.

The new karri tables are a simplified version of a preliminary set of predictive tables developed in 1972. They have correctly predicted the fire spread rates in 68 per cent. of 49 test fires.

Electrical Ignition of Logging Slash

A method of remote ignition of logging slash by pre-laid electrical incendiaries has been developed and modified along the lines of a Tasmanian device.

The best application of this technique would be in areas where:

- An intense fire is required quickly over a large area.
- The topography or fuel disposition makes it unsafe for hand lighting.

Moisture Differential in Slash Burning

An intensive trial aimed at detecting the presence and extent of a significant moisture differential between the un-cut and adjoining cut over forest, as an aid to control during slash disposal burns, was carried out near Quininup. Excluding holidays and the prohibited period, results indicate that throughout the whole burning season, there are likely to be only 5 to 8 days with a significant moisture differential.

If maximum use is made of such days, more slash burns can be completed with a given workforce.

Grassfire Behaviour Studies

Twenty-three test fires in heavy and light grass fuels were observed on farmland along the Blackwood Valley near Balingup. Headfire spread measurements showed that McArthur's "Grassland Fire Danger Meter" tended to overestimate slow fires and underestimate fast fires. It was apparent that the discrepancies were mainly due to fuel quantity, density and textural differences not accounted for in the Meter. An adjusted table was developed to account for these fuel characteristics and when tested it greatly improved predictions for both fast and slow moving fires.

RESEARCH : SOILS AND NUTRITION

The major activities during the year have been connected with the stream and soil core sampling programme associated with the woodchip project and bauxite mining environmental studies.

Stream Sampling

The major emphasis on the stream salinity study was from Mundaring and Dwellingup Divisions, with a limited number of samples from Busselton and Manjimup Divisions.

The trends observed were similar to those reported in 1974, all samples showing a rise in conductivity during late spring and early summer, as the base flow factor exerted its influence on stream water composition.

Soil Salinity Study

An intensive drilling programme was carried out during the year to study the distribution of salts in various forest soil profiles.

The main areas covered were the chipwood project area around Manjimup, bauxite mining leases Dwellingup, potential pine planting areas in the Donnybrook Sunkland and two experimental catchments east of Mundaring. Minor drilling programmes were also carried out on bauxite leases near Boddington and Kirup. In all cases the soil samples were analysed for pH, electrical conductivity, soluble salts, and chloride. The soil cores themselves were analysed for moisture content per cent., and bulk density. In some cases the studies were carried out jointly with other departments involved in the monitoring of the environmental impact of bauxite mining and woodchipping. Others were a wholly departmental responsibility.

A very wide range of salinity values was observed. Although some generalisations can be made regarding the occurrence of salt within the landscape, many exceptions to these have been found. Relatively large amounts of salts were present in many of the forest sub-soils, even in the high rainfall areas.

Pine Nutrition

The analysis of foliar samples from *Pinus radiata* experimental plots situated in the Donnybrook Sunkland and the Coastal Plain continued during the year, and this confirmed that phosphorus, copper, manganese and zinc levels are low in many of these soils.

RESEARCH PUBLICATIONS

Research Papers numbered 10, 12, 13 and 16 were published during the year as was Bulletin No. 84.

In anticipation of rising demand, Research Paper No. 3 "Some Aspects of Logging Hygiene" and No. 4, "Regeneration Methods in Mixed Marri-Karri Stands", were reprinted.

UTILISATION

Timber Seasoning

Investigation was continued into the problems of high temperature (120°C) kiln drying. The ferro-cement approach to achieving a desirable structure with low heat absorption or heat loss, and low corrosion and expansion factors was carried through the design and calculation phase. Copies of drawings and data were introduced at a seminar on high temperature seasoning in Mt. Gambier and at the 17th Forest Products Conference in Melbourne.

Mature butt logs of *P. pinaster* from Ludlow were sawn and air seasoned at Harvey, and graded to yield over 70 per cent. in Standard Grade and better.

Timber Preservation

Pressure treated railway sleepers (and plywood sheets), under test against termite attack at Port Hedland and Darwin, were again examined. *Mastotermes* attack in both areas had decreased, however termites were in contact with all test pieces and evaluation is proceeding.

The Pilbara railway systems are now handling a gross load in excess of 130 million tonnes/annum. Rail sleeper life is related to mechanical weathering which in turn depends on gross tonnes carried.

It appears at this stage that the life of untreated jarrah sleepers ranges from 100 million gross tonnes (m.g.t.) on tight curves to over 250 m.g.t. on easy curves. An average life on straights is suggested as 300 m.g.t. which equates to approximately 10 years for an annual movement of 30 m.g.t.

Departmental Sawmills

Continuity of production in sawn pine was achieved by the lack of plant failure and minimum withdrawal of mill crews for other tasks. An Anderson No. 1 log edger was installed at Harvey for baulk production, and an Anderson No. 2 edger at Busselton to replace the old Jensen and Dahl machine.

Other work included:

- Installation of a radial arm hob feed recovery bench for slab resaw at Busselton.
- A feasibility and cost study of the potential for upgrading the Grimwade mill for increased output.
- Redesign of the automatic gulleter.
- Design work related to handling flitches as well as logs through the Harvey edger.

Assistance was given to local authorities, other Government Departments, the sawmilling industry, the Standards Association and the general public on matters of timber technology and design.

EDUCATION AND PUBLICITY

Publicity

During the year, 16 new information sheets and one new issue of Forest Focus (Jarrah Dieback—No. 14) were published. Several information sheets and one issue of Forest Focus No. 12, (Marri Woodchip Project) were reprinted. Work has commenced on a number of publications, including regeneration in the karri forest type.

Detailed interim reports were prepared on the vegetation of Rottneest Island and on proposals for softwood plantations in certain locations within the Donnybrook Sunkland.

Displays were staged in the country and metropolitan area, and included the Royal Show, Fire Prevention Week and one at the Housing Industry Association centre. Large colour prints and other material were supplied on loan to the Department of Tourism for three displays.

Education

Educational activities of staff during the year included:

- The first Western Australian celebration of World Forestry Day on March 21. Literature was despatched to 91 secondary schools and 19 schools accepted the invitation to a film and discussion at the Institute of Forest Research and Protection.
- At the invitation of the Forestry Department, Australian National University, Inspector G. B. Peet participated in the fire control course as guest lecturer.
- Eighteen cadets were selected from 150 applicants to start at Mt. Lawley Technical College in February 1975.

Cadets from Mt. Lawley and Bunbury together with two mature age appointments comprise the 21 second year students at Manjimup and Dwellingup training centres.

Two scholarships leading to a degree in forestry at the Australian National University were awarded by the Department.



Senior High School students (L to R) Mark Pearce, Michelle Hardeman, Lyn Bevis and Fiona Halse examine mounted skins of native mammals on World Forestry Day 1975.

Public Enquiries

Enquiries from the public, government departments and special interest groups, remained at a level comparable with the previous year. The majority of enquiries related to choice of species for planting, and diseases of trees.

More than 60 talks were given to various groups and schools with particular emphasis on dieback quarantine.

An increase was noted in the level of public interest in forestry matters generally.

Library

There was an increase in the number of requests for information and also for loans of material both from the library stock and from the four Accession Lists issued during the year.

Statistics were recorded as follows:

Journal circulation	....	....	....	....	9 270
Requests from accession lists	....	....	....	....	2 612
Loans	....	....	....	....	2 900
Queries	....	....	....	....	873
Accessions	....	....	....	....	430
Loans from other libraries	....	....	....	....	380

ACCIDENT PREVENTION (SAFETY)

During the year 960 officers and employees worked 1 748 219 man hours, and suffered 55 disabling injury accidents, with a further 127 serious injury accidents requiring medical attention only.

The frequency rate for disabling injuries (accidents per million hours worked) was 31 and the average time lost was 11.5 days per accident. Of the 634 mandays lost, 251 were re-occurrences of injuries that needed further treatment.

All divisions and specialist sections have contributed to the overall success of the accident prevention programme and a number of them have achieved outstanding success by reducing their accident incidence to zero. Several sections have now worked for long periods without disabling injuries:

Walpole	....	....	200 000 manhours over 4 years
Dwellingup	....	....	250 000 manhours over 2 years
Kelmscott	....	....	100 000 manhours over 2 years

National Safety Council Awards were presented for these successes. The Working Plans section and Cadets have worked 3 years without disabling injury.

Towards the end of the year the Hon. Minister for Labour called on all heads of Government services to implement a more positive accident prevention policy. Though this Department has been a leader in safety, and the Minister made mention of this, it was considered that a major review of accident prevention measures was warranted. An adverse trend in accident occurrence which began in 1972 had continued to the past year. After the review, refresher training sessions were conducted for senior professional and field staff officers on management responsibilities and procedures.

Safety training sessions for front line supervisors had been carried out previously.

The tabulated summary illustrates the results which have been achieved since 1967, when active accident prevention policies were first implemented.



The Hon. Minister for Forests, Mr. Alan Ridge, presenting a 50 000 hours safety award in the Kelmscott Division.

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	76	110	458	9	253
1971/72	1 759 888	40	128	168	23	72	95	275	6	156
1972/73	1 728 577	45	112	157	26	64	90	414	9	239
1973/74	1 651 621	45	119	164	27	72	99	359	8	217
1974/75	1 748 219	55	127	182	31	72	104	634	11	362

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 man-hours worked.

STAFF MATTERS

Public Service Act

The Secretary, Mr. R. K. Reid retired on 11/8/74 and was replaced by Mr. R. H. Wilson.

Mr. V. K. Combs was promoted to the position of Accountant.

Mr. H. Campbell was promoted to Senior Divisional Forest Officer, while Mr. J. S. Skillen and Mr. R. J. Sneeuwjagt were promoted to Divisional Forest Officers.

Mr. R. J. Sneeuwjagt and Mr. G. Malajczuk rejoined the Department after completion of post-graduate courses in North America.

Mr. P. B. Dick 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.

During the year 12 officers were appointed under the Public Service Act to fill vacancies arising from resignations, retirements and transfers.

Forest Act

Mr. A. G. McEvoy, Senior Forester (Utilisation) and Mr. C. A. Pinkus, Officer in Charge Telecommunications, and Mr. G. Dickerson, Assistant Forester (Training) retired in March 1975.

Mr. G. N. Hutchinson was promoted to Senior Technical Officer (Radio Branch).

The following officers were promoted to District Foresters:

Mr. J. A. Dearle and Mr. N. K. James.

The following officers were promoted to the new position of Senior Forest Assistant:

Mr. A. J. Edwards, Mr. W. G. Buchanan, Mr. B. E. Brody and Mr. W. E. Townsend.

During the year there were 23 resignations and 4 retirements.

Visits

There were 30 interstate and 4 overseas conferences, together with courses, study meetings and Forestry Council meetings during the year. Altogether 27 officers attended such meetings which covered a range of topics and included woodchipping, rail sleepers, fire ecology, softwoods and forest protection.

APPENDIX IA

Statement of Revenue and Expenditure of the Consolidated Revenue Fund for the year ended 30th June, 1975

1973/74	Revenue	1974/75	1973/74	Expenditure	1974/75
	<i>Royalties</i>				
3 048 698	Logs	3 566 770	910 172	Salaries	1 161 833
40 130	Sleepers	44 886	145 038	Incidentals	165 124
860	Sawn Timber	555	9 203	Timber Industry Regulations Act	27 155
131 152	Poles and Piles	212 621	208 465	Hardwood Conversion	259 697
5 183	Mining Timber	8 841	1 426 411	Pine Conversion	1 902 375
18 588	Firewood	16 773	171 136	Recoupable Projects	99 167
21 462	Posts	19 445	47 770	Tree Nurseries	80 806
26 636	Sandalwood	18 444	20 003	Arboreta	17 901
8 898	Miscellaneous	31 505	12 000	Printing and Stationery	15 501
			9 605	Metric Conversion	3 902
3 301 607		3 919 840	5 162	Transfer of Mining Compensation	11 177
			955	Road Verges Committee	87
	<i>Pine Conversion</i>		27 001	Timber Industry Promotion	46 101
705 110	Pine Logs	1 019 232		Share of Revenue from Somerville	
885 344	Sawn Pine	1 223 708	5 010	Plantation Paid to University	6 653
				Payroll Tax	58 502
1 590 454		2 242 940		Special Research Grant	70 503
				<i>Excess of Revenue over Expenditure</i>	
				<i>distributed as follows</i>	
154 601	<i>Hardwood conversion</i>			9/10 to Reforestation Fund	2 911 662
157 520	Sawn Hardwood	156 546	2 726 710	Transferred to Treasury	312 685
2 473	Logs	184 665	276 273		
	Posts, Poles and Piles	978			
314 594		342 189			
	<i>Other Sales and Fees</i>				
57 165	Seeds and Trees	58 101			
56 280	Inspections Fee	66 513			
23 288	Rents and Leases	28 900			
436 277	Miscellaneous	281 540			
51 625	Compensation—Mining and other	111 792			
624 635		546 846			
	<i>Recoupable Projects</i>				
76 588	Specific Roads				
93 036	Other	99 016			
169 624		99 016			
6 000 914		7 150 831	6 000 914		7 150 831

APPENDIX IB

Forest Improvement and Reforestation Fund Account and General Loan Funds for the year ended 30th June, 1975

1973/74	Source of Funds	1974/75	1973/74	Expenditure	1974/75
1 598 757	Balance as at 1st July	1 413 581	2 240 391	<i>Divisional</i>	
2 726 710	9/10 Revenue	2 911 662		Wages, materials, etc. excluding Plant	3 156 311
140 728	Rents	145 356	1 872 913	<i>Head Office</i>	
227 428	Commonwealth Aid Road Grant	339 514	88 873	Salaries and Allowances	2 424 964
	Commonwealth Government Soft-		270 460	Incidentals	120 022
415 714	wood Forestry Agreement	684 663	777 791	Plant and Vehicles	341 584
1 700 000	General Loan Fund	3 000 000	7 566	Plant Operations	1 053 319
7 000	Aboriginal Training Scheme Advance		79 560	Purchase of Land	1 356
5 162	Mining Compensation Grant	11 177	147 557	Fire Equipment	243 614
	Employment Relief Schemes	69 596	55 815	Head office Housing and Building	45 854
			25 820	Como Headquarters	69 077
			44 563	Communications	101 905
			14 382	Research	57 213
			12 675	Drafting	20 492
			17 702	Surveys	23 839
			127 341	Training of Staff	17 309
			196 085	Insurances	125 366
			15 114	Pay Roll Tax	284 144
			17 649	Utilisation	35 925
				Aboriginal Training Scheme	3 707
				Employment Relief Schemes	152 162
			3 771 866		5 121 852
			6 012 257	TOTAL	8 278 163
			604 339	Less Recoups	756 019
			5 407 918		7 522 144
			1 413 581	Balance working account	1 053 405
6 821 499		8 575 549	6 821 499		8 575 549

APPENDIX IC

Statement showing distribution of Forests Department Expenditure

Consolidated Revenue Fund	....	....	....	....	\$	3 926 484
Reforestation Fund	....	....	....	....		4 522 144
General Loan Fund	....	....	....	....		3 000 000
						<u>11 448 628</u>

Distribution of Expenditure

1 Busselton	....	....	....	....		1 031 516
2 Mundaring	....	....	....	....		374 637
3 Dwellingup	....	....	....	....		948 805
4 Collie	....	....	....	....		541 916
5 Kirup	....	....	....	....		948 113
6 Manjimup	....	....	....	....		1 062 017
7 Narrogin	....	....	....	....		122 895
8 Kelmscott	....	....	....	....		284 112
9 Collier	....	....	....	....		32 952
10 Harvey	....	....	....	....		1 034 922
11 Pemberton	....	....	....	....		676 725
12 Nannup	....	....	....	....		517 052
13 Walpole	....	....	....	....		287 339
14 Kalgoorlie, Esperance	....	....	....	....		58 548
15 Wanneroo	....	....	....	....		856 579
16 Somerville	....	....	....	....		282 262
Head Office	....	....	....	....		2 388 238
						<u>11 448 628</u>

APPENDIX 2A

Exports from Western Australia of Timber, Tanning Substances and Essential Oils for the Year ended June 30, 1974

Item and Destination		Quantity	Value	Item and Destination		Quantity	Value
1	Sawlogs and veneer logs, in the rough or roughly squared-conifer	m ³	\$				
2	Sawlogs and veneer logs, in the rough or roughly squared, non-conifer (including poles, piling posts and other wood in the rough)						
	Interstate			7	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—	m ³	\$
	Overseas—				Flooring		
	United Kingdom		5		Interstate (c)—		
	Total		5		New South Wales	2 669	280 286
3	Sleepers—				Victoria	1 147	121 155
	Interstate—				South Australia	664	90 076
	South Australia	4 012	237 617		Northern Territory	1 081	143 010
	Total	4 012	237 617		Total	5 561	634 527
	Overseas—				Overseas (d)—		
	Israel	1 052	70 784		Japan	5	1 091
	South Africa, Republic of	67	4 798		New Zealand		15
	United Kingdom	12 702	1 094 160		Total	5	1 106
	Total	13 821	1 169 742	8	Other (e)—		
4	Timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm—non-conifer				Interstate—		
	Jarrah (a)—				New South Wales	23	2 092
	Interstate—				Northern Territory	36	2 040
	New South Wales	339	23 548		Total	59	4 132
	Victoria	5 893	354 346		Overseas—		
	South Australia	17 511	1 097 446		Canada		104
	Northern Territory	1 051	64 985		Greece	134	24 206
	Total	24 794	1 540 325		Italy	112	21 269
	Overseas—				Japan	55	13 722
	Bahrain	23	2 799		United Kingdom	413	55 971
	Canada	28	3 265		U.S.A.	18	3 934
	Germany, Federal Republic of	2 262	181 918		Total	732	119 206
	Greece	344	33 005		Total Timber items 1-8...	98 200	7 366 709
	Hong Kong	14	1 470	9	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 (f)—		
	Iran	137	16 133		Overseas—		
	Italy	176	21 496		Cocos Islands	60	100
	Japan	215	30 484		Hong Kong	59	53
	Kenya	274	17 100		United Kingdom	274	3 073
	Mauritius	77	6 550		U.S.A.	32	301
	Netherlands	1	156		Total	425	3 527
	New Zealand	623	47 015	10	Reconstituted wood (also known as particle board, chip board, sliver board, shaving board, flake board, residue board and wood waste board (f)—		
	South Africa, Republic of	662	51 354		Overseas		
	United Kingdom	7 797	640 037		Hong Kong	14 850	14 092
	U.S.A.	232	25 695		Japan	500	240
	Total	12 865	1 078 477		New Zealand	5 231	9 160
5	Karri (a)—				Singapore	47 276	63 579
	Interstate—				South Africa, Republic of	4 000	4 480
	New South Wales	8 228	520 957		United Kingdom	298	807
	Victoria	895	56 703		Total	72 155	92 358
	South Australia	18 359	1 249 670		Total Timber items 1-10		7 462 594
	Northern Territory	1 473	91 490	11	Casks, Vats, Barrels, etc., Empty (f)—		
	Total	28 955	1 918 820		Overseas—		
	Overseas—				United Kingdom		8 396
	Bahrain	6	976		Total		8 396
	Belgium-Luxembourg	57	4 982	12	Manufactures of wood (except furniture) N.E.I.—		
	Canada	36	3 992		Interstate (g)—		
	Germany, Federal Republic of	1 033	111 169		New South Wales		908 507
	Greece	62	4 332		Victoria		1 587 894
	Italy	76	9 323		Queensland		39 737
	Japan	275	24 717		South Australia		944 102
	Libyan Arab Republic	80	19 345		Tasmania		29 344
	New Zealand	3 013	227 002		Northern Territory		89 133
	Singapore		26		Total		3 598 717
	South Africa, Republic of	1 313	115 487				
	South West Africa	46	3 515				
	Uganda	4	294				
	United Kingdom	372	27 571				
	U.S.A.	989	106 204				
	Total	7 362	658 935				
6	Other (b)—						
	Interstate—						
	New South Wales	2	115				
	South Australia	6	657				
	Northern Territory	1	340				
	Total	9	1 112				
	Overseas—						
	Italy	10	1 709				
	New Zealand	14	996				
	Total	24	2 705				

APPENDIX 2A—continued

Exports from Western Australia of Timber, Tanning Substances and Essential Oils for the year ended June 30, 1974

Item and Destination		Quantity	Value	Item and Destination		Quantity	Value
			\$			kg	\$
Overseas—			52 934	Overseas		554	6 844
Indonesia			5 216	France		9 369	30 499
Japan			1 126	Germany, Federal Republic of		61	1 830
Kuwait			1 026	Hong Kong		7 555	52 834
Singapore			3 014	Italy		2	2 900
Sweden			397	Japan		273	1 388
Union of Arab Emirates			2 720	Malaysia		6 551	28 769
United Kingdom			30	Netherlands		12 052	24 102
U.S.A.				Singapore		1 591	3 679
Total			66 463	Switzerland		61	1 460
				Thailand		21 701	80 421
				United Kingdom		17 929	55 771
				U.S.A.			
13	Tanning Substances of Natural Origin	N.R.S.	N.R.S.	Total		77 699	290 497
14	Essential oils, concretes and absolutes, resinoids—	kg		Total Value of Exports on this Return .....		....	11 569 797
	Interstate						
	New South Wales	5 380	33 610				
	Victoria	15 781	95 131				
	Queensland	16	54				
	South Australia	1 420	14 335				
	Total	22 597	143 130				

(a) Excludes Timber cut to size for making Boxes or staves (Included in Item 6).

(b) See footnote (a).

(c) Relates to Interstate exports of non-conifer flooring only. Interstate export of conifer flooring included in Item 8.

(d) Relates to overseas exports of conifer flooring only. Overseas exports of non-conifer flooring included in Item 8.

(e) See footnotes (b) and (c) Item also includes conifer timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm.

(f) Interstate exports included in Item 12.

(g) Includes cork manufactures. See also footnote (f).

'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, 1974

Item and Origin		Quantity	Value	Item and Origin		Quantity	Value
		m ³	\$			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 (j)—		
	Overseas	(b)	(b)		Japan	26 633	14 046
	Timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm—conifer (c)—				Malaysia	39 576	14 134
2	Western Red Cedar (d)				Papua New Guinea	4 670	4 670
	Overseas				Philippines	85 016	16 616
	U.S.A.	148	16 277		Singapore	70 353	17 218
	Total	148	16 277		Taiwan	1 894 214	426 221
3	Douglas Fir (d)—				Thailand	3 024	1 215
	Overseas—				United Kingdom	1 548	3 590
	New Zealand	8	584		U.S.A.	1 301	1 119
	U.S.A.	1 261	160 502		Total	2 121 665	498 829
	Total	1 269	161 086	11	Reconstituted wood (also known as particle board, chip board, sliver board, shaving board, flake board, residue board and wood waste board)—		
4	Other—				Interstate (separate state details not available for publication)		
	Interstate (e)—				Total	874 935	1 913 128
	Victoria	9	843		Overseas—		
	South Australia	127	11 576		Korea, Republic of	451	209
	Total	136	12 419		South Africa, Republic of	4 163	3 143
	Overseas—				Total	4 614	3 352
	Canada	21	315		Total Timber Items 10, 11	3 265 298	2 999 609
	Malaysia	46	6 073		Total Timber Items 2-11		6 747 275
	U.S.A.	72	10 729	12	Match Splints (g)—		
	Total	139	17 117		Overseas—		
5	Timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm—non-conifer (c)—				Finland		110 161
	Interstate—				Total		110 161
	Tasmania	34	6 548	13	Rulers, wooden (a)—	No.	
	Total	34	6 548		Overseas—		
	Overseas—				China, People's Republic of	6 600	721
	Indonesia	1 732	111 400		Germany, Federal Republic of	72	9
	Malaysia	29 445	2 931 518		Japan	1 680	41
	Philippines	1 209	105 739		Netherlands	2 160	803
	Singapore	1 621	143 787		United Kingdom	8 634	8 652
	Thailand	432	109 484		U.S.A.	5	2
	Total	34 439	3 401 928		Total	19 151	10 228
6	Shooks and staves, sawn lengthwise, sliced or peeled, but not further prepared of a thickness exceeding 5 mm (f)—			14	Table mats, wooden	N.R.S.	N.R.S.
	Overseas			15	Wood Flour (k)—		
7	Wooden Beadings and mouldings (including moulded skirting and other moulded boards) (g)—				Overseas		
	Overseas—			16	Manufactures of wood (except furniture), N.E.I. (l)—		
	Austria		464		Interstate—		
	Malaysia		9 242		New South Wales		736 204
	Netherlands		916		Victoria		568 225
	Taiwan		3 737		Queensland		5 670
	Thailand		46		South Australia	191 317	
	United Kingdom		20 010		Tasmania		42 893
	Total		34 415		Total		1 544 309
	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—				Overseas—		
8	Flooring (h)—				Canada		236
9	Other—				China, People's Republic of		2 805
	Interstate (i)—				Czechoslovakia		274
	Overseas				Denmark		8 284
	Malaysia	553	89 298		Finland		4 648
	New Zealand	7	2 134		France		210
	Singapore	17	6 115		Germany, Federal Republic of		18 440
	United Kingdom	1	329		Greece		65
	Total	578	97 876		Hong Kong		7 082
	Total Timber Items 2-9		3 747 666		India		13 755
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—				Indonesia	1 319	
	Interstate—				Israel		582
	New South Wales	82 573	193 366		Italy		7 199
	Victoria	39 436	58 266		Japan		25 518
	Queensland	139 281	326 892		Korea, Republic of		856
	South Australia	2 794	5 776		Malaysia		10 543
	Total	264 084	584 300		Malta		12
					Mexico		712
					Morocco		65
					Netherlands		140
					New Zealand		3 656
					Norway	1 969	
					Pakistan, Islamic Republic of		38
					Philippines		101 900
					Singapore		12 021
					Spain		11 943
					Sri Lanka		2 296
					Sweden		57 152
					Switzerland		75
					Taiwan		173 461
					Thailand		50 888
					United Kingdom		11 794
					U.S.A.		9 170
					U.S.S.R.		63
					Vietnam, Republic of		148
					Yugoslavia		16
					Total		539 335

APPENDIX 2B—continued

Imports into Western Australia of Timber, Timber Products, Tanning Substances, Essential Oils and Paper Products for the Year ended June 30, 1974

Item and Origin		Quantity	Value	Item and Origin		Quantity	Value
17	Furniture, wood or wood framed (m)—	No	\$	21	Other (o)—	kg	\$
	Interstate—				Overseas—		
	New South Wales	....	319 604		India	2 000	459
	Victoria	....	711 763		Italy	480	1 436
	Queensland	....	562		United Kingdom	3 250	1 696
	South Australia	....	801 542		Total	5 730	3 591
	Total	....	1 833 471				
	Overseas—			22	Synthetic tanning substances, artificial rates for pre-tanning, tanning (tannic acids) and their salts, esters and other derivatives—		
	Canada	....	656		Interstate—		
	China, People's Republic of	....	9 689		New South Wales	10 848	16 705
	Denmark	....	21 728		Victoria	95 967	56 793
	Finland	....	2 286		Queensland	574	287
	Germany, Federal Republic of	....	5 112		South Australia	49	224
	Hong Kong	....	44 595		Total	107 438	74 009
	Hungary	....	292		Overseas—		
	India	....	13 940		Belgium-Luxembourg	1 000	3 439
	Indonesia	....	414		Germany, Federal Republic of	380 670	128 487
	Italy	....	30 471		United Kingdom	19 200	13 367
	Japan	....	59 619		Total	400 870	145 293
	Kenya	....	28				
	Korea, Republic of	....	726	23	Essential Oils, concretes and absolutes, resinoids—		
	Malaysia	....	22 451		Interstate—		
	Mexico	....	38		New South Wales	12	50
	Morocco	....	145		Victoria	2 399	17 211
	Netherlands	....	7 741		Total	2 411	17 261
	New Zealand	....	68 143		Overseas—		
	Norway	....	36 728		Brazil	1 440	3 491
	Pakistan, Islamic Republic of	....	641		India	17	99
	Philippines	....	7 192		Indonesia	10 232	37 803
	Singapore	....	166 790		Italy	2	77
	South Africa, Republic of	....	7		South Africa, Republic of	6 097	6 891
	Spain	....	17 793		Sri Lanka	32	842
	Sri Lanka	....	2 693		Swaziland	131 853	124 724
	Sweden	....	40 562		Taiwan	5 082	33 311
	Switzerland	....	50		U.S.A.	2 359	47 214
	Taiwan	....	212 849		Total	157 114	254 452
	Thailand	....	2 005				
	United Kingdom	....	105 291		Total Value of Imports on this Return	....	12 430 584
	U.S.A.	....	18 758				
	Yugoslavia	....	3 763				
	Total	....	903 196				
18	Clothes pegs, wooden	N.R.S.	N.R.S.	24	Paper Products—		
19	Tool handles, wooden—				Interstate Imports—		
	Interstate (n)—				Newsprint	1972/73	1973/74
	New South Wales	....	1 329		Other printing and writing paper	19 703	2 716
	Victoria	....	1 497		Tissues and wrapping paper	2 118 080	3 856 988
	Queensland	....	46 018		Other paper and paper board	1 150 182	1 505 133
	South Australia	....	187		Articles of paper pulp, paper or paper board	3 270 855	2 905 423
	Tasmania	....	726		Total	9 506 707	11 097 043
	Total	....	49 757		Overseas Imports—		
	Overseas—	Dozen			Paper, paperboard and manufactures thereof	6 207 118	7 421 563
	Germany, Federal Republic of	1	4		Total	6 207 118	7 421 563
	Italy	1	1				
	Japan	8	5				
	Switzerland	3	3				
	United Kingdom	49	84				
	U.S.A.	137	1 023				
	Total	199	1 120				
	Tanning Extracts of Vegetable origin—						
20	Wattle Bark Extracts (o)—	kg					
	Overseas—						
	Kenya	30 000	5 424				
	Mozambique	10 000	2 367				
	South Africa, Republic of	834 650	189 335				
	Total	874 650	197 126				

- (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) Excludes wood, sawn lengthwise, sliced or peeled, but not further prepared, veneer sheets and sheets for plywood, details of which are not available for publication.
- (k) Interstate imports included in Item 11.
- (l) Includes imports of wooden packing cases, casks, domestic articles of wood, and similar products.
- (m) Excludes imports, if any, of wooden medical, dental, surgical or veterinary furniture, non-domestic wooden chairs, and wooden legs imported separately as parts.
- (n) Includes brush and broom handles and the like.
- (o) 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

Year	Timber		Wood Manufacture Value	Essential Oils and Tanning Material*
	m ³	value		
Brought forward	13 081 830	\$ 177 786 912	\$ 8 536 935	\$ 17 368 964
1968	84 569	4 947 595	3 016 850	280 806
1969	86 455	4 984 098	3 802 927	267 565
1970	96 275	5 661 547	3 906 699	317 553
1971	79 362	4 803 842	2 110 802	343 512
1972	101 191	6 439 732	2 369 541	348 762
1973	111 547	7 036 637	2 604 116	377 736
1974	98 200	7 366 709	3 769 461	433 627
1975†				

* Tanning materials not recorded separately since 1967.

† Not available.

APPENDIX 4
SUMMARY OF IMPORTS OF FOREST PRODUCE

Year	Timber Woodware	Tanning Materials	Essential Oils
Brought forward	\$ 63 937 163	\$ 1 344 397	\$ 4 600 226
1968	8 135 532	75 657	143 696
1969	8 731 114	109 905	206 309
1970	10 968 170	153 169	293 845
1971	6 761 806	103 857	175 331
1972	5 578 819	144 219	227 530
1973	8 326 939	225 463	366 786
1974	11 738 861	420 010	271 713
1975†			

† Not available.

APPENDIX 5
SUMMARY OF LOG VOLUME PRODUCED

Year	Crown Land m ³	Private Property m ³	Total m ³
Brought forward	44 466 501	15 455 468	78 705 715*
1968	1 231 517	228 281	1 459 978
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
1975	1 096 356	87 957	1 184 313

* Includes 18 783 746 cubic metres estimated cut prior to 1917.

