FORESTS DEPARTMENT, WESTERN AUSTRALIA

ANNUAL REPORT 1972

Forests Department,
PERTH,
30th September, 1972

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, 1972.

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

Cover:

" The photograph on the cover shows a vigorous 53 year old jarrah pole stand near Dwellingup. Subjected to regular prescribed burns over many years, there is no doubt that the resultant fuel reduction was responsible for this particular stand escaping damage in the disastrous fire which swept through the area in January, 1961."

1—79840

MR. W. R. WALLACE

Mr. W. R. Wallace retired from the office of Conservator of Forests on 14th January, 1972. He was only the fifth person to hold that office since the formation of the Forests Department in 1919. On retirement he had given 43 years of distinguished service to the Department.

Mr. Wallace was a member of the first student intake to the Australian Forestry School when it was opened in Canberra in 1927. He graduated from there at the end of 1928 and commenced duty with the Forests Department in January 1929, being appointed Assistant Divisional Forest Officer in April 1930.

Mr. Wallace assumed control of the Dwellingup division and was also appointed Divisional Forest Officer during 1933. He was then to remain stationed at Dwellingup for 20 years until early 1954. This period covered the latter end of the depression, the war and the immediate post war years when Departmental finance and staff was extremely limited and he was called upon to administer and control much wider areas than the division of which he was nominally in charge.

He not only covered these administrative duties very ably but at the same time pioneered the research work and the initiation in practice of a fire weather service, which was the first of its kind in Australia and has been in operation with few adjustments until very recent times. The organisation, training and equipping of the first fire suppression gangs, which formed the foundation of the present highly regarded fire control organisation of the Department, was another significant achievement during this period.

Mr. Wallace was transferred to the Perth office as a Regional Superintendent in 1954 and appointed Deputy Conservator of Forests in 1961. In July 1969 he became Conservator of Forests. His period in this office was one where there was a very strong upsurge of public interest in environmental matters. The Department, since its inception, had been directly concerned with conservation and Mr. Wallace organised the dissemination, mainly by Departmental publications and participation on many governmental and other committees, of such information as had been gathered. His chairmanship and directing of the report of the Road Verges Committee was an example of achievement in this field.

Mr. Wallace has been and still is an active member of the Institute of Foresters of Australia. He was concerned with the formation and founding of the Institute, is a Past President and was elected Fellow in 1971.

The best wishes are extended to him for a long and happy retirement.

2—79840

PRINCIPAL OFFICERS *

Conservator of Forests	D. W. R. STEWART, B.Sc. (For.) Dip. For. (Canb.) Dip. For. (Oxon.).
Deputy Conservator of Forests	B. J. BEGGS, B.Sc. (For.) Dip. For. (Canb.).
Chief of Division	W. H. EASTMAN, B.Sc. (For.) Dip. For. (Canb.) Dip. For. (Oxon.).
Chief of Division	J. C. MEACHEM, D.F.C., B.Sc. (For.) Dip. For. (Canb.).
Chief of Division	P. J. McNAMARA, M.A. (Oxon.).
Chief of Division	J. B. CAMPBELL, B.Sc. (For.) Dip. For. (Canb.).
Utilization Officer	H. C. WICKETT, M.Sc. (Adel.) B. For. Sc. (N.Z.), M.I.E. (Aust.), Dip. For. (Canb.).
Superintendent	D. E. GRACE, B.Sc. (For.) Dip. For. (Canb.).
Superintendent (Research)	E. R. HOPKINS, B.Sc. (W.A.) Dip. For. (Canb.) Ph.D. (Melb.).
Superintendent (Fire Control)	F. J. CAMPBELL, B.Sc. (For.) Dip. For. (Canb.).
Superintendent	S. J. QUAIN, B.Sc. (For.) Dip. For. (Canb.).
Chief Draftsman	R. M. DAVIS, E.D.
Secretary	R. K. REID
Accountant	R. H. WILSON, B.A. (Econ.), A.A.S.A.
Registrar	B. M. SMITH, B.A.

* At 30th June, 1972.

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LIST OF COMMON AND BOTANICAL NAMES OF TREES USED IN THIS REPORT

EUCALYPTS	
Bald Island Marlock	*Euc. lehmannii*
Brown Mallet	*Euc. astringens*
Coral-flowered Gum	*Euc. torquata*
Dwarf Sugar Gum	*Euc. cladocalyx var. nana*
Jarrah	*Euc. marginata*
Karri	*Euc. diversicolor*
Marri	*Euc. calophylla*
Messmate	*Euc. obliqua*
Red Mahogany	*Euc. resinifera*
River Gum	*Euc. camaldulensis*
Silvertop Ash	*Euc. sieberi*
Sydney Blue Gum	*Euc. saligna*
Tallowwood	*Euc. microcorys*
Tasmanian Blue Gum	*Euc. globulus*
Tingle (Red)	*Euc. jacksonii*
Tingle (Yellow)	*Euc. guilfoylei*
Tuart	*Euc. gomphocephala*
W.A. Blackbutt (Yarri)	*Euc. patens*
Wandoo	*Euc. wandoo* Syn. *E. redunca* var. *elata*
CONIFERS	
Loblolly Pine	*Pinus taeda*
Maritime Pine (Pinaster Pine)	*Pinus pinaster*
Monterey Pine (Radiata Pine)	*Pinus radiata*
Patula Pine	*Pinus patula*
Slash Pine	*Pinus elliottii*
OTHER	
Sandalwood	*Santalum spicatum*
Sheoak	*Casuarina fraseriana*

CONTENTS

In view of the forthcoming changeover to the metric system of measurement, figures in this Report are given both in standard units and their metric equivalents.

CONVERSION FACTORS USED IN THIS REPORT

LENGTH	1 centimetre = 0·3937 in. 1 metre = 3·281 ft. 1 metre = 1·094 yd. 1 kilometre = 0·621 mile 1 yard = 3 feet = 36 inches	1 inch = 2·540 cm. 1 foot = 0·3048 m. 1 yard = 0·9144 m. 1 mile = 1·609 km. 1 mile = 1,760 yards = 5,280 ft.
AREA	1 cm^2 = 0·155 sq. in. 1 m^2 = 10·76 sq. ft. 1 km^2 = 0·3861 sq. mile 1 hectare = 0·003861 sq. mile 1 hectare = 2·471 acres 1 sq. kilometre = 100 hectares	1 sq. in. = 6·452 cm^2 1 sq. ft. = 0·0929 m^2 1 sq. mile = 2·59 km^2 1 sq. mile = 259 ha. 1 acre = 0·4047 ha. 1 sq. mile = 640 acres
VOLUME	1 cm^3 = 0·061 cu. in. 1 m^3 = 35·31 cu. ft. 1 m^3 = 0·706 load * 1 litre = 61 cu. in. 1 litre = 0·2642 gal. (U.S.) 1 litre = 0·2200 gal. (Imp.) 1 litre = 1,000 cm^3	1 cu. in. = 16·39 cm^3 1 cu. ft. = 0·02832 m^3 1 load * = 1·416 m^3 1 cu. in. = 0·01639 litre 1 gal. (U.S.) = 3·785 litres 1 gal. (Imp.) = 4·546 litres 1 gallon = 4 quarts
MASS	1 kilogramme = 2·205 pounds 1 metric ton = 1·102 short tons 1 metric ton = 0·9842 long tons	1 pound = 0·4536 kg. 1 short ton = 0·9072 metric ton 1 long ton = 1·016 metric tons
PRESSURE	1 kg. per m^2 = 0·2048 lb. per sq. ft. 1 gr. per cm^2 = 0·0142 lb. per sq. in.	1 lb. per sq. ft. = 4·882 kg. per m^2 1 lb. per sq. in. = 70·31 gr. per cm^2.
DENSITY	1 kg. per m^3 = 0·06243 lb. per cu. ft.	1 lb. per cu. ft. = 16·02 kg. per m^3
OTHER	1 m^2/ha. = 4·356 sq. ft/acre 1 m^3/ha. = 14·29 cu. ft./acre	1 sq. ft./acre = 0·2296 m^2/ha. 1 cu. ft./acre = 0·07 m^3/ha.

* This measure (1 load = 50 cu. ft.) is commonly used in the W.A. timber industry.

I. STATISTICAL SUMMARY OF MAJOR OPERATIONS

Sawnwood Production

	Cubic Feet	M^3	
Total Production of Sawn Timber	14,150,096	*400,739*	
Exports—Interstate	1,912,992	*54,177*	(13·5 per cent)
Exports—Overseas	1,660,064	*47,014*	(11·7 per cent)
Local Consumption	10,577,040	*299,548*	(74·8 per cent)

Trends in Production and Consumption

Year Ended 30 June		Production				Total Export	Local Availability	Sawmills (No.)	Employees Monthly Average (No.)
		Sawn		Hewn Non-conifer	Total				
		Non-conifer	Conifer						
1926	cub. ft.	14,522,733	n.r.s.	6,277,952	20,800,685	12,001,384	8,799,301	....	....
	m^3	*411,283*	....	*177,792*	*589,075*	*339,879*	*249,196*		
1938	cub. ft.	11,720,642	n.r.s.	2,573,540	14,294,192	7,545,744	6,748,448	134	3,112
	m^3	*331,928*	....	*72,883*	*404,811*	213,695	*191,116*		
1946	cub. ft.	8,869,847	n.r.s.	14,041	8,883,888	3,373,025	5,510,863	128	2,876
	m^3	*251,194*	....	*398*	*251,592*	*95,524*	*156,068*		
1951	cub. ft.	12,571,635	n.r.s.	1,183	12,572,818	2,342,492	10,230,326	256	4,047
	m^3	*356,029*	....	*33*	*356,062*	*66,339*	*289,723*	....	....
1956	cub. ft.	19,213,771	n.r.s.	5,308	19,219,079	4,568,034	14,651,045	274	5,804
	m^3	*544,134*	....	*150*	*544,284*	*129,367*	*414,917*	....	....
1960	cub. ft.	16,625,475	n.r.s.	....	16,625,475	6,167,132	10,458,343	265	5,037
	m^3	*470,833*	....	....	*470,833*	*174,643*	*296,180*	....	....
1965	cub. ft.	16,251,626	800,399	....	17,052,025	4,716,296	12,335,729	206	3,615
	m^3	*460,246*	*22,667*	....	*482,913*	*133,565*	*349,348*	....	....
1966	cub. ft.	16,795,276	582,582	....	17,377,858	2,432,378	14,945,480	203	3,518
	m^3	*475,642*	*16,499*	....	*492,141*	*68,885*	*423,256*	....	....
1967	cub. ft.	16,284,458	603,284	....	16,887,742	4,898,421	11,889,321	202	3,173
	m^3	*461,176*	*17,085*	....	*478,261*	*138,723*	*339,537*	....	....
1968	cub. ft.	16,589,629	583,706	....	17,173,335	2,986,212	14,187,123	188	3,209
	m^3	*469,818*	*16,531*	....	*486,349*	*84,569*	*401,779*	....	....
1969	cub. ft.	14,606,844	693,636	....	15,300,480	3,052,797	12,247,683	191	3,233
	m^3	*413,666*	*19,643*	....	*433,309*	*86,455*	*346,854*	....	....
1970	cub. ft.	15,017,493	596,510	....	15,614,003	3,399,534	12,214,469	163	2,869
	m^3	*425,295*	*16,893*	....	*442,188*	*96,275*	*345,914*	....	....
1971	cub. ft.	14,857,938	762,548	....	15,620,486	2,804,978	12,815,508	150	2,401
	m^3	*420,777*	*21,595*	....	*442,372*	*79,437*	*362,935*	....	....
1972	cub. ft.	13,382,688	767,408	....	14,150,096	3,573,056	10,577,040	154	2,533
	m^3	*379,006*	*21,733*	....	*400,739*	*101,191*	*299,548*	....	....

* As from and including 1964 these figures exclude persons employed in associated timber yards in the Metropolitan Area.
n.r.s. Not recorded separately.

Log Production*

	1972		1971	
	cub. ft.	m^3	cub. ft.	m^3
Jarrah	28,334,071	*802,438*	33,300,153	*943,060*
Karri	8,680,242	*245,830*	7,491,936	*212,172*
Wandoo	1,084,967	*30,727*	1,117,507	*31,648*
Pine	3,250,884	*92,067*	3,101,705	*87,840*
Other	1,135,844	*32,167*	1,145,153	*32,431*
	42,486,008	*1,203,229*	46,156,454	*1,307,151*

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

Made up as follows—
From State Forests and Crown Land—38,708,082 cub. ft. (*1,096,236 m^3*)—91·1 per cent
From Private Property — 3,777,926 cub. ft. (*106,993 m^3*)— 8·9 per cent

Value of Production

	1972	1971
Total Value of Sawn Timber (on mill skids)	$25,266,700	$27,291,500
Total Value of Other Forest Products	$4,559,400	$5,234,500

Forest Area			
		acres	*hectares*
Additions to State Forest		30,397	*12,302*
Excision from State Forest		288	*117*
Land Purchased for pine planting		456	*185*
Total Area of State Forest		4,506,717	*1,823,868*
Reforestation			
Cut-over area treated for regeneration		151,929	*61,485*
Afforestation			
Area planted with pines, 1971		6,160	*2,493*
Pinus radiata	2,958 ac.	*1,197 ha.*	
Pinus pinaster	3,178 ac.	*1,286 ha.*	
Other species	24 ac.	*10 ha.*	
Total area of pine plantation established		76,091	*30,794*
Pinus radiata	30,824 ac.	*12,474 ha.*	
Pinus pinaster	44,828 ac.	*18,142 ha.*	
Other species	439 ac.	*178 ha.*	
Total experimental areas (additional)		2,512	*1,017*
Management			
Survey—			
Topographical mapping		672,000	*271,943*
Assessment—			
Area covered		935,600	*378,600*
Engineering, new works—		miles	*km.*
Roads and tracks		133	*214*
Houses		1 (No.)	
Protection		acres	*hectares*
Prescribed burning		592,111	*239,627*
Fire outbreaks—			
Number		249 (No.)	
Area burnt		12,708	*5,143*
Nurseries (Hamel and Narrogin)			
Trees produced for—			
Private buyers		219,342 (No.)	
Forests Department		1,575,664 (No.)	
Sandalwood		tons	*m. tons*
Quantity exported		953	*968*

SOURCE AND APPLICATION OF FUNDS

	1971/72	1970/71
	$	$
Source—		
Royalties on timber etc.	3,025,684	2,986,031
Departmental fees, Sales of logs etc.	2,007,282	1,724,574
Sub-Total	5,032,966	4,710,605
General Loan Fund	1,100,000	500,000
Federal Aid Road Grant	176,006	210,000
Rents	70,982	68,461
Commonwealth Softwood Forestry Agreement	56,241	1,033,000
Increase or decrease in unexpended balance	—137,197	—521,383
Treasurers advance	462,000	....
TOTAL	6,760,998	6,000,683
Application—		
1. Expended from Consolidated Revenue Fund—		
Pine and hardwood conversion	995,731	891,676
Administration and general expenses	992,785	853,546
Transfer to Treasury	286,738	286,756
2. Expenditure under Reforestation Fund—		
Division—Direct operating costs	1,720,326	1,661,668
Head Office and general expenses	2,765,418	2,307,037
	6,760,998	6,000,683

2. REVENUE AND EXPENDITURE

Revenue for the year from all sources amounted to $5,032,966 compared with $4,710,605 in the previous year.

The increase in revenue reflects increased royalty charges approved and effected as from 1st August, 1971.

After deduction of specified expenses, the net revenue transferred to the Reforestation Fund was $2,757,712 ($2,678,627)—figures in brackets refer to the previous year. During the year this fund also received $1,100,000 ($500,000) from the General Loan Fund, advances totalling $56,241 ($1,033,000) under the Commonwealth Softwood Forestry Agreement, and Federal Aid Road Grants of $176,006 ($210,000). The $56,241 received under the Softwood Agreement represents the balance of allowable expenditure for the first 5-year planting programme which was completed in 1970/71.

It was expected that further advances would be received for the second 5-year agreement to commence in 1971/72 but the required Act of Parliament was not assented to and the Treasury made available a Treasurer's advance of $462,000 to cover costs incurred in 1971/72 pending the passing of the Commonwealth Act.

Expenditure from the Reforestation Fund for the year amounted to $4,485,744 ($3,968,705) and the balance held in the Fund at the 30th June was $916,010 ($788,813).

3. FOREST AREA

State Forests (Forests Act, 1918–1969)

The total area of State Forest at 30th June, 1972 was 4,506,717 acres (*1,823,868 ha.*) which is an increase of 30,109 acres (*12,185 ha.*) compared with the total area at 30th June, 1971.

During the year, additions totalling 30,397 acres (*12,302 ha.*) were made to State Forest and 288 acres (*117 ha.*) were excised and reverted to the Lands Department.

	June 1972		June 1971	
	acres	*hectares*	acres	*hectares*
Jarrah	3,233,360	*1,308,541*	3,214,639	*1,300,964*
Karri	183,850	*74,404*	172,903	*69,974*
Jarrah and Karri (mixed)	656,484	*265,679*	656,109	*265,527*
Jarrah and Wandoo (mixed)	163,824	*66,300*	163,785	*66,284*
Tuart	6,435	*2,604*	6,435	*2,604*
Tingle Tingle	10,932	*4,424*	10,697	*4,329*
Karri and Tingle (mixed)	13,885	*5,619*	13,885	*5,619*
Sandalwood	1,930	*781*	1,930	*781*
Pine Planting	181,007	*73,254*	181,145	*73,309*
Mallet	54,858	*22,201*	54,928	*22,229*
Miscellaneous	152	*61*	152	*61*
	4,506,717	*1,823,868*	4,476,608	*1,811,681*

Timber Reserves (Forests Act, 1918–1969)

The area held under Timber Reserve at 30th June, 1972 was 170,727 acres (*69,094 ha.*) which is an increase of 1,080 acres (*437 ha.*) on the area at 30th June, 1971.

	June 1972		June 1971	
	acres	*hectares*	acres	*hectares*
Jarrah	93,252	*37,739*	92,957	*37,620*
Wandoo and Jarrah	71,788	*29,053*	71,632	*28,989*
Jarrah and Karri	1,094	*443*	465	*188*
Pine Planting	4,584	*1,855*	4,584	*1,855*
Mallet	9	*4*	9	*4*
	170,727	*69,094*	169,647	*68,656*

Land Alienations, etc.

During the year ended 30th June, 1972, 121 applications for land and road provisions and closures were received covering a total of 35,850 acres (*14,509 ha.*).

The Department agreed to the 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	
acres	acres	acres	acres	acres	acres
34 (*14 ha.*)	9,887 (*4,001 ha.*)	3,510 (*1,420 ha.*)	350 (*142 ha.*)	45 (*18 ha.*)	....

No. of alienations approved—34
No. of leases approved —14

The total of freehold land held at 30th June, 1972 in the name of The Conservator of Forests, was 59,284 acres (*23,992 ha.*) an increase of 5,963 acres (*2,413 ha.*).

Mining in State Forests

A temporary ban placed by the Government on prospecting over wide areas of State Forest and Timber Reserves has prevented further increases in the areas of forest held under mineral lease (approx. *850,000 ha.*) and mineral claims (approx. *240,000 ha.*). Provisions made in a Bill to revise the Mining Act, which is currently before Parliament, allow for greater protection of the forest resource.

During the year Alcoa's plant at Pinjarra came into production. Exploration drilling and mining operations within the forest during the year have been carried out with strict attention to hygiene in an endeavour to limit the rate of spread of *Phytophthora cinnamomi*.

4. SAWMILLING, TIMBER INSPECTION AND FOREST PRODUCE

Timber Production

The production of 14,150,096 cubic feet (*400,739 m³*) of sawn timber was a decrease of 1,470,390 cubic feet (*41,642 m³*) on last year's figure. Of the total output 1,259,358 cubic feet (*35,666 m³*)—the lowest since 1933—came from private property, a decrease of 676,287 cubic feet (*19,153 m³*) on the 1970/71 figure.

At December 31, 1971 there were 154 sawmills registered of which 96 operated on Crown land and 58 on private property. This represents an increase of four on last year's registration, all being private property mills. Details of the annual intake of mill logs and production of sawn timber are given in accompanying tables.

The annual intake of logs (1829–1972) is given in Appendix 5.

Roundwood production from Departmental pine plantations totalled 3,204,765 cubic feet (*90,761 m³*) an increase of 159,345 cubic feet (*4,512 m³*) on the figure for 1970/71 (see Afforestation).

Local plywood factories obtained the following quantities of peeler logs—

	cubic feet	*m³*
Karri	193,693	*5,485*
Jarrah	39,887	*1,130*
Pine	127,598	*3,614*
	361,178	*10,229*

Timber Inspection

The total quantity of timber inspected during the year was 3,900,900 cubic feet (*110,476 m³*) made up as follows—

Railway Sleepers .... 2,834,703 cub. ft. (*80,280 m³*)
- Ex Crown Land .... 2,018,962 cub. ft. (*57,178 m³*)
- Ex Private Property 662,969 cub. ft. (*18,776 m³*)
- Re-inspected .... 152,772 cub. ft. (*4,326 m³*)

Other Sawn Timber .... 1,066,197 cub. ft. (*30,195 m³*)

All railway sleepers produced were inspected.

TIMBER PRODUCTION

PRODUCTION OF TIMBER FOR YEAR ENDED JUNE 30, 1972
(EXCLUSIVE OF HARDWOOD MINING TIMBER, FIREWOOD, POLES AND PILES)

Tenure	Log Volumes by Species (1)								Totals	
	Jarrah	Karri	Wandoo	Yarri	Sheoak	Marri	Pine (2)	Other	In Log	Recovery of Sawn Timber
Crown Land—										
cub. ft.	25,951,703	7,949,724	545,532	46,917	3,900	931,594	3,204,765	73,947	38,708,082	12,890,738
m^3	*734,967*	*225,141*	*15,450*	*1,329*	*111*	*26,383*	*90,761*	*2,094*	*1,096,236*	*365,073*
Private Property										
cub. ft.	2,382,368	730,518	539,435	46,724	135	32,627	46,119	....	3,777,926	1,259,358
m^3	*67,470*	*20,689*	*15,277*	*1,323*	*4*	*924*	*1,306*	....	*106,993*	*35,666*
Total										
cub. ft.	28,334,071	8,680,242	1,084,967	93,641	4,035	964,221	3,250,884	73,947	42,486,008	14,150,096
m^3	*802,437*	*245,830*	*30,727*	*2,652*	*115*	*27,307*	*92,067*	*2,094*	*1,203,229*	*400,739*

(1) Includes sawlogs and logs used in the production of plywood, veneer and re-constituted 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	Estimated Value at Mill Skids of Timber Obtained
	Sawn Timber Other Than Sleepers	Sawn Sleepers	Sawn Timber Other Than Sleepers	Sawn Sleepers		
1971						$
Cubic Feet	11,110,612	2,574,229	1,036,345	899,300	15,620,486	27,291,500
m^3	*314,653*	*72,902*	*29,349*	*25,468*	*442,372*	....
1972						
Cubic Feet	10,871,776	2,018,962	596,389	662,969	14,150,096	25,266,700
m^3	*307,895*	*57,178*	*16,890*	*18,776*	*400,739*	....

Distribution of Timber

By courtesy of the Commonwealth Bureau of Census and Statistics sufficient information, preliminary only, has been supplied to indicate recent trends in the State's exports and imports of timber (excluding items of plywood, veneer and particle board). Detailed information is in the supplement to this Report.

Exports: Compared with 1970–71 overseas exports of 1,660,000 cubic feet (*47,012 m³*) rose by some 610,000 cubic feet (*17,275 m³*) or 58 per cent. This increase was almost entirely due to higher exports of railway sleepers, with the United Kingdom once again dominating this market.

There was only a very slight increase in exports of other sawn jarrah and karri. New Zealand, United Kingdom and South Africa, in that order, were the major buyers.

Interstate exports increased by 156,000 cubic feet (*4,418 m³*) to some 1,913,000 cubic feet (*54,177 m³*) a rise of nearly 8·9 per cent, but details were not available when going to print.

Imports: The value of overseas imports fell by $200,000 to $2,572,000 when compared with 1970–71. Once again Malaysia (70 per cent) and Indonesia (17 per cent) provided the bulk of the imports in terms of value. It is of interest that Indonesia has increased its share of the market from nine per cent to seventeen per cent, whereas the corresponding figures for Malaysia are 79 per cent and 70 per cent.

Interstate imports at $66,670 were only slightly below the 1970–71 value of $71,264.

Western Australia has always imported practically the whole of its requirements of the wood products, paper, paperboard and manufactures thereof and the import value now exceeds $20 million annually. Trends over the last three years for which figures are available are as follows—

	1968–69 $'000	1969–70 $'000	1970–71 $'000
INTERSTATE IMPORTS (a)			
Newsprint	654	477	785
Other printing and writing paper	2,014	1,738	2,016
Tissues and wrapping paper	1,208	1,145	1,099
Other paper and paperboard	2,369	1,786	2,964
Articles of paper pulp, paper or paperboard	5,360	7,310	7,570
Sub-total	11,605	12,456	14,434

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OVERSEAS IMPORTS (b)			
Paper, paperboard and manufactures thereof—			
Sub-total	3,617	5,452	5,736
Total Imports	15,222	17,908	20,170

(a) Landed cost.
(b) Value f.o.b. at point of final shipment.

In value terms, Tasmania, in 1970–71, provided practically the whole of the newsprint and over 70 per cent of other printing and writing paper. Victoria supplied 68 per cent of tissues and wrapping paper and, with New South Wales, shared the majority of manufactured articles exported to Western Australia.

Local Availability: The quantity of timber available for use locally (production less exports) is the lowest since 1963. Housing approvals, which fell sharply to 11,825 in 1970–71, showed signs of improvement only during the last six months of the year and reached a total of 12,805.

Sandalwood

The demand for sandalwood increased slightly and 953 tons (*968 metric tons*) were exported during the year 1971–72 as compared with 842 tons (*855 metric tons*) for the previous year.

Sandalwood received at Fremantle during the year totalled 1,074 tons (*1,091 metric tons*) compared with 1,055 tons (*1,072 metric tons*) for the year ended 30th June, 1971, and this quantity was made up as follows:—

	Tons	*Metric Tons*
Crown Land:		
Logwood (including roots and butts)	938	*953*
Pieces	136	*138*
Private Property	Nil	Nil
	1,074	*1,091*

No orders for logwood or roots and butts were placed by distillers for oil distillation purposes.

Firewood Production

The following table shows the quantity of firewood produced according to returns received. A large quantity is also obtained from private property for which returns are not received.

	Crown Land		Private Property		Total	
	Tons	*Metric Tons*	Tons	*Metric Tons*	Tons	*Metric Tons*
Sawmills						
For Sale	69,497	*70,609*	7,567	*7,688*	77,064	*78,297*
Own Use	30,835	*31,328*	91	*92*	30,926	*31,421*
Permits and Licenses South-West	36,519	*37,103*	....	....	36,519	*37,103*
Permits and Licenses Goldfields	10,945	*11,120*	....	....	10,945	*11,120*
Other Permits						
Wundowie	103,290	*104,943*	....	....	103,290	*104,943*
Forest Offence....	50	*51*	....	....	50	*51*
	251,136	*255,154*	7,658	*7,780*	258,794	*262,935*

Other Forest Produce

Poles and piles obtained from Crown land during the year amounted to 1,040,458 lineal feet (*317,132 metres*) compared with 1,224, 200 lineal feet (*373,136 metres*) for the previous year. Returns from private property showed 63,935 lineal feet (*19,487 metres*) as compared with 89,529 lineal feet (*27,288 metres*) for the year 1970–71.

Fence posts and strainers cut from Crown lands totalled 228,502 of which 1,579 were produced by the Department. Records received show that 8,379 posts and strainers were obtained from private property, but this is only a small percentage of the total production from this source.

Apart from sawn timber supplied by sawmills, 8,029 tons (*8,157 metric tons*) of mining timber were used. All of this was obtained from Crown lands, 4,985 tons (*5,065 metric tons*) being from inland forests.

Due to the closure of the tannin extract plant the quantity of wandoo timber used for tannin extract was only 13,768 tons (*13,989 metric tons*) representing four months operations.

The number of Christmas trees sold was 8,570 compared with 9,115 the previous year. Revenue from sales amounted to $4,239.

FOREST PRODUCE NOT ELSEWHERE INCLUDED IN PRODUCTION TABLES

Description		South-West Division and Agricultural Areas			Goldfields Areas	Total
		Supplied by Department	Other Crown Land	Private Property		
Mining Timber	Tons	....	3,044	....	4,985	8,029
	Metric Tons	....	*3,074*	....	*5,065*	*8,139*
Pile, Poles and Bridge Timber	Lin. ft.	....	1,040,458	63,935	....	1,104,393
	Metres	....	*317,132*	*19,487*	....	*336,619*
Fence Posts and Rails	No.	1,570	174,128	8,379	37,475	221,552
Strainer Posts	No.	4	15,325	....	....	15,329
Wandoo Timber for Tannin Extract	Tons	....	1,660	12,108	....	13,768
	Metric Tons	....	*1,687*	*12,302*	....	*13,989*

5. FOREST MANAGEMENT AND CONSERVATION

FOREST MANAGEMENT

Unemployment Relief

During the second half of the year the Department participated in the Commonwealth Non-Metropolitan Unemployment Relief Scheme when the sum of $126,829 was made available from the Commonwealth Government through the State Treasury. This was spent on much needed silvicultural work which, because of insufficient reforestation finance, would not have otherwise been done.

Recruitment of labour commenced in January 1972 and a total of 115 men were employed during the remainder of the year. Although there was an overall turnover rate of 41·7 per cent some centres had extremely stable gangs. The standard of work and calibre of the men were most pleasing.

Tasks performed by the unemployment gangs were additional to normal departmental programmes which have had to be restricted over the years due to lack of finance. They included stand improvement work in the hardwood forests, softwood plantation pruning, raising of nursery stock for hardwood enrichment, roadside improvement and tourist development. Gangs operated from the Divisions of Wanneroo, Mundaring Weir, Dwellingup, Narrogin, Hamel, Collie, Kirup, Nannup, Manjimup and Pemberton.

At the end of the year 67 men remained in employment and funds have been made available to continue at this level at least for the next three months.

Working Plans

Hardwood Inventory: During the year assessment was carried out on 935,600 acres (*378,600 ha.*) in parts of Walpole, Harvey, Dwellingup, Kelmscott and Mundaring Divisions. In all 1,304 plots were measured covering 2,900 acres (*1,170 ha.*). Ninety-five per cent of the hardwood forest has now been assessed to the current standard and the results processed by computer. Ninety-seven plots were measured to relate the assessor's estimates to actual volumes present while 210 hardwood growth plots were remeasured and 26 new ones established.

Softwood Inventory: Measurements were made of 413 temporary plots, of which 223 were stand volume plots, and 1,470 permanent angle count plots in plantations in all divisions except Walpole. The condition of stands after thinning was checked with 833 plots in Mundaring and Wanneroo plantations.

Projects: The General Working Plan No. 85 was completed and approved by the Governor in Executive Council. This plan provides for the overall management of the forest resource during the period ending December 1976. A photographic method of upper stem diameter measurement, using one photo at each measurement point on the stem, was developed for volume table compilation. This will be particularly valuable in the karri forest, and will avoid "felling to waste" for volume table compilation.

In order to develop a system for measuring hardwood logs in metric units for royalty purposes, data was collected from logs in each major sawmill permit.

Assessment, involving sequential sampling, was carried out in the Intensive Management Unit in Collie Division to produce a map showing areas suitable for jarrah thinning, areas carrying transmission poles, stocking levels, and other information required for operational purposes.

Background information on different forms of land use was collated as the first stage of detailed studies to be carried out in each administrative division.

Automatic Data Processing

Forest Growth and Yield: Computer programmes were prepared to process permanent sample plot data for both hardwood and pine forest areas. The programmes create magnetic tape files of plot measurement data from which growth data can be extracted and summarised.

Mensuration: Work continued on the preparation of local log volume tables and local conversion factors for stacked timber. Stand volume tables for *P. radiata* stands were prepared for additional localities and work on tables for *P. pinaster* stands has commenced.

Ecological Research: The processing of ecological data now comes under two main headings:—

(i) Statistical analysis of sample plot data.
(ii) Automatic storage and recombination of encoded mapping data.

Land Use Surveys: Conventional statistical techniques have been applied to the analysis of data extracted from responses to questionnaires completed by visitors to forest areas. The automatic combination of mapping data by computer has proved useful in determining potential conflicts in land use.

Fire Research: Some work has been done towards the preparation of fire spread models for the major hardwood and pine species. The computer generation of "area seen" maps has assisted in the selection of fire tower sites.

Mapping and Surveys

Standard mapping of the forest areas of the South-West was further extended by the publishing of map sheet Busselton 80 while sheets Augusta 80 and Kirup 80 are in course of preparation. A revision was made of one mile to an inch maps Manjimup, Shannon, Pemberton, Walpole and Chudalup and these sheets have been republished. A limited revision was completed of Wanneroo 80 and Narrogin 80.

Preparation is at an advanced stage for the publishing of a special map illustrating State Forest, pine plantations and other relevant features. It is drawn at the scale 1: 500,000. An area of 177,000 acres (*71,630 ha.*) of pine plantations and environs was mapped from recently flown aerial photography. This includes the remapping of plantations in Busselton, Wanneroo and Mundaring Divisions. An area of 33,500 acres (*13,560 ha.*) was contoured.

The metric conversion of Departmental mapping was initiated with the conversion of the plantation map series to the scale 1: 12,500. A total of 36 maps have been converted and it is expected that the project will be completed by the end of 1972.

A project of mapping interpreted jarrah dieback-affected forest in Nannup and Busselton Divisions from 1: 40,000 photography was completed. This covered an area of 190,000 acres (*76,890 ha.*).

Included in a total of 860 items of general drafting completed were 10 co-ordinating and tower plans.

Forest Engineering

During the year 133 miles (*214 km.*) of roads, tracks and firelines were constructed while 3,977 miles (*6,399 km.*) of existing roads were regraded.

Plant and Equipment

Departmental workshops maintained in a satisfactory condition all items of plant and equipment. Among items fabricated in the workshops were two combination heavy duty gang trucks, one pedestrian type rotary slasher, one fireline plough and one pine planting machine.

Departmental Buildings

One house was built during the year, one was sold and the total number of Departmental houses remains at 501. Fourteen other buildings of various types were constructed, two houses were transferred and 35 old buildings, mainly huts, were written off.

Communications

Radio: Following the successful installation at Mt. William of a new design of repeater aerial system these aerials were installed at Mt. Wells, Mt. Dale and Wabling Hill. A useful increase in radiation and receiving efficiency has been gained together with receiver stability.

The old original equipment installed in Somerville, Gnangara and Mt. Frankland V.H.F. repeater stations was replaced by more modern transistorised equipment. Mt. Frankland station was also rewired throughout. Seventeen vehicles were wired for V.H.F. radio.

The aircraft radio beacons used in prescribed burning by aerial ignition, operated satisfactorily. Range is a widely variable factor attributable to forest density.

The radio branch of the Postmaster General's Department has allocated a test frequency in the proper D.F. band of 200–400 kilohertz (khz.). This low frequency should suffer less attenuation than the one presently in use. Tests will be conducted as soon as a suitable L.P. transmitter is available.

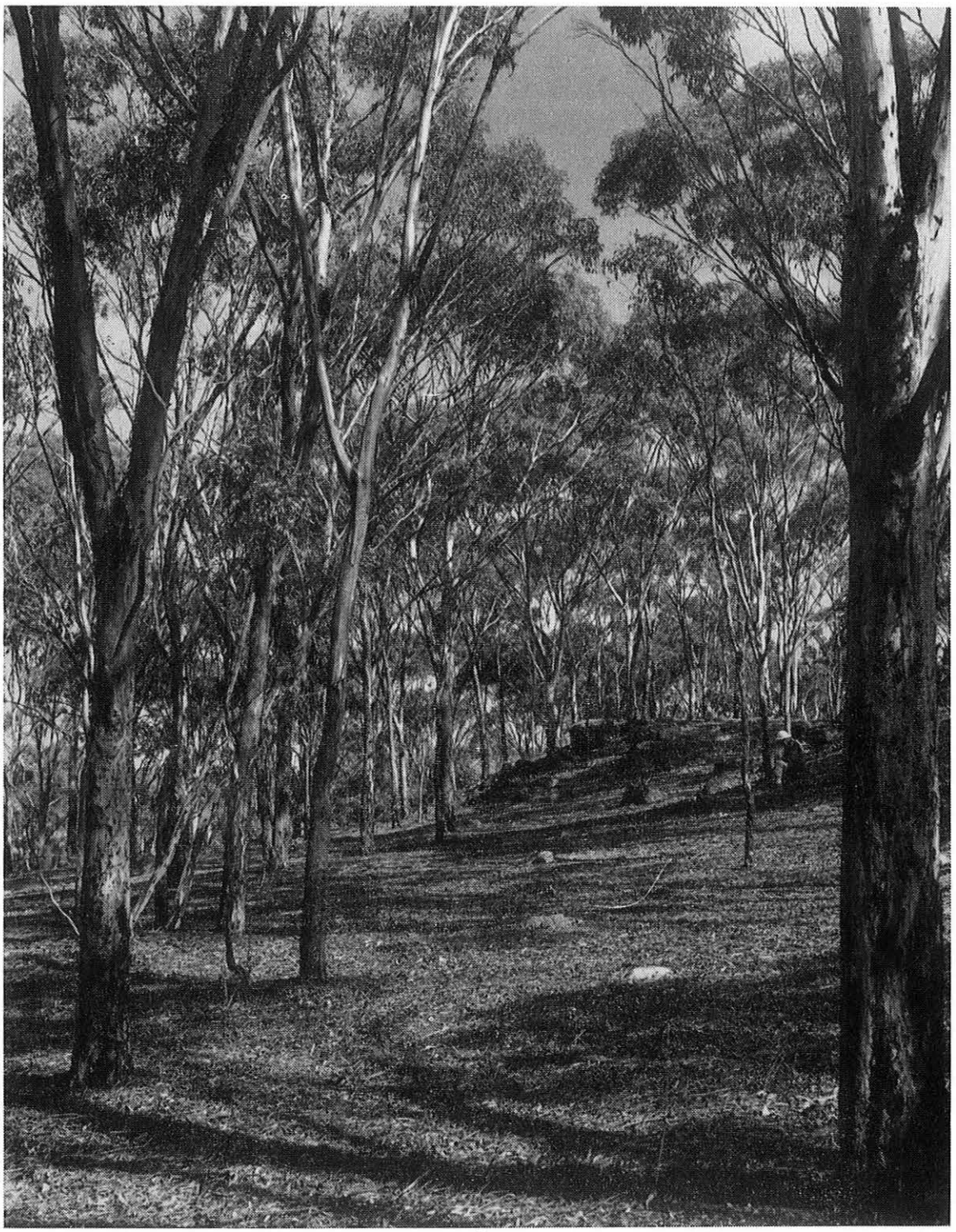
Radio-Telephones: Radio-telephones were installed at Milward, Sea View, Collins, Munro and Mornington fire lookout towers and at Harvey Office. This brings the number now in operation to 24.

Telephones: During 1971 a check on the operation of telephone lines, switchboards and telephone apparatus was made at all Divisional Headquarters. It is expected that the increasing use of radio-telephones between fire lookout towers and Divisional offices will substantially reduce the number of bush telephone lines needed and consequently the cost of maintaining them.

FOREST CONSERVATION

Dryandra State Forest

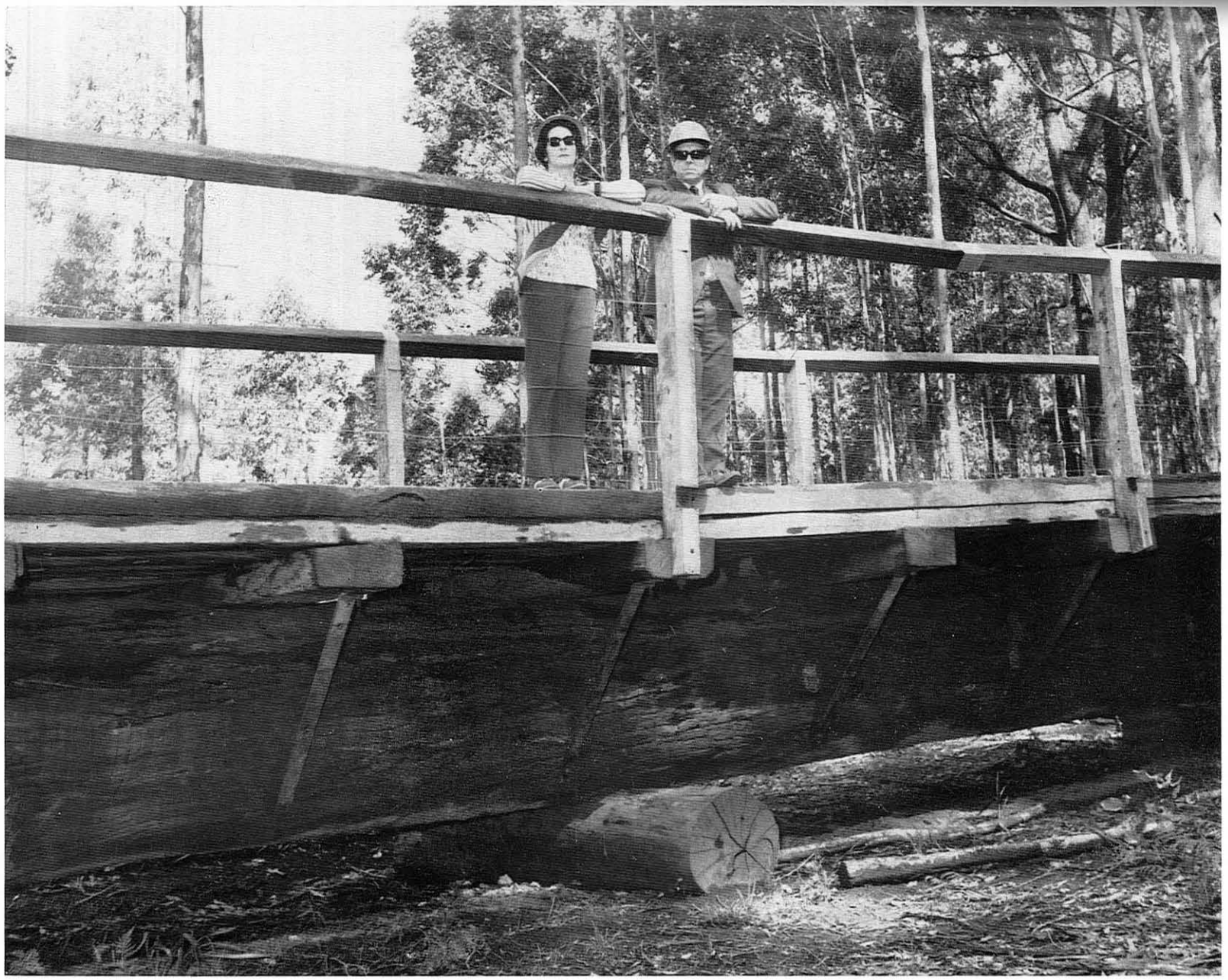
In pursuance of Working Plan objectives, and after detailed investigations, a forest lease was issued to Lions International for the purposes of maintaining and improving the former Dryandra Settlement as a camp site for underprivileged children, youth organisations, scientific bodies and other approved individuals or groups. The lease is administered by a Joint Management Committee under the control of the Conservator and covers approximately 88 acres (*36 ha.*), comprising the settlement and adjacent paddock. Access to the remainder of the forest is controlled under the Working Plan so as to avoid conflict with the multiple objectives of management of flora and fauna, recreation, scientific investigation and timber production.



Dryandra is well known for the rare fauna which inhabit the wandoo woodlands. However, scattered through the area are small, but distinct, stands of brown mallet (*Euc. astringens*) which occur typically on well-drained laterite " breakaways " and the scree below them.

The photograph shows a typical natural stand of brown mallet with its complete lack of understorey vegetation. This lack of vegetative cover could be due to leaching of the very high tannin content of the bark which is regularly shed from the tree.

Above—One Tree Bridge picnic spot on the Donnelly River west of Manjimup (1972). In 1904 a karri tree was felled across the stream to provide the basis for a bridge serving the nearby graphite mine. The bridge remained in service until 1943.



Above—In 1971 a section of the old bridge was recovered from the river and reconstructed on the bank nearby (photograph—1972).

Forest Recreation

Under the special grant for tourist facilities, 11 picnic spots were completed in Kelmscott, Collie, Nannup, Busselton, Manjimup and Pemberton Divisions. Two new sites were developed at the northern extremity of the forest in Wanneroo Division.

Of particular interest are the One Tree Bridge site where a section of the old bridge has been recovered from the river and restored for public inspection, and the Lesley Nature Trail where indigenous species along an attractive footpath have been labelled for public education.

Provision was made for manning Gloucester Tree out of season to provide a source of additional interest and information for tourists. However further visitor surveys indicate that additional funds will be required fully to meet the ever-increasing demand for recreational facilities in forest areas, especially those adjacent to major population centres.

Forest leases were issued for major tourist developments by the local authorities at the Logue Brook and Waroona dams. Joint Management Committees comprising representatives of the Shires, Public Works Department and Forests Department were set up to assist the further development of these projects.

6. REFORESTATION

Hardwood Logging

During the year 151,929 acres (*61,483 ha.*) of hardwood forest were logged and treated for regeneration. This was made up as follows:—

Forest Type	Maiden Bush		Cut-over Bush		Total Area	
	ac.	*ha.*	ac.	*ha.*	ac.	*ha.*
Jarrah	45,178	*18,283*	95,103	*38,488*	140,281	*56,771*
Karri	3,958	*1,602*	2,432	*984*	6,390	*2,586*
Marri	2,847	*1,152*	....	....	2,847	*1,152*
Wandoo	410	*166*	1,510	*611*	1,920	*777*
Tuart	....	....	491	*199*	491	*199*
Total	52,393	*21,203*	99,536	*40,282*	151,929	*61,485*

Jarrah Forest

Intensive Management Units: The total area selected for Intensive Management Units was increased from 254,090 acres (*102,830 ha.*) to 695,650 acres (*281,530 ha.*) during the year by the inclusion of additions to existing units in Dwellingup and Harvey Divisions and by the demarcation of completely new areas in Mundaring, Manjumup and Pemberton Divisions where investigations have yet to be completed.

Management objectives have been defined to meet special requirements and unique values in certain parts of the forest. These include management of flora and fauna (Chariup) and for recreational purposes (Mundaring and Kelmscott), in addition to catchment protection and timber production.

In other hardwood forest types special Working Plans have been drawn up for management for the protection of indigenous tree species—Ludlow (Tuart), Soho (Tingle), Russell (Wandoo), and a multiple-use plan was also completed for the mallet plantations and associated indigenous forest types at Dryandra. In each area appropriate prescriptions are being developed to cater for the needs of the particular values under consideration, but subject always to the overriding requirements of fire control, catchment protection and dieback hygiene. In most instances these special prescriptions require only minor modifications to existing techniques.

Dieback Areas: Visual evidence indicates that the forest hygiene programme is successfully reducing the number of new infections established, and that spread of dieback is being restricted to that connected with extension of already existing dieback patches. Excellent co-operation in the dieback hygiene programme has been obtained from the timber industry, Government instrumentalities and mining companies regularly working in the forest areas.

Hygiene and rehabilitation planting associated with the Intensive Management Units and including hardwood plot establishment amounted to 754 acres (*305 ha.*). Phytophthora-tolerant eucalypts were used to an increasing extent, and there is every indication that the use of tubelings and even open-rooted planting stock will result in substantial economies while still producing satisfactory results. Preferred species for the drier types are *Eucalyptus globulus*, *E. resinifera* and for the wetter sites, *Eucalyptus saligna* and *E. microcorys*.

Other silvicultural work connected with Intensive Management Units in the jarrah forest included substantial areas of thinning and culling carried out by temporary unemployment relief workers, together with approximately 10,000 acres (*4,000 ha.*) of top disposal cleaning in high quality jarrah stands, 1,280 acres (*518 ha.*) of pole thinning and 370 acres (*150 ha.*) of cull removal carried out by Departmental employees.

Karri Forest

Karri regeneration burning covered a total of 7,340 acres (*2,970 ha.*) in Manjimup, Pemberton, Walpole and Busselton Divisions with very satisfactory results. Associated hand planting of karri seedlings covered a further 310 acres (*125 ha.*) mainly on snig tracks and landings where regeneration by natural means is rarely successful because of lack of fuel for ash beds and excessive soil consolidation.

Approximately 3,000 acres (*1,200 ha.*) of preparatory scrub rolling was completed to allow advantage to be taken of the remaining natural seed supplies available from the current seeding cycle. Virtually all arrears of karri regeneration have now been overcome but cull removal and limited hand planting will be continued to ensure that the next natural seed crop can be used to full advantage for major regeneration operations in about four years time.

Other works in the karri forest included limited trials of early cleaning in regenerated stands and some non-commercial thinning for amenity purposes.

Reforestation of Areas Mined for Bauxite

Site restoration by the company and replanting by the Department covered 192 acres (*78 ha.*). In addition, an extensive follow-up fertiliser application programme was arranged with the company. Deep contour ripping again proved very successful in controlling surface erosion, often on quite steep sidlings, and there is ample evidence that attention to correct drainage practice is essential to restrict gully erosion of the replaced topsoil, which is extremely friable and unstable.

Tree establishment after ripping continues to be satisfactory particularly where Phytophthora-tolerant eucalypts are planted. The earlier plantings show that tree cover can be satisfactorily established on the rehabilitated sites, but as indicated in earlier reports, it is still uncertain that these areas will eventually produce a commercial timber crop.

7. AFFORESTATION

Pine Planting in the Future

During the year, work was commenced on the third revision of the General Working Plan for Pine Plantations in Western Australia. It is necessary from time to time to review our requirements in the light of present resources and current trends in population growth and timber consumption. The following pertinent points on the need and the urgency for an increased planting programme arise from this review.

The Need and the Urgency: It is strongly maintained that the State of W.A. should aim at a net self sufficiency in timber and wood products for the future.

Probably specialty timbers and wood products will always have to be imported, but a *net* self sufficiency implies a counterbalancing, exportable surplus of local production of our valuable hardwoods and some raw softwood material.

The perpetual annual yield from the presently dedicated hardwood forests of the State is insufficient to provide net self sufficiency for a population of more than one million.

In parallel with the State's population increase it is estimated that its requirements in timber and other wood products will have more than doubled by the turn of the century. It has been calculated that, by the year A.D. 2000, the annual timber requirement of the State will be in excess of 100 million cubic feet (*2·83 million m³*). Production from the hardwood forests will need to be supplemented by some 60 million cubic feet (*1·7 million m³*) per annum. The most effective and quickest means of achieving this timber production is by an immediately expanded programme of softwood plantation establishment.

Area of Plantation Required: The area of pine plantation required to produce 60 million cubic feet (*1·7 million m³*) per annum is between 300,000 and 400,000 acres (*121,400* and *161,900 ha.*) depending on the area distribution of the two major pine species within that total. If the proportion of the fast growing *Pinus radiata* can be increased to 50 per cent of our plantation area, the production target of 60 million cubic feet (*1·7 million m³*) per annum can be achieved as follows:—

P. radiata—150,000 acres at 300 cu. ft./ac./annum = 45,000,000 cu. ft.
(*60,700 ha.* at *21 m³/ha./annum = 1,275,000 m³*)

P. pinaster—150,000 acres at 100 cu. ft./ac./annum = 15,000,000 cu. ft.
(*60,700 ha.* at *7 m³/ha./annum = 425,000 m³*)

The total area of pine plantation in Western Australia at present is 76,091 acres (*30,794 ha.*), i.e., 30,824 acres (*12,474 ha.*) of *P. radiata* and 45,267 acres (*18,320 ha.*) of *P. pinaster* and other species.

Some 6,000 acres (*2,400 ha.*) per year are programmed for the next four planting seasons up to and including 1975. This would give a total plantation area of approximately 100,000 acres (*40,000 ha.*).

A yearly programme of 8,000 acres (*3,240 ha.*) would then be needed for each of the 25 years 1976–2000 inclusive, to achieve the minimum of 300,000 acres (*121,000 ha.*) mentioned above. The distribution within the 8,000 acres (*3,240 ha.*) would need to be approximately 4,280 acres (*1,730 ha.*) of *P. radiata* and 3,720 acres (*1,510 ha.*) of *P. pinaster* each year.

The shortage of land naturally suitable for *P. radiata* places severe limitations on our planting programme. Research projects aimed at extending the range of *P. radiata* on to poorer soils by means of fertilisers, are in hand and a policy of re-purchase of suitable farm land for planting with that species has been adopted. The aim is to consolidate plantations into reasonably large, compact areas so as to minimise the costs of hauling and to provide a concentrated, regular, annual flow of large quantities of raw material to the future milling and processing industries.

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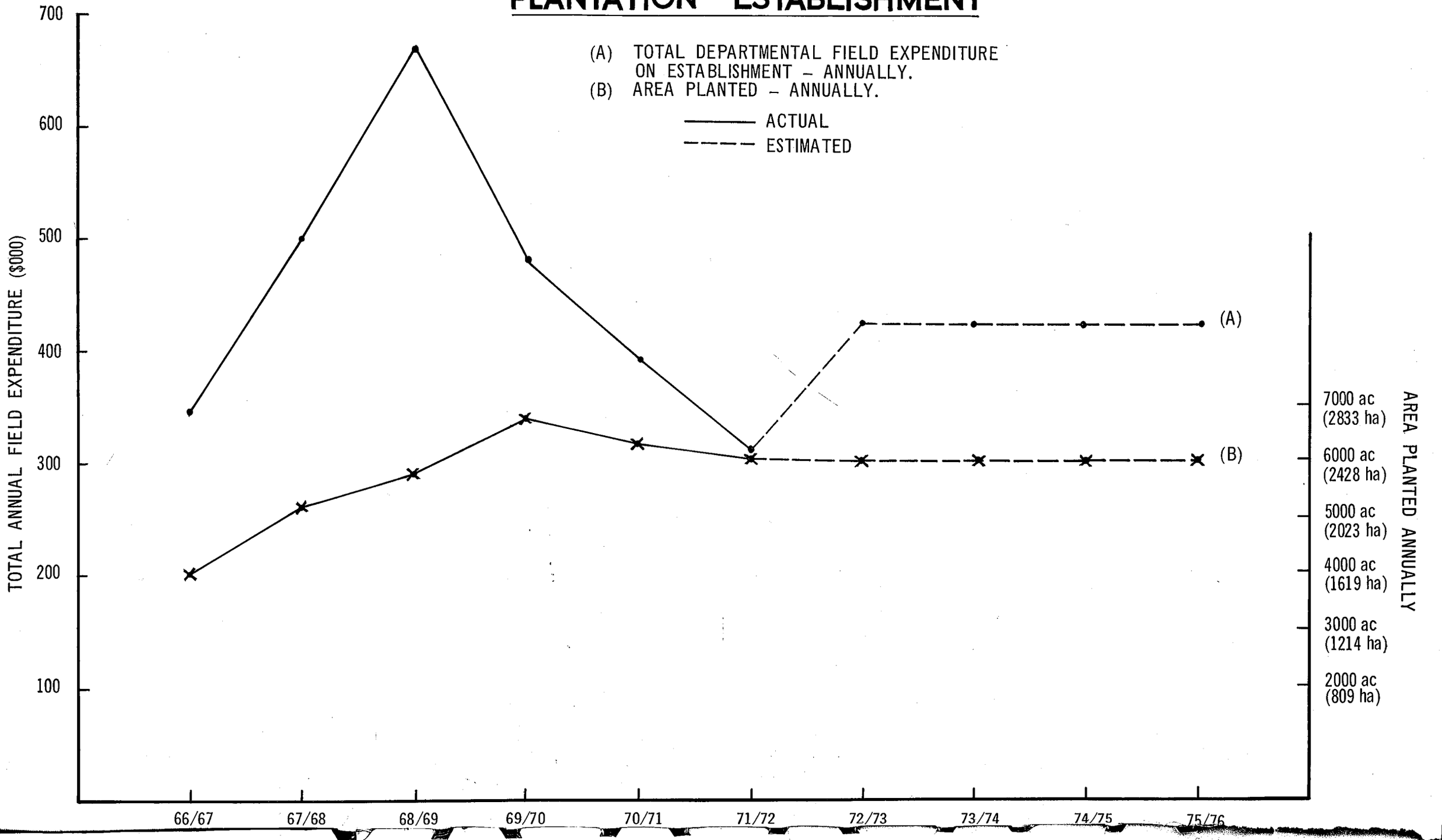
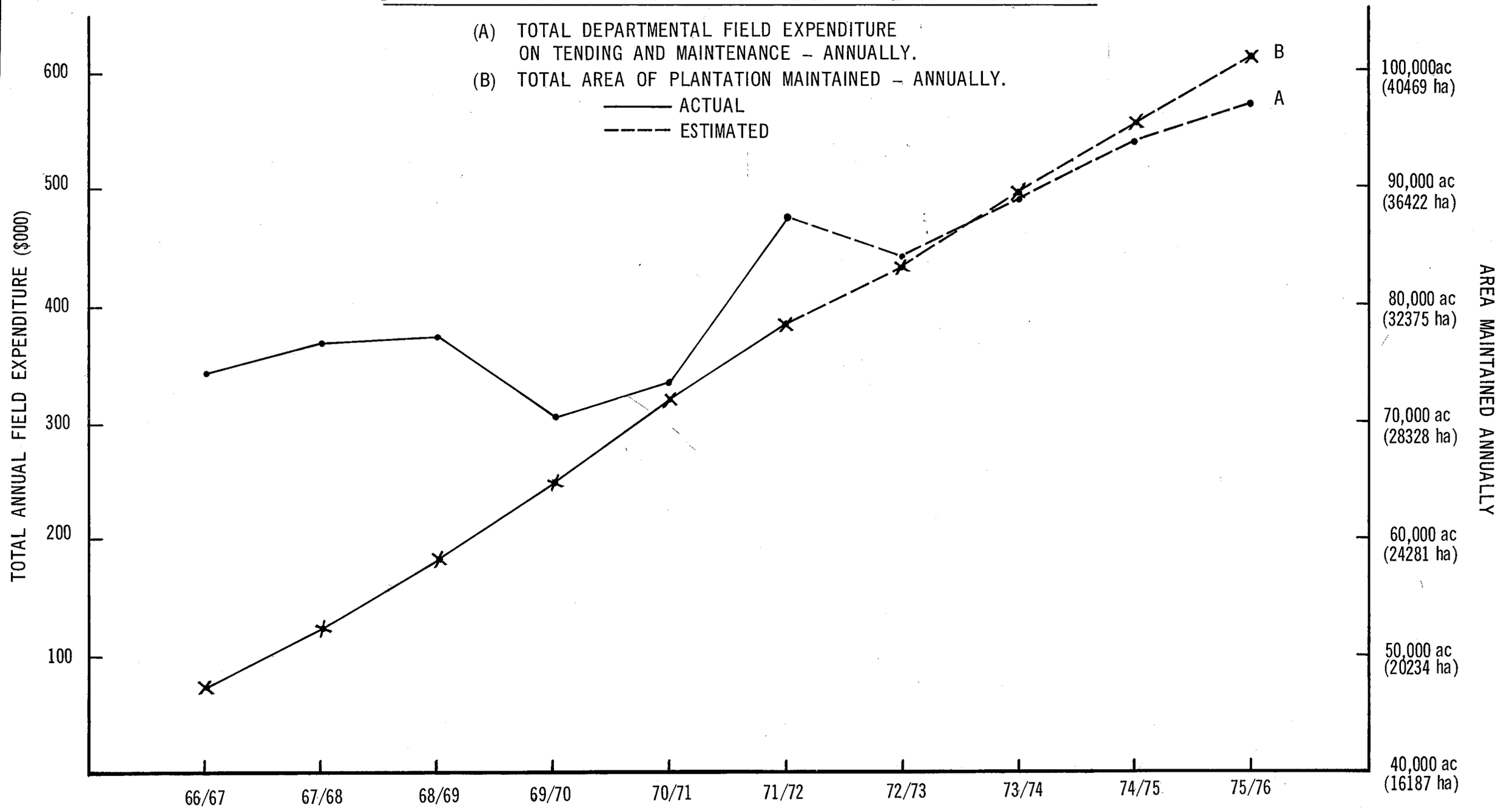
PLANTATION ESTABLISHMENT



PLANTATION TENDING AND MAINTENANCE



Costs and Returns: Stringent measures were taken in 1969 to reduce the costs of establishment and maintenance operations in plantations. The accompanying graphs show the results of analyses of these costs over the past five years and illustrate how, on a per-acre basis, they have been considerably reduced during a period of rising wages, by strict attention to planning and control of work.

The expected levels of expenditure during the next few years are also shown on these graphs. These figures are direct field costs and do not include such " overheads " as supervision and Head Office and Divisional administration.

The net revenue from sales of logs and sawn pine was approximately $300,000 in 1971/72. This was from some 3,200,000 cubic feet (*90,600 m*^{3}) of logs, the great bulk of which came from areas planted before 1955, i.e., from approximately 20,000 acres (*8,000 ha.*) of the older plantings. The increased plantings of the late 1950's and early 1960's are only just now reaching the first commercial thinning stage.

It will not be until 1985 that big volumes of plantation produce will start to become available. In the year 1990, it is estimated that approximately 20,000,000 cubic feet (*666,000 m*^{3}) of pine logs of various sizes and values could be available. An estimate of royalty return from such a volume at that time is extremely difficult to make, but it could be expected to reach $4,000,000.

Salient Points: The above paragraphs constitute a very brief summary of the present and estimated future situation. The salient points are:—

The need to achieve a *net* self sufficiency in timber and wood products for W.A. in the future.

The need to increase the pine planting rate to 8,000 acres (*3,240 ha.*) per year by 1976 in order to reach that goal.

The need to have an assured steadily increasing flow of funds to cover a regular planting and tending programme each year at that rate, at least until A.D. 2000.

Pine Silviculture

Silvicultural prescriptions for plantations have been revised in recent years. The new prescriptions aim at producing the maximum volume of high quality timber in a shortened rotation of 30 years for *P. radiata* (previously 40 years) and 40 years for *P. pinaster* (previously 60 years). This is to be achieved by early, heavy thinning promoting growth on crop trees which are pruned to a height of 20 feet (*6 m.*). The objective is to produce final crop trees of 20 to 24 inch (*50–60 cm.*) diameter with a 20 foot (*6 m.*) pruned bole. This new approach has been named " Prescription 70 ".

It is quite a radical departure from traditional practice and the reasons for this change are briefly outlined below.

The major volume and value returns from plantations come from the final crop. Costs of establishing and maintaining plantations are considerable and in order to maximise the return on this investment, the major recoup must be obtained as soon as possible, i.e., by shorter rotations.

Small-sized pine material is a low value product and avenues for sales of pulpwood and chipwood are limited in Western Australia. Long term yield forecasts indicate that under the old prescriptions, 70 per cent of the future cut would be in small sizes less than 9 inches (*23 cm.*) diameter. Under " Prescription 70 " less than 20 per cent of the yield in A.D. 2000 will be of logs less than 9 inches (*23 cm.*) diameter. Thirty per cent will be in pruned logs exceeding 18 inches (*46 cm.*) diameter suitable for production of quality timber and plywood.

The new regime is flexible in that, by promoting rapid growth on crop trees, advantage can be taken of market opportunities earlier. The rotation may well be further reduced if suitable markets develop for a somewhat smaller log.

The climate of Western Australia, with a pronounced summer drought is such that, on many sites, early heavy thinning is essential to avoid drought damage.

The " Prescription 70 " approach will make best use of the improved seed which is now becoming available from the tree breeding programme. This seed will permit a wider initial spacing, i.e., fewer trees planted per acre.

The system is realistic both for the climatic and economic conditions in Western Australia.

Plantation Areas

During the year, techniques were developed for storing a detailed record of pine plantation areas on computer memory. This is a fairly complex record because each year some 6,000 acres (*2,430 ha.*) of plantation are established over many different localities of varying quality. The system provides ready access to this information which covers over 40 years of planting.

Compilation of this record involved a careful re-examination of the existing plantation areas, many of which have been re-mapped over the years. A number of errors in the old record was discovered and corrected.

The distribution of plantation areas by Divisions as at December 1971 was as follows:—

TABLE 1

Division	*P. radiata*		*P. pinaster*		Other Species		Total	
	ac.	*ha.*	ac.	*ha.*	ac.	*ha.*	ac.	*ha.*
Wanneroo	82·5	*33·4*	29,784·0	*12,053·5*	153·0	*61·9*	30,019·5	*12,148·8*
Metropolitan	24·0	*9·7*	1,929·0	*780·6*	22·0	*8·9*	1,975·0	*799·3*
Mundaring	1,909·5	*772·7*	1,830·5	*740·8*	54·0	*21·8*	3,794·0	*1,535·4*
Kelmscott	607·0	*245·6*	2,369·5	*958·9*	16·5	*6·6*	2,993·0	*1,211·2*
Dwellingup	992·5	*401·6*	176·0	*71·2*	....	....	1,168·5	*472·8*
Harvey Hills	949·5	*384·2*	4,633·0	*1,874·9*	11·5	*4·6*	5,594·0	*2,263·8*
Harvey Coast	4,055·5	*1,641·2*	33·0	*13·3*	3·0	*1·2*	4,091·5	*1,655·8*
Collie	4,520·5	*1,829·4*	173·0	*70·0*	21·0	*8·5*	4,714·5	*1,907·9*
Kirup	7,461·0	*3,019·4*	188·5	*76·2*	12·5	*5·0*	7,662·0	*3,100·8*
Nannup	7,412·5	*2,999·8*	214·0	*86·6*	34·0	*13·7*	7,660·5	*3,100·2*
Busselton—								
Margaret River	819·5	*331·6*	400·0	*161·8*	19·0	*7·6*	1,238·5	*501·2*
Ludlow	790·0	*319·7*	3,054·5	*1,236·1*	52·5	*21·2*	3,896·5	*1,576·9*
Manjimup	526·5	*213·0*	....	....	....	....	526·5	*213·0*
Pemberton	673·5	*272·5*	43·0	*17·4*	40·0	*16·1*	756·5	*306·1*
Totals	30,824·0	*12,474·4*	44,828·0	*18,141·8*	439·0	*177·6*	76,091·0	*30,794·0*
Experimental Planting	491·0	*198·6*	1,858·0	*752·4*	163·0	*65·6*	2,512·0	*1,016·6*
Grand Totals	31,315·0	*12,673·0*	46,686·0	*18,894·2*	602·0	*243·2*	78,603·0	*31,810·6*

The 1971 plantings, totalling 6,160 acres (*2,493 ha.*) were spread over nine Divisions as follows:—

TABLE 2

1971 PLANTING

Division	*P. radiata*		*P. pinaster*		Other Species		Total	
	ac.	*ha.*	ac.	*ha.*	ac.	*ha.*	ac.	*ha.*
Wanneroo	13·0	*5·3*	2,327·0	*941·7*	4·5	*1·8*	2,344·5	*948·8*
Mundaring	52·0	*21·0*	160·5	*64·9*	5·0	*2·0*	217·5	*87·9*
Kelmscott	150·0	*60·7*	326·5	*132·1*	....	....	476·5	*192·8*
Dwellingup	492·0	*199·1*	12·0	*4·8*	....	....	504·0	*203·9*
Harvey Hills	362·5	*146·7*	....	....	1·0	*0·4*	363·5	*147·1*
Harvey Coast	148·0	*59·9*	157·0	*63·5*	....	....	305·0	*123·4*
Collie	293·0	*118·7*	107·0	*43·3*	7·5	*3·0*	407·5	*165·0*
Kirup	647·0	*261·8*	....	....	1·5	*0·6*	648·5	*262·4*
Nannup	595·0	*240·9*	38·0	*15·3*	....	....	633·0	*256·2*
Busselton—								
Margaret River	39·0	*15·7*	....	....	4·5	....	43·5	*17·6*
Ludlow	166·5	*67·3*	51·0	*20·7*	....	....	217·5	*88·0*
Totals	2,958·0	*1,197·1*	3,179·0	*1,286·3*	24·0	*9·7*	6,160·0	*2,493·1*
Experimental Planting	130·0	*52·6*	43·0	*17·4*	19·0	*7·6*	192·0	*77·7*
Grand Totals	3,088·0	*1,249·7*	3,222·0	*1,303·7*	43·0	*17·3*	6,352·0	*2,570·6*

Roundwood Production

Roundwood production from Departmental plantations, mainly in the form of thinnings, amounted to 3,204,765 cubic feet (*90,761 m³*) which was an increase of 159,345 cubic feet (*4,516 m³*) or 5·2 per cent, on last years figure. The following figures show the trend in pine log removals in recent years:—

Year Ended June 30	Cubic ft. (U.B.)	*m³* (U.B.)
1950	298,010	*8,440*
1955	710,845	*20,131*
1960	1,002,619	*28,394*
1965	1,721,951	*48,766*
1970	2,870,170	*81,281*
1971	3,045,420	*86,245*
1972	3,204,765	*90,761*

Removals by category and by species were as follows:—

Category	*P. radiata*		*P. pinaster*		Total	
	cu. ft.	*m*³	cu. ft.	*m*³	cu. ft.	*m*³
Sawlogs	1,273,674	*36,071*	366,371	*10,376*	1,640,045	*46,447*
Chipwood	371,329	*10,516*	971,950	*27,527*	1,343,279	*38,043*
Peeler Logs	116,820	*3,308*	10,778	*305*	127,598	*3,613*
Fence Posts and Rails	29,120	*825*	50,189	*1,421*	79,309	*2,246*
Miscellaneous	....	....	14,534	*412*	14,534	*412*
Total	1,790,943	*50,720*	1,413,822	*40,041*	3,204,765	*90,761*

Compared with the previous year there was increased production of sawlogs (9·3 per cent) chipwood (7·3 per cent) and fencing material which trebled in volume. However, peeler log removals were almost halved.

Roundwood removals from the various plantations were as follows:—

	cub. ft.	*m*³	cub. ft.	*m*³
Wanneroo (Gnangara)			806,651	*22,845*
Metropolitan			199,158	*5,640*
Collier	173,931	*4,926*		
Somerville	25,227	*714*		
Mundaring			648,383	*18,363*
Harvey			408,680	*11,574*
Collie			89,697	*2,540*
Kirup (Grimwade)			417,906	*11,835*
Nannup			189,143	*5,356*
Busselton			347,094	*9,830*
Ludlow	199,364	*5,646*		
Keenan	147,730	*4,184*		
Pemberton			95,326	*2,701*
Miscellaneous			2,727	*77*
			3,204,765	*90,761*

Sawn Production

The total sawn production from all sources was 767,408 cubic feet (*21,733 m*³) which was only a slight increase of 4,860 cubic feet (*138 m*³) on the 1970–71 figure.

Private Forestry

The area of privately owned pine forest in the State at 31st March, 1972, was approximately 9,374 acres (*3,794 ha.*). Increasing numbers of queries from private individuals and firms proposing to plant pines for commercial purposes are being received.

In January, 1972 an experienced professional officer was assigned specifically to provide prospective private planters with information on current knowledge of pine growing and site selection in this State.

In the six months January to June 1972 inclusive, 53 queries were dealt with and 15 site inspections made.

Mallet Plantations

No mallet bark was produced during the year but a quantity of mallet timber was supplied to a small tool-handle factory which operates near Narrogin.

Tree Nurseries

Hamel and Narrogin nurseries continued to supply trees at cost of production to people living in rural areas and some 219,000 plants were sold. The demand for eucalypts and ornamental trees rose slightly this year due to increased requirements for planting around new mining townships.

Distribution of plants from Hamel and Narrogin nurseries in 1971 was as follows:—

Nursery	Number of Plants Sold				Departmental Use			Number of Species
	Potted Stock	Tray Stock	Open Rooted	Total	Pines	Other	Total	
Hamel	38,305	18,150	77,366	133,821	663,500	174,332	837,832	200
Narrogin	79,071	6,450	....	85,521	....	....	....	85
Total	117,376	24,600	77,366	219,342	663,500	174,332	837,832	....

The most popular eucalypts sold were:—

River Gum	*Euc. camaldulensis*
Tuart	*Euc. gomphocephala*
Tasmanian Blue Gum	*Euc. globulus*
Dwarf Sugar Gum	*Euc. cladocalyx var nana*
Coral-flowered Gum	*Euc. torquata*
Bald Island Marlock	*Euc. lehmannii*

Departmental nurseries raised a total of 5,286,000 pine seedlings in 1971, mainly for the Department's afforestation programme. Some 213,000 seedlings were sold for private planting projects.

Inland Arboreta

The 56 arboreta established over a wide range of sites throughout the farming areas of the State continue to provide an invaluable demonstration of the performance of the different tree species in the areas. Routine maintenance of these was carried out during the year.

Arrangements are in hand to establish a new arboretum at Coolgardie and further species trials will be made at Kalgoorlie and Esperance.

The severe drought being experienced in the Kalgoorlie region has again demonstrated the remarkable ability of indigenous trees to withstand such harsh conditions. Many trees imported from other regions have suffered badly. The average annual rainfall for Kalgoorlie is 9·83 in. (*250 mm.*) but figures for the last 3½ years are as follows:—

1969	4·84 in (*123 mm.*)
1970	6·65 in. (*169 mm.*)
1971	4·77 in. (*121 mm.*)
Jan.–June 1972	3·14 in. (*80 mm.*)

Seed Supplies

During the year the bulk of the seed held at Kalgoorlie was transferred to the Como seed store. This amounted to 34 lb. (*15·4 kg.*) obtained from 18 varieties of eucalypts and two other tree species.

A further 24 lb. (*10·9 kg.*) were collected from 11 eucalypt and five other species growing in the Kalgoorlie region.

An unusual request was for nuts of zamia palm (*Macrozamia reidlei*) and some 10,000 were collected. Most of them were supplied to New Zealand.

Esperance Roadside Planting

In 1961 a scheme to plant shelterbelts along road surveys in the Esperance Shire was commenced by the Forests Department. The work was financed by a direct grant from the Lands Department and supervision carried out by a local committee. The scheme was discontinued in 1965 after some 61 miles (*98 km.*) had been planted.

In October 1971, following a request from the Shire of Esperance the scheme was re-introduced under conditions similar to those applying previously. However there is an additional proviso that future planting will not proceed on inadquately prepared sites, or on sites considered unsuitable by the reconstituted Management Committee. This committee, which is controlled by the Shire, also contains representatives from the Departments of Agriculture, Lands and Surveys, and Forests.

Subject to final inspection, some 14·6 miles (*23·5 km.*) of roadside have been selected for planting in July 1972. All final participants co-operated well on the clear understanding that success will depend on conscientious site preparation and subsequent weed control, and that continuation of the scheme will depend on the success of the 1972 planting.

8. PROTECTION

Fire Protection

State Forests Under Protection	4,476,608 ac. (*1,811,658 ha.*)
Indigenous Forest	4,378,894 ac. (*1,772,114 ha.*)
Pine Plantations	78,603 ac. (*31,811 ha.*)
Mallet Plantations	19,111 ac. (*7,734 ha.*)

A further two million acres (*809,400 ha.*) of Crown land and private property are indirectly protected due, either to their strategic significance in relation to State Forest or to their forest value.

The Fire Season

Fire suppression activities were at about an average level despite the fact that rainfall was below average and the mean fire hazard was above average. The spring was relatively wet but the summer drought was more severe and persistent than usual. There was an unusually high number of days with temperatures between 90°F (*32°C*) and 100°F (*38°C*).

The data below was recorded at the Forest Weather Stations at Dwellingup (Jarrah) and Pemberton (Karri).

	Jarrah		Karri	
	Average	1971/72	Average	1971/72
RAINFALL				
Annual (in.)	50·50	42·50	51·05	46·00
Annual (*mm.*)	*1,283*	*1,080*	*1,297*	*1,168*
October to April inclusive (in.)	10·77	10·50	14·92	12·69
October to April inclusive (*mm.*)	*274*	*267*	*379*	*322*
NUMBER OF WET DAYS				
Annual	127	123	194	213
October to April inclusive	44	44	83	80
TEMPERATURE				
Mean Maximum Oct.–Apr. inc. °F	77·2 (*25·1°C*)	77·3 (*25·2°C*)	73·0 (*22·8°C*)	75·0 (*23·9°C*)
Days of 100°F (*38°C*) or over (No.)	4	3	2	2
Days of 90°F (*32°C*) or over (No.)	27	46	14	20
RELATIVE HUMIDITY				
Days of 10% or less (No.)	3	2	1	Nil
Days between 11% and 15% (No.)	7	12	3	2
Days between 16% and 25% (No.)	35	29	8	14
FIRE HAZARD				
No. of Dangerous days	12	16	2	2
No. of Severe days	23	30	5	11
Mean Hazard	5·4	6·4	4·4	6·2

Prescribed Burning

Indigenous Forest		559,193 ac. (*226,305 ha.*)
Hand Burning	219,284 ac. (*88,743 ha.*)	
Aircraft Burning	339,911 ac. (*137,562 ha.*)	
Advance, Top Disposal and Regeneration Burning		23,684 ac. (*9,585 ha.*)
Plantations		9,234 ac. (*3,737 ha.*)
Clearing Burns	6,347 ac. (*2,569 ha.*)	
Burning Under Pine Canopy	2,887 ac. (*1,168 ha.*)	
Total Prescribed Burning		592,111 ac. (*239,627 ha.*)

Suitable weather conditions for prescribed burning did not occur until late in spring and as a result both hand and aerial ignition programmes were restricted. Fortunately, planned areas for burning were below average following review and lengthening of the rotation period between burns in many localities. The value of aerial ignition, with its high rate of area coverage on days suitable for burning, was further demonstrated under these circumstances. Much less of the programme would have been achieved with only ground ignition methods.

From research in recent years a sophisticated means of predicting fire behaviour in karri and *Pinus pinaster* forest has been developed. This follows and supplements similar work in jarrah forest, the end product of which has been in use for several years with outstanding success. As an adjunct to this project a direct method of predicting moisture content of leaf and twig litter on the forest floor has also been developed. Fire Hazard is the term commonly used in fire weather forecasts to describe this fuel moisture content and the new technique will provide a more accurate estimate. For the past three decades this estimate has been made by comparison with small wooden rods, a method also pioneered by the Forests Department.

Information being derived from Departmental studies of fire effects on forest plants and animals is generally supporting prescribed burning policies. It is being used in conjunction with improved fire behaviour understanding to achieve effective forest and environmental protection. Use of this more sophisticated knowledge is illustrated by the ignition procedure for prescribed burns in mixed vegetation types. In each area, lighting is carried out on several different days to ensure appropriate weather and fuel moisture conditions are used to suit each vegetation type and secure hazard reduction with minimum forest scorch and patchy burns favourable to fauna.

Several of this year's aerial burns were assessed in detail by ground crews to ensure that standards of quality control were being maintained. These assessments recorded the area burnt, scorch levels in the forest canopy and fauna sighted in the burnt area. The results were satisfactory and the burns were generally of good quality.

After consultations with officers of the Fisheries and Fauna Department on preservation of animal habitat a revised plan of prescribed burning was drawn up for the Dryandra forest.

Regeneration burning was successfully completed on relatively large sections of karri forest, which had been logged in recent years. This operation received priority over other burning due to the irregularity of seasons in which adequate seed is available in the forest and to the higher cost of alternative regeneration methods.

Assistant and advice was given to a number of other Departments on fire use and methods of achieving fire protection over undeveloped land.

Policies have been implemented to ensure that smoke from prescribed burning does not aggravate visibility problems in the metropolitan area when air dispersion alerts are current. Research by C.S.I.R.O. indicates bushfire smoke is not a health hazard and is dissimilar to photo-chemical smog.

Detection

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

	Karri	Jarrah	Pine
First watch	2/12/71	29/10/71	28/10/71
Last watch	18/4/72	22/5/72	29/5/72

For the first time in these forests computer techniques were used to aid in the selection of tower sites. The results were confirmed in the field with quickly-erected scaffolding. This computer technique has greatly improved flexibility and information for selecting new tower positions.

Two new towers were erected, one near Margaret River overlooking Keenan pine plantation and the second in Dryandra forest near Narrogin.

Tower communication by bush telephone lines continued to be phased out with the introduction of six new radio-telephones.

Fires and Fire Damage

Departmental forces attended 249 fires of which 59 were burning in private property or Crown land adjacent to the forest.

Indigenous forest	134 fires burnt	12,700 acres (*5,140 ha.*)
Pines	56 fires burnt	7·6 acres (*3.1 ha.*)

The protracted hot, dry fire season contributed to a higher acreage of burnt indigenous forest than was the case in the 1970–71 season.

The detection system assisted shires by locating and reporting fires burning in private property.

Bushfire brigades were supported by Departmental forces where fires in private property threatened State Forest. One of the most notable of these fires burnt 2,000 acres of forest and pasture in the Lunenburgh valley near Brunswick Junction, and posed severe suppression problems due to steep terrain, dense fuels and hot windy weather.

The number of fire lit from lightning strikes was higher than average, but it was satisfying to note the number of escapes from prescribed burns continued to decline in significance compared with other fire causes.

General

Training in fire weather forecasting was given to senior divisional staff, as more complex fire behaviour prediction methods now in use require increased understanding and competent assessment of weather factors.

An intensive check was carried out on all fire tanker trucks to ensure that a uniformly high standard of preparedness was maintained. With similar objectives in mind review of general fire control procedures continued and a comprehensive checking programme commenced to minimise operational problems.

Progress towards metric conversion was furthered by changing fire behaviour and weather tables to metric measure. Providing adequate progress is made in change over of weather recording instruments and in training of staff in the new procedures it is hoped metric terminology will be employed for fire control operations in this coming season.

9. RESEARCH

PINE SILVICULTURE

Pinus pinaster Plantations

Tree Breeding

Seed Orchards: A good yield of improved seed was obtained this year from the Joondalup seed orchard which, planted in 1963 and 1964, now contains 10·6 ha. of the best local and Portuguese clones. Details of past yields and an estimate of the 1973 yield are given below.

Collection		Production		Estimated Planted Area (ha.)
Year	Age	Number of Cones	Seed (kg)	
1968	5–6	3,385	13	105
1969	6–7	11,490	51	329
1970	7–8	14,147	71	403
1971	8–9	46,637	260	2,673
1972	9–10	22,946	123	1,262
1973	10–11	21,123	108	1,115

The estimate of area planted with genetically improved planting stock is based on tree percent of 50 and spacing of 3·6 m x 2·4 m (12 ft. x 8 ft.).

The estimated decrease in yield during the 1972–73 period pointed to the desirability of refertilization, which was recently carried out.

Planting of the Mullaloo seed orchard, which commenced in 1969, was completed in the current year. The total area of the orchard is 10·9 hectares.

Controlled Pollination: The early crossing programme for local and imported Portuguese clones was completed in 1970. The current programme of random-paired mating aims at production of 61 "superior" families from the 122 clones available. The approach adopted will minimize the possibility of excluding any good genotype.

A total of 882 flowers was isolated and pollinated in September 1971, with 55 per cent success.

Progeny Testing: Further trials, covering 4 hectares at Pinjar, 3·6 hectares at Gnangara and 2·4 hectares at Neaves, were planted in June 1972 at 3·3 x 3·3 metres spacing. Tubed progeny, grouped in five-tree line plots, was used.

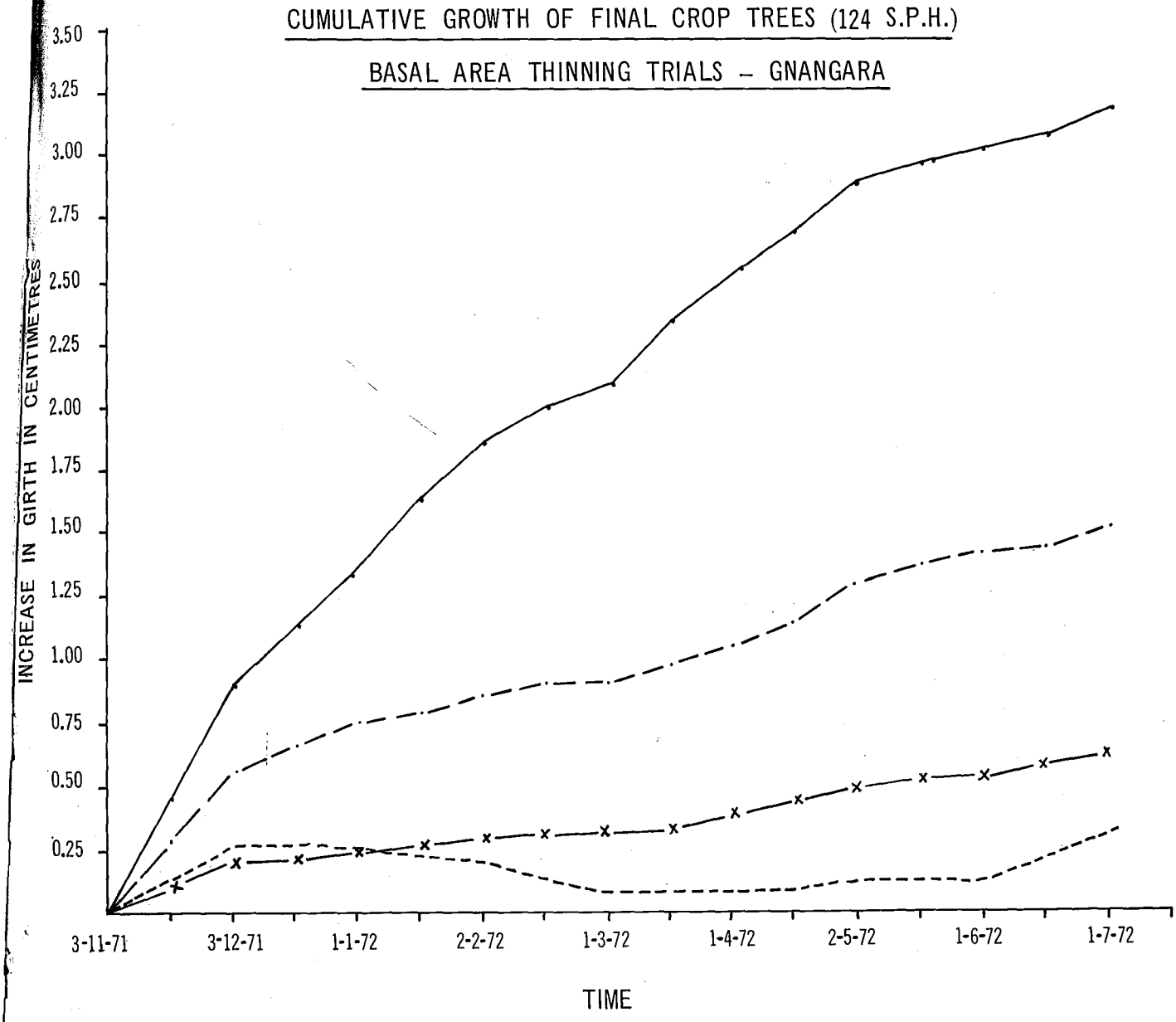
The Wanneroo research nursery produced 11,000 *Pinus pinaster* and 4,000 *Pinus radiata* seedlings for progeny trials.

Ten hectares of progeny trials, planted in 1968, were measured for height increment in January 1972. Height development for full-sib groups at a range of locations is shown below:—

Category	Height in Metres					
	Gnangara	Yanchep	Mundaring	Manjimup	Collie	Hamel
Best Cross	2·42	3·19	1·95	2·76	3·06	3·81
Top 25%	2·37	3·14	1·86	2·64	2·98	3·66
Top 50%	2·33	3·07	1·75	2·48	2·88	3·53
Top 75%	2·29	3·00	1·68	2·41	2·82	3·45
Mean	2·22	2·90	1·59	2·31	2·73	3·36
Routine SN	1·92	2·59	1·64	2·12	2·45	....
Worst Cross	1·81	2·30	1·19	1·90	2·45	2·83
Selfings	1·97	2·75	1·40	2·22	....	2·86

Thinning and Fertiliser Trials

Normal (609 kg/ha of superphosphate) and heavy (1,218 kg/ha of superphosphate, 304 kg/ha of ammonium sulphate) fertiliser treatments were incorporated into the South Lane–Poole thinning experiment after a satisfactory uniformity analysis of blocks. Very rapid response, monitored by frequent dendrometer readings was observed and is shown in the figure below.



LEGEND	SELECT MEAN DBHOB	TREATMENT	
	JAN. 1972	STAND DENSITY	FERTILIZER
——•——	33.25 cm	7.1 m^2/ha	High
·— — ·— — ·	32.72 cm	7.1 m^2/ha	Low
– – – – – –	24.28 cm	36.7 m^2/ha	High
×——×——×	26.29 cm	36.7 m^2/ha	Low

The results indicate that soil moisture is the limiting factor in the area, in that fertiliser response has been restricted to heavily thinned stands, where some moisture is available throughout the year. The lack of response in dense, lightly thinned stands, is attributable to exhaustion of soil moisture by early summer.

Large Pilot Plots: Monitoring soil moisture trends by neutron probe has revealed that although moisture stress is building up under five and a half year old stands (average height 2·9 m) it is as yet not critical. Thinning and fertiliser treatments will be implemented in 1973.

Pinus radiata Plantations

Tree Breeding

Seed Orchards: The Gleneagle seed orchard, now six years old, yielded 2 kg of seed in the current season. Planting has now been completed in the Manjimup seed orchard, which includes the best clones from Western Australia, South Australia, Victoria, New South Wales and Australian Capital Territory, as well as three " plus " trees from New Zealand. The total area planted is 15·8 hectares.

Seed Production Area, Grimwade

A yield of 54 kg of clean seed was obtained from 250 trees felled in the area. This will be sufficient to plant 640 hectares, at 3 m x 3 m spacing, with improved planting stock.

Study of the effect of cone age on seed availability indicated that viability declines after four years. The widely spaced, exposed trees in the seed production area retain seed for only two years. Fertilisation of the area with 1,218 kg/ha of superphosphate and 304 kg/ha of urea in 1969 markedly improved the volume increment of the seed trees—by 50 per cent— and raised the yield of seed by 40 per cent, as shown in the table below.

	1970 Crop		1971 Crop	
	Fertilised	Unfertilised	Fertilised	Unfertilised
No. of cones per seed tree	57	45	44	33
Seed weight/tree (gm)	127	97	112	61
Seeds per cone	92	93	97	85

Progeny Testing: The Western Australian segment of the International Gene Pool was planted this year at Grimwade (4·5 ha) and in the Blackwood Valley (5 ha). The Collie research nursery raised the 14,000 tubed seedlings needed for this project. The progeny tests now occupy 20 hectares.

Low Pruning

A low pruning experiment established five years ago was remeasured and the results evaluated. The experiment compared pruning to 2·3 m at ages four, five and six years with no pruning. The ages of pruning corresponded to mean stand heights of 4·8 m, 6·8 m and 9·3 m respectively.

At the age of nine years the early diameter differences between treatments were less apparent than two years previously but there were marked differences in basal area and standing volume. For example, plots pruned at four years produced 18 per cent. less volume under bark to a 6·3 cm top diameter than unpruned plots.

A careful study was made to determine whether age of pruning had influenced the incidence of major stem defects or had affected stem straightness. No relationship could be detected between pruning treatment and the number of forks and multiple leaders; nor between treatment and the incidence and severity of stem sweep, bend or kink.

Wood Property Studies

The installation of a large drying unit at the Manjimup Research Station has made it possible to commence study of wood properties of radiata pine in W.A. plantations. Attention so far has been focused on the Blackwood Valley plantations to investigate the seasonal variations in tree moisture content and to evaluate the influence of site quality and locality on wood basic density and moisture content. Preliminary data suggest both standing tree moisture and basic density are about average for the species.

Site Studies and Site Amelioration

A long term research programme has been commenced with the objective of determining the potential for pine planting of a large tract of State Forest south of Busselton. The programme is based on a series of trial plots which will eventually cover all major site types in the area. A site survey is being conducted concurrently with the early stages of the research. The soils in this area are of low fertility, with a known requirement of phosphorus and probably zinc. A number of field fertiliser trials have been established to determine the optimum initial level of superphosphate application; to check for minor element deficiencies; and to compare commercially available zinc and phosphate formulations.

A broadly similar series of nutrition investigations was commenced on coastal sands at McLarty plantation, near Harvey. In this case the objectives are to define optimum fertiliser combinations for various stages in the rotation for the Spearwood yellow sands, on which *Pinus radiata* is planted at present, and to determine whether planting of this species can be extended to the poorer grey Bassendean sands.

Species Trials

A large scale programme of experimental planting of coniferous species as yet inadequately tested in Western Australia was completed this year. Each species was planted on three widely different sites:

(a) good quality site for *Pinus radiata* at Nannup
(b) marginal site for *P. radiata* at Collie
(c) site unsuitable for *P. radiata* near Tone River.

JARRAH SILVICULTURE

Regeneration Studies

Current assessment of trials relating regeneration of jarrah to density of overstorey and degree of ground disturbance has disproved the earlier reported observation on the inhibition of germination by large veterans. However, under dense stands of 30 m^2/ha basal area only four per cent of sown seed developed into one year old established seedlings, compared with 11 per cent under very open stands of 4·5 m^2/ha basal area. Ploughing increased establishment rate by from six to nine per cent.

Response to Fertilisers

The response of jarrah to nitrogen (N) and phosphate (P) fertilisers has been found to reach a peak in the second and third years after application. By the fourth year the response declines to a level less than half of that of the peak years. Nitrogen alone gives a response over three quarters as great as the response to N and P together. Preparations are in hand for a field scale trial of fertilisation.

Effect of Crown Scorch on Growth Rates

During rotational prescribed burning, it is possible to control the degree to which the foliage of the trees is scorched. The effect of scorch on the growth rate of jarrah has been the subject of a trial established in 1969. Recent evaluation indicates an increase in girth increment of 20 per cent attributable to the fact that the scorching has prevented seeding, which normally depresses growth by as much as 30 per cent over half of the five-year seeding cycle. Trees scorched in spring develop a new crown within 3 months, whereas those scorched in autumn require up to 10 months, and have correspondingly lower girth increment.

Intensive Management Units

The location and delineation of the more highly productive areas of jarrah forests as intensive management units was expanded in the current year. Working Plans for two such units were completed during the year, and plans for a further six units are in an advanced stage of preparation. Major silvicultural work is now large confined to intensive management areas. The main operations include cutting to induce regeneration in under-stocked areas, poisoning dense *Banksia grandis* understorey, pole thinning, cull tree felling and poisoning, and dieback control and rehabilitation.

KARRI SILVICULTURE

Seed Production Assessment

During 1971, 3,212 hectares of cut-over karri forest were sampled to determine the adequacy of seed production for natural regeneration. Regeneration burns were largely confined to areas with reasonable seed supply. However favourable weather resulted in satisfactory germination even on the small area of poor seed production which was burned in anticipation that artificial regeneration would be needed.

Regeneration Surveys

An investigation into " stocked quadrat " technique of regeneration sampling was completed and the method successfully introduced into practice. It involves sequential sampling as a first stage, followed by systematic grid sampling of areas shown to be deficient.

Large Scale Silvicultural Trials

These cover the major pure and mixed stands in the southern forests. Results obtained so far indicate that clear-felling favours karri in both pure karri and mixed karri-marri stands. Retention of the appropriate seed source is a means of controlling the composition of the regenerated stands. There appears to be no cheaper suitable alternative to the full removal of the original stand by bulldozing, heaping, burning and ploughing in the establishment of exotics on mixed marri-karri forests. The main problem in obtaining full productivity of mixed marri-jarrah stands following utilisation of both species, is the removal of the high stocking of unsaleable and space consuming culls.

Karri Improvement Programme

Seed collection covering the geographical range of the species, resulted in eighty seed batches, each collected from "superior" trees within "superior" stands. The seedlings raised from these, totalling 7,000 were used to establish randomised trials in three separate study areas in the Warren, Donnelly and Gardner River systems respectively.

Surplus seed from the seed collection was sent to South Africa, where a similar trial will be conducted. In return, seed from five South African "plus" trees will be incorporated in subsequent trials, which ultimately will test about 400 families.

Early Thinning and Fertilisation—Karri Seedlings

Remeasurement 10 years after establishment of plots designed to show the effect of early thinning and fertilising of young natural karri regeneration, shows that the influence of fertiliser tends to fade, with the ashbed effect tending to dominate all others. Thinning had a marked beneficial effect on the growth of the larger stems (890/ha), but only on ashbeds. Thinning tended to depress growth of ashbeds. Relative volume increment rates of the larger trees using unthinned stands away from ashbeds as basis, (100), are given below.

	No Ashbed	Part Ashbed	Ashbed
Not thinned	100	190	330
Thinned	76	340	580

Seed Pelleting

Although pelleting raised the percentage of seedlings obtained by surface sowing of karri seed in the field from 1·7 per cent to 5·0 per cent, the year to year variations due to climate are excessive and limit the usefulness of the method.

SOILS AND NUTRITION

Site Nutrient Losses Caused by Thinning Operations

A series of log samples were collected during thinning operations in three pine plantations. From the chemical analysis of these samples an estimate was made of the major nutrients removed from the site by these operations (Table 1).

TABLE 1

WEIGHT OF NUTRIENTS REMOVED IN THINNING OPERATIONS

Location	Species	Age Years	Nutrient Removed kg/ha							
			N	P	K	Ca	Mg	Mn	Zn	Cu
Mundaring	*P. rad.*	12	49·8	1·7	21·4	15·7	8·8	0·10	0·07	0·02
	P. rad.	9	45·7	1·5	21·6	15·8	8·7	0·10	0·07	0·03
	P. rad.	44	221·5	4·5	56·6	85·5	24·5	1·07	0·19	0·08
	P. pin.	29	27·8	0·4	5·2	8·1	4·2	0·10	0·03	0·01
	P. pin.	40	60·0	0·9	10·8	17·4	8·1	0·08	0·08	0·03
Grimwade	*P. rad.*	30	204·8	12·7	49·5	108·8	28·3	1·60	0·41	0·23
	P. rad.	34	220·9	13·7	60·4	90·6	24·7	2·33	0·44	0·30
Nannup	*P. rad.*	14	129·8	28·0	69·1	52·2	20·2	1·38	0·34	0·19

It is evident from the data that thinning operations remove considerable quantities of nutrients from a site, and it is important to realize that these nutrients are completely lost from the forest system.

The most important nutrient losses are nitrogen, calcium, potassium and magnesium. Of these the loss of nitrogen is very significant—for example in the case of heavier thinning at Mundaring and Grimwade the nitrogen already removed from the site is equivalent to the nitrogen contained in urea applied at the rate of 473 kilograms per hectare.

Generally, the phosphorus content of the samples was very low, so the losses of phosphorus, which is one of the most important elements in pine nutrition in Western Australia, are small. The exception to this was the first thinning material from Nannup, where the pines are growing on extremely fertile young soils with abundant reserves of phosphorus.

The three major elements examined, viz., manganese, zinc and copper were present in extremely small amounts in the wood; consequently only slight losses of these elements were observed.

Soil Nitrogen Studies under Pine Crops

A detailed set of soil samples collected from under stands of *P. pinaster* and *P. radiata* and adjacent native vegetation indicated that there were no significant differences in the soil nitrogen levels of the different vegetation types.

Attempts were made to fractionate the soil nitrogen, but considerable difficulties were experienced due to the large amounts of iron and aluminium in the hydrolysates. However, the preliminary evidence indicates that alpha amino acid and hexosamine nitrogen levels are similar under plantation and native forest vegetation.

FIRE RESEARCH

Fire Behaviour Tables

Pine Plantations: A preliminary fire behaviour guide was developed for needle-bed fuels under *Pinus pinaster* stands. The tables predict in turn surface and profile needle moisture content, depth of fuel available for burning, rate of backfire spread, rate of forward spread including adjustment for wind, slope and "spotting" ahead and finally fire intensity or flame height with appropriate suppression action requirements.

In the prediction of litter moisture, allowances are made for the effect of drought, stand exposure and depth of needle-bed. The tables predict the day and night changes in surface moisture content as well as drying after rain. Testing of both phases of the tables is in progress and the training of divisional officers in the use of the tables has begun.

Studies of fire behaviour in *Pinus radiata* needle-beds have been intensified with a view to developing a fire behaviour prediction table for stands of this species. So far, over 40 field and laboratory fires have been observed in a wide range of environmental conditions.

Karri Forest: A set of tables predicting fuel moisture and fire behaviour has been developed along the same lines as for the pine tables. The tables also include adjustments for scrub fuel quantity and inflammability. The testing of these tables is continuing.

Assessment of Quality of Aerial Prescribed Burning

Ten areas in the northern and southern forests burnt by aircraft in the 1971/72 burning season were assessed for quality of burn actually achieved. The quantitative information will provide a basis for defining areas of weakness in current planning and prescriptions.

Growth Studies

Dendrometer measurements of girth increment were used to assess the effect of fire on karri pole and sapling stands, and on plantations of *Pinus radiata* subject to various fire intensities.

Karri: Saplings treated with high fire intensities (300 to 400 B.T.U.) in autumn have shown a marked decrease in girth growth, whereas spring fires of medium intensities (about 150 B.T.U.) have not altered growth. Significant changes in the stand structure resulted from both treatments, in that smaller, weaker trees were killed even at intensities of only 50 to 100 B.T.U. Although larger trees have developed some bole epicormics, the use of fire for thinning karri saplings is promising.

Pinus radiata: Full scorching by fire of intensities of about 250 B.T.U. in 14 year old trees, 24 metres tall, resulted in a 40 per cent death rate and zero growth increment of live trees. Fire intensities of 40 B.T.U. had a minimal effect on growth of trees in the same stand.

Pinus pinaster: Fire intensities of up to 80 B.T.U. have not affected the girth growth of young (average diameter of 225 mm) stands of this species. However scorching at higher intensities depressed increment for a minimum of one year after mild scorch, two years after medium scorch which affected half to three quarters of the crown, and four years after severe scorch which affected more than three-quarters of the crown.

Fire Ecology

Effect of Fires on the Understorey of the Jarrah Forest: Plots established last year in jarrah forest near Dwellingup, to measure the effect of prescribed burning on regeneration of understorey scrub, were burned during spring, summer and autumn. Fire intensities were maintained within one of three classes: cool (10 B.T.U. per second per ft.), medium (20–50 B.T.U.) and hot (50–200 B.T.U.). Future treatments will be conducted at three and six year intervals. Forty-two plots, including controls, are maintained, and scrub reassessment using point and metre quadrat sampling techniques are planned for the next spring in these plots.

Effect of Fires on the Understorey of the Karri Forest: Research into the effects of fire intensity, frequency and season of burning on a number of plant communities continued. At present there is no experimental evidence to suggest that any differences in scrub composition after burning are due to the season during which burning was carried out. However there appears to be a relationship between germination of legumes and fire danger index based on moisture and temperature. The most important factor appears to be burning frequency.

Studies in areas used as firebreaks and burned on a two to three year cycle for long periods reveal changes in the percentage composition of species. Although no species have been entirely eliminated by this very frequent burning, it is possible that in time, species that do not seed till the age of three to four years, may disappear altogether.

Present scrub communities are extremely fire resistant, 70 to 80 per cent of the species possessing underground organs, e.g., rootstocks, bulbs and tubers, which will survive even the hottest fires to sprout and grow again. The remaining 20 to 30 per cent and also many of the first category possess fire-resistant seed or fruits. The seed of many of these species requires heat treatment in order to germinate at all.

Wildflower species such as *Boronia megastigma* and *Crowea dentata* are practically "fire weeds" relying on fairly frequent fires in order to achieve full development. If the area is left unburnt these species disappear from the community only to re-appear after the next fire.

FAUNA

Animals of the Jarrah Forest

Fauna studies are continuing both on an exploratory basis to determine species distribution and on selected species to determine the effects of fire on the fauna. Detailed information on animal movements and distribution in relation to vegetation type is being collected for the yellow-footed marsupial mouse (*Antechinus flavipes leucogaster*) and the short-nosed bandicoot (*Isoodon obesulus*). Early difficulties in catching large enough numbers of quokkas (*Setonix brachyurus*) for study purposes have been overcome by the use of fences with funnel-traps at each end and the species can now be also studied in detail. All animals captured in the study areas are measured, weighed, ear-tagged for identification and then released.

Birds of the Jarrah Forest

A comprehensive study of the short-term effects of prescribed burning on bird populations was made in spring 1971. No significant changes in numbers or species representation was found in an area subjected to normal burning techniques. A second area was purposely burnt severely enough to scorch 50 per cent of the tree crowns. One species moved out of the burnt area while others, although remaining within the study area, moved away from scorched patches. No evidence of mortality was found and young western yellow robins were successfully reared from three nests under observation. One of these nests was in severely scorched forest.

Animals and Birds of the Karri Forest

The effect of fire on fauna is being studied on a 40 hectare block of karri near Pemberton. An intensive study is being carried out on a native rat, the southern bush-rat (*Rattus fuscipes*), and the birds and vegetation of the area. The rats are being live-trapped, weighed, measured and ear-tagged with numbered tags for later identification. The birds are recorded along line transects through the area and the vegetation is being studied along the transects and in permanent quadrats also. The area was burnt to wildfire intensity in January.

A quenda or short-nosed bandicoot (*Isoodon obesulus*).

Results indicate that the actual burn killed few if any animals. However during the weeks following the fire, the rats gradually disappeared from the burnt area and few young rats were caught. In contrast in the control block the usual complement of rats was caught, and in addition the numbers started to rise due to the appearance of young animals.

Immediately following the fire there was a drop in total bird numbers and also in the number of species present in the area. Later the numbers of birds increased over the pre-fire figures. Care must be taken in interpreting the figures since visibility increased considerably after the fire. The banded blue wren, the red-winged wren and the spotted scrub-wren have all left the area. The spotted scrub wren is now returning as the vegetation begins to grow again.

The place of the wrens was taken by the scarlet robin and the western shrike-thrush. The western yellow robin has also appeared and the numbers of white-breasted robin have increased.

These changes are directly related to the effects of the fire. The wrens all live in low dense scrub whereas the robins and the shrike-thrush prefer a relatively more open habitat.

Soil Fauna

During spring 1971 samples of soil animals were collected from well documented sites in the wandoo, jarrah and karri forests. Animals were provisionally identified and catalogued and specimens sent to specialist taxonomists in Australia and overseas for further study of the many new species involved. Characteristic differences in the fauna amongst sites were recorded. Where it was possible to compare burned and unburned areas within the same site-type, reduced number of species was generally found under the former.

Litter Decomposition

A field trial on thinned and fertilised *Pinus pinaster* plots at Gnangara estimated the relative rates of cellulose decomposition using cotton strips. In the leaf litter layer and the top 3 cm of soil there are no significant differences amongst treatments but below 3 cm depth the effects of fertiliser and stand density are significant at the 90 per cent level. Cellulose decomposition rates in the soil are faster with increased fertiliser and with low stand densities.

JARRAH DIEBACK

Field Screening for Species Resistance

Trial plots of a large number of eucalypt and softwood species established on an area infected by *Phytophthora cinnamomi* are now six or seven years old. Separation of resistant and highly susceptible species can now be made with some confidence at least up to age seven. *Eucalyptus globulus* and *E. resinifera* have demonstrated outstanding resistance on the well drained gravel sites of the trial while *E. microcorys* and *E. saligna* both show an acceptable degree of resistance. The two most susceptible species tested are *E. sieberi* and *E. obliqua*. Pines seem generally to be less affected than hardwoods. *Pinus pinaster* is outstanding followed by *P. elliottii*. *Pinus taeda* is definitely susceptible while the least resistance is shown by *P. patula*.

Low-cost Establishment

A five-acre field trial of *P. pinaster* raised in 7·6 x 1·3 cm diameter plastic tubes was conducted in the Mt. Cooke area. Survival after one year was 86 per cent compared with 89 per cent for normal open-rooted planting stock. Although the result is most satisfying, direct seeding trials have yielded equally good stocking at much less cost. Eucalypt planting stock raised in the same tubes proved unsatisfactory.

Land Use Studies

The ecologically-based site survey of the northern jarrah forest was completed. In addition to the 9,039 hectares of cut-over forest in Kelmscott Division surveyed in the previous year, a further 4,900 hectares in the Harvey Division were surveyed by a combination of ground survey strips and aerial photo-interpretation. This comprises the bulk of residual high quality virgin forest in the region. The purpose of this survey was to provide a basis for relating growth potential of jarrah to understorey vegetation and to climatic, edaphic and topographic features, as well as to indicate any site vegetation types as yet not represented in existing scientific reserves.

Aerial Photo-interpretation

All of the survey areas in the Kelmscott Division have been photographed from the air on 1: 15840 scale using panchromatic black and white, infra-red black and white, colour and colour infra-red films. The photo-interpretation based on these four media is being related to ground survey to assess their usefulness in land use planning. The study of relationships between various environmental and vegetation features by means of the computer mapping programme MIADS has revealed a high degree of covariance. The implication of this is that features difficult to identify on air photos, such as soil texture and ground vegetation, can be mapped on the basis of features which are readily identifiable from the air, such as topography and tree stratum. The surveys have also been related to recently published geomorphological studies to facilitate their extension to the region as a whole.

The sections dealing with definition and mapping of site-vegetation types have been completed, and the application of this to land use planning is in progress.

The vastness of the sand dunes along the south coast is captured in the photograph. The small object in the left centre foreground is a beach buggy.

New Surveys

Survey along similar lines was commenced in the Sunkland region, a low plateau south-east of Busselton, where the accent is chiefly on the potential for the establishment of exotic plantations.

SAND DUNE FIXATION

A review of the early departmental plantings of marram grass in 1936 on the south coast Callcup and Yeagerup dunes was made. Complete success has been achieved on the inland section of the Callcup dune, the entire area of which was planted in the one year. No moving sand now exists on this dune, and the whole area is progressing toward stabilisation and eventual formation of *Agonis* forest. As a result, there is no longer any threat of blocking the Warren River and of encroachment on farming properties and State Forest.

Partial edge planting of the vast Yeagerup dune proved inadequate, as the planted edge was buried by moving sand. The planting and stabilisation of the entire area thus appears essential. Failure was also experienced in planting of beach blowouts, where construction of artificial barriers is apparently needed to promote deposition of sand.

10. UTILIZATION

Departmental Sawmills

An automatic gulleter designed for Pemberton has proved very satisfactory in service and will be duplicated at other mills.

Drying sheds were constructed at Grimwade, Ludlow and Pemberton and the shed at Harvey was extended. The combined capacity of these sheds enables a holding of 600,000 su. ft. of dry stocks to service a market for seasoned sawn pine.

Engineering

Two new fire lookouts were erected, one at Dryandra and the other at Margaret River.

Technical enquiries from trade and industry were answered.

Timber Seasoning

A trial was initiated at the request of Forest Products Laboratory to test the effect on jarrah joinery stock of quarter sawing, edge stacking, close stripping and salt soaking. The trial is continuing.

The depth of the moving sand can be gauged by the photograph of a dune engulfing a jarrah forest.

Sleeper Tests

A further evaluation was made of the 1962 test section of treated marri sleepers in the Brunswick–Collie railway. Untreated controls had degraded seriously, while creosote-treated sleepers were in fair condition. Sleepers treated with P.C.P. (pentachlorphenol) in oil were markedly superior, conforming with results at Merredin and Bowelling, and confirming advice to North-West mining companies that considerable advantage lies in the use of oil-treated sleepers—irrespective of species.

Termites in the Pilbara

Inspections of termite attack, evaluation of damage potential and recommendations for treatment were made at the request of Mt. Newman Mining Company. It was established that the destructive species *Mastotermes darwiniensis* is confined largely to timbered creek beds north of the Tropic of Capricorn.

Preservative Treatment of Mallet Posts

Use of a portable post treatment plant made available by C.S.I.R.O. enables semi-commercial treatment of mallet posts with C.C.A. (copper, chrome, arsenic) preservative. Some 1,500 posts have been treated for trial in test sections of farm fencing.

Committees and Conferences

Standards Association: The new grading rule for W.A. structural hardwoods is at the final stage before printing.

Rules for wooden windows, mosaics, handles, etc., and for machine grading and timber preservation were completed during the year.

Metrication: In the Government Construction and Timber Sectors progress towards metrication is conforming with the schedules laid down.

II. LIBRARY

Library operations continued at much the same level as previously as shown by the following statistics:—

	1971/72	1970/71
Journal loans	9,610	10,473
Accession list requests	3,402	3,731
Loans and queries	4,706	4,782
Publications received	969	1,025

The library is now located in a more spacious area on the third floor and extra shelving has been ordered to overcome crowding on the existing shelves.

12. EDUCATION AND PUBLICITY

Education

State Forestry Cadetships: There were no Forestry Cadetships awarded in 1972 for studies at the University of Western Australia. However, two cadets graduated from the Australian National University in 1971, two are expected to graduate in 1972 and a further two in 1973.

Several officers attended a number of managerial and other courses during the year. These included the Rescue Service Course at Mount Macedon, the Executive Development Course at the Western Australian Institute of Technology and a course conducted by the Australian Institute of Management. Two officers attended a course on Automatic Data Processing Appreciation.

Field Cadet Training: Thirteen cadets from the 1971 intake passed out of the Mount Lawley Technical College to commence studies in the field. Two first year students failed to complete the course. No Forest Field Cadetships were granted this year.

In-Service Training: Six cadets from the 1970 intake graduated in a special ceremony held in the Como auditorium. They will now undergo two years in-service training.

Publicity

One meeting of the Australian Forestry Council was held in Darwin in June, 1972 and was attended by the Conservator and Deputy Conservator.

The Conservator also attended the three meetings of the Standing Committee of the Australian Forestry Council held in Melbourne (July, 1971), Mount Gambier (October, 1971) and Canberra (March, 1972) as well as the Steering Committee of the Forestry Development Conference (Melbourne, July, 1971) and the meeting of the Heads of Forest Services (Sydney, September, 1971).

The Department was represented at the AUS.T.I.S. Council meeting in Sydney, the Sirex Committee in Melbourne and the 8th All-Australian Timber Congress, also held in Melbourne.

New publications released during the year included:—

"Selected Flowering Eucalypts of Western Australia"—a booklet which presents in 69 full colour reproductions 34 species or varieties of some of Western Australia's most colourful eucalypts.

"Forestry in Western Australia"—2nd Revision, together with reprints of the chapters dealing with forest environment and the forest formations of the State.

Four research bulletins—Bulletin No. 79—"Short-term responses from controlled burning and intense fires in the forests of Western Australia."

Bulletin No. 80—"A study of scrub fuels in the jarrah forest of Western Australia."

Bulletin No. 81—"Germination in *Pinus pinaster* AIT."

Bulletin No. 82—"Drought resistance in seedlings of *Pinus pinaster* AIT."

"Forest Focus" Nos. 5, 6, and 7 with the focus respectively on afforestation with pines and forest recreation; the jarrah forest and bushfire survival; and birds of the jarrah forests and 100 years of sawmilling at Jarrahdale.

Six research papers were produced dealing with understorey fuels in the karri forest; commercial thinnings of radiata pine; some aspects of logging hygiene; regeneration methods in mixed marri-karri stands; fertiliser responses in *Pinus radiata*, and early responses to thinning in stands of *Pinus pinaster*.

13. TIMBER INDUSTRY REGULATION ACT, 1926-1969

The number of mills registered under the provisions of the Act as at December 31, 1971 totalled 154 (96 Crown Land and 58 Private Property).

The average number of persons employed in the timber mills each month throughout the year was 2,533, an increase of 132 on last year's figure.

The District and Workmen's Inspectors made 1,303 inspections of timber holdings.

There were 115 notifiable accidents for the year ending June 30, 1972, three being fatal.

The number of accidents per 100 persons employed was 4·54, a substantial reduction on last year's figure.

The cost of administering the Timber Industry Regulation Act for the year ending June 30, 1972, was as follows:—

Salaries	$12,011
Mileage, Travelling Allowances, Office Rent, Plant Cost and Sundries	$5,350
	$17,361

14. FOREST OFFENCES

Twenty-five breaches of the Forests Act and Regulations were reported during the year. Legal proceedings were instituted in two cases and ten cases were dealt with by charging royalty, forfeiture of deposits, collection of damages or confiscation and sale of timber illegally cut. The amount received by the Department in this way totalled $1,036.72. Warnings were issued in all other cases.

15. EMPLOYMENT IN FORESTRY AND THE TIMBER INDUSTRY

The number of wage earners directly employed in Forestry and the Timber Industry was estimated at 4,151, made up as follows:—

Forestry—		
Professional officers	54	
General field staff	247	
Clerical and drafting	79	
Wages employees	559	
Contractors and employees (estimated)	20	
		959
Timber Industry—		
Sawmill employees including bush workers at December 31*	2,533	
Firewood cutters and pole getters working under permits	159	
Sandalwood workers	93	
Apiarists, estimated (972 sites registered)	400	
		3,185
		4,151

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

16. ACCIDENT PREVENTION (SAFETY)

Further success has been achieved in combating the accident problem during the year under review.

An average of 962 employees and staff worked a total of 1,759,888 man-hours and suffered 40 disabling injury accidents involving the loss of 275 man-days. The disabling injury frequency rate for the year, which is the common measure of safety performance throughout industry, was 22·7 and the time lost per accident averaged 6·8 days. These figures compare favourably with last year's figures of 48 disabling injury accidents for a frequency rate of 27 and a time loss of 458 man-days.

There were a further 127 serious injury accidents (medical expenses only) which is also a reduction on last year's figure of 158.

The following table of all injury accident experienced during the five-year period 1967/68–1971/72 indicates the success that has been achieved following the implementation of an organised approach to the problem of preventing accidents.

ALL INJURY ACCIDENTS

	M.H.W.	D.I.A.	S.I.A.	Total Accidents	F.R.		Man-Days Lost
					D.I.A.	All Injury	
1967/68	1,895,600	124	312	436	65	230	1,701
1968/69	2,019,568	96	155	251	48	124	1,738
1969/70	1,901,020	70	129	199	37	104	721
1970/71	1,808,406	48	158	206	27	110	458
1971/72	1,759,888	40	128	168	22·7	95	275

M.H.W.—Man-hours Worked
D.I.A. —Disabling Injury Accident (resulting in lost time)
S.I.A. —Serious Injury Accident (resulting in medical expenses)
F.R. —Frequency Rate.

Whilst all divisions have contributed to the overall success, some have excelled by working the past year free of disabling injury accident. This indicates an increasing awareness throughout the work force of the benefits that accrue from safe work habits and it is confidently expected that further success will be achieved.

17. STAFF MATTERS

Public Service Act

On the 12 January, 1972, Mr. W. R. Wallace retired from the position of Conservator of Forests and was succeeded by Mr. D. W. R. Stewart. Mr. B. J. Beggs was appointed Deputy Conservator vice Mr. Stewart.

Mr. J. B. Campbell was promoted to Chief of Division to replace Mr. Beggs.

Mr. S. J. Quain was promoted to Superintendent on 10 May, 1972.

Mr. E. G. Baker retired from the position of Accountant on 9 July, 1971. Mr. A. C. Thomas retired from the position of Sub-Accountant on 2 October, 1971. These positions were filled by the promotion of Mr. R. H. Wilson and Mr. V. K. Combs respectively.

Mr. B. M. Smith was promoted to the position of Registrar from the Mines Department on 21 February, 1972.

The following were appointed Assistant Divisional Forest Officers during the year—B. E. Harvey, A. R. Lush, P. M. Jones and P. J. Bryant.

D.F.O. J. B. Sclater returned to duty after secondment to the Commonwealth Government.

D.F.O. A. D. Mather was seconded to the Commonwealth Government for a period of 2 years.

Forests Act

Appointments to the permanent staff included the following:—

7 Forest Guards, 7 Technical Assistants and 4 Forest Assistants.

Promotions included 1 Forester to District Forester, 2 Assistant Foresters to Foresters and 1 Forest Guard to Assistant Forester.

Two Forest Assistants retired, namely D. C. Field and J. F. O'Callaghan.

Resignations accounted for 2 Forest Rangers, 4 Forest Guards, 5 Technical Assistants and 1 Forest Assistant.

APPENDIX 1A

Statement of Revenue and Expenditure of the Consolidated Revenue Fund for the year ended 30th June, 1972

1970/71	Revenue	1971/72	1970/71	Expenditure	1971/72
$	*Royalties*	$	$		$
2,637,372	Logs	2,726,924	590,131	Salaries	701,957
90,468	Sleepers	82,611	100,006	Incidentals	107,812
1,410	Sawn Timber	1,770	5,560	Timber Industry Regulations Act	5,350
185,282	Poles and Piles	134,120	141,198	Hardwood Conversion	177,448
10,070	Mining Timber	8,675	750,478	Pine Conversion	818,283
22,422	Firewood	23,050	96,791	Recoupable Projects	118,364
12,833	Posts	15,225	52,474	Tree Nurseries	44,859
19,249	Sandalwood	19,669	4,896	Arboreta	8,242
6,925	Miscellaneous	13,640	3,688	Printing and Stationery	6,201
2,986,031		3,025,684		*Excess of Revenue over Expenditure distributed as follows*	
			2,678,627	9/10 to Reforestation Fund	2,757,712
	Pine Conversion		286,756	Transferred to Treasury	286,738
570,476	Pine Logs	544,974			
529,708	Sawn Pine	577,162			
1,100,184		1,122,136			
	Hardwood Conversion				
46,729	Sawn Hardwood	128,143			
81,264	Logs	113,062			
1,380	Posts, Poles and Piles	533			
129,373		241,738			
	Other Sales and Fees				
34,820	Seeds and Trees	36,748			
67,415	Inspection Fees	87,171			
49,677	Rents and Leases	53,047			
257,107	Miscellaneous	281,172			
....	Compensation—Mining and Other	59,193			
409,019		517,331			
	Recoupable Projects				
62,864	Specific Roads	83,730			
23,134	Other	42,347			
85,998		126,077			
4,710,605		5,032,966	4,710,605		5,032,966

APPENDIX 1B

Forest Improvement and Reforestation Fund Account and General Loan Funds for the year ended 30th June, 1972

1970/71	Source of Funds	1971/72	1970/71	Expenditure	1971/72
$		$	$	*Divisional*	$
56,430	Balance as at 1st July	778,813	1,661,668	Wages, materials, etc.	1,720,326
2,678,627	9/10 Revenue	2,757,712		*Head Office*	
68,461	Rents	70,982	1,255,776	Salaries and Allowances	1,469,493
210,000	Federal Aid Road Grant	176,006	71,072	Incidentals	183,322
201,000	Reserve Fire Fighting	....	147,115	Plant and Vehicles	136,893
1,033,000	Commonwealth Government Softwood Forestry Agreement	56,241	654,796	Plant Operations	683,247
			195,663	Purchase of Land	219,930
500,000	General Loan Fund	1,100,000	63,480	Fire Equipment	66,770
....	Treasurers Advance	462,000	52,507	Head Office Housing and Building	35,896
			33,693	Como Headquarters	33,539
			27,267	Communications	36,770
			45,420	Research	42,684
			8,047	Drafting	12,399
			4,855	Surveys	16,776
			6,096	Training of Staff	2,198
			127,454	Insurances	127,380
			75,320	Pay Roll Tax	110,033
			11,214	Utilisation	....
			....	Special Projects	4,266
			2,779,775		3,181,596
			4,441,443	TOTAL	4,901,922
			472,738	Less Recoups	416,178
			3,968,705		4,485,744
			201,000	Reserve Fire Control	....
			577,813	Balance working account	916,010
4,747,518		5,401,754	4,747,518		5,401,754

APPENDIX 1C

Statement showing distribution of Forests Department Expenditure

	$
Consolidated Revenue Fund	1,988,516
Reforestation Fund	3,385,744
General Loan Fund	1,100,000
	6,474,260

Distribution of Expenditure:—

1. Busselton	464,216
2. Mundaring	328,757
3. Dwellingup	490,540
4. Collie	349,449
5. Kirup	602,798
6. Manjimup	500,885
7. Narrogin	40,490
8. Kelmscott	177,612
9. Metropolitan	226,925
10. Harvey	618,013
11. Pemberton	318,854
12. Nannup	393,911
13. Walpole	245,262
14. Kalgoorlie–Esperance	33,679
15. Wanneroo	522,723
Head Office	1,160,146
	6,474,260

APPENDIX 2A

Exports *from Western Australia of Timber, Tanning Substances and Essential Oils for the Year ended June* 30, 1972

	Item and Destination	Quantity	Value
		Cub. ft.	$
	TIMBER		
1	Sawlogs and Veneer Logs, in the rough or roughly squared—Conifer	....	....
2	Sawlogs and Veneer Logs, in the rough or roughly squared—Non-Conifer (including poles, posts, piling and other wood in the rough—		
	Overseas—		
	France	188	151
	Germany, Federal Republic of	167	150
	Japan	171	147
		526	448
3	Sleepers—		
	Overseas—		
	Algeria	168,793	349,320
	Hong Kong	88,928	155,956
	Kenya	95,393	157,385
	South Africa	8,437	13,842
	United Kingdom	946,464	1,976,523
		1,308,015	2,653,026
	Australian States—		
	New South Wales	130	311
	South Australia	332,009	563,178
	Northern Territory	1,040	1,774
		333,179	565,263
	Timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm—		
4	Non-conifer—		
	Jarrah (*a*)		
	Overseas—		
	Bahrain	775	2,202
	Cyprus	4,330	8,319
	Germany, Federal Republic	34	50
	Greece	1,015	2,415
	Mauritius	2,425	4,532
	New Zealand	14,331	26,184
	Qatar	1,966	3,583
	Saudi Arabia	58	198
	South Africa	13,548	27,532
	United Kingdom	99,165	427,813
		137,647	502,828
	Australian States—		
	New South Wales	7,595	16,175
	Victoria	119,327	166,718
	South Australia	561,466	639,894
	Northern Territory	17,348	38,212
		705,736	860,999
5	Karri (*a*)—		
	Overseas—		
	Germany, Federal Republic	17,438	37,792
	Greece	2,458	6,361
	Mozambique	1,250	2,704
	Netherlands	10,379	23,787
	New Zealand	119,439	211,958
	Qatar	4,066	8,745
	Saudi Arabia	1,331	4,121
	South Africa	39,551	80,927
	South West Africa	1,042	2,217
	United Kingdom	6,671	15,333
		203,625	393,945
	Australian States—		
	New South Wales	84,644	129,832
	Victoria	8,603	14,868
	South Australia	519,764	677,013
	Northern Territory	67,215	132,249
		680,226	953,962
6	Other—		
	Overseas—		
	Malaysia	18	100
	Australian States—		
	South Australia	62	168
	Northern Territory	490	1,990
		552	2,158

	Item and Destination	Quantity	Value
		Cub. ft.	$
	Timber (including blocks, strips and friezes for parquet or wood block flooring, not assembled), planed, tongued, grooved, rebated, chamfered, v-jointed, centre v-jointed, beaded, centre beaded or the like, but not further manufactured—		
	Flooring—		
7	Overseas (*b*)—		
	Christmas Island	141	489
	Australian States (*c*)—		
	New South Wales	95,132	212,237
	Victoria	35,722	112,643
	South Australia	51,959	107,222
	Northern Territory	9,381	47,081
		192,194	479,183
8	Other (*d*)—		
	Overseas—		
	Austria	2	40
	Belgium-Luxemburg	295	832
	Canada	2	40
	France	2	40
	Germany, Federal Republic	35	90
	India	2	40
	Indonesia	2	40
	Iran	2	40
	Italy	3	80
	Kenya	2	40
	Malta	2	40
	New Zealand	358	1,594
	Pakistan	2	40
	Philippines	2	40
	South Africa	3	80
	Sweden	2	40
	Switzerland	2	40
	United Kingdom	9,370	21,571
	United States of America	5	120
		10,093	24,847
	Australian States—		
	New South Wales	862	1,724
	South Australia	27	110
	Northern Territory	216	650
		1,105	2,484
	Total of Timber Items 1-8	3,573,057	6,439,732
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.	sq. ft	
	Overseas—		
	Hong Kong	224	401
	Japan	57,600	876
	Malta	640	1,152
	United Kingdom	620	779
	United States of America	64,020	10,020
		123,104	13,228
10	Reconstituted wood (also known as particle board, chip board, sliver board, shaving board, flake board, residue board and wood waste board)—		
	Overseas—		
	Hong Kong	73,427	8,768
	Singapore	404,880	52,638
	United Kingdom	108	20
		478,415	61,426
	Total Timber Exports on this return	....	6,514,386
11	Casks, vats, barrels, etc., empty (*e*)		
	Overseas—		
	United Kingdom	....	10,054
12	Manufactures of Wood, except furniture, n.e.i.—		
	Overseas—		
	Christmas Island	....	439
	Indonesia	....	23,180
	Singapore	....	97
	South Africa	....	5,557
	Switzerland	....	100
	Tanzania	....	3,600
		....	32,973

APPENDIX 2A—*continued*

Exports *from Western Australia of Timber, Tanning Substances and Essential Oils for the Year ended June* 30, 1972

	Item and Destination	Quantity	Value
		Cub. ft.	$
	Australian States—		
	New South Wales	....	517,763
	Victoria	....	799,161
	Queensland	....	15,917
	South Australia	....	816,578
	Tasmania	....	41,801
	Northern Territory	....	60,640
		....	2,251,860
13	Tanning substances of natural origin	n.r.s.	n.r.s.
14	Essential Oils; concretes and absolutes; resinoids—	lb.	$
	Overseas—		
	Ceylon	44	1,610
	France	5,415	30,288
	Germany, Federal Republic	15,223	10,718
	Hong Kong	392	1,436
	Italy	18,769	38,093
	Japan	8	4,020
	Malaysia	1,851	2,006
	Singapore	6,761	7,490
	Switzerland	5,006	2,983
	Thailand	90	1,048
	United Kingdom	57,822	82,013
	United States of America	29,363	66,761
		140,744	248,376
	Australian States—		
	New South Wales	17,846	22,100
	Victoria	22,157	62,502
	South Australia	7,916	15,784
		47,919	100,386
	Total value of all Exports on this Return	....	**9,158,035**

(*a*) Excludes timber cut to size for making boxes or staves (included in Item 6).
(*b*) Relates to overseas exports of conifer flooring only. Overseas exports of non-conifer flooring included in Item 8.
(*c*) Relates to Interstate exports of non-conifer flooring only. Interstate exports of conifer flooring included in Item 8.
(*d*) 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.
(*e*) Interstate exports included in Item 12

"N.E.I." means "not elsewhere included"
"N.R.S." means "not recorded separately"
Basis of Value—F.O.B. at the point of final shipment.
(Information Supplied by the Commonwealth Bureau of Census and Statistics).

APPENDIX 2B

Imports *into Western Australia of Timber, Tanning Substances and Essential Oils for the Year ended June* 30, 1972

	Item and Origin	Quantity	Value
		Cu. Ft.	$
1	Sawlogs and veneer logs, in the rough or roughly squared, non-conifer, (including poles, piling, posts, and other woods in the rough)—		
	Overseas—	(*b*)	(*b*)
	Timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm—		
	Conifer (overseas imports exclude shooks and staves—see Item 6)—		
2	Redwood (*c*)—		
	Overseas—	....	....
3	Douglas Fir (*c*)—		
	Overseas—		
	New Zealand	5,155	6,369
	United States of America	34,166	81,458
		39,321	87,827
4	Other—		
	Overseas—		
	Malaysia	2,479	3,446
	New Zealand	1,904	2,909
	United States of America	1,641	5,741
		6,024	12,096
	Australian States (*d*)—		
	New South Wales	111	372
	Victoria	7	24
	South Australia	8,739	19,269
		8,857	19,665
5	Timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm—		
	Non-conifer (overseas imports exclude shooks and staves—see Item 6)—		
	Overseas		
	Ghana	2,642	6,933
	Indonesia	25,155	38,583
	Malaysia	641,169	1,014,595
	New Zealand	1,044	2,719
	Philippines	550	1,188
	Singapore	1,973	2,975
	Thailand	5,279	25,866
	United Kingdom	154	1,584
	Yugoslavia	339	925
		678,305	1,095,368
	Australian States—		
	New South Wales	217	678
	Victoria	2,792	3,685
	South Australia	36	130
	Tasmania	1,885	5,708
		4,930	10,201
6	Shooks and staves, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm (*e*)—		$
	Overseas	....	....
7	Wooden Beadings and Mouldings (including moulded skirting and other moulded boards) (*f*)—		
	Overseas—		
	Austria	....	266
	China, Taiwan	....	1,058
	Lebanon	....	5,057
	Malaysia	....	2,431
	Norway	....	620
	Singapora	....	568
	Sweden	....	790
	United Kingdom	....	9,289
		....	20,079
	Timber (including blocks, strips and friezes for parquet or wood block flooring not assembled), planed, tongued, grooved, rebated, chamfered, V-jointed, beaded, centre beaded or the like, but not further manufactured—		
8	Flooring (*g*)—		
	Overseas—		
	Sweden	2,185	3,813
9	Other—		
	Overseas—		
	Germany, Federal Republic	2	479
	Malaysia	23,741	78,234
	New Zealand	308	2,332
	Singapore	1,103	3,077
	United States of America	....	206
		25,154	84,328

	Item and Origin	Quantity	Value
		Cu. Ft.	$
	Australian States (*l*)		
	New South Wales	1,618	6,171
	Tasmania	92	684
	Northern Territory	867	2,810
		2,577	9,665
	Total, Timber Items 2-9	....	**1,343,042**
		Squ. Ft.	
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, blockwood, laminboard and the like, inlaid wood, cellular wood panels, whether or not faced with base metal—		
	Overseas—		
	China Mainland	305,656	15,008
	China, Republic of Taiwan	1,738,279	78,814
	Fiji	5,666,965	112,570
	Germany, Federated Republic of	6	18
	Japan	316,679	35,284
	Malaysia	2,612,745	65,341
	Netherlands	41,000	808
	New Zealand	86,400	13,050
	Philippines	41,600	1,965
	Singapore	808,368	42,037
	South Africa	550,098	9,645
	United Kingdom	164,184	11,229
	United States of America	25,492	5,016
		12,357,472	390,785
	Australian States—		
	New South Wales	727,539	311,128
	Victoria	785,075	203,906
	Queensland	2,642,905	580,272
	South Australia	42,163	9,266
	Tasmania	6,348	1,648
		4,204,030	1,106,220
11	Reconditioned Wood (also known as particle board, chip board, sliver board, shaving board, flake board, residue board and wood waste board—		
	Overseas—		
	Australian States	5,101,498	1,144,427
	Total of Timber Items 10, 11	**21,663,000**	**2,641,432**
	Total Timber Imports on this Return	....	**3,984,474**
12	Match Splints (*f*)—		
	Overseas—		
	Finland—	....	67,540
13	Rulers, wooden (*a*)—	No.	
	Overseas—		
	China (Mainland)	139,140	4,385
	Japan	912	69
	Netherlands	2,304	794
	New Zealand	272	153
	Sweden	4,800	782
	United Kingdom	10,591	8,970
		158,019	15,153
14	Table Mats, wooden	N.R.S.	N.R.S.
15	Wood Flour (*c*)	....	....
16	Manufactures of wood (except furniture) N.E.I. (*j*)—		
	Overseas—		
	Bulgaria	....	3,130
	Canada	....	415
	China (Mainland)	....	2,641
	China, Republic of Taiwan	....	95,113
	Czechoslovakia	....	552
	Denmark	....	1,715
	Finland	....	4,144
	France	....	942
	Germany (East)	....	2,084
	Germany, Federal Republic	....	1,627
	Greece	....	69
	Hong Kong	....	7,485
	India	....	17,287
	Indonesia	....	1,125
	Iran	....	71
	Italy	....	22,360
	Japan	....	10,722
	Kenya	....	183
	Malaysia	....	1,148
	Netherlands	....	3,613
	New Zealand	....	6,934
	Norway	....	637
	Pakistan	....	26
	Papua and New Guinea	....	420
	Philippines	....	27,729
	Portugal	....	114

APPENDIX 2B—*continued*

Imports *into Western Australia of Timber, Tanning Substances and Essential Oils for the Year ended June* 30, 1972

	Item and Origin	Quantity	Value
		Cub. ft.	$
	Singapore	....	3,893
	Spain	....	3,664
	Sweden	....	40,865
	Switzerland	....	95
	Thailand	....	25,746
	United Kingdom	....	9,828
	United States of America	....	323
	Yugoslavia	....	110
	Origin Unknown	....	35
		....	297,345
	Australian States—		
	New South Wales	....	625,952
	Victoria	....	381,479
	Queensland	....	23,043
	South Australia	....	99,772
	Tasmania	....	6,654
		....	1,136,900
17	Clothes Pegs, wooden	N.R.S.	N.R.S.
18	Tool Handles, wooden—	doz.	
	Overseas—		
	Germany, Federal Republic	2	4
	Japan	26	141
	Netherlands	1	1
	Switzerland	12	9
	United Kingdom	4	33
	United States of America	1,003	7,458
		1,048	7,646
	Australian States (k)—		
	New South Wales	....	42,251
	Victoria	....	10,579
	Queensland	....	14,787
	South Australia	....	135
	Tasmania	....	2,009
		....	69,761
19	Tanning Extracts of Vegetable Origin— wattle bark extracts (l)—	Cwt.	
	Overseas—		
	Brazil	1,545	15,091
	Kenya	118	1,120
	South Africa	6,688	67,617
		8,351	83,828

	Item and Origin	Quantity	Value
		cwt.	$
20	Other—		
	Overseas—		
	Norway	196	379
21	Synthetic Tanning Substances, artificial bates for pre-tanning; tanning (tannic acids) and their salts, ethers, esters and other derivatives—		
	Overseas—		
	France	11	1,773
	Germany, Federated Republic of	1,267	14,819
	Japan	....	5
	United Kingdom	884	28,221
		2,162	44,818
	Australian States—		
	New South Wales	36	726
	Victoria	660	11,860
	Queensland	32	475
	South Australia	7	2,133
		735	15,194
22	Essential Oils; Concretes and Absolutes—	Lb.	
	Overseas—		
	Brazil	15,344	23,748
	China (Mainland)	29,243	20,930
	China, Republic of (Taiwan)	800	2,940
	Germany, Federated Republic of	992	992
	Indonesia	25,913	38,388
	Italy	4	90
	Portugal	2,194	1,739
	South Africa	19,269	11,323
	Swaziland	137,185	76,306
	Switzerland	25,812	14,763
	United Kingdom	....	3
	United States of America	3,740	15,805
		260,496	207,027
	Australian States—		
	New South Wales	253	768
	Victoria	5,987	19,735
		6,240	20,503
	Total Value of all Imports on this Return	....	**5,950,568**

(*a*) Interstate imports are not recorded separately.
(*b*) Not available for publication.
(*c*) Interstate imports included in Item 4.
(*d*) See footnote (*c*). Item also includes imports of conifer timber, planed, tongued, grooved or the like.
(*e*) Interstate imports included in Items 4 (Conifer) and 5 (Non-conifer).
(*f*) Interstate imports included in Item 16.
(*g*) Figures relate to overseas imports of conifer flooring only. Interstate imports of flooring included in Item 4 (Conifer) and Item 9 (Non-conifer).
(*h*) Relates to Non-conifer timber only. All conifer timber, planed, tongued, grooved, etc., included in Item 4.
(*i*) Interstate imports included in Item 11.
(*j*) Includes imports of wooden packing cases, casks, domestic articles of wood and similar products.
(*k*) Includes brush and broom handles and the like.
(*l*) Interstate imports included in Item 21.

"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.

APPENDIX 3

Summary of Exports of Forest Produce since 1836

Year	Timber			Year	Timber			Wood Manufactures	Tanning Materials	Essential Oils
	Cub. ft.	M^3	Value		Cub. ft.	M^3	Value	Value	Value	Value
			£				£	£	£	£
1836 (a)	10,000	283	2,500	1901	7,150,600	202,505	572,354	....	....	....
1837	....	....	....	1902	6,256,750	177,191	500,533	....	....	....
1838	....	....	....	1903	7,748,450	219,436	619,705	....	859	....
1839	....	....	....	1904	8,072,300	228,608	654,949	....	32,876	....
1840	....	....	....	1905	8,709,500	246,653	689,943	....	154,087	....
				1906	(c) 8,830,700	(c) 250,085	708,993	....	140,720	....
1841	....	....	....	1907	(c) 6,409,550	(c) 181,518	511,923	....	98,773	....
1842	....	....	....	1908	(c) 9,869,509	(c) 279,504	813,591	....	79,934	....
1843	....	....	....	1909	(c) 10,830,450	(c) 306,718	867,419	....	59,633	....
1844	(b)	(b)	163	1910	(c) 12,074,100	(c) 341,939	972,698	....	93,733	....
1845	....	....	....							
1846	2,550	72	255	1911	(c) 12,449,500	(c) 352,570	986,341	....	83,470	....
1847	12,200	346	1,120	1912	(c) 11,297,100	(c) 319,934	903,396	....	49,004	....
1848	3,350	95	333	1913	(c) 13,619,850	(c) 385,714	1,089,481	....	47,377	....
1849	....	....	....	1914 (d)	(c) 6,279,750	(c) 177,843	502,152	....	18,197	777
1850	10,500	297	1,048	1915 (e)	(c) 9,968,500	(c) 282,308	808,392	....	6,127	381
				1916	5,432,100	153,837	441,991	....	10,208	1,102
1851	1,250	35	268	1917	3,890,650	110,183	310,893	....	18,959	2,060
1852	7,050	200	806	1918	3,436,250	97,315	274,141	....	16,886	3,995
1853	52,200	1,478	5,220	1919	4,135,750	117,124	332,584	11,535	18,875	3,987
1854	58,500	1,657	7,023	1920	5,065,300	143,449	465,731	21,935	22,121	3,704
1855	76,900	2,178	12,076							
1856	70,500	1,997	9,671	1921	9,816,250	277,996	1,137,819	24,916	23,073	10,017
1857	69,200	1,960	9,449	1922	8,309,750	235,332	1,041,047	22,248	13,328	6,878
1858	29,250	827	2,340	1923	7,911,310	224,048	997,454	12,377	21,161	20,075
1859	67,350	1,907	6,051	1924	11,126,861	315,113	1,367,517	11,505	29,606	39,877
1860	54,800	1,552	4,932	1925	11,844,303	335,431	1,477,997	13,298	40,136	42,057
				1926	12,001,384	339,879	1,522,958	10,072	15,056	47,819
1861	27,750	786	2,497	1927	12,580,262	356,273	1,651,149	8,727	15,818	26,544
1862	68,800	1,948	7,151	1928	10,384,784	294,097	1,265,383	7,783	27,662	39,131
1863	32,900	932	2,963	1929	7,635,237	216,230	960,435	6,603	35,850	63,307
1864	58,300	1,651	5,508	1930	6,579,743	186,338	807,425	4,687	40,628	77,510
1865	183,950	5,210	15,693							
1866	85,650	2,426	6,849	1931	4,127,856	116,901	507,382	26,615	35,333	56,170
1867	56,750	1,607	4,541	1932	3,062,673	86,735	361,700	85,488	42,016	59,301
1868	8,000	227	638	1933	2,235,540	63,310	262,617	80,332	33,352	26,331
1869	179,900	5,095	14,273	1934	4,060,830	115,003	487,248	76,107	20,904	26,720
1870	157,200	4,452	17,551	1935	5,326,117	150,836	636,466	65,494	15,284	35,363
				1936	5,598,180	158,540	697,522	50,665	12,237	27,526
1871	218,500	6,188	15,304	1937	5,673,903	160,685	699,684	52,338	14,491	38,185
1872	37,000	1,048	2,590	1938	7,545,744	213,695	932,420	47,934	13,865	35,128
1873	68,150	1,930	4,771	1939	5,704,250	161,544	722,310	43,518	17,842	25,550
1874	345,600	9,787	24,192	1940	5,049,585	143,004	634,859	62,796	19,485	47,736
1875	342,350	9,695	32,965							
1876	219,050	6,204	23,743	1941	6,091,187	172,502	790,876	74,935	13,686	59,867
1877	336,150	9,520	26,979	1942	5,244,634	148,528	700,474	64,454	6,986	74,904
1878	580,900	16,451	63,902	1943	3,516,566	99,589	605,327	32,426	1,598	70,523
1879	627,250	17,764	69,742	1944	3,645,354	103,236	613,994	25,324	1,294	72,704
1880	662,550	18,763	66,252	1945	2,851,475	80,754	570,028	27,307	2,795	103,055
				1946	3,373,025	95,524	722,061	(f) 2,618	4,872	128,050
1881	792,750	22,451	79,277	1947	3,458,628	97,948	865,255	13,118	12,056	151,768
1882	936,500	26,522	93,650	1948	3,584,405	101,510	1,099,073	6,572	9,556	116,465
1883	997,000	28,235	79,760	1949	3,198,212	90,573	993,152	6,639	5,112	75,395
1884	861,700	24,403	68,936	1950	2,857,946	80,937	974,493	13,525	8,243	78,550
1885	848,150	24,020	67,850							
1886	626,150	17,733	50,902	1951	2,342,492	66,339	(g) 918,485	25,101	16,581	125,833
1887	354,800	10,048	28,384	1952	2,373,553	67,219	1,032,909	47,689	19,120	119,109
1888	525,570	14,884	42,060	1953	3,965,188	112,294	2,074,421	120,095	34,136	70,852
1889	788,500	22,330	63,080	1954	3,858,956	109,286	2,248,320	59,360	80,248	55,273
1890	1,172,200	33,197	82,052	1955	3,477,249	98,476	1,935,019	79,893	37,338	80,882
				1956	4,568,024	129,367	2,818,716	119,459	554,760	90,928
1891	1,273,950	36,078	89,179	1957	4,684,017	132,651	3,256,719	78,934	588,544	58,993
1892	1,082,650	30,661	78,419	1958	5,572,681	157,818	3,875,705	39,762	337,655	101,814
1893	512,950	14,527	33,888	1959	6,461,535	182,991	4,373,218	41,612	259,046	52,843
1894	1,063,700	30,124	74,804	1960	6,133,240	173,693	4,160,354	20,549	366,606	63,905
1895	1,255,250	35,549	88,146							
1896	1,545,600	43,771	116,420	1961	5,533,847	156,719	3,838,387	25,305	201,957	95,475
1897	2,393,300	67,778	192,451	1962	5,660,937	160,318	3,993,663	194,380	281,364	81,506
1898	4,086,150	115,719	326,195	1963	5,484,259	155,314	3,966,697	255,190	254,726	70,402
1899	6,913,550	195,792	553,198	1964	5,266,329	149,142	3,686,732	272,187	322,916	88,666
1900	5,725,400	162,143	458,461	1965	4,716,296	133,566	3,545,627	523,596	326,156	76,019
							$	$	$	$
				1966	2,431,248	68,853	4,361,278	1,365,441	289,841	314,817
				1967	4,898,421	138,723	7,467,696	1,335,872	262,808	269,044
				1968	2,986,211	84,569	4,947,595	3,016,850	N.r.s.	280,806
				1969	3,052,796	86,455	4,984,098	3,802,927	N.r.s.	267,565
				1970	3,399,534	96,275	5,661,547	3,906,699	N.r.s	317,553
				1971	2,803,054	79,362	4,803,842	2,110,802	N.r.s.	343,512
				1972 *....	....	....	....	....	....	....
				Total	474,151,721	13,424,454	208,183,994	21,374,213	10,925,283	7,653,117

(a) The exports up to the year 1834 consisted only of supplies to shipping of which no record is kept.
(b) Not available.
(c) Approximate figures only.
(d) Six months ended 30th June.
(e) Year ended 30th June from 1915 onwards.
(f) Excludes casks (principally empty returns) previously recorded in this item from 1946–1966 inclusive.
(g) From 1951 onwards. Includes items for which the quantity in M^3 is not available
N.r.s.—Not recorded separately.
* See Appendix 2A

APPENDIX 4

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

Year	Timber, Woodware, etc.	Tanning Materials	Essential Oils
	£	£	£
1848	464	....	....
1849	....	....	....
1850	189	....	....
1851	3,216	....	....
1852	2,479	....	....
1853	790	....	....
1854	831	....	....
1855	1,464	....	....
1856	1,124	....	....
1857	744	....	....
1858	1,528	....	....
1859	690	....	....
1860	2,005	....	....
1861	1,459	....	....
1862	1,920	....	....
1863	1,568	....	....
1864	894	....	....
1865	548	....	....
1866	1,442	....	....
1867	1,727	....	....
1868	1,451	....	....
1869	1,408	....	....
1870	1,518	....	....
1871	736	....	....
1872	1,660	....	....
1873	1,008	....	....
1874	1,774	....	....
1875	2,707	....	....
1876	3,098	....	....
1877	2,036	....	....
1878	2,947	....	....
1879	2,340	....	....
1880	3,061	....	....
1881	3,639	....	....
1882	3,692	....	....
1883	6,667	....	....
1884	2,930	....	....
1885	11,479	....	....
1886	17,888	....	....
1887	8,136	....	....
1888	4,461	....	....
1889	7,686	....	....
1890	14,979	....	....
1891	18,406	....	....
1892	26,713	....	....
1893	14,493	....	....
1894	17,964	....	....
1895	47,128	....	....
1896	5,381	....	....
1897	164,552	....	....
1898	55,566	....	....
1899	45,689	....	....
1900	56,266	1,416	1,105
1901	80,134	1,740	1,546
1902	97,810	3,418	1,751
1903	102,383	3,556	1,348
1904	157,856	1,322	2,122
1905	98,494	582	1,592
1906	95,229	1,412	1,915
1907	122,016	2,767	1,549
1908	93,205	2,392	4,584
1909	90,502	4,129	4,033
1910	171,280	3,531	3,686
1911	152,133	2,912	4,938
1912	167,244	3,089	4,598
1913	202,640	2,651	5,392
1914	78,736	629	2,823
1914–15	107,763	2,082	4,988
1915–16	76,849	3,313	4,788
1916–17	75,681	2,848	3,848
1917–18	58,305	2,020	4,358
1918–19	62,824	1,181	4,168
1919–20	100,083	3,748	10,043
1920–21	171,654	*4,899	6,106
1921–22	92,448	5,865	6,577
1922–23	109,428	6,991	4,033
1923–24	133,983	2,790	3,301
1924–25	161,893	2,670	4,429
1925–26	144,989	5,826	4,449
1926–27	162,193	8,971	4,254
1927–28	183,196	9,648	6,955
1928–29	241,601	6,894	4,413
1929–30	197,532	10,825	3,980
1930–31	76,533	4,145	3,160
1931–32	164,496	4,705	3,505
1932–33	197,916	4,903	3,421
1933–34	183,944	4,310	3,888
1934–35	211,056	4,076	5,040
1935–36	228,451	5,401	3,921
1936–37	257,164	5,267	4,810
1937–38	270,126	4,777	6,560
1938–39	254,315	3,974	7,014
1939–40	259,399	6,802	23,027
1940–41	249,111	3,798	32,399
1941–42	283,611	15,846	33,828
1942–43	163,480	6,250	47,718
1943–44	149,928	7,883	68,871
1944–45	148,838	9,264	75,449
1945–46	†219,466	19,573	56,295
1946–47	386,465	12,395	78,091
1947–48	345,508	8,019	96,769
1948–49	470,755	8,662	42,926
1949–50	521,815	24,923	51,197
1950–51	640,059	21,147	161,358
1951–52	1,037,499	18,494	167,697
1952–53	509,667	21,493	69,804
1953–54	923,367	45,202	58,019
1954–55	816,052	27,395	76,464
1955–56	839,581	27,315	131,758
1956–57	830,700	35,403	99,863
1957–58	873,520	28,310	101,680
1958–59	815,300	9,365	62,983
1959–60	895,845	14,608	74,199
1960–61	1,203,641	12,621	60,942
1961–62	1,236,106	13,853	130,876
1962–63	1,978,937	9,868	63,739
1963–64	1,903,772	19,412	37,494
1964–65	2,289,999	21,677	69,741
	$	$	$
1965–66	4,856,090	60,963	132,862
1966–67	6,458,909	68,928	191,796
1967–68	8,135,532	75,657	143,696
1968–69	8,731,114	109,905	206,309
1969–70	10,968,170	153,169	293,845
1970–71	6,761,806	103,857	175,331
1971–72‡	....	....	....
Total	98,569,785	1,776,985	5,419,407

* This and subsequent years include tanning extracts, not previously recorded.
† This and subsequent years include values for furniture, bamboo, cane, etc., not previously included.
‡ See Appendix 2B.

APPENDIX 5

SUMMARY OF LOG VOLUMES PRODUCED IN WESTERN AUSTRALIA SINCE 1829

Year	Crown Land*		Private Property		Totals	
	Cubic feet	M^3	Cubic Feet	M^3	Cubic Feet	M^3
1829–1916†	....	....	....	....	663,267,850	*18,784,136*
1917 (*a*)	19,665,550	*547,513*	2,144,500	*60,732*	21,477,600	*608,245*
1918 (*b*)	7,665,550	*217,088*	504,950	*14,300*	8,170,500	*231,388*
1919 (*c*)	19,987,050	*566,033*	3,390,450	*96,018*	23,377,500	*662,051*
1920	28,292,200	*801,235*	5,762,900	*163,205*	34,055,100	*964,440*
1921	29,308,950	*830,029*	7,018,450	*198,763*	36,327,400	*1,028,792*
1922	36,122,400	*1,022,986*	15,640,150	*442,929*	51,762,550	*1,465,915*
1923	26,807,300	*759,183*	9,867,050	*279,435*	36,674,350	*1,038,618*
1924	42,004,450	*1,189,566*	9,342,800	*264,588*	51,347,250	*1,454,154*
1925	43,832,900	*1,241,348*	18,142,250	*513,789*	61,975,150	*1,755,137*
1926	48,823,750	*1,382,689*	25,037,600	*709,065*	73,861,350	*2,091,754*
1927	46,887,600	*1,327,857*	31,356,100	*888,005*	78,243,700	*2,215,862*
1928	42,781,250	*1,211,565*	23,334,450	*660,832*	66,115,700	*1,872,397*
1929	32,289,750	*914,446*	11,098,950	*314,322*	43,388,700	*1,228,768*
1930	31,654,150	*896,446*	11,653,600	*330,030*	43,307,750	*1,226,476*
1931	18,822,600	*533,056*	12,148,500	*344,046*	30,971,100	*877,102*
1932	11,742,850	*332,558*	4,115,950	*116,564*	15,858,800	*449,122*
1933	13,165,650	*372,851*	2,456,650	*69,572*	15,622,300	*442,423*
1934	21,263,100	*602,171*	6,330,400	*179,277*	27,593,500	*781,448*
1935	27,458,250	*777,618*	11,451,750	*324,314*	38,910,000	*1,101,932*
1936	31,400,600	*889,265*	13,436,150	*380,512*	44,836,750	*1,269,777*
1937	31,703,850	*897,853*	15,902,200	*450,350*	47,606,050	*1,348,302*
1938	31,737,450	*898,805*	15,928,950	*451,108*	47,666,400	*1,349,913*
1939	29,247,650	*828,293*	11,086,000	*313,956*	40,333,650	*1,142,249*
1940	27,660,100	*783,334*	9,139,550	*258,832*	36,799,650	*1,042,166*
1941	28,089,200	*795,486*	10,289,000	*291,384*	38,378,200	*1,086,870*
1942	26,636,650	*754,350*	5,633,400	*159,538*	32,270,050	*913,888*
1943	23,604,900	*668,491*	4,322,950	*122,426*	27,927,850	*790,917*
1944	22,252,500	*630,191*	4,456,200	*126,200*	26,708,700	*756,391*
1945	21,970,000	*622,190*	4,309,550	*122,046*	26,279,550	*744,236*
1946	21,126,500	*598,302*	5,482,350	*155,260*	26,608,850	*753,562*
1947	21,948,550	*621,583*	7,831,950	*221,801*	29,780,500	*843,384*
1948	22,251,350	*630,158*	8,871,900	*251,252*	31,123,250	*881,410*
1949	20,261,800	*573,814*	9,814,300	*277,941*	30,076,100	*851,755*
1950	21,081,150	*597,018*	9,932,650	*281,293*	31,013,800	*878,311*
1951	25,391,450	*719,086*	10,713,050	*303,394*	36,104,500	*1,022,480*
1952	28,942,550	*819,653*	11,938,300	*338,093*	40,880,850	*1,157,746*
1953	34,223,400	*969,207*	13,021,400	*368,766*	47,244,800	*1,337,973*
1954	37,485,950	*1,061,602*	13,562,000	*384,076*	51,047,950	*1,445,678*
1955	37,467,650	*1,061,084*	15,195,450	*430,335*	52,663,100	*1,491,419*
1956	39,811,350	*1,127,457*	13,773,350	*390,061*	53,584,700	*1,517,518*
1957	39,426,100	*1,116,547*	11,585,350	*328,097*	51,011,450	*1,444,644*
1958	39,069,500	*1,106,448*	12,397,450	*351,096*	51,466,950	*1,457,544*
1959	40,533,471	*1,147,908*	13,756,198	*389,576*	54,289,669	*1,537,484*
1960	38,882,028	*1,101,140*	12,017,553	*340,337*	50,899,601	*1,441,477*
1961	37,752,774	*1,069,159*	10,818,790	*306,388*	48,571,564	*1,375,547*
1962	39,243,552	*1,111,377*	9,789,268	*277,232*	49,032,820	*1,388,609*
1963	38,671,715	*1,095,183*	9,831,552	*278,430*	48,503,267	*1,373,613*
1964	39,431,089	*1,116,688*	10,220,000	*289,430*	49,651,089	*1,406,118*
1965	41,430,800	*1,173,320*	9,815,867	*277,985*	51,246,667	*1,451,305*
1966	42,224,817	*1,195,807*	10,105,791	*286,196*	52,330,608	*1,482,003*
1967	40,941,527	*1,159,464*	9,967,907	*282,291*	50,909,434	*1,441,755*
1968	43,485,765	*1,231,517*	8,060,784	*228,281*	51,546,549	*1,459,798*
1969	40,385,056	*1,143,705*	5,676,938	*160,771*	46,061,994	*1,304,476*
1970	39,597,323	*1,121,396*	6,203,619	*175,686*	45,800,942	*1,297,082*
1971	40,436,463	*1,145,161*	5,719,991	*161,990*	46,156,454	*1,307,151*
1972	38,708,082	*1,096,236*	3,777,926	*106,993*	42,486,008	*1,203,229*
Total	....	....	....	....	3,011,208,466	*85,277,451*

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

79840/9/72—500

WILLIAM C. BROWN, Government Printer, Western Australia