

# Report

## on the operations of the

# FORESTS DEPARTMENT

## WESTERN AUSTRALIA

for the
YEAR ENDED
30th JUNE, 1961

by

A. C. HARRIS, B.Sc. (Adel.) A.A.I.M.M.
CONSERVATOR OF FORESTS

50785/9/61—770

*Cover :—* Tuart Forest, Busselton

The Tuart forest has a very limited distribution being confined to the narrow coastal limestone belt from Yanchep to Busselton. It is only in the Busselton-Ludlow district, however, that it develops into a prime forest. The timber is very hard and dense with a strong interlocked grain and is admirably suitable where strains and abrasions are encounted

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PRESENTED TO BOTH HOUSES OF PARLIAMENT

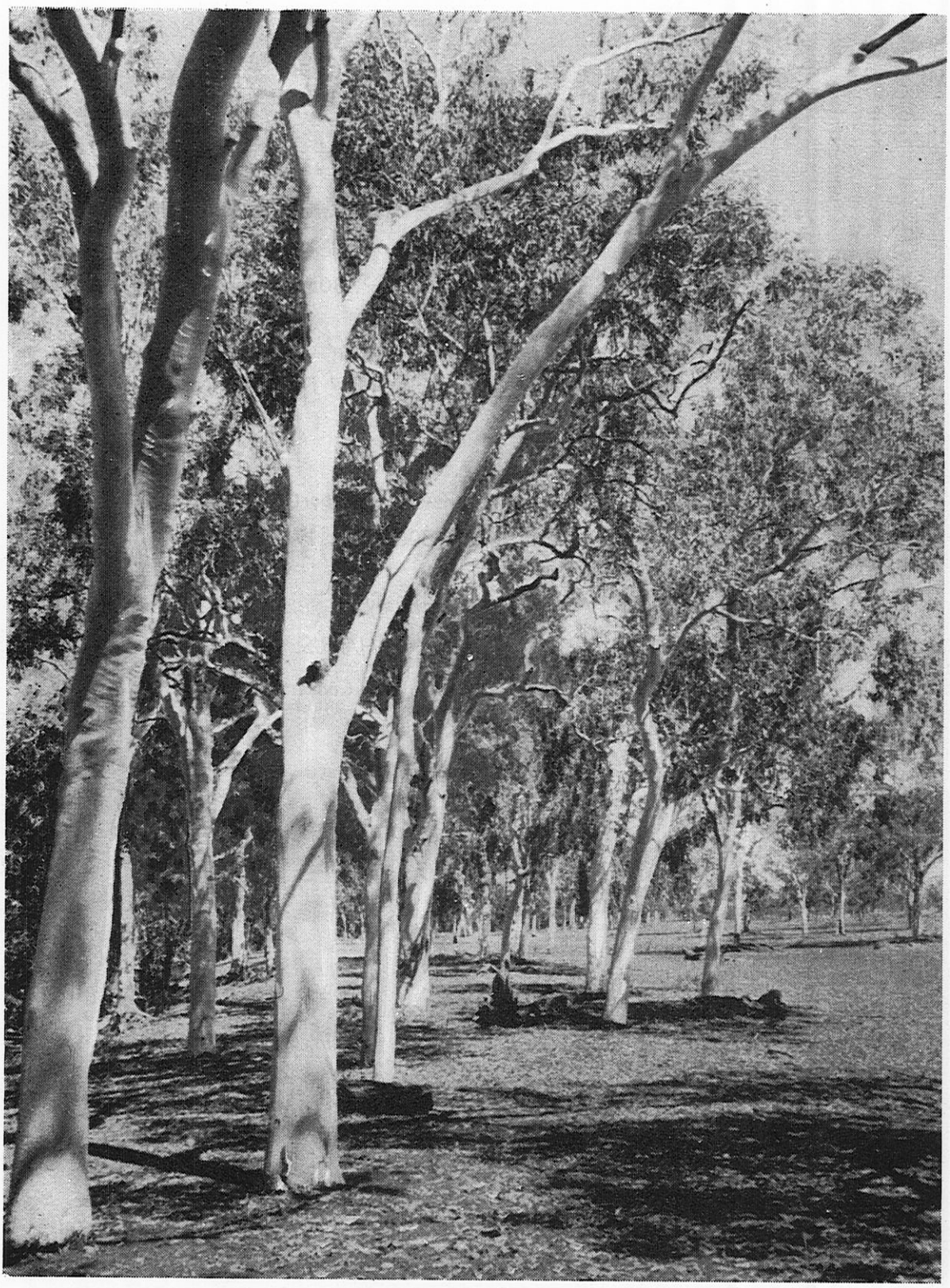
# CONTENTS

## PRINCIPAL OFFICERS

| | |
|---|---|
| Conservator of Forests .... .... .... .... .... | A. C. HARRIS, B.Sc. (Adel.), A.A.I.M.M. |
| Deputy Conservator .... .... .... .... .... | W. R. WALLACE, Dip.For. (Canb.). |
| Superintendent (Research Arboriculture and the Interior) | G. E. E. BROCKWAY, B.Sc. (Adel.). |
| Superintendent (Pine Plantations and Forest Management) | G. W. M. NUNN, B.Sc. (For.), Dip.For. (Canb.), M.I.S. (Aust.). |
| Superintendent (Development and South-West) .... | D. W. R. STEWART, B.Sc. (For.), Dip.For. (Canb.), Dip.For. (Oxon.) |
| Fire Control Superintendent .... .... .... .... | A. J. MILESI, B.Sc. (Adel.). |
| Utilisation Officer .... .... .... .... .... .... | H. C. WICKETT, M.Sc. (Adel.), B.For.Sc. (N.Z.), A.M.I.E. (Aust.), Dip.For. (Canb.). |
| Regional Inspector .... .... .... .... .... .... | D. R. MOORE, B.Sc. (Adel.). |
| Secretary .... .... .... .... .... .... .... | E. S. BUDD. |
| Accountant .... .... .... .... .... .... .... | A. B. TENGER, A.A.S.A. |
| Registrar .... .... .... .... .... .... .... | R. K. REID. |

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

| | |
|---|---|
| Brown Mallet .... .... .... .... .... | *Eucalyptus astringens* |
| Bullich .... .... .... .... .... .... | *Eucalyptus megacarpa.* |
| Jarrah .... .... .... .... .... .... .... | *Eucalyptus marginata.* |
| Karri .... .... .... .... .... .... .... | *Eucalyptus diversicolor.* |
| Marri .... .... .... .... .... .... .... | *Eucalyptus calophylla.* |
| Maritime Pine .... .... .... .... .... | *Pinus pinaster.* |
| Monterey Pine .... .... .... .... .... | *Pinus radiata.* |
| Peppermint .... .... .... .... .... .... | *Agonis flexuosa.* |
| River Banksia .... .... .... .... .... | *Banksia verticillata.* |
| Sandalwood .... .... .... .... .... .... | *Santalum cygnorum.* |
| Sheoak .... .... .... .... .... .... | *Casuarina fraseriana.* |
| Tuart .... .... .... .... .... .... .... | *Eucalyptus gomphocephala.* |
| Western Australian Blackbutt (Yarri) .... .... | *Eucalyptus patens.* |
| Wandoo .... .... .... .... .... .... | *Eucalyptus redunca var. elata.* |
| Warren River Cedar .... .... .... .... | *Agonis juniperina.* |
| Yate .... .... .... .... .... .... .... | *Eucalyptus cornuta.* |
| Sugar Gum .... .... .... .... .... .... | *Eucalyptus cladocalyx.* |
| Kimberley Ghost Gum .... .... .... .... | *Eycalyptus papuana.* |



Ghost gums in the Kimberleys. This open forest extends along the head waters of the Ord River. Heavy grazing has eliminated all other vegetation and left an exposed mineral surface extremely prone to erosion

*Forests Department,*
*PERTH,*
*30th September, 1961*

*TO THE HONOURABLE 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, 1961.*

*Yours faithfully,*
*A. C. HARRIS,*
*Conservator of Forests.*

# FORESTS DEPARTMENT

## I. STATISTICAL SUMMARY OF MAJOR OPERATIONS

**Timber Production (in cubic feet).**

| | |
|---|---|
| Total Production Sawn Timber .... .... .... .... .... | 15,783,370 |
| Exports—Interstate .... .... .... .... .... .... .... | 2,948,698 (18·7 per cent.) |
| Overseas .... .... .... .... .... .... .... | 2,263,834 (14·3 per cent.) |
| Local Consumption .... .... .... .... .... .... .... | 10,570,838 (67 per cent.) |

**Recent Trends in Production and Consumption**

| Year | Production | | | Total Export | Local Consumption | Sawmills | Monthly Average of Men Employed |
|---|---|---|---|---|---|---|---|
| | Sawn | Hewn | Total | | | | |
| | cub. ft. | cub. ft. | cub. ft. | cub. ft. | cub. ft. | No. | No. |
| 1925–26 .... .... .... | 14,522,733 | 6,277,952 | 20,800,685 | 12,001,384 | 8,799,301 | .... | .... |
| 1937–38 .... .... .... | 11,720,642 | 2,573,540 | 14,294,192 | 7,545,744 | 6,748,448 | 134 | 3,112 |
| 1945–46 .... .... .... | 8,869,847 | 14,041 | 8,883,888 | 3,373,025 | 5,510,863 | 128 | 2,876 |
| 1950–51 .... .... .... | 12,571,635 | 1,183 | 12,572,818 | 2,342,492 | 10,230,326 | 256 | 4,047 |
| 1951–52 .... .... .... | 14,717,112 | .... | 14,717,112 | 2,373,553 | 12,343,559 | 280 | 4,708 |
| 1952–53 .... .... .... | 16,973,332 | 1,761 | 16,975,093 | 3,965,188 | 13,009,905 | 306 | 5,395 |
| 1953–54 .... .... .... | 18,343,974 | 1,454 | 18,345,428 | 3,858,956 | 14,486,472 | 299 | 5,724 |
| 1954–55 .... .... .... | 18,915,967 | 4,561 | 18,920,528 | 3,477,249 | 15,443,279 | 279 | 5,879 |
| 1955–56 .... .... .... | 19,213,771 | 5,308 | 19,219,079 | 4,568,034 | 14,651,045 | 274 | 5,804 |
| 1956–57 .... .... .... | 17,798,984 | 3,790 | 17,802,774 | 4,679,979 | 13,122,795 | 261 | 5,574 |
| 1957–58 .... .... .... | 17,487,573 | 742 | 17,488,315 | 5,671,712 | 11,816,603 | 268 | 5,227 |
| 1958–59 .... .... .... | 17,758,023 | 1,310 | 17,759,333 | 6,465,021 | 11,294,312 | 260 | 5,155 |
| 1959–60 .... .... .... | 16,625,475 | .... | 16,625,475 | 6,167,132 | 10,458,343 | 265 | 5,037 |
| 1960–61 .... .... .... | 15,783,370 | .... | 15,783,370 | 5,212,532 | 10,570,838 | 238 | 4,790 |

**Total Cut**

Log Volumes (in cubic feet) .... .... .... .... .... 48,571,564

| | |
|---|---|
| Jarrah .... | 35,241,375 |
| Karri .... | 8,632,739 |
| Wandoo .... | 2,606,246 |
| Pine .... | 1,484,820 |
| Other .... | 606,384 |

Made up as follows :—

| | |
|---|---|
| From State Forest and Crown Land .... .... .... | 37,752,774 (77·7 per cent.) |
| From Private Property .... .... .... .... .... | 10,818,790 (22·3 per cent.) |

**Value Produced**

| | |
|---|---|
| Total Value Sawn Timber .... .... .... .... .... | £10,854,100 |
| Total Value of Other Forest Products .... .... .... | £2,464,000 |

**Departmental Expenditure and Source of Funds**

| | £ | £ | £ |
|---|---|---|---|
| *Gross Revenue* :— | | | |
| Royalties—Timber, etc. .... .... .... .... .... .... | 938,024 | | |
| Departmental .... .... .... .... .... .... .... | 336,506 | | |
| | | 1,274,530 | |
| General Loan Fund .... .... .... .... .... .... | 100,000 | | |
| Federal Aid Road Grant .... .... .... .... .... | 76,000 | | |
| | | 176,000 | |
| | | | 1,450,530 |
| *Gross Expenditure* :— | | | |
| Consolidated Revenue Fund .... .... .... .... .... .... | | 409,732 | |
| Reforestation Fund .... .... .... .... .... .... .... | | 989,991 | |
| General Loan Fund .... .... .... .... .... .... .... | | 100,000 | |
| | | | 1,499,723 |

(Detailed statements appear as appendices.)

**Forest Area**

| | | |
|---|---|---|
| Additions to State Forest | 14,602 | acres |
| Excisions from State Forest | 970 | ,, |
| Land purchased for Pine Planting | 479 | ,, |
| Total Area of State Forest | 4,343,153 | ,, |
| Area of National Parks (Approx.) | 320,900 | ,, |

**Reforestation**

| | | |
|---|---|---|
| Cut-over area treated for regeneration | 58,080 | ,, |

**Afforestation**

| | | |
|---|---|---|
| Area planted with pines, 1960 | 2,713 | ,, |
| Area cleared for pines | 2,286 | ,, |
| Area soil surveyed for pines— | | |
| Detailed Surveys | 12,400 | ,, |
| Reconnaissance Surveys | 300 | ,, |
| Total area of pine plantation established | 31,120 | ,, |
| Total experimental area | 852 | ,, |

**Management**

| | | |
|---|---|---|
| Survey :— | | |
| Theodolite Surveys | 83 | miles |
| Other Surveys | 270 | ,, |
| Map Sheet Compilation | 1,900 | sq. miles |
| Assessment :— | | |
| Air Photo Interpretation | 905,000 | acres |
| Engineering, new works :— | | |
| Roads and Tracks | 314 | miles |
| Telephones | 13 | ,, |
| Houses and Buildings (No.) | 5 | |

**Protection**

| | | |
|---|---|---|
| Controlled burning | 573,203 | acres |
| Fire Outbreaks :— | | |
| Number | 398 | |
| Area burnt | 475,979 | acres |

**Nurseries**

| | | |
|---|---|---|
| Hamel and Dryandra :— | | |
| Trees produced for— | | |
| Forests Department | 248,101 | |
| Private Buyers | 113,263 | |
| Plantation Nurseries :— | | |
| Pine Plantation Stock | Approx. 2·5 | million |

**Sandalwood**

| | | |
|---|---|---|
| Quantity exported | 672 | tons |

## 2. REVENUE AND EXPENDITURE

The log royalty rate was increased by 0·72 pence per cubic foot in the round from the 1st January, 1961. Prior to this there had been no increase since May, 1955, despite an increase of £2 6s. per week in the basic wage, over the same period.

Revenue for the year was £1,274,530 and Expenditure from the Consolidated Revenue Fund was £409,732. Of the net revenue £780,263 was transferred to the Forests Improvement and Reforestation Fund. Expenditure charged against this fund was £989,991. This included a much larger sum for fire suppression than in previous years due to the serious bushfires last summer. Expenditure exceeded the income for the year by £115,063 and the balance in the fund was reduced to £50,147 at 30th June, 1961.

Again £100,000 was made available from General Loan Funds for pine plantation work and £76,000 was received from the Main Roads Department from Federal Aid Road Grant funds for road construction and maintenance in forest areas.

Thinning operations in Departmental pine plantations returned a profit of £51,527 for the year.

## 3. THE FOREST AREA

### State Forests

The total area of State Forest at 30th June, 1961, was 4,343,153 acres which is an increase of 13,639 acres compared with the total area at 30th June, 1960.

During the year, additions totalling 14,602 acres were made to State Forest and 970 acres were excised.

The Department has applied for 447,600 acres to be added to State Forest and 259,100 acres to be created Timber Reserves under the Forests Act. These applications are now under consideration by the Crown Land Tribunal.

### Timber Reserves under the Forests Act

The area held under Timber Reserve at 30th June, 1961, was 1,779,581 acres, an increase of 11,278 acres on the area at 30th June, 1960.

| *Area Reserved For—* | June, 1960 acres | June, 1961 acres |
|---|---|---|
| Jarrah .... .... .... .... .... .... .... .... | 57,542 | 69,312 |
| Pine .... .... .... .... .... .... .... .... | 5,521 | 5,521 |
| Mallet .... .... .... .... .... .... .... .... | 1,140 | 648 |
| Sandalwood .... .... .... .... .... .... .... | 23,100 | 23,100 |
| Mining Timber, Firewood, etc. (Goldfields) .... .... | 1,681,000 | 1,681,000 |
| | 1,768,303 | 1,799,581 |

### Land Acquisitions

In order to acquire suitable areas for the growing of *Pinus radiata*, 479 acres of land were purchased in the Collie and Nannup Districts at a cost of £2,227.

To preserve valuable regrowth, consolidate irregular blocks and to eliminate potential fire hazards, 1,571 acres were purchased for inclusion in State Forest.

### Land Released

During the year 258 applications for land were received, covering a total of 220,396 acres.

The Department agreed to the release of land as follows :—

| ——— | No. | Timber Zone | | Outside Timber Zone |
|---|---|---|---|---|
| | | State Forest | Crown Land | Crown Land |
| | | acres | acres | acres |
| Alienations .... .... .... .... .... | 99 | 2,626 | 69,900 | 36,625 |
| Leases .... .... .... .... .... .... | 7 | 1,766 | 2,698 | 8,000 |

## 4. SAWMILLING, TIMBER INSPECTION AND FOREST PRODUCE

### Timber Production and Distribution

The production of 15,783,370 cubic feet of sawn timber was a decrease of 842,105 cubic feet or 5 per cent. on last year's figure. This is the lowest production of sawn timber since 1951–52, the decrease being mainly jarrah. Of the total production 3,515,025 cubic feet was obtained from private property, a decline of 410,325 cubic feet on last year.

During the year ended 31st December, 1960, 238 mills were registered, of them 131 operate on Crown land and 107 on private property.

Details of the intake of mill logs and production of sawn timber are given in the accompanying tables.

The annual intake of logs (1829–1961) is shown in Appendix 5.

Departmental plantations yielded 1,395,701 cubic feet of pine thinnings, which was an increase of 4·4 per cent. on last year's figure.

The following qualities of logs were used in local plywood factories :—

| | cubic feet |
|---|---|
| Karri .... .... .... .... .... .... .... .... .... | 19,461 |
| Pine .... .... .... .... .... .... .... .... .... | 89,048 |
| Total .... .... .... .... .... .... | 180,509 |

It is interesting that the supply of pine peeler logs increased by 55·8 per cent. on last year.

Sawn sleepers produced during the year amounted to 3,448,833 cubic feet of which 1,281,235 cubic feet was from private property. Of the sleepers produced, 3,113,308 cubic feet was inspected and a further quantity of 106,986 cubic feet was re-inspected during the year.

Other sawn timber inspected during the year totalled 988,232 cubic feet, an increase of 25 per cent. on the previous year.

Of the 30,941 (799,344 lineal feet) piles and poles produced, 49 (1,387 lineal feet) were inspected.

The distribution of timber was as follows :—

| Distribution | Sleepers | | Other Sawn Timber | | Total |
|---|---|---|---|---|---|
| | Karri | Jarrah and Other Species | Karri | Jarrah and Other Species | |
| | cub. ft. | cub. ft. | cub. ft. | cub. ft. | cub. ft. |
| Interstate .... .... .... .... .... | *Nil* | 753,921 | 947,415 | 1,247,362 | 2,948,698 |
| Overseas .... .... .... .... .... | *Nil* | 1,031,819 | 365,443 | 866,572 | 2,263,834 |
| Local .... .... .... .... .... .... | *Nil* | 1,663,093 | 1,587,463 | 7,320,282 | 10,570,838 |
| Total .... .... .... .... .... | *Nil* | 3,448,833 | 2,900,321 | 9,434,216 | 15,783,370 |

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

| Year | From Crown Lands | | From Private Property | | Total Quantity | Estimated Value of Timber Obtained |
|---|---|---|---|---|---|---|
| | Sawn Timber other than Sleepers | Sawn Sleepers | Sawn Timber other than Sleepers | Sawn Sleepers | | |
| | cub. ft. | cub. ft. | cub. ft. | cub. ft. | cub. ft. | £ |
| 1959–60 .... .... .... | 10,368,983 | 2,331,142 | 2,634,694 | 1,290,656 | 16,625,475 | 11,115,891 |
| 1960–61 .... .... .... | 10,110,484 | 2,167,598 | 2,224,053 | 1,281,235 | 15,783,370 | 10,854,099 |

In addition there was a production of 509,858 cubic feet of sawn pine from plantation thinnings. There was no production of hewn timber during these two years.

## TIMBER PRODUCTION

PRODUCTION OF TIMBER FOR YEAR ENDED 30th JUNE, 1961 (EXCLUSIVE OF MINING TIMBER, FIREWOOD, PILES AND POLES)

| | Mill Logs | | | | | | | | | Totals | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Jarrah | Karri | Wandoo | Yarri | Sheoak | Pine | Marri | Tuart | Yate | In Log | Recovery of Sawn Timber |
| Crown Lands .... | 27,006,259 | 7,592,234 | 1,273,056 | 413,316 | 35,493 | 1,395,701 | 13,936 | 22,696 | 83 | 37,752,774 | 12,268,345 |
| Private Property | 8,235,116 | 1,040,505 | 1,333,190 | 96,013 | 11,348 | 89,119 | 696 | 12,803 | .... | 10,818,790 | 3,515,025 |
| Total .... | 35,241,375 | 9,632,739 | 2,606,246 | 509,329 | 46,841 | 1,484,823 | 14,632 | 35,499 | 83 | 48,571,564 | 15,783,370 |

In addition to the above a total of 49,101 tons of Wandoo logs were treated for Tannin extract.

## Firewood Production and Consumption

The firewood consumption for the State was estimated at 725,880 tons almost half of which was used for industrial and mining fuel. The quantity of sawdust burnt as fuel increased from 107,289 tons to 123,789 tons.

The following table accounts for approximately 58 per cent. of the firewood consumed, the balance being obtained from private property for which specific records are not available.

Of the total quantity consumed 52 per cent. was obtained from Crown land.

| | Crown Land tons | Private Property tons | Total tons |
|---|---|---|---|
| *Production* | | | |
| Domestic Firewood— | | | |
| Firewood Permits (South-West) .... .... .... | 67,319 | 568 | 67,887 |
| Mill Waste sold as firewood (estimated 50 per cent. of total) .... .... .... .... .... .... | 39,864 | 18,886 | 58,750 |
| Domestic use on Goldfields .... .... .... .... | 25,978 | .... | 25,978 |
| Total Domestic Firewood as shown by returns | 133,161 | 19,454 | 152,615 |
| Industrial Firewood— | | | |
| Supplied under License, Nos. 3 to 8 Pumps .... | 17,322 | .... | 17,322 |
| Other Pumps .... .... .... .... .... .... | 479 | .... | 479 |
| Factories, etc. .... .... .... .... .... .... | 80,365 | 568 | 80,933 |
| Mill Waste sold as firewood (estimated 50 per cent. of total) .... .... .... .... .... .... | 39,865 | 18,886 | 58,751 |
| Mill Waste used as firewood .... .... .... .... | 83,169 | 3,764 | 86,933 |
| Total Industrial Firewood as shown by returns | 221,200 | 23,218 | 244,418 |
| Mining Firewood .... .... .... .... .... .... | 25,497 | .... | 25,497 |
| Total Firewood Produced (as shown by returns) | 379,858 | 42,672 | 422,530 |

| | tons | |
|---|---|---|
| *Consumption* | | |
| Domestic (estimated) .... .... .... .... .... | 411,500 | (at 2 tons per dwelling) |
| Industrial .... .... .... .... .... .... | 271,082 | (ex Govt. Statistician) |
| Pumping Stations .... .... .... .... .... .... | 17,801 | (as per F.D. Returns) |
| Mining .... .... .... .... .... .... .... | 25,497 | (as per F.D. Returns) |
| Total .... .... .... .... .... .... .... | 725,880 | |

## Other Forest Produce

Piles and poles obtained from Crown lands during the year amounted to 310,420 lineal feet compared with 291,084 lineal feet for the year 1959–60. Of this total, 19,255 lineal feet was produced from Departmental operations. Returns from private property show a production of 488,924 lineal feet and although this information cannot be accurately obtained, the figure indicates a reduction on a comparative figure of 577,798 lineal feet for 1959–60.

There were approximately 316,245 strainers and posts cut from Crown lands during the year of which 31,797 were produced by this Department. As private owners do not supply returns, these figures represent only a portion of the total production.

An increased amount of Mallet Bark was produced. Of the total of 566 tons, 186 tons came from thinnings on Departmental mallet plantations, 9 tons from Crown land and Reserves and the remainder from Private Property.

Nearly 30,000 tons of mining timber was used apart from timber supplied by sawmills. This was mainly supplied from Crown lands ; 13,000 tons being obtained from the inland forests.

The demand for Christmas trees continues to increase. For the year under review, 9,951 trees were supplied and the revenue from this source was approximately £1,680.

The following table shows numerous other items of interest produced from the forest areas of the State.

The estimated total value of this forest produce was approximately £2,464,000.

FOREST PRODUCE NOT ELSEWHERE INCLUDED IN PRODUCTION TABLES
OBTAINED DURING YEAR ENDED 30th JUNE, 1961

| Description of Forest Produce | South-West Division and Agricultural Areas | | | Northern, Central and Eastern Goldfields | Totals |
|---|---|---|---|---|---|
| | Supplied by Department | Other Crown Lands | Private Property* | Crown Lands† | |
| Mining Timber .... .... .... .... .... tons | 7 | 13,067 | 3,554 | 13,230 | 29,858 |
| Sleepers for Goldfields Wood Line .... .... cub. ft. | .... | .... | .... | 11,893 | 11,893 |
| Charcoal (includes 41,604 tons ex Wundowie) .... tons | .... | 41,674 | .... | .... | 41,674 |
| Piles and Poles .... .... .... .... .... lin. ft. | 19,255 | 291,165 | 488,924 | .... | 799,344 |
| Fence Posts and Rails .... .... .... .... No. | 30,462 | 114,956 | 24,015 | 142,607 | 312,040 |
| Strainer Posts .... .... .... .... .... No. | 1,335 | 2,870 | .... | .... | 4,205 |
| Mallet Bark .... .... .... .... .... tons | 186 | 9 | 371 | .... | 566 |
| Wandoo Timber for Tannin Extract .... .... tons | .... | 32,710 | 16,391 | .... | 49,101 |
| Bean, etc., Sticks .... .... .... .... .... No. | .... | 8,640 | .... | 3,420 | 12,060 |
| Boronia Blossom .... .... .... .... .... lb. | .... | 3,343 | 2,857 | .... | 6,200 |
| Stone .... .... .... .... .... .... .... cub. yds. | .... | 3,609 | .... | .... | 3,609 |
| Sand .... .... .... .... .... .... .... cub. yds. | .... | 762 | .... | .... | 762 |
| Loam .... .... .... .... .... .... .... cub. yds. | .... | 8 | .... | .... | 8 |
| Scout Staves .... .... .... .... .... No. | 288 | .... | .... | .... | 288 |
| Sawdust consumed as fuel, etc.† .... .... tons | .... | 123,789 | .... | .... | 123,789 |

* Complete figures for private property are not available. Only information furnished to the Department has been included.

† The apportionment between Crown land and private property is unknown.

*Honey Industry*

The forest areas of the State normally play a major role in honey production but the lack of any widespread flowering in either the karri or wandoo forest during 1960–61 caused considerable concern and emphasised the necessity for supplementary areas of other honey producing flora. The coastal scrub belt lying northwards from Yanchep provided some relief to what was undoubtedly a serious situation.

The honey industry is at present faced with the problem of providing for an increasing number of hives at the same time as a large quantity of honey producing flora is being reduced by the clearing of extensive areas in the South-West Land Division for agriculture.

The need to reserve permanently any suitable areas of wandoo on Crown land is obvious.

## Sandalwood

The quantity of sandalwood received at Fremantle was almost double that of the previous year and the stock position is now very satisfactory.

Deliveries during the year (including those under orders placed in the previous year) totalled 1,205 tons, compared with 610 tons for the year ended 30th June, 1960, and was made up as follows :—

| | tons |
|---|---|
| Crown Lands— | |
| Logwood (including roots and butts) .... .... | 930 |
| Pieces .... .... .... .... .... .... .... | 275 |
| Private Property .... .... .... .... .... .... | *Nil* |
| Total .... .... .... .... .... .... | 1,205 |

The total export was 672 tons compared with 533 tons for the previous year. No orders for logwood were placed by the oil distillers but 184 tons of roots and butts severed from the logwood at Fremantle were delivered to them for distillation.

The quantity of Sandalwood oil distilled was 13,637 lb. and this was exported Interstate and overseas.

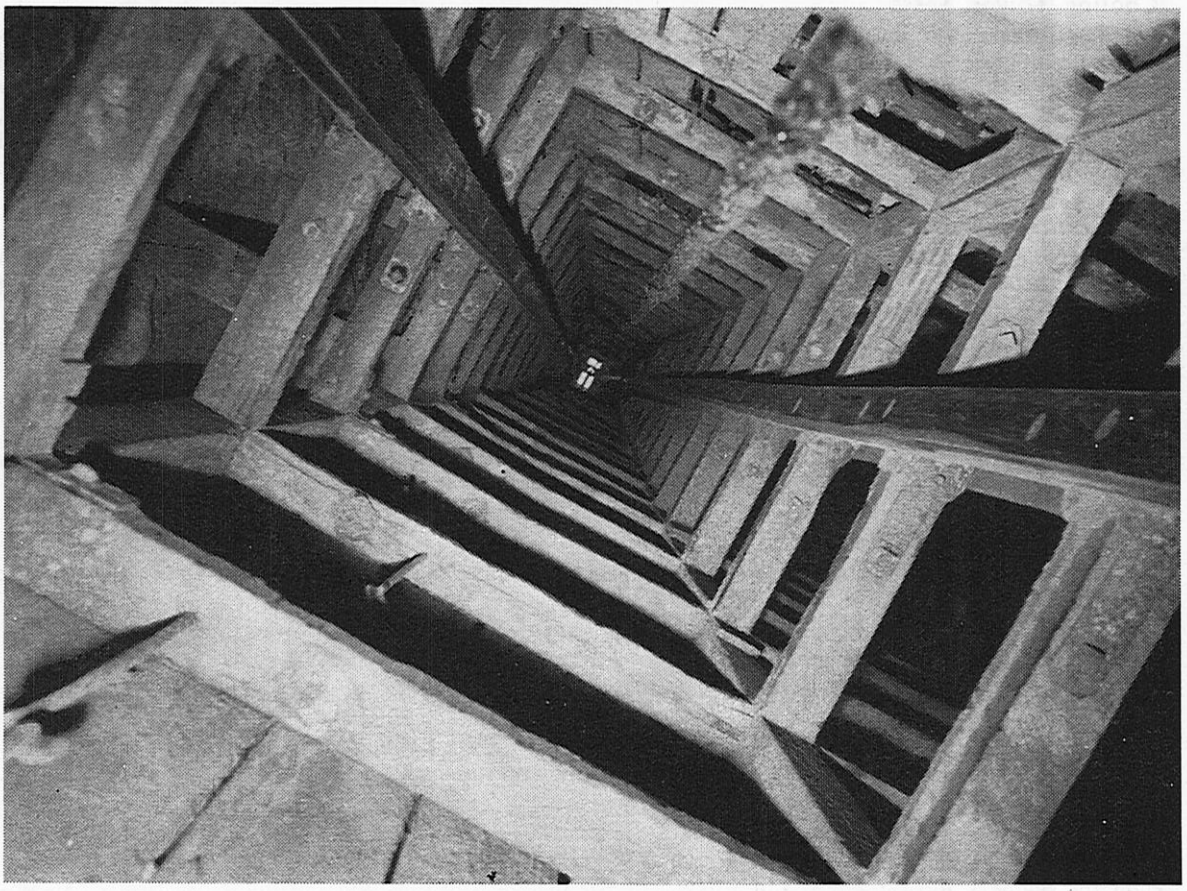
## 5. TIMBER UTILISATION

Tests to determine the strength properties of Western Australian timbers were continued during the year by the Council for Scientific and Industrial Research Organisation, Division of Forest Products. Results and figures for wandoo are now complete.

## Mechanical Properties of Jarrah, Karri, Marri, W.A. Blackbutt, Tuart and Wandoo

These data were obtained from small clear specimens in a green condition.

| | *Jarrah* lb. cub. ft. | *Karri* lb. cub. ft. | *Marri* lb. cub. ft. | *W.A. Blackbutt* lb. cub. ft. | *Tuart* lb. cub. ft. | *Wandoo* lb. cub. ft. |
|---|---|---|---|---|---|---|
| *Density* .... .... .... .... .... | 73 | 73 | 76 | 70 | 78 | 79 |
| *Static Bending*— | lb./sq. in. | lb./sq. in. | lb./sq. in. | lb./sq. in. | lb./sq. in. | lb./sq. in. |
| Fibre stress at limit of proportionality | 6,440 | 6,600 | 7,630 | 6,990 | 8,290 | 9,180 |
| Modulus of rupture .... .... .... | 9,880 | 10,600 | 11,300 | 9,500 | 11,800 | 14,600 |
| Modulus of elasticity .... .... .... | 1,480,000 | 2,070,000 | 1,960,000 | 1,670,000 | 1,780,000 | 1,990,000 |
| *Compression Parallel to Grain*— | | | | | | |
| Stress at limit of proportionality .... | 4,240 | 4,180 | 4,130 | 4,560 | 5,290 | 6,070 |
| Maximum crushing strength .... .... | 5,190 | 5,250 | 5,880 | 5,300 | 6,680 | 8,020 |
| Modulus of elasticity .... .... .... | 1,700,000 | 2,200,000 | 2,270,000 | 1,810,000 | 1,980,000 | 2,470,000 |
| *Compression Perpendicular to Grain*— | | | | | | |
| Stress at limit of proportionality— | | | | | | |
| Radial .... .... .... .... | 1,160 | 956 | 1,550 | 1,140 | 2,120 | 1,720 |
| Tangential .... .... .... .... | 1,290 | 1,260 | 1,360 | 1,120 | 2,120 | 2,040 |
| *Hardness*— | lb. | lb. | lb. | lb. | lb. | lb. |
| Radial .... .... .... .... .... | 1,300 | 1,400 | 1,490 | 1,250 | 2,110 | 2,250 |
| Tangential .... .... .... .... | 1,270 | 1,320 | 1,480 | 1,220 | 2,120 | 2,210 |
| End Grain .... .... .... .... | 1,310 | 1,370 | 1,420 | 1,230 | 1,890 | 2,050 |
| *Shear*— | lb./sq. in. | lb./sq. in. | lb./sq. in. | lb./sq. in. | lb./sq. in. | lb./sq. in. |
| Radial .... .... .... .... .... | 1,330 | 1,210 | 1,330 | 1,240 | 1,650 | 2,090 |
| Tangential .... .... .... .... | 1,320 | 1,460 | 1,330 | 1,300 | 1,840 | 2,120 |
| *Cleavage*— | lb./in. | lb./in. | lb./in. | lb./in. | lb./in. | lb./in. |
| Radial .... .... .... .... .... | 360 | 366 | 319 | 349 | 369 | 465 |
| Tangential .... .... .... .... | 385 | 460 | 399 | 383 | 504 | 456 |
| *Izod Impact* (Toughness)— | ft./lb. | ft./lb. | ft./lb. | ft./lb. | ft./lb. | ft./lb. |
| Radial .... .... .... .... .... | 9·2 | 15·2 | 14·2 | 9·3 | 12·0 | 15·3 |
| Tangential .... .... .... .... | 10·2 | 15·4 | 15·5 | 10·4 | 13·8 | 14·6 |



Karri mine guides in the shaft of a Kalgoorlie mine

The strength grouping of Western Australian timbers according to the C.S.I.R.O. system can now be stated as follows :—

Strength Group A.—Wandoo.
B.—Karri, Tuart, Marri.
C.—Jarrah, W.A. Blackbutt, Marri.

On green test data Marri is in Group B but because of the difficulty of obtaining it free of gum veins it may be wiser to consider it as Group C for structural purposes. Its rating will be re-considered when the data on dry testing become available.

**Strength of Poles and Stringers**

The strength testing of the full-size jarrah poles sent to C.S.I.R.O. in 1957 has been completed and the report is being prepared. Based on the pole testing results C.S.I.R.O. have also completed data sheets simplifying design procedure and affording economy in use of round stringer spans for standard highway bridge loadings. Copies of this pamphlet are available through the Department.

**Clear Finish Exposure Tests**

These tests are now complete and have shown that under adverse exposure conditions, *i.e.* in a westerly and a notherly aspect, the best clear finishes at present available will not last more than three years.

This maximum period can only be achieved if the finish is applied over a suitable priming and sealing system.

Twenty-seven proprietary finishes applied according to their manufacturer's instructions, failed within twelve months. Few of these instructions made any provision for the use of primers.

**Marine Borer Tests**

The Department is co-operating with the C.S.I.R.O., the Public Works Department and British Petroleum in experiments to test the resistance of marine borers of a variety of timbers, pressure treated with different preservatives. Jarrah and karri poles were exposed at Bunbury, Fremantle and Port Hedland and pine and other hardwoods at Kwinana and Port Hedland.

The first annual examination of these poles showed that marine borers were very active at all four sites. The creosote and copper-chrome-arsenic treated specimens are showing a high resistance to attack, but it is too early yet to predict the full value of these treatments.

**Cooling Tower Tests**

The Department is co-operating with C.S.I.R.O. to test the resistance of various treated and untreated timbers to attack by soft rot in water cooling towers. The first annual examination showed that the traditionally used Californian redwood was the best untreated timber followed in order by Vanikoro kauri, western red cedar, King William pine, oregon and teak. Next came wandoo which, like teak, is a hardwood with quite outstanding resistance to soft rot. However, radiata pine treated with copper-chrome-arsenic is superior to redwood and stands pre-eminent as a tower fill material.

**Preservative Treatment of Western Australian Timbers**

Two more pressure treatment plants were installed during the year by private industry. Both operate at 200 lb./sq. in., one at Picton using creosote for treating poles and the other in Perth using Tanalith (Copper-chrome-arsenic) for general purpose work.

The Department has prepared 500 marri sleepers some of which will be treated with pentachlorphenol and some with creosote. These will be tested in service by the W.A.G.R.

**Timber Shrinkage**

Shrinkage and movement data are now available for all Western Australian commercial species, and are shown in a new Division of Forest Products Technological Paper, No. 13.

**Seasoning of Karri Poles**

Further work on this subject is being carried out in collaboration with the Division of Forest Products.

**Design and Construction**

Assistance was given to Timber Development Association in the design and testing of trusses for farm buildings.

A pendulum docker has been built which requires only a light and uniform pull at all positions of the saw. Drawings can be made available to industry on request.

**Grading Rules**

Four meetings of the Western Australian Joint Timber Committee were held and revised grading rules for sleepers and crossings, and a new rule for bridge transoms were brought practically to completion.

## Forest Authority and Timber Industry Conferences

In 1943 representatives of the Forest Authorities and Sawmillers' Associations of the Eastern States met to discuss problems relating to availability of forest resources, interstate movement of timber, royalties and prices. It was given the name of Eastern States Timber Industry Stabilisation Conference. A permanent secretary was appointed, and annual meetings arranged. Representatives of the Department and the Western Australian sawmillers have attended the conferences in the various States as visitors but, in 1959, it was decided that the other States and Territories of the Commonwealth should be invited to become members. The name was then changed to Australian Timber Industry Stabilization Conference, (AUSTIS).

*AUSTIS Conference* 1962

Western Australia has the honour of acting as host State for the next conference which is to be held at Manjimup from 15th to 19th October, 1962. It is expected that about one hundred delegates will attend.

## Industrial Safety

Industrial safety has received considerable attention at AUSTIS conferences. A local safety committee has been set up by the Western Australian section under the chairmanship of the Utilisation Officer, and as a result of its work the quarterly accident summaries of the Department and the major sawmilling firms are circulated for comparison and promotion of accident-prevention effort. A set of safety rules to cover all phases of the industry is in course of preparation.

The Timber Industry Regulation Act Inspector and two other officers of the Department attended an industrial safety course during the year.

Jarrah sleepers on a bridge in Otago Province, New Zealand. After 50 years of service, only two of the original 200 sleepers had to be replaced. The dog spikes are still holding firmly in the original holes into which they were driven in 1911

## 6. FOREST MANAGEMENT

### Surveys and Map Production

This year, major surveys for mapping control were extended by 83 miles. Divisional staff carried out lower order surveys of 270 miles.

The compilation of base sheets for use in charting surveys was continued and a coverage in excess of 1,900 square miles was completed.

An "80" scale plan was produced in three colours for the Pemberton Division and an extension was added to the Mundaring "80." Reprints were issued for the Donnelly, Gleneagle and Harvey "80s" and a new temporary Jarrahwood "80" was produced.

*Air Photo Interpretation*

Working Plans Offices at Manjimup and Harvey were responsible for all air photo interpretation carried out during the year. The total area interpreted was as follows :—

| | acres |
|---|---|
| Manjimup .... .... .... .... .... .... | 715,000 |
| Harvey .... .... .... .... .... .... .... | 190,000 |
| Total .... .... .... .... .... .... | 905,000 |

The Department continued to obtain photos of forest areas at cost price from the State Survey and Mapping Committee. Special air photos were taken of seriously fire damaged areas which proved highly valuable in rapid mapping for the study of fire losses, designing of salvage operations and future fire control methods.

The wandoo forest area, on which the important tanning Extract and Honey industries largely depend, cannot be satisfactorily defined by aerial photography in spite of research work with various types of photographic film.

Species mapping of these areas was completed during the year by ground surveys.

An important development during the year was the compilation of maps from aerial photos covering 93,700 acres of existing and proposed pine plantations. These maps save a large volume of ground survey work and in the future will be used for the definition of established plantations. Field surveys will be kept to the minimum required for the production of sketch plans only.

*Standard Mapping*

The area now covered by standard 20 chain to 1 inch maps was increased by 766,370 acres bringing the net total area to 9,046,570 acres. Sketch maps covering a further 1 million acres have also been produced.

### Working Plans

The forest inventory, or stocktaking of timber and forest produce available both for the present and the future, is a continuous process built up by mapping, assessment, growth studies and records. The Department is now well equipped for this work and the first preliminary inventory was completed during the year.

Working Plans both for pine plantations and indigenous forest have guided operations over past decades and with each revision, assist to stabilize the wood using industries and to ensure the continuity of the many secondary industries and townships dependent upon the output from the forest.

### Forest Engineering

Engineering projects completed during the year are set out in the following table :—

| Item | Completed in Current Year | Present Total |
|---|---|---|
| Construction of Roads, Firelines and Tracks .... .... .... | 314 miles | 17,989 miles |
| Maintenance of Roads, Firelines and Tracks .... .... .... | 4,602 ,, | .... |
| Telephone Lines .... .... .... .... .... .... .... | 13 ,, | 1,811 ,, |
| Houses No. .... .... .... .... .... .... .... .... | 5 | 438 |

Seven houses were sold and seven were destroyed by fire at Dwellingup.

In view of the changeover from fire-break burning only, to mostly broadcast controlled burning, many tracks and firelines no longer warrant maintenance. For this reason, the total mileage of roads, firelines and tracks to be maintained in the older protected forest areas is under review.

### Departmental Buildings

This year's programme was marked by the building of several houses of a more modern style. The policy of providing amenities for Departmental tenants has been continued to the limit of available funds.

Due to the loss of seven dwellings and 39 other buildings in the Dwellingup bush fire, the total number of houses owned by the Department showed a reduction during the year.

The table following shows the number of new buildings erected and the total number of the various types as at the 30th June, 1961 :—

| Type | Constructed or purchased during the year | Totals as at 30/6/61 |
|---|---|---|
| Houses | 5 | 438 |
| Huts | 17 | 358 |
| Garages | 38 | 203 |
| Gantries | 9 | 36 |
| Offices | 2 | 37 |
| Lookout towers | 1 | 25 |
| Workshops (automotive) | .... | 17 |
| Sundry buildings | 19 | 151 |
| Totals | 91 | 1,265 |

## Communications

*Radio.*—Eighteen portable two-way radios were allocated to divisions for use in the field during fire suppression and controlled burning operations.

Modernised fixed stations were installed at Dryandra and the new Manjimup Office.

Somerville tower was fitted with a 40-watt fixed transmitter-receiver for communications with the fire gangs at Somerville and Collier plantations.

Wanneroo division was equipped with radio for fire control. Two mobiles and a fixed station were installed.

Modifications to all radio equipment were commenced. This was rendered necessary by the allocation of lower frequencies by the P.M.G.'s Department.

Tests with V.H.F. equipment were carried out and the results were promising. It is intended to carry out extensive field tests with this type of equipment in the coming fire season.

*Telephones.*—The headquarters telephone lines at Nannup, Collie and Manjimup were converted to the latest underground balanced metallic line systems and plans have been prepared for similar projects at Dwellingup and Pemberton.

Seven switch boards of various types were made up.

Despite the heavy call on the services of this branch during the abnormal fire season, the repair and overhaul of all equipment was kept up-to-date.

The new divisional headquarters, at Manjimup. This building houses the administrative and research staff, and will be used as the headquarters of the southern forest region

## 7. REFORESTATION

The selection and branding of trees to be felled by authorised officers of the Department or other means of close silvicultural control, is exercised over all permits in State Forest. This procedure ensures that trees are removed in such a way as to protect existing immature growth and encourage regeneration. Top disposal which follows felling operations assists to protect the young growing trees and also provides a good seed bed for future crops.

During the year, 58,080 acres of virgin State Forest were cut over and retreated for regeneration This consisted of 38,901 acres of jarrah, 4,593 acres karri, 14,577 acres wandoo and nine acres of other species.

## 8. AFFORESTATION

During the year, 2,713 acres of pine plantation were established and 61 acres were clear felled, making the present net area of plantation 31,970 acres, including experimental areas of 852 acres.

The 1960 pine planting was distributed as follows :—

| | acres |
|---|---|
| Mundaring | 180 |
| Palmer's | 6 |
| Bussell's Brook | 250 |
| Tooke's | 100 |
| Grimwade | 332 |
| Gleneagle | 89 |
| Myalup | 187 |
| Harvey Weir | 240 |
| McLarty | 92 |
| Gnangara | 230 |
| Pinjar | 360 |
| Blackwood | 647 |
| Total | 2,713 |

Ground preparation in readiness for future planting was continued and the position after the above planting was as follows :—

| | acres |
|---|---|
| Cleared awaiting initial burn | 5,489 |
| Part cleared | 716 |
| Part cleared following initial burn | 1,125 |
| Cleared awaiting cultivation | 454 |

### Soil Surveys

The total area in sight under Government ownership for the planting of the important species *Pinus radiata* is only 30,000 acres and additional areas are sought for purchase as funds permit.

The importance of careful soil survey of *Pinus radiata* country can not be overstressed. The technique of soil survey has been carefully developed but research continues on the subject with a view to the possible use of less fertile land in future years. For the present however, planting will continue only on areas expected to produce good average quality growth. There are now some hundreds of small plots established to add to future knowledge.

Details of work carried out during the year were :—

| | |
|---|---|
| Detailed Surveys | 12,400 acres |
| Reconnaissance Surveys | 300 acres |
| Inspections | 1,633 acres |
| Chemical Analyses | 268 samples |

This standard of survey was initiated in September, 1954, and since that date the following areas have been covered :—

| | acres |
|---|---|
| Detailed Surveys | 62,870 |
| Reconnaissance Surveys | 148,970 |
| Costal Plain Reconnaissance | 111,690 |

### Site Quality Mapping

Due to the restricted planting programme in the late war years, only small areas reached the age limits for site quality work during the year, and a total of 296 acres was mapped.

All plantations are now up to schedule on site quality mapping and first estimates for yields which are based upon this mapping.

**Production of Pine Timber**

The growing importance of pine in the industrial life of this State is illustrated by the increased supplies being taken year by year.

Production of timber from plantations, mainly in the form of thinnings, amounted to 1,395,701 cubic feet compared with 1,336,825 cubic feet last year. Included in this total are 89,048 cubic feet used for peeling and slicing, an increase of 31,921 cubic feet over the figure last year.

Wood wool manufacturing industries again took a large volume of the smaller sized logs, thus aiding in the more complete utilisation of each tree. A total of 14,950 cubic feet were supplied during the year.

The Education Department used 4,750 cubic feet of locally grown sawn pine in their manual training classes.

The pearl culture industry in the North-West used 400 pine poles for the construction of rafts for culture pots.

A private firm is at present investigating the economics of impregnating small round pine timber for use as posts and stumps.

Logs produced by the various plantations were as follows :—

| | cubic feet |
|---|---|
| Metropolitan— | |
| Gnangara | 114,670 |
| Somerville | 220,950 |
| Collier | 54,609 |
| Mundaring | 382,734 |
| Gleneagle | 1,612 |
| Carinyah | 238 |
| Harvey— | |
| Hamel | 8,500 |
| Harvey Weir | 115,286 |
| Myalup | 55,825 |
| Collie | 46,518 |
| Grimwade | 184,535 |
| Busselton— | |
| Keenan | 62,603 |
| Ludlow-Willcock | 50,351 |
| Boranup | 1,554 |
| Dwellingup | 850 |
| Pardelup | 72,548 |
| Pimelia | 22,318 |
| Total | 1,395,701 |

Due to the increased planting rate in post war years, future production is expected to reach 3,500,000 cubic feet by 1970 and will form an important factor in the anticipated development of the paper pulp industry in the South-West. A percentage of long fibred pine pulp is necessary as a mixture with indigenous Eucalypt pulp for many grades of paper.

**Private Property Pine Plantations**

Pine planting by companies and private individuals in this State has now reached a total of 684 acres and plans are in hand for this area to be considerably increased within the next few years.

One of the largest of these private plantations is being established by Cullity Timbers Pty. Ltd. in the hills above Roelands. Their property of some 7,500 acres is situated on good deep soil and to date 350 acres of *Pinus radiata* have been planted and a further 60 acres are planned for this year. The seedling stock for these plantings is grown in the Company's own nursery at Picton Junction.

The first plantings were made in 1954 and already trees have reached a height of some 40 feet with a diameter of about 7 inches.

Another plantation project is being undertaken by Bunning Bros. Pty. Ltd. in the North Bannister district where 180 acres of *Pinus radiata* have already been planted. This afforestation project was commenced with 55 acres in 1959. A similar area was planted in 1960 and 70 acres in 1961.

It is intended to maintain a planting rate of 60–70 acres per year until about 400 acres have been established on the present site. It is estimated that ultimately a further 600 acres will be suitable for planting in this region.

It is interesting to note that although the average rainfall on the plantation site is from 26 in. to 27 in. per annum, some of the pines planted in July, 1959, have made height growth of up to 11–12 feet.

Other sizeable private plantings are at Clontarf, 75 acres ; J. Banfield at Mundaring, 22 acres ; and the Church of England property at Manjimup, 100 acres.

The Department is always prepared to give information and advice to those wishing to carry out pine planting on their properties and will, if the land is considered suitable for the purpose, carry out soil surveys and the determination of the suitability of the land at cost, to encourage the development of private pine plantations.

It is perhaps not realised that large areas of land suitable for the planting of the fast growing *Pinus radiata* are not readily available in this State. To make any such project an economic possibility, comparatively cheap land must be obtained in the higher rainfall areas.

### Mallet Plantations

The total net area of mallet plantations stands at 19,048 acres. No planting was carried out in the current year, but the Department produced 186 tons of chipped bark and 210 cubic feet of mining timber from thinning operations.

### Seed Distribution

The Departmental Seed Store now carries seed from 173 different species with an estimated value of £12,500. In addition 1,076 lb. of conifer seed is held for the Department's use.

Sales of seed to Australian and overseas buyers amounted to £3,529 compared with £1,297 for last year.

Regular tests of germination percentage were carried out during the year.

### Tree Nurseries

A growing appreciation of the value of trees on farms and in country towns is evidenced by the number of trees supplied by the two Departmental nurseries at Hamel and Dryandra each year.

The greatest demand has been for open rooted pines both for Departmental use and private plantations and windbreaks. Apart from pines, the most popular species was, as in previous years, sugar gum (*Euc. cladocalyx*) of which 17,663 were distributed.

The year's work of the two nurseries is summarised on the following table :—

| Nursery | Number of Plants Sold | | | Departmental Use | Number of Species | Revenue | Expenditure |
|---|---|---|---|---|---|---|---|
| | Potted Stock | Tray Stock | Open Rooted Plants | | | | |
| | | | | | | £ | £ |
| Hamel .... .... .... | 23,737 | 2,832 | 54,279 | 244,788 | 96 | 3,285 | 5,332 |
| Dryandra .... .... .... | 29,040 | 3,375 | .... | 3,313 | 116 | 3,013 | 2,786 |

The above figures for Revenue and Expenditure are for the period 1st October, 1959, to 30th September, 1960, and they do not take into account the value of trees which were supplied for the Department's own requirements.

### Roadside Planting in State Forests

A total of twenty-four trial tree plots have now been established adjacent to the Albany Highway within the Gleneagle Division, from the 24 Mile Peg to the 47 Mile Peg, on sites where the indigenous forest is in an unthrifty condition.

During the year, 485 additional trees were planted, as well as 123 refills to replace losses in the previous planting. Thirty-nine species are now under trial in addition to *Pinus pinaster* which is well established in this area in plantation form. Planting has included both trees of ornamental and economic value and while it is as yet too early to obtain any indication of final results, development to date has been satisfactory.

### Inland Arboreta

There was a marked increase in arboretum establishment in the drier agricultural areas. Eleven new arboreta were established, and additional plantings were carried out in some of the existing arboreta.

In connection with this work, a total of 1,626 trees were planted, and during the year there was a loss of 18 per cent. of the planted stock. The chief losses are mainly attributed to saline soils, inadequate cultivation, and destruction by vermin.

Liaison with farmers and interested groups has been a very important part of this work, and lectures and advice has been given to 27 farmers' clubs. A series of sixteen talks on tree establishment in the Wheat Belt were delivered on the country sessions of the National radio station.

In connection with the establishment of Inland Arboreta, a detailed study of soil moisture regime is being carried out at Eneabba and Morawa. Results to date have given information of considerable value in arriving at the most suitable methods of soil preparation, optimum spacing of trees and most effective planting methods.

Whereas until recent years the Department's association with trees raised for distribution in the Agricultural areas usually ended with the despatch of trees from the nursery, the employment of an officer full time on arboricultural extension work has enabled a follow up of subsequent tree development to be made. It has thus been possible to form an appreciation of the problems encountered in the trees further development to study their solutions and to assist farmers by practical demonstrations and advice. An important problem being tackled is the unsatisfactory root development and occasional ultimate wind throw of trees raised in nursery containers. Comprehensive trials with various root treatments at planting time have been initiated with a view to eliminating this trouble and are currently proceeding.

The data emphasises the tremendous drain on soil moisture by tree crops and the indigenous scrub vegetation, and with ten year old trees at 15 x 15 feet spacing, the soil moisture is reduced to below wilting point by early summer, an remains at this level until the rains in late March or April.

### The Tree Society

This Society which claims a membership of 1,900 distributed through 42 branches, is an organisation wherein members of the public interested in tree preservation and tree establishment have banded together. This Society with its wide public representation has been able to give considerable publicity to these objectives, has been particularly active in Arbor Day ceremonies and associated functions.

The Junior Tree Society with some fifty branches is a promising extension of the Tree Society. It operates through the schools with encouragement from the nature services of the Department of Education. Several branches have established small nurseries for the raising of trees for local use. Other activities include the establishment of school arboreta and organisation of Arbor Day functions.

### Timber Development Association

The Forests Department is a sponser member of this organisation and is represented on the Council. Officers have assisted in manning exhibits at various displays and the Department provided appropriate display features for both the timber week display and the timber week procession.

## 9. FIRE PROTECTION

### State Forest Under Protection

| | acres |
|---|---|
| Indigenous Forest .... .... .... .... .... | 4,054,250 |
| Pine Plantations .... .... .... .... .... | 31,998 |
| Mallet Plantations .... .... .... .... .... | 19,048 |

Adjoining this protected forest there are some 1,700,000 acres of private property, Crown lands, and State Forest being held for pine planting, on which fires must be attended to promptly as they may menace the protected forest.

### The Fire Season

| | Jarrah | Karri |
|---|---|---|
| Rainfall .... .... .... .... .... .... | Drier than normal | Drier than normal. |
| | Below average from August onwards | Below average August to February, inclusive |
| Temperature— | | |
| Number of days over 90 degrees .... | 38 | 23 |
| Number of days over 100 degrees .... | 15 | 0 |
| Relative Humidity— | | |
| Number of days below 25 per cent. .... | 35 | 20 |
| Fire Hazard— | | |
| Number of days "dangerous" .... .... | 30 | 2 |
| Number of days "Severe Summer" .... | 20 | 3 |
| Mean Hazard .... .... .... .... .... | * | 4·6 |

* Records not available for Jarrah Region.

From 24th January to 9th February the Dwellingup fire weather station did not operate, having been destroyed by fire. Temperature and relative humidity data have been estimated for this period. Unfortunately all the Department's fire weather research records for the past 27 years were destroyed with the station.

The season generally was very severe with several heat waves associated with cyclonic disturbances giving rise to a record number of lightning strikes.

The weather pattern over the period 18th-25th January was the worst on record and culminated in the greatest fire disaster in the history of the Department, with the loss of a great proportion of the settlements of Dwellingup and Holyoake, and the complete destruction of Nanga Brook.

This is dealt with in detail in the appendices

Very severe fires also occurred in the Pemberton-Shannon Divisions, and at the beginning of March escaping private property fires burnt out Karridale.

## Controlled Burning

In the Jarrah Region the spring burning period was long and generally satisfactory though in some districts lack of rain and rising temperatures curtailed the programme.

Dry conditions in late autumn provided the opportunity for some very useful late burning without danger of scorching.

In the Karri Region burning conditions both in spring and Autumn were ideal and throughout the State a record acreage was control burnt as shown below :—

| *Prescribed Burning*— | acres |
|---|---|
| General | 493,370 |
| Advance and Top Disposal | 70,953 |
| Fire Breaks | 8,880 |
| Total | 573,203 |

## Detection

No new towers were brought into operation and Granite Peak lookout was not manned. Teesdale and Mt. Wells were destroyed in the January Dwellingup fires and will have to be replaced.

| *Manning of Towers*— | Jarrah Zone | Karri Zone |
|---|---|---|
| First Watch | 10/10/60 | 1/11/60 |
| Last Watch | 6/4/61 | 26/3/61 |

## Fires and Fire Damage

Total number of fires attended by Departmental gangs was 398, which is just above the average of 355 for the last 24 years.

The following table sets out the principal causes :—

| | |
|---|---|
| Lightning | 85 |
| Escapes from Settlers' fires | 64 |
| Escapes from prescribed burns | 49 |
| Travellers | 26 |
| Children | 26 |
| W.A.G.R. locos. | 24 |
| Deliberately lit | 20 |
| Mill surroundings | 18 |
| Bush Workers | 12 |
| Mill locos. | 12 |
| Householders | 11 |
| Hunters and fishermen | 8 |
| Tractors | 7 |
| Miscellaneous | 10 |
| Unknown | 26 |
| Total | 398 |

The most notable figure in this table is the unusually large number of lightning fires. Over the past 22 years, lightning strikes have caused 317 fires in State Forest, 85 of which were recorded in the summer of 1960–61.

The following table shows the incidence of authentic lightning fires over the past 22 years :—

OCCURRENCE OF LIGHTNING FIRES IN STATE FOREST—1939–1961

| Divisions | Years | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1939–40 | 1940–41 | 1941–42 | 1942–43 | 1943–44 | 1944–45 | 1945–46 | 1946–47 | 1947–48 | 1948–49 | 1949–50 | 1950–51 | 1951–52 | 1952–53 | 1953–54 | 1954–55 | 1955–56 | 1956–57 | 1957–58 | 1958–59 | 1959–60 | 1960–61 |
| Busselton .... | .... | .... | Details by divisions not available | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1 | .... | .... | .... |
| Mundaring .... | .... | 1 | | 1 | .... | .... | .... | .... | .... | .... | .... | 2 | 1 | 1 | 7 | 4 | 1 | .... | .... | 2 | 1 | 8 |
| Dwellingup .... | .... | 14 | | .... | 10 | 1 | .... | 1 | 2 | 1 | 5 | 14 | 5 | .... | 7 | 1 | 3 | 4 | 5 | 12 | 2 | 20 |
| Collie .... .... | .... | 3 | | .... | .... | .... | .... | .... | 1 | .... | .... | .... | .... | .... | 6 | 1 | .... | 3 | 1 | .... | .... | 5 |
| Kirup .... .... | 1 | .... | | .... | 8 | 1 | 1 | 1 | 1 | .... | .... | .... | .... | .... | 3 | .... | .... | .... | .... | 8 | .... | 1 |
| Manjimup .... | .... | .... | | .... | 4 | 1 | .... | .... | .... | 1 | .... | .... | .... | .... | .... | .... | .... | .... | 1 | 2 | .... | 14 |
| Narrogin .... | .... | .... | | .... | .... | .... | .... | .... | .... | .... | 1 | .... | .... | .... | .... | 1 | 1 | .... | 1 | .... | .... | .... |
| Gleneagle .... | 1 | 3 | | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 7 | 1 | 1 | 4 | 2 | 8 | .... | 14 |
| Metropolitan .... | .... | .... | | .... | .... | .... | .... | .... | .... | .... | .... | 1 | .... | .... | .... | .... | .... | .... | 1 | 1 | .... | .... |
| Harvey .... | 1 | 5 | | .... | .... | .... | .... | 1 | .... | 2 | .... | 2 | .... | .... | 3 | .... | 1 | 2 | 2 | 5 | .... | 8 |
| Pemberton .... | .... | .... | | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 2 | 1 | .... | .... | .... | .... | 1 | .... | 11 |
| Nannup .... | .... | .... | | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 2 | .... | 1 |
| Shannon River | .... | .... | | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | .... | 1 | .... | 3 |
| Totals .... | 3 | 26 | 10 | 1 | 22 | 3 | 1 | 3 | 4 | 4 | 6 | 19 | 6 | 3 | 34 | 8 | 7 | 13 | 14 | 42 | 3 | 85 |

As a matter of interest, it is frequently reported by field officers that, after lightning storms there are a large number of trees which were struck by lightning but from which fires did not develop.

Another point of interest is that these storms follow broadly defined paths. For example, the Dwellingup division has reported 107 lightning fires, *i.e.*, 34 per cent. of all fires from this source.

The number of escapes from settler's burns is up again to 16 per cent. from a low 9·5 per cent. last year.

The area burnt and damage caused was the highest in the history of the Department.

Thirty-three acres of pine plantation was burnt but was all salvagable.

*Points of Origin of Fires—*

| | |
|---|---|
| State Forest .... .... .... .... .... | 200 |
| Private Property . .... .... .... .... | 127 |
| Crown Lands .... .... .... .... .... | 71 |
| Total .... .... .... .... .... | 398 |

*Summary of Damage—*

| | acres |
|---|---|
| Slight .... .... .... .... .... .... | 116,502 |
| Medium .... .... .... .... .... .... | 52,262 |
| Severe .... .... .... .... .... .... | 307,215 |
| Total .... .... .... .... .... | 475,979 |

*Size of Fires—*

| | |
|---|---|
| Less than 1 acre .... .... .... .... | 151 |
| 1–5 acres .... .... .... .... .... | 71 |
| 6–10 acres .... .... .... .... .... | 28 |
| 11–20 acres .... .... .... .... .... | 15 |
| 21–50 acres .... .... .... .... .... | 24 |
| 51–100 acres .... .... .... .... .... | 19 |
| 101–200 acres .... .... .... .... .... | 13 |
| Over 200 acres .... .... .... .... | 77 |
| Total .... .... .... .... .... | 398 |

## Public Relations

Although some isolated instances of misunderstanding have occurred, co-operation between the Department and bush fire brigades continues to improve and there were some outstanding cases during the year under review.

In one instance in the karri region during February, when the Department was heavily committed at several serious fires, two bush fire brigades volunteered to stand by to answer a call anywhere in State Forest thereby considerably relieving the pressure on Departmental resources.

In another instance, at another fire in State Forest, Departmental fire-fighters were outnumbered four to one by local volunteer bush fire brigade personnel.

On the other side of the ledger, Departmental gangs were instrumental in saving a number of houses and orchards on private property, notably in the Kalamunda and Wanneroo areas.

Officers continue to encourage the formation of local fire control advisory committees and take an active place on them.

## 10. SILVICULTURE AND SOILS RESEARCH

### KARRI SILVICULTURE

### Flowering and Seeding

Systematic observations have continued on floral developments throughout the karri forest to facilitate the prediction of the time and location of flowering and the associated honey flow, and of the year, location and intensity of karri seed production. Such information is necessary firstly to enable full use to be made of the karri forest's honey potential and secondly to enable the requisite treatment to be given to the forest at the most favourable time to ensure the regeneration of cut over areas.

Flowering and seed production do not appear to run in any uniform pattern throughout the region. This is possibly due to unusually irregular weather conditions during the last two or three years, during which time light flowering at about six monthly intervals (autumn and spring) has occurred in different patches.

The time from bud inception to flowering varies from under one and a half to two and a half years. The first seed fall occurs from ten to twelve months after flowering with a proportion of the seed remaining in the tree for a further twelve months.

Karri seed fall in the Manjimup area varied between 40,000 and 180,000 acres. Adequate seed for regenerating karri in all cut over karri stands is forecast for Summer 1963 : half of these stands will have seed ready for dissemination (and regeneration) in 1962.

No general flowering year is forecast during the next three or four years at least.

Success of regeneration depends largely on the condition of the forest floor at the time of seed fall. Studies of this aspect emphasise the importance of the prior destruction of competing scrub. Some thirty per cent. of karri seedlings are found to occur on ash beds and fifty per cent. on surfaces distributed during logging operations.

### Blackwood (*Acacia melanoxylon*) Enrichment Planting

Experimental planting of blackwood was continued in the Pemberton district. Plants were raised locally in tubes and trays—1,300 from Victorian seed and 2,380 from the seed of elite Tasmanian trees.

It has been found that trees planted in freshly burnt country are eaten back by browsing animals attracted to the fresh growth resulting from the burn. On country burnt up to 18 months previously, establishment was satisfactory and browsing damage very much less. Amongst older scrub establishment was still successful but the plants while showing good height growth (increasing from two and a half to five feet in one year) carried only small etiolated tops.

Wide spacing of trees (up to one chain apart) has been used, as observations on small areas of blackwood many years ago have shown that by virtue of its ability to propagate by root suckers this species will within a few years become much more densely established. Results to date are particularly encouraging.

### Chemical Control of Growth on Tracks and Firebreaks

The encroachment of scrub growth over firelines and access tracks in the karri forest has always presented a serious maintenance problem and repeated hand slashing has been necessary.

Trials initiated in February, 1959, have been continued using a range of spraying materials, viz. :—

(1) The combined esters of 2.4.D and 2.4.5.T in water.
(2) Butyl ester of 2.4.5.T in water.
(3) Butyl ester of 2.4.5.T in distillate.
(4) Butyl ester of 2.4.5.T plus Diquat in water.
(5) Diquat in water.

Applied under pressure through spray jets from a moving tanker a penetration of from ten to twelve feet on either side of the track was obtained. This represents a much wider strip than can be hand slashed. The most effective spray was found to be the Butyl ester of 2.4.5.T at a concentration of 0·15 per cent. in water applied at a rate of not less than 75 gallons per acre. Such treatment costs approximately £6 per acre, *i.e.*, approximately half the cost of the hand slashing operation.

Two such treatments, with several months interval between them, are considered necessary.

### Cull Felling

A project of considerable silvicultural and utilisation advantage has recently been introduced in the karri forest. A cull-felling trial was initiated in September, 1960, at Pemberton and Shannon River. In a range of karri forest types and conditions the project has proved effective and workable.

In effect all trees of doubtful quality are proved and all useless trees with sufficient crown vigour to occupy effective growing space (*i.e.*, with more than 30 per cent. of normal crown) are felled to make way for a new crop. The Forests Department, through the mill as paying authority, recompenses the

fallers at current mill rates in respect of doubtful trees proved unacceptable and for the falling of culls on a sliding scale per foot of stump girth. Payments are made on the faller's record subject to spot check by the treemarker.

In practice, cull felling eliminates argument regarding quality in standing trees by the felling and proving of all trees marked, and it ensures that the karri forest, by the extension of logging to doubtful and cull trees, is left in the most productive condition following trade cutting. This is important to the future of the industry and the State.

Additional millable wood is recovered at a level of at least one load per acre and growing space available for regeneration is increased by at least 10 per cent. The next logical step in securing maximum productivity in the karri forest is the logging of marri for paper pulp and sawn timber. This aspect has been fully considered in planning for a pulping industry.

Cull felling is now accepted as a matter of course at Pemberton and Shannon River, but some problems of adaptation have occurred in respect to the different rates and conditions which apply in private industry. However, the proposal has been accepted in principle and trials have been initiated on the cutting sections of major companies.

On the basis of trial figures to date the cull felling project is self supporting in respect of costs per acre. Faller earnings are increased and the industry is subsidised to the extent that the Department is now paying for the falling of some doubtful trees previously proved by the mills.

## JARRAH SILVICULTURE

Due to the transfer of the Officer engaged in this section, jarrah research work has been considerably curtailed and no new experiments have been commenced. In addition, many of the existing experiments were either destroyed or seriously damaged by the Dwellingup fire.

Results of experiments to control jarrah coppice following thinning operations. Coppice has developed normally on the untreated stump to the left, while there is no evidence of coppice growth on the treated stump to the right after twelve months. Treatment used was 4 per cent. solution of 2.4.5.T ester in water, brushed on immediately after felling

The main points of interest in the year's work were :—

### Coppice Control in Jarrah Thinning

Trials to examine methods of controlling jarrah coppice following thinning have proved very successful following the application of a two per cent. solution of 2.4.5.T amine and ester respectively to the freshly cut stumps.

Various treatments were applied, namely, 2.4.5.T Ester, 2.4.5.T amine, and Ammonium Sulphamate in solution strengths of two per cent., four per cent. and six per cent. using teepol spreader in water. In each case 100 mls. of each solution were sprayed on each stump.

Freshly cut stumps under six inches in height were used for each trial of solution strength, separate trials being made for winter, spring, summer and autumn.

It was found that all treatments of amine and ester of 2.4.5.T in all seasons resulted in a complete prevention of coppice development except for two stumps treated with four per cent. ester in water applied in summer on which weak coppice developed. Ammonium Sulphamate was generally ineffective.

Using Diesoline as a carrier, a further trial of four per cent. ester also gave complete prevention of coppice development.

It was found that the best results were achieved when the stumps were cut as low as possible to allow the solution to be applied close to the root crown.

Application of these preventive measures should be carried out as soon after cutting as possible and solution should be applied to excess on each stump.

At present Dwellingup is using a two per cent. solution of 2.4.5.T ester or amine in water with brush application and a dye to indicate which stumps are treated, "Stanvac A" being used as a spreader. Results of this method are not yet available.

### Flowering and Seed Production in Jarrah

Seed fall was very light during the year, but a very heavy bud and flower drop occurred. Over 95 per cent. of the buds dropped had been attacked by an unidentified weevil.

There appears to have been very little jarrah seed dropped as a result of the Dwellingup fire as jarrah seeding germination is very scarce. On the other hand, marri has germinated profusely on the bare forest floor.

## PINE SILVICULTURE

### Tree Breeding

The Tree Breeding station at Wanneroo has now been completed and facilities for handling grafted material, pollen and scion material are much improved.

A further 251 grafts from 14 elite trees were planted out in the Neaves Road Arboretum during the year.

All elite trees discovered to date have been accurately located, measured, described and classified.

The total number of elite trees is :—

| | |
|---|---|
| *P. pinaster* .... .... .... .... .... .... | 80 |
| *P. brutia* .... .... .... .... .... .... | 5 |

Arrangements have now been made to establish a seed orchard near Wanneroo and it will be ready for planting in 1963.

### Germination Stimulation in *Pinus pinaster*

A further series of tests were carried out during the year, using polytheme bags as a packing medium for the stratified seed. These gave significally better results than calico bags packed in moist sawdust. With this treatment the final germination figure was 67 per cent. in 25 days as against 37 per cent. for the untreated control.

### Seed Orchard—Rottnest Island

An area of approximately six acres has been selected as a testing area for trees tolerant of highly calcareous soils.

Initial plantings with a variety of species were carried out during the year, but it appears that considerable nutritional problems are associated with these soils, and these will have to be overcome before trees can be established successfully.

## SOILS RESEARCH

### The Jarrah Forest

The staff position remained unchanged throughout the year, but following the Dwellingup fire several new projects dealing with the effect of fire on forests were commenced.

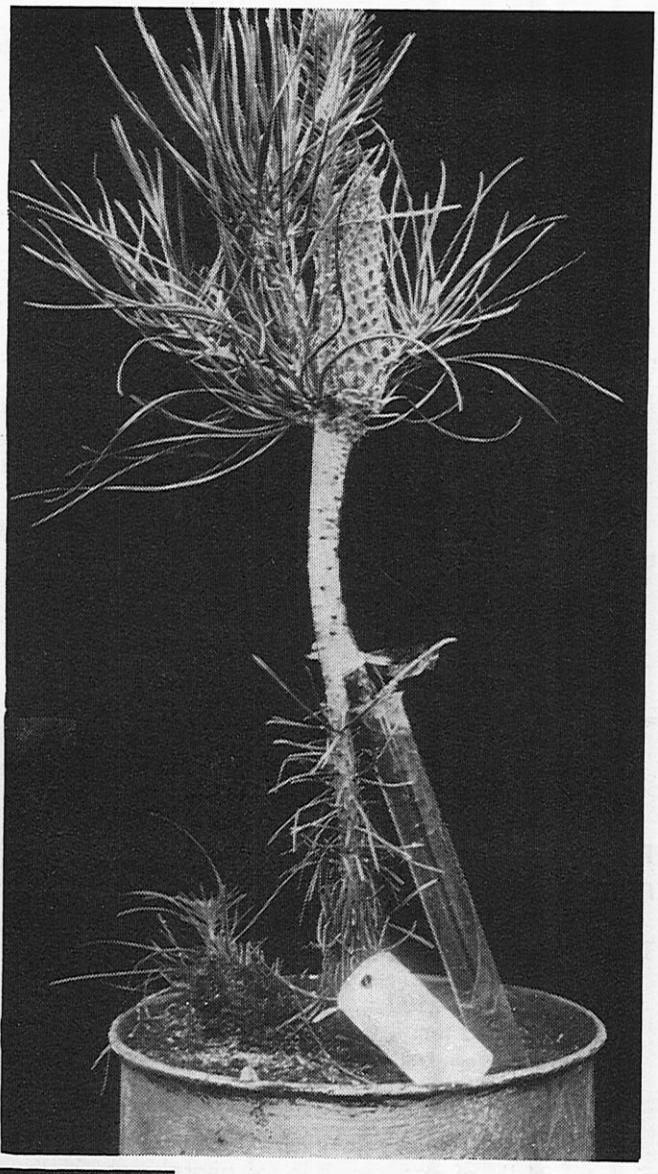
Research work was carried out along the following lines :—

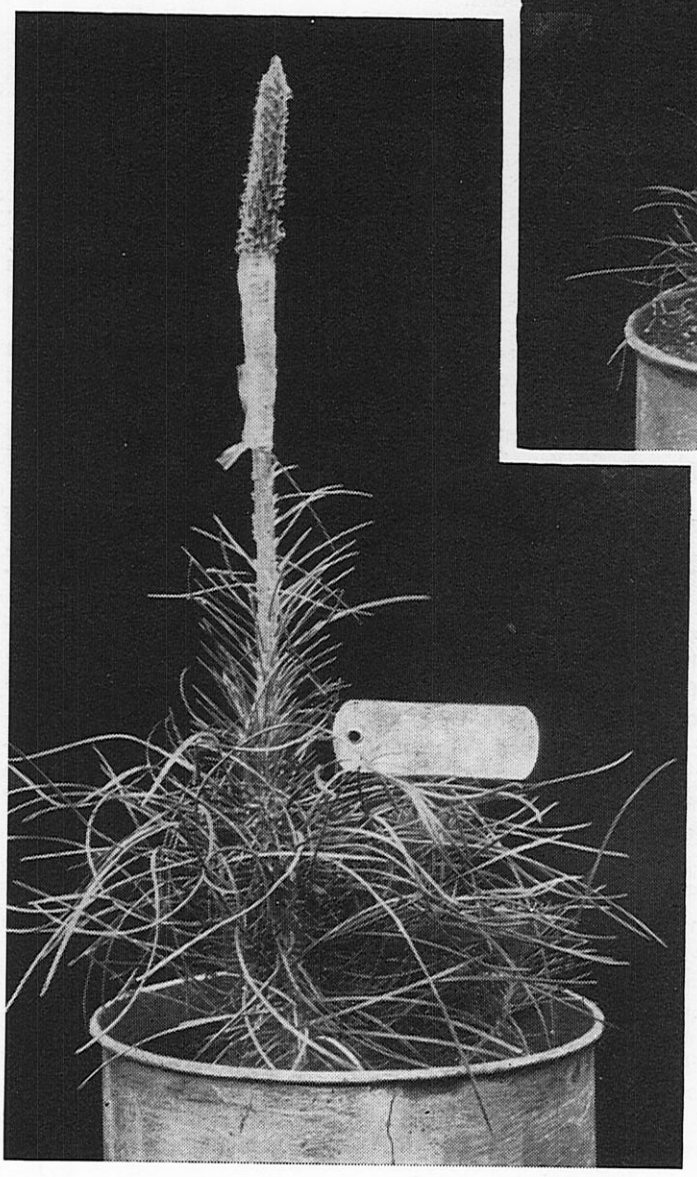
*Forest Litter Studies*

A brief investigation of jarrah litter components was carried out during the year.

The next important fraction of the litter analysed is considered to be the hot water solubles (33 per cent.), which appear to be identical with the material leached from jarrah litter by the winter rains during their first year on the forest floor.

Grafts of Pinus pinaster at Gnangara





Above—Bottle Graft

Left—Terminal Bud Graft

*The Effect of Fire on Forest Soils*

The paper " Ash Bed Effects in Western Australian Forest Soils " was published as a Departmental Bulletin during the year.

The major conclusions of this paper are summarised below :—

" The ash beds formed after heaps of forest slash are burnt, have a pronounced stimulating effect on the early development and growth of many Western Australian eucalypts.

These slash burns, which have temperatures of the order of 850 degrees centigrade, cause immediate and marked changes in the chemical properties of the soil.

Ash bed properties have been investigated on two forest types, *viz.*, karri and wandoo forests, covering a wide range of climatic and soil conditions.

The chemical changes in ashbeds are most pronounced in the first inch of soil and decrease rapidly with depth. The most important of these are increases in pH, total soluble salts, nutrients extracted by 2·5 per cent. acetic acid and the formation of calcium carbonate. By contrast, however, soil organic matter is reduced by the high temperature burns.

The stimulating effect of an ashbed is known to fall off rapidly with increasing age. Changes in the chemical properties of ashbed soils with time have been investigated.

It is shown that a period of at least 20 years is required before the ashbed soils return to their previous condition."

Following the Dwellingup fire in January, a new series of experiments were initiated to study further the effects of fire on jarrah forest soils.

The following lines are being investigated :—

(a) The effect of fire on the soil mesofauna.

(b) The availability of soil nutrients after a fire, using both chemical and pot culture techniques.

(c) The nitrogen cycle in burnt and unburnt soils.

(d) Microbiological activity in burnt and unburnt soils.

It is still too early to draw any conclusions from these experiments.

## Pine Plantations

*Forest Nursery Studies*

The data from the forest nursery fertility study was submitted for publication during the year. The results of this work are summarised below :—

" The oven dry weight production of *Pinus radiata* seedlings at Hamel Nursery varies between 4,580 and 9,190 pounds per acre. The variation is caused by both seasonal effects and the fertility status of the nursery bed.

Chemical analysis of the young pines indicated that the highest concentration of minerals is generally found in the pine needles, with nitrogen and potassium present in the greatest amounts.

The average annual uptake of nutrients from the nursery by the pines has amounted to 84 lb. of nitrogen, 8 lb. of phosphorus, 94 lb. of potzssium, 22 lb. of calcium and 14 lb. of magnesium per acre.

Continued nursery cropping has resulted in marked soil fertility changes, the chief of which are decreases in (1) organic carbon and nitrogen, amounting to 37,240 lb. and 1,796 lb. per acre respectively, and (2) exchangeable and readily soluble calcium, magnesium and potassium, with magnesium showing the most pronounced change.

The effect of pine cropping on the soils is briefly discussed and suggestions are made for improved nursery soil management ".

A detailed study was made on portion of the Nannup nursery, and it was shown that one of the major problems in this Nursery is the Blackwood River water, which was used for irrigating the young pines.

This water has a total soluble content of 186 grains per gallon, and has caused a large excess of soluble salts to accumulate in the soil during the summer, the soils examined having a mean total soluble content of 0·107 per cent. This combination of factors caused marked toxicity symptoms to appear in the pine crop and will have to be avoided in future crops.

*The Establishment of* P. radiata *on Laterite Soils*

During the year several officers from the C.S.I.R.O. Division of Soils, Adelaide, visited the State in connection with this project and some further lines of Research have been commenced.

Work was continued along the following lines :—

(a) *Soil Moisture Studies.*—The monthly soil sampling to determine variations in moisture content over a range of site qualities was continued until a year's results had been obtained. The data showed that generally the better pine sites had a more favourable soil moisture regime, and had ample sub-soil moisture reserves to withstand the summer drought.

The weekly irrigation of the plot (equivalent to three inches of rain per week) was continued throughout the summer at Gleneagle, but the weekly watering does not appear to have benefited the pines.

(b) *Tree Injection Studies.*—Observations in the tree injection experiments mentioned in the previous report were continued throughout the year. All trees recovered from the needle scorch on the lower limbs, but no increase in growth or vigour was observed as a result of the injections.

(c) *Soil Fertility Experiments.*—The field trial near Carinyah was continued. The area was top-dressed with superphosphate (one bag per acre) and the second series of plots put down under lupins and clover.

(d) *Soil Phosphorus and Nitrogen Studies.*—A series of transects have been laid out at Keenan plantation, and detailed soil and litter sampling has been carried out on these areas. The aim of this study is to assess the nutrient status of the different pine soils in relation to nutrient uptaken and tree growth.

### Soil Fertility

Detailed chemical analysis of soils from 14 different arboreta was an important part of the work at the Research Station.

These arboreta are mainly situated in the wheat belt area of the State, being located at Miling, Ballidu, Shackleton, Mukinbudin, Koorda, Yelbeni and Bencubbin.

## 11. LIBRARY

Despite the absence of a librarian for over two months, library services continued to expand with the number of inquiries increasing 20 per cent. on the previous year.

The resources of the library have been improved by the purchase of a photocopying unit by the Department. The cost of reproduction by this means is half that charged by outside services.

The transfer to the new premises was smoothly accomplished. Shelving space remains the same, and although the floor area is less than in the old quarters, it is more economically and attractively arranged. New blondewood furniture is in keeping with modern surroundings.

Advice has been given to several Government Departments on the establishment and organisation of their technical libraries.

## 12. FOREST ECONOMICS

### Log Volumes by Land Tenure

The histogram (Fig. 1) shows clearly that 23 per cent. of the total production of timber in W.A. still comes from private forest areas. This is a steadily declining source of supply.

On the other hand State Forest is producing only a little more than half of the State's total requirements, the remaining volume coming from Vacant Crown lands and from alienated areas on which the timber has been reserved to the Crown.

Probably no attempt is being made to replace the native forest being removed from private property, or vacant Crown lands. This must be recognised as a vanishing source of supply with the inference that the demand on State Forest must increase steadily in future.

There is, however, a limit to the sustained yield from existing areas of State Forest and to cope with the demand from our steadily increasing population, every effort must be made to dedicate to timber production in perpetuity, every acre of vacant Crown land still carrying good quality forests. Apart from action along these lines, the only means of increasing the State's timber potential is the maintenance of an adequate pine planting programme. The alternative is importation of a large portion of our requirements in the future—at higher prices, insecurity of supplies, and at considerable cost to our overseas trade balance.

Figures given in the Annual Report, 1959, of the Forestry and Timber Bureau indicate that Western Australia is not the only State facing the problem of reduced log production from Private Property.

Referring to actual sawn production, excluding sleepers, the Report states—"Of this total, the overall proportion from private property was 32·9 per cent., as compared with 33·7 per cent., in 1958 and 35·5 per cent., in 1957, a decline not without significance in relation to Australia's growing timber requirements and the need for increased forest reservation in face of her accelerating industrial expansion."

### Sleeper Production and Distribution

Fig. 2 clearly indicates the effect of the depression, the 1939-45 war years and the subsequent timber export control, on the production and distribution of sleepers.

Detailed figures are not available for the period prior to 1932, or for the war years. It is of interest, however, to compare export figures for three significant periods since 1932. These may be briefly described as follows :—

(1) The Pre-War Period—1932–39, inclusive.

(2) The Timber Export Control Period—1946–57, inclusive.

(3) The Free Trade Period—1958–60, inclusive.

## LOG VOLUMES BY LAND TENURE
### Percentage of Total Log Production

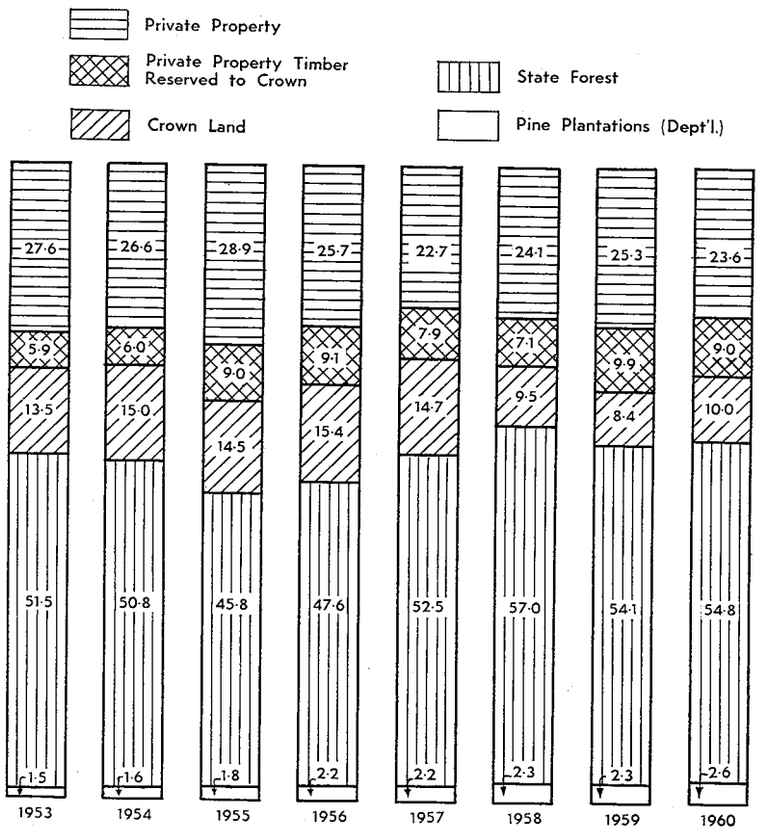



Fig. 1

## SLEEPER PRODUCTION AND DISTRIBUTION
### 1926 – 1960

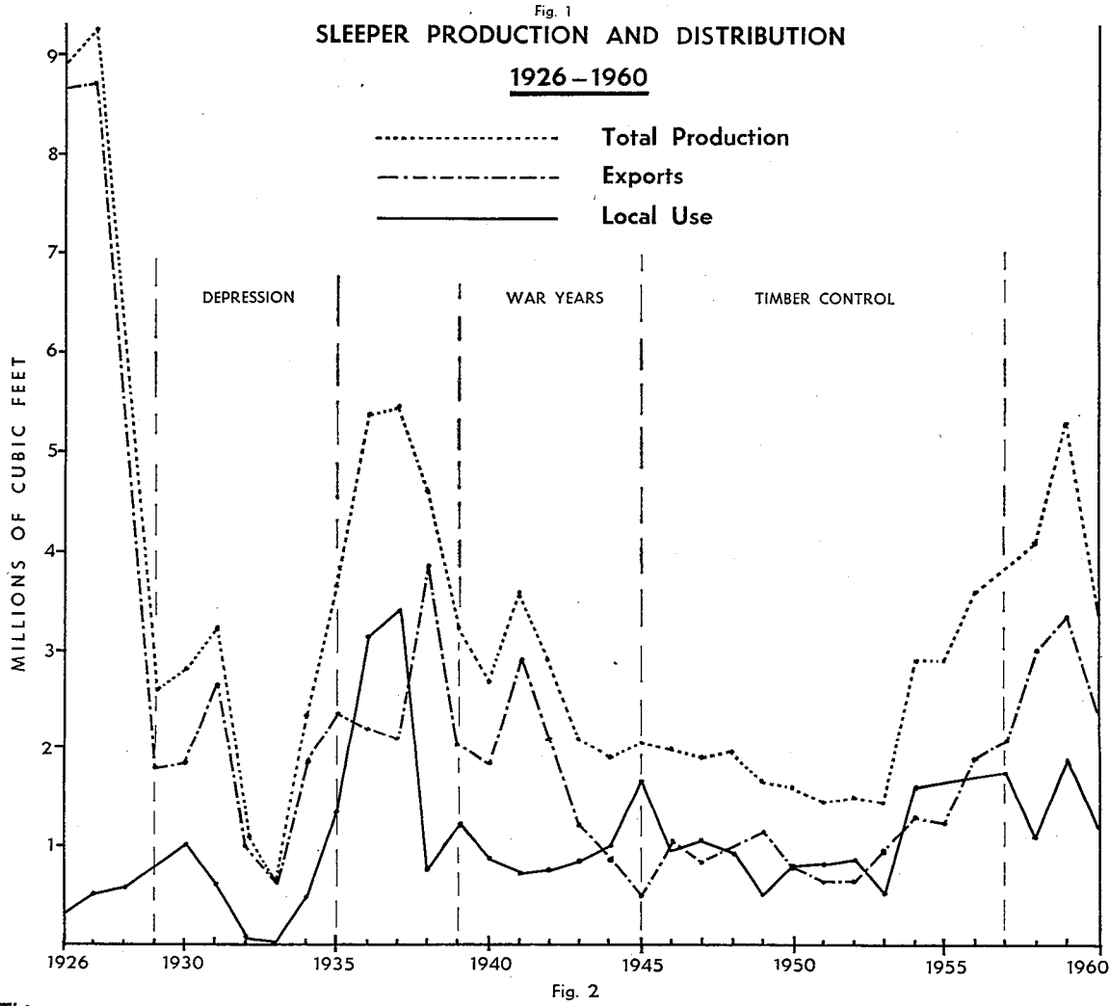



Fig. 2

The table below summarises total and average yearly exports of sleepers to the Commonwealth and other States and Overseas, under the three groupings listed above—in units of 1,000 cubic feet :—

| Destination | 1932–39 | | 1946–57 | | 1958–60 | |
|---|---|---|---|---|---|---|
| | Total | Yearly Average | Total | Yearly Average | Total | Yearly Average |
| Interstate | 2,189 | 273 | 9,077 | 756 | 1,653 | 551 |
| Overseas | 13,778 | 1,722 | 4,568 | 381 | 7,160 | 2,387 |
| Total | 15,967 | .... | 13,645 | .... | 8,813 | .... |
| Average | .... | 1,995 | .... | 1,137 | .... | 2,938 |

The figures show that under timber export control average yearly Overseas exports for the 12 years were only 22 per cent. of those in the eight pre-war years. The worst year was 1953, when only 4,000 cubic feet was exported to other countries. The best year, 1957, showed a figure of 1,122,000 cubic feet, of which 667,000 went to New Zealand.

Although only three years have been considered since the lifting of export restrictions (July, 1957) there are hopeful signs that the Overseas sleeper trade will regain its previous buoyancy.

The major Overseas buyers for the three periods were as follows :—

THOUSANDS OF CUBIC FEET

| 1932–39 | | 1946–57 | | 1958–60 | |
|---|---|---|---|---|---|
| Country | Quantity | Country | Quantity | Country | Quantity |
| South Africa | 3,276 | New Zealand | 1,388 | India | 2,502 |
| China | 2,326 | South Africa | 938 | New Zealand | 1,494 |
| Egypt | 2,177 | Ceylon | 695 | United Kingdom | 954 |
| Ceylon | 2,153 | Iraq | 449 | Pakistan | 688 |
| Iraq | 1,851 | Malaya | 352 | South Africa | 636 |
| New Zealand | 666 | United Kingdom | 274 | Iraq | 582 |
| Others (6) | 1,329 | Others (3) | 472 | Others (5) | 304 |

China, Egypt—except for 13,000 cu. ft. in 1956—Portuguese East Africa and Aden have placed no orders since the war years. On the other hand, India—88,000 cu. ft. in 1936—took no interest until 1958, while Pakistan became a new customer in 1959.

The Union of South Africa has been the most consistent purchaser, followed by Ceylon—now replaced by New Zealand—and Iraq. Persia (Iran) and Mauritius have sent fairly regular, but small orders and the spasmodic buying of the United Kingdom shows quite a marked improvement in regularity and size of orders since 1957.

## Value of Timber Exports and Imports

*Exports*

Following the boom period of the 1920's the value of exports fell sharply during the depression but commenced to rise steadily during the pre-war years due to increased sleeper orders from South Africa, Ceylon, China, Egypt and Iraq. The peak in 1938 is accounted for largely by the supply of 1,200,000 cubic feet of sleepers to Iraq. (Fig. 3).

Trade was depressed during World War II and the decade immediately following. With the relaxation of export restrictions and an extensive overseas sales campaign by the industry, some export markets were recaptured and new avenues of trade developed.

In 1953, export figures for karri were first segregated in statistical returns. Up to 1956 the United Kingdom was the biggest overseas buyer of karri, but has since lost its position to New Zealand. In 1959 and 1960 the Union of South Africa, Netherlands and Germany imported more karri than the United Kingdom.

A feature of the post-timber control period was the Indian order for sleepers, which accounts largely for the high peak in export values in 1959.

*Imports*

Except for the depression and war years, annual imports remained reasonably steady around the £250,000 mark. After the war, the value rose to a peak in 1952, when plywood imports were some £200,000 above the normal annual figure. A large parcel of plywood from Japan, valued at £155,000 contributed largely to this rise.

In recent years, value of imports has not altered greatly. It is of interest, however, to note that the value of Borneo timbers (round and sawn) imported into Western Australia has risen from nil in 1946, to £28,000 in 1950, £120,000 in 1955 and £295,000 in 1960. On the other hand, the corresponding figures for export of veneer and plywood—nearly all to Commonwealth States—are nil, £900, £14,000 and £280,000.

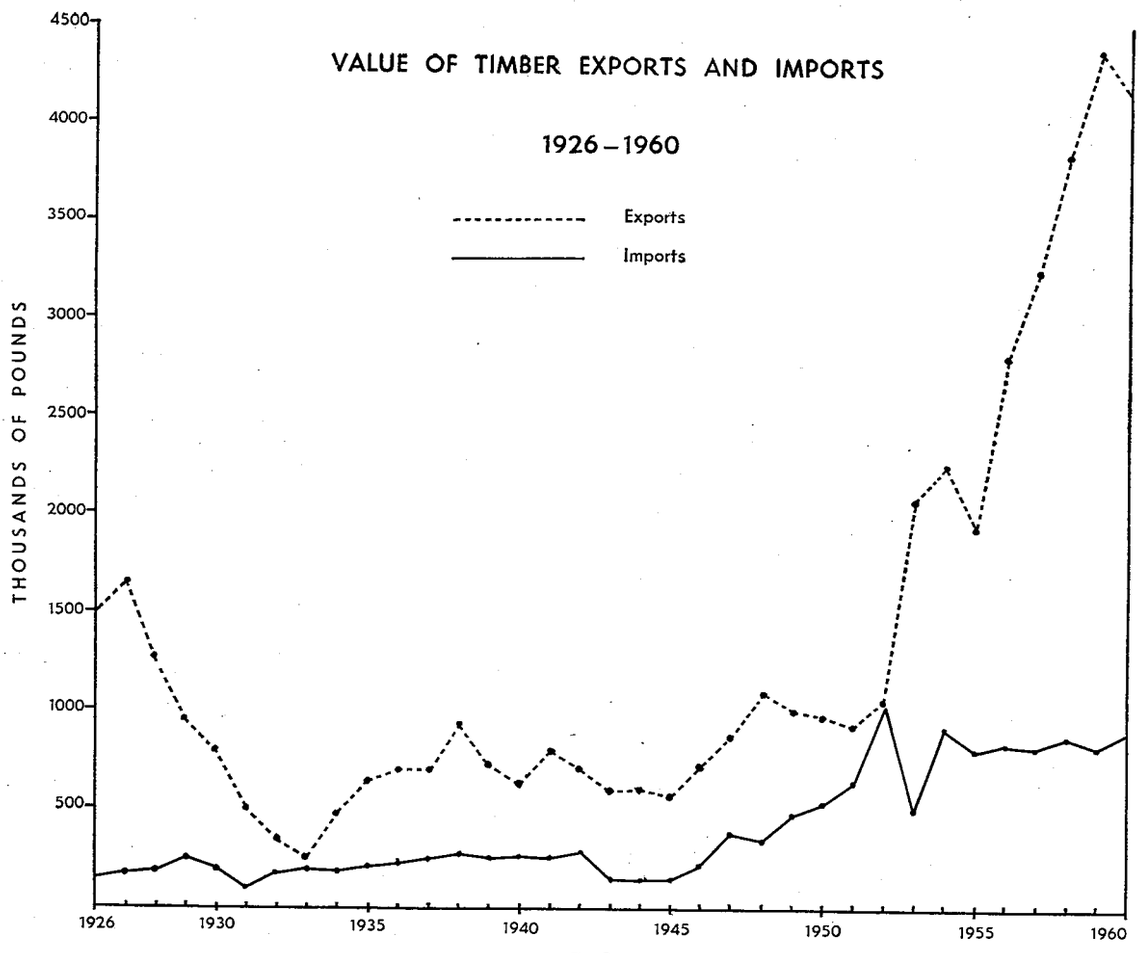

VALUE OF TIMBER EXPORTS AND IMPORTS
1926 – 1960
Exports
Imports
THOUSANDS OF POUNDS
4500
4000
3500
3000
2500
2000
1500
1000
500
1926
1930
1935
1940
1945
1950
1955
1960

Fig. 3

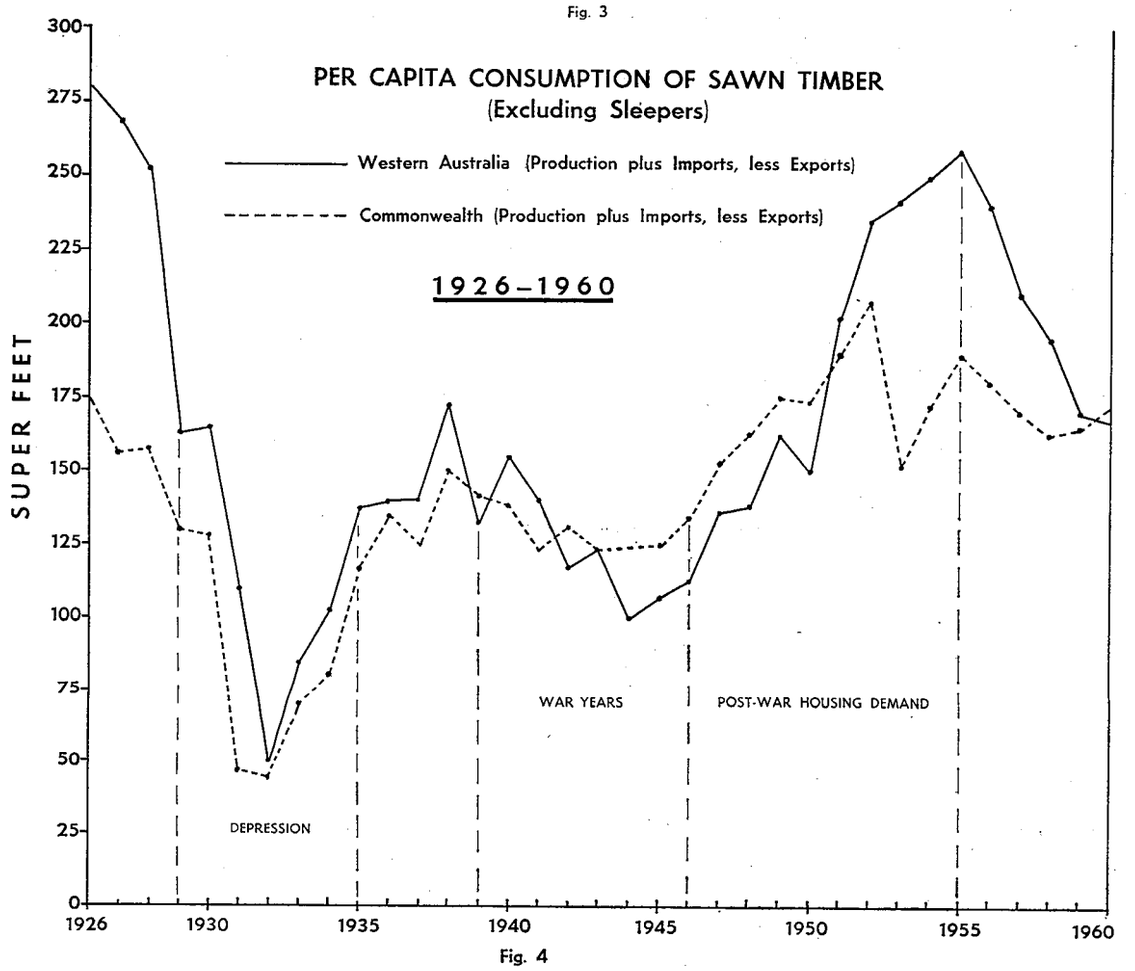

PER CAPITA CONSUMPTION OF SAWN TIMBER
(Excluding Sleepers)
Western Australia (Production plus Imports, less Exports)
Commonwealth (Production plus Imports, less Exports)
1926 – 1960
SUPER FEET
300
275
250
225
200
175
150
125
100
75
50
25
0
DEPRESSION
WAR YEARS
POST-WAR HOUSING DEMAND
1926
1930
1935
1940
1945
1950
1955
1960

Fig. 4

## Per Capita Consumption of Sawn Timber

Fig. 4 depicts the effect of the depression, the war years and the post-war housing demand on the per capita consumption of sawn timber for the Commonwealth and Western Australia.

Despite increased industrialisation and the use of substitutes for timber, per capita consumption for both the Commonwealth and Western Australia, has not fallen over the years and in both cases, is at present higher than the immediate pre-war figure.

Western Australia uses far less imported timber per person than the average for the Commonwealth. Since the war, the proportion of imports to local use has been—

| | per cent. |
|---|---|
| Western Australia .... .... .... .... | 5½ |
| Commonwealth .... .... .... .... .... | 18 |

In 1960 the respective figures were :

| | per cent. |
|---|---|
| Western Australia .... .... .... .... | 10 |
| Commonwealth .... .... .... .... .... | 21 |

## The Performance of Sawmills in Relation to Capacity

In 1960–61, general purpose hardwood mills (under permit or license) milled 70 per cent. of the State's total log production of 48,571,550 cubic feet. The corresponding figures for 1959–60 were 68 per cent. and 50,899,600 cubic feet.

In order to compare the performances of sawmills of varying capacity, figures were extracted for 53, grouped as follows :—

Major Mills (18)—Average log intake over 600,000 cubic feet per annum.

Medium-size Mills (22)—Average log intake 300,000–600,000 cubic feet per annum.

Small Mills (13)—Average log intake 60,000–300,000 cubic feet per annum.

The following table sets out in summarised form, the results obtained over the last two years :—

| Information | Mill Capacity | | | | | |
|---|---|---|---|---|---|---|
| | Major Mills | | Medium-size Mills | | Small Mills | |
| | 1959–60 | 1960–61 | 1959–60 | 1960–61 | 1959–60 | 1960–61 |
| Logs Through Mills—total ('000's of cu. ft.) .... .... | 22,985 | 22,516 | 8,742 | 8,235 | 1,654 | 1,648 |
| „ „ „ average ( „ „ „) .... .... | 1,276 | 1,251 | 397 | 374 | 127 | 128 |
| Sawn Output—total ('000's of cu. ft.) .... .... .... | 7,226 | 7,041 | 2,963 | 2,817 | 522 | 517 |
| „ „ —average ( „ „ „) .... .... .... | 401 | 363 | 134 | 128 | 40 | 39 |
| Recovery per cent.—weighted average .... .... .... | 31·44 | 31·27 | 33·90 | 34·21 | 31·73 | 31·41 |
| „ „ range .... .... .... .... .... .... | 38·4–27·8 | 39·2–28·4 | 49·6–26·5 | 46·0–28·5 | 45·9–25·7 | 37·9–25·2 |
| *Input per man-day—weighted average (cu. ft.) .... .... | 99 | 97 | 91 | 90 | 76 | 87 |
| „ „ „ —range (cu. ft.) .... .... .... .... | 129–81 | 124–75 | 156–58 | 162–63 | 152–61 | 124–57 |
| *Sawn Output per man-day—weighted average (cu. ft.) .... | 31·1 | 30·5 | 30·8 | 30·8 | 27·1 | 27·3 |
| „ „ „ „ „ —range (cu. ft.) .... .... | 41·8–22·8 | 40·2–21·8 | 54·5–18·3 | 55·6–20·7 | 53·7–18·3 | 41·9–17·6 |

* Based on the number of men under the mill roof and on the mill landing. Assumes every man works 8 hours per day.

## Land Use Studies in Western Australia

The State of Western Australia has an area of 624 million acres, but only 16 million acres receive more than 25 inches of rain per annum. Economic forestry for timber production is limited to this small area and at present only slightly more than 4 million acres are dedicated to the permanent production of timber. Even if all remaining areas of unalienated land suitable for timber production were dedicated the total area of permanent forest country would not exceed 5 million acres.

Agriculture, on the other hand, has vast areas into which it could expand and economically operate below the 25 inch isohyet. Even above the 25 inch isohyet there is considerable scope for expansion in the large areas of undeveloped alienated land.

Nevertheless, constant pressure from agricultural interests exists for the release of already dedicated forest country despite the Forests Department's strenuous opposition to further forest depletion. Moreover, agricultural interests have offered considerable opposition to the dedication for forestry of further suitable areas of vacant Crown land.

As the work of the Agricultural Economics Section of the University of Western Australia expanded and their investigations extended to farming above the 25 inch isohyet (mostly dairy farming), it became obvious that much of the farming was far from profitable. Fortunately there was close liaison between this section and the Forests Department and it was mutually decided to carry out a detailed investigation into the economics of forestry in Western Australia and to compare it with the economics of agriculture as practiced in the same areas. For the purpose of supplying the forestry and timber

industry data necessary, a Forests Department officer was seconded to the University for twelve months to assist in the investigation. It was intended that the forester in addition to supplying the technical and economic data on forests and forest products would become familiar with comparative budgeting, programming techniques and economic decision making.

The agricultural economic investigation was carried out by a senior post-graduate agricultural economics research student and an economic statistician under the direction of Dr. H. P. Schapper, Reader-in-Charge of the Agricultural Economics Section.

The twelve month study was recently completed and a report is in course of preparation.

## 13. EDUCATION AND PUBLICITY

### Education

One conference of senior professional staff was held during the year at Perth.

A short duration school on Air Photo Interpretation for Junior professional officers and senior officers of the General Staff was held at divisional centres.

Following the completion of the previous school, a further seven trainees commenced a two year course of instruction at Pemberton. The change of venue was necessitated by the rebuilding programme at Dwellingup.

A series of lectures on Forestry were delivered each week throughout the year at the Perth Technical College to 4th year Engineering-Surveying students and a short course of lectures was given to Town Planning students.

Enrolments for the Forestry course at the University of Western Australia and the Australian Forestry School, Canberra, have been maintained. The present position is as follows :—

| | Commonwealth Scholarship | State Scholarship | Independent |
|---|---|---|---|
| 4th Year—Canberra—To graduate, 1961 .... | 3 | .... | .... |
| 3rd Year—Canberra .... .... .... .... | 2 | 3 | .... |
| 2nd Year—University of W.A. .... .... | 2 | .... | .... |
| 1st Year—University of W.A. .... .... .... | 1 | .... | .... |

### Publicity

The following Bulletin's were published during the year :—

"The Development of Jarrah Regeneration," by A. C. van Noort.

"Variation in the Growth Rate and Quality of *Pinus pinaster Ait* in Western Australia," by E. R. Hopkins.

"The Fertiliser Factor in *Pinus pinaster Ait* Plantations on Sandy Soils of the Swan Coastal Plain, Western Australia," by E. R. Hopkins.

In addition, Bulletins 1, 3 and 4 of the Forester's Manual were revised and re-written during the year.

Departmental exhibits were again displayed during Timber Week activities in Perth and Manjimup and for the Australian Inland Mission at Kalgoorlie.

Lectures and talks were given to various Societies and Public Bodies by Senior Officers of the Department during the year. The Utilisation Officer and staff gave seven lectures to various groups.

## 14. TIMBER INDUSTRY REGULATION ACT, 1926-1950

The number of mills registered under the provisions of the Act at the close of the year totalled 238 (131 Crown Land, 107 Private Property).

The average number of persons employed on timber holdings each month throughout the year was 4,790 compared with 5,037 last year.

The District and Workman's Inspectors made 1,707 inspections of timber holdings.

There were 1,146 notifiable accidents, two of which were fatal.

The number of accidents per 100 persons employed was 23·93 compared with 21·04 for last year and 15·61 the year before.

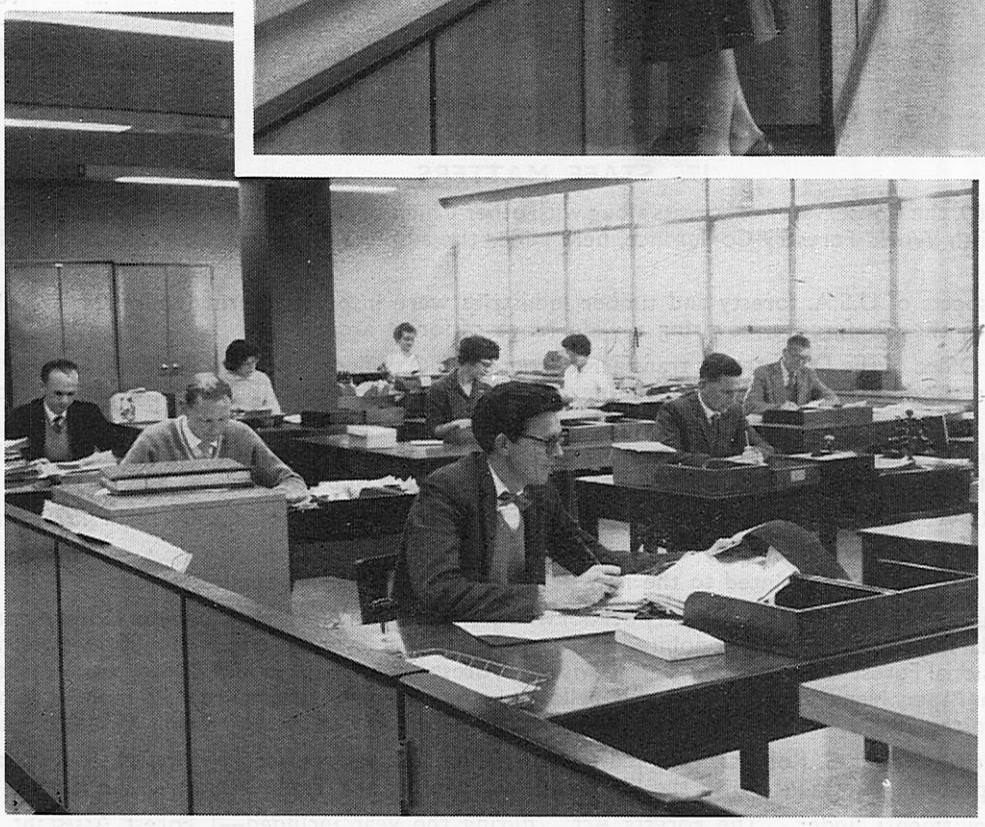
The cost to the Forests Department of administering the Timber Industry Regulation Act for the year ending 30th June, 1961, was as follows :—

| | £ |
|---|---|
| Salaries .... .... .... .... .... .... | 2,620 |
| Mileage, travelling allowances and sundries .... | 1,945 |
| Total .... .... .... .... .... | £4,565 |

## 15. FOREST OFFENCES

Sixty-three forest offences were reported during the year. Legal proceedings were taken in four cases and all resulted in conviction. Fines and costs amounted to £50 and £12 17s., respectively.

Warnings were issued in 30 instances and the remainder 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 £531 12s. 7d.



On the 31st May, 1961, the Head Office of the Department transferred from the Treasury Building to the 3rd and 4th floors of the new Rural and Industries Bank, 54–58 Barrack Street, Perth. (Phone 23 2011.) Office space and lighting are considerably improved as shown in these views of the interiors

## 16. EMPLOYMENT IN FORESTRY AND TIMBER INDUSTRY

The number of wage earners directly employed in Forestry and the Timber Industry was estimated at 6,476, made up as follows :—

| | | |
|---|---|---|
| *Forestry—* | | |
| Professional Officers | 36 | |
| General Field Staff | 139 | |
| Clerical and Drafting | 75 | |
| Wages employees | 666 | |
| Contractors and employees (estimated) | 20 | |
| | | 936 |
| *Timber Industry* | | |
| Sawmill employees including bushworkers at 31st December, 1960* | | 4,790 |
| Firewood cutters, pole getters, etc., on permits | | 477 |
| Goldfields firewood cutters, contractors and woodline employees and carters | | 76 |
| Sandalwood workers | | 37 |
| Apiarists, estimated (420 sites are registered) | | 160 |
| Total | | 6,476 |

* Includes employees of registered sawmills.

## 17. STAFF MATTERS

During 1960, the Conservator of Forests along with other Chiefs of Australian Forestry Departments, attended the fifth World Forestry Conference, held under the auspices of the F.A.O. at Seattle, Washington, U.S.A.

Various aspects of U.S.A. foresty and timber industries were inspected during tours arranged in connection with the Conference, covering a wide range of forest areas.

The Head Office of the Department transferred from the fourth floor, Treasury Building, Cathedral Avenue, to the third and fourth floors of the new Rural & Industries Bank Buildings, 54–58 Barrack Street, Perth. The move was completed on the 31st May, 1961.

The Accounts Branch, formerly a branch of the Lands Department became the Accounts Branch, Forests Department, with the appointment of an Accountant and a Sub-Accountant.

Mr. W. R. Wallace who graduated from the Australian Forestry School, Canberra in 1928, was promoted to the position of Deputy Conservator.

Mr. P. H. Barrett was appointed to the new position of Utilisation Economics Officer.

Two graduates of the Australian Forestry School who were granted Western Australian Government Forestry Scholarships in 1957 were appointed to the permanent staff under the Public Service Act as Assistant Divisional Forest Officers. Assistant Divisional Forest Officer E. R. Hopkins, who was awarded the Australian Paper Manufacturers Research Fellowship in Forestry, commenced 12 months leave without pay on the 29th July, 1960, to work at the School of Forestry of the University of Melbourne.

The Librarian, Miss L. S. Roberts, resigned to be married and was replaced by Miss M. E. Redman who had had previous experience with the library of the Forestry and Timber Bureau, Canberra.

New appointments under "The Forests Act" during the year included—1 Forest Assistant, 1 Forest Guard, 3 Forest Assessors, Grade II and 1 Forest Ranger, Grade I. Promotion included 5 Trainees to Forest Guards, 1 Clerical Assistant to Forest Assistant, 2 officers to Assistant Foresters, Class 5, and 2 officers to Forester, Class 6. District Forester J. C. Usher and Forest Assistant E. A. Field reached the retiring age and Assistant Forester C. H. Robins retires on the grounds of ill health. A District Forester, and an Engineering Draftsman were reclassified.

It is with deep regret that the death of Drafting Assistant H. A. Wilson, who passed away on 23rd February, 1961, is recorded.

## APPENDIX 1A

*Statement of Revenue and Expenditure of the Consolidated Revenue Fund for the Year ended 30th June, 1961*

| 1959–60 | Revenue | | 1960—61 | |
|---|---|---|---|---|
| £ | | £ | £ | £ |
| | *Royalties*— | | | |
| 733,839 | Logs | 736,793 | | |
| 48,604 | Sleepers | 35,452 | | |
| 2,237 | Sawn Timber | 2,009 | | |
| | | | 774,254 | |
| 23,020 | Piles and Poles | 23,431 | | |
| 23,341 | Mining Timber | 15,489 | | |
| 10,425 | Firewood | 12,728 | | |
| 2,479 | Posts | 3,114 | | |
| 4,457 | Sandalwood | 8,500 | | |
| 1,788 | Miscellaneous | 1,175 | | |
| | | | 64,437 | |
| | | | | 838,691 |
| | *Sales*— | | | |
| 91,683 | *Pine* Logs | 105,795 | | |
| 63,305 | Sawn Timber | 68,329 | | |
| | | | 174,124 | |
| 56,565 | *Hardwood* Logs | 51,346 | | |
| 26,983 | Sawn Timber | 27,973 | | |
| 4,740 | Piles and Poles | 5,934 | | |
| | | | 85,253 | |
| 81,916 | Other Forest Produce, Seeds and Trees ex Nurseries | | 113,792 | |
| | | | | 373,169 |
| | *Fees, etc.*— | | | |
| 24,216 | Inspection Fees | 22,850 | | |
| 13,732 | Rents, Leases | 13,680 | | |
| 1,875 | Miscellaneous | 1,925 | | |
| | | | | 38,455 |
| | *Recoupable Projects*— | | | |
| 20,238 | Specific Roads | 22,683 | | |
| 2,861 | Other | 1,532 | | |
| | | | | 24,215 |
| 1,238,304 | | | | 1,274,530 |

| 1959–60 | Expenditure | 1960–61 | |
|---|---|---|---|
| £ | | £ | £ |
| 145,297 | Salaries | | 151,959 |
| 27,724 | Incidentals | | 29,507 |
| 24,969 | Refunds of Royalties to Settlers | | 17,218 |
| | Direct Conversion— | | |
| 100,517 | Pine | 122,597 | |
| 72,392 | Hardwood | 62,762 | |
| | | | 185,359 |
| 1,285 | Timber Industry Regulations | | 1,945 |
| 25,528 | Recoupable Projects | | 23,744 |
| 6,988 | Forests Improvement, Collie Area | | |
| | | | 409,732 |
| 404,700 | | | |
| 833,604 | Excess Revenue over Expenditure | | 864,798 |
| 1,238,304 | | | 1,274,530 |

## APPENDIX 1B

*Forests Improvement and Reforestation Fund Account for the Year ended 30th June, 1961*

| 1959–60 | | 1960–61 | 1959–60 | | 1960–61 |
|---|---|---|---|---|---|
| £ | | £ | £ | | £ |
| 235,702 | Balance at 1st July | 165,210 | 971,287 | Expenditure | 1,025,671 |
| 758,420 | Nine-Tenths Net Revenue | 780,263 | 48,005 | *Less* Recoups | 35,680 |
| 18,370 | Direct Credits | 18,665 | 923,282 | | 989,991 |
| 76,000 | Federal Aid Road Grant | 76,000 | 165,210 | Balance at 30th June | 50,147 |
| 1,088,492 | | 1,040,138 | 1,088,492 | | 1,040,138 |

*Detail of Expenditure by Divisions*

| | £ | £ |
|---|---|---|
| Division 1.—Busselton | 16,553 | |
| Division 2.—Mundaring | 42,224 | |
| Division 3.—Dwellingup | 93,092 | |
| Division 4.—Collie | 55,237 | |
| Division 5.—Kirup | 49,622 | |
| Division 6.—Manjimup | 82,371 | |
| Division 7.—Narrogin-Dryandra | 8,729 | |
| Division 8.—Gleneagle | 34,691 | |
| Division 9.—Metropolitan | | |
| Division 10.—Harvey | 39,485 | |
| Division 11.—Pemberton | 76,784 | |
| Division 12.—Nannup | 81,007 | |
| Division 13.—Shannon River | 44,740 | |
| Division 14.—Kalgoorlie and Esperance | 2,909 | |
| Division 15.—Wanneroo-Gnangara | 121 | |
| Division 16.—Mt. Barker | 186 | |
| | | 627,751 |

## APPENDIX 1B—*continued*

| | | |
|---|---|---|
| Head Office Expenditure— | | |
| Vehicles and Equipment | 91,461 | |
| Mechanical Equipment | 15,415 | |
| Fire Equipment | 12,116 | |
| Training of Staff | 2,026 | |
| Research | 6,574 | |
| Drafting | 2,865 | |
| Salaries and Allowances | 170,446 | |
| Incidentals | 11,394 | |
| Insurances | 28,780 | |
| Special Surveys | 2,960 | |
| Communications | 8,928 | |
| Purchase of Land | 10,637 | |
| Como Headquarters | 13,176 | |
| Wundowie Firewood Project | 7,028 | |
| Pay Roll Tax | 14,114 | |
| | | 397,920 |
| Total Reforestation Expenditure | | 1,025,671 |
| *Less* Miscellaneous Recoups of Overheads, Refunds, Sale of Equipment, etc. | | 35,680 |
| | | £989,991 |

## APPENDIX 1C

*Statement of General Loan Fund Expenditure for the Year ended 30th June, 1961*

| *Expenditure on Pine Plantations*— | £ | | £ |
|---|---|---|---|
| Keenan | 7,132 | By General Loan Fund | 100,000 |
| Ludlow | 14,778 | | |
| Applecross | 7,882 | | |
| Collier | 2,129 | | |
| Gnangara | 31,852 | | |
| Scaddan | 24 | | |
| Harvey Weir | 4,968 | | |
| Myalup | 18,769 | | |
| Hamel | 635 | | |
| Wanneroo | 11,831 | | |
| | £100,000 | | £100,000 |

## APPENDIX 1D

*Statement of Afforestation Expenditure for Year ended 30th June, 1961*

| *Expenditure* | £ | £ | *Source of Funds* | £ | £ |
|---|---|---|---|---|---|
| Plantation Establishment | 124,737 | | General Loan Fund | | 100,000 |
| Plantation Maintenance | 63,164 | | Reforestation Fund | | 86,622 |
| | | 187,901 | Sales of Pine— | | |
| Buildings and Maintenance | 14,095 | | Logs | 105,792 | |
| Roads and Maintenance | 6,368 | | Sawn Timber | 68,332 | |
| Fire Prevention and Suppression | 9,075 | | | | 174,124 |
| | | 29,538 | | | |
| Research | 2,043 | | | | |
| Surveys and Plans | 283 | | | | |
| Essential Service and Communications | 6,287 | | | | |
| Administration | 12,098 | | | | |
| | | 20,711 | | | |
| Direct Conversion of Pine | 122,597 | | | | |
| | £360,746 | | | | £360,746 |

## APPENDIX 2A

*Exports from Western Australia of Timber, Tanning Substances and Essential Oils for Year ended 30th June, 1961*

| Item No. | Item and Destination | Quantity | Value |
|---|---|---|---|
| | | | £ |
| 63000 | *Wicker, Bamboo and Cane and all Manufactures thereof, N.E.I.*—* | cub. ft. | |
| | Australian States : | | |
| | Northern Territory | .... | 418 |
| | **TIMBER** | | |
| | *Undressed Timber, N.E.I.*—* | | |
| | *Sleepers :* | | |
| 63521 | *Jarrah :* | | |
| | United Kingdom | 268,703 | 189,778 |
| | Christmas Island | 37 | 59 |
| | Ceylon | 8 | 7 |
| | Malaya | 833 | 501 |
| | Mauritius | 18,266 | 9,950 |
| | New Zealand | 651,261 | 366,082 |
| | South Africa | 33,727 | 17,797 |
| | Greece | 5 | 7 |
| | Iran | 18 | 13 |
| | Iraq | 354,131 | 262,854 |
| | Italy | 18 | 14 |
| | India (Portuguese) | 7,500 | 5,531 |
| | Turkey | 18 | 12 |
| | Australian States : | | |
| | Victoria | 4,500 | 2,506 |
| | South Australia | 654,869 | 364,863 |
| | | 1,993,894 | 1,219,974 |
| 63522 | *Karri:* | | |
| | Australian States : | | |
| | Victoria | 61,261 | 29,485 |
| 63529 | *Other :* | | |
| | New Zealand | 34,062 | 17,699 |
| | Iraq | 6 | 8 |
| | Australian States : | | |
| | South Australia | 33,223 | 31,000 |
| | | 67,291 | 48,707 |
| 63550 | *Girders, Hewn :* | | |
| | South Africa, Union of | 436 | 300 |
| 64100 | *Softwoods :* | | |
| | Christmas Island | 42 | 86 |
| | Australian States : | | |
| | Northern Territory | 139 | 228 |
| | | 181 | 314 |
| | *Hardwoods, N.E.I.*—* | | |
| 64260 | *Jarrah :* | | |
| | United Kingdom | 439,528 | 358,805 |
| | Christmas Island | 738 | 762 |
| | Cocos Islands | 48 | 89 |
| | Ceylon | 3,711 | 3,431 |
| | Mauritius | 25,322 | 18,471 |
| | New Zealand | 114,068 | 79,674 |
| | Pakistan | 101,701 | 78,403 |
| | South Africa, Union of | 40,120 | 28,085 |
| | Bahrain Islands | 3,882 | 3,357 |
| | Belgium-Luxemburg | 10,296 | 7,445 |
| | Greece | 206 | 904 |
| | Iran | 902 | 733 |
| | Iraq | 45,999 | 34,752 |
| | Netherlands | 4,481 | 3,012 |
| | India (Portuguese) | 1,121 | 876 |
| | Mozambique | 38 | 24 |
| | United States of America | 4,790 | 4,527 |
| | Italy | 5,005 | 3,658 |
| | Australian States : | | |
| | New South Wales | 1,470 | 994 |
| | Victoria | 119,683 | 80,817 |
| | South Australia | 829,481 | 471,895 |
| | Northern Territory | 28,341 | 18,911 |
| | | 1,780,931 | 1,199,625 |
| 64280 | *Karri :* | | |
| | United Kingdom | 60,376 | 43,894 |
| | Christmas Island | 162 | 151 |
| | Mauritius | 2,495 | 1,884 |
| | New Zealand | 148,012 | 107,679 |
| | South Africa, Union of | 55,194 | 39,596 |
| | Belgium-Luxemburg | 14,191 | 11,778 |
| | Germany, Federal Republic of | 29,279 | 23,073 |
| | Italy | 63 | 50 |
| | Libya | 4 | 3 |
| | Netherlands | 55,295 | 44,518 |
| | Mozambique | 5,357 | 4,197 |
| | United States of America | 1,802 | 3,319 |
| | Australian States : | | |
| | New South Wales | 9,642 | 6,645 |
| | Victoria | 33,274 | 24,887 |
| | South Australia | 787,726 | 394,007 |
| | Tasmania | 1,819 | 1,637 |
| | Northern Territory | 53,693 | 36,329 |
| | | 1,258,384 | 743,647 |
| 64290 | *Other :* | | |
| | United Kingdom | 15,104 | 10,591 |
| | Christmas Island | .... | 1 |
| | Belgium-Luxemburg | 3,458 | 2,816 |
| | Greece | 939 | 167 |
| | Japan | 21 | 10 |
| | Australian States : | | |
| | Victoria | 13,130 | 11,932 |
| | South Australia | 6,941 | 3,959 |
| | Northern Territory | 1,681 | 2,508 |
| | | 41,274 | 31,982 |
| | *Shooks and Staves*— | | |
| | Australian States : | | |
| | New South Wales | 14,852 | 16,707 |
| | Queensland | 173 | 205 |
| | | 15,025 | 16,912 |
| | *Sawn Timber, Dressed or Moulded, N.E.I.*—* | | |
| 64410 | *Flooring :* | | |
| | United Kingdom | 4,635 | 5,329 |
| | Italy | 477 | 268 |
| | United States of America | 505 | 683 |
| | Australian States : | | |
| | *Other than Mosaic :* | | |
| | New South Wales | 48,547 | 56,498 |
| | Victoria | 29,534 | 33,939 |
| | South Australia | 201,037 | 157,001 |
| | Northern Territory | 4,370 | 6,934 |
| | *Mosaic Flooring :* | sq. yds. | |
| | New South Wales | 2,933 | 5,996 |
| | Victoria | 357 | 391 |
| | South Australia | 1,276 | 1,706 |
| | Australian Capital Territory | 1,512 | 4,000 |
| | | .... | 272,745 |
| | | cub. ft. | |
| 64490 | *Other :* | | |
| | Christmas Island | 160 | 318 |
| | Cocos Islands | 9 | 19 |
| | Bahrain Islands | 1,939 | 1,650 |
| | United States of America | 39 | 48 |
| | Australian States : | | |
| | New South Wales | 42 | 31 |
| | Victoria | 1,298 | 1,034 |
| | South Australia | 6,805 | 3,634 |
| | Tasmania | 7 | 12 |
| | Northern Territory | 15,766 | 17,246 |
| | | 26,065 | 23,992 |
| | | sq. ft. | |
| 64600 | *Veneer*— | | |
| | Australian States : | | |
| | New South Wales | 183,153 | 2,812 |
| | Victoria | 56,991 | 609 |
| | Queensland | 260 | 6 |
| | South Australia | 20,801 | 269 |
| | | 261,205 | 3,696 |
| 64790 | *Plywood*— | | |
| | Cocos Islands | 525 | 69 |
| | Greece | 36 | 3 |
| | Italy | 20 | 2 |
| | Australian States : | | |
| | New South Wales | 339,895 | 14,840 |
| | Victoria | 1,704,284 | 68,349 |
| | Queensland | 22,816 | 1,050 |
| | South Australia | 3,501,092 | 153,951 |
| | Tasmania | 320 | 16 |
| | Northern Territory | 211,565 | 8,728 |
| | | 5,780,553 | 247,008 |
| | Total, Timber Exports | .... | 3,838,387 |
| | **WOOD MANUFACTURE, N.E.I.** | | |
| | | No. | |
| 65050 | *Casks and Vats*— | | |
| | United Kingdom | 380 | 1,919 |
| 65400 | *Furniture of Wood*— | | |
| | United Kingdom | .... | 300 |
| | Christmas Island | .... | 1,911 |
| | Cocos Islands | .... | 590 |
| | Malaya | .... | 3 |
| | Rhodesia and Nyasaland | .... | 6 |
| | South Africa, Union of | .... | 72 |
| | Thailand | .... | 9,790 |
| | | £ | |
| | Australian States : | | |
| | New South Wales | 495 | |
| | Victoria | 468 | |
| | Northern Territory | 942 | |
| | | .... | 1,905 |
| | | .... | 14,577 |

## APPENDIX 2A—*continued*

*Exports from Western Australia of Timber, Tanning Substances and Essential Oils for Year ended 30th June, 1961*

| Item No. | Item and Destination | Quantity | Value |
|---|---|---|---|
| 65290 | *Manufactures of Wood (except Furniture), N.E.I.—** | | £ |
| | Christmas Island | .... | 344 |
| | Cocos Islands | .... | 2 |
| | Singapore | .... | 2 |
| | Denmark | .... | 2 |
| | Australian States : | | £ |
| | New South Wales | .... | 442 |
| | Victoria | .... | 2,615 |
| | South Australia | .... | 3,331 |
| | Tasmania | .... | 118 |
| | Northern Territory | .... | 1,953 |
| | | .... | 8,459 |
| | Total, Wood Manufactures | .... | 8,809 |
| | Total, Wood and Wick Raw and Manufactures | .... | 25,305 |
| | | .... | 3,864,110 |
| 16000 | *Tanning Substances of Natural Origin—* | cwt. | |
| | United Kingdom | 741 | 2,858 |
| | Ceylon | 8 | 39 |
| | India | 3 | 5 |
| | Malaya | 200 | 740 |
| | Mauritius | 1 | 4 |
| | New Zealand | 1,863 | 7,880 |
| | Jamaica | 80 | 288 |
| | Austria | 1,482 | 5,848 |
| | China, Republic of—Mainland | 1,706 | 4,566 |
| | Denmark | 3,357 | 10,115 |
| | France | 10 | 35 |
| | Germany, Federal Republic of | 4,514 | 10,359 |
| | Indonesia | 2,052 | 7,293 |
| | Netherlands | 2,955 | 7,522 |
| | Norway | 80 | 290 |
| | United States of America | 43,192 | 118,211 |
| | Australian States : | cwt. | £ |
| | New South Wales | 3,809 | 13,878 |
| | Victoria | 1,767 | 4,285 |
| | Queensland | 620 | 2,129 |
| | South Australia | 1,378 | 5,032 |
| | Tasmania | 200 | 580 |
| | | 7,774 | 25,904 |
| | | 70,018 | 201,957 |

| Item No. | Item and Destination | Quantity | Value |
|---|---|---|---|
| | | | £ |
| | *Essential Oils, Natural, Non-spirituous—* | lb. | |
| | United Kingdom | 16,550 | 29,591 |
| | Christmas Island | 810 | 235 |
| | Ceylon | 474 | 300 |
| | Hong Kong | 364 | 1,337 |
| | India | 448 | 182 |
| | Malaya | 280 | 481 |
| | Singapore | 1,305 | 1,440 |
| | South Africa, Union of | 2 | 12 |
| | France | 4,640 | 14,738 |
| | Germany, Federal Republic of | 1,940 | 139 |
| | Switzerland | 1,948 | 1,400 |
| | United States of America | 13,036 | 7,514 |
| | Australian States : | lb. | £ |
| | New South Wales | 59,720 | 18,110 |
| | Victoria | 56,763 | 17,739 |
| | Queensland | 85 | 191 |
| | South Australia | 855 | 2,076 |
| | | 117,423 | 38,106 |
| | | 159,220 | 95,475 |
| | Total Value of all Exports on this Return | .... | 4,161,542 |

* N.E.I. means "Not Elsewhere Included."

## APPENDIX 2B

*Imports into Western Australia of Timber, Tanning Substances and Essential Oils for Year ended 30th June, 1961*

| Item No. | Item and Origin | Quantity | Value |
|---|---|---|---|
| | | | £ |
| 63010 | *Wicker, Bamboo and Cane and Manufactures thereof—* | cub. ft. | |
| 63090 | United Kingdom | .... | 44 |
| | Hong Kong | .... | 17 737 |
| | Malaya | .... | 11,123 |
| | Singapore | .... | 1,953 |
| | Burma | .... | 193 |
| | China, Republic of—Mainland | .... | 85 |
| | Denmark | .... | 25 |
| | Japan | .... | 4,591 |
| | United States of America | .... | 13 |
| | Australian States : | | £ |
| | New South Wales | .... | 349 |
| | Victoria | .... | 2,489 |
| | Queensland | .... | 11 |
| | South Australia | .... | 702 |
| | | .... | 3,551 |
| | | | 39,315 |
| | TIMBER | | |
| 63400 | *Logs, not Sawn—* | | |
| | Ghana | 371 | 581 |
| | Malaya | 3,485 | 1,007 |
| | North Borneo | 55,514 | 19,173 |
| | Sarawak | 536,104 | 158,803 |
| | Nigeria and Cameroons (British) | 2,749 | 4,571 |
| | Gabon | 1,076 | 1,488 |
| | | 599,299 | 185,623 |
| | *Sawn Timber, Undressed, N.E.I.—* Softwoods, N.E.I.—** | | |
| 64120 | *Douglas Fir : (a)* | | |
| | United States of America | 58,501 | 46,275 |
| 64130 | *Hemlock : (a)* | | |
| | Canada | 5,408 | 2,281 |
| 64190 | *Other Softwoods : (a)* | | |
| | Brazil | 21,453 | 29,000 |
| | U.S.S.R. | 682 | 507 |
| | United States of America | 5,883 | 6,516 |
| | | 28,018 | 36,023 |
| 64200 | *Composite Item covering Interstate Imports of Sawn, Undressed Softwood, N.E.I.—** | cub. ft. | £ |
| | New South Wales | 2,011 | 3,197 |
| | Victoria | 326 | 680 |
| | Queensland | 932 | 1,313 |
| | South Australia | 5,143 | 5,612 |
| | Tasmania | 6,756 | 6,480 |
| | | 15,168 | 17,282 |
| | *Hardwoods, N.E.I.—** | | |
| 64230 | *Beech : (b)* | | |
| | Japan | 1,216 | 1,215 |
| | Yugoslavia | 757 | 1,083 |
| | | 1,973 | 2,298 |
| 64290 | *Other Hardwoods : (b)* | | |
| | Kenya | 697 | 392 |
| | Ghana | 4,471 | 5,164 |
| | Malaya | 195,233 | 136,263 |
| | North Borneo | 14 | 13 |
| | Sarawak | 265,289 | 178,700 |
| | Singapore | 5,657 | 3,500 |
| | Australia (Re-imported) | 89 | 383 |
| | Japan | 21,836 | 16,145 |
| | Philippines | 1,062 | 837 |
| | | 494,348 | 341,397 |
| 64300 | *Composite Item covering Interstate Imports of Sawn Undressed Hardwoods, N.E.I.—** | cub. ft. | £ |
| | Australian States : | | |
| | Queensland | 3,701 | 5,416 |
| | South Australia | 1,113 | 1,317 |
| | Tasmania | 31,599 | 27,324 |
| | | 36,413 | 34,057 |
| 64310 | *Box Shooks—* | | |
| | Malaya | 6,234 | 2,484 |
| | Australian States : | | |
| | South Australia | 1,800 | 2,256 |
| | | 8,034 | 4,740 |
| 64350 | *Cask and Vat Shooks and Staves—* | | |
| | Australia (Re-imported) | 3 | 12 |
| | Australian States : | | |
| | South Australia | 10,525 | 8,956 |
| | | 10,528 | 8,968 |

| Item No. | Item and Origin | Quantity | Value |
|---|---|---|---|
| | | cub. ft. | £ |
| 64410 | *Sawn Timber Dressed or Moulded, N.E.I.—** | | |
| | *Flooring : (c)* | | |
| | Norway | 1,312 | 1,387 |
| | Sweden | 9,477 | 7,737 |
| | | 10,789 | 9,124 |
| 64490 | *Other : (c)* | | |
| | Canada | 166 | 222 |
| | Germany, Federal Republic of | 8 | 95 |
| | | 174 | 317 |
| 64500 | *Composite Item covering Interstate Imports of Timber Dressed or Moulded—* | | |
| | Australian States : | | £ |
| | New South Wales | | 3,223 |
| | Victoria | | 32,108 |
| | Queensland | | 4,459 |
| | South Australia | | 104 |
| | Tasmania | | 1,041 |
| | | .... | 40,935 |
| 64690 | *Veneers—* | | sq. ft. |
| | Sarawak | | 23,392 |
| | Japan | | 5,625 |
| | Australian States : | sq. ft. | £ |
| | New South Wales | 139,113 | 4,966 |
| | Victoria | 22,859 | 1,135 |
| | | 161,972 | 6,101 |
| | | 190,989 | 6,659 |
| 64790 | *Plywood—* | | |
| | New Guinea | 47,536 | 2,250 |
| | Australia (Re-imported) | 2,100 | 157 |
| | Australian States : | sq. ft. | £ |
| | New South Wales | 60,663 | 6,017 |
| | Victoria | 144,549 | 11,119 |
| | Queensland | 1,488,739 | 106,417 |
| | South Australia | 34,561 | 1,668 |
| | | 1,728,512 | 125,221 |
| | | 1,778,148 | 127,628 |
| | Total, Timber Imports | .... | 863,607 |
| | WOOD MANUFACTURES | | |
| 65050 | *Casks and Vats, Empty—* | | No. |
| | Australia (Re-imported) | 494 | 3,202 |
| | Australian States : | | |
| | Victoria | 100 | 700 |
| | | 594 | 3,902 |
| 65080 | *Clothes Pegs of any Material—* | | Gross |
| | Hong Kong | 5,123 | 764 |
| | Czechoslovakia | 17,510 | 2,049 |
| | Denmark | 10,350 | 2,152 |
| | Netherlands | 360 | 92 |
| | Sweden | 26,900 | 3,615 |
| | Australian States : | Gross | £ |
| | New South Wales | 8,890 | 2,879 |
| | Victoria | 4,977 | 1,949 |
| | Tasmania | 17,443 | 6,306 |
| | | 31,310 | 11,134 |
| | | 91,553 | 19,806 |
| 65110 | *Blockboard (Covestock)—* | | sq. ft. |
| | Australian States : | sq. ft. | £ |
| | New South Wales | 4,860 | 1,146 |
| | Victoria | 2,880 | 774 |
| | Queensland | 7,340 | 1,602 |
| | South Australia | 4,600 | 520 |
| | | 19,680 | 4,042 |
| 65150 | *Last Blocks and Lasts— (d)* | | dozen |
| | United Kingdom | 17 | 395 |
| | Italy | 1 | 12 |
| | | 18 | 407 |
| 65160 | *Match Splints— (d)* | | |
| | Finland | .... | 20,821 |
| 65170 | *Rules and Rulers, Wooden— (e)* | | |
| | United Kingdom | .... | 8,762 |
| | Germany, Federal Republic of | .... | 2 |
| | Japan | .... | 56 |
| | Netherlands | .... | 815 |
| | | .... | 9,635 |

## APPENDIX 2B—*continued*

*Imports into Western Australia of Timber, Tanning Substances and Essential Oils for Year ended 30th June, 1961*

| Item No. | Item and Origin | Quantity | Value |
|---|---|---|---|
| | | | £ |
| 65180 | *Tool Handles, Unattached, of any Material*— | dozen | |
| | United Kingdom | 1,560 | 3,153 |
| | Canada | 18 | 185 |
| | France | .... | 3 |
| | Germany, Federal Republic of | 9 | 52 |
| | Japan | 24 | 37 |
| | Sweden | 120 | 173 |
| | United States of America | 632 | 1,554 |
| | Australian States : £ | | |
| | New South Wales 25,773 | | |
| | Victoria 6,719 | | |
| | Queensland 700 | | |
| | South Australia 13 | | |
| | Tasmania 1,916 | | |
| | | .... | 35,121 |
| | | .... | 40,278 |
| 65190 | *Table Mats, Wooden*— (*d*) | | |
| | United Kingdom | .... | 351 |
| | Germany, Federal Republic of | .... | 25 |
| | Italy | .... | 23 |
| | | .... | 399 |
| 65290 | *Manufactures of Wood (except Furniture), N.E.I.*, whether partly or wholly finished*— | | |
| | United Kingdom | .... | 1,732 |
| | Canada | .... | 93 |
| | Hong Kong | .... | 83 |
| | India | .... | 111 |
| | Malaya | .... | 88 |
| | Pakistan | .... | 55 |
| | Singapore | .... | 203 |
| | South Africa, Union of | .... | 2 |
| | Australia (Re-imported) | .... | 96 |
| | Austria | .... | 18 |
| | China, Republic of—Mainland | .... | 3 |
| | France | .... | 34 |
| | Germany, Federal Republic of | .... | 1,305 |
| | Italy | .... | 176 |
| | Japan | .... | 7,358 |
| | Netherlands | .... | 15 |
| | Norway | .... | 299 |
| | Sweden | .... | 384 |
| | Switzerland | .... | 119 |
| | United States of America | .... | 436 |
| | Australian States : £ | | |
| | New South Wales 11,829 | | |
| | Victoria 24,664 | | |
| | Queensland 2,708 | | |
| | South Australia 3,292 | | |
| | Tasmania 114 | | |
| | | .... | 42,607 |
| | | .... | 55,217 |
| 65410 | *Furniture, N.E.I., of Wood or Partly of Wood*— | | |
| | United Kingdom | .... | 4,481 |
| | Canada | .... | 614 |
| | Tanganyika | .... | 10 |
| | Hong Kong | .... | 4,450 |
| | India | .... | 146 |
| | New Zealand | .... | 38 |
| | Singapore | .... | 144 |
| | Australia (Re-imported) | .... | 841 |
| | Denmark | .... | 2,597 |
| | France | .... | 10 |
| | Germany, Federal Republic of | .... | 389 |
| | Greece | .... | 1 |
| | Italy | .... | 2,221 |
| | Japan | .... | 2,549 |
| | Netherlands | .... | 547 |
| | Norway | .... | 611 |
| | Sweden | .... | 6,993 |
| | United States of America | .... | 750 |
| | Australian States : £ | | |
| | New South Wales 49,765 | | |
| | Victoria 46,801 | | |
| | Queensland 1,661 | | |
| | South Australia 20,593 | | |
| | | .... | 118,820 |
| | | .... | 146,212 |
| | Total, Wood Manufactures | .... | 300,719 |
| | Total, Wood and Wicker, Raw and Manufactured | .... | 1,203,641 |

| Item No. | Item and Origen | Quantity | Value |
|---|---|---|---|
| | | | £ |
| | TANNING SUBSTANCES—NATURAL ORIGIN | | |
| 16010 | *Extracts*— | cwt. | |
| 16190 | United Kingdom | 100 | 969 |
| | Kenya | 19 | 85 |
| | Rhodesia and Nyasaland | 100 | 274 |
| | South Africa, Union of | 2,859 | 8,062 |
| | Norway | 594 | 743 |
| | Sweden | 339 | 376 |
| | Australian States : | | |
| | South Australia | 100 | 368 |
| | | 4,111 | 10,877 |
| 16200 | *Other Tanning Substances*— | | |
| | India | 948 | 1,638 |
| | South Africa, Union of | 40 | 112 |
| | | 988 | 1,750 |
| 87010–87290 | *Essential Oils, Natural, Non-spirituous*— | lb. | |
| | United Kingdom | 77 | 7 |
| | Ceylon | 808 | 341 |
| | India | 800 | 707 |
| | Trinidad and Tobago | 170 | 530 |
| | Belgium-Luxemburg | 1 | 10 |
| | China, Republic of—Formosa | 4,800 | 1,882 |
| | China, Republic of—Mainland | 1,386 | 581 |
| | France | 870 | 809 |
| | Malagas | 4,305 | 1,821 |
| | Indonesia | 1,100 | 456 |
| | Italy | 336 | 315 |
| | Netherlands | 2 | 2 |
| | Spain | 207 | 157 |
| | Sweden | 7 | 34 |
| | United States of America | 2,000 | 3,680 |
| | Australian States : lb. £ | | |
| | New South Wales 161,640 40,625 | | |
| | Victoria 11,596 5,373 | | |
| | South Australia 9,074 2,968 | | |
| | | 182,310 | 48,966 |
| | | 199,179 | 60,361 |
| | Total Value of all Imports on this Return | .... | 1,276,629 |

* N.E.I. means "Not Elsewhere Included."
(*a*) See Item 64200. (b) See Item 64300. (*c*) See Item 64500.
(*d*) Interstate Imports (if any) included in Item 65290.
(e) Interstate Imports not recorded separately.

## APPENDIX 3

*Summary of Exports of Forest Produce since 1836*

| Year | Timber | | Year | Timber | | Wood Manufactures | Tanning Materials | Essential Oils |
|---|---|---|---|---|---|---|---|---|
| | Cub. ft. | Value | | Cub. ft. | Value | Value | Value | Value |
| | | £ | | | £ | £ | £ | £ |
| 1836 (*a*) .... | 10,000 | 2,500 | 1899 .... | 6,913,550 | 553,198 | .... | .... | .... |
| 1837 .... | .... | .... | 1900 .... | 5,725,400 | 458,461 | .... | .... | .... |
| 1838 .... | .... | .... | | | | | | |
| 1839 .... | .... | .... | 1901 .... | 7,150,600 | 572,354 | .... | .... | .... |
| 1840 .... | .... | .... | 1902 .... | 6,256,750 | 500,533 | .... | .... | .... |
| | | | 1903 .... | 7,748,450 | 619,705 | .... | 859 | .... |
| 1841 .... | .... | .... | 1904 .... | 8,072,300 | 654,949 | .... | 32,876 | .... |
| 1842 .... | .... | .... | 1905 .... | 8,709,500 | 689,943 | .... | 154,087 | .... |
| 1843 .... | .... | .... | 1906 .... | (*c*) 8,830,700 | 708,993 | .... | 140,720 | .... |
| 1844 .... | (*b*) | 163 | 1907 .... | (*c*) 6,409,550 | 511,923 | .... | 98,773 | .... |
| 1845 .... | .... | .... | 1908 .... | (*c*) 9,869,509 | 813,591 | .... | 79,934 | .... |
| 1846 .... | 2,550 | 255 | 1909 .... | (*c*) 10,830,450 | 867,419 | .... | 59,633 | .... |
| 1847 .... | 12,200 | 1,120 | 1910 .... | (*c*) 12,074,100 | 972,698 | .... | 93,733 | .... |
| 1848 .... | 3,350 | 333 | | | | | | |
| 1849 .... | .... | .... | 1911 .... | (*c*) 12,449,500 | 986,341 | .... | 83,470 | .... |
| 1850 .... | 10,500 | 1,048 | 1912 .... | (*c*) 11,297,100 | 903,396 | .... | 49,004 | .... |
| | | | 1913 .... | (*c*) 13,619,850 | 1,089,481 | .... | 47,377 | .... |
| 1851 .... | 1,250 | 268 | 1914 (*d*) .... | (*c*) 6,279,750 | 502,153 | .... | 18,197 | 777 |
| 1852 .... | 7,050 | 806 | 1915 (*e*) .... | (*c*) 9,968,500 | 808,392 | .... | 6,127 | 381 |
| 1853 .... | 52,200 | 5,220 | 1916 (*e*) .... | 5,432,100 | 441,991 | .... | 10,208 | 1,102 |
| 1854 .... | 58,500 | 7,023 | 1917 (*e*) .... | 3,890,650 | 310,893 | .... | 18,959 | 2,060 |
| 1855 .... | 76,900 | 12,076 | 1918 (*e*) .... | 3,436,250 | 274,141 | .... | 16,886 | 3,995 |
| 1856 .... | 70,500 | 9,671 | 1919 (*e*) .... | 4,135,750 | 332,584 | 11,535 | 18,875 | 3,987 |
| 1857 .... | 69,200 | 9,449 | 1920 (*e*) .... | 5,065,300 | 465,731 | 21,935 | 22,121 | 3,704 |
| 1858 .... | 29,250 | 2,340 | | | | | | |
| 1859 .... | 67,250 | 6,051 | 1921 (*e*) .... | 9,816,250 | 1,137,819 | 24,916 | 23,073 | 10,107 |
| 1860 .... | 54,800 | 4,932 | 1922 (*e*) .... | 8,309,750 | 1,041,047 | 22,248 | 13,328 | 6,878 |
| | | | 1923 (*e*) .... | 7,911,310 | 997,454 | 12,377 | 21,161 | 20,075 |
| 1861 .... | 27,750 | 2,497 | 1924 (*e*) .... | 11,126,861 | 1,367,517 | 11,505 | 29,606 | 39,877 |
| 1862 .... | 68,800 | 7,151 | 1925 (*e*) .... | 11,844,303 | 1,477,997 | 13,298 | 40,136 | 42,057 |
| 1863 .... | 32,900 | 2,963 | 1926 (*e*) .... | 12,001,384 | 1,522,958 | 10,072 | 15,056 | 47,819 |
| 1864 .... | 58,300 | 5,508 | 1927 (*e*) .... | 12,580,262 | 1,651,149 | 8,727 | 15,818 | 26,544 |
| 1865 .... | 183,950 | 15,693 | 1928 (*e*) .... | 10,384,784 | 1,265,383 | 7,783 | 27,662 | 39,131 |
| 1866 .... | 85,650 | 6,849 | 1929 (*e*) .... | 7,635,237 | 960,435 | 6,603 | 35,850 | 63,307 |
| 1867 .... | 56,750 | 4,541 | 1930 (*e*) .... | 6,579,743 | 807,425 | 4,687 | 40,628 | 77,510 |
| 1868 .... | 8,000 | 638 | | | | | | |
| 1869 .... | 179,900 | 14,273 | 1931 (*e*) .... | 4,127,856 | 507,382 | 26,615 | 35,333 | 56,170 |
| 1870 .... | 157,200 | 17,551 | 1932 (*e*) .... | 3,062,673 | 361,700 | 85,488 | 42,016 | 59,301 |
| | | | 1933 (*e*) .... | 2,235,540 | 262,617 | 80,332 | 33,352 | 26,331 |
| 1871 .... | 218,500 | 15,304 | 1934 (*e*) .... | 4,060,830 | 487,248 | 76,107 | 20,904 | 26,720 |
| 1872 .... | 37,000 | 2,590 | 1935 (*e*) .... | 5,326,117 | 636,466 | 65,494 | 15,284 | 35,363 |
| 1873 .... | 68,150 | 4,771 | 1936 (*e*) .... | 5,598,180 | 697,522 | 50,665 | 12,237 | 27,526 |
| 1874 .... | 345,600 | 24,192 | 1937 (*e*) .... | 5,673,903 | 699,684 | 52,338 | 14,491 | 38,185 |
| 1875 .... | 342,350 | 23,965 | 1938 (*e*) .... | 7,545,744 | 932,420 | 47,934 | 13,865 | 35,128 |
| 1876 .... | 219,050 | 23,743 | 1939 (*e*) .... | 5,704,250 | 722,310 | 43,518 | 17,842 | 25,550 |
| 1877 .... | 336,150 | 26,979 | 1940 (*e*) .... | 5,049,585 | 634,859 | 62,796 | 19,485 | 47,736 |
| 1878 .... | 580,900 | 63,902 | | | | | | |
| 1879 .... | 627,250 | 69,742 | 1941 (*e*) .... | 6,091,187 | 790,876 | 74,935 | 13,686 | 59,867 |
| 1880 .... | 662,550 | 66,252 | 1942 (*e*) .... | 5,244,634 | 700,474 | 64,454 | 6,896 | 74,904 |
| | | | 1943 (*e*) .... | 3,516,566 | 605,327 | 32,426 | 1,598 | 70,523 |
| 1881 .... | 792,750 | 79,277 | 1944 (*e*) .... | 3,645,354 | 613,994 | 25,324 | 1,294 | 72,704 |
| 1882 .... | 936,500 | 93,650 | 1945 (*e*) .... | 2,851,475 | 570,028 | 27,307 | 2,795 | 103,055 |
| 1883 .... | 997,000 | 79,760 | 1946 (*e*) .... | 3,373,025 | 722,061 | (*f*) 2,618 | 4,872 | 128,050 |
| 1884 .... | 861,700 | 68,936 | 1947 (*e*) .... | 3,458,628 | 865,255 | (*f*) 13,118 | 12,056 | 151,768 |
| 1885 .... | 848,150 | 67,850 | 1948 (*e*) .... | 3,584,405 | 1,099,073 | (*f*) 6,572 | 9,556 | 116,465 |
| 1886 .... | 626,150 | 50,902 | 1949 (*e*) .... | 3,198,212 | 993,152 | (*f*) 6,639 | 5,112 | 75,395 |
| 1887 .... | 354,800 | 28,384 | 1950 (*e*) .... | 2,857,946 | 974,493 | (*f*) 13,525 | 8,243 | 78,550 |
| 1888 .... | 525,570 | 42,060 | | | | | | |
| 1889 .... | 788,500 | 63,080 | 1951 (*e*) .... | 2,342,492 | (*g*) 918,485 | (*f*) 25,101 | 16,581 | 125,833 |
| 1890 .... | 1,172,200 | 82,052 | 1952 (*e*) .... | 2,373,553 | (*g*) 1,032,909 | (*f*) 47,689 | 19,120 | 119,109 |
| | | | 1953 (*e*) .... | 3,965,188 | (*g*) 2,074,421 | (*f*) 120,095 | 34,136 | 70,852 |
| 1891 .... | 1,273,950 | 89,179 | 1954 (*e*) .... | 3,858,956 | (*g*) 2,248,320 | (*f*) 59,360 | 80,248 | 55,273 |
| 1892 .... | 1,082,650 | 78,419 | 1955 (*e*) .... | 3,477,249 | (*g*) 1,935,019 | (*f*) 79,893 | 37,338 | 80,822 |
| 1893 .... | 512,950 | 33,888 | 1956 (*e*) .... | 4,568,034 | (*g*) 2,818,716 | (*f*) 119,459 | 554,760 | 90,928 |
| 1894 .... | 1,063,700 | 74,804 | 1957 (*e*) .... | 4,684,017 | (*g*) 3,256,719 | (*f*) 78,934 | 588,544 | 58,993 |
| 1895 .... | 1,255,250 | 88,146 | 1958 (*e*) .... | 5,572,681 | (*g*) 3,875,705 | (*f*) 39,762 | 337,655 | 101,814 |
| 1896 .... | 1,545,600 | 116,420 | 1959 (*e*) .... | 6,461,535 | (*g*) 4,373,218 | (*f*) 41,612 | 259,046 | 52,843 |
| 1897 .... | 2,393,300 | 192,451 | 1960 (*e*) .... | 6,133,240 | (*g*) 4,160,354 | (*f*) 20,549 | 366,606 | 63,905 |
| 1898 .... | 4,086,150 | 326,195 | 1961 (*e*) .... | 5,533,847 | (*g*) 3,838,387 | (*f*) 25,305 | 201,957 | 95,475 |
| | | | Total .... | 433,451,636 | 72,786,250 | 1,672,458 | 4,001,155 | 2,613,317 |

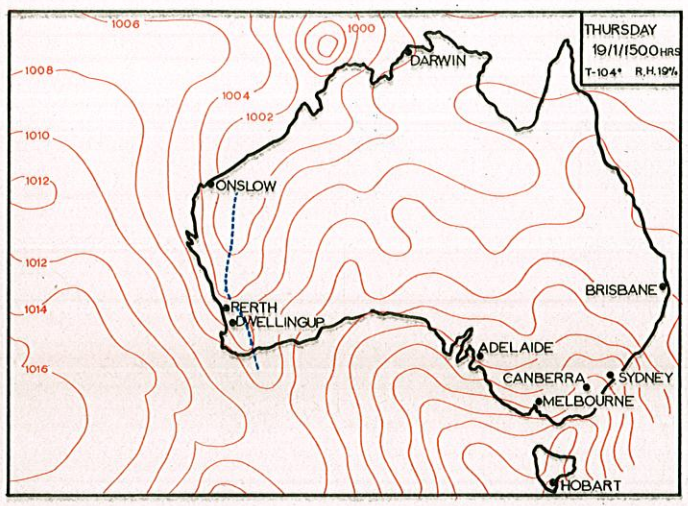
(*a*) The exports up to the year 1834 consisted only of supplies to shipping, of which no record is kept.
(*b*) Not available.
(*c*) Approximate figures only.
(*d*) Six months ended 30th June.
(*e*) Year ended 30th June.
(*f*) Excludes Casks (principally empty returns) previously included in this Item.
(*g*) Includes items for which the quantity in cub. ft. is not available.

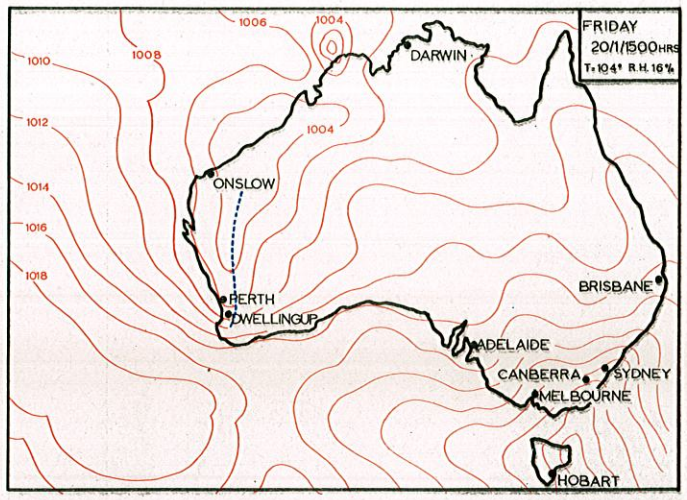
## APPENDIX 4

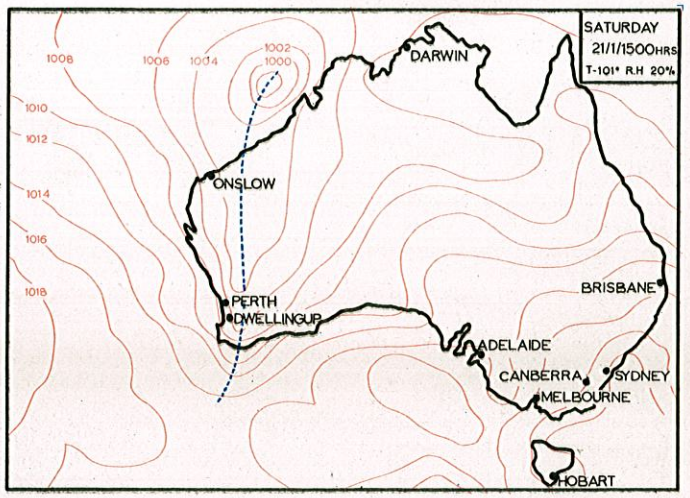
*Summary of Imports of Timber, Tanning Materials and Essential Oils, since 1848*

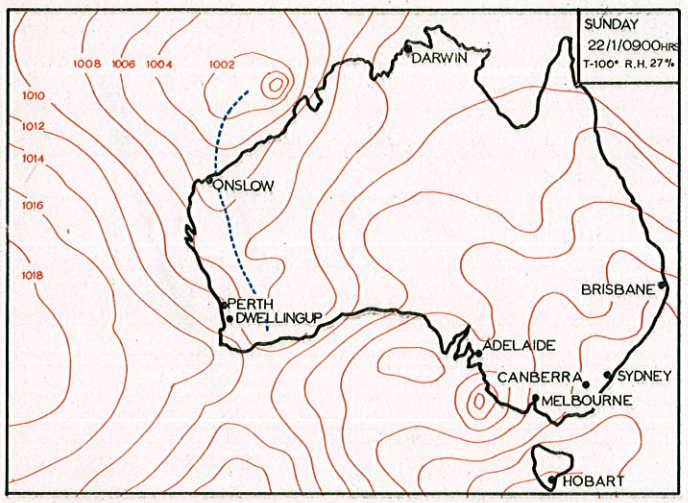
| Year | Timber, Woodware, etc. | Tanning Materials | Essential Oils | Year | Timber, Woodware, etc. | Tanning Materials | Essential Oils |
|---|---|---|---|---|---|---|---|
| | £ | £ | £ | | £ | £ | £ |
| 1848 .... .... | 464 | .... | .... | 1900 .... .... | 56,266 | 1,416 | 1,105 |
| 1849 .... .... | .... | .... | .... | 1901 .... .... | 80,134 | 1,740 | 1,546 |
| 1850 .... .... | 189 | .... | .... | 1902 .... .... | 97,810 | 3,418 | 1,751 |
| 1851 .... .... | 3,216 | .... | .... | 1903 .... .... | 102,383 | 3,556 | 1,348 |
| 1852 .... .... | 2,479 | .... | .... | 1904 .... .... | 157,856 | 1,322 | 2,122 |
| 1853 .... .... | 790 | .... | .... | 1905 .... .... | 98,494 | 582 | 1,592 |
| 1854 .... .... | 831 | .... | .... | 1906 .... .... | 95,229 | 1,412 | 1,915 |
| 1855 .... .... | 1,464 | .... | .... | 1907 .... .... | 122,016 | 2,767 | 1,549 |
| 1856 .... .... | 1,124 | .... | .... | 1908 .... .... | 93,205 | 2,392 | 4,584 |
| 1857 .... .... | 744 | .... | .... | 1909 .... .... | 90,502 | 4,129 | 4,033 |
| 1858 .... .... | 1,528 | .... | .... | 1910 .... .... | 171,280 | 3,531 | 3,686 |
| 1859 .... .... | 690 | .... | .... | 1911 .... .... | 152,133 | 2,912 | 4,938 |
| 1860 .... .... | 2,005 | .... | .... | 1912 .... .... | 167,244 | 3,089 | 4,598 |
| 1861 .... .... | 1,459 | .... | .... | 1913 .... .... | 202,640 | 2,651 | 5,392 |
| 1862 .... .... | 1,920 | .... | .... | 1914 .... .... | 78,736 | 629 | 2,823 |
| 1863 .... .... | 1,568 | .... | .... | 1914–15 .... .... | 107,763 | 2,082 | 4,988 |
| 1864 .... .... | 894 | .... | .... | 1915–16 .... .... | 76,849 | 3,313 | 4,788 |
| 1865 .... .... | 548 | .... | .... | 1916–17 .... .... | 75,681 | 2,848 | 3,848 |
| 1866 .... .... | 1,442 | .... | .... | 1917–18 .... .... | 58,305 | 2,020 | 4,358 |
| 1867 .... .... | 1,727 | .... | .... | 1918–19 .... .... | 62,824 | 1,181 | 4,168 |
| 1868 .... .... | 1,451 | .... | .... | 1919–20 .... .... | 100,083 | 3,748 | 10,043 |
| 1869 .... .... | 1,408 | .... | .... | 1920–21 .... .... | 171,654 | *4,899 | 6,106 |
| 1870 .... .... | 1,518 | .... | .... | 1921–22 .... .... | 92,448 | 5,865 | 6,577 |
| 1871 .... .... | 736 | .... | .... | 1922–23 .... .... | 109,428 | 6,991 | 4,033 |
| 1872 .... .... | 1,660 | .... | .... | 1923–24 .... .... | 133,983 | 2,790 | 3,301 |
| 1873 .... .... | 1,008 | .... | .... | 1924–25 .... .... | 161,893 | 2,670 | 4,429 |
| 1874 .... .... | 1,774 | .... | .... | 1925–26 .... .... | 144,989 | 5,826 | 4,449 |
| 1875 .... .... | 2,707 | .... | .... | 1926–27 .... .... | 162,193 | 8,971 | 4,254 |
| 1876 .... .... | 3,098 | .... | .... | 1927–28 .... .... | 183,196 | 9,648 | 6,955 |
| 1877 .... .... | 2,036 | .... | .... | 1928–29 .... .... | 241,601 | 6,894 | 4,413 |
| 1878 .... .... | 2,947 | .... | .... | 1929–30 .... .... | 197,532 | 10,825 | 3,980 |
| 1879 .... .... | 2,340 | .... | .... | 1930–31 .... .... | 76,533 | 4,145 | 3,160 |
| 1880 .... .... | 3,061 | .... | .... | 1931–32 .... .... | 164,496 | 4,705 | 3,505 |
| 1881 .... .... | 3,639 | .... | .... | 1932–33 .... .... | 197,916 | 4,903 | 3,421 |
| 1882 .... .... | 3,692 | .... | .... | 1933–34 .... .... | 183,944 | 4,310 | 3,888 |
| 1883 .... .... | 6,667 | .... | .... | 1934–35 .... .... | 211,056 | 4,076 | 5,040 |
| 1884 .... .... | 2,930 | .... | .... | 1935–36 .... .... | 228,451 | 5,401 | 3,921 |
| 1885 .... .... | 11,479 | .... | .... | 1936–37 .... .... | 257,164 | 5,267 | 4,810 |
| 1886 .... .... | 17,888 | .... | .... | 1937–38 .... .... | 270,126 | 4,777 | 6,560 |
| 1887 .... .... | 8,136 | .... | .... | 1938–39 .... .... | 254,315 | 3,974 | 7,014 |
| 1888 .... .... | 4,461 | .... | .... | 1939–40 .... .... | 259,399 | 6,802 | 23,027 |
| 1889 .... .... | 7,686 | .... | .... | 1940–41 .... .... | 249,111 | 3,798 | 32,399 |
| 1890 .... .... | 14,979 | .... | .... | 1941–42 .... .... | 283,611 | 15,846 | 33,828 |
| 1891 .... .... | 18,406 | .... | .... | 1942–43 .... .... | 163,480 | 6,250 | 47,718 |
| 1892 .... .... | 26,713 | .... | .... | 1943–44 .... .... | 149,928 | 7,883 | 68,871 |
| 1893 .... .... | 14,493 | .... | .... | 1944–45 .... .... | 148,838 | 9,264 | 75,449 |
| 1894 .... .... | 17,964 | .... | .... | 1945–46 .... .... | †219,466 | 19,573 | 56,295 |
| 1895 .... .... | 47,128 | .... | .... | 1946–47 .... .... | 386,465 | 12,395 | 78,091 |
| 1896 .... .... | 5,381 | .... | .... | 1947–48 .... .... | 345,508 | 8,019 | 96,769 |
| 1897 .... .... | 164,552 | .... | .... | 1948–49 .... .... | 470,755 | 8,662 | 42,926 |
| 1898 .... .... | 55,566 | .... | .... | 1949–50 .... .... | 521,815 | 24,923 | 51,197 |
| 1899 .... .... | 45,689 | .... | .... | 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 |
| | | | | Total .... | 18,902,268 | 542,443 | 1,835,934 |

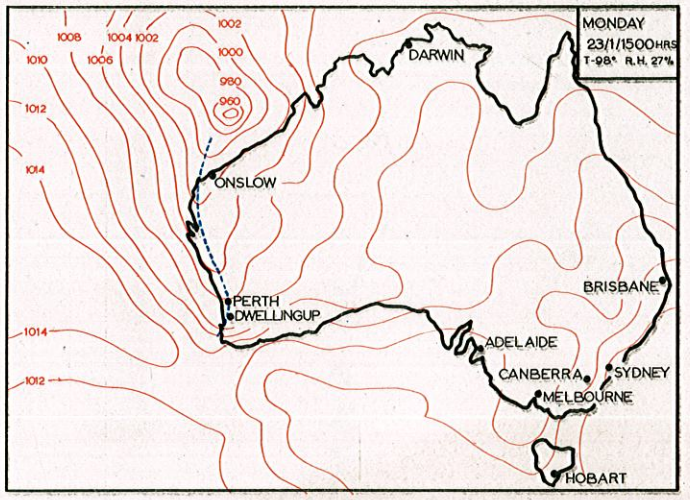
* This and subsequent years include tanning extracts, not previously recorded.
† This and subsequent years include values for furniture, bamboo, cane, etc., not previously included.

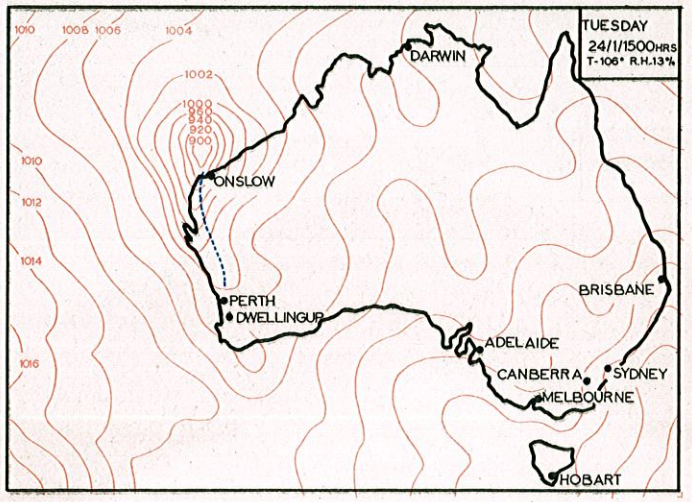


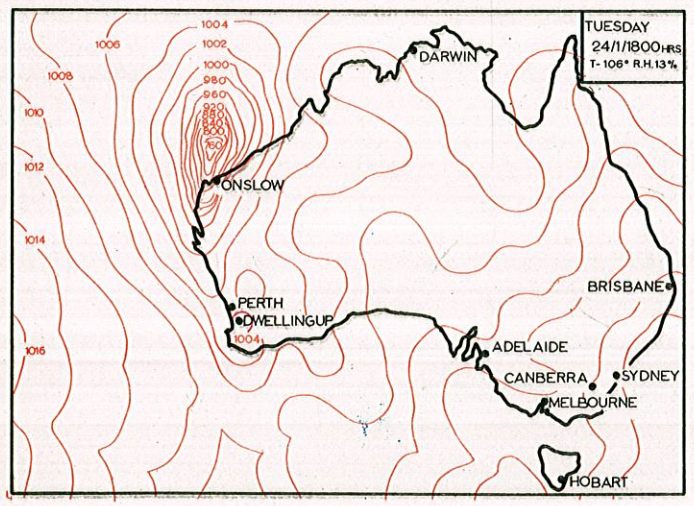



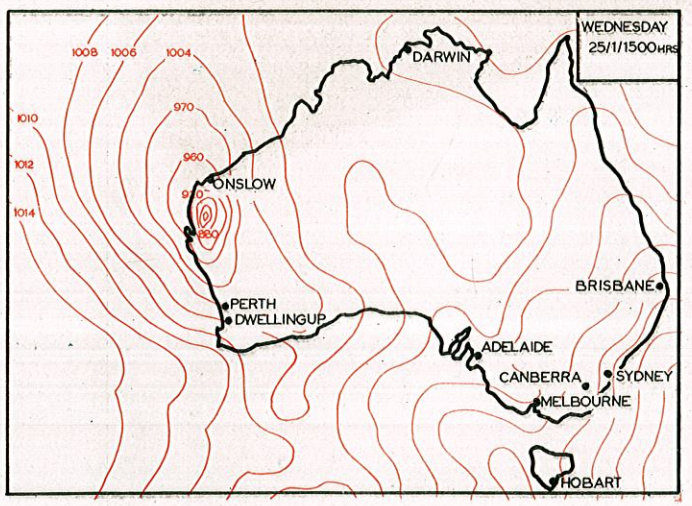




Fig. 5

Synoptic Weather Charts covering period from Thursday, 19th January, to Wednesday, 25th January, 1961, prepared by the Meteorological Bureau, Perth.

## APPENDIX 5

SUMMARY OF LOG VOLUMES PRODUCED IN WESTERN AUSTRALIA SINCE 1829

| Year | *Crown Land | Private Property | Total | Year | *Crown Land | Private Property | Total |
|---|---|---|---|---|---|---|---|
| | Cubic feet | Cubic feet | Cubic feet | | Cubic feet | Cubic feet | Cubic feet |
| 1829–1916† .... | .... | .... | 663,267,850 | 1939 (c) .... | 29,247,650 | 11,086,000 | 40,333,650 |
| 1917 (a) .... | 19,333,100 | 2,144,500 | 21,477,600 | 1940 (c) .... | 27,660,100 | 9,139,550 | 36,799,650 |
| 1918 (b) .... | 7,665,550 | 504,950 | 8,170,500 | 1941 (c) .... | 28,089,200 | 10,289,000 | 38,378,200 |
| 1919 (c) .... | 19,987,050 | 3,390,450 | 23,377,500 | 1942 (c) .... | 26,636,650 | 5,633,400 | 32,270,050 |
| 1920 (c) .... | 28,292,200 | 5,762,900 | 34,055,100 | 1943 (c) .... | 23,604,900 | 4,322,950 | 27,927,850 |
| 1921 (c) .... | 29,308,950 | 7,018,450 | 36,327,400 | 1944 (c) .... | 22,252,500 | 4,456,200 | 26,708,700 |
| 1922 (c) .... | 36,122,400 | 15,640,150 | 51,762,550 | 1945 (c) .... | 21,970,000 | 4,309,550 | 26,279,550 |
| 1923 (c) .... | 26,807,300 | 9,867,050 | 36,674,350 | 1946 (c) .... | 21,126,500 | 5,482,350 | 26,608,850 |
| 1924 (c) .... | 42,004,450 | 9,342,800 | 51,347,250 | 1947 (c) .... | 21,948,550 | 7,831,950 | 29,780,500 |
| 1925 (c) .... | 43,832,900 | 18,142,250 | 61,975,150 | 1948 (c) .... | 22,251,350 | 8,871,900 | 31,123,250 |
| 1926 (c) .... | 48,823,750 | 25,037,600 | 73,861,350 | 1949 (c) .... | 20,261,800 | 9,814,300 | 30,076,100 |
| 1927 (c) .... | 46,887,600 | 31,356,100 | 78,243,700 | 1950 (c) .... | 21,081,150 | 9,932,650 | 31,013,800 |
| 1928 (c) .... | 42,781,250 | 23,334,450 | 66,115,700 | 1951 (c) .... | 25,391,450 | 10,713,050 | 36,104,500 |
| 1929 (c) .... | 32,289,750 | 11,098,950 | 43,388,700 | 1952 (c) .... | 28,942,550 | 11,938,300 | 40,880,850 |
| 1930 (c) .... | 31,654,150 | 11,653,600 | 43,307,750 | 1953 (c) .... | 34,223,400 | 13,021,400 | 47,244,800 |
| 1931 (c) .... | 18,822,600 | 12,148,500 | 30,971,100 | 1954 (c) .... | 37,485,950 | 13,562,000 | 51,047,950 |
| 1932 (c) .... | 11,742,850 | 4,115,950 | 15,858,800 | 1955 (c) .... | 37,467,650 | 15,195,450 | 52,663,100 |
| 1933 (c) .... | 13,165,650 | 2,456,650 | 15,622,300 | 1956 (c) .... | 39,811,350 | 13,773,350 | 53,584,700 |
| 1934 (c) .... | 21,263,100 | 6,330,400 | 27,593,500 | 1957 (c) .... | 39,426,100 | 11,585,350 | 51,011,450 |
| 1935 (c) .... | 27,458,250 | 11,451,750 | 38,910,000 | 1958 (c) .... | 39,069,500 | 12,397,450 | 51,466,950 |
| 1936 (c) .... | 31,400,600 | 13,436,150 | 44,836,750 | 1959 (c) .... | 40,533,471 | 13,756,198 | 54,289,669 |
| 1937 (c) .... | 31,703,850 | 15,902,200 | 47,606,050 | 1960 (c) .... | 38,882,048 | 12,017,553 | 50,899,601 |
| 1938 (c) .... | 31,737,450 | 15,928,950 | 47,666,400 | 1961 (c) .... | 37,752,774 | 10,818,790 | 48,571,564 |
| | | | | Total .... | .... | .... | 2,477,482,634 |

* 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.

## APPENDIX 6

**Statement of Weather Conditions in the Northern Jarrah Forest Region—December, 1960 and January, 1961**

The weather leading up to and during the Dwellingup fires was the worst on record for the Northern Jarrah Forest Region and an outline of conditions as recorded at the Dwellingup weather station as being typical for the area is given below.

### WEATHER DURING EARLY SEASON (UP TO 31st DECEMBER, 1960)

The area generally experienced a dry year during 1960 with an annual rainfall deficit in excess of five inches. This deficit occurred mainly during the months of August to December, and the mean monthly temperatures were also above average during this period.

In conjunction with these above average temperatures heat wave conditions were experienced in the latter part of December, during which month Dwellingup recorded 19 days with temperatures above 80°, with five above 95° and four days of Dangerous fire hazard.

### WEATHER DURING THE PRE-FIRE PERIOD (1st JANUARY TO 18th JANUARY)

During this period both fire hazards and temperatures were high and very dry conditions prevailed.

The lowest hazard recorded was 7·8 (High Summer), the lowest daily maximum temperature was 82°, and there were five days with temperatures over 95° with a maximum of 107°.

During the latter part of this period a cyclone formed off the North-West coast of Western Australia and intensified as it moved slowly down the coast in a South-Westerly direction.

Troughs of low pressure associated with this cyclone formed down along the West coast and caused heat wave conditions and high fire hazards which continued throughout the fire period.

The progress of this cyclone system through the fire period is illustrated in the eight synoptic charts shown in Figure 5.

### WEATHER AT DWELLINGUP DURING THE FIRE PERIOD (19th JANUARY TO 25th JANUARY)

*Thursday, 19th January*

Fire Hazard — Dangerous
T. Max. — 104°
R.H. Min. — 19 per cent.
Winds — Moderate N.E. winds backing N., N.W., and S.W. during the day, light and variable at night.

Thunder and lightning was experienced during the late afternoon associated with unstable air in the trough and a number of lightning fires occurred at this period.

*Friday, 20th January*

Fire Hazard — Dangerous
T. Max. — 104°
R.H. Min. — 16 per cent.
Rainfall — 1 point (actually this fell on the previous evening).
Winds — Moderate E.N.E.–E.S.E. winds during the day and light to moderate variable winds at night.

A second series of thunderstorms was experienced at approximately 22·00 hours and further lightning fires occurred.

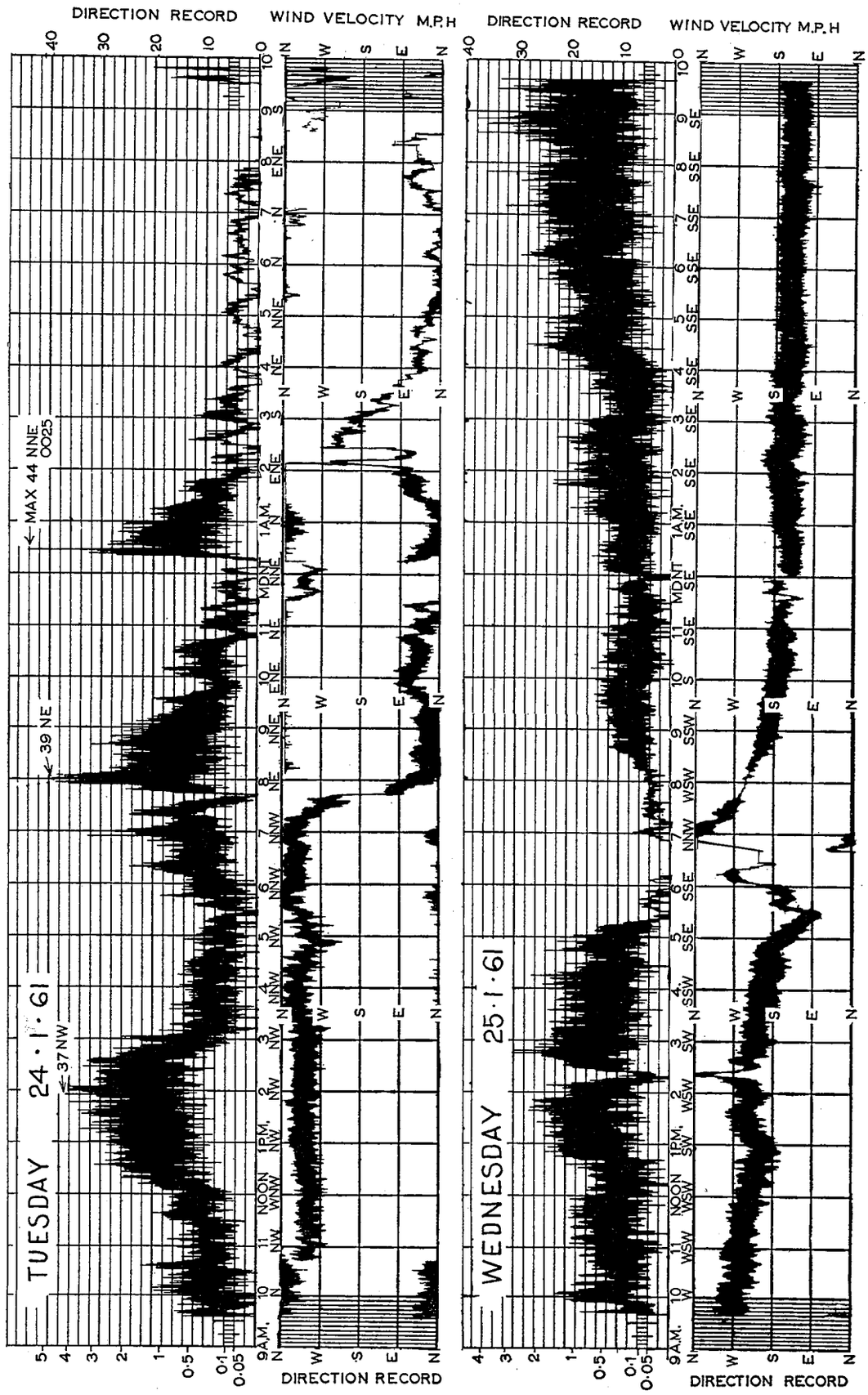



Fig. 6

Record of wind velocity and direction for Tuesday and Wednesday, 24th and 25th January, 1961. Taken from the recording anemometer at the Meteorological Bureau, Perth, W.A.

*Saturday, 21st January*

| | |
|---|---|
| Fire Hazard | Dangerous |
| T. Max. | 101° |
| R.H. Min. | 20 per cent. |
| Winds | Moderate to fresh E.N.E. winds backing N.W. and S.W. during the day, with moderate gusty S.E. winds at night. |

These wind changes were associated with the movement eastwards of a trough of low pressure. See Fig. 5.

*Sunday, 22nd January*

| | |
|---|---|
| Fire Hazard | Severe Summer approaching Dangerous |
| T. Max. | 100° |
| R.H. Min. | 27 per cent. |
| Winds | Moderate S.E. winds veering S.W. during the afternoon and evening. |

Winds were still very hot and actually were recurved north easterlies, coming from the trough which had moved inland. Moderate S.E. winds after midnight. The air was more stable, however, and this considerably aided fire suppression action.

*Monday, 23rd January*

| | |
|---|---|
| Fire Hazard | Severe Summer approaching Dangerous |
| T. Max. | 98° |
| R.H. Min. | 27 per cent. |
| Winds | Moderate east winds which decreased in strength during the afternoon, but increased again during the early evening. |

By this time a new trough had formed along the west coast with the axis of the trough extending southwards from the centre of the cyclone. See Fig. 5.

*Tuesday, 24th January*

| | |
|---|---|
| Fire Hazard | Dangerous |
| T. Max. | 106° |
| R.H. Min. | 13 per cent. |
| Winds | During the early part of the day the winds were moderate N.E., N. backing N.W. The N.W. breeze which commenced about midday showed a marked increase in strength. |

A wind velocity of 37 knots was registered at the Perth Weather Bureau at 2 p.m., and although this wind had a westerly component, and as it was largely influenced by the hot northerly gradient wind, did not produce any cooling effect. See Fig. 6.

During the late afternoon a small cell of low pressure formed in the trough to the South-West of Dwellingup and this had the effect of reinforcing the overall gradient winds. The intense temperatures in the fire area must also have had a further marked effect on wind force.

The Perth Anemometer recorded 39 knots at 8 p.m. at about which time Dwellingup was overrun. See Fig. 6. Local officers reported that the wind at this time was of gale force.

The first strong winds which struck Dwellingup were generally from the N.W.–N.N.W. but during the early hours of the 25th January another very strong series of gusts were recorded from the N.N.E. Perth recorded a maximum gust of 44 knots at 12·45 a.m. See Fig. 6.

During this period the small secondary low pressure cell moved south-easterly and filled, and at the same time the intense northern cyclone crossed the coast line near Carnarvon and immediately started to lose intensity.

Wednesday, 25th, was hot (92°) but much more humid with light variable south to south-west winds and thunder clouds forming towards midday.

Some thunder and lightning was in evidence and light rain commenced falling in the fire area in the late afternoon and evening.

This rainfall of about 50 points was general over the area and stopped the running fire.

## APPENDIX 7

### Major Fires in the Northern Jarrah Forest Region, 19th to 25th January, 1961

Following the severe build up of dangerous fire weather during the first 18 days of January a series of lightning fires through the Northern Jarrah Forest Region gave rise to an extreme fire situation unprecedented in the fire history of the Department, which culminated in the razing of Nanga Brook and the partial destruction of Dwellingup and Holyoake.

The story of the period 19th to 25th January, 1961, is briefly set out below with special emphasis on greater detail of the "Dwellingup fires."

On Thursday, 19th January, 1961, the dry lightning storms resulting from the cyclonic conditions already described struck first in the Harvey Division, where the maximum temperature was 106°, resulting in two fires around 3 p.m.

The storm moved into the Dwellingup Division between 5·30 and 6 p.m. and one of the early strikes put out of action the telephone in the towerman's hut at Mt. Wells resulting in delay of some twenty minutes in the reporting and locating of the strikes.

When connections were restored the towers reported six fires in the Dwellingup Division (fires 1–6 in Fig. 7), and one in the Gleneagle Division to the North.

Gleneagle gangs immediately attacked the fire in their Division and No. 5 in Dwellingup territory while Dwellingup gangs attended the other five.

Mundaring Division, with a maximum temperature of 107° were attending a non-lightning fire so the day ended with the Northern Division holding ten fires, with spread in the Dwellingup Division as shown in Fig. 8. The Mundaring Weir fire was held to under one acre, the Gleneagle fire burnt six acres and the Harvey fires three.

*Friday, 20th January*

| | |
|---|---|
| Fire Hazard | Dangerous |
| T. Max. | 104° |
| R.H. Min. | 16 per cent. |

On Friday 20th, Mt. Wells reported a new fire (No. 7 in Fig. 7) at 5 a.m. and further lightning activity resulted in another fire in the Gleneagle Division at 8 a.m. Collie reported their first strike at 8·30 ; Mundaring Weir their first at 9 a.m. ; Dwellingup's No. 8 was reported at 10 a.m. and Collie reported a second strike at 11·50 followed by a third at 1·30 p.m.

By 2 p.m. Dwellingup had logged fires Nos. 9 and 10.

When fire No. 10 was reported only one officer and one man were available to attend to it, and assistance was called up from Harvey and Mundaring Weir.

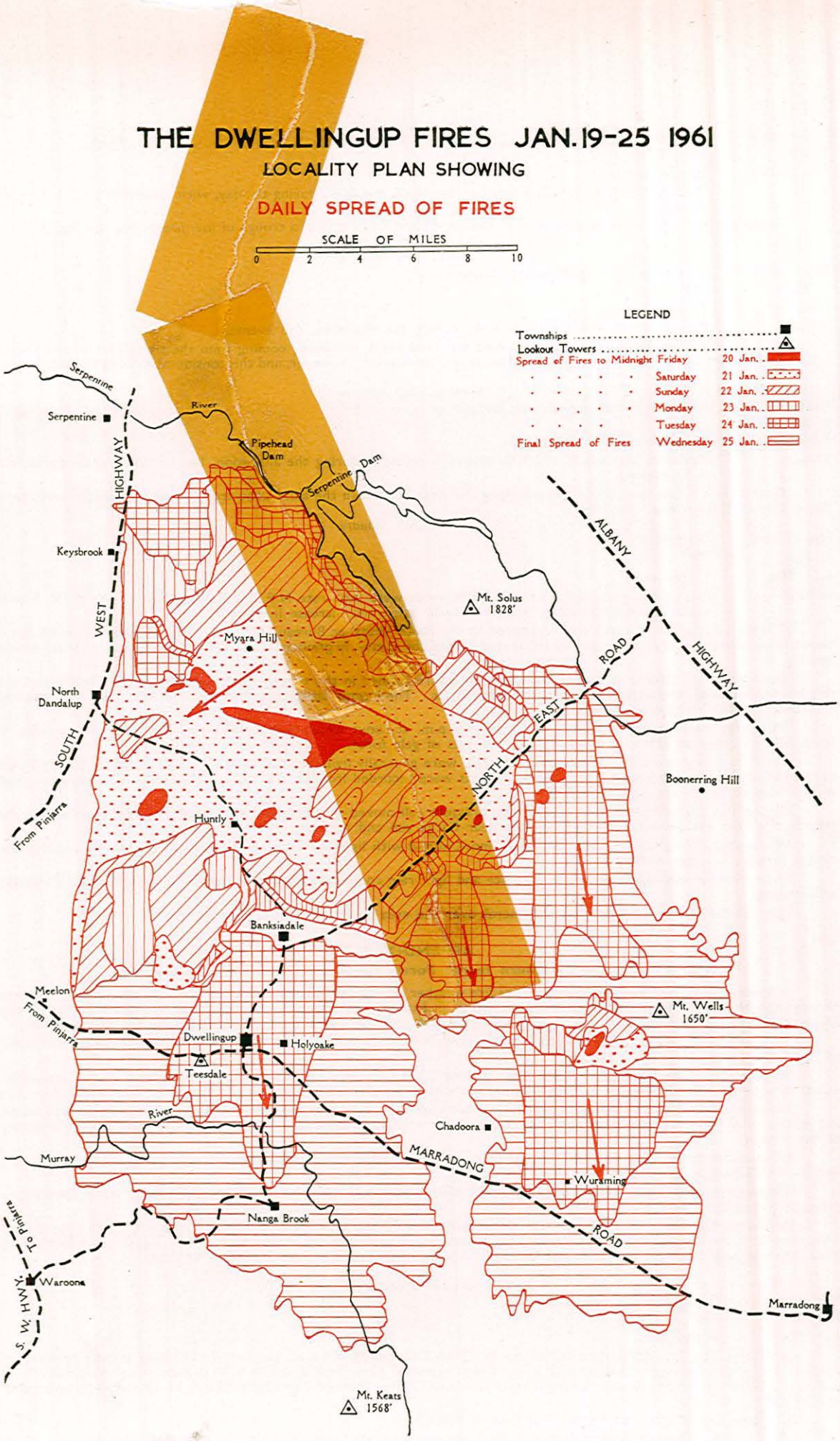

THE DWELLINGUP FIRES JAN. 19-25 1961
LOCALITY PLAN SHOWING
DAILY SPREAD OF FIRES
SCALE OF MILES
0 2 4 6 8 10
LEGEND
Townships
Lookout Towers
Spread of Fires to Midnight Friday 20 Jan.
Saturday 21 Jan.
Sunday 22 Jan.
Monday 23 Jan.
Tuesday 24 Jan.
Final Spread of Fires Wednesday 25 Jan.
Serpentine River
Serpentine
Pipehead Dam
Serpentine Dam
HIGHWAY
Keysbrook
WEST
Mt. Solus 1828'
ALBANY
ROAD
HIGHWAY
Myara Hill
North Dandalup
SOUTH
From Pinjarra
EAST
NORTH
Boonerring Hill
Huntly
Banksiadale
Meelon
From Pinjarra
Dwellingup
Holyoake
Teesdale
Mt. Wells 1650'
River
Chadoora
Murray
MARRADONG
ROAD
Wuraming
Nanga Brook
To Pinjarra
S. W. HWY.
Waroona
Marradong
Mt. Keats 1568'

Fig. 7

# THE DWELLINGUP FIRES JAN. 19-25 1961

## LOCALITY PLAN SHOWING

## POINTS OF ORIGIN OF INDIVIDUAL LIGHTNING FIRES

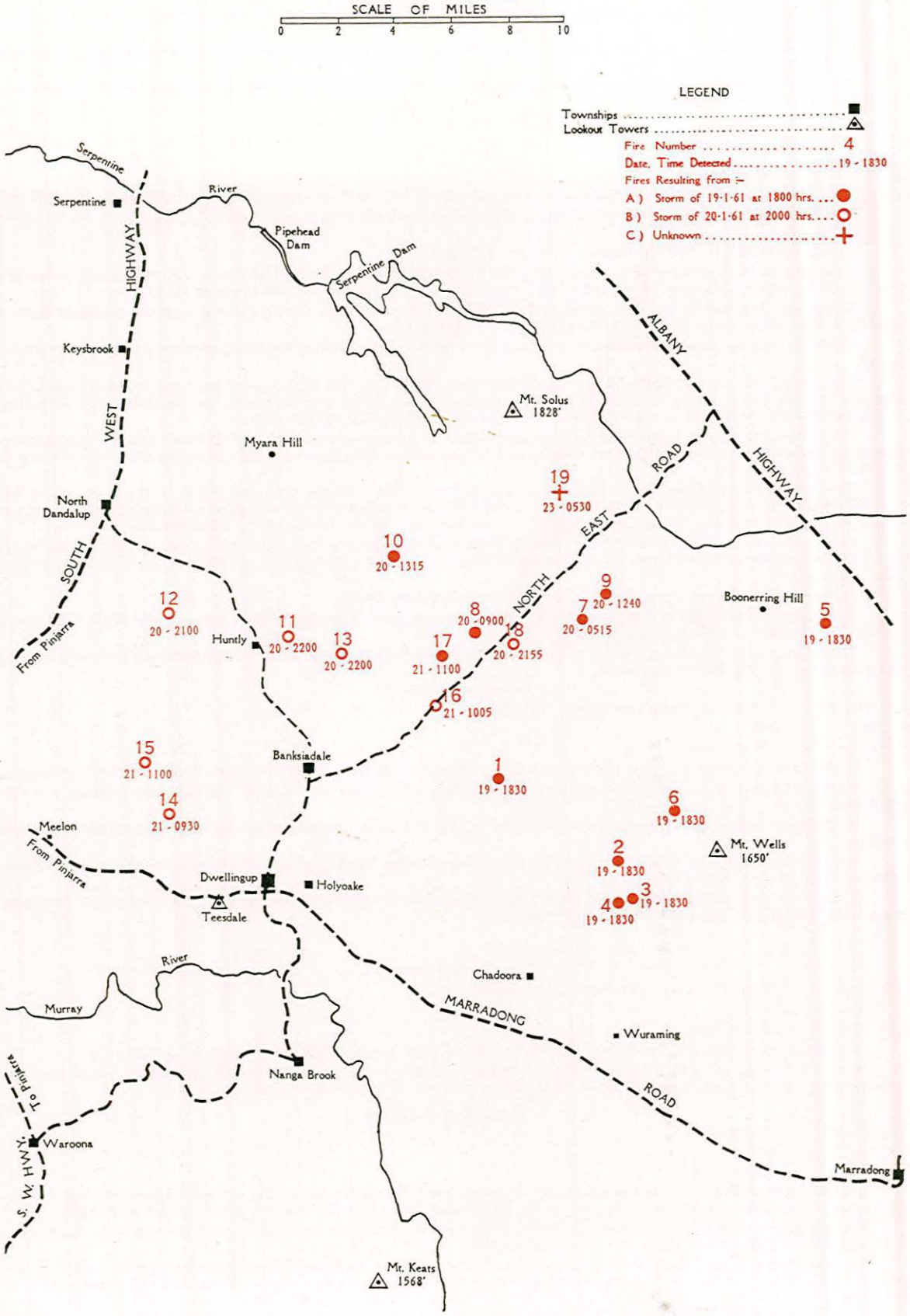



Fig. 8

Between 4 and 5 p.m. further storms resulted in a further fire in the Collie Division and two in the Harvey Division.

By 10 p.m. Dwellingup fires Nos. 11, 12 and 13 were reported, and from reports coming in it seemed certain that there had been further lightning strikes along the scarp.

Fire No. 10 had spread rapidly in a W.N.W. direction spotting ahead some six miles from the point of origin of the main fire.

At about 11 p.m. the wind changed to a North Easterly causing both the main fire and spot fire to move in a S.W. direction on a broad face.

Fires Nos. 3, 8 and 9 were requiring the attention of a large number of men although they were still held and all other fires were out.

By midnight the Collie fires had burnt over some 500 acres but were held, the Gleneagle fire was held to less than an acre as was the Mundaring fire.

The extent of the Dwellingup fires is shown in Fig. 8, with not a great area burnt, but with many miles of hot perimeter and fires 10 and 10A still running.

*Saturday, 21st January*

Fire Hazard Dangerous
T. Max. 101°
R.H. Min. 20 per cent.

At 4 a.m. a tongue of fire was discovered coming over the hills and approaching the South Dandalup River.

This fire may have come from No. 12, but it is possible it originated from new lightning strikes on the scarp during the night.

It was contained by Murray District bush fire brigades.

At 6·30 a.m. Harvey reported a new fire and No. 14 Dwellingup was reported at 9 a.m., but not located in the field until 11·00 by which time Nos. 15, 16 and 17 had also been found. No. 18 was picked up at 12·30 p.m.

These new fires out-flanked and completely nullified all the work done during the night on the Southern flank of No. 10, and all gangs were recalled to Dwellingup for re-grouping.

Visibility from the towers was practically nil and the position of the running fire face had to be ascertained by ground patrol.

The picture that emerged showed that fires 3 and 4 (the Wells fire) had broken away again and could be treated as a separate fire, and there was an extensive area with a series of running fires extending from the South-West to Boonering in the North-East and Myara in the North-West ; an area of nearly 250 square miles.

The general strategy envisaged holding the western flank on extensive areas of previously burnt breaks ; the northern face could be held by the Serpentine Dam clearing and by gangs from Gleneagle working South-East from this clearing to the North-East Road.

The Southern and South-Eastern faces were regarded as critical with the prevailing winds at the time, and it was planned to hold this face along the North-East Road by back burning at night from Dwellingup to Albany Highway, however, it was found that a spot fire had already jumped this road forming a salient which had to be contained.

During the day Mundaring Weir had two fires, one a lightning strike, and the staff were called out to another major lightning fire coming out of private property into State Forest. This was not stopped until Wednesday, 25th, after burning over 9,000 acres.

Harvey reported two more fires, one being a fresh lightning strike.

By midnight, the Marrinup fire (No. 14) was held on recently burnt country in light litter, and the Wells fire (Nos. 3 and 4) was held but still giving some trouble.

The Western and Northern flanks were quiet, the North-Eastern flank was being held precariously and back burning was proceeding up the North-East Road.

*Sunday, 22nd January*

Fire Hazard Severe Summer, approaching Dangerous.
T. Max. 100°
R.H. Min. 27 per cent.

By Sunday relief gangs and fresh officers were being drawn from as far north as Wanneroo and as far south as Nannup.

Most fire points were being held and consolidation was proceeding satisfactorily although the position was still dangerous.

At 4·15 p.m. Gleneagle had a smoke reported to the South-East but because of smoke haze no cross bearings were possible.

By 6·30 p.m. two large fires were discovered some 10–12 miles South-East of the Settlement which were probably lightning fires lit the previous day.

These fires eventually merged and burnt a large area in the Eastern Catchment area and necessitated all Gleneagle gangs being withdrawn from the Dwellingup fires.

*Monday, 23rd January*

Fire Hazard Severe Summer, approaching Dangerous.
T. Max. 98°
R.H. Min. 27 per cent.

All points were held, no breakaways had occurred and good progress was being made in mopping up.

By 6 p.m. it was felt that the position was satisfactory and that complete control would be achieved within the next few days although there was a perimeter of over 100 miles, most of it potentially dangerous.

*Tuesday, 24th January*

Fire Hazard Dangerous.
T. Max. 106°
R.H. Min. 13 per cent.

At dawn a fresh fire, No. 19, was discovered 3½ miles South-East of Mt. Solus, this outflanked the work being done on the South-East face from the dam clearing to the North-East Road, and the Wells fire had broken away again.

The gangs from the South-East face had to be withdrawn to contain the new fire by back burning from the North-East Road and the Wells fire gangs had to be reinforced.

By 11 o'clock the gangs back burning along North-East Road were reporting difficulty in holding their back fire, and between 11·30 and 1 o'clock the freshening North-West wind had taken the fire out of control over the road in several places and all gangs were withdrawn and instructed to report back to Dwellingup or, if this were impossible, to place themselves on safe ground since, in view of the forecast there was grave danger that some of the gangs might get cut off and engulfed by the fire.

It was intended to re-group and begin the fight all over again when the fire and weather pattern became clear.

At about 2 o'clock there was a breakaway from the Eastern flank of the Marrinup fire (No. 14) just north of the South Dandalup River and a head of fire was driven on a strong westerly wind towards Banksiadale to a point just South of the town, where it spotted over the road into country not so far involved in the fire.

Banksiadale was well protected but an officer and extra gangs were sent there as an added precaution and to prevent any back burning at this stage.

The fires south of Banksiadale presented a new threat and every effort was made to contain them but by late afternoon they had made considerable headway and further spot fires made effective control very difficult.

In view of the obvious danger to the settlement at this time, Holyoake was evacuated.

There was still no threat to Dwellingup and settlers on farms throughout the district were advised by telephone and couriers to evacuate their farms and come in to Dwellingup.

The police at Pinjarra were advised of the position and Wells and Teesdale Towers were evacuated.

It was realised that some of the very old mill houses might be ignited by flying embers, but the resources available were considered strong enough to ensure the safety of the town.

All women and children were concentrated in safe positions and the fire fighting gangs were deployed on threatened flanks and throughout the village with pack sprays and power pumpers.

By 7·30 p.m. the fire was still some two miles North of the town and everything was in readiness to meet it.

However, around 8 o'clock the tornado struck and the gale force winds, which persisted throughout the night, brought the fire down on the town in four heads.

Burning debris which showered over the town long before the actual fire reached the area started numerous spot fires throughout the settlement and ignited buildings at widely separated points.

The first two heads of fire were warded off but the other two engulfed the town and much heroic work was done in saving what was saved.

It is to the great credit of all personnel that throughout the terrifying experience of the night of January 24th there was no panic and not a single casualty.

*Wednesday, 25th January*

Shortly after midnight the fire had burned out Nanga Brook, after the majority of residents had been evacuated to Waroona. By first light on Wednesday, 25th, the new Southern and South-Western flanks of the now greatly extended fire were held on a line some 14 miles south of Dwellingup. Steady rain which commenced falling over the whole fire in the late afternoon, stopped the running fires and the long job of mopping up the large perimeter commenced.

*Fire Losses.*—One hundred and forty-five buildings throughout the district were lost together with heavy damage to orchards, fencing and stock.

Departmental losses included seven houses, two offices, two lookout towers, a sawmill and a number of outbuildings. Nine vehicles were destroyed and a quantity of stores and equipment.

Losses in the forest are difficult to assess as most of the fire damaged timber will be utilised by the sawmills.

The fire covered some 350,000 acres, but a large part of this area was not seriously damaged.

Assessments carried out since the fire show that 30 per cent. of the burnt area was virtually unaffected by the fire, entirely due to previous controlled burning in the past three or four years, 50 per cent. suffered more or less severe damage (depending on the time elapsed since previous controlled burning operations on those areas) and 20 per cent. was severely damaged, the trees being completely defoliated.

Jarrah is, however, a very fire resistant species, and most of the trees will recover, having suffered mainly a set back to growth. Surprisingly few trees of any value were killed by the fires.



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