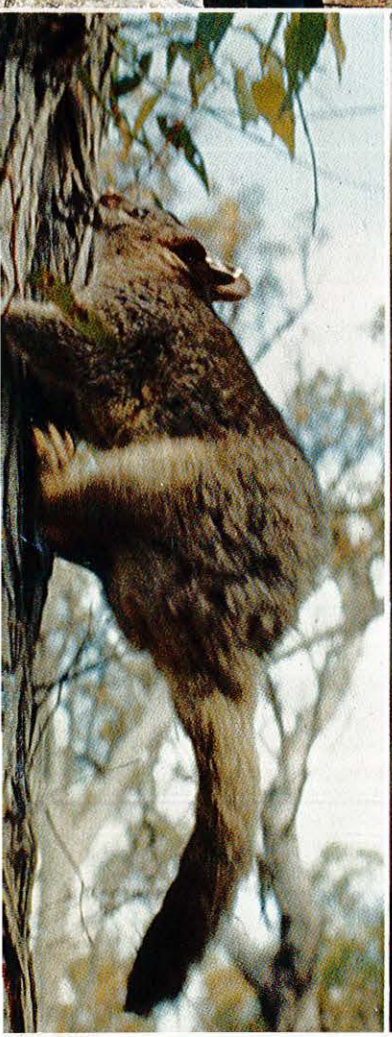
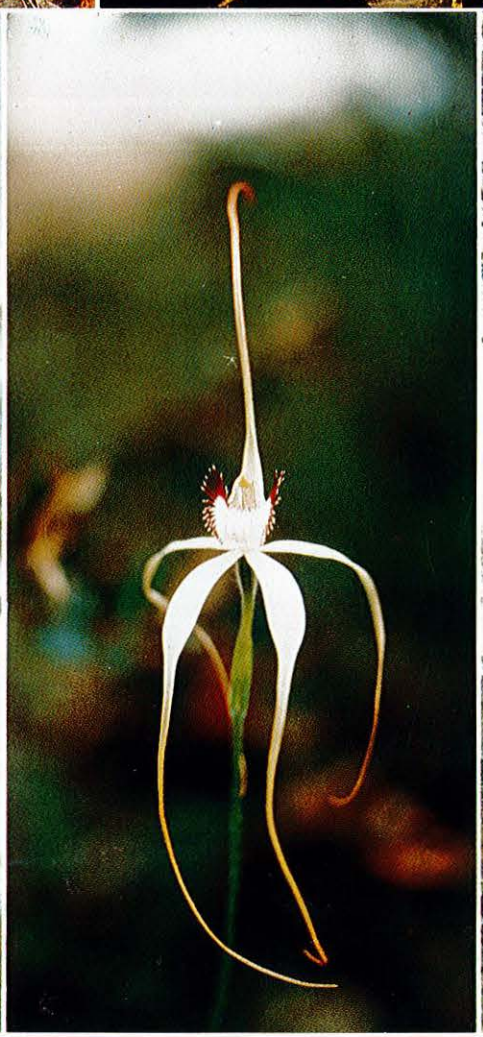
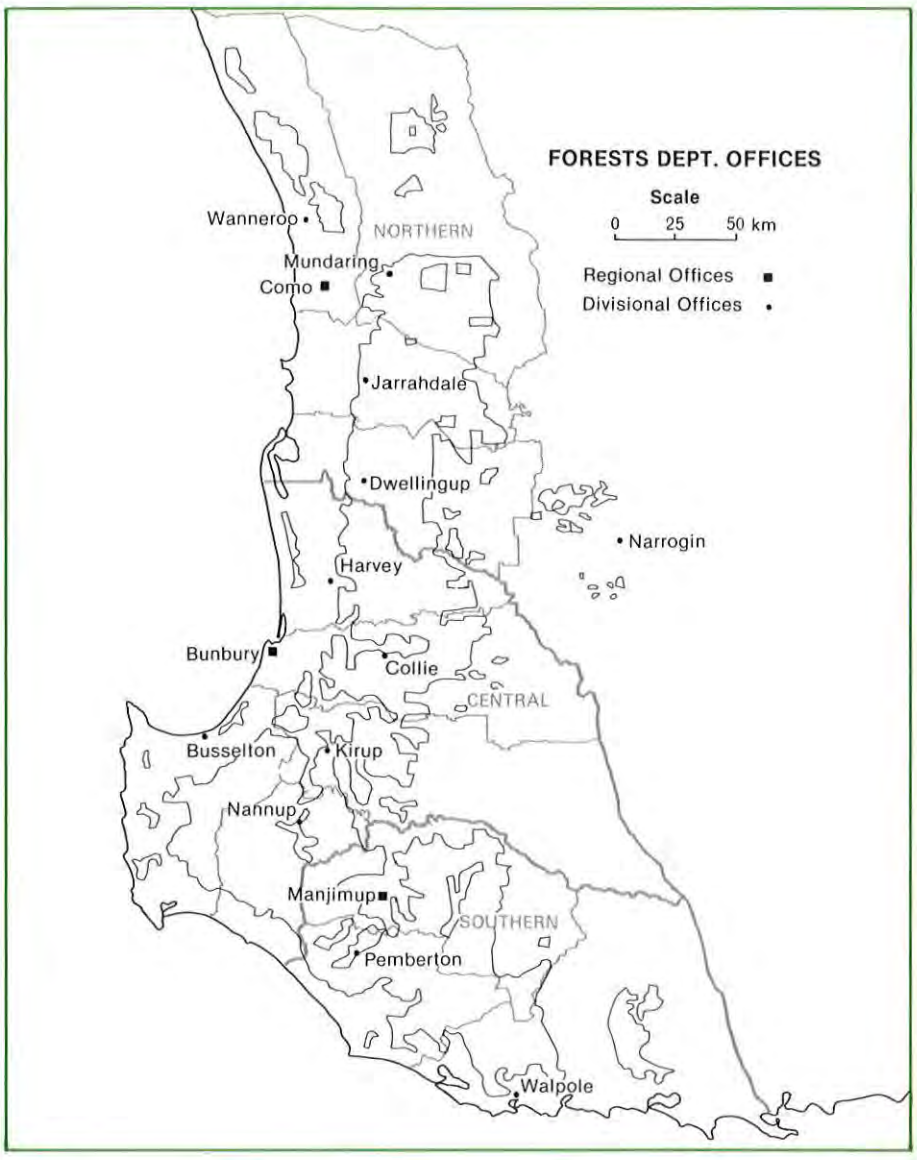
FORESTS DEPARTMENT WESTERN AUSTRALIA

2-5





Annual Report 1983



The Perup Fauna Priority Area is an example of the Department's multiple-use management of forests in Western Australia. The area is composed of jarrah and wandoo forest, and swampy flats. Since 1972, the area has been used for fauna research and habitat management for five species of mammal, all of which are on the "rare and in need of special protection" list. Compatible with the main use of wildlife management is education. A Forest Ecology Field Study Centre has been established where courses in field ecology are held.

FORESTS DEPARTMENT COMO, W.A.

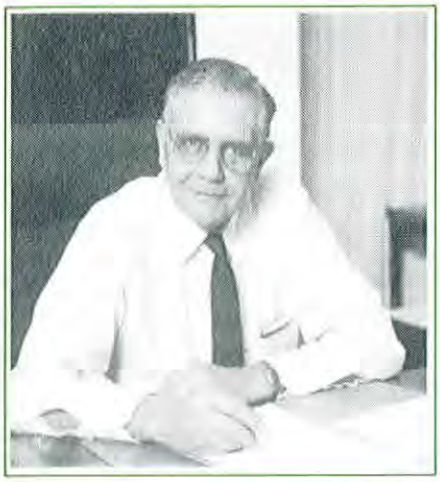
TO THE HON. BRIAN BURKE, M.L.A.
PREMIER AND MINISTER FOR FORESTS

In accordance with Section 42 of the Forests Act, I present the Annual Report of the operations of the Department for the year ended 30 June 1983.

P.J. McNAMARA,
Acting Conservator of Forests.

CONTENTS

1 FOREWORD



Several major changes occurred in the Department during the year. Foremost among these was the promotion of former Conservator of Forests, Mr B.J. Beggs, I.S.O., to the position of Director General of the Department of the Premier and Cabinet. This ended a lifetime association between Mr Beggs and the Forests Department. All staff wish him well in his new position.

The 'Year of the Tree' was brought to a successful conclusion through the Co-ordinating Committee. Funds from Federal and State sources were approved for a wide range of community and local authority projects. It is hoped that Commonwealth financing will be available for the expansion of these activities into a more comprehensive programme aimed at promoting Australia's Bicentenary.

Following the government's decision to declare the Shannon River Basin a National Park, joint planning for the integrated management of the D'Entrecasteaux National Park and the Shannon River Basin has commenced with the National Parks Authority. Timber production plans for the southern region are being adjusted accordingly and proposals are being developed for a pine planting programme aimed at stabilizing the timber industry in this region.

The economic recession has had serious effects on the home building industry and this year has been particularly difficult for the timber industry. Most sawmills adopted shorter working hours to curtail accumulation of stocks and the opportunity was taken to rationalize production by the closure of the Quininup, Jarrahwood, Palgarup and Nannup Brook sawmills. This was in line with the longer-term proposals in the General Working Plan and was accomplished with the least possible disturbance to the work force.

A highlight of the year was the Department's involvement with the CSIRO Division of Forest Research in a fire behaviour study carried out as part of the Federal government's Project Aquarius. Although the programme was plagued by unseasonal and unsuitable weather conditions, a wealth of new information about fire behaviour in heavy fuels under summer conditions was obtained. This will have far reaching effects in developing appropriate fire suppression strategies, both locally and throughout Australia.

Regrettably, the suppression of several fires suspected of being deliberately lit in State forest or on neighbouring Crown land, resulted in unavoidable and unbudgeted expenditure this year.

Extensive field trials investigating the long-term relationships between forest management practices and water quality and yield were established near Manjimup, in conjunction with the Public Works Department, and near Dwellingup by the Forests Department.

A comprehensive review of all aspects of the jarrah dieback disease was completed during the year, and has led to the tentative conclusion that it may be possible to develop a safe and workable management system for the jarrah forest based upon ecological site classification.

Department officers were significantly involved with organizing and presenting papers at the 53rd ANZAAS Conference in Perth this year. It is gratifying to note that the conference was both highly successful and achieved a new record for attendance.

It is pleasing to report that following the approval of a comprehensive works programme, the Department was able to provide full-time employment for some 94 people, using funds made available under the Federal Government's special employment programme.

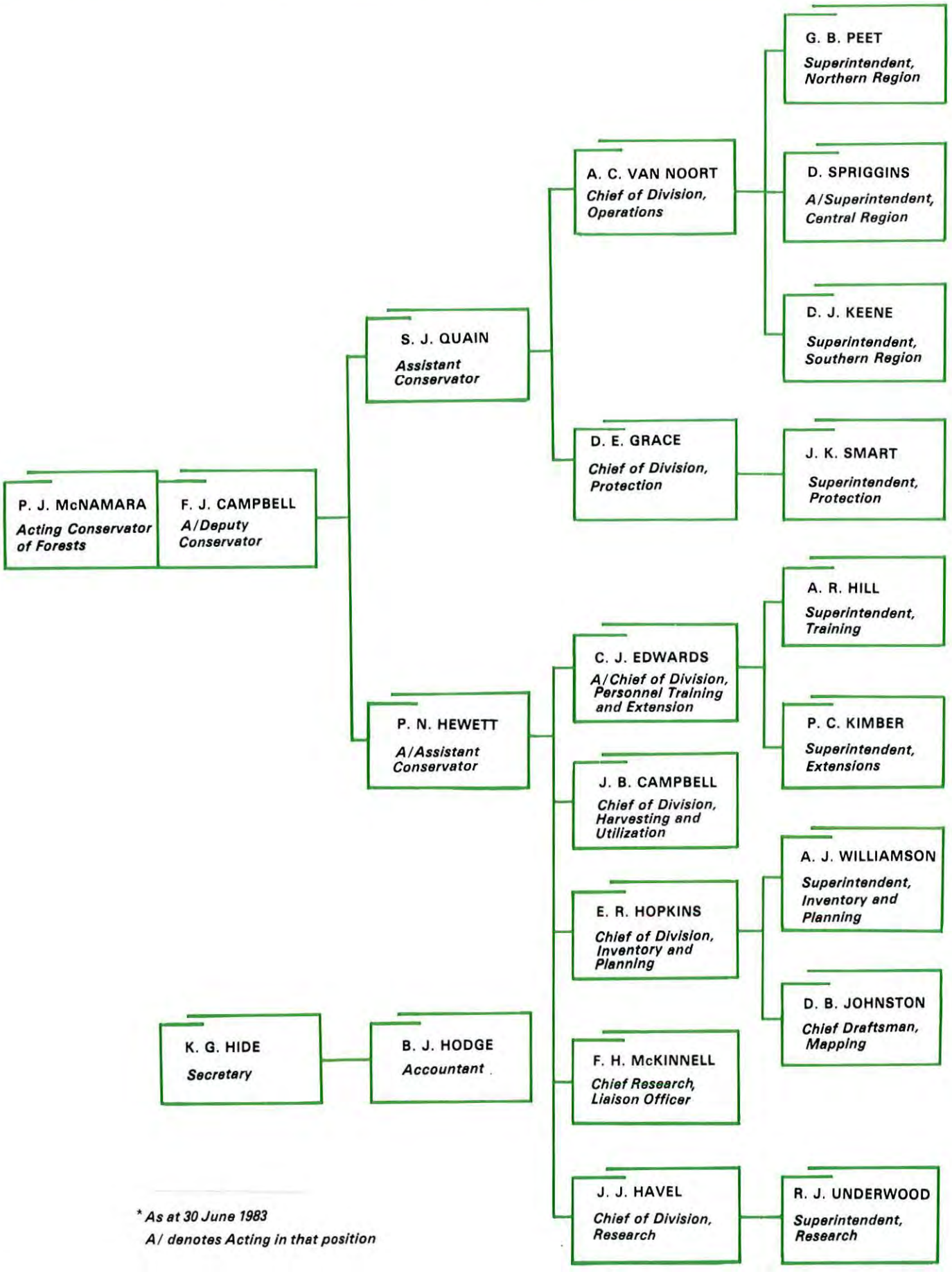
Lastly, I would like to commend all Departmental staff for their response to the changes and challenges during the year and for their participation in the activities that are set out in this report.

P.J. McNAMARA
Acting Conservator of Forests

Project Aquarius is a co-operative fire research project between Federal Government and the Forests Department of Western Australia, long experienced in fire management and research. The area chosen for the project was in the Donnybrook Sunkland.

Part of Project Aquarius was the research into the physiological stress experienced by fire fighters at the front of large fires (insert).

2 PRINCIPAL OFFICERS*



As at 30 June 1983

A/ denotes Acting in that position

3 OBJECTIVES

Forest policy involves the following management objectives.

Water Supplies: To protect, control and rehabilitate, where necessary, those forest areas that contribute to the water supply requirements of the State.

Timber Production: To regulate the removal of produce from the native forests to a level that can be sustained by the forest growth in the long term.

Other Forest Produce: Within the management guidelines for the forest, to ensure the future livelihood of those persons involved in "less important" forest industries.

Recreation and Tourism: To extend access to the forests wherever this is possible and to provide additional facilities for people to enjoy the many forest values that are available to them.

Flora and Fauna: To conserve the habitats of the many species of flora and fauna that exist in the forests of Western Australia.

Special Scientific Values: To set aside specific areas of forests for the purpose of education, reference and scientific study.

Mining: To rehabilitate and stabilize those forest areas upon which the original vegetation has been destroyed in the course of mining operations.

Forest Protection: To maintain and add to the areas of permanently reserved forests; to protect these forests from fire, insects and other harmful agencies, and to maintain and improve the health and vigour of the forest area.

Private Forestry: To encourage and assist private owners to establish and manage commercial forests, and to provide landholders with advice on planting trees for their shelter and protective values in the rural areas.

4 STATISTICAL SUMMARY OF FORESTRY ACTIVITIES 1982/83

The Forest Estate

Total area of State forest	1 869 171 ha
Additions to State forest	1 292 ha
Excisions from State forest	227 ha
Timber reserves	118 893 ha
Freehold land held in the name of the Conservator of Forests	26 368 ha
Land purchased for pine planting	Nil

Hardwood Forest Establishment

Area of karri and karri-marri forest regenerated	2 427 ha
Wandoo forest regeneration	280 ha
Tuart forest regeneration	62 ha
Catchment regeneration	930 ha
Reforestation of disease killed forest	656 ha
Reforestation of gravel pits	89 ha
Reforestation of areas mined for bauxite	271 ha
Reforestation of areas mined for coal	4 ha

Pine Forest Establishment

Areas planted with pines 1982	2 190 ha
Radiata	1 548 ha
Pinaster and other species	642 ha
Total area of pine forest established at 31 December 1982	54 744 ha
Radiata	28 389 ha
Pinaster and other species	26 355 ha

Nursery Production

Eucalypt plants for Departmental use	
Manjimup nursery	2 316 000
Hamel nursery	435 700
Narrogin nursery	2 000
Eucalypt plants for public sale	
Hamel nursery	147 900
Narrogin nursery	188 000

Nursery Production

Pine plants for Departmental use	
Radiata	1 607 600
Pinaster	923 500
Pine plants for public sale	482 500
Other plants	
Karratha nursery	48 958

Forest Protection

Area of prescribed burning	272 986 ha
Fire outbreaks	
Number of fires	247
Area burnt	4 225 ha

5 STATISTICAL SUMMARY OF FOREST-BASED INDUSTRIES 1982/83

Sawn Wood Production

Total production of sawn timber	265 340 m²

Log Production

	Crown land (m³)	Private Property (m³)
Saw logs hardwood +	637 063	75 459
Saw logs softwood +	41 611	1 908
Other logs hardwood*	412 117	21 835
Other logs softwood*	135 007	3 740

\+ includes logs used for production of plywood veneer.
* includes chip logs and particleboard material.

Hardwood Chip Logs

Quantity produced	433 952 m³

Firewood Production

Quantity produced	57 174 t

Poles and Piles

Quantity produced	215 555 lin m

Sandalwood

Quantity produced	1 714 t

Average Monthly Employment

Timber mills, including bush workers	1 760
Other timber reprocessing plants (est.)	3 000
Firewood, mining timber and pole cutters	59
Sandalwood workers	65
Apiarists	161
Forestry (including contractors)	1 228

6 THE FOREST ESTATE

Area of State Forest and Timber Reserves

The area of land held as State forest at 30 June 1983 was 1 869 171 ha, which represents a net increase of 1 065 ha compared with the area at 30 June 1982. The area of land under timber reserves (Forests Act 1918-76) was also increased this year by 105 ha to 118 893 ha. Freehold land held in the name of the Conservator of Forests totalled 26 368 ha, a decrease of two hectares for the year.

Type	Area (ha)
Jarrah	1 449 000
Karri	149 000
Wandoo	106 000
Mallet	10 000
Tuart	3 000
Goldfields species	30 000
Radiata	29 000
Pinaster	26 000
Very open areas	212 000
	2 014 000

Land Alienations and Leases

Land alienation is the process of removal of land from Crown to private ownership. This year a total of 26 applications for alienation was received, involving 10 247 ha, and 47 applications for forest leases were received involving 4212 ha. The Department agreed to the following:

(a) Alienations

	Number	Area (ha)
Timber zone —		
State forest .	2	15
Crown land .	5	364
Outside timber zone.....	Nil	Nil

(b) Leases

Timber zone —		
State forest	27	1 939
Crown land....	7	587
Outside timber zone.....	Nil	Nil

MAJOR FOREST TYPES WITHIN THE FOREST ESTATE

JARRAH includes pure jarrah; jarrah with marri, W.A. blackbutt, wandoo, W.A. sheoak and bullich as minor species; stands dominated by marri with jarrah as the minor species; stands dominated by W.A. blackbutt with jarrah or marri as the minor species; stands dominated by bullich with jarrah or marri as the minor species.

KARRI includes pure karri; karri with marri, and/or jarrah and the three species of tingle as the major or minor species.

WANDOO includes pure wandoo; pure powderbark wandoo; wandoo and powderbark wandoo with jarrah, marri and brown mallet as minor species.

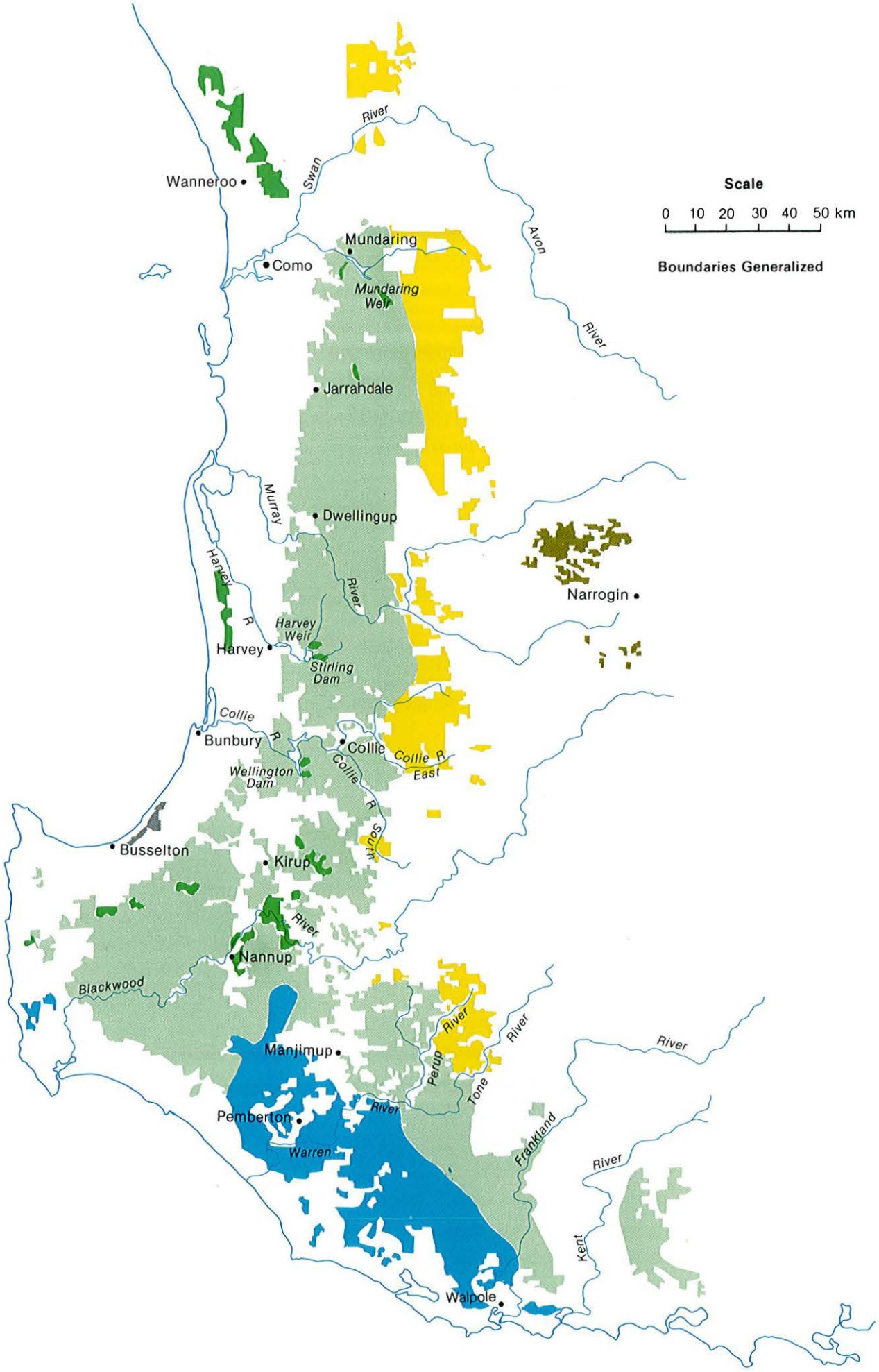
MALLET includes 8 300 ha of brown mallet plantation; mallet species with wandoo as the minor species.

TUART consists of pure stands only.

RADIATA includes pure stands in plantations only.
PINASTER includes pure stands plus a very small area of other species, in plantations only.

GOLDFIELDS SPECIES (not shown) includes pure stands of salmon gum, Dundas mahogany, Dundas blackbutt, Cleland's blackbutt, silver gimlet, sandalwood, jam and many others, or any of these species in combination.

VERY OPEN AREAS (not distinguished) includes swampy and rocky areas with sparse tree canopy; areas cleared for mining and not yet rehabilitated; powerlines and dams.


Scale
0 10 20 30 40 50 km
Boundaries Generalized
Wanneroo
Swan River
Mundaring
Como
Mundaring Weir
Avon River
Jarrahdale
Murray River
Dwellingup
Harvey R
Harvey River
Harvey Weir
Harvey
Stirling Dam
Narrogin
Collie
Bunbury
Collie R
Collie R East
Wellington Dam
Collie R South
Busselton
Kirup
Nannup
Blackwood River
Manjimup
Perup River
Tone River
Pemberton
Warren River
Frankland River
Kent River
Walpole

7 LAND MANAGEMENT

In accordance with its policy of multiple use, the Department manages forest land for the full range of forest values. Land management is an integral part of the Department's activities.

Land Use Management Plans

Final drafting of the Land Use Management Plan for the whole of the forest estate was given high priority during the year.

Flora

The search for gazetted rare species of plants continued in the Sunklands area between Busselton and Nannup. In the same area, populations of brown boronia *(Boronia megastigma)* were located and will be given special management.

Patches of the red-flowering variety of marri were also located in the Sunklands. The location of these stands is recorded on Forests Department maps.

Herbaria representing local species were maintained at Manjimup, Busselton, Dwellingup, Karratha and Como. The Como plant collection also includes species from the Kimberley.

In 1981, a seed orchard for rare Western Australian tree species was established at Collie. This work has been extended this year by further plantings near Balingup.

Manjimup research staff assisted the Western Australian Museum in a search for the little known wattle *Acacia scapeliformis.*

Liaison was maintained with the Department of Fisheries and Wildlife in controlling commercial harvesting of wildflowers in State forest.

Fauna

Research staff continued their routine fauna surveys. This included a two-month long fauna survey in the tuart forest. Nine species of mammals, 13 birds, three lizards, three frogs and four species of fish, were recorded for the first time.

Woylies *(Bettongia pencillata)*, which were abundant in the Sunklands area but disappeared by the end of the 1920s, were re-introduced into the region with permission from the Department of Fisheries and Wildlife.

Landscape Planning

A Landscape Management Seminar was hosted by the Department in May. Australian and United States experts contributed their ideas for the development of a forest landscape management system for Western Australia.

A number of landscape plans were prepared during the year. These included site planning for Departmental offices at Pemberton, Manjimup, Dwellingup and Wanneroo, and the re-design of the Karratha nursery.

The landscape management study for the section of Albany Highway passing through State forest was finalized and presented to operations staff for implementation.

A brochure entitled 'Design and Siting Guidelines — Development in Hot Arid Zones', was published.

Recreation

A forest recreation framework plan for the northern region was finalized, and local recreation planning commenced.

A three-day training school in recreation operations was run in May and attended by Departmental staff and officers from other government departments. A recreation operations manual and a new signs manual were presented at the school.

Recreation site plans were produced for a number of Departmental projects, and for other government agencies. The largest project among these was the preparation of a landscape rehabilitation and tourist development plan for the Oliver's Hill gun emplacement on Rottnest Island.

At Kununurra the Department undertook a joint project with the National Parks Authority for the development of recreation in the Hidden Valley National Park.

As well as the Project Aquarius investigations and silvicultural research, Manjimup research officers continued their research into forest fauna. A Phascogale tapaotafa, *or Wambenger, was recently found and tracked over several weeks.*

The Department's landscape planning section undertook several projects for other government agencies during the year, including a rehabilitation and tourist development plan for the Oliver's Hill gun emplacement site on Rottnest Island.

Establishment and Tending of Forests

Jarrah Forrest

The jarrah forest regenerates from lignotuberous seedling stock on the forest floor. Following logging, fire or natural death, openings are created in the forest canopy allowing seedlings to develop into saplings which grow into mature trees. The spread of jarrah dieback disease has severely affected the capacity of the jarrah forest to regenerate naturally on certain sites.

The Forest Improvement and Rehabilitation Scheme (FIRS) in the northern jarrah forests was continued in 1982/83. FIRS involves the thinning of regrowth forest, the regeneration of disease affected forest and the development of recreational facilities in accordance with the land use priority set for a particular area. The areas treated were 140 ha at Dwellingup, 395 ha at Jarrahdale and 106 ha at Harvey.

Rehabilitation of log landings, snig tracks and gravel pits proceeded with the co-operation of the timber industry, using a total of 65 000 plants.

Karri Forest

During the winter of 1982, 2 427 ha of cut over karri forest was regenerated. Of this, 766 ha was regenerated with natural seed fall from retained seed trees, 1569 ha was hand planted with karri seedlings and 92 ha was sown with karri seed.

Rehabilitation of landings, snig tracks and gravel pits continued in conjunction with the timber industry. Approximately 500 landings and associated snig tracks were ripped and planted with karri seedlings.

Wandoo Forest

Wandoo regeneration was carried out in the Mundaring division. In conjunction with the Public Works Department 120 ha was planted on the Helena catchment. In addition, 280 ha of wandoo was regenerated with natural seedfall from retained seed trees.

Mallet Forest

The Narrogin division contains most of the mallet forest under Forests Department control. This forest is mainly in plantation form.

During the year, 88 ha was thinned for tool handles and 60 ha was thinned for fence posts.

Tuart Forest

At Ludlow, 62 ha of tuart forest was regenerated and 32 ha prepared for regeneration.

In addition, 12 ha of clear felled pine forest was planted with tuart.

Pine Forest

The Department has a pine planting programme aimed at supplementing the production of the native hardwoods to provide net self-sufficiency in sawn timber supplies. State pine forests now cover 54 744 ha.

PINE FOREST ESTABLISHMENT

Area planted with pines 1982	
Radiata	1 548 ha
Pinaster and other species	642 ha
	2 190 ha
Total area of pine forest at 31 December 1982	
Radiata	28 389 ha
Pinaster and other species	26 355 ha
	54 744 ha

1982 PLANTING (HA)

DIVISION	Radiata	Pinaster and other species	Total
Wanneroo	—	449.7	449.7
Harvey	368.4	134.9	503.3
Kirup	523.9	5.4	529.3
Busselton	656.0	52.1	708.1*
Total	1 548.3	642.1	2 190.4

*Includes 87.1 ha of second rotation planting

Tending

The following pine forest tending was carried out during the year:

	ha
Scrub control	2 907
Fertilizing with Superphosphate	3 908
Fertilizing with Minor Elements	532
High pruning	4 852
Low pruning	2 012

Private Forests

Private interests advised the Department that 129 ha was planted with pine during the year, bringing the total area of privately owned pine forest in the State to 12 235 ha.

The W.A. Chip and Pulp Co. planted 46 ha of eucalypts (mainly *Eucalyptus globulus*) as a future chipwood resource. This brings the total area of private eucalypt plantation to 144 ha.

Inland Forests

Goldfields

As the higher price for gold remained steady, the increased demand for mining timber continued. There was also a marked increase in alluvial mining this year, for which the Department provided advice on site rehabilitation.

Rural extension work in the Kalgoorlie and Esperance area increased during the year.

Tree planting continued for the Goldfields Dust Abatement Committee, and revegetation of slime dumps proceeded with successful results.

Over 100 km of new firebreaks were constructed on sandalwood and timber reserves.

The assessment of the State's sandalwood resource continued, with financial assistance from the Australian Sandalwood Company.

Pilbara

Major capital improvements were made to the Karratha nursery, including the construction of a propagation house for raising cuttings. The nursery raised 52 000 Pilbara plant species and other arid zone plants. Ten thousand plants were used for the rehabilitation of the degraded South Common at Carnarvon under a project sponsored by the Carnarvon Environmental Committee in liaison with the Shire, Forests Department, Department of Agriculture, and Alcoa of Australia Ltd.

Over 500 enquiries on landscaping and tree and shrub establishment were handled by the Karratha staff. In general, the use of arid zone plants with a low water demand was encouraged.

Other extension projects included participation in radio talk-back shows, presentation of photographic displays

at five regional shows, and a seminar at Hedland Technical College on planting techniques and low water usage for arid zone species.

Liaison with the pastoral community and mining companies continued, including advice on the rehabilitation of mine sites.

Kimberley

The Broome nursery has been transferred from the Department of Regional Administration and the North-West to the Forests Department. One full-time nurseryman, one apprentice and three Aboriginal trainees are employed at the nursery.

During the year, the nursery was re-fenced and upgraded, and produced 60 000 plants. Nursery stock included species native to the Kimberley area, and some tropical flowering and fruit trees.

A clone-bank of mangoes associated with the Broome nursery was thinned and upgraded, and a clone-bank of cashew-nut trees was established.

Seed collections were made throughout the Kimberley and an advisory service was provided to Broome residents and local outlying communities.

Departmental staff at Kununurra continued to answer local enquiries and encourage tree planting by Aboriginal communities throughout the Kimberley. Close liaison was maintained with Shires, mining companies and pastoralists in rehabilitation projects. The Kununurra arboretum was extended.

Rhonda Robinson is one of the assistants at the newly acquired Broome nursery.

Sandalwood is a valuable forest product and is exported from the State by the Australian Sandalwood Company. Sandalwood chips are loaded into carriers for transport to the port.

Mining Rehabilitation

Bauxite Mining Rehabilitation

A total of 270.8 ha of pits, access roads and other clearings associated with mining was reforested by hand planting during the year. Seeds of native shrubs were broadcast over all areas and jarrah seed was introduced onto freely drained upland pit sites. The Department planted 92.8 ha at Jarrahdale, and Worsley Alumina Pty Ltd planted 30 ha in areas adjacent to their conveyor system. Alcoa of Australia Ltd planted 148 ha at the Del Park and Huntley mine sites. Species planted included wandoo, powder bark wandoo, flooded gum, bullich, marri, blackbutt, spotted gum, Sydney blue gum and red mahogany.

Mineral Sands Mining Rehabilitation

A total of 48 ha near Capel, mined by Westralian Sands Ltd, was landscaped and sown to pasture grass and clover by the company. A total of 49 ha, mined by Associated Minerals Consolidated at Capel, was seeded with pasture grass and clover, and 8.2 ha was planted with trees in a joint exercise between the company and the Forests Department.

Coal Mining Rehabilitation

In association with the Mines Department, the Forests Department landscaped and planted 4 ha of abandoned mine sites at Collie. At the old Stockton mine, now a recreation site, a further 3 ha were landscaped and planted with eucalypts and acacias.

Gravel Pit Rehabilitation

A total of 89 ha of disused gravel pits was rehabilitated on State forest and timber reserves in the south-west. Contributions to this programme were made by various Shires and the Main Roads Department. Trees planted included spotted gum, wandoo, marri, karri and red mahogany.

Catchment Rehabilitation

The Department planted 845 ha of former farmland in the Wellington and Helena catchments for the Public Works Department. This included the replanting of 120 ha of frost damaged areas in the Helena catchment. A further 85 ha was planted for the State Energy Commission in the Wellington catchment. Trees planted included wandoo, river gum, flooded gum, powder bark wandoo, swamp mahogany, Sydney blue gum and yellow stringy bark.

Protecting the Forest

Activities centred on two major programmes — protection from wildfire and protection from the spread of dieback disease.

Fire

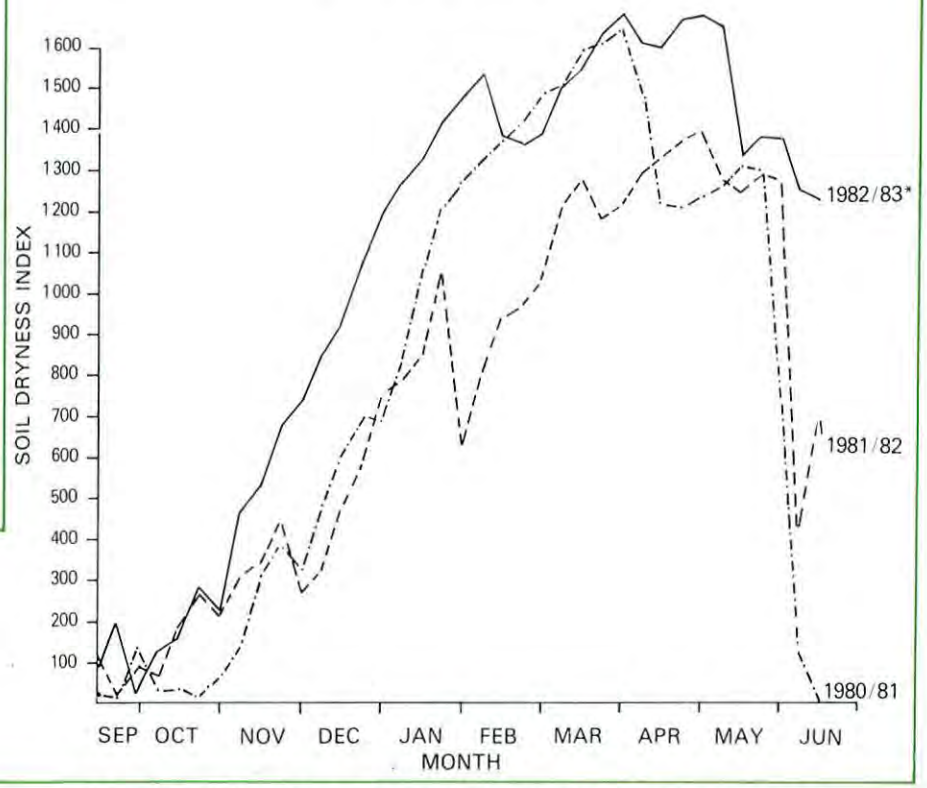
The area of land under the control of the Forests Department and protected from wildfires was 2 014 432 ha. In addition, protection was afforded to a considerable area of private and other government land adjoining and near State forest through the Department's detection programme, co-operative prescribed burning ventures and neighbour-to-neighbour fire suppression activities. Although approximately 46 per cent of all wildfires this season (covering 7288 ha) originated outside State forest, they were attended by the Forests Department fire suppression forces.

The weather for the fire season was generally warm and dry with an extended autumn. Some very hot, dry days occurred, leading to periods of extreme fire conditions. The number of fires this year was above average, with large fires occurring in the Harvey and Manjimup divisions.

Prescribed Burning

During the year, 57 aerial prescribed burns were programmed, 54 were completed and three were postponed to the 1983/84 burning season. All karri regeneration burns and Sunkland clearing burns were satisfactorily completed.

TREND IN THE SOIL DRYNESS INDEX AT MANJIMUP FOR THE LAST THREE YEARS



The extent of the prolonged dry fire season experienced in 1982/83 is apparent from the comparison of the Soil Dryness Index (an indicator of soil droughting) over the past three years at Manjimup. The graph clearly shows the early, dry spring, and the extended dry autumn conditions of 1982/83 compared with 1980/81 (also a dry summer) and 1981/82.

* THE INDEX NORMALLY DROPS WITH THE ONSET OF WINTER RAINS

The Department again co-operated with the Bush Fires Board, National Parks Authority and Public Works Department in fuel reduction programmes. Four prescribed burns, totalling 9400 ha, were completed in co-operation with the Bush Fires Board and local brigades in the Denbarker area.

Detection and Fire Suppression

The Department's fleet of nine Piper Super Cub aircraft provided the main fire detection service. A total of 7577 hours was flown. This was nine per cent above average, a result of the extended dry autumn conditions. In pine forests constant watch was maintained from four lookout towers. Another twenty towers were maintained as a back-up to spotter aircraft.

In January, a series of six deliberately lit fires was confined to a 520 ha area in State forest and adjoining private property near Harvey. In March a large wildfire escaped from private property into a nature reserve under the control of the Department of Fisheries and Wildlife, and into State forest some 85 km east of Manjimup. This fire required a major fire suppression force from the Department and voluntary bush fire brigades from the Cranbrook, Manjimup and Mt Barker Shires, before being brought under control. This fire burnt over 2300 ha. However, only 100 ha of State forest was burnt because the fuels in these areas had been reduced by regular prescribed burning. Once again the value of this measure has been emphasized.

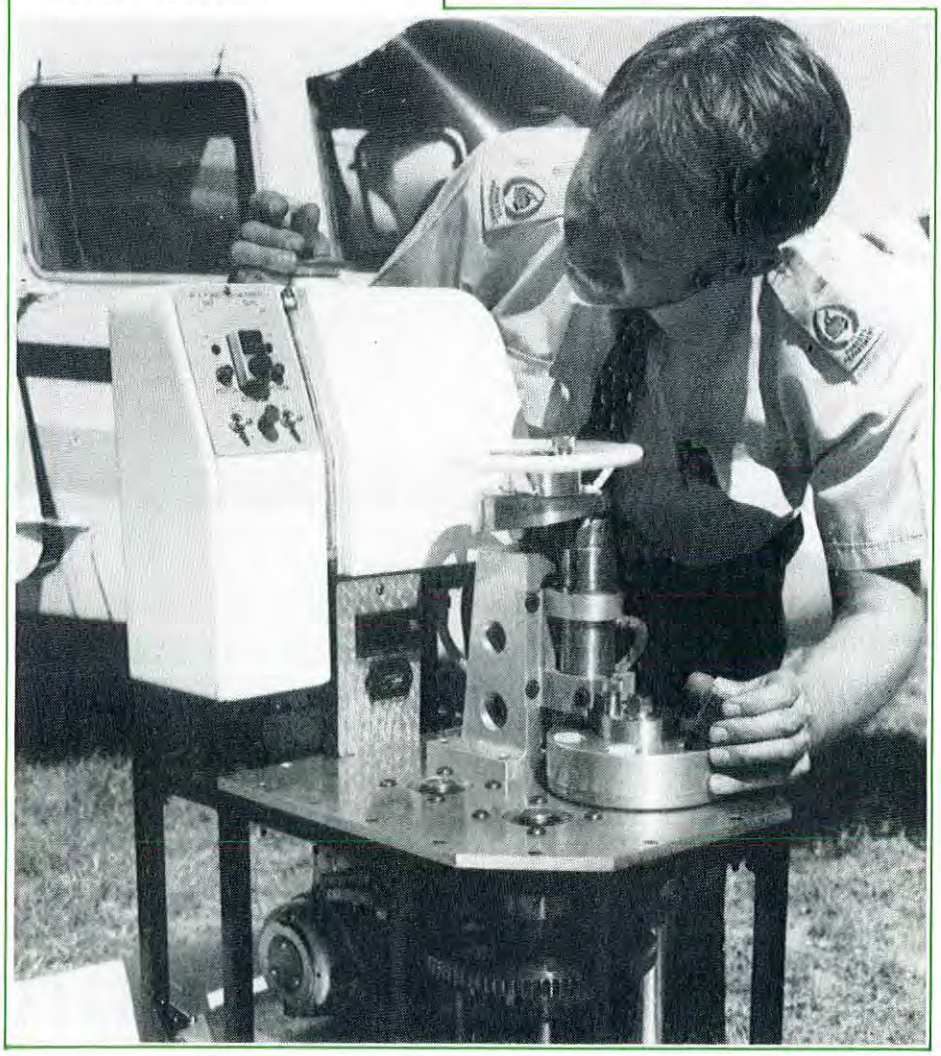
Other Activities

A fire protection plan for the southern region was completed.

Two incendiary machines, designed and constructed by the Department were supplied to the Bush Fires Council of the Northern Territory. Forester, G.W. van Didden, visited Darwin in May and assisted with the installation of the new equipment. He also instructed operators in the care and maintenance of the machines.

The introduction of computerized weather forecasting enables speedy dissemination of weather information, so vital during the summer fire season. Jean Collins of Protection branch is relaying an updated weather forecast.

Forester Gerard van Didden shows the new incendiary machine.



Two residential fire training schools were held in Busselton for 41 officers. A total of 394 wages staff received fire suppression training.

Disease

In July 1982, a task force was nominated to review all aspects of Departmental policy regarding dieback disease. Nineteen groups of experts were consulted and the task force put forward 24 policies which were accepted by the State government on 10 January 1983. This new policy, "Dieback Policy 1982", is publicly available and is progressively being implemented.

Disease Risk Areas

The area of State forest, timber reserves and other Crown land proclaimed as Disease Risk Areas (quarantine areas) remained at 719 561 ha. Access to these areas is restricted and is controlled by permits and patrols.

During the past year, 208 permits were issued, of which 196 are still current. A total of 361 patrols were carried out to ensure enforcement of the regulations.

Environmental Protection

Monitoring of major field operations continued, with a view to assessing any adverse environmental conditions and prescribing any necessary rehabilitation.

SUMMARY OF PRESCRIBED BURNING FOR PAST FIVE FIRE SEASONS

	FIRE SEASON				
	1978/79	1979/80	1980/81	1981/82	1982/83
Hardwood forest					
Burning by hand methods	57 801	53 137	42 561	34 946	36 193
Burning from aircraft	311 733	282 965	207 428	268 075	223 320
Total (ha)	369 534	336 102	249 989	303 021	259 513
Advance, top disposal and regeneration burns (ha)	3 861	3 051	9 014	6 382	7 333
Pine forest					
Clearing burns for pine establishment	2 008	987	3 749	4 158	3 560
Fuel reduction burning	1 932	1 938	1 798	2 946	2 580
Total (ha)	3 940	2 925	5 547	7 104	6 140

SUMMARY OF WILDFIRES FOR PAST FIVE FIRE SEASONS

	FIRE SEASON				
	1978/79	1979/80	1980/81	1981/82	1982/83
Number of wildfires attended					
Hardwood forest	121	81	95	87	121
Private property and Crown land adjacent to State forest	101	72	70	66	113
Pine forest	13	5	13	19	13
Total number	235	158	178	172	247
Area of State forest fires					
Hardwood forest	2 960	1 885	7 392	2 370	4 205
Pine forest	32	10	15	10	20
Total area (ha)	2 992	1 895	7 407	2 380	4 225

8 RESOURCE MANAGEMENT

Seed Supply

Seed from native species and pine trees growing throughout the State is an important forest resource.

This year seed collections totalled 536 kg comprising pine species (304 kg), native legumes (144 kg), karri (12 kg), other eucalypts (38 kg) and other species (38 kg).

Seed Store

Most seed issued this year was for Departmental nursery use and for the rehabilitation of bauxite mine pits. Sales of seed were made to mining companies for rehabilitation, to the public, and to organizations in other countries.

Departmental seed stocks at the end of June 1983 totalled 2 740 kg. This year, seed store transactions exceeded 500 despatches, and 275 seed lots were received and processed for storing. One hundred and twenty germination tests were performed. The return from sales of seed during 1982/83 amounted to $22 973.

The seed store was redesigned to improve storage and testing facilities.

NURSERY	For Sale to the Public		For Departmental Use		TOTAL
	Potted Stock	Open Rooted Stock	Potted Stock	Open Rooted Stock	
Commercial Nurseries (Mainly Hardwood)					
Narrogin	188 000	—	2 000	—	190 000
Hamel	147 900	—	435 700	—	583 600
Hardwood Nursery					
Manjimup	—	—	1 016 000	1 300 000	2 316 000
Pine Nurseries					
Gnangara	—	301 500	—	923 500	1 225 000
Nannup	—	181 000	—	1 607 600	1 788 600
TOTAL	335 900	482 500	1 453 700	3 831 100	6 103 200

Seed store technician John Lloyd checks the germination of eucalypt seed.

Tree Nurseries

The Department operates five commercial tree nurseries.

In 1982 these nurseries raised some 6.1 million trees which included approximately 3 million pine seedlings and 3.1 million eucalypt seedlings for regeneration and rehabilitation projects, as well as for shelter and amenity purposes. Approximately 615 000 of these trees were used for reforestation of water catchment areas.

Wood Production

Proper management of timber harvest from State forest remains a vital part of the Department's activities.

Areas Cut Over

Timber volume in an overmature forest is largely in a state of balance and has no net growth. As there is a continuing demand for timber, it is important to maximize the growth in those areas of forest allocated to wood production. Cutting and regeneration converts an overmature forest into one which is actively growing. At least a full rotation (the time for a species to reach a nominated felling age) is required to bring the forest into a managed condition.

Immature hardwood and softwood forests are thinned (partially cut) to increase productivity, enhance the growth of the final crop trees and maintain the forests in vigorous health. During the year, 194 ha of immature karri forest was thinned.

Log Production

This year, the volume of log timber produced from State forests was the lowest for many years. This was caused by a serious decline in the housing market. Large volumes of sawn timber stocks are held by all major sawmilling companies.

A summary of log production for the period 1968-83 is given in Appendix 5(a).

FOREST AREAS CUT OVER

		1982/83	1981/82
		ha	
Jarrah		23 744	24 676
	clear felled	985	2 181
Karri	removal of seed trees	451	1 848
	thinnings	194	319
Wandoo		326	609
Mallet		148	125
Pine	clear felled	160	266
	thinned	1 828	1 874

LOG PRODUCTION

Production of log timber (from all sources), including sawlogs and logs used for production of veneer, not including chip logs, mining timber, firewood, poles and piles —

	1982/83 m^3			1981/82 m^3		
	Crown land	private property	Total	Crown land	private property	Total
Jarrah	435 227	44 790	480 017	593 892	60 418	654 310
Karri	190 144	21 336	211 480	240 848	23 617	264 465
Wandoo	1 433	5 000	6 433	2 569	7 746	10 315
Yarri	1 320	1 155	2 475	1 605	3 311	4 916
Sheoak	867	6	873	1 199	222	1 421
Marri	7 626	1 469	9 095	9 120	891	10 011
Other	446	1 703	2 149	313	670	983
Total (Hardwood)	637 063	75 459	712 522	849 546	96 875	946 421
Pine	41 611	1 908	43 519	54 425	8 930	63 335
TOTAL	678 674	77 367	756 041	903 971	105 805	1 009 776
Other log materials*						
Hardwood	412 117	21 835	433 952	369 207	16 116	385 323
Softwood	135 007	3 740	138 747	119 049	5 904	124 953
TOTAL LOG TIMBER	1 225 798	102 942	1 328 740	1 392 227	127 825	1 520 052

*includes chip log and particleboard material.

Production of Hardwood Sawlog Timber from Crown Land

The Department's aim for sustained yield has yet to be achieved in both the hardwood and softwood forests because of the unbalanced distribution of age classes. While working towards this goal, the level of hardwood sawlog cut (the allowable cut) takes into account the State's present timber requirements, the inadequacy of hardwood forests to meet these requirements in future decades, increasing availability of pine and the need to provide a smooth transition in the timber industry from one type of resource to the other.

The allowable cut refers only to the volume of hardwood sawlogs used by general purpose sawmills, and does not include other sawlogs which, because of size or defect, cannot be used by these mills. Such sawlogs are termed salvage logs and frequently provide short scantling, small sleepers and pallet material for which there is a limited market.

The allowable cut from the hardwood forest is controlled by permits and licences issued from State Headquarters, whereas salvage material is sold under local licences.

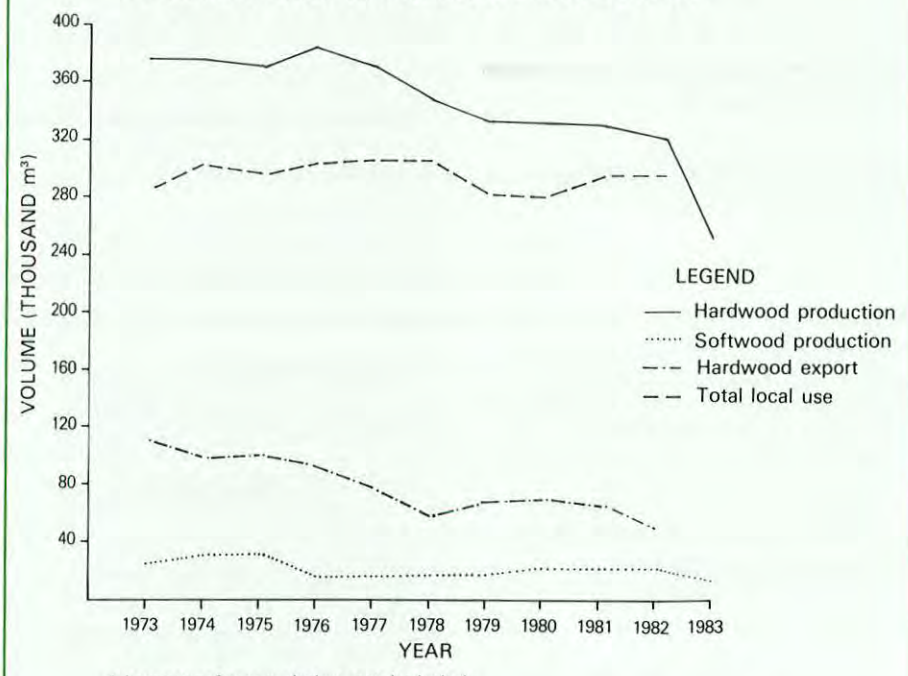
HARDWOOD SAWLOG PRODUCTION FROM CROWN LAND

	1982/83	1981/82
Head Office licences	582 525	784 849
Local licences	54 538	64 697

SAWN TIMBER PRODUCTION FROM CROWN LAND AND PRIVATE PROPERTY

	1982/83	1981/82
Sawn Timber Production		
Crown land	214 372	283 356
private property	22 927	32 312
Sawn Sleeper Production		
Crown land	23 638	23 586
private property	4 403	3 851
Total	265 340	343 105

TRENDS IN THE PRODUCTION AND USE OF WESTERN AUSTRALIAN SAWN TIMBER FOR THE LAST 10 YEARS*



* Imports of sawn timber not included.

Veneer Log Production

High quality logs for peeling and slicing into veneers (karri and pine) continued to be supplied to local plywood factories, at the level demanded by the market.

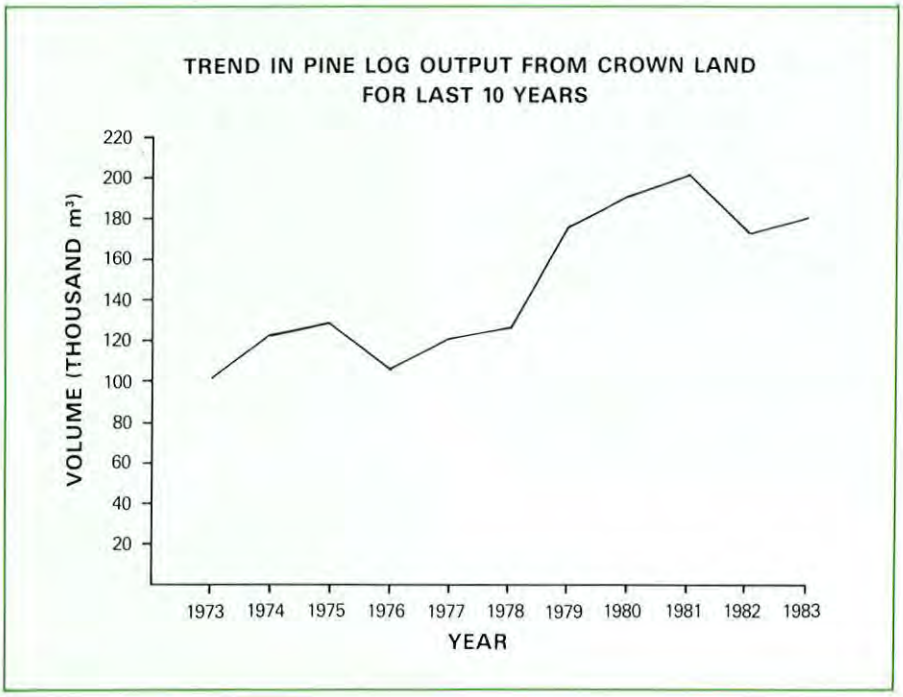
VENEER LOG PRODUCTION

	1982/83	1981/82
	rn^3	
Karri	975	2 326
Jarrah	Nil	Nil
Pine	3 741	5 740

Hardwood Woodchip Production

The level of output from this industry, although slightly higher than last year, was depressed because of prevailing adverse conditions overseas.

Marri and karri chip logs were supplied to W.A. Chip and Pulp Co. Pty Ltd for the production of woodchips. Of the 412 117 m^3 of chip logs produced, 69.84 per cent was marri and 30.16 per cent was karri. The W.A. Chip and Pulp Co. Pty Ltd also obtained 21 835 m^3 of chip logs from private property and 77 486 t of chips prepared from sawmill residue.



Production of Softwood Log Timber from Crown Land

The intake of logs for particleboard manufacture by Wesfi Pty Ltd, which comprises the bulk of softwood log production, recovered almost to the peak year of 1980/81.

The production of pine logs for other uses, mainly for sawlogs, fell considerably during the year. This was caused by the general downturn in the timber industry.

Most of the pine logging was undertaken by contractors to the Department.

Sandalwood

Sandalwood is obtained from the goldfields and Murchison areas for export mainly to Asia. The quantity of exports for the year was 1636 t compared with 1643.5 t in 1981/82.

Licences to obtain sandalwood were held by 20 contractors. Sixty-five people were registered as employed in the industry.

SANDALWOOD	1982/83	1981/82
From Crown land		
	t	t
Green sandalwood	1 047	1 021
Dead sandalwood	654	663
From private property	13	2
Total	1 714	1 686

Firewood Production and Consumption

Firewood is obtained as a by-product of sawmilling and from dead trees in the forest.

The figures for firewood production and consumption are not a true reflection of the total quantities used, as an increasing and unrecorded quantity of firewood is being gathered by the public for its own use. Reserves of firewood from forests just outside the Metropolitan area are now being allocated for home consumption.

Other Forest Produce

The demand for poles and piles declined during the year. Although there are many pole-sized trees in the jarrah forest, the number that are of sufficient quality to be used as poles is limited.

FIREWOOD PRODUCTION AND CONSUMPTION*

		1982/83 t	1981/82 t
Crown land			
Sawmills	for sale	35 950	40 219
	for own use	1 390	2 150
Firewood Contractors	local firewood permit	2 130	2 726
	forest produce licence	9 665	14 054
Industrial use		Nil	Nil
Total		49 135	59 149
Private property			
Sawmills	for sale	7 588	5 492
	for own use	451	426
Total		57 174	65 067

*These figures do not take into account the private collection of firewood from the forest.

OTHER FOREST PRODUCE

South-west Division and agricultural areas

Mining (m^3)	Crown land	3 713	3 649
	private property	NA	NA
Piles, poles and bridge timber (m)	Crown land	215 555	385 932
	private property	NA	NA
Fence posts and rails (No.)	Crown land	137 511	207 048
	private property	30 870	30 759
Strainer posts (No.)	Crown land	23 962	23 531
	private property	NA	NA
Goldfields area Crown land			
Mining timber (m)		158 543	138 784
Fenceposts and rails (No.)		24 925	25 086
Strainer posts (No.)		1 126	1 486

Timber Utilization

Hardwood Utilization

A recession in the building industry resulted in a greater emphasis being placed on the use of jarrah in high quality wood products such as furniture and timber panelling. Consequently, research into improving the seasoning of jarrah commenced late in 1982 in association with the timber industry.

This seasoning programme used the Department's high temperature kiln at the Harvey mill. The kiln was built ten years ago for research into the seasoning of radiata and pinaster pine and is the only high temperature timber kiln in Western Australia. Preliminary results from the programme show a high potential for rapid seasoning of jarrah to produce defect free sawn timber.

Softwood Utilization

Due to the overall slump in the timber industry the Department's Harvey sawmill has been temporarily closed. However, research has continued at the mill using the high temperature kiln and mechanical proof grader.

Quality assurance testing of random log samples from the Harvey mill was undertaken by the Western Australian Institute of Technology and the Radiata Pine Association of Australia. The results are encouraging and confirm that the strength qualities of pine exceed the minimum grade requirements specified by industry standards.

Timber Inspection

The Forests Department continued to provide a timber grading service to industry.

Log Pricing

The charges for hardwood logs supplied from Crown land are termed royalties and those for softwood logs are termed stumpages.

Hardwood sawlog royalties were increased by 11.6 per cent from 1 July 1982, in line with movements in the Consumer Price Index. Softwood stumpages for mill logs were not increased during 1982/83.

Water

The Department manages water catchments on State forest and other Crown land to the requirements of the water supply authorities. The objective is the maintenance and enhancement of the quality and quantity of water yields from the forest.

Catchment protection continued to receive high priority in Departmental planning, involving co-operation with the Public Works Department and the Metropolitan Water Authority in research, planning and operations.

The main water resource areas managed by the Department include the pine forests of the northern Swan Coastal Plain, and the jarrah forests and wandoo woodlands of the Darling Range. Research in these areas is concentrated on the forests' usage of water and its effects on the quantity and quality of water yields.

The review of dieback disease within State forest considered the protection of water resources as the main objective in any future planning.

The Forests Department manages water catchments on State forest, including the Wellington catchment of the Collie River.

9 SUPPORT SERVICES

The Department has several branches providing support services for management. These services provide information, advice, trained personnel and equipment necessary to achieve the management objectives of the Department.

Research

The activities of the Research branch are directed from the Como research headquarters. Specialist support is provided by regional research centres at Manjimup, Busselton, Dwellingup and Wanneroo.

Como

Research continued into the ecology of the northern jarrah forest. Studies have been concluded on the growth rate of jarrah in relation to site quality and fire intensity, the population dynamics of jarrah and the ecology of *Banksia grandis*.

Information on tolerance to *Phytophthora cinnamomi* is now available for all pine clones in the Manjimup *Pinus radiata* seed orchard. Susceptible clones have been removed and screening for *P. cinnamomi* has been extended to include elite *P. radiata* families from Tasmania, Victoria and the Australian Capital Territory.

Research into sandalwood establishment continued. Field trials have shown that successful establishment can be achieved by sowing pre-germinated seeds.

Wanneroo

The tree improvement program was directed towards producing strains of radiata, pinaster and wandoo best suited for a particular purpose or location.

The tree improvement program for *P. radiata* included selection of strains for dieback infected sites in the Sunkland, for fertile but drought affected sites in the Blackwood Valley and for open agro-forestry plantings.

For *P. pinaster*, the aim of producing faster growing, straighter trees with smaller limbs has been largely achieved. For *Eucalyptus wandoo*, field and glasshouse provenance studies were aimed at selecting suitable strains for the rehabilitation of forest mined for bauxite, and for salt-affected catchments in the agricultural zone.

Research continued into the efficient management of pine forests on the Swan Coastal Plain. Computer models were developed during the year which permit the analysis of major stand management variables.

Research into the use of fertilizer to maximize pine growth continued, with the emphasis being on marginal sites.

Studies into the replanting of pine forests at Gnangara continued, concentrating on identifying the causes of planting failures.

Dwellingup

Research at Dwellingup is primarily concerned with the jarrah dieback disease caused by *P. cinnamomi*.

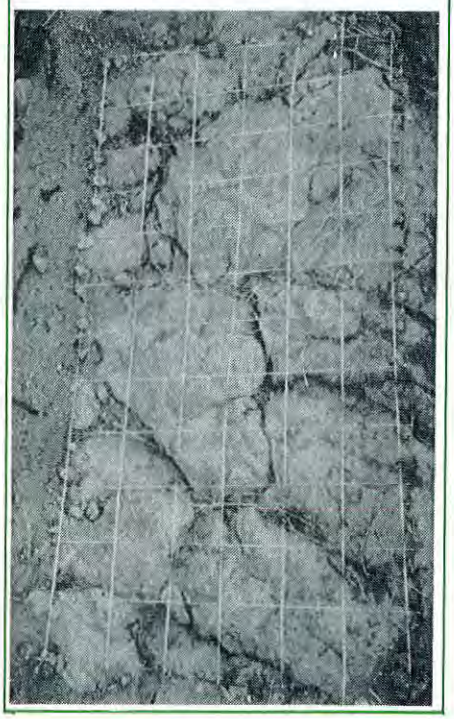
Major progress has been made in understanding the factors which influence the spread and intensification of dieback disease. On seemingly well drained, upland sites affected by the disease the main activity of the pathogen was found to occur in the subsoil at and above a concreted laterite layer. This layer causes a temporary ponding of water which has a lateral flow and contains a high concentration of *P. cinnamomi* spores. This in turn results in the infection and destruction of the tree's vertical roots, which are confined to channels through the concreted layer.

The capacity of the jarrah roots to withstand infection decreases as the temperature increases to 30°C. Thus, heavy rainfall during summer or early autumn creates optimum conditions for the fungal attack.

A survey of State forest has indicated that another pathogen, *Armillaria luteobubalina*, attacks the roots of several native tree species and shrubs, causing localized infection of roots, crown decline and even death. In some introduced eucalypts, crown deterioration and death has been shown to be caused by the fungi *Botryosphaeria* and *Cytospora*.

After three years of development, a method of directly measuring the transpiration of whole trees was perfected and is now being used to define the processes controlling transpiration in a 30 m tall jarrah tree. The results to date provide quantitative support for the observation that jarrah actively transpires throughout the dry summer season.

This excavation in the jarrah forest reveals the cap rock which impedes water drainage and thus favours the dieback fungus Phytophthora cinnamomi.



Detailed analysis of the growth of bauxite pit plantings was initiated, to guide future management and suggest improvements to rehabilitation methods.

The Department has participated with the Public Works Department, Alcoa, the Department of Agriculture and the Metropolitan Water Authority in a major re-organization of rehabilitation research. A major aim of research in this field is to devise appropriate rehabilitation methods for the saline zone of the jarrah forest.

Research continued into the effects of autumn fires on the understorey of the jarrah forest. The potential role and impact of these fires is now better understood. A study of the effect of fire on wood quality revealed the strong relationship between wound size and the extent of defects in standing trees. Further studies of tree damage following fire were carried out in conjunction with Project Aquarius.

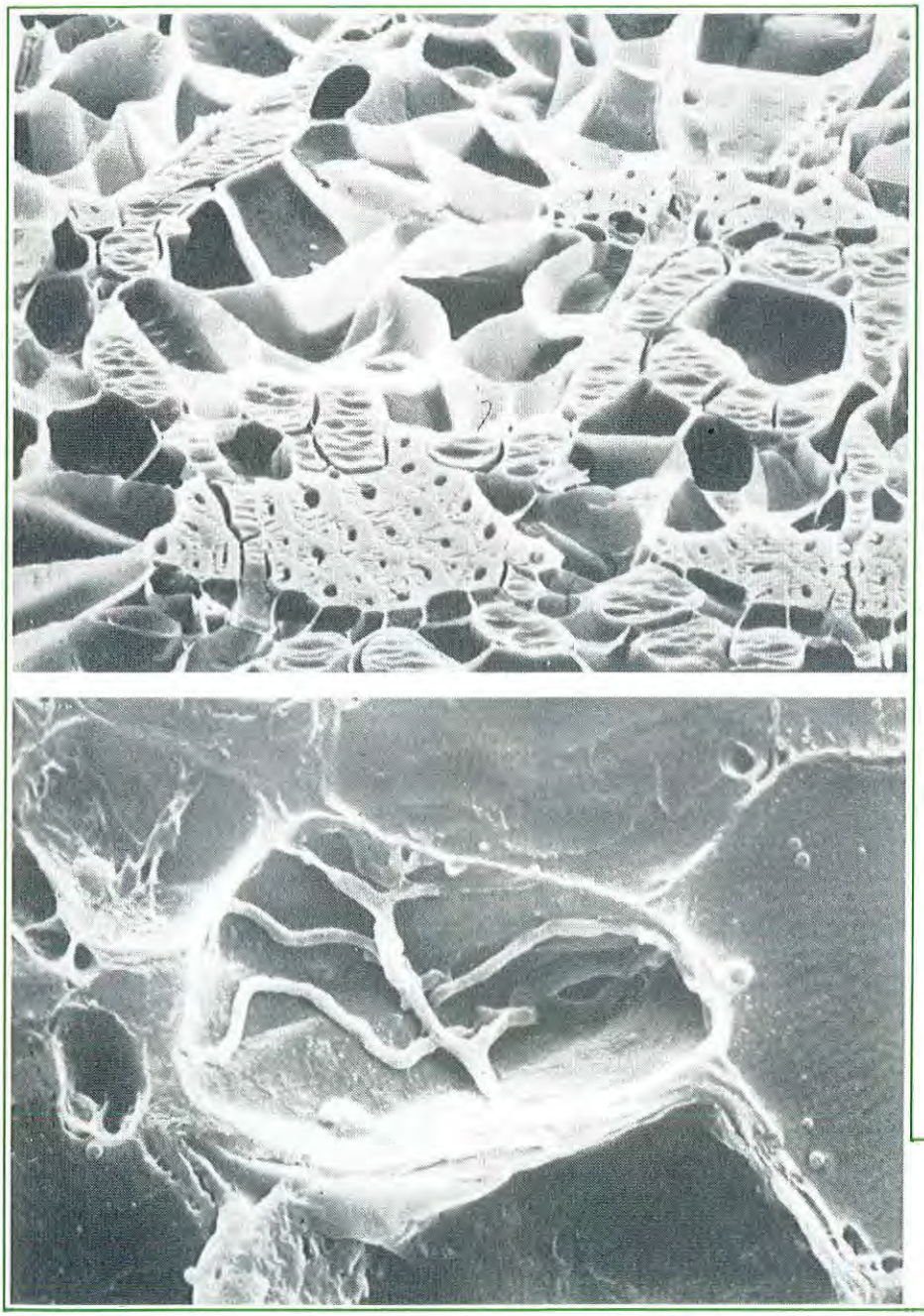
The relationship between water and timber productivity are being studied in the Yarragil catchment. The hypothesis that a reduction in crown cover of the forest will increase streamflow is being tested. In addition to increasing streamflow, the thinning is expected to increase the growth of the remaining trees, resulting in the production of high quality timber. The factors being monitored in the catchment include water yield, wood growth and quality, crown density and forest cover, density and composition of understorey regrowth and the spread of jarrah dieback disease.

Thinning the experimental catchment to 20 per cent crown cover resulted in a total of 110 m^3 per hectare of wood being removed. Only 20 m^3 per hectare was sold as sawlogs, but some 55-60 m^3 per hectare of the remaining trees was assessed as potentially utilizable. This study has highlighted the significance of residue markets to silvicultural treatment of the northern jarrah forest.

Busselton

Research at Busselton is mainly concerned with the silviculture of radiata pine growing in the Donnybrook Sunkland. The input and recycling of nutrients, in particular nitrogen, phosphorus, zinc and copper, using a superphosphate-clover system are being studied. Research into weed control techniques in pine forests continued. Eucalypt regrowth is now controlled by 'Roundup' (glyphosate), which is cheaper and easier to apply than 2,4,5-T and 2,4-D. Research into the pruning and thinning regimes of pine continued.

The wood quality of Sunkland grown pine is being assessed. Work is also proceeding with methods of replanting pine forests at Margaret River and Harvey.



Major progress was made in dieback research during the year. These highly magnified 3-dimensional photographs illustrate healthy jarrah cells (top) and a jarrah cell infected with the dieback fungus, Phytophthora cinnamomi.

The agro-forestry research programme was expanded. Trials were established at Esperance. In the Sunkland, the co-operative agro-forestry trial with the Department of Agriculture continued. In the Collie River Catchment area, the planting of pines and eucalypts to control salinity problems on former farmland purchased by the Public Works Department is progressing. Techniques of pruning trees and mulching debris from pruning and thinning operations were further investigated. A New Zealand agro-forestry research officer visited Western Australia, and a Forests Department officer studied agro-forestry in New Zealand under the Australia-New Zealand Forest Officer Exchange Scheme.

Manjimup

The first seed was collected from the karri seed orchards established in the 1970s. The results were promising and indicated a marked reduction in the costs of seed collecting. Studies have shown that karri planted in low rainfall areas seed prolifically at an early age, and as a result new seed orchards will be established east of Manjimup. Research into direct seeding techniques and thinning of young stands continued.

The survey of jarrah forest vegetation types was extended. The aim is to develop a site-vegetation classification for the whole of the southern jarrah forest. An outbreak of the gum leaf skeletonizer *(Uraba lugens)*, a very voracious insect seen for the first time in the southern jarrah forests, caused some concern this year and is being monitored.

The Western Australian phase of Project Aquarius, a co-operative study with the CSIRO into the bahaviour of large fires under dry conditions, was completed during summer. Information was obtained on coalescing fires, large flame fronts and the physical and psychological stress on firefighters operating under extreme temperatures. The data are currently being analysed by the Forests Department and the CSIRO.

Experimental fires in 10-year-old karri regrowth were carried out over a range of sites, as part of a long-term project to study the use of fire for fuel reduction in young karri stands. Results indicate that the scope for successful early burning of karri regrowth is strictly limited. Fuel accumulation is also being studied on a wide range of karri forest sites.

A machine called a Squirrel has been developed to aid seed collection and high pruning activities. Note the man standing in the bucket of the machine, pruning this pine tree near Busselton.

Following the successful re-establishment of the woylie *(Bettongia penicillata)* in the Perup, further woylie releases have been made near Collie and at St John Brook. Research related to management of fauna and flora continued at the Perup. The projects included the establishment of a tammar *(Macropus eugenii)* habitat and radio tracking a phascogale *(Phascogale tapoatafa)*. Field ecology training at the field station was also carried out.

Studies of bird populations in the karri forest continued and by the end of 1983, two years of detailed monitoring, mist netting and banding will have been completed. Further information was gained this year on the habits of karri forest birds, particularly the birds of the understorey. Nesting boxes were attached to trees in various parts of the forest. These boxes, intended for birds which nest in holes, were used mainly by the small marsupial carnivores, the mardo *(Antechinus flavipes)* and the phascogale.

Data Processing

Following the installation of the Department's second computer, all automated commercial systems were converted to operate under the new software facilities. This has resulted in improved efficiency, easier system use and maintenance.

Large-scale development of the computer facilities was ceased because of insufficient computer personnel. However, smaller projects, such as the telephone system, the budgeting sub-system, training courses, the information directory and a prototype personnel system, were completed.

Building renovations to the computer centre were commenced to overcome both environmental and spatial problems. These improvements will allow greater computer production time, especially in relation to the fire behaviour and suppression systems.

Inventory and Planning

The Inventory and Planning branch is concerned with the preparation of management information and management plans, and with the collection of the data on which the plans are based. Economic data, resource measurement data, and data on the distribution of diseases, particularly dieback disease, all contribute to the development of management plans.

A major undertaking was examination of various management options relating to the Shannon River Basin.

Hardwood logging plans for the next five years were developed for the central region, and one-year and four-year integrated sawlog and chiplog plans were prepared for the southern region. Logging plans were also developed for pine harvesting in the central region.

Sophisticated monitoring techniques were used in Project Aquarius. This is the infra-red pattern of a developing fire, read by a computer installed in an aircraft flying high above the area.

Economic analysis during the year included the calculation of compensation for forest land transferred to other agencies, regional timber demands and supplies, plantation requirements, and employment in the forestry and timber industry.

The computer-based Forest Management Information System (FMIS) has proved invaluable for providing resource information to assist management planning. Several new maps were added to the data base during the year.

A computerized inventory system for long line assessment has been developed. The system will enable resource data to be edited and analysed at remote terminals.

Large-scale, shadowless aerial photography for mapping jarrah dieback disease was taken over 58 000 ha during autumn. The total area photographed as at 30 June 1983 was 311 000 ha. Photo interpreters were involved in divisional programmes to train operations staff on recognizing the symptoms of *P. cinnamomi* attack.

Management level inventory was carried out to provide detailed wood resource information on 63 800 ha of hardwood forest. Other inventories included pole assessment in the northern region and mining timber in the central region. In the southern region, timber assessment was carried out for eight private properties on behalf of the Public Works Department.

Inventory and Planning staff assisted with the continuing assessment of sandalwood in the Goldfields and Murchison areas. A report was produced on the findings of the first two years of the survey.

During the year, 1900 permanent plots were measured to update softwood resource information.

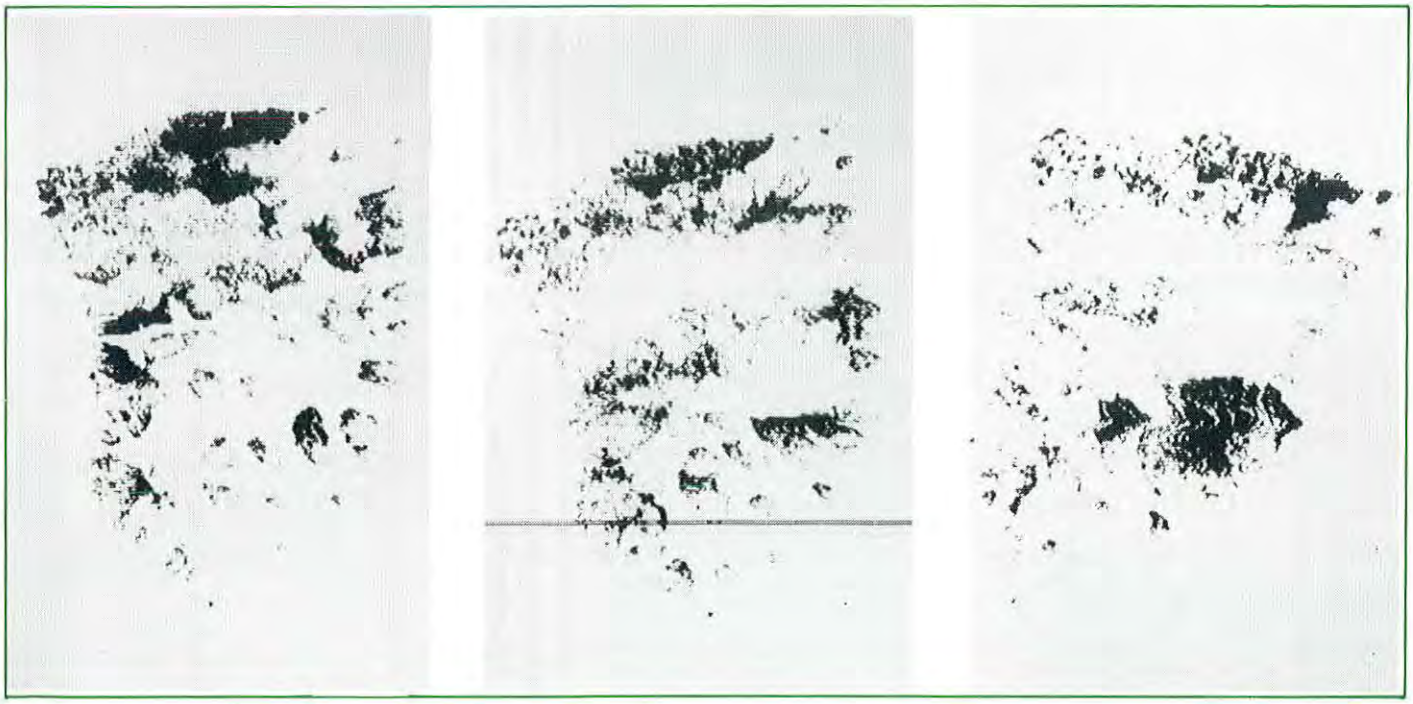
Permanent sample plots were established in karri regrowth forest and in mixed species in the Pemberton Arboretum. Two hundred plots have been established at Alcoa's Jarrahdale minesite to monitor the long-term survival and growth of bauxite rehabilitation plantings.

Mapping

The conversion of the Department's standard lithographs to the metric system was completed. The final four maps in this metric series, Manjimup, Walpole, Perup and Unicup, were published, and a programme to revise the earlier maps was commenced.

The Photogrammetric section was divided into a Photogrammetric and a Topographical section. The Photogrammetric section concentrates on mapping from aerial photos and producing maps of dieback free areas of the forest and forest hygiene conditions. The Topographical section is mainly concerned with the compilation of the 1:25 000 Australian Map Grid series of maps, and surveillance maps for spotter pilots.

The conversion of the land tenure plans to a transparent plastic base continued, with 33 new plans being provided for use in the field and by State Headquarters. Eight wall maps and 14 tower and co-ordination plans were supplied to divisional offices. Five relief models were made and sent to divisional offices where they are a useful planning and management tool.



To keep abreast of computer aided mapping developments, two members of the Mapping branch are receiving instruction in the operation of the INTERGRAPH CAD/CAM system. This instruction is being carried out in conjunction with the joint Rural Information System Project at the Land Information System Support Centre.

Extension

Metropolitan enquiries on the selection, establishment and maintenance of trees and on other tree issues, continued on a level comparable with last year.

In country areas a large number of enquiries reflected an increasing interest in the establishment of trees on farms for both aesthetic and protection purposes. The number of requests for advice on direct seeding were greater than those concerning the planting of nursery-raised seedlings.

Officers addressed seminars and farmer groups, and conducted field days with officers from the Department of Agriculture. Improved contact with farmers was achieved by announcing the visits of advisory officers over country radio, and by helping in the delivery of plants in bulk from Departmental nurseries to agricultural centres, where matters of concern to farmers could be discussed.

Throughout the wheatbelt, trials were conducted on grasshopper control, and on direct seeding as a technique of tree establishment.

Investigations into tree establishment on fly-ash (the ash that forms from coal burning at power stations) disposal areas continued in conjunction with the State Energy Commission.

The development of strategic tree planting on selected farms, with the approval of their owners, was continued with the aim of eventually using the farms as agro-forestry demonstrations.

Tree decline in rural areas received increased attention. A survey to determine the extent and causes of tree decline was completed throughout the Shires of Tammin and Wyalkatchem. A Departmental pathologist continued investigations into fungal pathogens associated with crown decline in wandoo in the wheatbelt.

Arboreta

Routine maintenance and inspections were made on the 68 Departmental arboreta located in the wheatbelt and goldfields. Signposting the arboreta, and labelling of individual species continued.

In the Kimberley, further plantings were made in the Kununurra arboretum and an irrigation system was planned. Development started on a new arboretum at Broome.

In the Kimberley and at Karratha, a new method of using low rainfall was introduced. The method involves constructing dish-shaped contoured banks, which are specially designed to collect and concentrate water. These banks are based on the Limanim system used extensively in Israel.

A 28 ha site at Karratha was acquired and its development as an arboretum commenced. Fencing and water-harvesting banks were completed, and an irrigation system using sewage effluent was partially installed this year.

Education

Public awareness of environmental issues, and concern for the management of the State's forests resources continued. This has been reflected in an increase in requests for informative presentations to a wide range of community and educational groups. Over 80 talks were delivered in the metropolitan area, mainly dealing with the forest as a resource, and with land-use management. An equal number of talks on similar topics was presented in country areas.

There was an expanded use of the field study centres at Jarrahdale and Mundaring. More schools used these centres than in previous years and there were more requests for the involvement of Forests Department staff in educational programmes. Staff presented films and lectures, conducted field exercises, and set up a new nature study programme at Mundaring.

The Forests Department provided the Education Department's Outdoor Education Branch with six officers to act as instructors on two five-day courses. The courses were part of a larger programme designed to train teachers in expedition skills, and included some basic instruction in environmental ecology.

Educational presentations were made mainly to primary schools. Resource material included *Forest Focus 29*, 'Tuning-In To Trees', slides, posters and films. The film library was increased to twelve 16 mm films and three video tapes, and over 100 screenings were booked throughout the year.

The annual Arbor Day celebrations took place on the 'Day of Trees', on 10 June 1983. In co-operation with the Education Department, Forest Department officers visited many schools throughout the state to assist in Arbor Day projects and talk to the children.

Publicity

A trailer mounted display on the theme of 'Trees for Rural Areas' was constructed and presented at 15 field days and agricultural shows, frequently as a joint display with the Department of Agriculture. It was awarded a prize at the Esperance agricultural show.

Smaller displays were mounted at a further 12 locations in both metropolitan and country areas. The Department's exhibit at the Royal Show attracted some 3500 people.

The Department is a member of the West Australian Chapter of the Australian Forest Development Institute. A successful field day was held at Manjimup, in conjunction with the W.A. Chip and Pulp Co., to study forest operations and the woodchip industry.

Greening Australia Campaign

The period 5 June 1982 to 30 June 1983 was declared 'Year of the Tree' throughout Australia. The Department gave strong support to 'Year of the Tree' programmes throughout the State.

In 1982 the Federal government announced its 'Greening Australia Campaign', which would continue until the bicentennial celebrations in 1988. The object of 'Greening Australia' is the re-establishment of significant areas of vegetation throughout Australia. As part of the campaign, a National Tree Program organization was set up in Canberra with representative committees in each state. The Western Australian Steering Committee was chaired by the Conservator of Forests and the Forests Department provided a secretariat for the Committee.

During the year, $37 500 was made available by State and Federal governments under the National Tree Program and was disbursed throughout the State in the form of grants for tree establishment and maintenance.

Two 'treepersons' were appointed to encourage community groups to become involved in tree planting and maintenance projects. One of the treepersons works in the metropolitan area and the other, based at Dumbleyung, works in the country.

Publications

The Department produces technical, informational and educational publications for world-wide distribution to the public and to professional and scientific communities.

Research publications included three *Technical Papers*. This new series is proving useful in publishing informative data on forestry research and practice, without the formality associated with *Research Papers* or *Bulletins*.

Four issues of the colour magazine *Forest Focus* were produced during the year. The latest edition, *Forest Focus 29,* was entitled 'Tuning-In To Trees' and was produced with the co-operation of the Education Department as part of the Year of the Tree activities. This issue was designed for school students, and it appears to have been effective in reaching the intended audience.

Thirteen brochures were produced to extend the popular range of topics already available in the 'Tree Care' series, recreation guides and the forest education series.

The Hon. Minister Assisting the Minister for Forests, Mr David Evans (centre) welcomes the appointment of the two treepersons, Ms Terri Smith and Mr Eddie Knott, who are promoting the planting of trees as part of the Greening Australia campaign.
Photo courtesy of West Australian Newspapers Ltd.

Appendix 6 lists Departmental publications as well as those articles prepared by Departmental officers and published externally.

Library

The acquisition and circulation of periodicals, books and pamphlet material has continued. Lists of the new accessions have been circulated each month. The use of the reference service has increased, particularly in the area of inter-library loans.

The expansion of the library collection has been limited due to budgetary restrictions.

Engineering

This branch provides engineering services in accord with Departmental needs.

Regional workshops are located at Manjimup, Collie and Gnangara, where major plant repair, development and fabrication of special equipment is carried out for forest operations. There are 17 tradesmen and nine apprentices employed in these centres.

Twelve maintenance workshops are located at Yanchep, Walpole, Nannup, Pemberton, Harvey, Jarrahdale, Grimwade, Como, Dwellingup, Mundaring, Margaret River and Ludlow. Nineteen tradesmen and nine apprentices are employed in these facilities.

Several courses were conducted for staff aimed at improving techniques in operating and maintaining field units. Design and fabrication projects on a wide range of industrial plant and equipment were also undertaken,

Radio Communications

This branch services the Department's extensive radio network, including radio repeater stations, fixed office radios, aircraft radio equipment and vehicle mobiles.

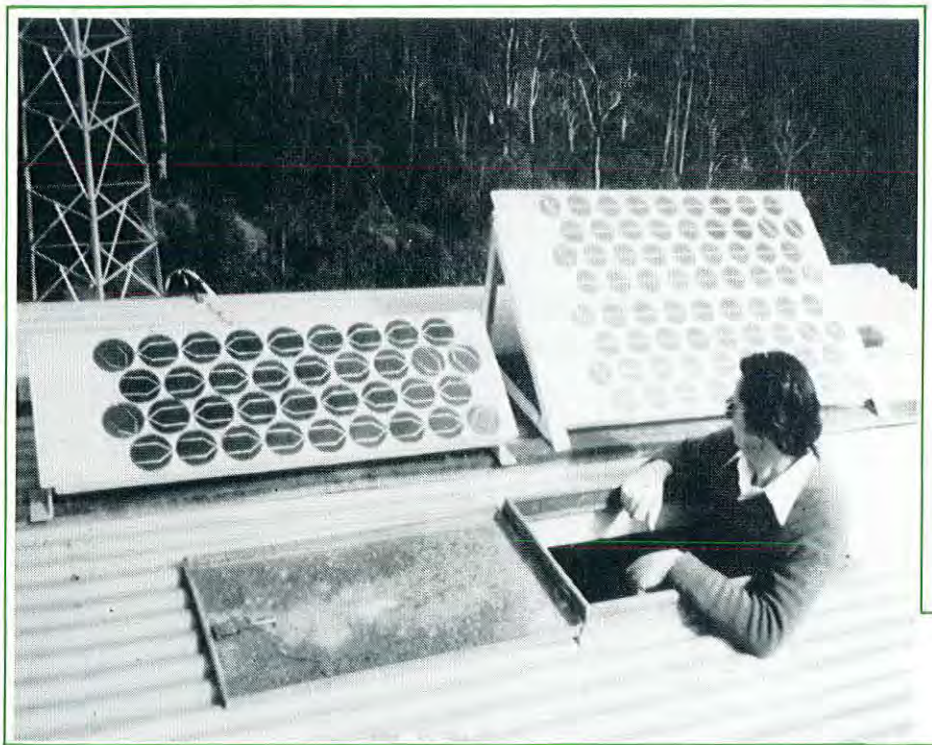
Two new very-high frequency (V.H.F.) talk-through repeater stations were developed to further improve services in the south-west of the State.

External radio communications were expanded with the installation of a V.H.F./H.F. radio at the Kirup office to provide radio contact with the Shires of Boyup Brook and Donnybrook and their bush fire brigades. Other equipment was installed at Wanneroo, Mundaring and Jarrahdale Forests Department offices to assist in communications with Shires and fire brigades.

A total of 350 vehicle radio installations was checked and serviced in the field and 100 vehicles were wired for V.H.F. radio.

Two V.H.F. radios and an inter-communication system for aircrew were installed in a twin engine aircraft used for aerial prescribed burning.

The sophisticated air-to-ground navigation equipment used for dieback photography was maintained. Assistance was provided in the development of the new incendiary machine for aerial prescribed burning.

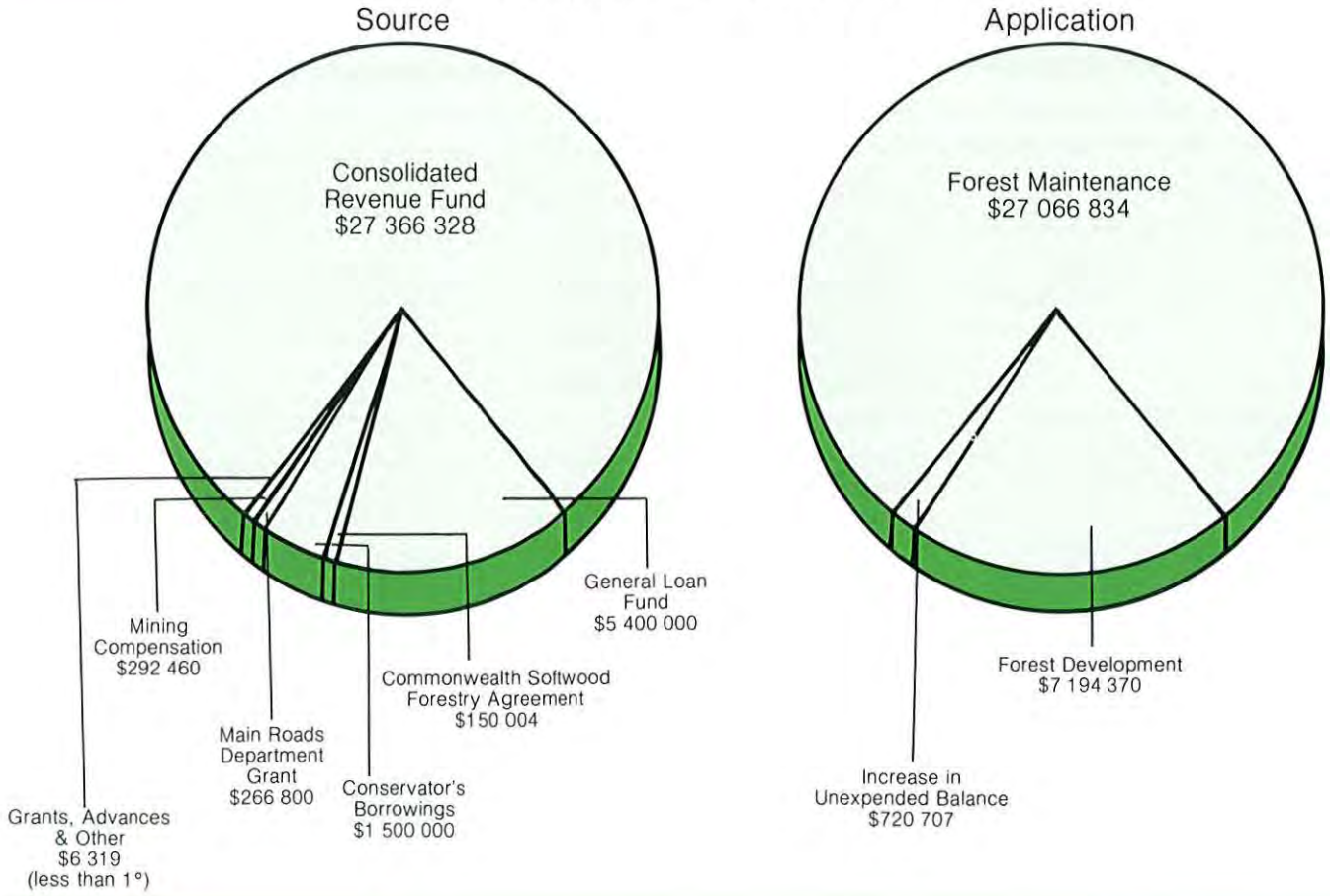


District Forester Mike Welch checks solar cells used to recharge radio/telephone batteries at a lookout tower in the south-west.

10 ADMINISTRATION

FINANCE

TOTAL FINANCE 1982/83: $34 981 911



Finance

All Territorial and Department revenue is paid into the Consolidated Revenue Fund. Allocations are made from this fund for forest maintenance activities and from the General Loan Fund for forest development.

Departmental Staff

Public Service Act

Mr B J Beggs was appointed Director-General, Department of Premier and Cabinet.
Mr P J McNamara became Acting Conservator.
Mr F J Campbell became Acting Deputy Conservator.
Mr P N Hewett became Acting Assistant Conservator.
Mr C J Edwards became Acting Chief of Division Personnel.
Dr F H McKinnell was promoted to Chief Research Liaison Officer.
Mr D J Keene was promoted to Superintendent.
Messrs R J Sneeuwjagt, H Campbell and Dr G Malajczuk were promoted to Inspectors.
Dr S Shea was seconded to the Department of Premier and Cabinet.
Mr D A Haswell and Mr R J Chandler were reclassified as Senior Divisional Forest Officers.
Mr I J Frame was promoted to Sub-accountant.
Mr R M Properjohn was promoted to Senior Cartographic Draftsman.

Forests Act

Retirements

Mr J A Dearle.
Mr P D Staley.

Promotions

Mr P Keppel to District Forester.
Mr T J Ashcroft to District Forester.
Mr R C Simmonds to District Forester.
Mr W C Adams to District Forester.
Mr E M Cracknell to District Forester.
Mr C N Broadbent to District Forester.
Mr B F Forster to District Forester.
Mr D P Speldewinde to District Forester.

Training

Field Cadets

Twelve cadets commenced training at the Bunbury Technical College in January 1983. A further twelve were admitted to the Cadet Training Centre at Dwellingup to commence the final year of the course.

Twenty-four field cadets graduated in December 1982 and a graduation ceremony was held in April 1983 at Bunbury. The Premier and Minister for Forests, Mr Burke, presented the certificates and prizes.

The Keynes Memorial Prize for the top student on the forestry cadet course was won by Glyn Yates. The Conservator's Prize for runner-up was won by Morten Nilsson.

The Mayor's Prize for the best student at Bunbury Technical College during 1981 was also awarded to Glyn Yates. This award enabled Mr Yates to visit Victoria and study fire control activities.

Fitness training formed part of the Field Cadets' curriculum and was made possible by the construction of a track which incorporated a series of exercise stands. Use of these facilities enabled cadets to become familiar with fitness programmes and their assessment.

Professional Cadets

Two cadets, Martin Rayner and Keith Sclater, commenced duty following graduation from the Australian National University (A.N.U.). Mr Rayner graduated with first class honours and was awarded the Schlich Memorial Trust Prize for forestry and the University Medal for the Faculty of Science.

Currently nine cadets are studying at A.N.U.. Four of these were graduates of the field cadet training course and previously held field staff positions.

General Training

A new training policy has been developed based on the needs of the Department and of individuals. This will provide staff with the skills and knowledge they need to carry out their work efficiently and safely. Fifteen officers received preliminary trainer training, to assist with training programmes in the field.

Courses in safety, protection and safe driving continued.

Public Relations

Internal and external communications were reviewed. The Department's computer was used successfully to disseminate information quickly to field centres.

Conferences, Study Tours and Awards

Seventeen officers attended interstate conferences or courses covering a wide range of subjects.

Dr F. McKinnell visited China for three weeks as part of the 1983 Australian Temperate Forestry Mission, to advise on eucalypt and conifer silviculture.

Employment in Forestry and Forest-based Industries

The number of salary and wage earners employed in forestry or in forest-based industries was estimated at 6 273 people, made up as follows:

Forestry —	
Professional Officers	101
General field staff	351
Clerical and Drafting	99
General division	8
Professional Cadets	9
Field Cadets	23
Full time wages employees	487
* Contract personnel	150
	1 228
Forest-based Industries	
+ Sawmilling employees, including bush workers	1 760
△ Other wood reprocessing industries (est.)	3 000
Firewood mining timber and pole cutters working under licenses (est.)	59
Sandalwood workers	65
Apiarists est. (2 176 sites registered)	161
	5 045
Total	6 273

* Contractors are employed periodically for clearing, road building, pine logging and hardwood logging. The figure given here is an estimate of average employment over the year.

\+ Includes employees of registered sawmills only and excludes persons employed in associated yards in metropolitan and country areas.

△ Includes employees "working in wood" as defined under the Factories and Shops Act (1963).

Housing and Building

Several minor works programmes have been completed at State Headquarters to improve access, accommodation and storage.

New staff housing was provided at Kirup, Nannup and Yanchep and office extensions at Dwellingup, Manjimup and Jarrahdale.

Forest Offences

Fifteen breaches of the Forest Diseases Regulations were reported. Legal proceedings were instituted in eight cases, and other offenders were warned.

Twenty breaches of the Forests Act and Regulations were reported. Legal action was not taken, but in seven cases royalty amounting to $275.32 was charged for illegally obtained forest produce. In two cases of unauthorized clearing of State forest, rehabilitation costs totalling $563.91 was paid. Warnings were issued in all cases.

Timber Industry Regulation Act, 1926-1969

A total of 136 mills was registered under the provisions of the Act at 31 December 1982, 63 mills on Crown land and 73 mills on private property.

The average number of persons employed in the timber mills each month throughout the year was 1 760. The 1981/82 figure was 2 116.

The District and Workmen's Inspectors made 1 066 mill inspections and 876 bush inspections.

There were 98 notifiable accidents during the year. None of these was fatal. A notifiable accident under Section 14 of the Timber Industry Regulation Act is comparable with a Lost Time Accident as defined by the Australian standard.

The number of accidents per 100 persons employed was 5.57. The 1981/82 figure was 6.24. This is equivalent to a frequency rate of approximately 30. (The frequency rate is calculated as the number of lost time accidents per 1 000 000 man hours worked).

The cost of administering the Timber Industry Regulation Act for the year was as follows:

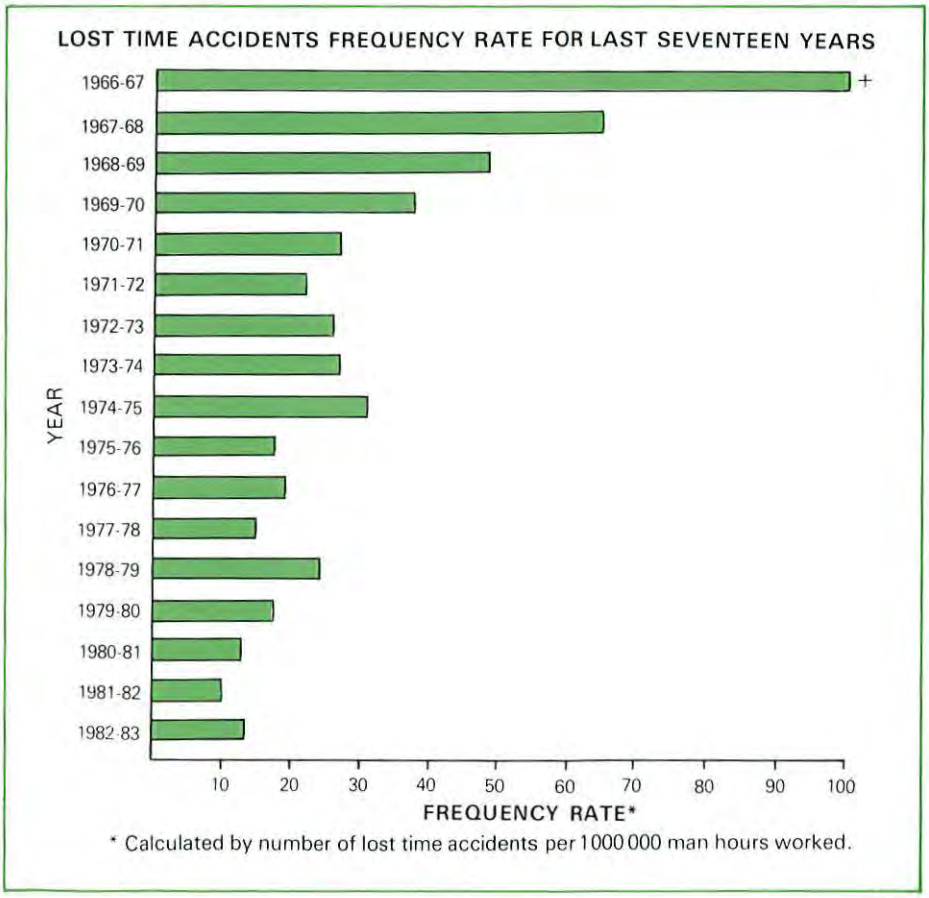
	$
Salaries	64 746
Travel allowances, office rent, plant cost and sundries	18 879
Total	83 625

Safety, Health and Welfare

Safety, health and welfare programmes continued to be an integral part of forest management in Western Australia.

The number of lost time injury accidents increased to 27 compared with 19 for the previous year. Correspondingly, the accident frequency rate rose from 10 for 1981/82 to 14 for 1982/83. This increase was primarily caused by a greater number of back injuries, which amounted for 41 per cent of all lost-time accidents.

At the presentation to the Forests Department of the Premier's 1983 Productivity improvement Award are, from left to right, the Acting Conservator of Forests Mr McNamara, the Hon. the Premier Mr Burke, Safety Officer Arthur Kesners and Forester Tom Wood.



* Calculated by number of lost time accidents per 1000 000 man hours worked.

The combined frequency rate for lost time and medical treatment accidents continued to decline:

Year		Frequency Rate
1978/79	—	100
1979/80	—	86
1980/81	—	84
1981/82	—	84
1982/83	—	83

The Walpole, Busselton, Mundaring, Kirup, Harvey, Narrogin and Jarrahdale divisions, the Cadet Training School and a number of sections at State Headquarters, all achieved a twelve month accident free period.

Five general safety training schools were conducted. Nominated personnel attended specialist courses on shotfiring, welding, first aid, correct lifting techniques, road safety, and chainsaw operations. Training courses in cardio-pulmonary resuscitation were attended by 375 Departmental staff and employees. This is the first time such training has taken place.

An ergonomist was commissioned by the Department to study facilities at computer terminals at the divisions and at State Headquarters.

Forester Tom Wood joined the accident prevention team to increase direct contact between field personnel and the Safety, Health and Welfare branch.

The Department's Safety Officer Arthur Kesners, won the Premier's 1983 Productivity Improvement Award with a submission which outlined the benefits of the Forests Department Safety Programme.

11 APPENDICES

APPENDIX 1(a)

Statement of Revenue Paid into Consolidated Revenue Fund for the year ended 30 June 1983

1981-82 $		1982-83 $
	ROYALTIES	
7 811 410	Logs	6 955 846
1 254 958	Chip Logs	1 361 848
31 926	Sleepers	15 430
501 530	Poles and Piles	437 975
24 799	Mining Timber	32 797
11 376	Firewood	8 067
41 285	Posts	37 523
62 256	Sandalwood	65 348
51 763	Miscellaneous	131 413
9 791 303		9 046 247
	PINE CONVERSION	
3 101 550	Pine Logs	2 427 789
426 266	Sawn Pine	81 697
3 527 816		2 509 486
	HARDWOOD CONVERSION	
203 254	Sawn Hardwood	3 597
270 692	Logs	286 872
7 693	Posts and Other	23
481 639		290 492
	OTHER SALES and FEES	
255 388	Seeds and Trees	384 188
91 129	Inspection Fees	91 308
136 951	Rents and Leases	116 260
1 394 125	Miscellaneous	1 395 456
1 877 593		1 987 212
	RECOUPABLE PROJECTS	
765 777	Miscellaneous	1 106 158
	COMMONWEALTH RECOUPS	
—	Aboriginal Advancement Programme	30 648
—	Special Employment Relief Programme	89 732
—		120 380
16 444 128		15 059 975

APPENDIX 1(b)

FORESTRY FUND ACCOUNT FOR THE YEAR ENDED 30 JUNE 1983

1981-82 $				1982-83 $
		EXPENDITURE		
1 354 333		H/W Forests — Establishment and Tending		1 689 584
4 204 261		S/W Forests — Establishment and Tending		4 067 864
276 854		Access Road Construction		366 759
530		Land Purchase		9 814
222 047		Plant and Equipment		474 003
584 053		Housing and Buildings		584 216
5 080		Sawmilling and Seasoning Plant		2 129
2 678 984		Forest Protection		3 494 116
684 972		Access Road Maintenance		533 786
2 018 011		Research and Other Services		2 307 789
3 111 629		Commercial Operations		1 892 953
239 640		Trade Operations		276 111
772 302		Recoupable Projects		1 325 346
	9 836 994	Salaries	12 005 119	
8 736 994	1 100 000	Less Charged to Development	1 100 000	10 905 119
	5 681 452	Administration Expenses	7 331 108	
4 961 452	720 000	Less Charged to Development	700 000	6 631 108
—11 301		Cash Order Balance		—299 494
29 839 841				34 261 203

	SOURCE OF REVENUE	
37 319	Balance Brought Forward	123 894
264 712	Main Roads Department Grant	266 800
857 181	Commonwealth Softwood Agreement	150 004
302 039	Mining Compensation	292 460
23 203 984	C.R.F. Contribution	27 366 328
4 080 000	General Loan Fund	5 400 000
1 200 000	Conservators Borrowings	1 500 000
18 500	Sundry Revenue	6 318
29 963 735		35 105 804
123 894	Less Balance Carried Forward	844 601
29 839 841		34 261 203

APPENDIX 2(a)

EXPORTS FROM WESTERN AUSTRALIA OF TIMBER, TIMBER PRODUCTS AND ESSENTIAL OILS FOR THE YEAR ENDED 30 JUNE 1982

INTERSTATE

DESCRIPTION OF ITEMS	QUANTITY m³	VALUE $
Jarrah timber, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm	7 902	1 261 235
Karri timber, sawn lengthwise, sliced or peeled but not further prepared, of a thickness exceeding 5 mm	16 029	2 504 719
Cork and wood, n.e.i.	7 653	1 512 000

n.e.i. — not elsewhere included

OVERSEAS

DESCRIPTION OF ITEMS AND COUNTRIES OF DESTINATION		
1. Wood in the rough or roughly squared	m³	
United Kingdom	8	3 699
TOTAL	8	3 699
2. Sleepers	m³	
Belgium	1 018	243 955
Kenya	51	12 886
Netherlands	28	6 363
New Zealand	9	2 453
Qatar	30	11 197
United Kingdom	16 614	3 861 797
TOTAL	17 750	4 138 651
3. Wood, planed, tongued, grooved, rebated, chamfered, v-jointed, central v-jointed, headed, centre headed or the like, but not further manufactured	m³	
Conifer		
Flooring		
Christmas Island	—	853
TOTAL	—	853
Non-conifer		
Cocos Islands	24	8 731
New Zealand	19	14 750
United Kingdom	88	28 854
TOTAL	131	52 335

ITEM AND DESTINATION	QUANTITY	VALUE
4. Wood, sawn lengthwise, sliced or peeled but not further prepared of a thickness exceeding 5 mm	m^3	$
Non-conifer		
Jarrah		
Bahrain	116	38 172
Cocos Islands	178	56 984
Kuwait	148	34 011
Singapore, Republic of	10	1 844
South Africa, Republic of	40	14 605
United Kingdom	270	74 726
United States of America	156	72 986
TOTAL	918	293 328
Karri		
Bahrain	3	978
Belgium-Luxembourg	3 094	539 076
Canada	23	7 598
Germany, Federal Republic of	360	92 925
Greece	10	2 692
Netherlands	174	40 084
New Zealand	529	145 502
South Africa, Republic of	608	165 704
United Kingdom	140	43 100
United States of America	779	306 743
TOTAL	5 710	1 344 402
5. Wood sawn lengthwise, sliced or peeled but not further prepared, of a thickness not exceeding 5 mm; veneer sheets and sheets for plywood, of a thickness not exceeding 5 mm	m^2	
Christmas Island	50	590
TOTAL	50	590
6. Plywood consisting solely of sheets of wood	m^2	
Cocos Islands	897	13 356
Kuwait	624	8 664
TOTAL	1 521	22 020
7. Blockboard, laminboard, battenboard and similar laminated wood products (including veneered panels and sheets)	m^2	
United States of America	440	491
TOTAL	440	491
8. Builders' carpentry and joinery (including prefabricated and sectional buildings and assembled parquet flooring panels)	m^2	
Christmas Island	—	1 500
Cocos Islands	—	13 680
Greece	—	330
Singapore, Republic of	—	1 505
TOTAL	—	17 015
9. Manufacturers of wood for domestic or decorative use (excluding furniture)	m^2	
United Kingdom	—	7 000
TOTAL	—	7 000
10. Manufactured articles of wood, not elsewhere specified		
Christmas Island	—	1 393
TOTAL	—	1 393

ITEM AND DESTINATION	QUANTITY	VALUE $
11. Wood furniture, not elsewhere specified.		
Christmas Island	—	1 510
Cocos Islands	—	12 544
Singapore, Republic of	—	86 246
United Arab Emirates	—	4 477
United Kingdom	—	6 042
TOTAL	—	110 819
12. Essential oils, concretes and absolutes; resinoids	—	—

APPENDIX 2(b)

IMPORTS INTO WESTERN AUSTRALIA OF TIMBER, TIMBER PRODUCTS, TANNING SUBSTANCES AND ESSENTIAL OILS FOR THE YEAR ENDED 30 JUNE 1982

INTERSTATE

DESCRIPTION OF ITEMS	QUANTITY m^3	VALUE $
Cork and wood	8 216	2 157 814
Plywood, consisting solely of sheets of wood (including core)	—	1 060 150
Reconstituted and 'improved' wood in sheets, blocks etc (e.g. chipboard, particleboard)	1 326 059	5 105 673
Other wood, worked, n.e.i. (including wood-based panels, veneers, wood wool, wood-flour, wooden beadings and mouldings etc)	—	1 723 067
Wooden tool handles, brush and broom handles and the like	—	190 758
Other wood manufactures, n.e.i. (including assembled parquet, flooring panels, boxes, picture frames, travel goods, clothes pegs, match splints, doors whether or not incorporating locks, hinges etc)	—	2 938 064

OVERSEAS

DESCRIPTION OF ITEMS AND COUNTRIES OF ORIGIN	QUANTITY m^3	VALUE $
1. Sawlogs, veneer logs in the rough or roughly squared including pitprops, poles, piling and posts		
Conifer	—	—
Non-conifer	—	—
2. Railway Sleepers		
3. Wood, sawn lengthwise, sliced or peeled, but not further prepared, of a thickness exceeding 5 mm		
Conifer		
Douglas Fir		
United States of America	1 777	390 241
TOTAL	1 777	390 241
Other		
Canada	111	22 395
Malaysia	40	6 915
New Zealand	34	7 626
United States of America	398	117 562
TOTAL	583	154 498

ITEM AND ORIGIN	QUANTITY m³	VALUE $
Non-conifer		
Meranti		
Malaysia	2 689	586 458
Singapore, Republic of	280	53 350
TOTAL	2 969	639 808
Ramin		
Indonesia	66	17 873
Malaysia	14	3 935
Singapore, Republic of	705	176 045
TOTAL	785	197 852
Teak		
Burma, Socialist Republic of the Union of	41	54 693
Singapore, Republic of	53	56 198
TOTAL	93	110 891
Kapur		
Malaysia	3 566	617 591
Singapore, Republic of	34	7 321
TOTAL	3 601	624 912
Keruing		
Malaysia	852	96 715
Singapore, Republic of	39	5 695
TOTAL	891	102 411
Nyatoh		
Indonesia	29	5 218
Malaysia	4 146	649 995
Singapore, Republic of	275	46 539
TOTAL	4 450	701 752
Other		
Brazil	29	12 899
Fiji	—	20
Malaysia	1 915	290 374
Netherlands	42	22 507
Singapore, Republic of	13	3 743
United Kingdom	—	307
United States of America	—	86
TOTAL	1 999	329 936
4. Wood (including blocks, strips and friezes for parquet or wood block flooring, not assembled), planed, tongued, grooved, rebated, chamfered, v-jointed, centre v-jointed, beaded, centre beaded or the like, but not further manufactured		
Conifer		
Douglas Fir		
United States of America	778	127 424
TOTAL	778	127 424

ITEM AND ORIGIN	QUANTITY m³	VALUE $
Other		
Netherlands	1	210
New Zealand	218	52 322
United States of America	410	64 871
TOTAL	629	117 403
Non-conifer		
Meranti		
Malaysia	1 324	356 208
Singapore, Republic of	157	41 695
TOTAL	1 482	397 903
Other		
Germany, Federal Republic of	—	235
Malaysia	40	14 426
Singapore, Republic of	91	19 654
United States of America	90	16 190
TOTAL	221	50 505
5. Wood sawn lengthwise, sliced or peeled but not further prepared of a thickness not exceeding 5 mm; veneer sheets and sheets for plywood of a thickness not exceeding 5 mm	m²	
China, Taiwan province only	2 794	1 971
Fiji	51 127	31 519
Germany, Federal Republic of	26 703	25 296
Italy	12 278	12 386
Malaysia	51 669	44 530
New Zealand	9 585	4 567
Singapore, Republic of	148 295	294 291
South Africa, Republic of	237 224	239 705
TOTAL	539 675	654 265
6. Plywood consisting solely of sheets of wood	m²	
China — Taiwan province only	2 935 117	1 317 297
Fiji	55	40
Germany, Federal Republic of	230	118
Malaysia	547 957	178 771
New Zealand	599 503	229 659
Papua New Guinea	109 138	65 209
Singapore, Republic of	1 500 765	548 139
United States of America	9 542	2 374
TOTAL	5 702 307	2 341 607
7. Reconstituted and 'improved' wood, in sheets, blocks or the like		
Netherlands	(a)	354
United States of America	(a)	17 807
TOTAL	(a)	18 161
8. Wood-based panels, n.e.i.	m²	
China-Taiwan Province only	29 250	27 176
Singapore, Republic of	2 608	15 916
TOTAL	31 858	43 092

ITEM AND ORIGIN	QUANTITY m²	VALUE $
9. Wood, simply shaped, n.e.i.		
Canada	(a)	16 249
Indonesia	(a)	5 751
Italy	(a)	275
Japan	(a)	3 509
Malaysia	(a)	9 120
New Zealand	(a)	2 457
South Africa, Republic of	(a)	2 340
Switzerland	(a)	20
United Kingdom	(a)	33 035
United States of America	(a)	405
Australia-Reimported	(a)	400
TOTAL		73 561

(a) Units of quantity are not comparable.

10. Wood manufactures, n.e.i.		
Casks, barrels, vats, tubs, buckets and other Cooper's products and parts thereof, of wood		
Finland	—	200
France	—	145 540
Italy	—	15
United Kingdom	—	3
United States of America	—	46 470
TOTAL	—	192 228
Builders' Carpentry and Joinery, excluding doors and assembled parquet flooring panels	m²	
Canada	—	73
China-Taiwan Province only	—	45 077
India	—	107
Italy	—	2 554
Malaysia	—	3 244
New Zealand	—	11 992
Singapore, Republic of	—	6 487
United States of America	—	70 850
TOTAL	—	140 383
Household utensils of wood, excluding spoons and forks		
China — excluding Taiwan Province	—	29 230
— Taiwan Province only	—	24 884
Denmark	—	789
Finland	—	100
France	—	4 841
Hong Kong	—	6 824
Indonesia	—	22
Italy	—	112
Japan	—	24 127
Malaysia	—	58 393
Mexico	—	73
New Zealand	—	552
Philippines	—	3 830
Singapore, Republic of	—	1 836
Thailand	—	2 722
United Kingdom	—	320
United States of America	—	2 493
TOTAL	—	161 147

ITEM AND ORIGIN	QUANTITY	VALUE $
Standard lamps, table lamps and other light fittings of wood		
Bangladesh	—	18
China — excluding Taiwan Province	—	482
— Taiwan Province only	—	2 725
Germany, Federal Republic of	—	79 040
Hong Kong	—	1 296
India	—	53
Italy	—	821
Malaysia	—	55
New Zealand	—	27 284
Philippines	—	67
Sweden	—	333
United Kingdom	—	533
United States of America	—	45
TOTAL	—	112 753
Trays, bowls of wood	No.	
China-Taiwan Province only	10 020	3 278
Hong Kong	2 131	3 591
India	655	295
Indonesia	8	1
Italy	68	1 057
Japan	15 040	62 526
Korea, Republic of	108	731
Philippines	15 166	7 206
Singapore, Republic of	40	18
Sweden	4 340	12 681
Thailand	5 301	20 131
United Kingdom	15	68
United States of America	200	378
TOTAL	53 092	111 961
Wood manufactures, n.e.i.		
Bangladesh	—	62
Belgium Luxembourg	—	4 646
Canada	—	7 119
China — excluding Taiwan Province	—	11 768
— Taiwan Province only	—	330 091
Denmark	—	874
Finland	—	42
France	—	500
Germany, Federal Republic of	—	1 988
Hong Kong	—	31 790
India	—	5 565
Indonesia	—	323
Ireland	—	58
Italy	—	4 754
Japan	—	33 293
Korea, Republic of	—	5 344
Macao	—	57
Malaysia	—	61 948
Mexico	—	175
Netherlands	—	16
New Zealand	—	24 266
Peru	—	43
Philippines	—	16 033
Singapore, Republic of	—	6 659
South Africa	—	2 863
Spain	—	8
Sri Lanka	—	14
Sweden	—	7
Switzerland	—	113
Thailand	—	4 817
United Kingdom	—	34 871
United States of America	—	247 505
TOTAL	—	837 612

ITEM AND ORIGIN	QUANTITY No.	VALUE $
11. Wood or wooden chairs and other seats — framed with seats or backs of any material		
Belgium-Luxembourg	24	4 482
Brazil	372	85 757
China — excl. Taiwan Province	5	186
— Taiwan Province only	11 239	222 845
Czechoslovakia	3 436	44 627
Denmark	171	10 887
Finland	137	4 982
France	108	8 093
Germany, Federal Republic of	13	928
Hong Kong	52	5 761
India	69	5 689
Italy	6 501	575 145
Japan	200	349
Macao	1	85
Netherlands	63	20 932
New Zealand	7 521	116 146
Norway	12	2 339
Philippines	762	6 862
Singapore, Republic of	26 252	453 438
Sri Lanka	1	887
Switzerland	7	1 646
United Kingdom	2 073	300 262
United States of America	987	95 847
Yugoslavia	3 380	47 706
TOTAL ALL COUNTRIES	63 386	2 015 882
12. Wood furniture, (n.e.i.)		
Belgium-Luxembourg	—	3 893
Brazil	—	2 247
China — excl. Taiwan Province	—	23 977
— Taiwan Province only	—	445 373
Denmark	—	7 009
Finland	—	6 030
France	—	2 230
Germany, Federal Republic of	—	1 024
Hong Kong	—	45 646
India	—	7 893
Indonesia	—	902
Italy	—	570 311
Japan	—	15 964
Korea, Republic of	—	4 634
Macao	—	85
Malaysia	—	28 437
Netherlands	—	1 114
New Zealand	—	79 262
Norway	—	163
Philippines	—	25 371
Portugal	—	63
Singapore, Republic of	—	380 981
South Africa, Republic of	—	572
Spain	—	1 174
Sri Lanka	—	123
Switzerland	—	912
Thailand	—	2 894
United Kingdom	—	266 010
United States of America	—	316 432
Yugoslavia	—	4 108
TOTAL ALL COUNTRIES	—	2 244 834
13. Tanning extracts of vegetable origin	kg	
Wattle bark extract		
South Africa, Republic of	754 840	434 215
TOTAL	754 840	434 215

ITEM AND ORIGIN	QUANTITY kg.	VALUE $
Other		
Italy	10 000	7 995
South Africa, Republic of	13 440	10 420
United Kingdom	2 740	3 819
TOTAL	26 180	22 234
14. Synthetic organic tanning substances, and inorganic tanning substances; tanning preparations, whether or not containing natural tanning materials: enzymatic preparations for pre-tanning		
Belgium-Luxembourg		25 381
Germany, Federal Republic of	—	25 759
New Zealand	—	54 625
United Kingdom	—	8 524
United States of America	—	445
TOTAL	—	114 734
15. Essential oils, concretes and absolutes		
India	—	851
Malaysia	—	76
Singapore, Republic of	—	293
United Kingdom	—	226
TOTAL	—	1 446

APPENDIX 3
SUMMARY OF EXPORTS OF FOREST PRODUCE — SINCE 1968

Year	Timber		Wood Manufacture Value	Essential Oils and Tanning Material*
	m^3	Value $	$	$
Brought forward	13 081 830	177 786 912	8 536 935	17 368 964
1968	84 569	4 947 595	3 016 850	280 806
1969	86 455	4 984 098	3 802 927	267 565
1970	96 275	5 661 547	3 906 699	317 553
1971	79 362	4 803 842	2 110 802	343 512
1972	101 191	6 439 732	2 369 541	348 762
1973	111 547	7 036 637	2 604 116	337 736
1974	98 200	7 366 709	3 769 461	433 627
1975	100 127	9 080 092	132 278	479 019
1976	94 136	9 823 037	993 199	214 918
1977	77 352	10 150 025	205 173	45 767
1978	58 833	8 809 324	4 625 089	41 422
1979	66 420	10 560 052	8 122 584	61 525
1980	71 955	12 265 737	591 670	255
1981	65 109	12 331 467	1 414 745	2 361
1982	48 448	9 599 222	1 671 328	Nil
1983	N/A	N/A	N/A	N/A

*Tanning materials not recorded separately since 1967

APPENDIX 4
SUMMARY OF IMPORTS OF FOREST PRODUCE — SINCE 1968

Year	Timber Woodware	Tanning Materials	Essential Oils
	$	$	$
Brought forward	63 937 163	1 344 397	4 600 226
1968	13 081 830	177 786 912	8 536 935
1969	8 731 114	109 905	206 309
1970	10 968 170	153 169	293 845
1971	6 761 806	103 857	175 331
1972	5 578 819	144 219	227 530
1973	8 326 939	225 463	366 786
1974	11 738 861	420 010	271 713
1975	14 053 751	465 884	641 859
1976	19 960 421	373 331	131 515
1977	24 857 792	603 819	39 143
1978	24 039 952	912 669	620
1979	18 200 508	614 628	48
1980	26 801 716	641 927	1 118
1981	28 691 997	512 128	126
1982	26 068 548	571 183	1 446
1983	N/A	N/A	N/A

APPENDIX 5(a)
SUMMARY OF LOG PRODUCTION — SINCE 1968

Year	Crown Land m³	Private Property m³	Total m³
Brought Forward	44 466 501	15 455 468	78 705 715*
1968	1 231 517	228 281	1 459 798
1969	1 143 705	160 771	1 304 476
1970	1 121 396	175 686	1 297 082
1971	1 145 161	161 990	1 307 151
1972	1 096 236	106 993	1 203 229
1973	1 060 359	102 992	1 163 351
1974	1 084 463	91 884	1 176 347
1975	1 096 356	87 957	1 184 313
1976	1 194 667	111 761	1 306 428
1977	1 429 493	106 848	1 536 341
1978	1 445 465	119 706	1 565 171
1979	1 489 515	129 665	1 619 180
1980	1 582 018	165 076	1 747 094
1981	1 593 512	161 966	1 755 478
1982	1 392 227	127 825	1 520 052
1983	1 225 798	102 942	1 328 740

* Includes 18 783 746m³ estimated cut prior to 1917.

Note — as in previous years this total includes log material used for reconstituted wood and chipwood. The increase since 1976 is due to the use of karri and marri by W.A. Chip and Pulp Company.

5(b)
TREND IN PINE LOG OUTPUT IN RECENT YEARS (INCLUDING PARTICLEBOARD LOGS)

	Crown Land m³	Private Property m³	Total m³
1970	81 283	1 514	82 797
1971	86 246	1 594	87 840
1972	90 161	1 306	92 067
1973	100 419	1 015	101 434
1974	123 393	1 167	124 560
1975	129 086	63	129 149
1976	105 567	—	105 567
1977	120 859	335	121 194
1978	125 548	1 677	127 225
1979	176 944	6 127	183 071
1980	191 363	4 827	196 190
1981	201 552	2 988	204 540
1982	173 474	14 834	188 308
1983	176 618	5 468	182 086

5(c)
TRENDS IN THE PRODUCTION AND USE OF SAWN WESTERN AUSTRALIAN TIMBER

Year Ended 30 June	Sawn Production (m³)			Export	Local Use
	Hardwood	Softwood	Total		
1970	425 295	16 893	442 188	96 275	345 914
1971	420 777	21 595	442 372	79 437	362 935
1972	379 006	21 733	400 739	101 191	299 548
1973	375 135	23 283	398 418	111 547	286 871
1974	374 899	26 534	401 433	98 200	303 233
1975	368 844	27 086	395 930	100 127	295 803
1976	383 010	16 258	399 268	94 136	305 132
1977	369 151	16 685	385 836	77 352	308 484
1978	347 111	18 669	365 780	58 833	306 947
1979	331 135	18 145	349 280	66 420	282 860
1980	331 411	21 400	352 811	71 955	280 856
1981	330 863	22 954	353 817	65 109	288 708
1982	320 915	22 190	343 105	48 448	294 657
1983	252 124	13 216	265 340	N/A	N/A

APPENDIX 6
Forests Department Publications Produced During the Year Ended 30 June 1983

Annual Report 1983

Forest Focus No. 26	—	'On Rational Grounds' 'Playing Possum'
Forest Focus No. 27	—	'From Germinants to Giants — The Manjimup Nursery' 'Trees for Badgingarra' 'New Light on the Numbat' 'Site for Sore Eyes'
Forest Focus No. 28	—	'Pilbara Gardens for Functional Beauty' 'Pioneers: A Profile' 'Timber for the Future — Pine' 'Notable Trees of Perth'
Forest Focus No. 29	—	'Tuning In To Trees'
Technical Paper No. 1	—	Forestry Terminology in Western Australia by F.H. McKinnell
Technical Paper No. 3	—	Introduction to the Detection and Interpretation of the Symptoms of Jarrah Dieback Disease in Western Australia by A.J. Brandis
Technical Paper No. 4	—	A New Incendiary Machine for Aerial Prescribed Burning by G.W. van Didden
Research Paper No. 70	—	Fertilizing Planted Karri *(Eucalyptus diversicolor* F. Muell) Seedlings by C.J. Schuster
Research Paper No. 71	—	Poor Response to a Slow Release Fertilizer by Young *Pinus Radiata* on Sandy Soil by R. Moore
Research Paper No. 72	—	Strength Properties of *Pinus Pinaster* Ait. in Western Australia by G.R. Siemon

Road Verges in Western Australia by Road Verges Conservation Committee of Western Australia

Trees in the Rural Landscape — Proceedings of a Conference held in Perth October 1981

Dieback Policy 1982 Forests Department of Western Australia

Extension Brochures

Tree Care Series No. 3	Trees for Rural Areas — South-west Raising Trees for Farms The Pilbara Garden Agroforestry Design and Siting Guidelines — Development in Hot Arid Zones
Forest Education Series	A Guide to Some Common Eucalypts of the Kununurra Area Big Brook Karri Forest — Forestry in Action
Recreation Area Guide	Pemberton Forests Drive Arbor Day Poster

External Publications

Cremer, K.W., Borough, C.J., McKinnell, F.H. and Carter, P.R.	Effects of Stocking and Thinning on Wind Damage in Plantations New Zealand Journal of Forestry Science 12 (2) (1982).

Tippett, J.T., Shea, S.R., Hill, T.C. and Shearer, B.L.	Development of Lesions caused by *Phytophthora cinnamomi* in the Secondary Phloem of *Eucalyptus marginata.* Australian Journal of Botany 31 (1983).
Chevis, H.W., and Stukely, M.J.C.	Mortalities of Young Established Radiata Pine Associated with *Phytophthora* spp. in the Donnybrook Sunkland Plantations in Western Australia. Australian Forestry Vol. 45 No. 3 (1982).
Rotheram, I.	How Much Does a Veteran Tree Suppress Growth of Surrounding Regeneration of *Eucalyptus diversicolor?* Australian Forestry Vol. 46 No. 1 (1983).
Shea, S.R., Shearer, B. and Tippett, J.	Recovery of *Phytophthora cinnamomi* Rands from Vertical Roots of Jarrah *(Eucalyptus marginata* Sm) Australian Plant Pathology Vol. II, No. 3, 25-28 September 1982.
Burrows, R.	A Look at Vandalism — Not a Pretty Site Australian Parks and Recreation, August 1982.
Anderson, G.W. and Batini, F.E.	Pasture, Sheep and Timber Production from Agro-forestry Systems with Subterranean Clover Sown Under 15-year-old *Pinus radiata* by a method Simulating Aerial Seeding. Australian Journal of Experimental Agriculture and Animal Husbandry. 23, 123-130. 1983.
Christensen, P.S.	The Distribution of *Lepidogalaxias salamandroides* and Other Small Fresh-Water Fishes in the Lower South-West of Western Australia. Journal of the Royal Society of Western Australia 65(4), 131-141.
Shea, S.R. and Broadbent, P.	Development in Cultural and Biological Control of *Phytophthora* Diseases in *Phytophthora:* its Biology, Taxonomy, Ecology and Pathology ed. by D.C. Erwin, S. Dartnicki-Garcia, P.H. Tsao. University of California, Riverside.
Shea, S.R., Shearer, B.L., Tippett, J. and Deegan, P.M.	New Perspectives on Jarrah Dieback. Ringyo Sgijutsu. May 1983.

APPENDIX 7
THE DEPARTMENT'S SAFETY RECORD OVER THE LAST 17 YEARS

Year	M.H.W.	L.T.A.	M.T.A.	Total Accidents	Frequency Rate			Man Days Lost	Duration Rate (days)
					L.T.A.	M.T.A.	L.T.A. M.T.A.		
1966-67	—	185	—	—	100+	—	100+	2 896	—
1967-68	1 895 600	124	312	436	65	164	230	1 701	14
1968-69	2 019 568	96	155	251	48	76	124	1 738	18
1969-70	1 901 020	70	129	199	37	67	104	721	10
1970-71	1 808 406	48	158	206	27	76	110	458	9
1971-72	1 759 888	40	128	168	23	72	95	275	6
1972-73	1 728 577	45	112	157	26	64	90	414	9
1973-74	1 651 621	45	119	164	27	72	99	359	8
1974-75	1 748 219	55	127	182	31	72	104	634	11
1975-76	1 762 693	31	113	144	17.5	64	82	383	12
1976-77	1 707 635	32	157	189	19	92	111	620	19
1977-78	1 764 519	26	151	177	15	86	100	731	28
1978-79	1 835 917	44	143	187	24	76	100	810	18
1979-80	1 826 452	32	125	157	17.5	68	86	938	14
1980-81	1 897 463	24	135	159	13	71	84	490	15
1981-82	1 915 184	19	141	160	10	74	84	459	18
1982-83	1 931 192	27	134	161	14	69	83	849*	22‡

M.H.W. — Man Hours Worked. L.T.A. — Lost Time Accidents.

M.T.A. — Medical Treatment Accidents.

* Of the 849 days lost, 254 were carried over from accidents sustained during the previous year.

‡ The Duration Rate for the 27 L.T.A. this year is 22 days. If the 254 days lost from the two carry over accidents are taken into account, the Duration Rate is 28 days.

APPENDIX 8

Common and scientific names of plants and animals mentioned in this report

Plants

Jam	..... Acacia acuminata
Wattle	..... Acacia scapeliformis
Brown boronia	..... Boronia megastigma
Bull banksia	..... Banksia grandis
W.A. sheoak	..... Casuarina fraserana
Powder bark wandoo	..... Eucalypus accedens
Brown mallet	..... Eucalyptus astringens
Rates tingle	..... Eucalyptus brevistylis
Dundas mahogany	..... Eucalyptus brockwayi
Marri	..... Eucalyptus calophylla
River gum	..... Eucalyptus camaldulensis
Silver gimlet	..... Eucalyptus campaspe
Cleland's blackbutt	..... Eucalyptus clelandii
Karri	..... Eucalyptus diversicolor
Dundas blackbutt	..... Eucalyptus dundasii
Tuart	..... Eucalyptus gomphocephala
Yellow tingle	..... Eucalyptus guilfoylei
Red tingle	..... Eucalyptus jacksonii
Spotted gum	..... Eucalyptus maculata
Jarrah	..... Eucalyptus marginata
Bullich	..... Eucalyptus megacarpa
Yellow stringy bark	..... Eucalyptus muellerana
Yarri or W.A. blackbutt	..... Eucalyptus patens
Red mahogany	..... Eucalyptus resinifera
Swamp mahogany	..... Eucalyptus robusta
Flooded gum	..... Eucalyptus rudis
Sydney blue gum	..... Eucalyptus saligna
Salmon gum	..... Eucalyptus salmonophloia
Wandoo	..... Eucalyptus wandoo
Pinaster	..... Pinus pinaster
Radiata	..... Pinus radiata
Sandalwood	..... Santalum spicatum

Animals

Woylie	..... Bettongia penicillata
Tammar wallaby	..... Macropus eugenii
Phascogale	..... Phascogale tapoatafa
Mardo	..... Antechinus flavipes

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