

1973

QUEENSLAND

ANNUAL REPORT

OF THE

DEPARTMENT OF FORESTRY

FOR THE

YEAR 1972-73

PRESENTED TO PARLIAMENT BY COMMAND

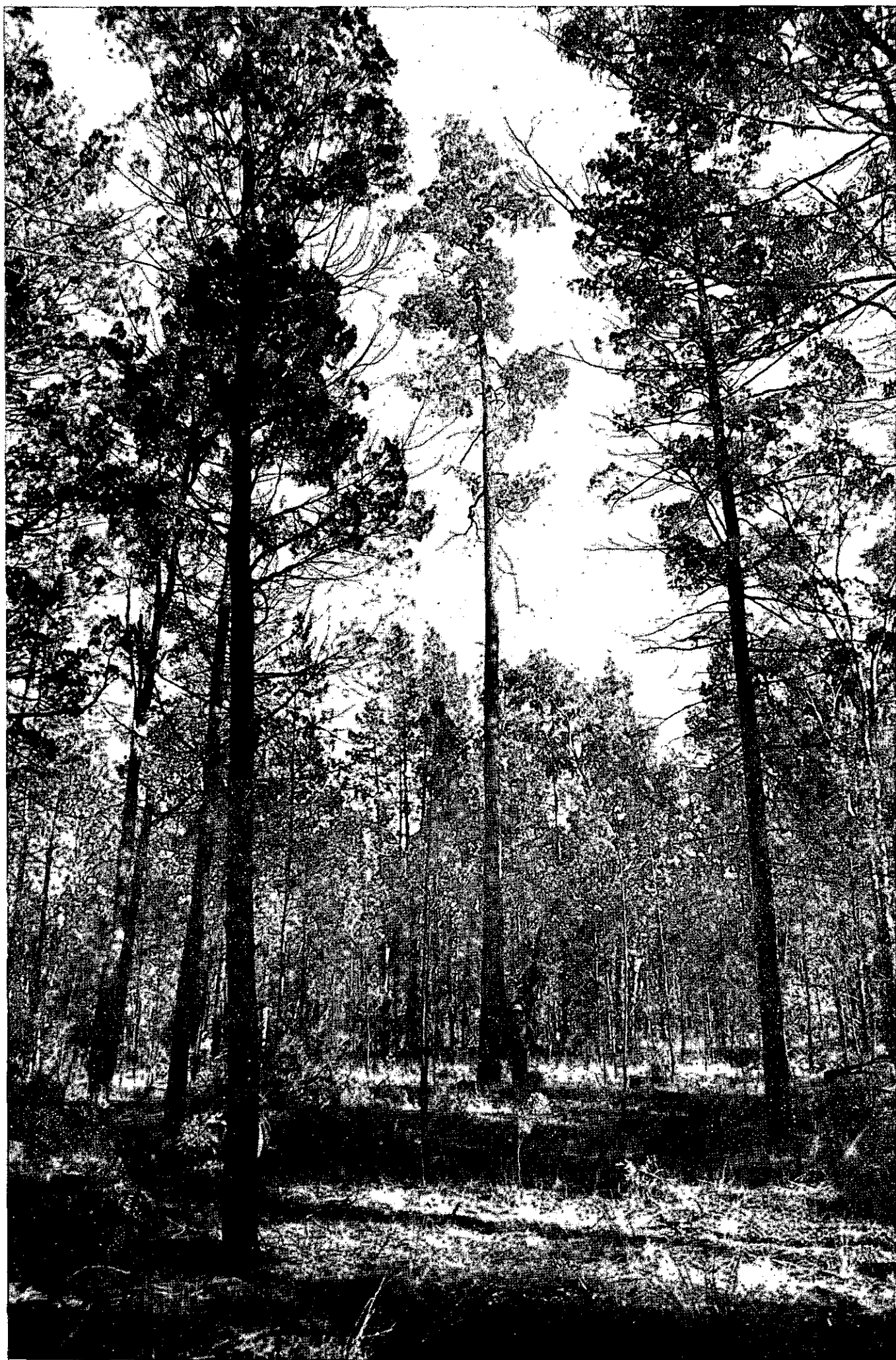
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2. Sustained Yield Management—Cypress Pine. Barakula State Forest. An example of practical conservation—Dalby District.

REPORT OF THE CONSERVATOR OF FORESTS

For the Year ended 30th June, 1973

TO THE HONOURABLE THE MINISTER FOR LANDS AND FORESTRY

INTRODUCTION

The year 1972-73 was one of record performance in the two main fields of Departmental endeavour. The area of new plantations established was 16,878.2 acres which surpassed by 1,227.7 acres the area planted in the previous year. Harvesting of timber from Crown lands was also at a level higher than in any preceding year and the volume marketed during the year was 246,175,150 superficial feet (hoppus) which was 5,551,815 super. feet above that recorded in 1965-66.

The first of these was made possible by the availability of Commonwealth Funds for the relief of unemployment and by the renewal of the Softwood Agreements Act for a further five years up to the year 1975-76 and culminates a period of activity stimulated by this Act. This has seen the area of softwood plantations rise from 116,022.3 acres at 31st March, 1966, to 205,556.5 acres at 31st March, 1973. The full scope of this activity is well illustrated by the following statement of years by which each 50,000 acre was achieved and the period taken between milestones:—

50,000 acres ..	1952-53 ..	30 years
100,000 acres ..	1962-63 ..	10 years
150,000 acres ..	1969-70 ..	7 years
200,000 acres ..	1972-73 ..	3-4 years

It is pleasing to report that this impressive increase in rate of planting has been handled efficiently and without any important increases in the supervisory and administrative staff. The increased work load has been willingly accepted and the proper tending of both new and older plantations has been maintained. This achievement is a tribute to the energy and dedication of the Department's staff.

As foreshadowed in last year's report the new Softwood Agreements Act entails a reduction in the area of new planting to be funded by the Commonwealth from 4,800 acres to 4,060 acres. In this regard Queensland had been looking for a substantial increase and had built up its programme in anticipation. For this reason the State is faced with the task of tending and pruning areas in excess of those for which the Commonwealth assumes responsibility and action has been taken to reduce the area of annual plantings to permit this to be done. To some extent this will be facilitated by reduced need for tending in the main areas of exotic planting which account for about two-thirds of the recent plantings and where increased use of machinery to clear and plough gives better control of weed species. This is of particular importance in relation to restrictions placed on the use of hormone weedicides in localities such as Beerburum where agricultural crops grow in close proximity to planting areas.

To date these exotic pines have been singularly free from serious disease but precautions are being taken to guard against the possible spread of *Phytophthora cinnamomi* the root rot fungus which has been the cause of serious losses in the Jarrah forests of Western Australia and which is widely spread in native forests of the Eastern States where it is causing some concern particularly in the South. Its presence in nurseries for exotic pines has been recognised for more than 10 years and control has been effected by fumigation with methyl-bromide prior to sowing. This procedure however led to other nursery problems and was not conducive to the production of sturdy hardened stock capable of giving near 100 per cent survival under other than ideal planting conditions. In an effort to avoid the need for such treatment the Beerburum nursery was relocated some four years ago and during the year the Tuan and Toolara nurseries have been replaced by one large nursery located at Toolara. These new nurseries are large enough to provide for at least three years rotation of sowing and have provision for treatment of water supply and sterilization of plant and equipment entering them. At the same time provision has been made for increased mechanisation of cultural operations such as weeding and root-wrenching.

The record harvesting from Crown lands has been made possible by the growing availability of plantation grown timbers which coupled with the increased use of Cypress Pine has helped to meet the unprecedented demand for forest products associated with the needs of the building industry. This increase in log supplies from Crown lands compensated for a decrease in availability from private sources particularly in the case of forest hardwoods which fell by some 14 million super. feet or about 13 per cent. from the previous year's level of 68 million super. feet. The demand is expected to continue as is the decline in supplies of hardwood from private areas. This will place additional strain on Crown lands and in particular on State Forests. To help meet this action has been taken for increasing sales of plantation species and to offer sales of Cypress Pine in the Injune area with continuing rights to annual quantities totalling 15½ million super. feet. In offering these amounts provision of 5½ million has been made to give existing mills the opportunity of building up towards an economic capacity. This entailed a change in sales policy which is consistent with the ideas behind the amalgamation policy and which has been well received by the industry. The remaining 10 million will be offered as two lots each of 5 million super. feet with open bidding.

During the year action was taken to increase stumpages overall by an average of about 25 per cent. to compensate for the loss in real value that has occurred since the previous major adjustment. It has been accepted that reviews of stumpages with this same objective will be made at two-yearly intervals and that the Consumer Price Index be used initially as the criterion on which stumpage is varied. This does not preclude the possibility of price adjustments that might be justified for other reasons such as changes in market conditions or in type of log provided. In this regard mill studies have been implemented to assess the effect on values of plantation logs operated to a top diameter of six inches and of improved quality because of the diversion to pulp or particle board of crooked stems considered more suited to these uses. In addition the co-operation of industry is being sought to develop a proper picture of the main markets that will permit a review that could result in pricing on a more realistic and equitable basis.

Industry continues to make use of the provisions that permit amalgamations of sawmills though, understandably after four years operation, the number of mills participating was lower this year.

Regular meetings with representatives of industry have taken place under the aegis of A.U.S. T. I. S. to the benefit of the Department and Industry alike and continue to contribute to good relationships that have long existed and are important to these complementary branches of forestry activity.

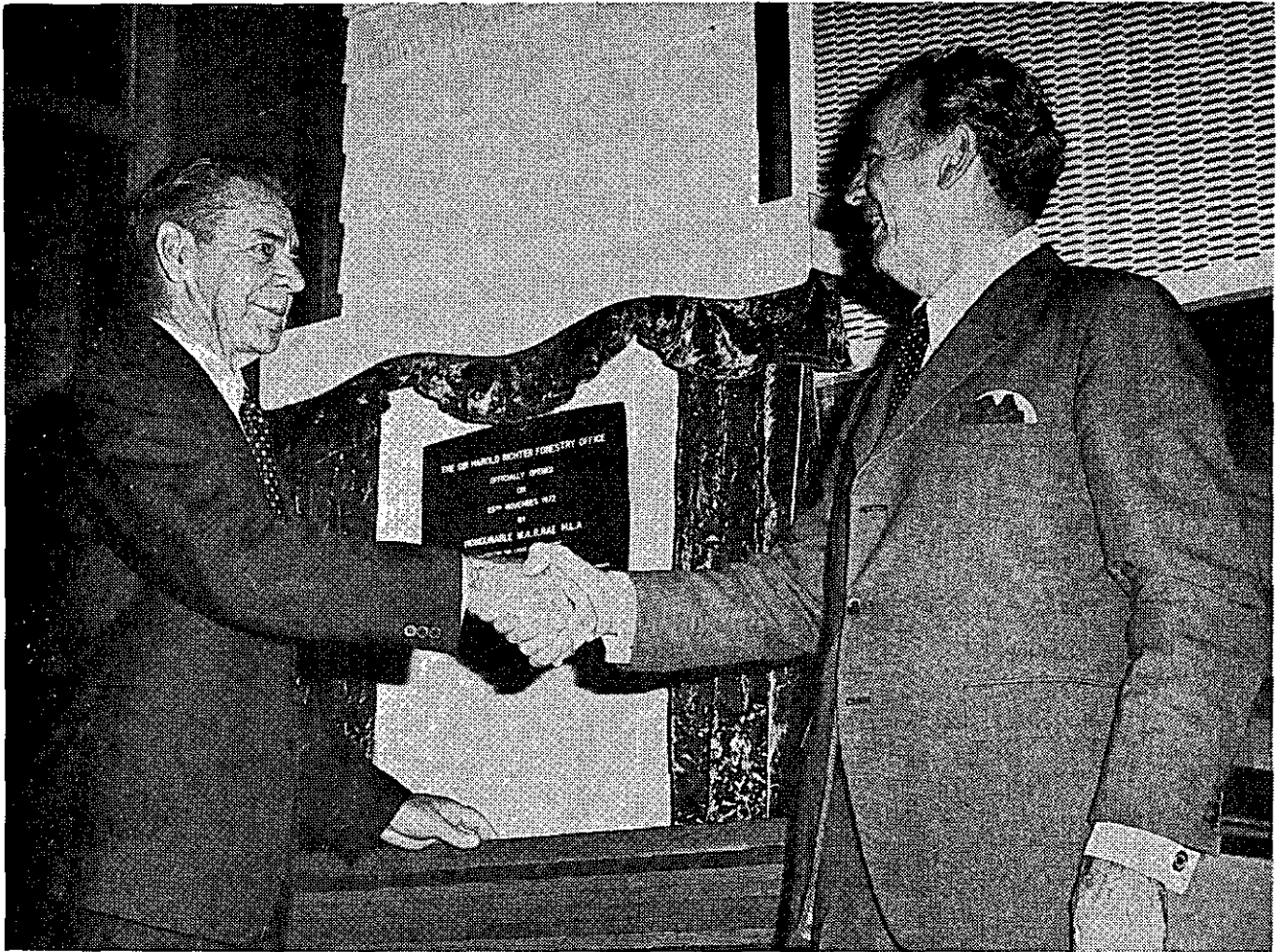
A further improvement is again recorded in respect to the number of blocks awaiting valuation of the timber crop in connection with freeholding activities. The area on which valuation was completed during the year exceeded that of new applications by 181,000 acres. At the same time the area awaiting field assessment fell by 394,000 acres to 474,000 acres. The area of new applications was 726,000 acres.

Largely as a result of the activities of the Forest Resources Branch in this field the area of State Forests rose by nearly 150,000 acres during the year. This increase relates chiefly to areas of good forest surrendered from Crown holdings in the course of freeholding. These areas have been recognised by the field parties which survey the forested parts in the course of assessment. Once again this year there has been no serious complaint made over valuations of timber submitted by this Department and the Staff can take a just pride in this happy position and the fact that they have established a great degree of confidence in their determinations.

The work of the National Parks Section continues to expand and this has necessitated a further increase in the professional and technical staff of that Section. During the year two qualified biologists and one zoologist were added to the staff and three boats designed for use in connection with marine National Parks were purchased. A point of some concern is the relatively small area (5,627 acres) by which the National Parks estate increased during the year despite the fact that proposals under reference to other Departments as required under the Act involve an area well in excess of half million acres. However agreement has been obtained for areas totalling some 80,000 acres for which reservation action is in progress and should be completed during the coming year.

Reference is made in the body of the report to the sharp increase in the number of visitors to National Parks particularly the more popular areas of South-East Queensland and to the attendant risks of damage to the habitat and environ-

mental values of sections of the park. To reduce this risk it is necessary that other areas capable of meeting the increasing public demand for the type of outdoor recreation that National Parks provide should be adequately developed. In this regard further progress has been made in the development of areas of State Forest for recreation purposes. The main area as developed during the year was that at Bunyaville which was officially opened by the Honourable the Minister for Lands and Forestry (Mr. W. A. R. Rae) in December. This area has proved most popular with the people of Brisbane, particularly those in the north-western suburbs and it is gratifying to note the way in which the amenities provided have been respected. It is hoped during the coming year to establish a similar area on State Forest 215 Redland with the co-operation of the Redland Shire Council in the provision of a water supply. Expenditure on this type of work was \$21,340.92 and provision of \$50,000 is being sought for 1973-74.



Official opening of the Sir Harold Richter Forestry Office, Yarraman, on 25th November, 1972, by the Honourable W. A. R. Rae, M.L.A., Minister for Lands and Forestry—Yarraman District.

MANAGEMENT

General

The area of State Forest as at 30th June, 1973, was 7,866,125 acres, a net increase of 148,555 acres.

Expenditure

Expenditure under the Reforestation Vote was \$6,968,811 compared with \$6,139,503 in 1971-1972. Expenditure from Trust Funds on projects associated with the Reforestation Vote was \$188,831.

Expenditure is itemised as follows:—

Item	Expenditure	Percentage of Total
Direct Expenditure of Projects—	\$	
Plantations	2,078,705	29.0
Natural Regeneration	294,268	4.1
Nursery Expenses	232,289	3.2
Research	311,819	4.4
Protection	911,811	12.7
Surveys	82,072	1.2
New Construction	163,652	2.3
Seed Collection	79,957	1.1
Maintenance of Capital Improvements	177,826	2.5
Total Direct Expenditure	\$4,332,399	60.5
Indirect Expenditure—		
Wet Time, Holidays and Leave	869,997	12.1
Supervision, Tools, Cartage, &c.	1,039,771	14.6
Camp Allowance	369,562	5.2
Pay Roll Tax	188,786	2.6
Workers' Compensation	121,837	1.7
Administration	235,290	3.3
Total Indirect Expenditure	\$2,825,243	39.5
Total Expenditure	\$7,157,642	100.0

Timber Assessment

During the year 68 new permanent plots were established to sample 3,000 acres of hoop and exotic pine plantations and 680 plots were remeasured in the Department's plantation areas.

Remeasurements of 600 permanent plots on State Forests in the coastal hardwood areas of South Queensland were also undertaken, sampling about 60,000 acres of Forest.

A further 160,000 acres of hardwood forest and 10,000 acres of Cypress pine, and 40,000 acres of rain forest in State Forests and Timber Reserves was sampled by strip survey.

Approximately 370,000 acres of other Crown Lands were sampled by strip survey to determine their suitability for permanent timber production.

Aerial reconnaissance of timber stands covered some 550,000 acres in the Cypress pine area during the year.

Valuation of Timber for Conversion of Tenure

There has been a further decline in numbers of new applications requiring Forestry valuation though this has been offset to some extent by renewal of previous applications. This has enabled field work to catch up on outstanding applications.

Over ninety per cent. of all applications received have now been finalised and a large percentage of the remainder carry timber stands which are of sufficiently high quality to warrant reservation for permanent timber production and negotiations to acquire a number of these areas are well in hand.

A further three blocks totalling 90,000 acres were valued under the Brigalow Development Scheme.

All Brigalow Scheme valuations requested have now been dealt with.

FREEHOLDING POSITION IN RELATION TO PREVIOUS YEARS

	As at 30th June, 1971		As at 30th June, 1972		As at 30th June, 1973	
	No.	Area	No.	Area	No.	Area
Total applications made	2,911	Acres 23,832,000	3,048	Acres 24,696,000	3,167	Acres 25,394,000
Withdrawn before valuation	29	245,000	32	270,000	32	242,000
Total requiring valuation	2,882	23,587,000	3,016	24,426,000	3,135	25,152,000
Valuation complete and determined by Land Court	2,323	17,987,000	2,525	19,882,000	2,668	20,862,000
Valuation complete and awaiting Land Court determination ..	240	1,931,000	241	1,617,000	207	1,532,000
Field assessment complete but not yet valued	181	2,182,000	168	2,059,000	191	2,284,000
Awaiting Field assessment	138	1,487,000	82	868,000	69	474,000
Totals	2,882	23,587,000	3,016	24,426,000	3,135	25,152,000

Employment Wages Staff

	Average 1972-73	As at 1-7-72	As at 30-6-73
Reforestation	1,469	1,418	1,459
Harvesting and Marketing	180	182	172
National Parks	80	72	81
Road Construction and Maintenance	67	71	79
Maintenance of Plant	63	64	65
Totals	1,859	1,807	1,856

Protection

SEASONAL CHARACTERISTICS. The failure of winter rains resulted in high levels of drought index at the start of spring.

Levels were in excess of those experienced at a similar time of the year in the severe 1968 fire season, however the onset of good storm rains in early October plus follow-up rain eased conditions, particularly in coastal areas. A feature of the fire season in western areas was the high incidence of lightning strike fires.

FIRE INCIDENCE. Two hundred and twenty-five fires were attended by departmental employees as against 233 in 1971-72. Thirty-seven fires were in excess of 1,000 acres, as against forty-one in 1971-72. Police Officers assisted in the investigations of 15 fires for breaches of provisions of the Rural Fires Act or the Forestry Act. Four successful prosecutions resulted in fines totalling \$105. Three demands met for costs of fire-fighting resulted in \$410.72 being recovered. Twelve letters of warning were issued and seven letters of appreciation were sent to persons helping to combat fire outbreaks.

The number of fires by month of occurrence and size obtained is set out in the table following:—

Month	Number of Fires	Size of Fires in Acres (Private and other Crown Lands as well as State Forests and Reserves)				
		0-10	11-100	101-1,000	1,001-10,000	10,000+
July	9	4	4	1	..	..
August	35	11	14	8	2	..
September	30	13	9	7	1	..
October	75	14	18	21	20	2
November	19	5	5	8	1	..
December	31	9	7	10	3	2
January	12	6	4	2	..	..
February .. .. .	..	..	..	..	..	..
March	6	2	..	3	1	..
April	4	2	1	1	..	..
May	2	2	..	..	..	..
June	2	1	1	..	..	..
Totals	225	69	63	61	28	4

Thirteen of the 225 fires were in softwood plantations. Of these five were started by causes unknown (total area 9.28 acres), one started from an escaped fire from a school pottery kiln (area 39.5 acres); two were accidentally lit by a bushman's cigarette (area 5.0 acres); one was an escape from a smouldering rubbish dump (area 0.33 acres); two escaped from departmental burning off operations (total area 0.55 acres); one started from an authorised stack burn on adjoining private property (28.1 acres) and one started from lightning (area 0.25 acres). Of the 83.01 acres

involved no areas have warranted replanting. Of the 39.5 acres of five year old *Pinus caribaea* involved in the school fire at Kennedy, North Queensland, well over 80 per cent. of stems have recovered. The remaining 20 per cent. were mostly small stems. In the 28.1 acres of five-year-old *Pinus elliotii* burnt on State Forest 531 Esk most stems have recovered. Loss in both larger fires is mainly in growth.

Two fires cost in excess of \$1,000 to control. Both were in Cypress Pine—one north of Chinchilla and the other in the Inglewood area.

The following table gives details of fire occurrence by Districts:—

District	Number of Fires	Area Burnt by Protection Classes			
		*Intensive	†Extensive	Non-Protected	Total
		(acres)	(acres)	(acres)	
Atherton	29	6,929	3,878	1,205	12,012
Brisbane	21	85	1,712	..	1,797
Gympie	32	267	3,950	35	4,252
Dalby	59	2,392	58,087	17,751	78,230
Mackay	12	99	730	2	831
Maryborough	15	1,559	3,919	..	5,478
Monto	12	800	6,500	..	7,300
Murgon	16	2,490	1,562	..	4,052
Warwick	17	1,046	4,286	8	5,340
Yarraman	12	667	65	..	732
Total	225	16,334	84,689	19,001	120,024

* Intensively protected forest land means all that covered by a detection system and on which actual fire suppression action will normally commence within two hours of the fire being reported to the local fire headquarters.

† Extensively protected forest land means forest land which may or may not be covered by a detection system, but on which suppression action will be taken on fires in a period longer than two hours from first report as access and the availability of fire suppression crews permit.

Major known causes of fire outbreaks by percentages were:—

Unauthorised burning off	11.6
Government, Semi-Government Authorities and bush workers	16.4
Escapes from permit fires	16.4
Re-lights of old fires	2.7
Lightning	11.1
Camp and billy fire escapes	3.6
Incendiarists	0.4
All other known causes	1.8
Unknown causes	36.0
Total	100.0

Communications

Installation of equipment purchased during 1971-72 has been proceeding smoothly and almost all items have been placed in service.

Twenty-five STC type CTR25/152A solid state remote VHF bases were acquired. These items have replaced earlier mobile type bases and this programme will continue into next year.

Thirty-five STC type MTR25/151A mobile units have also been purchased so as to enable the replacement of ageing TCA 1677A/25 units now in service in Dalby District.

Fire tower/base and firetower/tower communication has been improved by the issue of a further 10 VHF FM portables. This enables many unsatisfactory telephone lines to be discontinued. Out of the fire season these portables are to be issued to gangs engaged in field work.

Planning is proceeding on proposed North Queensland and Central Queensland SSB mobile and base installations. In the initial stages bases are planned for Rockhampton, Emerald, Roma, Atherton and Carnarvon N.P. Mobiles attached to these bases will be fitted with Royal Flying Doctor Service frequencies for emergency purposes. Three SSB 100 watt units have been installed on National Park small ships. The replacement of other AM equipment will follow next year. Six small Departmental craft are radio equipped and operate in Queensland waters. Most are equipped with both VHF and HF. The VHF provides contact with Departmental land and island bases.

Plans have been prepared for extensions to the Department's Communications Centre at Bunyaville (Brisbane). The extensions provide for a screened room, mechanical workshop, more storage space, inflammable fluid store and cover for section vehicles. Some items of test equipment have been obtained; namely an AWA F240 N & D set, Five Gain measuring attenuators, a Rhode and Schwarz Field Strength Meter and a B & L screened room.

Present staff now comprises the Communications officer, one Senior Technician, three technicians, one assistant technician, one apprentice, one storeman clerk and one automotive electrical mechanic.

Equipment in use includes 409 mobile units, 59 bases, 35 VHF portables, 49 Citizens Band transceivers, 26 SSB units and 8 UHF links.

Detection

The final stage of construction was reached of a 120 foot fire tower at Pechey in the Yarraman District. Concrete foundations were poured for a 90 foot tower at Western Creek in the Dalby District. Aircraft were used for fire detection in the Dalby and Gympie Districts only. A total of 31 hours was logged.

Equipment

One new fire tanker was constructed and after outfitting and trials, will be stationed in the Yarraman District. Work has now begun on the second of five fire tankers. Six 8 horse power pumps were purchased for fitting to 275 gallon slip-on fire tanks in the coming year. Ten smaller pumps of 4.5 horse power were purchased for use with smaller steel tanks in light vehicles. Six large 1.1 gallon drip torches were manufactured for boundary lighting in aerial ignition operations. Also a large pressurised flame torch was developed for use in future burning operations.

Fire Research

During the past twelve months, considerable progress has been made in the establishment of long-term fire effects experiments in a range of vegetation types. A 20 year old experiment on State Forest 958 Gundiiah in the Maryborough District which compares the effects of annual burning with complete protection in spotted gum type has been expanded to include an area of 1,200 acres which will be burnt on a three year cycle. Following a year of successful introduction of aerial ignition into routine departmental burning operations, work has commenced on establishing detailed permanent observation sites in several aerial ignition blocks covering a wide range of vegetation and fuel types. On these sites, fire behaviour is being documented during actual aerial ignition burns, and this information will be used to improve the burning prescription on future burns. Fuel and understorey characteristics on these sites will be used to determine the optimum desirable interval between burns and any permanent changes to the fuel type or understorey as a result of burning. A pilot study of fauna populations and the effect of aerial burning was carried out on State Forest 958 Gundiiah in the Maryborough District. In the Spotted Gum-Ironbark stand studied, a high population density of gliders (both the common black and the yellow-bellied) was observed before and after the burn. A careful survey revealed no deaths of any fauna and population levels were unaffected by the burn. Further faunal studies are planned on aerial burning blocks.

During May, 1973, 650 acres of eleven and twelve year old *P. elliotii* and *P. caribaea* plantation were burnt as a large-scale trial on State Forest 1004 Toolara in the Gympie District. The area was broken up into 20 separate compartments surrounding approximately 1000 acres of swamp country on which the natural timber had been pushed and heaped. The primary objective of the burn was to facilitate the later burning of the included swamp country. The burn commenced on 23rd May, 1973, one day after 34 points of rain, and was completed on 25th May, 1973. Weather conditions on the three days were very uniform. Maximum temperature was an average 24 degrees C, relative humidity was close to 65 per cent., and wind varied from 5-10 m.p.h. Burn results were encouraging, and only 18 acres (2.8 per cent. of total area) of bad scorch was obtained. (Crowns retaining 0-2 metres of green crown was defined as bad scorch). In view

of the dispersed nature of the 20 blocks involved, a total burning cost of 35 cents per acre was considered a very satisfactory result.

Work was completed during the year on a study of cane fires which was commenced at Tully in 1970 in co-operation with Forest Research Institute. A cane burning meter has been produced and a detailed report will be published in the near future by the Forestry and Timber Bureau.

General

Expenditure on fire fighting patrol and detection was \$182,703 compared with \$166,571 in the 1971-72 year. Direct suppression costs were \$37,912 (\$47,579). Prescribed burning to reduce forest fuel levels prior to the fire season cost \$22,993 (\$12,077). The area covered by prescribed burning was 301,311 acres (109,309 acres) of which 267,140 acres were burnt through aerial ignition and 650 acres were in Slash Pine Plantation. A total of 57 hours were flown in aerial ignition. In aerial burning operations the percentage of area burnt over on each block ranged from 25 to 95 per cent. with an overall average cover of 60 per cent. A total of 19,525 acres of privately owned land was covered by aerial ignition in conjunction with adjoining State Forest blocks with the permission of the various owners. Burning of logging debris cost \$2,654 (\$5,835) over an area of 10,461 acres (26,750 acres).

Co-operative burning with neighbours cost \$20,897 (\$15,472). New roads charged to protection and new fire breaks cost \$252,757 (\$266,587) and maintenance of existing protection roads and fire breaks cost \$330,631 (\$342,727).

Industrial Safety

The accident frequency rate for the year was 134.0 compared with 110.0 for the previous year. This high figure is attributed to the introduction of full pay on worker's compensation.

During the year two departmental safety courses were conducted with a total attendance of 21 supervisory staff.

MECHANICAL EQUIPMENT

Two hundred replacements and one additional vehicle were purchased during the year, as the commencement of a programme for replacement of light vehicles after two years' service. This is expected to reduce operating costs and improve reliability. A new development was the acquisition of twelve motor cycles in a move to reduce costs and increase efficiency. These provide cheap independent transport for men manning fire towers, and in some circumstances used in conjunction with utilities can substitute for four wheel drive vehicles.

A further ten rubber-tyred tractors were purchased, allowing a number of old machines equipped with blades and canopies to be allocated as "stand by" machines for fire emergencies. The new machines included four large four wheel drive units for ploughing and moulding for plantation establishment in coastal areas, and two smaller four wheel drive units for trial in the field.

Twelve crawler dozers were acquired to replace thirteen old machines. Included was a swamp dozer for trial in clearing for plantation establishment in wet areas, and six light units which can provide fast initial attack on forest fires.

The replacement of old type caravans was continued with the purchase of eleven two-berth self-contained caravans for use mainly by plant operators.

Delivery was taken during the year of two thirty-foot cruisers and one twenty-foot launch for National Parks work; one of the larger vessels is now fully operational and based at Cardwell in North Queensland.

Excessive delays in vehicle delivery and spare parts supply in some areas caused concern, as did staff problems caused by a shortage of tradesmen.

Purchase of Plant

Major items of Plant purchased during the year were:—

- 12 Crawler Tractors
- 10 Rubber Tyred Tractors
- 200 Replacement Motor Vehicles
- 1 Additional Motor Vehicle
- 12 Motor Cycles
- 11 Caravans

Census of Major Plant as at 30th June, 1973:—

- 473 Motor Vehicles/Trucks
- 61 Crawler Dozers
- 63 Rubber Tractors (including 6 Fordson Cranvel Tractors); and
- 32 Power Graders

Maintenance of Plant

Main items for the years 1971-72 and 1972-73 were:—

	1971-72	1972-73	Difference
	\$	\$	\$
Fuel	173,511	168,587	-4,924
Oils	18,567	16,227	-2,340
Tyres and Tubes ..	27,477	30,167	+2,690
Repairs	497,884	531,924	+34,040
Registration and Insurance ..	49,336	51,113	+1,777

ACQUISITION OF LAND

During 1972-73 an amount of \$218,238.01 was expended on the acquisition of land for Forestry purposes as follows:—

	\$
Purchase of Land	185,475.00
Survey Fees	31,844.80
Real Property and Lands Department Charges	893.26
Miscellaneous	24.95
	<u>\$218,238.01</u>

The expenditure of \$185,475 on land purchases includes the acquisition of an area of about 568 hectares, known as the Gambubal Tree Farm and situated west of the Great Dividing Range in the Warwick Forestry District.

This property which was formerly owned by Messrs. Hancock and Gore Limited carries 264 hectares of softwood plantations ranging in age from 11 to 17 years.

FOREST SURVEYS

Twenty-two survey parties operated during the year ended 30th June, 1973, engaged in the following types of Survey:—

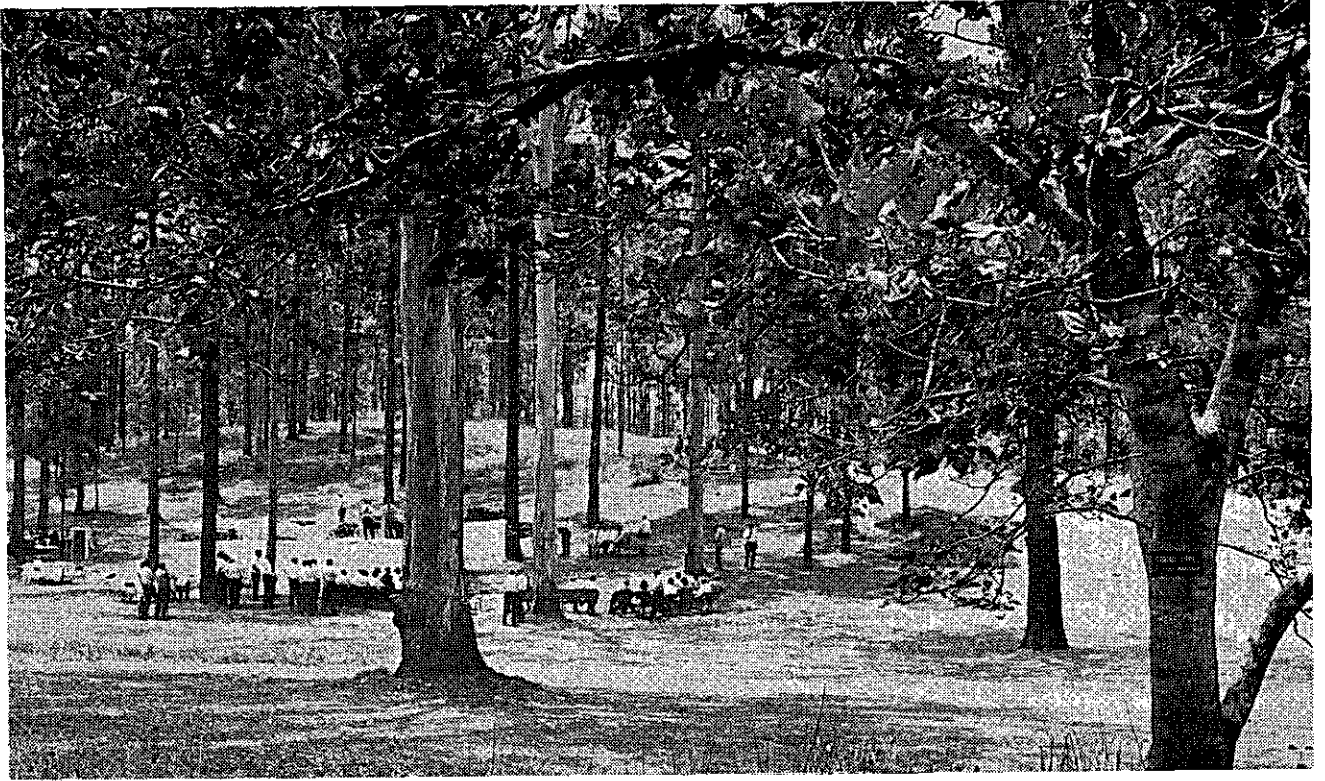
Parties	Type of Surveys
1	Boundary definition (surveyed by Authorised Surveyor)
2	Theodolite Control Surveys (to provide a framework for other type Forest Surveys)
11	General plantation management surveys associated with reforestation programme or general native forest management surveys
5	Forestry Inventory and Assessment Surveys to provide basic management data
3	Timber Assessment Surveys in connection with application for freeholding actions

Details of Surveys carried out by the parties are:—

	Miles
Boundary Definition Surveys	49
Theodolite Controls	47
Forestry Compass Traverses	879
Connections and Relocating Old Traverses	589
Level Surveys	55
Stripping and Assessment Surveys	3,959
Road Grade Surveys	48
Soil Surveys	41
Miscellaneous	261
Total	<u>5,928</u>

In addition to the above surveys, the following were also carried out:—

	Acres
Forest Inventory Survey Plots Remeasured ..	1,223
Forest Inventory Survey Plots Established ..	147
Predominant Height Determination	1,422
Plantation Site Index Assessment	3,137
Design and Field Location of Aerial Spraying Contracts	1,778



Official opening of Bunyaville State Forest Recreation Area, State Forest 69 Bunya, on 8th December, 1972, by the Honourable W. A. R. Rae, M.L.A., Minister for Lands and Forestry—Brisbane District.



Light intensity fire from aerial ignition—S. F. 832 Cordalba—Maryborough District.

Personnel

SURVEYS. At the end of the period, the total strength of Survey parties was 88, classified as follows:—

Forest Surveyor	Foresters	Survey Rangers	Survey Overseers	Estimators	Chainmen	Cooks	Labourers
1	6 (Includes one authorised surveyor)	12	19	3	20	7	20

MAPPING. The Drafting Branch comprises 42 Officers of whom four are engaged in mapping and drafting supervision. Twenty-four are engaged on cartographic compilations and preparing survey data, one in Survey training and Survey supervision and one on theodolite control surveys. One officer is engaged in operating a lettering and composing machine, two in duplication and photocopying. The remainder (nine) carry out administration mapping and drafting duties.

SURVEY TRAINING. Three Survey Training Courses, each of two weeks' duration were conducted at Beerburum by the Forest Surveyor. These courses catered for three Foresters, five adult Forest Trainees and 23 Forest Trainees. The Forest Trainees were also afforded three months' practical experience in Survey camps.

GENERAL. Wet weather seriously interfered with survey work during the year.

An electric composing and lettering machine was purchased for the production of brochures, Departmental forms, and mapping requirements.

Conversion of mapping and surveys to the metric system was continued during the period.

AUTOMATIC DATA PROCESSING

Stumpage Accounts for Natural-Grown Mill Logs measured under sales on Head Office Ledgers are now being processed by computer.

From log measurement data recorded on source documents prepared in the field, the computer assesses volume, classification and price of each individual log for Stumpage Account production and prints subsidiary reports to enable monetary, sale quantity and entitlement controls to be maintained each cycle.

A proposed system to process Stumpage Account for Plantation Timbers is at present being designed.

REFORESTATION

General

The 1972-73 financial year was a most successful year. Extra funds were available for all operations due to provision of funds by the Commonwealth to relieve rural unemployment. These permitted increases in treatment of native forests, in tending and pruning of plantations and the establishment of a record 16,878 acres to bring the total area of conifer plantations to 205,556 acres.

Availability of labour was satisfactory, except for a few isolated centres but there were indications towards the end of the financial year that it would be difficult to obtain adequate staff to maintain programmes particularly in isolated localities like Bulburin, Brooweena and Jimna by reason of increased demand for labour. The increases in wages and incremental pay based on service and improved long service and holiday leave should retain staff at major centres based on towns or close to towns of reasonable size with amenities.

No new operations were commenced during the year except on an area of established plantations in the Warwick District purchased during 1972-73 and efforts were concentrated on expanding existing plantations and on treated native forests. An area of 1,404 acres containing 630 acres of *Pinus* plantations, principally *Radiata Pine* aged from 11 to 17 years was purchased in the Warwick District. This is favourably located to serve as headquarters for neighbouring State Forests with substantial areas of very high growth potential. A small planting programme will be maintained on the purchased area where plots in *Radiata Pine* have shown growth comparable with very high Site Qualities in Southern Australia.

Weather conditions during the year were generally good. No wind damage of any significance was reported. Three cyclones were reported but only one which brought heavy rains to the Atherton Tableland affected forest areas. Though rainfall was in general below average it was well distributed throughout the year making 1972-73 a very good year for forest growth.

RAINFALL IN POINTS

Year	Hoop Pine Centres			Exotic Pine Centres		
	Yarraman	Imbil	Kalpowar	Beerwah	Bowenia	Kennedy
1972-73	3,188	5,001	3,005	5,933	5,689	6,653
Average	3,198	4,704	3,577	6,254	6,519	6,801

Monthly rainfall figures for representative plantation centres are as follows:—

Month	Yarraman		Tuan		Kennedy	
	Hoop Pine Centre Summer planting		Slash Pine Centre Winter planting		Caribbean Pine Centre Summer planting	
	Points	Average	Points	Average	Points	Average
July 1972 ..	3	155	16	232	8	97
August 1972 ..	56	125	65	190	5	131
September 1972 ..	1	129	55	172	125	50
October 1972 ..	574	293	513	346		245
November 1972 ..	454	316	998	388	207	216
December 1972 ..	376	424	207	598	332	657
January 1973 ..	735	421	1,009	795	811	1,039
February 1973 ..	601	456	885	872	1,274	1,557
March 1973 ..	126	349	553	747	2,147	1,570
April, 1973 ..	35	213	294	325	1,038	463
May 1973 ..	117	174	127	298	576	264
June 1973 ..	110	155	359	301	130	265

In the Hoop Pine centres, good early rains in October and follow up rains in the later months provided excellent summer planting conditions. Survivals were very good but some refilling was needed at Imbil where losses followed dry, heat wave conditions in March, 1973, when on successive days temperatures of 36°C and 35°C were recorded.

Rainfall distribution at Tuan was not as good as at Toolara and Beerwah the other important centres where Slash Pine is planted open-root in the winter. Good Autumn and early winter rains in 1972 were followed by a dry July-August-September but for the remainder of the year conditions were good and resulted in satisfactory survivals.

The good summer rains in early 1973 coincided with the normal planting season with Caribbean pines within the tropics and excellent survivals resulted.

REFORESTATION EXPENDITURE

Year	Loan Funds	Commonwealth Unemployment Relief	Total
1971-72 ..	\$ 6,138,787	\$ 234,314	\$ 6,373,101
1972-73 ..	6,968,811	786,165	7,754,976

These figures are exclusive of Salary payments to permanent officers. Loan funds included an amount of \$1,200,000 provided by the Commonwealth under the *Softwood Agreement's Act*.

Average annual employment of wages staff with these funds in 1972-73 was 1,469 as against 1,342 in the previous year. Cost per man-year increased 11% from \$4,750 in 1971-72 to \$5,250.

The main silvicultural operations carried out in the past two years were:—

Operations	1971-72	1972-73
	Acres	Acres
Area of new plantations established ..	15,650	16,878
Area of plantations tended ..	94,825	102,974
Area of plantations fertilised ..	14,168	15,273
Area of plantations pruned ..	10,610	15,418
Area of plantations thinned unmerchantably ..	1,583	1,082
Area of plantations thinned merchantably ..	9,524	12,151
Area of natural forest treated ..	28,709	32,743

Planting

The areas of plantations established between 1st April, 1972, and 31st March, 1973, are shown by districts and species in Appendix F and the net areas of effective plantation as at the 31st March, 1973, are shown by districts and species in Appendix G. The total area planted, 210,713 acres, includes 205,556 acres of conifers and 5,157 acres of broadleaf species.

By species new plantings were:—

Species	1971-72	1972-73
	Acres	Acres
Native conifers (mainly Hoop Pine)	3,478.8	3,313.7
Slash Pine	10,178.0	11,098.6
Loblolly Pine	133.8	215.4
Caribbean Pine	1,474.1	1,871.8
Radiata Pine	247.1	246.3
Patula Pine	62.6	39.4
Others	76.1	93.0
Totals	15,650.5	16,878.2

The total plantings in 1972-73 comprised:—

	Acres
New plantations	16,878
Replanting failed areas	124
Underplanting	158
	<hr/>
	17,160

Funds provided by the Commonwealth for unemployment relief enabled the planting of a record area of coniferous plantations. About 70 per cent. of this area was planted open-root with Slash Pine in three major centres in the South East of the State.

Practically the whole of the clearing for plantations is now done mechanically, with only steep sections of Hoop Pine areas being hand felled. Clearing of Hoop Pine areas on a push and heap basis is being more widely adopted. This has advantages in ease of burning off and of tending

and planting. Exotic pine areas are all cleared on a push, heap, burn, reheap and reburn basis to enable ripping where necessary, overall ploughing and mounding. Machine planting has been necessary at Tuan and Toolara where it is not possible to engage seasonal workers in numbers adequate to carry out the planting programme in the relatively short planting season. This has resulted in reduced costs of planting and in survivals superior to hand planting.

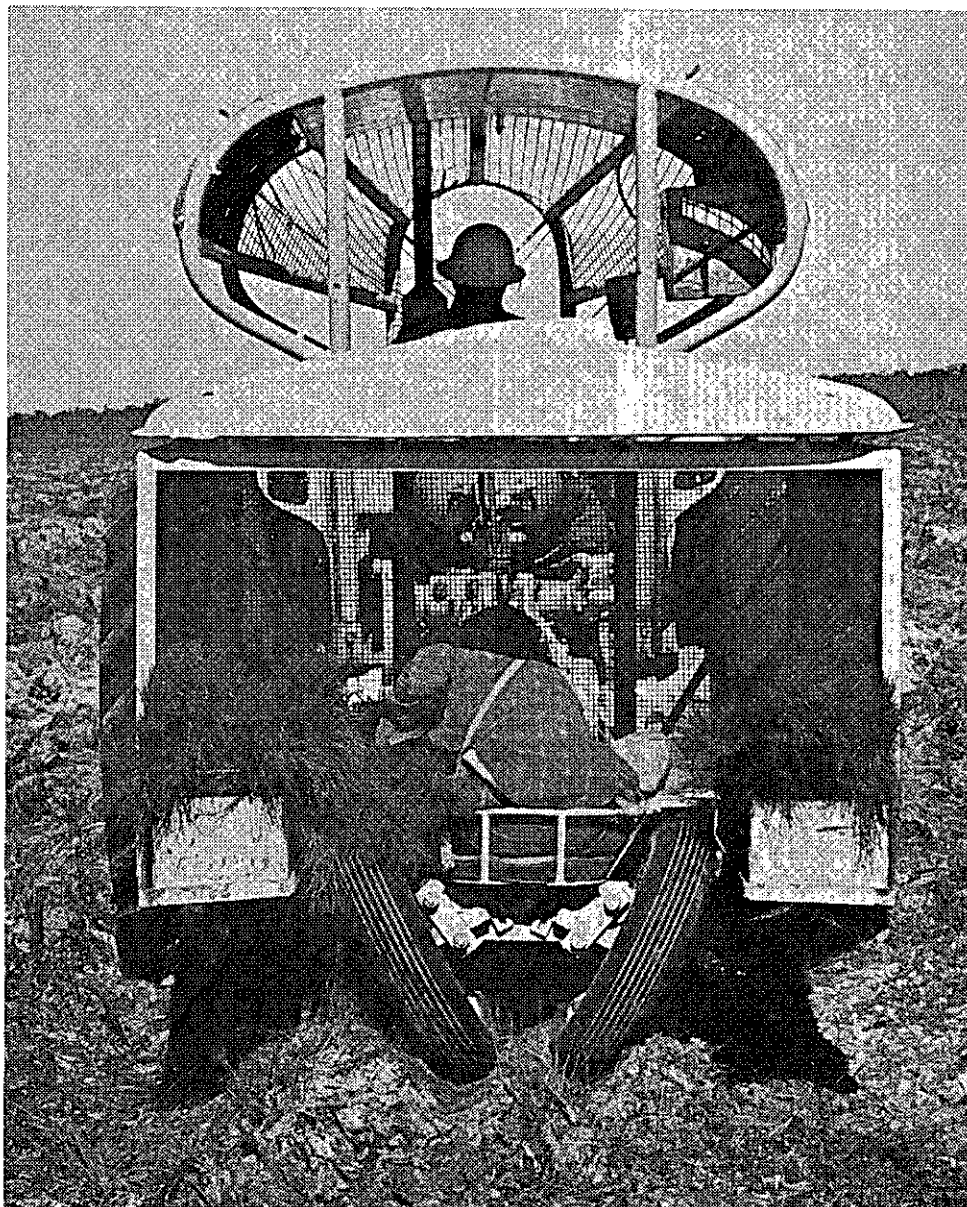
Acres planted at Tuan, Toolara and Beerburum were:—

Centre	Area Planted in 1972-73	Area Planted to 31-3-73
	Acres	Acres
Tuan	4,640	31,617
Toolara	4,841	31,549
Beerburum	2,097	28,533
Total	11,578	91,669

About half of the clearing for plantations was done by Departmental plant as insufficient contractors tendered for the work. This necessitates the keeping of a large Departmental dozer fleet which is also used on firebreak and road-construction.

Areas cleared by contract were:—

Species	Hoop Pine	Exotic Pines
	Acres	Acres
Total Contract area let in 1972-73	1,673	6,212



Machine planting of Slash Pine at S. F. 1004 Toolara-Gympie District.

The drop in interest of contractors is partly explained by an upsurge in land clearing by private landholders.

Site preparation carried out during the year involved:—

	Acres
Overall ploughing	6,214
Line mould ploughing	10,667
Deep rip	1,988

Tending

The total areas of plantations tended during the year was a record. This is associated with the increased area of young plantations and the availability of unemployment relief funds which enabled tending to be brought up to date in most centres.

Year	1970-71	1971-72	1972-73
	Acres	Acres	Acres
Area covered in tending ..	83,725	94,825	102,974

By far the greater part of the total area tended is in Hoop Pine plantations due to need to control the vigorous weed crop competing with young Hoop Pine on fertile scrub soils and continued lantana infestation in older areas.

Species	Total area plantations to 31-3-72	Area tended in 1971-72	Total area plantations to 31-3-73	Area tended in 1972-73
	Acres	Acres	Acres	Acres
Hoop Pine and other native conifers	80,512	56,011	84,035	66,667
Exotic conifers	108,754	38,814	121,472	36,307

Lantana is the most serious weed in Hoop Pine plantations and requires regular tendings in plantations of all ages. It thrives on the rich scrub soils with protection from fire and regenerates freely when stands are opened by commercial thinning. Misting with 2,4-D Amine at an early stage gives effective control. Silvicultural means of reducing the development of lantana includes (i) the encouragement of a vigorous understorey of rain forest species; (ii) the maintenance of a good canopy cover of Hoop Pine; (iii) adoption of more frequent and lighter thinnings to assist in maintenance and rapid closure of canopy.

There is a great need for biological control of this pest.

Exotic pine areas on the other hand have minor tending problems. With protection from fire these areas also can become infested with lantana but colonisation takes much longer and provided surveillance of areas is exercised it is not a problem. Moreover it is possible to prescribe-burn Slash, Loblolly and Caribbean Pine plantations and so control lantana regeneration.

In general tending in most exotic pine plantations can be completed by the end of the 3rd year. Following clearing, site preparation involves overall ploughing followed by line mounding. Areas with bad crops of weeds are given two overall ploughings. The coppice which develops on large stumps and big root stocks is spot treated with knapsack misters or sprays. Caribbean Pine is sensitive to medium concentrations of 2,4,5-T butyl ester and misting can result in severe malformation. Subsequent weed crops consist of some coppice but principally seedling development of Acacia, Persoonia, Grevillea, Banksia, Alphitonia, Baccharis, Leptospermum and Dillwynia species. Most of these are susceptible to 2,4,5-T ester applied in Slash and Loblolly plantations by knapsack misters, PTO misters or from aeroplanes. Aerial application is well suited to dirty areas but spraying with hormones by any method is being restricted due to effect on agricultural crops. This will mean that spraying will be limited to large scale plantation areas distant from agricultural cropping. Hence there would be few areas suitable. One such is the Department's main plantation area at Tuan and Toolara where over 60,000 acres of Slash Pine have been established and where it is planned to establish over 200,000 acres of plantations.

The Department of Primary Industries through the Agricultural Chemicals Distribution Act Board has declared hazardous an area in South East Queensland which includes the plantations at Beerwah and Beerburum. Within this area, permits must be obtained for the aerial or ground use of hormones. Where there are risks to crops, permits are not granted. With these restrictions, and increasing agricultural development along boundaries, the most economic tending practice will be by site preparation involving overall ploughing, and as far as sites permit, the use of mechanical equipment for tending to control regrowth. Inter-row

cultivation with bog and bush ploughs has given very favourable results. Row width is widened to 10 feet to permit long term use of machines between rows and row directions have to be planned together with access tracks to ensure maximum coverage by machines without creating erosion problems.

Generally speaking, increases in cost of labour and associated overheads make it necessary that plantations be designed to permit the maximum use of mechanical equipment, not only to enable the work to be done economically but also because of the reduced work force to enable planned work programmes to be carried out.

Fertilizing

The area of Pinus plantations fertilised during 1972-73 was 15,273 acres compared with 14,168 acres in 1971-72.

The 1972-73 fertilizing programme comprised:—

	Acres
Initial fertilizing new Pinus plantations ..	13,767
Refertilizing old areas Pinus plantations ..	1,506
	15,273

A general initial application of 2.32 cwt. per acre superphosphate containing 20.7 per cent. phosphorus is applied to all Slash, Loblolly and Caribbean Pine plantations on the coastal plain in south-east Queensland. In north and central Queensland the same application is applied to Caribbean Pine areas below site index 100 and initially to poorly drained areas which are given site preparation.

A general application of about 32 lb. of phosphorus per acre is also applied to areas being planted with Patula Pine and Radiata Pine at Pechey near Toowoomba.

Experiments have demonstrated an economic response to refertilizing certain areas of Slash Pine of site index less than 70. This need has been related to the foliar phosphorus level and applications of fertilizer are designed to raise that level to .070 per cent. for Slash and .075 per cent. for Loblolly pine. To date Site Index has been adopted as the criterion for refertilizing with Slash Pine in the Beerburum area where only relatively small sections of plantation were involved. At Tuan however, large areas in the earlier plantings appear to need retreatment and foliar analysis indicate that Site Index may not be a reliable guide to foliar phosphorus and to growth response following application of superphosphate. Work is being undertaken to permit the commencement of a programme of refertilizing in 1974.

Pruning

Acres of plantation pruned in 1972-73 were as follows:—

Year	Stage of Pruning				Total
	1st	2nd	3rd	4th	
	Acres	Acres	Acres	Acres	Acres
1971-72 ..	4,057	2,509	2,316	1,728	10,610
1972-73 ..	6,322	4,611	3,662	823	15,418

The pruning prescription was altered in 1971-72 to reduce pruning of all species to three stages, i.e., one ground pruning and two further lifts. Thus the figures above for the various stages would not be comparable. The objectives are to high prune 120 stems per acre to a minimum height of 21 feet and with a central knotty core of about 6 inches diameter. Pruning is restricted to areas Site Index 70 or better.

Thinning of Plantations

The area of plantations thinned merchantably in 1972-73 was 12,151 acres compared with 9,524 acres in 1971-72. The increase is associated with the current demand for timber, the increasing availability of plantation timbers and the increased demand for pulp wood chiefly for particle board manufacture.

Thinnings are being used for sawmilling and the manufacture of pulp (one factory), particle board (two factories) and hardboard (one factory). The total cut of 56.0 million super feet hoppus was used as follows:—

Use	Millions S.ft. hoppus
Sawmilling	27.7 Hoop Pine 12.6 Exotic conifers
Other uses—pulp, particle board and hardwood	15.7 all species

The acreage of plantations unmerchantably thinned at centres where there is no likelihood of a pulp market was 1,082 acres compared with 1,583 acres in 1971-72. The need for unmerchantable thinning is being reduced by planting at a wider espacement. For example Hoop Pine is planted at 10 feet x 9 feet instead of 9 feet x 8 feet at several isolated centres. The use of orchard and improved seed will also permit expansion of this practice to other centres where Caribbean Pine is planted.

Treatment of Natural Forest

The total acreage of natural forest treated in 1972-73 was 32,743 acres compared with 28,709 acres in 1971-72. Particulars of acreages treated for the various forest types are:—

Forest Type	1971-72	1972-73
	Acres	Acres
Eucalypt Forest	9,542	10,562
Cypress Pine Forest	19,003	21,982
Tropical Rain-Forest	164	199
Totals	28,709	32,743

The figures given include areas afforded the normal timber stand improvement treatment and areas of enrichment planting.

Normally Cypress Pine, Eucalypt and rain forests are silviculturally treated following logging. Treemarking for logging is carried out on all State Forests to ensure effective utilisation and retain the best growing stock. Treemarking rules have been drawn up for the particular forest types and are varied as necessary to suit the condition of the forests. The rules are revised periodically to ensure the most effective application by the markers and to meet the changing demands of the market. In the case of eucalypt forests, which often carry very defective trees, the cutter is paid a "dud" rate based on girth breast high to compensate for falling marked trees which do not yield millable logs.

There are considerable areas of wet sclerophyll eucalypt forest with inadequate regeneration or advanced growth of desirable species, but which are potentially very highly productive. These forests carry a heavy understorey of scrub and weed species which prevent regeneration of the area. Seed trees are quite often inadequate. Treatment of these areas involves brushing or dozing down the understorey, burning and planting or refilling with Blackbutt depending on the amount of regeneration achieved from available seed trees. In other areas, dozers are used to partially clear undergrowth making openings throughout the stand remaining after logging to enable Blackbutt to be planted in the openings on a spacing of about 12 feet x 12 feet. This work can be done most effectively and economically if it follows immediately after logging.

In good rain forest types in North Queensland which are deficient in primary species such as Maple, Northern Silky Oak, etc., lines are brushed 11 feet wide at 33 feet intervals through the forest and Maple and Kauri Pine are planted at 10 feet centres along the brushed lines.

In addition to areas treated by the Department, graziers holding special leases over the areas of State Forest are encouraged to treat the forest in return for improvement in grazing. Some progress has been made in both the Monto and Maryborough Districts in the treatment of Spotted Gum forests on several State Forests where about seven lessees are treating their useful forest types following marking by a Forest Officer of the trees to be retained. The spacing of crop stems is at a slightly wider spacing than normal forestry practice. The lessee may ringbark or treat the useless forest types except for trees which must be retained on a per acre basis for shade and along watercourses.

Nurseries

The number of nurseries operated during 1972-73 comprised:

Species	Numbers
Hoop Pine	12
Caribbean Pine	3
Slash Pine	3
Radiata and other exotic pines	2
Amenity	3

The Hoop Pine nurseries at Jimna and Palen Creek ceased operations during 1972-73 and stock for the areas they served will be produced more economically at other existing Hoop Pine nurseries. The Slash Pine nursery at

Tuan will cease production during 1973 and its production taken over by the new nursery at Toolara. Several small, isolated nurseries at Passchendaele, Pechey and Cathu are worked on a part-time basis.

The total number of plants transferred to the Department's plantations during 1972-73 was about 9.5 million which included some 380,000 refills.

The numbers of refills used by species were:—

Species	Number
Slash Pine	252,000
Hoop Pine	71,700
Caribbean Pine	28,500
Others	27,800
	<u>380,000</u>

Further good progress was made in control of weeding costs in the exotic pine nurseries with the use of Dacthal with Propazine and Diphenamid. Weeding costs in the Hoop Pine nurseries have averaged around \$8 per acre plantation established, not including overheads and it is expected that the routine use of herbicides will considerably reduce this.

Amenity Nurseries

Sales of plants for windbreak, shade and ornamental purposes at the amenity nurseries at Dalby, Salisbury and Bunyaville were:—

Nursery	Plants Sold	Value
		\$
Salisbury	101,523	23,641.60
Bunyaville	7,858	2,150.56
Dalby	16,671	4,502.14
Total	126,052	30,294.30

Sales commenced from the Bunyaville nursery in the latter part of the year.

Total plant sales increased slightly over 1971-72 when 120,744 were sold.

Sale of Trees

The number of plants sold from all nurseries to the public, Government Departments and other instrumentalities was as follows:—

Forest Plots	114,210
Schools and Government Departments	7,090
Other Sales	136,941
	<u>258,241</u>

Forest Plot Sales at concessional rates comprised the following species:—

Slash Pine	59,150
Caribbean Pine	28,515
Hoop Pine	13,130
Other Species	13,415
	<u>114,210</u>

Where forest plot rates are approved open root stock are made available at \$2.50 per 100 and tubed stock of approved species at \$7.50 per 100 less \$2.50 refund on tubes.

Christmas Trees

5,961 Christmas Trees were sold in 1972-73 for a total of \$3,473.10, compared with 6,223 sold in 1971-72.

Seed Collection

As well as providing for its own needs the Department has always endeavoured to meet outside demands for seed of tree species. In the past, large amounts of Slash Pine have been sold to overseas countries but more recently greatest demand has been for seed of Caribbean Pine, Eucalypts and Hoop Pine and seed collection has increased to meet demands in these species. Brazilian companies are very keen to obtain seed of Rose Gum and Sydney Blue Gum from tropical and subtropical provenances. Caribbean Pine seed is widely sought by tropical countries and a record collection of 287 lb. was made this year. There have been considerable enquiries also for Red Cedar seed.

The quantities of seed collected in 1971-72 and 1972-73 were as follows:—

Species	1971-72	1972-73
	Pounds	Pounds
Hoop Pine	188	107,674
Bunya Pine	6,110	4,907
Slash Pine	3,529	3,703
Caribbean Pine	75	287
Radiata Pine	Nil	72
Patula Pine	Nil	Nil
Loblolly Pine	345	127
Eucalypts	Nil	326
Totals	10,247	117,096

The record collection of Hoop Pine seed ensured that the planting programme with this species can be sustained until the next general seeding which could be in 4 or 5 years time. Seed quality was very good and it included a large collection from Jimna and Mount Mee which are two desirable provenances. Jimna provenance has been outstanding in trials with stock from other localities and Mount Mee strain has exhibited some resistance to Yarramania malformation and will be largely devoted to sowings at Yarraman.

All Slash Pine seed collected in 1973 was from seed orchards. Production from the main orchard yielded 151.5 lb. per acre which is the highest yield to date.

The Honduras Caribbean Pine seed crop in 1973 was only fair to poor. It is extremely erratic in seed production compared with Slash Pine which has consistently good seed yields each year. To meet requests for seed of the species every effort was made to collect as much seed as practicable. As a result, costs of collection were high. A good crop is anticipated from Bowenia in 1974 and a further effort will be made to meet outstanding requests of which it was possible to fill only about 25 per cent. this year.

The total value of seed sold in 1972-73 was \$13,043 compared with \$19,876 in 1971-72, but the 1972-73 figure does not include the value of sales of Honduras Caribbean Pine seed collected in 1973 which will be of the order of \$10,000.

Diseases and Pests

PATHOLOGY

Though considerable investigations were carried out into possible *Phytophthora cinnamomi* damage, the only positive identification of *Phytophthora cinnamomi* was found in the occurrence of dead, chlorotic, and stunted 6-year-old Radiata Pine in a trial plot established in Cypress Pine country at Dunmore (120 miles west of Brisbane). The results of a survey undertaken within the plot and in adjacent native vegetation suggests that the organism was introduced into the plot via infected seedlings and was not derived from local sources. An outbreak of *Phytophthora* root rot was recorded in the nursery bed in which some of the seedlings planted in the plot had been raised.

The lack of positive identification of *Phytophthora* in young plantations could be associated with quarantine measures taken at the new Slash Pine nurseries and rotational cropping in the nurseries. The new nurseries were so located on broad spurs that no surface water entered the nurseries and run off was easily dispersed to outside the nursery. Strict quarantine control is exercised over the use of machinery by use of washdown pads and a formalin dip.

The presence of dieback and deaths in the older natural forests, particularly of Grey Ironbark, in south-east Queensland is causing concern. No causal agent has been isolated.

The Department has supported the investigations being carried out at the Australian National University into *Phytophthora cinnamomi* and is grateful for the assistance provided for the Department's pathological investigations.

Fomes annosus was not recovered from root tissue of inoculum dowels in any of the total of three harvests of inoculated roots in an experiment initiated in 1970-71 to test the pathogenicity of an Imbil isolate of this organism on Slash Pine. The isolate used had caused total mortality of Slash Pine seedlings in earlier laboratory trials.

Reference was made in the 1971-72 Report to the occurrence of dieback in young Hoop Pine plantations in three Forestry Districts. A general recovery of affected trees was recorded in most areas during 1972-73. Strong circumstantial evidence exists which suggests that *Chaetoporus radulus* is pathogenic on Hoop Pine causing a root and butt rot. The organism has been found associated with living and dead, standing and windthrown stems in three Forestry Districts, and has been isolated from the roots and butts of living trees. Trees 6 to 26 years old have been affected.

Fomes noxius which is believed to cause root and butt rot of Hoop Pine in Queensland was found associated with dead and dying Hoop Pine trees in a further 9 compartments of plantations in the Gympie and Brisbane Districts.

So that survey work to assess the damage caused by *Fomes noxius* and *Chaetoporus radulus* in Hoop Pine plantations can proceed, work has been undertaken to determine a reliable technique for the rapid identification of these two organisms in culture. *Chaetoporus radulus* has proved to be amendable to the hyphal fusion technique sometimes used in the identification of unknown mycorrhizal fungi. However, only rare fusion between different isolates of *F. noxius* has been observed but further work endeavouring to make this technique reliable for the identification of this organism is planned.

The Poplar rust fungus *Melampsora medusae*, which was first detected in Australia near Sydney in January, 1972, was located on *Populus deltoides angulata* x *P. nigra italica persistante* in a trial plot near Beerwah in December, 1972. At the end of June, 1973, fresh uredia were still being produced on this evergreen hybrid. Two hyperparasites *Eudaruca caricis* and *Cladosporium* sp. have been observed to be infecting uredia of this rust fungus.

Considerable areas of Cypress Pine death were recorded on two reserves in the Dalby District. In a detailed survey undertaken in one area, it was found that dead trees were associated with the presence of water above an impermeable horizon located at depths to 66 inches. No likely pathogenic organisms were isolated from root and soil samples collected. Rainfall data on these reserves supported the hypothesis that excess soil moisture was responsible for these deaths as abnormally heavy rain fell just prior to two periods in which stress was observed in trees in the region.

All the pathology work carried out in 1972-73 has been handled by one pathologist as the second pathologist is still absent in New Zealand on studies of *Phytophthora cinnamomi*. With his return in 1973 it is expected to expand research into causes of death and dieback in both Hoop Pine and exotic pine plantations and dieback in the Eucalypt forest.

During the year, a survey was undertaken for nematodes occurring in many Departmental exotic and Hoop Pine nurseries. This work was carried out with guidance and assistance from the Nematologist with the Queensland Department of Primary Industries. A number of nematodes were found to be occurring at population levels which might be affecting the growth and development of their respective hosts. These included *Trichodorus minor* on Slash Pine and Caribbean Pine, *Pratylenchus n. sp.* on Caribbean Pine and *Tylenchus emarginatus* on Hoop Pine.

Entomology

Insect activity during 1972-73 was mainly confined to natural and plantation hardwood stands and the Hoop Pine plantations of south-east Queensland. Exotic plantations remain free from damaging insect activity and nursery pest activity was extremely low.

Hoop Pine Plantations

(i) *Hyleops glabratus* (COLEOPTERA: Scolytidae)—This insect was first reported attacking standing trees in 1971. That infestation ceased in the plantations during August-September, 1972, however, no obvious cause for the complete cessation of activity could be found. The bark beetle reappeared early in 1973 and has confined its activity to logging and pruning debris in all but two plantation areas. At State Forest Reserve 612 Avoca (Murgon District) approximately 100 trees have been attacked and killed and at State Forest Reserve 154 Elginvale (Murgon District) six tree deaths have been reported. An investigational programme on the insect is continuing.

(ii) *Coptopterus decoratus* (COLEOPTERA: Cerambycidae)—The branch pruning longicorn is known to occur in most Hoop Pine plantations and previous studies have indicated that its activity is more severe in low site quality areas. During the past year there was a low level of activity. Further studies, particularly on the insect's effect on tree growth, are planned.

(iii) *Eurhamphus fasciculatus* (COLEOPTERA: Curculionidae)—The giant pine weevil has previously been reported from log material only. During the past year these insects were observed attacking three natural grown Hoop Pine trees at Mt. Glorious (near Brisbane). The attack did not cause tree death but resulted in massive resinosis from punctures presumably associated with oviposition.

(iv) Seed and Itch Mites—Further investigations of a control for mites, which are a problem when handling seed, were undertaken. It was found that a 2 per cent. malathion spray treatment would control mite infestations and not adversely affect seed viability.

Hardwood Stands

During 1973 a severe infestation of the psyllid *Cardiaspina manifformis* was observed on Rose Gum in the Pomona-Cooroy area. Both natural and plantation trees were affected. Rose Gum in the same area was also being infested by the bull's eye borer (*Tryphocaria* sp. COLEOPTERA: Cerambycidae) and a giant wood moth species (LEPIDOPTERAS: Cossidae).

Nurseries

As mentioned above, no serious pest infestation was reported during the year. A laboratory study to investigate the efficacy of benzene hexachloride as a white grub (COLEOPTERA: Scarabaeidae) control in nurseries was concluded. The results of this study have not been fully collated and assessed. It was shown that the current application rate of benzene hexachloride (4 p.p.m.) will not control white grubs. At higher rates of application (16-20 p.p.m.) grub deaths appeared to be due primarily to a repellent effect which caused death by starvation rather than by toxic action of the chemical. Nursery trials to test the phytotoxicity of a range of candidate toxicants are in progress.

Ornamental Enquiries

Public enquiries on ornamental pest control continued at the rate of three to five per week and this year the number of enquiries concerning tree borers exceeded those concerning defoliators. Wood moths (Cossidae and Xylorictidae), auger beetles (Bostrychidae) and termites were among the most common insect pests reported.

Lantana Control

The Department has a particular interest in the biological control of lantana as the cost of controlling lantana in plantations and along roadside together with the loss of revenue due to increase in harvesting costs and lower productivity in native forests would be about \$1,000,000 a year.

The two hispids *Octotoma scabripennis* and *Uroplata girardi* which are being produced in quantity at the Department of Lands Research Station have been dispersed through the Departments State Forests and observations indicate that the insects are surviving and spreading. It seems that effective control of lantana can be achieved only by a complex of insect species and that those already introduced are not sufficiently effective to give acceptable results. With a view to improving biological control and as a follow up of earlier biological control work the Department is supporting a joint programme with New South Wales for a further overseas study in Central and South America into the biological control of lantana involving a total cost of \$50,000.

Zoology

Damage by native rats to Hoop Pine plantations continued at a similar level to other years in Murgon and Yarraman Districts. Some damage was also reported from Brisbane, Gympie, and Maryborough Districts. Investigations into the biology of the species causing most of the damage *Rattus tunneyi*, have continued, with the results being employed to develop a short term control program. Following the poor performance of wheat as a bait base extensive laboratory trials were conducted to find an alternative. In trials comparing the palatability of an assortment of foods, including grains, seeds, pelleted foods, and a variety of flavourings, sweet potato was found to be the most satisfactory. Further potential poison carriers will be tested.

Limited field trials conducted in both summer and winter in the Yarraman District suggest that 1080 on sweet potato can kill a significant proportion of a rat population. More extensive trials are planned for the 1973-74 period.

Two other possible control measures were investigated. The first, a male chemosterilant proved unsatisfactory in laboratory testing. The second, habitat modification, by ploughing in this case, warrants further experimentation.

SILVICULTURAL RESEARCH

The Officer-in-Charge of the Tree Breeding Section and Forest Soils and Nutrition Section supervise State wide programmes and were transferred from Beerwah to Head Office during the year. Because of this changed organisation reports of these sections are now presented separately and not in the station reports.

From April 1973, measurements of all experiments have been metric. Conversion of past measurements from Imperial Units to metric has been time consuming and is still continuing. However, it is complete for all experiments to be measured during 1973.

Some of the more important work of the Departmental Regional Research Stations, the Biometrics and Mensuration Section, the Soils and Nutrition Section and the Tree Breeding Section is reported.

Atherton Regional Research Station

The main work of this station is research in North Queensland rain-forest to determine silvicultural treatments, suitable for application to these forests. In addition this station conducts plantation research mainly with Caribbean Pine on poor soils in the coastal lowlands of the tropics, and with Hoop Pine on the Atherton Tablelands.

(i) **Rain Forests**—Research plots indicate great ages for some rain forest species when observed increments are related to tree size. As a check, samples were sent to the Radiocarbon Dating Laboratory of the Australian National University, Canberra, for dating. Some preliminary results are:—

Location	Species	Girth Breast High	Age
State Forest 251 Ismailia	Macintyre's Boxwood	Feet 6	Years 650 ± 100
State Forest 310 Gadgarra	North Queensland Kauri	22	1,085 ± 65

Apart from general interest the method may be used to establish the age of Queensland Maple trees in the grafting programme, thus giving an estimate of mean annual increment, an important additional character on which to base selection of phenotypes.

Significant differences in rate of growth were recorded in a series of plots established in poor quality rain forest as part of the work on enrichment planting of types in which there is poor representation of high value species. Four treatments were applied prior to enrichment planting with Queensland Maple. These were:—

- Bush undergrowth and ringbark all except selected species. The basal area (B.A.) retained in these species was about 18 sq. feet per acre.
- No brushing. Ringbark all except species belonging to Group A value class. The B.A. retained in stems of this group was about 7 sq. feet
- As for (b) with the addition of hormone poisoning of ringbarked stems.
- No brushing. Ringbark useless trees and species 20 ins. girth breast high (g.b.h.) or larger. This retained a B.A. of 77 sq. feet per acre in useful trees.

Mean heights of Maple 21 months from planting in January 1971, increments for 16 months and survival percentage are shown in the following table:—

Treatment	Mean Height	Mean Height Inc.	Per cent. Survival
(a)	Feet 4.7	Feet 3.4	95
(b)	2.7	1.7	84
(c)	3.7	2.6	86
(d)	2.1	1.0	82

In respect to height growth, analysis shows significant differences—

- at one per cent. level:—(a) over (b) and (d), (c) over (d);
at five per cent. level:—(a) over (c); (c) over (b).

The differences between (b) and (d) just fail to reach significance but are probably real.

Growth figures show the response to removal of the undergrowth and to the rapid canopy kill associated with use of poison. If this response is maintained a considerable reduction in cost of treatment could be achieved by eliminating brushing and use of poison. At present brushing constitutes more than half the total cost of treatment, whilst application of poison is relatively cheap.

A further seven Queensland Maple were grafted; six were large trees felled in normal logging operations, and the seventh was a particularly vigorous young tree in an underplant experiment. Clones from four were planted in the Maple clonal orchard and the other three clones will be planted later. Seedlings from the 1971 seed collection from the clonal orchard were segregated by parents and underplanted in treated rain forest on Reserve 1073 Smithfield.

(ii) **Tablelands Plantations**—Pre-emergent herbicides were tested in the Danbulla Hoop Pine nursery. Treatments were applied to beds immediately after sowing with application rate of 100 gallons of aqueous solution per acre. Main weed

species were: chickweed, billygoat weed, chicory, lesser swine-cress, crowfoot, caustic weed and shamrock. Results are shown in the following table:—

Treatment		Per cent. Weed Control			
Chemical	Rate	Days after Application			
		22	36	50	80
Chlorthal plus propazine	10.0 1.0	93.6	98.1	98.9	98.2
Diphenamid	9.6	36.8	76.9	74.4	76.5
Diuron	1.0	100.0	99.1	99.0	98.9
Fluometuron	4.0	100.0	100.0	100.0	99.5
Fluometuron	2.0	100.0	98.7	99.4	98.9
Ametryne	2.0	96.3	96.5	96.8	96.8

Chlorthal plus propazine, diuron, fluometuron and ametryne have given outstanding results. Diphenamid was not as effective as the other chemicals in suppressing broad-leaved weeds.

(iii) **Coastal Plantations**—Preliminary results on the seasonal effects of foliar applications of 2,4,5-T butyl ester, at a concentration of 0.5 per cent. a.i. in water, on woody regrowth in newly established plantations of Honduras Caribbean Pine were reported in last year's Annual Report. Assessments made twelve months after the initial treatment are shown in the table.

PERCENTAGE OF MEAN CROWN REDUCTION VISUALLY ESTIMATED TWELVE MONTHS AFTER TREATMENT

Species	Date Treated				
	28-4-71	30-6-71	1-9-71	2-11-71	4-2-72
Wattle	67.4	75.9	74.7	89.3	74.5
White Mahogany	35.6	58.3	38.8	36.6	35.9
Red Bloodwood ..	42.4	75.7	62.8	36.0	31.4
Cocky Apple	60.8	59.0	11.7	43.8	43.1
Swamp Mahogany	30.9	37.3	18.3	37.9	5.3
Turpentine	46.6	33.3	..	8.3	..
Grevillea	76.6	81.6	25.5	48.3	36.3

More tops were killed with each species for April and June sprays, except with wattle. The effect of the 2,4,5-T on wattle was different in that there was a fairly consistent kill irrespective of season. At Kennedy the most favourable period to spray for brush control in pine plantations was from April to June when by reason of limited development problem species could be handled more economically than later in the year.

In routine 2,4,5-T foliage spraying, control of Turpentine is very poor and of White Mahogany only moderate. The final assessment of a trial established in 1971 to test the effectiveness of picloram with or without 2,4,5-T on these species showed that.

- picloram at concentration of 0.1 to 0.2 per cent. successfully controls White Mahogany, but is relatively ineffective against Turpentine;
- mixtures in the range of 0.1 per cent. picloram + 0.4 per cent., 2,4,5-T to 0.2 per cent., picloram + 0.8 per cent. 2,4,5-T give successful control of both Turpentine and White Mahogany.

Data from measurement of Caribbean Pine 12 months after foliar spray application are shown in the following table:—

MEAN HEIGHT OF HONDURAS CARIBBEAN PINE TWELVE MONTHS AFTER FOLIAR SPRAYING

Chemical	Concentration Per cent.	Height	Height as percentage of Control
	a.i.	Feet	
2,4,5-T	0.125	4.33	88.4
2,4,5-T	0.25	4.17	85.1
2,4,5-T	0.50	4.28	87.3
2,4,5-T	0.75	2.34	47.8
Picloram	0.10	3.94	80.4
Picloram	0.15	4.33	88.4
Picloram	0.20	4.51	92.0
Control	Nil	4.90	100.0

All treatments caused a reduction of height development but only in the case of the heaviest 2,4,5-T treatment did this exceed 70 per cent. Trees sprayed with 2,4,5-T had a healthy appearance and suffered no malformation; those treated with picloram made good recovery from apical injuries but occasional multiple leaders persist. At the higher rates of application, picloram seemed to enhance apical growth, after the initial severe burning effect. In a subsequent phase of the experiment, healthy seedlings, varying from 3 feet to 4.6 feet in height, were sprayed with picloram and 2,4,5-T mixtures. In each treatment the mixture was found to be more damaging than either chemical applied alone.

An experiment to determine the best combination of sowing time, tubing and planting, of Honduras Caribbean Pine was established in 1970. The 1972 data were analysed, and the results show that the optimum procedures are early planting (in February) with stock from, either a March sowing and June tubing, or an April sowing with tubing in July, August or September.

At Weipa, on mined areas, only small numbers of stock were planted by the Department this year now that Comalco is raising the bulk of requirements at its local nursery. Plots of Chickrassy, Laran, Indian Rosewood and Pacific Rosewood were planted. All except Chickrassy, which is doing well on an older plot, are new to the area. In addition, 760 Hoop Pine of eight northern provenances were planted as refills in a failed plot of Honduras Caribbean Pine. A complete report on all work done at Weipa is in preparation.

Beerwah Regional Research Station

Three sections at this station handle silvicultural, tree breeding and nutrition research into the establishment and maintenance of exotic pine plantations on the coastal lowlands south of latitude 23 deg. S, and on the hinterland plateau country of southern Queensland.

(i) **Plantation Silviculture**—This section is responsible for silvicultural research into the southern pine plantations of sub-tropical coastal Queensland, the Honduras Caribbean Pine plantations at Byfield just within the tropics and the Radiata Pine plantations of the southern inland tablelands near Stanthorpe.

(a) **Sub-tropical Coastal Region**—Examination of several experiments established to determine the optimum sowing rates in Slash Pine nurseries shows that drill sowing to produce 20 seedlings per square foot is optimum in terms of seedlings with a firm bud at planting time, and in subsequent field survival and increment.

The excellent results reported in the 1972 Annual Report from pre-emergent weedicide trials in Slash Pine nurseries have been confirmed by further experiments in the 1972 sowings in Beerburrum, Toolara and Tuan nurseries. Current recommendations for pre-emergent spraying are the application of a mix of chlorthal at 201 lb. per acre with propazine at 1 lb. per acre; this combination gives excellent control of both grass and broad-leaved weeds.

Outplantings of Slash Pine were made mid-monthly from May to August in successive years from 1965 to 1968 to determine the optimum month of planting for open-root nursery stock. Stock subject to culling from routine beds in the Beerwah nursery was used in all plantings with similar stock from the "old" Beerburrum nursery included in the 1967 and 1968 plantings. All plantings were on lateritic podsolic ridge sites. In 1969 a further trial was outplanted to test whether the planting season could be extended outside the May-August period, and whether survival and initial height growth were comparable on lateritic podsolic ridge and humic gley swamp sites; uncultured stock from the "new" Beerburrum nursery was used. The trials outplanted from 1965 to 1968 showed that under normal seasonal conditions stock from both nurseries gave highly satisfactory survivals when planted from May to August; however height development was closely correlated with month of planting with the earlier May-June having by age 4-5 years an advantage of about 1 ft. in mean height over the later plantings. The 1969 plantings showed also that May to August plantings gave highly satisfactory survivals on both ridge and swamp sites, but that earlier March and April plantings and later September plantings were unsatisfactory; on ridge sites there was again a trend towards improved height growth with the May and June plantings, but on swamp sites July plantings have a slight advantage.

Work reported in the 1971 and 1972 Annual Reports on open-root planting of Honduras Caribbean Pine in winter has shown that acceptable field survivals can be obtained over a range of planting conditions by a combination of root wrenching and root dipping techniques. Further trials were initiated during the year to determine techniques for best results under routine conditions over a range of planting times and localities.

In 1971 a new series of species trials was established at Gregory to supplement information available from older trials on the best species for plantation establishment on the range of soil types occurring in this region. These trials have been

given site preparation treatments involving complete ploughing, supplemented by ripping on the shallower soils, and line ploughing; a standard fertiliser application of 314 lb. per acre superphosphate (20.7 per cent. phosphorus) as an individual tree application was given shortly after planting. Soil types

represented are deep, well-drained lateritic podsolics, well-drained red earths, poorly-drained gleyed podsolics and shallow clay-textured lateritic podsolics. The first-year performance of the main species under test is shown in the table below:

FIRST YEAR HEIGHT GROWTH (FEET) OF PINUS SPECIES ON A RANGE OF SOIL TYPES AT GREGORY
(Means of 2 replications)

Species	Coarse Lateritic Podsolite		Shallow Clay Lateritic Podsolite		Red Earth		Gleyed Podsolite	
	Mean Height	Height Inct.	Mean Height	Height Inct.	Mean Height	Height Inct.	Mean Height	Height Inct.
Slash Pine	2.50	1.29	3.03	1.79	2.47	1.22	2.53	1.46
South Florida Slash Pine	1.78	1.31	2.64	2.13	1.74	1.24	2.08	1.59
Honduras Caribbean Pine	3.03	1.68	3.17	2.04	3.46	2.07	2.41	1.20
Bahamas Caribbean Pine	3.28	2.07	3.98	2.85	4.02	2.66	3.12	2.06
Cuban Caribbean Pine	2.07	1.41	2.54	1.86	1.99	1.31	2.00	1.41
Benguet Pine	1.67	0.30	2.19	0.97	1.05	0.49	1.47	0.53
Ocote Pine	1.80	0.67	2.17	1.02	2.08	0.75	1.53	0.48
Sand Pine	1.59	0.70	..	..	..	..	..	..

It is of interest to note the slightly different rankings in first-year growth by site for each species. Bahamas Caribbean Pine is showing greatest early potential on all sites. Honduras Caribbean Pine is next on the deeper well-drained soils, but early growth is less satisfactory on the poorly-drained gley soils, where both Slash Pines are superior. There is little difference in the early performance of Cuban Caribbean Pine, Slash Pine and South Florida Slash Pine. However, Ocote Pine, Benguet Pine and Sand Pine are markedly inferior, and it does not appear that they will have any value as plantation species in this region. Continuation of these trials and implementation of future trials to define the role of each of the varieties of Slash and Caribbean Pines is proposed. Further progress on analysis of data from all old species trials on the sub-tropical coastal lowlands has been made, and results will be presented in a major review during the coming year.

In the mid-1950's a number of weedicide experiments were established in Slash Pine plantations at Beerburum to assess the effectiveness, and to determine the economics, of pre-plant foliar spray applications of 1 per cent. w/v 2,4,5-T butyl ester in water in controlling regrowth of unwanted species. These experiments were concluded and summarised during the year. With costs that applied during the currency of these experiments the general findings are that in areas of moderate regrowth the use of 1 per cent w/v 2,4,5-T butyl ester in water as a pre-plant foliar spray will give effective control of regrowth and significantly reduce the costs of subsequent and overall tending operations. In areas of dense regrowth the use of 1 per cent. w/v 2,4,5-T butyl ester in water will also give effective control of regrowth, but may result in slightly higher tending costs during the first decade in comparison to brush tending alone; in these areas the slightly

increased costs (associated with high material costs of 2,4,5-T then applicable) are more than offset by improved growth of Slash Pine during the first six years, which is equivalent to about one year's growth.

All long-term spacing, pruning and thinning experiments were measured and maintained during the year. Most emphasis on the current thinning programme is being placed on securing an understanding of the relationship between standing basal area, basal area increment, site index and age for all exotic pine plantations species. Simulation techniques using these growth functions are adopted to determine optimum regimes to meet long-term management objectives. In the past year basal area increment data was assembled from all thinning and spacing experiments in Slash, Loblolly and Honduras Caribbean Pines. This data is being submitted to computer analysis in a co-operative project with the Biometrics Section and it is anticipated that growth functions for each species will be determined in the coming year and results presented in a series of research papers.

(b) Tropical Coastal Region, Latitude 23°S—Work at this centre is concerned primarily with long-term spacing, pruning and thinning, trials with Honduras Caribbean Pine. This work has been expanded in recent years to cover nursery and site preparation, weed competition, species introduction, and underplanting.

Pending the development of growth functions based on standing basal area, basal area increment, site index and age relationships for Honduras Caribbean Pine as outlined above a brief review of the growth of this species at Byfield has just been completed. Tentative yield tables for Honduras Caribbean Pine stands pre-commercially thinned to 400 stems per acre and 300 stems per acre are:—

PROVISIONAL YIELD TABLES FOR HONDURAS CARIBBEAN PINE, BYFIELD—MERCHANTABLE VOLUME TO 4 INCHES DIAMETER UNDER BARK, CUBIC FEET PER ACRE

Age (years)	*Site Index 90			Site Index 100			Site Inedx 110		
	Volume	CAI	MAI	Volume	CAI	MAI	Volume	CAI	MAI
(1) Pre-commercially thinned to 400 stems per acre									
8	595	..	74	845	..	106	1,085	..	136
10	1,115	260	111	1,565	360	157	2,015	464	202
12	1,670	219	139	2,267	352	189	2,870	427	239
14	2,200	264	157	2,915	322	209	3,630	380	259
16	2,690	244	169	3,495	290	219	4,300	334	269
18	3,135	222	174	4,010	259	223	4,885	292	272
20	3,535	200	177	4,475	232	224	5,420	269	272
22	3,870	169	176	4,900	212	223	5,930	254	270
(2) Pre-commercially thinned to 300 stems per acre									
8	240	..	30	595	..	74	1,060	..	131
10	570	164	57	1,075	240	109	1,640	290	164
12	1,060	244	89	1,740	333	144	2,405	382	200
14	1,730	334	124	2,525	392	180	3,270	432	234
16	2,455	362	153	3,300	387	206	4,105	417	257
18	2,665	270	166	3,960	330	220	4,800	347	267
20	3,380	192	169	4,520	280	226	5,400	300	270
22	3,715	169	169	5,030	254	229	5,940	270	270

* Site index is the predominant height achieved or anticipated at age 25.5 years. height in feet of the tallest trees taken one per twentieth of an acre.

Predominant height is the average

These yield tables show that growth culminates at an early age, (10–12 years in stands pre-commercially thinned to 400 stems per acre and 14–16 years in stands pre-commercially thinned to 300 stems per acre), and this is followed by a rapid decline in growth with MAI/CAI curves crossing by about age 22 years, indicating relatively short rotations for this species. There is little difference in volume productivity by age 22 years between stands pre-commercially thinned to 300 or 400 stems per acre, especially at the higher site indices. While the 400 stems per acre stands show an initial increment advantage, this is not being sustained after about age 14 years. These findings are supported by the data from specific pre-commercial thinning experiments, and when these experiments are further examined for value production, the financial advantage of pre-commercial thinning to 300 stems per acre is clear-cut under management regimes aiming at the production of the maximum quantity of high quality sawlogs with minimum sacrifice of volume production.

The management of Caribbean Pine plantations in Queensland was reviewed in a joint paper by P. J. Hawkins, D. G. Nikles and W. J. Smith, entitled "Management, Genetic Improvement and Wood Properties of *Pinus caribaea* Mor. in Queensland", presented to the Seventh World Forestry Congress, Argentine, October 1972.

(c) Inland Southern Tablelands—Because of the small Radiata Pine planting programme at Paschendale work at this centre is restricted to maintenance and measurement of nursery trials, establishment trials, species trials, and several thinning and spacing experiments.

In the mid-1960's poor first-year survival of Radiata Pine in this low rainfall area was a cause of concern, necessitating high refilling costs, and resulting in the development of irregular plantations, both with regard to stocking and growth. With the development of better site preparation techniques involving complete or line ploughing to conserve moisture and reduce weed competition survivals in recent years have been greatly improved. At the same time other methods of improving initial survival were investigated.

A trial to examine the effect of 2,2-D.P.A. applied with an Arbogard to control grass competition on both unploughed and ploughed abandoned orchard sites showed that 2,2-D.P.A. gave excellent reduction in grass competition. However, Radiata Pine seedlings are highly susceptible to spray drift from this desiccant and this negated the beneficial effects of reduced competition. The benefit of ploughing was again shown in this trial where mean survival on the unploughed plots after two years was 74 per cent. compared with 93 per cent. of the ploughed plots.

The use of tubed stock for refilling in the summer after the initial winter planting has also been shown to be unreliable, as survival of tubed stock appears to be as dependent on prevailing weather conditions as that of open-root stock.

Conditioning of Radiata Pine nursery stock by various root wrenching regimes, and the use of clay slurry dips, has also offered a means of improving initial field survival. A trial was initiated in 1971 to test weekly, fortnightly, and monthly wrenching with and without the addition of clay slurry root dips at lifting. Assessment of the nursery stage of this trial at time of outplanting and after one year in the field has shown that—

- (1) height development of Radiata Pine seedlings can be significantly arrested by frequent root wrenching,
- (2) for undipped stock field survival and height growth is maximised under the fortnightly and monthly wrenching regimes respectively, and
- (3) clay slurry inhibited field survival and height increment of all stock given severe root-wrenching treatments.

Response to clay slurry contrasts with results with Slash and Caribbean Pines.

(d) General—Co-operative research projects have been maintained with the Forest Products Research Branch on the sampling of our primary exotic pine species, over a range of sites and localities to provide further information on basic wood properties, dry weight yields, and sawn recoveries.

Co-operative research was also maintained with the Mensuration and Biometrics section on associated aspects of plantation silviculture research. In particular a large number of sample trees of both Slash Pine and Honduras Caribbean Pine were measured at Tuan and Toolara to check on current volume tables. A start has also been made on the collection of sample tree data for a number of secondary species, (South Florida Slash Pine, Bahamas Caribbean Pine, Cuban Caribbean Pine, etc.) for which volume tables are lacking.

Dalby Regional Research Station

This station carried out research in the White Cypress Pine, Ironbark, and Spotted Gum forests in the area west of Dalby and Warwick with an annual rainfall of 20–30 inches, and in rainforests and sclerophyll forests on the Dividing Range east of Warwick where the rainfall generally exceeds

50 inches per annum. Research is also carried out into the growth of windbreak and shelterbelt trees suitable for planting on the Agricultural and pastoral land west of the Dividing Range.

A major project involving the analysis and review of data collected over a 25-year period from a series of thinning trials in evenaged Cypress Pine stands was commenced during the year. All measurements were transferred to punchcards and regression analysis was carried out to relate growth increment to a number of variables including standing B.A., rainfall, stocking, and age. Age determination was made difficult since the precise age of only one of the experiments was known, and the approximate age of all other experiments was estimated based on the growth patterns observed for the stems in this experiment. The necessity to determine approximate age became apparent however, when multiple regression linking the variables standing B.A., age, and rainfall to B.A. increment was carried out. This revealed that age in young stands is far more important than standing B.A. in determining the magnitude of B.A. increment. After consideration of a number of regression models the following equation was adopted as that most closely describing the growth pattern of evenaged cypress stands between the ages of 10 and 50 years:

$$BAI = 1.1135 - 27.3887 \frac{1}{R} + 38.2915 \frac{1}{A} - 4.6022 \frac{1}{BA} + 2041 \frac{BA}{A}$$

where BAI = basal area increment per acre-sq. ft.

R = mean annual rainfall over the measure period in inches

A = estimated age

BA = standing basal area per acre-sq. ft.

This equation explains 58.2 per cent. of the variation in the 656 sets of data used but projection beyond 50 years results in an underestimation of B.A.I. based on the current data available for older stands. At this stage the increments derived for 50 year old stands using this equation should also be taken as applying to stands of a greater age. Past measurements for all detailed yield plots in the western forests have now been placed on punchcards and preliminary growth data is available. These plots sample three major state forest reserves and are subjectively located to sample typical stands within these forests. They are measured at six yearly intervals and are subjected to routine treatment and logging at the same time as surrounding areas. Mean girth increments over the 15–35 year history of the plots has now been taken out by size classes, crown depth classes, soil depth classes, time since treatment, and crown dominance classes. The figures indicate that girth increment is predominantly affected by green crown depth, dominance, and time since the previous silvicultural treatment operations were carried out. The effect of silvicultural treatment is shown in the following table:—

WHITE CYPRESS PINE—MEAN GIRTH INCREMENT (INCHES)

Years since Treatment	S.F. 154 (Western Creek)	S.F. 328 (Yuleba)	S.F. 302 (Barakula)
0–5 .. ..	.55	.46	.43
5–10 .. ..	.40	.30	.36
10–20 .. ..	.26	.31	.37
20+ .. ..	.22	.22	.26
Mean .. ..	.28	.27	.30

Two experiments at State Forest 302 Barakula, which are aimed at determining the effect of different fractions of the Cypress Pine understorey on an overstorey of the same species were remeasured for the third consecutive year following establishment in 1969 and application of treatments in 1970. Increments in both the treated and the untreated plots have achieved extremely high values for this species over the 1971–72 period, contrasting with the poor increments for 1969–70 when drought conditions prevailed. The additional increment of the plots from which the whole of the understorey, less than 25 feet in height, was removed is relatively small by comparison with the seasonal fluctuation, but is nevertheless significant. (See table). The overstorey in these experiments is estimated at 50–60 years of age and the average g.b.h. about 29 inches.

ANNUAL BASAL AREA INCREMENTS OVERSTOREY—SQ. FEET PER ACRE

Treatment		1969–70	1970–71	1971–72
Understorey <10 ft.	Understorey 10–25 ft.			
Remove ..	Remove ..	0.49	1.87	3.17
Remove ..	Retain ..	0.46	1.58	2.54
Remove ..	Remove ..	0.95	2.40	3.47
Retain ..	Remove ..	1.01	2.14	3.25

Three experiments aimed at determining the most effective and economic method of removing the larger stems of unwanted species from the White Cypress Pine forests were assessed twelve months after treatment. The results indicate that frill or collar ringing with axes or chainsaws at any convenient height is likely to be less effective than similar treatments in which an arboricide solution is applied to the freshly cut surface, even in stems of up to 80 inches g.b.h. If the results are similar at the 24-month assessment it may be desirable to increase the maximum size of trees which may be treated with stem injections during routine operations, so that more effective destruction of these large stems may be achieved without the necessity to reintroduce knapsack spraying techniques into silvicultural operations.

An experiment aimed at determining suitable techniques for the raising of White Cypress Pine seedlings in jiffy pots for planting on sites devastated by wildfires was completed during the year. Previous field observations have indicated that seedlings are unlikely to be grazed by wallabies so long as they are planted not later than the summer season following the fire.

An experiment aimed at determining the effect of the removal of competition from select stems in a pure Spotted Gum stand, both with and without the application of arboricides was reviewed during the year. The graphical representation of data accumulated over a ten-year period has shown a significant increase in increments for stands in which all competitors were removed with arboricide application as against stands where only the larger competitors were removed or in which arboricide was not applied. A cost benefit analysis, however, showed that the added volume increment attributable to treatment was insufficient to cover the compounded cost of the operation at a reasonable interest rate.

Investigations into the control of Moonlight Cactus at Western Creek near Millmerran were continued with an experiment designed to determine whether better tuber kills could be obtained through the saturation of the ground around the base of the plant with 2,4,5-T.P. solution, following foliage spray application as against the foliage spray treatment alone. An evaluation trial was commenced with the organic arsenical cacodylic acid. Observations were continued in a number of other Moonlight Cactus experiments, all of which should be completed during the coming year, thus enabling a comprehensive review of the subject to be undertaken.

Observations were continued on the open plantings and underplantings in the high altitude forests on the Dividing Range to the east of Warwick. No new experiments are planned in this area since sufficient data has been gathered to enable silvicultural recommendations to be made on the future management of the forests in this area.

Gympie Research Station

The major work of this station is aimed at increasing the productivity of wet and dry sclerophyll forests in coastal Southern Queensland; it also embraces revegetation of sand-mined areas within State Forests.

A review of past seeding and enrichment planting studies was compiled. Following logging and protection of large areas of wet sclerophyll forest in south-east Queensland natural regeneration of desirable species is generally deficient, because of the understorey development. The understorey is mostly composed of rain forest elements or fern and litter which stop seed reaching mineral soil. Artificial replacement of growing stock by seeding and planting has been investigated with several species on a range of forest associations. Seven seedling experiments were conducted at intervals between 1940 and 1968 in both lower slope Blackbutt and White Mahogany forest types. Results were:—

- (i) Satisfactory germination of spot sown Blackbutt seed was obtained in the wet sclerophyll forests on sites that had been burnt, and soil cultivated, or where a crawler tractor had been employed to clear debris and disturb the soil.
- (ii) Pelleted seed improved germination but did not increase initial growth of seedlings.
- (iii) Rose Gum seed germinated satisfactorily on the wetter sites naturally occupied by the species.
- (iv) The growth of the germinants was generally slower than the weeds, so the seedlings quickly became suppressed.

Eleven enrichment planting experiments were laid down from 1957-1970, in upper and lower slope Blackbutt forests, White Mahogany forests, and mixed hardwood forests. The conclusions were:—

- (a) Enrichment planting, immediately following a heavy logging, has proved a successful silvicultural technique for building up the growing stock with fast growing eucalypt species such as Blackbutt.

The technique has been successful in a range of wet sclerophyll forests in south-east Queensland, where Blackbutt and White Mahogany are the major constituents.

- (b) Before planting the site should be given a complete logging, leaving only stems with a high growth potential. No seed trees are required.
- (c) A crawler tractor of at least 120 h.p. directed by a competent supervisor, is required to extend existing snig tracks and heap logging debris, so that approximately 50 per cent of the surface is clear of vegetation.
- (d) A silvicultural treatment is normally required, after machine disturbance, to ringbark or kill with hormone, suppressed stems and large useless overtopping remnant stand components.
- (e) On the mainland, Blackbutt raised in jiffy pots and galvanised iron tubes have similar survival and growth rates, but in the deep sands of Fraser Island, Blackbutt grown in the longer galvanised iron tubes gave better survival and growth than jiffy pot stock. The root systems of some Blackbutt grown in galvanised iron tubes exhibited poor root development, and have been subject to windthrow during periods of heavy winds. Jiffy pots have a cost advantage in the nursery and planting operations. Average planting rates have been 125 stems per acre.
- (f) Blackbutt Tallowood, and Gympie Messmate have displayed the best growth potential in the trials. Tallowood, being more shade tolerant, seems better adapted to the rain forest situation than the more light demanding Blackbutt and Gympie Messmate. Little work was done with Rose Gum, White Mahogany and Red Mahogany. Rose Gum is subject to grub attack in the bole and White Mahogany and Red Mahogany are slow growing species.
- (g) Blackbutt has shown the most rapid growth of all species planted irrespective of site. Growth has been similar for all forest types and at 15.5 years, mean g.b.h. of 35.0 inches has been achieved.
- (h) Fertilisation with a balanced mix has not improved initial survival or growth rate in any species or forest type.
- (i) Costs averaged over four trials totalling 45.8 acres, indicated the mean cost per acre of machine disturbance (120 h.p.), silvicultural treatment and planting 125 stems per acre was about 9 man hours/acre plus machine hire of approximately 0.68 hour/acre. Nursery and overhead costs were not included.
- (j) Natural regeneration of the commercially desirable species in the forest types investigated was poor.

Two more revegetation trials on a simulated sand-mining site were established at Hook Point on the southern tip of Fraser Island in February 1973. The site grew an open forest of Red Bloodwood, Forest Red Gum, Moreton Bay Ash and scattered Cypress Pine to 60 feet top height. The nutrient status of the sand is very low. Both trials are investigating container types and fertiliser combinations, and in one trial antitranspirant treatments will be applied.

Plants in the container trial and mulching trial, mentioned in the 1972 Annual Report, were wiped out by a severe frost in July 1972. A small species trial also established in early 1972, was badly frosted in July 1972 and only the lignotuberous species, Moreton Bay Ash, has reasonable survival.

Imbil and Yarraman Research Stations

These stations are concerned mainly with research into the establishment and maintenance of plantations of Hoop Pine and other species on rain forests sites and transition forest sites in south-east Queensland. Imbil with an average annual rainfall of 45 inches represents the warmer and wetter Hoop Pine plantation areas, while Yarraman, with an average annual rainfall of 32 inches represents the drier and colder inland sites.

Seven chemicals have been tested in the Hoop Pine nursery at Kenilworth to determine their suitability for weed control. Fluometuron at 2 lb. a.i. per acre in 50 gallons of water gave best overall control of a range of weed species but Hoop seedling survival was adversely affected. Ametryne at 2 lb. a.i. per acre in 50 gallons of water was only slightly less toxic to weed species and had no apparent adverse effect on Hoop seedlings. It is hoped that weedicide control of the range of weeds in the Kenilworth nursery can be achieved in the near future. Previous work has shown that bromacil at 0.3 lb. a.i. per acre can be recommended as a weedicide in Hoop Pine nurseries where the predominant weed species is ragweed.

At Imbil, the results of a small trial to test the survival and early development of shoot pruned, open root Hoop Pine in the field were not impressive. Leaders and laterals of stock derived from the 1970 sowing were pruned in July 1972. The plants were root wrenched one month later. On lifting from the beds in early November 1972, plants were dipped in a clay slurry and outplanted alternately with routine tubed stock. Soaking rain fell within a few hours of planting and continued for a few days. By April 1973 all shoot pruned plants were dead.

At Yarraman stock raised for outplanting in one year has now been established in the field. At the time of planting, there had been a highly significant response in height development due to the application of fertilisers in the nursery. The greatest response was to the addition of general fertilisers to the tubing soil together with weekly waterings of liquid fertilisers, although this response was only slightly better than that to general fertilisers only. The best combination of treatments involved application of both fertilisers to drill sown seedlings tubed at three months in polythene tubes. The effects of tube type or sowing methods were not in themselves significant. The polythene tubes were not removed from the seedlings at time of planting but were slit to allow the roots to emerge. This method of planting did not adversely affect survival at six months from planting. Subsequent height growth and survival will be followed. A further trial was commenced along similar lines in 1972-73. Treatments involve various organic and inorganic fertiliser mixtures in tubing soil, with nitrogen supplements, and a glass-house effect as the major variables. A simple polythene glass-house was constructed with sarlon shade and concrete base in order to stimulate growth during the cooler winter months. Resultant stock will be outplanted in November 1973.

The large trial for grass control initiated at Imbil in November, 1971 and referred to in the 1972 Annual Report was assessed in May 1973. The most promising control was given by 2,2-D.P.A. (7.4 lb. a.i. overall per acre in two applications a fortnight apart), applied in December 1971-January 1972. Grass was controlled in 38 per cent. of plots treated. Damage to Hoop Pine plants was negligible. An application of 2,2-D.P.A., 7.4 lb. a.i. per acre in April 1972 to the previous split application treatment increased grass control from 38 per cent. to 53 per cent. However this third application of 2,2-D.P.A. at the end of the growing season has been responsible for considerable damage to Hoop Pine plants.

The limited new trial plantings in the Yarraman District included *Cunninghamia konishii*, *C. lanceolata*, sugi, and Douglas Fir. Both the *Cunninghamia* species are exhibiting excellent growth and survival, while the Sugi and Douglas Fir failed within a short time of outplanting.

Mortality in young Hoop Pine from root rot (*Fomes noxious*), is continuing in widely scattered areas. Dead trees occur as isolated specimens, or more commonly, in clumps centred on old scrubwood stumps. Further observations were made of rate of spread of the disease in plots containing affected trees. The fungus does not appear to be spreading beyond the immediate neighbourhood of the infection areas.

Mensuration and Biometrics Section

With the return of a biometrician from overseas, this section is now at full strength for the first time since 1968 and in addition to an improved service to field research stations, several new projects have been initiated. An additional forester has also been seconded to assist with mensurational work associated with metric conversion.

Analyses of major experiments totalled 80 during the year, using analysis of variance or regression techniques, or a combination of both. Numerous small, straight forward analyses were also processed. The advisory service to field research stations and other branches was concerned largely with experimental and sampling design. The computer program GAVO, for analysis of variance and covariance for any balanced complete design has been revised and a number of new options included. Expected mean squares, and the component values for each mean square, can now be output for each factor in the analysis. These will be particularly useful in computation of heritabilities in genetics experiments. A new program has been written to determine if two groups of individuals belong to the same or separate populations. Prediction intervals for use in assigning an individual to a particular group are also calculated. The program is being used initially to examine skull and other body measurements on squirrel gliders for National Parks Branch. Another zoological project is concerned with prediction of age of rats from weight and incisor length. A sampling scheme to determine nutrient levels in the Toolara nursery was designed in 1971, and provided for the taking of 24 soil cores in each of 64 sampling units. A further investigation was carried out to determine the intensity and type of sampling required in future, and as a result the 1973 sample was reduced to 12

cores per sampling unit. This sampling intensity yields a coefficient of variation of eight per cent. for the most important nutrient parameters.

Further work was carried out on the development of a g.b.h. height relationship for Cypress Pine, using the most recent measure data for experiments and detailed yield plots from four localities. These were grouped according to plot type, locality and site quality based on depth to B horizon and relationships of the type $\log(\text{height}) = a + b \log(\text{g.b.h.})$ were fitted. No meaningful combination of groups was possible, and site quality, as measured by soil depth, had no predictable effect on the g.b.h. height relationship. While good overall relationships were obtained by combining the data for each locality, these are not very informative when applied to particular plots or experiments, which is necessary if they are to be used in volume estimation. An independent approach has been to assign to each plot a site index representing the average height of a 24 inch g.b.h. tree as estimated from a graph or regression equation. Using a series of measurements from detailed yield plots covering more than 20 years it was found that the g.b.h.—height relationship for each site index as defined above remained relatively constant on an individual plot for up to 10 years. It is thus worthy of further investigation as an indicator of the g.b.h.—height relationship to be used for volume estimation on individual plots for periods of up to 10 years.

Data from four thinning experiments at Pechy were used to develop a basal area increment prediction functions for Patula Pine. The best model was:

$$\text{BAI} = -9.5484 + 0.4603A + 0.3414B/A - 0.0092A \cdot R_1 + 6.2917R_1/R_2 + 0.0033R_1 \cdot R_2 - 4.2849A/R_2 - 0.0003 \text{ S.A.} + 0.9667S/B.$$

where B.A.I.=basal area increment (square feet) for the current year.

A = age (years) at commencement of period

B = standing basal area (square feet) at commencement of period

S = stocking (stems per acre)

R₁ = rainfall (points) for current year

R₂ = rainfall (points) for previous year.

This model explains 72 per cent. of the variation and is surprisingly good even for prediction of increment on a single plot in a particular year. Simpler models, in which the stocking variable was not included, were markedly inferior. These correspond to the standing basal area—basal area increment curves which have been used to define "limiting basal area" for other species. The present study highlights the importance of both stocking and standing basal area in predicting increments and suggests that the concept of "limiting basal area" may be inadequate for Patula Pine. Similar studies are in progress on other species for which much more information is available. These include site index in addition to the variables used for *P. patula* and will also examine whether increment per acre is depressed immediately following thinning. Cypress Pine thinning experiment data were also used to develop a basal area prediction equation, but proved less satisfactory than with *P. patula*. The best model explained only 58 per cent. of the variation. This is dealt with in more detail in the report of the Dalby Research Station.

Measurement of experiments in metric units commenced in April, 1973 and no major difficulties were encountered. For diameter measurement, fibreglass tapes as used by the British Forestry Commission have proved fairly satisfactory, but the tapes wear rapidly on young Hoop Pine where the bark is hard and rough. A large number of computer programs had to be converted to process data in both metric and Imperial units. Work so far has concentrated on making programs available to permit conduct of urgent computations on the 1973 measure. This aim has been largely achieved, but much remains to be done and there is already a back-log of 1973 data to be processed when programs are converted. Volume tables for all major species have been converted to metric; other species will be dealt with as required.

SOILS AND NUTRITION SECTION

Soil and nutrition research in Queensland forests involves investigation of Southern and tropical exotic pines, native araucarians and eucalypts. As well as determining the fertiliser requirements of various species on a range of sites, the programme extends its interest to soil studies, foliar analysis, nutrient cycling and mycorrhizas. Species/genotype x nutrient interactions are becoming an increasingly important segment and co-operative studies involving Nutrition and Genetics staff are planned.

In April, 1973, the Department hosted the fourth biennial meeting of Research Working Group 3 (Soils and Nutrition) of the Standing Committee of the Australian Forestry Council. A successful five day meeting was held at Caloundra attended by 23 delegates and observers plus a number of local officers with particular interest in specific sessions.

Liaison has been maintained with Comalco concerning the revegetation with commercial timber species of areas at Weipa mined for bauxite. An extensive fertiliser trial was established in 1973 with African Mahogany, American Mahogany and Northern Cypress Pine. Omission layouts were used testing for deficiencies of N, P, K and trace elements in the presence and absence of gypsum. With the appointment by Comalco of a professional forester as full-time regeneration officer, the Department will continue to keep close contact with the work but more in an advisory capacity.

Two new experiments were initiated in 1973 on simulated sand mined areas on Fraser Island as a co-operative project with the Coastal Hardwoods Section. The trials aim to define the conditions under which Blackbutt can be successfully established and grown on deep sands away from the beaches following extraction of heavy mineral.

The second paper on foliar analysis of southern pines was published during the year as "Principles and Practice of Foliar Analysis as a Basis for Crop Logging in Pine Plantations II. Determination of Critical Phosphorus Levels". Plant and Soil 37, 159-169. 1972. Two papers were presented at the Working Group meeting mentioned above; "Statement on Current Activities in Forest Nutrition" and "Nutrition of Tropical Conifers". A note "The Soils and Associated Vegetation Formations of Burleigh Head (National Park 41 Mudgeeraba)" was prepared for limited distribution.

(1) Exotic Pines—South and Central Queensland

In excess of 480 experimental plots of exotic pines were foliar sampled during winter 1973. These samples form part of several continuing projects aiming to define the relationship between foliar phosphorus levels and growth of both Slash and Loblolly Pines. One hundred and seventy plots of Caribbean Pine, mainly from fertiliser trials, have been sampled as part of a study aimed at determining the range of foliar nutrient levels associated with healthy growth and their variation with site index and soil type (see 1972 Annual Report). A further one hundred and four plots in four Caribbean Pine provenance trials at Beerburum and Byfield were sampled to ascertain if differences in foliar nutrient levels occur between provenances. Twenty-six Loblolly Pine ramets from the Beerburum orchard were sampled to investigate the foliar chloride levels in healthy and unhealthy grafted clones.

Trials dealing with site preparation and fertilising on poorly drained soils were reviewed during the year. One series was planted on a range of shallow clay sites in the Gympie district to assess the response of Slash Pine to fertilising with 2.5 cwt. per acre. Nauru rock phosphate under various site preparation treatments involving nil site cultivation, mound ploughing, and ripping to 18-24 inches. Mean height growth at one representative locality at Ringtail (Gympie District) is tabulated below:

MEAN HEIGHT (FEET) OF SLASH AND HONDURAS CARIBBEAN PINES ON A SHALLOW CLAY SOIL, S.F. 997 (RINGTAIL) (AGE 2 YEARS, MEANS OF 5 SITES)

Species	Fertiliser*	Site Preparation				Means
		Nil	Mound	Rip	Rip + Mound	
Slash	Nil	2.81	3.18	3.00	3.23	3.06
	Fertilised ..	3.05	3.99	3.46	4.06	3.54
	Mean	2.93	3.59	3.24	3.65	3.30
Honduras Caribbean ..	Nil	2.53	3.60	3.36	4.20	3.42
	Fertilised ..	2.89	4.80	4.09	5.58	4.34
	Mean	2.71	4.20	3.72	4.89	3.88
Means	Nil	2.67	3.39	3.18	3.72	3.24
	Fertiliser ..	2.97	4.40	3.78	4.82	3.94
	Mean	2.82	3.90	3.48	4.27	3.59

* 2.5 cwt./ac. Nauru Rock phosphate in the season of planting.

Both species have responded to phosphate and site preparation, with Caribbean Pine showing a greater response than Slash Pine. Mounding was superior to ripping, but ripping and mounding in the presence of phosphate achieved the best result.

On all other sites in the trials, responses to phosphate and site preparation have been obtained. Overall, the response to ripping is approximately equivalent to the response to mounding. Further trials to investigate fully the interactions between chemical and mechanical methods of site preparation and fertilising are envisaged for the near future.

Similar studies are current at Byfield where Honduras Caribbean Pine planted on a ground-water podzol ripped and mounded in combination with phosphate and trace element fertilisers has shown maximum responses to ripping combined with mounding and fertilising, and a possible response to the trace elements Zn and Mo. Mean height at age 6 years is tabulated in the next column.

MEAN HEIGHT (FEET) OF HONDURAS CARIBBEAN PINE ON A GROUND WATER PODZOL, S.F. 28 (BYFIELD) (AGE 6 YEARS SINGLE REPLICATION)

Fertiliser	Site Preparation		
	Nil	Mound	Rip + Mound
Nil	2.8	..	..
P + Cu*	13.7	23.1	26.8
P + Cu + Zn + Mo†	13.1	26.2	27.8

* 2 cwt./ac. superphosphate with 0.9% Cu + 2 cwt./ac. Nauru rock phosphate.

† 2 cwt./ac. superphosphate with 0.9% Cu, 0.8% Zn, 0.3% Mo + 2 cwt./ac. Nauru rock phosphate.

(2) Tropical Pines—North Queensland

A glass house trial was established in October, 1972, on a second pair of soils from ridge and swamp at Kennedy, testing the nutrient requirements of three different provenances of Caribbean Pine under inoculation conditions involving two different mycorrhizal fungi. A 2² x 3 x 9 factorial design was used. Fertilisers were applied as split dressings and inoculation carried out using pure cultures on agar or bran baits, in December, 1972. Several complex treatment effects are now evident; a general sensitivity to the fertilisers used has been noted throughout the trial as indicated by depressed growth compared to controls.

Additionally inoculation has had no effect to date, but a significant interaction between provenance, soil and fertilisers, has been recorded for the current increment period. This is illustrated in the table below:—

INTERACTION OF PROVENANCE, SOIL AND FERTILISER ON THE CURRENT GROWTH OF SEEDLING HONDURAS CARIBBEAN PINE (SOWN OCTOBER 1972, HEIGHT INCREMENT INCHES APRIL-JUNE 1973 MEANS OF TWO REPLICATIONS)

Fertiliser	Ridge Soil			Swamp Soil		
	Provenance*					
	K20	K58	K65	K20	K58	K65
All on	1.50	1.50	1.10	1.18	1.22	1.02
-N	1.42	1.73	1.38	0.79	2.28	1.14
-P	1.89	2.13	1.34	1.02	1.22	1.65
-K	1.18	1.30	1.18	1.42	0.87	0.79
-S	1.97	1.57	1.30	1.42	1.54	0.75
-Ca	1.65	1.46	1.38	1.30	0.94	1.18
-Mg	1.81	1.50	0.91	1.14	1.06	0.79
-Trace	2.20	1.30	1.02	1.06	1.14	1.18
Nil	1.65	1.02	1.18	1.26	1.97	0.79

LSD $p = .05, 0.24$; $p = .01, 0.35$

*Provenance sources: K20 Alamicamba, K58 Brus, K65 Mountain Pine Ridge.

This complex interaction can be interpreted as indicating that different provenances exhibit different deficiencies and sensitivities on the same soil, and react differently to different soils. For example, K20 is potassium deficient in the ridge soil but nitrogen deficient in the swamp soil. K58 exhibits no deficiencies but a phosphorus sensitivity in the ridge soil, whereas in the swamp it is potassium and calcium deficient and nitrogen and sulphur sensitive. K65 shows no deficiencies on the ridge soil but sulphur deficient and phosphorus sensitive on the swamp soil. This trial affords a demonstration of the need to examine closely the genotype environment interaction (in this case involving the edaphic factor) in any exotic introduction programme. Further work along these lines in extensive Caribbean Pine provenance and progeny trials is currently being planned.

(3) Hoop Pine—Brisbane Valley

Major efforts were again centred on further investigation of the "Yarramanian" syndrome (see 1972 Annual Report). Seven new field experiments covering nutrient balances, source of tolerance to malformation, and microbially induced auxin effects, were established during the year.

Previously established trials have been maintained. The results of a glasshouse trial (discussed in 1972 Annual Report) have been confirmed in the field. Expt. 2245 has shown that while soil pH can be manipulated through the application of both alum and lime, this has had no significant effect on malformation. Initially malformed stems have continued to demonstrate greater malformation in new growth, again

suggesting that more normal trees tolerate rather than escape the environmental factor/s responsible for Yarramania. Expt. 2246 has demonstrated that nursery stock types thought to be associated with malformation in the field have not exhibited more or less Yarramania than "normal" stock when planted in the field. Expt. 2261 confirms that stock of related seed source raised in different nurseries and outplanted at Yarraman have developed similar degrees of malformation. It can therefore be safely concluded that Yarramania cannot be directly attributed to nursery disorders. Malformed plants transferred to protected nursery conditions have generally failed to develop serious bends and kinks. Virology studies with the Department of Primary Industries are continuing.

(4) Nursery Nutrition

In addition to monitoring the major Slash Pine nurseries through soil analysis for fertilising with routine sowings, investigation of various aspects of nursery fertility is current in several nurseries.

The co-operative study with Biometrics Section to determine optimum sampling techniques for southern pine nurseries, based on the new Toolara nursery (see 1972 Annual Report) was completed during the year. Examination was made of the sampling intensity required within an individual bed to produce a nutrient concentration mean with an acceptable standard error.

Trials aimed at developing a suitable tubing mix for Caribbean Pine have been under way for some time in the Kennedy nursery and a successful mix has now been formulated based on the local Whitfield Creek soil, using filter press plus Q5 (NPK 5-7-4-4) as amendments. This mix comprises soil: filter press at 92:8 by volume plus 18 oz. Q5 per 100 plants i.e. approx. 0.5 cubic yards of mixture. A further trial was put down in 1972 season to investigate the possibility of using a sandy soil from Baird Creek as a base for a tubing mix. Good quality plants were produced by using a 10-20 per cent filter press plus 18 oz. Q5/1000 plants. However, the sandy nature of the material precludes its use without further amendments to improve binding ability, as difficulties were experienced in tubing and in core stability during planting.

(5) Soil and Plant Chemistry

Permanent soil observation plots established in newly planted Slash Pine at Beerburum in 1949, 1958 and 1961 are sampled at intervals to monitor soil changes over a rotation. The 1949 and 1958 plots were sampled for the sixth time in mid 1973 and the 1961 plots for the second time in 1972. To date, the plots have demonstrated only a fractional drop in phosphorus (from 127 to 110 ppm P) and nitrogen status (from 0.065 per cent. to 0.052 per cent.) Control plots in Eucalypt forests have shown little change over the period. These plots will continue to be sampled at four year intervals.

TREE BREEDING SECTION

Breeding work with *Pinus* species in central and south eastern Queensland is conducted from Beerwah by two foresters and two technical officers, with part time technical assistance at several other centres. Most of the work with Hoop Pine is carried out in south eastern Queensland from Imbil by a forester and technical staff, with part time technical assistance at other centres. The progeny and provenance trials with Hoop Pine in the Atherton and Mackay Districts, and the work with Caribbean Pine and other tropical species in the Atherton District are controlled directly by O/C, Tree Breeding Section with part time technical assistance at several centres.

(i) Exotic Pines

(a) SLASH PINE.—Assessment of control-pollinated families at Beerburum was continued in progeny trials 10 years of age.

A formal experiment to compare the relative development of seed orchard and routine stock was established on both well drained and poorly drained sites at Beerburum and Tuan in 1973. Treatments represented in the trial include three seed orchard batches from the Department's two slash pine seed orchards, two routine batches from high pruned stems in State Forest 611, and a mixed batch from twenty-nine open pollinated plus trees selected on poorly drained sites at Beerburum.

Cloning of superior trees selected on well drained and poorly drained sites at Tuan was commenced at Beerburum this year. It is planned to clone all selections made throughout the planting range of Slash Pine in a clonal reservoir which will serve as a convenient area for controlled matings and a ready source of scions for future seed orchard establishment. Searching for superior trees throughout the Slash Pine region was continued and, for the first time, a considerable number were selected at Toolara.

Since last reported in the 1970 Annual Report, production of a clean seed in the Department's two Slash Pine seed orchards has been as follows:—

Seed Orchard No. 1, S. F. 108, area 10.4 ac: 1971—765 lb.; 1972—629 lb.; 1973—1090 lb.

Seed Orchard No. 2, S. F. 589, area 17.8 ac: 1971—1058 lb.; 1972—1536 lb.; 1973—2612 lb. There was a very large increase in production of both seed orchards in 1973.

(b) CARIBBEAN PINES.—Most of the work on Caribbean Pines concerns the Honduras variety, but some work is also being carried out on the Bahaman and Cuban varieties and this is reported separately below.

Early in 1973 well replicated trials with up to 16 provenances of Honduras Caribbean Pine were established in the field in 10 different sites at seven coastal locations between 18°S and 27°S as part of the international study of seedlots supplied by the Commonwealth Forestry Institute, Oxford, U.K. Additional areas were planted with some important provenances for purpose of conservation and future selection. It is planned to apply three fertilizer regimes at several sites. The large range of provenances and environments involved will enable interactions to be estimated.

During the year it was decided to convert approximately 100 acres of superior plantations to seed production areas. Several areas at Kennedy, Cathu and Byfield were chosen with due regard to age, (about five years), seed source, (progeny of local superior trees), isolation from inferior stands, and ease of management. It is planned to begin the gradual reduction of stocking from a nominal 400 to about 100 select trees per acre late in 1973.

A heavy flowering occurred in seedling plantations (especially along roads) and in the clonal orchards and clone banks in 1973. A considerable amount of controlled crossing was possible, (46 full-sib crosses were made) because of the heavy flowering and the fact that work was carried out at Kennedy for the first time as well as at Byfield.

A large full-sib progeny trial was established on swampy and non swampy sites with intensive site preparation at Kennedy (54 entries), Byfield (64 entries) and Maryborough (40 entries). Three control populations were also established at each site, these population being derived from routine seed collections in the Kennedy, Byfield and Maryborough regions. It is planned to apply three fertilizer regimes at each site and, as in the provenance trials which were established in parallel, it is expected that the importance of genotype-by-environment interactions will be revealed by results of the study.

Section 2 of the Kennedy seed orchard was grafted in November 1972. Section 1 now contains 501 ramets from 27 clones. Five of the clones used in Section 1 were repeated in Section 2 and there are now 53 different clones within the two Sections. Stocks were planted in Section 3 for grafting in 1974.

Two small stands of Bahaman Caribbean Pine planted in 1961 and a 5-acre portion of the 1964 planting at Byfield were thinned during the year to promote seed production. In addition 22 superior trees were selected and established by field grafting in a clone bank-seed production area at Byfield in September, 1972. Some of the small ramets flowered in 1973. This area will be developed progressively as superior trees are selected in the future. A moderate flowering, the heaviest yet recorded, occurred in some 9 and 12-year-old seedling plantations at Byfield in 1973, and it is anticipated that several pounds of seed will be available in 1975.

A trial of nine provenances of Cuban Caribbean Pine was planted at two locations this year, the seed being supplied by the Commonwealth Forestry Institute, Oxford, U.K. The second small clone bank at Byfield was expanded to 0.75 ac., and stocks planted for grafting of local selections now available and to be made in young plantations. Two small stands planted in 1961 at Byfield were thinned in the course of conversion to seed production areas.

(c) HYBRIDS.—Work with various hybrids between varieties of Caribbean Pine and Slash Pine is continuing.

(d) LOBLOLLY PINE.—Of the 20 clones established in the small (2.5 ac.) seed orchard of Loblolly Pine that was field grafted at Beerwah in 1969 and 1970, five have developed severe stock-scion incompatibility and there are few ramets of these clones. The other 15 clones have shown nil or very little incompatibility. The first significant collection of seed within the orchard was made in 1973 when some 6.5 lb. of seed was obtained.

(e) RADIATA PINE.—Some breeding work has been going on with this species for many years. Observations were continued on existing progeny trials, and some further grafting was carried out within the clonal seed production area at Passchendaele. This area, other small areas of this type, and the selected ortets provide a substantial proportion of the seed used locally.

NATIONAL PARKS

Recreation on National Parks

Queensland's National Parks are being called upon to meet an increasing public demand for the healthy recreation and educational opportunities they provide. Observations by Park Officers show that park visitation in Southern Queensland is now the equivalent of each person in that area making one visit per year to one of these parks. This usage is expected to continue to increase as it has in other affluent countries.

A typical example of this increased demand for outdoor recreation was provided by numbers of people who visited Carnarvon National Park over the 6-day Easter-Anzac Day break. This park is 480 miles west of Brisbane and preserves outstanding examples of sandstone cliffs and gorges, aboriginal relics, a wide range of birds and other animals together with samples of dry inland vegetation in close proximity to ferns, mosses and rain forest species. Over the 6-day holiday period some 2,000 people visited the park and about two-thirds of these visitors came from South-East Queensland. These people were prepared to travel long distances to reach the park and then to hike far into the gorges and camp away from the camp grounds. Camping facilities were provided in 1965; before that only a few hundred people visited the area each year, in that year there were 1,200 visitors. Factors contributing to this large increase are improved access, the appeal of the scenic attraction of the natural landscape and provision of well kept basic camping facilities.

It is good to see such appreciation of the parks by the public but in the case of the more popular areas it poses problems of management. There must be a proper balance between use and preservation of the environment and management must endeavour to prevent erosion of the natural values of these parks. In such areas expansion of existing facilities can aggravate the position and the solution lies in an expanded park system and provision of additional camping and picnic areas. In this regard the increased use of State Forests for recreation and the scope that now exists for Environmental Parks will assist and it is desirable that maximum use should be made of these and other areas for outdoor recreation.

Park Proposals

The 1968 Annual Report recorded the addition of a graduate Forester to the National Parks staff. This officer has been engaged almost exclusively in assessing major regions of the State to select areas which will best meet the objectives of representation of important habitats and provision of outdoor recreation in surroundings of high scenic quality. This work entails definition of these areas in the field, and submission of proposals. Consideration of alternate land uses, reference to other Departments as required by the legislation and other formalities involved, inevitably involve considerable time before a final decision can be reached on any proposal.

To date the assessment has been confined to the eastern coastal strip working from south to north. It has been completed as far north as Cape Melville and is now concentrated on Cape York Peninsula. Areas identified and proposed as National Parks in the course of this study now exceed one-quarter of a million acres in total area. The extent of development and alienation of land from Crown ownership restricted the choice of areas but, if it proves possible to set aside as National Parks the areas selected, a reasonable range of the original scenery and vegetation types will have been preserved for future generations to know and enjoy.

As indicated above, Carnarvon National Park is already under pressure from heavy visitation. Action is under way to seek additional areas for parks in this region, which with its extensive areas of ranges and sandstone gorges, still contains much magnificent scenery undisturbed by development.

Long ago dubbed "the home of the rivers", this region includes the headwaters of the Nogoa, Comet, Dawson, Maranoa and Warrego Rivers. Protection of their upper catchment areas and of the sandstone formations which are part of the intake beds of the Great Artesian basin would be assured under National Park tenure, and recreational opportunities similar to that now afforded by Carnarvon would be provided in greater measure. The possibility of extensive adjacent State Forests providing a largely natural landscape and additional wildlife habitat and recreation values adds to the attractiveness of the proposals. At the same time the area is rich in historical interests—of the Aboriginal people, of the explorations of Mitchell, Leichhardt and Kennedy, of early settlement, and of exploits of bush-rangers such as the Keniff Brothers and of cattle rustlers whose activities, facilitated by the nature of the topography, continued into the relatively recent past.

(f) MISCELLANEOUS TROPICAL PINES.—Major species-provenance studies of Ocote Pine, Benguet Pine, Tenasserim Pine and Caribbean Pine were planted on several coastal and upland sites in north and Central Queensland in 1968 and 1972. On some sites a British Honduras provenance of Ocote Pine has shown greatest height growth but Honduras Caribbean Pine appears more robust and more widely adapted. Benguet Pine has not been generally promising on the sites planted, and the continental provenance of Tenasserim Pine have been especially slow in growth. Unfortunately these trials lacked intensive site preparation and fertilising. Weedings and initial fertiliser applications were carried out during the year. There are several plantings of these 1968 and 1972 studies in south eastern Queensland also. Again Ocote Pine (BH) has grown rapidly on coastal lowland sites, but Honduras Caribbean Pine has a healthier appearance. Benguet Pine has generally performed poorly.

(ii) Hoop Pine

(a) SOUTH EASTERN QUEENSLAND.—A light to moderate flowering occurred in many plantations in 1972-73. Many clones in the Imbil and Yarraman seed orchards produced female flowers, while a few clones produced male flowers, in the older, Imbil orchard. In the latter orchard 58 per cent. of plagiotropic ramets and 8 per cent. of orthotropic ramets produced pollen. In the Yarraman orchard (early-flowering section), about 6,000 female flowers developed, an enormous increase in the number produced last year, reflecting seasonal and age effects.

Most of the flowers produced in both orchard sections were hand pollinated in the controlled crossing programme or were mass pollinated with H45 pollen (in the early-flowering section), and a mixture of H45 and H97 (in the late-flowering section), these pollens being from two orchard clones. It is anticipated that such artificial pollination will be necessary for several years in order to utilise the numerous female flowers produced during the long period before abundant pollen is shed within the orchard.

Further progress was made in stocking the seed orchard at Yarraman where establishment of early and late-flowering sections by field grafting was commenced in 1970 and 1971 respectively. Twenty-five of the thirty clones originally allocated to the early flowering section are now fully grafted and 78 per cent. of all grafts were well established by September, 1972. Establishment of pollinator grafts in this section is also well advanced.

A detailed survey of the Imbil seed orchard (field grafting was started in 1965) was carried out during the year. The orchard occupies 17 acres and at this stage there is an average stocking of 98 grafter stations per acre. There are actually some 2816 orthotropic ramets established (two grafts were made at almost all stations as a precaution against stockscion incompatibility). There are 12 early-flowering clones (two with very few ramets due to incompatibility) and 10 late-flowering clones. An assessment of flowering of individual and paired ramets indicated that stocking should be reduced to the single best plant per station, and this has been undertaken.

A review paper entitled "Biology and genetic improvement of *Araucaria cunninghamii* Ait. in Queensland, Australia" prepared by the Officer in Charge, Tree Breeding Section was published in *Selection and Breeding to Improve some Tropical Conifers*, 1973 (eds. J. Burley and D. G. Nikles).

(b) NORTH AND CENTRAL QUEENSLAND.—Hoop Pine provenance trials were planted again this year in the Atherton and Mackay districts using provenances and designs (4 replications of 36—tree plots in an incomplete block design) similar to those in the 1971-72 plantings but a different set of six open-pollinated families (identity preserved) represented each provenance. The 16 provenances comprise 10 tropical and six subtropical seed sources.

(iii) Miscellaneous

The Officer in Charge, Tree Breeding Section, prepared several papers for and served as joint editor of the two volumes of *Selection and Breeding to Improve Some Tropical Conifers*, which was published jointly by the Commonwealth Forestry Institute, Oxford, U.K. and the Queensland Department of Forestry. He also spent a month in West Malaysia in September 1972 on a consultancy with F.A.O.

The third meeting of Research Working Group No. 1 of the Australian Forestry Council held at Mt. Gambier, South Australia, in October-November, 1972, was attended by the Officer in Charge. One result of the 1972 meeting was a decision to establish committees to consider action required to conserve forest gene resources. A committee has been established in Queensland and it has begun to develop a conservation programme to supplement the work already underway.

The National Park Estate

As at 30th June, 1973, there were 289 National Parks with a total area of about 2,568,851 acres. Five new parks were declared during the year:

N.P. No.	Parish	Area	Date of Gazettal
		Acres	
68	Dunstable	2,986	16-9-72
1216	Kenilworth	64	17-2-73
1083	Numinbah	345	24-3-73
1468	Bellenden Ker	2,000	24-3-73
2492	Redcliffe	231	23-6-73

The following areas were added to existing parks:

N.P. 60 Ossa	105 acres
N.P. 340 Weyba	33 acres
N.P. 465 Numinbah	12½ acres



Creek scene and epiphytes—Natural Bridge National Park—Springbrook.

However as a result of recomputation of area from more accurate boundary information the previous area of N.P. 340 Weyba was reduced by 18 acres and N.P. 465 Numinbah by 72½ acres. An area of 60 acres was excised from N.P. 880 Cairns and Smithfield for a Reserve for Electrical Works purposes.

Brief notes on the five new national parks follow:—

NATIONAL PARK 68, PARISH OF DUNSTABLE is located on the eastern fall of the Snake Range, about 35 miles west of Springsure. Its main feature is a hidden basin where some 1,800 acres of undisturbed vegetation is protected by surrounding sandstone cliffs up to 200 feet high. Several creeks in this basin exist through a narrow gap which forms its only entrance.

As a weathered geological formation it is very unusual and quite fascinating scenically. For this vegetation belt, vegetation is lush and varied with abundant wildlife.

NATIONAL PARK 1216, PARISH OF KENILWORTH was a Recreation and Scenic Reserve vested in the Commissioner of Main Roads. While its main feature is the Mapleton Falls, the vegetation is varied and interesting ranging from rain-forest with an abundant fern flora to open eucalypt forest. Fine views of the Obi Obi Valley are available from vantage points within the Park.

NATIONAL PARK 1083, PARISH OF NUMINBAH was a Scenic Reserve under the Commissioner of Main Roads and made available by that Department for National Park purposes. The area contains some fine forest country of considerable scenic appeal ranging from tall layered sclerophyll forest on the lower slopes to a true wet sclerophyll forest in its higher western regions with minor occurrences of gully rainforest and tall grassy forest. The Park is located along the Gold Coast—Springbrook main road above the Little Nerang Dam and its reservation will help to preserve the present scenic approach to the Springbrook plateau.

NATIONAL PARK 1468, PARISH OF BELLENDER KER is situated in high rugged country on the eastern fall of the Bellenden Ker Range to the west of Babinda. It serves as a connecting link between the northern and southern severances of the existing Bellenden Ker National Park and affords protection to the steep country adjoining that Park.

NATIONAL PARK 2492, PARISH OF REDCLIFFE was a Scenic Reserve under the control of the Commissioner of Main Roads, located within 20 miles of the centre of Brisbane on the Brisbane—Redcliffe Road. The Park contains an almost undisturbed sample of the natural vegetation of an area where development is intense and will become very much more so. The area contains open grassy forest and woodlands showing little evidence of any past disturbance.

Fauna Surveys

Two graduate zoologists took up duties with National Parks Branch during the year. One is stationed at Atherton and is responsible for fauna surveys on existing Parks, inspection of certain Park proposals and research work on specific native animals in the north Queensland region. The other, based in Brisbane, will carry out similar work in south-east Queensland.

National Park staff employed on fauna work now stands at four graduate zoologists and one technical assistant.

Following the elimination of goats on the Bunker Group Islands (Lady Musgrave, Hoskyn and Fairfax Island National Parks) early in 1971, a team of two shooters led by a graduate zoologist removed approximately 600 goats from Brampton Island National Park. It is hoped to extend this work to other island Parks.

A pig trap was erected on Southwood National Park.

A study on the effects of control burning on native fauna is continuing. This work is being centred on Bauple State Forest outside Maryborough.

Marine National Parks

Delivery was taken of three National Park Boats—two 30 feet aluminium Strikers, M.L. "Gannet" and M.L. "Shearwater", and a 22 feet fibre glass jet boat, M.L. "Whimbrel."

The "Gannet" is stationed at Cardwell and a skipper has been appointed; the "Shearwater" will be based at Gladstone and the "Whimbrel" will remain at Brisbane.

The only other National Parks boat, "Curlew", is based at Shute Harbour.

Two Marine Biologists have been appointed to carry out the initial marine National Park work. It is expected that they will commence duties early in the new financial year.

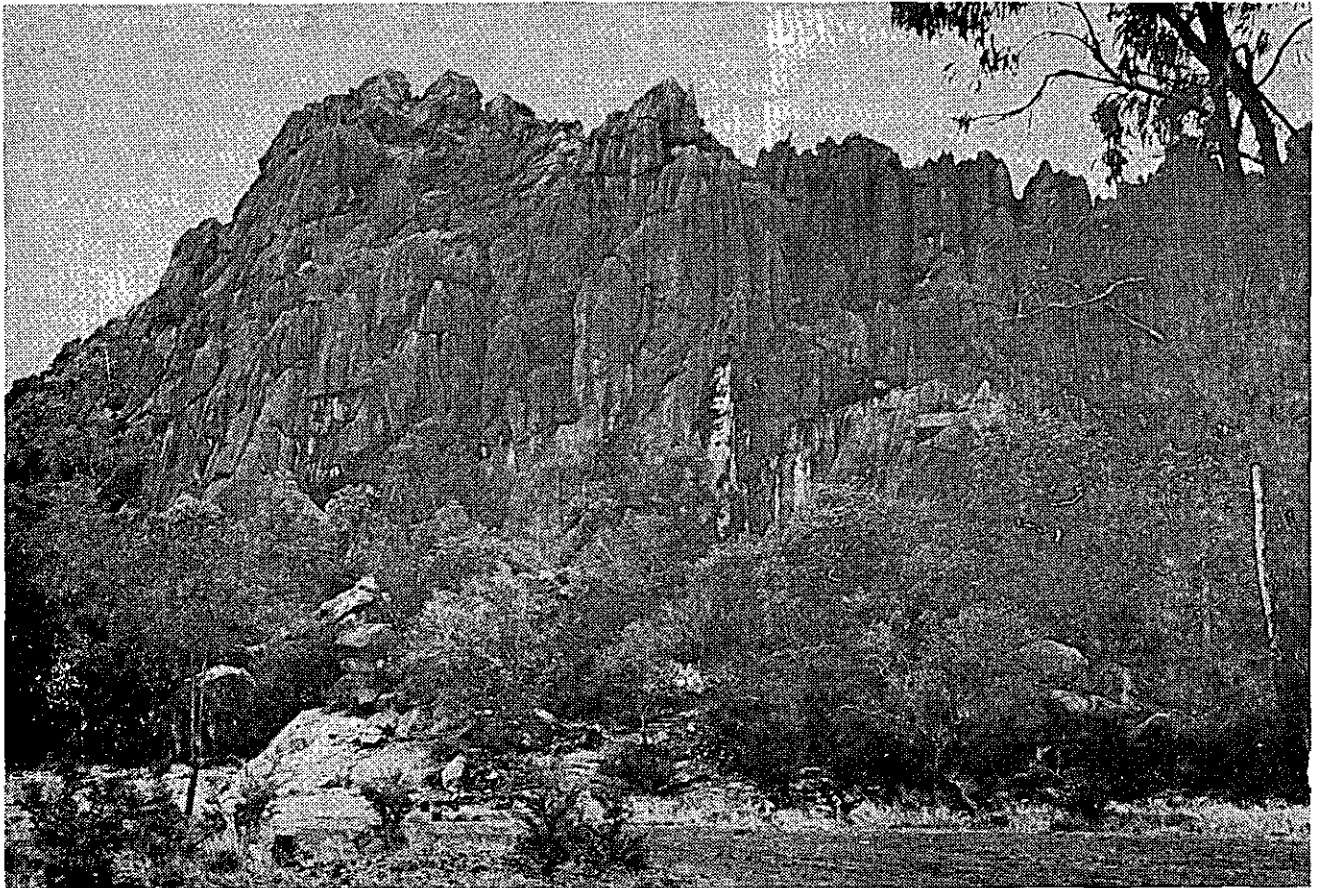
The Forestry Act sets out that, before any National Park can be set aside over the sea bed and waters above, the Governor in Council must first proclaim a Marine Park Area extending seawards from the mean high-water mark at spring tides. The outer limits of such an Area shall be defined by the Governor in Council in the Proclamation.

This merely defines an area on which the State relies as being territory within its control and within which it may set aside marine National Parks. The declaration of a Marine Park Area does not, in itself, impose any restrictions whatever within such area.

Two Marine Park Areas have been proclaimed and two National Park proposals within these Areas are presently being considered.

Publications and Publicity

National Parks Staff were called on to give a number of lectures during the year on topics associated with National Parks. Audiences included tertiary educational establishments, schools and service clubs as well as a range of conservation organisations. During the year a map of Girraween National Park was drawn and printed and the Lamington map was reprinted.



Entrance to Royal Arch Caves—Chillagoe National Park—Atherton District.

Staff

Two graduate Zoologists took up duty during the year. Vacancies for two Marine Biologists were advertised and successful applicants should be appointed early in the next financial year.

Specialist graduate staff now stands at—

- Two Foresters—park proposal investigations
- One Forester—visitor facilities and park management
- Three Zoologists—fauna surveys and research
- One Botanist—botanical surveys and research
- Two Marine Biologists—(not yet taken up duty)
- One Forester—(not yet taken up duty).

In addition there is a Technical Assistant working on fauna studies and a fourth graduate Zoologist has been given employment on the wages staff pending a more suitable position becoming available. This technical staff is essential if an adequate system of parks is to be established, managed on a sound scientific basis and made available to the public in such a way that a visit to a National Park becomes the truly rewarding and enriching experience that it should be.

As at 30th June, 1973, there was a field staff of 85 including four Rangers and 28 Overseers.

Overseas Conferences

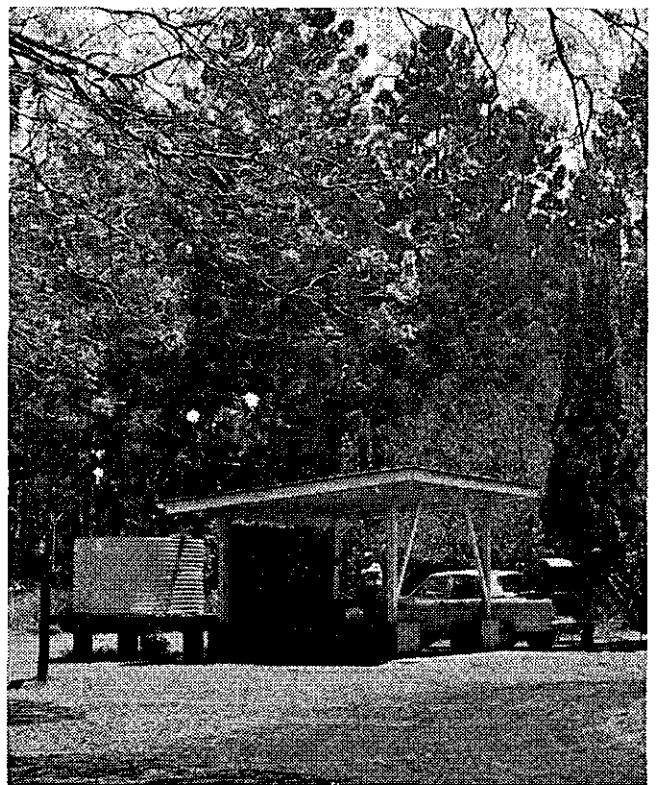
The Officer in Charge, National Parks Branch, Mr. H. S. Curtis, represented the Queensland Government at the Second World Conference on National Parks and also attended as an observer, the General Assembly and Technical Meeting of the International Union for the Conservation of Nature and Natural Resources (IUCN). These were held in the United States and Canada during September, 1972. Mr. Curtis also visited the Washington Headquarters of the United States National Park Service to discuss park administration and inspected a number of parks relevant to Queensland.

Mr. Curtis reported that not only would the conference papers and other documents provide a wealth of reference material and expert guidance on all phases of park management which will be of inestimable value in the administration of Queensland's parks but that the discussions and stimulation of ideas and the opportunity to meet at a personal level scientists of international standing in conservation and related fields was particularly valuable to a National Parks Officer. He expressed gratitude to the Queensland Government and the Department for supporting his attendance at the conferences and to IUCN for the invitation to attend its meeting as an observer.

The Canadian and United States nations and their National Park Services are to be commended for their outstanding generosity in hosting these two important Con-

ferences and it is desired to pay tribute to them and to IUCN for the excellent organisation. There are formidable problems associated with such multi-lingual meetings and all conference delegates were deeply indebted to the IUCN staff who worked far into the night to prepare, type and duplicate translations into the official conference languages to allow the next days activities to proceed.

Following consideration of a report on the IUCN Meeting, the Department has applied for membership and subject to ratification by the next General Assembly of the Union has been accepted as a member organisation.



Rogers Park Recreation Area, State Forest 289
Cooyar-Yarraman District.

Expenditure

During 1972-73 an amount of \$479,014.82 was spent on National Parks. Of this amount \$35,609.23 was spent on Marine National Parks, \$406,047.27 on Terrestrial Parks and the balance on miscellaneous items.

An overall breakdown of expenditure on Terrestrial National Parks is as follows:—

Works Description	Amount Spent \$
1. General overheads (leave, holidays, wet time, camp allowance, tools and equipment, cartage and freight, general supervision, &c.)	112,700.87
2. Fire detention, fire fighting and patrol ..	2,828.22
3. Planting and tending trees (on areas other than picnic and camping areas), eradication of declared noxious plants or other plants not native to the area ..	4,754.11
4. Track location and survey	1,083.56
5. Track construction and improvements ..	14,338.05
6. Track maintenance	56,938.56
7. Construction of picnic ground facilities (shelter sheds, barbecues, fireplaces, tables, seats, toilets, entrances, &c.)	31,066.12
8. Maintenance of picnic facilities (items listed under 7, mowing, tidying of grounds, rubbish disposal, cleaning of toilets, &c.) ..	75,269.92
9. Miscellaneous construction works (landings, jetties, parking areas, foot-bridges, lookouts, roads, fencing, &c.) ..	29,942.67
10. Maintenance of miscellaneous improvements	2,439.73
11. Construction of camping area facilities (ablution blocks, barbecues, fireplaces, tables, toilets, entrances, &c.)	15,612.08
12. Maintenance of camping areas	7,955.47
13. Erection of general signs	3,232.32
14. Maintenance of general signs	3,158.75
15. Construction of accommodation facilities for staff	14,035.43
16. Maintenance of accommodation and facilities for staff	5,666.85
17. Maintenance of Aboriginal relics (Bora grounds, paintings, &c.)	92.58
18. Special research projects	1,558.98
19. Construction of interpretative facilities (explanatory signs, name plating of trees, self guiding tracks, museums, literature, &c.)	177.51
20. Maintenance of interpretative facilities ..	109.86
21. Law enforcement and public information patrols	11,896.77
22. Boundary surveys	6,259.47
23. Construction and maintenance of firelines and prescribed burning	4,938.39
	<u>\$406,047.27</u>
Miscellaneous	\$37,358.32
Marine National Parks	\$35,609.23
TOTAL	<u>\$479,014.82</u>

HARVESTING AND MARKETING**General**

The most outstanding feature of the year's activities was the record harvest of milling timber from Crown timber areas, due mainly to the increasing supply of Plantation grown timber and Cypress Pine, both of which species groups also yielded record volumes.

During the year, two lots each of 1.5 million superficial feet (Hoppus) per annum of Exotic Plantation saw-log timber were offered for sale from the large and developing Toolara-Tuan "man made" forests east of Gympie and Maryborough. These sawlogs are additional to the pulpwood already supplying a particle board plant in Brisbane and were purchased by established local sawmillers.

The market for Cypress Pine particularly was buoyant during the year due largely to the increasing demand for this timber in the metropolitan and near coastal areas as well as in the rapidly expanding mining towns of Central Queensland.

There is a large volume of Cypress Pine growing in Crown forests in the vicinity of Injune, Mitchell, Mungallala and Augathella in excess of the licensed capacities of the existing mills in this region and action was proceeding at the close of the financial year towards offering for sale at auction about 15 million superficial feet in lots of varying amounts to give existing sawmillers the opportunity to increase their levels of production and also to permit the establishment of two new sawmills each with annual log supplies of five million superficial feet. This sale will take place before the end of December 1973.

These additional supplies of Crown Plantation Pine and Cypress Pine becoming available will help to offset the diminishing supplies of private timber, and help the house building programme which is being affected by shortages of all material.

Pulpwood Logging

During the past year, the harvest of pulpwood from plantations of various coniferous species has increased by over 50 per cent. to a total of 15.7 million superficial feet (Hoppus).

The yield of Hoop Pine has remained fairly steady at about 6 million superficial feet but for Slash Pine has increased from 2.9 million to 7.3 million superficial feet and for Loblolly Pine from 0.6 million to 1.2 million superficial feet. Patula Pine from the Pechey area is also now being harvested for pulpwood and a yield of 0.4 million superficial feet was reached for the year.

Increased quantities of forest hardwood for pulpwood were also operated during the year from State Forests in the Gatton area, and the harvest, on a thinning basis, was in excess of 13,000 tons, equivalent to about 3.4 million superficial feet Hoppus.



Slash Pine sawlogs from the Beerburum Plantation—Brisbane District.

Integrated Logging

In areas where there is a demand for pulpwood steps have been taken to upgrade the quality of log for sawing by the introduction of integrated logging. This entails the diversion to pulpwood of trees too small for sawmilling or better suited to pulpwood production by reason of poor form and of the tops of mill logs cut off at 6 inches diameter under bark.

This type of integration commenced with Hoop Pine in the Mary Valley in 1971 and extended to the Beerburum Sub-District in 1972. During the past year it was further extended to the Tuan-Toolara plantations of Slash Pine where pulpwood is harvested for a particle board factory, and to Pechey and Palen Creek where Patula Pine and Hoop Pine are harvested for a hardboard factory. It is hoped further to extend the system to the Murgon District in the coming year.

Stumpage Increases

During the year, action was taken to increase stumpage rates with the object of restoring them to the same level of real value as obtained in 1966, the time of the last major adjustment of stumpage rates. In general this entailed an overall increase of about 25 per cent. In the course of discussions with industry it was agreed that in future stumpage values would be reviewed at two yearly intervals on the basis of changes in the Consumer Price Index. This aims at

maintenance of real values and does not prevent consideration of stumpage levels for particular reasons such as results from mill studies, changes in market locations or standards of utilisation.

Average Locality Pricing

In an endeavour to simplify procedures for the sale of plantation timbers, a system of "Average Locality Pricing" was introduced in 1971 in the Beerburum area with the co-operation of the section of the industry concerned, and this system was extended during the year to most of the plantation areas on which logging is carried out.

Examination of residual stumpage assessments had shown that for a given average predominant height of stand, there was very little variation in respect of assessed costs of felling and snagging. In the average locality pricing system the haulage allowance is assessed for a central point located as average for two years' operations for a fairly large defined area, such as a whole Reserve or a group of Reserves, to determine an average total harvesting allowance for each 10 feet predominant height class.

In addition to the benefit to this Department from the simplification of procedures, purchasers can be advantaged by locating operations as close as possible to their mills, consistent with management requirements.

Automatic Data Processing—Computing of Log Timber Invoices.

During the latter half of the year, stumpage accounts prepared manually and measure records for automatic computer processing were prepared and processed at the same time for log timber other than Plantation timber throughout the six Forestry Districts of the South-east part of the State, to ensure hitch-free change to computer processing only of these invoices from 1st July, 1973.

Automatic processing by computer of log invoicing will be extended to all Districts and for Plantation Timbers as soon as practicable.

The major benefits of the computer in this work are:—

- (1) the reduction of office work of local Forest Officers affording them more time for important field duties;
- (2) the avoidance of errors of transcription arising from the previous system of copying log measurements and relevant data from field books into stumpage accounts;
- (3) the better appreciation of the value of individual logs, particularly in relation to girth class and extent of defect which will permit a more rational log pricing system to be evolved; and
- (4) the more rapid and more extensive availability of necessary and desirable statistical data in relation to the Crown log timber industry.

Mill Logs—Crown Lands

The following are the annual quantities of Mill Logs obtained from Crown Lands for the past ten years.

Year	Super. feet (Hoppus)
1963-64	212,000,000
1964-65	229,000,000
1965-66	241,000,000
1966-67	212,000,000
1967-68	227,000,000
1968-69	227,000,000
1969-70	234,000,000
1970-71	223,000,000
1971-72	234,000,000
1972-73	246,175,150

Rosewood

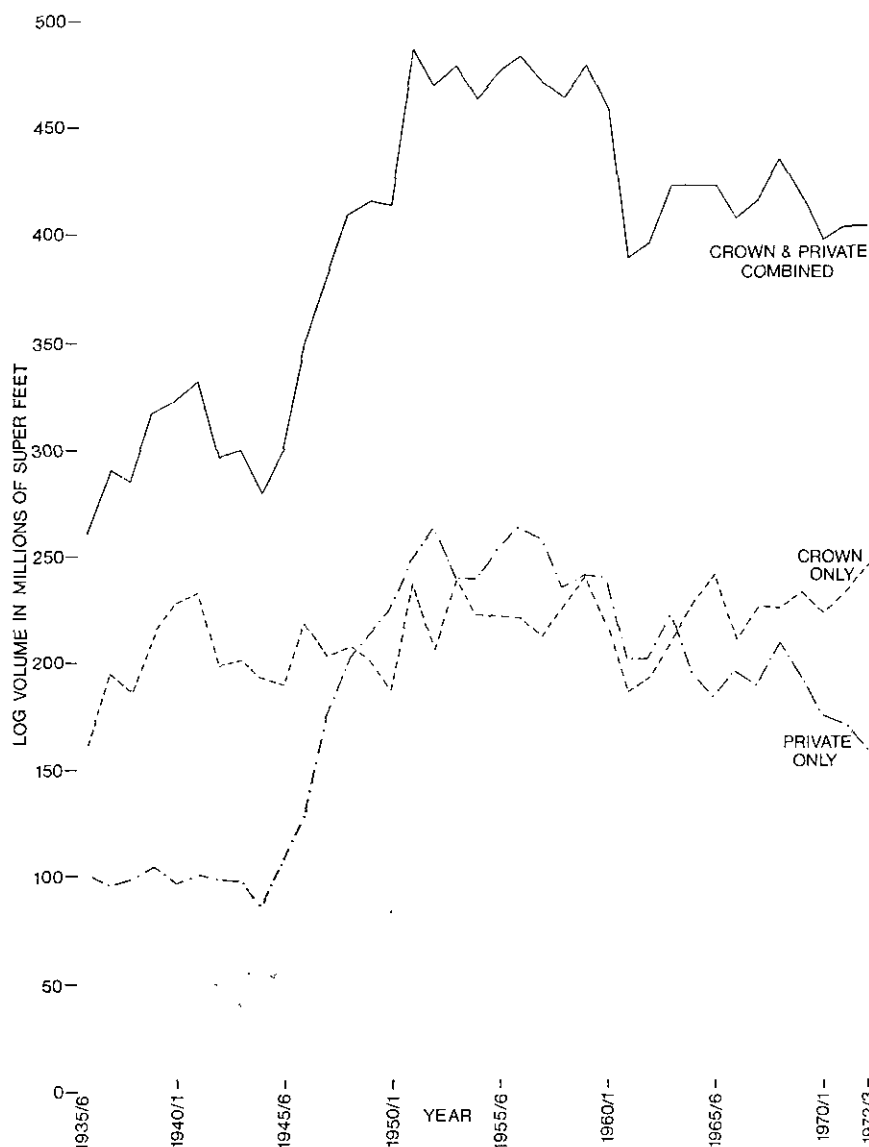
No Rosewood or Sandalwood was purchased or exported to Hong Kong during the year.

Dealers in Hong Kong are obtaining supplies of a low quality Sandalwood from Indonesia and China.



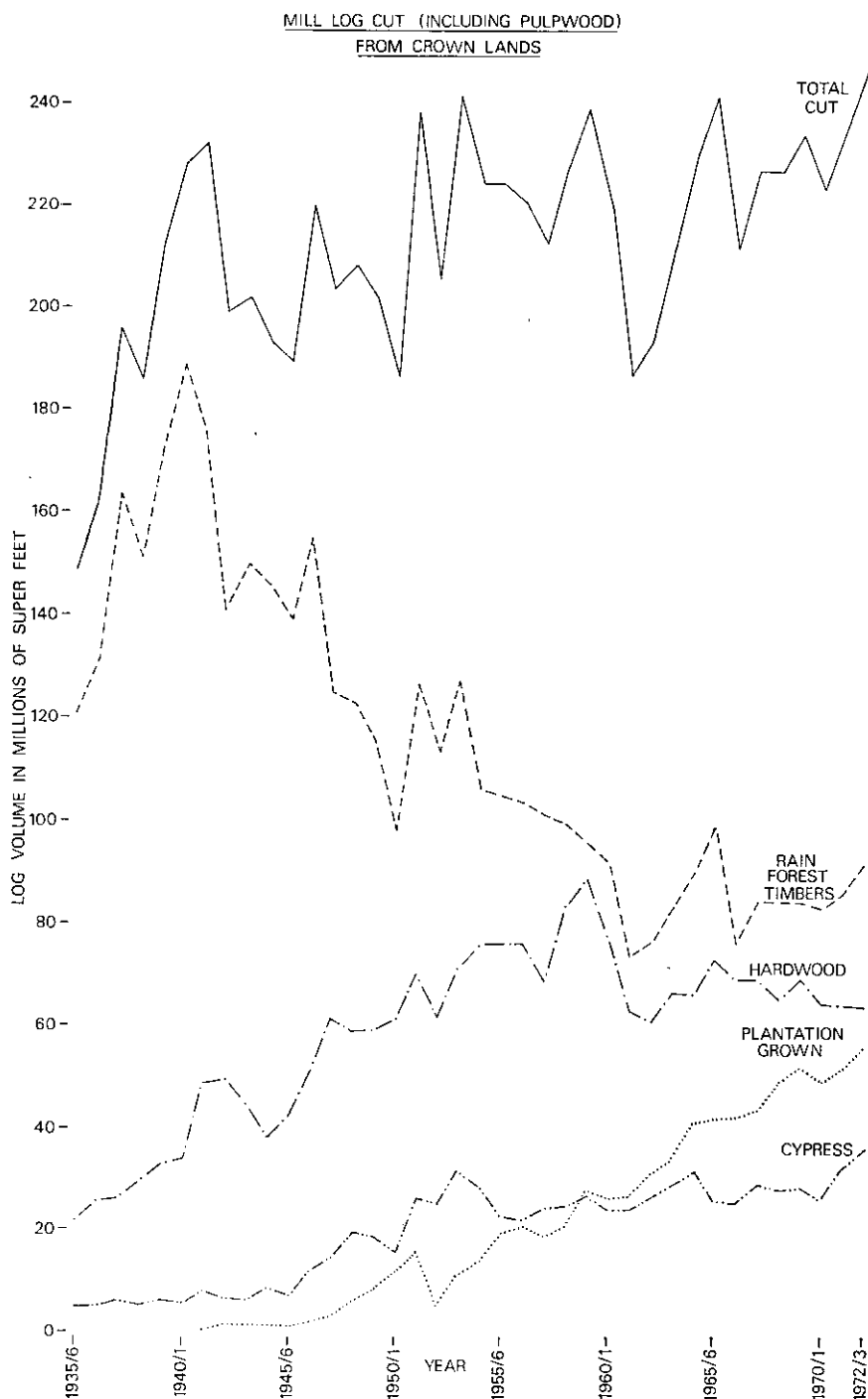
Marking a tree for harvesting, Sunday Creek State Forest, near Kenilworth-Murgon District.

MILL LOG CUT FROM CROWN AND PRIVATE LANDS



LOGS CUT FROM CROWN FORESTS AND PRIVATE LANDS

Year	Queensland Grown										Im-ported	Total
	Hoop and Bunya Pine	Kauri Pine	White Cypress Pine	Forest Hardwoods		Scrub Hard-wood	Cabinet Woods	Miscel-laneous Species	Plantation Timbers			
				Saw Logs	Pulp-wood				Saw Logs	Pulp-wood		
(1,000 superficial feet Hoppus)												
1968-69 ..	24,229	1,877	54,313	210,693	..	19,245	21,271	45,189	42,878	6,341	11,062	437,098
1969-70 ..	19,452	1,855	60,024	188,094	..	17,934	21,236	45,231	43,772	8,821	12,383	418,802
1970-71 ..	16,121	2,872	59,182	174,526	..	16,465	20,682	42,800	41,957	8,185	16,679	399,469
1971-72 ..	19,939	2,366	63,477	172,034	..	18,216	21,299	41,688	41,601	10,078	14,225	404,923
1972-73 .. (Estimated)	21,542	2,927	67,371	142,854	14,598	23,223	17,707	42,100	41,635	16,306	14,821	405,084



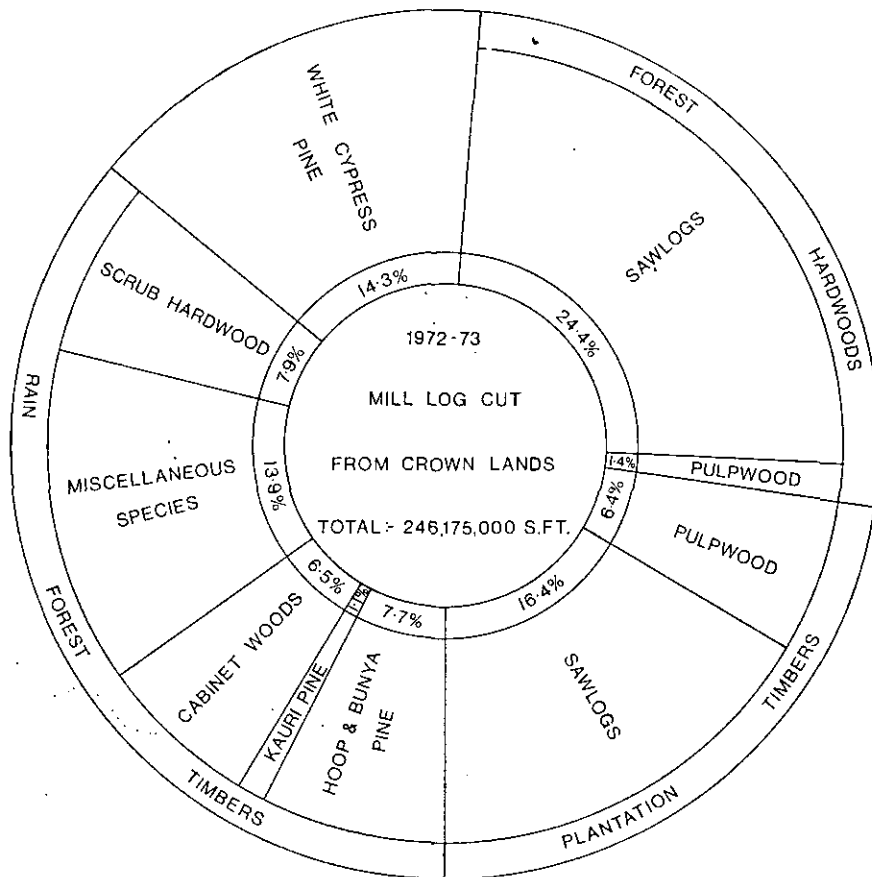
MILL LOGS CUT—CROWN LANDS

A comparison of quantities of various species of log timber cut from Crown Forests during the past five years is illustrated hereunder:—

Year	Hoop and Bunya Pine	Kauri Pine	White Cypress Pine	Forest Hardwoods		Scrub Hardwoods	Cabinet Woods	Miscellaneous Species	Plantation Timbers		Total
				Saw Logs	Pulpwood				Saw Logs	Pulpwood	
(1,000 superficial feet Hoppus)											
1968-69	20,211	1,811	27,933	65,257	..	13,834	17,866	30,864	42,966	6,341	227,083
1969-70	16,832	1,799	28,428	68,576	..	15,383	17,745	32,752	43,182	8,821	233,518
1970-71	14,813	2,401	26,508	64,783	..	15,749	17,204	32,570	40,397	8,185	222,610
1971-72	17,167	2,013	32,211	63,945	..	17,215	17,555	32,420	41,426	10,078	234,030
1972-73	18,996	2,715	35,147	60,174	3,430	19,574	15,978	34,141	40,344	15,672	246,171

LOGS CUT FROM PRIVATE LANDS

Year	Hoop and Bunya Pine	Kauri Pine	White Cypress Pine	Forest Hardwoods		Scrub Hardwoods	Cabinet Woods	Miscellaneous Species	Plantation Timbers		Total
				Saw Logs	Pulpwood				Saw Logs	Pulpwood	
(1,000 Superficial feet Hoppus)											
1968-69	4,018	66	26,380	145,436	..	5,411	3,405	14,325	..	..	199,041
1969-70	2,620	56	31,596	119,518	..	2,551	3,491	12,479	590	..	172,901
1970-71	1,308	471	32,674	109,743	..	716	3,478	10,230	1,560	..	160,180
1971-72	2,772	353	31,266	108,089	..	1,001	3,744	9,268	175	..	156,668
1972-73	2,546	212	32,224	82,680	11,168	3,649	1,729	7,959	1,291	634	144,092



The Timber Business (Crown Lands)

	1971-72	1972-73
(a) Mill Logs—		
Hoop and Bunya Pine	17,167,113 super. feet	18,995,837 super. feet
Forest Hardwoods—		
Saw Logs	63,944,859 super. feet	60,173,909 super. feet
Pulpwood .. .. .	.. .. .	3,429,928 super. feet
Scrub Hardwoods	17,214,728 super. feet	19,574,639 super. feet
White Cypress Pine	32,210,906 super. feet	35,146,533 super. feet
Kauri Pine	2,013,258 super. feet	2,715,330 super. feet
Cabinet Woods	17,555,300 super. feet	15,978,132 super. feet
Miscellaneous Species	32,420,125 super. feet	34,141,376 super. feet
Plantation Timbers—		
Saw Logs	41,426,486 super. feet	40,343,813 super. feet
Pulpwood	10,078,119 super. feet	15,672,292 super. feet
Limb Logs, Head Logs, Stumps and Flitches ..	13,370 super. feet	3,361 super. feet
	234,044,264 super. feet	246,175,150 super. feet
(b) Construction Timbers—		
Headstocks, Transoms, Crossings, Braces, &c.	400,724 super. feet	200,001 super. feet
Sleepers	535,938 pieces	574,716 pieces
Girders, Corbels, Piles, Sills	63,353 lineal feet	68,279 lineal feet
Girder Logs	80,020 super. feet	38,537 super. feet
Poles	92,457 lineal feet	97,543 lineal feet
House Blocks	1,166 lineal feet	4,514 lineal feet
Mining Timbers—Round	302,450 lineal feet	539,260 lineal feet
Mining Timbers—Sawn	Nil	158,482 super. feet
Gross receipts from Timber Sales, &c.	\$5,524,382.62	\$6,065,105.56
Net Revenue	\$2,855,681.79	\$3,134,013.92

Timber Felling and Timber Getting Award—State

The minimum weekly rates which the average competent cutter should be enabled to earn whilst using a suitable portable mechanised saw were increased during the year on three occasions with a total increase ranging from \$21.39 to \$27.64 depending on species and locality.

Logging Roads

The department's Roads programme for the year involved 69 miles of construction.

Location and working surveys covering 39 miles were carried out.

Expenditure from Forestry votes was as follows:—

	\$
New Construction	505,439
Maintenance	226,270
Subsidies to Shire Councils	44,097
Surveys	13,574
Pay Roll Tax	11,009
Workers' Compensation	4,893
Fares and Freights	2,367
	<hr/>
	807,649

Typical of the logging road construction jobs carried out by this Department is the Coolamon Creek Forestry Road of 3.5 miles completed in the subject year.

This road now affords more direct access from Gympie for the harvesting of about 18 million superficial feet of hardwood and pine milling timber in the Coast Range area

of the Murgon Forestry district. There was no other road access into this State Forest area from the East for about 20 miles from Kilkivan to Kandanga, and these alternative routes are much longer and more circuitous from Gympie. The new road is therefore of considerable value also for forest fire control and administrative purposes.

Steep and rocky slopes had to be negotiated by this road which was located and constructed to a standard suitable for log haulage entirely by Departmental employees and equipment for a total cost of about \$31,222.

Logging

The table below shows the quantities of log timber hauled during 1972-73 by contractors to the Department and the payment made to them for this work:—

Class	Quantities	Payments
South Queensland—	Super. feet	\$
Hoop and Bunya Pine	11,369,071	} 313,383.72
Forest Hardwoods	—	
Scrub Hardwoods	115,451	
Miscellaneous	198,841	
Red Cedar	6,605	
	<hr/>	<hr/>
	11,689,968	313,383.72
North Queensland—		
Cabinet Woods	730,404	21,458.86
Totals	<hr/>	<hr/>
	12,420,373	334,842.58

Constructional Timbers—Departmental Contracts

Below are shown quantities of constructional timbers obtained from Crown lands for year 1972-73, in comparison with those for the two previous years:—

Class of Timber	1970-71	1971-72	1972-73
Sleepers	241,877 pieces	294,930 pieces	315,952 pieces
Crossings	166,666 super. feet	189,257 super. feet	31,939 super. feet
Transoms	106,505 super. feet	112,385 super. feet	97,058 super. feet
Bridge Timbers—Girders and Piles	19,781 lineal feet	26,098 lineal feet	28,139 lineal feet
Girder Logs	96,174 super. feet	80,020 super. feet	38,537 super. feet

SAWMILLS LICENSING

The Sawmills Licensing Committee met at regular intervals during the year to consider matters relating to Sawmills Licensing and submitted recommendations as required.

During the first three quarters of the year the average number of mills in active operation was 403. Figures are not yet available for the final quarter.

The following table shows the position in respect to Sawmill Licenses as at 30th June, 1973.

Number of Licenses as at 30-6-72	Classification	New Licenses Issued	Licenses not Renewed			Licenses as at 30-6-73
			With-drawn for Amalgamation	Re-fused	Relin-quished	
401	General Purpose Mills	3	9	1	3	391
50	Other than General Purpose Mills	12	..	..	1	61
451		15	9	1	4	452

The increase in the number of Other than General Purpose Mills reflects the high demand for sawn sleepers which existed over the past year. Numerous applications for Licenses for this type of mill were received and granted where it was considered that such issue would not aggravate the supply position of existing mills. In such cases conditions and restrictions were imposed as necessary to safeguard supplies of milling timber for the existing industry.

Industry has continued to take advantage of the Department's amalgamation policy and a further nine licenses have been withdrawn following participation of the mills concerned in amalgamation.

Offences

During the year ended 30th June, 1973, officers reported 140 breaches of the Forestry Act.

Proceedings were successfully instituted against three persons; fines totalling \$141 were imposed and an amount of \$7.50 was recovered.

In 41 cases of unauthorised interference with timber and other forest products where it was considered that the offences did not warrant proceedings the value of the timber or other forest products was collected and warnings issued; an amount of \$8,673.96 was recovered in this manner.

In addition 11 breaches of the Rural Fires Act investigated by officers of the Department in their capacity as Fire Wardens were the subject of further appropriate action.

As the result of action taken in all cases, an amount of \$14,592.07 was recovered by the Crown in timber revenue and a further \$1,835.32 by way of fines, and in recovery of investigation and other costs.

FOREST PRODUCTS RESEARCH

General

Heavy demands on staff and facilities have resulted from the high level of demand prevailing in the building industry, from impending metrication and from rapid technological changes within the timber industry itself. New developments involve all aspects of the industry and this is necessary if timber is to retain its prominent position as a building material in the face of competition from other materials.

It is therefore essential that the timber industry should organise to ensure that the level of research is adequate to its needs. In this regard it appears that growing and processing industries will need to undertake a greater share of local development and promotion work and it is most important that co-operation with the Timber Research and Development Advisory Council should continue to grow.

Some progress has been made towards the provision of new laboratory accommodation to permit expansion of the Department's activities in the field of forest products research but it will still be some considerable time before this is achieved. Meanwhile it has been possible by re-organisation to expand work in the field of utilization research and to effect a minor increase in the number of technical staff.

Officers have been heavily involved in work associated with the development of Australian Standards and this work load has been heightened by the requirements for metrication of the many timber standards. Assistance has also been given to educational and other organisations by the provision of instructional staff for timber courses and seminars. Whilst this activity interferes with other work it is fully justified by its long-term benefits to the industry as a whole.

TIMBER CONVERSION SECTION

At Maryborough the West Indian Dry-wood Termite, *Cryptotermes brevis* continues to cause concern. During the year fumigation was carried out on all infested premises found by survey; those in Maryborough were all confined to a very restricted area but there was identified a small and apparently localised infestation in Brisbane. A re-survey of the infested areas is being implemented and evidence suggests that the insect is probably still contained within the area under detailed surveillance. Discussions with the Commonwealth Government are in progress to effect a joint approach aimed at eradication.

Four officers of the Branch attended the 16th Forest Products Research Conference in Melbourne during the year and there was also representation at the Australian Timber Industry Stabilisation Conference at Maryborough and meetings of various research working groups.

THE TIMBER USERS' PROTECTION ACTS

The number of formal complaints lodged with the Department was four more than last year and totalled 51; 49 of these were from in and around Brisbane, and two from country areas. This reflects to some degree the relative levels of building activity in these areas but there is also a lack of knowledge in country areas of the protection afforded to timber users by the Acts. It is planned to help overcome this by increased extension activity.

Investigation of new complaints and of some others carried over from the previous year led to one prosecution and the conviction of the offending party.

Thirty-three complaints were satisfactorily resolved consequent on remedial action taken during or following our investigation and these complaints were withdrawn; the remainder proved to be outside the provisions of the legislation.

Several of these latter complaints lapsed because they involved species not listed as Lyctus-susceptible in terms of these Acts. This reflects the wider utilisation of indigenous and imported timbers and action is being taken to expand by 137 the Schedule of susceptible species.

In addition to the investigation of complaints, routine inspections were made of some 250 building operations in Brisbane and at several country centres. As well as checking for Lyctus-susceptible material, these inspections provide an opportunity to note current trends in the building industry and to provide advice to builders on aspects of timber utilisation.

Testing for moisture content and preservative treatment under the provisions of the Acts was carried out on samples submitted during the year by the public, industry and Government construction authorities. This provides a necessary service to timber users and permits in these fields surveillance of the level of efficiency of producers so that remedial action may be taken where necessary. It is of interest to note that only 4 per cent. of preservative treatment samples and 7 per cent. of seasoned timber samples received failed to comply with requirements and these were brought to the notice of the producers concerned.

(i) Sawmill Economics

The year under review saw a resumption of mill studies at commercial mills operating on plantation softwoods. The studies were associated with the introduction of integrated logging of pulp and mill logs, and were aimed at determining the sawing characteristics of, and rate of production from, stems cut to six inches top diameter. Previous production studies on plantation species had been on stems cut to four inches top diameter, and reliable comparative data was required.

Two studies were carried out with the co-operation of the sawmillers concerned, at Amamoor on Hoop Pine and at Caboolture on Slash Pine. At each centre, three areas of widely differing predominant heights were sampled and the stems batched in three inch g.b.h. classes for study. Preliminary collation of data is complete but the results have not yet been considered in any detail. It is proposed to supplement these data with studies of sawn and grade recoveries at the Department's research sawmill.

The series of studies on Brush Box has been finalised. They indicated that some pricing relief was warranted, in comparison with other hardwoods, at the upper and lower ends of the size range. This has been implemented in the form of increased compulsory pipe allowances in these sizes. An attempt to relate tree type and log form to the quality of seasoned output in this very limited sample failed to reveal any worthwhile patterns which might have had application in tree marking practices.

A marketing, conversion and utilization problem at Gladstone with the high-volume species Sydney blue gum from the Winterbourne area was investigated where the species is at the northern limit of its natural range. Following field and mill studies, recommendations were made for the delineation of potentially troublesome material in the field and for its segregation and handling in conversion for this particular market, which is predominantly for larger framing sizes.

Sawing studies carried out at the experimental sawmill at Salisbury during the year were as follows:—

(a) SLASH PINE/CARIBBEAN COMPARISON

As foreshadowed in the previous report, material from 20 year-old paired plots of Slash and Honduras Caribbean pines at Toolara was studied as the first of a series of sawing trials aimed at comparing the productivity of the two species on a range of sites in the south-east of the State.

For each species stems were selected to sample stem size and straightness in terms of frequency occurrence in the stand and the paired plots studied covered a range of site qualities. Thus, while the composition of the actual samples differed, each was representative of the particular species on the site sampled.

Logs were sawn to best advantage and the resulting material graded after seasoning. While slash pine exhibited a higher recovery on an individual size class basis this was more than outweighed on a whole stand basis by the effect of the higher recovery from larger logs associated with the faster growth of Caribbean Pine. Caribbean Pine also showed some advantage in graded quality as shown in the table below:—

SEASONED RECOVERIES

Site Quality	<i>P. caribaea</i>					<i>P. elliottii</i>						
	R Per cent.	Per cent. by Grade*					R Per cent.	Per cent. by Grade*				
		1	2	3	4	5		1	2	3	4	5
Higher	55.8	4.3	S.I. 91 and 100			21.3	52.1	1.7	S.I. 86 and 90			23.7
Lower	51.9	2.8	S.I. 80 and 86			20.1	50.5	1.9	S.I. 80 and 81			29.3
Overall	53.9	3.6	0.5	38.0	38.6	20.7	51.3	1.8	0.2	35.3	33.3	26.4
			0.9	37.2	37.6				0.6	35.7	35.5	

* Grades in accordance with AS 108-1969

These two factors when considered in combination show for the Caribbean Pine an appreciable advantage in productivity over Slash Pine for the range of sites in these plots. Similar studies are proposed from other areas.

(b) CYPRESS PINE GRADED QUALITY

A study was carried out to investigate in Cypress Pine in the Cecil Plains-Millmerran area the behaviour of dry, bark-encased knots in flooring material after seasoning and dressing.

Log samples were drawn from a virgin area and from two re-cut stands. Analysis of data is not complete.

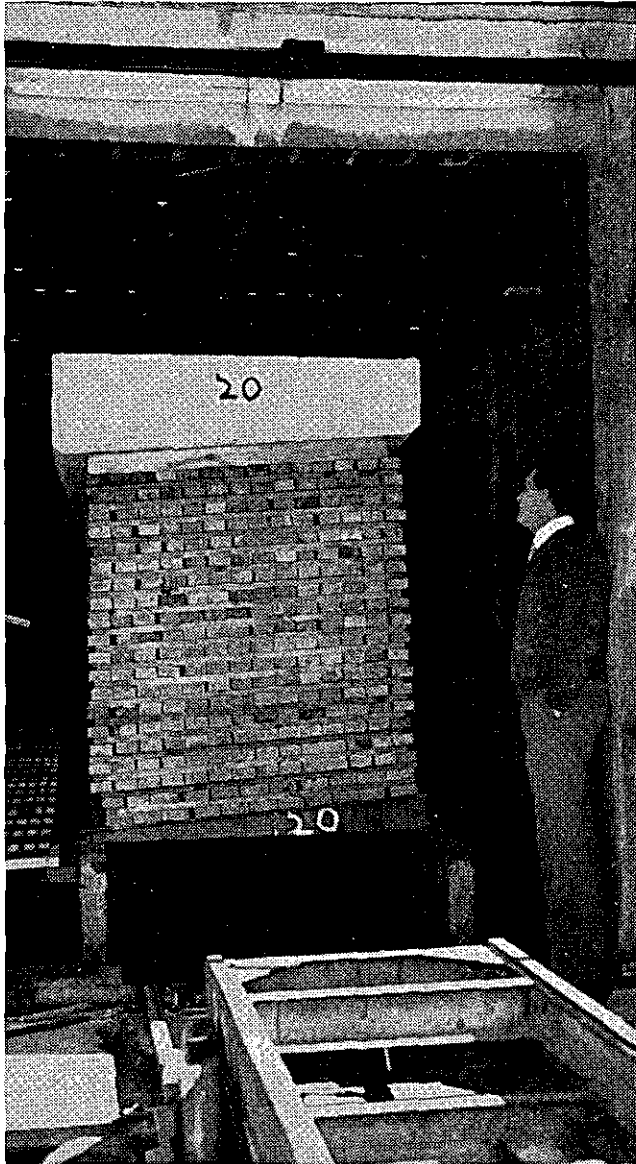
(c) HOOP PINE PRUNED STEMS

The sawing study continued on logs representative of the various thinning fractions of high pruned stems in older plantations in the Yarraman district. To date, two areas of high site index and two of low site index have been studied. Analysis of the data so far obtained is nearing completion.

It is intended that these studies provide factual information on the relative values of pruned stems at the various stages of thinning as a guide to correct pricing.

(ii) Seasoning and Timber Physics

Work in seasoning has again been concerned principally with material from young plantation-grown conifers, and has been an extension of work on the development of high-temperature techniques as a means of reducing seasoning degrade in this type of material.



High temperature kiln drying of Slash Pine framing. Note the weighting and tapered bearer to control twist.

In co-operation with a sawmilling firm an evaluation was made of high temperature seasoning and air seasoning under commercial conditions of hoop pine in 3 in. x 2 in. and 4 in. x 1½ in. size classes. Paired sections from the central flitch of young stems were studied and assessed for distortion after seasoning. The juvenile wood of hoop pine appears to present a greater distortion problem than comparable material of most other local conifers and twist can be particularly serious. In this test the results of the high temperature drying were very much superior to those from air drying. Viz.:

SIZE	Per cent. Building Grade or better (ASO 107)	
	High Temperature	Air Dried
4" x 1½"	Per cent. 99	Per cent. 44
3" x 2"	96	35

These figures confirm results from studies at the Department's research mill during the year which have been used to evaluate and refine temperature schedules for this species.

High temperature seasoning of *Pinus* species is now well established on a commercial scale at one major sawmill.

The section has again carried out testing and moisture content determinations on samples submitted by producers and by Government construction authorities.

Work has continued to accumulate data on the mechanical properties of local plantation timbers to permit development of mathematical correlations necessary for more accurate stress rating of this material. The mechanical stress-grading machine purchased last year has been extensively used on hoop pine available from sawing studies in continuation of work commenced in that year. At this stage the correlations being used are those developed elsewhere for *Radiata* pine and which will be modified for local species as sufficient data becomes available. The work is also providing useful information on the adequacy of current visual grading rules.

Routine quality control testing of slash pine which is being mechanically stress graded commercially by a Brisbane producer is now operating satisfactorily and approaches have been received from other firms for similar assistance on a contract basis. In addition to providing a useful service to industry, this type of activity also provides a valuable source of training and experience for technical staff.

Limited testing of cyclone bolting systems was undertaken for the Housing Commission. The results showed that there was nothing to be gained by increasing the bolt size from ½ in. to ¾ in. A feature of the systems tested was that the bolts were taken up through the roof battens.

A small veneer lathe is in the final stages of being installed at Salisbury. This machine will then be used to study recovery and quality of veneer from plantation conifers and also the size of knottycore in pruned stems.

Another major installation during the year was that of gas firing to replace wood firing of the boiler used for kiln operation. A pollution problem with the boiler has thereby been eliminated.

Extension work this year involved inspection and advice to sawmillers and timber seasoning operators in the Murgon, Monto and Atherton districts. In many instances amalgamation of licenses has resulted in the building of new sawmills. Generally the standard of sawmilling in these new mills is good with high production rates from the use of large accurate sizing-carriages. Seasoning procedures on the other hand, were found to be less satisfactory. In the majority of cases, though the quality of the final product was quite acceptable, but this could have been achieved more economically with more effective application of seasoning techniques particularly with difficult material.

Advice and assistance was given in the installation of a new seasoning operation in Brisbane, and advice was given on the design of a new sawmill for the Department of Native and Island Affairs at Bamaga Settlement.

WOOD STRUCTURE AND UTILISATION SECTION

(i) Wood Structure and Timber Identification

The requirements by industry and Government Departments for specialist assistance with the identification of timbers continued at a high level during the year and reflects the increasing variety of species being imported, and also the more complete utilisation of indigenous timber resources which is occurring.

(ii) Wood Quality and Tree Improvement

(a) SEED ORCHARD TREE EVALUATION

There was a decrease in the amount of work required this year in the screening for wood quality of "plus" trees which have been preselected as candidates for seed orchards on the basis of silvicultural and morphological characteristics. Six trees of Caribbean and Hoop Pine were evaluated and all were found to have satisfactory wood properties.

Screening of a twenty-clone loblolly pine seed orchard at Beerwah has not yet been undertaken pending the accumulation of sufficient data on between-tree and between-location variability in wood quality parameters for this species as grown locally. Meanwhile, determination of the wood characteristics of the twenty parent trees has been completed during the year and comparative analysis of the data will proceed shortly.

(b) SPECIES EVALUATION

Continuing the evaluation of 35-year-old stems of various species from the Benarkin arboretum, wood properties of chir pine were determined. Basic density and percent latewood were found to be higher than for *Radiata* and *Patula* Pines but lower than for Loblolly Pine in the same study. Fibre length was good and cell wall organisation satisfactory, but spiral grain was considerably worse than in the other species with a tendency to remain high in the outer rings. Though possibly associated with seed source, these results confirm general observations on spirality in Chir Pine and indicate that it is not a good prospect for sawn timber or veneer production. Resin concentrations in the corewood seemed unusually high in this sample.

Studies comparing wood properties and productivity of exotic species growing in trials at various localities in south-east Queensland have been continued. Following earlier work which showed the effect of site on wood quality and recoverable yields in 18-year-old Honduras Caribbean and Slash Pines at three locations, and the higher productivity of the former species, the work has been extended to include older material and also other species.

Comparisons made on 33-year-old shortleaf Loblolly and Slash Pines at Beerburum showed that average growth rate, (as expressed by ring width), basic density and per cent. latewood were found to be slightly higher in Slash than in Loblolly and markedly higher in both than in Shortleaf Pine. Grain spirality was slightly better in Loblolly than in Slash and the latter appreciably superior to Shortleaf. At this age and location Shortleaf Pine was inferior in overall wood quality to the other two species but the differences between Slash and Loblolly were not statistically significant in this trial.

Two similar studies on 19-year-old trees are in progress. Comparisons are being made between Honduras Caribbean, Loblolly, Slash and Ocote Pines at Beerburum, and results to date repeat the small and statistically non-significant differences mentioned above for Slash and Loblolly Pines. As would be expected mean annual radial increment was greater, and basic density and per cent. latewood was lower for both species in this younger stock.

As in similar trials reported last year, the Caribbean pine had the highest volume productivity. Its percent. latewood was very low compared with Slash and Loblolly Pines and its earlywood/latewood differential lower; however, it means basic density was only slightly lower (by 2 per cent. in the case of Loblolly and 7 per cent. in the case of Slash). The combination of these factors to give a wood with similar density to the other two species but with much greater textural uniformity is of great potential advantage in a general purpose softwood and these results confirm those from other comparisons made here between Slash and Caribbean Pines.

Ocote Pine was somewhat slower growing than the other three species but its wood was remarkably uniform in texture with the extremely low average latewood percentage of 14 per cent. There is in fact considerable difficulty in identifying and measuring annual rings in this species.

Observations on other wood properties are continuing in this and in another study on material of similar age which includes South Florida Slash Pine in lieu of Ocote Pine. The

wood properties of this variety of Slash Pine have not previously been determined here and will be of interest.

(c) PROVENANCE TRIALS

Evaluation of the wood properties and productivity of loblolly pine provenances has been initiated, commencing with a comparison of the Silver Springs (Marion Country) provenance with stock from local seed trees.

(iii) Growth Studies

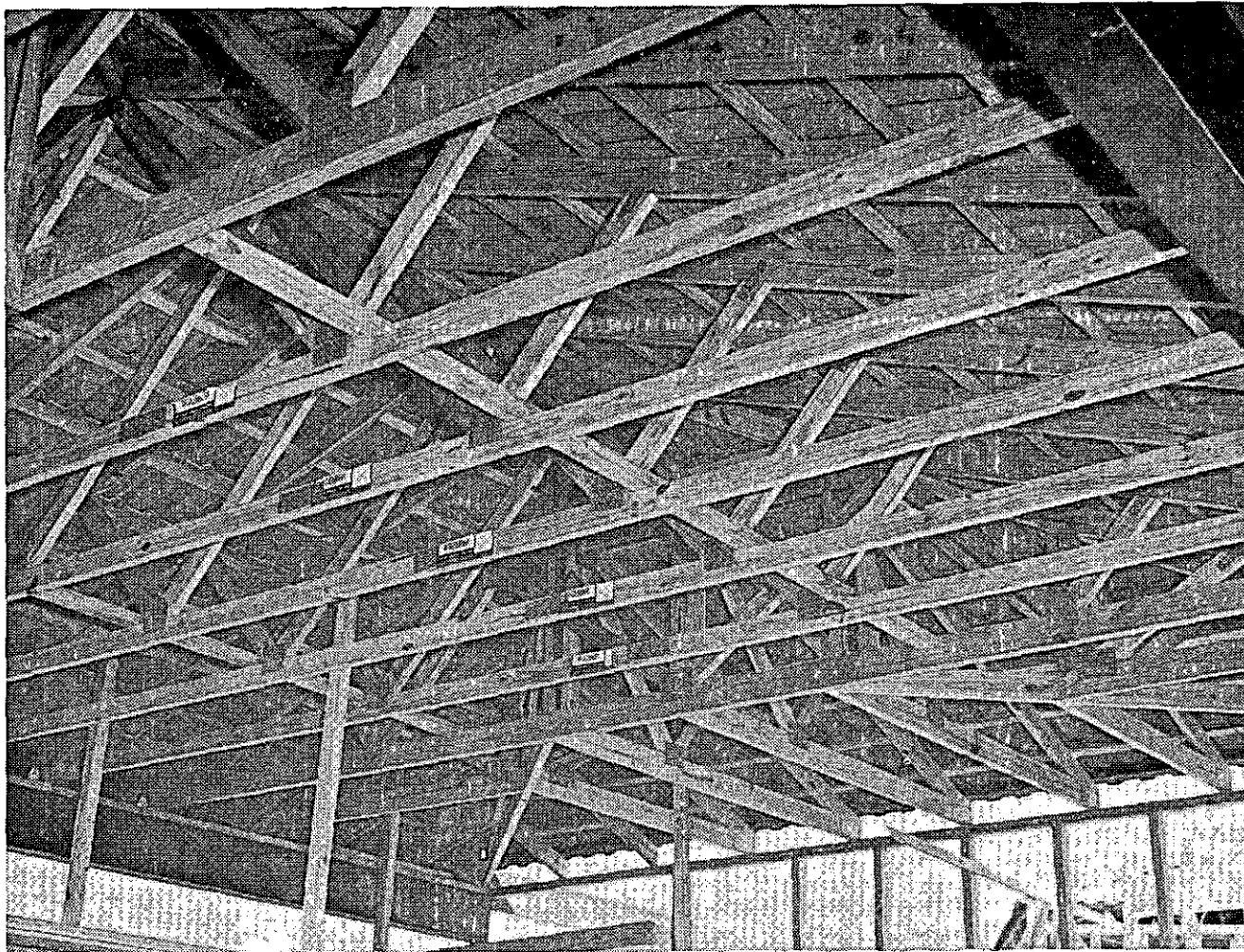
The physiology of wood formation in Honduras Caribbean pine is being studied at two locations, Byfield in Central Queensland and Danbulla in North Queensland. From observations on standing older trees (about 20 years) and felled younger stems (less than 9 years) relationships between apical and cambial meristematic activity and climatic factors considered likely to influence them are being investigated with a view to predicting the type of wood to be expected in this species under particular growing conditions, and providing external indicators of certain important wood quality parameters for possible use in the selection of parental stock for orchards.

The first year's observations at Byfield have confirmed the relationship between apical meristematic activity and the type of wood produced already well established for other species but with some very interesting variations. Shoot elongation and earlywood production commenced up to three months earlier than observed in Slash and Loblolly Pines in previous work at Beerburum and latewood development is apparently associated with a period of "slow terminal growth" and active needle elongation rather than the definite apical dormancy noted in the other two species. Relationships with some climatic factors are already apparent.

The North Queensland series has just begun. It is proposed to continue observations over a three-year period.

(iv) Defect Studies

To assist in the delineation of potentially troublesome material associated with more obvious pipe and brittle heart in Sydney blue gum occurring in large stands at Winterbourne in Central Queensland microscopic observations were made on serial specimens along radial strips from three logs. "Collapse" and unusually high shrinkage had been noted in the affected zone. While differential staining and other techniques did not reveal tension wood cells a gradation in the proportion of broken fibres with associated slip-planes and compression failures, decreasing from the brittle heart to normal wood has provided a basis for the possible demarcation



Slash Pine seasoned and stress graded is eminently suitable for roof trusses and house framing.

of the troublesome zone in the field when related to the extent of the visible defect. Further work is needed to confirm this.

(v) Utilisation

Enquiries for advice on the properties and uses of local and imported timbers continued at a high level throughout the year and there is a trend among both specifiers and users to utilise timber to best advantage.

Increased demand for timber, particularly in the latter half of the year has resulted in a shortage in both rough-sawn and dressed timber. This has been accentuated by difficulties with timber imports and by adverse local weather conditions.

(a) GENERAL BUILDING

Building activity has been brisk and supplies of all building timbers have fallen short of requirements. This situation will continue into the coming year but should be eased as the demand stabilises and production adjusts to meet particular requirements with increasing use of Cypress Pine and of plantation timbers.

The demand for seasoned plantation pine and rainforest timber framing continues to increase in south-east Queensland, but Central and North Queensland producers and users have been slower to recognise the advantages of seasoning this product.

While rainforest-timber and Brush Box processors have made considerable progress in meeting the need for deeper seasoned framing sections with glued laminated stock, pine producers have so far tended to concentrate on wall and roof framing, to the virtual exclusion of sub-floor framing, window-heads and similar larger sections. It is considered that the use of seasoned material for these purposes could be more important than in wall and roof members of smaller dimensions.

Cypress Pine is now well-accepted for framing timber in the major markets of south-east Queensland. The former single-grade Australian Standard for Cypress Pine framing has been replaced by a three-grade visually stress-rated system. This improved quality control should ensure even wider acceptance.

The State Committee convened by this Department to review the Australian Standard Light Timber Framing Code met several times during the year and has continued to press its claim for amendments considered essential to the effective operation of the Code in Queensland. Some have been implemented, but others outstanding have assumed even more importance with the acceptance in principle by State Local Authorities of the need for a Model Uniform Building Code based on a national code and embodying the Light Timber Framing Code as the standard for acceptable timber construction. It is anticipated this Committee will continue to meet a real need in presenting a widely representative view of our needs in the amendment of this important Standard.

A project was initiated during the year to determine the serviceability of lower durability species in housing, particularly as untreated external wall framing. In collaboration with the Queensland Housing Commission over 100 softwood framed prefabricated houses located in Brisbane and Toowoomba and imported from Europe about twenty years ago have been inspected. This survey so far indicates that, with certain basic inexpensive constructional precautions, untreated softwoods can be used satisfactorily in partially-protected situations such as external wall framing sheathed with timber and asbestos-cement.

In the course of the survey, indications were noted that some relaxation may also be possible of current recommendations requiring the preservative treatment of softwoods used as exterior cladding, and this aspect will be further investigated.

The observations are being supplemented by a survey of the serviceability of timber, especially softwoods, in buildings being demolished for road and high-rise unit construction in Brisbane. This also commenced during the year.

Extension of this project to cover lower durability rainforest timbers in North Queensland is planned.

Work is in progress to assess the serviceability and acceptability of locally grown *Pinus* species in uncovered flooring situations in domestic dwellings. Inspections are being carried out on a number of floors in the Brisbane area and the opinions of authorities in other States are being sought.

Observations have also commenced on the serviceability of lower-density rainforest timbers in uncovered floors as an adjunct to this study.

With the wider use of plantation-grown softwoods in general building, it has been found that nail types and sizes traditionally used here are not entirely successful and can lead to consumer resistance to these timbers. Larger nails have been used as an interim measure, and the grooved shank, flat-headed nails commonly used with this type of timber in other countries are now becoming available but

still in a limited range of sizes. Recommendations are being formulated for nailing procedures related to availability and cost.

Following complaints of shortages, a survey was carried out of availability of supplies of seasoned indigenous timbers suitable for use in internal joinery and mouldings. While some sectors of the market were not being adequately serviced, this, in part, reflected the temporary general deficiency which has occurred in timber supplies and it appeared that adequate and continuing supplies of these materials are normally available. It was evident, however, that closer ties require to be developed between producers, merchants and users to allow better co-ordination of production with needs.

Mechanically stress-rated Slash and Loblolly Pines are now being processed by one major producer principally for prefabricated roof-trusses; visually stress-rated softwood framing is also being marketed.

(b) STRUCTURAL ENGINEERING

Recommendations made to Electricity Supply Authorities this year, if adopted, will markedly increase the availability of strong, durable hardwoods for crossarms. These involve the inclusion of 23 additional species in the schedule and the trial of others available in large volume, together with a change in quality specification to allow the use of material from normal mill production giving acceptable minimum stress-ratings.

Expanded mining activity has resulted in an increased demand for mine timbers and for sleepers for associated railway construction.

The incidence of ground-line soft rot in hardwood poles and attack by marine borers in hardwood piles treated with fixed multi-salt preservatives is posing a problem currently being contained by increased loadings and amended maintenance procedures for poles and the use of naturally resistant species for marine piling.

An additional 14 species were recommended for inclusion in Electricity Authority pole specifications.

In collaborative trials with the Postmaster General's Department, Slash Pine poles treated with fixed multi-salt preservatives are comparing favourably with accepted hardwoods after six years in the field.

(c) PANEL PRODUCTS AND VENEERS

The Plywood Industry continues to develop, particularly in structural plywood production, with attempts being made to invade the platform flooring market.

Expansion of local particle board production is likely in the near future, to meet a rising demand. There is active promotion of this material for use as platform flooring.

These panel products, in decorative veneered or plain finish, are being more widely used as shelving and in other cabinetwork and furniture applications as the availability of solid timber in wide boards decreases.

Trials of plantation-grown hoop pine for match splints have shown improved characteristics over virgin material, particularly in butt logs from select stems, but also throughout the stem in both pruned and unpruned stems. This plantation material compared favourable with poplar except in regard to occurrence of whorls in the unpruned section and a slightly darker colour.

(d) PULPWOODS

Pulpwood utilization increased by a further 25 per cent. to over 30,000 cubic metres.

A new container manufacturing plant opened at the end of the year is obtaining about 60 per cent. of its requirements from the local fibre-board mill. This could reasonably be expected to contribute to an increasing demand which it is hoped may stimulate expansion of local pulping facilities.

(e) SPECIES UTILISATION

Wood property evaluation of two high volume species for which limited data is available has been initiated. These are Blackdown Stringybark and New England Blackbutt.

Re-evaluation of the mechanical properties of Brown Tulip Oak, Cadaga and Hickory Ash is also in progress.

(f) OTHER FOREST PRODUCTS

With increasing utilisation of plantation-grown softwoods the volume of bark accumulating has prompted enquiries from producers as to its possible uses. Some is being sold as a landscaping mulch or soil conditioner for gardens but, this market is limited. An Advisory Leaflet has been prepared for the guidance of producers and potential users of softwood bark in Queensland.

Duboisia leaf continues to provide a very valuable source of income to the State. Leaf exports last year were in excess of 735 tons dry weight, with a value of, about \$700,000.

Interest has been shown in the potential for naval stores production here. Imports of pine oil, spirits of turpentine, gum resin, crude and refined tall oil, rosin and rosin acids, derivatives of resin and resin acids, rosin spirit and rosin oil cost Australia over \$3,500,000 last year and Queensland's pine plantations are the best available source of raw material for these products in this country.

(vi) General

Assistance to T.R.A.D.A.C. in these councils' developmental and research activities has continued, and assistance was given to industry in the metrication of timber sizes and other building components while considerable time was also involved in timber standards work associated with metrication.

WOOD CHEMISTRY AND PRESERVATION SECTION

Five pressure treatment cylinders were registered by the Department during the year while two ceased operations, bringing the total of plants in service within the state to 36. The registration and quality control of these plants and of non-pressure installations remains the major area of work for this section, and imposes a limitation on the amount of research and development work which can be undertaken. It is desirable that the preservation industry take early action to assume greater responsibility for control of quality in its operations and the technical training of its operatives and so permit research staff to give greater attention to work aimed at meeting present problems and the requirements of the future.

During the year, selected plants have been engaged in the commercial trial under local conditions of newly marketed copper-chrome-arsenic salts of Australian manufacture which have been developed largely as a result of changes in tariff levels on imported salts. These trials are nearing completion and if results are satisfactory the new salts will be approved for general use under state legislation.

Field inspections and associated laboratory work have continued on the problem of "soft rot" in CCA-treated hardwood transmission poles.

Additional evidence shows that its incidence and severity is even more widespread than was apparent at the time of last year's report and it is now known to occur over a wide range of climatic and soil conditions throughout the State. The situation is being kept under review jointly by the Department and the Electrical Authorities. A comprehensive training school for the Authorities' inspectorial staff is being arranged to improve detection and treatment of affected poles, and trials are in hand with alternative pole preservative treatments and of remedial butt treatments.

Further failures have also occurred of hardwoods treated with copper-chrome-arsenic salts for marine use, and this has led during the year to the withdrawal of the general approval for these treatments for marine uses under "The Timber Users' Protection Acts".

These problems with copper-chrome-arsenic treatments under tropical and subtropical conditions pose an important challenge to the timber producing and treating industries, since the continued use of hardwoods, and particularly of young regrowth hardwoods, for these important round-timber markets will be largely dependent on development of a satisfactory means of ensuring adequate performance in situations of severe hazard.

The preservative treatment of railway sleepers is attracting increasing interest as the availability of mature prime hardwoods decreases. While this State is relatively fortunate in the quantity and location of forest types producing sleepers, supply at the present rate will become increasingly more difficult and more costly. There will also be increasing competition for available timber supplies between the sawmilling and sleeper producing industries, and a greater need for both to utilise fully all available suitable species and also smaller regrowth trees.

A recent survey by the Railway Department of the primary causes of failure in 136,294 condemned sleepers from routine maintenance operations showed the following proportions:—

Spike kill or overbored ..	18.5%
Decay or perished ..	61.9%
Split	10.4%
Rail Cut	1.0%
Termites	7.3%
Miscellaneous	1.1%

The problems of decay and weathering are therefore predominant as causes of failure even in the prime highly durable species currently in use and indicates that any general reduction in the accepted level of durability is undesirable.

It is intended that increased attention will be given to service trials of treatments which will convey greater protection against these factors, and which would also permit the use of timber with lower natural durability.

During the year the section has continued to provide an advisory and testing service for preservative treated timber to the timber industry and to Government specifying Authorities. A substantial quantity of sawn timber and plywood for a major construction project was sampled and tested against specification on a contract basis.

TECHNICAL AND FIELD STAFF TRAINING

(i) A further seven State Scholarships were awarded in 1973 all to new matriculants. The first year of the course is taken at the University of Queensland or the James Cook University of North Queensland. A further three years are then taken at the Australian National University, Canberra. The number of undergraduates holding State Forestry Scholarships as at the 30th of June, 1973, were:—First year 7; Second Year 6; Third Year 3; Fourth Year 6.

Four State Scholarship Holders graduated at the end of the 1972 academic year and took up duty as Foresters within the Department in January 1973. One of these, Mr. A. M. Harvey was awarded the Schlich Gold Medal. This Schlich Memorial Trust Prize is awarded annually by the Department of Forestry, Australian National University, Canberra to the student who has completed in that year the requirements for admission to the degree of Bachelor of Science (Forestry) with honours, and who shows the most promise in forestry.

(ii) Sixteen forest trainees completed three years practical field training in January. Fourteen of these have subsequently completed probationary periods as gangers and have been appointed field overseers. One has resigned. A further 30 trainees selected from applicants with at least Junior Examination passes commenced training in 1973. At the end of June the total number in training was 61.

(iii) The system of Adult Training introduced three years ago to supplement the Forest Trainee Scheme and provide an avenue of advancement for older employees with the necessary potential was continued in 1973. Eight completed training during the year, and took up positions as Field Overseers. The number in training as at 30th of June was 10.

(iv) During the year seven Technical Assistants and one Survey Assistant were appointed to positions in Forest Research, Forest Resources and Surveys. One of these is undertaking the training course for Surveying Technicians and the remainder will undertake the training course for Forest Technicians. All of these appointees had previously completed the Forest Trainee Course.

STAFF

As at the 30th June, 1973, there were 571 salaried officers on the staff comprising 257 in Head Office and 314 at District Centres. This represents an increase of 22 on the number of salaried staff as at 30th June, 1972. The number of wages staff employed was 1,856.

Fifty-eight salaried officers left the Department during the year, including eight officers who retired after long and meritorious service, namely:—

- Mr. G. B. Molesworth (Secretary to the Conservator of Forests, 48 years).
- Mr. R. H. Doggrell (District Forester, Gympie, 49 years).
- Mr. F. L. Crain (Senior Forest Ranger (Relieving), 38 years).
- Mr. N. S. Hills (Training Officer, Management Branch, 36 years).
- Mr. R. J. Fraser (Forest Ranger Division 1, 38 years).
- Mr. H. N. Schibrowski (Forest Ranger Division II, 20 years).
- Miss P. A. Callaghan (Stenographer), 48 years).
- Mr. D. J. Gordon (Temporary Clerk, 12 years).

We wish these officers many years of good health and much happiness in their retirement.

It is with regret that the deaths are recorded of—

- Mr. C. T. Makepeace, Senior Forest Ranger (Relieving) on 7th June, 1973.
- Mr. C. J. Harmon, Temporary Clerk, on 27th August, 1972.
- Mr. J. Zolte, Forest Technician Division I, on 1st December, 1972.

These officers had served the Department faithfully and efficiently during their respective periods of service and their untimely deaths will be greatly felt by all who served with them. Deepest sympathy is extended to their bereaved families.

ACKNOWLEDGMENTS

I desire to record my appreciation of the loyal and efficient service of all members of the staff during the past year.

C. HALEY,
Conservator of Forests.

APPENDICES

APPENDIX A

Return of Timber, &c., removed from Crown Lands during the Year ended 30th June, 1973

SPECIES	QUANTITY	
	Super. feet	Super. feet
Milling Timber—		
(a) Native Forests—		
Hoop and Bunya Pine—		
Ply	1,835,025	
Logs	9,246,162	
Tops	7,914,650	
		18,995,837
Kauri Pine	2,715,330	
White Cypress Pine	35,146,533	
Forest Hardwoods—		
Saw Logs	60,173,909	
Pulpwood	3,429,928	
Scrub Hardwoods	19,574,639	
Cabinet Woods	15,978,132	
Miscellaneous Species	34,141,376	
Limb Logs, Head Logs, Stumps and Flitches	3,361	
		171,163,208
(b) Plantation Thinnings—		
Hoop Pine	27,722,050	
Bunya Pine	72,657	
Kauri Pine	4,171	
Slash Pine	7,095,199	
Loblolly Pine	1,922,111	
Patula Pine	2,071,016	
Radiata Pine	986,524	
Caribbean Pine	150,042	
Maritime Pine	13,307	
Silky Oak	216,281	
White Cypress Pine	1,006	
Pond Pine	691	
Longleaf Pine	16,934	
Shortleaf Pine	652	
Benguet Pine	1,172	
		40,343,813
Pulp Wood—		
Hoop Pine	6,230,186	
Slash Pine	7,326,784	
Loblolly Pine	1,265,585	
Caribbean Pine	373,047	
Radiata Pine	49,453	
Patula Pine	423,421	
Kauri Pine	1,469	
Longleaf Pine	635	
Shortleaf Pine	1,479	
Benguet Pine	313	
		15,672,292
		246,175,150
		Expressed as Superficial feet (Hoppus) Log Measure
Other Classes—		
Sleepers Hewn	348 pieces	13,206
Sleepers Sawn—5 ft.	66,271 pieces	1,869,588
Sleepers Sawn—7 ft.	461,836 pieces	17,549,768
Sleeper Blocks (as Sleepers contained)	45,761 pieces	1,647,396
Transoms, Crossings, Headstocks, Longitudinals	200,001 superficial feet	200,001
Girders, Corbels, Piles, Sills, Kerb Logs	68,279 lineal feet	1,229,022
Girder Logs	38,537 superficial feet	38,537
Poles	97,543 lineal feet	682,801
House Blocks	4,514 lineal feet	37,104
Fencing Material—Round	196,953 lineal feet	492,383
Fencing Material—Split	138,897 pieces	1,250,073
Mining Timbers—Round	539,260 lineal feet	1,078,520
Mining Timbers—Sawn	158,482 superficial feet	158,482
		26,246,881

Other Classes—continued

Fuel	6,947 tons
Quarry Material—Sand, Gravel, Soil, &c.	1,097,137 cubic yards
Fibre, Bark, Dry Leaves, Reeds	27 bags
Duboisia	6,816 pounds
Flora	1,092 pieces
Peat	316 bags
Poling Timber (Copper Refining)	3,139 tons
Lawyer Cane	13 tons
Boat Knees	550 pieces
Bee Hives	17 hives
Black Wattle	1,059 stems
Charcoal	16 tons
Guano	2 cubic yards
Trees and Plants (number)	258,241
Brush Material (Brush Fence)	230 tons

APPENDIX B

Total Receipts, Department of Forestry, for the Year ended 30th June, 1973

RECEIPTS FROM DISTRICTS	TOTALS \$
Group 1—South Queensland (Brisbane, Beerburum, Beerwah, Benarkin, Bundaberg, Fraser Island, Gallangowan, Gympie, Imbil, Jimna, Kalpowar, Maryborough, Monto, Murgon, Yarraman)	2,540,009.38
Group 2—North Queensland (Atherton, Cairns, Cooktown, Charters Towers, Herberton, Hughenden, Ingham, Innisfail, Port Douglas, Ravenshoe, Townsville)	1,395,988.42
Group 3—Dalby, Roma, Taroom, Charleville, Mitchell, Quilpie	412,289.70
Group 4—Warwick, Goondiwindi, Inglewood, St. George, Stanthorpe, Cunnamulla	275,667.85
Group 5—Mackay, Rockhampton, Clermont, Bowen, Proserpine, Emerald, Springsure, Theodore, Winton	229,509.88
Group 6—Bacardine, Blackall, Jundah, Longreach, Muttaborra, Stonehenge, Aramac, Isisford, Jericho	102.71
Group 7—Cloncurry, Boulia, Kynuna, Mackinlay, Richmond	484.57
Group 8—Burketown, Coen, Croydon, Georgetown, Normanton, Thursday Island	Cr. 73.30
	\$4,853,979.21
OTHER RECEIPTS	
Forestry and Lumbering	849,462.50
Sale of Plants, Materials, &c.	61,273.39
Licences† (see note after Appendix C)	23,539.30
Rents	32,690.48
Grazing dues	58,810.87
Miscellaneous (Salisbury Area Timber Account, Forfeit Wages, Expenditure Recoveries, &c.)	47,452.30
Sale of U.S. tractors, trucks, &c.	137,897.51
	\$6,065,105.56
Plant Hire—	
Charged to Works Projects	1,588,838.13
	\$7,653,943.69
The above receipts were disposed of as follows:—	
To Consolidated Revenue Fund as repayment of previous expenditure	2,075.40
To Loan Fund as repayment of previous expenditure and surplus plant hire	510,223.32
To Forestry and Lumbering Fund:—	
As expenditure on marketing of log timber, maintenance of access roads, capital improvements, plant, TRADAC, &c.	4,007,631.05
As Interest and Redemption on Loans	3,134,013.92
	\$7,653,943.69

APPENDIX C

Proceeds of Sales of Timber, &c., for the period 1st July, 1969, to 30th June, 1973 (Financial Years)

Groups*	1969-70	1970-71	1971-72	1972-73
	\$	\$	\$	\$
Group 1	1,979,622.36	1,842,022.79	2,255,403.95	2,490,215.17
Group 2	1,180,982.07	1,232,363.10	1,363,037.35	1,363,224.19
Group 3	275,058.08	275,084.64	362,436.83	397,017.77
Group 4	165,452.07	161,452.07	221,304.55	268,993.90
Group 5	154,905.07	153,329.05	167,372.41	221,016.70
Group 6	244.77	214.17	207.73	102.71
Group 7	687.82	610.50	1,128.51	484.57
Group 8	264.70	38.50	325.50	Cr. 73.30
	\$3,757,216.94	\$3,715,273.36	\$4,371,216.83	\$4,740,981.71
Timber Research and Development Advisory Council	35,721.49	103,483.19	113,692.91	112,997.50
	\$3,792,938.43	\$3,818,756.55	\$4,484,909.74	\$4,853,979.21
Receipts—Forestry and Lumbering	324,612.22	488,348.17	676,130.72	849,462.50
Sale of Plants, Material, &c.	101,965.71	44,970.94	53,290.06	61,273.39
Licences†	20,460.45	19,917.00	20,531.45	23,539.30
Rents and Grazing Dues	71,474.08	79,590.87	85,853.73	91,501.35
Miscellaneous (Salisbury Area Timber Account, Forfeit Wages, Expenditure Recoveries, &c.)	31,851.29	53,075.91	180,804.83	47,452.30
Sale of U.S. Tractors, Trucks, &c.	85,673.13	86,096.97	136,555.00	137,897.51
	\$4,428,975.31	\$4,590,756.41	\$5,524,382.62	\$6,065,105.56

* For Districts within the groups, see Appendix B.

† Includes the following licence fees:—Fuel, Quarry, Sawmill, Apiary, Forest Products, Sales Permit.

APPENDIX D

Constructional Timbers Supplied During Financial Year 1972-73
under Forestry and Lumbering Operations

Class of Timber	Quantity	Sales Value
		\$
Crossings	31,939 super. feet	4,226.65
Headstocks and Braces ..	Nil	Nil
Transoms	97,058 super. feet	14,031.92
Piles	20,101 lineal feet	23,933.56
Girders—Dressed	8,038 lineal feet	21,586.42
Sleepers	270,191 pieces	726,198.13
Sleepers—Tramway	Nil	Nil
Sleeper Blocks (as sleepers contained)	45,761 pieces	54,544.46
Round Fence Posts	606 lineal feet	50.50
Split Posts and Rails, &c. ..	2,738 pieces	665.65
House Blocks	582 lineal feet	240.08
Total		\$845,477.37

APPENDIX E

Comparative Statement of Expenditure for Years 1971-72 and
1972-73

	1971-72	1972-73
	\$	\$
Revenue—		
Salaries	2,757,092	3,326,615
Cryptotermes brevis Investigation ..	1,476	13,267
Fares, Printing, Stores, &c. .. .	13,165	14,617
Travelling Expenses and Incidentals ..	164,806	210,099
National Parks	167,365	103,811
Cash Equivalent of Long Service Leave	28,974	59,810
Loan—		
National Parks	248,681	375,204
Recreational Facilities State Forests	15,392	21,341
Trust—		
<i>Reforestation Trust Fund—</i>		
Reforestation	6,138,787	6,968,811
Land Acquisition	39,487	218,238
Purchase of Plant	613,984	917,239
Access Roads	430,213	532,065
Purchase of Radio Equipment	24,492	24,500
Purchase of Firefighting Equipment	66,868	12,621
<i>Forestry and Lumbering Fund—</i>		
Interest and Redemption on Loans	2,855,682	3,134,014
Hardwood Supplies to Railway Department and others	587,239	764,368
Harvesting and Marketing Timber	1,435,823	1,605,717
Access Roads—Maintenance and Subsidies	316,306	275,584
Maintenance of Plant	942,296	1,057,629
Maintenance of Capital Improvements	138,419	188,831
Expenses—Timber Research and Development Advisory Councils	130,406	119,230
Total	\$ 17,116,953	19,943,611

APPENDIX F

Net Area of Plantation Established 1st April, 1972, to 31st March, 1973

Species	Brisbane	Gympie	Mackay	Mary- borough	Monto	Murgon	North Queens- land	Warwick	Yarraman	Totals
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1. Conifers										
A. Native Conifers—										
Hoop Pine	150.5	970.8	110.8	319.4	189.5	555.9	147.4	..	838.6	3,282.9
Kauri Pine .. .. .	..	..	..	..	..	..	..	..	..	..
Bunya Pine .. .. .	..	5.7	..	..	..	18.7	..	..	6.4	30.8
Other Native Conifers .. .. .	..	..	..	..	..	..	..	..	..	..
Total—Native Conifers	150.5	976.5	110.8	319.4	189.5	574.6	147.4	..	845.0	3,313.7
B. Exotic Conifers—										
Slash Pine	1,808.0	4,796.2	..	4,435.2	..	..	..	2.3	56.9	11,098.6
Loblolly Pine	214.0	1.4	..	..	..	..	..	..	..	215.4
Patula Pine .. .. .	..	..	..	..	..	..	..	..	39.4	39.4
Caribbean Pine	74.8	208.5	449.3	561.5	..	..	469.9	..	107.8	1,871.8
Radiata Pine .. .. .	..	..	..	..	..	..	..	189.5	56.8	246.3
Long Leaf Pine .. .. .	..	..	..	..	..	..	..	..	..	..
Other Exotic Conifers .. .. .	..	..	..	..	..	..	14.1	..	..	14.1
Total—Exotic Conifers	2,096.8	5,006.1	449.3	4,996.7	..	..	484.0	191.8	260.9	13,485.6
Total—Conifers	2,247.3	5,982.6	560.1	5,316.1	189.5	574.6	631.4	191.8	1,105.9	16,799.3
2. Broadleaved Species										
A. Native Forest Hardwoods—										
Rose Gum .. .. .	..	..	..	..	..	..	..	..	..	..
Grey Ironbark .. .. .	..	..	..	..	..	..	..	..	..	..
Tallowwood .. .. .	..	..	..	..	..	..	..	..	..	..
Blackbutt .. .. .	..	..	..	12.6	..	..	..	..	..	12.6
Gympie Messmate .. .. .	..	..	..	..	..	..	..	..	..	..
Others .. .. .	..	..	..	..	..	..	..	..	..	..
Total—Native Forest Hardwoods	..	..	..	12.6	..	..	..	..	..	12.6
B. Other Broadleaved Species—										
Silky Oak .. .. .	..	..	..	..	..	..	..	..	..	..
Queensland Maple .. .. .	..	..	..	..	..	..	..	..	..	..
Red Cedar .. .. .	..	..	..	..	..	..	..	..	..	..
Others .. .. .	..	..	..	..	..	..	..	..	..	..
Total—Other Broadleaved Species	..	..	..	..	..	..	..	..	..	..
Total—Broadleaved Species .. .. .	..	..	..	12.6	..	..	..	..	..	12.6
Miscellaneous Experimental .. .. .	..	..	..	50.6	..	..	14.9	..	0.8	66.3
Total—All Species	2,247.3	5,982.6	560.1	5,379.3	189.5	574.6	646.3	191.8	1,106.7	16,878.2

APPENDIX G

Net Area of Effective Plantation Classified into Forestry Districts to 31st March, 1973

Species	Brisbane	Gympie	Mackay	Maryborough	Monto	Murgon	North Queensland	Warwick	Yarraman	Totals
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
<i>1. Conifers</i>										
A. Native Conifers—										
Hoop Pine	2,255.1	24,281.4	353.0	2,624.5	5,696.7	15,905.1	2,069.6	16.7	29,263.3	82,465.4
Kauri Pine	5.3	156.2	2.7	69.7	3.6	4.8	292.4	0.8	7.3	542.8
Bunya Pine	7.4	623.6	..	0.8	1.2	163.2	3.0	..	199.8	999.0
Other Native Conifers	2.8	7.8	0.8	1.9	..	..	14.1	0.9	0.1	28.4
Total—Native Conifers	2,270.6	25,069.0	356.5	2,696.9	5,701.5	16,073.1	2,379.1	18.4	29,470.5	84,035.6
B. Exotic Conifers—										
Slash Pine	23,099.4	31,183.7	2,546.2	33,603.0	53.2	1.4	11.3	819.4	888.2	92,205.8
Loblolly Pine	4,085.7	297.1	10.1	55.2	2.7	9.4	14.0	239.3	42.5	4,756.0
Patula Pine	18.9	19.0	8.6	8.1	24.8	99.9	35.0	471.3	3,387.5	4,073.1
Caribbean Pine ..	560.6	703.0	8,179.5	2,919.2	1.4	0.7	2,509.0	..	124.3	14,997.7
Radiata Pine	0.5	..	..	..	..	12.0	..	3,503.0	1,289.4	4,804.9
Longleaf Pine	246.6	3.4	5.5	1.6	..	..	..	8.5	1.8	267.4
Other Exotic Conifers	61.0	41.2	95.5	19.9	9.5	3.6	60.0	43.9	81.4	416.0
Total—Exotic Conifers	28,072.7	32,247.4	10,845.4	36,607.0	91.6	127.0	2,629.3	5,085.4	5,815.1	121,520.9
Total—Conifers ..	30,343.3	57,316.4	11,201.9	39,303.9	5,793.1	16,200.1	5,008.4	5,103.8	35,285.6	205,556.5
<i>2. Broadleaved Species</i>										
A. Native Forest Hardwoods—										
Rose Gum	277.3	1,212.2	0.3	0.2	..	21.8	1.7	..	176.4	1,689.9
Grey Ironbark	209.6	182.4	0.1	0.1	..	9.4	37.8	..	469.5	908.9
Tallowwood	123.5	18.9	0.2	0.7	..	0.5	28.8	..	5.0	177.6
Blackbutt	240.4	234.9	0.1	121.9	..	8.6	0.2	..	0.5	606.6
Gympie Messmate ..	..	258.5	..	..	..	..	..	..	..	258.5
Others	29.6	75.9	1.3	2.0	..	..	10.9	..	2.8	122.5
Total—Native Forest Hardwoods	880.4	1,982.8	2.0	124.9	..	40.3	79.4	..	654.2	3,764.0
B. Other Broadleaved Species—										
Silky Oak .. .. .	..	66.8	..	0.4	..	25.0	26.5	..	484.3	603.0
Queensland Maple ..	..	70.5	..	..	0.6	..	248.5	..	..	319.6
Red Cedar .. .. .	..	6.9	..	..	..	..	31.7	..	..	38.6
Others	0.1	80.2	0.3	0.4	0.2	..	34.6	..	1.1	116.9
Total—Other Broadleaved Species	0.1	224.4	0.3	0.8	0.8	25.0	341.3	..	485.4	1,078.1
Total—Broadleaved Species	880.5	2,207.2	2.3	125.7	0.8	65.3	420.7	..	1,139.6	4,842.1
Miscellaneous Experimental	90.8	32.4	12.7	51.5	0.6	0.2	42.3	23.5	61.3	315.3
Total—All Species ..	31,314.6	59,556.0	11,216.9	39,481.1	5,794.5	16,265.6	5,471.4	5,127.3	36,486.5	210,713.9

APPENDIX H
Areas of Natural Forest Treated

A.—EUCALYPTS

Sub-District	Treated 1972-73	First Treatment 1972-73	Total as at 30th June, 1973
	Acres	Acres	Acres
Brisbane	514	191	32,994
Beerburrum	1,601	72	22,382
Gympie	937	845	21,179
Imbil	64	34	468
Mackay/Emerald/ Rockhampton	..	..	48,848
Maryborough	4,360	1,890	114,158
Bundaberg	665	..	38,937
Fraser Island	350	..	25,230
Monto	1,044	456	27,070
Murgon/Jimna	788	76	45,954
Atherton .. ..	..	..	3,712
Ingham .. ..	..	..	2,985
Warwick .. ..	..	..	10,462
Inglewood .. ..	..	..	15,697
Yarraman .. ..	..	..	6,414
Benarkin .. ..	..	..	2,067
Dalby/Chinchilla	239	239	82,790
Total—Eucalypts	10,562	3,803	501,347

APPENDIX H—continued

B.—CYPRESS PINE

Sub-District	Treated 1972-73	First Treatment 1972-73	Total as at 30th June, 1973
	Acres	Acres	Acres
Bundaberg .. ..	..	..	2,152
Fraser Island .. ..	..	..	4,424
Monto .. ..	..	..	2,496
Inglewood	5,401	3,420	116,052
Dalby/Chinchilla/ Roma	16,581	7,793	272,919
Total—Cypress Pine	21,982	11,213	398,043

APPENDIX H—continued

C—RAIN FOREST

Sub-District	Subsequent Treatment 1972-73	First Treatment 1972-73			First Treatment Completed 1972-73	Total at 30th June, 1973
		Brushed	Ring-barked and Thinned	Trees Interplanted		
	Acres	Acres	Acres	Acres	Acres	Acres
Natural Hoop Pine—						
Maryborough .. ..	..	..	..	..	..	65
Bundaberg .. ..	..	..	..	..	..	9,973
Total—Natural Hoop Pine	..	..	..	..	..	10,038
Natural Rain-Forest—						
Atherton	199	..	..	..	..	10,644
Ingham .. ..	..	..	..	..	..	1,364
Warwick .. ..	..	..	..	..	..	21
Total—Natural Rain-Forest	199	..	..	..	..	12,029
Total—Rain-Forest	199	..	..	..	..	22,067

APPENDIX H—continued

Grand Total—	Acres
Eucalypts	501,347
Cypress Pine	398,043
Rain Forest	22,067
	<hr/>
	921,457

APPENDIX J

Reservations for the Year ended 30th June, 1973

1st July, 1972—30th June, 1973

STATE FORESTS				
	No.	A.	R.	P.
As at 1st July, 1972	469	7,717,570	1	12.6
Declared	23	85,110	3	18
Declared and added to existing State Forests		71,770	0	33.3
Timber Reserves declared State Forests	2	4,242	0	0
Timber Reserves declared State Forests and amalgamated with existing State Forests		1,035	1	37
Error in Previous List		0	3	0
Recomputation of Boundary		12,717	0	8.1
Areas released		887	1	7.2
Amalgamation of existing State Forests—14				
Total as at 30th June, 1973	480	7,866,125	1	5.6
TIMBER RESERVES				
	No.	A.	R.	P.
As at 1st July, 1972	216	1,725,936	0	17.1
Declared				
Declared and added to existing Timber Reserves		160	0	0
Reserved revoked	-8	-6,821	2	37
Reserves transferred to Miscellaneous List	-6	-52	1	33
Error in Previous List		+ 0	0	0.8
Total as at 30th June, 1973	202	1,719,221	3	27.9
NATIONAL PARKS				
	No.	A.	R.	P.
As at 1st July, 1972	284	2,563,224	3	0.1
Declared	5	5,626	3	0
Declared and added to existing National Parks		150	2	28.3
Recomputation of Boundary		-90	2	5.5
Areas Released		-60	0	22.8
Total as at 30th June, 1973	289	2,568,851	2	0.1

APPENDIX K

Distribution of Personnel, 30th June, 1973

	Head Office	District Centres	Total
Salaried Officers—			
Professional	55	64	119
Technical	64	28	92
Field	8	105	113
Clerical	121	116	237
Miscellaneous	9	1	10
Sub Totals	257	314	571
Wages Staff	41	1,815	1,856
Totals	298	2,129	2,427

APPENDIX L

Tree Species Mentioned in Annual Report

Botanical Names

A. NATIVE CONIFERS

Bunya Pine	<i>Araucaria bidwillii</i>
Cypress Pine	<i>Callitris columellaris</i> syn. <i>glauca</i>
Hoop Pine	<i>Araucaria cunninghamii</i>
Kauri Pine	<i>Agathis robusta</i>
Northern Cypress Pine	<i>Callitris columellaris</i> syn. <i>intropica</i>
White Cypress Pine	<i>Callitris columellaris</i> syn. <i>glauca</i>

B. EXOTIC CONIFERS

Bahamas Caribbean Pine	<i>Pinus caribaea</i> var. <i>bahamensis</i>
Benguet Pine	<i>Pinus kesiya</i>
Caribbean Pine	<i>Pinus caribaea</i> (3 varieties)
Chir Pine	<i>Pinus roxburghii</i>
Cuban Caribbean Pine	<i>Pinus caribaea</i> var. <i>caribaea</i>
Douglas Fir	<i>Psuedotsuga menziesii</i>
Honduras Caribbean Pine	<i>Pinus caribaea</i> var. <i>hondurensis</i>
Loblolly Pine	<i>Pinus taeda</i>
Longleaf Pine	<i>Pinus palustris</i>
Maritime Pine	<i>Pinus pinaster</i>
Ocote Pine	<i>Pinus oocarpa</i>
Patula Pine	<i>Pinus patula</i>
Pond Pine	<i>Pinus serotina</i>
Radiata Pine	<i>Pinus radiata</i>
Sand Pine	<i>Pinus clausa</i>
Shortleaf Pine	<i>Pinus echinata</i>
Slash Pine	<i>Pinus elliotii</i> var. <i>elliottii</i>
South Florida Slash Pine	<i>Pinus elliotii</i> var. <i>densa</i>
Sugi	<i>Cryptomeria japonica</i>
Tenasserim Pine	<i>Pinus merkusii</i>

C. EUCALYPTS

Blackbutt	<i>Eucalyptus pilularis</i>
Cadaga	<i>Eucalyptus torrelliana</i>
Forest Red Gum	<i>Eucalyptus tereticornis</i>
Grey Ironbark	<i>Eucalyptus drepanophylla</i>
Gympie Messmate	<i>Eucalyptus cloeziana</i>
Moreton Bay Ash	<i>Eucalyptus tessellaris</i>
Red Bloodwood	<i>Eucalyptus intermedia</i>
Red Mahogany	<i>Eucalyptus resinifera</i>
Rose Gum	<i>Eucalyptus grandis</i>
Spotted Gum	<i>Eucalyptus maculata</i>
Sydney Blue Gum	<i>Eucalyptus saligna</i>
Tallowwood	<i>Eucalyptus microcorys</i>
White Mahogany	<i>Eucalyptus acmenioides</i>

D. OTHER BROADLEAVED TREE SPECIES

African Mahogany	<i>Khaya senegalensis</i>
American Mahogany	<i>Swietenia macrophylla</i>
Brown Tulip Oak	<i>Argyrodendron trifoliolatum</i> and <i>Argyrodendron polyandrum</i>
Chickrassy	<i>Chukrassia tabularis</i>
Indian Rosewood	<i>Dalbergia latifolia</i>
Laran	<i>Anthocephalus chinensis</i>
Northern Silky Oak	<i>Cardwellia sublimis</i>
Pacific Rosewood	<i>Pterocarpus indicus</i>
Queensland Maple	<i>Flindersia brayleyana</i>
Red Cedar	<i>Toona australis</i>
Rosewood	<i>Eremophila mitchellii</i>
Sandal Wood	<i>Santalum lanceolatum</i>
Silky Oak	<i>Grevillea robusta</i>
Turpentine	<i>Syncarpia glomulifera</i>

E. WEEDS, GRASSES, PALMS, ETC.

Billy Goat weeds	<i>Ageratum conyzoides</i> , and <i>A. houstonianum</i>
Chickory	<i>Cichorium intybus</i>
Chickweed	<i>Stellaria media</i>
Crowsfoot	<i>Eleusine indica</i>
Lesser swinecress	<i>Coronopus didimus</i>
Moonlight cactus	<i>Eriocereus tortuosus</i>