1972

QUEENSLAND

ANNUAL REPORT

OF THE

DEPARTMENT OF FORESTRY

FOR THE

YEAR 1971–72

PRESENTED TO PARLIAMENT BY COMMAND

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CONTENTS

TABLE OF APPENDICES

Picnic Area at Witches Falls National Park. This was the first National Park in Queensland. Proclaimed 1908.

REPORT OF THE CONSERVATOR OF FORESTS

For the Year ended 30th June, 1972

TO THE HONOURABLE THE MINISTER FOR LANDS AND FORESTRY

INTRODUCTION

The most important event of the year from the point of view of Industry and the Department alike has been the commencement of operations by the Woodland particle board factory at Sunshine. The factory was officially opened by the Honourable the Premier, Mr. J. Bjelke-Petersen on 18th November last and since then has steadily built up its intake of round timber from the State's plantations. This is extremely important to the Department in that it will permit the young plantations of the Tuan–Toolara area and of the Mary Valley to be thinned in accord with correct silvicultural practices and so promote the growth of the high pruned stems which will provide the final crop. From the stand point of industry the factory provides a useful market for waste from mills sustained by the State's softwood plantations and has allowed integrated logging to be introduced in the field with a resultant improvement in quality of the logs supplied to the saw mills. The successful operation of this type of logging in the Mary Valley has encouraged its extension to the Beerburrum District. In this regard I would like to place on record the Department's sincere appreciation of the degree of co-operation and goodwill shown by the principals and other staff of Woodlands Pty. Ltd., Hyne and Son, A.P.M. and Wilkinsons.

Conditions have remained buoyant throughout the year in all sections of the Industry and remain so at present. As a result the total cut of log timber for the State was five million super. feet up on the previous year. Record figures were achieved with Cypress Pine and closely approached with plantation timbers whilst the cut of natural pine, hardwoods and rain-forest species was sustained at or above last year's level. In addition there has been a lively demand for sleepers and mining timbers. An important development has been the increased movement of Cypress Pine into the market for framing in the Brisbane–Gold Coast area and the entrance to this same field of Slash Pine from the Department's softwood plantations of Coastal South Queensland. This is extremely important because of the diminishing availability of hardwoods and the increasing supplies of plantation timbers. In this regard the use of these softwoods has been greatly assisted by research on high temperature kiln drying conducted by the Department in collaboration with C.S.I.R.O. Industry has been quick to employ this technique which, with the adoption of stress grading, assures the building trade of a reliable stable product of known minimum strength.

Regular meetings of Aus. T.I.S. provided a valuable forum for discussions between Industry and the Department on matters of mutual concern. These meetings have been permeated by a fine spirit of co-operation which fostered open discussion and led to introduction of a number of changes without friction or subsequent recrimination. These meetings have contributed largely to the maintenance of good relationships which continue to be excellent.

Good use is still being made of the provisions made three years ago to ease the condition under which sawmills could be amalgamated within defined zones. Since then 120 mills have participated in unions which have served to strengthen their position and help them the better to meet the competition of other materials. In some supply zones these actions have simplified the position and the stage is approaching when it is possible to give consideration to a modification of timber sales policies to allow greater application of non-competitive sales. The Department is encouraged to aim at relatively early action in this regard by the fact that Industry has shown itself so willing to assist in the introduction of desirable changes.

Once again the area of softwood has been a record and at 15,650 acres exceeds last year's establishment by 515 acres. The achievement of this acreage against a reduced area of new planting financed by the Commonwealth under the Softwoods Agreements Act during its second five-year period was greatly helped by the availability of funds for the relief of unemployment. These funds were provided at a most opportune time and enabled the straightening of stems damaged by cyclone to be done expeditiously and without disruption of other activities associated with the active reforestation programme with Slash Pine in the southern coastal plain where plantations were submitted to the full blast of a most destructive cyclone. In the Tuan–Toolara and Beerburrum areas greatest damage was caused to the young stands two to five years old and most of these were of a size capable of being straightened. In older stands badly damaged stems large enough for pulp or saw log are being salvaged with the co-operation of Industry. This same co-operation has been displayed by the Maryborough firms operating on Fraser Island where the worst of the cyclone was felt and some four million super. feet of hardwood and pine in the native forests required to be salvaged.

The passing through the Commonwealth Parliament of legislation dealing with the second five-year period of the Commonwealth Softwood Agreements Act has been delayed firstly by the need to secure agreement between States and Commonwealth on the terms of extension and recently by amendments approved by the Senate but unacceptable to the Government and the States. The terms accepted by the States to form the basis of the new Act involve a reduction in the area of new plantings to be funded each year by the Commonwealth although the amount of financial assistance over the second five years is not expected to be less than in the first five years. In the case of Queensland the base acreage has been raised from 5,200 acres to 5,640 acres and the approved programme reduced from 10,000 to 9,700 acres. This means that the Commonwealth will now fund 4,060 acres against 4,800 acres in the final year of the first period and will contribute a lesser amount towards maintenance of other than first year areas established under the scheme than would have been the case had the Act been extended in its original form with base year area and approved programme unaltered.

This reduction of areas of new planting to be funded by the Commonwealth and the increased responsibility placed on the State for maintenance taken with the fact that the increased areas of exotics planted in 1965-6 and 1966-7 are now at the pruning stage make it necessary for the planting rate in Queensland to be curtailed and action is in hand to bring the area down by gradual steps to about the level of the approved programme.

The total area of new softwood plantations established since the inception of the Softwood Agreements Act is 72,611 acres. This means that in the past six years nearly 40 per cent. of the State's total area of softwood plantings has been established. The remaining 60 per cent. was established over a period of more than 40 years and shows how important the Commonwealth assistance has been in this field.

The other reason for delay in extending the Act relates to concern over the impact of these planting programmes on the environment in each of the six States. It is clearly demonstrable that these activities which result in rapid development of a forest cover protective to soil and to the environment have less impact than the far more extensive clearing for crops and improved pastures and in fact involve only a small percentage of the forest area under the control of the Department of Forestry. If the approved rate of planting is sustained to the end of this century less than 500,000 acres of plantation will have been established and the present combined areas of State Forest, National Parks and Timber Reserves exceeds 12 million acres and is increasing. Moreover in Queensland some 40 per cent. of the plantations are the native Hoop Pine under which the development of rain-forest species is encouraged.

The past year has again seen an improvement in the position regarding the number and area of selections subject to freeholding action and awaiting assessment and valuation of timber stands. The area under application to freehold and still needing field survey fell by 619,000 acres to a figure of 868,000 acres and the area covered by completed valuations exceeded the area of new applications by 717,000 acres.

Over the years there have been very few genuine complaints over the valuation of timber in association with freeholding. Initially some difficulties arose where hardwood stands carried large numbers of small poles but of recent

years adequate allowances have been made in such cases and there has been a general acceptance by landholders of the Department's valuations. In this the officers of the Forest Resources Section have done a particularly good job initially under very difficult and demanding conditions.

Interest in National Parks continues at a very high level and during the year the strength of the university trained staff in this Section was increased by three. In addition the involvement of the trained staff of all ten Forestry Districts in the management of the National Parks continues to assist the National Parks Section in its work. At the same time the area of National Parks Reservations increased by 90,731 acres. The main new area dedicated consisted of 61,300 acres in the north of Fraser Island to form the basis on which a larger area of some 100,000 acres will ultimately be reserved. Action is well in hand for the building of three boats needed for the investigation of Marine National Parks and for the management of Island Parks.

An event of great importance to the National Parks Section was the opening by the Honourable the Premier J. Bjelke-Petersen on Sunday 9th April of a new camping area at the Bunya Mountains on part of an area of 40 acres donated by Mr. and Mrs. Alan Stirling. At this ceremony the Honourable the Minister for Lands unveiled a plaque to commemorate this gift which reads "This camping area is part of an area of 40 acres generously donated to the people of Queensland by Mr. and Mrs. Alan Stirling for addition to the Bunya Mountains National Park and in appreciation of the service rendered to the State by the Honourable J. Bjelke-Petersen M.L.A. as Premier of Queensland..."

It is pleasing to report that the Department has also received a number of offers from similarly public spirited people to donate land of National Park value for inclusion in the Park estate. These offers are mainly in the Tamborine and Canungra areas.

In an effort to relieve some of the pressure on National Parks in areas near Brisbane and other centres of population and to promote the ideals of multiple use of State Forests funds were provided this year for the first time specifically for the use in development of suitable areas for use of the general public for open air recreation under forest conditions. These areas will complement the National Parks and provide for some activities which are not permissible on National Parks. Most of the $25,000 provided for this work was expended in the Brisbane, Gympie and Maryborough Districts.

Forest Recreation Area, State Forest 69 Bunya. This area some eight miles from the Brisbane G.P.O. will help reduce pressure on local National Parks.

MANAGEMENT

General

The area of State Forest as at 30th June, 1972, was 7,717,570 acres, a net increase of 9,216 acres.

Expenditure

Expenditure under the Reforestation Vote was $6,139,503 compared with $5,784,232 in 1970-71. Expenditure from Trust Funds on projects associated with the Reforestation Vote was $138,419.

Expenditure is itemised as follows:—

Item	Expenditure	Percentage of Total
Direct Expenditure on Projects—	$	
Plantations	1,724,733	27·5
Natural Regeneration	226,027	3·6
Nursery Expenses	214,532	3·5
Research	260,453	4·1
Protection	882,572	14·1
Surveys	92,729	1·5
New Construction	143,347	2·3
Seed Collection	27,547	0·4
Maintenance of Capital Improvements	134,078	2·1
Total Direct Expenditure	$3,706,018	59·1
Indirect Expenditure—		
Wet Time, Holidays and Leave	724,168	11·5
Supervision, Tools, Cartage, &c.	1,245,361	19·8
Camp Allowance	363,368	5·8
Pay Roll Tax	144,013	2·3
Workers' Compensation	52,563	0·8
Administration	194,273	3·1
Miscellaneous	*Cr.* 151,842	*Cr.* 2·4
Total Indirect Expenditure	$2,571,904	40·9
Total Expenditure	$6,277,922	100·0

Timber Assessment

Establishment of permanent plots in the plantations in Southern and Central Queensland continued with some 125 new plots being installed to sample about 6,000 acres of Hoop Pine and exotic pine plantations.

About 90,000 acres of State Forests and Timber Reserves were sampled by strip survey and about 400,000 acres of Crown land were stripped to provide details of timber stand volumes and to assess the potential of these forests for permanent timber production.

Aerial reconnaissance of timber stands was again concentrated on the western Cypress Pine region where some 20 selections and holdings were investigated covering 1,670,000 acres.

Since 1965 nearly 14 million acres have been flown for the purpose of investigating timber stands.

Valuation of timber on Land for Conversion of Tenure

As in the previous year the rate of new applications has been slow and this has allowed the Department once again to finalise more applications than new ones received during the year.

At this stage only 250 applications (8 per cent. of the total requiring valuation since 1960) are still not finalised and of these 168 have had the necessary field work completed.

The 82 selections not covered by field assessment is considerably fewer than the applications received (134) during the year.

In addition to these conversion applications the Department has been asked to provide valuations on 159 selections arising out of sub-divisions in the Brigalow Development Area No. III with a total area of 2,820,000 acres.

This includes some 46 applications (874,000 acres) which were dealt with and forwarded to the Land Administration Commission during 1971-72.

FREEHOLDING POSITION IN RELATION TO PREVIOUS YEARS

	As at 30th June, 1970		As at 30th June, 1971		As at 30th June, 1972	
	No.	Area	No.	Area	No.	Area
		Acres		Acres		Acres
Total applications made	2,784	22,692,000	2,911	23,832,000	3,048	24,696,000
Withdrawn before valuation	27	256,000	29	245,000	32	270,000
Total requiring valuation	2,757	22,436,000	2,882	23,587,000	3,016	24,426,000
Valuation complete and determined by Land Court	1,842	13,038,000	2,323	17,987,000	2,525	19,882,000
Valuation complete and awaiting Land Court determination	544	4,960,000	240	1,931,000	241	1,617,000
Field assessment complete but not yet valued	216	2,441,000	181	2,182,000	168	2,059,000
Awaiting field assessment	155	1,997,000	138	1,487,000	82	868,000
Totals	2,757	22,436,000	2,882	23,587,000	3,016	24,426,000

Employment Wages Staff

	Average 1971–72	As at 1–7–71	As at 30–6–72
Reforestation	1,342	1,337	1,418
Harvesting and Marketing	179	166	182
National Parks	67	59	72
Road Construction and Maintenance	72	74	71
Maintenance of Plant	61	60	64
Totals	1,721	1,696	1,807

Average expenditure on Reforestation per man-year for 1971-72 was $4,575 compared with $4,313 for 1970-71.

Protection

SEASONAL CHARACTERISTICS. The outstanding feature of the fire season was the occurrence of a period of very high to extreme fire danger rating associated with strong north-west winds in mid-November. This spell of bad fire weather affected an area from south of Gympie to north of Mackay and was prolonged in Central Queensland.

Storm rains in mid-October in the South-east generally eased fire conditions and by the end of November the fire season had virtually ended in coastal areas. In western districts, fire weather persisted into early January.

Heavy summer rains in early 1972 on top of those in early 1971 have resulted in high levels of grass fuel for the 1972-73 fire season.

FIRE INCIDENCE. Two hundred and thirty-three fires were attended by departmental employees as against 190 in 1970-71. The number of fires appear to be increasing with time. Forty-one fires were in excess of 1,000 acres compared with 18 in 1970-71. Police Officers assisted in the investigation of 24 fires for breaches of provisions of the Rural Fires Act or the Forestry Act. Three successful prosecutions resulted in fines totalling $120. Ten demands met for costs of fire-fighting resulted in $896.35 being recovered. Nine 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 attained 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	10,001+
July	11	5	2	4	..	..
August	5	3	..	2	..	..
September	23	6	6	5	6	..
October	73	18	24	25	6	..
November	104	26	19	30	22	7
December	14	6	7	1	..	..
January	..	..	..	..	..	..
February	..	..	..	..	..	..
March	2	1	..	1	..	..
April	..	..	..	..	..	..
May	..	..	..	..	..	..
June	1	1	..	..	..	..
Totals	233	66	58	68	34	7

Eleven of the 233 fires were in softwood plantations. Of these four were started by lightning (area 20·4 acres), two are suspected to have been lit by incendiarists (area 1·8 acres); two in Hoop Pine resulted from overburn in scrub burning operations (area 1·2 acres); two were small escapes from burning operations (area less than 0·1 acre) and one originated from a snigger's cigarette (area 0·1 acres). Of the 23·5 acres involved in the eleven plantation fires only 1·2 acres was in need of replanting—1·0 acres of Hoop Pine was salvage logged and the other 0·2 acres was Hoop Pine two-years old. Damage sustained in the other fires is in general loss of some increment only. The largest plantation fire covered 13·5 acres at Toolara in the Gympie District and originated from a lightning strike.

Eight fires cost in excess of $1,000 each to control. Five of these were in sand country on Fraser Island and at Cooloola, two were adjacent to pine plantations (one at Elliott River in the Bundaberg Sub-district and the other at Toolara in the Gympie District) and the other was in rough mountainous country at Mapleton in the Beerburrum Sub-district.

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

District	No. of Fires	Area Burnt Over (acres)			
		Crown Timber Areas		Private	Total
		Inside Protection Systems	Partly Protected or Unprotected		
Atherton	20	22,058	3,501	14,330	39,889
Brisbane	68	14,170	505	8,939	23,614
Dalby	24	12,981	2,072	12,097	27,150
Gympie	17	43,774	2,350	2,397	48,521
Mackay	27	46,383	1,540	1,430	49,353
Maryborough	22	32,091	62,280	4,166	99,347
Monto	5	5,100	650	1,800	7,550
Murgon	26	1,350	18	664	2,032
Warwick	10	1,715	..	5,202	6,917
Yarraman	14	5,824	..	4,368	10,192
Totals	233	186,256	72,916	55,393	314,565

Major known causes of fire outbreaks by percentages were:—

Unauthorised burning off	16·0%
Government, Semi-Government Authorities and bush workers	6·0%
Escapes from permit fires	10·0%
Re-lights of old fires	9·0%
Lightning	5·0%
Camp and billy fire escapes	..
Incendiarists	6·0%
All other known causes	8·0%
Unknown causes	40·0%
Total	100·0%

Communications

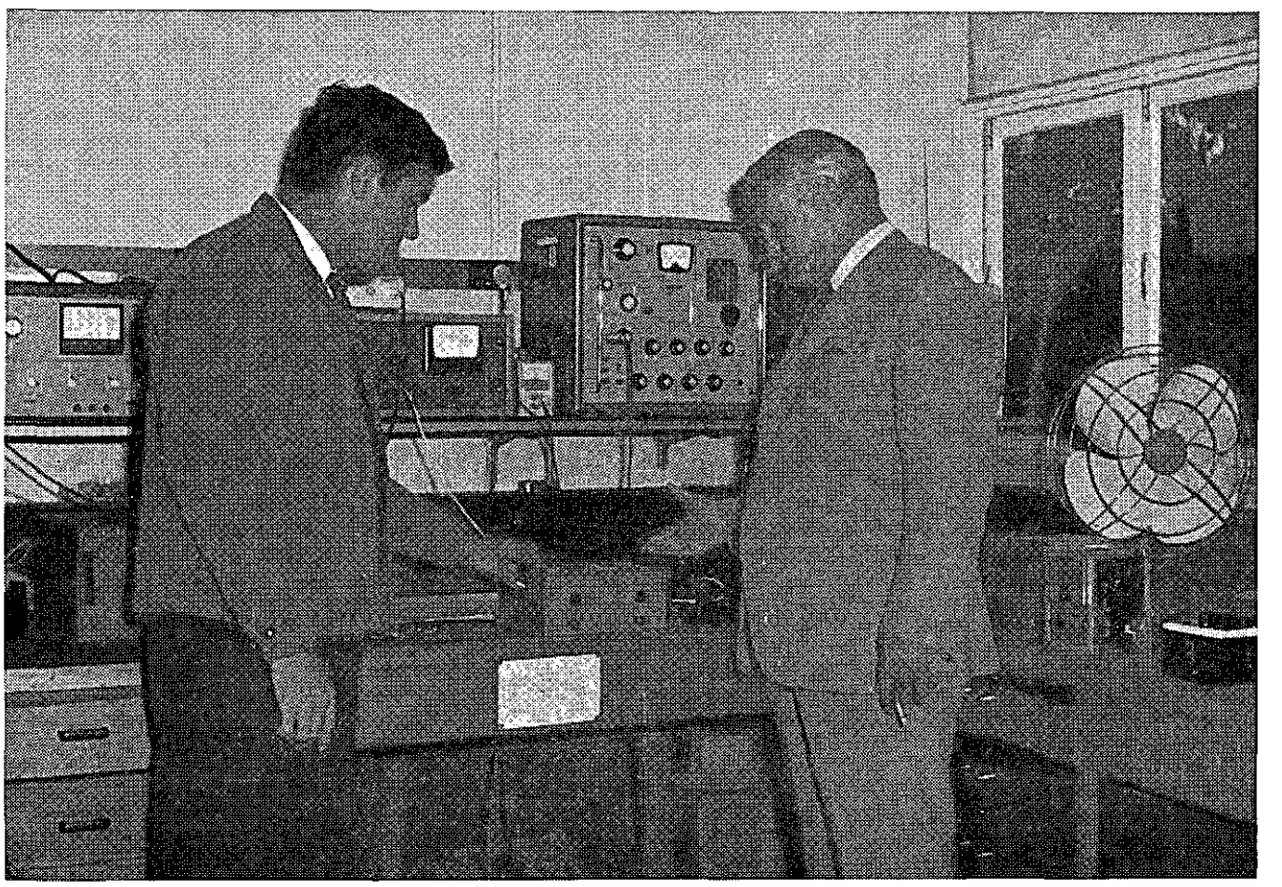
Installation of V.H.F. equipment has continued and the programme in Southern Queensland is nearing completion.

Twenty-five V.H.F. base stations were purchased during 1971-72 and will replace many temporary installations using mobile units.

S.S.B. 100 watt transmitter receivers have been purchased for installation in Central and North Queensland outside areas now covered by V.H.F. Some are fitted with channels for the Royal Flying Doctor Service and our own H.F. channel 4,615 Khz.

Three V.H.F. and three S.S.B. transceivers have been purchased for Marine National Parks boats.

An additional vehicle, supplied to the Communications Centre will enable a more flexible maintenance programme to be effected and the time to carry out on-the-spot repairs should be reduced considerably.



The Honourable V. B. Sullivan, M.L.A., Minister for Lands inspects the communications centre at State Forest 69 Bunya in the company of the officer in charge (Mr. B. Hinkler).

Presently there are 385 V.H.F. mobiles and 213 V.H.F. bases and 25 V.H.F. portables in service on three channels, 76·70 Mhz., 76·73 Mhz., 76·76 Mhz. A further 49 Citizens band radios and 69 remote control consoles are also in use.

Installations of U.H.F. 470 Mhz. radio control links have been completed at Mt. Glorious and it is expected to complete Bundaberg, Maryborough and Gympie bases next year.

Three thermo electric generators 3M type 510 have been purchased and will provide power for link and base equipment in remote areas.

Construction of the proposed North Queensland Communication Headquarters has been held up due to delays in the acquisition of land.

Detection

During the year, construction of a 120 foot fire tower commenced at Pechey in the Yarraman District.

Aircraft were used for fire detection in the Maryborough and Dalby Districts only. A total of 23 flying hours was logged.

Equipment

Five trucks, pumps and motors were purchased for later construction of specialised fire tankers, based on the New South Wales Forestry Commission design. Of the five new tankers one will be placed in the Yarraman Hoop Pine area and the other four in the rapidly expanding Tuan–Toolara exotic pine complex. Tankers replaced will be re-allocated to plantation areas in the Mackay and Murgon Districts.

A further four slip-on fire units of 275 gallon capacity were constructed and eight mop-up pumps purchased for use with small steel tanks in light vehicles.

A further tank was manufactured for carrying on the three-point linkage of the larger four-wheel-drive tractors.

Four large eleven gallon drip torches were manufactured for use off the back of vehicles to effect fast edge lighting in conjunction with aerial ignition operations.

Fire Research

The fire research programme has been expanded in the past twelve months by the inclusion of four detailed long-term fire effects experiments. Two of these are new experiments and two were previously part of the hardwoods silvicultural research programme.

These latter include an experiment on the effects of annual burning on Spotted Gum forest, which was established in 1951 on State Forest 958 Gundiah, and an experiment on the effects of burning at two-year and four-year intervals in Blackbutt forest, at Bellthorpe, Peachester and Fraser Island. Both experiments are long-term studies of the effects of various burning regimes on the regeneration, understorey, growing stock and nutrient status of commercially important hardwood types. Following successful trials of aerial ignition techniques last year, the scope for conducting prescribed burning on a more extensive scale has been widened, and these two experiments are vital guides in the long term for the formulation of a protection policy for hardwood areas.

The Spotted Gum experiment has recently been logged and is due for treatment. It is proposed to incorporate a further burning treatment (burning at three-year intervals) in an adjoining compartment.

The two new experiments include one to study the effects of prescribed burning in Slash Pine plantation at three-yearly intervals, on growth rate, understorey, fuel reduction, and nutrient status of the forest. The first burn was conducted in June, 1972. The other new experiment is on the effects of mild, moderate and hot fires on treated Cypress Pine and a mixed stand of Cypress Pine and Spotted Gum. This experiment is located at Barakula, and the burns were carried out in July-August, 1971. The effect of fire on mortality (to regeneration and growing stock), increment on surviving trees and stem and crown damage is being recorded. Assessment of mortality by height classes three months after burning was as follows:—

Type of Stand	Height	Mild Fire	Moderate Fire	Hot Fire
	Feet	Per cent.	Per cent.	Per cent.
Treated Stand ..	0—10	21	28	37
	10+	4	2	4
Mixed Stand ..	0—10	29	40	..
	10+	7	6	..

A further two weeks were spent studying cane fires at Bundaberg with the fire research section of the Forest Research Institute. Thirty cane fires were documented, and provided a contrast with burns studies at Tully in 1970. Most of this data has now been analysed, and a cane burning meter will be produced prior to the next cane harvesting season.

Further experimental fires were conducted at Toolara in Slash Pine plantation in conjunction with trials on the ground application of fire retardants.

Fire lines were prepared around small areas using Phos-Chek, Fire-Trol 931, Fire-Trol 934, Viscous Water and plain water. Experimental fires were then run in these areas and the effect of the prepared fire lines on the fire was recorded. The residual value of the treatment was tested by burning 24 hours after application of the treatment.

The retardant was applied with conventional light pumping equipment in general use throughout the State. Special mixing equipment is necessary for the mixing and application of Viscous Water. Further trials are planned.

General

Expenditure on fire fighting, patrol and detection was $166,571 (compared with $137,747 in the 1970-71 year). Direct suppression costs were $47,579 ($21,748). Prescribed burning to reduce forest fuel levels prior to the fire season cost $12,077 ($9,824). The area covered by prescribed burning was 109,309 acres (94,350 acres) of which 16,000 acres was burnt through aerial ignition and 201 acres were in Slash Pine plantations. Burning of logging debris cost $5,835 ($3,908) over an area of 26,750 acres.

Co-operative burning with neighbours cost $15,472 ($16,429). New roads charged to protection and new fire breaks cost $266,587 ($298,543) and maintenance of existing protection roads and fire breaks cost $342,727 ($351,582).

Industrial Safety

The accident frequency rate for the year was 110·0, being very similar to the 1970-71 figure of 112·9.

During the year three departmental safety courses were conducted with a total attendance of 28 supervisory staff.

MECHANICAL EQUIPMENT

General

A number of the Department's rubber-tyred tractors were fitted with special heavy duty canopies during the year to provide protection against falling limbs as well as the normal roll-over type of accidents, and to allow use as required within forest areas in fire-fighting activities. The design proved itself within a few weeks of fitting to one unit when the roadside edge collapsed and the tractor rolled down the embankment. The operator was not injured and only minor damage was sustained by the tractor and canopy.

In the heavy equipment field twelve graders were purchased to replace thirteen aged and non-standard machines, and this is expected to lead to improved performance by the grader fleet.

The projected earlier replacement of light motor vehicles should allow greater vehicle reliability and improve operating costs.

Five additional specialised fire tankers have been acquired and, after final fitting out to the New South Wales Forestry Commission's design, will be allocated to major plantation centres.

During the year tenders were called for two thirty-foot cruisers and one twenty-foot launch for Marine National Parks use. The vessels are now under construction and deliveries are expected early in the 1972-73 financial year.

Following the recent transfer of the Plant Inspector at Townsville to another Department it has been approved that the replacement Plant Inspector for North Queensland be based at the District headquarters at Atherton.

Purchase of Plant: Major items of Plant purchased during the year were:—

12 Graders;
2 Rubber Tyred Tractors;
85 Replacement Motor Vehicles;
9 Additional Motor Vehicles;
15 Caravans; and
5 4 x 4 Cab and Chassis Fire Tankers.

Census of Major Plant as at 30th June, 1972:—

472 Motor Vehicles/Trucks;
62 Crawler Dozers;
50 Rubber Tyred Tractors; and
32 Power Graders.

Maintenance of Plant—Main items for the years 1970-71 and 1971-72 were:—

	1970–71	1971–72	Difference
	$	$	$
Fuel	141,686	173,511	+31,825
Oils	18,735	18,567	−168
Tyres and Tubes ..	26,642	27,477	+835
Repairs	476,613	497,884	+21,231
Registration and Insurance ..	51,004	49,336	−1,668

ACQUISITION OF LAND

During 1971-72 an amount of $39,486.87 was expended on the acquisition of land for Forestry purposes as follows:—

	$
Purchase of Land	4,443.00
Survey Fees	34,614.43
Real Property Fees and Lands Department Charges	429.44
	$38,486.87

The expenditure of $4,443 represents the purchase of three parcels of land with a total area of 7 acres 2 roods 2·7 perches.

About 1 rood of this land, located near Esk, was acquired by the Department as the site for a fire tower.

The balance of the land acquired will be added to existing National Parks.

FOREST SURVEYS

Twenty-eight survey parties operated during the year ended 30th June, 1972.

For the various type surveys, the parties were divided as follows:—

Parties	Type of Surveys
1	Boundary definition (surveyed by Authorised Surveyor)
2	Theodolite Control Surveys (to provide a framework for other type Forest Surveys)
15	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
5	Timber Assessment Surveys in connection with application for freeholding actions

Details of surveys carried out by the parties are:—

DETAILS OF SURVEYS IN MILES

—	Miles
Boundary Definition Surveys	30
Theodolite Controls	55
Forestry Compass Traverse	948
Connections and Relocating Old Traverse	992
Level Surveys	8
Stripping and Assessment Surveys	4,795
Road Grade Surveys	38
Total Surveys for Period	6,866

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

100 per cent. Timber Assessments	54,984 acres
Forest Inventory Survey Plots Remeasured ..	707
Forest Inventory Survey Plots Established ..	186
Plantation Heighting for Thinnings	931 acres

Personnel

SURVEYS.—At the end of the period, the total strength of survey parties was 114 classified as follows:—

Forest Surveyor	Foresters	Survey Rangers	Survey Overseers	Survey Leading Hands	Cooks	Labourers
1	7 (Includes one Authorised Surveyor)	12	23	3	7	61

MAPPING.—The Drafting Branch comprises 38 officers of whom four are engaged in mapping and drafting supervision, 23 engaged on cartographic compilations and survey data, one in survey training and survey supervision, one on theodolite control surveys, and one in duplication and photo copying. The remainder (eight) carry out administration mapping and drafting duties.

SURVEY TRAINING.—Four Survey Training Courses were conducted by the Forest Surveyor, in the Beerburrum area, for periods of two weeks each. The following officers attended these courses, six Foresters, two Overseers, four Leading Hands and 38 Forest Trainees. The Forest Trainees were also attached to various survey camps for practical experience, for a period of three months.

GENERAL.—Only moderate interruptions due to wet conditions were reported during the year.

Accommodation has been improved considerably in many survey camps by the provision of caravans.

Towards the end of the period, preparations began for conversion to metric of all surveys and mapping.

AUTOMATIC DATA PROCESSING

Development of the Harvesting and Marketing Computer project has continued. Programming for Stage 1 (A) "Production of Stumpage Accounts for Natural Grown Timbers" has reached the stage were data capture can proceed. This will enable testing of the programmes and creation of master files.

The redesigned computer system for the Plantation Registrar is now operational.

Consideration is being given to the development of an Automatic Data Processing Section which would be responsible for most of the technical and commercial programming requirements of the Department.

All automatic data processing is currently carried out at the Treasury computer installation.

REFORESTATION

General

Rainfalls at the principal centres for silvicultural operations were generally well above average, and this is illustrated for some plantation centres in the table below.

RAINFALL IN POINTS

	Hoop Pine Centres			Exotic Pine Centres		
—	Yarraman	Imbil	Kalpowar	Beerwah	Tuan	Bowenia
1971–72	3,785	5,876	3,970	5,959	7,281	7,335
Average	3,186	4,667	3,476	6,298	5,262	6,451

The year's weather was characterised by the number and severity of its cyclones. Of the six cyclones which affected Queensland most damage to timber stands was caused by cyclone "Daisy" which brought heavy falls of rain and strong winds to the coastal fringe as it moved along the coastline from Sandy Cape to Cape Moreton. It caused severe damage to natural forests on Fraser Island, and windthrow of young Slash Pine in plantations at Tuan, Toolara and Beerburrum which had been made susceptible to this damage by waterlogged soil.

Although rainfalls at the principal Hoop Pine centres were generally above average in late winter and early spring, clearing and burning of the scrubs in preparation for summer planting was completed without serious delay. Monthly rainfall figures for Yarraman are given in the following table:—

RAINFALL IN POINTS

—	1971–72	Average	—	1971–72	Average
July ..	68	160	January ..	507	428
August ..	296	123	February ..	442	453
September	183	131	March ..	214	350
October ..	322	286	April ..	302	196
November	375	311	May ..	137	179
December	857	415	June ..	82	154
			Total ..	3,785	3,186

Field Operations

Actual expenditure in the field of silvicultural operations excluding overheads, amounted to $2,258,017 in 1971–72, compared with $1,918,449 in 1970–71.

The summary below shows the acreages of the main silvicultural operations in 1970–71 and 1971–72.

Operation	1970–71	1971–72
	Acres	Acres
Area of plantations established	15,135	15,650
Area of plantations covered in pruning ..	10,706	10,610
Area of plantations tended	83,724	94,825
Area of plantations thinned merchantably	8,936	9,524
Area of plantations thinned unmerchantably	919	1,583
Area of natural forest treated	21,372	28,709

Planting

Areas of plantations established between 1st April, 1971, and 31st March, 1972, are shown by Districts and species in Appendix F.

The net area of effective plantation as at 31st March, 1972, classified by Forestry Districts is shown in Appendix G. With the completion of this winter's planting the area of plantations will exceed 200,000 acres.

Total planting in 1971–72 comprised:—

	Acres
New plantations	15,650·5
Replanting failed areas	378·0
Replanting burnt areas	1·0
Underplanting	131·0
	16,160·5

Acreages of the various species planted in new plantations in 1970–71 and 1971–72 were:—

Species	1970–71	1971–72
	Acres	Acres
Native conifers (mainly Hoop Pine)	3,823·9	3,478·8
Slash Pine	9,210·8	10,178·0
Loblolly Pine	152·0	133·8
Caribbean Pine	1,521·2	1,474·1
Radiata Pine	325·0	247·1
Patula Pine	65·6	62·6
Others	36·7	76·1
Totals	15,135·2	15,650·5

The acreages planted at Beerburrum, Toolara and Tuan are:—

Centre	Acreage Planted 1971–72	Total Acreage Planted to 31–3–72
	Acres	Acres
Beerburrum	2,062·1	26,326
Toolara	4,325·9	25,790
Tuan	4,111·0	27,388
Totals	10,499·0	79,504

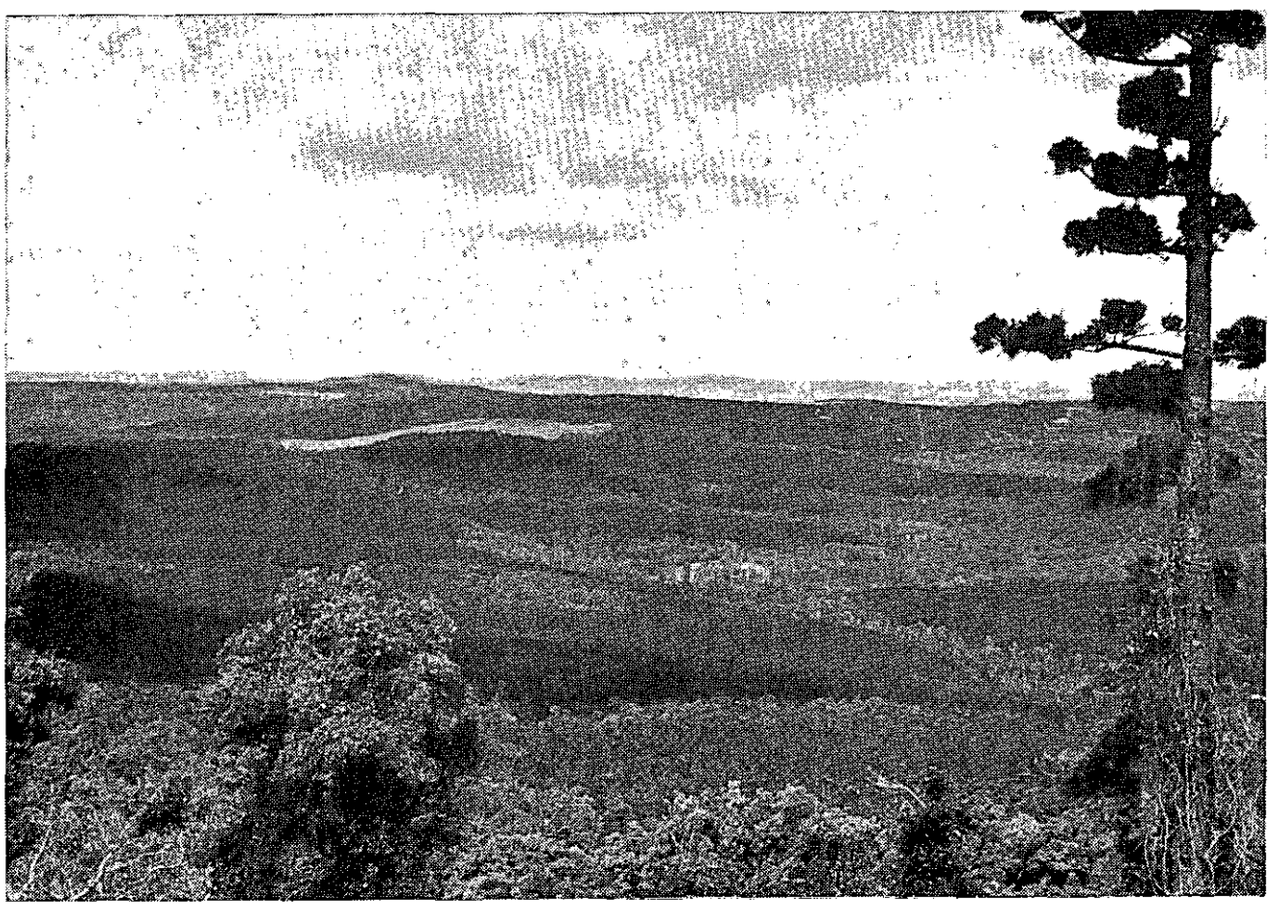
The planting season for Slash Pine is from May to August when the plants are dormant. Adequate soil moisture is required when planting open-root plants, and this can shorten the planting season. As for 1970, the 1971 winter planting season was one of below average rainfall and limited soil moisture. The position at Tuan is illustrated by the following table:—

RAINFALL AT TUAN

Month	1971 Planting Season	Average	1972 Planting Season
April	232	339	833
May	82	311	572
June	215	314	252
July	100	237	..
August ..	396	181	..

Soil moisture has been more favourable early in the 1972 winter planting season. Planting by planting machine was carried out on a trial basis in the 1971 planting season.

Survival of plantings was generally satisfactory with the exception of the Slash Pine areas where substantial re-filling was necessary. The total number of plants transferred to



Panorama Hoop Pine plantations at Kalpowar, Monto District.

the field was approximately 11·2 million and of this number, 633,570 were planted as re-fills. Numbers of re-fills by species were:—

	Plants
Slash Pine	559,869
Hoop Pine	32,953
Caribbean Pine	3,000
Others	37,748
Total	633,570

Following on the trials of complete ploughing reported last year a substantial area was so treated this year in preparation for planting with Slash Pine.

Areas of soil preparation treatments carried out for Pinus plantations during 1971-72 were:—

	Acres
Over-all plough	1,567
Line-mound plough	11,599
Deep rip	1,087

Pruning

Acreages of plantation pruned, as compared with those of 1970-71 were:—

Year	Stage of Pruning				Total
	1st	2nd	3rd	4th	
	Acres	Acres	Acres	Acres	Acres
1970–71	2,426	3,473	3,273	1,534	10,706
1971–72	4,057	2,509	2,316	1,728	10,610

The increase in acreage first pruned relates to the increase in the acreage planted in 1965-66 as compared with previous years.

New instructions for pruning were issued during the year, based on studies of experiments comparing three and four-stage pruning of Hoop Pine which showed that the extra cost of the four-stage operation cannot be justified in terms of added production of clear wood. Pruning is to be done to a minimum height of 21 feet as previously, but it is now to be completed in three stages for all species. In the past Slash Pine has been pruned in three stages, and Hoop, Radiata, Caribbean, Loblolly and Patula Pines in four stages. Pruning will continue to be restricted to areas attaining a rate of height growth which is not less than minima as defined for the various species. It is anticipated the new procedure will result in worth-while economy with only a minor sacrifice in the volume of knot free wood produced.

Thinning

The acreage of plantation thinned merchantably in 1971-72 was 9,524 acres as compared with 8,936 acres during the previous year. The quantity of timber cut was 51·5 million super. feet as compared with 48·6 million super. feet for 1970-71. The increase in thinning was associated with the commencement of merchantable thinning of plantations at Toolara and Tuan in an integrated saw-log and pulp operation and with an increase in thinning for pulp at Imbil. A substantial increase in acreage thinned is expected in 1972-73.

The acreage of plantation unmerchantably thinned was 1,583, as compared with 919 acres during 1970-71.

Tending

The total area of plantations tended during the year, as compared with previous years was:—

Year	1969–70	1970–71	1971–72
	Acres	Acres	Acres
Area covered in tending	62,840	83,725	94,825

The above average rainfalls, particularly in the summer months, again resulted in weed growth above normal necessitating the tending of larger areas of young Pinus plantations and older Hoop Pine plantations.

For the first time a substantial area of young Slash Pine plantation was tended by application of weedicide from the air. The weedicide applied was 2,4,5-T butyl ester which gives good control of eucalypt and wattle re-growth but is not injurious to Slash Pine at the rates of application when the Pine is dormant during winter. 2,4,5-T degrades rapidly on the forest floor and has been applied from the ground for some years past to control re-growth of wattle and Eucalypts in exotic pine plantations. About 12,218 acres were tended under contracts for aerial application of this weedicide at a price per acre which represented a major saving as compared with the cost of application from the ground.

Repair of Cyclone Damage

Young trees of Slash and Caribbean Pines in plantations at Beerburrum, Toolara and Tuan, which had been wind-thrown were straightened. This was done by standing the trees upright and packing soil against them as a temporary support, or in the case of the larger trees, by tieing with binder-twine to the bases of adjacent trees. Damage was most severe in plantations two and three years old. Four and five years old areas were less severely affected, and older areas suffered relatively minor damage. Damage to Slash Pine aged up to four can be repaired reasonably effectively by the means described. Affected trees on about 10,200 acres were treated.

Fertilizing

The area of plantations fertilised during the year was 14,168 acres as compared with 11,402 acres in 1970-71. Superphosphate fertiliser was applied to Pinus plantations in accordance with the normal practice of applying 53·8 lb. P contained per acre to all young Slash Pine and 65 lb. P contained per acre to all young Caribbean Pine at Bowenia with growth rate below Site Index 10. In addition, applications of mixed fertilisers were made at time of planting on an individual tree basis to Slash and Caribbean Pines on selected areas.

Fertiliser was applied from the air for the first time to a substantial acreage of Slash Pine. About 6,785 acres at Beerburrum, Tuan and Toolara were fertilised from the air under contract by the application of granulated superphosphate fertiliser at the rate of 53·8 lb. P contained per acre. This work was completed at a cost substantially less than the cost of application from the ground. Uniformity of spread was checked by a series of traps.

Treatment of Natural Forest

The total acreage of natural forest treated was 28,709 as compared with 21,372 for 1970-71. Particulars of acreages treated for the various forest types are:—

Forest Type	1970–71	1971–72
	Acres	Acres
Eucalypt Forest	6,246	9,542
Cypress Pine Forest	14,638	19,003
Tropical Rain-Forest	488	164
Natural Hoop Pine	Nil	Nil
Totals	21,372	28,709

Particulars of acreages treated by Districts are shown in Appendix H.

A decision was taken during the year to amend the rules for treatment of Cypress Pine forests. Groups of stems of all premerchantable sizes will now be thinned to an average spacing of 16 feet by 16 feet in lieu of 16 feet spacing for stems up to 30 feet high and 20 feet spacing for stems over 30 feet high. Use of hormone with sprays and in frills to control Bull Oak is to be discontinued.

Small stems of Bull Oak are to be cut with high stumps instead of stumps 6 inches high as previously. Light chain-saws are to replace axes on a trial basis for some of the work of ringbarking and cutting to stumps. Use of tree injectors is to be continued.

Nurseries

Twenty-four nurseries, classified as under, were operated during the year:—

13 Hoop Pine;
3 Caribbean Pine;
3 Slash Pine;
2 Radiata Pine; and
3 Amenity Nurseries.

The work at one of the Hoop Pine nurseries is performed by Prison Labour at the Palen Creek Prison Farm. The assistance of the Prisons Department in raising Hoop Pine planting stock for planting on State Forest 200 Palen

is gratefully acknowledged. Stock remaining in the Kalpowar nursery was planted out during the year and the nursery has been closed. No sowing of Hoop Pine was made in the Jimna nursery in 1971 and stock remaining in the nursery is due to be planted out in 1972-73.

Planting stock to the field from all nurseries during 1971-72 totalled approximately 11·2 million plants (exclusive of sales for amenity planting) as compared with 9·1 million during 1970-71.

Construction of the new Toolara nursery on a 50 acre site has proceeded in preparation for sowing in the spring of 1972. A preliminary planting of species suitable for landscaping purposes has been made on the site of the new amenity nursery at Dalby.

Seed Collection

Quantities of seed collected in 1970-71 and 1971-72 were as follows:—

Species	1970–71	1971–72
	Pounds	Pounds
Hoop Pine	476	188
Bunya Pine	5,846	6,110
Slash Pine	4,604	3,529
Caribbean Pine	238	75
Radiata Pine	31	Nil
Patula Pine	77	Nil
Loblolly Pine	613	345
Totals	11,885	10,247

The last major collection of Hoop Pine seed was in 1968, and stocks of seed in cold storage are low, at about 36,600 lbs. of which about 13,700 lbs. will be required for the 1972 sowings. Stocks of some favoured provenances are exhausted. Further, in accordance with the normal trend for the conditions of storage, the viability of the seed collected in 1968 has declined considerably since it was first placed in cold storage. The small collection made during the year was mainly from seed orchard and plantation sources. At this stage it is hoped it will be possible to make a collection in 1972-73 large enough to replenish stocks.

The quantity of Slash Pine seed collected was less than that for 1970-71 but included a larger quantity of orchard seed.

The crop of Caribbean Pine seed was relatively light and although the additional trees selected for the 1970-71 crop were available for collection, the collection was small. Supply of seed of this species continues to be sufficient for Departmental requirements only.

The total value of seed sold in 1971-72 was $19,876, compared with $15,835 during 1970-71. Slash Pine was the principal species sold. There is a considerable demand from overseas countries for seed of Slash and Caribbean Pines from Departmental sources.

Sale of Trees

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

Forest Plots	267,100
Schools and Government Departments	13,868
Other sales	131,038
Total	412,006

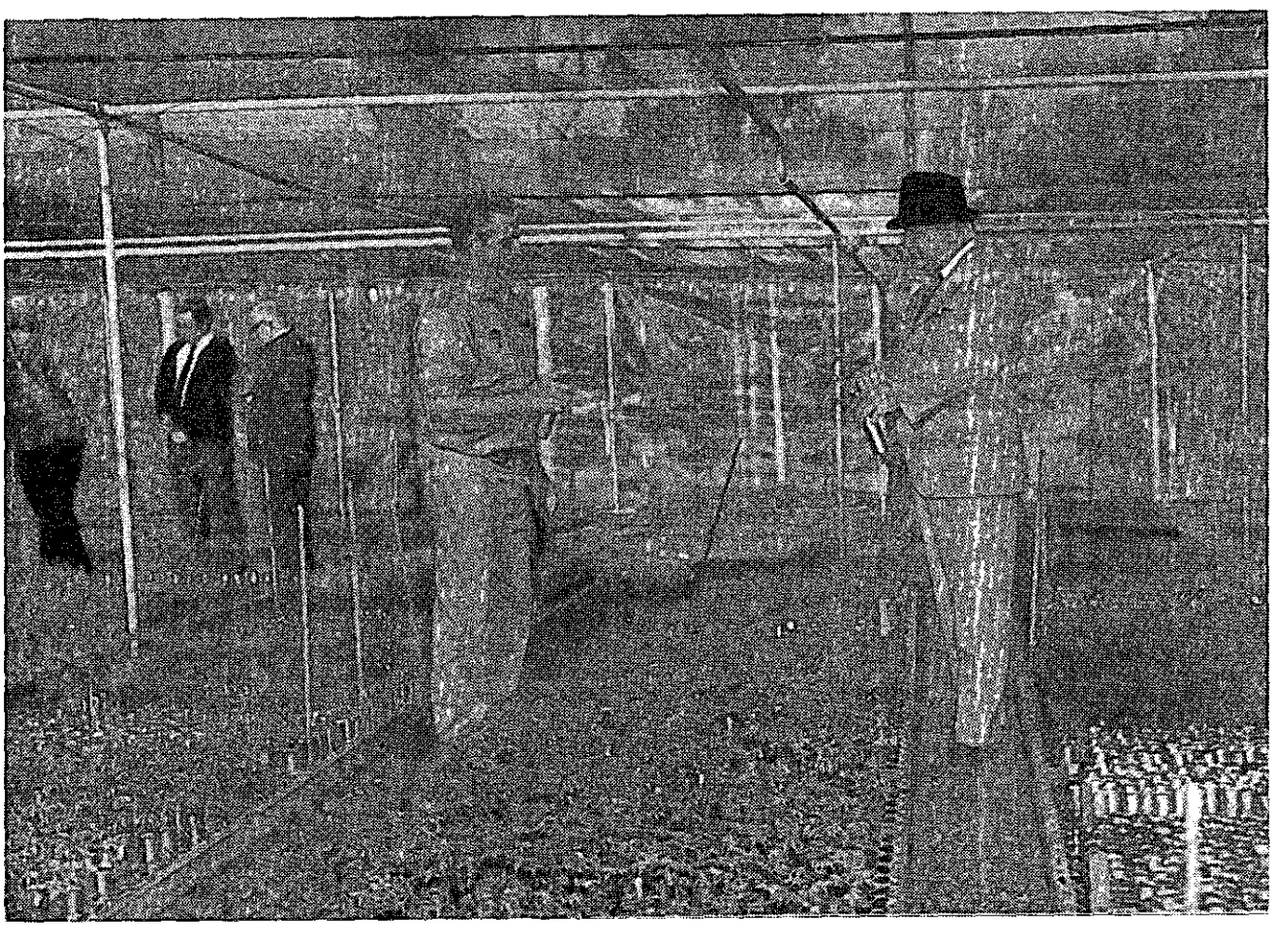
The forest plot sales at concessional rates comprised species:—

	No. of Plants
Slash Pine	142,970
Caribbean Pine	81,058
Hoop Pine	26,411
Other Species	16,661
Total	267,100

Amenity Nurseries

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

Nursery	Plants Sold	Value
		$
Salisbury North	105,454	19,448.70
Dalby	15,090	3,326.15
Totals	120,544	22,774.85



The Honourable V. B. Sullivan M.L.A., Minister for Lands inspects the new forest amenity nursery at State Forest 69 Bunya.

No sales were made directly from the new nursery at Bunyaville. During the year the scale of charges for plants was reviewed and prices were increased for the first time since 1965. Demand for plants continued to be at a high level.

Christmas Trees

6,223 Christmas trees were sold for a total of $3,631.12.

Diseases and Pests

(*a*) Insects, Birds and Animals

An attack by a bark beetle, *Hyleops glabratus* occurred on Hoop Pine trees in plantations in three Districts during the year, causing death of branches, and occasional death of the trees. Formerly this insect has been observed only in Hoop Pine branch litter on the ground.

While the present outbreak is not extensive the insect has potential for serious damage. Preliminary investigations have been made into the insect's breeding places and its life history. There was no other major outbreak of insect damage to standing timber producing trees.

Apart from white grub damage to Hoop Pine in one nursery insect damage to plants in Departmental nurseries was at a low level.

Further releases were made during the year of the lantana leaf-mining beetles *Octotoma scabripennis* and *Uroplata girardi*.

Populations of native rats in young Hoop Pine plantations continued at a high level in the Murgon and Yarraman Districts causing serious losses. Investigations into the breeding habits, home range movements and biology of the rats have been continued. Tests have shown that wheat, which has been used as a bait base for many years, is far from satisfactory for this purpose. Alternative bait bases are being tested.

(*b*) Fungi

A number of disorders of Pinus in Departmental nurseries was investigated. No fungal pathogen was found in association with chlorosis which appeared in patches in seedlings of Slash Pine at Gregory nursery.

Scattered losses of seedlings of Radiata Pine in Passchendaele nursery were found to be associated with *Diplodia pinea*. *Fusarium* species and *Macrophomina phaseoli* were found to be associated with patches of root rot of Slash Pine seedlings in Toolara nursery. Although *Phytophthora cinnamomi* has frequently been found to be associated with root rot of Pinus in Departmental nurseries in past years, no occurrence of this fungus was isolated from a nursery during the year.

The root rot fungus *Phytophthora cinnamomi* was found associated with chlorosis, stunting and occasional deaths of Loblolly Pine in plantations on poorly drained sites at Beerburrum and in the Mary Valley.

Reference was made in the 1970-71 Report to the finding of *Fomes annosus* on a standing dead tree of Patula Pine in a plantation near Atherton. This fungus causes serious root and butt rot of conifers in the Northern Hemisphere. A survey of the compartment concerned revealed the presence of the fungus on nine dead trees, eight of which had broken tops. No evidence was found that the fungus was pathogenic to the Patula Pine. In the inoculation experiment initiated during 1970-71 to test the pathogenicity of the Imbil isolate of *Fomes annosus* to Slash Pine, this organism was not recovered from either of two harvests of inoculated roots.

The fungus *Fomes noxius* which is believed to cause root and butt rot of Hoop Pine was found associated with deaths of Hoop Pine aged 6 to 41 years in a further 11 compartments of plantation in Gympie and Atherton Districts. More detailed survey work to assess the occurrence of loss and damage caused by this fungus is being planned. Observations were continued of the progress of the disease in the study plots which have been established in affected areas of Hoop Pine plantation.

A dieback which occurred in patches in a number of compartments of Hoop Pine plantation in Atherton, Gympie and Yarraman Districts ranging from 2 to 5 years old was examined. A number of fungi has been isolated from affected tissue, none of which is known to be pathogenic to Hoop Pine. Investigation is proceeding.

SILVICULTURAL RESEARCH

There has been some reorganisation of the Branch. This was prompted partly by the return of the Officer-in-Charge of the Forest Soils and Nutrition Section to Beerwah after a prolonged period of special leave during which he studied the ecology and physiology of Hoop Pine mycorrhizas. He is responsible for advising on nutritional and associated work at all research centres in the Department. The Officer-in-Charge of Coastal Hardwoods Research Section has moved his headquarters from Beerwah to Gympie but is still considered to be under the overall direction of Forest Research Officer, Beerwah.

The reports of the four departmental regional research stations and of the biometrics and mensuration section follow.

Atherton Regional Research Station

The main work of this station is research into the silviculture of North Queensland rain-forests with the object of determining treatment prescriptions suitable for application to these forests. In addition this station is responsible for plantation research mainly concerned with Caribbean Pine on poor forest soils in the coastal lowlands of the tropics and with Hoop Pine plantations on the Atherton Tablelands.

(i) *Rain Forests.*—As reported in the last annual report, an experiment has been commenced to observe the progress of stem defects in trees of valuable species after silvicultural treatment. During the year some of the trees were remeasured and photographed. Though it is too early to give conclusive results, it does appear that bends are filling out.

The study of seedling height growth in yield plots reported last year has been amplified and verified. Treatment greatly increases height increment over a wide range of basal areas as shown in the following table.

Mean Annual Height Increment (Feet) by B.A. Classes (Square Feet/Acre) for all Sizes Up to 20 Feet High—North Queensland Rain-Forests

Treatment	50–99 sq. ft.	100–149 sq. ft.	150–199 sq. ft.	200–249 sq. ft.	250–299 sq. ft.	300–350 sq. ft.	Mean
Control	..	·12 (152)	·09 (499)	·26 (1,476)	·14 (388)	·16 (78)	·21 (2,593)
Treated	1·02 (1,842)	1·29 (2,149)	1·08 (469)	..	..	..	1·16 (4,460)

Figures in brackets show the number of trees observed.

Increments are for 250 seedlings per acre. A lesser number of crop trees have considerably higher increments.

An experiment to test the effectiveness of Tordon in eradicating lawyer vine was inspected one year after treatment. Results are shown in the table.

EFFECTIVENESS OF TORDON IN KILLING LAWYER VINE

Treatment	Results
1. Slashing only	30 per cent. of stools show regrowth
2. Slashing and spraying with 2 per cent. Tordon 225 in distillate	No re-growth
3. No slashing. Spraying with 2 per cent. Tordon 225 in distillate	Weak new shoots in 50 per cent. of stools. Number of shoots per stool reduced from 11 to 2·7

Tordon shows some promise in eradicating lawyer vine, but treatment is costly. A previous experiment showed that provided the canes were slashed off at the stool and the stool cut to ground level, most died.

Tending experiments were established in 1966 and 1967 in natural regeneration which resulted from silvicultural treatment. In one of these experiments the natural regeneration, mainly Maple Silkwood, was derived from seedfalls in 1953 and 1954. A previous experiment in this natural regeneration, when about eight years old, showed that tending had very little effect on the growth of select stems compared with similarly selected stems in control plots. The treatments in the recent experiment were: (i) Control, no treatment; (ii) Removing all except selects by brushing and ringbarking; (iii) Thinning around selects to favour selects; (iv) Removing all except selects by basal application of 2,4,5-T butyl ester in fuel oil. Girth increments of the select Maple Silkwood are shown in the table.

CURRENT ANNUAL INCREMENTS (C.A.I.) IN GIRTH OF SAPLING MAPLE SILKWOOD BY TENDING TREATMENTS

Treatment (*See* Text)	1967–68		1968–70	
	Mean B.A. sq. ft.	C.A.I.	Mean B.A. sq. ft.	C.A.I.
	Per acre	Inches	Per acre	Inches
(i)	172·9	·79	187·9	·62
(ii)	59·4	1·05	72·3	1·15
(iii)	88·5	·89	102·0	·97
(iv)	119·0	·79	116·5	1·00
(iv) A	72·0	1·05	80·0	1·15
(iv) B	166·0	·68	154·0	·85

(iv) A and B are the individual plots in this treatment shown separately because of the wide difference in standing basal areas.

There has been a response to treatment which removed for the most part stems under 24 inches girth and the heavier the treatment the greater the response. Treatments (ii) and (iv) have given similar responses but (iv) is much cheaper involving 13 man hours per acre against 30 for treatment (ii). There is a reasonable correlation between standing basal area and girth increment. It was concluded that a tending between 10–12 years after the initial treatment would boost the girth increment of selected stems. Heights of the selects were measured initially, so height instead of age could be used in routine prescriptions. The effects of thinning on branch shed, and hence log length, are being studied. Branch shed observations were made at the commencement of the experiment and will be repeated this year.

Adjacent to the Hoop Pine provenance trial in rain-forest at Kuranda a small area was planted with the following species:—*Anthocephalus cadamba, Araucaria cookii, Callitris intratropica, Centrolobium ochroxylum, Cordia alliodora, Khaya grandifoliola, K. ivorensis, K. senegalensis, Terminalia calamansanai* and *T. superba.* The Anthocephalus particularly has started growing very well.

A further 29 grafts of Queensland Maple, representing 11 trees, were planted out in the Maple clonal orchard. Seed was collected from eight of the earlier clones, and sown at the Danbulla nursery. The resultant stock will be planted next year.

Northern Kauri Pine, enrichment-planted in a high altitude rain-forest near Atherton in December 1960, has developed leader die-back during the last few years. All the trees in the plantings have been affected. The die-back may be due to the Kauri Pine coccid (*Conifierococcus agathidis*).

(ii) *Upland Plantations.*—Hoop Pine provenance trials were established during the year, two on rain-forest sites, one at Kuranda, and one at Koolmoon, and one in wet sclerophyll forest at Mount Spec. Sixteen provenances in three replications at each site formed the main trial, with two less important provenances and routine stock being included in the surround.

Hoop Pine progeny trials were planted in conjunction with the provenance trials. They consist of two replications of 25 progenies at each of the three sites. Nineteen of these are improved southern progenies while six are non-select northern ones.

(iii) *Coastal Plantations.*—A hormone foliar spray trial was initiated in 1970 in a Honduras Caribbean Pine plantation. A wide spectrum of woody species re-growth was treated with a 0·5 per cent. concentration of 2,4,5-T butyl ester, plus surfactant, in water. Plots were sprayed again twelve months later using the same concentration. Standard K.E.F. knapsacks were used for the applications, and no protection was given to young pines. Observations are: (*a*) The treatment resulted in 100 per cent. kill of Wattle; (*b*) A satisfactory control of Swamp Mahogany, White Mahogany and Red Bloodwood, was achieved but not of Poplar Gum; (*c*) Effect on Cocky Apple and Red Almond were only a temporary set back; (*d*) Growth of Honduras Caribbean Pine was not affected by the application; (*e*) The removal of the woody growth was followed by development of a dense cover of giant spear grass, blady grass and kangaroo grass.

A field trial was initiated to study 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 re-growth in newly established plantations of Caribbean Pine. The design consisted of three replicates of a 3 x 5 factorial. Treatments were applied at 60 day intervals during the year. Ordinary knapsacks were used and F10-27 surfactant was added to the treatments at the rate of ½ fl. oz. per gallon. The trial will be fully assessed at the end of 1972. Recent observations show: (*a*) The susceptibility of treated species did not appear to be affected by the time of application. Cocky Apple was the only exception. The best results with this normally resistant species were achieved by treatments applied during the period April–June. (*b*) Early treatments could be handled more economically and efficiently due to initial light development of vegetation. (*c*) Resistance to spray drift of Honduras and Cuban Caribbean Pines was not affected by seasonal factors.

A screening trial for foliar sprays was established late in 1971 to test the effects of varying concentrations of picloram and 2,4,5-T propylene glycol butyl ether ester (2,4,5-T.P.G.B.E.E.) mixtures on species tolerant or partly tolerant to normal concentration rates of 2,4,5-T butyl ester. A surfactant (S.M.70) was added to the solutions at recommended rates. Water was used for dilution.

Turpentine and White Mahogany, which are problem species in young plantations at Cardwell, were selected for the trial and treated by an overall spray. Ten groups of suckers sprouting from broken roots or stumps of both species were used for each treatment.

After six months results show that (*a*) Turpentine was only slightly susceptible to a concentration range of 0·1 to 0·2 per cent. of picloram. However a 96 per cent. kill was obtained when a spray containing 0·1 per cent. of picloram and 0·4 per cent. of 2,4,5-T.P.G.B.E.E. was used. A concentration of 0·15 per cent. picloram and 0·6 per cent. 2,4,5-T.P.G.B.E.E. gave complete control. (*b*) For White Mahogany good results were obtained with rates as low

as 0·1 per cent. picloram. Mixtures containing 0·1 per cent. picloram and 0·4 per cent. 2,4,5-T.P.G.B.E.E. were equally effective. (c) No losses of pines were recorded in the treated areas.

Another experiment studied the effects of 2,4,5-T butoxy ethanol ester and 2,4,5-T butyl ester dissolved in water, and applied as foliar sprays to Wattles, Eucalypts and Cocky Apple. A randomised block layout was adopted and each treatment was replicated three times. Concentrations of active ingredients were 0·2 and 0·4 per cent. for both chemicals. A wetting agent was added. K.E.F. knapsacks were used for the application. Preliminary observations indicated: (*a*) Butyl ester was superior to butoxy ethanol ester in the control of Wattle. (*b*) At 0·4 per cent. butoxy ethanol ester was more effective on White Mahogany than butyl ester at equivalent concentration. (*c*) At 0·2 per cent. both chemicals had little effect on Red Bloodwood whilst a 0·4 per cent. concentration of 2,4,5-T butyl ester gave superior control of this species than did 2,4,5-T butoxy ethanol ester. (*d*) Neither chemical produced lasting effect on Cocky Apple. (*e*) Pines were not affected by spray drift.

A field trial was established to test tolerance of Honduras Caribbean Pine to varying concentrations of hormones. Pines were sprayed to the point of run-off four months after summer planting. Formula 10–27 wetting agent was added to all treatments at a rate of ½ fl. oz. per gallon. Concentrations tested varied from 0·125 to 0·75 per cent. for 2,4,5-T butyl ester, and from 0·10 to 0·20 per cent. for picloram 20K. Treatments were applied in randomised blocks of eight trees, each replicated twice. Results two months after treatment indicate: (*a*) Pines treated with a 0·125 to 0·50 per cent. water spray of 2,4,5-T butyl ester had fully recovered from the initial damage. They showed good form and normal height development. (*b*) Pines sprayed with 2,4,5-T butyl ester 0·75 per cent. did not exhibit harmful effects, but growth rates were retarded. (*c*) Picloram was initially far more damaging than 2,4,5-T butyl ester. Recovery was amazingly fast, especially for the 0·15 and 0·20 per cent. concentration rates and growth was only slightly retarded. However, multiple leaders have developed. Future observations will reveal whether form is permanently damaged.

In the last Annual Report mention was made of some preliminary results on the effects of varying concentrations of wetting agents on the response of coppice and seedling growth to hormone foliar spray. Seven treatments with three replications were used testing the effects of varying concentrations of two surfactants (E95 and F10-27) on the efficiency of 0·4 per cent. 2,4,5-T butyl ester foliar spray Results are shown in the table.

PERCENTAGE OF STEMS KILLED BY 0·4 PER CENT. 2,4,5-T BUTYL ESTER WITH VARIOUS CONCENTRATIONS OF SURFACTANTS 16 MONTHS AFTER APPLICATION

Species	Surfactant						
	E95	E95	E95	F10–27	F10–27	F10–27	Control
	8	4	2	1 (Fluid ounces per gallon)	½	¼	Nil
White Mahogany	18	67	46	7	0	38	11
Red Bloodwood ..	11	50	18	0	64	38	9
Wattles	61	42	65	54	40	55	81
Cocky Apple ..	34	12	19	11	12	28	23

The trial confirmed that the addition of surfactants decreases the effectiveness of 2,4,5-T butyl ester aqueous solutions on Wattles. There seems to be an optimum concentration of surfactant for maximum effect on the two Eucalypt species. With Cocky Apple the best kill was associated with the highest concentration of E95 and the lowest concentration of F10-27.

A trial of Honduras Caribbean Pine, using seed from unselected Nicaragua sources and from plus trees selected at Byfield from Mountain Pine Ridge British Honduras provenance is showing a slight height advantage to the British Honduras provenance at three years of age, whilst its stem form is conspicuously better.

In the Ocote Pine provenance trial, one of the Ocote Pine provenances, from Therico, at three years of age, has a small height advantage over adjacent Honduras Caribbean Pine provenances. The growth of the six provenances of Tenasserim Pine, planted in 1970, continues to be slow. The majority of the plants are now out of the grass stage.

On the mined areas at Weipa further trial plantings of Honduras Caribbean Pine, African Mahogany, American Mahogany, and Hoop Pine were made. New species added were *Khaya grandifoliola* and *K. ivorensis* and various Eucalypt species selected by the company. For these plantings Comalco prepared the planting area by contour grading, ripping the ironstone basement, spreading 2 feet 6 inches of top soil and ripping and grading the planting surface. In addition the Company planted over 50 acres, the main species being Northern Cypress Pine.

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°S and on the hinterland plateau country of Southern Queensland. A fourth section, dealing with native coastal hardwood forests in the sub-tropics transferred to Gympie during the year, but still functions within the administration of the Beerwah station.

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

(*a*) Sub-tropical Coastal Region.—A review of the recent series of Slash Pine nursery experiments seeking to define optimum sowing rate and method of sowing shows that there is little difference between sowing in drills at six inch centres, in two inch wide bands at six inch centres, or in drills at two inch centres (to simulate broadcast sowing), in terms of plant yield or seedling grade. However, increase in sowing rate results in a decrease in root collar diameter and height of seedlings, and a decrease in the yield per cent. of optimum grades of seedlings. This is illustrated in the table below:

YIELD OF SLASH PINE PLANTABLE SEEDLINGS BY SOWING RATE AND METHOD OF SOWING

Seedlings per sq. ft.	Percentage of Seedlings		
	6 inch Drills	2 inch Bands	2 inch Broadcast
20	84·3	87·0	88·0
30	84·2	80·7	78·1
40	70·7	74·3	69·7

There is also an interaction between seedling density and method of sowing. With six inch drills yields per cent. of plantable seedlings are comparable at 20 and 30 seedlings per square foot, with a marked decline at 40 seedlings per square foot; with both two inch bands and broadcast sowing yield of plantable seedlings decreases with increasing seedling density, and increase above 20 seedlings per square foot will necessitate an unacceptably high culling rate in the nursery.

Further experiments on the use of clay-slurry root dips applied to Slash Pine seedlings at lifting have confirmed the beneficial effects of this technique in improving field survivals under adverse planting conditions. It is expected that clay-slurry dips will avoid the necessity for refilling with subsequent substantial cost savings and long-term improvement in stand uniformity. A review of season of planting experiments has shown that over the normal range of seasonal conditions May–June are the optimum months for field planting, and that planting during these months results in significantly increased height growth.

Excellent results have been obtained from the first of a series of experiments comparing pre-emergent weedicides in the Slash Pine nursery at Beerburrum. Dacthal (chlorthal dimethyl) at 20 pounds a.i. per acre effectively controls grass and propazine at one pound a.i. per acre gives almost complete control of broad-leafed weeds. Diphenamid at seven pounds a.i. per acre gives excellent control of both broad-leafed and grass weeds. At these rates one of the weedicides had an

adverse effect on the germination or subsequent development of seedlings. Linuron at two pounds a.i. per acre gives complete control of all weeds, but adversely affects seedling survival. Further trials have been established at the 1972 sowings in all major Slash Pine nurseries to define optimum concentrations of these weedicides, and to test new formulations.

Nursery trials aimed at developing techniques for open-root planting of Honduras Caribbean Pine continue to give positive results. The most successful methods involve severe and frequent root-wrenching, with use of clay-slurry root dips immediately prior to outplanting. The effect of season of planting is also being examined. Survivals from three recent outplantings are shown in the following table.

PERCENTAGE FIRST YEAR SURVIVALS OF UNCULLED HONDURAS CARIBBEAN PINE WITH VARIOUS ROOT-WRENCHING AND ROOT-DIP TREATMENTS

Frequency of Wrenchings	Planted August, 1970		Planted July, 1971				Planted January, 1972			
	Clay*	Nil†	Clay		Nil		Clay		Nil	
	6″‡	6″	6″	3″	6″	3″	6″	3″	6″	3″
Weekly	97	84	86	81	57	47	80	87	71	83
Fortnightly	96	87	73	72	55	50	68	85	54	85
Monthly	95	70	63	71	41	37	77	92	44	82
Mean	96	80	74	75	51	45	72	88	56	83

* Roots dipped in clay-slurry at lifting.
† Roots not dipped in clay-slurry.
‡ Depth of root wrenching.

Conditions prevailing at planting were reasonable at the 1970 late winter planting, very adverse at the mid-winter 1971 planting, and good at the mid-summer 1972 planting; these conditions are reflected in the survivals. In each case clay-slurry root dips markedly improved survival. Acceptable survivals have been obtained in all outplantings involving weekly root wrenchings and clay-slurry. Future research is planned to define optimum season of sowing and outplanting with these techniques.

Large-scale species trials were established during the year over a range of sites at Gregory and Fraser Island to supplement existing trials aimed at determining the best species for plantation establishment in these localities. These trials have been laid out with a variety of site preparation and fertiliser treatments. The trials at Gregory cover a range of soil types through ground-water podsolics, podsolic gleys, clay-textured and loam-textured lateritic podsolics; those at Fraser Island are established over a range of poor quality hardwood forests. The main species under test are Slash Pine, South Florida Slash Pine, Honduras Caribbean Pine, Bahamas Caribbean Pine, and Cuban Caribbean Pine, Benguet Pine, Ocote Pine, and Sand Pine.

A comprehensive sampling of species trials of Honduras Caribbean and Slash Pine on sub-tropical coastal lowlands was commenced in association with staff of the Forest Products Research Branch to provide detailed information on basic wood properties, dry-wood yields, and sawn recovery, of both species. Growth data presented in the 1971 Annual Report showed the greater productivity of Honduras Caribbean Pine on well-drained sites in this region and the additional information is needed to determine the extent to which each species should be used in plantation establishment in this region.

Trial plantings over the past 20 years have shown that Hoop Pine can be established successfully without nitrogen fertilisation as an underplant to exotic pine species on the coastal lowlands once the exotics have closed canopy. Evidence indicates that the underplanted Hoop Pine does not have any significant effect on the growth of the overwood. The most appropriate stage at which to establish Hoop Pine as an underplant is after the first pulp thinning of the exotic pine, at about age 12 years. Growth data indicates that merchantable volume produced over a rotation age of 50 years for the exotic pine can be increased by some 35 per cent.; a yield of 2,760 cubic feet per acre is expected from the Hoop Pine, and 7,930 cubic feet per acre from Slash Pine on average quality sites. To provide data on the long-term economics of underplanting, and problems in the management of two-storied stands, several large-scale experimental underplantings have been made at Beerburrum over the past three years.

All long-term spacing, pruning and thinning experiments were measured and maintained during the year. Transformation of all past measure data from these experiments to a form suitable for automatic data processing is almost completed, and new summary sheets of growth data have been prepared. This task has taken some four years. Information now available will permit the development of major growth functions for exotic pine species over a range of sites and localities.

A review of one experiment established in 1940 to define optimum initial plant espacement in Slash Pine was completed recently, and the results included in a joint paper submitted to the 12th Pacific Science Congress, Canberra in August, 1971. The findings are summarized briefly in the table below.

EFFECT OF INITIAL ESPACEMENT ON THE PRODUCTIVITY OF SLASH PINE

Initial Plant Espacement (Feet)	Age (years) at which Limiting Basal Area* is attained at Site Indices† of			Merchantable Volume‡ (cubic feet/acre) at age		Standing Value§ ($A/acre) at age	
	70	80	90	12 years	20 years	12 years	20 years
7 x 7	12	12	11	2,296	5,473	102	378
8 x 8	12	12	11¼	2,197	5,116	107	385
9 x 9	13¼	13	13	2,082	4,934	101	441
10 x 10	18	16	14	1,872	4,575	96	413

* Limiting basal area is defined as the minimum standing basal area associated with maximum basal area increment. It is 118, 130 and 142 square feet per acre for site indices 70, 80 and 90, respectively.
† Site index is the predominant height achieved or anticipated at age 25 years. Predominant height is the average height in feet of the tallest trees taken one per twentieth of an acre.
‡ To four inches top diamater under bark. Site Index 87.
§ Based on current stumpage prices for pulp and sawlogs. Site Index 87.

These data show that while total productivity is increased with increasing stocking, standing values are greatest at age 20 years with 9 feet x 9 feet spacing under current prices for pulp and saw logs.

(*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.

Tentative yield tables have been derived for Honduras Caribbean Pine stands at Byfield un-commercially thinned to 300 stems per acre. These are tabulated below for three site indices.

MERCHANTABLE VOLUME PRODUCTION TO FOUR INCHES DIAMATER UNDER BARK BY SITE INDEX CLASSES OF HONDURAS CARIBBEAN PINE AT BYFIELD THINNED TO 300 STEMS PER ACRE
Cubic Feet per Acre

Age (years)	Site Index 110		Site Index 100		Site Index 90	
	Volume	C.A.I.	Volume	C.A.I.	Volume	C.A.I.
8	1,060	..	595	..	240	..
10	1,640	290	1,075	240	570	165
12	2,405	382	1,740	332	1,060	245
14	3,270	432	2,525	392	1,730	335
16	4,105	417	3,300	387	2,455	362
18	4,800	347	3,960	330	2,995	270
20	5,400	300	4,520	280	3,380	192

These data show the high productivity attained by the species, even with relatively heavy un-commercial thinning. To age 20 years mean annual increments for merchantable volume range from 169 to 270 cubic feet per acre. The species is characterized by very rapid early growth with current annual increments culminating between 12-14 years followed by fairly rapid decline in productivity. It appears that current annual increment and mean annual increment curves will cross shortly after age 20 years. Where management aims at maximum volume production, short rotations of about 25 years are indicated.

While a number of older species trials are maintained at this centre, more recent work has concentrated on the layout of trials to determine species and establishment methods suitable for planting large areas of swamp sites at Byfield. The growth data presented in the table below is from an experiment planted in February, 1966, on a ground-water podsol soil to compare the growth of several taxa and hybrids in the Slash-Caribbean Pine complex, and the effect of site preparation treatments involving mounding, and ripping and mounding. All treatments were given an application of 3 cwt. Nauru phosphate plus 1 cwt. Superphosphate per acre after planting.

GIRTH (INCHES) AND HEIGHT (FEET) DEVELOPMENT TO AGE SIX YEARS OF SLASH AND CARIBBEAN PINES AND THEIR HYBRIDS ON SWAMP SITES AT BYFIELD

Species and/or hybrid*	No Site Preparation		Mounded		Ripped and Mounded	
	Mean G.b.h.o.b.	Mean Height	Mean G.b.h.o.b.	Mean Height	Mean G.b.h.o.b.	Mean Height
S x H	12·99	19·8	15·53	25·2	14·57	24·7
S x C	11·22	18·2	15·20	25·4	14·37	24·3
C x H	9·51	14·4	..	..	13·74	25·5
H	†	..	13·38	23·9	..	..
C	9·90	15·6	12·96	22·6	13·25	22·6
S	10·59	16·7	12·88	20·2	11·47	18·1
B	..	..	12·06	22·0	10·12	17·4
D	..	..	11·90	17·0	11·78	16·3

* S = Slash Pine, D = South Florida Slash Pine, H = Honduras Caribbean Pine, B = Bahamas Caribbean Pine, C = Cuban Caribbean Pine.
† Not planted.

All taxa, other than South Florida Slash Pine and Bahamas Caribbean Pine, were derived from genetically improved seed. In all taxa, there has been a marked response to site preparation involving either mounding alone, or ripping and mounding; there is little difference between the two site preparation methods, and ripping prior to mounding is not warranted. All hybrids show hybrid vigor and indicate they are well adapted to these poorly-drained sites; growth differences between the three hybrids under test are slight at this age with the Slash x Honduras Caribbean Pine marginally best. Both the pure Honduras Caribbean Pine and the Cuban Caribbean Pine are growing well on these sites, with both Slash Pine and Bahamas Caribbean Pine somewhat inferior.

(*c*) Inland Southern Tablelands.—The staff position at this centre restricts work to the maintenance and measurement of establishment trials, species trials, thinning and spacing experiments. Some limited nursery research has continued aiming to define optimum grades of Radiata Pine seedlings.

An experiment established in August, 1965, to compare survival and growth of Radiata Pine planted at 8 feet x 8 feet spacing under a number of site preparation methods involving complete ploughing, plough mounding, ripping and plough mounding, ripping and rotary hoeing, was remeasured during the year. Growth and survival to age six years is summarized in the following table:—

THE EFFECT OF SITE PREPARATION ON THE GROWTH OF RADIATA PINE TO AGE SIX YEARS AT PASSCHENDAELE

Site Preparation Treatment	Percentage Survival	Mean Height (Feet)	Height Increment (Feet)	
			1966–68	1968–71
Complete Ploughing	79	22·3	6·0	14·6
Plough-mounding	66	16·9	4·0	11·4
Ripping + Mounding	85	17·9	3·7	12·6
Ripping	69	18·9	3·6	13·7
Rotary Hoeing	68	14·6	3·2	10·0
Nil	62	12·0	2·6	8·0

There has been a marked response to all site preparation treatments, with those involving deeper and more complete soil disturbance (complete ploughing, ripping, plus mounding, and ripping alone) giving the best overall growth, current increment and survival. Of these treatments complete ploughing has given best growth with survival slightly below that for ripping plus mounding.

(ii) *Tree Breeding.*—Breeding work with Pinus species is conducted from Beerwah by full time professional and technical staff with part time assistance at several other centres. Most of the work with Hoop Pine, which is reported under the heading "Imbil and Yarraman Research Stations", is conducted from Imbil; the provenance and progeny trials being established in the Atherton and Mackay Districts are also controlled from Beerwah.

(*a*) *Slash Pine.*—Assessment of control-pollinated and open-pollinated families grown at Beerwah from trees selected up to 25 years ago was continued during the year when progeny trials aged 10 to 14 years were studied. As before, families were evaluated for volume production and stem quality (straightness, forking, branching characteristics, etc.) In the older trials the control stock (routine) is the progeny of local high pruned trees. In both the control-pollinated trials assessed, all full-sib families from local plus trees were superior to the control. In Experiment 55 Genetics, which was remeasured and assessed at age 13 years, the average first-generation genetic gain was 23 per cent. in volume and 14·7 per cent. in mean stem straightness. Results for the nine individual families and for control stock are in the table below. Family G20 x G21 in Experiment 55 combined good stem quality and high yield while family G23 x G26 was outstanding in Experiment 41. Open-pollinated families gave about one-half of these gains.

The younger trials (planted in 1961 and subsequently) have the routine control stock replaced by a standard control family (G40 x G26). The plantings of 1961 and 1962 that were assessed during the year contain a total of 54 families and it is hoped to combine the data from these studies and make reliable estimates of genetic and environmental parameters.

GROWTH AND STEM QUALITY OF ROUTINE CONTROL STOCK AND NINE FULL-SIB FAMILIES FROM SELECTED SUPERIOR SLASH PINE AT AGE 13 YEARS IN A 4-REPLICATE PROGENY TRIAL AT BEERWAH

Family Name	Stems per acre	Predominant Height	Total Volume	*Mean Straightness	Ramicorns	Forks
	Number	Feet	cu. ft./ac.		Per cent.	Per cent.
Routine Stock ..	423	57·4	2,785	6·97	45·0	7·1
G21 x G23	424	60·3	3,606	7·53	11·6	0·7
G23 x G21	397	60·2	3,447	7·35	11·4	1·5
G8 x G21	414	59·6	3,477	7·91	17·6	0·7
G8 x G23	431	59·1	3,134	7·72	27·7	2·1
G11 x G23	413	60·3	3,488	7·94	37·9	6·5
G10 x G21	415	60·3	3,320	8·13	†N.A.	N.A.
G11 x G21	419	62·8	3,640	7·93	N.A.	N.A.
G10 x G23	405	58·6	3,248	7·93	N.A.	N.A.
G20 x G21	411	60·1	3,586	9·53	33·3	Nil

* Each tree scored on a scale from 5 to 10; perfect trees score 10; trees scoring less than 7 have serious stem defects.

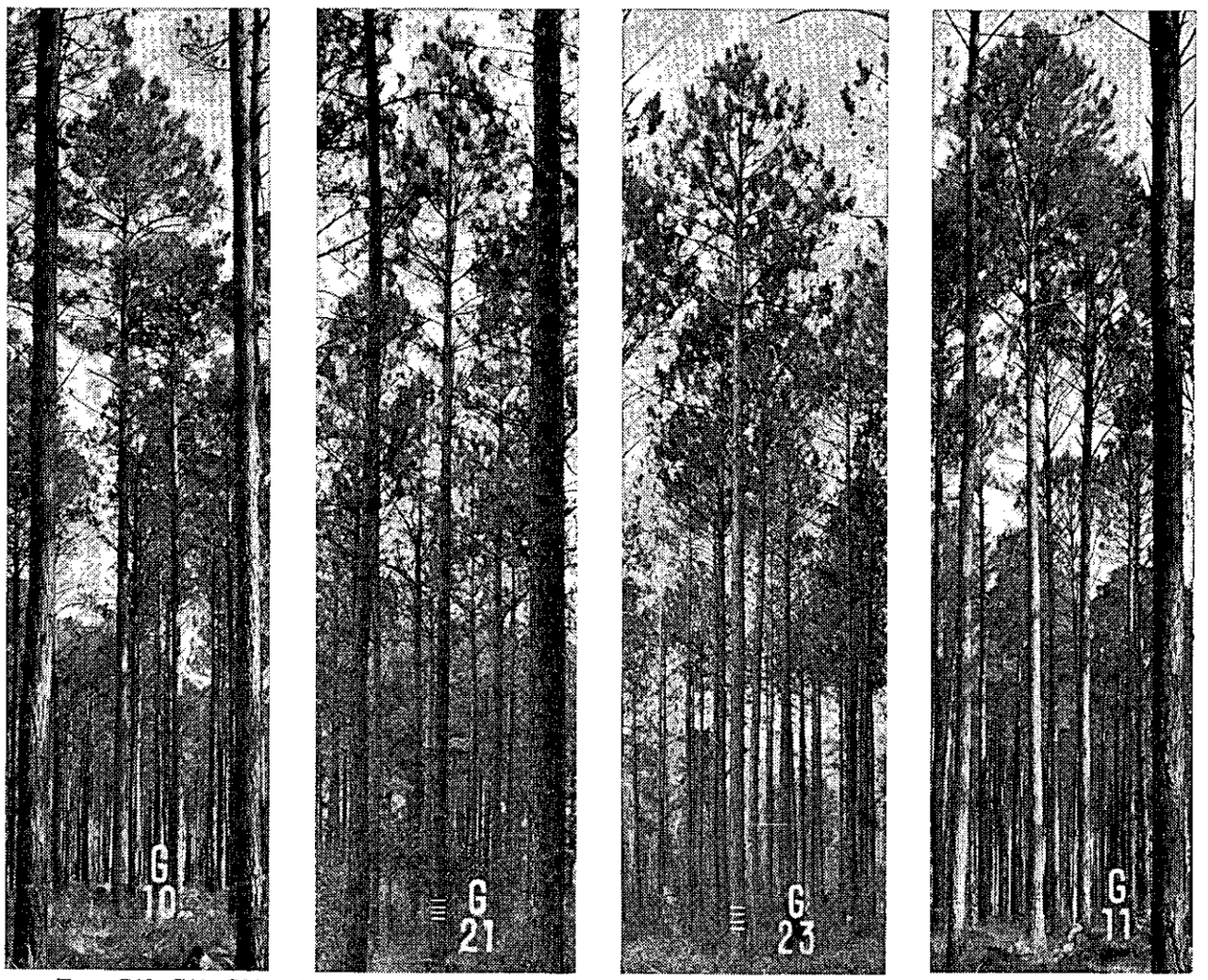
† Not available.

Second generation selection in plot of progeny from controlled pollination of elite trees G23 x G26. Age 15 years.

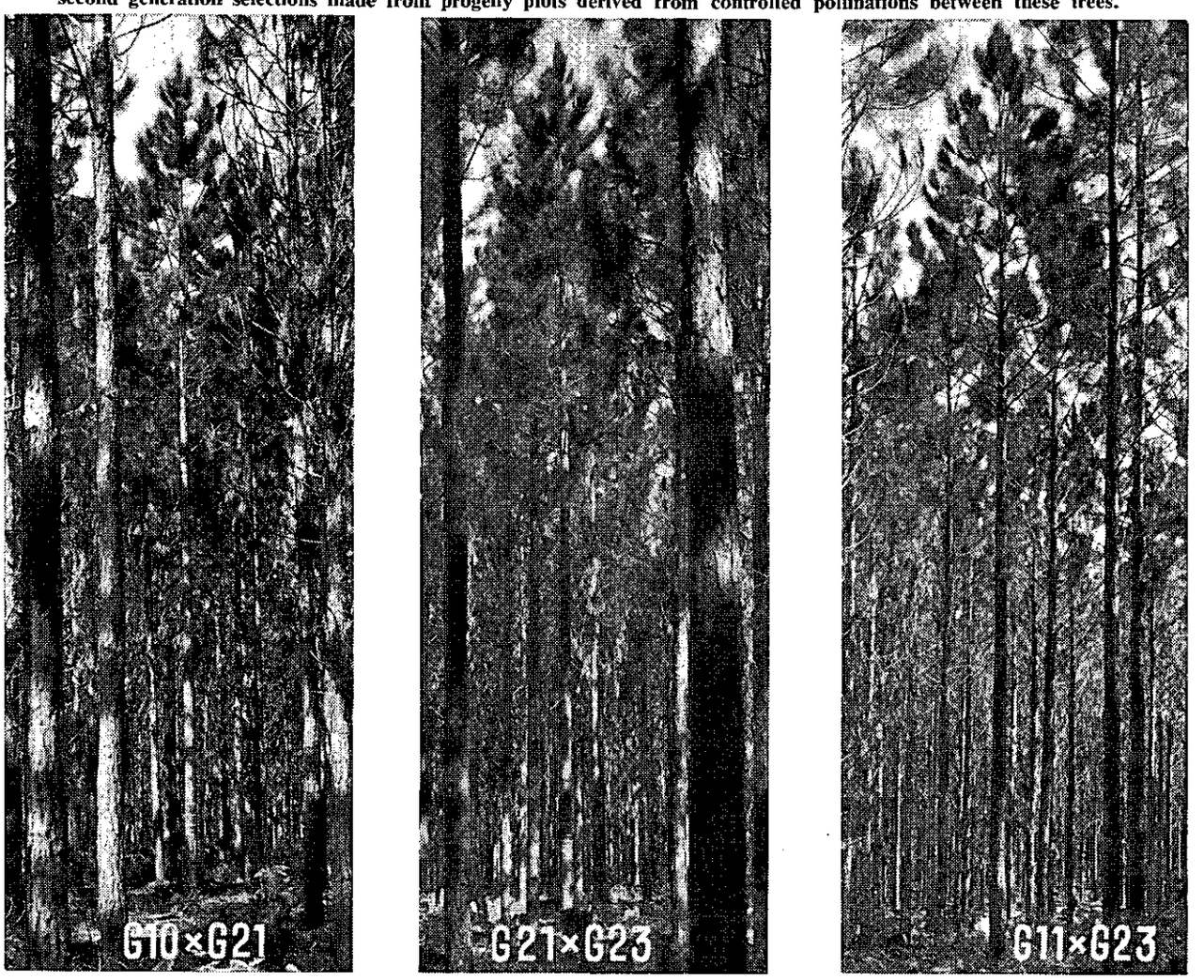
Objectives of the assessments and analyses are to identify the best families and the parent trees having the highest breeding values to permit selection of superior, second-generation trees within the progeny trials. These selected trees and others will be used to establish new seed orchards. Families from 50 parent trees have now been studied at age 10 or more. They comprise more than 100 full-sib families and 40 open-pollinated families. Preliminary selection of the best individual in each of the better families followed by reselection for unrelatedness has given 12 second-generation individuals of very high phenotypic and genotypic quality. It was estimated and *reported during the year that the progeny of such new clones will give second-generation genetic gains similar to those realised in stock from the first-generation selections, that is 20 per cent. in volume and 10 per cent. in stem straightness at ages about 15 years. One of the second-generation selections (in family G23 x G26 aged 15 years) is shown in photograph on this page and second generation selections are shown on page 17.

As reported in 1970 and earlier, the first major outplanting of seed orchard stock was at Beerburrum in 1965. It comprised 200 acres of plantations derived from orchard seed collected in 1963 and 1964. It was observed that a very small percentage of trees showed stem and crown malformations similar to those sometimes seen in progeny from self pollination and interspecific hybridisation. It was thought that these malformations were due to an unusual incidence of self fertilisation and hybridisation with Loblolly in the seed orchards in the early years when few clones produced strobili. The first opportunity to check on this hypothesis arose during the year when sample plots in the more extensive 1966 and 1967 outplantings at Beerburrum, derived from very much larger orchard seed collections in 1965 to 1966, were assessed. The incidence of malformations of the type noticed in the 1965 outplantings was markedly lower. It was also found that the routine orchard stock had superior height and girth growth to that of routine stock from crop trees and four times the number of trees of acceptable vigour and form. These data confirm the results of studies in older, control-pollinated progeny trials which have demonstrated the marked superiority of stock from selected trees.

*Nikles, D. G. *et al* (1971) in: Record of Proceedings Twelfth Pacific Science Congress, Canberra, 1971.



Trees G10, G11, G21 and G23 were selected as superior phenotypes 25 years ago. These trees are shown above second generation selections made from progeny plots derived from controlled pollinations between these trees.



(*b*) Caribbean Pine.—Selection of individual superior trees of var. *hondurensis* was continued in the Ingham, Rockhampton, Maryborough, Gympie and Beerburrum regions, and initiated in the Mackay region where 250 acres of plantations aged 9 to 11 years were searched for plus trees. Later in 1972 a reselection of the best 20 individuals available will be made for field grafting in a seven-acre extension of the Kennedy seed orchard. The first seven-acre section is located on tropical coastal lowlands near Cardwell and was field grafted early in 1968. Eighteen clones were used of which two failed completed due to stock-scion incompatibility. These failures and additional losses from incompatibility and other causes were subsequently replaced by the addition of 11 clones, giving a current complement of 27 clones. The first heavy flowering within the orchard occurred in 1972 when abundant staminate and ovulate strobili were borne on many ramets. There was great variation within and amongst clones in the production of strobili, the range among individual ramets for ovulate strobili being zero to over 100. It is estimated that 20 pounds of orchard seed will be produced in 1974. Substantial amounts of improved seed have been harvested from small grafted plots and progeny trials of selected clones at Byfield. Forty-two pounds yielded in 1972 brought to 280 pounds the total from these sources since collections began in 1965.

Superior trees selected within the tropical lowlands, chiefly around the Cardwell–Ingham area, are being established in a separate, isolated clonal seed production area at Kennedy.

Progeny trials of selected, superior var. *hondurensis* trees have been established principally at Byfield with supplementary tests at Beerwah. The marked superiority of progeny stock over stock from imported seed has been reported previously. Full-sib progeny trials planted in 1965 and 1966 and assessed at age 5·5 confirmed the superiority of local progeny stock and showed significant differences between families for stem straightness; the ranking of families for stem straightness was the same at Byfield and Beerwah.

GROWTH AND STEM QUALITY OF FULL-SIB FAMILIES FROM "PLUS" TREES AND OF ROUTINE STOCK FROM IMPORTED SEED GROWN IN REPLICATED LINE PLOTS FOR 5·5 YEARS

Family Name	*Volume of mean tree		†Mean Stem Straightness		Percentage of Trees	
	Byfield	Beerwah	Byfield	Beerwah	Foxtailed	Wind-firm
C46 x C57	0·95	1·20	7·35	6·84	0·0	100
C52 x C57	1·06	1·22	7·32	6·98	0·0	100
C20 x C57	0·62	1·41	7·25	6·74	10·0	98
C20 x C53	1·01	1·37	7·13	6·42	10·0	100
C29 x C57	0·52	1·35	7·10	6·41	0·0	96·7
C29 x C24	0·74	1·22	6·90	6·05	0·0	100
C29 x C46	0·71	1·59	6·49	6·02	3·3	96·7
Statistical significance	N.S.	N.S.	***	***	N.S.	N.S.
Mean all families ..	0·81	1·34	7·04	6·45	4·1	99
Routine stock ..	N.A.	0·83	5·30	5·78	39·0	84

* Cubic feet.

† Each tree scored on a scale of 5 to 10 points; perfect trees scored 10 points.

Provenance trials of var. *hondurensis* planted at four localities in 1956 were measured and assessed at age 14 years and reported on during the year. These studies showed that a population derived from Potosi, Honduras, was clearly inferior to stock from sources in British Honduras; that British Honduras coastal plain stock was superior to Mountain Pine Ridge stock at the two northern test centres (Byfield and Tuan); and that a small plot of var. *bahamensis* within the Beerwah planting gave growth about equal to and stem quality superior to that of var. *hondurensis*.

Seed supplied by the Commonwealth Forestry Institute, Oxford, from 16 provenances throughout the native range of var. *hondurensis* and local control lots was sown at Byfield and Kennedy nurseries. Sufficient stock has been raised to permit replicated trials of 16 provenances on swampy and non-swampy sites at Byfield and Kennedy–Cardwell, and replicated trials of 12 to 14 provenances at three other centres involving five sites. In addition stock of provenances not available previously will be used for establishment of conservation-cum-selection stands.

Variety *bahamensis* is showing considerable promise in South-East Queensland where Slash Pine is currently the species planted. In a ten-year-old variety and provenance trial of Caribbean Pine on a well-drained lateritic podsolic soil at Beerwah, varieties *hondurensis* and *bahamensis* produced equal volumes greatly superior to that of Slash Pine. Stem straightness and wind firmness of var. *bahamensis* was superior to that of var. *hondurensis*. (Both populations were from unselected seed sources.) At Byfield, too, var. *bahamensis* has superior stem form but its volume production is less than that of var. *hondurensis*.

Selection of superior individual trees within var *bahamensis* commenced during the year and 110 acres planted at Beerwah and Byfield between 1962 and 1964 were searched.

(*c*) Hybrids.—F_1 hybrids of var. *elliottii* by var. *hondurensis* and var. *elliottii* by var. *caribaea*, as well as other varietal hybrids within and among *P. elliottii* and *P. caribaea*, are being produced and studied. The hybrids of var. *elliottii* by var. *hondurensis* (to age 14 years) and var. *elliottii* by var. *caribaea* (to age six years) give higher volume production than all three parental varieties on swampy sites and they are superior to var. *elliottii* and var. *caribaea* on non-swampy sites at Beerwah and Byfield. The hybrids also have good stem quality, windfirmness and wood properties. Attempts being made to produce cheaply, seed of the hybrid var. *elliottii* by var. *hondurensis* were described in the 1971 report. During the current year stock plants were established in isolated mini-orchards at Byfield in which will be grafted single clones of select var. *elliottii* and var. *caribaea* trees. The flowering times of clones of these varieties overlap and F_1 hybrids are produced from seed on ramets of both varieties by natural cross-pollination. Plants from self-pollination within each clone will be largely recognisable in the nursery.

(*d*) Loblolly Pine.—About 25 per cent. of ramets in the 2·5 acre orchard of 20 clones (that had been field-grafted at Beerwah between 1968 and 1970) produced moderately-heavy to heavy crops of ovulate strobili in 1972 but shed little pollen. A very small amount of clean seed (12·5 ounces) was harvested this year in the orchard.

(*e*) Radiata Pine.—Additional "plus" trees were selected within progeny trials at Pechey and Passchendaele for cloning in a seed production area at Passchendaele.

(*f*) Miscellaneous Tropical Pines, Hoop Pine.—Seedlings from five continental and two insular sources of Benguet Pine were raised at two nurseries but the yield of plantable stock was much lower than anticipated due possibly to problems of mycorrhizal infection. This resulted in reduced outplantings and a need to hold over stock from one nursery for planting next year. Seed of provenances covering the natural range of Ocote Pine was received from Commenwealth Forestry Institute, Oxford. The seed is being held until preliminary studies of trials established in 1968 and 1971 provide leads on localities and conditions suitable for this species.

Sixteen provenances and a progeny trial of Hoop Pine were planted at three localities in the Atherton District and at one locality in the Mackay District. Sowings of further families and provenances that were made in 1971 at Danbulla and Cathu has yielded stock that will be used to plant follow-up trials at two centres in each District in 1972–73.

The Officer-in-Charge, Tree Breeding Section was involved in joint authorship of three papers for the Seventh World Forestry Congress. These were entitled: Management and Genetic Improvement of the native *Araucaria cunninghamii* Ait. in Queensland; Management, Genetic Improvement and Wood Properties of *Pinus caribaea* Mor. in Queensland; and International Co-operation in the Exploration, Conservation and Development of Tropical and Sub-tropical Forest Gene Resources.

(iii) *Nutrition.*—With the return of the Officer-in-Charge from special leave, work of the Section has been re-organised and widened. Nutrition studies will be extended on all major species in the plantation pragramme to include fertiliser trials, nutrient cycling and attendant soil studies, and maintenance of nursery fertility. Some changes in emphasis are envisaged, aimed at achieving a better understanding of the soil/forest system. Work is to be initiated on soil microbiology including mycorrhiza studies on exotics and Hoop Pine aimed at applying recent research findings to silviculture. It is hoped to develop a small programme concerned with rehabilitation of mined areas as an extension to existing co-operative projects with the hardwoods research section.

(*a*) Exotic Pines—Fertilising.—In recent years, work has concentrated on defining the nutrient requirements of Slash and Caribbean Pines on marginal sites subject to periodic water logging. These trials have shown that site preparation (cultivation and/or plough mounding) is advantageous, while phosphorus is the major limiting nutrient. An experiment planted in 1964 on a podsolic gley (40 ppm HCl soluble P), given light ploughing prior to planting, has yielded the following data:—

RESPONSE OF SLASH PINE TO CULTIVATION AND PHOSPHATE FERTILISING (AGE SEVEN YEARS, SPACING 8 FEET x 8 FEET MEANS OF FOUR REPLICATIONS)

Treatment	G.B.H. (ins.)	Basal Area (sq feet/ac.)	Average Predominant Height (feet)	Total Volume (cu. feet/acre)	Foliar Phosphorus per cent.		
					Age		
					2	5	7
Routine*	12·2	54·8	25·0	324	·069	·090	·084
CB†	14·1	69·2	30·4	570	·082	·083	·059
CB† P^{2}‡	16·1	89·4	34·0	871	·083	·099	·086
CB† P^{4}	17·1	102·9	34·6	1,062	·090	·104	·100
CB† P^{8}	16·9	101·2	35·1	1,068	·094	·116	·116

* No cultivation, fertilised 2½ cwt/acre Nauru rock phosphate age three.

† Cultivated, basal dressing 35 pounds/acre $(NH_4)_2SO_4$, 9 pounds/acre. KCl, 1·5 pounds/acre $CuSO_4$ as individual tree application.

‡ P as superphosphate 2, 4, 8 cwt/acre, respectively as split dressings to year two.

Optimum treatment involved site preparation and 4 cwt/acre superphosphate dressing, which raised site index from 65 (routine) to 93 and achieved a three fold volume improvement. The nil-P plots are now severely phosphate deficient (foliar P·059 per cent.). Results of the trial suggest that the critical level for Slash Pine on the site may be ·085 per cent. P. slightly higher than reported previously (see 1971 Annual Report).

Other work on swamp sites has aimed at assessing their utility for growing Caribbean Pine and the hybrids between the varieties of this species and Slash Pine. One such trial was planted in 1966 on a low humic gley mounded and fertilised with PNKCu.

RESPONSE OF SLASH, CARIBBEAN AND HYBRID PINES TO FERTILISING (AGE SIX YEARS, SPACING 12 FEET x 5 FEET, MEANS OF TWO REPLICATIONS, MEAN TREE VOLUME IN CUBIC FEET, DETERMINED FROM VOLUME EQUATION V = 0·38 BASAL AREA x HEIGHT

*Taxon	†Fertiliser Regime					
	Nil	P	PN	PNK	PNKCu	Mean
	Volumes in cubic feet					
SS	·19	1·73	1·68	1·88	2·09	1·32
SC	·34	2·12	2·10	2·22	2·20	1·54
SH	·52	2·67	2·40	1·97	2·62	1·88
CC	·08	1·02	0·72	0·88	0·62	0·57
CH	·23	1·86	1·37	1·31	2·00	1·20
HH	·04	1·34	1·09	1·16	1·33	0·86
Mean	·18	1·74	1·45	1·52	1·71	..

* S = Slash Pine. C = Cuban Caribbean Pine. H = Honduras Caribbean Pine.

† P = 5 cwt/acre superphosphate, N = 1 cwt/acre Urea, K = 2 cwt/acre KCl, Cu = 14 pounds/acre $CuSO_4$ all fertilisers applied in split dressings, individual tree application to age 1½ years.

Heterosis has been exhibited by all hybrids. All taxa responded to phosphorus whereas nitrogen has tended to suppress growth; response to potash is doubtful. SS, HH and the hybrids SH and CH have responded slightly to copper, which has depressed growth of CC; this latter taxon responded unfavourably to trace elements in another trial (see 1970 Annual Report). The SH hybrid has given the best overall growth (mean height 33 feet, mean stem volume 2·67 cubic feet at age six years) and is the best taxon for swamp planting.

Further work aimed at understanding the nutritional requirements of Caribbean Pine has commenced. As indicated in the 1970 Annual Report, this species at Byfield does not respond to phosphate fertilising where site index is above 100. Some unfertilised stands just below this site index have shown poor increment recently which is possibly due to limiting nutrition. Extensive foliage sampling in a series of stands on a range of sites from Kuranda to Beerwah was carried out this winter and will be supplemented by further foliage and soil sampling next year. These stands are planted on sites of former rain-forest, eucalypt forests and wallum swamps, on soils ranging from red loams to gleys and solodics; site indices range from below 50 to 120. Analyses will help gauge the "normal" level of nutrients associated with healthy growth, as well as giving an indication of possible deficiencies on a range of sites.

Omission trials have been initiated both in the field and glasshouse on soil types representative of large areas of planting lands in the Kennedy/Cardwell area. The glasshouse trial involves a study of the interaction between provenance, nutrients and mycorrhizal fungi on both ridge and swamp soils. Further field work is being planned for the 1972 planting season at Gregory to follow up early results obtained on ground water podsols (see 1970 Annual Report).

Foliar phosphorus levels were taken in a survey over 1,400 acres of Slash and Loblolly plantations at Beerburrum. Stands below site index 70 had phosphorus concentrations below critical level and it was recommended that 700 acres be fertilised.

In connection with the establishment of a new Slash Pine nursery at Toolara systematic sampling was carried out over 11 acres to yield 64 bulked samples each comprising 24 cores (10 cm. x 2·5 cm.) per sampling unit of 7,500 square feet. Analysis of these samples revealed a co-efficient of variation generally below 20 per cent. for most parameters except exchangeable potash. Potash figures were influenced by a lens of K-rich soil crossing one section of the nursery.

VARIATION WITHIN SOIL PARAMETERS—TOOLARA NEW NURSERY
(Mean and CV of 64 Samples)

Parameter	pH	Organic C per cent.	N (total) (ppm)	NO_3–N (ppm)	HCl–P (ppm)	K + (ppm)	Ca ++ (ppm)	Mg ++ (ppm)
Mean	6·2	1·86	560	5	53	52	343	58
CV	1·9	18·3	14·3	18·5	13·1	73·6	25·5	18·6

Detailed subsidiary sampling within a sampling unit was undertaken to determine the most efficient sample size for future sampling. On the basis of chemical analyses quoted above, fertilising recommendations were prepared for raising fertility levels; these involved the addition of 4 tons/acre filter press, 5 cwt./acre rock phosphate, 5 cwt./acre 21 per cent. P. superphosphate "Super King", 1 cwt./acre $(NH_4)_2SO_4$ ("Nitram"), 1½ cwt./acre K_2SO_4. Additionally, procedures were initiated for inoculating the nursery at sowing with spores of the mycorrhizal fungus *Rhizopogon roseolus*.

Two Patula Pine experiments established at Pechey on deep lateritic krasnozems have shown responses to P and K. One stand has been fertilised when 19 years old, the other at planting. Foliar samples were taken in winter to permit a better understanding of the nutrient requirements of Patula Pine on these soils. A large scale experiment was established on old cleared farmland in 1970 testing the response of Patula and Radiata Pines to phosphate and cultivation. Both species have responded to cultivation, but not to superphosphate.

RESPONSE OF RADIATA AND PATULA PINE TO CULTIVATION AND SUPERPHOSPHATE (AGE TWO YEARS, SUPER APPLIED 1½ CWT./ACRE—4·4 OUNCES/TREE AT PLANTING)

Treatment	Mean Height (Feet)	
	Radiata	Patula
Control	4·4	6·5
Cultivated	6·5	8·0
Cultivated + Super	6·1	7·0

(*b*) Exotic Pines—Nutrient Cycling and Underplanting. Phase I of studies on nutrient cycling in Slash Pine plantations has been completed. Data covers the monthly return over four years, of litter and major nutrients to the forest floor in 24 stands, ranging in age from 6 to 37 years. Analysis indicates that needle fall and nutrient return rise to age 16 years when it stabilises. The litter layer maximises at age 13 years at 6,000 pounds/acre, falling rapidly to 3,000 pounds/acre by age 20 years, at which time it stabilises. From these data it would appear that between ages 16-20 years and from thereafter, rate of litter decomposition keeps pace with rate of needle fall, with annual release to the soil of the quantities of nutrients listed below.

NEEDLE FALL AND NUTRIENT RETURN, SLASH PINE, AT TIME OF STAND STABILISATION
Pounds/acre/year

Needles	N	P	K	Ca	Mg	Na
3,500	10·5	·36	2·2	14	6	2·2

The effect of prescribed burning of Slash Pine on nutrient cycling is being investigated in a co-operative study with the Fire Research Section.

Another phase of nutrient cycling studies is linked to the underplanting programme and involves the formation of mixed stands of Slash Pine with broadleaved species with a view to studying the effect of mixed litter on litter decomposition. Concurrently, information will be gained on the ability of several rain-forest hardwoods to respond to underplanting. Oldest plantings are now 5½ years old and show great promise e.g. Queensland Maple at 5½ years is 10·9 feet; Hoop Pine under similar conditions would be 5·8 feet at the same age.

HEIGHT GROWTH OF RAIN-FOREST HARDWOODS UNDERPLANTED TO SLASH PINE*
(Underplants 312 Stems/Acre, Plot Area 0·5 Acres)

Species	Age (Years)	Survival percentage (Age 2)	Mean Height (Feet—June, 1971)	Thinning Damage November, 1971 (Percentage Stems)
Queensland Maple	5½	97	10·9	30
Crows Ash	5½	100	4·5	17
Honduras Mahogany	5½	89	5·2	17
Silky Oak	4½	99	3·3	24
Cairns Hickory	4	78	3·1	21
Coachwood	2	99	1·7	21

* Overwood SI84, planted 1954 on lateritic podsolic soil. Age 12 years and stocking 300 stems/acre at underplanting. Stand development June, 1971: Basal area/acre 146 square feet, predominant height 66 feet, total volume/acre 3,245 cubic feet, thinned 11/1971 to leave 118 square feet/acre.

(*c*) Native Conifers—Coastal Lowlands.—Early work at Beerwah aimed at introducing Hoop and Kauri Pines to the lateritic podsolic soils of the coastal lowlands, where in respect to these species nitrogen has been shown to be the major and phosphorus a minor deficiency. No consistent responses have been obtained to other elements.

Attempts to establish Hoop Pine as open plantings with annual dressings of nitrogen have been successful where close spacings have been used (3 feet x 3 feet) but growth is lower at conventional spacings (8 feet x 9 feet) possibly because of reduced fertiliser efficiency and grass competition. The most successful planting was established at 3 feet x 3

feet and progressively thinned to 600 stems/acre. At age 13 years, predominant height was 49·5 feet, mean G.B.H. (400 select stems/acre) 19 inches. This height growth is equivalent to site index 85 and has been achieved by fertilising annually with sodium nitrate to supply 94 pounds nitrogen/acre per annum, together with an initial phosphate dressing equivalent to 3 cwt./acre superphosphate. The cost of this fertilising, compounded at six per cent. to age 13, is $455/acre and uneconomic. In view of the success with underplanting Hoop Pine to *Pinus* fertiliser investigations on the coastal lowlands have been curtailed in favour of expansion into nutritional investigations in major Hoop Pine planting areas.

Acute malformation of stems and branches with attendant loss of apical dominance is common in all plantings on State Forests 289 and 466 since the 1965-66 season. Symptoms and initial investigations were reported previously (Annual Reports, 1970, 1971). Lesser occurrences have been observed in the Mary Valley, Gadgarra and Cathu, in plantations of similar age to those affected at Yarraman.

Investigations are proceeding on the assumption that the condition is caused primarily by adverse soil conditions involving nutrient deficiency or imbalances possibly allied to an inimical change in the soil microflora induced by a change in the seasonal rainfall pattern.

Nutritional studies involve both glasshouse and field trials. An omission type sand culture trial has enabled preliminary data to be gathered on deficiency symptoms and levels in foliage of seedlings, for the major nutrients and some minor elements. Further work is planned to examine deficiency symptoms in three-four year old trees—the age at which Yarramania becomes apparent. As the condition in the field is associated with low soil pH and high nitrogen (see below) attempts have been made to correct the condition by liming. Alternatively, attempts were made to induce malformation by acidifying "normal soil" with aluminium sulphate, or by using high nitrogen dressings (1,000 pounds/acre/annum N). Although pH was successfully manipulated, no inducement or correction of the condition has been achieved. Under glasshouse conditions (see table below) seedlings growing in soil from malformed areas show a high incidence of malformation (84 per cent.); trees in soil from healthy areas (but closely associated with malformed areas) show 58 per cent. malformation but only 9 per cent. where heavy nitrogen dressings were applied. Furthermore, seedlings responded markedly to dressings of aluminium sulphate, i.e. showing vigorous growth and little malformation (30 per cent.) even though pH was reduced to 4·1. Liming raised pH to 6·3 with attendant malformation of 90 per cent. The possibility that the growth response to aluminium sulphate is a sulphur response is being checked through foliar analysis. From this trial it must be concluded that high acidity and soil nitrogen *per se* cannot be held primarily responsible for the malformation condition.

Response of Hoop Pine to Soil Amendments in Glasshouse Experiments
(Means of Two Replications—Age Two Years)

Treatment	Soil pH				Mean Height (cm)				Per cent. Malformed Trees			
	Sh		Sm		Sh		Sm		Sh		Sm	
	N^0	N^1	N^0	N^1	N^0	N^1	N^0	N^1	N^0	N^1	N^0	N^1
Control	6·4	4·8	5·2	4·2	41	33	57	37	40	8	85	60
4 cwt/acre KCl	6·6	4·8	5·2	4·0	34	30	46	44	70	0	100	88
30 lb/acre $CuSO_4$	6·2	5·1	5·2	4·2	31	26	52	46	50	13	90	90
12·6 tons/acre $Al_2(SO_4)_3$	4·5	4·1	3·9	3·8	54	39	43	28	30	0	65	100
60 lbs/acre $MnSO_4$	6·3	4·8	5·1	4·2	49	38	49	47	80	29	62	90
11·4 tons/acre $CaCO_3$	6·8	6·4	6·3	5·7	49	28	49	30	79	6	90	90
Means	6·1	5·0	5·1	4·4	43	32	49	39	58	9	82	86

Sh = soil from beneath healthy trees.
Sm = soil from beneath malformed trees.
N^0 = nil nitrogen.
N^1 = 1,000 lb/acre nitrogen as $(NH_4)NO_3$.

Fertiliser trials have involved the addition of K, S, Cu, B and mixed trace elements (B, Zn, Mo). Potash and mixed traces have been ineffective in correcting the condition. A factorial experiment involving Cu, B, S and a complementary trial investigating the effects of various levels and forms of application of copper have demonstrated that copper alone has no effect on tree form. Stem form was poorer where sulphur was applied, but this effect was counteracted by adding boron. Boron alone resulted in a higher proportion of stems with bends. Overall, tree form was not improved by applying a mixture of Cu, B, S nor was the proportion of trees showing malformation.

Chemical analyses of soils and foliage collected from a range of sites exhibiting Yarramania, and sites in the Brisbane and Mary Valleys growing healthy plantations of the same age on similar soil types were completed during the year. Initial analyses were on bulked samples from ten single-tree plots at each location. Supplementary analyses will be undertaken on individual soil/tree samples as required. Significant differences between Yarraman samples and their equivalents from elsewhere were found for many soil/foliage parameters. However, in very few cases were significant differences found between malformed and healthy trees growing on the same site (see table over). These data indicate that straight trees growing amongst malformed trees at Yarraman are exhibiting tolerance to the causal agency rather than escaping from its influence.

NUTRIENT LEVELS IN SOILS AND FOLIAGE—HOOP PINE, YARRAMANIA AFFECTED AREAS AND HEALTHY PLANTATIONS

(Foliage data means of 24 samples each comprising 10 bulked sub-samples from individual trees. Soil data means of 6 samples each comprising 10 bulked sub-samples from beneath individual trees). All values in ppm except exchangeable cations (soil) which are meq percentage and soil Fe percentage.

Soil				Foliage			
Parameter	YM	YH	H	Parameter	YM	YH	H
Ca ++ ..	6·7	5·7**	16·6	Ca	11,592	12,412***	14,650
Mg ++ ..	1·4	1·3*	3·4	Mg	1,496	1,550***	1,746
Mn ++ ..	0·13	0·15	0·14	Mn	397	355***	571
K + ...	0·80	0·63**	1·10	K	8,875	9,354**	10,612
Na + ...	0·15	0·16	0·16	Na	1,408	1,255*	1,140
Al +++ ..	7·4	10·8*	0·94	Al	144	178	148
Fe Percentage ..	5·9	6·2	4·7	Fe	52	52	52
HCl–Cu ..	29	29	26	Cu	6·6	6·5	7·1
HCl–Zn ..	46	44***	90	Zn	34	36**	39
				B	19	19	16
SO_4–S	5·1	5·3	8·8	S	1,464	1,462	1,580
HCl–P	838	827	1,098				
Inorg–P ..	87	73*	170	P	1,177	1,176***	1,837
Kjel–N	4,038	3,860	3,702	N	11,183	11,162	11,208
NO_3–N ..	17	11**	4				
NH_4–N ..	15	14	9				
pH	4·8	4·6**	6·1				

YM = Yarraman, malformed; YH = Yarraman, healthy, H = Brisbane and Mary Valleys, healthy.
Significance of differences between Y and H parameters:— *at 5% level; **at 1% level; ***at 0·1% level.

The most notable effects are the changes in cation balance, and the low pH and high labile nitrogen levels in Yarraman soils. Previous analyses showed higher levels of total nitrogen and low pH in soils beneath affected trees, and a higher level of aluminium in their foliage; in the present case, foliage Al levels are similar throughout. Ca, K, Mg are lower at Yarraman than elsewhere while soil cation balance markedly favours Al at the expense of Ca and to a lesser extent Mg and K. Foliage Ca, K, Mg, however, while lower at Yarraman than elsewhere, are not reduced to the level where serious interference with nutrition may be expected. Equivalence ratios (i.e. monovalent vs divalent, divalent vs trivalent cations) are of similar order in all three situations. There is no indication of sulphur or micronutrient deficiencies and this confirms the results of field trials.

Work on nutrient balance, particularly with regard to cations, is continuing, but other avenues are being explored. One involves the possible role of bacteria or soil fungi producing kinetin or gibberellin like substances respectively which interfere with auxin balance within the plant. Meanwhile, field soil sterilisation trials are being carried out to induce changes in the soil microflora. Another approach involves further investigation of possible virus involvement; early grafting trials did not result in transmission of symptoms from affected to healthy trees, but further studies on the role of insect vectors have been initiated in co-operation with the virology group within the Department of Primary Industries.

Results of a limited provenance study planted on an area which subsequently succumbed to Yarramania, suggest that breeding for resistance to malformation may be possible by selecting within certain provenances with a high degree of tolerance to the condition. Stock from the Mount Mee provenance shows superior vigour and less malformation than others planted with it. Further work on this provenance is planned to ascertain the reasons for its resistance (or tolerance). Meanwhile stock of this and related provenances will be planted at Yarraman in place of local provenances (represented by Archookoora in table below) which are susceptible. Within a provenance, the relationship between tree vigour and degree of malformation is variable; positive, negative and nil correlations have been observed. Consequently breeding for vigour, a key to the Hoop Pine breeding programme, does not necessarily conflict with breeding for resistance to Yarramania.

PROVENANCE VARIATION IN TOLERANCE TO YARRAMANIA (AGE 3½ YEARS SINCE PLANTING)

	Provenance				
	Mount Mee	Boompa	Kalpowar	Gallangowan	Archookoora
Mean Height (feet)	6·6	5·2	6·6	5·6	5·2
Yarramania* Index 1971–72 Season's growth	2·65	4·01	4·32	4·53	4·56

* The higher the index, the greater the degree of malformation.

(*f*) Hoop Pine—Mary Valley.—On scrubby forest sites, Hoop Pine makes slow early growth but after canopy closure this improves markedly. Nitrogen fertilising in the formative years has been investigated as a means of hastening canopy closure. In a trial at Imbil, ammonium sulphate was applied to two year old trees for the ensuing two years as individual tree applications. At age six years an average height of 10·9 feet resulted from addition of 38 pounds/acre nitrogen; this represents a height growth response of 12 per cent. compared to control.

GROWTH OF HOOP PINE ON A FOREST SITE AT IMBIL—AGE 6½ YEARS

Treatment lb/acre N	Mean Height		Height Increment Age 2–6½ Years	
	Actual	Adjusted*	Actual	Adjusted*
Nil	9·1	9·3	7·0	7·1
19	9·4	9·6	7·2	7·4
38	10·9	10·5	8·4	8·0
115	10·1	10·4	8·1	8·3
191	11·0	10·9	8·7	8·5
LSDp = ·05		0·8		0·8

* Adjusted for initial height at time of fertilising at age 2 years.

Since suspension of fertilising (age 4 years) the advantage of the fertilised plots has been maintained. Height increment for the two years being 5·1 feet—an advantage of 20 per cent. over the controls. Foliar analysis is planned for this trial to determine whether other nutrients are limiting on these sites.

In the Mary Valley and elsewhere, notably Benarkin and Danbulla, crown die-back of three-four year old Hoop Pine is being investigated in co-operative studies between the section and the Pathologist. The possible role of nutrition or other site stress as predisposing factors to fungal attack will be examined in field trials planned for the current season which will test the interaction of fertilisers and fungicides.

The first of two papers on foliar analyses of southern pines was published during the year titled "Principles and Practice of Foliar Analysis as a Basis for Crop Logging in Pine Plantations 1" Plant and Soil 36, 109-119.

(iii) *Coastal Hardwoods.*—This section transferred headquarters from Beerwah to Gympie in January 1972. Its work is aimed at increasing the productivity of wet and dry sclerophyll forests in coastal Southern Queensland. Recently studies dealing with the revegetation of sand-mined areas within the State Forests have been included in the programme. The transfer to Gympie places staff of this section closer to their main areas of operation.

Sand-mining commenced on the frontal dunes of the southern ocean beach at Fraser Island in early 1972. While it may be some time before forested sites are mined, it is important to develop successful techniques now for the re-establishment of commercial forest on sand-mined areas. At this early stage Blackbutt is the main commercial species selected for trial and a large trial was established recently near Eurong on the eastern side of Fraser Island to study the survival and growth of Blackbutt planted in jiffy pots with three levels of nitrogen and phosphate. This trial is located on a poor quality Blackbutt forest with site preparation simulating current techniques adopted in sand-mining.

A small experiment was established earlier in the year on the same site to establish the tolerance of Blackbutt seedlings to nitrogen and phosphorus. Nitrogen as ammonium nitrate was applied at one ounce, two ounce, four ounce and eight ounce per tree, and phosphorus as superphosphate at two ounce, four ounce, eight ounce and 16 ounce per tree. The treatment design was a randomised block incorporating a 5^2 factorial treatment in each of two replications. At three months the most surprising feature was that the survival in the heavy applications of N and P ranged from 80 to 90 per cent. However, the experiment received over 40 inches of rain in the three months. Rapid leaching would have taken place in the sandy profile.

A small pilot trial was established in March 1971 on a sand-mined site at Rainbow Beach near Gympie to test the survival of Blackbutt seedlings planted under natural Wattle re-growth. The planting failed after a very dry period in October-November. It is of interest to note the natural Wattle re-growth of 2–15 feet high also lost the majority of its foliage after a total of 43 rainless days, during which the temperatures were frequently high and humidity was very low as a result of hot dry north-westerly winds. The majority of the Wattle showed signs of new growth within weeks of 312 points of rain, and approximately 90 per cent. have completely recovered.

A further series of trials has been established. One trial involved six different containers (standard 8 inch galvanised tubes; 2¼ inch and 1¼ inch jiffy pots; paper pots—small 1¼ inch x 2 inch, and large 1¼ inch x 5¼ inch, large polythene bags, 10 inch long 5½ inch wide) with Fraser Island Blackbutt and Honduras Caribbean Pine. One replication was established in each of three areas. A species trial on two sites included:—Blackbutt from Fraser Island and Cooloola State Forest, Blackbutt (var. *pyriformis*) from New South Wales, Gympie Messmate, Brush Box, Moreton Bay Ash, Grey Gum, and Bahamas Caribbean Pine. In a mulching trial with Fraser Island Blackbutt (tubed) filter press was placed in the planting hole, on top of the hole around the plant, mixed with the soil in the hole, and, finally the seedling was planted in pure filter press.

Several enrichment planting and seed spotting experiments were completed during the year. Following logging, tubed Blackbutt seedlings were planted in three Blackbutt forest types with varying rain-forest understorey components, namely, (*a*) nil to light, (*b*) light to medium, and (*c*) medium to heavy. Treatments included nil, one or two dressings of NH_4NO_3 and KH_2PO_4, planting on both disturbed and undisturbed soil, undergrowth brushed and not brushed, and rain-forest trees ringbarked and not ringbarked. Within each understorey type, no real stimulus to growth or survival was evident after six years from fertilisation, brushing or ring barking. However, the overwood remaining after logging appears greatly to influence the rate of growth of planted Blackbutt. The following table summarises the survival and growth in the three types at six years of age

GROWTH AND SURVIVAL OF ENRICHMENT PLANTED BLACKBUTT—AGE SIX YEARS

Block	Understorey Type	Per cent. Survival		Mean G.B.H.O.B.	Mean C.A.I. G.B.H.O.B.
		2 years	6 years	6 years	1968–70
				Inches	Inches
I	Nil—light rain forest understorey	93·7	50·0	15·9	1·80
II	Light—medium rain forest understorey ..	74·3	57·7	9·8	0·90
III	Medium—heavy rain forest understorey ..	80·0	43·3	15·7	2·63

Block III had very little overwood remaining and has the highest current girth increment over the past two years. Block II contains a good quality stand of advanced pole-sized Blackbutt and has the poorest girth development and current increment. Block I had slightly more overwood remaining than Block III. Heavy winds in 1967-68 caused up to 43 per cent. reduction in survival and it would appear vigorous young Blackbutt is susceptible to wind damage.

Observation plots laid down to record the occurrence of natural regeneration in each of the three types showed little to no regeneration of Blackbutt six years after treatment. Abundant Brush Box and Turpentine regeneration occurred in Block I. To summarize, enrichment planting immediately following logging is a means of stocking with Blackbutt, areas of transition forest where natural regeneration cannot be relied upon.

A second enrichment planting was established on Fraser Island in February 1967 to test survival and growth of Blackbutt planting as tubed stock (with and without fertilising with A.C.F. Bean Mixture) and spot sown along 'dozed lines in a failed section of the 1964-65 regeneration burn (Type 2–3 Blackbutt). Spot sowing was a complete failure. Survival of the planted Blackbutt at age 4½ years was 64 per cent. with fertiliser application and 57 per cent. without fertiliser application, and mean heights of survivors 6·0 feet and 4·7 feet respectively. As annual increments have favoured the fertilised plants it appears a real response to the application of this N-P-K (5·0–18·4–2·5) mixture has been obtained. However overall growth on this marginal type is disappointing.

Dalby Regional Research Station

This station carries out research in the White Cypress Pine and hardwood forests in the area west of Dalby and Warwick with an annual rainfall of 20 inches to 30 inches, and in rain-forests and sclerophyll forests on the Dividing Range east of Warwick where the rainfall generally exceeds 50 inches per annum.

The technique used for the silvicultural treatment of White Cypress Pine stands where Bull Oak is a major component of the understorey was reviewed. An assessment of the results of treatment with and without the application of 1 per cent. 2,4,5-T amine to the cut off Bull Oak stumps

revealed that the percentage of stumps shooting at eight years after treatment was reduced from 68 per cent. to 24 per cent. by the application of hormone, but the place of the stumps which were killed was occupied by the straggling, suppressed seedlings which were too small to cut off at the time of treatment. This is shown in the following table.

BULL OAK REGROWTH AT EIGHT YEARS AFTER TREATMENT

Locality	Treatment	Per cent. Re-growth	Number Present/Acre 1 foot +
S.F. 302	Brush	73	3,442
S.F. 302	Hormone ..	33	1,590
S.F. 154	Brush	58	1,675
S.F. 154	Hormone ..	22	1,586
Expt. 42	Brush	75	1,676
Expt. 42	Hormone ..	18	1,560

Experiment 36 established 15 years ago involves plots in which Bull Oak was brushed and allowed to regrow and in which Bull Oak stumps were hormoned at the time of treatment and re-growth subsequently removed. Both plots showed a marked response to treatment but there has been no real difference in rate of growth of comparable stems in each.

Bull Oak re-growth on the unhormoned treated plot is now quite dense and to provide information on the effect of its removal Experiment 134 was established in 1970, in close proximity to Experiment 36, in a White Cypress Pine stand which had been subjected to a brush treatment of the Bull Oak shortly after that experiment was treated. A randomised block layout was chosen with three blocks and three treatments:—1. Control, treated ten years previously. 2. Bull Oak re-growth brushed without hormone application. 3. Bull Oak brushed and hormone applied to low cut stumps. The initial remeasure fifteen months after treatment revealed an immediate and substantial growth response with treatments 2 and 3.

ANNUAL GIRTH INCREMENT IN INCHES—WHITE CYPRESS PINE

Block	Treatment		
	Control	Brushed	Hormone
	Inches	Inches	Inches
1	·32	·50	·65
2	·18	·31	·38
3	·15	·28	·43
Average	·22	·37	·49

If the pattern of the older experiments is repeated the increments of the brushed and hormoned plots will become similar, and will draw away from that of the control plots for a period of four to five years, following which the growth of the treated plots will steadily decline to approach that of the control plots. Cost/benefit studies have justified the economics of treatment.

Since the hormone treatment nearly doubles the cost of treatment and conveys no real advantage over brushing alone and since retreatment ten years after the initial treatment gives a marked growth response the use of hormone has been discontinued in routine treatment of such stands. Brush treatment at ten-yearly intervals is intended.

Trials aimed at determining the suitability of light weight chainsaws as a replacement for axes in White Cypress Pine silvicultural treatment work were continued during the year. Large scale cost trials were carried out on three State Forests, and these revealed that economics favour the use of chainsaws in stands where the cost of the axework exceed $5 per acre. Attempts to use the saws for low cut stump work failed because of the abrasive effect of loose sand particles in the chains and cutter bars.

An experiment has been established to determine the effect on the percentage kill obtained by substituting chainsaws for axes in the high frilling and collaring of large Eucalypts and Angophoras. Replicated trials over a range of size classes in Smooth Barked Apple, Narrow Leafed Ironbark, and Yellow Jacket, were initiated with single chainsaw frills at waist height being compared with axe frills at the same height with and without hormone application, basal axe frills with hormone application, and basal injections of Tordon 50D.

Detailed records of chainsaw usage are being kept on actual expenditure incurred and an average hourly plant hire figure will eventually be calculated. The test saws at 200 engine hours each have given a plant hire rate of about 80 cents per running hour, but it is anticipated that this will reduce to a figure of between 50 and 60 cents per hour. Such a plant hire rate when applied in average stands will mean a hire rate of between 70 cents and one dollar per acre.

An experiment which was commenced in 1965 to study the development of regeneration on an area burnt by a severe wildfire, and sown with 2 pounds per acre of White Cypress Pine seed, was summarised during the year. Monthly sowings were carried out from April, 1965 to March, 1966 in a randomised block layout. Although seedlings appeared in three out of the four blocks there were as many plants in the unsown plots as in those which were sown, see table, and it was concluded that the seedlings developed as a result of natural seed dispersal. Since all adult White Cypress Pine were killed by the fire the seed must have fallen either prior to the passing of the fire, or immediately thereafter, while the trees were dying.

NUMBER OF SEEDLINGS REACHING PRIMARY LEAF STAGE

Block	Sown Plots	Unsown Plots
1	1	1
2	0	0
3	36	30
4	10	10
Total	47	41

It was observed that the fire had been far more intense in Blocks 1 and 2. It was concluded that the fire had destroyed most of the natural seed in the Blocks, thus accounting for their poorer regeneration development. Observations also showed that seedlings continued to appear in the plots well into 1966 from seed which had fallen no later than the end of January, 1965. It was postulated that this partial dormancy of White Cypress Pine seed is a survival mechanism which ensures that a proportion of the seed will germinate to take advantage of infrequently occurring conditions favourable to seedling survival. The failure of the broadcast sowing was attributed to the large weight of natural seedfall as compared with the amount sown in this trial. Heavy grazing of the established seedlings by cattle and wallabies took place over the first three-four years but few deaths occurred.

An experiment was commenced in September, 1971, to determine the effect of the removal of 30-50 feet high re-growth stems of Crooked Gum and Yellow Jacket on the growth of associated White Cypress Pine stems of approximately the same height. Prolific suckering of frilled or cut off Eucalypts occurred in White Cypress Pine stands following silvicultural treatments applied without hormone before the mid 1960's, and there are consequently large areas now being considered for follow-up treatments where this re-growth is the only material to be removed. The use of tree injectors has lowered costs but a typical injection treatment still costs between $3 and $5 per acre. This experiment should give valuable information to aid in allotting priorities for the treatment of these stands.

Experiments aimed at finding an economical technique for the control of Moonlight Cactus were continued. Digging of underground tuberous root systems was commenced in a trial which was started two years ago to determine the effect of month of treatment on the kill obtained with high volume spray application of various herbicides. Two plots each containing 50 plants covering a range of size classes, were established and sprayed each month for twelve successive months, commencing in December 1969, one with 5 per cent. 2,4,5-T.P. and the other with 0·25 per cent. Tordon 50D. A similar plot was established every three months and sprayed with one per cent. 2,4,5-T.P. A complete kill of the above ground portions of the plant was achieved by all treatments. Digging of the tuberous root systems at two years after treatment in plots sprayed up to June, 1970, revealed that an overall kill in excess of 90 per cent. had been achieved for the five per cent. 2,4,5-T.P. treatment. Seasonal trends should become clear after assessment of the remaining plots.

MOONLIGHT CACTUS—PERCENTAGE DEAD AFTER TWO YEARS

Month Treated	Herbicides		
	5 per cent. 2, 4, 5—T.P.	0·25 per cent. Tordon 50D	1 per cent. 2, 4, 5—T.P.
	Per cent.	Per cent.	Per cent.
December, 1969 ..	92	92	98
January, 1970 ..	91	86	..
February, 1970 ..	100	98	..
March, 1970	81	90	74
April, 1970	90	90	..
May, 1970	90	73	..
June, 1970	96	67	63
Average	91	85	78

Encouraged by an attack by cattle on Moonlight Cactus plants which had lost their sharp needles during an exploratory burning trial, a large scale fire experiment was initiated to determine the effect of control burning on the growth of this weed, and its susceptibility to grazing attack. A good burn was achieved because of the dense grass cover on the area. Many plants lost their needles and suffered top die-back, but a flourishing re-growth followed almost immediately. No grazing damage was observed. It is anticipated that large scale seeding will occur before it is possible to reburn the area.

Work was continued on inland Spotted Gum research as an extension of the coastal programme.

Observations were continued on the open plantings and the underplantings in the high altitude forests on the Dividing Range to the east of Warwick.

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-forest sites in South-East Queensland. Imbil with an annual rainfall of 45 inches represents the warmer and wetter Hoop Pine plantation areas, while Yarraman, with an annual rainfall of 32 inches represents the drier and colder inland sites.

(i) *Plantation Silviculture*—The weedicide trial laid down in the Kenilworth Nursery in November, 1970, demonstrated that bromacil at 0·3 pounds a.i. per acre achieved a useful level of weed control, and did not cause any significant mortality of pine seedlings. There now exists a considerable amount of evidence to support the use of bromacil as a weedicide in Hoop Pine nurseries where ragweed is the main weed.

With a view to reducing nursery costs, trials have been again initiated at the Yarraman nursery with the object of producing Hoop Pine planting stock in one year as against the present two years. Procedures under investigation include, method of sowing, root-wrenching interval, timing of tubing, tube-type, stand-down methods, and the use of fertilisers, both in seed beds and tubing soil.

It is as yet too early to form conclusions, but indications are that while crown development has shown only minor responses, root systems appear to be developing particularly well within the fertilised treatments, especially those tubed early into polythene tubes.

Lopping of excessively large stock was the subject of a trial begun in the Imbil nursery in May, 1971. Rapid development of new leaders after tubing resulted in the plants being still large at planting. At tubing leaders were reduced to one and at planting the development of double leaders was negligible. In some cases where the stem lopped immediately above a whorl the leader has failed to develop strongly but in general the results are promising and the plants are making vigorous growth in the field.

A small trial conducted at Imbil on spray-tending of large inkweed showed that mister application of a 2,4-D–2,4,5-T ester mixture as in current routine controls large inkweed provided the spraying of external foliage was thorough. Mortality was 100 per cent. seven weeks after spraying. The trial also demonstrated that a considerable saving in spray-time and volume of spray could be achieved by brushing all shoots and branches less than six inches above the ground, and spraying the stumps with the same ester mix. Mortality was again 100 per cent.

At Imbil a large trial was initiated in November 1971 to investigate weedicide treatments of grass in plantations. Initial spraying in rings, area of each approximately one square yard, around the plants, was carried out in December, 1971. Despite a favourable season for growth of grass the two, 2,2-D.P.A. treatments still showed a measure of control at the end of the growing season. The second stage of the experiment provides for repeat spraying late in the growing season and this could give good control. Weedicides tested, included amitrole, atrazine, simazine, diuron and paraquat, which were found to be clearly inferior to 2,2-D.P.A.

Measurement and treatments have been maintained in continuing experiments at Imbil, but of special interest was the application of initial treatments in the forty-odd plot trial designed to study thinning prescriptions within the select fraction. The treatments outlined in the 1971 Annual Report broadly were:—(*a*) No treatment. (*b*) Thinning from below. (*c*) Thinning mainly from below but with removal of larger stems where necessary to break up clumps. (*d*) Thinning to confer maximum benefit on 80 well spaced final crop stems per acre. (*e*) Thinning as per (*c*) but with rigid numbers control.

It soon became clear that, although the major parameters of stocking, predominant height, volume and basal area, were very similar in all the plots within a block, nevertheless, there was considerable variation in detail, particularly in regard to the location and spacing of the dominant stems. In the situation where there are 80 dominants per acre evenly distributed in a plot, and with only codominants and sub-dominants between them, removals under treatments (*b*), (*c*) and (*e*), would be the same, and those under (*d*) would be very similar. This exact situation of course rarely occurs but as the distribution of the dominants approximates closer to it, so the differences between treatments diminish. For this reason the variation in detail betwen the plots was of some consequence as it reduces the precision of the experiment.

Treatments (*c*), (*d*) and (*e*) represent relatively fine variations of treatment based on favouring a select 80 crop trees per acre. Though plots meet rigid criteria of stocking, height, volume and basal area these treatments are influenced by the way in which the crop trees are distributed through the plot. Therefore to obtain more precise information some 250 individual crop trees have been selected through the plots within four g.b.h. classes, 35 inches-40 inches, 40 inches-45 inches, 45 inches-50 inches and 50 inches plus. Distances and bearings were taken to all neighbouring trees within 25 feet radius. These will be studied to determine the way in which size, distance and position, of tree influence growth of the crop trees.

A repeat of this experiment is under way at Yarraman.

Additional species trials, commenced during the year at Yarraman, included the following species: Douglas Fir, Honduras Caribbean Pine, Loblolly Pine, Maritime Pine, Ocote Pine, Pond Pine, Pringle's Pine, Radiata Pine, Sugi, Smoothleaf Pine, *P. pseudostrobus var. oaxacana, P. tenuifolia.*

No conclusions can yet be drawn on the relative success of the various species within established trial plantings. Differences between sites, apart from soil type, are often quite marked, and such factors as frost tolerance, and ability to withstand grass competition are frequently critical in the establishment phase. More extensive site preparation, including discing or rotary hoeing of planting lines prior to establishment, has on some sites considerably improved the initial growth and survival of several species, primarily due to the reduced grass competition.

Rat damage within young Hoop Pine plantations in the Yarraman District has been a considerable problem during the last two winters, necessitating massive baiting of experiments within affected plantations.

The performance of both experimental plantings of Red Cedar, established at Imbil in October, 1969, has been most disappointing during the past season. On both sites the species has lacked vigour, probably due to a number of factors, e.g. heavy frosting in the winter of 1971 followed by a very dry spring, and perhaps the continual spraying with Endrin. Both experiments will be terminated.

The Red Cedar in the smaller systemic trial has shown very poor growth. Also the systemic insecticides have not provided protection from the twig borer as efficiently as they did during the first year. On this season's results there is little to choose between azimphos-methyl and azodrin. Both give a much cheaper form of control than three-weekly spraying with endrin 0·1 per cent.

Season of growth studies are continuing at both Imbil and Yarraman.

(ii) *Tree Breeding*—The second and final phase in establishment of a major Hoop Pine provenance study in south-east Queensland and Northern New South Wales was carried out during 1971-72. This year a further six families of each of 25 provenances from throughout the range were planted in two replicates at each of ten localities. In addition six families of each of a further ten provenances were planted in two replicates at each of two of the ten localities. (The outplantings made this year in North and Central

Queensland are described in an earlier section of this report). Some refilling was carried out in the replicates that had been planted in 1970-71, but initial survival at most localities in the plantings of both years has been very high. This was due in part to the above-average rains of the wet seasons of 1971 and 1972. Whereas the 1970-71 outplantings had good rains in most localities throughout 1971, the 1971-72 outplantings have experienced very dry conditions since the cessation of the prolonged wet season in May, 1972.

Although these large and comprehensive provenance trials (involving some 50 provenances) have been successfully established at a total of 18 localities from Northern New South Wales to North Queensland, it is not intended to cease collections of Hoop Pine provenances. It is realised that seed of several potentially-important provenances has either not yet been collected at all or has not been collected in sufficient quantity to ensure conservation of the gene resources of these populations. Efforts will be continued, therefore, to secure seed from such sources for establishment of conservation-cum-selection stands. There will be opportunity to collect good-quality seed from some new sources and other sources that are still poorly represented within plantations during the 1972-73 seed-fall. Recent routine assessments of pollen tube development in sample conelets from several natural stands indicate that seed of very high viability can be anticipated from Fraser Island, Mount Mee, Gladfield, Granite Creek, and some other localities in 1972-73. Similar assessments of conelets from plantation sources show that good 1972-73 seed crops are developing in some Mary Valley and Murgon plantations. In view of the demonstrated superiority of stock of Jimna provenances (Murgon District) in South-east Queensland plantations plans are being made for a large seed collection from crop trees, seed stands, and selected "seed" and "plus" trees in the Jimna plantations.

Another large trial of open pollinated progeny from "plus" trees was outplanted in the 1971-72 season. This study, comprising 22 families from selections at Imbil and Yarraman and three control lots, was planted at five localities in South-east Queensland. A 5 x 5 lattice design with six replicates of ten-tree line plots was used. Also 19 of the same families were included in progeny trials planted at four localities in North and Central Queensland.

This year flowering was negligible in the Imbil seed orchard (grafting beginning in 1965). In the seed orchard at Taromeo, where field grafting commenced in March, 1970, there was a light flowering (16 ramets) only. The Imbil seed orchard yielded 73 pounds of seed in 1971, virtually all of which was the result of hand pollination. An assessment of clones in the early-flowering section of the Taromeo seed orchard has shown that three clones now show a high incidence of "early incompatibility"; one other clone has improved since last year. Further grafting of orthotropic scions was carried out in the early-flowering section (of 30 clones) and the late-flowering section (of 21 clones) with the aim of achieving full stocking as soon as possible. Grafting of plagiotropic (pollinator) grafts in the early flowering section of this orchard is progressing.

An extension of the clonal reservoir at Imbil was made with the grafting of ten clones of "plus" and "A" class seed trees from the Mary Valley. With the grafting of these clones at the reservoir the total number of grafts stands at 261, representing 47 clones of trees that are either high quality phenotypes or possess interesting or unusual characteristics.

Recent and earlier work on the propagation of Hoop Pine by means of rooted cuttings was reviewed during the year. This method of propagating mature trees of Hoop Pine is very difficult because there is a very strong effect of age on rooting ability, and because ramets with orthotropic habit can only be secured from propagules induced to form on the main stem. The most important objective of work with cuttings is to provide clonal root stocks for the grafting of several valuable clones which show a very high incidence of stock-scion incompatibility when ordinary seedling root stocks are used. Some success has been achieved by means of the following sequence of steps: induce juvenile coppice shoots to develop on the main stem by decapitation or girdling; collect cuttings and propagate them in rooting beds; use the first generation of rooted cuttings as a source of a new generation of coppice shoots which are similarly propagated, and so on. The main restriction in this procedure is the very slow rate at which coppice shoots can be developed.

Mensuration and Biometrics

Staff changes have again interrupted the biometrical service, with the resignation of one biometrician and the absence of another overseas. A new biometrician has been appointed, and work on the design and analysis of experiments for field research stations and other branches of the Department has generally been maintained at a satisfactory level. However, some projects have been interrupted, including the completion of the general analysis of variance programme, the programme for analysis of lattice designs in Hoop Pine provenance trials, development of g.b.h.-height relationships for White Cypress Pine, and investigation of non-linear growth functions for site index determination.

Following large scale trials last year, a sampling scheme was provided for routine aerial fertilising in exotic plantations. Further trials were conducted in an effort to improve uniformity of distribution of fertiliser. These indicated that reducing swathe width from 33 feet to 18 feet did not result in an economically justifiable improvement, but that an increase in granule size of the fertiliser to a range of $\frac{1}{8}$ inch to $\frac{1}{4}$ inch produced a much more even distribution.

An investigation is also in progress to determine suitable sampling methods to monitor changes in the kangaroo population of Southwood National Park, and in particular changes resulting from fencing the park.

A revised Slash Pine volume table was produced for application to integrated logging sales. Data from stands planted at 8 feet x 8 feet only were used to develop the following equations:—

$$V_3 = 0{\cdot}7781 + 4{\cdot}6177A - 0{\cdot}02475H + 0{\cdot}3362AH$$
$$V_3 - V_4 = 0{\cdot}001700/(A-0{\cdot}01) + 0{\cdot}002490H/(A-0{\cdot}01)$$
$$V_3 - V_6 = 0{\cdot}1009/(A-0{\cdot}03) + 0{\cdot}01705H/(A-0{\cdot}03)$$

where V_3, V_4 and V_6 are underbark volumes in cubic feet to diameters of 3, 4 and 6 inches underbark respectively, A is basal area in square feet and H is predominant height in feet. Volumes to 4 and 6 inches are obtained from the above equations by subtraction. The major source of sample tree data in the past has been the Beerwah-Beerburrum area, but as thinning operations extend into Gympie and Maryborough Districts, a detailed investigation of the application of a single general volume table to all Slash Pine plantations in South-east Queensland will be made. Sample tree measurements are now becoming available for varieties of Slash and Caribbean Pines and hybrids between them. These will provide comparative information on form and bark thickness which will assist in the evaluation of both silvicultural and tree breeding experiments involving these varieties.

A general revision of the Yarraman Hoop Pine volume table was also completed and the new tables will be issued in the near future. Further investigation of the log length—small end diameter volume table for Hoop Pine has shown the influence of both predominant height of the stand and g.b.h. of the tree from which a log is derived. The effect would be most important where the log length—small end diameter table is applied to mill logs from the base of the tree and residual pulpwood volume derived by subtraction from the overall volume to three inches diameter. This could be of practical significance in the case of Slash Pine, and will be further investigated for that species. Checks on the accuracy of current volume tables were carried out as required. Volume allowances to cover losses due to top breakage in pulpwood sales were calculated for Hoop Pine and Slash Pine.

Plans for the change to measurement of experiments in metric units commencing in April, 1973 are well advanced. As far as possible the new field measurement forms will be produced by computer from the most recent measure in imperial units. Fortunately in the case of plantation experiments no changes in the structure of data records will be necessary, but the opportunity is being taken to standardise the subdivision of plots for determination of predominant height. Programming and design of stationery for this phase of the conversion is complete. Detailed yield plots will require changes to the layout of both field sheets and data records, while sample tree procedures will require complete revision. Preparation of metric volume tables and conversion of computer programmes will also be required. The Yarraman Hoop Pine volume table is already available in metric units, and one computer programme used to produce summaries of plantation experiments has been converted. Tables for conversion from imperial to metric units were prepared in cases where the range or accuracy of available tables was unsuitable.

Processing of experiment measure data generally proceeded smoothly. Some maintenance of existing programmes was required, but major revisions and enhancements are being deferred pending metrication. Two programmes were written for Forest Resources Branch, for use in processing plantation yield plots, and another programme for predominant height determination in experiments was modified to accept plantation yield plots. Compatibility in the processing of plantation experiments and yield plots is being maintained.

With the completion of punching of the Barakula data all past measurements of White Cypress Pine detailed yield plots are now available for computer processing. A further programme has been written to provide increments by girth classes on individual plot subdivisions to meet immediate

requirements. Progress with the North Queensland rain-forest yield plots is less satisfactory. Although a considerable amount of data has been punched, it was not possible to initiate any major programmes.

A part-time PLAN programming course was conducted for officers of Forest Research Branch, Forest Resources Branch and A.D.P. Section with particular emphasis on the linkage of PLAN segments with higher languages.

FOREST HYDROLOGY RESEARCH—NORTH QUEENSLAND

The main function of this work is to investigate the influence of forest vegetation on the water resource and to arrive at methods of forest management which will maintain soil and water values at a high level.

The experimental catchment project east of Babinda to investigate the hydrological consequences of converting lowland rain-forest to pastures is continuing. The meteorological instrumentation was strengthened during the year with the installation of an Indicating Solarimeter coupled to the C.S.I.R.O. Digital-Event Recorder. This recorder now has transducers measuring rainfall, evaporation and solar radiation.

Two additional soil moisture access holes were constructed during the year making a total of four holes in each catchment plus two in an adjacent pasture stand. The soil moisture status of these holes is monitored at fortnightly intervals.

Because of problems associated with current meter gauging for obtaining rating curves for the two measuring weirs at high flows, an attempt was made to obtain a rating curve by using a "pondage drawdown" technique. The results seem to be satisfactory and will provide the basis for future stream discharge calculations.

Hourly stream discharges are calculated by computer after stream heights from the recorded charts are converted to a computer acceptable form on a strip chart conversion unit. This information is now becoming available and preliminary data analysis will take place in the near future.

Measurements continued in the experiment to investigate the nature of water use in Hoop Pine plantations of different ages, in rain-forest and in tropical pastures on the Atherton Tableland. This involves the routine measurement of soil moisture levels to depths of nine feet in each of the vegetation types. Measurements were also continued on the throughfall plots which are associated with the soil moisture holes.

The sedimentation experiment in Scrubby Creek catchment R. 194 commenced during 1968-69 is continuing. This is planned to test the effectiveness of special conditions in the timber sale agreements in maintaining the domestic water supply free of sediment during and after logging operations. Further logging was carried out during the 1971 dry season, but most of the disturbance was away from the main streams. The 1972 wet season was marked by prolonged heavy rain from both cyclonic and "Monsoon" influences, and streamflow remained at a high level for a long period. The suspended sediment pattern in Scrubby Creek was similar to that of previous years, viz. high levels of suspended sediment for the first few major stream rises, dropping to much lower levels as the wet season progresses. The maximum concentration of 1,420 p.p.m. this year was substantially lower than the maximum of 3,200 p.p.m. recorded during the 1971 wet season.

NATIONAL PARKS

The United States of America has proclaimed the year 1972 as National Parks Centennial Year *"in recognition of the establishment on March 1, 1872, of the world's first National Park, Yellowstone, which advanced a new concept of land use in setting aside an outstanding natural area in perpetuity for the benefit and enjoyment of the People".*

In the pioneering situation which still existed in much of the United States at that time it was indeed a far-sighted action, No-one could then have imagined technological advances which were to come during the next 100 years, the tremendous changes which mankind was to make on the global landscape, or the intense need for permanently reserved natural areas which now exists.

It is appropriate in this centennial year to look back over the history of Queensland's National Parks and to assess their future role. Some events of significance in the history of our National Parks are:—

1906—Legislation is passed to make provision for the creation of National Parks—as a result of the efforts of R. M. Collins whose imagination was fired by what he had seen on a visit to Yellowstone.

1908—Queensland's first National Park, Witches Falls on Tamborine Mountain, is dedicated. Shortly afterwards in the same year an area of 22,500 acres on the Bunya Mountains is proclaimed a National Park.

1915—Lamington National Park is created, Romeo Lahey bringing to a successful conclusion the campaign begun by R. M. Collins.

1930—The National Parks Association of Queensland is formed with Romeo Lahey as its President and guiding spirit.

1959—Passing of *"The Forestry Act of* 1959" represents a considerable step forward in National Park legislation in Queensland.

1962—Romeo Lahey crowns a lifetime of achievement in the National Parks movement by securing the dedication of the Daintree River Gorge National Park which, with an area of 133,000 acres, became Queensland's largest park and remains today second only to the Simpson Desert National Park.

1967—With the creation of the Simpson Desert National Park, the total area of National Parks in Queensland exceeds 2 million acres.

1968—Forestry Act is amended to provide for the specialised management of National Parks by the declaration of areas within existing National Parks as Primitive, Primitive and Recreation, Recreation, Scientific or Historic areas.

1971—Forestry Act is amended to provide for the establishment of Marine National Parks.

Future Role

The last decade has seen a tremendous upsurge in public interest in National Parks and in visitation rates. Undoubtedly this trend will continue and in an urban society the parks will provide increasingly for the recreation needs of the people. Their value in this direction can scarcely be over-emphasised, and yet their major role in the next 100 years may well lie in another direction.

Now, more than ever before, man has at his command forces that can cause major and even catastrophic changes to his environment. Suddenly we are faced with the need to solve a range of fundamental ecological problems that simply did not exist when Yellowstone was dedicated. Their solution will require extensive use of natural areas for study and comparison, and until these problems are solved this could well be the most important role that our National Parks will have to play—a role that will be vital to the maintenance of environmental quality and perhaps even the very existence of life as we know it. A wide range of natural areas will be needed and it is of major importance to secure as soon as possible an adequate system of reference areas on a global basis.

This is in line with Queensland Policy as was indicated in the Department's Annual Report for 1964 where it was stated—

> "An important object of National Park administration must therefore be to reserve permanently typical examples of all the main environments including the less scenic."

Queensland has an important role to play in this regard because of the variety and range of environments which exist, from desert to wet tropical rain-forest, swamp and coral reef, from treeless plain to montane heathland, and encompassing a latitudinal range of almost 20 degrees. The task of systematically examining, assessing and selecting representative areas in so vast a State is formidable but useful progress has been made in the coastal regions where natural areas are under greatest pressure for development.

Survey of Coastal Lands

The study of coastal areas from Tweed Heads to Cape Melville which was completed to Shoalwater Bay near Rockhampton during 1970–71, was extended north to the Tully River during 1971–72, and should be completed in the near future. For the purposes of this study, the lowlands from the border to Shoalwater Bay are considered to be a biological unit distinct from the coastal lowlands further north. Therefore, since field work in this section of the total study area was completed at an early date, reports covering it have been submitted, and recommendations are presently under consideration.

Cape York

A small start was made during the year on a project which it is hoped will lead to a full identification of those parts of the Cape York Peninsula which should be reserved as National Park if the major scenic and biological features of this most northern part of Queensland are to be preserved. As the survey of coastal lands draws to a close, a major part of the field work now carried out will be centred on the Peninsula.

Rain-Forest Survey, South-east Queensland

A survey of remaining rain-forest areas in south-east Queensland in conjunction with the rain-forest ecology section of C.S.I.R.O., was continued during the year. As mentioned in the last Annual Report this work is proceeding slowly partly because of the difficulty experienced by C.S.I.R.O. staff in finding time for the necessary field work. The expert knowledge which these officers bring to the study is greatly appreciated.

Marine National Parks

Following inspections carried out earlier this year, three Marine Park proposals are under consideration. One of these inspections, involving certain reefs and islands in the Capricorn and Bunker Groups, was carried out using the Department's 56-foot boat "Korawinga".

Three boats—two 30-foot aluminium vessels and one 22-foot fibreglass jet boat—are presently under construction and will be completed early in the new financial year. These will be named respectively "Shearwater", "Gannet" and "Whimbrel". It is proposed to name all National Parks boats after birds of the Queensland coastline, and the boat already stationed at Shute Harbour is to be renamed the "Curlew".

Fauna

General fauna survey work was carried out on the following National Parks—Springbrook, Girraween, Cunningham's Gap and Southwood, and also on the Woodgate Park proposal (presently State Forest 278 Hercules).

Research, directed towards future wildlife management procedures, has commenced on the grey kangaroo (*Macropus giganteus*) in Southwood National Park. With the construction of a fence around this Park, it is essential to know the population dynamics, food and water requirements, etc. of these animals. An ecological study of the sugar glider (*Petaurus breviceps*) is being carried out at the same time.

Introduced animals are a perennial problem. Approximately 90 goats were removed from Fairfax Island, Lady Musgrave Island and Hoskyn Island National Parks in January. These had been responsible for considerable damage to the vegetation, particularly on Fairfax Island.

A programme of wild pig extermination on Southwood National Park will commence as soon as the fence is completed early in the new financial year. Experiments will be carried out on trapping techniques to determine their effectiveness for use in other National Parks.

A paper entitled "The Albert Lyrebird in Display" was published in The Emu (Vol. 72 Part 3). Work on the vocal behaviour of this species is being continued.

Dipperu National Park

On Dipperu National Park near Nebo a detailed strip-line survey was carried out as part of a plan to identify all areas of *Harrisia* cactus infestation. Detailed notes on vegetation, soils, and other features of interest, were taken along the strip lines, and from these notes a map of the Park will be drawn which will be useful for future management.

This is the first time that extensive information on the type and distribution of vegetation on a National Park has been gathered by strip survey methods. Completion of the map, and its future uses, will allow judgment to be made of the value of this type of work on other National Parks, and, in respect to time, cost, and information obtained, will afford comparison with other methods of gathering data.

An estimated area of 525 acres of this Park was found to be infested with *Harrisia* and this was treated at a wages cost of approximately $800.

Park Works

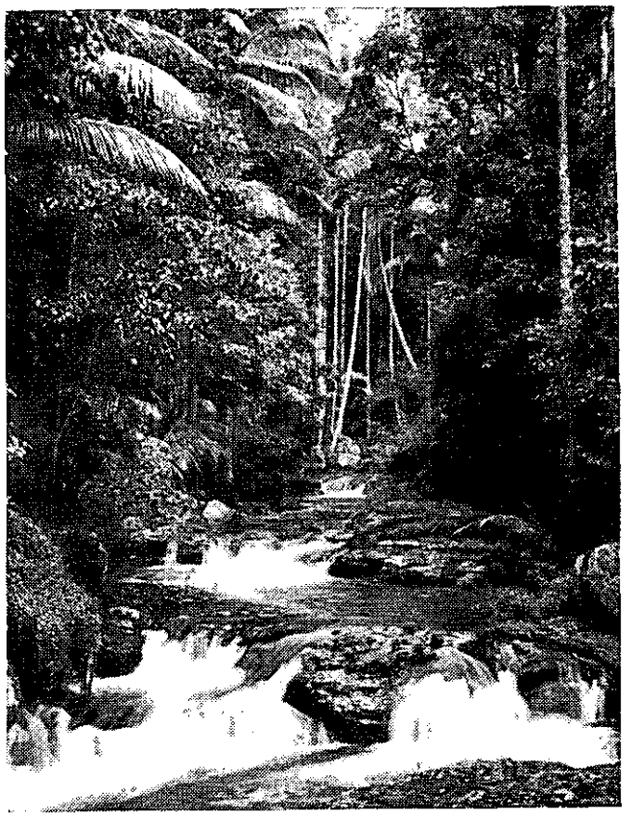
During 1971–72 the following National Parks had amounts exceeding $500 expended on them. The major part of this expenditure is for constructing and maintaining visitor facilities.

Southern Queensland

Girraween, Bunya Mountains, Burleigh Heads, Carnarvon, Coalstoun Lakes, Cunningham's Gap, Lamington, Kondallila, Mount Barney, Mount Glorious (Maiala and Boombana), Noosa, Natural Arch, Ravensbourne, Southwood, Springbrook (Gwongorella and Warrie), Tamborine.

Central Queensland

Brampton Island, Cape Hillsborough, Conway, Dipperu, Eungella, Linderman Island, Long Island, South Molle Island, Whitsunday Island.



Cedar Creek, Joalah National Park, Mt. Tamborine.

North Queensland

Chillagoe Caves, The Crater, Dunk Island, Green Island, Lake Barrine, Lake Eacham, Magnetic Island, Mossman River Gorge, Mount Elliott, Palmerston, Wallaman Falls, Jourama, Crystal Creek.

Major development works were undertaken on the following National Parks:—

BUNYA MOUNTAINS NATIONAL PARK—Construction of shower and toilet facilities, information shelter and sealing of road at Dandabah.

NOOSA NATIONAL PARK—The road to the Lookout on the top of Laguna Hill was sealed.

CHILLAGOE CAVES—The pathway system within the caves was extended, power was brought to the entrance of Donna Cave and work was commenced on the construction of an additional house to serve as employee accommodation.

SOUTHWOOD NATIONAL PARK—Work to construct a dog and marsupial proof fence to surround this park was commenced and is nearing completion.

CARNARVON NATIONAL PARK—A new pumping plant was installed as part of an overall plan to upgrade the water supply system at the camping area.

DIPPERU NATIONAL PARK—The treatment of *Harrisia* cactus infestations was continued in conjunction with a strip survey which gave information on the flora and fauna of the National Park. Approximately 525 acres of the National Park were found to be infested to some extent with *Harrisia* cactus.

GIRRAWEEN NATIONAL PARK—The camp ground on this popular National Park was further improved.

CONWAY NATIONAL PARK—Over half a mile of new walking track was constructed to complete the first stage of track system in the northern part of the National Park.

CAPE HILLSBOROUGH—A shower and septic toilet block was constructed on the picnic area.

Expenditure

An amount of $416,046 was spent on National Parks this financial year. Of this amount $64,900.80 was spent on Marine National Parks, $349,059.76 on Terrestrial Parks and the balance on miscellaneous items.

An overall breakdown of expenditure on terrestrial 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.)	90,644.39
2. Fire detention, fire fighting and patrol	4,094.77
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*	3,870.66
4. Track location and survey	688.02
5. Track construction and improvements	4,975.29
6. Track maintenance	46,322.26
7. Construction of picnic gound facilities (shelter sheds, barbecues, fireplaces, tables, seats, tiolets, entrances, &c.)	26,957.94
8. Maintenance of picnic facilities (items listed under 7, mowing, tidying of grounds, rubbish disposal, cleaning of toilets, &c.)	55,124.78
9. Miscellaneous construction works (landings, jetties, parking areas, foot-bridges, *lookouts, roads, fencing, &c.*)	46,933.72
10. Maintenance of miscellaneous improvements	1,763.67
11. Construction of camping area facilities (ablution blocks, barbecues, fireplaces, tables, toilets, entrances, &c.)	24,939.03
12. Maintenance of camping areas	5,002.04
13. Erection of general signs	12,276.76
14. Maintenance of general signs	2,987.87
15. Construction of accommodation facilities for staff	2,002.31
16. Maintenance of accommodation and facilities for staff	3,215.79
17. Maintenance of Aboriginal relics (Bora grounds, paintings, &c.)	802.57
18. Special research projects	2,803.35
19. Construction of interpretative facilities (explanatory signs, name plating of trees, self guiding tracks, museums, literature, &c.)	433.16
20. Maintenance of interpretative facilities	31.18
21. Law enforcement and public information patrols	7,532.46
22. Boundary surveys	2,262.93
23. Construction and maintenance of firelines and prescribed burning	3,394.81
Total	$349,059.76

Recreation on National Parks

The Forestry Act states that "The cardinal principle of management of National Parks shall be the preservation, to the greatest possible extent, of the natural condition". National Parks belong to the public who have the right to use them. There is however a conflict between this use and the continuing viability of the National Parks as reference samples of natural biotypes. A National Park has a certain recreational carrying capacity which should not be exceeded if the important Park attributes are to remain unimpaired.

The standard of visitor facilities has been maintained at a high level and the parks were visited by an estimated 2½ million people during the past year. This serves to emphasise the problem of potential overuse of the parks which is of especial importance in regions of high population concentration. In these areas efforts will have to be made to channel much of the use to other areas, where recreational opportunities of an acceptable standard, can be provided. The establishment of recreational facilities on State Forests, which was commenced this year will assist in meeting the demand for outdoor recreation in largely natural surroundings.

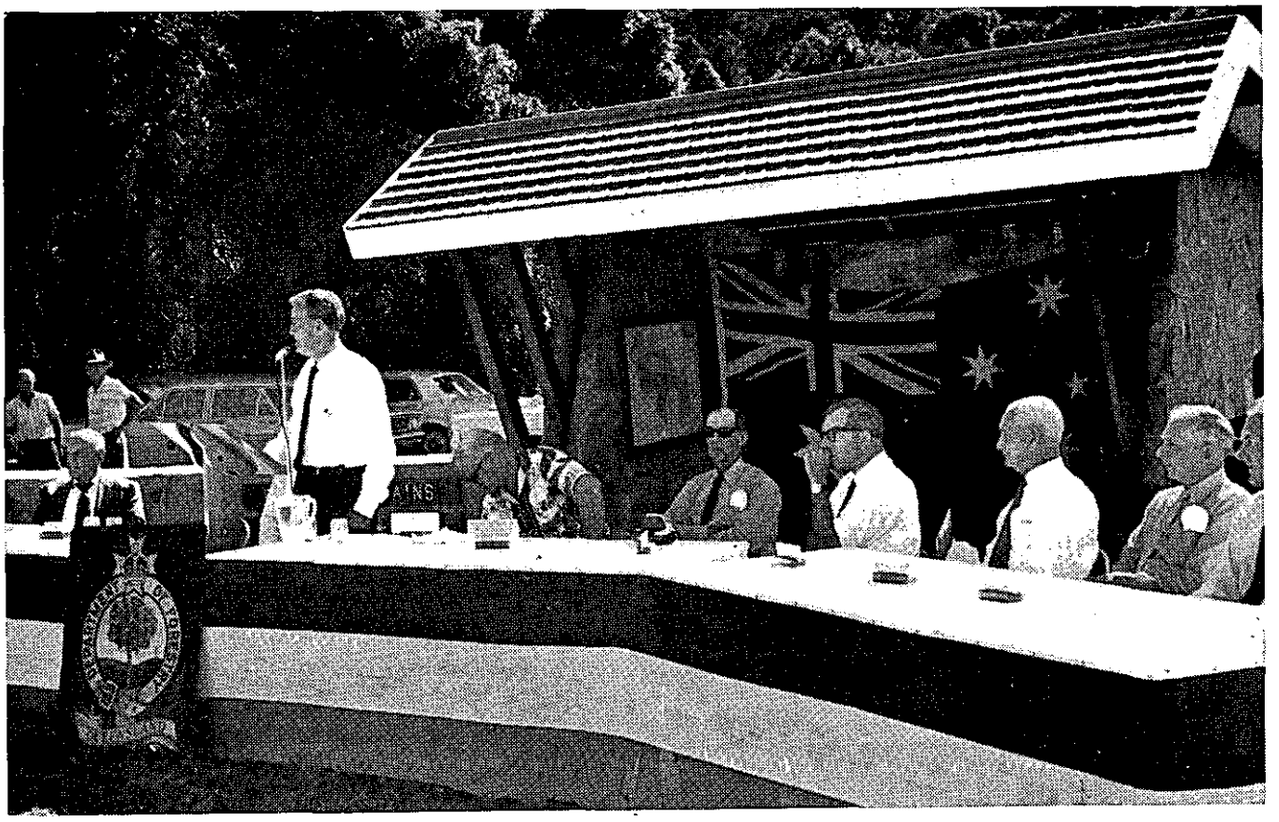
Maps of National Parks

During 1971–72 the Department published maps of the National Park areas at Springbrook, Dunk Island and Burleigh Heads. These maps are of a high standard and are available for sale to the general public.

Addition to Bunya Mountains National Park

On Sunday, 9th April, 1972, a function was held at the Bunya Mountains National Park to mark the donation of 40 acres of land by Mr. and Mrs. A. Stirling for inclusion in the National Park.

The Premier of Queensland, the Honourable J. Bjelke-Petersen M.L.A. performs the opening ceremony of the camping grounds on part of the area donated by Mr. and Mrs. A. Stirling for addition to the Bunya Mountains National Park. April 9th, 1972.



The Premier, Honourable J. Bjelke-Petersen opened a new camping area and associated facilities on portion of the donated area while the Minister for Lands the Honourable V. B. Sullivan unveiled a plaque which read—

> "This camping area is part of an area of 40 acres generously donated to the people of Queensland by Mr. and Mrs. Allan Stirling for addition to the Bunya Mountains National Park and in appreciation of the service rendered to the State by the Honourable J. Bjelke-Petersen M.L.A. as Premier of Queensland . . ."

Mr. and Mrs. A. Stirling and the plaque that commemorates their generous gift of land for addition to the Bunya Mountains National Park.

New Reservations

The following new reservations were proclaimed during the year ended 30th June, 1972.

NATIONAL PARK 3, EPPING FOREST—This park was gazetted on 9th October, 1971, over an area of about 6,580 acres comprised in portion 1, parish of Epping Forest in the Clermont Area to provide permanent protection to the habitat of a rare species of hairy nosed wombat. At the present time only three species of hairy nosed wombat are recognised. One is fairly common in southern Australia and the two Queensland species are of considerable scientific interest because of their extreme isolation from the southern species. It is considered this National Park will ensure the survival of the species in the Clermont area.

NATIONAL PARK 1404, GRAFTON—Gazetted on 9th October, 1971, this park covers an area of about 98 acres in portion 180, of the parish of Grafton and adjoins Bellenden Ker National Park. It was considered that the steep forest country adjoining Bellenden Ker National Park should remain under Crown control and it will be amalgamated with that park at some convenient time.

NATIONAL PARK 1050, ALFORD—This park was gazetted on 27th November, 1971 and covers an area of about 1,720 acres in portion 149 of the parish of Alford and is situated on the eastern fall of the Great Dividing Range in the vicinity of Mount Roberts. It has numerous scenic features including high mountains, cliff faces, waterfalls, rain-forest and tall grassy woodland. Most of the area is virgin country rich in wildlife.

NATIONAL PARK 114, WEST HILL—Gazetted on 27th November, 1971, this park has an area of about 830 acres in portion 62, parish of West Hill and was formerly part of a grazing selection on the coast line adjacent to West Hill Island, an existing National Park. The former lessee is still permitted to graze the area. The National Park has about two miles of beach front land, backed for most of its length by vine scrub in a broad hollow behind the frontal dune. The western part of the area is open forest country. A broad corridor of park-like country separates these two forest types. The area has considerable potential for public recreation with its long beach front and adjacent island.

NATIONAL PARK 1391, TRINITY—This park was gazetted on 4th December, 1971 and comprises an area of about 2,280 acres in portion 170 of the parish of Trinity. This area was proclaimed a National Park to preserve a representative sample of a particular type of rain-forest and an area of grassy eucalypt woodland on the western fall of the coast range south of Cairns.

NATIONAL PARK 16, CARREE—This park was gazetted on 4th December, 1971 and embraces an area of about 61,300 acres in the parishes of Carree and Wathumba on the northern end of Fraser Island. This park is of historic and scientific interest and contains sand dunes, swamps, freshwater lakes and wallum vegetation in an almost completely natural state. Vantage points overlooking the lakes together with a profusion of flowering plants make this park a scenic attraction as well as an area of considerable interest. It is intended this area will ultimately form part of a National Park of some 100,000 acres.

NATIONAL PARK 1447, MOURILYAN—This National Park was gazetted on 20th May, 1972 over an area of about 535 acres in portion 300, parish of Mourilyan. The park is situated along the Moresby Range and includes about three miles of the coastline between Coquette Point and Etty Bay, south-easterly of Innisfail. The area is well timbered and carries commercial species and attractive stands of Fan Palms. Mangroves occur on the low seaward slopes. This area is a valuable addition to the National Parks of Queensland as rain-forest close to the seashore has been preserved at very few points along the coast.

NATIONAL PARK 1202, MALENY—This park, covering an area of about 196 acres 3 roods 10 perches was gazetted on 20th May, 1972, and embraces portion 185 and an unproclaimed Beauty Spot Reserve (R. 594), parish of Maleny. The area is heavily timbered and contains a wealth of Piccabean Palms and Orchid growth. The most spectacular feature is the deep narrow rocky gorge through which the Obi Obi Creek flows and which is known as "The Narrows".

NATIONAL PARK 821, PEAK ISLAND—Gazetted on 20th May, 1972, this National Park covers an area of about 70 acres embracing the whole of Peak Island in the parish of Meadow Flats. The island is situated in Keppel Bay about nine miles from Emu Park, and is extremely attractive from the scenic viewpoint. It has good fishing and provides shelter for small craft in certain weather conditions. With the establishment of the Rosslyn Bay small boats harbour, it is expected that this and other Keppel Bay Islands will be visited by the public to an increasing extent.

NATIONAL PARK 1445, HULL—This park was gazetted on 3rd June, 1972, and covers an area of about 1,200 acres of portion 506, parish of Hull. This area contains diversity of vegetation forms including limited occurrences of mixed mesophyll vine forest, mesophyll palm vine forest, tall sedge forest, and medium grassy woodland with low layered woodland occupying the greater part of the area. This latter type provides a suitable buffer zone for the other complex habitats. The park also supports an abundance of birdlife. Readily accessible from the Bruce Highway, this area is one of the few complex remnants of its kind available.

NATIONAL PARK 8, MAZEPPA—An area of about 10,195 acres in portion 6, parish of Mazeppa was gazetted a National Park on 17th June, 1972. This park contains a largely undisturbed Gidgee/Brigalow association. Gidgee (*Acacia cambagei*) is an important vegetation type within this State and, as with Brigalow, it is desired that some representative areas of this species be preserved both for intrinsic interest and for availability at a future date for research, if required, into problems which may arise in the agricultural or pastoral use of gidgee soils. The park which is situated approximately 35 miles north-west of Clermont, was selected by the Land Administration Commission following a request that a sample of gidgee be made available for reservation.

Additions to National Parks 1971–72—

	A	R.	P.
N.P. 496 Roberts	1	0	13·8
N.P. 601 Cedar and N.P. 714 Tamborine	1	2	13·5
N.P. 645 Pitt	1	0	8
N.P. 647 Tamborine	0	1	4·4
N.P. 603 Haly	4,679	2	27·1
N.P. 2155 Tiffin	48	0	0
N.P. 678 Ossa	463	0	0
N.P. 253 Beor	650	0	0
N.P. 1392 Bellenden Ker	4	3	26
N.P. 41 Mudgeeraba	0	3	32
N.P. 56 Southwood	110	0	0
Total	5,960	2	4·8

Excisions from National Parks 1971–72—

	A	R.	P.
N.P. 496 Roberts (Road purposes)	4	0	37·2
N.P. 192 Ravenshoe (Road purposes)	23	0	0
N.P. 2155 Tiffin (Road purposes)	48	0	0
N.P. 228 Hook (Lighthouse)	1	0	0
N.P. 603 Haly (Road purposes)	130	0	0
Total	206	0	37·2

Area of National Park Reservations

As at 30th June, 1972, there were 284 National Parks in Queensland covering an area of approximately 2,563,225 acres, an increase of 90,731 acres for the year.

Staff

During the year the National Parks technical staff was increased by the appointment of a Botanist and a Zoologist. Field staff as at 30th June, 1972, consisted of three Rangers, 28 Overseers and 42 workmen.

HARVESTING AND MARKETING

General

The total Crown and private log harvest for the year was about seven million super. feet (Hoppus) more than for 1970-71, despite a further drop of about three million super. feet in the cut of private log timber.

There has been little change in the total annual log production from Crown and private sources over the past 10 years. In this period private supplies have dropped by about 30 million super. feet or 15 per cent. whilst Crown supplies have increased by about 40 million super. feet or 20 per cent.

The reduced yield of Crown log timber of natural Hoop and Bunya Pine over the last 15 years or so has been offset by the increasing supply of plantation pine and Cypress Pine, to such an extent that the total cut of all Crown log timber in 1971-72 at 235 million super. feet has only been exceeded three times in the last 20 years.

The harvest of plantation timber, principally thinnings, has increased from about 20 million super. feet, with no pulpwood, in 1956-57, to about 52 million super. feet, including a record 10 million super. feet of pulpwood, in 1971-72.

The Crown log cut of 32·2 million super. feet of Cypress Pine was also a record for this species, as was the total Crown and private combined cut of about 63 million super. feet.

Kauri Pine, mainly from North Queensland, has averaged about two million super. feet per annum over the last 15 years and it is expected that this rate will be maintained.

In order of volumes harvested, the principal Cabinet Wood species in Queensland are Silky Oak, Maple Silkwood, Queensland Maple, Black Bean, Red Silkwood, Brown Salwood, Brown Quandong, Queensland Walnut, Silver Silkwood, Rose Mahogany and Red Cedar. These valuable timbers are obtained mainly in North Queensland rain-forests and constitute about 5 per cent. of the total log input. This supply has been maintained at about 20 million super. feet per annum over the last 20 years.

During the year, nine lots of Crown timber suitable for the production of a total of 136,000 sleepers were offered at auction, such sales conveying the right to establish new sleeper mills and the right to continuing supplies without further competition. All the lots were purchased, six attracting bids above the upset prices. The total number of sleepers produced from Crown timber areas in 1971–72 was 535,938, an increase of 25 per cent. over the previous year.

Mill Logs—Crown Lands

The following are the annual quantities of Mill Logs obtained from Crown lands as from 1962–63:—

Year	Super. feet (Hoppus)
1962–63	194,000,000
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

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. The dealers prefer Sandalwood to Rosewood as it has a stronger aromatic value for the manufacture of joss sticks, etc.

Mill Logs Cut—Crown and Private Lands

This table shows logs cut by all mills in the State annually, for the periods indicated:—

Year	Queensland Grown									Imported	Total
	Hoop and Bunya Pine	Kauri Pine	White Cypress Pine	Forest Hardwoods	Scrub Hardwoods	Cabinet Woods	Miscellaneous	Plantation Thinnings	Pulpwood		
	(1,000 superficial feet Hoppus)										
1966–67	24,009	1,627	49,261	224,073	Previously Included with Forest Hardwoods	19,550	40,176	36,668	4,889	8,962	409,215
1967–68	21,936	1,582	56,803	216,679		20,743	42,770	40,284	5,000	11,598	417,395
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	19,873	2,344	63,559	172,008	17,925	21,299	41,698	41,601	10,078	14,225	404,610

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	Pulpwood
	(1,000 superficial feet Hoppus)								
1967–68	19,644	1,601	29,178	69,298	14,183	17,412	31,652	39,000	4,938
1968–69	20,211	1,811	27,933	65,257	13,834	17,866	30,864	42,996	6,341
1969–70	16,832	1,799	28,428	68,576	15,383	17,745	32,752	43,182	8,821
1970–71	14,813	2,401	26,508	64,783	15,749	17,204	32,570	40,397	8,185
1971–72	17,167	2,013	32,211	63,945	17,215	17,555	32,420	41,426	10,078

The Timber Business (Crown Lands)

	1970–71	1971–72
(*a*) Mill Logs—		
Hoop and Bunya Pine	14,813,000 super. feet	17,167,113 super. feet
Forest Hardwoods	64,783,000 super. feet	63,944,859 super. feet
Scrub Hardwoods	15,749,000 super. feet	17,214,728 super. feet
White Cypress Pine	26,508,000 super. feet	32,210,906 super. feet
Kauri Pine	2,401,000 super. feet	2,013,258 super. feet
Cabinet Woods	17,204,000 super. feet	17,555,300 super. feet
Miscellaneous Species	32,570,000 super. feet	32,420,125 super. feet
Plantation Timbers	40,397,000 super. feet	41,426,486 super. feet
Pulpwood	8,185,000 super. feet	10,078,119 super. feet
Limb Logs, Head Logs, Stumps and Flitches	53,000 super. feet	13,370 super. feet
	222,663,000 super. feet	234,044,264 super. feet
(*b*) Construction Timbers—		
Headstocks, Transoms, Crossings, Braces, &c.	361,411 super. feet	400,724 super. feet
Sleepers	430,174 pieces	535,938 pieces
Girders, Corbels, Piles, Sills	64,732 lineal feet	63,353 lineal feet
Girder Logs	96,174 super. feet	80,020 super. feet
Poles	146,081 lineal feet	92,457 lineal feet
House Blocks	8,821 lineal feet	1,166 lineal feet
Mining Timbers—Round	427,329 lineal feet	302,450 lineal feet
Mining Timbers—Split	Nil	Nil
Mining Timbers—Sawn	223,900 super. feet	Nil
Gross receipts from Timber Sales, &c.	$4,590,756.41	$5,524,382.62
Net Revenue	$2,393,014.29	$2,855,681.79

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 $3.00 to $4.00 *depending on species and locality.*

Logging Roads—1971–72

The Department's Roads programme for the year involved 49 miles of construction.

Location and working surveys covering 39 miles were carried out.

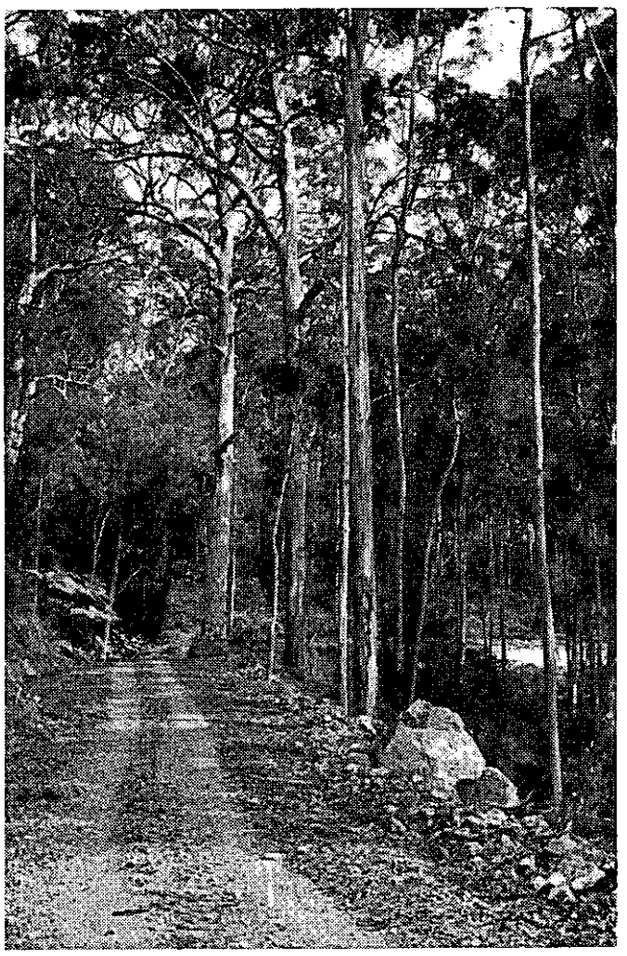
Expenditure from Forestry votes was as follows:—

	$
New Construction	417,315
Maintenance	261,285
Subsidies to Shire Councils	49,372
Workers' Compensation	2,162
Pay Roll Tax	10,946
Surveys	3,090
Fares and Freights	2,351
	746,521

Logging

The table below shows the quantities of log timber hauled during 1971–72 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	10,834,671	
Forest Hardwoods	—	
Scrub Hardwoods	76,761	276,782.23
Miscellaneous	105,337	
Red Cedar	21,903	
	11,038,672	276,782.23
North Queensland—		
Cabinet Woods	762,077	22,626.49
Totals	11,800,749	299,408.72



Logging road constructed to give access to important stands of Sydney Blue Gum (here shown) and New England Blackbutt on State Forest 316 Winterbourne, Monto District.

Constructional Timbers—Departmental Contracts

Below are shown quantities of constructional timbers obtained from Crown lands for year 1971–72, in comparison with those for the two previous years:—

Class of Timber	1969–70*	1970–71*	1971–72*
Sleepers	216,493 pieces	241,887 pieces	294,930 pieces
Crossings	49,110 super. feet	166,666 super. feet	189,257 super. feet
Transoms	133,624 super. feet	106,505 super. feet	112,385 super. feet
Bridge Timbers—Girders and Piles	14,086 lineal feet	19,781 lineal feet	26,098 lineal feet
Girder Logs	211,564 super. feet	96,174 super. feet	80,020 super. feet

*c.f. Table (*b*) of The Timber Business—which includes also timber sold at stump from Crown Lands.

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.

The average number of mills in active operation for the first three quarters of the year was 426. Figures are not yet available for the final quarter.

The following table sets out the position in respect to Sawmill Licenses as at 30-6-1972.

It will be noted that industry has continued to take advantage of the Department's policy permitting amalgamations within zones with the result that during the year 19 licenses were withdrawn following participation of sawmills in amalgamation.

Current licenses are shown dissected into two classifications only. These classifications relate to the amalgamation policy. Mills in each category are permitted to amalgamate only with mills similarly classified.

Number of Licenses as at 30–6–71	Adjustments †	Classification	New Licenses Issued	Licenses not Renewed			Total Licenses as at 30–6–72
				Withdrawn for Amalgamation	Refused	Relinquished	
421	−2	General Purpose Mills	4	18	2	2	401
49*	+2	Other than General Purpose Mills	5	1	..	5	50
470	..	..	9	19	2	7	451

* Other than General Purpose Mills comprise mills wholly or mainly restricted to the production of sleepers and/or mining timbers.

† Adjustments required to correct error in previous classification listing.

Offences

During the year ended 30th June, 1972, officers reported 415 breaches of the Forestry Act.

Proceedings were successfully instituted against 24 persons; fines totalling $1,000 were imposed and an amount of $5,434.98 was recovered.

In 24 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 $6,387.77 was recovered in this manner.

In addition 26 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 $10,789.12 was recovered by the Crown in timber revenue and a further $2,114.67 by way of fines, miscellaneous and investigation costs.

FOREST PRODUCTS RESEARCH

General

The demand for research, developmental work and advice in all fields of forest products utilisation has continued and it is evident that present staff and facilities are unable to handle adequately the demands being made upon them. Unfortunately, the provision of improved facilities is still subject to delay and unless the position can be rectified it will be necessary to review the fields in which work is undertaken. This is undesirable since, as mentioned last year, the needs of the timber producing and using industries in these regards are increasing under the stress of changing economics, technology, and raw material.

A corollary of these changes is the demand for soundly based timber standards which will ensure sound utilisation practices and most efficient use of the timber resource. For these reasons officers of the Department have continued to devote time to active participation in a large number of National committees engaged in framing these standards. Work associated with the change to metric in the timber industry is increasing as the event approaches and its implications are being realised by industry.

The Branch has maintained a close liaison with the two Timber Research and Development Advisory Councils and this will be intensified with the appointment of technical staff by the southern Council. During the year T.R.A.D.A.C. assisted in presenting the Department's display at the Brisbane Exhibition featuring Southern Queensland species in dwelling construction.

Three officers of the Department attended the 8th All Australian Timber Congress in Melbourne during the year and two were present at the Annual Conference of Australasian Pulp and Paper Industry Technical Association in Tasmania. Both Conferences proved to be valuable to the officers concerned and to the work of the Department.

The infestation of the West Indian Dry Wood Termite, *Cryptotermes brevis*, in Maryborough is still a cause for serious concern since resurvey of the affected area has revealed 16 premises attacked by the insect. These occurrences lie well within the boundary of the area originally surveyed and this gives reasonable grounds for hoping that the insect has not yet spread further afield. However it is evident that fumigation restricted to detected infestations has not been fully effective in eradicating the insect. Further fumigation work is proposed and Commonwealth assistance is being sought for a treatment programme aimed at securing complete eradication as a matter of urgency before spread occurs and the task becomes impracticable. If this is allowed to happen, then the insect could spread over much of eastern coastal Australia and become a serious pest of lower density timbers, including softwoods, whose production and usage are increasing rapidly.

The Timber Users' Protection Acts

The number of formal complaints lodged with the Department rose to a total of 47, an increase of 20 over the previous year. Of these only 32 breached the Acts and all involved lyctus susceptibile timber. All but four were from the Brisbane area. In most cases the source of the timber was Northern New South Wales.

No prosecutions were instituted during the year but action is proceeding in several cases. Most complaints were withdrawn following investigation after remedial action had been taken by the builder or timber supplier.

The complaints lodged constitute only a small proportion of the total number of cases where susceptible material is supplied and used, most of which are not reported either because of ignorance of the Acts or because corrective action is arranged privately between the supplier and the purchaser. Inspectorial work covering 400 building operations mainly in the Metropolitan area disclosed lyctus susceptible timber in 54 cases and corrective action was taken. However this reveals a serious position because the buildings inspected comprise only a small proportion of the total operations and unless necessary action is taken by producers more stringent application of the provisions of the Acts will be required.

In conjunction with inspections in country areas advice on timber utilisation is featured and there is a need to expand this activity.

No complaints were made under these Acts in respect of moisture content of timber but samples of seasoned material received for routine testing showed almost 10 per cent. to have a moisture content outside the allowable range.

Wood Chemistry and Preservation Section

The registration of a further pressure treatment cylinder during the year brings the total number of such plants in the State to 33 and requirements associated with registration and quality control of the operation of these and other treatment plants constitutes a major part of the work of this Section. During the year some 12,000 individual chemical determinations were made including 2,200 spot tests for the Housing Commission and industry.

In general the standard of commercial treatment has been satisfactory. Removal of a rebate on duty levied on imported copper-chrome-arsenic salts led the major companies to seek approval for the use of Australian manufactured salts which are currently being tested prior to any general approval.

Problems are still encountered with the branding of treated timber, particularly from plants in New South Wales, and greater uniformity in legislative requirements is being sought.

Further evidence relative to the failure of treated timbers in marine use has emphasised the need for more work in this field. The Department contributed an additional amount towards publication of the report by Dr. Ruth Turner on her survey of marine borers in Australian waters.

A major problem has arisen with the discovery of "Soft Rot" fungi in power transmission poles treated with copper-chrome-arsenic salts and with creosote. The degree of attack varied, but in some cases, surface softening was quite advanced within a few years of installation and extended from ground line to approximately nine inches below.

In view of the widespread use of treated poles in this State, a study is being undertaken involving considerable work in both field inspections and laboratory analyses. To date approximately 10 per cent. of poles examined have been found to be already attacked and 20 per cent. show incipient attack. The affected poles are widely distributed throughout the State over a wide range of climatic and soil conditions. Work is being done in collaboration with other Authorities and preservative supplies, and trials are also proposed of alternative preservative treatments and of butt treatments for both new and affected poles.

Investigations are continuing into corrosion problems in kilns associated with high temperature drying, and into performance of opaque and clear finishes on timber substrates. There is also interest in the chemical properties of, and possible outlets for, the large quantities of softwood bark becoming available.

Timber Conversion Section

(i) *Sawmill Economics.*—During the year, work continued at the Department's experimental sawmill at Rocklea on the comprehensive sawing study with Hoop Pine logs drawn from the high pruned fraction of some of the older plantations. Samples of high site indices from the Yarraman District have been processed and action is proceeding on a sample of low site index. The study will extend to other major Hoop Pine plantation District to provide comparative data on stand fractions site indices and plantation areas.

A sawing study has been commenced on material from paired plots of Slash and Caribbean Pine from Toolara to determine the relative merits of these two closely related species grown under similar conditions in South-east Queensland. Information provided on volume production, recovery of sawn material, behaviour in seasoning and sawn grade distribution will assist in the choice of species for use in plantation programmmes in this region.

In all recent sawing studies on Plantation Pine, it has been the practice to measure bends and sweep in logs. It is hoped that, eventually, when sufficient data is accumulated, it will be possible to establish a relationship between stem form and sawn recovery which could have an effect on silvicultural practices and on diversion of stems to sawn log or pulp.

The series of studies on Brush Box, arranged in co-operation with the Hardwood Association of Queensland and commenced last year is nearing completion. Grading of the material at the seasoned stage has been completed for four of the five mills studied but wet weather delayed completion of grading at the fifth mill.

The whole of the output from one of the mills studied and samples of approximately 1,000 super. feet from each of the other four mills have been seasoned, resawn (in the case of flitch material) and regraded at Rocklea. All one inch boards from these samples have been dressed and re-graded under commercial conditions. Comparative data on degrade after seasoning and after dressing for all the areas of origin has been obtained. Further analyses of these data is proceeding.

Two important milling studies are planned for the coming year—

(*a*) Associated with the introduction of integrated operation of pulp and mill log a mill study of Hoop Pine cut to 6 inches top diameter will be carried out in the Mary Valley.

(*b*) A study of recovery and sawn grade of Cypress Pine from the Cecil Plains and Millmerran areas will be carried out at the Rocklea mill, to investigate local problems of sawn timber quality.

(ii) *Seasoning and Timber Engineering.*—Work is continuing on the high temperature drying of plantation Hoop Pine framing sizes as an extension of the work on Slash Pine carried out last year. Results to date confirm the advantages of this method of seasoning over conventional seasoning at lower temperatures. This work will be continued in association with sawing studies on plantation species. It is of interest to note that high temperature seasoning of plantation material is being carried out commercially following the experimental work reported last year.

The Department is equipped to carry out quality control strength testing to assist industry and during the year the "Amsler" machine was used to calibrate a mechanical stress grader put into use by a Brisbane firm. A "Micro-Stress" mechanical stress grading machine purchased recently will be used in conjunction with the "Amsler" strength testing machine to develop mechanical stress grading programmes for local species and to examine more closely the suitability of visual grading rules for application to our timbers.

An experiment on methods of seasoning Brush Box in pre-cut framing sizes and in 2-inch and 1½-inch bark-to-bark flitches was carried out in conjunction with the mill studies reported previously. Resawing of the flitches after seasoning was successfully undertaken using a 24-inch, 40 teeth tungsten tipped saw supplied by the Timber Research and Development Advisory Council. Analysis of the data is not yet complete, but the advantages of this method over cutting to finished dimensions before seasoning are already evident.

Comparative tests of nailed joints in house frame construction have shown pneumatic to be superior to hand nailing particularly with seasoned hardwoods.

The milling of small logs from plantation involves problems in disposal of small sized material. A pilot test with ⅜-inch Hoop Pine nail-laminated up to 4 inches x 2 inches showed satisfactory strength and indicated that the process could have economic application.

With the purchase of a replacement 16-inch planer, thicknesser, it is possible to machine wood specimens accurately to fine tolerances. This will permit the determination of basic strength properties from small clear specimens of plantation species. For this work accuracy of specimen preparation is vital.

The prolonged wet weather stimulated interest of local timber processors in various aspects of kiln drying and advice and assistance was given in this field.

Determination of moisture content in samples submitted by industry and by housing authorities has continued and 2,326 samples were tested during the year.

The Department recently purchased a 4-foot veneer peeling lathe and extensions are currently being built at Rocklea to house this machine. The lathe will be used initially with pruned plantation stems for recovery studies and investigations of size of knotty core.

Wood Structure and Utilisation Section

(i) Wood Structure and Timber Physics

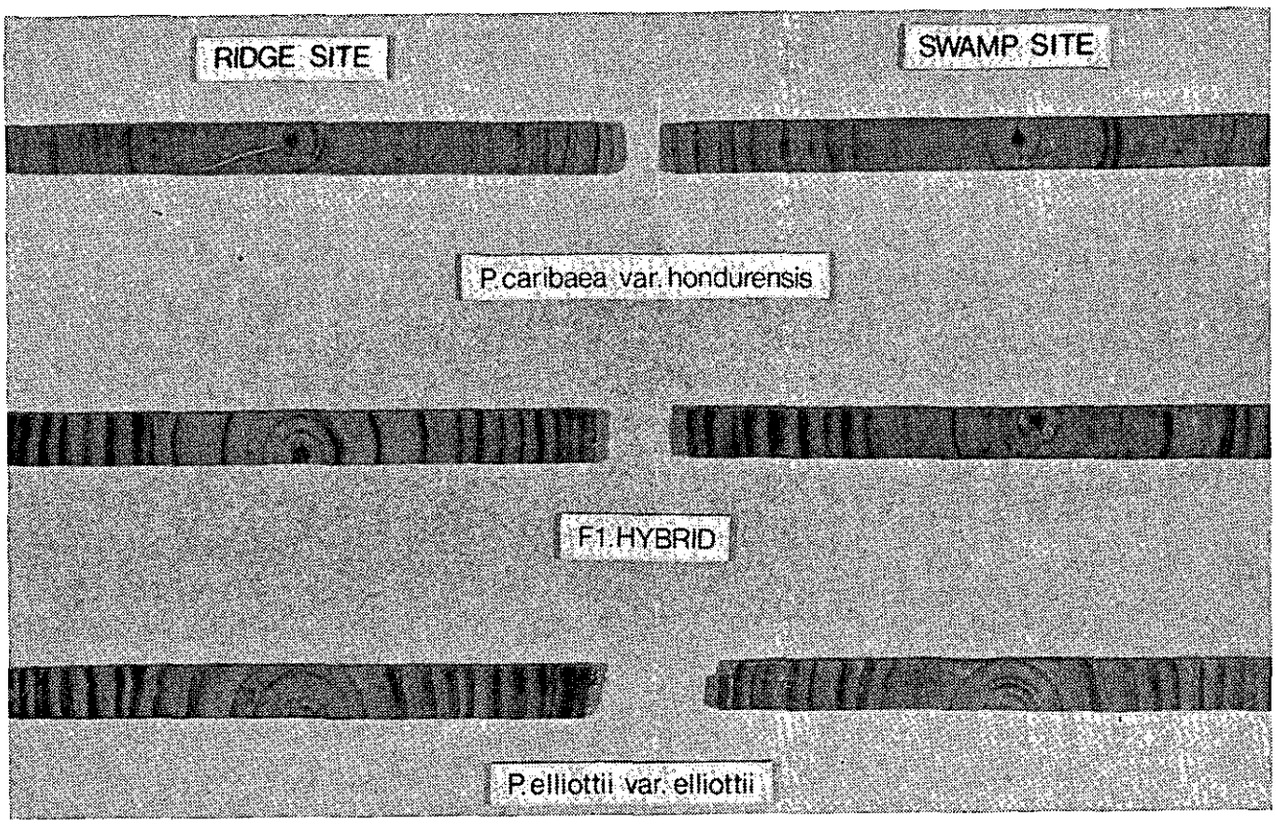
Timber Identification—The demands on this section for specialised service to industry and Government Departments was reflected in the record number of 7,725 wood, plywood and veneer samples identified during the year. This represents an increase of 27 per cent. on last year's figures.

(ii) Wood Quality Assessment and Improvement

(*a*) *Seed Orchard Tree Evaluation*—Wood quality screening of "plus" trees for the Taromeo Hoop Pine seed orchard and the Kennedy Caribbean Pine seed orchard has continued. Nineteen trees were evaluated during the year, of which 17 had acceptable wood characteristics. A total of 47 Caribbean Pine candidates has now been screened with 85 per cent. of them considered to have acceptable wood quality in addition to the primary selection criteria. It is encouraging that the average wood quality score for these has been found to be 20 per cent. higher than the minimum acceptance standard adopted, showing that wood quality standards can be maintained whilst productivity is increased.

(*b*) *Species Evaluation*—Additional work has been done on the wood properties of 35 years old Loblolly Pine in the continuing project on selection weighting factors. Supplementing data reported last year, at least in this small sample, Loblolly had greater tracheid length but poorer grain spirality and cell wall organisation (micellar angle) than Radiata and Patula Pines. Since Loblolly had an average basic density comparable with Slash Pine but lower percentage latewood, it seems possible that its slightly lower strength classification could be due to poorer grain spirality and cell wall organisation.

(*c*) *Species Hybrid and Varietal Trials*—Further work on the Slash x Honduras Caribbean Pine F1 hybrid indicated that the hybrid had better grain spirality than either parent, thus supplementing results reported last year.



Wood of the Slash x Caribbean Pine hybrid. Typical wood specimens of Honduras Caribbean and Slash Pines and the Slash x var. hondurensis F1 hybrid from two sites at Beerburrum at age 13 years. These show the hybrid to be intermediate in percentage latewood and textural uniformity between the parental species and the effect of site on these features in hybrid and parental stock.

A study of the wood properties of Bahamas and Honduras Caribbean Pines from a trial planting at Beerburrum showed that the Bahamas variety had lower basic density, similar percentage latewood and micellar angle, appreciably lower compression wood, higher grain spirality and somewhat shorter tracheid length than the Honduras variety but a high utilisation potential for both varieties was indicated. Wider comparisons with stock approaching merchantable age are planned. In the Beerburrum trial the Bahamas variety surpassed the Honduras in volume and dry weight of wood produced. It also displayed superior stem straightness.

(d) Ecological Influence on Wood Quality and Productivity—The effect of site index on wood properties and cellulose yields in 18-19 years old Honduras Caribbean and Slash Pine stock at three locations is being studied. Higher productivity on better sites seems to be associated with somewhat lower basic density and percentage latewood in both species but the dry wood weight/acre is nevertheless higher on the better sites because of the overriding influence of the higher volume production on these sites. For saw and plylog production, this somewhat more uniform wood of lower density could be more suitable for general purpose use, especially in Slash Pine.

(iii) UTILISATION

Extension services to industry made increased demands on this Section during the year, with 1,056 enquiries for advice on the properties and uses of local and imported timbers and minor forest products.

The sawn timber market in Queensland continues to be buoyant, and overall, demand exceeds local supply with production deficits mainly in constructional hardwoods, high grade non-coniferous plywood, joinery and cabinet wood timber. South-eastern Queensland draws largely on Northern New South Wales for supplies of sawn constructional and structural hardwoods and poles. This inter-State movement can be expected to continue, despite an anticipated increase in the extent to which Queensland-grown conifers will contribute to the demand in that area.

Queensland's imports from overseas, while not at a high level are nevertheless growing with an increase in net log and sawn timber imports from 25 million super. feet in 1967–68 to some 34 million in 1971–72. Within this volume, coniferous softwood imports (from New Zealand, the Americas, Europe, New Guinea and South-east Asia) being maintained at about 12 million super. feet annually, while, over the five year period, non-coniferous log imports for plywood production have increased by 50 per cent. (from New Guinea and the South-east Asian region) and non-coniferous sawn timber by over 100 per cent.

(a) General Building—The supply of pre-cut seasoned framing components for on-site fabrication appears to be a phase in the development of complete framing systems consisting of modular panels fabricated off-site to reduce costs in housing. Interest is already being shown by industry in the development of such systems and technical assistance is being provided.

Over 20 per cent. of the houses in South-east Queensland now employ concrete slab-on-ground construction, with a consequent decrease in the demand for timber flooring systems. Whilst there are some indications this trend may have slackened, there is scope for promoting the use of parquetry and strip flooring on concrete slabs.

The demand for deeper sub-floor framing sections continues to increase. This has accentuated the problems of shrinkage associated with the use of unseasoned hardwood. Such problems can however be minimised by slight modifications of constructional practices and every opportunity is being taken to appraise industry of these simple procedures.

These shrinkage problems and active promotion have nevertheless contributed to a buoyant market for lower shrinkage unseasoned pine framing and for completely stable seasoned material in rain-forest timbers, pine and, to some extent, hardwoods such as Brush Box. Complete framing systems in these materials have been or are being developed using the Australian Standard Light Timber Framing Code to advantage.

There has been a marked increase in interest in plantation grown Slash and Loblolly Pines for general construction and in their use as stress graded material in prefabricated roof trusses. Pine and rain-forest timbers now hold about 15 per cent. of the framing market, compared with only five per cent. three years ago.

The demand for Cypress Pine is still strong but there has been a sharp change in usage. The market for flooring and cladding has declined whilst there has been an upsurge in its popularity for framing where its property of low shrinkage is important.

The Light Timber Framing Code is being more widely applied and has been incorporated in some Local Authority by-laws as a minimum standard. Attempts are being made to secure uniformity in its adoption and to ensure that the Code adequately meets the requirements of Queensland conditions, a State Review Committee covering a wide range of interests was convened by this Department.

Trends in two-level housing created an increased demand for seasoned 1¼ inch and 2¼ inch stock in wide decorative timbers for beams and internal stairs. Some readjustments by industry were needed to meet this requirement and initial problems caused purchasers to look to imported timbers. Producers have now indicated a capacity to meet all demands for this end-use in local seasoned material.

(*b*) *Structural Engineering*—The high demand for engineering hardwoods continues as industrial development proceeds and that for railway sleepers has increased to meet the needs of new lines. Assistance was given to the Railway Department in their endeavour to maintain proper quality standards.

There is also a steady demand for hardwood poles for constructional and power line uses.

(*c*) *Panel Products*—During the year a second particle board factory was opened in Brisbane and its requirements of raw material is being largely met by exotic and indigenous softwoods from plantations in South-east Queensland.

Hardboard production has not expanded correspondingly and is meeting competition in the internal sheeting market from asbestos-cement and gypsum boards. There are, however, some prospects for extension of an export market in this commodity.

Plywood production has been sustained and stimulated by an increased demand for structural plywood, where local rain-forest species and indigenous conifers are being employed, but a high proportion of the output also contains veneers from imported logs. Face veneers for plywood and particle-board are under severe competition from imported veneers.

Appreciable quantities of Hoop Pine are now being used locally as match splints.

(*d*) *Pulpwood*—The demand for conifer pulpwood has increased to 8·2 million super. feet and although still a relatively small market, it is nevertheless a significant outlet now for plantation grown pine. About half of the pulpwood cut in these species is used in hardboard and particle-board production and the remainder in paper-board.

TECHNICAL AND FIELD STAFF TRAINING

(i) A further eight State Scholarships were awarded in 1972, six to new matriculants, one to a student who had completed the second year of the degree course in Forestry, and one to a student who needed one semester only (half an academic year) to complete degree requirements. 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 numbers of undergraduates holding State Forestry Scholarships as at 30th June, 1972, were:—First year, 6; second year, 2; third year, 6; fourth year. 5.

Two State Scholarship Holders graduated at the end of the 1971 academic year and took up duty as Foresters within the Department in January, 1972. Both graduated with first class honours, and both received additional awards. Mr. R. N. Byron was awarded the Timbind Utilisation Medal and Mr. R. W. Carter received the Commonwealth Forestry Bureau Book Prize. Two other students who completed the fourth year in 1970 were granted extensions of their scholarships to enable them to complete degree requirements.

(ii) Nineteen forest trainees completed three years practical field training in January. Eighteen of these have subsequently completed probationary periods as gangers or leading hands and been appointed field overseers. One has resigned.

A further 27 trainees selected from applicants with at least Junior Examination passes, commenced training in 1972. At the end of June the total number in training was 62.

(iii) The system of Adult Training introduced two years ago to supplement the Forest Trainee Scheme and provide an avenue of advancement for older employees with the necessary potential was continued in 1972. The initial group of six have now completed training and taken up positions as field overseers. The number in training as at 30th June was 13.

(iv) During the year five Technical Assistants were appointed to positions in the Forest Research, Forest Resources, and Forest Products Research Branches. One of these is undertaking the Training Course for Timber Technicians and the remainder will undertake the Training Course for Forest Technicians. Four of these appointees had previously completed the Forest Trainee Course.

(v) One Technical Assistant completed the Training Course for Timber Technicians during the year and has been appointed Timber Technician Division II, Forest Products Research Branch.

The Honourable V. B. Sullivan, M.L.A., Minister for Lands christens a newly constructed barbecue at the Bunyaville Forest Recreation Area.

STAFF

As at 30th June, 1972, there were 549 salaried officers on the staff comprising 246 in Head Office and 303 at District Centres. This represents an increase of 27 on the number of salaried staff as at 30th June, 1971. The number of wages staff employed was 1,807.

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

Mr. A. R. Maher (Senior Forest Ranger, 38 years).
Mr. C. W. Frost (Forest Ranger, Division I, 33 years).
Mr. M. L. Smith (Forest Ranger, Division II, 33 years).
Mr. W. Collins (Temporary Male Assistant, 11 years).

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

It is with regret that the death is recorded of Mr. H. W. Hausknecht, National Parks Ranger, Brisbane, on 23rd January, 1972. Mr. Hausknecht first joined the Department in March, 1942, but resigned for family reasons in 1945. He was re-employed in 1946 and was appointed to National Parks work as an Overseer in 1947. He became National Parks Ranger in Mackay in 1949 and in January 1960 was transferred to the position of National Parks Ranger in Brisbane. Though suffering from ill-health for some years before his death he was a consistently cheerful and helpful officer.

ACKNOWLEDGEMENTS

I desire to record my appreciation of the loyal and efficient service of all members of this 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, 1972

Species	Quantity Super. feet	Super. feet
Milling Timber—		
(*a*) *Native Forests*—		
Hoop and Bunya Pine—		
Ply	1,882,917	
Logs	8,070,072	
Tops	7,214,124	
		17,167,113
Kauri Pine	2,013,258	
White Cypress Pine	32,210,906	
Forest Hardwoods	63,944,859	
Scrub Hardwoods	17,214,728	
Cabinet Woods	17,555,300	
Miscellaneous Species	32,420,125	
Limb Logs, Head Logs, Stumps and Flitches	13,370	
		165,372,540
(*b*) *Plantation Thinnings*—		
Hoop Pine	29,676,710	
Bunya Pine	40,926	
Kauri Pine	450,984	
Slash Pine	6,182,801	
Loblolly Pine	2,167,274	
Patula Pine	1,819,111	
Radiata Pine	927,881	
Caribbean Pine	27,256	
Canary Island Pine	817	
Coast Cypress Pine	3,436	
Longleaf Pine	1,622	
Southern Silky Oak	87,629	
Shortleaf Pine	25,700	
Smoothleaf Pine	1,172	
Mexican Cypress Pine	2,285	
Benguet Pine	641	
Chir Pine	8,392	
Arizona Cypress Pine	1,762	
Bentham's Cypress Pine	2,285	
		41,426,486
Pulp Wood—		
Hoop Pine	6,011,076	
Slash Pine	2,950,731	
Loblolly Pine	580,553	
Shortleaf Pine	119,616	
Longleaf Pine	279,361	
Caribbean Pine	136,782	
		10,078,119
		234,044,264

Other Classes—		Expressed as Superficial feet (Hoppus) Log Measure
Sleepers Hewn	138 pieces	6,979
Sleepers Sawn—5 ft.	74,514 pieces	2,086,392
Sleepers Sawn—7 ft.	401,066 pieces	15,240,508
Sleeper Blocks (as Sleepers contained)	60,220 pieces	2,167,920
Transoms, Crossings, Headstocks, Longitudinals	400,724 superficial feet	400,724
Girders, Corbels, Piles, Sills, Kerb Logs	63,353 lineal feet	1,140,354
Girder Logs	80,020 superficial feet	80,020
Poles	92,457 lineal feet	647,199
House Blocks	1,166 lineal feet	6,996
Fencing Material—Round	131,969 lineal feet	329,922
Fencing Material—Split	103,359 pieces	930,231
Mining Timbers—Round	302,450 lineal feet	604,900
Mining Timbers—Sawn	— superficial feet	—
		23,642,145

Other Classes—*continued*	
Fuel	9,630 tons
Quarry Material—Sand, Gravel, Soil, &c.	950,861 cubic yards
Freestone	826 cubic feet
Fibre, Bark, Dry Leaves, Reeds	12 bags
Duboisia	1,025 pounds
Flora	1,595 pieces
Peat	394 bags
Mulga Wood	72 tons
Poling Timber (Copper Refining)	3,270 tons
Lawyer Cane	6 tons
Boat Knees	225 pieces
Bee Hives	14 hives
Black Wattle	167 stems
She-Oak Bark	— bushels
Caustia Gahnia	1,143 pounds
Trees and Plants (Number)	412,006 plants
Brush Material (Bush Fences)	605 tons
Boomerang Blanks	— pieces

APPENDIX B

Total Receipts, Department of Forestry, for the Year ended 30th June, 1972

Receipts from Districts	Totals $
Group 1—South Queensland (Brisbane, Beerburrum, *Beerwah*, Benarkin, Bundaberg, Fraser Island, Gallangowan, Gympie, Imbil, Jimna, Kalpowar, Maryborough, Monto, Murgon, Yarraman)	2,255,403.95
Group 2—North Queensland (Atherton, Cairns, Cooktown, Charters Towers, Herberton, Hughenden, Ingham, Innisfail, Port Douglas, Ravenshoe, Townsville)	1,363,037.35
Group 3—Dalby, Roma, Taroom, Charleville, Mitchell, Quilpie	362,436.83
Group 4—Warwick, Goondiwindi, Inglewood, St. George, Stanthorpe, *Cunnamulla*	221,304.55
Group 5—Mackay, Rockhampton, Clermont, Bowen, Proserpine, Emerald, Springsure, Theodore, Winton	167,372.41
Group 6—*Barcaldine*, Blackall, Jundah, Longreach, Muttaburra, Stonehenge, Aramac, Isisford, Jericho	207.73
Group 7—Cloncurry, Boulia, Kynuna, Mackinlay, Richmond	1,128.51
Group 8—*Burketown*, Coen, Croydon, Georgetown, Normanton, Thursday Island	325.50
	$4,371,216.83

Other Receipts	
Forestry and *Lumbering*	676,130 72
Sale of Plants, Materials, &c.	53,290 06
Licences† (see note after Appendix C)	20,531.45
Rents	31,286.37
Grazing dues	54,567.36
Miscellaneous (Salisbury Area Timber Account, Forfeit Wages, *Expenditure* Recoveries, &c.)	180,804 83
Sale of U.S. tractors, trucks, &c.	*136,555.00*
	$5,524,382.62

	$	
Plant Hire—		
Charged Loan Fund Projects	*1,359,107.37*	
Trust Fund Projects	151,011.90	1,510,119.27
		$7,034,501.89

The above receipts were disposed of as follows:—	
To Consolidated *Revenue Fund as repayment* of previous expenditure	1,603.31
To Loan Fund as repayment of previous expenditure and surplus plant hire	554,178.10
To Reforestation Fund as payment of previous expenditure	9,175.83
To Forestry and Lumbering Fund:—	
As *expenditure* on marketing of log timber, maintenance of access roads, capital improvements, plant, TRADAC &c.	3,533,862.86
As Interest and Redemption on Loans	2,855,681.79
	$7,034,501.89

APPENDIX C

Proceeds of Sales of Timber, &c., for the period *1st July, 1968, to* 30th June, 1972 (Financial Years)

Groups*	1968–69	1969–70	1970–71	1971–72
	$	$	$	$
Group 1	2,096,203.72	1,979,622.36	1,842,022.79	2,255,403.95
Group 2	1,240,764.03	1,180,982.07	1,282,363.10	1,363,037.35
Group 3	292,793.77	275,058.08	275,084.64	362,436.83
Group 4	201,687.92	165,452.07	161,452.07	221,304.55
Group 5	168,566.71	154,905.07	153.329.05	167,372.41
Group 6	689.36	244.77	214.17	207.73
Group 7	771.30	687.82	610.50	1,128.51
Group 8	138.40	264.70	38.50	325.50
	$4,001,615.21	$3,757,216.94	$3,715,273.36	$4,371,216.83
Timber Research and Development Advisory Council	Nil	35,721.49	103,483.19	113,692.91
	$4,001,615.21	$3,792,938.43	$3,818,756.55	$4,484,909.74
Receipts—Forestry and Lumbering	639,829.35	324,612.22	488,348.17	676,130.72
Sale of Plants, Material, &c.	37,501.34	101,965.71	44,970.94	53,290.06
Licences†	18,403.65	20,460.45	19,917.00	20,531.45
Rents and Grazing Dues	67,514.35	71,474.08	79,590.87	85,853.73
Miscellaneous (Salisbury Area Timber Account, Forfeit Wages, Expenditure Recoveries, &c.)	37,664.23	31,851.29	53,075.91	180,804.83
Sale of U.S. Tractors, Trucks, &c.	38,168.50	85,673.13	86,096.97	136,555.00
	$4,840,696.63	$4,428,975.31	$4.590,756.41	$5,524,382.62

* 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 1971–72 under Forestry and Lumbering Operations

Class of Timber	Quantity	Sales Value
		$
Crossings	189,257 super. feet	24,511.41
Headstocks and Braces	2,628 super. feet	424.53
Transoms	112,385 super. feet	16,012.92
Piles	17,700 super. feet	22,901.09
Girders—Dressed	8,451 super. feet	25,333.35
Sleepers	234,710 pieces	493,265.29
Sleepers—Tramway	2,746 pieces	2,685.56
Sleeper Blocks (as sleepers contained)	60,220 pieces	72,311.71
Round Fence Posts	4,654 lineal feet	2,312.28
Split Posts and Rails, &c.	2,550 pieces	743.04
Total		$660,501.18

APPENDIX E

Comparative Statement of Expenditure for Years 1970–71 and 1971–72

	1970–71	1971–72
	$	$
Revenue—		
Salaries	2,323,060	2,757,092
Cryptotermes brevis Investigation	4,647	1,476
Fares, Printing, Stores, &c.	10,968	13,165
Travelling Expenses and Incidentals	113,829	164,806
National Parks	75,208	167,365
Cash Equivalent of Long Service Leave	25,948	28,974
Loan—		
National Parks	198,949	248,681
Recreational Facilities State Forests	..	15,392
Trust—		
Reforestation Trust Fund—		
Reforestation	5,784,232	6,138,787
Land Acquisition	38,276	39,487
Purchase of Plant	636,584	613,984
Access Roads	353,225	430,213
Purchase of Radio Equipment	24,870	24,492
Purchase of Firefighting Equipment	29,976	66,868
Forestry and Lumbering Fund—		
Interest and Redemption on Loans	2,428,543	2,855,682
Hardwood Supplies to Railway Department and others	458,197	587,239
Harvesting and Marketing Timber	1,272,997	1,435,823
Access Roads—Maintenance and Subsidies	295,013	316,306
Maintenance of Plant	864,244	942,296
Maintenance of Capital Improvements	120,756	138,419
Expenses—Timber Research and Development Advisory Councils	67,964	130,406
Total $	15,127,486	17,116,953

APPENDIX F

Net Area of Plantation Established 1st April, 1971, to 31st March, 1972

Species	Brisbane	Gympie	Mackay	Maryborough	Monto	Murgon	North Queensland	Warwick	Yarraman	Totals
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1. Conifers										
A. Native Conifers—										
Hoop Pine	242·2	863·8	66·0	295·3	165·7	560·7	175·4	6·6	965·6	3,341·3
Kauri Pine	..	..	..	..	..	..	..	..	..	..
Bunya Pine	6·0	72·5	..	..	..	37·3	..	..	21·7	137·5
Other Native Conifers	..	..	..	..	..	..	..	..	..	..
Total—Native Conifers	248·2	936·3	66·0	295·3	165·7	598·0	175·4	6·6	987·3	3,478·8
B. Exotic Conifers—										
Slash Pine	1,908·6	4,150·8	..	4,048·0	..	..	..	..	70·6	10,178·0
Loblolly Pine	75·0	58·8	..	..	..	..	..	..	..	133·8
Patula Pine	..	..	..	..	..	..	..	2·2	60·4	62·6
Caribbean Pine	78·5	116·3	353·8	464·7	..	..	460·8	..	..	1,474·1
Radiata Pine	..	..	..	..	..	..	..	179·3	67·8	247·1
Long Leaf Pine	..	..	..	0·6	..	..	..	..	..	0·6
Other Exotic Conifers	..	..	..	0·6	..	..	2·0	3·9	15·1	21·6
Total—Exotic Conifers	2,062·1	4,325·9	353·8	4,513·9	..	..	462·8	185·4	213·9	12,117·8
Total—Conifers	2,310·3	5,262·2	419·8	4,809·2	165·7	598·0	638·2	192·0	1,201·2	15,596·6
2. Broadleaved Species										
A. Native Forest Hardwoods—										
Rose Gum	..	..	..	..	..	..	..	..	..	..
Grey Ironbark	..	..	..	..	..	..	..	..	..	..
Tallowwood	..	..	..	..	..	..	..	..	..	..
Blackbutt	..	..	..	..	..	..	..	..	..	..
Gympie Messmate	..	..	..	..	..	..	..	..	..	..
Others	..	..	..	..	..	..	..	..	..	..
Total—Native Forest Hardwoods	..	..	..	..	..	..	..	..	..	..
B. Other Broadleaved Species—										
Silky Oak	..	..	..	..	..	..	..	..	..	..
Queensland Maple	..	..	..	..	..	..	..	..	..	..
Red Cedar	..	..	..	..	..	..	..	..	..	..
Others	..	..	..	..	..	..	..	..	..	..
Total—Other Broadleaved Species	..	..	..	..	..	..	..	..	..	..
Total—Broadleaved Species	..	..	..	..	..	..	..	..	..	..
Miscellaneous Experimental	..	..	52·9	..	..	0·2	0·7	0·1	..	53·9
Total—All Species	2,310·3	5,262·2	472·7	4,809·2	165·7	598·2	638·9	192·1	1,201·2	15,650·5

APPENDIX G

Net Area of Effective Plantation Classified into Forestry Districts to 31st March, 1972

Species	Brisbane	Gympie	Mackay	Maryborough	Monto	Murgon	North Queensland	Warwick	Yarraman	Totals
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1. Conifers										
A. Native Conifers—										
Hoop Pine	2,089·2	23,169·3	262·2	2,303·0	5,511·4	15,351·6	1,979·3	16·7	28,314·8	78,997·5
Kauri Pine	5·3	194·1	2·5	69·7	3·6	4·8	292·4	0·8	7·6	580·8
Bunya Pine	7·4	619·8	..	0·8	1·2	144·5	3·0	..	129·3	906·0
Other Native Conifers	2·8	7·2	0·5	1·9	..	..	14·3	0·9	..	27·6
Total—Native Conifers	2,104·7	23,990·4	265·2	2,375·4	5,516·2	15,500·9	2,289·0	18·4	28,451·7	80,511·9
B. Exotic Conifers—										
Slash Pine	21,313·5	26,398·2	2,463·0	29,394·8	52·0	1·4	11·3	817·1	952·0	81,403·3
Loblolly Pine ..	3,878·7	300·4	7·3	55·2	2·7	9·4	14·0	239·6	66·1	4,573·4
Patula Pine	18·9	22·0	8·1	8·1	24·0	100·5	35·0	471·3	3,433·1	4,121·0
Caribbean Pine ..	494·9	499·2	7,610·2	2,349·3	1·4	0·7	2,087·0	..	6·8	13,049·5
Radiata Pine ..	0·5	..	..	..	..	12·0	..	3,759·5	1,111·3	4,883·3
Long Leaf Pine ..	251·8	3·1	7·3	1·6	..	..	..	8·5	2·8	275·1
Other Exotic Conifers	55·8	40·5	75·2	19·9	9·5	3·6	46·1	43·9	83·5	378·0
Total—Exotic Conifers	26,014·1	27,263·4	10,171·1	31,828·9	89·6	127·6	2,193·4	4,899·1	5,654·6	108,754·3
Total—Conifers ..	28,118·8	51,253·8	10,436·3	34,204·3	5,605·8	15,628·5	4,482·4	4,918·1	34,106·3	188,754·3
2. Broadleaved Species										
A. Native Forest Hardwoods—										
Rose Gum	277·3	1,212·6	0·1	0·2	..	21·8	1·7	..	187·4	1,701·1
Grey Ironbark ..	209·6	182·2	0·1	0·1	..	9·4	37·8	..	469·5	908·7
Tallowwood	123·5	18·9	..	0·7	..	0·5	28·8	..	5·0	177·4
Blackbutt	240·4	234·9	..	58·3	..	8·6	0·2	..	0·5	542·9
Gympie Messmate ..	..	258·5	..	..	..	..	..	..	..	258·5
Others	29·6	76·1	..	0·8	..	..	10·9	..	2·8	120·2
Total—Native Forest Hardwoods ..	880·4	1,983·2	0·2	60·1	..	40·3	79·4	..	665·2	3,708·8
B. Other Broadleaved Species—										
Silky Oak	..	94·3	..	0·4	..	25·0	26·5	..	544·3	690·5
Queensland Maple ..	..	71·5	..	..	0·6	..	248·5	..	..	320·6
Red Cedar	..	7·8	..	..	..	..	31·7	..	..	39·5
Others	0·1	77·3	0·3	0·4	0·2	..	34·6	..	1·1	114·0
Total—Other Broadleaved Species ..	0·1	250·9	0·3	0·8	0·8	25·0	341·3	..	545·4	1,164·6
Total—Broadleaved Species	880·5	2,234·1	0·5	60·9	0·8	65·3	420·7	..	1,210·6	4,873·4
Miscellaneous Experimental	91·9	32·6	147·4	0·9	..	0·2	22·4	23·5	94·6	413·5
Total—All Species ..	29,091·2	53,520·5	10,584·2	34,266·1	5,606·6	15,694·0	4,925·5	4,941·6	35,411·5	194,041·2

APPENDIX H

Areas of Natural Forest Treated

A.—EUCALYPTS

Sub-District	Treated 1971–72	First Treatment 1971–72	Total as at 30th June, 1972
	Acres	Acres	Acres
Brisbane	838	530	32,480
Beerburrum	1,216	184	20,781
Gympie	..	..	20,242
Imbil	..	..	404
Mackay/Emerald/ Rockhampton	..	..	48,848
Maryborough	4,705	752	109,798
Bundaberg	370	..	38,272
Fraser Island	958	..	24,880
Monto	599	540	26,026
Murgon/Jimna ..	643	..	45,166
Atherton	..	..	3,712
Ingham	..	..	2,985
Warwick	..	..	10,462
Inglewood	..	..	15,697
Yarraman	..	..	6,414
Benarkin	..	..	2,067
Dalby/Chinchilla ..	213	213	82,551
Total—Eucalypts	9,542	2,219	490,785

APPENDIX H—continued

B.—CYPRESS PINE

Sub-District	Treated 1971–72	First Treatment 1971–72	Total as at 30th June, 1972
	Acres	Acres	Acres
Bundaberg	..	..	2,152
Fraser Island	..	..	4,242
Monto	..	..	2,496
Inglewood	4,788	4,371	110,651
Dalby/Chinchilla/ Roma	14,215	9,111	256,338
Total—Cypress Pine	19,003	13,482	376,061

APPENDIX H—continued

C—RAIN-FOREST

Sub-District	Subsequent Treatment 1971–72	First Treatment 1971–72			First Treatment Completed 1971–72	Total at 30th June, 1972
		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	..	164	164	22·3	164	10,445
Ingham	..	..	..	..	..	1,364
Warwick	..	..	..	..	..	21
Total—Natural Rain-Forest	..	164	164	22·3	164	11,830
Total—Rain-Forest ..	..	164	164	22·3	164	21,868

APPENDIX H—continued

Grand Total—	Acres
Eucalypts	490,785
Cypress Pine	376,061
Rain Forest	21,868
	888,714

APPENDIX I

State Forests, Timber Reserves and National Parks listed by Forestry Districts and Sub-Districts as at *30th June, 1972*

District	Sub-District	State Forests		Timber Reserves		National Parks	
		No.	Area	No.	Area	No.	Area
			A. R. P.		A R. P.		A R. P.
Brisbane	Beerburrum ..	26	104,164 2 23·6	10	2,096 3 38	12	4,284 3 18
	Brisbane	32	170,357 1 36	14	19,198 0 4	33	94,123 2 16·1
	Total	58	274,522 0 19·6	24	21,295 0 2	45	98,408 1 34·1
Dalby	Chinchilla-Barakula	16	863,817 0 38	3	17,911 0 0	1	25,970 0 0
	Dalby	24	539,502 1 30	3	1,026 0 39	1	31,553 0 0
	Roma	23	431,250 1 9	4	103,602 0 0	1	4,350 0 0
	Total	63	1,834,569 3 37	10	122,539 0 39	3	61,873 0 0
Gympie	Gympie	31	290,420 0 10	2	1,436 0 8	4	2,132 0 0
	Imbil	11	145,712 3 0	2	148 2 3	1	640 0 0
	Total	42	436,132 3 10	4	1,584 2 11	5	2,772 0 0
Mackay	Emerald	4	142,306 0 35	10	264,241 2 10	5	1,396,175 0 0
	Mackay	10	170,459 0 20	19	100,491 2 19·1	91	316,027 1 38
	Rockhampton ..	44	896,609 3 38	13	107,408 1 2	16	13,194 0 0
	Total	58	1,209,375 1 13	42	472,141 1 31·1	112	1,725,396 1 38
Maryborough ..	Bundaberg	17	205,339 0 15	21	83,940 2 10	..	..
	Fraser Island ..	1	313,800 0 0	..	..	1	61,300 0 0
	Maryborough ..	37	372,753 1 21	15	28,476 0 37	6	13,933 0 0
	Total	55	891,892 1 36	36	112,416 3 7	7	75,233 0 0
Monto	Kalpowar	7	41,452 2 0	14	58,677 2 35	..	..
	Monto	35	563,620 0 35	20	61,925 1 8	6	4,932 0 0
	Total	42	605,072 2 35	34	120,603 0 3	6	4,932 0 0
Murgon	Gallangowan ..	3	38,250 0 0	..	..	..	..
	Jimna	12	114,752 0 34	..	..	..	..
	Murgon	13	129,716 2 38	9	27,074 1 3	..	..
	Total	28	282,718 3 32	9	27,074 1 3	..	..
North Queensland	Atherton	35	863,495 3 6	33	807,726 3 13	66	318,459 3 3
	Ingham	16	580,469 0 0	4	8,279 1 0	30	244,728 0 0
	Total	51	1,443,964 3 6	37	816,006 0 13	96	563,187 3 3
Warwick	Inglewood	34	458,309 1 37	2	182 0 8	..	..
	Warwick	14	81,076 3 37	4	5,958 3 28	6	15,819 3 0
	Total	48	539,386 1 34	6	6,140 3 36	6	15,819 3 0
Yarraman ..	Benarkin	4	70,852 0 0	3	4,442 2 26	..	..
	Yarraman	20	129,082 2 30	11	21,692 0 6	4	15,602 1 5
	Total	24	199,934 2 30	14	26,134 2 32	4	15,602 1 5
	Grand Total ..	469	7,717,570 1 12·6	216	1,725,936 0 17·1	284	2,563,224 3 0·1

At 30th June, 1972—

Total area set apart as—

	A.	R.	P.
State Forests	7,717,570	1	12·6
Timber Reserves	1,725,936	0	17·1
National Parks	2,563,224	3	0·1
Total Reservations	12,006,731	0	29·8

APPENDIX J

Reservations for the Year ended 30th June, 1972

1st July, 1971—30th June, 1972

STATE FORESTS

	No.	A	R.	P.
At 1st July, 1971	461	7,708,354	0	33·6
Declared	13	45,267	1	10
Declared and added to existing State Forests		21,798	0	3
Timber Reserves declared State Forests	1	4,161	0	0
Timber Reserves declared State Forests amalgamated with existing State Forests		1,125	0	5
Recomputation of boundary		1,083	0	29
Areas released		−64,218	1	28
	475			
Amalgamation of existing State Forests	−6			
Total as at 30th June, 1972	469	7,717,570	1	12·6

TIMBER RESERVES

	No.	A.	R.	P.
At 1st July, 1971	221	1,660,571	0	28·1
Declared	3	79,212	0	0
Declared and added to State Forests and National Parks	−3	−891	0	13
Declared and added to existing Timber Reserves		+324	0	32
Recomputation of Boundary		+0	0	15·8
Areas released		−1,923	1	25·8
Reserves revoked	−5	−11,356	1	20
Total as at 30th June, 1972	216	1,725,936	0	17·1

NATIONAL PARKS

	No.	A.	R.	P.
At 1st July, 1971	274	2,472,493	2	34·1
Declared	11	85,004	3	10
Declared and added to existing National Parks		5,959	1	36·8
Timber Reserves declared National Parks		1	0	8
Recomputation of boundary		−28	0	11·8
Areas released		−206	0	37·2
Amalgamation of existing National Parks	−1			
Error in Reservation List		+0	0	0·2
Total as at 30th June, 1972	284	2,563,224	3	0·1

APPENDIX K

Distribution of Personnel, 30th June, 1972

—	Head Office	District Centres	Total
Salaried Officers—			
Professional	46	67	113
Technical	61	21	82
Field	11	97	108
Clerical	121	117	238
Miscellaneous	7	1	8
Sub Totals	246	303	549
Wages Staff	41	1,766	1,807
Totals	287	2,069	2,356

APPENDIX L

Tree Species Mentioned in Annual Report

Botanical Names

A. NATIVE CONIFERS

Bunya Pine	*Aruacaria bidwillii*
Cypress Pine	*Callitris columellaris* syn, *glauca*
Hoop Pine	*Araucaria cunninghamii*
Kauri Pine	*Agathis robusta*
Northern Cypress Pine	*Callitris columellaris* syn. *intropica*
North Queensland Kauri	*Agathis palmerstonii*
Southern Kauri Pine	*Agathis robusta*
White Cypress Pine	*Callitris columellaris* syn. *glauca*

B. EXOTIC CONIFERS

Arizona Cypress Pine	*Cupressus arizonica*
Bahamas Caribbean Pine	*Pinus caribaea* var. *bahamensis*
Benguet Pine	*Pinus kesiya*
Bentham's Cypress Pine	*Cupressus benthamii*
Canary Island Pine	*Pinus canariensis*
Caribbean Pine	*Pinus caribaea* (3 varieties)
Chir Pine	*Pinus roxburghii*
Cuban Caribbean Pine	*Pinus caribaea* var. *caribaea*
Douglas Fir	*Psuedotsuga menziesii*
Honduras Caribbean Pine	*Pinus caribaea* var. *hondurensis*
Loblolly Pine	*Pinus taeda*
Longleaf Pine	*Pinus palustris*
Maritime Pine	*Pinus pinaster*
Mexican Cypress Pine	*Cupressus lusitanica*
Montezuma Pine	*Pinus montezumae*
Ocote Pine	*Pinus oocarpa*
Patula Pine	*Pinus patula*
Pond Pine	*Pinus serotina*
Pringle's Pine	*Pinus pringlei*
Radiata Pine	*Pinus radiata*
Sand Pine	*Pinus clavsa*
Shortleaf Pine	*Pinus echinata*
Slash Pine	*Pinus elliottii* var. *elliottii*
Smoothleaf Pine	*Pinus leiophylla*
South Florida Slash Pine	*Pinus elliottii* var. *densa*
Sugi	*Cryptomeria japonica*
Tenasserim Pine	*Pinus merkusii*

C. EUCALYPTS

Blackbutt	*Eucalyptus pilularis*
Crooked Gum	*Eucalyptus dealbata*
Flooded Gum	*Eucalyptus grandis*
Grey Gum	*Eucalyptus propinqua*
Gympie Messmate	*Eucalyptus cloeziana*
Moreton Bay Ash	*Eucalyptus tessellaris*
Narrow-leaved Ironbark	*Eucalyptus crebra*
New England Blackbutt	*Eucalyptus Andrewsii*
Poplar Gum	*Eucalyptus alba*
Red Bloodwood	*Eucalyptus intermedia*
Red Mahogany	*Eucalyptus resinifera*
Rose Gum	*Eucalyptus grandis*
Spotted Gum	*Eucalyptus maculata*
Sydney Blue Gum	*Eucalyptus Saligna*
Tallowwood	*Eucalyptus microcorys*
Tumbledown Gum	*Eucalyptus dealbata*
White Mahogany	*Eucalyptus acmenioides*
Yellow Jacket	*Eucalyptus bloxsomei*

D. OTHER BROADLEAVED TREE SPECIES

African Mahogany	*Khaya senegalensis*
American Mahogany	*Swietenia macrophylla*
Black Bean	*Castanospermum australe*
Brigalow	*Acacia harpophylla*
Brown Quandong	*Elaecarpus ruminatus*
Brown Salwood	*Acacia aulacocarpa*
Brush Box	*Tristania conferta*
Bull Oak	*Casuarina luehmannii*
Cairns Hickory	*Flindersia ifflaiana*
Coachwood	*Ceratopetalum apetalum*
Cocky Apple	*Planchonia careya*
Crows Ash	*Flindersia australis*
Gidgee	*Acacia cambagei*
Honduras Mahogany	*Swietenia macrophylla*
Maple Silkwood	*Flindersia pimenteliana*
Northern Silky Oak	*Cardwellia sublimis*
Queensland Maple	*Flindersia brayleyana*
Queensland Walnut	*Endiandra palmerstonii*
Red Almond	*Alphitonia excelsa*
Red Cedar	*Toona australis*
Red Silkwood	*Palaquium galactoxylum*
Rosewood	*Eremophila mitchellii*
Rose Mahogany	*Dysoxylum fraseranum*
Sandal Wood	*Santalum lanceolatum*
Silky Oak	*Grevillea robusta*
Silver Silkwood	*Flindersia acuminata*
Smoothbarked Apple	*Angophora costata*
Southern Silky Oak	*Grevillea robusta*
Swamp Mahogany	*Tristania suaveolens*
Turpentine	*Syncarpia glomulifera*
Wattle	*Acacia* spp.

E. WEEDS, GRASSES, PALMS, ETC.

Blady grass	*Imperata cylindrica*
Fan Palms	*Licuala* spp. and *Ptychosperma* spp.
Giant spear grass	*Heteropogon triticens*
Inkweed	*Phytolacca octandra*
Kangaroo grass	*Themeda australis*
Lawyer vine	*Calamus* spp.
Piccabean Palms	*Archontophoenix* spp.
Ragweed	*Erigeron canadensis*

By Authority: S. G. REID, Government Printer, Brisbane