

1969

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QUEENSLAND

# ANNUAL REPORT

OF THE

# DEPARTMENT OF FORESTRY

FOR THE

YEAR 1968-69

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PRESENTED TO PARLIAMENT BY COMMAND

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BRISBANE:  
BY AUTHORITY: S. G. REID, GOVERNMENT PRINTER.

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**HOOP PINE, PLUS STAND**—Compartment 1B Stony Logging Area, Amamoor—Planted 1929–30. Selected as a Plus Stand and thinned to 100 stems per acre in July, 1956, to promote Seed Production. Stand displays excellent stem straightness, high form factor, good internode length, and small horizontal branches.

# REPORT OF THE CONSERVATOR OF FORESTS

For the Year ended 30th June, 1969

## TO THE HONOURABLE THE MINISTER FOR LANDS

### INTRODUCTION

Last year's report stressed the difficulties faced by many licensed sawmills, particularly those operating hardwoods from native forests situated in the zone from Gympie to the New South Wales border. The limited and continually decreasing supply of logs available to these mills was pointed out. The position as regards the overall log supply has not improved during the year, and in fact there is no way in which this can be improved in the short term. Many mills have reached the stage where economic milling and marketing of product is difficult if not impossible. At various times during the last 15 years the Department has discussed this problem with the Industry, without arriving at any satisfactory solution. It is therefore gratifying that during the year and with the full agreement of the Industry a first and most important step was taken to meet the position.

Since it is not possible immediately to increase annual supplies of log timber on a sustained basis the Sawmills Licensing policy was changed to permit amalgamation of sawmills under well defined conditions designed to maintain stability in the Industry throughout the State. These conditions preserve the rights, privileges and licensed capacities of all mills and define zones within or between which mills may amalgamate, restricting the new mill site to at or near the site of one of the participating mills. This new procedure does give the Industry an opportunity to build up larger units designed to make best use of the available material both in the sawmills, and on the market. Already there is evidence that this is being done as a number of applications for amalgamation have been lodged and the Department has been notified of well advanced plans of groups of sawmillers in this regard.

It is inevitable that the implementation of action in this direction will accelerate the closing down of a number of country mills but in general this is necessary to the healthy survival of the timber industry in Queensland and to the preservation of the livelihood of those it sustains in the field, mill, factory and transport. Year by year mills have slowly passed out of production starved by the failure of log supplies. The new policy could halt this process and allow the best use to be made of remaining supplies in the larger more efficient units that can now be built up through amalgamation.

It is unfortunate that efforts to establish a body representative of all branches of the timber industry over the whole State have not yet been successful. The Department is keenly aware of the need that exists for such a body in the fields of market research, product promotion and trade training. The welfare of the whole industry in a world of change and intense competition could well depend on its formation. The Timber Advisory Council is meeting this need in New South Wales and action is in hand in other States to follow the lead of the senior State in this regard.

It is pleasing to report the resumption in May of regular meetings of the State Committee of the Australian Timber Industry Stabilisation Conference. This was after a break of more than two years. These meetings attended by representatives of the Timber Industry and of the Department are designed to permit free and frank discussion of matters of common interest. Approached in a spirit of co-operation they will result in a better appreciation of the problems of both the Industry and Forestry and help maintain good relationship based on mutual trust and respect. In the past these meetings have served a very useful function, and have contributed to the solution of many problems. It is confidently expected that they will prove at least as useful in the future.

Making full use of the financial aid provided under the Commonwealth Softwood Agreement Act the area of new plantations established was again a record. At 12,002 acres the area planted exceeded by 2,553 acres the area planted in 1967-68, itself a record. This expansion of softwood planting is happening in each of the six States and in the Commonwealth Territories. It stems from the deep concern of those best qualified to assess Australia's needs in forest products and their importance to the national economy. By the end of the 1969 winter the millionth acre of plantations will have been planted in Australia and just under 16 per cent. of this area is in Queensland. It is extremely important to maintain the planting programme at least at its present level and to retain as State Forest compact areas adequate for its support. By far the largest component of Australia's annual payment of \$200,000,000 for imports of timber and wood-products is in respect of pulp and paper. World trends show a steady increase in per capita consumption of these products especially in the more developed countries. This, in association with population increases, has caused spectacular rises in the level of total usage. Australia conforms to the general pattern and so the Department's efforts in plantation establishment are being concentrated as far as practicable on the development of an area in the south-east of the State which has the potential to provide softwood in the massive quantities essential for a modern pulp and paper plant using the Kraft process best adapted to Slash Pine. Vital to this project are the State Forests in the Tuan-Toolara region and at Beerwah-Beerburum. The area planted at these centres prior to the 1969 winter was 52,812 acres of which 6,517 acres were planted this year. These areas supply a sound nucleus on which to build but it is a matter of great economic importance to the State to increase and not decrease the current rate of planting to ensure that the advantage this nucleus confers is not lost to areas in other States with programmes of more recent origin.

One noteworthy and beneficial effect of the increased planting programme has been a marked reduction in costs. This is particularly so in the case of overhead charges which have been reduced by half at centres of major activity.

As with all other branches of primary industry, Forestry suffered severely from the effects of the disastrous drought which endured through most of the year. Rainfalls for important forest centres where records have been kept for up to 45 years were the lowest recorded. Three major effects of the drought were losses through fire and drought, reduced growth and a substantial increase in expenditure on fire protection. It is a tribute to the dedication and efficiency of the Department's fire fighting organisation that losses were held to the level experienced and that only 102 acres out of a total of 150,692 acres of plantations throughout the State was burnt over by wild fires.

Expenditure on fire fighting and patrol was \$265,978 which is more than \$150,000 above that of a normal year. A large part of this expenditure was directly related to the protection of private or public property for which the Department has only a good neighbour responsibility. This is as it should be since the Department has equipment for the work and has a core of men trained in fire-fighting. However this service to the community has to be paid for from loan funds which increase the Department's indebtedness and on which interest must be paid. At the same time the programme of productive work is reduced by the amount involved. Clearly a separate provision is required for an expenditure of this nature which is of direct benefit to the community.

Whilst increments in older plantations in South Queensland were only 20 per cent. of those of a normal year serious losses were, in general, confined to the summer planting of Hoop Pine though in restricted areas where conditions were most severe heavy losses of Hoop Pine and Patula Pine up to five years in age were experienced. Viewed in the light of total planted area the restricted incidence of these losses indicates how well the major plantation species are adapted to the conditions of soil and climate that obtain in the areas where they are planted.

Harvesting and Marketing of Crown timbers was at the same level as in the previous year. The quantity of Hardwoods logged dropped by about 4 million super. feet and this was compensated by an increased cut of plantation timbers which rose to a record 49,337,000 super. feet for the year. Of particular significance has been the increased rate of operation of Slash Pine in the Beerwah-Beerburum district. This species is well suited for use in framing of houses and will provide an excellent substitute for declining hardwood supplies for these and other building purposes. In this field the Department is co-operating with Industry in seasoning studies at high temperatures aimed at determining optimum schedules for production of stable members for supply to builders.

The demand for plantation Hoop Pine continues at a high level; new sales of Hoop Pine milling timber amounting to 1,200,000 super. feet per year were made from Jimna and Mary Valley plantations. In addition an agreement was completed for the sale of Hoop Pine pulp-wood from the plantations of the Mary Valley to a local firm which intends to establish a particle board factory.

The market for Cypress Pine remained buoyant throughout the year and requests for additional licensed sawmill capacity have been received from sawmillers throughout the Cypress belt. Most of these requests have been for the operation of private Cypress becoming available in increasing quantities as a result of freeholding activities. Freeholders have 10 years to pay for the merchantable timber involved in conversion and therefore it has been accepted that the licensed capacity should be sufficient to permit the operation of the available private timber in that time. This principle has required the granting of additional licensed capacity in many zones of supply and as a result most applications have received Ministerial approval either in part or in full.

The position regarding the valuation of timber standing on areas subject to freeholding action has shown further substantial improvement. During the year a total of 233

new applications were referred to the Department for valuation of merchantable timber as required under the Land Act. By the end of the year only 172 areas still required field assessment. This represents only seven per cent. of the total number of applications that have required timber valuations. In all 2,601 such applications covering nearly 21 million acres have been referred to this Department for valuation. Of these more than 83 per cent. have been finalised.

Excellent development has been made by the grafted stock in the seed orchard for Caribbean Pine (var. *hondurensis*) located at Kennedy in coastal North Queensland. Some grafts are more than 12 feet high 15 months from grafting. Of greater significance, however, is the fact that most clones have already produced male or female flowers including some from ortets in plantations which have failed to flower after up to 17 years in the field.

In June Queensland was host to a Conference of Ministers in charge of National Park Administration in each of the Australian States. The Conference was presided over by the Honourable V. B. Sullivan M.L.A., Minister for Lands, and attended by representatives of the Commonwealth and of all States except Tasmania. Both the Conference and the associated tours of National Parks were highly successful and presented opportunity for study and discussion of special features of merit in administration or practice that each State can with advantage adapt to its own needs and environment.

Amending legislation of the *Forestry Act Amendment Act 1968* will have an important influence on the management of National Parks in Queensland. By defining Primitive, Primitive and Recreation, Recreation, Scientific and Historic areas to be embraced in management plans for their specialised treatment the amendment requires the assembly of reliable information for each park on which classification can be soundly based.

Further progress was made in the reservation of National Parks representative of the Tropical Lowlands with the proclamation during the year of 6 reserves. At the same time action is being taken in an endeavour to preserve typical areas of Brigalow, Wallum and other important ecological associations not adequately covered by existing National Park reservations.

During the year 1968-69 the area of National Park Reservations increased by 84,179 acres to a total of 2,369,116 acres. Some 38,680 acres of the increase resulted from a change in designation of Scenic Areas which, under the Amendment to the Act, now become National Parks.

## MANAGEMENT

### General

The area of State Forests as at the end of the year was 7,260,794 acres a net increase of 288,277 acres.

### Expenditure

Expenditure under the Reforestation Vote was \$5,142,755 compared with \$4,580,967 in 1967-68. Expenditure from Trust Funds on projects associated with the Reforestation Vote was \$136,138.

Expenditure is itemised as follows:—

Item	Expenditure	Percentage of Total
Direct Expenditure of Projects—	\$	
Plantations .. .. .	1,310,051	24.7
Natural Regeneration .. .. .	192,761	3.7
Nursery Expenses .. .. .	177,551	3.4
Research .. .. .	145,966	2.8
Protection .. .. .	915,690	17.4
Surveys .. .. .	87,456	1.7
New Construction .. .. .	196,686	3.6
Seed Collection .. .. .	20,536	0.4
Maintenance of Capital Improvements .. .. .	131,250	2.5
Total direct expenditure .. .. .	\$3,177,947	60.2
Indirect Expenditure—		
Wet Time, Holidays and Leave .. .. .	475,833	9.0
Supervision, Tools, Cartage, &c. .. .. .	995,985	18.8
Camp Allowance .. .. .	269,337	5.1
Pay Roll Tax .. .. .	82,872	1.6
Workers' Compensation .. .. .	72,831	1.4
Administration .. .. .	156,040	3.0
Miscellaneous .. .. .	48,048	0.9
Total indirect expenditure .. .. .	\$2,100,946	39.8
Total expenditure .. .. .	\$5,278,893	100.0

### Employment

The number of men engaged on Reforestation work was 1,484 as at 1st July, 1968 and 1,175 at the end of June, 1969.

The average level of employment on this work was 1,343 compared with 1,398 in 1967-68.

Average expenditure per man per year was \$3,822 compared with \$3,368 in 1967-68.

### Timber Assessment

Assessment work on State Forests continued at a high level with 347 new plots being established mainly in North Queensland rain forest, coastal hardwood forests and also in young Hoop Pine plantations.

A total of 20,757 permanent plots have now been established on State Forests.

In addition 580 permanent plots were remeasured the majority of these being in Hoop Pine and exotic pine plantations.

Three large Pastoral Holdings and a number of grazing selections were stripped to determine their suitability for State Forest purposes, the area covered being nearly 240,000 acres. Most of these areas had already been inspected by aerial reconnaissance which enabled the ground assessment to be concentrated where the major stands of timber occurred.

### Valuation of Timber on Lands for Conversion of Tenure

The steady rate of progress in dealing with freeholding applications which was reported last year has been maintained.

At the end of last year there were 247 applications involving 2,644,000 acres which still awaited field work. During the year 233 new applications were received totalling 2,367,000 acres.

Despite this there are now only 172 applications (2,174,000 acres) awaiting field assessment. This represents only 7 per cent. of the total number of applications for which the Department has been required to make timber valuations.

The Department has also been asked to provide valuations for 53 selections in the Brigalow Development Area No. III totalling 1,331,000 acres and during the year inspected and valued timber on 50 of these selections covering 1,255,000 acres. These figures have not been included in the figures for freeholding applications in the table below.

In a number of areas the outstanding applications are scattered and frequent camp shifts, or longer travel will have to be undertaken. This will slow down the rate of assessment of the remaining applications.

## FREEHOLDING POSITION IN RELATION TO PREVIOUS YEARS

	As at 30th June, 1967		As at 30th June, 1968		As at 30th June, 1969	
	No.	Area	No.	Area	No.	Area
Total applications made .. .. .	2,115	15,664,000	2,371	18,425,000	2,601	20,775,000
Withdrawn before valuation .. .. .	34	216,000	27	188,000	24	171,000
Total requiring valuation .. .. .	2,081	15,448,000	2,344	18,237,000	2,577	20,604,000
Valuation complete and determined by Land Court .. .. .	810	3,565,000	1,063	5,363,000	1,464	9,183,000
Valuation complete and awaiting determination by Land Court .. .. .	681	6,052,000	676	6,316,000	684	6,349,000
Field assessment complete but not yet valued .. .. .	199	1,916,000	358	3,914,000	257	2,898,000
Awaiting field assessment .. .. .	391	3,915,000	247	2,644,000	172	2,174,000
Totals .. .. .	2,081	15,448,000	2,344	18,237,000	2,577	20,604,000

### Protection

**SEASONAL CHARACTERISTICS.** The fire season was the most severe and prolonged since 1957-58, especially in the south-eastern part of the State. West of the ranges, in Warwick and Dalby districts, conditions were less severe.

There was sufficient rain in early spring to provide a build-up of vegetation. Lack of follow-up rains, and dry and windy weather in late spring and early summer dried this growth and set the stage for high-intensity fires.

The table shows that October and November were very bad months, with October featuring more outbreaks than for the whole of the 1966-67 season.

Early December rains gave some respite; but a heavy fire load persisted well into February, when no useful follow-up rains fell in the normal wet season.

Mild autumn weather, and a reduction of burnable fuel by drought and earlier fires brought relief at the year's end.

**FIRE INCIDENCE.** There were 440 fires attended, against 212 for the 1967-68 year (itself an above-average year). Eighty-six fires were in excess of 1,000 acres each. These fires put severe strain on the fire-fighting staff and organisation of the Department and by far the most important cause of these fires is unauthorised burning off in contravention of the provisions of the Forestry Act and of the Rural Fires Act. Cost of suppression and of damage caused to property warrant the firmest action in those cases where individuals show deliberate disregard for the law and for the lives and property of others. Many of the Department's officers are also Fire Wardens but, whilst the goodwill and co-operation of neighbours are of the utmost value and importance, there are cases where leniency would be misplaced. This year eight successful prosecutions brought fines totalling \$270, eight demands were made for costs of fire-fighting and two of these have been met. Twenty-five letters of warning were issued.

Against this, the Department sent 15 letters of thanks to neighbours who helped combat fires in various ways.



ARAUCARIA LOGGING AREA, IMBIL—Management Road in Hoop Pine Plantation.

Number of Fires by month and size are set out in the table following:—

Month	Number of Fires	Size of Fires in acres (Private and other Crown Lands as well as Forest Reserves)				
		0-10	11-100	101-1,000	1,001-10,000	10,001+
July .. .. .	4	2	2	..	..	..
August .. .. .	6	2	2	2	..	..
September .. .. .	46	19	13	9	3	2
October .. .. .	140	31	31	42	32	4
November .. .. .	108	28	25	27	24	4
December .. .. .	44	17	5	14	7	1
January .. .. .	45	8	17	13	7	..
February .. .. .	28	17	2	7	2	..
March .. .. .	8	5	..	3	..	..
April .. .. .	8	3	1	4	..	..
May .. .. .	..	..	..	..	..	..
June .. .. .	3	2	1	..	..	..
Total .. .. .	440	134	99	121	75	11

It is a tribute of the vigilance of the Department's employees and to the quality of the protection system that only 18 fires or about 4 per cent. were in softwood plantations, for a 102-acre coverage. This is less than 1 per cent.

of the year's planting programme. The two largest (43.8 acres in Maryborough sub-district in the Tuan Creek Slash Pine complex and 30 acres in Gympie sub-district in the Toolara Slash Pine complex) resulted from lightning strikes

from the same storm, and burnt in relatively mild conditions with only moderate scorch in most places, and very few deaths. The most damaging plantation fire was in the Yarraman district when 4.8 acres of 17-year-old Hoop Pine was burnt after a spot fire from departmental burning operations entered the plantation. The fire crew standing by restricted the area burnt over and the timber was big enough to be salvaged. Net estimated loss by clear-falling at this age and having to replant, less salvage was \$2,250. Hoop Pine is very fire sensitive and almost always fire causes widespread death necessitating clear-falling and replanting.

Other serious fires are listed below by sub-districts. Loss in hardwood stands is not easy to assess for some years. However, the dry season following fires of high intensity has in many cases increased difficulty of recovery, and aggravated the degrade in fire-scarred logs. The fire research Forester has established plots in representative areas, and study of their future growth and recovery will indicate loss patterns. From observations by field foresters, it is safe to say that this year's losses of hardwood by death and damage due to fire will total tens of thousands of dollars.

## SERIOUS FIRES

Sub-District	Cost of	Area
	Suppression	Burnt Over
	\$	Acres
Brisbane .. .. .	5,177	14,280
	4,824	1,937
Beerburrum .. .. .	4,313	5,192
Gympie .. .. .	4,713	9,350
	7,443	4,250
Fraser Island .. .. .	1,103	72,900
	6,116	1,890
Murgon .. .. .	5,226	2,400
	1,775	4,473
Yarraman .. .. .	1,685	32,300
	878	30,000
National Parks—(Lamington) ..	1,538	1,880

As happened in 1967-68, Fraser Island had another extensive fire. In view of the increasing human activity on the Island this pattern may well persist. The most difficult and costly fires to control were in the steep and broken high-quality hardwood forests of Gympie, Brisbane and Murgon districts. Some of the fires posed severe threats to outer Brisbane suburbs at various times.

The following table gives more detail of the measure of the fire season in the various districts:—

District	No. of Fires	Area Burnt Over (acres)			
		Crown Timber Areas		Private	Total
		Inside Protection Systems	Partly Protected or Unprotected		
Atherton .. .. .	12	10,334	10,837	2,264	23,435
Brisbane .. .. .	103	27,331	19,076	24,954	71,361
Dalby .. .. .	28	6,767	304	1,570	8,641
Gympie .. .. .	71	30,567	21,225	11,962	63,754
Mackay .. .. .	21	25,242	148,620	4,219	178,081
Maryborough .. .. .	57	9,163	116,493	25,460	151,116
Monto .. .. .	7	10,487	15,797	4,150	30,434
Murgon .. .. .	74	11,412	4,489	10,365	26,266
Warwick .. .. .	12	215	9,550	1,082	10,847
Yarraman .. .. .	25	836	4,410	66,308	71,554
National Parks—All Districts ..	30	3,064	2,122	2,535	7,721
<b>Total</b> .. .. .	<b>440</b>	<b>135,418</b>	<b>352,923</b>	<b>154,869</b>	<b>643,210</b>

## Major known causes of fire outbreaks by percentage were:—

Unauthorised burning off .. ..	27.3%
Smoking materials .. .. .	10.7%
Government, Semi-Government Authorities and bush workers .. ..	8.4%
Escapes from permit fires .. ..	8.2%
Relights of old fires .. .. .	7.0%
Lightning .. .. .	5.9%
Camp and billy fire escapes .. ..	3.9%
Incendiarists .. .. .	2.3%
All other known causes .. .. .	9.0%
Unknown causes .. .. .	17.3%
<b>Total</b> .. .. .	<b>100.0%</b>

## Communications

The VHF network was expanded by purchase of a further 50 mobile transceivers, 30 of which went to Atherton and Mackay districts, the last districts to be equipped. The remainder strengthened existing networks in other districts. Seven new bases were also commissioned.

The Department now has 275 mobiles and 36 base stations in operation.

Eight ultra high frequency links were purchased to enable more efficient remote control of distant bases and more flexible choice of optimum base sites.

Three major items of test equipment were purchased chiefly to help comply with the P.M.G.'s requirements for frequency measurements.

Field users of radio during the fire season were constantly drawing a comparison between their heavy dependence on the radio network in this severe season and its virtual absence in the last bad year of 1957-58. All were high in their praise for the reliability and quality of the performance of the network.

## Detection

The highlight of the year was the opening by the Honourable J. Bjelke-Petersen, M.L.A., Premier and Minister for State Development, of the tallest tower in the State. A photo of it appears in this report. It overlooks 7,000 acres of valuable Hoop Pine plantations and thousands of acres of hardwood areas in the Murgon district. It is 135 feet to floor level and cost \$7,420 to build.

A further tower of the same design has been built south of Bundaberg in the Elliott River exotic pine area.

Its height is 112 feet to floor level and cost \$7,310.

Trouble in fabrication has delayed the building of the modified steel tankstand type fire towers in North Queensland. However one of 60 feet has been completed in the Tinaroo Dam area, and the other two are in course of erection.

Frequent use was made of aircraft to supplement the fixed detection system and to plan tactics for fighting active fires.

The problem of secondary towers—those needed only on bad days each year has been solved by use of steel tankstands up to 60 feet high, with fenced in platforms without cabins. Even with modifications to improve safety, these structures should cost less than \$10 per foot of height. On days of bad visibility they will help fill in critical gaps in the detection system.

Two such structures have been erected in Warwick district.

## Equipment

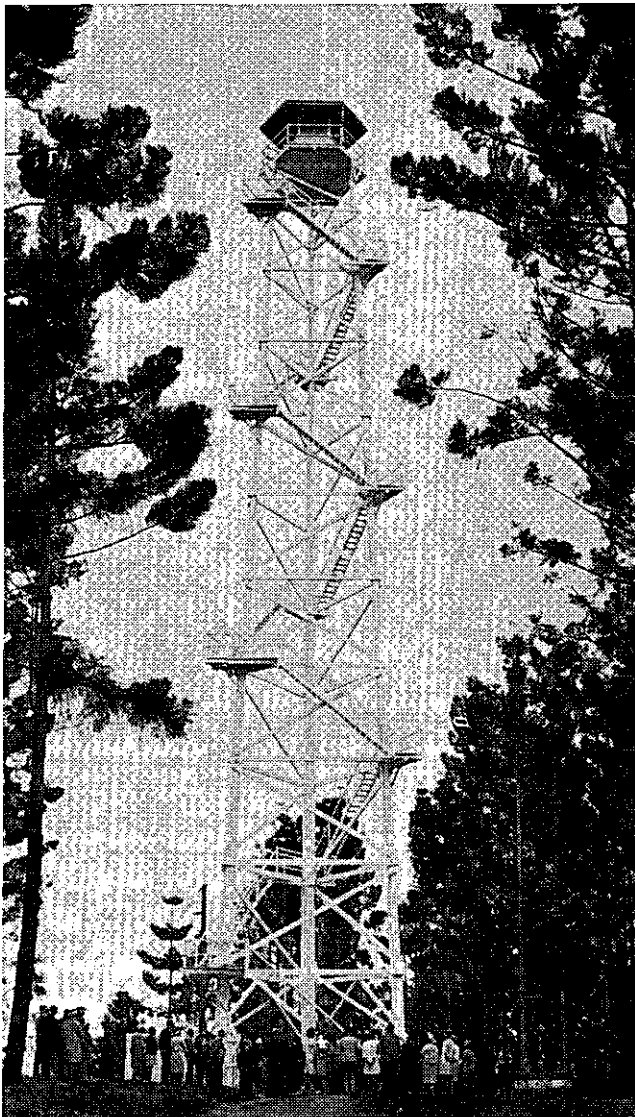
Contracts were let for the supply of 22 slip-on units of 275 and 425 gallons capacity. These constitute the most general defence unit for major fires.

There were no notable new items of equipment introduced.





**OFFICIAL OPENING OF GALLANGOWAN FIRE TOWER** by the Premier and Minister for State Development, The Honourable J. Bjelke-Petersen, M.L.A., in August, 1968. The Conservator of Forests (Mr. A. R. Trist) is addressing the gathering, the Premier is seated to his right.



#### **Fire Research**

The headquarters of the fire research Forester are well located for the assembly of data on fire behaviour in some of the most important economic forest types of Southern Queensland. Within the compact Gympie district are major natural forests and plantations of hardwoods, Slash Pine plantations at Toolara and Hoop Pine plantations in the Mary Valley. Valuable observations were made and information gathered on going wild fires in each of these management types during the protracted period over which fires were experienced.

A series of experimental fires in Slash Pine plantations was undertaken to assess the practicability of prescribed burning of this species.

Observations were also made on burning of felled rain forest prior to establishment of Hoop Pine plantations.

#### **General**

As would be expected, expenditure on fire fighting, patrol and detention was high at \$265,978 (compared with \$118,855 in 1967-68 year). Direct suppression costs were \$120,577 (\$26,034). Prescribed burning to reduce fuels prior to the bushfire season cost \$9,889 (\$8,691) and covered 84,983 acres (74,251 acres). Burning of logging debris cost \$3,216 (\$3,601). Co-operative burning with neighbours cost \$14,797 (\$11,962). New roads charged to protection, and new firebreaks cost \$320,647 (\$201,974), while maintenance of existing protection roads and firebreaks cost \$251,866 (\$216,464).

A

**FIRE TOWER, GALLANGOWAN STATE FOREST, MURGON DISTRICT.** The State's tallest fire tower—135 feet to floor level. Built in timber by Departmental labour and cost \$7,420.

### Industrial Safety

The yearly result was not encouraging and the table shows a rise which is becoming a trend.

Year	Frequency Rate (Accidents per 1,000,000 man hours worked)
1961-62	150.6
1962-63	150.1
1963-64	132.6
1964-65	120.5
1965-66	93.3
1966-67	101.6
1967-68	101.1
1968-69	119.9

This year's increase was largely due to an unexplainably high rate in the final quarter of 1968 which reached the alarming figure of 170.5, the highest quarterly rate for many years. It might be that this figure reflected the fatigue engendered by the prolonged fire season. It is well known that tired men are more liable to have accidents.

The year ended on an encouraging note with a record low quarterly rate of 59.5. It is significant that employment figures for the same quarter were well down indicating that the workforce tended to have fewer new employees, and these constitute an accident prone group.

Four district assistants were trained as safety officers and it is hoped that their specialist knowledge will soon effect a lowering of accident incidence.

During the year, one safety training course was held for 12 supervisors.

### MECHANICAL EQUIPMENT

#### General

The maintenance programme on the vehicle fleet is now planned on a time basis in lieu of the mileage control previously applied. This change has brought about a marked improvement in working time of vehicles and at the same time it has reduced accidents and breakdowns due to mechanical failures to negligible proportions.

Increased use is being made of A.D.P. programmes. Data on mechanical availability of vehicles processed by four week periods showed an average availability of 93.7 per cent. with a range from 96 per cent. to 80 per cent. This is a most satisfactory position. A.D.P. data is also used for six-monthly revision of plant hire charges for each type of machine using up-to-date figures for performance and costs.

Delays in finalising insurance claims and in securing plant parts are important causes of loss of working time with heavy equipment and vehicles. They also prevent most effective use of skilled staff.

During the year a two-week course was held on hydraulic equipment and power shift transmission in earth moving machinery and increased in-service training is planned to instruct staff on the advanced equipment now in use.

All districts were visited by the newly appointed chain saw instructor and operators were afforded training in use and maintenance of saws. These visits will be made on a regular basis because of the need caused by the turn-over of operators.

Construction of a workshop at Maryborough was started during the year and a larger workshop at Rockhampton was rented.

#### Receipts and Expenditure

Details are:—

	1967-68 \$	1968-69 \$	Difference \$
Loan—Purchase of Plant	494,504	499,108	+4,604
Trust—			
Maintenance of Plant ..	699,704	813,599	+113,895
Plant Hire Credits ..	907,166	1,240,655	+333,489
Excess of Plant Hire over Maintenance of Plant	207,462	427,056	+219,594
Sale of Plant .. ..	42,897	38,168	-4,729

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

- 8—52 D.B.H.P. tractor/dozers
- 3—115 B.H.P. graders
- 4—72 B.H.P. rubber tyred tractors
- 3—52 B.H.P. rubber tyred tractors 4 wheel drive
- 87—Replacement motor vehicles
- 12—Additional motor vehicles

Maintenance of Plant—Main items for the years 1967-68 and 1968-69 were:—

	1967-68 \$	1968-69 \$	Difference \$
Fuel .. ..	114,760	133,537	+18,777
Oils .. ..	16,781	23,133	+6,352
Tyres and Tubes ..	26,036	37,056	+11,020
Repairs .. ..	413,336	479,976	+66,640
Registration, Insurance .. ..	42,994	12,568	-30,426
Travelling expenses	12,252	7,732	-4,520

Census of Major Plant as at 30th June, 1969:—

Motor Vehicles and Trucks .. ..	436
Crawler Tractors—	
Up to 50 H.P. .. ..	28
50 to 100 H.P. .. ..	29
Over 100 H.P. .. ..	20
	77
Rubber Tyred Tractors .. ..	37
Power Graders—	
40 to 80 H.P. .. ..	6
80 to 100 H.P. .. ..	12
Over 100 H.P. .. ..	15
	33

### ACQUISITION OF LAND

During the year 1968-69, an amount of \$28,950.19 was expended on the acquisition of land for Forestry purposes as follows:—

	\$
Purchase of Land .. ..	13,694.34
Survey Fees .. ..	14,303.76
Real Property Fees and Lands Department Charges .. ..	277.80
Compensation for Improvements .. ..	24.25
Miscellaneous .. ..	650.04
	<u>\$28,950.19</u>

The expenditure of \$13,694.34 represents the purchase of five parcels of land with a total area of 839 acres 1 rood 0 perches which, except for 1 rood 24 perches at Beerburum purchased to gain control of a water supply adjacent to forestry land, will be added to existing State Forests and National Parks.

### FOREST SURVEYS

Thirty-two survey parties operated during the year and as at 30th June, 1969, 28 survey parties were engaged in Forestry survey activities.

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

Parties	Type of Surveys
3	Theodolite Control Surveys (to provide a framework for other type Forestry Surveys)
16	General plantation management surveys associated with reforestation programme or general native forest management surveys
6	Forestry Inventory and Assessment Surveys to provide basic management data
7	Timber Assessment Surveys in connection with applications for freeholding actions

Details of all surveys carried out by these parties are tabulated below:—

#### DETAILS OF SURVEYS IN MILES

Theodolite Controls	Forestry Traverses	Connections and Relocating Old Traverses	Level Surveys	Stripping and Assessment	Site Index
99	1,449	439	82	3,930	157

Total of surveys for period 6,156 miles.

### Personnel

**SURVEY.**—At the end of the year the total strength of survey parties consisted of 122 members. These members were comprised of following officers:—

Foresters	Forest Surveyor	Survey				
		Rangers	Over-seers	Leading Hands	Labourers	Cooks
7	1	11	27	8	58	10

**MAPPING.**—Drafting Branch comprises 31 officers, of whom 12 are engaged in cartographic compilations and revisions, two in reproductive duties of duplication and photocopying, two in theodolite control surveys and survey training and the remainder carry out administration mapping and drafting duties.

### AUTOMATIC DATA PROCESSING

The Computer system for Plant Accounting has now functioned satisfactorily for a full year to provide for management, up-to-date useful information not previously available.

Wherever practicable, existing computer systems have been transferred to the Treasury Department computer and necessary work for conversion and maintenance has been undertaken.

A report on the preliminary investigation into the present system of log timber accounts has been completed and the design of a proposed computer system has commenced.

A total of 400,000 cards were punched for all Branches during the year. The 45 per cent. increase was occasioned through the operation of the Plant Accounting system and greater volumes of input from other sections. An additional pair of machines was installed in November 1968. Present staff consists of four trained male officers and eight punch-verify operators. Courses for trainee programmers are conducted within the Department. Useful courses outside the Department are availed of, wherever possible.

### REFORESTATION

#### General

Drought conditions prevailed for most of the year in the principle forest areas of the State. As a result growth rates have been severely depressed and losses have been experienced particularly in this year's plantings. Rainfall records kept by the Department for more than 35 years show that in many centres 1968-69 is the worst year over that period. At Yarraman only 20.93 inches were recorded against an average of 31.07 inches and a previous record low of 21.48 inches in 1936-37. Tuan, representative of the main Slash Pine plantation area recorded 25.24 inches against an average of 52.11 inches and the previous low of 35.47 inches.

The following table shows rainfalls representative of the main plantation areas:—

RAINFALL IN POINTS

	Hoop Pine Areas			Exotic Pine Areas		
	Yarraman	Imbil	Kalpovar	Beerwah	Tuan	Bowenia
1968-69	2,093	2,861	1,746	4,447	2,524	5,188
Average	3,107	4,637	3,548	6,178	5,211	6,446

Figures for all centres are well below average whilst Kalpovar and Tuan recorded less than half their average rainfall.

Hoop Pine once again showed its ability to handle conditions of severe drought. Apart from establishment losses after the summer planting the only serious losses recorded were in young plantings up to four years old at Kalpovar, and the Goodnight Scrub in the area where conditions were most severe. In general, losses in first year areas were fewest in compartments planted early in the season.

With Slash Pine, the most important exotic planted in Queensland, no losses were recorded in other than the winter 1968 plantings. Survivals were generally satisfactory but localised losses up to 30 per cent. occurred and these were refilled. The behaviour of old plantations up to 40 years in age along the coastal plain in South East Queensland indicates that this species is well adapted to conditions of soil and climate that obtain in the area in which it is planted.

The other species important to the softwood planting programme of the State is Carribbean Pine which is planted in coastal areas north of Maryborough as tubed stock in the summer. In this area conditions were nearer to normal and survivals were good even in first year areas.

The most severe losses occurred with exotic pines in the Yarraman district at Pechey and on frosted sites within the Hoop Pine plantations. On these sites heavy losses were experienced in both young and old stands and salvage logging of Patula Pine and Radiata Pine was necessary. These are difficult sites and these species are planted to provide a shelter under which Hoop Pine can be established whilst at the same time yielding valuable logs. At Pechey severe losses occurred in young plantations of Patula Pine up to four years in age. Here the deep red soils have poor moisture holding capacity and experience in this and earlier droughts shows that conditions are marginal for the species. Radiata Pine has shown up better than Patula Pine and will be used to greater extent in future plantings using stock raised from seed from Diplodia resistant trees.

### Field Operations

The following table shows the areas covered in the main silvicultural operations for the year and also in 1967-68:—

Operation	1967-68	1968-69
Area of plantations established .. ..	Acres 9,449	Acres 12,002
Area of plantations covered in pruning ..	14,126	14,698
Area of plantations tended .. ..	72,866	80,975
Area of plantations thinned merchantably	7,987	9,765
Area of plantations thinned unmerchantably	1,309	1,403
Area of natural forest treated .. ..	25,821	28,769

In all of these operations there has been a substantial increase in the area covered and this has been achieved without any increase in the labour force. Increased use of machines and greater efficiency as a result of expanded operations have allowed this to be done.

### Planting

The area of new plantations established was 12,002 acres and 2,553 acres above the record area planted in 1967-68. In addition 313 acres of plantation was replanted after clear falling and 143 acres were underplanted with Hoop Pine in frost areas in the Yarraman and Murgon districts following thinning of the exotic cover crop. The replanted areas were mainly in the Mary Valley where Kauri Pine plantations have been salvage logged as a result of the depredations of the Kauri Pine coccid (*Conifericoccus agathidis*) and planted with Hoop Pine.

To build up quickly softwood supplies in South East Queensland adequate for a pulp and paper industry, most of the increased planting has been concentrated in the Slash Pine areas at Tuan, Toolara and Beerburum. The following table shows the 1968-69 planting at these centres and the total areas planted.

Centre	Acres Planted 1968-69	Total Area Planted to 31-3-69
Beerburum .. ..	Acres 1,690.0	Acres 21,089
Toolara .. ..	2,521.4	14,875
Tuan .. ..	2,305.3	16,848
Totals .. ..	6,516.7	52,812

Further increased plantings are programmed for this region in winter 1969 and good May rains have allowed much of this to be completed before the end of June.

Areas of plantation established are shown by Districts and species in appendices F and G and from them the following figures are derived.

Species	Acres Planted 1968-69	Total Area Planted to 31-3-69
Native Conifers (chiefly Hoop Pine) ..	Acres 3,293.1	Acres 68,603.9
Exotic Conifers (chiefly Slash, Caribbean, Radiata and Patula Pine) .. ..	8,642.8	76,624.2
Eucalypts .. ..	58.0	3,766.4
Other Broadleaved species .. ..	4.0	1,243.5
Miscellaneous Experimental .. ..	3.9	230.7
Total .. ..	12,001.8	150,468.7



**THINNING CYPRESS PINE, BARAKULA.** During the year 16,719 acres of Cypress Pine Forest were afforded silvicultural treatment. This stand is spaced at an average 20 feet x 20 feet.

Advantage was taken of the long dry period to clear a record area for planting. As far as possible, consistent with working compact blocks, clearing operations were concentrated on the preparation of poorly drained types on which in normal years machines can work for a restricted period only. This preparation involves mounding and in some cases additional drainage. Effective use was made of a Hymac 80 drainer to construct drainage channels which permitted machines to operate within a few weeks of treatment.

Except in the case of steep and rocky sections within the Hoop Pine areas practically all forest clearing is by machines and by contract. However of necessity the Department handles extensive poorly drained areas with its own dozers and to provide full time use of these machines, other forest areas are also prepared by the Department.

#### Pruning

Acres of plantations pruned in 1968-69 compared to 1967-68 were:—

Year	Stage of Pruning				Total
	1st	2nd	3rd	4th	
1967-68 ..	Acres 3,783	Acres 2,309	Acres 5,414	Acres 2,608	Acres 14,114
1968-69 ..	3,659	3,829	3,829	3,381	14,698

These figures show a slight increase in areas pruned as necessary to keep the pruning programme up to date.

#### Tending

The total area of plantations tended during the year compared to previous years was:—

Year	1966-67	1967-68	1968-69
Area covered in tending ..	Acres 58,300	Acres 72,866	Acres 80,975

The increase disclosed in area tended reflects the rapid lift in annual plantings and the improved rate of operation of plantation thinnings, particularly Hoop Pine. Tending is necessary in all young plantations whilst in older Hoop Pine plantations an influx of lantana follows merchantable thinning and necessitates tending within twelve months.



**PRE-PLANT SPRAYING IN HOOP PINE PLANTATIONS, YARRAMAN.** Use of Hormones with Misting Unit has greatly reduced first year tending costs in Hoop Pine Plantations and given excellent control of weeds

Cost of tending has been held over the past five years or so by increased use of hormones in new techniques. With Hoop Pine it is now general practice to have a pre-plant mister application of hormone weedicides followed by one or more post plant coverage or by knapsack spot spraying as necessary. The hormones used are varied to meet the needs of different weed crops but the standard application consists of 2 pints 2,4-D and 1½ pints 2,4,5-T amine per acre in water with the addition of wetting agent. Weed control has been excellent and these techniques have halved the cost per acre of first year tending in Hoop Pine areas. With the exotics good control of Eucalypt and wattle regrowth is achieved by the application of 1½ lb. (acid equivalent) 2,4,5-T ester per acre in water with wetting agent. One or two pre-plant applications by mister or knapsack is usual. In older stands that did not have this type of treatment coppice from bush tendings presents a persistent problem which is handled by foliar spray of fresh regrowth after brushing or, in the case of advanced regrowth by injection with 5 per cent. 2,4,5-T amine. The use of aircraft for pre-plant spraying with 1½ lb. (a.e.) 2,4,5-T ester in 2½ gallons dieselene per acre was subject of a large scale trial during the year. This method could effect a reduction in cost of application and enable large areas to be treated at the most favourable time.

### Thinning

There was a substantial increase in the area of plantations covered in merchantable thinning and this is directly related to the record volume of softwood thinnings cut during the year.

### Fertilising

The application of fertiliser, consisting of 2½ cwt. rock phosphate per acre, to Slash Pine areas was brought up to date during the year. A further aerial application trial was carried out during the year using Christmas Island rock phosphate, to check on uniformity of application, but results were not satisfactory, due, it is thought, to the floury nature of the fertiliser used. Much of the fertiliser is lost as dust into the air. Granulation of the fertiliser should overcome the problem. Due to the excellent results obtained in experiments from an initial application of 5 oz. superphosphate and 1 oz. urea per tree on newly mounded areas, it is proposed to adopt this as routine in Slash Pine plantations.

### Treatment of Natural Forests

The acreage of natural forest treated in 1968-69 are shown in the following table together with that for 1967-68:—

Forest Type	1967-68	1968-69
	Acres	Acres
Eucalypt Forest .. .. .	11,149	10,337
Cypress Pine Forest .. .. .	13,932	16,719
Tropical Rain Forest .. .. .	740	1,713
Natural Hoop Pine .. .. .	Nil	Nil
Total	25,821	28,769

The 1968-69 area shows an increase of 2,948 acres over that for 1967-68 and this is largely due to an increase in the area of Cypress Pine forest treated.

Had it not been necessary to curtail expenditure on this work to provide for the extra expenditure entailed in fire fighting and patrol the area treated would have been much greater.

Increasingly the selection of stems for retention is done by trained Overseers using a paint gun. Hormones are used in the removal of unwanted stems in hardwood and Cypress Pine forests. 2,4,5-T amine is in general use whilst Tordon is used with species difficult to kill with 2,4,5-T. Injectors are used in the hardwood forests and on Eucalypt, Angophora and *Tristania* species in the Cypress area. Bull Oak, Wattle and unwanted Cypress are treated by knapsack application to cut stumps.

The increase in acreage of rain forest treated reflects the reduced amount of work to be done under the new trial rules which involve the destruction of unwanted trees over 20 inches g.b.h. only.

### Nurseries

In its planting programme, the Department uses stock produced by 13 Hoop Pine nurseries and 9 exotic pine nurseries. One of the Hoop Pine nurseries is maintained by the Palen Creek Prison Farm. As stated last year, a new nursery was constructed at Beerburum to produce open root Slash and Loblolly Pine. This involved the closure

of the old nurseries at Beerwah and Beerburum. The first stock produced in the new Beerburum nursery was of excellent planting quality and early survival in the field has been good and with normal climatic conditions no refilling should be needed. The production of stock from the single nursery resulted in a large saving in costs.

Expansion of the exotic pine nurseries at Tuan and Toolara and of the Hoop Pine nursery at Little Yabba is in progress. The exotic pine planting programmes at Tuan and Toolara have been expanded considerably. The nurseries will be trebled in size to allow for increased sowing and to permit fallowing for two years out of three.

The Little Yabba nursery lends itself to expansion. It is well located to provide Hoop Pine planting stock for both the Gympie and the Brisbane districts.

The nurseries produced about 7,000,000 plants for the field. Of these about 3,000,000 plants were tubed.

Most nurseries were free of serious disease. At the Jimna nursery however there were outbreaks of *Rhizoctonia* root rot and *Sclerotium* fungi. Trouble diagnosed as nutritional greatly reduced the production of the Toolara Slash Pine nursery. Soil and foliar analyses are being carried out on soils and planting stock to check on the nutrient status of the nursery.

During the year two officers of the Department visited South Australia, Victoria and New South Wales to study nursery and plantation practices. Particular attention was paid to mechanisation in exotic pine nurseries and consideration is being given to its introduction to the main Slash Pine nurseries in Queensland.

The Department maintains two amenity nurseries for the production of stock to meet demands for trees for ornamental, shade, shelter and windbreak purposes. Due to the limited area available at the Rocklea nursery and increasing public demand, it is proposed to establish a new amenity nursery in 1970 at S.F. 69 Bunya well located to serve the northern suburbs.

### Seed Collection

During the year the following collections of seed were made of the major plantation species:—

	Lb.
Hoop Pine .. .. .	23,368
Bunya Pine .. .. .	6,543
Slash Pine .. .. .	2,403
Caribbean Pine .. .. .	37
Radiata Pine .. .. .	54

The Hoop Pine seed crop was not general and of the 23,368 lb. dry weight of seed collected, 20,404 lb. was collected in the Yarraman district with 15,000 lb. of this from plantations. The viability of plantation seed was generally very satisfactory averaging about 50 per cent. compared to 45 per cent. for seed from natural stands. Careful attention was paid to sampling of potential areas prior to collection to assess seed fertility and to time of collection in relation to degree of seed ripeness. Collections made even a few days too early can have substantially depressed viability.

Collection of Slash Pine seed included 2,082 lb. collected from the seed orchards whilst the remainder was collected from good phenotypes selected throughout the plantations. The amount of orchard seed collected is considerably more than required for the Department's Slash Pine programme. Orders have been received for Slash Pine orchard seed from other Australian States, New Zealand, African countries, and Fiji.

Total sales of all seed in 1968-69 amounted to \$11,877.47.

As predicted the Caribbean Pine seed crop was poor and only a small collection was made. However a determined effort was made to collect as much seed as possible from well formed vigorous trees. This seed should be far superior to imported seed and costs less per pound. With this species also, requests have been received from Overseas for the purchase of seed. These can be expected to increase when improved seed is available in quantity from "plus" stands and from the Kennedy seed orchard.

Adequate stocks of seed of Slash Pine, Caribbean Pine and Hoop Pine are held to meet future requirements. In the case of Hoop Pine, the stored seed is largely from the Yarraman, Monto and Maryborough provenances. Efforts will be made to obtain seed from the Jimna-Gallangowan and Imbil provenances as soon as a crop is available. Building up supplies from Jimna-Gallangowan is important as provenance trials show that stock from this source is superior in vigour to that of other provenances.

### Sale of Trees

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

Forest Plots .. .. .	128,366
Schools and Government Departments	8,524
Other private plantings .. .. .	147,692
<b>Total .. .. .</b>	<b>284,582</b>

#### Forest Plots sales involved:—

Slash Pine .. .. .	42,136
Caribbean Pine .. .. .	40,270
Hoop Pine .. .. .	16,375
Miscellaneous .. .. .	29,585
<b>Total .. .. .</b>	<b>128,366</b>

Plants for approved Forest Plots are supplied at concession rates of \$2.50 per 100 for open root and \$5.00 per 100 for tubed stock. Pot plantings would cover about 250 acres and are down on the previous year. However A.P.M. and a South Coast Company raise their own plants and the total area of private plantings would not be very different from last year's.

### Amenity Nursery

The two amenity nurseries at Rocklea and Dalby supplied the following plants for windbreak, shade or ornamental plantings.

Nursery				Plants Sold	Value
Rocklea	..	..	..	75,742	\$ 11,281.18
Dalby	..	..	..	14,213	2,296.85

In addition, 14,500 plants were sold ex Rocklea nursery to beach mining firms for reclamation purposes and returned \$1,428.00.

The demand for plants from these amenity nurseries continues to increase and this is shown by numbers of plants sold and by the monetary return which both exceed the 1967-68 figures.

### Christmas Trees

6,328 Christmas trees were sold for a return of \$3,313, approximately the same as in 1967-68.

### Diseases and Pests

Concern is being felt about a disorder occurring in young Hoop Pine plantations in the Yarraman area which causes severe malformation of the stem and branches and dieback of the leader and branches. Investigations and experimental work are being carried out and the strongest indication is that the trouble may be nutritional and due to some minor element deficiency. The disease is most severe in 3 year old areas.

#### (a) INSECTS, BIRDS AND ANIMALS—

Native rats (*Rattus culmorum*, *Rattus lutreolus* and *Rattus assimilis*) continue to be the most serious pests of Hoop Pine plantations. However, although losses were again heavy as a result of rat activity in the winter and spring of 1968, the level of activity was lower than in 1967. It was however widespread with severe damage reported only from a few widely dispersed centres. Present indications are that damage during the current season should be further reduced.

It is considered that this improvement is in part due to early detection of rat activity and the application of more effective control measures developed as a result of investigations over the past three years.

A graduate Zoologist, appointed recently, has commenced a study of the biological and ecological aspects of the problem. These studies are directed towards better control of the pest through an understanding of the factors that influence serious outbreaks of activity such as have been experienced periodically since 1951.

The provision of facilities in the new Biology Laboratory, has permitted investigations to be intensified on a number of major insect pests. Studies are proceeding on the control of white grubs (*Scarabaeoidea*), a pest which causes serious losses of seedlings in Hoop Pine nurseries, and on insects affecting seed production in Hoop Pine. In addition, studies were commenced on *Coptopterus decoratus* (Cerambycidae), the Hoop Pine branch pruner, and of related pest species, following discovery of heavily infested areas.

Investigations during the year indicated that it will be possible by the use of acaricides to reduce or even eliminate the intense irritation caused by the hay itch mite (*Pediculoides ventricosus*) to workers handling Hoop Pine seed. Further testing will be necessary to confirm results before the method is recommended for adoption.

Exotic softwoods continue to remain free of serious insect pests. Even the bagworm (*Hyalartia huebneri*), a pest of Radiata Pine, has been quiescent for some seasons now. However from enquiries received an upsurge in pests of ornamentals has become apparent. This is believed to be related to drought during the past two springs and the serious effects of most pests reported to be damaging ornamentals are probably attributable to poor tree vigour.

#### (b) FUNGI—

The Biology Laboratory, occupied for the past twelve months, has provided greatly improved facilities for Pathology studies. The proposed provision of a glasshouse and additional technical staff will increase the scope and quantity of work that can be carried out.

As discussed elsewhere, the widespread drought resulted in deaths in many of the younger plantations. There was no evidence that *Phytophthora cinnamomi* root rot was associated with any *Pinus* spp. deaths, no doubt because rainfall in the past two or three years was not conducive to the build up of *P. cinnamomi*. *Macrophomina phaseoli*, the cause of root rot diseases of a number of conifer species was present in the roots of Hoop and Loblolly Pines that died during the drought. This fungus has been reported from interstate and overseas to kill drought weakened Pines. Heavy localised losses of Hoop Pine, with *M. phaseoli* in the roots, were recorded from several centres in 1, 2 and 3 year plantation areas.

In the Yarraman district hail, presumably followed by *Diplodia pinea*, caused heavy losses in small blocks of Radiata Pine and to a lesser extent Patula Pine. Hoop Pine, also severely damaged by the same hail storm, suffered no serious effect.

*M. phaseoli*, as well as being associated with drought losses, was recorded for the first time from a conifer nursery in Queensland. *Fusarium* and *Pythium* spp. were also isolated but the role of these fungi in the disease which resulted in severe chlorosis and heavy loss of Patula Pine is not yet known.

*Rhizoctonia* root rot has continued to cause losses in the Jimna nursery. Some deaths occurred in summer in 14 to 17 month old Hoop Pine seedlings, and in late summer in 7 month old seedlings. P.C.N.B. applications to some extent controlled the disease but further work is to be carried out on this aspect. A minor outbreak of collar rot (*Sclerotium rolfsii*) at the same nursery was controlled with P.C.N.B.

For some time root and butt rots of plantation Hoop Pine due to wood rotting fungi, particularly *Fomes noxius*, have caused losses in restricted areas in North Queensland. In the past few years there have been reports of root and butt rots from the major South Queensland Hoop Pine plantations but these have mostly been isolated patches with few deaths. During the year it was found that root and butt rot was present in scattered areas in 4-to 8-year Hoop Pine plantations in the Imbil sub-district. In an assessment in one of these areas, in 6- and 7-year plantations, deaths totalled 1 per cent. of the stand. Sixty per cent. of the losses recorded were apparently due to a fungus, possibly *F. noxius*, which produced a sterile stocking of fungal tissue on the butt of the dead trees. Another fungus, *Chaetoporus radulus*, was found associated with some of the deaths in this area and also with one dead 30-year-old tree elsewhere in the sub-district.

Work proposed on this problem includes extension of the survey to define distribution, severity and annual increase of the disease, attempts to investigate whether scrub-wood stumps left in the clearing of these areas for plantation establishment are infection centres, inoculation studies to determine which fungi are responsible for the disease and identification of fungal cultures obtained from diseased trees. An investigation of the effect of *F. noxius* on Caribbean Pine was commenced with a planting of this pine in a School Forest Plot in North Queensland where serious *F. noxius* attack resulted in clear felling of the original Hoop Pine Stand.

*Fomes annosus*, the cause of a serious root and butt rot of conifers in the Northern Hemisphere, has been recorded in a small isolated Hoop Pine plantation on the Atherton Tableland without causing any known deaths. Following a thinning in the area in November 1968 detailed observations were commenced to determine whether or not the fungus is pathogenic.

## SILVICULTURAL RESEARCH

A number of new experiments were established during the year. Older experiments were remeasured and in appropriate cases results were analysed to determine findings from experimental work. Some of the more important work is referred to in the reports following for the 4 regional research stations.

### Atherton Regional Research Station

The main work of this station is research into the silvicultural characteristics of North Queensland rain forests with the object of determining treatment prescriptions suitable for application to these forests. An increasing effort is now being directed to work associated with the establishment and maintenance of exotic pine and Hoop Pine plantations.

(i) *Rain Forests*.—Further information for the key to the North Queensland rain forest tree species based on vegetative characters was gathered during the year and at this stage 2,300 individual trees belonging to 550 species have been examined and key characters recorded. In 426 tests of the key by persons with a limited knowledge of rain forest trees, a correct identification was obtained in 338 cases and in 58 further cases the correct species was included in a small number of possibilities but the operator was not able to reduce the number of possibilities to one. In 30 cases a wrong identification was made, in 8 cases because of operator error and in 22 cases because of deficiencies in the key. These have been rectified.

Linear sampling was carried out in one compartment to determine its suitability for treatment under 1967 treatment rules. The strips were pegged and their suitability for determining the results of treatment will be tested in five years' time. Linear sampling was carried out in a second area with the object of testing the value of Forest Inventory Survey strip data or x40 relascope assessment of basal area by species and size classes in providing data required to specify the treatment for a particular area.

A number of measurements have been made over the years to determine the relationship between crown size and g.b.h.o.b for the prime cabinet species of the rain forest. Data obtained are shown in the following table.

MINIMUM SPACING OF PRIME CABINET SPECIES TO PERMIT CROWN DEVELOPMENT FOR VIGOROUS GROWTH

G.B.H.O.B. Inches	No. of Trees Measured	Average Crown Area Square Links	Upper Limit Trees per Acre	Minimum Spacing Feet
24-36	72	951	105	20
36-48	117	1,308	76	24
48-60	117	1,838	54	28
60-72	78	2,451	41	33
72-84	51	3,214	31	37
84-96	50	3,640	27	40
96-108	16	4,028	25	42
108-120	8	5,185	19	48

These data indicate that the spacings currently adopted in merchantable thinning, below normal cutting girth limits, are inadequate for vigorous growth.

Reference was made in 1967-68 Annual Report to two experiments in which treatment was applied in 1956. In fact this refers to one experiment in which four treatments were applied, one to each of four six-acre virgin plots. Preliminary results indicate that the treatment which involved the removal or negation of all useless stems, irrespective of size class, was the most effective in assisting established regeneration of the prime cabinet timbers and in recruiting seedling regeneration of these species. Lighter treatments which involved the removal or negation of useless species for prescribed distances from the prime cabinet species were less effective in promoting the growth of the regeneration classes than the heavy treatment, but were more effective than nil treatment. All treatments involving destruction of useless species resulted in higher girth increments on commercial species than those recorded in the control section and the magnitude of the difference was approximately 100 per cent. in all girth classes.

Earlier spot-sowing trials had indicated that dusting with animal repellants and insecticides was ineffective because the dust was removed by rain. Trials during the year, using latex as a sticker, indicated that the latex held the dust on the seed but the repellants and insecticides did not prevent rodents attacking the seed.

Enrichment plantings of a number of species have been carried out in selectively logged and silviculturally treated stands located on soils derived from the major rock types. Silvicultural treatment consisted of brushing or ringbarking all useless trees and species. Typical results are given in the table on page 13.

The basalts give rise to red clay loams, the granites to grey gritty loams to clay loams, the metamorphics to rather poor silty soils and the rhyolites to grey loams.

Queensland Maple and Silver Ash are the most promising species tested. Cairns Hickory has grown nearly as well as Queensland Maple and North Queensland Kauri on equal metamorphic sites and is a possibility for these sites. Northern Silky Oak has performed badly because of browsing by pademelons (*Thylogale stigmatica*). Red Cedar has suffered some damage from the shoot borer (*Hypsipyla robusta*) but most trees will produce useful logs. Hoop Pine and North Queensland Kauri Pine were slow starters but subsequent growth is satisfactory. Some of the species tested are slower growing than others, but provided site is satisfactory and overhead light is plentiful, growth is good.

In the last Annual Report the initiation of an experiment to test the response of underplanted Queensland Maple to the quick elimination of overhead canopy with the aid of arsenic, the slow elimination of overhead canopy, the removal of low canopy only and the removal of high canopy only was reported. At the end of the current report year, 30 months after treatment, the mean heights of the tallest 40 stems per acre were 17.3 feet, 14.5 feet, 11.7 feet and 15.1 feet respectively for the four treatments. Natural seedlings are responding in the same way to release, but their growth rate is poorer.

(ii) *Plantations*.—In the older trial plantings, both on the Atherton Tableland and the relatively infertile coastal soils, Honduras Caribbean Pine continues to show the greatest vigour. However Benguet Pine is performing well on the more fertile, well-drained sites and may yet out-produce Caribbean Pine on such sites. Bahaman Caribbean Pine planted in 1966-67 at Kennedy on the coastal lowlands is showing satisfactory growth but is less vigorous than the Honduras variety. An outstanding feature of the 1967-68 trial plantings in the Kuranda area is the rapid early growth of Ocote Pine (var. *ochoterenai*) and White Cypress Pine (*intratropica*). The first trial of *P. tropicalis* was established at Kennedy in 1968-69.

During the year a further 6.5 acres of plantation were added to the trials at Weipa being conducted in co-operation with Comalco on the replaced overburden following bauxite mining. Thirteen species were tried, five of which have not been included in earlier trials. These were Hoop Pine, Queensland Maple, Mexican Cedar, *Swietenia mahogany*, and *Gmelina arborea*. The more promising of the trial species to date are Honduras Caribbean Pine, African Mahogany, White Cypress Pine (*intratropica*), Teak, American Mahogany and *Xylia dolabriformis*. The shoot borer has severely attacked the Red Cedar and to a lesser extent, the African Mahogany, but the latter has recovered with little defect.

In the provenance trials with Bahaman Caribbean Pine established on the Tableland at Danbulla in 1966-67, the Grand Bahamas and Abaco sources have excelled Honduras Caribbean Pine in height growth to date. They are also superior in straightness. Development of the Benguet Pine provenances outplanted at Kuranda and Danbulla in 1967-68 has been slow and many plants do not look healthy. Trials of Honduras Caribbean Pine derived from lowland sources in British Honduras and Nicaragua were outplanted at Kennedy on a normal site and a mounded wet site in 1968-69.

Preliminary indications from growth and survival in the field 2 to 4 months after outplanting are that the optimum nursery schedules for Honduras Caribbean Pine at Kennedy is to sow in March and tube 2 to 3 months later for either February or April outplantings. The experiment will be repeated over a number of years.

A spacing experiment testing spacings of 7 feet x 7 feet, 8 feet x 8 feet, 9 feet x 9 feet, 10 feet x 10 feet and 12 feet x 12 feet with improved Honduras Caribbean Pine stock was established at Kennedy early in 1969.

Observations were continued on an experiment established at Kennedy in 1966-67 to test the effect of ripping, mounding, and ripping and mounding on the growth of Honduras Caribbean Pine on silty clays and clay loams with poor internal drainage. In all treatments involving soil disturbance, initial height growth has been far better than in the controls but there is no difference in response to the different soil disturbance treatments.

An experiment was established in 1966-67 to test the effectiveness of several methods of grass control in degraded pastures to be planted with Hoop Pine and the response of Hoop Pine to the treatments. Treatments were rotary hoeing only and rotary hoeing followed by the application of 2,2-DPA once at 20 lb. per acre, as 2 split dressings each of 10 lb. per acre, and as 3 split dressings each of 5 lb. per acre. The first application of 2,2-DPA included 2,4-D and 2,4,5-T as amines. Further treatments were no pre-plant site preparation but ringtending as considered desirable at and after planting and a control given no pre-plant or post-plant tending. No further tending has been required on the plots

GROWTH DATA FOR SPECIES USED IN ENRICHMENT PLANTINGS—NORTH QUEENSLAND RAIN FORESTS  
(Each Line Refers to a Separate Plot)

Species	Rock Type	Height Development—Feet				Girth Development—Inches				Underplant Basal Area Square Feet per Acre	Overwood Basal Area Square Feet per Acre	
		Age Years	Survival per cent.	Average Height	Maximum Height	M.A.I.	Age Years	Number per Acre	Average G.B.H.O.B.			M.A.I.
Queensland Maple	Basalt	7-2	71	20-6	37-3	2-9	12-2	218	13-9	1-1	23-3	55-5
	Basalt	10-0	71	24-5	47-0	2-4	10-0	216	8-5	0-8	8-6	112-8
	Granite	6-3	90	19-3	29-5	3-0	15-3	294	17-7	1-2	50-3	52-2
	Granite	5-8	79	17-3	28-6	3-0	12-2	253	17-5	1-4	42-9	163-0
	Metamorphic	3-3	90	16-1	27-3	4-9	13-2	295	16-2	1-2	42-5	98-1
	Metamorphic	7-3	70	21-0	32-5	2-9	10-1	N.A.	8-7	0-9	N.A.	80-7
Silver Ash	Basalt	5-2	85	22-3	29-0	4-3	10-3	N.A.	14-0	1-4	N.A.	N.A.
Cairns Hickory	Metamorphic	9-2	88	18-7	29-7	2-0	12-3	226	5-6	0-5	4-0	129-6
	Metamorphic	10-1	48	24-1	35-0	2-4	10-1	N.A.	7-4	0-7	N.A.	80-7
Northern Silky Oak	Basalt	10-2	55	9-1	20-7	0-9	N.A.	N.A.	N.A.	N.A.	N.A.	N.A.
Red Cedar	Basalt	6-3	94	20-3	30-8	3-2	10-3	N.A.	14-5	1-4	N.A.	N.A.
Hoop Pine	Basalt	7-2	93	21-6	35-3	3-0	10-2	262	12-6	1-2	23-0	70-9
	Granite	7-3	91	24-6	37-2	3-3	10-2	326	15-3	1-5	42-4	38-0
	Metamorphic	10-2	99	20-3	39-9	2-0	10-2	158	7-0	0-7	4-2	99-0
	Rhyolite	10-2	87	19-3	42-7	1-9	10-2	114	8-8	0-9	4-8	75-6
North Queensland Kauri	Metamorphic	10-2	92	23-3	37-5	2-3	10-2	186	9-3	0-9	8-9	123-8

N.A. = Not Available.





**HOOP PINE NUTRITION WORK. Glass house at Beerwah Forest Research Station.**

treated with 2,2-DPA whereas all the other plots, excluding the controls, have had three subsequent ring tends. The height growth of the Hoop Pine has been equal in all treatments, including the control.

It was hoped that Honduras Caribbean Pine plantations would control the grass on these degraded pastures, allowing Hoop Pine to be subsequently established as an underplant, or as an open planting on a grass-free site. However it is now apparent that a complete grass cover remains under such stands until about age 10 years and that sufficient will survive to recolonise the area under older stands. Hoop Pine underplants have a healthier green colour than open plantings on these degraded pastures but growth rate is not improved. In a 1960-61 planting of alternate rows of Hoop Pine and Honduras Caribbean Pine, average height of the Hoop Pine is now 31 feet compared with an average height of 20 feet in the control planted on a similar site as a pure stand.

#### **Beerwah Regional Research Station**

At this station three sections handle various aspects of research into the establishment and maintenance of exotic pine plantations on the coastal plain south of latitude 23 deg. S and on the hinterland plateau country of southern Queensland. A fourth section deals with native coastal hardwood forests in the sub-tropics.

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

(a) *Sub-tropical Coastal Region.*—A detailed evaluation of the older species trials with Slash, Loblolly and Honduras Caribbean Pines was commenced during the year. In the Beerwah area (latitude 27 deg. S) in 14 trials on deep well-drained sites Caribbean Pine has produced 41 per cent. more volume than Slash Pine to about 15 years of age. It is much less satisfactory on shallow soils and ill-drained sites. Slash Pine outyields Loblolly Pine beyond age 10 years except on deep humic soils and alluvial soils with ample moisture, where Loblolly thrives. South Florida Slash Pine has performed well on well-drained sites and may be more productive on such sites at Beerwah than Slash Pine.

Trials with Sand Pine and Longleaf Pine, to determine their suitability for planting on deep coastal sands and sand dunes, were extended during the year. The area planted was not burned, site preparation consisting of brushing the understorey and poisoning the larger trees with an injector. Despite

drought conditions good survivals were obtained from the 1968 plantings.

The series of nursery experiments with Slash Pine, commenced several years ago to investigate means of producing smaller better-balanced plants and to define more clearly optimum grades of planting stock, was continued. A further season of sowing trial confirmed that open sowings later than September will result in greatly reduced yields of plantable stock, although shading (35 per cent. Sarlon cloth) will restore yields to near comparable levels should delayed October or November sowings become necessary. August and September sowings yield comparable quantities of plants, but the September plants are usually softer at time of outplanting. Initial results from density of sowing experiments indicate that an output of 20 plants per square foot can be attained.

The effect of Myrtaceous regrowth on the growth of exotic conifers is to be studied in large scale experiments in the course of establishment in 2, 12 and approximately 22-year-old stands of Slash Pine at Beerburum and Toolara and of Honduras Caribbean Pine at Byfield. The treatments will be complete removal of all regrowth; routine foliar spray treatment; and retention of all regrowth.

A review of spacing experiments now aged 20-30 years with Slash Pine and Loblolly Pine on well drained sites indicates that where an integrated pulp/sawlog market is anticipated optimum initial plant espacement is 8 feet x 8 feet; where only a sawlog market exists optimum spacing is 10 feet x 10 feet. It is planned to establish a series of new spacing experiments using orchard grade Slash Pine on a range of sites. Rectangular spacings which may lessen costs of preparation of site for planting or may be optimum for mechanical thinning techniques will be tested as well as square spacings. The first of these new trials was outplanted in 1969 on a high quality, well-drained site with the object of supplying a pulp/sawlog market. Five square spacings were adopted ranging from 6 feet x 6 feet to 10 feet x 10 feet.

Trial plantings over a wide range of localities, sites and soil types have shown that Hoop, Kauri and Bunya Pines can be successfully established as underplantings to exotic pines once the latter have closed canopy. Hoop Pine is the species favoured for routine underplanting as Kauri Pine is subject to defoliation from coccid attack and Bunya Pine is less vigorous. It is predicted that Hoop Pine, planted at time of first thinning of the overwood at 250-300 stems per acre in the thinned spaces, would yield a bonus crop of 2,700 cubic feet per acre at time of clear falling 38 years later. In trials established up to 18 years ago there is no evidence that the underplants have adversely affected the growth of the overwood.

All long term pruning and thinning trials were maintained and measured during the year. Further progress was made on the transformation of past measure data to a form suitable for use in automatic data processing and for application of simulation techniques. It is hoped that this mammoth task will be completed within the next 18 months.

(b) Tropical Coastal Region, Latitude 23 deg. S.—A season of sowing and tubing experiment was commenced with Honduras Caribbean Pine in 1967. Sowing dates were mid-February, mid-March and mid-April. Plants were tubed at 1, 2 through to 6 months from sowing but no plant was tubed after August. Outplanting was in mid-December and late January. Germination was similar at all sowings, tubing survivals were uniformly high and outplanting survival has been high. As tubing is cheaper with 2 and 3 month plants than with one month plants, and lifting is cheaper with these plants than with older plants, the conclusion from this test was that mid-March sowing following by late-May and June tubing was ideal for Byfield. This is the same as the finding from the Kennedy experiment.

Overgrown Honduras Caribbean Pine stock was topped after outplanting in 1967 by the removal of about 6 inches of the leader. Where branches were present, these competed to replace the leader. Form pruning was necessary to establish one leader and the resulting stem had a bad kink. Where there were no branches a number of leader buds developed below the cut and these competed for the lead. Form pruning was necessary to establish the dominance of one of these. The resultant stem was reasonably straight. Some leading stems 30 inches to 40 inches tall in August 1967 were cut back to 6 inches. These plants were very sluggish in the production of new leaders and subsequent growth has been poor.

Experiments have been established to determine site, age, standing basal area, basal area increment relationships in Honduras Caribbean Pine. As stand age in the oldest of these experiments is only 15 years it is too early to draw conclusions about these relationships.

As it is anticipated there will be no early pulp market for timber grown at Byfield and that minimum cutting girth of sawlogs will be at least 27 inches, experiments have been established to ascertain the effect of unmerchantable thinning on the subsequent production of the stand. In a 1956-57 stand of Honduras Caribbean Pine the following treatments were applied:—(A) Unthinned apart from removal of runts and useless stems; (B) Unmerchantable thinning to the best 400 stems per acre at age 4 years; (C) Unmerchantable thinning to the best 300 stems per acre at age 4 years; (D) Unmerchantable thinning after selection for carry-up pruning at age 5 years to favour 120 selected stems per acre. Growth data prior to first merchantable thinning in 1968 is tabulated below.

GROWTH OF HONDURAS CARIBBEAN PINE—AGE 11·6 YEARS—FOLLOWING EARLY UNMERCHANTABLE THINNING  
(Means of 5 replications)

Stems per Acre	G.B.H. (BA) Inches		Pre-dominant Height Feet	Merchantable Volume Per Acre Cubic Feet	
	Select	All		Select	All
478 (A) ..	27·8	25·4	64·3	812	2,512
399 (B) ..	28·3	26·2	63·6	823	2,260
299 (C) ..	29·5	28·0	65·2	946	2,078
363 (D) ..	28·6	26·3	63·4	848	2,057

The letters in brackets in column 1 refer to the treatments applied.

First merchantable thinning was applied when basal area per acre of other than select stems 27 inches and over g.b.h.o.b. exceeded 40 square feet, 30 square feet of which was removed in a thinning to favour select stems. In all treatments this has occurred at the same age. First merchantable thinning has freed all selects from competition of dominant stems in treatments C and D but this will not be achieved in treatments A and B until the next thinning.

A spacing experiment with Honduras Caribbean Pine was established during the year covering a range of spacings from 7 feet by 7 feet to 12 feet by 12 feet. A duplicate phase was also established at Kennedy as reported earlier.

(c) Inland Southern Tablelands.—Investigations are continuing into nursery techniques and stock handling procedures with Radiata Pine in an attempt to produce hardier and well-balanced stock better able to withstand the dry conditions frequently encountered. Field survival and development by height classes of seedlings outplanted on cultivated and uncultivated sites are being studied. The effect of lopping plants in the nursery and of storing plants at near freezing point before planting is also being investigated.

An experiment to test square spacings with Radiata Pine from 7 feet by 7 feet to 10 feet by 10 feet was outplanted in 1967. There was some replanting of rabbit damaged plots in 1968. The experiment will be managed on the basis of sawlog production.

(ii) Tree Breeding.—Tree breeding work with *Pinus* species is conducted from Beerwah while tree-breeding work in Hoop Pine, reported under the heading "Imbil and Yarraman Research Stations", is supervised from Beerwah.

(a) Slash Pine.—A replicated provenance trial was established in Queensland in 1956 with 12 populations of Slash Pine from throughout its range. It was remeasured after 13 years in the field. In the Beerburum outplanting, the best provenance is Flagler Co., Florida. It is the most southerly source included in the trial, originating near the southern limit of the typical variety. This population is no more productive, however, than the locally acclimatised population, which derived from north eastern Florida. In outplantings further north (at Toolara and Tuan), stock from local seed is superior. Therefore it appears unnecessary to introduce other unselected stock of Slash Pine.

Several populations of South Florida Slash Pine including stock from the far south of Florida, are growing on a similar site and are of the same age as the Slash Pine trial at Beerburum. Both varieties have grown about equally fast, but the South Florida trees have much poorer straightness. In a series of trial plots at Toolara, Tuan and Byfield, South Florida Slash is often superior in growth to Slash Pine. These observations have prompted further trials. Tests of 16 Slash Pine populations, of both varieties but mainly southern have been sown at Beerwah, Tuan and Byfield.

Control-pollinated progenies from crossings among superior phenotypes of Slash Pine are being studied for volume production, stem quality and wood properties as they reach the stage for first commercial thinning at about age 15 years. These studies enable estimates of genetic gains and combining abilities to be made. They also provide opportunity for identification of the best progenies and for selection of superior phenotypes within them. The new generation of "plus" trees produced by such combined family and individual selection will be used in the establishment of new seed orchards.

Studies made this year again show wide variation in volume production and stem quality among progenies. The progenies studied had an average gain of 20 per cent. in total volume production over routine stock. There are good indications, however, that by selection of clones with high combining ability, a new orchard could be constituted, the progeny of which, at age 15 years, would have a gain expectation of 30 per cent. in volume. The progeny assessments also confirmed that a large gain in stem straightness is achieved.

New progeny tests with stock from local and overseas orchard seed were established again this year at Beerburum and Tuan, this time on both ridge and mounded swamp sites, with fertilisation.

(b) Caribbean Pine.—Further provenance trials of Honduras Caribbean Pine were established during the year with stock from coastal plain sources in Nicaragua and British Honduras. These populations may be adapted to poorly-drained sites, so these trials were outplanted on ridge and mounded swamp sites in three locations.

Additional "plus" trees were located during the year. Two of them will be grafted in the 20-clone seed orchard at Kennedy to replace ramets of a few clones which have failed since establishment early in 1968. Already some ramets of most clones have produced pollen and/or seed cones.

A light crop of Honduras Caribbean Pine cones was harvested from the 10 acre clonal seed production area and selected seed trees at Byfield. This year a moderate to heavy crop of flowers developed, following three successive light to very light crops. Observations on the intensity of flowering of Honduras Caribbean Pine over a large part of its planted range in Queensland show a strong effect of environment. The Kennedy location appears to be highly satisfactory for the seed orchard.

Several more full-sib progeny seed lots were harvested and stored for future use in a large progeny trial which will involve many crosses resulting from the systematic mating pattern now in use. Seed of six standard control lots was reserved for use in future progeny tests and to provide a link between them.

Several provenance trials of Bahaman Caribbean Pine have been established in the field since early 1966. One series, outplanted at three centres, was measured recently after 3·5 years in the field. There are only slight differences in height growth between the Grand Bahama, Abaco and New Providence populations but the Andros Island material is consistently the slowest growing. Almost all of the seed of Bahaman Caribbean Pine used in Queensland is from Grand Bahama and Abaco Islands.

**TREE IMPROVEMENT—SLASH PINE—BEERBURRUM**  
**Progeny Tests—Compartment 13, Glass Creek Logging Area—Age 12½ years.**  
**Planting spacing 10 feet x 10 feet—Unthinned.**



**ROUTINE STOCK.**  
**419 Stems per acre.**  
**Volume Standing—2210 cubic feet per acre.**  
**Percentage of Stems scoring 8 or more for Stem Straightness—**  
**1 per cent.**

(c) Hybrids.—No easy solution has yet been found to the problem of mass-producing the highly desirable F<sub>1</sub> seed of the hybrids var. *elliottii* x var. *hondurensis* and var. *elliottii* x var. *caribaea*. Attempts to root cuttings taken from young F<sub>1</sub> hybrid trees of *P. elliottii* x *P. caribaea* have so far failed.

A plot of 100 grafted ramets of 20 selected F<sub>1</sub> trees was established for the production of F<sub>2</sub> hybrid seed, in the hope that F<sub>2</sub> progeny will include a satisfactory proportion of individuals well-adapted to mounded swamp sites. Small numbers of five and six year old F<sub>2</sub> trees show promise on such sites.

(d) Loblolly Pine.—A range-wide, 14 source provenance trial of Loblolly Pine which had been planted in 1955 and 1956 was measured in 1968. The population from near Silver Springs, Marion Co. (Fla.) was clearly the best, both on a good site (at Beerburrum) and a poor site (at Tuan); the next best material was the acclimatised local population, which originated in north eastern Florida (see table).

The Slash Pine provenance trial at Beerburrum mentioned above was planted in the same compartment, on similar sites, in the same month and it has had the same cultural treatments as the Loblolly Pine trial. It is therefore of considerable interest to note that the M.A.I. merchantable volume to age 13 years for the Loblolly Pine (Silver Springs) and the best Slash Pine (acclimatised race) are 239 and 206 cubic feet per acre respectively.

Additional ramets were established in the Loblolly Pine seed orchard by means of field grafting. New progeny tests with local and imported orchard seed from clones selected



**PROGENY OF ORCHARD TREES G15 x G24**  
**422 Stems per acre.**  
**Volume Standing—2920 cubic feet per acre.**  
**Percentage of Stems scoring 8 or more for Stem Straightness—**  
**27 per cent.**

overseas (South Africa, Rhodesia and Texas) were established.

Provenance	Stocking Trees per Acre		M.A.I. Merchantable Volume* (Cu. Feet per Acre)	
	Beerburrum	Tuan	Beerburrum	Tuan
Silver Springs, Fla	400	300	239	97
Acclimatised local.	400	300	172	83

\* Means of 4 replications per location.

(e) Radiata Pine.—Assessment of a 10-year old wind-pollinated progeny test of Radiata Pine at Pechey revealed two more parent trees with high combining ability for health, volume production and stem straightness. Several such parents have now been identified in this way and established as clones in seed production areas at Passchendaele. Five-year old full-sib pogenies of New Zealand "plus" trees at Pechey and Passchendaele so far show no general superiority over local, selected stock. Similar observations have been made at Canberra, A.C.T. Thirty-six progenies have been raised in the nursery as part of the co-operative progeny test of 6 local and 30 other clones in the Talleganda, N.S.W. seed orchard. Outplantings on cultivated sites at Pechey and Passchendaele are planned for next year.

(f) Miscellaneous Tropical Pines.—Seed of 2 insular and 3 continental provenances of *P. merkusii*, kindly supplied by the Commonwealth Forestry Institute, Oxford, was used to raise stock for outplantings in North Queensland. Several new "plus" trees of Benguet Pine were chosen for cloning in the seed production area of grafted ramants at Beerburum. Early growth of Ocote Pine (var. *ochoterenai*) at several centres is very promising and superior to that of the typical variety.

An invited position paper on "Breeding for High Yield Characters—Growth and Yield" was prepared for the Second World Consultation on Tree Breeding, Washington D.C., August, 1969.

(iii) Nutrition.—The chief work of this section deals with the nutrition of the exotic pines planted on the coastal plain in south-east Queensland. Recent work has been largely directed to the nutrient requirements of Slash Pine on poorly drained sites.

An omission trial established with Slash Pine on a mounded podzolic gley in 1966 was measured in 1969. Fertilisers were applied as split dressings to the individual trees to supply:—

P as  $\text{NaH}_2\text{PO}_4$  equivalent to 5 cwt. per acre super-phosphate.

N as urea 1 cwt. per acre.

K as KCl 2 cwt. per acre.

Ca as  $\text{CaCO}_3$  5 cwt. per acre.

Mg as  $\text{MgSO}_4$  1.5 cwt. per acre

and a trace element mixture containing zinc, boron, copper, molybdenum and manganese.

The responses are shown in the following table:—

RESPONSE OF SLASH PINE TO FERTILISATION ON A MOUNDED PODZOLIC GLEY SOIL—AGE 3 YEARS

Treatment	Mean Height Increment Feet			Mean Height Feet May 1969
	6.66— 7.67	7.67— 7.68	7.68— 5.69	
Control .. ..	0.98	1.04	1.82	4.86
All on .. ..	2.43	3.06	2.83	9.33
Minus Phosphorus ..	0.99	1.20	2.10	5.37
Minus Nitrogen ..	1.93	2.71	2.97	8.64
Minus Potassium ..	2.51	3.30	2.65	9.47
Minus Ca. and Mg. ..	2.59	3.30	2.77	9.72
Minus Traces ..	2.43	3.28	3.01	9.70

There has been a big response to added phosphorus; a lesser response to nitrogen during the first two growing seasons only and no response by age 3 years to added cations or trace elements.

In another experiment established in 1966 on a mounded low humic gley site, Slash Pine has responded to phosphorus and, to a lesser extent, nitrogen. There has been no response to potassium or copper. Cuban and Honduras Caribbean Pines, hybrids of these species, and their hybrids with Slash Pine, in the same experiment, have shown a big response to phosphorus, but no response to nitrogen, potassium or copper.

Trials initiated in 1959 with application of Nauru rock phosphate (16.8 per cent. P) to 24-year-old Slash Pine stands of low site quality (site index 55), on shallow ridge

soils, have shown an economic response. This is shown in the following table:—

RESPONSE OF SLASH PINE EIGHT YEARS AFTER DELAYED APPLICATION OF ROCK PHOSPHATE ON SHALLOW RIDGE SOILS

Nauru Rock Phosphate Added	Merchantable Volume per Acre Cubic Feet		Discounted* Stand Value	Foliar P Per Cent. 1963
	Standing 1967	Increment 1959-1967		
\$				
SITE I				
Nil .. ..	1,523	711	134.61	0.054
2 cwt. per acre	1,916	1,221	180.54	0.087
4 cwt. per acre	2,052	1,253	202.35	0.102
SITE II				
Nil .. ..	1,753	897	165.19	0.064
2 cwt. per acre	2,421	1,272	281.18	0.088
4 cwt. per acre	2,292	1,238	266.20	0.100

\* Calculated from the stand value at age 32 years discounted at 4 per cent. to the time of fertilising—age 24 years.

Glasshouse and field trials have shown that the early growth of Patula Pine on lateritic krasnozems soils at Pechey can be improved by site cultivation in particular, and to a lesser extent by fertilising. Of the nutrients tested, phosphorus has given the greatest response by age 2 years. A large trial testing cultivation and various rates of application of super-phosphate and Nauru Rock phosphate on both Patula and Radiata Pines will be established at Pechey this year.

The response at Byfield of Honduras Caribbean Pine now 15 years old to the broadcast application of phosphatic fertiliser, 3 parts Nauru rock phosphate to 1 part super-phosphate, has been examined. The fertiliser was applied at 2 cwt., 4 cwt. and 6 cwt. per acre in 1960 in one series of experiments and in 1964 in a second series of experiments. There has been a marked response in growth rate to fertiliser application in site index 75 and 85 stands, a less marked response in site index 95 stands and no response in site index 105 to 135 stands. Where there has been a response, it has been greater in the 4 cwt. than in the 2 cwt. treatment. In some cases there has been a further response to the 6 cwt. treatment. The response in the site index 75 and 85 stands has more than met the cost of fertilising at all levels and there are indications that this will also be the case with site index 95.

(iv) Coastal Hardwoods.—The work of this section is directed towards increasing productivity of the wet and dry sclerophyll forests of the Brisbane, Gympie and Maryborough districts.

Girth increments, based on measurements over 14 years, have been computed for the species occurring in the detailed yield plots sampling the Blackbutt and White Mahogany vegetation types on the Blackall Range. At the last remeasure stems were classified as "acceptable" or "unacceptable" on crown appearance. An "unacceptable" tree is one with a crown exhibiting any non-vigorous traits (e.g. clear deterioration, excessive malformation, dead branches and branchlets comprising one-third or more of the crown, or an epicormic-type crown resulting from breakage of the main branches). Girth increments are shown in the table and indicate the gains to be obtained from increasing the Blackbutt component of the stand.

ANNUAL GIRTH INCREMENTS IN INCHES—WEST SCLEROPHYLL FORESTS—BLACKALL RANGE

Species	"Acceptable" Crown		"Unacceptable" Crown	
	G.B.H.O.B. —60 inches	G.B.H.O.B. 60 inches+	G.B.H.O.B. —60 inches	G.B.H.O.B. 60 inches+
Blackbutt .. ..	1.04	1.04	0.73	0.49
Tallowwood .. ..	0.82	0.64	0.59	0.45
Red Mahogany, White Mahogany ..	0.52	0.52	0.42	0.42
Brush Box, Turpentine .. ..	0.55	0.50	0.37	0.30
Red Bloodwood, Brown Bloodwood ..	0.35	0.35	0.29	0.29

The planting of blackbutt on sites within its geographic range but on which it does not occur naturally must be approached with caution. The oldest plots of Blackbutt planted on a White Mahogany site at 11.5 years of age had similar stand parameters to a plot planted at the same time on a good quality Blackbutt site. Each stand had been unmerchantably thinned to 25 feet by 25 feet. Average predominant height on the White Mahogany site was 79.8 feet as against 80.2 feet on the Blackbutt site; mean g.b.h.o.b. figures were 31.7 inches and 31.0 inches respectively. The development of Gympie Messmate on the White Mahogany site was similar to that of the Blackbutt.

Forest Type	Tractor	Disturbance— Machine-Hours per Acre	Treatment— Man-Hours per Acre	Planting— Man-Hours per Acre	Per Cent. Soil Exposed
White Mahogany .. .. .	D4	0.63	3.75	4.88	45
White Mahogany .. .. .	D6C	0.68	3.53	4.56	47
Blackbutt .. .. .	TD18A	1.74	0.89	3.95	58

Seed spotting following disturbance has generally given unsatisfactory results. Pelleting of seed in a clay mixture improves germination. In one trial 51 per cent. of spots seeded with pelleted seed became stocked as against 14 per cent. of spots seeded with unpelleted seed.

On Fraser Island Blackbutt is regenerated by a late summer burn under retained seed trees. An assessment made six months ago after a February 1968 burn indicated that to obtain 30 to 40 per cent. of milliacres stocked with Blackbutt at that stage, crowns of seed trees should not be further than 40 to 50 feet apart. The average distance of crown spread from the bole was 33 feet for stems with an average g.b.h.o.b. of 100 inches; prevailing winds are south-east and crown spread was elongated in a north-west direction. To increase the seedling stocking in areas deficient in regeneration, Blackbutt stock was raised on Fraser Island and outplanted. Plants were raised in Fraser Island sand in a range of jiffy pot sizes and in plastic "bullets" with bi-weekly application of a liquid general purpose fertilizer. No advantage in germination or growth was obtained from fumigating with chloropicrin or from the incorporation of blood and bone, a general purpose fertiliser or potassium chloride in the sand. Increased germination resulted from adding vermiculite to sand as a seed cover. Enrichment planting of sections deficient in regeneration was done at a spacing of 15 feet by 15 feet. Field trials were established to test the survival and growth of planted Blackbutt of Fraser Island and mainland origins raised in various containers with and without field application of fertilisers.

Over the past four years experiments have been established in the Spotted Gum-Ironbark forests of the Maryborough district testing the effect of 2 selective logging treatments on increments of the larger stems in the residual stand. The logging treatments were—

- (1) Log all merchantable trees over 78 inches g.b.h.o.b. and thin the 48–72 inches fraction to 25 feet by 25 feet retaining the best trees.
- (2) Log to retain only trees of an "acceptable" vigour standard (judged visually), trees retained to be at spacings no closer than 50 feet by 50 feet in the 72 inch plus girth classes and no closer than 40 feet by 40 feet in the 48–72 inch girth classes.

Trial area A had a good representation of all girth classes while in trial area B the stand was dominated by a number of large overmature Red Ironbarks. Stems per acre greater than 48 inches g.b.h.o.b. retained after applying treatments 1 and 2 were 12.0 and 6.6 respectively in Area A and 7.8 and 1.5 respectively in Area B.

Periodic annual girth increments of Spotted Gum in 48-72 inch girth class over the period 1965-69 for Area A and 1966-68 for Area B are tabulated.

#### ANNUAL GIRTH INCREMENTS— SPOTTED GUM—INCHES

Treatment 2 Stem Classes	Treatment 1		Treatment 2	
	Area A	Area B	Area A	Area B
Acceptable Stems ..	0.47	1.30	0.62	1.40
Unacceptable Stems ..	0.31	0.41	..	..

These figures, and similar figures for the Ironbarks, indicate that it is possible to separate the vigorous from the non-vigorous trees by inspection and that there is a response to wider espacement even at the low stockings present.

As a result of trials in enrichment of forests with a rain forest understorey the following procedures have been established for application following logging. The area should be subjected to additional disturbance by use of a dozer to destroy weed species and bare the soil. This is followed by ringbarking of unwanted stems and enrichment planting at 12 feet by 12 feet on sections where stocking is inadequate. The times involved in these operations in three trials are tabulated together with the percentage of the area on which the mineral soil was exposed.

Of the machines tested the D6C with powershift gave best disturbance whilst the D4 was too small. The number of plants put in averaged from 100 to 115 per acre.

#### Dalby Regional Research Station

This station carries out experimental work 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 the rain forest and sclerophyll forests on the Dividing Range east of Warwick where the rainfall generally exceeds 50 inches per annum.

Investigation of arboricides for the control of unwanted species in White Cypress Pine forests has been an important part of the work of this station for the past decade and standard treatments have been prescribed. To kill unwanted *Eucalyptus* and *Angophora* species a basal injection of 2,4,5-T amine is applied at intervals around the butt whilst with Bull Oak the same hormone is applied to low frills or to cut stumps.

Analysis of large scale seasonal trials with basal injections in Smooth-barked Apple and Spotted Gum is nearing completion. Winter treatments with 2,4,5-T preparations are significantly better than summer treatments but the differences are not great enough to warrant suspension of the work in summer. There is less seasonal variation when picloram preparations are used. No correlation has been established between percentage kill and rainfall in these trials but there is a distinct decrease in kill with increase in size of stem above 30 inches g.b.h.o.b. for both species with all formulations. Experiments with spaced injections at waist height are continuing as this method could be cheaper than basal injection especially with the Ironbarks.

The effect of Bull Oak on the growth of White Cypress Pine is illustrated in an experiment established in 1961 and measured periodically since. Observations covered four plots each of (i) untreated control (ii) all Bull Oak brushed and (iii) all Bull Oak brushed and 2,4,5-T amine applied to the stumps. Periodic girth increments of White Cypress Pine on the plots are tabulated.

#### PERIODIC ANNUAL GIRTH INCREMENTS IN INCHES— TREATED AND UNTREATED CYPRESS PINE

Bull Oak Treatment	G.B.H.O.B.—Inches				
	Mean 1968	Periodic Annual Increments			
		61-63	63-64	64-66	66-68
(i) Nil .. .. .	15.5	0.42	0.17	0.07	0.19
(ii) Brush only .. .. .	21.5	0.87	0.65	0.27	0.40
(iii) Brush + 2, 4, 5-T	22.3	0.86	0.58	0.33	0.52

These figures indicate the extent of the competition provided by a dense stand of Bull Oak in this low rainfall forest. The Bull Oak which was brushed only, has coppiced freely and is competing increasingly with the White Cypress Pine. The Bull Oak treated with 2,4,5-T is virtually free of coppice and the regeneration should offer little competition over the next decade.

Most thinning experiments in White Cypress Pine are in even-aged stands. However, the greater part of the Cypress forests are uneven aged and current management keeps them so. To obtain information on the effect of understorey White Cypress Pine on the overwood, two new experiments were established at Barakula in a good quality stand composed of a well spaced overstorey and two distinct levels of understorey.

The effect of rabbit grazing on regeneration of White Cypress Pine has been demonstrated in a Goondiwindi experiment summarised after 16 years of observation. It was found that no effective regeneration was secured in rabbit infested areas but that 45 new stems per acre had become established in the areas protected from rabbits. It was concluded that insolation rather than grazing of the regeneration by rabbits was the major cause of failure of the prolific regeneration which occurred from time to time. Grazing by the rabbits removed the ground cover and with it the protection from the scorching effects of the sun which is necessary for the regeneration to become established.

Further work was carried out aimed at finding a cheap and reliable method for destroying *Harrisia tortuosa*. This included spray treatment with 2,4,5-TP and with picloram and tuber injection treatments using a tree injector modified to take a butcher's brine needle.

During the year a 20-acre experiment was established in a mixed age Spotted Gum stand north of Barakula to test responses to 2 different logging and treatment regimes. These are—

- (i) the current tree-marking rules (Circular 1784) for logging Spotted Gum followed by standard treatment, and
- (ii) a modified management regime which retains only trees of a higher standard of apparent vigour and log length and requires that gaps in the stand created by logging be of a size large enough for regeneration to grow vigorously.

Further trial plantings were made on open forest and rain forest sites in the high rainfall area to the east of Warwick. New species tried were Bunya Pine, Lawson's Cypress, Suji, Short-Leaf Pine, and Maritime Pine. Survival of Suji was poor, probably due to the dry conditions encountered after both the winter and the summer plantings. Mean height growth of the more interesting of the trial species on a rain forest site at 3,300 feet A.S.L. at slightly less than age 3 years was Radiata Pine 15 feet; Patula Pine 11 feet; Loblolly Pine 11 feet; Mexican White Pine 8 feet; Benguet Pine 8 feet; Hoop Pine 5 feet and Kauri Pine 2 feet. This locality is too cold for Kauri Pine in open plantings and on more extensive clearings may prove to be too cold for Hoop Pine. Hoop Pine has survived well when underplanted in the rain forest immediately after logging. Work is continuing on the degree of removal of overwood required to promote vigorous growth of the underplants without creating a weed problem. Kauri Pine and Queensland Maple also show promise as underplants.

#### Imbil and Yarraman Research Stations

These two 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 wetter Hoop Pine plantation areas, while Yarraman with an annual rainfall of 30 inches represents the drier, more inland sites.

(i) *Plantation Silviculture*.—The report year was one of the driest on record at both Imbil and Yarraman, a feature being the almost complete failure of summer rains and periods of intense heat. There was a poor crop of weeds, resulting in low routine tending costs and consequent difficulty in assessing the economics of using some of the herbicides on trial. There were severe drought losses among trial species planted on forest sites at Yarraman in summer 1967-68 and in winter 1968 and heavy losses in some exotic species in older plantings.

Experiments were commenced in 1967-68 at Imbil to evaluate selected triazines (propazine and prometryne), substituted ureas (diuron, monuron and neburon) and bromacil as post-emergent weedicides in Hoop Pine nurseries. The weedicides were applied by knapsack spray in 38 gallons of water per acre, 5 months after sowing. The numbers of weeds which appeared on 16 square feet observation areas in the ensuing 15 months were as follows:—Control 146; bromacil 1; diuron 8; monuron 26; neburon 98; propazine 32; prometryne 21. The first 3 weedicides were applied at 0.8 lb. (a.i.) per acre and the latter 3 at 0.5 lb. (a.i.) per acre. None of the weedicides had an adverse effect on the seedlings.

The experiment was repeated in 1968-69 at the low shade Imbil nursery and the high shade Kenilworth nursery. The same weedicides are being tested and trifluralin has been added. Rate of application was 1.0 lb. (a.i.) per acre in 100 gallons of water four months after sowing of the Hoop Pine seed. Six weeks after application bromacil, diuron, monuron and propazine were exercising good control of weeds but both bromacil and diuron had killed some Hoop Pine plants. Future work will aim at establishing the lower limit of application consistent with good weed control and absence of damage to Hoop Pine.

The frost-site study aimed at delineating in advance of planting, areas in which open planted Hoop Pine would fail because of frosting, was continued. Frost lines were located in the 1968-69 plantings at Yarraman, Gallangowan and Jimna using tables derived from the Yarraman multiple regression equation which associates minimum distance from a gully at which frosting of Hoop Pine will not occur with a number of site variables. The accuracy of prediction of these frost lines will be tested after each winter for several years. Check plots established in 1967-68 Gallangowan and Jimna plantings showed no frost damage in the winter of 1968 outside the predicted frost area. These will be examined again after the winter of 1969 by which time the Hoop Pine will be more susceptible to frost damage. Rose Gum cover crops have been removed from areas at Jimna and Gallangowan on sites where it is predicted lethal frosts will not occur. These will be observed in the coming winters.

During the 1968 winter preliminary investigations, in collaboration with an officer of the Bureau of Meteorology, were initiated in the Yarraman area to determine factors likely to lessen severity of frosting. Indications are that under still air conditions a scrub break does not impede the flow of air down a gully and the temperature below the break is lower than above the break. Under gradient wind conditions the temperature on the windward side is higher than on the leeward side because of added turbulence. The presence of vegetation lifts the level of lowest temperature in the atmosphere from ground level to the general level of the vegetation. This work will continue in the winter of 1969.

Earlier work at Imbil on weed control on newly burned rain forest sites has shown that effective control of one group of weeds was given by 2,4-D ester, applied as a mist 1 to 1½ lb. (a.i.) per acre and of another group by 2,4,5-T ester applied at 1½ lb. (a.i.) per acre. There were indications in earlier work that in using mixtures of the two esters it was necessary to apply 1½ lb. of 2,4,5-T per acre but that a lesser quantity of 2,4-D might be effective. The 1968-69 work aimed to determine the most economic mixture of the esters and also the effect of adding an emulsifying oil, E95. It was found that a mixture of ¾ lb. of 2,4-D and 1½ lb. of 2,4,5-T gave 97 per cent. control of the weeds susceptible to 2,4-D but only 75 per cent. control of the weeds susceptible to 2,4,5-T. The percentage kill in the latter group increased as the quantity of 2,4-D in the mixture was increased up to 1½ lb. per acre, the highest level tested. The addition of one pint of emulsifying oil per acre did not improve the effectiveness of 2,4-D but it did improve the effectiveness of 2,4,5-T in killing susceptible weeds. Tests of diuron and bromacil in limiting weed germination following plantation burns were carried out at both Imbil and Yarraman. Because of the low weed germinations in untreated areas these tests were of little value in indicating the economics of using these soil-residual weedicides.

Some poorer sections of Hoop Pine plantations older than 30 years were fairly severely defoliated by the Hoop Pine branch pruner (*Coptopterus decoratus*) at scattered locations in the Mary Valley. Thinning and fertiliser treatments have been applied on an experimental scale to test whether this will limit the rate of spread of the insect.

In sections of recent plantings of Hoop Pine in the Yarraman district severe stem malformations have appeared at about age two years and have continued to about age four years. In the same area though not necessarily on the same trees severe die-back has appeared at about age four years. This "Yarraman disease" as it is designated demands thorough investigation and nutritional and pathological studies are being initiated.

Fertiliser trials using rates of application of nitrogen between 100 and 1,000 lb. per acre applied as ammonium sulphate to the base of two-year-old Hoop Pine growing on low quality eucalypt sites at Imbil have not shown any significant response during the first six months after application. This lack of response may have been the result of the dry season or grass competition. Pilot trials in the nursery testing applications of between 100 lb. and 600 lb. of nitrogen per acre, in the form of ammonium sulphate to unhealthy 16-month nursery stock, have shown responses in both colour and growth to all levels of nitrogen. The response to 200 lb. of nitrogen was as great as to 600 lb. of nitrogen.

The experimental planting of Red Cedar at Imbil reported in 1967-68 failed due to frost and drought. The planting will be repeated in the coming year. A second small planting is being used to test the effectiveness of the systemic insecticides gusathion, rogor and azodrin in the control of the shoot borer.

The programme of establishing trial plots of about five acres on well represented forest types in the Yarraman district, not currently considered to be plantable with Hoop Pine, continued with the outplanting of a further three plots bringing the total established in the last three years to 14.

The plots established this year were on a tall forest type at Mt. Binga with reasonable soil depth, a stunted forest type at Googa on shallow soils and a heavy black soil type in the Bunya Mountains. It is considered the plots now established reasonably sample the range of possible planting types in the Yarraman district. The recent drought caused heavy losses in 1967-68 trial plots with correlations between soil type, species and survival.

(ii) *Tree Breeding.* In the seed orchard at Imbil, in which field grafting began in 1965, 12 of the 20 clones present produced some ovulate strobili in 1968-69. This was the second successive flowering of any consequence. No staminate strobili were borne, however, even on the plagiotropic pollinator ramets that were first introduced in 1967. Hand pollination was therefore carried out again.

It was discovered recently that Hoop Pine trees of provenances in the Murgon and Monto districts appear to be exclusively late flowering. It is now proposed to establish the Taromeo orchard in two sections, one for early-flowering and the other for late-flowering clones.

The search for superior phenotypes of Yarraman District provenances (early-flowering) was accelerated, and by the end of the year the target of 30 "plus" trees for the orchard was almost reached. Stock plants in the 17-acre orchard site at Taromeo are expected to be ready for grafting in the spring of 1969. Searching for superior late-flowering trees will continue for another year or so, after which it is hoped to begin grafting some 30 clones in the second section of the orchard. Selection of additional seed trees and seed production areas was continued in plantations.

During the year measurements were made of 4.5-year-old trees in trials of routine stock and wind-pollinated and full-sib progenies. The parents were "plus" trees selected 10 years ago in Mary Valley plantations. Analyses revealed a pleasing number of progenies to be significantly taller than routine stock (see table). The genetic gain in height in the full-sib test was 20 per cent., while that in the two wind-pollinated tests was 16 and 10 per cent. respectively. Of the parent trees represented in the tests, trees H2, H6, H10, H15, H23, H26, H60, H61, and H63 are among the 20 that are included in the Imbil seed orchard. In several cases there is a poor parent-offspring relationship which suggests that phenotypic selection for vigour may be rather inaccurate.

Wind-pollinated Progenies†				Full-sib Progenies‡	
Progeny Code	Mean‡ Height (feet)	Progeny Code	Mean§ Height (feet)	Progeny Code	Mean‡ Height (feet)
HG	12.8**	H61	12.9**	H2 x HA	12.1**
ST60	12.4**	H2	12.3	HG x H10	11.9**
ST63	12.1**	H10	12.1	HG x HA	11.4**
H20	11.7*	H23	11.8	HB x H20	11.4**
ST239	11.4*	H26	11.4	H2 x H1	11.3*
ST260	11.3*	H6	11.2	H2 x H10	11.3*
HJ	11.2	H63	10.9	HG x H13	11.1*
HL	11.0	H64	10.9	H13 x H10	10.7
ST181	10.4	H60	10.6	H13 x HB	10.2
H28	10.1	H15	10.1	HD x HB	10.1
Routine	9.8	Routine	10.4	H20 x HA	10.1
				HD x H13	8.7
				Routine	9.1

\* Asterisks indicate significance of difference of means from mean of routine stock.

† Means of 4 replications of 49-tree plots after 4.5 years in field.

‡ Correlation of initial and final heights not significant so final heights not adjusted.

§ Height of stock at planting highly correlated with height at 4.5 years, so final height adjusted by co-variance.

A new progeny test of 30 full-sib progenies was started in the Imbil nursery and an outplanting of 55 full-sib progenies was established in the Mary Valley. An extension of this trial was made by planting 12 of the progenies at Goodnight Scrub to test their performance in that dry environment.

Wind-pollinated progenies of several trees selected at Yarraman for possible superior frost-hardiness, and of "wild" trees in a number of provenances subject to severe cold, were tubed in readiness for tests of the variation that exists in this trait.

Methods for striking cuttings of both young and old trees of Hoop Pine have been under study for some years. This is of value for the propagation of clones which are not amenable to heteroplastic grafting because of various types of stock-scion incompatibility. It is also important for the production of clones for special genetic studies, e.g., on incompatibility, and for possible commercial propagation of, e.g. frost-hardy individuals and other specially desirable trees.

Good progress has been made in propagating both young and old trees, by means of the following steps: induction of juvenile coppice near the base, collection and division of the coppice shoots into several pieces, treatment of the cuttings with root promoters and placement of the cuttings in humidified sand beds.

Provenance trials in which strong seed source effects have been observed are of limited scope, so it was decided to establish a new, comprehensive study of the genecology of the species. Seed collections were made in 1966, 1967 and 1968 from 12 or more individual trees in some 45 natural stands throughout the range of the species in Queensland, New South Wales and New Guinea. Wind-pollinated seed from six parents at each of 31 selected collection localities was sown in two replications at both the Benarkin and Gallangowan nurseries in the spring of 1968. Germinations were generally good at both nurseries. Wide variation in seedling size, form, leaf morphology and colour is evident between and within provenances. It is planned to sow seed from the other six trees per provenance in the spring of 1969.

A general paper on the breeding of Hoop Pine was presented at the Fifth Conference of the Institute of Foresters of Australia, Perth, 1968.

#### Mensuration and Biometrics

This section of Forest Research Branch is located in Head Office, and provides a biometrical and technical data processing service to research stations and other branches of the Department.

The staff position improved during the year with the filling of a vacancy for a biometrician. A technical programmer was also appointed as biometrician following completion of university studies.

A new set of volume tables for Caribbean Pine was prepared and issued, including total volume and merchantable volumes to 3, 4 and 6 inches d.u.b. The new tables indicate that the previous tables, based on limited data, were underestimating volumes of taller stands. Further measurements of Radiata Pine sample trees have been made, and a revised volume table for this species is being prepared to cover thinnings in stands with predominant heights above 70 feet. A check of the Hoop Pine volume table over a number of compartments in the Yarraman District proved quite satisfactory.

Predominant height data for all suitable Hoop Pine experiments at Imbil have been computed from the original field measurements, and will be used to prepare a revised site index prediction equation. Preliminary analyses have been carried out, but investigation of a number of basic growth functions is proposed, before the final form of equation is decided upon.

Good progress has been made with the transfer of old measure data of Beerwah experiments to punch cards, in addition to processing of current measurements. The input section of the computer programs used with these plantation experiments has been redesigned to make more efficient use of core storage and to provide compatibility during projected developments. Testing will commence in the near future. The procedures used in processing plantation experiments have been extended to White Cypress Pine experiments, and a modified program developed to handle these data. Major points of difference are the automatic computation of standing values and the inclusion of recruits.

Changes have been made in the coastal hardwoods detailed yield plot procedures to permit the inclusion of crown acceptability classes, and computer programs have been revised to utilise this. In addition, the standard detailed yield plot program will now handle plots of any size either singly or in groups, so that it can be used for processing many of the larger coastal hardwoods experiments as well as detailed yield plots. Preliminary design of a similar system for White Cypress Pine detailed yield plots has been carried out, and current remeasures are being recorded in a form suitable for card punching.

Processing of quarter chain linear sampling data from North Queensland rain forests was continued. Extensive revision of one program, and correction of a number of small errors were required.

In addition to routine analyses, biometrical projects for the year included completion of the analysis of a large series of arbocide experiments established in the Dalby district, design and analysis of pre-planting weedicide trials in Hoop Pine areas, investigation of aerial fertiliser distribution, design of a plywood glue-line experiment, and investigation of sampling intensity in White Cypress Pine management surveys. Assistance was given in determining a standard sampling procedure for preservative treated timber and design of a sampling scheme for Blackbutt regeneration areas on Fraser Island was commenced. Regression analysis of a time study of snigging in plantations was undertaken and equations were fitted to a number of sets of log price data.

A series of computer programs for analysis of variance, analysis of co-variance and regression analysis was prepared. These aim at combining the most frequently needed facilities with simple data preparation and minimum computer time, and do not attempt to duplicate the large, generalised statistical analysis program available at the Treasury computer installation.

Twenty copies of the card key for rain forest species were prepared for field testing prior to producing the final key. A small additional program was written to assist in data checking.

Preliminary analysis of the data from a degrade sawing study was undertaken, involving a considerable amount of programming. A part time course in FORTRAN programming was given for officers of the Department.

## NATIONAL PARKS

### Amending Legislation

The *Forestry Act Amendment Act 1968* included some important provisions for the management of National Parks in Queensland. Increasing park visitation inevitably brings problems in protecting the park from undue disturbance and thus necessitates special management. The preparation of a complete Management Plan for a park requires a detailed knowledge of the park which cannot readily be obtained, for the relatively large number of separate parks in Queensland. What can be done however is to apply specialised management to certain areas of selected parks as knowledge of these areas is obtained and as park usage patterns become discernable.

The amendments to section 40 of the Forestry Act make provision for such specialised management. Within existing National Parks areas may be declared as Primitive, Primitive and Recreation, Recreation, Scientific or Historic, and managed in certain specific directions accordingly. It is emphasised—

- (1) that the basic reservation of National Park and the procedures adopted in setting aside a National Park are not changed;
- (2) that the declaration of these Special Purpose areas within a National Park should take place only when in the opinion of the Conservator sufficient information is available with respect to the flora, fauna and natural features of the park and its potential value in relation to the uses to which the park may be lawfully applied.

Under this amending legislation the term "Scenic Area" for reservations under 1,000 acres was deleted and all such areas are now known as National Parks.

### Protection of Animal Life

The amending legislation also made it clear that all forms of animal life are protected on a National Park by an appropriate alteration in the definition of "Forest Products". While it had always been the intention that all forms of animal life should be protected some doubt had arisen as to the interpretation of the original definition. The new definition clarifies the position.

### Interstate Conference on National Parks

The Third Ministerial Conference on National Parks was held in Queensland from the 23rd to the 27th June, 1969, and was attended by Ministers from all Australian States, with the exception of Tasmania. A delegate from the Commonwealth Government representing the Minister for the Interior also attended. The Ministers were accompanied by Officials concerned with the administration of National Parks in the various States. The Minister for Lands, the Honourable V. B. Sullivan, M.L.A., was conference chairman. Departmental officials from Queensland attending were the Conservator of Forests, Mr. A. R. Trist; the Secretary of the Department, Mr. W. Wilkes, the National Parks Biologist, Mr. H. S. Curtis, the Zoologist, Mr. P. S. Ogilvie and Forester P. J. Stanton. Mr. A. W. Whitaker acted as Conference Secretary.

The Honourable V. B. Sullivan, M.L.A., in opening the Conference paid a well deserved tribute to his predecessor as National Parks Minister, the Honourable Harold Richter, M.L.A., whose ill-health forced his retirement shortly before the Conference. Mr. Sullivan said of Mr. Richter—

"As the Minister for Local Government and Conservation in this State for a number of years he accomplished much in those wide and diversified fields. I know that he had a particular affection for National Parks and that he was a most helpful, constructive and sympathetic Minister".

The Agenda for the formal Conference in the former Legislative Council Chamber of Parliament House, provoked much useful discussion over a wide range of subjects relating to the many problems concerned with National Park administration throughout Australia. Action is in hand to follow up a number of resolutions passed at the Conference.

Delegates were afforded the opportunity of making pre-conference tours to various National Parks in South Eastern Queensland including Natural Bridge, Purlingbrook, Springbrook and Lamington, with overnight stays at Binna Burra Lodge and O'Reilly's Guest House. At the conclusion of the Conference, delegates also visited Jollys Lookout and Maiala National Park at Mt. Glorious.

An invitation was extended by Mr. M. V. Porter, Minister of Public Works, Victoria, to hold the Fourth Ministerial Conference in 1970 in Victoria. This was agreed to by all delegates.

These conferences have proved very valuable not only for the formal discussion which takes place but also for the opportunity which they afford for the interchange of ideas and knowledge in personal discussion between individuals away from the conference table.

### Ranger Training

Reference was made last year to the attendance of officers from Queensland at the New South Wales Ranger School. A further invitation was received and three officers attended the 1968 School. The courtesy of the New South Wales Government and its National Parks and Wildlife Service in allowing officers from other States to attend is gratefully acknowledged.

### Lamington Administration

The importance of Lamington National Park warrants the development of an administrative headquarters for the park, and it is desired to record appreciation of the action of Queensland Holiday Resorts Pty. Ltd. in allowing the Department to acquire an area of land from Binna Burra property which will enable such development to take place without the necessity of having to clear part of the park.

### National Park Reservation Proposals

Work on the task of securing adequate National Park Reservations for Queensland continued during the year. National Parks staff inspected park proposals in many parts of the State. Wet tropical lowlands, inland dry "scrubs", geological features of interest, brigalow scrub, wallum areas, Araucarian vine forests were some of the types of country inspected.

Australia has one of the most highly urbanised populations in the world, and in a few decades this population will have to rely mainly on National Parks and similar reserves for those forms of outdoor recreation requiring natural surroundings. It has become clear that in a modern industrialised community such recreation is essential for the mental and physical health of the population. These facts should be basic criteria in considering any proposal to set aside an area as National Park.

### Tropical Lowlands

In the previous annual report mention was made of the series of 20 proposed reserves intended to preserve representative samples of the tropical wet lowlands. *Reservation of these areas is now well in hand.*

Six of the proposed National Parks were proclaimed prior to 30th June, 1969 and four more should be reserved in the near future.

Investigation of the remaining areas should be finalised in 1969-70.

### Wallum National Park Proposals

Wallum development is now proceeding apace and opportunity to preserve samples of this interesting assemblage of plant communities in their natural state will soon be gone. Based on a published C.S.I.R.O. survey of the Wallum lands a series of representative areas have been selected and action initiated towards seeking their reservation as National Parks.

### Brigalow Areas

Some progress has been made in securing reservation of brigalow associations. A National Park has been proclaimed over about 8,385 acres on the Dawson River north of Injune whilst it is hoped to effect in the near future a reservation along the Moonie Highway. Another National Park in Area 3 of the brigalow development scheme, is under consideration.

However these 3 areas represent only a small fraction of the original area of brigalow. Action is in hand to supplement them to some extent by administrative action to preserve the more valuable of the relatively small areas of brigalow which occur in State Forests in the Dalby and Warwick Forestry Districts.





**BOAT FOR NATIONAL PARKS SERVICE.** This modern 20-foot boat fills a long-felt need in the management of the National Parks on the coastal islands of the Barrier Reef.

### New Reservations

The following new reservations were proclaimed during the year ended 30th June, 1969.

(a) NATIONAL PARK 645, PITT. On 26th October, 1968 an area of about 13,800 acres in the parish of Pitt was proclaimed a National Park. Situated south of Cardwell, the area is a unique biological complex at the southern limit of the wet tropics in Australia. It coincides with the limit of mesophyll vine forest and various species of plants and animals.

(b) NATIONAL PARK 1334, GLADY. On 23rd November, 1968, an area of about 3,050 acres embracing much of the well-known Eubenangee Swamp about 10 miles north-west of Innisfail was proclaimed National Park. It contains open water pools, sedge swamps and Tea-Tree swamps as well as some treeless grasslands and rain forest. Being on basaltic alluvia, these swamps exhibit important floristic differences from swamps on alluvia from granitic or from metamorphic rock. The swamps and their surroundings also provide a valuable habitat for a number of species of water birds.

(c) NATIONAL PARK 647, ROCKINGHAM. A National Park covering an area of about 1,350 acres in the parish of Rockingham was gazetted on 23rd November, 1968. The park is situated east of Tully between the Hull River and the Tully-Mission Beach Roads and represents a typical area of Lowland vegetation on granite soils of the very wet coastal plain. It contains mesophyll vine and palm forests, tall grassy woodlands with sedge forest patches and low layered woodland and supports more than 20 species of rain forest birds including the Cassowary and Scrub Hen.

(d) NATIONAL PARK 1161, NOOSA. An area of about 1,141 acres in the parish of Noosa was reserved as National Park on 30th November, 1968. Much of the wallum country on the lowlands of the coastal area north of Brisbane is rapidly being developed and the park has preserved a good sample of typical undisturbed wallum land supporting flora and fauna associated with such country.

(e) NATIONAL PARK 135, CURLEWIS. On 21st June, 1969, an area of about 13,500 acres in the parish of Curlewis was proclaimed a National Park. The Park is located halfway between Bowen and Ayr and covers the northern section of Cape Upstart. Named by Captain Cook, Cape Upstart is spectacularly rugged with outstanding scenic beauty. The terrain is extremely diverse and ranges from the starkness of great rock ramparts facing the sea, through stunted eucalypt forests to pleasant scrub lined creeks on the landward side.

(f) NATIONAL PARK 76, MELLISH. On 21st June, 1969, an area of about 8,385 acres in the parishes of Mellish and Pyramid was declared a National Park. Situated north of Injune and formerly part of Lonesome Holding, the area has preserved in its natural condition a sample of the Brigalow Scrub which is being cleared under the Fitzroy Basin Development scheme and provides a vantage point for the scenic views of the Arcadia Valley and Dawson River Gorge.

(g) NATIONAL PARK 1356, BELLENDEN KER. An area of about 1,170 acres in the parish of Bellenden Ker and situated at the mouth of the Russell River, north of Babinda was proclaimed a National Park on 28th June, 1969. The new park secures a mangrove habitat in a high rainfall zone.

### Additions to Existing Parks

Additions totalling 3,253 acres have been made to various parks during the year, the most notable being the addition of 2,588 acres to National Park 914, parish of Walsh (Burrum River) and 480 acres to National Park 1024, parish of Gladly.

### Area of National Park Reservations

As at 30th June, 1969, there were 261 National Parks covering an area of approximately 2,369,116 acres.

### Fires

In common with other areas National Parks suffered some severe fires during 1968-69. Major outbreaks occurred at Lamington, Springbrook and Noosa. One fire on Lamington threatened the unique and interesting mountain Mallee-Heath community at Dave's Creek. Its successful control in difficult country was greatly facilitated by the use of a helicopter to determine the extent of the fire and to locate a site for a fire line where physical access would be possible. The helicopter was made available in the emergency by the Army and it is desired to express appreciation for this.

### International Biological Programme

National Parks officers are co-operating with the Department of Botany of the University of Queensland in its participation in the International Biological Programme. The specific study concerns the conservation of major plant communities in Australia and involves, *inter alia*, the listing of the main vegetation types which occur on existing National Parks of Queensland.

### Tree Name-plates

Tree name plates were renewed and additional ones attached along tracks in several parks in south-east Queensland. This feature has proved popular with park visitors and will be extended. However it involves quite a large amount of work in checking the identity of the tree, ensuring that the botanical name is correct and selecting the most desirable of the vernacular names where more than one exist.

### A Picnic Ground Maintenance Problem

An unusual problem which arose on a Lamington National Park picnic ground is now well under control. A combination of high wallaby population and drought resulted in the loss of grass cover over a major area of the picnic ground. Natural regrassing of the area was prevented by erosion plus the wallabies habit of preferring to eat any new shoot which appeared rather than graze on the fully grassed areas. Top dressing, replanting and temporary fencing of the worst affected sections was necessary to re-establish the grass cover.

### Lyrebirds

Study has commenced on the Prince Albert Lyrebird (*Menura alberti*), one of the most interesting animals of Queensland. Lyrebirds are renowned for their powers of mimicry and the work has been concerned with a study of Lyrebird song by means of tape recordings. During 1968-69 broad indications were obtained of the variation of song within and outside the breeding season and between the birds in various localities. It is proposed to continue the study during the forthcoming year and the work will be greatly facilitated by the use of automatic recording apparatus generously made available on loan by the Wildlife Research Division of C.S.I.R.O. It is hoped that the data obtained will prove of value to C.S.I.R.O. by supplementing the work they have already carried out on the Superb Lyrebird.

### Literature

During the past year new leaflets were produced for Springbrook, Natural Bridge and Lamington National Parks, and a particularly fine map of Lamington has been printed.

### Some Features of the Year's Work

**TRACK SYSTEM**—A further 222 chains of new tracks were constructed during the year bringing the total length of track systems as at 30th June, 1969, to 270 miles 55 chains.

In addition to expanding the walking track system and carrying out maintenance work on walking tracks and other facilities, the following work was undertaken during the year:—

**Lamington**—A new 6-man barracks was built at the Binna Burra end of the Park.

A picnic area with tables, fire place and safety fenced lookout was constructed at Moran's Falls near O'Reilly's Guest House.

**Bunya Mountains**—A large number of Hoop and Bunya Pine were planted on the sides of the new road through the Park.

**Cunningham's Gap**—A further toilet block was provided on one of the picnic grounds and commencement made on a shelter shed.

**Mt. Glorious**—The old shelter shed at Jolly's Lookout was reconstructed into a feature of dignity and interest.

**Springbrook**—Further picnic tables were provided at Gwongorella.

**Noosa Heads**—A compass indicator was erected at Tingirana Lookout.

**Natural Bridge**—Toilet system improved and hand basins installed. A new 2,000-gallon tank was installed at the Camp.

**Girraween**—A new tool shed and garage were constructed and improvements carried out to the camping and picnic area.

**Carnarvon**—A new 4-cubicle septic block was provided. A new 2,000-gallon tank was installed and shower facilities extended. Additional fire places were built.

**Eungella**—New septic toilet block was completed. Picnic area was fenced. A new storeroom/garage was built at Broken River.

**Finch Hatton Gorge**—Gents toilet block was constructed.

**Cape Hillsborough**—Picnic tables and fire places were provided and 1,000-gallon water tank installed.

**Conway**—Park headquarters were built. Additional table and fireplaces provided.

**Mt. Elliott**—Tables and fire places built and toilets provided. Picnic and parking area was extended.

**Mt. Spec**—A new shelter shed and additional tables and seats were constructed.

**Magnetic Island**—Fire lines were cut to afford greater protection.

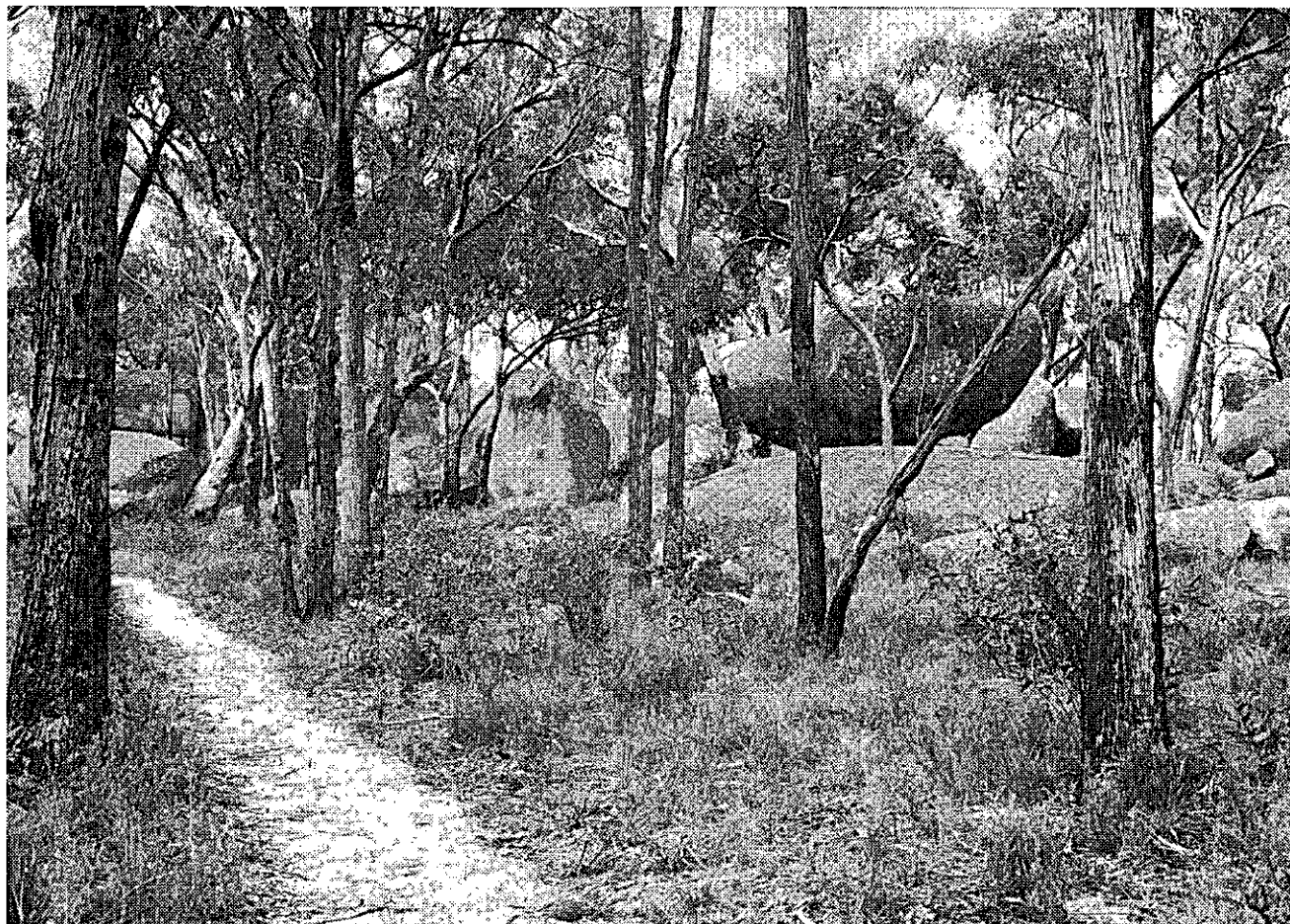
**Jourama Falls**—Tables and fireplaces were provided and road access was improved.

**Wallaman Falls**—Additional tables were constructed and a further 3 fire places provided. A foot bridge was constructed over a gully on the walking track. Parking area was improved.

**Hinchinbrook Island**—New picnic tables were constructed.

**Palmerston**—A toilet block has been constructed at Crawford's Lookout.

**Chillagoe Caves**—Passage-ways and access within the Cave systems were improved by means of further "Ship's Ladders" concrete stairways and handrails. Gas lighting was installed in Stage Cavern and the Ball Room.



**WYBERBA NATIONAL PARK, THE GRANITE BELT.** Typical Granite Boulders with walking track. Work on this Park commenced in 1965-66 and its wild flowers and rugged beauty attract some 25,000 visitors each year.

## HARVESTING AND MARKETING

## General

The volume of milling timber (including pulpwood) cut from Crown Land during the year was, at 227,113,204 superficial feet Hoppus measure, remarkably close to the figure for 1967-68.

Considering the species groups there were only two movements of consequence—the cut of Forest Hardwoods fell by about 4,000,000 superficial feet, whilst the cut of plantation timber (including pulpwood) increased by about 5,400,000 superficial feet.

Softwood plantation timbers are of increasing importance in the overall Crown operation. The way in which the increased cut of these timbers is more than offsetting the decline in the cut of natural Hoop and Bunya Pine is shown in the following Table.

	Natural Hoop and Bunya Pine	Plantation Timbers (including pulpwood)
1958-59 .. ..	40,808,000 super. feet	20,296,000 super. feet
1968-69 .. ..	20,211,000 super. feet	49,337,000 super. feet

A system survey was commenced during the year on the compilation of stumpage accounts for log timber and of statistics relating to the Harvesting and Marketing of timber. This is preliminary to the design of a series of computer programmes which it is hoped will replace the present methods of handling such work. Advantages expected will be a reduction in the time spent by field and office staff on stumpage accounts and a rationalisation and standardisation of accounting and record-keeping, with wider and more ready availability of statistics.

## 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 including Pulpwood
	Hoop and Bunya Pine	Kauri Pine	Plantation Thinnings	Pulpwood	Hardwood	Cabinet Woods	Miscellaneous	White Cypress Pine		
(1,000 superficial feet Hoppus)										
1963-64 .. ..	29,597	1,685	32,860	416	230,424	20,306	42,772	53,328	12,478	423,866
1964-65 .. ..	27,059	2,058	37,761	3,637	219,397	22,646	43,862	55,447	12,088	423,955
1965-66 .. ..	26,247	1,529	36,271	3,918	229,805	23,167	45,579	50,402	8,024	424,942
1966-67 .. ..	24,009	1,627	36,668	4,889	224,073	19,550	40,176	49,261	8,962	409,215
1967-68 .. ..	21,936	1,582	40,284	5,000	216,679	20,743	42,770	56,803	11,598	417,396
1968-69 Estimated ..	24,000	1,900	43,000	6,300	230,000	21,000	45,000	54,000	11,000	436,200



**TRACTOR SNIGGING IN HOOP PINE PLANTATION, AMAMOOR.** Tractor snigging is becoming general practice with Plantation Thinnings. A record 49 million super. feet of these thinnings were logged during the year.

**Mill Logs—Crown Lands**

The following are the annual quantities of Mill Logs obtained from Crown lands as from 1959-60:—

			Super.feet (hoppus)				Super.feet (hoppus)
1959-60	..	..	239,000,000	1964-65	..	..	229,000,000
1960-61	..	..	219,000,000	1965-66	..	..	241,000,000
1961-62	..	..	187,000,000	1966-67	..	..	212,000,000
1962-63	..	..	194,000,000	1967-68	..	..	227,000,000
1963-64	..	..	212,000,000	1968-69	..	..	227,000,000

Quantities of the various species of log timber cut from Crown Forests during the past five years is shown below:—

Year	Hoop and Bunya Pine	Kauri Pine	White Cypress Pine	Forest Hardwoods	Scrub Hardwoods	Cabinet Woods	Miscellaneous	Plantation Timbers	Pulpwood
(1,000 superficial feet Hoppus)									
1964-65	21,195	1,913	31,944	66,381	14,050	19,697	33,106	37,757	3,637
1965-66	22,769	1,681	26,425	72,947	16,478	20,389	37,881	38,116	3,918
1966-67	21,144	1,598	25,197	68,648	11,191	14,538	26,970	37,450	4,889
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

**The Timber Business**

	1967-68	1968-69
<b>(a) Mill Logs—</b>		
Hoop and Bunya Pine	19,644,000 super. feet	20,211,000 super. feet
Forest Hardwoods	69,298,000 super. feet	65,257,000 super. feet
Scrub Hardwoods	14,183,000 super. feet	13,834,000 super. feet
White Cypress Pine	29,178,000 super. feet	27,933,000 super. feet
Kauri Pine	1,601,000 super. feet	1,811,000 super. feet
Cabinet Woods	17,412,000 super. feet	17,866,000 super. feet
Miscellaneous Species	31,652,000 super. feet	30,864,000 super. feet
Plantation Timbers	39,000,000 super. feet	42,996,000 super. feet
Pulpwood	4,938,000 super. feet	6,341,000 super. feet
Limb Logs, Head Logs, Stumps and Flitches	13,000 super. feet	29,000 super. feet
	<b>226,919,000 super. feet</b>	<b>227,142,000 super. feet</b>
<b>(b) Construction Timbers—</b>		
Headstocks, Transoms, Crossings, Braces, &c.	214,214 super. feet	455,506 super. feet
Sleepers	627,873 pieces	693,024 pieces
Girders, Corbels, Piles, Sills, and Girder Logs	88,044 lineal feet	58,990 lineal feet
Poles	457,666 super. feet	495,493 super. feet
House Blocks	199,752 lineal feet	294,443 lineal feet
Mining Timbers—Round	12,176 lineal feet	15,678 lineal feet
Mining Timbers—Split	214,695 lineal feet	216,652 lineal feet
Mining Timbers—Sawn	Nil	488 pieces
	42,127 super. feet	22,859 super. feet
Gross receipts from Timber Sales, &c.	\$4,406,521.27	\$4,840,696.63
Net Revenue	\$2,409,146.64	\$2,689,955.15

**Hewn Timber Prices**

No price change made during the year.

**Rosewood**

Approximately 50 tons of Rosewood was purchased and exported to Hong Kong during the year.

No Sandalwood was purchased or exported during the year.

**Timber Felling and Timber Getting Award—State**

During the twelve months under review, variations of rates under this Award included provision for a competent cutter to earn a minimum wage of \$57.49 per week, (previously \$56.14 per week) in the Eastern District of the Southern Division of the State, such increased margin also applying to rates for other defined areas.

However the most important variation was the introduction of rates for timber cutters using mechanical saws.

**Logging Roads—1968-69**

The Department's Road Programme for the year involved 59 miles of new construction.

Location and working surveys covering 41 miles were carried out.

Expenditure from Forestry Votes was as follows:—

	\$
New Construction	330,803
Maintenance	166,765
Subsidies to Shire Councils	52,653
Workers' Compensation	5,803
Pay Roll Tax	5,768
Surveys	2,986
Freights and Fares	5,336
Resumptions for Access	1,456
	<b>\$571,570</b>

**Logging**

The table below shows the quantities of timber hauled during 1968-69 by contractors to the Department and the payments made to them for this work:—

Class	Quantity	Payment
South Queensland—		\$
Hoop and Bunya Pine	13,659,495 Super. feet	
Forest Hardwoods	129,976	
Scrub Hardwoods	50,004	330,147.68
Miscellaneous	92,496	
Red Cedar	26,465	
	<b>13,958,436</b>	<b>330,147.68</b>
North Queensland—		
Cabinet Woods	915,619	24,968.14
Totals	<b>14,874,055</b>	<b>355,115.82</b>

Constructional Timbers—Departmental Contracts

Below are shown figures for supply of constructional timbers from Crown Lands for 1968-69 in comparison with those for the previous two years:—

Class of Timber	1966-67	1967-68	1968-69
Sleepers .. .. .	345,499 pieces	349,770 pieces	403,379 pieces
Crossings .. .. .	17,348 super. feet	53,250 super. feet	93,388 super. feet
Transoms .. .. .	51,059 super. feet	77,194 super. feet	96,824 super. feet
Bridge Timbers—Girders and Piles .. .. .	19,280 lineal feet	24,286 lineal feet	27,549 lineal feet
Girder Logs .. .. .	429,729 super. feet	457,666 super. feet	495,493 super. feet



**MELLUM CREEK BRIDGE—BEERWAH PLANTATION AREA—Constructed during the year at a cost of \$3,970: background of Loblolly Pine aged 34 years—Compartment 7, Mellum Logging Area.**

**SAWMILLS LICENSING**

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

During the first three quarters of the year an average of 484 mills were in active operation and this compares with the average of 490 for the preceding year.

The following table shows the position in regard to Sawmill Licenses as at 30th June, 1969:—

Number of Licenses as at 30-6-68	Classification	New Licenses Issued	Changes in Classification		Licenses not Renewed			Current Licenses as at 30-6-69	Total Licenses as at 30-6-69
			Plus	Minus	Refused	Relinquished	Under Consideration		
490	General mills .. .. .	1	..	..	5	14	2	470	472
6	Case mills .. .. .	..	..	..	..	..	..	6	6
29	Sleeper mills .. .. .	..	..	..	..	2	..	27	27
11	Other restrictions .. .. .	1	..	..	..	..	..	12	12
536		2	..	..	5	16	2	515	517

In June of this year approval was given to a scheme proposed by the Department, after discussion with the industry, which permits amalgamation of Sawmills within certain specified zones. The implementation of this scheme will lead to a reduction in the number of individual licenses and to the utilization of available log supplies in fewer more economic units.

#### Offences

During the year ended 30th June, 1969, officers reported 136 breaches of the Act and Regulations administered by the Department.

Proceedings were successfully instituted against 7 persons and fines totalling \$210 imposed.

In 54 cases of unauthorised timber operations where it was considered the offence did not warrant proceedings, the value of the timber was collected and warnings issued. Appropriate action was taken in other cases.

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 a result of action taken in all cases, an amount of \$7,814.76 was recovered by the Crown in timber revenue.

### FOREST PRODUCTS RESEARCH

#### 1. Engineering and Seasoning

With the increasing interest being shown by the Timber Industry in the conversion of plantation timbers to stud and scantling sizes, research is being concentrated on the ways in which a stable dry product can be produced.

Although material fixed green gives very few problems, this is in general impracticable to do and due to the small size of available trees, distortion during drying can be serious unless care is taken in the conversion and seasoning operation.

With the co-operation of Industry an experiment was commenced to determine the effect of drying small Hoop Pine logs before conversion. Indications to date are that during drying in the round, the logs stabilise and it would appear that stud sizes cut from such material remain straight. It is hoped to find at what moisture content satisfactory recovery of these sizes can be achieved.

With species normally sawn with bark on, pilot trials by C.S.I.R.O. and overseas experience indicate that kiln drying at high temperatures could result in a stable product being produced. Experiments using the Department's kiln, which has been modified to obtain the desired temperatures, have been arranged to dry sawn timber provided by the Timber Industry.

In co-operation with the university, small-scale tests have been carried out on finger jointed and laminated material from plantation grown timbers and these indicate that products acceptable to the user can be produced.

Problems with raised and shelled grain in machining Slash and Loblolly Pine were related to the non-uniformity of texture of these species with marked development of late wood. These defects, common in more temperate zones and acceptable to the trade in such countries are exaggerated by comparison with the remarkably uniform indigenous species (Hoop and Kauri Pine) with which the local trade is familiar. Precautions to minimise the incidence and extent of these processing defects were prescribed.

#### 2. Sawmill Economics

No mill studies were carried out on a commercial scale during the year under review. Data obtained from the Cypress Pine studies carried out at 10 mills has been examined in detail with a view to revision of the log classification rules in order to obtain a better relationship between visible appearance of the logs and the sawn material produced.

Sawing studies have been carried out on various species and ages of plantation material being felled from experimental plots. These studies have been undertaken to obtain additional information on the quality of sawn material which will be obtained from the larger logs now becoming available in quantity and will assist in log price determination.

Emphasis has been placed on scantling sizes which will be tested for mechanical and seasoning properties with the object of obtaining information for the future utilisation of our plantation grown timbers.

During the year, data from 10 per cent. samples of stumpage accounts was taken out for Hardwoods, Cypress Pine and for rain forest species from North Queensland and provided interesting and valuable information on the type of log that is being provided to Sawmills.

The 10 per cent. sample for rain forest species over the period showed that the percentage of cabinet woods is being maintained and under the present tree-marking practices the volume of logs less than 6 feet in girth has reduced from 35 per cent. in 1966 to 26 per cent. in 1968. This means that Industry is now receiving a better parcel of logs than it did prior to the beginning of 1967.

#### 3. Utilisation

Some 900 enquiries were received from all sections of the Timber Industry for advice on the properties and uses of Queensland and imported timbers and of minor Forest Products.

Interest in imported softwoods and rain forest species for use as mouldings continued and these timbers almost completely supplanted local material on the Brisbane market. Insistence by the State Governmental construction authorities on the use of Australian grown timbers has restored portion of the market to local species which are available in ample quantities.

With increasing quantities of plantation grown softwoods becoming available more attention is being devoted to their utilisation and marketing. There is a growing realisation that these species can replace dwindling supplies of hardwoods in building construction uses for which their suitability has been long recognised overseas. Some producers have been content to supply and builders to use these softwoods in accordance with normal practices used for hardwood without regard to the desirability of minor adjustments in normal procedures in order to exploit to the full the advantages of Pine as a structural material. Although unseasoned material can be used for framing; the public is becoming more demanding in constructional quality standards and more reluctant to accept the adverse effects of shrinkage and distortion tolerated as normal in hardwood framing. The Pines shrink less, season more quickly than the hardwoods and can be fabricated more easily when dry and for these reasons will be preferred for general building framing. Technical assistance has been given to Industry to overcome minor problems associated with the production of seasoned sized scantlings but architects and builders must recognise their responsibility in using this material correctly.

Finger jointed pine studs are now being marketed and glued laminated Slash Pine scaffold planks have been given provisional acceptance by the appropriate authority and they are being closely checked to ensure satisfactory in-service performance.

Whilst laminated beams of Brush Box have been accepted by architects for use as feature material, it is considered that there is a real need for mass produced, pre-shrunk laminated building members as a utility product in standard framing sizes. Such product would replace unseasoned hardwood. The pines and low density brushwoods are particularly suited to the production of this type of material. Price reduction to an acceptable level can be achieved by the judicious use of higher strength laminates in the highly stressed outer zones with low grade material in the central three-fifths of the beam depth.

With the trend to vermin plate construction, builders adopted the undesirable practice of permanently fixing seasoned flooring and using it as a platform for completion of the building. This practice is being discouraged as it promotes, cupping, checking and movement of the floor.

The greater use of air conditioning in buildings, makes it necessary for designers, builders and joiners to realise the need to modify established practices in such buildings. Fixing of seasoned timber at the normal 10-15 per cent. moisture content range prior to switching on of the air conditioning unit results in joint failures and, with parquet flooring, lifting of the fingers. Specifications and constructional schedules should be arranged to allow permanent fixing after the controlled conditions have been in operation for a stabilisation period.

The use of Departmental buildings to demonstrate the effective use of plantation timbers is being continued and emphasis is to be placed on service tests of widely used non-film finishes which have a shorter life than film finishes but which have the advantage of lower maintenance costs under some conditions of use.

Through membership of Timber Technical Committees and sub-committees of the Standards Association of Australia assistance has been provided in the preparation and revision of numerous timber standards. The completion of a set of standards for Australian grown softwoods now being printed will give a complete set of Standards for Queensland species.

To achieve the most efficient use of the raw material available from the forests, it is essential that all products be graded to these standards and that specifiers and users become familiar with them and order accordingly. Proper use of these standards will help both miller and purchaser and improve the performance of timber in those uses it is properly qualified to meet.

Three officers attended the Fourteenth Forest Products Conference held in Sydney and several papers were presented. Lectures were continued for the Certificate Course in Wood Technology at the Eagle Farm Technical College. That this course is being appreciated more by Industry is evidenced by the enrolment this year of 46 students in stage 1 of the course.

Under the Timber Users' Protection Act, 33 complaints were received and investigated and of these, 4 showed no breach, 18 were settled by the parties concerned, 1 conviction secured and the balance are still under consideration. In addition, some 200 routine inspections and 9,000 miles were travelled in investigational work carried out in connection with utilisation of timber.

#### 4. Wood Structure and Timber Physics

Some 5,200 wood samples were identified during the year and, for many of these timbers, information on properties and uses was provided. The marketing of an unprecedented number of species imported from a wide range of countries has necessitated a much more intensive study of the anatomy of imported species. Accurate identification is essential if published data on imported species is to be of any value and, when such is not available, anatomical examination assists in reliable assessment of properties and utilisation potential.

Screening of 16 trees selected on external characters for the Hoop Pine seed orchard to be established at Taromeo revealed that all had acceptable wood quality. These preselections were predominantly from the Brisbane Valley. The wood quality of these trees was less variable than was the case with the preselections for the Imbil orchard which came chiefly from Mary Valley plantations. This is probably explained by the wider range of provenances represented in the Mary Valley than in the Brisbane Valley plantations. Evaluation of a further 12 candidates is in progress.

The comparative evaluation of the wood quality of parental stock, their open and control pollinated progenies and routine stock of Slash Pine has continued. Work last year had indicated a deterioration in most wood quality assessment criteria in the half-sib families as a group compared with routine stock. Even lower values for the parental stock suggested an adverse effect due to the faster growth rate of progenies and parents. Extension of this work to 12 thirteen-year-old control-pollinated progenies, more representative of stock from the seed orchard, indicates from incomplete data that, although fibre length appears slightly lower in the full-sib families than in routine stock, other inferiorities have not shown up. In fact, spiral grain and micellar angle appear superior to routine stock. The comparisons were made on the 10-year core in all cases and studies in older stock will be undertaken as soon as possible.

A preliminary evaluation of wood quality characteristics of three thirty-five-year-old trees of Suji grown in an arboretum at Benarkin indicates that the characteristics studied were superior to those from published data for Japanese grown material. Basic density was low but uniform at 24.2 lb./c.ft., the pith to bark trend providing only a slight increase with age. Cell wall organisation was good, grain spirality low and uniform, percentage late wood low at 18 per cent. Mature tracheid length was low in comparison with other Queensland grown conifers but adequate at around 3.5 mm and tracheid diameter 25-30 $\mu$ . This species could provide a useful, good-working, uniformly textured wood with an appearance quite different from other conifers in this State.

Continuing comparative evaluation of the wood of Caribbean Pine with other species confirms earlier assessment of its high potential. Its textural uniformity, cell wall organisation and fibre length are superior to Slash and closer to Hoop Pine, its grain spirality is superior to both, and basic density in the 10-year core only 2 lb. lower than both which, at that age, have similar values.

Studies are in progress on Hoop Pine, Caribbean Pine and Loblolly Pine with a view to evaluating the relative effect of each structural and physical characteristic used in wood quality assessment on specific properties of timber, plywood and pulp products. This information is essential to the development of criteria for the framing of effective selection indices for use in tree improvement work. The structural and physical property analysis has been commenced. Multivariate analysis will be used to determine the weighted effect of each feature on mechanical properties, the distortion

rating of sawn material, preservative penetrability and retention, and paper handsheet properties of matched samples. This is a comprehensive project on which data will be accumulated as time permits.

Preliminary reports on the pulping trials conducted by the Division of Forest Products on plantation grown conifers of Slash, Loblolly, Hoop and Caribbean Pine indicate that these species are satisfactory for pulp and paper production, the properties of which should be comparable with that from Radiata Pine.

#### OFFICER TRAINING

(i) Foresters are recruited from graduates in Forestry for the most part through the State Scholarship Scheme. The Forestry course involves 4 years at University—the 1st in Queensland and 3 years at the Australian National University in Canberra. As at 30th June, 1969, the numbers of undergraduates holding State Scholarships were:—First Year, 5; Second Year, 4; Third Year, 9; Fourth Year, 3.

(ii) Sub-professional Officers and Overseers are afforded training under the Forest Trainee Scheme. Trainees are selected from applicants of at least Junior standard and undertake a 3-year course of practical training and study designed to meet the needs of all branches of forest work—Reforestation, Harvesting and Marketing, Survey and National Parks.

This year 30 trainees began the course and the number in training at the end of June was 61.

To supplement the recruitment from this scheme and to provide avenues of advancement for older employees of outstanding ability an Adult Trainee Course of 18 months duration leading to Overseer grading has been designed and will be implemented in the coming year.

#### STAFF

As at 30th June, 1969, there were 499 salaried officers on the staff comprising 217 in Head Office and 282 at District centres. This represents an increase of 11 on the number of staff as at 30th June, 1968. The number of wages staff employed was 1,536.

Thirty-eight salaried officers left the Department during the year, including 2 officers who retired after long and meritorious service, namely:—

Mr. R. V. Collins (Forest Ranger Division I, 41 years' meritorious service)

Mr. A. R. Cole (Forest Ranger Division II, 41 years' meritorious service)

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

#### ACKNOWLEDGEMENT

I acknowledge with sincere appreciation the wholehearted support and co-operation which I have received from all members of the staff not only during the past year but during the whole of my 50 years service in Forestry in Queensland.

At all times the staff have shown a dedication in furthering the varied interests of the Department and the good fellowship which prevails is a cause of much gratification to me.

As this is the last Annual Report that I will have the honour to submit, it is appropriate to specially acknowledge the outstanding service of some of the officers with whom I have been associated for so long, and the loyalty, support and inspiration accorded to me by them. In particular, I would refer to the Deputy Conservator (Mr. L. J. Rogers), the Senior Forester (Mr. C. Haley) and the Secretary (Mr. W. Wilkes). I also desire to record with gratitude, acknowledgement of the work and dedication of all Heads of Sections and District Foresters.

Finally, to one and all, a most sincere thank you for your assistance, your guidance and your loyalty.

A. R. TRIST,

Conservator of Forests.

## APPENDICES

## APPENDIX A

## Return of Timber, &amp;c., removed from Crown Lands during the Year ended 30th June, 1969

SPECIES	QUANTITY		
	Super. feet	Super. feet	
<b>Milling Timber—</b>			
<b>(a) Native Forests—</b>			
Hoop and Bunya Pine—			
Ply .. .. .	2,487,485		
Logs .. .. .	9,258,004		
Tops .. .. .	8,465,148		
			20,210,637
Kauri Pine .. .. .	1,811,341		
White Cypress Pine .. .. .	27,932,987		
Forest Hardwoods .. .. .	65,257,261		
Scrub Hardwoods .. .. .	13,834,387		
Cabinet Woods .. .. .	17,865,529		
Miscellaneous Species .. .. .	30,863,579		
Limb Logs, Head Logs, Stumps and Flitches	29,178		
			157,594,262
<b>(b) Plantation Thinnings—</b>			
Hoop Pine .. .. .	30,508,652		
Bunya Pine .. .. .	70,871		
Kauri Pine .. .. .	2,575,217		
Slash Pine .. .. .	2,809,313		
Loblolly Pine .. .. .	3,578,684		
Patula Pine .. .. .	2,372,445		
Radiata Pine .. .. .	974,442		
Caribbean Pine .. .. .	81,999		
Benguet Pine .. .. .	584		
Maritime .. .. .	2,113		
Chir Pine .. .. .	21,471		
Red Cedar .. .. .	318		
			42,996,109
<b>Pulp Wood—</b>			
Slash Pine .. .. .	2,177,951		
Loblolly Pine .. .. .	1,164,874		
Hoop Pine .. .. .	2,998,549		
			6,341,374
			227,142,382
			Expressed as Superficial feet (Hoppus) Log Measure
<b>Other Classes—</b>			
Sleepers Hewn .. .. .	14,464 pieces	549,632	
Sleepers Sawn—5 ft. .. .. .	103,696 pieces	2,903,488	
Sleepers Sawn—7 ft. .. .. .	342,498 pieces	13,014,924	
Sleeper Blocks (as Sleepers contained)	232,366 pieces	8,365,176	
Transoms, Crossings, Headstocks, Longitudinals	455,506 superficial feet	455,506	
Girders, Corbels, Piles, Sills, Kerb Logs	58,990 lineal feet	1,061,820	
Girder Logs .. .. .	495,493 superficial feet	495,493	
Poles .. .. .	294,443 lineal feet	2,061,101	
House Blocks .. .. .	15,678 lineal feet	94,068	
Fencing Material—Round .. .. .	119,466 pieces	298,665	
Fencing Material—Split .. .. .	134,398 lineal feet	537,592	
Mining Timber—Round .. .. .	216,652 lineal feet	433,304	
Mining Timber—Split .. .. .	488 pieces	1,952	
Mining Timber—Sawn .. .. .	22,859 superficial feet	22,859	
		30,295,580	

## Other Classes—continued—

Fuel .. .. .	10,479 tons
Trees and Plants (number) .. .. .	182,202 plants
Sand, Gravel, Soil, Antbed, &c. .. .. .	459,533 cubic yards
Freestone .. .. .	1,459 cubic feet
Fibre, Dry Leaves, Reeds .. .. .	283 bags
Duboisia .. .. .	1,099 pounds
Flora .. .. .	760 pieces
Peat .. .. .	33 bags
Mulga Wood .. .. .	52 tons
Poling Timber (Copper Refining) .. .. .	2,794 tons
Lawyer Cane .. .. .	3 tons
Boat Knees .. .. .	300 pieces
Bee Hives .. .. .	20 hives
Black Wattle .. .. .	1,434 stems
Tea-tree .. .. .	120 stems
Tea-tree Bark .. .. .	430 bushels

## APPENDIX B

## Total Receipts, Department of Forestry, for the Year ended 30th June, 1969

RECEIPTS FROM DISTRICTS	TOTALS \$
Group 1—South Queensland (Brisbane, Beerburum, Beerwah, Benarkin, Bundaberg, Fraser Island, Gallangowan, Gympie, Imbil, Jimna, Kalpowar, Maryborough, Monto, Murgon, Yarraman) .. .. .	2,096,203.72
Group 2—North Queensland (Atherton, Cairns, Cooktown, Charters Towers, Herberton, Hughenden, Ingham, Innisfail, Port Douglas, Ravenswood, Townsville) .. .. .	1,240,764.03
Group 3—Dalby, Roma, Taroom, Charleville, Mitchell, Quilpie	292,793.77
Group 4—Warwick, Goondiwindi, Inglewood, St. George, Stanthorpe, Cunnamulla .. .. .	201,687.92
Group 5—Mackay, Rockhampton, Clermont, Bowen, Proserpine, Emerald, Springsure, Theodore, Winton .. .. .	168,566.71
Group 6—Barcardine, Blackall, Jundah, Longreach, Muttaborra, Stonehenge, Aramac, Isisford, Jericho .. .. .	689.36
Group 7—Cloncurry, Boulia, Kynuna, Mackinlay, Richmond .. .. .	771.30
Group 8—Burketown, Coen, Croydon, Georgetown, Normanton, Thursday Island .. .. .	138.40
	\$4,001,615.21
<b>OTHER RECEIPTS</b>	
Forestry and Lumbering .. .. .	639,829.35
Sales of Plants, Materials, &c. .. .. .	37,501.34
Licenses† (see note after Appendix C) .. .. .	18,403.65
Rents .. .. .	14,065.70
Grazing dues .. .. .	53,448.65
Miscellaneous (Salisbury Area Timber Account, Forfeit Wages, Expenditure Recoveries, &c.) .. .. .	37,664.23
Sale of U.S. tractors, trucks, &c. .. .. .	38,168.50
	\$4,840,696.63
<b>Plant Hire—</b>	
Charged Loan Fund Projects .. .. .	1,116,590.15
Trust Fund Projects .. .. .	124,065.50
	\$1,240,655.65
	\$6,081,352.28
The above receipts were disposed of as follows:—	
To Consolidated Revenue Fund as repayment of previous expenditure .. .. .	154.60
To Loan Fund as repayment of previous expenditure and surplus plant hire .. .. .	341,159.15
To Forestry and Lumbering Fund:—	
As expenditure on marketing of log timber, maintenance of access roads, capital improvements and plant .. .. .	3,050,083.38
As Interest and Redemption on Loans .. .. .	2,689,955.15
	\$6,081,352.28

## APPENDIX C

## Proceeds of Sales of Timber, &amp;c., for the Period 1st July, 1965, to 30th June, 1969

Groups*	1965-66	1966-67	1967-68	1968-69
Group 1 .. .. .	2,011,656.17	2,082,015.22	1,996,563.12	2,096,203.72
Group 2 .. .. .	831,938.94	727,344.54	1,122,548.51	1,240,764.03
Group 3 .. .. .	231,565.70	262,199.37	314,039.38	292,793.77
Group 4 .. .. .	168,362.89	163,554.98	195,825.58	201,687.92
Group 5 .. .. .	129,467.16	125,449.88	134,006.20	168,566.71
Group 6 .. .. .	804.97	453.88	381.85	689.36
Group 7 .. .. .	259.48	398.75	585.15	771.30
Group 8 .. .. .	..	..	336.00	138.40
	\$3,374,055.31	\$3,361,416.62	\$3,764,285.79	\$4,001,615.21
Receipts—Forestry and Lumbering .. .. .	348,852.41	402,527.38	464,468.53	639,829.35
Sale of Plants, Material, &c. .. .. .	39,041.37	47,297.77	43,980.56	37,501.34
Licenses† .. .. .	18,715.25	18,762.00	18,662.17	18,403.65
Rents and Grazing Dues .. .. .	33,007.67	39,278.71	50,624.71	67,514.35
Miscell. (Salisbury Area Timber Account, forfeit wages, Expenditure Recoveries, &c.) .. .. .	497,167.13	74,914.13	12,122.75	37,664.23
Sale of U.S. Tractors, Trucks, &c. .. .. .	34,121.07	36,248.34	52,376.76	38,168.50
	\$4,344,960.21	\$3,980,444.95	\$4,406,521.27	\$4,840,696.63

\* For Districts within the groups, see Appendix B.

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



## APPENDIX E

## Comparative Statement of Expenditure for Years 1967-68 and 1968-69

	1967-68	1968-69
	\$	\$
<b>REVENUE—</b>		
Salaries .. .. .	1,633,359	1,808,364
Cryptotermes brevis Investigation ..	3,805	490
Fares, Printing, Stores, &c. ..	10,374	11,150
Travelling Expenses and Incidentals ..	89,144	98,997
National Parks .. .. .	64,047	69,997
Cash Equivalent of Long Service Leave	11,799	10,404
<b>LOAN—</b>		
National Parks .. .. .	135,000	159,841
<b>TRUST—</b>		
<i>Reforestation Trust Fund—</i>		
Reforestation .. .. .	4,580,967	5,142,755
Land Acquisition .. .. .	34,735	28,950
Purchase of Plant .. .. .	494,504	499,109
Access Roads .. .. .	272,971	344,734
Purchase of Radio Equipment ..	14,989	29,592
Purchase of Firefighting Equipment	14,992	19,991
<i>Forestry and Lumbering Fund—</i>		
Interest and Redemption on Loans	2,409,147	2,689,955
Hardwood Supplies to Department of Railways and others .. .. .	439,294	534,049
Harvesting and Marketing Timber	1,240,951	1,339,461
Access Roads—Maintenance and Subsidies .. .. .	227,577	226,836
Maintenance of Plant .. .. .	699,704	813,600
Maintenance of Capital Improvements	127,811	136,138
<b>Total .. .. .</b>	<b>\$ 12,505,170</b>	<b>13,964,413</b>

## APPENDIX D

Constructional Timbers Supplied During Financial Year 1968-69  
under Forestry and Lumbering Operations

Class of Timber	Quantity	Sales Value
		\$
Hewn Crossings ..	49,084 super. feet ..	5,472.79
Sawn Crossings ..	44,304 super. feet ..	4,939.94
Headstocks and Braces ..	3,840 super. feet ..	517.90
Hewn Transoms ..	37,136 super. feet ..	4,587.70
Sawn Transoms ..	55,848 super. feet ..	8,975.09
Piles .. .. .	10,121 lineal feet ..	10,263.64
Girders—Dressed ..	17,428 lineal feet ..	54,761.88
Hewn Sleepers ..	14,464 pieces ..	20,658.96
Sawn Sleepers ..	156,579 pieces ..	239,908.26
Sleeper Blocks (as sleepers contained) ..	232,336 pieces ..	237,772.23
Split Posts and Rails, &c.	12,371 pieces ..	5,121.54
<b>Total .. .. .</b>		<b>\$592,979.93</b>

## APPENDIX F

## Net Area of Plantation Established 1st April, 1968, to 31st March, 1969

Species	Brisbane	Gympie	Mackay	Mary- borough	Monto	Murgon	North Queens- land	Warwick	Yarraman	Totals
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
<i>1. Conifers</i>										
<b>A. Native Conifers—</b>										
Hoop Pine .. .. .	200.0	605.3	36.0	324.3	357.5	754.7	41.0	..	961.9	3,280.7
Kauri Pine .. .. .	..	..	..	..	..	..	0.6	..	..	0.6
Bunya Pine .. .. .	..	6.7	..	..	..	3.6	1.5	..	..	11.8
Other Native Conifers .. .. .	..	..	..	..	..	..	..	..	..	..
<b>Total—Native Conifers .. .. .</b>	<b>200.0</b>	<b>612.0</b>	<b>36.0</b>	<b>324.3</b>	<b>357.5</b>	<b>758.3</b>	<b>43.1</b>	<b>..</b>	<b>961.9</b>	<b>3,293.1</b>
<b>B. Exotic Conifers—</b>										
Slash Pine .. .. .	1,613.7	2,671.2	..	2,709.0	..	..	..	..	62.0	7,055.9
Loblolly Pine .. .. .	19.4	74.8	..	..	..	..	..	0.6	..	94.8
Patula Pine .. .. .	..	..	..	..	..	1.9	..	..	69.2	71.1
Caribbean Pine .. .. .	54.2	25.3	390.4	277.2	..	..	390.3	..	..	1,137.4
Radiata Pine .. .. .	..	..	..	..	..	..	..	209.3	31.4	240.7
Long Leaf Pine .. .. .	..	..	..	..	..	..	..	..	..	..
Other Exotic Conifers .. .. .	2.7	1.5	..	..	..	..	9.7	3.0	26.0	42.9
<b>Total—Exotic Conifers .. .. .</b>	<b>1,690.0</b>	<b>2,772.8</b>	<b>390.4</b>	<b>2,986.2</b>	<b>..</b>	<b>1.9</b>	<b>400.0</b>	<b>212.9</b>	<b>188.6</b>	<b>8,642.8</b>
<b>Total—Conifers .. .. .</b>	<b>1,890.0</b>	<b>3,384.8</b>	<b>426.4</b>	<b>3,310.5</b>	<b>357.5</b>	<b>760.2</b>	<b>443.1</b>	<b>212.9</b>	<b>1,150.5</b>	<b>11,935.9</b>
<i>2. Broadleaved Species</i>										
<b>A. Native Forest Hardwoods—</b>										
Rose Gum (and <i>E. saligna</i> ) ..	..	..	..	..	..	..	..	..	..	..
Grey Ironbark .. .. .	..	..	..	..	..	..	..	..	..	..
Tallowwood .. .. .	..	..	..	..	..	..	..	..	..	..
Blackbutt .. .. .	..	..	..	58.0	..	..	..	..	..	58.0
Gympie Messmate .. .. .	..	..	..	..	..	..	..	..	..	..
Others .. .. .	..	..	..	..	..	..	..	..	..	..
<b>Total—Native Forest Hardwoods</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>58.0</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>58.0</b>
<b>B. Other Broadleaved Species—</b>										
Silky Oak .. .. .	..	..	..	..	..	..	..	..	..	..
Queensland Maple .. .. .	..	4.0	..	..	..	..	..	..	..	4.0
Red Cedar .. .. .	..	..	..	..	..	..	..	..	..	..
Others .. .. .	..	..	..	..	..	..	..	..	..	..
<b>Total—Other Broadleaved Species</b>	<b>..</b>	<b>4.0</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>4.0</b>
<b>Total—Broadleaved Species ..</b>	<b>..</b>	<b>4.0</b>	<b>..</b>	<b>58.0</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>..</b>	<b>62.0</b>
Miscellaneous Experimental ..	..	..	..	..	..	..	1.4	2.5	..	3.9
<b>Total—All Species .. .. .</b>	<b>1,890.0</b>	<b>3,388.8</b>	<b>426.4</b>	<b>3,368.5</b>	<b>357.5</b>	<b>760.2</b>	<b>444.5</b>	<b>215.4</b>	<b>1,150.5</b>	<b>12,001.8</b>

## APPENDIX G

## Net Area of Effective Plantation Classified into Forestry Districts to 31st March, 1969

Species	Brisbane	Gympie	Mackay	Maryborough	Monto	Murgon	North Queensland	Warwick	Yarraman	Totals
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
<i>1. Conifers</i>										
A. Native Conifers—										
Hoop Pine .. ..	1,433.9	20,546.2	98.2	983.4	4,948.8	13,138.9	1,587.5	3.7	24,648.8	67,389.4
Kauri Pine .. ..	5.3	524.3	2.5	69.7	3.6	4.9	285.5	0.8	7.4	904.0
Bunya Pine .. ..	0.9	469.9	..	0.8	1.2	68.5	1.7	..	73.7	616.7
Other Native Conifers	2.1	7.4	0.5	1.9	..	..	0.2	..	..	12.1
Total—Native Conifers	1,442.2	21,547.8	101.2	1,055.8	4,953.6	13,212.3	1,874.9	4.5	24,729.9	68,922.2
B. Exotic Conifers—										
Slash Pine .. ..	16,600.6	15,361.2	2,473.3	19,039.1	52.0	1.4	11.5	767.4	942.9	55,249.4
Loblolly Pine .. ..	3,554.1	192.8	7.3	54.8	2.7	88.7	14.0	236.7	21.5	4,172.6
Patula Pine .. ..	19.8	37.8	8.1	8.2	24.0	167.6	35.0	459.9	3,561.7	4,322.1
Caribbean Pine .. ..	242.4	273.6	6,280.6	806.1	1.4	5.4	855.2	..	4.3	8,469.0
Radiata Pine .. ..	0.5	..	..	..	..	16.8	..	2,922.2	765.3	3,704.8
Long Leaf Pine .. ..	237.9	2.1	7.3	1.0	..	..	..	8.8	2.8	259.9
Other Exotic Conifers	58.5	28.4	117.5	19.1	9.5	4.3	19.8	32.1	72.1	361.3
Total—Exotic Conifers	20,713.8	15,895.9	8,894.1	19,928.3	89.6	284.2	935.5	4,427.1	5,370.6	76,539.1
Total—Conifers ..	22,156.0	37,443.7	8,995.3	20,984.1	5,043.2	13,496.5	2,810.4	4,431.6	30,100.5	145,461.3
<i>2. Broadleaved Species</i>										
A. Native Forest Hardwoods—										
Rose Gum (and <i>E. saligna</i> ) .. ..	277.3	1,273.7	0.1	0.2	..	17.7	1.1	..	187.4	1,757.5
Grey Ironbark .. ..	203.4	182.3	0.1	0.1	..	71.1	37.8	..	469.5	964.3
Tallowwood .. ..	123.5	19.0	..	0.7	..	..	28.2	..	5.0	176.4
Blackbutt .. ..	200.2	221.0	..	58.3	..	..	..	..	0.5	480.0
Gympie Messmate .. ..	..	258.5	..	0.1	..	..	..	..	..	258.6
Others .. ..	29.0	80.6	..	0.9	..	..	10.4	..	2.8	123.7
Total—Native Forest Hardwoods	833.4	2,035.1	0.2	60.3	..	88.8	77.5	..	665.2	3,760.5
B. Other Broadleaved Species—										
Silky Oak .. ..	..	94.4	..	0.4	..	25.0	26.5	..	625.2	771.5
Queensland Maple .. ..	..	70.8	..	..	0.6	..	247.6	..	..	319.0
Red Cedar .. ..	..	5.3	..	..	..	..	31.3	..	..	36.6
Others .. ..	0.1	77.4	0.3	0.4	0.2	..	34.3	..	1.1	113.8
Total—Other Broadleaved Species	0.1	247.9	0.3	0.8	0.8	25.0	339.7	..	626.3	1,240.9
Total—Broadleaved Species	833.5	2,283.0	0.5	61.1	0.8	113.8	417.2	..	1,291.5	5,001.4
Miscellaneous Experimental .. ..	57.0	34.2	44.6	..	..	0.1	11.8	17.2	65.3	230.2
Total—All Species ..	23,046.5	39,760.9	9,040.4	21,045.2	5,044.0	13,610.4	3,239.4	4,448.8	31,457.3	150,692.9

APPENDIX H  
Areas of Natural Forest Treated  
A.—EUCALYPTS

Sub-District	Treated 1968-69	First Treatment 1968-69	Total as at 30th June, 1969
	Acres	Acres	Acres
Brisbane .. ..	623	623	31,308
Beerburum .. ..	321	70	20,528
Gympie .. ..	60	60	20,242
Imbil .. ..	245	245	404
Mackay/Emerald/ Rockhampton .. ..	1,297	1,297	47,440
Maryborough .. ..	2,112	150	108,249
Bundaberg .. ..	1,280	779	37,852
Fraser Island .. ..	1,236	251	23,217
Monto .. ..	1,004	940	23,741
Murgon/Jimna .. ..	1,852	1,368	44,078
Atherton .. ..	..	..	3,712
Ingham .. ..	..	..	2,985
Warwick .. ..	..	..	10,462
Inglewood .. ..	..	..	15,697
Yarraman .. ..	..	..	6,414
Benarkin .. ..	..	..	2,067
Dalby/Chinchilla .. ..	467	467	81,581
<b>Total—Eucalypts</b>	<b>10,497</b>	<b>6,250</b>	<b>479,977</b>

## APPENDIX H—continued

## B.—CYPRESS PINE

Sub-District	Treated 1968-69	First Treatment 1968-69	Total as at 30th June, 1969
	Acres	Acres	Acres
Bundaberg .. ..	..	..	2,152
Fraser Island .. ..	..	..	4,424
Monto .. ..	..	..	2,496
Inglewood .. ..	5,371	2,604	99,890
Dalby/Chinchilla/ Roma .. ..	11,348	7,142	238,178
<b>Total—Cypress Pine</b>	<b>16,719</b>	<b>9,746</b>	<b>347,140</b>

## APPENDIX H—continued

## C.—RAIN FOREST

Sub-District	Subsequent Treatment 1966-69	First Treatment 1966-69				First Treatment Completed 1968-69	Total as at 30th June, 1969
		Brushed	Ringbarked and Thinned	Logged under Treemarking Conditions	Trees Interplanted		
	Acres	Acres	Acres	Acres	Acres	Acres	Acres
Natural Hoop Pine—							
Maryborough .. ..	..	..	..	..	..	..	65
Bundaberg .. ..	..	..	..	..	..	..	9,973
<b>Total—Natural Hoop Pine</b>	..	..	..	..	..	..	<b>10,038</b>
Natural Rain Forest—							
Atherton .. ..	..	..	1,704	5,300	..	1,704	8,648
Ingham .. ..	..	9	9	3,040	9	9	1,364
Warwick .. ..	..	..	..	..	..	..	21
<b>Total—Natural Rain Forest</b>	..	9	1,713	8,340	9	1,713	<b>10,033</b>
<b>Total—Rain Forest..</b>	..	9	1,713	8,340	9	1,713	<b>20,071</b>

## APPENDIX H—continued

Grand Total—	Acres
Eucalypts .. ..	479,977
Cypress Pine .. ..	347,140
Rain Forest .. ..	20,071
	<u>847,188</u>

## APPENDIX I

State Forests, Timber Reserves and National Parks listed by Forestry Districts and Sub-Districts as at 30th June, 1969

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 .. ..	Beerburum .. ..	28	102,743 3 8	13	3,366 1 31	11	4,091 3 28
	Brisbane .. ..	36	189,077 1 26	18	26,079 0 3	34	92,421 1 22.1
	Total .. ..	64	291,821 0 34	31	29,445 1 34	45	96,513 1 10.1
Dalby .. ..	Chinchilla-Barakula	15	820,697 0 38	3	17,911 0 0	1	26,000 0 0
	Dalby .. ..	22	510,368 3 35	5	5,977 0 39	1	13,145 0 0
	Roma .. ..	16	422,511 3 22	4	103,602 0 0	1	4,385 0 0
	Total .. ..	53	1,753,578 0 15	12	127,490 0 39	3	43,530 0 0
Gympie .. ..	Gympie .. ..	36	288,975 2 13	3	2,511 1 8	4	2,132 0 0
	Imbil .. ..	11	145,712 3 0	2	148 2 3	1	640 0 0
	Total .. ..	47	434,688 1 13	5	2,659 3 11	5	2,772 0 0
Mackay .. ..	Emerald .. ..	3	132,358 3 35	9	193,866 2 10	3	1,379,400 0 0
	Mackay .. ..	8	166,629 0 0	19	100,491 2 19.1	90	287,338 1 38
	Rockhampton ..	35	706,367 3 28	14	112,559 2 22	15	13,124 0 0
	Total .. ..	46	1,005,355 3 23	42	406,917 3 11.1	108	1,679,862 1 38
Maryborough ..	Bundaberg .. ..	16	202,952 2 15	21	84,260 2 10	..	..
	Fraser Island ..	1	371,890 0 0	..	..	..	..
	Maryborough ..	38	368,354 0 13	15	28,476 0 37	6	13,933 0 0
	Total .. ..	55	943,196 2 28	36	112,736 3 7	6	13,933 0 0
Monto .. ..	Kalpowar .. ..	5	37,079 1 0	14	59,127 2 35	..	..
	Monto .. ..	24	456,231 2 35	26	121,013 0 32	6	4,932 0 0
	Total .. ..	29	493,310 3 35	40	180,140 3 27	6	4,932 0 0
Murgon .. ..	Gallangowan ..	3	38,250 0 0	..	..	..	..
	Jimna .. ..	11	112,543 0 34	..	..	..	..
	Murgon .. ..	12	126,843 0 0	9	28,099 1 3	..	..
	Total .. ..	26	277,636 0 34	9	28,099 1 3	..	..
North Queensland ..	Atherton .. ..	35	846,852 3 6	35	823,535 3 13	50	278,682 0 19
	Ingham .. ..	13	522,170 0 0	5	8,509 0 8	30	221,372 0 0
	Total .. ..	48	1,369,022 3 6	40	832,044 3 21	80	500,054 0 19
Warwick .. ..	Inglewood .. ..	26	428,515 0 17	4	7,162 0 8	..	..
	Warwick .. ..	14	80,802 3 37	4	5,958 3 28	6	15,819 3 0
	Total .. ..	40	509,318 0 14	8	13,120 3 36	6	15,819 3 0
Yarraman .. ..	Benarkin .. ..	4	70,842 0 0	3	4,442 2 26	..	..
	Yarraman .. ..	16	112,023 2 0	9	14,978 2 25	2	11,699 3 0
	Total .. ..	20	182,865 2 0	12	19,421 1 11	2	11,699 3 0
Grand Total ..		428	7,260,793 3 2	235	1,752,077 2 0.1	261	2,369,116 1 27.1

At 30th June, 1969—

Total area set apart as—

	A.	R.	P.
State Forests .. ..	7,260,793	3	2
Timber Reserves .. ..	1,752,077	2	0.1
National Parks .. ..	2,369,116	1	27.1
Total Reservations .. ..	11,381,987	2	29.2

## APPENDIX J

## Reservations for the Year ended 30th June, 1969

1st July, 1968, to 30th June, 1969

## STATE FORESTS

	No.	A.	R.	P.
At 1st July, 1968 .. .. .	411	6,972,517	1	9
Proclaimed 1-7-68 to 30-6-69 ..	16	133,694	2	11
Crown Land added to Existing State Forests .. .. .	..	42,647	0	14
Proclaimed Converted Timber Reserves .. .. .	5	105,117	2	7
Timber Reserves amalgamated with State Forests .. .. .	..	2,320	0	0
State Forests amalgamated with existing State Forests .. .. .	-4	..	..	..
Areas released .. .. .	..	-68	2	0
Recomputation of boundary .. .. .	..	4,565	3	1
<b>Total at 30th June, 1969 ..</b>	<b>428</b>	<b>7,260,793</b>	<b>3</b>	<b>2</b>

## TIMBER RESERVES

At 1st July, 1968 .. .. .	244	1,881,676	0	28.1
Proclaimed 1-7-68 to 30-6-69 ..	2	436	3	8
Timber Reserves Converted to State Forests or National Parks ..	-9	-86,344	0	6
Reserves amalgamated with Timber Reserves .. .. .	-1	..	..	..
Crown Land added to existing Timber Reserves .. .. .	..	1,266	2	20
Recomputation of Boundary .. .. .	..	-40	3	22
Reserves cancelled .. .. .	-1	-44,800	0	0
Areas released .. .. .	..	-117	0	28
<b>Total at 30th June, 1969 ..</b>	<b>235</b>	<b>1,752,077</b>	<b>2</b>	<b>0.1</b>

## NATIONAL PARKS

	No.	A.	R.	P.
At 1st July, 1968 .. .. .	81	2,284,937	1	20
Proclaimed 1-7-68 to 30-6-69 ..	6	28,596	0	0
Crown Land added to existing National Parks .. .. .	..	1,819	2	17.8
Areas converted to National Parks ..	1	15,235	0	0
Recomputation of boundary .. .. .	..	-102	3	35.3
Areas released .. .. .	..	-48	2	32.5
Scenic Areas now designated National Parks .. .. .	173	38,680	0	17.1
<b>Total at 30th June, 1969 ..</b>	<b>261</b>	<b>2,369,116</b>	<b>1</b>	<b>27.1</b>

The *Forestry Act Amendment Act 1968* deleted the term "Scenic Area". Such areas are now included in the term "National Park".

## APPENDIX K

## Distribution of Personnel, 30th June, 1969

Salaried officers .. .. .	499
Other employees .. .. .	1,536
<b>Total .. .. .</b>	<b>2,035</b>

## APPENDIX L

## Tree Species Mentioned in Annual Report

## Botanical Names

## A. NATIVE CONIFERS

Bunya Pine .. .. .	<i>Araucaria bidwillii</i>
Hoop Pine .. .. .	<i>Araucaria cunninghamii</i>
Kauri Pine .. .. .	<i>Agathis</i> spp.
White Cypress Pine .. .. .	<i>Callitris columellaris</i> syn. <i>glauca</i>
	" " syn. <i>arenosa</i>
	" " syn. <i>intratropica</i>

## B. EXOTIC CONIFERS

Bahaman Caribbean Pine ..	<i>P. caribaea</i> var. <i>bahamenis</i>
Benguet Pine .. .. .	<i>P. kesiya</i>
Cuban Caribbean Pine ..	<i>P. caribaea</i> var. <i>caribaea</i>
Honduras Caribbean Pine ..	<i>P. caribaea</i> var. <i>hondurensis</i>
Loblolly Pine .. .. .	<i>P. taeda</i>
Long Leaf Pine .. .. .	<i>P. palustris</i>
Maritime Pine .. .. .	<i>P. pinaster</i>
Mexican Cypress .. .. .	<i>Cupressus lusitanica</i>
Mexican White Pine .. .. .	<i>P. strobus</i> var. <i>chiapensis</i>
Ocote Pine .. .. .	<i>P. oocarpa</i> and var. <i>ochoterena</i>
Patula Pine .. .. .	<i>P. patula</i>
Radiata Pine .. .. .	<i>P. radiata</i>
Sand Pine .. .. .	<i>P. clausa</i>
Short Leaf Pine .. .. .	<i>P. echinata</i>
Slash Pine .. .. .	<i>P. elliotii</i> var. <i>elliottii</i>
South Florida Slash Pine ..	<i>P. elliotii</i> var. <i>densa</i>
Suji .. .. .	<i>Cryptomeria japonica</i>

## C. EUCALYPTS

Blackbutt .. .. .	<i>E. pilularis</i>
Brown Bloodwood .. .. .	<i>E. trachyphloia</i>
Grey Ironbark .. .. .	<i>E. drepanophylla</i>
Gympie Messmate .. .. .	<i>E. cloeziana</i>
Narrow Leaved Ironbark ..	<i>E. crebra</i>
Red Bloodwood .. .. .	<i>E. gummifera</i>
Red Ironbark .. .. .	<i>E. fibrosa</i> spp. <i>fibrosa</i>
Red Mahogany .. .. .	<i>E. resinifera</i>
Rose Gum .. .. .	<i>E. grandis</i>
Spotted Gum .. .. .	<i>E. maculata</i>
Tallowood .. .. .	<i>E. microcorys</i>
White Mahogany .. .. .	<i>E. acmenioides</i>

## D. OTHER BROADLEAVED SPECIES

African Mahogany .. .. .	<i>Khaya senegalensis</i>
American Mahogany .. .. .	<i>Swietenia macrophylla</i>
Brush Box .. .. .	<i>Tristania conferta</i>
Bull Oak .. .. .	<i>Casuarina luehmanni</i>
Cairns Hickory .. .. .	<i>Flindersia ifflaiana</i>
Mexican Cedar .. .. .	<i>Cedrela odorata</i>
Northern Silky Oak .. .. .	<i>Cardwellia sublimis</i>
Queensland Maple .. .. .	<i>Flindersia brayleyana</i>
Queensland Silver Ash .. .. .	<i>Flindersia bourjotiana</i>
Queensland Walnut .. .. .	<i>Endiandra palmerstoni</i>
Red Cedar .. .. .	<i>Toona australis</i>
Rosewood .. .. .	<i>Eremophila mitchellii</i>
Sandalwood .. .. .	<i>Santalum lanceolatum</i>
Silky Oak .. .. .	<i>Grevillea robusta</i>
Smooth-Barked Apple .. .. .	<i>Angophora costata</i>
Teak .. .. .	<i>Tectona grandis</i>
Turpentine .. .. .	<i>Syncarpia glomulifera</i>