1968

QUEENSLAND

ANNUAL REPORT

OF THE

DEPARTMENT OF FORESTRY

FOR THE

YEAR 1967-68

PRESENTED TO PARLIAMENT BY COMMAND

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REPORT OF THE CONSERVATOR OF FORESTS

For the Year ended 30th June, 1968

INTRODUCTION

Queensland is facing a difficult period during which the sawmilling industry that relies on the native forest in the south-eastern part of the State must adjust itself to decreasing supplies of logs. Although the cut from Crown land can be reasonably well sustained, the cut of privately owned timber is decreasing, and will continue to decrease. It will be many years before the cultural work that has been carried out in the natural forests will give increased yields to compensate for the dissipating private timber resource. The position that has been reached by the sawmilling industry can be regarded as serious. During the year 27 mills became defunct because of lack of log supplies, but despite this, over 200 mills, or approximately 40 per cent. of the 500 odd operative sawmills in Queensland have reached the stage where their individual input does not exceed 250,000 superficial feet of log annually. These mills have licensed capacities that would permit the processing of much greater volumes, and many of them would be eager to saw greater quantities of logs. It is a matter of grim reality that the forests cannot support any increased cut of logs. In the part of the State where the problem is most acute—i.e., the area between Gympie and the New South Wales border, the availability of logs will decrease rather than increase. There is no easy solution to this problem. Owners of licensed sawmills that have been operating for many years have the right to continue in operation whilst they can secure log supplies which they consider justify continued operation. Amalgamation of sawmills could aggravate rather than improve the position, excepting under circumstances that are rational to the timber supply available in the area concerned. The Department has from time to time indicated to the Industry the limits of its field of action in connection with this problem. It would appear that real advances towards its solution can come only from the Industry itself.

The outstanding feature of the year 1967-68 has been the progress in the implementation of plans for increased planting of softwoods. This activity has been stimulated by the loans on a favourable basis provided by the Commonwealth for this specific purpose. A record area of 9,449 acres of new softwood plantation was established during the year. The target is 10,000 acres annually. This should be achieved in 1968-69 and thereafter maintained.

The cut of thinnings from softwood plantations continues to increase. During the year, the yield from this source was 44,000,000 super. feet, which is the highest yet achieved. Greater volumes will become available as the plantations increase in area and in age, and in due course, the plantations will play a dominant role in timber production in the State. It is of great importance both to the Industry and the Department that the wood produced by plantations should be soundly used from the outset, and endeavours are being made to ensure that this is achieved.

With the Japanese interest in purchase of wood chips in large quantities, preliminary investigations were carried out to ascertain what areas along the Queensland coast could sustain exports of the order required to enable bulk shipping. Australian eucalypt forests carry large quantities of timber unsuitable for sawmilling. Substantial areas of our timbered lands carry no commercial mill timbers but the wood available is suitable for fibre board production and could be suitable for use in pulp industries. The species in our eucalypt forests are many and vary considerably in density. Samples of the eucalypts concerned have been forwarded to Japan for testing.

A new sale involving the sustained cutting of 2,500,000 super. feet annually of naturally grown Hoop Pine was made in the Goodnight Scrub area near Bundaberg. The purchasers propose the establishment of a match industry near Brisbane.

A further sale of 2,000,000 super. feet of exotic pines (on an annual sustained basis) based on the Beerwah–Beerburrum plantations was also finalised.

During the year 25,820 acres of native forest of Cypress Pine, hardwood and rain forest were treated but this rate of treatment would need to be increased several fold if effective stocking of the forests is to be improved and sustained yield from our forests is to be maintained and increased.

Following experimental evidence that with site preparation, the poorly drained Wallum lands are very satisfactory for planting with *P. elliottii* var. *elliottii*, such are now being brought into production. The departmental designed plough used for drainage and mounding has proved to be very successful, enabling site preparation to be done cheaply. The success of this work will enable cheaper plantation establishment in exotic pine areas through cheaper clearing costs. Furthermore, the cost per acre of plantation of both roads and protection will be decreased by the compactness of areas planted. These poorly drained areas previously constituted gaps between plantations on the better drained land.

With the introduction into Queensland of pressure treatment of timber using copper-chrome-arsenic salts several practical problems arose. One of the most important was that due to the Lyctus borer problem in this State, it was necessary that timber be treated at higher moisture contents than those normally used. With the co-operation of Industry, officers of the Department modified the process and as a result, Patents to the Vacuum Diffusion Process were secured during the year. This process has resulted in the more economic and effective treatment of timber.

The drywood termite survey of houses in Maryborough revealed the presence of Cryptotermes brevis, a native of the West Indies, in nine houses. To eliminate the known presence of these termites, these houses were fumigated during the year. The ready co-operation of the owners and tenants and the assistance of the Queensland Housing Commission and Works Department in supervising the contractor's work is greatly appreciated. The survey has been extended and to date, no further infestations have been located.

Activities on tree breeding have been considerably increased during the year, and those particularly interested in this field are referred to the body of this report. Perhaps the most important points are the continued good yield of Slash Pine seed from the seed orchards (although not as good as in the previous year), the establishment of new seed orchards with both Honduras Pine and Hoop Pine, and of provenance trials with *Pinus khasya*.

Arboricides are ensuring good kills of unwanted species in western cypress forests, 2,4,5-T amine is the main arboricide used, but picloram is used on the more resistant species. Cut stump treatments are used with bull oak and small trees generally and the application is by injector at inch spacings between ends of cuts. The costs of the arboricides are recouped with a handsome profit because of the quicker and more certain kill obtained. Season of application is of little practical importance.

One of the most pleasing features of the year's operations has been the continued progress made in the valuing of timber requested in connection with the conversion of tenure of Grazing Selections. Despite the influx of new applications being maintained at a high level of nearly 4,000,000 acres per annum (when the Brigalow Area III conversions are also considered), there has been an overall improvement in the position.

As at 1st July, 1967, there were some 3,910,000 acres awaiting the field work associated with valuation. By June 30, 1968, this figure had been reduced to 2,920,000 acres. This means that the effective area over which the field work was completed during the year was over 5,000,000 acres.

Aerial reconnaissance from light aircraft has been of great help in eliminating areas which would would be unprofitable to assess on the ground and has allowed Nil values to be determined on 132 Selections grossing 1,500,000 acres in area. It has allowed blocks adjacent to areas of public interest to be covered quickly. Since the initial flying programme in 1965, a total of 480 blocks totalling 7,100,000 acres have been subject to aerial inspection at a cost substantially below that of ground inspection.

It is confidently expected that by the end of December 1968 the only areas outstanding will be some of the 1968 applications.

Machinery for exchange of views, and co-operative discussion between the States and the Commonwealth has been available for many years in the field covered by forestry. Initially these were regular meetings of Heads of Services, but over the last few years they have been replaced by meetings of the Australian Forestry Council (at Ministerial level), and the Standing Committee of the Council (at permanent head level). These discussions have been invaluable in co-ordinating forestry activity throughout the Commonwealth.

The lack of some similar organisation in the field of National Park Administration has long been felt, and it is pleasing to report that this deficiency is now being rectified. Arranged by the Hon. T. L. Lewis, M.L.A., Minister for Lands in New South Wales, the first interstate conference on National Parks took place at Koscuisko National Park during the period 3rd to 6th May, 1968. Queensland was represented by the Minister for Local Government and Conservation, the Honourable H. Richter, M.L.A., the Conservator of Forests, Mr. A. R. Trist, and the Secretary of the Department, Mr. W. Wilkes. Fruitful discussion took place on several aspects of National Park administration whilst away from the conference table, the opportunity afforded for personal discussion with Officials from the various States proved beneficial to all concerned. At the conclusion of the Conference, the Hon. H. Richter, M.L.A., invited representatives of the various States to come to Queensland for a Conference in 1969.

During the year 17,229 acres were reserved as National Parks, bringing the total so reserved at 30th June, 1968, to 2,323,617 acres. There are several large and important proposals at present under consideration.

The Ninth Commonwealth Forestry Conference was held in India in January, 1968. The Department at the request of the Organising Committee of the Conference contributed several guiding papers to this Conference. This is a measure of the regard in which the Department is held overseas. In addition to this, and connected with the National Parks, an officer of the Department was invited to submit a paper at the Munich Congress of the International Union of Forest Research Organisations.

MANAGEMENT

General

The area of State Forests as at the end of the year was 6,972,517 acres, a net increase of 253,185 acres.

Expenditure

Expenditure under the Reforestation Vote was $4,580,967, compared with $3.999,365 in 1966-67. Expenditure from Trust Funds on projects associated with the Reforestation Vote was $127,811.

Expenditure is itemised as follows:—

Item	Expenditure	Percentage of Total
Direct Expenditure on projects—	$	
Plantations	1,137,441	24·2
Natural Regeneration	171,789	3·6
Nursery Expenses	176,562	3·8
Research	157,039	3·3
Protection	659,654	14·0
Surveys	139,791	3·0
New Construction	194,395	4·1
Seed Collection	26,800	0·6
Maintenance of Capital Improvements	123,900	2·6
Total direct expenditure	$2,787,371	59·2
Indirect Expenditure—		
Wet time, Holidays and Leave	531,429	11·3
Supervision, Tools, Cartage, &c.	820,825	17·4
Camp Allowance	280,378	6·0
Pay Roll Tax	80,481	1·7
Workers' Compensation	49,113	1·0
Administration	125,793	2·7
Miscellaneous (Less Stores Suspense of $2,300 Credit)	33,388	0·7
Total indirect expenditure	$1,921,407	40·8
Total expenditure	$4,708,778	100·0

Employment

The number of men engaged on Reforestation work was 1,404 at 1st July, 1967, compared with 1,484 at the end of June, 1968.

The average level of employment on this work was 1,398, compared with 1,318 in 1966-67.

Average expenditure per man per year was $3,368, compared with $3,129 in 1966-67.

Timber Assessment

It has been necessary to concentrate the Department's trained assessment crews largely on the task of completing the field-work in outstanding freeholding applications and several survey camps were transferred from forest inventory to this work. As a result, assessment work on State Forests was reduced during the year. However, in areas of plantation and rain forest being covered by inventory for the first time, 180 new plots were established, bringing to 20,410 the number of permanent yield plots that sample the State Forests of Queensland.

Remeasurement of inventory plots mainly in Coastal Hardwood forests and plantations covered an area similar to that of the previous year.

In addition some 70,000 acres of forest land under grazing selection tenure and considered to merit acquisition as State Forest were covered by strip survey to provide estimates of stocking and of value.

Valuation of Timber on Lands for Conversion of Tenure

The steady increase in the number of applications for freeholding referred to this Department for the valuation of timber has been maintained, but despite this, there has been, for the second year in succession, a marked decrease in the number of blocks still requiring field assessment. It is expected that this improvement will continue, and that all outstanding applications will have been covered by field parties by the end of the calendar year 1968.

Of the 605 applications for which valuations have not been finalised, 140 carry forest areas which would be suitable for State Forest. Negotiations are presently taking place with respect to 80 of these cases and will follow with respect to others. To date State Forest reservation of 85,000 acres has been negotiated and finalised with the lessees of 40 selections previously sought for conversion to freehold.

The following table shows the present position in regard to freeholding applications compared with that for the two previous years. In addition the Department has been asked to provide timber valuations on about 1,000,000 acres within Area III of the Fitzroy Basin Land Development Scheme.

FREEHOLDING POSITION IN RELATION TO PREVIOUS YEARS

	As at 30th June, 1966		As at 30th June, 1967		As at 30th June, 1968	
	No.	Area	No.	Area	No.	Area
		Acres		Acres		Acres
Total applications made	1,730	11,742,000	2,115	15,664,000	2,371	18,425,000
Withdrawn before valuation	27	120,000	34	216,000	27	188,000
Total requiring valuation	1,703	11,622,000	2,081	15,448,000	2,344	18,237,000
Valuation complete and determined by Land Court	380	1,418,000	810	3,565,000	1,063	5,363,000
Valuation complete and awaiting determination by Land Court	722	4,186,000	681	6,052,000	676	6,316,000
Field assessment complete but not yet valued	134	910,000	199	1,916,000	358	3,914,000
Awaiting field assessment	467	5,108,000	391	3,915,000	247	2,644,000
Totals	1,703	11,622,000	2,081	15,448,000	2,344	18,237,000

Protection

Seasonal Characteristics. Following record June rains the spring was abnormally dry. The table below demonstrates the steady build up in incidence of fires as the year progressed, until a peak was reached in November, which recorded nearly one-third of the year's fires. A State of Fire Emergency was imposed in late November in south east Queensland, and conditions in Brisbane District were particularly severe at this period. Early December storms reduced the hazard and the State of Emergency was lifted after four days.

Good rains in January brought the fire season to an early end but, conditions have been dry since then, and early unseasonal westerlies have caused the year to end with abundant fuels in most areas in a fairly dry state.

Fire Incidence. The number of fires at 212 is well above the 124 of 1966-67 season; two-thirds of these were of less than 100 acres, reflecting the increased efficiency of detection and communication services.

Increased use was made of Police assistance to investigate unauthorised fires, though many minor breaches are dealt with by the Department's officers. There were 23 Police investigations, three successful prosecutions, and 19 letters of warning sent by the Department. In addition $125 was recovered to cover costs of fighting two fires. Two letters of thanks for outside help by way of fire fighting and detection were sent.

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

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	2	1	1	..	..	..
August	7	3	2	1	1	..
September	41	15	13	12	1	..
October	41	19	16	3	3	..
November	70	18	18	19	14	1
December	24	9	7	5	3	..
January	8	2	2	3	1	..
February	7	4	..	2	1	..
March	2	1	1	..	..	..
April	5	2	3	..	..	..
May	2	1	1	..	..	..
June	3	2	..	..	1	..
Total	212	77	64	45	25	1

There were eight plantation fires, mostly small and causing little damage. One fire in 5-year-old Hoop Pine cost $702 to suppress and destroyed 8·8 acres of plantation valued at $3,170. It was caused by a breakaway from scrub burning operations. Another of unknown origin burnt over five acres of 18-year-old plantation at night. Costs of suppression were $124 but after salvage damage to the plantation was estimated at $2,500.

Other notable fires were three in Brisbane district in the late November emergency which cost $2,416 to suppress and a large fire in the Inglewood District which cost $2,380 to suppress. The largest fire by area burnt covered 31,000 acres of Fraser Island. In this area of difficult access, large fires are inevitable. Little commercial timber was damaged, but fires on any part of the Island can pose erosion problems by destroying the vegetative cover and exposing the raw sand. Tracks are being extended each year on the Island to give improved access for control of these fires, which will increase in number as mineral sands and tourist activities increase.

The table below sets out by Districts the areas covered by all fires attended by forestry personnel. Because of the lack of fuel, most cypress pine areas had a reasonably mild fire season.

District	No. of Fires	Area Burnt Over (acres)			
		Crown Timber Areas		Private	Total
		Inside Protection Systems	Partly Protected or Unprotected		
Atherton	..	..	..	..	..
Brisbane	37	12,606	5,410	12,335	30,351
Dalby	20	5,044	406	1,300	6,750
Gympie	42	8,035	648	2,469	11,152
Mackay	2	830	1,583	464	2,877
Maryborough	26	38,963	7,146	8,600	54,709
Monto	..	..	..	..	..
Murgon	22	3,535	1,428	2,255	7,218
Warwick	20	24	1,800	4,210	6,034
Yarraman	25	312	852	2,462	3,626
National Parks—All Districts	18	103	90	239	432
Total	212	69,452	19,363	34,334	123,149

Major known causes of outbreaks by percentage were:—

Unauthorised burning off	27%
Government and Semi-Government authorities	7%
Smokers	5%
Recreations' camp fires, &c.	3%
Lightning	6%
Restarts of fires	5%
All other known causes	17%
Unknown causes	30%
Total	100%

Communications

A further 30 VHF radio sets were purchased, and radio base communications were improved at district headquarters in Monto, Murgon and Dalby. The Communications Officer visited North Queensland to assess the radio requirements of Atherton and Mackay districts, and it is expected that these districts, the last to be equipped, will be given a 2-way radio system in 1968-69. Meanwhile, a few mobile sets have been made available to these districts to give some measure of help and to test their requirements. To instal new equipment and service the extensive State network the Communications section now has a staff of five technical officers including an apprentice, and a storeman-clerk.

Districts are making constant use of radio in general administrative work as well as in fire work.

Detection

The first of the 3-legged towers proved the wisdom of converting to this type of structure. Costs per foot at $66 was about 25 per cent. down on the 4-legged design, formerly adopted, and the structure is very stable and firm. The second such tower is nearing completion at Gallangowan State Forests, and at 130 feet it is believed to be the tallest wooden pole tower in Australia. It replaces a tower outgrown by the surrounding Hoop Pine plantations.

During the year, three more towers were approved for North Queensland. Since the requirement for detection in Mackay and Atherton districts did not warrant setting up a second Departmental tower-building team, it was decided to build cabins on specially strengthened steel tank stands. Two towers of 60 feet and one of 80 feet were purchased, and will be erected in 1968-69.

Some fire lookouts in places where telephone line construction and maintenance are major items have been given communication by portable radios on the same frequency as the Departmental network.

Aircraft were again made use of during the year to supplement the fixed detection system.

Equipment

Following the major pump re-equipment programme in 1966-67, attention was turned to getting types of water containers to suit various vehicles. Some canvas trailer tanks were purchased.

Further development and purchase of Liquid Petroleum Gas flamethrowers was made. Two types of drip torch were developed by a firm to the Department's design, and put into general usage.

Fire Research

A graduate forester is now employed full time on bushfire research, from headquarters at Gympie. His work is largely directed to the study of fire behaviour in different forest types. In particular a number of experiments have been established involving prescribed burning in Slash Pine plantations with assessment of damage and influence of fire on growth.

General

Total expenditure on fire fighting patrol and detention was $118,855 ($78,530 in 1966-67). Direct costs were $26,034 ($8,850). Prescribed burning for protection purposes covered 74,251 acres (42,710 acres) at a cost of $8,691 ($4,678). Burning of logging debris (top disposal) cost $3,601 ($4,094). Co-operative burning with neighbours cost $11,962 ($8,751). New roads charged to protection and new firebreaks cost $201,974 ($227,405) and maintenance of existing protection road sand firelines cost $278,908 ($216,464).

Industrial Safety

The accident frequency rate for the whole year was 101·1 (101·6 in 1966-67). The table below shows the steady improvement attendant on efforts in this regard culminating in 1965-66 when the rate was 93·3. Since then the figure has been held at about 101.

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

Factors which have to be contended with are associated with the nature of forest work which, as with other Rural Industries, involves small work-units widely spread throughout the State and with increased staff to handle the expanded work programme. Because of these difficulties the manner in which the level has been held over the past two years can be regarded as satisfactory.

During the year the Job Safety handbook was revised and reprinted and a new section added to cover Bushfire safety and survival. Safety education was further promoted by the instruction given to 16 supervisors in a course conducted on Fraser Island.

MECHANICAL EQUIPMENT

General

An increase of $137,659 in funds allocated to the Purchase of Plant enabled the Department to purchase a number of new tractor/dozers and rubber tyred tractors as well as allow for a reasonable replacement programme of motor vehicles and the purchase of additional motor vehicles. Despite this the Department is still operating at least 24 tractors/dozers which are proving too costly to operate and early replacement of the bulk of these machines is desirable.

Progress has been made in providing workshops for the maintenance of the vehicles and equipment needed to cope with the increased work of the Department. New workshops are in course of construction at Gallangowan and at Beerburrum whilst arrangements are in hand for one to be built by the Department of Works at Maryborough.

During the year the staff position improved with the appointment of an additional Plant Inspector with Headquarters at Maryborough and an extra Plant Instructor. At the end of the year staff in the Mechanical Equipment section included 5 Plant Inspectors, 5 Plant Instructors, and 30 mechanics.

Training schools for instructors and mechanics were conducted at Innisfail, Brisbane and Townsville.

Plant Hire Rates

Costs associated with the operation and maintenance of tractors (track type and rubber tyred) power graders and motor vehicles are now handled by the Automatic Data Processing Section and detailed returns are now available on a monthly, six monthly and yearly basis. This will assist to a considerable extent in maintaining up to date plant hire rates. As a result, rates for tractor/dozers and power graders were adjusted as from 1st February, 1968, and for motor vehicles as from 28th March, 1968.

Receipts and Expenditure

Details are—

	1966–67 $	1967–68 $	Difference $
Loan—Purchase of Plant	356,845	494,504	+137,659
Trust—			
Maintenance of Plant ..	638,394	699,704	+61,310
Plant Hire Credits ..	809,307	907,166	+97,859
Excess of Plant Hire over Maintenance of Plant	170,913	207,462	+36,549
Sale of Plant	32,248	42,897	+10,649

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

6—52-D.B.H.P. tractor/dozers
1—92-D.B.H.P. tractor/dozer
1—98-D.B.H.P. tractor/dozer
5—120-D.B.H.P. tractor/dozers—with power shift transmission
6—67-B.H.P. rubber tyred tractors
2—67-B.H.P. rubber tyred tractors 4 wheel drive
2—102-B.H.P. rubber tyred tractors 4 wheel drive
2—68-B.H.P. rubber tyred tractor-loaders, all wheel steer, all wheel drive
18—Replacement motor vehicles
10—Additional motor vehicles.

Maintenance of Plant.—Main items under this head for the years 1966-67 and 1967-68 were:—

	1966–67 $	*1967–68* $	*Difference* $
Fuel	128,440	114,760	−13,680
Oils	14,575	16,781	+2,206
Tyres and Tubes ..	23,121	26,036	+2,915
Repairs	353,724	413,336	+59,612
Registration, Insurance	37,763	42,994	+5,231
Travelling expenses	16,912	12,252	−4,660

Acquisition of Land

During the year 1967-68, an amount of $34,734.61 was expended on the acquisition of land for Forestry purposes as follows:—

	$
Purchase of land	16,436.65
Survey Fees	14,488.34
Real Property Fees and Lands Department Charges ..	64.00
Compensation for Improvements	3,745.62
	$34,734.61

The expenditure of $16,436.65 represents the purchase of three (3) properties with a total area of about 5,801 acres 3 roods 18 perches for addition to State Forests. Two of these properties contain planting land and will be added to existing reservations.

Forest Surveys

This section of the Department's work has continued at much the same level as in the previous year and has been carried out in the field by 35 survey parties during the first half of the year and 32 in the second half.

Three parties were occupied for the whole period carrying out Theodolite control surveys to provide a framework for other type Forestry surveys.

Nineteen parties were engaged in general Plantation management surveys associated with Reforestation programme and Native forest management surveys.

Of the remaining parties four were employed on Forest Inventory and Assessment Surveys to provide basic management data and nine were employed full time on timber assessments in connection with applications for freeholding actions. A number of parties employed in general survey work were also employed on a part-time basis on assessment surveys.

DETAILS OF WORK IN MILES

Theodolite Controls	Forestry Traverses	Connections and Relocating Old Traverses	Investigation and Levels	Stripping and Assessment
143	1,260	1,133	40	5,665

Personnel

Survey.—At the end of the year 191 members had been engaged in survey work compared with 185 for the previous year. These members comprised Foresters (10), Forest Surveyor (1), Forest Rangers (10), Overseers (10), Survey Trainees (3), and other personnel (130).

Mapping.—With a further increase of four officers the Drafting Branch staff now totals 26, of which 11 are engaged in cartographic compilations and revisions and the remainder are carrying out administration drafting and mapping duties.

Automatic Data Processing

The year marked the introduction of computer methods to the accounting functions of the Department. For many years the computer has been used for statistical and technical purposes by the research branches and for forest inventory survey calculations and freeholding assessments. However, the addition of accounting projects has necessitated the formation of an A.D.P. Section staffed by trained systems analysts and programmers to carry out this work.

Punch-room facilities are being extended to six (6) card-punch or verifying machines and further additions are anticipated during 1968-69. During the year under review, 275,000 cards were punched for all Branches.

Since February, 1968, when the A.D.P. Section was formed, a system of plant accounting by computer for heavy mechanical equipment and motor vehicles has been introduced. This system will reach the full running stage in July, 1968. A preliminary investigation is under way into the conversion of log timber accounts to computer methods.

REFORESTATION

General

During the year, weather conditions were generally good resulting in satisfactory growth in plantations and native forests with only minor damage from wind and fire. Except in the southern part of the State, rainfalls were above average for the year but not over the autumn period. Conditions in winter 1967 led to the successful establishment of about 5,000 acres of Exotic pines planted open root in that season but some refilling was necessary in the Pechey and Passchendaele areas where rainfall and soil moisture conditions are more variable. Adequate summer rains gave good survivals in the tubed plantings of Hoop and Caribbean pines and falls in May, 1968, allowed an early start for the record planting of 7,000 acres of Exotics projected for the winter.

Rainfall is shown below for six centres representative of the main Hoop Pine and Exotic Pine areas.

RAINFALL IN POINTS

	Hoop Pine Areas			Exotic Pine Areas		
—	Yarraman	Imbil	Kalpowar	Beerwah	Tuan	Bowenia
1967–68	2,740	6,260	4,359	5,759	6,701	7,084
Average	3,143	4,675	3,600	6,101	5,251	6,515

Only at Yarraman and Beerwah—the most southerly centres—does the rainfall fall slightly below average.

Projected programmes for 1967-68 in plantation establishment and treatment of established plantations and native forest stands were completed and in many cases improved on due to improved techniques, better control of weeds in young plantations, nurseries, firebreaks, &c., and the use of hormones. To secure the full benefit of prevailing good soil moisture conditions, and to avoid having to suspend planting due to deterioration in soil moisture, it is necessary to increase staff at our major centres temporarily at planting time so that planting is completed as quickly as possible. It is also necessary in Hoop Pine areas to effect proper weed control on young areas. No staffing problems have been encountered in plantation areas except in the main sugar growing areas where the start of the sugar harvesting draws off numbers of our staff.

Winter 1967 was mild and free from severe or unseasonal frosts. As a result, few reports of frost damage to Hoop Pine were recorded.

The area planted during 1967-68 at 9,449 acres was 1,479 acres above that of the previous year. At the same time essential tending, pruning and other cultural work in both plantations and indigenous forests was carried out at about the same level as in the year 1966-67. This was achieved with a small increase in the labour force which at an average of 1,398 for the year was only 80 up on the average for last year. Factors making this possible included the increasing use of machines in preparation of plantation areas, the greater use of hormones in first year tending of Hoop Pine plantations, greater efficiency in nurseries producing at near to capacity to cope with the planting programme and the effect of the decision taken the previous year to treat and plant with Slash Pine a number of poorly drained soil types previously regarded as unplantable. There has also been increased use of machines in hormone tending of Exotic plantations and in the application of fertilizers, whilst attention is being given once again to the use of aircraft in both of these operations. In one large scale trial for which results are being evaluated, rock phosphate was applied over 800 acres of Slash Pine plantation at the rate of 3 cwt. per acre with a considerable saving in costs.

Field Operations

The following summary of the figures for the chief operations for the year are compared with the 1966-67 figures.

Operation	1966–67	1967–68
	Acres	Acres
Area of plantation established	7,970	9,449
Area of plantation covered in pruning ..	16,757	14,126
Area of plantation tended	58,301	72,866
Area of plantation thinned merchantably	7,301	7,987
Area of plantation thinned unmerchantably	1,209	1,309
Area of natural forest treated	28,200	25,821

In the coming year, it is planned to reach the target of 10,000 acres per year of new softwood plantations as set out in the Commonwealth Act. Whilst up to the present, Hoop Pine constitutes nearly half of the area planted, the target programme will entail 3,000 acres of Hoop Pine and 7,000 acres of Exotics of which about 6,000 acres will be Slash Pine concentrated in coastal south-east Queensland from Bundaberg to Caboolture. The prime reason for this concentration lies in the need to build up, as quickly as possible, pulpwood resources adequate to support a major pulp and paper industry with associated integrated wood using industries. In this region for the first time large scale plantings were made with Slash Pine on poorly drained sites previously the subject of experimental treatment. Results of these experiments had been evaluated during the previous year and this indicated that, with site preparation and fertilizing, satisfactory plantations can be raised with cheaper costs of establishment and reduced unit cost of protection. For use in this work, a disc plough was developed in the Gympie District for mounding. Drawn by a rubber-tyred tractor, the twin discs form a mound 3 feet across and about 10 inches above normal ground level. Trees are planted in the centre of these mounds. Over considerable areas, mounding is the only site preparation needed but some of the more extensive swamps will also need draining and it is planned to include some of these in the areas prepared next year. Many of these swamps have rich humic soils which, when drained, are well suited to the growth of Loblolly Pine.

Plantation areas are shown by districts and species in appendices "F" and "G" and from them the following figures are taken:—

Species	1967–68	Total Area Planted to 31–3–68
	Acres	Acres
Native Conifers (chiefly Hoop Pine) ..	3,359 3	65,305 1
Exotic Conifers (chiefly *Slash*, *Caribbean*, *Radiata and Patula Pine*)	6,060 4	67,928·9
Eucalypts	1·6	3,700·5
Other Broadleaved species	2·7	1,236·9
Miscellaneous Experimental	24·6	226·3
Total	9,448·6	138,397·7

Tending

Area tended during the year compared to previous years was:—

Year	1965–66	1966–67	1967–68
	Acres	Acres	Acres
Area covered in tending ..	59,126	58,300	72,866

Some of the increase in area tended is due to the increase in the planting programme and the remainder to seasonal conditions particularly in Hoop Pine areas where lantana is the most serious weed in older plantations and its development is largely influenced by rainfall.

Mounding on Poorly Drained Soil Type in preparation for planting on S.F.—1004 Toolara (Gympie District). Slash Pine (Pinus Elliottii) is planted on mound

The cost of first-year tending in Hoop Pine plantations has been substantially reduced by the increased use of hormones both before and after planting. Pre-plant spraying is by misters and improved control of weeds with attendant saving in cost was achieved by the use of higher concentrations in 2,4-D and 2,4,5-T and increased amounts of wetting agents. Post-planting spot spraying is applied using knapsack sprays with low volume nozzles.

Pruning

Figures for 1967-68 compared to 1966-67 are as follows:—

Year	State of Pruning				Total Area
	1st	2nd	3rd	4th	
	Acres	Acres	Acres	Acres	Acres
1966–67 ..	3,229	4,943	5,928	2,657	16,757
1967–68 ..	3,783	2,309	5,414	2,608	14,114

Diseases and Pests

(*a*) Insects, birds and animals—

There were no serious outbreaks of new insect pests in forests or plantations during the year and existing pests showed no unusual upsurge of activity. This contrasted with experience in urban areas where, during the summer months, there was an unusually high incidence of attack on native and exotic ornamental trees by a range of foliage pests and trunk borers.

The Kauri Pine coccid (*Conifericoccus agathidis*) has declined somewhat in importance with the progress achieved in harvesting affected Kauri Pine.

Control of nursery pests of Hoop Pine is becoming increasingly important as higher plant production becomes necessary to meet the demands of the increased planting programme. Treatments and their application are at present under review with a view to reducing losses below levels previously tolerated. The main pests concerned are white grubs (*Scarabaeoidia*), the golden mealy bug (*Nipaecoccus aurilanathus*), grasshoppers and cutworms (*Noctuidae*). With early recognition of these and other minor pests and increased efficiency of application of control measures, significant savings of stock should be possible. Exotic Pine nurseries are relatively free of insect pests.

Investigation of insect pests of Hoop Pine seed has shown that losses of from 20 per cent. to 30 per cent. of viable seed from this cause are general. Promising results have been achieved by the use of systemic insecticides introduced into the trunks of trees. Other work just completed has shown that soil treatment at planting can significantly reduce losses from white grub damage in the field in areas where this problem occurs. Although bagworms (*Hyalarcta hubneri*) have not been present in pest proportions in Radiata Pine at Passchendaele for five years, collection of data on the subsequent growth of damaged trees has been continued. Biometrical analysis of data is now being undertaken with a view to determining the long term effects of such damage on trees and hence the justification for control measures against any future outbreaks.

With the anticipated completion of the Biology Laboratory early in the coming year, the excellent facilities available will permit commencement of much useful biological work, previously not possible. This is expected to permit further refinement of control measures based on a fuller knowledge of the biology of the pest species.

Investigation of the rat problem in the Murgon District is proceeding. This work is necessarily seasonal as the rats are present in high numbers only during the months May to October inclusive. Although experimental work was commenced in the 1967 season, the main value of results so far has been in the development of techniques and experimental layout. At present, work is to be confined firstly to possible improvements in the efficiency of baiting and assessment of its value as a control and secondly to an assessment of remedial measures involving straightening and ramming undermined trees. Most work is, of necessity, long term as the true value of measures can only be assessed on the condition of trees at the cessation of rat attack, usually at about 7 years of age.

Forest Products Research

The number of enquiries on insect pests of timber, received during the year indicates that both Industry and the Public are becoming increasingly aware of the importance of avoiding loss of timber from this source. Whilst most enquiries required only routine recommendations for treatment, a considerable proportion required identification of the pest species involved. This is a most important aspect as, depending on species, little or no treatment may be required.

Active participation in a Committee of the Standards Association of Australia has resulted in the production of the Standard Code "Physical Barriers used in the Protection of Buildings against Subterranean Termites". This method

of termite protection is time proved in Queensland and particularly suited to the majority of our domestic building designs.

As a result of the initial survey of the immediate area surrounding the site of the first finding of the West Indian drywood termite (*Cryptotermes brevis*), nine houses have been fumigated with methyl bromide. Extension of the surveyed area is being undertaken currently and an additional 100 premises have been inspected. As yet, no further instances of infestation by *C. brevis* have been found.

Laboratory work has been undertaken during the year, as opportunity permitted, on the establishment of nucleus colonies of *Lyctus brunneus* and *Calymmaderus incisus* so that testing work can be undertaken more rapidly when the Biology Laboratory is available for occupation.

(*b*) Fungi—

Soil fumigation was carried out in four nurseries for *Pinus spp.* sowings made during the year. In three of the nurseries, this treatment was for the control of *Phytophthora cinnamomi* root rot while in the fourth nursery, a small area of seed bed was fumigated for a sowing of Patula Pine which is subject to serious damping off losses. The area fumigated for 1967-68 sowings in the four nurseries was 0·90 acre compared with 2·19 acres in four nurseries in 1966-67 and 2·51 acres in seven nurseries in 1965-66. The reduction in area fumigated was despite increased sowings at Beerburrum and Beerwah nurseries which between them have constituted 60-80 per cent. of the annual fumigation programme to date. This reduction resulted from the practice of making two consecutive sowings following fumigation of a seed bed. It has been found in practice that a third sowing without treatment is not successful. As a result of the construction this year of the new nursery at Beerburrum to replace both the present Beerburrum and Beerwah nurseries, the area of seed bed to be fumigated for the 1968-69 sowings will be less than 0·5 acre.

Because of the similarity of soil fumigation for soil borne disease and also nut grass control, there has been an association between these two fields over the last few years. This year, contract fumigation, with methyl bromide, of areas in Toolara and Tuan nurseries was carried out for nut grass control. Arrangements are being made for the fumigation of a large nut grass infested area of Bowenia nursery.

During the planning of the new Beerburrum nursery, consideration was given to measures to be adopted in the layout and operation of the nursery to minimise risk of soil borne diseases, particularly *P. cinnamomi* root rot.

A number of outbreaks of terminal crook disease of *Pinus spp.* caused by *Colletotrichum acutatum* were reported. Towards the end of winter, the disease occurred on Caribbean Pine at Bowenia and Gregory nurseries and later in 1967, the disease attacked Slash Pine at Gregory and the A.P.M. nursery at Kallangur. The outbreaks on Caribbean Pine were the first known occurrence on this host, the fungus being previously recorded on Slash Pine from four Queensland forest nurseries and in New Zealand on Radiata Pine.

Pine needle-cast disease of nursery stock, caused by *Lophodermium sp.*, which occurred at Beerwah and Beerburrum nurseries during winter 1967 was mentioned in the last annual report. By the end of winter 1967, this fungus was collected frequently on needles retained on trees, as well as on needle litter which is more usual. At that stage, the fungus was widespread throughout south-eastern Queensland plantations. Severe defoliation in several small areas of Patula Pine was apparently caused by this fungus. Possibly the wet conditions experienced during winter 1967 were responsible for this occurrence, but the level in normal winters and the effect of the fungus on tree growth is not known.

The first outbreak of *Rhizoctonia* root rot for some years was reported on Hoop Pine in the Jimna nursery. Deaths occurred in December and February in 15- to 17-month-old plants, the total loss being under 1 per cent.

Black or charcoal root rot of *Pinus spp.* (*Meacrphomina phaseoli*) was recorded for the first time in Queensland from the Lowood area. Young trees were killed at a time when the fungus was active in the area on agricultural crop host species. On pines, this is normally a seedling disease but reports from South Australia indicate that the fungus has killed four-year-old Radiata Pine trees weakened by several dry seasons.

Dieback of both Hoop Pine and Caribbean Pine was reported from several areas but the causes of these symptoms are not known.

Very late in the year, there was a report of deaths in an area of Slash Pine plantation (1950 planting) at Beerburrum. When first recorded, there were 8 deaths but another 47 trees in about one-third acre were showing symptoms. From a preliminary investigation, it appears that the trouble is occurring below ground and studies will be continued next year.

Seed Collection

Seed collections made during the year for plantation establishment were:—

	lb.
Hoop Pine	55,419
Slash Pine	1,747
Caribbean Pine	5
Loblolly Pine	125
Radiata Pine	14

A very good collection of Hoop Pine seed was made during the year and supplies are now sufficient for plantings of Hoop Pine for the next five years. Laboratory germination tests indicate that at least 80 per cent. of the seed has a viability of over 40 per cent. The outstanding aspect in this respect was the high viability of seed collected from plantations in the Yarraman District, practically all of the seed being over 40 per cent. Plantation seed generally shows poorer viability than seed from native areas due to lack of fertilization through poor pollen production. Plantations do not produce male flowers in quantity until the plantations are 25 years or more in age.

The Hoop Pine seed collection was largely from the Yarraman, Monto and Maryborough Districts. Little or no seed was collected from the Murgon and Imbil Districts due to either poor crops or poor results from fertilization tests carried out on test collections made from plantations.

An experiment was commenced during the year to test the effect of storing Hoop Pine seed in cold storage at 5°F, 15°F and 25°F, against normal storage temperature of about 38°. As stated previously, the viability of Hoop Pine seed deteriorates gradually in cold storage at 38°F. There are indications that at lower temperature, the deterioration is reduced considerably.

The Slash Pine seed collection included 1,397 lb. from Seed Orchards which was about 250 lb. less than the 1967 collection. Collection is more than adequate for our planting requirements but the Department has orchard seed in store against the possibility of a poor crop in the future.

The poor collection of Caribbean Pine seed was expected because of observations made at the time of flowering. Male flowering has been poor at Byfield, the main centre for collection of Caribbean Pine seed, over the last three years and there is little prospect of a good collection before 1971. This could limit the expansion of the Caribbean Pine planting programme in North Queensland. It is expected that seed will be available by 1972 from the Caribbean Pine seed orchard recently established at Kennedy in North Queensland and this will provide planting stock of vastly improved form.

Nurseries

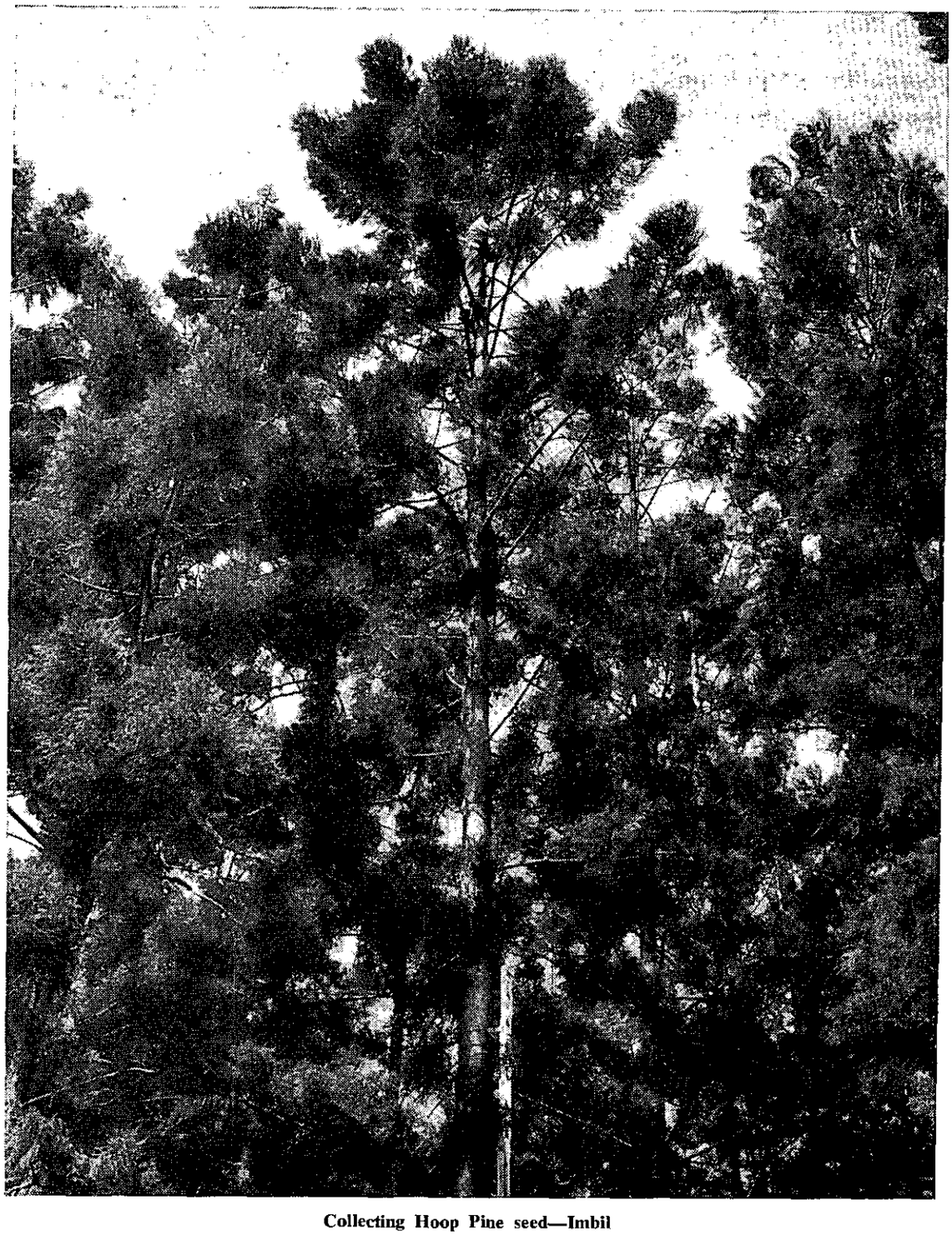
Further extension of several nurseries was undertaken during the year and action was taken for the production of planting stock for the Beerwah and Beerburrum areas from a new nursery at Beerburrum. The use of this larger nursery will involve the closure of the old nurseries at Beerwah and Beerburrum which have been in constant use for many years. Considerable trouble was experienced in recent years in these nurseries through fungal attack by *Phytophthora cinnamomi* and the need for costly fumigation. It is expected that the new nursery will not only produce stock more cheaply for the field but also provide better planting stock. With a much larger area available for sowing, it will be possible to fallow for at least 2 years out of 3 which should assist in combating fungal troubles. The increased production from the one centre and the good site will allow for mechanisation of nursery practices. Expansion of the Tuan and Toolara nurseries will also permit reasonable fallowing and introduction of mechanisation.

At the present time, the Department maintains 12 Hoop Pine nurseries and 10 Exotic Pine nurseries for production of plantation species. Hoop Pine is also raised for Departmental use at the nursery at the Palen Creek Prison Farm.

Two amenity nurseries are also maintained for the production of stock to meet public demand for plants for ornamental, shade, shelter and windbreak purposes. Departmental nurseries produced 6,400,000 plants for the field and there were 9,900,000 plants in the nurseries prior to the commencement of the 1968 winter planting.

Production per lineal foot of drill down, has increased over the last few years to about 4·5 plants in the case of Hoop Pine and to about 7 in the case of Slash Pine. There is still considerable variation in results from Hoop Pine sowings from year to year. Seed dressing with Captan 50 has improved germinations up to 20 per cent. in Hoop Pine nurseries.

Organic manures continue to show advantages over inorganic in the maintenance of healthy plant growth but cow manure introduces a weed problem in nurseries where it is used. Trials are under way to effect control over this source of weed infestation by fumigation of the manure before use.



Collecting Hoop Pine seed—Imbil

Treatment of Natural Forests

Areas of natural forest treated in 1967-68 are shown in the following table together with those for 1966-67:—

Forest Type	1966–67	1967–68
	Acres	Acres
Eucalypt Forest	15,873	11,149
Cypress Pine Forest	11,643	13,932
Tropical Rain Forest	684	740
Natural Hoop Pine	Nil	Nil
Total	28,200	25,821

The area of Eucalypt forest treated has fallen by about 4,700 acres whilst the areas of White Cypress Pine and of Northern rain forest treated has increased. This is associated with the possible demand for Hardwoods in south-east Queensland for pulping purposes and the increased cost per acre of the hormone treatment now adopted for Hardwood areas. Hormone treatment is far more effective than ringbarking alone in the killing of unwanted stems and in prevention of coppice growth.

New treatment rules have been introduced for rain forest treatment in North Queensland which will have the effect of reducing cost of treatment per acre and allow for a larger area to be covered.

New rules for tree marking of merchantable trees were introduced during the year for Spotted Gum types and Flooded Gum and Brush Box types. These rules permit retention to a higher girth limit of the best stems in the stand thus ensuring better growing stock and a superior source of seed for re-stocking the area.

Sale of Trees

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

Forest Plots	596,913
Schools and Government Departments	8,704
Other Private Plantings	88,378
Total	693,995

Forest Plot sales covered the following species:—

Slash Pine	522,285
Caribbean Pine	44,256
Radiata Pine	4,710
Patula Pine	2,200
Hoop Pine	17,610
Miscellaneous	5,852
Total	596,913

Timber species are supplied at concession rates from Departmental nurseries for planting in approved forest plots. Total sales showed an increase of about 160,000 plants on figures for 1966-67.

Amenity Nurseries

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

Nursery	Plants Sold	Value
		$
Rocklea	65,257	10,476.05
Dalby	10,227	1,819.59

These sales are slightly above 1966-67 figures.

Christmas Trees

Only 6,136 Christmas trees were sold for a total value of $3,373. This is a decrease of 3,749 on 1966-67 sales. The lower sales were due to competition from private firms and individuals.

SILVICULTURAL RESEARCH

A major part of the work of this Branch has been the remeasurement and maintenance of long term current experiments. The new work initiated at each of the research centres and some of the findings of research are referred to below.

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. Some work is also done on local problems associated with the establishment of plantations in North Queensland.

(i) Rain Forests.—Preliminary trials of spot-sowing as a means of regenerating rain forest areas deficient in seedling regeneration have shown that the technique will be very satisfactory in the absence of seed destruction by animals—both vertebrate and invertebrate. However, in areas of high hazard, dusting with animal repellants and insecticides has not prevented seed destruction. This probably results from the removal of the applied dusts by rain.

Further grafted stock were planted in the Queensland Maple seed-orchard near Kuranda. Despite a heavy regrowth of secondary rain-forest species, the stock planted the previous year grew quite satisfactorily and survival was good.

Previous experiments have shown that in treated rain forests there is negligible growth advantage in the regeneration classes of the better species as a result of follow-up tends in the following eight years. A further two tending experiments were established in 1967 in rain forests which were silviculturally treated in 1955, in order to determine whether a follow-up tend 12 years after the initial treatment would be necessary to maintain adequate increments on selected stems of the desired species.

The establishment of an experiment to determine the impact, on the height growth of underplanted Queensland Maple, of the quick and slow removal of all the canopy and of the removal of the low canopy only and of the high canopy only was reported last year. In the plots in which all shade was removed rapidly with the aid of arsenic poisoning the average height of the Queensland Maple underplants 15 months after treatment was 7·4 feet. In those in which all shade was removed rapidly except for saplings under six inches g.b.h.o.b. the average height was 6·1 feet. In those in which the tree stand between 6 inches and 18 inches g.b.h.o.b. was retained and the remainder poisoned the average height was 4·2 feet. In the plots in which the overwood is being removed without the aid of poison, the average height of the underplants is 4·6 feet. It is encouraging that a heavy regrowth of secondary species has occurred with complete and rapid canopy opening as this should induce good form in the underplants. This latter method of establishing Queensland Maple is much cheaper than the establishment of open plantations and may well produce a stand with comparable girth increments and improved bole length. The natural regeneration of the more valued species responded to canopy opening in a similar way to the planted Maple but the magnitude of the response was less. This is probably due to delayed recovery from the suppression to which these plants had been subjected previously.

An experiment covering 25 acres was established in 1956 when a virgin rain forest was given standard silvicultural treatment but without prior logging. This experiment was measured and then logged during the report year. The effectiveness of the treatment and the damage done to the small size classes in logging is now being assessed. In another 1956 experiment, a logged stand was given a cheaper silvicultural treatment than the prescribed treatment. This consisted of selecting the more valuable stems in the stand and destroying useless stems by brushing or ringbarking within a specified distance of the selected stems. This reduced costs as some areas were left untreated because of the absence of a selected stem and also because no trees of useful species were destroyed. Over the 12 years since the treatment was carried out, the average annual girth increments of the selected trees have been satisfactory when compared with those of similar species in stands afforded the more expensive routine treatment. Experiments are being designed to ascertain the effect of the newly prescribed treatment rules on the growth of the desired components of the stand.

Girth increment data, derived from treated yield plots and other treated experiments, have been assembled by species. The species fall broadly into two categories, a faster growing group and a slower growing group. As the valuable cabinet woods, with the exception of Queensland Walnut fall into the former group, this group has been subdivided into two groups, viz.:—"Valuable Cabinet Woods" and "Other Fast Growing Species". Girth increments for the three groups are shown below:—

PERIODIC ANNUAL GIRTH INCREMENTS IN INCHES BY SPECIES GROUPS

Species Group	G.B.H.O.B. Class Inches	Period			
		1955–58	1958–61	1961–63	1963–67
Valuable Cabinet Wood Species	12–24	·55 (75)	·56 (65)	·57 (56)	·65 (42)
	24–36	·64 (40)	·64 (42)	·87 (47)	·92 (55)
	36–48	·65 (28)	·58 (31)	·70 (31)	·91 (33)
	48–60	·68 (24)	·62 (21)	·86 (16)	·85 (18)
	60–72	·43 (9)	·58 (13)	·74 (21)	·96 (23)
	72–84	1·12 (9)	·55 (8)	·79 (8)	·50 (4)
	84–96	..	·99 (1)	·45 (1)	1·32 (5)
Other Fast Growing Species	12–24	·71 (4)	·59 (4)	·66 (4)	·53 (3)
	24–36	·63 (8)	·51 (7)	·67 (7)	·50 (5)
	36–48	·48 (9)	·54 (7)	·60 (6)	·78 (7)
	48–60	1·01 (1)	·45 (3)	·57 (4)	·82 (5)
	60–72	·85 (6)	·64 (5)	·72 (5)	·80 (4)
	72–84	..	·39 (1)	·53 (1)	1·13 (2)
Slow Growing Species	12–24	·46 (97)	·38 (89)	·43 (77)	·45 (63)
	24–36	·35 (71)	·32 (78)	·43 (83)	·61 (88)
	36–48	·34 (54)	·29 (47)	·47 (57)	·66 (61)
	48–60	·43 (37)	·36 (33)	·44 (35)	·69 (37)
	60–72	·51 (18)	·32 (20)	·50 (20)	·53 (23)
	72–84	·34 (3)	·20 (4)	·49 (6)	·70 (7)
	84–96	·58 (2)	·23 (2)	·46 (2)	·74 (2)
	96–108	·79 (1)	·42 (1)	·00 (1)	·02 (1)

The numbers in brackets are the numbers of trees from which the means are derived.

Lineal sampling procedures have been devised for use both in determining the type of treatment most suitable for an area and in assessing the effects of treatment. The appropriate treatments are determined empirically from the number of quarter-chain quadrats per acre stocked with various sized trees, the smaller the trees, the more intensive the treatment considered to be optimum. Consideration is also given to keeping the basal area of the stand below certain upper limits. The soundness of the criteria adopted has still to be tested experimentally. The method adopted is simple enough for use by field officers and two assessments were so made during the year. A third area treated about five years previously was sampled and found to be well regenerated with over 50 quarter-chain quadrats per acre (out of 160) with a class 1 tree in a dominant position.

Some effort was made to relate the data recorded in forest inventory work with the treatability criteria. This has been found possible to a limited degree only, chiefly because no figures on stand basal area are collected, but the stocking of trees of merchantable species over 18 inches g.b.h.o.b. does give some lead as to the treatability of an area.

A trial punched card key for the field identification of rain forest species in the region between Townsville and Cooktown was produced for testing. It is based on 1,250 sets of observations of individual trees covering 470 tree species. Information has subsequently been gathered from a further 250 individual trees bringing the total number of species covered to about 500. The key has proved to be a satisfactory tool for the identification of rain forest species at all field staff levels.

A publication—"Silvicultural Research and Management in North Queensland Rain Forests" was prepared for 9th Commonwealth Forestry Conference, India, 1968.

(ii) Plantations.—Observations and measurements in existing species trials have been continued. Observation plots were established in Bahaman Caribbean Pine and Benguet Pine plantings at Kennedy near Cardwell. The following trial species were outplanted on the Atherton Tableland or near Kuranda mainly on open forest sites:—Bahaman Caribbean Pine, Honduras Caribbean Pine, Cuban Caribbean Pine, Benguet Pine (N.W. Thailand), Patula Pine, Ocote Pine, *P. occidentalis, P. strobus* var. *chiapensis* and White Cypress Pine.

Further trial plantings were made at Weipa on land leased by Comalco. Species represented were Teak, White Cypress Pine, American Mahogany, Red Cedar, Neem and *Chickrassia tabularis*. In the earlier planting in 1966-67, Honduras Caribbean Pine is doing reasonably well and looks the most promising. African Mahogany and American Mahogany are doing well. *Xylia* and *Acrocarpus* deserve further testing. Teak has failed. It appears that fertilizer studies will be necessary before successful plantations of this species will be established at Weipa.

Earlier trials now 10–15 years old with Benguet Pine on rainforest sites on the Atherton Tableland and on open forest sites on the coastal lowlands, indicate that this species could have a place in reforestation programmes in North Queensland. A provenance trial including six sources of Benguet Pine collected over the range from India to the Philippines was established during the year on open forest sites at Kuranda and Kennedy and on a rain forest site on the Atherton Tableland. Three provenances of Ocote Pine were included in the trials which also included control plots of Honduras Caribbean Pine.

A season of sowing, tubing and planting experiment in Honduras Caribbean Pine was carried out at Kennedy. Trials of systemic insecticides to control the Red Cedar Shoot Borer (*Hypsiphyla robusta*) in new plantations have been inconclusive as there has been no population build-up of the borer.

Trials with (a) several 2,4-D and 2,4,5-T formulations and concentrations in water and diesel distillate applied to the leaves; (b) one per cent. and two per cent. 2,4,5-T butyl ester in diesel distillate applied to the bark; and (c) 0·6 per cent. and one per cent. trysben (2,3,6-T.B.A.) in water applied to leaves and soil, were carried out to control lantana (*Lantana camara*) in plantations. It was found that 2,4-D amine at a concentration of 0·2 per cent. a.i. (active ingredient) as a foliar spray and 2,4,5-T butyl ester at one per cent. a.i.) in diesel distillate as a basal bark application gave the best prospects of controlling Lantana at a reasonable cost. Follow up treatment of plants not killed initially is necessary.

Beerwah Regional Research Station

Three sections of this station handle aspects of research into the establishment and maintenance of exotic pine plantations on the coastal plain south of latitude 23° S and on the sub-coastal plateau country of southern Queensland. The fourth section deals with coastal hardwood forests.

(i) Plantation Silviculture.—This section is responsible for silvicultural research in Slash Pine, Loblolly Pine and Honduras Caribbean Pine plantations established on the coastal lowlands of Southern and Central Queensland, and in Radiata Pine plantations on the southern highlands at Passchendaele.

A great deal of time has been spent in transforming past measure data from long term experiments into a form suitable for analysis by computer techniques, and the development of the necessary computer programmes. The stage has now been reached where a review of some of the oldest spacing and thinning experiments should be possible in the coming year.

Recent developments in the use of genetically improved seed, nursery fumigation and nutrition, the greater use of machine clearing in site preparation, the draining, plough-mounding and planting of poorly-drained sites previously considered as unplantable have necessitated a thorough re-examination of past nursery and establishment techniques in coastal exotic plantations. This review has been accelerated by poor first-year survivals in recent years in several routine Slash Pine plantings. A study carried out on the month of winter planting of Slash Pine over the past three seasons using both routine and orchard grade planting stock from Beewah and Beerburrum nurseries indicates that time of winter planting, the use of orchard seed, or nursery of supply has not materially affected first-year survival or height growth. Further detailed examination of nursery techniques, stock handling methods, and planting methods is proposed to elucidate the factors responsible for these sporadic poor survivals.

EFFECT OF MONTH OF PLANTING ON FIRST YEAR SURVIVAL AND HEIGHT GROWTH—SLASH PINE

Year Planted	1965	1966	1967	1967
Nursery	Beerwah	Beerwah	Beerwah	Beerburrum
Seed Grade	Routine	Orchard	Orchard	Orchard
Month Planted—	*Survival Per cent. and Height in Feet—Winter after Planting*			
May	100—N.R.	100—2·8	99—2·0	99—1·9
June	96—N.R.	97—2·7	100—2·1	100—1·9
July	96—N.R.	98—2·2	93—2·0	99—1·9
August	100—N.R.	99—2·3	98—1·9	89*—1·7

N.R.—Not recorded.

* Heeled in stock given atypical nursery treatment.

A season of sowing, tubing and outplanting experiment with Honduras Caribbean Pine was established at Byfield. Sowing was done in February, March and April and tubing one month, two months, three months, four months and five months after germination provided that no tubing was done after the end of August. It was found that survival from all tubings was good. Tubing of one month seedlings was more costly than other tubings because of the care required to handle the tender plants. If tubing was delayed beyond the age three months, the plants wilted after tubing and developed bends. The growth in the galvanised iron tube was so slow that outplanting size was dictated by age at tubing rather than month of sowing.

With the likelihood that Bahaman Caribbean Pine will become increasingly important in the plantation programme, a series of pregermination trials have been conducted in the nursery and laboratory in recent years. The initial laboratory trial indicated that the best seed treatment was a 48-hour water soak at room temperature although the more recent trials in both the laboratory and nursery indicate that there is little difference between water soak treatments, from 24 to 60 hours at room temperature, and moist cold storage for periods up to 14 days or a combination of these treatments, all of which will generally improve germinative energy, and germinative capacity of the seed. There is some suggestion that moist cold storage treatments are likely to be more

successful than water soak treatments with increasing age of seed. An experiment dealing with depth of sowing gave no significant difference in germinative capacity with seed sown from ⅛ inch to ⅜ inch deep, although the deepest sowing gave significantly faster germination.

Two species which are considered worthy of further trial are Sand Pine and Pond Pine, the former for deep coastal sands and dunes, and the latter for swamp sites. Further outplantings to extend the range of sites on which these pines have been planted were made during the year. Measurement of Ocote Pine planted two years ago shows that the early growth of this species has been comparable to Slash Pine.

A paper entitled "Aspects of Management of Plantations in Tropical and Sub-Tropical Queensland" was prepared for the Ninth Commonwealth Forestry Conference, India, 1968. Two papers dealing with "Spacing and Thinning in Southern Pine Plantations in Southern Queensland" and "Nurseries in Queensland" were presented to the inaugural meeting of the Australian Forest Research Working Group No. 5 (Plantation Silviculture) held at Beerwah in May 1968.

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

(*a*) Slash Pine.—Total yield of clean seed from the two grafted seed orchards was 1,360 lb. which was a little less than the 1967 collections. The plots to which nitrogen, phosphorus and potassium are added, again gave substantially higher seed yields than those given phosphorus and potassium only and almost double the number of cones per ramet compared to the unfertilized trees.

A large experiment was planted at Beerburrum, Tuan and Gregory with the objects of investigating family-by-locality interaction and introducing new germ-plasm. Many of the entries were wind-pollinated families from individual clones in seed orchards in south-eastern U.S.A. and South Africa. Results of this comprehensive test will assist in deciding whether it is desirable to have differently constituted seed orchards to supply seed for different environments.

A large part of the work with Slash Pine now is the study of established progeny trials preparatory to initiation of the next stage of improvement—Phase II. It is expected that some individuals selected for Phase II will be chosen on the combined bases of family indices and phenotypic performance in the progeny trials established at Beerwah. Additional trees will be found by intensive searching of the large areas of routine plantation now available.

(*b*) Caribbean Pine.—This year a seven acre clonal seed orchard of Honduras Caribbean Pine was established at Kennedy in coastal North Queensland (latitude 18°15'S). Eighteen clones were included, the principal criteria for selection of the ortets being, in order of importance, superior form (outstanding straightness and absence of foxtails), good dominance in the local stand and acceptable wood properties. Properties favoured were minimal spiral grain, moderate mean basic density and maximum fibre length. Field grafting on one of the paired seedling stocks planted previously at sites spaced at 24 feet by 24 feet was carried out in February 1968. Initial grafting success was 75 per cent. Where necessary, regrafting was done on the alternate stock plants. Scion growth has been rapid generally, so much so that a few ramets produced pollen in June. Concern about possible climatic effects on the reproduction of Honduras Caribbean Pine has increased with the third successive extremely poor flowering at Byfield (coastal lowlands latitude 23°S) in winter 1968. Previously there had been only one flower-crop failure between 1959 and 1965.

Experiments have been in progress for some years on delayed stock-scion incompatibility which is rather widespread and seriously affects the survival of grafted ramets in some clones. It has been found that the use of stock plants that were half-sib progeny of the scion parents reduced markedly the incidence of the trouble. In mildly and moderately incompatible clones, this technique appears to be a practical solution for seed orchard work. In severely incompatible clones, air-layering would be a more satisfactory technique.

Further provenance trials were established in the field during the year including for the first time, stocks from coastal Nicaraguan sources. Sowings were again made using seed from Nicaragua and also from two coastal plain provenances in British Honduras.

Plans have been formulated and a start has been made on the implementation of a systematic mating design (tester crosses) and complementary field design for the establishment of combined genetic and selection experiments. The objects are to study parental breeding values, inheritance and correlations of traits, to provide for future progeny test and pedigree selection and so to enable continuous genetic improvement.

A progeny trial of 60 wind-pollinated families of Bahaman–Caribbean Pine, using seed from trees selected in natural stands, was established in the field at Beerburrum and Gregory. The comprehensive provenance trials with this variety, which were established last year at four centres, were repeated this year. Cuban Carribbean Pine, aged seven years, shows excellent form and good growth rate at Byfield.

(*c*) F_1 Hybrids of Slash and Carribbean Pines.—The oldest tests of F_1 hybrids (var. *elliottii* x var. *hondurensis*) are now aged 10 years and, together with the numerous younger trials, continue to show growth superior to Slash Pine. This hybrid could replace Slash Pine in the reforestation of large areas of south-east Queensland if means were available to mass produce hybrids cheaply. Accordingly investigations were commenced on the feasibility of propagating selected young hybrids by cuttings, on the performance of F_2 families in comparison with F_1 families and of the possibility of establishing clonal seed orchards of late flowering Honduras Caribbean Pine and early flowering Slash Pine. The programme of crossing each of the two varieties of Slash Pine with each of the three varieties of Caribbean Pine and of crossing the Caribbean Pine varieties amongst themselves was continued. The hybrid var. *hondurensis* x var. *caribaea* is showing very rapid early growth at Byfield.

(*d*) Loblolly Pine.—Because of the revival of interest in this species, a 2·5 acre seed orchard was commenced during the year with the planting of nursery-grafted ramets from 14 superior trees. A field grafting trial gave such good results that this procedure will be used to complete establishment of the orchard. Ten new superior phenotypes were located during the year. Wind-pollinated families from 25 Queensland and South African trees were planted in progeny tests at Beerburrum and Kenilworth using a balanced lattice design with 25 trees per plot.

(*e*) Radiata Pine and Bishop Pine.—Approximately 10 lb. of Radiata Pine seed was collected during the year from clonal seed production areas. Two new phenotypic selections were made at Passchendaele and included in an existing seed production area by field grafting. Further outplantings were made at Passchendaele, Pechey and Yarraman of full-sib progeny from trees selected on the basis of wind-pollinated progeny, for good health, form and vigour.

At Passchendaele, an eight-year-old trial of 30 clones, produced in Canberra from cuttings and established co-operatively with the Forest Research Institute, was measured and assessed. Some of these A.C.T. clones are performing well. Likewise a few of several 12- to 14-year-old wind-pollinated families from trees chosen in New Zealand are growing well at Passchendaele. A provenance trial of Bishop Pine involving six seed sources was established in the field at Passchendaele.

(*f*) Miscellaneous Tropical Pines.—Provenance trials of Benguet Pine and Ocote Pine were outplanted at a number of tropical and subtropical sites. Some of these plantings have been referred to in the report of the Atherton Regional Station. Other outplantings were made at Cathu on upland and coastal sites, at Byfield and at Gregory. Sowing of *P. tropicalis* seed has yielded sufficient plants for several outplantings. Small clonal seed production areas of *P. merkusii* and Benguet Pine were planted at Beerburrum.

A research note "The Vegetative Reproduction of Caribbean Pine in Queensland" was published. A paper entitled "Variability of *Pinus Caribaea* (Mor.) in Young Queensland Plantations" was prepared for the Ninth Commonwealth Forestry Conference, India 1968. Two officers attended the meeting of the Australian Forest Research Working Group on Tree Improvement and Introduction held at Canberra.

(iii) *Nutrition.*—This section carried out work chiefly in connection with the determination of fertilizer requirements of exotic pine plantations, established on the coastal lowlands of south-eastern Queensland. Further limited work is carried out on nutrient problems on reserves in other areas. A plant and soils laboratory carries out work as required by this section and Departmental staff in other centres.

It is well documented that phosphorus is the major nutrient deficiency of exotic pines grown on the coastal lowlands. Results from long-term field experiments continue to verify that the routine application of phosphatic fertilizers, on lateritic podzolic soils, supporting both Slash and Loblolly Pines, is economic. Current work is directed towards prediction of phosphorus deficiency, through foliar analysis. Work on determination of the optimum levels of phosphorus in the foliage of Slash and Loblolly Pines, indicates that foliar phosphorus levels of 0·077 per cent. for Slash Pine and 0·099 per cent. for Loblolly Pine can be regarded as critical. Increment drops off markedly at foliar concentrations below these levels. It has been found that these critical levels are remarkably constant over a wide range of age classes.

At Beerburrum on areas of poorly drained soils including ground water podzols, podzolic gleys and low humic gleys, all previously considered to be unplantable, experiments have been established to assess the limiting nutrients for exotic pines. The major deficiency evident by age two years, for

all species tested, is phosphorus. For Slash Pine, minor deficiencies of nitrogen are evident, but for Honduras and Cuban Caribbean Pines and their hybrids with Slash Pine there has, as yet, been no significant response to nitrogen. Potassium and copper are not limiting at this stage for any of the species tested.

During the year a large scale field experiment of 13·2 acres was established at Gregory on a poorly drained area which carried stunted vegetation. It is designed to test three types of site preparation, the suitability of Slash Pine and the three varieties of Caribbean Pine for planting on this type of site and the response to added phosphorus, nitrogen, potassium and minor elements.

An experiment established in 1965 to study the response of Slash Pine to cultivation and various forms of phosphatic fertilizers on a gleyed podzolic soil was measured in 1968. It involved an untreated control, cultivation only and cultivation and basal fertilizer with or without phosphatic fertilizer. The basal fertilizer applied at planting contained nitrogen, potassium and copper. Phosphorus in various forms was broadcast at rates calculated to add 75 or 150 p.p.m. to the top 4 inches of the soil.

Responses are shown in the following table:—

RESPONSE OF SLASH PINE TO CULTIVATION AND DIFFERENT PHOSPHATIC FERTILIZERS IN THE PRESENCE OF ADDED NITROGEN—AGE 3 YEARS

Treatment	Height in Feet		
	75 p.p.m. P_2O_5	150 p.p.m. P_2O_5	Mean
No cultivation or Fertilizer ..	..	..	6·77
Cultivation only	..	..	9·85
Cultivation and Basal Fertilizer—			
Nil Phosphate	..	..	10·38
Superphosphate	11·46	12·16	11·81
Christmas Island Phosphate (Calcined)	10·64	11·47	11·06
Nauru Rock Phosphate	10·29	10·94	10·61
Christmas Island Phosphate (Raw)	9·93	10·58	10·26

The table indicates a negligible response in this young plantation to raw Christmas Island phosphate and to Nauru Rock phosphate and the best response is to superphosphate. It is considered this difference in rate of response to added phosphorus is the result of prior cultivation and the addition of nitrogen at time of planting. It is anticipated a more marked response to the addition of Nauru phosphate will show up with the passage of time. The table also indicates the marked response to site cultivation.

Field experiments on the nutrition of Patula Pine growing on lateritic krasnozems, at Pechey, have continued and it is now obvious that phosphorus is the major nutrient deficiency.

Growth of Hoop Pine, established as an open planting on coastal lowlands, is limited primarily by the lack of nitrogen with a secondary deficiency of phosphorus. The critical level of nitrogen in the foliage depends on the concentration of phosphorus and *vice versa*. The critical levels of these nutrients for practical purposes can be taken as 1·35 per cent. for nitrogen and 0·120 per cent. for phosphorus. Hoop Pine underplanted to Slash or Loblolly Pine has foliar nitrogen and phosphorus levels well above these critical levels.

The primary limiting nutrient for Kauri Pine, open grown on the coastal lowlands is nitrogen, with little or no growth occurring unless this element is added; phosphorus is a secondary deficiency. Phosphorus depresses growth in the absence of fertilizer nitrogen but increases growth in the presence of nitrogen. A slight response is obtained from an application of potassium and from a trace element mixture containing copper, zinc, boron and molybdenum.

The series of experiments commenced to study the phosphorus cycle in plantations of Slash Pine of different ages, on comparable soil types, is continuing.

A paper "Nitrogen and Phosphorus Nutrition of *Araucaria cunninghamii* Ait. and its Significance for the Underplanting of *Araucaria* to *Pinus*" was presented to the A.N.Z.A.A.S. Conference, Christchurch. Two other papers were published covering work done by this section (i) "The Productivity and Nitrogen Economy of Artificial Ecosystems Comprising Various Combinations of Perennial Legumes and Coniferous Tree Species" Australian Journal of Botany, 15:467-480. (ii) "Nutrient Requirements of Kauri Pine on a Lateritic Podzolic Soil in Southern Queensland" Australian Forestry 32 (1):55-62.

(iv) *Coastal Hardwoods.*—Work in this section at present entails investigation into (a) logging and treatment in wet and dry sclerophyll forests, (b) enrichment planting following logging and treatment of wet sclerophyll forests, (c) the use of hormones to eradicate unwanted stems, and (d) the effect of control burning on tree growth, nutrient status and weed control.

A logging and treatment trial was established in a White Mahogany–Tallow-wood forest with a scrubby understorey in part. In one treatment, only stems meeting a high standard of vigour and log length were retained—this resulted in 3,106 superficial feet per acre being removed in logging. The other logging applied was to a 72-inch cutting girth and a fostering of advance growth—this yielded 1,637 superficial feet per acre in logging. Enrichment planting following 'dozer disturbance was carried out in the heavily logged area. This disturbance resulted in mineral soil being exposed on 45 per cent. of the area. Disturbance took approximately one hour per acre, ringbarking of unwanted stems 3·5 man hours per acre and enrichment planting, five man hours per acre. Application of a balanced NPK fertilizer to the enrichment planted stock did not improve growth on this granitic site.

The present silvicultural treatment rules for Spotted Gum forests prescribe an espacement of 20 feet by 20 feet for pole size trees. In 1964, a series of plots was established in a reasonably even-aged stand to compare growth at 35 stems retained per acre with that from the standard 100 stems per acre. Girth increment recorded has averaged 0·81 inches per year for the wider spaced stems against 0·55 inches in the standard treatment. During the year, a further experiment was commenced with Spotted Gum to test the effect on growth of spacings ranging from 25 feet by 25 feet (70 per acre) to 40 feet by 40 feet (27 per acre). In this experiment, thinning was carried out with and without the use of 2,4,5-T.

The application of 2,4,5-T solution to spaced cuts is satisfactory for the eradication of unwanted Blackbutt stems in treatment. Use of the amine formulation in water is slightly more effective than the application of butyl ester in distillate and gives a faster kill. Results from a trial involving the application of 4 c.c. of 5 per cent. solutions of amine and butyl ester to tomahawk cuts (3 inches long) spaced 2 inches and 3 inches apart on Blackbutt up to 42 inches g.b.h.o.b. illustrate the effect.

Formulation	Cut Spacing	Percentage Kill at Intervals Since Treatment			
		5 months	12 months	19 months	25 months
5% butyl ester	2 inches	74	95	96	97
5% butyl ester	3 inches	65	80	83	91
5% amine ..	2 inches	85	98	98	100
5% amine ..	3 inches	88	94	95	98

Stems arising as coppice from previous treatments are more easily killed than other stems. Rose Gum has proved very difficult to kill with spaced cuts and the degree of susceptibility appears to some extent to be seasonal. A series of experiments has been established testing the seasonal susceptibility of a number of species.

A detailed analysis of soil nutrient levels was made in a Spotted Gum–Grey Ironbark forest which has been control burned annually since 1952. Annual burning is apparently having some effect on nutrient levels since the amount of variation is greater in the burned area than in the control, and levels can be broadly related (in a curvilinear fashion) to the average percentage of each sample plot burned annually. Major chemical factors for which differences between the annually burned and control areas were detected as being statistically significant are pH (5·8 for the burned area and 5·4 for the control) and total phosphorus (113 and 75 lb. per acre). Since the initial levels are not known, any trends must be treated with caution. However, it appears that a previous report of deterioration of soil fertility with annual burning has not been substantiated. Further sampling is planned at intervals of five years. Girth growth of Spotted Gum has improved markedly since 1964 indicating that much of the decline in annual increment prior to that time may be attributed to complex climatic factors and not to the effects of annual burning. Perodic annual girth increments of Spotted Gum were for 1961-64, 0·17 inches, and for 1964-67, 0·31 inches, and continue to be of the same order for both burnt and unburnt plots.

Dalby Regional Research Station

This station carries out experimental work in the White Cypress Pine (*glauca*) and hardwood forests in the area west of Dalby and Warwick with an annual rainfall of 20 inches to 30 inches. Work is also carried out in the rain forests and sclerophyll forests on the Dividing Range east of Warwick, where the rainfall generally exceeds 50 inches per annum.

(i) *White Cypress Pine and Western Hardwoods.*—A major field of study at this station for the past 15 years has been the chemical control of unwanted species, and this year has at last seen a significant reduction in the time spent on this work. With the exception of some localised problems which can be expected to occur from time to time, the techniques at present being employed for the eradication of unwanted species in our White Cypress Pine forests must be regarded as highly satisfactory. Present research in this field is now concerned predominantly with further reduced treatment costs through the application of less hormone to achieve the same percentage kill. The most widely used herbicide in western forests is still 2,4,5-T amine in water applied to cut stumps, low frills, and as basal stem injections; picloram is finding increasing usage in basal injections where species resistant to 2,4,5-T occur. The publication of complete results of research by this station into the destruction of unwanted trees will be undertaken in the coming year.

Studies on the effect of unwanted species, principally Bull Oak, on the growth of White Cypress Pine were continued this year, and results show substantial volume and value increases with the removal of these species. In one trial on an average site which was treated with 2,4,5-T eleven years ago, increased growth of White Cypress Pine would recoup the initial treatment cost compounded at 15 per cent. Expenditure on White Cypress Pine treatment work is clearly a sound investment.

All thinning experiments were remeasured this year along with 35 detailed yield plots in the forests north of Chinchilla. Preliminary assessment shows that recent good growing seasons have boosted increments over all plots to well above the levels of the previous period, which included the 1965 drought year.

Subsequent to destruction of the stand by fire in 1964, a number of species were planted on a good quality White Cypress site on State Forest 150 Dunmore. Figures for survival and average height of the most promising species to date are:—

Species	Age in Years	Survival per cent.	Average Height (feet)
Radiata Pine	3	90	7·3
Loblolly Pine ..	3	90	7·0
White Cypress Pine ..	3	96	6·1
Slash Pine	3	89	5·8

During the year, planting included seed orchard stock from drought resistant Loblolly Pine from the United States of America and Long Leaf Pine. In addition, just before winter, plantings of native and exotic species were made along dozed lines with the object of establishing seed trees which will ultimately restock the area. It is thought that this could prove the most economical method of restocking with White Cypress after an area has been devastated by fire.

Further herbicide trials aimed at the eradication of the noxious plant *Harrisia tortuosa* from Western Creek, west of Millmerran, were instituted during the year, but have so far met with little success. There appears to be no alternative at the present time to the tedious but effective method whereby pellets of arsenic pentoxide are injected into the fleshy branches, and result in the complete destruction of the cactus and its tuberous roots.

In a plot, two chains in diameter, containing lignotubers of Narrow Leaved Red Ironbark of known age, all over-wood was destroyed to observe the response to liberation. These lignotubers had been stagnating at this stage for about 13 years. Another plot will be treated this year. No other new work is being considered for Narrow Leaved Red Ironbark and the emphasis in hardwood research is being directed to Spotted Gum.

Some new tree species of possible amenity value in western areas were planted out for trial during the year. In co-operation with the Department of Education, 14-year-old trees on the black soil at Bowenville State School were assessed. Both *E. brockwayi* and *E. longicornis* (Syn. *E. oleosa* var. *longicornis*) displayed excellent growth. Species which have not been included in Departmental trials but which have been observed to be doing well in the Dalby area include *Angophora costata, Brachychiton australe, E. kruseana, E. lehmanni, E. platypus, Melaleuca armillaris,* and *Phytolacca dioica. E. erythronema* and *E. stricklandi* which failed in Departmental plantings have also proved successful in some private plantings.

Results from a trial of tin-plated tubes and plastic bags as containers for growing seedlings of three tree species showed that there were no appreciable differences between the two types of container in survival, rate of growth, resistance to droughting and amount of lifting required during stand-down. Tin-plated tubes were more readily filled with soil, and more easily handled in nursery operations.

Micro-insects galling White Cypress Pine in the nursery were controlled by fortnightly sprayings of 0·03 per cent. dimethoate. The seedling plants appeared to be tolerant to this insecticide at this concentration.

(ii) *Mountain Forests.*—Trial plantations were established on a rain forest site at Gladfield at 3,300 feet A.S.L. in the spring of 1965 and on fairly heavy soils on a level open forest site at about 2,500 feet A.S.L. near Emu Vale in the summer of 1965-66 and in the following summer. On both sites Radiata, Patula and Loblolly Pines have shown the best early vigour. Benguet Pine, *P. pseudostrobus* var. *oaxacana, P. strobus* var. *chiapensis, P. ponderosa, P. michoacana, P. tenuifolia* and *Cunninghamia lanceolata* have been less impressive to date though all these species have grown well on the rain forest site. Hoop Pine has not grown vigorously and has been frosted except where protected by dense weeds or where located on fairly steep slopes. Chermes (*Pineus boerneri*) has been observed on the Radiata Pine at both sites. Some hybrid poplars were outplanted last winter in an open forest creek valley site near Gladfield.

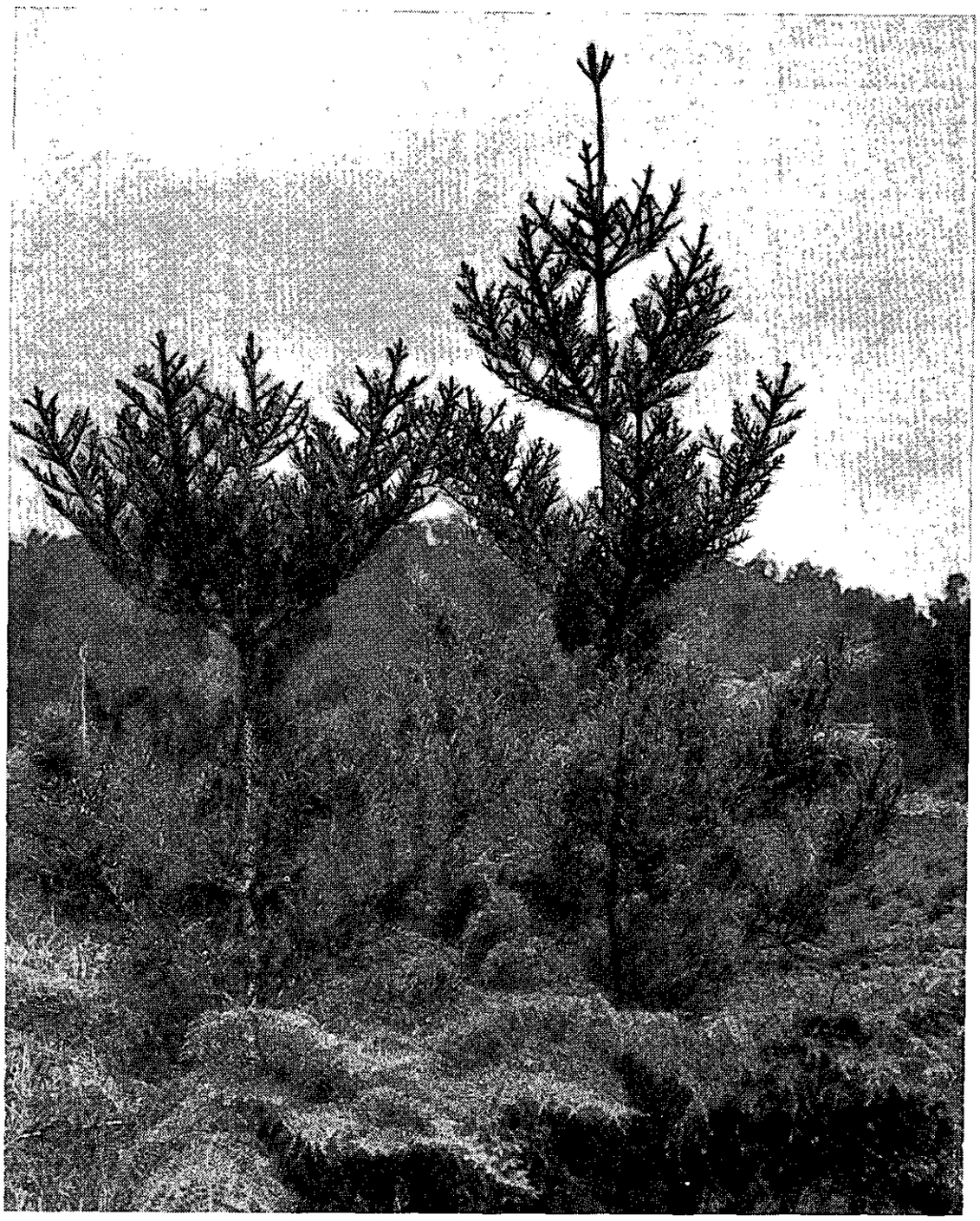
Observations on rain forest plots, heavily logged six years ago, indicate that regeneration of merchantable species in that period has been negligible. Hoop Pine planted in logged scrub has shown better growth in heavily logged areas. The effect, on the growth of Hoop Pine and of weeds, of the removal of specified percentages of the crown cover is being observed in a fairly extensive underplanting of Hoop Pine carried out at Gladfield at about 3,300 feet A.S.L. in 1963 and 1964. It has been noted that losses of underplants, due to browsing by the native fauna, have been much more serious on snig tracks than elsewhere.

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.*—Tests were established in Imbil Nursery to evaluate selected triazines (propazine and prometryne) and substituted ureas (diuron, monuron, neburon and bromacil) as weedicides for use after the emergence of Hoop Pine seedlings. The tests have not been assessed to date but it is clear that many of these weedicides give long term protection from weed germination. The effect of the residue in the soil on subsequent Hoop Pine germination will also be studied.

The 1966-67 work on the relative efficiency of hormones for weed control in Hoop Pine plantations at Imbil tested 2,4-D amine, 2,4,5-T amine, mixtures of the two amines and mixtures of the two esters when applied as mists at rates varying from 0·75 lb. to 2·5 lb. (a.i.) in two gallons of water per acre. The ester mix comprising equal quantities of 2,4-D and 2,4,5-T and applied at the rate of 1½ lb. (a.i.) per acre was shown to be significantly superior to all amines and amine mixes tested. The current year's experiment was designed to determine the optimum economic concentration of esters to control weeds susceptible to 2,4-D and those susceptible to 2,4,5-T. Application rates as mists varied between ½ lb. (a.i.) and 1½ lb. (a.i.) per acre. A mixture of the two esters at 1 lb. (a.i.) per acre was included as a treatment to gauge any interaction between the two. Optimum economic application rate of 2,4-D ester was shown to be 1 lb. (a.i.) per acre. This concentration resulted in a 90 per cent. kill of Inkweed (*Phytolacca octandra*), Peach (*Trema aspera*), Lantana and Wild Tobacco (*Solanum auriculatum*). Control decreased at lower rates of application. Wattle (*Acacia* spp.), Cape Gooseberry (*Physalis peruviana*), Wild Gooseberry (*Physalis minima*), Blackberry (*Rubus fruticosus*) and Devil's Fig (*Solanum torvum*) were resistant to all concentrations of 2,4-D ester tested. Optimum economic application rate of 2,4,5-T ester was shown to be 1½ lb. (a.i.) per acre. At this rate, the kill of wattle was 98 per cent. and satisfactory control of Peach, Devil's Fig, Lantana, Tobacco, Cape and Wild Gooseberry was achieved. Inkweed proved to be largely resistant to all application rates of 2,4,5-T tested. Use of the ester mix at the rate of 1 lb. per acre gave satisfactory control of all the above weeds.



Two Hoop Pine Grafts in the Imbil Seed Orchard bearing their first cone crop thirty months after grafting

The plots on which the application of diuron had achieved such outstanding weed control at Imbil in 1966-67 were kept under observation in the current year. Tending costs in this second year have again been considerably lower than in the untreated section of the compartment. There has been no adverse effect on the growth rate of Hoop Pine in its second year in the field. Screening tests of other soil residual weedicides—bromacil, treflan, trysben and monuron were carried out in the current year together with further tests of diuron. Application rates were two lbs. per acre in 100 gallons of water. It was found that diuron was the most effective weedicide. Bromacil also was found to give a high kill of weeds and there are indications that it may have a more prolonged effect than diuron. Tests designed to show the optimum economic concentration of diuron and bromacil applied in four gallons of water per acre, by blowermist, indicated that economic considerations made an application rate of 1 lb. of diuron per acre preferable to 2 lb. and 3 lb. per acre and an application rate of ¾ lb. of bromacil per acre preferable to 1½ lb. per acre.

A small trial using diuron and bromacil was also carried out at Yarraman. Diuron was applied by mister at the rate of 2 lb. per acre in 4 gallons of water and by knapsack at 2 lb. per acre in 100 gallons of water. Bromacil was similarly applied at rates of 1 lb. and 2 lb. per acre. These tests gave less satisfactory weed control than at Imbil. This was partly because some weeds were already present when the weedicides were applied. However a scattered germination of Inkweed, Wild Gooseberry and Keeled Goosefoot (*Chenopodium carinatum*) was reported following the application of the weedicides. The plots sprayed by knapsack were cleaner than those sprayed by mister indicating more even application or better soil penetration with the former. The more satisfactory results being obtained at Imbil may be due to the more frequent occurrence of showers with consequent better spread of the weedicides. As at Imbil, these weedicides had no adverse effect on the Hoop Pine plants.

An experimental planting of Red Cedar was made at Imbil, half being spaced at 6 feet by 6 feet and the remainder at a wider spacing to permit vehicle access. The closer spacing aims at securing early control of the site and thus reducing tending costs. The trees will be sprayed with dieldrin to control the Red Cedar Shoot Borer until the main stem exceeds a height of 20 feet. Two spraying schedules are being tested, one at three week intervals during the period when the borer is active and the second in which spraying is carried out when judged necessary because of population build up. In the closer spacing, the insecticide will be applied from a pressure pump at ground level; in the wider spacing, it will be applied from a pressure pump mounted on a truck. An untreated control has been omitted as this could be a centre for re-infestation of the sprayed plots. At Imbil, a trial planting was made of Poplar Gum of mountain origin in Timor.

The programme of establishing five-acre trial plots to determine the most suitable plantation species for scrubby forest sites and open forest sites was continued with the planting of two further plots at Yarraman. It is considered the scrubby forest sites have now been adequately sampled as well as open forest sites carrying trees of low commercial value with a potential height growth in excess of 75 feet and in which root penetration of pines is likely to exceed 24 inches. A plot will be established on a scrubby forest site in Stables Logging Area, State Forest 289 Cooyar and plots will also be established on representative open forest sites carrying vegetation incapable of reaching a height of 75 feet but in which root penetration of pines is likely to exceed 24 inches. Plots will also be established on sites in which root penetration of pines is unlikely to be 24 inches. Species planted have included Hoop Pine, Bunya Pine, Slash Pine, Long Leaf Pine, Chir Pine, Loblolly Pine, Radiata Pine, Patula Pine, Maritime Pine, Bahaman and Cuban Caribbean Pines, Benguet Pine and *P. pseudostrobus* var. *oaxacana*. Growth and survival have generally been satisfactory but it is too early to determine the most suitable species for the several sites.

A study was made of the incidence of frosting in Hoop Pine plantations in the Yarraman District. It was found that frost losses were generally confined to gully systems and that the distance from the gully at which frosting ceased could be predicted from multiple regression equations using elevation above sea level, angle of elevation to the false crest at right angles to the gully, distance from gully bottom laterally to a point 10 feet above the gully bottom and minimum grass temperature during the winter as independent variables. Frosting was likely to be more severe on black clay soils than on other types. The soundness of this prediction equation for indicating frosted areas is being tested during the current winter in the Yarraman and Murgon Districts. Previous work showed that spraying the Hoop Pine plants with a maleic hydrazide solution or a borax solution in March and April did not lessen frost damage. Some satisfactory Hoop Pine stands have been established on frosted areas under a cover crop of Rose Gum which is cut back to about two feet high after each winter, but in general costs are high, growth rate is low and survival rate is unsatisfactory. Good survivals of underplanted Hoop Pine have been obtained on frost areas with an overwood of *Pinus* species. It is important to limit the density of the overwood to secure reasonable growth rate and acceptable form in the underplanting. Radiata Pine is recommended for planting on colder sections of frost sites and on all frost sites which have black clay soils. An equal mixture of Hoop Pine and Radiata Pine at an espacement of 9 feet by 6 feet is recommended for planting on the remainder of the frost sites. This would be afforded an early pulp thinning if the survival of Hoop Pine is satisfactory. A joint study on the occurrence of frosts at Yarraman is being carried out by officers of the Bureau of Meteorology and of this Department.

A study of spacing experiments established at Imbil in 1933-34 and 1936-37 at spacings of 6 feet by 6 feet, 8 feet by 8 feet, 9 feet by 9 feet, and 10 feet by 10 feet indicated that in stands managed for the production of saw-logs and ply logs, the wider the spacing the greater has been the value of the thinnings obtained to date. The stands are now thinned to equal basal areas and the value of the residual stand also increases with increase in original spacing. This has led to a recommendation that initial espacement in stands managed for the production of case, saw and ply logs should be 10 feet by 10 feet. However, where the opportunity of securing an early pulp thinning exists initial espacement of 8 feet by 8 feet in preference to the current 9 feet by 8 feet is favoured.

Standing basal area, basal area increments, site index and age relationships were studied in Hoop Pine experiments at Imbil. It was found that optimum basal area (the minimum basal area giving maximum basal area increment) increased with increasing age and with improvement in site index, also the maximum basal area increment for a stand of site index 80 dropped from 10·2 square feet per acre per annum at age 10 to 6·0 square feet per acre at age 25 and remained at this level to age 40. Prior to age 25, the better the site index of the stand, the greater the maximum basal area increment. After age 25, maximum basal area increment appeared to be largely independent of site quality over the range of sites studied. This ability of Hoop to maintain relatively high basal area increments at Imbil at least to age 40 is in contrast to the performance of Slash Pine on the coastal lowlands where the basal area increment steadily drops as the stand ages and is at a relatively low level after age 30.

Papers entitled "Spacing and Thinning of Hoop Pine in the Mary Valley" and "Weedicides—Nursery and Plantation", were prepared for the meeting of the Australian Research Working Group No. 5 (Plantation Silviculture) held at Beerwah in May 1968.

(ii) *Tree breeding*.—There are three main aspects of the tree breeding programme with Hoop Pine in south-east Queensland that are being developed simultaneously. (1) Sources of improved seed available now are being increased as rapidly as possible by continuous selection of superior seed trees in plantations. (2) Seed orchards, comprising clones of the very best phenotypes among the seed trees are being established to supplant the individual seed trees in due course and to provide a greater genetic gain. (3) Controlled breeding among the orchard clones and other superior trees is going on concurrently to permit future selection on the combined basis of phenotype and family indices, and the subsequent establishment of improved orchards.

More plantation seed trees were selected this year bringing the total number to 780. Also, two new "seed production areas" were accepted in superior, routine plantations. Prediction of seed viability and nomination of the best compartments for cone collection was again attempted using the method of examining immature sample cones for pollen tubes. Additional data taken during the year has improved the regression of expected seed viability on average number of pollen tubes per ovule, but further work is needed to find a better crop sampling procedure.

Field work on the second seed orchard at Taromeo was commenced this year. A 17-acre site was planted up in December, 1967, with vigorous routine stocks in pairs at 18 feet by 18 feet spacing. Extra plants were placed in alternate, non-access rows for the future plagiotropic ramets which will serve as pollinators during the interval when orthotropic ramets produce seed cones only. It is planned to include some 40 to 50 clones in this orchard when the field grafting is commenced, perhaps in the spring of 1969. Seventeen selections in the Yarraman District have now been accepted on the scores of growth and form characteristics; 14 have yet to be checked for wood properties. All accepted trees are being pre-grafted in an attempt to identify any with severe early incompatibility. The ortets and clones are also being observed to determine their flowering habits. The search for superior phenotypes for the orchard and controlled breeding is continuing in the Yarraman and Monto Districts and has been extended to the Murgon District.

The grafting of orthotropic scions in the Mary Valley orchard at Imbil, which was commenced in 1965, is now almost complete for 18 of the 20 clones. During the year, early incompatibility was detected in virtually all ramets of two clones which are now being replaced by two new clones. So far no symptoms of delayed incompatibility are apparent in the orchard. A moderate crop of ovulate strobili occurred in the orchard this year; all strobili were hand-pollinated with a mix from several of the best ortets. A small orchard seed crop is thus expected for the first time next year.

Since 1963, several wind-pollinated and full-sib families from superior phenotypes have been established in trials at Imbil and Yarraman with the object of estimating the likely gains attainable, comparing breeding values of the ortets and providing improved stock for future selection. As part of this programme, sowings made at Imbil this year will provide stock for a trial of 30 full-sib families from 15 parents and another of 30 wind-pollinated families. A trial was also established in the field involving 18 full-sib families from 9 selected phenotypes.

A well-replicated five-year-old clonal (grafted) experiment involving 10 clones (ortets selected for special phenotypic characteristics) was measured this year. Highly significant differences were found among clones for stem straightness, internode length, branch angle and thickness. Although differential stock-scion compatibility may have influenced scion height and diameter, these data were also analysed and showed large and significant clonal effects. Simple correlations were computed among the crown characteristics but only internode length and branch thickness were significantly related ($r = +0{\cdot}87$). No significant correlations were found between rate of growth and any crown characteristic. Several parent-clone correlations were also computed; significant associations were found for internode length ($r = +0{\cdot}93$) and branch angle ($r = +0{\cdot}75$). The non-significance of the parent-clone correlation for branch thickness ($r = +0{\cdot}53$) is not interpreted as necessarily indicating a low gross heritability because of the greatly varying stand densities among the sites where the ortets are growing. The parameters estimated are phenotypic variances and correlations only, not additive genetic variances and correlations which would be more indicative of potential genetic gains. However, the values suggest there may be considerable gross genetic co-variances of these important traits and that at least some are favourably associated.

Mensuration and Biometrics

For some years, computer processing of remeasure data from experiments has been carried out on a limited scale. The entire system was extensively revised during the year with a view to application to all normal plot measurement calculations. This included the design of new field measurement forms, standardised methods of recording, a new layout for data cards and an enhanced computer programme with many new facilities. Much use has been made of PLAN

sub-routines in the basically FORTRAN programme to permit more flexible input and data validation, and improved processing efficiency. The sub-routines have also been incorporated in several other programmes using the same data. Options have been included to permit processing of plantation F.I.S. measurements as well as experimental data.

This year most of the remeasure data from Beerwah Forest Research Station has been processed without difficulty, and it is anticipated that the system can be extended to other research stations. The eventual aim is to transfer all past measurement records to punch cards, and a start has been made in this regard. Because of differences in procedure adopted in the past, recalculation of measure data is desirable before a review of a major experiment is undertaken.

Volume tables for Hoop Pine (Yarraman District) to top diameters of 3 inches and 6 inches were prepared during the year. Some work was done on the Caribbean Pine volume table but it was decided to defer the complete revision until more data is available. A good deal of preparatory programming work to facilitate projected volume table revisions has been completed. A high efficiency PLAN sub-routine package has been developed to cover all the basic computations required on the sample tree measurements, and has been incorporated in a number of FORTRAN programmes, including a regression analysis programme for direct computation of volume equations from the field data. The main point under investigation at present lies in the preparation of volume tables to top diameters of 3 inches, 4 inches and 6 inches, which will maintain correct relativity over the range of sizes encountered in thinning sales. It appears that in future much closer attention will have to be paid to size class distribution in the collection of data for volume table preparation.

The resignation of a biometrician in August, 1967, again led to deferment of a number of outstanding analyses. In other respects, the biometrical and technical data processing service to research stations was maintained. Projects undertaken during the year included processing of quarter chain linear sampling data from North Queensland rain forest areas, analysis of regeneration observations in rain forest experiments, generation of a rain forest species key, adjustment of the Imbil seed orchard design to include pollinator grafts, preliminary investigation of equations for representing current log price lists for plantation species, and analysis of observations on frost damage in Hoop Pine. In the last case, the regression analysis programmes available at local computer centres did not prove entirely satisfactory, necessitating a good deal of additional programming. Programmes were also developed for evaluating the equations obtained and determining confidence limits on these estimates.

Assistance was given to staff of research stations in development of programmes where necessary. In the case of a programme for processing coastal hardwood detailed yield plot data, a special input sub-routine was written. A number of PLAN sub-routines have been added to the FORTRAN library tape at the Treasury Computer Centre to permit more efficient character handling. Seminars in advanced aspects of FORTRAN programming were conducted for the programming staff of the Department.

NATIONAL PARKS

Interstate Conference on National Parks

At the invitation of the Honourable T. L. Lewis, M.L.A., Minister for Lands in New South Wales, the Minister for Local Government and Conservation in Queensland, the Honourable H. Richter, M.L.A., The Conservator of Forests, Mr. A. R. Trist, and the Secretary of the Department, Mr. W. Wilkes, attended an interstate conference on National Parks held at Kosciusko National Park during the period 3rd to 6th May, 1968.

The Honourable T. L. Lewis, as Chairman of the Conference, extended a welcome to all present. The Honourable H. Richter in reply mentioned the desirability of the States getting together and having yearly conferences. They would then be in a position to approach the Commonwealth Government, when necessary, with a unified voice. Whilst the States could get together and learn from one another, Mr. Richter stated that he did not necessarily favour uniformity in administration.

A very fruitful discussion took place on several aspects of National Park administration, whilst away from the Conference table, the opportunity afforded for personal discussion with officials from the various States proved beneficial to all concerned.

Delegates were shown improvements and facilities provided for tourists to the world-renowned Kosciusko Park. The visitors' centre and museum on the road into Perisher Valley was particularly impressive.

At the conclusion of the Conference, the Honourable H. Richter, M.L.A., invited representatives of the various States to come to Queensland for a Conference in 1969.

Warm appreciation is expressed to the Honourable T. L. Lewis, Minister for Lands in New South Wales, and his staff for the very complete and thorough organisation of the Conference and the associated field trips and for the many courtesies extended to the visitors from Queensland.

New South Wales Ranger School

The Honourable T. L. Lewis, New South Wales Minister for Lands, kindly invited the attendance of Queensland Rangers at a National Parks Ranger School which was held at Royal National Park in October, 1967. Two officers from this Department attended the School which proved most valuable. Attendance at future Schools by Queensland Rangers would certainly be worthwhile should New South Wales continue to extend this courtesy to other States.

Munich Congress of I.U.F.R.O.

The National Parks Biologist attended the Munich Congress of the International Union of Forest Research Organisations, in connection with the formation of a new section of the Union to cover the field of Forest Recreation and Wildlife Research. At the invitation of the organising Committee, he presented a paper entitled "Wildlife for Forest Recreation in Australia" as a contribution to the discussion of the scope of activities of the new section.

While overseas, he also visited the United States and certain western European countries to learn of their developments in the fields of National Park Administration and the use of Forests for Public Recreation.

National Park Proposals

Much time has been spent during the past year investigating areas proposed for National Park reservation. This work has been facilitated by the secondment of a graduate Forester to the staff in August, 1967.

The necessity to reserve some of the coastal wallum country and its associated types of vegetation is also becoming increasingly urgent. Only a few very small National Parks already exist in this type of country, though the Department has been seeking the reservation of some larger areas for some time. During the year, two more areas, each of approximately 14,000 acres, were added to the list of proposals. One of these, consisting of an existing State Forest and some adjoining Vacant Crown Land is situated just north of the mouth of the Burrum River. The other proposal, which contains a great variety of coastal vegetation types, as well as wallum country, also covers, in part, an existing State Forest and is situated between Gladstone and Bundaberg.

Tropical Lowlands

Dr. L. J. Webb of the Rain Forest Ecology Section of C.S.I.R.O. made a survey of the wet tropical lowlands of North Queensland and in 1966, recommended the reservation of a series of 20 areas as National Parks to preserve in their natural state, representative samples of the major habitat-types of the region. Inspection of some of these proposals has been carried out by Departmental officers and progress toward reservation made.

The selection of these areas on a scientific basis by Dr. Webb with his background of many years of ecological study of the region makes them particularly valuable, and following publication of his report by the Royal Society of Queensland, the project has aroused world-wide interest. This Department has received through Dr. Webb, a request from London from the Secretary of the I.U.C.N. Commission on Ecology asking to be informed which of the proposals have been implemented and also for the Secretary General of I.U.C.N. in Switzerland to be notified.

Scientific Research

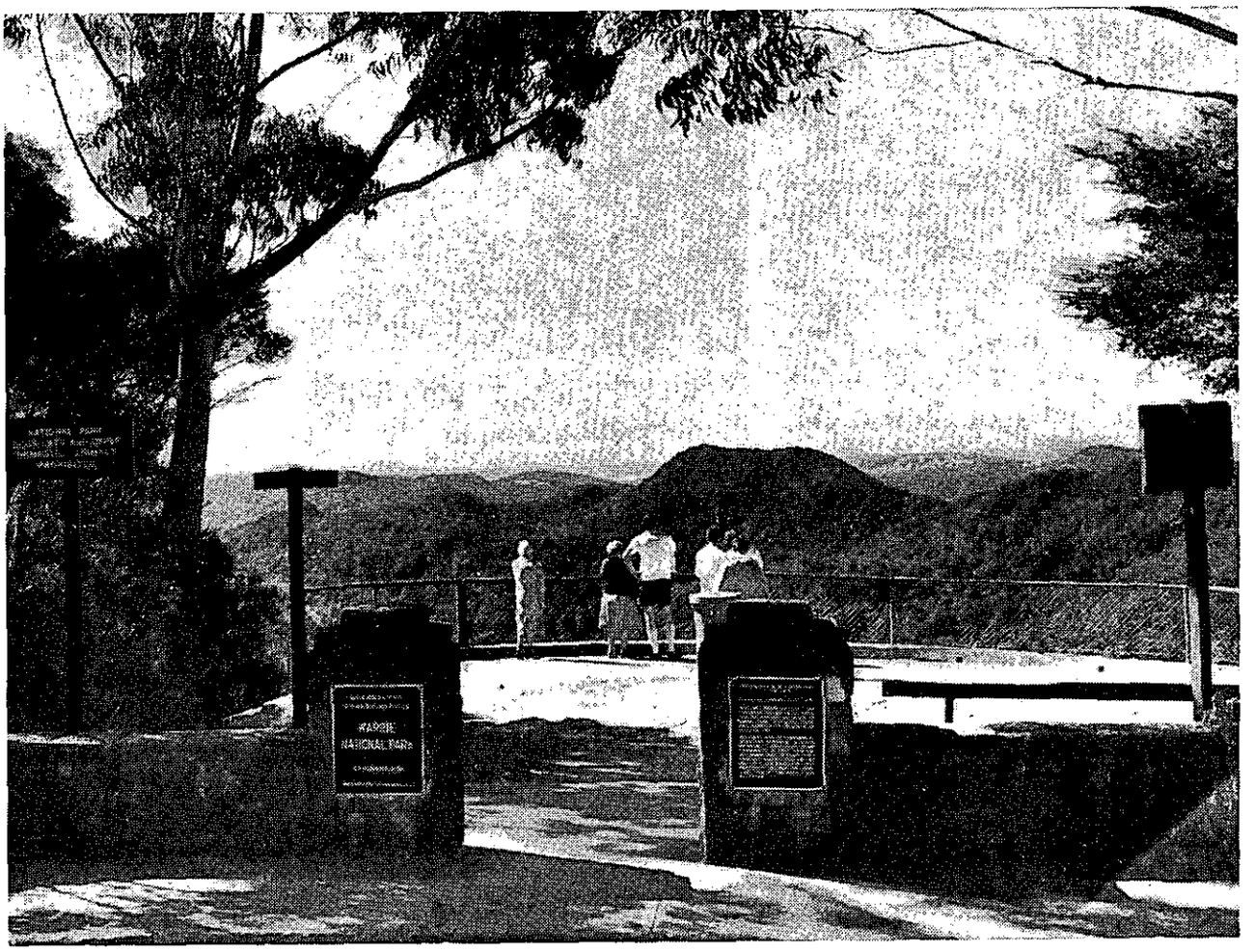
During the year, a number of Permits were issued to authorise scientific work in Queensland National Park. Most of these went to Australians but scientific institutions from European countries and the United States were represented.

Fauna

The fauna survey of Lamington National Park was completed and arrangements are proceeding for the publication of a booklet covering the flora, fauna, geology, history, topography and track systems of the Park, as well as a small leaflet outlining the main points of these categories.

An inspection was made of the Iron Range region in company with Zoologists from the Queensland and Townsville Universities. This produced information on the unique fauna of the area, several species of which are restricted in distribution to a very limited area of Cape York Peninsula. A National Park proposal in this area has been supported by the Department for some time and the results of this fauna survey emphasise the importance of reserving an area in this region.

Preparations have been made for a faunal survey of the Springbrook and adjacent National Parks during the coming year.



Lookout at Warrie National Park, Springbrook

(A memorial plaque to the late C. J. Trist, the first Secretary of the Department, is featured at the entrance)

Staff

Mention has been made of the addition of a graduate Forester to the permanent staff employed full time on National Park work. This staff now includes three graduates, three Rangers and a wages staff of approximately 50.

Only those directly concerned in the administration of the Parks have a full appreciation of the extent of the contribution made by officers of the Department other than those employed full time on National Parks work. This can at times, give rise to uniformed (and unwarranted) criticism of the standard of Queensland's National Park administration on grounds of its staff being inadequate. For this reason, it is proposed briefly to outline the work done by other sections of the Department and to pay tribute to the contribution these officers make to the overall running of the National Parks system.

A number of officers are directly concerned in the work of National Park administration: The work is under the direct control of the Secretary, while the overall management of the Parks is personally directed by the Conservator. The District Foresters at Atherton and Mackay and the Foresters assisting them, are responsible for National Parks work in their areas, and all Foresters whether directly involved in Park management, or not, are National Park Officers to the extent that they can and do, take action to police National Park regulations, suggest areas for reservation, investigate National Park proposals in their territory, and assist the public by answering questions concerning the Parks. Of those officers directly concerned in the work of the Park administration, eight have University degrees (while other graduate Foresters assist as required) and four have travelled overseas and studied at first hand, the management of National Parks in other lands.

The skills of draftsman, surveyor, engineer, chemist, wood technologist and photographer plus a competent administrative and clerical staff are freely available, and it must be realised that it would be impossible to supply all these skills as part of an independent organisation except at a far greater cost than could be met from presently available National Park funds.

National Parks 1967-68

As at 30th June, 1968, reservations were:—

National Parks—
81 covering 2,284,937 acres

Scenic Areas—
173 covering 38,680 acres

Total—
254 reserves covering 2,323,617 acres.

New Reservations

(*a*) An area of about 3,070 acres being unproclaimed Timber Reserve 165, parish of Aberdeen, was proclaimed a National Park on 19th August, 1967. This reserve, which lies some distance west of Mount Aberdeen National Park,

consists in the main of broken granite hills rising sharply from relatively flat surrounds. The area supports a flora and fauna that is peculiar to these drier granite ranges. Due to the severe limitations of its habitat, it is a type that is in grave danger of total destruction. While not outstandingly scenic, the value of this area is enhanced when considered in relation to the vast extent of surrounding flat country.

(*b*) An area of about 1,930 acres of Crown land in the Black Trevethan Range in the parishes of Annan and Monkhouse. The main feature of this Park is Black Mountain, a unique geological feature standing up above the surrounding forest and composed of huge granite boulders.

(*c*) Early in 1963, an area of about 7,300 acres, embracing the greater part of the catchment area of the Mossman River was gazetted as National Park. Following on consideration of the North Queensland Land Classification Committee's report, a large area immediately to the north of the Mossman River National Park was set apart as National Park in 1964 and amalgamated with the existing National Park along the Daintree River. A subsequent investigation of the Rex Creek Catchment Area, which included Timber Reserve 142 as well as Vacant Crown Land between Mount Demi and the Mossman River watershed, revealed that this area would be a valuable addition to this National Park. Accordingly, on 21st October, 1967, 6,500 acres of this catchment area was declared a National Park and amalgamated with existing National Park 133.

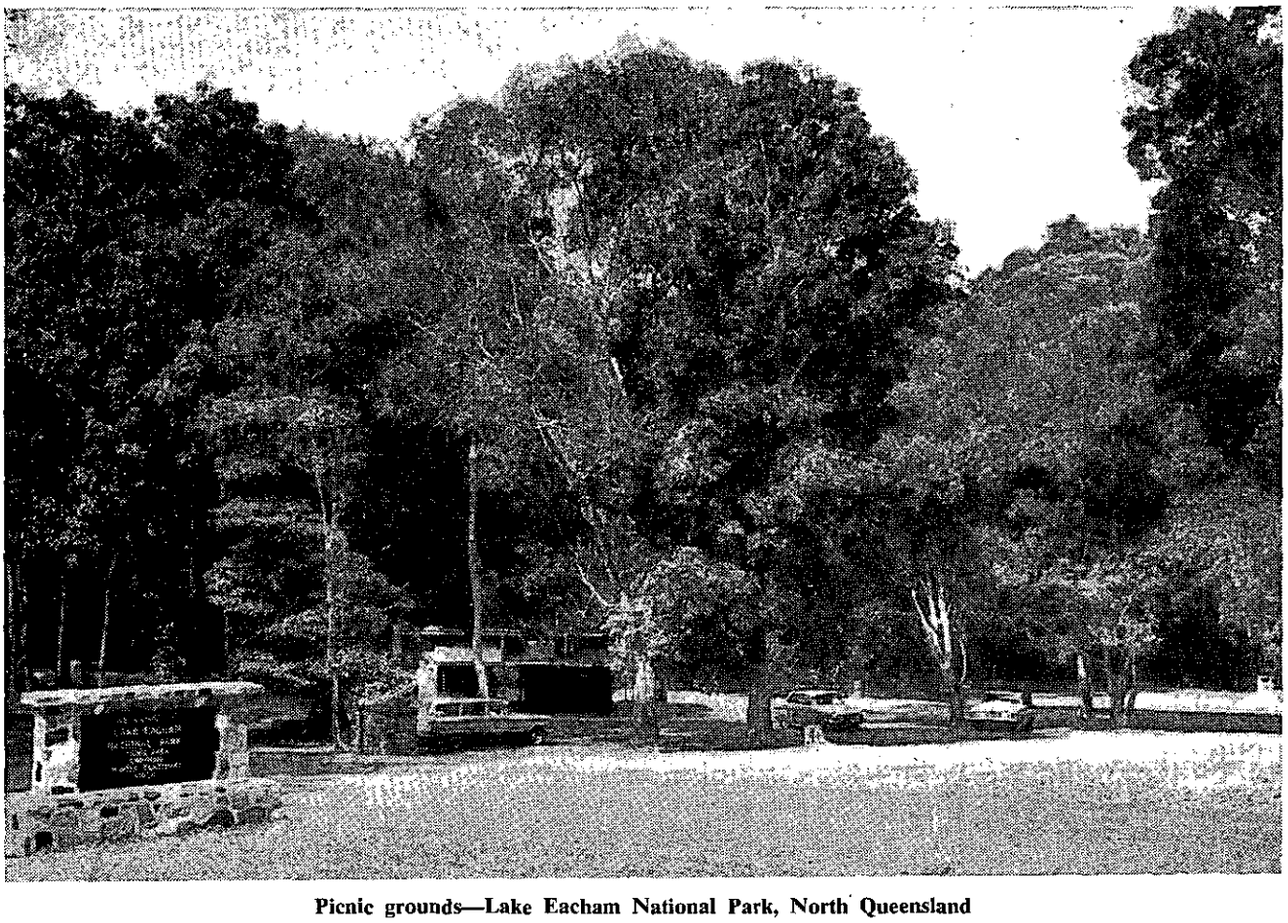
(*d*) Following representations by Dr. L. J. Webb, a Scientist attached to the C.S.I.R.O. Division of Plant Industry, an area of about 2,850 acres, being part of Timber Reserve 1244, parishes of Japoon, Johnstone and Jordan was proclaimed a National Park. The area comprises mostly flat and gently sloping series of tablelands rising in places to rugged ranges. The complex structure and relatively open forest floor make this area a valuable habitat for the widest diversity of arboreal and ground mammals.

(*e*) An area of about 3,625 acres in the parish of Whyanbeel was declared a National Park. This Park is situated along the valley of Barratt Creek, a tributary of the Daintree River. The area is heavily timbered with tropical rain forest generally occurring in the gullies on the lower slopes and wet eucalypt forests on the upper slopes and narrow ridge tops.

(*f*) The reservation as Scenic Area of approximately 25 acres comprised in former Reserve for Scientific Purposes R. 225, parish of Bunker–Lady Musgrave Island.

Track System

During the year, 160 chains of new tracks were constructed bringing the total length of track system as at 30th June, 1968, to 268 miles 13 chains.



Picnic grounds—Lake Eacham National Park, North Queensland

Some Features of the Year's Work

Apart from the major task of maintaining and expanding the walking track system within the Parks, some details of the year's activities are as follows:—

Lamington—A new 6-man barracks has been built near the shelter shed at O'Reillys Guest House.

Mount Glorious—Three E.C. toilets (single units) have been erected at Manorina National Park and a new 3-bay barbecue was erected at Boombana National Park.

Springbrook—A new 4-cubical public septic block was erected at Purlingbrook.

Tamborine—Picnic tables were erected at Witches Falls and a start made on a circuit track. Fire places were constructed at McDonald Park.

Noosa Heads—Reticulated water was installed from the Shire Council's mains to the picnic area.

Montville—The access road and parking area were sealed.

Ravensbourne—A new shelter shed with water supply was provided at the old lookout site.

Girraween—A new 3-cubicle septic block was provided.

Carnarvon—Toilet system was converted to a flush system. Water supply to shower blocks was improved. A new 2,000 gallon tank was installed for use by visitors. Six table-seat units and three fire places were built.

Eungella—Ladies and gents' dressing sheds were constructed.

Bluff Point—The picnic area was extended and two fire places were constructed.

Mount Elliott—Five chains of road construction to a number of picnic sites on Alligator Creek were undertaken. Picnic facilities in the form of tables and fire places were provided.

Magnetic Island—Fire lines have been cut round the town area and a number of fire warning signs have been erected in prominent positions.

Wallaman Falls—Septic toilets have been provided. A parking area has been constructed and signs erected. Tables have been provided. At the Falls lookout, a 60 ft. x 3 ft. concrete apron and path along the safety fence was constructed. Ladies and gents' toilets have been constructed at the lookout.

Dunk Island—A small picnic area with tables and fire places has been constructed adjacent to the jetty.

Palmerston—Conversion of toilets from E.C. to flush septic style has been completed at the picnic area on Goolangan Creek.

Lake Eacham—Reticulated water was installed at the picnic area. The Loop road was regravelled and bitumened.

Crater—A bitumen-surfaced loop road terminating at the entrance to the Crater track has been provided.

Mossman Gorge—A grouted stone barbecue fire place was constructed in the picnic area. Tables were also provided, and contribution made to improvement of road access.

Curtain Fig Tree—A set of eight concrete steps have been installed at the track entrance to the Curtain Fig Tree to improve access.

Chillagoe Caves—A residence-cum-office was erected in the town of Chillagoe. Access within the cave system was improved by means of "Ships ladders" concrete stairways and handrails.

Number of Visitors

Accurate figures are not available as to the number of visitors to all National Parks during the year, but it is known that the general public is showing an ever-increasing interest in National Parks. A record number of over 870,000 was recorded to the South Queensland Parks alone. The total recorded throughout Queensland is approximately one million two hundred thousand and this is a conservative estimate. The actual figure could be much higher.

Literature

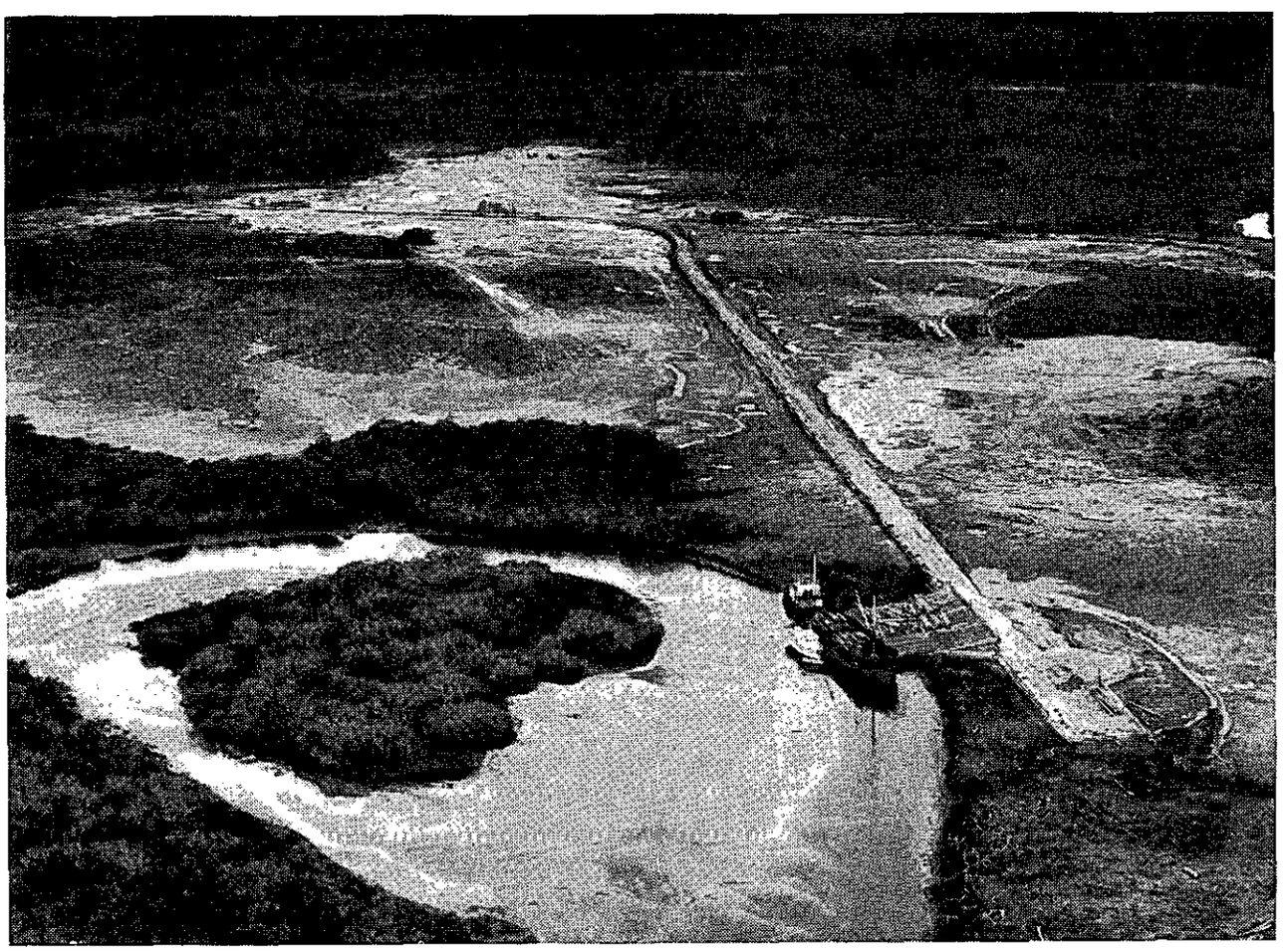
During the year, pamphlets were produced for:—

(*a*) Chillagoe Caves, National Parks and Scenic Areas.

(*b*) Eungella National Park.

(*c*) Facilities on National Parks—Central and Northern Queensland.

As opportunity offers, further pamphlets will be brought out on individual Parks.



Causeway and Log Loading Point constructed by the Department at Puthoo Creek on Fraser Island

HARVESTING AND MARKETING

General

The volume of milling timber (including pulpwood) cut from Crown Land during the year increased by about 7 per cent. compared with 1966-67, the total being 226,919,000 superficial feet Hoppus measure.

There was a further reduction in the cut of natural grown Hoop and Bunya Pine, but there was an increase for all other species groups.

The increasing importance of plantation grown softwood to industry in Queensland is demonstrated by the fact that the volume operated in 1967-68 (including pulpwood) was more than double the volume of natural Hoop and Bunya Pine harvested.

At the beginning of the year, stumpage rates for sleeper timber supplied from Crown Land were increased, for the first time in over twenty years. Increases were also applied to other short railway and tram-line timbers, but the rates now current for such material are still regarded as concessional.

Mill Logs Cut—Crown and Private Lands

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

Year	Queensland Grown								Imported	Total
	Hoop and Bunya Pine	Kauri Pine	Plantation Thinnings	Pulpwood	Hardwood	Cabinet Woods	Miscellaneous	White Cypress Pine		
	(1,000 superficial feet Hoppus)									
1962–63	28,277	2,114	31,443	..	212,014	21,404	38,937	50,044	12,833	397,066
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 Estimated ..	22,000	1,600	39,000	5,000	215,000	20,000	43,000	55,000	10,000	*410,600

* Includes Pulpwood.

Mill Logs—Crown Lands

The following are the annual quantities of Mill Logs obtained from Crown lands as from 1958-59:—

	Super. feet (hoppus)		Super. feet (hoppus)
1958–59	*228,000,000*	*1963–64*	*212,000,000*
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

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)								
1963–64	25,236	1,615	28,932	66,664	11,405	16,653	27,949	33,243	416
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

The Timber Business

	1966–67	1967–68
(*a*) **Mill Logs—**		
Hoop and Bunya Pine	**21,144,000 super. feet**	**19,644,000 super. feet**
Forest Hardwoods	**68,648,000 super. feet**	**69,298,000 super. feet**
Scrub Hardwoods	**11,191,000 super. feet**	**14,183,000 super. feet**
White Cypress Pine	**25,197,000 super. feet**	**29,178,000 super. feet**
Kauri Pine	**1,598,000 super. feet**	**1,601,000 super. feet**
Cabinet Woods	**14,538,000 super. feet**	**17,412,000 super. feet**
Miscellaneous Species	**26,970,000 super. feet**	**31,652,000 super. feet**
Plantation Timbers	**37,450,000 super. feet**	**39,000,000 super. feet**
Pulpwood	**4,889,000 super. feet**	**4,938,000 super. feet**
Limb Logs, Head Logs, Stumps and Flitches ..	**5,000 super. feet**	**13,000 super. feet**
	211,630,000 super. feet	**226,919,000 super. feet**
(*b*) **Construction Timbers—**		
Headstocks, Transoms, Crossings, Braces, &c.	**204,548 super. feet**	**214,214 super. feet**
Sleepers	**678,537 pieces**	**627,873 pieces**
Girders, Corbels, Piles, Sills, and Girder Logs ..	**68,671 lineal feet** **429,729 super. feet**	**88,044 lineal feet** **457,666 super. feet**
Poles	**212,051 lineal feet**	**199,752 lineal feet**
House Blocks	**15,865 lineal feet**	**12,176 lineal feet**
Mining Timbers—Round	**33 pieces**	**Nil**
Mining Timbers—Split	**457,849 lineal feet**	**214,695 lineal feet**
Mining Timbers—Sawn	***Nil***	**42,127 super. feet**
Gross receipts from Timber Sales, &c.	**$3,980,444.95**	**$4,406,521.27**
Net Revenue	**$2,114,718.33**	**$2,409,146.64**

Hewn Timber Prices

The prices of hewn timber were increased from 1st September, 1967, and the following table shows the old and the new prices:—

	Previous Price $	As from 1-9-67 $
Sleepers (7 feet)—squared, hewn or sawn per 100 pieces	131.00	145.00
Crossing Timbers per 100 super. feet	9.65	10.65
Transoms per 100 super. feet ..	10.65	11.75
Braces per 100 super. feet	9.95	11.85
Head stocks (12" x 6") per 100 super. feet	12.25	13.50

Rosewood

No Rosewood or Sandalwood was purchased or exported during the year.

Timber Felling and Timber Getting Award—State

During the twelve months under review, the Basic Wage rate under this Award varied as follows:—

As from 3rd July, 1967—$37.32 to $38.32
(General Ruling Declaration dated 30th June, 1967)

Logging Roads, 1967-68

The Department's Road programme for the year involved 65 miles of new construction.

Location and working surveys covering 261 miles were carried out.

Expenditure from Forestry Votes was as follows:—

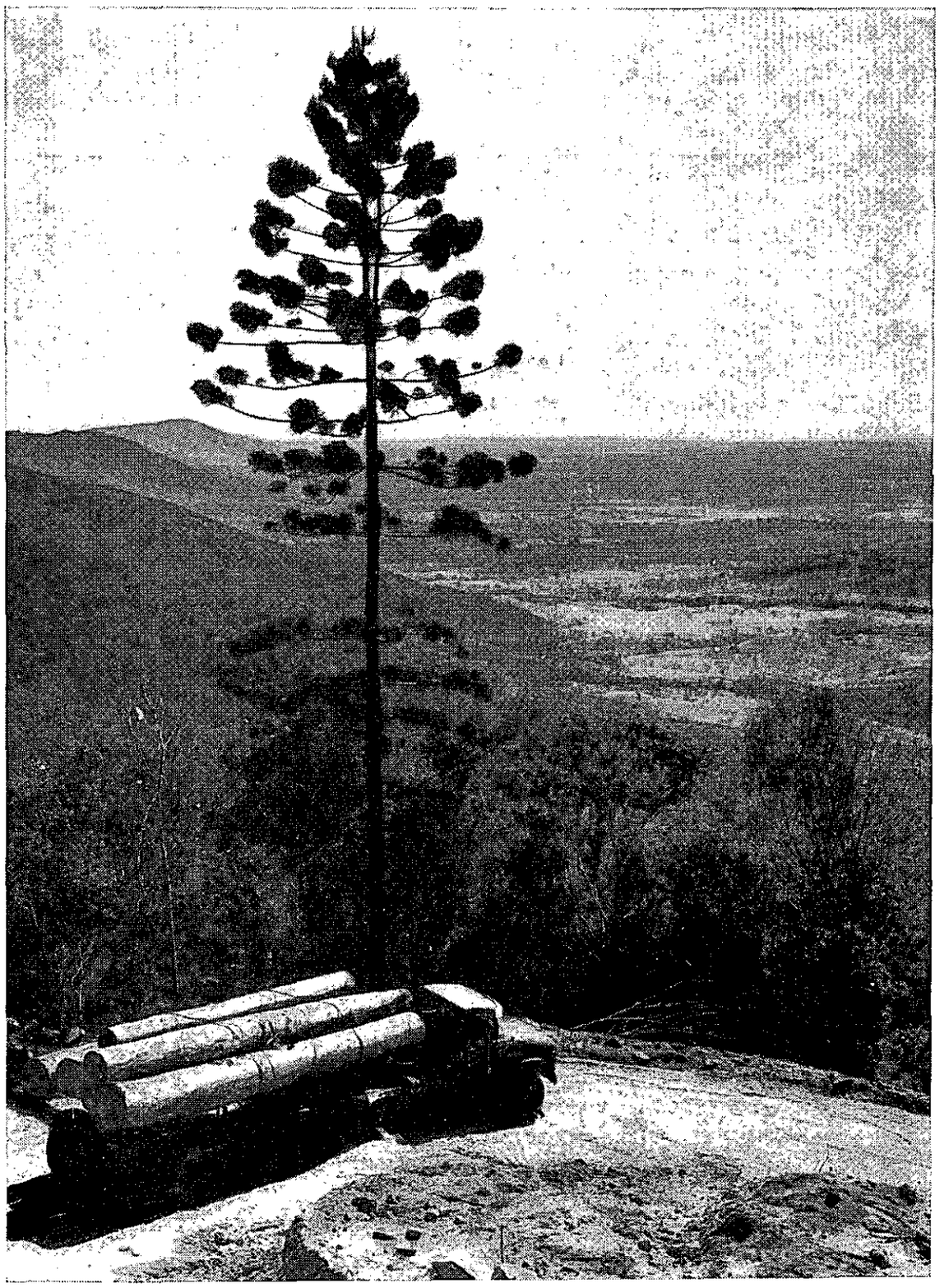
	$
New Construction	263,993
*Maintenance	183,929
Subsidies to Shire Councils	39,106
Workers' Compensation	2,795
Pay Roll Tax	5,779
Surveys	2,470
Freights and Fares	2,414
Resumptions for Access	62
	$500,548

*A refund of $11,566.00 has been received from the Commonwealth Government as subsidy on flood damage restoration in North Queensland.

Logging

The table below shows the quantities of timber hauled during 1967-68 by contractors to the Department and the payments made to them for this work.

Class	Quantity	Payment
South Queensland—	Super. feet	$
Hoop and Bunya Pine	13,485,949	327,650.93
Forest Hardwoods	5,533	
Scrub Hardwoods	38,337	
Miscellaneous	82,403	
Red Cedar	10,808	
	13,623,030	327,650.93
North Queensland—		
Cabinet Woods	823,621	23,407.32
Forest Hardwoods	170,164	6,336.15
	993,785	29,743.47
Totals	14,616,815	357,394.40



Hauling Hoop Pine logs to mill over Colosseum Creek Road

Constructional Timbers—Departmental Contracts

Below are shown figures for supply of constructional timbers from Crown Lands for 1967–68 in comparison with those for the previous two years :—

Class of Timber	1965–66	1966–67	1967–68
Sleepers	311,538 pieces	345,499 pieces	349,770 pieces
Crossings	3,026 super. feet	17,348 super. feet	53,250 super. feet
Transoms	3,302 super. feet	51,059 super. feet	77,194 super. feet
Bridge Timber (Round)	21,298 lineal feet	19,280 lineal feet	24,286 lineal feet

SAWMILLS LICENSING

The Sawmills Licensing Committee met at regular intervals during the year to consider matters relating to the licensing of sawmills and their capacity and submitted recommendations as necessary to the Conservator of Forests.

In the first-three quarters of the year, 490 mills were in active operation. This compares with 524 mills which operated in the second quarter of the previous year and is indicative of the trend towards a reduced number of licensed sawmills.

The following table shows the position in regard to Sawmill Licenses as at 30th June, 1968:—

Number of Licenses as at 30–6–67	Classification	New Licenses Issued	Changes in Classification		Licenses not Renewed			Current Licenses as at 30–6–68	Total Licenses as at 30–6–68
			Plus	*Minus*	*Refused*	*Relinquished*	*Under Consideration*		
514	General mills	..	..	..	1	23	..	490	490
7	Case mills	..	..	..	..	1	..	6	6
32	Sleeper mills	1	..	1	..	3	..	29	29
10	Other restrictions	2	1	..	..	2	..	11	11
563		3	1	1	1	29	..	536	536

The corresponding figure for Licenses current at 30th June, 1967 was 563 so the reduction was 27 during the period. This is a direct result of the increased difficulty that mills are experiencing in obtaining supplies of logs and with the rapid decline in availability of private timber, further reduction is inevitable.

Offences

During the year ended 30th June, 1968, officers reported 148 breaches of the Acts and Regulations administered by the Department.

Proceedings were successfully instituted against 11 persons and fines totalling $220.00 imposed.

In 41 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. In some instances, part of the cost of investigation was charged. Appropriate action was taken in other cases.

As a result of action taken in all cases, an amount of $3,260.29 was recovered by the Crown in timber revenue.

FOREST PRODUCTS RESEARCH

1. Engineering and Seasoning

The staff position in this section improved with the filling of the job of Sawmill Engineer which had been vacant for some three years. Arrangements were made for this officer to spend three months at the Forest Products Division of C.S.I.R.O. in Melbourne to permit him to become familiar with current research programmes being undertaken and with the latest techniques.

There has been some further improvement in trade practices in the seasoning of timber but there is still a need for better understanding of the behaviour of timber and of correct practices on the part of builders and timber users. As an example, well seasoned flooring correctly laid is frequently submitted to severe conditions with the summer sun streaming through large glass windows whilst the house is locked up awaiting occupancy. This results in the opening-up of the floor and leads to avoidable complaints and criticism of the timber.

Work carried out in co-operation with the Timber Industry has shown that Cypress Pine, which has usually been machined in the green state, can be machined satisfactorily after seasoning. Adoption of this practice by the Trade will further increase the popularity of Cypress Pine, particularly for flooring.

2. Sawmill Economics

The last of a series of Cypress Pine Mill Studies that embraced Queensland and two New South Wales mills was completed and the data has shown the need for a revision of the weight placed on factors influencing log classification. Because an important part of the market for Cypress Pine is in New South Wales, it is desirable for the welfare of the industry to achieve a uniform system of log classification and pricing for Cypress Pine in the two States. To this end, discussions have been held with officers of the New South Wales Forestry Commission.

The main sawing study undertaken at the Department's Rocklea mill was concerned with Slash Pine which is the principal exotic species planted in Queensland and yields a softwood with properties similar to those of Radiata Pine which is being imported from New Zealand. Supplies of Slash Pine are rapidly increasing and they will have to be used more and more by the building industry for uses traditionally reserved to hardwoods. To promote the use of this species and so compensate for decreasing availability of hardwoods is now one of the most important tasks facing this Department and the timber-using industry. For this reason, priority has been given to sawing studies with this species to establish procedures which will obtain best results from the material available.

3. Utilization

Mr. Watson of this branch paid two visits to the Forest Products Division of C.S.I.R.O. Melbourne for an investigation of relationships between taxonomic groupings, timber properties and utilization potential. Some interesting findings were made regarding density, hardness, certain aspects of mechanical strength and their influence on wood use. Close relationships were found between taxonomic and durability groupings of species. These and other established relationships have been incorporated for use in the assessment of log and sawn timber.

Over 800 enquiries were received from all sections of the timber industry for advice on the uses of Queensland and imported timbers. An increasing interest was evident in Rain Forest species to take the place of hardwoods of which supplies are diminishing. There was also an increased interest in imported timbers, due in part to the increasing quantities of attractively presented softwoods from neighbouring countries becoming available at competitive prices.

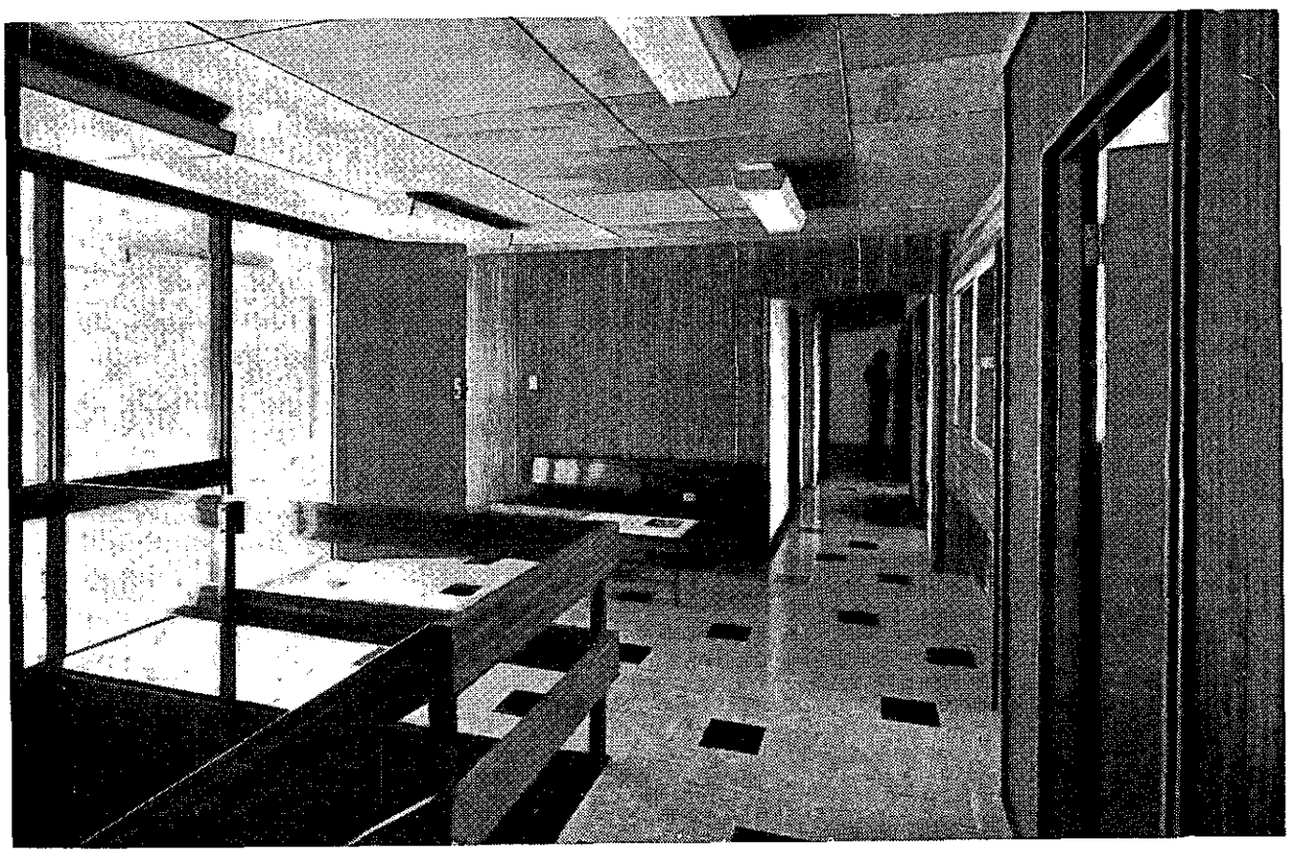
Changes in general building practices have resulted in enquiries which indicate that builders and designers are unfamiliar with the properties of timber. In many instances, timber is blamed for problems which are caused by its misuse.

Insufficient attention to the provision of adequate sub-floor ventilation in structures is still responsible for numerous complaints regarding cupped flooring and the occurrence of fungal attack soon after fixing.

The tendency to design for larger spans, which require larger dimensioned members, has highlighted the need either to allow for the shrinkage of unseasoned material or to specify seasoned timber. In this regard, use of laminated seasoned material could fill an important role.

With brick-veneer construction, timber framing has been blamed for problems encountered particularly with aluminium-framed windows when the fault is due to lack of knowledge of requirements in the integrated use of materials of differing behaviour.

The use of unseasoned hardwood for framing is good and recommended practice where timber sheeting is used but alteration of construction design and use of seasoned timber may be required to obtain best results with brick-veneer.

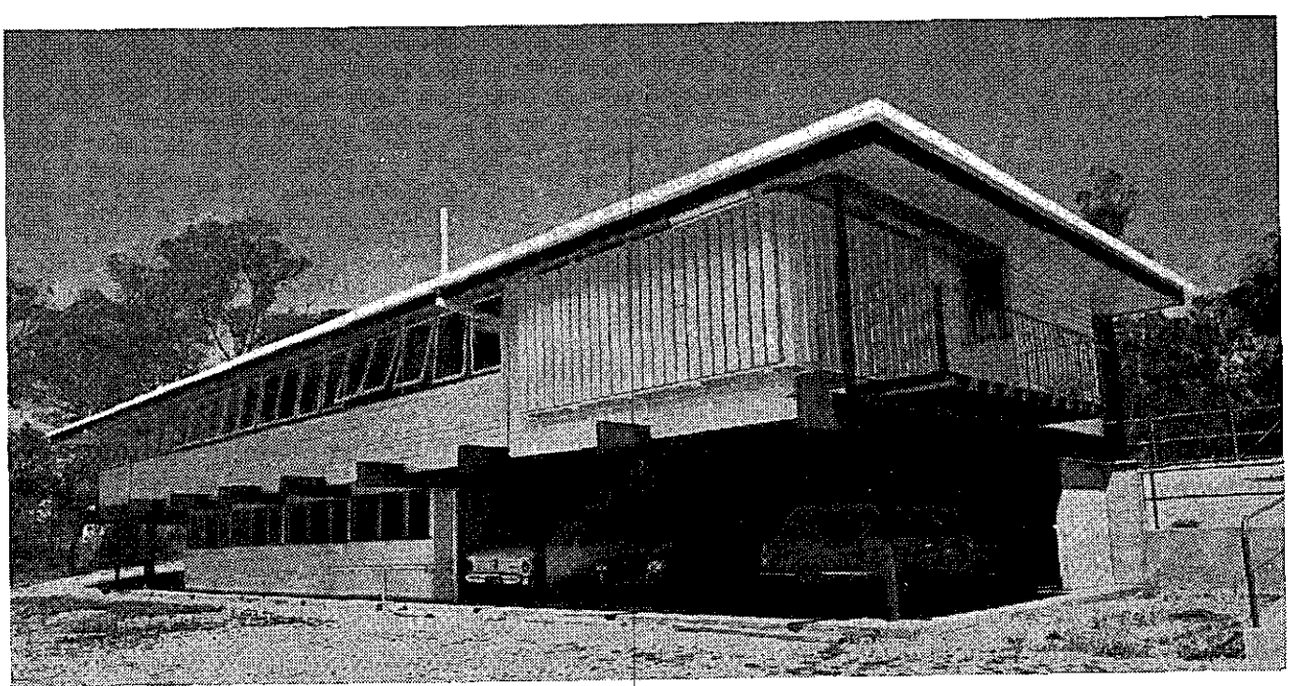


FOREST BIOLOGY BUILDING

Showing the aesthetic application of timber in the form of laminated Brush Box components, sheeting materials including Queensland Walnut, Silky Oak, and Hoop Pine plywood ceiling

The increasing use of vinyl floor coverings glued to timber floors has, in some instances, given unsatisfactory results and, in all cases investigated, the cause has been either the fixing agent or the impervious nature of the covering material.

The answer to most of these problems lies in the field of education and officers of the Department serve as lecturers for the Wood Technology Course at the Eagle Farm Technical College and at the Queensland Institute of Technology, and have given addresses during the year to the Queensland Master Builders' Association and other like Associations. As an extension of this principle, the Department uses plantation timbers whenever possible in its own buildings to demonstrate their proper use and to show that they can be satisfactorily and economically used.



FOREST BIOLOGY BUILDING

Showing large laminated Brush Box bearers which facilitate the provision of an unobstructed area under the building and support the timber structure which has slash pine flooring and rough sawn exterior wall cladding

One pleasing feature is that the Department's Pamphlet No. 5, "Queensland Building Timbers and Specifications for Their Use", is in keen demand by users and specifiers.

Considerable effort has been devoted with the Standards Association of Australia to developing standards and codes of practice for the use of timber. During the year, a Standard code "Physical Barriers used for the Protection of Buildings against Subterranean Termites" was published. The method outlined for protection from termites is time proved in Queensland and is particularly suited to the majority of our domestic building designs. Progress has been made with standards for softwood species, poles and piles, preservative treatment of timber, and a code of recommended practice for light timber framing. The coming year should see the publication of most of them and their strict use will result in the better utilization of available timber supplies with economic advantages to the user.

Under the Timber Users' Protection Act, 54 complaints were received and investigations carried out. In sixteen of these, evidence did not disclose a breach of the Act, eighteen were settled between the people concerned whilst one conviction was secured. The balance are still under investigation or in process of litigation.

In addition, some 250 routine inspections were made and it is evident that industry and users of timber are still not fully aware of the provisions of the Acts.

4. Wood Structure and Timber Physics

Work has continued on the screening of seed orchard trees with the object of ensuing that the planting stock obtained from this parental source has acceptable wood characteristics to allow full utilization of the higher yields being obtained.

All orchard preselections have now been phenotypically assessed and, to date, 44 of 58 examined have been found to have acceptable wood characteristics in Hoop Pine and 26 of 31 in Caribbean Pine.

A more meaningful measure of the relative worth of this parental stock is being obtained by comparative evaluation of the wood of their open-pollinated progeny, both between families and with routine stock. Data for sixteen 14-year-old families of Slash Pine (*Pinus elliottii* Engelm. var. *elliottii*), routine plantings in the same 4-replicated experiment, and the seed orchard parents involved are being analysed.

An effect of preselection for high vigour on features affecting wood quality indicates the prudence of the present policy of secondary selection to eliminate trees with substandard wood properties and it seems that a higher selection intensity for wood quality may be necessary.

Extension of these parent/offspring/routine stock comparisons to older material and other species is proposed, as well as evaluation of the wood quality of control-pollinated progeny.

An extensive study has been made of the variation in several wood characteristics between and within eight 25-year-old provenances (differentiated seed sources) of Hoop Pine, using test material established at Yarraman and Imbil. Observations on the 160 trees studied, ten from each provenance at each location, have been completed and statistical analysis is proceeding.

Differences between and within provenances in spiral grain, basic density and micellar angle have been established or are apparent. Fibre length varied considerably within but little between provenances.

There was an apparent general tendency for faster growing provenances (viz.: Jimna, Kalpowar and Gallangowan) to have—

(*a*) higher basic density regardless of site, and

(*b*) poorer cell wall organisation and slightly lower fibre length when planted on the better site at Imbil.

Grain spirality was generally somewhat higher on the better site.

Site effects will require careful consideration in evaluating these provenances.

Arrangements have been made for the Division of Forest Products, C.S.I.R.O. to conduct pulping trials with plantation grown conifers, material from 88 trees each of Slash, Loblolly and Hoop Pine and 44 of Caribbean Pine being supplied. Each species, with the exception of *P. caribaea*, was represented by two age classes and a range of localities. Sizes were those expected to be available for commercial pulping.

To assess the effect of wood property variation on pulp and paper properties, trees with extremes of fibre length and basic density in each species and age group were selected for individual pulping. This involved the prior determination in our laboratory of fibre length and basic density for 168 trees.

In addition to the important primary objective of assessing the paper making potential of the material, valuable data has been accumulated in two important wood quality assessment criteria. This information for routine stock will be used in the development of species norms for comparative evaluation of species and parental candidate trees.

Data from the extensive Hoop Pine provenance trial samples revealed the existence of a previously undetected definite pith to bark variational trend for basic density. This was the same as found in *Pinus* species but with a much less marked radial variation.

5. Wood Chemistry and Preservation

The stage has been reached in Queensland when there will be no spectacular increase in the installation of vacuum pressure treatment plants using multi-purpose salts. This industry has expanded considerably since its inception some eight years ago and the State is now well covered with such plants. During the year two new plants were installed and a further three are proposed. A departure from conventional tank treatment with boron salts is the use of these salts in vacuum pressure plants and four plants are now using this method.

A total of 100 plants were inspected during the year and although there has been some improvement in plant control, there is still need for mill management to realise that preservation is an integral part of the industry. Careful selection and adequate training of plant operators is necessary to obtain the full benefit from this section of the industry.

During the year, some 5,400 samples were submitted for testing and these involved some 5,000 spot tests and over 3,000 chemical analyses.

The majority of poles used by the Electricity and P.M.G. authorities are now treated with CCA salts and this has greatly increased the quantity of timber that can be used for such purposes.

Experiments carried out in co-operation with the Railway Department on the use of treated sleepers at Normanby had to be discontinued because of reconstruction of the rail track. Test sections are still in use at Brisbane and Deeral in North Queensland, and additional information will be obtained from these.

There is still an increasing demand for railway sleepers and new experiments will be started shortly using oil-borne preservatives which method of treatment should reduce mechanical degrade which cannot be achieved with water-borne preservatives. A commercial plant has been constructed for this purpose and, in co-operation with the Railway Department, species not currently accepted will be tried. Results to date indicate that this type of treatment will assist greatly in meeting the increasing demand for sleepers.

During the year, further inspections were made of the test pieces submerged in the Brisbane River at Oxley and these continue to show superiority in durability of pine treated with CCA salts. Similarly, CCA treatment of sapwood on species such as Satinay and Brush Box increases the life considerably when compared with untreated piles.

Inspection of two wharves with untreated turpentine piling in the lower Brisbane River showed a remarkable freedom from *Sphaeroma terebrans* attack between tide levels, probably due to the smothering effect on this Crustacean of crude oil accidently released on the water surface.

Although research work has been restricted, investigations were continued on the problems associated with the treatment of some rain forest species with copper-chrome-arsenic formulations.

In the laboratory, investigations have been carried out into the quantitative analysis of starches and into methods of dieldrin analysis other than by the Gas Chromatograph.

Experience in the laboratory has been such as to justify simple referee methods of analysis. Sophisticated instrumental methods limit the range and class of laboratory capable of carrying out quality control.

Patent rights on the Vacuum Pressure Diffusion Process for treatment of timber have been granted. This development has resulted in most plants in Queensland adopting this process and enquiries have been received from outside the State.

6. Plywood and Veneer

There has been a reduction in the number of samples of plywood tested and this is in part due to adoption by the Plywood Association of Australia of a Quality Control System.

Commercial treatment of constructed plywood with all purpose preservatives presents many difficulties and work is proceeding in an endeavour to make this economically possible.

The wider use of dieldrin for treatment of veneers has presented some problems which it is hoped can be overcome by using a spray system instead of the dip method.

7. Insects

The number of enquiries on insect pests of timber indicates that industry and users are aware of the importance of avoiding loss of timber from this source. Whilst many enquiries need only routine recommendations for treatment, a large proportion require identification of the pest species involved. Owners of buildings would be well advised to obtain advice for any form of borer attack as in many cases damage is due to green timber borers which cause no further trouble when timber dries and thus require no treatment.

As a result of the initial survey after the first finding of the West Indian drywood termite, *Cryptotermes brevis*, nine houses have been fumigated with methyl bromide.

The survey has been extended but no additional cases of infestation by this particular species have been found.

STAFF

As at 30th June, 1968, there were 488 salaried officers on the staff comprising 215 in Head Office and 273 at district centres. This represents an increase of 28 on the number of staff as at 30th June, 1967. The number of wages staff employees was 1,848.

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

Messrs.—

C. H. Morris (Timber Sales Officer, 46 years' service).

C. J. J. Watson (Timber Identification and Utilisation Officer, 45 years' service).

E. Fryer (Forest Ranger Division II, 34 years' service).

O. P. Reed (Forest Ranger Division II, 27 years' service).

Miss—

M. G. McDonald (Clerk-Typist, 46 years' service).

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

ACKNOWLEDGEMENT

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

A. R. TRIST,
Conservator of Forests.

APPENDICES

APPENDIX A

Return of Timber, &c., removed from Crown Lands during the Year ended 30th June, 1968

Species	Quantity Super. feet	Super. feet
Milling Timber—		
(*a*) Native Forests—		
Hoop and Bunya Pine—		
Ply	2,566,729	
Logs	8,872,193	
Tops	8,205,301	
		19,644,223
Kauri Pine	1,600,843	
White Cypress Pine	29,178,452	
Forest Hardwoods	69,298,409	
Scrub Hardwoods	14,182,762	
Cabinet Woods	17,411,674	
Miscellaneous Species	31,652,031	
Limb Logs, Head Logs, Stumps and Flitches	13,207	
		163,337,378
(*b*) Plantation Thinnings—		
Hoop Pine	28,083,705	
Bunya Pine	227,437	
Kauri Pine	3,454,915	
Slash Pine	3,153,899	
Loblolly Pine	1,790,889	
Patula Pine	1,376,159	
Radiata Pine	825,473	
Caribbean Pine	33,327	
Benguet Pine	446	
Short Leaf Pine	4,584	
Chir Pine	730	
Mexican Cypress	474	
Rose Gum and Blackbutt	40,154	
Silky Oak	7,467	
		38,999,659
Pulp Wood—		
Slash Pine	2,076,325	
Loblolly Pine	737,681	
Hoop Pine	2,072,204	
Caribbean Pine	52,191	
		4,938,401
		226,919,661

Other Classes—		Expressed as Superficial feet (Hoppus) Log Measure
Sleepers Hewn	22,427 pieces	852,226
Sleepers Sawn—5 ft.	96,381 pieces	2,698,668
Sleepers Sawn—7 ft.	385,314 pieces	14,641,932
Sleeper Blocks (as sleepers contained)	123,751 pieces	4,455,036
Transoms, Crossings, Headstocks, Longitudinals	214,214 superficial feet	342,742
Girders, Corbels, Piles, Sills, Kerb Logs	88,044 lineal feet	1,584,792
Girder Logs	457,666 superficial feet	457,666
Poles	199,752 *lineal feet*	1,398,264
House Blocks	12,176 lineal feet	73,056
Fencing Material—Split	97,673 pieces	879,057
Fencing Material—Round	138,938 lineal feet	3,473,450
Mining Timber—Split	Nil pieces	
Mining Timber—Round	214,695 lineal feet	429,390
Mining Timber—Sawn	42,127 super. feet	42,127
		31,328,406

Other Classes—*continued*—	
Fuel	17,531 tons
Trees and Plants (number)	703,193 plants
Sand, Gravel, Soil, Antbed, &c.	499,221 cubic yards
Freestone	1,573 cubic feet
Fibre, Bark, Dry Leaves, Reeds	316 bags
Duboisia	8,790 pounds
Flora	651 pieces
Peat	149 bags
Mulga Wood	33 tons
Poling Timber (Copper Refining)	2,694 tons
Charcoal	160 bags
Lawyer Cane	4 tons
Boat Knees	150 pieces
Bee Hives	5 hives

APPENDIX B

Total Receipts, Department of Forestry, for the Year ended 30th June, 1968

Receipts from Districts	Totals $
Group 1—South Queensland (Brisbane, Beerburrum, Beerwah, Benarkin, Bundaberg, Fraser Island, Gallangowan, Gympie, Imbil, Jimna, Kalpowar, Maryborough, Monto, Murgon, Yarraman)	1,996,553.12
Group 2—North Queensland (Atherton, Cairns, Cooktown, Charters Towers, Hughenden, Ingham, Innisfail, Port Douglas, Ravenswood, Townsville)	1,122,548.51
Group 3—Dalby, Roma, Taroom, Charleville, Mitchell, Quilpie	314,039.38
Group 4—Warwick, Goondiwindi, Inglewood, St. George, Stanthorpe, Cunnamulla	195,825.58
Group 5—Mackay, Rockhampton, Clermont, Bowen, Proserpine, Emerald, Springsure, Theodore	134,006.20
Group 6—Barcaldine, Blackall, Jundah, Longreach, Muttaburra, Stonehenge, Winton, Aramac, Isisford, Jericho	381.85
Group 7—Cloncurry, Boulia, Kynuna, Mackinlay, Richmond	585.15
Group 8—Burketown, Coen, Croydon, Georgetown, Normanton, Thursday Island	336.00
	$3,764,285.79

Other Receipts	
Forestry and Lumbering	464,468.53
Sale of Plants, Material, &c.	43,980.56
Licenses† (See note after Appendix C)	18,662.17
Rents	11,530.79
Grazing Dues	39,093.92
Miscellaneous, (Salisbury Area Timber Account, Forfeit Wages, Expenditure Recoveries, &c.)	12,122.75
Sale of U.S. Tractors, Trucks, &c.	52,376.76
	$4,405,521.27

	$	
Plant Hire—		
Charged Loan Fund Projects	647,253.48	
Trust Fund Projects	259,912.95	907,166.43
		$5,313,687.70
Treasury Collections—		
Advances from Loan Fund	4,965,000.00	
Commonwealth Advance—Softwood Agreements	481,000.00	5,446,000 00
		$10,759,687.70

APPENDIX C

Proceeds of Sales of Timber, &c., for the Period 1st July, 1964, to 30th June, 1968

Groups*	1964–65	1965–66	1966–67	1967–68
	$	$	$	$
Group 1	1,908,772.03	2,011,656.17	2,082,015.22	1,996,563.12
Group 2	817,934.78	831,938.94	727,344.54	1,122,548.51
Group 3	254,680.03	231,565.70	262,199.37	314,039.38
Group 4	132,461.89	168,362.89	163,554.98	195,825.58
Group 5	141,366.96	129,467.16	125,449.88	134,006.20
Group 6	2,131.89	804.97	453.88	381.85
Group 7	15.95	259.48	398.75	585.15
Group 8	..	..	..	336.00
	$3,257,363.53	$3,374,055.31	$3,361,416.62	$3,764,285.79
Receipts—Forestry and Lumbering	359,518.58	348,852.41	402,527.38	464,468.53
Sale of Plants, Material, &c.	24,777.14	39,041.37	47,297.77	43,980.56
Licenses†	7,587.45	18,715.25	18,762.00	18,662.17
Rents and Grazing Dues	26,809.12	33,007.67	39,278.71	50,624.71
Miscell. (Salisbury Area Timber Account, forfeit wages, Expenditure Recoveries, &c.)	38,730.48	497,167.13	74,914.13	12,122.75
Sale of U.S. Tractors, Trucks, &c.	30,123.66	34,121.07	36,248.34	52,376.76
	$3,744,909.96	$4,344,960.21	$3,980,444.95	$4,406,521.27

* For Districts within the groups, see Appendix B.
† Includes the following license fees :—Fuel, Quarry Royalty, Brand, Sawmill, Apiary, Forest Products, Sales Permit.

APPENDIX D

Constructional Timbers Supplied During Financial Year 1967–68 under Forestry and Lumbering Operations

Class of Timber	Quantity	Sales Value
		$
Hewn Crossings	14,527 super. feet	1,617.16
Sawn Crossings	38,723 super. feet	4,238.28
Headstocks and Braces	920 super. feet	121.80
Hewn Transoms	30,194 super. feet	5,574.13
Sawn Transoms	76,274 super. feet	9,182.02
Piles	7,818 lineal feet	11,305.82
Girders—Dressed	16,469 lineal feet	45,751.30
Hewn Sleepers	117,529 pieces	127,621.04
Sawn Sleepers	108,490 pieces	164,520.46
Sleeper Blocks (as sleepers contained)	123,751 pieces	122,618.65
Split Posts and Rails, &c.	14,175 pieces	5,820.86
Total		$498,371.52

APPENDIX E

Comparative Statement of Expenditure for Years 1966–67 and 1967–68

—	1966–67	1967–68
	$	$
REVENUE—		
Salaries	1,463,830	1,633,359
Cryptotermes brevis Investigation	444	3,805
Fares, Printing, Stores, &c.	9,638	10,374
Travelling Expenses and Incidentals	86,075	89,144
National Parks	62,191	64,047
Cash Equivalent of Long Service Leave	8,953	11,799
LOAN—		
National Parks	89,999	135,000
TRUST—		
Reforestation Trust Fund—		
Reforestation	3,999,865	4,580,967
Land Acquisition	15,887	34,735
Purchase of Plant	356,845	494,504
Access Roads	186,314	272,971
Purchase of Radio Equipment	18,969	14,989
Purchase of Firefighting Equipment	17,832	14,992
Forestry and Lumbering Fund—		
Interest and Redemption on Loans	2,114,718	2,409,147
Hardwood Supplies to Department of Railways and others	364,562	439,294
Harvesting and Marketing Timber	1,235,745	1,240,951
Access Roads—Maintenance and Subsidies	185,567	227,577
Maintenance of Plant	638,395	699,704
Maintenance of Capital Improvements	124,215	127,811
Total $	10,980,044	12,505,170

APPENDIX F

Net Area of Plantation Established 1st April, 1967, to 31st March, 1968

Species	Brisbane	Gympie	Mackay	Maryborough	Monto	Murgon	North Queensland	Warwick	Yarraman	Totals
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1. Conifers										
A. Native Conifers—										
Hoop Pine	241·4	526·2	..	348·6	377·3	672·2	109·0	..	1,074·8	3,349·5
Kauri Pine	..	..	..	..	..	..	..	..	..	..
Bunya Pine	..	9·5	..	..	..	0·1	..	..	0·2	9·8
Other Native Conifers	..	..	..	..	..	..	..	..	..	..
Total—Native Conifers	241·4	535·7	..	348·6	377·3	672·3	109·0	..	1,075·0	3,359·3
B. Exotic Conifers—										
P. elliottii	894·7	1,616·3	..	1,930·6	..	..	..	..	85·5	4,527·1
P. taeda	..	38·9	..	..	..	1·5	..	0·2	4·8	45·4
P. patula	..	..	..	..	..	0·5	..	..	38·2	38·7
P. caribaea	21·2	29·7	703·4	155·4	..	0·7	146·6	..	3·4	1,060·4
P. radiata	..	..	..	..	..	0·4	..	279·5	81·4	361·3
P. palustris	..	..	..	..	..	..	..	..	1·2	1·2
Other Exotic Conifers	..	..	8·0	1·8	..	1·8	0·8	..	13·9	26·3
Total—Exotic Conifers	915·9	1,684·9	711·4	2,087·8	..	4·9	147·4	279·7	228·4	6,060·4
Total—Conifers	1,157·3	2,220·6	711·4	2,436·4	377·3	677·2	256·4	279·7	1,303·4	9,419·7
2. Broadleaved Species										
A. Native Forest Hardwoods—										
Euc. grandis (and *E. saligna*)	..	..	..	..	..	..	..	..	..	..
Euc. drepanophylla	..	..	..	..	..	..	..	..	..	..
Euc. microcorys	..	..	..	..	..	..	..	..	..	..
Euc. pilularis	..	..	..	..	..	..	..	..	..	..
Euc. cloeziana	..	..	..	..	..	..	..	..	..	..
Others	..	0·4	..	..	..	..	1·2	..	..	1·6
Total—Native Forest Hardwoods	..	0·4	..	..	..	..	1·2	..	..	1·6
B. Other Broadleaved Species—										
Silky Oak	..	..	..	..	..	..	..	..	..	..
Queensland Maple	..	..	..	..	..	..	..	..	..	..
Red Cedar	..	2·5	..	..	..	..	..	..	..	2·5
Others	..	..	..	..	..	..	0·2	..	..	0·2
Total—Other Broadleaved Species	..	2·5	..	..	..	..	0·2	..	..	2·7
Total—Broadleaved Species	..	2·9	..	..	..	..	1·4	..	..	4·3
Miscellaneous Experimental	0·9	..	23·2	..	..	..	..	0·4	0·1	24·6
Total—All Species	1,158·2	2,223·5	734·6	2,436·4	377·3	677·2	257·8	280·1	1,303·5	9,448·6

APPENDIX G

Net Area of Effective Plantation Classified into Forestry Districts to 31st March, 1968

Species	Brisbane	Gympie	Mackay	Maryborough	Monto	Murgon	North Queensland	Warwick	Yarraman	Totals
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1. Conifers										
A. Native Conifers—										
Hoop Pine	1,233·9	19,495·2	62·2	659·1	4,591·3	12,384·2	1,546.5	3·7	23,665·0	63,641·1
Kauri Pine	5·3	672·9	2·5	69·7	3·6	4·9	284·9	0·8	7·4	1,052·0
Bunya Pine	0·9	463·2	..	0·8	1·2	64·9	0·2	..	68·7	599·9
Other Native Conifers	2·1	7·4	0·5	1·9	..	..	0·2	..	..	12·1
Total—Native Conifers	1,242·2	20,638·7	65·2	731·5	4,596·1	12,454·0	1,831·8	4·5	23,741·1	65,305·1
B. Exotic Conifers—										
P. elliottii	14,986·9	12,690·0	2,473·3	16,330·1	52·0	1·4	11·5	767·4	880·9	48,193.5
P. taeda	3,534·7	118·0	7·3	54·8	2·7	88·7	14·0	236·1	21·5	4,077·8
P. patula	19·8	37·8	8·1	8·2	24·0	165·7	35·0	459·9	3,532·7	4,291·2
P. caribaea	188·2	248·3	5,890·2	529·9	1·4	5·4	464·9	..	4·3	7,332·6
P. radiata	0·5	..	..	..	..	16·8	..	2,712·9	718·3	3,448·5
P. palustris ..	237·9	2·1	7·3	1·0	..	..	..	8·8	2·8	259·9
Other Exotic Conifers	55·8	26·9	117·5	19·1	9·5	4·3	10·1	29·1	53·1	325·4
Total—Exotic Conifers	19,023·8	13,123·1	8,503·7	16,943·1	89·6	282·3	535·5	4,214·2	5,213·6	67,928·9
Total—Conifers ..	20,266·0	33,761·8	8,568·9	17,674·6	4,685·7	12,736·3	2,367·3	4,218·7	28,954·7	133,234·0
2. Broadleaved Species										
A. Native Forest Hardwoods—										
Euc. grandis (and *E. saligna*)	277·3	1,273·7	0·1	0·2	..	17·7	1·1	..	185·4	1,755·5
Euc. drepanophylla ..	203·4	182·3	0·1	0·1	..	71·1	37·8	..	469·5	964·3
Euc. microcorys ..	123·5	19·0	..	0·7	..	..	28·2	..	5·0	176·4
Euc. pilularis ..	200·2	221·0	..	0·3	..	..	..	..	0·5	422·0
Euc. cloeziana ..	..	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	2·3	..	88·8	77·5	..	663·2	3,700·5
B. Other Broadleaved species—										
Silky Oak	..	94·4	..	0·4	..	25·0	26·5	..	625·2	771·5
Queensland Maple ..	..	66·8	..	..	0·6	..	247·6	..	..	315·0
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	243·9	0·3	0·8	0·8	25·0	339·7	..	626·3	1,236·9
Total — Broadleaved Species	833·5	2,279·0	0·5	3·1	0·8	113·8	417·2	..	1,289·5	4,937·4
Miscellaneous Experimental	57·0	34·2	44·6	..	..	0·1	10·4	14·7	65·3	226·3
Total—All Species ..	21,156·5	36,075·0	8,614·0	17,677·7	4,686·5	12,850·2	2,794·9	4,233·4	30,309·5	138,397·7

APPENDIX H

Areas of Natural Forest Treated

A.—EUCALYPTS

Sub-District	Treated 1967–68	First Treatment 1967–68	Total as at 30th June, 1968
	Acres	Acres	Acres
Brisbane	412	412	30,685
Beerburrum	573	75	20,458
Gympie	20	20	20,182
Imbil	..	..	159
Mackay/Emerald/ Rockhampton	1,577	1,577	46,143
Maryborough	2,904	894	108,099
Bundaberg	1,161	770	37,073
Fraser Island	1,120	431	22,966
Monto	784	655	22,801
Murgon/Jimna	2,296	1,953	42,710
Atherton	23	23	3,712
Ingham	..	..	2,985
Warwick	..	..	10,462
Inglewood	..	..	15,697
Yarraman	..	..	6,414
Benarkin	..	..	2,067
Dalby/Chinchilla	279	279	81,114
Total—Eucalypts	11,149	7,089	473,727

APPENDIX H—*continued*

B.—CYPRESS PINE

Sub-District	Treated 1967–68	First Treatment 1967–68	Total as at 30th June, 1968
	Acres	Acres	Acres
Bundaberg	..	..	2,152
Fraser Island	..	..	4,424
Monto	..	..	2,496
Inglewood	4,628	1,924	97,286
Dalby/Chinchilla/ Roma	9,304	4,896	231,036
Total—Cypress Pine	13,932	6,820	337,394

APPENDIX H—*continued*

C.—RAIN FOREST

Sub-District	Subsequent Treatment 1967–68	First Treatment 1967–68				First Treatment Completed 1967–68	Total as at 30th June, 1968
		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
Total—Natural Hoop Pine	..	..	..	..	..	..	10,038
Natural Rain Forest—							
Atherton	..	230	692	6,567	..	680	6,944
Ingham	..	42	39	3,615	6	39	1,355
Warwick	21	..	..	..	..	..	21
Total—Natural Rain Forest	21	272	731	10,182	6	719	8,320
Total—Rain Forest	21	272	731	10,182	6	719	18,358

APPENDIX H—*continued*

Grand Total—	Acres
Eucalypts	473,727
Cypress Pine	337,394
Rain Forest	18,358
	829,479

APPENDIX I

State Forests, Timber Reserves, National Parks and Scenic Areas listed by Forestry Districts and Sub-Districts as at 30th June, 1968

District	Sub-District	State Forests		Timber Reserves		National Parks		Scenic Areas	
		No.	Area	No.	Area	No.	Area	No.	Area
			A. R. P.		A. R. P.		A. R. P.		A. R. P.
Brisbane ..	Beerburrum	29	100,423 3 8	14	5,686 1 31	1	1,669 3 20	10	2,422 0 8
	Brisbane ..	36	189,077 1 26	18	26,079 0 3	11	85,998 2 0	23	6,382 3 32·1
	Total ..	65	289,501 0 34	32	31,765 1 34	12	87,668 1 20	33	8,805 0 0·1
Dalby ..	Chinchilla–Barakula	15	820,292 2 18	3	17,911 0 0	1	22,000 0 0	..	..
	Dalby ..	21	505,279 3 35	5	5,977 0 39	1	13,145 0 0	..	..
	Roma ..	15	416,880 1 37	4	103,602 0 0	..	..	..	..
	Total ..	51	1,742,453 0 10	12	127,490 0 39	2	35,145 0 0	..	..
Gympie ..	Gympie ..	36	288,963 3 31	3	2,511 1 8	..	..	3	991 0 0
	Imbil ..	11	145,712 3 0	2	148 2 3	..	..	1	640 0 0
	Total ..	47	434,676 2 31	5	2,659 3 11	..	..	4	1,631 0 0
Mackay ..	Emerald ..	3	132,358 3 35	9	193,872 2 0	3	1,379,400 0 0	..	..
	Mackay ..	8	166,200 0 0	19	100,491 2 19·1	25	258,429 0 0	64	15,538 1 38
	Rockhampton	34	568,231 2 28	14	113,897 2 22	2	12,104 0 0	13	1,020 0 0
	Total ..	45	866,790 2 23	42	408,261 3 1·1	30	1,649,933 0 0	77	16,558 1 38
Maryborough	Bundaberg ..	15	199,253 3 35	21	84,260 2 10	..	..	..	..
	Fraser Island	1	371,890 0 0	..	..	..	..	..	..
	Maryborough	38	368,354 0 13	16	29,911 0 37	3	10,540 0 0	3	805 0 0
	Total ..	54	939,498 0 8	37	114,171 3 7	3	10,540 0 0	3	805 0 0
Monto ..	Kalpowar ..	4	28,077 2 0	15	59,172 0 35	..	..	..	..
	Monto ..	16	387,656 2 35	32	178,713 0 38	1	3,830 0 0	5	1,102 0 0
	Total ..	20	415,734 0 35	47	237,885 1 33	1	3,830 0 0	5	1,102 0 0
Murgon ..	Gallangowan	3	38,310 0 0	..	..	..	..	..	..
	Jimna ..	9	107,528 0 34	..	..	..	..	..	..
	Murgon ..	11	104,517 0 0	10	50,428 1 3	..	..	..	..
	Total ..	23	250,355 0 34	10	50,428 1 3	..	..	..	..
North Queensland	Atherton ..	35	845,718 3 6	34	823,163 0 13	16	267,164 0 0	32	6,834 0 19
	Ingham ..	12	499,770 0 0	5	53,308 0 0	15	204,247 0 0	13	1,835 0 0
	Total ..	47	1,345,488 3 6	39	876,471 0 13	31	471,411 0 0	45	8,669 0 19
Warwick ..	Inglewood ..	25	424,505 1 31	4	7,162 0 8	..	..	..	..
	Warwick ..	14	80,802 3 37	4	5,958 3 28	2	15,325 0 0	4	494 3 0
	Total ..	39	505,308 1 28	8	13,120 3 36	2	15,325 0 0	4	494 3 0
Yarraman ..	Benarkin ..	4	70,797 0 0	3	4,442 2 26	..	..	..	..
	Yarraman ..	16	111,914 0 0	9	14,978 2 25	..	11,085 0 0	2	614 3 0
	Total ..	20	182,711 0 0	12	19,421 1 11	..	11,085 0 0	2	614 3 0
	Grand Total	*411*	*6,972,517 1 9*	244	1,881,676 0 28·1	81	2,284,937 1 20	173	38,680 0 17·1

At 30th June, 1968—

Total area set apart as—

	A.	R.	P.
State Forests	6,972,517	1	9
Timber Reserves	1,881,676	0	28·1
National Parks	2,284,937	1	20
Scenic Areas	38,680	0	17·1
Total Reservations	11,177,810	3	34·2

APPENDIX J

Reservations for the Year ended 30th June, 1968

1st July, 1967, to 30th June, 1968

State Forests

	No.	A.	R.	P.
At 1st July, 1967	385	6,719,332	2	29
Proclaimed 1-7-67 to 30-6-68	24	187,146	3	4
Proclaimed Converted Timber Reserves	5	39,234	0	0
Crown Land added to Existing State Forests	..	21,669	3	16·8
Timber Reserves amalgamated with State Forests	..	5,076	0	21
Areas released	−1	−808	3	10
State Forests amalgamated with existing State Forests	−2	..	..	
Recomputation of boundary	..	866	2	28·2
Total at 30th June, 1968	411	6,972,517	1	9

Timber Reserves

At 1st July, 1967	256	1,944,264	1	7·1
Proclaimed 1-7-67 to 30-6-68	1	13,550	0	0
Areas released	..	−4,015	0	0
Reserves cancelled	−5	−19,310	3	38
Timber Reserves Converted to State Forests or National Parks	−8	−52,954	0	21
Recomputation of Boundary	..	142	0	0
Total at 30th June, 1968	244	1,881,676	0	28·1

National Parks

	No.	A.	R.	P.
At 1st July, 1967	77	2,267,812	1	20
Proclaimed 1-7-67 to 30-6-68	3	8,625	0	0
Proclaimed Converted Timber Reserve	1	5,200	0	0
Crown Land added to existing National Parks	..	4,150	0	0
Areas released	..	−850	0	0
Total at 30th June, 1968	81	2,284,937	1	20

Scenic Areas

At 1st July, 1967	172	38,575	3	36·3
Proclaimed 1-7-67 to 30-6-68	1	28	0	0
Crown Land added to existing Scenic Areas	..	76	0	20·8
Total at 30th June, 1968	173	38,680	0	17·1

APPENDIX K

Distribution of Personnel, 30th June, 1968

Salaried officers	488
Other employees	1,848
	2,336

APPENDIX L

Tree Species Mentioned in Annual Report

Botanical Names

A. Native Conifers

Bunya Pine	*Araucaria bidwillii*
Hoop Pine	*Araucaria cunninghamii*
Kauri Pine	*Agathis* spp.
White Cypress Pine	*Callitris columellaris* syn. *glauca*
,, ,,	syn. *arenosa*
,, ,,	syn. *intratropica*

B. Exotic Conifers

Bahaman Caribbean Pine	*P. caribaea* var. *bahamensis*
Benguet Pine	*P. kesiya*
Bishop Pine	*P. muricata*
Chir Pine	*P. roxburghii*
Cuban Caribbean Pine	*P. caribaea* var. *caribaea*
Honduras Caribbean Pine	*P. caribaea* var. *hondurensis*
Loblolly Pine	*P. taeda*
Long Leaf Pine	*P. palustris*
Maritime Pine	*P. pinaster*
Mexican Cypress	*Cupressus lusitanica*
Ocote Pine	*P. oocarpa* and var. *ochoterenai*
Patula Pine	*P. patula*
Pond Pine	*P. serotina*
Radiata Pine	*P. radiata*
Sand Pine	*P. clausa*
Short Leaf Pine	*P. echinata*
Slash Pine	*P. elliottii* var. *elliottii*

C. Eucalypts

Blackbutt	*E. pilularis*
Grey Ironbark	*E. drepanophylla*
Gympie Messmate	*E. cloeziana*
Narrow Leaved Ironbark	*E. crebra*
Poplar Gum	*E. alba*
Rose Gum	*E. grandis*
Spotted Gum	*E. maculata*
Tallowwood	*E. microcorys*
White Mahogany	*E. acmenioides*

D. Other Broadleaved Species

African Mahogany	*Khaya senegalensis*
American Mahogany	*Swietenia macrophylla*
Bull Oak	*Casuarina luehmanni*
Neem	*Azadirachta indica*
Queensland Maple	*Flindersia brayleyana*
Queensland Walnut	*Endiandra palmerstoni*
Red Cedar	*Toona australis*
Rosewood	*Exemophila mitchellii*
Sandalwood	*Santalum lanceolatum*
Silky Oak	*Grevillea robusta*
Teak	*Tectona grandis*

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