1974

QUEENSLAND

ANNUAL REPORT

OF THE

DEPARTMENT OF FORESTRY

FOR THE

YEAR 1973–74

PRESENTED TO PARLIAMENT BY COMMAND

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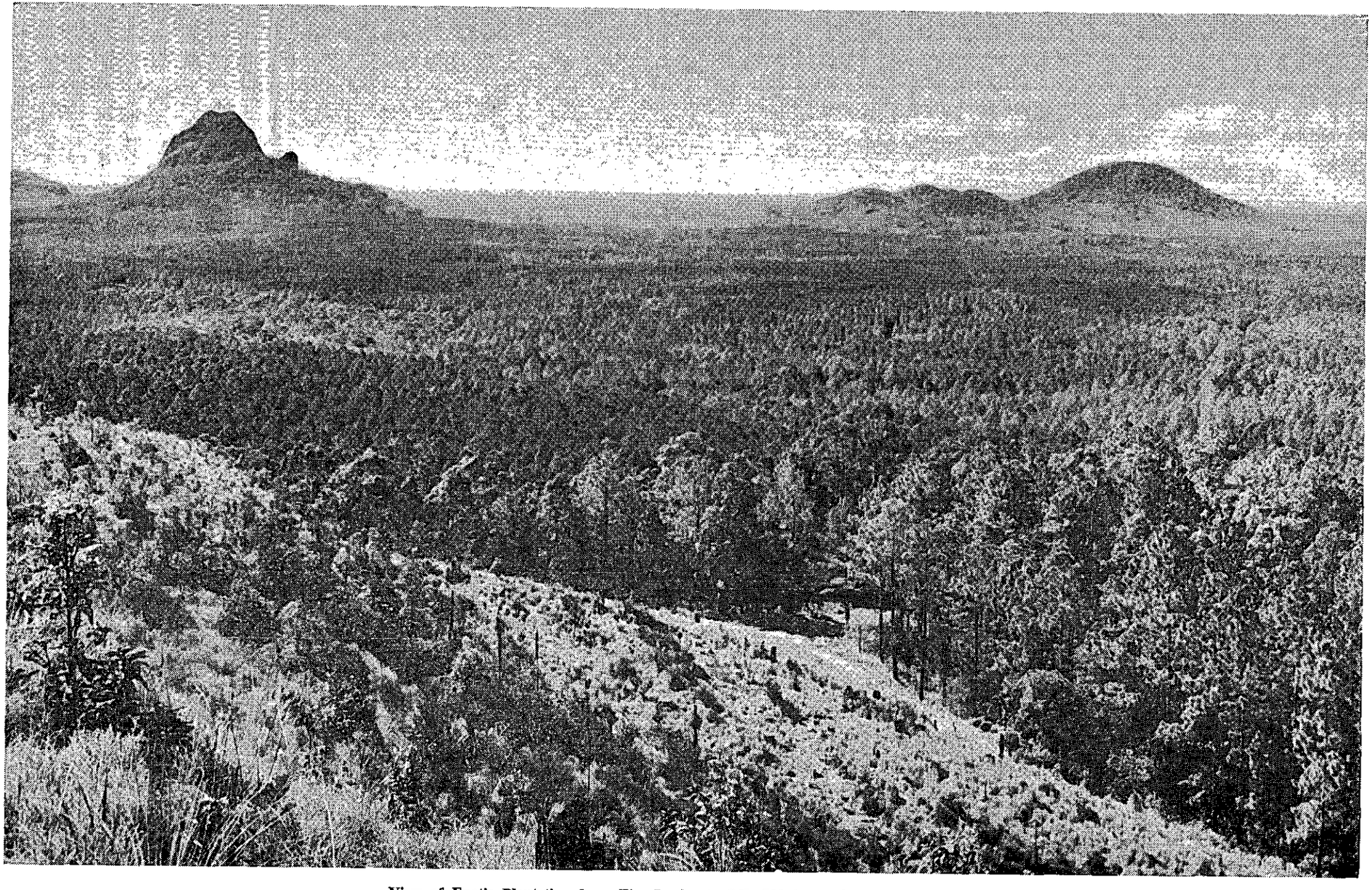


View of Exotic Plantation from Fire Lookout—S.F. 589 Beerwah—Brisbane District.

REPORT OF THE CONSERVATOR OF FORESTS

For the Year ended 30th June, 1974

TO THE HONOURABLE THE MINISTER FOR LANDS AND FORESTRY

INTRODUCTION

The year under review has been one of mixed fortunes; it commenced with conditions that ensured the success of the major winter planting and made the fire season one of the mildest on record; industry was enjoying continuing and unprecedented buoyancy and was confidently planning for the future; the first set-back came with the extensive flood rains which disrupted logging throughout the State and caused serious damage to roads and to property; next the escalation of the rate of inflation caused sharp increases in costs; finally the impact of credit restrictions in building could quickly extend to the timber industry and delay important developments.

Once again in the field of reforestation the emphasis has been on the establishment of softwood plantations though necessary steps have been taken to reduce the annual programme to bring it into line with that approved under the Softwood Agreements Act which has just completed its eighth year of operation. With last year's 12,649 acres the total area of softwood plantings rose to 218,788 acres of which 94,314 acres or 43 per cent. has been planted during the currency of that Act. It has been calculated that an area of 400,000 acres of effective softwood plantations is needed for Queensland to achieve self sufficiency and it has been the aim of the Department to reach this target by the end of the century. In its plantations, Queensland has built up a very valuable estate such that within the next decade there will stand in these man-made forests a volume of softwoods equal to that of natural Hoop, Kauri and Bunya Pine milled to date in Queensland. More and more these plantations are contributing to the timber economy of the State. Last years cut from this source was a record 62,277,654 superficial feet which represents some 33 per cent. of the total cut of mill and pulp logs from State Forests, though the area of plantation of productive age would be only 1 per cent. of the total area of State Forest.

The policy of establishing plantations of softwoods has recently come under criticism from some conservation bodies but the following facts should be realized. Softwoods are the major needs in the timber economy and the natural supplies, never substantial by world standards, are now almost exhausted. It is by establishment of plantations only that softwoods can be grown efficiently and self sufficiency attained. Softwood production should therefore be regarded in the same way as any agricultural crop necessary to man's needs in a modern community. It may help to keep matters in correct perspective to compare the area proposed for plantations with that for other essential crops. The area cleared for sugar currently exceeds 750,000 acres and that for wheat 1,250,000 acres. If the planting programme can be sustained at near its present level the area of softwood plantations will be 400,000 acres by the end of the century. This is less than 4 per cent. of the present area of State Forests and National Parks which has been increasing at the rate of about 250,000 acres per year. In implementing the planting programme the sharp rise in costs associated with employment of labour has made it necessary to rely to a greater extent on the use of mechanical equipment in an effort to hold costs at an acceptable level. This has led to the mechanisation of the main exotic nurseries at Toolara and Beerburrum, the increased use of planting machines with Slash Pine and extended use of contract work in site and firebreak preparation. At the same time power saws are being used in ground pruning.

With Hoop Pine, encouraging results have been obtained from the use of a planting machine adapted to handle tubed stock, from machine planting in May of open root stock after root pruning and dipping in a clay slurry and from mechanical tending. This could prove to be a major breakthrough with this native species which produces one of the world's finest softwoods but has always suffered from high costs in nursery, in planting and in tending. Results are also promising for the successful use of open root stock of Caribbean Pine.

The past year saw a further increase in the area of native forest afforded silvicultural treatment aimed at improving the production of mill logs from these forests. The area covered was 33,780 acres as against 32,743 acres in the previous year. The increase was brought about by the use of chain saws for the removal of unwanted stems in the treatment of Cypress Pine. The practice of holders of grazing leases over areas of State Forest carrying out treatment following tree marking by Departmental Officers has extended and is attracting the interest of a growing number of lessees particularly in the Monto and Maryborough Districts. Funds for Aboriginal advancement made available to the Department by the Commonwealth were utilised in the employment of extra Aborigines in treatment work on State Forests in the Atherton, Maryborough and Rockhampton sub-districts.

The year has been one of continuing buoyant conditions for the timber industry and this has been reflected in the premiums paid at auctions of plantation timbers involving continuing supplies and by the number of new projects recently completed or in progress. Chief of these are new softwood mills to operate plantation timber at Passchendaele, Melawondi, Maryborough and Builyan, modern hardwood mills at Builyan and Cooroy resulting from amalgamations whilst major groundworks are being carried out at Monkland for the second particle-board factory as provided in the agreement with Woodlands Pty. Ltd.

With the change to metrication and the demand it has placed on the clerical resources of the industry and on its field staff at a time of sharp increases in wages there has arisen a keen awareness of the need for simplification of procedures in the measuring and pricing of crown timbers. For some time now the Department has recognised this need and has been endeavouring to modify procedures in a number of ways. These have included the introduction of area pricing to sales of plantation timbers, adoption of overbark measurements with Cypress Pine and its extended use in North Queensland and the reduction in the number of pricing groups in North Queensland. In pursuance of this policy action has commenced to extend area pricing to Cypress Pine a species which by reason of its size range and the topography of the sites on which it occurs lends itself to this system of stumpage determination. At the same time with the co-operation of the Department of Railways over bark measurement and simplified methods of making allowances for defect are being tested in respect to hardwood log supplies from the Injune area. It is hoped to demonstrate its efficiency in this area and gradually extend the principle to other centres. In the first instance it is necessary to have a sample of adequate size to give reliable figures for average defect by areas and by species. The computerisation of harvesting and marketing accounts permits the data to be assembled at little additional cost and this could well be one of the important benefits to flow from the use of the computer in this field. In its first year of operation the computer has handled the hardwoods and rain forest species of six districts and met all that was expected of it. Its scope has now been extended to include Cypress Pine and to cover two additional districts. It is hoped to take in plantation timbers by January, 1975, and this will leave only the two northern districts, Mackay and Atherton to be introduced to the system.

With the major developments that have taken place in Gladstone, in mining centres and in the Gold and Sunshine Coasts new and important markets for timber have opened which make it necessary that the system of Keymarkets and Depots on which stumpage evaluation really depends should be reviewed and relationships between areas readjusted. To permit this to be done the Department has undertaken with the co-operation of Industry a survey of markets in which millers from different areas are disposing of their products. Full data are not yet available but preliminary examination of what has been assembled confirms the fact that a review is needed.

The past year has been marked by a significant increase in the number of freeholding applications referred to the Resources Branch for the determination of timber values. Despite this the Department has been able to keep pace with the work and during the year has reduced by about 500,000 acres the area still to be valued. In this field it is hoped that the new legislation making provision for Forest Entitlement Areas will greatly reduce the delays that have occurred when areas sought for conversion included forest of quality that justified its retention for timber production. Action in this regard has resulted in the reservation of more than 1½ million acres as State Forest. Not only is this of great importance as a source of timber supply but it has great significance in the preservation of environmental factors and wild life habitats. Such reservation will still be sought where forest areas are large and located so that they can be brought under management in due course but this will now be complemented by the provision for Forest Entitlement Areas which will apply to areas of lesser extent or isolated from existing or potential State Forest where forest management by the State is not practicable. Scope is now provided for involving the landholder in the management of these Entitlement Areas on the basis of his sharing in the returns and for both State and Landholder to benefit from its implementation and there is a real challenge to the Department to see that it works this way.

In respect to National Parks steady progress has been made in both areas reserved and in staff expansion. During the year the first two Marine National Parks were declared one at Green Island the other at Heron Island and two Marine Biologists were appointed to assist in the preparation and implementation of management plans for the parks. One of these has been stationed on Heron Island. Including these the area of National Parks increased by some 192,000 acres and now stands at 2,768,000 acres. A major purchase for addition to the National Park estate was that of Egg Rock for an expenditure of $40,000. The survey of the Cape York Peninsula to locate representative areas for reservation as National Parks has been continued and arrangements have been made for the work to be expedited by the use of an Army helicopter under favourable conditions this spring. The Commonwealth is providing the helicopter service which will operate from Weipa and assist a number of Departments both Commonwealth and State to gain an improved knowledge of the region. From this Department in addition to the National Parks survey, officers from Forest Resources Branch will make an assessment of the timber resources of a substantial area around Shellbourne Bay.

It is pleasing to note that important new reservations involving 41,254 acres at Cape Melville constitute the first National Parks declared in the Cape York Peninsula. In all the Department has under consideration Park proposals that cover in total more than 1 million acres and many of these are under reference to other Departments as required under the Forestry Act. Trained staff in the National Parks Branch consists of 15 University graduates and these have the assistance of Forestry graduates and field staff in the management of the Parks. In connection with the preparation of documents for consideration of the Grants Commission it was calculated that the value of this and other assistance afforded by the Forestry Department was in excess of $120,000 for the year 1972–73 and this would be considerably greater for the year under review. The public use and appreciation of the Parks continues to increase and in this regard the provision of recreation facilities on areas of State Forest is helping to meet the needs of the people. The area at Bunyaville to the north west of Brisbane has proved singularly successful and over Easter attracted over 2,000 visitors. Encouraged by this action is in hand to establish a similar picnic area at Daisy Hill on the Redlands State Forest. Such areas have now been set up in all the Forestry Districts and others are planned.

Steady improvement has also occurred in respect to accommodation for the Department's staff. Within recent years new offices have been built at Toolara and Yarraman. During the year the National Parks building at Salisbury was extended and, at present, work is in progress on an office at Imbil which will replace the original building after some 60 years of service. Plans are in hand for a similar office at Cardwell whilst on a major scale it is expected that in the coming year there will be a start on the new Forest Products Research Building at Salisbury and perhaps on the Training Centre at Gympie.

In conclusion since this will be my last report as Conservator of Forests there are a number of acknowledgements that I would like to make. Firstly I would like to express my sincere gratitude to those members of the staff who have accorded wholehearted loyalty and service over the years. The assistance and co-operation of officers from associated Departments has made the way easier and is fully appreciated. Finally during my term of office the representatives of the Timber Industry have been most helpful and co-operative with the result that relationships between the Department and Industry have continued to improve and it has been possible to introduce changes in a spirit of mutual trust.

Official Naming Ceremony of Tenison Woods Mountain, D'Aguilar Range on State Forest 809, Samsonvale, by the Honourable W. A. R. Rae, M.L.A., Minister for Lands and Forestry, on 9th June, 1974.

MANAGEMENT

General

The area of State Forest as at 30th June, 1974, was 8,063,091 acres a net increase of 196,966 acres.

Expenditure

Expenditure under the Reforestation Vote was $8,415,499 compared with $6,968,811 in 1972–73. Expenditure from Trust Funds on projects associated with the Reforestation Vote was $224,461.

Expenditure is itemised as follows:—

Item	Expenditure	Percentage of Total
Direct Expenditure of Projects—	$	
Plantations	1,938,134	22·4
Natural Regeneration	330,481	3·8
Nursery Expenses	264,929	3·1
Research	292,200	3·4
Protection	754,830	8·7
Surveys	89,251	1·0
New Construction	173,739	2·0
Seed Collection	64,502	0·8
Maintenance of Capital Improvements	201,059	2·3
Total Direct Expenditure	$4,109,125	47·5
Indirect Expenditure—		
Wet Time, Holidays and Leave	1,579,964	18·3
Supervision, Tools, Cartage, &c.	1,832,945	21·2
Camp Allowance	342,034	4·0
Pay Roll Tax	268,814	3·1
Workers' Compensation	67,241	0·8
Administration	270,062	3·1
Miscellaneous	169,775	2·0
Total Indirect Expenditure	$4,530,835	52·5
Total Expenditure	$8,639,960	100·0

(Total Expenditure includes $274,504 received on account of Aboriginal Advancement Fund, Commonwealth Unemployment Relief, and Flood Submergence Claim.)

Timber Assessment

During the year plantation remeasures were concentrated in the Department's Hoop Pine plantations where plots sampling 5,000 acres were remeasured and new plots were established to sample 4,000 acres of younger plantations which were mapped for site index.

Remeasurements of established plots in three of the major coastal hardwood State Forests were undertaken with supplementary strip sampling. An area of 100,000 acres was covered.

The major resources investigation work occurred on other Crown lands where a total of 400,000 acres was stripped. Of this total roughly half was Cypress Pine and half hardwood forest.

Aerial reconnaissance was continued during the year in the Cypress Pine region and some 230,000 acres were flown in this assessment.

All the Department's assessment data is computerised to provide details of timber areas, volumes, valuations and yield. These programmes are continually under revision to increase the range of information which can be made available for management or industrial purposes.

Valuation of Timber for Conversion of Tenure

This year there has been an increase in the number of applications for conversion due possibly to the return to good seasons. Despite this increase the dealings with applications has continued to improve and only 7 per cent. of all applications received now remain to be valued.

A large proportion of these carry good quality forests which warrant reservation for permanent timber production, and negotiations towards acquisition are in hand.

The major feature of the year with regard to freeholding applications was the introduction of legislation to amend both the Lands Act and Forestry Act to provide for the creation of Forest Entitlement Areas. While not conflicting with the process by which State Forests can be acquired from grazing selections the new amendments provide for those lesser areas of good quality forests being retained for long term timber production under the control of the Crown even though the whole selection becomes freehold tenure. There is also provision for the lessee and the Conservator of Forests to enter into an agreement for the protection, treatment, and management of the forest area and for the lessee to obtain a share in the proceeds from the sales of forest product. Worthwhile benefits are expected to the Crown in obtaining protection, treatment and improved growth of small isolated forest areas, to the lessee by improvement of grazing and a sharing in proceeds, and to the sawmilling industry in ensuring future supplies.

COMPARATIVE POSITION RE FREEHOLDING APPLICATIONS AT THE END OF JUNE 1972, 1973 AND 1974

	As at 30th June, 1972		As at 30th June, 1973		As at 30th June, 1974	
	No.	Area	No.	Area	No.	Area
		Acres		Acres		Acres
Total applications made	3,048	24,696,000	3,167	25,394,000	3,312	26,417,000
Withdrawn	32	270,000	32	242,000	33	237,000
Total requiring valuation	3,016	24,426,000	3,135	25,152,000	3,279	26,180,000
Valuation complete—						
(a) Determined by Court	2,525	19,882,000	2,668	20,862,000	2,768	21,703,000
(b) awaiting determination	241	1,617,000	207	1,532,000	277	2,234,000
Field assessment complete—Not yet valued	168	2,059,000	191	2,284,000	91	1,154,000
Awaiting Field assessment	82	868,000	69	474,000	143	1,089,000
Totals	3,016	24,426,000	3,135	25,152,000	3,279	26,180,000

Employment Wages Staff

	Average 1973–74	As at 1–7–73	As at 30–6–74
Reforestation	1,365	1,459	1,393
Harvesting and Marketing	170	172	172
National Parks	75	81	78
Road Construction and Maintenance	64	79	54
Maintenance of Plant	63	65	65
Totals	1,737	1,856	1,762

Protection

SEASONAL CHARACTERISTICS. Heavy rainfalls in July with very mild winter conditions resulted in forest grasses remaining green through the winter in most areas. Good spring and summer rains also contributed to a very mild fire season. The wet winter restricted the amount of aerial burning done.

FIRE INCIDENCE. Forty-seven fires were attended by Departmental employees as against 225 in 1972–73. The number of fires was the lowest since 1961–62. Only four fires were in excess of 1,000 acres and all these involved large tracts of private property or unprotected State Forest, under mild conditions in March. Police Officers assisted in the investigation of three fires for breaches of the Rural Fires Act. One successful prosecution resulted in a fine of $25. One demand met for costs of fire-fighting resulted in $79.32 being recovered. Two letters of warning were issued and five letters of appreciation were sent to persons reporting or assisting to combat fire outbreaks.

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

Month	Number of Fires	Size of Fires in Acres			
		0–10	11–100	101–1,000	1,001–10,000
July	2	1	..	1	..
August	2	2	..	..	..
September	8	4	3	1	..
October	11	6	3	2	..
November	9	5	2	2	..
December	5	2	3	..	..
January	1	1	..	..	..
February	2	1	..	1	..
March	5	..	..	1	4
April	1	..	1	..	..
May	1	1	..	..	..
June	..	..	..	..	..
Totals	47	23	12	8	4

Three of the 47 fires were in softwood plantations. Locations and acreages were Kennedy (1·5), Beerburrum (0·01), and Bowenia (0·5). One started from a lightning strike, one from incendiarism whilst the cause of the other is unknown.

The following table shows fire occurrence by Districts and by degree of protection afforded the areas burnt—

District	Number of Fires	Area (Acres) Burnt by Protection Classes			
		*Intensive	†Extensive	Non-Protected	Total
Atherton	3	2	300	5	307
Brisbane	10	8	155	..	163
Gympie	8	32	690	..	722
Dalby	7	1	3,745	8	3,754
Mackay	4	1	230	100	331
Maryborough	3	530	..	..	530
Monto	1	..	..	1,750	1,750
Murgon	1	3	..	..	3
Warwick	9	71	3,171	..	3,242
Yarraman	1	3	..	..	3
Total	47	651	8,291	1,863	10,805

* Intensive implies land covered by a detection system where fire suppression will normally commence within two hours of report to local headquarters.

† Extensive denotes areas not covered by a detection system, or where more than 2 hours will elapse between report and attack.

Major known causes of fire outbreaks by percentages were:—

Unauthorised burning off	14·9
Government, Semi-Government Authorities and bush workers	12·8
Escapes from permit fires	2·1
Re-lights of old fires	nil
Lightning	10·6
Camp and billy fire escapes	8·5
Incendiarists	4·3
All other known causes	2·1
Unknown causes	44·7
Total	100·0

Communications

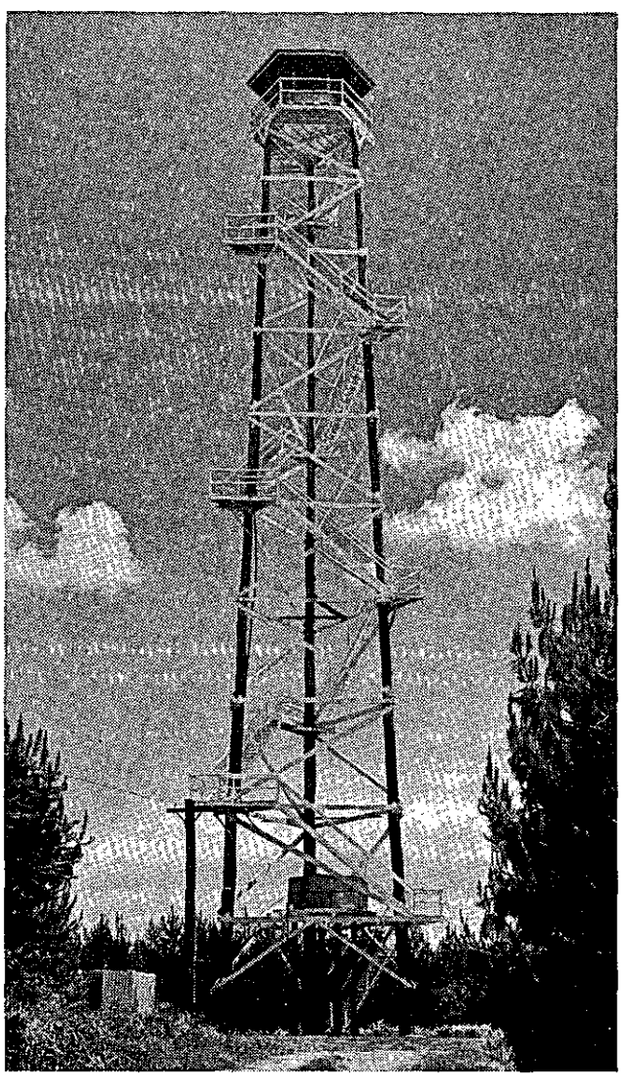
The extensions to the Communications Centre at Bunyaville near Brisbane are in progress. Installation of telecommunication equipment has been proceeding and most items previously purchased are in use. The completion of V.H.F. installations in the State will be effected with the supply of 31 of these units now on order.

Mobile and base installations for H.F. S.S.B. units are proceeding throughout Central Queensland in the Injune, Roma, Emerald, Baralaba, Duaringa, Augathella areas and Carnarvon National Park.

Feasibility studies are in hand directed towards the establishment of a H.F. point to point network throughout the State for fire weather broadcasts.

Two additional main bases operating through remote 100 ft. masts located at elevated sites on adjoining State Forests were installed at Gympie and Maryborough and similar installations are planned for Rockhampton, Ingham and Dalby. Several other minor bases were completed or substantially rebuilt.

Five more V.H.F. portable sets were purchased for use in firetower/base communication in lieu of telephone lines and in aerial ignition or other field work and the aircraft chartered for aerial ignition work was equipped with radio for co-ordination of ground and air activities.



Fire Tower at Pechey, Yarraman District.

Equipment in use comprises 455 V.H.F. mobile units, 21 H.F. S.S.B. 100 W units, 83 V.H.F. portables, 10 U.H.F. links, 39 consoles and 63 bases.

Arrangements are in hand to secure the allocation of two more V.H.F. channels. Frequencies sought are 76.715 and 76.745 MHz which are intermediate to the three currently in use by the Department.

Detection

An 80-foot tower was completed at Western Creek in the Dalby District. Because of the mild fire conditions, no use was made of aircraft for fire spotting.

Equipment

One new fire tanker was stationed at Toolara and the old unit transferred to Bowenia. Ten mop-up pumps were purchased for use with 100 gallon tanks on light vehicles. A large motor driven edge lighter was constructed for use on boundary lighting of aerial ignition blocks. A frame and extra capsule cabinet was constructed for use with the priming machine in aircraft for aerial burning.

Fire Research

Further experimental burning was carried out in exotic pine plantations during the autumn and winter period of 1974 and the research staff participated in the prescribed burning of a number of areas.

A successful demonstration of the techniques used in these burns was conducted at a field day at Toolara in April, which was attended by Departmental Officers from all exotic pines plantation centres.

Further experimental fires have been documented and a prescribed burning guide prepared from the information so obtained. The guide was used for all burning work during the year, and with minor modification arising from the 1974 burns, should suffice for future routine burning operations.

A system of fuel typing based on understorey composition and exposure has been developed, and fuel maps are prepared by typestripping at five chain strip intervals. These are used in conjunction with site index maps to develop a burning prescription for each compartment to minimise the crown scorch on the block. Areas which will require preliminary edge burning immediately following rain are also defined by the fuel map, as are those areas which are difficult to burn and which may require a follow-up operation.

Prescribed burning was carried out on an operational basis with the following management objectives:—

(1) Protection of small isolated areas of plantation which may be outside the normal detection system of a manned forest station, and where unit cost per acre of protection is high because of isolation.

(2) Hazard reduction in high risk areas e.g. along main roads, railways or access routes to fishing spots or other areas used for recreation by the general public.

(3) Reduction in tending costs, particularly in areas subject to infestation by lantana.

(4) To facilitate clearing and burning of included swamps.

(5) To establish a system of burnt buffer strips throughout the larger plantation areas, supplementing the existing protection system.

(6) To strengthen the external firebreak system in those sections where maintenance is difficult or expensive due to the existence of swamps or steep, rocky terrain.

Areas so burnt included—

(1) 1,035 acres of Slash Pine at Toolara to provide a buffer strip one compartment wide linking the main Tin Can Bay Road to the external break east of Elliot Logging Area.

(2) 95 acres of Slash Pine constituting an area of high fire risk in Tuan East Logging Area on State Forest 915 Poona.

(3) 90 acres of Slash Pine and 40 acres of Honduras Caribbean Pine at Byfield primarily to control lantana development in this area.

All burns were highly successful and the amount of scorch recorded was negligible.

In November 1971 a fire swept over part of an initial espacement trial aged 2 years 8 months at Byfield with flame height to 8 feet. Although this meant the loss of two of the four replications the experiment has been remeasured *in toto* to observe the rate and extent of recovery following the wild fire. The exent of damage and subsequent height growth are tabulated:—

Recovery of Honduras Caribbean Pine following wild fire in a stand aged 2 years 8 months:—

Damage Classification	No. Stems	% Mortality		Mean Ht. (ft) before fire	Mean Ht. CAI (ft) of survivors	
		First 8 Months	Next 12 Months	8/71	71/72	72/73
Crowns seriously burnt	266	20·3	0	9·5	3·1	5·0
Crowns partly burnt ..	558	1·6	0·2	9·5	4·1	5·1
Base burnt only	180	1·1	0	9·1	5·0	6·1
Not burnt ..	1,097	0·8	0·2	8·5	7·1	7·5

The first remeasure was eight months after the fire by which time mortality had stabilized. Loss in growth is related to extent of damage initially sustained and the effects were still shown in the 1972–73 increments.

General

Expenditure on fire fighting, patrol and detection was $77,902 compared with $182,703 in the 1972–73 year. Direct suppression costs were $5,136 ($37,912).* Prescribed burning to reduce forest fuel levels prior to the fire season cost $24,804 ($22,993). The area covered by prescribed burning was 269,965 acres (301,311 acres) including 141,114 acres burnt through aerial ignition 127,654 acres hand burnt and 1,197 acres in exotic pine plantation. Burning of logging debris in hardwood forests cost $2,609 ($2,654) over an area of 5,882 acres (10,461 acres).

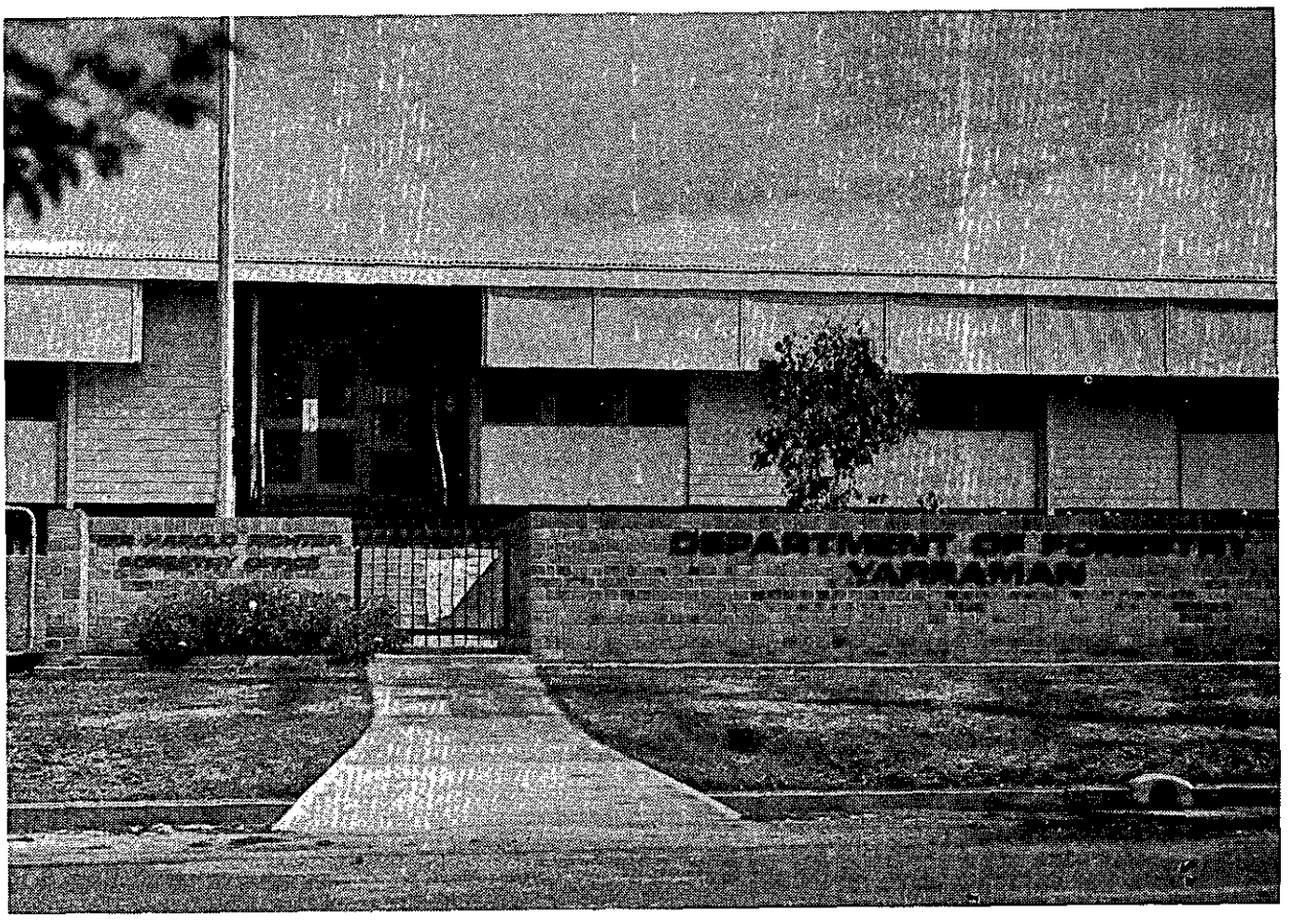
Co-operative burning with neighbours cost $14,770 ($20,897). New fire breaks and roads charged to protection costs $186,306 ($252,757) and maintenance of existing protection roads and fire breaks cost $352,571 ($330,631). Some contract break maintenance by ploughing was carried out in the Beerburrum and Toolara Slash Pine areas.

Industrial Safety

The accident frequency rate for the year was 121.0 compared with 134.0 for 1972–73.

During the year two officers qualified as job safety trainers. Ten Departmental safety courses were conducted with a total attendance of 65 supervisory staff. A number of safety committees was active during the year.

* Figures in brackets apply to previous year (1972–73).



The "Sir Harold Richter Forestry Office", Yarraman. Sir Harold played a prominent part as foundation member of the Australian Forestry Council in negotiations leading to the Commonwealth Softwoods Agreements Act.

MECHANICAL EQUIPMENT

The prolonged wet weather during the year affected the usage rate of the Department's heavy equipment, with a reduction in hire credits.

Serious delays are being experienced in the delivery of trucks, tractors, etc., and no immediate improvement seems likely. Orders were placed during the year for 37 replacement trucks, 6 crawler dozers, 1 power grader and 14 rubber-tyred tractors, but none of these units had been supplied by the end of the period. This has entailed continued use of machines scheduled for replacement and contributed to a substantial rise in cost of repairs.

There has also been a serious shortage of spare parts which has been met to some extent by reclaiming procedures, although generally at cost increase.

Fortunately there was a low turnover of mechanical tradesmen. It is thought that the incremental pay scheme introduced in the previous year has helped with this, and there has certainly been an improvement in workshop output.

Advantage was taken of the offer by various tractor and vehicle suppliers to conduct service schools on equipment in use, and this allowed selected mechanics from various centres to be brought up to date on quipment development.

An assistant to the Mechanical Equipment Officer was appointed during the year and it is expected that his knowledge and experience will be particularly valuable in the adaptation of available equipment and the development of new equipment to meet present day requirements in plantation establishment and maintenance.

Purchase of Plant

Major items of Plant purchased during the year were:—

68 replacement motor vehicles
1 light bus

Census of major plant as at 30th June, 1974:—

475 Motor vehicles and trucks
59 Crawler tractors
63 Rubber-tyred tractors
30 Power-graders

Maintenance of Plant

Main items for the years 1972/73 and 1973/74 were:—

	1972–73	1973–74	Difference
	$	$	$
Fuel	168,587	160,893	−7,694
Oils	16,227	15,430	−797
Tyres and Tubes ..	30,167	34,210	+4,043
Repairs	531,924	661,952	+130,028
Registration and Insurance ..	51,113	37,087	−14,026

ACQUISITION OF LAND

During 1973–74 an amount of $15,984·84 was expended on the acquisition of land for Forestry purposes as follows:—

	$
Purchase of Land	1,250–00
Survey Fees	14,399–75
Real Property and Lands Department Charges	279–20
Miscellaneous	55–89
	15,984–84

The expenditure of $1,250 represents the purchase of a parcel of land with a total area of 33·3 acres which will be added to an existing State Forest.

Survey fees relate principally to areas of State Forest obtained in the course of freeholding actions or from assessment surveys on Crown holdings.

FOREST SURVEYS

Twenty-two survey parties operated during the year. Personnel consisted of:—

Forest Surveyor	1
Foresters	6
Survey Rangers	12
Survey Assistant	1
Survey Overseers	16
Estimators	5
Chainmen	18
Labourers	23
Cooks	7

Work and type of survey conducted were—

Parties	Type of Survey	Details of Work Done
1	Boundary Definition (Authorised Surveyor)	8 Miles (Survey)
3	Theodolite Control (Basis of other Surveys)	48 miles (Survey)
10	Management (Reforestation and Native Forest)	1,318 miles (Traverses)
8	Forestry Inventory and Timber Assessment (For Management or Freehold actions)	2,679 miles (Strip lines)

These parties also performed 51 miles of Road Gradient survey and 95 miles of level surveys mainly for drainage schemes in Slash Pine plantations.

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

—	Number	Acres	Hectares
Forest Inventory Survey Plots re-measured	1,103	..	..
Forest Inventory Survey Plots established	82	..	..
Predominant Height Determination	..	3,138	1,270
Plantation Site Index Assessment ..	..	1,874	758
Design and Field Location of Aerial Spraying Contracts	..	690	279
Totals	1,185	5,702	2,307

This programme was achieved despite the serious interruptions of the prolonged wet season and in the circumstances is most satisfactory.

Survey Training

Three Survey Training Courses, each of two weeks' duration were conducted by the Forest Surveyor at Beerburrum. These courses catered for six Foresters, five Adult Forest Trainees and twenty-two Forest Trainees. The Trainees also received three months practical experience in various Survey Camps.

Mapping

The Drafting Branch comprises 46 officers of whom four are engaged in mapping and drafting supervision, and one in the supervision of Surveys and Survey training. Twenty-five are engaged on cartographic compilations, preparing survey data, calculating contract areas for scrub falling and aerial photograph interpretation. Two are engaged in theodolite and level surveys. One officer is engaged operating a lettering and composing machine, two in duplication and photocopying and twelve carry out administration mapping and drafting duties.

AUTOMATIC DATA PROCESSING

All Stumpage Accounts for natural-grown mill logs measured in eight of the ten Forestry Districts are now being processed by computer in metric measurements.

An approved system to process Stumpage Accounts for plantation timbers is at present being implemented.

REFORESTATION

General

Features of the year that affected work on reforestation were:—

(1) The extended wet season over the whole of the commercial forests of the State.
(2) Sharp increases in costs particularly in labour intensive activities.
(3) Labour shortages in some country centres.

Despite these it has been possible to achieve the establishment of the programmed area of new plantations and a small increase in the area of native forests afforded silvicultural treatment.

Total expenditure in 1973–74 on reforestation works was $8,415,497 about $660,521 more than in 1972–73. The expenditure in 1973–74 included not only State Loan Funds but also funds provided under Unemployment Relief, Aboriginal Advancement and Flood Submergence and advances under the Commonwealth Softwood Agreement Act. The area of native forest treated was 33,780 acres compared with 32,743 acres in 1972–73. The planting programme was reduced and 12,649 acres was established compared with the record 16,765 acres in 1972–73. The principal reduction was with Slash Pine which dropped from 11,098 acres to 7,988 acres.

Labour difficulties were experienced throughout the year particularly in the more remote Hoop Pine centres. Turnover of labour was high despite the provision of incremental pay comprising an extra $6 a week after one year's service rising to $8 and $10 after two and three years. This has meant that the Department has had to rely largely on the loyal services of its long serving employees without whom the Department's performance would be seriously affected.

Field employees receive a disability allowance of $4·50 to compensate for conditions under which much of the work has to be performed but it is becoming increasingly difficult to enlist the younger generation to the service particularly in the remote Hoop Pine centres. This, together with the increased labour costs has made it necessary to extend the use of machines wherever possible. The exotics lend themselves more to mechanisation than does Hoop Pine or the treatment of the native forests. In the case of Hoop Pine efforts are being made to introduce machine planting on suitable slopes where mechanical tending would also be possible. With Cypress Pine the use of small power saws for removal of unwanted

stems has held the cost of treatment and allowed 24,127 acres to be treated as against 21,982 acres in the previous year. Small power saws are also being used for ground pruning in plantations with considerable saving in cost per acre. Power misters have been used on a large scale to control lantana regeneration in Hoop Pine plantations. The use of machines also effects an important saving by reducing the overhead component of the work.

Good rains throughout the year seriously interfered with site preparation of areas for new plantations. Rain forest areas being converted to Hoop Pine plantations are cleared in late winter and early spring. Where the area was cleared on a push and heap basis, few problems were encountered but in some Yarraman and Murgon areas it was not possible to effect broadcast burns on areas pushed only and this resulted in costly heaping by dozer to permit burning. Clearing and site preparation involving ploughing and mounding for exotic pine plantations in the flat, generally poorly drained soils of the coastal plain were also seriously hampered and preparation of areas for the 1974 winter planting was months behind schedule.

The favourable growing conditions promoted regrowth of weeds in both new and old Hoop Pine plantations, particularly lantana and together with the shortage of labour led to difficulties in the correct timing of tending operations. Control of lantana in plantations is a real economic problem in Hoop Pine plantations where prescribed burning is impossible. Biological control provides the only hope and this is still a long way off. Investigations by Entomologists from the Queensland Lands Department and C.S.I.R.O. in Central and South America to locate lantana parasites suitable for introduction into Australia are proceeding and one or two introductions are showing promise. Hoop Pine plantations established on cleared rain forest with a humus enriched soil are an ideal habitat for lantana. It infests the young plantations to canopy closure, persists under canopy and when canopy is broken by thinning it reinfests the area in large numbers. In the exotic plantations and native forests of the coastal belt complete protection from fire induces rapid changes in the ecological succession associated with the strong development of lantana to problem proportions. Prescribed burning in the Eucalypt forests has brought the lantana under control and similar results have been obtained where such burning has been carried out in Slash Pine plantations. It is therefore proposed to extend the use of prescribed burning in plantations of Slash and Caribbean Pines as a means of effecting economic control of lantana and groundsel.

During the year six cyclones caused damage to young plantations of Caribbean Pine in North Queensland and of Slash Pine in South-east Queensland. Straightening of stems in plantations up to 3 years old was necessary over about 3,000 acres.

RAINFALL IN POINTS—SOME PLANTATION CENTRES

Year	Hoop Pine Centres			Exotic Pine Centres			
	Yarraman	Imbil	Kalpowar	Beerwah	Tuan	Bowenia	Kennedy
1973–74	5,249	9,854	5,399	12,513	8,520	11,827	13,784
Average	3,210	4,704	3,539	6,320	5,264	6,591	6,554

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

Month	Yarraman		Tuan		Kennedy	
	Hoop Pine Centre Summer planting		Slash Pine Centre Winter planting		Caribbean Pine Centre Summer planting	
	Points	Average	Points	Average	Points	Average
July 1973 ..	950	155	2,049	232	95	97
August ..	255	125	145	190	121	131
September	249	129	243	172	331	50
October ..	393	293	353	346	537	245
November	373	316	399	388	824	216
December	390	424	1,123	598	2,212	657
January 1974 ..	1,816	421	1,983	795	2,913	1,039
February	74	456	481	872	3,239	1,557
March ..	354	349	950	747	2,412	1,570
April, ..	79	213	188	325	505	463
May ..	206	174	519	298	553	264
June ..	110	155	87	301	42	265
	5,249	3,210	8,520	5,264	13,784	6,554

The excellent rains provided good planting conditions for Hoop Pine and the Exotics. Survivals in general were high with little refilling necessary except in some Slash Pine areas at Beerburrum where losses occurred from a field incidence of *Phytophthora*.

REFORESTATION EXPENDITURE

Year	Loan Funds	Commonwealth Unemployment Relief	Aboriginal Advancement	Flood Submergence	Total
	$	$	$	$	$
1972–73	6,968,811	786,165	..	..	7,754,976
1973–74	8,140,993	145,438	59,038	70,028	8,415,497

Included in the loan funds are $1,021,806 in 1973–74 and $1,200,000 in 1972–73 received under the Commonwealth Softwoods Agreement Act. Salary payments to permanents are excluded.

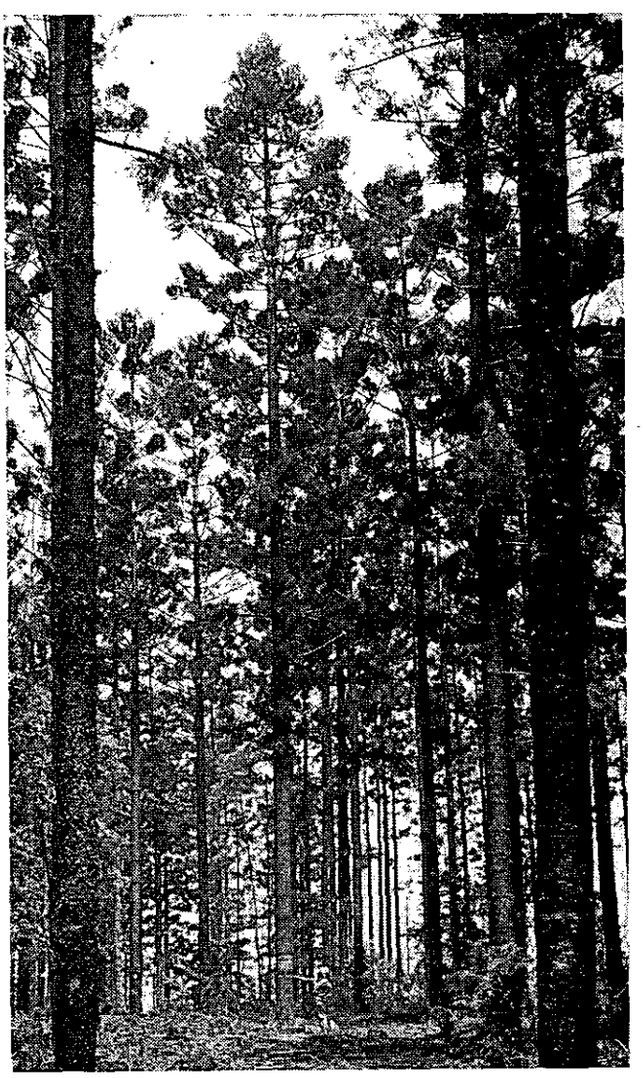
The average annual employment of wages staff with the 1973–74 funds was 1,365 against 1,469 in 1972–73. Cost per man-year increased by about 20 per cent. in 1973–74 from about $5,250 in 1972–73 to about $6,300 in 1973–74.

The main silvicultural operations carried out in the past 2 years were:—

Operations	1972–73	1973–74
	Acres	Acres
Area of plantations established	16,765	12,649
Area of plantations tended	102,974	81,285
Area of plantations fertilised	15,273	7,622
Area of plantations pruned	15,418	14,828
Area of plantations thinned unmerchantably	1,082	1,105
Area of plantations thinned merchantably	12,151	13,055
Area of natural forest treated	32,743	33,780

Planting—Open Plantations

The areas of plantations established between 1st April, 1973, and 31st March, 1974, are shown by districts and species in Appendix F and the net areas of effective plantations as at the 31st March, 1974, are shown by districts and species in Appendix G. The total area 223,988·9 acres includes 218,788·3 acres of conifers and 5,200·6 acres of broadleaf species.



Hoop Pine Stand—Compartment 1B Coolabunia—Age 48 years. Nanango, Yarraman District.

By species new plantings were:—

Species	1972–73	1973–74
	Acres	Acres
Native conifers (mainly Hoop Pine)	3,313·7	2,968·7
Slash Pine	11,098·6	7,988·6
Loblolly Pine	215·4	262·8
Caribbean Pine	1,871·8	1,119·9
Radiata Pine	205·3	249·7
Patula Pine	31·3	35·0
Others	29·0	24·3
Totals	16,765·1	12,649·0

The total plantings in 1973–74 comprised—

	Acres
New Plantations	12,649
Replanting failed areas ..	41
Replanting Burnt Areas ..	Nil
Underplanting	483
	13,173

Wet conditions impeded work on site preparation and, coupled with increasing costs, caused the surrender of contracts for some 4,800 acres of clearing in the exotic centres. As a result the summer planting of Caribbean Pine at Byfield and Cardwell was reduced and only a very small area of prepared land will be carried over to next winter's planting. This and the need for more intensive site preparation with exotics to avoid the use of 2,4,5–T. in tending and with Hoop Pine to permit machine planting will place great strain on the Department's equipment unless there is renewed interest from private contractors who normally have handled about half the area. Other site preparation done by the Department's plant covered complete ploughing of 6,308 acres, line mounding of 6,384 acres and 442 acres of deep ripping. Ploughing is carried out on all exotic areas of suitable slope and gives improved growth and reduces weed regrowth with saving in tending costs. Mounding is done on all poorly drained sites whilst deep ripping is applied to shallow soils with less than 18 inches to clay.

To facilitate the use of mechanical equipment spacings have been varied to allow 10 feet between the rows of Slash, Loblolly and Caribbean Pines where stock from orchard or improved seed is available.

Acreages planted at Tuan, Toolara and Beerburrum were:—

Centre	Area Planted in 1973–74	Area Planted to 31–3–74
	Acres	Acres
Beerburrum	1,757	29,996
Toolara	3,526	35,066
Tuan	3,037	34,723
Totals	8,320	99,785

Tending Conifer Plantations

The total area of plantations tended during the year decreased considerably from 102,974 acres in 1972–73 to 81,285 acres, though the total area of plantations increased by 12,649 acres to 223,988 acres.

Year	1970–71	1971–72	1972–73	1973–74
	Acres	Acres	Acres	Acres
Area covered in tending ..	83,725	94,825	102,974	81,285

Areas covered by Species were:—

Species	Total Area of Plantations to 31–3–73	Area tended 1972–73	Total Area of Plantations to 31–3–74	Area tended 1973–74
	Acres	Acres	Acres	Acres
Hoop Pine areas	84,035	66,667	87,231	58,904
Exotic Pine areas	121,472	36,307	131,556	22,381

The prolonged wet conditions was the main cause of the reduction in the tending in Hoop Pine where only 67 per cent. of the planted area was tended in 1973–74 compared with 79 per cent. in 1972–73. The reduction in area of exotic pine tended results from ploughing and from cessation of tending of regrowth in older stands. In this regard trials have shown that over the past four years there has been no significant loss of increment of Slash Pine or Honduras Caribbean Pine from retention of a moderately-dense understory once the plantations have closed canopy.

The percentage of the exotic area tended was only 17 per cent. in 1973–74 compared with 30 per cent, in 1972–73.

Fertilizing—Conifer Plantations

The area of new Pinus plantations fertilized during 1973–74 was 6,800 acres comprising mainly Slash Pine areas in South-east Queensland. Newly established plantations of Slash and Loblolly Pine are given a general dressing of 2·32 cwt. superphosphate (20·7 per cent. P) per acre immediately after planting. With Caribbean Pine in Central and North Queensland only poorly drained sites and those of site index less than 100 are fertilized.

A contract for aerial application to 5.107 acres fell through because the fertilizer available was unsuitable for the purpose by reason of the high proportion of fine dust which gave erratic distribution. The material was applied by tractor-drawn spreaders at a cost comparable with the contract price and the distribution was quite satisfactory. Hand application is much more costly but still is necessary on some wet and irregularly shaped areas.

It is expected that difficulties with supply of super-phosphate will delay the fertilizing of the 1974 planting.

Pruning

The acreages of plantations pruned in 1973–74 by species were as follows:—

Species	Stage of Pruning				Total
	1st	2nd	3rd	4th	
	Acres	Acres	Acres	Acres	Acres
Hoop Pine	1,698·4	1,603·1	964·3	963·1	5,228·9
Exotic Pines	4,763·2	2,520·1	2,316·2	Nil	9,599·5
Totals ..	6,461·6	4,123·2	3,280·5	963·1	14,828·4

All pruning is now done in three stages with a ground pruning to 8 feet and two lifts by ladder to 15 feet and 21 feet. The figure for the fourth stage will cease to be shown as it merely represents the completion of areas previously pruned on a four stage basis. Overall a total of 14,828 acres were given one stage of pruning in 1973–74 compared with 15,418 acres in 1972–73.

Lightweight chain saws introduced for ground pruning have been very satisfactory resulting in a considerable reduction in pruning costs in all stands but particularly with heavy limbed species like Radiata Pine and Patula Pine. A knapsack type saw with the motor in the back pack driving a chain saw through a flexible drive has been given trials on ground pruning and shows promise.

Thinning of Plantations

The area of plantations thinned merchantably in 1973–74 was 13,055 acres compared with 12,151 acres in 1972–73.

Thinnings were used as follows:—

Use	Million Super. Feet Hoppus		
		1972–73	1973–74
Sawlog	Hoop Pine ..	27·7	25·9
	Exotic Pines ..	12·6	16·6
		40·3	42·5
Other uses— Pulp, particle board, and hardboard	..	15·7	19·4
Totals	..	56·0	61·9

The cut of 61·9 million superficial feet was a record being an increase of 5·9 million superficial feet over the 1972–73 cut.

The area of plantations thinned to waste was 1,105 acres compared with 1,082 acres in 1972–73.

Treatment of Natural Forests

The total acreage of natural forest treated in 1973–74 was 33,780 acres compared with 32,743 acres in 1972–73. Particulars of acreage treated for the various forest types are:—

Forest Type	1972–73	1973–74
	Acres	Acres
Eucalypt Forest	10,562	9,338
Cypress Pine Forest	21,982	24,127
Rain Forest	199	315
Totals	32,743	33,780

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

Enrichment Planting

Blackbutt is used for enrichment planting in native forest treatment work in wet sclerophyll forests of South-east Queensland, whilst Maple and some Kauri Pine are used in enrichment planting of suitable logged-over rain forest types in North Queensland, poorly endowed with high quality primary species. A start was made in South Queensland in 1973–74 with enrichment planting of logged rain forest with Hoop and Bunya Pine.

No alterations were made to the treatment practices during the year but the Cypress Pine treemarking rules were altered to provide for a minimum spacing of 10 feet in thinning of the 24 in.–36 in. g.b.h. class.

The use of lightweight power saws in Cypress Pine treatment has enabled the cost of the work to be reduced and a greater area to be treated. 24,127 acres were treated compared with 21,982 acres in 1972–73. A valuable adjunct to the Department's treatment of native forests is the type of operation applied in forests providing pulpwood for the manufacture of hardboard and envisaged for application to any chip project that may develop. The procedure entails marking by a forest officer of stems to be retained followed by the removal of unmarked stems by the contractor. This improves the quality production of the forest leaving it in an excellent condition with the best stems having ample space for development. Forests so treated in the Gatton district have been inspected by representatives of the Australian Conservation Foundation without attracting adverse comment and the Department would welcome the opportunity to extend its application to all its hardwood forests. It has everything in its favour; it provides labour and is a source of revenue; it saves the cost of treatment and improves the forest; it utilizes inferior stems which would otherwise be destroyed in treatment; it has no adverse environmental effect. Another way in which the Department has contrived to extend the area of treated forest has been by co-operation with lessees who hold grazing leases on State Forests. Here also the stems for retention are marked by a forest officer and the lessee carries out the treatment work. In this way both forest productivity and grazing are improved. Over 1,000 acres were so treated during the year mainly in the Monto and Maryborough Districts.

Concern is felt regarding the spread of Moonlight Cactus on State Forest 154 Vignoles in the Millmerran District. Despite a continuing control programme implemented by the Department involving implantation of the Cactus with arsenic pentoxide pellets and foliar spray or mist application with 5 per cent. 2,4,5–TP70, recent surveys have shown that this pest now extends over 26,000 acres on State Forest 154 with further infestations on adjoining lands. The current control programme aims at treatment of about 4,000 acres annually. Over the past three years 13,000 acres have been treated at an average cost of about $4 per acre. Every effort is made to prevent flowering and fruiting. The cactus is a serious pest and efforts are being made to organise a concerted attack involving landholders and other interested parties without which the Department's efforts will be of little avail.

Nurseries

The number of nurseries operated during 1973–74 comprised—

Species	Number
Hoop Pine	10
Caribbean Pine	3
Slash Pine	2
Radiata and other Exotic Pines ..	2
Amenity	3

The Slash Pine nursery at Tuan closed during 1973 and the large mechanised nursery at Toolara supplies Slash Pine stock for both Tuan and Toolara.

The total number of plants including refills transferred to the Department's plantations during 1973–74 was about 8 million.

Amenity Nurseries

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

Nursery	Plants Sold	Value
		$
Salisbury North	88,834	25,891.33
Bunyaville	11,851	3,790.34
Dalby	19,801	6,133.59
Total	120,485	35,815.26

Plant sales decreased slightly in 1973–74 as 126,052 were sold in 1972–73.

Sale of Trees

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

Forest Plots	92,152
Schools and Government Depots ..	39,417
Other Sales	124,772
Total	256,341

Total sales in 1972–73 were 258,421.

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

Slash Pine	27,700
Caribbean Pine	46,085
Hoop Pine	9,513
Other Species	8,854
Total	92,152

The demand for trees for establishment of commercial plantations decreased considerably with a reduction in sales of 22,058 seedlings. The number of Caribbean Pine planted in North Queensland increased from 28,515 to 46,085 whereas the number of Slash Pine seedlings planted in South-east Queensland decreased considerably from 59,150 to 27,700.

Christmas Trees

5,301 Christmas trees were sold in 1973–74 for a total of $4,255.59 compared with 5,961 sold in 1972–73. The number of Christmas trees sold each year has continued to decrease due to availability of artifical trees and sales by private growers.

Seed Collection

During the year the Department has continued to meet its own requirements and supply seeds for outside demands mainly for Slash Pine, Caribbean Pine, Eucalypts and Hoop Pine. Two hundred and twenty-two lb. of the 1972–73 collection of Caribbean Pine was sold to outside organisations in 1973–74 whilst a record collection of 520 lb. in 1974 has enabled the Department to offer 351 lb. for sale. This fell short of requests which totalled 870 lb. for 1974 and have already reached 1,049 lb. for 1975.

Continued interest is being shown by Malaysia, Brazil and other South and Central American countries for seeds of the more favoured *Eucalyptus* species. Requests for seed of Red Cedar prompted the collection of 20·5 lb. of seed this year. Also in response to requests for Maple seed a collection of 131 lb. was arranged.

The quantities of seed collected of the major species in 1972–73 and 1973–74 were as follows:—

Species	1972–73	1973–74
	Pounds	Pounds
Hoop Pine	107,674	1,064
Bunya Pine	4,907	2,170
Slash Pine	3,703	3,731
Caribbean Pine	287	520
Radiata Pine	72	26
Patula Pine	Nil	Nil
Loblolly Pine	127	15
Eucalypts	326	213
Totals	117,096	7,739

All the Slash Pine seed collected in 1974 was from seed orchards.

The total value of seed sold in 1973–74 was $32,092 compared with $13,043 in 1972–73. This includes the sale value of Honduras Caribbean Pine seed collected in 1973 but not that collected in 1974 which will be of the order of $16,000.

Diseases and Pests

PATHOLOGY

(1) *Phytophthora Root Rot*

Climatic conditions for the past few years and this year in particular have been favourable to the development of *Phytophthora cinnamomi* which thrives in wet soils and causes a rot of the fine feeding roots of a wide range of plants including various pines and eucalypts.

During late summer and autumn *P. cinnamomi* was isolated from a number of exotic pine areas in South-east Queensland. Diseased pines from which isolations were made were Slash Pine (Beerburrum and Beerwah), Loblolly Pine (Crohamhurst) Radiata Pine (Passchendaele and Gladfield) and Sand Pine (Fraser Island). In addition it was isolated from a number of native species at Beerburrum, Toolara and Fraser Island. These include *Banksia aemula, Casuarina* sp., *Dillwynia floribunda,* and the heathy *Leucopogon magarodes* and *Aotus lanigera.* The heaths are of interest because some are highly susceptible to *P. cinnamomi* and could be useful as indicators of its presence.

There are two mating types of *P. cinnamomi,* designated A_1 and A_2, both of which occur in Queensland. The A_2 type is the only one which has been associated with horticultural crops such as Avocado, Pineapple and Macadamia whilst the A_1 has been recorded on native species from a relatively small number of areas. A start has been made this year to determine the mating type of the *P. cinnamomi* isolates from *Pinus* spp. in Queensland. Whilst a number of isolates remain to be typed of those dealt with 6 occurrences gave A_2 and only one, *A. lanigera* from Toolara, gave A_1.

The Department has continued to assist financially the investigations at the Australian National University into *P. cinnamomi* and other *Phytophthora* spp. from Australian native forests.

(2) *Basidiomycete Root Rots*

Another form of root rot, in which decay of the woody structural tissues of roots occurs, is caused by fungi of the Basidiomycete class. The following is a record of diseases caused by such fungi.

Armillaria mellea was found associated with deaths of 9-year-old Radiata Pine in an experimental plot at Gladfield.

The 1970–71 and 1971–72 Reports referred to the occurrence of *Fomes annosus* on standing dead Patula Pine in a plantation near Atherton. Twenty-seven trees have been felled to determine by culture methods if the fungus was attacking living trees. Twenty-four trees had butt stain and three of these contained advanced decay in the butt. No *Fomes annosus* was isolated. Observations on the area are continuing.

Fomes noxius, associated with root and butt rot of Hoop Pine in Queensland, was found on dead and dying Hoop Pine in a further four compartments in the Gympie, Brisbane and Atherton Forestry Districts. In June, 1974, a survey undertaken for sporophores of the fungus at Imbil and Amamoor. They were found to occur frequently on the undersides of fallen logs and stumps of Hoop Pine known to have been infected previously with the fungus. Previously, fruiting body production by this fungus in Queensland was thought to be rare.

Chaetoporus radulus which has been associated with root and butt rot of Hoop Pine in Queensland was found in two root rot infection centres in Hoop Pine plantations at Imbil and Amamoor.

(3) *Nursery Diseases*

None of the diseases which in the past have caused serious losses in either *Pinus* spp. or Hoop Pine nurseries were recorded during the year. The fumigation measures used in the older *Pinus* spp. nurseries and the use of fallow areas and quarantine measures in the two new Slash Pine nurseries have contributed to this.

Macrophomina phaseolina and *Fusarium* spp. were isolated from tubed Caribbean Pine at Toolara and from Radiata Pine at Pechey; *Pythium* sp. was also isolated from the Pechey material. *M. phaseolina* is a serious root pathogen either alone or in combination with *Fusarium* spp. in conifer nurseries elsewhere, but has not been of major significance in Queensland nurseries.

Young Blackbutt seedlings in small peat pots at two nurseries exhibited symptoms of chlorosis, leaf necrosis and shoot death. A *Pythium* sp. was recovered from Beerburrum samples but no potential pathogens were isolated from Toolara samples.

Improved quarantine measures in nurseries have been instituted to reduce the likelihood of introduction of pathogens and to try to ensure stock being exported from them is free of disease. The areas of the two new Slash Pine nurseries are large enough to permit fallowing at least two years out of three. Irrigation water is chlorinated at Toolara nursery and action is in hand to install a chlorinator at Beerburrum. In nurseries where *Phytophthora* has been isolated, all stock exported is dipped in a fungicidal solution of Difolitan.

(4) *Other Field Diseases*

A foliage blight was recorded in several compartments of Radiata Pine at Passchendaele in November, 1973, some 3–4 weeks following a severe hailstorm. A feature of the disorder was the near simultaneous death of foliage (almost 100 per cent. on many trees) over the area. Even seriously affected trees were observed to be producing new shoots in January, 1974. A number of fungi including *Diplodia pinea* were isolated from affected branches. A similar disorder was reported from a private Radiata Pine planting near Warwick.

Reference was made in the 1971–72 Report to the occurrence of dieback in young Hoop Pine plantations in three Forestry Districts. Surveillance was maintained throughout the year for renewed outbreaks of the disorder and for the second year, none was recorded.

There were several collections of unidentified *Lophodermium* spp. found fruiting on dead portions of the most recent foliage of several *Pinus* spp. in south-eastern Queensland. *Lophodermium* spp. (needle cast fungi) can usually be found fruiting on older or fallen foliage but following exceptionally wet weather in previous years, the fungus has been recorded in *Pinus* spp. in Queensland on young needles.

A fungus, possibly *Botryosphaeria ribis* was isolated from a dieback and canker disease of young Blackbutt planted on Fraser Island in 1972. Damage varied from slight to severe branch and shoot dieback, and one tree was killed by a canker about 30–40 cm above ground level. This fungus, the cause of canker diseases of a number of tree species, may also be implicated in the dieback and canker of Hoop Pine last reported in 1971–72.

The dieback and death in Cypress Pine forests reported in the 1972–73 annual report is continuing and it is estimated that 3,000 acres are affected to some degree. Salvage logging of affected areas has been necessary. Investigations indicate that dieback appears to occur mainly in areas which have been subjected to prolonged waterlogging in the soil substrata following above average rainfalls in recent years. So far there is no evidence that a pathogen attack is a causal agent. Surveys are in progress to delineate all dieback areas and investigations aimed at control are proceeding.

Widespread observations have been made of death and dieback of eucalypts along the coastal plain as far north as Bundaberg following the record summer rains. Many species are affected particularly Ironbarks, Grey Gum, Grey Box, Spotted Gum and Flooded Gum. The damage appears to be severe in more exposed clumps of trees. No pathogen has been isolated from any of the affected trees. No cause has been determined for the dieback and death of Grey Ironbark in the hardwood forests previously reported from Gympie and Nambour. Observations in conjunction with logging operations indicate extensive decay of the branches of the crown, suggesting that the problem has occurred over a long period.

Entomology

In the forest the major insect problems during the year were caused in Hoop Pine plantations by *Hyleops glabratus* and *Strongylurus* (*Coptopterus*) *decoratus* whilst there was a minor outbreak of bag moth (*Hyalarcta huebneri*) in Radiata Pine plantations. With timbers in use the dry-wood termite (*Cryptotermes brevis*) and the activities of native subterranean termites were sources of chief concern.

PLANTATION PESTS

Hyleops glabratus continues to infest the Hoop Pine in the Gympie and Murgon Districts but the only losses attributed to it during the year were recorded from Imbil in the Mary Valley. Field and laboratory studies in progress on this insect include investigation of the pathogenicity of an associated symbiotic fungus.

Examination of more than 2,200 trees in Compartment 5A Harrys Logging Area at Amamoor showed only 1 per cent. of the stems had not been attacked at some time by *S. decoratus.* Most damage was old and only 3 per cent. of branches examined revealed active larvae. Parasites on the beetle have been observed for the first time and have been reared in the laboratory. They may account for the relatively low population despite its wide-spread distribution over a number of years. Associated with *S. decoratus* and causing similar damage mainly to smaller branchlets have been found large numbers of an un-named weevil. Studies have been widened to cover both of these insects.

The major forest insect problems encountered during the year were caused by *H. glabratus* and *S. decoratus* in Hoop Pine plantations. There was a minor outbreak of *H. heubneri* in *Pinus* plantations. Apart from the continuing problem with eradication of *C. brevis,* subterranean termites were extremely active on the domestic front.

The bag moth (*H. huebneri*) reappeared as a pest this year and caused severe defoliation of several species in trial plots in the Yarraman District. It was also reported from plantations of Radiata Pine at Pechey where it caused only minor defoliation.

Pests on Ornamental Trees

Widespread defoliation of *Delonix regia* (Poinciana) by *Pericyma cruegeri* and *Melia azedarach* (White Cedar) by *Leptocneria reducta* was experienced in the Brisbane region. Unusually severe defoliation of native *Melaleucas, Callistemons* and *Leptospermums* by several species of *Lepidoptera* also occurred.

Roeselia lugens caused severe defoliation of Grey Ironbark (*Eucalyptus siderophloia*) in several roadside and farmland areas in South-east Queensland and the processional caterpillar (*Ochrogaster contraria*) was particularly common also.

Lantana Control

Because of the high cost of lantana control great importance is attached to work directed at biological control and the Department is continuing its support of a programme of search for parasites in South and Central America. At the same time it is assisting in the spread of promising insects raised by the Department of Lands at its Research Station in Brisbane. In this regard the hispids *Octotoma scabripennis* and *Uroplata girardi* have been released throughout the State Forests of Queensland where lantana is a pest and the results of these releases are now being appraised. Reports indicate that establishment of *Uroplata* has been highly successful in some localities and some damage is being caused to lantana under the canopy of Hoop Pine particularly at Amamoor. There is also evidence of satisfactory spread of the insect which in the Gympie District has been located up to 6 miles from the nearest point of release in 1971. *Octotoma* released at the same time has not been recovered. These releases were of from 500 to 1000 insects and, even where successfully established, the degree of damage effected by *Uroplata* is not such that would justify hopes that by itself it will exert adequate control unless there is a massive build up in its numbers. As an aid to this and to observe the degree of control achieved larger releases of up to 30,000 per site are being made at Mt. Glorious near Brisbane under conditions of environment comparable with those that obtain in much of the Hoop Pine plantations.

Forest Products Insects

Investigation and treatment of the localised infestation of the introduced dry-wood termite, *C. brevis*, in the Maryborough area continued during the year in an effort to prevent its wider spread.

Fumigation with methyl bromide of a further eight houses located during resurvey of the affected area was carried out in September. Since then another four infested dwellings have been detected and await treatment. One of these is located in the same part of Maryborough but the other three are in nearby townships and were located by tracing the movement of articles of furniture from previously known infested premises.

The continued, if slow, expansion of the perimeter of the area of confirmed infestations makes it clear that treatment confined to these buildings alone is insufficient to eradicate or even contain the insect. In recognition of this and of the acknowledged seriousness of this timber pest, the Commonwealth Government has agreed to share with the State the cost of expanding the treatment programme to include a buffer zone of three chains radius around each infestation site. Planning for this was on hand at the close of the year, but it presents considerable difficulties.

At the same time a survey is being made in all major ports of entry to the State to check for any other possible infestations.

Following reports of a supply problem with mining timbers in the Central Queensland area an investigation revealed that much of this was due to attack by the borers *Lyctus brunneus* and *Mesoxylion cylindricus* on the sapwood of Spotted Gum causing a rejection of this species by some mines. Even with highly susceptible sapwood such as this species has, the problem could be at least significantly reduced by improvement of storage and handling methods, and by some segregation of timber species for particular use requirements. Even so, some form of preservative treatment could be justified in view of the large scale of the mining operations.

Log borers

The unusually protracted and heavy summer rains in most areas led to substantial quantities of logs remaining in the bush for lengthy periods and to attack by borers. Complaints and enquiries regarding borer damaged timbers are already being received. The insects most commonly encountered included *Mitrastethus australiae, Xyleborus perforans, Platypus* spp., *Pachychotes clavatus* and several bostrychids and longicorns. *Prospheres aurantiopictus* was seldom detected and, since this is the only species which persists in seasoned timber, the major proportion of the borer-affected timber should pose no continuing risk to users.

Domestic and Industrial Pests

Termites were certainly the most significant single insect problem with timber in service and accounted for over 50 per cent. of inquiries received from the public in this area. Most of these concerned the subterranean species *Coptotermes acinaciformis* and *Schedorhinotermes intermedius* and many were associated with either inadequate or a complete absence of pre-treatment under concrete floor slabs. This is becoming quite a serious problem.

Overall the public enquiries concerned a wide range of insects including bostrychids, longicorns, weevils, and *Lyctus* spp. The recent period of excessive demand for sawn timber will undoubtedly give rise to an increase in reports of *Lyctus* damage in the coming summer.

Research

Studies on the habits and life cycle of *C. brevis* in Queensland are being continued. A survey is being made of the species distribution of Lyctidae within the State and results from the first series of test blocks are now being assessed. Some blocks were lost in the recent major flooding and resampling may be necessary in some areas.

Zoology

Happily there has been a substantial drop in rat activity in the Yarraman and Murgon districts where most damage has been caused in the past. No doubt this is but a phase in the cycle of population behaviour such as has occurred in the past and no relaxation of effort towards control is contemplated.

Extensive field trials have confirmed the value of sweet potato for use in baiting with the poison 1080 and these achieved kills of 85 to 100 per cent. with an average of 93 per cent. Further large scale baiting is proposed this year over some 1,000 acres of infested plantation.

Sweet potato has proved most successful as a poison carrier attractive to the rats but presents difficulties in the preparation and storage of the baits. In consequence efforts are continuing to develop a more suitable bait and a number of substances are ready for testing in the field using a new technique involving fluorescent tracer dyes.

FOREST RESEARCH

Following on increase in the research staff at Yarraman the control of plantation silvicultural research work in the inland southern tablelands was transferred from Beerwah to the Yarraman Regional Station. Radiata and Patula are grown on the southern tablelands and in the Yarraman District and this will unify the control of experiments with these species. Transfer of the tree-breeding and nutrition research work will follow. All measures carried out by Forest Research staff since the 1st April, 1973 have been in metric units. Accordingly the data quoted in this section of the Report are in metric units.

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

Atherton Regional Research Station

The main work of this station is research to determine silvicultural treatments for application to North Queensland rain-forests. In addition it conducts research in plantations of Caribbean and Hoop Pine on the Atherton Tableland and the lowlands of the tropics.

(i) RAIN FORESTS. Increasing use of relascope prisms is being made in measuring basal areas per hectare where needed to relate to recorded diameter increments. Close estimates of basal area can be obtained by using a $\times$ 9·18 m²/ha prism on a random grid in the plot. If these points are permanently marked with pickets increments in basal area can be obtained also. Initial establishment of points can be expensive but remeasures are quick. Some conditions for use are that enough points be used (minimum of 20), and that the plot have a surround of similar treatment so that points near the boundary will be representative of the plot.

Earlier experiments established in logged and silviculturally treated forest to determine when follow-up treatment should be applied to benefit regeneration of the more valuable species showed little difference in growth of selected trees between untended plots and plots tended 8-10 years after the initial treatment.

However a marked response has been recorded in an experiment with Silkwood regeneration in an area afforded silvicultural treatment 12 years before its commencement in 1967 when the average height of selected trees was 11 metres.

Treatments applied were:—

(a) nil treatment;

(b) destroy all stems except 740 per hectare selected in the regeneration, and useful stems in overwood with diameter in excess of that prescribed for each of four species groups;

(c) select stems as in treatment (b) but destroy only overwood trees apparently interfering with select trees.

Treatment times were 74 man-hours per hectare for treatment (b) and 10 man-hours per hectare for treatment (c). Diameter breast high increments of 370 stems per hectare of Silkwood regeneration are shown by treatments in the table.

DIAMETER BREAST HIGH INCREMENTS OF SILKWOOD REGENERATION BY TREATMENTS (cm)

Treatment (see text)	Standing Basal Area m^2 per hectare	Mean Annual Diameter Increment (cm)			Total Diameter Increment (cm)
	1968	1967–68	1968–70	1970–72	1967–72
a	40·91	0·75	0·66	0·45	2·97
b	14·26	0·94	1·15	1·13	5·50
c	21·01	0·78	0·96	0·96	4·48

An area underplanted in 1929 with Queensland Maple, Silkwood, Queensland Silver Ash and Red Cedar, was logged in 1969. Prior to logging about 160 selected trees per hectare were marked on the basis of form and spacing. In 1970 treatments applied to provide data to aid in managing such high quality stands were:—

(a) no treatment;

(b) all non-selected stems removed by ringbarking or poisoning;

(c) select stems, stems less than 20 cm diameter breast high and other stems of cabinet wood species greater than 4·6 m from select stems retained; all other stems removed by ringbarking or poisoning;

(d) all non-select stems greater than 20 cm diameter breast high removed by ringbarking or poisoning.

Treatment times per hectare were (b) 52 man-hours (c) 13 man-hours (d) 18 man-hours. Average annual diameter increments 1970-73 for select stems of the four underplant species and Northern Silky Oak are shown in the table.

AVERAGE ANNUAL DIAMETER INCREMENTS OF THE PRIME CABINET SPECIES FOR THE PERIOD 1970–1973 (cm):—

Treatment (See text)	D.B.H. Classes (cm)								All Stems
	0–10	10–20	20–30	30–40	40–50	50–60	60–70	70–80	
a	0·65 (7)	0·67 (80)	0·90 (205)	1·03 (273)	1·35 (136)	1·42 (42)	1·71 (7)	2·00 (1)	1·04 (751)
b	0·82 (6)	1·44 (26)	1·66 (120)	1·80 (271)	1·87 (116)	1·80 (26)	2·07 (11)	..	1·78 (576)
c	0·34 (32)	0·67 (106)	0·95 (257)	1·11 (354)	1·61 (134)	1·39 (42)	2·23 (8)	..	1·09 (933)
d	0·73 (71)	1·14 (205)	1·56 (278)	1·66 (284)	2·12 (90)	1·79 (25)	2·30 (1)	0·4 (1)	1·50 (955)

Figures in brackets are numbers of stems from which the averages were derived.

These data support (d) as the most efficient treatment.

Grafting continued in the Queensland Maple seed-orchard at Kuranda from which 632 grams of seed were collected.

(ii) PLANTATIONS. Thinning of Honduras Carribbean Pine with stem injections of undiluted solution containing 60 per cent. W/V MSMA (monosodium methylarsonate), varying from 20 to 240 grams active ingredient per square metre basal area, commenced on 26th January, 1973. Treatments applying 240 grams of the solution per square metre appeared to have severely affected plants six months after application. However an assessment carried out twelve months after the treatments revealed that 79·3 per cent. of the trees had fully recovered and resumed normal growth. The remaining 20·7 per cent. were dead. None of the treatments achieved a satisfactory kill. There was no evidence of damage caused to adjacent trees by poison translocation through root grafts. Some Hoop Pine provenances, particularly that from Coen, reach plantable size in a year in the nursery. The opportunity was taken this year to establish a plot using 50 one year plants of Coen provenance, stumped at about 5 cm above soil level, and planted out open root in the wet season, to compare with routine tubed plants. Three months after planting all stumps had begun to shoot.

During the year little work has been done by Departmental staff at Weipa, now that Comalco have their own Forester. The Department's work on trial plantings at Weipa has been written up as Research Paper No. 5.

Beerwah Regional Research Station

Three sections at this station handle silvictultural, tree breeding and nutrition research into the establishment and maintenance of exotic pine plantations on the coastal lowlands south of latitude 23 degrees. The silvicultural work is reported here while the nutrition and tree breeding work are covered in the Forest Soils and Nutrition, and Tree Breeding Sections of this Report. The major concern is the southern pines of U.S.A. and the three varieties of Caribbean Pine.

Preliminary results from a trial established in 1969 which seeks to relate field performance of 1–0 Slash Pine stock to seedling morpholigical characteristics show the importance of shoot condition to survival.

SURVIVAL AND HEIGHT GROWTH OF SLASH PINE SEEDLINGS AS RELATED TO SHOOT DEVELOPMENT CLASSES*

Shoot Class	Survival % 1973	Mean Diam. (mm) Ground Level 1969	Mean Ht. (cm)		Height Increment (cm) 1969–73
			1969	1973	
1	34·7	3·8	19·5	393·8	374·3
2	49·6	5·0	23·2	423·7	400·5
3+4	66·1	6·1	27·2	455·2	428·0
5	85·4	6·8	25·9	481·2	455·3
6	76·3	6·1	23·1	450·2	427·1
7+8	82·5	6·6	25·7	476·8	451·2

* Shoot classes are based on needle and bud maturity. Classes 1 to 4 show increasing development of secondary foliage and terminal bud. Class 5 stock is dormant. Class 6 is actively reshooting. Class 7 is forming a resting bud after reshooting and Class 8 stock has again become dormant after reshooting.

Field survival and height growth are correlated with height and diameter at planting and analysis indicated minima of 22 cm and 5 mm for satisfactory results substantially confirming routine standards of 7 inches and pencil thickness. Best survival and increment were given by Class 5 closely followed by Class 7–8.

All Slash Pine root dip trials have been summarized and findings substantiate those previously reported. A kaolin clay slurry (1 kg mixed in 1 litre of water) effected significant gains in field survival especially under adverse environmental conditions. Clay cost is approximately 23c/1000 plants treated. Dipping immediately on lifting is recommended. Sodium alginate both as a root and shoot dip proved inferior to, and more expensive than, the clay root dip.

Jiffy pots (5·7 cm x 5·7 cm) were tested for the raising of Honduras Caribbean Pine. Direct sowings were made in September, October and November, 1972, with outplantings at 3, 4 and 5 months after sowing. Results are shown in the table.

PERFORMANCE OF HONDURAS CARIBBEAN PINE SOWN IN JIFFY POTS AT TIME OF PLANTING AND AT FIRST YEAR MEASURE

Sowing	Age (Months)	At Planting			1st Year Measure	
		Month	Height (cm)	Root/ Shoot	Height (cm)	Survival %
Sept.	3	Dec.	9·0	0·399	..	0·0
	4	Jan.	13·3	0·444	71·3	92·3
	5	Feb.	17·8	0·450	58·2	79·7
Oct.	3	Jan.	14·0	0·257	72·0	93·9
	4	Feb.	18·5	0·411	71·4	83·2
	5	March	24·8	0·214	62·9	69·7
Nov.	3	Feb.	14·4	0·238	64·0	85·1
	4	March	18·4	0·482	68·5	30·1
	5	April	23·4	0·231	73·4	94·1

This trial indicated that Honduras Caribbean Pine can be successfully raised in the pots tested. Field survival has been influenced by conditions after planting related to time of planting and under mild conditions all treatments gave satisfactory growth and survival. This gives flexibility in time that plants can be held for suitable planting conditions and by reason of a considerable saving in costs as compared with tubing, results warrant further large scale trials.

A new series of site preparation trials was established at Tuan and Toolara on shallow heavy clay sites. The trials are designed to test the growth response to single tyne deep ripping (61 and 91 cm deep) and its economics. Mounding and fertilising treatments are included in the factorial design.

Further species trials were summarized and a number terminated. Emphasis is now placed on defining the potential of Loblolly Pine, the two varieties of Slash Pine and the three varieties of Caribbean Pine in the plantation programme on the sites available. In the autumn of 1972 a large scale species trial was established on three regosol sites at Fraser Island. Original vegetation types were coastal Cypress Pine-Oak (*Casuarina* sp.), poor quality Blackbutt and moderate quality Blackbutt. Nine species were tested on both upper and lower slopes. All species were fertilized with a mix containing nitrogen, phosphorus, potassium, calcium and trace elements. A high and a low level of phosphorus were applied to the Slash Pine and Honduras and Bahamas Caribbean Pine plots. Development at late winter 1973 is shown in the table.

SURVIVAL AND HEIGHT DEVELOPMENT, AUGUST 1973—PINES AGE 1 YEAR 5 MONTHS AND BLACKBUTT AGE 1 YEAR 2 MONTHS ON REGOSOL—FRASER ISLAND (MEANS OF 2 REPS).

Species	Cypress-Oak Site			Poor Blackbutt Site			Moderate Blackbutt Site		
	% Surv.	Mean Ht. (cm)	CAI 72–73 (cm)	% Surv.	Mean Ht. (cm)	CAI 72–73 (cm)	% Surv.	Mean Ht. (cm)	CAI 72–73 (cm)
Bahamas Caribbean Pine	99·3	135	101	98·2	137	104	98·5	148	121
Honduras Caribbean Pine	94·7	100	42	96·1	121	62	96·1	130	89
Cuban Caribbean Pine	99·3	85	45	98·6	100	65	98·8	95	62
Slash Pine	99·3	91	43	99·0	99	52	88·9	100	52
South Florida Slash Pine	99·0	79	58	96·1	78	70	97·8	72	64
Loblolly Pine	98·8	79	43	98·6	94	59	96·1	93	59
Sand Pine	58·3	54	32	42·3	63	37	37·9	66	48
Longleaf Pine	82·5	2	..	71·6	2	..	65·4	2	..
Blackbutt	71·9	150	136	77·2	186	165	72·4	182	170

Statistical analysis of the data for the pine species shows significant differences for percentage survival and height growth by species and sites and a first order site-species interaction. Slope position shows no significant difference at this stage. The very good early performance of Blackbutt and Bahamas Caribbean Pine is noteworthy.

The fertilizer section of the experiment shows an overall significant response in height growth to the application of an additional 56·8 kg/ha phosphorus to bring the high level to 98·9 kg/ha. Mean height increment 1972-73 for Slash, Honduras and Bahamas Caribbean Pine increase from 68 cm to 74 cm at the higher application rate.

Within the tropics Honduras Caribbean Pine gives growth far superior to that of Slash Pine and is the species planted on the coastal plain. A series of paired plots established with Slash Pine and Honduras Caribbean Pine at Tuan, latitude 25 degrees 30S, in the 1950's continues to show growth of Honduras Caribbean Pine superior to that of Slash Pine on the well drained sites of this sub-tropical coastal area. Caribbean Pine was planted as tubed stock and Slash Pine as open root stock but otherwise treatments have been the same including pre commercial thinning to 750 stems per hectare. Development is shown in the table.

On ground water podzol sites post plant heath regrowth (mainly *Aotus* spp.) may adversely affect survival and growth of newly established plantations. Two experiments were initiated to assess post plant mechanical cultivation on these sites and the effect of both method of application and composition of fertilizer on planted Slash Pine and heath regrowth.

In 1969–70 a series of experiments was established to study the effect of forest regrowth on increment of Slash Pine at Beerburrum and Toolara and on Honduras Caribbean Pine at Byfield. The experiments were established at each centre in 2 and 12-year-old plantations and at Beerburrum also in a 22-year-old plantation. Treatments are nil removal of regrowth, complete removal of regrowth annually and periodic removal of regrowth when considered to be interfering with the growth of the plantation. Soil nutrient status under each of the treatments is being monitored.

So far the response to tending has not yet become clear at Toolara and Byfield where regrowth is less dense, but at Beerburrum indications are that at least up to time of crown closure tending is necessary to avoid loss in increment. The response at Beerburrum is shown in the table.

STAND DEVELOPMENT JULY, 1971—HONDURAS CARIBBEAN PINE (PCH) AGED 19 YEARS 5 MONTHS, SLASH PINE (PEE) AGED 19 YEARS, TUAN

Species	Current Stocking Stems per hectare	D.B.H. (B.A.) (cm)	Predom. Height (m)*	Basal Area (Including thinnings) (m^2 per hectare)	Merchantable Volume (Including thinnings)† m^3 per hectare
Lateritic podzolic soils (Means of 5 Reps.)					
PEE	728	21·8	18·8	31·11	155·6
PCH	740	26·3	21·0	43·20	233·4
Ground Water Podzolic Soils (One Rep. Only)					
PEE	736	22·0	18·2	28·08	153·8
PCH	754	23·0	19·8	31·45	153·3

* Mean height of tallest stems taken one per 0·02 hectare.

† Stems 12 cm + diameter breast high to 10 cm top diameter under bark.

HEIGHT AND DIAMETER INCREMENT OF SLASH PINE AT BEERBURRUM UNDER SEVERAL TENDING REGIMES (See text)

Treatment of Broadleaf Regrowth	1967 Planting Mean of 6 Reps.		1956 Planting Mean of 4 Reps.		1947 Planting Mean of 4 Reps.	
	Ht. Incr. 69–73 (m)	Mean D.B.H. 1973 (cm)	P. Ht. Incr.* 69–73 (m)	D.B.H. Incr. 69–73 (cm)	P. Ht. Incr. 69–73 (m)	D.B.H. Incr. 69–73 (cm)
Complete Removal	5·6	13·7	4·0	2·9	2·5	3·1
Periodic Removal—						
Foliar Spray	5·7	13·9	3·9	2·9	2·5	3·2
Nil Removal	5·4	12·9	3·9	2·8	2·4	2·9
Statistical Significance	0·2 †	0·9 ‡	.. Nil	.. Nil	.. Nil	0·3 †

* Predominant height increment.

† Significantly different at 5 per cent. probability level.

‡ Significantly different at 1 per cent. probability level.

Statistical analysis of growth data bears out field observations that growth of some individuals on the untended plots of the youngest stand has been retarded and there were problems in selecting 500 stems per hectare of sufficient vigour for ground pruning. Undoubtedly this was due to competition of the weed growth. It is doubtful if a significant difference will continue to show up for mean D.B.H. increment of the oldest stand.

Measure data from an unreplicated pilot trial, testing the response of Honduras Caribbean Pine and Slash Pine to soil preparation and fertilizer application at Byfield, latitude 23 degrees south, on a range of sites previously considered unplantable, have been processed.

The measure data are shown in the table below.

GROWTH PARAMETERS—SLASH PINE AT AGE 8 YEARS 3 MONTHS AND HONDURAS CARIBBEAN PINE AT AGE 8 YEARS 5 MONTHS—ON "UNPLANTABLE SITES" AT BYFIELD FOLLOWING SITE PREPARATION AND APPLICATION OF FERTILIZER

Soil Type	Species	Site Preparation	Fertilizer A*		Fertilizer B†		Nil Fertilizer	
			Mean D.B.H. (cm)	Mean Pre. Ht. (m)	Mean D.B.H. (cm)	Mean Pre. Ht. (m)	Mean D.B.H. (cm)	Mean Pre. Ht. (m)
Gleyed Sand	Slash	Rip + Mound	14·85	10·7	14·55	10·5	..	..
		Mound	13·37	10·0	13·13	9·6	..	..
	Caribbean	Rip + Mound	17·56	13·6	14·54	11·9	..	..
		Mound	14·23	11·6	15·40	12·3	..	..
Ground Water Podzol	Caribbean	Rip + Mound	16·00	12·8	16·41	13·0	..	..
		Mound	14·40	11·9	15·54	12·6	..	..
		Nil	11·76	9·0	10·95	7·8	..	2·0
Ironstone Gravel Ridge	Caribbean	Rip + Mound	17·39	15·7	17·65	15·2	..	..
		Mound	15·22	14·2	15·42	14·4	..	..
		Nil	14·90	13·3	14·53	13·3	16·75	14·5

* Fertilizer A—250 kg/ha Nauru rock phosphate plus 250 kg/ha granulated superphosphate plus 0·9 per cent. copper.

† Fertilizer B—0·8 per cent. Zn and 0·03 per cent. Mo additional to fertilizer A.

It is clear there is a substantial response to site preparation on all soil types. There is a major response to the application of phosphatic fertilizer to groundwater podzols and on other experimental evidence, to gleyed sands. There appears to be no response to the application of fertilizer to ironstone gravel ridge soils. The response to phosphatic fertilizer on groundwater podzols is well illustrated in the photograph included in this report.

Ground water podzol at Byfield, planted with Honduras Caribbean Pine, aged 9 years. Treatments: Foreground—ripped only; left background—ripped and fertilized; right background—ripped, mounded and fertilized.

Dalby Regional Research Station

This station carries out research in the White Cypress Pine, Narrow Leaf Ironbark, and Spotted Gum forests in the area west of Dalby and Warwick with an annual rainfall of 500–750 mm, and in rainforests and sclerophyll forests on the Dividing Range east of Warwick where the rainfall generally exceeds 1200 mm per annum. Research is also carried out into the growth of windbreak and shelterbelt trees suitable for planting on the agricultural and pastoral land west of the Dividing Range.

The analysis and review of data collected over a period of more than 25 years from Cypress Pine thinning experiments have been completed with the preparation of a paper describing the observed and anticipated growth behaviour of this species in South-west Queensland under a wide range of management conditions. The basal area growth model based on estimated stand age was rejected in favour of one based on mean diameter of the select fraction of the stand and the stocking level over the period under consideration. The correlation of basal area increment with the mean diameter of the select stems in a stand rather than with their age is seen as a reflection of the ability of this species to recover from suppression and overcrowding in heavily stocked stands.

The growth model indicates that for average conditions of stand and climate in the Cypress Pine forests of this region, maximum basal area increment drops from about 0·6 m^2/ha for a stand with a mean select diameter of 5 cm, to about 0·2 m^2/ha for one with a mean select diameter of 40 cm. The standing basal area which produces maximum basal area increment rises from approximately 5 m^2/ha for stands with a mean select diameter of 5 cm, to in excess of 20 m^2/ha for those with a mean select diameter of 40 cm.

It was also determined in the review that, unlike Slash Pine in coastal plantations, the smaller stems in evenaged, thinned Cypress Pine stands contribute proportionately more to basal area increment than is indicated by the proportion they represent of the standing basal area. Moreover, in unevenaged stands the proportion of basal area increment contributed by the smaller stems may be twelve times as great as the proportion, they constitute of standing basal area. This ability of Cypress Pine to grow as an understory species and recover from suppression is an important factor to be considered when choosing between evenaged and selection management techniques in these forests.

The effect of overstory on development of natural regeneration of Cypress Pine was demonstrated in an experiment in which a wide range of regeneration stocking levels exist following thinning in 1937 of an evenaged Cypress Pine stand to various spacings. The influence of the overstory stocking and standing basal area levels on the development of regeneration is shown in the following table:—

REGENERATION OF WHITE CYPRESS PINE UNDER VARIOUS STOCKINGS OF THE OVERWOOD

Plot	Overstory 1937–1967		Regeneration Stocking/ha 1967
	Stocking/ha	Basal Area Range (m^2/ha)	
1	175	1·9—7·9	278
8	274	2·3—9·7	656
2	274	3·5—10·6	244
5	274	3·2—10·1	244
7	418	3·0—12·3	133
3	484	5·6—13·8	156
9	746	4·9—13·5	100
6	1,055	8·1—17·9	56
4	1,910	11·5—20·1	11

Growth projection, based on models derived from the Cypress Pine thinning experiments, revealed that the optimum thinning prescription for maximum value production on a rotational basis in evenaged stands involved premerchantable thinning to approximately 330 stems/ha as early in the life of the stand as possible, consistent with certain silvicultural requirements, followed by merchantable thinning to maintain a standing basal area range of 12–15 m^2/ha. Reduction of basal area to 6 m^2/ha late in the life of the stand allows regeneration to develop for the next crop. Clear felling of the overstory at a diameter of 39 cm, after a rotation of 110 years, produces a mean annual merchantable volume yield of 1·37 m^3/ha and a value yield of $6.45/ha per annum based on 1971 prices.

A nursery trial involving the raising of White Cypress Pine seedlings in peat pots was concluded during the year and it was found that the growth of seedlings in standard 20 cm x 4·5 cm tin plate tubes was far superior to that of plants raised in either 6 cm or 8 cm peat pots. The seedlings raised in peat pots were severely affected by dead topping, which may have been caused through root contact with a plastic underlay. At 6 months after sowing the height of seedlings in 8 cm pots averaged 4·24 cm and this was significantly greater than that of the seedlings in 6 cm pots at 3·73 cm. Regular foliage applications of aquasol had no appreciable effect on height growth but blood and bone, applied as a soil additive, increased height growth for both pot sizes.

A long term experiment designed to assess the quantity of seed production, seedfall and litter fall in well stocked Spotted Gum stands has been terminated. Monthly trap collections for a period of five years at two sites were sifted for seed, and the various litter components separated, counted and weighed. When the results were analysed, it was concluded that at a particular site good seed years occur at an average interval of 4 to 5 years with a minimum period of 3 years between successive heavy seed crops. Heavy seedfall can occur at any time but maximum seed fall generally occurs from October to January. Viability was generally at a very high level independent of time of seed fall.

The number of viable seed per gram of clean seed cast averaged between 210 and 231 over the two sites. Annual seedfall was shown to vary from numbers 4 000/ha during a very poor year to well in excess of 4 500 000/ha during a bumper crop.

Monthly litter falls ranged from 52·3 kg/ha during the winter months to 2 894·8 kg/ha during the peak litter fall months of November and December. Annual litter fall for both sites was of the order of 3 382 to 3 643 kg/ha. It was concluded that seedfall was unlikely to be a limiting factor in restocking cut over stands of Spotted Gum.

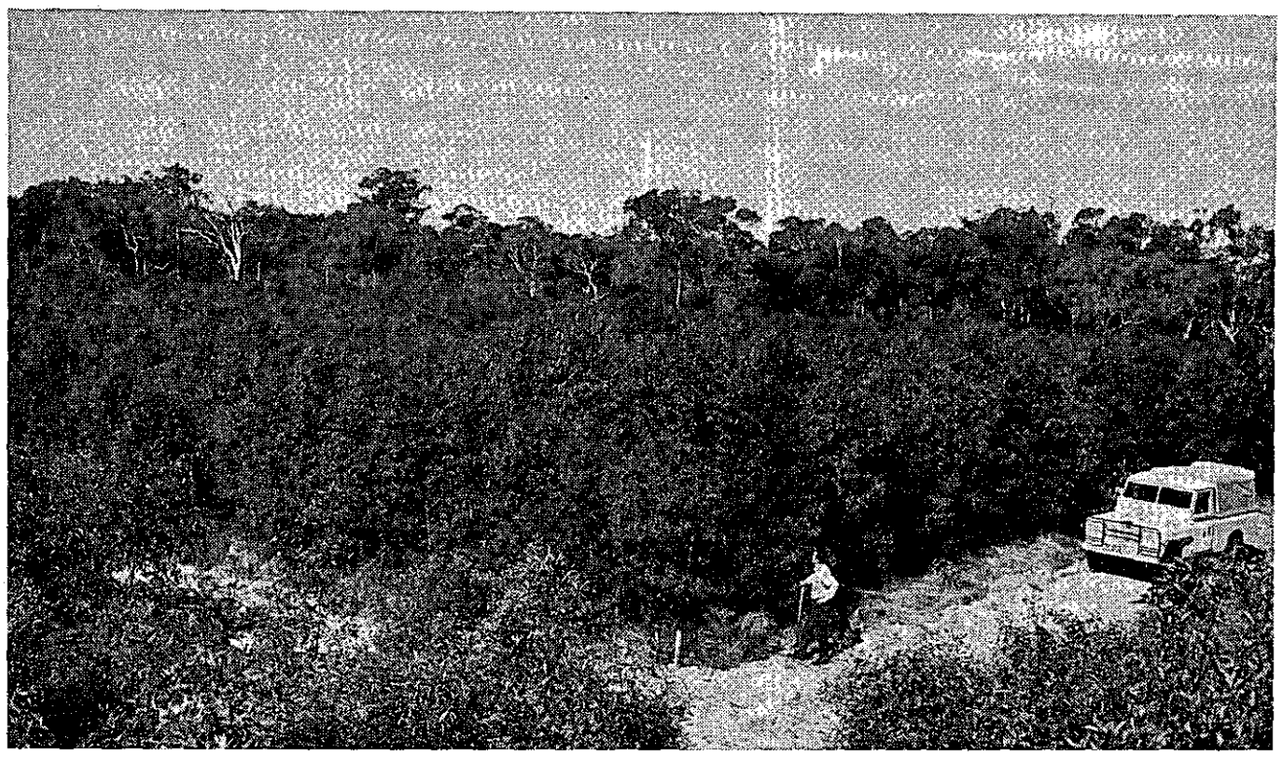
Investigations into the control of Moonlight Cactus at Western Creek near Millmerran were continued with the final assessment of a trial which involved the high volume spray application of 1·0 per cent. and 5·0 per cent. 2,4,5-T.P., and 0·25 per cent. picloram solutions to cactus plants at monthly intervals over a period of 12 months. The average complete kill of above and below ground portions of the plant obtained with each of these formulations was 61 per cent., 93 per cent. and 68 per cent. respectively, once again confirming the superiority of 5·0 per cent. 2,4,5-T.P. for the control of this noxious weed. There was a marked seasonal trend for all treatments with summer applications giving better results than autumn or winter applications.

Many of the underplanting experiments in the Warwick rainforests have been terminated. Preliminary results indicate that of the species tried only Hoop and South Queensland Kauri have been generally successful as underplants under the range of conditions sampled, but their growth has been well below that of open grown stock. In the open plantation trial plots on cleared rainforest sites many species have proved unsuitable because of form, growth rate or animal attack. At present it appears that the most suitable species for plantation purposes are Radiata, Patula, Hoop and Bunya Pines in that order. Recent mortality in some of the younger plots of Radiata Pine (5 years) attributed to *Phytophthora cinnamomi*, and in some of the older plots (8–9 years) to *Armillaria mellea*, however, may require some future revision to this species priority.

Gympie Research Station

The major work of this station is aimed at increasing the productivity of wet and dry sclerophyll forests in coastal Southern Queensland; it also embraces revegetation of sand-mined areas and the multiple use of timber and pasture in Spotted Gum–Ironbark forests.

Blackbutt planted to enrich a medium quality Blackbutt forest on Fraser Island, has grown slowly since planting. A range of fertilizers was applied to ascertain which nutrients are lacking in the sand profile. A second trial using a variety of planting containers including, paper pots, peat pots, plastic bags and galvanised tubes, was set down in a White Mahogany forest type at Woondum State Forest near Gympie. The very wet weather during the nursery phase ruined many of the paper pots and caused considerable loss of young seedlings in most container types. The third experiment was an extension of the research into the revegetation of sandmined forest at Inskip Point at the northern end of the Cooloola sandmass. As mentioned in the 1973 Annual Report, two fertilizer trials have been established at Hook Point at the south end of Fraser Island under simulated sandmined conditions. The new experiment was similar in design to the Hook Point trials. Early survival on the sandmined area has been poor.



Fertilized Blackbutt aged 1 year 6 months on a simulated sand mined site—Hook Point, Fraser Island. Average height 13 feet.

Trials initiated over the last three years and aimed at establishing Blackbutt and other species including *Pinus* on deep sands subject to sandmining have been summarised. On hind-dune areas formerly supporting layered forests at Inskip Point and actually mined, trials were a failure. Drought and frost appeared to be involved as well as defined factors possibly connected with chloride toxicity and changes in hydrological and structural properties of the sand mass following mining. Forest Red Gum, Carbeen and Bancroft's Red Gum survived but with poor stocking and growth. The former two species were native to the site prior to mining. Simulated mining trials were conducted on layered forest sites on Fraser Island subject to overburden (top soil) stripping, stacking and respreading. No mining of sub-soil was carried out. Analysis revealed no inimical changes in nutrient status of overbudren due to this treatment. Analysis of mined soils mined from Inskip Point indicated however, a drop in nitrogen and organic content in the sub-soil following mining. Blackbutt was successfully established on the simulated mined areas with survival of better than 90 per cent. at year one and 80 per cent, at year two (different sites). Best growth was achieved by using advanced stock 50 cm high and 16 weeks old raised in 2390 cm^3 capacity polythene bags. Fertilizer responses to nitrogen and phosphorus were obtained. Height increment in the first year of stock planted in large polythene bags and fertilized with superphosphate at 300 kg/ha and ammonium nitrate at 150 kg/ha was 3·4 m. These trials demonstrate a potential for eucalypt plantations on deep sands. However, leaching losses of ammonium nitrate are high and the use of slow relase fertilizer (ureaforms) will have to be considered.

The Department and a Stock Grazing Permittee are participating in a co-operative multiple use trial involving the production of timber and pasture in a logged and silviculturally treated Spotted Gum forest at Neerdie north of Gympie. Half the site of approximately 150 ha will be sown with improved pastures and fertilized aerially, and the remainder left under native pasture as a control. The trees retained will be at different spacings which should produce varying pasture response. A series of sampling point will be established throughout the pasture and control blocks to measure the growth of the trees and pasture. It is aimed to determine a management regime which will give satisfactory production of both timber and pasture.

Imbil and Yarraman Research Station

These stations are mainly concerned with research into the establishment and maintenance of plantations of Hoop Pine on rain forest sites Imbil with an average rainfall of 1 260 mm, represents the warmer and wetter Hoop Pine plantation areas, while Yarraman, with an average annual rainfall of 800 mm, represents the drier and colder inland sites. The silvicultural research work is reported here while the tree-breeding and nutrition work is reported in separate sections of the report.

(*i*) Hoop Pine. Investigation into means of raising suitable planting stock in one year have continued at Yarraman. The first trial (mentioned in previous reports) involved inorganic fertilizer treatments, different tube types and different sowing techniques. After one growing season in the field it was apparent that effects of nursery fertilizer treatments continued in the field in that mean height was still greatest for the heavy nursery fertilizer treatments. Height increments in the field, however, were fairly uniform for different nursery fertilizer treatments.

In the nursery stage the polythene tubes gave better growth than the metal tubes, but is is now evident that the metal tubes provide a more stable core of soil for outplanting and mean height increment in the field was significantly greater for the stock raised in metal tubes.

In general, stock is developing well in the field and although a second measure has not yet been carried out, inspection indicates that stock is taller and better developed than routine stock of the same sowing planted out one year later.

Field Development of Young Hoop Pine—Mean Height (cm) after One Growing Season in the Field

Tube	Sowing Method	Fertilizer					Mean
		Control	Aquasol	Q5	Aquasol + Q5	Mean	
Polythene	Broadcast ..	20·5	23·5	20·0	25·0	22·2	22·3
	Drill	22·0	23·5	20·5	23·5	22·4	..
Metal	Broadcast ..	25·5	24·0	23·0	24·5	24·2	25·2
	Drill	26·0	26·0	26·0	26·5	26·1	..
	Mean ..	23·5	24·2	22·4	24·9	..	23·7

A second trial involved the use of various organic and inorganic fertilizers in tubing soil with a glasshouse effect as another major variable. Resulting stock was outplanted in November, 1973. Results of the nursery stage still await statistical analysis, but the table indicates that despite the mild winter there has been a considerable response to the warmer conditions encountered in the glasshouse. There would appear to be no response to the addition of organic fertilizer to the tubing soil while the addition of inorganic fertilizer appears to have depressed growth.

MEAN HEIGHTS (cm) OF YOUNG HOOP PINE RAISED UNDER DIFFERENT FERTILIZER REGIMES AND WITH DIFFERENT COVERING

Cover	Organic Fertilizer	Inorganic Fertilizer			Mean	Mean
		Nil	NPK 1	NPK 2		
Sarlon Only	Nil	8·98	8·02	8·79	8·60	..
	Cow Manure ..	9·58	8·59	9·04	9·07	8·83
Sarlon Plus Glasshouse	Nil	13·08	9·41	9·40	10·63	..
	Cow Manure ..	11·97	9·19	9·80	10·32	10·47
..	Mean	10·90	8·80	9·26	..	9·65

Flowering and fruiting studies of lantana in Hoop Pine plantations were carried out at Imbil from 1962 to 1970. These showed flowering occurred twice per year, in the autumn or early winter and again in spring or early summer. In the absence of an older pollen source viable seed is not produced until a plant is about 40–45 months old. However, where a pollen source of this age, or older, is available lantana produces viable seed at age 27 months. The period between flowering and production of seed is one month. The spring flowering produces much more viable seed than the autumn flowering.

Seed germination tests in the nursery have shown that germination is spread out over three and a-half years, but is 90 per cent. complete after two years. The pattern of germination in the field appeared to be the same as in the nursery tests. Germination rates are faster in the warmer, wetter months.

The importance of birds in spreading lantana seed was not determined. Lantana development was severely restricted where light intensity was low. A scrubwood understory inhibits lantana growth. It was recommended that healthy external and internal scrub breaks be retained as a seed source for a scrubwood understory in the plantations.

(ii) TRIAL PLANTINGS. Assessment of species trials at Imbil should be completed later this year. Much of the latter part of 1973 was spent collating growth data on all species trials established on sclerophyll forest sites in the Yarraman District. In conjunction with this work, a broad survey of the soils and vegetation of these areas was undertaken to:—

(a) provide more information on soil/vegetation associations for delineation of useful soil/vegetation types;

(b) gauge the extent of marginal forest areas within the main Hoop Pine plantation network, and their composition according to the various types determined in (a);

(c) determine which areas, if any, would be suitable for future plantation establishment.

Investigations were largely based on locally available "plantability" maps developed from previous strip surveys of these areas. Such maps show vegetation types, simple soil profile descriptions and respective boundaries where possible. A total of 237 sites was located within the various forest areas of Yarraman, Benarkin, Googa, and Mt. Binga. These data were then compared with the original strip surveys to delineate soil/vegetation types. Pertinent points which have emerged from the data are:—

(a) the growth of Radiata Pine and Patula Pine is relatively rapid when compared to other species on the same site. However there are problems with both species. Radiata Pine is subject to attack by *Diplodia* sp. particularly following summer hailstorm damage sometimes resulting in total loss, whilst severe drought losses occur with Patula Pine;

(b) Hoop Pine and Bunya Pine, for the most part, appear unsuited to sclerophyll forest sites when planted without intensive site preparation.

Frost sensitivity and blady grass competition are significant contributors to such poor growth;

(c) apart from patula Pine *P. pseudostrobus* var. *oaxacana* appears the most promising of the Mexican pines tried, but it and many of the Mexican pines have exceedingly poor form and carry large branches, usually to ground level which make them unacceptable for timber production;

(d) of other conifers tried Bahamas Caribbean Pine and Loblolly Pine generally exhibit the best growth on sclerophyll forest sites in the Yarraman District. The hybrid *P. caribaea var. caribaea* x *P. elliottii var. elliottii* has made reasonable growth on one site;

(e) overall results of trial plantings in the Yarraman District suggest that Radiata Pine, Patula Pine, Bahamas Caribbean Pine and Loblolly Pine warrant more extensive trial.

Planning is in hand for a new series of plots which will include the four species listed above and Hoop Pine. The effects of site preparation, grass control and fertilizer, will also be investigated.

Forest Soils and Nutrition Section

Soils and nutrition research is now conducted at several field centres with overall supervision by the Section leader in Brisbane. Activities were expanded during the year with initiation of nutritional work in White Cypress Pine forests and the establishment of a large co-operative project with Tree Breeding Section on the nutrient requirements of tropical pines in 29 trials involving four species and differential fertilizers applied in standard designs permitting inter site comparisons to be made.

Several papers were published or prepared during the year by section staff: "Provenance x Soil Environment Interation in eight months old *Pinus caribea var. hondurensis* . . ." in Tropical and Progeny Research and International Co-operation, 1974, IUFRO: "Zinc Uptake by Ecto- and Endo-Mycorrhizas of Conifers" (joint paper with C.S.I.R.O. staff), Soil Biology and Biochemistry 6, 1974: "An Approach to Commercial Revegetation of Sand Mined Areas in Southern Queensland", and "Species, Environment and Fertiliser Interaction in Pine Plantations in the Bundaberg District . . ." in Proceedings Institute Foresters Australia 7th Triennial Conference 1974; "Revegetating Surface-Mined Areas and Spoils in Northern Australia, Particularly Bauxite at Weipa", to Regional Symposium on Mining Rehabilitation in Northern Australia, 1974; "The Effect of Management Practices on Soil Fertility Status of Beerwah Forest Nursery" and "The Use of Organic Amendments in Southern Pine Nurseries" in Qld. Department Forestry Research Paper No. 3.

(i) EXOTIC PINES—SOUTH AND CENTRAL QUEENSLAND. Foliar sampling of fertilizer experiments in Honduras Caribbean Pine at Byfield and in Slash and Loblolly Pines further south, was carried out during the year. While optimum foliar phosphorus levels have been established for the southern pines, they have not yet been established for Honduras Caribbean Pine. It is hoped the position with this species will be clarified during the coming year

An experiment established in 1968 on a groundwater podzol soil near Bundaberg has shown large responses to fertilizer. No difference was shown between three methods of site preparation ripping, mounding and complete cultivation. Previous experimental work had shown that some form of preparation is essential for these sites. At age 5½ years, Bahamas Caribbean Pine has shown the best performance to date. Results are shown in the table.

RESPONSE OF FOUR *Pinus taxa* TO FERTILIZING ON A GROUND WATER PODZOL AT GREGORY, NEAR BUNDABERG

Fertilizers*	Mean Height (m) Age 5½ Years Mean of 6 Observations				Mean of 24 Observations
	Slash Pine	Honduras Caribbean	Bahamas Caribbean	Cuban Caribbean	
Nil	1·72	1·86	2·07	1·59	1·81
P	4·66	4·86	5·25	4·59	4·84
P + N	4·94	5·61	5·85	4·78	5·30
P + N + K	5·31	5·89	6·13	5·43	5·69
P + N + K + T	5·75	6·02	6·50	5·54	5·95
Means of 30 Observations ..	4·47	4·85	5·16	4·39	..
	Means of		30	24	6
	L.S.D. P = ·05		·35	·35	NS

* P as superphosphate; 620 kg/ha; N as urea 120 kg/ha;
K as muriate of potash 248 kg/ha; T as mixture of Cu, Zn, B and Mo.

The nitrogen dressing applied at planting was responsible for significant plant losses and considerable damage as fertilizer burn. Slash Pine was the most tolerant species while Bahamas Caribbean Pine was the worst affected.

In terms of stand development Honduras and Bahamas Caribbean Pines are the best developed. Bahamas Caribbean Pine performed best for the first two seasons. Slash Pine outperformed Cuban Caribbean Pine in the early stages of this experiment but at the recent measure is just superior to the Cuban but inferior to the two other varieties of Caribbean Pine.

All *taxa* have shown a marked response to superphosphate with a lesser response to nitrogen, potassium and trace element mix. The average response to superphosphate is in excess of 165 per cent. and the additional response to nitrogen, potassium and trace element mix is 9·5 per cent., 7·4 per cent. and 4·6 per cent. respectively. The response to phosphorus is continuing whereas that to nitrogen does not persist past the third season. The response to potassium and trace element mix is continuing. All species have shown the same magnitude of response to phosphorus fertilizing; the maximum response to date for each *taxon* was obtained in the fourth or fifth season.

Further experiments have been established to elucidate further responses to fertilizing at Bundaberg using the three varieties of Caribbean Pine and Slash Pine. One field experiment is designed to investigate the interaction between, phosphorus, lime and a trace element mix on a very acid (pH below 4) podzol. A further trial covering 25 ha, established on a soil catena extending from a good ridge site to a poor swamp site, examines responses to nitrogen, potassium and trace element mix applied in the presence of basal phosphorus. A trial has been established on a ridge site (lateritic podzolic) to quantify the long term response of the three varieties of Caribbean Pine to additions of phosphorus with and without a basal dressing of nitrogen, potassium and trace elements.

A review of nutrition of Patula Pine growing on deep lateritic krasnozems at Pechey was completed during the year (see 1973 Report). Site index of established plantations is correlated with foliage phosphorus and potassium status [equation (1)] and with soil pH, available phosphorus and cation status [equation (2)].

$$\text{Log S.I.} = 2{\cdot}531^{**}\ P + 0{\cdot}3443^{*}\ \log K + 0{\cdot}1717$$
$$R^2 = 0{\cdot}9761^{**} \qquad \text{Equation (1)}$$

$$\text{Log S.I.} = -0{\cdot}04668^{***}\ pH + 0{\cdot}3541^{***}\ \log Pa - 0{\cdot}01132^{***}\ \frac{Ca + Mg}{K} + 0{\cdot}1462$$
$$R^2 = 0{\cdot}9992^{***} \qquad \text{Equation (2)}$$

These results have been confirmed by glasshouse and field trials in which responses to phosphorus and potassium have been obtained. Glasshouse work has demonstrated the importance of soil moisture in these deep well drained soils; the response to phosphorus is independent of soil moisture level which directly affects growth, whereas optimum response to potassium is dependent on an adequate moisture supply. In the field, 5-year-old Patula Pine have shown best growth when fertilized from establishment with a mixture of superphosphate and potassium chloride equivalent to 75 kg/ha phosphorus plus 78 kg/ha potassium. Nineteen-year-old stems also have responded to combined dressings of superphosphate and potassium chloride.

A three-year-old experiment established to investigate the productivity of the second rotation of Slash Pine was reviewed during the year (see 1970 report). Stock raised from seed collected from the first rotation trees was planted in July, 1970, on a site which previously carried a 30-year-old stand of Slash Pine. Although direct growth comparisons of the first and second rotation will not be available until age six, growth and general health has been quite satisfactory to date on this second rotation site. Complete ploughing without burning as compared to burning only of the site prior to establishment of the second rotation has improved early growth, increasing mean height from 2·0 m to 2·3 m. A fertilizer trial established on the site has demonstrated an early response of 10 per cent. to superphosphate and a possible response of 4 per cent. to nitrogen. No response to liming has been obtained. There has been no interaction between site preparation and fertilizing. An indication of nutrient distribution of the study area can be gauged from the table.

NUTRIENT DISTRIBUTION (kg/ha) ON SECOND ROTATION SITE PRIOR TO SITE PREPARATION

Part of Ecosystem	Nutrient Content—kg per hectare				
	Nitrogen	Phosphorus	Potassium	Calcium	Magnesium
Surface Biomass*	148	8·6	50	126	25
Nutrients in soil 0–10 cm† ..	462	29·0	218	2 419	307
Removals in Logging‡ ..	243	5·3	80	166	46

* After felling and prior to site preparation. Data includes tree crowns.

† Total nitrogen and phosphorus—exchangable potassium, calcium and magnesium. Before site preparation. Data includes imputs from decompomposition of litter and thinning slash.

‡ Data includes removals in thinnings and clear fellings.

The surface biomass contains between 54 and 76 per cent. of the estimated total quantity of nutrients (except phosphorus) removed from the site in logging. More phosphorus is present in the surface material retained than is removed from the site in logging. After burning and consequent reduction of the surface material the pH of the surface one centimetre of soil increased from 4·6 to 6·0. The nitrogen content of the surface also increased but due to the loss of surface material there has been a net loss of 32 kg of nitrogen per ha from the burnt site. The total phosphorus content of the surface soil remained unaltered by burning; the phosphorus from burnt slash accumulating largely in the surface centimetre of soil. The exchangeable potassium, calcium and magnesium levels were increased by burning, this increase being confined to the surface one centimetre.

(*ii*) TROPICAL PINES—NORTH QUEENSLAND. The field omission trial reported last year (see 1973 report) has been maintained; statistical analysis of height growth for 1972–73 season (latest data available) confirms the existence of phosphate and nitrogen deficiencies on the swamp site and of phosphorus on the ridge site; slight trace element responses on both sites are not statistically significant. Growth on the swamp site without fertilizer is inferior to that of the ridge site but with fertilizer growth is equivalent on the two sites. Responses to treatments are shown in the table.

RESPONSE OF HONDURAS CARIBBEAN PINE TO FERTILIZING ON SWAMP AND RIDGE SITES AT KENNEDY (latitude 18° 20′ S.)

Site	Height Increment 1972–73 (cm) Means of 3 Replications								
	Fertilizer Treatment								Mean
	Nil	All On	Minus N	Minus P	Minus K	Minus Ca	Minus Mg	Minus Traces	
Ridge	38·6	46·0	38·7	30·1	40·5	45·2	43·7	40·9	40·5
Swamp	27·9	49·8	35·1	24·5	53·7	45·7	58·5	45·5	42·6
Mean	33·2	47·9	36·9	27·3	47·1	45·5	51·1	43·2	..

L.S.D. p = ·05 — Interaction 11·0 — Fertlizer 7·8

Multiple regression analysis of data from a series of trial plots of Honduras Caribbean Pine planted on a variable site, has indicated that factors influencing survival differ from those promoting growth. Survival at age three years was correlated with time of planting, the age of the trees, the degree of site preparation and the depth to clay (R^2= 0·6465, significant at 0·01 per cent. level); height growth on the other hand was correlated with the age of trees (as would be expected), the degree of site preparation and the soil characteristics depth to clay, pH, texture and soil chroma (R^2=0·8465, significant at the 0·01 per cent. level). From this analysis, it will be possible to draw up a schedule for site selection and preparation for certain areas in the Kennedy–Cardwell region.

(iii) Hoop Pine—Brisbane Valley. Investigations into the nature of a malformation problem in young plantation Hoop Pine have continued. All trials mentioned in previous reports have been maintained and assessed for malformation. In general though, the degree of malformation decreased in 1973 and particularly in 1974, and the series of large experiments established in 1972–73 have not shown significant results.

Despite the reduced incidence of malformation overall, the most important finding from the 1973 assessments is that the application of boron in the form of borax has significantly (at 1 per cent. level) reduced the proportion of stems exhibiting stem bends and kinks in current growth. A copper-boron-sulphur factorial trial (suggested by the results of some early foliage analyses indicating lower copper, boron and sulphur levels in malformed plants) was established in March 1971. Treatments were $CuSO_4$ at 336 kg/ha, Borax at 0·56 kg/ha and elemental S at 126 kg/ha. The percentage of plants affected with stem bends and kinks in current growth as at June 1973 is shown in table below.

Percentage of Hoop Pine Stems with Malformation in Current Growth 5–72—6–73

	Nil Sulphur		Plus Sulphur		Copper Means
	B_0	B_1	B_0	B_1	
Cu O	46·2	13·4	38·3	9·6	26·9
Cu 1	38·9	14·9	37·8	13·4	26·2
Sulphur Means	28·4		24·8		
Boron Means ..	B_0 40·3		B_1 12·8		

Similar results were achieved in the 1972 assessments, suggesting that boron deficiency may be involved in the disorder, perhaps becoming apparent only during periods of maximum height growth activity.

As an adjunct to nutritional studies with Hoop Pine, a glass house omission trial in sand culture was conducted to determine levels of nutrients in young seedlings (12 months old). Deficiency symptons were recorded for all nutrients and foliage content of the respective nutrients are presented in the table below. Copper and molybdenum were the only nutrients for which deficiency levels could not be established.

Deficiency Levels in Hoop Pine Seedlings from Sand Culture
(Means of 3 replicate pots)

Fertilizer Treatment	Nutrient										
	Per cent.						ppm				
	N	P	SO_4–S	K	Ca	Mg	Mn	B	Cu	Zn	Fe
Complete	2·77	0·34	0·135	1·46	0·60	0·057	43	17	4	17	58
Deficient	0·92	0·04	0·035	0·20	0·18	0·016	21	4	8	13	32

(iv) Hoop Pine—Mary Valley. A second omission trial in the series planned for forest sites (see 1973 Report) was established in late 1973 on a site previously occupied by Grey Ironbark and Forest Red Gum with an understory of Wattle and lantana. Comparison plots have been established in adjacent routine plantings to measure the response in experimental plots to the site preparation and clean tending that is basal to all fertilizer treatments. The initial outstanding response to cultivation in the 1972 planting is still evident and is repeated in the 1973 trial. Future plantings will include *Pinus* sp. as well as Hoop Pine.

Further foliage analyses to hand for an older trial established on a scrubby forest site (see 1973 Report) indicate that cation status (K, Ca, Mg) and boron levels are satisfactory for healthy growth but sulphur is only marginal; no data is yet available for copper and zinc. The two nutrients known to be marginal on this site are now nitrogen and sulphur; refertilising will be delayed until trace element analyses are completed.

Response to treatment of Hoop Pine dieback with fertilizers and fungicides (see 1973 Report) has not been demonstrated perhaps because of a general decline in dieback throughout the affected area since 1972. However, there is evidence of a positive response in tree height growth involving the application of sulphur either in fungicide or fertilizer form, and this might be regarded as further evidence for marginal sulphur deficiency in certain Hoop Pine areas of the Mary Valley.

A series of permanent plots in Hoop Pine plantations at Imbil was again sampled for soil pH in winter 1974. The aim of these plots is to monitor any changes in soil pH. Forty-two years records on four stands planted 1917–1924 and first sampled in 1932 are now available. There is a trend towards increasing acidity with the passage of time, but pH has been relatively constant with little consistent rise or fall since 1949, in both 1917 and 1924 plantings. The average level about which determinations fluctuate varies from 6·5 to 6·9 depending on the plot. These levels are normal, and fall within the range for rainforest soils with Hoop Pine as a natural component of the vegetation—such soils from recent surveys have a pH range of 4·3 to 7·4 and a mean of 6·4, from 59 sampled forests.

(v) Softwood Nurseries. Hoop Pine stock from the second crop of long term nursery nutrition trials in the Imbil and Kenilworth nurseries were lifted and graded and samples prepared for chemical analysis. The aims of these trials are to determine the optimum use of mineral-nitrogen fertilizers in these nurseries in place of farmyard manure.

In the Yarraman nursery, the long term trial with Hoop Pine established in 1972 (see 1973 Report) was harvested and tubed for field outplanting. Observations to date have indicated marked differences between organic and inorganic fertilizer treatments.

Trials are continuing on the development of suitable tubing mixes for Honduras Caribbean Pine at the Kennedy nursery. A suitable mix based on sandy soil from Baird Creek modified by the addition of 15 per cent. filter press and 500 g of mineral fertilizer per 1 000 plants has been developed. Plants tubed in this mix have given good survival and had adequate mycorrhiza development. These trials are now being extended to the examination of the utility of the mix for direct sowing with various containers including jiffy pots, paper pots and plastic bags in order to overcome some of the tubing and planting difficulties experienced with a basic sandy mix in metal tubes.

(vi) Cypress Pine—Dalby District. Investigations have been initiated into the nitrogen economy of White Cypress Pine following observations that increment on Cypress has been less than might be expected following eradication of Bulloak with arboricides. The suggestion that Bulloak may be important to the nitrogen nutrition of Cypress Pine, through its putative ability to fix nitrogen, is to be investigated. Basic data is being collected on the distribution of nitrogen in Cypress-Bulloak stands at Western Creek—intensive sampling of trees, litter and soils was completed in winter 1974.

Mature Cypress Pine stands have shown a positive response to the application of ammonium sulphate at approximately 400 kg N/ha added between September 1970 and January 1974. Over this period, fertilized trees have responded in diameter growth (0·35 cm 1970–73 compared to 0·23 cm for controls), crown density and increased flowering. Foliage and soil samples were collected in winter 1974 to ascertain the order of response and whether uptake of other nutrients has also been improved. Further trials are planned to measure the response of Cypress Pine to nitrogen applied at the regeneration phase or shortly after planting.

TREE BREEDING SECTION

Breeding work with *Pinus* species in Central and South-east Queensland is conducted from Beerwah Regional Research Station with technical assistance at other centres. Most of the work with Hoop Pine is carried out from the Imbil Regional Research Station with technical assistance at other centres. The progeny and provenance trials with Hoop Pine in the Atherton and Mackay Districts, and the work with Caribbean Pine and other tropical species in the Atherton District are co-ordinated with the southern work by O/C Tree Breeding Section.

(i) Exotic Pines

(a) SLASH PINE. The great superiority over routine stock of single-cross and open-pollinated families of selected superior trees has been demonstrated in Queensland for about 25 years. But studies comparing routine stock and bulked orchard stock could not be started until soon after the orchards began to produce seed abundantly. Such a study was planted in 1973. For an interim assessment of the performance of bulked seed orchard stock, sample plots were established in the first major plantings of orchard stock at Beerburrum (1966 and 1967), and in routine stock and a single cross in an adjacent experiment. The plots are on comparable well-drained sites. Measures were made at age 7 years, and stem form and crown characteristics were assessed at ages 7 and 8 years. Trees were also classifed for "acceptability".

Results are present in the table below.

COMPARISON OF GROWTH AND STEM AND CROWN QUALITY OF ROUTINE, ORCHARD AND SINGLE CROSS STOCK AT THE AGE INDICATED (DATA FOR 2 PLOTS PER POPULATION)

Population	Seed Batch and Weight	Year of Planting	Stocking and Growth at Age 7 Years			Tree and Crown Features*				
			Trees (No/ha)	Ht. (m)	D.B.H. (cm)	B.A. (m^2/ha)	A	B	C	D
Routine ..	N159R .. 112 kg	1966	1 135	8·9	14·9	19·9	16	20	10	7·1
Orchard ..	N1490 .. 52 kg	1966	1 105	9·3	17·0	25·1	35	22	8	7·7
Orchard ..	N1630 .. 191 kg	1967	1 070	9·9	16·3	22·2	47	11	4	7·8
Single Cross ..	G20 x G40 Small	1966	1 148	9·7	15·7	22·2	72	6	5	8·8

* Orchard batch N1630 assessed at age 7 years: other populations assessed at age 8 years.

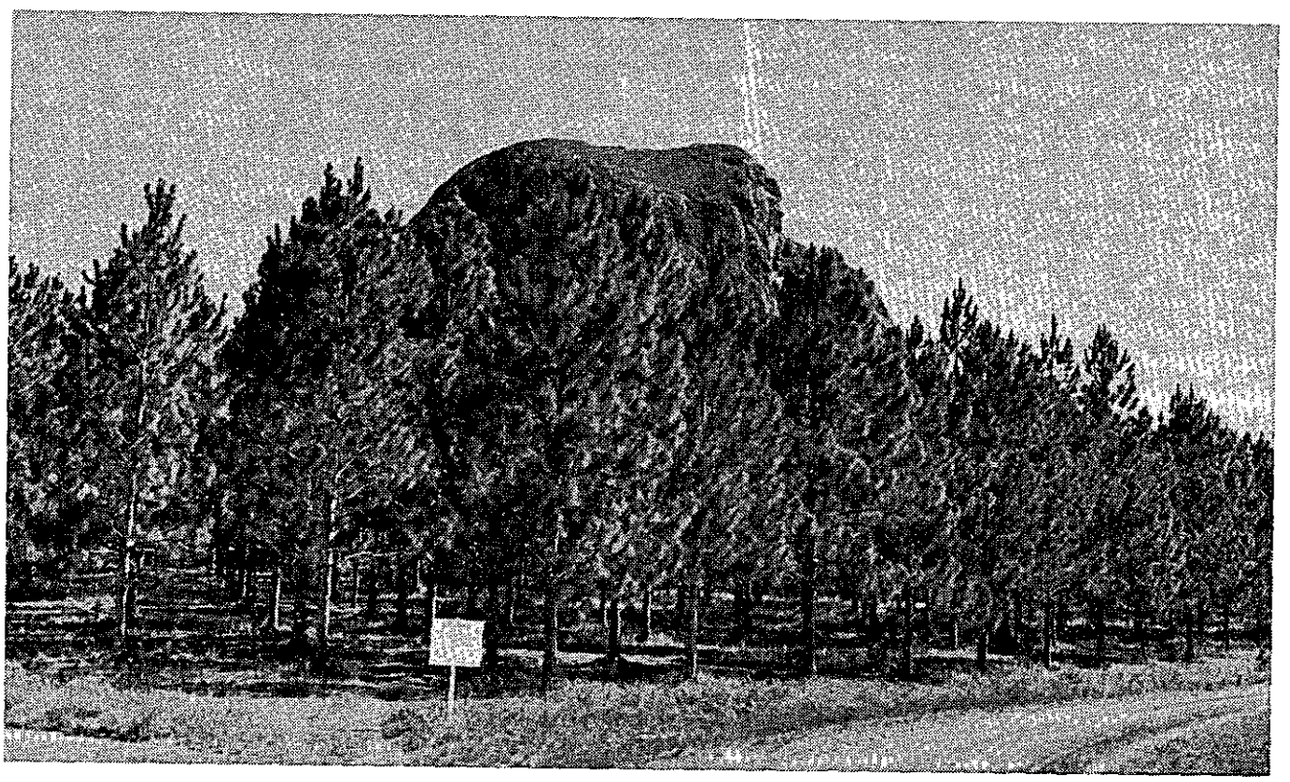
A: Percentage of "acceptable" trees, i.e., dominant or codominant trees scoring 8 points or better for butt straightness (out of a possible 10), and with no double leader, no heavy ramicorns and no more than 2 moderate ramicorns.

B: Percentage of trees with heavy ramicorns.

C: Percentage of trees with double leaders.

D: Mean score for butt straightness out of a possible 10.

The results indicate that bulked orchard stock is more vigorous and has better stem quality than routine stock. Further-more, the orchard stock resulting from the larger seed batch and later collection (N1630) has better stem quality than the other lot (N1490). This confirms the frequent observation that stock from a young orchard, where pollen is in short supply and from only a few clones, is inferior to that from the mature orchard. It is confidently expected that orchard stock from seed collections made since 1969, when the orchard came into very heavy production (664 kg), will be of rather better quality than the stock of batches N1490 and N1630.



Slash Pine Seed Orchard at R.589, Beerwah—Brisbane District.

(b) Caribbean Pines. Most of the work on Caribbean Pines concerns the Honduras variety, but some work is also being carried out on the Bahamas variety and this is reported separately below.

Further field grafting of Honduras Caribbean Pine was carried out in the Kennedy seed orchard to replace some failures. Its first significant seed crop (5 kg) was harvested in 1974. A new mating plan was adopted for controlled pollination of superior trees of Honduras Caribbean Pine which have been selected for seed orchards and for the breeding of new selection populations. Each selection is polycrossed (20 standard pollens) and double pair mated. Such a scheme provides well for future estimation of important parameters such as parental breeding values, variances and convariances, etc., and for future selection of a new generation of superior trees of fully known pedigree. A total of 33 controlled crosses was made at the two breeding centres (Cardwell and Byfield).

Observations were continued on comprehensive provenance trials of Bahamas Caribbean Pine that were planted on many sites between 1966 and 1968. A preliminary review of the 1966 plantings indicated there is relatively little geographic variation within the taxon, although northern provenances tend to grow faster, and southern provenances tend to display better stem form. Most plantations in Queensland are of northern provenances. Ten new superior trees were selected and, together with the best 5 of 22 earlier selections, were field grafted in Section 2 of the combined clonal bank-seed production area that is being established progressively at Byfield.

(c) Hybrids of the Varieties of Slash Pine and Caribbean Pine. The F1 hybrid of Slash Pine and Honduras Caribbean Pine, first planted in 1958, is the most vigorous cross, but sound seed has been very difficult to produce in quantity due to seasonal isolation of the varieties and very low viability of the seed. There are indications, however, that this problem may be overcome in one or two ways: (a) through production of F2 hybrid seed (which has high viability) in a clonal orchard of selected F1 trees which flower synchronously: and/or (b) through production of F1 seed in special orchards employing late-flowering clones of Honduras Caribbean Pine many of which have been observed and several have been selected recently. Use of possible method (a) above is strongly encouraged by preliminary results of studies on the growth of F2 hybrids. In a Beerwah study at 3·5 years of age the F2 hybrids are only slightly less tall than F1s (see table). Also notable is the excellent performance of the F1 hybrid of Slash and Bahamas Caribbean Pine in its first field trial. Other studies show all three hybrids are more vigorous than their parental varieties when grown on artificially drained swampy sites.

Mean Height (m) of 3·5 Year-old Hybrids of Slash Pine (S) Bahamas (B) and Honduras (H) Caribbean Pines Grown on Fertilized Swamp and Ridge Sites at Beerburrum (Means of 4 Replications per Site)

Hybrid	Swamp Site	Ridge Site	Sites Combined
S x H—F1	3·32	4·65	3·77
S x B—F1	3·34	4·30	3·66
S x H—F2	3·19	4·46	3·61

(d) Loblolly Pine. The second significant seed collection (7 kg) was obtained this year from the small clonal orchard (1 ha) established in 1969 and 1970.

(e) Radiata Pine. Several highly superior families have been noted that are relatively well adapted to the marginal, subtropical environments of south eastern tablelands where the species is grown in Queensland. Families from New Zealand selection PR55 are notable for superior growth rate, excellent stem straightness, fine branches and relative freedom from die-back. The Cedros and Guadalupe Islands provenances are greatly inferior to local material descended from mainland populations.

(f) Miscellaneous Tropical Pines. Observations continued on the adaptability, yield and variability of several tropical pines being tested widely in Queensland.

(ii) Hoop Pine

(a) South East Queensland. Several progeny trials at Imbil have been measured and assessed recently at ages 9 to 10 years. Results of recent studies on two open-pollinated progeny trials that were planted in 1964–65 and reassessed at age 9·5 years are given in the table. (See 1969 Annual Report for data on progeny heights at age 4·5 years).

Growth and Stem Straightness of Open-pollinated Families from Superior Phenotypes and of Routine Stock at Age 9·5 Years (Means of 4 Replications) Imbil State Forest

Progeny Trial at Yabba				Progeny Trial at Coonoon			
Family	D.B.H. (cm)	Ht. (m)	Stem Straightness*	Family	D.B.H. (cm)	Ht. (m)	Stem Straightness*
H2	16·61	12·63	3·42	HG	17·24	11·55	3·49
H6	16·51	12·06	3·48	HJ	15·52	10·95	3·02
H26	16·40	11·55	2·95	H20	15·23	10·20	2·93
H63	16·23	11·24	3·52	ST63	15·03	10·65	3·05
H10	16·20	11·79	3·07	ST260	15·03	10·22	3·26
H61	16·09	12·39	3·48	H28	14·85	10·11	3·08
H23	16·03	12·07	3·27	ST60	14·65	10·76	3·10
H60	15·60	11·45	3·21	HL	14·62	10·45	3·13
H64	15·57	10·58	3·46	ST239	14·61	10·23	3·00
H15	15·32	11·02	3·50	ST181	14·16	9·75	3·20
Means	16·06	11·68	3·34	Means	15·09	10·49	3·13
Routine	14·07	10·43	2·91	Routine	13·40	9·22	2·77
Genetic Gains (%)	14·0	12·0	15·0	Genetic Gains (%)	13·0	14·0	13·0

* Mean score on a scale of increasing merit from 1 to 6.

The growth and stem straightness of all 20 families from selected superior trees were found to be better than that of routine stock. This indicates that routine use of seed from such superior trees would give considerable genetic gain. Stock from a clonal seed orchard of the same plus trees should give double the gains shown in the table. The excellence of the open-pollinated progeny of select tree No. H2 and the relatively poor quality of routine stock are clearly seen in the paired photographs. They also show that the H2 progeny has gained full control of the site and suppressed weed growth, while the routine stock has not yet closed canopy. Comparison of the results obtained at 4·5 and 9·5 years of age show that the rankings of families for height growth have changed little.

All parents of the families listed in the Yabba trial (except H64) and eleven others (not included in the tests reported) were included in the clonal seed orchard (7 ha) started at Imbil in 1965.

Open pollinated progeny trial of *Hoop Pine*, Imbil Sub-District, planted 9 ft. x 9 ft. aged 9½ years showing routine stock on left and progeny of select tree H2 on right. Note superior growth, stem straightness and site control of progeny stock.

(*b*) NORTH AND CENTRAL QUEENSLAND. The provenance trials planted early in 1972 and 1973 on 7 sites in the Atherton and Mackay Districts, and each containing 12 or 16 provences were maintained. Initial survival was very high on all sites, but moderate to heavy losses have occurred on a few sites.

(iii) MISCELLANEOUS. The Officer in Charge, Tree Breeding Section, was an invited lecturer to the FAO/DANIDA Training Course on Forest Tree Improvement held in Kenya in September–October 1973. As Chairman of IUFRO Working Party S2.03.1 on Breeding Tropical Species he attended a joint meeting of IUFRO Working Parties S2.02.8 and S2.03.1 at Nairobi immediately after the Training Course. Three papers from Queensland were presented at the meeting—"Genetic variation among populations of *Pinus caribaea* var. *bahamensis* Barr. and Golf. grown in Queensland, Australia, a preliminary report", "Progressive establishment of a combined clonal bank and clonal seed production area of *Pinus caribaea* var. *hondurensis* Barr. and Golf. between 1960 and 1973 in Queensland, Australia," and "Establishment of a co-operative progeny trial of *Pinus caribaea* var. *hondurensis* Barr. and Gold. in Australia and Fiji."

Mensuration and Biometrics Section

Biometrics staff remained at a strength of 3, all employed for the majority of time on service work, which showed an increase on the previous year. The number of experiments on which analysis of variance and/or convariance was carried out totalled 112; involving approximately 2 000 individual analyses using the computer program GAVO. A further 90 requests were received for analysis using a variety of other programs available but the majority were for regression analysis and graph plotting. A total of 420 individual regressions were calculated using the step wise regression program FRAS, and 350 graphs were generated by the program PLOT.

Program GAVO was further expanded and now has the ability to handle up to 8 factors. Other facilities added provide for data listing, printing of residuals, output of 5 per cent., 1 per cent. and 0·1 per cent. L.S.D.'s and a test for linear, quadratic and cubic trends in the main effects.

A new program was developed to sort and summarise the mass of data collected from Slash Pine nursery technique and field establishment trials established over the last few years. Data are presented in a form suitable for analysis by regression techniques.

Data from quarter chain linear sampling in North Queensland rainforests were processed during the year, including both reassessments and new work. Changes to programs were required in the case of reassessment because of changes in field recording methods.

Further work was carried out on squirrel gliders for National Parks Branch. The data, measurements on skull and other body features, were run on two C.S.I.R.O. classificatory programs. The results supported the previous classification of the individuals into two separate groups, as indicated by the program mentioned in the last Annual Report. The results also isolated a few individuals that did not fit into either group and on which further investigation would be warranted.

Two programs were developed and used on data from Hoop Pine Mill studies to summarise recovery by grades and board sizes.

Basal area predication functions were developed for Honduras Caribbean Pine using data from thinning and other suitable experiments. The model which explained most of the variance (72·3 per cent.) was—

$$\begin{aligned} BAI = {} & -3{\cdot}639 + 1{\cdot}268A + 0{\cdot}06408B + 0{\cdot}1084\,B^2/A^2 \\ & + 279{\cdot}0\,B/(S.A.) - 0{\cdot}005443\,A.S. + 37{\cdot}62\sqrt{B/A^3} \\ & + 0{\cdot}001245\,R_1 - 0{\cdot}001262R_2 - 7{\cdot}909R_1/R_2 \\ & + 0{\cdot}00006599\,A.R. - 1{\cdot}947\,B.A./S + 0{\cdot}0006951\,S.SI \\ & - 0{\cdot}03716\,B.SI/A + 0{\cdot}01653\,\sqrt{B/SI} \end{aligned}$$

where

BAI = basal area increment (square feet) for the current year.
A = age (years) at commencement of period
B = standing basal area (square feet) at commencement of period
S = stocking (stems per acre)
R_1 = rainfall (points) for the current year
R_2 = rainfall (points) for the previous year
SI = site index (feet)

Standing basal area, stocking and their interactions are the most important variables. Site index was the least important variable in this analysis, probably because of its distribution within the data. Overall, the present Caribbean Pine experiments do not provide a well distributed set of data for regression analysis, and action is in hand to establish further plots to improve the position for future work. An interesting indication from the present data is the apparent loss of about 0.5 square feet of basal area increment in the year immediately following thinning.

An investigation was made into the evenness of spread of "Super King" fertilizer obtained by the tractor mounted "Vicon" spreader. An intensive systematic sampling scheme was employed and initial results indicate that the degree of evenness obtained is very satisfactory.

As with aerial application, the larger and more uniform the fertilizer particle size, the better the distribution.

A simple random sample was made over one compartment at Toolara to determine the number of sample plots required to estimate stocking in newly planted areas to within ± 25 trees per hectare. It was determined that 15 circular plots of 0·05 ha per compartment would give the desired degree of accuracy.

Mensuration staff increased by one with the secondment of an additional forester to the section. Metrication continued to occupy an important place in most activities of the section. All experiments are now being measured in metric units and all basic computer programs to handle the data have been re-written to accept both metric and imperial measurements, all output being in metric units. Programs for the production of full D.B.H., height, basal area and volume summaries of plantation experiments were completed during the year, and efforts will now be concentrated on the production of these metric summaries for all major experiments. The data will then also be in a suitable form for further studies such as site index and basal area growth models.

Metric volume tables for the major plantation species have been completed and issued for use in timber sales. A small PLAN subroutine was written to permit these volume functions to be assessed with maximum efficiency in the computer system for timber sales being developed by A.D.P. Section.

Sample trees have been measured in a number of trial plots of Slash Pine and Caribbean Pine varieties as a guide to the interpretation of early growth measurements. Samples were small and stands still relatively young, but interesting trends are evident in bark thickness and volume relationships. Below are set out bark volume as a percentage of over bark volume, and under bark volume as a percentage of that predicted by the standard Slash Pine volume table.

Taxon	Bark%	Volume%
North Florida Slash Pine—		
(Beerburrum)	26·8	100·0
(Gympie)	27·6	97·9
(Maryborough)	27·2	99·1
South Florida Slash Pine	35·5	71·1
Bahamas Caribbean Pine	26·9	96·9
Cuban Caribbean Pine	35·4	95·6
Honduras Caribbean Pine—		
(Gympie)	32·1	75·4
(Maryborough)	29·5	78·0
North Florida Slash Pine x Honduras Caribbean Pine	27·4	96·5
Longleaf Pine	25·9	108·5

Volumes of South Florida Slash Pine are extremely poor relative to the other taxa and this must be considered in evaluating the performance of this variety under local conditions. Honduras Caribbean Pine also shows relatively poor volume relationships but on suitable sites its rapid growth more than compensates for this.

The non-linear function $H = A\,(1-e^{-kt})^{\frac{1}{1-m}}$ has been investigated in relation to the revision of site index tables this is an excellent model for describing the development of predominant height with age on individual plots where an adequate age range is included. In Hoop Pine the function has been fitted to individual plot data, but attempts to relate individual parameter estimates to site index suggest the presence of a number of different height development patterns. This will be further investigated.

Studies in the bark volumes of North Queensland rain forest species have commenced, to permit the preparation of log volume tables based on length and centre diameter over-bark. Preliminary investigation suggests that the allowance presently used in North Queensland will require amendment.

All existing sample tree data are being converted to metric units. This involves a major change in the way in which the data are recorded and organised, but will mean easier access to information for mensurational studies in future. A new set of subroutines for manipulating the data has been written and tested, and is now in use in a number of projects.

Revision of the card key for the identification of North Queensland rainforest species continues to be a joint project involving this Department and the Forest Research Institute, Atherton. Further data were incorporated in the key during the year, and an undated version, covering 727 species produced for field testing before general issue.

NATIONAL PARKS

Park Management

The Forestry Act provides that the cardinal principle to be observed in the management of National Parks shall be the permanent reservation, to the greatest possible extent, of their natural condition and it is therefore essential that management practices be in conformity with this requirement.

Studies involving scientific and recreation requirements and visitor impact are in hand on some of the most heavily visited parks.

Two such areas are the Carnarvon National Park in the Central Highlands and Heron Island, in the Capricorn Group of islands.

This work involves a multidisciplinary team of zoologists, botanists, marine biologists and foresters with formal training in park planning and interpretation.

Within existing and proposed National Parks, due emphasis is being given to primitive, recreation, scientific and historic values in the compilation of and putting into practice of management plans.

Progress in covering the parks in the State with such plans has been slower than desired as the efforts of the team have been concentrated for a time on assessment of and acquisition of additional areas of National Park designed to preserve as complete a sample as possible of the diverse vegetation, habitats, and land forms within Queensland and its adjacent coastal waters. Urgency has been lent to this task by the stage and rate of development of the State.

For this same reason little progress has been made in the field of park interpretation. However, during the year, a forestry graduate transferred to the National Parks Branch to promote this aspect of park work. Initially attention will be given to the publication of brochures outlining for visitors the main features of individual parks to be followed at a later stage by more ambitious booklets to meet the needs of park enthusiasts and students. In addition, it is planned to establish interpretative facilities on the more popular National Parks.

Camping Area—Bunya Mountains National Park—Yarraman District.

Park Investigation and Proposal Work

The survey of areas for inclusion in the National Park estate continued with major activity on Cape York Peninsula north of the 16th parallel, the most difficult region yet covered. Isolation, lack of access and food supplies and oppressive heat impede the progress of the work and affects the physical resources of the staff. To overcome these and facilitate the conduct of the survey the co-operation of the Commonwealth has been sought and the Department of the Army is assisting by provision of a helicopter based in Weipa for use in this and other investigative work.

That the effectiveness of a National Park system within a region is not necessarily a function of the percentage area of the region reserved was amply demonstrated by a study of the situation in the high rainfall region of the central coastal areas completed during the year. The region involved is centred on Mackay and stretches from between Proserpine and Bowen to south of Carmila. Within this region is the greatest concentration of National Parks in Queensland, 88 parks, in area more than 280,000 acres, involving some of our largest parks. In spite of this, the study revealed some serious deficiencies. Some extremely good scenery had not been included in the system, and some of the most widespread vegetation types were not represented in any park.

An investigation of the Daintree River–Cooktown region was completed early in the year, a report has been prepared and recommendations made. Scenically, this region is one of the most magnificent in Queensland, and has great biological diversity and interest in fauna and flora. It is an area where Australian and New Guinea species mix.

Arising from previous work on the Peninsula the first National Parks on the mainland north of Cooktown were gazetted during the year. These were Reserve 4, parish of Melville, of 40,700 acres (including Cape Melville), Reserve 203, parish of Tupia, of 540 acres, near the homestead of Starcke Station.

Action has continued on a major park proposal in the Central Highlands area, surrounding Carnarvon and Salvator Rosa National Parks a region of great interest to visitors to inland Queensland. This year approximately 95,000 acres were gazetted National Park in the parish of Nardoo. This brings into the National Park system Brigalow and softwood scrub containing Bonewood (*Macropteranthea* sp.)—a habitat not previously represented in parks in this region. Small springs in isolated basins along the steep sandstone walls along the Great Dividing Range provide remote locations for the more adventurous to camp.

There is a need for substantial park reservations in areas of Central Queensland where pastoral and mining developments have led to a rapid growth in population. To provide for recreation and wilderness areas and preserve flora and fauna for scientific and education purposes a detailed study has been made of the region and extensions outlined for present National Parks and to existing Park proposals.

Around Gladstone several National Park proposals are in hand. It is hoped to extend Mt. Castletower National Park, centred on the northern end of the Many Peaks Range, to provide areas suitable for recreation, both picnicking and bush walking, and as an extensive wilderness area.

Following a detailed inspection of Curtis Island, proposals have been formulated for an extensive National Park to preserve a diversity of scenic coastline forms supported by an extensive area of marine plains and a range of coastal vegetation types. This Curtis Island proposal has great potential for both intensive and extensive recreational pursuits. Parts can also be used for educational purposes.

Several areas are being investigated in the Kroombit Tops Tableland area in an effort to provide an area of montane forest and rugged mountain topography.

The Blackdown Tableland, approximately 100 miles west of Rockhampton, is a mountain region to 3,200 feet and containing waterfalls and spectacular sandstone gorge and cliff scenery. The tableland is further enhanced by the unexpected forest types occurring there, together with occurrence of a number of rare species of plants. The area has considerable value for a range of recreational pursuits. It is hoped to incorporate in a National Park a sizable area of the tableland and surrounding lowlands. Near Rockhampton, several proposals resulting from the systematic sampling of coastal areas, and rain forest types, have been formulated. The proposal on Mt. Archer is one such case. The unusual "vine" scrub occurring on the range is of great interest particularly when coupled with the scenery contained in the area.

Similarly, the Townsville region has been the subject of activity for extension of existing National Parks.

Following announcement of the establishment of the Institute of Marine Science the National Park proposal on Cape Cleveland was considerably enlarged to allow formation of a large sized National Park designed to incorporate the existing Mt. Elliot National Park, with adjacent lowland country containing fresh and salt water swamps, sand dune vegetation and mangroves fronting Bowling Green Bay.

It is also planned to extend Magnetic Island National Park in the near future to include more of the headlands and beaches which provide much of the charm of the island.

It is hoped that in time, large area National Parks will be strategically placed around all the developing centres of population to provide the necessary open air recreation and wilderness characters which are a basic avenue of relief from the pressures of our increasingly urbanised areas.

The National Parks Estate

As at 30th June, 1974, there were 292 National Parks with a total area of about 2,760,803 acres. Eight new parks including two Marine National Parks, were declared during the year:

N.P. No.	Parish	Area	Date of Gazettal
		Acres	
1091 ..	Sarabah	3·5	29–9–73
4 ..	Melville	40,770	27–10–73
203 ..	Tupia	540	27–10–73
276 ..	Alton and Fairymount ..	1,380	8–12–73
846 ..	Fitzroy	80	20–4–74
4 ..	Nardoo	95,000	20–4–74
268 ..	Bunker (Heron/Wistari Reefs)	24,000	16–2–74
1495 ..	Trinity (Green Island) ..	7,400	16–2–74

The following areas were added to existing parks:—

N.P. 763 Grafton	1,070 acres
N.P. 16 Caree and Wathumba	21,800 acres
N.P. 1447 Mourilyan ..	68 acres

Two areas of 4·6 acres and 7 acres were excised from N.P. 641 Hewittville and N.P. 275 Conway respectively for tourist purposes. National Parks 641, 642, 643 and 644, parish of Hewittville, were amalgamated to form the one National Park 641, Hewittville. Similarly, National Parks 1359, 1404 and 763, parish of Grafton, were amalgamated to form the one unit N.P. 763 Grafton.

Brief notes on the six new terrestrial National Parks follow:—

NATIONAL PARK 1091, PARISH OF SARABAH: This area of 3·5 acres was generously donated to the Crown for National Park purposes by Miss A. Curtis, a resident of North Tamborine. It is situated in a bend of Canungra Creek, approximately 4 miles from the town of Canungra. The park carries undisturbed rain forest containing Black Bean (*Castanospermon australe*) over most of its area and is possibly the only example of this type of vegetataion remaining along Canungra Creek.

NATIONAL PARK 4, PARISH OF MELVILLE, is located in the Cape Melville area north of Cooktown. This area has as its main feature the rugged slopes of the Melville Range fringed by attractive beaches. Cape Melville is the northern extremity of a mountain range the main feature of which is massive outcrops of granite which should have great tourist attraction.

NATIONAL PARK 203, PARISH OF TUPIA includes Mt. Webb and is situated on the Morgan River area north of Cooktown. It is designed to preserve an area of rain forest of considerable scientific interest being developed on basalt and, as a consequence, much richer in life than rain forest developed on other parent materials in this area.

NATIONAL PARK 276, PARISHES OF ALTON AND FAIRYMOUNT is located on the Moonie Highway close to the township reserve of Alton. This area was set aside to preserve a sample of the said ridge vegetation types, including beautiful wildflowers which occur in certain restricted localities along the Moonie Highway.

NATIONAL PARK 846, PARISH OF FITZROY, was formerly held as a Perpetual Lease Selection by Mr. O. Forster of The Caves who surrendered the whole of the selection for National Park purposes. The park which is located north of Rockhampton and adjoins the Mt. Etna Cave system has considerable scientific value as it carries vine scrub developed on limestone.

NATIONAL PARK 4, PARISH OF NARDOO, extends along the Great Dividing Range for approximately 25 miles from the eastern boundary of Salvator Rosa National Park and includes a substantial area of easier country in the headwaters of several creeks which flow into the Nogoa River.

Apart from the scenic quality of the steep range country and several mountain peaks included, the area has added value in that certain vegetation associations, including some of the Brigalow types, occur there.

In addition to the above a total amount of $48,664.60 was expended from National Park funds for purchase of land for addition to existing National Parks and for new National Parks.

The major amounts were spent on additions to the Barron Gorge National Park and to the Lamington National Park system of the area surrounding and including the well known feature of Egg Rock in the Numinbah Valley.

These areas will be gazetted as National Parks during the coming year.

Marine National Parks

Queensland's first two Marine National Parks were gazetted this year.

HERON–WISTARI REEFS MARINE NATIONAL PARK: This marine park in the Capricorn Group offshore from Gladstone incorporates the coral reef surrounding Heron Island and nearby Wistari Reef and extends to a distance of ⅛ of a mile from mean low watermark at spring tides at the exposed outer edge of the reefs. The area of the park is approximately 24,000 acres.

GREEN ISLAND MARINE NATIONAL PARK: This marine park offshore from Cairns extends to a distance of one mile beyond the reef edge. The area of the park is approximately 7,400 acres.

Two Marine Biologists took up duty during the year. One, stationed on Heron Island, is investigating methods of assessing the structure and fauna composition of coral reefs. He is also carrying out proposal inspections of the reefs of the Capricorn and Bunker Groups. The other is stationed in Brisbane and is responsible for marine park proposal inspections elsewhere in Queensland waters. He is also researching the ecology and migration of marine turtles. Two positions for technical assistants to the Marine Biologists have been advertised and will be filled in the next financial year.

The broad inspection of areas suitable for declaration as Marine Park areas, in which further Marine National Parks may be gazetted, is continuing using the graduate staff, their technical assistants and National Park boat crews.

Within these Marine Park areas, further detailed inspection is underway to determine the areas most suitable for reservation as Marine National Parks.

It should be noted that Hinchinbrook Island and Hinchinbrook Channel National Parks already contain a considerable area of tidal mangroves in which most of the species occurring in Queensland are present. Interpretative work in this area is proposed in the near future.

The National Parks boats, the "Shearwater" and "Gannet" have been used for Marine National Park proposal inspections of the Capricorn and Bunker Groups reefs, five reefs between Grafton and Trinity Passages off Cairns and Low Isles Reef off Port Douglas. A park proposal is being prepared for the coral reefs in the vicinity of Peel Island, Moreton Bay, following inspections made from M.L. "Whimbrel". A master plan for National Parks involvement in the islands and reefs of the Capricorn and Bunker Groups is in preparation. Management plans for the existing Marine Parks are being developed. These will include setting aside of areas of reef from which fishing is totally excluded, development of reef walking tracks, diving stations and underwater trails and controlling the movement and mooring of small craft within the parks.

Fauna Studies

Fauna survey work has commenced or continued on a number of National Parks. These include Crows Nest, Ravensbourne, Bunya Mountains, Carnarvon, Eubenangee Swamp, Lake Eacham, Lake Barrine and Thornton Peak.

Brief fauna surveys have also been carried out on a number of National Park proposals. Significant areas in this programme include the Cooktown–Daintree River region and selected sites adjacent to the headwaters of the Jardine River.

Sea bird nesting data is being monitored on a handful of selected islands to assist in formulating management plans.

Studies into—

(a) the effects of control burning on selected native fauna,

(b) the distribution of North Queensland possums in relation to habitat,

(c) the distribution of the yellow bellied glider in Queensland and

(d) the taxonomic differentiation of the sugar glider and squirrel glider are continuing.

Staff

Two Marine Biologists and a graduate Forester were added to the salaried staff of National Parks Branch during the year.

Specialist graduate staff now stands at:—

One Forester—Officer in Charge National Parks Section assisting Officer in Charge National Parks Branch
Two Foresters—Park proposal investigations
One Forester—Visitor facilities and park management
One Forester—Interpretation methods and facilities
Three Zoologists—Fauna surveys and research
One Botanist—Botanical surveys and research
Two Marine Biologists—Marine Park proposal investigations and research.

The above eleven graduate staff are assisted by five technical staff and additional positions have been advertised for two technical assistants for the Marine Biologists.

National Park field staff as at 30th June, 1974, consists of four Forest Rangers, 33 Overseers and 45 workmen. These purely National Parks staff are assisted very considerably by District Foresters and other District field and clerical staff in matters of administration and inspections.

With the general rise in visitation it will be necessary to increase the personnel engaged in providing additional amenities and in maintaining the existing tracks and facilities.

Overseas and Interstate Conferences

Several officers have represented the National Parks Branch of the Department at Interstate Conferences and, during the year, Mr. H. S. Curtis, Officer in Charge, National Parks Section, represented the Department at an International Conference on the use of ecological principles for the development of tropical forests, which was held at Bandung, Indonesia. His participation will be of value to the State in the future planning of land use with particular reference to tropical forests.

The courtesy and attention accorded by the Indonesian hosts who so ably organised and managed the Conference and enabled the delegates to appreciate not only technical aspects but also the friendly and cultural side of our near northern neighbours is gratefully accorded.

Expenditure

During 1973–74 an amount of $610,010.08 was spent on National Parks. Of this amount $24,280.73 was spent on Marine National Parks and $585,729.35 on terrestrial parks. This also includes a small amount for miscellaneous items and a vote adjustment credit of $477.85.

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

Works Description	Amount Spent $
1. General overheads (leave, holidays, wet time, camp allowance, tools and equipment, cartage, general supervision, &c.)	159,157.38
2. Fire detention, fire fighting and patrol	790.68
3. Planting and tending trees (on areas other than picnic and camping areas), eradication of exotic plants and animals	2,208.07
4. Track location and survey	1,257.48
5. Track construction and improvements	17,793.19
6. Track maintenance	61,903.96
7. Construction of picnic ground facilities (shelter sheds, barbeques, fireplaces, tables, seats, toilets, parking areas, entrances, &c.)	28,328.33
8. Maintenance of picnic facilities (items listed under 7, mowing, tidying of grounds, rubbish disposal, cleaning of toilets, &c.)	95,559.10
9. Miscellaneous construction works (landings, jetties, footbridges, lookouts, roads, fencing, &c.)	19,697.07
10. Maintenance of miscellaneous improvements	4,005.56
11. Construction of camping area facilities (ablution blocks, barbecues, fireplaces, tables, toilets, entrances, &c.)	2,387.46
12. Maintenance of camping areas	14,020.00
13. Erection of general signs	3,840.42
14. Maintenance of general signs	3,278.90
15. Construction of accommodation facilities for staff	7,248.68
16. Maintenance of accommodation and facilities for staff	5,507.06
17. Maintenance of Aboriginal relics (Bora grounds, paintings, &c.)	95.82
18. Special research projects	850.78
19. Construction of interpretative facilities (explanatory signs, name plating of trees, self guiding tracks, museums, literature, &c.)	112.30
20. Maintenance of interpretative facilities	1,111.28
21. Law enforcement and public information patrols	23,411.14
22. Boundary surveys	1,818.47
23. Construction and maintenance of firelines and prescribed burning	5,371.57
24. Inspection for issue of permits under Rural Fires Act and investigation of breaches of this Act	279.31
25. Subsidies to Shire Councils for construction and improvement to access to a park	6,000.00
26. General costings not applicable to any particular park	120,173.19
	586,207.20
Less vote adjustment credit	477.85
	585,729.35
Marine National Parks	24,280.73
Total	610,010.08

HARVESTING AND MARKETING

General

Abnormal rains associated with severe flooding throughout the State caused a drop in the harvest from Crown land of about 11·4 million from the record 1972–73 cut of 246·2 million superficial feet.*

Despite this the Cypress Pine forests of the west produced a record harvest of 35·4 million superficial feet from Crown lands and the yield of thinnings from plantations rose to a record 62·3 million superficial feet with increases in use of mill logs and of pulpwood for particle board.

Plantation Timber

The growing importance of the production from plantations is clearly shown by the fact that the annual cut of plantation timber has almost caught up with that of native hardwoods.

Keen interest was shown in auction sales conveying sawmill license capacity and priority rights for subsequent annual sales. Four such auction sales were held during the year as follows:—

(a) Kenilworth (State Forest 135, Cambroon) on 21–9–73. Quantity offered 500,000 superficial feet per annum which attracted a final bid of $10.65 per hundred superficial feet over upset.

(b) Gambubal (State Forest 661 Emu Vale, near Warwick) on 25–1–74. Quantity offered 1,500,000 rising to 3,000,000 superficial feet per annum and this was bought at $10.30 per 100 superficial feet over upset.

(c) Fraser Island (State Forest 3 Poyungan) on 30–5–74. Quantity offered was 250,000 superficial feet per annum—purchased at upset.

(d) Bulburin (State Forest 67 Bulburin, near Monto) on 4–6–74. Quantity offered was 300,000 superficial feet per annum and this was bought at $4.53 per 100 superficial feet over upset.

Cypress Pine

Resources survey work by this Department has revealed a large volume of Cypress Pine growing in Crown forests in the vicinity of Injune, Mitchell, Mungallala, Augathella and Baralaba in excess of requirements for the licensed capacities of the existing sawmills and in December 1973 four lots each of 1 million superficial feet per annum and four lots each of 0·5 million superficial feet per annum were offered at Auction to give existing sawmills the opportunity to increase their levels of production for more efficient operation. All lots were purchased at upset and it is anticipated that much of the additional sawn Cypress Pine produced will help to meet the needs of the rapidly developing mining towns of Central Queensland.

Average Locality Pricing

This is now in use for all plantation areas on which logging is carried out with the exception of North Queensland. Introduction of the system to North Queensland will be done as soon as possible in the light of continuing operations and discussions with the Industry in the north. A commencement has been made with its introduction to the Cypress Pine forests.

Developments in Logging

Since 1970, when mechanised snigging was approved for all plantation areas, small crawler tractors for the steeper Hoop Pine areas and wheel type tractors for the easier Exotic Pine areas have proved efficient, and relatively cheap to purchase and operate.

Work is well advanced on site preparation for an additional particle board plant to be constructed at Gympie and with the increasing pulpwood harvesting operations there is the need for equipment with high productivity to keep up the flow of logs with minimum disruption from adverse weather conditions.

Two items of plant of great interest in this regard were introduced into the Gympie area this year viz.:—

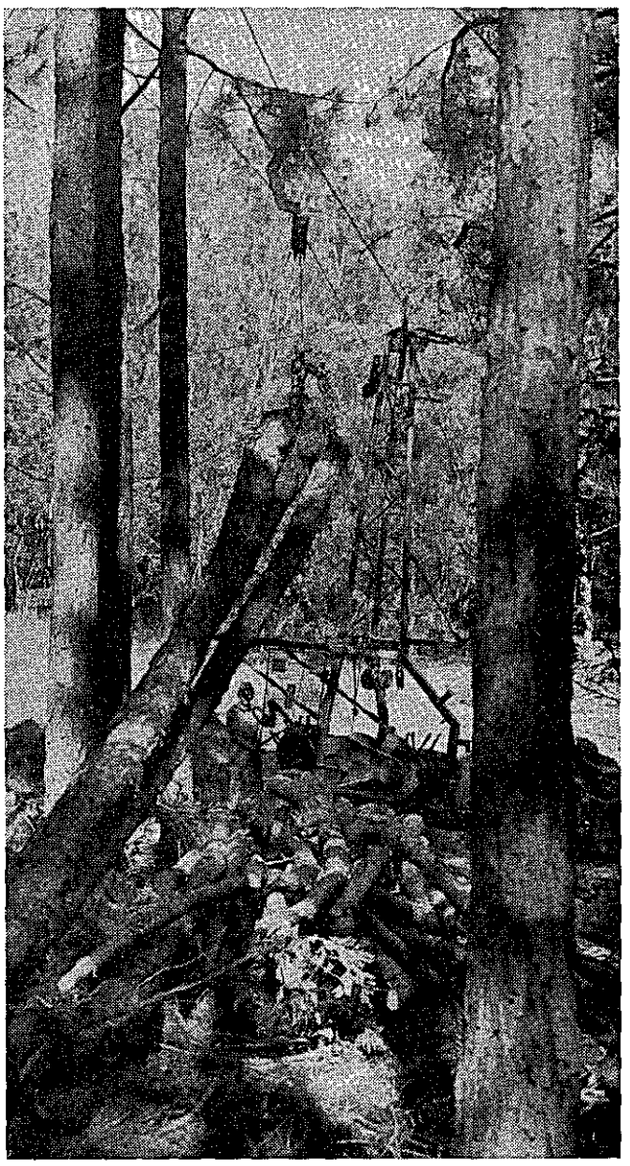
(a) The Mini-Alpine cable logging equipment.

(b) The forwarder.

The Mini-Alpine system with trained experienced operators can deliver logs from stump to truck loading site at a high productivity rate relatively free of abrasive grit and with little soil disturbance.

The forwarder is a self loading multi-wheel drive articulated transporter of logs from pre-bunched heaps in the plantation to a hard road suitable for large fast highway trucks. Its high production rate is achieved by speed in loading, unloading and in turn-around time and it has the advantage of being able to operate under soft or boggy conditions which would stop a normal haulage truck.

* With log volumes superficial feet are Hoppus in all cases.



Cable extraction of Slash Pine pulp thinnings provides minimum soil disturbance and cleaner logs, Toolara State Forest.

Tests to ascertain optimum operating techniques are being carried out with both these items of plant.

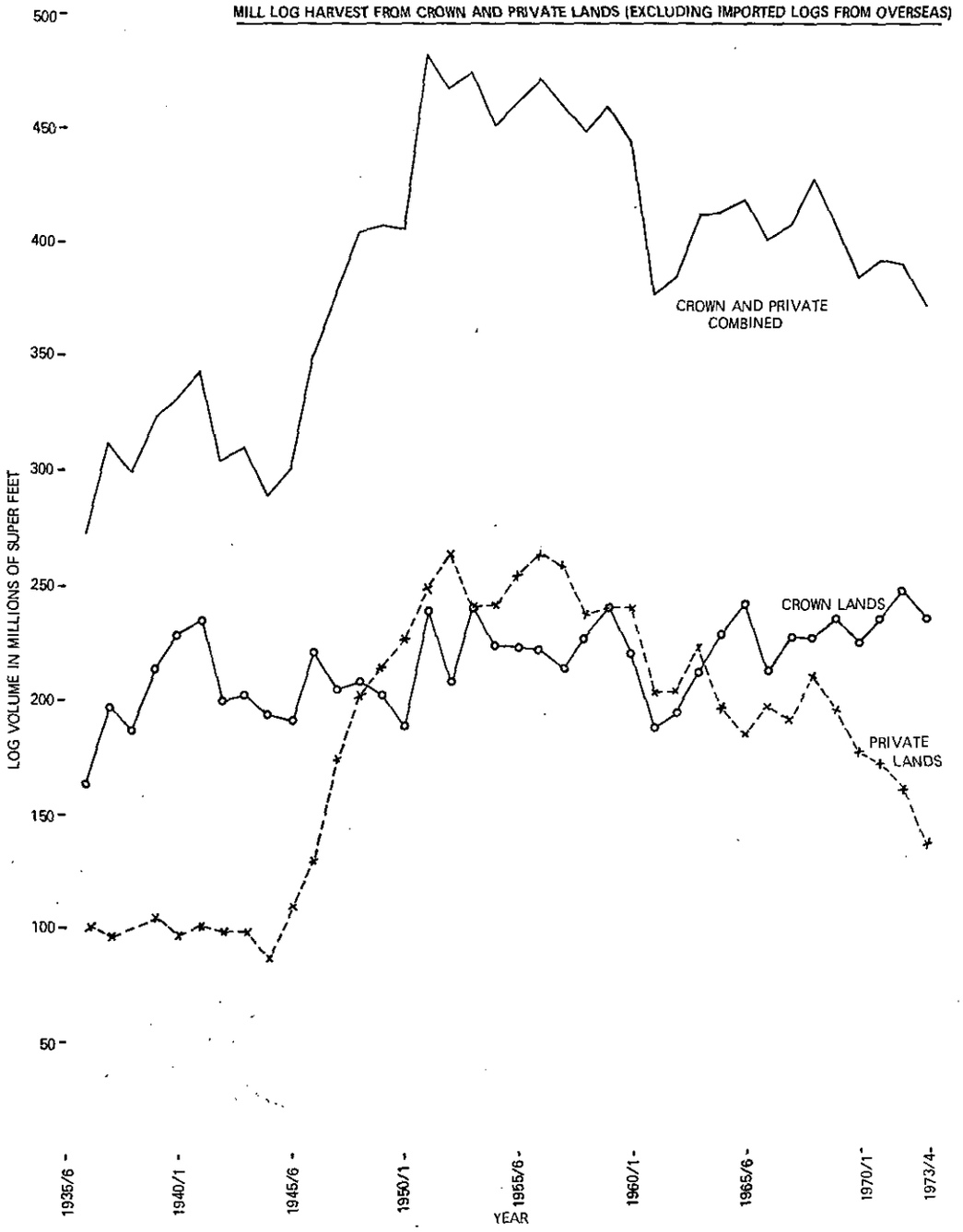
Mill Logs—Crown Forests

The following are the annual quantities of Mill Logs harvested from Crown Forests for the past ten years:—

Year	Super. feet	Year	Super. feet
1964–65	229,000,000	1969–70	234,000,000
1965–66	241,000,000	1970–71	223,000,000
1966–67	212,000,000	1971–72	234,000,000
1967–68	227,000,000	1972–73	246,000,000
1968–69	227,000,000	1973–74	235,000,000

Rosewood

No Rosewood or Sandalwood was purchased or exported to Hong Kong during the year. However, a request has been reecived from the Australian Sandalwood Company in Perth to supply about 17 tonnes of Rosewood to each of three merchants in Hong Kong in 1974–75, indicating renewed interest in this aromatic wood.

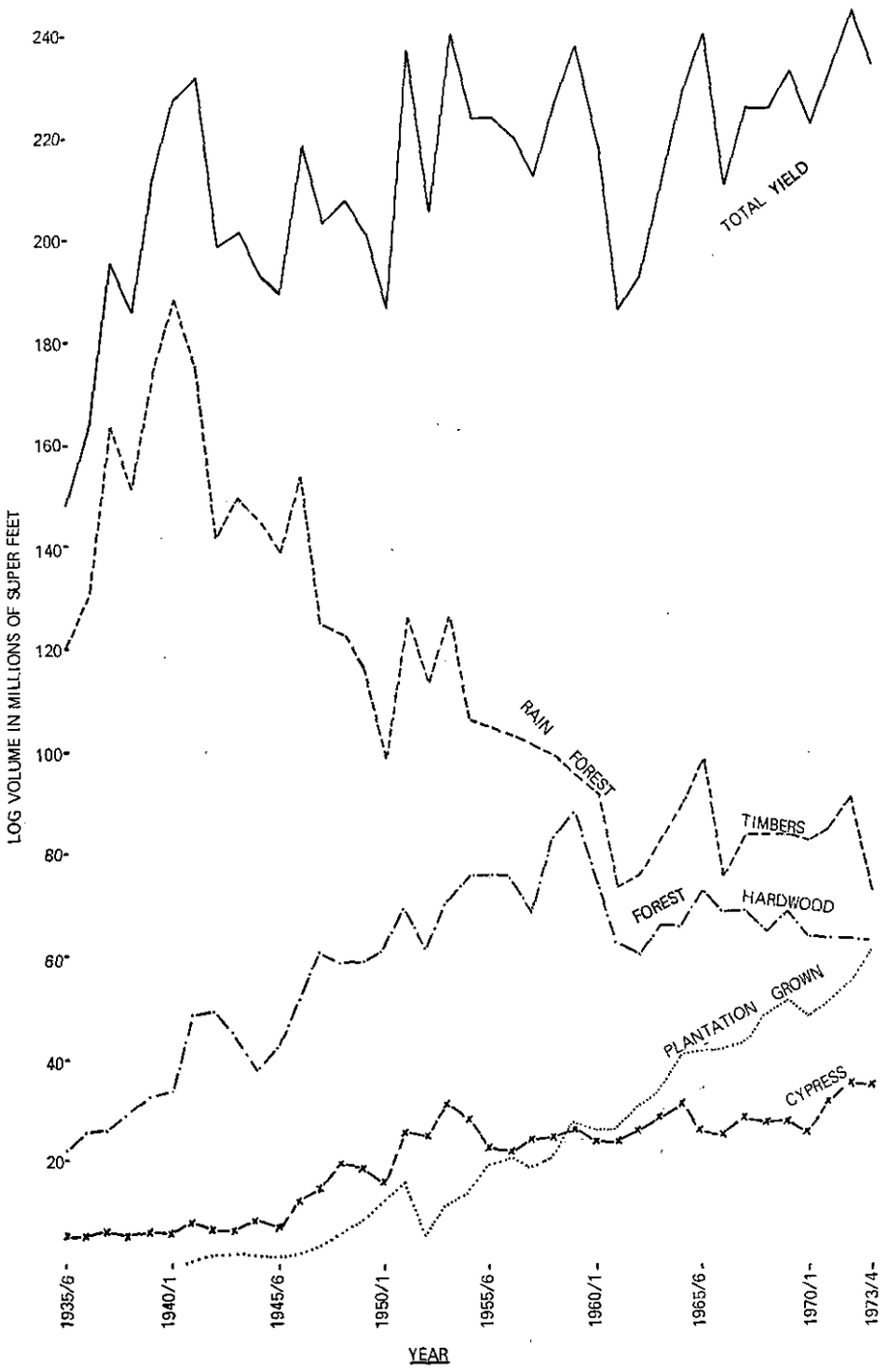


MILL LOGS PROCESSED FROM CROWN AND PRIVATE FORESTS

This Table shows by years Logs processed by all Mills in the State

Year	Queensland Grown										Imported from Overseas	Total
	Hoop and Bunya Pine	Kauri Pine	White Cypress Pine	Forest Hardwoods		Scrub Hardwood	Cabinet Woods	Miscellaneous Species	Plantation Timbers			
				Saw Logs	Pulpwood				Saw Logs	Pulpwood		
	(1,000 superficial feet)											
1969–70 ..	19,452	1,855	60,024	188,094	..	17,934	21,236	45,231	43,772	8,821	12,383	418,802
1970–71 ..	16,121	2,872	59,182	174,526	..	16,465	20,682	42,800	41,957	8,185	16,679	399,469
1971–72 ..	19,939	2,366	63,477	172,034	..	18,216	21,299	41,688	41,601	10,078	14,225	404,923
1972–73 ..	21,482	2,927	67,385	141,064	14,629	23,456	17,780	41,866	41,540	16,306	14,821	403,256
(Estimated) 1973–74 ..	15,027	1,676	65,138	140,187	12,503	18,969	13,788	38,164	43,650	21,043	9,072	379,217

MILL LOG HARVEST (INCLUDING PULPWOOD) FROM CROWN LANDS



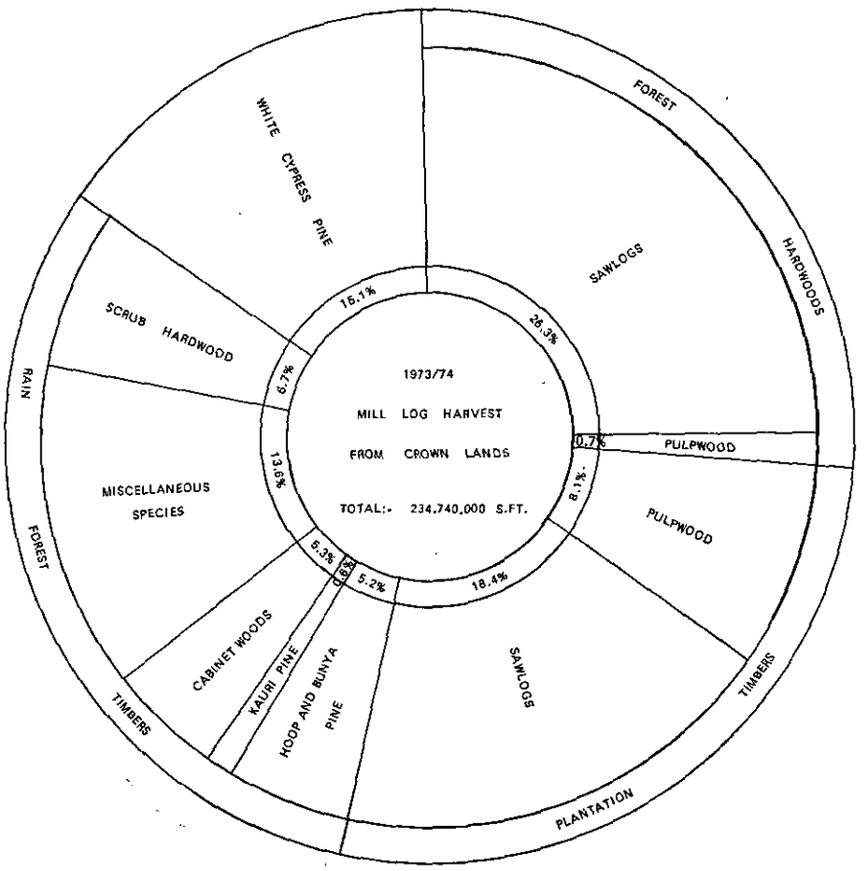
Mill Log Yield from Crown Forests

Quantities of various types of log timber harvested from Crown forests during the past five years.

Year	Hoop and Bunya Pine	Kauri Pine	White Cypress Pine	Forest Hardwoods		Scrub Hard-woods	Cabinet Woods	Miscel-laneous Species	Plantation Timbers		Total
				Saw Logs	Pulpwood				Saw Logs	Pulpwood	
				(1,000 superficial feet)							
1969–70 ..	16,832	1,799	28,428	68,576	..	15,383	17,745	32,752	43,182	8,821	233,518
1970–71 ..	14,813	2,401	26,508	64,783	..	15,749	17,204	32,570	40,397	8,185	222,610
1971–72 ..	17,167	2,013	32,211	63,945	..	17,215	17,555	32,420	41,426	10,078	234,030
1972–73 ..	18,996	2,715	35,147	60,174	3,430	19,574	15,978	34,141	40,344	15,672	246,171
1973–74 ..	12,172	1,428	35,363	61,831	1,738	15,708	12,387	31,835	43,152	19,126	234,740

MILL LOG YIELD FROM PRIVATE FORESTS

Year	Hoop and Bunya Pine	Kauri Pine	White Cypress Pine	Forest Hardwoods		Scrub Hardwoods	Cabinet Woods	Miscellaneous Species	Plantation Timbers		Total
				Saw Logs	Pulpwood				Saw Logs	Pulpwood	
				(1,000 Superficial feet)							
1969–70 ..	2,620	56	31,596	119,518	..	2,551	3,491	12,479	590	..	172,901
1970–71 ..	1,308	471	32,674	109,743	..	716	3,478	10,230	1,560	..	160,180
1971–72 ..	2,772	353	31,266	108,089	..	1,001	3,744	9,268	175	..	156,668
1972–73 ..	2,486	212	32,239	80,890	11,199	3,882	1,802	7,725	1,196	634	144,092
Estimated 1973–74 ..	2,855	248	29,775	78,356	10,765	3,261	1,401	6,329	498	1,917	135,405



The Timber Business (Crown Forests)

	1972–73	1973–74
(*a*) Mill Logs—		
Hoop and Bunya Pine	18,995,837 super. feet	12,172,111 super. feet
Forest Hardwoods—		
Saw Logs	60,173,909 super. feet	61,831,494 super. feet
Pulpwood	3,429,928 super. feet	1,737,861 super. feet
Scrub Hardwoods	19,574,639 super. feet	15,708,139 super. feet
White Cypress Pine	35,146,533 super. feet	35,363,116 super. feet
Kauri Pine	2,715,330 super. feet	1,427,838 super. feet
Cabinet Woods	15,978,132 super. feet	12,386,744 super. feet
Miscellaneous Species	34,141,376 super. feet	31,835,176 super. feet
Plantation Timbers—		
Saw Logs	40,343,813 super. feet	43,152,034 super. feet
Pulpwood	15,672,292 super. feet	19,125,620 super. feet
Limb Logs, Head Logs, Stumps and Flitches ..	3,361 super. feet	567 super. feet
	246,175,150 super. feet	234,740,700 super. feet
(*b*) Constructional Timbers—		
Headstocks, Transoms, Crossings, Braces, &c.	200,001 super. feet	315,217 super. feet
Sleepers	574,716 pieces	286,650 pieces
Girders, Corbels, Piles, Sills	68,279 lineal feet	78,872 lineal feet
Girder Logs	38,537 super. feet	70,926 super. feet
Poles	97,543 lineal feet	126,839 lineal feet
House Blocks	4,514 lineal feet	5,451 lineal feet
Mining Timbers—Round	539,260 lineal feet	610,002 lineal feet
Mining Timbers—Sawn	158,482 super. feet	296,391 super. feet
(*c*) Gross receipts from Timber Sales, &c.	$6,065,105.56	$5,607,137.41
(*d*) Net Revenue	$3,134,013.92	$2,704,828.80

Imports of Sawn Timber from Overseas

Imports of sawn timber from overseas for the last 3 years were:—

	Log Equivalent*
1971–72—18,270,000 super feet ..	30,450,000 super feet
1972–73—20,886,000 super feet ..	34,810,000 super feet
1973–74—31,806,000 super feet ..	53,010,000 super feet

*Assuming 60 per cent. recovery.

The large increase in imports in 1973–74 over the previous year is comprised mostly of non-conifer timbers where quantities imported almost doubled, Meranti being the major species involved.

The following table shows the major species imported, countries of origin and quantities in 1,000's superficial feet sawn for the three years indicated:—

Species	1971–72	1972–73	1973–74	Countries of Origin
Douglas Fir ..	4,014	5,533	6,476	United States of America, New Zealand, Canada
Klinki Pine ..	3,367	1,268	934	Papua New Guinea
Kauri Pine ..	800	906	1,175	Papua New Guinea, Fiji, Malaysia
Other Conifers	2,653	2,005	1,860	Brazil, Papua New Guinea
Meranti ..	2,428	3,631	7,029	Malaysia, Singapore
Other non-Conifers ..	3,683	5,754	10,730	Malaysia, Papua New Guinea

Timber Felling and Timber Getting Award—State

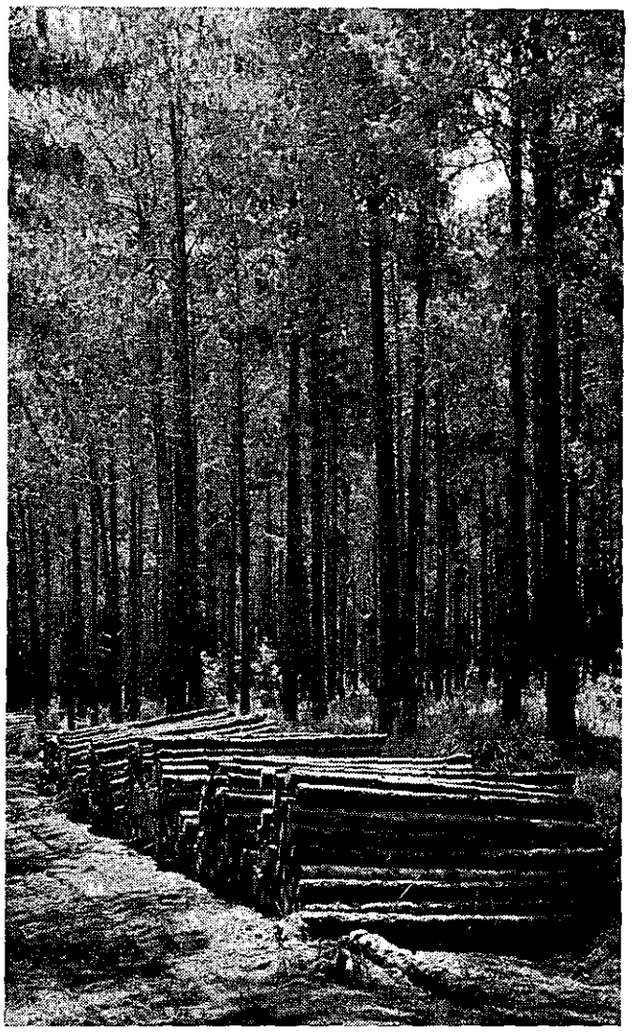
The minimum weekly rates which the average competent cutter should be enabled to earn whilst using a suitable portable mechanised saw were increased during the year on five occasions with a total increase ranging from $47.90 to $59.34 depending on species and locality.

Logging Roads—1973–74

The Department's Roads programme for the year involved 53 miles of construction and 46 miles of location and working surveys.

Expenditure from Forestry votes on logging roads was as follows:—

	$
New Construction	327,077.81
Maintenance	246,233.99
Subsidies to Shire Council ..	58,734.96
Pay Roll Tax	16,929.37
Workers Compensation	6,047.02
Fares and Freights	3,411.72
	$658,434.87



Patula Pine thinnings, Compartment 4 Sharman Logging Area. State Forest 909, Crows Nest, Yarraman District.

Logging

The table below shows the quantities of log timber harvested during 1973–74 by contractors to the Department and the payment made to them for this work.

Class	Quantities	Payments
South Queensland—	Super. feet	$
Hoop and Bunya Pine	6,801,636	219,710.24
Scrub Hardwoods	108,779	
Miscellaneous	152,241	
Red Cedar	4,754	
	7,667,410	219,710.24
North Queensland—		
Cabinet Woods	471,606	15,775.50
Totals	8,139,016	235,485.74

Constructional Timbers—Departmental Contracts

Below are shown the yield of constructional timbers from Crown forests for year 1973–74, in comparison with that for the previous two years:—

Class of Timber	1971–72	1972–73	1973–74
Sleepers	294,930 pieces	315,952 pieces	134,311 pieces
Crossings	189,257 super. feet	31,939 super. feet	120,107 super. feet
Transoms	112,385 super. feet	97,058 super. feet	111,415 super. feet
Bridge Timbers—Girders and Piles	26,098 lineal feet	28,139 lineal feet	48,003 lineal feet
Girder Logs	80,020 super. feet	38,537 super. feet	70,926 super. feet

Offences

During the year 157 breaches of the Forestry Act were investigated.

Prosecution proceedings were successfully instituted against 24 persons, and fines totalling $1,224 were imposed whilst suitably worded letters were directed to other offenders warning them that further breaches would lead to more severe action.

From action taken in cases involving unauthorised interference with timber or other forest products a total of $36,841.42 was recovered for royalty and for costs of investigations.

In their capacity as Fire Wardens, Forest Officers also investigated six breaches of the Rural Fires Act.

SAWMILLS LICENSING

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

During the year the number of licensed sawmills dropped from 452 to 433 and, of these, 383 mills actually operated during the first three quarters.

The following table shows the position in respect to Sawmill Licenses as at 30th June, 1974:—

Number of Licenses as at 30-6-73	Classification	New Licenses Issued	Licenses not Renewed			Licenses as at 30-6-74
			Withdrawn for Amalgamation	Refused	Relinquished	
391	General Purpose Mills	3	16	1	3	374
61	Other than General Purpose Mills ..	4	..	1	5	59
452		7	16	2	8	433

Seven new mills were licensed mainly to permit the operation of logs not normally operated by existing mills and which would otherwise be destroyed in clearing operations. For this same reason increased capacity was issued to a number of licensed mills. In all such cases necessary restrictions were imposed to safeguard supplies of milling timber for the existing industry.

Sixteen licenses were withdrawn in connection with actions for amalgamation and this compares with nine in the previous year. This is making for a more healthy condition in the milling industry and it is good to see the process continuing.

During the year the Sawmills Licensing Act was amended to require the licensing of sophisticated portable mills of the "Forestmill" type.

As a result a number of applications for licenses have been received and are under consideration. Prior to this such mills could operate freely on private timber and the amendment will enable them to be brought under control and so help to preserve stability in the industry.

FOREST PRODUCTS RESEACH

Probably the most significant development in the forest products field during the year has been the introduction of metrication in the timber industry. Some producers and merchants converted on 1st January but the changeover in the industry was still far from complete at the close of the year although it was becoming evident that demand from suppliers and users for metric sizes of timber was increasing. It was unfortunate that the conversion occurred at a time when the resources of the industry were already fully extended to meet the very high level of demand then current in the building industry.

Late in 1973 agreement was reached between the various species groups on the range of preferred metric sizes to be adopted, and, although the degree of rationalisation achieved was not as great as would have been desired these decisions did allow work to proceed in good time on the wide range of metric technical and promotional literature essential to producers and users of timber. The staff of the Branch was heavily committed during much of the year in providing technical assistance in this area, including work on the metication of the large number of timber standards in current use. This work will continue for a time yet, and it is in such areas that joint participation with industry through the Timber Research and Development Advisory Council has proved to be most valuable.

The exteremly high level of demand which prevailed throughout most of the year in the construction industry led to severe shortages in most building materials, including timber of both local and imported species. Unfortunately this situation usually leads to some depreciation in quality of both production and use, and this is already being reflected in an increased number of complaints being received by the Department. There were indications by the end of the year however that this excessive demand was easing somewhat.

It was pleasing to note that timber structures generally performed well during the major flooding which occurred in many parts of the State early in 1974, and apart from those cases of actual mechanical damage, serious depreciation was relatively uncommon and very largely confined to non-structural components such as joinery and furniture, particularly those containing certain reconstituted sheet products. The Department and T.R.A.D.A.C. jointly provided advice and publicity on means of minimising unnecessary deterioration of saturated timber in buildings during the period of drying out.

Significant problems have continued in the field of timber preservation due to the failure of copper-chrome-arsenic treatment to perform as well as expected under some high hazard conditions. There also developed during the year some serious shortages in widely used chemical preservatives, mainly Boron, which posed a problem to industry and necessitated urgent work by departmental staff to aid some users to change to alternative preservatives.

The West Indian Drywood Termite, *Cryptotermes brevis*, remains a problem in the Maryborough area and, while the infestation is still apparently restricted in extent, it has nevertheless been detected at three nearby sites, apparently spread by movement of infested timber articles. The Commonwealth Government has agreed to share the cost of a major effort to eradicate the pest but this work has yet to be commenced, and does present considerably difficulty.

During the year an officer of the Branch attended an international conference in Sydney on rail sleepers at which there was represented a wide range of timber and other interests. Several interstate meetings of Standards committees were also attended by Branch officers.

The work of the individual sections of the Branch is reported below.

The Timber Users' Protection Acts

The number of complaints lodged with the Department again increased and this year totalled 63. This was 12 more than in the preceding year.

These and a further 20 complaints carried over from the previous year were investigated. As a result 28 of the complaints were satisfactorily resolved between the parties concerned and no further action was taken; of the remainder, 23 were found to have insufficient grounds for complaint in terms of the Acts, one was outside the time limitations which apply and investigations are still proceeding on 31. No prosecution actions were taken during the year.

With the utilisation of a wider range of species, both indigenous and imported, it was found necessary to introduce early in 1974 a substantial amendment to the list of timbers specifically included in the Acts as being susceptible to attack by lyctus borer and therefore subject to legislative control in this regard. A total of 261 species is now listed and this provides improved protection to the buyers and users of timber.

In addition to investigation of actual complaints a number of routine inspections of building operations was also made, mainly in the Greater Brisbane Area, and visits were made to sawmills and woodworking establishments in the area.

It is unlikely that these inspections achieve much better than a one per cent. coverage of residential building operations but they do provide a useful guide to current practices in use by both builders and timber producers. It was not possible to extend inspectorial visits to country areas as much as would be desired.

Supplementing these routine inspections the Department also gains useful information from samples submitted for testing by the public and by lending and constructing authorities. Tests of preservative treatment were made on 2519 such samples and 2020 determinations of moisture content were carried out. The preservative testing showed only 2·5 per cent. failure rate but some 16 per cent. of moisture content tests failed to comply with the requirements of the Acts. Many of these latter however were relatively minor discrepancies and necessitated no further action other than to advise producers on modification of treatment or seasoning practices where this appeared necessary.

The high proportion of interstate timber being used in the south east of the state does cause some difficulty in fully implementing the provisions of the Queensland Acts and discussions were held during the year with officers of the New South Wales Forestry Commission with a view to making legislation in the two states as uniform as possible.

Wood Chemistry and Preservation

This section provides testing and advisory service to industry and the public mainly in the field of timber preservation which is increasing in scope and importance. Changing patterns of utilisation pose new problems for both producers and users in that less durable timber species are being more widely used and many of our native species exhibit treatment characteristics which require special consideration.

Some 11,400 chemical determinations were made during the year of which 2,416 were tests of preservative treatment on behalf of industry and governmental authorities. Soil and foliar analyses were carried out on 570 samples for the Silvicultural Branch of the department.

Supervision and control of timber preservation under the provisions of The Timber Users' Protection Acts constitutes an important part of the work of the section. Two additional pressure treatment plants were installed and registered giving total of 38 such installations in use throughout the state. While the general level of quality control in the treatment plants was satisfactory some plants require closer control over treatment techniques and quality control measures.

During the year a serious shortage of Boron Salts developed and necessitated urgent laboratory investigations into alternative preservatives such as Sodium Fluoride and Dieldrin. Acceptable standards of treatment and of analytical techniques and control were developed and plant operators trained in these techniques. The requirements for this work again emphasised the need for the preservation industry to assume greater responsibility for routine quality control and technical training of operators in order to allow research staff to devote greater attention to investigational work aimed at meeting problems of this nature.

Field inspections and associated laboratory investigations have continued on the problem of "soft rot" in CCA treated hardwood transmission poles. The attack occurs at ground line and involves slight to severe softening of the wood extending to about 9 inches below ground. Research into this problem entails considerable time in inspections and analytical determinations. It has become clear that "soft rot" is far more widespread and its incidence more severe than was thought at the time of last year's report. It is now known to occur over a wide range of climatic and soil conditions throughout the State. A comprehensive training school for line inspection personnel of electrical authorities was held in Brisbane during the year and aimed to improve the detection and treatment of affected poles. The trainees were then to conduct training programmes in their own areas.

Trials are in progress with alternative preservative treatments and remedial butt treatments to standing poles. The latter include surface barrier applications and bandages of diffusible salts.

Following failures of treated marine piling in certain areas the general approval for CCA treated hardwoods for marine use under The Timber Users' Protection Acts has been withdrawn and each application is now examined on its merits before approval is given.

The continued use of hardwoods, and particularly of young regrowth hardwoods, for these important round timber markets depends largely on the achievement of adequate performance in situations of severe hazard either by development of new treatment processes or of supplementary treatments.

The branding of treated timber originating from New South Wales still presents some problems and this matter has again been brought to the attention of the authorities and of the producing industry in New South Wales by this Department. Officers of the Department participated in joint meetings at Casino to discuss this and other matters of mutual concern.

During the year officers from various timber firms were trained in the laboratory in quality control relative to timber preservation and the good relationship and co-operation of industry with the laboratory continued. It is desirable that laboratory staff be given as much time and opportunity as possible for work in the field as an aid to greater efficiency in their research work. Action which is well in hand towards the building of a new laboratory which will greatly improve facilities available but meanwhile lack of space and cramped working conditions result in the severe restriction of essential applied research.

TIMBER CONVERSION SECTION

(1) Sawmill Economics

During the year sawing studies undertaken have been conducted in the main at the Department's experimental mill. However, with the co-operation of the Railway Department, studies are currently in progress at that Department's Ipswich mill, on the effect of gum rings on recovery in Spotted Gum logs. These studies will continue as suitable logs become available. It is intended to build up data progressively on the sawing characteristics of this type of log for application in log marketing procedures.

By arrangement with industry through the State Committee of the Australian Timber Industry Stabilisation Conference, surveys have been initiated on the movement of sawn timber throughout the State covering all species groups. It is now more than ten years since similar surveys were last attempted, and in the intervening period, marketing patterns have changed considerably in some species and in certain areas of production. These surveys will assist greatly in ensuring that any review of the basis of the Department's log pricing will be soundly based in line with market patterns.

It was reported last year that a series of sawing studies had been commenced to compare the productivity of Slash and Caribbean Pines from paired even-aged plots of the two species on a range of sites in the south-east of the State. The second segment of this series, on material from Tuan State Forest in the Maryborough District, has been completed.

The study previously reported on material from Toolara showed that by reason of its poorer form Caribbean Pine gave a lower recovery from stems of comparable size, but, overall by reason of the larger average stem size it gave a higher recovery per cent. and a better grade distribution of seasoned product.

This has been generally confirmed by the further study on the Tuan samples although in this instance the difference between the two species were not as great.

SEASONED RECOVERIES

P. caribaea						*P. elliottii*					
Recovery %	Per cent. by Grade*					Recovery %	Per cent. by Grade*				
	1	2	3	4	5		1	2	3	4	5
		S.I. 80, 86, 91, 100						S.I. 80, 81, 86, 90			
ex Toolara (Aged 20 years)											
53·9	3·6	0·9	37·2	37·6	20·7	51·3	1·8	0·6	35·7	35·5	26·4
		S.I. 76, 78, 79, 84						S.I. 70, 71, 72, 75			
ex Tuan (Aged 21 years)											
53·2	3·7	0·5	73·9	10·1	11·8	52·3	2·1	0·4	74·3	13·4	9·9

* Graded in accordance with AS 108–1969.

While the average girths in the respective study samples from Tuan and Toolara were similar, the site index of the Tuan plots is appreciably lower and it might have been expected that sawn recoveries from this area would have been more adversely affected by this difference in stem form than these results indicated.

Some difference is evident in the grade distribution between the two areas for both species, mainly in the lower grades. Knot size was the most important factor in determining these lower grades and it would seem therefore that branch size must have been rather smaller in the Tuan samples although this was not recorded.

The study of graded quality in Cypress Pine mentioned last year has been completed. The particular problem being investigated was the reported poor behaviour of dry, bark-encased knots in logs drawn from an area at Cecil Plains. Sample logs were drawn from:—

(a) A virgin stand in the Cecil Plains area,

(b) A recut stand in the Cecil Plains area, and

(c) A recut stand in the Millmerran area.

The study confirmed that the problem is generally more severe in the Cecil Plains area than at Millmerran, and more severe also in the virgin area than in the recut area. The criterion adopted was the percentage of sawn output rejected because of loosening of this type of knot after seasoning.

The figures for each area were as follows:—

Area	Per cent. sawn material Rejected for loose knots after Seasoning
Cecil Plains (virgin)	9·6
Cecil Plains (recut)	6·5
Millmerran (recut)	3·9

It is interesting to note that the percentage loss is directly proportional to the percentage of study logs which had been down-graded because of doze or rot. This does not necessarily infer a direct relationship but the factors could be indirectly related in that fire damage in the past may have contributed to both aspects of log quality.

At the request of the sawmilling industry, sawing studies have been commenced at Rocklea on *Pinus patula* stems from three plantation areas in the Yarraman District following reports of low recovery from some stands. In addition to the usual recovery and sawn grade data by area and g.b.h. class, the effect of included bark and resin pockets will also be assessed on an area basis.

Further stems of Slash Pine to 6-inch T.D.U.B. have been sawn at Rocklea to supplement the data obtained in studies at a commercial mill last year to establish sound value/size relationships in such material.

Sawing studies on Hoop Pine logs representative of the various thinning fractions of high pruned stems in older plantations in the Yarraman District are complete and the results are being studied. A study on similar material from the Mary Valley is planned.

The small veneer lathe purchased by the Department has been installed. Two small pilot studies, on large Slash Pine and rain forest species were attempted as part of the running in period. The Slash Pine was graded after drying according to the standard for structural veneer but the quality was such that it could also have performed well by a face veneer standard with a much higher value return. Further peeling studies are planned for major plantation species and the dual-standard grading will be applied in these.

(ii) Seasoning and Timber Mechanics

Interest by industry in high temperature seasoning of young plantation grown conifers has increased, following the earlier work on Slash Pine carried out in the Department's experimental kiln at Rocklea in association with the Division of Building Research of C.S.I.R.O.; further work has now been carried out independently at Rocklea on Hoop Pine. The results of this work have not yet been fully analysed but appear promising.

As an extension of this work, the Department is currently co-operating in a study at a commercial mill on the effect of varying sticker thickness in high temperature seasoning of Slash Pine.

Advice and assistance have been given during the year to two firms on the design and operation of high temperature kilns. At the request of an importing firm, high temperature drying trials were undertaken on a limited range of imported Fijian timbers. Results tended to confirm our own and overseas experience that most hardwoods are not amenable to high temperature drying whereas conifers respond well to this treatment.

In addition to the normal extension service on seasoning matters, some surveillance of industry performance was effected from moisture content determinations made on seasoned timbers on behalf of constructing authorities and others. Where the results of these tests indicated a need for corrective action this was followed up with the supplier concerned.

In the field of timber mechanics, work has continued to accumulate data on the mechanical properties of plantation timbers. The purposes of this work are two-fold:—

(a) by the testing of clear specimens, to relate mechanical properties to anatomical characteristics of the various species,

(b) to determine the relationship between strength and stiffness for the various species and defect combinations to allow application to mechanical stress grading, and, to assist in the refinement of visual grading rules.

Routine quality control testing of mechanically stress graded Slash and Loblolly Pine has continued on behalf of one major producer during the year. There has been some indication that the strength-stiffness relationship differs somewhat between these two species and this is being further investigated in view of the greater interest being shown by both suppliers and users in mechanically stress graded timber. Quality control testing has become a significant part of the work of the branch in this field, and requests from industry for further work of this kind are being considered.

Extension work this year involved inspection and advice to sawmillers on seasoning problems in Central Queensland area, and also in the Maryborough and Gympie areas.

Contact is being maintained with the Capricornia Institute of Advanced Education of Rockhampton where work is being carried out on the mechanical testing of glued sections on behalf of a local timber producer. In view of the particular interest shown by the Institute in timber mechanics, mutual benefits should derive from the interchange of information on a continuing basis.

The supply of a new planer/moulder to the experimental sawmill at Rocklea has greatly improved the efficiency of the operation of the mill. Precision dressing of sawn plantation pine and other species from the mill can now be carried out with improved presentation of the product for performance testing in departmental building projects or for public display purposes.

WOOD STRUCTURE AND UTILIZATION SECTION

Wood Structure and Timber Physics

(1) Timber Identification

As a continuing specialist service to industry and other Government Departments, 5,926 wood, plywood and veneer samples and wooden articles were identified during the year. A challenging project recently commenced involves the identification of over 2,000 wooden aboriginal artifacts for an anthropological study by the Queensland museum. These show a surprising range of species used for weapons.

(2) Wood Quality Assessment and Improvement

(a) *Seed Orchard Tree Evaluation*

Considerable data have been assembled on the variation in wood characteristics between trees and locations for Loblolly Pine (*Pinus taeda*) in South-east Queensland, and it is now possible to formulate acceptance standards and a wood quality assessment system for this species for application initially to the twenty-clones in the seed orchard at Beerwah.

(b) *Species Evaluations*—

Studies have continued in a programme aimed at comparing the wood quality and productivity of exotic conifers at several locations in South-east Queensland.

In a comparison of Honduras Caribbean, Loblolly and Ocote Pines and two varieties of Slash Pine (vars. *elliottii* and *densa*) aged 19 years at Beerburrum results were similar to those reported last year for another trial of these species. Significant differences were found between the species for several of the wood properties studied while Caribbean Pine again performed best on the basis of volume and dry-wood weight yields, followed in order by South Florida Slash Pine (var. *densa*) Slash Pine (var. *elliottii.*) Loblolly Pine and finally Ocote Pine. This is the first comparison of the wood of the two varieties of Slash Pine as grown in Queensland and in this trial var. *densa* gave higher volume and dry-wood weight yields per acre (by 7–8 per cent) of wood with better mechanical properties.

In comparing Slash and Loblolly Pines at age 25 years in a fully replicated study at Tuan, Maryborough District, volume and wood weight yields per acre were higher for Slash Pine (by 42 per cent. and 49 per cent. respectively) which also had some better wood characteristics, including higher basic density and micellar angle; on the other hand, Loblolly had betten grain spirality and less compression wood.

In accumulating further basic data on Patula Pine (*Pinus patula*), small samples of 22 to 43 years old stock from three different locations in South-east Queensland were examined. These were all apparently from the same original South African source. The growth rate at Pechey is significantly slower than at Yarraman and Benarkin but the material from this area was generally superior to that from the other sites for wood quality parameters. The markedly higher basic density and percent latewood, together with other features would be expected to give significantly higher strength wood from the Pechey area.

(c) *Provenance Trials*

Two provenances of Loblolly Pine, one from a local seed source, one from Marion County, Florida, were evaluated at age 17 years at Beerburrum and Tuan. No major differences between provenances were found for volume, basic density, mechantable volume or dry-wood weight yields. However, some differences were observed in respect of other properties and the local source was also straighter with a thinner bark. In general the differences in wood properties and yield were not of practical importance but the local source did produce wood of less even texture whereas its superior straightness would be expected to give higher sawn yields.

Volume and wood weight yields were higher at Beerburrum than Tuan for both seed sources, with the faster growth-rate reflected in some general depreciation in wood properties but which would have little practical effect on market potential.

(d) *Estimation of Genetic Parameters*

Studies involving 12 full-sib and 16 half-sib Slash Pine families are being re-examined with a view to determining clearer estimates of genetic parameters for wood properties and growth. Additionally, attempts are being made to determine the genotype convariance of wood properties with one another and with growth parameters to permit evaluation of volume gains with the effect on wood properties linked genetically to growth rate.

(e) *Juvenile/Mature Relationships*

An important development for application in tree improvement work has been the establishment for Loblolly Pine of high correlations between basic density for the core to ten-years and whole-crop up to 40 years. The five year core though less reliable was nevertheless adequate for use in early evaluation of progenies where this is needed. Extension of observations beyond the 10 year core gave little improvement in reliability of estimate.

(f) *Physiology of Wood Formation*

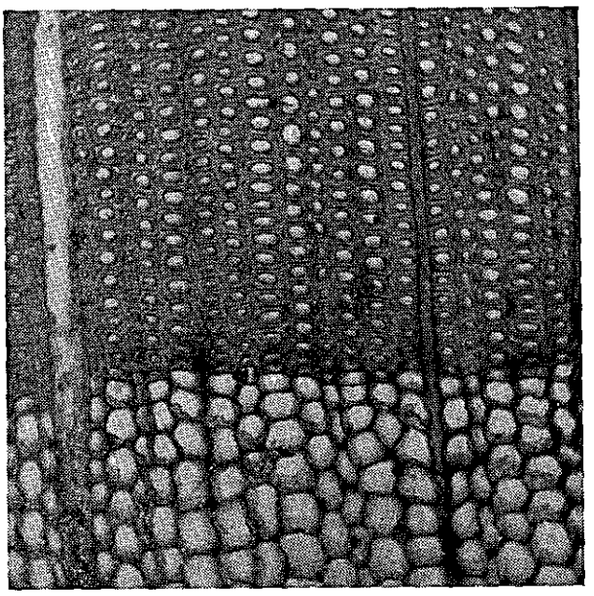
For the second year observation have been made on the physiology of wood formation in *Pinus caribaea* var. *hondurensis*, at Byfield, and the study has been extended to Danbulla in North Queensland.

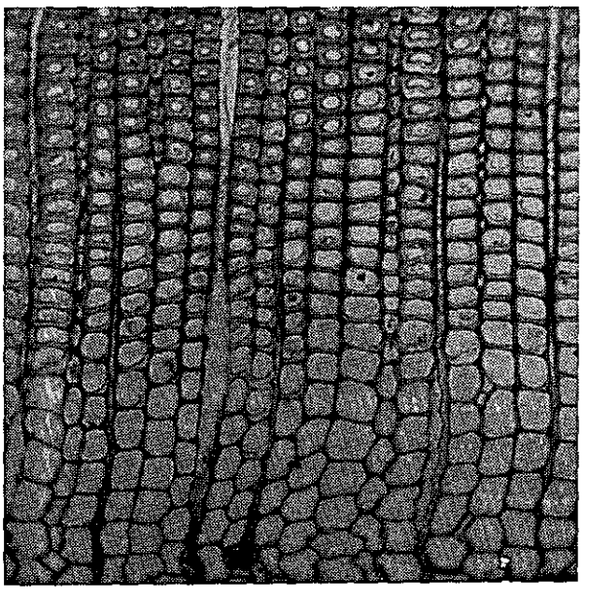
The sensitivity of this species hase been shown by the production of false latewood bands in response to very short-term changes in climatic conditions.

The transition to true latewood occurs at about the same time of the year at both locations and some three months later than for Slash and Loblolly Pines in South-east Queensland.

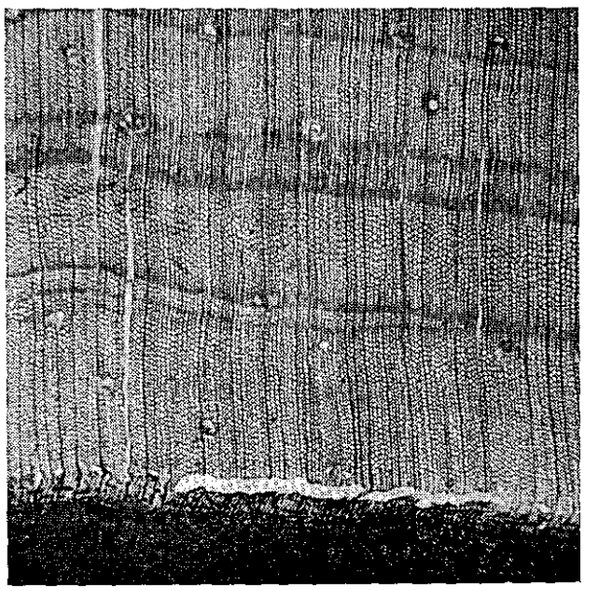
There are indications that faster growth and higher percent latewood observed at the northern location may be due to more favourable growing conditions there while latewood is being formed, resulting in larger latewood cell diameter.

Extreme physiological variability between trees at the one site has been observed, with resultant variation in their patterns of wood development. Some exhibit cambial dormancy others do not.





Variable ring development in Caribbean Pine.



Marked cambial dormancy (top left) and continuous growth (top right) in different trees at the same time of year on the same site.

(Bottom left): False latewood bands resulting from short duration climatic changes.

(g) *Timber Defects*

In conjunction with a graded recovery study by the Conversion Section, studies have begun on the incidence and cause of resin and bark pockets in *Pinus patula.* This is a very prevalent and economically important defect in this species and is believed, from subjective observations, to vary in incidence with locality. An attempt is being made to correlate its occurrence with climatic or edaphic factors. So far its initiation in earlywood bands, at a time of rapid growth, suggest a possible relationship with factors affecting moisture stress. The defect is not confined to *P. patula* but occurs much less commonly in other exotics.

(h) *Bark Properties*

With increasing interest in the utilization of forest residues a project was initiated during the year with the aim of determining some of the physical properties of the bark of the major plantation areas of the State, Hoop, Slash, Loblolly and Caribbean Pines. Green and basic density, and moisture content data has been determined for a "wet" season in some localities and further work is proceeding.

UTILISATION

The demand for extension and advisory services continued at a high level and 870 individual enquiries on the utilisation of indigenous and imported timbers were handled. Favoured by tariff changes timber imports into Queensland from overseas increased sharply during the year. The volume of logs imported fell by more than half whilst that of sawn timber increased substantially.

(1) General Building

The boom conditions which prevailed in the building industry for most of the year led to delays in the supply of most building materials including timber. This situation appeared to be changing rapidly however, towards the end of the year under the impact of economic restrictions.

The excessive demand led to some depreciation in quality standards chiefly with some imports from the South-east Asian region. Marketing of the many species from these areas and their subsequent use gives rise to problems of grading and utilisation which have not been entirely resolved by industry. Most sections of the local timber industry on the other hand maintained acceptable standards which was creditable under the circumstances.

The use of seasoned framing continues to increase in South-east Queensland but there is little evidence yet of this trend extending to other parts of the State. Pine millers are showing increasing interest in producing seasoned sub-floor and superstructural framing members in recognition of the advantage in marketing a complete framing system in seasoned softwoods.

There has also been increasing interest in laminated members using short or small-dimension material and the department has provided assistance and advice to several producers working on product development in this field.

The use of Cypress Pine in framing expanded by about a further 20 per cent. and there has been some interest also in its use for prefabricated roof-trusses.

An appreciation of the advantages to be gained from a reduction in the on-site labour component of building costs is indicated by activity in the development of prefabricated, as against precut, framing systems.

The Australian Standard Light Timber Framing Code has been gaining acceptance steadily but slowly. Its inclusion in State Uniform Building Regulations currently being developed would ensure its wider acceptance and be of great value in providing uniform minimum timber constructional standards acceptable to all approving and lending authorities.

The survey to assess the serviceability of lower-durability timbers as untreated external wall framing mentioned last year has been continued and extended to North Queensland, in collaboration with the Queensland Housing Commission. Fifty houses 14 to 27 years old framed with mixed rain forest timbers have been inspected. As in the southern Queensland softwood framing survey commenced last year it is being found that with basic inexpensive constructional precautions these timbers give quite satisfactory service under all types of cladding even under tropical conditions.

Inspection of 22 old houses demolished in Brisbane for developmental projects has indicated that untreated softwood cladding also performs well provided that maintenance is not neglected. These surveys are providing valuable information on the relative durability of various timber species.

With increasing interest in the marketing of softwood strip flooring further observations have been made on its performance in service and these confirm its structural adequacy and suitability and value for normal covered applications. When used uncovered with a well-maintained protective coating to improve its resistance to indentation and wear it can also be quite satisfactory in lightly trafficked domestic situations or where it is intended to be covered later.

A noticeable trend in the use of hardwood strip flooring is the increased use of standard grade material of mixed species in place of select grade of single species.

Two projects have been initiated to investigate moisture content changes in building framing and wall cavities over a range of constructional types and localities to formulate more soundly based recommendations for cavity ventilation and allowable moisture-content for lower-durability wall framing. One study involves observations on houses, the other on simulated external wall panels.

(2) Structural Engineering

Acceptance by Electricity Supply Authorities of a much wider range of species for crossarms and of suitable quality material from normal mill production, has eased supply problems in some areas and reduced costs. Assistance has been given in the drafting of a revised crossarm specification based on standard timber grading rules.

The high demand for railways sleepers continued but seems to have been met by the extended species schedule previously prepared in collaboration with the Railway Department.

A considerable market has developed for preservative treated round timber for retaining walls and park playground structures. Although mostly in open forest hardwoods now, the wider use of softwoods can confidently be expected.

(3) Mixed Species Utilisation

Work has been commenced to develop a simple method of assessing on-site the suitability for particular uses of individual framing members from mixed parcels without requiring species identification. Good relationships between some physical and mechanical properties have been developed as a first stage in this project.

(4) Panel Products

Plywood production was sustained at a high level, for use as a decorative finishing material and in structural applications. The industry has shown considerable initiative in the development and promotion of sheeting, flooring and box beams. Large volumes of structural plywood are also being used for temporary applications in high-rise building construction.

Trials have been commenced to test the serviceability of certain rain forest timber veneer species and a range of protective finishes in plywood truck trays compared with solid timber trays.

Particle-board utilization is expanding into areas of more intensive competition with plywood, hardboard and solid timber. Thinner sheets are being produced for use in furniture manufacture. In New Zealand more than 75 per cent. of all houses built have particle board floors and it seems likely this use will develop here also. The popular platform type of construction in Queensland offers some advantages to sheet flooring but at the same time, problems inherent in the use of this method of construction have become evident both in New Zealand and here. Some progress has been made in the preparation of an Australian Standard Specification and Code of Practice for the use of structural grades of particleboard.

(5) Mill Residues

A start has been made in preliminary estimation of the largely unused resources available as with sawdust, shavings and edgings. Overseas trends and local interest indicate that this resource will rapidly assume economic importance and no longer be a problem of waste disposal.

(6) North Queensland Trends

In conjunction with a lecture tour of major North Queensland centres undertaken at the request of the Timber Research and Development Advisory Council (North Queensland), a survey was made of trends in the industry. It was noted that the optimum utilisation of general building timbers was being seriously inhibited by the failure of industry to produce and market to uniform quality grades.

Recommendations were made that local industry should take action to produce and market its products in accordance with the relevant Australian Standards, and that specifying and approving authorities also should adopt standard grades to a greater degree in definition of their requirements. To date there has been no indication that this has yet occurred.

(7) Pulpwood

Pulpwood utilisation increased by 9 per cent. on the previous years' figures, to over 62,000 cubic metres, with increased softwood and reduced hardwood volume components by 21 per cent. and 49 per cent. respectively.

Further enquiries have been received regarding the possibilities of developing an export chip market, based largely on mill and logging waste. Samples of 28 open-forest hardwood species from South-east Queensland have been collected for two separate pulp evaluation trials in Japan. Result to date indicate yields and pulp quality to be generally satisfactory. The trials are not yet complete.

(8) Other Forest Products

The profitable export market for *Duboisia* leaf has been maintained at a value of about $700,000.

The increasing cost to Australia of pine oil, resins and related products, which approached $4,000,000 during the year under review, has undoubtedly stimulated interest exhibited from two sources in the establishment of local production. Assistance and encouragement has been given in exploratory feasibility enquiries.

(9) General

Lecturers were provided for technical education courses in Wood Technology and for intra-departmental training courses. Assistance was provided to the Education Department in the up-dating and reconstruction of the Wood Technology Course to better serve the needs of industry. It is hoped that these new courses will be increasingly available in country areas.

TECHNICAL AND FIELD STAFF TRAINING

(i) A further four State Scholarships were awarded in 1974, three to new matriculants and one to a student who had completed the first year of the degree course in Forestry. The first year of the Course is taken at the University of Queensland, or at the James Cook University North Queensland. A further three years are then taken at the Australian National University, Canberra.

The number of undergraduates holding State Forestry Scholarships as at 30th June, 1974 were:—First Year 4; Second Year 1; Third Year 6; Fourth Year 2.

Six State Scholarship holders graduated at the end of the 1973 Academic year and took up duty as Foresters within the Department in January 1974.

(ii) Seventeen Forest Trainees completed three years practical field training in January. After serving probationary periods as gangers they were appointed field overseers. A further 26 trainees selected from applicants with at least Junior Examination passes commenced training in 1974. At the end of June the total number in training was 51.

(iii) The system of Adult Training introduced in 1970 to supplement the Forest Trainee Scheme and provide an avenue of advancement potential ability was continued in 1974. The number of Adult Trainees at 30th June, 1974, totalled 8. Five completed training during the year and took up positions as Field Overseers.

STAFF

As at 30th June, 1974, there were 590 salaried officers on the staff comprising 269 in Head Office and 321 at District centres. This represents an increase of 19 on the number of salaried staff as at 30th June, 1973. The number of wages staff employed was 1,762.

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

Mr. B. E. Barstow (Clerk, Sales and Contracts), Brisbane, 46 years),

Mr. F. S. Gordon (Forest Ranger Division I, Ingham, 31 years).

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

It is with deep regret that the deaths are recorded of—

Mr. R. G. Spanner (Forest Ranger Division I, Yuleba).

Mr. F. R. Taylor (Male Assistant, Brisbane).

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

ACKNOWLEDGEMENTS

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

C. HALEY,
Conservator of Forests.

APPENDICES

APPENDIX A

Return of Forest Products and Quarry Material removed from Crown Lands during the Year ended 30th June, 1974

Species	Quantity Super. feet	Super. feet
Milling Timber—		
(a) Native Forests—		
Hoop and Bunya Pine—		
Ply	1,136,627	
Logs	5,923,326	
Tops	5,112,158	
		12,172,111
Kauri Pine	1,427,838	
White Cypress Pine	35,363,116	
Forest Hardwoods—		
Saw Logs	61,831,494	
Pulpwood	1,737,861	
Scrub Hardwoods	15,708,139	
Cabinet Woods	12,386,744	
Miscellaneous Species	31,835,176	
Limb Logs, Head Logs, Stumps and Flitches	567	
		160,290,368
(b) Plantation Thinnings—		
Hoop Pine	26,483,108	
Bunya Pine	42,669	
Kauri Pine	8,536	
Slash Pine	8,896,443	
Loblolly Pine	3,554,284	
Patula Pine	2,986,521	
Radiata Pine	859,182	
Caribbean Pine	271,821	
Pinaster Pine	3,962	
Silky Oak	33,316	
Chinese Fir	1,085	
Chir Pine	7,056	
Longleaf Pine	2,858	
Shortleaf Pine	1,193	
		43,152,034
(c) Pulpwood—		
Hoop Pine	5,550,760	
Slash Pine	10,835,798	
Loblolly Pine	1,326,606	
Caribbean Pine	217,050	
Radiata Pine	64,671	
Patula Pine	1,128,544	
Pinaster Pine	2,191	
		19,125,620
		234,740,700

Other Classes		Expressed as Superficial feet (Hoppus) Log Measure
Sleepers Hewn	754 pieces	28,648
Sleepers Sawn—5 ft.	50,603 pieces	1,416,884
Sleepers Sawn—7 ft.	235,093 pieces	8,933,534
Sleeper Blocks (as Sleepers contained)	200 pieces	7,200
Transoms, Crossings, Headstocks, Longitudinals	315,217 superficial feet	315,217
Girders, Corbels, Piles, Sills, Kerb Logs	78,872 lineal feet	1,419,696
Girder Logs	70,926 superficial feet	70,926
Poles	126,839 lineal feet	887,873
House Blocks	5,451 lineal feet	32,706
Fencing Material—Round	317,442 lineal feet	793,605
Fencing Material—Split	106,031 pieces	954,279
Mining Timbers—Round	610,002 lineal feet	1,220,004
Mining Timbers—Sawn	296,391 superficial feet	296,391
Offcuts—Pallet and Short Length Sawn Timber	59,449 superficial feet	59,449
		16,436,412

Other Classes—*continued*	
Fuel	7,226 tons
Quarry Material—Sand, Gravel, Soil, &c.	1,403,364 cubic yards
Fibre, Bark, Dry Leaves, Reeds	24 bags
Flora	2,249 pieces
Peat	198 bags
Poling Timber (Copper Refining)	874 tons
Lawyer Cane	3½ tons
Boat Knees	20 pieces
Bee Hives	22 hives
Black Wattle	638 tons
Charcoal	22 tons
Trees and Plants (number)	256,341
Brush Material (Brush Fence)	60 tons
Freestone	82 cubic feet

APPENDIX B

Total Receipts, Department of Forestry, for the Year ended 30th June, 1974

Receipts from Districts	Totals $
Group 1—South Queensland (Brisbane, Beerburrum, Beerwah, Benarkin, Bundaberg, Fraser Island, Gallangowan, Gympie, Imbil, Jimna, Kalpowar, Maryborough, Monto, Murgon, Yarraman)	2,417,223.66
Group 2—North Queensland (Atherton, Cairns, Cooktown, Charters Towers, Herberton, Hughenden, Ingham, Innisfail, Port Douglas, Ravenshoe, Townsville)	1,219,753.82
Group 3—Dalby, Roma, Taroom, Charleville, Mitchell, Quilpie	466,786.16
Group 4—Warwick, Goondiwindi, Inglewood, St. George, Stanthorpe, Cunnamulla	254,201.43
Group 5—Mackay, Rockhampton, Clermont, Bowen, Proserpine, Emerald, Springsure, Theodore, Winton	242,309.64
Group 6—Barcaldine, Blackall, Jundah, Longreach, Muttaburra, Stonehenge, Aramac, Isisford, Jericho	157.65
Group 7—Cloncurry, Boulia, Kynuna, Mackinlay, Richmond	616.12
Group 8—Burketown, Coen, Croydon, Georgetown, Normanton, Thursday Island	43.90
	$4,601,092.38

Other Receipts	
Forestry and Lumbering	427,287.26
Sale of Plants, Materials, &c.	82,339.46
Licences (see note after Appendix C)	32,879.30
Rents	34,873.34
Grazing dues	62,035.46
Miscellaneous (Salisbury Area Timber Account, Forfeit Wages, Expenditure Recoveries, &c.)	40,779.28
Miscellaneous TRADAC	12,705.11
Sale of U.S. tractors, trucks, &c.	313,145.82
	$5,607,137.41
Plant Hire—	
Charged to Works Projects	1,462,153.72
	$7,069,291.13

The above receipts were disposed of as follows:—	
To Consolidated Revenue Fund as repayment of previous expenditure	891.38
To Loan Fund as repayment of previous expenditure and surplus plant hire	442,019.62
To Forestry and Lumbering Fund:—	
As expenditure on marketing of log timber, maintenance of access roads, capital improvements, plant, TRADAC, &c.	3,921,551.33
As Interest and Redemption on Loans	2,704,828.80
	$7,069,291.13

APPENDIX C

Proceeds of Sales of Timber, &c., for the period 1st July, 1970. to 30th June, 1974 (Financial Years)

Groups*	1970–71	1971–72	1972–73	1973–74
	$	$	$	$
Group 1	1,842,022.79	2,204,307.41	2,490,215.17	2,345,146.31
Group 2	1,282,363.10	1,329,330.26	1,363,224.19	1,188,048.58
Group 3	275,084.64	348,381.93	397,017.77	442,893.72
Group 4	161,610.61	216,149.29	268,993.90	245,077.36
Group 5	153,329.05	157,693.29	221,016.70	230,477.40
Group 6	214.17	207.73	102.71	157.65
Group 7	610.50	1,128.51	484.57	616.12
Group 8	38.50	325.50	*Cr.* 73.30	43.90
	$3,715,273.36	$4,257,523.92	$4,740,981.71	$4,452,461.04
Timber Research and Development Advisory Council	103,483.19	113,692.91	112,997.50	148,631.34
	$3,818,756.55	$4,371,121.83	$4,853,979.21	$4,601,092.38
Receipts—Forestry and Lumbering	488,348.17	676,130.72	849,462.50	427,287.26
Sale of Plants, Material, &c.	44,970.94	53,290.06	61,273.39	82,339.46
Licences†	19,917.00	20,531.45	23,539.30	32,879.30
Rents and Grazing Dues	79,590.87	85,853.73	91,501.35	96,908.80
Miscellaneous (Salisbury Area Timber Account, Forfeit Wages, Expenditure Recoveries, &c.)	53,075.91	180,804.83	47,452.30	53,484.39
Sale of U.S. Tractors, Trucks, &c.	86,096.97	136,555.00	137,897.51	313,145.82
	$4,590,756.41	$5,524,382.62	$6,065,105.56	$5,607,137.41

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

APPENDIX D

Constructional Timbers Supplied During Financial Year 1973–74 under Forestry and Lumbering Operations

Class of Timber	Quantity	Sales Value
		$
Crossings	120,107 super. feet	18,433.41
Headstocks and Braces	3,351 super. feet	720.45
Transoms	111,415 super. feet	17,428.84
Piles	12,510 lineal feet	12,010.79
Girders—Dressed	12,190 lineal feet	35,531.95
Sleepers	133,311 pieces	332,453.24
Sleepers—Tramway	Nil	Nil
Split Posts and Rails offcuts, &c.	787 pieces	393.50
House Blocks	Nil	Nil
Guide Posts	3,647 super. feet	861.74
Hewn Bridge Timbers	19,952 super. feet	4,453.90
Total	..	$422,287.82

APPENDIX E

Comparative Statement of Expenditure for Years 1972–73 and 1973–74

——	*1972–73*	*1973–74*
	$	$
Revenue—		
Salaries	3,326,615	4,006,660
Cryptotermes brevis Investigation	13,267	10,778
Fares, Printing, Stores, &c.	14,617	19,164
Travelling Expenses and Incidentals	210,099	293,017
National Parks	103,811	331,910
Cash Equivalent of Long Service Leave	59,810	31,509
	3,728,219	4,693,038
Loan—		
National Parks	375,204	269,084
Recreational Facilities State Forests	21,341	25,593
	396,545	294,677
Trust—		
Reforestation Trust Fund—		
Reforestation	6,968,811	8,140,993
Land Acquisition	218,238	15,985
Purchase of Plant	917,239	252,191
Access Roads	532,065	342,750
Purchase of Radio Equipment	24,500	15,018
Purchase of Firefighting Equipment	12,621	21,787
	8,673,474	8,788,724
Forestry and Lumbering Fund—		
Interest and Redemption on Loans	3,134,014	2,704,829
Hardwood Supplies to Railway Department and others	764,368	370,921
Harvesting and Marketing Timber	1,605,717	1,662,090
Access Roads—Maintenance and Subsidies	275,584	315,685
Maintenance of Plant	1,057,629	1,187,065
Maintenance of Capital Improvements	188,831	224,461
Expenses—Timber Research and Development Advisory Councils	119,230	161,426
	7,145,373	6,626,477
Total	19,943,611	20,402,916

APPENDIX F

Net Area of Plantation Established 1st April, 1973, to 31st March, 1974

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	306·3	914·9	82·4	248·8	143·0	476·0	93·0	..	652·5	2,916·9
Kauri Pine	..	..	..	..	..	..	..	..	..	..
Bunya Pine	..	..	..	..	..	51·8	..	..	..	51·8
Other Native Conifers	..	..	..	..	..	..	..	..	..	..
Total—Native Conifers	306·3	914·9	82·4	248·8	143·0	527·8	93·0	..	652·5	2,968·7
B. Exotic Conifers—										
Slash Pine	1,439·7	3,400·2	..	3,032·4	..	..	..	..	116·3	7,988·6
Loblolly Pine	146·6	116·2	..	..	..	..	..	..	..	262·8
Patula Pine	..	..	..	..	..	..	..	..	35·0	35·0
Caribbean Pine	29·4	31·0	306·3	343·7	..	..	409·5	..	..	1,119·9
Radiata Pine	..	..	..	..	..	..	..	202·7	47·0	249·7
Long Leaf Pine	..	..	..	..	..	..	..	..	..	..
Other Exotic Conifers	..	..	..	..	..	..	4·3	2·0	..	6·3
Total—Exotic Conifers	1,615·7	3,547·4	306·3	3,376·1	..	..	413·8	204·7	198·3	9,662·3
Total—Conifers	1,922·0	4,462·3	388·7	3,624·9	143·0	527·8	506·8	204·7	850·8	12,631·0
2. Broadleaved Species										
A. Native Forest Hardwoods—										
Rose Gum	..	..	..	..	..	..	..	..	..	..
Grey Ironbark	..	..	..	..	..	..	..	..	..	..
Tallowwood	..	..	..	..	..	..	..	..	..	..
Blackbutt	..	..	..	..	..	..	..	..	..	..
Gympie Messmate	..	..	..	..	..	..	..	..	..	..
Others	..	..	..	..	..	..	..	..	..	..
Total—Native Forest Hardwoods	..	..	..	..	..	..	..	..	..	..
B. Other Broadleaved Species—										
Silky Oak	..	..	..	..	..	..	..	..	..	..
Queensland Maple	..	..	..	..	..	..	..	..	..	..
Red Cedar	..	..	..	..	..	..	..	..	..	..
Others	..	..	..	..	..	..	..	..	..	..
Total—Other Broadleaved Species	..	..	..	..	..	..	..	..	..	..
Total—Broadleaved Species	..	..	..	..	..	..	..	..	..	..
Miscellaneous Experimental	14·7	..	..	..	..	..	3·3	..	..	18·0
Total—All Species	1,936·7	4,462·3	388·7	3,624·9	143·0	527·8	510·1	204·7	850·8	12,649·0

APPENDIX G

Net Area of Effective Plantation Classified into Forestry Districts to 31st March, 1974

Species	Brisbane	Gympie	Mackay	Mary-borough	Monto	Murgon	North Queens-land	Warwick	Yarraman	Totals
	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres	Acres
1. Conifers										
A. Native Conifers—										
Hoop Pine	2,567·0	25,186·7	434·5	2,983·1	5,839·7	16,436·6	2,219·6	16·7	29,880·5	85,564·4
Kauri Pine	5·3	140·5	2·7	69·7	3·6	4·8	292·4	0·8	7·3	527·1
Bunya Pine	14·4	623·6	..	0·8	1·2	215·0	3·0	..	253·7	1,111·7
Other Native Conifers	2·8	7·8	0·8	1·9	..	..	14·1	0·9	0·1	28·4
Total—Native Conifers	2,589·5	25,958·6	438·0	3,055·5	5,844·5	16,656·4	2,529·1	18·4	30,141·6	87,231·6
B. Exotic Conifers—										
Slash Pine	24,601·5	34,607·5	2,547·4	36,905·3	53·2	1·4	11·3	819·4	1,062·7	100,609·7
Loblolly Pine ..	4,222·3	426·5	10·1	55·5	2·7	9·4	14·0	239·3	42·5	5,022·3
Patula Pine	18·9	19·0	8·6	8·1	24·8	99·9	35·0	471·3	3,374·2	4,059·8
Caribbean Pine ..	589·7	734·0	8,523·8	3,336·8	1·4	0·7	2,966·4	..	67·7	16,220·5
Radiata Pine ..	0·6	..	..	..	..	12·0	..	3,705·7	1,229·4	4,947·7
Longleaf Pine ..	246·6	3·4	5·5	2·2	..	..	..	8·5	1·8	268·0
Other Exotic Conifers	61·0	41·2	96·4	25·2	9·5	3·6	64·5	45·9	81·4	428·7
Total—Exotic Conifers	29,740·6	35,831·6	11,191·8	40,333·1	91·6	127·0	3,091·2	5,290·1	5,859·7	131,556·7
Total—Conifers ..	32,330·1	61,790·2	11,629·8	43,388·6	5,936·1	16,783·4	5,620·3	5,308·5	36,001·3	218,788·3
2. Broadleaved Species										
A. Native Forest Hardwoods—										
Rose Gum	277·3	1,204·6	0·3	0·2	..	21·8	1·7	..	176·4	1,682·3
Grey Ironbark ..	209·6	182·4	0·1	0·1	..	9·4	37·8	..	469·5	908·9
Tallowwood	123·5	18·9	0·2	0·7	..	0·5	28·8	..	5·0	177·6
Blackbutt	240·4	249·8	0·1	117·8	..	8·6	0·2	..	0·5	617·4
Gympie Messmate ..	..	280·4	..	..	..	..	..	..	..	280·4
Others	29·6	75·9	1·3	2·0	..	..	10·9	..	2·8	122·5
Total—Native Forest Hardwoods ..	880·4	2,012·0	120·8	120·8	..	40·3	79·4	..	654·2	3,789·1
B. Other Broadleaved Species—										
Silky Oak	..	69·5	..	0·4	..	25·0	26·5	..	484·3	605·7
Queensland Maple ..	..	70·5	..	..	0·6	..	248·5	..	..	319·6
Red Cedar	..	6·9	..	..	..	..	31·7	..	..	38·6
Others	3·6	80·2	0·3	0·4	0·2	..	34·6	..	1·1	120·4
Total—Other Broadleaved Species ..	3·6	227·1	0·3	0·8	0·8	25·0	341·3	..	485·4	1,084·3
Total—Broadleaved Species	884·0	2,239·1	2·3	121·6	0·8	65·3	420·7	..	1,139·6	4,873·4
Miscellaneous Experimental	99·4	32·4	12·7	51·5	0·6	0·2	45·6	23·5	61·3	327·2
Total—All Species ..	33,313·5	64,061·7	11,644·8	43,561·7	5,937·5	16,848·9	6,086·6	5,332·0	37,202·2	223,988·9

APPENDIX H

Areas of Natural Forest Treated

A.—EUCALYPTS

Sub-District	Treated 1973–74	First Treatment 1973–74	Total as at 30th June, 1974
	Acres	Acres	Acres
Brisbane	152	43	33,146
Beerburrum	994	473	23,376
Gympie	1,040	910	22,219
Imbil	32	..	500
Mackay/Emerald/ Rockhampton	466	466	49,314
Maryborough	4,058	1,234	118,216
Bundaberg	414	..	39,351
Fraser Island	804	..	26,034
Monto	673	479	27,743
Murgon/Jimna ..	602	425	46,556
Atherton	..	..	3,712
Ingham	..	..	2,985
Warwick	91	..	10,553
Inglewood	..	..	15,697
Yarraman	..	..	6,414
Benarkin	..	..	2,067
Dalby/Chinchilla ..	12	12	82,802
Total—Eucalypts	9,338	4,042	510,685

APPENDIX H—continued

B.—CYPRESS PINE

Sub-District	Treated 1973–74	First Treatment 1973–74	Total as at 30th June, 1974
	Acres	Acres	Acres
Bundaberg	..	..	2,152
Fraser Island	..	..	4,424
Monto	..	..	2,496
Inglewood	5,392	4,026	121,444
Dalby/Chinchilla/ Roma	18,735	10,223	291,654
Total—Cypress Pine	24,127	14,249	422,170

APPENDIX H—continued

C—RAIN FOREST

Sub-District	Subsequent Treatment 1973–74	First Treatment 1973–74			First Treatment Completed 1973–74	Total at 30th June, 1974
		Brushed	Ring-barked and Thinned	Trees Interplanted		
	Acres	Acres	Acres	Acres	Acres	Acres
Natural Hoop Pine—						
Maryborough	..	..	..	..	..	65
Bundaberg	..	..	..	..	..	9,973
Total—Natural Hoop Pine	..	..	..	..	..	10,038
Natural Rain-Forest—						
Atherton	148	..	167	..	..	10,959
Ingham	..	..	..	..	..	1,364
Warwick	..	..	..	..	..	21
Total—Natural Rain-Forest	148	..	167	..	..	12,344
Total—Rain-Forest ..	148	..	167	..	..	22,382

APPENDIX H—continued

Grand Total—	Acres
Eucalypts	510,685
Cypress Pine	422,170
Rain Forest	22,382
	955,237

APPENDIX I

State Forests, Timber Reserves and National Parks listed by Forestry Districts and Sub-Districts as at 30th June, 1974

District	Sub-District	State Forests		Timber Reserves		National Parks	
		No.	Area	No.	Area	No.	Area
			A. R. P.		A. R. P.		A. R. P.
Brisbane	Beerburrum ..	30	127,676 1 8	5	1,664 0 0	13	4,349 0 0
	Brisbane	29	147,524 1 24	14	19,196 1 24	36	94,648 0 32
	Totals	59	275,200 2 32	19	20,860 1 24	49	98,997 0 32
Dalby	Chinchilla–Barakula	19	888,576 1 8	3	17,912 2 0	1	25,970 0 32
	Dalby	21	554,676 0 0	3	1,026 0 32	1	31,542 1 08
	Roma	30	488,029 3 24	3	83,791 3 24	1	4,349 0 0
	Totals	70	1,931,282 0 32	9	102,730 2 16	3	61,861 2 0
Gympie	Gympie	30	290,426 1 08	2	1,436 0 32	4	2,146 3 08
	Imbil	10	144,484 1 08	2	148 2 0	1	640 0 0
	Totals	40	434,910 2 16	4	1,584 2 32	5	2,786 3 08
Mackay	Emerald	7	185,308 2 32	10	264,218 2 16	7	1,494,134 3 08
	Mackay	10	170,465 1 24	16	97,199 3 08	91	316,122 2 32
	Rockhampton ..	51	993,026 0 32	11	105,158 0 0	14	13,270 1 08
	Totals	68	1,348,800 1 08	37	466,576 1 24	112	1,823,527 3 08
Maryborough ..	Bundaberg	20	236,088 2 32	20	64,266 1 08	..	..
	Fraser Island ..	1	292,072 0 32	..	..	1	83,124 1 24
	Maryborough ..	37	372,769 3 24	15	28,638 0 16	6	13,934 0 0
	Totals	58	900,930 3 08	35	92,904 1 24	7	97,058 1 24
Monto	Kalpowar	7	41,456 2 32	13	63,624 3 24	..	..
	Monto	39	637,548 1 24	16	30,494 2 0	6	28,900 3 08*
	Totals	46	679,005 0 16	29	94,119 1 24	6	28,900 3 08
Murgon	Gallangowan ..	3	38,253 2 16	..	..	..	..
	Jimna	4	116,403 3 08	..	..	..	..
	Murgon	14	139,793 1 24	9	27,072 3 08	..	..
	Totals	21	294,450 3 08	9	27,072 3 08	..	..
North Queensland	Atherton	35	863,667 0 16	33	807,698 0 32	68	370,174 2 16*
	Ingham	16	577,013 0 16	3	8,273 3 24	30	244,733 1 08
	Totals	51	1,440,680 0 32	36	815,972 0 16	98	614,907 3 24
Warwick	Inglewood	28	471,084 2 16	1	172 0 0	1	1,379 1 08
	Warwick	16	85,942 2 16	3	2,494 0 0	6	15,819 3 08
	Totals	44	557,027 0 32	4	2,666 0 0	7	17,199 0 16
Yarraman ..	Benarkin	4	70,996 3 08	3	4,443 2 16	..	..
	Yarraman	20	129,806 2 0	10	21,692 0 32	4	15,601 2 16
	Totals	24	200,803 1 08	13	26,135 3 08	4	15,601 2 16
	State Totals ..	481	8,063,091 0 32	195	1,650,622 2 16	292	2,760,841 0 16*

* Denotes Marine Parks included.

APPENDIX J

Reservations for the Year Ending 30th June, 1974

1st July, 1973 to 30th June, 1974

STATE FORESTS

	No.	Hectares	A.	R.	P.
As at 1st July, 1973	480	3 183 327·613	7,866,125	1	05·6
Declared	11	55 480·295	137,091	3	08
Declared and added to existing State Forests		11 775·962	29,098	2	00
Timber Reserves declared State Forest	4	10 552·9	26,076	0	32
Timber Reserves declared State Forest and amalgamated with existing State Forests		18 767·0	46,373	1	08
Recomputation of boundary		— 297·376	— 857	2	29·6
Area released		—16 518·149	— 40,816	0	32
Amalgamation of existing State Forests	—14				
Total as at 30th June, 1974	481	3 263 088·245	8,063,091	0	32

TIMBER RESERVES

As at 1st July, 1973	202	695 758·4113	1,719,221	3	27·9
Declared	1	325·468	804	1	08
Declared and added to existing Timber Reserves		2 047·376	5,059	0	16
Timber Reserves declared State Forests	—6	—29 319·9	— 72,449	2	00
Reserves transferred to Miscellaneous List	—2	— 1·869	4	2	32
Recomputation of boundary		— 26·185	— 67	2	03·9
Area released		— 785·491	— 1,941	0	00
Total as at the 30th June, 1974	195	667 997·8103	1,650,622	2	16

NATIONAL PARKS

As at 1st July, 1973	289	1 039 528·1573	2,568,851	2	00·1
Declared	6	55 782·611	137,838	3	08
Declared (Marine National Park)	2	12 700·0	31,381	2	32
Declared and added to existing National Parks		9 295·426	22,968	3	24
Recomputation of boundary		— 4·438	— 188	0	32·1
Area released		— 4·732	— 11	2	16
Amalgamation of existing National Parks	—5				
Total as at the 30th June, 1974	292	1 117 297·0243	2,760,841	0	16

APPENDIX K

Distribution of Personnel, 30th June, 1974

—	Head Office	District Centres	Total
Salaried Officers—			
Professional	59	69	128
Technical	70	27	97
Field	10	107	117
Clerical	120	116	236
Miscellaneous	10	2	12
Sub Totals	269	321	590
Wages Staff	42	1,720	1,762
Totals	311	2,041	2,352

APPENDIX L

Tree Species Mentioned in Annual Report

Botanical Names

A. NATIVE CONIFERS

Bunya Pine	*Aruacaria bidwillii*
Coastal Cypress Pine	*Callitris columellaris* syn. *arenosa*
Cypress Pine	*Callitris columellaris* syn. *glauca*
Hoop Pine	*Araucaria cunninghamii*
Kauri Pine	*Agathis robusta*
South Queensland Kauri Pine	*Agathis roburta*
White Cypress Pine	*Callitris columellaris* syn. *glauca*

B. EXOTIC CONIFERS

Bahamas Caribbean Pine	*Pinus caribaea* var. *bahamensis*
Caribbean Pine	*Pinus caribaea* (3 varieties)
Chinese Fir	*Cunninghamia lanceolata*
Chir Pine	*Pinus roxburghii*
Cuban Caribbean Pine	*Pinus caribaea* var. *caribaea*
Douglas Fir	*Psuedotsuga menziesii*
Honduras Caribbean Pine	*Pinus caribaea* var. *hondurensis*
Klinki Pine	*Araucaria hunsteinii*

B. EXOTIC CONIFERS *continued*

Loblolly Pine	*Pinus taeda*
Longleaf Pine	*Pinus palustris*
North Florida Slash Pine	*Pinus elliottii* var. *elliottii*
Ocote Pine	*Pinus oocarpa*
Patula Pine	*Pinus patula*
Pinaster Pine	*Pinus pinaster*
Radiata Pine	*Pinus radiata*
Sand Pine	*Pinus clausa*
Shortleaf Pine	*Pinus echinata*
Slash Pine	*Pinus elliottii* var. *elliottii*
South Florida Slash Pine	*Pinus elliottii* var. *densa*

C. EUCALYPTUS

Bancrofts Red Gum	*Eucalyptus bancroftii*
Blackbutt	*Eucalyptus pilularis*
Carbeen	*Eucalyptus tessellaris*
Flooded Gum	*Eucalyptus grandis*
Forest Red Gum	*Eucalyptus tereticornis*
Grey Box	*Eucalyptus moluccana*
Grey Gum	*Eucalyptus propinqua*
Grey Ironbark	*Eucalyptus drepanophylla*
Gympie Messmate	*Eucalyptus cloeziana*
Narrowleaf Ironbark	*Eucalyptus crebra*
Rose Gum	*Eucalyptus grandis*
Spotted Gum	*Eucalyptus maculata*
Tallowwood	*Eucalyptus microcorys*
White Mahogany	*Eucalyptus acmenioides*

D. OTHER BROADLEAFED TREE SPECIES

Bonewood	*Macropteranthea* sp.
Bulloak	*Casuarina luehmannii*
Meranti	*Shorea* spp.
Queensland Maple	*Flindersia brayleyana*
Queensland Silver Ash	*Flindersia bourjotiana*
Red Cedar	*Toona australis*
Rosewood	*Eremophila mitchellii*
Sandlewood	*Santalum lanceolatum*
Silky Oak	*Grevillea robusta*
Silkwood	*Flindersia pimenteliana*
Wattle	*Acacia* spp.
White Cedar	*Melia azederach*

E. WEEDS, GRASSES, PALMS, ETC.

Moonlight Cactus	*Eriocereus tortuosus*
Lantana	*Lantana camara*

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