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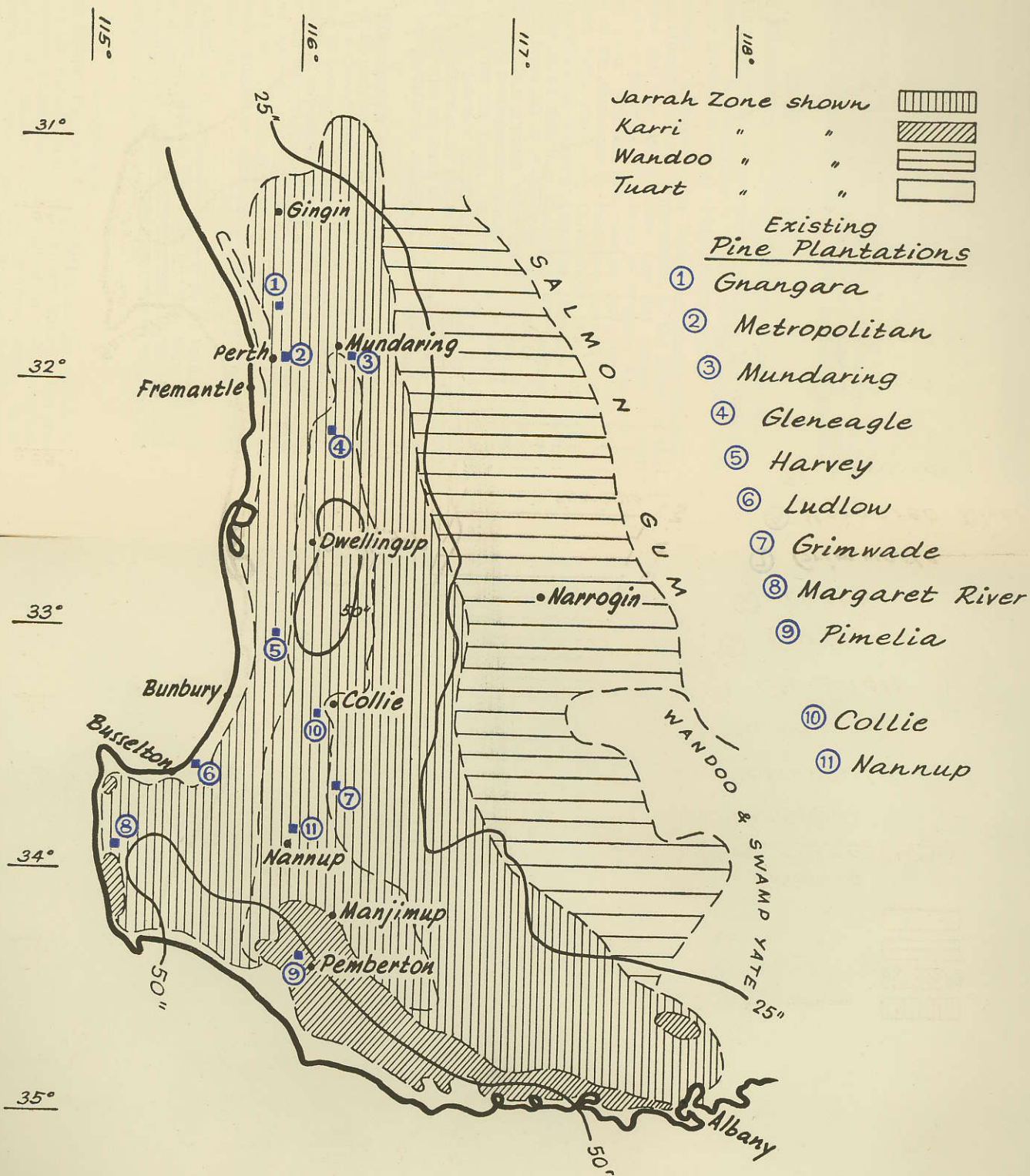
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FOREST MANAGEMENT IN THE EUCALYPT FORESTS OF THE SOUTH-WEST OF WESTERN AUSTRALIA.

SUMMARY.

Western Australia, although containing a very small percentage of its land area under forest, has been fortunate in having the greater part of the prime eucalypt forest dedicated to forestry.

By virtue of an excellent Forests Act, easily managed forest, and the relatively slow development of population over a history of one and a quarter centuries, it has been possible during four decades of active forestry to bring a eucalypt forest of between 4 and 5 million acres to a fairly satisfactory condition of forest management under working plans.

Due in no small measure to forest photogrammetry, the forest capital and the permissible cut from State Forest have been approximately decided. It is still in excess of the actual cut and working plans are nearing the stage (1960) when the cut will be correctly distributed over the State Forest.

INTRODUCTION.

1.—Definition of Management and Policy under the Forests Act.

Throughout world forestry there are varying ideas on the definition of "Forest Management." In submitting a paper on the subject it is necessary, therefore, to be clear on what definition is accepted.

In Western Australia a comprehensive Forest Act places considerable powers, including virtual financial independence, in the hands of the Conservator of Forests and the policy under this Act makes it clear that the aim of the Act is to bring the forests of Western Australia to the basis of sustained yield. The Act also provides for a Working Plan to have the approval of the Governor in Executive Council and thus it constitutes a document from which the Government does not lightly depart. Forest Management in Western Australia, therefore, is looked upon as warranting the broad definition that it is the business of co-ordinating the different branches of Forestry to carry out the wishes of the owner of the forest. This is a much wider definition than that sometimes accepted, namely that management is concerned primarily with the determination of the cut from the forest. It follows from the policy set down in the Act that the forester in Western Australia has the way smoothed for him as he is directed at the outset to apply the idealistic conceptions of Forestry and does not have to any great degree the problem of the owner wishing the forester to manage a forest for short term or spasmodic ends.

The Forests Act, 1918, together with amendments in 1954 is regarded by foresters generally as an excellent piece of legislation giving practically all the powers needed by a Conservator: to hold, buy and exchange land; to control timber getting by permit or license and to dispose of forest produce on either a stumpage or sale basis. It sets up a fund of 90 per cent. of the net revenue for the reforestation and improvement of the forests and it provides for the control of the forest under Working Plans. It provides also the machinery for the making of regulations to ensure the submission by permit holders of all those statistical returns, necessary to the study of the forest.

It is, of course, a matter of first importance in a young country that adequate and stable finance should be available to those planning the future and at the date of writing there is every prospect that the fund arising from the net revenue will ensure steady and stable finances for management of the indigenous forests.

2.—Apologia.

In the paper which follows the reader may feel that the author is unduly congratulatory to the Forest Service of Western Australia on the subject of the high standard which has been reached in a short period of time over a large area of 5 million acres of Eucalypt forest. It is therefore desirable to point out at the outset that much of the development which can be claimed is due to the remarkable assistance which nature offers the forester in Western Australia.

Although there are some difficulties to be met, one may say by and large that the hardwood belt of Western Australia in many ways presents ideal conditions. The whole of the forest is virtually one continuous area of 5 million acres. It is topographically easy and presents no serious engineering problems, while at the same time being well drained. Soils are such that road making is an extremely simple problem and over the greater part of the forest it is possible to extract timber directly by the mere process of clearing a track.

There is a sound basic mapping framework provided by the Lands Department survey system and map projections on which to base Forestry map production and species generally are readily separated by air photogrammetry.

There are some minor silvicultural complications arising from mixed species, but the forest throughout is easily regenerated and reasonably fire resistant. The climate lends itself to control-burning programmes over long periods of the year.

Nature has provided high points strategically situated throughout the whole of the area from which lookout towers can detect and locate fires to a high degree of efficiency, thus reducing those difficulties which confront many foresters in this connection and which make it necessary in some forests to introduce air transport for fire control and other activities.

The relatively slow and even growth of population from the first settlement in 1829 to only 658,000 in 1956 is also an important factor, as at no time has the local demand on the forest ever exceeded its productive capacity.

When such factors are taken into account it will be realised that, while claiming a high order of development in the mere four decades since the passing of the Forests Act (1918), this development has been greatly assisted by nature and the general economy of the State and taken advantage of by those Forestry leaders who have guided the planning.

3.—Development of the State and the "Eras" of Forest Management.

It would be unrealistic to discuss forest management without a first reference to State statistics and history, and the interrelated economics.

It will be noted that throughout the paper, round figures are used to avoid repeating long numbers. The term "load of timber" represents 50 cubic feet full volume.

An amplification of the chronology and statistics of those seeking greater detail is given as Appendix 1, "Historical Review" and Appendix 2, "Statement of Facts."

Forest development in Western Australia is intimately connected with the growth of population and to give a brief picture of development, it is convenient to subdivide the 127 years 1829 to 1956 into "eras."

It will be seen from an examination of the facts of these eras, that the manner of the development of the State of Western Australia has been most propitious to the development of forest management, and at no time has a sudden or unforeseen demand on the forest estate forced the forester to act seriously against the interests of the ideals of Forestry. Localised over-cutting, to meet export demands, which caused alarm prior to the 1928 Working Plan, is now seen in its true perspective as having resulted in only minor damage when related to the present five million acres. Considerable damage to the forest has however resulted due to uncontrolled fires over an area of about 3 million acres of virgin forest in which there was little or no access or timber getting prior to the 1945 Working Plan.

Clearing of high forest from lands of poor agricultural value has destroyed some of the original prime forest, but much less than would have been expected had sudden population developments, apart from goldmining, taken place. This, however, may be noted only in passing as we are now concerned with the problem of management of the State Forests, about half of which are virgin, and which fortunately contain the great bulk of the original prime forest.

It is of interest that about 100,000 acres within the prime Karri zone has been alienated, of which about 45,000 acres, or nine per cent. of the Karri forest, has been cleared or ringbarked. Generally speaking, alienation of Jarrah forest has been largely confined to areas of lower quality forest and the great bulk of the prime belt is today State Forest in large unbroken areas. The major inroads into the prime Jarrah belt naturally followed up the valleys in which better soils were associated largely with Marri and Blackbutt. *
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The period of 127 years since cutting commenced may conveniently be divided into eras, as follows:—

4.—1829-1880: The Pioneering Era.

The first 50 years—pioneering era, during which no large forest exploitation took place and the State's population was still less than 30,000. The total timber cut in this era was insignificant, amounting to only about 619,517 loads, or less than one year's current cutting, most of which was undoubtedly from forest outside the areas which are now State Forest.

During this era timber getting was controlled by the Lands Department under an act gazetted in 1843 and concessions were granted at a nominal rental.

5.—1880-1900: The Era of Concessions and Leases.

These two decades saw the issue of timber concessions or leases and a steady build up of the timber trade, exporting about half the total cut.

At the end of this era, the turn of the century, the population had grown to 179,708 and the cut from the forests to 410,000 loads per annum.

During these two decades, it is estimated that a total cut of logs was 2,494,880 loads, but that only half of this cut would have come from what is now State Forest. *106 loads from SF before 1900.*

6.—1900-1920: The Era of Early Permit Control under the Land Act.

There was a Forests Department under the Land Act, 1898, and some control of cutting by girth restriction was introduced, but little detailed control in the forest was accomplished.

This era saw the issue of Timber Leases which gave exclusive rights to cut any kind of timber, and permits under the Land Act, 1904, which brought in a measure of girth control and provided for royalties. These leases and permits resulted in the establishment of the industry on approximately the scale at which it still works today and by the end of this era the annual cut for the State, including Private Property, had grown to approximately 700,000 loads, and there was some concern as to the ability of the forest to sustain this cut, about a third of which was being exported.

(Highest cut, 1900-1920; 889,000 loads in 1903; average for 20 years—610,000 loads.)

By 1920 the population of the State had reached 331,000, and that of Perth was 154,000.

7.—1920-1955: The Era of Forest Management.

This span of 35 years saw the implementation of the Forests Act of 1918 and could be called the era of the introduction and consolidation of forest management and working plan control, which initially was by broad measures restricting the total cut.

This era, apart from some deceleration during the war years, represented an extremely active period of forest engineering during which mapping, access, housing, communications, and water supplies had high priority and during which time reforestation and protection were brought to an advanced position over about 2½ million acres of forest. Assessments and working plans were developed by 1956 for some 5 million acres.

As an indication of the material works associated with the development of forest management, a few statistics as at June, 1956, are quoted as follows:—

	Miles
Road and track system	15,336
Telephone lines	1,670
Houses	422
Offices	45
Automotive units	354
Radio—fixed and mobile sets	86
Fire lookout towers	35

8.—Working Plans and the Permissible Cut.

Occasionally criticism has been directed at the practice in this State of covering the whole of the Jarrah and Karri forests of five million acres in one general working plan, in lieu of the generally accepted ideal of covering smaller more homogeneous working circles, each of which is individually planned towards sustained yield.

The writer does not defend the practice on academic grounds but points out that the first of these major plans, 1927-28, was a practical attempt to introduce some form of control in a little known, wild and fairly homogeneous forest, much of which was economically inaccessible and in country with a population of only 415,000 people. It was spectacularly successful.

Under the conditions of development of this State, some migration of the timber industry was unavoidable but the results of the successive General Working Plans have proved the effectiveness of this form of control in the eras of first planning by arresting that migration during the period 1928 to 1956. The successive working plans were 1928, 1939, 1945 and 1956 and the two latter plans, while reducing the cut on portions of the Northern Region, introduced or provided a future for large new sawmills in the far South region, which had, up to 1945, been on the borderline of economic hauling during the pre-war (1939) and war-time economy of the State. The main market was Perth, 200 miles distant, and the State population was only 472,000 at the outbreak of World War II.

These plans have, apart from determining a cut, for the State Forest as a whole, in all cases prescribed the cut individually for some 64 working plan areas within the whole, while each successive working plan has brought this cut for each working plan area nearer to the basis of sustained yield. The 1956 plan provided for cutting on all State Forest to be brought to that basis by the 1960 revision, although of course, this can be imperfectly accomplished until more precise data of growth and yields are available.

It is well to emphasise that the development of large new sawmilling towns from the 1945 and 1956 plans (and others will arise from the 1960 plan), is not a migration but an expansion well within the capacity of the forest, and that only minor adjustments to areas are expected to be necessary as more precise data for planning becomes available. Each of the main new centres is based upon what is considered to be a sufficient area of forest and a permit with a specified annual cut is in a sense a working plan prescription.

The writer forecasts that the permissible cut will be found to be not less than one million loads per annum and points out that the cut from the State Forest has, up-to-date been of the order of only 478,000 loads as an average per annum, since the 1928 working plan with a maximum of less than 700,000 loads reached in 1955,* at which date it was reasonably, if not perfectly, distributed over the forest under a group selection system of treemarking.

The 1956 Working Plan introduces the term "Planning Section" for the following reasons:—

- (a) Previous general working plans used the term "Working Plan Areas" incorrectly as many of the areas were not suitable for a working plan coverage towards sustained yield, and were merely old concession or permit areas.

- (b) It was considered that any new subdivision into "working circles" or "working plan areas," implying by definition units on which sustained yield was prescribed, would be premature (in view of the fact that during the five-year period of the plan, the organisation is in existence to produce improved data on the inventory and growth rates).
- (c) The term "Planning Section" was deliberately chosen as a term having no specific implication in the vocabulary of Forestry, with a view to its deletion and replacement by the term "Working Circle" in the 1960 plan. With some adjustments, therefore, most of the Planning Sections of 300,000 to 500,000 acres of forest will become true working circles, supporting a sawmill or group of sawmills and industries in 1960. The term "Planning Section" will probably be retained and taken to mean a large area of forest for which there is a plan, but which for various reasons, cannot be regarded as a sustained yield unit. An example of such a section could be a large area of lower quality forest which, though capable of sustaining sawmilling for 20 or 30 years, is earmarked for ultimate alienation with the increase of population.

* **Note.**—It is to be noted that figures for State Forest and Crown Lands given in Annual Reports include considerable cutting from land which will not be under permanent management and these figures have been reduced to arrive at the above estimate.

9.—The Forest Inventory.

The Forest Inventory, upon the accuracy of which all sound planning must depend, commenced about 1920 in Western Australia on the old system of strip or grid survey at 40 chain intervals and some millions of acres were assessed, upon which data most of the earlier dedications of State Forest and the Working Plan determinations depended.

In the early decades, in fact until about 1945, most assessments considered only the volumes per acre then acceptable to sawmillers and sleeper cutters and experience has since shown that these volumes were a very low percent. of the actual wood volume, or even of the volume which would be accepted by sawmillers on today's standards.

Thus the early Working Plans, and even the 1945 Plan, were extremely conservative in determining the cut, the formula being in essence to regard the total marketable volume over 90in. girth as the source of supply for 60 years in the expectation that the volumes under 90in. girth would by then supply the future cut, reduced if necessary.

From about 1947 the use of war time air photos began to show that a more accurate forest inventory was possible and by the early years of the present decade, equipment and photos were available and staff trained in both forest photogrammetry and new field inventory methods based upon the assessment of the entire stand, as opposed to the earlier assessments of only that volume which was acceptable to the trade.

In 1951 for the Royal Commissioner, the first attempt at a statement of the total forest capital was made and since that date improved assessments continue to show an increasing wood capital due to far higher per acre volumes being recorded under the new assessment methods.

During 1954 and 1955, following the setting up of a working plan centre in the far South and a concentrated drive on assessment, a detailed stocktaking was made of standing timber over about 2.2 million acres of forested country, mostly virgin. Field assessment, using air photo plans, produced volume estimates as reliable as those previously based on over 10 times the amount of field work and as a result of these estimates the 1956 Working Plan envisaged the permissible cut at not less than 900,000 loads per annum. This figure, which it is expected can be increased in the 1960 plan, is at the moment primarily of academic interest as it has been pointed out earlier in the paper that the timber trade in Western Australia today is using only about 700,000 loads per annum from the area covered by the Working Plan and there is room for expansion of the Industry as, and when, economic conditions allow of the sawmilling of virgin areas further than 200 miles from the main market.

An export trade is undoubtedly to be encouraged at least for the next decade in order to make it possible to introduce management into these large areas of virgin forest. Until this can be done the Forests Department is facing up to high expenditures annually on the development of roads in this country in order to introduce an elementary (and preliminary) form of protection by extensive prescribed burning.

The road system being opened up by the Department is now in the vicinity of 1,000 miles per annum, which is adding to the existing system of approximately 15,000 miles, and while serving as a first step to forest management, is certainly less desirable than if such roading could develop as part of the utilisation of the virgin forest.

10.—Working Plan Prescriptions.

On the subject of Working Plan prescriptions, control and records, it is perhaps useful to quote directly from the 1956 General Working Plan as follows:—

Principal Prescriptions.—

- (1) The object of the Plan is to stabilise the Timber Industry; to ensure continuity of timber getting operations, and in so doing, ultimately to bring the cutting of the forests in units known as "working circles" to a sustained yield basis.
- (2) The subdivision of all available forest under State control in the South-West Zone of Western Australia into Planning Sections, and Working Plan areas to provide, as far as possible, sufficient forest in each section of area to ensure continuity of operations of existing mills or their equivalents and townships depending upon them.
- (3) The provision for the sale of timber as required for new mills within the estimated allowable annual cut of the forests.
- (4) The provision for the sale of areas for short life mills on which land clearing projects are proceeding or are expected to proceed, in order to utilise timber which would otherwise be destroyed and lost to the State.

11.—Prescriptions Common to all Planning Sections.

Marri.

Marri, long regarded as an unmerchutable species, has not been included in Planning Section calculations, but its utilisation has an important bearing on forestry. Its destruction by felling or ringbarking, cannot be countenanced except from small areas of soils suitable for *P. radiata* plantations, as foresters are convinced that it has a future value for timber and forest products. As a General Prescription therefore, all avenues of marketing Marri will be followed up during the period of this Plan.

Piles and Poles.

There is a large surplus of Jarrah, Marri and Karri small poles for which markets are not readily available, but which will not be "thinned to waste" during the period of this plan.

Large poles and piles are available in reasonable quantities to meet the requirements of the State, but for the period of this plan the bulk of the requirements can still be found from Private Property and from areas destined to be cleared for farming or for plantations.

Major Jarrah piles over 50 feet in length are comparatively scarce and will be provided only for special Government requirements. As a General Prescription, therefore, poles and piles, apart from specials over 50 feet in length, will be sold only where they can be legitimately removed as a silvicultural operation.

Sundry Timbers.

Wandoo and Blackbutt are included generally under Jarrah volumes as they are now generally acceptable to sawmills operating Jarrah permits.

12.—Sylviculture and Protection.

The regeneration and protection of State Forests is supervised by Officers-in-charge of Divisions, governed by policy as laid down in the Foresters' Manual and superintended by senior officers.

The basis of our sylvicultural work is that the regeneration shall be the result of the fellings themselves and cuttings are controlled to this end as well as for considerations of management.

Close control of treemarking on permits under the "selection" system ensures the retention of immature growing stock and its protection during falling operations. Advance burning before milling and top (slash) disposal operations after milling ensure a new stocking of the openings by natural regeneration either from seed or from advanced growth.

Sylvicultural treatment required for special areas is the subject of instructions from the Conservator.

Top disposal and regeneration of all areas of forest cut over in the past are up-to-date, and, subject to the delaying of top disposal burning in a few cases awaiting a seed year, the whole of the country cut over annually by sawmills receives this treatment. Cut over areas of approximately 2 million acres, apart from minor portions, are satisfactorily stocked with regrowth.

Current policy and explanations of sylvicultural work are summarised in the following papers:—

"Second Growth Karri Forest" by J. C. Meachem, 1954.

"Regeneration of Jarrah" by A. C. Harris, 1955.

These papers are too lengthy for inclusion in this plan but are filed with the original Working Plan documents.

Fire protection is the responsibility of Divisional and District Officers assisted by the Fire Control Superintendent and his Staff. The permissible cut for future cutting cycles is intimately connected with the success or failure of fire protection and its extension into new areas. It is based upon controlled burning in Autumn, Winter and Spring months, and early suppression of fires in Summer. Its extension into areas at present unprotected is proceeding rapidly.

The necessary staff for these operations is provided for in the annual estimates and "Schemes of Expenditure for the Reforestation Fund" which receives approval annually by Parliament.

13.—Working Plan Control and Records.

Maps are held by the Chief Draftsman of all Permit areas and kept up to date.

Annual cutting coupes for each Sawmill Permit are approved by the Conservator.

Areas cut over quarterly by each mill are recorded on progress plans at field offices, and this information is transferred annually to the record plans at Head Office showing areas cut over for the year, species and volumes obtained and a record of the area of each permit remaining to be cut over.

The Registrar maintains a Permit Register in which all new permits, adjustments and cancellations are recorded, together with a register showing the loads cut each month and each year on each permit.

At the close of each financial year, the Registrar will prepare a Working Plan Record Statement showing:—

- (a) New permits or licenses issued for the year—within the plan.
- (b) Issues allowed for under the Plan but not made.
- (c) Issue of permits, if any, outside the provisions of the plan.
- (d) Excess or deficit of cutting compared with permissible permit or license intake.
- (e) The total intake, output, and recovery of each permit or license.

Note.—Divisional staffs are provided for 12 Divisions, most of which control from 300,000 to half a million acres of State Forest, together with isolated areas of other tenure.

Temporary assessment lines run on each quarter's cutting by the treemarkers themselves assist to keep them aware of the volumes marked and trees retained by them and provide data for Divisional Office and Head Office checks against the quarterly and annual cutting records.

Permanent assessment lines are established as required and serve the dual purpose of recording the volume remaining per acre for future use and of providing the basis for growth studies for management purposes.

Quarterly Trade Operation summaries from Divisions also record areas cut over within and outside State Forest, and volumes obtained, by species, together with records of silvicultural work and protection.

With the foregoing information available, the Management Branch incorporates such information as is necessary in the Detailed Annual Report and the Conservator's Annual Report to Parliament. These reports, together with the plans, assessments and tables abovementioned form the records necessary for forest management and the information for periodical revision of the Working Plan.

APPENDIX 1. HISTORICAL REVIEW, 1829-1956.

1829-1839.

Reports of the valuable hardwood forests existing in Western Australia influenced the decision of the British Government to establish a settlement at the Swan River and timber was probably the State's first export, it being recorded that a certain amount of sawn timber was exported in 1831 through James Henty. This timber was pit sawn, as no sawmill then existed, but pit sawyers and woodyards were operating at that time in and around Perth. The British Admiralty were early interested in our timber, as satisfactory repairs to H.M.S. Success at Fremantle in 1830 brought an order for 200 loads for H.M. Dockyards.

1840-1850.

This early interest in timber getting resulted in the Lands Department assuming control of cutting and the issue of licenses to cut and export under an Act gazetted in 1843. A pair of pit sawyers operated under a monthly license but timber for export was cut under a yearly license, the cutting area being not less than one square mile and the license fee £20 per square mile per annum.

After several abortive attempts at erecting sawmills—machinery for this purpose had actually arrived in the "Lotus" in 1829—the first steam driven mill was built at Guildford in 1844 by a Mr. Cowan, assisted by a Mr. Monger. By this time, settlement had pushed through the Darling Ranges and the sandalwood trade commenced in 1845 with the first export to the Far East of four tons. About the following year, the name "Jarrah" was adopted in place of mahogany to avoid confusion with the true mahogany of commerce. The following ten years saw considerable interest being taken in the development of the timber trade, several attempts being made to form local companies in Perth and at the Vasse to export our product, but without much success. In 1847, the Government of the day issued the first regulations to control the pulling and export of Sandalwood and to prevent the danger from bush-fires.

1851-1889.

In 1858, the first mill of any size was built at Quindalup near the Vasse by Mr. Harry Yelverton, a concession being granted him by the Government. Within six years the yearly export value of Jarrah and Karri had risen to £15,693. A comparative boom developed and in the decade to follow, concessions were granted at Lockeville, Jarrahdale and Canning; the first locomotive was introduced into the State at Lockeville, and the export value of timber rose to £24,192, a value which more than trebled itself in the next 20 years. As our timbers were becoming well known overseas, the Government decided to encourage export trade and induce development by granting these concessionaires the sole right for a period of years to remove, sell or export the timber on them at a mere nominal rent per annum. This policy, which may have been expedient at the time, reacted to the detriment of the forests and the State in later

years. A Royal Commission appointed in 1877 did nothing to rectify the position nor did repeated warnings by Mr. J. Ednie Brown when appointed the first Conservator of Forests in 1896.

1890-1899.

Hitherto forest activities had been administered by the Lands Department, but a separate Department, the Department of Woods and Forests, was created in 1896, with Mr. Ednie Brown as Conservator, acting under the Minister for Lands. Although his administration was of short duration—he died in 1899—many of his recommendations and suggestions bore fruit in later years when the Forests Act became law. During his brief regime, the value of export trade rose from £116,420 to £553,198, with 41 mills operating and employing 2,500 men; minimum girth restrictions in falling were defined; pine planting was initiated; some sandalwood was sown; the Bush Fires Act amended, and a Forests Act recommended.

1900-1915.

A second Royal Commission sat in 1903, and in their findings stated that "State acquiescence in the destruction of good timber only because the trade demands it, is a crime against coming generations; and any attempts to increase the export in the interest of foreign companies, or with the object of inducing more men to join in timber getting at the expense of posterity, needs wise resistance The responsibility of making provision for the reforestation of the 530,000 acres of cutover Jarrah country is important and urgent; the longer it is delayed the more difficult the task Relief can only come by immediate legislation through which measures, means and men may be secured wherewith to cope vigorously and effectively with the vital interests of the vast potentialities which we inherit in our magnificent forests."

Fifteen years passed before these discerning recommendations were given effect in the Forests Act of 1918. In the meanwhile, under the guidance of Mr. C. G. Richardson, the Department had turned its attention to pine planting and plantations were set out at Hamel and Ludlow. In the Land Act of 1904, a permit system of tenure of cutting rights was introduced and by 1909, 570,000 acres were held under permit, 31 mills were operating throughout the State, 3,400 men were employed and £500,000 being paid annually in wages. In that year, the export value of timber amounted to £867,419. The boom broke during the war years of 1914-1918, just after the export value had topped the £1,000,000 mark for the first time.

1916-1922.

In 1916, Mr. C. E. Lane-Poole was appointed Conservator to succeed Mr. Richardson and immediately modern scientific principles in management and silviculture were brought into practice. The initial move was a stocktaking of cutover and virgin forest upon which advice and recommendations for the future were based. A serious shortage of prime merchantable forest was disclosed and steps were promptly taken to conserve, protect, and rehabilitate our timber wealth. The reformation of the Department dates from the passing of the Forests Act in 1918—the first permanent State Forests were dedicated, the first working plans for management drawn up and regeneration measures in the cutover Jarrah forest initiated. Fire control was commenced and a Forests Products Laboratory was set up in Perth to study problems of utilisation, the State contributing to the upkeep. The valuable leadership of Mr. Lane-Poole was, however, only shortlived as he resigned in 1921 after disagreement with the Government on the question of the timber concessions.

1923-1929.

Mr. Lane-Poole was succeeded by Mr. S. L. Kessell who remained in office for 23 years, years full of active development and vigorous expansion. The provisions of the Forests Act had furnished the Department with its own financial resources, three-fifths of the net revenue of the Department being placed to the credit of the Reforestation Fund each year, and from 1921 to 1929, following another trade boom, gross revenue rose

from £75,469 to £228,614. This enabled the programme of management and silviculture to be increased quickly and effectively. Stocktaking of Jarrah and Karri was completed, topographical surveys and mapping of the forest area were undertaken, mallet bark resources were surveyed and sowing commenced, pine plantations, both on coastal sand plain and the heavier soils of the ranges were laid out and working plans for Jarrah and Karri drawn up. Regeneration measures were energetically pursued and fire prevention and control measures expanded. The dedication of State Forests, providing the Department with security of tenure in the forest, was rapid, until in 1929, 2,974,344 acres had been placed under Forests Department jurisdiction. A step vital towards the stabilisation of the timber industry and the management of the forest was taken in 1929 when a general Working Plan for Jarrah was approved providing for a permissible annual cut on a sustained yield basis, a Working Plan for Karri having been previously approved in 1927.

1930-1938.

Progress was so rapid in the restocking of the cutover bush that in 1930, for the first time, the area of forest regenerated exceeded that cutover. With this development of silvicultural work was commenced the provision of housing for workers in the bush, a big road and firebreak building programme, the linking of permanent offices and headquarters and fire towers by telephone, and in general the reawakening and re-settlement of the cutover bush. This received a welcome fillip during the depression years of 1931-33 when large numbers of unemployed were given work in the forest enabling much of the leeway of past years to be overtaken. By 1936, 350,000 acres had received treatment.

Since the establishment of the Forests Products Laboratory at Crawley in 1921 (this unfortunately only lasted a few years, being transferred to Melbourne), the growth of research into problems of utilisation had been steady and much had been achieved in the fields of seasoning, kiln drying, manufacture of paper pulp and tannin extract, establishment of specifications and grading rules, co-operation with Commonwealth authorities being constantly maintained. In 1933 a second side of research, that of inquiry into problems of management, silviculture and nutrition in indigenous forest and plantations of exotics came into prominence, when a comprehensive programme of investigations entailing extensive field trials with statistical analyses of results was entered upon. Completed investigations have been published periodically and the results achieved materially affected principles and practice in all fields of forest operations.

1939-1944.

Of necessity the outbreak of war in 1939 called a halt to continued active development. Problems of manpower and the diversion of work to channels with a direct bearing on wartime economy reduced the normal expansion of all work to bare maintenance and protection. Commonwealth control of timber production and output was instituted in 1941, with Mr. S. L. Kessell as Controller and a branch staffed by departmental officers opened in Western Australia in 1942. In April, 1943, Mr. Shedley, Assistant Conservator, was appointed Deputy Controller of Timber for Western Australia. Serious shortage of labour in the timber industry and the disruption of markets reduced the log output from 40,333,654 cubic feet in 1939 to 26,279,568 cubic feet in 1945. Regeneration operations in the indigenous forest and pine planting activities were reduced to the barest minimum, a skeleton field staff concentrating on fire protection and maintenance of utilities, helped by Civil Alien Corps and Army personnel. Women assisted in such jobs as controlled burning and manning lookout towers. It fell to the lot of the Department to maintain firewood supplies for the Metropolitan market and public utilities and to contribute to numerous undertakings involving the use of readily accessible mobile labour.

1944.

First Plywood factory opened.

First Departmental sawmill to operate on departmental Pine Plantation built.

1945-1953.

Following the cessation of hostilities in 1945, the Department found itself with depleted funds owing to low wartime revenue, with a big leeway in works programme to overtake and little hope of return to normality for some years to come. Mr. Kessell resigned to enter commercial life in 1945 and was succeeded by Dr. T. N. Stoate. However, some progress was made towards a return to routine development. A new Working Plan for Jarrah, Karri, and Wandoo was approved in 1945 and a special plan for sleeper sawmilling drawn up, hewing being now practically a thing of the past. Fire prevention and control received special attention in the matter of organisation and modernised equipment, power pumping units being incorporated and radio communication established.

Loan funds again became available from 1948/49 and a resumption of pine planting took place following the approval by Executive Council of the first Pine Plantation Working Plan in 1951.

A Royal Commission in 1950 examined many phases of Forestry in Western Australia, resulting in a number of important recommendations.

1953-1956.

The term of office of Dr. T. N. Stoate expired in 1953, and Mr. A. C. Harris was appointed Conservator in October of that year.

In 1954, the Forests Act, 1918, was given its first serious revision, one of the most important amendments being the provision that nine-tenths, in lieu of three-fifths of the Net Revenue was to be credited to the Reforestation Fund. A thorough revision of royalties was made, and revenue was increased to over £1 million per annum as a result. Many overdue capital works, such as the roading of unprotected forest, the rehabilitation of transport, plant and equipment, and the expansion of housing, workshops and buildings were accomplished. Fire Protection Policy was reviewed and considerably revised in the light of past experience.

Rapid developments took place in the use of Forest air photogrammetry and resulted in the detailed assessment of over two million acres of relatively unknown forest, followed by the approval of a revised General Working Plan in January, 1956. Pine plantation policy was reviewed and a revised Plantation Working Plan approved in January, 1956, with the emphasis being laid upon increasing the percentage of *Pinus radiata* and the necessity to purchase land suitable for this species.

Considerable advances were recorded in the dedication of remaining Crown timber lands as State Forest. New peaks of timber production were reached in each year from 1953 onwards, and the needs of the Australian market having been caught up with, increased exports of timber overseas became possible.

APPENDIX 2.

STATEMENT OF FACTS AND FORECASTS AS AT JUNE, 1955. WESTERN AUSTRALIA.

Population of State, 1955—658,538.

Estimated population of State at 1985 A.D.—1,305,000.

Estimated population of State at 2000 A.D.—2,000,000.

Area of State—975,920 square miles.

Area of State which has over 10 inches rainfall—409,886 square miles.

Population of Perth, 1956—359,000.

Estimated population of Perth at 1985 A.D.—1,000,000.

Estimated population of Perth at 2000 A.D.—1,400,000.

Area of State Forest at June, 1955—3,834,207 acres.

Comprising—

Jarrah (including Marri, Blackbutt, Wandoo, Tuart)—3,233,432 acres.

Karri (including Tingle)—513,958 acres.

Potential State Forest (mostly Jarrah and Wandoo)—561,000 acres.

Total State Forest anticipated—4,395,207 acres.

Per cent. of area of State—0.7 per cent.

Per cent. of area of State which has over 10 inch rainfall—1.67 per cent.

Pine and Mallet plantation areas available, included in above—239,835 acres.

For *Pinus radiata*—14,000 acres.

For *Pinus pinaster*—131,000 acres.

Present plantations—

Pinus radiata—3,644 acres.

Pinus pinaster—16,758 acres.

Total pine—20,402 acres.

Anticipated five years' planting—10,834 acres.

Future total proposed—200,000 acres.
