affected. In some cases certainly the regulation of stream flow by the preservation of a forest canopy may affect more than one State and call for joint action, but any forest areas which it may be necessary to preserve for this or any other subsidiary reason should be regarded as additional to the minimum fixed for the supply of timber, unless, of course, they are to be regarded as a source of timber supply also.

Similarly no consideration has been given to the export trade, not that such a trade is not to be desired, but because it is considered essential first of all to provide for Australia's needs. Any States desiring to foster export would naturally take steps to reserve increased areas.

The allocation to the various States of the 25,000,000 acres, or any other fixed minimum decided upon, might be discussed by the members of the Conference. Naturally the determinations of the Conference are not binding on the various governments concerned, but every effort should be made by each State to meet its responsibilities and to dedicate for Forestry purposes the area allotted to it. As any alienation of State Forests so dedicated would affect not only the State driectly concerned, but also Australia as a whole, it is a matter for consideration whether all proposed alienations should not be referred to the Federal Parliament before being allowed. Such a proposal would naturally meet with much opposition, but nevertheless appears to be worthy of serious thought.

An investigation of the early records of plantation work in South Australia and the results now apparent, shows that over a large part of that State it is not possible to produce hardwood forests which can compare with those of other States, while on the other hand, one or two species of softwoods can be grown with highly satisfactory results. If South Australia could be assured that the Forestry policy of other States would result in its hardwood requirements being supplied at a cost lower than that of locally grown hardwood there would be no necessity for its Forestry Department to worry about hardwood forests except perhaps in a few specially favoured localities, and its attention could be concentrated upon the production of the more profitable crops. Examples of a similar nature affecting other States could be quoted showing the necessity for viewing the Forestry situation from the standpoint of the whole of Australia rather than of the individual States. The production of paper pulp, about which much is heard at present, is an important case in point. One or two States will probably be found to be in a much better position than the others to undertake the supply of this national necessity, and after enquiry by competent authorities has disclosed the position, the efforts of whatever States are chosen could be concentrated on the problem.

In conclusion, I would suggest that it needs no elaboration to indicate the numerous problems which confront us in every direction, and that no more suitable institution could undertake their investigation than an Australian Institute of Forestry, Education, and Research.

Mr. C. LANE-POOLE, Conservator of Forests, Western Australia, read his paper on—

FOREST WORKING PLANS AND THE IMPORTANCE OF STANDARDISING A SYSTEM OF FOREST STATISTICS THROUGHOUT THE COMMONWEALTH.

By Mr. C. E. LANE-POOLE, Conservator of Forests, Western Australia.

There are many forms of property vested in the Crown, and among these there is none so important as the forests of the State.

The forests differ from all other Crown property in that they do not belong to this generation alone, but to all future generations.

The generation of to-day has a right to make use of that quantity of timber which, under proper management, will be replaced by the growth of the forests. In other words, we may use only the forest interest, and the forest capital must be left intact, for it is the property of all future generations.

This basic principle has been recognised from the earliest times wherever the timber requirements of the population living around a forest area has been found to exceed the annual increment of the forest. In such cases the State has been obliged to intervene, recognising that while the claim of one generation to supply its timber requirements must receive every consideration, the cutting of the timber must on no account be allowed to be carried out in such a manner as to destroy an asset which is the property of the nation.

The State then lays down rules for cutting, which are based on the rate of growth of the forest. This is a working plan in its simplest form, and such plans have existed from the earliest times.

Pliny lays down a plan for working chestnut coppice for the supply of vine rods to the vineyards. We read in Justinian's Pandects that the timber must be cut on conservative lines as would be cut by a father of a family working his own private forest. The coppice was to be worked on an eight years rotation, and standards were reserved and could only be cut by the State.

The objects of a Forest Working Plan may be numerous, but generally speaking they can be placed under two main headings:—

A. The felling and utilisation annually of that amount of timber which the forest can yield annually and for ever, so that each year the amount felled may be replaced by the growth of the forest.

B. The reproduction of the best species in the shortest time possible in the areas that have been cut out.

These two basic principles are at the root of all Working Plans; on them depends the future of the forests and the timber industry.

A Working Plan, then, is the method by which the Forest property may be safeguarded; but when the history of European Forestry is reviewed we find that great difficulty was experienced in every country.

Well-conceived Forest working plans failed through the fact that they were not sufficiently protected under the laws of the country.

They were often merely regulations made by a far-seeing forester who was able during his lifetime to see that the provisions were carried out; but a

forest does not grow in the lifetime of a man, and unless the working plan is protected there is a danger of its being drastically altered through a change in the forest authority.

Again, it was found that without a change in the authority governing the forests, it all too frequently occurred that a change in the rule or government of the country was followed by a reversal of forest policy, the cessation of the operations of the working plans, and the destruction of the forests.

This latter danger, viz., lack of continuity of forest policy through the continually changing Government of the country, is of course far greater than the danger of the new forester reversing a plan.

A forester might revise and amend the plan, but he would never recommend the cessation of its operations or so alter it that the destruction of the forest would ensue.

It is the ceaselessly changing Government control that we have to fear and to guard against, and this can only be done by bringing the Forest Working Plans under a Legislative Act, so that the forester has the full force of the law behind him.

Even so, there is a risk that a future Government may repeal or amend such an Act; at the same time it will be generally conceded than an amending Act which would result in the denudation of the forest lands—a fact which would be brought forcibly before the Government by the forestry authority—would stand little chance of receiving the assent of Parliament.

In order to emphasise the importance of protecting forest working plans with the full force of law, I will describe to you what occurred in another colony.

That colony possessed a small area of valuable indigenous forest. The Government, recognising its importance, appointed a very distinguished and learned French forester as head of the Forest Department.

This man collected a mass of forest statistics bearing on the growth of the various timbers that made up the virgin forests, and with this data to go on he laid down a working plan regulating the cutting of timber in the forest.

His data showed him that the trees of a certain diameter and over might be regarded as mature, and therefore should be cut; further, that it took 40 years for trees of a diameter class immediately below the mature class to reach maturity. He therefore fixed the rotation of the forest at 40 years. He also found that it took four rotations, or an average of 160 years, for a seedling to become a mature tree.

The Conservator based his plan on these data. He divided the total area of forest into a number of series or working circles, and each of these he divided into 40 annual cutting sections. Each series was a forest unit, and the felling of timber was restricted to the cutting section marked off as being the one for that particular year, so that after a lapse of 40 years, when the timber workers will have worked over the whole series, they would return to the first cutting section, in which they would find that the timber which 40 years before was too small and immature for felling was now fit for the axe.

The working plan was a model one in every way, and the Conservator had left no detail unprovided for in the carrying out of its provisions. I saw the forest 30 years after the inception of the plan and found that the Conservator had been correct in nearly all his estimates as to the growth of the various species, and that under his plan the forest had yielded practically all that it could produce for the timber industry.

The Conservator had evidently been a power in the land and had brought up his foresters in the way they should go, and his plan was regarded as a law in the country. Yet the plan was in reality only a departmental measure, and there was nothing in the Forest Act to protect it; and this brings me to the point which I wish to particularly emphasise.

The population of wood workers living around the forest when the plan was first put into operation was just sufficient to absorb the timber that the forest could produce. In 20 years, however, the population had increased, the boys growing up had learnt but one trade or calling—the use of the felling axe, the broad axe, and the pit saw. They grew to man's estate and, under the law of the land, were entitled to a say in the management of the country's affairs.

The timber workers became a power politically: they clamoured for more bush to work. What cared they for future generations, so long as they could live by plying the trade they had been born to!

Their votes were cast in favour of a candidate for parliamentary honours who promised them more bush. They got it. In one year the cutting sections were doubled, and they have remained doubled ever since.

The immediate effect of this was to greatly increase the prosperity of the district; twice as much timber was cut, more mills started working everywhere, and everyone had more than enough to eat and drink.

No one was so popular as the new member, he was in everyone's estimation a heaven-sent genius. Had he not been able to announce in the House that he had actually doubled the Forest revenue in one year, that he only had to pursue the policy he had adopted to establish a forest revenue of one million pounds; further, had he not caused an influx of population into the district, and were there not four new mills running, and, lastly and not least, let everyone look at the new port he had opened whence timber cut from the eastern end of the forest could be shipped.

The only dissenting voice was that of the forester, and it was drowned in the tumultuous shouts of joy of the community. Let us see what the politician really accomplished when he broke the Conservator's working plan. He doubled the area of cutting sections, that is to say, he decreased the number of cutting sections from 40 to 20, or the rotation of the forest from 40 to 20 years.

Unfortunately, the politician could not at the same time double the rate of growth of the trees—this is fixed by laws over which he has no control.

The effect of halving the rotation will be that, at the end of 20 years, the timber left in the first section will not have reached maturity, and the Government will then be faced with two alternatives:—

1. The reduction of the minimum girth so as to allow the cutting of the immature timber.
2. The closing of the forest for 20 years so as to allow the trees to put on the necessary growth and so reach maturity.

The first alternative will result in the destruction of the forests and the timber industry. The second will result in the closing of the timber industry for 20 years, and the exodus of the population who have found their living in the forest.

The second is the right course, but the vote of the timber workers will doubtless result in the first being adopted.

The effect, then, of the incidence of the heaven-sent legislator into the realms of forestry was, in the first place, to double the area of the working sections and, therefore, to temporarily increase the prosperity of the district; the final effect will be to destroy the forests and kill the timber indusry.

The far-reaching effect of the disastrous policy will not end here. The farming population many miles away from the forests in a district with a very light rainfall will feel the effects also.

They have been used to depending on the river for their water, and, with its aid and Government-constructed irrigation canals, have made an arid country productive.

But soon the source of this river will be denuded of the forests which, like a great sponge, regulated the water supply of the plains, taking up the excess in winter and giving it back in the summer.

In lieu of the perennial river, the farmer of the plains will find himself faced with devastating floods in the winter and a dry river-bed in the summer.

Not only, then, will the timber industry have been destroyed, but the farming industry dependent on the river, whose mother was the forest, will also vanish.

How could all this have been avoided? The answer is, by protecting the forest working plan. In the instance I have related, the Conservator's plan was only a departmental measure which was at the mercy of the local member. Had that plan been protected by a Forest Act, then it would have required an amending Act to break it. Both Houses of Parliament would have had to review it, and the voice of the forester would have been heard; his report would have been called for and tabled, and in the face of it the amending Act would have been defeated.

Thus it is that France, the mother of European forestry, protects her "Reglements d'exploitation." The approval of the Directeur General des Eaux et Forêts is necessary before the forester can revise a plan, and the consent of Parliament is necessary before a plan can be broken.

While the protection of working plans is necessary under any form of government, it will, I think be generally conceded that such protection is more necessary in self-governing colonies than in crown colonies. It is unnecessary for me to explain this; the reasons are all too apparent.

It came, therefore, as a great surprise to me that in no State of the Commonwealth was provision made under any of the Forest Acts for working plans. The Director of Forests, Queensland, has added to his excellent timber regulations a provision relating to working plans, but the skeleton Act of that State is silent on the subject.

In my short visit to South Australia, Victoria, and New South Wales I saw on every hand in the forest work executed in the early days the evidence of the lack of working plans.

In the indigenous forest work of a sylvicultural nature had often been begun without any definite plan at all, and apparently only to relieve unemployment. Good as the work had been it had been dropped as soon as labour conditions were once more normal.

This applied also to plantations; everywhere were to be seen scattered plantations of small areas, none of which was large enough to be worked economically from the point of view of supervision. While from the conversion standpoint none was capable of keeping even a small mill going continuously or offered any hope of yielding a sustained supply of timber for an industry to absorb.

In one State I saw a plantation which had been devastated by fire; from the few remaining trees I would judge it to have been a fine plantation, begun on a well conceived plan. I was informed that money had failed, the extension of the plantation ceased, the staff was dismissed, scrub grew over the fire breaks, and one day a bush fire came along and destroyed everything. During this period of forest neglect in one district, doubtless political forestry was focussed on another electorate and another plantation started.

All this lack of continuity of forest policy; this shandy-gaff of forestry and politics can only be guarded against by sound forest working plans, and these plans must be protected by all the force that the laws of the State can bring to bear.

We may put fine forest legislation on the statute book. We may reserve all the timber lands in the State. We may make such reserves permanent; but without protected working plans all our work is of little avail.

I will not attempt in this brief paper to go into the various types of working plans. The Forests of the Commonwealth vary in each State, and the working plans will differ according to the sylvicultural requirements of the forest being dealt with.

Here in Western Australia in the main Jarrah and Karri belts, and also in the Tuart country there is no doubt that the Plan should be worked on a "clear felling system." Our timber industry, however, is mainly an export one, and the mills are taking the best timber, with the result that for many years to come the system of cutting must of necessity be "selection."

I hope, however, as years go on and our population and local timber market increases to convert the system gradually from selection to clear felling.

Though the working plans must necessarily differ with each State, and each type of forest, all the plans must be based on a foundation of forest statistics. Whether we are dealing with the Brush forests of Northern New South Wales, or the open gimlet and salmon gum forests of the Western Australian Goldfields, forest statistics are required.

We must know the rate of growth, both in height and in girth, of the various species that make up the forest, in order to arrive at the annual increment in volume per tree and per acre, and so obtain the figure which the French forester calls the possibilité of the forest—the amount of timber that can be cut in one year and which we know will be replaced by the growth of the timber over the whole area of forest in the same period of time.

I may, perhaps, be looking rather far ahead, but I think a time will come when the forest wealth of the Commonwealth will be regarded as of such importance that it will be managed under one organisation for the benefit of all States for all time.

When this occurs it would be of the greatest ad-

vantage if the Chief Working Plans officer found one system of collecting forest statistics instead of seven different systems.

Even should this unification of forest departments not occur there is every advantage in laying down one system of collecting statistics.

The annual forest conferences have already resulted in a marked co-operation between the foresters in each State, and in the matter of forest statistics co-operation will be to the advantage of every State. A forester in Western Australia would derive great benefit from a comparison of his jarrah data with the data collected by a forester working in the ironbark country of Victoria or New South Wales, unless, however, the data are based on a similar system of collecting forest statistics the comparison would be far less valuable.

The collection of statistics here offer the same difficulties as in the tropical forest. Our forests are made up of trees the growth of which, for the most part, cannot be analysed by the usual stem analysis system, owing to the fact that the rings on the cross sections are unreadable, we have no option but to adopt the sample plot method.

I will now describe the system I have inaugurated here. I wish to make it clear that there is nothing new about the system, it is a very old one and has been found to answer well in France, Algeria, West Africa, India, and South Africa. It is necessary to modify it to suit the local conditions or the type of forest being dealt with, but the main principle should be the same.

My object in describing it is that it may form the basis of a discussion so that this conference may arrive at a uniform system of collecting forest statistics throughout the Commonwealth.

Nothing whatever is known in this State as to the rate of growth of the main timber species. Estimates of the age of maturity of jarrah and karri differ as widely as forty and eight hundred years. There was nothing for it but to set to work and collect forest statistics.

I accordingly had 25 sample plots set out in the various types of forest. The area of each plot was in most cases five acres, though in Karri regrowth near the Leeuwin four one-acre plots were measured.

In each plot every tree was measured. The girth taken, at breast height, viz., 4ft. 3in., and the height to the top twigs for trees that had not yet made a definite bole, and to the first branch for trees that had.

Each tree was numbered by means of little galvanised iron tags, which had previously been serially stamped with numbers from one to 999. The tags were tied to the tree by means of light wire, care being taken to allow enough room for girth growth.

The place where the girth measurement was taken was also marked with paint or tar. But here a difficulty was met with, some of the timbers, karri, for instance, has a deciduous bark and jarrah has a very rough bark which is hard to mark with any paint.

I propose obviating this by using a 4in. nail and driving it into the tree at a given distance above the exact spot where the girth measurement was taken. This should prove a safer system. Here are the instructions and the forms in use for the work.

These are copies of forms already filled up in connection with Plot 17, as it seemed to me that in this way the object of the forms would be rendered clearer.

Form No. 1 gives the Forest District, the Field Book No., the Lithograph No., the date of first measurement, and the age of the stand, if known. Then follows a brief history of the forest. In the case of Plot 17 it will be seen that the forest around was milled over in 1881 and was cleared up in 1893-94. Then follows a description of the plot, and finally the object of the measurement is given, viz., "To find the rate of growth of Karri."

Form No. 2 is intended to receive all the notes regarding the sylvicultural operations, and also notes regarding any event likely to affect the growth of the trees, fires, droughts, etc.

Form No. 3 gives the position of the block with a rough sketch taken from the Field Book. On the back of this form a lithograph of the locality on the usual 80-chain to the inch scale, is pasted. This is useful, as it enables an officer to see the general locality of the sample plot in relation to the surrounding country.

Form No. 4 requires little explanation. The measurements obtained by the field officers are written in the Field Book, and this form is used to transcribe all the data. The form before you is only one page of course, and there might be 50 such pages for a big plot embracing thousands of trees.

The three first forms give all the information regarding the plot, and the fourth gives the measurements which are taken at given intervals of time.

The information regarding each plot is thus collected together, so that it is readily accessible at any time. Again, the information regarding all the plots in the country may be collected into volumes, with an index at the beginning, giving the number of the plots, the district, the object of the measurement, the volume, and the page.

FOREST STATISTICS.

Sample Plots.

General Instructions.

1. Each plot to receive a number.
2. The object of measurements.
3. The size of the plot which will vary according to the nature of the forest, and the object to be achieved to be stated. (In Western Australia 1 to 5 acres in Jarrah, Karri and Tuart where growth statistics are required.)
4. The plot should be chosen carefully so as to represent an average of the type of forest that is being dealt with.
5. The boundaries of the plot to be blazed and corner pegs to be inserted, bearing the number of the plot, and usual direction trenches cut.
6. Position of the plot to be plotted on a map and distance and bearing to a surveyed point noted.
7. Girth of trees to be measured at 4ft. 3in. from the ground (on sloping ground on upper side) in inches and eighths.
8. The point of measurement to be marked with paint or tar, the upper edge of the paint line being the point. In case of trees with deciduous bark, a nail to be driven exactly two feet above the point of measurement.
9. A small galvanised label with number stamped on it to be affixed to the tree with wire or a nail. Care must be taken to allow enough wire for increase in girth.

10. Height of tree to be measured to first limb in the case of trees that have made their main trunk or bole, and to the topmost twig in the case of saplings and poles, the trunk of which is not yet determinable.
11. Whether the tree is dominant, sub-dominant, dominated or suppressed will be noted in the remark column on Form 3. Letters D, sd, d, s would be sufficient.
12. Measurements to be taken every five years.

Form No. 1.

WESTERN AUSTRALIA.

Sample Plot No. 17.

Name of Plot—Karridale.
Field Book No. —Breen, A.
Lithograph No. —440/80.

Date of first measurement—Nov., 1916. By J. Breen and Donovan.

Age of crop if known.

Past history of the forest—Karridale milling was begun in 1881, but the patch at Karridale was not completely cut out until 1893 or 1894, when Mr. Davies (Concessionaire) had the area between the mill and coast hill cleared. 1893-94 may be taken as date of regrowth. (Ext. from M. 3151/16.)

Description of the Plot—One acre. A good patch of young Karri and fairly even.

Object of measurement—To find the rate of growth of Karri.

Form No. 2.

WESTERN AUSTRALIA.

Sample Plot No.

Sylvicultural and other operations carried out from year to year, also any event likely to affect the growth of the trees, such as fires, drought, etc.

Form No. 3.

WESTERN AUSTRALIA.

Sample Plot No. 17.

Position of Plot.

Karridale: Litho. 440/80.

Situated—From a peg 205 links to the South of P.O. Reserve along the Augusta road, with bearing 118° 45′ for 1,578 links to the South-East corner peg of the sample acre.

Karridale.
Friday, 24th November, 1916.
Sketch Plan.

Form No. 4.

WESTERN AUSTRALIA.

Department of Woods and Forests.

Sample Plot No. 17.

GIRTH AND HEIGHT MEASUREMENT.

(Cut-out Karri at Karridale.)

No of Tree.	Species.	Girth at 4ft. 3in., and Height.										Remarks.
		1916.		19 .		19 .		19 .		19 .		
		G.	H.	G.	H.	G.	H.	G.	H.	G.	H.	
1	Karri	37½	...	...	...	...	...	...	...	...	...	
2	do.	44	...	...	...	...	...	...	...	...	...	
3	do.	51½	...	...	...	...	...	...	...	...	...	
4	do.	43	...	...	...	...	...	...	...	...	...	
5	do.	34	...	...	...	...	...	...	...	...	...	
6	do.	18	...	...	...	...	...	...	...	...	...	
7	do.	52	...	...	...	...	...	...	...	...	...	
8	do.	15½	...	...	...	...	...	...	...	...	...	
9	do.	30½	...	...	...	...	...	...	...	...	...	
10	do.	34	...	...	...	...	...	...	...	...	...	
11	do.	53	...	...	...	...	...	...	...	...	...	
12	do.	38½	...	...	...	...	...	...	...	...	...	
13	do.	57	...	...	...	...	...	...	...	...	...	
14	do.	61	...	...	...	...	...	...	...	...	...	
15	do.	9½	...	...	...	...	...	...	...	...	...	
16	do.	47½	...	...	...	...	...	...	...	...	...	
17	do.	32	...	...	...	...	...	...	...	...	...	
18	do.	42	...	...	...	...	...	...	...	...	...	
19	do.	42	...	...	...	...	...	...	...	...	...	
20	do.	29	...	...	...	...	...	...	...	...	...	
21	do.	38	...	...	...	...	...	...	...	...	...	
22	do.	51½	...	...	...	...	...	...	...	...	...	
23	do.	21½	...	...	...	...	...	...	...	...	...	
24	do.	48	...	...	...	...	...	...	...	...	...	
25	do.	51½	...	...	...	...	...	...	...	...	...	
26	do.	40	...	...	...	...	...	...	...	...	...	

Mr. R. DALRYMPLE HAY, Chief Commissioner of Forests, New South Wales read a paper on—

AUSTRALIAN FORESTRY — NEW SOUTH WALES' EXPERIENCE IN A STATE UNDERTAKING, WITH CONCLUSIONS AND SUGGESTIONS THEREON.

By R. DALRYMPLE HAY,

Chief Commissioner of Forests, New South Wales.

Mr. President and Gentlemen,—

At previous Conferences we have, more or less empirically, discussed Australian forestry and many of the questions which the subject embraces. These discussions have been valuable and instructive. They have given us much matter for consideration, and sometimes they have provided the groundwork for action; but for purposes of record and reference they have been in some respects inconclusive.

With such a premise I venture to suggest that we have now reached a stage of deliberation at which it is opportune to definitely state the conclusions to which we have been guided by our experiences in forestry development, and to place upon record such deductions as we collectively may make after discussion and consideration of those experiences and conclusions.

The object of a Conference such as this is that each one of us, by full and free interchange of experience and opinion, shall improve our knowledge, enhance the value of our work to the respective States, and thereby contribute to the greater and better development of forestry as it exists in Australia.

It will, I think, be conceded that forestry practice in Australia has been largely on elementary lines. We have been feeling our way, and our work has been mainly that of experimentalists endeavouring to ascertain the best methods of applying principles under widely different conditions.

The aim of each of us has been to lay down a system best calculated to meet our respective needs; but, in part, this work has been more or less hampered by inadequate means, and it is therefore not disparaging if we have to admit that some of it is incomplete, or, at least, inconclusive in results. Still, in each State, something has been accomplished; some discovery has been made; some useful end has been attained.

The development of forestry is not the work of a day; it is a task of years, and it demands of the forester patience and persistence, and a large measure of intelligent observation. There are, indeed, few undertakings in which evolution is more gradual, or in which a mistake once made takes longer to rectify. Of course we experience failures; but, by studying the records of failure and avoiding repetition of them, we find the road to ultimate success.

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REPORT

of the

Resolutions, Proceedings, and Debates

of the

Interstate Conference

on

Forestry

held at

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