Bulletin No. 60

FORESTS and WOOD

A reprint of a series of articles which appeared in the "Western Mail"

by

T. N. STOATE, M.Sc.(Adel.), Dip. For. (Oxon)

Conservator of Forests, Western Australia.

Man and the Forests

From time immemorial man has struggled against the forest. The inhabited regions of the world were mostly wooded, though today they show little evidence of it over large areas. Small clearings were made, at the expenditure of great effort, for the grazing of a few domestic animals, or to provide ground for cultivation. This age-old struggle is still going on in the newer undeveloped countries. Carving a home out of the heart of the forest is still being carried out today, though on a more pretentious scale than formerly. In drier regions such as Australia, the Mediterranean seaboard, and the Southern and South-Western States of America, forest and scrub fires are lit by man to assist in clearing, and to improve forage upon lands, including forests on which they wish to range their stock.

Man has struggled to destroy forests, and taken very little thought of the future, until the realisation has grown upon him that timber is in short supply. The general world-wide paucity of timber supplies has had attention focussed upon it through the after-effects of the war upon timber trade and our own present shortage of timber.

In early times our needs in timber were perhaps more obvious than they are today. Wood was the only fuel for most people, transport was in wooden carts or boats, and even bows and arrows of wood were used as weapons of war.

Timber and Living Standards.

Paradoxically enough, however, probably the most highly developed country in the world, the United States of America, is the greatest consumer of timber ; for industrialisation has caused demands by people for timber for new purposes. The United States uses half the sawn timber, more than half the paper, and two-fifths of the wood in all forms consumed in the world.

It appears that if the world generally is to try to rise to the living standards reached by the Americans, one of the most important steps to be taken would be the growing of more timber. Although the United States had the greatest timber supply in the world (she has 630,000,000 acres of forest land, and is still the world's greatest producer), that country imports today ten times as much timber as Australia uses.

This has a most important bearing on any planning to meet the future potential requirements for our or any other country.

Deficiencies.

Only two States in the Commonwealth, Western Australia and Tasmania, can meet their own requirements, and as Tasmania is the second smallest producer and Western Australia only the fourth highest following New South Wales, Queensland, and Victoria in that order, it can be seen that the surpluses in these two States cannot make any considerable contribution towards meeting Australia's total deficiency.

When the other forms in which wood is used, paper, cardboard, and so on, are taken into account, the picture is found to be even worse, for although there are paper mills in Australia we rely on imports to a very great extent.

Forests being Overcut.

Then the forests of Australia, despite the great efforts being made in South Australia with exotic pines, are being overcut, so the situation is steadily growing worse.

Australia, unfortunately, is poorly endowed with forest timber land and in normal times had to rely on imports to meet one-third of her total requirements. This is the position with only a fraction of the population we are talking of building up in our country. The problem is accentuated at the moment by the fact that we are unable to obtain imports. America has been forced to place restrictions on exports. Europe's post-war reconstruction programme has made tremendous demands on her own supplies, and accounted for all of Canada's present supplies.

Narrow Margin.

Australia, with a population of only seven million people, has, it is estimated, a limit of 19,000,000 acres of commercial forest suitable for permanent reservation. That is apart from timber reserves which will not be retained as forest for all time, and excluding dry inland wooded areas which carry only a small volume of wood. Thus our undeveloped country has three acres per head of population as compared with United States' five acres. France and Germany have one acre ; Norway and Sweden nine, and Finland 10 acres.

Compared with these countries, we are, therefore, very poorly supplied with wood considering our potential requirements from every viewpoint.

Forests Need Rain.

The great forests of the world are found in regions with rainfall of about 40 inches and upwards per annum. The drier wooded areas of our continent contain a large number of Xerophilous trees and woody shrubs peculiar to regions receiving less than 10 inches of rain per annum. Country devoid of tree growth is, of course, rare, although the Nullarbor Plain is an outstanding example.

While, however, the major portion of Australia carries trees and may be said to be wooded, dense forest is confined to a very narrow fringe around the seaboard. The savannah forests of the interior yield firewood for the mines, tan-barks, sandalwood, etc., but do not produce timber to any extent. These open, park-like formations carry scattered trees of low habit only.

Balance Upset.

The condition of our Australian forest resource is even less satisfactory than the amount of forest available.

The primitive forest consisted not only of trees, but of shrubs, herbs, grasses, mosses, lichens, fungi, bacteria, worms, insects, birds and animals living in interdependence. While erosion by wind, water, run-off and floods was part of this "balanced" world, its present influence is far more pronounced now that the natural order has been upset by man using machines and so forth. Primitive man was more or less part of this balanced system.

It is, of course, self-evident that modern civilisation and life would be impossible without modifying and disturbing the original conditions. Modern man has consequently upset this balance and often set in motion a train of consequences of which he is even ignorant, much less powerless to stop.

Australia's forests have been cut ever since the advent of the white man until now only the more distant and less accessible areas remain virgin and available for large-scale timber cutting.

Fire Damage.

Another form of interference by man lies in the misuse of fire. The drastic effect of this use was seen in the total destruction of the remaining Victorian Mountain Ash forests in the year 1939. This tree, unlike most Eucalypts, is fire-tender and, after living for hundreds of years, was finally reached by fire and killed. Western Australia's fire-tender species are the Mallets and many Goldfields trees. Jarrah and Karri resist fire very well, but the dead gaunt framework of the crowns shows the effect of fire, apart from the damage to the trunks.

The conservation then, as far as possible, of natural resources, the maintenance of the landscape as it were, and of the natural balance is a matter of great importance to the nation, and in the forest it is possible. The fact that half the people of Australia live in our capital cities, and a much higher percentage in an urban environment, is not without significance for the conservation of natural resources upon which they depend.

Man is a relatively short-lived animal with a notoriously short memory and one with usually a careless view of the future.

Intrinsic Properties.

Timber is one of the great raw materials of the world renewable annually through growth. Wood may even prove to be the most important single basic raw material of the future because of its almost universal potentialities and because, as the world's metal, oil, and other resources which have made it so rich become depleted, we may have to turn to wood for so many of our supplies.

There are certain intrinsic properties of wood which distinguish it from other materials and make it so much sought after. These include its cheapness, its high strength in proportion to its weight, in tension, bending, compression and shear, its toughness and rigidity, its insulating properties against both heat and sound, its resistance to corrosion in air and in water, the ease with which it can be fabricated with simple tools which the ordinary workman can use, and then its sheer beauty impossible of reproduction in any other material.

Plywood.

Advances in the field of modern wood construction have seen the importance attached to drying practice and moisture contents for various purposes, the use of metal connectors to reduce the size of members and permit the building of greater spans than before, the size and shape and coating surface of nails. But perhaps no other single factor has been responsible for such significant advances as the development in glues and glueing techniques. Plywood, a thin and resilient layered material, has with modern glues opened up new fields in wood use. It can be made up in sheets much larger and with greater strength than boards from the sawn log. Compressed to increase its strength and hardness, and built up with waterproof glues, its range of products has been extended. The war produced the wooden Mosquito aircraft made in both Europe and Australia, the high-powered plywood speedboat, and the modern wooden propeller of plywood.

Peace-time household products include such things as furniture, the plywood axe-handle, and the plastic bath, so light that it can be stood up in the corner. In Western Australia, incidentally, butter boxes are being made of Karri plywood.

Wood, or the cellulose of wood, is used in paper for reading, wrapping and writing, cardboard for containers, rayon or artificial silk fabrics, including clothing, parachutes, motor car tyres, and so on, and in explosive manufacture, cellophane duco, cellulose acetate, in modern motion picture film, and a wide range of other goods now in everyday use.

Deceptive.

The trends in timber consumption have caused much confusion of thought and have frequently been wrongly interpreted. The world has seen, in the last few decades, and particularly in the war years, an unprecedented efficiency in production of manufactured goods. Motor cars, and machines and gadgets of all descriptions have been produced in metal, tending to cause a belief that wood was not being used to such a great extent. Some people have even questioned the necessity for many forestry activities because they were afraid that eventually steel and concrete would so reduce the demand for timber that a surplus of this commodity would result.

The actual per capita consumption of timber in such a highly industrialised country as the United States is, however, about the same as it was thirty years ago. New uses for wood have been found, but a saving has been made in other directions. One interesting aspect of this saving has been the change in the form of housing for the people. In urban housing some of the population is now housed in multi-family structures with masonry or concrete and steel walls with much less timber per family than a generation ago. Still the majority of our own houses are single family dwellings of frame construction, and it is important to observe that, while the average wooden dwelling requires 16 loads of timber for its construction, the average brick dwelling yet uses eight loads of timber.

The significance of these consumption trends lies in the fact that not only can the population in the more highly industrialised countries be expected to increase, but the more densely populated and backward countries can be expected to achieve a higher standard of living and hence use vastly more timber.

Forests are an important source of employment throughout the world. In young, comparatively undeveloped countries, such as Western Australia, this employment, particularly in sawmilling in the forest, is a form of land settlement of prime importance. It is generally overlooked by those people who think the only forms of land settlement involve clearing the forest.

The conservation and improvement of forests in Australia are important as a means of producing in our own country material, that is, timber which at present must be imported from overseas. There has been an increasing desire on the part of many Australians to make our country self-supporting and to produce much of our requirements within our own shores, but, strangely enough, that doesn't seem to apply to timber.

In conclusion, foresters have had to work to keep pace with the changing conditions. Timber of merchantable quality has had to be produced in regions where it was not previously found. An outstanding example of that is to be seen in the State of South Australia. Here in Western Australia, near Perth, a forestry project in the making, so

far unique in the world, is the growth of softwood forests entirely on artificial fertiliser. Trace elements have had to be used by foresters to correct disorders in trees, and the value of zinc to forest trees was first discovered in Western Australia. Of late years much interest has been shown in races and strains of trees which develop better form and reach merchantable size in quicker time.

Timber Is A Crop

Looking beyond the present, it becomes apparent that it is essential for the economic well-being of the State, to conserve the forests on which most largely rest the future continuance and prosperity of the timber industry.

There is a recipe which will make good the vast despoliation of our forests. This recipe is forestry. Timber is a crop which can be grown, though admittedly in longer time, like any other crop. It is not a mine which lasts merely until the ore is exhausted. Already West Australian forestry has achieved much of which to be proud. Large-scale examples of growth of trees in managed forest show that good forest practice is both possible and feasible under our conditions. Fire control is so well established that, in the fully protected forests, fires no longer constitute an insuperable obstacle to forestry. Research into some of our forestry problems has met with outstanding success and has achieved world recognition.

Much to be Done.

Much remains to be done. There is a great task facing foresters both to increase the productivity of our natural forests and to supplement timber supplies by afforesting large areas with exotic conifers. It can be done Australia cannot safely continue to rely on timber imports.

The advantage of maintaining and managing forests as a means of preserving the native animals and wildflowers, and for tourist, recreational and aesthetic purposes reinforces the economic arguments for timber production.

The indifference of so many people to the proper management of their forests is due not only to lack of knowledge and understanding of the requirements and potential earning capacity of managed forests. It is due also to general apathy to the source and magnitude of the supply of wood, paper, even textiles, etc., upon which they have relied so satisfactorily in the past.

Blindly unheeding Australians have ruthlessly attacked their forests from the time of first colonisation. Studded around the southern and eastern coasts of our continent are paddocks of ringbarked trees, monuments to a thoughtless, though quite natural destruction. Inland, where the trees are smaller and the woods generally burn more easily, all traces of forest have disappeared from vast areas. Now in replacement of the axe a new destroying agent, the bulldozer, has been introduced to the forests in an attempt to increase the tempo of destruction of one crop, the tree crop, so that it may be replaced by another crop—grass.

The erroneous beliefs which dominate our rather primitive general economy, and the emphatic reports of faulty observers, are very numerous.

" Why cannot we destroy this forest and make the land available for agriculture ? " is a cry frequently heard though it may be phrased in such terms as " this land along a main road or a railway does not carry any marketable timber and should not be allowed to lie idle."

Such statements are incorrect in two ways ; the land concerned in such phrase almost invariably carried considerable valuable timber, and also a forest is never idle but in a state of continuous production.

Food Over-stressed.

The overriding belief that the production of food is of supreme importance tends to dominate our whole outlook. In a country such as Australia which produces a surplus, even an abundance of food, this belief is more than a little difficult to understand. In the light of the knowledge that Australia is not self-supporting in wood and wood products, and must rely upon imports from overseas, the attitude of those people who seek to raze more and more trees and forests in an attempt to grow more grass is truly inexplicable. Yet still the destruction continues.

In a world struggling out of the chaos wrought by war, the need for a realistic policy of conserving natural resources is not fully appreciated, perhaps because more obvious things hold sway. Building homes with the raw materials on hand and the creation of new industries appeal more to the imagination.

The lasting and informed support of the people is essential to a long-term conservation project like forestry. Hence the use of the power of education through every possible avenue must still be maintained to bring home to more and more people the need for conservation to avoid further depletion of our natural resources. It is absolutely essential from the material aspect to conserve the resources upon which must rest, to a very large extent, the future industrial development and prosperity of our country. The dedication of our forests for the perpetual growth of timber and for the attendant uses, represents our major achievement in the conservation of natural resources. By this means also the source of the pure water to fill our reservoirs has been protected.

The machines which industry has placed at our disposal, the more modern and hence better known inventions of mankind, and the amazing chemical materials which science has provided have made us feel that almost anything is possible. From time immemorial, man has used the trees of the forest for timber. Now he is using them to provide shelter, clothing, even food, and an almost unlimited number of articles in everyday use in our modern civilisation. Few people realise that the materials they use so little resembling the original timber, are really wood in some chemical form.

Food from Wood.

Steeply rising prices, together with material shortages, have stimulated the search for more products from wood, the universal substitute. Increased experimental work is being carried out on the production of innumerable chemical products, including food, from wood ; the aim of course being to use waste wood for the purpose.

In the case of jarrah, any attempt at pulping presents technical, quite apart from economic difficulties. As a source of ground-wood pulp it has the almost insuperable disadvantage that it must be bleached. Further, it would make only a short-fibred substitute pulp for which there is not at present a great unfilled demand in Australia. For ordinary chemical pulp it has too low a yield of cellulose, and what there is of it is too low in pentosans which are regarded as the glue or lubricant of pulp.

For wall-board manufacture it has the colour disadvantage of all the darker eucalypts, but experiments with its use are still being carried on. One saving grace which jarrah possesses in this respect is its high content in its cellulose of the special type required for the manufacture of cellulose acetate for such materials as rayon. Should a use even be found for lignin, the other great constituent of wood with cellulose, the chemical use of jarrah could be regarded in a very different light. Tremendous efforts are being made by research chemists to solve the problem of lignin.

From the economic standpoint the good forests of jarrah are far too valuable for the production of a high quality, higher priced timber, to be converted into a low-grade, lower priced article such as pulp or chemical wood. Moreover, timber of the type of our hardwoods is in short supply and is much sought after around the world today. The demand for jarrah as sawn timber far exceeds supply and there will always be a market for jarrah overseas where its peculiar strength, lasting qualities, and beauty, are well recognised. It is these markets which should be considered in determining the use to which any jarrah forest, even though of poor quality, should be put.

The Role of Forestry in Land Use

An excerpt from the laws of the Canton of Uri in the fifteenth century reads " Anyone found with an axe in the forest without authorisation shall be beheaded, and whoever sets fire to a forest shall be bound and thrown into it." The members of a fire gang, battling with a forest fire, may be forgiven for sometimes thinking future forest legislation might take a hint from this.

The resurgent vigour of the demand for more land settlement is so great that it returns periodically to forest land and supported by bodies or individuals in whom the immediate reason may erase all recollection of previous similar timber destroying projects.

Dr. Gaha, a Tasmanian member of the House of Representatives, a year or so ago proposed that it should be made unlawful throughout Australia for anyone to ringbark a tree. That may be a little drastic for a State like Western Australia, and perhaps the proponent did not expect it to be accepted too literally. However, Dr. Gaha would be perhaps surprised to learn that there are still people in Australia who want this or that section of forest " cut out " so that it may be cleared for " agricultural settlement."

Our Forest Poverty.

Australia has only 1.08 per cent. of forested area, less than any other land mass of similar extent, except Antarctica. Yet most Australians are quite unconcerned at the destruction of even this small area of forest. Our forbears and ourselves have spent our lives in cutting down the forest to make way for agricultural settlement and it seems impossible for us to understand there can be an end to it.

Timber today in Australia is not simply a commodity which is difficult to obtain. The imports on which we Australians have relied in the past have been restricted. To meet in part the present demand, our local production has been stepped up in all States of the Commonwealth except Western Australia, but at the expense of future supplies. Nevertheless we are forced to do without much of the quantity of cellulose we formerly used. Our morning newspaper, by its reduced size, illustrates this point very well.

Costly Imports.

The small trickle of imports costs about five times as much as that produced in our own country and, of course, the small import requires some of the all-too-short dollar currency.

There is not, of course, any absolute necessity to use timber. We can build fewer houses, cut fewer fruit cases, use even still smaller newspapers, and always eat ice cream from cones instead of buckets, and so forth. But it does seem very foolish of Australians to refuse to grow timber in their own country, partly because they are apathetic, partly because everyone wants to clear the forest in his own district to grow butter, etc., and partly because we as a people are still ignorant of the fact that Australia was poorly endowed with forests by Nature.

Australians would be indignant at the thought of relying upon imported butter, for example, but are quite unconcerned about relying upon imported timber.

A Dwindling Reserve.

Western Australia's first Conservator of Forests reported in 1896 that, after carefully checking the computations in connection with the demarcation of the respective forest areas, he considered that the figure of 20,000,000 acres could be relied upon as representing a fairly correct record of the principal forest surfaces of the colony. Today Western Australia has 3,300,000 acres dedicated in the South-West.

Prior to the appointment of Mr. Ednie Brown it had been a matter of getting rid of this encumbrance. No-one realised its potential value. It had little current value. Land was alienated and timber gradually destroyed by axe and fire. Fortunately jarrah forest is very resistant and it takes time to destroy ; a process we call clearing.

Concessions were given to companies to build mills to find employment for people, as in all young countries. Timber was first exported in 1831. From this humble beginning a great industry, the timber industry, has been built up, and now the annual value of forest produce is worth some £300,000. This great and lasting industry, which has done so much to develop the South-West, employs, in normal times, upwards of 5,000 men, and provides important revenue for our railways and harbours.

Whittling Away.

Through the years there has been a constant whittling away of the forest estate. In the first place it was merely a matter of giving away forest to people who would destroy the timber and to provide clearings in which the necessary food could be grown. This went on until about 50 years ago. There was apparently an unlimited supply of timber for the small timber industry and the problem confronting the people was the getting rid of this encumbrance to their agriculture.

Then some people began to foresee the coming shortage. Fifty years ago Ednie Brown said : " The loss to the State in the absolute destruction of the forest is a matter of grave responsibility to those who carry it out or even countenance it in any way." Ednie Brown's efforts were of so little avail that for 20 years there was not even a Conservator of Forests in the State until the appointment of C. E. Lane-Poole.

Timber is Wealth.

It is of interest that one man kept his 5,000 acres of forest intact, did not allow an axe in it, and sold the timber later for more than £70,000. Many people must now regret their lack of foresight in their destruction of timber.

The needs of the expanding timber industry began to be considered and few people thought of alienating good virgin forest.

The cutting of the timber by the mill before alienation was insisted upon. This was some improvement, but the good forest was destroyed in exactly the same way as it had always been, and in any case " cutting " merely meant taking the best of the trees. Such an excuse sufficed for the post Group Settlement period.

Undeserved Odium.

The odium of holding up land is concentrated on the Forests Department, and the real purpose of Forest Reserves as areas dedicated permanently to the production of timber, fuel, and other forest produce and other uses, is obscured.

Intelligent development of the production capacity of the forest as is now being done in Western Australia, for maintenance of our forests, would have helped very materially in carrying on the struggle by demonstrating that they have a tangible value apart from their influence on environment. It is providing an answer to the constant complaint that the Government is holding large areas of land (the Forest Reserves) from agricultural settlement and putting them to no alternative use.

Fire Control.

In young countries the determination of the dedicated forest boundary is a long and difficult process and tremendous destruction of irreplaceable forest takes place early. The second stage in the protection of the forest against its enemies is protection from fire. This requires a network of roads giving ready access to the forest area. Then man now has at his disposal means which enable him to organise some degree of fire control. Through the adoption of modern methods, including radio and automotive equipment and power pumpers for the prevention and suppression of fires and painstaking attention to the small details of organisation and equipment, this State has made remarkable progress in the control of fire.

The fortunate securing by Western Australia of some of this equipment through War Disposals has greatly accelerated fire control in the forests under protection. It is vital to our economy that our forests should be protected and that the latest equipment be available for the purpose. Common sense dictates that loss and waste from such causes be reduced to a minimum.

World Shortage.

Timber shortage is general throughout most of the civilised world. The Technical Committee on Forestry and Primary Forest Products of the United Nations Interim Commission on Food and Agriculture reported in 1944 that—" In the face of rapidly multiplying uses for wood which create ever-mounting wood needs, the world is confronted by the inescapable fact that the forests—sole source of wood—are steadily diminishing."

Over 60 per cent. of the softwood timber upon which the world depends for construction material is in North America and Europe. Of the once heavily forested continent of Europe, the report says, only three countries now have appreciable quantities of timber beyond their national needs.

We cannot look to foreign sources, therefore, to supply any substantial part of our timber needs. Europe and Asia cannot meet their own. The undeveloped forest resources of the tropics may supply greater quantities of cabinet woods and speciality items, but they cannot take the place of the coniferous forest of the Temperate Zone.

Canada's exportable surplus now goes to the United States of America. In 1945-46 the Forest Service made a survey of forest resources of the United States. It reported plenty of cause for concern and that several decades of limited supply must be faced ; and if adequate measures were not taken to build up the stocks of growing timber, the period of inadequate supply would be prolonged indefinitely.

Perhaps it may be well to stress two basic facts which should be obvious, but that are too often overlooked.

1. Forests and natural resources constitute the very foundation of our material prosperity. Science and invention can aid immeasurably in raising the world's standard of living, but they must have soil, water, wood, minerals, and other raw material on which to work.

2. In the long run all nations will prosper as natural resources are abundantly and readily available, or suffer as they are scarce. Inequalities in the distribution of wealth between nations, as between individuals, will doubtless continue, but all will be better or worse as the sources of wealth are plentiful or meagre.

Forestry IS Rural Development

Australia is poorly forested because the bulk of the continent is sparsely watered. Vegetative cover in any land is determined in great measure by its rainfall. Most of the economic forest growth of the world is found in regions with a rainfall of 40 inches or more. In the tropics, of course, the aggregate precipitation is far above this figure.

The rain-bearing storms which, sweeping from west to east along the southern coastline of Australia, provide for most of our wheat-growing districts do not, except in the small South-West corner of this State, deliver a forest rainfall until they meet up with other moisture-laden winds on the eastern seaboard. Further north they are even less bountiful in the arid and semi-arid country which relies on occasional thunderstorms.

Of the great bulk of the land in this continent of ours, outside the tropics, an unfortunately small percentage only is favoured with the rainfall conducive to worth-while natural forests. These forests were the uncertain sources to which Australians had to look for their timber supplies ; uncertain it has been proved because they were quickly devastated by the early comers in their endeavours to grow grass. This has been done with almost unbelievable prodigality while we import our timber needs from other lands. This, in short, is Australia's forestry dilemma.

A Millionaire's Country.

In Western Australia, to particularise, our available timber is adequate for today's needs with our existing small population, and few people think beyond the present and immediate future. " Something new " has always had an appeal to the human mind, and visions of the manufacture of steel, of motor cars, of aeroplanes held sway while the development, even the care and maintenance, of the more important timber resources, the forest, is put off until tomorrow—and tomorrow never comes.

Few people, other than the foresters, appreciate the fact that Western Australians are supplied with timber for everyday purposes, only because they are using for common needs, timber of great size, high quality, unusual beauty, and potential high value, which is so scarce in the world that it should be reserved for the particular demands which it alone can meet. Twenty years ago one of a band of visiting Canadian foresters remarked " This sure is a millionaire's country all right. They even use hardwood in their outhouses."

We Can Grow Softwoods.

The situation cannot be rectified overnight. People cannot be expected to do without pickets on the back fence because the wood available is too good for the purpose, or to forgo their right to have cases because only cabinet woods can be obtained for their construction.

Softwood, timber which supplies seven-eighths of the world's industrial demands, can be grown in abundance in Western Australia while at the same time steps are taken to establish our natural forests on a better foundation to replace the unthinking exploitative pattern of the past. Foresters are capable of a vast upbuilding of the timber crop of the State designed to more than triple Western Australia's wood potential.

The fashioning of wood from the tree or log is one of the most ancient of industries and must, of course, have been practised long before recorded history. In Australia—the world's youngest continent in terms of settlement by the white races—the original inhabitants managed, in some regions at least, without much timber. Aborigines in the dry interior, for example, needed it for little more than spears and fires. They did not, however, have newspapers, cinematograph films, tram tickets, spectacle frames, phonograph records, explosives, plastics, insecticides, glues, fertilisers, or even the latest cardboard dress collar, and were able to survive largely without clothing and shelter requiring wood.

Inadequate Supplies.

Those peoples of the world with a high standard of living by contrast use enormous quantities of wood drawing upon the supplies accumulated by nature over the ages.

Attempts to improve living standards and to increase industrialisation in those countries with a low average standard of living inevitably result in greatly increased demand for forest products.

The potential world demand for wood in the form of timber caused by back lag during the war years and requirements for new homes and industries, etc., may not be as great as anticipated and undoubtedly the consumption will fluctuate. Yet the uncomfortable fact remains that Australia must rely upon imports to meet her needs and in times of stress, such as these, must do without. This her people, particularly those in the Eastern States, today regret so much. With an increase in population the position must worsen.

With so many defence research projects in hand at the present time, it is pertinent to reflect upon Australia's capability before many years have passed to wage a war with her inadequate timber supplies.

Overseas Needs.

People have become so accustomed to reading, hearing and even repeating such phrases as " guns for butter " and " butter for Britain " that there is a tendency to overlook the perhaps more plebeian needs of a country. The United Kingdom is today in desperate need of timber for railway waggon repairs and construction and railway sleepers to transport her food, and timber for a host of purposes.

Britain, little in area, has three and a third millions of acres of forest, precisely the same as Western Australia has had dedicated as State Forest. From the forests already sorely overcut and depleted by two wars, the British are producing today almost twice the output of Western Australian forests. The small reserve of timber which it is vital that she should hold against a future emergency is daily dwindling.

Australia might think more of " Eucalypts for England " and " Sleepers for Scotland."

Forestry and Agriculture.

It is perhaps understandable that the term " land settlement " should be associated in the public mind in Australia with agriculture, since settlers are regarded as people who provide, among other things, our bread and meat and grow our fruit, and so forth. That this is incorrect cannot be gainsaid.

Neither the common use of the expression nor the impulse which is given to it by Governments which create Land Settlement Boards to deal with agricultural development should in any way alter the viewpoint which must be taken by responsible opinion that the term " land settlement " as used today is a misnomer and that what is meant is " agricultural settlement."

It has come to be accepted in Australia that forest land must be cleared to grow agricultural crops for which a market must be sought outside our country, the trade possibilities in other countries being constantly stressed.

While this may be correct in business and trade, it is fundamentally unsound and the height of foolishness to destroy a crop for which there is a market inside Australia and which is sorely needed in our country to grow one for which an overseas market must be sought.

Australians would do well to ponder the fact that of all rural industries, the forestry industry or tree cropping is one of the best and most desirable. As has been said it is required to provide the needs of an internal market. It involves a crop which does not require seasonal harvesting and can—on buyers' markets or in times of low market values—be allowed to accumulate for a price rise. Cream must be harvested twice daily, eggs daily, hay, wheat, fruit, etc., at particular times of the year, but timber is a much kinder and more amenable crop. The people engaged in the forestry industry in field pursuits may enjoy the advantages of living in settlements or small townships with their accompanying amenities at lower cost and for the most part are required to work a shorter spread of hours than most agricultural workers.

South Australian experience has shown that pine plantations will support one family per twenty-four acres, whereas current agricultural settlement schemes envisage four hundred acres for a family. The consequent economic advantage to a country is very great when the provision of railway, road, education and other public facilities is considered.

In evaluating the long-term advantages and potentialities of forestry, it must not be overlooked that forests are required to protect our land against widespread erosion, to protect our water-sheds and hence, in effect, provide the water supplies of our cities and towns. Add to those advantages the tourist, recreational and aesthetic values of forests and one may then say forestry settlement must indeed be a major factor in any land settlement scheme.

Our Heritage—The Forest

The need and value of a comprehensive Australia-wide programme of forest works for the augmentation, replacement and development of our forests has been emphasised by the present acute shortage of timber in the Commonwealth. While some attention, inadequate though it may have been, has always been given to our needs in war, Australia in the past has not prepared itself, at least in timber programming, for the demands of peace.

In the long story of mankind's dealing with the plant world, there are few more tragic chapters than the ruthless destruction of forests in Australia. Admittedly the story of destruction in parts of Europe, Asia and Africa pales into the dimness of history, if not of antiquity, and hence may be lost for comparison. In all young countries, young in the influence of white man, timber is the most abundant, most readily obtainable and most useful raw material in creation ; yet it is valued lightly, if at all, and consequently slaughtered.

The desirability of such works of improvement for the lasting productiveness of our forests, our water, our soil, and other land resources is incontestable.

The appeal of the new industry in the aftermath of war in comparatively undeveloped countries such as Australia is so strong, however, that it is difficult to make apparent the need for a programme of organic conservation works on a scale sufficiently broad to be physically and socially effective within a reasonable time. Prudence, nevertheless, dictates the wisdom of such measures.

Water Supply and Forests.

From time immemorial man has given thought to the possibility of water conservation to irrigate, and hence farm, a more extensive area. Now, with modern construction of concrete and power equipment applied to the damming of rivers and the excavation of canals, he can provide for the support of a still greater population than was possible in former times.

In doing so man has repeatedly overlooked the need for forests to protect his watersheds, and also the latent power and strength in forests to support a more than adequate share of the population in the growing civilisation. Unfortunately, also, not only has this part which can be played by forests in providing wealth and employment for our people been consistently forgotten, but also, until recently, the serious results attendant upon the up-setting of the balance of nature.

In Australia timber is becoming precious. The amount of available and useable timber supplies will markedly influence the future development and economy of Australia. It is a factor which will affect population growth and the development of other resources.

In the South-West of this State the conflict between timber production and the growth of agricultural products is due largely to an apparent sufficiency of timber through an obvious surplus in the immediate vicinity of the observer. Paradoxically, however, the need for greater timber production in Australia is readily understood in the inland regions.

Water is so important to the economy of Western Australia that it is difficult and in some ways meaningless to attach an economic value to it. Continuous reduction of our timber resources would inevitably place timber in the same category.

Queensland Softwoods.

A recent report by the Director of Forests of Queensland referred to the vanishing of Queensland's softwood forest assets, the only extensive natural softwood resources in Australia. This echoes and amplifies the stated opinion of foresters that Australia's timber resources are quite inadequate for her needs.

The perpetuation of our nation's timber supply calls for determined effort on the part of our people, a people long prone to believe that the production of food is a first consideration, while some industrial expansion is permissible. Agriculture's sister rural industry, forestry, has been consistently overlooked, a circumstance which is freighted with vast significance. Australia's timber supplies are inadequate for her needs in time of peace. In war the seriousness is obvious. No matter how distant the danger may be, no-one should look with equanimity upon the prospect.

Illustrative of the intensified hunt throughout the world for timber resources is the quest for tropical woods. Central Africa was investigated as a wartime measure. The Americas, Costa Rica, Honduras and Nicaragua have been included in the search. Australia today is importing, at a very high price, small quantities of timber from such widespread regions as Brazil and the East Indies, Borneo and Sarawak.

Faced with this situation the recent Empire Forestry Congress in London stressed the need for materially strengthening present conservation and protective activities.

False Impressions.

It is to be expected that some of the lower standard countries may in time supply temporarily, certain manufactured timbers and fashioned-timber articles at a lower price than they can be produced in Australia. Also it is noteworthy that some countries with inadequate supplies of timber for their own full requirements export timber to other countries in exchange for much needed machinery, electrical equipment and so forth. Such temporary trading causes not only disorganisation of existing business in any country, but creates in the public mind a false impression of sufficiency in timber supply.

This cyclical instability of supplies and markets plays an important and fundamental role, of course, in trade in agricultural as well as forest products in Australia, and is most upsetting to our general economy. Wood may be regarded as the universal substitute. It is used in the construction of a tank stand, for example, because it is cheaper than the old-fashioned stone support.

The major characteristics of wood as a raw material can be grouped into two categories. Its assets are aesthetic appeal, ease of fabrication, low cost, non-conduction of heat, agreeableness to touch, light weight and chemical stability. As to liabilities, wood shrinks and expands, is non-homogeneous, can burn, may decay, varies widely in its properties, splits easily and its conversion is difficult.

Industrial research on wood products, like research work on all materials of construction, has as its aim the improvement of the product to increase its assets or reduce its liabilities. In the early years of forest products research, the effort was usually concerned with controlling or limiting the liabilities of wood so that its assets might be enhanced in competition with other materials. In the background was the hazard of competition from some startlingly new and superior product that might suddenly come on to the market.

The growing scarcity of wood in the world, under modern industrial expansion, has caused, during the past two decades, a change to research into ways and means to increase the life and usefulness of timber products, primarily because of the increasing shortage of wood.

Utilising Waste.

Inevitably with timber short, the effective use of wood-waste is a problem in which the public at large becomes interseted. This problem of waste is not only an individual one for the sawmill owner, or even merely industry-wide, it is today a world-wide problem. Research workers are engaged upon it everywhere and notably in the big forest products laboratories in Madison in the U.S.A., Princes Risborough in England, Dehra Dun in India, and our own in Melbourne.

Some of the failure to utilise waste is due to a lack of technical processes for making a useful product from material now wasted. To a much larger degree, however, this failure is due to the lack of cheap, efficient prodecures for handling and concentrating wide-scattered amounts of waste.

While the provision of timber for the material needs of the people is no doubt the first purpose of forests in our modern civilisation, and while their role in protection of our water supplies may be conceded, it must not be forgotten that there are other purposes of forests. For example, who first gave expression of the need of the forest for modern man to resort to for the good of his soul and his physical being is not known, but existence of the need and the consequent derivable benfit cannot be disputed. Possibly it could be said to date, as far as history is concerned, from the time of Robin Hood and his merry men, and certainly our ancestors for many generations have repaired to the woods of old England in holiday and festive spirit. With the passing years a day in the woods has become a tradition, a tribute to man's love of nature.

Those were the formative men and the formative years of such conceptions as the National Park idea of our Australian Continent ; and it is well to realise that with continued development of our agricultural lands, throughout even the present century, forests will become increasingly important in providing the need of the bushland in our modern civilisation.

We foresters believe that in the virgin karri forests of Western Australia we still have a beauty and a majesty beyond compare. They still are ours as a national possession unaltered from the natural state. They should and will, we foresters believe, have the support of the Australian people.

Timber is in Short Supply

Australia is still in the fiercely destructive stage viewed from a rational Forestry standpoint. Man-made fire takes its annual toll of our timber. Then to the old-fashioned method of destroying forests by ringbarking with the axe can be added the modern bull-dozer, which not only pushes the trees down, but piles them into heaps to facilitate their disposal by burning. The folly of our extravagance in the utilisation of our forest resources has not yet been generally realised.

In the past, Australians, despite the warnings of foresters, have grossly overestimated the stand of timber occurring here and, incidentally, have always underestimated the original productivity of forest areas. Both have contributed to the low value which has been placed on forests. Apart altogether from the use of wood for sawmilling, mining, fuel, etc., the intentional destruction of standing timber to make way for agriculture has accounted for a great deal of the heavy drain upon our original forest resources.

Perhaps we do not appreciate fully a supply of timber until we are faced with its opposite, an unfulfilled demand for timber. This is the position which has faced Australia during the war years, though it was not realised by the general public. Today the man in the street can see Australia's shortage of this essential raw material and, moreover, has learnt that the little timber we can import now is costing nearly three times as much as our own.

Shortage of timber then has resulted in more public awareness of the vital importance of that commodity in our economic life and that we face serious problems of supply both now and in the future. This is therefore an appropriate time to examine the timber situation.

Humanity's Needs.

National welfare in its broadest sense requires more than the present enjoyment of the common blessings of life ; it means an adequate supply of natural resources, of which timber and forest products are outstandingly significant.

The importance of timber in human affairs has been basic rather than immediate. Much has been written since the war's end of the dietary standards necessary to maintain life in the various countries and attention has been focussed upon the teeming millions who are said to have a food ration below the calorific standard necessary to sustain vigorous life. The three material necessities are food, clothing, and shelter, and, in view of the much publicised low standard of food, thought must be given to the other two requirements. Hence humanity's need for timber becomes apparent.

Wood Ranks Next to Food.

Exceeding in importance every other basic raw material except food, wood plays a vital part in providing the two other basic necessities of life and, of course, also in the preparation of food itself.

It may perhaps be claimed that timber famine can never exist since use will be made of other materials. The effect goes deeper than that. Among the millions in the crowded countries of the world, where only a few can enjoy the luxury of wood, life adjusts itself to the privations imposed by chronic wood starvation. In the absence of other fuel, the rural population may even burn cattle dung and other agricultural refuse which should go to maintain the fertility of the soil. However, such people have not lost their need for timber and its derivatives. A study of the levels of consumption of forest products in different countries reveals a great potential demand in many of them and indicates the contribution to improvements in standards which wood can make in the form of houses, furniture, conveyances, paper, textiles, and other goods.

Heavy Consumption.

The United States of America provides an example of the high level of consumption which can be reached by one country, for she uses half the sawn timber and more than half the paper of the globe.

Of a total of about twenty million tons of wood-pulp produced annually in the world before the war, the North American continent supplied approximately half of it. The United States used nearly all of this, obtaining a greater supply of newsprint from Canada than from within her own boundaries. Sweden, Germany, Finland, and Norway between them produced the other half of the pulp, except for comparatively small quantities elsewhere. The United Kingdom was one of the most important markets though considerable quantities crossed the Atlantic.

Wood Products.

Of all the raw materials which have been turned into man's service probably timber has been the least changed in function through the ages, certainly until recent years. A new phase of forest utilisation has, however, now been entered, and many of the new wood products have already contributed materially to improved living standards for the people of some countries, including our own.

By proper application wood can present a future of unlimited service to man. Paper alone is steadily increasing in use, embracing types as diverse in character as blottings and grease-proofs, newsprint and high class writing papers, tissues and hard wrapping papers. Ninety per cent. of the paper made is produced from wood, of which coniferous wood, on account of its fibre length and other properties, is the best raw material. In Australia rapid strides in this field have been made by using hardwood, mixed with a percentage of imported pulp, for paper-making.

During the war considerable research was made into cellulose packaging and wrapping materials, and the results of this should have a far-reaching effect on the containers of the future. These articles are potentially capable of absorbing great quantities of pulp. One hard, strong product is obtained by pressing together, under the application of heat, many sheets of paper impregnated with a waterproof resin.

Cellulose.

The use of cellulose as the basic raw material for the first plastic to appear commercially was due to the abundance in which it was found in nature, and apart from cotton, where it appears in its present form, wood offers the most economical source of cellulose today.

Cellulose derivatives were used for a variety of important war applications and their further extension into the ordinary commercial field is inevitable. One interesting example is the construction of hammer heads employed for assembly purposes by manufacturers of intricate machinery. Such heads will not mar delicately machined metal surfaces.

Chemical transformation of wood and wood products into various items that in their finished form bear little or no resemblance to the timber from which they are made, are illustrated by explosives used in industry and war.

Complacency.

Australia's position is definitely not one for the complacency shown by so many of us. With a relatively high living standard her timber use ratio is high by comparison with that of the great majority of the peoples of the earth. She is already forced to rely upon imports to the extent of one-third of her requirements. Yet still the destruction of timber lands goes on. There is nothing inimical to the cutting of trees in a forest policy, that process is an integral part of forest management. It is the complete removal of forests which causes loss. Timber itself is a raw material which is replaceable annually through growth in a properly managed forest.

Man, at least when living in communities, has almost for ever been forced to till the soil to grow food. This action has become almost instinctive. Most of us, even those living in towns and not engaged in a rural occupation, grow a few vegetables or maybe keep a few fowls. Clearing the land then, which usually means clearing the forest, has come to be looked upon more or less as a natural process. Perhaps few realise the lands they till were once forested. Early man, and modern man differs but little, obtained his timber by cutting down a tree supplied by bountiful nature. He was not forced to grow it from early times, as with food crops.

Those facts are basic. In the estimation of the future timber position in Australia in relation to world's timber supplies, difficulties arise. The future population level appears to be unpredictable. Little more can be said than that Australia must, to a great extent, be forced to do without. This will not occur in Western Australia in the lifetime of many of us. It could, moreover, be avoided by a vigorous policy of timber growing.

Past consumption figures are an unsatisfactory guide for the future and, owing to the variation within them, are difficult to assess. It is a recognised fact that current economic conditions exert powerful influences on the trends of all branches of commercial activity, and an impoverished public is capable of very great buying retrenchment. The food industry which caters for the first of the three vital human wants, namely, food, clothing, and shelter, was unable to withstand the last economic depression. Similarly the consumption of timber was seriously curtailed in Australia.

The correct policy, however, must be to plan to have abundant timber permanently and easily avilable for all purposes.

A World Timber Shortage

Some interesting facts emerge from the discussion of the Empire forests and timber supplies during the British Empire Forestry Conference held last year in England and attended by 110 delegates from the various countries making up the Empire. In order to include the whole of the English-speaking world, there were three guest foresters from the United States, two of whom were members of the Food and Agricultural Organisation.

The study of the problem of timber supply in its broad sense with respect both to the immediate and the future needs of Empire countries was probably the transcendent one, since the supply of timber is unquestionably the prime purpose and justification for forestry, though not by any means the only one.

An account was given of what F.A.O. sought to do in the range of international forestry, commencing first with a forest inventory of the world. Attention was drawn by F.A.O. delegates to the importance of timber as one of the major raw products needed to supply the three basic material requirements of mankind, namely, food, clothing, and shelter.

The highlights of the conclusions which emerged were the desperate straits in which Britain and some of the countries of the Empire found themselves when normal imports of timber were cut down, or cut off entirely shortly after the outbreak of war ; and that the need for timber is a vital issue confronting the Empire today.

The conference reported that it could not but be deeply impressed with the great inadequacy of timber supply, not only in Empire countries, but also in the world. This scarcity is very definitely delaying rehabilitation of industries in the post-war period, and in so doing is an important factor in delaying a return to world economic stability. It is preventing the provision of adequate housing for Empire peoples and is calculated to interfere with the standards of living of Empire citizens.

Unfortunately, adequate statistical data are not available, either as to Empire timber resources, or as to deficiencies in supply. That there exists a great shortage is indisputable, but there are so many world factors operating that it was impossible to prepare an estimate with any degree of authority or accuracy.

The data contributed to the conference show that, in round figures, Canada has 133,000 million cubic feet of softwood and 59,000 million cubic feet of hardwood standing timber ; that India has 7,000 million cubic feet of softwoods and 16,000 million cubic feet of hardwoods ; that British Guiana has 13,000 million cubic feet of hardwoods ; that Australia has 11,000 million cubic feet of hardwoods ; and that all other countries have less than 2,000 million cubic feet of softwoods and less than 2,000 million cubic feet of hardwoods—in most cases much less. Although India has a large volume of standing timber it is insufficient to meet her own requirements, and the hard fact remains that Canada and Newfoundland alone of all the countries concerned have an exportable surplus of softwoods.

Imports Reduced.

The following examples of reductions in imports of wood and wood products are quoted to show how countries were thrown back on their own resources during the war. The figures given represent equivalent volumes of round logs in true measure under bark.

Country.	Net Imports, in millions of cub. ft.	
	Average, 1934-38.	1945.
United Kingdom	1,207.7	477.0
Australia	60.4	30.2
South Africa	89.0	34.0

While the shortage exists in both sawn timber and in pulp and paper products the Conference subscribed to the opinion of F.A.O. that the most critical shortage was in sawn timber.

New Uses for Timber.

Largely as a result of the war, new uses of timber and forest products have increased, and the timber and pulp and paper industries are paying greater attention to better utilisation in the forest. There is an increasing tendency for the pulp industry to be attracted by the smaller material and to link up more closely with sawmilling. Developments in this direction encourage the rapid development of regrowth in cutover forests and of softwood plantations on which the world must rely more and more for future supplies. Moreover the use of laminated wood and the use of timber connectors in structural buildings renders the growth of large timber less important.

The production of veneer and plywood has made great expansion in the last 20 years. Wood as the raw material for chemical industries is only on the threshold of its possibilities, provided they can depend on the cheap supply of by-products and waste. Fats, oils and resins, cellulose, and lignin can all be produced and used in large quantities ; but the greatest hope for the future lies in fibre products.

The great versatility of wood is a major point in its use as a raw material. It can be converted at will into food, clothing, liquid, solid or gaseous fuel, buildings, fibre products, and paper, to mention only some of its uses. It is up to foresters to grow more of it so that the world can increasingly enjoy its numerous advantages.

Forest Reserves.

The Conference urged the reservation throughout the Empire of all land which is primarily suitable for forest, under conditions which prevent its alienation ; and that, as the long term element is basic to proper forest management, forest authorities must be assured of continuity in the provision of adequate finance.

Australia, though largely wooded, and for the most part covered in vegetation, is a poorly forested country and relies upon imports to meet her requirements, though timber could be grown here.

Although Australia cannot supply even now, with her small population, her requirements in sawn timber, reference is often made to the manufacture of paper from Australian woods. Although paper is already produced in Australia, we import normally nearly 50 per cent. of our total wood cellulose, and the diversion of any timber to paper-making, in the long run, has no advantage.

From the technical viewpoint it is of interest that Boas, in " The Commercial Timbers of Australia," states that relatively few timbers in Australia have suitable grinding or cooking qualities for making good quality pulp, in addition to availability in large quantities in or near localities where economic factors are suitable for paper making. In spite of much investigation only one of the Eucalypts, Mountain Ash, was until recently found to be suitable for the production of ground-wood pulp. It has now been shown that Messmate Stringybark can be ground with suitable technique.

Many of the light-coloured eucalypts yield satisfactory sulphate, sulphide, or soda pulps on digestion. The darker-coloured timbers yield pulps which are too costly to bleach. For long fibred additions to chemical pulps Australian grown *Pinus radiata*, Hoop Pine, Bunya Pine, and Queensland Kauri are used, but most of the long-fibred pulp for blending is, of course, imported.

The present size of our morning newspaper has surely drawn the attention of everyone to the scarcity in Australia of newsprint, and the timber from which it is made, for everyone today must know paper is made from wood.

In a recent article in the " Christian Science Monitor " the question is asked : " Will pulpwood trees be so scarce in the United States in another 50 years that paper will be too expensive for common use ? That is a very real question today."

Newsprint Needs.

The United States, with its well-known high standard of living for its people, is fortunate in having as a neighbour Canada, with its mighty timber resources. Yet already newspaper publishers in the United States are considering the building of newsprint mills in Alaska in order to assure themselves of a paper supply. It is admitted that the cost will be high, but they will be certain of supplies for a period at least.

The United Nations Education, Scientific, and Cultural Organisation has deplored the growing depletion of the world's newsprint supply. " The real exercise of the liberty of the press, both in the domestic and international field, is conditional upon the solution of the problem of production and distribution of newsprint." It is not generally understood what a tremendous consumption of wood is caused by our modern demands for paper.

The United States, of course, consumes more pulp and paper than the rest of the world combined. Moreover, with the single exception of Canada, which can be drawn upon also, the United States is the largest producer of paper.

Approximately 200lb. of pulp is now used by every man, woman, and child in the United States. No other country in the world, except Canada, which exports 85 per cent. of her pulp to U.S.A., can have a consumption even approaching this figure.

Some Startling Figures.

The " New York Times, which prints half a million copies each day, consumes daily the entire tree crop for 50 acres of land. It has been calculated by one writer that all the papers in the United States, equivalent to about 350 millions, consume each year the wood from nearly one million acres.

In Australia, people seem hardly to be aware of the growing consumption of paper in the high living standard countries. Even the drastic cut in our newspapers already referred to seems to most people to be connected only with a dollar shortage.

We used to read of wood being required from the cradle to the grave, and are accustomed to read of new substitutes for timber in these commodities. Do we appreciate fully, however, the growing demands for timber in other directions? The telephone has become part of our daily lives, and we who can remember when telephones were little known, have accepted them as almost necessary for our existence. Yet, is the consumption of timber caused by telephones fully understood? A New York telephone directory alone requires 60,000 tons of paper per year.

Timber has, in a sense, replaced gold as a medium of exchange for we use paper money and also paper cheques and bank drafts. Paper is literally the currency of civilisation.

Complacency.

Australians are today astonishingly complacent in the face of a crippling shortage of timber. Our imports upon which we relied in the past have been cut off and the small trickle coming in costs five times as much as the timber produced in our own country, and moreover, consumes precious dollars.

It seems that the timber-destroying agents, the bush fire and the settler's axe, have, like the blowfly, always been with us, and hence are imperfectly understood.

An aroused public opinion could go a long way toward correcting flagrant abuses to our national timber supply in Australia. Public indifference to such practices would be startled into alarm if the facts about our disappearing timber reserves were understood.

The starting of new industries in Australia is eminently desirable, but with this unfortunately, the ensuring of supplies of basic raw material for one of our oldest and most important industries, the timber industry, is being overlooked.

It is not too late, for better late than never.

Timber

Basic Raw Material

Any large scale survey of human necessities must reveal the dependence upon wood of the vast majority of people. Too often we fail to appreciate the things to which we are accustomed in our everyday life, and timber is by no means an exception. Practically all the people of the world use wood in one form or another. In most countries wood is so inextricably interwoven with human existence and welfare that it is rightfully regarded as one of the most indispensable of all renewable natural resources.

Our forests and the industries of our State which depend upon our forests for their raw material constitute one of our most important natural and industrial resources. The annual value of the products of the West Australian forests industries is in normal times about £3,000,000.

Not only does it behove us to preserve this resource and these industries so that this wealth may always be derivable, but we must increase and further develop it for the sake of our Commonwealth as a whole.

With a present world shortage of almost every need, it might be felt that timber, like most other things, can be expected to be available in sufficient quantity shortly. That will be the case so far as Western Australia is concerned, and even for the whole of Australia if sufficient timber for importation can be made available from the world's diminishing supplies. The implication of increasing industrial development throughout the world on the lines of the United States of America, which uses about two-fifths of the world's wood, can, however, hardly be disregarded.

Australia is not a country of unlimited resources; it is extremely dependent upon certain goods which must be imported from overseas. Many of these goods cannot be produced in Australia—we must bring them from overseas or go without. This does not, though, apply to timber, which we have always imported to the extent of one-third of our requirements. Sufficient timber for our needs could be grown in our own country enabling us to develop a better balanced economy by reducing, in part at least, the volume of goods which can only be obtained by importing.

Tanning Materials.

The unhappy position of Australia in regard to minor forest products is well exemplified by tanning materials. The imports total more than £300,000 per annum, though this is offset now to an extent by the export of £100,000 worth of wandoo extract from Western Australia. Ironically enough, nearly all the import is in the form of wattle bark extract from the Australian wattle trees grown in South Africa, and even some wattle bark is included. The world's market for tanning materials, much of which could be grown in Australia, is an important one, and the annual value of tans imported into the United Kingdom approaches £3,000,000.

The future of even the comparatively small supplies of timber we have in Australia is a serious one. Victoria has had her mountain ash forests destroyed by fire, Queensland's hoop pine production will suffer a very great drop within five years, while New South Wales is now reaching out to her hitherto inaccessible remaining mountain forests. Tasmania is converting her hardwood forests into paper, and there the paper and pulp industry is already highly developed, and probably over-developed, with reference to the capacity of the forests to supply continuously the wood requirements of the desired industry. South Australia has never had any forests, though she has made an important contribution to her timber needs from her pine plantations, and, finally, the whole of the virgin forests of Western Australia will be cut over in 30 years.

This means then that Australia will have to look to imports, if they are obtainable, to an ever-increasing extent for her timber supplies. It does not mean that no timber will be cut here ultimately, but that the volume of production must fall increasingly with the years. Even in the most heavily cut districts, there will always be some milling, as can be seen today in the little hardwood mills in South Australia.

Of course there are some very important factors affecting the duration of our timber supplies, and it must be emphasised that we are here dealing with many which have never been accurately determined and which are subject to considerable variation as time passes. The more important variables include the actual quantity of timber, its accessibility, how much may be turned into National Parks, the increment of the forests which will vary with the area finally retained for the purpose, the intensiveness of protection, the intensiveness of reforestation, the losses from fire, disease, windfalls, etc., which will vary with the degree of protection and other features of management, the rate of cutting, degree of utilisation varying with market conditions, etc.

Future Markets.

Opinions vary greatly as to future market requirements. Some people think that substitutes will take the place of a large share of the wood which we are now using, thus greatly reducing the drain upon the forests. Undoubtedly this will occur, for one of the important commercial properties of timber is its cheapness, and, as the price of any timber article rises, so will its economic position be increasingly assailed by a substitute. Fence posts of concrete are being used today on farms in South Australia under timber famine conditions, at a cost of 4s. each, or £20 per hundred, but there is no danger of their being used for many years at this price in the South-West of Western Australia. Cement, by the way, is now transported in paper bags, a forest product.

The present use of substitute materials for the almost universal wood of some centuries ago, did not all come about because of a scarcity of timber. Admittedly some of the markets formerly held by wood have rightfully passed on to products having better inherent qualities for the specific use. The passing of the wattle and daub chimney should not disturb the equanimity of the most ardent wood enthusiast. The wooden rails used on our first Western Australian railway have no place in the modern scheme of things.

On the other hand, there are those people who believe there will be even heavier demands upon the forests in the future to supply the raw material for many uses other than as sawn timber, such as paper and other cellulose products.

It is of interest in this connection that, in the United States of America, one of the most highly developed countries of the world, the per capita consumption of timber has remained very much the same over the past 20 years. Wood is still one of the most important of the raw materials which are consumed in great quantities in that country. It is true that great quantities of wood substitutes are being used, but so far at least those substitutes have done no more than prevent the expansion of the timber demand.

Some of the sawn timber substitutes today are made of wood. One of the more important of these is plywood, which has been termed " the material of unlimited uses." There is every indication that the development and improvement of synthetic resin adhesives during the last few years is tending to revolutionise the timber industry. Plywood, formerly looked upon with doubt for anything except the most unexacting tasks, has now taken its place as one of the more valuable structural materials. While war demands hastened the development of this product, as exemplified by the Mosquito Bomber and the thin-shelled speed boat, there is an increasing production of these techniques to the everyday needs of industry.

Plywoods and Laminations.

There are two basic wood products in which modern glues play a part, a constantly increasing part. They are plywoods and laminations. With regard to the first, wood, as can be seen from a sample of this single ply veneer, is strong in one direction and so weak in the other, that it can be easily broken with the fingers. Strength is obtained in both directions by crossing the plys and bonding them with a strong adhesive, resulting in a balanced three-ply construction which, through the use of glue, is strong in all directions. Lamination consists in the taking of solid wood in thin sections and glueing it with all the plys running in the same direction. Because no two pieces of wood have the same grain, there is an inevitable slight crossing of the grain which makes the laminated construction stronger than solid wood of the same dimension and very much less subject to splitting and checking.

Laminated construction is shown in the wooden aeroplane propeller and in the modern axe handle, in which the timber is further treated by impregnation with synthetic resins and the compressing to the required density by the application of both heat and pressure to develop high strength properties and toughness. In America laminated timber is successfully establishing itself in the field of curved structural wood members, such as arches and curved chords for roof and bridge structures.

Everyone knows that the great softwood forests of the world, which form the bulk of the timber resources of the world, occur mainly in a belt in the Northern Hemisphere across Northern America, Northern Europe, and Northern Asia. Some occur outside this belt. There is one fairly large body of softwood in Brazil, but certainly not more than is needed for use in South America. Australia has a comparatively small pocket represented by the hoop pine of Queensland, and has also some hardwood.

Europe and Asia.

Generally, the forests of Europe are managed on a sustained yield basis and their product is practically all needed in Europe, though a little Baltic deal has always reached other countries, such as Australia. One interesting recent development in Europe is the plan to plant 5,000,000 acres of forest in the British Isles and to spend nearly £10 per acre in doing so.

In Northern Asia there is a large wooded area of low grade timber, of low volume per acre, which at the present time is utilised below its capacity. There is little doubt, however, that if industrial development is to take place in that country quite apart from the Orient, the entire cut will be absorbed there.

The supplies of timber in Mexico and the Central American States are not large and will not be more than sufficient to supply the Mexican home demand when that country reaches a higher plane of economic development. In Eastern Canada the pulp and paper industry will more than require its timber supplies, while British Columbia and Alaska are already widely drawn upon by the United States to meet her needs beyond her own production.

Australia.

Since in future years it is apparently going to be impracticable to secure any substantial additional quantity of timber from sources outside Australia, we must grow within our own shores nearly all the timber which we shall need, or do without it.

Few consumers look far ahead if their immediate needs are being supplied, but it is perhaps at the present time when there is a temporary shortage even in Western Australia that the realisation can be brought home to our people that timber is going to be permanently scarce in the not very distant future.

For many years, foreseeing difficulties ahead, the Governments of Australia have sought to solve the timber supply problem. Efforts have so far consisted mainly in creating and administering the State Forests and in providing moderate sums of money for forestry practice.

In Western Australia the possibilities of proper forest management were very great and have undoubtedly been taken advantage of, though much remains to be done. From the point of view of Australia as a whole, however, we have not yet gone far enough to solve the problem within a reasonable length of time, and time is immensely important in this particular problem.

Our total forest resources, moreover, at the present time, are not fully developed. Aside from their potential industrial uses, we have their unrealised potentialities from the standpoint of recreation and travel as well as for the safeguarding of the water supplies of the nation, and so forth. Although a number of important progressive steps have been taken in the direction of reforestation, there is still much more requiring attention.

This Was A Forest

" There was gold in the forest-clad mountains which Abel Janszoon Tasman spied on an afternoon in November, 1642. But it was 200 years before men found it, breaking their way through the scrub tangle of Western Tasmania. Today those same mountains stand stark, bared of their forest landscape—naked, rugged hills, majestic and beautiful in their barrenness, but weird and awe-inspiring as a landscape of the moon. Heedless greed for minerals has turned many square miles around the Mt. Lyell mine into a region of the dead.

" Men killed the trees, the grass—everything. First, they cut trees without reckoning to smelt the ore—for copper was the paying proposition, they found, not the gold. Sulphur fumes from furnaces withered what trees remained.

" Bush fires swept through the dead limbs and leaves, and the soil lay bare and black. Heavy west coast rain licked the soil away so that only the gravel and the rock remain—red and ochre and mauve. . . . . "

This report in a newspaper is an example of many in our brief Australian history which includes a long record of forest destruction, the full import of which has never been fully appreciated by the people.

One outstanding factor in forest destruction in a climate such as ours is fire, and fire is the greatest single obstacle to the practice of successful forestry in Western Australia today. Apart from its direct influence in aiding land clearing, its direct killing of trees, its direct burning of tree trunks to destroy or reduce their timber value, fire has an indirect influence upon forests. A healthy forest community enjoys the beneficial effect of an unbroken canopy of variable distance above the ground intercepting the sun's rays and precipitation, and checking wind velocity and the loss of heat by radiation.

The Toll of Fires.

In addition, organic matter such as leaves and other forest litter, is supplied annually to the soil by the trees and the smaller vegetation, thereby protecting the soil and greatly influencing its relation to water and air and increasing its fertility. The forest vegetation, therefore, reacts on its environment in a direct and positive way and forms part of the various climatic, edaphic, physiographic and biotic factors which make up the environment in which the trees grow and develop. The various factors supplement each other within certain, although ill-defined, limits and the whole vegetation of the forest is the result of their combined action. Alteration of a single factor may create a most significant condition so far as a given type of tree community or forest is concerned.

In accounting for the unsatisfactory condition of the crowns of the trees in our repeatedly burnt jarrah and karri forests, the direct effects of fire are obvious in the gaunt framework of limbs with few leaves, or worse in the fire-killed trees destroyed outright. The indirect effects on the environment are not so apparent.

Apathy.

The human is a very apathetic and shortsighted animal, and has a remarkable tendency to seek something different, something new. Australians as a whole are not interested in, for example, white ants or bushfires. Our forefathers had them, we have grown up with them. They are part of our life, our very way of living.

Similarly with the destruction of forests. We have been brought up in a struggle to carve a home out of the heart of the forest. A quarter of a century ago C. E. Lane-Poole, the then Conservator, once viewing some karri regrowth at Denmark, remarked " what a glorious sight !" The land owner replied : "I call it an awful sight !" Today we have reports of the cheaper clearing of heavy karri regrowth because of the introduction of bulldozers. An Australian forester literally shivers on reading this, for other countries would metaphorically " give their ears " for that regrowth. It is certainly all in the point of view.

All in the Point of View.

We are all humans seeking something different in the search of what we call development, and a prophet hath no honour in his own country. In Australia it is a seeking for, perhaps, milk or butter or potatoes, or whichever the particular district yields, to send overseas. In order to achieve this, much of our forest wealth has had to be destroyed in the clearing of the land.

I wonder how often Australians stop to think that we already import 50 per cent. of our wood cellulose consumption.

The construction of a great dam destined to become part of an important irrigation project captures the imagination, and much thought is given by all to the value of water and engineering projects in our young country. Seldom is a thought given to Nature's engineering feat—the building of the forest which provides the water for the dam.

Australians have always had forests, and hence there is less in these complex organisations of Nature to excite our interest than in a comparatively puny man-made wall. A forest is nothing new.

Anomaly.

Once in a great hall in a country town on the occasion of the discussion of a developmental project for the district, I thought it symbolic of Australia's indifference to the source of her timber supplies, that the immense beams overhead were of imported oregon, yet all the talk centred on the production of exports.

It is not surprising that some nations blessed with abundant forests have developed high standards of living. Such nations have based their living upon a perpetually renewable material and can live well even after the last drop of oil has been pumped, the last ton of steel fabricated, and the last ton of coal mined. This fact arises from increasing industrialisation based on wood. Here are the world productions of some important materials given in millions of tons :—

Wood	1,200,000
Coal	1,300,000
Petroleum	275
Steel	135
Milk	200
Potatoes	250
Wheat	150
Corn	120
Sugar	27
Meat	30
Cotton	8
Wool	2

In gross tonnage only coal is produced in greater volume than wood. If all the foodstuffs in the above table be added together, they amount to 777 million tons.

The Fuel Problem

The largest use of wood, fuel, is the most wasteful and among the most important. Over vast regions, where coal is either unavailable or costly, wood constitutes the only fuel and makes life possible. Even in regions of wood scarcity the population depends upon wood or charcoal for winter warmth and the preparation of food. Indeed, there are many examples of complete denudation of forested lands in Africa and Asia through generations of harvesting for fuel alone.

The use of sawdust as a fuel is an interesting development to most Australians in a land where it is mostly burnt at the mills.

Sawdust had its day in British Columbia during the late 1920's and the 1930's. It was highly satisfactory in the type of burners that were developed. Prior to the introduction of these, sawdust was a waste product. A certain amount went into making steam at the various mills, but the greater proportion of it was disposed of merely to get rid of a nuisance around the plant.

The principal drawbacks to sawdust as a fuel are its bulk, calling for large storage space, and its tendency to heat and rot in the bin.

Sawdust Burning.

The burner is extremely simple. A cast iron or curved brick lining directs the sawdust from the storage hopper into the fire box. The sawdust burns in the fire box, being readily started with paper, and feeds by gravity down into the fire box as the pile in the box burns away.

The early users of sawdust were able to supply all their requirements for the cost of hauling it away. Soon a change was made to a very modest charge per unit of 200 cu. ft. though it still remained the cheapest fuel that could be bought. This, coupled with very satisfactory performance, resulted in a very rapid expansion in its use. As the use and demand increased, the price followed suit, until today the cost of sawdust as a fuel is about on a par with wood, coal or oil.

The use of sawdust as a fuel, however, declined because the demand far exceeded the visible supply. The mills even introduced sawdust-making machines to turn slabs, edgings and trimmings into a finely divided hog fuel, which was a very fair substitute

for the sawdust itself. During the war years, when everything, including fuel, was in short supply, the great many users found it absolutely impossible to secure supplies of sawdust and large numbers of sawdust burners were discarded.

Man, the great destroyer of forests, is coming by hard experience to value them for much more than their solid produce. The "hewer of wood and drawer of water" (of former times, replaced by the axeman and bulldozer operator of today) has in most places overhewn his wood and then found that he has overdrawn—or at least dissipated his water as well.

Timber and the Future

A shortage of timber is one of the vital problems confronting the British Commonwealth of Nations today. The exigencies of the moment have brought home to the people of Australia more clearly than ever before the need for greatly increased effort to improve our timber position. Current requirements for timber are not being met and the supplies forthcoming in Australia are being maintained only with considerable difficulty from our forests.

Is is true, of course, that the present difficulty in our particular State of Western Australia is due more to shortages of manpower and materials than to an immediate scarcity of standing timber. This should lead no-one, however, to the comforting conclusion that all is well with the forests. It is always wise, particularly in time of crisis to face the facts. If we do we shall find the last of our virgin forests will be cut out in about 25 to 30 years and that the State must then expect a reduction in cut and a cessation of export even with our present small population.

Dismal Situation.

As far as Australia as a whole is concerned, the situation is particularly dismal. On a continent which so many people have wrongly supposed to have a vast extent of forests we shall, in a few decades, have to depend entirely on the crop which the present care of the forester will provide for us, together with some growth, of course, which followed early cutting fortuitously and escaped destruction by subsequent bush fires.

We shall find, in short, that we are far from making adequate provision to meet our timber requirements, with the discouraging prospect, that, under the strain of a period which is clamouring for wood in unprecedented quantities in Australia, the situation will get steadily worse instead of better.

One of the worst and commonest errors made by many people is to suppose that the forest resources of Western Australia are endless. In many quarters in Western Australia there is a disposition to view our timber position apathetically because there has always seemed to our few people to be a large area of unused, unwanted, forest. It should be known that timber is a crop, but all too often there is a tendency to regard it as a mine.

Migration Effect.

Already Western Australia is thinking of a 50 per cent. increase in population in the next decade. If a similar increase were to be made in the following decade, our normal surplus for export would have disappeared and our high quality, high value eucalypts, jarrah and karri would have been pressed into service for the common everyday uses of timber. This is not only a depressing prospect; it is an unthinkable one for a State which has the potential forest resources and world timber markets of Western Australia.

As has always been the case wherever natural resources abounded, the people of our South-West have become so accustomed to seeing abundant supplies of timber, and thinking of them in terms of inexhaustability, that there is little active support for a vigorous forest policy. In some instances pressure groups still clamour for the diversion to agriculture of parts of our all-too-small forest estate.

Confusion of thought in the minds of Australians has led to the application of the term Land Settlement to a process of forest destruction followed by grass growing chiefly for butterfat production. Forestry, with its ancillary industries, which use the product of the forest, is overlooked notwithstanding the fact that the forestry industry supports a greater population per unit of area than most types of agriculture, and hence is a desirable form of Land Settlement.

Drift to Cities.

It is a similar confusion of thought which has caused one of Australia's leaders to say anent the drift to the cities that if not arrested this movement will within a decade force Australia to import primary products. Timber, which Australia already has to import to fill her wants, is one of the most important primary products among human needs. Yet still the process of forest destruction goes on in Australia to induce a yield of products less needed by her own people.

West Australians are having brought home to them very clearly today the fact that the end of our surplus timber has almost arrived. With the expected growth in population in the next three decades the seriousness of the position must be apparent to all.

Apart altogether from the perennial and often quite unjustifiable argument that this or that forest land is better suited to agriculture, a more important question of immediate concern to us all is our failure to meet our timber demands from within our own country even with our present small population of some seven millions of people. It is, therefore, a matter of keen interest to Australians that adequate steps should be taken for a progressive increase in timber growth in our own land. In time of war it would be vital to our defence.

The question is essentially one for consideration in relation to overall Australian requirements. It is expected by all Australians that the expansion of our population in the next two decades will be of generous proportions. Even at this stage a belated recognition of our shortcomings in the past will stimulate efforts towards greater care and attention in the future.

Everyone should know that forests are one of our most basic resources and that the future demands for wood as well as for other forest products and services will require the maximum productivity of which they are capable.

Timber Indispensable.

One of the constructive results of the present acute timber shortage in Australia should be to emphasise that timber is a crop which is indispensable to the nation. Every effort must, therefore, be made to see that our forests are fully conserved and protected and that their productivity is raised to the highest possible level. The more this is done today the less will be the need for further sacrifices and for more drastic action later.

Finally, the growing of timber is only one purpose of forests. Other uses of forests are many and varied. Afforestation is claimed to be a cheaper and more effective anti malarial measure than simple drainage under the conditions prevailing in Uganda. The aim of afforestation is to dry up the swamps more or less completely, leaving a minimum number of holes and ditches for permanent needs. This rather less spectacular work was carried into effect most successfully close behind the shore line of the Atlantic Ocean in the well-known Landes of southern France now long famous as the scene of the arresting of the movement of sand dunes on a truly national scale. Three million acres of pine forests, the support of so many industries, now cover this one-time fever-stricken province.

Undeniably wood has been the most important commercial product of forests but clearly, forests have a multiple use, the use of forest lands and products for a variety of purposes : wood, water through water catchment protection, honey, grazing, flora and fauna, fish, recreation and scenery are all provided by our forests although their main purpose is indeed the growing of crops of timber.