SD
177
B4

UC-NRLF

B 3 842 754

Canadian Pulp & Paper Association

Bulletin Number Thirty-four

Issued October 15th, 1921

FORESTRY CONDITIONS IN SWEDEN, FINLAND, NORWAY, GREAT BRITAIN AND FRANCE

by E. Beck

THE articles herein reprinted were written by Edward Beck, who, as a representative of the Canadian Pulp and Paper Association, spent the summer of 1921 in Sweden, Norway, Finland, Great Britain and France, investigating forest conditions. His particular quest had relation more to the administration of the forests—the part played by the State and by the private owners in the maintenance and renewal of the forest resources—than to the more abstruse subject of practical silviculture.

As will be noted, in all the countries visited the State is found to take the larger share of the responsibility for the future of the forests, both in the regulation of cutting and in providing the means for sowing and replanting cut-over lands as well as for regenerating in reclaimed lands and other waste places. This applies to an almost equal extent whether the forests are owned outright by the State or are in the hands of communities or in those of corporations or individuals. The State, in return for the revenues derived therefrom, and in acknowledgment of the economic factors involved, undertakes the responsibility of ensuring perpetuation of the forests. Particularly is this the case in Sweden, where the Forest Service puts back into the forests at least 50 per cent. of the revenue derived therefrom. In Norway and Finland, the governments expend on these projects large sums of money. In France reforestation is being carried on at considerable public expense in order to overcome the ravages of war. In Great Britain, for the first time in centuries, the State has set seriously to work to cultivate new forests and parliament has voted three and a half millions sterling to assist in carrying on the work. It is significant that the Forest Commission

having the responsibility for the expenditure of this appropriation and composed of such men as Lord Lovat, Mr. F. D. Acland, M.P., and Mr. R. L. Robinson, has set aside a considerable proportion of this fund for the purpose of assisting the owners of private but unproductive lands to plant them with trees and is reimbursing such owners to the extent of two pounds per acre for land thus brought under sylvaculture.

One other significant fact in connection with forestry conditions in the countries visited, particularly in respect to Sweden, is found in the attention given by the State to the establishment and maintenance of institutions of instruction in forestry. These include both colleges for the training of the higher forest experts and schools for the development of forest rangers and other workers. As a result of the work of these institutions the foresters of Sweden, Norway and Finland may fairly claim to equal if not excel in efficiency and in scientific equipment those of any other country. The result of this is shown in their work, and proves that the investment is a profitable one for the countries undertaking it. There is less doubt and uncertainty as to a given course in forestry operations in these countries than in any other, with the possible exception of Germany, where forest culture, prior to the war, was admitted to have reached a very high plane.

The articles herewith reproduced were given a wide circulation through the Canadian press. They were printed by the Montreal GAZETTE, the Toronto GLOBE, Montreal LA PRESSE, the Winnipeg TRIBUNE, the Moncton TRANSCRIPT, the London FREE PRESS, the Hamilton SPECTATOR, the Quebec TELEGRAPH, the Saskatoon PHOENIX, the Border Cities STAR, the Ottawa JOURNAL, the Charlottetown GUARDIAN, the Vancouver WORLD, the Calgary HERALD, the Edmonton JOURNAL, the Victoria TIMES, the Saskatoon STAR, the Halifax LEADER, and other daily newspapers, as well as by the Canadian Pulp and Paper Magazine, the Journal of Commerce, Canadian Forestry Journal and a number of other periodicals. They have provoked some editorial discussion and, it is believed, have assisted in some degree in building up a public opinion in Canada in favour of a better and more enlightened treatment of Canadian forests, particularly upon the part of the various governments upon whom rests the responsibility for maintaining Canada's natural resources.

The acknowledgments of the Association are due to the above-mentioned publications for their co-operation in the effort, as well as to Mr. Carl O. deDardel, consul-general of Sweden for North America, to Mr. L. Aubert, consul-general of Norway for Canada, to the Swedish Cellulose Association of Stockholm, the Finska Cellulosaforeningen of Helsingfors, the De Norske Papirfabrikanter Forening of Kristiania, to Lord Lovat, head of the British Forestry Commission, and his associates, to l'Administration des Eaux et Forêts, Paris, and to numerous pulp and paper companies and others in the countries visited for courtesies received and assistance rendered. Particular acknowledgments are due to Baron Mannerheim, president of Kramfors Aktiebolag, Stockholm, Sweden, and his immediate associates, for their exceptional kindness and co-operation.

ARTICLE No. 1

PRELIMINARY SURVEY OF FOREST CONDITIONS IN SWEDEN

STOCKHOLM, SWEDEN, MAY 21.—The first impression obtained by a Canadian investigating forestry in Sweden is that the industry here has passed beyond the experimental stage. It is more or less an exact science. It is difficult to conceive of a body of Swedish foresters, for instance, sitting down to discuss seriously some of the, to them, elemental questions concerning methods of conservation and cutting such as still engage forestry minds in other lands. They have passed that stage here. Forestry is a scientific business. They have been at it for many years. Upon it largely rests the nation's material welfare.

The State and the private interests, furthermore, are not in conflict. There seems to be but little divergence of opinion as to general policies and certainly no hindrance to proper development by reluctance to provide the required funds, whether these are drawn from the public exchequer or from private sources.

A Swedish forestry expert, Herr C. A. Agardh, is on record as writing, in 1857, that "It may be said that the position of Sweden as an independent nation and as a civilized country is contingent upon the existence or non-existence of forests." And in 1921, Prof. Gunnar Anderson, with whom I have

talked in Stockholm, says, in an introduction to a work on the Natural Resources of Sweden, after considering Sweden's possessions in minerals, water powers and agricultural and other natural resources, that "the future of Sweden lies in her forests" and that "nature has presented Sweden with no source of wealth to be compared with what lies slumbering in the depths of the forests."

The purpose of this and succeeding articles will be to disclose the manner and the means obtaining in Sweden to utilize to the best advantage this great natural asset and to ensure its permanency as well as to contrast these means and methods with those employed in Canada, where the forest wealth is not less important if perhaps not at present so greatly appreciated.

Investigating forestry in Stockholm, Sweden's beautiful capital, is naturally confined to visits to Governmental bureaux, talks with departmental officials, an inspection of the very notable school of forestry and its adjacent research laboratory, than which there is probably none better equipped or better conducted. Actual visits to the forests are to follow.

The forest areas of Sweden cover some fifty-five million acres, of which about two-thirds are in private ownership and the rest government owned. The community of interest between the government and the private owners is readily apparent. It manifests itself in close co-operation by both interests for the protection and betterment of existing forests and of provision for their perpetuation. On the surface, at any rate, there is complete harmony. It is true that the State is trying to increase its holdings by the purchase of private forests wherever possible, but there is no general demand for confiscation, by purchase or otherwise.

All cutting, whether on private or public lands, is subject to the same strict regulations. Private owners willingly submit to whatever rules are imposed for the general good. The nature and extent of these rules and regulations will be dealt with later.

It is of interest to note that the public forests are not sold or leased to private interests as in Canada. When the Swedish government has pulpwood or other standing timber to dispose of its foresters go into the forests and mark each identical tree to be cut down with an individual number. These trees

may be scattered over a wide area and separated by considerable distances or they may be grouped together, as circumstances dictate. The right to cut the trees thus selected for cutting is then disposed of at public auction to the highest bidder. There is seldom any lack of competition, as most of the pulp and lumber companies are only too anxious to conserve their own resources by buying when they can buy to advantage.

An outstanding feature of the Swedish timber regulations is that immediate profit from the felled timber is never made the chief consideration. Everything is subordinated to the purpose of ensuring a permanent yield of wood. Selection of trees for cutting is made on the basis of improving the remaining forest. The "diameter limit" regulation, as observed by some of the Canadian provinces, under which all trees cut are required not to fall below a certain prescribed minimum trunk measurement, appears to have no place in Swedish forestry. Weak and immature trees are the first to be taken out in order to give the sturdier ones a better chance for development. If there is any hard and fast rule employed it would appear to be that no tree capable of increased development is allowed to be cut until it has reached its maximum growth unless for the purpose, as already stated, of giving a more promising tree a better chance. There is no such thing as indiscriminate cutting. All waste is eliminated. Trees are cut to within three or four inches of the ground. High stumps are unknown. Slash and other debris is seldom left on the floor of the forest to incite forest fires or serve as a breeding place for wood-destroying insect pests. Swedish lumbermen try to utilize every waste product from their lumbering operations. Top logs, even down to one or two inches in top diameter, are bundled and strapped with steel wire and floated to the nearest charcoal plant to be converted into charcoal. What waste cannot be utilized is destroyed.

Swedish forests, as a rule, are comprised of about 80 per cent. conifers and 20 per cent. broad-leaf species. Trees mature under the most favourable conditions in from 75 to 80 years. In some instances, however, they require two or three times as long. Reforestation, which is carried on on an ever-increasing scale, will be dealt with later.

An important feature in helping to bring about these desirable results is to be found in the fact that all logging in Swedish forests is supervised by the forester. In Canada, in most instances, the forestry and the logging departments are separate and independent institutions. They are frequently antagonistic. The former is usually concerned with scientific forestry and with making the most of the raw material; the latter's principal object is to make as many logs at as low cost as possible. In Sweden the forester is in full charge. He will not permit the sacrifice of the future forest even for a temporary benefit of cheap logs. It is a point well worth the consideration of Canadian lumbermen and limit-holders.

ARTICLE No. II.

CO-OPERATION BETWEEN THE STATE AND THE PRIVATE FOREST OWNERS IN SWEDEN

STOCKHOLM, SWEDEN, JUNE 5.—Co-operation between the State and the owners of the private forests accounts in a large measure for Sweden's pre-eminence in forest development. The State's liberality in providing the means, its wisdom in enacting reasonable laws for the preservation of the forests and to provide for their continuity, combined with the private owners' willing compliance therewith, constitute the second most important factor.

There is apparently no conflict between the State and the private owners in these matters. Swedish forests have been under legal control for more than seven centuries. There are few general laws applicable to the entire country. Different laws apply to different provinces or districts. Their enforcement and supervision are invested in local forest commissions, one for each province, which in turn is answerable to the State Forest Service, which has general supervision both of the forest laws and of the State-owned forests. The commissions usually comprise in their membership a representative of the State, one of the private owners and one of the immediate district concerned. Besides enforcing the law and arbitrating disputes, they maintain forest nurseries and distribute plants and seeds for purposes of reforestation. They encourage the planting of idle lands and promote local interest in tree culture. Their expenses are met by means of a small tax imposed on the stumpage values of the timber cut in their

respective districts. They are also subsidized by the national and the provincial governments and derive additional revenue from the sale of seeds and plants. They serve to obviate some of the objections which the owners of the private forests might otherwise offer to interference with their undeniable private property rights in their forest holdings.

In 1918 it was found necessary to pass a stringent general law forbidding the cutting of young growing forests unless and until it was shown that such cutting was essential to their improvement. Exception was made in the case of land destined for agricultural purposes, pastures, building sites, etc. In enforcing this law the commissions are empowered to fine disobedient owners, to confiscate wood illegally cut and to prohibit absolutely for stipulated periods any further cutting on the areas involved. In such cases the owners have the right of appeal to the courts. This law is the result of excessive cutting during the recent war period when the demand for lumber and its price were both abnormal.

Laws fixing a minimum diameter limit for cutting, such as prevail in Canada, have been applied from time to time in several of the provinces. They have usually proven unsatisfactory and are not regarded as having contributed to the general improvement of the forests.

Speaking generally, it may be said that the State's efforts are directed principally to securing a greater volume of reproduction. The private owners, while not neglecting this important feature, are said to give more of their attention to improved logging operations and to forest upkeep. No new laws are enacted for the control of the forests until there has been full and free deliberation between the governmental authorities and the private owners. New laws and regulations are usually the result of mutual agreement.

The Swedish public forests are managed by the Swedish Forest Service, operated as part of the national Department of Agriculture. The Service is governed by a director general and six assistant directors, with district foresters, assistant foresters, forest engineers, etc., for each of the several districts into which the public forests are divided. The Service is organized on semi-military lines. It has a distinctive uniform and a very pronounced esprit-de-corps. Its personnel includes young men of high social standing to whom the

remuneration paid, which is less than unskilled labourers receive in Canada, is probably a secondary consideration.

The Forest Service has complete control over the State forests and either supervises or manages the other publicly owned forests, such as those owned by various counties, villages, parishes and communities. Many of these, by the way, derive considerable income from the proceeds of their forest possessions. It has charge of the execution of the laws governing the management of all forests and of cutting and all other regulations. Its officers pay visits of inspection to private as well as public forests to see that the laws are being observed.

An official estimate made in 1908 placed the value of the State forests at that time at \$62,000,000; of other public forests at \$21,000,000 and of private forests at \$334,000,000, or a total of \$417,000,000. These values are said to have advanced from 25% to 35% in the meanwhile.

Taxes on private forests have risen considerably during and since the war and now amount, in some instances, to as much as 40% to 45% on the income derived from them. There is, however, no important tax imposed on standing timber, as it has been thought that such a tax besides being an inducement to unnecessary cutting might deter private capital from being employed in reforestation.

The State Forest Service derives its revenues from the sale of standing timber and in other ways. It shows an annual surplus. It expends about 50 per cent. of its income on forest improvements and upkeep. This is in marked contrast to what the Canadian provinces are doing for their Crown lands. Quebec, for example, which is more liberal in its forest appropriations than most, has forty-five millions of acres under license against Sweden's less than half that extent. Quebec derives an annual income of about \$4,500,000 from its Crown lands and appropriates for their upkeep, administration and improvement about \$400,000.

Education plays an important part in Swedish forestry. The government spares no expense in educating and training picked men for forest work in both its higher and its less important branches. A college of forestry has been in existence here since 1828. It is now located on beautiful grounds on the outskirts of Stockholm, in buildings especially erected and well adapted to its purpose. It gives instruction in both

theoretic and practical forestry, its course covering three years. The entrance requirements include nine months of practical training in the field as well as a certificate of graduation from a high school or college. It is said to be without an equal in Europe. Its courses are in such demand that would-be entrants have to go through a preliminary elimination trial, which only two-thirds of those entering survive. Its graduates are in great demand for both governmental and private service.

In connection with the college the government maintains a forest laboratory which devotes all of its efforts to research on questions bearing on forestry. It has two sections, one devoted to forest management and to investigations in regard to the growth of stands, and the other mainly to geological and botanical subjects. It is exceptionally well-equipped and ably staffed. A visit disclosed a number of important and interesting experiments in progress. The laboratory maintains experimental areas in all parts of the country and is doing a work that no private agency is competent to undertake.

The State also maintains a number of schools of a lesser grade, situated throughout the country, chiefly for the training of forest rangers. There are eleven of such schools in all. At each school there is an experimental forest area for the practical instruction of the students, who are also required to spend part of their school year in the forests doing actual forest work. The course usually comprises a full year of study and the object sought is practical insight into forest management and the supervision of forest operations. Charcoal burning, which is an important part of the industry, is also taught.

A visit of inspection was made to one of the best of these rangers' schools located near Bispargarden in middle Sweden, where it has been established since 1898. The school has a director and assistant director who live on the premises. It employs two rangers and other necessary staff. It graduates eighteen students every year. A primary education is sufficient for admission. The average age of the students is twenty-two years. There are many more applicants than can be accommodated. The students are lodged and boarded at the school free of charge, their only expenses being for books, etc. Each student is allowed 25 kroner a month (about \$6.25). The

studies are mostly of a practical character, and include forest accounting, ditching, loggers' camp construction and other co-related subjects. The school maintains a nursery as well as an experimental plot. It also operates an extensive plant for the extraction of seeds from tree cones. It buys the cones in large quantities from the private forests and other sources and markets the seeds all over the world and derives a large revenue therefrom.

The work that this school and its fellows are doing in training men for practical work in the forests cannot be over-estimated. In the opinion of the visitors it supplies one of the most important elements in Sweden's progressive forest policy.

Reforestation as practiced in Sweden and forest fire protection will be treated in future articles.

ARTICLE NO. III.

HOW SWEDISH FORESTS ARE PROTECTED FROM DEVASTATION BY FIRE

STOCKHOLM, SWEDEN, JUNE 15.—Devastating forest fires, common in Canada, are practically unknown in Sweden. There are no vast stretches of burnt-over lands such as offend the eyes of the traveller along the north shores of Lake Superior and that represent the complete waste of untold millions of potential wealth. It was not always so. There are evidences that most of Sweden's forest areas have been burned over at some time in their history, and most of what has not been burned has been logged. Few virgin forests remain. Those that do are highly prized and well cared for. A visit to one of the best of these, under the guidance of Mr. Holgren, chief of the Government Forest Service, and head of the Colonization Board, near Fagelsjo in the Norrlands district, disclosed a fine stand of spruce and pine about three hundred years old, which was said to be one of the oldest and best in the country.

Swedish forests are, however, not entirely immune to fire, but fire hazards and losses have been reduced to a minimum. A Swedish forest authority estimates that the wood lost by fire does not exceed one-half of one per cent. of the standing timber in any one year. In money value this has been calculated at \$250,000 a year for the whole of Sweden, and in

acreage at an average of from ten to twelve thousand acres in the public forests and at probably from thirty to forty thousand acres in those owned privately.

Most of the forest fires which occur in Sweden are attributed to sparks from locomotives, although, considering the way in which the railways abut on the forests, fires from this cause are surprisingly few in number. "Dry lightning", common in Western Canada and frequently a cause of forest fires, is unknown here. Climatic conditions also contribute to keeping down the number of fires. Promiscuous invasion of the woods by hunting, fishing and camping parties is discouraged and danger from the carelessly dropped match and the abandoned camp fire is thus eliminated. The laws for the protection of the forests against fires are very stringent and strictly enforced. There are no "Warning" signs tacked to the trees. They are said to be unnecessary. The people have long since been educated to a realization of the economic value of the forests to the life of Sweden. Every man, woman and child is a natural forest protector.

Many of the forests, especially those in Central and Southern Sweden, are traversed by good roads. In the State forests the roads are built and maintained by the State. In the private forests the owners are compelled to build and maintain these public roads which means to them a considerable expense. Small villages, usually consisting of a few families who divide their interest between cultivating small farms and working in the forests, are located at frequent intervals. The State and some of the private companies are promoting colonization and inducing settlers to take up plots of land in the forests by providing them with houses, land, a small amount of capital and equipment on very generous terms, and allowing them to apply their labour in the forests to their indebtedness.

These agencies all combine to reduce the fire hazards. Incipient fires are quickly discovered. Help is nearly always readily at hand. The law requires that every citizen between 16 and 60 must respond to a call to fight a forest fire. The Swedish military is also subject to similar service when it is required of them. A district forest overseer has authority, when necessary, to call for a detachment of 600 soldiers from

the nearest military station to fight forest fires as well as to guarantee payment, in the government's name, to all civilians who respond to his call.

Swedish forest experts who have visited Canada marvel at the tremendous losses sustained by Canadian forests through the agency of preventable fires. They incline to the opinion that adequate fire protective measures are more necessary in Canada than restrictions on cutting. They are willing to admit that many differences exist between the physical conditions in the two countries, but they insist that Canada's forest fire losses could be greatly reduced by systematic effort and good laws properly enforced such as have been applied with such good effect in Sweden.

ARTICLE No. IV.

ARTIFICIAL AND NATURAL REFORESTATION AS PRACTICED IN SWEDEN, AND RESULTS ACHIEVED

STOCKHOLM, SWEDEN, JUNE 10.—“Yes, Sweden will have some worth-while forests in fifty or one hundred years,” admitted Baron Mannerheim, head of the Kramfors Company in Stockholm, one of the largest lumber and pulp concerns in Sweden and among the largest owners of private forests, in reply to a complimentary remark on the condition of Sweden's forests. The Baron knows Canada. He made an extended visit there a year or so ago. He saw much to admire in the industrial development of the Dominion. He thinks, however, that we are not very far advanced in the administration of our forests. “You ought to make indiscriminate cutting impossible,” he said. “You ought to pass laws against it. In the long run, the companies over there would find it to their financial advantage as well as to the country's general good.”

The Baron is himself an ardent believer in artificial reforestation and has done much for its promotion in Sweden. His company's forestry department under his inspiration is probably the most progressive of any in the country, and is much farther advanced than any other. The personnel of his foresters is exceptionally high.

I don't know how old the Baron is. If called upon to guess I should say somewhere in the sixties. In all probability

he will not be living fifty years hence to see the fruits of his efforts to improve Sweden's forests; certainly not to see them as they will appear after the lapse of another century. Nevertheless, his modest admission is not only typical of his own disinterested regard for the forests, but is characteristic alike of the Swedish national attitude towards the subject of forestry in general. Everybody is looking forward to and working for the future. There is not the slightest danger of Sweden ever becoming a forest bankrupt; or that the Swedish forests will ever recklessly be exhausted for the sake of providing immediate profits, however great the temptation.

That is not to say, however, that Sweden does not now possess fine forests in abundance, or that these forests are not now being utilized to the limit of prudence and to the full extent of the demands made upon them by Sweden's constantly increasing export trade in lumber, pulp, paper and other forest products, as well as to supply the domestic requirements of these commodities.

After a thorough and painstaking inspection of several government forests and four extensive private forests, including those owned by the Mo Domsjo Company, the largest private forests in Sweden, the Holmens Bruks Company, the Kramfors Company, the Fiskeby Paper Company, as well as of forests owned by communities and by farmers, one is most impressed with the fact that in Sweden the forests are farmed. They are cultivated with all the care and assiduity that is given to the cultivation of the wheat lands in the Canadian Northwest or to the cotton plantations in the Southern States. The result obtained is a permanent, constant and ascertainable current yield and an assurance that, barring accidents, this yield will continue indefinitely and in increased volume for all time to come.

Not all Swedish foresters agree as to the superiority of any given method of reforestation but none allows his forests to go uncultivated. Planting and seeding follow cutting almost invariably. Experiments are in progress to ascertain how to obtain a maximum yield in the shortest period of time. Drainage is resorted to to improve the soil. In the Mo Domsjo forests more than 6,000 miles of ditches have been constructed to this end, at large cost but with highly gratifying results. Most of the companies maintain private nurseries in which

to develop plants. Some of them are putting out two million and upwards of seedlings every year. Hardly any land is permitted to go uncultivated for more than three years after being cut over; the interval being allowed merely to permit the soil to recuperate itself and to get in readiness for a new growth. Seeding is carried on by means of horse-drawn mechanical seeders of plow-like appearance. Pine and spruce are usually sown in conjunction, an equal quantity of each species of seed being dropped into the ground together. Boys and girls and young women, as well as men, are employed in the planting and seeding operations, the object being to reduce the labour cost to the minimum.

Re-planting is admittedly a costly operation, especially when the interest on the capital investment is taken into account. But here they do not consider the question of compound interest on the capital which is the bugbear of reforestation in Canada. Each year's operations are looked upon from a bookkeeping point of view as a unit. Cost is calculated on that basis. Swedish forest experts are not all convinced, however, of the efficacy or the economic value of artificial replanting, although evidences of its practical results are by no means wanting. Southern Sweden possesses some fine examples of cultivated forests which are from fifty to sixty years old. They are now ready for their first thinning and will yield a very satisfactory harvest. In some of them the trees are planted at regular intervals of six feet in either direction. They are mostly pine and spruce. They are fine upstanding trees and present a uniform appearance of almost military precision. There are a few cultivated forests older than those described but systematic efforts at replanting seem to have had their beginning much less than fifty years ago.

In Northern Sweden apparently no efforts were made to propagate forests in any large way up to fifteen years ago. Since that time planting and seeding have become very general. Everywhere one finds plantations of from five to fifteen years of age giving signs of healthy and vigorous growth and promising extensive crops of mature trees in due time. In many of these plantations foresters tell us their plantings yield 95 per cent. of healthy trees.

As in Canada, so in Sweden, there are two schools of foresters. One believes in leaving to Nature most of the work

of replanting the forests and of rendering only such assistance as may seem actually to be necessary. The other believes that the best results are to be obtained in every case by artificial cultivation. With the former, financial considerations frequently prevail. What's the use of spending money to do something which Nature will do alone and do much better if it is left to her to do, they say. They also assert that artificial propagation impairs the stamina of the trees and involves risks of early losses which are avoided when Nature does the work.

Mr. Carl Eric Barth, chief forester for the Fiskby Paper Company, is one of those who believe in giving Nature every chance to replant the forests. In his woods near Finspong he shows some interesting results obtained from strip-cutting, as it is called. This involves the clean cutting of a strip in the midst of the forest about 1,000 feet wide and two or three times as deep. Seeds from the surrounding trees are scattered by the wind over the clean-cut area and in time take root and develop into trees. Plots so cut in the Finspong woods show a proficient growth after three years. On some plots cut over about seven years ago there is a fine growth of young trees which give promise of developing into excellent stands of pine and spruce. Mr. Barth is very enthusiastic for this method of cutting and has prepared an elaborate report, showing its results for presentation to the Swedish Forestry Association which, in conjunction with a number of Norwegian foresters, is to visit his woods this summer.

Forest-master Isaac Ljungquist of the Holmens Bruks Company is also strong for the natural method of reforestation and has many spots in his woods to prove what can be done in this way. He is opposed to spending money on nurseries and on planting and seeding unless it can be shown that such expenditures are vitally necessary. He admits that there are circumstances which can only be met by artificial means and he does not neglect to seed or plant his land when natural means are not available.

But the success of Sweden's forests, it is very evident, depends less upon the methods employed for securing a new growth of trees than it does upon the scientific means employed in harvesting the current crop. In America, and to some extent in Canada, forests are cut down on the principle

of securing the greatest yield of wood for the smallest outlay of money. In Sweden, both in theory and practice, the main object sought in cutting seems to be to obtain the maximum yield of wood compatible with the least injury to the standing forests. There is all the difference between scientific and unscientific forestry in the two principles. The first consideration given to logging in Sweden is how to cut in such a manner as to insure an increased growth to the remaining forest. With the exception of the "strip-cutting" method, above referred to, and which is by no means universally employed, there is little or no clean-cutting. Trees are taken out by selection, either because they have reached their maximum growth and consequent yield or to ensure a better opportunity to those left standing by increased space, ventilation and sunshine. Birch is usually employed to afford protection to the growing pine and spruce. Attention is given to crop rotation. The soil is studied as to its fitness for the species to be grown on it. Drainage is resorted to wherever necessary. Where clean-cutting is indulged in it is made in selected spots and these spots are replanted or seeded with the least possible delay.

In every direction the forests show the effect of the good care they receive. Barren spots are very scarce. There is very little underbrush to obstruct the view or make travel difficult through the forests. Most of the forests present an appearance approaching that of cultivated park areas. Large groups of trees, especially pines and spruces, grow uniformly in height and girth. There are few crooked, stunted or dwarfed growths, defective trees being the first to yield to the woodman's axe. After a thinning the minor branches are left on the ground to afford protection to the seedlings and contribute to the fertility of the soil, but debris-strewn forests are unknown.

To sum up, it may be said that while intensive forestry in Sweden may not have reached the degree of development attained in Germany or in France it is beyond criticism in its employment of those methods of cutting best designed to obtain the greatest possible yield of timber and at the same time to facilitate as much as possible the best natural reproduction, and that in accommodating the adaptability of the species employed to the varying conditions of the country, in efficient fire protection, in counteracting the influences of

forest insects and diseases and in its economical utilization of the forest yield in industrial operations, Sweden ranks second to no other country.

ARTICLE No. V.

FINNISH PROGRESSIVE FORESTRY, THOUGH OF RECENT DEVELOPMENT, SHOWS SOME GOOD RESULTS

HELSINGFORS, FINLAND, JUNE 23.—Finland, perhaps more than Sweden, is dependent upon her forest resources. As in Sweden, the people appreciate the importance of maintaining and increasing these resources, although this realization, as interpreted into practical usage and protective legislation, dates back less than a quarter of a century. Before that time, Finnish forests were largely allowed to take care of themselves.

During the last twenty-five years, progressive forestry laws, based upon those of Sweden, have been enacted and are now rigidly enforced. State and private owners of forests co-operate together in building up and maintaining the forests and in employing means for their perpetuation.

The practice of reforestation on a broad scale is carried on almost universally, except in the more northerly parts of the country, where there is still much wild land. Finnish forest methods, however, are generally based upon the theory that it is better to let nature do the work where possible and to use artificial means only where necessary, and most of the cutting is done with that end in view. Some fine examples of natural forests from 60 to 80 years old are to be seen.

Here, as in Sweden, the private owners put their forestry and logging operations under a single supervision and management. The chief forester directs how and what trees shall be cut, always with the object of impairing the growing forest as little as possible. Cutting operations are, when necessary, followed up with replanting. Most of the companies buy timber in addition to cutting their own. They maintain separate organizations to deal with bought timber but the same requirement as to replanting is made to apply.

The extent of the forest organizations built up and maintained by the companies may be illustrated by that of the Kymmene Aktiebolag, one of Finland's largest pulp and paper

companies, which owns over 600,000 acres of forest lands scattered over a wide area. This company employs a chief forester, nine district chiefs, one hundred foremen and the necessary labourers, all of whom devote their entire time to forest operations. The chief forester and the district chiefs are well paid and are each provided with a home which is also the forest headquarters for the district. All the chiefs are trained foresters and have been through the technical schools established for that purpose. This company has also accomplished what few state or private owners have succeeded in doing, having made a complete survey of their forests and learning to a certainty the amount of available timber, the annual growth and all other details. By means of this survey they have been enabled to map out their forest program for years in advance.

Finland's total area comprises approximately 144,250 square miles, of which about 17,000 square miles, or 11.75%, consist of inland waters. More than one-half of the land area is made up of forests. There are about 73,000 square miles which produce merchantable timber, of which about 58,000 square miles are classed as highly productive. About one-third of Finland's land area lies north of the Arctic circle and includes most of the less productive forests.

The State owns about 38 per cent. of all the land, including 20,000 square miles of productive forests. (There are private companies in Canada which control almost as great a forest area.) Private companies own a greater proportion of the best forests, their holdings approximating 38,000 square miles. The State sells the standing timber on its holdings by methods similar to Sweden's and makes adequate provision for its replacement. Private owners are restricted as to the uses of their forests and are not allowed to cut in any manner that is considered injurious to future development. When they cut the land clean, as they sometimes do, they are obliged to replant it.

Selective cutting is generally practiced, the trees being taken out with due regard to the effect produced on those left standing. Drainage is resorted to for the purpose of increasing production, and thinning is carried out in a scientific

manner at necessary intervals. Fire hazards have been reduced to a minimum and the fire losses, compared with those in Canada, are practically negligible.

Pine and spruce form the basis of most of the forests, with an admixture of birch and other hardwood species. No authentic survey of the timber resources of Finland is available, although there are several estimates which are held to be reliable. One, made by Col. Gosta Serlachius, president of the Finska Cellulosaförbundet, places the timber resources of the country at approximately 31,000,000,000 cubic feet (335,000,000 cords). Calculations made on the assumption of an annual growth of 1.5%, which has been shown to be below the actual, indicates a yearly timber yield for the entire country of 15,650,000 cords.

Finland's present timber requirements for all purposes, domestic and industrial, are drawn chiefly from a territory which includes rather less than three-fourths of the total forest area of the country. This territory, however, represents a considerably larger part of the actual timber resources. It is estimated that from 20% to 25% of the total standing timber of the country may be classed as merchantable material of sawlog dimensions.

In normal years Finland exports about 300,000,000 cubic feet of timber and sawn lumber. (There are approximately 375 sawmills in Finland, many of which, however, are of very limited capacity.) The wood pulp industry produces 220,000 tons of mechanical and 350,000 tons of chemical pulp a year, using up about 900,000 cords of wood in the process. The consumption of timber for domestic requirements, including industrial and railway fuel (all locomotives here burn wood) has been estimated at 5,000,000 cords a year, much of which is hardwood, principally birch.

These figures indicate on the surface that Finland is using every year an amount of wood equal to or exceeding the estimated annual growth, although in reality, especially when active reforestation is taken into account, the annual increment is considerably greater. It has been estimated that the forest resources of Finland are sufficient to insure a supply of pulpwood for requirements based upon the present rate of consumption for 145 years, without taking into account the new forests that are growing up in the meantime.

During recent years the Finnish government has increased its forest holdings by purchases from private owners, a policy adopted with a view to restoring the productivity of lands exhausted by reckless cutting in the past and of raising the general standard of economic forestry in the country. The most desirable areas of accessible timber lands in Finland are now well taken up and there is apparently little prospect for industrial companies to increase their holdings by purchasing additional lands from the State. During the unsettled conditions of the past few years there have been many transfers of land among private and corporate owners, with the result that several of the stronger industrial companies have greatly improved their position in this respect. To-day, however, the State is doing its utmost to prevent agricultural lands from being bought up by the companies for reversion to forests.

Forest practice and lumbering methods in general while showing marked improvement in the last fifteen years are still said to fall somewhat short of the high stage of development reached in Sweden. State supervision and control, as already noted, have been responsible for great improvement in forestry practice and the increasing value of timber has gradually forced a higher standard of efficiency in lumbering methods and the utilization of timber for industrial purposes. In some remote districts there is said to be still much waste of timber by reason of careless lumbering and from fires and other sources, but these are in a fair way of being eliminated.

Timber and water powers constitute Finland's chief national asset, and the lumber, pulp and paper industries are and must continue to be the foundation of the entire economic life of the country. The present population of Finland does not exceed 3,500,000. Although 55 per cent. of the people are classed as dependent on agriculture, the country as a whole is not self-sustaining as to food. Many peasant farmers engage in lumbering during the winter season and the sale of timber from small peasant holdings constitutes an important part of the annual cut of timber. The growth and present importance of the timber industry is of prime importance to the national welfare. The fact that the Government and the people as a whole fully realize this is shown by the manner in which the forests are now being maintained as well as by the steps that are being taken to ensure their future.

ARTICLE No. VI.

WHAT NORWAY IS DOING TO KEEP HER FORESTS IN A STATE OF CONSTANT PRODUCTIVITY

CHRISTIANIA, NORWAY, JULY 2, 1921.—Norway has been in the business of forest cultivation for more than sixty years. In 1907 the golden anniversary of the beginning of Norway's present efficient forestry system was officially celebrated. A volume containing a history of the development and progress of the forests was published. The lapse of sixty years, however, has, according to the leading Norwegian forest authorities, merely enabled them to make a fair start. Norwegian forests, they say, are still in their infancy; cultivation ought to have begun a century before it did. They are hoping to make up for lost time.

Norwegian forestry owes much of its later development to the work of the Norwegian Forestry Association founded by Mr. Axel Heiberg in 1898. Mr. Heiberg gave me a succinct statement of its activities.

The Association, he said, was founded for the purpose of restoring the forests along the whole Norwegian coast from Lindesnace (the Nace of Norway) to the North Cape. Its work, in the first instance, was educational and the enlistment of public and private financial support, which met with a generous response.

Restoration of the depleted forests had to be achieved by planting, and in carrying on the work the Association profited by the example of Denmark where afforestation had been successfully carried on by Dalgas. They were also helped out by the Norwegian Government experimental plantations established in 1860. Their efforts soon bore fruit, and in time surpassed in results those obtained in Denmark, owing, probably, to a soil better adapted to tree-growth.

The secondary efforts of the Association have been devoted to improving and preserving the forests already in existence, which has been accomplished by the practice of rational cutting and of drainage. The Association was confronted with the problem of preventing the sand-drifts on the Jaederen and this work promises complete success. Another task was to stop the progressive decline of the timber line on the Norwegian mountains, which has been done through the importa-

tion of firs and pines, principally from the Pacific Coast States and British Columbia, and which are found to be more hardy than the native trees.

In the beginning the Association had only one forester, or provincial forest guard, in Hedemarken. Now it has over fifty scattered all over the country.

The parent association is divided into sub-divisions representing every province, and embracing 15,000 individual members, and is constantly expanding. It distributes large sums for use in planting, sowing, ditching, experimentation, instruction, etc. It obtains its funds by private subscription and government subsidies. Its annual budget amounts to 500,000 kroner, one-half of which is provided by the government. Up to 1920 it had brought under cultivation some 100,000 acres; had planted 150,000,000 trees, sown 5,000 kilograms of seed, and constructed 6,000,000 meters of ditching.

"It might seem from these figures," Mr. Heiberg says, "that we have reached a state of perfection in respect to our forests. In reality we are merely at the beginning. We have, however, established the fact that it is possible to make new forests, to restore old and decrepit ones, and to develop a forest capable of giving a sustained yield as long as it receives reasonable treatment. We have demonstrated that the enormous stretches of heaths in Norway, which do not now produce anything, can be covered with trees, and we are prepared to expand all this work on a large and more profitable scale as fast as the means are provided. We are working for a plantation on such a scale as will help the credit of the country and promote extensive colonization. Last year I made an inspection tour of our West Coast districts where much of our work has been carried on. The hill-sides, once bare, are now covered with young trees, firs and pines, all in a healthy state of growth and development. There is great future wealth in store for us if we expand this work as we should."

There are in Norway, as in Sweden and Finland, both State and private forests. The latter largely predominate. Altogether, the forest lands comprise about 28,000 square miles, or about 23 per cent. of the country's total area which consists of about 124,450 square miles. Compared with Canada's forest area that of Norway appears almost insignificant, yet

Norway regards her forest possessions as of the utmost importance and spares neither money nor effort to keep them in a state of constant production. Her national vitality depends upon them.

Norway's natural resources are strictly limited in extent. The supply of timber ranks among the first and most important. It furnishes the main source of Norway's export trade and provides fuel, building material and other wood necessities for home consumption. One-sixth of Norway's labourers find their employment in the wood-refining industries; one-tenth in the paper industry. Norwegian railways derive more than 12 per cent. of their total traffic revenues from the pulp-wood, cellulose and paper industries; some of the railways depend almost exclusively upon the revenues so derived. Appreciation of these facts has not only led Norway to the adoption of a policy of strict conservation of her remaining forests, but also to employ all available means for the building up of a forest supply for the future. To-day the country is not forest self-sustaining and is obliged to import considerable quantities of wood from Finland. Formerly wood was also freely imported from Russia.

The productive timber lands of Norway consist of about 21,825 square miles, of which 11,500 are held by peasants and other small owners, 5,575 by incorporated companies, and 4,750 by the State, the latter including communal lands, parish and other endowments. The tendency at present is to discourage the further acquisition of forest lands by private owners. Incorporated companies are, in fact, debarred by law from increasing their holdings by purchasing lands from peasants and other individual holders. Wherever possible and practicable the State is resuming ownership of these lands and using them to build up new forests.

Private ownership in the past, before the State established control of the forests, was charged with wasteful methods and irresponsible care, resulting in depleted and sterile forest lands. These practices are what led to the present national forest policy. The private owners of to-day, however, need no restrictive laws to compel them to do their duty by their forests. They have long since learned their lesson. The forest lands owned by the incorporated companies in Norway are

the best kept of any, as well as the most prolific in their annual yield. The companies spend much more, proportionately, than does the State on their upkeep.

However, Norwegian forest laws do not leave it entirely to the owner to say what shall be done. The owner cannot do as he pleases with his woods. All cutting is done under government prescribed regulations. So-called clean-cutting, which is permitted in Sweden and Finland with certain restrictions, is seldom practiced in Norway. Selective cutting is the only approved method. All cutting is done with regard to its effect upon the standing forest, rather than for the immediate yield. Norwegian foresters are unusually successful in maintaining their forests by natural means. In many parts of the country artificial reforestation is seldom necessary, cutting being done in such a way that Nature replants the cut-over area in a remarkably short time, maintaining the forests in a state of constant development. In other parts the long interval between seed-bearing seasons makes artificial forest propagation essential and in these localities seeding and planting are carried on extensively.

The State and the private owners work well together and the results obtained are of the best. Violations of the regulations are very rare. The State is also generous in its support of the forest industry generally and does everything possible to encourage its development.

Coniferous timber areas are estimated to represent about 82 per cent. of Norway's total productive forests, Scotch pine and white spruce constituting the principal species. The State Forest Department, which administers the public forests and supervises the administration of those privately owned, is now engaged in completing a survey of the country's total timber resources which, when completed, is expected to lead to further restrictions. An unofficial estimate, covering thirteen million acres of productive forest lands, gives an average of 9.2 cords per acre, or approximately, 3,675,000 cords. The total annual consumption, exclusive of imports, has been calculated at about 1,320,000 cords for the wood-using industries and at about 4,765,000 cords if the wood used for fuel, for construction and other domestic purposes is taken into account. According to this calculation Norway is consuming annually from 25% to 30% more wood than its forests

are yielding. This is generally admitted by Norwegian foresters. They say, however, that the discrepancy will disappear in the development of new forest areas now under way. For the present, expansion of the saw-mill industry has stopped. A decline in the other classes of wood products during the next few years is generally anticipated.

As already indicated, more than half of the productive forest lands of Norway is represented by small holdings, principally peasant properties. The small proportion owned by the industrial companies represents land acquired many years ago. Most of the pulp and paper companies of Norway have to depend upon purchased timber for their raw material, a development which, according to some of the companies, places them at a distinct disadvantage in comparison with similar companies in Canada and other pulp and paper producing countries, and renders their profitable operation somewhat difficult.

Competition between Norwegian wood-buyers for the available supply of domestic pulp-wood is becoming increasingly keen. Most of the mills are located in the south-eastern part of the country on the Glommen, Drammen and Skien Rivers, which afford access through their water connections with the best timber areas of southern and central Norway. Contracts for wood supply are made to run for six months' periods and call for delivery of the wood at the river bank, roughly barked and cut to standard lengths. Timber is scaled and stamped by the purchasers' agents or through competitive timber-driving associations which handle all the timber floated on the principal rivers. Costs of handling wood from point of delivery to mills are pooled and distributed on the basis of quantity and distance. Both buyers and sellers are organized, but conditions do not favour the elimination of competition altogether.

Here, as in Sweden and Finland, much attention is given to the education of foresters, and the personnel of those in charge of the forests—the forest-masters and engineers—is very high. The State maintains a number of schools for the development of engineers and rangers, the courses including practical forest experience with theoretical instruction in the class-rooms. A university course in higher forestry is about to be established.

Twenty-two years ago Norway had no more than twenty-five trained foresters who had been through the high schools, and most of these came either from Germany or Sweden. At present the Norwegian high school of forestry has over 500 graduates to its credit. In addition, the State maintains nine subsidiary forestry schools, whose average attendance is about 500 pupils, farmers as well as intending foresters taking advantage of the courses to obtain a practical knowledge of tree culture.

"The attention given to the training of foresters," said a Norwegian forest authority, "has made possible a wonderful progress in the expert handling of our forests."

The same care to eliminate as far as possible fire risks exists here as throughout the Scandinavian forests generally. Well-built roads permeate all the principal forests and little settlements at short intervals of distance provide a permanent and ever-available fire-fighting force whenever required.

The attention given to the housing and care of the forest forces is worthy of note and explains in some measure the eagerness with which the young Norwegians adopt forestry as a profession whenever the opportunity to do so is afforded them.

ARTICLE No. VII.

EXTENSIVE FOREST PROGRAM ADOPTED BY THE BRITISH FORESTRY COMMISSION AND HOW IT IS BEING CARRIED OUT

LONDON, JULY 21—Among the possible causes contributing to the unprecedented period of drought through which the British Isles are passing is included that of the destruction of the forests which resulted from the war.

"May it not be," asks a writer in the DAILY MAIL, "that we owe the drought from which we are suffering to the fact that most of our trees worth calling trees have been felled. It seems to be an established fact that local afforestation increases the rainfall of the district, and the denudation of the soil, owing to the destruction of forests, in India is a fact equally well-established. Trees evaporate more water than even seas and lakes."

Be that as it may, after centuries of alternate care and neglect—ranging from severe enactments by the Normans intended to preserve the forests as hunting places for royalty, down to the eighteenth century forestry boom, caused by the demand for timber for ship-building, and its subsequent deflation when wooden ships became obsolete—Great Britain was never so deeply concerned nor so active as just now in forest promotion. The government is endeavouring by every possible means to restore the United Kingdom as nearly as possible to a self-supporting forestry basis. That this will take many years to accomplish if, indeed, it can be brought about at all, is apparently no deterrent. Britons are accustomed to a long look ahead. And in any event an active start has already been made to bring about the desired result.

The Forestry Commission of Great Britain, of which Lord Lovat is the head, and which was brought into being by an Act of Parliament passed in 1919, as a direct result of the enormous inroads made into Britain's standing timber during the war, has made much headway during its brief existence and now has an extensive forestry program well organized.

A preliminary grant of 3,500,000 pounds sterling was voted by Parliament for the purposes of the Commission. This sum is intended to cover a ten year period. The program to which it is to be applied includes the afforestation of 150,000 acres of new land by direct action of the State; assistance to local authorities and private owners for the afforestation or re-afforestation of 110,000 additional acres; the purchase and reconstruction of hardwood areas; the education of forest officers, landowners and land agents, working foresters, and foremen; research and experiment, and the encouragement of forest industries.

The Commission has added to this program the work of obtaining a survey of the entire woodlands resources of Great Britain in which they have enlisted the assistance of private organizations and individuals and which is to be completed within three years. This survey which is estimated to cost 80,000 pounds sterling, is expected to give essential facts and figures with a sufficient degree of accuracy as to enable Parliament to come to a decision as to the country's permanent forest policy, when, it is anticipated, a still more generous financial arrangement will be made for carrying on the work.

The Commissioners favour the continuance of the plan already adopted by Parliament in creating a "block" ten-year period for the purpose of financing the State forests. They are of the opinion, however, that the difficulties already encountered and inherent to beginning work on a ten-year block grant, due to the slender basis on which to estimate and the unforeseeable changes in prices and values, as well as the uncertainty as to the government's policy at the end of the period, make some change of the arrangement desirable.

"Forestry," they assert with truth, "is obviously not a subject which can be taken up or dropped at will without serious loss of efficiency."

They suggest that, while adhering to the ten-year block grant system, Parliament should also systematically review progress at the middle of each recurring period and simultaneously make provision for a further ten-year program, which in turn would be reviewed and extended after an interval of five years.

The suggestion will appeal to all practical foresters wherever a State forestry policy is under consideration. Much of the lack of success of forestry policies and many of the difficulties encountered are traceable to haphazard or short-period legislation and to the failure at the outset to devise a permanent policy that will ensure continuity of effort and give to the practical foresters sufficient scope to make their works effective.

Pending the adoption of some such permanent policy by Parliament the British Forestry Commission is acquiring land by lease and purchase as fast as suitable areas are obtainable and bringing it under forest cultivation, as well as carrying on other sections of their program. The lands thus acquired are forest areas which were partly or wholly denuded to supply Britain with wood during the war, or grazing and other non-agricultural lands more suited for tree-growing than for other purposes.

Prior to the war the United Kingdom possessed about 3,000,000 acres of woodlands which yielded every year some 45,000,000 cubic feet of timber. It imported wood and wood products, including woodpulp, to an amount equivalent to 550,000,000 cubic feet of standing timber. These imports, an enquiry disclosed, increased fivefold between 1850 and 1910. Consumption rose during the same period from $3\frac{1}{2}$ to 11 cubic

feet per capita of population. The ratio of home to foreign timber had declined and in 1914 amounted to barely 10 per cent. of the supply. The value of imported timber had risen steadily for the thirty years prior to the war while the quality had as steadily deteriorated.

The average annual imports for the five years preceding the war 1909-1913, inclusive, amounted to 10,204,000 loads of wood and timber and 859,000 tons of woodpulp. In 1914, wood and timber imports declined by about 20 per cent. but the quality of woodpulp increased to 990,000 tons and did not decline below the pre-war level until 1916. Apart from this the reduction of imports which began in 1914 was continued at a slightly less rate in 1915, and at an increasing rate in 1916 and 1917, to reach bottom in 1918. In 1918 the total imports of wood and timber amounted to 2,479,000 loads or roughly 25 per cent. of the pre-war figure. It was in order to make up as much as possible of the heavy deficit in 1916-1918 that the home woods were exploited to the utmost. On the other hand the recovery in imports had been even more rapid than the decline. Wood and timber were imported to the amount of 6,866,000 loads in 1919 and 7,418,000 loads in 1920. Woodpulp imports exceeded the pre-war level in 1919 and increased in 1920 to 1,094,000 tons, which is the maximum yet recorded.

As regards prices, the reports show that there was a progressive rise in values as imports declined. The average price of all imports of unmanufactured timber during 1909-1913 was £2.77 per load, in 1916, £6.4 per load and in 1918, £11.8 per load. The price fell to £10.5 in 1919, to rise to £11.0.8 in 1920. The rise in the price of woodpulp was from £4.7 per ton in 1909-1913 to £10.7 per ton in 1916 and £30.4 in 1918. The total value of the wood imports in 1920, inclusive of wood manufactures, was £120,326,000 against £34,314,000 the average of the five years 1909-1913.

"That the state of things was unsatisfactory in time of peace was generally admitted," the commission declares in reviewing its first year's operations. "It required but one year of war to show how critical the position was in a time of national emergency.

"In 1913 the quantities of timber and grain imported were about equal and headed the list of imports. They absorbed between them a quarter of the total shipping which entered British ports from overseas. In 1916 the people were hungry, yet, despite the most strenuous efforts to set more ships free for importing grain, it was found impossible to reduce by even one per cent. the proportion of shipping required to carry the timber essential for operations of war abroad and at home. Napoleon's maxim that an army marches on its belly had to be brought up to date. The Great War showed that the belly can only move on wood and iron of which wood is required in far greater bulk. Not till arrangements had been made for supplying the requirements of the army from the French forests and the home demand by ruthless felling of the old and young woods in the United Kingdom could tonnage be released for further imports of food."

In 1915 a committee was appointed to expedite home fellings and it soon became evident that owing to the depletion of home resources a national forest policy based on considerations of public safety was inevitable after the war. It was this realization that induced the steps which subsequently led to the present efforts to restore permanent and adequate forests in Great Britain.

This policy, based on national insurance has, the Commission points out, as cogent arguments in its favour in time of peace as in time of war.

"The timber consumed in Great Britain and by the British Army in France between the years 1915-1920," says the Commission, "cost the country at least £190,000,000 more than a similar amount of wood would have cost at 1909-1913 prices. In the year 1920 the Nation imported approximately one-tenth less wood and pulp than in 1914 and paid over £80,000,000 more for their purchase.

"There is no reason to suppose," it is added, "that the average annual demands for timber for house construction, delayed repairs and industrial developments will be less in the next decade than they were during the five years immediately preceding the war. If this is the case, and the price of timber does not fall much below a figure midway between the 1913 and 1920 prices, we shall have to pay for the whole of the period of 1915-1920 anything between £400,000,000 and

£600,000,000 more for our timber than we should have had to pay for a similar amount at 1909-1913 prices.

"It is not argued that if the planting program now adopted had been completed before the war the price of timber would not have risen. It can, however, definitely be stated that had these additional woods been in existence they would have competed with Scandinavia and Finland and tended to keep prices of softwoods at a lower level."

Referring to the forest situation in Great Britain prior to 1919, the Commission sums up conditions as follows:

"Those accustomed to the highly developed State forests of the Continent, with their regular succession of age classes and their ordered routine based on centuries of experience will have difficulty in realizing the conditions under which State forestry made its start in this country. Apart from the Crown woods the State forests in Great Britain in 1919 consisted of a few hundred acres of plantation recently acquired in Ireland.

"As a result of the absence of State forests, there was no organized higher executive staff with British experience, no forest officer personnel, no body of foresters and foremen with State forest experience or customs, and, above all no forestry code. Surveys of plantable land were only beginning and little or no statistical information had been collected regarding privately owned woodlands. British forestry research was yet in its infancy. Admirable as had been the pioneer work it had seldom been directed to those particular points which were of importance to a forest authority initiating State Forestry 'ab avo'. It is true that experiments on a considerable scale had been undertaken by private individuals, but although in the mass they represented a body of information of real importance, the results had seldom been reduced to a form available for general application. In embarking on a policy of State forestry a start had therefore to be made, if not from the scratch, from a point very near it."

Taking these statements into account, it is interesting to discover through the first annual report of the Forest Commission just issued, that the Commission has made a more than satisfactory beginning. It is now in possession of 103,100 acres of land scattered throughout England, Ireland, Scotland and Wales of which 68,000 acres are classified as plantable. The area planted including that planted during the current season

of 1920-1921, covers 8,000 acres. Work is progressing by well-developed steps. The program contemplates an average annual expenditure of £400,000 to £420,000 a year; the acquisition of 260,000 acres of afforestation land by 1925 and the planting of 60,000 acres of the same; preparations for planting an additional 21,000 acres in 1926 and 24,000 acres in 1927. The Commission estimates that it will be obliged to purchase seed in 1926 sufficient to supply upwards of 70,000,000 seedlings for the planting season of 1929 as well as to acquire some 50,000 additional acres of land by that year.

The area planted in 1919-20 amounted to 1,595 acres (since increased, as stated, to over 8,000 acres) of which 1,474 acres were placed under coniferous plantation and 121 acres planted with broad leaved species. The number of plants used was 3,484,000. Scots and Corsican pine accounted for 35 per cent. of the plants while Norway and Sitka spruce provided 37 per cent. The Douglas fir, common to Western Canada, is highly esteemed here for its fast growing quality and general sturdiness and is being used on an increasingly large scale. European and Japanese larch, oak, ash, beech and other tree varieties are also cultivated.

Production statistics induce the Commission to believe that land capable of producing the faster-growing conifers under optimum conditions gives the best financial returns even where the cost of acquiring the site and establishing the crop is relatively high. First class Douglas fir land capable of growing up to 160 cubic feet per acre per annum will, the Commission states, given a market for pit-props, pay back the cost of planting in the course of the first 25 years. On the other hand, the poorer classes of Scots pine land, especially at high altitudes, however cheaply acquired and planted, only begin to pay back the original outlay after 40 to 50 years, and at the time of final felling make but a low return on the capital invested.

The returns from afforested ground vary widely, the Commission finds. In the examination of some 1,100 plots and sub-plots in different parts of Great Britain and Ireland, it has been shown that returns run from 160 cubic feet per acre per annum in the case of first class Douglas fir land down to 40 cubic feet or less per acre per annum for poor Scots pine land. In afforesting hill grazings, whether at present

used for deer, sheep or common grazing, it is found that the land varies from that suitable for the faster growing conifers on the lower slopes to land on the upper slopes which will produce 40 cubic feet per acre per annum. Taking a return of only 60 cubic feet per annum as an average return on the whole area and allowing 30 cubic feet of grown timber to the ton, it is figured that about two tons per acre per annum will result. Taking the gross value of timber at from six pence to ten pence per cubic foot, the gross annual return works out at something between £1.10s. and £2.10s. per acre.

The figure generally accepted by the Commission for employment in forest land is one man to every 100 acres during the planting stage, one man to every 50 acres in the productive stage, and one man to every 25 acres when forest industries have been established round the forests.

Where necessary the Commission provides housing for its foresters and forest labourers.

In respect to private and corporately owned woodlands, which the Commission under the Act is also bound to assist, the policy adopted and in effect is that of offering assistance to landowners and corporate bodies, during the initial ten-year period in reafforesting at least 50,000 acres of old woodland as well as in planting 60,000 acres of new lands, at an estimated cost to the Forestry Fund of £327,000, of which £137,000 is allotted to proceeds-sharing schemes between private individuals or corporate bodies and the State, and the remainder to the bestowal of grants and loans. The grants contemplate paying £2 per acre as an inducement to private owners to replant felled areas and to extend the area of their operations.

For educational work, the Commission contemplates an initial expenditure of £20,000 a year, it being expected that educational institutions participating in the grant will provide a similar amount on the pound for pound principle.

A personal visit paid to the Dean and Highmeadow forests and to the Tintern Woods, situated in Gloucestershire and Monmouthshire, and to other State forests, found them in the hands of competent forest engineers who are making splendid progress in their efforts to bring these woodlands back into the highest degree of efficiency and economic return.

One of the most noticeable things about British cutting methods is that cutting is done closer to the ground than is practiced even in the Scandinavian forests where stumps over five inches high are seldom found. In Britain the cutting is made almost level with the ground. The explanation is offered that wood-choppers are employed by the piece, their compensation being based on the cubic contents of the logs. There is, of course, practically no snow in these woods to obstruct close cutting.

Practically no pulpwood is at present derived from the British forests, nor is it probable that such wood can be grown to commercial advantage in competition with Canada, Newfoundland, Scandinavia and Finland. At present the State forests yield wood for building purposes, pit props, telegraph poles and various industrial uses, and in some instances return a profit on their operations despite the numerous difficulties under which they temporarily labour.

ARTICLE No. VIII.

WHAT FRANCE IS DOING TO RESTORE THE RAVAGES SUFFERED BY HER FORESTS DURING THE WAR

PARIS, JULY 28.—Not the least of the post-war reconstruction problems confronting France is that of the restoration of her productive forests. Before the war these forests comprised approximately 185,000,000 acres and although they did not constitute the country self-supporting in forest products they went very far in that direction. The bulk of these forests, about 177,000,000 acres, were in private hands, 3,000,000 acres were owned by the State and the balance by the communes.

The war wrought great havoc with the French forests. Those that did not succumb to the depredations of the enemy or were not destroyed through being in proximity to the fire zone, were heavily drawn upon for fire-wood, trench timber and other war necessities, so that at the Armistice the Water and Forest Board of France, which is the national body clothed with authority over the forests and internal waterways, found itself with a program literally "shot to pieces", a greatly reduced staff and a depleted budget with which to begin

building anew. That the Board, backed by the government, has taken up the problem with vigour and great energy is typical of the French spirit which remains undiminished in the face of the greatest difficulties. Nevertheless, the authorities all admit that, given the most favourable developments, it will take at least a century to bring France's forests back to the state of productiveness in which they were prior to the summer of 1914.

A survey made immediately after the Armistice showed that in the territory occupied by the enemy, the forests had been ruthlessly destroyed, irrespective alike of the German army's actual requirements, and of the effect upon France's economic future. The war zones spread over eleven forest-bearing departments, including Aisne, Ardennes, Marne, Meurthe, and Moselle, Meuse, Nord, Oise, Pas-de-Calais, Somme, Vosges, and Belfort Territory. In these parts 300,000 acres of State forests, 322,500 acres of parish forests and 922,000 acres of privately-owned forests were subjected to devastation. In over one-third of this territory the productive capacity of the forests was completely destroyed. Over half a million acres must be refitted and rewooded to make it of any use. Another area of 375,000 acres shows the effects of abusive, premeditatively destructive, or wasteful fellings in which reserve plantings have been almost obliterated. It is calculated that it will require from 60 to 100 years of intensive cultivation to bring these forests back to normal. Their loss involves to France an annual shortage of over 1,000,000 cubic meters of wood.

France looks to Germany to assist in meeting her timber necessities as well as to provide some of the funds needed for rebuilding her forests. The Peace Treaty stipulated that Germany should deliver to France all the timber necessary for reconstructing the devastated regions, and this work is now going on. It also obligated Germany to make further deliveries of timber on account of the indemnity due to France. These deliveries have been hampered by the lack of adequate transportation facilities, but, eventually, they are expected to reduce the scarcity of timber in France until such time as the forests can again become productive.

Meanwhile, the French people themselves are not losing time nor sparing any effort to hasten the coming of that

period. The Water and Forest Board has been entrusted with the supervision and direction of the work of reconstructing the forests, and for that purpose has set up a special Forest Reconstitution Service. In each department which suffered from invasion there has also been established, independent of the usual forest inspections, a special so-called "Forest Reconstitution Inspection", each with a special staff with definite duties all relating to the restoration of State, parish and privately-owned forests as well as to re-wooding.

The work in the State forests is done entirely at public expense. In the case of the parish and private forests the French parliament has set up a Fund, budgeted as "Forest Reconstruction Works", upon which the parish and private owners may draw for the means to re-establish their woods. These funds enable the Forest Board to effect restoration works, in agreement with the private owners, in the latter's forests, the outlay eventually to be recouped, it is expected, out of the indemnities received for war damages.

The work of reconstruction is well started, as a personal visit to some of the war-devastated areas disclosed. The first steps taken involve clearing the land of wire-entanglements, filling trenches, dug-outs, and mine craters, opening up roads and paths and making it possible as well as safe for the forest rangers to go about their task. Recutting of the underwood spoilt by shrapnel and shot or improperly worked by the friendly or enemy troops is another preliminary step. Reserves damaged by projectiles but which may still be utilizable are being cleared up and restored.

Incidentally, a considerable amount of timber used for defense works has been recovered and is being utilized for new buildings.

Nurseries have been established by the Forest Service nearby the places where new planting is going on. Many sources, including Canada, are being drawn upon for the necessary seed. Delivery of plants and seeds has also been claimed from Germany as compensation in kind. Restocking is being carried on in accordance with a plan carefully elaborated by the Forest Board with special reference to the mutual adaptability of the soil to the seeds and with regard to ensuring a maximum yield of timber in a minimum period.

It is in the great State forest ranges of St. Gobain and Coucy (Aisne) that the war has worked its greatest ravages and where reconstruction work can be carried on most effectually, although the Board, so far as possible, is initiating the new work simultaneously in every district affected.

Among the measures put into effect by the Forest Board to assist in meeting the situation are those of permitting a more liberal degree of cutting to supply immediate requirements which involves an abandonment of the policy of reserving certain stock of exceptional size for a future date; to increase the number of young and medium trees whose annual growth is important and to sacrifice the older barks of slow-growing possibilities; the utilization of all non-permanent resources; the reduction of railway transportation rates on timber in order to facilitate its movement; the greater utilization of the home-grown resinous species which in the past have been disregarded in favour of those of the Northern European countries on account of their assumed inferior quality; the working of France's colonial forests, especially those of French Western Africa, where, investigation has shown, there are vast forest resources suitable for French requirements but which have formerly been ignored in preference to imports from Scandinavia; bringing into accessibility the State forests in the Pyrenees which have hitherto not been economically exploited owing to lack of transportation facilities and other causes.

Another measure, and one which the Board regards as of importance, provides for State assistance in the management and development of Communal woods and forests by a system of money grants to the municipalities owning forests to enable them to construct roads and other works for forest betterment, such grants to be repayable out of the net proceeds of the timber sold.

Regarding the policy of private or State ownership of forests, French authorities believe there is ample opportunity for both systems but regard re-afforestation on an extensive scale as essentially work for the State, holding it to be more or less economically unsound for private capital to engage in the work.

"Development plantations, creating reserve stocks in foliaceous forests," the Forest Board reports, "means sparing continually trees when working the forest. Private owners, under the necessity of obtaining income, cannot as a rule afford to do this properly. Such work can only be successfully carried on by the State or other perennial owner, such as Departments, Municipalities, and public establishments. It is therefore advisable to encourage the transfer to such public ownership of woods and forests, the State acquiring preferably the poorest or most damaged whose reconstitution involves long periods of time, and leaving to the corporations and private owners those forests in a normal working condition.

There is a law in France, known as the "Audiffred Law," passed in 1913, which permits and provides for private forest owners, who so desire, to entrust the State Forest Department, with the entire management and administration of their forest property. Few owners, it is said, have taken advantage of the law, preferring to retain their own control, but in instances where it has been applied it is said to be working satisfactorily and the State is now engaged in propaganda intended to impress upon private owners the benefits involved in the system.

Speaking generally, the forest service of France has been in existence since 1827. The Forest Board is clothed with many powers, including the enforcement of all necessary laws and regulations. Its organization is very complete and comprises forest brigadiers, rangers, inspectors, keepers, etc., all of whom are specially qualified by practical training for their work. The Board maintains a National Forestry College at Nancy, where the higher officers receive their training, and a professional forest training school at Barres (Loiret), where the under-staff is educated. A research and experimental Station, equipped with a wood-testing laboratory, forms part of the college equipment at Nancy, and has branches in a number of districts.

French forestry lost heavily in personnel during the war, but is being rapidly rebuilt, the authorities recognizing that no department is more necessary to the present and future national welfare than that of tree culture.

UNIVERSITY OF CALIFORNIA LIBRARY
BERKELEY

Return to desk from which borrowed.
This book is DUE on the last date stamped below.

JAN 26 1948

190ct48MP

LD 21-100m-9,'47(A5702s16)476

Gaylamount
Pamphlet
Binder

Gaylord Bros., Inc.

Stockton, Calif.

T. M. Reg. U. S. Pat. Off.

U.C. BERKELEY LIBRARIES

C032638989

SD

177

B4

461658

THE UNIVERSITY OF CALIFORNIA LIBRARY