

PART II.

FUNDAMENTAL PRINCIPLES UNDERLYING A POLICY OF FOREST CONSERVATION FOR CANADA

CHAPTER I—PRELIMINARY CONSIDERATIONS

So much has been said and written on the subject of forest conservation in the past decade, and particularly during the past three or four years; so many general suggestions for better methods of conservation have been put forward; so many conferences have examined into and reported upon conditions,—that it is manifestly impossible for this Commission to deal with the subject without some repetition of data previously presented. We are strongly of the opinion, however, that it is only by constant reiteration of these fundamental truths, that the principles underlying proper forestry practice may be impressed upon the public mind with sufficient force to impel action on the part of the government of the day.

Too often, the term "forest conservation" is interpreted as something which might be considered as a fad,—something altogether too idealistic to command the attention and respect of the practical man in this western hemisphere. This condition arises from the fact that many persons, having been inspired with concern for the national welfare, but without a very practical knowledge of the subject with which they were endeavouring to treat, have made proposals which were entirely beyond the realm of practicability. If principles of conservation are to be applied in this country, they must be principles which have basis, not only in science, but, also in sound business economics. The Commission is firmly of the opinion that forest conservation is a sound business practicability in Canada, and in the ensuing remarks consistent effort will be made to demonstrate our position in this regard.

Until comparatively recent years it has been the boast of Canadians that our country was one of 'inexhaustible forest resources.' Even to-day, there are men prominent in business, professional and political life, who, lamentably ignorant of actual conditions, are prone to the utterance of expressions of satisfaction with and reliance in the extent of our forest supplies. There are still to be found districts where the presence of timber is considered by the local people to be a barrier to development,—a repetition, in newer localities, of the condition which applied at the time the pioneers settled the St. Lawrence valley and southern Ontario. Again, timber operators have, for several generations past, been striving, under the conditions of severe competition which obtain on this continent, to convert standing timber values into legal tender, while they, and the public generally, have lived in unjustified security in the mythical timber supplies presumed to lie beyond. Coincidentally, fire, insects and fungus diseases have been taking severe toll of our forest supplies. These several factors, and erroneous beliefs arising out of them, have contributed, more than anything else, to ignorance and misunderstanding on the part of the people generally. It is high time that these misconceptions were dispelled.

The time has most assuredly come, when, if Canada is to continue as a producer of wood commodities for the world markets, we must take cognizance of conditions as they actually exist in this country, and apply economic methods

in the conduct of our forest business. During the period of our development we have, to a great extent, dissipated, or permitted to be dissipated, through fire, insects, decay, and in a measure by wasteful methods of exploitation, a forest estate which, properly handled, would have placed, and which if now properly taken in hand, still may place Canada in the forefront as a supplier of timber and timber products, more particularly of the coniferous or softwood species.

The one factor in the forest which renders feasible the rehabilitation of our forest estate, is the power of regeneration and of continued growth. In past control of the forest property, these powers, or the full possibility of these powers, have in greater degree been neglected. To use an analogy, we have, in our unjustified conviction of inexhaustible supplies, left our forest capital in current account, failing almost entirely to take advantage of its capacity to earn interest; we have been and still are failing to properly husband and protect a resource in the same manner which any sound business man applies in the profitable use of his most valuable asset. In many instances we have treated the forest resource in the same manner that many of the early settlers in this country and in others have treated the land,—allowed it to become impoverished to such an extent that it cannot be expected to produce profitable and continuous crops unless steps are taken to re-establish the conditions which are essential thereto.

This neglect to treat the forest as a crop has been characteristic of forest administration on this continent, as it has during the pioneer periods in other parts of the world. Consideration of the forest as a crop is, however, a stage which must be attained by every country which hopes to maintain proper economic equilibrium between production and consumption of natural products of the soil. One may look to the more densely populated regions of Europe where the lessons of forest improvidence were learned sixty, eighty or even a hundred years ago, and where, by the application of rational forest practice, what would appear to us on this continent to be almost ideal conditions, obtain; or one may turn to India where, seventy years ago, a forest estate, well-nigh ruined by the traders, was taken in charge, and where, through the ensuing years, by the application of rational methods, a national estate of enormous proportions has been built up, with a current annual revenue of some three million pounds sterling, rapidly increasing.

While, as a result of its investigation, the Commission does not consider the present as a time for despair or for the application of panic methods, we do believe that it is essential to national progress that better methods of forest conservation should be applied in Canada. We do not believe that it is necessary to adopt theoretical measures or to consider the hoarding of timber supplies. We believe that the term "conservation", as it ought to be applied, means the liberal but careful use, for the benefit of the present generation, of mature timber as it may be required in domestic consumption and for foreign trade; consonant with that, however, is our belief that the protection and development of immature timber is a most essential element of conservation,—necessary not only to provide for future generations but essential even to the present one, in that it will directly build up a confidence in this country, as one of permanency in forest industries, to the end that further capital may be encouraged to seek investment here. Although there are other economic factors which at present retard the flow of capital to forest industries in Canada, there is most certainly no single factor, and probably no group of factors, which would more surely and more rapidly inspire confidence, and ensure an influx of foreign capital, than would the adoption of a progressive forest policy. When our systems of forest management become such that the forests are handled on the basis of sustained yield, and when adequate protection is given, then will additional capital seek permanent investment here.

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By the term "forestry" is meant the management of timber lands in such a manner as to provide successive and continuous crops of timber of the kind and size required by the uses to which it is to be put. The methods to be applied may vary greatly in their intensity and cost. The more scarce that timber may have become in any country, and consequently the more valuable, the more intensive and costly may be the methods applied in management and development of the forest. Conversely, in a country where supplies are more plentiful, and wood consequently cheaper, the more extensive and less costly must be the methods of regulating the forest. In all cases, however, the principle of cropping timber, crude though the method may be, is essential before it may be stated that the practice of forestry is being applied.

It is now thoroughly recognized in all civilized nations where forests constitute any considerable part of the national estate, that the formulation of an adequate forest policy is definitely a function of the State. Although in some countries private forestry practice has been the forerunner of a broader national policy, it has pre-eminently been the experience of nations that private forestry cannot serve the full requirements of national welfare.

In agriculture, the state may lay out a programme of educational work for the guidance and advice of citizens, and may depend for actual agricultural development on the efforts of private individuals; active participation by the state in agricultural practice may be more or less confined to experimental demonstration and research work. This limited activity in agriculture, by the State, is sufficient only by reason of the fact that the returns from agriculture come frequently, and, with most crops, are secured within the space of one year or season; the returns are large, and give the farmer, in addition to a considerable portion of his food supply, a very fair return for his labour, and on any capital he may have invested. The pursuit is, therefore, one which appeals to private endeavour.

Similar conditions do not obtain in the practice of forestry. The time element is a serious one, and returns in the form of a forest crop are deferred for at least one, and more probably two or three generations, after the reproduction of a stand of timber takes place. Moreover, considered on the basis of normal prices of forest products, the financial returns to be secured are by no means so attractive to the individual, even if it were possible for him to reproduce his crop and reap it during his own lifetime. Furthermore, due to the long period through which the forest must go before it can be harvested, and to the many things which may happen during that period—fire, insects or fungus infestations—forest practice is attended with such hazards that to the private individual it is not, after all, very attractive.

So far as the production of wood crop is concerned, private forestry practice on this continent is to all practical purposes confined to (1) corporations that absolutely depend on a continuous supply of timber over an extended period of time, to protect heavy financial outlay in mills and equipment; (2) owners of large estates which are to be retained in a family from one generation to another, and who feel a sense of responsibility in leaving the forest estate unimpaired, perhaps improved; (3) philanthropists or persons who may financially be able to carry it on as a hobby; and (4) farmers, or others, who having small woodlots on their holdings, may actually put into effect some system of management which may bear indications of elementary silvicultural practice. Of the four classes referred to, it may readily be seen that only in the case of the permanent corporations is it at all probable that any extensive programme of forestry might be carried out. Naturally, the corporation manages its timber holdings with one object in view, namely, the production in the quickest possible time of the particular class of wood product it requires. There would be no

justification, therefore, in anticipating that a comprehensive national forest policy could be developed solely through the activities of private corporations.

From the standpoint of making available to its citizens a continuous supply of forest products, it is essential that the State itself should formulate and execute a policy which will give adequate results. Moreover, by reason of the climatic influence of forests, and their effect on water supply and in the regulation of stream flow, the State must shoulder the main responsibility for the protection and development of the forest resources.

CHAPTER II—THE ECONOMIC USE OF LAND

In all civilized parts of the world it is now thoroughly recognized that it is essential to economic development and national safety that a country should maintain an appreciable part of its area under forest cover, and that there should be produced locally a considerable part of the requirements of timber products. The soundness of this principle has been abundantly demonstrated in European countries, where, notwithstanding density of population, and the consequent demand on the land for other purposes, there are now definitely maintained under forest cover large percentages of the land areas of the individual states. The fallacy and the danger of neglect in this respect was clearly demonstrated in Great Britain during the late war; as a result, Britain has embarked upon a sound and extensive policy of rebuilding her forest area.

The extent to which forests are maintained in some of the important European countries is indicated in the accompanying table. Two points, referred to above, stand out very clearly; (a) the low percentage of forest land in Great Britain, as compared to other countries, explains and justifies her present constructive efforts to increase the forest area; (b) that Belgium, Finland, France, Alsace-Lorraine, Germany, Norway, Poland, Russia and Sweden, all of which are favourably situated to compete strongly against the American continent in the supply of forest products in Europe, retain relatively large percentages of their land areas under forest cover, particularly when density of population and the consequent demand upon land for other purposes are taken into consideration.

SOME FOREST AREAS IN EUROPE

Country	Forest Area in acres	Percentages of Total Land Area
Austria.....	7,600,000	37.7
Belgium.....	1,321,240	18.2
Finland.....	49,410,000	60.0
France.....	24,420,150	18.4
Alsace-Lorraine.....	1,088,270	30.3
Germany.....	30,905,840	23.8
Great Britain and Ireland.....	3,315,200	4.3
Norway.....	17,037,570	21.4
Poland.....	21,881,140	22.8
Russia.....	440,000,000	38.7
Sweden.....	55,550,000	54.8

Taking Europe as a whole, the total area under forest is 774,118,460 acres, comprising 31.1 per cent of the total land area. In Canada, excluding Prince Edward Island, the Northwest Territories and the Yukon, where timber resources are either relatively inconsequential, or so inaccessible that they do not affect the general situation, we have a forest area of 1,216,408 square miles (778,501,120 acres), or nearly 60 per cent of the land under consideration. Of this, however, 775,748 square miles (496,478,720 acres) is unmerchantable or

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inaccessible forest, so that the area from which supplies must for many years be drawn is in the neighbourhood of 20 per cent of the land area. True, our population is small, but allowing for consistent increase, it should be our aim, with the resources at our disposal, to continue a large net export of forest products. It must also be kept in mind that as against a per capita consumption of only 35.8 cubic feet, in Europe, our per capita consumption in Canada is 285 cubic feet.

Of the countries listed in the table, Austria, Finland, Norway, Poland, Russia and Sweden are net exporters of wood products, and of these, Finland, Norway and Sweden are cutting in excess of their annual growth in order to maintain export trade. In still other parts of the world, also, experience has clearly demonstrated the necessity for maintenance of the forest. India maintains under forest cover 22.7 per cent of her land area; Japan 53.3 per cent; Asiatic Russia 29.3 per cent; United States 28.9 per cent; and New Zealand 25.7 per cent. All of these facts, indicative of the experience in other countries, clearly point to the necessity of permanently maintaining in a productive condition the forest area of Canada.

In countries of limited land areas and dense population, it is frequently necessary that land quite suitable for agriculture should be devoted to timber production, in order that proper equilibrium should be maintained. In other countries, where land areas are great and populations relatively small, such a condition does not as a general rule exist. One characteristic of timber growth is its ability to thrive on the poorer soils which cannot possibly support profitable agricultural crops. While, manifestly, timber may be grown more rapidly on the better soils, still, so long as climatic factors are not unfavourable, so long as lack of drainage does not prevent, and so long as the surface has not been entirely robbed of its soil cover, timber may profitably be grown. Rough topographic features frequently prevent absolutely the production of agricultural crops on areas where timber may be successfully grown.

It is into the latter category that Canada falls. With a land area of 3,603,336 square miles, and of this area over 75 per cent entirely incapable of producing profitable agricultural crops; with a population of only eight and three-quarter millions; with a very considerable part of the non-agricultural areas quite capable of growing excellent timber,—there is no need, as a general policy, to use agricultural lands for timber production. It is true that, even in Canada, there are advantages to be gained by the use of limited areas of agricultural land for this purpose, for the farm woodlot, for shelter, or for aesthetic purposes; in the main, however, and for the assurance of a continuous supply of timber, there is no necessity of permanently dedicating to forest production lands which will yield greater money return in agricultural crops. Even in the country to the south, United States, with a population of twelve or thirteen times as great, the use of agricultural lands to maintain the timber supply is not necessary as a general policy. For this continent it may truly be said that, providing true forest lands are properly protected and developed, there need be no conflict whatsoever between agriculture and forestry interests; indeed, the two are essential one to the other, and both of them the fundamental basis of national development, progress and safety. To over-development of agriculture and allied pursuits, and to neglect in recognizing the necessity of forest cover, are attributed the decadence of several countries, once wealthy and productive. Even in Canada and the United States notable examples are to be found of regional decadence and penury resulting from denudation of forest lands which were primarily unsuited to agriculture.

The realization of these facts by the people of Canada will result in a proper conception of what forestry is. It will at the same time remove some entirely erroneous ideas as to there being a basis for conflict between agriculture

and forestry. It may well be reiterated that, broadly speaking, there is no necessity for using truly agricultural lands for the production of timber for this or for succeeding generations.

Aside from their value in producing timber for use, there are many instances in which forests must be maintained for the protection of watersheds and the regulation of stream flow. Discussion of this phase of forestry is not within the scope of the present enquiry, except in so far as protection forests, as they are called, may also serve as a source of supply of timber for use as saw timber, pulpwood, mine props, fuel, etc.

CHAPTER III—LAND CLASSIFICATION

The remarks in Chapters I and II clearly indicate that there must be a division of land into the agricultural and non-agricultural, in order that each may be assigned to its proper field of use. Some definite and systematic process must be undertaken to properly segregate lands in the two classes. Neglect to do that has resulted in the abandoned farms and settlements in various parts of Canada and other countries, on the one hand; and, elsewhere, in the degeneration into desert wastes of lands that at one time supported excellent stands of timber. Although in democratic countries it is difficult, if not impossible, for governments to adopt extreme methods of paternalism in the settlement of lands, it is everywhere fundamental to a successful settlement policy, that settlers should be prevented, so far as possible, from taking up lands which are known to be of insufficient agricultural value to support them. In every province of Canada are found glaring examples of indiscriminate and injudicious settlement. Too often the effort has been "anything to get another settler in a district,—another taxpayer and school supporter". If a mistake is made by the individual settler, it is considered to be entirely his own fault. Such haphazard policies have resulted in many ignorant failures, and also in fraudulent use of natural resources.

If the "breaking" of a misguided settler were the only consequence of such hit-and-miss policies, the situation would be bad enough; when, however, the breaking process is accompanied by the partial or complete destruction of adjacent resources—frequently the case—the fault is greater a thousand-fold. A settler, unintelligent enough to select a piece of land which is incapable of supporting him, may hardly be expected to exercise any better judgment in treatment of other resources which may exist in the district. There is, therefore, a very definite responsibility, upon the part of governments, to guide in some manner and to some extent the settlement which takes place.

If it be accepted that agriculture and forest production are essential to proper economic development, it is axiomatic that their greatest development can only take place if conditions for each pursuit are rendered as favourable as possible. As above brought out, fundamental to this is the classification of the lands of any region into the agricultural and the non-agricultural. On this continent, it is only within very recent years that really serious thought has been given to this basic requirement. Even more recent, have been any serious practical attempts at systematic land-classification; and strange though it may appear, such efforts have been initiated, not so much by the land organizations which really should bear the responsibility for rational settlement, but more frequently by other agencies who have had before them some definite and limited settlement problems; or, by still other agencies which have suffered greatly as a result of the antiquated and haphazard methods of unguided settlement. Only now, is there becoming evident some appreciation of the necessity for the application of principles underlying land-classification.

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Land-classification is a process which, for lands under control of the federal government, should be placed immediately in general effect; a process that should be developed and fostered by the federal authorities for use in the provinces; a process which should without further delay be applied in each province that controls its own land problems. It is not for a moment argued that a government, provincial or federal, should project itself into extremely paternalistic measures which would relieve the settler of all his responsibilities in selecting land. It is incumbent upon governments, however, to go a very great deal further than they have yet gone, to prevent in every possible case the irrational settlement that frequently occurs on non-agricultural lands, and to encourage proper settlement by the acquirement and correlation of information regarding lands which may still be available.

In the province of Nova Scotia the great bulk of the land area has already been alienated in fee simple. At the present time, it is a rarity to dispose of government land for settlement, as the good or fair land has long since been disposed of. Under such circumstances, the belief may be engendered that, although in earlier days a system of land-classification would have been of inestimable value, the fact that the land is nearly all disposed of would render entirely unnecessary a system of land-classification. Such a conclusion is entirely erroneous. In that province, land-classification, and treatment resulting therefrom, is the only means by which the weaknesses and mistakes of past methods of settlement may in part be rectified, and plans developed to return the lands of that province to their full state of productivity whether in forest or field crop.

In New Brunswick, evidences of faulty settlement abound; much of the land has been alienated, but a definite system of land-classification is under way for the balance of the Crown lands. In Quebec, a much smaller proportion of the provincial area has been settled. It appears that steps are now being taken to control settlement by application of the principles of land-classification. In Ontario the situation in many ways resembles that in Quebec; there is a great similarity in settlement problems of the two provinces. Here also, the control of settlement by preliminary land-classification is all-essential. Both in Ontario and Quebec, conditions are such that in many districts the general or extensive segregation of lands into two classes is a relatively simple matter. There is nothing but condemnation for a policy which would jeopardize the safety of large areas of valuable timber supply for the purpose of establishing a few isolated settlers. Particularly in Quebec, the promise of more carefully restricting settlement to areas of known agricultural value, is one which constitutes a most important step in the right direction. The day is far gone when we may gamble millions of feet of merchantable timber, or thousands of acres of young forest growth, against the pittance which a handful of isolated settlers can contribute to the national wealth.

In the Prairie Provinces, the land problems are perhaps not so intricate, by reason of the fact that there exist in the south vast expanses of land essentially agricultural; even there, however, a certain amount of land-classification has been necessary. In the more timbered regions to the north, work of this character is of utmost importance, and, where it has not already been performed, should precede further attempts at colonization. The land-classification work which has been carried out by the Topographic Surveys Branch, Department of the Interior, merits special commendation. The greater development in, and more extensive application of, this kind of work, will ensure results in settlement vastly superior to those which have been in evidence heretofore. Further, work of this character, carried out by the federal government may serve as an excellent example to the provinces that have similar problems to deal with.

In British Columbia, by reason of the rugged nature of the country, land-classification problems are not so difficult, and the area requiring treatment in this manner is relatively small as compared to other parts of Canada. In great measure, nature has classified a large part of the area as absolutely unsuitable by soil and topographical conditions to agricultural pursuits. Even in this province, however, many classification problems present themselves for solution.

Generally for Canada, it will be seen that future settlement should at least be preceded by the extensive classification of lands which have not been dealt with in that manner; and that there are cases, even in parts of regions already settled, where a classification should be effected, if the land resources are to be brought either by public or private enterprise to their full state of productivity. Wherein lies the national, provincial or community gain, in the settler who cannot sustain himself on land which he may have chosen, or upon which he may have been permitted or even encouraged to settle?

CHAPTER IV—THE DEDICATION OF FOREST LANDS

Broadly speaking there are, after all, only two main purposes for which large areas of land may be used, namely, in agriculture and in forestry; use of the productive characteristics of the soil are also confined to these pursuits. Undoubtedly there are other uses for more restricted areas, particularly in mining. Mining, however, is not dependent on productivity of the soil, but upon the formations which lie in or beneath it; and inasmuch as the mining of areas carrying rich deposits can be carried on, and to a greater extent is pursued on true forest lands, in view of the fact that this may be done without serious detriment to the forest, it is therefore quite sufficient, in a general scheme of land-classification, to confine ourselves to two main classes,—agricultural and forest lands.

An effort has been made in Chapters II and III to show, in the first place, that lands should be assigned to the uses for which they are best adapted; secondly, that to permit of so doing they must be subjected to a process of classification. Upon completion of the latter operation, an excellent beginning has been made, but several further steps are necessary if the lands classified as forest are to be maintained in a state of profitable productivity. For agricultural lands, further procedure is pretty well confined to the enforcement of settlement regulations; beyond the application of consistent effort, upon the part of governments, to properly guide settlement, further action may pretty well be left to individual and private effort. Forest lands, on the other hand, must be accorded entirely different treatment. It is of utmost importance that forest lands should, for the purpose of economic management and development, be definitely reserved under conditions which prevent the alienation of any area primarily suitable for forests, except for reasons consistent with the forest policy as a whole. Having decided that a certain tract is primarily adapted to forest production, it is of transcendent importance that it be dedicated permanently thereto by statutory legislation.

It is manifestly essential to the production of any crop that the area on which it is to be grown should be definitely assigned to that purpose for the life of the crop. It matters not whether the crop be of oats, potatoes, or anything else, success can only be attained by the exclusive use of the tract for the entire period required for the seeding, growth and harvesting of the crop. Similarly, timber being a crop, if it is to be successfully grown, the land must be definitely reserved for that purpose. There is only one known method by which public land may be securely reserved, namely, by the creation of statutory national forests, forest reserves, or whatever they may be called. Experience throughout the world has shown that the practice of simply preventing settle-

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ment upon such lands, but without taking any further steps for their dedication, cannot serve to the full the purposes for which such lands are intended. For proper development certain measures have to be effected if timber land is to be successfully handled, and all of these requirements call absolutely, and without any question whatsoever, for statutory reservation.

There are many who argue that statutory reservations are not necessary, and that mere provision for the exclusion of settlement will fully meet the requirement. To meet such an argument it is perhaps only necessary to state that, when a period of one, two or three generations is required for growing of the timber crop, there must be assurance or guarantee against changes in policy for that period. An area permanently dedicated by statute to forest production naturally enjoys security from tampering with the policy upon which it is based. If, during the course of the period required for the production of a crop of oats, a farmer were continually changing his mind as to just what he would grow there, or the methods under which he would grow it, there would be small chance of his obtaining a successful crop of any kind. Precisely the same thing applies to the timber crop; as a matter of fact, due to the long time necessary for its development, there is much greater liability to frequent changes of policy which are absolutely inimical to the attainment of maximum or even average results; and it is partly to offset this predisposition to tampering, that permanent dedication of forest lands is necessary.

By way of explanation let us first of all consider the individual, or the public. If there is one thing necessary in this country, it is to demonstrate to, and convince the people of, the aims of forest policy. If no action be taken for the creation of statutory forests, what is more difficult for the isolated settler to understand, if a mile, two miles, or ten miles from him there is a large area of forest land which, although it may be reserved against settlement, is not the subject of more complete reservation? While he may be informed that it is not suitable for settlement, it nevertheless lies there in more or less dormant state, no action being taken toward proper development of it. This engenders in him a prejudice, frequently amounting to animosity, toward the policy, simply because the policy is in itself neither definite nor concrete. On the other hand, from the time the forest reserve is created and placed under development, whether the settler may at first like it or not, he has, nevertheless, placed in front of him, some definite tangible action, the aims of which are at least obvious. He knows, moreover, that before he or anyone else can alter the policy, a considerable amount of elaborate procedure is required. In these circumstances, he is less liable to interfere with the area so reserved; indeed, it may arouse his resentment should any other person attempt to do so.

It has frequently happened that, even after a proper classification, large areas of true forest land have been allowed to remain subject to settlement regulations, the only preventive against unjustifiable settlement being the provisions of land settlement regulations. Experience has thoroughly demonstrated that the restricting features of a settlement act will not of themselves satisfactorily guide settlement. Times without number, such superficial treatment of unreserved forest lands has resulted, firstly, in the incoming of ignorant settlers who entertain hope of securing a livelihood on the inferior land; secondly, in the ingress of the bogus settler, who enters the forest, not with the idea of making a farm for himself, but purely for the purpose of taking out what timber wealth there may be available, and later abandoning the area to repeat his fraudulent practices elsewhere.

Exemplifying further, the danger of leaving true forest lands unreserved, it may be pointed out that there have been very numerous instances where communities or municipalities, desirous of establishing school districts, or entering upon other municipal ventures, have urged that lands absolutely non-agricultural

in character be made available for settlement. This is an extremely short-sighted and very dangerous policy; the only purpose which it can possibly serve is in allowing misguided settlers to go on the land, and to have them appear as potential taxpayers—only temporarily, however. Although the existence in a certain district of a certain number of residents may be a basic requirement to the establishment of a school district, or some other undertaking of this character, the benefit of this class of resident is short-lived; so long as the land made available to him is incapable of successful agricultural development, it is utterly impossible that he should develop into a taxpayer, or in any other manner serve the advantage and responsibilities of the community.

Generally speaking, the public takes a great deal more interest in something which is definite than they do in something which lacks decision. It is true that past experience has shown that, in some districts where the formation of forest reserves was undertaken, there was at first a certain amount of unrest among the people in the vicinity. A comparatively short time after the creation of such reserves, however, and upon the upbuilding of the personnel and facilities for the administration of such reserves, people have realized that something definite—something which would redound to their own advantage, immediately, or at least ultimately—was being done, and some definite purpose was being attained. This has resulted in an entire change of attitude on the part of the people, and in many parts of Canada the forest reserve has become a very permanent and thoroughly accepted fixture in the domestic life of the people.

Viewing the matter from another angle, namely, from the standpoint of forest industry,—we have surely seen enough, too much, in fact, of the migration of industries from place to place. In Nova Scotia, New Brunswick, Quebec, Ontario, and clear across to the Rocky Mountains, we have witnessed the exhaustion of timber supplies accessible to forest industries in various districts. We have seen industries modify or completely change their programs; in many cases we have seen them move elsewhere, in order to overcome the difficulty of securing raw materials at close range. While it may be relatively a simple thing for a small portable sawmill to move about from place to place, seeking its wood supplies, it is a vastly different thing to consider the migration of the pulp industry, for instance, or, as a matter of fact, of some of the present large-scale sawmills; such huge sums of money are invested in these plants, and the process of moving would involve such great economic loss, that it simply must be prevented by some means. The only means by which it may be prevented is by the assurance of continuous supplies of raw materials at, or within reasonable reach of, points where they are located. This permanent supply can only be brought about by the permanent assignment of forest lands to timber production and the proper management and development of such lands to that end.

If it is necessary that special laws should be enacted for the guidance and control of persons engaged in agricultural pursuits; if it is necessary that, in urban communities, laws should be provided for the protection of individual and municipal rights; it is just as necessary that special legislation should be promulgated for the protection and development of lands which are to be permanently assigned to timber production. Very naturally, as special laws are required, the legislation must be applicable to specific areas, and those areas must naturally coincide with the districts which have been determined upon as being required for forestry purposes; that is to say, the forest law itself must delimit the areas to which it is to apply.

Moreover, an organization which is responsible for timber administration must necessarily operate under legislation which contributes directly to success of the undertaking. The proper protection and development of forest lands requires the construction of improvements and the provision of many other facilities for the carrying out of various phases of forest management. So long

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as uncertainty exists as to actual definition of the tract under forest management, it is impossible to formulate and put into effect a concrete plan of improvement work. No forest area can be properly handled without the expenditure of money for such improvement work, and necessarily the expenditure of such limited funds as are obtainable by the services in this country must be applied where they will be of permanent value. One of the greatest economic wastes which occurs in forest expenditure in this or in any other country lies in frequent changes in improvement plans, due to altering circumstances surrounding land status. If, therefore, a comprehensive protection and development plan is to be effected for a forest tract of, say, a million acres, before expenditure on such plan is justified, it is of paramount importance that the organization which bears the responsibility for the carrying out of such plan should have unhampered and continued control of the area with which it is to deal.

Finally, one of the greatest difficulties in development of adequate and efficient forest services in this country, and in all others, lies in the building up of permanent personnel. If, therefore, a service has not full control of all activities taking place within the forest area, it is frequently impossible to develop the permanent skeleton staff which is so essential to success in forest protection operations. To make this point clear it is only necessary to cite the case of a well organized forest reserve, where a staff is maintained throughout the year—in the summer engaged largely in fire protection operations, in the winter carrying on those phases of forest activities relating to timber utilization—and to compare with the latter an unorganized forest area where, during the course of the fire period, it is necessary to carry a large seasonal staff, but where, during the winter months, there is insufficient work to justify the employment of a sufficient percentage of the staff to constitute the permanent skeleton force so essential in forest protection activities.

In municipal fire protection experience has shown that it is absolutely necessary to maintain a permanent trained force, and to provide highly specialized equipment—both ready at all times, upon the call of fire. In such cases, it is entirely doubtful that more than a small proportion of the time of the fire staff is actually expended in constructive work, but this non-effective time must be paid for in order that the highly concentrated values of town properties may receive adequate protection. In forest protection, it is just as essential that the feature of permanency should apply to a part of the organization; it is furthermore, necessary that the field of activities of such an organization should be defined. The only manner in which these results may be properly attained is by the definition by Statute of areas which are to be placed under protection.

To be successful a forest policy must be continuous. Success cannot be attained if, with each succeeding administration, or even at longer intervals than that, there are going to be readjustments in area which may partly or entirely upset the plans for administration. It is here considered necessary to point out that it is generally the case that the objections from time to time raised against the creation of forest reserves, are more frequently based on entirely false premises. The very expression "forest reserve" is one which has frequently given rise to misconceptions, and for this reason the Commission is strongly of the opinion that the earlier the use of the term is discontinued, and a better one adopted in its place, the sooner there will be removed from the public mind some of the uncertainties which now exist. A large part of the population conceive a forest reserve as being an area where timber is reserved from present use, for the benefit of future generations. As a matter of fact, there are some forest reservations in this country to which this condition seems to have been applied, but this is not generally the case. As has previously been pointed out, the term "conservation" involves the use, for the advantage of the present generation, of all timber which matures during its time and which is necessary for

domestic consumption or for export trade; along with that, however, the reproduction of the timber must be secured and the young stands protected against fire and other depredations, so that the forest area may be made to yield continuous crops of timber for this and succeeding generations.

There has frequently been misunderstanding between different governments, and between various departments of the same government, as to the aims of the forest policy in the creation of forest reserves. If it be thoroughly appreciated at the start that, in this country at least, there is no necessity for the use of any extensive areas of agricultural lands for timber production, and that the policy of every forest service in this country takes full cognizance of that fact, a great many of the difficulties which have arisen, and a great many of the petty disputes which have occurred, would entirely vanish for lack of any substantial economic basis.

Owing to the long period required to produce the timber crop, and by reason of the fact that the annual harvest must be confined to a relatively small part of the forest tract, large areas are necessary for the successful conduct of forest administration. Although these large areas may frequently contain small tracts of agricultural lands, the policy to be determined upon for the larger area cannot be subservient to the requirements of a limited number of isolated settlers located on these small agricultural tracts. As previously demonstrated, forest administration requires legislation entirely distinct from that applied in other pursuits, consequently, if provision be made at all for the settlement of small parcels of agricultural lands in forest districts, these provisions must take full cognizance of, and be made amenable to, the requirements of the forest policy for the entire area. Frequently it has occurred that, after the classification of considerable areas as true forest land, land departments responsible for settlement policy have taken strong objections to the creation of forest reserves, on the ground that small areas of agricultural lands had been included. Too often, this has resulted in delay in the permanent dedication of forest lands to the purpose for which they were by nature intended. If a district or region consists essentially of true forest land, it should, without delay, be permanently dedicated to forest production; if necessary, and if it will not prove abortive of the principles underlying the forest policy, small areas of agricultural land may later be eliminated, although the conditions under which they are so eliminated, and their subsequent treatment, must be made to harmonize with the forest policy.

While, in certain parts of Canada, notable progress has been made in the permanent dedication of forest land, by the creation of forest reserves, etc., the placing of the forest estate on a basis which will render it susceptible to proper management absolutely demands that there be a vigorous acceleration in this process of dedication. Absolutely nothing is to be gained, and a very great deal is to be lost, in retaining in a state of unproductive suspense, large areas of land which are suitable to no other purpose than the production of timber. As previously pointed out, such a state of dormancy encourages the illegitimate settlement and fraudulent use of timber resources.

In the province of Nova Scotia, no forest reserves or provincial forests exist. As has previously been explained, the forest resources, both timber and soil, have in a large measure been alienated. The Commission, however, strongly urge the position that those remnants of the forest which still remain in the hands of the province should receive definite examination, and wherever there are opportunities in that direction they should be considered as the nuclei of permanent provincial forests, which from time to time may be extended by the acquirement of adjacent lands as the opportunity for purchase offers. The Commission are reliably informed that from time to time opportunity is accorded for the purchase, at very low cost, of lands which, although now more or less

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denuded of merchantable timber, either bear young growth or are still quite capable of producing a new crop of timber. In a province where absolute forest land comprises such a large part of the total land area, about 70 per cent; in a region where forest industry plays such a large part in the economic and industrial life of the people,—it is surely incumbent upon the State to play a much more active part in that pursuit which is fundamental to the continuance of such industry, namely, timber production. The experience in this province has abundantly demonstrated that private industry cannot be depended upon to play the leading part in forest conservation and timber production, and under such circumstances, the time has most certainly come when the state itself should make a beginning in the management of forest land, if only to point out the way, and to provide the incentive, by which the private owners may realize that a piece of timber land has potentialities far greater than those represented in timber now available.

In New Brunswick, although there are as yet no forest reserves, the province still retains title to about one-half of the forest area, and during the past seven or eight years has engaged in the systematic examination and classification of such land. Under these circumstances, it is only necessary to strongly urge that a definite policy of forest reservation be inaugurated for such districts where the classification has been completed, and that areas which justify permanent assignment to forest production should by statute be dedicated as provincial forests. The tendency in that province has been perhaps to delay action until the classification is completed, but it is forcibly suggested that such a delay is both unnecessary and perhaps dangerous. That forest industry in that province is even now in a very serious condition, insofar as future timber supplies are concerned, merely accentuates the necessity for the establishment of permanent forest areas.

In the province of Quebec, although at different times large areas have been set aside as forest reserves, it has frequently been the case that these were not preceded by a proper classification. More frequently, also, such reserves were merely established by Order in Council, with the result that the conditions under which the reserves were created left them very susceptible to reduction without the necessity of recourse to legislative enactment. In other words, from many of these reserves large eliminations can at any time be made by Order in Council. More recently, however, the government of that province has engaged itself with the creation of smaller reserves which have a definite aspect of permanency. It is strongly urged that this latter feature should in future be permitted to play a much more prominent part in the legislation under which forest reserves are set aside.

In Ontario a much more limited area has been set aside as forest reserves and parks, but the legislation under which they were created is much more definite, and does not offer such freedom in withdrawals as is the case in Quebec. In some of the reserves, at least, there has been a tendency to withhold mature timber from disposal on the grounds that the forest is required for the preservation of scenic attractions which the reserves offer. In the Timagami Reserve, for instance, the tendency toward restriction in the disposal of timber has been very pronounced, with the result that there is a strong feeling in the public mind that the timber resources of that area are entirely prohibited from use.

On provincial lands in British Columbia a beginning has been made in the creation of forest reserves for watershed protection in the dry-belt country. The Forest Act under which this province operates is an excellent one, and it only remains to apply in their entirety the provisions of, and the principles underlying, that Act, and the province will ere long have permanently assigned to forest production those areas which are primarily adapted to that purpose.

Although in numerous cases forests are very essential for watershed protection, their main use is in producing timber, and their permanent dedication is just as necessary for this purpose, as it is for watershed protection.

Without question the most consistent and most continuous policy for forest reservations in Canada has been effected in the Prairie Provinces, and the Railway Belt of British Columbia under the auspices of the federal government. In the British Columbia Railway Belt the area of forest reservations approximates $1\frac{1}{2}$ million acres, comprising 15.6 per cent of the total area. In Alberta the forest reserves include almost 12 million acres, comprising 7.35 per cent of the provincial area; large areas of forest land are also included within the Dominion parks, bringing the total area of reserved forest in the neighbourhood of 10 per cent of the provincial area. In Saskatchewan the area of forest reserves is 5,900,000 acres, comprising 3.7 per cent of the provincial area. In Manitoba 2,500,000 acres have been permanently reserved, comprising a little less than 2 per cent of the provincial area.

The areas referred to in the foregoing paragraph as having been created forest reserves by Dominion legislation have been placed under a definite system of protection and development. To a greater extent the boundaries of such reserves have been demarcated, and, over the district in which they occur, the federal service and the people of the surrounding country are dealing with something which is tangible and definite. Although necessarily they must from time to time be subjected to minor alterations, these reservations are absolutely of a permanent character and will continue as such. With the exception of the dry-belt portion of the Railway Belt, however, (and not altogether, there) the necessary forest reservations have by no means been completed. Taking as an example, the Prairie Provinces, and considering for the moment the statistical data brought out in Chapters 6, 7 and 8, Part I, of this report; recalling, also, the proportional areas permanently dedicated to forest production by other countries (see Chapter II Part III) it is quite apparent that further action is required for the permanent assignment of the lands to forest production by the creation of state forests.

Taking the Dominion as a whole, and including all reservations which bear even a semblance of forest reserves—including reserves and parks, statutory or otherwise, demarcated or undefined—the aggregate is only eight per cent of the total land area. As previously implied, however, a very large part of this is under forms of reservation which are very susceptible to withdrawals; a large part of it is in the form of parks, where timber may not be exploited,—so that, the percentage of land area of Canada which may be said to have been permanently dedicated to forest production is very small indeed, almost trifling, in fact. When 75 per cent of our land area is absolutely incapable of agricultural production, what is to be done with the great margin between that large percentage and the area already dedicated? Are we to leave it in a state of hopeless indefiniteness—a sort of “no-man’s land”—absolutely unsuited to agriculture, but still unassigned to a useful purpose, when the experience of nations throughout the world clearly shows that an area percentage many times greater than that permanently dedicated to forest production in Canada, is essential to the national development and to economic safety?

Having had the opportunity to study the organizations in various parts of Canada, and having seen the marked effect which the permanent dedication of forest land brings to bear in the work of such services, in the minds of the people, and in the stabilizing of forest industry, the Commission is very strongly of the opinion that, notwithstanding the patent desirability and necessity of colonizing true agricultural lands, the processes of segregating lands in two classes is as economically desirable as it is feasible, and that the adoption and strict pursuance of a policy of permanent reservation of forest lands is one of the most important phases of forest conservation.

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The existence, in this country, of so much forest land has apparently induced an attitude of carelessness or of partial indifference on the part of people, and of governments, with the unfortunate result that over vast areas the condition of our forest estate has deteriorated to a condition which calls for the most vigorous resuscitative measures, the first principle of which is permanent reservation of forest lands for the continuous production of timber.

CHAPTER V—FOREST LEGISLATION

It is not proposed at this stage to indulge in academic discussion of the details of forest legislation, but rather to lay down certain broad principles which should be observed in the framing of forest acts; also, wherever it may be necessary, to point out some of the weaknesses that prevail in legislation now existing.

There is probably no single factor which is more efficacious in the conduct of good forest administration than the existence of a thoroughly sound and comprehensive forest act. Manifestly, such an act cannot be so drafted as to contain provisions to meet every contingency that may arise in forest administration; but it is of primary importance that it should lay down, in some detail at least, the general principles which are to be observed in carrying on the forest business of the country or district to which it is to apply; to some part of such an act, it should be possible to refer any detail of administration which may arise, and to extract therefrom the guiding principle upon which decision of the isolated case must be based. The principles of the forest policy must be enunciated in a manner which leaves no doubt as to their being positive in character, rather than being merely permissive. Altogether too often, legislation of this character is framed in such a manner, and contains so many provisos, that under the pressure of political exigency multifarious interpretations, entirely foreign to the true principles underlying the act, render abortive its practical operation. In other cases, the act may be so extremely general in character as to permit the passage thereunder of regulations which are entirely opposed to the principles of rational forestry practice.

If it be accepted that the state bears a distinct responsibility in the careful treatment and proper husbanding of the natural resources to which it holds title in trust for its people, it follows that, in addition to proper use of timber which is now mature, the state must also protect and develop by every possible means within its power, that outstanding attribute of forests—the power to regenerate and re-establish themselves. In assuming responsibility for seeing that adequate supplies of timber are provided for future generations, the state does nothing that is more dutiful or more charitable than the average man who feels a responsibility in carrying life insurance for the protection of his family. In neither case is self-denial to the extent of hoarding required; but in both of them the expenditure of money and effort is required in order that protection may be afforded.

Even in Canada, if an individual were to inherit as part of an estate, an area of particularly well-regulated timber land; and if he were immediately to strip it of its timber wealth, he would be roundly criticized for his selfishness and his short-sightedness in destroying something which it had taken many years of painstaking effort and a considerable amount of self-denial, to build up. If, on the other hand, he were to remove from the forest the amount of timber which it can annually produce, he is securing the full advantage to which he is morally entitled, and he is taking full advantage of the natural growth, to which by the laws of nature he is alone entitled. In precisely the same manner, but even to a greater extent, the state must be expected to accept, along with the natural advantages of the timber resources, the responsibilities

which accrue in the maintaining that resource as a permanently productive organism.

In the premises above outlined, the basic principle upon which the forest act must be built up is that of accepting in a full measure the responsibility for administering the forest resource on the basis of sustained yield. With that fundamental principle clearly and unreservedly enunciated, all other features of the forest act should of necessity be made to subserve that basic principle.

It has previously been pointed out that if the forests of Canada be properly handled there will be no necessity, in a general way, for the use of agricultural lands for timber production; absolutely a corollary to this statement, however, is the fact that true forest lands must be maintained in productive condition. The forest act must, therefore, provide clear-cut, unequivocal, and permanent dedication of areas already classified as forest land, and for the addition thereto of lands which, upon subsequent classification operations, are found to fall into that category. Moreover, provision must be made that alienations which are not fully consistent with the forest policy as a whole shall not be permitted. If in Canada we are to entertain any hope of renovating our forest policies; if we are to any appreciable extent to improve what is over vast areas a sadly depleted and deteriorated forest estate; if we are to permanently maintain in a flourishing condition the gigantic industry that has been built up,—we must approach the question of forest dedication in a positive and vigorous manner; we must sweep aside all the palpably trivial, albeit the sometimes ingenious, arguments that are so frequently advanced; arguments serve only to delude governments and the people, and, by obscuring the true perspective, deter them from the adoption of constructive and statesmanlike policies.

In a country which contains so much undeveloped agricultural land, what could be more foolish, more misleading, or more subversive of economic development, than acceptance of the time-worn argument that, because some large area of true forest land may contain a few small pockets of land susceptible of farming operations, the area as a whole must not be dedicated to forestry; that it must be retained in a state of desuetude, the object a desultory effort at settlement which tends toward destruction of its utility for any productive purpose whatsoever. Just as an isolated piece of non-agricultural land surrounded by fertile soils cannot be allowed to interfere with the course of agricultural development, so must the isolated pocket of agricultural land, in a district adapted by nature only to the production of timber, be made amenable to the inherent requirements of forest development. Too frequently, the natural resources of this country have been made to serve the ends of the organizations responsible for their administration, rather than the administering organization being itself moulded, modified, or otherwise reformed to meet the practical requirements of the resource with which it was endeavouring to treat. Too frequently, organizations which have well-nigh out-served their purpose have been permitted to prevent or hamper development of forest organizations, and to hinder the application of principles fundamental to proper management of forest lands. For these, as well as for the basic reasons previously outlined, it is of utmost importance that the forest act should definitely provide for the permanent reservation of true forest lands.

The question of the forest authority will be dealt with in some detail in the following chapter. It is, however, necessary to mention here that the forest act must definitely constitute the forest authority, or forest service, and must without qualification assign to it the administration of the forest area. The function of control of raw materials which serve the requirements of the second largest industry in this country is a responsibility which fully justifies the establishment of a service competent, and sufficiently extensive, to deal adequately with the problems which will confront it. Forestry problems are in themselves suffi-

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ciently intricate, and require ingenious effort in their solutions, without burdening the authority with duties extraneous to the purpose for which it is created, and without hampering it with such departmental connections as may operate to thwart the principles for which it exists. By the act which brings it into being, the forest service must be clothed with the power, and provided with the machinery, essential to the conduct of its work. It must be an entity; it cannot properly serve its true purpose if it be circumscribed by considerations or connections which are foreign to the objectives of forest management.

In addition to making the provisions previously outlined,—all of which are basic requirements to the successful application of a forest policy—the forest authority must be given legislative basis for the conduct of forest surveys; this work is of such paramount importance that in most instances the forest act should definitely call for it. The authority must be both empowered and instructed to carry on forest protective operations; to manage and regulate the forest in such a manner and under such methods as will attain the object of forestry practice—sustained yield; to carry on all other activities which are related and essential to the forest conservation program which may have been decided upon. Obviously the details of all these provisions cannot very well be set out in an act requiring legislative sanction, but, as previously stated, the general authority and the guiding principles must be clearly and positively enunciated. If such provisions be adequately met, it may then be left to the service itself to formulate detailed regulations that must conform to the spirit and letter of the act. The act itself must be so formidably and securely constructed, that it will be invulnerable to attacks which are subversive of the principles upon which it is based.

In discussing legislation now existing in various parts of the Dominion, it may at the outset be stated that nowhere in Canada is there in effect a perfect forest act. Some may exhibit weakness in one direction, while others may on that particular point be sufficiently staunch. In most cases, however, the services responsible for administration of the acts are fully cognizant of existing weaknesses, and in many instances it only remains for governments to treat with a little more sympathetic consideration the representations which have been or may be made by the forest authorities.

In Nova Scotia there is in reality no forest act which may be designated as such. Disposition of such forest resources as still remain unalienated is under the provisions of a land act, and of a department which has but little active interest in, or experience with forestry problems. As will later be pointed out, there is legislation which applies, and an authority which in a measure controls, one phase of forest activity, but in so far as clear definition of a forest policy is concerned, by legislative act or otherwise, the government of that province has never expressed itself. The Commission strongly urges the necessity of a thorough review of the forestry situation by the government of Nova Scotia; such a study will of itself display the glaring need of concerted action in the framing and effecting of a forest policy in Nova Scotia.

Some years ago, the province of New Brunswick placed on the statute books an excellent example of progressive forest legislation. By the act there was created a service which, under the most trying circumstances, has endeavoured to improve conditions. Without desiring to engage in non-constructive criticism, it may be pointed out that if the Act, as such, is sufficiently definitive of policy, its application up to the present time has not been such as to arrest the serious depletion in forest resources which is taking place. The situation in this regard has been fully dealt with in Part I, Chapter III, of this report; it is sufficient to say here, that the present serious conditions call for a thorough review of the Act, and the provision of requirements which will more adequately prevent further dangerous depletion in the wood capital of that province.

More particularly in recent years, the government of the Province of Quebec has shown a disposition to attack in a constructive manner the forest problems which present themselves. The forest act contains many excellent provisions, but, as is the case elsewhere, it is well to consider whether the Act is sufficiently indicative of a concrete policy; and if so, whether such a policy is being carried out. Similarly in Ontario, notable progress has been made in forest legislation, but the question may well be put—does the Act clearly exhibit a concrete policy of forest development, or is it one merely made up of temporary expedients for the control of utilization and provision for forest protection? Putting it another way, does the forest legislation in Ontario enunciate the fundamental principles of forest policy set out hereinbefore,—or is it a heterogeneous mass of “do’s” and “don’ts” lacking clearly definition of a concrete policy for permanent maintenance of the forest resources?

Having been organized in more recent years, and having adopted the very wise procedure of “starting off with a clean sheet”, the forest service of British Columbia enjoys the fortune of operating under an excellent forest act; having, moreover, the most extensive timber resources found anywhere in Canada, the province undertakes administration of a resource which is still very far from a state of depletion. This very wealth in timber, however, has an inherent tendency to deflect attention from some of the ideals underlying rational forest practice; and in this province it may with fairness be stated that the service, in the press of administrative operation of a gigantic timber-sale business, has by force of circumstances been able to give only secondary consideration to some phases of forest policy which those in control thoroughly recognize as justifying primary consideration. Here again, we may state, careful review of the act may indicate that some important phases of the policy enunciated in the forest act have been relegated to the background owing to the pressure of other work.

Notwithstanding any inherent weaknesses which may appear in the individual forest acts of the various provinces, it may to their credit be stated that, in every case where a province has passed such an act, and created a service for its enforcement, consistent effort has been exerted, and marked success attained, concentrating to a greater extent in the one act the various aspects of forest legislation. Unfortunately the same cannot be said of forest legislation promulgated by the federal government. As will be fully exemplified in the succeeding chapter, this anomalous situation has given rise to a serious overlapping of forest authorities, and a lamentable failure in the clear definition of forest policy.

To form a comprehensive idea as to what comprises the Dominion forest policy, it is necessary to have recourse to at least three Dominion acts, and to several sets of regulations made thereunder. Firstly, there is the “Forest Reserves and Parks Act”, which makes provision for the administration of lands included within reservations of a character defined in the title of the Act. The provisions, however, apply only to those tracts contained within the boundaries of such reservations as had not been the subject of alienation prior to passage of the Act. The forest reserves section of the Act is administered by the Forest Service of the Department of the Interior, while the parks legislation is administered by the Dominion Parks Branch of the same department. Within the boundaries of both forest reserves and parks there are timber berths which were created and licensed prior to the establishment of forest reserve or park; although the work of fire control rests with the Parks and Forest services, the functions of woods management and general administration are controlled by still another branch of the same department. If the functions of timber administration and fire protection were absolutely distinct in principle and in operation, there might possibly be some hope of successful treatment of forest lands under this very objectionable form of dual control; forest protection and woods management are, however, intricately and inseparably related to each other; forest

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protection cannot properly be provided unless the service responsible therefor also controls the methods of utilization. Therefore, if legislation is to be effected, it must be so formulated as to take full cognizance of this fact, clothing the service with full responsibility for all forms of forest activity.

On Dominion lands outside of forest reserves and parks—as well as on timber berths previously referred to as being included in the reservations—the legislation in effect is contained in the Dominion Lands Act. The function of administrative control of timber resources also lies with the Dominion Lands Branch, although the forest fire protection on such lands has otherwise been designated as the function of the Forest Service. Here again, and even to a greater extent, there exists the anomaly of dual legislation and administrative control in two lines of work which are entirely unsusceptible of appropriate or even sensible division one from the other. There is little doubt that a great many of the present departmental difficulties arose from the fact that, because the lands of the western provinces were administered under the Dominion Lands Act, the same machinery was made use of, and still is used, in disposing of timber resources of unreserved lands. In greater measure, the regulations under which these timber resources have been and still are demised take under purview but two main considerations;—(1) the making available to industries of timber supplies, and (2) securing therefrom the revenue justified. Except in a most antiquated and superficial manner, no definite policy for the continuance on a permanent basis of the forest resources is laid down; nor is there any proper observance of the principles underlying land-classification and the subsequent assignment of lands to the use for which they are physically and economically suited. Very naturally the deficiencies of such legislation in this regard entirely fail of conviction, either within the service itself, or in the public mind, as to their being anything concrete or tangible in the forest policy, other than providing for the use of timber. The serious anomalies to which these deficiencies in legislation give rise will be more fully explained later in the report.

In view of the fact that such close supervision is maintained over the operations of railways by the Board of Railway Commissioners; in view of the general realization of the fire hazards consequent upon railway operations; and finally, in view of the urgent necessity of standardization in requirements made of companies operating in several or all provinces of the Dominion,—the fire regulations applicable to railways are in the main provided in the Dominion Railway Act, and in orders promulgated thereunder by the Railway Board. Inasmuch as such fire regulations restrict themselves to a limited and very specific field of forestry activities, and inasmuch as no attempt at interference in other aspects of forest policy can logically be made, the otherwise inherent objection to dual legislation with respect to fire is almost if not entirely removed. As a matter of fact, the Railway Commission actually enforces its legislation through the personnel of forest services already established throughout the country; no attempt has ever been made by the Board to usurp the function of actual fire control; rather, taking advantage of the powers with which it is endowed, that body has by vigorous and timely legislation furnished the machinery through which the constituted forest authorities may ensure the application of preventive measures against fire on the part of railways. The excellence of fire protective regulations, and the administration thereof, provided by the Railway Board in this regard, stands forth as a monument to the principle of truly concerted effort, exemplifying in full measure how much can be accomplished by thorough co-operation between several services, when each works to the end for which it exists, rather than considering the size, or relative importance of the individual service, as the goal of the forest protection policy. Just as it has been considered necessary to insert fire prevention measures in the criminal law of the country, to enforce attention of the individual to his responsibilities;

and as almost any great amount of fire prevention legislation can hardly be considered as superabundant; so, the provisions of the Railway Act, and of the body which regulates railway operations, serve a necessary and exceedingly helpful purpose in the solution of railway fire problems.

After all, fire protection is not forestry; it is merely a means to an end,—to make possible the application of a policy of continuous forest production. Similarly, fire legislation may be regarded in the same light; consistent effort of every conceivable organization to bring about adequate fire legislation will not create harmful anomalies. Entirely the opposite is true, however, in regard to other phases of forest legislation; the enactment of numerous laws, and the maintenance of various services, over the same districts, for the conduct of forest administration, merely serve to obscure the policy itself, and give rise to overlapping of effort, and economic waste in expenditure of public funds. For a given expenditure in forest operations, by any government the mere act of limiting in degree the efficiency attainable, by the maintenance of dual organizations for forest administration, involves unjustifiable economic waste.

Returning now to federal legislation for forest management,—so far as parks may be necessary to serve the recreational requirements of the people, it may at once be stated that the principle underlying their creation is not based upon the necessity for timber production; provided, therefore, the areas so assigned are kept within the bounds of propriety and economic requirements, there is no objection whatever to the application of special legislation; indeed the operation of such areas requires specific treatment. The reverse is true, however, for timber lands controlled by the one government, and which are handled essentially for timber production purposes. Just as settlement legislation must be centralized in the one service, so also should timber management be centralized in the service created and responsible for that work. The legislation which voices the policy of the government must be an entity, and the carrying into effect of that policy must be centered in one authority; otherwise administration of the forest resources must remain indecisive, and must inevitably give rise to almost endless difficulties and disputes. Dual control forestalls development, and induces a state of inertia; meanwhile, the forest itself continues in a state of constant deterioration.

The question of overlapping in authority will be more fully considered in Chapter VI. It is sufficient to the discussion of forest legislation to point out that there is urgent necessity for the formulation by the Dominion of a comprehensive forest act which will clearly depict the policy of the government, and which will definitely constitute a consolidated and entire service responsible for all those phases of administration which relate to timber production and utilization; a policy which clearly displays the future of permanence, and leads to management of the timber resources for sustained yield.

Insofar as present regulations for forest reserves apply to protection and disposal of federal timber resources, they contain many excellent provisions, and show, perhaps more than any other Canadian forest legislation extant, the methods of conservation in treatment of forest lands. The one serious defect is that they apply to such a small part of the federal timber resources, and that they do not point with sufficient clarity and with adequate force to the unquestionable necessity of materially adding to the area of permanent reservations.

Obviously, it is incumbent upon the federal government to remould its forest legislation so that it may not only give effect to a substantial policy for Dominion lands, but that it may also have an exemplary effect upon other governments of the country, and encourage them in the introduction, modification, or reconstruction of their forest laws as may be necessary,—to the end that each individual forest act will not only serve the requirements of the province for which it is enacted, but that it may constitute a definite link in the broader

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legislative program for the entire Dominion. Much may be accomplished toward standardization of forest legislation, but perhaps basic thereto is the realization that the lead must be taken by the Dominion. Before such leadership may appropriately be undertaken, however, the federal administration must "set its own house in order."

CHAPTER VI—THE FOREST AUTHORITY

Just as consolidation of forestry enactments in a comprehensive and thoroughly definitive Act is an essential feature of constructive forest legislation—so is the centralization in one service of all forest activities of a government a primary requisite of sound forest administration.

The forest resource is too valuable an asset to permit of the rather shiftless treatment to which in this country it has been subjected from the beginning. Upon the basis of this asset there has been built up an enormous industry, involving invested capital to the extent of 600 millions of dollars. As pointed out in Part I, these industries are second only to agriculture in the value of their production; and they contribute to an enormous extent to domestic and export trade. Fundamental to their continuance is the maintenance of a permanent supply of the raw materials upon which they can alone thrive. Continuous supplies of wood can only be provided if the forests are retained in productive condition. In every part of Canada except the province of British Columbia, the timber supplies have been subjected to very severe depletion, and everywhere the methods of exploitation have been both wasteful and destructive, with little care or thought for the very necessary future supplies.

The very fact that, in every case, the initial development in disposal of timber resources has been carried out under the aegis of land departments, and that it is in considerable measure due to the methods pursued that the forest resource has deteriorated to its present condition, surely points to the fact that vigorous action is necessary for the constitution of proper forest authorities where they do not now exist. Even in this country, it has already been thoroughly demonstrated that it is only upon development of properly constituted services, and the inclusion in them of trained personnel, that the broader conceptions of forest management have been introduced. It is quite true that from time to time, even under the ordinary land administrative machinery, reforms have been introduced, but in nearly every instance such reforms have been the result of pressure from exterior sources, or by the assimilation of the results of experience in districts or countries where forest regulation was on a more stable and more satisfactory basis and controlled by technical services. So far as forestry is concerned, the mere introduction of some new idea or method in the routine disposing of timber does not constitute reform in treatment of the forest crop; more frequently, it savours of the expedient to meet merely the public convenience, rather than the application of some radical and effective measure which will serve the ideals of proper forest management.

After all, however, it was perhaps only natural,—certainly, it was very human,—that government administration, finding in the forest a source of revenue, should centre in its land organization the responsibility of extracting from the forest the greatest possible amount of revenue. In this one direction, some of the organizations so entrusted were eminently successful in their efforts; but in most instances the effort ceased just there, and but little heed was given to the condition of the forest after exploitation, or to the possibility of its repeating those revenues at a later time. Notwithstanding the success which such methods of securing revenue may have met with, it is significant that, one by one, as various governments have divorced control of forest

activities from their land-administrative machinery, and placed responsibility therefor in a special service, the revenues derived from the forests have been markedly increased. In the light of this fact, the argument that the older method is more productive in a monetary sense fails entirely of conviction.

If it be the case—and, everywhere in the world, experience points in this direction—that the mere function of forest protection requires the establishment of special services, how much more so is it a fact that the treatment of a productive organism, such as the forest, must be placed in control of a service especially qualified therefor. Although it undoubtedly embraces many aspects of practical business, forestry is nevertheless a science that has only attained its higher results, and can only approach the ideals, in those countries where the influence of the trained officers has been brought to bear. Too frequently, in this country, the term 'forestry' is construed to mean fire protection. As previously pointed out, fire protection is not forestry; it is, rather, a means by which the practice of forestry may be made susceptible of practical application. The two, although they are distinct phases of forest management, are inextricably related; without fire protection, the benefits of rational forest practice are lost to the country; conversely, without the application of at least some of the rudimentary principles of forestry, fire protection is difficult of attainment, and cannot of itself solve the problems of continued and profitable forest production.

From the foregoing remarks, it is manifest that the importance of the forest resource in the economic development of the state fully justifies, and indeed demands, the institution of a thoroughly modern, well-trained, properly manned and adequately paid forest service; and that it should be made the exclusive function of such a service to give effect to the forest policy which is laid down in the act creating it. The entire administration of forest lands must be exclusively vested in such a service, and no exterior organization should be permitted to hamper its work, so long as the forest service confines its attention to activities which are strictly its own business.

Aside from the futile argument previously referred to that small areas of agricultural lands justify the withholding from its proper function of large tracts of true forest land, the general argument brought to bear, for retention of timber administration in a position entirely subservient to land-administration, is that land and timber are so bound up together that one cannot be treated without dealing with the other. Obviously, timber and land are rather intimately related, but the application made of this relation, in the general argument is, to say the least, puerile. If a land-owner leases to another individual an area upon which the latter is to engage in the production of an agricultural crop, he must convey the right to clear and unhampered use of the land for the purpose proposed, and he cannot by any logical method of reasoning establish a right to alter the condition or status of the land in such a manner that the lessee is restricted or prevented from carrying out his intentions; true, upon termination of the lease the lessee is required to return the land to its lawful owner, but during the term for which the lessee may have legal control, it is entirely beyond the right of the owner to dictate the methods under which the crop shall be raised or disposed of. After all, public lands are vested in the Crown, in the right of the people of a political division; it therefore devolves upon a government to centre the administration of such resources as may be available in those services which are best qualified to protect, control, and develop them for the public good. If it is essential that governments maintain large technical staffs for the development and guidance of the agricultural industry which is distinctly a private enterprise, how much greater is the necessity that technical services be developed for treatment of the forest, which in the main is a state property, and that the function of control be vested exclusively in such services.

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The service must be provided with funds necessary to the proper conduct of its operations, and it must be required to render account of expenditures incurred, and of revenues accruing from its administration. Only by such treatment, may the true position of the service in relation to the economic administration of the state be apprehended, and in this manner the service permitted to justify its existence. Whereas the old conception of timber administration consisted in the extraction of the greatest possible amount of revenue, with the minimum possible expenditure, without due regard for the retention of productive characteristics of the timber,—the modern and true conception of forest administration is: by taking advantage of all the characteristics with which the forest is by nature bestowed, by judicious use of the timber supplies which it can provide, to maintain it permanently in a productive state, so that from it there may be received the greatest possible continuous financial returns—meanwhile expending upon its upkeep such sums as are required to attain all of the objects in view.

In many parts of Canada the annual toll exacted of the forest has been out of all proportion to expenditure made in its upkeep. If we for one moment reflect on the prodigious sums which have been derived through exploitation of the forest; when we candidly consider the present dilapidated condition of the forest estate; when, by recourse to historical records, or in many cases even by the exertion of our own memories, we recall the extent and magnificence of timber wealth which this country in former years exhibited,—well may we pause to consider whether we have put, or even yet are putting, back into the forest, by way of protective effort and constructive development, the portion which is unquestionably its due. On the contrary, we have over widespread tracts bled the resource of its entire yield, we have continuously eaten into the woods' capital, we have so far failed even in adequate protection to that which now remains. It seems to have been characteristic of our race that, while we have assuredly been adepts in utilization, we have been remiss in the application of principles of conservation. As one authority has so aptly expressed it: "almost every devilish contraption for the utilization and destruction of timber owes its existence to the ingenuity of the Anglo-Saxon mind;" but we have been far less inventive in the conceiving of means and processes for the protection and proper use of timber resources. If we are in any reasonable degree to adopt the conception that the forest is an organism capable of providing successive crops of a commodity which is a basic requirement of our civilization, what possible excuse exists in a government extracting possibly two or three million dollars from the forest, annually, and putting back into it, in protection and administrative machinery, some three or four hundred thousand dollars. Manifestly, no farmer would expect to derive annually an income from five to ten times as great as the monetary value of the labour, and of all other provisions which must be made, in the process of producing agricultural crops.

It is essential to completion of the subject presently under review, that reference should now be made to the status of the various forest services throughout the Dominion.

1. NOVA SCOTIA

In the province of Nova Scotia there exists no forest service which may appropriately be designated by that name. Such fragmentary timber business as may require transaction by the government of that province is centralized in a land administration that contains no technical forest officers, and which does not employ any field staff for the conduct of timber business or the inspection of timber operations. As a result of the prevalence of forest fires, the province has had recourse to fairly efficient fire legislation, and has set up

for enforcement of the latter, a somewhat loosely jointed organization operating under direction of a Commissioner of Forests and Game. Although undoubtedly the latter officer has, since the inception of his office, acquired some considerable knowledge of forest protection problems, the government employs no technical officers who have had any intensive training in forest protection work, or who have an adequate conception as to the various other phases of forest activities that are so intimately related to the work of forest protection.

Undoubtedly, the apathy on the part of the government and of the people of this province is due to the fact that such a large proportion of the forest estate is now under private control. It need only be pointed out, however, that the importance of the forest industry in the industrial life of this province is so pronounced, that it is incumbent upon the government to exhibit a very much more vital interest in forest activities than it now displays. The serious condition to which the forest resources of Nova Scotia have already come, clearly indicates that forest management is not a function which can be left exclusively to the initiative of private enterprise; in this regard, the attitude of laissez-faire which has been in evidence has been productive of such inferior results, that a thorough renovation in conceptions of forest policy is imperative.

Taking into consideration the total expenditure incurred by the government in all its activities associated with forest protection work, not more than \$8,000 or \$10,000 per annum is so used. It must not be inferred that this figure represents the total amount expended in fire protection in the province; it does, however, include all expenditures made by the government. In a province where private ownership of forests has for so long continued rampant, it is obviously out of the question for the government to now adopt methods of extreme paternalism, in order to resuscitate the forest resource; nevertheless, there is an underlying obligation upon the government to exert a much more active interest in forest policy and in the activities of forest industry, to the end that the conditions of both may be greatly improved.

While it is an unfortunate circumstance that so much of the forest has been alienated, it has previously been pointed out that there still remain the nuclei of areas which may well be dedicated to permanent forest production, and excellent opportunity exists for the re-acquirement, at exceedingly moderate rates, of depleted timber lands which are still quite capable of being developed to a state of productivity. In addition to having obligations in the direction of actual forest production, the government bears the moral responsibility of in some manner guiding the efforts at forest management upon the part of private owners. Moreover, the farm woodlot in Nova Scotia, playing as it does such an important part in rural development, and in the activities of the rural populace, is a subject which well merits, if it does not actually demand, the guidance of a well organized forest service, brought into being under government auspices.

The plausible answer which may be anticipated to such suggestions obviously is that, receiving practically nothing in direct revenue from the disposal of timber, the government can ill afford to commit itself to expenditures which a forceful policy will of necessity require. Although difficulties in providing funds undoubtedly exist, such an answer to a question of such great economic importance would absolutely lack candour. While it is quite true that assessments upon timber land, made under the auspices of municipal organizations, are returned to the forest in the form of fire protection, and that added to this is the mere pittance of \$8,000 or \$10,000 directly contributed by the government in the form of staff, publicity materials, and expenses of administration, it is only necessary to point to the large amount of money that finds its way to the public coffers which is derived from direct taxation of timber properties and forest industries. Such revenue, exacted absolutely from the woods'

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capital of the province, upon being absorbed into the consolidated revenue of the province, loses its identity, and is utilized to finance the government in its obligations in other directions, none of it being returned to the forest,—the latter, meanwhile, continuing its process of deterioration.

Beyond all doubt, the government of the province of Nova Scotia will be sadly derelict in its duty if it indulges in further procrastination upon a great public economic question that bespeaks the most painstaking consideration, and begs the most vigorous action for conservation and development of the forest resource, through the building up of an organization to serve that purpose.

2. NEW BRUNSWICK

In this province, governmental interest in forest questions is very much more pronounced. As previously intimated, an excellent forest act exists, and under it there is appropriate provision for a constituted authority. Perhaps more in this province than in any other, has the fact been exemplified, that the creation of an active forest service, to replace the time-worn system of timber administration through a routine land-office organization, results not only in the better conduct of timber operations, but also in increased revenue. From the time of its inception seven years ago, the Service, so far as the limitations in the numbers of its personnel have permitted, has exerted great influence upon forest activities in the province, and it has become a very agile wheel in the machinery of government. Even with the limited efforts it has been able to put forth, the service has fully justified itself with the industries, with the people, and with the administration. That it has not handled more expeditiously all of the problems that properly come within its purview, may almost entirely be attributed to the fact that it has not been provided with the funds essential to development of a technical and administrative staff of sufficient proportions, nor with adequate appropriations for the carrying out of investigations and studies which are fundamental to the improvement of the methods of forest regulation and utilization.

For several years prior to the establishment of the Forest Service, the initial steps for which were taken in 1917, the annual forest income in New Brunswick was in the neighbourhood of \$550,000. The first year through which the Service acted as a constituted authority, 1918, the revenue was over \$750,000, and since that time it has on no occasion fallen below \$810,000; indeed it has twice exceeded the million mark, once reaching over 1½ million dollars. It must be frankly conceded that these increases are in considerable measure due to increases in timber dues and fluctuations in the annual cut, but the fact remains that the Service itself has been highly instrumental in development of forest revenue. Looking at the other side of the picture, however, we find that except for extraordinary expenditure in actual fire-fighting during seasons of great emergency, the province has not materially increased the amount put back into the forest,—a mere quarter or a fifth of the revenue received; indeed the tendency has been to restrict legitimate expenditure of the forest service upon work of extreme importance. Truly, this is false economy; it would almost appear that, having become thoroughly accustomed to the nice increase which more efficient forest organization has made possible, the government now shows a tendency to parsimony in the financial support given to its forest service.

Owing perhaps to the exigencies of the financial situation, the government of New Brunswick, also, has succumbed to that very alluring temptation—the too liberal use of woods' capital to furnish current revenue. A review of Chapter III, Part I, of this report, will surely serve to convince even the most skeptical mind that the governmental authorities may with great public benefit give heed to the warnings of its forest service. It was, after all, the apprehension

with which the government of some years ago became obsessed—the fear of vanishing timber supplies—that gave rise to the forest act, as well as to the forest service. The mere existence of these two important factors in the application of forest policy cannot of itself bring about the salvation of the timber industry in New Brunswick. If it was necessary to supply the tools with which a certain piece of reformatory work was to be done, it is even more necessary to permit the unhampered operation of those implements, in order that they may accomplish the object for which they were provided.

In the provisions already made by the province, a most excellent start was made toward forest conservation. It will well stand repetition in another way, however, that if stagnation is to be forestalled, and subversion of the true principles of the Act avoided, the Government of New Brunswick must provide the wherewithal through which the Service can properly function; the Government must give heed to the advice which it is within the power and propriety of the Service to place at its disposal, and must translate into actual remedial measures the basic requirements of which it may through its forestry advisers be apprised.

3. QUEBEC

It is about twenty years since the government of the province of Quebec, recognizing the necessity of building up a forest service, realizing that technically trained men were essential thereto, and in the absence of such educational facilities in Canada, sent two promising students to a foreign university to secure special training in the theory and methods of conservation and proper forest practice. Upon completion of their training, these men returned to the province, and since that time have been continuously engaged in forest administration, and in the development of a provincial forest school from which has been recruited the technical personnel of a growing forest service.

Although it may by no means be stated that the policy effected, and the administration developed in the province of Quebec, has been all that could be desired; although it is undoubtedly true that the government of that province has extorted from the forest resource a very large revenue, which has in great degree been applied to current expenditure in other directions, it is nevertheless the case, that there has been a certain amount of stability and consistency in the movement of the Service toward more reformed methods, that has perhaps in some other provinces been rather seriously lacking. Although there have undoubtedly been weaknesses in forest administration it must in fairness be conceded that the government has shown a tendency to give greater heed to the suggestions made by its forestry advisers, and has in some directions effected legislative reforms looking to better administration and to the provision of more adequate facilities to serve the functions of forestry education and research, than has been the case elsewhere in Canada.

Although much greater interest is now being exhibited in these directions, two outstanding weaknesses in the administration of the Quebec Forest Authorities have been in lack of permanently dedicating forest lands, and in failing to adequately develop machinery for a stock-taking of forest resources within the province. As explained elsewhere, these two activities are fundamental requisites to progress in forest management. Latterly the service has imposed strenuous survey requirements upon the lessees of timber lands; let the government not adopt in too great degree the practice of 'letting the other fellow do it', and thereby lose sight of the fact that the Service itself has a very vital and far-reaching obligation to consistently engage in this process of forest inventory.

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Forest industries are very strongly entrenched in the economic life of the province, and particularly in the pulp industry greater development has taken place than in any other part of Canada. If it be within the bounds of propriety to definitely point to any weaknesses which may exist, it might be stated that, although the reforms brought about by the government of Quebec in its plans for forest administration contain many excellent provisions, there has perhaps been a tendency to overlook in some measure the vital necessity of taking the industries fully into confidence, in order that the reformative measures to be imposed might be practical, and that they might be thoroughly understood by those who are to be most affected by them. It is considered entirely feasible that the authorities of this province would have made the advances which they have made, and at the same time might have enjoyed in fuller degree the confidence of the industry, had there been a greater tendency to allow them access to, and encourage their participation in, forest counsels.

Perhaps to this lack of free interchange of opinion, and the dearth of unselfish co-operation which otherwise would arise therefrom, may be attributed the action recently taken to more or less isolate from the timber administration the function of fire protection. It is understood that it is in certain measure due to pressure of the industry, which has not been satisfied with the fire protective efforts displayed by the forest service, that a special organization has been created for that purpose. It may forcibly be stated that the necessity for such action should not have been permitted to develop; and it would not have arisen, had there been greater co-operation and more intimate relation between the forest service and the forest industries. This unfortunate condition is by no means a recent development; rather, it is the accumulation of sentiment over some years. It is over ten years since timber-holders in the province of Quebec, being dissatisfied with the methods of protection then in vogue, insisted upon the privilege of themselves carrying on the function of fire protection. The situation was quite analogous to a case in a large city where, for instance, one large part of the community—the wholesale section, for example—being dissatisfied with the fire protection afforded by the municipality, might demand that they be absolved from their contributions to the municipal fire fund, through taxation, and be permitted to install their own fire protective personnel and equipment.

Just as might be expected, if the demand in the hypothetical case above suggested were acceded to, in the fire protection situation in Quebec things developed to the stage where neither party considered that the efforts being put forward by the other were sufficiently comprehensive or successful. In the progress of fire control works, by reason of the existence of two organizations, and in some cases due to an overlapping in functions a certain amount of jealousy arose which made it necessary for the government of that province to take some action for the improvement of conditions generally. It is most unfortunate that one feature of this action consists in the segregation of the functions of timber administration and protection into two distinct branches; but it may at least be hoped that permitting the forest protection work to develop to that extent which the fire situation demands, will bring about very much improved conditions in that regard; and that, later on, when conditions are propitious for reuniting the two services, the opportunity for such action will immediately be seized and put to advantageous use.

Forest protection and timber utilization problems have attained such paramount importance in the economic development of the province of Quebec, that no longer will conditions permit of half-hearted effort in their solution, or of petty disputes and jealousies as between various organizations having interest in and responsibilities therefor.

For many years, the province of Quebec has enjoyed an enviable reputation for careful administration of public finance. Some other provinces have, through heavy expenditure in public works, and through over-optimistic development, been reduced to a state approaching financial embarrassment. Quebec, however, is more frequently alluded to as an outstanding example of what can be accomplished when a tight rein is held upon the public purse. To a material extent, however, its position in this respect has been built up upon the practice of withdrawing capital from the 'forest bank' and placing it in the public purse for general current expenditures, effecting in this manner a serious reduction in the capital growing stock of the forest. Nothing is more reasonable, more economically sound, or more adequately serves the true principles of conservation than that mature timber should be harvested and put to proper use. If in so doing, however, an unreasonable amount of the revenue so derived is diverted to other phases of public administration, without putting back into the forest the proportion which is essential to its successful permanent maintenance, it may truly be said that a province is merely manipulating its financial position at the expense of its natural resources.

4. ONTARIO

For a great many years the province of Ontario simply drifted along without any clear conceptions of forest policy, and with a very loosely jointed method of administering the forest resource. The development of a technical forest service had its origin in connection with tree planting work, rather than as a result of appreciation that management of timber lands required the services of technical men. For many years after the nucleus of a forest service was installed, the organization itself made no effort to expand and absorb those functions of public administration which absolutely came within its proper scope.

In the meantime, as previously implied, a very loose and cumbersome organization was developed under the control of land-office routine for the administration and protection of the timber resources. About ten years ago, however, the province became aware of at least some of the deficiencies, and steps were taken to place fire protection in charge of the Provincial Forester who had previously confined himself to tree-planting and educational work. It has always been a condition which begged explanation that, while the government very evidently appreciated the necessity for specially trained men—in that, some sixteen or seventeen years ago, it established at its university a curriculum in forestry—several years passed before the slightest advantage was taken of the men so trained, notwithstanding the fact that the cost of educating them was in a large measure being defrayed by the province. Even after concentration of tree-planting and forest protection functions in the one service, several years expired before more than a sprinkling of technical men was employed, notwithstanding the fact that in other provinces it had been clearly demonstrated that technically trained men were, if not absolutely essential to the conduct of proper fire protection, at least a very advantageous acquisition thereto. However, after several years of watching these men go into other fields, the province eventually did comprehend that considerable advantage was to be served in building up an organization of men trained under the auspices of its own university.

Some three or four years ago further steps for consolidation of forestry functions were taken, and the forest service at last came into control of the timber administrative machinery of the government. If it be claimed that the latter phase of the work has not exhibited signs of great improvement, it may without question be attributed to the fact that, in endeavouring to cope with very complex problems in organization for fire protection, the service has

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perhaps given less heed to the demands of timber administration than the conditions of the latter would justify. After all, a government is indeed absorbed by multifarious problems requiring solution; if, therefore, a good forest act be provided; if provision for constitution of a proper service be made; and if funds for proper conduct of the work be made available,—it must surely remain for the service itself to develop the fine points in its policy, and to justify its existence by taking a firm grasp upon the problems which confront it. In other words, having through the good graces of the government been created as an entity, it devolves entirely upon the service itself to exert with the utmost possible force the functions which are upon it bestowed,—to the end that it may become a forceful factor in economic administration of those resources of the province which are placed under its responsibility.

When the extent of the resources to be administered and protected are reflected upon, and the funds which have for several years been made available to this end are considered, it is quite apparent that the forest service of Ontario has been treated quite as liberally, if not actually more so, than have other provinces in the Dominion. This fact notwithstanding, there is ample evidence that the government of Ontario also has followed the practice of extracting too great a toll from its forest resource, without returning thereto, by way of protection and competent administration, the amount which proper conduct of the forest business would demand.

As is the case in Quebec, so in Ontario, the forest industry is of extreme importance in the economic development of the province. As pointed out in Chapter V, Part I, a situation has developed in the balance as between timber production and wood consumption which can only be rectified by the application of vigorous measures. If remedial measures in this direction are to be expected, on the one hand the government must give its forest service a freer hand in the formulation and pursuance of policies which will permit of improvement; on the other hand, the service must arouse itself to obtain these readily justified concessions from the government, and upon receipt of them to exert a forceful attitude in the performance of its various functions.

5. BRITISH COLUMBIA

In that part of the report which deals with the forest resources and forest industries of the province of British Columbia, a clear conception has been given as to the extreme importance of both in the development of the Coast province. Gorging in a wealth of timber far surpassing anything else in the Dominion, it was some considerable time before the necessity of proper administration was borne in upon the government. Twelve years ago an excellent forest act was put into force, by it was brought into being a forest service which has been very active in administration of the forest resource. As so frequently happens, when a business of this character has been allowed to slide along in somewhat haphazard fashion for a period of years, particularly in a province which has had so rapidly to surmount the obstacles of pioneering, when action was taken, it was of most comprehensive character. Truly, the British Columbia Forest Act portrays all the features of western optimism, and the desire to do things on a comprehensive scale.

It is, however, also characteristic of legislative reforms that are brought about so rapidly, that although they serve to better conditions to a very great extent, they are not always acted upon in their entirety. Not long after the British Columbia Forest Service got under way the war broke out, and there was consequently a serious depletion in staff. For a considerable period of years, therefore, some of the more fundamental phases of the policy laid down in the Act received scant attention. For the greater period of time for which it has

been in force, by far the larger portion of time and effort on the part of the service has been expended in forest protection and in the administrative routine of handling a gigantic timber-sale business. To some of the more refined aspects of forest management, the Forest Service, with its limited personnel, simply did not have the time which their relative importance would warrant.

Possibly somewhat obscured by the fact that nature has in large measure herself classified the forest lands of British Columbia, there has not, for instance, been sufficient attention given to the process of permanently dedicating true forest lands. At the time the service was inaugurated, the government of the day, and the forest service itself, dilated somewhat extensively upon the intentions of the administration in the permanent assignment of forest lands to timber production. It was not, however, until within the past two or three years, and even then only by reason of the necessity for providing watershed protection in the dry-belt, that concrete action for the creation of forest reserves was taken. Although these reserves were not created with the primary object of timber production directly in view, the very act of creating them has, by force, brought to the attention of the service the existing necessity for the redemption of its pledges to the broader principles of forest conservation. It may, therefore, reasonably be anticipated that the dedication process will from now on receive much greater attention.

So much for the temporary weaknesses in the Forest Service itself; it may also be pointed out that, in this province also, the governments have exemplified a most active interest in the production of revenue from timber resources, at the same time neglecting to face the urgent necessity of spending more money upon the protection and administration of a forest resource which is of the greatest possible import to the province itself, and which must also play a large part in the provision of wood supplies for the internal consumption and external trade of the entire Dominion.

It has previously been pointed out that it is the very existence of the huge stands of high grade timber in British Columbia, and the prevalence of tree species and climatic conditions which induce the rapid regeneration and growth of timber, that furnish the leverage by which that province has so successfully overcome the handicaps of distance from extensive markets. Continued prosperity of the timber industry, which is by a wide margin the most important in the province, is absolutely contingent upon the maintenance of those advantages which, as explained above, the province now enjoys.

The timber resource furnishes in great measure the revenue upon which the province depends. During the financial stringency of more recent years, there has been a tendency upon the part of the government to require some reduction in expenditures of the Forest Service. It may emphatically be stated that, if under such circumstances a government feels that there is necessity for speeding up the efficiency of a forest service which may already be in existence, it is most assuredly quite appropriate to take action toward that end. The crippling of an organization which is just getting nicely established, however, by in measure withdrawing financial support essential to its full continuance, is not only extremely discouraging to the service itself, but can in no manner be justified in sound economics. The effort should be to secure greater value for every dollar spent in forestry activities, rather than to cheapen or stifle the organization, and in this manner jeopardize the safety of a source of revenue which is basic to financial soundness of the province.

In no other part of Canada is there a more thorough appreciation of the fact that in the forested districts all efforts at settlement must be made to conform to the requirements of forest policy. It might naturally be expected that, in a province where the amount of agricultural land is relatively so limited and the amount of timber so great, there would perhaps be a tendency to sub-

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merge timber problems to the requirements of settlement. The policy of the government of British Columbia, however, has been soundly expressed in the Forest Act, and, from the standpoint of forest conservation, it may be stated that the administrations which have from time to time operated under the Act, have thoroughly recognized that the timber of British Columbia is the primary natural resource; and that, except in restricted areas of purely agricultural lands, all arrangements for settlement are made to subserve continuance of the forest.

It is also worthy of mention that in British Columbia there is evidence of much more intimate, and more co-operative relation, between the forest administration and the industries. The views of the industry are given the most serious and sympathetic consideration in the counsels of the government upon forest questions, and generally, in this regard there are signs of a most healthy condition which, if permitted to continue, must unquestionably result in the attainment of the ends which are of paramount concern to both—forest conservation.

6. THE DOMINION

It would manifestly be unfair, after such frank, even if somewhat general treatment, of some of the deficiencies of provincial forest authorities, if the Commission were to refrain from equal candour in dealing with the same questions for the Dominion. It was forcibly brought to our attention at public hearings, by persons in no way connected with the government services, that there exist in the Dominion organization some conditions which make impossible the attainment of the degree of efficiency which the forestry situation demands. Into this situation the Commission has taken occasion to enquire. Referring first, however, to the general attitude of the Dominion toward forest conservation, it may at the outset be stated, that, although the federal government is by no means making the financial provisions which the work merits, if it be proper to use as a gauge the ratio between revenue and expenditure, they have, relatively speaking, gone a very great deal further in the provision of financial means than have any of the provinces. It is not argued that the federal government has gone farther than might naturally be expected; rather, the situation is that commendation is due for accepting in large measure an obligation, which, in view of revenues derived from timber resources at its disposal, might under less statesmanlike or more selfish administration have been shirked.

The federal appropriation for the various activities carried on by its forest service is upwards of a million dollars per year. This is expended in tree-planting work on the prairies; forest protection on all timberlands in the prairie provinces, the Railway Belt of British Columbia, and the Peace River Block in the same province; timber administration and development on forest reserves throughout the same regions; silvicultural research work in nearly all provinces of Canada, the furnishing of silvicultural advice to private timber owners; co-operative work toward conduct of forest inventory in various provinces; the operation of the Forest Products Laboratories at Montreal and Vancouver—where research in all phases of forest products, and technical service for the industries, are provided; in the conduct of forestry publicity throughout the country; and miscellaneous other work relating to the foregoing.

It will therefore be perceived that the work divides itself into six main classes (1) administration, protection and development of timber lands; (2) prairie tree planting; (3) silvicultural work in eastern Canada; (4) forest inventories; (5) forest products research; and (6) publicity. With all but the first of these, there is little to be offered by way of criticism, except that the limitations of funds and staff do not permit of the operations being carried on with sufficient intensity and over sufficiently widespread areas. It is in connection with the

first of these,—treatment of timber lands—that the Commission senses a necessity for some detailed consideration.

In the preceding chapter, and elsewhere, at least some idea has been conveyed of the overlapping which exists in the federal forest authorities. A brief summary of development of the organization will give a clearer conception of present conditions and the underlying reasons therefor. As was the case in all provinces, administration of timber resources was first developed in the land-office organization. About twenty-five years ago, the first Superintendent of Forestry was appointed. He was not a technical forester, as in earlier years there were no men of this calling in Canada. He had, however, become imbued with some of the principles of forest conservation, and entertained ambitions of greatly improving forest administration in this country. In short order, he secured the services of two or three technical men. In one direction, he started the prairie tree-planting work; in another, he laid the foundations of forest reserves policy; in still another, he inaugurated the forest protection service; continuing meanwhile to act in an advisory capacity to the Department in connection with its timber problems. Although his status may have been somewhat loosely defined, his relation to the timber administrative problems, and to the development of policy in connection therewith, increased in importance. By the year 1910, the soundness of the tree-planting policy had been thoroughly proven, the forest reserves had been increased in area, the fire protection service had been developed to larger proportions, and the Superintendent of Forestry—by this time, another individual—exercised the direction of policy in timber administration.

The year 1911 witnessed, on the one hand, the passage of a much broader act for control of forest reserves—a distinct advance in forest policy—but shortly thereafter a most unfortunate change was made, in that the function of control in timber policy outside of forest reserves was withdrawn from the head of the forest service, and vested exclusively in Timber and Grazing Branch.

This retrograde action at one fell stroke entirely divested the timber-administrative organization of the services of the technical staff which had meanwhile been developed to considerable proportions in the forestry service. This unfortunate condition has continued for upwards of twelve years, during that period there has not been on the staff of the Timber Branch a single forester, and until very recently the policy has developed entirely without any technical guidance whatsoever. The bald situation is that, whereas on the one hand the government has built up in the Forestry Branch a strong organization for forest protection generally, and for timber administration on some 22 million acres of forest reserves—a service which is thoroughly characterized by a technical administration—it has, on the other hand, left to the control of the Timber Branch—a thoroughly routine administrative organization, albeit manned with thoroughly conscientious officials—the handling of the greater part of the merchantable timber on Dominion Lands in western Canada. Notwithstanding the fact that aside from affording protection, the time when technical help is most urgently required,—when the timber crop is being, or is about to be removed—for twelve years, the timber berths in Manitoba, Saskatchewan, Alberta, and in the British Columbia Railway Belt, have been exploited without the slightest attention to the truly forestry aspects of utilization.

But the situation is perhaps even more serious; even on licensed timber berths created prior to, but situated within, the forest reserves—on which areas the government is obviously committed to a policy of consistent forest regulation—the control of timber operations lies exclusively in the non-technical organization; consequently, notwithstanding an active policy for proper

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treatment of forest reserve lands, the forestry service has had absolutely no voice in the determination of timber policy on timber berths, and the latter have been operated without any regard for the requirements as to silviculture or fire protection. Time and again this lack of control has frustrated the efforts at proper management on adjacent lands within the forest reserves, in a measure nullifying the attainment of purposes for which the reserves were created, and incidentally retarding the success of the technical organization.

It has previously been explained that there is an intimate relation between forest protection and timber utilization; without adequate fire protection forest production must fail, and utilization becomes impossible; conversely, if fire protection is to be effected there must be some control over timber operations. In these circumstances, the anomaly which exists within the forest reserves is at once apparent; when it is observed, however, that precisely the same condition obtains in all other timber lands under control of the federal government in the West, it is manifest that this extreme inconsistency permeates pretty thoroughly the entire organization.

Fundamental to any successful plan of fire protection is the employment of a permanent skeleton staff throughout the year. Just as the volunteer fire brigade must, on account of its inefficiency, give way to a permanent brigade when an urban community passes the stage of infancy, so must a forest protection staff, if it is to be efficient, carry at least a skeleton organization throughout the year. While a private concern may perhaps afford to carry valuable employees over a period through which their services may not actually be required, no government service could withstand the criticism of so doing; consequently, if the skeleton staff essential to adequate fire protection is to be provided, it can only be on the assumption that work may be supplied throughout the year. This is a perfectly simple thing to do on a forest reserve, and in that behalf furnishes one of the strongest organization reasons for establishing permanent forests. However, on timber lands not so reserved, there is under the present state of affairs, no work in which the skeleton staff may be really profitably employed. It is true that some trivial employment might be devised—a mere pretence at continuity in service—but this would of itself be subversive of the object in view, in that it would entirely ruin the morals of the staff.

Looking now, at the field work of timber employees; to a greater extent their serious work is performed outside of the fire season, while during the summer they are to a greater extent employed on work of a trivial and routine nature.

It is at once apparent that solution of the difficulty lies in combining the work of the two classes. The inter-relation of the two phases of forest activity of itself clearly justifies such a deduction; but, when it is observed that it would also usefully serve to overcome the present impossibility of carrying a permanent skeleton of fire protective staff on Dominion lands, the logic of such a solution is demonstrated beyond all question. Frequently it has been argued that, even with present dual control in forest activities, consolidation of duties could be effected for these two classes of employees. Without question the physical act of so doing could be effected, but it would not accomplish the objects in view. Such a proposal entirely fails to take cognizance of the frailties of human nature; it ignores the axiom that the average man cannot properly serve two employers. In the odd case, it may under emergency be successfully done for a limited period of time, but as a general proposition it is economically unsound, it is not susceptible of practical application, and it is perverse of discipline so essential to successful operation of a fire-protective organization. It is one thing to assign to dual duties an employee whose intrinsic value to an employer lies only in the actual labour he is capable of performing; it is quite another thing, however, to place an employee, upon whose efforts timber values of

great consequence are at stake, under responsibility or obligation to perform work for any other organization. Again, while it is quite a feasible thing to provide that two field men, performing different lines of work, should be supervised by one head office, it is almost assuredly not possible to secure efficiency under a system of organization which provides that the one field man should work under the direction of two distinct supervising offices.

Before voicing the obvious conclusion which arises from the foregoing discussion, one or two other points which have a very decided bearing upon the general problem must receive attention. The importance of an intimate and thoroughly co-operative relation between the forest services and the forest industries has already been discussed. In many instances, forest services have, in their initial stages, had to contend with an inherent prejudice, if not an active opposition, upon the part of timber operators. This condition arises entirely through a difference in viewpoint. Although at times a forest service must—if it is to work toward the objects for which it exists—impose measures which may conflict with the views of the operator, if that service is to attain permanent success in public administration, it must gradually win the confidence of the industry. In earlier stages, this confidence may only take the form of a beneficent tolerance, but ultimately the service must create general confidence in its own work and in the objects thereof. The trait of unreasonableness is no more characteristic of the timber operator, than it is of any other class of hard-working human beings; and even if a forest service must start out with a viewpoint diametrically opposed to that of timber operators, there is at least this to be said: that, whereas the forest service exists for the express purpose of perpetuating the timber supplies, the forest industry depends for continued existence upon that very condition which the forest service has as its objective. Here indeed, is common ground; in the appreciation, on both sides, of that common interest, lies the means whereby the prejudices or animosities may be removed.

In view of the fact that the forest organization is the public servant, to it, falls the primary responsibility of justifying its position, and of popularizing itself by efficient and practical administration. The Commission strongly believes that in the anomalies of departmental organization previously described, lies the fundamental reason for which the industries, the public, and even other departments of the government administration, have perhaps failed in understanding, or in appreciation of, the efforts put forward by the federal forestry service. On the one hand, it is burdened with the difficult and thankless task of fire protection—in its successes, hardly noticed; in its failures, strongly condemned; on the other hand, by the retention of timber administrative functions in another organization, the very means by which the forest service must be brought into that intimate relation with the forest industry, is denied. Meanwhile, under this faulty organization, the greater part of forest utilization on Dominion lands continues without technical guidance, by which means alone better conditions for protection and for regeneration of a new stand may be brought about.

The question may well be asked whether, in the sufferance of such pronounced anomalies, the relation which should exist between head offices and field staffs is in any way comprehended? A manufactory in the East may, through the enlargement of its business, find necessity for the establishment of branch houses in western Canada; in these circumstances the field offices obviously exist for the convenience of, and transaction of business for, the headquarters in the East. In treatment of timber resources under control of the federal government, however, it must be kept clearly in mind that those resources lie in the West; therefore, rather than conceiving that the field staff

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exists merely for the convenience of a Head Office, the true conception is that the latter should be so construed and administered as to meet the requirements of the forests of western Canada. A realization of the fact that the forest is something more than a mine, from which so many thousand dollars must be extracted for revenue purposes, will assist greatly in an appreciation that, if the forest resource is to be properly managed, a service properly organized is the one and only means to that end.

The degree to which an exaggerated viewpoint as to the importance of 'current revenue' may entirely oppose the operation of fundamental economic factors is exemplified in the present methods of timber berth administration. Largely because the payment of ground rentals, and charges of such character, provides in the aggregate a considerable revenue, there are instances where timber berths which consist essentially of agricultural land are permitted to be continued from year to year, notwithstanding the fact that there are contained in the licenses requirements as to progress in utilization, and provision for withdrawal of agricultural lands upon removal of the timber. Such treatment of forested agricultural lands is not only inherently unsound, but has an effect entirely destructive to the successful application of forest policy, in that it obscures from the public view the aims of forestry; in many instances, the forest service which has no responsibility for the existing fault, and with whose policy the practice is entirely in conflict, suffers the weight of unwarranted public opprobrium.

What other conclusion is there to be reached, or what other suggestion to be made, than that the federal government should without further delay vest in its forest service those functions of the administration which have to do with the production, protection, and utilization of federal timber resources.

While it is manifestly foreign to the right or duty of the federal government to interfere in the details of forest administrative matters of the provinces which control their resources, it is strongly the view of the Commission that the federal government through its forest service should take a keen interest in all those phases of forestry work in the Dominion which assume the aspect of national consequence. As a basis for this broader field of activities it is essential that thorough consolidation of forestry functions within the forest service should be effected. In such consolidation the Commission sees an opportunity, not only for the better conduct of those matters which are the exclusive function of the federal government, but for a much broader forest policy, which involves close co-operation with all forest authorities in the country, in solution of forestry problems throughout the Dominion. The Commission has had brought to its attention that, even now, some excellent co-operative work is being carried on between the federal and provincial services, but progress in this direction is seriously hampered by anomalies consequent upon the overlapping in functions within the federal organization.

The claim is not made that by such consolidation there will be any great saving in expenditure; rather, the gain will be in greatly increased efficiency of administration. When it is considered that in Canada, under existing conditions of political division, there must be at least six forest authorities (the federal and five provincial) the necessity and opportunity which exist for standardization in legislation and administrative methods is at once obvious. In this latter direction, as in many others, the federal service can be of inestimable service to Canada and to each individual province thereof. After all, is this not the higher conception of the principles underlying Confederation?

CHAPTER VII—FOREST SURVEYS

Forest surveys of one class or another are a basic requirement of almost every phase of forestry. They are in evidence during the process of land-classification; they again appear in the demarcation of areas dedicated to forestry; they are required in the administration and protection of timber areas; they are essential to the effective application of any management plan to specific areas. There is indeed practically no forest activity in which the survey does not furnish the basis of the plans. Inasmuch as the main subjects to which surveys of the several foregoing types relate, have already been, or in ensuing chapters will be considered, it is not essential to the present discussion that they should here receive detailed treatment.

Of far greater importance, in the question with which the Commission is under the necessity of dealing, are surveys made for the purpose of stock-taking; that is to say, forest inventories. While it may be possible to frame the basis of a forest policy without detailed knowledge of the amounts of timber available, it is essential to the development, and in giving effect to that policy, that reliable estimates should be secured, upon the basis of which plans of management for sustained yield may be based. Aside from the latter, however, it is of paramount importance that, for the country as a whole, and for the various provinces or regions thereof, we should have a much more intimate knowledge than we now have as to the actual timber resources.

Of two or three outstanding facts in the forestry situation which have during the course of its enquiry been firmly impressed upon the Commission, one, most assuredly is, the glaring lack of detailed knowledge regarding the extent of timber supplies. Some of the factors contributing to this inadequacy of data have been discussed in Part I, and repetition of them is unnecessary. Very necessary, however, is the reiteration, in the strongest possible terms, of the urgent necessity for further work of this character. Every forest service in Canada, provincial or federal, only too freely admits that its knowledge of the extent of timber resources is entirely inadequate. Every such service is imbued with the strongest desires to increase its knowledge by means of forest surveys, but unfortunately each one of them works under limitations as to funds and staff which simply do not permit of the necessary progress in this branch of their work.

Any business which involves the derivation of annual revenue reaching into the millions naturally justifies, and indeed demands, that concrete knowledge should be available as to the extent to which revenue may be so extracted without impairing the capital. In Canada, we have so far pathetically failed in the application of this principle, for notwithstanding the great amount of work which has been done, our knowledge of actual timber resources of the various regions is at best imperfect.

Although the data regarding pulpwood resources and timber supplies generally, presented by the Commission in Part I of the report, is based upon the most accurate information available, it is admitted without any reservation whatsoever that in many instances the statements and records from which conclusions had of necessity to be drawn were seriously lacking in accuracy. As has been explained, however, in every line of business, when the detailed knowledge necessary to the solution of some particular problem is not sufficient to permit of accurate calculations, it is necessary to canvass the situation and to resort to the use of the most reliable estimates which can be secured.

After all, there is only one means by which an inventory of reasonable accuracy can be made, and that is by the conduct of extensive reconnaissance surveys. Inventories so far undertaken have consisted partly in the results of such surveys carried out under standardized methods; partly in the results of

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more intensive cruises performed on specific areas by forest services or timber owners; and, partly in the application of average figures secured by the foregoing means to more remote areas upon which there is a general knowledge of timber conditions, but in which no actual surveys, even of the reconnaissance type, have been undertaken. Indeed, it has at times been necessary to apply a general knowledge of forest conditions to considerable tracts which have not even been explored. By reason of the latter aspect in some forest inventories that have been made, people have at times been inclined to dispute the wisdom of using inventory figures which have their basis in such crude methods of determination. It may, however, be pointed out that, even without exploratory surveys, the general character of forest growth on a remote area may in general terms be determined, by reason of the fact that the extent and character of forest growth is definitely controlled by climatological factors, by elevation, by latitude and by topography. The application of these fundamental factors in forest geography, permits of reasonable determination of the conditions probably existing on remote areas.

Thoroughly conceding the inaccuracies of inventories of this character, however, it may for the reasons explained be taken that such inventories are very far superior to no inventories at all. The importance of using even imperfect information of this character has been thoroughly demonstrated in past years. Until comparatively recently the average person in Quebec, Ontario, or even some of the other provinces, has entertained the idea that the unexplored north country contained vast stretches of excellent timber, although under conditions existing it was not susceptible of commercial exploitation; many people even yet are deluded by a belief of this character. For those, however, who have taken occasion to enquire or to consult the various reports from time to time issued, such delusions have been entirely dissipated; that is to say, the placing of estimates in such form that they may be accessible to the public serves a very useful and necessary purpose in informing the people as to the status of our resources.

Although these inventories have in greater or lesser degree brought to the attention of the people the necessity for forest conservation, we must not labour under the impression that further and more intensive work of this character is not required. As previously intimated, for the entire Dominion it is of utmost importance that we should have a good general knowledge of the amount of timber we have, in order that we may apply to the business administration of that timber the principles and methods which will permit of its continuance. Moreover, it is necessary that by surveys and investigations we should have more intimate knowledge as to the losses which have been sustained through natural or accidental causes, and that we should secure much further knowledge as to the rates of growth which apply under the varying conditions in different parts of the country.

There has perhaps been the tendency, even in districts where only extensive reconnaissance has been carried out, to simply leave it at that. In the press of other work, for some years at least, there may be a disposition to forego the more intensive surveys. The Commission, however, strongly expresses the view that, for a great many years to come, it will in various parts of Canada be necessary to have carried out, on a consistent year-to-year plan, both extensive and intensive forest surveys, in order that we may obtain more accurate data as to our resources, and thus be able to make practical application of such information in timber administration.

A summary of the work which has so far been done is of interest. In Canada, the extensive examination of forest lands was first put into general effect by the federal forestry service. During the course of fifteen years, extensive tracts of timber lands in Western Canada were subjected to extensive

forest survey. In Manitoba, a very material part of the timbered area of the province has been surveyed by extensive methods, and type maps prepared. Similarly, in Saskatchewan the greater part of the accessible timber area lying to the north of the agricultural belt, and also some of the hinterland, have been examined and mapped. In Alberta, the greater part of the Rocky Mountain and Foothill areas have been examined extensively and mapped, and in more recent years, the preliminary work has been supplemented by much more intensive surveys. Similarly, the Lesser Slave, Peace River and Lac la Biche areas have been examined and mapped. Finally, in the Railway Belt of British Columbia, a great deal of extensive reconnaissance has been performed, and, on many of the forest reserves created as a result of this survey work, more intensive surveys and maps have been made.

It may here be stated, that much of the extensive reconnaissance work carried on by the federal forest service in years past served as an excellent basis in land-classification. At the time it was undertaken, no general classification work of this character was being carried on by any service, upon the basis of which the permanent assignment of forest lands could be made. It was several years later that, resulting from the activities for soldier settlement, the land-classification work, as a specialized activity, was devised and put into effect by the Topographical Surveys Branch of the federal organization.

It may with accuracy be stated, that the federal forest service has, year in and year out, given more serious attention to this very important question of surveys than has been the case elsewhere in Canada. Such surveys have not only served the purposes of classification and forest inventory; they have formed the very essential basis for the many activities consequent upon forest reserve administration.

In 1909 the Province of Nova Scotia financed a rapid forest survey conducted by technical foresters, and the results were later published by the Commission of Conservation; as so frequently happens, however, where no service which can make practical application of the results of such work exists, the report was placed upon the shelf, and since that time its dusty pages have been used only for casual reference by the government or by others, at any time some information regarding the forests of this province was required.

Over a period of several years, the Conservation Commission, in co-operation with the British Columbia Forest Branch, carried on a forest inventory in that province. The report of this survey indicates probably one of the most complete attempts at inventory yet undertaken in Canada. The work was very extensive in character, but use was made of all of the most reliable data extant. Since then a limited amount of survey work has been carried on in that province, but more generally, it has consisted in the examination of specific areas, aimed at timber sales, etc., rather than for the purpose of general stock-taking. Extreme caution is required to see that the very existence of this valuable report, extensively used as it is, by both the forest service and the industry, does not deter the authorities of that province from the pursuance of further forest survey work, especially designed and carried out for the purpose of amplifying knowledge as to the forest conditions generally, and to offer the basis for various phases of forestry work.

Before its abolition about three years ago, the Conservation Commission entered into a co-operative arrangement with the Ontario Government, with the object of conducting a forest inventory in that province. Notwithstanding the many years through which the forests of that province had been exploited, there was not available any consistent or extensive information as to the forest resources, the forest service itself rarely having undertaken survey work of this character. The work, in these circumstances begun under the auspices of the

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now defunct Conservation Commission, has since been carried on by co-operation between the federal and provincial forest services. It is not yet completed, but much valuable information has been secured, and before very long it should be possible to present to the governments, to the public, and to the industries, a report on Ontario resources, corresponding favourably with that already in existence for British Columbia.

One fortunate result of the very carrying out of this kind of work has been the inauguration, by the Ontario Service, of a system of forest surveys, one district at a time, for the purpose of mapping the timber resources in the various regions. It is upon the basis of such work that the formulation of management plans may be founded; therefore, money expended in this direction, in addition to serving meanwhile the requirements of administration and protection, brings forward the date when Ontario may make application of such of the principles of forestry as economic conditions may permit.

In Quebec, and so far as unalienated forest lands are concerned, the program of forest survey work lags behind that of other provinces. It is not to be inferred that no such work has been undertaken by the forest service; but rather, that in its efforts to bring about the survey of timber lands licensed to pulp companies and to lumber companies, by the holders thereof, the forest service itself has not gone nearly so far as it might have done, in the examination of timber lands controlled by the province. Whether or not it be by co-operative work between the federal and provincial services, it is of great importance that a general survey of forest conditions in Quebec be undertaken, in order that more accurate knowledge of the timber resources may by this means be made available. Surveys carried out exclusively by the provincial forest service are also necessary to furnish the basis of more accurate and more consistent work in other forest activities.

Reference has already been made to the consistent year-to-year survey which has been undertaken by the forest service of New Brunswick. For seven years this work has steadily progressed, until now over 60 per cent of the Crown land areas has been examined and mapped. For that province, it is not so necessary to urge the necessity of survey work as to point to the desirability of putting the facts secured from such surveys to practical use in the forest policy.

Generally, for both federal and provincial governments, the Commission is impelled by the dearth of reliable data regarding forest resources to reiterate its view that, owing to the fundamental purposes which forest surveys serve, a much more consistent, a far more widespread, and very much more general plan of forest survey work should be instituted; that this may be made possible, it is essential that more adequate funds should be provided for this specific purpose.

CHAPTER VIII—FOREST PROTECTION

The work of forest protection involves the control of all factors which may operate to destroy the value of timber or of timber land. Such definition would obviously include the protection of forest areas against losses through theft and similar causes. The latter, however, are susceptible of thorough control through the operation and enforcement of timber regulations, so that it is unnecessary to treat with them further. Discussion will therefore be confined to losses through accidental or natural causes which, by their nature and extent, require for their solution the provision of special control measures.

PROTECTION FROM INSECTS AND FUNGI

In Part I of the report repeated references have been made to the losses sustained in the forest as a result of the depredations of insects. For a great many years in this country, but little attention was given to the very important

subject of forest entomology. As a matter of fact, although there have undoubtedly been insect epidemics at various periods during the entire course of historical times, these very evidently have not been of such serious or widespread consequence as to demand and secure the more careful treatment which, as a result of development of science, is now made possible.

Although undoubtedly forest insects have operated to destroy timber from earliest times, it is more recently, and it is as a result of the deteriorated conditions to which our forests have come, that insect manifestations have assumed more dangerous aspects. A few cases in point are, the attacks of the spruce budworm in Quebec, New Brunswick and Ontario; the operation of the larch sawfly, which some thirty-five years ago practically wiped out the stand of merchantable tamarac in Canada; and finally, the attacks of various dendroctonus bark beetles in the forests of British Columbia.

It is not proposed to enter into any detailed discussion of these outbreaks, for they have been the subject of careful treatment in various entomological reports which have been published. It is, however, appropriate that brief reference be made to the conditions which have given rise to one or two of these attacks. Taking, therefore, the spruce budworm as an example,—this insect during the past ten years has wrought damage to the spruce-balsam stand of eastern Canada amounting perhaps to 150 million cords. The name which has been given the insect unfortunately conveys the impression that it operates to a greater extent on spruce; this, however, is not the case, as balsam is the tree more favoured as a food by this very active agent of destruction.

For a great many years the forests of New Brunswick and Quebec have been very extensively operated for spruce. Until about ten or fifteen years ago, however, the operations were in large measure confined to the taking out of larger spruce timber. With the development of the pulp industry, however, and also the continued reduction in the size of saw-logs, an incentive toward the use of smaller timber was given, so that over a given area the tendency has undoubtedly been to utilize even a greater proportion of spruce. Balsam never has been, and probably never will be, used to any great extent for lumber, as it has certain physical defects which render it an inferior wood for this purpose. Within the past few years, however, it has been thoroughly demonstrated that, so far as fibre characteristics are concerned, balsam is quite susceptible of successful use in pulp manufacture. Indeed in the province of New Brunswick it has, during the past few years, been used for this purpose to about the same extent as spruce.

Preceding the use of balsam for pulpwood, however, there was a long period through which practically the exclusive use of spruce for pulp obtained, and, as between the use of spruce and balsam, the same thing may be said of lumbering operations. Under these circumstances the proportion of balsam in the coniferous stands of New Brunswick and Quebec rapidly increased, and in this manner conditions in the forest became propitious for the attack of an insect which preys primarily upon the balsam. Although the aggregate of the damage which occurred in the province of Quebec was very much larger than in New Brunswick, in the latter province the great bulk of the balsam was destroyed, and, owing to the severity of the attack, the insect spread to spruce. Although the epidemic has now spent itself, the damage which has been wrought is nothing short of appalling, and, in New Brunswick at least, it has been the means of bringing about a very serious situation in the timber supplies available.

Perhaps there is no better illustration than the budworm epidemic, as to what may happen when, through continued extravagant utilization of the more valuable species, and the leaving of others which apparently have no value, the natural balance of the forest conditions developed by nature is seriously

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disturbed. Although forest insects may be found operating in any healthy stand of timber growing under natural conditions, it is to a great extent due to the upsetting of, or interference with, such natural conditions, that outbreaks of this character occur. In other words, the methods of utilization adopted in this country have been such as to disturb the natural balance, and thereby have rendered possible the development of various insects to abnormal proportions; our methods have predisposed the forest to the attacks of such insects.

In addition to utilization, however, there are several conditions which have given rise to increase in the severity and frequency of insect epidemics. To a greater extent forest insects first attack trees whose vitality has been weakened. There are, indeed, some insects whose operations are confined entirely to dead timber. The dendroctonus bark beetles more or less confine their attacks to living trees, but even here it is the case that the epidemic has its source in attacks first made on trees of reduced vitality. Not only have utilization methods brought about such weakening in the timber stand, but also, as a result of forest fires much unfortunate damage has been done, not only in the value of timber lost, but in the weakening of the timber which remains.

Turning now to the question of fungus diseases, somewhat the same process of reasoning may be applied. It is not so generally known as it might and should be, that all rot in wood is brought about by the activities of various fungus plants. It matters not whether the wood consists of a tree, a fence post, a railway tie, a foundation sill, a factory floor, or whether it be simply a board lying in a damp situation upon a cellar floor—all rot that takes place in wood, results from the attacks of fungi, the development of which is brought about by the use of wood in an unpreserved condition, and in situations favourable to the development of these parasitic plants.

At the present time in the eastern provinces, and particularly on some of the pulpwood limits, considerable concern is now felt for the safety of the remaining balsam stand, owing to the widespread attack of fungus which destroys the heart of balsam trees. The rapid spread of this disease, and the intensity of its attack, may in large measure be attributed to the fact that until recently practically all balsam was left in the forest, until its proportion as a constituent of the forest became too great. By this means, the very food upon which this particular fungus found the optimum conditions for development was made available in concentrated quantities. Another instance of the same problem, exists in the extensive rot to which various species of poplar are subject. So long as this tree is confined to mixed stands where its numerical proportion is reasonable, the damage brought about by the fungi which attack it is not considerable. Wherever, however, poplar is found over extensive areas, in almost pure stands, it is at once patent to the most casual observer that by far the greater part of the trees are affected by a very destructive heart rot. Here again it may be stated, that the abnormal increase in these fungus attacks is brought about by the disturbance, accidental or otherwise, of natural timber conditions. In all too frequent instances, as a result of fire, the reproduction has consisted essentially in poplar growth, and in this manner almost pure stands of poplar have taken possession of areas previously occupied by several species. It is in such conditions as these, that the damage to poplar by fungi to which it is particularly susceptible is brought about.

It will therefore be perceived that there is a very intimate and very serious inter-relation in the attacks of insects and fungi, and that both of these are in large measure consequent upon faulty methods of utilization, and upon the occurrence of fires. We have, therefore, the three great agents in destruction of the forest, fire, insects and fungus decay, all of which operate to very seriously deplete the timber resources. There is, unfortunately, an insidious sequence

in the attacks of these forest enemies. First of all, due more frequently to human carelessness, fire occurs which kills outright much of the timber, and seriously damages or reduces the vitality of that which remains; divers insects attack both dead and dying trees causing great destruction; finally, by reason of the injuries to trees, caused by fire and insects, innumerable avenues are opened up for the ingress to the wood tissue of the spores of fungus plants.

With the subject of forest entomology and forest pathology, the Commission is manifestly not in a position to deal at any length. As previously stated, it is only comparatively recently that scientific study has been applied to those phases of forest protection, and it must naturally rest with the more technical bodies to develop the methods and means by which the severity of attacks of this kind may be moderated, and the forest rendered, so far as possible, impervious to the outbreaks of the unfortunate epidemics to which our forest resources have during the past generation been subject. In this regard, however, there is one thing which it is obviously the duty of the Commission to strongly impress upon the governments and upon the people, namely, that if any methods to control these insects and fungus attacks are to be found, they must naturally involve in some degree the modification of present methods in utilization of timber. Inasmuch as the troubles have been caused by lack of protection and imperfect methods of utilization, it is hardly reasonable to expect that any antidote or any method of treatment may be discovered which does not involve the modification of at least some phases in the methods now prevalent. Just as a physician, in prescribing some drug with which he may hope to allay the severity of some disease which has attacked the human body, must also prescribe strict dietetic requirements in order that the medicinal application may be permitted to have its proper effect, so must we be prepared to assist the forest entomologist and the forest pathologist in their efforts to devise means of control by giving reasonable heed to the requirements which they may place upon us in the improvement of methods under which the forest is exploited.

With this somewhat brief discussion of the problems which are, as a matter of fact, of outstanding importance in forestry development, we now pass to discussion of one of the most evident, one of the most widespread, causes of forest depletion—the forest fire, which agent is responsible, not only for manifold direct losses, but, as previously explained, is the primary cause of secondary and multifarious attacks by other agents.

FOREST FIRE PROTECTION

Owing to the fact that any plan of forest management must utterly fail, if adequate fire protection be not afforded; due to the fact that the damage caused by fire is about the first thing which strikes the eye upon the inspection of forest areas in almost any part of Canada, and to the deep-seated feeling that *something* must be done to control them; and due to the fact that appropriations provided for forest administration have in this country been so limited;—practically the first problem attacked by any forest organization on this continent, upon its inception, is that of fire protection. In fact, in the public mind the term "forestry" is to a large extent synonymous with "forest protection," although the latter is but a small part of the former, and should not be construed as being the object of forest management; the public therefore expects expenditures to be in the main devoted to fire protection. As has been repeatedly stated, fire protection is a means to an end.

Moreover, the fire protection problem is not in itself susceptible of complete solution until some questions of forest utilization have first been dealt with. What would be the real value of the most modern city fire-fighting organization, if citizens were allowed to follow entirely their own inclinations in

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the construction of buildings, or if they were permitted to maintain about such buildings conditions which are inimical to public safety? The statement is ventured that as much, if not actually more, has been accomplished in municipal fire protection, in the forestalling of conflagrations, by the stringent restrictions (imposed directly, by municipal fire laws, and indirectly, by insurance underwriters) as to buildings, and the manner in which the latter shall be constructed, heated, wired, maintained, etc., as by the development of fire brigades furnished with the complicated mechanical fire-fighting apparatus now to be found in every up-to-date city.

Nevertheless by reason of the serious fire losses which are sustained, and by reason of the extent to which they operate in the depletion of the forest resources, fire protection is undoubtedly the problem to which the greatest amount of time and effort must be given, and upon which the larger portion of funds available must be expended. Although there has during the course of the past ten or more years, been notable development in organization for fire protection, made possible very largely by increased appropriations provided by various governments for this purpose, the Commission considers one thing as being perfectly obvious, namely, that until the problem of fire protection is to a much more satisfactory extent solved, the efforts directed at, and the money to be expended upon, forest protection must inevitably be increased.

There are two things in Canada to-day which make the attainment of success in fire protection difficult: (a) careless exploitation, and (b) inadequate organization for fire prevention and control. Insofar as the first of these may, within the limits of economic conditions, be improved, even at greater final cost of the wood product, the solution of the fire protection problem will to that extent be simplified; as for the second, on fire protection itself, also, there must be greater direct expenditure both for preventive operations, and for more adequate measures of control.

Frequently one encounters an expression of the opinion: "the more money we spend in fire protection, the more fires we seem to have." The more accurate statement in the premises is: "the more we spend in fire protection, and the further we go in organization for that purpose, the more fires we locate and fight which formerly would not have received any attention whatsoever, and the more the timber that is saved to the country". Frequently what is taken to cite instances where, after the expenditure of the large sums in fire-fighting, and where as the result of adverse climatic conditions, fires considered to have been brought under control have broken away again, and spread over large areas; and to express the opinion that such cases are clear evidence that "nothing can be done in the control of forest fires, until the rain comes." In such hasty conclusions, however, the fact is more frequently entirely overlooked that, even when fires that have apparently been under temporary control do break out again and run over considerable additional areas, their possible aggregate area has been reduced by at least the area over which the fire could have spread during the period of time for which it was temporarily held in subjection; indeed, owing to the accumulative proclivities of fires, the area saved is generally much greater. Moreover, it may seriously be stated that the public impression as to what can be done in the control of serious forest fire is more frequently reached in rather glaring ignorance of the results which can be, and which have frequently been, attained by those forest organizations that have given proper attention to the detailed study of modern methods of fire prevention, detection, and control. Nothing can be more disconcerting to a foreman in charge of the fire job, than the expression, by some member of his crew, that "nothing can be done," when perhaps at the very moment when he vents such an opinion, there may be in operation some work definitely leading to successful control. Such expressions, however, are by no means confined to persons working on the fire line,—more

often than not, desiring to get away from it—they constitute one of the most serious psychological processes of the public mind with which fire protection organizations have to contend.

It would be much more appropriate, much more constructive and manifestly more helpful, if governments and the public would recognize at the start that, beset with difficulties though it may be, the forest fire problem is susceptible of solution; and that its solution depends in larger measure upon public support and upon government interest in development of protection organizations, than it does on the inherent difficulties of the problem itself. If in the year 1914, the people of Canada had been faced with the statement that during the course of the Great War they would be called upon to expend the sum of two or three billion dollars, very naturally there would have been many to say that it simply could not be done. Canada's gross effort during the great war was not exclusively the result of an outburst of patriotism in 1914; rather it was the result of the continuous development of feeling on the part of her people that upon the result of the great struggle in Europe depended the continuance of her position as a member of the Great Commonwealth of Nations. Little was it realized in 1914, how deeply the tumultuous conditions in Europe struck at the foundations of our Empire connections. During the course of those trying years, however, and the more heavy the burden of the undertaking became, the more insistent became public sentiment and public demand for continuance of the great effort until success should be attained. With such sentiments—poorly expressed though they may be—Canada was imbued, in a problem that might well have struck terror to her people.

In the forest fire situation lies a condition which, so far as our material wealth is concerned indeed strikes at the roots of our prosperity. What is really needed in the present dilemma is a thorough awakening upon the part of the people, and upon the part of the administrations put into power by people of this country, to the fact that if we are to continue for very much longer as a supplier of softwood products to the needs of the world, we are simply compelled to approach the forest fire problem in a very much more intensive and more constructive manner, even though this may involve saddling ourselves with increased expenditures, which are so necessary to adequate solution of the forest fire problem.

FOREST FIRE HAZARDS

The importance of forest fire protection is something which, although not yet fully apprehended, is more and more enforcing itself upon the attention of the people and of the governments in Canada. This results from the widespread damage which has in nearly every region been experienced, and also from the heavy losses, both in life and property, which have at times been sustained by sufferers in forested tracts. When it is stated that 90 per cent of all the forest fires occurring in this country are caused by human agencies, and are therefore preventable, it is at once obvious that vigorous steps are required to improve our methods of fire prevention. Entirely aside from the concrete damage actually sustained, forest fires so militate against the practice of forestry that no proper management can be instituted until satisfactory methods of fire protection have been devised and applied. The danger of total loss through forest fire, to which various tracts of timber are subject, constitutes the greatest single deterrent to the practice of forest management, not only by the state, but by private individuals or corporations on whom must depend to a very considerable extent continuous production of timber on forest lands.

The experience of Canada on this important subject is not by any means unique; on the contrary, it pretty well conforms to the general laws of evolution in forest policy as evidenced in the development of civilized nations throughout

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the world. In this country we are, after all, still passing through the pioneer stage; settlement is still advancing step by step, into the wilderness, the land being claimed for agriculture by the use of axe and fire. For several generations the fight to win homes from the forest has been waged and, as explained elsewhere, there still remains in the minds of certain elements in the community what may be perhaps an inherited subconscious antagonism to the forest. The unfortunate feature of the situation just described is that this attitude is evidenced more particularly in that part of the population which is in close proximity to the forest, and which is hence in a position, either through malicious intention or through carelessness, to do the greatest damage to the forest. In treatment of this element of the national forest fire hazard there lies a problem in education which merits the most serious consideration and the most conscientious endeavour of every organization and every individual whose effort may be brought to bear in its solution. If there is to be any reasonable amount of timber left in Canada at all, we must do far more than await the serious consequences of catastrophes to impress upon the people the necessity for exercising adequate precautions. Truly, we must anticipate the occurrence of holocausts, and by the application of preventive measures we must render them impossible.

From the standpoint of forest conservation, forest protection is pure insurance against loss through fire of capital stock in soil and timber. If, therefore, the "premiums" to be paid for such insurance are to be kept within reasonable limits, it is essential that they should be applied as far as possible in providing for fire protection on lands which are to be assigned permanently to timber production. The fundamental necessity for statutory dedication of true forest lands has already been dealt with in detail; suffice it to note here, that in fire protection just as much as in any other phase of forestry the situation calls for permanent forest reservation, in order that proper methods of and facilities for protection may be installed. On such areas, there should be concentrated the great bulk of expenditure in money and in effort; after all, it is on these areas that we propose at least some more rational plan of forestry than has heretofore been practised in Canada.

There is, after all, some limit to the funds which can be provided for fire protection. Relatively speaking, our population is small, and neither it nor the population which may be expected within the next generation could support the enormous expenditures which would be required to provide adequate fire protection on the entire forest area. While no part of the forest area can justifiably be entirely neglected, it is therefore quite logical to apply the greater part of our fire protection expenditures to areas of greater timber value. The term "timber value" is not restricted, however, to the existence of heavy stands of timber presently merchantable. An adolescent stand of timber situated within reasonable proximity to forest industries represents much greater value than does a magnificent stand located in some remote quarter of the hinterland. While it is true that by reason of development in transportation facilities, the latter may in years to come become more valuable, the adolescent stand of timber in the more accessible location should manifestly be the object of the more serious effort in forest protection.

During the course of its enquiry the Commission has had brought to its attention the fact that the various authorities in this country are now giving more careful consideration to this principle of proper regional application of public funds appropriated for forest protection work. Although it is urged that in no case should forested areas be left entirely without some form of protection, even if it be restricted to prevention work, the Commission nevertheless strongly endorses, as an economic necessity, the principle that the greater part of the funds available should be expended in the protection of both mature timber and young growth in regions of relative accessibility.

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It has previously been stated that at least 90 per cent of the forest fires are caused by human agencies. Before proceeding further with our discussion, it will be helpful to consider the relative importance of these various agents. Over a five year period, 1918-1922, there occurred in Canada an average of some 5,800 forest fires per year. Over one-third of these exceeded ten acres before being extinguished. As regards the causes, it is an unfortunate feature of the situation in Canada that for about one-quarter of the fires which occur it is impossible to determine the origin; setting aside those for which the cause is unknown, however, the various factors in the cause of fires, and the relative position attributed to them, is as follows:—

Cause	Percentage occurrence
Railways.....	26
Campers.....	24
Settlers burning slash.....	22
Lightning.....	10
Lumbering.....	9
Known causes not specified.....	6
Incendiary.....	3
Total.....	100

(a) RAILWAYS

In former years very large numbers of fires, and much of the timber damage incurred, were attributed to the operation of railways. During the past twelve years, however, by reason of excellent regulations furnished through the aegis of the Board of Railway Commissioners, the railway fire situation has been vastly improved. To-day, the railways, instead of being one of the most important factors in fire damage, as they formerly were, are far less destructive than are some of the other factors. Although railways are found to head the list in the table above, it must be pointed out that by reason of the fixed nature of the hazard, and the special protective measures which are taken to combat it, there is a far larger percentage of incipient fires along railway lines which are successfully extinguished before any appreciable damage is done. Therefore, large though the total number of railway fires may be, the total damage therefrom does not in any way approach the destruction wrought by fires from other causes.

(b) CAMPERS, HUNTERS, FISHERMEN, ETC.

Campers' fires—which class includes neglected camp-fires, travellers' and hunters' fires, etc.—are second in the above list, although in point of damage they stand pre-eminently at the top. Unfortunately, the public at large has not the slightest comprehension as to the number of fires caused from this source or of the untold damage resulting from inexperience or utter carelessness of this class of forest user. By reason of the fact that the hazard obtaining in this class is not a fixed one, as in the case of railways, but is, rather, subject to the most erratic fluctuations both in degree and location, it is one for which successful preventive and control measures require the most careful, the most intensive, the most mobile, and the most alert protective organization which can be devised.

While fires from this source have always offered the greatest difficulties in forest protection work, it is scarcely realized, perhaps, what an important factor the advent of such a necessary and useful acquisition as the automobile has played in increasing the fires in this category. Formerly, relatively a small proportion of the population could make use of the forest areas, and when they did so there was a certain amount of stability and regularity in their movements while in the forest; they were relatively easy to keep track of.

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With the introduction of the automobile, however, there came the means by which a much larger proportion of the people might pay fleeting visits to timbered regions, stopping at one point or another for very brief intervals, and in almost every case, if not actually making use of a camp fire, at least almost always having resort to the use of matches for smoking, for smudges, or for sundry other purposes which provide opportunity for carelessness, and a liability to forest fires.

While, on the one hand, the number and intensity of fires caused by other agents may have remained more or less stationary, or in some cases may even have decreased, notwithstanding the great increase in the amount and efficiency of propaganda directed toward the prevention of fires due to campers, etc., their numbers still increase. Whereas in bygone years, the average citizen gave little thought to visiting the woods; in these days, few are those who, if they can in any way manage it, do not get back into the timbered areas,—for fishing, hunting, picnicking, or, even just to get there! Something assuredly must be done to stem the tide of destruction that the ignorance or carelessness exhibited by these people causes. It is a most unfortunate feature of the situation that many of them do not even realize that forest fires have the slightest effect upon their own position; they apparently ignore, as something entirely extraneous to their own life and contributing in no manner to their well-being, the success of forest industries which stake their future upon a continuity in wood supplies.

(c) SETTLEMENT

It is almost unnecessary to again refer to the vital part our methods of settlement may play either in forest protection or forest destruction. As explained in Chapter III, there are many instances in which indiscriminate and unguided settlement have resulted, not only in improper selection of lands, but also in the destruction of adjacent timber resources. Therefore, in so far as it may be possible for the governments of the day to definitely control settlement in forested regions, and to apply to such settlement activities those provisions which will ensure safety to the timber stand, a very important and far-reaching contribution will be made to the preservation of the forest wealth of this country.

(d) SETTLERS' AND LOGGING SLASH

Fire hazard may be appropriately divided into two main classes; the invisible and the visible. As typical of the "invisible" hazard we have campers, travellers, hunters, and so on,—including all transient or itinerant forest users; any one of these may at a dangerous time unconsciously or carelessly commit, or omit, some act and thereby cause a forest fire. On the other hand, typifying the "visible" hazard, we have settlers' slash, or logging slash, either one of which very greatly multiplies the danger of the invisible hazard. Settlers' slash fires, that is, fires resulting from land-clearing operations, account for over one-fifth of the forest fires in Canada; there is not a province where in greater or lesser degree this serious hazard does not apply. It may not be within the scope of forest service activities to determine the relative merits and demerits of clearing land by the use of fire, more particularly broadcast fires; in some cases there are arguments that it is not nearly so effective as it is believed to be; but again, in other cases, there is no other known practical method of getting rid of the huge accumulations of slash consequent upon land-clearing operations. Be that as it may, so long as undisposed-of slash remains on areas within or contiguous to timber land, there is a very evident hazard, which must in some manner be met.

In the same category is slash resulting from road construction. Too frequently, large sums of money are expended in the building of expensive roads traversing forest districts, without making provision for the disposal of slash and debris which is not only unsightly, but, subject as roads are to constant travel, creates a menace that in many instances has given rise to serious conflagrations.

So far as settlers' slash is concerned, there is an obvious necessity to get it off the land in some manner; it cannot be simply moved to adjacent areas, so almost invariably it is burned. So long as the fire is kept within control upon his own land, any damage which may be occasioned thereto is a matter which concerns only the settler. On the other hand, with logging slash, aside from reducing fire danger, there are few who conceive of any necessity for getting the slash out of the way; in other words, the incentive which exists in land-clearing to complete the job, in order that the land may be properly used in agriculture, is lacking. Setting aside, for the moment, any purposes other than fire prevention which might be served by the disposal of logging slash, let us first deal with the latter on the basis of its utility as a fire protection measure.

To begin with, there are those who, being fundamentally opposed to slash disposal, start off with the dogmatic statement that the process accomplishes nothing even in fire prevention. While many would consider it unnecessary to argue that point, expressions of such opinions are so prevalent that the issue cannot be avoided. As against such views it should be only necessary to ask: if slash disposal accomplishes nothing, why does practically any person engaged in forest activities find it to his interest, regardless of any legal requirements to clean up the slash around his camps or other works? Is it *only* for the purpose of preventing fire from spreading from his camps to the timber, or is it also a measure of protection to the camp itself? Whichever it may be, or if it be *both*, there is the clear admission of the fact that slash is a very dangerous factor in the spread of fire—unless the claim be made that such clearings are made for the purpose of beautifying the landscape!

Strange though it may appear, the Commission has had arguments placed before it—also, it need hardly be said, by those fundamentally opposed to slash disposal—that the leaving of slash in the woods is not only in no way opposed to principles of fire prevention, but that it is actually beneficial to the area upon which it is allowed to remain by furnishing fertilizer to the soil. One would perhaps be equally justified in taking the stand that reaping machinery used on the farms should be so constructed that it would remove only the head or the top few inches of the grain stalks, in order that the straw might be left to be ploughed in for fertilizer. It is not argued that wood in a state of disintegration does not add humus to the soil; rather, that the forest by the natural decay of roots, leaves, small twigs and herbaceous growth, is abundantly supplied with the requisites for the accumulation of humus without adding thereto those portions of the tree which of all its parts take the longest time to decay. Such an argument is obviously futile, and manifestly is advanced not as a concrete proposal for the betterment of soil conditions within the forest, but as an expedient to controvert any utility that may lie in the practice of brush disposal in other directions.

Still others argue that in the natural forest there is an accumulation of brush and other debris resulting from natural causes such as the death of trees. This is in many cases quite true, particularly in forests that are over-mature; in fact the farther the timber is beyond maturity, the more heavy the accumulation of this natural debris. But can it be argued that the latter condition entails no danger? Nothing is to be gained by citing the fact that before the advent of man the forests grew, the old trees died, they were replaced by young growth,

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with a certain amount of debris at all times present,—and fires were then infrequent; and consequently, natural debris is not dangerous. The hypothesis accurately represents conditions, but the conclusion is unsound, in that it fails in recognizing the importance of the injection of man into the situation; it fails in appreciation of the “invisible” hazard to which forests are in modern times subjected. Moreover, as will in the succeeding chapter be pointed out, in the practice of allowing forests to become over-mature, there is an utter lack in observance of the principles of conservation; the time has most certainly passed when we may justifiably base arguments for present-day methods upon conditions which existed in the forests of by-gone years. Assuming that in our program of conservation, there are removed those over-mature forests which do exhibit tendency towards unfavourable fire conditions, can it be argued that in the near-mature or mature forest the debris conditions may in any way be compared to the slash conditions which are the inevitable result of logging operations?

It must surely be admitted that the presence of logging slash without any question whatsoever constitutes a serious hazard. While it may be argued that the slash cannot in itself cause fire; that the presence of an agent to kindle fire is essential to the occurrence of such a misfortune; the bald fact remains, that if a fire does start in close proximity to slash, the latter is one of the quickest, most intensive, and most certain means by which it may spread to valuable timber which may be adjacent thereto. If exception be taken to the veracity of the last statement, it is only necessary to consider character of forest fires, and experience with them throughout the Dominion. In various parts of the country it is a relatively simple matter to find evidence of fires which, although not in all cases occurring before the advent of man, most certainly preceded the accumulation of slash from logging operations. The date and the extent of these fires is written in the fire-scars found upon trees which survived. In such cases, one of the remarkable features revealed is the relatively large number of trees which did so survive, clearly indicative of the fact that the fire was not intense. To all practical purposes, it is only the ground fire that trees can survive. Even to-day, when fires occur in mature natural timber, or even in the over-mature stands, which have in no way been affected by the accumulation of logging slash, the intensity of the fire is not ordinarily great; indeed, very frequently it runs only on the ground. With the foregoing conditions, compare the effects and intensity of present-day fires, more frequently started in or near logging slash; once the fire hits the slashing it does not even require a chance wind to carry it into the crowns of resinous trees; the slash in itself provides the means by which it does so.

It is absolutely the experience of fire-fighting organizations that the fire which occurs in or reaches logging slash is the one which almost invariably gets into the crowns of the trees, where it requires only a wind—the latter frequently caused by atmospheric changes brought about by the fire itself—to carry it through the crowns, over wide stretches of timbered country, killing every vestige of timber and other vegetable growth which lies in its path, and leaving in its wake only charred rampikes which in short order become the prey of wood-boring insects that complete the work of destruction, leaving useless an area that previously was capable of contributing the raw materials of industries that otherwise would thrive.

Let us face the issue; let us at least frankly admit what is obviously, and what has absolutely been demonstrated by experience to be, an incontrovertible fact—that logging slash, road construction slash, settlers' slash, any conceivable kind of slash, in, adjacent, or within any reasonable proximity to timber lands which have present or future value, is a hazard which plays a most important part in our forest protection problem, both in the phases of prevention and

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control. Altogether aside from what we may be willing or able to do to counteract the condition, if we cannot admit that slash constitutes a serious hazard, we must utterly deny to our own dearly bought experience that which is its due; we must ignore the experience of forest organizations and forest users throughout the world.

For those who truly realize and admit the seriousness of the slash problem, it is in the decision as to what can be done, what should be done, and how it will be done, that the main differences of opinion lie. The two primary arguments advanced against brush disposal are the cost, and the danger which some methods of brush disposal may entail in the forest.

Before proceeding further with the argument, we may indulge in homely analogy, which is nevertheless very much apropos, and may conduce to a more impartial consideration of the slash problem. After having moved into a new house; having unpacked his effects in the kitchen, in the back shed, or upon the back stoop, having in the process relegated to the back yard the waste paper, excelsior and other miscellaneous riff-raff incidental to such operation, it finally dawns upon the performer that there has accumulated in the said yard a fire hazard of somewhat serious proportions. In so doing, he may or may not have broken the law; likewise, he may or may not be very seriously concerned with that phase of the question. He does realize, however, that the hazard is there; and, moreover, although he may be completely convinced that the rubbish will not of itself take fire, his fear is in no manner assuaged by any belief that he would not really be responsible if someone else happened to drop a match or to throw a burning cigar into it. No, unless he is entirely lacking in any sense of self-protection, to say nothing of the safety of the property of others, he sets about to devise the ways and means of removing the hazard. He cannot with safety engage in a broadcast burn; that might result in something more serious. On the assumption that the hazard must be entirely removed, he would have but two practical alternatives; (1) to cart the rubbish away, or (2) to pile it and burn it. It is needless to discuss the various means by which it could be carted away, so let that alternative be put aside. Let us now presume that in the other alternative,—piling and burning—he still entertains considerable fear as to fire spreading and causing other damage. If, however, he must be entirely rid of the nuisance by other means than its complete removal from the premises, his only solution lies in collecting the rubbish in one or more piles and setting fire to it; or in starting a small fire in a safe position and gradually destroying the waste. If, however, he suffers such serious apprehensions, that he is too afraid to use fire, his next best effort is to collect the rubbish in a compact pile or piles and leave it there. Although the latter process may not entirely remove the hazard, he has nevertheless reduced it an hundred-fold, and he may await the day when, climatic conditions being propitious, his reviving courage may prevail upon him to complete the job and entirely remove all hazard by burning. Although, indeed, the latter day might never come, the fact remains that he has in great measure reduced the hazard, and he therefore lives in greater security, and in freedom from insistent calls from neighbours, and fire or police departments, exhorting him to "clean up."

It may at once be perceived that essential to the sequence of events portrayed is the fundamental recognition that the original hazard exists. If that be not recognized by the individual himself, it will be very vividly recognized for him by others. Let us study the process of reasoning displayed by the other people. Do they say "Here is an increased fire hazard which threatens at least an entire city block; let us double our fire brigade and fire equipment!" If such illogical reasoning were applied in any city, and fire hazards allowed to develop, it would unquestionably be followed forthwith by the decision of

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underwriters that the insurance premiums must also be increased; generally, all round, there would be not only the increased hazard, but it would directly affect the people in other directions to their serious financial disadvantage.

We may concede that in the analogy the case outlined may involve a greater degree of fire hazard in the physical sense; that is, the menace of fire may be greater than is the case with woods' slash,—in that paper and excelsior may be more inflammable than logging debris, and also the prevalence in the town of so many factors in the cause of fire. Fire hazard, however, involves more than these two physical conditions; in determination of hazard there must be considered the value of property endangered, and also the degree to which protection organization is developed to control fires which occur. In the up-to-date town, on account of the concentration of property values, the organization for protection is very highly developed, and the fire hazard is by that means reduced. In the forest, on the other hand, while values may not be so concentrated, neither is the protective machinery so highly developed nor so well equipped. Even admitting the greater inflammability of the back-yard rubbish, therefore, there is not quite so great a difference between the net hazard thereof and that which exists in the logging slash, as might at first be supposed.

Inasmuch as the disposal of logging slash, if it is to be brought about at all, is definitely linked up with the process of forest utilization, further discussion as to what is being done in this direction in Canada, and what may further be done, will be dealt with in the ensuing chapter when timber administration is under discussion. In the present discussion, treatment is necessarily confined to slash as a factor in the forest fire hazard.

It is thought that the foregoing remarks may in some degree serve to "clear the decks" in a subject which has entailed many acrimonious debates, even quarrels. Whether or not it may under conditions existing in this country be economically possible to dispose of logging slash is, at the moment, beside the point. The desire is to remove from the public mind any inaccurate impression which may have there been formed that logging slash does not contribute to the fire hazard, or that it does not increase the expenditures which must be made on fire protection to offset the hazard so occasioned. Beyond question it does! No matter what argument may be brought to bear to offset the possibility of requirements for slash disposal, the bald, incontrovertible fact is that the hazard exists; admitting the omnipresence of the contributing invisible hazard—the camp-fire, the smoker, the hunter—the slash itself constitutes one of the most serious dangers with which logged-over and adjacent forest areas are beset.

From the standpoint of fire protection, there are variations in methods which are applied or have been suggested for slash disposal, but in the controversy so far waged on the subject there has, as previously explained, been a tendency to minimize a danger where the process of magnifying could much more appropriately be applied. On occasion, the same persons who have argued with great energy that the slash is not a hazard, have almost in the same breath admitted that it should be carried out along trails, tote roads, and in such places where the invisible hazard is liable to assert itself. On other occasions, those who have declaimed against the existence of any hazard in slash have, even if unwilling perhaps, admitted the desirability of the lopping of slash, in order that the brush might more rapidly disappear as a result of decay.

As previously intimated, one of the more frequent arguments against slash disposal is the danger which the stage of burning might impose upon the surrounding forest. Those who advance such arguments, however, seldom stop to consider how very greatly the hazard may be reduced, even if the debris be properly piled and left without being burned.

There is the class who insist that the damage of slash exists only for one or at most two years, when in almost any part of this country there may be found logging slash that after six, eight or even ten years still exhibits a high degree of inflammability, and merely requires the kindling spark to make it react all too quickly and completely. Still others have argued that when the slash is green—even the slash of coniferous trees—it is not very inflammable, utterly ignoring the fact that every year there occur fires that travel for miles in the tops of living trees, and that the condition which makes this possible is the exceedingly resinous nature of coniferous vegetation.

Manifestly, such arguments are rather seriously characterized by subterfuge. If we are to argue for or against slash disposal, let the argument be upon the basis of facts, rather than upon suppositions that lack foundation; let it be on the basis of the costs of the operation and economic feasibility, rather than upon an unreasoned desire simply to avoid it. And in gauging the practicability of those costs, let us not forget that, if we do not assume the burden, we have in any case other alternative expenditures to meet, (1) an inevitable increase in the outlay for securing adequate fire protection, and (2) an ultimate added expenditure, either in stumpage or in operation costs, due to the reduction in timber supplies through fires and the necessity for going farther afield for wood supplies occasioned by fire depletion.

(e) MISCELLANEOUS HAZARDS

There are other elements in the forest fire hazard of the country, some of them more prevalent in certain districts than in others. Lightning, for instance, is claimed as causing 10 per cent of the fires of which the origin is known. This figure is reached, however, not as a result of prevalence of extreme lightning hazard throughout the Dominion, rather there are certain areas where, on account of frequent dry electric storms, many fires are started from this source. As a general rule, in districts not subject to such storms, the fire occasioned by lightning is more frequently extinguished by the rain which accompanies the storm. Obviously, nothing can be done to forestall the occurrence of lightning fires; only in the development of quick detection facilities and organization for rapid control, in areas subject to this special hazard, lies the possibility for action.

Undoubtedly, many fires are caused by incendiarism. In some cases the purpose is purely malicious in character; in others, it may be for the attainment of some secondary object such as increasing the growth of forage plants, for grazing purposes; in still others, it may be for the purpose merely of securing a job on the fire-line, the organization of which is necessary to combat the fire. Whatever the underlying motive may be, incendiarism is a hazard that must definitely be reckoned with, and every effort directed at its curtailment, both by educational propaganda to demonstrate the economic losses which are involved in forest fires, and in the application of stringent legal measures for the penalizing of those who may engage in this insidious practice.

ORGANIZATION FOR FIRE PROTECTION

The work of fire protection may be appropriately divided into three distinct phases, prevention, detection and control. The success of any organization in the entire problem depends very largely upon the degree to which it recognizes the important features of the problems presented in each of these three phases, and upon the discretion and effort which it displays in the specialization of its organization to meet those special requirements. Unfortunately, largely by force of circumstances in this country, most of the organizations that have been

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developed have had to first concentrate their attack upon the problems of fire control. As a matter of fact, more frequently the first stage in development of fire protection staff has been in the appointment of voluntary or per diem fire rangers, whose services were merely called upon in event of the outbreak of fire. The next stage is in the appointment of seasonal rangers, who, although carrying on a certain amount of prevention and detection work, are in many instances forced to temporarily neglect these phases in order to directly attack problems of control.

While it has been the experience and effort of all such services to endeavour to meet the demands of each individual phase of the problem, it is unfortunately the case that about as rapidly as the organization could be developed, the fire hazard itself, and the actual number of fires, have very greatly increased. The situation is, therefore, that there is no protection organization in the country that has yet solved to a sufficient extent the problems of prevention; of detection, it may be said that although in certain regions the equipment and staff to perform this function with reasonable efficiency have been provided, this is not the case generally throughout the Dominion.

FIRE PREVENTION

It is not our purpose to deal with the subject of fire prevention in any detail, as at least the more efficient forest protective organizations have a clear conception as to the manifold duties and requirements essential to preventing fires. Of greater importance, at the moment, is expression of the conviction that the forest service must primarily be provided with a good fire act, which not only makes provision for penalties which will be commensurate with the offense of starting forest fires, but will also give the service thorough legal basis whereby, in danger periods at least, it may thoroughly control all travel through forested regions, and may have supervision of all phases of forest use which have bearing upon the fire hazard. In some of the provinces excellent legislation has been provided leading to the control of transients in the forest, and the working out of details to make such legislation effective is manifestly the duty of the protective service. The extent to which the service has gone or may go in controlling this invisible fire hazard may in large measure be used as a criterion of the success of the organization in fire prevention work.

Coupled with the control of forest travellers and forest users, there must be provisions ensuring that various operations consequent upon settlement which takes place adjacent to and in the vicinity of forest areas, should be subjected to adequate control.

Perhaps more important than all, in fire prevention activities, however, is the necessity of carrying on through every possible channel a persistent propaganda calculated to inform the people who live near, or have occasion to visit the forested regions. This work must even be extended to the towns and cities where perhaps even a relatively large part of the population may never have the opportunity to visit the woods. The latter is essential in view of the fact that there exists in this country the most pressing necessity for thoroughly awakening the people as to the importance of forest industry in our economic life, and consequently the urgent necessity which exists for protecting the timber supplies which are essential to the continuance of such industries. This educational campaign has been, and must continue to be, persistently carried out in the schools, churches, recreation clubs, boards of trade,—in fact, in every conceivable institution or organization wherein questions which concern the public good are considered and discussed.

FIRE DETECTION

The pioneer form of fire protection consisted in the assignment of a man to a specific part of the forest with the duty of travelling about trying to prevent the occurrence of fire; in his travels to act as the agent of detection; and, finally, upon noting a fire to go about the process of extinguishing it either himself or by the organization of a crew sufficient to accomplish that purpose. Very obviously when these three functions are centered in the one man, when the situation is such as to demand his entire attention in exercising one of them—control, for example—the phases of prevention and detection must necessarily be left entirely in a state of suspense. While a fire ranger may be actually extinguishing a fire somewhere in his district, there may in another quarter of the district be some transient party whose movements require careful watching, or indeed, there may actually be a fire starting for which there is no person to function in detection. This fundamental drawback to concentration of all phases in the one individual, or a group of men, in the fire protection organization, has led in all cases to at least the realization that special measures are required for fire detection. In such services and such forest regions where development has got beyond the stage of infancy, the function of detection is exercised by a separate unit which operates almost exclusively for that purpose. Where complete lookout systems have been established, the lookout men so employed are required at all times to be on their towers or in their mountain cabins for the sole purpose of detecting incipient fires, and also for the purpose of reporting from time to time upon the progress made on fires which are being fought by the control staff. The function of fire detection is also exercised by patrolmen on horse-back, on foot, in canoes, in motor boats, on railway speeders, etc., etc.

Owing to the rapid development of aircraft during the war, great interest has been displayed in the use of this kind of equipment for the purpose of fire detection in forested regions. In the public mind there has arisen perhaps the belief that in aircraft lies the final solution of the forest fire troubles. Although experience tends to show that there is a most important purpose which such equipment can serve in forest protection work, it is, nevertheless, the case that the use to which aircraft can legitimately and successfully be put in fire operations is much more limited than it is by many believed to be.

Taken by and large, in a district which offers suitable topographic conditions and facilities for the establishment of a fixed lookout system properly equipped with the means of rapid communication by telephone, or by other means, the lookout system perhaps offers the greatest possibilities for successful fire detection. In reaching this conclusion, the question of relative cost must obviously be taken into consideration; it is not merely an expression of opinion, it is the result of actual experience after trial of both methods.

There are, however, vast areas, particularly in the northern parts of the eastern provinces and the prairie provinces, where topographic conditions render extremely difficult the installation of lookout systems and the necessary facilities for rapid communication essential thereto. More generally such areas are interlaced with a system of lakes and rivers which, although offering excellent means of getting about from place to place, still offer difficulties in construction work, and indeed offer a considerable obstruction to the rapid transport of large bodies of men and supplies. It is in these areas that there lies the greatest opportunity for the use of aircraft in fire detection. As a matter of fact, they are being so used in various parts of the Dominion, and it entirely depends upon the question of cost whether it will be possible to continue this method of fire detection. Obviously the operation of aircraft entails large expenditure for machines, for the establishment of bases, and for the provision of highly special-

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ized personnel. Although excellent work has been performed in various parts of the country by the aircraft units assigned to fire detection, it cannot yet be said that full efficiency for the money expended has been secured, and it depends in large measure upon the confinement of expenditures to reasonable proportions, and the attainment of proper efficiency, whether aircraft will find a permanent place in forest protection work.

FIRE CONTROL

As previously explained, there is overlapping both in personnel and equipment as between the three phases of fire protection. Aircraft, for instance, in addition to being used for fire detection are on occasion very useful indeed in exercise of the function of control. One of the recent developments in forest fire-fighting equipment is the light-weight, high-power gas engine pump. Over a period of ten years or so this class of equipment has been highly specialized. The pumping outfits are readily susceptible of transportation by flying boat, and particularly in a lake country contribute greatly to the effectiveness of control. Manifestly, large crews of men cannot be transported by aircraft, for this would involve the use at one particular base of so many machines that the cost would be prohibitive. The use of light gas engine outfits has, however, made possible the use of much smaller fire crews, in many cases at least; and in some instances it has already been possible to transport by aircraft the portable pumps and the small number of men necessary to effect fire control.

Perhaps, however, one of the most useful purposes of aircraft in serving the function of control lies in the transportation "overhead" from one point to another. Not only are supervisory officers permitted to get rapidly from one part of their districts to another by this means, in a time of fire emergency, but expert fire-fighting foremen, of whom the number is all too limited, may be transported rapidly from place to place, and their services by this means brought to bear in different places. It is obvious that if the services of supervisory officials and fire-foremen can by rapid transportation be distributed over a greater area within which a fire emergency exists, it makes possible the application of greater experience over a larger area, in solution of the more intricate fire problems.

It will readily be perceived that the transportation of fire fighting crews, even to the extent of parties of from five to ten men, and of the equipment and supplies essential to their operation, involves the use of a type of machine very much larger, and consequently of much greater cost than is required in the provision of aircraft which serve only the function of fire detection. Not only is the provision of aircraft of large carrying capacity much more expensive, but their operation entails the provision of base equipment and personnel very much more expensive than in the case of the smaller machines. Therefore, although these larger machines have been, and probably will continue to be, used to a certain extent in this direction, it is, nevertheless, the case that aircraft will more extensively be used in fire detection. Beyond that stage it is probable that in greater measure fire-control functions will be confined to the transportation of "overhead" as previously explained.

The foregoing discussion of aircraft has been related more particularly to the use of hydro-aircraft. If we now consider locations where flying machines of the land type are used, it will be even more clearly appreciated that, except for the transportation of "overhead", the function which may be served is essentially that of detection. This is thoroughly exemplified in the operations now being carried out in the southern part of the Rocky Mountains, where land machines only can be used, and where the function served is practically confined to fire detection, along with their utility in serving by their psychological effect the function of fire prevention.

As for other means of fire control, it may be stated that very great development has been made during the course of the last ten years. Prior to that time, upon the outbreak of fire, it was quite customary to witness the greatest kind of confusion and excitement when steps were being taken for the mobilization of a fire crew and transporting it to the scene of the fire. By the application of careful study in this problem, and the preparatory provisions which are made in order to facilitate mobilization, there is indeed a vast difference in the modern methods followed and the success attained in quickly getting a fire crew organized, equipped, provisioned and transported to the place where their services may be required.

So long as the services of per diem or of temporary men were depended upon for fire control the accompanying state of excitement and confusion previously described continued. It has only been as a result of the development of the permanent skeleton staff, made responsible for continuous preparation for fire emergencies, that any reasonable success has been attained. Very naturally, during the crisis of a fire season it is a very difficult matter to find time for careful study of the requirements, consequently, although actual work in fire detection and fire control may themselves be confined to the time of fire hazard, all those steps which lead to the better solution of the fire problems,—to wit, preparation—must necessarily be carried out at such times of the year when careful and calculated concentration may be given organization work. For this reason it may be stated that the extent to which a fire-fighting organization may display efficiency during the course of the summer, may in very large measure be attributed to the preparatory work in which they have engaged during the winter months.

Just as proper fire detection requires the installation of fire lookouts, aircraft, and rapid communication by means of telephone, so does the function of fire control demand the provision of adequate trail and road facilities over which fire-fighting forces may rapidly be transported. Furthermore, it demands the provision at strategic points of the various kinds of tools, equipment and other supplies required for the maintenance at various points of a body of men who, if they are to work satisfactorily in accomplishment of the object in view, must not only be properly equipped with the necessary tools and apparatus, but must also be properly provided with food supplies and temporary living quarters.

In preparations of this character, every forest protective organization which has shown reasonable signs of development now takes careful heed of the requirements previously outlined. It will therefore be seen that a somewhat remarkable change has been effected in conception of the intricacies of fire control work, as compared with the conception of ten or fifteen years ago. Although there are organizations in which the permanent skeleton staff is limited to a small percentage of that carried during the fire season, it is nevertheless true that in every case where any reasonable efficiency has been attained, some skeleton staff has been continuously on the job throughout the year devising the ways and means for conducting a successful campaign of fire protection over the lands which may come under its responsibilities.

The old conceptions of voluntary fire-fighting have in large measure disappeared, and in the present day it is rather thoroughly recognized that to secure proper efficiency on the fire line it is necessary that the force mobilized for fire-fighting operations must be compensated for services rendered. It is desirable that fire protection organizations should be vested with authority to commandeer the services of all able-bodied persons for the fighting of fires which may occur within the district; it is also only fair, and is conducive to the rendering of much more satisfactory work, that the services so commandeered be reasonably paid for. It may here be pointed out, however, that this

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development has given rise to a situation, particularly in districts where unemployment is prevalent, where a certain type of man, in order to provide himself with employment, will on occasion resort to incendiarism. The seriousness of this situation is fully recognized by all services, and various steps have at different times been taken to offset or curtail it. By reason of the fact that in cases of incendiarism the very evidence upon which the perpetrator of the offence may be convicted is frequently destroyed in the fire, this phase of the problem renders very difficult indeed the apprehending of the culprit. On the other hand it has led to a feature in modern forest fire legislation which places the onus of proof upon the accused; it has also led to the provision of penalties which are in many instances much more commensurate with the offence than was in former years the case.

In the details for the betterment of organization for fire prevention, fire detection and fire control operations, the Commission manifestly can go no further than to strongly express the view that, owing to the very serious nature of the fire hazards existing in almost every part of Canada—there are few regions free from them—it is of transcendent importance that every possible assistance, both by way of legislative enactment and by financial support, should be given the various organizations whose duty it is to solve the very difficult problems that confront them. To the industries and to the forest services may well be left the detailed suggestions of better methods: the Commission can only urge that greater heed be given by the governments and by the people to such suggestions. One of the inherent defects of democratic government is that the governments cannot after all go very far in advance of public opinion. In the government which goes just so far as public opinion may of itself dictate, we have exemplified an administration which is essentially one of political expediency; in the government that definitely recognizes the necessity for some reform that may be some considerable distance in advance of public opinion, and takes steps to educate public opinion to that degree which permits of application of the reform, we have exemplified true statesmanship.

Into the fire problem, this latter requirement enters very strongly; such a large part of the population is so circumscribed in its activities and movements, that the people little realize how vitally the question of forest supplies affects them. Obviously, the governments, the forest services, and all other organizations that engage in patriotic work must shoulder the responsibility of enlightening and advancing public opinion, so that much more vigorous action may from a political standpoint be justified, in solution of the forest fire problem.

FIRE PROTECTIVE ORGANIZATIONS

It will, perhaps, be of interest to make a summary statement which will indicate the extent of forest fire protection organizations in various parts of Canada.

(a) NOVA SCOTIA

As has so often been stated, the timber lands of this province have in a large measure been alienated, and until very recently there was little effort displayed on the part of the government to take any vital interest in fire protection. It is true that there was legislation on the statute books which made provision for certain steps when fire emergencies arose. To a greater extent, however, this legislation was characterized by the fundamental weakness of depending altogether too much on voluntary and gratuitous service.

As a result of severe fire losses, however, the province a few years ago came to the realization of the fact that further action was necessary. Accordingly, a new act was passed, making provision for the appointment of an officer

who would give part of his attention to the special work of fire protection. Aside from the necessary office staff, however, the present organization in the province does not include any officers paid entirely by, and under exclusive responsibility to, the provincial fire officer. Although the organization now in effect is manifestly very much superior to that which preceded it, it has nevertheless the fundamental weakness inherent in any organization which is characterized by dual responsibilities. The present fire protection system is carried out to a large extent through the machinery of organized municipalities. Some eighteen or twenty chief fire rangers are appointed, one for each unit of the protective organization—whether it be for one municipality, for part of a municipality, or for the combination of two municipalities—these men operating under the general supervision of the Commissioner of Forests and Game. Such men are paid a retainer of a couple of hundred dollars a year by the government, and under authority of the government the men are vested with certain powers essential to the enforcement of the fire act.

Timber lands are assessed at the rate of one-half cent per acre, and by this means a forest protection fund is established for each municipality, from which all other expenses of fire protection work are defrayed by the municipality. In the first place, the latter organization assumes a responsibility for paying the chief ranger on a per diem basis for services rendered, and also defrays the cost of the services of assistant or sub-chief rangers whom the chief rangers may find it necessary to employ, together with the cost of the actual fire-fighting operations which it may be necessary to carry on. In the event of a deficit, additional funds have to be provided by the municipality; in the event of a surplus, the latter remains to the credit of the forest protection fund of the municipality.

In the province of Nova Scotia the fire hazard is not inordinately great. Settlement penetrates pretty well all parts of the mainland, and in greater or lesser degree, the areas of timber are interspersed with agricultural and fishing communities. For these reasons the problems of fire control are simplified. Topographical conditions naturally favour fire control work, inasmuch as there are numerous lakes and rivers, advantage of which may be taken in the control of fire. Still further, as to the timber itself, the forest type is essentially Acadian in character, that is, hardwoods enter to a considerable extent into the composition of the timber stand, and, being very much less inflammable than our conifers, the fire hazard is in that manner reduced. Finally, owing to the maritime situation, climatic conditions in the average year are such as to reduce the danger of fire; indeed, some parts of the province are so subject to high degrees of moisture that even during relatively dry periods the fire hazard is less accentuated than it otherwise would be. All of these things, therefore, contribute to a lessening of the fire hazard in Nova Scotia, as compared to other parts of Canada.

For these reasons, combined with the fact that so much of the timber is privately owned, there has previously not been the same incentive to more intensive or more complete government control in fire protection activities. Indeed, on some areas owned by the government, but leased for long periods of time to private corporations, the government has absolved the latter from contributions to the fire fund, and have permitted them to develop their own machinery for fire protection. In some such instances a very good work has been done, so that it can by no means be suggested that the system is entirely lacking in efficiency. Therefore, whether or not it might be better for the government itself to entirely control and supervise fire protection activities, there is still the strongly existing necessity that its interest and participation in work of this character should be very much more pronounced than is the case at the present time. As has previously been explained, the province of Nova Scotia does not

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spend more than eight or ten thousand dollars in the protection of a resource which, even though essentially privately owned, is still the foundation of a timber industry which plays a most important part in the economic development of the province.

(b) NEW BRUNSWICK

In the province of New Brunswick, we deal with an area where fire hazards are very much more pronounced than is the case in Nova Scotia, and also, where owing to the control by the government of approximately one-half of the timber resources of the province, it has in the natural course of development been absolutely necessary that the provincial authorities should exemplify in a far greater measure an interest in and control of fire protection matters.

The forest service of the provincial administration exercises full control over fire protection activities except in one or two isolated cases where, owing to peculiar circumstances, arrangement has been made that fire protection should be administered through the machinery of local organizations. Broadly speaking, however, the great bulk of the timber lands of the province come directly under the control of the government forest protection service. Timber land owners and lessees are assessed at one-half cent per acre, and by this means a forest protection fund is raised and the financial means of carrying out forest protection work is supplied.

Although the experience of the past few years, and particularly that of 1923, has clearly demonstrated that the fire protective organization is not as yet sufficiently manned, equipped, or organized, to adequately control the forest fire situation, it is nevertheless true that there has been a vast improvement in the situation. For this province, it is only necessary to suggest that on the part of the administration and of the people, there is an urgent necessity for more general appreciation of the value of the forest resource in the life of the province. There is also an urgent necessity for the proper protection of that resource in order that it may continue to play its important part; and the more extensive provision of funds to permit of more adequate staff, the installation of more extensive equipment, and a greater degree of organization of all forest protection activities.

(c) QUEBEC

The situation in the province of Quebec has already been referred to in Chapter VI when treating of the forest authority. In this province, and particularly in those parts of it where timber lands have been permanently or temporarily disposed of to operating companies, fire protection has been carried on by associations of timber owners, especially developed for that purpose. Previously, all timber holders had contributed to the province, at stated rates per acre or per mile, funds which were expended by the latter in forest protection work. Being dissatisfied with the measure of control secured by this means, however, the timber-holders secured from the government permission to carry on, through organized associations, the protection work on their own lands. This was, of course, a very different development from simply permitting each individual holder of timber to carry on his own fire protection work. These associations rapidly have become both representative and comprehensive in character, and under their care, forest protection in the province of Quebec has been very materially advanced.

Just as formerly, however, the timber holders were not quite satisfied with the measure of control exercised by the government protective service so it has recently developed in the mind of the government protective service that possibly the forest protective associations were not exhibiting that degree of efficiency which the government authorities desired. The more recent development has

been, therefore, that the association plans for fire protection are to be subjected to careful review by the government, and in any case where it is evident that such plans are inadequate, provision is made that the government itself, through its protection service, will again take over fire protection operations. The present situation, therefore, places directly upon the associations the responsibility of justifying their existence by the efficiency of the forest protection which they may afford.

It has previously been demonstrated in detail that there is a very direct relation between forest protection and other phases of timber administration. It is, therefore, strongly to be urged that the arrangements recently made in this province, where the work of fire protection has to a certain extent been divorced from timber administration, shall not be permitted to operate in such a manner that fire protection and timber administration, which are inherently related, will not be so far separated, one from the other, that the true purpose of each, or both, may be so individualized that its true relation to the other may be obscured.

For those areas where the timber resources have not been disposed of in any manner, the government through its own service carries on the work of fire protection. In this province, therefore, we have exemplified two distinct methods of fire protection administration.

Although there is perhaps implied above some doubt as to ultimate efficacy of fire protection carried out by private bodies, it should be stated that the position of the Commission in this behalf is not dictated by a feeling that the inherent weaknesses of association control lies in a theory of the inability of private organizations to carry out the physical operations of fire protection work as efficiently as can government organizations; indeed, there are many who argue that through private enterprise greater efficiency can be attained. The inherent difficulty lies entirely in another direction. To a greater extent the soil rights of the great bulk of forest lands in this province, and in most of the other provinces, lies in the Crown; individuals or companies enjoying timber-cutting privileges are restricted to certain sizes and classes of timber. While the timber-holder displays no greater tendency to selfishness than do other classes, he would perhaps be not quite human if, in the protection of an area in which he has only a part interest, and a temporary interest, he did not incline to the more pronounced concern with, and more intensive protection of, that part which is more fully his own. Similarly, he would hardly be human if, while protecting his own interest, he failed to worry so much about adjacent lands, which, although not of material concern to him, are nevertheless a definite part of the timber wealth of the country.

In the expenditure of funds and effort, the timber holder is liable to consider as of greater concern to him, the merchantable timber to which by virtue of his license he has exclusive right. To argue that greater efforts should not be directed at the protection of the greater values would unquestionably constitute defiance of economic laws; yet, on the other hand, experience only too clearly shows a tendency on the part of timber-holders, perhaps, to be unappreciative fully of the potential value of young timber, particularly if it be not their own. Here again, it must be recognized that in the forest we are dealing, not with definite, fixed values which may be given to various parts of the timber stand, but with a living organism, to the regenerative and productive capacities of which there must be attributed the relative value which they merit, regardless of who may hold title to them.

Again, in carrying out the work of fire protection there are various provisions which must be made, which involve more or less the permanent use of land; telephone lines, lookouts, trails, roads, buildings, are all requisites of fire protection. Although, in this instance, also, private effort may be equally or more

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efficient in the physical act of construction, there is nevertheless through this channel an accumulation of private property upon government lands which are, after all, only under more or less temporary alienation, which temporary alienations are, moreover, under the liability to frequent change in control. It is perhaps unnecessary to point out, also, that such improvements, if they are not actually of the nature of public utilities, must in many cases be connected up with, and made effective through, similar facilities which are essentially public works. It may here be conceded that the accumulation of private property on public lands, brought about through the activities of forest protective associations in Quebec, undoubtedly presents some difficulties in reversion to other methods, if it were deemed advisable to adopt a system of exclusive protection through government service.

The foregoing arguments notwithstanding, and aside from the respective merits of one form of protection or the other, it may be thoroughly conceded that the changes which have from time to time been made, and which of themselves may have portrayed a weakness in fundamental conception of the problem, are indicative at least of this: that there was a growing appreciation on the part of the industries, and of the governments, that more efficient protection was required. Of Quebec we may therefore say that very material progress has been made; private enterprise has acted to spur the government to greater interest, and, on the other hand, the government services have demanded more of private industry.

(d) ONTARIO

In the province of Ontario the function of fire protection has always been exercised in greater degree through the government service. Many years ago, when for the first time timber holders were assessed for part of the cost of the fire protection service, there was a demand from them that they should be permitted to select and use their own employees for the protection of timber lands under license or lease to them. This concession was granted by the government, but official appointments were made entirely through that part of the public administration which had responsibility for fire protection work. Later on, although official appointments still continued in the government service, licensees were called upon to pay the entire cost of protection on their limits. In other words, although the government performed the official act of appointing the men, vesting in them the authority essential to the performance of their duties, the licensees enjoyed exclusively the privilege of paying for their services. This system naturally led, over large areas, to the concentration of fire protection efforts to more valuable stands of timber and camp equipment, the property of licensees, and perhaps to somewhat extensive neglect of adjoining timber areas in which the licensees had no direct interest, or possibly considered that they contained little timber of potential value.

For unlicensed lands, the government itself developed an extensive, if somewhat unwieldy, system of fire-ranging which was above all things characterized by the temporary nature of appointments. At one time the province carried a staff of rangers varying from one thousand to twelve hundred men, while the permanent skeleton staff which would manifestly be necessary to the successful control of such a large staff was entirely lacking.

Under both of these methods, as might have been expected, serious difficulties arose, and the degree of efficiency obtained was by no means sufficient to meet the demands of the situation. In more recent years, therefore, the province, through its forest service, has definitely committed itself to, and engaged itself with, the organization of fire protection on a district basis, in which there is provided the permanent skeleton staff so necessary to the attainment of efficiency in fire protection work.

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The Commission has also been apprised of the fact that the Ontario Forest Service has already gone in a most intensive way into the provision of all the modern fire-fighting equipment which has, by developments of recent years, been made available. Realizing also, the great difficulties of developing by ordinary methods a fire protection organization which will adequately control the fire situation in the north country, the province is undertaking a comprehensive plan of aircraft operations. It may merely be pointed out that, although greater concentration of fire protection effort should manifestly be applied in districts of high timber value and relative accessibility, there is danger in leaving too much unguarded the resources of the north country which, although now somewhat inaccessible, may in later years be called upon to offset the depletion which is taking place in the more accessible parts of the province. The use of aircraft cannot of itself solve all the problems of fire protection. More or less essential to success, even with aircraft facilities, is the maintenance of the ground force which may be used to act in unison with the air detection force.

Whereas, a few years ago, the province of Ontario, through its very large but entirely temporary fire ranging organization, probably expended more money per acre for fire protection, over very large tracts, than has been expended by other organizations on this continent over similarly large tracts, and, by reason of the lack of the skeleton permanent organizations, probably secured less efficiency than did some of the other organizations with more limited financial means at their disposal, the province is at least now embarked upon a fire protection organization in which some of the more vital principles essential to success are thoroughly recognized.

(e) BRITISH COLUMBIA

Notwithstanding the very high timber values in the province of British Columbia, it was not until 1912, under operation of the new Forest Act, that steps for efficient organization were taken. Prior to that time the fire protection work had been handled entirely through the operation of a loosely organized fire-ranging staff, consisting almost entirely of men hired seasonally, or even for shorter periods of time when the fire danger might be acute.

The Act of 1912, and the forest service created under it, both of which were the culmination of strong public sentiment and government appreciation of the necessity of taking further steps in forest protection, made possible the entire reorganization of the fire protection machinery. The province is divided into eight main forest districts in charge of each of which there is a district forester responsible for the conduct of fire protection and timber administration work for that district. One of the most important features in efficient fire protection organization lies in the necessity of close inspection and control of field operations. Whereas the fire rangers had formerly been more or less directly responsible to a head office situated at some considerable distance, the district organization brought the supervising office into close contact with the rangers' work. Such a condition not only operates to provide for better inspection and closer checking by more responsible officers of the forest service, but also, by bringing such officers into direct contact with the problems and difficulties of the forest ranger, induces a much better spirit of co-operation between the field and head offices; it slowly but surely works to the improvement of forest rangers who may have the inherent qualities of good rangers, and it just as surely eliminates from the staff the inefficient men who, by reason of their shortcomings, should find no place in an organization which has charge of a resource of such great and general public value.

The fire hazards in different parts of the province vary greatly. In the dry-belt of the Interior, there exists the most serious menace to be found anywhere in Canada. The annual precipitation in this country varies from a minimum

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of 8 inches to a maximum of 12 inches, depending on the locality and yearly variations in climate. Most of the precipitation falls in the form of snow during the winter months, so that during the summer, from early spring until September at least, there is, except for very brief intervals, a more or less continuous hazard. Timber stands in the dry-belt are lighter, and consequently wood values are not so concentrated as in other parts of the province. The forests of this region, however, serve the very important function of watershed protection, and on that account, if for no other reason, their protection and permanent maintenance is absolutely essential to the well-being of the community. Incidentally, it may be stated that the entire stand of western yellow pine, so far as this species is found in Canada, is confined to the dry-belt; while the quantities of this timber are limited, there are certain uses for which the wood is highly prized, and its careful protection is desirable. It is in the dry-belt country that very considerable ranching operations are carried on, and for this reason many people have reason to visit the upland country, thus increasing the fire hazard. Also, severe dry electric storms are experienced and many fires are started by lightning.

In the interior wet belt conditions are entirely different. Owing to more abundant precipitation, the average season does not present serious fire hazards, except in unusually dry years, and for more or less brief periods. Timber values, on the other hand, are very high, and the occurrence of fire emergencies from time to time absolutely demands continuous organization for fire protection. On the Coast also, owing to the very heavy precipitation experienced, it is rarely that any extended period of fire danger is experienced. The occurrence of very serious fires during the last few years, however, has clearly demonstrated that such emergencies can arise and continue for more or less extended periods. There are some parts of the Coast District where it can almost be stated that no material fire danger exists; in the Queen Charlotte Islands, for instance, the precipitation is so heavy and so general, that little trouble is experienced with fire. For all of the coast regions, the timber values are exceptionally high, and on this account careful precautions must be taken if great losses in timber through fires are to be forestalled. In the Coast District the fire hazard centres very largely around logging operations. Here and there, scattered up and down the coast, both on the island and on the mainland, there are numbers of operators engaged in taking out timber. To a great extent these operations are carried on by the use of donkey engines and logging railroads. Therefore, in addition to the hazard incidental to any logging operation through the presence of men, there is the added hazard due to the use of equipment, the power of which is developed through the use of fire.

In a province where climatic and timber conditions vary so greatly from place to place, the work of fire protection is naturally carried out under various methods. In some parts of the interior, where transportation facilities are poor, the staff must necessarily resort to the use of saddle and pack horses for transportation. Where roads are better automobiles and trucks are very extensively used; where water communication is good, gasoline boats provide the means of conveyance. In the Coast region particularly, the Forest Service operates quite a fleet of gasoline boats, both for carrying on fire protection activities and also for timber administration. Finally, the province has taken advantage of an air base established at Vancouver by the Royal Canadian Air Force, and to a limited extent use aircraft in fire protection operations, more particularly for moving "overhead" and portable fire-fighting units.

Notwithstanding the great advances made in forest protection in British Columbia during the past decade, it is apparent that further development is required. For a province that reaps such large revenue from its forests, it is all too evident that insufficient funds are used in its protection. The

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money for fire protection is derived through the operation of a "forest protection fund," to which the licensees and owners of timber lands contribute at the rate of 2½ cents per acre for the amount of land within their timber holdings. To this fund the government also contributes in the ratio of \$3 to every \$2 contributed by timber holders. From the total fund so established fire protection operations throughout the province are carried on, including the protection of all unalienated timber lands.

Basing conclusions upon the average expenditure for the past five years, it may be stated that the province spends approximately one-half million dollars in fire protection annually, nearly ten per cent of which has been in the provision of equipment, including motor boats, automobiles, fire-fighting pumps, tools and miscellaneous equipment required for the work. The balance of the expenditure has been divided about half-and-half between preventive and detection work, on the one hand, and fire-fighting operations, on the other. If there is, perhaps, one direction more than any other where we may point to a weakness, it is in the fact that, relatively speaking, exceedingly limited funds have been devoted to the provision of improvement facilities such as trails, lookouts, telephone lines, etc. In these directions advantage has been taken of the various public works already existing and of the numerous avenues of travel which have, during the history of the province, been provided. There is no doubt whatever, that the high timber values in British Columbia not only justify, but actually demand, the expenditure of much larger sums of money on capital account, in the provision of all those improvements which are so essential to the operation of a successful fire protection organization. This again leads to the question of dedication of forest areas; wherever action in this behalf is not taken, it is more frequently the case that, not enjoying full title or assurance to the land on which it is desired to provide such facilities, the forest service hesitates to expend any large amount of funds thereon, until such time as they may have assurance that the expenditures which might so be made will be of permanent value; indeed, in the premises, it is almost impossible to get funds for that purpose.

(f) THE DOMINION

The function of forest fire protection in the prairie provinces and in the Railway Belt of British Columbia is exercised by the federal forest service. As in other regions, the beginning of this forest protection work was in the provision of a widely scattered and loosely supervised fire-ranging staff. Although there existed during the early history of the organization, several forest reserves, none of these had been thoroughly organized on basis of fire protection administrative units. The serious fire situation which obtained in 1909 and 1910, the more liberal financial support which the service was able to secure, and the availability of a larger number of specially trained men made possible a complete reorganization of the field work in 1912. In that year a "district system" was effected, inspected offices being installed in each of the three prairie provinces and in the Railway Belt of British Columbia. Organization of the reserves was at once begun, and, regardless of what the other administrative necessities might be, the reserves were subdivided into administrative units based on the requirements of fire protection. Individual reserves are in charge of forest supervisors, who are provided with such technical assistance as the limits of personnel permit, and with a permanent ranger staff; these constitute the skeleton fire protection force, retained throughout the year. During the fire season this staff is supplemented by additional steady employees in the capacity of assistant rangers, and, largely by reason of development in organization generally, it has been possible to secure a certain amount of season to season stability, even in the men secured in this latter grade.

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Along with this organization of personnel, there was inaugurated a definite system of improvements, consisting of roads, trails, buildings, lookouts, telephones, and miscellaneous other projects. After ten or twelve years' work, although there still remains much work to be done of this kind, there is, nevertheless, installed on these reserves a comprehensive layout of improvements. The forest rangers are to a greater extent properly housed under conditions which contribute to their contentment, so far as such isolated conditions will permit, and by transportation and communication facilities they have been linked up with the outer world, so that there is definite knowledge, at practically all times, as to what the conditions may be, and what work is being performed on the reserves. Thousands of miles of roads and trails, many hundred miles of telephone lines, hundreds of buildings, many lookouts, and other improvements of a permanent character have been installed. Just as the federal government has gone further in the establishment of permanent forest reserves, so have they gone further perhaps in the development of permanent improvements and in the provision of various facilities essential to modern fire protection, than have other organizations.

So much for the forest reserve areas; an entirely different situation exists outside of the forest reserves, on the vast areas of timber-lands designated as "Dominion Lands". Owing to the fact that the forest service exercises no administrative control over timber matters on such lands, it has been impossible to develop work which would justify the retention of a year-long staff. This results in the present condition, namely, that fire protection on these lands is carried out through the operation of a staff entirely seasonal in character. There is no necessity to repeat or enlarge upon the impossibility of developing a satisfactory fire protection organization by this means. The method is one which has been tried and has continuously failed in the attainment of even reasonable efficiency; it is one which at best may only be considered as an expedient until such time as true forest lands may be permanently dedicated to forest production, by the establishment of forest reserves, properly organized and equipped with personnel and facilities essential to a proper degree of forest protection.

Over such a large area there is naturally great variation in fire hazards. So far as British Columbia is concerned the conditions have been somewhat briefly reviewed in the previous section. The remarks made for the province generally, apply with equal force in the Dominion Railway Belt. In Manitoba the fire hazard is not inordinately great, but from time to time the province experiences periods of severe, if not very extreme drought, as a result of which serious fire emergencies may arise. Some parts of the province are relatively inaccessible, notably the territory to the east of Lake Winnipeg, and also the northern part of the province. In past years fires have wrought almost untold damage on such areas, and it is only recently that measures in any way approaching effectiveness have been applied. In Saskatchewan the average fire hazard is more pronounced than in the case of Manitoba, and emergencies occur at more frequent intervals. In Alberta the fire danger is even still greater, particularly in the mountains, where from year to year and from place to place emergencies of considerable intensity occur.

Over such an extended territory also, methods of control vary greatly. It may truly be said that every method of patrol adopted in any part of Canada may be found in application in one part of the West or another. Horses, dogs, canoes, motor boats, automobiles, railway speeders, aircraft,—in fact, almost any form of conveyance that may possibly be conceived, is used to some extent. Particularly in the use of aircraft for fire protection, the federal service has perhaps gone further than other organizations, by reason of its ability to secure

from other federal organizations the essentials to such operations. Two distinct classes of air operations are carried on. In Manitoba hydro-aircraft are used exclusively, and in addition to performing the function of detection, they are also used in a measure for fire control. In Alberta on the other hand, by the use of land aircraft a very considerable part of the Rocky Mountain Forest is patrolled; in this case, the operation serves more exclusively the function of fire detection, as the machines are not capable of transporting men or supplies and cannot, therefore, well be used in control operations, except for the transportation from place to place of "overhead."

It is hoped that a clear idea has been given of the fire protection problems in Canada, and that the steps now being taken to combat forest fires have been sufficiently explained. It has been frequently stated that there is an appalling lack of comprehension as to the seriousness of the fire situation, upon the part of the people and the governments, and as to the necessity of effecting radical improvement in control of the situation. It is characteristic of human beings that in their varied activities they are imbued with an ever-present necessity for self-protection. In cases where the higher and less selfish application of this trait manifests itself, the necessity lies in the possible need of those who may be dependent; it is a favourable development of civilization that man now has a tendency to look further into the future and to provide more or less adequately for the contingencies which may arise, not only for himself, but for others who he feels have a claim on him. Children are taught not only the laws of self-protection, but are also encouraged in greater or lesser degree to cultivate a regard for the future. These manifestations are witnessed not only in the individual, but also in communities, and even in nations there is evidenced the spirit of collective self-protection. Aside from the stupendous expenditures incurred during the late war, and in incidentals arising therefrom, we in Canada annually appropriate some 11 or 12 million dollars for limited preparedness against the possible attack of an invader. It is not argued that such expenditures are unnecessary; rather, it is merely pointed out that these expenditures are made purely in the exercise of this spirit of self-protection. Moreover, these expenditures are made in a direction in which, although the greater assurance of safety may fully justify them, there is nevertheless no direct monetary benefit either in the form of revenue or in any other direction.

Agriculture is an industry in which to a greater extent the practical operations can be, and in fact are, left almost entirely to private enterprise, State activities being more or less confined to the educational, experimental and research functions, and to the administration of various enactments,—all to the end that private enterprise in agriculture may work under the most advantageous conditions. Every act of the State to encourage agriculture is fully justified, for after all it is our leading industry. Here again, however, the returns to the State are indirect; comparatively little that could be designated as direct revenue is received by any government as a result of its interest and expenditure in agricultural activities. This fact notwithstanding, the federal government alone appropriates annually close upon six million dollars for agriculture and allied pursuits.

After these digressions for the purpose of comparison, we may again consider the vital part which the forest has played in the industrial development of Canada, and the important part it must continue to play, unless we are going to allow industries of great magnitude to go into decadence. From this source, some six governments in Canada derive in the aggregate a very extensive direct revenue, although, as has already been pointed out, in the extraction of these revenues they have been trading rather seriously on our capital stock. In various localities, we in greater or lesser degree seem to exhibit some evidence that we comprehend the fact that our forest reserves are continuously menaced

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by fire; but, even doing so, do we take sufficient steps to offset or adequately ameliorate the severity of the attacks? As against the eleven or twelve million dollars appropriated annually for preparedness against attack from a *possible* invader, just how much money do we expend, or how much energy do we devote, in meeting an *actual* enemy, that is constantly reducing the value of our estate? In stumpage values and in extraordinary fire fighting, our direct annual fire bill is fifteen million dollars; our actual loss, in products, in wages, and in other directions, many times that amount; what do we provide to reduce this annual toll imposed by fire? As against possibly seven or eight million dollars expended by various governments in Canada for the encouragement of agriculture, from which they receive little or no direct revenue, just how much do the same governments spend in the protection and development of the forest resources, which in several provinces at least is the financial mainstay?

Taking the aggregate of amounts expended by the government organizations that exercise the function of forest fire protection, there is expended on forest fire protection in Canada, by such organizations, somewhat less than two and one-half million dollars. On the other hand, the total of direct forest revenues closely approximates twelve million dollars, this including only stumpage and other miscellaneous charges incidental to the sale of standing timber. In Part I of the report it was shown that the total value of primary forest products, exclusive of lumber, pulp, shingles and lath, is approximately 170 million dollars. With such facts as these before us, can it be said that two and one-half million dollars is ample provision toward continuance of the forest resource and forest industry, when experience has abundantly shown that we have not yet conquered the fire hazard?

In those forest areas where fire protection facilities are provided in greater degree, namely, on the forest reserves in western Canada, the expenditure for fire protection is less than 2½ cents per acre. In some districts where timber values are very high, larger expenditures per acre are undoubtedly made, but over broad tracts, from 2 to 2½ cents is the best provision which has been made. Can it for a moment be said that we are applying to our forests anything more than a pittance in protection—the only insurance they get? Such treatment of the forest resource attains precisely the same result as does the purchase of cheap and unreliable insurance in every-day life; namely, we are unable to collect that for which we insure. Indeed the forest resources under present provisions so seriously lack protection, that it is well-nigh impossible for a timber-holder to make any reasonable arrangements for commercial insurance upon his timber property, for there are no companies that can assume the risk at rates which can be met. In a town or city where great fire hazards are allowed to accumulate, and where insufficient organization for fire control is provided, underwriters must necessarily impose what would appear to be exorbitant rates for insurance; these it may be impossible for the community to sustain, and if the town burns there is a dead loss. This is precisely the condition which applies on our timber areas. It is the condition which retards not only the development of proper methods of forest management, but also very largely retards the influx of capital so necessary to development. Moreover, by reason of the large losses sustained, we must go farther afield for wood supplies, and there results a continual rising in cost of raw materials to the industries already established.

Truly, the reasoning which we apply to our forest business is seriously deficient in business principles, and this is not due to an absence of those who can point the way; rather is it the result of that peculiar form of psychology that is born of riches—a lack of appreciation of the value of resources until they are on the ebb. As evidence of rather inconsistent reasoning applied to two natural resources, it may be stated that in some districts where game

control measures are rather effectively developed, if some one should shoot a moose or deer out of season, and for that offence be prosecuted and subjected to such penalty as law may provide, the officer responsible for the conviction usually has the sympathy and support of the local population. Just why is this? It is because the enforcement of laws which are aimed at the conservation of game animals appeals strongly to the sporting instincts of human nature. Compare to this the more frequent occurrences in connection with fire trespass cases; not only many of the people, but even judicial officers, more frequently those in rural communities, are disposed to underestimate the seriousness of fire offences; very often offenders are permitted to get away with penalties in no way commensurate with the offences committed. The destruction of considerable areas of forest entails much greater damage and disadvantage to all people in a community, but, simply because a fire case is one which does not perhaps appeal to their sporting instincts, the true significance is not attached to it. Assuredly, it is almost past understanding that, in a question which affects so profoundly the welfare of the people, the latter do not attach more importance to it.

Exemplifying another phase of the reasoning applied by the public to the fire problem; it is now thoroughly recognized that as a measure of fire control, it is essential that all travel within the forest, during the danger period, should be controlled. This object is most frequently attained through the enforcement of travelling or camping permit laws. The one thing which is fundamental to the success of such a permit law is that the officer who issues the permit should bear the responsibility for the enforcement of the permit conditions. The only part of Canada where a permit law of this character has been successfully worked out, is in the province of British Columbia, where a forest ranger is responsible, not only for the issuance of permits, but also for controlling the fire situation which may arise through the exercising of this function. Elsewhere in Canada, where permit laws have been established, there has been failure to appreciate this fundamental requirement. In other words, having come to the conclusion that a permit law is essential to fire protection, there is a decided tendency to evade the only means by which such a law can be enforced and made to produce the results required. Resort is more often taken to the use of other public officials, possibly municipal officers, justices of the peace and so on, and the process of issuing permits is simply gone through as a matter of routine, no responsibility attaching to many of those issuing them. After all, if there is necessity for a permit law, there is just as much necessity for establishing the machinery essential to its proper enforcement; if this be not done, the law itself must inevitably fail of its purpose. It is due to the absence of adequate provision for enforcement, that critical fingers are pointed at a law of this character, and false claims made that it can accomplish nothing.

These, and hundreds of other examples which might readily be cited, clearly point to the necessity of adopting methods that will, in addition to educating the people by appeal to their reason, compel observance on the part of those who cannot be so convinced of the necessity of protecting the forest resources. By every known expedient of law and of persuasion, we have simply got to bring about a change of attitude on the part of the public toward the subject of forest conservation.

CHAPTER IX—TIMBER ADMINISTRATION

It having been decided by a government that forest lands are to be permanently used for timber production; having provided legislation and having created the responsible authority to lay down and carry out that policy; having subjected lands to a classification upon the basis of which they are segregated into two classes; having dedicated forest lands to the purpose for which they

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are intended; finally, having provided for the survey of the timber resources, and for their protection;— it is then necessary to give consideration to some of the outstanding principles which should be observed in the treatment of timber lands.

Before dealing with the permanent forest areas it should first be pointed out that classification will show many instances in which agricultural lands bear stands of timber of greater or lesser value. To lands of this character it is necessary to accord special consideration.

AGRICULTURAL LANDS BEARING TIMBER

Notwithstanding the fact that, as a general proposition, all agricultural land should be permanently assigned to that use, it is obvious that considerable economic loss would be sustained if a valuable stand of timber were allowed during the process of settlement to be simply destroyed, without putting it to some form of use. Before the land is actually turned over to settlement, every effort should be made to bring to one form of utilization or another valuable timber standing thereon. It may on occasion be advisable to use the settler himself as the instrument in bringing about utilization, for frequently by such means the timber may be made to offset the subsequent heavy labour cost in land-clearing operations. From the standpoint of conservation, however, the only restriction which must be observed is that valuable timber is neither intentionally nor accidentally wasted. In view of the purpose for which the land is ultimately to be used, there is clearly no necessity for imposing any conditions which look toward the retention of any part of the stand; the effort should be to get it entirely removed just as quickly and completely as possible.

So much for mature timber on agricultural lands. There is a second degree of the same problem, namely, in the existence of many near-mature stands which, although not immediately suitable for utilization, will in the course of a few years reach the state of merchantability. Here again, considerable economic loss would entail, if the settlers were permitted to destroy the forest. Where absolutely no market now exists for the immature timber, and where there is distinct possibility of such a market developing by the time the timber approaches maturity, naturally it should be preserved, as here again, it may be made to offset in considerable measure the cost of clearing operations.

As applying to both the foregoing cases, it may be stated that operations for pulpwood provide an excellent opportunity for the disposal of timber in sizes which would be deemed entirely unmerchantable in almost any other form of forest utilization. For either case, therefore, and on the primary assumption that the land is agricultural, the principle of sound economics is faithfully served, and can only be satisfied, in the immediate utilization of the timber.

In attributing great economic value to merchantable or near-merchantable timber on agricultural lands, it is perhaps well to emphasize that, on areas where the timber stand is heavy, the process of land-clearing is in itself a very laborious and expensive one. For this reason it has frequently occurred that the clearing of such lands, under restrictions which do not permit of actual sale of part or all of the timber, imposes upon the land, when eventually cleared, capital charges that may actually place it beyond the point where it can yield a proper interest return even under intensive agricultural use. While the economic waste involved is perhaps not so glaring in the case where clearing charges consist in labour given by the settler who may remain on the land (there must, after all, be some value attributed to the farm, as a home for him and his descendants), if such labour must in the first place be paid for in cash, it is readily perceived how serious the burden may be. There is surely a great

degree of logic in the position that where timber, which has a value as such, offers obstructions to the use of land for the purpose to which it is best suited, the timber value itself may justifiably be applied against the operations of clearing. As a project capable of financial success, how much more simple it is to attack a piece of timbered agricultural land, upon which the timber values may be made to offset clearing costs, than it is to go in upon an area where all timber of value has been removed—or else is subject to removal for the benefit of others—leaving to the one that must undertake the clearing a multiplicity of stumps, with little else but hard work to apply to the clearing.

It is by no means argued that under the beneficent clauses of a homestead act, settlers should be given title to valuable tracts of timber,—far better than that, would be the practice of disposing of timbered agricultural land by sale outright to the highest bidder, and leaving it to private enterprise to utilize the timber, and subsequently make the land available for agriculture: rather, the argument is that the methods under which timber is disposed of on agricultural Crown lands do not take into consideration the character of the land itself, or, if they presume to do so, the method is most assuredly not an efficacious one, and large amounts of agricultural land are permitted to be withheld from their proper use by persons speculating upon a general rise in timber values. In addition to preventing legitimate agricultural development, such methods throw out of economic balance the value of true forest lands, and by that means retard proper development in forestry.

Truly, if there be any market at all for timber on agricultural lands, there is just as great economic waste in retaining it, as there is in the retention indefinitely of over-mature timber on true forest land.

The third phase of the problem is the case where agricultural land bears young growth of some valuable species, for which there is no present value, and for which there will not develop a value for many years. Under conditions obtaining in this country, there is no economic justification for the preservation of such stands; if they are susceptible of removal, the proper treatment is to permit of the lands being cleared and made available to settlement at the earliest possible moment. After all, it must be remembered that these very young stands did not cost anything in their establishment; it is usually the case that the sum-total of the value of agricultural crops which could be raised in the same time which maturing of the timber would require, would far exceed the monetary value of the timber at maturity, if the latter were to be retained. While in some respects this position may be opposed to the views of some conservationists, and while, from a sentimental standpoint it most certainly is disappointing to anyone having an interest in trees to see healthy young growth of timber removed, the matter must, after all, be considered in its economic aspects, and full recognition must be given to the fact that, if in agriculture lies the economic use of any particular tract, every step even involving the destruction of a considerable amount of timber reproduction, should be taken to make it available for agricultural development.

Once more, it may be stated that, if the foregoing conceptions are given the approval which in sound economics they unquestionably merit, there will be almost entirely removed from the public mind the present unfortunate and unwarranted basis for the belief that there exists an inherent factor of conflict between agriculture and forestry.

A practical demonstration of the theories outlined above, and of the economic loss involved in failure to make available for agriculture lands which are primarily suited therefor, lies in the case of some timber berths, the licenses to which are renewable from year to year, presumably for almost indefinite periods of time. Such licenses almost invariably provide for diameter limits below which no timber is allowed to be removed, and there are frequently other

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provisions designed primarily to serve cases where timber is presumed to be in occupation of non-agricultural lands. More frequently occurs a blind adherence to such conditions, notwithstanding the fact that by so doing, agricultural land is withheld from its proper use. It should hardly be necessary to emphasize that this blind adherence to the application of routine administration is creative of just as many serious mistakes, and gives rise to as many misconceptions, as does the impractical or unintelligent adherence to established routine in any other activity whose many variables of condition or degree may require the injection of important exceptions.

As exemplifying the importance of bringing timbered agricultural lands to their proper use, let us consider, for a moment, the effect of the negative policy upon the all-important and very irritating question of taxation. As land has greater value in agriculture—if it be capable of that use—than it has in timber production, it may under the former use be subjected to more severe assessment for taxation. True forest land, on the other hand, being useful for one purpose only—and that, a less productive one—cannot stand taxation to nearly the same extent. In the premises, every tract of agricultural land withheld from cultivation in a community either limits the community activities which may be carried on, or else increases the taxation which must be applied to agricultural lands used as such. Similarly, owing to the constant demand for improvements in any community under development, true timber lands are by such means called upon to pay a higher rate than is their due.

To the general policy of confining timber production to non-agricultural lands, there are, of course, some exceptions. In some cases, although not often, in the protection of watersheds or catchment basins, it may be necessary to retain under forest cover areas which might otherwise be advantageously used in agriculture. With this phase of forestry, however, the Commission would be wandering too far afield from its true purpose, were it to engage in extended discussion. Therefore, beyond recording the fact that, where such requirements do apply, the timber produced on such areas may also be made to serve the purpose of furnishing timber supplies, the question may well be left to treatment by more scientific bodies.

Similarly, where conditions other than the necessity of providing timber supplies render it desirable that limited amounts of agricultural land should be kept in forest, whether for the purpose of shelter, for aesthetic reasons, or to provide recreational facilities—such cases may well be left to special consideration, as they do not materially affect the questions under review by this Commission.

THE MANAGEMENT OF TRUE FOREST LANDS

We now pass to a discussion of the greater problem, namely, the administration of timber on true forest lands, which it is presumed have been, or will be dedicated to forest production in the form of statutory reservations.

The retention of timber beyond the stage of maturity, even upon true forest lands, involves economic waste. Although timber may continue to live for scores or even hundreds of years after it has reached financial maturity, the limited growth which the individual tree puts on is entirely offset, if not actually more than counteracted, by losses throughout the stand by the general decadence therein. Therefore, except insofar as the systematizing of a plan of consistent annual use of timber (in order that these annual supplies may be properly distributed over the required term of years, until they are replaced by younger timber coming on) may require its retention temporarily, timber which has reached maturity should be cut. Entirely aside from the decadence due to natural conditions, it is beset with so many hazards that the only proper treatment is that it should be put to conservative use at the first opportunity.

In the conception that forest conservation involves the retention beyond maturity, for future use, of timber which is now marketable, there is just as fundamental an error, albeit a less dangerous one, as there is in neglecting to adequately protect the seedling growth, the saplings, the adolescent trees, and the near-mature timber, which obviously should constitute the future timber supplies.

To permit of consistent treatment of the subject, and in order that it may properly synchronize with the fundamental principles outlined in the previous pages, it is essential that in dealing further with this phase of the problem, we should consider timber as a crop. Unless this fundamental conception be applied to the timber resources, we must inevitably continue to conceive of the forest as a mine. Adopting the principle, it is now proposed to deal with various phases of the subject.

1. REGENERATION

While it is manifestly beyond the scope of the Commission to discuss in detail the technicalities of forest regeneration, there are some fundamental points which may well be considered. Recognizing, on the one hand, that under conditions of proper management and protection, timber has the power of reproducing itself naturally, recognizing, on the other hand, that starting with bare land, and with a quantity of seed, it is possible to secure seedling growth which in the course of years may be built up into a stand of timber;—it is desirable to consider which of these two very different methods may have the greater and more economical application in Canada. On the one hand, it requires no great degree of imagination or study to reach the conclusion that, for very broad areas in this country, there exists an excellent opportunity for carrying on timber production, without resort to the use of artificial methods such as seeding and planting; on the other hand, for areas where the soil has been entirely divested of tree growth, or even on areas which have been entirely divested of merchantable species, if any reproduction of the more desirable kinds of timber is to be secured, it can only be done by artificial means.

Considering for a moment the relative cost of the two methods, and using by way of illustration only the most general figures, it may be stated that the planting up of forest areas with seedlings or transplants grown in a nursery may cost anywhere from ten to twenty dollars per acre,—even more, if heavy transportation costs have to be met. Notwithstanding its high cost, the very fact that under this method, some definite and complete piece of work is being undertaken, the yearly results of which are clearly perceivable to the public as time goes on, artificial regeneration is one which appeals strongly to the imagination of the people in this country. More frequently, for the person who has got beyond the belief that forestry consists solely of fire protection, his conception of forestry is that of extensive planting and growing of timber. While it is by no means argued that there are not extensive areas where such planting operations are both necessary and readily justified, it should be strongly emphasized that the conception that forestry consists essentially in tree planting, is one which operates to restrict the general application of the true principles of forest conservation.

Let us for the moment call to mind that probably nowhere in Canada are amounts greater than three or four cents per acre being expended in fire protection work. Without further elucidation, it will surely be abundantly clear that the application of funds at the rate of from ten to twenty dollars per acre, for artificial regeneration, would over relatively small areas entirely exhaust the gross appropriation of public funds for forestry purposes, leaving nothing for the protection and administration of timber resources made available by nature:

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and that such treatment would result in the utter neglect of valuable resources now existing. It is true that in some European countries, as a result of intensive utilization of timber in years gone by, there was necessity for the adoption of artificial methods of regeneration. In Great Britain it was only by such means that the forest could be re-established. Perhaps, rather surprising to some people who may lean strongly toward this conception of forestry, will be the statement that, even in Europe, the present trend of forestry development is back toward the systems of natural regeneration. It has been found that, although it has been possible to plant and grow timber more rapidly and more consistently by artificial means, the method has, nevertheless some inherent disadvantages entirely aside from cost, which have caused forest authorities to give serious consideration to returning to methods more closely resembling those used by nature.

Just as a market gardener may, by the use of hot-beds and cold-frames, produce vegetables in shorter time than is possible under entirely natural conditions, so may we in growing timber adopt the quicker and perhaps more certain methods of artificial regeneration; in both cases, however, the results are accomplished at greatly increased cost. Furthermore, as the gardener can find a market for the produce so derived because it becomes available at a special time, so may timber grown from nursery stock be profitably marketed if it happens to be so located that, by reason of low transportation costs, it is as cheap as, or cheaper than, wood grown in natural stands.

Let us therefore get a clear conception of the problem. Regeneration by artificial methods is relatively very costly, and should only be adopted where the production of the species required cannot be satisfactorily secured by natural means. The high cost of artificial regeneration is the price we must pay for past carelessness in treatment of natural forest, and in some areas we must submit to these higher costs, if we are to have anything else than weeds and waste. Having re-established the forest by that means, however, our future methods of forest regulation should aim once more at natural regeneration.

For the purpose of illustration, let it be assumed that one hundred acres of waste land are planted with spruce seedlings at a cost, say, of \$15 per acre; the immediate total outlay therefor being \$1,500, aside from the cost of the land. In 50 years we may have a stand, 30 cords to the acre, or 3,000 cords in all. By that time the original cost of replanting will at 4 per cent have accumulated to \$10,660, to which amount must be added the accumulated value of expenditures made in the interval. Let us suppose that, apart from the cost of protection, incidental expenditures have been compensated by the value of material secured from any thinnings which have been made. Again, let us suppose that protection of the area has cost us at the rate of 10 cents per acre per year—stands which entail large investment in the beginning must be adequately protected; at the time of cutting, therefore, our accumulated protection charges have at the same rate of interest reached \$1,526. The total cost of the stand of spruce 50 years hence is \$12,186. Therefore, each of the 3,000 cords of wood harvested must carry a production cost of \$4.06, aside from any rental value on the land itself, and also on the assumption that thinnings have carried other costs.

Compare the foregoing to expenditures actually made in the care of natural woods. At best we may spend perhaps 4 cents per acre in protection (and that, over very limited areas only) and practically nothing in management, other than charges directly attributable to the phase of utilization. Starting with a stand naturally reproduced, we might have twenty or twenty-five cords per acre in the 50 years, and our accumulated protection costs on 100 acres would be \$610, or, taking the twenty cord stand, 30.5 cents per cord.

It may well be asked, therefore, how our industries could possibly withstand the costs of artificial regeneration? The answer is simply this: by careless

treatment and lack of protection the industries are rapidly being driven farther afield for wood supplies. It does not require any great railway mileage to absorb in freight charges a sum greater than \$4.00 per cord; when it is remembered that even now logs are, in many instances, driven by stream over distances that require two years to bring them to the mill, it will readily be seen how easily the charge may be absorbed. In the foregoing illustration we have set aside the charges on land; we have also adopted a relatively low rate of interest; it must not be hastily assumed, therefore, that wood can, by artificial methods, be produced at the cost mentioned. Rather, the proper conclusion to be drawn is, that in the dissipation of timber resources in close proximity to forest industries we are rapidly bringing our timber lands to that state where it will be necessary to replant them with desirable species, and the raw materials must then carry a heavy production charge. Heretofore, in talking of "production cost" of timber, it has been our custom to include, not the cost of growing, but only the cost of the physical operation of harvesting, the cost of a tithe in protection perhaps, and the cost of transportation; and by this shiftless business calculation, we have left unproductive areas close at hand which, accorded proper treatment, would have produced in continuity.

Although forest protection alone cannot in all cases bring about the proper natural regeneration of desirable species, it is a factor of outstanding importance in determining whether or not we shall saddle ourselves with the added cost of artificial methods. In allowing our present losses to continue, we are doing nothing more than gambling as between two, three or four cents (frequently, a fraction of a cent) per acre toward fire protection, and *real* fire protection, in a situation that without real protection must ultimately and inevitably impose production costs of four, five or six dollars per cord on our raw materials; we are gambling the pittance, and, as frequently happens with the "long shots", we are rapidly and consistently losing. When experience elsewhere dictates that even if we do have to resort to artificial planting to restore our neglected timber lands, we shall probably in any case come back again to natural regeneration, wherein lies the logic of proceeding fullsteam ahead to heavy production costs? We have had our "fling"; let us gather up the remnants and apply methods more characterized by sanity and providence.

In Part I, Chapter II, Section 10, in discussing the custom of calculating our resources in "so-many-years' supply" an analogy was drawn between this practice and the principle of annuities. When we cast our eyes over the extent of timberland in Canada which can be made and maintained permanently productive, we are a faithless and supine people indeed, if we tremble before the responsibility, and rest content to count the years. More than that, even in such selfish and short-sighted calculations, we neglect even to provide that outstanding characteristic of the annuity system, namely, security from reduction, except through withdrawal of the annuity itself.

Although, therefore, as a result of past neglect, whether it be through extreme cutting or through lack of protection to remaining stands, there are many areas where artificial methods must be resorted to if a usable stand of timber is to be produced, it is senseless to talk of doing that, if we cannot at the same time devote far more than the one-five hundredth part to the protection of timber already standing. The turning away of our eyes, and of our endeavours, from the extensive provisions of nature, and the adoption of artificial methods upon a large scale, savours of the heroics of the small boy who turns from a good home and three square meals a day, to a temporary life in the brambles with rabbits for his daily fare, simply because it seems courageous to hunt rabbits and be independent.

By all means let us re-establish the forest upon areas close to the wood markets, where natural regeneration is impossible; but, by all means, let us depend upon the cheaper, saner methods of natural regeneration wherever that

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method can be pursued; and in order that the latter method may afford the results of which it is capable, let us more adequately protect the forest. If our efforts at protection were increased four-fold, it would only impose upon the wood at the time of cutting an additional cost of somewhere from fifty cents to one dollar per cord. Of one thing we may rest assured; if we do not afford more adequate protection, and even without the application of artificial methods, the cost of our wood will increase far more than the cost of protection, due to the added expense of bringing the timber for longer distances; indeed, we have seen it do so several times over within recent years.

2. INTERMEDIATE TREATMENT

The handling of timber between the time of regeneration and that of utilization involves many problems of a technical nature, with which the Commission is manifestly not in a position to deal. The occasion is seized upon, however, to reiterate one important point, and to introduce another: (a) it is this period through which the timber must be absolutely protected against interference of any kind—the area must be reserved against other destructive use and against tampering and it must be protected from fire; (b) whereas, in Europe and some other parts of the world, there is a market for small material taken from the forest in the operations of thinning, and the value of such intermediate products is such as to more than pay for the operation,—in this country, it is only in the most isolated cases that this applies; the artificial planting of timber demands timely thinnings, if optimum results are to be secured, and as this cannot here be done at a profit, thinnings impose an added cost, rather than being revenue-producing.

3. UTILIZATION

The purposes of forest production vary greatly. A forest area may be administered exclusively for the continual production of timber; on the other hand, it may be required solely for the purpose of watershed protection; or it may serve both objects. Even in the most extreme cases of watershed-protection-forests, however, it is more frequently possible, and decidedly in the interest of economy, that mature timber should be utilized, in order that waste may be prevented, and the cost of watershed-protection by this means reduced. In a country where forest areas are extensive, notwithstanding the fact that the quality of timber may be relatively poor, there is a tendency toward tying-up in various forms of protection areas, valuable assets in mature timber. Although naturally, if the area is to serve its purpose, it must be subjected to special treatment, there are times and cases where great economic losses are entailed in absolutely preventing the removal of timber.

On the principle that a forest is to be handled for sustained yield, the stage of forest utilization theoretically does, and practically should, involve the removal from the forest in annual or periodical instalments of an amount approximately equal to the gross increment in the forest for that year or period. Needless to say, it is physically impossible to take from the forest the actual identical wood which is produced in the year or period; rather, the wood available and which should be used, is that amount of mature timber which is equal in volume to the increment in the entire forest for the particular period.

Maturity in timber is relative, and depends on many factors; in no case is maturity the maximum size or age which a tree is capable of attaining. Maturity is that stage at which timber reaches the point where, although it may increase in size and volume, it does so at a rate slower than will make it financially profitable to retain. As between different uses for which timber is grown, there is variation in the time of maturity; for lumber, shingles, etc., large clear

logs are required; for pulpwood, much smaller trees will suffice. Finally, size of the individual tree is no indication of financial maturity,—a tree twenty inches in diameter may still be growing at a rate which justifies its retention; on the other hand, a tree ten inches in diameter may be suppressed and over-mature. Over a given forest area of considerable size, if utilization is carried on in one part of it to such an extent that, merely by reason of accessibility—and consequently, reduced cost in logging—trees are taken which have not reached financial maturity, whereas in other parts of the stand mature or over-mature trees are left uncut simply because they are more difficult to get at,—there is lack of economy, in that the quality of young stands is impaired, while areas of over-mature timber are left unproductive.

If the forest is to be maintained in a continuously productive state, there are four main points which must be kept in mind during the stage of utilization:—

- (a) That the natural regeneration of desirable species is required;
- (b) That the forest has to be protected until the next crop is matured;
- (c) That over a forest unit there must not be removed in one year a greater volume of wood than the forest can grow in one year;
- (d) That the operation must be productive of financial profit.

With these pre-requisites in view, let us examine closely the methods actually pursued in Canada. First of all, there are many who will say at the outset; that if (d) is to be attained, (a), (b) and (c) must one or all be relegated to the background, as they are "entirely impracticable", "purely theoretical", and that profits cannot be earned if they be applied. Taking the latter statement at its value, we may at once conclude: if (d) cannot be carried out in such a manner that the other three are observed, *then* the forest cannot be maintained in a continuously productive state; the forest areas must continue to decline in extent and quality; the industries must find some other raw material; or, as is more frequently stated, "we will plant new forests"!

It is entirely owing to the fact that, deluded by supposed "illimitable supplies" we have simply refused to recognize the axioms of the problem, and having developed our forest industry on that unsound basis, we find it difficult to now bring ourselves to take the action required. We assume that it would entirely upset our forest industry, and that it would rob us of our markets, as the requisites could only be applied at increased cost of forest products; in such an assumption, however, we not only presume, but actually condone, the ultimate degeneration of the forest, of forest industries, and of thriving communities; either that, or we simply refuse to look ahead, we refuse to be influenced by any motive other than immediate and temporary gain, and in so doing, we trade upon the capital, soil and timber, thus robbing nature of the power to produce and contribute continuously to the welfare of the state.

(a) REPRODUCTION OF DESIRABLE SPECIES

The securing of suitable reproduction is one of the most important branches of silviculture; by natural methods it can only be economically done by control of the methods of utilization. So far as the commercial utilization of timber is concerned, there is only one part of Canada where there is definite and material control over logging operations, along lines which will permit of desirable reproduction, namely, on the forest reserves in Western Canada. Elsewhere, from Atlantic to Pacific, while the methods applied may have some restricting features theoretically aimed at suitable reproduction, they are measures the utility of which have long since been exploded, not only in other countries, but here in Canada where they have failed of the purpose for which they were designed.

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Although the adoption of "diameter limits" in this country was originally designed to assure a proportion of the stand being left for future use, the practice was later re-vamped as a method of securing regeneration—it being assumed that if all trees below a certain size were left in the forest, ample provision was thereby made for reproduction. While it must be admitted that at least one reason for which it has failed of that purpose is because the logging slash was also left, and frequently the entire area was destroyed by fire, there are other cogent reasons. In the first place, in operating virgin timber, or even in second or third cuttings over the same area, the leaving of all trees below a certain diameter—ten or twelve inches, as the case may be—does not ensure that the number of trees so left will act as seed trees. As previously pointed out a ten-inch tree may be over-mature, and certainly under the conditions assumed it is generally a suppressed one,—and this, the tree that is left to regenerate its kind. It may be one in five, or only one in ten of such trees that may bear a crop of vigorous seed, but the others nevertheless remain indigent, contributing nothing, but on the other hand, consuming soil food, moisture, and light, all of which are essential to the new crop.

Very frequently the requirement to leave all trees below a specified size entails the retention of a greater number of trees than are taken out. There are certainly selection systems which are successfully used in countries where rational forestry is practised, but none that are successful approach in crudity this hit-and-miss policy of dictating in legal phraseology the size of the trees which must be left. If trees are to be left for reproductive purposes, they must be those that are qualified to serve that purpose, not the old suppressed weaklings that are themselves beyond recovery, to say nothing of their being incapable of giving birth to a thrifty new crop. Entirely aside from inability of suppressed trees to successfully function in the latter direction, they are all too frequently subject to windthrow as soon as the stand is opened up. Particularly on areas where a ten-inch diameter limit has been enforced, an inspection of the logged-over lands, a year or two following the operations will frequently reveal a veritable jungle of slash, fallen trees and debris. Under such methods it is futile to even talk of satisfactory reproduction of the stand, let alone the entertaining of hopeful expectations of securing it. Moreover, many an operator would willingly have sacrificed a healthy, vigorous tree of large size, and better able to withstand the shock of opening up in the stand, if in exchange therefor he might have secured several of smaller size, which by the application of routine methods, he is prevented from taking. That these smaller trees are susceptible of commercial exploitation in many districts is all too clearly exemplified in the frequent seizures made over areas where trees "under-size" have been cut; also, on some areas where some operators have been ingenious enough to take improper advantage of exceptions made where skidding roads are required, the mileage of skidding roads, and the number of seven, eight or nine-inch stumps, passes understanding!

If a selection system is required for any area, application of the diameter limit will unquestionably ensure the retention of a certain volume of timber, but beyond that, its utility has in innumerable cases been disproved. Examination of woodlands in almost any part of Canada, will furnish abundant proof of this statement; in fact, the diameter limit system seems to have the virtue, or the failing, of permitting the reproduction of several species other than those actually desired. Why then are other methods not applied, except, as previously stated, on the forest reserves in Western Canada; simply because the designation of trees to be removed, other than by written word in a contract, involves the physical operation of selecting the trees. To avoid the latter, and to confine inspection to the time after which the cutting takes place—i.e., after any damage has been done—there are written in the license, specifications which can by that means only be defined by the size of timber to be removed. In other words, to

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save money in the cost of timber administration, we enforce a system which does not even accomplish the purpose for which it was intended.

The time of utilization is the most critical in the life of the forest. By what is then done, and how it is done, there is assuredly determined the probable future or character of the forest. Unless we are willing to devote something, even to sacrifice something, at that stage, we cannot hope to maintain the forest in a state which will permit or induce regeneration of the species desired. The presence or absence of logging slash also has a marked effect upon reproduction. There are many who argue that leaving the slash is actually beneficial to the young growth, in that it provides shelter to the seedlings. While the number and varied character of the reasons advanced for the leaving of slash in the woods are myriad, this particular one apparently entirely ignores the fact that perfectly healthy stands of almost any kind of tree may be grown on a bare field, devoid of timber for generations, without applying thereto a layer of slash, notwithstanding the fact that conditions for development of the seedlings in such a field may not be so favourable as in the properly regulated forest. If, however, in such circumstances, it were argued that a layer of slash must be provided, we would then find many to question the advisability of such action, owing to the cost of such treatment.

As a matter of fact, in the foregoing obverse application of the slash problem, we arrive at the real reason underlying the many objections to the enforcement of slash disposal provisions—namely, the cost. While there may possibly be species of trees whose seedlings might thrive the better for some protection, the leaving of slash can in no measure be advanced as a necessity; indeed its disadvantages so far outweigh the benefits which might be derived, that were we to adopt it as an *essential* feature in forest regeneration, we would simply fly in the face of experience gained throughout the world.

(b) PROTECTION

So far as fire is concerned, the hazards attendant upon the accumulation of slash in the woods have been somewhat extensively dealt with in the preceding chapter. Before passing to a brief discussion of the economics of slash disposal, reference may first be made to the influence of slash upon forest insects.

There is practically no case in which the leaving of refuse incidental to any use of land does not result in a deterioration of the areas so mistreated. In the case of woods' slash, the debris constitutes the breeding place of insect and plant parasites which contribute largely to a general weakening in the vitality of the timber stand. There are those who, being opposed to slash disposal, have the temerity to argue that the leaving of slash provides the insects with food, and, by so satisfying their remarkable appetites, their attacks upon growing timber are thus ameliorated: it were just as logical to argue that the leaving of corn husks and stalks in the cornfield by providing a food which will appease the attitude of rodents, would afford protection to the growing crop against the attacks of these destructive mammals; the prodigious breeding capacities of forest insects, and of rodents, are in the reckoning entirely overlooked.

The number and kind of forest insects is legion; some attack only dead wood; others confine their attention to the living trees; still others may be partial to both. It must, after all, be remembered that what we know as "life" in a tree is confined to the tissue between the bark and the wood and to the leaves and buds; in the solid wood of trees, life has ceased. For these reasons, there is an overlapping in the attentions displayed by insects and fungi, as between living and dead timber. It is of interest to note here that, in the comparatively recent epidemic of the bark-beetle, which attacked western yellow pine, the only

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practicable method of control which could be developed was in the utilization of timber infested by the insects, and the complete destruction of all slash and debris incidental to the operation. With this particular species of timber, control measures were relatively more simple, owing to the restricted distribution of the tree. Nevertheless, it was only by complete removal of both the merchantable material and slash that control could be effected.

Coming now to the economics of slash disposal as a fire protection measure, we must in the first place, admit the hazard: that, surely, is self-evident, and being so, it is highly desirable, in fact absolutely essential, that slash disposal requirements should be enforced if it is economically feasible to do so. Let us first of all examine the basis for the arguments that it cannot economically be done; with very few exceptions those who adopt this position have never tried it,—such men can tell us all about how much they think it will cost, but never having tried it, they have no more justification for the utterance of positive statements on the subject than they would have in dictating the cost of some other operation in which they are entirely inexperienced. However, a few spasmodic experiments have been tried by operators, from which unfavourable results are claimed to have been obtained. There is, however, a certain amount of psychology to the slash disposal problem. There is probably no form of activity in which a greater amount of efficiency can be wasted, if the performer is so disposed, than in brush-disposal. If, therefore, an experiment is undertaken, the mental attitude of the performer will have a very great deal to do with the results to be obtained. If he be one who, simply because he does not want to have to do it, simply will not believe that it can be done, there is slight prospect of our getting cost figures that will show the practice is feasible.

There is something inherently disagreeable and unattractive about the work of slash-disposal; lumber-jacks do not like it, and logging foremen whose jobs depend upon "low-production costs" dislike the very thought of it. Nevertheless, entirely aside from the mental attitude of the operator himself, these are the men through whom experiments are invariably performed. The foreman to whom may be assigned the conduct of an experiment, is not relieved of his other responsibilities for low-production costs; he is simply told to try the thing and see what the cost may be. In the first place, the assignment of his best or average men to the job will increase his other costs, so he studiously avoids that; rather, he more frequently assigns the poorer men of his staff, men who will not be missed so much from the felling, the skidding or the hauling; upon the efforts of these inferior men the economic feasibility is determined of a phase of forest utilization, which, by reason of its efficacy in reducing fire hazard, is highly desired. More frequently the foreman, and even the men, are fully aware that the employer himself is skeptical as to the economic possibility of brush disposal, particularly if it is going to enhance his cost of production; under such conditions it is hardly to be expected that they will exert themselves unduly to demonstrate that brush disposal may be feasible.

Compare the attitude just described to the opposite, and very much more constructive one; namely, that as brush disposal will greatly reduce the fire hazard, what is the very lowest cost for which it can be effected? As against the skeptical frame of mind under which some operators have approached brush disposal *experiments*, compare the mental attitude of the operator who approaches slash disposal from the viewpoint that it is by the terms of his license an essential requirement of his timber contract, in an *actual commercial* operation. He is faced with the necessity of disposing of his slash just as firmly as he is required to conform to any other condition of his contract; if he cannot dispose of his slash and still secure a profit from his operation, he is doomed to failure. Manifestly, beset by a vigorous requirement that he should do so, he sets about the job in a manner entirely different from the other man who

may simply be trying to establish as a fact some preconceived opinion that it cannot be done; his employees are fully apprised of the fact that it has to be done, and if, by insufficient attention to details of the project they saddle the employer with undue costs, they are rather forcibly brought to time.

The only justifiable reason for a conclusion that brush disposal is not economically practicable would be that it never was accomplished at reasonable cost. Notwithstanding the arguments that have been repeatedly placed before the Commission to the effect that brush disposal would impose additional costs of three, four or even six dollars per thousand feet of lumber produced, the Commission has been at pains to enquire into costs of such operations in the only part of Canada where brush disposal has been consistently required and enforced, namely on the forest reserves in Western Canada. For a period of twelve years the federal forestry service has persistently developed brush disposal requirements as an essential feature of all sales of forest reserve timber. Faced with the certainty that they would be forced to perform the operation, timber operators in the forest reserves have been subjected to the only practical test as to economic feasibility which has so far been applied in Canada. Cost figures, all the way from 40 cents to \$1.25 per thousand board feet of lumber produced, have been stated, the former in some cases quoted by forestry officials, the latter, about the highest figure claimed by timber operators who have tried it. Neither figure may be taken as the final opinion of either class; in some cases a forest service tally will show higher costs; in others, the operators have admitted of slash disposal being carried on for from 75 cents to \$1.00 per M.

Whatever the exact cost may have been under the varying conditions, how greatly at variance are these figures with those so frequently put forward by the operator who has never submitted the process to practical test. With the latter, slash disposal is apparently an utter impossibility; with the former, it is an established fact. When such cases are presented to operators in regions where slash disposal has never been required or properly tried, the invariable rejoinder is that "conditions are different in our country." It verily seems that the conditions in every region where there exists an inborn hostility to slash disposal are "entirely different" from those which obtain in regions where brush disposal is successfully practised. Actually, however, the essential difference in conditions more frequently relates to the laws applied, and the attitude of both timber operators and the public, rather than to any outstanding difference in the conditions affecting the problem itself. A white spruce stand in northern Manitoba, Saskatchewan or Alberta, is directly comparable to a white spruce stand in Ontario, Quebec, New Brunswick or Nova Scotia. All of the conditions or difficulties which are presumed to render brush disposal so impossible of application in the eastern provinces, are to be found in some parts of the prairie provinces where brush disposal is successfully carried on. For instance, the difficulties of burning wet brush are frequently urged as the preventing factor in brush disposal during the New Brunswick or Nova Scotia winters; can these conditions be said to exceed the wetness of brush piles subject to the extremely sudden thaws caused by Chinook winds in Alberta? Again, the danger of burning at any other time is frequently cited as the insurmountable obstacle to brush disposal in Eastern Canada; can the average fire hazard in any part of the east be compared to that which obtains in many parts of Western Canada, where droughts are frequent, and high winds more prevalent? In any case, as has previously been pointed out, if the difficulty of burning is the main deterrent, how greatly the fire hazard would be reduced even by proper piling.

It may further be pointed out that in the slash disposal operations on forest reserves in western Canada, the operators are in direct competition with other operators on licensed timber berths; in fact, in some instances, the operator

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carries on under the two methods. How then, it may be asked, can the operator upon whom slash disposal is imposed compete with his neighbour; or how is it that the one operator will work under both methods when one must be the cheaper? While the Commission manifestly cannot adopt the position that the operation with slash disposal as a requisite is less expensive than the other, it has at least been drawn to our attention that the practice, efficiently carried out at the proper time, has some features which compensate at least in part for the expenditure involved. Slash disposal may require the addition of a man to the felling crew, but when the brush is disposed of, the subsequent operations of skidding are rendered less difficult. It is strongly doubted that these compensating factors can ever entirely overcome the added cost imposed by brush disposal, but they naturally must have some effect in reducing it.

All of these arguments presuppose that the process shall be efficiently carried out. Time and again, in attacking the project, operators have simply instructed the men to "pile and burn" it, only to find that they were required to return and perform the operation over again. The expense of brush disposal is in the handling of the brush; therefore, if it has to be handled twice, the operation may be twice as expensive—sometimes even more. The operator who realizes this, and insists on proper methods in the first place, is the one who shoulders the least cost of this phase of his logging operations; he is also the one who first realizes the possibilities in the practice, and on subsequent occasions is able to make a higher tender on the next sale, than can the operator who, having never attempted to secure efficiency in brush disposal, figures too highly upon this phase of the operation.

Nevertheless, with the added cost, how can such operators successfully compete? Simply by calculating the lowest possible figure for which adequate brush disposal may be carried out, and which through actual experience they have learned, deducting that from the amount which he could otherwise bid, and tendering on that basis. Moreover, frequently the operator himself shoulders a part of it, but, in the final analysis, the bulk of it is borne by the government, or more correctly, the people of Canada. This is the case where brush disposal is confined to one region. Notwithstanding the fact that the people pay, by a small reduction in the revenue received from such operations, it pays—in fire protection.

This leads to another phase of the problem of brush disposal, and as to whether it should be applied. More frequently, the timber operator may incline too strongly to the opinion that on licensed timber lands his own view as to whether brush disposal is possible or not must be accepted. In Canada, we boast that the people still control 85 or 90 per cent of the forest area, because, in addition to an interest in the timber, the soil rights have been retained in the Crown. In other words, we take great pride in the thought that we may impose such restrictions upon the uses of timber land as will ensure proper treatment. Can it, however, be claimed that enjoying this right, the people of Canada are demanding proper treatment? If so, in what direction? As a matter of fact, are these licensed lands being handled one whit better than the privately owned timber land? Still another feature in the problem is the fact that in the final reckoning the people must in any case, pay the cost of additional requirements which through their governments they may impose upon timber operators. If, therefore, the fire hazard, and losses consequent thereupon, are so great that some radical steps must be taken to reduce it, even at increased cost of the final product, by what means or right may an individual operator oppose the public desire and the public necessity?

As for privately-owned timber, if the fire hazard consequent upon accumulated slash is such as to endanger other resources, surely there exists a public right that restrictions calculated to remove or reduce the danger should be

enforced. That power is held and exerted by the State in many other directions where private property interests are involved. Wherein can a timber property, or the operation of it, claim exemption from restrictions which may be necessary to assure the safety of the public domain?

In the foregoing discussion, we have struck at the roots of the slash question. If a satisfactory solution is to be arrived at, slash disposal requirements must be applied throughout the country: they must apply to both privately owned and publicly controlled timber lands. The methods to be applied cannot be entirely uniform, but at least they can all recognize that the necessity for their imposition lies in the hazard of slash, and that in the material reduction of that hazard lies the objective. Manifestly, the Commission, with its comparatively brief study, may not dictate the methods which should be adopted. We may only reiterate that the hazard of the slash is such that our rapidly dwindling resources cannot longer withstand the losses occasioned from this source; that there already exist cases where the practice is successfully carried out on a commercial scale; finally, that these point the way to widespread and effective action by the federal and provincial governments in Canada, for the prevention of the further accumulation of slash hazards in the timber-lands of this country. We anticipate the question that if Canada were to adopt such action, how would we compete with our great neighbour, the United States, where also there exist similar needs. That phase of the question we must leave until international aspects of forest conservation are discussed in Chapter XI.

(c) THE USE OF FOREST INCREMENT

The principles underlying the handling of forests for sustained yield have been the subject of constant reference throughout this report. It is, therefore, almost unnecessary to state that if a greater amount of timber be removed from the forest that it can annually produce, there must result a steady decrease in the volume of the growing stock. An area consisting entirely of mature timber might naturally be subjected to heavier cutting, but elsewhere provision must be made that an increment of corresponding volume is being obtained.

Nowhere in Canada have these principles been applied. In those parts of the country where the actual increment may perhaps approximate or even exceed the amount annually utilized, the entire balance is disturbed by fire and other losses. Moreover, as previously pointed out, we know so little as to what our annual increment may be, that in very few places, indeed if anywhere, has any practical application of the principle of sustained yield been effected. The forest reserves which are under at least a crude form of management offer the best opportunity for immediate application of the principle. Many studies must be carried out before the exact state of balance can be determined, but it may be pointed out that when, by reason of serious depletion in timber supplies, we in Canada are rapidly coming to the stage where we will of necessity have to adopt the economic principle of sustained yield, the more we may now do by way of preparation, the further we may go in development of methods adapted to our conditions, the better and the earlier will we be able to apply proper business methods to the conduct of our forest business.

For these reasons the Commission strongly urges that forest reserves already existing should be placed under management for sustained yield; and that the areas under such form of treatment should be expanded as rapidly as possible. By such action, we shall not only take into consideration the needs of future generations, but we will be recognizing the existing urgency for the more rational treatment of our forest resources for the benefit of the present generation.

(d) FOREST UTILIZATION AT A PROFIT

While there are several countries where the phase of utilization is handled directly as a state function, on this continent we have followed the practice of harvesting our timber entirely through private enterprise. Although there are very restricted localities in this country where state operation of timber may not be very far distant, in the main it is entirely probable that to private enterprise the business of bringing the products of the forest to the markets will be left. If this be the case, there must continue the necessity of providing a profit to private industries so engaged.

The extent of forest industries in Canada has been discussed in some detail in Part I. At this stage we are not so interested in the extent of them, as in their continuance on a permanent basis; our interest is to determine by what means permanent supplies of the raw material essential to continuance of such industries, may be ensured. In the foregoing pages there have been described the various factors in present methods of utilization which operate against permanency in wood supplies. That the adoption of more conservative methods of utilization, and of more adequate fire protection, are required, has been made abundantly clear. How then are we to go about it? Although fortunes have been made in the timber industry, they have probably not been so frequent as has been the case in other industrial activities. Many forest industries of the present day are beset with financial difficulties. Their continuance is essential to our economic development, and we must, therefore, leave a reasonable profit in the business. Under these circumstances we cannot simply say: the cost of all reforms must be borne by the industry. Rather, if we are to enforce methods which will ensure the reproduction of young timber; if we are to adequately protect our forests, and in so doing enforce slash disposal requirements; if we are to limit ourselves to the annual yield of our timber areas; and if we are to effect other requirements aimed at perpetuation of the forest resource; the people of Canada must in large measure shoulder the burden, by subjecting themselves to the inevitably higher costs of wood products entailed in such methods. Had we started earlier in the game, the burden would be less severe; but we must now face the issue under conditions which have been brought about by our own neglect. There is nothing to be gained by attributing present difficulties to a past generation; the present generation has by huge industrial development and by careless treatment of the wood supplies—in spite of the examples and experiences of other nations made available for its guidance—been in large measure responsible for present conditions.

Very much apropos in the present discussion is a reference to the question of taxation of timber properties and timber industries. Throughout the land the one effort seems to be to impose such taxes, whether they be in the form of land rentals or business assessments, which have only one object in view, viz., the attaining of revenue. In many instances the method or extent of such charges is such as to operate against attainment of the ideals of forestry—permanent timber production. Very naturally a timber land owner, or even the holder of a timber license, who is subjected to continually increasing rates of taxation, sooner or later reaches the stage where he will "operate the timber for all it is worth" and abandon any claim to what remains; the remnants in such cases are frequently sheer waste, or soon become so. Rather humanly, perhaps, such methods of treating timber-holders appeal rather strongly to the public, but they result in a constant increase in the price of wood products nevertheless, and the good public pays; there is, however, a stage in taxation where the industries must cease passing on the added costs—the stage where foreign competition enters into the problem. The inevitable result is that at this point the operator must "take it out on the timber" or go to the wall.

The Commission is, obviously, not in a position to deal in detail with the question of forest taxation as that is of itself an intricate problem, involving many phases of economics. Suffice it to say that there is great merit in the principle of basing timber taxation upon the yield of timber-lands at the time of harvest, rather than upon the inequitable basis of areas and continuous application of charges, to get rid of which many valuable areas are subjected to the most destructive utilization.

Looking at the question of taxation of timber in its broader aspects, the state is quite justified in expecting a profit on the business of handling a natural resource; is it however justified in the continuance of present practice? Seriously depleted as they are, must our forest resources still be called upon to pay for the establishment of manifold public works; are we justified in the present state of that resource, in extracting revenues in the ratio of six-to-one, five-to-one, or even four-to-one? Surely there is some other phase of our manifold human activities that can be made to shoulder its proper burden. Surely something can be done to prevent the further diversion from their proper use of funds extracted from the forest. The present condition of the forest resource is in itself undeniable evidence that some other operation in our economic life is escaping its proper burden, because the revenues which are extracted from the forest and diverted to other uses, are in large measure drawn from the woods' capital.

CHRISTMAS TREES

While really foreign to our work, the question of Christmas trees has so frequently been raised that at least brief reference to it will not be amiss. On all sides people object strongly to the permitting of extensive cutting of trees for this purpose. It should be pointed out that so long as use is confined to such trees as will properly serve the purpose,—that is, bushy trees, grown in the open,—there is no economic loss in the practice; indeed it is a legitimate business. The practice of lopping the tops from large trees merely to utilize a part of them, however, is strongly to be condemned.

CHAPTER X—OTHER FORESTRY ACTIVITIES

So far, our discussion has referred more particularly to forestry activities on state-controlled lands. After all, in Canada the great bulk of forest lands are still in public ownership, and the methods to be applied on such lands therefore constitute the main problem. Aside from this, however, there are two or three directions in which forestry may be practised, and although in Canada steps which have so far been taken in this direction are very limited, it is desirable that some reference at least be made to them.

(1) MUNICIPAL FORESTS

Particularly in the older provinces where extensive tracts of land have, during past generations, been rendered practically devoid of timber, there have developed barren areas which, if they are to be put to some use, and if they are to be prevented from causing damage to the better farm lands in the same regions by giving rise to blow-sands, must be re-established with forest cover. In various parts of Europe municipal or communal forests have been established with various objects in view; in some cases for the fixing of lighter soils that are subject to drifting; in others to take advantage of the ameliorative effect of forest upon extremes of climate, and for aesthetic reasons; in others, for the protection and purification of the municipal water supply; finally, in some cases for the essential purpose of providing wood supplies. Indeed, in Europe there are some municipalities which have reached that happy state where the public forests

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have become so productive that they carry in considerable measure the expenses of municipal administration, and thereby reduce the amount which it would otherwise be necessary to exact from the citizens under various forms of taxation.

In Canada only a small beginning has been made in the development of municipal forests—this action being for the most part confined to the province of Ontario, where recently the government has provided legislation and taken certain action to provide assistance to municipalities who undertake the establishment of municipal forests. Although in earlier days the older parts of the province carried magnificent stands of timber, through continuous exploitation for agricultural uses timber has in many regions become exceedingly scarce. In fact, even the farm woodlots have been subjected to severe depletion, and in many instances, through lack of protection against grazing, their condition has seriously deteriorated.

The possibility of accomplishing much good work in the direction of municipal forests is not, however, confined to this province. Parts of Quebec, parts of New Brunswick, and perhaps even more extensively in the province of Nova Scotia where private ownership of lands predominates, great opportunity exists for the establishment of public forests, through municipal efforts, which will serve the local requirements of their people. Entirely aside from the question as to whether such municipalities have the power under their charters to engage in pursuits of this character, however, it may be pointed out that the only basis upon which reasonable development of this kind might be expected would be in the display of a considerable amount of interest in the whole subject by the governments. There are so many intricacies involved in work of this character, there are such great liabilities to loss, and finally so much is to be gained by the adoption of standard methods which ensure success, that governmental support and interest in work of this character is of the greatest possible moment.

(2) PRIVATE FORESTS

So far as the practice of private forestry over appreciable areas is concerned, it is in a large measure confined to the operation of various corporations who, in the acquirement of timber lands, have come into possession of extensive tracts of privately owned land. After all it is only within comparatively recent times that private corporations have shown any great interest in the possibilities of rational forest practice, and to a large extent the existence of such interest is confined to pulp companies, who on account of their large financial investment in plant, realize the necessity of perpetuating their timber supplies. While in isolated cases lumbering concerns have in a measure evinced a similar interest, this has not been nearly so evident as in the case of pulp companies.

Nowhere may it be said, however, that private forests held by corporations are under intensive forest management. More frequently development is in its initial stages, and foresters have been primarily employed upon survey and mapping of forests and upon the preparation of working plans, rather than in actually applying intensive forest regulation. In some cases, companies have established forest nurseries of considerable extent, and taking advantage of the young stock so produced, have planted up limited areas of denuded forest lands. In one case the nursery operated by a private company now contains over 20 million seedlings and transplants, and the same company has so far planted up some 2,500 acres of unproductive land. The few other companies who have engaged in this line of endeavour have planted relatively smaller tracts.

In view of the fact that forest industries have, under our methods, been developed exclusively by private enterprise, the corporations must in some measure be depended upon for the development of proper forest practice. Under

these circumstances there is a strong desirability, if not an actual necessity, that the governments concerned should, even at some cost, display a vital interest in and give encouragement to operations of this character. It may also be stated that, whereas these companies also control under license large areas of forest lands, the governments are in a position through co-operative work with such companies to gradually but surely work toward the better management of licensed timber lands.

3. TREE PLANTING

The third phase of private forestry operations lies in the plantation of woodlots or shelterbelts. In many parts of Canada the remnants of the original forest furnish the farmer with an excellent basis for the retention and proper management of a woodlot. It is hardly necessary to enlarge upon the benefits accruing from farm woodlots. Although the careless treatment to which some woodlots are subjected would appear to indicate a lack in appreciation of their value, still there is pretty firmly impressed in the minds of the rural populace the desirability of having conveniently at hand a small tract of timber.

If it be considered as an essential requirement in any farming community that there should be at least some part of the area retained under forest cover, the consumption must also include the premise that the woodlots should be properly handled. A very great deal is done by the various governments in this country for the guidance and advice of farmers in the production of regular products of the farm, and there just as surely devolves upon the same governments the necessity for providing every encouragement and help in proper treatment of the woodlot. The value of woodlots from the standpoint of economic production on the farms in Canada has been rather fully elucidated in Part I, Chapter X, Section 6c. It is there pointed out that the production of wood products on the farm is vastly greater than it is by the average person believed to be. Under such circumstances the engagement of governments in pursuits aimed at the improvement of the methods under which farm woodlots are handled is fully justified by the economic requirements of the country.

Excellent opportunity in this direction exists in the eastern provinces. In Ontario, for instance, the government does evince a certain amount of interest in these problems. It may be pointed out, however, that the work is one which should be carried out over broad regions. Great economic loss is involved if in one particular region large sums of money are expended in the planting up of new woodlots when in another part of the province, through careless treatment on the part of owners, woodlots may rapidly be degenerating. In Quebec, and also more particularly in the provinces of New Brunswick and Nova Scotia, excellent opportunities exist for government activity in the better development of farm woodlots.

Perhaps, however, the desirability of woodlots is more thoroughly appreciated by the farmer who does not happen to possess any timbered lands than it is by any other individual. Although tree planting is very necessary in some regions where timber may be a natural product of the soil, there are other districts in which, during the period of civilization at least, no timber stand has existed, and where, if anything of this nature is to be brought about, afforestation is necessary. The best example of this condition exists in some parts of the prairies, in the provinces of Manitoba, Saskatchewan, and Alberta. In these provinces the need for tree planting was thoroughly recognized by the federal government, and some twenty years ago action toward a definite policy of tree planting was inaugurated. The preliminary steps consisted in the acquirement of suitable land and the establishment at Indian Head,

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Saskatchewan, of a forest nursery station. From this station, and also from a similar one further north in the province, there have, since their inception, been distributed some seventy million seedlings and cuttings. At the present time the annual distribution from these stations is in the neighborhood of five million per year. All of these seedlings and cuttings are distributed without cost other than transportation charges to many thousands of farmers located throughout the treeless portions of the prairie provinces.

At times exception has been taken by various persons to the continuance of this policy of free distribution of planting material on the ground that it constitutes undue interference with commercial enterprise. If there is one thing which is essential, however, to the success of any scheme of this character it is that the farmer must be required to perform certain fundamental duties in order that the trees planted may have a reasonable chance of development. In all cases where trees are disposed of free of charge, therefore, definite requirements both in preparation for the planting and in the subsequent treatment of the plantation are imposed upon those who take advantage of the scheme. By this means the Forest Service is better able to ensure success in the undertaking.

Aside from the foregoing, however, the position may also be advanced that inasmuch as people situated in treeless parts of the country are called upon to contribute by various means of taxation to the consolidated revenue of the Dominion, they have, perhaps, some inherent right to the benefits accruing in the application of forest policy and the expenditure of forestry funds. It may quite reasonably be argued, therefore, that entirely aside from the fact that the requirements imposed upon the farmer under consideration of free planting material the latter has every right to expect some help, some advice, and some guidance in the establishment of a shelterbelt or woodlot upon his farm in a region which has not been by nature endowed with such advantages.

In the province of Ontario, and also in Quebec, similar operations are carried out by the forest services, although to more limited extent. Naturally, in the eastern provinces where in any case timber is more frequently found growing under natural conditions, there has not been the same necessity for the adoption of large scale methods in tree planting.

Aside from its direct benefits to the farms or communities affected thereby, it may be pointed out that work of this character contributes very generally to the education of people throughout the country as to the value and advantages of the timber. If the government neglects to display some active interest in the timber needs of a timberless country, and confines its attentions and expenditures entirely to the timbered regions, it can hardly expect that the people of the former will be very active in support of reformative measures, the only effect of which is perceptible to them in the form of increased cost of wood material. Here, therefore, exists a very important reason for which people in treeless portions of the Dominion can be made to see that the benefits of the proper forest policy accrue to the people of the Dominion generally.

For the purpose of bringing the operations for tree planting—i.e., artificial regeneration—so far as they have been developed in this country, into true perspective with the work of management of natural timber lands, it may be pointed out that at the present time the total area of private plantations in existence in Canada probably does not exceed 50,000 acres, including shelterbelts, planted woodlots, and true forest plantations. Although work of this character must manifestly not be permitted to restrict the efforts put forward for the proper management of our natural forests, it is at once obvious that when such large areas of waste lands are to be found, and when there are regions so greatly in need of the benefits to be derived from forest cover, the various governments in Canada should greatly increase their interest in, and facilities for, tree planting work.

(4) SILVICULTURAL RESEARCH

One of the most essential requisites in the formulation of management plans for any forest area or region is a comprehensive knowledge of the silvicultural requirements and growth conditions in the various individual tree species, and in the numerous associations of these species which occur under natural timber conditions. Obviously, if any extensive knowledge is to be obtained on the subject of increment within the forest, it is necessary that detailed studies should be made to ascertain the rates at which the forest is actually growing; further than that, it is necessary to ascertain by what method of silvicultural treatment the natural or ordinary rates may be increased in order that the forest may be made to produce the maximum possible results.

So far, work of this character in Canada has been extremely limited. Most of the forest organizations have been so busy with problems relating to forest protection and timber administration, that as yet they have not been able to give adequate attention to this most important work, nor indeed have they been able to secure sufficient financial provision to enable them to expand in this direction. Although several of the provincial services have engaged in isolated studies of specific problems, it is more particularly in the federal organization that the development of these lines of work has primarily been brought about. The latter service through co-operation with the provincial services, and also with the timber owners, has made an excellent beginning in silvicultural studies, and with the exception of the province of Nova Scotia, where no forest service exists and consequently co-operative arrangements have therefore not been feasible, some work of this character is carried out in every province of the Dominion. By the establishment of forest experiment stations in New Brunswick, Quebec and Ontario, excellent plans have been laid for the detailed study of some of the more vital problems affecting the timber stands of eastern Canada. In the West, similar studies have been initiated on forest lands under the control of the Federal Government.

(5) FOREST PRODUCTS RESEARCH

The term forestry more properly relates to the production of timber crops. Forest conservation, however, involves not only the proper care and use of growing timber, but extends into the economic use of forest products, in order that the drain upon the timber resources may be kept within reasonable bounds. A definite function of the federal forest service, therefore, is in the conduct of forest products research which aims at the development of methods under which the final wood product may be made to serve more efficiently, and for a longer time, the needs of the people. It includes a detailed study of the chemical and physical properties of wood, including anatomy, testing, seasoning, and preservation; it includes also the study of the products of timber other than the wood itself, involving research in wood distillation; finally, it includes detailed investigation into all forms of industry which have as a basis the use of wood or other timber products.

It is unnecessary for the purposes of this report to enter into detailed discussion regarding the operation of the Forest Products Laboratories; suffice it to say, that the federal organization has a main laboratory established at McGill University at Montreal, where all lines of forest research are carried out, and as a branch to this institution there is a timber testing station at Vancouver, British Columbia. Between the two of them they serve the function of making the necessary studies and fundamental experiments, and at the same time furnish technical service to the various forest industries, many of whom have come to recognize the institution as a vital aid in their proper economic development.

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CHAPTER XI—SOME INTERNATIONAL ASPECTS OF FOREST CONSERVATION AND SOME COMPARISONS

So far, our treatment has been entirely confined to Canada, and the subject might well be so confined, were it not for the fact that there are some general relations which may have some effect at least upon the degree to which conservation is practised. Although these relations cannot be dealt with in detail, some general references may be of interest.

Let us consider Canada as a nation supplying softwoods in greater or lesser degree to various countries throughout the world; eliminating the United States for the moment, just why is it that we can enter the softwood markets of Europe, India, Australia, Japan and other countries, some of whom have very considerable supplies of the softwoods? Firstly, it is because we have relatively greater quantities; secondly, because we can lay down our forest products more cheaply in those countries than they can be produced there. But why is this the case; how is it that we can sell our softwoods to India, when in the Himalayas there are very extensive softwood forests? Why can we market softwoods in Great Britain when there are extensive coniferous supplies much closer at hand in the Baltic countries, and particularly in Russia? There are several reasons, among which may be cited the following: (a) having a greater supply per capita we place less appreciation upon the actual value of wood: having always obtained it in abundant quantities at relatively low cost, we seem to regard more modestly the monetary value of wood, than do other countries; (b) in taking out our timber, we do not call for the close utilization demanded in other countries; we condone the removal of only the better material, leaving large quantities to rot in the woods, and obviously, this permits of marketing at lower cost; (c) we permit the removal of timber under systems that do not properly provide for regeneration of the stand: in our methods of management, nothing which in any manner approaches the condition implied in the term "forestry" obtains; in other words, as our forests are not handled for sustained yield, we do not pay the operating costs of such a system of management, and consequently our wood is sold to the logger at lower stumpage rates, and taken out more cheaply; and, (d) we do not even charge up against our wood the cost of adequate fire protection, for, as has previously been explained, nowhere in Canada is sufficient protection afforded.

If there be any doubt as to the accuracy of the foregoing, it is only necessary to examine the supplies now available, and the export trade in forest products, of various parts of Canada, and the proof will be found therein. In years gone by, Ontario, Quebec, New Brunswick and Nova Scotia did a large foreign trade in timber products. When, however, the square timber from Ontario and Quebec vanished, particularly the white pine, exports from these two provinces were measurably curtailed. So long as Ontario and Quebec continued to supply high grade lumber of pine or spruce, they, along with New Brunswick and Nova Scotia continued to export to the European market. As timber became less accessible to tide-water shipment, however, exports decreased. Finally, although other factors, such as present rates of exchange, and the cost of labour, undoubtedly bear upon the situation, in many parts of eastern Canada the supplies of high grade lumber have become so scarce that the opportunities for competing in the European market, which is a particular one, are in large measure restricted. In earlier days, the eastern mills used bigger logs which furnished a large percentage of high grade lumber; to-day, the timber to be seen in the log-pond of almost any mill in these provinces offers indeed a sight in sad contrast with the experience of former years; while naturally, if timber is used to a five or six inch top, this constitutes closer and better utilization; nevertheless it does not provide the high grade materials which will stand ocean freight rates, or satisfy the demands of fastidious foreign markets.

The European market has, therefore, been in great measure curtailed, so far as the eastern provinces are concerned, and this has been brought about by constant diminution in the proportion of sizable logs obtainable. By cutting out, in the early days, the larger logs, discarding much of the smaller material, and slowly but surely reducing the sizes, these provinces are now at the stage where there is great difficulty in competing in overseas trade. The eastern provinces clearly illustrate that, even without having added the costs of proper management and adequate protection, the natural trend in a country where wood supplies have at one time been plentiful is toward such extreme reduction in supplies that a crisis impends before remedial measures are taken.

Consider on the other hand, British Columbia; logs, of a size which would arouse the most envious interest of the eastern sawmill man, are shattered in logging operations, left in the woods, or destroyed in the slash-fire. With an abundance of high grade material, British Columbia can and does ship her lumber to Europe by way of the Panama canal; in fact, she can even lay down at some eastern Canadian ports certain classes of material that now rapidly obtain a market, whereas in by-gone years they would have failed entirely in competition with local products.

Considering now, the United States—our closest and best market; just why is it that we can compete there, when that country has softwood supplies two and a half times as great as our own? The cost of installing logging equipment and sawmill machinery is less in the United States than it is with us; in some districts at least, labour is cheaper, when the supply, the hours, the demands as to sustenance, climatic conditions and in some measure, the general efficiency, are considered; with a larger population, the quantities and varying grades of lumber supplied may be absorbed within a much shorter radius; all of these factors contributing to the advantage of the American operators, then, how should we be able to compete with them?—Because notwithstanding their greater actual supply, having a population some thirteen or fourteen times as large as our own and rapidly increasing, their relative supplies, if used exclusively for domestic consumption, would provide for their requirements in the ratio of one-to-five, as compared to ours. Including however, the consumption for domestic use and for export, the United States consumes softwoods in quantity close upon eight times as great as the total cut of softwoods in Canada. That the latter figure is not greater, is due very much to larger per capita consumption of softwoods for pulpwood in Canada. Under these circumstances, the American people, fully aware of their greater number, probably in many cases labouring under the belief that the ratio of consumption is even higher than indicated above, and having for this reason been brought closer to that appreciation of impending shortage in supplies,—consequently place a relatively higher value upon wood than do we. Under these circumstances stumpage rates generally are higher; timberlands are more heavily taxed; more money is spent in fire protection, and finally, utilization methods show greater care. All of these factors enhance the cost of domestic wood products, and permit of our own products competing in the American market.

Wherein lies the moral? Simply in this: almost every civilized nation in the world to-day attributes to wood a higher intrinsic value; spends more in its protection and management; insists upon more economical utilization; demands more by way of stumpage;—than we do in Canada. Under the operation of these factors, we compete, but we do so at the expense of our own forest conditions, until, as in the case in some parts of Eastern Canada, the time arrives when so far as European competition is concerned, the grades of material we can supply do not meet the foreign requirements.

The question may well be asked; if the foregoing are the underlying reasons for our temporary success, with competition as keen as it is, how could we expect to compete in the foreign markets if we were to adopt even the rudi-

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mentary principles of proper forest management, and thus enhance our cost? Enlarging the problem, how can the North American continent compete against other countries if more conservative and hence more costly methods be applied? As between this continent and Europe—there is in Europe a general desire instilled in the people to conserve their supplies, but, being in financial straits, and having to compete against this continent, they in some cases, overcut the annual yield, and thus decrease their annual woods' charges by reduction in the efficiency of management. If the competition from the American continent were less keen, they would not sacrifice good management to the same extent. If competition from this continent, however, were more severe, probably more of the principles of proper forest management, in certain parts of Europe at least, would go by the board.

Similarly, as between Canada and the United States—the latter is spending more in protection and management of her forests; the financial burden borne by her forest industry is greater—both in spite of competition from Canada. The question arises,—if Canada were to increase her expenditure for protection and management; if she were through additional charges upon operators (collected ultimately, of course, from the consumer of timber products) would not our American neighbours themselves, feeling a temporary relief at least, see the opportunity for the better, if more expensive, treatment of their timber lands?

After all, is not this what is happening all the time? One nation adopts a policy aimed at better methods in some phases of its administration; other nations follow. In so far as this situation applies to forest resources, the unfortunate feature of it is that it apparently takes a nation well nigh on the brink of exhaustion to start things working in the opposite direction. By way of analogy,—several commercial concerns in severe competition go through a stage of price cutting, until they are selling below cost; one or two go to the wall, giving slight relief; another two or three raise prices a little, to, or above, the cost of production, and the balance have the choice of doing likewise or going out of business. In this enlightened age we even have abundant evidences of "fixing prices up", rather than cutting them down! A little of the same principle, in conservation,—applied as between regions of a country as between countries of a continent, as between continents—will do much for the relief of all. Most assuredly, if in Canada we are selling our wood supplies more cheaply than we can, even under the crude methods which we follow, reproduce them, we are truly engaging in a process that is nothing more than "price-cutting"; we are eating into our capital, precisely in the same manner as the commercial price-cutter who must disturb some fund other than legitimate profits to offset the "cuts".

In view of the timber situation in that country, the United States can well afford to subject her forest industries to reasonable competition. In any particular forest industry in that country, there is just as much desire for protection from severe competition as is the case in any other industry; but, notwithstanding the fact that outside competition could in a considerable measure be overcome by the reduction in protection charges, taxation and the like, in the United States these charges are maintained on a higher level, even, than they are in Canada. Before proceeding with the discussion of the main subject, and, recognizing American operators as our chief competitors, both in the United States and in other parts of the world, it will be well worth while to draw some comparisons in the degree to which conservation measures are applied in that country and in Canada.

As previously stated, the United States has two and a half times the supply of softwood timber that we have, but about 80 per cent of it is in private ownership. On account of a much larger population, however, as a nation they

have earlier been brought to a realization of impending shortage in supplies, particularly in some districts; the fact that 80 per cent of their timber is privately owned is therefore significant; it indicates that, in spite of the fact that only one-fifth of the timber resources are subject to government control, they have as a people seen fit to impose upon themselves measures of conservation considerably in advance of, and involving greater expenditure than, requirements of similar character in Canada. Owing to many political divisions in the United States, it is obviously out of the question to make a complete comparison between forestry activities in that country and Canada. We may, however, take the federal organizations,—in each case, they comprise the most extensive organization, and carry on their work over widespread areas.

The United States Forest Service administers 157 million acres of National Forest lands. Of this acreage, some 3 million acres is situated in the Eastern States, most of it having been acquired by repurchase under the "Weeks Law"; 20½ million acres in Alaska; and 133 million acres in the western States, the latter directly comparable to the 22 million acres of forest reserves under control of the federal forestry service in western Canada. It will be immediately noted that the area of federal forests in the western United States is about six times as great as that of the federal forests in western Canada. On all federal forests in the United States the expenditure is upwards of \$6,000,000. In Canada about \$650,000 is spent in their upkeep and development; in addition however, the Canadian service is responsible for protection on some 180 million acres of unreserved timberlands, upon which the expenditure is about \$225,000. From the foregoing, it is at once perceived that not only have our neighbours gone a very great deal farther in the dedication of lands to permanent forest production, but in their protection, management and development, they make very much more liberal financial provision.

Special mention may be made of the national forests in eastern United States. Previously, the great bulk of timberlands in the east had passed into private hands, but in 1911 the "Weeks Law" made provision for the repurchase of absolute forest lands. By reason of great complications in State boundaries, due to the many political divisions, and also owing to a certain lack of State interest, it was considered to be in the national interest that public forests should be established. In a period of twelve years about 2 million acres have been purchased with a total expenditure of over 10 million dollars; this added to other public lands, brings the total area of National Forests in the eastern States to over 3 million acres. This indicates a phase of federal activities in forestry unknown in Canada. The claim is not made that conditions in Canada demand a similar method here, but it nevertheless clearly demonstrates that in United States clear recognition has been given to the principle that, regardless of conditions of land tenure, the national government must take a direct interest in the betterment of forest conditions and forest policy from the Atlantic to the Pacific.

This conception is even more clearly exemplified in the recent enactment of the McNary-Clarke Bills, in the United States Senate and the House of Representatives, respectively. After a thorough enquiry by a Committee, that body recommended and secured the passage of the Bills referred to, by which the federal government has committed itself to yearly statutory appropriations of \$2,700,000 to be devoted to co-operative work with the individual states in forestry. Of this amount \$2,500,000 is appropriated for co-operative fire protection, and for the investigation of forest conditions and the studies of forest taxation. The balance of \$200,000 is appropriated in two equal amounts for co-operation with the individual states in tree planting, and in the development of shelterbelts and woodlots. The same bill makes further provision for the creation of additional national forests, thus continuing and augmenting the policy inaugurated many years ago.

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Here indeed is an example of constructive statesmanship. That the federal government, in addition to over six millions now spent in forestry work, should make available upon the principle of state co-operation, an annual fund of nearly two-and-three-quarter million dollars, the great bulk of which is for forest protection, the balance for the upbuilding of new forests, assuredly indicates that our neighbours have awakened to the peril with which their forest resources are beset. Other examples, in State forest activities, might be cited; indeed many lessons may be learned from private organizations in that country; but the federal example will suffice to establish the argument that Canada is seriously lagging behind her most important competitor, in the appreciation which is attached to, and the protection afforded, her forest resources.

It surely requires no further argument to demonstrate the weakness of our present condition; it is surely evident that if we do not apply relatively as great, or perhaps even greater, effort in forest conservation, our resources must continue to decline to that state where we shall be unable to compete. While there is room for collaboration with our neighbours on matters of forest policy, the stage has long since been passed, when we may afford to merely *follow* in measures of conservation. It is puerile to urge that unless our neighbours do something, it is impossible for us to do that thing. Indeed, the situation demands that, benefiting so far as we can from the experience of other nations, we should strike out for ourselves and march forward on a policy which has as its basis the perpetuation of the forest resources. We are prone to proclaim our independence, and our national vigour; let us sweep aside misgivings as to what may happen if we pursue better methods of forest management, if we continue in our present course we shall ere long have little to conserve, and of what avail will markets then be? If on the other hand, we embark on a policy that aims at the proper protection and development of our forests, we will not alone be the gainers; *all* nations are anxious and waiting to apply the principles of conservation, but as is the case in all other lines of activity the "price-cutter" while he lasts, sets the pace in the application of the economic law of capital and legitimate profits.

CHAPTER XII—CONCLUSIONS AND RECOMMENDATIONS

As typifying relative attitudes in certain parts of Europe, in the United States, and in Canada, respectively, we may use an analogy....."A", "B", and "C" are three individuals of different age; of different degree, in possession of world means; and of different temperament, largely the result of environment. "A" has, through the thrift of his forefathers, become possessed of an estate which, although not so restricted as to prevent him from tampering with the principal, consists largely in sound investments which furnish the wherewithal for his comfortable existence. In addition to the estate, however, he inherits also a spirit of providence, wisdom, and of responsibility. He goes through life, living upon the just profits of his property, and in addition to living a life of contentment, he dies in the knowledge that he has not dissipated his estate; he has fully met his responsibilities.....(Europe).

"B" is the son of a race, the first of which suddenly came into possession of a huge estate, far surpassing in extent the more modest belongings of "A". His forefathers, however, were not so provident; some parts of the estate were so inaccessible that they were unable to tamper therewith; but for that which was accessible, they dissipated in great degree the capital therein. Nevertheless, when "B" arrived upon the scene, he received an inheritance which, although sadly reduced from its original value, was still of relatively large proportions. He inherited also the improvidence of his ancestors, and carried on along lines very similar to those pursued by them. By reason of past dissipation of some of the

more desirable properties, he has perforce to be a little more careful, but he nevertheless neglects to resuscitate those parts which have been mistreated, and continues to eat into the capital of the remainder. Having raised a large family of twelve* children, however, he becomes obsessed with the fear that continued dissipation of his estate, although it would permit of greater luxury for himself and his family, will in the end provide only a parsimony for each one of them; having before him, also, manifold examples of the failure of businesses conducted along similar lines, he feels that perhaps even he may in his later years feel the pinch. He realizes that, having lived in affluence, his friends, knowing the extent of the estate of which he became possessed by inheritance, will think unkindly of him if he should leave it impoverished. His pride is touched, and he sets about to moderate his yearly demands, and to save his resources from further depreciation; realizing the pleasure and virtue in his changed life, he goes even further and endeavours to build it up slowly but surely, so far as his circumstances and his energy may permit.....(United States).

"C" comes of similar stock, and becomes possessed of an estate which has gone through a process somewhat similar to "B's". Having only one* child, he is not at such an early stage obsessed by fears that have harried "B". With a very small family he may put on more "side" than can "B" with his twelve; notwithstanding the fact that his actual estate is less than half what "B's" may be, he feels and tries to demonstrate to the world that he really has more. By the extent to which he relatively exceeds the annual expenditure of "B", is determined the time at which "C", too, is stricken with fears as to the future income for himself and his family of one.....(Canada).

In every-day business life, measures are frequently taken to forestall the sequence of events portrayed above. Many men who have accumulated fortunes place the handling of their estates in the hands of a trust company, or other reliable executors, who may be depended upon to preserve the assets, and thus protect the good name of the family in the community.

In observance of similar principles, the people of a community, of a province, or of a country, formulate a constitution and elect a government to transact their public business, and to preserve the estate of which they are collectively possessed. As we do in almost every other line of human activity, therefore, can we not apply the same principles of wisdom, providence, and foresight in our treatment of the forest resources? Our governments are elected, not only for the purpose of collecting revenue and making expenditures, but also for the business-like administration of our natural assets. We expect governments to look to our own welfare, but, unless we demean ourselves as a nation, we must expect them to preserve the assets of the state. We take good care to see that future generations shall participate in the costs of preserving the state by warfare during our generation: we therefore have the responsibility of maintaining the natural assets in a state of productivity, that future generations in turn may have the wherewithal to pay.

So much for our national responsibilities,—we have still others which concern our internal economy. In bestowing upon those provinces which control their natural resources the monetary benefits to be derived from the management of their timber wealth, Confederation did not absolve them from the responsibility of so conducting their forest business that they would contribute also to the national welfare; nor did Confederation absolve the federal government from exercising a national interest in and responsibility for the application of proper care of the forest heritage of the Dominion. Functions, as between the Provinces and the Dominion, are intricately interlaced; there are extremes to which neither one should go, or can go, without infringement upon the autonomy of the other; but jointly, they bear a great responsibility in seeing that such

* The population of the United States being some twelve or thirteen times that of Canada.

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measures as may be applied will redound to the national advantage. We are one people; as a unit, we extract national revenues and apply expenditures throughout the Dominion in other lines of activity. Similarly, as application of the principles of conservation demand concerted action, we must as a united people formulate and apply such methods as will observe those principles.

It has been shown that in the Maritime Provinces the timber situation is very serious, not only as a result of fire and other losses, but also through depletion due to excessive utilization; it has been demonstrated that in Quebec, Ontario, and in the Prairie Provinces, a serious situation exists in solution of which the fire problem and utilization methods play a vital part; it has been made clear that in British Columbia, although the timber resources exceed those of the balance of the Dominion, here too, serious inroads have been made upon the forest by fire, and that methods of utilization are wasteful. Yet, we cannot simply say: as resources are exhausted elsewhere, British Columbia will supply the need; such a conclusion involves the leaving unproductive of the greater part of the land area of all other provinces, when they can and should be made productive.

Our past neglect has, it is true, brought us to that stage where, during the process of rehabilitating the forest resources in other parts of Canada, we must in a measure depend upon British Columbia. Owing to the limited extent to which the latter province can participate in agricultural development, as compared to other provinces where opportunities in that direction are much greater, does not this very condition of itself lead to the conclusion that the people of Canada, represented by the federal government, have a direct responsibility in the preservation of the forests in British Columbia? If there be justification for the expenditure of relatively large sums of money in the development of agriculture in other provinces, in order that they may produce in greater volume, is there not a similar justification for the exercising of greater interest in the forest problems of British Columbia? Likewise, the forest problems of other parts of the Dominion, being of national consequence, demand the display of federal interest. To bring these matters into their true perspective, we must cease so closely confining our attention to the revenue-producing aspects of the forest resources; we must recognize some of the national aspects of the problem of forest conservation, and apply ourselves as one people to their solution.

RECOMMENDATIONS

From the evidence as to the extent of our forest resources, presented in Part I, and from the description of the shortcomings in our present methods of handling those resources, it is only necessary to conclude that definite, radical, and constructive steps in forest conservation are of transcending importance if Canada is to protect and further develop her forest industries, and as a country to engage in world trade in forest products. We are still dissipating our woods' capital, perhaps more than any other nation in the world; our forest industry is a gigantic one, and even if we are to consider only the preservation of that, we must conserve the raw materials on which it depends.

Fully recognizing that, as a non-technical body, we are not called upon to go into detailed recommendations regarding the intricacies of forestry practice which are manifestly the concern of the technical forest services, the Commission has in the foregoing pages attempted to point to the *practical* weaknesses and the *business* shortcomings of our present methods. Based upon those explanations, there are presented herewith the recommendations which the Commission has to offer, strongly urging that all of them are essential to the formulation and execution of a rational forest policy in Canada. Although the Commission was appointed under federal authority, we have during the course of our studies

been imbued with a pressing duty to apply ourselves to provincial as well as federal problems, as they are intimately related; for these reasons we have considered the whole problem.

1. LAND CLASSIFICATION

(a) That the federal government should pursue more vigorously the classifying of lands which come under its control, with a view to assigning them to permanent forest production. The technical organization for this work already exists: it requires expansion and greater financial support.

(b) That provinces which control their own resources should develop local machinery for land-classification work, and within their boundaries apply the procedure outlined in (a).

(c) That, owing to the existence in all provinces of the Dominion of large areas of unproductive land quite capable of producing forest crops, and to the national necessity that these lands should be put to economic use, it is incumbent upon the Federal Government, in addition to treating with lands directly under its control, to foster by whatever means or methods may be possible, a consistent and comprehensive plan of land-classification for all lands where there is question as to the proper economic use, throughout the Dominion. Great economy will be effected if the Provinces co-operate with the Dominion and concede to the latter the responsibility of bringing about standardized methods in this work.

2. DEDICATION OF FOREST LANDS

(a) That Dominion lands already classified as true forest lands should be permanently assigned to forest production by their creation as National Forests; and that, as and when additional areas are classified as such, they too should be permanently dedicated.

(b) That similar action be taken in those provinces where direct control is exercised in forestry matters; and that in Nova Scotia, in particular, definite provision be made, and concrete action be taken by the province, for the dedication as provincial forests of all timber lands remaining in the Crown, and the addition thereto of forest areas which may be acquired by purchase at reasonable cost, to the end that a reasonable proportion of the forest lands of that province may be placed and managed directly under public control.

(c) That the federal government exert all possible efforts in assisting to the consummation of the objects outlined in (b), so that, throughout the Dominion, there may be developed a complete chain of publicly owned forests. The position is not taken that all true forest lands should be in public ownership, for that might stifle initiative; rather, that each province should have within its boundaries considerable areas of publicly owned and managed forests, in order to ensure continuity in supplies for forest industries, and to provide protection to stream flow.

3. FOREST LEGISLATION

(a) That the federal government should thoroughly revise its forest legislation in such a manner as to make a clear definition of its forest policy, and more adequately provide for enforcement of principles of that policy upon lands subject to federal control; and that such legislation should make thorough provision for other forestry activities consequent upon the responsibilities of the federal government in developing, through co-operation with the provinces, a national forestry policy and program of Dominion-wide application.

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(b) That provinces exercising control over their forest resources should thoroughly review the legislation in which the forest policy is defined, and upon the basis of which their respective forest services operate, bringing into clearer definition the essential requirements of the policy, and providing for proper management of their forest lands. In cases where no comprehensive forest law now exists, action toward that end should be taken without further delay. There is no province or region in Canada where modern forest legislation is not urgently required for the proper conduct of the forest business.

(a) That for the accomplishment of both (a) and (b) the federal government, as far as the limitations of provincial autonomy may permit, exercise such effort as may be within its power to encourage and develop greater uniformity in forest legislation throughout the Dominion.

4. FOREST AUTHORITIES

(a) That the federal government under the authority of more adequate legislation, suggested in 3a, above, should thoroughly reconstitute and enlarge its present forest service, centralizing therein all functions pertaining to forest production, protection and management, now seriously scattered throughout various branches, to the detriment of economical and efficient administration; that in so doing primary consideration shall be given to the object in view; and that the policy to be formulated, and the service created for its enforcement, shall exhibit the extent and dignity justified by the handling of Canada's second greatest natural resource. In no manner should the proper management of true forest lands be limited or circumscribed by other considerations or organizations.

(b) That the organization and status of the individual provincial services should be thoroughly reviewed by the respective governments, and that where weaknesses in the authority are found to exist, or where the carrying out of the fundamental principles of forest policy are being neglected, steps should be taken to improve conditions in that behalf; and particularly, that the province of Nova Scotia should definitely constitute a forest authority, for the purpose of developing and perpetuating the forest resources and forest industries of that province.

(c) That in re-organizing its forest service full cognizance should be taken of the fact that the federal government has certain functions to perform, even in provinces which control their own resources, and that the forest service must be properly constituted and provided with adequate funds to that end.

Note:—The Commission strongly advises that more serious consideration be given to the providing of appropriate but practical uniforms for forest officers. This will contribute to greater esprit de corps and bring the services into greater respect with the public. It may also be stated that in many cases the services are subjected to serious depletion in staff through the inadequacy of the salaries paid.

5. FOREST PROTECTION

(a) That in view of the serious depletion annually sustained in forest resources on federal timber lands, more adequate financial provision should be made, to permit of the present protective services being enlarged upon and greatly improved; that in making such financial provision, recognition be given to the fact that forest protection entails the provision of adequate improvements and facilities, which should be considered as capital expenditure.

(b) That similar action be taken by the provinces which exercise the function of forest protection, to the end that forest resources within their boundaries may be more adequately protected.

(c) That for reasons which have been rather clearly explained, there exists every justification and necessity for the participation by the federal government

in measures aimed at protection of the forest resources in all provinces. In the time which the Commission had to study the matter, we are not in a position to explain in detail the steps which should be taken. We may strongly urge, however, that the provision of funds from the federal treasury even for forestry work in the provinces, is quite in keeping with federal responsibilities, there is great need for federal aid to, and co-operation with the individual provinces, both in the solution of the fire problem, and in the control of forest insects and forest diseases. At this stage the Commission strongly commend the action recently taken by the federal government, in calling a conference of provincial ministers and forest officials for the discussion of fire protection problems. The extension of this idea is strongly urged, in order that the forest authorities throughout the country may recognize the inter-relation, as between the different provinces, of the forest fire problem.

Note.—The provision of more adequate facilities for fire protection is of paramount importance. Roads, trails, telephones, lookouts, air-craft, and numerous other works, are an essential requisite, and even at heavy immediate capital expenditure will quickly repay their cost in the timber saved by their use.

6. FOREST SURVEYS AND INVENTORIES

(a) That the federal government should enlarge its organization for the survey and inventory of the forest resources of Canada, and that it should co-operate fully with the provinces in providing, at as early a date as may be possible, much more reliable data regarding the extent of forest resources in various parts of the Dominion, than are now available.

(b) That within their boundaries the provinces should exert in greater intensity the function of forest surveys, and co-operate with the federal organization in the securing of preliminary forest inventories.

7. FOREST MANAGEMENT

(a) That the federal government, after the proper constitution of the forest service should thoroughly revise the legislation and methods in which timber is disposed of on lands subject to federal control, incorporating in such all those essential features of forestry which economic conditions may permit.

(b) That the provincial forest authorities should also take the action defined in (a).

(c) That owing to the great desirability of standardizing, so far as may be possible, regulations under which timber is disposed of, and to make provision for the proper study of the economics of taxation of timber lands, the federal government should make provision in its forest authority for a unit definitely organized for that purpose.

(d) That on federal forest reserves, such areas which now present opportunities for intensive management for sustained yield, should be immediately brought under measures to that end.

(e) That similar action be taken in the provinces for certain areas of lands already reserved, where economic conditions permit.

(f) That, on account of the fire hazard presented by woods' slash, some definite action must be taken to provide for the proper treatment of slash in logging operations.

8. TREE PLANTING AND WOODLOTS

(a) That the federal government continue and enlarge upon its present tree planting work in western Canada.

(b) That similar action be taken in the eastern provinces.

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(c) That for both federal and provincial land there should be developed within the individual forest services units which would exercise the function of giving advice and help to farmers throughout the country in the management and treatment of their woodlots.

(d) That efforts in this direction should not be permitted to overshadow 9c, following.

9. SILVICULTURAL RESEARCH

(a) That the program of silvicultural research and growth studies now engaged in by the federal service, should be considerably enlarged upon, in order that more of the main problems underlying the development of proper forest management should be brought more quickly and generally to their proper solution.

(b) That forest authorities of the provinces should continue to co-operate with the federal service in silvicultural research work, and themselves engage in work of this character where the solution of purely local problems is essential to the development of proper plans for management.

(c) That forest experiment stations are urgently required throughout the Dominion, not only for the progress of silvicultural work, but also for the purpose of demonstrating to the people the objects and results of proper forest management.

10. FOREST EXPENDITURE

(a) That throughout the Dominion there be more thoroughly recognized, that in the protection and management of forest lands, a much larger part of the revenue extracted therefrom must be returned to the forest; that this is all-essential, even though other sources of revenue must be resorted to.

(b) That owing to the time element involved in all phases of forest practice, methods should be devised and applied whereby the forest services may be assured of continuous appropriations to cover at least those phases of their work which demand assurance and continuity in funds.

11. FORESTRY CONFERENCE

(a) That following upon the British Empire Forestry Conference held in Canada during 1923, and the conference of Dominion and provincial officials held in January last, there should, within a period of one year, be called a general conference to include, not only government representatives and forest officials, but also qualified representatives of the forest industries, or others interested in various phases of forest activities, for the purpose of discussing the ways and means for the improvement of methods in forest utilization and protection, and for determining the applicability of any measures which may be presented to such conference in the conduct of forest business.