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REPORT OF

THE ROYAL COMMISSION ON PULPWOOD

CANADA

Chairman: JOSEPH PICARD

Deputy Chairman: WILLIAM A. ANSTIE

Commissioners:

JOSEPH G. SUTHERLAND, R. W. McLELLAN, A. B. KERR

Secretary: E. H. FINLAYSON, B.Sc.F.

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INTRODUCTION

Under the authority of Order in Council, dated August 14, 1923, P.C. 1576, the Commission was instructed to make an inquiry into the pulpwood situation in Canada. The terms of reference covering the commission were as follows:—

"to inquire into and report on the forest resources of Canada, with particular regard to: —

"(*a*) the extent in each Province of wood of various kinds available for the manufacture of pulp;

"(*b*) the quantity of wood so available on lands owned by Provincial Governments and subject, under Provincial laws and regulations, to restrictions requiring the partial or total manufacture of such wood in Canada;

"(*c*) the quantity of wood so available on lands owned by the Dominion Government and subject, under Federal laws and regulations, to restrictions requiring partial or total manufacture in Canada;

"(*d*) the quantity of such wood on other lands and the conditions under which such lands are held, whether by ownership or lease, whether by corporations or individuals, whether by citizens of Canada or citizens of other countries;

"(*e*) the quantity of pulpwood produced in each Province of Canada during the past ten years, showing the portion used in Canada and the portion exported;

"(*f*) the question of the prohibition or restriction of the export of pulpwood from Canada;

"(*g*) any other matter touching upon the production, manufacture or sale of pulpwood essential to comprehensive consideration of the next preceding section (*f*);

"(*h*) the making of recommendations that may be deemed expedient for the better conservation of the supply of pulpwood for present or future use."

The inaugural meeting of the Commission was held in Ottawa on September 10, 1923, at the office of the Secretary of the Commission, E. H. Finlayson, Acting Director of Forestry. Organization meetings followed, during the course of which an analysis was made of the statistics and other information available, and machinery set in motion for the acquirement of further data. Plans were formulated for the taking of evidence in various parts of the Dominion. In deciding upon the itinerary of its tour, the Commission has striven to cover the situation adequately, compatible with reasonable expense. Representative points were selected in each province, meetings widely advertised, and every effort made to secure expression of all shades of public opinion upon the questions under enquiry. The Commission is under a debt of gratitude to the many public officials, and to the numerous persons in various walks of life, who voluntarily gave evidence of great value, and who in many cases went to considerable trouble in the compilation of special information. Special reference should be made to the works of the Bureau of Statistics; the figures published by this organization have been of inestimable value in compiling the report.

Throughout the enquiry, the Commission followed the practise of having witnesses appear voluntarily. That such procedure was justified is rather fully demonstrated by the great variety of persons who appeared before, or made representations to, the Commission.

In the province of Nova Scotia public hearings were held at Halifax, New Glasgow, North Sydney and Digby; in New Brunswick, at St. John, Fredericton, Newcastle, Bathurst, Campbellton and Edmundston; in the province of Quebec, at Montreal, Quebec City, Sherbrooke and Riviere du Loup, residents of this province also having the opportunity of appearing before the Commission at the Ottawa sessions. In Ontario, public hearings were held in Ottawa, Toronto, Port Arthur, Sault Ste. Marie, North Bay and Cochrane. It will therefore be perceived that, generally for eastern Canada, persons interested were given good opportunity to present their views without undue inconvenience.

In Western Canada, with the exception of British Columbia, the pulp and paper industry has not as yet been developed. In the Prairie Provinces, therefore, hearings were held only at Winnipeg, Prince Albert and Edmonton, at which points inquiry was made regarding the potential pulpwood resources of the respective provinces. In British Columbia, on the other hand, there has been very considerable development; consequently, hearings were held at Vancouver, Victoria, Prince Rupert, New Westminster, Kamloops, Revelstoke, Nelson and Cranbrook, thus meeting, so far as possible, the convenience of people in that province. A total of 382 witnesses appeared before the Commission at its public hearings. Although a great deal of the information received by the Commission was secured on these occasions, numerous representations in the form of petitions and correspondence were received from persons who were either unable to attend the hearings, or who, having done so, were desirous of submitting further statements. All of this evidence has been subjected to the most careful scrutiny and study, and the findings of the Commission are based upon all information received orally or by correspondence, publicly or privately.

Perusal of the terms of reference clearly indicates the scope of the enquiry. The Commission is required to determine upon the basis of the best available information, the amount and distribution of pulpwood supplies in Canada. Manifestly, the Commission could not undertake an actual survey of forest resources; rather, its duty has been to collect and correlate all the information which could be assembled in the course of public hearings and through consultation with those people who, officially or otherwise, have made it their business to secure reliable information of this character.

As influencing the extent of supplies, the Commission was required to investigate the status of pulpwood timber in various parts of Canada, with a view to determining the extent to which it is being used to supply Canadian industries, and the extent to which it is exported in an unmanufactured condition. Arising from the foregoing, the Commission is required to place before the Government the facts regarding proposals for the restriction of exports. Finally, the Commission is required to study the methods under which the timber is produced, managed, and used, with a view to the recommendation of measures which would more adequately ensure the maintenance of the forest resources in the state of continuous productivity.

There are, therefore, three distinct phases of the problem:—

(A) The question of actual pulpwood supplies in various parts of the country, and the uses to which those supplies are put;

(B) Questions of forest conservation, and recommendations in connection therewith;

(C) The question of the prohibition or restriction of the export of pulpwood.

The general plan of the ensuing report is to deal separately with the three phases referred to above. Although it is aimed to follow, so far as possible, the sequence of the terms of reference, by reason of the varied classes of ownership and the divergence of forest authorities, it is necessary, in order to avoid frequent repetitions, to present the data in the manner which seems most appropriate.

PART I

PULPWOOD RESOURCES IN CANADA

CHAPTER I—PRELIMINARY REMARKS

In attempting an inventory of the pulpwood resources of Canada there are several factors affecting the situation which must be subjected to careful analysis before proceeding to statements of supplies available in Canada or in any individual province thereof. Following are some of the more important:—

(*a*) The very term "pulpwood" is under the present stage of development rather indefinite. The popular conception of a stick of pulpwood is a piece of wood four feet in length with a diameter of perhaps seven, eight, or nine inches. A stick of wood of this diameter being the ideal pulpwood bolt, the average person conceives a tract of trees of this size to be the ideal pulpwood forest. On the hypothesis, however, that the eight or nine inch *stick* is the ideal one, it must at once be conceded that the ideal pulpwood forest is one in which the *average* four foot stick is of that diameter. Obviously, this leads to the conclusion that the ideal *tree* for pulpwood purposes is eleven or even twelve inches in diameter; from that tree there are taken bolts all the way from three inches to eleven or twelve inches in diameter. Moreover, the fact that wood can be used to a three inch diameter does not indicate that an area containing trees of that small size can be operated with financial success. The average conception that the pulpwood forest is one of very small trees is therefore erroneous.

The foregoing remarks apply to eastern Canada. Such misconceptions have led to the belief that pulpwood may readily be distinguished from saw-timber on the basis of the size, when such is not the case; small saw-timber may also be used as pulpwood, and large pulpwood may also be used as saw-timber, to say nothing of similar overlapping which may occur between pulpwood and railway ties, fuelwood, fence posts and the like; all of which makes clear definition very difficult if not impossible. In fact, in British Columbia there is practically no distinction as to size. In that province pulpwood comes from spruce, hemlock and balsam logs exactly similar to those from which lumber is manufactured; indeed, to reduce the logs to such a size that they may be handled in the grinders or chippers of a pulp mill, they must first be sawn into blocks of convenient proportions.

With the foregoing explanation, it is manifest that much overlapping may occur, as between pulpwood and saw-timber, in a statement of resources for these products.

(*b*) Not only in size, but also in species, there is serious overlapping. Spruce, the most valuable tree for pulp manufacture, is also the mainstay of lumber production in Nova Scotia, New Brunswick, Quebec, Manitoba, Saskatchewan and Alberta. In the other provinces, also, large quantities of it are sawn into lumber. In lesser degree, the same may be said of balsam,—second to spruce in desirability for pulp manufacture, and to a limited extent sawn into lumber. Similarly, western hemlock of the Pacific Coast (a species very much superior to eastern hemlock, and in British Columbia just as important as spruce in pulp manufacture) is also used extensively for lumber. Eastern hemlock, on the other hand, largely used in lumber manufacture, is in Canada used only to a very limited extent in pulp manufacture, although much larger quantities are so used in the Lake States.

The jackpine of eastern Canada and the prairies and its kindred species in the Rockies and British Columbia, lodgepole pine, have not as yet been used very extensively in pulp manufacture. The jackpine, however, does enter appreciably into the consumption of many pulp mills in eastern Canada, and for kraft mills is an important species. It is rather generally conceded, also, that jackpine and lodgepole pine may before long be used to a very much greater extent, even in newsprint manufacture. As against present and potential use in pulp manufacture, these species are to a considerable extent used for lumber, and very extensively indeed for railway ties, fence posts and fuel.

Still further, poplar (aspen and cottonwood), of which only a couple of thousand cords is used in Canada for pulp, is in the United States used to the extent of between three hundred and four hundred thousand cords annually. It is true that its use is essentially confined to one method, the soda process; true also, that by reason of deficiencies in the qualities of its fibre, it can never be so satisfactory for pulp manufacture as species previously mentioned, yet, as a species, present in large amounts, it has decided potentialities, especially in view of diminution in supplies of the more valuable kinds. Poplar, also, is used in a limited way for saw-timber and for numerous other purposes.

There are still other species, referred to later, where this overlapping in uses may occur.

(*c*) Viewing the matter from another angle,—various species possessing the necessary physical properties of fibre in greater or lesser degree, but also used very extensively for saw-timber and other purposes, must in the final analysis be considered as potential pulpwood supplies. Douglas fir, so prolific on the Pacific coast, is now successfully used in the manufacture of kraft, and there is little doubt that in time processes will be devised whereby those properties, for which there are at present objections to its use in the mechanical or sulphite processes, may be removed. Similarly, although the difficulties to be overcome may appear far greater, there is hope at least that the birch, maple, and beech of eastern Canada—now in a large measure considered to be weed species—may economically be used for conversion into pulp products.

(*d*) There is also to be considered the question of region. At present there is not in Canada a single pulp mill between Fort Frances and the Pacific Coast. Are we, or are we not, then, to consider the Prairie Provinces as a region of potential pulpwood supplies? The fact that there is considerable probability of a mill being established in Manitoba, in the near future, indicates that the prairie provinces must be considered in this light. On the other hand, there are the Territories, Mackenzie River and Keewatin, the District of Patricia, and the Yukon. For a great many years at least they cannot be considered even as potential areas of pulpwood supplies.

(*e*) Again, there is the finer distinction of position or locality. Accessibility is a difficult thing to define, for, after all, it is relative. Some stands of timber which are under operation today were twenty-five years ago considered to be quite inaccessible. As new methods of logging are developed, and as the value of timber increases, due to depletion of stands at closer range, timber once considered inaccessible is brought to the market. Notwithstanding this indefiniteness of accessibility, there are areas of timber for which no future market can be foreseen.

(*f*) Finally, in considering the question of merchantability, we are again dealing with something which is relative. Unless we are to entirely neglect past experience, it is necessary to concede a value to some of the stands of timber now too remote for profitable operation, just as in more recent years we have learned to recognize potential value in a young stand of timber. Nevertheless, in a practical consideration of the supply problem, some line of distinction must be drawn between the merchantable and the unmerchantable, for undoubtedly

there are many thousands of miles of the forest area that bear a scrubby growth of timber too isolated to be of any local use, too small to be profitably operated even in the distant future, and too old and suppressed by conditions inimical to tree growth to permit of their development into anything better.

In outlining these governing factors, and in emphasizing the variation in importance which may be attributed to one or more of them, there is no desire to becloud the issue, nor is there any inclination to exaggerate the difficulties involved in approaching a statement of pulpwood resources. By way of analogy it may be stated that, whereas the geologist, as a result of many thousand precise measurements of "strikes" and "dips", may by purely mathematical calculation reach definite and well-understood estimates of coal resources (and, owing to obscurity of the coal, the estimates are seldom questioned) the individual or body that attempts an estimate of forest resources is confronted with a problem that entails many perplexing variables. Firstly, there is the growth or increment of timber due to biological processes; secondly, there are the many agents,—depletion by use, crudely measured as it is, and the wastage due to fires, insects, and fungus decay—which may reduce, offset, or even more than obliterate any increase in timber content due to growth. Such factors have very naturally engendered a feeling of caution, not only upon the part of scientific men engaged in forestry work, but in men engaged entirely in the practical business of forest utilization. It is nevertheless essential that consistent effort be made to itemize our resources as well as may be possible.

To this end, there is presented herewith, in Table No. 1, statistics showing the classification of land; the general character of the forest and status of ownership; the amounts of saw-timber now available; the quantities of pulpwood of the more important species, and the ownership and availability of such pulpwood. Figures covering all of these points are given for Nova Scotia, New Brunswick, Quebec, Ontario, Manitoba, Saskatchewan, Alberta and British Columbia. In Prince Edward Island the stand of timber is very small, merely serving the local demands, and it does not enter into the general problem. On the other hand, the Territories and the Yukon are eliminated from consideration, owing to their absolute inaccessibility, and to the great limitations in and inferiority of the timber growth. It is well to accentuate that the tables for saw-timber and pulpwood overlap; in other words, we have not in Canada the amount of saw-timber indicated plus the pulpwood shown; rather, the pulpwood figures include all of the saw-timber of the species mentioned.

In compiling the statement of pulpwood resources the Commission has had to depend to a large extent upon figures supplied by the federal and provincial services in charge of forest administration, and upon the information of persons having expert knowledge of the situation in various parts of the country. Great effort has been made to have the data presented herewith as truly representative of actual conditions as possible. For a considerable number of years, some of the forest services have engaged themselves in systematic investigation of forest resources, with a view to compiling a forest inventory, special surveys having been undertaken for this purpose. Although the results secured are admittedly estimates, they are nevertheless based on systematic and scientific enquiry, with a full knowledge of existing conditions. For this reason the results are much better than a guess,—which unfortunately has been the outstanding characteristic of many previous estimates; moreover, the figures may be taken as being the most reliable ones available, subject to correction though they may be as further data are acquired.

On these premises, and with Table No. 1 as a basis, we proceed to discussion of the pulpwood situation in various parts of the Dominion. In treating with conditions in the individual provinces, questions of conservation will not be dealt with in detail, as that subject will be considered more fully in Part II of

TABLE No. I.—FOREST AREAS AND PULPWOOD RESOURCES IN CANADA

(Not including Prince Edward Islands, The Yukon or the Northwest Territories)

Province	Total Area Sq. Miles	Water Area Sq. Miles	Net Land Area Sq. Miles	Agricultural Area Sq. Miles	Barren Land Sq. Miles	Forest Area Sq. miles		Total Forest Area
						Merchantable and Accessible	Unmerchantable and Inaccessible	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Nova Scotia	21,428	360	21,068	3,792	2,526	3,720	11,030	14,750
New Brunswick	27,985	74	27,911	4,671	1,764	18,000	3,476	21,476
Quebec	706,834	15,969	690,865	40,000	134,043	203,125	313,697	516,822
Ontario	407,262	41,382	365,880	60,000	65,880	75,000	165,000	240,000
Manitoba	251,832	22,500	229,332	57,332	34,400	27,600	110,000	137,600
Saskatchewan	251,700	14,200	237,500	113,000	74,724	25,000	24,776	49,776
Alberta	255,285	6,737	248,548	129,398	32,500	60,000	26,650	86,650
British Columbia	355,855	2,439	353,416	20,700	183,382	28,215	121,119	149,334
Totals	2,278,181	103,661	2,174,520	428,893	529,219	440,660	775,748	1,216,408

Province	Ownership of Forest Area Sq. Miles			Saw Timber Resources F.B.M.		Pulpwood Resources In Cords		
	Unalienated	Leased or Licensed	Privately Owned	Softwoods	Hardwoods	Spruce	Balsam	Hemlock
	(9)	(10	(11)	(12)	(13)	(14)	(15)	(16)
Nova Scotia	1,195	1,254	12,301	7,500,000,000	3,500,000,000	15,000,000	10,000,000	4,300,000
New Brunswick	1,680	9,121	10,675	9,073,710,000	8,634,000,000	24,114,000	8,806,000	270,000
Quebec	410,774	71,875	34,173	41,353,000,000	12,735,500,000	156,300,000	122,700,000	3,435,000
Ontario	183,428	48,600	7,972	15,112,000,000	7,735,000,000	114,870,000	12,630,000	4,140,000
Manitoba	127,021	2,095	8,484	2,335,000,000	105,000,000	22,000,000	1,150,000	Nil
Saskatchewan	43,335	1,175	5,266	3,950,000,000	4,000,000,000	30,850,000	1,600,000	Nil
Alberta	71,054	1,991	13,605	11,700,000,000	5,200,000,000	77,000,000	3,000,000	Nil
British Columbia	134,257	12,077	3,000	350,047,000,000	800,000,000	111,430,000	50,857,000	101,142,000
Totals	972,744	148,188	95,476	441,070,710,000	42,709,500,000	551,564,000	210,743,000	113,287,000

TABLE No. 1.—FOREST AREAS AND PULPWOOD RESOURCES IN CANADA—*Concluded*

Province	Pulpwood Resources In Cords						Status of Pulpwood Resources In Cords		
	Jackpine and Lodgepole	Poplar	Total Stand of Pulpwood	Available under present conditions	Total Stand Spruce, Balsam, Hemlock	Available Spruce, Balsam, Hemlock	Unalienated	Leased or Licensed	Privately Owned
	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)	(25)
Nova Scotia	100,000	500,000	29,900,000	20,400,000	29,300,000	20,000,000	322,000	3,946,000	25,632,000
New Brunswick	569,180	3,913,466	37,672,646	29,750,000	33,190,000	26,600,000	537,600	18,027,000	19,108,046
Quebec	17,775,000	44,940,000	345,150,000	160,000,000	282,435,000	131,000,000	146,920,000	178,000,000	20,230,000
Ontario	36,920,000	39,290,000	207,850,000	128,000,000	131,640,000	84,500,000	118,986,700	75,110,000	13,753,300
Manitoba	20,500,000	28,200,000	71,850,000	27,500,000	23,150,000	9,500,000	65,725,090	3,671,373	2,453,537
Saskatchewan	62,700,000	60,400,000	155,550,000	48,600,000	32,450,000	13,600,000	143,330,000	7,070,000	5,150,000
Alberta	85,000,000	110,000,000	275,000,000	81,000,000	80,000,000	26,000,000	261,347,000	7,277,000	6,376,000
British Columbia	28,572,000	3,057,000	295,058,000	135,000,000	263,429,000	125,000,000	126,500,000	149,029,000	19,529,000
Totals	252,136,180	290,300,466	1,418,030,646	630,250,000	875,594,000	436,200,000	863,668,390	442,103,373	112,231,883

EXPLANATORY NOTES

1. As indicated in the title of the Table, the figures do not include Prince Edward Island, the Yukon or the Northwest Territories, the timber supplies of which have practically no effect upon the present discussion.

2. In columns 12 to 18 inclusive, there is overlapping in timber quantities; i.e., the figures for saw-timber include all timber of saw-log size available under practices in effect in the various provinces; these larger sizes are also included in the cordage figures for pulpwood species. In computing saw-timber resources, there are instances where cruises are based upon different log-scales. In some cases, therefore, notably in Ontario, where the Doyle rule is used, the mill cut will over-run to a considerable extent figures shown in the table.

3. Poplar is included under the heading of pulpwood although the amount of this species manufactured into pulp in Canada is negligible. It is, however, used to a considerable extent in the United States.

4. Jackpine is used for pulp manufacture in Canada to a very limited extent only, but its use for this purpose will probably increase; it is therefore included.

5. Only in British Columbia is hemlock used to a material extent in pulp manufacture.

6. As explained in the text of the report, there are still other species which may in the future be used in pulp manufacture. At present, however, spruce and balsam supply over 93 per cent of pulpwood supplies; hemlock, jackpine and poplar together less than 7 per cent; and all other species only one-quarter of 1 per cent.

7. The figures in columns 19, 21, 23, 24 and 25 include all of the timber in the areas referred to, without regard to accessibility or merchantability. In columns 20 and 22 available supplies are shown. In the latter figures, most liberal application has been made of the terms "merchantable" and "accessible," all timber for which a market within many years can be foreseen has been included. In calculating supplies it is upon the latter figures that greater reliance must be placed.

8. Under "balsam," column 15 and elsewhere, is included the "white fir" of British Columbia.

the report. After dealing with the provinces, the general situation as regards pulpwood supplies in the Dominion, and the use of those supplies, will be described.

CHAPTER II.—NOVA SCOTIA

The most outstanding feature of the forestry situation in the province of Nova Scotia is that the great bulk of the forest area has been alienated in fee simple. Owing to its maritime position, the relative accessibility of all parts of the province, and the consequent availability of timber products for sea-borne traffic to foreign markets, the demand for timber cutting privileges was early in evidence. At the time of these early demands, the significance of the forest in successful permanent development of the state was not fully realized; nor had the principle that the state should retain reasonable control of forest areas been appreciated in any degree. Coincidental with the demand for timber, strong efforts were put forth to settle the province, and unfortunately, but scant consideration was given to the suitability for agricultural purposes of the land so settled upon. Consequently, long before there was any thought of conservation, the great bulk of the forest asset had passed from crown control.

SECTION 1.—TOTAL PULPWOOD RESOURCES

As indicated in Table I, the total forest area of Nova Scotia is 14,750 square miles—70 per cent of the land area. Of the latter a little better than one-quarter may be considered as merchantable and accessible. The total pulpwood stand, including spruce, balsam, hemlock, jackpine* and poplar, is estimated at 29,900,000 cords. Hemlock and jackpine may at once be eliminated, owing to the necessity for their use for other purposes—hemlock for lumber, and jackpine for railway ties and such purposes—and also on account of their limited distribution. This leaves a net stand of 25,500,000 cords of spruce, balsam and poplar, of which some 500,000 cords are of poplar. The proportion of poplar in the timber stand of the province is small; also, it has never been used to any extent in local pulp mills. During the past two or three years a limited amount, some 4,000 or 5,000 cords, has been exported to United States mills for use in the manufacture of book papers.

Confining discussion, therefore, to spruce and balsam we find a total stand of twenty-five million cords. Of this amount, not more than eighty per cent, at the very outside, may be considered as merchantable and accessible, or liable to become so in the future. Notwithstanding general accessibility of nearly every part of the province, by some method of transportation, there are considerable areas where timber growth is so sparse and stunted, that under conditions of natural regeneration the timber will probably never become merchantable for pulpwood or lumbering operations. We have, therefore, a net stand of approximately twenty million cords of spruce and balsam from which pulpwood supplies, and the lumber supplies of these particular species, must be drawn.

SECTION 2.—PULPWOOD ENTIRELY UNDER CONTROL OF THE PROVINCE

Timber lands in Nova Scotia have been alienated to such a great extent, in one form or another, that those areas to which the province retains full title are almost negligible, in so far as timber value is concerned. Only 1,195 square miles, or 8·1 per cent of the forest area, consisting largely of the riff-raff, but still having productive value if properly managed, remains in the Crown. There is estimated to be only 322,000 cords of the five species, widely scattered in

* Jackpine is also known locally as "princess" or "scrub" pine; and occasionally as cypress.

small blocks, and so far as present conditions are concerned, almost entirely unmerchantable. In determination of methods to be adopted in its disposal or use, however, the province has unquestioned and exclusive control.

SECTION 3—PULPWOOD UNDER REGULATIVE CONTROL OF THE PROVINCE

The total area of leased and licensed timber land is 1,254 square miles, 8·5 per cent of the forest area, estimated to contain a total pulpwood stand of 3,946,000 cords, largely balsam and spruce. The greater part of this area, approximately 814 square miles, and over 75 per cent of the timber, is included in one lease in Cape Breton Island, the balance comprising a large number of smaller areas leased to individuals and companies.

The terms of the lease in Cape Breton give the lessees entire control of operations, practically the only provincial control being a requirement for peeling or rossing of the wood in Canada. Without rejecting the terms of the lease, therefore, the province could not increase the degree of local manufacture required of the operators, nor in other directions control the methods of utilization. On the balance of leased lands, while the province retains the right to prescribe conditions of home manufacture, no actual control is exercised either in that direction, nor in regulation of the sizes cut. In fact, no inspection of operations is made at all, and the areas are to a greater extent treated as if they were private lands for the time being.

The practice of disposing of timber lands in fee simple at a stated price per acre continued until 1899, the object apparently having been to settle the country no matter whether farm or forest land was taken. In the latter year a lease system in connection with timber lands was introduced, and lessees secured tenure for a twenty year period (renewable for a further twenty years) at the fixed price of 40 cents per acre, this fee covering the entire period of the lease. In 1904 the Act was amended increasing the rate to 80 cents per acre, for which lessees were entitled to the privilege of cutting all timber to a diameter limit of ten inches. This practice continued until 1910 when, under consolidation of the Crown Lands Act, provision was made for the disposal of timber on a stumpage basis. The old provision for leasing, however, remained in the Act, and in actual practice it turned out that comparatively little timber was sold on the stumpage basis. The quantities of timber sold on the latter basis were so small, and the costs for scaling of cuts relatively so large, that the practice, being less productive of revenue than the other method, was discontinued. Even at the present time, in event of application for crown timber, it would be disposed of as a lease at so much per acre for the twenty year period. Some attempt is now made at appraisal, and higher prices charged than previously. By reason of complete absence of inspection, the provision as to the ten inch diameter limit is entirely inoperative. No attention is given to the question of manufacture, and except for limitations as to time, therefore, lessees enjoy practically the same privileges as private land owners.

SECTION 4—PULPWOOD ON PRIVATELY OWNED LANDS.

Of the total forest area, 14,750 square miles, an area of 12,301 square miles, or 83·4 per cent, has been alienated in fee simple. As a result, by far the greater part of the timber supply, a total of 25,632,000 cords or nearly 86 per cent of Nova Scotia's potential pulpwood stand, has passed completely out of control of the province. It is this situation which renders the more difficult and expensive the formulation and application of a rational forest policy in that province,—a step, however, which is none the less imperative.

SECTION 5—OWNERSHIP OF TIMBER LANDS AND PULPWOOD RESOURCES

An analysis of the status of ownership is of interest. No absolute figures are available, but, basing calculations upon the best information obtainable, it is possible to make some interesting and reasonably accurate deductions. Including the Cape Breton lease which, by virtue of the conditions previously described, is really beyond control of the province, a timber area of some 5,928 square miles is in the hands of some 329 holders of areas greater than 1,000 acres; there are some 1,056 owners of forest tracts between 200 and 1,000 acres in extent; and the balance of the privately owned forest is made up of parcels less than 200 acres in extent. For the latter two classes, namely, holdings of less than 1,000 acres, it has been impossible to segregate details; it may be concluded, however, that the greater part of such holdings is in the hands of local residents.

Of greater interest is a study of ownership of the larger holdings, for after all, the area of 5,928 square miles represents approximately 40 per cent of the provincial forest area, and over 48 per cent of the privately owned timber land; moreover, included in private lands of this category is the great bulk of the total 3,720 square miles of merchantable timber land of the province. Of the 5,928 square miles, approximately 17 per cent (1,018 square miles) is held by individuals, while the other 83 per cent (4,910 square miles) is held by companies and corporations. Viewing the matter from another angle, 4,221 square miles, or a little better than 71 per cent, is held by Canadian individuals, companies and corporations and 1,707 square miles (29 per cent) is under foreign control. essentially American. Of the 1,707 square miles under foreign control at least 1,331 square miles (78 per cent) is held by three American pulp companies that do not manufacture pulp within the province. In other words, approximately 9 per cent of the forest area of the province, and probably at least 14 or 15 per cent of the pulpwood resources, are in the hands of the three companies referred to. Including all foreign holdings, the great bulk of which are American, it may be deduced that somewhere from 17 to 20 per cent of Nova Scotia's pulpwood supplies are so held.

SECTION 6.—SUMMARY RE PROVINCIAL CONTROL OF MANUFACTURE

Lacking the right to impose manufacturing restrictions upon lands privately held, and having made commitments which restrict such action in the Cape Breton lease, it will be perceived that even in event of the province desiring to impose such manufacturing restrictions, the latter could only be applied to less than five per cent of the pulpwood stand in the province.

SECTION 7.—CONSUMPTION OF TIMBER IN NOVA SCOTIA

Although a discussion of saw-timber supplies and consumption—except insofar as they overlap or otherwise affect pulpwood supplies—is extraneous to the main object of this report, it is necessary that reference be made to this side of the question in order that the picture may be complete. Table I gives a total for the province of 7½ billion board feet of softwood saw-timber, including, —in addition to the spruce, balsam, hemlock and jackpine, used to a greater or lesser extent for pulp—all of the white and red pine. In addition there is estimated to be a stand of 3½ billion feet, board measure, of hardwoods. Confining

discussion, however, to the softwoods, the estimates for pulpwood species are as follows:—

Spruce	3,750,000	M.B.F.
Balsam	1,500,000	"
Hemlock	1,650,000	"
Jackpine	5,000	"
Total	6,905,000	"

The balance of the 7½ billion feet of saw material, viz., 595 million feet, consists essentially in white and red pine. On account of their increasing scarcity, and their high value for other purposes, white and red pine are necessarily eliminated from any consideration of pulpwood resources. The eastern hemlock, also, though in some regions used in pulp manufacture, is not extensively utilized for this purpose in Canada or the Atlantic States; in any case, the limited supply which remains in Nova Scotia is rather urgently required for saw-timber and such other purposes. As previously intimated, the limited amount of jackpine available is also required for other purposes.

This leaves the amount of 5¼ billion feet of spruce and balsam, of saw-timber quality, which converted to cubic measure represents 10½ million cords. The latter amount, however, is included in the 20 million cords of available spruce and balsam pulpwood mentioned in section 1, and shown in Table I. It is now proposed to analyse consumption figures in order to see how the available supplies of these species may be expected to supply the requirements for both lumber and pulp manufacture. As a basis for study, four tables, II, IIa, IIb, and IIc, are presented herewith.

TABLE II.—LOCAL CONSUMPTION OF WOODS FOR PULP MANUFACTURE—NOVA SCOTIA

Cords

Year	Spruce	Balsam fir	Hemlock	Poplar	Total
1913	17,557	1,305	1,700	.....	20,562
1914	9,577	974	226	.....	10,777
1915	20,290	430	.....	.....	20,720
1916	14,387	50	.....	.....	14,420
1917	17,510	354	500	10	18,374
1918	10,154	1,414	.....	100	11,668
1919	18,668	1,838	245	.....	20,751
1920	22,823	1,772	.....	.....	24,595
1921	22,145	217	.....	.....	22,362
1922	45,933	744	.....	242	46,919
Total	199,044	9,098	2,671	352	211,165

NOTE.—The table shows total consumption of wood in the Nova Scotia pulp mills. From this table, from Table IIB, and from the export statistics, Tables IIA and IIC are derived.

TABLE IIa.—CONSUMPTION AND EXPORT OF PULPWOOD—NOVA SCOTIA—SPRUCE AND BALSAM

Cords

Year	Manufacture		Export	Total
	Spruce	Balsam	Spruce and Balsam	
1913	17,557	1,305	6,049	24,911
1914	9,577	974	1,557	12,108
1915	20,290	430	3,310	24,030
1916	14,387	50	3,735	18,172
1917	17,510	354	770	18,634
1918	10,154	1,414	.....	11,568
1919	18,668	1,838	15,712	36,218
1920	22,823	1,772	27,211	51,806
1921	22,145	217	29,800	52,162
1922	45,933	744	34,650	81,327
Total, 10 years	199,044	9,098	122,794	330,936

NOTE.—It is possible that the amount of spruce and balsam exported is in reality greater than indicated, as rail shipments are cleared at a New Brunswick port of exit, and are therefore reported in exports of the latter province.

TABLE IIb.—SPRUCE AND BALSAM MANUFACTURED INTO LUMBER—NOVA SCOTIA

M BOARD FEET

Year	Spruce	Balsam	Total
1913	156,311	5,251	161,562
1914	169,192	7,754	176,946
1915	184,922	7,091	192,013
1916	144,263	8,906	153,169
1917	142,695	4,664	147,359
1918	93,467	5,122	98,589
1919	146,941	7,509	154,450
1920	176,715	10,982	187,697
1921	73,805	4,838	78,643
1922	69,583	1,764	71,347
Total, 10 years	1,357,894	63,881	1,421,775

NOTE.—The table does not include the figures for total lumber production in Nova Scotia, but only for the species mentioned. The lumber cut of all species is shown in Table IIe.

The conversion into cords of timber used in lumber manufacture, as shown in Table IIb, and consolidation with figures for pulpwood consumption and export, as shown in Tables II and IIa, gives the total figures for spruce and balsam consumption in pulpwood and lumber. The only exception is a small amount of these species shipped by rail through New Brunswick for export to the United States. The amount handled in this manner will not appreciably affect the average figures arrived at in Table IIc.

TABLE IIc.—AMOUNT OF SPRUCE AND BALSAM CONSUMED IN MANUFACTURE OF LUMBER, PULP AND IN EXPORT—NOVA SCOTIA

Expressed in Cords – 500 B. ft. = 1 cord

Year	Spruce	Balsam	Exports, Spruce and Balsam	Total
1913	330,179	11,807	6,049	348,035
1914	347,961	16,482	1,557	366,000
1915	390,134	14,612	3,310	408,056
1916	302,913	17,862	3,735	324,510
1917	302,900	9,682	770	313,352
1918	197,088	11,658	.....	208,746
1919	312,550	16,856	15,712	345,118
1920	376,253	23,736	27,211	427,200
1921	169,755	9,893	29,800	209,448
1922	185,099	4,272	34,650	224,021
Total, 10 years	2,914,832	136,860	122,794	3,174,486
Average	291,483	13,686	12,279	317,448

Consideration of Table IIc reveals the fact that the average yearly cut of these two species for home manufacture of lumber and pulp, and for the export of pulpwood, was 317,448 cords. The only available figures for the amounts of timber used in some other directions, essential to the present discussion, are those of the decennial census. Figures covering 1920 indicate that in that year the farm woodlots of Nova Scotia supplied among others the following wood products:—

Fuelwood	cords	568,966
Fence Posts	pcs.	1,176,350
Rails	"	1,176,016
Railway Ties	"	95,252

Figures for individual species are not available, but it is quite certain that the great bulk of the fuel was hardwoods; still, a limited amount of softwoods is used. Probably the large part of the fence posts and rails are of species other than pulpwood, although spruce is used to a considerable extent for these purposes. As to railway ties, in the scarcity of jackpine it is quite probable that a considerable part of the total are of spruce. The railways also secure large quantities of ties from other sources. Considering all such uses, it is quite reasonable to assume that the spruce and balsam used for these purposes would increase the previous total average yearly consumption of spruce and balsam to some 340,000 cords. Finally, large amounts of both species are used in the coal mines of the province. The wood used in the latter industry in Nova Scotia is practically identical with that cut for pulpwood, both in species and sizes consumed, and from reports of mining industry it is quite certain that over 50,000 cords of spruce and balsam is consumed annually in coal mining operations. This brings the average annual grand total consumption of these two pulpwood species up to *400,000 cords per year.*

So much for combined figures for the two species,—it will readily be perceived that, with the very limited amount of balsam used, (less than 5 per cent for lumber and pulp manufacture) the more serious situation exists in regard to spruce. With a total quantity of not more than 12 million cords of available spruce for all purposes, the average annual drain on supplies of that species has been not less than 330,000 cords.

SECTION 8—THE EXTENT OF PULP AND SAWMILL INDUSTRIES

Table IId shows the wood consumed and the pulp manufactured at the various mills within the province.

TABLE IID

Year	Wood Consumption	Total Production
	Cords	Tons
1913	20,562	20,562
1914	10,777	10,777
1915	20,870	20,870
1916	14,437	14,437
1917	18,374	20,355
1918	11,668	10,017
1919	20,751	17,659
1920	24,595	23,384
1921	22,362	17,802
1922	46,919	37,562

Of the nine or ten pulp mills, only eight were active in 1921, and six in 1922. Statistics for the latter year give the province credit for a little less than 2 per cent of Canada's total production of pulp. Several years ago an attempt was made to introduce the manufacture of chemical pulp, but unfortunately the venture failed of success at that time, and so far no chemical fibre has been made. The production of the pulp mills is, therefore, still confined to groundwood; of the latter, Nova Scotia's production constitutes 3 per cent of the Canadian total for this class of pulp. No paper is manufactured in the province.

At the present time plans are under way for the construction of another pulp mill on the south coast, which will undoubtedly increase to a material extent the pulp production of the province. Latterly, also, hope has been revived that the chemical pulp mill already established, but hitherto a failure, may be brought into successful operation.

It is quite clear from the figures cited in Table IId, and from the foregoing remarks in that regard, that the pulp industry in this province has had an elementary and rather erratic development. By some this has been attributed very largely to the lack of sufficient water-powers. The Commission enquired into this side of the question, however, and although it is true that the province is by no means blessed with the abundant water-powers found elsewhere, there are, nevertheless, a considerable number of undeveloped sites which could be put to use if conditions in other respects warrant development for pulp manufacture. Rather than attribute lack of development of this industry to the lack of water-powers, we are inclined to the view that the underlying reason is the difficulty of securing, in sufficiently consolidated areas, adequate reserves of timber to justify the installation of large mills. Any person desirous of promoting the industry is, in the first place, confronted with the rather involved conditions of timber ownership. There are not still remaining in the Crown any considerable areas of pulpwood timber which would constitute satisfactory nuclei for pulpmill operations and there is, therefore, in considering a venture of this kind, the uncertainty as to whether promoters could acquire by purchase timberlands which would, on the basis of prices to be paid, justify the development.

These drawbacks notwithstanding,—favourably situated as it is from a shipping standpoint; in close proximity to foreign markets without the necessity of rail hauls; and with such a large percentage of potential forest land at its disposal,—the timberlands of the province are most assuredly capable of development to that position wherein they might support, in a stable manner, a pulp industry of more substantial proportions than that of the present time.

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TABLE IIe.—NOVA SCOTIA LUMBER PRODUCTION, 1913 TO 1922 INCLUSIVE BY KINDS OF WOOD QUANTITY CUT AND VALUE

Kind of Wood	1913		1914		1915		1916		1917	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	156,311	2,108,770	169,192	2,378,081	184,922	2,701,004	144,263	2,015,924	142,695	2,494,977
Hemlock	63,851	742,627	59,815	808,213	52,872	698,716	33,404	424,081	30,611	601,702
White Pine	28,918	478,540	17,265	277,657	25,591	539,012	16,354	254,260	12,467	273,593
Birch	13,095	171,317	16,600	233,775	16,436	225,705	11,703	156,249	6,303	144,562
Balsam Fir	5,251	59,165	7,754	95,407	7,091	87,583	8,906	116,143	4,664	84,048
Maple	2,946	37,404	2,957	37,169	4,102	55,784	1,934	25,215	567	16,334
Beech	1,770	23,643	2,908	34,945	1,570	24,669	1,428	19,166	12,958	258,726
Red Pine	1,657	24,490	1,207	18,084	1,101	17,039	1,578	23,857	1,878	33,329
Oak	614	18,938	474	13,303	356	10,425	211	5,750	185	7,100
Poplar (Aspen)	95	1,038	53	647	90	1,193	561	7,574	20	358
Jack Pine	51	826	105	1,570	221	3,285	102	1,651	471	13,830
Cedar	50	600	444	5,335	2	60	.....	.....	.....	.....
Ash	42	1,106	78	1,302	29	355	25	376	155	3,626
Poplar (Balsam)	35	397	75	915	5	60	3	36	.....	.....
Tamarack	26	273	13	168	70	1,029	129	1,690	1,221	23,336
Poplar (Cottonwood)	10	130	38	555	3	36	116	2,312	100	2,000
Basswood	.....	.....	45	750	10	150	.....	.....	87	2,008
Elm	.....	.....	21	368	4	60	1	25	885	22,501
Butternut	.....	.....	.....	.....	.....	.....	.....	.....	1	15
Other Kinds	.....	.....	.....	.....	.....	.....	.....	.....	1,463	29,098
Custom Sawing	.....	.....	.....	.....	.....	.....	.....	.....	19,979	392,966
Poplar (All kinds)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	274,722	3,669,264	279,044	3,908,244	294,475	4,366,165	220,718	3,054,309	236,710	4,404,109

Kind of Wood	1918		1919		1920		1921		1922	
	M. Ft. B.M.	Value	M. Ft. B.M.	Value	M. Ft. B.M.	Value	M. Ft. B.M.	Value	M. Ft. B.M.	Value
		$		$		$		$		$
Spruce	93,467	2,163,495	146,941	4,058,326	176,715	6,167,144	73,805	1,971,833	69,583	1,745,922
Hemlock	25,528	589,954	28,414	853,249	44,261	1,455,461	20,418	453,929	20,447	469,543
White Pine	9,379	261,153	6,372	224,431	16,033	565,572	7,135	270,364	5,437	154,164
Birch	12,047	282,881	7,497	291,680	10,344	350,514	5,958	159,629	2,763	65,785
Balsam Fir	5,122	110,718	7,509	200,770	10,982	346,877	4,838	117,531	1,764	40,891
Maple	3,902	98,490	1,268	24,765	2,978	97,880	752	20,043	779	18,940
Beech	3,362	85,429	1,819	55,901	1,572	54,145	913	20,484	269	5,382
Red Pine	445	11,363	709	21,047	2,805	91,756	825	24,783	158	3,741
Oak	408	21,907	123	5,001	163	5,910	92	3,214	54	1,694
Poplar (Aspen)	55	1,295	71	1,874	.....	.....	.....	.....	.....	.....
Jack Pine	60	1,200	30	930	1,453	50,090	100	2,500	40	680
Cedar	.....	.....	70	1,400	1,601	51,035	242	6,956	.....	.....
Ash	2	45	7	160	27	830	21	470	2	40
Poplar (Balsam)	2,202	44,840	77	1,642	.....	.....	.....	.....	.....	.....
Tamarack	26	515	1	40	2	60	26	640	1	15
Poplar (Cottonwood)	.....	.....	.....	.....	.....	.....	.....	.....	35	685
Basswood	47	916	.....	.....	35	1,065	.....	.....	.....	.....
Elm	2	38	10	200	.....	.....	12	252	81	1,630
Butternut	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Other Kinds	766	19,266	.....	.....	821	37,135	98	2,097	40	800
Custom Sawing	19,512	398,534	23,886	516,554	.....	.....	.....	.....	.....	.....
Poplar (All kinds)	.....	.....	.....	.....	354	10,460	11	270	.....	.....
Totals	176,332	4,092,039	224,804	6,257,970	270,166	9,275,934	115,246	3,054,995	101,451	2,509,912

In Table IIe will be found complete figures for lumber production from all species. The peak production of the decade occurred in 1915, which year was preceded by two years of relatively high production. Serious falling off occurred in the following four years, and a rebound to figures comparable to those of earlier years occurred in 1920. The year 1921 shows a reduction of approximately 57 per cent from the previous year, and finally, 1922, the last for which figures are available, shows a still greater reduction,—the lowest cut in the decade.

In a province formerly containing stands of excellent merchantable saw-timber, there has during the past two or three generations, been a rapid wastage in supplies. Although the decline in production cannot be entirely attributed to waning supplies, it is undoubtedly true that the inability of the province to supply the high grades of lumber which were formerly produced has had a marked effect on lumber production. The number of establishments entering into production in 1920 was 576. It will readily be perceived, therefore, how widespread are the effects of such serious curtailment in production.

Of utmost importance in the present discussion is the extent to which the sawmills are dependent on spruce. Formerly, white and red pine and hemlock supplied large quantities of lumber, but the proportion of these has rapidly decreased, until the serious drain now falls on spruce. Spruce has, over the decade, furnished over 60 per cent of the entire lumber production. Only in two years has the cut of this species constituted less than 60 per cent. In other years it has varied from 63 to 67 per cent. When it is considered that seven of eighteen other species used are cut in appreciable amounts, it is at once clear that to maintain its high percentage cut, the amounts of spruce consumed are relatively very large.

SECTION 9.—THE TREND OF PULPWOOD BUSINESS IN NOVA SCOTIA

The official figures for pulpwood exports from the province, shown in tables IIa and IIc, are based on returns made by collectors of customs at the various ports of exit. It may be pointed out, however, that pulpwood originating in one province, and shipped through and cleared from a port in another province, is credited to the latter. The customs figures quoted in statistical reports do not, therefore, in all cases accurately represent the amounts of wood cut for export in the various provinces. It was found to be a hopeless task to go back over the decade and construct compensated tables for the adjustment of statistics. However, as a result of a study of this export business at the various ports of exit, it has been possible to adduce information of value in application to the export business. In Nova Scotia, during the past year or two, a small export business has developed in Cumberland and adjacent counties, and shipments of pulpwood, essentially poplar, have been made by rail through New Brunswick and cleared at McAdam Junction in the latter province. The amount so handled approximates 4,500 cords. Similarly, of the pulpwood shipped by vessel through the St. Lawrence waterway, small amounts (less than 100 cords) were cleared at ports in other provinces. Although, for the year for which the figures were secured, the aggregate was only 4,548 cords, it nevertheless constitutes a material percentage of Nova Scotia's export, and must therefore be considered.

Reference to the customs figures reveals a sharp increase in exports in 1919, this increase being maintained through the succeeding years. It was due largely to the acquirement and operation for export, by one company, of the large lease in Cape Breton Island. Exports from this property have not as yet reached the figures which the operating company anticipates; when all improvements have been completed the exports of this company alone are expected to run from 35,000 to 40,000 cords annually. However, export figures for the years indicated are as follows: 1919, 7,520; 1920, 28,500; 1921, 30,450; 1922, 32,400; 1923, nil. Some 36,000 cords are rossed and ready for shipment during the season of 1924. Comparison of these figures with total reported exports clearly indicated that, aside from small purchases which this company may have made from farmers, little or no other wood cut by farmers could have been exported through Nova Scotia ports in 1920 or 1921. In 1922 there was a small margin of 2,240 cords which was probably handled in this manner.

The census figures for operations in 1920, show that in that year the farmers of Nova Scotia disposed of 29,518 cords of pulpwood. In the same year the mills of the province consumed 24,595 cords, of which 18,703 cords was purchased, and the balance cut from limits owned by them. The difference between farmers' production and the amount purchased by mills, viz., 10,815 cords, would apparently represent the amount of farmers' wood available for export. This amount is considerably greater than the amounts shipped by rail through New Brunswick. It is, therefore, quite probable that the census returns for farmers' wood are excessive. It is nevertheless quite clear that, aside from activities of the Cape Breton firm, the farmers of the province are materially increasing their output of pulpwood. That this is true is clearly indicated by export figures for 1923, when 11,451 cords of pulpwood was exported through Nova Scotia ports and an additional 4,548 cords by rail through New Brunswick, bringing the total Nova Scotia export for that year to approximately 16,000 cords. In that year, the company operating in Cape Breton Island did not export any wood whatever; manifestly, therefore, the great bulk of the total export of 16,000 cords in 1920 was from the farmers' holdings.

That a considerable local market for farmers' wood already exists is evident from the statistics for pulpwood consumption. During the 6 year period, 1917 to 1922 inclusive, the pulp mills purchased approximately 80 per cent of their requirements. These mills, however, are not readily accessible to all parts of the province, and to this may be largely attributed the increased interest in the cutting of pulpwood for export.

Assuming an annual export of 35,000 cords from the Cape Breton property, and 15,000 cords from farmers' holdings, it may readily be expected that hereafter total exports from these two sources will approximate 50,000 cords. Aside from these, however, two other large American concerns have purchased, and are preparing for operation, large tracts of timber land. It may on this basis be anticipated that within a few years exports may reach a figure from 75,000 to 100,000 cords.

It is difficult to gauge what amount domestic requirements will reach. The ten year period, 1913 to 1922, shows an average yearly consumption of 21,126 cords. The later years of the decade, however, show higher figures, and 1922 shows a consumption of nearly 47,000 cords. It does seem reasonable to expect that, with the stabilization of conditions, from 45,000 to 50,000 cords would be consumed annually by local mills already established. As intimated, previously, another mill is expected to be operated at Sheet Harbour on the south coast. The wood supply for the mill projected will add very largely to domestic consumption.

Under these circumstances there is every reason to believe that, if the lumber industry is to be sustained, the annual requirements of spruce and balsam will be at least 500,000 cords.

SECTION 10—SUMMARY OF SITUATION—DURATION OF SUPPLIES

In the discussion of pulpwood resources, the amounts available, the annual consumption therefrom, and the probable amounts required, have been described in some detail. Simple mathematical division of the available supplies by the probable requirements would give us a good idea of the probable duration of supplies, were it not for the several variable factors which complicate the situation. On the one hand we have the annual growth, or increment, and, offsetting the latter in greater or lesser degree, the losses due to fire, insects and decay.

Unfortunately, from the data available—or rather, in the utter lack of any really reliable data—the Commission is not able to closely gauge the probable increment which has taken or is taking place; nor to ascertain from statistics available what the counteracting losses may have been. It is of paramount importance, however, that a few observations should be made regarding the subject, in order to dispel some of the misconceptions that are so prevalent. The matter will be treated with, so far as circumstances permit, and many of the general observations brought out in the discussion may be considered as having some application to other provinces in Eastern Canada.

Due to the fact that the climatic conditions in Nova Scotia favour the rapid germination of tree seeds, and that in more open situations, particularly on pastures and abandoned farms, tree growth is rather rapid, the most exaggerated ideas prevail regarding the rapidity of growth in the forest. In discussing the question of increment we must, in the main, confine ourselves to the areas where forests are to be perpetuated, i.e., on absolute forest soils; and to the conditions of relatively greater density which are required for the production of timber of quality suitable for the trades. Simply because a tree grown on relatively good soil in the open, where light conditions are most favourable, may develop to a large diameter in a comparatively few years, it must not by any means be assumed that similar growth is attained in the forest, for such is very far from being the case. Just as the character of man is in great measure the product of environment, so is the character of individual tree growth the product of site and density.

On this subject, we cannot, perhaps, do better than quote Fernow, on this continent the outstanding forester of his day, who, after making a study of forest conditions in Nova Scotia, discussed the question in part, as follows:—

" Most extravagant ideas exist as to the rate of growth of trees, observations of single trees growing in the open being taken as a basis to be translated into performance by whole acres of trees. The idea prevails that Nova Scotia spruce in the Nova Scotia climate is growing at an extraordinary rate. As a matter of fact, while it can be stated that the climate is most favourable to reproduction, i.e., to the establishment of young growth, the rate of growth of trees in the forest is not very different from the ordinary rate to be found in the New England States under similar conditions.

" Some 550 trees were analyzed as to their rate of diameter growth, and a number of sample plots were measured to arrive at a conception of growth conditions. From these measurements it appears that to produce a spruce tree, 12 inches in diameter on the stump, may require from fifty years for the most favoured trees, to one hundred and seventy years for trees which had for a long time to compete for light with their neighbours. The unusually rapid-growth trees are, to be sure, found only occasionally; the much more usual rapid growers require eighty to ninety years to make the 12-inch diameter. In other words, 1 inch of diameter is formed in the best average case in six to seven years; in the poorer conditions, in fourteen years. Older, stouter trees that have averaged twenty years in making one inch of diameter are not infrequent, and twelve years may, as in Sweden, be considered the average performance in the natural woods. That is to say, it took a hundred and forty to a hundred and fifty years, on the average, to grow the trees that are now being lumbered.

" A series of measurements were made on second growth trees, which are in more favourable light conditions, and, hence, make better growth. Some 250 trees of this description in various regions were analyzed. Here, as is to be expected, a very much better rate prevails owing to, and in proportion to, the light admitted. Fifty trees on an *old pasture* south of Springhill in Cumberland

county, ranging from thirty-five to fifty-nine years, had averaged one inch in five years, *i.e.*, a tree of 12-inch diameter on the stump was grown in sixty years. The same rate was found in *old pastures* in other localities. But in the forest, twenty trees in Colchester county, ranging in age from thirty-five to forty-eight years grew at the rate of 1 inch in seven years, making the 12-inch tree in eighty-five years. This may be assumed as a fair average rate for second growth trees.

"These statements refer to red spruce, which is the species most prominent in Nova Scotia forests. The white spruce, which forms rarely as much as 10 per cent, and usually not much more than 1 per cent, of the natural forest growth, is the species which occupies readily the abandoned pastures near the coast, and there, in the full enjoyment of light, grows as rapidly, or perhaps more rapidly, but into a poorer tree—a "ladder" tree, as, on account of the branches, a lumberman has called them. A few trees of this species that were measured, showed that they had developed at the rate of 1 inch in four years. Balsam fir, which in some parts is erroneously called white spruce, shows about the same rate of growth. One inch in five to six years seems the rate for young second growth of this species *on pastures*.

"White pine is the fastest grower; yet a group of 25 trees ranging from 63 to 84 years and averaging 68 years of age, evidently second growth, averaged only 11.4 inches in diameter. They had grown at the rate of 1 inch in six and two-thirds years.

"Some 26 trees of hemlock in the forest, an old stand on a first-class site near a stream, ranging from one hundred and seventy to two hundred and sixty-nine years, averaged two hundred and ten years, with an average diameter of 20 inches, made, therefore, 1 inch in ten years—a very good performance for this species."

While there is no desire to depreciate the possibilities of forest growth in Nova Scotia, there is, nevertheless, the rather obvious duty to shed as much light as possible upon actualities. No good purpose can be served by deluding oneself with the belief that the unregulated forests of Canada show an annual increment equal to that of intensively managed forests in Europe; in fact, it is just such delusions that must be removed from the public mind, if a true perspective of our forestry problems is to be acquired.

In some of the intensively managed forest areas of older countries, which have been under regulation for scores of years, rates of increment approximating $2\frac{1}{2}$ to 3 per cent may be attained; even so, such rates cannot be applied to their forest areas as a whole. On occasions, it has been suggested that percentages running from 1.25 to 1.5, or perhaps even a little higher, are about the limit which may be applied wholesale over large areas in such countries. Even these figures are only attained by the influence of the more favourable rates, secured in highly managed forests, upon the general average. Under such circumstances, it is manifestly futile to argue that in Canada we may apply higher figures—if as high—over large areas of very seriously depleted, and in some cases injuriously treated, forest land.

With the foregoing considerations in mind, and if, only for the purpose of reaching at least some conclusion, we adopt the arbitrary figure of 1 per cent, in Nova Scotia; rather liberally taking the total spruce-balsam stand of some 25 million cords (although there is certainly justification for not including all of it); it is perceived that the annual increment would be 250,000 cords. As against this, there is an annual consumption which, as previously explained, has been 400,000 cords, and the anticipated annual consumption, some 500,000 cords, —in the premises, a clear indication of serious depletion, through cutting alone.

There are, however, the other much more insidious agents in depletion,—fire, insects and fungus decay. Of fire, it may be said that there are all too abundant examples of the serious losses which the province has sustained. On the average, the fire menace cannot be considered to be great; further, on account of relative accessibility, the availability at close range of labour for fire control operations, and finally the character of the country, which offers many barriers to the spread of fire, the fire menace is quite susceptible of reasonable control, and latterly, there is evidence of much improvement in this direction. These facts notwithstanding, fire has been a serious factor in depletion, and is still very much to be reckoned with.

As for insects,—the mere fact that the province has not experienced an epidemic such as the budworm infestation of New Brunswick and Quebec, conduces to the popular belief that Nova Scotia has no serious forest insect problems. While there is perhaps no reasonable ground for thinking that an outbreak of this kind is impending, it is nevertheless a fact that insects do serious damage in the forests of that province, as they do in every province of the Dominion.

Finally, with regard to damage wrought in the forest by fungus diseases, while as yet it has not been the subject of very intensive study in that province, the loss from this source is an essential factor in depletion. For instance, the rot of balsam, a species which constitutes such a large part of the pulpwood stand, is something which must be reckoned with; and fungus decay is present in many other forms.

It is therefore evident that, aside from depletion through consumption, there are these other agents which may partially, totally, or more than counterbalance the forest increment due to growth. The precise state of balance which exists, it has not been possible to determine. It is firmly believed, however, that the increment is almost, if not more than, offset by these several agents of destruction; and that in calculating the probable duration of supplies, no allowance for growth may justifiably be made, unless and until such losses are more successfully curtailed.

On the assumption that these untoward losses may be so controlled that they will not on the average exceed the amount of annual increment in the forest, and if we are to be content with working on the extremely destructive theory of ultimate exhaustion, it would at first glance appear that the stand of pulpwood species might meet immediately anticipated requirements for a period of fifty years, at the end of which time the really useful commercial forest would be exhausted, and the pulpmills, sawmills and other industries, dependent thereon, would be scrapped. The calculation presupposes the free interchange in use of spruce and balsam in the industries, however. If we consider only the spruce—which as previously explained, furnishes the great bulk of the supplies —we might expect exhaustion of that species in from 30 to 35 years' time.

Except in so far as they may serve a temporary expedient,—on the one hand, to discount alarmist propaganda that predicts absolute exhaustion in the immediate future; on the other hand, to emphasize the need for more modern and more economic treatment of the forest resources—such methods of calculation reduce the problem to a state approaching absurdity. Manifestly, it would not be economically feasible, during the depletion period, to pool the annual cut among all the mills of the province on the basis of equality, for, by enhancing cost of production, this would render it impossible for the industry as a whole to compete with other sources of supply. On the other hand, if during the depletion stages, the principle of "survival of the fittest" is permitted to operate unhampered, there would be uninterrupted sequence in the closing down of manufactories,—a dwindling away of forest, forest industries, population and everything that constitutes thriving communities.

Were we to content ourselves with consideration of a question of such great national consequence upon the very material basis of "so-many-years" supply, and if the precise number of years computed were sufficient to remove any apprehension which may be entertained for the well-being of the present generation, our position would, with one or two important exceptions, be analogous to that of the man who, well along in life and without sufficient income to sustain him, decides upon the purchase of an annuity. The exceptions, however, render entirely untenable such a basis of consideration; (1) whereas the annuitant may have no responsibilities beyond his own security and comfort, the state has other definite and far-reaching obligations; (2) whereas the security and comfort of the annuitant may be thoroughly provided by such means, permitting any material part of the forest estate to fall into a condition of decadence is inevitably accompanied by disastrous results to the economic life of the district so mistreated, even in the present generation.

Too frequently, the suggestion is offered that when the softwoods are gone, we may resort to the use of hardwoods. Taking the problem on that basis, it may be stated that more and better hardwoods can be grown farther south, much closer to the markets that mean so much to eastern Canada. In any case, the demand of the world to-day is for softwoods: Australia, with her extensive gum forests, imports softwoods from the Pacific coast; India, with hardwoods far surpassing anything that we can produce, does likewise; European countries spend stupendous sums in the protection, maintenance and development of coniferous forests, when hardwoods are much easier to propagate. With a country by nature adapted and predestined to the production of softwoods, there is scant comfort, therefore, in assuming that Canada can in any material way compete in hardwood markets of the world. Nevertheless, it is greatly to be hoped that ere long more extensive uses may be found for our hardwoods; if this can only be brought about, paradoxical though it may seem, it will in the final analysis be profitable to operate hardwoods at apparent loss, if thereby we can prevent the further encroachment of hardwoods upon the areas of coniferous timber, and by that means perpetuate the more valuable and more necessary softwoods. In agriculture, the operation of weeding is a laborious one, and enters very largely into the cost of producing crops; the farmer who will not pull his weeds, simply because there is no sale for weeds, is destined to failure in his vocation.

So far as duration or continuation of supplies is concerned, there are two outstanding facts in the forestry situation of Nova Scotia; (1) that if the losses by fire, insects, and decay can be and are successfully counteracted, it will make possible the utilization of forest increment which is now wasted; (2) that, even with the removal or essential reduction of these losses, and consequent addition of annual growth to the credit side of the forest ledger, consumption on the present scale involves continuous depletion, and portends ultimate exhaustion, unless steps be taken to so handle and develop the forest that the annual increment may be increased.

It is not the extent or consumption of the present pulp industry that contributes essentially to the constant depletion which has taken place, and is still taking place,—for, with the area available for growing timber, the province most assuredly should be able to support this and other forms of industry; rather, net depletion results from all of the losses consequent upon failure to adequately protect, and failure to handle the forest on a basis which will take full advantage of the growth that is possible in the province.

CHAPTER III.—NEW BRUNSWICK

During the course of its early history New Brunswick experienced several methods of land disposal. Firstly, the old French seignoiries; subsequently, grants to officers of the Royal Service. For failure to comply with conditions, however, these lands all reverted to the Crown. There then followed a lengthy period during which considerable areas were disposed of by sale to companies, groups, and individuals, ostensibly for settlement purposes. Finally, during the period of initial railroad development, 1860 to 1880, large areas were granted as subsidies to railway companies. Since that time no large grants or sales have been made. At present, land disposal is confined to small sales of isolated lots, and to grants up to 100 acres in extent, for farming purposes, made under provisions of the Labour Act.

Arising from land disposal made under these various methods, the present situation is that a little less than one-half of the forest area is alienated in fee-simple.

SECTION 1.—TOTAL PULPWOOD RESOURCES

Upon reference to Table I it will be seen that the total forest area is 21,476 square miles, 76.9 per cent of the land area of the province. The total stand of pulpwood is 37,672,646 cords, including spruce, balsam,* hemlock, jackpine** and poplar. The amount of hemlock in the province is relatively insignificant, and, as it is rather urgently required for saw-timber supplies, it may be eliminated from further consideration. Jackpine is not found in large quantities, and the fact that its use for railway ties will probably increase materially, as a result of the development of the wood-preserving industry in the province, justifies the elimination of the greater part of it from serious consideration as pulpwood. Poplar is present in considerable quantities, and if the species were used to any extent by local industries, it might be considered to be of relatively great importance. It is not so used, however, and its present importance as pulpwood is confined to export.

Making a small allowance for jackpine, but otherwise basing discussion upon the supplies of spruce and balsam available, the province has supplies of these species to the extent of approximately 33 million cords. Of this quantity, about 80 per cent may be considered as merchantable and accessible, or liable to become so in the future. So far as transportation is concerned, it is conceded that all parts of the province are relatively accessible; that is, there are few areas from which timber could not be removed by some method or other. If, therefore, all of the timber could be rated merchantable in other respects, the total stand of 33 million cords might be considered as available. There are, however, numerous areas where the timber growth is so stunted, and where it is so sparsely scattered, that it is not reasonable to anticipate that natural regeneration will, within any reasonable time, provide merchantable stands of timber either for pulpwood or lumber. The accessible and merchantable pulpwood timber, therefore, is 26,600,000 cords of spruce and balsam; from this stand, both pulpwood and lumber supplies of these species must be drawn.

SECTION 2.—PULPWOOD UNDER EXCLUSIVE CONTROL OF THE PROVINCE

While in the province of New Brunswick timber lands have not been permanently alienated to nearly the same extent as is the case in Nova Scotia, the great bulk of the forest area is either alienated in fee simple, or the timber cutting rights disposed of under long-term license or lease. Only some 1,680

*Balsam is locally referred to as "fir" in New Brunswick.
**Jackpine is known locally as "princess" pine.

square miles of timber land, 7.8 per cent of the forest area, remains unalienated in any form whatsoever. The timber content of these unalienated lands is, however, very low, being estimated at 537,600 cords. To a very great extent this timber is widely scattered over the area, in amounts which will not permit of successful exploitation either for sawmill purposes or for pulp operations.

SECTION 3.—PULPWOOD UNDER REGULATIVE CONTROL OF THE PROVINCE

An area of 9,121 square miles, comprising approximately 42.5 per cent of the forest area has been disposed of under license or lease to lumbermen, pulp companies, and others interested in timber lands. This area is estimated to contain some 18,027,000 cords of pulpwood, about 90 per cent of which is spruce and balsam. Over all of this timber, the provincial authorities are in a position to exercise control, both in regard to requirements for local manufacture, and in restrictions and regulation of methods of cutting. As a matter of fact the provincial regulations do prescribe that softwood timber from licensed Crown lands shall be manufactured within the province; also, there are serious cutting restrictions as to size, particularly in the case of spruce. It is necessary to state, further, that by virtue of diameter limits now in effect for spruce, approximately 5.7 million cords of this species—about one-half of the amount of spruce available on Crown lands—is under prohibition against cutting. However, as this timber grows to legal sizes, the restriction automatically vanishes.

SECTION 4.—PULPWOOD ON PRIVATELY OWNED LANDS

Altogether, some 10,675 square miles, 49.7 per cent of the total forest area is alienated in fee simple. These private lands carry pulpwood to the extent of approximately 19.1 million cords, slightly more than half of the total stand for the province. Here also, spruce and balsam constitute about 90 per cent of the stand. It thus appears that a little more than one-half of the pulpwood resources have passed entirely beyond control by the province, both in regulation as to the methods under which it shall be operated, and in restrictions as to location of manufacture.

SECTION 5.—OWNERSHIP OF PRIVATE LANDS AND PULPWOOD RESOURCES

It has been impossible to secure accurate or complete figures covering all of the alienated forest area. It has been ascertained, however, that of the total private forest amounting to 10,675 square miles, an area of 4,323 square miles (40.5 per cent) is held in parcels of 1,000 acres and upwards. The remainder, 6,352 square miles, comprises the smaller holdings, less than 1,000 acres in extent, the great bulk of which is undoubtedly held by residents of the province.

Analysis of ownership of the large holdings (4,323 square miles) reveals interesting data. In the first place, 4,088 square miles (nearly 95 per cent) is held by corporations or companies, as against only 235 square miles held by individuals. This condition, combined with the fact that a large part of the licensed lands are controlled by corporations or companies, clearly indicates the great extent to which the operators might be expected to exert influence upon the forest policy of the province; it assuredly emphasizes the necessity for close co-operation between the provincial authorities and the timber operators in the development of an adequate policy for the management of forest lands.

As regards the degree of local and foreign control,—of large holdings 3,053 square miles (about 70 per cent) of the area is controlled by Canadian corpora-

tions, companies and individuals, while the other 30 per cent, or 1,270 square miles, is controlled by foreign interests, essentially American. It is true that American interests in licensed lands are also very heavy, but, so far as outright control is concerned, foreign ownership applies to slightly less than 6 per cent of the area of the larger timber holdings in the province. An area of approximately 846 square miles, 3·9 per cent of the total forest, is owned by three American companies; of the latter, one company manufactures in Canada part of the product of its timber lands, while the other two export entirely to the United States.

It is worthy of note that over 54 per cent of the larger private holdings is in the hands of the New Brunswick Railway Company, a Canadian concern. The holdings of this one company comprise over 10 per cent of the total forest area of the province.

SECTION 6.—SUMMARY RE PROVINCIAL CONTROL OF MANUFACTURE

From the foregoing discussion it is manifestly the case that, even lacking the power to enforce manufacturing conditions over timber on privately owned lands, the province does have such control over about one-half of the total pulpwood resources; in fact, legislation requiring local manufacture is now on the statute books.

SECTION 7.—CONSUMPTION OF TIMBER IN NEW BRUNSWICK

Table I gives the total stand of softwood saw-timber, available under present diameter limits, as 9,073,710 M feet, board measure; this amount including spruce, balsam, hemlock and jackpine of saw-log size, as well as all other conifers found in the province. The saw-timber estimates for pulpwood conifers are as follows:—

Spruce	5,446,130	M.B.F.
Balsam	1,554,580	"
Jackpine	135,000	"
Hemlock	135,000	"
Total	7,270,710	"

There is, therefore, approximately 1·8 billion feet, board measure, of other softwoods, consisting essentially in red and white pine (870 million), cedar (925 million) and a small amount of tamarac. The 7 billion feet of spruce and balsam included in the saw-timber figures, converted to cubic measure represents 14 million cords. Aside from timber of saw-log size, therefore, the net amount of spruce and balsam pulpwood is approximately 19,600,000 cords. With these facts before us, it is appropriate to analyse statistics of wood consumption, in order that conclusions may be drawn as to the extent to which supplies available may be expected to meet the requirements for both pulp and lumber manufacture.

Table III gives the figures for pulpwood consumption over the decade 1913 to 1922. Very clearly indicated indeed, is the fact that species other than spruce and balsam furnish only a trifling part of the pulpwood used. Table IIIa includes figures for the amounts of spruce and balsam sawn into lumber.

TABLE III—LOCAL CONSUMPTION OF WOODS FOR PULP MANUFACTURE—NEW BRUNSWICK

Cords

Year	Spruce	Balsam Fir	Other Species	Total
1913	48,037	5,084	.....	53,121
1914	41,895	7,444	.....	49,339
1915	92,060	23,782	.....	115,842
1916	63,489	16,105	.....	79,594
1917	85,941	17,539	2,106	105,586
1918	79,141	30,992	.....	110,133
1919	111,425	29,182	.....	140,607
1920	30,989	148,421	1,313	180,723
1921	62,439	58,671	.....	121,110
1922	102,483	102,482	.....	204,965
Total	717,899	439,702	3,419	1,161,020

TABLE IIIA—SPRUCE AND BALSAM MANUFACTURED INTO LUMBER—NEW BRUNSWICK

M Board Feet

Year	Spruce	Balsam	Total
1913	316,703	17,311	334,014
1914	315,505	23,178	338,683
1915	519,699	45,659	565,358
1916	426,544	25,551	452,095
1917	457,746	36,707	494,453
1918	268,150	38,689	306,839
1919	337,025	77,735	414,760
1920	368,103	53,150	421,253
1921	208,203	23,568	231,771
1922	303,877	30,854	334,731
Total	3,521,555	372,402	3,893,957

NOTE.—Complete figures for lumber production from all species will be found in Table IIIE.

By consolidation of consumption figures, as given in Tables III and IIIa, the figures in Table IIIb, for total consumption of spruce and balsam in the pulp and lumber industries, are derived.

TABLE IIIB.—AMOUNT OF SPRUCE AND BALSAM CONSUMED IN MANUFACTURE OF LUMBER AND PULP—NEW BRUNSWICK

Expressed in Cords — 500 B. ft = 1 cord

Year	Spruce	Balsam	Total
1913	681,443	39,706	721,149
1914	672,905	53,800	726,705
1915	1,131,458	115,100	1,246,558
1916	916,577	67,207	983,784
1917	1,001,433	90,953	1,092,386
1918	615,441	108,370	723,811
1919	785,475	184,652	970,127
1920	767,195	254,721	1,021,916
1921	478,845	105,807	584,652
1922	710,227	164,190	874,417
Total, 10 years	7,760,999	1,184,506	8,945,505
Average	776,099	118,451	894,550

It is thus shown that the average annual consumption of the two species was 894,550 cords; but this does not represent the total cut of these species, as there still remains to be included the wood cut for export, and for use in other directions.

TABLE IIIc—EXPORT OF PULPWOOD FROM NEW BRUNSWICK

Cords

Year	Exports
1913	141,553
1914	143,787
1915	119,896
1916	127,730
1917	156,255
1918	263,907
1919	193,354
1920	185,637
1921	213,266
1922	144,639
Total	1,690,024
Yearly average, 1913–22	169,002

NOTE:—These figures include all species.

In view of the lack of 1923 figures for domestic consumption and to preserve uniformity in the tables, Table IIIc, for exports, is drafted for the same decade as that of Tables III and IIIa. Export figures for 1923 are available, however, and it is interesting to note that the total exports for that year, through New Brunswick ports, was 173,828 cords. This figure, it will be observed, is very close indeed to the average of 169,002 cords established for the decade.

It has previously been explained that a certain amount of pulpwood originating in Nova Scotia is exported through McAdam Junction; and to that extent official export figures for New Brunswick are swelled. On the other hand, a considerable amount of wood originating in New Brunswick is exported through Quebec and Ontario ports of exit. Records clearly indicate that the latter shipments much more than offset the amount of pulpwood coming from Nova Scotia. In the period over which this interprovincial traffic was studied, it was established that the net additional export with which New Brunswick must be charged is approximately 6,000 cords. Applying this figure to the average of official exports, it may be concluded that New Brunswick net exports now average 175,000 cords per year.

Unfortunately, it is impossible to state accurately the proportion of total exports which consist of poplar, as against spruce and balsam. Basing conclusions upon evidence submitted, however, it is thought that at least twenty per cent of the total is poplar. On this premise, the exports of spruce and balsam amount to 140,000 cords.

Before attempting summation of spruce and balsam consumption, it is necessary to consider the use of these species for miscellaneous purposes. Census figures indicate that in 1920 the farms of New Brunswick supplied the following wood products:—

Fuelwood	427,046 cords
Fence posts	218,386 pcs.
Rails	315,756 "
Railway ties	249,825 "

Although the amounts of the various species used in the foregoing products are not available, as is the case of Nova Scotia, considerable amounts of spruce are consumed for these purposes. It is quite safe to assume, therefore, that at least twenty to twenty-five thousand cords of spruce and balsam are so used. In the mines of the province a limited amount of the species is used for props. We therefore take 26,000 cords as the total consumption of spruce and balsam in all of these miscellaneous uses.

Another use to which very large quantities of wood are put is in lath manufacture. In lath production the province of New Brunswick ranks second only to Ontario. Over the 7 year period, 1916-1922, lath production averaged approximately 200 million per year, of which between 75 and 80 per cent were manufactured from spruce. This gives a total average consumption of spruce for this purpose of approximately 65,000 cords. Large quantities of laths are manufactured from slabs, but the lath industry in New Brunswick has been developed to such extremes that large quantities of timber are cut specifically for this purpose. The cutting of timber for lath manufacture, while providing indeed for close utilization, is nevertheless exceedingly destructive, as timber lands are practically stripped. By reason of increased markets for this product, it is quite certain that figures for 1923 and 1924 will show lath manufacture far in excess of the average previously quoted. It is therefore quite safe to say that at least 40,000 cords of spruce timber is consumed per year in lath manufacture. Although it is believed that a certain portion of this amount may be balsam, the estimate is nevertheless based directly upon the affirmed returns of operators.

The summation of figures previously arrived at for pulp and lumber consumption, for exports, and for miscellaneous uses, leads to the conclusion that the average annual consumption of spruce and balsam in the New Brunswick forests is approximately 1,100,000 cords. While of wood consumed in pulp maufacture, the proportion of balsam used in New Brunswick is very much higher than in other provinces (due to the large quantities of this species present, and to the efforts which have been made to salvage the budworm infected wood) this is far more than offset by the much more extensive use of spruce in lumber manufacture, and in other uses. Table IIIb indicates quite clearly that over 86 per cent of the wood used in combined pulp and lumber manufacture is spruce. This percentage is further increased when lath and miscellaneous products are considered. It is therefore clear that with a total accessible and merchantable spruce supply of some 19.4 million cords, the annual consumption of this species is at least 900,000 cords.

SECTION 8—THE EXTENT OF PULP AND SAW-MILL INDUSTRIES

While development of the pulp industry in New Brunswick has not been phenomenal, it has nevertheless been fairly consistent. This fact is clearly indicated in Table IIId. The number of mills operating over a period of years is five, and, until 1923, when paper was made for the first time at Bathurst, the output has been entirely of various classes of pulp, mostly for export. The production of groundwood has been fairly consistent over the decade, much greater fluctuations being evident in chemical pulp.

TABLE IIIᴅ—PULP PRODUCTION—NEW BRUNSWICK
Pulp Production—tons.

Year	Ground-wood	Bleached Sulphite	Unbleached Sulphite	Sulphate	Total including screenings, etc.
1913	6,702	20,209		3,000	29,911
1914	4,319	21,510		1,000	26,829
1915	8,344	53,749		.....	62,093
1916	7,154	36,220		.....	43,374
1917	7,245	43,009		8,086	58,340
1918	6,463	30,766		29,390	66,619
1919	6,447	12,833	43,779	12,127	75,186
1920	6,225	31,476	37,997	12,475	89,069
1921	5,220	29,113	19,197	7,774	61,810
1922	6,879	47,898	27,221	16,583	99,750

NOTE.—For the last three years, the figures given under the "Total" column include screenings; consequently the figures are greater than the aggregate of totals for groundwood, sulphite and sulphate.

That the industry has not developed to an even greater extent, may in part be attributed to the fact that adequate power development is rather lacking. Grand Falls on the St. John River is an excellent power site, and, if certain difficulties relating to storage can be obviated, will add materially to the power available for use within the province, thereby making possible a greater development in the pulp and paper industry. There is to be considered, however, the very serious question of timber supply. Unless the consumption for lumber and lath be seriously curtailed, it is altogether doubtful that consumption for pulp can be materially increased unless methods for the use of species other than spruce and balsam are devised and applied. To the lack of developed power, also, is due the fact that a greater quantity of paper is not produced within the province. A beginning has been made, however, and increased production of paper only awaits more adequate supply of power.

In Table IIIe will be found the figures for lumber production in the province. The peak year was 1915, relatively high production being maintained through 1916 and 1917. A falling-off occurred in 1918, with evidence of recovery through 1919 and 1920. The following two years, the last of the decade, showed the lowest production of the entire period; in fact, from a production standpoint 1921 was one of the most serious which the industry has faced for many years, and the year 1922 indicates only partial recovery. In the individual years of the decade, spruce production has varied in percentage of total cut, from 61 per cent to 84 per cent; in only two years has it been below 70 per cent, and over the entire decade it has furnished 76 per cent of the total cut. Although the province has always been more noted for its spruce, in by-gone years there were also to be found large amounts of excellent white pine. The supplies of the latter species have been very seriously reduced, however, and in only one year of the decade did production exceed 8 per cent of the total lumber production. Hemlock production has been even smaller in amount, and this species is rapidly approaching extinction as a commercial wood.

TABLE IIIe—NEW BRUNSWICK LUMBER PRODUCTION, 1913 TO 1922 INCLUSIVE BY KINDS OF WOOD, QUANTITY CUT AND VALUE

Kinds of Wood	1913		1914		1915		1916		1917	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	316,703	4,618,212	315,505	4,863,010	519,699	8,137,717	426,544	6,923,496	457,746	8,518,085
White Pine	31,287	545,847	28,924	586,649	35,507	658,278	32,525	638,764	38,161	865,690
Hemlock	21,952	271,736	26,189	333,549	14,922	192,965	9,358	123,426	29,192	533,895
Balsam Fir	17,311	162,160	23,178	324,718	45,659	673,114	25,551	391,951	36,707	665,01
Birch	5,749	84,622	8,034	121,430	8,356	116,073	10,199	187,385	4,100	108,469
Cedar	2,154	19,802	8,936	84,724	5,531	73,342	5,566	54,807	9,258	148,619
Maple	1,945	27,707	1,839	32,582	1,393	19,176	1,980	37,000	291	6,120
Beech	838	11,850	512	7,118	214	2,527	511	6,597	48	965
Poplar (Aspen)	641	6,731	735	6,910	850	9,948	127	1,818	127	2,179
Jack Pine	358	4,882	400	5,625	559	7,366	442	5,831	277	4,304
Red Pine	201	2,959	431	6,217	586	8,279	390	6,081	5,555	121,026
Ash	32	866	20	332	32	515	37	735	13	243
Basswood	21	345	6	120	30	437	356	5,112	1,076	21,880
Poplar (Balsam)	13	156	86	1,032	5	70	1	15	.....	.....
Tamarack	12	318	2	40	67	885	11	185	806	13,880
Butternut	12	240	1	20	.....	.....	1	15	.....	.....
Oak	11	241	4	115	.....	.....	5	250	1	40
Elm	7	112	6	102	6	90	24	535	49	1,162
Poplar (Cottonwood)	.....	.....	.....	.....	102	1,420	21	256	.....	.....
Cherry	.....	.....	.....	.....	.....	.....	6	138	.....	.....
Other Kinds	.....	.....	.....	.....	.....	.....	.....	.....	1,660	32,500
Custom Sawing	.....	.....	.....	.....	.....	.....	.....	.....	8,430	280,029
Poplar (All Kinds)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
	399,247	5,758,849	414,808	6,374,293	633,518	9,902,202	513,655	8,384,397	593,497	11,324,101

TABLE IIIe—NEW BRUNSWICK LUMBER PRODUCTION, 1913 TO 1922, ETC.—*Con.*

Kinds of Wood	1918		1919		1920		1921		1922	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	268,150	7,409,857	337,025	11,385,733	368,103	13,229,697	208,203	6,100,012	303,877	7,560,499
White Pine	70,349	2,195,303	30,099	1,171,690	23,524	958,438	18,884	557,719	14,420	456,217
Hemlock	19,162	437,798	11,902	333,826	25,865	977,747	9,460	249,687	5,052	112,588
Balsam Fir	38,689	1,031,611	77,735	2,526,872	53,150	1,730,233	23,568	619,842	30,854	635,687
Birch	13,409	403,548	6,565	255,838	4,635	157,741	5,311	171,909	2,624	66,804
Cedar	16,457	351,483	6,139	183,254	20,145	715,848	424	11,181	1,369	34,818
Maple	587	10,932	964	28,546	1,642	61,780	1,125	33,431	169	5,134
Beech	60	1,410	107	2,785	27	1,063	321	8,790	32	913
Poplar (Aspen)	51	1,082	160	3,604						
Jack Pine	157	3,936	2,486	72,467	1,727	54,863	588	11,750	23	483
Red Pine	998	25,321	294	8,974	3,243	101,937	315	10,910	462	11,826
Ash			7	321	3	112	4	95	16	515
Basswood	129	4,092	20	480	226	6,944	113	3,351	46	1,540
Poplar (Balsam)	7	120	400	12,000						
Tamarack	1,621	51,724	5	105	8,593	268,965	34	600	795	15,110
Butternut			10	250	5	156	13	320		
Oak			2	80						
Elm	10	270	21	435	6	183	861	17,243	13	340
Poplar (Cottonwood)			8	240					4	80
Cherry										
Other Kinds	1,837	45,780	2,519	48,764	4,678	101,880	632	9,315	274	4,340
Custom Sawing	10,952	215,045	21,125	441,213						
Poplar (All Kinds)					213	6,539	127	2,467		
	442,625	12,189,312	497,593	16,477,477	515,785	18,374,126	269,983	7,810,622	360,030	8,906,894

The figures in Table IIIe and remarks of the foregoing text clearly indicate that a serious situation faces the wood-using industries of New Brunswick. At one time the province contained very large supplies of excellent coniferous timber, but, owing to continued and rapid use, through several generations, and as a result of fire and insect losses, there has been such a serious diminution of softwood supplies available as to provoke the utmost concern. Geographically, the province is most favourably situated to compete in timber supply in foreign markets, both on this continent and in Europe; growth conditions also are favourable. If the province is to continue to compete in foreign lumber markets, however, high quality must be maintained. With continued serious reduction in the sizes of logs—and consequently of the better grades of lumber—experienced over the last decade, the province cannot for very much longer hope to compete with the much superior product of the Pacific Coast, which latter offers serious competition even now.

It is also evident that, without actual increase in the timber grown, lumber and pulp production cannot both be permanently maintained on the present scale, and some economic adjustment in consumption of the two industries is imperative.

SECTION 9—TREND OF THE PULPWOOD BUSINESS IN NEW BRUNSWICK

As indicated in Table IIIc, the average yearly export of pulpwood from 1913 to 1922 was 169,002 cords. In 1923, when pulpwood exports for the entire Dominion increased approximately 38 per cent over those of the previous year, it might have been expected that New Brunswick exports would show proportionate increase. Such was not the case, however, the actual increase in this province being less than 22 per cent over 1922. Even this figure is misleading, however, for the 1922 exports from the province were themselves lower in amount than they had been for six years; in fact they were but little greater

than the individual exports of the years 1913 and 1914. A more satisfactory comparison may be made, therefore, to the average annual export of 169,002 cords; this demonstrates that 1923 exports were not quite 3 per cent greater than the average for the decade. Unfortunately, figures for domestic consumption in the year 1923 are not available, but taking those for 1922, namely 204,965 cords, it is at once perceived that the local consumption of pulpwood in that year was over 76 per cent greater than the average annual consumption for the decade; indeed, it was greater, by 13 per cent, than the consumption of any previous year in the history of the industry. It is therefore evident that, in contradistinction to Nova Scotia, where increased drain on the pulpwood resources was in the main due to exports of raw wood, in New Brunswick it has been due to greater domestic production of pulp.

It is of interest to study the source of supplies of pulpwood for both export and domestic use, although this can only be done for the year covered by the Census, namely 1920. In that year, New Brunswick pulp manufacturers cut 95,618 cords from their own limits, as against 85,105 cords purchased from outsiders. On the other hand, the farmers of the province produced and sold 196,991 cords. If it were assumed that all wood purchased by the mills was derived from the farms, it is evident that the farmers' cut for export was 111,886 cords,—the smaller the proportion of farmers' wood purchased by the local mills, the greater would be the figure for farm wood exported. While it is difficult to hazard a specific estimate as to the amount of farmers' wood actually exported, it is quite reasonable to assume that some of the wood purchased by local mills was secured from owners or operators of timber lands other than farm lands. Taking the latter amount at 10 per cent of total purchases, this would increase the figure for farmers' exports from 111,886 to 120,397 cords. Now, the total exports for that year amounted to 185,637 cords. Consequently, there would be left some 65,240 cords as representing the exports of timberland owners interested in selling wood in the United States. Aside from local timber operators cutting wood for the export trade, there are several companies which, while operating under Canadian charter, are controlled by foreign capital, and are cutting wood extensively for use in mills in the United States. After careful study of the situation, it seems quite reasonable to ascribe this quota of 65,240 cords of exported wood to operators in these two categories (it was probably a little higher). On these premises, farmers' wood supplied approximately 65 per cent of the exports, the other 35 per cent coming from Canadian and American holders of timberlands interested in export. If it be argued that farmers supplied all the wood purchased by local mills, they still must have furnished over 60 per cent of the export wood. Manifestly, therefore, the conclusion is that the farmers supplied between 60 and 65 per cent of the wood exported in that year.

It has previously been intimated that of a total of 180,723 cords of wood used locally for pulp manufacture in 1920, 85,105 cords, or 47 per cent, was purchased by the mill operators, and that the great bulk of this came from farmers. Over a six year period, 1917-1922, the percentage of wood so purchased was 43 per cent. In the first three years of this period the percentages of purchased wood were relatively very much smaller, while in 1921 it was over 61 per cent, and in 1922 it was 57½ per cent. These facts clearly show the extent to which New Brunswick mills depend upon purchased wood. It is also made abundantly clear that there exists in the province a very considerable market for pulpwood which is already taken advantage of to a material extent by local wood cutters.

With some uncertainty surrounding the possibilities of further power development, it is difficult to forecast future development of the industry. The latest capacity figures for mills already established are those of 1922, when

the total for all classes of pulp was 110,000 tons. In that year the total output in pulp of all grades was 104,822 tons,—95 per cent of total capacity. In attaining this performance 204,020 cords of wood was consumed. If capacities were to remain stationary, probably the highest consumption of wood might not exceed some 215,000 cords. As improvements are made, however, capacities are correspondingly increased. If additional power becomes available, it is a certainty that the production of groundwood pulp will be increased, and this apparently is the most pressing economic need to-day. Whereas, every other pulp producing province in the Dominion has groundwood capacity much greater than for the manufacture of chemical pulp, in New Brunswick the reverse is true; in fact, in the latter province chemical pulp capacities are 12 or 13 times greater, and actual production of chemical pulp over 14 times greater than of groundwood. It is the inadequacy of power supply at the present time which prevents further manufacture of groundwood, and thereby retards development and prevents attainment of the higher aims of the manufacturer—the manufacture of paper, or other final products of wood fibre. While in order to build up and stabilize her industry it appears to be of utmost importance to increase production of groundwood, it seems to be certain that the province cannot very well stand further development in the manufacture of chemical pulp unless processes for the use of hardwoods are developed. In the chemical processes approximately two cords of wood are required for the production of one ton of fibre, whereas, for mechanical pulp one cord suffices; in view of the shortage of supplies, this in itself indicates the desirability of directing effort toward increase in the amount of groundwood.

If plans of the New Brunswick Electric Power Commission, which embrace a comprehensive scheme of development and transmission, are brought to successful fruition, there is every hope that the production of groundwood pulp will materially increase, and that the complete cycle in manufacture to paper or other finished products of wood fibre will be attained. In this manner, a greater proportion of the wood grown in the province would be utilized to sustain home industries than is possible under conditions at present obtaining. The fact must not be lost sight of, however, that spruce supplies will not permit of great expansion of the pulp and paper industry without curtailment of lumbering operations. There is positively no hope of maintaining an average annual production of 350 million feet of spruce saw-timber, and at the same time developing the pulp industry to greater capacity.

As for pulpwood exports, while there has been no alarming increase, it is also doubtful whether they may be expected to decrease under conditions existing. Wood cut from privately owned timberlands is freely exported, while unalienated and licensed Crown timber is restricted from export by reason of manufacturing requirements which are essential features of the licenses or sales.

SECTION 10.—SUMMARY OF SITUATION: DURATION OF SUPPLIES

While it is not proposed to repeat in detail the general arguments propounded in Chapter II, section 10, many of the statements made therein apply with equal, or perhaps with even greater force, in New Brunswick,* consequently, it is important that specific treatment should be accorded the situation in this province.

To begin with, there is the available spruce-balsam stand approximating 26·6 million cords, against which may be placed the annual consumption of 1·1 million cords. Eliminating, for the moment, the annual increment, and also the counteracting losses through fire, insects, and decay, it would appear that upon

* See also Section 10, Chapter II.

the "ultimate exhaustion" basis the supplies might suffice for about 24 years. Here again, however, there is presumed a free interchange in use of spruce and balsam in the two industries. Taking spruce alone, of which there is an available stand approximating 19·4 million cords, and an annual consumption of ·9 million cords, the supply would appear sufficient for about 21 years.

In dealing with the question of increment, it may be stated that conditions for regeneration are on the whole quite favourable in New Brunswick, but there is no basis for a conclusion that the rate of growth, following germination, exceeds that of Nova Scotia. True, in certain favoured localities such as the Bay of Fundy coast, better growth is secured; but taking the province as a whole, the rate of one per cent, which was applied for purpose of analysis in Nova Scotia, would seem to be justified for application to New Brunswick conditions. Thus, with a total spruce-balsam stand of approximately 33 million cords, the annual increment would be some 330,000 cords,—very much lower, it will be observed, than the annual consumption of the two species.

On the other hand, the province has suffered stupendous losses from insects and fire; undoubtedly, also, the loss through fungi has been considerable, because unhealthy forest conditions resulting from the attacks of insects and fire materially increase susceptibility to these other tree diseases.

For several years fires have been severe, culminating in 1923, when the resultant losses were the worst that have been experienced since the great Miramichi fire of 1825. In 1923, "the total damage to standing timber, not including injury to the young trees and to the soil, based on present stumpage values, amounts to over three and one-half million dollars—a total loss, except for the comparatively small amounts which it is possible to salvage before the wood-boring beetles render the wood useless for saw-logs. The timber land burned consisted mainly of some of the best growing softwood forests in the province. . . . . The (merchantable) timber killed by fire, including both hard and soft-woods, is placed at 1,100,000,000 feet."*

Manifestly, it would exaggerate the situation out of all measure to base consideration of annual losses on those of one very serious year; taking, however, the past six years, it appears that the average annual loss of merchantable timber of all species has been approximately 520,000 cords, *plus* a large amount of young growth the figures for which are not available. Just what proportion of this loss was incurred by pulpwood species, it is impossible to say, but it is quite reasonable to assume that by reason of the high inflammability of coniferous species, as compared to the much lower danger in hardwoods, the average annual loss of spruce and balsam has been probably not less than 400,000 cords, particularly if the additional areas of young growth of these species are considered.

While no exact figures for the timber destroyed by the budworm are available, estimates of the spruce and balsam lost through the attacks of these insects are estimated variously from ten to twenty million cords. Taking the period, from the time the insect became epidemic, until the present—about 10 years—and using only the lower figure for total losses, the average annual loss from this source alone has been at least one million cords,—probably greater.

It is not possible to give any figure for the loss through fungus decay, no complete studies having been attempted. Setting this loss aside, however, it appears that New Brunswick forests have been subject to spruce and balsam depletion at the rate of at least 2½ million cords per year; that is, these species have been subject to depletion, through utilization and loss, about seven times as great as annual growth. Putting it another way,—aside from consumption in the industries, average losses in this province have been about four times the annual increment.

* Report of Chief Forester, New Brunswick, 1923.

The budworm epidemic having subsided, there is no reason (unless some other visitation is suffered) to anticipate continuance of this exceptionally heavy drain on the supplies. Insects and fungi are, however, omnipresent, and material losses therefrom are always in evidence. Combined with average fire losses (unless the latter be materially reduced as a result of rigorous measures to that end) it is quite apparent that they will continue to exceed annual increment to a material extent.

The foregoing remarks lead to the inevitable conclusion that the figures, arrived at by simple division of the stand by average consumption, give altogether too optimistic results. The large annual cut from the stands available is in no way counteracted by annual increment, because the latter is itself far more than offset by the other losses.

These deductions surely emphasize the conclusions arrived at in Section 8, namely, that "without actual increase in the timber grown, lumber and pulp production cannot be maintained on the present scale, and some economic adjustment in consumption of the two industries is imperative. Further, they emphasize the urgent necessity of reducing to the lowest possible minimum the losses annually suffered from fires, insects and decay. The situation in this province is veritably the occasion for the utmost concern: if impending decline in the forest industry is to be forestalled, it can only be by the application of serious measures aimed at the curtailment of wastage that now takes place, and in measures designed to increase the annual increment."

CHAPTER IV.—QUEBEC

In passing to a discussion of the pulpwood situation in the province of Quebec, we now have to consider a region where the land areas, and consequently timber resources, are on so much larger a scale that it has not been possible for the Commission, with the information at its disposal, to penetrate to the same degree of finesse some of the points discussed for Nova Scotia and New Brunswick. In the latter provinces, settlement and forest exploitation have for many years extended to almost all parts. In Quebec, and in the provinces farther west, there are still vast areas which may be designated as hinterland, about which the knowledge as to actual resources is at best imperfect.

SECTION 1.—TOTAL PULPWOOD RESOURCES

With a total land area of 690,865 square miles the forest embraces some 516,822 square miles, approximately 75 per cent. Of this forest area, slightly less than 40 per cent may be considered as merchantable, or liable to become so within a reasonable time.

On the entire forest area there is reputed to be a total stand of 345,150,000 cords of pulpwood of the five species, spruce, balsam, hemlock, jackpine and poplar. The amount of hemlock present is relatively small—less than 1 per cent—and it is, moreover, rather urgently in demand for dimension lumber; it may therefore reasonably be eliminated from serious consideration as pulpwood. While there is a larger amount of jackpine, approximating 5 per cent of the total stand above referred to, and while this species enters to a limited extent into the consumption of most pulp mills which are dependent upon areas where jackpine is a constituent of the stand, there are nevertheless other uses, such as railway ties, etc., to which the species is admirably adapted, and for which it is in great demand. Therefore, so far as the present stand of merchantable jackpine is concerned, it is not altogether probable that it will enter very strongly into pulpwood supplies. By reason of the development of extensive

young stands of this species, still far from maturity, it is, however, quite conceivable that it will ultimately become of much greater importance for pulp manufacture.

Although the total stand of poplar in the province is approximately 45 million cords, the extent to which this species has been used by local pulp industries is almost negligible. Future developments may bring about more extensive use within the province, but at the present time its importance as a pulpwood species is confined almost entirely to export.

Making reasonable allowances for jackpine and also to a certain extent for poplar, the total accessible and merchantable stand of pulpwood in the province is approximately 160 million cords. Of this amount spruce and balsam are available to the extent of about 131 million cords. This reduction is necessary by virtue of the fact that the figures for total pulpwood stand include vast areas of forest land sparsely timbered with small trees, in many cases of great age, growing under conditions of very inferior drainage, and for which there is little justification for the hope that they will become merchantable within any reasonable time.

SECTION 2.—PULPWOOD UNDER EXCLUSIVE CONTROL OF THE PROVINCE

As previously intimated, the province of Quebec embraces such a large area of forest land, some of it very rugged and inaccessible that exploitation has not penetrated the hinterland to nearly the same extent as has been the case in the maritime provinces. Moreover, the authorities of the province early recognized the desirability of retaining in the Crown title to forest lands. For these reasons, relatively a small portion of the forest area has been alienated in fee simple. However, there have been disposed of, under the license system, large areas of the more accessible blocks of timber.

Aside from all lands totally or partially alienated, the province still retains full title to both soil and timber on an area of 410,774 square miles, approximately 79·5 per cent of the forest. On this vast tract, the total stand of the five species is approximately 147 million cords. Without further explanation, however, the figure is liable to be misleading, for, to a greater extent the quantity is made up of timber very thinly scattered over exceedingly large areas which have no commercial value now, and which cannot be expected to attain merchantability for a great many years to come,—some of it, never. Somewhat less than about 30 million cords, may be considered to be of value at present or within reasonable time in the future.

Reference to Table I will indicate that even this total of 147 million cords on unalienated lands is less than the total stand on leased or licensed lands; moreover, so far as merchantability is concerned, the proportion is very much lower,—probably little more than one-quarter of the amount of timber in this category on the lands under Crown License. Even so, the 30 million cords of reasonably merchantable timber constitutes a reserve, and with the additional forest area unalienated in any form, leaves the province in an excellent position for the shaping of future forest policy,—any restrictions as to methods of operation or control of manufacture, which may appear to be desirable or necessary being thoroughly applicable to this portion of the forest resource.

SECTION 3—PULPWOOD UNDER PARTIAL CONTROL OF THE PROVINCE

Crown lands under license, some 71,875 square miles, embrace 13.9 per cent of the forest area. It is these lands that contain the great bulk of the accessible and merchantable timber of the province. Through several generations timber has been disposed of on this basis, with the result that lumbermen

and pulp operators have taken advantage of the method to acquire vast areas of timber to provide for the requirements of their manufacturing industries. The total stand of the five species on these lands is estimated at 178 million cords. Eliminating those portions which have no present value and no visible future value, however, there is estimated to be about 100 million cords of pulpwood available, nearly 90 per cent of which is spruce and balsam.

Although the licenses under which this timber is held may be virtually perpetual, they are nevertheless subject to very definite control by the provincial authorities. Only upon compliance with regulations which may from time to time be established may the licenses be considered as permanent in character. From the viewpoint of the State, therefore, it is a fortunate circumstance that over the major portion of the merchantable timber stand, the province is strongly entrenched in a position which permits of developing the policy under which the forest estate is operated; making provision, as circumstances and economic conditions permit, for improved methods of utilization. Not only are methods of operation subject to control, but the province may and does apply the principle of home manufacture of the timber cut from licensed Crown lands.

SECTION 4—PULPWOOD ON PRIVATELY OWNED LANDS

Approximately 6.6 per cent (34,173 square miles) of the forest area has been alienated in fee simple. Of this, about one-third carries a stand of pulpwood timber estimated at approximately 20¼ million cords, all of which may be considered as accessible and merchantable, as it is situated in the older, and consequently well settled, parts of the province. The timber included consists essentially in spruce and balsam with small proportions of other pulpwood species. It is this body of timber that is entirely divorced from provincial regulation or control, both from the standpoint of operating methods and requirements for domestic manufacture. From such lands, as well as from the small woodlots of settlers on agricultural lands, is drawn the large quantity of pulpwood annually exported to the United States. It is therefore evident that of the total merchantable pulpwood stand in the province, approximately 12.6 per cent is under present conditions exportable without manufacture.

SECTION 5—OWNERSHIP OF PRIVATE TIMBERLAND AND PULPWOOD

The alienated forest area of 34,173 square miles may be divided in three main classes,—firstly, the seigniories conceded mainly during the French regime, comprising an area of 16,686 square miles; secondly, settlement lands disposed of largely under aegis of the Church, embracing an area of 14,707 square miles; thirdly, an area of 2,780 square miles granted as subsidies to railways. In addition to the foregoing main methods of disposal, as a means of colonization the government has for many years followed the practice of issuing "location tickets" on timber bearing lands. The location ticket, granted by sale to the settler, imposes certain conditions and restrictions as to residence and clearings, the observance of which entitles him to letters patent.

Due to the absence of any consistent and well segregated records of ownership, either in the provincial or federal head offices, it is impossible to present a comprehensive discussion on the subject of ownership as between individuals and companies, or between Canadians and foreigners. However, the figures presented in the preceding paragraph in a measure indicate the various classes of private holdings. Further, it may be stated that, so far as is known, approximately 60 per cent of the privately owned timberlands is controlled by foreign capital. On the hypothesis that the timber, even though

varying greatly in density of stand from area to area, is nevertheless fairly consistent in acre averages as between the several classes that have been alienated, it would appear that about 12 million cords, with free right of export, are controlled by foreign capital, this amount constituting 7½ per cent of the total merchantable and accessible stand of the province.

SECTION 6—SUMMARY RE PROVINCIAL CONTROL OF MANUFACTURE

The foregoing discussion reveals the fact that, under ownership conditions which obtain in Quebec, governmental restrictions as to manufacture, calculated to prevent the export of raw wood, apply to over 87 per cent of the available supplies. Further, that so far as future disposal of forest lands which are at present unmerchantable is concerned, the present method of license, which reserves to the Crown the soil rights, ensures that the ratio of exportable wood to the total stand will increase. Owing to present rapid utilization and diminution in the amount of privately owned timber, it is reasonable to anticipate that the ratio will decrease.

SECTION 7—CONSUMPTION OF TIMBER IN QUEBEC

Table I gives the total stand of coniferous saw-timber in the province as closely approaching 41½ billion feet. Included in this are the following amounts of the species indicated:

	M.B.F.
Spruce	15,000,000
Balsam	10,000,000
White Pine	7,500,000
Cedar	5,000,000
Red pine	1,800,000
Jackpine	1,250,000
Hemlock	800,000
Larch	3,000
Total softwoods	41,353,000

The hardwood stand of saw-timber size, consisting of birch, maple, poplar, beech and other species is estimated at about 12¾ billion feet, board measure.

Confining discussion to the essential pulpwood species, spruce and balsam, it is well to study the consumption under the various forms of utilization. The spruce and balsam saw-timber, converted to volume measurement represents approximately 50 million cords of wood. Aside from this amount, there is therefore available some 81 million cords of spruce and balsam which is suitable for the manufacture of pulp,—the aggregate available amount of the two species being 131 million cords (see Table I).

Table IV shows the amounts of the various species used in pulp manufacture over the decade 1913 to 1922. It is noticeable that spruce and balsam supplied nearly 98 per cent of all pulpwood used in that period. While jackpine has been used to the extent of less than 2 per cent, the amounts of hemlock and poplar used locally are to all practical purposes negligible. Comparing spruce and balsam, the former has supplied approximately 65.5 per cent, and the latter 32.2 per cent of all the pulpwood consumed. It is evident from the figures for individual years that there has not been any great variation in the proportions of spruce and balsam. The table clearly demonstrates, further that the heavier drain for pulpwood requirements falls upon spruce, furnishing as it does, nearly two-thirds of the supply.

TABLE IV—LOCAL CONSUMPTION OF WOODS FOR PULP MANUFACTURE—QUEBEC

Cords

Year	Spruce	Balsam	Jack-Pine	Hemlock	Poplar	Miscell-aneous	Total
1913	389,523	222,738	13,327	705	3,641	.....	629,934
1914	404,290	211,943	16,746	172	3,345	.....	636,496
1915	455,165	213,376	25,953	286	3,182	.....	697,962
1916	564,083	331,307	24,615	1,258	3,009	.....	924,272
1917	849,004	255,695	.....	1,581	3,589	.....	1,109,869
1918	733,606	342,807	.....	5,336	3,704	25	1,085,478
1919	760,586	410,389	.....	2,146	2,894	119	1,176,134
1920	831,921	484,551	1,558	12,602	3,115	68	1,333,815
1921	715,432	363,405	26,975	3,630	1,760	75	1,111,277
1922	916,445	424,407	62,251	1,173	609	555	1,405,440
Total	6,620,055	3,260,618	171,425	28,889	28,848	842	10,110,677

TABLE IVA—SPRUCE AND BALSAM MANUFACTURED INTO LUMBER—M. BOARD FEET—QUEBEC

Year	Spruce	Balsam	Total
1913	412,259	20,746	433,005
1914	657,983	198,934	856,917
1915	599,811	170,794	770,605
1916	497,241	141,352	638,593
1917	548,159	30,097	578,256
1918	459,091	34,616	493,707
1919	484,075	42,442	526,517
1920	557,018	47,116	604,134
1921	384,220	26,764	420,984
1922	414,889	42,239	457,128
Total	5,014,746	765,100	5,779,546

NOTE:—Complete figures for lumber production of all species will be found in Table IVE.

Table IVa shows the consumption of spruce and balsam consumed in the manufacture of lumber. By converting to cordwood measure the amounts so used, and consolidating them with figures for pulp consumption, as shown in Table IV, the combined figures of Table IVb covering spruce and balsam consumption in the two industries are derived.

TABLE IVB—AMOUNT OF SPRUCE AND BALSAM CONSUMED IN MANUFACTURE OF LUMBER AND PULP—QUEBEC

Expressed in cords—500 B. ft. = 1 cord

Year	Spruce	Balsam	Total
1913	1,214,041	264,230	1,478,271
1914	1,720,256	609,811	2,330,067
1915	1,654,787	554,964	2,209,751
1916	1,558,565	614,011	2,272,576
1917	1,945,322	315,889	2,261,211
1918	1,651,788	412,039	2,063,827
1919	1,728,736	495,273	2,224,009
1920	1,945,957	578,783	2,524,740
1921	1,483,872	436,933	1,920,805
1922	1,746,223	508,885	2,255,108
Total	16,649,547	4,790,818	21,440,365
Average	1,664,954	479,082	2,144,036

The average consumption of spruce and balsam for both lumber and pulp over the decade was 2,144,036 cords. It will be observed from Table IV that, with the exception of 1918 and 1921, there was in each year an increase in pulpwood consumed, over that of the previous year. Table IVb for combined consumption, on the other hand, does not denote nearly the same tendency toward continuous increases; in fact, the average of 2,144,036 cords appears to offer an excellent basis for consideration of the question. While the tendency to increase has been pronounced in pulpwood, the general tendency has been toward decrease in consumption of the species for lumber,—the latter offsetting the former, and thereby creating more or less constancy in combined consumption.

It is now necessary to discuss pulpwood exports, figures for which are given in Table IVc.

TABLE IVc—EXPORT OF PULPWOOD FROM QUEBEC

Cords

Year	Export
1913	882,260
1914	687,421
1915	624,269
1916	786,879
1917	698,839
1918	885,772
1919	661,414
1920	827,982
1921	601,846
1922	553,839
Total	7,210,521
Yearly average	721,052

It is of more than passing interest to note that the exports in 1923, official figures for which have been secured, totalled 760,328 cords. Although this indicates an increase of some 47,300 cords over the average for the decade, it is to be noted that in four previous years Quebec exports had been greater than they were in 1923,—the year of greatly increased exports for the whole Dominion. As a matter of fact, it would seem that, except for fluctuations due to conditions in the industry, there has been nothing approaching abnormality in Quebec pulpwood exports.

Although the figures in Table IVc permit us to gauge, approximately, the export trade in this commodity, they do not, as explained elsewhere, accurately represent the actual exports. Some wood comes in from the maritime provinces and from Ontario, and is cleared at Quebec ports, and thus credited to Quebec; on the other hand, a much larger quantity is cut in Quebec, and leaves Canada through Ontario and New Brunswick ports, particularly the former, and is thus not credited to Quebec, in which province it originates.

Complete figures covering this interprovincial traffic, as previously stated, are unavailable, but a period study made of transactions at ports of exit indicates that, on the one hand, Quebec exports were swelled to the extent of some 49,000 cords by wood coming from Ontario, New Brunswick and Nova Scotia. As against this, official export figures for the province are short by some 90,500 cords of pulpwood cut in that province, but exported through Ontario and New Brunswick ports. While there is no basis for the definite conclusion that pulpwood shipments by the various routes are constant from year to year, there is no reason to believe that they are not fairly so; we may, therefore, apply a net increase of 41,500 cords to the average of official yearly figures for Quebec

exports; in these premises, the average yearly exports from that province may be set at 762,500 cords.

Statistics as to quantities of the various species exported never having been collected, no authoritative figure can be given for the amount of poplar which finds its way across the border. From available information regarding poplar consumption in the United States, and imports of poplar to that country, and upon the basis of evidence received from persons interested in the export trade, it appears that about 60,000 cords of poplar is cut and exported from the province. Deducting this from the yearly average arrived at above, the total exports of spruce and balsam therefore approximate 702,500 cords.

Turning to the consumption of pulpwood species for other purposes, the census figures covering 1920 indicate that the farms of Quebec supplied the following products:—

Fuelwood	3,303,436 cords
Fence posts	4,064,675 pcs.
Rails	1,622,493 "
Railway ties	532,713 "

In view of the presence of other species, better adapted to such purposes, the percentage of spruce and balsam consumed in these directions is relatively low. Appreciable amounts are so used, however, and it is conservatively estimated that about 50,000 cords of spruce is consumed in these directions. The mines of the province are not such as to entail the use of sufficient amounts to require consideration.

The average yearly production of lath in the province has been approximately 165 million, of which about 129 million are manufactured from spruce. The total amount of wood used in production of the latter is about 56,000 cords. In Quebec laths are primarily made from slabs and other waste resulting from larger operations. Nevertheless, a certain amount of small spruce timber is cut especially for this purpose, and the allowance of ten thousand cords for this appears reasonable.

Coming to a summation of figures for spruce and balsam consumption for lumber, pulp, and miscellaneous purposes, it is apparent that a total upwards of 2,900,000 cords has been annually so used. There is little doubt that if figures were available for still other uses, such as piling and round or hewn construction timbers, the total consumption would reach 3 million cords per year. As between these totals, the annual consumption of spruce alone must run between 2,200,000 and 2,300,000 cords, which amount is drawn from a total merchantable and accessible stand of approximately 90 million cords.

SECTION 8.—THE EXTENT OF PULP AND SAWMILL INDUSTRIES

Of Quebec it may truly be said that the development of the pulp and paper industry has been phenomenal. In a period of fifteen years there has been built up, from very humble beginnings, an industry which now involves an invested capital close upon two hundred millions of dollars. Quebec leads all other provinces in production of pulp, furnishing slightly more than one-half of the Dominion total. In the production of paper products she is a close second to Ontario,—supplying 43 per cent of all paper products manufactured in the Dominion. By reason of projects now under development, it is quite clear that the near future will witness considerable expansion of the industry.

So far as past development is concerned it is only necessary to review the figures presented in Table IVd, to appreciate to the full the remarkable development which has been experienced. There has been consistent growth in almost every phase of the industry. In the manufacture of groundwood,

increases have been consistent except for fluctuations due to industrial conditions, the most serious disturbance in market conditions occurring in 1918. In production of chemical pulp, also, marked progress has been experienced. Finally, in the manufacture of newsprint the record is one of almost continuous progress.

TABLE IVD—PULP AND PAPER INDUSTRY—QUEBEC

Year	Pulp Production						
	Groundwood	Sulphite Bleached	Sulphite Unbleached	Sulphate	Soda	Miscellaneous	Total
	Tons						
1913	398,664	52,825		60,238	2,572	.....	514,299
1914	394,321	56,503		62,692	1,893	.....	515,409
1915	425,626	50,612		82,405	3,150	.....	561,793
1916	448,938	142,880		90,909	3,877	.....	686,604
1917	519,891	148,859		111,924	3,576	.....	784,250
1918	493,520	180,972		124,507	3,031	.....	802,030
1919	515,457	40,215	145,279	126,945	3,395	.....	831,291
1920	558,149	36,815	210,799	147,903	4,838	16,262	974,766
1921	482,176	63,051	121,992	110,972	3,479	3,236	784,906
1922	612,597	44,257	244,578	178,260	793	7,720	1,088,205
Totals	4,849,339	184,338	632,651 / 722,648	1,096,755	30,604	27,218	7,543,553

TABLE IVD—PULP AND PAPER INDUSTRY—QUEBEC

Year	Paper Production					
	Newsprint	Book and Writing	Wrapping	Boards	Other Paper Products	Total
			Tons			
1913	.....	.....	.....	.....	.....	.....
1914	.....	.....	.....	.....	.....	.....
1915	.....	.....	.....	.....	.....	.....
1916	.....	.....	.....	.....	.....	.....
1917	297,623	14,696	36,870	34,852	7,089	391,130
1918	296,618	17,161	39,418	35,827	30,956	419,980
1919	316,409	19,295	40,098	45,323	35,098	456,223
1920	358,185	24,130	48,705	54,685	21,193	506,898
1921	323,254	15,428	33,475	27,166	13,745	413,068
1922	457,608	21,533	57,465	32,595	18,576	587,777
Totals	2,094,697	112,243	256,031	230,448	126,657	2,775,076

Turning, now, to lumber production, Table IVe gives the amounts of lumber manufactured from the various species. With relatively low production in 1913 (the previous year, 1912, had also been one of low production) there was a sharp increase in 1914, the latter year giving the peak for lumber production of all species in the decade. It was, moreover, the peak year of spruce lumber production, and, with the exception of hemlock, the peak year in lumber production from all species of pulpwood value. There was a slight falling off in 1914, a much larger decrease (about 24 per cent) in 1915, followed by small yearly increases between 1916 and 1920. Even in 1920, the production was still about 19 per cent below that of the peak year 1914, and 15 per cent below 1915, subsequent to which year the serious reduction in production had occurred. The years 1921 and 1922 witnessed a still further reduction,—in fact, production was far below average, and was but little greater than in the low year, 1913.

TABLE IVE—QUEBEC LUMBER PRODUCTION, 1913 TO 1922 INCLUSIVE BY KINDS OF WOOD, QUANTITY CUT AND VALUE

Kinds of Wood	1913		1914		1915		1916		1917	
	M Ft B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	412,259	6,498,301	657,983	9,646,031	599,811	9,243,084	497,241	8,075,194	548,159	10,528,751
White Pine	72,140	1,649,202	118,231	2,641,281	157,256	3,566,557	60,439	1,428,174	108,306	2,559,872
Hemlock	38,491	543,514	31,323	438,522	38,064	529,473	35,944	541,676	45,381	917,169
Birch	34,124	645,204	27,986	427,906	44,980	799,113	43,191	810,822	26,839	721,209
Balsam Fir	20,746	304,920	198,934	2,850,724	170,794	2,445,769	141,352	2,106,145	30,097	551,541
Basswood	13,121	271,077	14,221	248,868	11,890	241,951	9,725	188,762	4,453	111,544
Red Pine	9,750	197,271	20,920	435,764	17,895	306,907	4,590	85,282	3,422	87,704
Maple	7,364	129,049	8,391	135,682	6,405	115,476	3,961	77,715	7,389	182,316
Cedar	6,727	105,433	8,273	115,822	4,493	73,363	4,014	71,891	11,549	219,135
Ash	4,756	89,603	3,965	73,353	6,156	108,095	4,235	77,966	3,444	79,426
Elm	3,449	59,636	3,016	49,251	3,490	57,064	2,190	36,551	2,179	47,129
Poplar (Aspen)	1,709	26,417	2,395	29,230	907	12,638	826	12,621	2,781	47,492
Beech	1,596	26,364	.....	.....	.....	.....	69	1,242	1,194	22,528
Tamarack	1,472	22,734	4,287	70,007	2,791	47,476	112	1,945	3,733	70,968
Jack Pine	1,160	18,561	13,727	192,178	12,006	197,852	9,622	182,818	2,849	58,892
Oak	611	15,819	1,462	40,205	459	12,777	565	13,304	173	7,585
Butternut	326	6,966	795	16,695	246	9,480	76	2,470	109	2,393
Poplar (Cottonw'd)	238	3,465	.....	.....	.....	.....	.....	.....	21	335
Poplar Balsam	200	2,290	.....	.....	.....	.....	397	5,955	462	7,072
Cherry	70	1,536	273	7,371	58	1,731	74	2,350	31	2,177
Hickory	22	466	.....	.....	.....	.....	.....	.....	115	4,610
Chestnut	10	300	.....	.....	.....	.....	.....	.....	36	1,278
Walnut	5	400	.....	.....	.....	.....	.....	.....	41	3,330
Poplar	.....	.....	2,116	26,090	1,086	15,609	.....	.....	.....	.....
Other Kinds	.....	.....	.....	.....	.....	.....	.....	.....	9,266	192,924
Custom Sawing	.....	.....	.....	.....	.....	.....	.....	.....	15,545	291,446
Totals	630,346	10,618,528	1,118,298	17,444,980	1,078,787	17,784,415	818,523	13,722,883	827,574	16,718,726

Kinds of Wood	1918		1919		1920		1921		1922	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	459,091	10,896,168	484,075	16,921,079	557,018	21,757,658	384,220	11,262,555	414,889	10,564,141
White Pine	137,282	4,002,780	79,550	3,319,183	61,792	2,891,786	42,802	1,628,122	60,615	2,186,988
Hemlock	51,820	1,198,754	54,779	1,665,626	72,418	2,714,857	57,295	1,562,226	42,131	973,407
Birch	39,833	1,170,442	40,944	1,582,050	55,398	2,619,241	56,179	1,915,032	39,850	1,347,298
Balsam Fir	34,616	771,100	42,442	1,240,198	47,116	1,869,740	36,764	949,236	42,239	993,542
Basswood	9,542	290,025	13,299	495,365	15,277	679,589	13,316	456,834	8,126	256,183
Red Pine	10,514	325,430	7,528	289,297	9,549	376,076	4,087	134,894	3,746	105,660
Maple	18,889	537,391	10,618	395,867	15,165	755,734	14,177	531,960	8,860	300,322
Cedar	19,227	419,477	9,461	295,552	23,199	894,756	8,863	255,646	8,710	224,301
Ash	6,084	142,628	4,545	160,687	6,258	269,664	5,510	203,359	3,806	117,953
Elm	5,204	141,986	4,112	131,521	5,667	235,178	6,130	193,302	2,575	71,975
Poplar (Aspen)	1,836	39,413	6,181	211,254	.....	.....	.....	.....	.....	.....
Beech	1,126	29,398	3,231	102,705	2,157	89,852	3,254	97,685	1,545	45,842
Tamarack	4,002	101,904	2,153	67,491	2,719	106,298	822	19,486	871	22,041
Jack Pine	2,272	61,712	3,479	102,805	15,679	723,025	11,284	306,700	7,355	180,618
Oak	310	10,813	1,462	48,802	960	50,484	695	35,311	547	21,588
Butternut	238	9,277	317	11,368	422	16,643	263	10,344	224	7,838
Poplar (Cottonwood)	33	665	.....	.....	.....	.....	.....	.....	.....	.....
Poplar Balsam	443	12,413	170	4,682	.....	.....	.....	.....	.....	.....
Cherry	210	4,892	133	4,255	828	33,575	112	3,891	108	3,654
Hickory	72	2,725	30	915	10	490	42	1,920	24	855
Chestnut	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Walnut	4	140	22	685	45	1,480	8	350	57	2,650
Poplar	.....	.....	.....	.....	4,219	161,789	2,644	64,388	1,365	30,430
Other Kinds	9,516	202,483	3,758	93,938	20,536	880,286	1,047	23,221	1,711	31,740
Custom Sawing	28,920	544,588	112,323	3,050,321	.....	.....	.....	.....	.....	.....
Totals	841,084	20,916,604	884,612	30,195,646	916,422	37,128,201	649,334	19,656,462	649,354	17,489,026

In the individual years of the decade spruce production has fluctuated, in percentage of total cut, from 55 per cent to 66 per cent of the total, and over the entire decade it has furnished material for very nearly 60 per cent of total production. Whereas white pine at one time constituted a very material part of the saw-timber cut in Quebec, it has, due to the waning of supplies, fallen off very seriously; in only one year of the decade did production of this species reach 15 per cent of the total; more frequently, it has varied between 5 per cent and 10 per cent of the total.

It is at once evident from the foregoing discussion that the great drain for both lumber and pulp production falls upon spruce.

SECTION 9—TREND OF THE PULPWOOD BUSINESS IN QUEBEC.

It has previously been demonstrated that 1923 export figures do not exhibit any startling increase over the average exports for the decade, being only approximately 5½ per cent greater. It was also pointed out that in four previous years the total exports had been greater than those of 1923. It is interesting to note, however, that as compared to 1922, in which year the exports were low, the 1923 figure shows an increase over the previous year of a little more than 37 per cent,—synchronizing closely with the annual increase for the Dominion exports of approximately 38 per cent. The more significant comparison, however, is undoubtedly that made to the figure for average exports for the decade. With these facts in view, it is clear that the great increase in the total use of pulpwood over the decade was occasioned by increased production by the pulp industry within the province. By reason of new pulp projects at present under development, it is safe to assume that the next few years may witness still greater local consumption of pulpwood,—to the extent possibly of several hundred thousand cords. Even if there be no further gain in exports, therefore, we may definitely anticipate a considerable enlargement upon the amounts of pulpwood cut from the forests of Quebec.

In 1920, the year covered by the Census, pulp manufacturers in Quebec cut from their own limits 1,062,387 cords of pulpwood, as against 271,428 cords purchased from outsiders. In the same year the farmers and settlers of the province produced 695,481 cords. Assuming, for the moment, that all wood purchased by the mills originated from farmers and settlers, it appears that some 424,053 cords would have been available for export, and under these circumstances the percentage of farmers' wood to total exports would be approximately 51 per cent. This, obviously, would represent the lowest possible minimum of farmers' wood exported. Going to the other extreme, and assuming that all of the farmers' wood was exported, it is clear that the latter would have constituted slightly less than 84 per cent of total exports. This manifestly disposes of some extravagant claims which have at times been made "that 90 per cent, or even 95 per cent, of the exported wood comes from the farms." Furthermore, it is known that many mills purchase wood from farmers and settlers; it is also known that many operators, other than farmers, enter very materially into the export trade; both of these facts indicate clearly that the percentage of farmers' wood in total exports is much lower than has frequently been stated. In the absence of concrete data, it is estimated that about seventy-five per cent at least of the wood purchased by mills comes from the farmers, and under these circumstances, the amount of wood cut by the latter, and available for export, would be some 492,000 cords,—about 60 per cent of total exports.

Although under ordinary circumstances accurate conclusions ought not to be drawn from calculations based upon figures for the one year, it may be pointed out that, whereas the 1920 figures indicate that the mills purchased

about 23 per cent of their wood, the average purchases for the six year period 1917 to 1922 represent 25½ per cent of total consumption. A certain degree of constancy in percentage amounts purchased by the mills, coupled with a somewhat similar condition in exports, in a measure justifies tentative conclusion as to the extent to which farmers' wood enters into exports.

In the foregoing discussion it is made evident that within the province there has been a limited market for pulpwood from farm lands. It is equally clear, however, that the pulp manufacturers in this province have not so far taken advantage of the opportunity to purchase wood from this source to the same extent as has been done in some other provinces.

The situation as regards pulpwood supplies of and consumption from private lands is one which should be the cause of some concern at least to the owners thereof. With a total supply of about 20¼ million cords, this timber is being removed at the rate of about 1,070,000 cords per year. Although this consumption does not directly affect Crown lands, licensed or unlicensed, for the privately owned timber lands it is a degree of utilization which simply cannot be sustained for any great length of time.

Review of the statistics also makes clear that with development of the pulp industry there has been a marked falling-off in the lumber industry. Although, as fully explained in Chapter I, the profitable pulpwood forest is one containing trees of sizes larger than those conceived by the man on the street, it is nevertheless the case that the pulp operator can make use of smaller material than can the saw-mill operator. With the reduction in size of accessible timber, therefore, brought about as a result of generations of saw-log exploitation, many timber areas have become of relatively greater value to the pulp operator than they can be to the saw-mill man. In this province also, it appears to be true that with continuous and rapid development in pulp manufacture, the supplies available cannot be expected to sustain a saw-mill industry of the same proportion as that which existed a few years back.

SECTION 10—SUMMARY OF SITUATION—DURATION OF SUPPLIES

As a preliminary to further discussion, and working upon the 'ultimate exhaustion' basis*, it may be observed that with a total available spruce-balsam stand of 131 million cords, and a total annual consumption of these woods approximately 3 million cords, the supplies might be expected to fill requirements of present proportions for a period of 43 or 44 years. Such a result is, however, based on the assumption that balsam would be used for lumber as well as for pulp. Taking available spruce supplies amounting to about 90 million cords, offsetting which there is an annual consumption of 2.3 million cords,—the supply would suffice for about 39 years.

The difficulty of establishing a precise relation between annual growth in the forest and annual wastage due to the various agents of depletion, has been fully explained in dealing with Nova Scotia and New Brunswick, in Chapters II and III; of Quebec it may be said that by reason of the more northerly situation of a greater part of the province, and comparative remoteness from the humid conditions which obtain in more maritime districts, the conditions for actual regeneration of trees in the province generally are not so favourable as in Nova Scotia and New Brunswick. Whether or not the same position should be taken regarding the annual growth, after germination is secured, is open to question. Certainly, however, there is no ground for the belief that the rate of increment generally in Quebec is greater than it is in the Maritime Provinces. Accordingly, adopting the rate of 1 per cent, and applying this to the entire spruce-balsam stand of 279 million cords (altogether generous treatment, it is

* See also, Section 10, Chapter II.

true, when the inaccessibility of, and very poor growing conditions on such large areas are considered) the total increment derived would be 2.79 million cords.

While annual consumption exceeds the figure thus arrived at for increment, it is close enough, perhaps, to permit of the general observation that total increment and actual consumption may be fairly close to each other; upon this premise, it is at once apparent that all losses from fire, insects, and decay represent a net depletion in the stand.

During the past five years the average area fire loss has been approximately one million acres per year; of this, about 270,000 acres consisted of merchantable timber; 115,000 acres of young growth; 260,000 acres of cutover lands; and the balance, previous burn and barren. A most conservative estimate of average timber loss is 2 million cords per year, of which probably 1½ million cords per year at least would be in the pulpwood species, only a small percentage of which is susceptible to salvage. On the other hand the losses through budworm attacks have been variously estimated from 100 to 150 million cords over the period of about 10 years through which the insect has operated; taking the lower figure, the budworm has caused annual depletion at the rate of 10 million cords, part of which has already been salvaged. Losses through other insects and through fungi, it is impossible to determine, but there is every evidence that they are considerable. Although the budworm is apparently still operating in some parts of the province, the epidemic stage is past, and unless the province is visited with other infestations of similar character this average annual depletion amounting to at least 11½ million cords, for fire and budworm, will not be continued,—there would be little hope for the province if it were.

Obviously, however, there is every reason for the conclusion that unless the fire situation is to be in large measure controlled—and the building up of an organization for that purpose will be the work of many years—the annual loss from this and other pests will continue to exceed the amount of the annual cut; it will also exceed the amount of the annual increment presumed above. Putting it another way, these losses may be expected to more than counteract annual growth in the forest; therefore, the annual cut at present taking place manifestly constitutes only part of the actual net depletion in the wood capital of the forest. If the annual cut be increased (there is every reason to anticipate that it may, as a result of increasing mill capacity) the wood will disappear that much more rapidly. Finally, that amount by which fire and similar losses exceed the amount of annual increment, added to the total cut, together represent the actual net depletion in the forest.

Here again, it is abundantly clear that figures derived by mathematical division of annual consumption into total supplies are entirely misleading, and err on the side of optimism to an extent which can in no sense be justified. If a smaller rate of increment be used—and there is considerable argument for doing so—the situation is that much worse.

Obviously, if there is at present any approach to equality between the annual increment and consumption, the problem which faces the province of Quebec is that of preventing increased cut, and of bending all efforts towards drastic curtailment of fire and insect wastage. If these ends be attained there is some hope at least of establishing a balance between net annual growth and annual consumption. It need hardly be stated that the longer vigorous measures in this direction are delayed, the greater will be the reduction in wood capital, and the more hopeless will become the task of establishing a direct balance between growth and use.

CHAPTER V.—ONTARIO

In Ontario, also, as distinct from conditions of accessibility found in the Maritime Provinces, a large part of the forest area is so far removed from present or anticipated methods of transportation that many areas must be eliminated from practical consideration in an estimate of supplies available for a considerable period of time.

SECTION 1—TOTAL PULPWOOD RESOURCES

The total land area of the province is 365,880 square miles, embracing a forest area of 240,000 square miles, or approximately 65·6 per cent. Of the latter some 75,000 square miles, or 31 per cent, is considered to be merchantable and accessible, carrying timber susceptible of exploitation at present or within a reasonable time in the future.

On the entire forest area there is reputed to be a total stand of 207,850,000 cords of the five species, spruce, balsam, hemlock, jackpine and poplar, which if so used, and altogether aside from accessibility, would be available as pulpwood. The proportion of hemlock is small, less than 2 per cent, and it has never been used locally to any appreciable extent in pulp manufacture. Furthermore, by reason of diminution in the stand of available saw-timber, the hemlock is more or less urgently required to fill the requirements for the manufacture of rough dimension lumber, for which purpose it has for many years been extensively used. Jackpine, on the other hand, constitutes between 17 and 18 per cent of the total stand, the species having taken possession of extensive areas of fire-swept land, particularly in northerly districts. There is little doubt that when the extensive young stands of this species develop to maturity, it will prove one of the most valuable woods in Ontario, largely by reason of its prevalence. Even now it is one of the important trees of the province. The present merchantable stand is urgently in demand for uses such as railway ties, and to a very limited extent it is used in the manufacture of pulp.

The stand of poplar in Ontario approximates 39¼ million cords, but the extent to which it has been used in pulp manufacture in Canada is, to all practical purposes, negligible. While future developments may increase its use in this direction, its importance as a pulpwood species at the present time is confined entirely to export.

Making liberal allowance for jackpine and also for poplar (on the assumption that these species may attain greater importance in pulp manufacture) the total merchantable and reasonably accessible stand of pulpwood in the province is about 128 million cords. Of this amount, spruce and balsam, the main species now used, are available to the extent of 84½ million cords. The large reduction which has been made from the total stand for the entire forest area results, as previously implied, from the fact that considerable areas of the north country, as well as more limited stretches to the south, are so sparsely timbered with stunted old growth, that there is no justification for anticipating that they will attain merchantability within such limits of time as would permit of their serious consideration even as potential supplies.

SECTION 2.—PULPWOOD UNDER EXCLUSIVE CONTROL OF THE PROVINCE

Although very serious inroads have been made on the merchantable timber stand of older Ontario, and, in more recent years, large areas of pulp timber in the north country have been disposed of, there still remains, exclusively in the Crown, a very large part of the total forest area, some of it carrying timber susceptible of exploitation. The total area of forest unalienated in any form

whatsoever is 183,428 square miles, 76·4 per cent of the whole. This very large area carries a stand of the five pulpwood species estimated at approximately 119 million cords. As in the case of analogous figures for Quebec, however, qualifications are necessary in order to avoid misconception. Of the foregoing amount, about 46·6 million may be considered as the accessible and merchantable stand of the five species, of which some 30·3 million cords is spruce and balsam. On comparison with Quebec figures it will be seen that although total figures for unalienated timber in Ontario are not so high, the proportion which is accessible is greater. This arises from the fact that a much larger part of the province of Quebec is very inaccessible, and, also, the area of sparsely timbered country is much greater.

It may be pointed out that, in dealing with unalienated Crown lands, the broadest permissible interpretation is placed on the terms "merchantable" and "accessible"; it must by no means be inferred that the larger parts of such areas are immediately so; rather, the aim has been to make allowance for areas which will probably come under exploitation when the present more accessible stands are depleted. In Ontario, although the great bulk of the presently merchantable timber has been disposed of under license, the province nevertheless retains unimpaired control of a large proportion of the forest area, and holds a reserve of timber; which although perhaps of little immediate consequence, may later enter materially into the provision of pulpwood supplies, provided such resources are properly husbanded and protected.

SECTION 3—PULPWOOD UNDER PARTIAL CONTROL OF THE PROVINCE

Altogether an area of 48,600 square miles, embracing 20¼ per cent of the entire forest area, has been disposed of under the license system for lumbering and pulpwood operations. As previously intimated, it is this area that constitutes the immediately merchantable stand of timber, and from it the greater part of timber supplies for industries of the day are being drawn. On such lands the total pulpwood stand of the five species is a little better than 75 million cords. Eliminating stands of little present or anticipated value, there is estimated to be some 67.6 million cords of merchantable pulpwood; and of the latter, some 45 million cords is of spruce and balsam.

Insofar as manufacturing requirements are concerned, the conditions under which this timber is held are similar to those obtaining in Quebec; that is, it is required of operators that pulpwood shall be manufactured into pulp in Canada. In this manner, it will be seen, the province is in a position to fully control exports. Moreover, the licenses are subjected to changes in regulations which may from time to time be promulgated, and herein the province has the opportunity to exercise measures of control over operations, and to apply, as economic conditions permit, the restrictions and methods demanded by rational forestry practice.

SECTION 4—PULPWOOD ON PRIVATELY OWNED LANDS

An area of 7,972 square miles, about 3.4 per cent of the total forest area, has been alienated in fee simple. This consists essentially in railway subsidies, grants to settlement companies in the early days, and scrip lands disposed of to veterans. It is considered probable that the actual area of alienated timber land exceeds this amount, but these figures include all for which information is available in the provincial records. The total stand of pulpwood is approximately 13¾ million cords, all of which may be considered as accessible. Of this a little better than 9 million cords consists of spruce and balsam.

As to various classes of ownership,—5,390 square miles have been granted to railways, 630 square miles to settlement companies, and the balance, 1,952 square miles, as scrip to veterans. Records as to the extent to which these private timberlands are held by foreign capital were not available; from the nature of the grants, however, it is not probable that any large percentage is so held.

Insofar as timber on these private lands is concerned, the owners enjoy free right of export, and it is from such lands, as well as from areas under settlement, that the pulpwood exported from Ontario originates.

SECTION 5—SUMMARY RE PROVINCIAL CONTROL OF EXPORTS

It is apparent from the foregoing that, under conditions of tenure of timberlands in Ontario, the manufacturing restrictions at present in effect for all timber on Crown lands, whether licensed or not, preclude export of unmanufactured timber to the extent of almost 90 per cent of available supplies. The only exception to this general condition is in the case of poplar, and, on occasion, fire-killed timber. For the latter classes of material the province has permitted a certain amount of exports. Until recently, the exportation of unmanufactured hardwoods was also permitted, but the legislature recently placed an embargo on the export of all of the valuable hardwoods. So far as spruce and balsam are concerned, also, over 89 per cent of the available supplies are subject to local manufacturing restrictions, and hence are not permitted to be exported in a raw state. It also appears evident, that with the low percentage of privately owned timberland in the province, the ratio of exportable wood to the total stand is, under the present degree of use, liable to decrease rather than increase; particularly is this the case if unalienated lands at present unmerchantable are considered.

SECTION 6—CONSUMPTION OF TIMBER IN ONTARIO

Review of figures in Table I indicates that the stand of coniferous saw-timber in Ontario is 15,112 million feet, board measure. Included in this figure are the following amounts of the species indicated:—

	Ft. B.M.
Spruce	4,000,000,000
Jackpine	1,500,000,000
Hemlock	1,250,000,000
Balsam	200,000,000
	6,950,000,000

The balance, 8,162 million feet, consists essentially in white and red pine, with relatively very small amounts of other softwoods. The hardwood stand, consisting of birch, maple, beech, poplar, and less important species, is estimated at 7,735 million feet.

Limiting discussion to the essential pulpwood species, spruce and balsam, a review of consumption will now be undertaken. First of all, the amounts of spruce and balsam, listed above, converted to cordwood measurement represent 8.4 million cords. Aside from this amount, therefore, there is 76.1 million cords of spruce and balsam less than 12 inches on the stump, and suitable for pulp manufacture. These two amounts together represent the total available spruce-balsam stand of 84.5 million cords (see Table I).

Table V shows the consumption of the various species in pulp manufacture during the decade 1913-1922. It is at once observed that over the whole period

spruce and balsam supplied nearly 97 per cent of the total wood consumption of the industry. Jackpine was used to the extent of less than 2 per cent; hemlock slightly more than 1 per cent, while the consumption of poplar was negligible in amount. Comparing spruce and balsam, the former has supplied 88.8 per cent of the total; the latter 7.9 per cent. There seems to have been no regularity in variation as to percentages of balsam between the individual years of the decade. Comparing the consumption of these two species to that in Quebec, it is noticeable that in Ontario the proportion of balsam used is very much less than in Quebec,—this undoubtedly being due to the fact that balsam is not so prevalent in the Ontario pulpwood forest. Undoubtedly, however, the outstanding feature of the table is the fact that, throughout this period, and for the decade as a whole, spruce supplied in very great measure the requirements of the pulp mills of the province.

TABLE V.—LOCAL CONSUMPTION OF WOODS FOR PULP MANUFACTURE—ONTARIO

CORDS

Year	Spruce	Balsam	Jack pine	Hemlock	Poplar	Total
1913	259,999	54,165	6,056	524	500	321,244
1914	358,988	75,218	7,969	5,076	500	447,751
1915	396,115	66,631	16,000	1,820	61	480,627
1916	528,165	77,121	15,102	15,520	1,704	637,612
1917	659,276	35,927	2,850	36,436	1,206	735,695
1918	711,574	41,803	25,851	1,759	3,704	784,691
1919	779,442	39,227	15,402	2,958	3,827	840,856
1920	887,519	34,998	14,185	3,914	2,056	942,672
1921	624,011	56,384	13,431	5,330	1,433	700,589
1922	897,988	64,150	17,210	1,287	.....	980,635
Total	6,103,077	545,624	134,056	74,624	14,991	6,872,372

TABLE VA.—SPRUCE AND BALSAM MANUFACTURED INTO LUMBER—M BOARD FEET—ONTARIO

Year	Spruce	Balsam	Total
1913	104,485	4,364	108,849
1914	85,738	10,878	96,616
1915	84,095	4,341	88,436
1916	65,484	1,256	66,740
1917	49,477	2,271	51,748
1918	64,127	2,061	66,188
1919	180,487	1,439	181,926
1920	108,766	7,102	115,868
1921	44,565	1,355	45,920
1922	61,205	2,129	63,334
Total	848,429	37,196	885,625

NOTE.—Complete figures for lumber production of all species will be found in Table VE.

In Table Va are included the figures for consumption of spruce and balsam in the manufacture of lumber. Converting the amounts consumed to cordwood measure, and consolidating the figures so derived with those of Table V, consumption in pulp manufacture, Table Vb is obtained, containing the figures for total consumption of the species in both industries.

TABLE Vb.—AMOUNT OF SPRUCE AND BALSAM CONSUMED IN MANUFACTURE OF LUMBER AND PULP—ONTARIO

Expressed in Cords—500 Bd. Ft. = 1 Cord.

Year	Spruce	Balsam	Total
1913	468,969	62,893	531,862
1914	530,464	96,974	627,438
1915	564,305	75,313	639,618
1916	659,133	79,633	738,766
1917	758,230	40,469	798,699
1918	839,828	45,925	885,753
1919	1,140,416	42,105	1,182,521
1920	1,105,051	49,202	1,154,253
1921	713,141	59,094	772,235
1922	1,020,398	68,408	1,088,806
Total	7,799,935	620,016	8,419,951
Average	779,993	62,002	841,995

For both lumber and pulp, the average yearly consumption of spruce and balsam was 841,995 cords. Refence to Table V shows that with the exception of 1921, in which year pulp production fell off, there was a continuous increase in amounts of wood consumed. The figures for lumber production in Table Va, however, show absolutely no inclination to continuity in variation; in part this is due to the fact that in Ontario, spruce is not the most important lumber species. The combination Table Vb, however, does exhibit more or less constancy in the variations. From this fact, as well as from consideration of the figures, it is quite evident that in Ontario the main use for spruce supplies has been in the manufacture of pulp. Also, if the year 1921 be overlooked, it is clearly the case that, in the later years of the decade, spruce and balsam consumption had almost doubled that of the first year. In other provinces, notably New Brunswick and Quebec, increase in pulpwood consumption was to a great extent compensated by decrease in lumber manufacture, and in those circumstances the yearly average derived for the decade was a safe one to use in gauging present consumption. Such is not the case in Ontario, however, for it cannot be expected that with continuous development in pulp output, there will be compensating reduction in lumber production. The average for the last five years of the decade is approximately 1,017,000 cords; the average for the last 4 years, about 1,050,000 cords; and the average of 1919, 1920 and 1922 is approximately 1,142,000 cords. Now, the relatively low figure of 1918 was, nevertheless, a considerable increase over 1917, and there was therefore no curtailment; in fact the figure for that year merely represented a step upward in rapidly increasing consumption. The low figure of 1921, however, was due entirely to curtailment. While there would perhaps be justification for taking the average for the three years 1919, 1920 and 1922, as a basis for gauging consumption from now on, it is thought advisable to include 1921, as a year of sub-normal production, and to accept, as a basis of further calculations, the approximate average for the last four years, namely—1,050,000 cords.

Coming to the question of pulpwood exports, Table Vc gives the official figures for the decade, these being based on authentic returns from collectors of customs at the various ports of exit.

It may here be observed that in 1923 the Ontario exports reached the unprecedented figure of 414,218 cords. Neglecting the 1923 figures, for the time being, however, a study of the figures in the table indicates that, in contradistinction to both Quebec and New Brunswick, there has been a very decided, and almost continuous, upward trend in the amounts of Ontario exports. Here

TABLE Vc.—EXPORTS OF PULPWOOD FROM ONTARIO

CORDS

Year	Exports	Year	Exports
1913	84,699	1920	202,171
1914	139,743	1921	239,264
1915	202,239	1922	269,419
1916	149,745		
1917	161,652	Total	1,844,394
1918	199,421		
1919	196,041	Yearly average	184,439

again, therefore, it cannot be considered satisfactory to take the yearly average for the decade as a basis for estimating present or future consumption. With the exception of the year 1915, when exports were comparable to those of more recent years, there is a distinct "break" in the export figures between 1917 and 1918; in the latter year exports approached the 200,000 cord mark, and have nearly maintained or else exceeded that figure ever since. Therefore, taking the five years 1918 to 1922, the average annual export may be set at 221,263 cords. Referring again to 1923 exports, it will be seen that the average from and including 1918, a six-year period of high exports, would be upwards of 250,000 cords.

Before proceeding with discussion of consumption, however, it is advisable once more to refer to the question of interprovincial traffic in pulpwood. As stated in discussion of the export situation in Quebec, Ontario exports are swelled by an amount of some 41,500 cords of wood, cut in Quebec, but leaving Canada through Ontario ports. A similar situation exists in the west, in the province of Manitoba, a considerable amount of pulpwood is cut and exported through Fort Francis, an Ontario port of exit. In the year studied, some 27,500 cords of wood were handled in this manner, and apparently the trend is toward increase. On this basis, it appears that, in order to arrive at a true figure for Ontario exports, the customs figures must be reduced by some 70,000 cords. Depending upon the average selected, therefore (as between the five and six year figure) the average exports from Ontario may be said to have varied from about 150,000 to 180,000 cords per year. While there is perhaps no reason to expect that the abnormal figures of 1923 will be maintained, it does seem reasonable to assume that, contingent upon continuance of the present condition, permitting export, we might expect continued high exports. It is therefore quite reasonable to take the higher of the two averages, namely, 180,000 cords, as a basis for further discussion.

It is worthy of mention that the abnormal increase of exports experienced in 1923, for Ontario, accounts in great measure for the startling increase of 38 per cent in total Dominion exports.

Lacking official data in the customs reports as to the respective amounts of the various species exported, it is not possible to give accurate figures for this phase of the situation. By studying the import and consumption figures of the United States, however, and applying the process of elimination, it is possible to arrive at figures which indicate reasonably well the exports of the main species. United States consumption of imported poplar over the four-year period 1919 to 1922 averaged 160,000 cords per year, practically all of which was used in the States of Maine, New York, and Pennsylvania. Of poplar, it has already been explained, Quebec and New Brunswick have supplied 60,000 and 35,000 cords, respectively; it is undoubtedly the case, therefore, that most, if not all, of the balance, 65,000 cords, was supplied from Ontario. It must be clearly borne in mind that these figures do not include the amounts for the year

1923. During the latter year, Quebec and New Brunswick have undoubtedly maintained, if not increased, the export quota ascribed to them; also, Nova Scotia has "come in" with a small amount.

In Ontario, as previously stated, total exports for 1923 showed a most unusual increase, and, if the evidence given to the Commission in this connection is accurate, there is no doubt that a large portion of the total exports consisted of poplar. It may be pointed out, however, that the consumption of poplar in United States is restricted in amount by the capacity of that branch of the industry which can use it, and the figures indicate that the soda pulp industry has experienced relatively little development over a decade or more. If, therefore, 1923 exports included any great increase in the amount of poplar, it can only have been brought about by serious curtailment of the domestic cut of poplar in the United States, or else as a result of abnormal stocking-up of poplar supplies in that country. It should here be stated that poplar which may be exported for matchwood, excelsior or products other than pulp is not taken into consideration.

Setting aside the 1923 figures which clearly were far from normal, it is quite evident that the average annual exports of poplar from Ontario approximated 65,000 cords. The balance of exports manifestly is of spruce and balsam, perhaps in the ratio of about ten to one. The net average annual exports of these two species, therefore, may be taken at 115,000 cords. Of all the exports, spruce has averaged 57½ per cent (probably more, as it is doubtful whether balsam attains the one-to-ten ratio); poplar, approximately 36 per cent; and balsam about 6½ per cent.

Approaching an estimate of spruce and balsam consumption in other directions, the last census gives, for the year 1920, the following amounts of wood products as having been supplied by the farms:

Fuelwood	2,855,675 cords
Fence posts	1,106,086 pcs.
Rails	372,375 pcs.
Railway ties	635,610 pcs.

By reason of the prevalence of hardwood for fuel, and of jackpine for railway ties, it is improbable that large amounts of spruce are used in these directions. A certain amount of spruce does find its way into consumption for these purposes, however, and for this, 35,000 cords is a conservative estimate. The small amounts of spruce and balsam consumed in the mines of the province, and also in lath production, would probably not greatly exceed 5,000 cords; in Ontario, lath stock is largely drawn from pine supplies, and essentially from slabs and other waste of sawmill operations.

Summing the various items of spruce and balsam consumption it appears that, for the manufacture of pulp and lumber; for exports, and for miscellaneous other purposes, the average consumption of the two species may be set at some 1,200,000 cords, of which spruce furnished approximately 1,116,000 cords, or 93 per cent. This average amount, and any increase which may arise through development in the pulp industry, must be drawn from a total of available spruce stand approximating 75 million cords.

In order to avoid premature conclusions as to the extent to which the available quantity of spruce will supply future demands, it will be necessary to review possible developments in the pulp and lumber industries. As pointed out, in Ontario, spruce has not so far attained such prominence in lumber production as has been the case in all other eastern provinces and also on the prairies. Pine has headed the list of lumber species in Ontario, but as will be pointed out later, the waning in supplies of this species may give rise to conditions where (if the lumbering industry is to be sustained on any basis comparable to that of the present) it will probably be necessary to add very materially to the annual cut of spruce.

SECTION 7—THE EXTENT OF PULP AND SAW-MILL INDUSTRIES.

In Ontario also, development of the pulp industry has been phenomenal. Fifteen years have witnessed almost constant increase in production. In 1922 the pulp production for this province alone exceeded the total production of the entire Dominion in the year 1912. Capital invested in the industry now reaches close to 150 million dollars. Although second to Quebec in quantity of pulp manufactured, Ontario leads all provinces in the production of paper products, with 47.4 per cent of the Dominion total to her credit.

TABLE Vd—PULP AND PAPER INDUSTRY—ONTARIO

Year	Pulp Production						
	Ground-wood	Sulphite Bleached	Sulphite Un-bleached	Sulphate	Soda	Miscel-laneous	Total
				Tons			
1913	135,753	87,699		5,046	.....	.....	228,498
1914	202,715	115,877		6,641	.....	.....	325,233
1915	247,825	106,401		10,000	.....	.....	364,226
1916	308,416	154,530		10,068	.....	.....	473,014
1917	310,620	165,173		12,981	560	154	489,488
1918	277,922	216,255		10,459	730	.....	505,366
1919	351,572	45,229	189,893	9,931	1,202	.....	597,827
1920	393,582	56,173	188,547	10,867	930	4,302	654,401
1921	337,014	45,367	129,392	5,703	722	1,313	519,511
1922	483,664	30,458	196,392	13,150	.....	2,644	726,308
Totals	3,049,083	845,935 177,227	704,224	94,846	4,144	8,413	4,883,872

Year	Paper Production					
	News-print	Book and Writing	Wrapping	Boards	Other Paper Products	Total
				Tons		
1913	.....	.....	.....	.....	.....	.....
1914	.....	.....	.....	.....	.....	.....
1915	.....	.....	.....	.....	.....	.....
1916	.....	.....	.....	.....	.....	.....
1917	316,147	33,445	10,563	19,228	4,172	383,555
1918	325,023	30,989	12,388	51,922	4,906	425,228
1919	352,254	39,023	10,193	92,355	4,967	498,792
1920	380,943	49,066	17,866	103,356	9,533	560,764
1921	389,266	38,102	14,016	61,954	4,540	507,878
1922	499,201	43,275	18,283	80,605	7,074	648,438
Totals	2,262,834	233,900	83,309	409,420	35,192	3,024,655

The figures in Table Vd clearly indicate the development in individual phases of the industry. Except for fluctuations due to industrial conditions, there has been constant increase in production of ground wood; 1918 and 1921, the only individual years which show decreases, were in turn followed by years of very much greater increases. Figures for production of chemical pulp, also, indicate consistent progress, except in the sulphate and soda processes; of the former it may be said that development has been retarded by restriction in available markets; as for soda pulp, manufacture by this process has never been developed to any great extent.

TABLE Vg.—ONTARIO LUMBER PRODUCTION 1913 TO 1922 INCLUSIVE, BY KINDS OF WOOD, QUANTITY CUT AND VALUE

Kinds of Wood	1913		1914		1915		1916		1917	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
White pine	516,098	15,396,269	488,312	10,158,751	623,119	12,700,225	604,562	12,549,487	611,726	14,870,638
Hemlock	142,731	2,394,986	185,453	2,805,852	107,913	1,560,783	70,112	1,094,507	164,688	3,339,985
Red pine	132,646	2,461,900	85,181	1,474,798	102,776	1,873,955	55,086	1,060,358	91,893	2,266,057
Spruce	104,485	1,597,652	85,738	1,438,200	84,095	1,373,217	65,484	1,186,162	49,477	1,167,918
Maple	61,213	1,107,384	53,266	1,074,007	35,311	653,701	24,395	497,144	12,574	342,922
Elm	27,305	593,853	26,431	560,029	20,266	396,827	13,527	287,338	12,646	263,688
Birch	25,665	512,005	23,153	454,216	15,374	286,042	15,727	311,516	10,421	293,880
Jack pine	24,297	352,510	17,890	268,585	10,597	161,951	17,520	315,107	12,227	278,436
Basswood	22,867	501,959	23,741	502,370	12,452	246,679	8,530	179,628	8,952	228,982
Cedar	9,493	151,484	7,072	120,130	2,659	44,139	2,858	49,032	5,770	79,232
Beech	8,701	145,464	12,026	204,638	3,360	57,548	4,155	71,459	1,809	37,715
Ash	5,677	142,698	5,877	129,917	3,429	71,504	2,219	47,531	3,010	68,352
Oak	5,081	171,324	3,903	120,631	2,335	66,342	2,451	72,749	1,505	60,217
Balsam fir	4,364	69,478	10,878	183,064	4,341	60,431	1,256	18,470	2,271	45,809
Tamarack	4,691	66,324	4,319	65,388	2,959	46,192	2,527	43,158	2,535	51,767
Poplar (Aspen)	1,714	20,879	4,889	55,647	1,465	18,178	1,577	21,963	1,235	24,731
Chestnut	1,307	25,072	1,163	25,942	522	12,043	457	10,898	240	9,633
Poplar (Balsam)	1,060	17,296	2,392	25,597	482	5,911	273	4,143	1,309	22,282
Hickory	625	23,260	900	25,299	203	5,534	144	5,059	53	2,151
Poplar (Cottonwood)	500	5,990	569	8,144	1,492	16,775	945	16,455	641	12,745
Butternut	178	5,100	635	8,594	115	2,892	123	2,781	11	365
Cherry	176	4,635	262	7,866	65	2,095	90	2,552	20	1,334
Black gum	125	3,000	12	168					10	805
Walnut	35	1,617	46	1,727	28	968	32	1,178		
Tulip	20	358	23	412	1	18				
Sycamore	11	255								
Sassafras	1	745								
Other kinds									6,843	67,124
Custom sawing									108,398	1,901,681
Whitewood										
Totals	1,101,066	25,773,407	1,044,131	19,719,972	1,035,341	19,663,950	894,050	17,848,675	1,110,264	25,438,449

Kinds of Wood	1918		1919		1920		1921		1922	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
White pine	585,342	20,336,885	355,000	14,938,090	520,206	24,444,777	398,872	14,432,709	479,933	17,271,484
Hemlock	121,538	3,183,841	79,999	2,505,203	89,539	3,236,410	72,460	1,987,203	68,900	1,712,339
Red pine	89,693	2,978,929	80,662	3,084,531	80,511	3,349,339	80,275	2,344,150	62,807	1,871,806
Spruce	64,127	1,931,947	180,487	6,100,925	108,766	4,372,501	44,565	1,258,001	61,205	1,623,744
Maple	24,351	704,743	24,504	954,824	37,012	1,560,912	31,857	1,184,989	20,290	726,034
Elm	13,780	281,083	11,566	432,534	20,954	838,940	14,043	498,941	12,446	433,938
Birch	10,485	349,019	16,791	635,657	24,776	1,108,369	20,798	748,102	15,298	542,902
Jack pine	19,026	530,261	23,808	752,018	44,236	1,629,715	34,326	804,488	28,841	633,010
Basswood	14,247	274,067	11,928	449,157	13,835	569,780	12,688	454,475	9,863	337,000
Cedar	3,230	80,705	3,804	117,143	7,691	259,197	2,833	85,400	2,354	68,955
Beech	3,592	97,979	5,204	170,433	4,531	175,650	3,907	114,895	2,843	84,459
Ash	1,741	54,581	2,476	83,994	3,845	151,463	3,188	106,659	2,351	78,168
Oak	2,296	76,879	1,238	79,548	3,564	164,767	2,267	111,184	1,971	96,661
Balsam fir	2,061	48,408	1,439	48,224	7,102	257,475	1,355	38,106	2,129	60,675
Tamarack	1,387	36,623	1,414	43,012	11,803	482,925	748	21,773	719	20,006
Poplar (Aspen)	3,484	74,969	4,817	150,653	7,352	261,081	5,347	202,517	1,640	45,653
Chestnut	735	22,191	631	21,073	699	33,690	371	18,588	479	22,586
Poplar (Balsam)	1,385	29,009	391	11,824						
Hickory	141	6,185	151	4,366	155	6,115	132	6,234	111	5,857
Poplar (Cottonwood)	82	1,935	242	5,488						
Butternut	26	773	47	1,974	51	2,460	59	2,354	56	1,989
Cherry	41	1,404	164	3,831	155	6,564	104	4,903	88	3,929
Black gum	8	565	13	740	72	4,640	15	1,415	19	887
Walnut									5	150
Tulip										
Sycamore										
Sassafras										
Other kinds	2,250	57,946	3,874	118,592	6,046	225,607	3,844	91,078	1,918	44,084
Custom sawing	144,714	3,007,827	129,549	2,957,550					14	1,000
Whitewood										
Totals	1,110,062	34,168,754	940,199	33,671,384	992,901	43,142,377	734,054	24,518,164	776,280	25,687,280

Table Ve indicates the lumber production from all species, over the period 1913 to 1922. The average yearly production was approximately 974 million feet board measure. In their general trend, the figures show a falling off in production, small but none the less clear-cut. Peak production for the decade centred on the years 1917 and 1918, since when the reduction has occurred.

For the entire period, white pine has furnished 53.2 per cent of the lumber supplies; hemlock, 11.3 per cent; spruce, 9.1 per cent; and red pine about 9 per cent. These four conifers have therefore supplied 82.6 per cent of all the lumber, the balance of the cut coming from jackpine, cedar, balsam, tamarack (aggregating 3.6 per cent) and the hardwoods. Although the total figures give spruce third place, this position was attained by virtue of relatively high cut in two or three individual years; its general position has been fourth, red pine more frequently occupying third rank, and hemlock, second. Perhaps of interest, here, is the fact that jackpine supplies slightly less than 2.4 per cent of sawn lumber. From the foregoing, it is also evident that the cut of hardwood lumber is less than 14 per cent of the total.

It is necessary to make special reference to the pine situation. Adding together the production for both white and red pine, the total production in ten years was approximately 6,045 million feet,—62.1 per cent of total production, and an average of over 600 million feet per year. Now, the total remaining stand of these species is estimated at some 8 billion feet, board measure. The conclusion is perfectly obvious; for only a few years, may we expect the supplies of mature pine to last, at the present rate of consumption.

The original stand of white and red pine in Ontario is estimated to have contained some 45 billion feet. Since the beginning of the industry in the province, however, lumbering operations have been chiefly directed at exploitation of these two species. In point of geographical location, and by definition of their habitat, they occupied the more accessible regions, and it is but natural that, offering the very highest grades of lumber, they should have been the subject of main interest. As a result of land settlement, the encroachment of hardwoods on cut-over pine lands, but mainly on account of fires on logged-over areas, the reproduction of these species has been prevented on approximately one-half of the original pine-bearing area. On these areas where reproduction of the species has taken place, the new growth is for the most part in the younger age classes, and cannot, therefore, be expected to produce saw-material for many years to come.

Just as white and red pine have, through depletion, passed into relative insignificance in provinces further east, it appears quite clear that we are upon the threshold of a similar experience in Ontario. In a discussion of pulpwood resources, the significance of the serious pine situation lies in the fact that, unless lumber production falls off very perceptibly, we may soon expect, from this direction, a more serious attack on spruce supplies than has so far been experienced. If pine production over the decade be segregated in two five year groups, it is immediately perceived that the average for the later period is much lower than for the first half of the decade. This is undoubtedly due to the fact that supplies are becoming less accessible, and we may with every assurance expect a still further falling off. Unless, therefore, total lumber production is to be seriously curtailed, we may indeed expect larger consumption of other species. Spruce, offering the second largest stand of available coniferous saw-timber, will very naturally be the species of greatest interest.

Anticipating at least some further development in the pulp industry, which is bound to materially increase the consumption of pulpwood, and with an additional drain impending on pulpwood species through lumbering activities, it is abundantly clear that hasty conclusions, based upon figures presented in Section 6, would greatly exaggerate the degree of adequacy in supplies.

SECTION 8.—TREND OF THE PULPWOOD BUSINESS IN ONTARIO

Except in 1915, when exports were very much greater than in the years preceding it,—higher indeed than exports in each of the 5 years following—the first eight years of the decade show a persistent tendency toward increased exports. It has already been established that average figures for the last half of the decade greatly exceed those of the first five years. In Ontario, therefore, the export trade in pulpwood has had a much greater effect in increasing the cut of spruce than has been the case in Quebec or New Brunswick; exports therefore share, with local pulp manufacture, the responsibility for increased drain on pulpwood resources. This relation is the more obvious when the very large exports for 1923 are considered. Under all the circumstances, we are quite justified in the conclusion reached,—that we may expect even greater demands upon existing supplies.

In the year covered by the Census, the local pulp manufacturers cut from their own limits some 612,893 cords of wood. On the other hand 329,779 cords were purchased from other sources. In the same year the farmers of the province produced and sold 249,237 cords. It is immediately noticeable that, in Ontario, a situation, entirely different to that in other provinces, exists; namely, the pulp mills actually buy more than the total quantity produced by farmers and settlers. It is therefore clear that large quantities were purchased from wood-cutters other than farmers. It will be remembered that 1920 was a year of very active pulpwood operations on the farms, prices being at a peak; it is therefore improbable that the farms had ever produced so much pulpwood as they did in that year. Notwithstanding this fact, the amount purchased by the mills in 1920 represented a falling-off of approximately 100,000 cords from the amount purchased in 1919, and even 1918 (a year of moderate production of pulp) showed very large purchases by the mills. Two deductions are obvious, (1) that the impetus to production of pulpwood on the farms has been induced by the possibilities of export trade, brought about by the increased activities of American pulpwood buyers on this side of the line; and (2) that, altogether aside from prices which may be offered by the respective parties, and aside from the question of locality, there exists within the province a demand for purchased spruce and balsam very materially in excess of the amount of those species cut by the farmers and settlers. That the first is true, may be freely conceded; as for the second, it is only necessary to observe that in the six year period 1917 to 1922 Ontario mills purchased wood at the yearly average rate of 295,000 cords. Even taking the unprecedented exports of 1923, and assuming that the startling increase was due to farm wood-cutting activities; conceding further, that the proportion of poplar (unused to any extent in Canada) remained as low as in previous years, namely 36 per cent; it is at once apparent that the average annual purchases of Ontario mills greatly exceed the amount of spruce and balsam entering into exports, derived by eliminating poplar on the foregoing basis.

In view of the peculiar circumstances previously related, it is manifestly difficult to determine with any degree of accuracy the percentage of farmers' wood entering into exports. On the one hand, it is well known that, particularly in the north country, considerable numbers of wood contractors other than farmers engage in the operation of timberlands held specifically for that purpose; on the other hand, it is equally well known that in the aggregate the mills purchase large quantities of wood from farmers. In 1923, undoubtedly, the percentage of farmers' wood to total exports was high. For more normal years, represented by an average net export of 180.000 cords, however, it is considered that not more than from 40 to 50 per cent of the exports, if that much, consisted of wood cut by farmers or settlers.

It is quite clear that in the province market already exists for the disposal of spruce and balsam pulpwood, and that the market is already taken advantage of to a material extent by farmers and settlers. It is also quite clear that the pulp companies, having for the most part large timber holdings at their disposal, purchase wood from other sources to a much greater extent than is the case in Quebec; that they do so, may also be taken as an indication that they are endeavouring to conserve their own supplies.

SECTION 9.—SUMMARY OF SITUATION—DURATION OF SUPPLIES

If only to permit study of the situation, it is proposed, for this province also, to analyse the results secured by application of the theory of 'ultimate exhaustion.'* The total available spruce-balsam stand is 84·5 million cords, and the total annual consumption 1·2 million cords; the quotient, 70 years, represents the time that supplies might be expected to last, were it not for other factors in depletion. For spruce alone, the stand is 75 million cords and annual consumption 1·12 million cords,—67 years' supply, in the same premises.

In Ontario similar difficulties are met with in discussion of increment, as elsewhere. Conditions for regeneration and for growth, however, are very similar to those which obtain in the province of Quebec; and certainly there is no justification for taking a rate higher than one per cent, if even that figure is justified. The problem must be dealt with, however, and in the lack of data which would compel the use of a lower rate, one per cent is adopted for further calculations.

Applying this rate to the total spruce-balsam stand of 127.50 million cords (just as liberal an application as was made in Quebec, and equally open to question) the annual increment would be 1.275 million cords,—in this province, apparently a little greater than consumption, and undoubtedly due to the fact that spruce is not used to the same extent for lumber as is the case in Quebec. A slightly increased use in that direction—which is entirely probable as a result of white pine depletion—would bring consumption into balance with the assumed increment. For the purpose of discussion, therefore, we may say that there is approximate balance between the two. All other factors in depletion—fire, insects and decay—therefore represent *net* depletion.

During the past five years the average area of timber lands burned annually has been approximately 670,000 acres, of which 210,000 acres was merchantable timber; 270,000 acres young growth; and 190,000 acres cut-over lands. Making proper allowance for species other than pulpwood, and applying very conservative figures as to stands, the average loss of the pulpwood species has been at least 1 million cords per year, a portion of which is subject to salvage. Fortunately the province has not suffered from a budworm epidemic in any way approaching the widespread severity that was experienced in Quebec and New Brunswick; more limited losses have been suffered, however, to a total of perhaps 5 million cords in all. Consequently over a ten-year period an average annual loss through budworm has been about half a million cords. No estimate is possible for damage by other insects, although continuous loss is caused thereby. For the material losses by fungi, also, no figures are available.

It will at once be perceived that the aggregate of all these losses is very much higher than the amount annually consumed in actual utilization; it is also much greater than annual increment. Consequently, neglecting a probable increase in consumption, the net annual wastage through all factors of depletion will result in reduction in supplies at a much more rapid rate than that indicated by the simple division of the amount annually used into the amount of the total available stand.

*See also Section 10, Chapter II.

As previously inferred, unless the lumber industry is to go into decline, it may definitely be expected that a greater amount of spruce will be used in the sawmills of the province. Also, at least some further expansion may be expected in the pulp industry. Under such circumstances, an unfavourable balance between increment and consumption is almost bound to develop.

In conclusion it may be stated that the large net depletion involves serious inroads upon wood capital, which condition is absolutely inimical to the permanence of the lumber and pulp industries. If these industries are to maintain the important position they now hold in the industrial life of the province, there are two main problems which must be faced in a very practical and very energetic way; (1) material reduction in the amounts of losses through fire and insects; and (2) regulation of cutting operations in such a manner that the yearly consumption will be kept within the limits of net annual increment.

CHAPTER VI.—MANITOBA

Coming to western Canada we encounter a distinct change in forest conditions, and also in the manner and extent to which the forest resources have been subjected to exploitation. The forest of Manitoba is much less complex in composition, consisting essentially in a spruce-jackpine-poplar forest with relatively small proportion of other species such as tamarac, balsam and white birch. While a few other hardwoods are found in the southern half of the province, this is the westerly and northerly limit of such species. The distribution of the forest also is quite different from that in Eastern Canada, in that there is a more or less distinct line of demarcation between the absolutely open lands—the prairie—and the wooded country. So far as forest industry is concerned, it has been confined almost entirely to lumbering operations. No pulp mills have as yet been established, and the only activity in the direction of pulpwood has been in taking out relatively small amounts for mills farther east in Ontario, and for export to the United States. It should therefore be kept in mind that in the following discussion of pulpwood resources the subject is treated on the basis of potentialities rather than actualities.

SECTION 1.—TOTAL PULPWOOD RESOURCES

Manitoba has a land area of 229,332 square miles, of which the forest area is 137,600 square miles, or approximately 60 per cent. Of the latter some 27,600 square miles (20 per cent) is classified as merchantable and accessible, the balance, 110,000 square miles, consisting of unmerchantable forest.

On the entire forest area, there is estimated to be a total stand of 71,850,000 cords of the four species, spruce, balsam, jackpine and poplar, which is used for this purpose, and aside from the question of actual accessibility, would be available as pulpwood. It will be noted that hemlock has disappeared, as this species is not native to Manitoba. Of the foregoing amount, jackpine is present to the extent of 20,500,000 cords, and poplar to the amount of 28,200,000 cords, these two species aggregating over 67 per cent of the total estimated stand.

The resources of Manitoba have been subjected to severe exploitation for saw-timber, and also, by reason of extensive railway construction, to operation for railway ties as intimated in the introductory paragraph, however, operations for pulpwood have been confined exclusively to a relatively small amount, originating largely in the peninsula between Lakes Winnipeg and Manitoba and in the southeastern portion of the province.

A large portion of the pulpwood resources above stated consist in very sparsely timbered areas from which, under present conditions or under conditions of development which can reasonably be anticipated, will hardly develop a market. The total amount considered to be available and merchantable within the near future is 27,500,000 cords of the four species. Of this amount spruce and balsam, the only species in great demand for pulp manufacture elsewhere in Canada, are present to the extent of 9½ million cords.

SECTION 2—PULPWOOD UNDER EXCLUSIVE CONTROL OF THE DOMINION

In this province ownership of the forest resources lies in the Crown, in the right of the Dominion of Canada. Until very recent years, the disposal of timber by the federal government had been confined to the licensing of timber berths to supply sawmill operations; to supply tie and other construction timber for railways; and finally, under a system of permits, to provide settlers with timber for buildings and other structures consequent upon the settlement of lands for farming purposes. As a result of these developments the greater part of the accessible saw and tie timber has been alienated so far as the merchantable material is concerned. Moreover, to a greater extent the timber rights so demised have been intensively used, and consequently there has been a notable reduction in the timber resources.

The Dominion, however, still retains unimpaired title to over 92 per cent (127,021 square miles) of the forest area of the province. On this area the total stand of all species under review is estimated to be 65.7 million cords, only 20.6 million cords of which, however, are of spruce and balsam. Further, of the latter, approximately 7 million cords, only, may be considered as merchantable; the balance is either far too remote, or is in such thin stands, that it cannot be given serious consideration for many years to come.

SECTION 3—PULPWOOD UNDER REGULATIVE CONTROL OF THE DOMINION

An area approximating 2,100 square miles has been disposed of in the form of licenses and berths, the total stand thereon being estimated at about 3.67 million cords. Of the latter nearly 2 million cords is of spruce and balsam. All timber so disposed of, however, is subject to conditions requiring manufacture in Canada. Also, it is subject to regulation of the Crown as to methods under which it shall be operated.

It is of interest to note here, that about three years ago, a tract of some 720 square miles, lying to the east of Lake Winnipeg, was disposed of as "Pulpwood Berth No. 1". Later, an extension to the area was granted by Order in Council, but so far no operations have taken place.

SECTION 4—PULPWOOD ON PRIVATELY OWNED LANDS

An area of 8,484 square miles, comprising 6.17 per cent of the total forest area of the province has been disposed of in fee simple,—to the railway companies, as subsidies; as grants to the Hudson's Bay Company; and to settlers taking up land. On these private lands the total stand is 2.45 million cords, of which a little better than one-half million cords is available spruce and balsam. Under present conditions, all of this timber carries the privilege of export, although relatively little has heretofore been exploited for that purpose.

Of the area privately owned, some 800 square miles is owned by the railways and the Hudson's Bay Company, and 4,600 square miles by settlers, and the ownership is therefore essentially Canadian. The balance is a miscellany of private holdings the controlling classes of which it is not possible to segregate.

SECTION 5—SUMMARY *RE* FEDERAL CONTROL OF EXPORTS

From the foregoing discussion, it is manifest that in Manitoba, by reason of manufacturing restrictions imposed upon all except privately owned timber, the Dominion Government already effectively prevents the export of unmanufactured pulpwood. In effect, this restriction applies to all except 3.4 per cent of the total stand, and to all but 5.4 per cent of the merchantable balsam and spruce timber available.

SECTION 6—CONSUMPTION OF TIMBER IN MANITOBA

Table I indicates that the total stand of soft-wood saw-timber in the province is 2,335 million feet, board measure. Of this amount, spruce contributes 2,000 million; jackpine 250 million; balsam 75 million; the balance of 10 million consisting of other softwood species of relatively little importance. These amounts, however, are included in the totals in cordwood measure. Of spruce and balsam, therefore, there is available for all purposes approximately 9½ million cords.

Up to the present time there has never been a cord of wood converted into pulp in Manitoba, and at the present time there is only to be considered, therefore, the consumption for lumber and other purposes, and for exports. Table VI gives the amount of spruce manufactured over the decade, expressed in cords.

TABLE VI.—SPRUCE MANUFACTURED INTO LUMBER—MANITOBA

Expressed in Cords – 500 Bd. Ft. = 1 cord

Year	Spruce
1913	
1914	129,234
1915	81,278
1916	78,772
1917	111,482
1918	105,168
1919	100,440
1920	55,856
1921	112,220
1922	120,846
	106,312
Total	1,001,608
Average	100,161

NOTE. In only one year of the decade, viz., 1917, was balsam reported to have been manufactured, and then only to the extent of 20,000 feet B.M. This species is therefore eliminated from the table.

It appears that the average annual consumption of the species for lumber has been approximately 100,000 cords. While the average production for the first five years of the decade is perceptibly higher than for the second half, and this may partly be attributed to falling-off in supplies, it is in greater measure due to decrease in the demand of local markets. The figure of 100,000 cords may manifestly be taken as a fair average.

So far as exports of pulpwood are concerned, the customs figures for wood handled through Manitoba ports of exit indicate so few shipments that it is not necessary to include a table similar to that for other provinces. For instance, customs figures, even for 1923, indicate an export of only 80 cords, while data for previous years is also fragmentary in character. On the other hand, it is well known that in recent years the cutting of pulpwood in, and shipment from, the province, has reached material proportions. As a result of evidence presented to the Commission, and on the basis of study of interprovincial traffic

in pulpwood for export, it is considered that we may definitely figure upon an annual export of from thirty to forty thousand cords, practically all of which goes out through Fort Frances, Ontario.

In regard to uses for other purposes such as railway ties, construction timber, fuel, etc., detailed statistics are lacking. Spruce particularly, however, is used to a far greater extent on the prairies for such purposes than is the case further east. It is conservatively estimated that at least 80,000 cords of the species is consumed as fuel, and that an additional 10,000 cords is used for railway ties and construction timber. While these figures are entirely in the nature of rough estimates, it is fully believed that they are, if anything, too conservative.

Summing up the consumption of balsam and spruce for all purposes, it is quite clear that from 200,000 to 230,000 cords, at least, represents the average annual consumption of the species. As previously pointed out the total available and merchantable stand is 9½ million cords, and from this amount the supplies required must be drawn.

SECTION 7.—THE EXTENT OF THE LUMBER INDUSTRY

Table VIa indicates clearly the lumber production of the industry in Manitoba. The outstanding feature is that spruce is, relatively speaking, the only species of importance in sawmill production of the province, furnishing over 94 per cent of all lumber produced. To a limited extent jackpine, tamarack, and poplar have been used, and, by reason of diminution in the quantity of available spruce suitable for sawing, it may definitely be anticipated that other species may come into greater use.

For the entire time during which statistics have been collected, i.e., since 1908, the year 1913 showed the peak in lumber production. As far as can be ascertained, in no year previous to 1908 did production reach the figure of 1913. It seems improbable, moreover, that it will for years attain that figure again, for, after all, the readily accessible stands have been seriously depleted. With the great increase in production in British Columbia, due to the bounteous supplies of high-grade timber, and to the introduction of large-scale methods, the producers of the latter province have invaded the prairie market to a very large extent. It is therefore probable that the Manitoba mills will be more or less restricted in their markets to supplying local demands, with a limited export to neighbouring states just south of the International Boundary.

SECTION 8.—THE TREND OF PULPWOOD BUSINESS IN MANITOBA

It has previously been explained that at present the pulpwood business in Manitoba is entirely confined to the export trade. To a far greater extent, the wood which is so cut comes from farmers and settlers engaged in clearing, and these operations are more or less confined to the southeastern part of the province, the peninsula between Lakes Winnipeg and Manitoba, and to the Dauphin district.

Most assuredly, however, it is to be expected that the near future will witness the introduction of pulp manufacturing within the province. Already one pulp concession has been made and extended, and from time to time interest is displayed in other tracts deemed suitable for ventures of this character. It may be pointed out that the introduction of one mill of a 100-ton capacity, basing production on newsprint, will involve additional consumption of about 40,000 cords annually. After all, the pulpwood resources of the province are, at best, rather slender, and it is accordingly of the utmost importance that the government should scrutinize most carefully the beginning of operations in this province, and ought not to permit over-development such as has occurred in some

other regions. Aside from the patent desirability of developing export trade (so far as the natural resources will permit, on a perpetual basis) it is altogether doubtful if more than one such mill would be required to supply the present newsprint requirements of the three prairie provinces; the annual consumption of newsprint between Manitoba and the Rockies is only about 55 or 60 tons. In development of the industry, therefore, it is readily perceived that caution should be exercised, with the idea in view that those industries which are developed will be of such size and so located that the available resources of raw materials will supply their requirements in perpetuity.

TABLE VIA.—MANITOBA LUMBER PRODUCTION, 1913 TO 1922 INCLUSIVE BY KINDS OF WOOD, QUANTITY CUT AND VALUE

Kinds of Wood	1913		1914		1915		1916		1917	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	64,617	858,007	40,639	543,886	39,386	506,289	55,741	824,554	52,584	928,350
Jack Pine	2,783	32,585	201	2,824	465	6,491	148	2,500	92	1,460
Tamarack	2,172	27,544	3,096	45,602	1,584	23,858	470	6,346	280	5,280
Poplar (Aspen)	2,066	23,681	394	5,074	797	10,693	202	2,436	340	4,946
Poplar (Balsam)	268	3,210	120	1,362	94	1,509	112	1,187	108	2,140
Birch	27	771	2	40	9	210	5	113	10	300
Oak	26	624	11	572	16	240	17	488	30	1,300
Cedar	1	18	.....	.....	.....	.....	1	15	.....	.....
Elm	1	18	12	216	6	140	3	70	80	2,400
Poplar (Cottonwood)	.....	.....	183	2,152	.....	.....	1,012	13,170	.....	.....
White Pine	.....	.....	.....	.....	.....	.....	.....	.....	160	4,750
Basswood	.....	.....	.....	.....	.....	.....	.....	.....	120	3,360
Ash	.....	.....	.....	.....	.....	.....	.....	.....	28	450
Maple	.....	.....	.....	.....	.....	.....	.....	.....	20	900
Balsam Fir	.....	.....	.....	.....	.....	.....	.....	.....	10	220
Other Kinds	.....	.....	.....	.....	.....	.....	.....	.....	260	4,720
Custom sawing	.....	.....	.....	.....	.....	.....	.....	.....	94	1,570
Poplar, all kinds	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	71,961	946,458	44,658	601,728	42,357	549,430	57,711	850,879	54,216	962,146

Kinds of Wood	1918		1919		1920		1921		1922	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	50,220	1,154,847	27,928	877,745	56,110	1,981,396	60,423	1,369,884	53,156	1,327,793
Jack Pine	86	1,560	179	4,705	577	17,530	69	1,264	159	3,343
Tamarack	241	5,770	444	12,773	260	10,140	278	5,950	1,057	24,482
Poplar (Aspen)	528	10,915	301	10,419	.....	.....	.....	.....	.....	.....
Poplar (Balsam)	2,070	48,880	52	1,540	.....	.....	.....	.....	.....	.....
Birch	6	160	4	210	286	12,900	.....	.....	.....	.....
Oak	.....	.....	4	160	.....	.....	4	200	.....	.....
Cedar	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Elm	.....	.....	.....	.....	.....	.....	12	360	400	12,000
Poplar (Cottonwood)	.....	.....	.....	.....	.....	.....	.....	.....	158	3,444
White Pine	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Basswood	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Ash	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Maple	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Balsam Fir	400	8,000	.....	.....	10	350	.....	.....	.....	.....
Other Kinds	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Custom sawing	496	9,920	1,441	30,127	.....	.....	.....	.....	.....	.....
Poplar, all kinds	.....	.....	.....	.....	1,176	36,274	941	20,409	.....	.....
Totals	54,047	1,240,052	30,353	937,679	58,419	2,058,590	61,727	1,398,067	54,930	1,371,062

SECTION 9.—SUMMARY OF SITUATION—DURATION OF SUPPLIES

When the area of forest is considered, it is quite evident that the lumber industry has never been developed to large proportions; the obvious reason being, that the timber available has not been such as to enable the province to compete in outside markets with the lumber from British Columbia and the eastern provinces.

Although the average fire menace in Manitoba cannot be considered a serious one, the province has on numerous occasions been subjected to extreme climatic conditions, and enormous damage has been wrought by forest fires. Over the five-year period, 1918-22, the average area of timber land burned was approximately 85,000 acres; of which 37,000 acres carried merchantable timber; 40,500 acres was young growth; and 7,500 acres consisted in cut-over lands. The average annual loss in merchantable timber was 110 million feet, board measure. It is therefore quite evident that, when young growth destroyed is taken into consideration, the annual fire loss was probably in the neighbourhood of 275 or 300 thousand cords, all species included.

In a previous section the annual consumption of spruce is placed at from 200 to 230 thousand cords. If to this figure then were to be added the amounts of other species consumed for all purposes, it will be seen that the amount of wood actually used exceeds the quantity which was destroyed annually in the period referred to. At the same time, it is very obvious the fire losses constituted a very serious part of the total depletion.

Although the province has always suffered to some extent from insect infestations, there has been nothing approaching the budworm epidemic experienced in the east. The larch sawfly did great damage to the tamarack stand thirty or thirty-five years ago, but since that time no general epidemic has affected the more valuable species.

While annual increment in the accessible and merchantable spruce-balsam stand cannot by any means be considered to measure up to the amount of these species annually utilized, there is a possibility that increment on the entire stand may reach close to the amount used, and, in such circumstances, fire and other losses constitute net depletion. For this reason, the outstanding problem facing the government lies in the curtailment of such losses. The success of any fur-their development in forest industry, particularly in pulp manufacture, is almost entirely contingent upon a more successful and more complete scheme of fire protection.

CHAPTER VII.—SASKATCHEWAN

In Saskatchewan, forest types are very similar to those in Manitoba. The number of species of importance is very small, and there is also a fairly clear line of demarcation between the prairie region to the south and the timbered region to the north. Forest industries in this province, also, have been almost entirely confined to lumbering, tie, and fuel operations; with the exception of one or two isolated cases, during the period of peak prices in the pulpwood markets, this province has never produced pulpwood either for export or for domestic consumption.

SECTION 1—TOTAL PULPWOOD RESOURCES

The land area of the province is 237,500 square miles, of which amount 49,776 square miles (21 per cent) is classified as forest land. It is at once noticeable that the forest area of this province is much less than that of Manitoba, due to the fact that, extending clear across the southern half of the province, is a solid belt of almost exclusively agricultural land. Of the forest area some 25,000

square miles (52 per cent) carries timber considered to be merchantable and accessible from the standpoint of pulpwood operations, at present or within reasonable time in the future. The balance 24,076 square miles, consists in very sparsely timbered areas for which no value can be foreseen.

The total pulpwood stand of the province is estimated at 155,550,000 cords of spruce, balsam, jackpine and poplar. Of this amount 123,100,000 cords is jackpine and poplar, and 32,450,000 cords is spruce and balsam. These figures, however, include very thin stands which are entirely incapable of successful exploitation. The total accessible and merchantable stand is estimated at 48,600,000 cords, of which some 13,600,000 cords is of spruce and balsam.

SECTION 2.—PULPWOOD UNDER EXCLUSIVE CONTROL OF THE DOMINION

As in Manitoba, the federal government controls the forest resources of the province. For many years past, the disposal of timber cutting privileges has been on the license system, the Crown retaining title to the soil, and also retaining the right of control over cutting operations. Along similar lines, permits have for years been granted to cover tie and construction timber operations of railways, and also to settlers requiring wood for their buildings and other structures. By far the greater part of the original saw-timber stand has been disposed of; in fact, it has been very largely cut out.

The government, however, still retains full title to a forest area of 43,335 square miles,—87 per cent of the total. On this area the estimated total stand of spruce, balsam, jackpine, and poplar is 143.3 million cords. Only 29.7 million cords is spruce and balsam, however, and of the latter some 10.88 million cords is reasonably accessible and will probably be exploitable within reasonable time. For the balance of the material, it is impossible to foresee any markets which would justify its consideration even as potential supplies.

SECTION 3.—PULPWOOD UNDER REGULATIVE CONTROL OF THE DOMINION

The area under timber license and permit in Saskatchewan approximates 1,175 square miles,—between 2 and 2½ per cent of the forest area. The area in this category was formerly much greater, but large tracts culled over in lumbering operations have been abandoned, greatly reducing the area under license. For the area remaining under this temporary form of alienation, the total stand is estimated at approximately 7 million cords of all species; of this, spruce and balsam total 1.46 million cords of accessible pulpwood.

To all of this licensed timber, the requirement for local manufacture applies, and, consequently, it is under prohibition for export purposes.

SECTION 4.—PULPWOOD ON PRIVATELY OWNED LANDS

The area of timberland alienated outright is some 5,266 square miles, embracing about 10.6 per cent of the forest. This area carries a total stand of 5.15 million cords of all species, of which 1¼ million cords includes all of the spruce and balsam which could be considered available for pulpwood.

Of the total area so demised, 1,083 square miles is controlled by the Hudsons Bay Company, the railways and other companies, in the larger holdings. Of the balance, some 3,042 square miles is held by settlers, and 763 square miles in miscellaneous holdings. The exact character of control it has not been feasible to determine, but to a greater extent they appear to be under essentially Canadian control.

SECTION 5.—SUMMARY *RE* FEDERAL CONTROL OF EXPORTS

From preceding discussion it is quite evident that, by virtue of outright control on 87 per cent of the forest area, and by reason of manufacturing restrictions on timberlands held under license or permit, the government already rather effectually prevents the export of unmanufactured wood. Indeed, such restrictions apply to over 96 per cent of the total stand, and to over 90 per cent of the available stand of spruce and balsam.

SECTION 6.—CONSUMPTION OF TIMBER IN SASKATCHEWAN

As indicated in Table 1, the total stand of softwood saw-timber is estimated at 3.95 billion feet, board measure, including 3 billion feet of spruce, 800 million feet of jackpine, 100 million feet of balsam, and 50 million feet of other softwoods of relatively small importance.

TABLE VII.—SPRUCE MANUFACTURED INTO LUMBER.—SASKATCHEWAN

Expressed in Cords – 500 Bd. Ft. = 1 cord

Year	Spruce
1913	225,500
1914	111,364
1915	127,940
1916	168,268
1917	176,306
1918	151,670
1919	84,904
1920	108,742
1921	21,784
1922	19,218
Total	1,195,696
Average	119,570

NOTE.—No balsam is reported to have been cut, and this species is therefore deleted from the table.

Table VII gives the consumption of spruce in lumber manufacture over the decade, expressed in cords. Table VIIa gives the lumber cut of all species. Reference to the latter table reveals the fact that in Saskatchewan, also, spruce has been the mainstay of the lumber industry, having furnished over 99 per cent of the supplies. The average annual consumption of spruce, for lumber, has been approximately 120,000 cords.

So far as past consumption is concerned, operations for pulpwood may be neglected, as the very isolated cases in which this product has been cut and exported do not affect to any degree the figures for total consumption. Of great importance, however, is the consumption in other directions. Material amounts of spruce are consumed as fuel, railway ties, construction timber, and also for a miscellany of purposes in connection with improvements in the settlements. It is estimated that at least 80,000 cords is used for fuel and an additional 12,000 cords for railway ties. It is therefore probable that the total spruce consumption for these and miscellaneous purposes approximates 100,000 cords. Accordingly, it appears that the average consumption of spruce in the province reaches a total of some 220,000 cords per annum. The total available stand of this species is 13½ million cords, from which the supplies to fill requirements for all purposes must be drawn.

SECTION 7.—THE EXTENT OF THE LUMBER INDUSTRY

Upon reference to Table VIIa, it will be seen that, with a peak production in 1913, there has been a serious falling-off in lumber manufacture. For the whole period over which statistics have been collected, that is from 1908 onward, the absolute peak in production occurred in 1912. The preceding year was also one of relatively high production. It is manifest, therefore, that in Saskatchewan, the three years centring on 1913 showed the highest development in the lumber industry. This was followed by a decided reduction, until in recent years production has been very low. The cause is not far to seek; at the beginning of the decade two very large mills were in almost constant operation, the industry being centred at Prince Albert and Big River. With the exhaustion of supplies on limits held by them, and the impossibility of securing additional supplies within reasonable distance, the operators of large mills simply wound up their business. The result is that at the present time there is not a large saw-mill in the province, the large-scale operators having ceded the industry to the operators of smaller outfits. It seems entirely doubtful that the industry will be rejuvenated on a large-scale basis. Although there are still some good tracts of saw-timber available, they are rather inaccessible, and in any case, by reason of topographic conditions, they are more likely to be operated from the Manitoba end. Another feature which has retarded lumbering development in this province has been the invasion of Saskatchewan markets by timber from British Columbia.

TABLE VIIa.—SASKATCHEWAN LUMBER PRODUCTION, 1913 TO 1922 INCLUSIVE, BY KINDS OF WOOD, QUANTITY CUT AND VALUE

Kinds of Wood	1913		1914		1915		1916		1917	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	112,750	1,878,352	55,682	828,162	61,970	867,612	84,134	1,187,054	88,153	2,031,669
Tamarack	1,813	27,193	844	12,675	650	9,500	61	1,095	.....	.....
Jack Pine	206	2,472	146	1,752	124	1,741	21	375	.....	.....
Poplar (Aspen)	31	465	5	75	105	1,325	59	827	194	3,810
Poplar (Balsam)	.....	.....	.....	.....	15	175	.....	.....	.....	.....
Poplar (Cottonwood)	.....	.....	.....	.....	.....	.....	.....	.....	3	50
Custom Sawing	.....	.....	.....	.....	.....	.....	.....	.....	25	500
Poplar (all kinds)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
White Birch	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	114,800	1,908,482	56,677	842,664	62,864	880,353	84,275	1,189,351	88,375	2,036,029

Kinds of Wood	1918		1919		1920		1921		1922	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	75,501	2,115,694	41,358	1,294,348	53,268	2,034,524	10,346	259,455	9,222	273,179
Tamarack	.....	.....	90	2,700	628	23,120	400	10,000	210	6,200
Jack Pine	.....	.....	.....	.....	396	13,907	55	1,347	148	3,718
Poplar (Aspen)	14	218	.....	.....	.....	.....	.....	.....	.....	.....
Poplar (Balsam)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Poplar (Cottonwood)	.....	.....	.....	.....	.....	.....	.....	.....	4	75
Custom Sawing	320	6,395	1,004	29,640	.....	.....	.....	.....	.....	.....
Poplar (all kinds)	.....	.....	.....	.....	79	3,070	91	2,291	.....	.....
White Birch	.....	.....	.....	.....	.....	.....	.....	.....	25	750
Totals	75,835	2,122,307	42,452	1,326,688	54,371	2,074,621	10,892	273,093	9,609	283,922

SECTION 8—THE TREND OF PULPWOOD BUSINESS IN SASKATCHEWAN

As previously inferred, no such business exists at the present time. Some fourteen years ago, when hopes ran high as to the success of a power development near Prince Albert, there was a flurry of excitement regarding the possibilities of pulp manufacturing in the district. With the failure of the power scheme, however, such hopes were shattered. Since then, there have on various occasions been mere suggestions as to possible pulp mill promotions in the northern country. While there may be possibility of development of this character, the supplies available are limited and rather widely distributed. Certainly, on the basis of present methods of handling timber lands, the resources of the province cannot support local pulp industries of large proportions.

Lying so far north, the timber areas of this province are very remote from pulpwood markets of the present day. Even during the period of peak prices, shipments were very limited. It is quite conceivable, however, that with depletion of supplies at closer range to the pulp mills of the northern middle States, a market might develop in that direction if export were to be permitted. Of more importance and greater benefit, however, would be the development of a market in Manitoba if the industry becomes established in that province.

SECTION 9—SUMMARY OF SITUATION—DURATION OF SUPPLIES

As previously implied, it is altogether probable that, until such time as economic conditions permit the handling of timber on the basis of sustained yield, and the greater care in treatment called for under such a system of management is accorded, lumber production in Saskatchewan has passed the peak. It was never very large on account of the fact that, as in Manitoba operators were more or less restricted in markets by competition from elsewhere.

Fire losses have been very severe in this province, the menace being greater than that obtaining in Manitoba. Over the five-year period, an average upwards of 600,000 acres was burned over annually,—260,000 acres bearing merchantable timber; 300,000 acres being young growth; and some 40.000 acres cut-over timber land. The annual loss in merchantable timber approximated 1 billion feet board measure, all species included. It has previously been shown that annual utilization of spruce and balsam is about 220,000 cords; so that, aside from the young growth destroyed, the average annual fire loss in the period referred to was over twice the amount of spruce and balsam utilized yearly. It is therefore quite certain that annual losses to the spruce-balsam stand, through fire, greatly exceeded the depletion in supplies through legitimate utilization.

Annual utilization of the two species greatly exceeds the amount of annual increment in the merchantable and accessible stand; in fact it probably reaches close to the total increment in the entire stand of these species, regardless of accessibility or merchantability. All fire losses therefore constitute a net depletion. As for other factors in wastage—insects, fungi, etc.—while no widespread epidemics have occurred in the really merchantable species other than tamarac, these pests are always present and contribute materially to deterioration in the stands.

As in Manitoba, it is at once obvious that the problem in this province lies in solution of the fire problem and in the more conservative treatment of timber resources which remain.

CHAPTER VIII.—ALBERTA

With the exception of the east slope of the Rocky Mountains, the only important change in type in the Alberta forest, as compared to that of Saskatchewan, is in the introduction of another species, lodgepole pine, which may be considered as the counterpart of the jackpine which extends eastward to the Atlantic. In the Rocky Mountains several other species are introduced, the only one of importance from the standpoint of the present discussion being Engelmann spruce; the latter may be considered as the counterpart of white spruce with which we have to a great extent been dealing. Within the province, both species of pine and both species of spruce, referred to, are found, their limits of distribution overlapping to a considerable extent.

In the more accessible parts of the province the timbered areas have been very severely culled in lumbering. Also, by reason of the extensive coal mining industry, large amounts of timber have been consumed as pit props. Furthermore, with a large mileage of railway construction, extensive areas have been exploited almost exclusively under the very wasteful and rather destructive process of tie-manufacture.

SECTION 1—TOTAL PULPWOOD RESOURCES

With a land area totalling 248,548 square miles the area classified as forest land is 86,650 square miles, approximately 35 per cent. Of the latter, over 69 per cent is classified as merchantable and accessible forest, the balance being either so remote or so sparsely timbered as to be considered entirely unprofitable.

The total pulpwood stand is estimated at 275,000,000 cords, over 70 per cent of which is jackpine and poplar, leaving some 80,000,000 cords of spruce and balsam. Confining ourselves to the merchantable and accessible stand, however, the total for all species is 81,000,000 cords, of which only 26,000,000 cords of spruce and balsam are available.

SECTION 2—PULPWOOD UNDER EXCLUSIVE CONTROL OF THE DOMINION

As in other prairie provinces, in Alberta control of the forest resources lies with the federal government, and the methods under which timber has been disposed of for lumbering, for railway construction, and to settlers, are identical with those already described for Manitoba and Saskatchewan. While probably the proportion of merchantable saw-timber which has been alienated in this manner is not so great as in the other two provinces, it is nevertheless the case that the greater part of the accessible stands have been disposed of.

The government, however, still retains unimpaired title to 71,054 square miles, representing 82 per cent of the total forest area. The stand of spruce, balsam, jackpine and poplar on this unalienated area is estimated at 261.3 million cords. Of the latter the amount of spruce and balsam is approximately 76.5 million cords, of which 22.5 million cords only may be considered as reasonably accessible and merchantable. Estimates for the total stand in Alberta naturally include many large areas which for many years to come will be absolutely inaccessible, and there are also other areas which are so sparsely timbered as to render them entirely incapable of successful commercial exploitation.

SECTION 3—PULPWOOD UNDER REGULATIVE CONTROL OF THE DOMINION

19,091 square miles within the province have been disposed of under the system of licenses and permits, representing about 2.3 per cent of the entire forest area. Here also, however, large areas which at one time were under this temporary form of alienation have, after being exploited, been abandoned and reverted to the Crown.

The total stand on licensed and permit lands is estimated at 7.28 million cords for all species; of this spruce and balsam total approximately 1.88 million cords of accessible pulpwood. By reason of manufacturing clauses contained in the regulations applying to timber licenses and permits on Dominion lands, all the timber in this category is prohibited from export.

SECTION 4—PULPWOOD ON PRIVATELY OWNED LANDS.

The area of timber land which has been completely alienated is 13,605 square miles, embracing approximately 15.7 per cent of the total forest area. The total stand of all species is approximately 6.38 million cords, of which somewhat better than 1.6 million cords is available spruce and balsam.

By far the greater part of the alienated timber land, namely 10,044 square miles, is held by settlers, and hence may be considered as being essentially under Canadian control. The Hudson's Bay Company and the railways control some 872 square miles, and this area, therefore, falls in the same category so far as control is concerned, 1,328 square miles is held by companies and individuals other than those previously mentioned. For the latter lands it has not been feasible to determine the character of control. For the entire alienated area, however, it appears quite clear that control is essentially Canadian in character.

SECTION 5—SUMMARY RE FEDERAL CONTROL OF EXPORTS

The conclusion to be drawn from the foregoing is that by reason of outright control of operating conditions on 82 per cent of the forest area, and also by application of manufacturing restrictions on lands held under license or permit, the export of unmanufactured wood is already rather effectually prevented. From the standpoint of timber quantities, the export restrictions apply to approximately 95 per cent of the total stand, and to over 93 per cent of the available spruce and balsam.

SECTION 6—CONSUMPTION OF TIMBER IN ALBERTA.

Reference to Table I indicates that the total stand of saw-timber in the province is estimated at 11.7 billion feet, board measure. This quantity includes 8.5 billion feet of spruce, 2.5 billion feet of jackpine, .2 billion feet of balsam. The balance of one-half billion feet is made up of Douglas fir, larch and other coniferous species in relatively small quantities and of no great importance from the standpoint of the present discussion.

Table VIII gives the consumption of spruce and balsam in the manufacture of lumber during the decade. Upon consideration of figures in Table VIIIa, it is noticeable that in Alberta the proportion of other species sawn is somewhat higher than is the case in Saskatchewan and Manitoba. Particularly is this the case with jackpine; also, Douglas fir, being available in restricted localities, a certain amount of lumber has been sawn from that species. Aggregating the figures for these latter two species with the cut for all other species in the province, it is seen that over the entire period spruce furnished 87 per cent of the total cut. The average annual consumption of spruce has been 52,420 cords.

TABLE VIII.—SPRUCE AND BALSAM MANUFACTURED INTO LUMBER—ALBERTA

Expressed in Cords – 500 Bd. Ft.=1 cord

Year	Spruce	Balsam fir	Total
1913	83,408	.....	83,408
1914	79,790	.....	79,790
1915	27,982	40	28,022
1916	29,544	.....	29,544
1917	60,282	1,768	62,050
1918	39,600	.....	39,600
1919	40,440	402	40,842
1920	71,058	1,750	72,808
1921	46,228	.....	46,228
1922	45,864	412	46,276
Total	524,196	4,372	528,568
Average	52,420	437	52,857

The pulp industry has not yet penetrated this province, nor has there ever been cut any quantity of pulpwood either for export to the United States or for use in other provinces of the Dominion. Aside from lumber production, however, there are several directions in which there has been considerable consumption of spruce. Particularly is this the case in fuelwood operations, in railway construction, in settlement improvements, and in coal mining operations. It is estimated that not less than 70,000 cords of spruce is consumed as fuel; another 10,000 cords in railway ties and construction timber; and finally, some 20,000 cords of spruce finds its way into the mines in the province. The total consumption for such uses may, therefore, be set at approximately 100,000 cords.

Summing up the foregoing figures, it would appear that the average annual consumption of spruce in the province of Alberta approximates 150,000 cords per annum. As indicated elsewhere the total available stand of the species is estimated at 26 million cords, from which quantity the supplies to fill requirements in all directions must be drawn.

SECTION 7—EXTENT OF THE LUMBER INDUSTRY

Detailed figures for lumber productiion from all species are to be found in Table VIIIa. For the decade covered, the peak of production occurred in 1914. Going back over the entire period through which statistics have been collected, it may be stated that the absolute peak occurred in 1911; also, 1912 was a year of relatively high production. As in the case of Saskatchewan, it appears quite clear that the lumber industry in the province has a more or less continuous growth up to 1911, continuing through 1912, 1913 and 1914, after which there was a serious falling-off. Of the later years, only in 1920 did production attain anything like the figures in the first part of the decade.

This falling off in Alberta has not, as was the case in Saskatchewan, been due to absolute cessation of manufacturing by large concerns. For years there have been mills of fair size, and such mills still continue to operate. Although certain parts of the province have been rather seriously depleted, there still remain in places considerable blocks of timber which will most certainly serve present average requirements of the industry. It is undoubtedly the case that the falling-off in lumber production of this province has been due to the invasion of Alberta markets by British Columbia timber.

TABLE VIIIa.—ALBERTA LUMBER PRODUCTION, 1913 TO 1922 INCLUSIVE BY KINDS OF WOOD, QUANTITY CUT AND VALUE

Kinds of Wood	1913		1914		1915		1916		1917	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	41,704	566,250	39,895	572,100	13,991	189,304	14,772	213,668	30,141	477,254
Jack Pine	2,237	35,407	4,488	65,450	3,099	45,640	2,808	40,853	1,911	33,103
Douglas Fir	291	3,971	231	3,350	119	1,465	244	3,032	60	1,066
Tamarack	76	1,260	199	2,985	44	586	65	1,080	215	4,175
Poplar (Balsam)	70	965	69	1,051	245	2,628	119	1,251	31	465
Poplar (Aspen)	59	724	308	3,720	397	3,995	331	3,687	68	995
Birch	25	325	11	140	2	45	11	425	.....	.....
Poplar (Cottonwood)	.....	.....	35	350	58	564	.....	.....	242	3,647
Balsam Fir	.....	.....	.....	.....	20	260	.....	.....	884	14,822
Other kinds	.....	.....	.....	.....	.....	.....	.....	.....	75	1,400
Custom Sawing	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Maple	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Poplar (all kinds)	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	44,462	608,902	45,236	649,146	17,975	244,487	18,350	263,996	33,627	536,927

Kinds of Wood	1918		1919		1920		1921		1922	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	19,800	423,174	20,220	542,465	35,529	1,273,869	23,114	628,795	22,932	579,714
Jack Pine	986	20,522	3,200	93,497	4,092	153,622	2,523	73,999	2,338	62,294
Dougals Fir	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Tamarack	90	945	150	3,500	4	120	21	550	60	1,380
Poplar (Balsam)	50	1,000	102	2,190	.....	.....	.....	.....	.....	.....
Poplar (Aspen)	452	7,733	85	2,550	.....	.....	.....	.....	.....	.....
Birch	.....	.....	.....	.....	.....	.....	.....	.....	82	2,050
Poplar (Cottonwood	192	3,790	.....	.....	.....	.....	.....	.....	.....	.....
Balsam Fir	.....	.....	201	5,040	875	27,000	.....	.....	206	4,353
Other kinds	14	450	.....	.....	.....	.....	.....	.....	.....	.....
Custom Sawing	804	16,080	2,214	47,226	.....	.....	.....	.....	.....	.....
Maple	.....	.....	1	50	.....	.....	.....	.....	.....	.....
Poplar (all kinds)	.....	.....	.....	.....	729	25,575	344	7,805	.....	.....
Totals	22,388	473,694	26,173	696,518	41,229	1,480,186	26,002	711,149	25,618	649,791

SECTION 8—TREND OF THE PULPWOOD BUSINESS IN ALBERTA

It has already been intimated that no pulp has been manufactured in the province. On several occasions, proposals for introduction of the industry have been under consideration by various concerns. Particularly in the north country, centering more or less on Lesser Slave Lake, such proposals have been put forth, but for numerous reasons development has not materialized. While there is no doubt that, if other conditions were favourable, the timber supply of the province is sufficient to sustain at least one pulp industry of fair size, the great part of the timber is rather widely scattered, and, more important still, it is not as a general rule conveniently situated with respect to favourable power sites.

Aside from actual local development of the pulp industry, it seems highly improbable that there will for many years be any other market for pulpwood cut in this province. Remotely situated as Alberta is, the eastern pulpwood markets are entirely shut off; on the other hand, manifestly the province could hardly expect to market pulpwood in British Columbia or in the Northwestern States. In the latter province, and in neighbouring States, the timber supply so far exceeds that of Alberta, and the conditions under which it is operated are relatively so much more advantageous, that no outlet for Alberta pulpwood can reasonably be expected in that direction.

SECTION 9—SUMMARY OF SITUATION: DURATION OF SUPPLIES

Notwithstanding the fact that the timber resources of Alberta are greater than those of Saskatchewan and Manitoba, the lumbering industry never developed to very large proportions. By far the greater part of the original stand was in the Rocky Mountains, the foothills of the Rockies, and in the north country. Although the mountains and the foothills were reasonably accessible, timber had to be driven long distances by the rivers, and the latter were subject to such abnormal rise and fall, that many discouraging losses were suffered by various companies engaged in timber operations. On the other hand, it is only during the past ten years that the north country has been made accessible by railways.

In the mountains, the foothills, and the north country, however, most extensive fires have occurred. Originally the foothills and the mountain valleys contained most excellent stands of white and Engelmann spruce, with an admixture of lodgepole pine and other species. Although extensive fires occurred previous to the advent of the white man in the region, it is particularly during the course of the last forty or fifty years that the bulk of the fire damage has occurred. As is well known, Alberta is subject to frequent dry spells and to high winds, and this combination of unfavourable climatic factors has, along with wanton carelessness on the part of man, contributed to the extensive destruction of a great many billions of feet of excellent saw-timber. The same is true of the north country, where large areas, once containing magnificent stands of white spruce, were burned over, and succeeded by scrubby stands of inferior, and in some cases almost useless, species.

Over the five year period, 1918-1922, the average annual area of timber destroyed by fire was approximately 213,000 acres. Of this, 87,000 acres carried merchantable timber; 107,000 acres was young growth; and 19,000 acres, cut-over lands. The average annual loss in merchantable timber was some 437 million feet, board measure, of all species. As explained in Section 6, the average annual consumption of spruce and balsam approximates 150,000 cords. After making due allowance for other species destroyed by fire, it is at once evident that the amount of the pulpwood species burned annually exceeds greatly that actually consumed in legitimate utilization. If the area of young growth burned over be included, it is quite probable that the annual loss of spruce and balsam was somewhat over three times as great as the amount utilized. On this basis the annual drain on spruce supplies must run from 600,000 to 700,000 cords.

Although in this province, also, destructive insects are found working in the timber, epidemics have not been general, for many years at least. Perhaps greater losses have been sustained through the oprations of fungi, although no intensive study of the latter has been made, and it is not possible to estimate actual losses.

Taking into consideration the stand of timber still available, it would appear that Alberta is in a better position than either Manitoba or Saskatchewan. It is quite as evident, however, that continuation of the industry, on a permanent basis, is entirely contingent upon a material reduction in the wastage due to fire. As pointed out above, depletion from this cause is greater than that through utilization; if, therefore, the losses be in large measure curtailed, the timber supplies of the province will not only permit of sustension of a forest industry of present proportions, but considerable expansion may be possible. The present difficulty in, and future danger to, establishment of the pulp industry in Alberta, lies in the seriousness of the fire losses which have already occurred, and in those which take place from time to time, as unfavourable climatic conditions are experienced.

CHAPTER IX.—BRITISH COLUMBIA

In approaching discussion of the pulpwood situation in British Columbia, we now have to deal with a province in which forest resources and forest industries, more particularly lumbering operations, are on a scale far surpassing those in any other part of the Dominion. During previous generations, when magnificent square timber was being rapidly exploited in Ontario, Quebec, and in the Maritime Provinces, the resources of British Columbia were still inaccessible, and but little known. It is to a greater extent during the past generation that the gigantic industry of the Pacific Coast has been developed. Even at the present time, exploitation is largely confined to the harvesting of a magnificent stand of timber which is the accumulation of centuries under the excellent growth conditions peculiar to the Pacific slope.

In dealing with the pulpwood resources, it must be remembered that in this province, more than anywhere else, the question of overlapping in uses, as between species, is of extreme importance,—not only because there are woods which may ultimately be used for pulp manufacture, which are not at present so used, but because they are available in such large quantities. Supplies of several softwood species are so extensive, that, even presupposing the exhaustion of species presently used for pulp manufacture, it is very far from probable that the province would face a shortage of raw materials for the industry. Whereas, in other provinces, the exhaustion of softwood species at present used in pulp manufacture, would involve reversion to the use of hardwoods of inferior fibre qualities, and presenting great difficulties under present methods of transportation,—in British Columbia, the reserve supply is of softwoods, which, although they may still present difficulties of a chemical nature in present processes of manufacture, have nevertheless the physical properties of the fibre which admirably adapt them to use for pulp manufacture; also, they possess properties which simplify their transportation by water. Moreover, with the development of more intensive and more conservative methods of logging, large quantities of material which are now wasted may be brought to use in either one of the two branches of the industry.

For the foregoing reasons it must be borne in mind that the following observations regarding pulpwood supplies relate only to species now used, and commonly considered as pulpwood on this continent; therefore, it must not be inferred that the pulpwood resources of this province are permanently limited to the amounts of the species treated with.

As stated in Chapter I, there is in this province no distinction, as between sawlogs and pulp logs, based upon size. In Eastern Canada, pulpwood invariably includes logs of smaller sizes; but in British Columbia, large logs are used for the manufacture of both lumber and pulp. Upon inspection of logs lying in the water at any British Columbia pulp mill, one would fail to determine the use for which they were intended, except by their very presence in the vicinity of a pulp mill; the kinds of logs in a boom or raft might offer some suggestion, but the size of them would not do so. Two conditions give rise to this situation; first, the presence of abundant supplies of large logs; second, in many cases logs are towed for long distances, sometimes in rough water, which prevents their being handled in the small sizes customary in eastern Canada. Except as to species, therefore (and the species consumed in pulp manufacture are by no means limited to that use) the same classes of material are used in both industries. Pulpwood in four-foot lengths was reported in this province for the first time in 1923, and this was an isolated instance of special material, cottonwood, cut in the Fraser valley for export to American mills.

It is perhaps desirable at this stage, also, to refer to the fact that in addition to the distinction of ownership, as between public and private lands, we

have both federal and provincial control of public lands. While the greater part of the area is under provincial control, the "Railway Belt," embracing a strip forty miles wide, from the summit of the Rockies westward; the "Peace River Block"; and the "Coal Lands" of the Crowsnest District,—aggregating in all, some 22,700 square miles—are controlled by the federal government. Through the ensuing pages, the province as a whole will be dealt with, and, whenever necessary, reference to federal control will be made.

SECTION 1.—TOTAL PULPWOOD RESOURCES

The province has a total land area of 353,416 square miles. Although characteristically a timber region, there is included within the provincial boundaries a large area of rocky barren and waste lands which are unproductive even of timber. The extent of agricultural lands is limited, embracing some 20,700 square miles, approximately 5.9 per cent, of the land area. The total forest, 149,334 square miles, comprises about 42.2 per cent of the land area. Of this 28,215 square miles, approximately 19 per cent, is classified as merchantable and accessible forest. It should be observed, however, that in British Columbia, while a forest tract might not be accessible under methods used in that province, it may still carry a stand of timber which might be susceptible of operation under methods used elsewhere; this accounts for the relatively small area classified as "merchantable." Notwithstanding this fact, the exceedingly rugged topographic features render inaccessible, under any known method of logging, a considerable part of the forest land which might otherwise be considered merchantable.

The total stand of spruce, hemlock, balsam, jackpine and poplar, is estimated at 295,058,000 cords. As indicated in Table I, spruce (which includes the *Sitka*, of the Coast, and *Engelmann*, of the higher altitudes) is present to the extent of 111.4 million cords; hemlock (a species entirely distinct from, and superior to, the eastern hemlock) to the amount of 101.1 million cords; balsam (in which are included species of the genus Abies, the more important being commonly known as "white fir") 50.86 million cords; jackpine or lodgepole pine, 28.57 million cords; and poplar, including cottonwood, 30.57 million cords. These figures, however, include large amounts both of inaccessible and scattered timber; that portion of the total stand which may be considered susceptible of commercial exploitation, now or within reasonable time, amounts to some 135 million cords.

So far, jackpine has not been used in British Columbia for the manufacture of pulp, and the use of poplar in this direction has also been exceedingly limited; as a matter of fact, cedar and Douglas fir have been used to a greater extent than has been the case with the other two. The main species used in pulp manufacture in British Columbia, however, are spruce, hemlock and balsam (white fir), more particularly the first two.

Of the 135 million cords of accessible and merchantable material of the five species, about 125 million cords cover the available spruce, hemlock and balsam. Unless and until larger quantities of other species are used, it is from this stand that supplies for the pulp mills of the province will mainly be drawn. It may here be pointed out that, although the use of Douglas fir in pulp operations has so far been confined to a comparatively small amount of kraft, it has been very successfully used in that direction. Greater development of that phase of the industry, and the use of Douglas fir therein, would bring the stand of this species amounting to over 100 million cords into consideration as potential supplies. Such a development may also bring to use large quantities of sawmill waste of this species.

SECTION 2—PULPWOOD UNDER EXCLUSIVE GOVERNMENTAL CONTROL

That part of the forest area of British Columbia which has so far not been subjected to any form of alienation, approximates 134,257 square miles,—almost 90 per cent of the total. As is the case in all provinces, however, the unalienated area cannot of itself be taken as indication of the proportion of accessible timber remaining in the Crown. Although both the federal and provincial governments still retain full title to much valuable timber, the more accessible stands have in past years been sought out by those engaged in timber operations, and secured under one form of tenure or another. That this is the case is clearly shown in Table I,—the aggregate for pulpwood species on leased and private lands being materially greater than that on the unalienated area.

Nevertheless, the total unalienated stand of the five kinds is about 126·5 million cords, of which spruce, hemlock and balsam approximate 104·85 million. Of the latter, probably less than 25 million cords may be considered accessible and merchantable. This amount, however, is not available to present pulpmills; the supposition is made that ultimately, additional mills will be constructed at advantageous points, in the interior as well as on the Coast, to take advantag of the existing supplies.

In view of the fact that both the provincial and federal governments nov follow exclusively the practice of leasing or licensing timber areas, rather tha disposing of them in fee simple, the question of export is thoroughly controllab under manufacturing conditions applicable to timber lands held under su forms of tenure.

SECTION 3—PULPWOOD UNDER REGULATIVE GOVERNMENTAL CONTROL

An area of some 12,077 square miles, comprising 8 per cent of the total forest area, has been disposed of under the various systems of leases and licenses applied by the federal and provincial governments. It is such lands that include the greater part of the really merchantable timber in British Columbia to-day. The total pulpwood stand of the five species is approximately 149 million cords, of which the three main kinds provide 140 million cords. Of the latter amount, probably 90 million cords may be considered as accessible and merchantable.

Legislation applying to timber lands under license and lease embraces serious restrictions as to export. On Dominion lands, it is required generally that all timber cut must be manufactured in Canada. There is a general ruling of the same character on provincial lands, but an exception is made, in that, under supervision of a log export committee, the home manufacturing requirement may be waived to permit the export of logs not marketable within the province. This subject will be dealt with more fully later; suffice it to say, here, that on all such lands, either one government or the other is in a position to fully prevent the export of unmanufactured timber if they are to do so.

SECTION 4—PULPWOOD ON PRIVATELY OWNED LANDS

The forest land which has been alienated outright amounts to about 3,000 square miles,—about 2 per cent of the total. This includes Crown grants of several classes, railway grants, and timber lands disposed of to settlers and others at various times during the history of the province. On such lands the total pulpwood stand of the five kinds is about 19·5 million cords, of which spruce, hemlock and balsam approximate 18·3 million cords. Of the latter, 12 million cords may be rated as accessible and merchantable.

Timber on privately owned land carries the privilege of export. By application of a tax on certain classes of crown grants, however,—which tax is almost entirely rebated if timber is manufactured locally—the province has, in effect, gone farther to encourage the local manufacture of privately owned timber than any other province in the Dominion. As implied above, however, this does not apply to all private timber, as there are certain classes of grants to which the tax could not legally be applied. Although there is undoubtedly a tendency to restrict by this means the export of privately owned timber, large quantities of unmanufactured logs are exported; in other words, while the method is a deterrent, it certainly has not the effect of preventing exports.

Of the 3,000 square miles of timber land in private ownership, approximately 1,350 square miles, or 45 per cent, is in the form familiarly known as "crown grants". The balance comprises large grants to railways, and lands disposed of in small parcels to settlers and others. Of the crown grants, some 83 per cent (1,124 square miles) is held by companies and corporations, and 17 per cent (226 square miles) by individuals. It has not been feasible to determine accurately the extent to which private holdings are controlled by Canadian or foreign interests. It is apparent from records of ownership, however, that at least 37 per cent of crown granted timberland is directly under foreign control, and undoubtedly a considerable additional area stands in the name of companies which although operating under Canadian charter, are controlled by foreign capital.

SECTION 5—SUMMARY RE GOVERNMENTAL CONTROL OF EXPORTS

It has been explained that for unalienated and licensed timberlands under federal control in the Railway Belt, the privilege of export is not allowed; and that on provincial lands export is under control of the government through the aegis of the Log Export Committee. It is perhaps fitting, at this stage, that the purposes and operation of this organization should be explained.

Section 103B of the British Columbia Forest Act provides that under the authority of the Lieutenant Governor in Council, the requirements of the Act as to local manufacture of crown land timber may be waived, when the public interest demands such action. Now, in the Coast district of this province, the logging and manufacturing phases of the timber industry are to all practical purposes distinct one from the other, and, as a general rule, they are carried on by different operators; that is, to a greater extent logging is carried on as an entirely separate business, and the logs sold to the mills for manufacture. It is true that in some cases large manufacturers also carry on logging operations, but even such companies generally purchase a part of their logs; in the main, therefore, logging and manufacturing are two separate industries. Obviously, under these circumstances, there is some difficulty in maintaining equilibrium between the supply and demand for logs. If the logging interests fail to harvest an adequate supply of logs, the manufacturers are without sufficient raw materials; if the loggers exceed the requirements of the manufacturers, there becomes a surplus which reacts to the disadvantage of the logging interests, for naturally the manufacturers will not buy in excess of their requirements.

From an economic standpoint, it is essential that the mills be kept supplied with all the raw materials necessary to supply the market demands for manufactured lumber and other forest products. In other words, the conditions of the industry induce a tendency to over-production of logs. Unfortunately it is not feasible to hold over until another year a surplus of logs which may have developed during the previous season, on account of the activities of a marine borer, the teredo, which causes great damage to logs

held in salt water for more than a few months. Furthermore, the lumber industry in British Columbia has been developed largely on the basis of foreign trade. The demand of such markets is for the better grade of lumber. This in itself tends to restrict manufacture in British Columbia mills to the better grade logs. Local markets in the province cannot absorb all the products of the low grade logs; markets further east in Canada can in the main only be supplied by rail shipment, and expensive carrying charges tend to restrict such shipments to the better grades. Therefore, in addition to the accumulation of surplus logs through over-production on the part of the loggers, there is an accumulation of logs containing low grade material for which there is considerable difficulty in securing markets.

Shortly after the outbreak of the war in 1914, and due to curtailment in manufacturing operations, there was an abnormal surplus of logs. To meet the situation the provincial government, by order-in-council, waived the embargo, and to provide for control of exports, afterward established the Log Export Committee, which includes three representatives of the logging interests, three representatives from different branches of the manufacturing interests, and representatives of the provincial forest service. Any operator having logs, which he avers to be unsaleable in British Columbia, is required to substantiate his claims before this Committee. The manufacturing representatives, fully cognizant of local market requirements, may demonstrate to the committee the existence of any local demand, in which case export is not allowed; on the other hand, the loggers have the opportunity to prove their efforts at sale within the province. Upon recommendation of this committee the granting of actual permission for export rests with the government.

It is upon the basis of the arrangement just described that the province controls the exportation of logs cut from Crown lands. Details as to the amount of export so permitted will be given in the ensuing section, which deals with timber consumption in the province.

In conclusion, it may be stated, that while manufacturing restrictions on crown land timber have in many instances been waived, the Provincial Government, as well as the Federal Government, has the right at any time to prevent the export of unmanufactured timber cut from Crown lands. Computation, based upon the figures for the five species under consideration as pulpwood, indicate that the two governments may control, in this manner, over 93 per cent of the total stand in the province; and of the accessible quantities of the three main pulpwood species, spruce, hemlock and balsam, 92 per cent is fully subject to such regulation.

SECTION 6.—THE CONSUMPTION OF TIMBER IN BRITISH COLUMBIA

One of the outstanding features of the forests of British Columbia is the prevalence of softwood or coniferous species. Nowhere else in Canada is the number of softwood species so large, nor the development of individual species so great. The total stand is estimated to be 350 billion feet, board measure. Including the smaller sizes which ordinarily are not used for sawmill purposes, the total stand of spruce, hemlock and balsam is 263.4 million cords. Of this amount, as previously intimated, 125 million cords may be considered available.

Table IX indicates the amounts of pulpwood of various kinds which were consumed in the pulp mills of the province during the decade 1913 to 1922. As compared to figures for other provinces, the most noticeable feature of the table is that the consumption of hemlock is more than one-third greater than that of spruce. Together, these two have supplied nearly 88 per cent of the pulpwood used. Balsam (most of which is white fir) supplied nearly 9 per cent; while the

balance was of poplar cedar Douglas fir and miscellaneous species. The three main species therefore supplied nearly 97 per cent. Pulp manufacturing is a comparatively recent development in British Columbia and figures for the years 1913 to 1920 depict almost constant increase in consumption. In 1921 the slump, which affected the industry throughout Canada, had a similar effect in this province. The year 1922, however, showed partial recovery. It is at once evident that, although the average annual consumption of wood by the industry was 176,317 cords, this figure cannot be taken as an accurate gauge of yearly use. The average for the past five years, approximately 253,000 cords, more adequately represents the situation. Even this figure is merely of temporary use, for greater development is to be expected.

TABLE IX.—LOCAL CONSUMPTION OF WOODS FOR PULP MANUFACTURE—BRITISH COLUMBIA

Cords

Year	Spruce	Hemlock	Balsam	Poplar	Miscellaneous	Total
1913	39,742	44,431	.....	.....	.....	84,173
1914	21,637	39,772	18,604	.....	.....	80,013
1915	34,526	53,009	3,000	.....	.....	90,535
1916	33,433	65,529	8,571	1,464	.....	108,997
1917	66,925	60,702	.....	363	6,824	134,814
1918	104,258	81,912	30,227	2,377	.....	218,774
1919	117,747	112,664	9,691	507	9,749	250,358
1920	99,772	159,513	17,777	561	17,994	295,617
1921	75,451	114,037	33,114	364	2,274	225,240
1922	70,136	155,487	35,843	454	12,729	274,649
Total	663,627	887,056	156,827	6,090	49,570	1,763,170

Note.—Included under "Miscellaneous" are the amounts of cedar, Douglas fir and other species used.

TABLE IXa.—SPRUCE, HEMLOCK AND BALSAM MANUFACTURED INTO LUMBER—BRITISH COLUMBIA

M Board Feet

Year	Spruce	Hemlock	Balsam	Total
1913	62,302	39,052	15,255	116,609
1914	73,712	31,116	13,701	118,529
1915	56,360	24,959	3,276	84,595
1916	49,077	28,051	1,266	78,394
1917	95,899	53,936	29,557	179,392
1918	109,944	55,111	12,172	177,227
1919	93,958	59,512	8,291	161,761
1920	132,096	87,227	11,384	230,707
1921	66,509	72,032	3,795	142,336
1922	81,696	68,016	19,876	169,588
Total	821,553	519,012	118,572	1,459,138

Note.—Complete figures for lumber production from all species will be found in Table IXe.

TABLE IXa.—AMOUNT OF SPRUCE, HEMLOCK AND BALSAM CONSUMED IN MANUFACTURE OF LUMBER AND PULP—BRITISH COLUMBIA

Expressed in Cords

Year	Spruce	Hemlock	Balsam	Total
1913	164,346	122,535	30,510	317,391
1914	159,061	102,004	46,006	317,071
1915	147,246	102,927	9,552	259,725
1916	131,587	121,631	11,103	264,321
1917	258,723	168,574	59,114	486,411
1918	324,146	192,134	54,571	570,851
1919	305,663	231,688	26,273	563,624
1920	363,964	333,967	40,545	738,476
1921	208,469	258,101	40,704	507,274
1922	233,528	291,519	75,595	600,642
Total	2,306,733	1,925,080	393,973	4,625,786
Average	230,673	192,508	39,397	462,578

Table IXa shows the amounts of the three main pulpwood species which were manufactured into lumber. For this purpose, spruce was used to a considerably greater extent than hemlock, although the latter half of the decade shows a tendency to increased use of the latter wood; balsam, on the other hand, shows no material tendency in this direction. For all three species, the table shows increasing use. The average for the latter half of the decade, approximately 176 million feet, is materially higher than the average for the decade, and very much greater than the average for the first half.

In Table IXb will be found combined figures for consumption in lumber and pulp. Having already indicated from the previous tables that the tendency is toward increased consumption of the species in both pulp and lumber manufacture, this fact is very thoroughly substantiated in Table IXb. Whereas, the average for the decade was 462,578 cords, that for the last five years was approximately 596,200 cords. It is therefor quite clear that in considering consumption of these species the round figure of 600,000 cords may be taken as a fair average of present use.

EXPORTS

The methods under which the export of timber is permitted from provincial lands has already been described. The lack of any satisfactory means of distinction between logs for lumber and pulp manufacture, respectively, previously referred to, renders very difficult indeed, if not impossible, the tabulation of pulpwood exports from this province. True, the customs figures for ports of exit, where shipment is by rail, indicate in a measure the extent of the business in the interior, but to a much greater extent pulpwood logs cross to the United States by water, being towed in booms or rafts, and in the same tow there may be timber destined for use in both industries. It is however, well established that pulpwood so exported is confined to the three species, spruce, hemlock and balsam. Therefore, the figures for total exports of these species obviously would constitute the maximum quantity of Canadian wood which could have been used by foreign pulp mills to which British Columbia timber is accessible. The difficulty in closer determination, is, however, that all of the exports of these species are not used for this purpose.

It is nevertheless necessary to study the extent to which these exports participate in the total consumption of the pulpwood species. Accordingly, Table IXc is presented herewith, giving the exports of spruce, hemlock and balsam over the decade 1914-1923.

TABLE IXc.—EXPORTS OF SPRUCE, HEMLOCK AND BALSAM—BRITISH COLUMBIA

Expressed in Cords

Year	Spruce	Hemlock	Balsam	Total
1914	11,047	3,833	37	14,917
1915	13,489	18,300	4,313	36,102
1916	1,233	2,290	224	3,747
1917	2,133	8,184	1,596	11,913
1918	13	5,461	37	5,511
1919	831	17,721	1,499	20,051
1920	657	4,120	256	5,033
1921	9,003	18,510	1,586	29,099
1922	10,990	43,996	3,407	58,393
1923	16,509	58,253	9,841	84,603
Total	65,905	180,668	22,796	269,369
Average	6,590	18,067	2,280	26,937
Average last 5 years	7,598	29,520	3,318	39,436

Review of these figures indicates that, while the average annual exports for the decade have been—spruce, 6,590 cords; hemlock, 18,067 cords; and balsam, 2,280 cords; the general tendency has been toward increase. The last five years therefore offer the better basis of averages. As shown in the table these are,—spruce, 7,598 cords (19.3 per cent); hemlock, 28,520 cords (72.3 per cent); and balsam 3,318 cords (8.4 per cent). It is at once evident that the proportion of hemlock in total exports of the three species has increased materially.

It is also of interest to note the source of these exports. From the records it has been determined that 31 per cent of total exports of these species has come from crown lands, the balance being cut from private holdings. Referring now to the amounts of the individual species, 17.8 per cent of the spruce exported came from crown lands; also, 35.2 per cent of the hemlock, and 57.6 per cent of the balsam were so derived.

The much smaller actual quantities, and the lower percentage from crown lands, of spruce permitted to be exported, are explained by the fact that this wood finds a ready market in Canada. Most of it is of the species Sitka, the finest of all the spruces, very highly prized for some special lines of manufacture, and also very desirable for pulp manufacture. Hemlock, also, is used extensively in pulp and lumber manufacture in Canada, but at times when logs of the several species are plentiful, those of hemlock tend to become a drug on the market, and there consequently arises an insistent demand for export privileges. Balsam, consisting essentially of white fir, an excellent pulpwood, is inferior for lumber manufacture, and when logs of this species are not so located as to be absorbed by the local pulp mills, export privileges are sought.

While not essential to the subject of this report, it is perhaps appropriate, in order to obtain a true perspective, that mention should be made of the extent of exports of other species. For the decade, total exports of all species, for both pulp and lumber, reached nearly 836 million feet, board measure. Cedar heads the list, with upwards of 442.3 million,—well over half of the total. To a greater extent the clear cedar is manufactured in this country, being sawn into shingles and high grade lumber; and the inferior logs exported to the United States and Japan. Douglas fir logs were exported to the extent of 187.1 million feet. There then follow, in order of quantities exported, hemlock, with 122.4 million; spruce, 46.1 million; pine, 7.7 million; balsam, 4.6 million; and some 25.6 million of miscellaneous species not included in the foregoing. It is therefore apparent that nearly 80 per cent of the log exports is of species other than those used in pulp manufacture.

Another feature of the records is that, of total exports approaching 836 million feet, approximately 42.5 per cent originated on provincial crown lands. This high percentage is in a measure accounted for by heavy exports in 1915, in which year the accumulated surplus of logs was disposed of by this means. Although exports of crown land timber in 1922 and 1923 was greater than in any other year of the decade except 1915, the average annual exports of this class of timber, for the last five years, were considerably less than the average during the first half of the decade. The records also show that the ratio of crown land timber exported, to that exported from private lands, was much smaller during the last half of the decade than during the first five years; in fact, during the first five years, crown land timber comprised 74 per cent of total exports, whereas, during the last five years, they were but 26 per cent.

SUMMARY OF TOTAL CONSUMPTION

In dealing with other provinces, and before attempting summation of consumption of pulp woods, it was necessary to refer to numerous uses, other than pulp and lumber manufacture, for which the pulpwood species are consumed. This is not necessary in British Columbia, for, almost if not entirely, the wood for fuel, construction, ties and pit props is supplied from other species. Consequently, consumption of spruce, hemlock and balsam is almost entirely confined to lumber and pulp manufacture and to exports. Apparently, therefore, the total annual drain on the supplies of these species approximates 639,500 cords, which is drawn from the available supply of 125 million cords.

SECTION 7.—THE EXTENT OF THE PULP AND SAWMILL INDUSTRIES

It is not proposed to deal at length with this subject; obviously a detailed discussion of the sawmill industry would entail treatment beyond the scope of the report. It is desirable, however, that a few observations should be made in this connection, in order that the relation of wood manufacturing operations to timber supplies may be apprehended.

The pulp industry is comparatively new to the Pacific Coast, and was undoubtedly attracted there by the large supplies of cheap raw material available. As with large-scale lumbering operations, so with pulp manufacturing, particularly in the United States there has been a tendency to migrate westward. So long as the supplies of raw materials in Ontario and Quebec hold out, it is doubtful that a similar situation will arise in Canada; but, without question, if the supplies of those provinces are not conserved, the experience of our neighbours to the south will be repeated in Canada.

The figures for pulp production in Table IXd show almost constant development over the decade. As yet, the industry is confined to the Coast where supplies are more plentiful, more concentrated, and where shipping facilities are of the best. The province ranks third in pulp production, furnishing, in 1922, 9.2 per cent of the total for Canada. Groundwood constitutes over half of the pulp, and newsprint over 95 per cent of paper products manufactured in the province. Although in Ontario, the relative proportion of pulp manufactured into final paper products is much greater than is the case in British Columbia, the latter province completes the manufacturing cycle to a relatively greater extent than is the case in Quebec.

Figures for the lumber manufacturing industry are set forth in Table IXe. It may be stated that in 1908, lumber manufacture approximated 650 million feet. Rapid advance in production was then experienced, reaching a preliminary peak in 1911, with about 1,340 million. There then followed, until and including 1916, a falling-off in output, and production was relatively

low. A sharp increase occurred in 1917, in which year British Columbia finally took lead of all other provinces in lumber production. The province also led in 1914, but her position then was of a temporary character, as Ontario regained and retained the premier position through 1915 and 1916. The year 1917 seems to have been the definite turning point, however, and it seems entirely improbable that, in the occupancy of first place in lumber production, British Columbia will again be superseded. The absolute peak in production occurred in 1920, when the very large output of 1,443 million feet was attained. This was followed by a sharp decline in 1921, and partial recovery in 1922.

TABLE IXD.—PULP AND PAPER INDUSTRY—BRITISH COLUMBIA

Year	Pulp Production					Paper Production		
	Ground-wood	Sulphite, bleached	Sulphite, Un-bleached	Sulphate	Total	Newsprint	Wrapping	Total
	Tons	Tons		Tons	Tons	Tons	Tons	Tons
1913	38,535	22,819		.....	61,354	.....	.....	.....
1914	32,692	23,660		.....	56,352	.....	.....	.....
1915	41,111	24,712		.....	65,823	.....	.....	.....
1916	48,313	30,342		.....	78,655	.....	.....	.....
1917	65,620	43,392		2,863	111,875	76,077	2,927	79,004
1918	91,588	66,329		15,244	173,161	113,142	9,374	122,516
1919	99,767	11,518	73,369	9,472	194,126	125,904	9,406	135,310
1920	108,774	14,160	78,306	17,242	218,482	136,568	10,721	147,289
1921	89,348	17,273	51,544	6,888	165,053	92,594	5,407	98,001
1922	100,483	24,077	63,997	9,869	198,426	124,555	6,045	130,600
Total	716,231	211,254 67,028	267,216	61,578	1,323,307	668,840	43,880	712,720

In contradistinction to conditions in all other provinces except Ontario, the pulpwood species—spruce, hemlock and balsam—have in British Columbia furnished but a small part of the lumber sawn. While the tendency is toward increased use of spruce and hemlock for this purpose, in the peak year, 1920, they furnished only 15 per cent of the total lumber manufactured. Balsam (white fir) is relatively unimportant in lumber production. Far in the lead of all species, is Douglas fir, the mainstay of the lumber industry of the Pacific Coast. In British Columbia, this species occupies a position comparable to that previously held in Ontario by white pine. Although the production of Douglas fir in British Columbia has never attained a figure equal to that of spruce for all Canada, it has during the past few years been creeping upward, and possibly the time is not far distant when it will exceed the amount of spruce cut in the entire Dominion. White pine, it surpassed in production several years ago, and, although essentially confined to one province of the Dominion, while other species prevail in several, Douglas fir occupies second place in total production, with enormous cuts each year. The stand of this species is still very large, and it is not to be anticipated that even continued heavy consumption will witness substitution of Douglas fir by other species.

TABLE IXB—BRITISH COLUMBIA LUMBER PRODUCTION 1913-1922 INCLUSIVE BY KINDS OF WOOD, QUANTITY CUT AND VALUE

Kinds of Wood	1913		1914		1915		1916		1917	
	M. Ft. B.M.	Value	M. Ft. B.M.	Value	M. Ft. B.M.	Value	M. Ft. B.M.	Value	M. Ft. B.M.	Value
		$		$		$		$		$
Douglas Fir	792,852	10,895,007	601,412	6,806,650	453,415	5,332,108	574,382	8,067,168	704,352	12,490,192
Larch	86,062	1,182,014	59,029	685,290	28,023	362,089	36,651	575,037	45,050	811,483
Cedar	82,627	1,210,276	93,970	967,592	54,666	981,000	78,935	1,490,685	121,723	2,290,226
Spruce	62,302	960,934	73,712	887,566	56,360	766,353	49,077	719,687	95,899	1,692,657
Yellow Pine	58,939	874,014	34,616	463,525	35,166	457,758	92,698	1,455,396	75,102	1,726,113
Hemlock	39,052	549,062	31,116	342,531	24,959	285,637	28,051	392,674	53,936	1,038,986
White Pine	29,783	429,224	14,765	211,443	7,664	118,881	5,021	81,048	20,473	418,710
Balsam Fir	15,255	227,012	13,701	172,909	3,276	27,122	1,266	17,046	29,557	606,049
Jack Pine	4,306	61,522	7,041	88,084	4,207	56,698	7,242	102,758	1,721	31,540
Poplar (Cottonwood)	2,381	38,069	7,149	95,728	1,110	10,948	2,336	28,240	1,825	22,925
Birch	62	804	22	440	50	2,000	.....	.....	12,365	253,355
Maple	26	280	54	2,101	40	800	7	79	10	200
Yellow Cypress	.....	.....	19	475	880	12,833	271	2,893	46	698
Red Alder	.....	.....	6	90	.....	.....	.....	.....	5	100
Other Kinds	.....	.....	.....	.....	.....	.....	.....	.....	32,781	617,131
Custom Sawing	.....	.....	.....	.....	.....	.....	.....	.....	5,699	108,936
Totals	1,173,647	16,428,218	936,612	10,724,424	669,816	8,414,227	875,937	12,932,711	1,200,544	22,109,301

Kinds of Wood	1918		1919		1920		1921		1922	
	M. Ft. B.M.	Value	M. Ft. B.M.	Value	M. Ft. B.M.	Value	M. Ft. B.M.	Value	M. Ft. B.M.	Value
		$		$		$		$		$
Douglas Fir	714,018	17,299,290	817,591	22,395,242	901,915	34,412,916	680,845	16,613,882	820,724	18,778,646
Larch	69,768	1,745,788	112,230	308,602	49,222	1,891,524	32,992	764,122	26,374	539,641
Cedar	91,266	2,333,740	79,334	2,551,461	144,173	5,241,327	83,473	2,439,384	90,170	2,947,097
Spruce	109,944	3,044,708	93,958	2,679,746	132,096	5,185,209	66,509	1,674,355	81,696	2,023,901
Yellow Pine	64,706	1,424,727	37,776	1,081,287	80,578	2,899,820	40,020	1,001,493	30,708	715,405
Hemlock	55,111	1,338,766	59,512	1,535,745	87,227	2,911,032	72,032	1,850,168	68,016	1,576,721
White Pine	6,280	161,829	8,847	216,187	20,100	740,912	12,305	333,637	15,671	445,837
Balsam Fir	12,172	256,655	8,291	200,129	11,384	434,918	3,795	77,631	19,876	423,466
Jack Pine	925	19,115	11,834	332,823	13,637	557,640	2,629	66,038	4,305	112,388
Poplar (Cottonw'd)	1,060	23,766	524	15,113	1,328	55,761	1,164	32,028	86	1,652
Birch	40	674	15	700	24	855	80	2,208	90	2,707
Maple	21	339	12	460	801	31,025	28	616	43	1,061
Yellow Cypress	7,114	163,266	10	400	.....	.....	.....	.....	42	1,260
Red Alder	5	87	7	295	35	1,220	9	207	20	360
Other Kinds	23,984	514,657	20,225	568,068	750	30,000	.....	.....	33	1,000
Custom Sawing	1,222	23,800	14,174	329,666	*	*	385	11,552	.....	.....
Totals	1,157,636	28,351,207	1,164,340	32,215,924	1,443,270	54,394,069	996,266	24,867,321	1,157,854	27,571,142

SHINGLE PRODUCTION IN BRITISH COLUMBIA 1913—1922

Year	Quantity M. Pcs.	Value
		$
1913	643,484	1,204,713
1914	1,060,272	2,054,632
1915	1,894,642	3,231,508
1916	2,009,798	4,019,197
1917	2,390,402	6,606,875
1918	2,162,184	6,641,174
1919	2,150,790	10,363,379
1920	2,135,857	11,190,999
1921	2,374,251	8,516,512
1922	1,826,329	8,120,921
Total	18,648,009	61,949,910

LATH PRODUCTION OF BRITISH COLUMBIA 1913—1922

Year	Quantity M. Pcs.	Value
		$
1913	108,859	163,688
1914	59,140	115,024
1915	46,345	78,201
1916	45,729	96,900
1917	42,679	116,557
1918	49,741	179,041
1919	45,748	203,298
1920	107,224	733,119
1921	104,420	716,765
1922	90,459	499,240
Total	700,344	2,901,833

SECTION 8—THE TREND OF PULPWOOD BUSINESS IN BRITISH COLUMBIA

Perhaps the outstanding feature of pulpwood operations in this province is the insignificant amount taken out by farmers and settlers. For the entire Dominion, 1920 Census figures showed a total farmers' production of this commodity amounting to 1,178,019 cords, practically all of which was cut in the provinces from Manitoba eastward. British Columbia farmers participated only to the extent of some 1,300 cords. The reason is readily found, however, in the absolutely different character which pulpwood operations assume in British Columbia, as compared to those of eastern Canada. Firstly, the few existing mills are not so situated as to permit of farmers participating in the supply, timber usually being available at closer range; secondly, the class of timber used is of such large size, and consequently so difficult to operate, that the business of logging entails capital expenditure and logging experience far beyond the possibilities of the average farmer; finally, the farming population within reach of the mills is so limited, that the mills could not depend upon them as an essential or regular source of supply. In eastern Canada, a farmer, with the help of his team and a few ordinary tools, may without difficulty get out a considerable quantity of wood; on the Coast, for the class of pulpwood used, many thousands of dollars must be invested in equipment before a timber area may be successfully logged.

For the foregoing reasons there has been little development in farmer pulpwood operations. Within the past year or so, however, a few small operators have commenced the cutting of four foot wood in the Fraser Valley. The district contains large quantities of cottonwood which are an obstruction to cultivation. A market for this material having developed in the neighbouring State of Washington, a number of farmers are taking advantage of it, and through the medium of brokers are disposing of quantities, so far not exceeding nine or ten thousand cords in all.

So long as pulp manufacture is confined to the Coast, and pulpwood operations to the heavy stands which prevail there, the cutting of pulpwood by farmers must remain of small proportions. With the establishment of mills in the interior, however, operating in lighter stands of timber, and using smaller wood, it is altogether probable that the farmer with wood to dispose of may find a market for it. Until then, the business cannot develop except for what opportunities may offer through export to neighbouring states. In the Nelson and Cranbrook districts of southern British Columbia small quantities of pulpwood, aggregating possibly 11,000 or 12,000 cords, are cut and exported,—to a greater extent by those engaged in pole and tie operations, however, rather than by farmers.

Records for the six year period 1917 to 1922 show that the pulp mills of British Columbia purchased over 39 per cent of the pulpwood required for their operations. Notwithstanding the segregation of logging and manufacturing, in two distinct industries, the investments in a pulp mill are so heavy, that it is necessary to protect the wood requirements by the acquirement of timber lands. From such lands, the mills have secured the balance of the wood required for their purposes. As previously inferred, the purchased wood is secured from loggers, either in the open market or by contract. Frequently, also, limits held by a pulp company are operated under contract with logging companies.

From the standpoint of exports, it is difficult to anticipate future developments. It has already been shown that over the decade there have been considerable exports of pulpwood species, but these in no manner approach the large quantities exported from individual provinces in the east. There is statutory authority for continuing exports of provincial crown land timber, under special permit, until 1930, in which year further amendment to the Forest Act would be required if the practice is to continue.

It is also impossible to gauge probable future progress of the pulp and paper industry. For several years past, developments have been expected both in the southern and the northern interior, but as yet no mills have been established. The abundance of raw materials, however, and the interest from time to time displayed in the possibilities of different sites, may surely be taken to augur that the industry is destined for material expansion in British Columbia.

SECTION 9—SUMMARY OF SITUATION: DURATION OF SUPPLIES

From figures presented in discussion of the pulpwood resources of the province, it is evident that the supplies available are quite adequate to sustain all forms of industry as developed up to the present time. Indeed, there is manifestly room for material expansion whenever market conditions may justify such action. Having frankly conceded apparent adequacy in supplies, however, it is necessary to allude to certain factors which may militate against development of the timber industry to the extent predestined by the rather bounteous provisions of nature.

Although she is now successfully competing in world markets, British Columbia is rather isolated, topographically, from the rest of the Dominion. The Rocky Mountain system offers a barrier to transportation by rail which can be surmounted only by the payment of expensive rail charges. Looking in other directions, and with the exception of neighbouring states, the province is separated from the rest of the world by the Pacific. On both sides, she is confronted with transportation charges upon her products which have in some manner to be overcome. Had these transportation difficulties not existed, however, there is at least some doubt that industries would have been developed to the degree in which they now exist; the very isolation of British Columbia resources —if they were to be brought under exploitation—necessitated the influx of capital, in order that the handicap of excessive transportation charges might be reduced to the lowest possible minimum, namely, by the local manufacture of raw materials. The one thing which has served to attract the very necessary capital has been the abundance and general high quality of British Columbia timber; a coniferous forest, equalled nowhere in the world except in the adjoining States, offered the incentive to outside capital, and by large-scale production of high class products, the handicaps of distance have in a measure been overcome.

It is rather evident that prosperity of the timber industry, and of the province, is, in the first place, largely dependent upon the maintenance of the advantage she now holds by virtue of abundant supplies of high grade material; secondly, upon the home manufacture of raw materials. Even with the exhaustion of present remarkable stands of timber, the province enjoys an additional advantage in the almost ideal conditions for the rapid growth of timber. All of these advantages, however, are such that, if they are to continue in their beneficial effect, they must be given adequate protection.

Remove, for the moment, from British Columbia, the huge timber; remove, the excellent growth conditions which obtain,—and British Columbia would stand precisely in the position of many other timber depleted countries or regions, *plus* transportation charges which would render impossible her competing with the outside world. If this be true in the extreme hypothesis, it is proportionately so in less extreme application; conversely, everything which can be done to protect and conserve the remnants of the centuries-old timber stand, and everything which may be done to encourage and protect the remarkable powers of reproduction and growth which the species and the climate of the province induce, will abundantly contribute to the ability of industry to overcome all of the disadvantages of high transportation costs which her products must inevitably bear.

So far as pulpwood species are concerned, the division of total available stand by the amount of annual consumption would indicate supplies, on the present scale of production, for a period of 195 years.

By reason of the complex nature of the forest, and in the lack of facts regarding growth it is difficult to estimate the annual growth in pulpwood species. For the whole forest area, however, a rough estimate of the balance between annual increment and depletion by fire and other losses was published by the Forest Branch of the Province in 1923. This estimate is admittedly based upon entirely inadequate data, and must therefore be accepted in that light. On the entire forest area gross annual increment is set at 796,500,000 cubic feet. Against this, the losses by fire, decay, waste, etc., are set at 352,000,000 cubic feet; leaving a net annual increment of 444,500,000 cubic feet. At the same time, the figure for total annual consumption of wood for all purposes, being the average for 1920, 1921 and 1922, is about 2,140 million feet, board measure, which is equivalent to approximately 468 million cubic feet of standing timber.

The foregoing figures would indicate that the aggregate of consumption, and depletion by other factors, is fairly close to the amount of annual growth. It may be pointed out that to a great extent the annual cut is made in fully matured stands where there is no increment previous to cutting; and where, after cutting, there may be material increase in increment. They illustrate nevertheless that in this one province, there probably is not a negative balance, as between gross depletion and gross annual growth, which condition prevails elsewhere throughout the Dominion.

It will be perceived that, under such conditions, whatever may be saved by the prevention of annual losses through fire, etc., will increase so much the amount of timber which might be used without disturbing the wood capital. In fact, it has been estimated that, if adequate fire protection be provided, the forests of the province can, under conservative exploitation, supply several times the present annual cut without seriously depleting the capital stock. The amount and effect of such losses are greatly increased by some of the more destructive and wasteful features of present-day methods of exploitation. So far as fire is concerned, and particularly on the Coast, the average menace is not unusually great. Other parts of the province do present fire problems of great difficulty, however.

The problem, therefore, which faces the province to-day, is not one of curtailment in production,—with the supplies available, such action would constitute hoarding, when the world demands timber; rather, the problem lies in the development toward increased use, but along lines and under methods which will insure perpetuation of the stand. The maintenance of advantage which the province enjoys in quantity, quality, and growth of timber—so essential to the overcoming of other disadvantages with which the industry is beset—demands the more careful and more complete use of timber which is harvested, and the protection of it, and of the young timber stands, from fire.

CHAPTER X—CANADA*

In the foregoing chapters the situation in the individual provinces has been discussed in some detail; and we are now in a position to deal in a practical manner with the question as it affects the Dominion as a whole.

From the data presented, it will be perceived that the country may be divided into four main regions, based upon the degree to which supplies are available and the extent to which the pulp industry has been developed:—(*a*) the Maritime Provinces, where the supplies available are very limited, and where the industry has not been developed to large proportions; (*b*) Quebec and Ontario, where supplies appear to be much more extensive, but where, also, the industry has developed to enormous proportions,—almost, it might be said, to

* Prince Edward Island, the Yukon, and the Territories are not included.

the maximum which will permit of permanence; (*c*) the Prairies, where supplies of spruce and balsam are not great, and where the industry has not yet become established; and (*d*) British Columbia, where abundant supplies are available, and where the industry, although certainly well established, has not nearly reached the maximum which the wood supplies make possible. This is, to be sure, rather arbitrary division, for except in the case of British Columbia there is perhaps a little liability to overlapping between regions; not so much, however, as might at first glance appear. The Prairies might to a limited extent serve to augment Ontario supplies, but the impending introduction of the industry to Manitoba renders this improbable. Obviously, the Maritime Provinces cannot supply Quebec or Ontario to any material extent; the reverse is more liable to be the case, and indeed, Quebec is already shipping some logs to New Brunswick. In the ensuing discussion, therefore, these broad regions will be kept in mind.

SECTION 1—DISTRIBUTION AND OWNERSHIP OF PULPWOOD RESOURCES

It is necessary to state here that, in summation of pulpwood resources, only the main species are dealt with. It has been clearly explained that the introduction of other species to extensive use in the industry would of itself greatly increase the supplies available; particularly is this the case in British Columbia.

The total land area of that portion of the Dominion under review is 2,174,520 square miles; of which 1,216,408 square miles, about 56 per cent, is forest. For comparative purposes it may be of interest to note here that the agricultural area amounts to 428,893 square miles, not quite 20 per cent of the land area. Of the whole forest area, a little better than 36 per cent is considered to be merchantable forest, the balance being either entirely inaccessible or too sparsely timbered to permit of successful operation now or within any reasonable time.

The total available stand of pulpwood species is estimated at 630 million cords, of which amount 436.2 million cords is spruce, balsam and hemlock. By regions and by ownership, the supplies are distributed approximately as indicated in Table X.

TABLE X—DISTRIBUTION AND OWNERSHIP OF AVAILABLE PULPWOOD—CANADA*

Millions of cords

Region	Entirely unalienated	Licensed or leased	Privately owned	Total
Maritime Provinces	0·30	15·70	30·60	46·60
Quebec and Ontario	56·50	132·00	27·00	215·50
Prairie Provinces	40·35	5·50	3·25	49·10**
British Columbia	24·00	90·00	11·00	125·00
Total	121·15	243·20	71·85	436·20
	27·8%	55·7%	16·5%	100%

*Prince Edward Island, the Yukon, and the Territories not included.
**Available only if the pulp industry becomes established locally.

Of the total quantity available 27.8 per cent still remains entirely in the Crown; 55.7 per cent has been leased or licensed, practically all of it under terms which permit the application of domestic manufacturing requirements. Of both licensed and unalienated timber almost 83 per cent may be subjected to

such restrictions if the respective governments so desire; most of it is already so restricted. The remaining 16.5 per cent is privately owned, and no restrictions in export have been applied, except in British Columbia where certain taxes, referred to in Chapter IX, have a tendency in that direction. It is perhaps well to point out that if *total* resources of the five species are taken, having no regard to the question of accessibility, the approximate percentage of unalienated timber is 61 per cent; licensed or leased, 31 per cent; and privately owned 8 per cent. The great difference between these percentages and their respective counterparts above, indicates clearly the extent to which the resources have been disposed of either under license or in fee simple.

To obviate possible misunderstanding of the general timber situation, it is advisable to emphasize that although Quebec and Ontario show a large stand of the pulpwood, as compared to British Columbia, it must not be inferred that the former provinces have a total timber stand in any way comparable to that in British Columbia. A mere glance at the saw timber figures in Table I will immediately remove any misapprehension in that direction; including both hardwoods and softwoods British Columbia has over 70 per cent of the merchantable saw timber in Canada to-day. So far as species at present utilized for pulp manufacture are concerned, however, the eastern provinces have the greater stand of pulpwood.

Very prominently featured in Table X is the great extent to which timber has been completely alienated in the Maritime Provinces; notwithstanding the relatively small amount of timber which they possess, they account for over 42 per cent of all the privately owned pulpwood in the Dominion, Nova Scotia exhibiting this feature to a greater extent than New Brunswick. Equally startling is the relatively insignificant reserve of unalienated timber held by the Maritime Provinces, as compared to the fair proportions in full control of the governments in other provinces.

As is the case in many industrial activities in Canada, foreign capital enters very strongly into the control of forest industries in many parts of the Dominion; particularly is this the case with large scale operations such as the pulp mill and sawmill properties. In the main, however, these industries are conducted by companies operating under Canadian charter.

So far as timber holdings are concerned, our main interest is to determine to what extent foreign control may tend to encourage exports of unmanufactured wood. It is already thoroughly established that unalienated and licensed timber, is in large measure, under restriction for exports, and we may therefore confine discussion to privately owned timber. Unfortunately no complete or accurate figures can be presented, but it has been determined that approximately 30 per cent of private holdings is directly controlled by foreign companies, corporations and individuals. This figure applies to areas, but for the purpose of very general conclusion it is permissible to apply it to timber quantities; on this basis it may be stated that some 21.5 million cords, or about one-half of one per cent, of the available pulpwood timber falls in this category. It is not to be hastily concluded that all of this timber is held exclusively for export purposes; a certain part of it is, and for the balance the general tendency is undoubtedly toward export. Such holdings are centered largely in the Maritime Provinces, in Quebec, and in British Columbia.

SECTION 2—REQUIREMENTS FOR MANUFACTURE IN CANADA

To summarize the situation throughout the Dominion, it may be stated that under legislation extant the available pulpwood of Canada is subject to restrictions, or available for export, as indicated in Table Xa.

TABLE Xa—LOCAL MANUFACTURING RESTRICTIONS VS. EXPORT PRIVILEGES—CANADA

Millions of cords

Region	Manufacturing restrictions	Export privileges	Total
Maritime Provinces	12·90	33·70	46·60
Quebec and Ontario	188·50	27·00	215·50
Prairie Provinces	45·85	3·25	49·10
British Columbia	114·00*	11·00**	125·00
Total	361·25 82·8%	74·95 17·2%	436·20 100%

*Under conditions described in Chapter IX, a certain amount of provincial Crown land timber is allowed to be exported under special permits.

**As described in Chapter IX, limited restriction is placed on some classes of privately owned timber; not, however, to a degree which prevents export.

SECTION 3.—DOMINION CONSUMPTION OF PULPWOOD

In treatment of the matter by individual provinces, in Chapters II to IX, a good idea has been given of the extent to which the pulpwood resources are called upon to supply the annual requirements of Canadian industries. In this instance there is nothing to be gained in a summing up by regions; of greater importance is a discussion of total consumption for the Dominion. Table Xb gives figures for pulpwood consumption of the various species for the decade 1913 to 1922.

TABLE Xb—WOOD CONSUMED IN CANADIAN PULPMILLS, 1913-1922

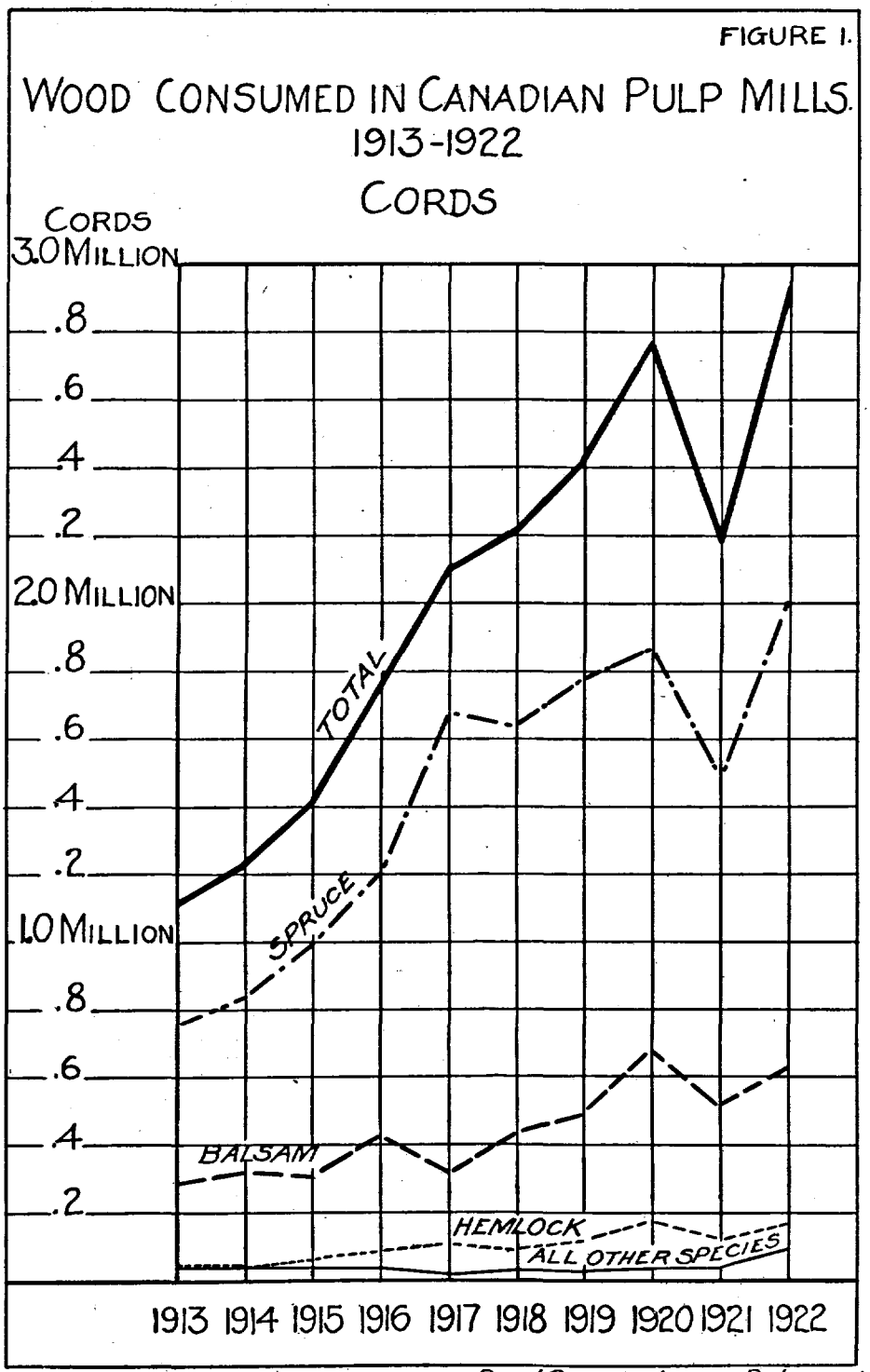
Cords

Year	Spruce	Balsam	Hemlock	Jack Pine	Poplar	All Others	Total
1913	754,858	283,292	47,360	19,383	4,141	.....	1,109,034
1914	836,387	314,183	45,246	24,715	3,845	.....	1,224,376
1915	998,156	307,219	55,265	41,953	3,243	.....	1,405,836
1916	1,203,557	433,154	82,307	39,717	6,177	.....	1,764,912
1917	1,678,656	309,515	101,321	2,850	5,168	6,824	2,104,334
1918	1,638,733	447,243	89,007	25,851	9,885	25	2,210,744
1919	1,787,868	490,327	118,013	15,402	7,228	9,868	2,428,706
1920	1,873,024	687,519	176,029	15,743	5,732	19,375	2,777,422
1921	1,499,478	511,791	122,997	40,406	3,557	2,349	2,180,578
1922	2,032,985	627,626	157,947	79,461	1,305	13,248	2,912,608
Total	14,303,702 71·12%	4,411,869 21·93%	995,492 4·93%	305,481 1·52%	50,281 0·25%	51,725 0·25%	20,118,550 100%

In Figure 1, there is shown graphically the total consumption of wood by the pulp mills of Canada from 1913 to 1922, based upon the figures of Table Xb. In the same chart are included consumption graphs for spruce, balsam, hemlock, and for other species. If figures previously presented have by any chance failed of conviction as to the important part which spruce plays in supplying raw materials for the industry, the spruce curve in Figure 1 will surely do so. The relative importance of spruce and balsam, in this regard, is also clearly depicted. The amounts indicated by individual curve for hemlock, and figures for the same species in Table Xb, are due almost entirely to the extensive use of the western species for this purpose in British Columbia. Finally, prominently displayed is the insignificant extent to which all other species—jackpine, poplar,

FIGURE 1.

WOOD CONSUMED IN CANADIAN PULP MILLS. 1913-1922



Royal Commission on Pulpwood.

Douglas fir, cedar, etc.—contribute supplies for the pulp industry; the amounts of the latter species are so small that they cannot be plotted individually on the scale of the chart.

It is obvious that, aside from British Columbia where considerable amounts of hemlock are used, the proportion of spruce used in the Dominion would be at least 75 per cent of the total; actually, however, it is 71 per cent. Balsam (including white fir of the Pacific Coast) is also important, closely approching 22 per cent. Generally for Canada, therefore, these two are manifestly the main species, providing over 93 per cent of all pulpwood supplies.

As explained in previous chapters, spruce and balsam, are also used to a greater or lesser extent in the manufacture of lumber, and consumption in the latter industry has therefore a very important bearing upon depletion in the stand of pulp woods. The primary graph of Figure 2 shows the combined total consumption of spruce and balsam in the pulp and lumber industries; other graphs show combined consumption for each of the two species. For hemlock no graph is included in Figure 2, as British Columbia is the only province in which it enters materially into consumption of both industries,—in the eastern provinces its use is almost entirely confined to lumber manufacture.

SECTION 4.—EXPORTS OF PULPWOOD

As previously explained, the only statistics available for pulpwood exports are secured from the returns of customs collectors at the various ports of exit. For the whole of Canada, these figures may be accurate, as far as they go, but, owing to a considerable amount of interprovincial traffic in pulpwood, such returns do not correctly indicate the amounts of wood originating in each province and exported from Canada; also, in British Columbia there is no distinction between saw-logs and pulp logs, so far as water shipments are concerned, and hence, the figures for the considerable quantities of wood destined for American pulpmills, shipped from that province by water, do not appear in customs returns as pulpwood exports. The official export figures are, however, shown in Table Xc.

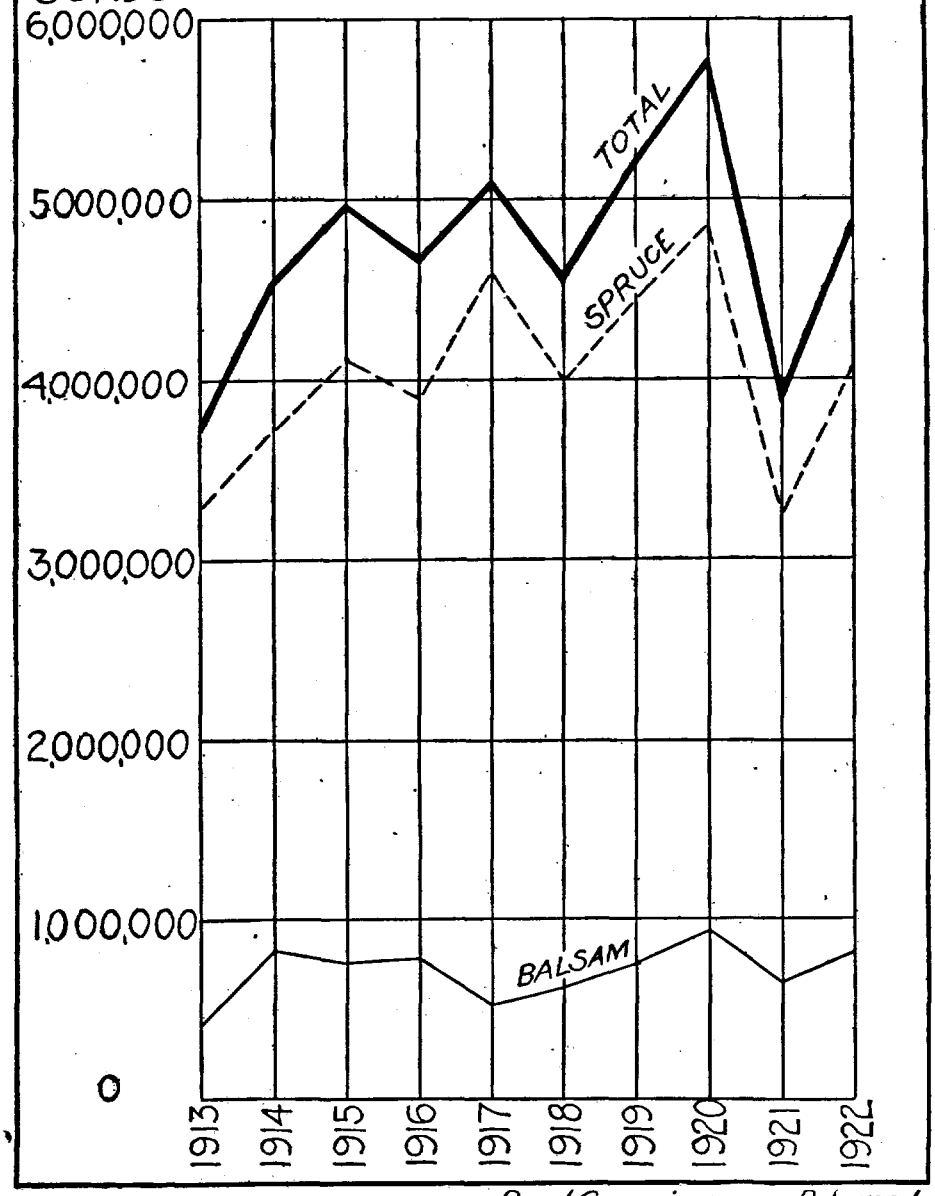
TABLE Xc—EXPORTS OF PULPWOOD FROM CANADA, BY PROVINCES

Year	Nova Scotia	New Brunswick	Quebec	Ontario	Prairies	British Columbia	Canada
1908	1,630	84,809	683,703	72,166	.....	.....	842,308
1909	5,842	86,599	737,877	105,306	.....	.....	935,624
1910	.....	89,628	742,933	110,580	.....	.....	943,141
1911	55	122,698	636,136	89,050	.....	.....	847,939
1912	5,773	150,901	751,815	72,379	.....	.....	980,868
1913	6,049	141,553	802,260	84,699	.....	69	1,035,030
1914	1,557	143,787	687,421	139,743	.....	.....	972,508
1915	3,310	119,896	624,269	202,239	.....	.....	949,714
1916	3,735	127,730	786,879	149,745	.....	118	1,068,207
1917	770	156,255	698,839	161,652	.....	329	1,017,845
1918	.....	263,907	885,772	199,421	.....	436	1,349,536
1919	15,712	195,354	661,414	196,041	.....	1,754	1,070,275
1920	27,211	185,637	827,982	202,171	65	4,338	1,247,404
1921	29,800	213,266	601,846	239,264	347	8,030	1,092,553
1922	34,650	144,639	553,836	269,419	16	8,772	1,011,332
1923	11,451	173,828	760,328	414,288	80	24,255	1,384,230

Figure 3, based on the figures of Table Xc, includes graphs for the Dominion total exports, and for exports from individual provinces where the figures are of sufficient size to permit of plotting.

FIGURE 2.

CONSUMPTION OF SPRUCE & BALSAM
IN
PULP & SAWMILL INDUSTRIES
CANADA 1913-1922



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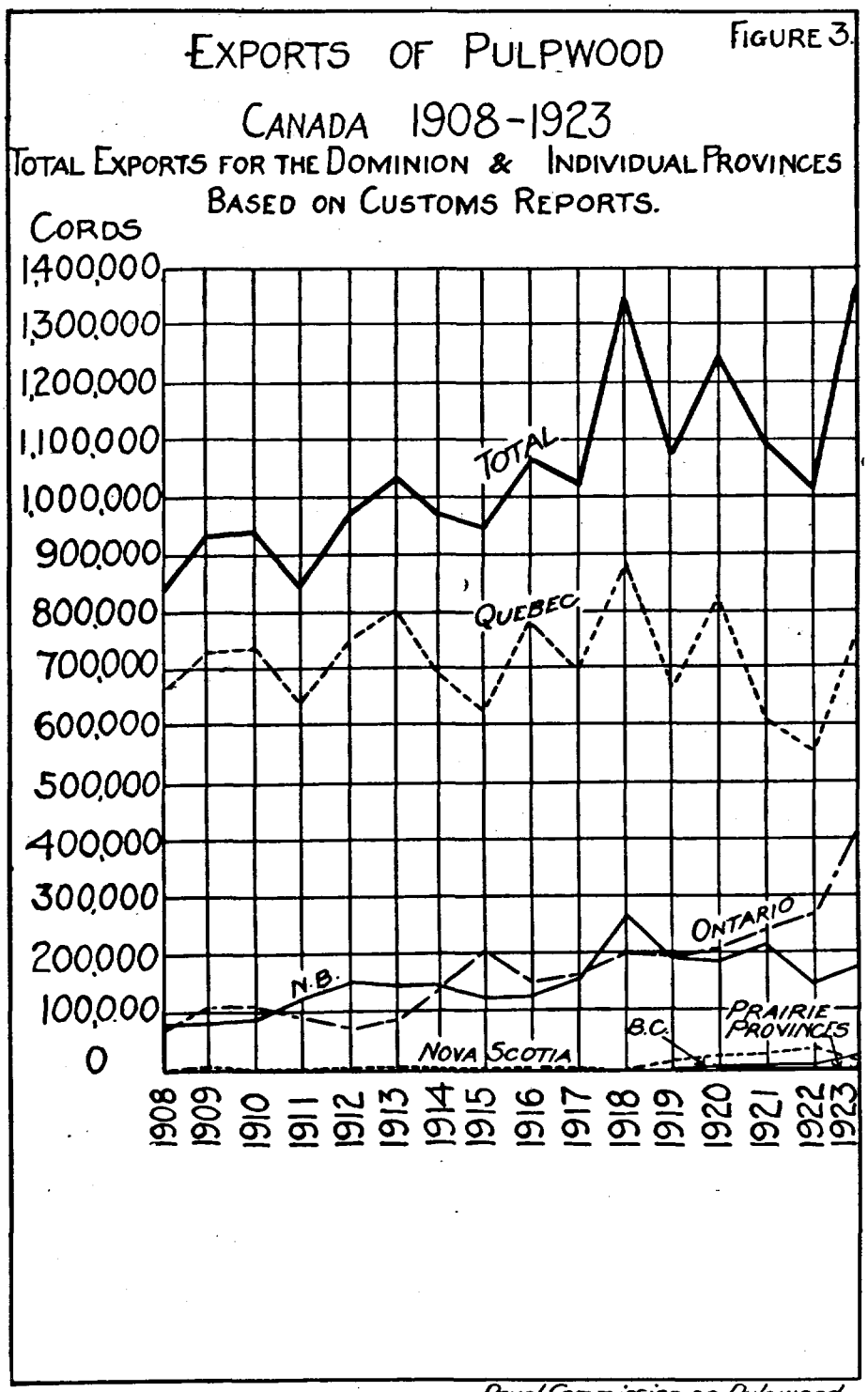
While Figure 3 is of general interest, and particularly for eastern Canada gives an excellent idea as to the relative positions of the individual provinces in exports, it has been considered desirable to construct a chart which will show in an empirical manner the extent to which unmanufactured wood, of the main pulp species, whether actually used for pulp or not, has been exported. In Figure 4, therefore, adjustment of both individual and total figures has been made, firstly, to compensate as between provinces for wood transhipped (possible only for the last couple of years); secondly, to include the spruce, balsam and hemlock exported from British Columbia. The graphs of Figure 4 may therefore be taken to represent with greater accuracy the actual situation regarding export of pulp woods.

A study of Figures 3 and 4 accentuates the fact that the province of Quebec is by a large margin the source of the greater part of pulpwood exported from the Dominion; assuredly this province has been the 'barometer' of the pulpwood export business, so closely do the graphs for that province and for the Dominion synchronize in their general trend. Over the entire period Quebec furnished approximately 68.3 per cent of total exports.

Another thing, clearly illustrated,—although pulpwood exports have not increased quite so rapidly as in the public mind they are believed to have done, there nevertheless has been a very decided upward trend; even in the last decade, the curve, if mathematically averaged, would show pronounced proclivity upwards. For this feature of the situation, Quebec is perhaps not so responsible as are the other provinces combined; on four previous occasions, the former showed exports in excess of those for 1923; while the graphs for Ontario, New Brunswick, British Columbia and Nova Scotia show decided tendency toward increased exports; the latter provinces have contributed in greater measure, therefore, toward the forcing upward of the exports for the whole Dominion.

Before leaving the general question of exports, it is desirable that reference be made to the relation between domestic consumption and exports of pulpwood. The situation in this regard is plainly perceived by examination of Figure 5. Prior to 1913 exports exceeded the amount used in Canadian mills, but in that year the cordage locally consumed overtook the quantity exported; and the gap between them has almost constantly increased since that time. There has therefore been a continuous decrease in the ratio of exports to total pulpwood production, until in 1922, the last year for which total production figures are available, exports approximated roughly one-quarter of total production. In view of the fact that larger quantities of wood were most certainly available for export, the demand for our wood in American markets has by no means kept pace with the demand in this country,—thus illustrating more rapid development of the pulp industry in Canada, as compared to that in United States.

Although exports of pulpwood from Canada to the United States—reported as such through the Canadian Customs—consist almost wholly of spruce, balsam and poplar, the respective amounts of these species cannot be determined from export returns. By using United States figures for pulpwood imports and consumption, however, it has been possible to come to reasonably definite conclusions regarding the amounts of the three species exported from Canada, and also as to the regions in which they are primarily used. By this means it has been determined that, of the Canadian pulpwood exports in the six year period 1917-1922, spruce comprised approximately 68 per cent of the whole; balsam, about 20 per cent; poplar about 12 per cent. These figures, therefore, give an excellent indication as to the classes of wood, and the degree to which they have participated in exports. Apparently in 1923 considerably greater interest has been evinced in poplar exports; and it seems probable that from now on the percentage of this species will be greater than heretofore.


EXPORTS OF PULPWOOD
FIGURE 3.
CANADA 1908-1923
TOTAL EXPORTS FOR THE DOMINION & INDIVIDUAL PROVINCES
BASED ON CUSTOMS REPORTS.
CORDS
1,400,000
1,300,000
1,200,000
1,100,000
1,000,000
900,000
800,000
700,000
600,000
500,000
400,000
300,000
200,000
100,000
0
TOTAL
QUEBEC
ONTARIO
N.B.
B.C.
PRAIRIE PROVINCES
NOVA SCOTIA
1908
1909
1910
1911
1912
1913
1914
1915
1916
1917
1918
1919
1920
1921
1922
1923
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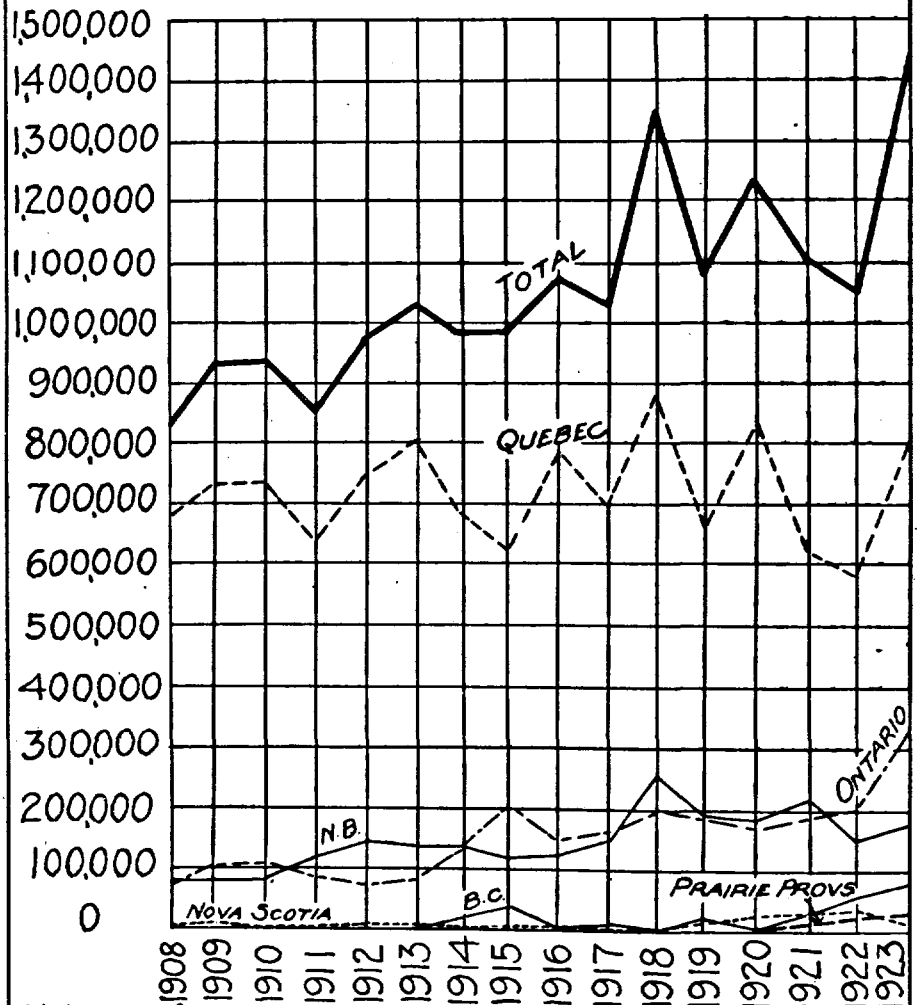
EMPIRIC CHART FIGURE 4.

GROSS EXPORTS OF UNMANUFACTURED WOOD OF PULPWOOD SPECIES CANADA 1908-1923



Note: The figures, upon which the above graphs are based, include all log exports of Spruce, Balsam and Hemlock in British Columbia; adjustments have also been made to compensate for interprovincial traffic in pulpwood. A better idea of actual exports of pulp woods is secured from this chart than from Fig. 3.

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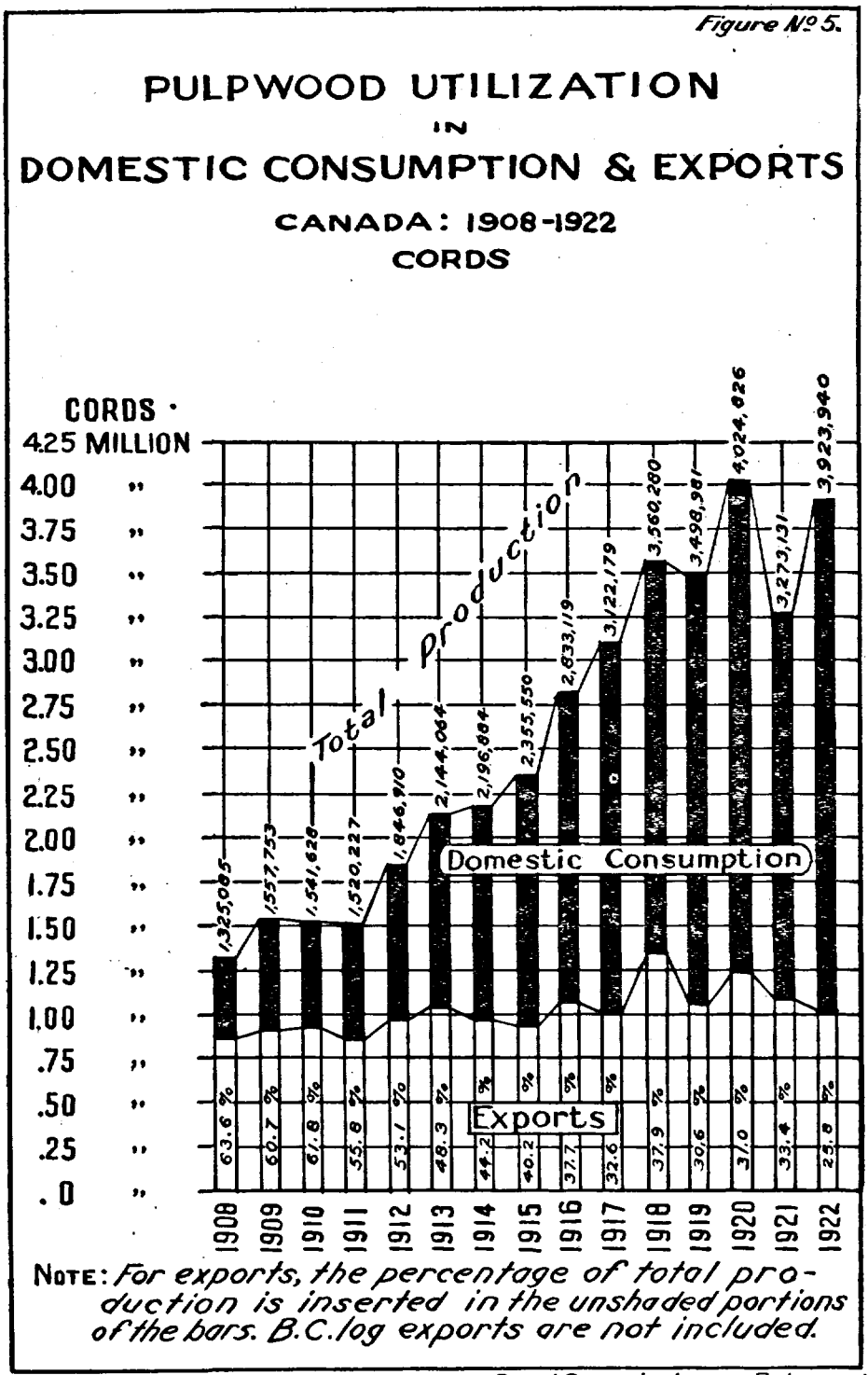
Figure No. 5.



NOTE: *For exports, the percentage of total production is inserted in the unshaded portions of the bars. B.C. log exports are not included.*

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Aside from log exports in British Columbia—most of which is consumed by mills in the neighbouring state of Washington—about 90 per cent of Canada's spruce export is consumed in New York, Maine, Pennsylvania and New Hampshire,—about one-half of it being used in New York State alone. The only other States participating to any extent in the use of imported spruce are Michigan, Wisconsin, Massachusetts and Vermont. As for poplar, with the exception of relatively small amounts of cottonwood shipped from British Columbia to Washington State, over 99 per cent. of Canada's total exports of this species are consumed in New York, Maine, and Pennsylvania. For balsam, similar figures cannot be given; it may be assumed, however, that the use of exports of this species is practically on the same basis as spruce,—if anything, a higher proportion being used in New York, Maine, Pennsylvania and New Hampshire,—owing to the higher percentage of this species in the forests of Quebec and New Brunswick—and a correspondingly lower percentage in Michigan and Wisconsin.

While it is impossible to present accurate figures as to the extent to which farmers' wood participates in total exports, a review of the situation throughout the Dominion indicates that the percentage of farmers' wood probably runs betwen 60 and 65 per cent of the total amount of pulpwood exported.

SECTION 5—TOTAL CONSUMPTION OF THE MAIN PULPWOOD SPECIES

In sections 3 and 4, the utilization of pulp woods for home manufacture and for export have been dealt with. In discussion pertaining to the various provinces, it has been shown that extensive use is made of these woods in other directions: fuel, railway ties, mine timber, construction timber, etc., all enter into consumption, and exact their toll on the pulpwood resources of the country. Unfortunately annual statistics are not available for all such products, but definite conclusions have been reached in this connection, and it now remains to explain in general terms the total demand upon the pulpwood resources.

TABLE Xd—ANNUAL UTILIZATION OF MAIN PULPWOOD SPECIES

Province	Spruce	Balsam	Hemlock*	Total
Nova Scotia	330,000	70,000	.....	400,000
New Brunswick	900,000	200,000	.....	1,100,000
Quebec	2,300,000	700,000	.....	3,000,000
Ontario	1,116,000	84,000	.....	1,200,000
Prairies	570,000	.....	.....	570,000
British Columbia	320,000	51,200	268,800*	640,000
Total	5,536,000	1,105,200	268,800*	6,910,000

*British Columbia only.

In Table Xd are figures representing what may be considered as the minimum annual requirements of the main pulpwood species. In some cases they are based upon average consumption over the decade 1913-1922, but in other instances where such an average was not truly indicative of actual use in the latter half of the decade, the average for the later years was taken. By "minimum requirements" is meant use on the same basis as that of the present time. Obviously, in certain provinces, more particularly, Quebec, Ontario and British Columbia, anticipated expansion of the industry will involve greater consumption. However, such increase may in part be offset by curtailment in lumbering operations, more particularly in Ontario and Quebec. On the other hand, with a continuance of present conditions, some increase might be expected in pulpwood exports. Under these circumstances there seems to be little doubt that the consumption of these pulp wood species may in the near future run between 7 and 7½ million cords per year.

SECTION 6—THE EXTENT OF FOREST INDUSTRY IN CANADA.

Just how much the forest has meant, and still means, in the development of this country is but meagrely appreciated by the public in Canada. In the early days, it was undoubtedly the large profits of the fur trade that attracted attention to the possibilities of this country, and gave rise to the first settlements. Later, however, as settlement increased, and became more stable, the population settled down to two main pursuits,—agriculture and timber production.

In many instances the presence of the forest was considered as an obstruction to agricultural development, and magnificent stands of timber were ruthlessly swept out of existence by the use of fire and axe, with little or no financial return from the timber cut. In other instances, however, although timber offered obstruction to agriculture, its value was more truly appreciated, and it was made to not only pay the costs of clearing, but its operation was the means of furnishing the early settler with much needed cash at a time when he was too remote from markets for agricultural produce to reap any money return therefrom.

Many a thriving agricultural community to-day owes its original success to the fact that its pioneers, besides adding yearly to the area of soil under cultivation, spent a considerable period of their time working in the lumber camps and the mills, securing therefor immediate cash returns for the labour they gave,— ready money, so necessary to general development of communities situated beyond the limits of participation in trade in the general agricultural markets. Nor has the day yet gone, when the settler, literally hewing out a farm and a home for himself and his family, takes advantage of the employment offered in the logging camp, the sawmill, the pulpmill, or other forest industries, and in this manner augments his cash income, and thereby sustains himself on the land until the latter is brought to that state where it is sufficient to the complete sustenance of his family.

In earlier days the profit in forest activities lay in the production of square timber, but very rapidly there developed industries for the manufacture of the raw wood into various products. To-day, the ramifications of Canadian industry based upon the use of wood as a raw product, are myriad. Nowhere in the Dominion is a home built, a town constructed, or almost any other process known to modern industry and development pursued, but some product of the wood-using industry is brought into play.

Leaving out of consideration, for the moment, the production in wood manufactories, the total value of primary wood products—i.e. fuel, ties, logs, pulpwood, square timber, etc., but including neither manufactured lumber nor pulp—produced in 1920, was approximately 212 million dollars. That year, however, was a peak in production and also in value of the products. On the other hand, in 1921 a serious slump was experienced due to various industrial disturbances and falling prices. Figures for 1922 may, therefore, be taken as a better gauge of production. In that year the total value of these primary products was over 170 million dollars. Of interest in this connection are the figures in Table Xe giving the value of primary timber production by provinces and the volume of timber consumed in each case. Table Xf gives the values of the primary forest products.

As implied above, however, these figures do not by any means indicate the total value of the forest as a source of production. If we merely add to the above the net value* of sawmill and pulp mill products, the total value in

*By "net value" is meant the value of pulpmill and sawmill production less the cost of pulpwood and sawlogs entering into manufacture of pulp and lumber.

1922 was upwards of 266 million dollars. Going a step further, and including the net value of paper products, the total production exceeded 323 millions. In attaining even the latter figure, there have been included only the main industries directly dependent upon wood. If to this there be added the production of other manufactories in which wood in some form is the essential raw material, the total value of production from wood reaches upward of 400 million dollars. As a matter of fact, forest industries rank second only to agriculture in the value of production, and are therefore of great national importance in development of the country. Aside from monetary values in production, the sawmills, pulp and paper mills, and the logging operations basic thereto, give employment to upwards of 100,000 persons; and the capital invested therein reaches close to 600 millions of dollars.

TABLE XE—PRIMARY FOREST PRODUCTION—CANADA, 1922

——	Standing Timber consumed	Total Value
	cu. ft.	$
Canada	2,377,845,182	170,850,096
Quebec	794,950,736	56,981,829
Ontario	655,604,824	52,639,909
British Columbia	447,433,011	30,666,860
New Brunswick	200,993,104	15,628,228
Nova Scotia	107,604,716	7,079,738
Alberta	54,821,103	2,502,151
Manitoba	52,097,177	2,595,641
Saskatchewan	49,398,813	2,088,626
Prince Edward Island	14,941,598	667,114

TABLE XF.—PRIMARY FOREST PRODUCTION, 1922

Products	Unit Used	Quantity reported or estimated	Converting factor	Standing timber consumed	Total value
			cu. ft.	cu. ft.	$
Totals				2,377,845,182	170,850,096
Firewood	Cords	8,860,846	95	841,780,560	38,228,702
Ties	No.	14,558,063	12	174,696,756	13,215,986
Poles	"	436,899	13	5,679,687	1,707,378
Posts	"	13,848,569	2	27,697,138	1,354,268
Rails	"	5,265,325	2	10,530,650	450,133
Mining timber	M ft. b.m.	70,486	219	15,436,434	1,721,025
Wood distillation	Cords	59,169	123	7,277,787	479,299
Logs used in sawmills	M ft. b.m.	3,408,264	219	746,409,816	55,066,273
Pulpwood used	Cords	2,912,608	117	340,775,136	40,375,599
Miscellaneous products	"	84,848	117	9,927,216	850,078
Square timber exported	M ft. b.m.	55,140	219	12,075,660	1,492,344
Logs exported	"	185,489	219	40,622,091	3,270,575
Pulpwood exported	Cords	1,011,332	117	118,325,844	10,359,762
Miscellaneous exports	"	227,441	117	26,610,597	2,278,674

It is almost a platitude to state that the preservation of an industry of such gigantic proportions—involving as it does, the investment of so much wealth and the employment of so many people—is a matter of primary importance to the people of this country. Basic to continuance and further development of the forest industry, however, is the sustentation of supplies of the raw material, wood,—and consequently of the forests. Through several generations —deluded by what appeared to be a surfeit of supplies—we have, through extravagant exploitation and neglect in adequate protection, made very serious inroads upon the timber supplies.

It is essential to discussion of the subject under review to enquire a little more closely into the two main branches of forest industry, viz., the pulp and lumber manufacturing operations.

(a) The Pulp Industry in Canada

Much has been written of the early development of pulp manufacturing. So far as manufacture of pulp from wood is concerned, historical record of the industry is complete, for it is only within comparatively recent years that pulp has been made from wood on a commercial scale. The present enquiry, however, relates more particularly to the availability and use of wood for this purpose; consequently no attempt is made to review the history of the industry; rather, discussion will be confined to a period of ten or fifteen years, during which time the industry has become such an important factor in depletion of timber supplies.

Capital invested in the pulp industry closely approximates 400 million dollars. The industry includes over a hundred mills, most of which are situated in Quebec, Ontario, British Columbia and New Brunswick. As stated in Chapter II, Nova Scotia has several mills, but they are small in size, and their total production is not large. The remaining four provinces have as yet no pulp mills. The combined value of pulp and paper commodities manufactured amounts to over 140 million dollars annually. These pulp and paper mills give regular employment to some 25,000 operatives, exclusive of employees engaged in the cutting and removal of pulpwood supplies; in the latter operations another 25,000 employees are engaged at certain seasons of the year. The annual wage bill in the milling end of the industry approximates 35 million dollars, and in addition probably 20 or 25 millions of the amount expended for wood supplies constitutes wages to woods operators.

Table Xg gives figures for pulp production of the several classes over the period 1908 to 1922, from which is readily perceived the rapid growth of the industry in nearly all phases. Only in the production of soda pulp is a lack of progress noticeable; for ground-wood, sulphite and sulphate, the increase has been phenomenal. Moreover, when the scale of present operations is considered, it is evident that volume development has been largely a matter of 15 years.

TABLE Xg.—PRODUCTION OF WOOD-PULP IN CANADA, 1908-1922

Year	Ground-wood	Sulphite	Sulphate	Soda	Total
	tons	tons	tons	tons	tons
1908	278,570	82,311	.....	2,178	363,079
1909	325,609	114,926	.....	4,873	445,408
1910	370,195	95,987	.....	8,422	474,604
1911	362,321	110,391	.....	24,121	496,833
1912	499,226	142,978	33,469	6,959	682,632
1913	600,216	183,552	68,284	2,572	854,624
1914	644,924	217,550	70,333	1,893	934,700
1915	743,776	235,474	92,405	3,150	1,074,805
1916	827,258	363,972	100,977	3,877	1,296,084
1917	923,731	374,894	161,547	4,136	1,464,308
1918	879,510	494,322	179,600	3,761	1,557,193
1919	990,902	562,115	158,475	4,597	1,716,089
1920	1,090,114	675,733	188,487	5,768	1,960,102
1921	931,560	481,984	131,337	4,201	1,549,082
1922	1,241,185	678,878	217,862	793	2,150,251

Several factors have contributed to this development; firstly, increased markets in the United States, due to enormous increase in the consumption of paper products, coupled with the inability of the industry in the eastern part of that country to proportionately increase its output, owing to lack of pulpwood

supplies and adequate supplies of cheap power; secondly, the availability of timber supplies in Canada, so located as to permit of cutting and transportation at reasonable cost; finally, the presence in this country of abundant opportunities for hydro-electric development, so necessary for the economical grinding of wood and so desirable in the manufacture of paper.

Detailed figures of pulp production in the various provinces have already been given. Summarizing for the Dominion, Table Xh shows the extent to which the provinces have contributed to the total.

TABLE XH.—PULP PRODUCTION BY PROVINCES—CANADA, 1908-1922

Year	Quebec	Ontario	British Columbia	New Brunswick	Nova Scotia	Total for Canada
	tons	tons	tons	tons	tons	tons
1908	201,450	108,124	.....	36,711	16,794	363,079
1909	238,286	132,491	644	49,991	23,996	445,408
1910	282,938	156,076	350	9,285	25,955	474,604
1911	312,522	140,959	90	24,163	19,099	496,833
1912	459,420	142,257	25,254	29,525	26,176	682,632
1913	514,299	228,498	61,354	29,911	20,562	854,624
1914	515,409	325,233	56,352	26,829	10,777	934,600
1915	561,793	364,226	65,823	62,093	20,870	1,074,805
1916	686,604	473,014	78,655	43,374	14,437	1,296,084
1917	784,250	489,488	111,875	58,340	20,355	1,464,308
1918	802,030	505,366	173,161	66,619	10,017	1,557,193
1919	831,291	597,827	194,126	75,186	17,659	1,716,089
1920	974,766	654,401	218,482	89,069	23,384	1,960,102
1921	784,906	519,511	165,053	61,810	17,802	1,549,082
1922	1,088,205	726,308	198,426	99,750	37,562	2,150,251

Quebec stands considerably in the lead, with 50.6 per cent of the total pulp production in Canada in 1922. Ontario follows with 33.8 per cent, more than one-third of the Dominion total. British Columbia with 9.2 per cent; New Brunswick, with 4.6 per cent; and Nova Scotia, with 1.7 per cent, complete the list. Quebec is also strongly in the lead for every individual class of pulp; Ontario being second for all classes except sulphate, which is produced in greater quantity in New Brunswick. Nova Scotia produces nothing but groundwood, and supplies 3 per cent of the Dominion production of that class of pulp.

As will be seen in Table Xi, the paper manufacturing industry has also experienced notable progress during the 6-year period for which figures are available. Particularly is this the case with newsprint, which constitutes over

TABLE XI.—PAPER MANUFACTURE IN CANADA

Year	Newsprint	Book and Writing	Wrapping	Boards	Miscellaneous	Total
	tons	tons	tons	tons	tons	tons
1917	689,847	48,141	50,360	54,080	11,261	853,689
1918	734,783	48,150	61,180	87,749	35,862	967,724
1919	794,567	58,228	59,697	137,678	40,065	1,090,235
1920	875,696	73,196	77,292	158,041	30,726	1,214,951
1921	805,114	53,530	52,898	89,120	18,285	1,018,947
1922	1,081,364	64,808	81,793	113,200	25,650	1,366,815

79 per cent of Canada's total output of paper products. Substantial progress is noted also in the manufacture of wrapping paper and paper boards. Development in the manufacture of book and writing papers, although considerable, has

not been so pronounced as in the case of other products, due to the fact that markets have been more restricted. Ontario leads in paper production with 47.4 per cent of the Dominion total to her credit; moreover, with the exception of wrapping papers, she leads in all individual classes of paper products. Quebec is a close second, with 43 per cent of total production. Finally, British Columbia, with 9.6 per cent, consisting entirely of newsprint and wrapping papers. Within the past year, only, paper has been produced for the first time in the Maritime Provinces, at Bathurst, N.B.

Some idea of the importance of the pulp industry in Canada's external trade may be gleaned from the fact that with a total value of pulp produced in 1922, approximating 85 million dollars, pulp to the value of 41 millions was exported; of this, United States purchased over 33 million dollars worth, 80 per cent of the total exports. Great Britain was the next best customer, taking seventeen per cent; Japan, three per cent; and numerous other countries, smaller quantities.

Of total paper production in 1922, amounting in value to over 106 million dollars, exports exceeded 75 million dollars, of which the United States took about 65 million dollars, nearly 87 per cent of all paper exports. Newsprint forms over 90 per cent of the total value of paper exported, and in 1922 the United States imported this commodity to the value of nearly 63 million dollars. It is at once observed that United States imports of paper products, made in Canada, consist essentially of newsprint. Other countries buy from Canada relatively greater quantities of other paper products than does the United States. "Canada supplies over eighty per cent of the newsprint paper imported annually into the United States. Over two-thirds of the total consumption of newsprint by that country is either of Canadian manufacture or is made of pulpwood or wood pulp imported from Canada."*

With a net value** of products of Canadian pulp and paper mills, amounting in 1922 to 141 million dollars, exports of pulp and paper commodities to the United States aggregated 98 million dollars—about 70 per cent of Canada's total production of pulp and paper.

It is of special interest to note here, that if the value of exported pulpwood be included, the aggregate value of pulpwood, pulp, and paper production in Canada in 1922 was approximately $151,400,000; of this amount, the United States purchased approximately $108,400,000—71.6 per cent of total value production. Manifestly, contributing in such large measure to Canada's export trade, the industry is one of utmost importance. Combined pulp and paper imports in 1922, approximated only $9,300,000; whereas combined exports of the same commodities to all foreign countries totalled $115,800,000—the gross† contribution of the industry toward favourable trade balance being more than 106 million dollars.

(B) The Lumber Industry in Canada

Deeply written in the history of, and intricately related to, the industrial development of Canada, is the story of the lumbering industry. From earliest times, the forest, although the subject of destructive attacks for the purpose of land clearing, has nevertheless been looked upon as a source of supply for the main materials entering into construction operations. First of all, used in the round; later, squared for export; finally, sawn into lumber and other more finished forms,—timber development has been continuous and rapid.

In a country so young, and with such extensive areas of true forest land at its disposal, it is rather difficult to comprehend that the peak in lumber production may already have been passed. Unfortunately, reliable statistics for

*Census of Industry: The Pulp and Paper Industry, 1921 and 1922; Dominion Bureau of Statistics.

**The value of the pulp entering into the manufacture of paper has been deducted.

†To arrive at the net effect of the industry on trade balance, it would, of course, be necessary to take into consideration the value of materials imported to assist in production.

production prior to 1908, are not available, and definite comparisons cannot therefore be made between figures for production subsequent to 1908 and the years which preceded it. In view of the fact that large volume in lumber production has been brought about by the introduction of large-scale equipment and methods, developed during the present generation; also, due to the development of markets for the lumber of British Columbia, in which province the timber wealth is great; there is some possibility of reaching a hasty conclusion that the 1911 peak in Canadian lumber production constituted the absolute peak in the history of the industry. It may be pointed out, however, that for many years preceding 1908 there was in the eastern provinces an enormous production of white pine timber, much of it exported as squares; and such figures as are available indicate that it is quite possible that the absolute peak in production actually occurred some years prior to 1908.

We may, however, confine discussion to the period for which adequate figures are available. In 1908 the total lumber production was 3.35 billion feet, board measure. The three succeeding years witnessed rapid and almost constant increase to a maximum of 4.92 billion feet in 1911. For the period presently under consideration, the latter year furnished the highest peak in lumber manufacture. Production then steadily decreased in 1912 and 1913 to 3.82 billion, rising again to 3.95 billion feet in 1914. The years 1915 and 1916 showed decrease to 3.49 billion. Recovery occurred in 1917, when the total cut was 4.15 billion feet, but production again fell off through 1918 and 1919 to 3.82 billion. The year 1920, in which active interest was displayed in all forms of forest industry, showed a total cut of 4.3 billion feet, but this was in turn followed by a drop in 1921 to lowest figures on the statistical records, namely, 2.87 billion feet. 1922, the latest year for which figures are available, shows recovery only to 3.14 billion feet.

Taking into consideration the additional drain upon forest resources which the introduction of the pulp industry has entailed, it seems at least doubtful that the peak figure of 4.9 billion feet, attained in 1911, will again be reached. Only in British Columbia are there supplies available to an extent which would justify the conjecture that total production may again rise so closely to or in excess of the 5 billion mark.

Throughout the whole period 1908 to 1922, spruce has been far in the lead of all other species in consumption for lumber; in Ontario and British Columbia only it yields first place to white pine and Douglas fir, respectively, but in all other provinces it has been the main species in lumber manufacture. Until and including 1912, white pine ranked second for the Dominion; giving way to Douglas fir in the year 1913, it again superseded the latter, and retained second place from 1914 to 1918. In 1919 white pine again dropped to third position, its place being taken by Douglas fir in that year; apparently the latter species will always retain second position, unless indeed it overtakes spruce in first place; at all events, it seems to have completely outdistanced white pine. Hemlock has consistently occupied fourth place in production over the period. Fifth, in point of volume production, for all but 3 of the 15 years, is the aggregate of all hardwoods. Finally, red pine, cedar, balsam, yellow pine and tamarack (larch) have contributed to the total, amounts varying for different species and for different years all the way from 15 or 20 million to 150 million.

An analysis of lumber production from the various species over the decade 1913-1922, the figures for which appear in Table Xj, is of interest. Spruce provided 34.7 per cent of all the lumber produced; Douglas fir, 19 per cent; white pine, 18 per cent; and hemlock, 7 per cent; the aggregate for these four species being 78.7 per cent of the total. Of particular importance is the fact that spruce furnished over one-third of the supplies for all lumber produced in the country,

as well as furnishing the great bulk of the pulpwood supplies. The average annual consumption of all species was approximately 3.7 billion feet; of spruce, about 1.3 billion; Douglas fir, 700 million; white pine, 670 million; and hemlock, 260 million.

Ontario led all provinces in total lumber production up to 1912, British Columbia being second, and Quebec third. In 1913, British Columbia temporarily assumed first place, Ontario dropping to second position. In 1914 and 1915 Quebec took the lead, followed by Ontario and British Columbia. In 1916 the production of these three provinces was very close, Ontario leading, British Columbia and Quebec following. In 1917 British Columbia took the lead, and Ontario and Quebec definitely settled into second and third places, respectively; and these relative positions have been maintained ever since. There is every reason to believe that British Columbia will permanently retain the lead, which she has attained by virtue of abundant supplies and a much wider market than this province previously enjoyed. New Brunswick has consistently occupied fourth place; Nova Scotia fifth, followed by the prairie provinces and Prince Edward Island.

TABLE XI.—CANADA: LUMBER PRODUCTION, 1913 TO 1922 INCLUSIVE, BY KINDS OF WOOD, QUANTITY CUT AND VALUE

Kinds of Wood	1913		1914		1915		1916		1917	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	1,274,215	19,125,837	1,441,438	21,199,799	1,564,113	23,843,548	1,340,678	21,201,198	1,466,558	27,870,543
Douglas Fir	793,143	10,898,978	601,643	6,810,000	453,534	5,333,573	574,626	8,070,200	704,412	12,491,258
White Pine	678,330	18,502,041	667,678	13,880,255	849,196	17,584,149	719,140	14,957,048	791,592	18,997,428
Hemlock	306,342	4,505,767	334,361	4,734,229	238,992	3,271,612	177,354	2,583,566	324,107	6,437,180
Red Pine	144,320	2,688,653	107,763	1,935,543	122,387	2,206,840	61,653	1,175,835	102,751	2,508,181
Cedar	101,053	1,487,633	118,738	1,294,238	67,366	1,172,279	91,375	1,666,455	148,364	2,738,287
Larch	96,325	1,327,672	71,791	882,188	36,192	491,687	40,031	630,642	53,844	980,970
Birch	79,360	1,424,236	76,424	1,247,816	85,733	1,437,658	81,543	1,478,970	60,576	1,533,223
Maple	73,580	1,303,315	66,610	1,283,643	47,418	848,091	32,402	639,182	21,105	552,964
Balsam Fir	64,957	845,955	256,452	3,654,741	233,521	3,327,839	180,349	2,679,494	104,957	1,976,790
Yellow Pine	58,939	874,014	34,616	463,525	35,166	457,758	92,698	1,455,396	75,102	1,726,113
Basswood	36,009	773,381	38,013	752,108	24,382	489,217	18,616	373,592	14,790	369,764
Jack Pine	35,404	508,840	44,090	626,108	31,283	481,323	37,929	652,353	19,825	427,105
Elm	30,766	653,699	29,490	610,041	23,795	454,497	15,750	324,582	15,859	337,092
Beech	12,983	208,332	15,686	250,301	5,343	88,000	6,403	102,762	16,192	321,759
Poplar	11,136	153,376	21,621	264,430	9,324	113,873	9,064	124,591	9,526	158,482
Ash	10,509	234,303	9,941	204,919	9,617	180,484	6,516	126,608	6,650	152,097
Oak	6,348	207,156	5,854	174,826	3,166	89,784	3,149	92,541	1,894	76,242
Chestnut	1,317	25,372	1,163	25,942	522	12,043	457	10,888	276	10,911
Hickory	647	23,726	900	25,299	203	5,534	144	5,059	168	6,761
Butternut	516	12,306	1,431	25,309	361	12,372	200	5,266	121	2,773
Cherry	246	6,171	535	15,237	123	3,826	170	5,040	51	3,511
Black Gum	125	3,000	12	168	.....	.....	.....	.....	.....	.....
Walnut	40	2,017	46	1,727	28	968	32	1,178	51	4,135
Tulip	20	358	23	412	1	18	.....	.....	.....	.....
Sycamore	11	255	.....	.....	.....	.....	.....	.....	.....	.....
Sassafras	1	45	.....	.....	.....	.....	.....	.....	.....	.....
Yellow Cypress	.....	.....	19	475	880	12,833	271	2,893	46	698
Red Alder	.....	.....	6	90	.....	.....	.....	.....	5	100
Other kinds	.....	.....	.....	.....	.....	.....	.....	.....	52,348	944,897
Custom sawing	.....	.....	.....	.....	.....	.....	.....	.....	160,632	3,025,833
Whitewood	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Totals	3,816,642	65,796,438	3,946,254	60,363,369	3,842,676	61,919,806	3,499,550	58,365,349	4,151,703	83,655,097

TABLE XJ—CANADA: LUMBER PRODUCTION, 1913 TO 1922, ETC.—*Con.*

Kinds of Wood	1918		1919		1920		1921		1922	
	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value	M Ft. B.M.	Value
		$		$		$		$		$
Spruce	1,142,777	29,198,716	1,335,297	43,954,446	1,490,098	56,089,633	874,456	24,621,202	1,018,333	25,743,197
Douglas Fir	715,812	17,347,058	817,591	22,395,242	901,915	34,412,916	680,845	16,613,882	820,724	18,778,646
White Pine	808,652	26,958,500	479,937	19,872,271	641,687	29,602,205	480,214	17,228,634	576,292	20,520,044
Hemlock	273,356	6,753,119	234,785	6,899,719	319,592	11,306,052	232,169	6,114,436	204,742	4,848,002
Red Pine	102,105	3,354,827	89,198	3,404,029	96,253	3,925,008	85,530	2,515,507	67,173	1,993,033
Cedar	130,228	3,186,565	98,808	3,148,810	197,004	7,169,963	95,675	2,799,167	102,603	3,275,171
Larch	77,135	1,943,269	16,490	438,333	73,233	2,783,232	35,323	823,181	30,087	628,875
Birch	76,165	2,215,847	72,286	2,780,984	95,920	4,267,480	88,609	3,007,682	60,966	2,034,354
Maple	47,884	1,355,255	37,485	1,408,268	57,714	2,512,079	47,962	1,771,742	30,185	1,052,831
Balsam Fir	94,774	2,260,196	139,538	4,271,272	132,390	4,733,598	71,707	1,834,217	97,716	2,174,650
Yellow Pine	64,737	1,425,447	37,776	1,081,287	80,578	2,899,820	40,020	1,001,493	30,708	715,405
Basswood	23,965	569,100	25,247	945,002	29,428	1,259,478	26,118	914,700	18,036	594,763
Jack Pine	23,512	638,306	45,016	1,359,245	81,885	3,203,812	51,574	1,268,086	43,209	996,534
Elm	19,016	423,840	15,709	564,690	26,637	1,074,701	21,063	710,208	15,515	519,883
Beech	8,321	218,620	10,581	338,236	8,494	330,040	8,445	243,559	4,841	140,700
Poplar	13,945	302,058	13,584	435,165	15,530	563,659	10,679	332,548	3,498	86,422
Ash	7,827	197,254	7,035	245,162	10,145	422,549	8,723	310,583	6,175	196,676
Oak	3,014	109,599	2,829	133,591	4,727	222,761	3,058	149,909	2,572	119,943
Chestnut	735	22,191	631	21,073	699	33,690	371	18,588	479	22,586
Hickory	213	8,910	181	5,281	165	6,605	174	8,154	135	6,712
Butternut	264	10,050	374	13,592	478	19,259	335	13,018	280	9,827
Cherry	251	6,296	297	8,086	983	40,139	216	8,794	196	7,583
Black Gum										
Walnut	12	705	35	1,425	107	6,120	23	1,765	76	3,537
Tulip										
Sycamore									5	150
Sassafras										
Yellow Cypress	8,219	186,566	10	400					42	1,260
Red Alder	55	1,087	7	295	35	1,220	9	207	20	360
Other kinds	35,209	753,225	30,646	835,812	33,107	1,285,968	6,009	137,323	3,976	81,928
Custom Sawing	208,448	4,254,014	308,377	7,468,937						
Whitewood									14	1,000
Totals	3,886,631	103,700,620	3,819,750	122,030,653	4,298,804	168,171,987	2,869,307	82,448,585	3,138,598	84,554,072

TABLE XK

CANADA: LUMBER PRODUCTION, BY PROVINCES, 1908-1922

Thousands of Feet—Board Measure

Year	Nova Scotia	New Brunswick	Prince Edward Island	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Yukon	Canada Total
1908	216,825	308,400	No report	690,135	1,294,794	56,447	91,166	41,382	647,977	.....	3,347,126
1909	273,551	391,203	1,874	638,582	1,519,080	59,861	87,340	52,850	790,601	.....	3,814,942
1910	260,871	419,233	5,273	790,197	1,642,191	42,922	75,931	45,127	1,169,907	.....	4,451,652
1911	388,114	467,500	7,715	756,508	1,716,849	53,745	134,745	51,084	1,341,942	.....	4,918,202
1912	312,763	449,738	6,771	677,215	1,385,186	39,535	157,255	47,478	1,313,782	.....	4,389,723
1913	274,722	399,247	6,391	630,346	1,101,066	71,961	114,800	44,462	1,173,647	.....	3,816,642
1914	279,044	414,808	6,790	1,118,298	1,044,131	44,658	56,677	45,236	936,612	.....	3,946,264
1915	294,475	633,518	7,453	1,078,787	1,035,341	42,357	62,864	17,975	669,816	.....	3,842,676
1916	220,718	513,655	7,331	818,523	894,050	57,711	84,275	18,350	875,937	.....	3,490,550
1917	236,710	593,497	6,896	827,574	1,110,264	54,216	88,375	33,627	1,200,544	.....	4,151,703
1918	176,332	442,625	6,393	841,084	1,110,062	54,047	75,835	22,388	1,157,636	229	3,886,631
1919	224,804	497,593	8,971	884,612	940,199	30,353	42,457	26,173	1,164,340	253	3,819,750
1920	273,978	515,785	6,241	916,422	992,901	58,419	54,371	41,229	1,443,270	179	4,298,804
1921	115,246	269,983	5,803	649,334	734,054	61,727	10,892	26,002	996,266	.....	2,869,307
1922	101,451	360,030	3,472	649,354	776,280	54,930	9,609	25,618	1,157,851	.....	3,138,598

Of considerable interest, and closely allied with the sawmill business proper, is the production of lath and of shingles. Of the former, the total production in 1922 was over 1 billion, with a value of approximately $5,700,000. Of this spruce supplied nearly 50 per cent; white pine, nearly 20 per cent; hemlock, Douglas fir, cedar, and miscellaneous species following in the order named.

Ontario leads in lath production, supplying about one-third of the total, closely followed by New Brunswick and Quebec. Relatively much smaller quantities are produced in British Columbia and Nova Scotia. To a great extent, laths are produced from slabs, edgings and other waste of lumber manufacture, but with increase in the price of and markets for this commodity, the tendency has been to use material that otherwise would be sawn into lumber. Furthermore, as mentioned in Chapter III, in New Brunswick, and to a certain extent in Nova Scotia, there are many instances where timber is actually cut specifically for the purpose of lath manufacture.

The shingle industry is of even greater importance, particularly in British Columbia where high-grade raw materials therefor are abundant. In 1922, the total shingle cut in Canada was some 2·5 billion, valued at $10,400,000. Over 95 per cent of the shingle cut is of cedar, and British Columbia furnishes about three-quarters of the Dominion total. Quebec and New Brunswick, together, produce over 20 per cent, Ontario and the other provinces contributing very small proportions of total production. In contradistinction to the lath industry, shingles are, as a general rule, sawn from timber cut especially for that purpose.

In 1922 the capital invested in the sawmill and allied industries approximated 165 million dollars, and the total value of products, not including pulpwood sawn at such mills, was 106 million dollars. Both of these figures represent a decrease, however, from 1920 when the lumber cut was over 4 billion feet and shingle production nearly 3 billion. In 1922, all of these mills gave employment to some 32,000 persons; in 1920, to over 40,000.

Although neither in point of capital invested, nor in the value of production, is the industry on such a large scale as the pulp industry, it is nevertheless one of great magnitude, and its continuance on a permanent basis is a matter of transcending importance to Canada. It provides all-important commodities for domestic consumption, and is itself the basis of many other industries. Very important also is its relation to the external trade of the country. For the four-year period 1919 to 1922, the average annual value of lumber, square timber, shingles, and lath, exported from Canada was $76,300; average annual imports of the same commodities over the same period amounted to $9,500,000. The difference, $66,800,000 was the contribution of these particular branches of forest industry toward attainment of a favourable trade balance.

(C) Other Branches of Forest Industry

While obviously the pulp and the lumber industries are by far the more important, there are other activities associated with total forest production of the country. In more recent years effort has been made to segregate figures for the logging operations, as distinct from pulp, lumber, and other manufactories. Figures for the logging industry include production of sawlogs, square timber, pulpwood, ties, poles, posts, piling, and mine timber, fuelwood, etc. In 1922 the total capital invested was 35 million dollars, and total value production 116 million dollars, the former may reasonably be added to the capital figures presented for the other branches of forest industry. The production value, however, may not be so treated; manifestly, the value of all logs sawn into lumber, lath and shingles, or converted into pulp, have already been taken care of in production values quoted for those industries. We may, however, by elimination of the latter, arrive at a net production value for the logging industry. Including fuelwood, poles, posts, rails, mine timber, and wood used in distillation processes, etc., the net production value of these products in 1922 was approximately 75 million dollars. Not including farmers or small wood cutters, who carry on independently, the logging industry gives seasonal employment to some 35,000 persons.

While there are still other forms of industry dependent upon woods supplies, the majority of them are concerned with the higher or more complete processes of manufacture. It is fitting that brief reference be made at this stage, however, to the importance of woods operations on the farms. Here is an industry which, although unorganized, and perhaps not amounting to a very great deal in the individual case, is in the aggregate one of very considerable proportions. In 1920, the total value of ordinary forest products on the farms of Canada was $67,700,000. If to this figure there be added the value of maple syrup and maple sugar—obviously a product of the forest—the total is increased to over 72 million dollars. Comparison with other agricultural values is of interest. The 72 million dollars of forest products, arrived at above, was more than 11 per cent of the total value of all grain crops produced on the farms of Canada in 1920; over 32 per cent of the value of all forage crops; over 11 per cent greater in value than the value of all field crops other than the foregoing, i.e. greater than the aggregate of all root crops, tobacco, hops, flax, etc.; more than two-and-three-quarter times the value of all fruit crops produced on the farms; finally, considerably greater in value than total egg production.

Manifestly, aside from their importance in organized industry, forest activities play a most important part in the pursuits of the rural populace.

(D) General

The aggregate of figures quoted in subsections (a), (b), and (c), preceding, is illuminating. As previously intimated, and without including all of the money invested in standing timber, the capital invested directly in forest industry is about 600 million dollars; total production value, up to and including the lumber and pulp stages, 266 millions; and if paper products be included, 323 million dollars. As against the latter figure exports of these commodities totalled 210 millions, nearly two-thirds of total production. Viewing the matter from another standpoint, imports of the same products approximated 19 million dollars, and the favourable trade balance was therefore 191 million dollars. If we were to include in the exports and imports, figures for furniture, doors, sashes, cooperage, and others of the more highly manufactured articles, it would be necessary to deduct some 3 million dollars from the favourable trade balance of 191 million dollars, previously arrived at.

Canada's grand total exports of all commodities for the calendar year 1922 approximated 885 million dollars; of this amount, wood products contributed 210 millions, almost one-quarter of the whole. Canada's exports of wood products to the United States amounted to 175 million dollars; that is to say, five-sixths of all wood products which were exported went to the United States. Finally, of Canada's total exports to the latter country, amounting to 340 million dollars, wood products contributed over one-half. In our trade with that country, therefore, the forest products play even a greater part than agricultural products. Even a cursory study of these facts reveals how important are the forest industries in our external trade, and consequently, how fundamental to national prosperity are the protection and management of the forest resources, so that the supply of raw materials, upon which these industries are entirely dependent for their success, may be perpetuated.

SECTION 7—SUMMARY OF SITUATION: DURATION OF SUPPLIES

In discussion relating to the individual provinces a clear conception has been given of the pulpwood situation in the various parts of the country. The fallacy of calculating probable duration of supplies by division of total available pulpwood resources by annual consumption has been consistently and intentionally emphasized. In some districts the result secured in this manner might

by chance approximate the true condition, but in the lack of detailed data regarding losses due to other factors in depletion—fire, insects, and decay—such fortuitous calculations are necessarily not to be depended upon. As previously intimated, however, they may be made to serve two useful purposes; first, to offset panic propaganda that portends cessation of forest industry in the immediate future; and, on the other hand, to show the absolute impossibility of permanently sustaining forest industries under present wasteful methods and lack of adequate protection to mature and immature timber.

Within the foregoing limitations it may be stated that division of total annual consumption into the amount of available pulpwood in Canada gives a quotient indicating 63 years' supply. By regions, a similar process would indicate supplies for 31 years in the Maritime Provinces; 51 years' supplies in Ontario and Quebec, taken together; and 195 years' supplies in the province of British Columbia. Taken precisely as they stand, the figures for the eastern provinces, although by no means portraying the gloomy situation that some ardent advocates would urge upon us, nevertheless do indicate how appropriate and essential is a most careful and thoroughly candid consideration of supplies, at the present moment.

Equally uncertain, in the lack of sufficient data, are calculations which presume on definite rates of growth. As pointed out in some detail in Chapter II, Section 10, the most exaggerated ideas of forest increment are prevalent. Firstly, the fact is frequently overlooked that in the mature forest there is no net increment; the growth of individual trees therein is totally offset, and in many cases more than counteracted, by natural losses in the whole stand. Secondly, the growth in younger stands under natural conditions in the forest is much less than it is commonly supposed to be. Undoubtedly the reason for prevailing misconceptions in this regard is that the growth performance of individual trees grown in the open, under better light conditions, and very frequently on more favourable soils, is erroneously applied to timber growing under less favourable conditions in the forest, thus exaggerating out of all measure the increment in the forest. Too frequently, also, the enthusiast will point to some tree which has been set out as a transplant from the tree nursery, and which has received attentive care during the course of its life, and will then translate into terms of forest increment the attainments of the highly favoured individual tree,—one would be as fully justified in expecting that the almost countless plants derived from a spring seeding of garden vegetables would, without judicious thinning, each reach maturity.

Although perhaps the very last thing which the Commission would care to have laid at its door, would be that of minimizing or underrating in any manner the losses due to forest fires, it has, during the course of the enquiry, been thoroughly impressed upon us that in some quarters the most extravagant ideas prevail regarding the losses annually sustained through forest fires. Frequently, one reads or hears statements to the effect that ten, eight, six, or five times the amount of timber which is annually utilized, falls prey to fire.

If such statements were confined to the expression of total losses which have in the past years been sustained from this cause, as compared to the amounts which have heretofore been consumed through legitimate industry, perhaps no serious objection might be made. The extreme propagandist, however, ignores essential fact, when he translates past occurrences into annual happenings. By such melodramatic statements he may do a great deal to arouse some people from a state of apathy; yet, at the same time, he may engender in the minds of those seriously and patriotically interested in the problem, the fear that, if the losses are as great as they are by the extremist claimed to be, there is in Canada but little hope of finally surmounting the fire difficulties.

There is, after all, some limit to the expenditures which may be made in fire protection, and we might as well candidly admit that, if fire losses in this country were ten times as great as annual utilization, there would be little hope in this country—or in any other country similarly situated financially, and with respect to markets for forest products—of finding the wherewithal to finance a scheme of forest fire defence which would be impenetrable. A much better purpose will be served, and much greater confidence inspired in our ability to conquer the forest fire evil, if we look the situation fairly and squarely in the face—neither minimizing nor exaggerating the losses annually sustained. The best available figures, while lacking the lurid complexion of statements so often set before us, most assuredly portray a situation that demands vigorous action and unceasing effort on the part of the governments, the industry, and the people of Canada.

Based upon the losses sustained from 1918 to 1922, Canada's average annual forest fire bill was $14,500,000. During this period more than 3½ million acres of merchantable timber was burned over; over 4 million acres of young growth; and some 2½ million acres of cut-over lands, upon which the young growth which had been established was destroyed. The $14,500,000, mentioned above, includes the stumpage value of the timber destroyed, and the cost of actual fire fighting operations—some 2½ million dollars—but does not include the regular expenditures in fire protective work, although the latter are directly incurred because of the existing fire hazards. Such figures, however, do not give a true indication of the economic loss sustained as a result of forest fires. In the forest industry, perhaps more than any other, the cost of manufactured products to a very great extent consists of labour charges. Therefore, in addition to loss in stumpage values, and expenditures in fire fighting operations, forest fires entail direct loss in the employment value of any district which they may affect.

In 1923 forest fires were more severe than they had been for several years. Particularly in Ontario, Quebec, and New Brunswick, very heavy forest losses were suffered. The inclusion of figures for that year would therefore swell to much greater proportions the figures for losses previously quoted. For the whole of Canada, it is manifestly impossible to state the exact loss incurred in stands of the pulpwood species. In discussion relating to the various provinces, however, this has been done wherever possible.

Numerous references have also been made to losses through insect attacks. Unfortunately, it has only been at times when insect epidemics have occurred that public attention has been focused upon the extremely destructive nature of these pests. Thirty-five or forty years ago when the larch sawfly swept across from eastern to western Canada, killing out practically the entire stand of tamarack, but little attention had been given to the subject of forest entomology. Other insect attacks of lesser severity undoubtedly occurred during the following twenty-five years, but aside from noting the destruction which occurred, but little was done. In the last decade, the two infestations which have excited the most general or local attention have been the spruce budworm and the pine bark beetle attacks. Insofar as they affected pulpwood species, some idea of the resultant damage has been given. It is only necessary to accentuate here, that insect losses are very far from being limited to the epidemics which have aroused public concern in some districts. Forest insects are to be found wherever timber grows, just as the germs of many diseases may be found in a human body even though it be a moderately or entirely healthy one. It only remains for some overtaxing of the vital conditions—a weakening in the constitution of the human body or the body of timber—and these enemies, germ or insect, as the case may be, assert themselves and become epidemic.

Scientific study of these insect depredations has clearly revealed that an epidemic results from a weakening in the vitality of the stand, either of the individual trees growing therein, or in a disturbance of natural growing

conditions. For instance, as a result of continuous exploitation of spruce in New Brunswick, for many generations, the balsam being left almost untouched, the proportion of the latter species in the stand increased very greatly. It was largely the preponderance of balsam, the favoured tree of the badly named "spruce budworm", in the New Brunswick forest, that induced conditions favourable to an epidemic outbreak of the insect. Similarly, in the dry belt in western Canada, the old stand of yellow pine, repeatedly scarred and otherwise injured by frequent fires, resulting in greatly reduced vitality, became the subject of the bark beetle epidemic.

With a knowledge that, in greater degree, forest insects attack dead, dying, or weakened trees, it requires only casual observation in any part of the woods which has been logged over, to realize the unhealthy conditions that are brought about by the methods of utilization which prevail in this country. After all, we are only at the beginning of studies of the forest insect problems which confront us, and the development of practical methods of control is of utmost importance. As is the case with so many ailments of the present day, the prevention of disease is in a large measure a question of improving conditions of general health; so, in forest insect control, practical success will probably only be attained when the methods under which our woods are operated, and the conditions in which they are left, are improved.

Still less is known of the fungus diseases which affect the forest, but the same may be said, namely, that reduced vitality of the forest is in large measure responsible for fungus trouble. No complete estimate of the damage done by any one or more of the many forest diseases due to fungus has been attempted. In more recent years the 'white pine blister rust' has reached the epidemic stage; much damage occurred in the United States and to a more limited extent in eastern Canada. In western Canada, also, the same disease has jeopardized the safety of the limited white pine resources of British Columbia. Of more significance from the standpoint of pulpwood supplies, however, is the rot in balsam; on many areas in eastern Canada the degree of rot in this species has reached the epidemic stage, and is the cause of widespread concern. These are but two specific illustrations of the losses which are sustained from attacks of these insidious enemies of forest growth. Here again, disease is in large measure the result of weakening of the stand, either by fire or by utilization in such a manner that the equilibrium of natural conditions is seriously disturbed.

There is, more or less, a cycle, or an inter-relation, in the attacks of these agents in depletion. Forest fires are almost invariably followed by insect attacks; so that even those trees which may not have been entirely killed by fire, are left in a weakened condition, and thus are very susceptible to insect attacks. The insects in turn still further weaken the stand, and open up countless avenues of ingress for the spores of destructive fungi.

Throughout Canada, the annual merchantable timber loss from fires is conservatively estimated at 800,000,000 cubic feet, and upwards of a million acres of young growth. During the last ten years the spruce budworm loss averaged 1,345,000,000 cubic feet per annum, in addition to the injury from bark beetles and other insects. The extent of losses due to fungi is, as previously explained, unknown. Including the timber utilized in forest industry, therefore, there is little doubt that the forests of Canada are being depleted at the rate of upwards of 5 billion cubic feet per annum, as against which there is the increment due to growth, the amount of which cannot be accurately determined.

In conclusion, it is desirable that reference be made to some economic conditions that prevail in the four main regions. In Chapters II and III, and more generally in the current chapter, it has been clearly enunciated that the

supplies available in the Maritime Provinces will not permit of further expansion of the pulp industry unless lumbering operations are in some measure curtailed; in fact, the continuation of both industries even on the present scale cannot much longer be maintained, even if fire and insect losses were to be reduced to a minimum. In Ontario and Quebec, the available supplies would probably render possible the sustention, on present scale, of both forms of industry, if fire and insect losses were to be controlled, but even on the latter assumption, comparatively little further expansion can be justified. In the Prairie Provinces permanence and limited expansion of the industry is very largely dependent on solution of the fire problem. Finally, in British Columbia the supplies are such as to permit large expansion on a permanent basis, if adequate fire protection be afforded, and more conservative methods of exploitation be adopted.

The question may well be asked, therefore,—in a case where curtailments is necessary, which of the two industries is the more important, and which should give way? In 1922 the sawmill industry, with capital invested approximately 165 millions, produced commodities valued at 106 million dollars, and gave employment to 32,000 persons; to effect this result standing timber to the extent of 746 million cubic feet was consumed. On the other hand, the pulp industry, with some 400 millions invested, produced commodities valued at 140 million dollars, and gave employment to 25,000 persons; to accomplish this 341 million cubic feet of standing timber was consumed,—less than half of the amount consumed by sawmills. From the foregoing it is clearly evident that, for a given quantity of timber consumed, the pulp industry is the more productive of commodity values, and offers relatively greater employment.

The reason for this is twofold; first, in the pulp and paper industry the degree of manufacture attained is much higher, and consequently, the production value from a given quantity of wood is greater; second, by the utilization of much smaller sizes in pulp manufacture, not only can more complete use be made of all trees that are cut, but upon arrival at the mill a much greater proportion of the wood—nearly all of it, in fact—finds its way into the manufacture, particularly in the mechanical process. In the sawmill operation, on the other hand, larger quantities of material are left in the woods, and again, at the mill there is a very large wastage of wood, which has given rise to that pre-eminently destructive appurtenance of the Canadian and American mills, the sawmill burner.

Accordingly, except insofar as the pulpwood operation induces a tendency to the cutting of immature timber, it may be conceded that from the standpoint of conservation of wood supplies, the use of the latter for pulp manufacture is the more economical. Were it not for other economic factors, the obvious conclusion might be that a province or district which is short of timber supplies should engage exclusively in pulp manufacture, and that it should depend upon outside sources of supply for lumber and allied products of the sawmill. As against such a deduction, however, it may be offered that there is no province in the Dominion where the sawmill industry should not play an important part in industrial life; true forest lands embrace relatively such a large proportion of the various provincial areas, and the products of the sawmill are of such great importance in urban and rural development, that, to say the least, each province should be able to supply in considerable measure its local requirements of sawmill products, if not actually to engage in export trade.

Cases very much in point are the provinces of New Brunswick and Nova Scotia. Timber supplies are inadequate for the sustention of present industries. While it is perhaps beyond the scope of this Commission to indicate the treatment which should be accorded, it is entirely within its prerogative to suggest, as has already been done, that an economic adjustment between consumption

in the two forms of industry is of paramount importance. Obviously, with the conditions of ownership which obtain in these provinces, there is room for, and the greatest necessity of, the closest degree of co-operation between the industries and the governmental authorities, in treatment of a problem that begs of solution.

The extent to which forest industries may be sustained on the basis of supplies available, and present rates of depletion, has been discussed in some detail. Each province, or at least each region, must be considered as an entity, demanding within itself the continuance of forest industry. For Canada as a whole, it may be forcibly stated that the continuance of forest production on the present scale, to say nothing of increasing the output, is absolutely contingent upon very material reduction in the amount of losses annually suffered from fires, insects, and decay.

Playing such a large part in the successful industrial development of this country, and contributing in such great measure to our external trade, the forest wealth of Canada simply must be placed upon the business basis of capital and interest, and depletion in all directions confined to the amount of timber which the forest is capable of producing.