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A STUDY OF THE PULP AND PAPER INDUSTRY OF THE PROVINCE OF QUEBEC

IN RELATION TO

ITS PRESENT AND FUTURE WOOD SUPPLIES

by
Paul E. Lachance

A dissertation submitted in partial fulfillment
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ABSTRACT

A STUDY OF THE PULP AND PAPER INDUSTRY OF THE PROVINCE OF QUEBEC IN RELATION TO ITS PRESENT AND FUTURE WOOD SUPPLIES

by Paul E. Lachance

The purpose of this dissertation is to estimate the wood supplies of the Province of Quebec in relation to those required by the Quebec pulp and paper industry, and to suggest measures for improving present conditions and assuring the conservation of the forest as well as the welfare of this industry.

To this end, the importance of the Quebec pulp and paper industry, the geographical distribution of the mills, the laws and regulations affecting the industry, the average yearly wood consumption and the distribution of the annual cuts to groups of mills are studied in Part I.

The abundance of softwood species, the availability of cheap sources of power, the great facilities in the transport of pulpwood to the mills and finished products to markets, due principally to the geography of Quebec, the location of established communities, government policy and forest regulations were all contributing factors in the establishment in Quebec of nearly half of the Canadian pulp and paper mills.

The pulpwood consumption of the Quebec pulp and paper industry during the years 1941 to 1951 is analysed by groups of mills. During the last four years of that period the yearly pulpwood consumption averaged 5,206,000 cords, which represents an increase of 30% over that of the first four years of the decade. An analysis of the 1950-51 pulpwood cut and of its distribution to the groups of mills is also of interest. It shows that no group of mills gets its wood exclusively in its own district, and also that many mills are badly located in relation to their wood supplies.

Part II of the study consists of an estimate of the volume of timber on the forest land available for the use of forest industries, which includes the Crown lands, with the exception of Township Reserves, and the large private forest properties, the whole lying south of the 52nd parallel of latitude. Use was made of official figures obtained from forest inventories which cover 42% of this area; for the rest, personal estimates were necessary. The forest land mentioned above, with an area of 218,490 square miles, shows a merchantable volume of 79,712 million cubic feet of wood, 80% of which is of softwood species. A net sustainable cut of the softwood species is established for each group of watersheds. For this purpose a careful study was conducted of the forest fire losses which occurred during the years 1949, 1950, 1951 and of losses due to insects and diseases, with the result that a total net

sustainable cut of 12,722 thousand cords of softwood is shown to be possible on the forest land available for the use of forest industries. This sustainable cut is compared with the average annual cutting drain of softwood, which amounted to 8,955 thousand cords on Crown lands and on all private forest properties during the period 1947 to 1951. This study shows that, despite a great reserve of mature and overmature softwood in remote watersheds, cutting operations on the most accessible forest areas should be reduced for a period of years by 1.5 million cords a year in order to build up the growing stock on these areas.

Part III presents measures to increase the present yield of the forest through a greater utilization of all species and use of waste materials. Proposals are made to increase the future crop through better forest management and silvicultural practices. The contribution which Quebec's last virgin forest stands could make toward assuring sufficient pulpwood supplies to the pulp and paper industry is outlined in Chapter XV. The use of these supplies would permit the industry to reduce its cutting operations on the more accessible watersheds during the time necessary to build up the growing stock thereon. Finally, is proposed a provincial plan for sustained yield management of the Crown forest lands, based on watersheds as management units.

PREFACE

A more or less critical condition coming to obtain in the vast forests of Quebec and the rapidity with which the grinders and digesters of the pulp and paper mills can liquidate wood, combined with a desire to contribute toward the conservation of these forests and the continuous functioning of the mills, were the reasons behind the choice of subject for this study.

In this thesis an attempt is made to present an overall picture of existing conditions of the forests of Quebec, especially in their relation to the supply of pulpwood for the pulp and paper industry, and to offer suggestions for their improvement.

Part I describes the expansion of the pulp and paper industry in the Province of Quebec and its requirement in pulpwood. Part II consists of a survey of the forest resources of Quebec, and an estimation of a sustainable annual cut of softwood. In Part III are proposed measures for improving forest conditions and assuring a continuous supply of softwood to the established pulp and paper mills of the Province of Quebec.

Most of the data for this dissertation have been derived from official statistics or from public documents; an important part, however, is the product of personal observation and investigation.

I am most grateful to the chairman and members of my committee for their most valuable advice, and to the officers and others connected with the Bureau of Forest Management and the Bureau of Forest Statistics in the Department of Lands and Forests of the Province of Quebec for the kindly manner in which they have taken a personal rather than official interest in providing basic information.

I owe much to my associates on whom fell the burden of my consulting work during many months, to personal friends and fellow foresters whose advice helped toward the progress of this work, especially to André Linteau, silviculturist for the Canadian Forestry Branch, for his constructive criticisms. To every one I can only express my deep sense of gratitude, and most of all to John O. Wilson, a consulting forester of wide experience, whose advice and encouragement from beginning to end has done more than anything else to keep this work going.

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INTRODUCTION

THE PROVINCE OF QUEBEC, ITS PHYSICAL AND ECONOMIC GEOGRAPHY

Quebec, with its area of some 600,000 square miles, is the largest province of Canada. Extending from the United States' border north to Ungava Bay, and from the Province of Ontario and Hudson Bay east to the western boundary of Labrador and the Gulf of St.Lawrence, its area is ten times that of the State of Michigan.

Over half of this vast territory the "Great North", as it is often called, 312,000 square miles in area, is an unproductive land of tundra, rock and water. What few trees are found there are stunted, and rarely reach a diameter of commercial size. This is due to the poor condition of the soil, as well as to the very short growing season at this latitude.

The development of this part of the Province depends solely on the discovery and exploitation of minerals and metals of great value, found sometimes even at the surface of the ground. The present undertaking of Hollinger Mines Company on the border of Labrador and Quebec is a typical example of recent development. A few years ago

an immense deposit of iron ore was discovered near Knob Lake; today more than a thousand people are working on this project, and within a short time a private railroad 360 miles long will carry the mineral to Seven Islands, a small town on the shore of the St.Lawrence. The location of this railroad is shown on the map on page 6.

The southern part of the Province, 284,000 square miles in area, extending north approximately to the 52nd latitude, includes the entire St.Lawrence basin and the southern watersheds of James Bay. This area, in contrast to the northern part of the Province, is relatively fertile and it is here that the majority of the inhabitants live.

Through this southern section flows the great St.Lawrence River, running from Lake Ontario to the Gulf of St.Lawrence and the sea; only a mile or so wide at Montreal and Quebec, it spreads to twenty, forty, then sixty miles across as it nears the gulf, and carries ships from the Atlantic Ocean inland to Montreal, a distance of 800 miles.

Several mountain ranges are found to the south as well as to the north of the St.Lawrence River; on the south, the Appalachians and the Notre Dame Mountains; on the north, running parallel with the river, the beautiful Laurentian Mountains, which like the others are covered with forest. Black spruce, a characteristic tree of the boreal region,

forms the bulk of the stands, while the so-called northern hardwoods enrich by the color of their foliage the more southerly portion of the Province.

Mention should also be made of the Ottawa River which flows into the St.Lawrence near Montreal; of the Richelieu River, which for years was the main channel of communication between Canada and the United States. Half-way between Montreal and Quebec, on the north side of the St. Lawrence, is the St.Maurice River, while a hundred miles east of Quebec is the vast gorge of the Saguenay, reaching westward to Lake St.John.

From the time of the first settlement these rivers have been important as a means of transportation, and for this reason it is not surprising to see the principal cities situated along their shores.

The exception to this are those villages and cities established in the more southerly part of Quebec, now called the Eastern Townships. With the development of the railways the flat fertile lands of Abitibi have been opened up and settled for agriculture.

For over three centuries the population of Quebec has been encouraged and urged by the clergy and provincial government to open more and more of the land for agricultural purposes. Even today a Coloniza-

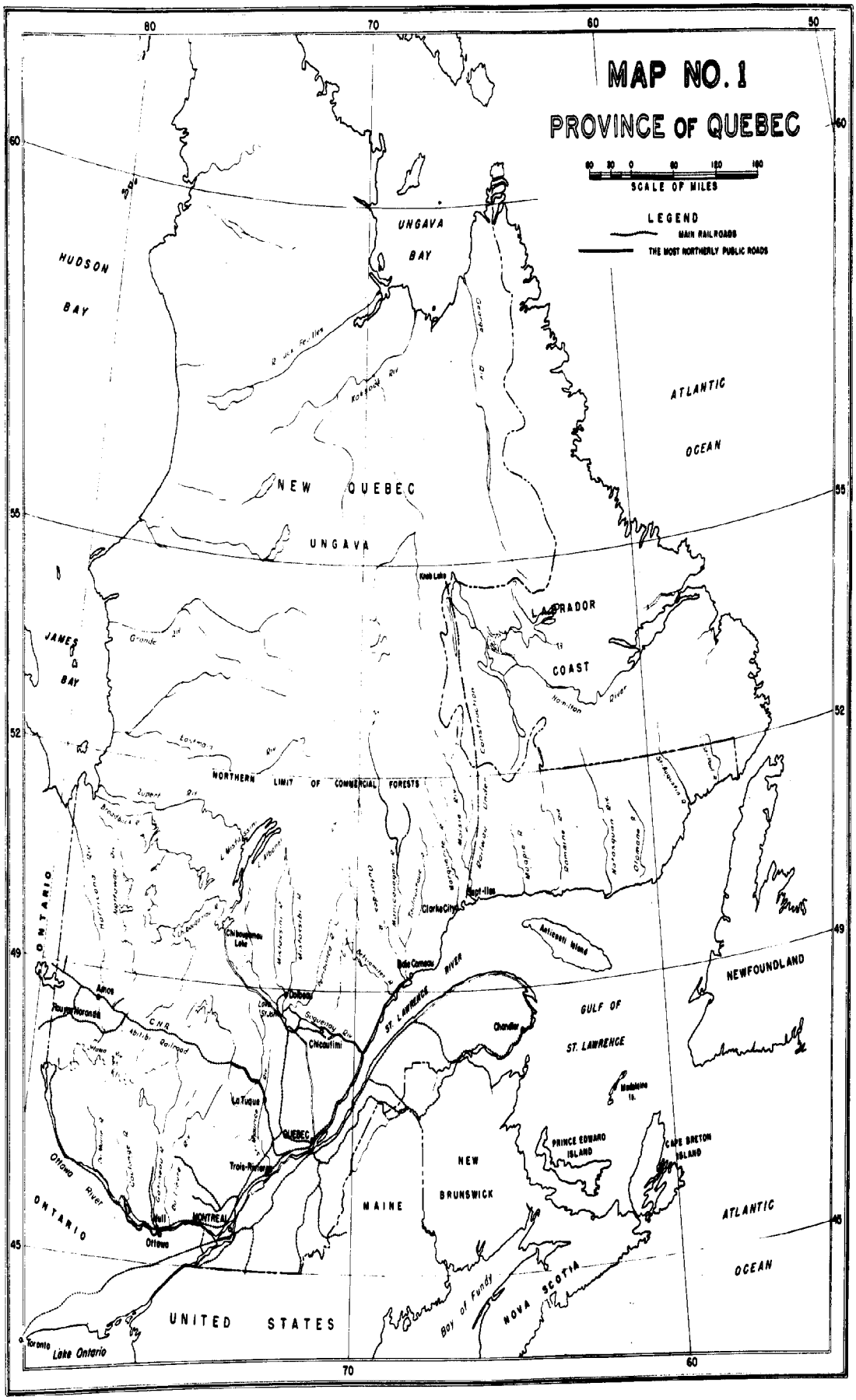
tion department serves to foster the establishment of settlers throughout the Province. However, after three hundred years of efforts to colonize the country, not much more than 20,000 square miles are under cultivation. This represents 8% of the area south of the 52nd latitude; and considering the topography and the poor quality of the soil for agricultural purposes there is no hope that more than 20% of this southern part of Quebec will ever be successfully developed for agriculture.

It is therefore unnecessary to raise the question as to whether the Province of Quebec is a forest or an agricultural land. The forests and the mines, served by hydro-electric developments are, and will remain, the most important assets of the Province as well as the main source of prosperity of its people.

The development and progress of Quebec will always be largely a matter of communication facilities. Quebec is fortunate in having so many rivers leading to the St.Lawrence. This permits water transportation from the Province to all parts of the world. Railroads also serve the southern part of Quebec and tie it to other parts of North America. However, the fact that no public railroad exists north of the 49th latitude shows how undeveloped Quebec still is, and how its 4,000,000 inhabitants are concentrated in the southern portion

of the Province. Public roads are concentrated where the bulk of the population lives. Exceptions are the Chibougamou Road and the road along the North Shore of the St.Lawrence which have been developed for mining and logging activities.

The map presented on page 6 will serve to illustrate the general geography of Quebec, its main railroads, the termini of the most northern public roads and the line of the 52nd parallel, which is considered as the northern limit of commercial forests.


MAP NO. 1
PROVINCE OF QUEBEC
SCALE OF MILES
LEGEND
MAIN RAILROADS
THE MOST NORTHERLY PUBLIC ROADS
HUDSON BAY
UNGAVA BAY
ATLANTIC OCEAN
NEW QUEBEC
UNGAVA
JAMES BAY
LABRADOR COAST
NORTHERN LIMIT OF COMMERCIAL FORESTS
ONTARIO
NEWFOUNDLAND
GULF OF ST. LAWRENCE
ST. LAWRENCE RIVER
MAINE
NEW BRUNSWICK
PRINCE EDWARD ISLAND
CAPE BRETON ISLAND
NOVA SCOTIA
Bay of Fundy
UNITED STATES
Lake Ontario
Toronto
Ottawa
MONTREAL
QUEBEC
Trois-Rivières
Chicoutimi
La Tuque
Amos
Rouyn-Noranda
Chibougamau Lake
Clarke City
Port-Cartier
Baie Comeau
Anticosti Island
Chandler
Knob Lake
Ottawa River
C.N.R.
Abitibi Railroad
80
70
60
50
60
55
52
49
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PART I

THE QUEBEC PULP AND PAPER INDUSTRY

CHAPTER I

A GENERAL REVIEW OF THE PULP AND PAPER INDUSTRY IN CANADA

Owing to the immensity of her forest resources and the tremendous water-power of her rivers, Canada is one of the greatest paper-producing countries of the world. Her forest wealth is surpassed only by that of Brazil, Russia and the United States, and her wood pulp production only by the United States. Even though she does not lead the field in wood pulp manufacturing, she occupies today first place in world newsprint production.

A brief summary of the development of this industry in Canada is presented in this chapter.

The beginning of this industry early in the 19th century was due to a pressing demand for paper. The fact that the immense Canadian forests would shortly supplant the linen and cotton rags used at that time as raw material was then undreamt of.

"The first paper-mill in Canada was built at St.Andrews East in 1803-05 by a group of New Englanders and later operated by James Brown, stationer of Montreal. This was the inception of one of Canada's

most important industries." Such are the words engraved on a tablet by the Historic Sites and Monuments Board which erected a cairn in the parish of St.Andrews East, in what was up to the time of Confederation called Lower Canada, now the Province of Quebec.

Some years later, in 1819, another mill, The Acadian Paper Mill, was established in Nova Scotia.

The first mill in Ontario, which was then called Upper Canada, was the Crooks' Hollow Mill. This mill was in operation in 1826 at Flamborough West, now Greensville, near Hamilton. In honor of this the Executive Council of the Province of Upper Canada recommended "that His Excellency (Peregrine Maitland) may be pleased to issue his warrant in favour of the said James Crooks for the premium of 125 pounds accordingly". 1/

According to the census of 1851 Upper and Lower Canada had five mills each; ten years later Lower Canada had six and Upper Canada five.2/

This was the situation in Canada in 1861 when the Civil War broke out between the Northern and Southern states of the Union. "The

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1/ George Carruthers, "Paper in the Making", The Garden City Press Cooperative, 1947, p. 282.

2/ L.J. Pouliot, Chief of Forestry Branch, Dominion Bureau of Statistics, "Canadian Export Commodities and Industries", Commercial Intelligence Journal, March 31, 1945, p. 261.

war curtailed the output of the American mills, but it increased American consumption of paper. A number of their mills were destroyed, and others had to close down as the war went on, so that ordinary newsprint rose to 28 and 30 cents a pound! Naturally, the Canadian manufacturers took full advantage of the situation, and in spite of heavy duties continued to sell large quantities across the border until American production picked up again".3/

Under the stimulus of the demand for paper at home and from the United States a number of new mills were erected in Canada.

As linen and cotton rags were becoming increasingly expensive, and the quantity quite limited for the new industry which was rapidly expanding, papermakers after experimenting with esparto (Spanish) grass and straw, began to use wood fibre for the making of paper. In this way they could keep the price of paper low and "enable the newspaper proprietors to issue their paper as cheaply as they do".4/ Nearly all Canadian wood species were tried, but finally spruce, then balsam, and to a lesser extent jack pine, hemlock, and poplar, were found appropriate for the making of newsprint because of their long fibres.

3/ George Carruthers, "Paper in the Making", p. 463.

4/ J. Douglas Borthwick, "The Canada Paper of Montreal", "Montreal, its History, with Biographical Sketches", published in 1875.

The first wood pulp mill in Canada was a soda pulp mill, built at Windsor Mills, in the Province of Quebec, in 1864 by Angus and Logan. Two years later, in 1866, Alexander Buntin, owner of what was at that time the largest paper mill in Quebec, the Valleyfield Paper Mills, converted his mill into a groundwood pulp mill, the first in America. This mill had two Voelter grinders which, according to the builder's estimate, "should consume 18,000 cubic feet of wood a year using a 60 H.P. turbine".5/

These two pulp mills are not mentioned in the census of 1871, which covers only the 21 paper mills then in operation; 12 located in Ontario, 7 in Quebec and one each in New Brunswick and Nova Scotia. These paper mills had 760 employees, distributed $197,815 in wages and salaries, and produced paper valued at $1,071,651.6/

In 1875 the Canada Paper Company of Montreal was the largest concern engaged in the business of paper-making in the Dominion. With five paper machines in its Quebec mills, situated at Portneuf, Sherbrooke and Windsor Mills, the company was consuming annually 9,000 cords of wood for the production of approximately 2,000 tons of paper.7/

5/George Carruthers, "Paper in the Making", p. 424.

6/L.J. Pouliot, "Canadian Export Commodities and Industries", Commercial Intelligence Journal, March 31, 1945, p. 261.

7/J. Douglas Borthwick, "The Canada Paper of Montreal", "Montreal, its History, with Biographical Sketches", published in 1875.

Apparently in 1878 the paper business in Canada was somewhat tight, and Buntin, Angus, Riordon, Barber and others signed an agreement to maintain prices for newsprint at 7 cents a pound until Jamary 1st, 1880. And in 1879, John Livingstone of Dominion Paper made the observation that "the demand for the year 1879 will quite equal the supply, if Americans will keep to their own green pastures".8/

However, the industry was expanding constantly - to such an extent that the census of the year 1881, recorded 36 paper and 5 pulp mills in operation in Canada, with a total of 1,588 employees, a payroll of $460,476 and an output valued at $2,509,993, consisting of pulp valued at $63,300 and paper valued at $2,446,693.

Up to 1880 the development of the industry was somewhat slowed down in Canada as well as in the United States by patent controls over the wood pulping processes. But in that year wood grinder patents expired and the processes of making sulphite pulp from wood, although under Canadian patents, could then be used more freely and the rest of the nineteenth century was to see a real expansion of the paper industry.

In 1887 Charles Riordon installed the first sulphite mill in Canada at Merriton on the Welland Canal, in Ontario.

8/ George Carruthers, "Paper in the Making", p. 507.

Under the incentive of William Barber, the Toronto Paper Manufacturing Company built, in 1885, at Cornwall, Ontario, the first sulphite pulp mill to use the Ritter-Kellner, or direct cooking method. During the same year William Barber succeeded in using electric power in his mill, the William Barber and Brothers Mill at Georgetown, Ontario. By doing so, this mill became "the first paper mill to use electric power on the continent, for not until 1896 was it employed by an American paper mill, the Cliff Paper Company, of Niagara Falls, N.Y."9/

In the year 1889, the E.B. Eddy Company built at Hull, P.Q. the first Mitscherlich mill in Canada, with an output of 22 tons of sulphite pulp a day.

During the period 1881 to 1891, nineteen more pulp mills were built in Canada, bringing the total to 24. Seventeen were located in Quebec, 3 in Ontario, 2 in Nova Scotia and one each in New Brunswick and British Columbia, and the annual values of the products amounted to $1,057,810.10/

The mill of British Columbia mentioned in the census was the

9/ Article by A.C. Hastings, Paper Trade Journal, Oct. 16, 1897, p. 116.

10/ L.J. Pouliot, "Canadian Export Commodities and Industries", Commercial Intelligence Journal, March 31, 1945, p. 261.

British Columbia Pulp and Paper Mills Company, in operation from 1894 at Alberni, Vancouver Island. This mill however, used only rags imported from Britain. It was not until 1909 that British Columbia had its first mill using wood as raw material.

This brief history of the early pulp and paper industry in Canada would not be complete without mention of the fact that the first mill to produce chemical pulp by the sulphate, or kraft, process was the Brompton Pulp and Paper Company. This mill was built in 1907, at East Angus, in the Eastern Townships, P.Q.

The progress achieved by the Canadian paper industry during the last two decades of the nineteenth century was relatively small because of a still meager population as well as a limited foreign market. Such, however, was not the case in the United States, where the demand for cheap newspapers and magazines was increasing constantly with the population and caused a higher production of the existing mills. But at the beginning of the twentieth century, the owners of the northeastern American mills began to realize that their forests were being depleted rapidly and that paper production could be maintained only through heavier importation of wood pulp. Therefore the first move of the American papermen was to increase their importation of Canadian wood pulp, which could be brought into the States by paying the small duty in force at the time.

This duty was initially 1/12 of 1 cent per pound for groundwood. At the same time the American publishers, despite the strong opposition of the American paper mill owners, tried to force the Congress to remove all duty on wood pulp and newsprint entering the United States from Canada.

On the other hand, the provincial governments of Quebec and Ontario, knowing that more and more wood pulp and pulpwood was being exported to the United States, began to realize the economic importance of their softwood timber lands. They could see in their immense wood supply and water-power facilities the means of establishing a sound Canadian newsprint industry. They tried, therefore, by their policies to encourage the building of more newsprint mills within their borders.

Because of the constantly increasing movement of pulpwood across the border, it is not surprising to find restrictions being imposed as early as 1900. The Eastern provinces of Canada were most affected, since they have always been the center of the exploitation of pulpwood. In January 13, 1900, "regulations were made by the Ontario Government by which the exportation of spruce and other woods suitable for pulp, cut on lands of the Crown, was prohibited".11/

11/ "Pulpwood Export Regulations", Canadian Lumberman, June 1, 1915, p. 30.

In 1903, following the example of Ontario, the Province of Quebec passed regulations in regard to pulpwood. To promote the development of the pulp and paper industry in Quebec, the Provincial Government reduced the stumpage charge on pulpwood cut under license on Crown land whenever the wood was to be transformed in the Province; while wood for export was subject to a charge of 65 cents a cord of 128 cubic feet, the stumpage for local consumption was 40 cents a cord.12/

A Dominion regulation, similar to that of Ontario, covering federal Crown lands in the Prairie provinces and elsewhere came into force in 1907.13/

Throughout Canada pulpwood cut on private lands was unaffected by these government regulations and thus continued to be exported. Between 1898 and 1905 Canadian exports of pulpwood increased from 369,217 cords to 645,428 cords, an increase of 74.8%. From 1905 to 1910 pulpwood exportation increased from 645,428 to 943,141 cords, an increase of 46.1%. From 1898 to 1910, the total increase was 155.4%.14/

A group of American paper-mill owners, competing with mills importing Canadian wood at a lower cost than domestic wood, were

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12/ "Canadian Pulpwood Export Duty", American Lumberman, April 4, 1903, p. 12.

13/ Commercial Intelligence Journal, March 31, 1945, p. 261.

14/ Bulletin "Forest Products of Canada, 1916", Forestry Branch, No. 62, p. 9, Ottawa, Canada, 1918.

constantly demanding more protection from their government against what they considered unfair competition. Therefore in 1909, when the United States Congress passed the Payne-Aldrich Tariff Act, the Provinces of Quebec and Ontario were warned that if they were to continue to export so much pulpwood to the United States, Congress would be forced to increase the present duties on wood pulp and paper.

Two years later, in April, 1910, by an order in Council, the Quebec Government prohibited the export of unmanufactured pulpwood cut on Crown lands. Similar legislation was passed in New Brunswick on April 26, 1911, and in British Columbia in 1913, but no laws were enacted prohibiting or regulating the export of pulpwood from the Province of Nova Scotia.15/

During these years American newsprint publishers brought considerable pressure to bear on President Taft for the conclusion of a reciprocity agreement between Canada and the United States. This Reciprocity Treaty, which was presented in the legislatures of both countries the same year, proposed to admit free of duty into both countries certain basic raw materials, among them newsprint. The bill approving this treaty was carried in both houses of the United States Congress, but was defeated in Canada.16/ Two years later, in 1913, the Underwood Tariff Act was enacted in a special session of Congress called

15/ "Pulpwood Export Regulations", Canadian Lumberman, June 1, 1915, p. 30.

16/ U.S. Status at Large 1911, Vol. 37, Chap. 3, p.6, Washington, 1913.

by President Wilson soon after his inauguration. After a first revision prepared by the Ways and Means Committee of the House of Representatives, the House approved the new bill with little delay. After a long and protracted debate it was finally passed by the Senate, and became effective on October 3, 1913. Under the terms of this bill, Canadian newsprint, wood pulp and pulpwood, were to be admitted into the United States completely free of any tariff restrictions[17]; this clause has never been changed.

While the above mentioned commodities were admitted to the United States duty-free, the provincial restrictions on the export of pulpwood cut on Crown land remained in effect.[18]

As a result of these laws many new pulp and paper mills were established in Canada. By 1909, the International Paper Company, which on January 31, 1898 had grouped the interests of 20 of the largest newsprint mills in Maine, Massachusetts, New Hampshire, Vermont and New York, succeeded in obtaining lease rights on over 2,500,000 acres of Canadian forest lands. This marked the beginning of the acquisition of vast forest limits by American industrialists.

But the real development of the pulp and paper industry had begun shortly before the turn of the century, when a series of large

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17/ U.S. Status at Large 1913, Vol. 38, Chap. 16, p. 164, Washington, 1915.

18/ In Canada, by virtue of the Act of British North America, the Provinces have full control over natural resources.

groundwood and newsprint mills were built, principally in the Provinces of Quebec and Ontario and mostly along the St.Lawrence and on the banks of other important rivers. In 1899, the Laurentide Paper Company built at Grand'Mere, in the St.Maurice region, the first mill in Canada to make newsprint paper exclusively. In the same region was established in 1901, the Belgo-Canadian Company at Shawinigan Falls, followed by the St.Maurice Paper Company at Three Rivers. It was only in 1919 that the International Paper Company began the construction of its Three Rivers mill, which is today the largest paper mill in the world, having eight paper machines. In 1925, this company built the Gatineau mill, near Ottawa, and in 1931 the Dalhousie mill in New Brunswick.

A similar development was also taking place in the Chicoutimi Region along the Saguenay River. The Chicoutimi Pulp Company opened a groundwood mill in 1898 which, for a time, was the largest in the country. In 1901, Price Brothers & Company became interested in the paper business, acquired a small groundwood mill at Jonquière in 1901 and built a newsprint mill at Kenogami in 1910.

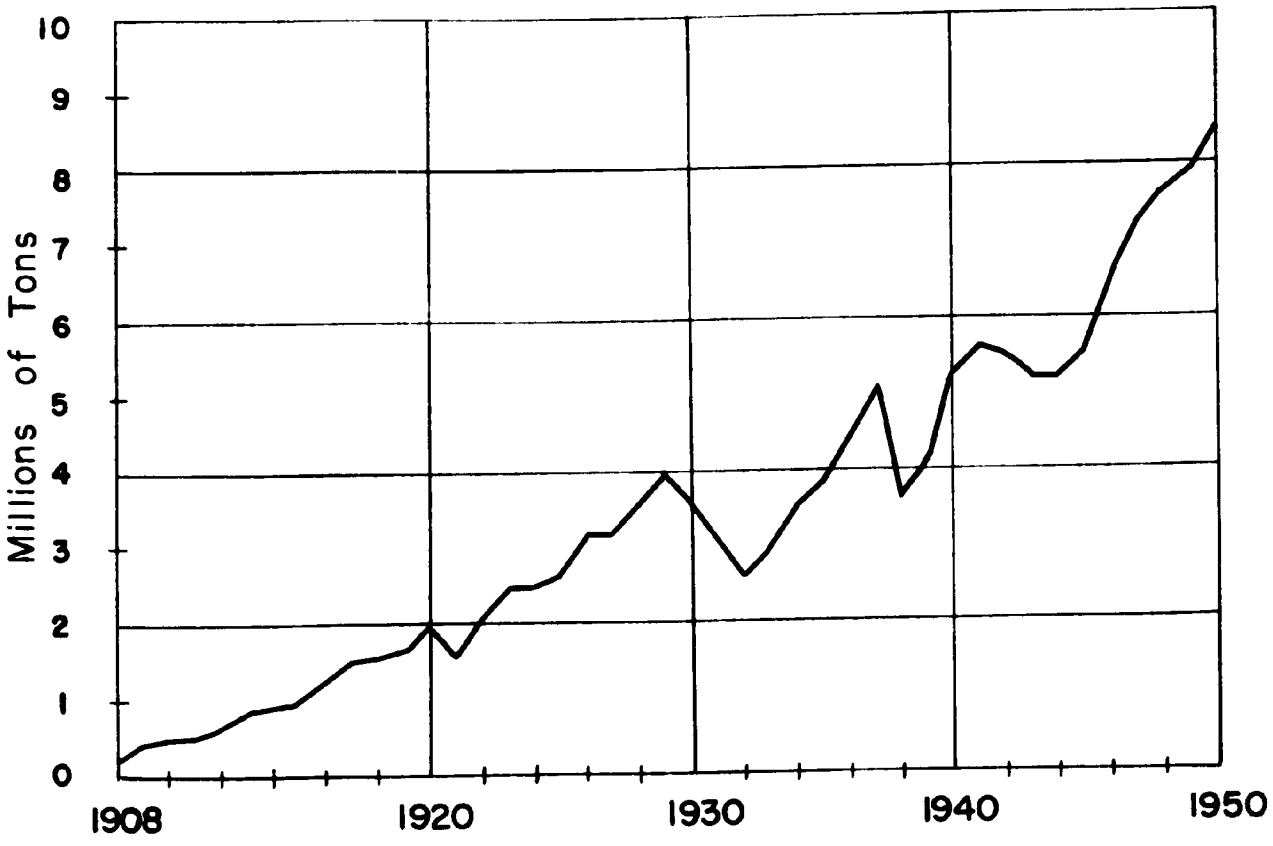
During the same period this new industry was also expanding in the Province of Ontario. A mill was built at Sault St. Marie in 1895, another at Espanola on the Spanish River in 1905, still another at Sturgeon Falls in 1907. The interests of these companies were amalgamated in 1912

to operate under the name of the Spanish River Paper Company. In the same year the Ontario Paper Company, which supplies paper to the Chicago Tribune, was organized; and finally in 1926, many Ontario and Quebec mills were amalgamated to form the Abitibi Power and Paper Co. Ltd.

The progress of the pulp and paper industry cannot better be illustrated than by the expansion of its output. Figure 1 shows the Canadian wood pulp production from 1908 to 1950.

Figure I

Canadian Wood Pulp Prodution
1908 - 1950



As shown in Figure 1, wood pulp production in 1950 was 8,473,014 tons, the highest ever reached in the industry. This represented the output of 123 mills.[19/]

Such has been the growth of the Canadian pulp and paper industry during the past thirty-five years that it is today Canada's leading industry. It occupies first place among industries in regard to gross and net value of production, salaries and wages, and is surpassed in number of employees only by the sawmill industry. Table 1 on the following page illustrates its importance in 1950, and shows its rank among leading Canadian industries.

19/ Forestry Branch bulletin 106. Department of Resources and Development, Canada, 1952.

TABLE 1

PRINCIPAL STATISTICS OF THE TEN LEADING CANADIAN INDUSTRIES, 1950

Industries	Gross Value of production		Salaries and wages		Employment		Net Value of production	
	Thousands	Rank	Thousands	Rank	Number	Rank	Thousands	Rank
Pulp & Paper	$954,138	1	$169,246	1	52,343	2	$511,143	1
Slaughtering & meat packing	757,043	2	54,532	15	20,522	17	107,701	9
Motor Vehicles	675,867	3	94,415	3	29,355	5	284,785	2
Non-ferrous metal smelting and refining	669,883	4	58,748	9	19,863	18	202,712	4
Petroleum Products	511,516	5	30,558	27	10,056	31	107,371	10
Sawmills	496,948	6	111,492	2	58,722	1	239,225	3
Primary iron and steel	340,540	7	85,412	4	29,051	7	154,542	5
Butter & Cheese	330,709	8	41,952	23	21,022	14	74,354	25
Cotton yarn and cloth	257,384	9	55,220	14	26,967	10	95,309	16
Flour mills	247,108	10	11,918	38	4,903	39	31,837	39

SOURCE: DOMINION BUREAU OF STATISTICS, "The Pulp and Paper Industry, 1951."

CHAPTER II

THE IMPORTANCE OF THE QUEBEC PULP AND PAPER INDUSTRY

If the pulp and paper industry has reached such an importance in Canada's economic life, it is in large part due to the ever-increasing production of the Quebec mills. This was especially remarkable in the years following the first World War when for example, in 1918, the Quebec wood pulp production of 802,030 tons was half the total production of 1,557,193 tons for the whole country. To point out the importance of Quebec's production, in regard to that of the rest of Canada, Figure 2 has been prepared and is presented immediately following Table 2, that gives the Canadian wood pulp production by provinces for the years 1929 to 1950. Wood pulp production in Quebec increased constantly up to 1929; after the slump of the depression years it rebounded to the same high in 1939. A similar fluctuation was experienced by the Ontario mills, whereas the mills of British Columbia and the rest of Canada continued to increase production even during those years.

TABLE 2

PRODUCTION OF WOOD PULP IN CANADA BY PROVINCES[1]

Quantity in thousand tons

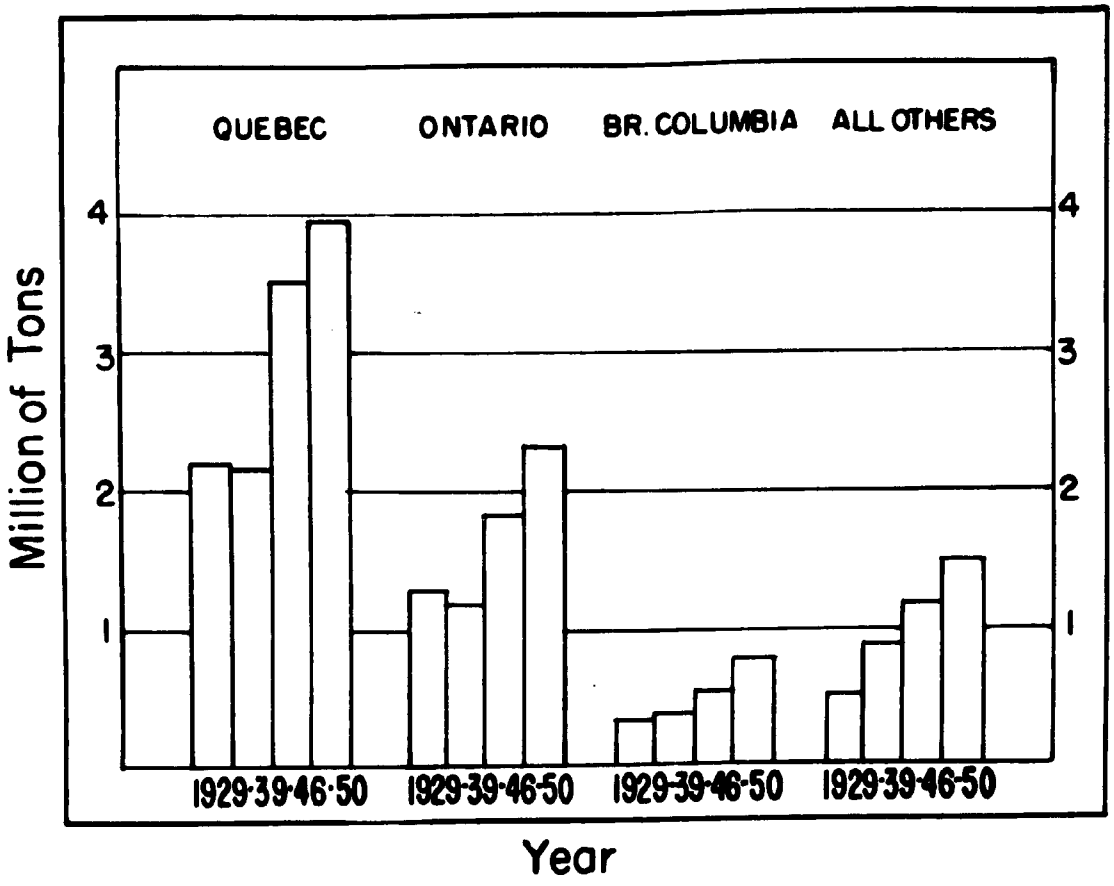
Year	Canada	Quebec	Ontario	British Columbia	Other [2]
1929	4,252	2,175	1,255	304	518
1930	3,619	1,833	1,044	335	407
1931	3,168	1,514	858	310	486
1932	2,663	1,240	786	260	377
1933	2,980	1,361	867	344	408
1934	3,636	1,813	1,000	384	439
1935	3,868	1,916	1,088	377	487
1936	4,485	2,236	1,257	416	576
1937	5,142	2,551	1,467	426	698
1938	3,668	1,859	1,058	242	509
1939	4,166	2,119	1,159	321	567
1940	5,290	2,794	1,369	446	681
1941	5,721	2,972	1,507	508	734
1942	5,606	2,896	1,519	481	710
1943	5,273	2,617	1,491	450	715
1944	5,271	2,767	1,316	490	698
1945	5,601	2,887	1,469	521	724
1946	6,615	3,461	1,838	520	796
1947	7,254	3,752	2,100	593	809
1948	7,675	3,902	2,226	688	859
1949	7,853	3,698	2,138	667	1,350
1950	8,473	3,923	2,297	777	1,476

1/ Source: Dominion Bureau of Statistics.

2/ Includes Nova Scotia, New Brunswick, Manitoba and Newfoundland.

Figure II

Wood Pulp Production by Provinces
in Millions of Tons of 2000 lbs.



Such has been the progress of this industry during the past twelve years that Canada's wood pulp production in 1950 was twice that in 1929; this has been the case for Quebec, Ontario and the other provinces. In British Columbia, however, the expansion has been even more remarkable. It now has four pulp mills and has tripled its production.

Today the Province of Quebec continues to produce about half the total Canadian production of wood pulp.

The demand for newsprint has been so great from the beginning that the pulp and paper industry throughout Canada, and particularly in Quebec, has tended to concentrate on the production of newsprint.3/ In 1950, of a total production of 3,315,631 tons of paper produced in Quebec, 2,766,159 tons (83%) were of newsprint paper; the rest consisted of paper-boards, 254,367 tons (8%); wrapping paper, 122,632 tons (4%); and 172,473 tons of book, writing, tissue and other kinds of papers amounting to 5% in all.

It should be noted at this point that in 1950 the Province of Quebec alone produced 2,766,159 tons of newsprint paper as compared with 1,013,000 tons produced by the United States. In other words, Quebec produced twice as much newsprint paper as the whole United States.

To show the position of the Province of Quebec in regard to the other provinces in 1950, Table 3 on the next page gives certain general statistics on the number and types of mills, number of employees, quantity of pulpwood used and gross value of finished products.

3/ Another factor was that tariffs imposed by the United States on specialties prevented Canadian manufacturers from entering this highly profitable field, as the United States market would have been necessary to absorb the production.

TABLE 3

PRINCIPAL STATISTICS OF THE PULP AND PAPER INDUSTRY OF CANADA, BY PROVINCES

1950

Item	Quebec	Ontario	British Columbia	Other provinces 1/	Canada
Number of mills	54	44	9	16	123
Pulp mills	12	9	4	7	32
Pulp and paper mills	32	18	5	9	64
Paper mills	10	17	-	-	27
Number of employees	22,900	16,977	4,573	7,893	52,343
Pulpwood consumption (cords) 2/	5,160,181	3,163,762	711,340	2,131,515	11,166,798
Gross value of products 3/	$ 421,720,396	$ 299,446,083	$ 86,886,870	$ 146,084,302	$ 954,137,651

1/ New Brunswick, Newfoundland, Nova Scotia and Manitoba.

2/ Cords of 128 cubic feet of piled rough wood, or 85 solid cubic feet.

3/ Sum of values of pulp produced for sale in Canada, for export, and of paper manufactured. Does not include pulpwood or pulp produced in combined pulp and paper mills for their own use in making paper.

(Sources: "The Pulp and Paper Industry, 1950". Dominion Bureau of Statistics, Ottawa.)

It will be noted that the position of Quebec in this branch of Canadian economy is an outstanding one from every point of view.

If the pulp and paper mills of the Province of Quebec play a primary role in the Canadian industry as a whole, they also play an outstanding part in the internal economy of Quebec itself, being by far the Province's leading industry. The pulp and paper industry in Quebec employs more people, pays more salaries and wages, and the material used in the manufacture of its products represents a greater value in dollars than that of any other industry in Quebec. Although the official statistics do not give the amount of capital invested in this industry in Quebec, it is probable that it is well over one billion dollars.

Mention has been made of the fact that some 23,000 people were employed in mills and pulpwood cutting operations in 1950. The $71,000,000 they earned in salaries and wages represents an important contribution to the purchasing power of a part of Quebec's population. Furthermore, according to a statement made by Mr. S. Audet, vice-president of the "Union Catholique des Cultivateurs", 84% of Quebec's farmers, many of whom are operating marginal farms, supplemented their farm income by working in the woods. Lastly the pulp and paper industry spends $9,000,000 annually for Quebec farm products to feed their

employees and horses.

Farmers and settlers owning woodlots cut and sell to the mills between 600,000 and 800,000 cords of pulpwood annually, and thereby collectively increase their income by several million dollars.

The value of the pulp and paper industry in Quebec can be traced throughout other phases of the economic life of the Province. The transport of enormous quantities of coal, lime, sulphur, wood, machinery, and of the finished products, is valued at approximately $35,000,000 annually. In 1945, for example, the Canadian National Railway alone used 80,000 box-cars for the shipping of Quebec pulp and paper products. In addition, thousands of cords of pulpwood were hauled by rail during that year to Quebec mills.

Furthermore entire communities and towns such as Baie Comeau, Windsor Mills and Clermont owe their very existence to the pulp and paper mills built in their midst.

CHAPTER III

GEOGRAPHICAL DISTRIBUTION OF THE PULP AND PAPER MILLS IN QUEBEC

Industries have the general tendency to concentrate in particular localities. This is called the localization or geographical location of an industry. In modern manufacturing several factors account for the location of a mill within a region, and even in some specific place. The distribution of raw material, the sources of power available, transportation facilities in regard to material used as well as to the finished product, and established communities, are all factors to be taken into account. These are the major causes which determined the distribution of the pulp and paper mills of the Province of Quebec.

It is difficult to attribute the location of a mill in one place rather than another to the operation of any one of the above mentioned factors. Invariably one factor is balanced against another; what is the deciding factor for one may be of little importance to another. It is therefore the convergent action and interplay of all these factors, and in most cases of other specific factors, which determine the location of a mill. An analysis of the factors determining the localization of each of the 42 pulp and paper mills of the Province

would be both tedious and unnecessary, but it is deemed fitting to give an example or two by way of illustration.

One example is the Anglo-Canadian Pulp and Paper Mill in Quebec City, which was established in 1926 by Viscount Rothermere for the purpose of supplying newsprint to England. The determining factors in locating this mill were:

1.- By locating on the St.Lawrence at Quebec, the mill had deep-water facilities giving easy access to world markets for its finished products and easy transport for raw material including pulpwood.

2.- Power was available in sufficient quantity and at reasonable rates, without the necessity for capital outlay.

3.- Living accommodation was available for the mill workers near the proposed mill site, again without any capital outlay on the part of the promoters.

4.- Wood supplies from Crown limits for the first twenty years were within easy reach of the mill, with a very low transportation factor from holding ground to mill. Perpetual supplies on a cheap water transportation route were also available for future years.

5.- Quebec is well located in relation to purchased wood supplies.

6.- Plenty of labor was available for the mill in Quebec and for the logging operations on the Crown lands leased by the company.

7.- Rail communications provided all-year-round transportation facilities for the finished product and for incoming raw materials including wood. This reduced to a minimum the need for capital outlay on storage facilities for the five months when navigation on the St. Lawrence is at a standstill.

A contrasting example is that of the Quebec North Shore Pulp and Paper Company mill, built on the St.Lawrence in 1939 at the mouth of the Manicouagan River, some two hundred and fifty miles below Quebec City. The factors in favor of constructing the mill at this site were:

1.- The presence of a vast virgin forest of black spruce.

2.- The fact that falls on the Outardes River near the mill site presented the possibility of developing all the power necessary to run the mill.

3.- Deep-water facilities, except for those months when the St.Lawrence is closed to navigation.

These factors justified the immense capital expenditure demanded by:

1.- Establishing a complete town site.

2.- Storing the finished product for at least four months each year, during the time the St.Lawrence is frozen over.

Other disadvantages which had to be considered were the lack of rail communication, and the necessity of bringing the woods labor force from some distance, a necessity which still presents itself year after year.

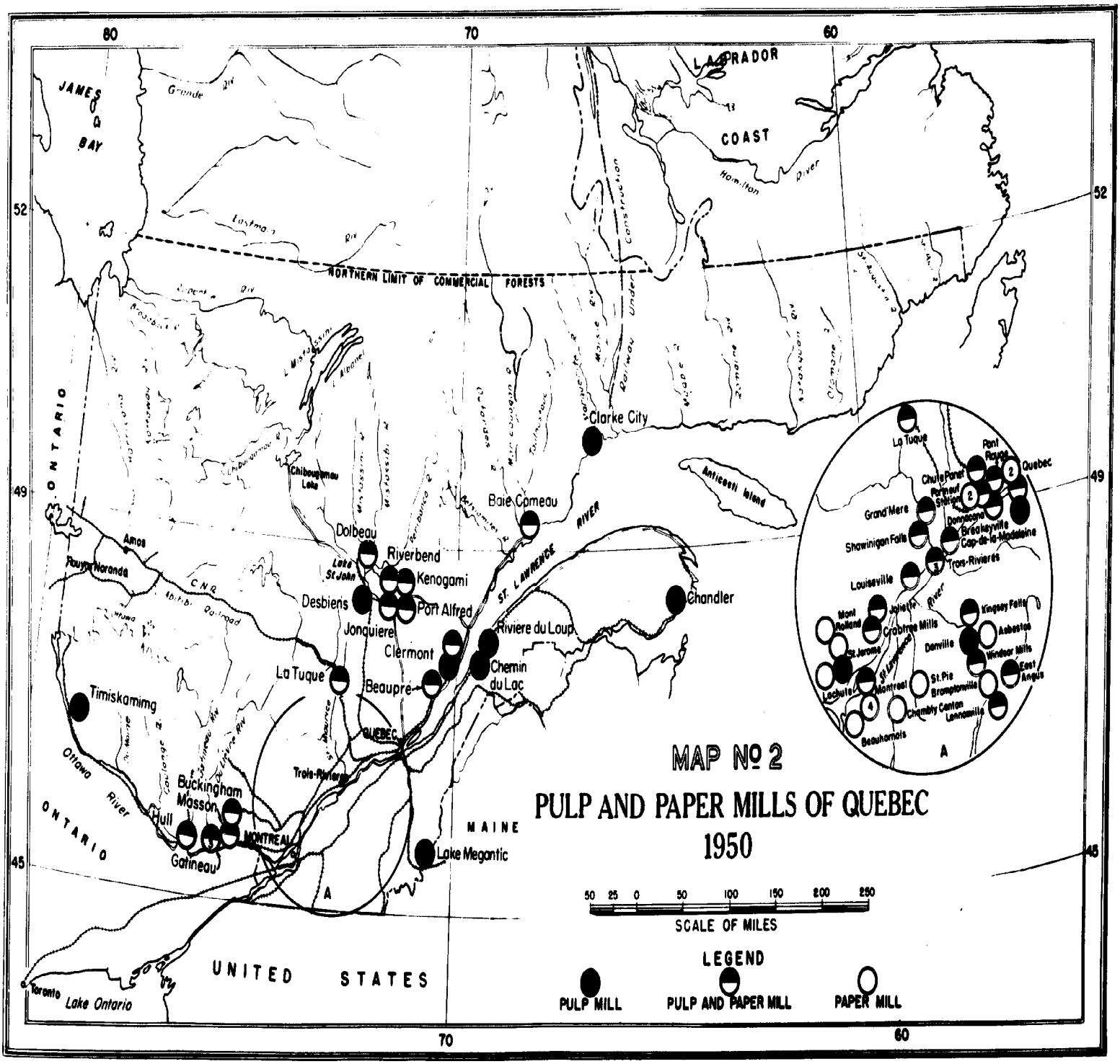
A map presented on the next page shows the location of the 54 pulp and paper mills in operation in 1950. Of these, 11 are pulp mills, 31 pulp and paper mills and 12 paper mills. Since this thesis is concerned primarily with the supply and consumption of pulpwood, no further attention will be given to paper mills. This narrowing in scope is necessary in order to deal only with mills utilizing pulpwood exclusively as raw material.

The requirements for a sound foundation for the pulp and paper industry have been so well met in the Province of Quebec that it seems worth describing how the proximity of the pulpwood supply, the availability of cheap sources of power, the easy transportation of pulpwood to the mills and of the finished product to markets, and finally the labor supply and the location of established communities, have each contributed to the location of the mills.

Proximity of pulpwood supply:

At the beginning of the century the lumber industry was the only one drawing wood from the forest, and that to satisfy the needs of

PROVINCE OF QUEBEC



but a small population and a limited export market. As a consequence, most of the regions of the Province of Quebec were more or less still in the wilderness stage when the pulp and paper industry began to establish itself there. Immense spruce and balsam stands, drained by rivers which could carry the wood directly to the mill, proved a great temptation to American newspaper publishers in the Northeastern States. They appreciated the great advantage in being able to establish mills at the mouths of huge rivers, where the enormous wood supplies necessary could be cheaply collected. This contrasted very favorably with the heavy transportation costs of wood imported by rail, which was the only transportation means available for supplying their established mills in the United States.

Thus for example, in 1899, the St.Maurice watershed, with its 16,076 square miles of pulpwood reserve, saw the beginning of the construction of several mills; first the Laurentide Paper Company mill at Grand'Mere; then, in 1901, the Belgo-Canadian Company mill at Shawinigan Falls, to be followed in later years by the construction of four more pulp and paper mills at Three Rivers, all at the mouth of the St.Maurice. These mills at Three Rivers form the largest center of newsprint production in the world.

The call for "cheap wood at the mill" was an important factor in the concentration of mills on the St.Maurice. The same can be said of that of the Ottawa and Saguenay watersheds. Elsewhere the mills were spread out, principally along the St.Lawrence River, mostly at the mouths of rivers which could carry the wood directly to the mills.

Availability of cheap power:

An abundance of cheap pulpwood is necessary for the establishment of a sound newsprint industry; but this alone is of little use where there is insufficient cheap power available. Gaspé peninsula, for example, one of the earliest settled regions of the Province, still has only one small chemical pulp mill, and the power for this was at first developed by coal, then by diesel. The mill of Bathurst, in New Brunswick, might well have been built at the mouth of the Cascapedia River in Gaspé region, whence it obtains most of its raw material, had any water-power been available there. The example of Gaspé serves to illustrate how lack of water-power facilities in a region with sufficient pulpwood supply retards mill development.

The numerous falls on the rivers flowing into the St.Lawrence River and James Bay offer plenty of potential supplies of power. These rivers can be used not only for driving the wood, but also to furnish

adequate and suitable water supplies for the mill, and can easily be developed for power.

At first the falling water alone provided the power for the mills. Dams were built and the water flowing by gravity furnished all the power required for the operation of the machinery. A list of all the Quebec pulp and paper mills which have used and still are using turbines for the direct driving of their grinders would be too lengthy; but mention may well be made of the following: the Donohue Brothers Limited at its mill on the Malbaie River, the Gulf Pulp and Paper Company on the Ste. Marguerite, the Canada Paper Company at its mill on the St. Francis River, and the Brompton Pulp and Paper Company, also on the St. Francis River, which as early as 1882 had a 1200 horse-power hydro-turbine.

Later, with the development of hydro-electric power, from 1888 on, the mills were able to adapt themselves to generated power developed at the site of the falls. This new manner of using water-power has been given such wide application that today, of the forty-two pulp and paper mills in Quebec, at least sixteen have hydro-electric installations. Many more use electrical power supplied through trans-mission lines.

Large production of pulp and paper demands such great power

facilities that those rivers with the largest power potentials are centers for the concentration of pulp and paper mills, as is the case with the St.Maurice, Saguenay and Ottawa Rivers.1/

Until transmission of power was developed, mills had to be built at the source of power. But when, in 1900, the Shawinigan Water and Power Company, the first important Quebec power company, offered power at a distance through transmission lines, pulp and paper mills could be built at places otherwise more convenient and advantageous than power sites. Power through transmission permitted, for example, the construction of the Three Rivers mills, which as mentioned before form the largest newsprint-producing center in the world. An example of long transmission of power worthy of mention is that of the Anglo-Canadian Pulp and Paper Mills built in Quebec in 1926, which are run by power developed on the St.Maurice, some 90 miles from the mills.

Transportation of pulpwood to the mill and finished products to markets:

The cost of transportation of the wood to the mill and of finished products to consuming markets is a factor of the greatest importance in determining the location of a pulp and paper mill.

1/These three rivers together have hydraulic turbines developing nearly 5 million horse-power.

In Quebec the transportation of the wood from the stump to the mill was formerly almost exclusively based on horse transportation to waters which could carry the wood down to the mills. Today tractors and snowmobiles supplement horses in hauling the wood from the stump to truck roads or directly to drivable streams. As the drive, i.e. the moving of the wood by floating it loose down-stream, or in booms across lakes using tugs as motive power, is the least expensive way of delivering large quantities of wood to mills, most mills in Quebec still transport the major portion of their wood requirements in this way.

For the hauling of wood from timber limits located in watersheds other than that in which the mill is located, the transportation is done by boat, rail or truck, depending on the distance and the facilities available. On the St.Lawrence the wood is transported to the mills by lake boats and schooners. For long distances and inland transportation the wood is usually moved by rail, except on comparatively short hauls, up to say thirty miles, in which case the transportation is by truck.

The choice of transportation method depends upon two factors: the methods available and the cost involved. Associated with cost is the value of the wood accruing to the fibre species; the higher this

value the more the company can afford to pay for transportation. Black spruce, for example, is a high-value species on account of its high density. A company can afford to pay a higher transportation cost for this species than for any other because of its higher yield in pulp. Using black spruce, smaller volumes and less weight of wood produce more pulp and more paper, which in turn means more money out of which the increased cost of transportation can be paid.

The importance of water transportation during the summer months is such that a keen competition results during this period between rail and water transportation. Often in the Interstate Commerce Commission Report, or in the Board of Railway Commissioners' Reports for Canada, mention is made of "summer rate" for railroad transportation. These "summer rates" were instituted in order to permit competition with water routes. In 1936, for example, the rate for the transportation of newsprint from Quebec to Chicago by rail had to be reduced from 38.5 cents to 28 cents per hundred pounds from May 1st to November 30th, in order to compete with water transportation.2/ There has been, however, no "water competitive rate" in effect since the last war. On the contrary, the tendency has been to use rail for shipment in order to cut down the expense of winter storage.

2/ Interstate Commerce Commission Report, 1937, Vol. 219, p. 611.

Mention should also be made of the advantage held by those mills having deep-water facilities, not only in the shipping of the finished products, but also in the receiving of the raw material, including pulpwood, by lake boat and schooner. This advantage may prove to be one of the most important factors in the maintenance of certain established mills which, because of an insufficient supply of wood in their vicinity, may in the future have to count on wood from remoter regions to assure themselves of long-term wood supplies.

The transportation of newsprint paper by rail from American, as well as from Canadian, production centers, in relation to definite territories or centers of newsprint consumption, required, as early as the beginning of 1900, that a system of group-rating, based on domestic and international joint rates, be established. It is doubtful that any difference in rail rates from Quebec mills to the United States has been sufficient to cause the concentration of mills in one region rather than in another. Considering, however, that most of the production of paper from Quebec and the Maritime Provinces which is exported to the United States supplies the markets of New York, Boston, Philadelphia and Pittsburg, it is interesting to know the difference between the rail rate paid by the mills of a certain region and those of another for the transport of newsprint paper from the mill to New York for instance.

In the Canadian-American rail rate structure the "Grand'Mère group" which includes the mills of Ottawa, Three Rivers, Grand'Mère, Quebec, and East Angus, is the only one officially recognized since 1933. All mills lying north or north-east of the Grand'Mère group are subject to higher rates, and these points of shipment are called "arbitrary points". Although many increases or decreases of rates have been applied from time to time, in order to meet fluctuating economic conditions or the competition between rail carriers or water and rail carriers, the following domestic and international joint rates from Eastern Canadian mills to New York, as revised and approved by the Interstate Commerce Commission and the Board of Railway Commissioners in 1934, have served ever since as the basis for compilation of rates.

From	To New York
	In cents per 100 pounds
Jonquière	37.0
La Malbaie	36.0
Beaupré	34.5
St.Raymond	34.0
Quebec	32.0
Grand'Mère	32.0

(Board of Railway Commissioners, Judgement and Orders, Vol. 24, p. 80)

In accordance with the basic rates authorized in 1934, mills located along the Saguenay River had to pay $1.00 a ton more than the Grand'Mère group or Quebec City mills for the transport of newsprint delivered to New York.

Established communities:

The building up and maintenance of a town site, in order to house the labor necessary for the running of a mill, is a very expensive item for any company. Therefore, wherever possible, the companies erecting new mills tried to locate them in villages or localities where a labor force was already established. Due to the geography of the Province this has been an easy matter. As the St.Lawrence and its main tributaries served as natural thoroughfares for the earliest settlers, villages and cities were established all along the south shore of the St.Lawrence, and on the north shore from the Saguenay River inland, most especially at the mouth of and along the principal rivers.

Therefore most of the pulp and paper companies, by building their mills either along the St.Lawrence or its main tributaries, found communities already established near the proposed mill sites. The companies which established themselves early in this Province had that advantage, but mills which came later, the Quebec North Shore Paper

Company for example, had to acquire limits farther from any population center and go to the expense of building up a whole town site with all modern facilities, such as water, sewage, electricity, and so on.

Despite the material advantages to be gained by building mills in or near communities already established, this factor was of less importance than an abundance of pulpwood, water-power and transportation facilities in influencing the concentration of mills in one place rather than another. Usually, several factors decided the issue.

CHAPTER IV

GOVERNMENT POLICY AND REGULATIONS AFFECTING THE PULP AND PAPER INDUSTRY

In a study of the pulp and paper industry with regard to its wood supply, it is essential to consider government policy and regulations affecting this supply.

Without giving a complete history of policies and rules of the government concerning the administration of public forest land since the beginning of the colony, it is important to mention some of the early regulations which serve today as the basis of the Woods and Forest Regulations governing the Department of Lands and Forests in its relations with Crown timber limit users.

Up to 1827, the cutting of logs on Crown lands in Quebec for domestic use, as well as that of large timber for the Royal Navy, was done by individuals and by companies who paid no dues. About this time the government, having come to realize that the forest had a value, began to issue, and charge for, cutting permits. Although these permits were sold at public auction, the buyers, by making previous arrangements to avoid overbidding one another, defeated the purpose of the auction and

cutting rights were obtained at very low prices. The permit was sold on a stumpage basis and there was no other charge. The buyer could renew his permit each year, provided he had paid his stumpage dues, by simply making a request in writing to the government prior to May 1st.

In 1849, private sales of cutting rights were permitted. A law adopted by the Legislature gave the Lands Commissioner the right to issue cutting permits on Crown lands subject to prices, conditions and restrictions established by the Cabinet. In 1866 the law was modified and timber limits were sold at public auction twice a year, a sale price or "premium" of a minimum of $4.00 per square mile being exacted of the buyer. Unfortunately, as the public auction took place only twice a year, the Land Commissioner had the right in the interval to sell cutting rights by private sale. This system was followed up to 1874 when such private sales were definitively forbidden.1/

Up to 1934 public auction of cutting rights on Crown timber limits was the rule and the bidding was on the rate of stumpage to be paid. In the years 1920 to 1930, however, the government established a minimum stumpage rate, and bidding was on the basis of the premium to be paid over and above this minimum.

Although the law stipulating that licenses to cut wood on

1/ Esdras Minville et autres, La Forêt, 1944, p. 89.

Crown lands be granted only by public auction has never been revoked, no public auction has been held since 1934, and the granting of cutting rights on Crown timber limits is done by the adoption of special bills by the Legislature. This is undoubtedly the most important change in the principles established in 1874 concerning the disposition of Crown timber limits. The other rules and regulations established some hundred years ago have remained the same. Licenses to cut continue to be renewable year after year, and the payment of a ground rent, established in 1851, continues to represent the acceptance by the government of the renewal of licenses, with the difference that the $0.50 per square mile paid for ground rent in 1851 has climbed to $10.00 today, payable whether the area is operated or not.

This procedure of renewing licenses from year to year in Quebec has some very undesirable results. It is generally regarded as insecure and detrimental to long-term policies, such as are essential in promoting sustained yield forest management. Limit-holders, advised by their foresters, advocate a longer and more secure tenure. But the authorities maintain that the renewable feature is perpetual and they have legalized borrowing on the security of the limit by levying a fee on such transactions. This in fact and in law means that so long as borrowed money is outstanding against any limit the government is forced to renew the licence.

The Woods and Forests Regulations stipulate that any transfer of timber limits must be made by notarial deed, and that such transfer shall only come into force on its acceptance by the Minister of Lands and Forests and upon payment of a bonus of $65.00 per square mile or fraction of a square mile (O.C.[2]/48 - 1945). This regulation on transfer was established in 1849, and the premium has varied greatly since. It was $8.00 per square mile in 1868, $4.00 in 1877, $1.00 in 1880, $4.00 in 1901, $20.00 in 1920, $50.00 in 1937, $60.00 in 1941 and finally $65.00 in 1945.[3] Such a premium is required when the transfer of timber limits is a definite sale. When, however, a mortgage is raised on the security of a limit the premium is only $10.00 per square mile plus an additional $1.00 per square mile when the initial holder recovers ownership of the limits he had mortgaged.

Besides the annual ground rent limit-holders must pay stumpage fees on the wood they cut, the quantity cut being determined by scale. These fees vary for each species but are uniform for specific species throughout the Province regardless of the location of the timber limit. At present the rate of stumpage for spruce, balsam and hemlock, cut in rough pulpwood on licensed lands, is $2.00 a cord (O.C. 460-1948 and 598-1951) plus 15 cents a cord as a special tax, called educational tax (O.C. 2523, 1948 and Bill No. 48, 1946.)

2/ O.C. as used here means Order in Council.

3/ P.E. Lachance, "Etude sur les tarifs de droit de coupe", mimeograph copy to the Quebec Forest Service, 1943.

The laws and regulations of the Province place certain responsibilities on limit-holders and private owners of more than 2,000 acres each of forest land in regard to the protection of those forest lands against fire. Wardens must patrol these areas throughout the fire season. These regulations in regard to fire protection of forest areas may be carried out by the limit-holders themselves or through associations of limit-holders responsible to the Provincial Fire Protection Service. Fire protection on vacant Crown lands, forest reserves, and on small private timber tracts is done by the Provincial Fire Protection Service itself. All this will be dealt with later in this thesis.

Cutting permits held by Crown timber limit-holders do not give them the right to cut the wood as they please; they must comply with the "Woods and Forest Regulations" and the special laws governing the management of Crown lands adopted from year to year. Without going into the details of all the Quebec forest legislation, the most important laws and regulations which affect the pulp and paper industry should be considered.

According to Article 12 of the Woods and Forests Regulations, "Each licensee must furnish to the Department, in addition to a working plan for the whole area which he holds under license, a special working plan for the sector to be operated during the first decade". The cutting

operations, in turn, in order to conform to the working plan, must comply with some very detailed specifications: the allowable annual cut as specified in the special working plan must not be exceeded for the said period; the cutting program for each season must be submitted to the Department of Lands and Forests at least three months before the commencement of the work; the areas to be logged must be examined before cutting by the forest engineers of both the licensee and the government; no cutting is allowed in stands which are not mature. "The forest engineer who has prepared the seasonal cutting program shall be responsible for carrying it out and for the supervision of the cutting operations"; within three months following the end of any operating season the same forest engineer "must deliver to the Department of Lands and Forest a post-cut report"; and finally "before exploiting stands of green wood, the licensee must, if it can be done economically, exploit the stands damaged or depreciated by windfall, insects, fungi, etc...; for each decade subsequent to the first, the general working plan must be revised and brought up-to-date, and another special working plan prepared".

And the Regulation continues: "The Minister of Lands and Forests may make special regulations for operations on licensed lands for which no working plan has been furnished. If, for any special reasons, it becomes necessary to authorize the exploitation of non-damaged lands,

the volume of the cuts there shall be limited to an empirical possibility fixed by the Minister, and it may be permitted to cut there only trees of twelve inches (12") and over in diameter, except spruce, balsam, and jack pine which may be cut to ten inches (10"); paper birch, poplar, and aspen which may be cut to seven inches (7") in diameter, measured one foot from the ground."

Article 13, as amended, stipulates that: "All timber cut on Crown lands after the first of May 1910 must be manufactured in Canada, that is to say, converted into pulp or paper, deals or boards, or into any other articles of trade or merchandise of which such timber is only the raw material".

However, the following timber is exportable (O.C. 2125, 28 May 1940):

"a) All aspen and poplar cut on Crown lands and on settlers' lands with a certain percentage of softwoods to facilitate foreign transactions.

b) All pit or mine props prepared for the English market and cut on Crown or settlers' lands.

c) Wood of whatever other nature cut during clearing operations on lands occupied in good faith and held in virtue of an occupation permit or a location ticket, the whole to the satisfaction of the Minister of Colonization.

d) In certain cases the Minister of Lands and Forests (O.C. 3250 of Nov. 27, 1942) is authorized to permit the exportation of wood damaged by fire."

"It is understood that the Minister of Lands and Forests shall be authorized to collect a supplementary tax of at least ten cents per cord on softwoods which will benefit from this exportation permit",(O.C. 2125, May 28, 1940.)

There is also legislation dealing with conservation in which mention is made of a cash bonus of $10.00 for each acre of land reforested and maintained in good order. However, the maximum is $500.00 per license-holder (O.C. 1015 - 1944).

In 1941, by article 99, Chapter 93, R.S.Q.[4] 1941, permission was given to the Minister to issue special permits to cut timber on vacant Crown lands.[5] This can be done under certain conditions, and providing that a report has been prepared by a forest engineer describing the forest conditions of the block to be operated. The maximum amount of wood allowed to be cut under such a permit is 150,000 cubic feet but "may be increased to 300,000 cubic feet when the timber is intended to be sawn in a sawmill the operating of which is an economic necessity for a neighbouring locality". The tariff of stumpage dues for wood cut for

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4/ R.S.Q.: Revised Statutes of Quebec.

5/ "Vacant Crown land" is the term commonly used in Eastern Canada for unassigned or unoccupied Crown forest land.

industrial purposes from vacant Crown lands is usually double the regular tariff prevailing on timber limits. According to official figures 7.5% of the total cut on Crown lands in 1950 came from cutting operations under special permits on vacant lands.6/

Besides the above general regulations, special laws and regulations have been passed from time to time. The following are some of those passed during the last fifteen years.

On May 11, 1937, Bill 53 was adopted, which reads in part as follows: "The object of the present act is to regulate the shipping to places outside the province of wood cut on public and private lands and unworked, by means of permits. The permits granted to farmers and settlers shall be gratuitous".

On April 22, 1941, Bill 34 was passed, decreeing that: "The Lieutenant-Governor in Council may authorize the Minister of Lands and Forests to grant a reduction in stumpage dues to timber limit-holders who carry out, under the direction of forestry engineers, work or improvements according to sylvicultural data to ensure better planning of operations and more rational working of the forest. The reduction granted must not exceed the cost of the technical labour employed in carrying out such work or improvements".

6/ Rapport du Ministre des Terres et Forêts de la Province de Québec, 1952, p.30.

In 1947, two bills respecting forest conservation were adopted.

Bill 21 authorizes the Government: "1- to undertake a complete inventory of the forest resources of the Province, of their extent and of their value, and also to undertake the research it may deem expedient to advise as the best means of insuring their preservation, renewal and utilization for the greatest benefit of the population of the Province; 2- The Lieutenant-Governor in Council may appoint specialists, technicians, counsels, officials and employees whose services he shall deem useful for the attainment of these aims, fix their fees, remuneration and salaries and to authorize any and all other expense which he deems necessary to conduct such inventory for good purpose; 3- The Government is authorized to spend for such purposes, out of the consolidated revenue fund, a sum not exceeding two hundred thousand dollars; 4- The carrying out of this act is entrusted to the Minister of Lands and Forests."

Bill 24 stipulates that "Any wood cut on Crown lands under a cutting license issued in conformity with the Lands and Forests Act must be wholly worked within the Province". However, it is mentioned in Section 2 of the act that: "Whenever, owing to particular industrial, commercial or economic conditions, the Lieutenant-Governor in Council deems in the interest of the country, of the province or of a region of the province that a derogation should be made to Section 1, he may limit, to

the extent and upon such conditions as he may determine, the application of such section and authorize the Minister of Lands and Forests to issue permits accordingly".

These laws and regulations represent a first and a very good step toward the conservation of the forest. However, they can produce little in the way of actual sustained yield management without the good will and cooperation of each and every one of the limit-holders. Forest management, in a broad sense, is achieved through the application of silviculture and engineering, together with economics and finance. It is, unfortunately, very easy for anyone to over-emphasize some one of these sciences at the expense of others in appraising the feasibility of complying with certain laws or regulations in some specific case, a practice which often defeats the purpose for which these laws were passed. The latest available Report of the Minister of Lands and Forests, published in March 1952, reveals that in 1951, of the 79,732 square miles of Crown land leased to the forest industry, 12,166 square miles, or 15 per cent, were still being operated without any working plan, and that plans for an additional 12,000 square miles of limits were obsolete.

Forest inventories, although initiated some thirty years ago, still cover only 42 per cent of the accessible forest. Despite the excellent laws and regulations covering fire protection, 418 square miles of woodland were burned in 1951, and the average burned-over area for the last twenty-seven years is about 318 square miles annually.

CHAPTER V

PULPWOOD CONSUMPTION OF THE PULP AND PAPER INDUSTRY BY GROUPS OF MILLS

The world demand for newsprint, paper, and wood pulp in general has been such since the beginning of the last World War (in 1939) that, in order to meet it, the Quebec pulp and paper industry had to more than double its pre-war pulpwood cutting operations. According to provincial statistics, pulpwood production jumped from 2,300,000 cords in 1939, to 7,332,000 cords in 1948. In 1949 it was 6,059,000 cords, while in 1950 it dropped to 4,851,000 cords, due largely to inventory adjustments.[1] Of the total yearly cut of pulpwood in the Province approximately one million cords are sent annually to Ontario, New Brunswick or foreign countries (principally the United States) to be converted into wood pulp. Based on a publication of the Quebec Department of Lands and Forests,[2] Table 4 presents the production of pulpwood in the Province, the amount used in the Quebec mills, and the quantity exported or sent to mills outside the Province, as well as the amount cut or bought in other provinces to be processed in Quebec mills, for the four cutting seasons 1947-48 to 1950-51 inclusive (years ending March 31st in each case).

1/ Although this survey covers only the years up to 1951, it is interesting to note that in 1951 production climbed to 7,412,677 cords.

2/ "Statistiques Forestières, 1951".

TABLE 4

SOURCE OF RAW MATERIAL USED IN QUEBEC PULP AND PAPER MILLS DURING THE FOUR-YEAR PERIOD 1947 to 1951

Volume in thousand cords

Year ending March 31st	Total Quebec production	Exported or used outside Quebec	For use by Quebec mills		
			Cut or bought in		Total
			Quebec	Other provinces	
1947-48	6,785	1,237	5,548	1/	5,548
1948-49	7,332	1,369	5,963	160	6,123
1949-50	6,059	1,061	4,998	116	5,114
1950-51	4,851	929	3,922	103	4,025
Total	25,027	4,596	20,431	379	20,810
Average	6,257	1,149	5,108	126 2/	5,202

1/ Figure included in the Quebec production, as breakdown not available.

2/ Based on three years only.

It can be seen from the above official statistics that the Quebec pulp and peper mills require slightly more than five million cords of pulpwood a year if their average production for the period 1947-48 to 1950-51 is to be maintained. At this rate of consumption the home use of pulpwood is equivalent to 83% of the total production of pulpwood on Crown and private lands in Quebec.

It is necessary, in order to present a complete analysis of the requirements of the pulp and paper mills, not only to know the total amount of pulpwood used annually in the Province, but also its distribution among the 43 mills situated therein. In order to attain this goal, the 43 pulp and paper mills have been distributed in nine groups according to their geographical location. This procedure has been necessary in order to make use of figures drawn from confidential reports which the companies are required to submit each year to the Provincial Bureau of Statistics. The mills, which appear on map 3, page 61, are grouped as follows:-

Group 1 - Ottawa Valley

Name	Location
Canadian Inter. Paper Co. Ltd.	Gatineau
" " " " "	Temiskaming
Eddy, E.B. Co.	Hull
International Fibre Board Ltd.	Gatineau
Masonite Co. of Canada Ltd.	Gatineau
MacLaren, James, Co. Ltd.	Buckingham

Group 2 - Saguenay

Consolidated Paper Corp. Ltd.	Port Alfred
Price Brothers & Co. Ltd.	Jonquière
" " " " "	Kénogami
" " " " "	Riverbend
St.Lawrence Paper Mills Ltd.	Dolbeau
St. Raymond Paper Ltd.	Desbiens

Group 3 - Lower St.Maurice

Name	Location
Canadian Inter. Paper Co. Ltd.	Trois-Rivières
Consolidated Paper Corp. Ltd.	Cap de la Madeleine
" " "	Trois-Rivières
St.Lawrence Paper Mills Ltd.	" "

Group 4 - Middle St.Maurice

Brown Corporation	La Tuque
Consolidated Paper Corp. Ltd.	Grand'Mère
" " " " "	Shawinigan Falls

Group 5 - Middle St.Lawrence

Anglo Canadian Pulp and Paper Mills Ltd.	Quebec
Donohue Bros. Ltd.	Clermont
Nair Falls Pulp Co. Ltd.	"
St.Ann Paper Co. Ltd.	Beaupré

Group 6 - Lower St.Lawrence

Gaspesia Sulphite Co. Ltd.	Chandler
Gulf Pulp and Paper Co.	Clarke City
Mohawk Corp. Ltd.	Rivière du Loup
Quebec North Shore Paper Co.	Baie Comeau
Soucy F. Flo. Reg'd.	Chemin du Lac

Group 7 - Portneuf

Building Products Ltd.	Pont Rouge
Donnacona Paper Co. Ltd.	Donnacona
Ford, J. and Co. Ltd.	Portneuf Station
St.Raymond Paper Ltd.	Chute Panet

Group 8 - Eastern Townships

Breakey John Ltd.	Breakeyville
Brompton Pulp and Paper Co. Ltd.	East Angus
Canada Paper Co.	Windsor Mills
Lake Megantic Pulp Co.	Lake Megantic
Megantic Mfg Co. Ltd.	" "
Dominion Paper Co.	Kingsey Falls

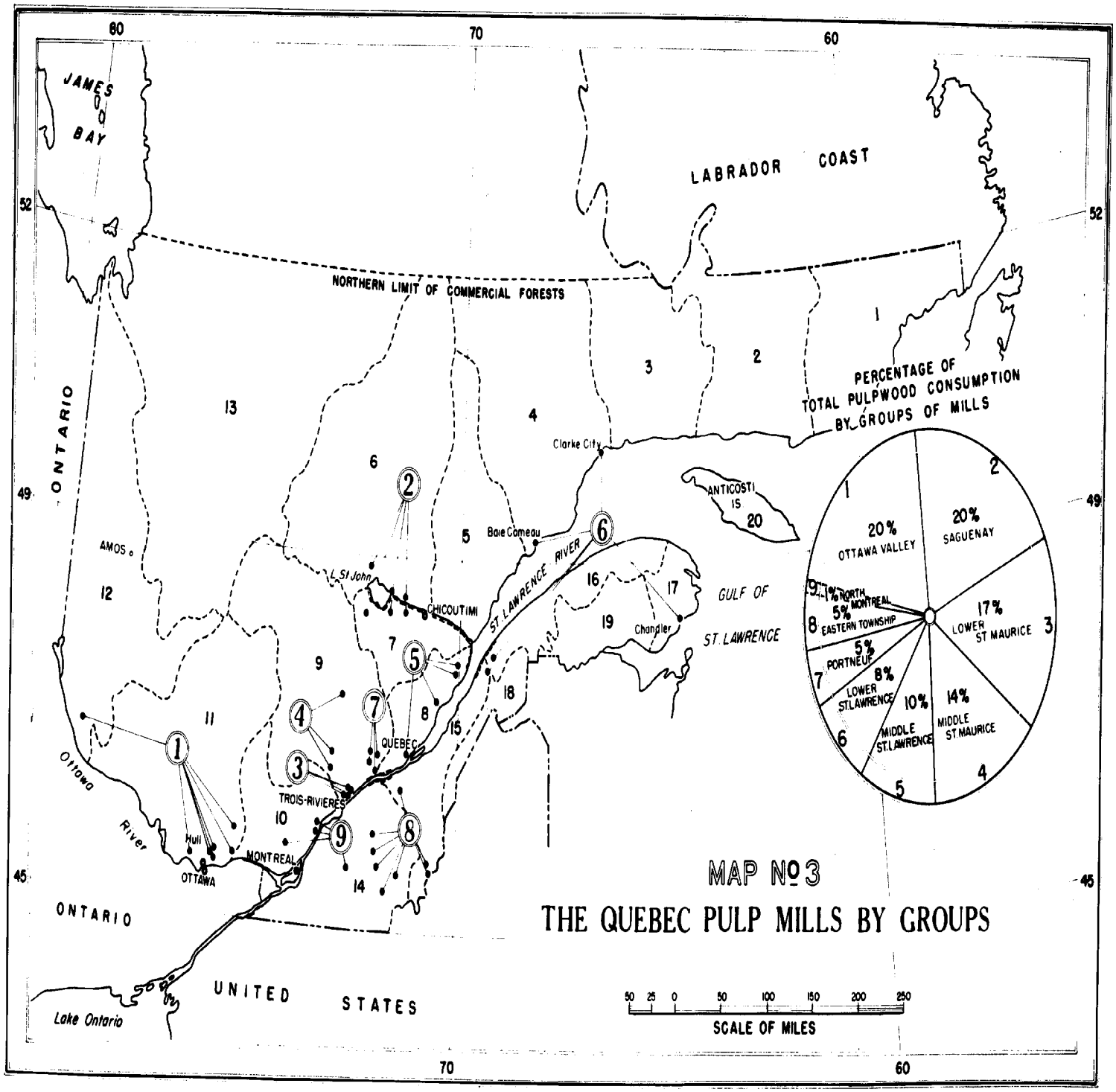
Group 9 - North Montreal

Barrett Co. Ltd.	Joliette
Building Products Ltd.	Ville Lasalle
Howard Smith Paper Mills Ltd.	Crabtree Mills
Wilson J.C. Ltd.	St.Jerome
Yamaska Mills Inc.	St.Pie

As mentioned previously the mills were distributed by groups according to their geographical location, no attention being given to ownership or to whether or not these mills were drawing their raw material from their own timber limits in the vicinity or were getting it from farmers or pulpwood dealers. The mills grouped together therefore are located either in the same watershed or the same region. There is an exception for Group 6, "The Lower St.Lawrence", which includes the more easterly mills of the North and South Shores of the St.Lawrence. This has been necessary in order to avoid giving figures on wood consumption for a group of less than three mills, which would have been the case by taking the mills of Clarke City and Baie Comeau as a separate group.

The pulpwood consumption, during the last decade, for the nine groups of mills is presented in Table 5.

PROVINCE OF QUEBEC



MAP NO 3

THE QUEBEC PULP MILLS BY GROUPS

TABLE 5

ANNUAL WOOD CONSUMPTION BY GROUPS OF MILLS

Group No.	Group Name	Yearly Wood Consumption		Increase in consumption between the two periods	Percentage of total wood consumption
		Four-year average 1941 to 1944	Four-year average 1948 to 1951		
		Thousand cords	Thousand cords	Percent	Percent
1	Ottawa Valley	898	1,051	17	20
2	Saguenay	760	1,024	35	20
3	Lower St. Maurice	649	893	38	17
4	Middle St. Maurice	654	729	11	14
5	Middle St. Lawrence	358	545	52	10
6	Lower St. Lawrence	269	398	48	8
7	Portneuf	189	272	44	5
8	Eastern Townships	219	271	24	5
9	North Montreal	8	23	198	1
Total wood		4,004	5,206	30	100

A study of the figures presented above reveals that the total amount of pulpwood used in the mills as reported to the Bureau of Statistics differs little from that given in Table 4, the latter being established by deducting from the total cut of pulpwood in the Province the volume of wood exported or sent to be converted outside the Province. Furthermore, it shows that 81% of the Quebec wood consumption is used by mill groups 1 to 5, the balance being distributed among the four other groups. The Ottawa Valley and the Saguenay groups are the greatest consumers of pulpwood, each using 20% of the total; the Lower St.Maurice, which represents the Three Rivers mills, 17%; the Middle St.Maurice group, 14%, and the Middle St.Lawrence, 10%. These are the five most important groups. Of the four other groups, the Lower St.Lawrence group, which includes the mills of the North Shore as well as some of the South Shore, is the leading one with a consumption of 8%, followed by the Portneuf and Eastern Townships groups utilizing 5% respectively. The ninth and last group, the North Montreal group, is the least important, with a consumption of only 1% of the total amount of pulpwood used by the Quebec pulp industry.

Another point to be stressed is the overall increase of 30% in wood consumption between the first four years of the decade (1941-1944) and the last four years under study (1948-1951). This general

increase, of course, has resulted mainly from the increasing demand for newsprint paper. The reasons behind the great variation of increase existing between the groups are not always clear nor easy to explain.

Group 1 increased its consumption of pulpwood by 17%. If the increase of this group, which is the most important of all, has been less than the average it may be due to the fact that this group of mills not only includes two mills producing fine paper, but also the Gatineau mills which are among the best integrated mills in Quebec, one making newsprint while the others, utilizing bolts of poorer quality, make Masonite, Insulboard and Ten-Test. Consequently a greater output has been possible without a corresponding increase in wood consumption.

For Groups 2, 3, 4, 6 and 8, the increase in consumption has been the result of improvement and modernization of machinery involving replacement of old grinders by new ones with higher capacity, change in the size or model of screens, and finally increase in the speed of the paper machines, all of which augmented the capacity of the mills. The increase shown by Group 5 comes from the amelioration of their equipment together with the addition of new machinery. The larger consumption of wood by Group 7 was due partly to a greater demand for building products and partly to an improvement in machinery. Finally, Group 9, the North Montreal group, had only two mills in production from 1941 to 1944,

whereas 5 mills were in operation during the years 1948 to 1951. This readily explains the increase of 198% between the first and the last years of the decade.

Throughout this chapter discussion has centered upon the pulpwood consumption of the Quebec pulp and paper mills. As the mills during the four-year period, 1948-51, were running at normal capacity, their pulpwood consumption in that period can be taken to represent their average annual requirements for the immediate future. Therefore the management of the Quebec forests should be such as to assure the perpetual cutting of at least this volume of pulpwood if the present consumption of the existing mills in Quebec is to be maintained.

CHAPTER VI

ANALYSIS OF THE 1950-51 PULPWOOD CUT AND DISTRIBUTION TO MILLS, BY GROUPS

A careful study of the Quebec pulp industry requires not only an estimate of its pulpwood requirements but also an analysis of the cut and of the distribution of the wood to the mills. This was made possible through the help of the Provincial Government Forest Service and the Bureau of Statistics which gave the writer access to the 1951 reports sent by the companies to the government. In these statements the companies report on the amount of pulpwood which they have cut on Crown and private lands in the different districts of the Province, as well as on all wood bought in the various districts.

The Quebec pulp and paper companies during the cutting operations of the year 1950-51 (ending March 31, 1951) either cut on their own land or bought in Quebec and outside 4,024,838 cords of pulpwood. Of this amount, 2,410,532 cords came from Quebec Crown lands, 1,511,886 cords from private lands in Quebec, and the rest from other provinces.

An analysis of the cut of pulpwood for the year 1950-51 is pre-

sented in Table 6 which gives in percentage the volume of pulpwood cut in each district and indicates to which of the nine groups of mills this wood was directed. It also specifies whether the wood was cut on Crown lands or on private lands.

A study of this table shows that of the ten administrative districts, four districts accounted for 72% of the pulpwood cut: St.Maurice (24%), Quebec (18%), Lake St.John (16%) and North Shore (14%). The other six districts accounted for only 28% of the cut of that year. Furthermore, 61% of the pulpwood cut or bought by the mills came from Crown lands, while 39% came from private lands. The Ottawa, Saguenay and Middle St.Maurice groups showed a procurement of approximately 80% of the wood from Crown lands; the Lower St.Maurice and Eastern Townships groups, 60%; whereas the other groups: Middle St.Lawrence, Lower St. Lawrence, Portneuf and North Montreal showed a reverse position by procuring from 64% to 100% of their wood from private lands. This indicates not only that the pulp and paper mills of some groups hold more Crown forest lands than others, but it also implies that there is less Crown land or a lack of pulpwood available thereon in these latter groups.

Although the question of ownership and tenure of the forest land in the Province of Quebec will be discussed at length in the next chapter, it should be indicated at this point that most of the Crown lands

TABLE 6

DISTRIBUTION IN PERCENTAGES OF THE PULPWOOD CUT BOTH ON PRIVATE AND CROWN LANDS, BY DISTRICTS, DURING 1950-51, FOR THE QUEBEC PULP AND PAPER MILLS, ACCORDING TO ITS MILL GROUP DESTINATION

Group no.	Group name	Crown land Private land	Districts										Total
			St.Maurice	Quebec	Lake St. John	North Shore	Ottawa	Lower St. Lawrence	Temiscamingue	Abitibi	Montreal	South Shore	
1	Ottawa Valley	Crown	32	-	-	-	26	-	14	-	7	-	79
		Private	-	-	-	-	9	-	6	1	5	-	21
2	Saguenay	Crown	2	4	65	10	-	-	-	-	-	-	81
		Private	-	-	12	2	-	5 1/	-	-	-	-	19
3	Lower St. Maurice	Crown	36	2	-	12	-	4	1	1	3	-	59
		Private	11	5	-	4	-	15 1/	-	3	--	3 2/	41
4	Middle St. Maurice	Crown	61	12	--	-	-	-	-	4	-	-	77
		Private	4	6	-	-	-	--	-	8	-	5 2/	23
5	Middle St. Lawrence	Crown	-	9	-	15	-	-	-	5	-	-	29
		Private	-	53	-	10	-	--	-	-	-	8	71
6	Lower St. Lawrence	Crown	-	-	-	34	-	-	-	-	-	2	36
		Private	-	-	-	35	-	28	-	-	-	1	64
7	Portneuf	Crown	-	15	15	6	-	-	-	-	-	-	36
		Private	-	41	11	10	-	2	-	-	-	-	64
8	Eastern Townships	Crown	-	4	-	-	-	-	-	2	-	-	6
		Private	-	88	-	-	-	-	-	6	-	-	94
9	North Montreal	Crown	-	-	-	-	-	-	-	-	-	-	-
		Private	-	61	-	-	-	-	-	33	6	-	100
	Total	Crown	21	4	13	9	6	2	3	1	2	--	61
		Private	3	14	3	5	2	6	1	2	1	2	39
		TOTAL	24	18	16	14	8	8	4	3	3	2	100

1/ Includes the pulpwood cut on Anticosti Island.

2/ " a small percentage of wood cut in New Brunswick.

- Symbol to indicate nil or zero.

-- " " " that the volume of pulpwood cut represents less than 1%.

leased to wood-using industries are in the hands of the pulp and paper industry. Consequently it is normal that the greater part of the pulpwood used by the Quebec mills comes from this source; but it is surprising to see how considerable has been the cut on private lands. As will be seen in the course of the survey which forms the second part of this thesis, the percentage of pulpwood cut on private lands for the year 1950-51 is approximately the same as the average for the four-year period 1947 to 1951.

An increase in the cut on woodlots accounts in part for this high percentage of wood cut on private lands. Since 1940 the demand for newsprint, and consequently for pulpwood, has been so great that farmers owning woodlots preferred to stay home and cut their own wood, thereby making more money than they would by working in companies' lumber camps. The profits they made were so much higher than the proceeds of farming that it was not unusual to see farmers with their hired men cutting pulpwood on the woodlot during the summer months instead of cultivating the farm land.

This action on the part of the farmers created such an acute shortage of labor in the pulpwood operations of the companies that they had to keep increasing the price per cord for the cutting of pulpwood in order to attract men from other industries to cut their wood. At the

same time the companies had to increase their purchase of wood from private lands, i.e. from farmers and pulpwood dealers.

Another reason for the large amount of wood cut on private lands is the increase of the cut on freeholds. Many companies, again to keep pace with the increasing demand for paper, and realizing that the Crown timber limits they leased were not large enough to permit a cut which would satisfy their full needs, did not hesitate to intensify the cutting of wood on their freeholds. Companies without freehold went on the market to get their supplementary wood supplies. This fact, of course, not only resulted in a heavier cut on woodlots but induced pulpwood traders to search for small freeholds which had been lying dormant for years.

The second point of significance in the analysis given by Table 6 is the fact that no group of mills gets its wood exclusively in its own district. A distinction however must be made of the Lower St.Lawrence group which, on account of its mills' location, groups together mills of the North and South Shores of the Lower St.Lawrence. In this group the North Shore mills get their wood exclusively from the North Shore, while the mills located on the South Shore get their wood supplies from districts of the South Shore (usually with the greater part of their supplies coming from New Brunswick).

As far as all other groups are concerned:

1. - The Eastern Townships Group gets its wood supply from two districts:
   a) The district around the mills.
   b) From the virgin forests of Abitibi, many miles to the north.

2. - The North Montreal Group of mills gets its wood from three districts.

3. - The Portneuf Group of mills gets its supplies from four districts.

4. - The Ottawa Valley Group, the Saguenay and the Middle St.Lawrence each get their wood supplies from five districts.

5. - The Lower St.Maurice, from eight districts (out of a total of ten).

A map showing the districts which supplied pulpwood to the three main groups of mills; the Ottawa Valley, the Saguenay and the Lower St.Maurice, is presented on page 74.

The fact that some groups of mills are located on the shore of the St.Lawrence with far-reaching water transportation facilities is a main reason why these mills get wood from other districts. The government has in recent years recognized that many mills have inadequate reserves of pulpwood supplies and has been granting these mills additional limits. In most cases, however, it could only do so from

Crown lands located hundreds of miles away from the established mills. Mill owners naturally look for additional limits on water transportation routes because water transport is so much cheaper than any other form. But mill owners do not hesitate to use other means of transportation, particularly rail, where no other form is available.

In the case of the Middle St.Maurice Group there are no deep-water transportation facilities, but this group draws wood from six districts, almost exclusively by rail, the exception being the wood cut in its own district, which is driven down the river.

It is extremely difficult to get enough information to present a clear picture of all this wood movement from the forest to the mills, but one prominent forester has stated that 58% of the wood cut in Quebec reaches the mill by river drive, 27% by rail, 10% by truck and 5% by boat.

A study of this complex pattern of wood supply to the various existing mills leads one inevitably to three outstanding conclusions:

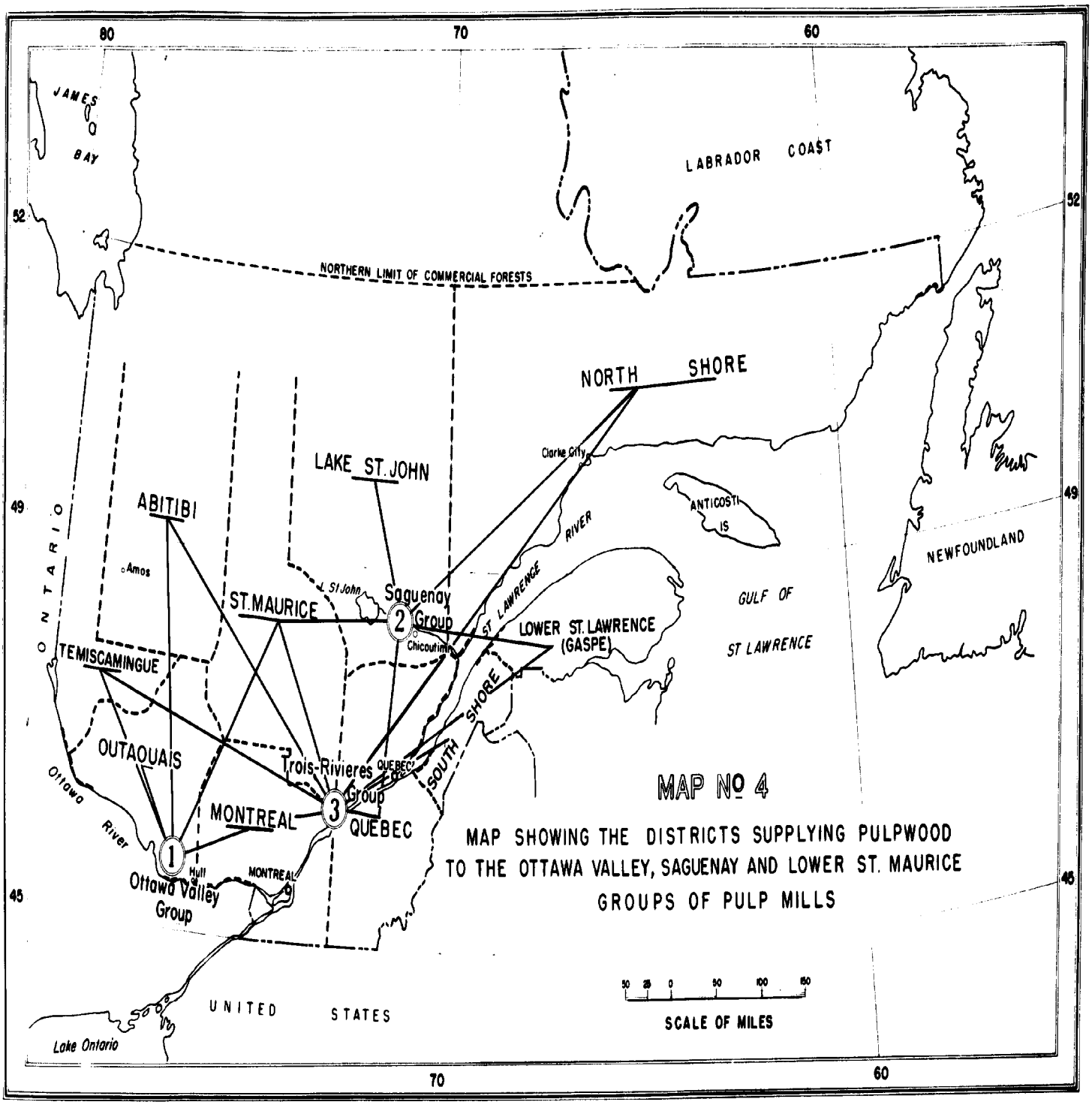
1. - Many mills are now badly located in relation to their wood supplies, due partly to poor initial planning and partly to lack of forest management on their own cut-over lands.

2. - This situation will become much worse if inadequate forest management continues on lands near the mills and on private lands.

3. - There is a lot of uneconomic cross-hauling of pulpwood throughout the Province. For example, over 150,000 cords of wood cut in the Lower St.Lawrence district is sent to five mill groups, namely the Saguenay, Lower and Middle St.Maurice, Middle St.Lawrence and Portneuf. Another example involves mills in New Brunswick which draw the bulk of their supplies from Gaspé, whereas the only mill in Gaspé gets a substantial volume of its wood supplies from areas in New Brunswick in the immediate vicinity of the New Brunswick mills.

The general picture of the movement of wood throughout the Province does not reveal a healthy economic situation. It indicates continued increase in wood cost due to transportation, because the forest areas available to established mills within the most economic zone are not able alone, under present conditions, to supply the present pulpwood requirements of these mills. It is the purpose of this thesis to point the way to a betterment of this situation.

PROVINCE OF QUEBEC



MAP No 4

MAP SHOWING THE DISTRICTS SUPPLYING PULPWOOD TO THE OTTAWA VALLEY, SAGUENAY AND LOWER ST. MAURICE GROUPS OF PULP MILLS

PART II

A SURVEY OF THE QUEBEC WOOD SUPPLY

AND AN ESTIMATE OF A SUSTAINABLE ANNUAL CUT OF SOFTWOOD

Scope of Knowledge

The expansion of the pulp and paper industry in Quebec and its requirements in pulpwood have been described in the first part of this thesis. The question now is whether or not the forest lands of the Province are able to maintain on a perpetual basis the present average annual drain in wood. The answer lies first in a forest resource appraisal and, second, in an estimate of the annual sustainable cut.

While literature on the subject of wood supplies is abundant, writers generally prefer to present the forestry situation in Quebec without supporting their views by adequate figures; the information given is usually too general and totally inadequate. The main trouble is that the available statistics are not presented in a form which can be readily understood. Further, there are no data at all on certain aspects of this great problem, such as the amount of wood and possibilities of exploitation of the forests lying north of the 52nd parallel of latitude. South of the 52nd parallel, the forests are better known, but as yet there is no clear demarcation between farm and forest land; and of a total of 257,747 square miles of forest land, only 92,000

square miles have been covered by forest inventory. It should be mentioned, however, that nearly all the rest (145,000 square miles) has been covered by aerial photography; but as the photography was for war purposes the scale used is too small for effective and reliable use in forestry.

To present a survey of the Quebec forest resources it has been necessary to use whatever information was available: aerial photography, aerial sketching, private and government forest inventories, and official statistics. This has been a task requiring lengthy research and compilation.

Procedure and the Difficulties encountered

Although further explanation will be given in the course of this survey by way of clarifying data and tables, it is important at the outset to indicate the procedure followed.

1- A map of the Province, prepared in 1944 by the Bureau of Forest Economy, giving the area south of the 52nd latitude and showing the heights of land of the 102 main hydrographic watersheds, has been used as the basis for this work.

2- For each of the 102 watersheds, the following information was compiled:

a) Total Area of the Watershed

Although there is no official publication giving the total area of the main watersheds, these figures are available at the Department of Lands and Forests in Quebec. They have been carefully checked for the purpose of this thesis.

b) Ownership and Tenure of the Land - Forest area.

Under this heading were included timber limits, forest reserves, vacant Crown land, farmers' and settlers' land, and another item called "miscellaneous" that included areas the tenure of which is uncertain.

It has been very difficult to distribute the acreage within a watershed as no statistical information on ownership and tenure on this basis is available. In many cases a timber limit is so placed that it lies in more than one watershed, in which case it was necessary to find the area in each watershed. Land ownership figures, compiled by counties by government statisticians, were of no use in making this survey as no relation exists between counties and watersheds.

c) Surveys

Area covered by forest inventory - Average volume per acre - Total volume.

The data included in most of the forest inventory reports have been used without modification. However, revision of figures was necessary for obsolete reports.

d) Unsurveyed area

Area not yet covered by forest inventory - Estimate on volume per acre and total volume.

As will be explained later, aerial photography and sketching, and appraisals based on personal experience, were largely used in making the estimate.

e) Totals

Total volume of wood and average volume per acre for the total forest area.

It should be remembered that the total volume of wood was computed for the gross area, which of course includes some water and waste land.

f) Gross Sustainable Annual Cut

As the information available on the distribution of age classes is far from complete,[1] a very rudimentary method had to be used

1/ As is shown in Table 9, only 42% of the forest land available for the use of forest industry has yet been covered by forest inventory.

to establish the annual gross sustainable cut. This will be explained at length in Chapter IX.

g) Losses Due to Fire, Insects, and Diseases

The publication since 1949 by the Protection Service of the Department of Lands and Forests of statistics on the forest area destroyed by fire in each watershed of the Province has permitted the compilation of these figures for the years 1949, 1950, and 1951, and the estimation of the loss in wood supply for the groups involved in the survey.

As far as loss due to insects, fungi, diseases, and windthrow are concerned, this loss has been estimated in a very rudimentary manner. Following the example of the Canadian Federal Service and that of many states in the U.S.A., it has been estimated that the loss due to insects and diseases is equivalent to the total loss by fire. This estimate is probably conservative if consideration is given to the enormous losses occasioned in these last few years by the spruce sawfly, the spruce budworm, the birch die-back, and the bronze borer.

h) Cutting Drain

This is based on the statistics of wood cut on Crown land during

the seasons of operation 1947-48 to 1950-51 inclusive. As far as the cut on private land is concerned, it will be explained later in Chapter X how the figures, as given in the Report of the Minister of Lands and Forests by administrative districts, have been transformed by groups of watersheds for use in this thesis.

Since these figures are taken from many different official sources - in the Department of Lands and Forests, and in the Department of Colonization - the results of the compilation in this thesis cannot always be reconciled with official statistics. But the apparent differences are, in general, due to:

1.- The constant changes which occur in ownership and tenure of the land.

2.- The difference between the methods used by the Forest Service and in this survey. The government uses as the basis of its statistics for timber limits and reserves the areas mentioned in bills or leases, while in this survey the compilation was based wherever possible on area as mentioned in the inventories and management plans of the companies leasing these areas. Since the latter are based on the latest ground surveys they are more nearly exact.

3.- The difficulty of coordinating data from various departments, either because of lack of recent compilation or lack of uniformity in the statistics.

For various reasons it would be unwise to divulge the figures arrived at for each watershed. Such action would, in many cases, give away information on the growing stock of individual companies, or it might reveal confidential information on a specific watershed shared only by the government and the interested companies. Therefore, in order to obviate these difficulties, the 102 watersheds have been grouped into 20 different groups and the detailed figures have been applied to their respective groups. A list of the watersheds included in each group follows, and a map presenting these 20 groups will be found on page 85.

Groups of watersheds

Group 1: Des Esquimaux, Coxipi, St.Augustin, Les Mecatina, Olomane, Masquaro.

Group 2: Natashquan, Aguanus, Nabesipi, Watshishou, Piastibaie, Romaine.

Group 3: Mingan, St.Jean de Mingan, Magpie, Sheldrake, Bouleau, Moisie.

Group 4: Ste.Marguerite, Aux Rochers, Pentecote, Godbout, Franquelin, Trinité, Manicouagan, Outardes.

Group 5: Bersimis, Sault-au-Cochon, Portneuf, Escoumains, Sault-au-Mouton, Bergeronnes, Marguerite de Saguenay.

Group 6: Shipshaw, Peribonka, Mistassini, Mistassibi, Rat & Alex., Chamouchouane & Ashamouchouane.

Group 7: Ouiatchouane & Iroquois, Metabetchouane, Kenogami, A Mars, Saguenay & St.Jean de Saguenay.

Group 8: Noire de St.Siméon, Malbaie, Gouffre, Ste Anne de Beaupré, Montmorency, Jacques Cartier.

Group 9: Ste Anne de la Pérade, Batiscan, St.Maurice.

Group 10: Yamachiche, Maskinongé, L'Assomption, Du Nord, Rouge.

Group 11: Petite Nation & Blanche, Lièvre, Gatineau, Coulonge, Noire, Dumoine.

Group 12: Kipawa, Ottawa, Harricana, Lac Abitibi.

Group 13: Nottaway, Broadback, Rupert, Eastmain.

Group 14: Chateauguay, Richelieu, Yamaska, St.François, Nicolet, Becancour, Du Chêne.

Group 15: Chaudière, Etchemin, Du Sud, Ouelle & Trois Saumons, Du Loup, Trois Pistoles, Isle Verte.

Group 16: Rimouski, Métis, Matane, Cap Chat, Ste Anne des Monts, Mont Louis, Madeleine.

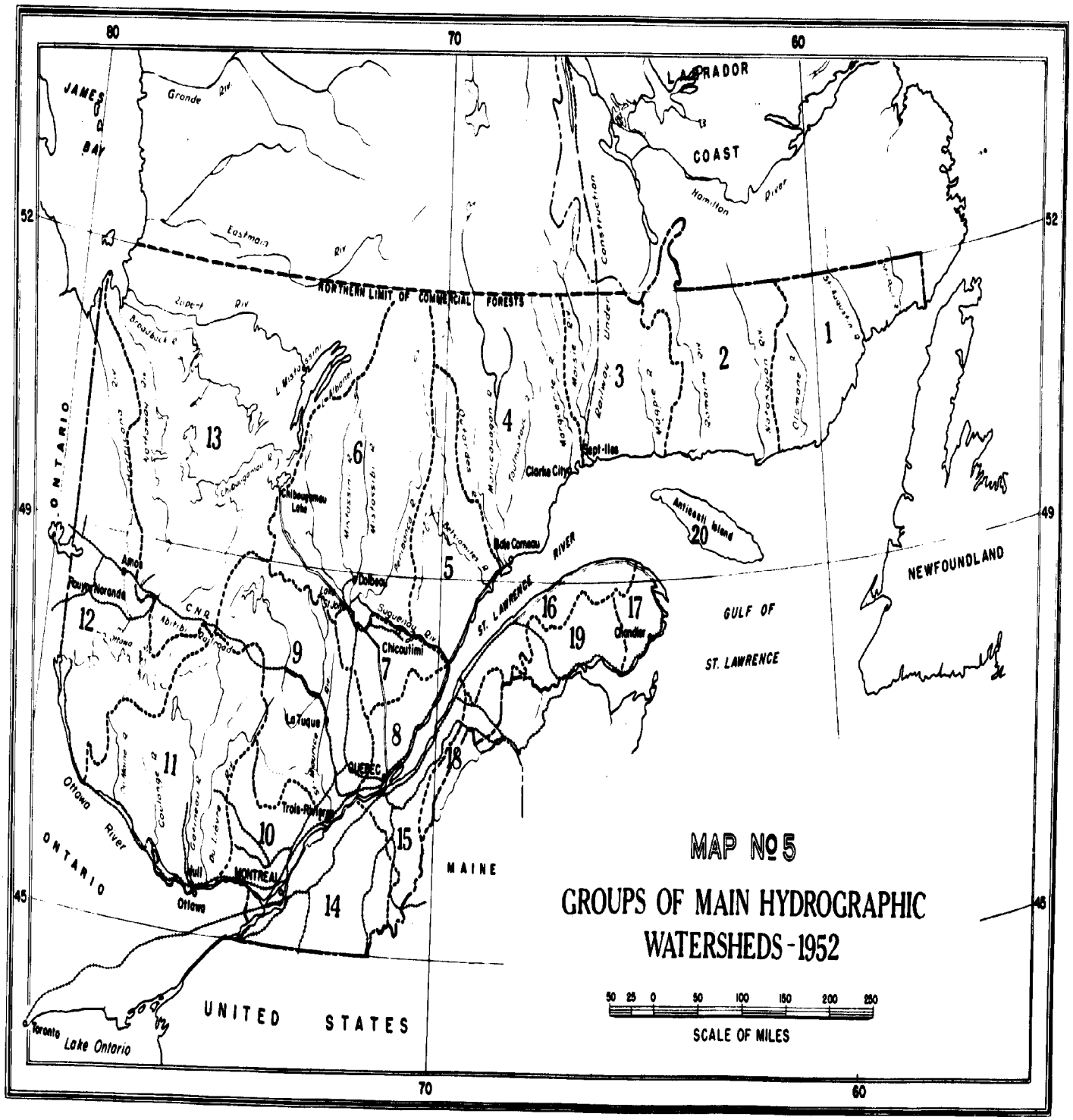
Group 17: Darmouth, York, St.John, Port Daniel, Grand & Little Pabos, Grand River & Malbaie.

Group 18: St.Jean, Noire de St.Jean, St.Francis de St.Jean, Temiscouata.

Group 19: Patapedia, Matapedia, Nouvelle, Grande Cascapedia, Little Cascapedia, Bonaventure.

Group 20: Anticosti Island.

PROVINCE OF QUEBEC



CHAPTER VII

DISTRIBUTION OF THE FOREST LANDS OF QUEBEC BY AVAILABILITY FOR MAJOR USES, OWNERSHIP AND GROUPS OF WATERSHEDS

Prerequisite to estimating the forest wealth of Quebec by groups of watersheds is the ascertaining, not only of the ownership of the forested land, but also the tenure, that is to say the manner in which the land is held.

According to the figures obtained by this study and presented in Table 7, the total forest land of Quebec south of the 52nd latitude amounts to 257,747 square miles. This includes some water and waste land. Of this total of accessible forest 229,513 square miles, or 89%, is held by the Crown and designated as Crown lands, while the rest, 28,234 square miles, or 11%, belongs to individuals or companies. Of the privately owned forests, the large owners - pulp and paper companies, lumber companies, and some individuals - have a total of 8,469 square miles, or 3.3% of the total forest land. Owners of less than 2,000 acres each hold 6,891 square miles, or 2.7%; the farmers, 9,709 square miles, or 3.8%, in woodlots; and the settlers still have 3,165 square miles, or 1.2% of the forest land.

The Province of Quebec, by maintaining ownership of some 90% of the present accessible forest land, is in line with all other provinces except New Brunswick and Nova Scotia, where 50 per cent and 71 per cent respectively are privately owned.[1/] Of the 229,513 square miles of the accessible forest land owned by the Crown, 142,029 square miles, or 55.1%, is still vacant. Of the rest, 80,642 square miles, or 31.3%, is under lease to companies; 2,773 square miles, or 1.1%, is kept by the government in township forest reserves to supply wood for the normal expansion and development of neighboring communities; 2,374 square miles, or 0.9%, in Domanial forests, which are reserved for industries in need of more wood; 296 square miles in Indian reserves and some 1,399 square miles of Crown land of which the tenure is uncertain.

Figure 3 and Table 8, analyzing the distribution of the entire land area of the Province, with emphasis not so much on the ownership of the forest land as, first, on the area of forest land available for the use of large forest industries and, second, on that of farmers' and other forest land for local use, are presented on pages 89 and 90. In Table 8, the data are related to the twenty groups of watersheds of the Province.

1/ "Canada's Forests and the War", Department of Mines and Resources, 1947, p. 8.

TABLE 7

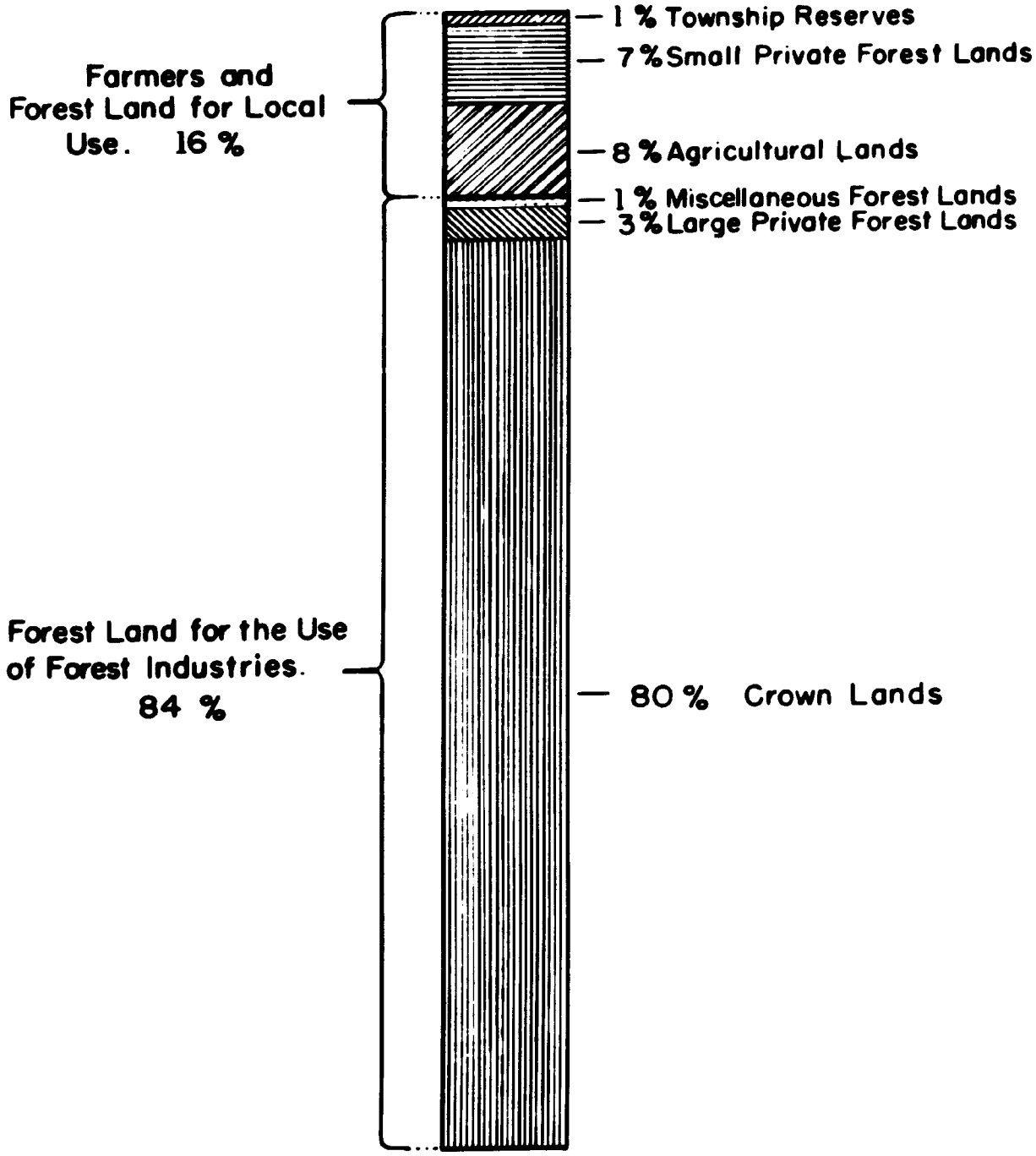
TENURE OF FOREST LANDS BY OWNERSHIP, SOUTH 52nd LATITUDE

(Water and unproductive areas included)

	Square miles	Percentage
I - Crown forests		
a) Timber limits	80,642	31.3
b) Township forest reserves	2,773	1.1
c) Indian, Military Reserves (Federal)	296	0.1
d) Domanial forests	2,374	0.9
e) Vacant forests	142,029	55.1
f) Miscellaneous	1,399	0.5
Total	229,513	89.0
II - Privately-owned forests		
a) Owners of more than 2,000 acres	8,469	3.3
b) " " less " 2,000 "	6,891	2.7
c) Farm woodlots	9,709	3.8
d) Settlers' forest land	3,165	1.2
Total	28,234	11.0
Total forested land	257,747	100.0

Figure III

Land Area of the Province of Quebec, South of 52nd Latitude
by Major Uses and Ownership 1/



1/ It should be noted that this chart illustrates the major uses and ownership of the entire land area of the Province, whereas Table 7 gives the tenure of the forest lands only.

TABLE 8

LAND AREA OF THE PROVINCE OF QUEBEC, SOUTH OF 52nd LATITUDE, BY MAJOR USES, OWNERSHIP AND GROUPS OF WATERSHEDS

AREA IN SQUARE MILES

Group no.	Forest land available for the use of forest industries									Farmers' and other forest land for local use			Total land area
	Crown lands						Private lands 2/	Misc. 3/	Total	Town. Reserves (Crown lands)	Private lands 4/	Total	
	Crown timber limits				Vacant 1/	Total							
	Pulpwood & Lumber	Pulpwood	Lumber	Total									
1	-	-	-	-	8,380 5/	8,380	-	-	8,380	-	4	4	8,384
2	-	-	-	-	13,419	13,419	-	-	13,419	-	14	14	13,433
3	-	-	54	54	14,224	14,278	-	-	14,278	69	31	100	14,378
4	-	8,875	20	8,895	14,500	23,395	309	-	23,704	96	63	159	23,863
5	-	6,209	73	6,282	4,138	10,420	314	99	10,833	166	291	457	11,290
6	-	10,440	381	10,821	14,815	25,636	-	-	25,636	479	1,393	1,872	27,508
7	-	2,969	73	3,042	240	3,282	47	272	3,601	295	1,014	1,309	4,910
8	-	1,729	-	1,729	100	1,829	700	31	2,560	108	1,345	1,453	4,013
9	-	12,621	-	12,621	3,050	15,671	1,527	95	17,293	117	1,796	1,913	19,206
10	-	2,151	216	2,367	-	2,367	128	57	2,552	34	4,197	4,231	6,783
11	108	13,599	2,301	16,008	237	16,245	140	815	17,200	47	4,256	4,303	21,503
12	193	7,041	1,928	9,162	10,025	19,187	157	7	19,351	705	3,845	4,550	23,901
13	76	1,662	75	1,813	43,374 6/	45,187	75	-	45,262	176	710	886	46,148
14	-	20	80	100	-	100	277	20	397	13	10,639	10,652	11,049
15	-	301	281	582	-	582	452	22	1,056	140	4,789	4,929	5,985
16	-	354	975	1,329	661	1,990	493	-	2,483	101	1,866	1,967	4,450
17	-	1,524	102	1,626	238	1,864	112	49	2,025	25	710	735	2,760
18	-	8	649	657	-	657	289	1	947	167	1,547	1,714	2,661
19	-	3,331	223	3,554	283	3,837	339	227	4,403	35	1,385	1,420	5,823
20	-	-	-	-	-	-	3,110	-	3,110	-	-	-	3,110
Total	377	72,834	7,431	80,642	127,684	208,326	8,469	1,695	218,490	2,773	39,895	42,668	261,158 7/
Percentage									84			16	100
" "						95	4	1	100				
" "										6	94	100	

1/ Includes Domanial reserves, 2,374 sq. mi.

2/ Owners of more than 2,000 acres.

3/ Includes Indian reserves, 240 sq.mi.; military camp etc. 56 sq.mi.; balance area, 1,399 sq.mi.

4/ Includes Crop lands 20,130 sq.mi.; woodlots 9,709 sq.mi.; settlers 3,165 sq.mi.

5/ Total vacant lands is of 15,145 sq.mi. but 6,765 sq. mi. have been disregarded as barren land.

6/ Total vacant lands is of 55,141 sq.mi. but 9,954 sq.mi. have been disregarded as barren land.

7/ The total land area is 277,877 sq.mi. by adding the 16,719 sq. mi. which have been disregarded as barren land.

The following may serve to clarify Table 8.

A - Forest land available for the use of forest industries.

This area includes all forest land, either in the hands of the main industries of Quebec or susceptible of serving their requirements of wood supplies. It amounts to 218,490 square miles and belongs either to the Crown or to private owners.

1- Crown land ownership

208,326 square miles, or 95% of the forest land available for the use of forest industries, is owned by the Crown. To this total an area of 1,399 square miles of Crown land, which appears under the heading "miscellaneous", must be added.

The area in Crown land includes the leased Crown timber limits, 80,642 square miles, or 39%, and some 127,684 square miles, or 61%, vacant Crown land.

a) Crown timber limits

Of the total Crown land in timber limits 72,834 square miles, or 90%, are leased to pulp and paper companies for pulpwood production; 7,431 square miles, or 9%, to lumber companies; 377 square miles, or 1%, to companies or individuals, for pulpwood and lumber production.

b) Vacant Crown land

The vacant Crown land, that is to say forest land not yet leased, amounts to 142,029 square miles. This figure is obtained by adding to the total of vacant Crown land the 16,719 square miles which for Groups 1 and 13 had been disregarded as barren land. The area in Domanial Reserves, 2,374 square miles, was included as vacant Crown land. These reserves were established for a double purpose; first, to provide a special ground for forest research and experimentation by the Forest Service; second, to constitute a wood reserve for small industries and also for any other need.

If the area of 2,374 square miles in Domanial Reserves is deducted from the 142,029 square miles considered as vacant, there remains only 139,655 square miles of vacant Crown land (which includes water and waste land). This area is smaller by some 12,000 square miles than the area in vacant Crown land given in the Report of the Minister of Lands and Forests for 1952. This discrepancy may be due to the fact that certain Crown lands, listed as vacant, have been leased since the publication of the Report.

2 - Private lands

Another source of wood supply on which the wood industry of Quebec can count is the large private forest lands or freeholds.

They amount to 8,469 square miles, or 4% of the total forest land available for the use of forest industries. These private forests owe their origin either to the French Regime in Quebec when large tracts of land were granted to the "Seigneurs" in gratitude for their services to the King, or to the liberality of the provincial government when "scrip" was granted to railroad companies to help them to cover the cost of building railroads. "Scrip" was a document giving the owner right to a number of acres of forest land which could be held or located almost anywhere in the Province. Scrips were given to the railroads as a subsidy. From time to time the railroad companies sold them in order to realize some money. This was the origin of many of the present private forest lands.

3- Miscellaneous

Some 1,700 square miles, representing less than 1% of the total forest land available for the use of forest industries, are given under the heading miscellaneous. The Indian Reserves, 240 square miles, and the military camps, 56 square miles, belong to the Federal Government and are of little importance in this thesis. The remainder, 1,399 square miles, has been difficult to place either under Crown or private ownership. In most cases it was the result of differences in acreage between the total area of a watershed and that of the

land under definite ownership. Considering the percentage of land owned by the Crown, as compared to that in private ownership, it could very well be considered as part of the Crown land.

B - Farmers' and other forest land for local use

The second part of Table 8 shows that only 42,668 square miles, or about 16% of the total land area of Quebec, is not destined to serve the main wood-using industries of the Province. This area, being the most accessible of all, is either in farm land, small forest tracts, or in township reserves.

1- Crown ownership - Township reserves

The township reserves, 2,773 square miles in area, or 6% of the farmers' and other forest land for local use, are maintained by the government for the benefit of farmers and settlers who have no wood on their property. By undertaking to pay stumpage they can obtain a permit to cut wood for their own use, but are forbidden to cut it for commercial purposes. Therefore these reserves cannot be regarded as a source of wood supply for wood-using industries.

2- Private lands.

Some 40,000 square miles of farmers' and other forest land

for local use are privately owned. Of this area 20,130 square miles are crop lands, 9,709 square miles are in woodlots, 6,891 square miles are small forest tracts, and 3,165 square miles, still mostly forested, are destined to become crop lands. That leaves approximately 20,000 square miles of forest lands set aside for local use.

Though a large quantity of pulpwood is cut every year from woodlots, small forest properties, and settlers' lands, those forest lands have been placed under the heading "farmers' and other forest land for local use" for the following reasons:

1- Lack of information necessary to permit their distribution by groups of watersheds.

2- The fact that these small forest tracts serve not only the pulp and paper industry, but also constitute the main source of wood supplies for Quebec's 2,000 fixed and portable sawmills.

3- The instability of a great part of these forest areas which, within a few years, may become part of agricultural lands.

Concluding this explanation of Table 8, the following facts should be mentioned regarding the twenty groups of watersheds under study in their relation to ownership and tenure:

1- Of the 20 groups, one group, Number 20, is in complete private ownership. This is Anticosti Island.

2- Two groups, Numbers 1 and 2, consist of vacant Crown lands only.

3- Vacant Crown land exists in all groups except Groups 10, 14, 15, 18 and 20.

4- Private land exists in all groups of watersheds.

5- Township reserves are found in all groups except 1, 2, and 20.

CHAPTER VIII

WOOD INVENTORY BY GROUPS OF WATERSHEDS

This survey strives to measure the wood supplies available on the forest lands which will serve the main wood-using industries. These forest lands cover 218,490 square miles, or 139,834,000 acres.

Knowing that only approximately 40% of the most accessible area of Quebec (south of the 52nd parallel) had been covered by inventory and reconnaissance, the writer had to resort to aerial photography, aerial sketching, the opinion of surveyors and foresters, and his own personal knowledge in conjunction with forest inventories and reconnaissance inventories, in order to arrive at an estimate of the volume of wood thereon. By this method the average volume of wood on each watershed was determined, for the whole area, unproductive land included, without any regard to species.

First, the area covered by ground inventory was separated from that where no field work has ever been done. Second, a careful study was made of all available forest inventories - companies' inventory reports, Government inventories, and reconnaissance. In some cases, the average volume per acre was the weighted average of the

inventories conducted in a specific watershed; in others, the inventory reports were so old that a readjustment was necessary. This accounts for all the areas covered, at one time or another, by ground survey.

Concerning the area as yet uncovered by inventories, the average volume of wood per acre given is the result of careful consideration. In many instances, aerial photographs were examined, and experienced foresters consulted before the estimated average volume for the area was decided.

The summary of this survey is presented in Table 9. It reveals that the presently accessible forest land available for the use of forest industries, 139,834 thousand acres in area, has an estimated volume of wood of 79,712 million cubic feet. This is for all trees, softwood and hardwood, 4" and up D.B.H. Considering that this volume is for all forest land (productive and unproductive), it comes to an average per acre of 570 cubic feet, or 6.7 cords.

The area which has been covered by forest inventory amounts to 58,096 thousand acres, and represents 42% of the whole area. It has a total volume of wood of 43,547 million cubic feet. This gives an average of 750 cubic feet, or 8.8 cords per acre.

TABLE 9

VOLUME OF TIMBER ON FOREST LAND AVAILABLE

FOR THE USE OF FOREST INDUSTRIES BY GROUPS OF WATERSHEDS

Group no.	Area	Area covered by forest inventory			Area not covered by forest inventory			Total Volume	
	Thousand acres	Thousand acres	Million cu.ft.	Av. per acre cu.ft.	Thousand acres	Million cu.ft.	Av. per acre cu. ft.	Million cu.ft.	Av. per acre cu. ft.
1	5,363	-	-	-	5,363	2,145	400	2,145	400
2	8,588	4,322	2,455	568	4,266	1,392	326	3,847	448
3	9,138	3,284	1,349	411	5,854	1,739	297	3,088	338
4	15,171	3,791	3,449	910	11,380	6,342	557	9,791	645
5	6,933	3,306	4,288	1,297	3,627	2,386	658	6,674	963
6	16,407	5,496	5,012	912	10,911	5,455	500	10,467	638
7	2,305	1,576	1,508	957	729	407	558	1,915	831
8	1,638	1,171	1,033	882	467	239	512	1,272	777
9	11,068	7,966	5,586	701	3,102	974	314	6,560	593
10	1,633	463	295	637	1,170	636	544	931	570
11	11,008	6,769	5,529	817	4,239	2,389	563	7,918	719
12	12,385	3,656	2,219	607	8,729	2,834	325	5,053	408
13	28,968	8,891	4,921	553	20,077	7,882	393	12,803	442
14	254	54	59	1,092	200	138	690	197	776
15	676	450	336	747	226	130	576	466	689
16	1,589	1,152	1,541	1,338	437	314	719	1,855	1,167
17	1,296	1,101	853	775	195	136	697	989	763
18	606	499	448	898	107	102	953	550	908
19	2,818	2,159	1,870	866	659	525	797	2,395	850
20	1,990	1,990	796	400[1]	-	-	-	796	400
All groups	139,834	58,096	43,547	750	81,738	36,165	442	79,712	570
Percentage	100	42			58				

[1] Estimated.

The area not yet covered by any kind of forest inventory represents 81,738 thousand acres, or 58% of the total area under study. These forest lands are less accessible than those which have been inventoried and surveyed. They are mostly situated north, north-east, and north-west of the St.Lawrence River, and are usually located at the head of the watersheds draining into the St.Lawrence. The total volume of wood on this area amounts to 36,165 million cubic feet, an average of 442 cubic feet, or 5.2 cords per acre.

An interesting point brought out by Table 9 is that of 20 groups of watersheds, four groups (No. 4, 6, 11, and 13) contain more than half the growing stock of the Quebec forests; in fact, they have 40,979 million cubic feet of a total of 79,712 million.

The fact that approximately 95% of the wood requirements of the Quebec pulp and paper industry is softwood, necessitates not so much an estimate of the total volume of wood in the Province as of the present stock of softwood. From study of the most recent forest inventories in the hands of the Forest Service, the percentages of the standing timber in softwoods and hardwoods have been established by groups of watersheds. These percentages, as well as the total and average volume per acre for these species, are presented in Table 10.

TABLE 10

CUBIC-FOOT VOLUME OF SOFTWOODS AND HARDWOODS ON FOREST LAND AVAILABLE FOR THE USE OF FOREST INDUSTRIES BY GROUPS OF WATERSHEDS 1/

Group no.	Total			Percentage of the stock		Softwood 2/			Hardwood		
	Million cu.ft.	Percent	Cu. ft. per acre	SW. Species	HW. Species	Million cu.ft.	Percent	Cu.ft. per acre	Million cu.ft.	Percent	Cu. ft. per acre
1	2,145	2.7	400	96	4	2,059	3.2	384	86	0.5	16
2	3,847	4.8	448	95	5	3,655	5.8	425	192	1.2	23
3	3,088	3.9	338	94	6	2,903	4.6	318	185	1.1	20
4	9,791	12.2	645	92	8	9,008	14.2	593	783	4.8	52
5	6,674	8.3	963	85	15	5,673	8.9	819	1,001	6.2	144
6	10,467	13.1	638	77	23	8,060	12.7	491	2,407	14.9	147
7	1,915	2.4	831	81	19	1,551	2.4	673	364	2.3	158
8	1,272	1.6	777	60	40	763	1.2	466	509	3.1	311
9	6,560	8.2	593	63	37	4,133	6.5	374	2,427	15.0	219
10	931	1.2	570	65	35	605	1.0	370	326	2.0	200
11	7,918	9.9	719	60	40	4,751	7.5	431	3,167	19.6	288
12	5,053	6.3	408	66	34	3,335	5.2	269	1,718	10.6	139
13	12,803	16.0	442	85	15	10,883	17.1	376	1,920	11.9	66
14	197	0.3	776	60	40	118	0.2	466	79	0.5	310
15	466	0.6	689	52	48	242	0.4	358	224	1.4	331
16	1,855	2.3	1,167	83	17	1,540	2.4	969	315	1.9	198
17	989	1.2	763	82	18	811	1.3	626	178	1.1	137
18	550	0.7	908	74	26	407	0.6	672	143	0.9	236
19	2,395	3.0	850	95	5	2,275	3.6	807	120	0.7	43
20	796	1.3	400	95	5	756	1.2	380	40	0.3	20
All groups	79,712	100.0	570	80	20	63,528	100.0	456	16,184	100.0	114
Percentage	100					80			20		

1/ Volume includes all trees 4" and up D.B.H.

2/ 95% of the volume of softwood is of Spruce (59%), Balsam (32%) and Jack Pine (4%).

This table reveals that 80% of the total stock is softwood. The softwood volume is 63,528 million cubic feet, which gives an average per acre of 456 cubic feet, or 5.3 cords. Ninety-five percent of this total consists of species now used in the manufacture of pulp and paper: spruce - 59%, balsam - 32%, and jack pine - 4%. The remaining 5% consists of pine, cedar, hemlock, and larch.

The volume of hardwood, 20% of the total stock, amounts to 16,184 million cubic feet, giving an average per acre of 114 cubic feet for the whole area under study. The chief species are birch, poplar, maple, and beech.

The conclusions to be drawn from Table 10 are the following:

1- There is a predominance of softwood volume in all groups. Eleven groups have between 81% and 96% of their volume in softwood; eight groups, between 60% and 77%, and one group, 52%.

2- The distribution of the softwood stock between the groups is very unequal. Groups 4, 6, and 13 account for 44% of the present total stock. Figures for Groups 5, 9, and 11 bring this percentage up to 67%. This observation stresses the economic importance of these six groups to the future of the Quebec pulp and paper industry.

3- The hardwood stock is concentrated is six groups: 5, 6, 9, 11, 12, and 13. These groups alone account for a volume of 12,640 million cubic feet, or 80% of the total hardwood stock. The volume shown for hardwood should be taken with caution on account of the present epidemic which affects birch, the most important species.

CHAPTER IX

GROSS SUSTAINABLE CUT OF SOFTWOOD, UNDER PRESENT CONDITIONS

The growth of the wood-using industry in the Province, principally due to the expansion of the pulp and paper industry during the last forty years, has been such as to raise the question whether the present annual pulpwood requirements can be supplied by the forest areas now serving the mills until such time as the large areas of second growth are ready for harvesting.

A number of methods can be employed for the determination of the gross sustainable cut when the regulation of the forest is based on more detailed timber-survey data than those mentioned in the preceding chapter. However, since in this case area and timber volume by groups of watersheds are the only basic information available, but few methods can be used, and no more than a rough approximation of the cut can be made.

At the turn of the century there was no forest school in Quebec, and few accurate surveys and inventories had been made. When the Department of Lands and Forests was organized in 1909, its officers soon decided that some control of the cut was necessary if the forests

were to be managed on a sustained yield basis. Owing to the immense area of the forests and a numerically restricted personnel, it was difficult to determine a growth rate for even large individual tracts. Since some general and easily applied solution of the problem was needed, it was decided to take representative samples, based on a number of existing surveys, and from this work out a forest growth percent applicable to the average pulpwood forest of Quebec. Growth was determined on these samples which, expressed as a percentage of the total growing stock volume, was assumed to apply generally to existing forests. The figure arrived at was 2 percent of the total growing stock for trees 4" D.B.H. and over.

From an estimate of gross annual sustainable yield, obtained in the above manner, 20 percent was deducted as a reserve to meet unforeseen contingencies, principally for losses due to fire, insects, and diseases. This, again, was an arbitrary decision, there being at that time no records compiled on these forest losses in Quebec. It is said that the 20 percent deduction was adopted following careful study of the records of such losses kept by those European countries whose climate and forest types are similar to those of Quebec.

Present forest inventories supply information as to site quality, area and volume by age classes, dead or defective trees encountered, growth studies, comparative facility of the terrain, etc. With such

data and information on hand the forester has a clear picture of the forest, which enables him to better guide the forest owner in the adoption of an annual allowable cut for his property. In determining the allowable cut the forester must, of course, be guided not only by these specific data, but by the owner's current need for wood and the ultimate aim of leading the forest towards desirable regularity. On forests under management a modification of an area-volume method is the one most widely used in Quebec, where clearcutting is the general practice in pulpwood operations.

As mentioned in Chapter VIII, many of Quebec's virgin forests are not yet covered by adequate surveys and working plans. Until such time as more complete information on these areas will permit the use of less arbitrary methods, 2 percent of the growing stock (less 20 percent for contingencies) is accepted by the Department of Lands and Forests for determining the allowable cut on these areas.

With such meager information available on Quebec's forest resources, the only alternative to the use of a flat growth percentage was Von Mantel's formula. This formula was developed following the observation that when a forest is more or less regulated there is an approximately linear relation between growing stock and age that can be represented by a right triangle. Based on this assumption, the cut from an actual forest can be estimated by the formula:

$$\text{Annual Cut} = \frac{\text{Actual growing stock}}{\text{Rotation} / 2}$$

Both of these approaches are arbitrary, and give a reasonably good estimate of allowable cut on a forest only when the area-age distribution of the growing stock has some semblance of regularity. Strictly speaking, neither is applicable to the unregulated forest found in Quebec, but with the information available there was no other choice. It was, therefore, only a question of deciding which method would give a more realistic estimate of allowable cut.

The accuracy of an allowable cut reached by an empirical growth percent method depends on whether or not the total volume and yield of the sample forest data used are fairly representative of the areas to which it is applied. The applicability of Von Mantel's formula also depends on the accuracy of the growing stock estimate and the degree of forest regularity, but in addition requires a specific estimate of the rotation. As in Von Mantel's formula the total growing stock is always divided by half the rotation, at 100 years it works out mathematically to 2 percent of the total growing stock. Applied to the same growing stock for shorter rotations, Von Mantel's formula gives, of course, a proportionately higher percent of the total growing stock as the indicated cut.

In the more accessible watersheds, due to the cutting and fires which have taken place thereon, there is a certain regularity in the

distribution of the age classes of the immature stands. However, because the available area of mature timber is in short supply, the younger stands were often encroached upon during cutting operations; for example, substantial areas of the 50 and 60 year age classes were cut. While these younger age classes are reasonably well-stocked, their total area, and consequently total volume, is often too low. The rate of cutting of the mature wood in these areas should be such as to give time for the immature stands to reach a rotation age, which is set at about 70 years. Current growth on these areas exceeds, of course, 2 percent of the total growing stock. But to cut more than 2 percent would hinder the necessary building up of the young stands, and would create a highly undesirable gap in the cutting operations. (The economic and social factors related to sustained yield are discussed in Chapters XIII and XV.)

When applied to the virgin forests, where most timber stands are over-mature and current growth is practically non-existent, a cut of 2 percent of the total growing stock naturally exceeds the growth. This is necessary in these areas in order to bring about increased growth and promote age class regularity.

Table 11 presents an estimate of the possible annual gross

sustainable cut of softwood, based on 2 percent of the total growing stock. It does not take into consideration any deduction as reserve for unforeseen contingencies. 1/

1/ Losses due to fire, insects, and diseases will be considered in the following chapter.

TABLE 11

GROSS SUSTAINABLE CUT OF SOFTWOOD, UNDER PRESENT CONDITIONS, ON FOREST LAND AVAILABLE FOR THE USE OF FOREST INDUSTRIES BY GROUPS OF WATERSHEDS

(one rough cord = 85 solic cubic feet)

Group no.	Present softwood stock	Gross sustainable cut
	Thousand cords	Thousand cords
1	24,224	484
2	43,000	860
3	34,153	683
4	105,976	2,120
5	66,741	1,335
6	94,824	1,896
7	18,247	365
8	8,976	180
9	48,624	972
10	7,118	142
11	55,894	1,118
12	39,235	785
13	128,035	2,561
14	1,388	28
15	2,847	57
16	18,118	362
17	9,541	191
18	4,788	96
19	26,765	535
20	8,894	178
All groups	747,388	14,948

CHAPTER X

NET SUSTAINABLE CUT OF SOFTWOOD UNDER PRESENT CONDITIONS

Losses due to fire, insects, and diseases are so often a challenge to the sound management of the forest, and consequently to the possible continuity of wood supply to the wood-using industry, that they merit very careful and detailed consideration in this thesis.

Fire losses

One of the great difficulties in making this survey on timber resources in Quebec has been to present figures by groups of watersheds. Most official statistics are given by counties, administrative districts, or forest protection districts (which are not the same as the administrative districts). Very rarely do these units coincide with watershed areas. Fortunately, beginning in 1950, the Forest Protection Service has been publishing statistics by watersheds on the forest area burned annually. It was possible therefore to prepare a table giving this information for the years 1949, 1950, and 1951. This table shows that an average of 203,056 acres of forest land were destroyed by fire annually during these three years. By coincidence, this average happened

to be the same as the past 27 year average of 203,812 acres. On the other hand, it is much lower than the 302,859 acre average for the past 10 years.1/

TABLE 12

FOREST AREA BURNED IN THE PROVINCE OF QUEBEC

BY GROUPS OF WATERSHEDS

Group no.	Year 1949	Year 1950	Year 1951	Total	Annual Average 1949-51
	Acres	Acres	Acres	Acres	Acres
1	10,881	-	-	10,881	3,627
2	-	527	5	532	177
3	2	7	3	12	4
4	490	4,274	2,565	7,329	2,443
5	1,038	3,868	16,035	20,941	6,980
6	7,449	83,277	69,969	160,695	53,565
7	825	11,200	31,216	43,241	14,414
8	857	8,953	1,384	11,194	3,731
9	17,890	14,584	16,536	49,010	16,337
10	5,946	2,082	713	8,741	2,914
11	13,786	9,130	801	23,717	7,906
12	27,374	36,185	100,893	164,452	54,817
13	846	863	16,985	18,694	6,231
14	34,868	1,034	150	36,052	12,017
15	1,735	1,494	491	3,720	1,240
16	12,496	11,759	8,717	32,972	10,991
17	77	907	23	1,007	336
18	1,204	8,949	401	10,554	3,518
19	122	4,532	771	5,425	1,808
20	-	-	-	-	-
All groups	137,886	203,625	267,658	609,169	203,056

1/ G. Paquet, "Les incendies forestiers dans le Québec - les pertes", "Un problème de Conservation", 1951.

These figures of the area burned annually make it possible to calculate the volume of wood thus destroyed. Some of these groups of watersheds may have suffered either heavier or lighter losses during this three-year period than at any other time. Unfortunately there is at present no other way of estimating fire losses by watersheds than by multiplying the average acreage burned in each group of watersheds by its average volume of wood per acre. This procedure does not take into account whether the fires occurred in mature or immature stands, recent or old cut-over areas, or the fact that in some instances, when the forest roads permitted access to the fire area, a certain percentage of wood was salvaged. To compensate for this variation in the volume of wood lost, the figure used as the average volume per acre is that for the gross area, which includes well-stocked and poorly-stocked forest land, waste land, and water areas, thus giving a conservative estimate.

Table 13 shows the total yearly losses in softwood and hardwood species based on the above method of calculation. For the softwood species the loss is almost 95 million cubic feet, or the equivalent of slightly over 1 million cords a year, whereas the loss is 34 million cubic feet, or 400 thousand cords a year, for the hardwood species.

It is interesting to note in Table 13 that, of a total loss for all groups of 1.5 million cords, a little over 1 million cords

TABLE 13

LOSSES DUE TO FIRE IN THE PROVINCE OF QUEBEC

BY GROUPS OF WATERSHEDS

Group no.	Area burned av. 1949-51	Losses in volume 1/						
		Total	Softwood			Hardwood		
	Acres	Thousand cords	Volume per acre cu.ft.	Thousand cu.ft.	Thousand cords	Volume per acre cu.ft.	Thousand cu.ft.	Thousand cords
1	3,627	17	384	1,393	16	16	58	1
2	177	1	425	75	1	23	4	-
3	4	-	318	1	-	20	-	-
4	2,443	18	593	1,449	17	52	127	1
5	6,980	79	819	5,717	67	144	1,005	12
6	53,565	402	491	26,300	309	147	7,874	93
7	14,414	141	673	9,701	114	158	2,277	27
8	3,731	34	466	1,739	20	311	1,160	14
9	16,337	114	374	6,110	72	219	3,578	42
10	2,914	20	370	1,078	13	200	583	7
11	7,906	67	431	3,407	40	288	2,277	27
12	54,817	263	269	14,746	173	139	7,620	90
13	6,231	33	376	2,343	28	66	411	5
14	12,017	110	466	5,600	66	310	3,725	44
15	1,240	10	358	444	5	331	410	5
16	10,991	151	969	10,650	125	198	2,176	26
17	336	3	626	210	2	137	46	1
18	3,518	38	672	2,364	28	236	830	10
19	1,808	18	807	1,459	17	43	78	1
20	-	-	380	-	-	20	-	-
All groups	203,056	1,519	467	94,786	1,113	169	34,239	406

1/ Losses in volume are based on the average area burned during the period 1949-51.

(1,181,000) of wood were destroyed in six groups out of the twenty; these are Groups 6, 7, 9, 12, 14, and 16, which Map 5 shows to be included in the more accessible forest areas. This bears out the observation that, while virgin forests are more subject to fire from natural causes, the majority of fires in Quebec (approximately 70%) are due to the human element, and therefore are most likely to occur in the more accessible forest areas.

Considering that the loss of 1.5 million cords a year is the estimate for only a protected area of 165,000 square miles, this average may be considered a very conservative one.

In 1950, of the 258,000 square miles of forest land lying south of the 52nd parallel of latitude, only the 165,000 square miles referred to above, or 64%, were protected against fire, while 93,000 square miles, or 36% of the forest, were still without any organized protection. This latter area lies mostly north of the presently leased timber limits and in the extreme northeastern part of Quebec.

At this point it may be useful to give some general information on forest fire protection in Quebec. It consists primarily in a system of detection, based on a network of observation towers, supplemented by patrols on foot, and others traveling by canoe, truck or motor boat.

Recently seaplanes have been coming into use for patrolling during periods of high fire hazard.

On areas where forest operations are in progress fire fighting equipment is kept at strategic points. Upon receipt of a report that a fire has been sighted near an area under operation, a force is dispatched to take control. When the fire occurs in a less accessible area, a reconnaissance party is sent to accurately locate it and ascertain its extent and direction of travel. A fighting force may then be sent to control the fire, but usually approach to the main front of fire is possible only after rain or a change of wind. All that they can do in the meantime is to put out fire burning in patches. When a fire is accessible and has an extended front, approximately 100 men per mile are required to effect control. Even in these numbers they can accomplish nothing in halting the advance of a big fire, as the method of back firing is seldom ever used in Eastern Canada. When rain comes the men are placed along the edges of the fire to prevent its further spread. When a fire is located in the interior of an extensive limit, or on vacant land, and thus not readily accessible, little or nothing is done to fight it. The fire burns itself out or is extinguished according to the will of Providence.

Forest fire protection is assumed either by the Government Forest Protection Service, six protective associations, or non-affiliated

limit-holders. Organized in 1924, the Forest Protection Service takes care of the protection of some of the vacant Crown lands, the forest reserves, the colonization lots, and some private forest lands of less than 2,000 acres. The protective associations operate as syndicates and are composed of forest owners or limit-holders who have grouped together for the purpose of protecting their forest lands. The non-affiliated limit-holders who themselves assume the protection of their forests numbered 35 in 1950.

It must be noted that the Protection Service has control over associations as well as over individuals to see that they comply with the protection regulations. Furthermore, the government assumes fifty per cent of the cost of fighting any forest fire.

The Forest Protection Service assumed in 1950 responsibility for the protection of 47.8% of the forest area below the 52nd parallel, while the associations were responsible for 49.3%, and the 35 limit-holders for 2.9%.

Forest fires in the Province of Quebec, although fewer in number per million of acres protected than in Maine, New Hampshire, Vermont, and New York, have, as an average for the past 10 years, burnt a larger acreage every year per million acres protected than was burnt

in those states. The Quebec average is 2,686 acres burnt per million of acres protected, whereas it is 2,115 acres in Maine, 1,716 acres in New Hampshire, 407 in Vermont, and 1,588 acres in New York. In those states forest conditions are much the same as in Quebec.

In conclusion, the fact that 1.5 million cords of wood which, at an average stumpage price of $2.00 a cord, have a value of $3,000,000, go up in smoke, year after year, demonstrates how important it is that forest protection standards be maintained at highest efficiency in the forest of the Province of Quebec. Many suggestions have been offered for improving the situation. Among them should be mentioned those advanced by an executive of a company having timber limits in private ownership and under license in Quebec, when addressing the annual meeting of the Association of Forest Engineers of the Province of Quebec in 1951.2/ The remedies suggested are summarized below.

1 - In general

Forest travel permits should not be given out indiscriminently. A black list should be established giving the names of people known to

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2/ F. Boutin, "Les incendies forestiers dans le Québec - les remèdes", "Un problème de Conversation", 1951.

have started forest fires or as given to carelessness. Furthermore, permits for circulation on Crown leased lands should be issued by the timber limit-holders themselves. The Minister of Lands and Forests, who has the power to close forests to traffic at any time, should decide in principle that the forest be closed to traffic in any sector where the fire index 3/has reached the "high" bracket, delegating to the forest fire inspectors the right to apply this decision according to local conditions. Finally, any person found to have started a fire should be prosecuted.

2 - In particular

a) Cost of forest fire protection should be shared by fishing and hunting clubs in a proportion determined by the government.

b) Permission for the burning of brush by settlers should be given only when the fire index is low, and severe punishment should be imposed on settlers who light brush fires without permits.

c) Forest fire rangers should be well trained.

3/ The fire index is a gauge employed by the fire protection organizations of Quebec which takes into account the relative humidity of the air, evaporation, type of forest, state of the forest floor, etc. and indicates the relative danger of forest fire.

d) Parachutists brigades should be organized - implying of course more use of airplanes. Modern equipment for the prevention, detection, and combatting of forest fire by the Protection Service and all protective associations should be provided.

e) Research in prevention, detection, and forest fire fighting, using gas, bombs, etc. should be undertaken.

The enforcement of these suggestions would prevent many forest fires in Quebec. At present anyone can obtain a forest travel permit to go fishing or take a trip anywhere throughout the forest at almost any time in summer. The limit-holders, who hold the forest land under lease and are responsible for its protection, have no authority to refuse entry upon their limits. Although the Minister of Lands and Forests closes a sector to traffic whenever the fire index reaches the "high" bracket, it is often the case that a specific area would have been closed much earlier, were the decision left to the forest fire inspectors.

It would seem only just that those using the forest for pleasure should bear their share of the cost of protection, rather than that it be left entirely to the limit-holders. Furthermore, if sportsmen were paying something toward protecting the forest from fire, they would probably be more careful.

Considering that approximately 30% of forest fires in Quebec are caused by the burning of brush by settlers, permission for such fires should be obtainable only from forest rangers themselves, not from assistants, and should be given only when the fire index is low.

Concerning the other suggestions mentioned, it is self-evident that better training and equipment, as well as research and the modernization of fire fighting methods would improve the situation. These, however, depend upon adequate forest fire protection budgets, both for the government agency and for forest protective associations.

Losses Due to Insects and Diseases

A reduction of losses due to insects and diseases is of prime importance in Quebec if a sustained source of raw material is to be available to the wood-using industry. Unless losses due to these sources are brought to a minimum, no conservation policy can be effective and any plans to assure the future of the pulp and paper industry will be futile.

It is generally estimated in Canada that the probable yearly losses by insects and diseases are slightly higher than those due to fire. In order not to be over-pessimistic in this survey the losses due to insects and diseases have been estimated as being only equal to those of fire.

The spruce and balsam stands in Quebec are suffering severe attacks of the spruce budworm. From its first appearance in the western part of Quebec in 1939, this plague has spread until it is now affecting all regions of the Province where spruce and balsam trees of all ages are suffering its attack.

The hardwood stands, principally those of white and yellow birch, have been severely attacked by a mysterious disease, often called birch die-back. This disease was first scientifically investigated in New Brunswick in 1932 and its presence in Quebec first observed as of serious proportions in 1939. Gaspé and the Matapedia Valley were the regions most seriously attacked. Since then this epidemic has been observed in all the other regions, so that today between 35% and 98% of the white birch, and between 62% and 100% of the yellow birch, depending on the region where the sampling was done, are attacked by this insect or disease. The percentage of mortality varies between 0% and 68% for white birch and 0% and 70% for yellow birch.4/

In estimating the annual loss of wood, considering that some of the trees affected by insects and diseases are harvested, especially softwood trees, it seemed logical to evaluate the net loss as being at least equal to that due to fire; that is to say, to 1.5

4/ Quatorzième Rapport Annuel sur l'Entomologie Forestière, Ministère des Terres & Forêts, Québec 1952, p. 15A.

million cords a year. The distribution of the losses has been based on the percentage of the forested area available for the use of forest industries in each group. Table 14 gives for each group the total loss in softwood and hardwood species, the volume being given in thousand cords. Table 15 gives a summary of the total average losses, which are estimated as occurring on forest land available for the use of forest industries, the total loss being distributed amongst the groups according to their respective areas.

TABLE 14

LOSSES DUE TO INSECTS AND DISEASES ON THE FOREST LAND AVAILABLE FOR THE USE OF FOREST INDUSTRIES, BY GROUPS OF WATERSHEDS

Group no.	Losses in volume 1/				
	Forest land area for the use of forest industries		Total	Softwood	Hardwood
	Sq. miles	Percent	Thousand cords	Thousand cords	Thousand cords
1	8,380	3.84	58	43	15
2	13,419	6.14	93	68	25
3	14,278	6.53	99	73	26
4	23,704	10.85	165	121	44
5	10,833	4.96	75	55	20
6	25,636	11.73	179	131	48
7	3,601	1.63	24	18	6
8	2,560	1.17	18	13	5
9	17,293	7.91	120	88	32
10	2,552	1.17	18	13	5
11	17,200	7.87	120	88	32
12	19,351	8.86	135	99	36
13	45,262	20.72	314	230	84
14	397	.18	3	2	1
15	1,056	.48	7	5	2
16	2,483	1.14	18	13	5
17	2,025	.93	14	10	4
18	947	.43	7	5	2
19	4,403	2.02	30	22	8
20	3,110	1.42	22	16	6
All groups	218,490	100.00	1,519	1,113	406

1/ Assuming that losses due to insects and diseases equal the fire losses.

TABLE 15

SUMMARY OF LOSSES DUE TO FIRE, INSECTS AND DISEASES ON THE FOREST LAND AVAILABLE FOR THE USE OF FOREST INDUSTRIES

BY GROUPS OF WATERSHEDS

Group no.	Total			Fire losses			Insects & disease losses		
	Total	Softwood	Hardwood	Total	Softwood	Hardwood	Total	Softwood	Hardwood
	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords
1	75	59	16	17	16	1	58	43	15
2	94	69	25	1	1	-	93	68	25
3	99	73	26	-	-	-	99	73	26
4	183	138	45	18	17	1	165	121	44
5	154	122	32	79	67	12	75	55	20
6	581	440	141	402	309	93	179	131	48
7	165	132	33	141	114	27	24	18	6
8	52	33	19	34	20	14	18	13	5
9	234	160	74	114	72	42	120	88	32
10	38	26	12	20	13	7	18	13	5
11	187	128	59	67	40	27	120	88	32
12	398	272	126	263	173	90	135	99	36
13	347	258	89	33	28	5	314	230	84
14	113	68	45	110	66	44	3	2	1
15	17	10	7	10	5	5	7	5	2
16	169	138	31	151	125	26	18	13	5
17	17	12	5	3	2	1	14	10	4
18	45	33	12	38	28	10	7	5	2
19	48	39	9	18	17	1	30	22	8
20	22	16	6	-	-	-	22	16	6
All groups	3,038	2,226	812	1,519	1,113	406	1,519	1,113	406

Net sustainable cut of softwood

Table 16 shows the extent to which losses due to fire, insects, and diseases affect sustainable cut. From a gross sustainable cut of 14,948 thousand cords of softwood, 15%, or 2,226 thousand cords, is deducted as average loss from the above causes. The remaining 85%, or 12,722 thousand cords, represents the net sustainable cut of softwood for all groups of watersheds.

Four groups of watersheds (4, 5, 6, and 13) have outstanding possibilities. Together they present a net sustainable cut of 6,954 thousand cords of softwood a year, which is 54% of the total net sustainable cut. They cover a vast area, and are among the least accessible watersheds. The importance of these watersheds to the stabilization of the pulp and paper industry will be considered in the third part of this thesis.

Groups 2, 3, 9, 11, and 12 have a net sustainable cut varying between 500 thousand cords and 1 million cords a year. The others, because of their small acreage, the low density of their stands, or deterioration due to overcutting and fire, are of much less importance. Four groups (1, 7, 16, and 19) have a net sustainable cut which varies between 200 and 500 thousand cords; four groups (8, 10, 17, and 20)

between 100 and 200 thousand cords; two groups (15 and 18) less than 100 thousand cords. Group 14 shows no net sustainable cut, losses due to fire being 40 thousand cords more than the estimated gross sustainable cut.

The figures presented will no doubt arouse controversy; but they are the result of exhaustive research and an objective appraisal of available statistics.

No attempt has been made to give figures on gross and net sustainable cut for hardwood species, which at present are little used by the Quebec pulp and paper industry. Lack of knowledge of the growth of hardwoods, and uncertainty as to their present volume, tremendously reduced in recent years by diseases affecting especially birch, prevents even a rough estimate.

TABLE 16

YEARLY NET SUSTAINABLE CUT OF SOFTWOOD, UNDER PRESENT CONDITIONS ON FOREST LAND AVAILABLE FOR USE OF FOREST INDUSTRIES, BY GROUPS OF WATERSHEDS

One cord = 85 solid cubic feet

Group no.	Gross sustainable cut	Losses	Net sustainable cut
	Thousand cords	Thousand cords	Thousand cords
1	484	59	425
2	860	69	791
3	683	73	610
4	2,120	138	1,982
5	1,335	122	1,213
6	1,896	440	1,456
7	365	132	233
8	180	33	147
9	972	160	812
10	142	26	116
11	1,118	128	990
12	785	272	513
13	2,561	258	2,303
14	28	68	- 40
15	57	10	47
16	362	138	224
17	191	12	179
18	96	33	63
19	535	39	496
20	178	16	162
All groups	14,948	2,226	12,722
Percentage	100	15	85

CHAPTER XI

PRESENT AVERAGE ANNUAL CUTTING DRAIN (1947-1950)

It would be pointless to present a survey of the wood resources of Quebec and the net sustainable cut of softwood without presenting also the current total drain, its composition as regards species, major uses, the ownership of the land from which it comes, and recent trends in rate of cutting. To achieve this goal, cutting operations on Crown lands and on private lands will be studied separately for the period from 1947 to 1950 inclusive.

Average annual cutting drain on Crown lands

Prior to 1948 the volume of wood cut on Crown lands was reported by districts only. But beginning with the Report of the Minister of Lands and Forests for that year the cut has been reported by main watersheds.

This change has made it possible to present Table 17 in its present form, giving by groups of watersheds the total volume of wood cut during the years of operations 1947-48 to 1950-51, that is to say, from the end of March of one year to the end of March of the following.[1/]

1/ Considering that the statistics available for cutting drain on private lands were compiled for calendar years, in both cases this will be referred to in the text only by the year.

TABLE 17

PRESENT AVERAGE CUTTING DRAIN (1947-1950) FROM ALL TIMBER

ON CROWN LANDS BY GROUPS OF WATERSHEDS

Group no.	Cut 1947-48	Cut 1948-49	Cut 1949-50	Cut 1950-51	Four-year average	
	Thousand cu.ft.	Thousand cu.ft.	Thousand cu.ft.	Thousand cu.ft.	Thousand cu.ft.	Equivalent in thousand cords
1	6	-	-	-	1	-
2	15	-	6	236	64	1
3	91	5	-	23	30	-
4	39,155	42,161	34,505	44,809	40,157	472
5	25,306	18,269	14,782	24,074	20,608	242
6	63,791	66,666	40,728	76,330	61,879	729
7	36,864	34,220	23,803	37,534	33,105	389
8	26,239	16,576	9,946	18,930	17,923	211
9	96,733	66,908	55,624	77,420	74,171	872
10	13,205	13,941	11,033	19,041	14,305	168
11	87,208	83,875	70,788	82,472	81,086	954
12	50,901	48,290	33,677	45,716	44,646	525
13	17,048	18,799	21,525	45,009	25,595	301
14	915	1,427	2,164	3,265	1,943	23
15	4,973	4,872	3,231	6,146	4,805	56
16	15,636	16,670	14,097	17,773	16,044	189
17	12,129	10,693	4,651	13,970	10,361	121
18	8,495	8,933	8,203	9,290	8,730	102
19	39,516	28,021	21,202	37,001	31,435	370
20	-	-	-	-	-	-
All groups	538,226	480,326	369,965	559,039	486,888	5,725

Study of this table reveals that the cut for these four years was quite well balanced. In fact, the cuts of 1947 and 1950 were 123 million cubic feet more than the four-year average, whereas the ones of 1948 and 1949 were 124 million cubic feet less.

Cutting operations, varying greatly between the groups, have been reported in all groups where Crown land exists. The volume cut was insignificant in Groups 1, 2, and 3, and to a certain degree in Groups 14 and 15. On the other hand, almost half of the cut, 2,555 thousand cords out of a total of 5,725 thousand cords, took place in Groups 6, 9, and 11. The other groups of watersheds showed a cut from 100 thousand cords to 525 thousand cords.

This table gives the total cutting drain on Crown lands, but does not mention species or uses of the wood cut in each watershed. To present more detail it was necessary to have access to unpublished data. The 1950 scaling sheets of the Scaling Department made it possible to separate the cut in softwood and hardwood in each watershed during that year, as well as to determine the amount cut in pulpwood, sawlogs, and other products. The application of the same percentage of wood cut in pulpwood and sawlogs by species in 1950 to the four-year average cutting drain, as presented in Table 17, permits the presentation of Table 18.

TABLE 18

PRESENT AVERAGE CUTTING DRAIN (MARCH 1947-48 TO MARCH 1950-51) FROM ALL TIMBER ON CROWN LANDS BY GROUPS OF SPECIES, MAJOR USES AND BY GROUPS OF WATERSHEDS

Group no.	Total			Sawlogs and other products			Pulpwood
	Total	Softwood	Hardwood	Total	Softwood	Hardwood	
	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords
1	-	-	-	-	-	-	-
2	1	1	-	1	1	-	-
3	-	-	-	-	-	-	-
4	472	472	-	20	20	-	452
5	242	241	1	14	13	1	228
6	729	724	5	163	158	5	566
7	389	386	3	68	65	3	321
8	211	205	6	20	14	6	191
9	872	825	47	112	65	47	760
10	168	143	25	96	71	25	72
11	954	808	146	298	152	146	656
12	525	517	8	267	259	8	258
13	301	300	1	102	101	1	199
14	23	17	6	16	10	6	7
15	56	49	7	32	25	7	24
16	189	177	12	167	155	12	22
17	121	121	-	20	20	-	101
18	102	85	17	78	61	17	24
19	370	363	7	49	42	7	321
20	-	-	-	-	-	-	-
All groups	5,725	5,434	291	1,523	1,232	291	4,202
Percentage	100			27			73
" "	100	95	5				

This table shows that of the present average cutting drain of 5,725 thousand cords, 5,434 thousand cords, or 95%, is of softwood species.2/ This is a very important point, as the pulp and paper industry at present has machinery especially adapted for the use of softwood species. In fact, the figures reveal that 4,202 thousand cords, or 73% of the total production of timber on Crown lands, were transformed into pulpwood during these four years. This in turn indicates that the equivalent of 1,523 thousand cords, or 27% of the total average cut, were converted into sawlogs and other products, such as spoolwood, veneer, etc. In the production of sawlogs the softwood species still predominate, being used in a proportion of 80%.

It would unnecessarily complicate the presentation of these data of the average cutting drain on Crown lands to give separately the amount of wood cut in timber limits, reserves, and vacant lands on special permits.

Map 6 on page 147illustrates better than words could do which are the most important groups of watersheds in the cutting of softwood species on the Crown lands.

2/ Included in the total cut is 12,000 cords cut annually on Township reserves for local use, which could not be separated from the total by watersheds.

Average annual cutting drain on private lands (1947-50)

In this study of the average annual cutting drain on private lands, it would have been desirable to present data on the cut on large private forest lands separately from the cut on small forest lands and woodlots. The cut on forest land available for the use of forest industries would then have been separated from that of forest land for local use, and the comparison between net sustainable cut and cutting drain would have been more to the point. Unfortunately the statistics available do not permit of such segregation by groups of watersheds. Therefore the average cutting drain on private land is for all private forest lands without any distinction as to whether the cutting operations took place on large or small timber lands, on farmers' or settlers' woodlots.

Although the Report of the Minister of Lands and Forests gives no details as to the amount of wood cut on private lands, it does mention the total pulpwood cut by the owners of large limits and by the small owners. These figures lead to the conclusion that, for the four-year period under study, the large private owners cut 52% of the total pulpwood cut on private lands.

Table 19 presents figures on the pulpwood cutting drain on private lands by administrative districts for the years 1947 to 1950

TABLE 19

PRESENT AVERAGE CUTTING DRAIN (1947-50) FROM ALL PULPWOOD

ON PRIVATE LANDS BY ADMINISTRATIVE DISTRICTS

District	Cut 1947	Cut 1948	Cut 1949	Cut 1950	Total Average
	cords	cords	cords	cords	cords
Abitibi	95,420	97,567	144,656	142,754	120,099
St.Maurice	128,456	191,603	161,921	102,744	146,181
Lake St.John	62,816	75,476	33,230	89,990	65,378
North Shore	310,941	336,936	333,030	307,182	322,022
Ottawa	56,553	85,659	85,544	78,005	76,440
Temiscamingue	36,148	31,189	121,280	60,192	62,202
Montreal	39,309	74,973	46,415	58,726	54,856
Quebec	411,757	434,208	421,898	362,285	407,537
South Shore	675,807	750,976	487,249	550,875	616,227
Lower St.Lawrence	250,019	350,614	405,350	275,348	320,333
Total	2,067,226	2,429,201	2,240,573	2,028,101	2,191,275

inclusive. These data were taken from the annual Report of the Minister. The transformation of the figures given by administrative districts, which are related neither to watersheds nor to counties, is made in a summary table. The statistics presented in Table 19 show that the cut of pulpwood on private lands did not vary much during these four years from the total average cutting drain of 2,191,275 cords. There is, however, a great variation in the amount of pulpwood cut in the various districts. The cut, from a minimum of 55 thousand cords in the Montreal district, reaches a maximum of 616 thousand cords in the South Shore district.

To the average pulpwood cutting drain on private lands must be added that of sawn lumber and other products.

These figures, obtained from the annual reports of the Minister of Lands and Forests, are given by administrative districts for the years 1947, 1948, and 1949. For 1950 the report did not give the volume cut in sawn lumber by districts, but only the total cut. The figures by districts for 1950 were obtained by applying to that year the percentage of distribution of the cut in the other years.

The figures on the cutting drain from all sawn timber and other products on private lands by administrative districts are presented

in Table 20. It will be seen that the equivalent of 1,806,572 cords of wood was sawn as a yearly average during the period 1947-50. It remains now to ascertain how much of this lumber and other products was of softwood and how much of hardwood species. This information is available for the cutting operations of 1947 in a publication called "Statistiques forestières" published annually by the Department of Lands and Forests. By applying the same percentage of softwood found in the 1947 cut to the average annual cutting drain for the period, it has been possible to present a summary giving the average annual cutting drain (1947-50) from all timber on private lands by groups of species, major uses, and administrative districts.

Table 21, giving this summary, shows in its first part a total cutting drain on private lands of 3,996 thousand cords, of which 3,521 thousand cords, or 88% were of softwood species (mostly spruce and balsam).

The second part of the table shows the volume of wood cut in sawn lumber by main species. It amounts to the equivalent of 1,806 thousand cords, or 45% of the total cut. Of this volume cut in lumber, 74% was of softwood species. The remaining 55% of the total cut on private land was used for pulpwood bolts.

TABLE 20

PRESENT AVERAGE CUTTING DRAIN (1947-50) FROM ALL SAWN LUMBER AND OTHER PRODUCTS ON PRIVATE LANDS, BY ADMINISTRATIVE DISTRICTS

District	Cut 1947	Cut 1948	Cut 1949	Cut 1950	Four-year average
	Cords	cords	cords	cords	cords
Abitibi	195,828	200,336	192,320	192,150	195,158
St.Maurice	16,643	16,695	15,803	16,013	16,289
Lake St.John	50,935	51,939	49,859	49,817	50,637
North Shore	8,701	9,275	8,898	8,896	8,943
Ottawa	26,534	27,824	26,715	26,687	26,940
Temiscamingue	33,619	33,389	32,072	33,804	33,221
Montreal	363,701	372,848	359,039	357,613	363,300
Quebec	515,705	528,665	507,540	507,064	514,743
South Shore	230,507	237,435	227,984	225,955	230,470
Lower St.Lawrence	368,253	376,558	361,501	361,172	366,871
Total	1,810,426	1,854,964	1,781,731	1,779,171	1,806,572

Another point which should be noted is the fact that the heaviest drain on private forest lands is south of the St.Lawrence, in the more developed districts. The districts of Quebec, South Shore, and Lower St.Lawrence present a cutting drain of 2,456 thousand cords, or 61% of the total drain. The presence in these districts, however, of large and heavily cut private forest lands makes one hesitate to attribute this large proportion of the cut in these districts solely to the greater number of farm woodlots.

Considering that approximately 1,100,000 cords of pulpwood cut on private lands came from large timber limits,3/ and that approximately the equivalent of 200,000 cords of softwood species have been cut in lumber from large private lands, it may be concluded that the average annual cutting drain of softwood species on large private holdings amounted to 1,300,000 cords, or 37% of the total softwood cut on all private lands.

3/ 52% of the total - 2,190,000 cords.

TABLE 21

PRESENT AVERAGE ANNUAL CUTTING DRAIN (1947-50) FROM ALL TIMBER ON PRIVATE LANDS BY GROUPS OF SPECIES, MAJOR USES AND ADMINISTRATIVE DISTRICTS

Districts	Total			Sawn lumber and other products				Pulpwood
	Total	Softwood	Hardwood	Total	Softwood		Hardwood	
					Pulpwood species	Other species		
	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords
Abitibi	315	305	10	195	173	12	10	120
St.Maurice	162	157	5	16	7	4	5	146
Lake St.John	116	115	1	51	45	5	1	65
North Shore	331	330	1	9	6	2	1	322
Ottawa	103	89	14	27	10	3	14	76
Temiscamingue	95	93	2	33	13	18	2	62
Montreal	418	244	174	363	98	91	174	55
Quebec	923	707	216	515	227	72	216	408
South Shore	846	816	30	230	163	37	30	616
Lower St.Lawrence	687	665	22	367	323	22	22	320
All Districts	3,996	3,521	475	1,806	1,065	266	475	2,190
Percentage	100			45				55
" "	100	88	12					

Present average annual cutting drain on all timber lands.

This third part of the chapter presents a summary of the average annual cutting drain (1947-50) on all timber lands of the Province of Quebec by groups of species, ownership, and groups of watersheds.

In order to maintain consistency in the utilization of statistics, the drawing up of Table 22 entailed a certain transformation. The volume of wood cut on private lands, given in the official statistics by administrative districts, had to be transformed according to groups of watersheds. The only way to make this change was to distribute the average cut of a district among the groups of watersheds included therein. The proportion of freehold lands, farms, and forest lands for local use, included in the respective groups, has served as the basis of calculation and distribution of the average drain.

Table 22 presents a summary of the average annual cutting drain on all timber lands of Quebec.

This table shows that the present average annual cutting drain from all timber, based on cutting operations during the years 1947 to 1950 inclusive, was 9,721 thousand cords. Of that amount

TABLE 22

PRESENT AVERAGE ANNUAL CUTTING DRAIN (1947-50) ON ALL TIMBER LANDS OF THE PROVINCE OF QUEBEC BY GROUPS OF SPECIES, OWNERSHIP, AND GROUPS OF WATERSHEDS

Group no.	Total Drain								
	Total			Crown lands			Private lands		
	Total	Softwood	Hardwood	Total	Softwood	Hardwood	Total	Softwood	Hardwood
	Thousand cords	thousand cords	thousand cords	thousand cords	thousand cords	thousand cords	thousand cords	thousand cords	thousand cords
1	-	-	-	-	-	-	-	-	-
2	1	1	-	1	1	-	-	-	-
3	3	3	-	-	-	-	3	3	-
4	585	585	-	472	472	-	113	113	-
5	376	374	2	242	241	1	134	133	1
6	790	785	5	729	724	5	61	61	-
7	439	435	4	389	386	3	50	49	1
8	390	342	48	211	205	6	179	137	42
9	1,127	1,050	77	872	825	47	255	225	30
10	387	271	116	168	143	25	219	128	91
11	1,163	965	198	954	808	146	209	157	52
12	770	755	15	525	517	8	245	238	7
13	466	460	6	301	300	1	165	160	5
14	608	445	163	23	17	6	585	428	157
15	689	628	61	56	49	7	633	579	54
16	527	504	23	189	177	12	338	327	11
17	227	224	3	121	121	-	106	103	3
18	474	444	30	102	85	17	372	359	13
19	613	598	15	370	363	7	243	235	8
20	86	86	-	-	-	-	86	86	-
All groups	9,721	8,955	766	5,725	5,434	291	3,996	3,521	475
Percentage	100	92	8						
" "	100			59			41		

8,955 thousand cords, or 92%, was of softwood species. The Crown lands supplied 5,725 thousand cords, or 59% of the total average cut; the rest, 3,996 thousand cords, was cut on private timber lands. Of the cut on Crown lands, 95% was of softwood species, whereas on private lands it was 88%.

To realize fully the extent and importance of such an annual drain one must remember that this volume of wood represents in standing timber a strip of forest land 1,520 miles long by one mile wide (using a stand figure of 10 cords to the acre). This is equivalent to a strip one mile wide stretching from Quebec City to Chicago!

Another interesting fact shown by the summary table is that the private forest lands, which represent only 11% of the presently accessible forest land of Quebec, supply at the moment 41% of the total cut needed by the wood-using industry.

Since the softwood species are of the greatest importance to the pulp and paper industry, attention will now be focused upon them, in the 20 groups of watersheds under study.

It has been pointed out that 92% of the average drain of wood in Quebec is of softwood species. A minimum of 1,000 cords was cut in all groups except in Group 1. In Groups 2 and 3 the cut was insignificant.

In Group 20, it was 86 thousand cords out of a total of 9 million, which is 1% of the total. For the other 16 groups, cutting operations were more important: 4 groups showed a cut between 200 and 400 thousand cords; 7 groups, between 400 and 600 thousand cords; 3 groups, between 600 and 800 thousand; and 2 groups, over 800 thousand cords. These figures on the volume of softwood cut in various groups of watersheds indicate little more than the greater importance of some groups over others. To really show the significance of the average softwood cutting drain by groups of watersheds, one has to know how it compares with the annual net sustainable cut under present conditions.

Net sustainable cut vs. total drain

Table 23 brings out the following facts:

1- While the net sustainable cut of softwood species is 12,722 thousand cords on all forest lands available for the use of the Quebec main forest industries, the present average annual cutting drain from softwood on all presently accessible forest land of the Province is 8,955 thousand cords, or 70% of the net sustainable cut.

2- 60% of the present average annual cutting drain from softwood comes from the Crown lands and amounts to 5,434 thousand cords.

3- The column showing the balance reveals that:

a) In 3 groups (1, 2, and 3), there exists no cutting operation. Therefore the net sustainable cut remains untouched.

b) In 3 groups (6, 13, and probably 20, in which latter group figures have been given on estimates only), the average annual cutting drain from softwood is so small, compared with the net sustainable cut, that these groups constitute a large reserve of softwood.

c) In 3 groups (4, 5, and 11), the average annual cutting drain from softwood is slightly inferior to the net sustainable cut.

d) In the 11 other groups (7, 8, 9, 10, 12, 14, 15, 16, 17, 18, and 19), the average annual cutting drain from softwood is superior to the net sustainable cut under present conditions.

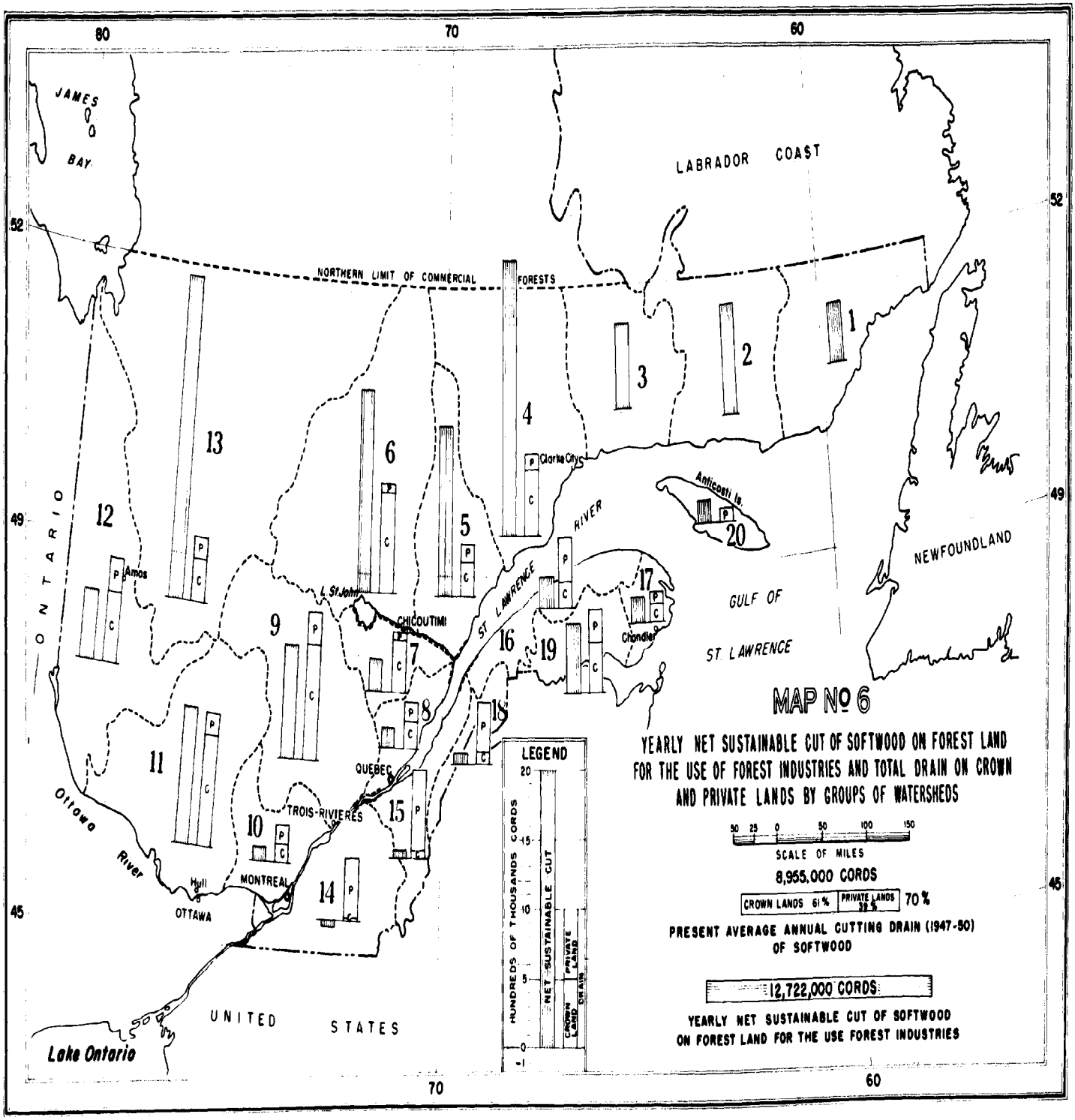
Map 6 shows that the accessibility of the groups mentioned in (3d) above is the main reason for the heavier cut occurring in these watersheds as compared with that in the others. Indeed, these eleven groups of watersheds are being depleted at such a rate that, as will be demonstrated, the inclusion of the cut from woodlots and small forest tracts in the figures for the total drain on these groups of watersheds does not change appreciably the conclusion to be drawn from study of the situation in relation to these groups.

TABLE 23

BALANCE BETWEEN NET SUSTAINABLE CUT OF SOFTWOOD UNDER PRESENT CONDITIONS ON FOREST LAND AVAILABLE FOR THE USE OF FOREST INDUSTRIES, AND ITS PRESENT AVERAGE ANNUAL CUTTING DRAIN ON ALL ACCESSIBLE TIMBER LANDS OF THE PROVINCE BY GROUPS OF WATERSHEDS.

Group no	Net sustainable cut	Average annual cutting drain, 1947-50			Balance
		Total	Crown lands	Private lands	
	Thousand cords	Thousand cords	Thousand cords	Thousand cords	Thousand cords
1	425	-	-	-	425
2	791	1	1	-	790
3	610	3	-	3	607
4	1,982	585	472	113	1,397
5	1,213	374	241	133	839
6	1,456	785	724	61	671
7	233	435	386	49	- 202
8	147	342	205	137	- 195
9	812	1,050	825	225	- 238
10	116	271	143	128	- 155
11	990	965	808	157	25
12	513	755	517	238	- 242
13	2,303	460	300	160	1,843
14	- 40	445	17	428	- 485
15	47	628	49	579	- 581
16	224	504	177	327	- 280
17	179	224	121	103	- 45
18	63	444	85	359	- 381
19	496	598	363	235	- 102
20	162	86	-	86	76
All groups	12,722	8,955	5,434	3,521	3,767
Percentage	100	70			30
" "		100	60	40	

PROVINCE OF QUEBEC



Were more detailed statistics available, comparison of the net sustainable cut with the total average annual cutting drain would not have included the cut on the forest land for local use. However, as it has been estimated that only 37% of the cutting drain on private lands comes from large private timber limits,4/ it is possible to compare the net sustainable cut with an amount equal to the sum of the average annual cutting drain on Crown lands and 37% of the cutting drain on private lands. This will keep separate the volume of wood cut by small forest owners, farmers, and settlers. The comparison would then conform more to reality.

This would mean that, while the net sustainable cut of softwood is 12,722,000 cords on all forest lands available for the use of Quebec's main forest industries, the present average annual cutting drain from softwood thereon is 6,734,000,5/or only 53% of the net sustainable cut.

This throws a different light on the picture presented by Table 23, and would indicate that cutting operations, as a whole, on Crown lands and on large private forest properties could be almost doubled. But, due to the poor distribution of the cut throughout the Province, eleven of the more accessible groups of watersheds are overcut, while others, admittedly less accessible, are practically untouched.

4/ See page 139.

5/ This figure is the sum of the cut on Crown lands (5,434,000 cords) and that on large private lands (1,300,000 cords).

Referring to Table 23, for the eleven groups of watersheds mentioned above, with a total annual allowable cut of 2,790,000 cords, the figures show an average annual cutting drain of 5,696,000 cords. Despite the fact that it is precisely in those groups of watersheds that the cutting on small forest properties (woodlots and settlers' forest tracts) is most considerable, the cutting on Crown timber limits and large private holdings alone should be reduced by 29%, if the aim of gradually putting these most accessible watersheds on a sustained yield basis is to be achieved. This conclusion is reached by taking the sum of the cut on Crown lands and 37% of the cut on all private timber lands, as was done earlier. This calculation would indicate that the drain on Crown lands and on large private holdings alone in those 11 groups of watersheds is approximately 3,926,000 cords, which figure is still above that of the allowable cut.

The situation as seen today does not differ greatly from that described by the late Henri Roy, Chief Forester of the Province, in his annual report of 1942, page 7. According to Mr. Roy, the seriousness of the forestry problem lay in faulty distribution of cutting operations as to areas, a defective general plan of management, and want of care in the application of silvicultural methods. He stated that it was becoming more and more evident that our interests would be furthered rather by

increased care of the forest in proximity to the mills than by the placing of too much reliance upon remoter reserves, which could not in any case afford relief from existing embarrassment. He cited this as an acute problem calling for immediate solution.

Mr. Roy's understanding of the forestry situation was a very clear one. However, although intensive management of the forest in the more accessible areas is of prime importance, it is doubtful that the pulp and paper industry of today could be assured of a continuous supply of wood without immediate recourse to the forest in watersheds as yet unexploited. This would lead to a better distribution of the cut, and place the pulp and paper industry in position, not only to continue profitable operations, but also to satisfy an increasing world demand for newsprint.

PART III

MEASURES TOWARD ASSURING A CONTINUOUS SOFTWOOD SUPPLY TO THE QUEBEC PULP AND PAPER INDUSTRY

CHAPTER XII

POSSIBILITIES OF INCREASING THE YIELD THROUGH BETTER UTILIZATION

The time is past when the Quebec wood-using industries were able to maintain their production by the use of only one or two species. For instance, the lumber industry, which at one time considered white pine as the only valuable species, was glad in later years to use spruce and balsam, and finally any species of reasonable size. In its turn the pulp and paper industry, which in the beginning used only spruce in the manufacture of newsprint, was forced before very long to accept balsam fir trees for use in the making of paper.

This was the situation up to the time of the Second World War, when suddenly a greater demand for lumber, plywood, veneer, and paper of all kinds made the wood-using industries realize the possibility of utilizing other species. First the lumber industry began cutting the remaining sound hardwood trees to transform them into veneer and lumber. In turn the pulp and paper industry, realizing the rapid disappearance of spruce and balsam in the vicinity of the mills, began utilizing a certain quantity of jack pine, hemlock, and poplar. Some sulphate pulp mills increased their use of tolerant hardwoods growing in stands in the

vicinity of the mills, which up to that time had been considered of little or no value in the making of pulp.

Dr. L. Thiesmeyer, president of the Pulp and Paper Research Institute of Canada, in an address at the Annual Meeting of the American Pulpwood Association in New York in February, 1952, said: "--- since it is more difficult and more costly to increase the supply of pulpwood, attention is focused on the better utilization of the wood that is available. This means reduction of waste, both in the woodlands and in the mills. It means the use of materials that were formerly discarded, left to rot or to encourage fires in the bush, or poured down the sewers at the mills".1/

Bickerstaff, chief silviculturist of the Dominion Forest Service, states that "the Ottawa Valley, for example, could easily produce four times its present annual yield of wood fibre, and it could continue to do so without any increase in the growth" by utilizing all the trees which are growing in the stands and by the application of rudimentary silviculture.2/

Although Bickerstaff proves that physically the forests of the Ottawa Valley can produce four times their present annual yield of

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1/ "Research and Pulpwood Production", Journal of Forestry, Vol. 50, No. 10, Oct. 1952.

2/ "Silviculture and Utilization", the Forestry Chronicle, Vol. 25, No. 3, Sept. 1949, p. 160.

wood fibre by more complete utilization and the application of rudimentary silviculture, he does not prove, in his article, that this is economically possible. It depends on whether or not the utilization of low grade hardwoods is possible and economic and on the cost involved in the application of rudimentary silviculture.

Furthermore, supposing that such possibilities do exist in regard to the Ottawa Valley, it is self-evident that this would not necessarily be the case everywhere, as the increase in the annual yield of wood per acre would itself vary depending on the types of forest encountered.

Keeping in mind that a greater yield is possible through the increased utilization of all species, it is important to know up to what point such an increase of utilization of all species would affect the present and the future of the Quebec pulp and paper industry.

At present spruce and balsam are the two basic species utilized by the Quebec pulp and paper industry. The use of other species, such as jack pine, hemlock, and poplar, is very limited. Together they account for approximately 6% of the total volume of wood used in 1951. This is despite the fact that during the war the pulp and paper industry, under pressure of a greater demand for paper, increased the utilization

of these species, and some mills used as much as 10% of them in the making of newsprint. But in general the Quebec newsprint mills, which produced 83% of the Province's total paper production in 1950, cannot use economically much more than 8% of species other than spruce and balsam without great alteration being made in the mills. Such alterations would require extensive capital outlays, which would not be justifiable in a country with such an abundance of spruce and balsam. Therefore any increase in the utilization of jack pine, hemlock, and other species will have to come from kraft paper mills located in regions where those species can be obtained easily, and sometimes at lower cost on account of their proximity to the mills.

If attention is focused on those groups of watersheds which show the greatest overdrain of softwood, the question naturally arises as to how far the use of hardwood, which in these regions stands in quantity on areas in close proximity to the mills, would help the pulp and paper industry to solve its problem of continuous and economic wood supplies.

Although it is now generally admitted that almost any kind of wood can be used in the making of pulp, it seems unlikely that use of the hardwood species will to any marked extent affect the requirements of the Quebec pulp and paper mills in softwood, as the majority of the

mills are making newsprint paper. The newsprint mills may continue, and even increase, the use of poplar in the making of their paper, but a greater utilization of the other hardwood species is to be expected only from present and future sulphate pulp mills. Therefore, considering the capital outlay which would be required to transform the newsprint mills so that they could accept hardwood in larger volume as raw material, it is not at all likely that there will in the near future be much change in the present set-up.

The fact, however, that most of the Quebec hardwood stands are found in those groups of watersheds where there is at present an overdrain of softwood may incline some mills in those regions to install the necessary equipment to produce sulphate pulp and kraft paper in order to utilize to an increasing extent those hardwoods which are growing in close proximity. But even should market conditions be auspicious for such expansion, the Quebec mills intending to embark upon a program of transformation or integration should investigate carefully the actual amount of hardwood usable in the making of paper.

It should be noted that most available estimates of the volume of hardwood were supplied as secondary information by cruisers in the course of softwood inventories. Furthermore, the majority of these inventories were made previous to the birch dieback and bronze borer

attacks which so severely damaged the yellow and white birch in the forests of Eastern Canada. Personal experience has shown that in some localities the 1939 volume estimate of merchantable and uncut hardwood stands had to be reduced by 50% in 1951 as the result of the damages caused by these calamities. The difficulty of obtaining sound birch logs is such that many Quebec furniture factories are on the verge of closing their doors due to the lack of suitable material.

It is still too soon to hazard a prediction as to what effect the attack on white and yellow birch (the most important hardwood species in Quebec) will have on the future composition of the mixed and hardwood stands. Only comprehensive regeneration studies could indicate with assurance the real trend. In the southern part of Quebec, where the majority of the hardwoods are found, the mixedwood types (composed of white birch and balsam) are generally reverting to a softwood type. In this way the epidemic is only accelerating natural evolution, since white birch is a light species, and reproduces only after fire, while balsam is a tolerant species, which has already established itself under the hardwood trees. In some hardwood stands where the white and yellow birch have been decimated, weed species like fire cherry and aspen are springing up.

It might be mentioned here that recent discoveries in hardwood utilization through new processes will tend to favor the establishment of mills in the United States, where good quality hardwood can be found, rather than in Quebec where the hardwood is of poor quality and of much slower growth.

While a certain increase in the yield could be obtained through better utilization of other species than spruce and balsam, it is also possible that a greater harvest of these two species could be obtained by salvaging a large part of what is now being left in the forest.

Even in the most depleted watersheds, located along the St. Lawrence Valley, a considerable amount of pulpwood could be made available through the integration of the operations of the softwood lumber industry with the pulp and paper industries which are generally located in the same region. "Preliminary logging waste studies conducted in Eastern Canada by the Ottawa (Forest Products) Laboratory indicate that large quantities of merchantable wood material are left in the forest after the completion of sawlog operations. Waste of usable material occurs as a direct result of low standards of utilization on the part of management in accepting only the higher quality material, and because of the overcautious attitude of the workers, who avoid cutting logs that may be culled. Results indicated that for softwood sawlog operations

about 21% of the volume of the original stand was left in the woods as logging waste".3/

Considering that the equivalent of over 2 million cords of softwood are cut into lumber every year, and assuming that the abovementioned percentage of this is left in waste, if only half of this waste could be salvaged in pulpwood it would represent 210,000 additional cords of pulpwood - enough to supply a good-sized mill.

Another way in which the pulp and paper industry could increase the yield of its timber limits in Quebec would be by harvesting the many patches of mature wood now left standing in the forest. It is a well known silvicultural practice to leave some trees standing as seed trees in cut-over areas. Usually, however, in the softwood forests of Quebec, seedlings are already established before cutting takes place, and an advance regeneration is under way. Thus, there is no need to leave patches of mature trees. Moreover, patches left standing alone would inevitably succomb to windthrow. Again, the fact that the pulp and paper companies are clear cutting spruce-fir stands, to the lowest possible diameter on the stump (generally 5"), too often leads to the assumption that utilization is perfect. This is by no means so, for many patches are left on the upper slopes of logging chances because of the difficulties presented by the terrain and its low productivity.

3/ J.A. Doyle, "Good Logging Practices Increase Forest Yields", The Forestry Chronicle, Vol. 28, No. 4, 1952.

However, since many of these patches are composed of black spruce, a higher cost of extraction would be justified by the greater value in wood fibre compared with that of other softwood species such as balsam.

Recent research undertaken by the Canadian Pulp and Paper Research Institute has resulted in definite suggestions as to means of economically harvesting the trees on these difficult sites. Among these suggestions are a greater use of chutes and the use of suspended cables. Should systematic application of these methods be undertaken by the companies it is likely that an additional 2% of the yearly cut could be harvested. This would represent approximately 100,000 cords a year.

Although the utilization of softwood species other than spruce and balsam, and that of hardwood species, may favor the development of more sulphate pulp mills, the use of these species will not appreciably affect the demand for spruce and balsam in the making of newsprint, Quebec's main paper product.

The problem of ensuring continuity in the raw material supply for newsprint production, on a sound economic basis, remains acute and calls for increased yield from currently exploited timber limits. The only possibilities of achieving this lie in even more complete harvesting and in the utilization of the softwood waste materials from lumber operations.

CHAPTER XIII

POSSIBILITIES OF INCREASING THE SUSTAINABLE SOFTWOOD CUT THROUGH INCREASED GROWTH BY BETTER MANAGEMENT

Management for sustained yield.

In a recent forest economic study published in Sweden, Karl V. Algvere states that, "Overmature virgin forest presents an example of the 'Depreciative type of forest enterprise'. Here the large diameter classes are usually in excess and provide a very favorable start for logging operations."

"Because old trees predominate, the annual average increment of the growing stock is rather low in comparison to normal conditions. The annual rate of cutting is rather high in the beginning and as a rule it exceeds the annual growth. Characteristic in the long run, however, is the gradually decreasing volume of annual cuts. Abrupt reductions in the growing stock can result in replacement of the 'depreciative' type with the 'appreciative' type 1/ of forest enterprise, despite the desire to accomplish a gradual transition directly to the normal sustained yield type. Such a transition from liquidation cutting to a policy of

1/ 'Appreciative type' is Algvere's term for a forest enterprise in which an effort must be made to build up the growing stock.

building up a new growing stock means, to practical management, a decrease in cutting rates and a consequent change in operating profit. It means that operating income is decreasing, but simultaneously, expenditures per volume unit are increasing." 2/

This statement is highly applicable to the forest situation in Quebec, as on the greater part of forest lands serving the pulp and paper industry cutting operations have been taking place in overmature virgin stands. The forestry situation observed today in the 11 groups of watersheds showing a certain degree of overcut indicates that the 'depreciative' type of forest enterprise practiced in these forests is giving way to the 'appreciative' type. The time has come to reduce the annual cut in order to build up the growing stock and avoid a gap in the cutting operations. In some of these watersheds the annual cut proposed in this work (see Table 23) is, and must be, inferior to the annual increment, owing to the limited area of mature timber thereon. It would not be necessary to suggest such a reduction in the annual cut had the limit-holders confined the cut to the overmature and mature stands alone. But as generally all trees of 5" and up D.B.H. were harvested, younger stands were encroached upon.

The expenses involved in the building of the mill itself,

2/ Karl V. Algvere, "Research in Economics of Forest Management", Stockholm, Sweden, 1952.

together with the heavy cost of opening-up the timber areas to be exploited (building of roads, camps, and dams) led to a natural desire on the part of the industry to obtain the cheapest wood possible, i.e. that which was nearest the mill. This policy, followed over a period of years, resulted in the overcutting of those areas in proximity to the mills. Furthermore, the present situation has been aggravated by forest fires, which destroyed many square miles of mature forest on those areas.

Due to the depletion of the forest areas near the mills the pulp and paper industry is now forced to rely to an ever-increasing extent on wood supplies from more distant areas, at, naturally, higher cost. This, in turn, has brought about a more serious determination on the part of the companies to manage the forest for sustained yield.

In 1946 the Canadian Pulp and Paper Association formulated the following policy: "To provide continuous supplies of low-cost pulpwood to meet the needs of the industry" through the following measures:

"1. Adopt a policy of sustained yield forest management for all forest areas owned or leased by the industry, and institute measures which will ensure continuous forest growth on such areas.

2. Advocate and promote a similar policy on other private lands serving our industry." 3/

3/ J.O. Wilson, "Implementing the Forest Policy", The Forestry Chronicle, Vol. 23, No. 3, Sept. 1947.

The common aim of the Forest Service and the pulp and paper industry to place Quebec's large forest lands on a sustained yield basis is understandable, as the Forest Service is responsible for the continued productivity of the Crown forest land, which represents 89% of the total forest lands of Quebec 4/, and the pulp and paper industry, which holds under lease 90% of these limits, naturally desires the assurance of a constant supply of raw material.

As the area of the average timber limit in Quebec is some 700 square miles, sustained yield is practicable, not only on a regional or unit basis (main watersheds), but on large individual timber limits. As is pointed out by Buttrick, however, this does not mean that within a single timber limit each portion of the limit will be on sustained yield or that clear cutting must be abandoned as a silvicultural system. But, as Buttrick puts it, "The essential is that approximately an equal volume of timber matures each year so that cutting may be carried on in an orderly fashion, modified only as necessitated by economic factors. 5/

As to the small forest properties, it would be difficult to place them on a self-sustained yield basis, and this might not even be practical or economic from the point of view of the individual owner. However, it would be desirable that these properties be operated for

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4/ South of the 52nd parallel of latitude.

5/ P.L. Buttrick, "Forest Economics and Finance", John Wiley & Sons, New York, 1943, p. 300.

continuous production under a regional management plan (such as by group of watersheds). In this way, the industry could rely on a steady supply of wood from this source and the private owners could be assured of a more certain market.

Now, how can the growing conditions on the Crown timber limits and the large private lands serving the pulp and paper mills of Quebec be improved with least delay? Without going into this problem in great detail it may be stated that this can be achieved by effective fire protection, and by better management of the forest for sustained yield through the following measures.

Logging operations should be planned in such a way as to assure an orderly distribution of age classes for future cuts.

The application of this policy would be possible through improved cooperation and understanding on the part of the management, the forester, and the logging superintendent. In order to supply the wood at the mill at a cost fixed by the management (which is always the lowest possible cost), the woods manager could not permit the logging superintendent to cut "expensive wood". Therefore, it has been obviously futile, generally speaking, for the forester, in suggesting the location of logging operations, to take into account stand conditions so that the proposed cut would favor a more orderly distribution of age classes.

By cutting the overmature stands, and thus permitting the start of new growth, a certain order was created in the forest, but the extent or the area of the new stands varies greatly. This is not surprising, however, as the proper distribution of age classes is seldom reached during the first rotation following the cutting of a virgin forest, because economic conditions, among others, do not always permit regularity in the volume of the cut.

It is encouraging to see that there is a tendency today for companies to follow more and more the recommendations of their foresters, not only in the planning of immediate logging operations, but also in the making of a long-term policy which will gradually lead to better regulation of age-classes.

Appropriate cutting methods.

1. Harvest cuttings

The establishment of the natural regeneration of the most desirable species is the primary purpose of harvest cuttings. Clear cutting has been the method used in Quebec for the past twenty years, and as has been shown by Candy 6/ most of the softwood forests in Eastern Canada have been kept productive under this method. It has been found difficult, however, to maintain the conifers in the mixed stands of the St.Lawrence

6/ R.H. Candy, "Reproduction on Cut-over and Burned-over Land in Canada", Forest Research Division, 1951.

region, where a strong competition is offered by the tolerant hardwoods. Cutting the softwoods alone and leaving the hardwoods standing prevents an adequate regeneration of the first, and often results in the deterioration of the second. On the other hand, clear cutting in this type is followed by an abundance of brush and weed species. Local experimentation in mixed forest types is so recent and limited that definite recommendations can hardly be made. Until definite results are obtained locally, the "Recommended forest practice standards for New England" issued by the Silvicultural Committee of the Society of American Foresters (1943) is probably the surest guide to follow.

As the majority of pulpwood forests in Quebec belong to the softwood type, attention should be focused on this type rather than on the mixed and hardwood types. As far as harvest cutting is concerned, it is a question whether partial cutting would yield more wood than clear cutting. It seems that opinions on the subject are divided. 2/

Frequent cuttings can reduce the mortality and salvage dead trees, and thus provide a volume of wood which otherwise would be lost at the time of the final cutting. Moreover, properly conducted shelterwood or selection cuttings are liable to improve density and general growing conditions so that annual increment has a chance to increase. To this effect Westveld states, "Another significant aspect of partial cutting

2/ Group discussion on cutting, following presentation of paper by R.S. Johnson at Annual Meeting of the Canadian Pulp and Paper Association, March 1950. Woodlands Section Index No. 1074 (F-2).

worthy of study is the possibility that frequent cutting in an all-aged forest where a substantial growing stock of thrifty trees is built up and maintained, may result in lower cost per cord through increasing the annual yield per acre, effecting maximum utilization of wood grown and permitting integration of high quality saw-timber and pulpwood production". 8/

A few operators have recently initiated some types of partial cuttings in uneven-aged stands growing on the better sites and in close proximity to the mills. It is too soon to judge the results of these experiments, but should they prove successful others no doubt will follow the example. It will be interesting, for instance, to see what percentage of the stand can be removed by selection cutting without unduly exposing the residual stand to windthrow.

It would seem, however, that clear cutting will remain for some time the most appropriate method for a very large part of the Quebec forests, namely, the boreal region where long rotations are the rule. So far as establishment of regeneration is concerned, clear cutting in softwood types gives very satisfactory results.

2. Intermediate cuttings

If intensive silviculture is to be practiced in Quebec, the

8/ Marinus Westveld, "Silvicultural Problems of Eastern Canada's Pulpwood Forests as viewed by an American Forester", Woodlands Section Index No. 756 (F-2), January 1945.

areas where it would likely be profitable would be the most accessible forests in regions favored by longer growing seasons and fertile soils. This is exactly where the present study has revealed the occurence of excessive cutting, namely those watersheds nearest the mills.

Under the conditions that obtain in Quebec, a dense regeneration usually follows clear cutting of spruce-fir stands. Disengagement operations could be practiced advantageously in these over-crowded stands of reproduction, were the cost not prohibitive. Thinnings, practiced at pole stage, that is to say, when softwood stands have reached some 30 years of age, and when applied to Quebec's best forest areas, would undoubtedly result in an increased growth and a higher yield. This, contrary to liberation cutting, brings a certain immediate profit from the wood harvested by the operation to offset the expense involved.

Intensive practice of silviculture in this Province is in its infancy; and as yet no comprehensive studies on the cost of conducting such operations are available. So much remains to be learned about the proper management of the spruce-fir and mixed forests of Quebec, and so little is being done in the application of silvicultural practices, that it is difficult to make altogether specific recommendations in this respect.

Intensive forest management and silviculture will probably never come into general practice in this Province, owing principally to the extent of the forest, the relatively high proportion of sites of poor quality, and the costs involved in such practices. However, the rising cost of wood supplies as they are brought from farther and farther afield will eventually lead to an intensive silviculture on the areas in the vicinity of the mills. The increase in yield to be expected from following such practice, coupled with the high cost of wood from remote areas, will bring this transition about in the long run in the more accessible regions.

Before embarking upon expenditures related to forest stand improvements, however, the limit-holders should be assured of long term tenure.

CHAPTER XIV

CONTRIBUTION OF QUEBEC'S LAST VIRGIN FOREST STANDS

It was pointed out in the second part of this work that softwood cutting operations on the Crown timber limits and on large private holdings, in at least eleven of the most accessible groups of watersheds, should be reduced by 1,136,000 cords a year if the drain on these forest areas is to be brought in line with the net sustainable cut. However, this reduction of the cut should approximate one million and a half cords a year if stands on these forest areas are to have their growing stock built up and gradually put on a sustained yield basis.

A much more detailed analysis of the net sustainable cut and the drain on each group of watersheds would have been required to ascertain whether the overcut is more pronounced on Crown lands or on large private holdings; the lack of precise information does not permit such detailed analysis. However, referring to Table 8, where the area of Crown timber limits is given as well as that of large private holdings, and comparing these areas to the drain on Crown and on large private lands, it is readily seen that conditions vary greatly between the groups. In some groups of watersheds, as in Groups 7, 8, 15, and 18 for example,

it is almost certain that the cut on Crown timber limits is twice that of their net sustainable cut; whereas in other groups, where the area in large private holdings is more considerable, the overcut comes mostly from those private forests.

Although it was impossible to estimate the net sustainable cut on the small private forest lands, Map 6 shows how important was the total softwood drain on all private forest lands during the four years under study. Considering that approximately 63% of that drain comes from small private forest properties, it is doubtful that the area in woodlots and small forest tracts is large enough to withstand the continuance of such a drain.1/ In fact it is generally admitted that the Quebec woodlots and small forest tracts are, in general, considerably overcut and in bad productive condition. The probability is that the annual cut on small private lands will decrease considerably in the years to come.

There has been no means of establishing accurately how much softwood cut on small forest properties has served the Quebec pulp and paper mills, as a certain percentage of the pulpwood cut on those properties is either sent outside the Province or exported. However, this survey shows that 1,090,000 cords of pulpwood have been cut as an average on

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1/ It should be noted that on Map 6 the bars showing the drain include the softwood cut on small private lands, whereas the bars showing the net sustainable cut do not include that of small private lands. This is unfortunate, but information available does not permit the estimation of a net sustainable cut on small private forest lands by groups of watersheds, whereas statistics on drain do not separate the drain from wood on large and small private forests.

small forest properties during the years 1947 to 1951. This is the equivalent of 21% of the pulpwood consumption of the Quebec pulp and paper industry, based on the average of 5,206,000 cords a year.

As in the aforementioned eleven groups of watersheds the yearly cut of softwood on the companies' Crown timber limits and their large private holdings should be reduced by one and a half million cords, and as the cut on small forest properties is bound to diminish, the pulp and paper industry must be prepared to meet this curtailment of cheap pulpwood supplies.

The longer the companies continue to overcut on the more accessible watersheds, the longer will be the period of enforced curtailment of cutting thereon if these forests are to be brought to a semblance of normalcy, and therefore the longer the companies will be forced to rely upon wood supplies from more distant sources.

Many companies holding reserves in the north should start immediately taking a greater volume of their wood requirements from these reserves. This is especially true in the case of those companies which have concentrated their entire wood operations in the timber limits they hold in the vicinity of the mills, while keeping impressive timber limits in Groups 4, 5, or 6 as reserves for "rainy days", or in case

they should run short of wood or decide to enlarge the production of their mills. A cut of approximately 500,000 cords a year could be undertaken in the timber limits of Groups 4, 5, and 6 without compromising the sustained yield management of these forests, and would help greatly towards easing the situation in other less fortunate groups of watersheds, such as those mentioned in Table 23.

The mills of the Middle St.Maurice Group and those of the Ottawa Group are so situated that they can, in general, draw upon the more northerly watersheds during the period of adjustment without too much difficulty. Indeed, in some cases companies of the St.Maurice Group are already doing so. The present cutting operations conducted by a company in the forests of Group 13, over the height of land from the St.Maurice watershed (Group 9), will serve to illustrate the feasibility of this suggestion.

As to the mills of the Eastern Townships, those of the Portneuf Group that are located inland, and the North Montreal Group, (with a yearly pulpwood consumption of 5%, 2%, and 1% respectively of the total Quebec pulp and paper mills' consumption), the problem of supplying pulpwood at reasonable cost from outside their regions and of assuring their future would necessitate much longer study than can be given to it here. However, considering that some Eastern Townships mills already find it economical to use black spruce from Abitibi, which comes by rail,

it is possible that most of these mills could get their pulpwood supply from Group 13. Permission was recently granted by the Quebec legislature for the construction of a railroad between Amos and James Bay; if this project is realized it will greatly facilitate such movement of wood.

On the other hand, it is possible that the answer to the pulpwood requirements of the mills located on the north side of the St. Lawrence lies in the reserves farther down the St.Lawrence on the North Shore, and this may help towards solving the problem of the inland mills as well. If all pulpwood drawn from the vicinity of those mills, which is now directed to other mills along the St.Lawrence, were left to the inland mills it is probable that they would get enough wood to operate, and at the same time be able to keep their large timber holdings on a sustained yield basis.

The solution of the pulpwood requirements for the pulp and paper mills located along the shores of the St.Lawrence, and affected by a general reduction of wood supplies around their mills, is not difficult to find, but it should be applied before the stands of mature wood in the vicinity are entirely cut. The companies involved would have the choice between two possibilities: obtaining limits at the headwaters of the rivers in the groups of watersheds on the north shore (Groups 4 and 5), or initiating operations in the northeasterly groups of watersheds (in Group 1, 2, or 3) where at present no cut takes place.

As there are no more Crown timber limits available along the shore of the St.Lawrence in Groups 4 and 5, companies desiring to cut in any of these watersheds could acquire pulpwood cutting rights only in the upper part of these basins. If the expenses involved in the opening up of these territories, together with the cost of operating the limits, were to be supported only by the new limit-holders it is probable that the extraction of the raw material would prove too costly. In most cases, if not all, a road would have to be built into the newly acquired limit at a cost varying between $5,000 and $25,000 a mile, from the point reached by the company road on the more southerly limit, which in most cases runs only a few miles inland.2/ As the stands are generally of lower density in these limits than in those already leased, the cost of extraction per cord would be higher. The cost of transporting the wood to the mills would also be higher than that met by the average company. This would be due not only to the loading of the wood on boats and its transport to the mills, but also because all bolts cut on the upper part of the river, being carried down the main river, which is already used for drive purposes by the present limit-holders, would have to be marked individually and separated before loading. While it may be argued that the same problem exists on the St.Maurice River, where different companies are driving wood on the same river, those companies have their mills on

2/ It is to be noted that the construction of roads on timber limits is always at the limit-holders' full expense.

the St.Maurice River and, though they have high sorting costs, they do not have the extra cost of loading the wood and transporting it long distances by boat to the mills.

The other possibility, which seems more logical and economical, would be for those companies having deep-water facilities at their mills to initiate operations in the northeasterly groups of watersheds (in Group 1, 2, or 3) where at present no cut takes place.

Such a project would be feasible only by the cooperation of the companies, the Provincial government, and possibly the Federal government. In a general way, the project might be worked out along the following lines:

In order to reduce as much as possible the cost of such operations those companies in need of a supplementary wood supply could form a cooperative - which might be known by some such name as the "Quebec Logging Cooperative" - with the interested companies as the only shareholders. The management setup of the new cooperative should include logging, forestry, and wood transport and distribution divisions. This naturally would imply the operation of deep-water vessels for delivering the pulpwood to established mills farther west on the St.Lawrence. Forest fire protection, the establishment of townsites, and the construction of

roads and wharves would all be at the expense of the cooperative. Organization of transportation to these new forest areas would also involve the cooperative in extra costs, at least during the development period.

The virgin stands on these groups of watersheds are for the greater part at a stand-still as far as growth is concerned. The exceptions are those areas where fires and blowdowns have taken place and young forests are again established and growing to maturity. Extensive cutting of these overmature stands would be to the advantage of the future management of these forests.

Considering this, and in order to encourage the established Quebec pulp and paper mills to put their present limits on sustained yield management, the Provincial government should be willing to lease the mature and overmature forests of Group 2 or 3 to this logging cooperative, for a minimum of thirty years, at a nominal stumpage rate.

The privilege of having the sole cutting right on these watersheds would mean that the cooperative could use the entire sustainable cut of the forest on each watershed. This would result in a great reduction in operating costs.

The Federal government might aid the cooperative by subsidizing the building of wharves and the construction of main roads. As in this

area the forest lies back from the shore line, some twenty to thirty miles inland, the cost of road construction would be very high. The contribution of the Federal government would be of great help, and could probably be granted by virtue of the Forestry Act. 3/

This presentation of a very important project is necessarily brief; but it may serve to suggest a possibility which seems economically sound and which merits further investigation. It appears, at first sight, to be one of the best ways in which many of the Quebec pulp and paper mills could get black spruce pulpwood at a cost within reason; and as long as there are some much cheaper supplies obtainable in more accessible watersheds, these, taken along with the more expensive supplies, would bring average costs within economic bounds.

It is perhaps opportune at this point to suggest that something should be done to put stumpage rates on a sounder basis, with the distance from the forest to the mill introduced as a factor in determining the stumpage to be paid. Under this stimulus many companies might be encouraged to cut a greater part of their wood supplies from overmature stands, which lie unproductive farther away from the mills, and to reduce the cutting of the remaining stands growing in the vicinity of the mills.

3/ The Canada Forestry Act, Bill 62, Part 4, 1949.

CHAPTER XV

A PROVINCIAL PLAN FOR SUSTAINED YIELD MANAGEMENT OF CROWN LANDS

While it would be difficult at the present stage to impose sustained yield management on private forest lands, it is important that this be done without further delay on all accessible Crown forest properties. Some Crown timber limit holders are already managing their forests with the ultimate aim of bringing them under sustained yield management. They are confining their cut to the mature and overmature stands and are opening up the whole of their limits as quickly as economic conditions and demand warrant. The forest laws and regulations call for the maintenance of each timber limit on a sustained yield basis, and the work accomplished by the understaffed Forest Service in implementing this policy is deserving of the highest praise. But as yet, due to a very limited staff of foresters, little has been done in the field of forest economics.

While it is very important that there be the closest supervision of cutting operations on Crown timber limits, and necessary that the scaling of all wood cut thereon be reported accurately, it is also of the utmost importance that a general plan of management for the Crown

lands of the Province be prepared and followed, because the forests are the foundation of Quebec's present economy. Such a plan, well implemented, would permit at any time an analysis of the forest conditions of specific regions, as well as that of the majority of the forest land of Quebec, of which 89% of the total is Crown land. It would, thereby, be possible to have in constant view an over-all picture of Quebec's wood supplies in relation to the wood-using industries, and to formulate laws and regulations of a nature such as to assure the perpetuity of the one and the welfare of the other.

The objective of this chapter is to propose such a provincial plan for the sustained yield management of Crown lands.

Fifteen management units

The Province is at present divided into 11 administrative districts,[1/] with a forester as chief of each district. The area included in these districts has little or no relation to areas comprised within watersheds, as can be seen by comparing the boundaries of these districts on Map 4 and those of watersheds on Map 5. These districts were established many years ago, and the facility of access to and within the areas at that time was the deciding factor in fixing their boundaries. But as travelling conditions have improved throughout the Province and

1/ Since the publication of the statistics used in Part II, the Lake St.John District has been divided to form two districts, bringing the total to 11.

forest activities have increased tremendously since the organization of these districts, a modification is proposed as to the boundaries of the present administrative districts, as well as to their number. The fact that in recent years the Forest Service has been publishing more and more statistical data by watersheds rather than by administrative districts indicates that the following proposal may be well founded.

It is suggested that management units be confined to groups of drainage areas. The Province would be divided into 15 units of management based on the 20 groups of watersheds used in the course of the survey of Part II of this dissertation. As no wood operations are conducted in Groups 1, 2, and 3, these three groups and Group 4 would form, for the present, one unit of management. Group 13, the James Bay Region, would be part of other groups, as cutting operations thereon are still limited. Of course Anticosti Island, Group 20, being privately owned, would not be included in this plan of management.

A general plan of sustained yield management to be prepared for each unit

The internal economy of a group of watersheds depends so much on the forest condition of Crown lands, both vacant lands and those under lease, that it is no longer sufficient to know that this or that timber limit is, or is not, under sustained yield management. Sound

forest planning calls for the preparation and maintenance of a sustained yield management plan for all the Crown forest lands within the unit. The reasons behind this are many and should be given special attention.

1.- Such a plan would make known to the wood-using industries, as well as to the people, not only what the forest resources of the unit are, but more important still the annual volume of wood which, under sustained yield, can be drawn from the unit. This would assure a continuous and economic supply of wood. Continuous supplies do not necessarily mean, however, sufficient supplies. With the information available under such a plan the wood-using industries would be in better position to plan the future of their enterprise. Some would reduce and others would increase the output of their mills, some would diversify their products, others would move out of a particular unit, while yet others might decide to establish themselves in a unit already occupied but not sufficiently so to make use of its entire sustainable cut. Undoubtedly such public information in regard to Crown forest could have a very favorable psychological effect on the users of the forest and a beneficial effect on its use. By users is meant here those using the forest as a source of raw materials, as well as those using it as a source of pleasure.

2.- It would assure the maintenance of established communities, the existence of which depends to a large extent on the work supplied by wood operations of the pulp and paper industry.

Every year briefs are presented to the Forest Service, by members of Chambers of Commerce or other associations, stressing the importance of maintaining the wood-using industries established in their communities, which assure the livelihood of many people. They are wont to request that sufficient wood supplies be guaranteed to these industries so that they will not have to close in two, five, or ten years. When a community is surrounded by Crown timber limits leased to larger companies, which sometimes have no plant in the locality , the brief is presented in different terms. It asks that pressure be brought to bear on those companies to resume forest operations so as to provide work for the men living in the parish. Such requests are especially pitiful, in that often the company has ceased operations in the locality because of lack of merchantable wood and cannot resume operations there until the second growth is ready to harvest.

The wood operations themselves, in many instances, have been a contributing factor in the establishment of many Quebec communities, particularly on the north shore of the St.Lawrence. It is, therefore, logical to expect that the forest be managed in such a way as to continue to provide work for the people of those communities. This calls for sustained yield management, not only of the whole unit, but also wherever economically possible of every main watershed within that unit.

3.- A sustained yield management plan for the unit, and wherever possible for the main watersheds therein, would also favor the establishment of permanent forest settlements.

For many years the companies have been complaining of the tremendous labor turnover in the woods, which is detrimental to the individual as well as very expensive for the companies. Despite greatly improved living conditions in the company camps, compared to what they were some fifteen years ago, the labor turnover problem continues to be as great as ever. The need of the workers for a better social life, and the natural desire of married men for the home life, is at the root of this problem.

The establishment of small but permanent settlements in the woods, where men could live with their families - where they would be assured of school facilities, of religious services on Sunday, and wherever possible of a few acres of farmland - may prove to be the solution of this problem, permitting the people to live a comparatively full and happy life in the woods and at the same time assuring the companies of a steady high-quality labor force. The undesirable would not wish to live in a high standard settlement, nor would he be accepted by the community; he would either have to live up to the standards of the community or quit and move on.

Such a project, however, is hopeless unless the forest, through sustained yield management, could provide sustained work.

The advantages of having a sustained yield forest management plan for each unit have been stressed at length. The next thing to consider is how such a plan could be worked out.

In a general way, the initial management plan of the Crown forests within each watershed of the unit would be based on information which already exists and which is indicated in the survey of Part II of this thesis. The making of this plan would be facilitated by the continued cooperation of the main wood-using industries which submit to the government a management plan and a working plan for the limits they hold in the unit. While they would be encouraged to continue to present separate forest management plans for their holdings in each of the main watersheds in the unit, they would be called upon to make separate management plans only for those parts of their limits lying in different units.

For a company to operate such a small area in a unit where it has no other holdings would be costly and complicated since it would involve separate management and working plans for these odd pieces of forest land. A solution to this particular problem resides in the

adjustment of such small areas, sometimes simply involving an exchange of areas between neighboring limit-holders. This would make for a better and more logical distribution of forest limits. The provincial authorities already foster such adjustments, but limit-holders should be further encouraged to make them by abrogation of the exchange fee of $65 per square mile now charged by the government for any exchange of timber limits.

Were all Crown timber limit holders, even those having one square mile of forest land, asked to provide the Forest Service with a management plan of their holdings, the general value of the forest management plan for the Crown lands would be greatly increased.

Such would be the general basis of the sustained yield management plans of the Crown forests within each unit. First, however, preparation of these plans would require the services of many more foresters within the Forest Service. A much larger staff would be necessary for each district forester, so that he could properly supervise all items of the sustained yield forest management plan. The companies also would need many more trained foresters to keep their inventories and management plans up-to-date and to attend to the forestry elements of their forest management plan.

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