AN ANALYSIS OF GEOGRAPHICAL FACTORS DETERMINING THE NORTHERN LIMITS OF THE PULP AND PAPER INDUSTRY IN NORTHERN ONTARIO

by

G.C. POWER, B.Sc. (Econ.)

A thesis submitted to the Faculty of Graduate Studies and Research in Partial Fulfilment of the requirements for the degree of Master of Arts.

Department of Geography
McGill University
Montreal

August 1959

TABLE OF CONTENTS

Statistical Tables

Page

Maps

PREFACE

Pulp and paper manufacturing is one of Canada's best known industries, but the spectacular woods operation of British Columbia seem largely to overshadow the equally significant forest industries of eastern Canada, particularly in popular accounts of Canadian manufacturing. It was therefore with great interest and some trepidation that the writer approached the problem of preparing a thesis on a topic which was to him, a new arrival from England, beyond the range of his experience or knowledge.

Looking back, there can be little doubt that the first plan for this thesis suffered from a lack of acquaintance with even the broadest aspects of the industry in eastern Canada. Once this had been overcome, the problem remained that such a widely scattered industry did not lend itself easily to an intensive geographic study. In addition, the industry is itself well supplied with research workers and actively engaged in many fields of research on its own behalf. At first glance it would appear presumptious to study the pulp and paper industry from the point of view of economic geography.

Nevertheless, this thesis is presented in the firm conviction that it is sometimes of value to be "on the outside looking in". With this in mind, and acknowledging that it would be superfluous to attempt a detailed description of the pulp and paper industry in northern Ontario, the thesis is broadly designed to present a picture of the major causes and effects of plant location north of the Arctic watershed.

Written information dealing specifically with the Ontario northland is scant, but the pulp and paper industry in Canada is well documented. Great reliance has been placed upon information obtained from Canadian paper companies operating in northern Ontario and further assistance was readily obtained from the Ontario Department of Lands and Forests at Kapuskasing and Cochrane, Ontario. Much of the data concerning market conditions in United States was made freely available by the U.S. Department of Agriculture and U.S. Department of Commerce, Washington, D.C.

During the spring and summer of 1958 the writer made several visits to Washington, D.C., where much background information concerning newspaper publishing was kindly provided by the Washington Post and Mr. T.H. Serrell, President of the Washington Publishers' Association. The writer also travelled several thousand miles by car through northern Ontario and Quebec to visit paper mills and woodlands operations. That this thesis is presented at all is due in large part to the help and understanding which the organizations and their staff listed below so freely extended at that time.

- Abitibi Power and Paper Company, Iroquois Falls, Ontario.
  T.H. Stone, Woodlands Manager, Iroquois Falls.
  C.W.R. Day, Assistant Woodlands Office, Iroquois Falls, Ontario.
- Canada Paper Company, Windsor Mills, Quebec.
  E. Martinsson, Woodlands Division.
- Canadian International Paper Company, Montreal, Quebec.
  J.F. Rivard, Chief Forester.
- Howard Smith Paper Mills Ltd., Montreal, Quebec.
  R.L.B. Hunter, Quebec Division, Quebec City.
  R. White, Superintendent, Cochrane Subdivision, Cochrane, Ontario.
- Longlac Pulp and Paper Company, Longlac, Ontario.
- Spruce Falls Power and Paper Company, Kapuskasing, Ontario.
  T.P. McElhanney, Woodlands Division.
- R.E. Wicks and Company, Cochrane, Ontario.
  R.H. McHendry, Woodlands Manager.

CHAPTER I

P R I N C I P L E S

It is inevitable that the economic geography of Subarctic Canada[1] will attract greater attention as human occupation and activity increase. Indeed those lands, for so long the realm solely of the physical scientist, are already exercising an attraction for a number of students and research workers from the social sciences.

But so little has been written about the most elementary considerations of economic geography in this part of Canada that researchers are frequently deterred from working there for fear of becoming snarled in endless definitions and explanations which are not directly pertinent to the topic of study. The problems facing a student hoping to work in Subarctic Canada are many. Most geographers working towards an M.A. or Ph.D. find that a broad field of research is difficult to handle satisfactorily in this form, for such a topic generally requires years of preparation and is likely to absorb considerable financial resources. It is not surprising therefore that research geographers are loath to attempt to unravel the elements of Subartic economic geography.

Many students are either unaware of, or purposely ignore, the association that their areas of study have with the broad spread of Canadian economic geography, although to create a self-imposed

---

1. Subartic Canada: here defined as that part of northern Canada lying with the forest zone where black spruce is the dominant tree species (see Map [illegible], p. 31).

limit in this way sometimes makes the finished work of little value to other geographers, or to the social sciences as a whole.

Technique

One of the greatest problems for the student of economic geography who wished to produce work which is of some lasting value is technique. Isiah Bowman was aware of this difficulty when he wrote: "Rigorously to employ a technique is desirable but to limit research to the application of known techniques is to invite formalism. Perhaps the greatest danger is the substitution of purely technical procedure for creative thinking."[2] But the physical and social sciences follow a number of standard techniques which are usually quite effective. Unhappily this is not always so in economic geography. Techniques must here be flexible enough to embrace a wide field of study - in terms of both space and time - but must also be sufficiently formalised to permit a large number of variables to be organised into an intelligible whole.

To achieve this, the art of regional analysis is a useful stand-by. Yet, of all the techniques available to economic geography this is most clearly open to the dangers which Bowman points up. An alternative method, sometimes referred to as the "Topical Method",[3] similarly has certain shortcomings; for a systematic analysis of climate, physique, soils, vegetation and occupations (which this technique requires)

---

1. Bowman, I. "Geography in Relation to the Social Sciences", Part V, Report of the Commission on Social Sciences of the American Historical Association, New York 1934.

2. Topical Method - Step by step analysis in common usage among geographers, which considers, in succession, Geology, Physique, Soils, Climate, Occupations, etc. See Douglas Johnson "Studies in Scientific Method", Journal of Geomorphology 1942-46.

can be circumvented by a simpler, less stereotyped approach. The more rigid framework of economic analysis has something to offer, but the insuperable problem remains that economic geography is, in large part, qualitative and in consequence quantitative models are subject to severe limitations.

Just as it would be inconsistent for the economist to include geographical considerations in his analytical models it is unusual for the geographer to use the methods and terms of the economist in writing a geographical account. Common ground exists between the sciences but there are few approaches common to both. To some extent there is a need to wed the different approaches - at least from the geographer's point of view - because economics is of importance in determining many of the patterns of occupation and human activity which are his raw materials, and also because a problem in the social sciences, or more precisely in geography, can only rarely be expressed simply through one discipline. A number of chapters of this thesis are broadly designed and it is hoped that more is gained by stepping outside the strict lines of division between disciplines than would result from abiding within them.

Location

This thesis is in part a location study, of why industry chooses to locate in certain areas and shuns others of apparently equal potential. The forces underlying location are largely, but not exclusively, economic; some are physical, while others are social and historical.

For example, tree growth in a given area may be stunted or

sparse and the resulting yield of pulpwood as low as five cords[4] per acre in consequence. Wood is not cut because costs per cord of extraction and transportation to the mill are so high that the normal margin of profit on the finished produce is eliminated. The economist would contend that location of woods operations is determined by the costs of producing, and the demand for, the finished product. To the geographer's way of thinking the poor quality of the trees is a result of soil characteristics, climate and drainage; in turn these make the wood inaccessable or expensive to extract and are therefore the major factors influencing the decision not to cut wood in a given area.

Both geographer and economist are right, or rather neither is categorically wrong, for both approaches yield valuable information explaining the 'why' of location, but the real problem remains - to determine the relative importance of each factor in guiding a final choice of location for its woods operations. A possible solution lies in shaping a strict economic analysis, but generally the variables are so numerous that the analysis can bear little relation to actual field problems.

For example, the optimum location may be determined by weighing the various manufacturing costs against each and choosing the least cost location. This makes two assumptions; one, that the entrepreneur is motivated only by the desire to maximize profits; two, that he acts rationally in the economic sense.

All too often the latter assumption breaks down in practice,

---

4. Cord: Unit of measurement of stacked wood defined by Federal Statute as the amount that can be piled in a space containing 125 cubic feet.

for choice of location is infrequently purely an economic choice; it often involves historical and personal factors. The optimum location may have been established under conditions which have since changed, or the entrepreneur may have personal contacts of a business or social character at a site far from the optimum location and prefers to build a plant at that site.[5] Thus no economist can be said to have successfully outlined a 'general theory' of location which has proved completely satisfactory,[6] and the empirical studies contained in most recent work have, in the main, emphasised the problems of formulating one rather than pointed a way to a solution.

The geographer is in a position to bring together the specialized work of various sciences and may make a valuable contribution by synthesis, but he must avoid overstating the case for his own discipline. Walter Isard was perhaps aware of this when he wrote, "Physical features have a critical value as barriers only with respect to a given or assumed state of technology and in particular transport technology."[7] The following chapters are in part designed to show how the pulp and paper industry in the James Bay Basin reflects Isard's generalisation.

Despite the fact that this thesis is written about a relatively small area of Canada its wider application is not overlooked. There is

---

5. See M. Greenhut: Plant Location in Theory and Practice (1956) Part 3, Empirical Studies.

6. See E. Hoover: The Location of Economic Activity.
   M. Greenhut: op. cit.
   W. Isard: Location and the Space Economy 1956.

7. W. Isard: op. cit., Introduction.

a progression in the following chapters from general aspects of the pulp and paper industry in Canada to the particular features of those mills located within James Bay watershed; bearing in mind that a close economic and geographic association and interaction exists between the North American industry as a whole and the mills in James Bay Basin.

CHAPTER II

AN OUTLINE OF CANADA'S PULP AND PAPER INDUSTRY

Asked whether paper is a luxury or a necessity most people would answer, with little hesitation, that it is a necessity. Few, however, would be immediately aware of the tremendous extent to which paper is part of almost all aspects of modern life. In the last half century its use has become so extensive that it now ranks in people's minds with water and other resources that are so frequently taken for granted, as an expendable material.

The greater part of postwar expansion in paper consumption has taken place on the North American continent. Canada, with her vast forest resources and long-established pulp and paper industry, has been in a strong position to satisfy this demand. So great has it been in fact, that the major suppliers of pulp and paper in both Canada and United States have, until recently, employed their capacity to its physical limit. Demand has outrun supply in the last nineteen years despite programmes of rapid plant improvement and the construction of new mills. Only in the last year and a half has capacity kept pace with consumption, so that late in 1958 only 85% of North American capacity was operating. The President of the Canadian Pulp and Paper Association, R.M. Fowler, described the situation as "a return to normality in an economy of abundance, after nineteen years of abnormality caused by war and its aftermath."[1]

---

1. R.M. Fowler, President of the Canadian Pulp and Paper Association: Address to the Annual Meeting of the Pulp and Paper Association, February 1959.

The air of optimism prevailing in Canada for a number of years past has been tempered by the industry's experience in the last year and a half. It is now clear that many observers were not justified in considering Canada's huge forest potential as unlimited (there are 1.7 million square miles of forest land of which 892 thousand square miles is estimated as productive),[2] for it must at all times be related to the demand for forest products. This demand has determined the growth pattern of the Canadian industry since World War II and it will just as surely be the most important factor in guiding the future as it has been in determining the past.

Measured in physical terms - of potentially productive forest - Canada's ability to produce is an expression of the limitations that physical factors exert upon the Canadian pulp and paper industry. But actual output during recent years is an indication of the economic restrictions which affect it. It is in the light of these latter restrictions that the following brief survey is constructed.

Size

Although not the most spectacular Canadian industry, pulp and paper has grown hand in hand with the striking postwar expansion experienced by the whole Canadian economy - paralleling other major resource developments such as hydro-power and minerals. For many years it has led all other industries in terms of gross value of production and selling value of factory shipments (the main criteria by which the Dominion Bureau of Statistics measures industrial size.)

---

2. Newsprint Data 1958: The Newsprint Association of Canada.

Latest yearly figures available indicate that 128 pulp and paper mills were operating at the close of 1957. Forest concessions held by these mills, combined with the area occupied by farm woodlots, totalled some 302 thousand square miles. Thus total occupied forest land in 1957 was only 34% of the forest estimated as productive and a mere 18% of the forested area of Canada.

A little more than one third of all wood cut from forest holdings was used to make pulp. Output was some ten and one half million tons, of which Quebec produced nearly half of the total. Ontario accounted for 26% and British Columbia 11%, while the other provinces produced the remainder. More than three-quarters of the pulp produced was converted into various forms of paper within Canada, so that integrated pulp and paper mills dominated the industry. 2.3 million tons of raw pulp were exported, mostly to mills in United States.[3]

Newsprint

Newsprint is by far the most important form of paper made in Canada and absorbs roughly three-fifths of all wood pulp, as the following table shows:

Table 1

Wood Pulp Supply and Shipments in Canada - 1956[4]

Shipments	Tons Thousands	Percent
Raw Wood Pulp	2,914	26.0
For Newsprint	6,433	57.5
For Boards Paper Board and other	1,094	9.8
For Papers	748	6.7
Total Pulp Available	11,239	100.0

3. Newsprint Data 1959: The Newsprint Association of Canada.

4. The Pulp and Paper Industry 1957: Dominion Bureau of Statistics.

Since the end of World War II, Canadian newsprint production has increased from approximately 4 1/2 million tons in 1946 to more than 6 million tons in 1958, and with capacity now greater than current production in Canada could produce more than 7 million tons per year. Such a rate of expansion over the last twelve years has clearly been in response to a major growth in demand for newsprint which has outstripped demand for other forms of forest products, so that newsprint is becoming relatively more important to the industry as a whole every year.

Consumption

The major stimulus to newsprint production has come from United States. The proximity of this gigantic market and its importance to Canadian paper producers is a key factor in the understanding of the pattern of activity and location of mills north of the border. Nevertheless domestic and overseas markets are of considerable importance, the latter particularly to mills at coastal sites, and it seems likely that overseas markets will gain greater attention from Canadian firms over the next few years.

Canadian mills have for many years provided the major share of all newsprint consumed in United States and as recently as 1954 supplied 80% of the total. However rapid expansion of mills in southern United States is now biting into the Canadian share of U.S. markets and in relative terms Canada is supplying a smaller share of U.S. consumption. But demand has been moving ahead so rapidly that in absolute terms exports of newsprint from Canada to United States have remained steady since 1954 at a little more than five million tons yearly.

Throughout most of the postwar period newsprint manufacturers have been hard pressed to keep pace with the demands of U.S. newspaper publishers. Immediately after the Second World War publishers began to pass on the effects of rising advertising linage and bigger newspaper circulations, but with the advent of television as a major advertising medium the level of newspaper advertising has become far more responsive to general business conditions. Demand for newsprint therefore, after slackening somewhat during the 1954 recession, rose sharply throughout 1955 and 1956. But the recent recession has again brought about a considerable slackening of newsprint demand resulting from reduced advertising.

Capacity

Despite the encouragement of generally heavy demand the number of new mills coming into operation in Canada has been limited. Of the 2.6 million tons added between 1946 and 1958 more than 65% has been in the form of improvements and speed-ups of existing plant and equipment. The greater supplies of raw material required for increased paper manufacturing have been achieved mostly through more efficient cutting operations and a more systematic use of existing limits.

The Canadian industry as a whole reacted rather slowly to the postwar trend of demand and it was not until 1955 that a big wave of expansion developed. The time-lag between planning and production has been such that this capacity has only become fully available during the last two years - just as demand from United States for pulp and newsprint has slackened appreciably, and competition from mills in southern United States has become a serious threat in the market.

Present State of the Industry

The situation therefore has been one where the Canadian pulp and paper industry has experienced a pause in both its long-term trend of production and its rapidly increasing capacity. Many immediate plans for new mills and new plant and machinery have been postponed and the rate of capital investment in the industry as a whole has fallen sharply. It is probable that total addition to capacity in 1959 will be relatively small.

Consumption of newsprint in United States declined 7% between its peak in late 1956 and a low which occurred in the spring of 1958. Most estimates indicate that future increases in North American consumption will take place at reduced speed compared with pre-1957 rates. Thus Canadian mills face a rather slowly expanding market at the present time.

Competitive Position

In addition, Canadian paper mills are experiencing a growing threat of competition in U.S. markets from mills in the southern states. United States newsprint capacity now stands at a little over 2 million tons and mills have been operating at rates exceeding 80% of capacity for the past three years despite the addition of half a million tons new capacity over that period.

The material advantages which Canada was thought to possess over all other areas of North America for the production of newsprint are dwindling as technological advances improve quality and reduce the cost of southern newsprint. The dense, rapid growth of southern pine, the ease of cutting, and the availability of cheap water transportation

for the finished product, all yield cost reductions compared with Canadian operations. Vernon E. Johnson has established that the cost of delivering newsprint from a mill at Mobile Alabama "is an average $5 per ton less" than the delivery cost from New Brunswick to the same customers.[5]

But free price competition does not reign in the newsprint markets of North America and therefore Canadian producers do not face the apparently simple problem of competing with southern mills on a price for price basis. Newsprint is regarded as a standard product, sells at a standard price, (see Chapter VII), and is sold at a delivered price, so that Canadian producers have got to reduce average costs per ton sufficiently to make profits at f.o.b. fixed prices. It is thus an advantage from a competitive point of view for low cost producers in southern United States if they can hold the delivered price as low as possible.

During the recent recession Canadian mills have, for the first time since the end of World War II, seriously felt the squeeze between rising production costs and the delivered price of newsprint. Recently some Canadian manufacturers have favoured raising the delivered price, but no action appears likely at the present time. Strong competition from overseas, notably Scandinavia, in the North American market has made Canadian manufacturers fearful of pricing themselves out of the market.

---

5. Vernon E. Johnson, President of New Brunswick International Paper Companies, November 1958.

Thus the competitive position of Canadian mills producing newsprint for North American consumption (and they form the majority of the 128 operating mills) is poorer now than it has been at any time since 1946. Most manufacturers are hoping for gradual improvement in the situation in the early 1960's, and the prospect of rising North American consumption and more efficient cost saving techniques of manufacturing lend much support to this view. Nevertheless a few clouds now threaten the formerly unsullied horizons of the Canadian pulp and paper industry.

CHAPTER III

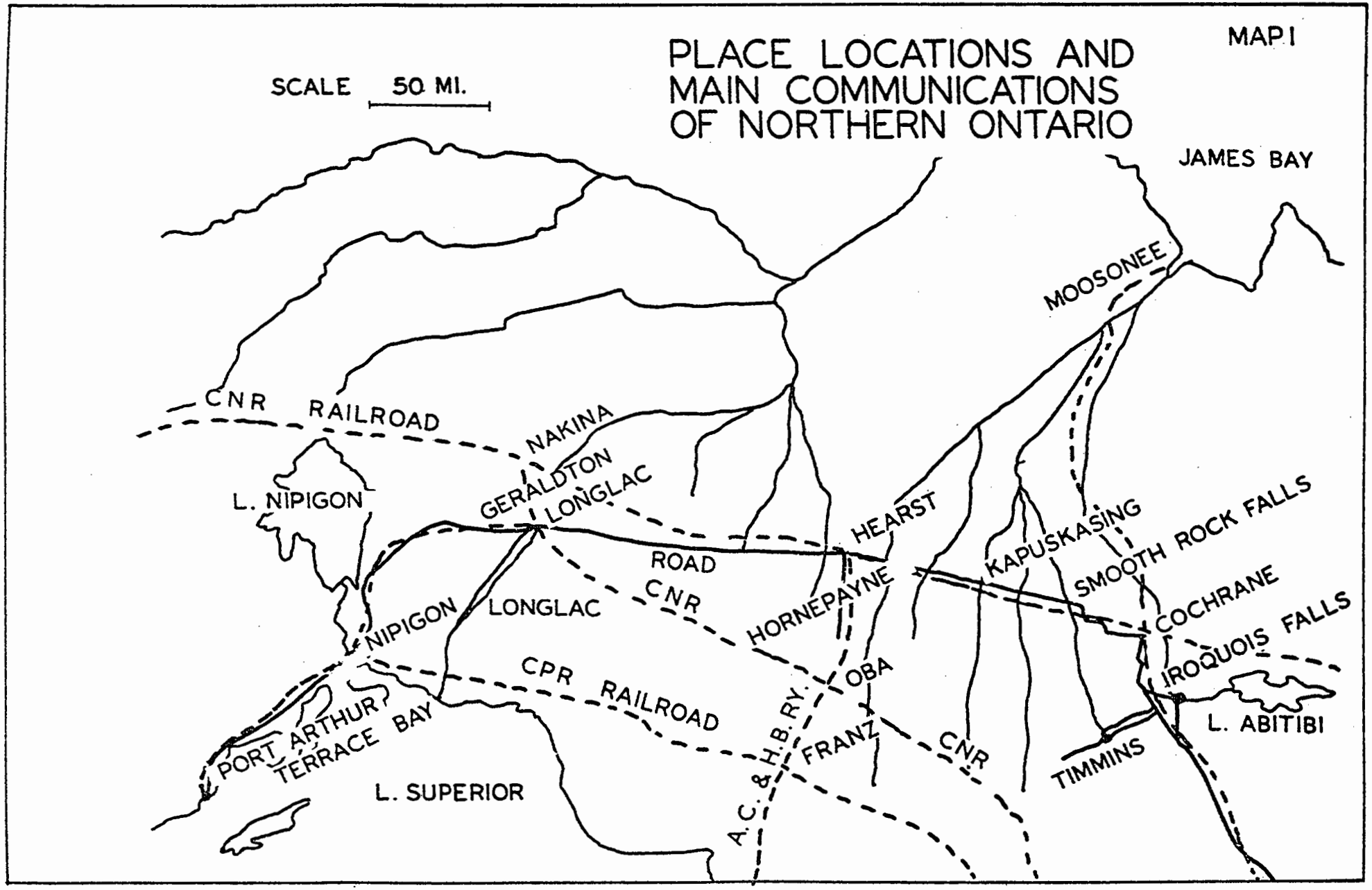
PHYSICAL CONDITIONS AND MILL LOCATIONS

In the light of present economic conditions in the industry the northerly position and physical isolation of the James Bay basin from the heart of the North American continent appears to be a handicap to development of the pulp and paper industry.

That part of Ontario which surrounds James Bay lies within the southern limits of Subartic Canada. For Hudson Bay, biting as it appears to do into the middle of Canada, extends severe climatic conditions far south around its shores in winter. James Bay forms a southerly 'appendix' of Hudson Bay extending from Cape Henrietta Maria at the 55th parallel of latitude south to Moosonee near the 52nd parallel.

Thus while latitude alone would not bring this part of northern Ontario within Subartic Canada the influence of the large cold water mass forces temperatures below freezing for about 7 months of the year. Mean daily temperatures in northern Ontario do not rise above 0°F during January and by April are still not above freezing point. May is probably the first month in which temperatures rise sufficiently to encourage tree growth for substantial periods of each day. The frost free period over most of the area is little more than 60 days.

Although a gradual climatic gradient exists from north to south over the area, drainage conditions and soil characteristics are largely responsible for the pattern of tree growth. This whole region


MAP I
PLACE LOCATIONS AND MAIN COMMUNICATIONS OF NORTHERN ONTARIO
SCALE 50 MI.
JAMES BAY
MOOSONEE
CNR RAILROAD
NAKINA
GERALDTON
LONGLAC
L. NIPIGON
HEARST
ROAD
KAPUSKASING
SMOOTH ROCK FALLS
COCHRANE
IROQUOIS FALLS
L. ABITIBI
NIPIGON
LONGLAC
CNR
HORNEPAYNE
CPR RAILROAD
OBA
A.C. & H.B. RY.
FRANZ
CNR
TIMMINS
PORT ARTHUR
TERRACE BAY
L. SUPERIOR

lies within a few hundred miles of the northern limits of forest growth which is not a clear-cut boundary but rather an ecotone, or broad transition belt.

There is no clearly defined climatic boundary to tree growth around Hudson Bay. Marr contends that climate is not the local limiting factor determining tree growth, nor the factor preventing trees growing north of what is generally accepted as the tree line. He concludes that the direct factor preventing the occurrence of forest over all land surfaces is the lack of soil.[1] The experience of companies holding timber limits between Cochrane and Moosonee strongly confirms this fact.

However most woodlands managers of paper companies in the area would also cite drainage as an equally significant factor in tree growth. The enormous number of rivers flowing from the arctic watershed to James Bay ensure that innumerable bands of well-drained land extend on either side of each river for distances varying between roughly 400 yards and 1 mile which are particularily favourable to the growth of the black spruce.

Between the rivers, which frequently flow over ground slightly higher than the general level (usually between levées) lie areas of ill-drained muskeg, shallow, acidic soils and bare rock surfaces. Even black spruce which is the hardiest tree found in this part of Canada is frequently unable to obtain a permanent hold here and as a result islands of treeless ground form far to the south of the climatic limits of tree

---

1. Marr, J.W.: Ecology of the Forest-Tundra Ecotone on the East Coast of Hudson Bay - Ecological monographs, McGill University, 1948.

growth.

The existing pattern therefore is not, as is frequently stated, one where a tree line extends in a south-curving arc across North-West Territories, Hudson Bay and Ungava Peninsula, for there is no tree line as such but only a disorganized pattern of barrens and forest determined in its detail by strictly local conditions.

Furthermore there is apparently no clearly defined commercial limit of forest growth, a feature which woodlands managers of the various pulp and paper firms cutting within the James Bay drainage basin emphasised. The northern limit of merchantable lumber varies with economic conditions in the industry, being indirectly dependent upon the price of newsprint, the costs of manufacturing and the expected profit margins of the various firms. Moreover it is likely to vary from firm to firm depending upon the profit margin that each is willing to accept. Small firms whose operation bring returns close to break-even point are more likely to cut wherever they can glean profits in stands which more prosperous competitors would regard as unmerchantable.

A case in point is A.E. Wicks and Co. which has woods operations along the Abitibi River between mile 90 and mile 120 of the Ontario Northland Railroad; (i.e. roughly 90 to 120 miles north of Cochrane), north of any operations currently undertaken by other companies. In the past this same company has cut particularily good stands of black spruce near Moosonee, further north than any other company east of the Rockies.

Both Spruce Falls Power and Paper Co. and Abitibi Power and Paper Co. whose limits extend between 50 and 100 miles north of the C.N.R. main east-west railroad (Quebec to Winnipeg) have found that certain stands even in the most northerly parts of their limits contain excellent timber. Nevertheless, extraction would be more costly than other areas currently being cut over; so that until the better sections of their holdings are temporarily exhausted it will not be worth while to cut it. Under present conditions the northern sections of their limits are unmerchantable, but it is conceivable that they will become merchantable as the limits currently being cut are exhausted (these companies work on a natural regeneration programme of 90-100 years for regrowth of cut-over areas).

Thus the severe natural conditions of this part of northern Ontario which would prove an obstacle to human occupation, settlement and farming do not necessarily militate against the growth of commercial forest. Such conditions are, in fact, ideally suited to growth of black spruce, which is the most sought-after wood for newsprint, due to its high quality and selling value.

But physical conditions offer a strong deterrent to permanent settlement and industry north of the line of towns between Hearst, Ontario and La Reine, Quebec. This line is roughly the northernmost extent of the Ontario part of the Clay Belt. Clay deposits found over an extensive section of this part of northern Ontario offer comparatively favourable soils for settlement and farming. The towns of Hearst, Cochrane, Kapuskasing and Smooth Rock Falls are located immediately south of the physical boundary which divides poor lands compounded of

muskeg, ill-drained forests and shallow acid soils from the Clay Belt. These towns also take advantage of a natural fall line on the Kapuskasing, Groundhog, Mattagami and Abitibi rivers to generate power for homes and industry, (see Map 1).

To the south of these settlements lies another significant forest ecotone. From this area to the arctic watershed (close to Lake Superior) gradual climatic amelioration, improved soil conditions and better drainage result in the gradual inclusion of a wide variety of trees. Deciduous woods begin to mix with black spruce and appear in larger numbers near the southern watershed, the forest classification of Canada 1956 describes the species as balsam fir, aspen, white birch and jackpine.[2] Aspen as well as birch frequently recolonise after black spruce and balsam fir are cut over, while south of Geraldton, Hornpayne and Timmins it becomes increasingly uncertain that the black spruce - balsam fir association will even regenerate naturally; in other words it ceases to be the climax except in a few scattered locations.

But whatever physical advantages and disadvantages the James Bay basin appears to have as a source of raw material and hydro-electric power, its extreme isolation from the major North American centres of population, manufacturing, and newsprint consumption is a severe handicap.

The major centres of population along the north-eastern seaboard of United States lie approximately on a radius of 700 miles from the three pulp and paper mills at Kapuskasing, Smooth Rock Falls and

---

2. Forest Classification of Canada 1956 - Pulp and Paper Research Institute of Canada.

Iroquois Falls. The industrial concentrations of the central states which include cities such as Chicago, Cleveland and Detroit, lie nearly 600 miles in a direct line from the mills.

The actual physical distances do not appear significant when taken out of context, but when they are considered alongside the position of potential competitors in the newsprint market the serious handicap of location becomes apparent. Mills in the James Bay basin are farther from major newsprint markets than any other mills in eastern Canada. Their competitive position, with respect to freight and transportation costs on the finished product, is poor compared with mills in southern Canada, such as those at Cornwall and Windsor Mills which are within 400 miles of the major U.S. markets.

Just as distance raises the delivered cost to the finished product, so essential supplies for construction, services and certain foodstuffs suffer heavy freight cost, and prices of gasoline and diesel fuel are as much as ten cents per gallon more expensive than in the metropolitan areas of southern Canada. The area is not self-sufficient in foodstuffs, despite some full-time farming in the Clay Belt and part-time farming around the major settlements.

The isolation of this part of James Bay basin is aggravated by the communications which, although adequate for most requirements, are laid down along an east-west axis, (see Map 1). One main road from North Bay to Port Arthur serves the whole region. The road surface is for most of its length excellent, despite extremely difficult rock and muskeg conditions. At the present time this artery carries much

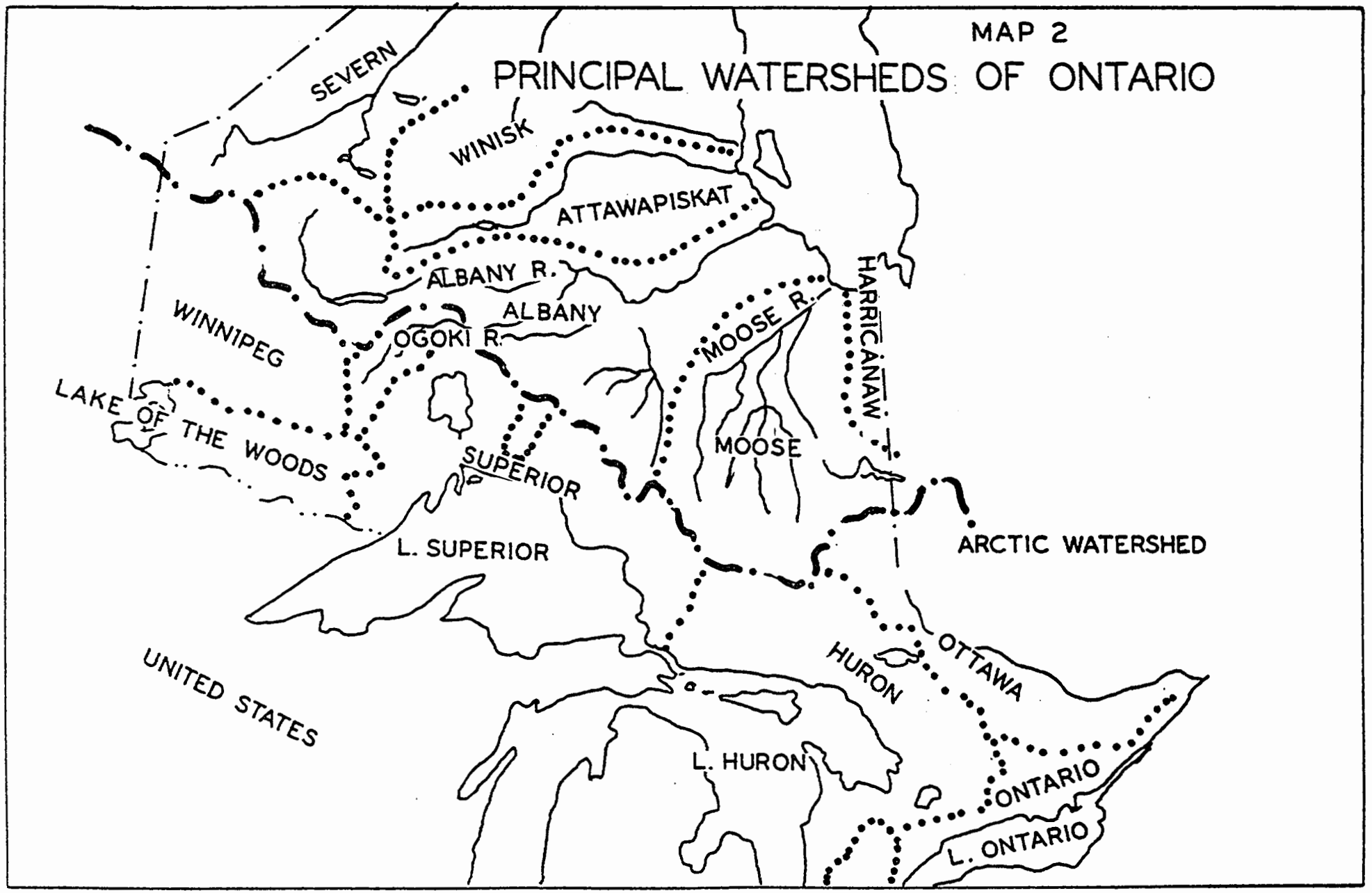
heavy transcontinental trucking but this will probably be re-routed to the south when the Trans-Canada Highway is completed. There are also two major rail lines, the transcontinental C.N.R. route and the Ontario-Northland railway. When the C.N.R. route was planned it was hoped that Quebec would gain a deep hinterland to the west, but these northern lands were so poor that even in Quebec, where colonization has been heavily subsidized, this dream has not been fulfilled.

Both road and main railroad feed across the region rather than through it, and only the Ontario-Northland railroad from Cochrane to Moosonee provides a service along a north-south axis. Most communications lie across the physical pattern of the James Bay basin and severly limit the region's development, (see Map 1). The large populations and markets of the south decree that communications would be more efficient and less costly designed along a north-south axis. With connecting road or rail lines from the northland to the north shore of lake Superior the region could take advantage of the cheap water transportation to central U.S.A. and the eastern seaboard via the Great Lakes and St. Lawrence Seaway. Freight savings might be particularly significant on a heavy commodity like newsprint or pulp.

The only communication which provides a north-south connection is the natural line of the rivers, but the direction of flow (which can be so cheaply used to transport wood to a pulp mill) would carry wood northward towards the Arctic rather than southward towards the major markets of the world. Throughout the whole region rivers drain generally towards the north, a physical fact which proves costly to the pulp and paper industry.

The tenuous links of physique, communication and economic activity between this part of Ontario and the south are in part a reflection of the way economic activities have developed. Most towns within the watershed are reliant upon a single industry, usually extractive in character, for their livelihood. Porcupine, Cobalt, Timmins and Geraldton for example are all mining towns based upon local sources of gold, silver and cobalt ores. The towns of Kapuskasing, Smooth Rock Falls, Ansonville and Iroquois Falls were all originally planned in part or in whole as company towns, having been developed, constructed and owned by the pulp and paper companies. Only Hearst and Cochrane have any diversification of occupations, but even they are still reliant for the most part upon a small variety of extractive and construction industries.

Indeed this modal or unit structure is the outstanding feature of communities in the James Bay basin. It is therefore difficult to make any useful generalizations about the settlement of the area, for the nature of economic activity prohibits its treatment as a cohesive geographical region from the point of view of industrial geography, although it bears a distinct agricultural regionality as part of the Clay Belt.


MAP 2
PRINCIPAL WATERSHEDS OF ONTARIO
SEVERN
WINISK
ATTAWAPISKAT
ALBANY R.
ALBANY
OGOKI R.
WINNIPEG
LAKE OF THE WOODS
SUPERIOR
L. SUPERIOR
MOOSE R.
MOOSE
HARRICANAW
ARCTIC WATERSHED
UNITED STATES
HURON
OTTAWA
L. HURON
ONTARIO
L. ONTARIO

CHAPTER IV

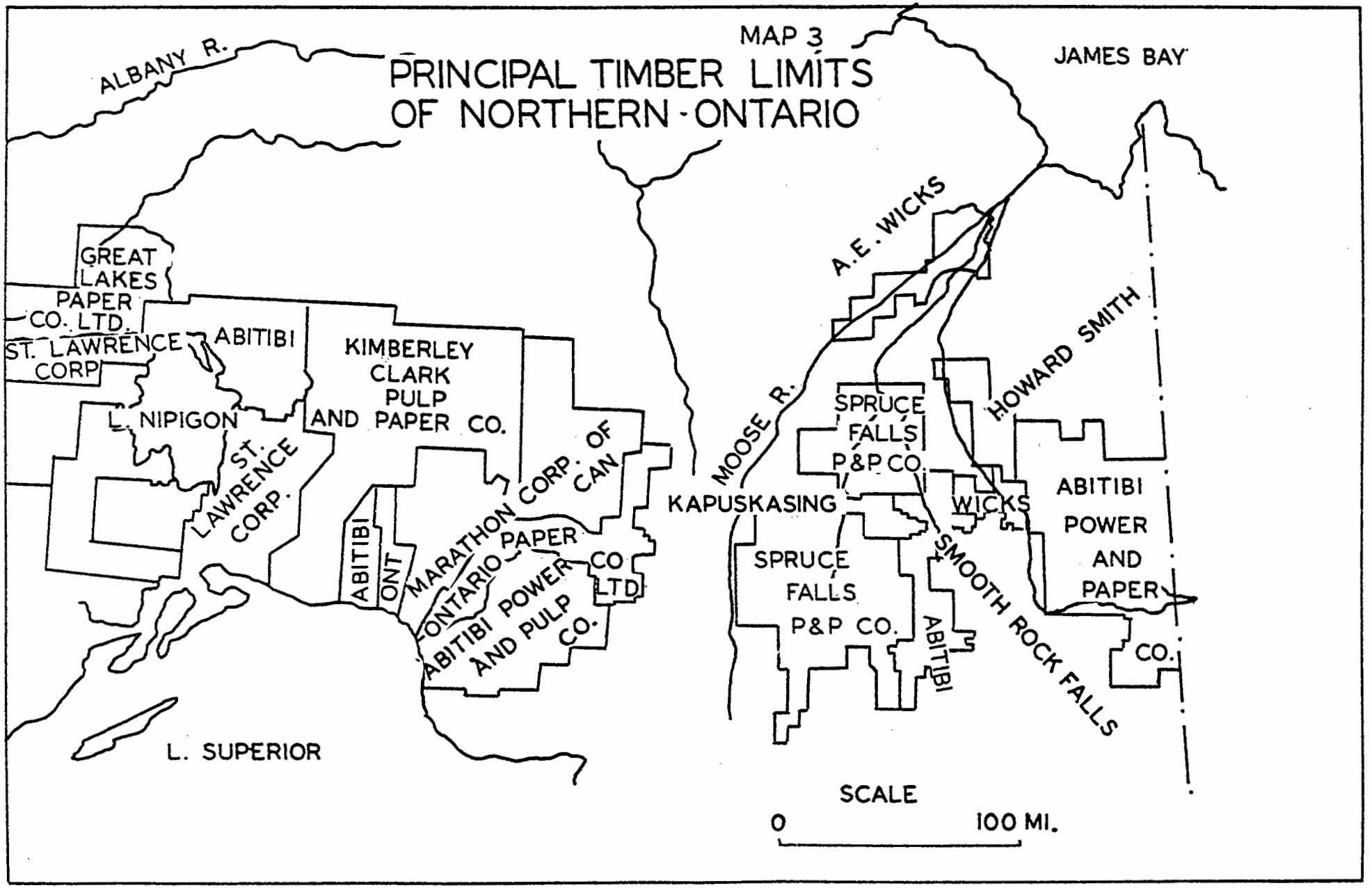
AVAILABILITY OF RAW MATERIALS

Woods operations in the James Bay basin supply raw material to two groups of pulp and paper mills, but mill locations are diverse in response to a variety of factors that inevitably enter into an entrepreneur's decision when he sites his manufacturing process. The physical isolation of wood resource in this part of northern Ontario reduces, but does not eliminate, the attraction of the raw material source as a mill location.

Firms have a wide choice of location and, depending upon what advantages may be derived, they may be found anywhere from the source of raw material to the market. For example, pulp and paper mills located within the James Bay basin (at the raw material source) necessarily gain cost advantages from the minimisation of transportation costs on the raw material. Alternatively firms located outside the area sacrifice some of this advantage for economies in manufacturing and transportation of the finished product to the market.

Of all mills using this part of northern Ontario and Quebec as a source of raw material, (see Map 3), three are located so as to reduce transportation costs on pulpwood to a minimum, Abitibi Power and Paper Company at Iroquois Falls and Smooth Rock Falls, and Spruce Falls Power and Paper Company at Kapuskasing.

These three are physically closely associated being within 100 miles of each other; forest limits are adjoining in the case of


MAP 3
PRINCIPAL TIMBER LIMITS
OF NORTHERN ONTARIO
ALBANY R.
JAMES BAY
A.E. WICKS
HOWARD SMITH
GREAT LAKES PAPER CO. LTD.
ST. LAWRENCE CORP
ABITIBI
KIMBERLEY CLARK PULP AND PAPER CO.
L. NIPIGON
ST. LAWRENCE CORP.
MOOSE R.
SPRUCE FALLS P&P CO
KAPUSKASING
WICKS
ABITIBI POWER AND PAPER CO.
ABITIBI ONT
MARATHON CORP. OF CAN
PAPER CO LTD
ONTARIO ABITIBI POWER AND PULP CO.
SPRUCE FALLS P&P CO.
ABITIBI
SMOOTH ROCK FALLS
L. SUPERIOR
SCALE
0
100 MI.

Kapuskasing and Smooth Rock Falls plants. The third mill at Iroquois Falls is separated from the other two only by a limit leased by Howard Smith Paper Company on the Abitibi River near Cochrane and a narrow belt of farming land, (see Map 3).

In relation to the main pulp and paper areas of Eastern Canada (St. Lawrence and Ottawa Valleys and Lakehead region) Kapuskasing, Smooth Rock Falls and Iroquois Falls stand like outliers, linked with their southerly neighbours and each other only by the farthest extent of their limits. Although their isolation from other concentrations of the industry is not complete, for all practical purposes such as pulpwood supply, power and transportation connections they form a separate grouping. Furthermore, although their forest limits are adjoining, or in the same general locality, they are independent of each other for supply of raw material. Each mill forms a complete unit having no physical or economic links with its neighbours except common main road and rail connections.

Each plant site is oriented towards the raw materials of the pulp amd paper industry, power, water and of course the major raw material pulpwood. The industry itself is weight-losing[1] in character, for the raw pulp before manufacture is heavier, more bulky and more difficult to move by most transportation methods than is the finished product.

It might be expected that the heavy demands on power, water and raw materials which the manufacturing process makes would encourage

---

1. Weight-losing: The finished product is lighter than the raw materials.

location of mills near to the source or sources or raw materials. However, for most mills located in southern Canada numerous southward-flowing rivers provide a very cheap method of transportation for pulpwood from its source to a convenient bulk-breaking point[2] nearer to the main markets than a location at the raw material source. There are many locations where river transportation, water power, labour supply and good communications to the market combine to produce a low cost plant site away from the origin of the raw material.

But an entrepreneur suffers few disadvantages with respect to major raw materials by locating north of the arctic watershed for as well as some of the best quality newsprint pulpwood in the world there is also abundant water power for use in manufacturing and some sulpher, (for chemical pulp processes) indigenous to the area.

Power

As the company names imply, the three mill sites at Spruce Falls, Smooth Rock Falls and Iroquois Falls were chosen initially because they could be adapted to supply hydro-electric power which is heavily used in the manufacturing process, but as the mills expanded, more distant supplies of hydro-power from the fall-line along the southern rim of the Hudson Bay lowland had to be tapped.

The Ontario section of the James Bay watershed has a water power potential estimated at 1,397,000 horse-power, of which the Albany River has 175,000 horse-power in ten sites. The greater part of devel-

---

2. Bulk-breaking point: usually a trans-shipment point.

oped power comes from the Moose River and its tributaries, most importantly the Abitibi River which has a potential of 500,000 horse-power on eleven sites four of which have been developed, the Mattagami River with its tributaries the Groundhog and Kapuskasing has 400,000 horse-power potential at 11 undeveloped and 6 developed sites.

The Abitibi Power and Paper Company has three plants on the Abitibi generating a total of 112,350 horse-power. The original developments at Iroquois Falls-1914 and Twin Falls-1921 yield 32,350 and 30,000 horse-power respectively; the Island Falls development yields 50,000 horse-power. But the mill has outgrown this supply and draws supplementary power from Ontario Hydro's Abitibi Canyon development which yields 264,000 horse-power. Smooth Rock Falls mill has some on-site power but its major supply is derived from the Smoky Falls development on the same river of 75,000 horse-power capacity.[3]

Although power potential is by no means exhausted in the James Bay basin an additional source of cheap power was added to the region in 1958 with the opening of the Trans-Canada natural gas pipeline. By agreement with the natural gas authorities the three pulp and paper mills in the area are hoping to gain certain cost benefits from the use of natural gas. Burners are currently being installed at Kapuskasing and Iroquois Falls as an alternative power source. Under terms of the agreement the companies will receive natural gas at reduced rates subject to the proviso that they are off-peak users liable to suffer reduced supplies during periods of peak demand. Thus natural gas will become

---

3. Water Powers of Canada 1958 - Water Resources Branch, Department of Northern Affairs & National Resources, Queen's Printer, Ottawa.

a supplementary source of power rather than a replacement for hydro-electricity or coal.

Other Raw Materials

Other raw materials used in the manufacturing process account for a small but significant proportion of manufacturing costs. Chief among these is coal which is a major power source, but costs are high because of the long rail hauls involved. Sulpher and sulpher dioxide are also used in the chemical sulphate and sulphite processes of pulp-making. Smooth Rock Falls which produces bleached sulphite pulp and Iroquois which produces small quantities of the same material, depend upon local supplies, chiefly Hayleybury and Noranda (where it forms a bi-product of copper smelting), but some sulphite is also imported from Texas.

Pulpwood

The major raw material cost to the manufacturer is pulpwood, accounting for roughly 45% of total costs of raw materials. The James Bay basin has two attractions as a source, pulpwood quality, and pulp-wood quantity. Although the resources of the area are not unlimited, sufficient spruce is available within the basin to supply several mills in perpetuity on a rotational cutting basis and also to provide considerable reserve for possible future expansion.

For example Kimberley-Clark Corporation financed the Spruce Falls Power and Paper Company at Kapuskasing[4] during 1924 when the company came in search of sufficient timber limits to sustain a paper mill

4. Information was obtained from the company in the Woodlands Department at Kapuskasing.

in perpetuity, largely as a response to rapidly rising North American demand for newsprint during that period. The move northward was partly motivated by shortage of good limits in the more southerly parts of Canada where the paper industry had been long established.

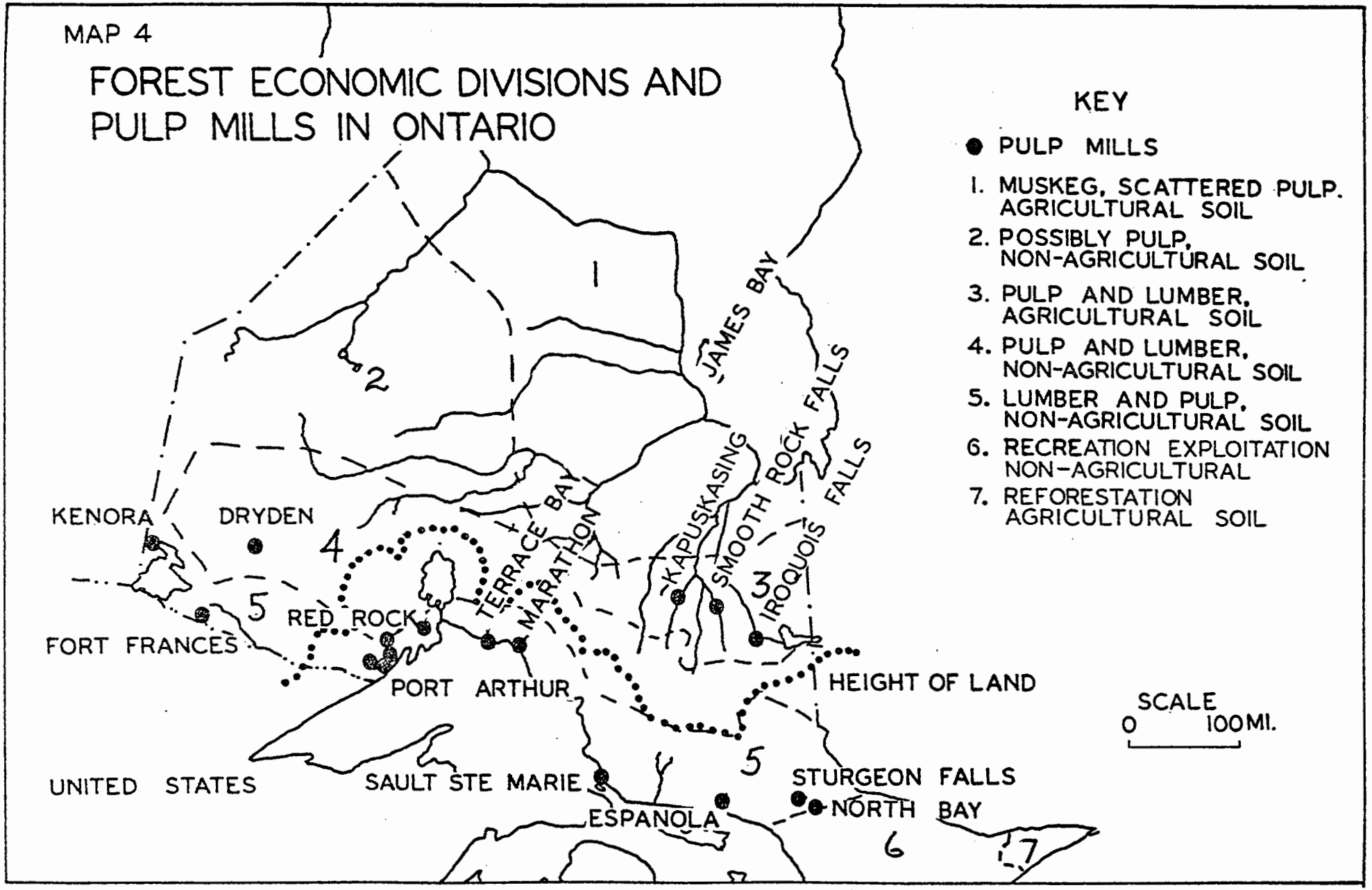
At the present time the company leases 6400 square miles of land from the Ontario government, which must be sufficient to supply the mill on a rotational basis in perpetuity under existing government regulation of the industry. However only 43% of the total area leased by Spruce Falls Company is considered productive at the present time, 28% is non-productive. Black spruce accounts for nearly 90% of all wood cut, while balsam and poplar make up the remainder. During 1957 only 31 square miles of timberland were cut to provide 270,000 cords of wood. This, plus 80,000 cords purchased from farm woodlots, was sufficient to supply the mill during that year. The most favourable areas supplied an average of 40.4 cords per acre compared with roughly 10 cords per acre from poor lands; the overall average yield was 13.7 cords per acre.

The Iroquois Falls mill of Abitibi Power and Paper company[5] has an annual allowable cut of 217,000 cunits[6] (255,000 cords). More than one fifth of the Iroquois limit is classified as "Nonforest" but the 43 square miles of merchantable timber has a concentration of 80% black spruce, 3% balsam fir, 10% Jackpine and 7% poplar and birch. This latter 7% is mostly regrowth/

---

5. Information obtained from the Woodlands Department at Iroquois Falls.

6. Cunit: 100 cubic feet of solid wood. A cord increased by volume appropriately 85 cubic feet.


MAP 4
FOREST ECONOMIC DIVISIONS AND PULP MILLS IN ONTARIO
KEY
PULP MILLS
1. MUSKEG, SCATTERED PULP. AGRICULTURAL SOIL
2. POSSIBLY PULP, NON-AGRICULTURAL SOIL
3. PULP AND LUMBER, AGRICULTURAL SOIL
4. PULP AND LUMBER, NON-AGRICULTURAL SOIL
5. LUMBER AND PULP, NON-AGRICULTURAL SOIL
6. RECREATION EXPLOITATION NON-AGRICULTURAL
7. REFORESTATION AGRICULTURAL SOIL
JAMES BAY
KENORA
DRYDEN
TERRACE BAY
MARATHON
KAPUSKASING
SMOOTH ROCK FALLS
IROQUOIS FALLS
RED ROCK
FORT FRANCES
PORT ARTHUR
HEIGHT OF LAND
SCALE
0 100 MI.
UNITED STATES
SAULT STE MARIE
ESPANOLA
STURGEON FALLS
NORTH BAY

established in areas which have been cut-over and which carried a high proportion of black spruce when the mill first started producing (Map 4).

Like the mill at Kapaskasing it has always been company policy that the mill at Iroquois should be self-sufficient in woodpulp supply and despite rapid expansion of output the company's extensive limits have made this policy possible. Both Spruce Falls Power and Paper Company and Abitibi Paper Company were able to take full advantage of the James Bay basin as a plant location from the point of view of raw materials.

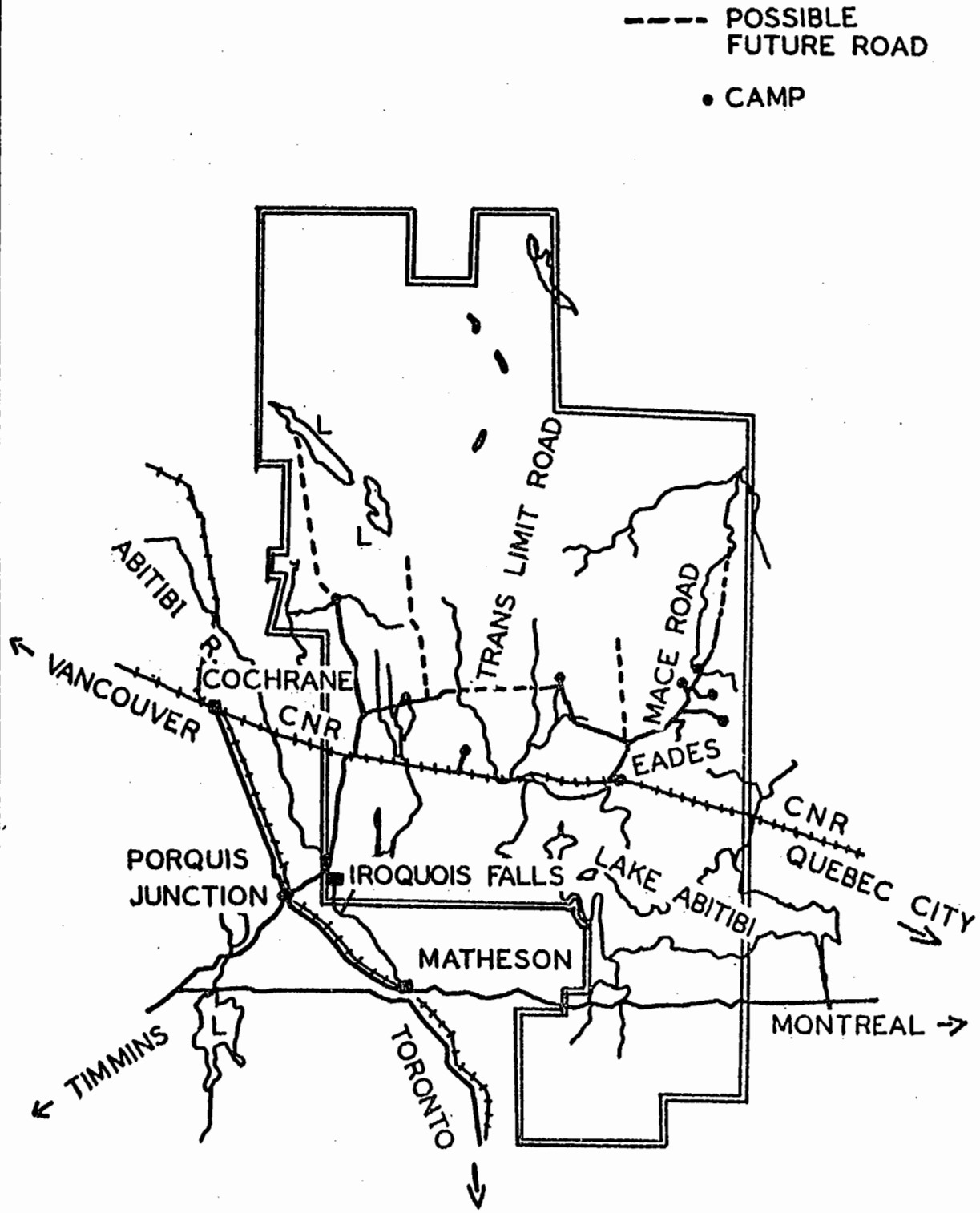
The potentialities of this part of northern Ontario as a location for paper mills were first realised during the early decades of the 20th century. The Iroquois plant was the first mill to be established north of the arctic watershed in this area. The discovery of gold, silver and cobalt at the Porcupine and neighbouring areas of Quebec attracted many prospectors. Among them F.H. Anson, sponsored by the Ogilvie family of Montreal, returned from a summer mineral prospecting expedition in 1910 with favourable reports on the forest potential and as a result he was able to raise finances for a mill at Iroquois Falls.

Limits were leased from the Ontario Government in 1912 totalling 1560 square miles of land, and this was sufficient to supply the mill capacity of 200 tons of pulp daily. At this time the only means of access was by river from the rail head at Matheson 25 miles south of Iroquois Falls.

During the early years woods operations concentrated on

MAP 5

IROQUOIS FALLS WOODLANDS LIMITS – 1958



the most accessible timber along the Abitibi River and around the shores of Abitibi Lake. But with expansion in demand, resulting in increasing production during the period 1920 to 1929, the company was forced to go further afield for pulpwood and a logging railroad was driven some thirty miles northward across the limit to within 150 miles of James Bay, while the whole limit was extended piecemeal in the same direction. (see Map 5)

By 1954 demands for newsprint once again encouraged the company to open access roads eastward and northward from the railhead, while the old rail line was converted to an all-weather road. In effect this opened the limit some forty miles north of the mill and eastward to the Quebec border. During a span of 40 years the original limits were extended from 1560 square miles to 4300 square miles and capacity at the mill from 200 tons of pulp to more than 850 tons of pulp daily.

Almost half of the limit still remains to be developed mostly to the north of present access roads. As rotational cutting continues, the more accessible wood in the southern part of the limit will be temporarily exhausted and the company will be forced to extend operations gradually northward. Recent capacity increases are already stimulating planning and construction of new access roads across the northern section.

From a long term point of view, room for expansion is a critical factor in the pulp and paper industry. The long term trend in consumption of paper and newsprint on the North American continent

makes it attractive to firms to hold easily accessible reserves of pulpwood which may be exploited whenever demand justifies greater production. The companies operating in James Bay basin are well located for expansion without incurring the high costs of long haul and scattered sources of supply, from which the mills at Cornwall and Windsor Mills in southern Canada have suffered.

Iroquois, Smooth Rock Falls and Kapuskasing mills are free to expand cutting to the north at virtually any time that demand and costs provide a satisfactory profit margin on an expanded mill operation. Whereas most mills in the south are already at a point where their timber boundaries are fixed by the presence of other mills and agricultural landowners, the three mills within the James Bay Basin retain a flexible northern boundary.

At present woods operations do not extend to the northern limits currently held under license, but sufficient wood is available there to satisfy most foreseeable requirements. There is no physical reason why spruce cannot be cut almost to the shores of James Bay, given the necessary technological and transportation improvements on raw material extraction to justify it on a cost basis.

CHAPTER V

WOODS OPERATIONS SOUTH OF THE MILL SITES

The great attraction of the James Bay basin as a source of high quality pulpwood makes it of vital importance to the companies concerned that woods operations should be technically efficient in order to overcome physical difficulties which beset extraction of the wood. Inaccessibility of merchantable timber detracts from the appeal of high quality spruce by raising handling and transportation costs from the woodlot to the mill.

This problem looms larger the further north woods operations are extended, but even in the more southerly parts of the limits difficult terrain increases the costs of extraction and handling compared with limits south of the arctic watershed. Costs increase rapidly as operations are extended farther from the mill sites and terrain conditions deteriorate. Nevertheless the physical limit of operations is being constantly pressed northward on the crest of a number of technological improvements in pulpwood handling.

Northward - flowing rivers, mostly tributaries of the Moose River, provide the only water transportation over this part of the James Bay basin. The value to woods operations of cheap river transport is very high because for the most part there are no charges on this method of delivery to the mill except those handling costs which are incurred in moving the wood to the stream, along the river, and into the mills.

But to take full advantage of water transport in James Bay basin mills would have to be located at the northernmost extent of their limits. This would involve high initial capital charges on mill construction and isolation from the main road and rail routes and settlements. The present locations of the three mills are an attempt at compromise between the loss of water transport and the disadvantages of sites which could use the prevailing stream flow. (See Map 3). Three mills are sited roughly mid-way between the northernmost and southernmost parts of the limits along the line of farming land which has developed in the Ontario part of the Clay Belt in association with the east-west road and rail.

This belt of agriculture, which is rarely more than 6 miles wide on either side of the east-west railroad is discontinuous between Kapuskasing and Iroquois Falls, but forms a dividing barrier between the northern and southern sections of leased limits, separating the mill sites at Smooth Rock Falls and Kapuskasing from their northern limit holdings. Abitibi has managed to purchase townships formerly held within its limits by war veterans, so that there is a continuous north-south spread over a distance of approximately 80 miles at Iroquois Falls.

Wood cut in the southern sections can be moved directly down the Kapuskasing River to the Spruce Falls mill, down the Mattagami to Smooth Rock Falls and across lake Abitibi to Iroquois Falls. The Groundhog River, which also serves the Kapuskasing limits, is usable only to Fauquier; wood is here transshipped into

trucks for a journey of 20 miles to the mill, or is used in the company sawmill at Fauquier.

All three companies make use of the headwaters of a number of streams flowing to James Bay and therefore suffer some handicaps compared with mills located near the mouths of the large southward flowing rivers in Canada. Stream flow is very variable, and snow melt brings high spring floods and leaves a low summer flow. Much of the annual precipitation of the area appears as run-off because absorption and transpiration losses are relatively small, although evaporation from lakes is substantial in summer. Annual run-off diminished from roughly 20 inches at the headwaters near the arctic watershed to 6 inches near James Bay.

In consequence, the rivers are only usable for logging during a few weeks in spring and even then the flow volume is unreliable. Their small width and shallow depth frequently delay the movement of pulpwood downstream and as many as 6,000 cords of wood are occasionally stranded upstream after the spring flood crest has passed.

Spruce Falls Power and Paper Company - Kapuskasing[1]

Of the 270,000 cords of wood cut on company limits during the 1957 season roughly 210,000 cords reached the mill after some form of river drive. The Kapuskasing R. is the largest of the three rivers serving the mill and is now the only river to carry any volume of wood direct from the cutting site to the mill (101,800 cords in 1958). The Groundhog R. handled roughly 16,000 cords of wood during

1. Information provided by Woodlands Division, Spruce Falls Power and Paper Company - Kapuskasing.

the 1957-58 drive, but the quantity is declining each year; 1958 was a particularly dry season and more than 6,000 cords of wood were stranded along this river. The Opasatika R. to the west of the mill is no longer of any importance for logging drives and only 119 cords of wood were driven in the 1957-58 season.

The declining importance of the Groundhog R. and Opazatika R. is a reflection of the difficulties of driving wood down such shallows and unreliable streams. Their small size and flow make it necessary to cut wood at the stump to 4 ft. or 8 ft. lengths to ease passage of wood downstream. The company is now finding that reduced handling charges from cutting 16 ft. or tree length wood, skidding mechanically and moving in one haul, from stump to mill, more than offset the higher cost of trucking compared with river transport. So that wood cut more than 6 miles from a suitable river is now usually trucked direct to the mill in preference to trucking to intermediate landing in 4 ft. or 8 ft. lengths and then driving from intermediate landing to mill.

The Opazatika and Groundhog suffer from the additional handicap, in comparison with the Kapuskasing R., that they do not flow direct to the mill. All wood entering these rivers has to be removed at either Opasatika or Fauquier and trucked or railed to the mill. This additional handling is equivalent to a second trans-shipment, proportionately raises the delivered cost of wood at the mill.

The bulk of woods operations south of the river are still using river transport down the Kapuskasing, but merchantable timber

is becoming scarce within a range of 6 miles on either side of the main stream and camps are being moved progressively further from water transport. Cutting usually begins in September over most of the limit and continues through until March. During the 1957-58 season when some production set-backs were experienced only one camp was open in the limit south of the mill during summer.

All wood is moved in a period of roughly 60 days between the beginning of January and March 10th; at the height of the hauling season 5,700 cords reached the mill daily, although the average for the hauling season is about 4,000 cords. 50% of all wood cut on limits is handled in 4 ft. lengths, mostly reaching the mill by water; 27% is cut in 8 ft. lengths but most of this is handled from the north of the mill via the company railroad or by horse and river drive from a camp south of the mill; the remainder - mostly 16 ft. length - is usually trucked direct to the mill.

The company uses two cable yarders which can move approximately 10-12,000 cords each per season from the stump to the access road. In addition, a number of tractors are employed in summer operations for tree length and 16 ft. skidding, but mechanical maintainance is costly due to heavy undergrowth in the working area and soft or boggy terrain. Most of the 8 ft. and 4 ft. cutting is moved from the stump by horse and chain or sleigh immediately following the winter freeze-up when the ground is hard enough to bear bulldozers for winter access roads. Trucking directly to the mill, which takes place entirely in winter (accounting

for roughly 50,000 cords per year), is dependent upon snow roads for a hard surface. Terrain which is quite impassable in summer can usually be easily and quickly opened to hauling operations immediately after freeze-up.

During early years at Kapuskasing, the mill relied upon water transportation for its wood supply and upon horse and chain, or sleigh, to move wood from the stump to water. But during the postwar years, the shortage of horses for log hauling reduced the extent of these operations; furthermore costs of summer pasturing and winter feed for horses have been steadily rising, and the number of horses for rent has declined in consequence. Operations with horses are now roughly as expensive to the company as mechanized wood hauling. Continual advances in reducing costs have also helped to bring mechanization to a competitive cost level with the horse. At the same time power-saw cutting has replaced the buck-saw so that output (measured in cords per man hour) has risen considerably.

Linked with the steadily declining value of horse operations, the river drive has experienced a similar loss of cost advantage. Once the tractor and cable-yarder took over from the horse in the initial stage of hauling, the 16 ft. log length began to replace 4 ft. and 8 ft. lengths, although it is less easily driven by water.

The cable yarder, with its suitability for truck loading, in effect eliminated one step in the number of times wood had to be handled before it reached the mill. Thus while the costs of handling via horse, river and rail haul have become relatively higher,

mechanization has reduced the number of times wood has been touched on arrival at the mill and direct truck haul from stump to mill has become relatively less expensive.

Truck hauling has been able to take advantage of the severe winter conditions not only at Kapuskasing, but also on the Smooth Rock Falls and Iroquois Falls limits where the Companies have come to rely upon ice or hard-packed, frozen, snow surfaces for truck access to cutting areas. Trucks and trailer trucks from 10 cords to 40 cords carrying capacity in size are now able to move almost to the stump to receive loads. Heavy undergrowth (with swamp and muskeg in slightly lower areas) which is almost impassable to tractors in summer, is easily cleared or ridden over by bulldozers in winter. A hard surface of frozen snow eliminates the necessity of gravel surfacing for access roads, which is expensive and in comparatively short supply, particularly at Smooth Rock Falls.

Abitibi Power and Paper Company - Smooth Rock Falls[2]

The Mattagami R. is more adaptable to log driving than the Kapuskasing R. and the mill at Smooth Rock still places greater reliance upon water transportation than the Spruce Falls Power and Paper Company. Smooth Rock limits are long and narrow extending along both sides of the Mattagami R. north and south of the mill. The Mattagami is one of the two major rivers which form the headwaters of the Moose R. and possesses, as previously noted,

---

2. Information obtained from the Woodlands Department of Abitibi Power and Paper Company, Iroquois Falls.

(Chapter IV) considerable hydro-power potential. The hydro dam at Sturgeon Falls to some extent regulates peak floods in spring and even the yearly flow, which reduces the risk of logs stranding before the log drive reaches the mill.

As a producer of high quality bleached sulphite pulp, the mill consumes only black spruce and balsam. Its output of about 250 tons of pulp daily is about one third the size of the neighbouring company mill at Iroquois. The total annual cut is therefore proportionately smaller and only 3 or 4 logging camps are open in the southerly part of the limit in winter. These have enough wood available close to river transport to make horse skidding and river driving cheaper than trucking direct to the mill.

Wood is cut in the spruce swamps and river levees and reduced to 8 ft. bolts at the primary landing to which it is forwarded by tractor, Blue Ox, Nelson skidder or horse. It is moved from there to the river by tractor and sulky or arch. 16 ft. wood is cut from the higher ground and skidded in log lengths to the primary landing from which it is moved to the river by truck or the mill direct. More than three quarters of all wood supplied to the Smooth Rock mill is obtained from limits lying to the south of the mill site[3].

While physical conditions are rather more in favour of the utilization of river drive in logging operations here than on the Kapuskasing limits, they are at the same time far less favourable to

---

3. Bennett W.D.: Logging Atlas of Eastern Canada, Pulp & Paper Research Institute of Canada, 1958, P.5 (d).

complete mechanization and trucking direct to the mill. Despite intensive aerial photography and ground surveys, insufficient gravel and road surfacing material has as yet been found to provide all-weather access roads to the year round operations usually in progress at the four main camps. Most of the limit is so poorly drained that road locating is frequently a major and costly operation.

Any extension of logging areas away from the proximity of the river favours trucking direct to the mill on winter roads as an alternative to water drive, but there appears to be no immediate prospect of this taking place. Capital investment involved in full mechanization of woods operations is high - it runs to some $4\frac{1}{2}$ million in woodlands equipment on the Spruce Falls limits - and the smaller scale of operations at Smooth Rock makes truck haul far less attractive. Partly this is a result of the smaller quantities of wood cut in any one year, but partly it is a reflection of the physique which favours all-year-round operations based on horse or mechanical skidding and river driving direct to the mill.

Abitibi Power and Paper Company - Iroquois Falls[4]

Of the three mills in the James Bay basin, Iroquois Falls is most favourably located to take advantage of water transportation. The mill site on Abitibi R. is connected with Lake Abitibi by a 30 mile system of lake and river channels, drowned when the Twin Falls hydro dam backed up the waters of Abitibi R. to within 6 miles of its exit from Lake Abitibi. The wide channels and water level control

---

4. Information obtained from the Woodlands Department of Abitibi Power & Paper Company, Iroquois Falls.

at Twin Falls make this section of the river well suited to the driving and storing of logs.

Lake Abitibi effectively cuts the forest limits into a large northerly and small southerly section. The lake itself is narrow from north to south and long in an east-west direction, and its shoreline is broken and irregular; overall depth is less than 16 ft. and there are many islands. The lake lies in a basin-like depression of clays and sands thinly scattered over shield rocks, and has created its own area of drainage so that numerous short and small streams, (usually less than 20 miles in length) enter the lake from all directions; of these, the longest within Abitibi company limits are the Lowbush and Circle Rivers (see Map 5).

The presence of Lake Abitibi and its numerous short rivers enlarges the drainage basin of the Abitibi R. upstream from the mill in a northerly direction; so that, where stream flow is sufficient, river driving can bring logs to the mill from townships more than 30 miles north of the mill and 50 miles east. Two-thirds of the yearly cut on Abitibi limits enters the lake or river and reaches the mill by water, and roughly one-third is now trucked direct to the mill along winter or all-weather roads. By August 1958 roughly 40,000 cunits of the previous winter's cut had reached the mill and 70,000 cunits were still in the river after crossing the lake.

Changes in the methods of pulpwood extraction on Abitibi limits are following those apparent at Kapuskasing despite the physically more favourable system of water highways. Abitibi, like

the other two companies has found that trucking is becoming more competitive with river driving for hauling wood supply to the mill, so that the proportion of wood trucked has been gradually increasing since World War II. Future plans call for heavier reliance upon mechanical rather than physical hauling.

During the early years of operation at Iroquous, only the most accessible forest was cut. In general, this was found in the immediate proximity of the mill along the banks of the Abitibi River above Twin Falls and around the shores of Lake Abitibi. As these supplies were exhausted, operations were extended in a northerly and easterly direction and, after a rail was constructed north through the westerly section of the limits in 1925, wood began to enter the mill for the first time along an all land route. At roughly the same time two main landings were established on Abitibi lake at Lowbush in the west and Eades at the lake's most northerly bay. For a while the small rivers of the north shore were used for drives to these two intermediate landings, but since World War II, the practice has been to haul wood onto the frozen lake by truck for dumping to await the spring thaw. After 1954 when the old rail was converted to all-weather road and a trans-limit road link was established to Adair township in the far east near the Quebec border, truck hauling over land to the mill began to replace the lake and river route.

In common with other mills in James Bay basin, most cutting takes place in winter and all hauling in the 60 days between approximately January 1st and the beginning of March. The Company usually

operates 5 camps during the winter along the trans-limit road and keeps one or two open all the year round.

Of recent years all operations have been switched to cutting 16 ft. logs, because the company has found that it yields considerable cost reductions (over 8 ft. or 4 ft. bolts) in handling and loading. Horse and chain skidding to access roads is still the predominant skidding method, but cable yarders have been successful, particularly on all-year-round operations. A small number of John Deere tractors are employed but they have proved to be too light in the wetter sections of the limit to give satisfactory results.

For the main haul, trucks of 12 to 15 cords capacity are becoming more extensively used and can load 25 cords with a trailer addition. As at Kapuskasing, the flexibility of trucking on winter roads and reduced handling involved in direct trucking to the mill more than offsets the low cost of water transportation and direct trucking eliminates at least one stage of handling, reducing the number of transfers from three by river to two by truck.

The lake and river also have some physical disadvantages which cause delays in the spring drive. Shallow lake waters require shallow-draught tugs for towing log booms. To gain the necessary towing power, the tugs use winch power from the bow as well as stern paddle wheel power to tow the log boom. As a result, tugs travel three times farther towing a boom across lake Abitibi than an ordinary tug would travel in deep water.

The hydro dam at Twin Falls sometimes causes water in the river to back up so far that the normal flow of Abitibi R. is reversed. Water moving back from the power dam to lake Abitibi frequently delays free logs on their trip down the river and, on occasion, has been known to drive logs back to the lake. The water level has to be carefully controlled and the sluices on the main dam opened regularly to allow logs to reach the mill 14 miles downstream.

Conclusions

In summary, it seems apparent that the southerly woods operations of all three mills in the James Bay basin have been evolving along parallel lines. Endowed with a certain amount of water transportation, (frequently unreliable and soon too small to handle ever growing quantities of annual allowable cut), the companies for a time concentrated upon effecting improvements to available water transportation. At the same time the advantages of mechanical cutting, skidding and hauling have become constantly greater. Improved trucks with greater capacity and more efficient loading machinery are finally beginning to show cost advantages over the old methods using man-power, frequent handling and water transportation.

The detailed character of the new cutting methods and the wide range of devices employed is a reflection of how closely woodlands' managers are attempting to adapt mechanical methods in the woods to local terrain conditions. Experimentation is constantly under way and trial and error have been a feature of postwar operations. After nearly fifty years of dominance by horse and man, wood operations

are beginning to acquire an entirely new pattern. Dominated by the large truck, aided by easy construction of winter roads and reinforced by mechanical skidders, woods operations are effecting a push to the north to open up new timber stands formerly inaccessible to man, horse, and water transportation.

CHAPTER VI

WOODS OPERATIONS NORTH OF THE MILL SITES

In response to increased mill capacities and growing demands for pulpwood, forestry limits have been cut-over in the more northerly parts of James Bay basin to as far as 90 miles north of the Clay Belt settlement. Formerly regarded as inaccessible, these limits have been developed for the most part under extremely unfavourable physical conditions.

Both Kapuskasing and Smooth Rock Falls plants cut a small proportion of their total wood requirements on concessions north of the mill, but Kapuskasing limits are better developed and a greater proportion of annual cut can be hauled via a company railroad from Smoky Falls than can be moved to Smooth Rock along winter roads. Northward flowing rivers effectively bar logging drives to the mill as a major hauling method throughout the area of these concessions.

In addition to the mills at Kapuskasing and Smooth Rock Falls, seven firms with mills located south of the arctic watershed face the problem of moving pulpwood from the James Bay basin over distances up to 400 miles without the aid of river driving. Longlac Pulp and Paper Company at Terrace Bay, Marathon Paper Mills of Canada at Marathon, and Howard Smith Paper Mills Limited at Cornwall hold limits in the Ontario part of the basin. Less important, though still significant, are a group of concessions in Quebec which supply part of the requirements of Canada Paper Company at Windsor Mills,

Canadian International Paper Company, Richmond Pulp and Paper Company at Bromptonville and Howard Smith Paper Mills Limited[1].

It is likely that most of the companies are operating near the cost margin in order to extract wood from their holding in James Bay basin. But only Longlac draws the major part on its mill supply from concessions north of the arctic watershed, and to overcome the transport problems has resorted to drainage and hydro developments on the Kenogami R. to create an artificial southward river flow for log driving (see Map).

Information on costs is restricted because most companies prefer to keep their data confidential. Several firms do not separate their northern operations as a unit for accounting purposes and in consequence their operations are measured on a cost basis in conjunction with more southerly woods operations.

One such example is Canadian International Paper which holds the most northerly concessions in the Quebec part of James Bay basin. The company leases near Chibougamou cover some 500 square miles northwest of the St. Maurice River, Gouin Reservoir and Chibougamou Lake. The company includes this limit with middle and upper St. Maurice valley to form one unit for accounting purposes. The whole is within economic limits for production, and the actual costs in each area cannot be separated.

The Chibougamou limit was originally obtained by exchange of leases with Abitibi Power and Paper Company in an effort to consolidate

---

1. Bennett W.D.: Logging Atlas of Eastern Canada, Pulp and Paper Research Institute of Canada, 1958, pp. 5(c), 5(d).

limits. International prefers to hold limits in this area in preference to other northern limits because they find the higher volume of spruce (roughly 85% black spruce, 7% Jackpine, 5% balsam fir) particularly attractive. The most northerly concessions in Ontario are held by A. E. Wicks and Company of Cochrane and cover an area of some 1,500 square miles. Almost all merchantable timber on their limit is black spruce, but the proportion of merchantable to unmerchantable timber is very low. This section of James Bay basin does not form a consolidated limit and only widely scattered stands of merchantable timber are currently licensed (cost of licensing is $13.80[2] per square mile and the high proportion of waste, water and muskeg makes an all-embracing limit unprofitable). All merchantable timber near the Ontario Northland railroad is now held under license by A. E. Wicks or Howard Smith Paper Mills Limited.

Total pulpwood cut on the A. E. Wicks limit averages 60,000 cords yearly but during the production cut-backs in 1958 only 22,000 cords were cut. The company is not itself a manufacturer of newsprint but sells its pulpwood under contract, or on the open market, to paper manufacturing firms. Ontario Paper Company at Thorold, Ontario, holds a long-term contract for 10,000 cords per year, and Howard Smith takes a little pulpwood in most years. Iroquois Falls mill has in the past taken substantial quantities on a short-term contract basis. For the first time Interlake Tissue took a small quantity of wood in 1958 and A. E. Wicks hope for further yearly contracts[3].

---

2. June 1958

3. Information provided by R. H. MacHendry, Woodlands Manager of A. E. Wicks and Co., Cochrane.

Transportation to buyers' mills usually necessitates a long rail haul; sometimes several hundred miles. All wood leaving Hudson Bay Lowland has to use the Ontario Northland railroad and transportation costs on the raw material delivered at the mill are very high, so that to preserve a profit margin A. E. Wicks Company has had to resort to a number of unusual woodlands techniques.

Wood is usually cut into 4 ft. lengths for rail transport and is peeled before loading to reduce the amount of bark and other waste. After peeling, wood dries quickly and the weight is further reduced. Most wood is cut during winter and skidded by horse and sleigh, then trucked along winter roads to the rail. Some of the more isolated stands are cut and skidded to northward flowing streams such as Tucker River. From here logs are driven northward to the Abitibi and left in booms (of roughly 7,000 logs each) to float down the Abitibi to McInnes Siding. A river boat at McInnes prevents loss or back drifting on the sluggish river and wood is removed and debarked in a mechanical debarker. Any wood driven has to be dried out for one year so that it is lightened for rail shipment.

Problems of mechanization in this area illustrate the difficulties that other companies, Abitibi and Spruce Falls Company for instance, will experience should they be forced to use their most northerly limits during the course of rotational cutting. If roads are bulldozed, the surface frequently breaks and bog soils and muskeg can swallow tractors, machines and men, so that road building must await the freeze-up and, due to the late peeling season, roads are

just softening when they are most needed to move newly peeled wood from the stump. Water supply and sanitation of logging camps is often complicated and costly because there are no wells in the predominantly clay subsoil and cesspools do not drain.

Perhaps the most pressing need is for an efficient swamp tractor. The type currently in use - "The Bombardier" is not sufficiently strong in construction and has a hauling capacity of only 1,500 lbs. This $4,500 machine lasts only one season on average and costs of maintenance during that season sometimes equal the purchase price. After one 7 mile trip through typical land consisting of 99% muskeg and clay, the machine has to be hozed and wheels and wheel bearings greased to prevent destructive wear. The machines are inadequate for the loads of up to 4 tons which they are frequently required to carry.

The land averages 50% to 60% swamp and muskeg and this is sufficient to prove a barrier to access by machine over the greater part of the Hudson Bay Lowland. Even if physical difficulties are overcome, costs of extraction are usually raised to a prohibitive level in the attempt.

The company operates without a preferential freight rate on pulpwood and usually sells F.O.B. railhead or delivery (in which case prices are adjusted accordingly). Cost to the Thorold Mill by rail is approximately 38 cents per 100 lbs. of wood which is probably very close to the margin and leaves as little as 1 or 2 cents profit after delivery to A. E. Wicks. Shipment of machinery and equipment

in to woods operations is equally high; to move a tractor by rail from Cochrane to Mile 90 on the Ontario Northland railroad averages between $75 and $100.

It is not surprising therefore that the company is experiencing great difficulty in the competitive market at the present time. Profits are being squeezed between the going market price on pulpwood, rising freight prices, licence requirements of the Ontario Department of Lands and Forests and union wage rates. Nevertheless the company is still optimistic of survival in Hudson Bay Lowland, pinning its faith upon conquering the price-profit squeeze eventually.

In the northern sections of Spruce Falls limits roughly 22,000 cords per year are cut at several camps near Nashin Lake. Wood is driven for short distances by water across the lake and then transshipped to the narrow gauge railroad maintained by the company from Smoky Falls to the mill. This system is comparatively costly and if the mill is forced to rely more heavily upon these northern supplies, the old rail may be converted to an all-weather road. In this area roughly 30% or more of the land surface is lake and muskeg, and north of Smoky Falls in the Hudson Bay Lowland, more than 60% of land surface is barren or muskeg [4].

One of the great problems facing pulp mills in northern Ontario is the necessity of maintaining woodlands on a sustained yield basis. Most companies are now carrying out research and reaforestation

---

4. Information from Woodlands Department, Spruce Falls Power and Paper Company, Kapuskasing.

programmes to ensure regrowth of their more accessible woodlands after cutting. Woods operations on a sustained yield basis are tied to the growth cycle of black spruce which in this part of Canada is roughly 100 years to maturity.

Most cut-over areas are left to regenerate naturally but a number of the higher, better drained locations need reaforestation to establish black spruce in any quantity. The use of trucks and cable-yarders, in association with clear-cutting by power-saw has proved the logging method least damaging to natural regeneration. Damage to advance growth is minimized so that this timber comes to merchantable size more rapidly than seed.

Nevertheless woodlands management and rotational cutting have been relatively recent developments in the pulp and paper industry although all companies now realise that efficient woodlands management is in their long-run interests. Prior to such programmes, the most accessible timber was often indiscriminately cut by careless and wasteful operations. Regrowth of merchantable timber has in many cases been slowed or entirely eliminated. As a result, some firms have been forced to extend woods operations further to the north due to absolute lack of resources close to the mill. In this respect, mechanization has been a matter of absolute necessity.

Abitibi Power and Paper Company has estimated that skidding and loading by tractor and push-off truck has reduced the number of man days on woods operations by 40% and horse days by 18%. Truck hauling also quadrupled the range of woods operations from the mill

between 1947 and 1956.

The number of men employed in the northern forests is being gradually reduced as labour saving machines become more common in woods operations. Labour costs have always been the major cost item in delivery of the raw material to the mill, but more so in the past than at present. The number of times wood is handled in transit has been cut almost in half in some operations and only the number of men employed at cutting has risen, in step with the increased forest yield.

Particularly since World War II labour has become scarcer and more costly. Fewer and fewer men are prepared to leave their homes for long periods to live and work in the forest. Although wage levels have risen rapidly and camp living conditions have improved enormously, earnings and conditions in other industries are offering more than commensurate wages.

From the company viewpoint, labour costs have risen steeply since labour was organized in Ontario and Woodlands workers began to bargain through the union. Union rates during the early part of 1958 stood at $8 per rough cord and an individual cutter earned an average $25 per day with the best rates at roughly $40 per day paid on a piecework basis. A. E. Wicks and Company was paying $12.90 per peeled cord on most of the wood cut on their limits during the 1958 season. The peeled cord, A. E. Wicks believe, is the only economic unit for a company operating so far north, dependent almost entirely upon rail transport to their markets.

While the pulp and paper industry in northern Ontario is forced to sell at the current market price F.O.B. New York, it cannot afford to take a high cost differential on woods operations compared with mills in southern Canada and United States. The end result of high cost woods operations in the industry, while it continues to sell newsprint on a basing point price system, is inevitably lower profit margins to the companies concerned. Mills in James Bay basin hesitate to extend woods operations to the physical margin in Hudson Bay Lowland when demands for raw materials can be satisfied from more accessible timber south of the mill site.

This situation has created an atmosphere of experimentation and innovation in woods operations unparalleled in almost any other area of Canada. Programmes of woodlands management, cost reducing technical innovations and labour saving operations are all aiding the mills to put cutting on a competitive basis. Nevertheless the immediate future holds little prospect of extending cutting rapidly northward, particularly while more accessible timber has not yet been cut on a rotational basis. During the longer term, experimentation with such devices as a wood pipeline (which has recently been devised by the Pulp and Paper Research Institute) may bring merchantable timber north of the mills within the margin of economic cutting.

CHAPTER VII

PRODUCTION, PRICING AND MARKETING

To enter into the realm of manufacturing costs, marketing and pricing is to tread upon delicate and uncertain ground. Nevertheless such is their importance in any discussion of locational effects that they cannot be overlooked. The task of analysis is doubly difficult because information is frequently unattainable and when obtained is sometimes unreliable.

The competitive nature of the Canadian pulp and paper industry has induced a number of companies to maintain strict secrecy concerning details of costs. The only published information is to be found mostly in company reports, but it can be said with some certainty that the published yearly reports of incorporated companies cannot be relied upon to present the full picture.

Information from an alternative source, the trade unions, similarly cannot be verified and an analysis relying on either or both of these sources would be of small value. Arbitration between labour and management usually builds a compromise picture on which to base a settlement of disputes, but this would hardly be a satisfactory academic solution.

Production Costs

Production costs can only be outlined in general rather than specific terms. For example, they may be divided for convenience into materials, direct manufacturing, overhead and marketing costs. To

some extent material costs have already been dealt with; suffice it to add here that a number of sources (statements by leading executives, annual reports and independent summaries) suggest that materials usually represent between 40% and 50% of total costs, with pulpwood alone accounting for between 20% and 40%.

Later in this chapter some attempt will also be made to present a detailed assessment of marketing costs (accounting for roughly 10-12% of total costs). About 20% of total costs come from manufacturing and fuel and power add perhaps another 5-8%. The remaining 15-25% of the total is accounted for by depreciation charges on machinery and equipment, federal and provincial taxes, bond and equity interest and allowances for contingencies.[1]

It would appear that labour costs in the mill and in the forest are somewhat higher in Ontario than in Quebec or the Maritimes. A number of estimates offered the writer have suggested that there is perhaps a 20% wage differential between the costs of labour to mills in northern Ontario and to those in Quebec, but this is not verified and should be regarded with extreme caution.

But it is clear that woods labour accounts for perhaps three quarters of the cost of pulpwood delivered to the mill at a rate for rough wood cutting of between $8 and $9 per rough cord plus handling costs to the mill. Within the mill operation itself it is difficult

---

1. Company Annual Report - Abitibi Power and Paper Co. - 1958
Annual Report of St. Lawrence Corporation - 1958

or impossible to isolate labour costs and any figures offered here would be merely guesses.

Power costs tend to be more stable than most other costs. This is in large part a result of company ownership of hydro generating capacity. The mills in James Bay basin are well placed in that they generate a large proportion of their required power. Thus these companies are subject to power increases only on that part of power drawn from the Ontario Hydro grid. As carrying charges on capital investment are reduced, power rates show a tendency to fall.

Machinery and equipment within the mill, the third major operating cost item, is generally subject to a fairly low rate of obsolescence. Sound maintainance policies and improvements to machinery have maintained efficient operations from a number of old machines now operating in mills in northern Ontario. However, paper manufacturing plants have recently introduced speed ups and new high-speed newsprint machines which have the prime virtue of greatly reducing the quantity of labour used while maintaining a greater rate of production compared with the old machines. Moreover depreciation charges on such machinery are larger and tax deductible.

The recent programme of replacement undertaken by mills in James Bay basin has strengthened their profit position and eased the squeeze between the fixed selling price and rising costs.. Total investment in plant and machinery at each mill runs to between $20 and $30 million. At Kapuskasing, a company town, total capital invested is in excess of $85 million. Of this total, roughly

$10 million has been used for woodlands machinery and equipment and a further $1 million is accounted for yearly by insurance charges.

Perhaps the most important single statistic in assessing operating costs is operating profit per ton at a given mill. But the statistics generally available do not go into such details for reasons that are not difficult to understand. The companies feel that divulging such facts would lead to vital information reaching competitors, government and labour.

Operating profits certainly vary from mill to mill and it is possible that mills in James Bay basin are operating with higher break-even points and somewhat higher costs than mills in some other parts of Canada. But this cannot, for the above reasons, be confirmed by comparative statistics. When operations are not maintained at full capacity, as in the last 15 months, low cost mills usually operate at a higher rate than high cost mills in order to minimize losses and maintain recorded profits for producers with more than one mill. The only indication that mills in James Bay basin were high cost producers came in mid-1958 when the Abitibi mills in particular were producing at a rate of capacity slightly lower than the industry average.

Pricing and Marketing

It would be neither feasible nor practical to divorce analysis of pricing policies from marketing in the newsprint industry, or in the pulp and paper industry in general, because the delivered pricing systems now in force and closely adhered to over a number of years past are closely related to transportation costs.

The mills operating in northern Ontario adhere to the pattern within the industry as a whole for the sale and marketing of newsprint. There is little information available relating to the pricing of paper products other than newsprint so that the following is mostly limited to a discussion of the marketing structure for that product.

The most outstanding feature of the marketing structure is a basic geographical feature. A relatively small number of widely scattered producers sell to a relatively large number of consumers in widely scattered parts of North America. This is perhaps the root cause of the involved and long-standing marketing pattern in the pulp and paper industry.

Newsprint is marketed for the most part under a system of contracts extending for as short a period as one year to as much as 15 years. But contracts are frequently flexible and, when full quotas are not taken up, the outstanding amount is transferred to the following year's contract. In actual fact, the newsprint contract is frequently simply a letter of intent to buy requirements from a particular mill at going prices.

Integration backward from newspaper publisher to newsprint producer has become more common in recent years. Publishers find that it is to their advantage to be able to preserve some degree of control over newsprint manufacturing in order to ensure a regular and adequate supply of the grade of newsprint which they require. For example, the New York Times Company holds a minority 49% interest in

the Spruce Falls Power and Paper Company, ensuring supplies from that mill to its affiliated newspapers. This mill supplies the remainder of its output - tissue and other paper grades - to the Kimberly - Clark organization which is the majority shareholder.

Abitibi Power and Paper Company has no similar arrangement with respect to its North American sales. Abitibi Sales Company Limited, Toronto, was incorporated early in 1947 for the purpose of handling company sales and Abitibi Service Incorporated, of Dayton, Ohio, was also established that year to service newsprint contracts with United States consumers because the Abitibi mills in northern Ontario, like the other company mills, are forced to sell on the open market at all times.[2]

Both contracts and manufacturer-publisher associations tend to maintain and perpetuate an existing pattern of distribution from mill locations to consumers. The James Bay basin is no exception. In some cases shipment from the mill to controlling publishers involves a higher transportation cost than if supplies had been obtained from the nearest mill. Indeed several newsprint manufacturers are closer to the consumer than the Kapuskasing or Iroquois mills.

Newsprint is delivered under a uniform zone delivered price system and the immediate impact of transportation costs would therefore appear to fall on the seller. As a result the manufacturers, such as those in James Bay basin, can be expected to concentrate sales within

---

2. Financial Port Card - Abitibi Power and Paper Co., Ltd. - The Financial Post Corporation Service - Montreal, 1959.

areas or points where they can maintain a freight rate advantage over all other mills. Newsprint leaving the Iroquois Falls mill maintains a relative advantage only at Cleveland and in common with several other mills has some advantage at Pittsburgh.

The mills in James Bay basin sell under the existing price structure so that newsprint brings $135[3] per ton F.O.B. mill delivered New York and bleached sulphite pulp from Smooth Rock Falls brings $155 per ton[3] delivered at New York dock effective since October 1, 1957. The following table indicates how successive price increases in newsprint have occurred over the last twenty years within the framework of the zone price system.

TABLE 2

Canadian Newsprint
Contract Prices per ton to U.S. Consumers
(Delivered base zone prices - U.S.$ per ton)

1939		51	1949		101
1940		51	1950	January	101
1941		51		November	107
1942		51	1951	January	107
1943	January	51		July	117
	March	55	1952	January	117
	September	59		June	127
1944		59	1953		127
1945	January	59	1954		127
	April	62	1955		127
1946	January	68	1956		131
	July	74.80	1957	January	131
	August	75		March	135
	October	85			
1947	January	85	1958		135
	March	91	1959	February	135
1948	January	91			
	March	97			
	August	101			

Source: American Newsprint Publishers Association.

3. U.S. Dollars - April 1959.

In effect the zone price system ensures that the James Bay mills sell in United States at the same price as their competitors, the price varying by only a few dollars between the different zones.[4] Economic opinion is divided on the merits and demerits of zone pricing and U.S. government on occasion has questioned its legality.

It is clear however that the mills in James Bay are forced to incur freight absorption costs to their main markets in order to sell at the zone price. This is a severe hardship, for distance is expressed as a cost in that losses incurred in delivering newprint paper to the market reduce the profit realised per ton.

It is also clear that, of all Canadian mills the three in James Bay basin which are grouped for pricing purposes in the Grand Mere group with southern Quebec, have suffered and probably still suffer the greatest losses of all mills in eastern Canada from the process of freight absorption, as Tables Nos.3, 4, 5 and 6 show.

---

4. The last published information obtainable was for the year 1951 from the American Newsprint Publishers Association.

TABLE 3

Newsprint Freight Rates from Selected Mills to New York City 1939, 1951 and 1959

Year	Short Line Miles	Rate per Ton $	Rate Per ton mile Cents	From
1939	475	7.00	1,489	Three Rivers, Quebec
	757	9.20	1.215	Iroquois Falls, Ontario
	1,032	9.20	0.891	Kapuskasing, Ontario
1951	475	13.73	2.653	Three Rivers, Quebec
	757	16.00	2.114	Iroquois Falls, Ontario
	989	18.20	1.849	Coosa Pines, Alabama
1959	475	17.40	N.A.	Three Rivers, Quebec
	1,032	21.40	N.A.	Kapuskasing, Ontario
	989	N.A.	N.A.	Coosa Pines, Alabama

N.A. - Not Available.

TABLE 4

Newsprint Freight Rates from Selected Mills to Specified United States Destinations 1939, 1951 and 1959

Year	Short Line Miles	Rate per ton $	Rate per tone mile Cents	From	To
1939	1,039	9.80	.943	Kapuskasing	Philadelphia
	565	8.00	1.416	Grand Mere	Philadelphia
	621	8.20	1.320	Iroquois Falls	Dayton, Ohio
1951	624	14.40	2.308	Three Rivers	Cleveland
	499	14.40	2.886	Iroquois Falls	Cleveland
	737	15.20	2.062	Cossa Pines	Cleveland
1951	670	15.20	2.269	Three Rivers	Pittsburgh
	591	15.20	2.572	Iroquois Falls	Pittsburgh
	797	15.80	1.982	Coosa Pines	Pittsburgh
1959	624	N.A.	N.A.	Three Rivers	Cleveland
	499	20.00	N.A.	Iroquois Falls	Cleveland
1959	670	21.00	N.A.	Three Rivers	Pittsburgh
	591	21.00	N.A.	Iroquois Falls	Pittsburgh

N.A. - Not Available

TABLE 5

Comparison of Freight Rates and Derived Delivery Costs on Standard Newsprint from Three Rivers to New York City - 1946 to 1959

Year	Standard Newsprint Freight Allowed New York City Average Wholesale Price per ton $ U.S.	Exchange Rates Yearly Average U.S. $ in Canadian	Newsprint F.O.B. Mill Southern Quebec Average Wholesale Price per ton $ Canadian	$ U.S.	Derived Delivery Cost per ton S. Quebec to N.Y. City $ U.S.	Freight Rate Per ton Three Rivers to N.Y. City $ U.S.
1946	72.29	103.29	68.57	65.28	7.01	7.40
1947	88.62	100.00	79.48	79.48	9.14	8.98
1948	97.69	100.00	86.55	86.55	11.14	11.40
1949	100.00	102.26	89.72	87.46	12.54	11.80
1950	100.92	107.62	95.24	87.62	13.30	12.60
1951	111.00	105.19	102.46	97.27	13.73	13.73
1952	121.00	97.89	105.46	107.57	13.43	N.A.
1953	125.50	98.34	109.79	111.43	14.07	N.A.
1954	125.75	97.32	108.68	111.36	13.79	N.A.
1955	125.94	98.63	110.73	112.10	13.84	N.A.
1956	130.10	98.41	113.11	114.70	15.40	N.A.
1957	133.59	95.88	112.26	116.38	17.21	N.A.
1958	134.00	97.06	113.06	116.00	18.00	N.A.**
1959*	135.00	96.98	113.07	116.09	18.91	17.91

* March 1959
** N.A. - Not Available.

Refs: Wholesale Prices, 1951 to 1957 - U.S. Department of Labour, Bureau of Labour Statistics, U.S. Government Printing Office.

Prices and Price Indices, 1933 to 1959 - Dominion Bureau of Statistics Prices Division, Queens Printer, Ottawa.

Bank of Canada Statistical Summary, 1958 - Research Department, Bank of Canada, Ottawa. 1958.

TABLE 6

Newsprint

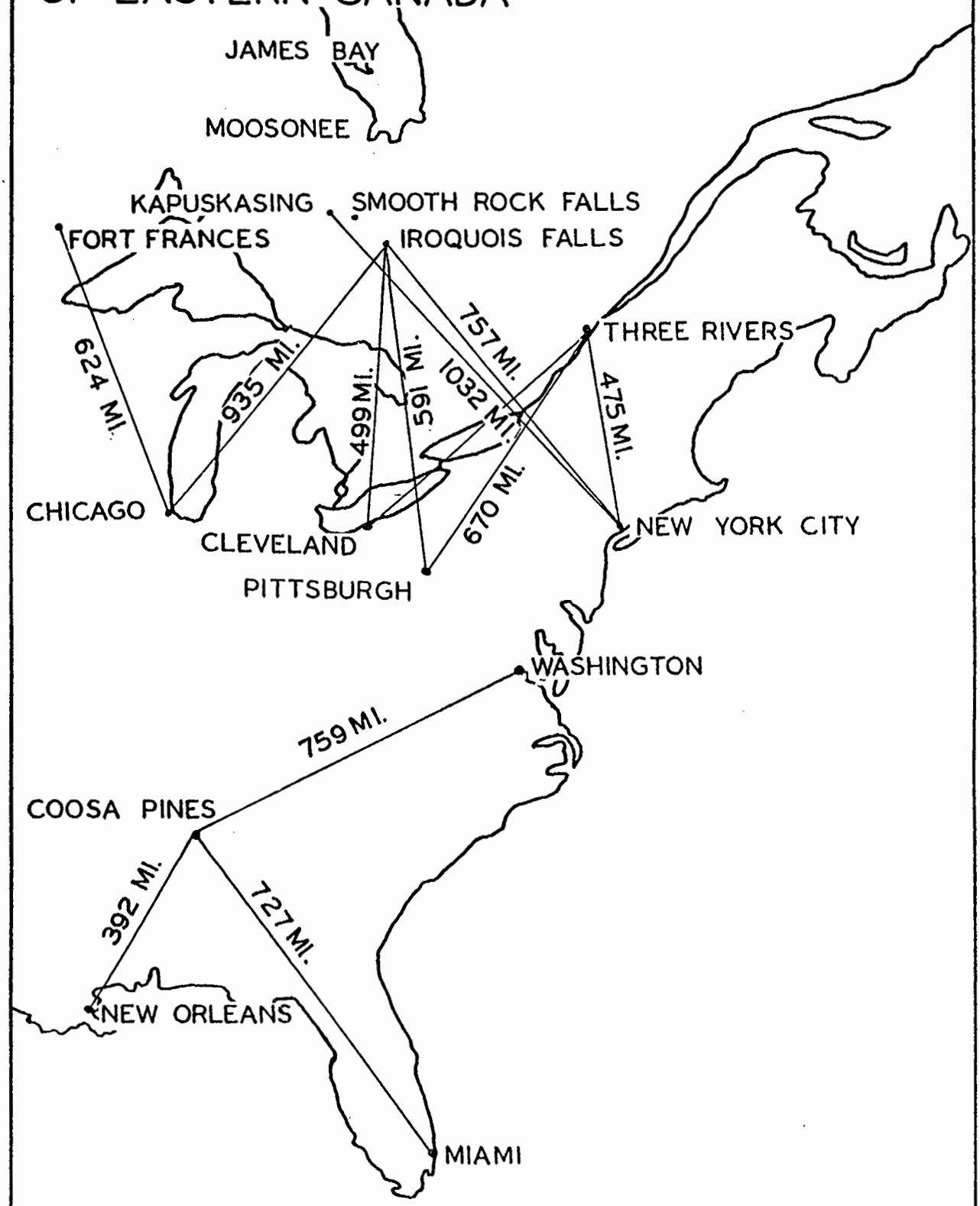
Freight Absorption and Phantom Freight from Iroquois Falls, Ontario and Three Rivers, Quebec to Selected U.S. Points - 1951 (Dollars)

1	2	3	4	5	6	7	8	9	10
Zone	Mill and Destination	Destination Miles	Delivered Zone Price	Average Sample Rail Freight to Selected Centre	Zone Price Differential	Administered Transportation Charge	Average Realised Mill-Net Price Cols.4-5	Average Mill-Net Zone Price Cols.4-7	Freight Absorption (-) Phantom Freight (+) Cols.8-9 per ton
1	Three Rivers to Boston	426	110.50	11.60	-1.50	12.23	98.90	97.27	+ 1.62
1	Iroquois Falls to Boston	711	110.50	16.20	- 1.50	12.23	95.30	97.27	- 1.98
3	Three Rivers to Pittsburgh	670	111.50	15.20	- 0.50	14.23	96.30	97.27	- 0.97
3	Iroquois Falls to Pittsburgh	591	111.50	15.20	- 0.50	14.23	96.30	97.27	- 0.97
Port City	Three Rivers to N.Y. City	475	111.00	13.73	- 1.00	13.73	97.27	97.27	-
Port City	Iroquois Falls to N.Y. City	757	111.00	16.00	- 1.00	13.73	95.00	97.27	- 2.27
Port City	Three Rivers to Cleveland	624	111.00	14.40	- 1.00	13.73	96.60	97.27	- 0.67
Port City	Iroquois Falls to Cleveland	499	111.00	14.40	- 1.00	13.73	96.60	97.27	- 0.67

Source: Transportation Factors in the Marketing of Newsprint.

MAP 6

DISTANCES OF SELECTED NEWSPRINT MILLS FROM MARKETS OF EASTERN CANADA



The distance handicap is most clearly illustrated from Table 6 which shows the apparent freight absorption in 1951 on newsprint from Iroquois Falls mill compared with Three Rivers to the main U.S. markets, (see also Map 6).

Many economists agree that the process of freight absorption is likely to protect high cost mills from the ravages of free price competition and price cutting during times of excess capacity such as were experienced in the 1930's. Even with the aid of fixed prices and freight absorption the Abitibi Power and Paper Company remained in receivership from 1932 until a refinancing was successfully arranged in 1946. It is by no means clear that under a system of free prices the James Bay mills would have survived this period at all, for the zone delivered pricing system was developed initially to protect sellers from price wars and extreme losses at a time when large excess capacity was the ruling feature of the industry.

"Geographic boundaries of the zone delivered price system when the zones were originally established probably reflected the average delivery cost of newsprint mills shipping to various sections."[5] F.O.B. factory pricing with freight allowed was designed to modify, perhaps even to eliminate, the effect of geographical location on costs. But the zone price system has been progressively distorted through extensive re-adjustment of newsprint freight rates (Tables 4 and 5) and by a series of general freight increases. Zone

---

5. Transportation Factors in the marketing of Newsprint, p.99.

price differentials are the least flexible part of the pricing structure and adjustment to rapidly rising freight costs has been slow. As a result it would appear that newsprint manufacturers are able to discourage the establishment of new plants outside existing areas of industry concentration. The inflexible nature of zone price differentials despite rapidly rising transportation costs has, on the whole, tended to increase freight absorption costs to mills in northern Canada and particularly to the three mills in James Bay basin.

If these mills are in fact high cost producers (as they appear to be) and if their operations are marginal as indicated by the weaknesses exposed during the 1930's, their survival is dependent, in large part, upon the system of pricing and marketing prevailing in the newsprint industry. In so far as the present system encourages a distortion of the economic pattern of plant distribution and capacity, new expansion in James Bay basin will simply supplement that geographical distortion.

The Kapuskasing mill sells newprint mainly to the New York Times Company and, at a current rate of $21.40[6] per ton, for a short line distance of 1,032 miles to New York is severely handicapped compared with southern Quebec mills which average $17.40 per ton for a distance less than 500 miles[7] (this presumes Kapuskasing sells to New York City although Chicago is an alternative market).

---

6. Freight Department, Canadian National Railway - Montreal, 1959. This is the currently quoted rate.

7. The Current New York - Three Rivers rate quoted by Freight Department, Canadian Pacific Railway - Montreal, 1959.

The main markets for Iroquois Falls mill are Pittsburgh and Cleveland where the mill holds a rate advantage over all competitors, but the cost of $21 and $25 per ton respectively entails considerable freight absorption, despite a port price differential to these cities, standing at $1 discount per ton in 1951, (see Table 6, facing page 69).

It is quite clear that the burden of freight rate increases falls particularly heavily upon the James Bay basin mills. Table 5 facing page 32, shows that while the base price Three Rivers to New York has risen from $7 per ton in 1939 to $17.40 per ton in 1959 or about 150%, the costs from Kapuskasing to New York have risen from $9.20 to $21.40 over the same period and costs from Iroquois Falls to Cleveland from $8.20 to $20 or 144%.

During the last 20 years, however, the New York delivered price has risen from $51 to $135 or by 167.4%, so that on a straight percentage comparison, it would appear that the delivered price is nearly keeping pace with rising transportation costs, although there may be some time lag between the establishment of new freight rates and a comparable base price increase.

Thus it would appear that the James Bay basin mills are not making losses by conforming to the fixed price of $135 per ton, even in comparison with their competitive situation in 1939. However, every freight increase is putting them at a greater freight cost disadvantage compared with other Canadian mills and with mills in southern United States. Unless freight rates equalization is rapidly completed

and unless zone price differentials are constantly varied in line with general freight increases, the more distant Canadian mills will continue to absorb a heavier freight burden and suffer a growing disadvantage in costs compared with their competitors.

CHAPTER VIII

FUTURE PROSPECTS

It is neither logical nor practical to consider the future growth of James Bay basin as a source of pulpwood and as a seat of paper manufacturing except in the broader environment of the pulp and paper industry and future consumption of paper products in North America as a whole. But the pitfalls of foretelling the future are legion, particularly for so large a field of business activity as is paper manufacturing.

Before venturing views about the future, it is a salutary experience to survey the fate of many projections which attempt to forecast with an accuracy unjustified by the statistical basis employed. Without referring to the several specific forecasts, it is necessary to scan the growth of the pulp and paper industry in Canada during the last fourteen years - observing that it has outstripped any that was envisaged before the Second World War - to realise how difficult it would be to try to forecast the next ten years with any degree of certainty or accuracy.

A glance at the history of the pulp and paper industry over the last decade invites the question whether 1958 has been a turning point. But it is manifestly beyond the scope of any individual, with only limited research resources, to embark upon a thorough examination of such a broad question with enough

authority to make the conclusions worthy of consideration.

It is indeed fortunate that the Royal Commission on Canada's Economic Prospects 1955 devoted some considerable effort to a study of the pulp and paper industry. A Brief presented by the Canadian Pulp and Paper Association at that time (1956) offered an authoritative statement of prospective demands in the industry. The estimates that the Association submitted were firmly based on a review of the past and forecasted the future with only limited ambition. The Brief remarked, of a forecast showing prospective demands for Canadian newsprint, "All that can be said and perhaps expected in that estimates should pass the test of reasonableness - as we believe these do"[1].

Even in 1955, when the Brief was prepared, it was impossible to foresee the events of late 1957 and 1958 when the industry suffered some setbacks. As a result, the 1960 forecast of U.S. newsprint consumption, at 5,250 thousand tons, may now be too optimistic. Consumption during 1958 was some 100 thousand tons less than the 1955 figure of 5,025 thousand tons, and this casts some doubt that the Association estimate will in fact be reached.

Nevertheless the long term estimates still fall within the range of the reasonable, particularly if the indicated recovery from the recent slack markets is as rapid as their onset at the end of 1957. The Association foresees "more than a doubling" of newsprint shipments from Canada by 1980 and "a 50% increase in shipments to United States ...

---

1. Submission to Royal Commission on Canada's Economic Prospects by Canadian Pulp and Paper Association, p.

In all a doubling or production would be needed to meet these requirements"[2].

The Association further estimated that between 1955 and 1980, woodpulp and pulpwood requirements would need to increase slightly more than 100%, (actually nearly 110%) over 1955 levels to meet in full the various demand trends. To support this overall growth, Canadian woodlands, currently yielding a crop of roughly 12.8 million cords, may be required to yield 27 million cords. Part of this increase the Association expected will be derived from more complete use of existing forests, from reduced losses and from greater use of material currently regarded as waste. After subtracting the addition from these sources roughly 3.5 million cords of wood remain to be supplied from new limits.

If this pattern does, in fact, work itself out during the next twenty years, it will likely have far-reaching effects upon that part of Canada's forest resources near to the margin of profitable and economic exploitation at the present time. It is possible that the next twenty years will see a filling-out of the northern frontier of Canada's pulp and paper industry, for it is in a northerly direction that the greatest ease of expansion now lies.

On the other hand, if competition from Southern U.S.A. or overseas countries such as Sweden intensifies, Canada's industry may be called upon to increase capacity by less than the volume indicated by the C.P.P.A. forecast. Most of the increase in supply of pulpwoop

---

2. Submission to Royal Commission on Canada's Economic Prospects by Canadian Pulp and Paper Association, p.53.

then required might be derived through more efficient usage of existing limits. As a result, the location pattern of the industry today would likely change very little.

Perhaps the most powerful and possibly the least predictable factors regulating the present locational pattern are the freight rate structure and the zone price marketing system. Should the former be altered significantly or should the latter be modified or abandoned the industry would respond to an entirely new set of cost and price forces which would undoubtedly be forthcoming.

But the marketing system has a long history of stability and has for long commanded the adherence of mills located in widely scattered parts of the North American continent. The forces which originally established and now maintain this pattern are found so broadly throughout the industry that there is little inducement to sacrifice the cost and sometimes profit benefits that accrue to newsprint manufacturers as a result of the zone price system.

The freight rate structure is more volatile and far more complex. It has already been pointed out that "across the board" freight increases have tended to widen the disparity between rates for equal distances rather than maintain a theoretical equality. It is highly likely that further general increases will be forthcoming in the near future which may discourage the entry of marginal producers, and increase the burden of freight absorption already born by Canadian mills located at points far distant from the main North American markets. The effect of the freight rate equalization policy introduced by the

Canadian "Railway Act" 1952 is so far difficult to determine, and the newly appointed Royal Commission which will inquire into the Canadian freight rate structure may suggest further realignment.

Many unknown possibilities exist which might prove to have far-reaching effects upon the pulp and paper industry should they become accomplished facts. Nevertheless, there is room for guarded optimism about the future of the industry in James Bay basin, assuming that the growth pattern forecast by C.P.P.A. is proved reasonable in the course of time. Mills are already firmly established here with adequate raw material supplies, heavy investment in plant and equipment and firm connections with a number of major consumers. Only a very serious decline in newspaper lineage resulting in reduced newsprint consumption, or the creation of an unfavourable price and freight structure, would seriously jeopardise their future.

It may be anticipated that increases in North American demand are likely to be reflected in the demand for paper products from James Bay basin. Such stimulation to production in the area should reinforce the trends in woods operations clearly under way at the present time, for it will lend added impetus to company plans for exploiting resources on existing limits northward of the present cut-over areas.

Under present methods of extracting raw material from the James Bay basin, rising costs of pulpwood delivered at the mill are inevitable as the cutting limits are moved northward. The increasingly difficult terrain, lack of suitable road and water communications and

progressively lower yield per acre of pulpwood all ensure that costs of extraction will become an ever more vital factor in the overall costs of production. In an industry where such costs put a powerful squeeze on final profit margins, it is essential that the delivered price of wood at the mill be held in check.

Throughout the region there is an acute awareness that this is the vital problem. It is most clearly apparent in the willingness of companies, in co-operation with Ontario Government forestry officials, to experiment. An attack is currently under way on three broad fronts; new methods of extraction from stump to access roads are being developed, artificial regeneration is being attempted and in conjunction with the use of formerly unsuitable tree species at the mill, the yield of pulpwood per acre is increasing. A new network of access roads is also being gradually constructed to carry improved trucks and machines to and from the cutting areas.

The objectives of experiments and innovations (described in Chapters V and VI) in handling wood from the stump are twofold. Initially cost reductions are being achieved by the substitution of machine power for man and horse power. But as terrain conditions deteriorate northward and a greater quantity of swamp and muskeg appear between the merchantable timber stands man and horse (and also most forms of standard moving equipment, such as John Deere and Terratac tractors and cable-yarder), fail in the jobs to which they are assigned. It is for these conditions that new methods and equipment must be specifically designed.

Equally serious is the problem of providing access roads over the northern sections of the limits. Shortage of good road material within a radius of 30 miles of construction has delayed an adequate road system on Abitibi limits and in the Smoky Falls area. Aerial surveys and map interpretation are proving of great assistance in this search so that eskers and gravel trains are being located more rapidly and more frequently than by ground cruising surveys.

With emphasis moving to road transport, away from difficult water hauling, roads are becoming a necessity to successful and cheap woods operations. But capital investment necessary for highways is very high and several companies confirmed that such a burden would be very hard to bear even for companies with very low production costs and wide profit margins (i.e. large reserves for capital expenditure). They further contend that the Ontario government should assist or subsidise road construction on crown limits operated (but not owned) by the paper companies. If this aid were forthcoming, future operations on timber rated as accessible, but not now cut, would be facilitated and the competitive position of northern Ontario firms would be strengthened.

Possibly the greatest hopes for holding the line on raw wood costs lie in the programmes of woodlands improvement and artificial regeneration organised on a joint basis by the Ontario Department of Lands and Forests and the paper companies. Both programmes are designed to encourage faster regrowth of cut-over areas to merchantable size with the aim of producing more wood from a given area over the period of the rotational cycle. If the programmes meet with success

it can confidently be expected that the most difficult terrain on present limits will never have to be exploited to maintain wood supply.

If demand on the North American continent forges ahead sufficiently to encourage the establishment of new mills, this part of northern Ontario is a potential site for at least one new mill. Already there are, from time to time, suggestions that the number of mills in James Bay basin could be increased. But the possible sites for a new mill are strictly limited, both physically and economically. The attraction of possible sites within James Bay basin compared with alternative locations elsewhere in Canada is very poor and there can be little doubt that the three most favourable sites in the area are already utilized.

Sufficient limits must be found to support a new mill in perpetuity. This entails not only finding an absolute quantity of pulpwood, but also finding wood concentrated over a small area to give a yield per acre of merchantable timber high enough for economic extraction. While the former is possible within the basin, the latter is far from certain.

The largest areas of merchantable timber not utilized at the present time lie to the north of the crown lands now held under lease. However, the yield per acre frequently falls below 10 cords and the proportion of waste land, swamp, water and muskeg averages more than 50% of the total land surface. A favourable area of land lies around the town of Hearst between the limits presently held by the mills at Kapuskasing and Smooth Rock Falls. But the resources

available here are insufficient to support a mill with capacity greater than 400 tons of pulp daily unless some extra limits are added from those now held by the mills to the east and west of the projected site, for it is doubtful if a new mill of less than 400 tons capacity would prove economical at the present time.

Sioux Lookout has been marked for some time as a prospective site for a new mill, and is better served by rail than any sites in James Bay basin. Furthermore a larger block of merchantable timber is available in the area to be taken up as limits. Plans were under way during the early part of 1958 to build a mill at Sioux Lookout but the recession has forced shelving of the project for the present. There can be little doubt, however, that as conditions improve in the industry the scheme will be revived.

It is apparent that while the physical capacity for expansion exists in James Bay basin, the area suffers severe economic handicaps imposed by its geographical location. As a general rule Subarctic Canada as a whole experiences similar handicaps, and while the North American economy can be fed from more easily accessible resources, the Subarctic will remain on the borderland of economic activity.

The future of Subarctic Canada, and James Bay basin in particular, lies only in part with its own ability to overcome the physical problems peculiar to the area. For the most part, the pace of North American economic development will be the major determinant.

Two factors are of vital importance, the extent to which the rate of economic growth outpaces supply from existing sources and the

rate at which natural resources presently being exploited are exhausted. The latter factor is of little importance to the pulp and paper industry because by sensible forest management present areas of wood supply will theoretically last in perpetuity. So that James Bay basin cannot rely upon the exhaustion of its competitor's raw material supplies to stimulate its own pulp and paper production. Hopes for future expansion in the area must be placed in a rapid and continuing growth in demand for paper products. For if demand increases in advance of supply, prices are likely to rise sufficiently to raise the marginal level of production in the industry. In this event the James Bay basin could hope for considerably expanded output from existing mills or the construction of new mills.

But the future must remain shrouded in uncertainty, for there can be no guarantee that the conditions described above will be fulfilled. If they are there is again no guarantee that such conditions would be maintained. The paper industry in James Bay basin has suffered serious decline in the past during periods of falling or low prices such as those of the 1930's. The past history of the area and its future prospects are indicative of the problem facing all of Subarctic Canada as well as the James Bay basin.

This problem is not, as some writers have emphasised, simply a problem of adverse physical conditions, but the problem of distance - distance from the markets of North America and isolation from the industrial heartland of the continent. Despite the improvement of road and rail and despite technological advances, both of which in effect draw the Subarctic closer to the large centres of

population, costs of transportation still restrict its development. As a result the future, like the past, promises only slow growth of economic activity, concentrated not in a regional pattern, but in isolated nodes of population and industry.

SUMMARY

The forces underlying location of pulp and paper mills in Northern Ontario are largely, though not exclusively economic; some are physical and a few are social and historical. Physical features have a critical value as barriers only with respect to a given state of technology, and any attempt to cut pulpwood from areas north of present boudaries in the industry is limited, for the most part, by the costs and efficiency of methods used to move pulpwood to the mills. Northern Ontario mills are distant from the main North American markets and, under existing practices of zone price selling they are forced to carry some part of the weighty burden of transportation costs on the finished product. While the present newsprint pricing system is maintained it effects the attraction of abundant raw material in northern Ontario and the area offers only limited inducement as a location for new pulp and paper mills.

BIBLIOGRAPHY

Chapter I

- Bowman, I.: Geography in Relation to the Social Sciences, New York, 1934.
- Greenhut, M.: Plant Location in Theory and Practice, 1956.
- Hoover, E.M.: The Location of Economic Activity, New York, 1948.
- Robinson, E.A.G.: The Structure of Competitive Industry, Cambridge, 1931.

Chapter II

- Canadian Pulp and Paper Association: Reference Tables, Montreal, May, 1958.
- Dominion Bureau of Statistics: The Pulp and Paper Industry, Annual Report 1956, Queen's Printer, Ottawa.
- Monthly Bank Review of Nova Scotia, August 1958, Toronto.
- Newsprint Association of Canada: Newsprint Data 1958.

Chapter III

- Bennett, W.D.: Logging Atlas of Eastern Canada, Pulp and Paper Research Institute of Canada, Montreal, 1958.
- Halliday, E.R.: A Forest Classification of Canada, Department of Lands and Forests, Ottawa, 1929.
- Hare, F.K.: The Climate of the Eastern Canadian Arctic and Subarctic and its Influence on Accessibility, Montreal 1950.
- Hustich, E.: Phytogeographical Regions of Labrador Arctic, Volumbe 2, No. 1, 19
- Lower, A.R.M. and Innes, H.A.: Settlement and the Forest Frontier in Eastern Canada; Canadian Frontiers of Settlement Series, Vol.IX.
- Marr, J.W.: Ecology of the Forest Tundra Ecotone on the East Coast of Hudson Bay - Ecological Monographs No. 1, McGill University 1948.
- Moir, D.R.: Land Forms in the Region of South of Hudson Bay, Republication Manuscript.
- Neilson, J.M.: The Mistassini Territory of Northern Quebec. Canadian Geographical Journal, Vol.37, 1948.
- Ritchie, J.C.: The Vegetation of Northern Manitoba, Studies in the Southern Spruce Forest Zone. Reprint from Canadian Journal of Botany, Vol.34, pp.523-561, 1956.

BIBLIOGRAPHY contd.

Chapter IV

- Lachance, P.E.: A Study of the Pulp and Paper Industry of the Province of Quebec in Relation to its Present and Future Wood Supplies. Ph.D. dissertation, University of Michigan, 1953.
- Miller, V.P.: A Geographical Analysis of the Location Factors of the Pulp and Paper Industry in Eastern Canada.
- M.A. thesis at Pennsylvania State University 1957.
- Water Resources Branch, Department of Northern Affairs and National Resources - Water Powers of Canada, Ottawa 1958.

Chapter V

- Bennett, W.D.: Logging Atlas of Eastern Canada - Pulp and Paper Research Institute of Canada, Montreal 1958.
- 'Canadian Pulp and Paper Industry', Annual Review, April 1958.
- "The Paper Industry', October 1956. "Truck Trailer Hauling in Abitibi's Pulpwood Operations."

Chapter VI

- Canadian Pulp and Paper Industry: "Logging the Labrador", Vol.9, No.6, June 1956.
- Jarvis, J.M.: Air Photo Interpretation for Forest Management, Canadian Pulp & Paper Industry, Vol.11, No.3, March 1958.

Chapter VII

- Abitibi Power and Paper Co.: Annual Report 1958.
- Bank of Canada: Statistical Summary 1958 - Research Department, Bank of Canada, Ottawa 1958.
- Dominion Bureau of Statistics: Prices and Price Indices, 1933 to 1959. Ottawa 1934 to 1959.
- Johnson, V.E.: Statement to Royal Commission on Canada's Economic Prospects 1956. Ottawa 1957.
- Kellog, R.S.: Newsprint Paper in North America - Newsprint Service Bureau, New York 1948.
- U.S. Department of Agriculture: The Demand and Price Situation for Forest Products, Washington 1957.
- U.S. Department of Commerce: Transportation Factors in the Marketing of Newsprint, Transportation Series No. 2, Washington 1952.
- U.S. Department of Labor: Wholesale Prices - 1951 to 1957.
- Bureau of Labor Statistics, Washington 1952 to 1958.
- Financial Post Card - Abitibi Pulp and Paper Co. Ltd. - The Financial Post Corporation Service, Montreal 1959.

BIBLIOGRAPHY contd.

Chapter VIII

- Canadian Pulp and Paper Association - Submission to the Royal Commission on Canada's Economic Prospects, Montreal 1956.