THE PAPER INDUSTRY IN THE LAKE STATES REGION

1834-1947

A thesis submitted to the Graduate School of the University of Wisconsin in partial fulfillmemt of the requirements for the degree of Doctor of Philosophy.

by

Maurice Lloyd Branch

Date July 29, 1954

To Professors: **Earley**

Witte

Knight

This thesis having been approved in respect to form and mechanical execution is referred to you for judgment upon its substantial merit.

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Approved as satisfying in substance the doctoral thesis requirement of the University of Wisconsin.

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Date August 12, 1954

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MAURICE LLOYD BRANCH

A Thesis Submitted in Partial Fulfillment

of the Requirement for the Degree of

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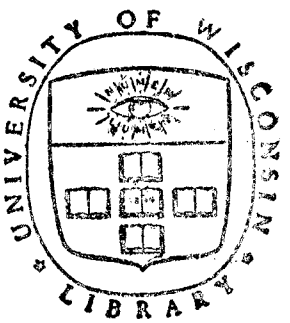
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MLB

PART I

THE SCOPE AND NATURE OF THE STUDY

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CHAPTER I INTRODUCTION

CHAPTER I

INTRODUCTION

Section I. Why Study a Regional Industry?

For at least two decades economic studies on a regional basis in the United States have become somewhat a vogue for economic investigations. This has come about because a regional investigation is one of the better ways - in fact in some instances the only way - to study economic growth. Economic growth has taken on added significance for students since the concept of economic maturity and its consequential effect upon income and employment became the subject of much discussion in the 1930's. Correlative to many of the aspects of economic growth is the analysis of location of industry, the importance of which has been noted by E. M. Hoover's excellent book, Location of Economic Activity.[1] To answer,

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[1] E. M. Hoover, Location of Economic Activity (New York, 1948).

therefore, some of the questions which arise in an investigation of problems of economic growth and industry location, it seems necessary, as part of the analysis, to make empirical studies of actual industries. These industries, furthermore, are often naturally divided along and studied by economic regions.

Section II. The Lake States Region Defined

The study of a region can take a variety of forms depending upon the particular field and nature of the inquiry. Furthermore economic regionalism, which is itself a special type of study, can be approached in numerous ways. Although a regional analysis need not follow the boundaries of a political subdivision or subdivisions, this investigation is a regional study of an industry which naturally follows the political borders surrounding three states - Minnesota, Wisconsin and Michigan. In economic literature these three states are often referred to as the Lake States.

Historically the paper industry developed in this region in such a manner as to make the industry structurally and economically separate from areas surrounding it. On the region's northern and eastern boundaries, the Great Lakes and the U. S. - Canadian border provide the separating factor. On the region's western and southern borders, wood supply is the definitive factor. The Lake Central area (Illinois, Indiana, Ohio) on the Southern border,

which could conceivably be included in the Lake States region by its geographic position, is distinct by its lack of wood and the nature of the paper industry which is found there.

What is more, government bureaus, such as the census bureau and forestry division of the Department of Agriculture, and other agencies and other students have dealt with, collected data on and studied the Lake States area as it is defined here.

Section III. The Thesis

It is hoped that this investigation will make a significant contribution to the knowledge of the economic development and location of the paper industry in the Lake States. Although a strong thread of locational analysis can be traced throughout this investigation, the main stress is placed on the factors and conditions affecting the growth and development of the industry. It is assumed the treatment of the growth and change of an industry in a region, when combined with consideration of the forces that have impinged upon it during its various phases of development, is a valid and possibly superior way of finding out what factors determine an industry's location.

The growth of an industry implies adjustment and rationalization of that industry to a configeration of forces which act and react upon it. In a "static" environment or an environment in which change is secular,

an industry can theoretically adjust in time so it is perfectly rationalized with its environment and optimum with respect to its position in this environment; change and growth are not dominant characteristics. In this environment also it is likely that the factors which were instrumental in the initial location of the industry will remain as relatively important over time as they were originally.

However, in our modern economy change is the rule rather than the exception. And the position of an industry in its economic environment may be optimum in its inception but later non-optimum. This means an industry must continuously adapt and re-adapt its position in accordance with changed conditions.

The degree to which an industry can adjust to change depends upon a large number of factors. A street corner shoe-shine boy can adjust to a changed market configeration more easily than a steel mill. On the other hand, the steel company might be better able to mold the market forces to its advantage than the shoe-shine boy. Yet, both must adapt to change - the phenomenon of change being a universal attribute of our society.

The paper industry in the Lake States region (and generally in the United States) has been constantly under the coercion of change since its beginning. For the Lake States changed conditions have generally been the handmaiden of growth and progress, but for some paper-producing

regions, of decline. Change, adjustment to change, and growth is a pattern which is evident throughout the history of paper manufacture in the Lake States region. These changes have resulted from both natural and institutional causes.

A complete and exhaustive study of the causes of change and their effects on progress and development of the paper industry is not attempted. This investigation is confined primarily to the study of certain key enabling (or disabling) factors in the initial location and later development of paper manufacture in this region. In large degree, this study deals with the two basic constituents of papermaking - water and wood. Throughout the reader should look for the constantly changing configeration of these two elements, as well as others, to which the paper industry in this region has continuously had to orient itself.

Section IV. The Lake States Paper Industry

The pulp and paper industry (or paper industry as used here) comprises those establishments engaged primarily in the manufacture and sale of pulp, paper and paperboard. Paper firms are of two general types: integrated and non-integrated. The integrated mill manufactures its own pulp jointly with the manufacture of paper. The non-integrated mill manufactures paper only; it buys manufactured pulp. Firms engaged principally in converting paper stock into

paper products, such as bags, boxes, envelopes, labels, dishes, paper napkins, waxed paper, crepe paper and wall paper are generally excluded from consideration, although this separation cannot always be made.[2] The principle products manufactured by the pulp and paper industry are groundwood, sulphite, sulphate and soda pulp; newsprint, wrapping, book, writing, tissue, sanitary, building and miscellaneous papers and paperboards of all kinds.

The paper industry of the United States, of which the Lake States paper industry is an important part, is a substantial contributor to the annual increase in the income of the nation. In 1947,[3] on the basis of value added by manufacture, the Paper and Allied Products Industries accounted for approximately 1.3 percent of the value added by all industries, and 3.8 percent of the value added by all manufacturing industries in the United States. The value added was $2.23 billions.

The Lake States region is one of the major paper-producing areas in the United States. In 1947, on the basis of value added, the pulp and paper-paperboard industry in this region produced 18 percent of the total value added by the entire United States paper industry. By rank, on the above basis, Wisconsin and Michigan were

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[2] In the text when converting manufacture is also included with pulp, paper and paperboard manufacture, the name "Paper and Allied Products" is used.

[3] U. S. Bureau of Census, Manufactures.

second and third in the nation; New York, first. Minnesota was fifteenth.

Within the respective states, the paper industry is likewise an important source of income. On the basis of value of products, the paper industry ranked third among all industries in Wisconsin; seventh in Michigan and fifth in Minnesota in 1947.

In relation to the above measures, the paper industry is an important part of the national economy as well as the economies of the separate Lake States. What is more, if the value contributed by those industries which service and equip the paper industry is also included in the above measures, the importance of the paper industry is increased.

Section V. Economic Studies of the Paper Industry

The only two notable books written on the general economics of the paper industry in the United States are L. T. Stevenson's, The Background and Economics of American Papermaking,[4] and J. A. Guthrie's, The Economics of Pulp and Paper.[5]

There are innumerable books and articles written on the history of the paper industry in the United States. Among the books, those written by Dard Hunter and

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[4] Louis T. Stevenson, The Background and Economics of American Papermaking (New York and London, 1940).

[5] John A. Guthrie, The Economics of Pulp and Paper (The State College of Washington Press, 1950).

Lyman Weeks contain most of the general history which is available. There are some definitive histories of the paper industry within the separate states, of which an example is, 1848-1948, A History of the Wisconsin Paper Industry.[6] Most of these histories contain some information of value for economic interpretation and analysis.

There are many studies of individual companies, but these are generally more historical than economic. There are, however, a large number of economic studies, both large and small, on certain specific aspects of the paper industry, such as pulpwood consumption. These latter studies are often regional in scope. Again, sections of the industry itself, such as newsprint manufacture, have been thoroughly investigated.

Some but not many regional economic studies have been made of the paper industry. The Executive Department of the Division of Commerce of New York State in 1942 published an economic analysis entitled, "The Paper and Pulp Industries of New York State". This study deals with New York State in particular; however, much of the material presented is regional in scope. The Southern and Pacific Coast regions have been studied more or less comprehensively. On the other hand, little in economic analysis has been written about the Lake States region. Although

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[6] Howard Publishing Company, 1848-1948, A History of the Wisconsin Paper Industry (Chicago, 1948).

the Lake States have been included for comparative purposes in studies of other regions, they have not themselves been the center of such a study. It is hoped, therefore, this present study may partially fill a gap left by an important paper-producing region which has heretofore received no special attention from students.

Section VI. Methodology

This study is not intended to be a history; rather, it makes use of the analytical-historical method to describe and explain the importance of certain basic enabling factors in the location and development of the paper industry in this region. Furthermore, this study is not an attempt to prognosticate the future of the industry in this region. Any reference to the future will come only as a result of and to the degree which an analysis of these enabling factors may indicate, as a first approximation, the industry's future. An inquiry which attempts to depict what the industry's growth in future is likely to be in this region would go far beyond the confines of this investigation.

Historico-statistical comparisons are primarily relied upon to indicate what the position of the Lake States has been, either wholly or separately, relative to other regions and to the entire United States industry.

Section VII. Chapter Sequence

This study is divided into five parts, the first and last parts are the introduction and conclusion respectively. Parts II, III, and IV present the body of the study and are formulated on a chronological basis by separating the material into three major time periods: 1834-1890, 1890-1919, and 1919-1947.

Part I, The Scope and Nature of the Study, includes Chapter I, the Introduction. Part II, The Pioneer Period of Papermaking in the Lake States Region, 1834-1890, comprises Chapter II which explains how and why paper manufacture became established in the Lake States in this period. Certain popular notions are dispelled. Here it will be noted that aside from the region's natural endowment of water which could be used for power, the circumstances which brought papermaking to this region were common to almost all areas in the United States where paper manufacturing was established before 1890. Part III, Lake States Papermaking Undergoes Change and Growth, 1890-1919, includes Chapter III which shows that the conditions responsible for the initiation and growth of the industry in this region before 1890 were largely superceded by quite different conditions in the next period, 1890-1919. Adapting itself to these new conditions made it possible for the region's paper industry to grow substantially in this period. Part IV, Paper Manufacture in the Lake States,

1919-1947, consists of Chapters IV, V, and VI. Chapter IV is designed to give a statistical analysis of the development and character of the paper industry from 1919-1947. The importance, competitively, of a cheap and abundant wood supply for the Lake States paper industry is emphasized. Chapter V attempts to present the entire picture - from the past to the present - of the circumstances which have affected the supply of wood for papermaking; the changes in this wood supply which the Lake States paper industry has had to conform and adapt itself to. Chapter VI presents some new problems connected with water use and trade restrictions which have appeared for the most part since 1919, and which have affected the growth and character of the Lake States paper industry. Part V, Conclusion, consists of Chapter VII which gives a summary and the conclusion of the study.

PART II

THE PIONEER PERIOD OF PAPERMAKING IN THE LAKE STATES REGION, 1834-1890

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CHAPTER II

PAPER MANUFACTURE COMES TO THE LAKE STATES

Section I. Introduction

The passage of time often obliterates knowledge of cause and effect. The reasons for the existence of an industry today, for example, need not, in fact, probably does not explain why and how it came to be established. The notion is common that the paper industry was attracted to the Lake States region because wood, the stuff from which paper is now made, is found in abundance there.[1]

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[1] An example of this belief is shown by a statement about the Fox River area which reads ". . . events of 1872 fairly well established the Fox River as the paper making center of Wisconsin. Natural advantages had much to do with this . . . the forests adjacent to the settlements had trees suitable for pulping . . ." See: 1848-1948, A History of the Wisconsin Paper Industry, op. cit., p. 14.

It is also believed the first group of enterprisers to become active exploiters of this region's wood resources, the lumbermen, provided the paper industry with much of the capital and entrepreneurship for its beginnings and early development, that is, as lumbering waned, lumbermen sought to redeploy their capital and talent.[2]

That wood was used as a raw material in the early development of the paper industry in this region is a mistaken notion, as will be clearly shown later.[3] It will suffice at present to state that wood was not used in significant amounts to make paper until after 1890, over 55 years after the first paper mill appeared in this region.

Furthermore, there is reason to believe that the contributions of lumber personnel and capital to the development of the paper industry in the period up until 1890 were less than had been thought. For example, lumbering in the Lake States did not decline significantly until after the turn of the twentieth century; it was still at a peak as late as 1904. This hypothesis is not easily tested,

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[2] One of Wisconsin's early lumbermen wrote that ". . . Papermaking on the Wisconsin River, and in a measure upon other northern Wisconsin streams either followed lumbering, or was carried on jointly with the lumber mills then in operation. . ." See: J. H. H. Alexander, "Eighty-Four Years Ago", The Paper Industry, XIV (December, 1932), 670.

[3] A complete picture of the introduction and use of wood for making paper is given in Chapter III.

however. No comprehensive investigation of the actual sources of capital and enterprise for this region's paper industry has been made. A part of this study, consequently, is devoted to examining the validity of this hypothesis. In addition it is hoped that study of this pioneer period will establish how and why paper manufacturing became located in this region during this period and will reveal characteristics to help explain the development of the industry in later periods.

The 56 years between the establishment of the first paper mill in this region (1834) and 1890 provides the focal point for this query into the beginnings of papermaking in the Lake States region. This is referred to as the "pioneer" period [4] because during this time papermaking began in the Lake States and because this period was distinctly different from others to follow. An era in the art of papermaking had largely come to a close by 1890. Conditions which enabled the initiation and growth of the industry were superceded by other and distinct conditions. Rags and straw, the principle raw materials in papermaking before 1890 were largely displaced by wood; water, a principle source of power, lost much of the

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[4] The pioneer period thus defined excludes from practical consideration the paper industry of Minnesota. By 1890, Minnesota's paper industry was yet too small to be included in the statistics of the U. S. Census Bureau; in that year there were only two paper mills in the state.

influence it had on the location of paper mills after this period.

Section II. How and Why the Paper Industry Came to the Lake States

A. Papermaking Moves West

Although nearly 150 years elapsed between the building of the first paper mill in America and the first mill in the Lake States region, events which led to the latter fitted into a general pattern which saw most of what is now the United States proliferated with paper mills.

Just as the art of papermaking had spread from East to West in direction since antiquity, the art after it was carried from Europe to America by William and Nicholas Rittenhouse, continued its westward movement across the United States.

The first mill built west of the Appalachian Mountains did not appear until 1793, in Kentucky, and the second mill established west of the mountains was built in Western Pennsylvania in 1796. From this point on mills appeared in a fairly linear, east-west fashion across the American continent. From western Pennsylvania the Lake States were soon reached. The first mill in Ohio appeared in 1807; in Indiana in 1826; in Michigan, 1834; in Illinois, 1840; in Wisconsin, 1848; and in Minnesota,

1859, by which time the first paper mill in California had appeared.[5]

B. The Pattern of Movement

Besides the directional east-west movement, the spread of the paper industry fitted into other more or less regular patterns.

Papermakers Followed the Printer

Papermakers were seldom if ever among the "first wave" of western settlement of the United States. Even the first paper mill in America did not appear until a fairly considerable time had elapsed after the original settlements. In all cases, the first paper mills did not appear until after a local market had appeared, usually in the form of a printing shop. For this reason, the Rittenhouses settled near Philadelphia where a printing house had been operating since 1685. They did not stay long in New York after their arrival from Holland because no printing establishment existed there at the time.[6]

The population centers which attracted the printer,

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[5] Dard Hunter, Papermaking, The History and Technique of an Ancient Craft, 2nd ed. (New York, 1947).

[6] Dard Hunter, Papermaking in Pioneer America (Philadelphia, 1952), p. 22.

who in turn supplied the market for the papermaker's products, also supplied the basic raw material for papermaking - rags.

Water Power Vital

Water was another controlling factor in the location of paper mills in early America. Water is an absolute requirement for papermaking. It provides the solution in which the cellulose fibres of rags or straw can be suspended and formed into a mat which becomes paper when the water is removed. But more important to these early mills, water supplied the basic source of power. Paper manufacturers throughout the United States up until about the turn of the 20th century were limited in their choice of location to those sites which could supply them with adequate water energy. Furthermore, water was, in those frontier days, an important transportation medium often connecting the manufacturer to his raw material supply and to his market.

Markets Localized

A third factor can be recognized in this very early developmental pattern - the localized character of the market. This localization of industry was, of course, due to the slow, inadequate and costly transportation system of this period. Dard Hunter writes that "An

examination of the paper used in early Ohio imprints and for the inscribing of documents and letters reveal that the early settlers of the West did not rely upon the well-established mills of New England and Eastern Pennsylvania for their writing and printing paper. From the beginning of printing in Ohio, the newly founded paper mills of the West supplied the needs, although not always in sufficient quantity, and only after overcoming almost insurmountable difficulties of transportation".[7]

The difficulties of securing paper by early printers from distances sometimes not over 100 miles is typified in an editorial in the Scioto Gazette by its Ohio editor, Nathaniel Willis. This was in 1802, five years before the first paper mill appeared in Ohio.

> "By reason of the Menongehalia River not having been navigable for some time past, we have been disappointed in receiving a supply of paper from Redstone, which was contracted for and to have been delivered at the mouth of Scioto last month; in order to obtain a supply we sent to the mills at George-Town, Kentucky, but in this effort we were also disappointed, there not being a ream to be had, we have therefore been under the necessity of sending by land to Redstone, at a very heavy expense, from whence we shall be furnished in two weeks, our readers will therefore excuse our issuing half a sheet, during that period. From the circumstances of the high price at which paper now comes at, the Editor earnestly calls on those indebted, . . . to come forward and make payment."[8]

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[7] Ibid., p. 110.

[8] Ibid., p. 105.

Such was the pattern of development of the paper industry when it reached Michigan in 1834. In its general outline, the pattern fairly accurately portrays the initiation of the paper industry over the entire United States. The pattern's several parts - (a) the east-west movement of the industry, (b) its close proximity to a community which could supply a market and raw material, (c) its location near water power, (d) and finally, the localized character of its market - could be seen in each area as frontier America headed towards the Pacific.

C. The Lake States - The Pattern Repeated

The pattern of location and development of paper firms in the Lake States repeated closely the development which took place previously in the eastward sections of the United States.

The first mills established in Michigan, Wisconsin and Minnesota not only fitted the spatial, east-west pattern - having been established in 1834, 1848 and 1859 respectively - but they also fitted the localized form as well. Furthermore, the specific locations of these mills were oriented to water power and the market.

In both Wisconsin and Minnesota, the first paper mills produced for the printer's market.[9] Wisconsin's first

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[9] The first mill in Michigan produced a product known as butcher's paper; however, printer's paper was produced shortly thereafter.

papermakers were Messrs. Ludington and Garland, who erected their mill in 1848 on the Menominee River on the west side of Milwaukee. On January 10, 1848, the Milwaukee Sentinel and Gazette reported that this new paper mill ". . . will be welcome news to many of the presses in the territory dependent on Milwaukee for their supplies of paper, as we understand they have but a short stock on hand, and there is none for sale here".[10] One year hence, the mill, under new management, was turning out 110 reams a week, "enough to supply the entire press of the state". As this mill was not supplying all the presses in the state, a ready market was found in Chicago, "which so busied Cameron /the new proprietor/ that he never had a stock in store".[11]

The earliest mention of paper made in Minnesota's pioneer mill appeared in the Minnesota Farmer and Gardener in 1860. In this paper the editor says that "this number of the Farmer and Gardener is issued upon the first printing paper manufacture in Minnesota or the North-west".[12]

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[10] Howard Publishing Co., 1848-1948, A History of the Wisconsin Paper Industry, op. cit., p. 6.

[11] Ibid., p. 6.

[12] Hunter, Papermaking, The History and Technique of an Ancient Craft, op. cit., p. 563.

Such were some of the circumstances which brought papermaking to the Lake States region. A glance at production statistics of Lake States mills over the last 30 years of this pioneer period show that an expanding market supplied the necessary impetus to growth and development of the industry, even though market areas at the outset were fairly localized.

After the Colonial-frontier period was over and comprehensive transportation was initiated by the railroads; after these and other factors had freed the markets from their "localness"; many paper-producing locales disappeared and paper manufacture became oriented to forces which were nationwide. Producing regions superceded producing localities in the struggle for existence. As will be shown, these larger and more comprehensive forces were tolerant of the Lake States, and the region's industry prospered and grew as the national economy overshadowed the local economy of earlier days.

Section III. The Lake States - Abundant Water for Power

In the early days of papermaking in the Lake States region, water as a source of power was, along with market possibilities, the major factor in the location and early development of the industry. Literature of that day, from publications of Chambers of Commerce to those of historical societies, lauded the merits of the fine power sites

which could be found in this region. As late as 1908, in a thorough study of water powers in Wisconsin, it was written that "Probably not more than a half dozen other states in the Union are so favorably situated with reference to water powers as is Wisconsin. If properly husbanded and developed it seems certain that at an early date these water powers will be regarded as the most important natural resources of the state".[13]

Water Power A Definitive Factor in Early Plant Location

A visual conception of the importance of water power in locating paper firms in Wisconsin (which was also typical of the Lake States and the United States as a whole before 1890) is seen by Map 2-A, which shows the distribution of pulp and paper mills in 1895. From this map one can see a very close correlation of plant location to water power sites. Few if any of these mills are located on other than water power sites.

Water Power More Important to Paper Industry Than to Most Industries

Although water power was an important source of power for all United States industry in general in the period

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[13] Leonard S. Smith, The Water Powers of Wisconsin (Madison, Wisconsin, 1908), Wisconsin Geological and Natural History Survey, Bulletin No. XX, Economic Series No. 13, p. xvii.

Map 2-A

Distribution of pulp and paper mills[a] in Wisconsin, 1895.[b]

[a] Pulp mills and paper mills are shown separately even though they may be combined into a single firm.

[b] Compiled from: Lockwood's Directory of the Paper and Allied Trades published by Lockwood Trade Journal Co., New York, 1895.

before 1890, it was proportionately of much greater importance for the paper industry; this can be seen in Table 2-1.

Table 2-1

Power generated in all U. S. manufacturing industries, in the U. S. paper industry and in the Lake States paper industry, 1890.[a] (shown as percent of total power generated by steam and water)

	All U.S. Manufacturing Industries	U.S. Paper Industry	Lake States Paper Industry[b]
1. Water power	22	69	81
2. Steam	78	31	19

[a] Source: U. S. Census Bureau, Manufactures.
[b] Wisconsin and Michigan

Whereas all U.S. manufacturing industries derived about 22 percent of their power from water in 1890, the paper industry generated 69 percent from this source. The relatively rich endowment of water which could be used for power in the Lake States appears to be indicated by the fact they generated 81 percent while the entire nation's industry generated only 69 percent of its power from water.

Furthermore, the need for much power in the manufacture of paper was great. As late as 1900, the U.S. Census Bureau reported that the paper industry ranked second among all industries in the average amount of power used per establishment; this was 15 times more

power than required in the average manufacturing establishment in 1900.[14]

It can be concluded, therefore, that the great need for power in manufacturing paper, coincident with the availability of water power in certain areas, were definitive factors in the location and development of the paper industry in general and the Lake States paper industry in particular, before 1890.

Section IV. Industry Growth, 1860-1890

Paper Manufacturing Grows Rapidly

In the Lake States paper manufacturing took part in and far outstripped the general development of the industry between 1860[15] and 1890. Growth of paper production (by value) for the Lake States and the United States is shown in Table 2-2 for this period.

The two states combined (Wisconsin-Michigan) comprised only about 1.52 percent of total value of paper products for the United States in 1860, but by 1890 this proportion had increased to approximately 9.0 percent. On the basis of an index of growth, Wisconsin-Michigan's paper industry

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[14] U. S. Census Bureau, Manufactures, 1900.

[15] 1860 was the first year in which statistics for the Wisconsin and Michigan paper industry were recorded by the U. S. Census Bureau. Regular listing of statistics for the paper industry in Minnesota did not occur until after 1904.

Table 2-2

Index of growth of paper production (by value) for the United States and Wisconsin-Michigan. Also Wisconsin-Michigan production as percent of U. S., 1860-1890.[a]
(1860 = 100)

	1860	1870	1880	1890
United States				
1. Index of Production	100	240	259	350
Wisconsin-Michigan				
1. Index of Production	100	220	780	2250
2. Value of Production as percent of U. S.	1.52	1.71	4.48	8.8

a Source: U. S. Bureau of Census, Manufactures.

increased in size over 22 times between 1860 and 1890. This increase took place while the entire U. S. paper industry (Wisconsin-Michigan included) increased only about 3.5 times.

These index numbers, of course, reflect primarily the smallness of the Lake States industry in 1860, thus growth is magnified; however, the increased percentage of total U. S. value of production of paper produced by the Lake States is a real and significant indication of the region's growth during this period.

The changes in the size and configeration of the markets appears to have been partial reason for the growth in this period. Aside from the fact that total consumption

of paper was increasing (see Table 3-1, p. 42), an apparent and significant change was taking place in the market structure initiated by a more developed transportation system. Undoubtedly, the period of rapid growth in railroads after the Civil War facilitated the merging of many of the local markets which had existed earlier.[16] In Wisconsin, for example, the period 1860-1890 saw a seven-fold increase in railroad mileage and a twenty-two-fold increase in the value of paper production.[17]

Between 1870-1890 when much of the very early market localness presumably disappeared, water power as a consequence must have furnished one of the main conditions for the growth of certain areas within the region such as the Fox River Valley in Wisconsin. We turn attention to this area, which was a highly concentrated paper-producing area

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[16] In Wisconsin, for example, a fairly well-developed network of railroads was being established between 1860 and 1890. In fact, railroad growth after 1890 declined abruptly in Wisconsin.[a]

Date	Miles of R. R.
1860	891
1867	1030
1890	5583
1910	6533

[a] See: William F. Raney, "The Building of Wisconsin Railroads", The Wisconsin Magazine of History, Vol. XIX (State Historical Society of Wisconsin, 1936), 388.

[17] U. S. Bureau of Census, Manufactures.

by 1890, to investigate a final subject concerning early paper manufacture in the Lake States - the apparent origins of capital and enterprise.

Section V. The Origins of Capital and Enterprise: A Partial Investigation

A. Introduction

An investigation into the type of entrepreneur who initiated papermaking during this pioneer period in the Lake States and how he accumulated the capital to start his business is important because: (1) It tests the hypothesis that lumbermen and lumber capital contributed significantly to the inititation and development of the paper industry before 1890. (2) It adds to the knowledge of the origins of papermaking in this region and its later development.

A complete investigation of the entire region is not attempted. An effort is made to test the hypothesis only in the Fox River Valley - an area small enough to afford minute investigation, but large enough, it is hoped, to be significant.

After consultation with a number of informed people directly connected with the paper industry, the Fox River Valley was selected for "sample" study for the following reasons: (1) It is one of the oldest and longest lived paper areas in the region. (2) The reasons for the original location and growth of the industry in this area

were, in general, similar to those encountered by firms in other parts of the region. And (3), the Fox River Valley is today, as it was then, one of the most concentrated paper areas in the region.

B. Fox Valley Paper Pioneers:[18] Their Source of Capital

Capital Requirements Small Prior to 1890

The amount of capital needed to start a paper business in the late 1800's in the Fox Valley was indeed small by today's standards. For nine companies in the area (see appendix B) originating before 1890, an average of $74,000 was used to launch a paper business. For individual firms this ranged from $10,000 to $150,000. Even on a capital per ton of capacity basis, the amount of capital needed was small in comparison with today. Using $74,000 as average, a mill established in the Fox Valley before 1890 with a daily capacity of ten tons meant an investment of only $7,400 per ton of capacity. In 1949, total assets per ton of daily capacity in the average paper mill in the United States amounted to

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[18] The term pioneer is used here to indicate those persons whose names appeared on the original incorporating documents of paper firms established in the Fox Valley in Wisconsin before 1890. A complete list of these incorporators was made. Information about each was then sought through company, county, and state records, histories, etc. The information thus derived is presented in Section V of this chapter. For further details see appendix A.

about $65,000.[19] Some recent mills have been built at approximately $100,000 per ton of daily capacity.

In general, the passage of time reflected growing capital requirements for a firm entering the industry. For those firms in the valley which began operations after 1880, an average of about $151,000 more was required to launch a going concern than before 1880.[20]

Apparent Sources of Capital

Table 2-3 shows the apparent sources of venture capital provided by the men who established paper businesses in the Fox Valley before 1890. The results do not show that any industry was significantly more important than any other in contributing entrepreneurs and

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[19] American Paper and Pulp Assoc., The Statistics of Paper (2nd ed.; New York, 1949), p. 58.

[20] The average amount of capital employed in paper establishments in the United States as reported by the U. S. Census office in 1902 was:

1850	$ 16,390
1860	25,320
1870	51,043
1880	64,878
1890	138,412
1900	219,538

Here we see in 1890 about $74,000 more capital was employed in the average firm than in 1880. Note that this is not starting capital, however.

Table 2-3

Apparent Sources of Capital of 38 Pioneers of Papermaking in the Fox River Valley[a]

Source	Primary	Secondary
1. Borrowed	2	—
2. Inheritance	3	—
3. Saved money from previous employments or business ventures		
a. Lumber industry	8	1
b. Flour industry	6	3
c. Trading and merchandising	4	3
d. Paper industry (elsewhere)	4	—
e. Real estate	1	—
f. Other	8	2
4. Received free industrial site	1	—
5. Saved army pay	1	—

[a] Source: Compiled from data collected by the author.

their capital to the infant paper industry. Only eight persons out of 38 in the group studied could be said to have supplied capital which was accumulated primarily from some branch of the lumber industry. In one case, capital saved from lumbering was a secondary source.

The fact nine persons once engaged in flour milling were among the early contributors of capital is of historical interest. The Fox River Valley was in the days

just prior to the paper industry one of the more concentrated flour milling areas in the region. On practically every available power site was situated a flour mill. Fred L. Holmes writes, "By 1870 Neenah had fifteen and Menasha eleven flour mills with a capacity of 4,000 barrels /per mill/ a day".[21]

However, as the great plains of the West were conquered, the center of the flour industry shifted and left this once flourishing flour center of the Fox Valley, along with other flour centers in the region, in line to becoming a depressed area. Obviously, millers caught in such inexorable economic forces could either move their businesses elsewhere, sell, or convert their properties into some other enterprise. It is not therefore surprising to find nine millers turning to paper manufacture and contributing their capital as well as their talent to the infant paper industry.[22]

Amount of Borrowing Unknown

Historical documents record few cases where the

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[21] Fred L. Holmes, ed., Wisconsin (Chicago, 1946), II, 49.

[22] In the case of the Fox River Flour and Paper Company, both products were manufactured at the same time. Later, however, the word "Flour" was dropped from the name and the concern produced paper entirely.

money to start a paper business was borrowed.[23] What is more, it is doubtful whether banks of that day could have provided much of the venture capital which went into the paper industry. The assets of the oldest bank in the lower Fox Valley, the Bank of Neenah as it was called in 1861 when it began business, was a mere $8,633.34. At this time the bank was incapable of offering much help. By 1870, it had increased its assets to $144,875.82.[24] It remains doubtful, however, whether it would have loaned on long-term for fixed capital purposes. If borrowing did take place, therefore, it probably was between lender and borrower on an individual basis, although the possibility that some bank funds may have been used as venture capital in paper firms cannot be discounted.

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[23] It seems probable that many more of these pioneers than shown in Table 2-3, page 31, either borrowed or inherited capital, about which there is no written record. For example, one of these pioneers started a papermaking concern with $150,000. Investigation nowhere indicates he borrowed or inherited any of it. On the other hand, the same records tell that he was employed for a few years in occupations from which it is unlikely he would have made $150,000 in his entire lifetime. It is probably safe to suppose biographers of that day presented their subjects in only the most favorable light. To relate that a person had borrowed or inherited most of his resources to employ in a business in which he is later depicted as a pioneer, would probably have detracted from some of the romance which usually surrounds a pathfinder.

[24] These figures were taken from a pamphlet describing some of the early history of this bank, published by the First National Bank of Neenah, Wisconsin.

Sources of Capital Diverse

This study shows that the capital used to establish paper companies in the Fox River Valley before 1890, in most cases came from individuals of diverse backgrounds who had accumulated savings while engaged in other lines before entering the paper business. Thus, although lumbering provided some of the capital and talent to foster the beginnings of the industry, these contributions were not of enough significance to establish any simple, direct line of causal development.

However, as noted, lumbering interests did contribute significantly to the development of paper manufacturing in some sections of the Lake States after 1890. The development on the Wisconsin River, which is today the second largest paper-producing area in Wisconsin, took place largely on the capital and enterprise of lumber people.[25] But in this case, the time element limits its relevance for our pioneer period. By 1890, no paper mills had yet been established in the Wisconsin Valley. Judging from the Fox River Valley sample, the lumber-to-paper theory, applied to the period prior to 1890, constitutes an oversimplification which ignores the role of such other previously established industries as flour milling.

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[25] Alexander, "Eighty-Four Years Ago", op. cit., p. 670.

C. Pioneer Papermakers in the Fox River Valley: Some Personal History

The dates and places of birth, the time of their arrival in Wisconsin, how old they were before starting a paper firm, tells something of the background and type of enterpriser who established papermaking in the Fox River Valley in Wisconsin.

Pioneers Were Part of Western Movement

The western migration in the 1800's in the United States included in it most of the Fox Valley paper pioneers studied. Only 4 of these men were born in the midwest. Of 28 early papermakers for whom places of birth were discovered, only 4 were born outside the continent of North America, 1 of these being born on board ship as his parents were crossing the Atlantic. Two of the 24 in North America were born in Canada. Twenty-two papermakers, therefore, were born in the United States, and of these, 18 in either the New England or Middle Atlantic states. While still in their youth they arrived in Wisconsin.

Pioneer Papermakers Were Resident Businessmen

By comparing the dates on which these Fox Valley pioneers arrived in Wisconsin with their dates of birth, it is possible to deduce one characteristic about the

type of person who initiated papermaking in the valley. The average age of these pioneers was 15.5 years on their arrival in Wisconsin. Furthermore, they were an average age of 41.3 years when they entered the paper business; indicating these men had been in Wisconsin an average of 25.8 years, mostly as adults, before entering paper manufacturing. Among these men, there were only 4 who had any previous knowledge of papermaking.

From this it seems possible to conclude that the men who were responsible for initiating papermaking in the Fox Valley were not "outsiders", but men who had spent much of their youth and early manhood in the area. They were presumably men who, although they had no previous knowledge of papermaking, perceived the opportunities in their own surroundings through daily acquaintance with growth, development and change in the economic environment.

In 1891, one year beyond the pioneer period under investigation, paper manufacturing apparently began to attract outsiders. In that year six men, called "eastern capitalists", a name popularly describing eastern businessmen or non-native businessmen of that day, came from New York to establish a paper firm in the Fox Valley. These men, unlike those who came to Wisconsin in their youth, apparently immigrated into this region with a view to entering the papermaking business. The bulk of the entrepreneurship,

and therefore most of the capital which fostered pioneer paper mills in the Fox Valley was of a "home-grown" type, however.

D. Kimberly-Clark - An Example of the Formation of an Early Paper Mill

The story of the formation of Kimberly-Clark is an example of the genesis of a paper company formed in this pioneer period. It is told[26] the conception of Kimberly-Clark began around a pot-bellied stove in one of the town's hardware stores. Here a Colonel M. H. P. Haynes, at the time an employee of the only paper company in the vicinity, would "marvel out loud about the margin between what it cost to make paper and the price that it brought". One of the members of this group was Charles B. Clark. Becoming genuinely interested in the possibility of starting a paper firm, he spent many hours with Col. Haynes and together they "covered the back of many an old envelope with figures bearing on what it would cost to get another paper mill started. . ." The problem of getting enough capital was a real one. Colonel Haynes had none and Mr. Clark had only $7,500, most of which his mother had saved for him out of army pay which he had sent home to support her. In view of the fact that the Colonel and

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[26] Kimberly-Clark, Four Men and a Machine, 1947, pp. 5-6. Kimberly-Clark Paper Company was formed in 1872 in Neenah, Wisconsin.

Mr. Clark had figured it would take $30,000 to start a business, the search began for those who could supply the balance. Thereupon Mr. John A. Kimberly and Mr. Havilah Babcock, then partners in a general store, were induced to contribute $7,500 each to the new venture. That left only a fourth partner to be contacted. Mr. Kimberly suggested a Chicago drygoods salesman by the name of Frank C. Shattuck. Shortly after Mr. Shattuck joined the group and contributed his $7,500, Kimberly-Clark came into existence.

This illustration appears to be typical; typical in the sense the talent was "home-grown" and came from diverse business backgrounds, and typical in that the capital represented the modest savings of individuals willing to risk them in a new venture.

Section VI. Conclusion

Contrary to popular notion, the paper industry did not begin in this region because of the availability of suitable wood for making paper. Wood did not become an important raw material in papermaking until after the pioneer period, 1834-1890. Furthermore, lumbermen appear to have contributed much less than was supposed in the way of capital and talent to the industry in this period. In so far as the study of the Fox River Valley indicates the sources of capital and enterprise, these factors were supplied by men with diverse backgrounds who

had been in the area long enough to see the opportunities of making paper. By and large, these pioneer papermakers had accumulated savings from previous employments and businesses to start their paper firms.

The establishment of the paper industry in the Lake States fitted into a general pattern of location and development of the industry in most of the United States up until 1890. The factors which allowed or limited this early development were largely universal to all areas where papermaking began during this period. After the frontier had moved on and communities arose which demanded paper, the printer and papermaker moved in to supply this demand. If demand were present, all that was needed was power and capital. In the Lake States these two factors apparently were present in the form and amount to allow the industry to start, and to grow rapidly in this period. The new industry in the Lake States in this period had oriented itself well with the factors controlling the manufacture of paper, but soon after it was under pressure to re-orient itself to new conditions.

PART III

LAKE STATES PAPERMAKING UNDERGOES CHANGE AND GROWTH, 1890-1919

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CHAPTER III

THE PAPER INDUSTRY IN TRANSITION

Section I. The Forces of Change

A. Introduction

As the pioneer period drew to a close in the 1880's, changes had begun to appear which were to revolutionize the art of papermaking. These were (1) the innovation and, after 1890, rapid displacement of rags and straw by a new material for making paper - wood and (2), the decline of the influence of water power on the location and growth of the industry with (3), the increased use of steam. The period 1890-1919 is the period of transition in which the paper industry largely adapts itself to these new circumstances. In what manner and how successful the Lake States were in adjusting to these new conditions will be examined below.

In order to understand the changes which took place between 1890 and 1919, it is necessary to return to the pioneer period. It was during this earlier period that pressures were developing which were to initiate the changes indicated above. However, the obscurity of the past prevents complete discernment of these initiating forces; some speculation is necessary.

One important question is "Why did wood replace rags and other materials in making paper?" If, for example, it were established that paper prices were rising because of a scarcity of raw materials, then one reason wood was brought in as a substitute would be evident. On the other hand, if paper prices were falling prior to the substitution of wood, then it would appear another explanation is necessary. To make such an analysis, conditions and growth statistics for the 1860-1890 period must be examined.

B. Conditions and Growth of Paper Manufacture, 1860-1890

Paper Prices Decline

Perhaps the first thing evident about growth in this period, Table 3-1, is that production of total paper increased in quantity over 7 times between 1860 and 1890, but production on the basis of value increased only about 3.5 times. On this evidence it appears that paper prices dropped.

Table 3-1

Index of U. S. production of paper in quantity and value of production. Index of U. S. per capita consumption of paper and U. S. population growth, 1860-1890.[a]
(1860 = 100)

	1860	1870	1880	1890
1. Index of U.S. production (quantity)	100	306	358	740
2. Index of U.S. production (value)	100	240	259	250
3. Index of per capita consumption	100	240	224	370
4. Index of U.S. population growth	100	127	164	200

[a] Source: U. S. Bureau of Census

Further evidence from scattered price data before 1890 verifies that paper prices did decline after the Civil War. Weeks reports in his history of paper manufacturing in the United States that "While prices had sailed skyward from 1861 to 1865 they declined at a rapid rate from 1865 to 1880. . ." Prices seem to have fallen after 1880 also, for he reports that whereas in 1875 newsprint was selling for nine cents a pound, in 1895 it sold for "two and three-eights to two and three-fourths cents . . ." Superfine calendered book paper sold for "thirteen to fourteen and one-half cents" in 1875, and for "four and three-quarters and five and one-half cents" in 1895.[1] From 1890 to 1900, Table 3-2 shows prices continued

[1] Lyman H. Weeks, A History of Paper Manufacturing in the United States, 1690-1916 (New York, 1916), p. 297.

Table 3-2

An index of average wholesale prices of newsprint and manila wrapping paper, and a general wholesale price index, 1890-1900.[a] (1913 = 100)

	Newsprint	Manila wrapping	General Price index[b]
1890	169.8	117.8	78
1892	151.1	114.3	76
1894	143.6	119.7	71
1896	122.2	120.5	71
1898	97.3	94.1	73
1900	124.9	98.4	79

[a] Source: U. S. Dept. of Labor, Bureau of Labor Statistics, "Wholesale Prices, 1890-1923", Bulletin No. 367 (Washington, 1925), p. 194.

[b] Source: U. S. Census Bureau, Historical Statistics of the United States, 1789-1945 (Washington, 1949), p. 231.

to decline rapidly for newsprint and less rapidly for manila wrapping paper. It can be concluded, therefore, that paper prices fell generally throughout the period from 1865 to 1900.

Because paper prices fell, it might be supposed that raw materials, particularly rags, were not scarce, yet historical records give much evidence to the contrary.

Rags in Chronic Short Supply

A shortage of rags apparently plagued even the early papermakers in America.. Dard Hunter writes that "During the early years of American papermaking, the contempory newspapers and almanacs carried notices and advertisements imploring the public to save rags for the paper mills".[2] Further statement that rags were in short supply throughout the period prior to the general use of wood pulp is given in the Encyclopedia of Social Sciences:

> ". . .the demand for paper soon outstripped the supply of rags, so that the industry was chronically handicapped by the shortage of raw material. The invention of paper making machinery in the early part of the nineteenth century, which multiplied the productive capacity of the industry, still further accentuated the shortage of raw material; this intensified the search for other fibrous materials to be used as substitutes for rags."[3]

The Unrelenting Search for a Substitute

Technical research into materials which might be used in the manufacture of paper has been carried on since the art was discovered.

> "The history of paper-making in Europe and in the United States is shot through and through with the records of persistent speculating and experimenting in the endeavor to escape from the limitation imposed upon it by sole dependence upon rags."[4]

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[2] Hunter, Papermaking in Pioneer America, op. cit., p. 61.

[3] "Pulp and Paper", Encyclopedia of Social Sciences, Vol. 12, p. 705.

[4] Weeks, op. cit., p. 211.

"As late as 1870," writes Weeks, "anxiety and speculation over the scarcity of paper-fibre was at such a height that consideration was given to the possibility of producing pulp from animal as well as vegetable substances."[5]

It is apparent from these historical records that rags were in short supply and that this gave the principle impetus to the introduction of wood.

C. Wood Fiber is Introduced

Wood Responsible or Price Decline?

It is entirely possible that the introduction of wood as a raw material effected a downward pressure on paper prices in this period. For example, Weeks relates:

> "During the closing years of the last and the opening years of the present century. . .by perfecting of the wood-pulp processes, an overwhelming increase in output resulted and a corresponding demand for paper was developed. Also wood-pulp made possible the multiplying of the kinds of paper and the manufactures therefrom to an extent that could not have been imagined a half century before."[6]

And further, the Census Bureau reported in 1900, that ". . .the utilization of the cheaper raw material

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[5] Ibid., p. 217.

[6] Ibid., p. 288.

of wood pulp,. . .resulted in a pronounced decrease in the cost of paper. . ."[7]

Wood was undoubtedly a factor causing prices to decline, but only in the period 1880-1900. Wood pulp comprised only 3.5 percent of the raw materials used in paper manufacture in 1879. This proportion increased to about 22 percent in 1889, and to 52 percent in 1899.[8] In 20 years wood pulp had made large gains as a raw material, the greatest gain taking place between 1890 and 1900.

Why a general decline in paper prices took place between 1865 and 1890 need not be investigated further. It is sufficient for this study to show that the use of wood was the resultant of a long and persistent search for a substitute for rags and straw in making paper.

Section II. Wood Becomes Dominant

An Industry Based on Rags

Historically, the emergence of paper manufacture as a major industry in the United States dates from the period in which wood fiber became the principle material. Up until that time rags and straw were the basic materials.

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[7] U. S. Census Bureau, Manufactures, Part III, 1900, p. cli.

[8] See Table 3-3, p. 48.

In the United States before 1827 when straw was first successfully used, rags, for the practical purpose of making paper, were the only raw material available. ". . .rags and rags only were the fundamentals in all paper-making. . ."[9] Straw was not used in any substantial quantity until sometime after 1860, in which year it was estimated that eighty-eight percent of the raw material for making paper was rags. "Even the straw wrapping paper required a high percentage of rags to give it the necessary strength."[10]

Wood Takes Over

Table 3-3 depicts the transition period in which wood pulp displaced all others as the primary material from which paper is made. In 1879, wood pulp made up only about 3.5 percent of total raw materials used. Rags and straw made up 31.2 and 38.3 percent respectively. By 1899, however, wood pulp had surpassed both rags and straw. In that year it comprised about 52 percent of materials used, whereas rags and straw made up only about 10 and 16 percent respectively. A view of this change is reported by the census bureau in 1902 when it

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[9] Weeks, op. cit., p. 218.

[10] Stevenson, The Background and Economics of American Papermaking, op. cit., p. 18.

Table 3-3

Raw Materials Consumed in the Manufacture of Paper in U. S., 1879-1919,[a] and for the Lake States, 1900 and 1919.[b] (shown as percent of total raw materials used)

U. S.	Wood pulp	Rags	Straw	Manila rope	Paper stock
1879	3.5	31.2	38.3	13.2	13.7
1889	21.6	15.2	21.9	32.4	8.6
1899	52.4	10.5	16.5	4.5	16.0
1909	61.3	7.7	6.6	2.5	21.2
1919	60.0	4.1	5.3	1.7	27.6
Lake States	Wood pulp	Rags	Straw	Manila rope	Paper stock
1900	63.0	16.7	1.4	1.3	17.0
1919	71.0	5.8	-	-	23.0

[a] American Paper and Pulp Assoc., The Statistics of Paper (New York, 1951), p. 19.

[b] U. S. Bureau of Census

stated that "of the $70,530,236 reported as the cost of all materials in 1900, only $13,902,092 represented the cost of rags, old paper, and manila stock which fifty years ago were the only materials for papermaking. From this it may be realized to what extent the modern process of making paper from wood fiber has supplanted the old".[11]

[11] U. S. Census Reports, Manufactures, Part III, Special Reports on Selected Industries (Washington, 1902), p. 1018.

The re-use of paper increased in importance throughout the period covered by Table 3-3.[12]

Lake States Convert to Wood More Rapidly Than Elsewhere

By 1900, the Lake States were ahead of the nation's paper industry as a whole in converting to wood pulp. In that year 63 percent of the materials used was wood pulp, while for the entire U. S. paper industry it was about 52 percent. By 1919, the proportions were 71 and 60 percent for the Lake States and United States respectively.

The higher proportion of wood pulp used in the Lake States in the period 1900-1919, undoubtedly reflected the relative abundance of wood found in this region. Furthermore, the conversion to wood was apparently aided by the decline in the lumber industry which took place in this region after 1890.

In Wisconsin, as it was noted,[13] papermaking in some areas was carried on jointly with lumbering, but more generally it immediately followed the decline of this industry which set in about 1890.

The decline of lumbering in the Wisconsin River Valley, one of the greatest lumbering areas in the region

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[12] The re-use of paper further magnifies the importance of wood pulp because most re-used paper is made from wood pulp.

[13] Supra, p. 13.

in its hey-day, was signalled by the appearance of the first paper mills in this area shortly after 1890. Until this time the Fox River Valley was the dominant paper producing area in Wisconsin, but ". . . the greatly increased use /of wood pulp/ created an enormous demand for the product /paper/, which the Fox River mills could no longer supply. This led to the growth of the industry in the upper Wisconsin Valley, where both wood and water power were accessible."[14] What is more, besides the fact that wood and water power were accessible, lumbermen and lumber capital were apparently available also. Robert Fries in his study of the lumber industry in Wisconsin wrote, "Before 1900 . . . the more prosperous lumbermen of Wisconsin had accumulated so much capital that their problem was one of investment rather than acquisition of new capital for the industry."[15]

The contributions of lumbering personnel and capital, and an abundant wood supply provide, in part, good reasons for the rapid conversion to wood pulp which took place in the Lake region after 1890.

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[14] Publius V. Lawson, "Paper-Making in Wisconsin", Proceedings of the State Historical Society of Wisconsin (Madison, 1910), p. 279.

[15] Robert Fries, Empire in Pine, the Story of Lumbering in Wisconsin, 1830-1900 (Madison, 1951), p. 102.

Use of Wood and Paper Production Closely Related

Between 1899 and 1949, as Table 3-4 shows, growth in the production of paper and paperboard is seen to closely parallel growth in the use of wood pulp. In view of

Table 3-4

Index of growth of wood pulp and paper production (quantity) in the United States, 1899-1949.[a]
(1899 = 100)

	1899	1909	1919	1929	1939	1949
1. Wood pulp production	100	240	340	535	735	1160
2. Paper production	100	188	276	513	622	935

[a] Source: The Statistics of Paper, op. cit., p. 19.

this relationship, and the fact that since 1919 wood pulp has provided over 90 percent[16] (about 65% wood pulp and 30% reused paper) of the raw material, suggests strongly that cheap pulpwood has defined in the past and will define in the future the pattern of growth and development of the paper industry. The position of the Lake States in relation to the supply of wood will be treated fully in Chapter V.

Section III. Water and the Paper Industry

A. Introduction

The technological innovations which swept in wood to replace rags as the basic raw material in the manufacture

[16] The Statistics of Paper, op. cit., p. 19.

of paper, were in part contemporary with technological changes which gradually substituted steam power for water power during the period 1890-1919.

As depicted in Chapter II, an important factor in the location and development of the paper industry in its early beginnings was water power. Today, by contrast, water as a source of power is a negligible factor in the location and growth of the industry in this region and in the United States. This transition took place to a large extent during the period between 1890 and 1919.

B. Water Power Declines

The technological changes which took place in the use of water and steam in papermaking, unlike those which took place in raw materials, were primarily the results of autonomous technological developments not related to the paper industry alone. Whereas it was partly the increased demand for paper causing raw material scarcities which hastened the search for new raw materials, it cannot be assumed this same demand had any such direct influence on developments in the use of steam in papermaking. Nevertheless, the innovations in the use of steam in manufacturing in general were of great importance to the paper industry.

Moreover, the periods marking off the transition from the use of water to steam are not so sharply defined

as they are for the change in raw materials. Although the technical changes allowing for the substitution of steam power for water power were largely initiated in the period 1890-1919, these changes came gradually and had not worked themselves out by the end of the period. This is partly true because in a few instances steam power would have been a more expensive substitute and because once established, power systems change slowly within individual firms. After a dam has been erected and a power system to utilize water has been built, the cost of running the system is relatively small in relation to the initial outlay, or in relation to building a new steam system. This would explain in part why water power, as late as 1939, was still supplying an average of 27 percent of the power generated within the nation's paper concerns.[17]

The extent to which the substitution of steam for water power took place between 1890 and 1919, is shown in Table 3-5. Total energy produced from water power declined from 81 percent in 1890, to 61 percent in 1919, while steam power increased in inverse proportion. The rapidity of change is magnified by the fact that electrical generation of energy by steam turbines, the most common method of generating electricity today, did not begin until 1905, when the first all-turbine steam

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[17] U. S. Bureau of Census, Manufactures, I, 1939.

generating plant was built in this country;[18] this means that much of the change indicated in Table 3-5 took place after 1905. By 1919, steam turbines were supplying about 20 percent of the power generated by steam[19] whereas 14 years earlier none.

Table 3-5

Power generated in the Lake States and U. S. paper industry by steam and water (shown as percent of total energy generated from these two sources).[a]

	1890		1919	
	Water power	Steam power	Water power	Steam power
United States	69	31	56	44
Lake States[b]	81	19	61	39

[a] Source: U. S. Bureau of Census, Manufactures.

[b] Wisconsin and Michigan

C. Steam and Papermaking

Factors Initiating an Increased Use of Steam

At least three factors were responsible for the increased use of steam and the consequent decline in water as a source of energy in papermaking: (1) The increased demand for power as paper mills became larger, more

[18] Federal Power Commission, National Power Survey: Interim Report, Power Series No. 1 (Washington, 1935), p. 6.

[19] U. S. Bureau of Census, Manufactures.

mechanized, and more numerous, coincident with the limited amount of power which could be supplied actually or economically by water and (2), the technical development of electrical generation of energy by steam and improved electrical transmission and (3), because steam is necessary for making paper, it is economical and efficient to generate power from it also.

Power Needs Increased as Water Power Became Limited

The amount of power that can be generated from water depends upon the efficiency of generating equipment used and the power capacity of the water site on which a plant is located. In the Lake States region natural restrictions imposed by insufficient water heads and irregular stream flow on the one hand, and economic considerations on the other, were the primary factors causing the relative decline of water power in paper manufacture after 1890.

If the restrictions causing the decline of water power are natural rather than economic, then the barrier to increased generation of power from water is not likely to be overcome even in the long-run. In an economic survey of Wisconsin in 1934 it was said that "Because of the extremely variable flow of Wisconsin streams it would appear that water power cannot be depended upon to furnish a greater percentage of electric energy requirements than

at present".[20] Irregular stream flow of water has always been bothersome to the papermaker. Technical restrictions from this cause were recognized as early as 1900 when the U. S. Census Bureau reported, "For the paper machines steam is the most satisfactory power, on account of the constant and easily governed speed of the steam engine, whereby uniformity in the thickness of the paper can be secured. Water power, on the other hand, is sure to vary in volume and pressure, and can not be quickly enough controlled to make the flow of pulp so uniform."

Economic factors, on the other hand, may vary in the long-run if not in the short-run. Construction costs and going-concern costs vary through time due to relative changes in resource costs and efficiency. Consequently, the economic advantages of one type of power system over another may be only short-run. Water power was used to a great extent prior to 1890 not only because adequate power from other sources was largely lacking, but also because it was economical to use water where the manufacturing process required large amounts of power and where power flow did not have to be constant. The U. S. Census Bureau in 1900 wrote:

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20 Wisconsin Regional Planning Commission, Wisconsin (Madison, Wisconsin, 1934), p. 332.

> "The grinding of wood is usually accomplished by water wheels commonly fitted directly with the stones by which the wood is converted into pulp. From 75 to 100 horsepower per ton of wood pulp is required each twenty-four hours for these grinders and the necessary auxiliary machinery. . .In the preparation or beating of stock and all general work about the mill. . .water power is more economical than any other. . ."[21]

But only a little more than 30 years later in the same Wisconsin survey cited above, it was stated that ". . .it costs approximately twice as much to build the average water power plant as it does to build an average steam plant of the same capacity". And furthermore, "Present /1934/ large, modern steam plants in the state are generating current more cheaply than the average hydro plants".[22]

However, besides these advantages in using steam or disadvantages in using water for power, other factors involving the use of steam in paper manufacture were also taken into account.

Power from Steam a By-Product

In modern papermaking steam has always played an important role. Even when paper was loft-dried, steam was used to provide the proper humidity and temperature

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21 U. S. Bureau of Census, Manufactures, Part III, 1900, p. 1026.

22 Wisconsin Regional Planning Committee, op. cit., pp. 332-333.

for drying. By 1919, it is improbable that without steam paper could have been made of the quality and efficiency which was achieved by that time.

Steam used before 1905 was low-pressure steam employed primarily in reciprocating steam engines.[23] The exhaust of these engines was often used for drying and heating purposes. After 1905, a steam generating plant could build up steam to a high pressure, then channel it through a turbine for generating electricity. Similar to the old systems, after passing through a turbine, it could be used for its main function in papermaking - drying. Power thus derived in this system was called "by-product power"; as long as steam had to be used for cooking, drying, etc. in the manufacture of paper, it was found economically and technically efficient to build up its pressure so that it could be used for creating power. This fact, therefore, helps validate the use of steam for power over the use of water in most instances (even when both were available) here in the Lake States since about 1905. Today most of the firms in the Lake States originally equipped with water power use it in connection with grinding wood pulp or hold it in reserve as emergency auxiliary power.

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[23] These engines were basically the same as the engine developed by Watt.

Paper Mills Freed to Locate Almost Anywhere

As greater and more efficient electrical generation came into operation in this period, the technique of transmitting power over distance underwent rapid improvement. This latter development was significant to those industries which were bound to a specific location for generating power. All industries dependent upon water for power were in this class. The ability to transmit power over distance meant a virtual liberation of those water-bound firms. In regard to power needs, it became possible, consequently, to locate anywhere within an area of effective power transmission from a central generating plant.[24] If there were enough of these generating plants, their over-lapping might conceivably mean a firm could locate anywhere in the United States with respect to adequate power. As a result, industrial location came a long way in the 1890-1919 period from the inflexible limitations placed upon it by early power usage.[25]

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[24] By 1939, a large generating plant could supply a circular area of 200,000 square miles. See: National Resources Planning Bd., "Industrial Location and National Resources" (Washington, 1943), p. 268.

[25] It will be noted this so-called power liberation does not mean water power will not be used where it is economically available, but only that power generated from water will not restrict the user to water power sites.

It can be concluded that the water resource as a supplier of power in the Lake States region declined greatly in significance for the location and development of paper firms after 1890. Again, this does not say water power was not important as a source of energy in the Lake States even after 1919, but merely that much of its earlier influence had been nullified.

Section IV. Industry Growth, 1890-1919.

Table 3-6 pictures the growth of the U. S. and Lake States paper industry between 1890 and 1919.

Table 3-6

Index of value of production for the U. S. and Lake States paper industry. Also Lake States value of production as percent of U. S. production, 1890-1919. (1890 = 100)

	1890	1899	1909	1919
United States				
1. Index of growth	100	326	520	765
Lake States[a]				
1. Index of growth	100	415	890	1850
2. Percent of U. S. production	8.8	11.9	15.3	18.8

[a] Minnesota included after 1899.

For the entire U. S. industry, growth of the manufacture of paper on the basis of value was substantially greater than in the preceding period. The index of growth showed an

increase of about 7.5 times in the 1890-1919 period and only 3.5 times in the 1860-1890 period.

For the Lake States, although growth was not as great as in the preceding period (19 times in the 1890-1919 period as opposed to 23 times in the 1860-1890 period), growth was greater than for the United States as a whole. In 1919, Lake States production was about 19 percent of U. S. production, whereas it was about 9 percent in 1890, and only about 2 percent in 1860.

Section V. Conclusion

The 1890-1919 period was decisive in the development of the paper industry. It was during this short span of years that circumstances evolved which were to help mold the geographical pattern as well as the nature of the industry for the indefinite future. At least three aspects of the period are especially notable to this study: (1) The replacement of rags and straw with wood as the principle raw material. The ramifications of this change are numerous and great; especially for the Lake States. (2) In view of the decline of the influence of water power, more emphasis is thereby placed on wood supply as a definitive factor for location and development. (3) In spite of drastic alterations in the nature of paper manufacturing, the new conditions were so favorable to the entire industry, and particularly to the Lake States industry, that a great growth in production took place.

Thus, looking backwards, the circumstances which brought papermaking into the Lake States were almost entirely abrogated by new conditions of which the dependence on a cheap and abundant wood supply was paramount. Indeed, as it will be shown more fully, wood supply became the *sine quo non* of development and growth for the industry in general and the Lake States industry in particular.

PART IV

PAPER MANUFACTURE IN THE LAKE STATES, 1919-1947

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CHAPTER IV

GROWTH AND NATURE OF THE INDUSTRY

Section I. Introduction

In the last chapter it was shown that with wood as the principle raw material, the paper industry in the Lake States, a region relatively abundant in wood, recorded a large relative and absolute growth for the 1890-1919 period. But the rate of growth was not to last. What took place in regard to growth and change in the following period, 1919-1947, along with certain regional comparisons, will continue the analysis of the Lake States paper industry.[1]

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[1] Unless otherwise noted, the statistics presented in the tables and elsewhere in this chapter were taken from the U. S. Bureau of Census on manufactures. All price series have been restated in 1926 dollars.

Section II. Industry Growth, 1919-1947

In the 28-year period between 1919 and 1947, the growth of paper manufacture in the Lake States (Table 4-1) slackened noticeably compared with the two earlier periods studied. The growth of the index of value of production was

Table 4-1

Index of paper production (by value) for the Lake States and the United States. Also value of production in the Lake States as percent of U. S. production, 1919-1947. (1919 = 100)

United States	1919	1925	1929	1935	1939	1947
1. Index of growth	100	164	177	145	205	322
Lake States						
1. Index of growth	100	165	175	142	210	285
2. Percent of U. S. production	18.8	19.3	18.6	19.1	19.8	19.0

not quite 3 times over the period 1919-1947; this compares with a growth rate of 19 times for the period 1890-1919, and 23 times for the 1860-1890 period. It would appear from these figures the Lake States paper industry has completed its relative growth (compared with the entire industry) and much of its absolute growth. It is not unusual for an industry, or an industry within a region to go through a fairly regular growth pattern. R. A. Gordon writes, "All industries tend to follow a typical pattern of growth, in which rapid increase in output is followed

by less rapid expansion and eventually by relative stability or decline."[2] This growth pattern has been likened to a drawn-out S-curve. By plotting the index numbers of growth (on the basis of value of production) for the Lake States industry from 1834 to 1947 (Chart 4-A), such a pattern of growth as described above appears to be occurring.

Returning to Table 4-1, the index of growth from 1919 to 1939 for the Lake States follows closely the growth index for the United States. In the 8-year period 1939-1947, however, U. S. growth was greater than the Lake States'. This is not a long enough period to indicate a trend. Nevertheless, if the paper industry in the Lake States can maintain its relative position (as it has for the most part in this period) with respect to the entire industry, then it will remain as it has for most of its past, the second largest paper-producing region in the nation on the basis of value of production. Whether it can maintain this position depends on a number of factors, not the least of which is the cost and availability of wood for its industry.

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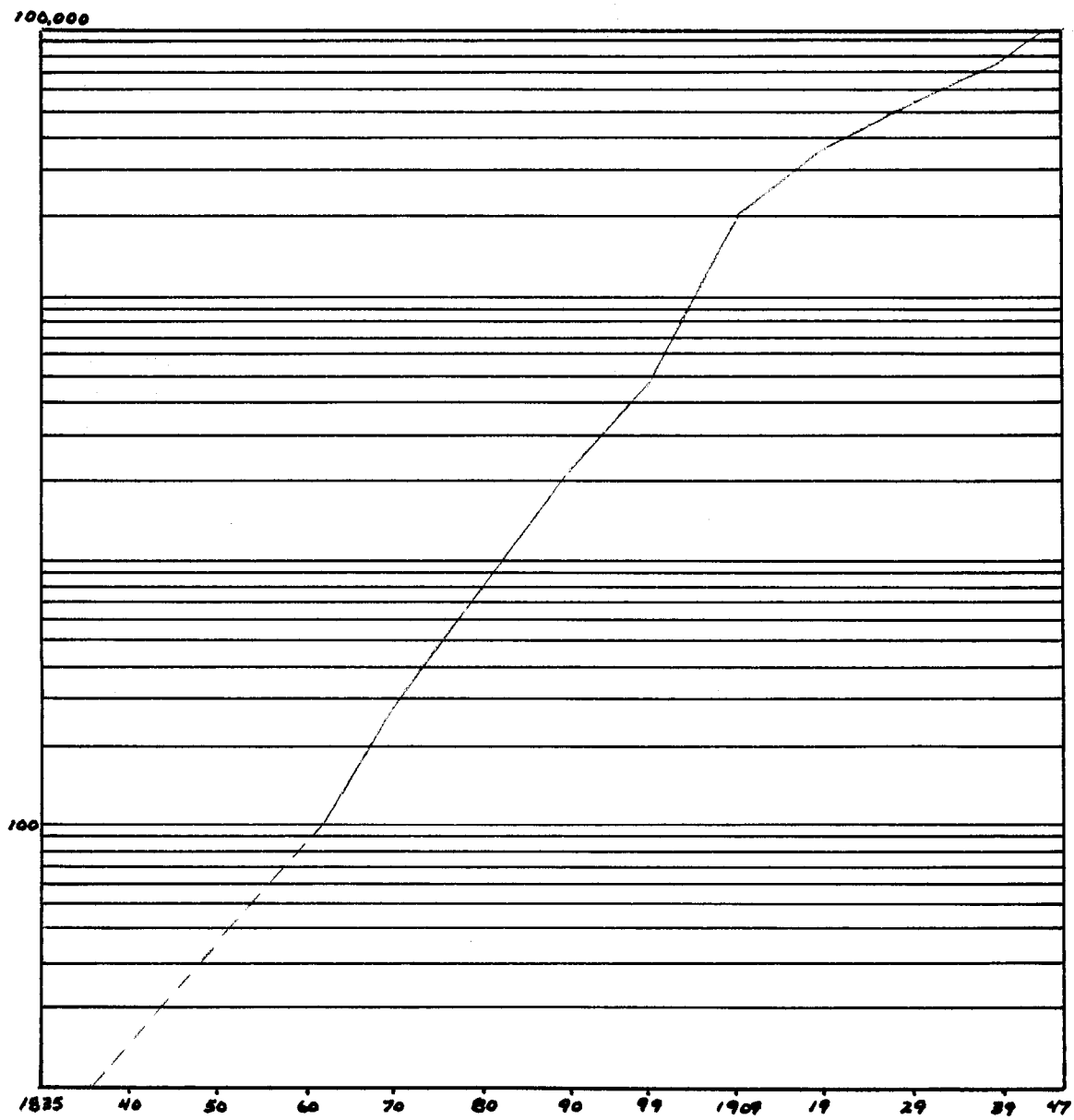
[2] R. A. Gordon, Business Fluctations (New York, 1952), p. 105. See also: A. F. Burns, Trends in the United States Since 1870 (New York, 1934).

Chart 4-A

Index of value of production
for Lake States paper industry, 1835-1947.[a]

(1860=100)



[a]Source: U.S. Bureau of Census, Manufactures. 1835 figure estimated.

Section III. Pulpwood and Wood Pulp Production

The price of the wood that goes into making paper directly affects a firm's and region's ability to compete in the market. Regional differences in the prices which producers must pay for pulpwood are therefore important.

Regional Wood Supplies and Pulpwood Prices Related

Regional differences in pulpwood prices within the major paper-producing areas primarily reflect the relative scarcity or abundance of suitable pulping wood, although some minor price differences may result from local labor supplies or local logging conditions.

The price of pulpwood at the mill in four major paper regions is shown for the years 1928 to 1947 in Chart 4-B. As the chart indicates, both the New England and Lake States regions have had to acquire wood at a higher price than wood used in either the Pacific Coast or Southern regions.

Averaging pulpwood prices between 1928 and 1943, the price of southern pine was $5.25 a cord; of hemlock in the West, $7.40; of spruce and balsam in the Lake States, $10.80; and of spruce and balsam in the Northeast, $11.70. Data for 1942 to 1946 are ceiling prices established for pulpwood by the O. P. A.[3]

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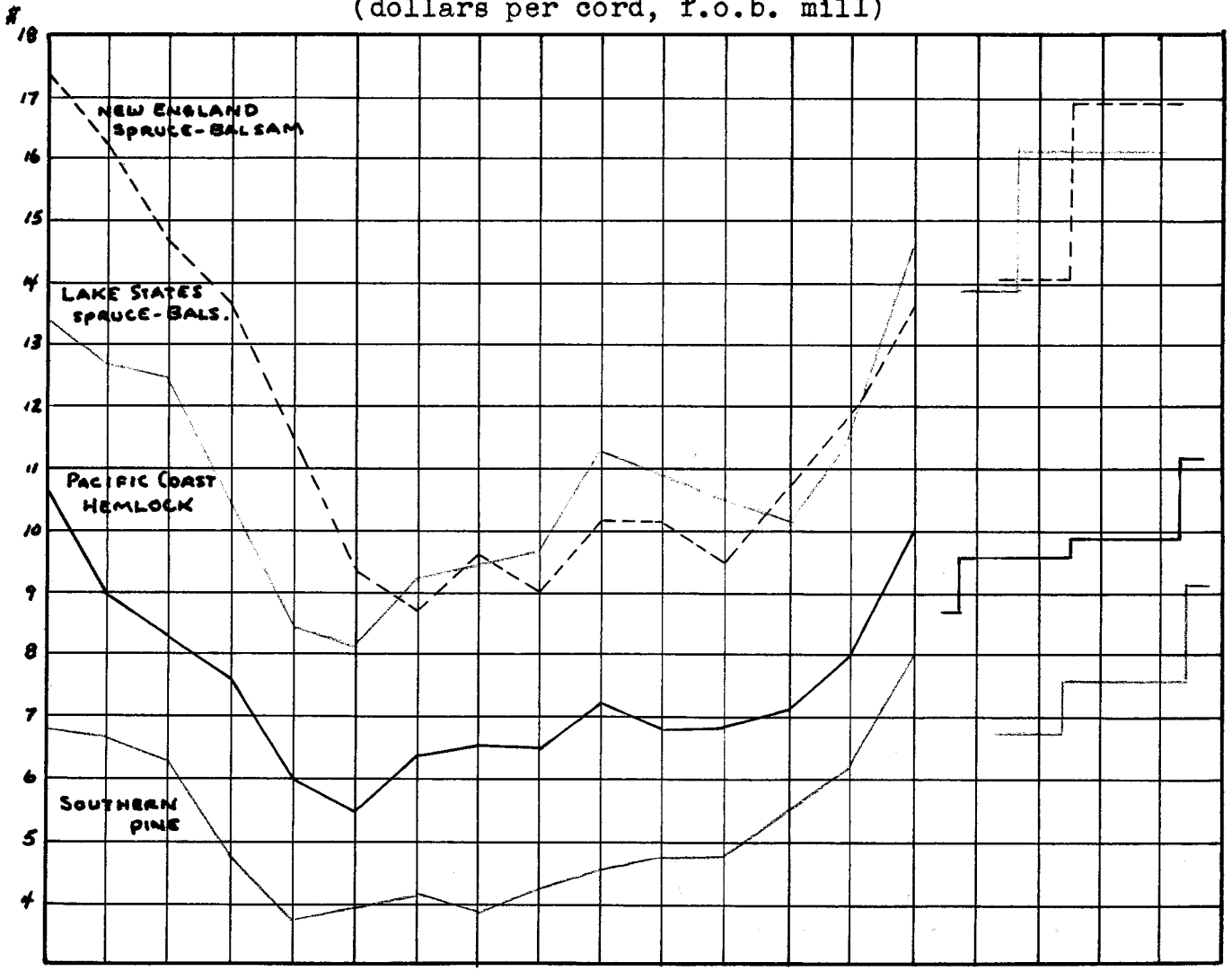
[3] Guthrie, The Economics of Pulp and Paper, op. cit., pp. 144, 145.

Chart 4-B: regional differences in pulpwood prices, 1928-1947.[a]
(dollars per cord, f.o.b. mill)



[a]Source: Guthrie, The Economics of Pulp and Paper, op. cit., p. 144

Table 4-2 shows pulpwood production in the major paper-producing areas between 1919 and 1947. In 1919

Table 4-2

Pulpwood production in major paper-producing areas in the U. S., 1919-1947.* (shown as percent of total U. S. production)

	1919	1929	1939	1947
1. Lake States	26	25.4	15.4	11.6
2. New England[a]	34	31.2	15.9[h]	12.5[j]
3. Middle Atlantic[b]	17.8	10.2	8.2	7.4
4. Pacific Coast[c]	3.9[e]	14.5[f]	20.7[i]	19.3
5. South[d]	11.0	23.7[g]	39.5	45.0

[a] Maine, Vt., Mass., N. Hamp.
[b] N. Y., Penn.
[c] Wash., Ore., Calif.
[d] D. C., Fla., Ga., Ill., Ind., La., Md., Miss., N. J., S. C., Tenn., Tex.
[e] Calif., Ore.
[f] Wash. only
[g] 1929-1947, Md., N. C., S. C., Ga., Fla., Tenn., Ala., Miss., La., Ark., Tex.
[h] Also Tenn., Ohio, Ky.
[i] Wash., Ore.
[k] Also Rhode Is.

* Source: U. S. Census Bureau; The Statistics of Paper, 1950, op. cit.

the South ranked fourth and the Pacific Coast fifth among the five areas shown in this table. At that time, the Pacific Coast and South were coming on the scene as pulpwood producers and, therefore, as paper-producers. By 1947, the South was first among these areas, producing

nearly half of the pulpwood in the nation. The Pacific Coast was second. The Lake States were fourth, just behind the New England area. During this period the Middle Atlantic area had fallen from third to last place. The increased percentage of pulpwood harvested in the South and Pacific Coast regions reflects the relative abundance and lower price of pulpwood in these areas compared with the Lake States and other areas, and thus, to a large extent, accounts for the regional price differences in pulpwood shown in Chart 4-B.

Pulp Costs Depend Largely on the Price and Type of Wood

Regional differences in the prices of pulpwood reflect themselves in regional differences in the cost of manufacturing wood pulp.

Table 4-3 shows some regional cost differences in the production of groundwood pulp, unbleached sulphite and unbleached sulphate pulp. In producing both groundwood and sulphite pulp, the Lake States and Northeast regions showed considerably higher manufactured costs than the Pacific Coast region in 1945. The South produces primarily sulphate and very little sulphite or groundwood pulp. In the production of sulphate pulp, the South showed the lowest manufactured costs. Comparing only sulphate pulp costs, the higher costs for the Lake States are not too significant because they

Table 4-3

Cost of manufacturing groundwood pulp (A), unbleached sulphite pulp (B), and unbleached sulphate pulp (C), 1945.[a]
(dollars per ton)

	(A)	(B)	(C)
	Wood Cost		
Lake States	$19.16	$40.27	$34.99
Northeast	23.29	49.41	n.a.
Pacific Coast	12.87	26.01	20.79[b]
	Conversion and Expense		
Lake States	14.62	19.87	24.51
Northeast	10.53	23.18	n.a.
Pacific Coast	11.70	19.44	15.12[b]
	Total Manufactured Cost		
Lake States	33.78	60.14	59.50
Northeast	33.82	72.59	39.71[c]
Pacific Coast	24.57	45.45	35.91[b]

[a] Source: Guthrie, The Economics of Pulp and Paper, op. cit., pp. 146, 147, 148.

[b] Pacific Northwest (Washington and Oregon)

[c] South

produce relatively little of this kind of pulp. On the other hand, if the products of the Lake States and Southern regions become competitive in the future,[4] then comparison of regional pulp costs is significant even though the pulp produced is different. The same holds true of the Northwest region. Thus, comparing pulp costs of the major sulphite producers, Northwest, Pacific Coast and Lake States areas, and the sulphate pulp costs of the South, we find the South and Pacific Coast have a considerable advantage over the Lake States and Northeast regions. Comparing total manufactured costs for 1945, the regions ranked in order: Northeast, $72.59; Lake States, $60.14; Pacific Coast, $45.45 a ton for sulphite pulp; and the South lowest with sulphate pulp costs of $39.71 a ton.

In pulp production, differences in pulpwood costs account for the greater share of the total manufactured cost differences. In conversion and expense the higher cost differences for the Lake States and Northeast is partially explained by the grades of paper produced. These two regions produce relatively more "quality" and specialized papers which require more refined pulp than papers such as newsprint, coarse paper and board. These latter

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[4] That is if similar products can be produced from either sulphite or sulphate pulp. To a large extent, these two regions are not competitive at present as will be shown in Section IV of this chapter.

products are produced in relatively large quantities in both the South and Northwest as will be shown.

The conclusions to be drawn from the foregoing analysis of pulpwood prices and wood pulp costs seem evident: the Lake States region produces paper which costs more to manufacture than paper in the two large and fast-growing regions of the South and Northwest. Second, on a competitive basis, these higher costs place the Lake States region at a disadvantage. And third, if this region must compete to a larger extent with the South and Northwest in the future, much will depend on the conditions of supply in the various regions of a single factor - wood.

Section IV. Paper and Paperboard Production

The following series of tables is designed to present some important aspects of the development of paper manufacture in the Lake States during the period between 1919 and 1949,[5] as well as the position of the Lake States relative to the other major paper-producing regions. It should be noted particularly, that the Lake States altered its production considerably during this period in the face of competitive pressures.

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[5] In this section, 1949 figures are used instead of 1947, because a better classification of the types of paper produced was possible. 1947 figures had to be used where values were wanted because no value figures are available for 1949.

"Freeing" Newsprint Causes Lake States To Shift Production

Perhaps the most notable change in the nature of the industry in the Lake States and in the United States occurred as a result of the passage of the Underwood Tariff in 1913. Under the provisions of this tariff, newsprint, a product which had previously been protected, was freed from payment of import duty. The effects on newsprint production in the U. S. were negligible, however, until after the war. But when more normal conditions began to appear, Canadian newsprint rapidly drove domestiv newsprint out of the market.

Table 4-4, newsprint production and consumption, clearly discloses the effects of the 1913 tariff. Between 1919 and 1949, production fell 30 percent for the entire industry. A truer picture of the loss of the newsprint market to Canadian producers is shown by the ratio of production to consumption. The proportion of consumption of newsprint supplied by domestic producers fell 55 percent during this period.

For the Lake States, the decline in production was even more notable. In 1949 they produced only about 2 percent of total domestic newsprint production, whereas in 1919, almost 18 percent. The index of production showed a 93 percent fall. Relative to U. S. consumption, the Lake States produced a meager .29 percent in 1949.

Table 4-4

Index of volume of production of newsprint in the Lake States and the United States; Lake States production as percent of U. S. production; and U. S. production as percent of U. S. consumption, 1919-1949.[a] (1919 = 100)

United States[b]	1919	1924	1929	1934	1939	1949
1. Index of production	100	112	107	75	72	69
2. Production as percent of consumption	72	53	37	31	27	17
Lake States						
1. Index of production	100	117	97	n.a.	66	6.9
2. Percent of U. S. production	17.6	18.4	15.1	n.a.	16	1.6

[a] Source: U. S. Tariff Commission, "Newsprint", War Changes in Industry Series (Revised, 1951), Report No. 22, pp. 20-21, and U. S. Bureau of Census, Manufactures.

[b] For more complete statistics see Appendix C.

Wisconsin, the major producer of newsprint in the Lake States at the time of the Underwood Tariff, had to drastically alter her paper manufacture. In 1919 she produced 116 thousand tons of newsprint. This amounted to about 9 percent of the newsprint produced in the nation, and was about 20 percent of the total quantity of paper produced in the state. By 1947 newsprint was not produced at all in Wisconsin. Thus, in the period between 1919 and 1947, Wisconsin's paper firms stopped producing newsprint and shifted their production into

higher-valued products. This process of shifting into higher-valued products is called up-grading about which more will be said later.

Production of Wrapping Papers Declined

Table 4-5 shows the Lake States were relatively small producers of wrapping papers in 1949, although

Table 4-5

Index of volume of production of coarse wrapping paper in the Lake States and U. S. Also Lake States production as percent of U. S. production, 1919-1949. (1919 = 100)

United States	1919	1924	1929	1934	1939	1949
1. Index of production	100	143	175	158	253	320
Lake States						
1. Index of production	100	90	156	n.a.	163	148
2. Percent of U. S. production	25.6	16	22.8	n.a.	16.4	11.8

they produced about 26 percent of the nation's wrapping papers in 1919. In 1919, wrapping papers made up about 19 percent of the total paper produced in the Lake States; in 1949, only about 10 percent. Apparently competition from the Southern and to a lesser extent the Northwest paper regions was partly responsible for this decline.

The South and Northwest were not even included in the U. S. Census figures of 1919 as producing enough wrapping papers to mention, but in 1949, the South

produced about 55 percent of the nation's wrapping papers, and the Northwest (Washington) about 10 percent. In the South, coarse wrapping papers made up approximately 23 percent of total paper and paperboard produced in that region in 1949. It seems plausible to conclude that Southern and Northwestern competition in wrapping papers along with Canadian competition in newsprint prompted the Lake States to shift into production of higher-grade papers.

South Largest Producer of Paperboard

The production of paperboard in the Lake States[6] has shown a steady absolute growth as indicated by the index of production in Table 4-6, but has been unsteady

Table 4-6

Index of volume of production of paperboard in the Lake States and U. S. Also Lake States production as percent of U. S., 1919-1949. (1919 = 100)

United States	1919	1924	1929	1934	1939	1949
1. Index of production	100	152	233	213	320	250
Lake States						
1. Index of production	100	123	267	n.a.	310	354
2. Percent of U. S. production	16	12.9	18.2	n.a.	15.3	22.7

[6] Wisconsin and Michigan. Paperboard production in Minnesota is negligible.

with regard to its relative position in the entire paperboard industry. In 1949, Wisconsin-Michigan produced about 23 percent of the nation's paperboard, whereas ten years earlier, only 15 percent. On the other hand, in 1919 paperboard made up 26 percent of total paper produced in Wisconsin and Michigan; in 1949, 32 percent.

For this type of paper the South appears to have gained relative to the Lake States. In 1919, the Census Bureau did not list the South as a producer of paperboard large enough to mention; in 1949, it produced more paperboard than any other region - 40 percent of the total produced in the U. S. Furthermore, paperboard comprised 55 percent of the total of all paper produced in the South. In 1949, the Northwest produced only about 5 percent of the nation's paperboard. It will be noted that in the production of coarse wrapping paper and paperboard, about 80 percent of the total paper produced in the South in 1949 was comprised of these two types, in the Northwest, 90 percent (includes newsprint). During the 1919-1949 period therefore, the South or Northwest offered little competition in papers other than wrapping and paperboard.

Book Paper Production Unstable

In book paper, Lake States production, as shown in Table 4-7, fluctuated considerably relative to U. S. production. In the 30-year period, volume of output

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Table 4-7

Index of volume of production of book papers in the Lake States and U. S. Also Lake States production as percent of U. S. production, 1919-1948. (1919 = 100)

United States	1919	1924	1929	1934	1939	1948[a]
1. Index of production	100	128	182	128	187	173
Lake States						
1. Index of production	100	129	128	n.a.	150	268
2. Percent of U. S. production	30.5	30.7	21.6	n.a.	24.4	47.5

[a] 1949 figures not available.

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fluctuated between 22 and almost 50 percent of U. S. output. The growth index shows, however, this fluctuation did not occur entirely within the Lake States; total U. S. production fluctuated quite drastically also. In general, growth was much more moderate in the Lake States for this type of paper than for certain other types shown below. Book papers comprised about 21 percent of the total paper produced in the Lake States in 1919 and 20 percent in 1949.

Fine Papers: Small Relative Growth

The production of fine papers (largely writing papers), indicates only a slow relative growth for the Lake States as compared with U. S. production, Table 4-8.

Table 4-8

Index of volume of production of fine papers in the Lake States and U. S. Also Lake States production as percent of U. S. production, 1919-1948. (1919 = 100)

United States	1919	1924	1929	1934	1939	1948[a]
1. Index of production	100	122	212	145	209	330
Lake States						
1. Index of production	100	55	n.a.	n.a.	242	415
2. Percent of U. S. production	18.4	8.3	n.a.	n.a.	26.6	23.2

[a] 1949 figures not available.

Between 1919 and 1948, production of fine papers in the Lake States increased about 4 times; this was a little greater than growth for the whole industry which was about 3 times. In the Lake States fine paper composed about 5.5 percent of total paper produced in 1919, and 7.5 percent in 1948.

Tissue-Sanitary Papers: Largest Relative and Absolute Growth

Finally, in the production of tissue and sanitary papers, Table 4-9, the Lake States showed the largest

Table 4-9

Index of volume of production of tissue-sanitary papers in the Lake States and United States. Also Lake States production as percent of U. S. production, 1919-1949.
(1919 = 100)

United States	1919	1924	1929	1934	1939	1949
1. Index of production	100	127	200	240	340	625
Lake States						
1. Index of production	100	124	n.a.	n.a.	575	1220[a]
2. Percent of U. S. production	15.1	14.9	n.a.	n.a.	25.7	29.6[a]

[a] Estimated by the author.

relative as well as the largest absolute growth of all the types of paper produced in this region. In 1919, the region produced about 15 percent, and in 1949, 30 percent of the nation's tissue-sanitary papers. The index of growth during this period shows a growth over 12 times while total U. S. production of this paper increased only about 6 times. Tissue-sanitary paper made up about 2.5 percent of total paper produced in the Lake States in 1919, and about 11 percent in 1949.

Lake States Production: High-Valued Products

Of the different types of papers shown in the preceding tables, the tissue-sanitary and fine papers recorded the greatest index of growth for the Lake States.

However, the tissue-sanitary and paperboard groups showed the greatest relative growth compared with U. S. production. These latter figures, which give a better perspective of the Lake States in relation to the entire industry, bring out an interesting aspect of paper manufacture in the Lake States. For those products which it is possible to have a substantial degree of product differentiation or a high degree of adaptability to new uses, namely the tissue-sanitary and paperboard groups,[7] the greatest comparative rate of growth has taken place.

In the tissue-sanitary papers, it appears the Lake States have had a comparative advantage over most other areas in their production and sale. In the paperboard group, the Lake States have increased their production relative to the U. S. as a whole, but growth has been comparatively less than in the South, and somewhat less than in the Northwest.

Wisconsin-Michigan Produce Relatively More High-Valued Papers Than Other Areas

The extent Lake States production is in the higher-valued types of paper is shown in Table 4-10 which gives the principle production statistics for paper and

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[7] On the other hand, newsprint, book, coarse wrapping papers are not so well adapted for new uses, although advertising is used to differentiate some of these products by brands.

paperboard mills in selected states in the major paper-producing regions in the nation - Northwest, Northeast, Lake States and the South.

In 1947, Wisconsin and Michigan ranked first and third respectively among the areas shown on the basis of average value per ton of paper produced. Louisiana papers had the lowest average value; this is because she produces little else except paperboard and coarse wrapping papers which are relatively low-priced products.

On the basis of average value-added per ton of paper produced, Wisconsin showed a considerable advantage over all other areas and the United States' average. As explained, Wisconsin's leadership on this basis is due to her production of relatively more quality and specialized papers than these other areas, thus prices reflect a greater mark-up over material costs (compare line 1 with 4 in Table 4-10).

High-Valued Products Mitigate Effects of High Wood Costs

Another important conclusion can be drawn from the above facts: by producing quality and specialized papers, Lake States firms are able to mitigate the effects of high wood costs. If a firm can introduce a substantial amount of product differentiation, or if its products are adaptable to new uses, the company can expect and

Table 4-10

General production statistics
for paper and paperboard mills in selected states, 1947

Item	U.S.	Mich.	Wis.	Wash. Ore.	Louis-iana	N.Y.
1. Value of products (millions of dollars)	$2,819	$217	$238	$146	$144	$453
2. Production (thous. of tons)	21,114	1,536	1,392	1,189	1,343	3,106
3. Average value per ton	$135	$143	$171	$123	$108	$146
4. Cost of materials, fuel supplies, containers, purchased elect. energy and contract work (millions of dollars)	1,768	136	142	106	97	294
5. Materials cost per ton	85	89	102	88	73	95
6. Value-added by manufacture (millions of dollars)	1,050	81	96	41	47	158
7. Av. value-added per ton	50	53	69	35	35	51

receive higher prices. If, consequently, average price exceeds substantially average cost, then this firm's value-added (price minus cost of materials) and average profit is relatively large. This situation existed for Wisconsin in 1947 as shown in Table 4-10. Wisconsin in that year produced paper at a higher average materials cost per ton than any other area examined; and yet because it likewise produced paper products which were priced higher per ton than the average, it was possible for her to have the highest value-added per ton.

In other words, the disadvantage at which the Lake States operate relative to other paper regions with respect to wood supply, as shown in Section III, is materially lessened by their ability to produce and sell quality and specialized papers.

This conclusion does not imply that Lake States mills should not be concerned about their high-cost wood supply, but it does suggest that if they can prevent their wood costs from rising further relative to those of competing regions, the Lake States should be able to hold their own profitwise. If they can reduce their wood costs relative to other areas, their position should even improve. Furthermore, as suggested in the next chapter, this problem of relatively high wood costs can be at least partly overcome.

Section V. Conclusion

The statistical analysis of the Lake States paper industry for the period ending in 1947 showed certain favorable as well as unfavorable signs.

Although no attempt is made to forecast, some factors and circumstances appear which allow some speculation about the future of the Lake States industry. First, growth, both relative and absolute, slackened considerably compared with the two earlier periods. Whether this is the normal phase of the growth of an industry, or the result of competitive pressures or both, is of considerable import to the industry. Second, this region's paper industry showed an ability to change in order to meet new conditions. If new circumstances arise in the future, judging from this 1919-1947 period, there appears some reason for believing the Lake States can adjust to them. Third, production has shifted into higher-valued products where the region had in 1949 a comparative (on a value basis), but largely non-competitive (product basis), advantage over the Southern and Northwest regions particularly. Yet, these latter two regions grew decisively in this period and there is cause to speculate what the effects would be if these regions made a serious effort to compete in the same types of paper produced in the Lake States. Fourth, as it has been concluded repeatedly, the ability of the Lake States

to compete successfully in the manufacture of paper depends largely on its ability to get an abundant and relatively cheap supply of wood. The next chapter takes up this important subject.

CHAPTER V

LAKE STATES WOOD SUPPLY - HISTORY AND PRESENT CONDITION

Section I. Introduction

Although wood became an important raw material in papermaking as early as 1890, wood supply had not been a serious problem for this region's paper industry until the competitive pressures of the Southern and Northwest paper regions began to be felt; this was in the period beginning about 1919.

The growth figures presented in the last chapter showed that the Lake States had successfully competed in the past with other regions in the production of paper. Between 1860 and 1919, the region increased its share of total U. S. value of paper production from 1.5 to about 19 percent. However, from 1919 to 1947, its share remained almost stabilized at 19 percent.

Presumably the Lake States have failed to increase their share of the nation's paper market since 1919 because, in part at least, of competition from the rapidly growing South and Northwest. Since the South and Northwest may offer even more competition in the future, and because these two regions have abundant and cheap wood supplies, the wood resources of the Lake States region have in recent years come under serious study.

The keynote of this wood supply problem is typified in the report of a Wisconsin "Committee on Land Use and Forestry" in 1932 which, while referring to Wisconsin, is applicable to the entire region:

> "The future profit-and-loss sheet with Wisconsin forest industries is inherently bound up with costs of raw material, conversion, and transportation, all in relation to similar costs of competing species and regions and to the location of future markets of consumption. The permanence of Wisconsin's forest industries depends on the balances they can show on their ledgers. However favorable may be their location with reference to markets and however low their costs of conversion, they cannot hope to survive if they cannot secure an adequate supply of raw material at a price which permits a margin for profit. Such resources have in the past meant standing timber. In the future, resources will mean productive capacity of the lands. If Wisconsin lands can produce the necessary species in as little time and with as little cost as other regions, then a basic requirement for industrial stability will be assured."[1]

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[1] State of Wisconsin, Forest Land Use in Wisconsin, Report of the Committee on Land Use and Forestry (Madison, 1932), p. 42.

Consequently, this chapter is concerned with the basic, complex problems of wood supply in the Lake States: (1) Some of the background history surrounding wood resources and their utilization is given. This history is important because the present condition of these resources is largely the result of circumstances which began before paper manufacture was established in this region. (2) Some factors affecting the present wood resources and their supply are studied. (3) And finally, the future supply outlook of wood in relation to future needs of the paper industry is estimated.

Section II. Forest Survey, Past and Present

A. Introduction

The wood resources in the Lake States region have changed considerably since the white man's axe felled the first tree of the virgin forest which he found there. The changes have been quantitative and qualitative in the proportion of various species of trees of which these forests are composed. Both changes have had wide and decisive effects on the paper industry which is located in this region today.

B. Forest Survey, Past and Present - the Quantitative Changes

The story of the economic development of the Lake States could largely be told by the story of activities

which centered about the use of their great forests. Jean Nicolet, whom history records as the first white man to enter this region, found here one of the great forest areas of the United States; a forest which stretched from Michigan to Minnesota; a forest resource that set in motion economic forces from which industries and fortunes were built. This area contains 122.7 million acres of land[2] of which 103.7 million acres were forest in the day of Nicolet. Today this forest area has dwindled to 54.7 million acres, about 45 percent of the land area. Of this, 50 million acres of forest of actual or potential commercial value remains.[3]

This Forest Was Rapidly Cut

The epic growth of the Middle West as frontier America moved toward the Pacific is a story of development on the one hand and destruction on the other. In the Middle West as great cities rose from the soil, great forests were literally mined from the land with no thought to replacing or conserving this valuable resource. This mining process in the Lake States region is said to have begun by the erection of the first sawmill sometime between 1809 and 1813

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[2] U. S. Dept. of Agriculture: Forest Service, Forest Resources of the Lake States Region, Forest Report No. 1 (Washington, 1950), p. 3.

[3] Ibid., p. 6.

by Jacob Franks, an employee of the American Fur Company, near the present site of DePere, Wisconsin.[4] However, lumbering as the beginning of a multi-million dollar business probably did not begin before 1835 in this region.[5]

Pine in enormous quantities drew lumbermen from the East, and before 1870 the Lake States region attained the lead over all other areas in the nation in the production of lumber. It held this lead until superceded by the southern pine region between 1900 and 1910. The peak of production was passed in 1892 when output reached the fabulous figure of 8.9 billion board feet. In 1899, Wisconsin, Michigan and Minnesota, in order, still led the nation in lumber production with a combined total of 8.7 billion board feet, two-thirds of which was pine.[6] The once prominent white pine which was estimated by Dr. B. E. Fernow at not less than 350 billion board feet,[7] is hardly but a memory in the Lake States with only approximately 2.4 billion board feet remaining.[8]

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[4] Moses M. Strong, History of the Territory of Wisconsin, from 1836 to 1848 (Madison, 1885), p. 280.

[5] U. S. Dept. of Agriculture, "Timber Depletion, Lumber Prices, Lumber Exports, and Concentration of Timber Ownership", Report on Senate Resolution 311 (Washington, 1920), p. 13.

[6] Ibid., p. 17.

[7] Ibid., p. 18.

[8] U. S. D. A., Forest Resources. . ., op. cit., p. 7.

Mr. Filibert Roth, who was commissioned to do a survey of forest conditions in Wisconsin in 1897, reported in 1898 that the original stand of pine in northern Wisconsin alone was 129.4 billion board feet. He estimated at that time (1898) only 17.4 billion feet remained standing, that between 1873 and 1898, 66 billion feet had been cut, and between 1840 and 1873, 20 billion feet had been cut, leaving 26 billion feet as "probably wasted, chiefly destroyed by fire".[9] Today all pine types in the Lake States make up only 4.4 million acres of which 3.07 million acres are seedlings and saplings or poorly stocked.[10]

A view of the true or commercial forest area of the Lake States as it exists today can be seen by Map 5-A. After a century and a half of settlement, land clearing, lumbering and forest fires, this area is essentially a cut-over, burned-over region. And to the extent wood resources were wasted and destroyed, to the extent the soil's productiveness for growing wood was impaired, wood-using industries as heirs to these historical circumstances are the losers.

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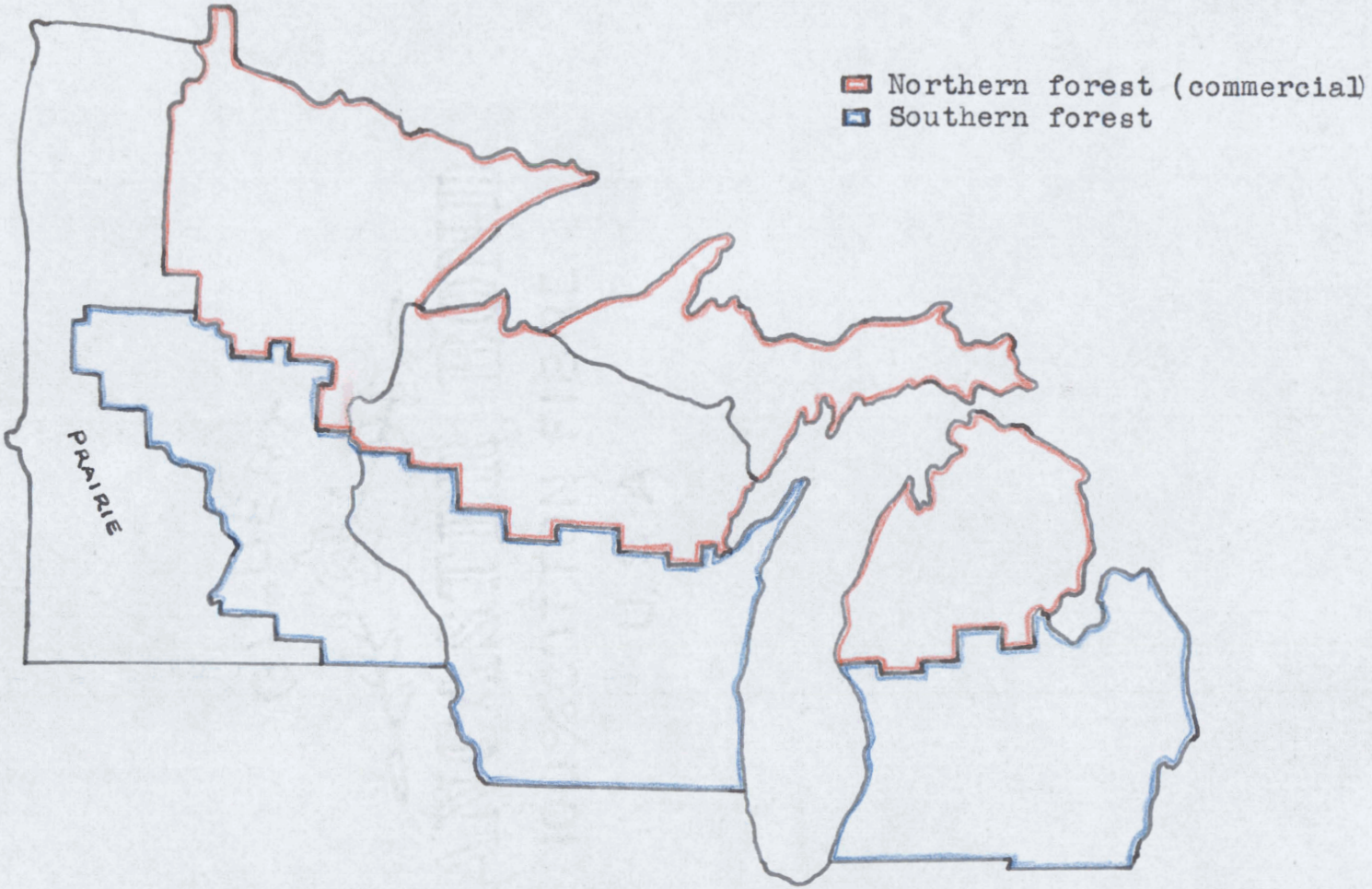
[9] Filibert Roth, Forestry Conditions in Northern Wisconsin, Wisconsin Geological and Natural History Survey No. 1 (Madison, 1898), p. 16.

[10] U. S. D. A., Forest Resources. . ., op. cit., p. 7.



Map 5-A

Principle forest zones in the Lake States Region, 1950[a]

[a]Source: U.S.D.A., Forest Resources . . ., op. cit., p. 3.

Some People Were Concerned About the Rapid Depletion

The white man's onslaught on the splendid forests which he found in this region did not go unheeded, however. As early as 1867 some people were forecasting the day when all the lumber in the state of Wisconsin would be gone.

> "When that time comes, when the famine of lumber is on us, the taxable property of the state will loose [sic] a large percentage of its value, and manufactures of lumber must almost cease, with with [sic] its use in buildings. And another and severer wind than any that now reaches us, will come to us unrestrained from the north. That will be a sad day for the state. But come it surely will, unless the people shall immediately take steps to renew their forests."[11]

F. Roth wrote in his survey in 1898 that

> "During the forty years of lumbering nearly the entire territory [of Wisconsin] has been logged over. The pine has disappeared from most of the mixed forests and the greater part of pineries proper has been cut. . .Nearly half of this territory has been burned over at least once: about 3 million acres are without any forest cover whatever, and several million acres more are but partly covered by the dead and dying remnants of the former forest."[12]

And further, in the report of the Forestry Commission of the state of Wisconsin in 1899 it was stated,

> "There are now dozens of cities and villages where the inhabitants have begun to wonder what will become of them when the timber is gone and the mills

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[11] J. A. Lapham, J. G. Knapp and H. Crocker, "Report on the Disastrous Effects of the Destruction of Forest Trees, now going on so rapidly in the State of Wisconsin" (Madison, 1867), p. 30.

[12] Roth, Forestry Conditions. . ., op. cit., p. 12.

close down. Everybody has seen settlements very prosperous ten years ago, which are now abandoned by almost all their former inhabitants."[13]

This lumbering extravaganza was described by one person as having harvested a forest "ultimately worth some nine billion dollars"[14] in Wisconsin alone. Indeed, the lumber industry reaped most of the region's rich inheritance of forest.

Wood Industries To Follow Inherited Vastly Depleted Wood Resources

As a result of the lumber industry which preceded it, the paper industry in the Lake States region inherited certain historically determined circumstances. Some of these circumstances, it now appears in retrospect, were "limiting factors" to the growth and development of the industry. From the viewpoint of the paper industry, the destruction and waste of usable forest resources meant reduced wood supplies and higher wood costs for future operations. Even the destruction and waste of non-pulp species has increased pulpwood costs, as some woods can be used for both lumber and pulp. Perhaps the greatest limitation, however, resulted when lumber companies did not replenish these forest resources, and

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[13] State of Wisconsin, Public Documents of the State of Wisconsin, Report of the Forestry Commission (Madison, 1899), II, 15-16.

[14] Francis F. Bowman, Why Wisconsin (Madison, 1948), p. 60.

furthermore, made it difficult (by burning the land, etc.) for nature to replenish herself with these resources.

C. Forest Survey, Past and Present - The Qualitative Changes

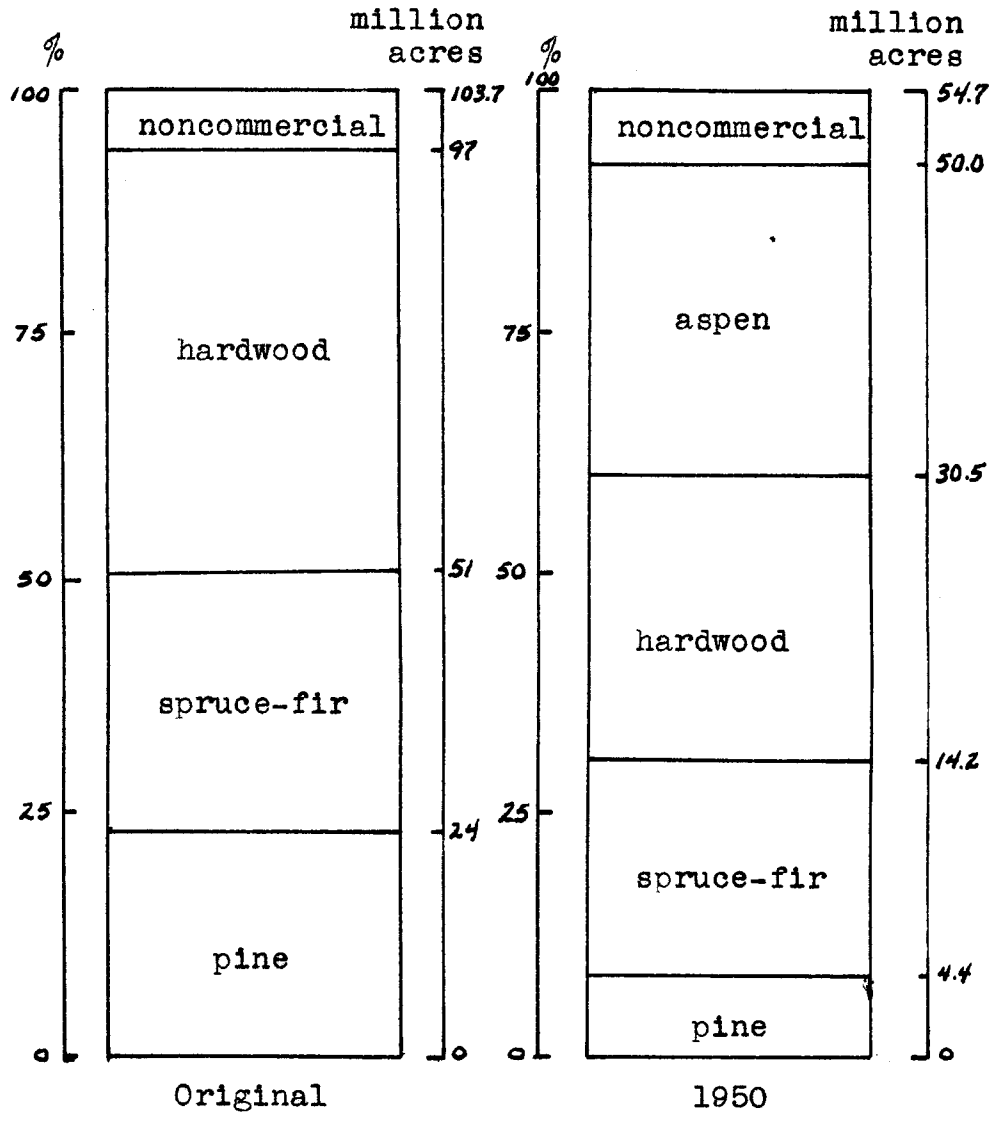
Aspen Replaces the Pine

The picture of qualitative changes wrought by the lumber industry is seen in graphic form in Figure 5-1. Besides the physical decrease in the original forest, a substantial change in composition of tree types has taken place. Particularly one observes the drastic decrease in the pine group and the large increase in the aspen-type tree. Presumably, aspen occupied a negligible portion of the original forest area. The occurrence of the aspen since that time, however, has had interesting and unforeseen effects on the paper industry.

Aspen, until a relatively short time ago, was considered a "weed tree". Although it is classed with the hardwoods, it has not been used to any considerable extent in the production of lumber. Likewise its value for papermaking was considered negligible until a few years ago. Although some aspen was used in early paper manufacture for making groundwood pulp, its short fiber and undesirable color meant it could be used only in the cheapest grades of paper. However, pushed by a serious wood-supply shortage plus the fact that large quantities

Figure 5-1

Original and present composition of Lake States forests, by species[a]



[a]Source: U.S.D.A., Forest Resources . . ., op. cit., p.iii.

of aspen were literally in the backyard, the paper industry set to work to devise ways and means of employing this ubiquitous tree. Since 1930, aspen has comprised an increased proportion of the wood pulp used in papermaking in the Lake States. In 1948, aspen made up twenty-two percent of the total volume of wood used for making paper which was about ten times the quantity used in 1935;[15] this amounted to approximately one-third of the pulpwood produced in the Lake States in 1948. Although aspen will never become as desirable for pulping as spruce, it probably will continue to be used as a valuable supplement to other pulps in the production of paper.

Another interesting feature of the aspen in that it propagates by wind and has succeeded in establishing itself in those areas where white pine and other conifers have been nearly completely cut out or where the area has been burned over. Although propagation in this manner leaves open spots as well as an uneven distribution of trees in size and concentration, it has provided a welcomed addition to the pulpwood supply and without, for the most part, a heavy investment in forest planting and management. The aspen will not, as now viewed, be planted commercially. If time and money are invested in growing a commercial forest, they will be spent on the much more

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[15] U. S. D. A., Forest Resources. . ., op. cit., pp. 32-33.

desirable spruce, pine or balsam-fir. It is estimated by the Lake States Forest Service that possibly 8.5 million acres may remain more or less permanently in aspen-type wood.[16]

Aspen Replaces Pine - Gain or Loss for Paper Industry?

Little did anyone realize that mass liquidation of the white pine would eventually prompt the rise of the aspen to take its place, and further, that this tree which was thought to be a weed would find use in making paper. For the paper industry, as a consequence, what appeared to be an irreparable loss of certain wood resources occasioned by lumbering activities, has in the course of time been partially offset as the result of the aspen.

Where aspen has replaced the spruce-fir group, the result is negative, but where white pine has been replaced, from the strict supply angle of the paper industry, a gain occurs. It is doubtful whether white pine would have ever been used in papermaking because of its much greater value in construction. Even today those wood types which can be used for both lumber and pulp are seldom used for pulp because of the higher prices they bring as lumber.

Thus, evaluating whether the lumbering industry created circumstances with respect to wood supply which were

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[16] Ibid., p. 15.

limiting or encouraging to the development of the paper industry is difficult. On the one hand, wood which was lost and wasted by the lumber industry and might have been used by the paper industry later, and forest soil which was damaged are debits to the ledger. On the other, the availability and innovation of aspen to supplement a scarcity of other pulpwood has been a credit.

Section III. Present-day and Potential Pulpwood Supply of the Lake States Region

A. Drain[17] and Growth

Given a forest resource base, the relation of drain to growth determines whether this base will eventually be capable of supplying more or less of the pulpwood needs of the Lake States paper industry in the future. Many factors influence both growth and drain and must be considered in any estimate of the future supply of wood. These factors can be classified as natural and institutional. Table 5-1 summarizes present-day growth and drain statistics for pulpwood in the Lake States region. It

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[17] Drain is defined as timber which is cut, wasted or destroyed by disease, fire, etc. - the total depletion of standing timber from all causes.

Table 5-1

Volume and drain of pulpwood in the Lake States, 1950[a]
(in thousands of cords)

species	total pulpwood volume	allowable drain	average comm'l drain 1947-50[b]	non-comm'l drain	total drain	total pulpwood consumed
Spruce	9100	270	365	30	395	
Balsam fir	10600	430	330	40	370	
Hemlock	7000	250	155	20	175	
Jack pine	7700	400	405	30	435	
Aspen	25600	1650	590	80	670	
	60000	3000	1845	200	2045	3419[c]

[a]Source: From information compiled by the Lake States Forest Experiment Station, St. Paul, Minnesota.

[b]Averaged from: A.G. Horn, "Technical Notes", Nos. 301, 320, 336, 364 (Lake States Forest Experiment Station maintained by U.S. Department of Agriculture).

[c]Based on total pulpwood receipts for 1950 of 2.419 million cords (of which 0.554 million cords were imported), plus 1.000 million cords of equivalent measure of imported wood pulp (estimated).

should be kept in mind that net timber growth will take place only if actual drain is less than allowable drain.[18]

Most Valuable Pulp Species Overcut

Some caution must be exercised when interpreting the figures shown in Table 5-1. Looking at the totals only, one finds demand is not taking all of the allowable supply, or total drain is less than total allowable drain. From this it might be concluded there is no shortage of pulpwood in the region. For an accurate picture of the situation, however, it is necessary to look at individual-specie figures. In 1950, for example, total receipts of wood by the paper industry from all sources ranked in quantity were: aspen, spruce, pine and balsam-fir.[19]

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[18] The column entitled "allowable drain" in Table 5-1 involves an estimate of growth based on the present age and number of the various species of trees. Allowable drain is defined as "the quantity of merchantable timber that can be cut annually during specified periods while building up or maintaining a growing stock adequate to fulfill certain future needs". The annual needs upon which these allowable drain figures are computed are estimated at four million cords. These allowable drain figures are set, therefore, so a point in time will be reached when all needs for pulpwood within the region will be met on a sustained yield basis. As the permanent base from which wood is now cut grows larger, the allowable drain will likewise become larger. Finally, actual drain and allowable drain will be equal at a level where all needs are fulfilled. See: U. S. D. A., Forest Resources. . ., op. cit., pp. 41, 46.

[19] A. G. Horn, "Technical Notes", No. 364 (Lake States Forest Experiment Station maintained by the U. S. Dept. of Agriculture at St. Paul, Minnesota, 1950).

Of these four wood-types, spruce and pine show a total drain greater than allowable drain. This overdrain would have presumably been larger if not for large spruce imports; half of the total receipts of spruce by Lake States mills in 1950 was imported from outside the region as was approximately one-third of the total receipts of pine.[20] For aspen, balsam-fir and hemlock, total drain was less than allowable drain and furthermore, imports of these species were a negligible proportion of total receipts.

It should also be remembered that spruce is perhaps the most desirable wood for papermaking while aspen is much less desirable, thus further distorting this picture. Consequently, rather than the optimistic setting which the total figures present, the picture is less bright when individual species' supply-demand figures are studied. If the totals are used, total pulpwood consumption by Lake States mills compared with total drain gives a more accurate picture of supply oriented towards demand.

Long range plans are presently oriented towards reducing the growing base of aspen and increasing the growing base of spruce. In the meantime, the manner in which the paper industry has made the most of the situation reflected by the table above (too much aspen and too little spruce in relation to demand) has been quite remarkable;

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[20] Ibid.

it has succeeded in employing increasing amounts of aspen in its pulp and paper products. In 1950, of the fifty mills operating in the Lake States, all but seven used aspen in varying amounts for the manufacture of pulp. Aspen represented almost one-third of the average commercial drain and slightly more of the total drain.[21]

B. Natural Factors Affecting Growth and Drain

The growth of a forest is similar in one respect to growth of a population. If the birth rate is greater than the death rate, population is growing and vice versa. Likewise, if annual growth of a forest is greater than its annual mortality (wood lost by fire, disease, insects, etc., excluding cutting[22]), then the forest is tending to increase.

The most important factors affecting the biological growth of forest are natural - soil, climate and natural mortality. Lake States forests, compared with other regions, have relatively small growth factors. Average growth in cubic feet per acre in the Lake States is one-third less than in the Pacific Northwest and only one-half of that reported in the South. It is considerably less

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21 Ibid.

22 An institutional factor considered in the next section.

than in the New England or Lake Central regions.[23] Although some of this differential is the result of soil and climate, most is the result of heavy mortality and the excessively large proportion of acreage in deforested or newly restocked condition.[24]

Heavy Drain Results from Natural Factors

The non-commercial drain figures shown in Table 5-1 reveal that an average of 200 thousand cords of pulpwood succumbs to suppression, fire or natural enemies each year. As trees grow in size, for example, they compete with each other for the available food, light and water. Many are suppressed and killed in this process.[25] Under good management conditions, however, much of this wood

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[23] U. S. D. A., Forest Resources. . ., op. cit., p. 27.

[24] In view of the fact that in many parts of the region timber is young, more than half of the annual growth consists of so-called "in-growth", that is, volume credited to trees which have just reached minimum merchantable size. In Clearwater, Minnesota, for example, a survey in 1949 showed that sixty-three percent of the current annual growth was newly recognized volume of trees which had just entered the 6-inch diameter class. Tree growth up to the 6-inch class is not recorded in growth statistics although the acreage on which this growth occurs is included. This distorts these growth figures somewhat when comparisons between regions are made. See: Ibid., p. 27.

[25] A fairly well-stocked 20-year-old jack pine stand loses half of its trees through suppression before it reaches thirty years of age and half of the remainder before it reaches fifty years. See: Ibid., p. 27.

can be salvaged for pulpwood, posts, etc., before its value is entirely lost.

Fires are a constant menace to our forests. Up until the early part of the century, many billions of feet of lumber as well as 2800 human lives had been lost in forest fires in the Lake States alone.[26] Under the tragic stimulus of these losses, the three Lake States have established protection systems with the help of Federal aid which now are among the best in the country. During the ten-year period, 1938-47, total forest acreage burned annually was held to an average of 94,232 acres, or less than two-tenths of one percent of the area protected.[27]

Losses likewise occur from insects and diseases. Experts working with these natural enemies believe losses can be reduced considerably. Other losses occur from wind, sleet, drought, floods, browsing, etc. In 1932, for example, a heavy wind destroyed about 300,000 cords of jack pine and other timber in the Superior National forest. A storm in 1940 felled some thirty million feet of pine in the Chippewa National forest.[28] It is believed that losses from natural causes could be reduced twenty-five percent

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[26] Ibid., p. 28.

[27] Ibid.

[28] Ibid.

through improved forest management and better forest utilization.[29] If these losses could be reduced, the region would come nearer the goal of meeting its own wood needs.

C. Institutional Factors Affecting Growth and Drain

Actual commercial or cutting drain (as shown in Table 5-1) must be considered in the overall question of wood supply. As pointed out earlier, both spruce and pine are being overcut. If this overcutting should continue, the stocks (as indicated by "total pulpwood volume" in Table 5-1) of each would eventually disappear. Overcutting is partly volitional and partly the result of ignorance. If a forest owner chooses to follow cutting practices which will eventually exhaust his stock, an explanation might lay in the fact it is more profitable for him to do so. It may be more profitable to cut his forests in such a manner because of an unwise system of taxes on his forest crop. Fortunately, it has been recognized that unwise tax laws can undo much conservation work and education, and steps to rectify this situation have been taken.

On the other hand, ignorance may be at fault, and to the extent this is true, education appears to provide the answer. Today in the Lake States region more and more is being heard through all the mediums of communication about forest conservation. There are numerous

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[29] Ibid., p. 29.

organizations throughout the region, such as the Trees for Tomorrow groups, the 4-H clubs, etc., which are not only talking and educating, but "doing" in the form of actual tree planting. Rural schools and young people's groups are planting literally thousands of seedlings each year in these programs. Farmers also are being educated by agricultural extensionists, pamphlets and fairs on how to make their farm woodlots a source of profit on a sustained yield basis.

Much of this education has been prompted by findings which indicated that private owners are cutting proportionately more than conservation officials have estimated to be their allowable cut. For example, in 1948 private owners owned approximately sixty percent of the commercial forests in the Lake States, but they were responsible for almost eighty percent of the entire cutting drain; their actual cutting was about ten percent more than estimated allowable cut.[30]

D. Private vs. Public Land Ownership as Related to Growth and Drain

The whole sphere of public vs. private ownership of natural resources is an extremely complex, but an historically interesting development. Early frontier activity seems to verify the inability or incapacity of private

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[30] Ibid., pp. 38, 43.

owners to utilize natural resources prudently and conserva - tively. In the Lake States in regard to the wood resources, private owners have wasted and destroyed much of these public assets. And furthermore, certain of these private owners have perpetuated this waste by encouraging others to buy forest land for farming.

A Cycle of Land Ownership - Public to Private to Public

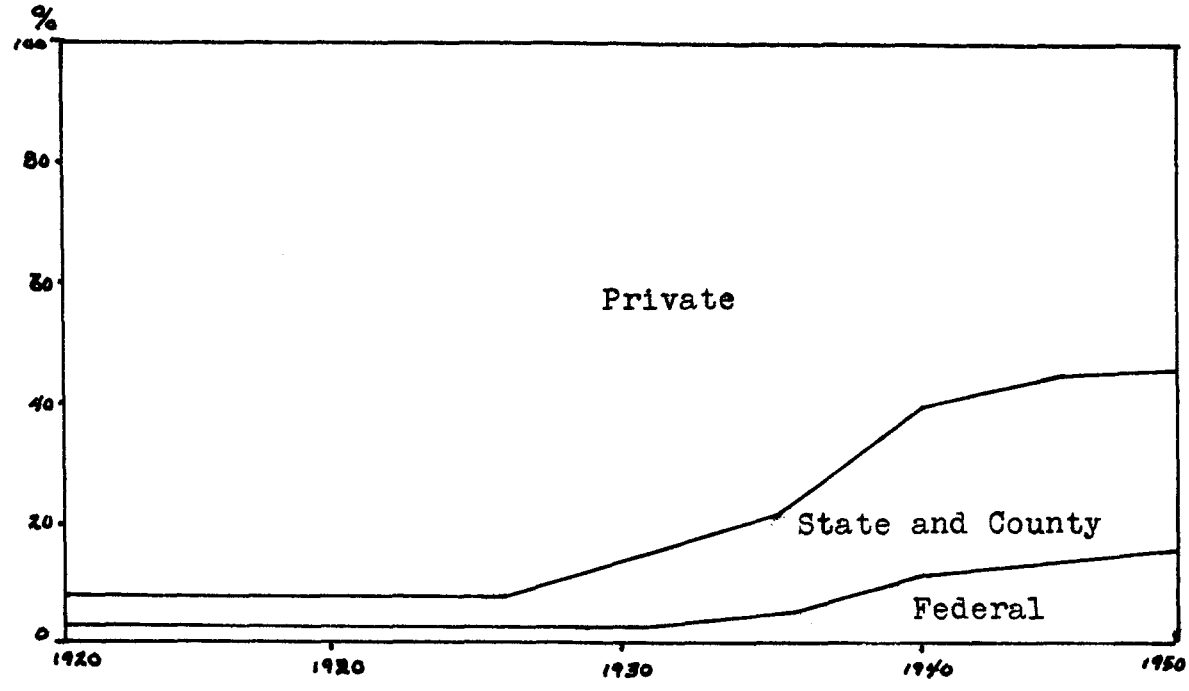
At one time, most of the land known as the United States was owned by the government. How it disposed of this land is a long and fabulous story, but dispose of this land it did until the low in public ownership was reached in the early 1900's. Since that time, however, the trend has been reversed and an increase in public ownership has occurred.

In the Lake States, wood resources have gone through (and are still going through) the cycle of public to private back to public control. Since 1925, there has been a slow, steady accretion of forest land on the part of public owners as can be seen in Figure 5-2. Most of the state and county acquisitions have been obtained through tax forfeitures.

The story of early private farm ownership in the northern sections of the Lake States goes back to the late 1800's and early 1900's when both public and private agencies tried to create interest in this land for farming.

Figure 5-2

Trend in forest-land ownership in the Lake States[a]



[a]Source: U.S.D.A., Forest Resources . . ., op. cit., p. 16.

Lumber and railroad companies in particular utilized all sorts of persuasive methods to sell land which they had acquired and cut-over or no longer had need of. Showing some concern over propaganda put out by various foreign agents of these companies, a letter was published in the "Annual Report of the Board of Immigration" of Wisconsin in 1882, by a prospective immigrant which read:

> " 'I beg to ask your Honorable Board for some information regarding the State of Wisconsin, particularly the northern portion thereof. Agents and commissioners without number are at present engaged in advertising every conceivable section of the Union, in Europe; and when we consider the prevailing tendency of our age for fraud and swindling, and the well-grounded suspicion with which the representatives of Agents and their honesty and veracity are looked upon, it is almost impossible, with such a chaos, to arrive at correct conclusions.' "[31]

Mr. K. K. Kennan who was appointed agent for the immigration board and Wisconsin Central R. R. Co. wrote from Europe that people who were interested in coming to the United States were interested in receiving reliable pamphlets "because those of some of the States and railroad companies are obviously exaggerated and untrue, and have no such weight with intelligent people as do the carefully prepared reports of your Honorable Board".[32]

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[31] Wisconsin Board of Immigration, "Annual Report of the Board of Immigration" (Milwaukee, 1885), p. 9.

[32] Ibid., p. 11.

However, in preparing its literature about the advantages and disadvantages of the State of Wisconsin, the immigration board was not above a slight bit of exaggeration when it wrote:

> ". . .there is no better land in the State for cultivation than in the counties named in the foregoing table /all of which were the northern so-called pineries/. . .It must be conceded that it is easier, and probably more profitable during the first years to raise a crop on a prairie farm than in the timber regions, where energy and endurance is required to develop its agricultural resources, but where the results obtained are of lasting benefit to the settlers."[33]

It is now well-known that much of land in the northern sections of Wisconsin, Michigan and Minnesota which was put to the plow was unsuited to agriculture. Mr. Roth in his survey in 1898 estimated that "nearly 40 percent /of the northern area of Wisconsin/ is either not at all suited for agriculture or only doubtfully so and should by all means be left to forest".[34]

Another surge to acquire farm land took place during World War I when high land values in the corn belt stimulated a great movement of corn belt farmers into northern areas where farm land was still available. Bearing out the veracity of Mr. Roth's statement, however, by 1927, seventeen northern counties in Wisconsin had 3,041,133 acres

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[33] Ibid., p. 14.

[34] Roth, Forestry Conditions. . ., op. cit., p. 5.

with one or more tax certificates against them.[35] Much of this land was abandoned.

Tax forfeitures have been a prevalent but unplanned method of public land acquisition. In 1898 in Wisconsin, county governments owned about one and one-half percent of the area in tax deeds "and about five times this amount conditionally on tax certificates".[36] In 1920 less than ten percent of the forest land in the Lake States region was in public ownership. The Federal government held less than two million acres. The states held only about three million acres and counties held virtually no forests at all. Between 1925 and 1945, however, states and counties took over about one-fourth of the privately owned forest lands through tax forfeiture. During this same period, the Federal government enlarged its holdings by about six million acres, mainly by purchases and exchanges. In 1950, public agencies controlled about forty-four percent of all forest land or forty-one percent of the commercial forest area of the Lake States region.[37]

The consequences of changes from pre-frontier government ownership to private ownership of this northern forest

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[35] Forest Land Use in Wisconsin, op. cit., p. 58.

[36] Roth, Forestry Conditions. . ., op. cit., p. 6.

[37] U. S. D. A., Forest Resources. . ., op. cit., p. 15.

area were several: a misallocation of resources in that land good for producing only forests was withheld from this production; the deterioration of much of this forest land; a succession of farm failures or eked-out livings; and finally, the loss of much tax revenue and subsequent difficulty of maintaining public roads, parks, schools, etc. Reversal of this process - private to public forest land ownership - has had one important consequence: realization of the need for some scientific and objective planning of land use. The manifestation of this realization into concrete form is being accomplished through rural zoning and forest crop laws.

E. Private Forest Land Ownership and the Wood Supply

Both farm and non-farm private land owners are still in command of over half of the forest land (see Figure 5-2, p. 111). Within the private ownership group, the proportion of farm to non-farm ownership is important to the problem of wood supply because the non-farm portion, representing industry-ownership primarily, generally practices better forest utilization and management than the farm group. In Wisconsin, farm and non-farm owners owned about an equal amount of forest area in 1950. In the Lake States as a whole, farmers own one-fourth of all the forest land.[38]

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[38] Ibid., p. 20.

In the private non-farm group, there has occurred and is occurring a substantial change in the complexion of ownership; changes in the size of holdings as well as character of ownership. In 1913, 10 owners held 24 percent of all the standing timber in Wisconsin and 96 owned 75 percent.[39] For the Lake States as a whole, 4 owners held 12 percent of the standing timber, 17 held 23 percent, 44 held 37 percent, and 215 owners held 65 percent (each owning sixty million feet or more).[40] The present picture indicates that only in Michigan is any substantial amount of land held in large quantities.

As for the type of ownership, a considerable change has taken place. According to Roth, in 1898, eighty percent of the total forest area held by private owners was held by lumbermen,[41] whereas at present, holdings of lumber companies are relatively small and are declining. Holdings by pulp and paper companies, on the other hand, are relatively large in Wisconsin and Minnesota and are increasing in all three of the Lake States; their holdings have increased more than 33 percent between 1945 and 1950. Only

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[39] U. S. Dept. of Commerce: Bureau of Corporations, The Lumber Industry, Part I (Washington, 1913), p. 17.

[40] Ibid., p. 22.

[41] Roth, Forestry Conditions. . ., op. cit., p. 6.

in Michigan are total holdings by lumber companies greater than pulp and paper companies.[42] (See Figure 5-3).

Two Views by Paper Companies on Future Wood Supply

There are presently two views taken by pulp and paper companies in regard to pulpwood supply. One view supports a "grow your own" philosophy. These companies have witnessed the growing shortage of homegrown stock along with frequent fluctuations in pulpwood prices on the open market, and they feel that in order to insure themselves of a supply of pulpwood regardless of the vagaries of the market - foreign and domestic- they will have to grow their own supply. There are, on the other hand, those companies which do not wish to or do not have the funds to tie up in such a long-run investment project. These people believe or hope there will be an adequate supply of pulpwood if farmers and small forest owners can be educated to the economic advantages of caring for their woodlots properly and if there is a large public reforestation program. Out of this philosophy has come many of the educational and legislative programs mentioned above. This strategy, of course, would be much less costly in investment for the wood-using industries.

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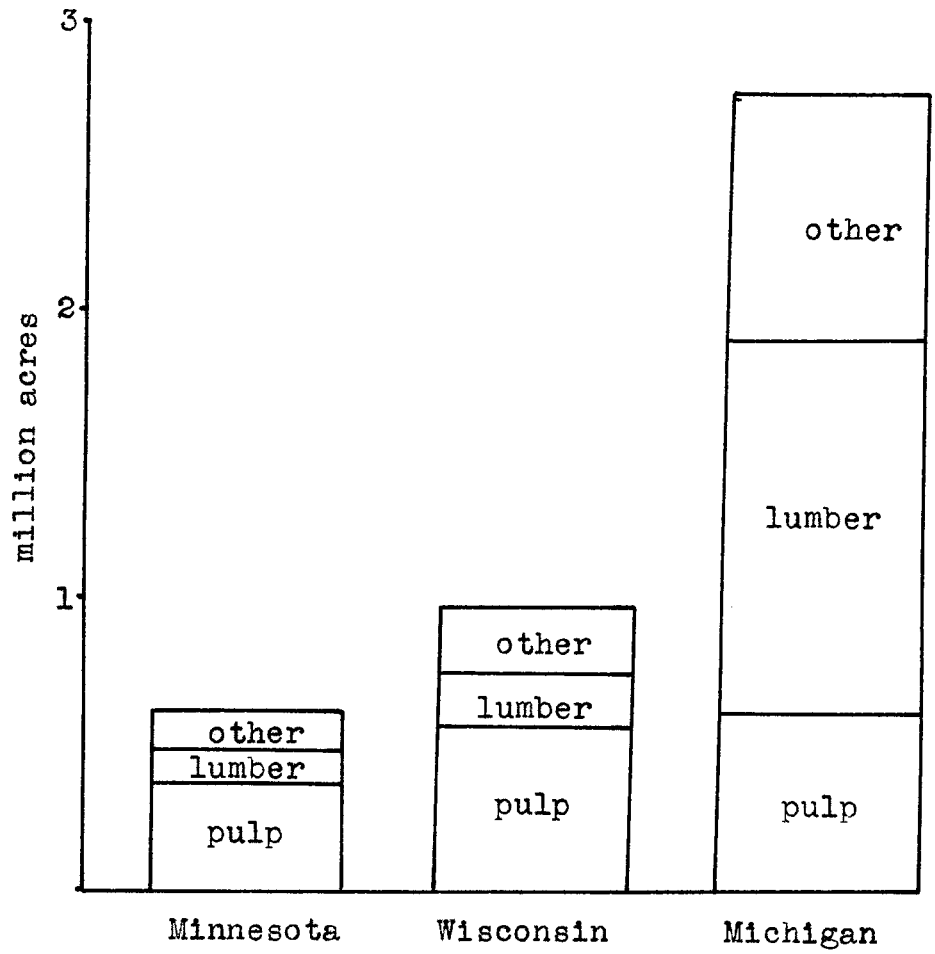
[42] U. S. D. A., Forest Resources. . ., op. cit., p. 21.

Figure 5-3

Acreage of large (50,000 acres or more) and medium-sized (5000 to 49,999 acres) private holdings owned by different industry groups in the Lake States, 1950.[a]



[a]Source: U.S.D.A., Forest Resources . . ., op. cit., p. 21.

F. Public Control and Wood Supply - Rural Zoning and Forest Crop Laws

The problem of private farm settlers trying to manage a living on land which is extremely reluctant to provide such a living, has resulted in a severe test of democratic government. Not only were these sub-marginal farmers unable to keep body and home together, but also they were a heavy burden on their respective governments. They provided no tax funds to pay for services furnished them by the government. Furthermore, they were withholding from economic production much land capable of producing forests. It would have been an easy matter under another system of government to have dealt with this situation by coercion, but the problem had to be overcome within the precepts of our political philosophy.

The methods used - education, legislation and government aid - are traditional democratic means and have been employed in all three of the Lake States. The educational aspect has been mentioned. The legislative and government aids have taken principle form in Rural Zoning and Forest Crop laws. Zoning is creation by law of districts within which regulations prohibit certain specified uses of land which are considered harmful to the public interest. Thus, the objective is set up to regulate land use in order to secure the best utilization of natural resources in terms of profit, human life and happiness. This means that in

time most of the land primarily suited for growing forests will be turned again into that mode of production. Furthermore, in time, wood-using industries can expect an increased supply of wood for all purposes from these lands.

The Forest Crop program is designed to encourage private owners to use their land for forestry. In Wisconsin this is achieved by reducing the annual tax charge on forest land. Under the provisions of the Wisconsin law, a landowner can enter a fifty-year contract with the State Conservation Department. Under this contract, the owner agrees to use the land for forestry, and if he complies with certain other regulations, his annual tax is reduced to ten cents an acre. The state, from its general fund, agrees to advance the local government approximately ten cents an acre in addition. When the owner harvests a timber crop, he pays a ten percent severance tax to the state which is turned back into the general fund. A short time after this law went into effect, it was extended under similar conditions to include county-owned land also.

Section IV. Future Wood Supply

The Goal

The goal of forestry in the Lake States is to provide this region with its entire wood needs in the future. Experts believe this objective can be achieved by A. D. 2020

if proper measures are taken.[43] Because total wood needs (for lumber, pulp, etc.), not the needs of a single group or industry, must be the scope of any public program, the goal which is proposed is not specific but general to all demands for wood. In other words, if the entire effort in this region were directed towards self-sufficiency in pulpwood alone, this goal could presumably be achieved more quickly.

The goal of self-sufficiency by A. D. 2020, if achieved, will provide an annual yield on a sustained basis of over four million cords of pulpwood for the paper industry.[44] This yield would cover not only present but estimated future needs resulting from industry growth. At present, as it was shown, only about two-thirds of the total quantity of pulpwood required is supplied within the region. For some of the most valuable species, only about one-half of the needs are got within the region.

Methods of Attaining the Goal

The two general methods of attaining the proposed goal are improved forest management and an increased rate of planting. Better forest management of existing and future forests is estimated to be able to increase the annual

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[43] Ibid., p. 47.

[44] Ibid., p. 46.

yield by at least 60 percent over the present rate,[45] but this is not enough to meet needs; planting is also necessary. To meet requirements "the rate of planting should be increased very soon to at least 100,000 acres per year", 2.5 times the 1946 rate.[46] This would result in 5 million acres being planted within 50 years. The first yields of pulpwood from this planting would probably appear about 30 years after the initial planting.

During the period before the yields from new plantings make self-sufficiency possible, pulpwood yields can be increased by better forest management. However, the industry, although it will undoubtedly continue to search for ways of using more aspen in its paper manufacture, must presumably rely heavily upon imports of certain species from outside the region until the goal of self-sufficiency is approached. This interim period will probably be a crucial one for the Lake States paper industry.

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[45] Ibid., p. 47.

[46] Ibid., p. 51.

CHAPTER VI

WATER USE AND TRADE RESTRICTIONS: NEW OBSTACLES TO GROWTH?

Along with the complex factors within the region which affect wood supply and the manufacture and sale of paper, restrictions involving the movement of paper, pulp, and pulpwood in international trade must be considered briefly. Although trade restrictions affecting the paper industry are very old, legislation which has appeared recently has restricted industry growth and caused considerable change in certain lines of paper manufacture in the Lake States. What is more, the threat of new changes in trade restrictions which would affect this region is present.

In this final period a relatively recent problem concerning the use of water in manufacturing has demanded increased financial outlays on the part of Lake States

paper firms. Because of public regulation and increased costs, the problem of water use and disposal has become an impediment to growth.

Section I. Wood Supply and Trade Restrictions

Because the Lake States are deficient in wood and therefore must import a considerable quantity of pulpwood and wood pulp, trade restrictions affecting this supply are an important issue. The focal point of this problem is primarily the trade restrictions between the United States and Canada.

Canadian Restrictions on Pulpwood Exports

The most important legislation in recent years affecting pulpwood exports from Canada was passed in 1947 in Ontario, the largest provincial exporter of pulpwood. At that time an Order-in-Council was passed which would gradually limit the export of pulpwood from the province until exportation is entirely cut off in 1957.[1] The likelihood that the other provinces will follow with similar restrictions presents a serious problem to those paper mills which have depended on these imports.

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[1] Since 1900, Canada has established a land policy by which suitable agricultural land has been offered for sale to the public but most of the forest land has been retained as "crown lands" under the jurisdiction of the several provinces. The provinces thereby, are able to sell stumpage rights under lease and specify in the contract the type of wood utilization which is to be

Integrated Mills[2] Affected Most

It is the integrated paper mill which is most affected by Canadian restrictions on the export of pulpwood. In the Lake States about one-half of the paper mills are of the integrated type. In 1947, as shown in Table 6-1, imports from all areas outside of the region amounted to about 27 percent of total receipts of pulpwood by Lake States mills. Imports from Canada provided about 97 percent of this outside supply. Canada is even more important as a supplier of pulpwood than these figures indicate because most of these imports are spruce. Spruce, it is remembered, is perhaps the most desirable wood for making paper. Spruce made up about 83 percent of pulpwood imports from Canada in 1947.[3]

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employed. This has permitted the restriction of the export of pulpwood from time to time by both Canada and Newfoundland. Since 1916, Newfoundland has required that timber be "manufactured into either paper or paper pulp, sawn timber or other saleable products of timber" before exportation. Thus, by restricting the export of wood in such a manner, the manufacture of wood into a more finished product will be stimulated, consequently keeping at home the profits generally connected with semi- and finished manufacture. Stevenson, op. cit., p. 194.

2 Mills that manufacture their own pulp.

3 Horn, "Technical Notes", No. 301, op. cit.

Table 6-1

The production and imports of pulpwood in the Lake States, 1947[a]

Destination to:	Production by states			Region total	Imports		Total receipts	Imports as % of receipts
	Minn.	Wis.	Mich.		Canada	Other (U.S.)[b]		
Minnesota	443			443	54		497	10.9
Wisconsin	341	451	439	1232	466	24	1722	27.0
Michigan	21	42	239	302	142		444	32.0
Exported by the L.S.	47			47				
Total	852	493	679	2024	662	24	2686	26.5

[a]Source: Horn, "Technical Notes", No. 301, op. cit..

[b]Montana, South Dakota, Idaho and Colorado.

Between 1947 and 1950,[4] imports of pulpwood from Canada fell from 466 to 257 thousand cords while imports from Western United States increased threefold. Apparently, in view of the cutting off of Canadian pulpwood and in order that good contractual relations may be built up, many mills have already shifted from Canada to the West as a source of supply. At present, American subsidiaries in Canada can export pulpwood cut on leaseholds, but the number is not large. Furthermore, there is no way of knowing whether these American subsidiaries will always be allowed this export privilege.

Canadian Restrictions Stimulating Reforestation

The Canadian restrictions on the export of pulpwood is having another effect, in this case a favorable one, on the Lake States; it is stimulating reforestation. In time, as was shown in the last chapter, there appears to be no reason why this region should not be self-sufficient for its own pulpwood on a sound economic basis. The sooner this event occurs, the more favorable will be the competitive position of the Lake States paper industry.

Non-integrated Mills Depend on Market Pulp

Whereas the integrated mill must supply itself with pulpwood, the non-integrated mill is wholly dependent upon

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[4] Horn, "Technical Notes", No. 364, op. cit.

market pulp if wood pulp is used in its paper manufacture. In most instances, these producers are more at the mercy of market vagaries than are the integrated mills. This is true, to some extent, because non-integrated mills generally take the surplus pulp produced by integrated mills, and in periods of peak production, integrated mills may have little surplus pulp for sale; in such case, the non-integrated mills must look elsewhere for their supply. As a result, these non-integrated mills are subjected to rather wide fluctuations in pulp prices.[5]

Region Imports About 25 Percent of Its Pulp Needs

For some time there have been no U. S. restrictions on the importation or exportation of wood pulp. In 1949, U. S. paper mills imported about 13 percent of their total consumption of pulp.[6] However, this figure includes consumption by integrated as well as non-integrated mills, and therefore clouds the fact that between 1947 and 1951, imported pulp made up an average of 55 percent[7] of the

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[5] Price fluctuations of this sort can be partially offset by varying the pulp content of the paper - i.e., by varying the proportion of wood pulp, rag pulp, waste pulp, etc. which makes up the actual paper product.

[6] U. S. Dept. of Commerce, "Wood Pulp, Paper and Board - 1949", Facts for Industry, Series M14D-09, p. 4.

[7] "Newsprint Review", Pulp and Paper, XXVI (July 1, 1952), 150.

total market pulp (i.e., pulp available to the non-integrated mills) sold in the United States. This indicates that not an inconsiderable proportion of the non-integrated mills' wood pulp supply was imported.

In the Lake States about half of the paper mills are of the non-integrated type. Thus, the region as a whole is vitally dependent upon wood pulp manufactured for the open market. In 1947, 96.7 thousand tons of pulp was manufactured for sale within the Lake States.[8] This amounted to only 6.2 percent of total production of 1547 thousand tons.[9] However, in this same year, Lake States mills consumed 2100 thousand tons of pulp, which meant about 600 thousand tons or over 25 percent was imported.[10] This shows that Lake States mills are dependent upon outside sources for a considerable part of their pulp, as they were also for pulpwood.

No Restrictions on Pulp Imports From Canada

Until now, the imports of pulp into this country have been unrestricted by Canada; however, again no one can predict how long this situation will last. It is conceivable,

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8 Ibid.

9 However, about one-third of this total was produced from imported pulpwood. See also: U. S. D. A., Forest Resources. . ., op. cit., pp. 32, 33.

10 U. S. D. A., Forest Resources. . ., op. cit., p. 33.

for example, that Canada, wishing to promote the upgrading of her paper manufacture, might restrict the export of wood pulp as she has already done in the case of pulpwood. This prospect seems to give added urgency to efforts designed to make the Lake States less dependent upon outside sources for their pulp and pulpwood supplies.

Section II. U. S. Trade Restrictions and the Production of Paper

Lake States Industry Protected Against Foreign Competition?

In addition to the effects on the supply and cost of raw materials and consequently the price of paper, trade restrictions may affect price by limiting the supply of paper offered for sale. Whereas Canadian export restrictions on wood supplies have affected paper manufacturing in the United States, the United States tariff on imported paper affects U. S. paper firms by limiting competition in the domestic market. To what extent the welfare of the industry in the Lake States is posited on protection is therefore of considerable interest.

Unfortunately, too little evidence exists to answer this question. For only one case - newsprint - is the evidence concrete; and even in this instance, the circumstances surrounding the removal of duties were so particular as to make it extremely dangerous to generalize

concerning the possible effects of freer trade on other types of paper. Nevertheless, the problems which arose and the adjustments which were made in the United States and the Lake States as the result of allowing foreign newsprint paper to enter free are of considerable importance.

Paper Has Always Been Protected

Throughout the history of the United States, paper has been a protected product. On July 4, 1789, in the first tariff act of the new nation, it was written, "on all writing, printing or wrapping paper, paperhangings and pasteboard, 7½ per centum ad valorem". Since that time, paper has been protected. Duties have ranged as high as forty percent ad valorem and twenty cents a pound.[11]

Between 1789 and the Underwood Tariff in 1913, no less than eighteen separate acts were passed altering paper duties and adding new duties to meet changed conditions in the home market.

The Underwood Tariff of 1913 was probably the most notable tariff in our history from the standpoint of the paper industry. It was in this act that all pulp was placed on the free list, and also all printing paper valued

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[11] Stevenson, op. cit., p. 190.

up to 2½ cents a pound - which at the time comprised principally newsprint paper. It is to this act paper manufacturers continually refer as an example of the folly of legislators on the one hand, and an economic disaster on the other. For those who would reduce the duties on other types of paper, the newsprint industry remains the martyred example of the inevitable result.

The Hawley-Smoot Tariff Act of 1930 is the next important trade bill affecting the paper industry. In all except one paragraph in the sections of the tariff dealing with paper, rates were raised to their highest levels in many years. The overall rate of duty was about 26 percent for paper products.[12] During this same period of the 1930's however, several Reciprocal Trade Agreements were passed with the general effect of lowering the duties on paper. An agreement with Canada in 1936 bound newsprint to the free list where it remains today.

In 1952, duties on paper were 3 to 6 cents a pound and/or 10 to 30 percent ad valorem for certain of the major types of paper.[13] Rates ranged from as low as

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[12] Statistical Abstract of the United States, 1950, p. 868.

[13]

Type[a]	Cents per pound		Percent
1. Paperboard, plain			10
2. Book paper, coated	5	plus	15
3. Glassine	3	plus	15
4. Kraft wrapping			30
5. Writing paper, sheets	3	plus	25
6. Tissue	6	plus	20

[a] Source: Import Publications, Inc., Custom House Guide (New York, 1952).

5 percent for some types of photographic paper to 60 percent for cigarette paper.[14] In 1952, of the total volume of paper imports, newsprint comprised 95 percent of the total and all other papers combined only 5 percent. All paper imports, except newsprint, amounted in volume to .0009 percent of total U. S. production of paper in 1952.[15] It would appear foreign competition in paper other than newsprint is largely lacking at present in the United States.

Newsprint Industry Shifts to Canada

The lowering of duties on newsprint back in 1913 signalled the end of the importance of that industry in the United States as it has been noted. Interestingly enough, however, newsprint was placed on the free list not for reasons usually propagated by free traders, but due to pressure of the powerful publishers of America. In 1898, when the International Paper Company was established, the newspaper publishers feared "a paper trust" was being formed, and the government was entreated to prosecute this so-called trust under renewed enforcement of the Sherman law initiated by Roosevelt. At the same time the Roosevelt administration was leaning towards efforts to conserve our

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[14] Custom House Guide, op. cit.

[15] Harry Hansen, ed., The World Almanac and Book of Facts for 1954 (New York, 1954).

fast dwindling forest resources. Liberalizing imports on those products which consumed wood was thought to be a step in the right direction. The result of these forces was the Underwood Tariff of 1913, a law it was thought would both help prevent a monopoly and conserve our forests.[16]

After the Underwood Tariff was passed, reaction in the paper industry began.[17] The number of firms producing newsprint fell from 65 in 1913, to 38 in 1926, and to only 13 in 1949. Likewise, a fall in the percentage of total consumption of newsprint produced domestically from 93 percent in 1913, to 48 percent in 1926, and further to 17 percent in 1949 took place. In the Lake States, 19 mills were producing newsprint in 1913, but only 1 in 1949.[18] In 1914, one year after the Underwood Tariff became law, the Lake States produced 246 thousand tons of newsprint or about 19 percent of total United States production. Within the Lake States, newsprint production amounted to 29 percent of all paper produced in that year. In 1949 the entire region produced hardly enough newsprint to mention. It seems possible to conclude, therefore, that "freeing" newsprint paper wrought substantial changes in

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[16] cf., Stevenson, op. cit., p. 191.

[17] For more detailed information see Appendix C, p. 168.

[18] Lockwood's Directory. . ., op. cit.

paper manufacture in the Lake States as well as the United States. What is more, spokesmen[19] for the paper industry are convinced, in view of these facts, that reducing duties on other types of paper will bring about an historic parallel of the fall of the newsprint industry.

Whether or not reducing restrictions on other types of paper would have the same result is impossible to know at this point. In the case of newsprint, the tariff reduction merely activated conditions which were in evidence before the "freeing" of this commodity. The United States Tariff Commission cites the following circumstances as the main reasons for the shift of this industry from the United States to Canada: (1) the upward trend of newsprint consumption; (2) the reduction in the economically available stands of timber suitable for the production of paper through heavy cutting and devastation by insects, fire and disease; and (3) the increase in the competing demand for wood for the production of lumber and other types of paper.[20] If the tariff had been allowed to remain, the result would have been clear: due to the fact that newsprint and other grades of paper are substitutes, the

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19 See: D. K. Brown, "How Reciprocal Trade Agreements Act Affects the Pulp and Paper Manufacturing Industry and Its Effect on Workers' Wages", Southern Pulp and Paper Journal, VIII (June, 1945), pp. 12-14.

20 U. S. Tariff Commission, "Newsprint", op. cit., p. 3.

prices of all papers would have been substantially higher. It would have meant, furthermore, where paper products have been devised for a great variety of new uses as substitutes for other materials and other uses, this substitution would probably have been materially lessened due to higher paper prices.

As a consequence of the loss of the newsprint paper market, the Lake States mills upgraded their manufacture to better quality and more specialized papers. On the basis of what has been shown, this upgrading process seems to have been to the advantage of the Lake States.

Effects of Freer Trade in All Papers Unknown

It would require an exhaustive study of specific duties and specific cost and manufacturing data on particular grades of paper before an attempt could be made to predict what the effects of freer trade might be on the Lake States industry. On the other hand, it is probably safe to say there would be some re-allocation of resources and this would affect production, costs and sales. It could likewise be safely predicted that certain types of paper, namely, printing and writing papers, would feel the competitive pressure first as a result of freer trade. This would be true because these types of paper can be produced on large scale and by more or less well-known and standard techniques. The Canadian industry is well adapted for this

type of manufacture. Finally, in the event of freer trade, the Lake States region's ability to compete successfully with Canadian paper manufacturers would depend upon comparative average costs of manufacture. And these costs, once again, are determined largely by the costs of obtaining an adequate wood supply.

Aside from these few remarks, to what extent trade restrictions have or are now enabling the development of the paper industry in the Lake States is difficult to answer. With little past evidence to go on, it is only possible to condition an analysis of the future with certain possible repercussions which might result from lowering or raising trade restrictions on paper.

Section III. Water for Processing Paper

A. Introduction

Aside from the fact that "pure" water is needed in the manufacture of quality papers, great quantities of water are also necessary. Even the casual observer is impressed by its primacy. Almost every stage of paper manufacture employs water in one way or another. To the person impressed by "raw" statistics and unprocessed figures, the quantity of water used is by far the most amazing factor in the production of paper. Using averages, it would be safe to say it takes about 40,000 gallons of water to produce a ton of paper and approximately 73,000

gallons to produce a ton of chemical pulp.[21] Comparing these figures with water consumption in U. S. cities in 1945, it was estimated that the average per capita consumption of water per day in communities over 10,000 was 140 to 150 gallons.[22] Thus one 200 ton fully integrated paper mill requiring approximately twenty-two million gallons of water a day would supply enough water for a community of 150,000 residents. On the basis of water used per dollar of value added in manufacture, the paper and pulp industry uses more water than any other industry in the United States.[23] A. E. Griffin states the need for large amounts of pure water when he writes that "the paper manufacturing industry is probably more dependent upon the adequacy and purity of its water supply than

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[21] The President's Water Resources Commission, A Water Policy for the American People, I (Washington, D. C., 1950), 178.

[22] Ibid., p. 177.

[23]

Industry	Gallons of Water Used Per Dollar of Value Added[a]
An integrated paper mill	1879
Steel	1400
Oil refining	973

[a]Source: S. Powell and H. Bacon, "Magnitude of Industrial Demand for Processed Water", XLII Journal of the American Water Works Association (August, 1950), p. 783.

almost any other line of endeavor, with the possible exception of the textile trade".[24]

Due to the fact that the Lake States have shifted from the production of coarser, poorer quality into finer, better quality papers, their need for large quantities of pure water has increased relative to those areas where this shift has not occurred in the same degree. At the time when need for cleaner water increased, lack of adequate government regulation of stream use was such as to allow waters to become dirtier in this region.

The need of acquiring clean water for papermaking has motivated the paper mills in this region to install expensive filtering and cleaning plants. At the same time, state governments have now accepted the responsibility of preventing further water damage by regulatory and enforcement measures. Increased costs and increased water control have meant new obstacles for the Lake States paper industry.

B. Water Purity and Papermaking

The need for large quantities of water free from impurities is of utmost interest to the papermaker. Today if a location were being sought on which to build a paper mill, to no small degree would the quantity of pure water

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[24] A. E. Griffin, "Water for the Paper Industry", CIII Paper Trade Journal (October 22, 1936), 29.

available at a reasonable cost be a determining factor. If either supply were insufficient or cost of cleaning the water too great at a prospective mill site, that site could not be used. For established mills with no water available other than the supply near which they are now situated, cleaning water before use has become an extremely expensive operation in many instances.

In the manufacture of paper, water impurities[25] are extremely bothersome to the papermaker. Depending upon the type of paper produced, impure or dirty water often impairs the strength of paper or makes an otherwise desirable high-grade paper seem dull and "lifeless". In general, the better the quality of paper, the clearer must be the water used in its production. To the extent, therefore, the Lake States produce higher quality papers than other regions, it is safe to assume the cost of cleaning water in this region is also greater.[26]

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[25] There are three general classes of impurities found in water which present particular problems in their elimination for the paper industry.
(a) Physical: floating material in water, such as leaves, sticks, dirt, etc.
(b) Chemical: industrial wastes, dissolved natural salts, iron, manganese ore, etc.
(c) Bacteriological: slime-forming bacteria, bacteria causing decomposition, iron bacteria, molds, etc.

[26] See Table 4-10, p. 84.

Problem of Polluting Wastes

Not only must the papermaker be concerned about the purity of the water he uses, but also about the purity of the water which carries away by-product wastes of papermaking. The total problem of water disposal can be classified for our purposes as the problem of pollution.[27]

Since the first great pine fell signalling the denuding of large land areas of our forest resource, since the first industry sought an easy disposal of its wastes by dumping them in the nearby stream or river, and since urbanization, the problem of water pollution has been present, until today its correction is one of the most difficult problems faced by certain industries and areas, among which is the paper industry in this region.

The problem of water pollution is vast, complex and specialized, but this study is concerned only with one aspect - the economic problem of pollution. The problem of pollution for the paper industry is significant because of the financial costs and public restrictions involved, and consequently, their effects on location and growth of the industry.

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[27] Pollution as defined in the Wisconsin statutes includes "contamination or rendering unclean or impure the waters of the state, or making the same injurious to public health, harmful for commercial or recreational use, or deleterious to fish, bird, animal or plant life".

From the public (or social) point of view in the Lake States, pollution is detrimental to fish, wild life and scenic worth of the public domain as well as public health. Obviously, anything causing certain areas to be less attractive than they otherwise would be for tourists and sportsmen runs directly into a vocal and influential tourist and sportsmen patronizing group as well as sportmen's groups, such as Izaak Walton Leagues. This opposition and opposition arising from protectors of public health has now been crystallized in the form of legislation and legislative agencies designed to lessen and prevent pollution of public waters of the Lake States. Some legislative orders have been given to the effect that a plant either show evidence of materially cutting down on pollution attributable to its operations within a certain period of time or cease operating altogether; this has resulted in restricted operations in some instances.

From the economic point of view, polluted water adds to the cost of using water in papermaking on two counts: as an output in the form of by-product waste and as an input in the form of a raw material. First, because of social pressures mentioned above, the problem of neutralizing harmful effects of industrial wastes involved in papermaking is proving to be extremely costly in technical as well as research dollars. Second, "dirty" water regardless

of its source, adds substantially to the cost of papermaking because water must be "clean" before using.

Both social and economic elements present themselves as barriers in the economic location and development of the industry in this region. For example, a proposed new mill would have to face (a), the legislative barrier - proof that its operations would not contribute to the pollution of any river, stream or public body of water and (b), the economic barrier - that increased costs involved in waste elimination would tend to make its operations too costly. J. M. Conway, president of the Sulphite Pulp Manufacturers' Research League, writes, "It is a conservative guess that total outlay by the industry to reduce all types of pulp and paper mill pollution in these two states /Wisconsin and Michigan/ has now exceeded $15,000,000."[28] And further, he estimates in Wisconsin alone, "To rid. . . sulphite pollution[29] is certain to cost the industry an unproductive investment of at least $25,000,000, and this could conceivably reach higher."[30]

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[28] J. M. Conway, "Report for 1952", Sulphite Pulp Manufacturers' Research League located at Appleton, Wisconsin.

[29] Wood sugars in sulphite liquor reduce the dissolved oxygen content of the surface waters below normal, and to whatever extent this occurs it impairs the environment for aquatic life.

[30] J. M. Conway, "Report for 1951", Sulphite Pulp Manufacturers' Research League located at Appleton, Wisconsin.

In the South where the sulphate pulping process prevails, this disposal problem is not so acute. In 1950[31] there were 35 sulphate and only 1 sulphite mill among 9 southern states; whereas, in the Lake States there were 29 sulphite and only 10 sulphate mills. Almost 40 percent of the sulphite pulp mills in the U. S. are found in the Lake Region. The Northeast and Northwest produce predominantly sulphite pulp also.

Comparing with the South on the basis of the types of paper as well as the types of pulp manufactured, the Lake Region must have cleaner water for use on the one hand, and is forced to expend greater effort in eliminating the harmful effects of cooking liquor wastes on the other.[32]

It can be concluded, therefore, that water as a processing agent in the production of paper has presented a growing problem to this region's paper industry; this is true regardless of the probable inter-regional differences of this problem. The problem is at the same time both social and economic and presents itself as a serious

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[31] Lockwood's Directory. . ., 1950, op. cit.

[32] In this regard, no study of the regional comparisons of water costs and enforcement control is known to the author, and due to the scope of such an investigation, this aspect of the problem is not dealt with.

drawback in the location of new firms as well as the development of existing firms in the Lake States.

C. The Water Problem and Land Use

In regard to the paper industry, the water problem and the use of land resources, especially the forest resource, are curiously connected and related. Unwise cutting of timber often results in water damage. This occurs when undue logging on a watershed causes erosion of the soil which in turn results in sedimentation and bacterial growth in waters which have their source from this watershed. This water damage makes paper manufacture more costly as we have seen.

The principle damage to watersheds occurred during the era of lumbering. The clear-cutting practices of the lumbermen, the fires they often started to clear the land, and other practices added to the burden of the papermaker at a later date. To understand precisely how land use and water are interconnected, it is necessary to consider their physical relationship.

Forests Regulate Water Flow and Thus Water Purity

A forest is not merely a collection of trees, ". . .it is an integrated biological community with special climate, undergrowth, and topsoil."[33] Forest land provides a good

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[33] B. Frank and A. Netboy, Water, Land and People (New York, 1950), p. 36.

example of the benefits of good plant cover on soil and water conditions. In addition to producing timber, forage and other products, forests are regulators of water flow. In some localities this valuable service exceeds that of any other product or service. Extremely essential to water flow is the water storage capacity of the soil which depends on porosity of the soil. The floor of a forest is an excellent storer of water because it is highly porous. Porosity is due to animal and insect activity found in organic layers of the topsoil, and this, in turn, is the result of decayed leaves, twigs, plants, and other matter. When forests are cut this topsoil loses its porosity due to subjection directly to rain, wind and sun which kills the animal and insect activity and consequently destroys the soil's water-holding capacity. This means the soil delivers far more water in a shorter period of time to streams and rivers after a snow, thaw or rain than it would otherwise, thus causing floods or flood conditions as well as sedimentation and pollution.

Fire, likewise, has destroyed many watersheds. Fires were rather common in the logging days when some were started by carelessness while others were started deliberately in order to clean the land of brush and residue of logging operations. Fire, furthermore, destroys the humus or organic matter of the topsoil. "Practically every burned area is a potential flood or silt source, and to

the extent that a watershed has been damaged by fire, so has the water resource."[34]

Today the farmer has replaced the lumberman as the unwitting contributor to this water problem. Improper farming methods cause much watershed deterioration. Improper cultivation not only increases run-off by destroying the topsoil, but also adds materially to water pollution and troublesome sedimentation problems. In some cases, legislative authorities are to be blamed for allowing certain areas, i. e., strategic watersheds, to be open for homesteading and timber cutting. As we have seen in the last chapter, however, legislators have become aware of this problem and many states now have laws which restrict farming, logging, etc. in certain areas.

As forest lands are replanted and land use in general is rationalized in accordance with the total problem of resource use, the paper industry will be benefited. It will be benefited not only by an increased wood supply, but also by an improved and cleaner flow of water.

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[34] E. N. Nunns, "Our Water Resources", TAPPI, XXXII (August, 1949), 26A.

Section V. Conclusion

It is difficult to assess how possible changes in trade restrictions and the increased costs of water use will affect the relative position of the Lake States paper industry.

Apparently the sulphite pollution problem in the Lake Regiom can eventually be solved, but not without incurring substantial costs. J. M. Conway wrote, "We now can report for the first time that in 1952 . . . mills made tangible advances far beyond the laboratories and pilot plants, and that the industry is taking firm steps toward long-term solution of this difficult problem."[35] He points out however, that ". . . it is safe to assume that plant and equipment to provide reasonably thorough year-round reduction of pollution by any of the processes which now look most promising will require any average-size Wisconsin or Michigan mill to make an unproductive investment of between $1,500,000 and $3,000,000."[36]

In regard to the extent which increased Canadian competition would presumably result if U. S. tariff duties on paper imports were reduced, one can only speculate. The decline of the U. S. newsprint industry after duties on newsprint were taken off in 1913 is a special

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[35] Report for 1952, op. cit.

[36] Report for 1951, op. cit.

case. The large-scale nature of Canadian manufacture, the availability of a cheap supply of wood and power, the nature of newsprint manufacture, along with certain conditions in the United States, all were factors which lent themselves to the ease with which this industry shifted to Canada. That the manufacture of other types of paper would shift to Canada if U. S. duties were taken off cannot be assumed. There are certain advantages which Lake States mills enjoy for example, which could not be easily overcome by Canadian manufacturers. (1) The transportation advantage which Lake States mills have with respect to the large midwestern market.[37] (2) Many paper mills in the Lake States are suited to handle small, special orders of paper. Canadian mills are characteristically designed for large-scale, mass production of cheaper grades of paper and therefore are not well-adapted for filling these types of orders. (3) Furthermore, the American producers have a certain "feel" or knowledge of the market which is often difficult for foreign producers to get; this is particularly true in

[37] Further transportation advantages exist as the result of car-pool arrangements, such as the one created by the Wisconsin Paper Group. By pooling what would otherwise be less-than-carload allotments, the various members of this paper group obtain several advantages. (1) A cost saving by being able to ship in full-car allotments. (2) A comprehensive coverage of the midwest markets as well as many of the large markets elsewhere. (3) A saving in storage costs by the producers as well as the wholesalers. This saving results from the ability to fill orders promptly and without delays in shipment.

the specialty and high-grade paper markets. (4) Finally, the American entrepreneur has an advantage in knowledge and legal patents in the production of many of the specialized and quality papers. These factors, presumably, would at least slow any movement of the American paper industry to Canada if U. S. duties are lowered or taken off.

PART V

SUMMARY AND CONCLUSION

CHAPTER VII

SUMMARY AND CONCLUSION

An analysis of paper manufacturing can largely be made by studying the influences of three factors - water, raw materials and markets - upon the industry's location and development. Recording the historical interplay of these factors on the location and development of the paper industry in the Lake States region summarizes broadly the nature of this study.

Although the paper industry was established in this region as part of a more general pattern of development, its geographical configeration was determined primarily by the location of water suitable for generating power. Markets and raw materials were much less controlling factors on early location. Over the course of time, however, these latter factors came into supreme prominence in regard

to industry location, whereas water power lost practically all of its earlier influence; steam replaced water as the principle source of power. By employing steam several limitations involving the use of water power were overcome: (1) The amount of energy capable of being generated at a damsite is limited, while there is no such physical limitation when steam is used. (2) The proper application and control of power could not be achieved with water power generated by water wheels as it was before 1890, and (3) the strict locational bounds placed upon the users of water power were overcome.

Due to the ubiquity of water resources, the requirement of large quantities of water for processing paper has never exerted a strong influence on plant location. On the other hand, the purity of water has become increasingly important. Relative to the South and Northwest, the Lake Region suffers the hardships of needing cleaner water for the higher grades of paper manufactured, and of having a larger number of mills causing sulphite pollution. The greatest of the problems of pollution attributable to paper manufacture comes from the disposal of spent sulphite cooking liquors. Although the technical difficulties of this problem will undoubtedly be solved, the estimated cost will be high to Lake States mills. For determining present-day location of paper mills, the requirements involving the use

and disposal of processing water were ranked third in importance, behind raw materials and markets, by a group of paper company officials.[1] Water power was rated least important. For contrast these same company officials were asked to rate the factors which were most important in the initial location of their firms.[2] Ten rated water power as most important. Processing water was rated one of the least important factors.

Perhaps the most interesting aspect of this study has to do with the change which took place in the raw materials used in papermaking, and especially how this change benefited the Lake States industry.

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[1] The results of a survey of company officials of eighteen paper mills in the Fox River Valley. The following ratings were given to the directive: "Rank in importance the factors you would consider most important for locating your type of paper mill today.

Factors	Rating 1st	Rating 2nd
Market	14	1
Water, processing		6
Raw material	3	6
Water power	1	
	18	

[2] Factors ranked in importance for the initial location of eighteen paper firms in the Fox Valley.

Factors	Rating 1st	Rating 2nd
Water power[a]	10	
Market	4	6
Raw material	2	5
Water, processing	1	
Free landsite	1	
Shipping facilities		1
	18	

[a] Four officials not listing water power first were of mills established after 1890.

The substitution of wood for rags and straw in making paper was a great boon to the Lake States paper industry as well as the industry generally after 1890. Until this time, rags and straw were the principle raw materials. Therefore, that paper mills located and grew within the Lake Region prior to 1890, was not because of the availability of the region's wood supply. That a paper industry established itself during the 1834-1890 period in this region and that this region contained abundant wood resources are two disassociated circumstances. On the other hand, industry growth since 1890 has been directly associated with the region's wood supply. It can be regarded largely as accident, therefore, that pre-1890 paper mills of the Lake Region later found themselves to be favorably located with respect to a plentiful supply of the new raw material - wood. To put it differently, if the Lake States had been as barren of forests as Kansas, other things the same, it is very probable that a paper industry would have started in much the same way, but it is almost certain it could not have grown without the availability of wood.[3]

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[3] In this regard, paper production in Ohio, where the industry began earlier (1807) than in the Lake States but where forests are largely lacking, increased on the basis of value only about six times during the 1890-1919 period, whereas Lake States production increased about nineteen times. Source: U. S. Bureau of Census, Manufactures.

Whereas value of Lake States production increased about nineteen times in the 1890-1919 period, the 1919-1947 period showed a growth of only about three times. This decline in the rate of growth of Lake States mills came during a period when the competition of two relatively new paper-producing regions began to be felt.

The South, and to a lesser extent the Northwest, have since 1919 established themselves as major paper-producing regions. In the period between 1925 and 1947, the South,[4] whose competition the Lake States have most to fear, increased its volume of production seventeen times while the Lake States increased its production five times.[5] In 1925 the South was producing about three percent of the nation's paper and paperboard, but in 1947, twenty-four percent. The Northwest produced about five percent of the nation's paper in 1925 and eight percent in 1947.[6] The success of these two regions has been due largely to the availability of relatively cheap and abundant wood resources and therefore lower costs of production. As yet, however, the South and Northwest are not competing seriously, except in a few lines, with the higher quality

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[4] La., N. C., S. C., Ala., Ark., Tex., Ga., Fla., Va.

[5] The Statistics of Paper, op. cit., pp. 22, 23.

[6] Ibid.

products of the Lake States. But paper-producing areas have upgraded their manufacture over the course of time, and consequently, it is likely that the South and Northwest will one day compete on a larger scale with the Lake States. If and when this occurs, it will be extremely important that the mills in the Lake Region be producing at costs comparable with mills in these other areas; it is in this regard that wood costs are decisive for the future growth of the Lake States industry.

At present the condition of wood resources in the Lake States is unfavorable both with respect to the needs of the region's paper industry and in comparison with wood costs of the South and Northwest. Too much aspen and too little spruce and fir is found in the Lake Region. Furthermore, cutting drain is taking too much spruce and fir in relation to allowable drain. What is more, much of the land which was originally covered with forests and is naturally fitted to grow forests, is currently unproductive and in many cases a public burden. The possibility that pulpwood supplies from Canada will be cut off by 1957 is an additional problem for Lake States mills. In 1947 about twenty-six percent of total receipts of pulpwood by Lake States mills came from Canada. There is little hope in the short-run that Canadian supplies can be replaced without increasing wood costs.

To a large extent, however, these unfavorable conditions can be overcome in the long-run. Forestry experts believe that with proper forest management and increased planting, the region can supply its future pulpwood needs on a sustained basis by the year 2020. Much is being done to meet this goal.

The importance of markets in early location of paper mills was considerable, but on the whole, less than water power. The ability to reach the largest markets by navigable rivers and lakes allowed more geographical leeway in locating firms than did the need for power which restricted the firm to a site adjacent to falling water. What is more, expanding markets were a stimulant whereas water power was a deterrent to industry growth in the latter part of this early period.

Today the location of paper mills with respect to markets is important as regards their ability to compete successfully. Lake States mills are very favorably situated to a large paper market. Since 1860, they have been within a potential market area comprising about thirty percent of the nation's population,[7] a market which they

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[7] Total population of North Central States[a] as percent of U. S. population, 1860-1950.[b]

Date	1860	1890	1920	1940	1950
Percent of U.S.	29	36	32	30	29

[a] Includes: Ohio, Ind., Ill., Mich., Minn., Wis., Iowa, Mo., N. D., S. D., Neb., Kan.

[b] Source: Statistical Abstract of the United States, 1953.

were able to cultivate more intensively as transportation facilities improved after the Civil War. A sample of the extent to which Lake States mills cultivate this vast Midwestern market today is indicated by officials of Fox Valley paper mills.[8] Company executives of fourteen out of eighteen paper mills stated that over one-half of their total annual sales is in the Midwest.

The largest U. S. paper markets are located in the north central and northeastern states. Lake States mills, consequently, have a decided advantage over the Northwest and a slight advantage over the South with respect to their position to these markets. Furthermore, the rapid growth in population on the west coast tends to divert some of the potential competition of that area's paper products from the Midwestern and Eastern markets.[9] It would appear that for the indefinite future the paper mills

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[8] Percent of total annual sales of eighteen Fox Valley paper mills in Midwestern United States.

Percent	No. of mills
Over 90% in Midwest	6
Over 74%, less than 90%	3
Over 49%, less than 75%	5
Over 29%, less than 50%	2
Less than 30%	2
	18

[9] The west coast (California, Oregon and Washington) has increased its percent of total U. S. population from about 3.2 percent in 1900, to 9.5 percent in 1950. See: The Statistical Abstract of the United States, 1953.

in the Lake Region will be as favorably located to the large paper markets as any other major paper-producing region. This conclusion is in part confirmed by officials of sixteen paper firms in the Fox Valley in their replies to the question: "If you could move your concern without incurring any costs, where would you move it?" Nine officials believed they would remain in practically the same location, four thought they would move closer to their markets, three closer to their raw material supply. Considering only the market factor, it seems safe to presume that officials of Lake States mills need have little concern for their geographical location.

Although no attempt is made to forecast, the findings of this study indicate that at least four factors will be important in determining the future of the Lake States paper industry. These factors are ranked as to their importance in the industry's future. First, and unquestionably the most important factor is wood supply. The decisive question is, "Can the Lake States supply their own wood needs at prices competitive with those of the South and Northwest?" The answer is they can, but not for many years. How the Lake States will fare in the interim period, therefore, would seem to depend largely on the severity of product competition they will face. Other things the same, if production in the South and Northwest remains primarily in the lower quality products, Lake

States production should remain about as profitable as in the 1919-1947 period. If, however, these other regions should enter into production of higher quality products, they would probably offer a serious threat to the competitive position of the Lake States until the latter are in a position to lower their wood costs.

Markets are next in importance - their size and location. Both the size and location of paper markets appear highly favorable to the Lake Region's paper industry. Of the factors considered here, the market factor appears to be the most favorable for the Lake States. Of course, the extent to which the Lake States will cultivate these markets will depend on other factors such as total demand for paper which have not been considered.

Third in importance is the possibility that Canada will shut off wood supplies by 1957. This is a serious problem for Lake States mills, for although wood can be got elsewhere, undoubtedly higher manufacturing costs and perhaps restricted output would result. To the extent wood costs are increased in relation to other paper-producing areas, the competitive position of Lake States mills will be jeopardized. Immediate attention to supplying more of the wood needs within the region will provide the basis for a long-run solution of this problem.

The final factor is the pollution problem. Aside from knowing that relative costs of pollution control

will be higher in the Lake States than in most areas, it is impossible to know how much higher these costs will be or their effect on the competitiveness of the Lake States mills. In relation to the other factors, however, this one seems least important.

Appendix A

The following list represents those individuals whose names appeared on the original incorporating documents of paper firms established in the Fox River Valley in Wisconsin before 1890. These individuals have been termed "pioneers" for the purposes of this section of the study.

The research procedure for this Fox River study was first, to make a list of all the companies and original incorporators or partners of those companies established before 1890. Second, all pertinent information found was tabulated for each of these individuals and companies. In this search information, historical societies; individual company documents and records; state, county, and city histories and biographies; newspapers and periodicals; death certificates; and bank ledgers were studied. Numerous personal interviews were made, but it was found that individuals' memories, even though excellent, added little to what could be got from written records.

It should be noted, that many of these people listed below were not "pioneer papermakers" in the sense that they made some notable contribution to the development of paper manufacture in the Valley. For reasons obscured by time, many, it is almost certain, contributed rather

Appendix A
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nominal amounts of capital or talent, yet their names appeared as founders, and aside from this, they have not been heard of since in the field of papermaking. Some evidence was found to show that a person was sometimes made a co-founder if he brought a particular skill to the enterprise even though his financial risk or entrepreneurship may have been small or nothing. Consequently, there are several people about whom no information was found. These names are included in the list in view of the possibility that their contributions were significant but overlooked by the author.

About those men who were outstanding in the paper industry in the Fox Valley and who were the "moving spirit" and principle venturers, a great deal of information was found. This section of the study would not be meaningless if only these individuals were included.

A list of incorporators of paper firms established in the Fox River Valley before 1890.

Name	Company
*Ames, G.	Ames Woodpulp Co.
*Babcock, Havilah	Kimberly-Clark
Bowen, A. D.	Ames Woodpulp Co.
Brown, S. M.	Winnebago Paper Co.
*Clark, Charles B.	Kimberly-Clark

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Clark, W. A.	Valley Pulp and Paper Co.
Cobb, Nathan	Neenah Paper Mill
*Cook, Samuel A.	Menasha Paper Co.
*Davis, John R., Sr.	Winnebago Paper Co.
*Ford, John R.	Winnebago Paper Co.
*Frambach, Col. H. A.	Eagle Paper Mill
*Freeman, H. G.	Fox River Flour & Paper Co.
*Gilbert, William	Gilbert Paper Co.
*Hastings, A. M.	Ames Woodpulp Co.
*Hewitt, Henry, Jr.	Outagamie Paper & Pulp Co.
*Hewitt, W. P.	Outagamie Paper & Pulp Co.
*Hooper, Moses	Neenah Paper Co.
Howard, Charles B.	Island Paper Co.
*Hyde, D. M.	Valley Pulp & Paper Co.
Jamison, John	Neenah Paper Co.
*Kimberly, John A.	Kimberly-Clark
*McMillan, R.	Fox River Flour & Paper Co.
*McNaughton, John	Patton Paper Co.
Newman, C.	Winnebago Paper Co.
Parkhurst, A. G.	Valley Pulp & Paper Co.
*Patton, A. W.	Patten Paper Co.
*Priest, A. W.	Outagamie Paper & Pulp Co.
*Richmond, C. P.	Richmond Mill
*Richmond, G. N.	Richmond Mill

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*Richmond, N.	Richmond Mill
Robinson, Dr. N. S.	Neenah Paper Mill
*Rogers, H. J.	Ames Woodpulp Co.
*Russell, F. T.	Neenah Paper Co.
Servis, Mrs. E. A.	Winnebago Paper Co.
Servis, C. H.	Winnebago Paper Co.
*Shattuck, Frank	Kimberly-Clark
*Sherry, Henry	Neenah Paper Co.
Shoemaker, Hiram	Winnebago Paper Co.
*Spaulding, G. W.	Fox River Flour & Paper Co.
*Smith, Edward	Neenah Paper Mill
*Smith, Hiram	Neenah Paper Mill
*Strange, John	John Strange Paper Co.
*Thilmany, Oscar	Thilmany Paper Co.
*Wambold, S. K.	Fox River Flour & Paper Co.
Wharton, W. G.	Fox River Flour & Paper Co.
*Whiting, George	Whiting Paper Co.
*Whorton, J. H.	Fox River Flour & Paper Co.
*Van Nortwick, John S.	Combined Locks Paper Co.
*Van Nortwick, William M.	Combined Locks Paper Co.
*Van Ostrand, D. C.	Neenah Paper Mill

* Included in the compilation of Table 2-3.

Appendix A
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A list of paper companies established in the Fox River Valley before 1890.

Name of company	Date established
Ames Woodpulp Co.	1873
Combined Locks Paper Co.	1889
Eagle Paper Mill	1874
Fox River Flour & Paper Mill	1883
Gilbert and Whiting Paper Co.	1881
Island Paper Co.	1888
John Strange Paper Co.	1888
Kimberly-Clark Paper Co.	1872
Menasha Strawboard Paper Co.	?
Neenah Paper Mill	1874
"The Old Red Neenah Mill"	1865
Outagamie Paper and Pulp Mill	1886
Patten Paper Co.	1874
Richmond Paper Mill	1853
Thilmany Pulp and Paper Co.	1883
Valley Pulp and Paper Co.	1879
Western Wood Pulp Co.	1872
Winnebago Paper Mill	1874

Appendix B

The amount of capital used to start nine paper mills in the Fox River Valley before 1890.[a]

Name of company	Date established	Starting Capital
Ames Woodpulp Co.	1873	$20,000
Atlas Paper Mill	1879	125,000
Gilbert Paper Co.	1887	100,000
Kimberly-Clark	1872	30,000
Neenah Paper Co.	1885	75,000
"Old Red Neenah Mill"	1865	10,000
John Strange Paper Co.	1888	100,000
Thilmany Pulp and Paper Co.	1883	150,000
Geo. A. Whiting Paper Co.	1886	62,000

[a]Source: From the records of individual companies and from State, county, general and personal histories.

Appendix C

Newsprint Paper: No. of firms; United States production, consumption and imports, 1913 to 1949.[a] (quantity in thousand of tons)

Year	No. of firms	Apparent consumption	U.S. Production		Imports for consumption			% of cons. imported fr. Canada[b]
			quantity	% of cons.	quantity	% of cons.	% of prod.	
1913	65	1402	1305	93.1	147	10.5	11.3	10
1914		1547	1313	84.9	278	18.0	21.2	
1915		1509	1239	82.1	333	22.1	26.9	24
1916		1690	1315	77.8	439	26.0	33.4	
1917		1779	1359	76.4	492	27.7	36.2	
1918		1752	1260	71.9	602	34.4	47.8	
1919		1841	1324	71.9	628	34.1	47.4	
1920		2197	1512	68.8	731	33.3	48.3	
1921		2012	1237	61.5	792	39.4	64.0	
1922		2451	1448	59.1	1029	42.0	71.1	
1923		2831	1521	54.1	1308	46.5	86.0	
1924		2821	1481	52.5	1359	48.1	91.6	
1925		2988	1563	52.3	1448	48.5	92.6	45
1926	38	3519	1687	47.9	1851	52.6	109.7	
1927		3492	1517	43.4	1987	56.9	131.0	
1930		3496	1726	35.1	2280	65.2	186.0	60
1935		3309	948	28.6	2383	72.0	251.4	66
1940		3775	1056	28.0	2763	73.2	261.6	73
1945		3352	725	21.6	2669	79.6	368.1	79
1949	13	5517	927	16.6	4640	84.1	506.6	79

[a]Source: U.S. Tariff Comm., "Newsprint", War Changes in Industry Series (Revised, 1951), Report No. 22, pp. 20-21.

[b]Source: "Newsprint Review", Pulp and Paper, XXVI (July 1, 1952), 162.

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