

Working Draft

Papermaking in Maine: Economic Trends, 1894-2000

By:

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INTRODUCTION AND SCOPE

During the year 2002, Great Northern Paper Company shut down newsprint production at Millinocket. Thus quietly vanished an era in Maine's industrial history. A century earlier, Maine's paper industry was on a dramatic growth spurt. In the 1890's, Rumford Paper Company's newsprint mill claimed to be the world's largest; it was soon eclipsed by Great Northern's Millinocket mill in 1899. That mill was powered by the world's largest hydro dam of its day (Ripogenus, built 1911). Great Northern claimed the first machine to run at 1,000 feet a minute. From this age of superlatives to the quiet shutdown of an old paper machine, there lies a tale of industrial change that has not been told from the perspective of the entire century. The firm's dramatic bankruptcy filing in winter 2003 revived concern over the long-term competitive position of Maine's entire paper sector.

This essay reviews major economic trends in Maine's paper industry since the late 19th century. First, it will set the context at national and regional levels. It then offers a broad statistical picture of the industry's production in the state, relying on secondary data and mill listings from past publications. In addition to general statistical trends, it includes a focus on Maine "milltowns." The primary paper industry is the branch of the industry that converts primary fiber, logs, chips, wastepaper, rags, or market pulp, into paper or pulp. For context, however, a few details are provided concerning paper converting (boxes, envelopes, etc.) and the paper machinery business.

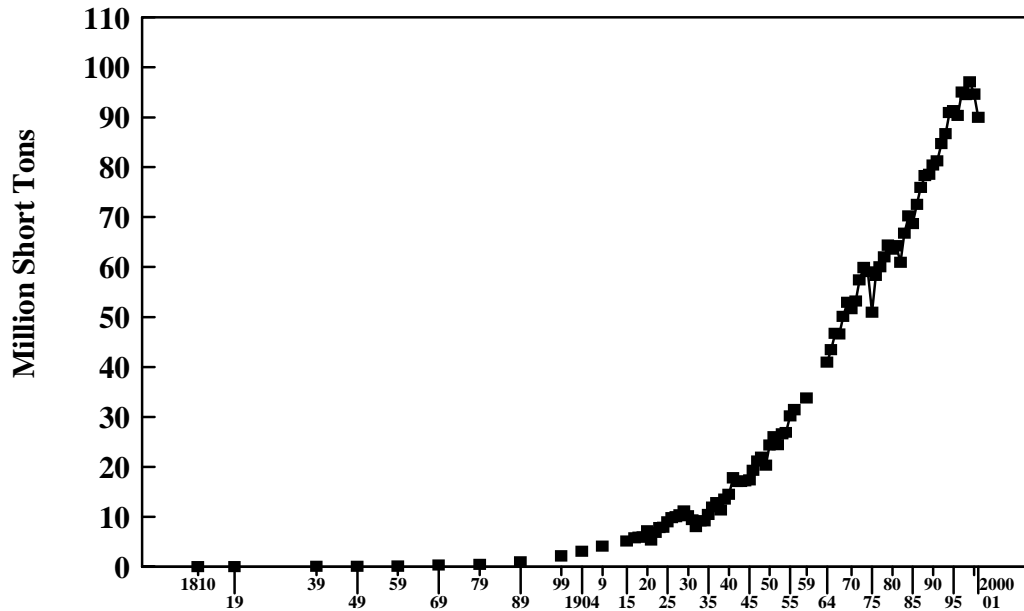
A more complete historical review would also consider communities where mills have been closed. In Maine there were about 35 paper mills in 1900, and several more were built during the century. By 1999, only 17 mills remained. In a few instances, the mills that went out were one of several in a given community -- Rumford and Jay-Livermore Falls are examples.

In the standard regional histories, the textile and shoe industries, which employed far larger numbers of people, naturally tend to overshadow paper. Small paper mills were widespread in late colonial times and through most of the 19th century. They often employed less than a dozen workers. During the 19th century, the typical paper mill was far smaller than the typical textile plant in terms of jobs and local economic impact. A long list of town histories supply evidence on the history and occasionally the social relations of individual mills and towns (Moulton, 1995 and Leane, 1972). In contrast, standard corporate histories are usually meager sources for details on individual communities. Before summarizing Maine's paper history, I first review U.S. and New England trends.

THE U.S. PAPER INDUSTRY

The U.S. paper industry displayed a strong record of sustained growth over the 20th century (Fig. 1). This growth has helped to maintain paper manufacturing as a significant economic presence in New England, even though the prominence in total tonnage now goes to other timber based regions in the South, Midwest, and West. (Industry history is thoroughly reviewed in Anderson, 1942; McMurrin, 1988; Hunter, 1955; Ingram, Ince, and Mehlberg, 1999; Smith, 1971; Smith, 1972; Smith, 1997; USDA, 1961; Wesley, 1916; Patrick, 1999; Guthrie, 1972; McKeever, 1987; and Ince, et al., 2001, supply details with excellent graphics for 1970-2000.) The decline in output after 1999 was the first time since records were kept that capacity actually fell as well. This indicates that the turn-of-21st century industry is restructuring and not merely surviving another business cycle.

Figure 1
U.S. Paper and Board Production
1810 to 2001



**Sources: Dwight Hair, SB228, p. 18; AF&PA, 1998, p. 2;
and Pulp & Paper, Jan. 2002, p. 36.**

A major driving force, especially for the Northeast up to World War I, has been growth in the newspaper industry (Table 1), which grew dramatically from 1850 to 1900. Newsprint came into its own as a grade after the Civil War. In the Tenth Census (Backup Table 12), newsprint was not even identified as a leading grade. Production nationwide in 1870 was estimated at only 130 daily tons. By 1890, newsprint had vaulted to 700 daily tons, and more than doubled to 1,900 daily tons in 1900. The decline in newsprint prices of the latter 19th century (Fig. 2) is both a cause and an effect of this upsurge in demand. Newsprint prices were inflated by Civil War shortages, and then plummeted through World War I as mills grew larger and faster, technology improved, and competition increased.

Table 1
Daily Number of Newspapers and Average Circulation, 1850-1963

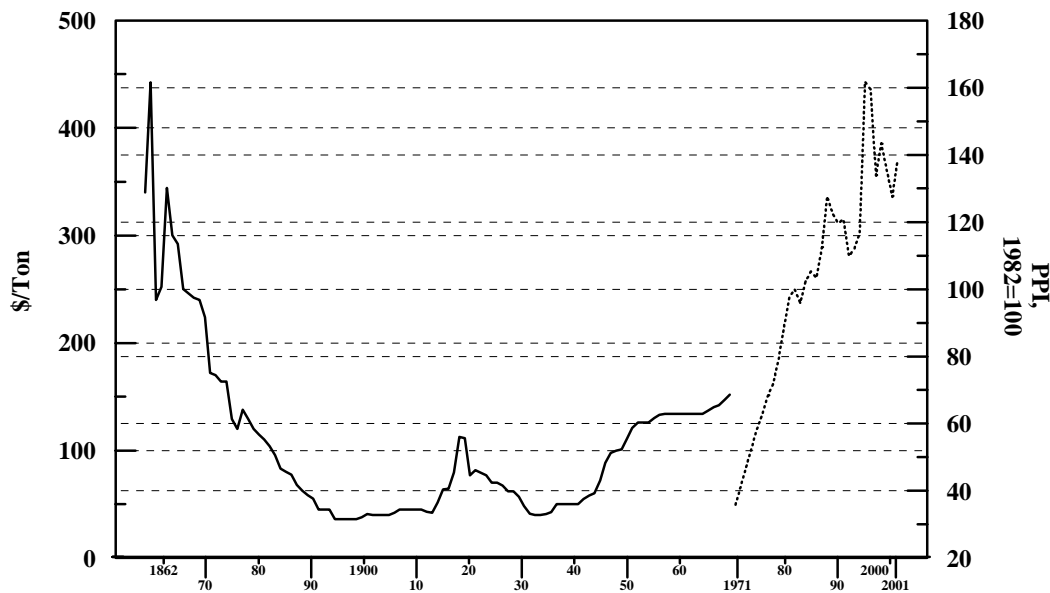
	No. <u>Newspapers</u>	Average Circulation/ <u>Issue</u>
1850	254	758
1860	387	1,478
1870	574	2,602
1880	971	3,566
1890	1,610	8,387
1900 *	2,226	15,102
1919	2,441	33,029
1939	2,040	42,966
1963	1,766	66,527
2000	1,480	55,700

* Up to 1900 incl. small number of periodicals.

Source: Historical Statistics of the U.S., p. 545; Year 2000 from P&P, NAFB, p. 193.

Figure 2

Newsprint Paper Price (per ton), 1862-1970



Source: McMurrin, 1988; and U.S. Bureau of Labor Statistics.

Note: 1862-1892 FOB Mill
 1893-1970 Delivered New York
 1971-2001 National Averages, Producer Price Index, 1892=100

The changing mix of U.S. paper usage is of considerable importance for Maine. From the early 1900's to 1929, newsprint was the leading single grade (Table 2). Newsprint production grew rapidly, tripling from 1899 to 1919; and doubling again, during the 1920's. As we see below, Maine was important in this branch of the industry. War and Depression slowed growth of all branches of the paper industry. In the 2 decades after 1949, newsprint and paper consumption roughly doubled. Because of rapidly growing paperboard usage, total paper and board output more than doubled. Newsprint growth since 1969 has been modest, even as paper consumption nearly doubled yet again in only 30 years.

Table 2
U.S. Apparent Consumption of Paper, Newsprint, All Paperboard, and Pulpwood

Year	Newsprint	All Paper	Newsprint	All Paper & Board	All Pulpwood
			as % of All Paper		
	-----1000 tons-----			-----1000 cords-----	
1899	569	1,773	32.1%	2,168	1,986
1919	1,841	4,403	41.8%	6,253	6,656 *
1929	3,813	9,108	41.9%	13,411	13,989
1949	5,523	14,788	37.3%	24,694	28,464
1969	9,915	29,972	33.1%	54,498	64,577
1999	11,986	57,093	21.0%	104,051	79,972

* Data for 1916.

** Pulpwood consumption peaked at 97.3 MMT in 1995; in 1999 was about = 1979.

Sources:

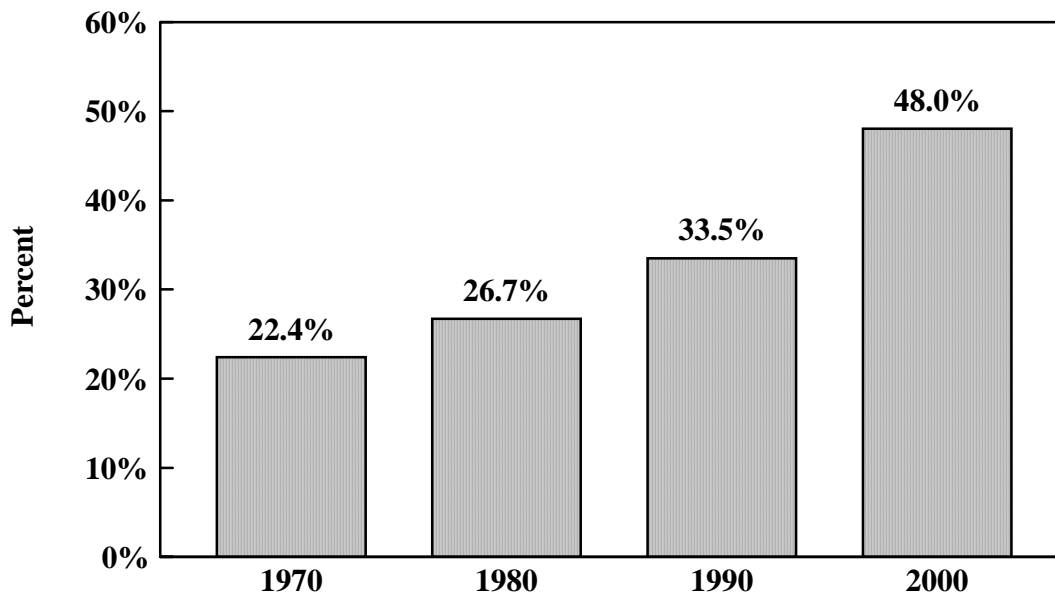
1899-1955, TRR, p. 427, and Hair, 1958
1969 & 1999, FS Howard, FPL-RP-595.

Despite growth nationally, however, many of New England's paper mills have experienced competitive pressures from newer, larger mills in Canada, the U.S. South and even offshore. The resulting machine retirements and mill closings have led to layoffs in town after town. Further, rapid mechanization and automation have boosted output per worker, and have eliminated many labor-intensive tasks. In communities heavily dependent on paper mills, economic and social stresses have been significant. During periodic industry downturns, public and governmental interest in the industry's future increases (Anon., 1995; Clark, 2001; and Skelton, 2002).

Ominously for a state dependent on primary paper, U.S. pulpwood usage grew only 25% from 1969 to 1999, as end product usage was doubling. This was due to imports as well as

increased usage of recycled fiber (Fig. 3). U.S. pulpwood usage peaked in 1995 at 97.3 million cords, and then declined. The 1999 level of pulpwood usage was about the same as it had been in 1979.

Figure 3
U.S. Recovery Rate
Paper and Board



Source: AF&PA.

Note: Recovery rate = (tons recovered paper collected/tons "new supply")

NEW ENGLAND

Early Development in the Northeast

The Colonial paper industry was affected by several key location factors, primarily water supply, a large labor supply, a rag supply, and markets. These factors favored urban locations or small nearby communities. By the late 19th century, the early wood-pulp paper mills needed larger and larger quantities of water for process use. They required huge quantities of electricity, and hence needed mainstream dams. Small side creeks could no longer turn their machinery. Most importantly, many new mills brought growing volumes of wood to their gates by river log drives. The mills also needed the rivers to carry away their wastes. This explains the growth of late 19th century mills at downstream locations such as Westbrook in Maine, Windsor Locks in Connecticut, and Holyoke in Massachusetts. The combination of mill waste and urban wastewater was a fatal blow to many miles of river for decades. Later suburban development often surrounded these mills. The Tenth Census, in 1880, takes a snapshot of the industry on the verge of its dramatic conversion to woodpulp. In 1880, according to these data, New England plus New York accounted for 60% of the value of U.S. paper output, and 55% of the nation's mills.

From the 1890s to the 1970s, the appetites of the mills for wood grew ever larger. They now had to be located in the timber, and on major rivers, where their owners could control vast expanses of timberland as well as hydropower. It was not until this period that the paper industry of Northern Maine took its modern form. Here, one "milltown" after another emerged at the edge of the wilderness – Millinocket, Rumford, Woodland, Van Buren, and the others (Smith, 1972; Irland, 1989; Irland, 2000; and Irland, n.d.).

In 1900, the Northeast (including Mid-Atlantic states) contained 608 paper mills accounting for 64% of U.S. paper capacity and 73% of pulp capacity. The region's pulp mills were larger than any other region; 74 mills made pulp only. By 1940, the region contained 39% of national paper capacity and 27% of its pulp capacity. But its average pulp mills still was less than half the size of the average southern mill. The number of northeastern newsprint mills fell dramatically from 1900 to 1940. They were outcompeted by Canada. The region's industry continued to rely heavily on producing specialties for regional customers: book and writing (112 mills); wrapping paper and board (230), and industrial papers (94).

By 1990, the Northeast still had more paper mills than any other region, but by then produced only about 14% of the nation's paper. Its 57 pulp mills accounted for only about 8% of the nation's pulp output (Ohanian, 1993, p. 40).

Shifting Grade Mix

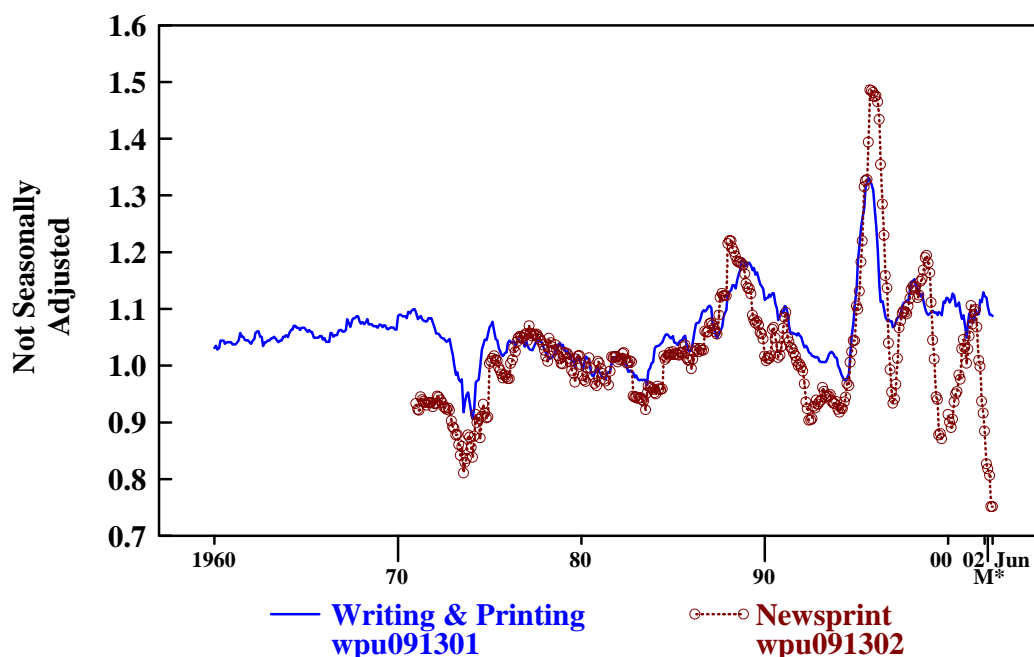
In 1880, the leading grades were printing and writing papers and wrapping papers. In 1905, according to that year's Manufacturing Census, Massachusetts led the region's paper industry with 11,705 wage earners and 627 salaried workers toiling in 87 establishments. This was well ahead of Maine, and just behind New York, the Northeast's leader (New York in that year had 177 mills). Massachusetts' value of paper production in that year was very nearly double that of Maine. In 1905, New England produced 39% of all of the nation's paper, 44% of the book paper, and 73% of the fine paper. The region's specialization in high-end grades was already well established (Backup Table 12). By 1930, newsprint production had ceased in the other states, and still accounted for about half of Maine's production. The four states shown individually in that year (ME, MA, NH, and VT) manufactured 1.7 million tons of product (Backup Table 12).

By 1950, New England had well overtaken New York (2.060 million tons to 1.144) and supplied 19.4% of the nation's paper output. Much of this (1.3 mm tons) was in Maine. Newsprint had already declined in importance in the face of Canadian competition which supplied 60% of U.S. needs at that time. According to the U.S. Manufacturing Census that year, the region supplied 30% of U.S. output of uncoated groundwood, 26% of fine paper, 29% of special industrial paper, 42% of the cardboard, and 34% of the wet machine board.

Since the mid 1990s, the U.S. paper industry has endured severe operating and price conditions (Fig. 4). Paper mill shrinkage and shutdowns have been widespread. During the decade of the 1990s, U.S. paper mills added 43.2 million tons of capacity, while 25.3 million tons were retired. Most retirements were in small mills, which are most common in the Northeast (Ince, et al., 2001). According to the Forest Resource Association (*FRA Bulletin*, June 2001, p. 2), from 1989-1999, there were 52 U.S. pulp mills that closed permanently or switched to recycled fiber. A further tabulation for 1999 to 2001 identified a total of 47 more "capacity reductions" most of which were individual machines at large mills (*Pulp and Paper*, Jan. 2001, p. 44; for Northeastern examples, see Irland, 2001, p. 8). In 2001, U.S. papermaking capacity fell slightly for the first time on record; capacity fell again in 2002 (Rudder, et al., 2003). From 1999 to 2002, a total of 105 paper machines were closed in North America (Rudder, et al., 2003, p. 34).

Figure 4

Producer Price Indexes, Selected Commodities Jan. 1960 to June 2002, Real Prices



Source: BLS Website.

Industry Role in New England Employment Structure, 1919-1997

Over most of the 20th century, the paper industry sustained its role in the New England's economy. In 1919, paper accounted for only one seventh the jobs as the huge textile industry. There were no massive concentrations of paper jobs analogous to the multi-mill textile centers like Lowell and Manchester. But in 1919, paper was 3.9% of the region's manufacturing jobs, and it was 4.8% in 1997. Of course, paper participated in the general loss of regional manufacturing jobs of recent decades (Fig. 5; Backup Table 2).

In 1999, according to Lockwood-Posts, the region contained 219 converting plants, more than half of which are located in Massachusetts. The Census of Manufactures identifies a far larger number, however (Table 3). These include some major national brand names like Avery-

Denison. Converting is mostly located in or near population centers, because of its customer orientation, and because uniform delivered pricing policies by the primary mills eliminate incentives to locate near the primary mills (Maine Development Foundation, 1982). A total of 41 communities smaller than 10,000 in population had converting plants.

Table 3
New England Paper Industry, 1997

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Source: 1997 Census of Manufactures State Reports.

Table 4
Maine and New England Paper Converting Plants, 1999

		New	
	<u>Maine</u>	<u>England</u>	
Office Supplies	--	18	
Boxes/Containers	3	95	
Cutup Plants	--	8	
Specialty	3	76	
Paper Plates, Related	--	7	
Envelopes	--	15	
 Total	 6	 219	

Source: Lockwood-Post's Directory, 1997.

A number of communities that were once milltowns (Westbrook and Brewer) are no longer such, despite the persistence of a paper industry. This is because surrounding urban areas grew into more diversified economies. The true paper milltowns and larger towns strongly influenced by the industry participated in strong industry growth from the teens to about the 1960's. The industry then reached its employment peak, as supply limits or competitive pressures from other regions took their toll. At surviving mills, job levels declined steadily and significantly. Some mills lost 50% of their jobs between the 1980s and year 2000. This was one cause of what is almost a diagnostic trait of the New England paper milltowns – population decline. In some instance the decline is dramatic, usually for the more isolated communities:

	<u>1900</u>	<u>1940</u>	<u>1960</u>	<u>2000</u>
Millinocket, ME	4,528 (1920)		7,453	5,203
Rumford, ME	3,770	10,230		6,472
Brewer, ME	4,835		9,009	

For many others (Backup Table 10), the growth in population over the century was subdued at best. Declining paper employment was only one factor. Serious academic studies of worker and community adjustment to papermill and wood products employment reductions are few (but see, e.g., Boucher, 1998; Holmes, 1997; Kortelainen, 1998; Machlis and Force, 1993; Randle and Ironside, 1996; Stevens, 1978; and Tremble, 1998).

In some instances, residential spreading out with better transportation contributed. In still other instances, small wood products or other manufacturing plants closed. Virtually everywhere, railroading jobs vanished. In virtually every milltown where population has grown, it is because a spreading suburban influence has turned surrounding areas into bedroom communities (Windsor Locks, CT, Pepperell, MA, Westbrook, ME) depending on jobs in nearby areas.

Since the northeast is one of the culture hearths of large-scale papermaking in North America, it contains the oldest and smallest mills. Apparently mundane traits such as machine width, and speed have seen dramatic change. The oldest mills are at a cumulative disadvantage over time. Restricted space for expansion, high costs of retrofitting pollution controls, and expensive energy are other challenges. Mills have met these challenges in a variety of ways, mostly by up-scaling to produce more specialized, higher value grades. Many have not survived. Still, many mills are in the high end of the industry cost rankings for their grades. In periodic industry downcycles, those mills are first to suffer layoffs and further downsizings as managers struggle to compete. Even as the surviving mills have expanded output, jobs are fewer every decade, and many of the jobs are at risk in every recession. Given the challenges, it might seem surprising that the industry has endured as well as it has in this region.

MAINE PAPER INDUSTRY

This section first summarizes fragmentary data on Maine's 19th century paper industry. Later, it presents a series of mill-by-mill tabulations and maps, 1894-1999. These may be of use to historians interested in the industrial history of Maine communities as well as those concerned with the development of the industry as a whole. The level of detail permits showing changes within Maine over time as well as contrasts with the Northeast and the Nation. Economic impacts, fiber sources, and milltowns are also discussed.

Colonial mills in Maine have left little trace. With its tiny population it had minimal sources of rags and a limited market. A project for a mill at Stroudwater, by Samuel Waldo was supposedly built in about 1731; traces appear in court records (Hunter, 1952, p. 38-40; Weeks, p. 24 ff).

A summary of a fragmentary U.S. Census in 1810 by Tench Coxe lists two mills in Maine. Weeks (p. 139) notes Maine's third mill established on Cobbossee Stream by Robert Gardiner in about 1811-12. He also notes mills at Vassalboro (1823), North Yarmouth (1816-36), and Union (1816-1843). A private directory cited by Weeks (p. 273) listed 16 paper mills in Maine, the largest being Grant, Warren and Co. with 100 workers. Others were noted at Mechanic Falls, Gardiner, Vassalboro, Hampden, South Orrington, Waterville, Portland, Belfast, and Bloomfield. Recollections of 19th century papermaking are sprinkled through Henry Richards' (1940) memoir (esp. chs. XXI, XXV, XXVI).

Mechanization already allowed paper mills to pay relatively higher wages by the late 1800's. In the Bureau of Industrial and Labor Statistics (BILS) report of 1887 (pp. 76-78), wages for paper "machine" men are \$3.00/day; "girls" received \$0.85 per day, and other workers \$1.50 to \$2.75. Pulpmill wages were \$1.20 to \$1.75/day. In contrast, woolen mills had no

wages above \$1.40, and \$0.80 to \$1.25 was common, depending on skill. Printers earned \$1.62, stonecutters \$2.50, and saw filers \$2.50.

In the 1880 (Tenth) Census of the U.S., a detailed table appears with a concentrated summary of the U.S. paper industry. In that year, Maine's paper industry, with 12 mills, stood on a par with Vermont's, and had half as many mills as New Hampshire. The nation's leaders were New York (168 mills) and Massachusetts (96 mills), with Massachusetts the leader in sales volume despite the smaller mill count. In 1880, Maine's value of sales was less than Connecticut's (Backup Table 12). This history of individual mills in Maine's emerging era of wood-pulp paper is recounted in Smith (1972). By 1887, the State BILS tallied 8 paper mills and 9 pulp plants (Table 5).

Table 5
Paper Mills in Maine, by County, 1887

	<u>Paper</u>	<u>Woodpulp</u>
Androscoggin	1	1
Cumberland	1	3
Kennebec	3	1
Oxford	1	1
Penobscot	1	1
Somerset	--	2
Sagadahoc	<u>1</u>	--
Total	8	9

Source: Bureau of Industrial & Labor Statistics, 1st Annual Report, pp. 233-234.

Note: Among the 87 leather and leatherboard plans may be a few that would later be considered part of the paper industry

In 1899, Maine's 37 mills were noted to consume 674,000 cords of wood, of which 79% was domestic spruce, and one-seventh was poplar. Other species, and imports, were nominal. An additional 107,000 tons of purchased pulp were used, leaving significant Maine pulp for use elsewhere. Compared to the U.S., Maine had a strategic advantage, with minimal reliance on imported wood and a pulp surplus. In 1899, no use of rags was recorded for Maine, though some rag fiber must still have been used in fine papers.

By contrast, rags remained important elsewhere in the U.S. In 1904, recycling was important, with 588,000 tons of used paper the largest Nonwood fiber by tons, followed by 304,000 tons of straw and 294,000 tons of rags, cotton waste, and flax (BILS, 1906).

In 1904, the U.S. grade mix was only 19% newsprint measured by sales dollars (BILS, 1906, p. 131). Maine had established a strong presence in this important grade, making 24% of U.S. tonnage in that year.

This concentration in newsprint turned out to be untimely, however, as Canadian imports rushed in following the removal of a tariff in 1913. Other factors, such as newspaper chains' desire to control supplies, and a highly pro-development Canadian policy, were also involved. From 1912 to 1918, Canadian shipments of paper to the U.S., largely newsprint, rose from 3.9 million tons to 37.7 million tons (Smith, 1971, p. 332). By 1934, the depths of the Depression, the U.S. had gone from self-sufficiency to 70% dependence on Canadian newsprint (see Kellogg, 1935; Roach, 1994). The price pressures swept away small mills and forced cost-reducing improvements in the survivors.

By 1905, New York and Massachusetts were roughly even in production value, with Maine catching up, with just under 60% of that level of sales. At that time, mills and machines were still under construction. By 1930, Maine had far surpassed Massachusetts' tonnage, but

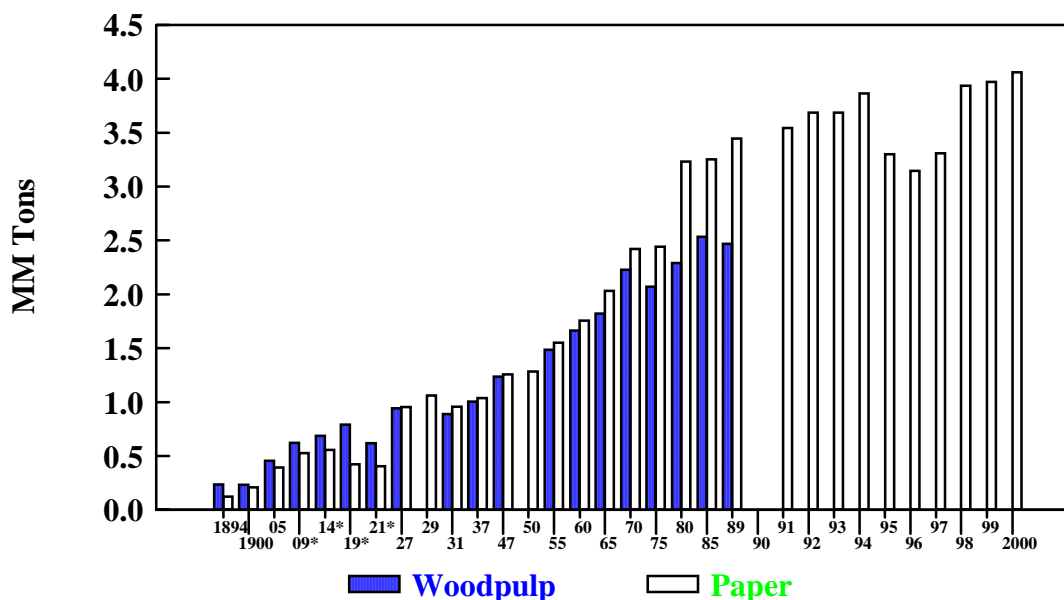
still fell far short of New York. By 1950, however, Maine's production surpassed New York's, partly due to contraction in that state.

In the early 1950's, Great Northern alone still produced a third of U.S. newsprint production. After the 1950's, a growing southern paper industry began installing modern newsprint machines, and Maine's newsprint mills were squeezed between large, low-cost Canadian mills to the north and modern, high-speed mills in the south. The first southern newsprint mill was built at Lufkin, Texas in 1942. By the mid 1990's, the competitive squeeze had virtually ended Maine newsprint production – the last holdout was a single Great Northern machine. By the year 2000 not one of the continent's top ten newsprint producers was in Maine. The company had upgraded the rest of its production to a range of specialties, and stood third in North American coated groundwood. In late 2002, newsprint production quietly winked out in Maine forever as GNP's last newsprint machine was taken down. Thus did Maine come full cycle, from dominating this leading grade with world-class mills a century before.

Production estimates for pulp and paper in Maine diverge for the 1890-1900 period, probably due to weakness in the sources (Fig. 6). But the trends shown highlight several key facts. First, Maine was in pulp surplus from 1894 to the early 1920's, based on its extensive timber and power resources. This emphasized the state's similarities to nearby Canada. Second, the volume of production does not seem to have risen as much as might be supposed given the large number of mills built from 1894 to 1914. This is partly due to the small size of many of those mills and may also reflect data weaknesses. According to this information, paper output fell after 1914, which is consistent with rising Canadian imports of newsprint after 1913.

Figure 6

Maine Woodpulp and Paper Production 1894 to 2000



* = Partial data.

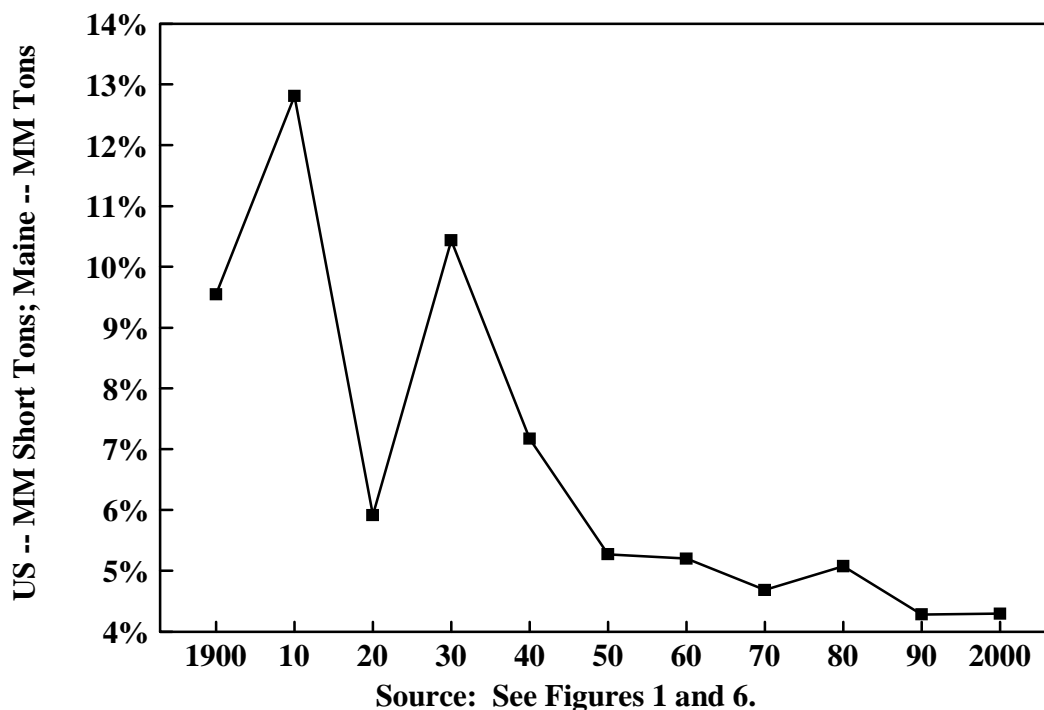
Sources: 1894 from Maine Bur. Ind. & Labor Stats, 1894, p. 123 (tpd x 3 pd days); Atlas of the Resources of Maine, Supplement, Feb. 1987; The Forest of Maine; Current Ind. Rept. MA26A(89)-1 to 1989; and Paper 1991-99 from AF&PA (Pulp data not available after 1989).

The impact of the Depression is clear in the data. In 1931, 6 of the State's 42 mills were shown as idle or dismantled. A substantial postwar growth spurt shows clearly. According to the AF&PA data, production reached about 4 million tons by 1994, then receded until a final late 1990's resurgence caused by high industry-wide operating rates. As of year 2000, production estimates suggest that machine closures were offset by output growth at surviving machines.

The chart of Maine's share of U.S. production shows the State's changing role in the national paper industry. Part of the decline is due to the emergence of the paper board industry (for boxes), which is concentrated in the South (Fig. 7).

Figure 7

Maine Paper Production as % of U.S., Paper & Board Output, 1900-2000



Mill Maps and Data, 1894-1999

A variety of sources permit a fairly fine-grained view of the changing paper industry over just over a century. Clearly, by 1894, a wave of new investment -- virtually all of it in wood-based grades -- had placed Maine on a growth track (Figs. 8-14 below). Even as of 1906 mills were still being built, but after World War I, with only a few exceptions, the dominant pattern was growth of leading mill centers offsetting shutdowns of small, marginal mills.

A caution in reading these backup tables: in the earlier years, tabulators spoke of a pulp “mill” in the same sense as we now speak of a pulp “line.” That is, a given “pulp and paper mill” might contain more than one “pulp mill,” reflecting the pulp mix used. For example, many newsprint mills manufactured both ground wood and sulfite pulp for their newsprint. Some mills

made only pulp, others both pulp and paper, and still others made only paper, using purchased pulp.

The number of Maine mills making paper was 19 in 1894, rose to 32 by 1931, and then fell to 18 in 1999.

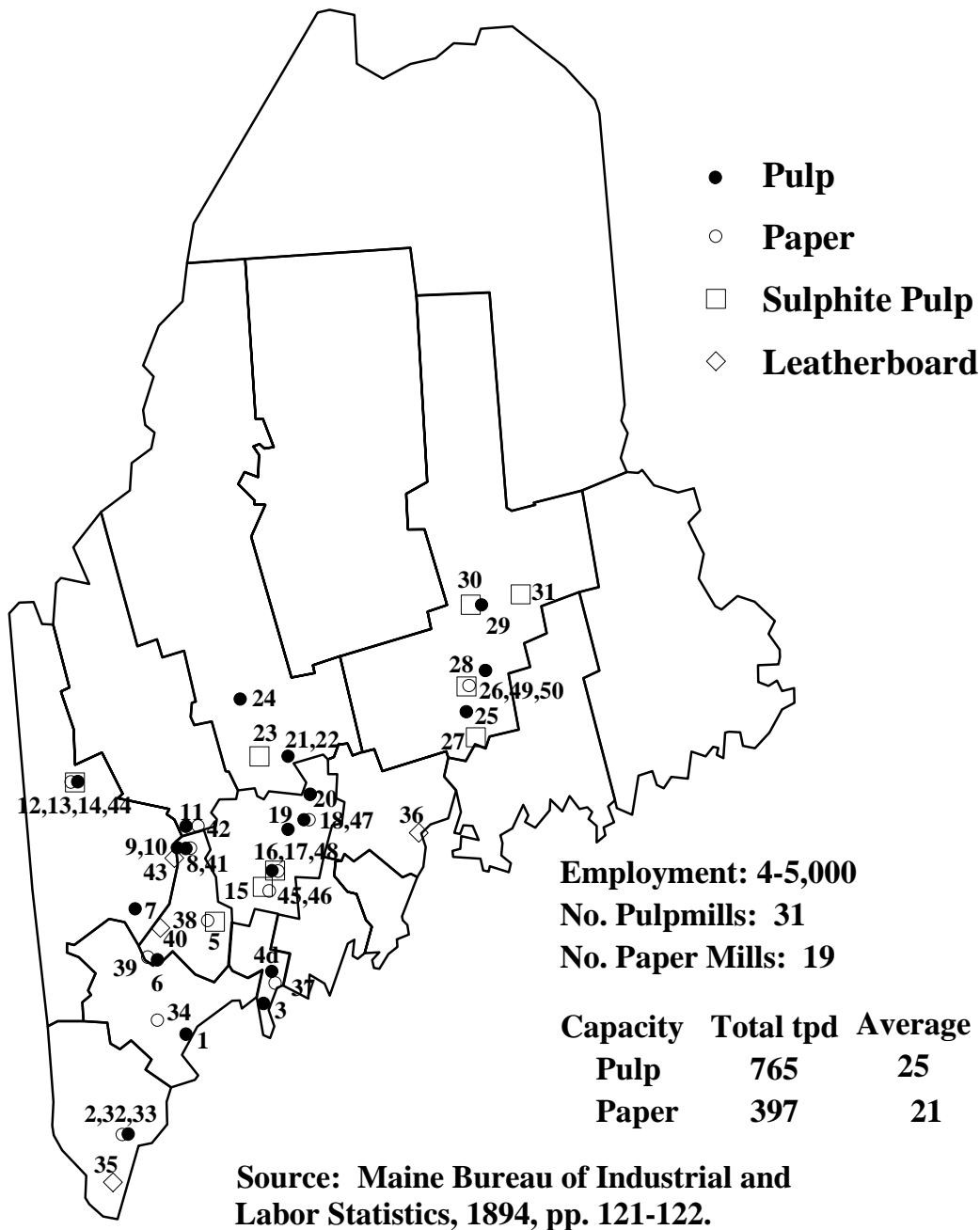
The “bottom line” for a paper mill is tonnage, the product of trim width, speed, and basis weight. Since weights have declined over time, and since paper is sold by the ton, tonnage is the general measure for output. In the 1894 state listing the average pulp line (called a mill in those days), produced 25 tons per day. The State’s entire output at that time (in 19 mills) could be produced by a single modern paper machine. By 1961, the average Maine pulp line produced almost ten times as much, or 218 tpd. In reporting mills in 1999, the average pulp output was 843 tpd (which overstates the increase, counting by mills instead of individual pulp lines).

The tables also show changing corporate organization. As early as 1894, there were multiplant firms, with 28 companies running a total of 50 mills. To 1906 there was no net change in the number of firms, reflecting consolidation (e.g., I-P), and several new entrants. The number of companies fell to 17 by 1959, and since then Champion has been absorbed by I-P. Several recycled mills shown in 1999 are idle, as are Great Northern’s two mills at this writing (March 2003).

The years 1894-1906 stand out as a period of stunning national growth in the industry. From only 452,000 tons in 1879, output doubled by 1889, and then more than doubled by 1899. Yet another doubling took place by 1909. This is the reason we include three maps for this fairly brief period.

Figure 8

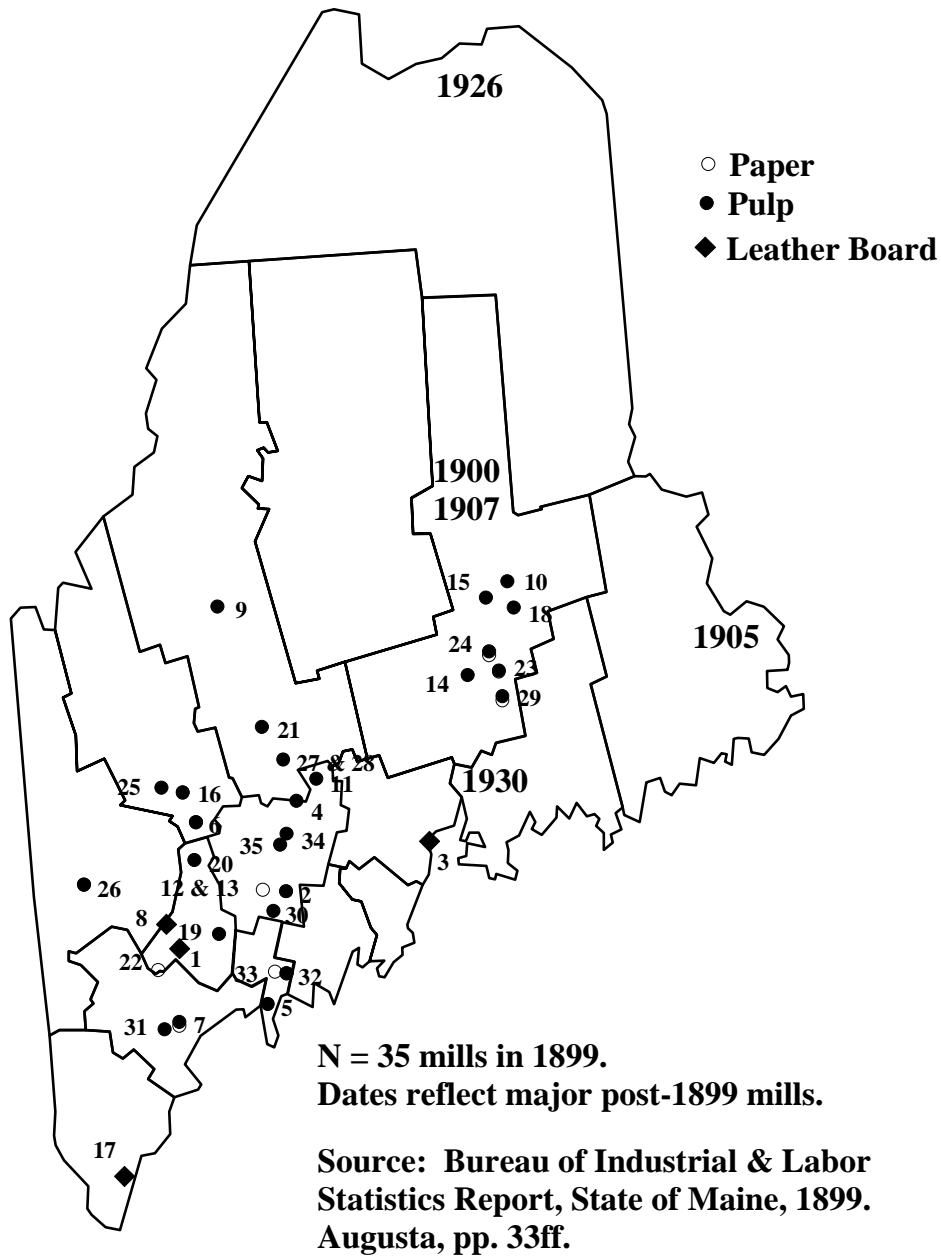
Pulp and Paper Mills, 1894



See Backup Table 1 for details.

Figure 9

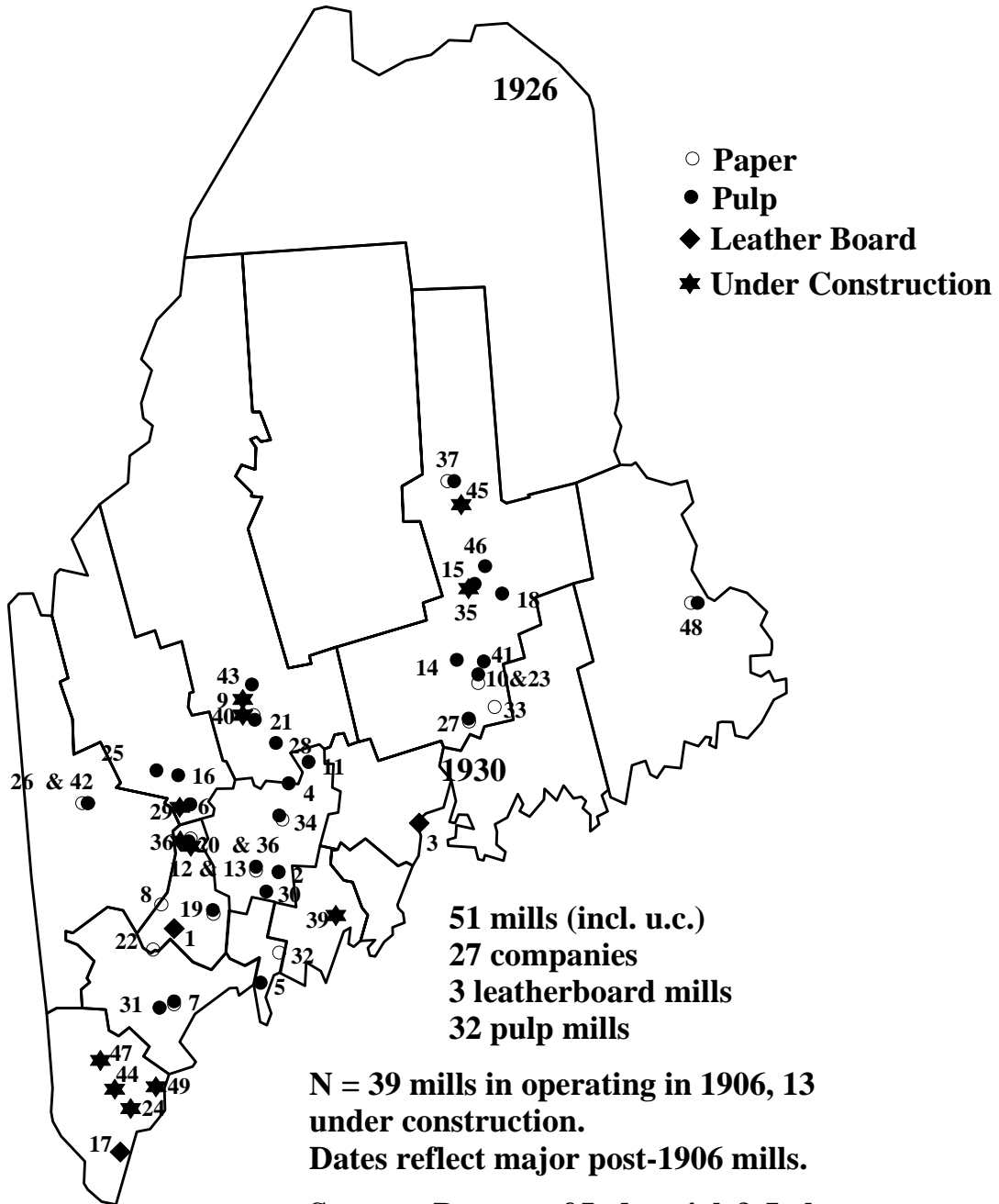
Pulp, Paper & Leather Board Mills, 1899



See Backup Table 2 for details.

Figure 10

Pulp, Paper & Leather Board Mills, 1906



N = 39 mills in operating in 1906, 13 under construction.

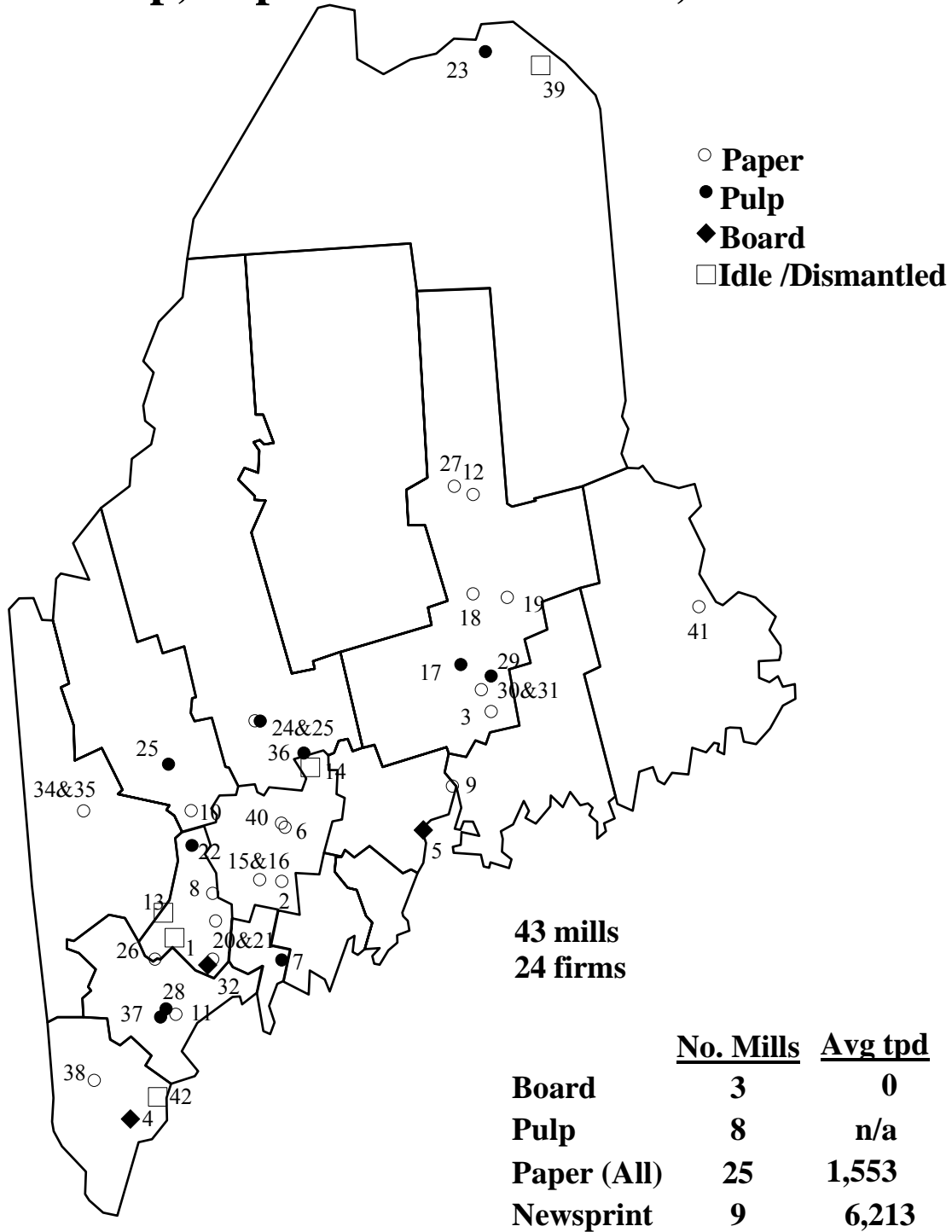
Dates reflect major post-1906 mills.

Source: Bureau of Industrial & Labor Statistics Report, State of Maine, 1906. Augusta, pp. 142ff.

See Backup Table 3 for details.

Figure 11

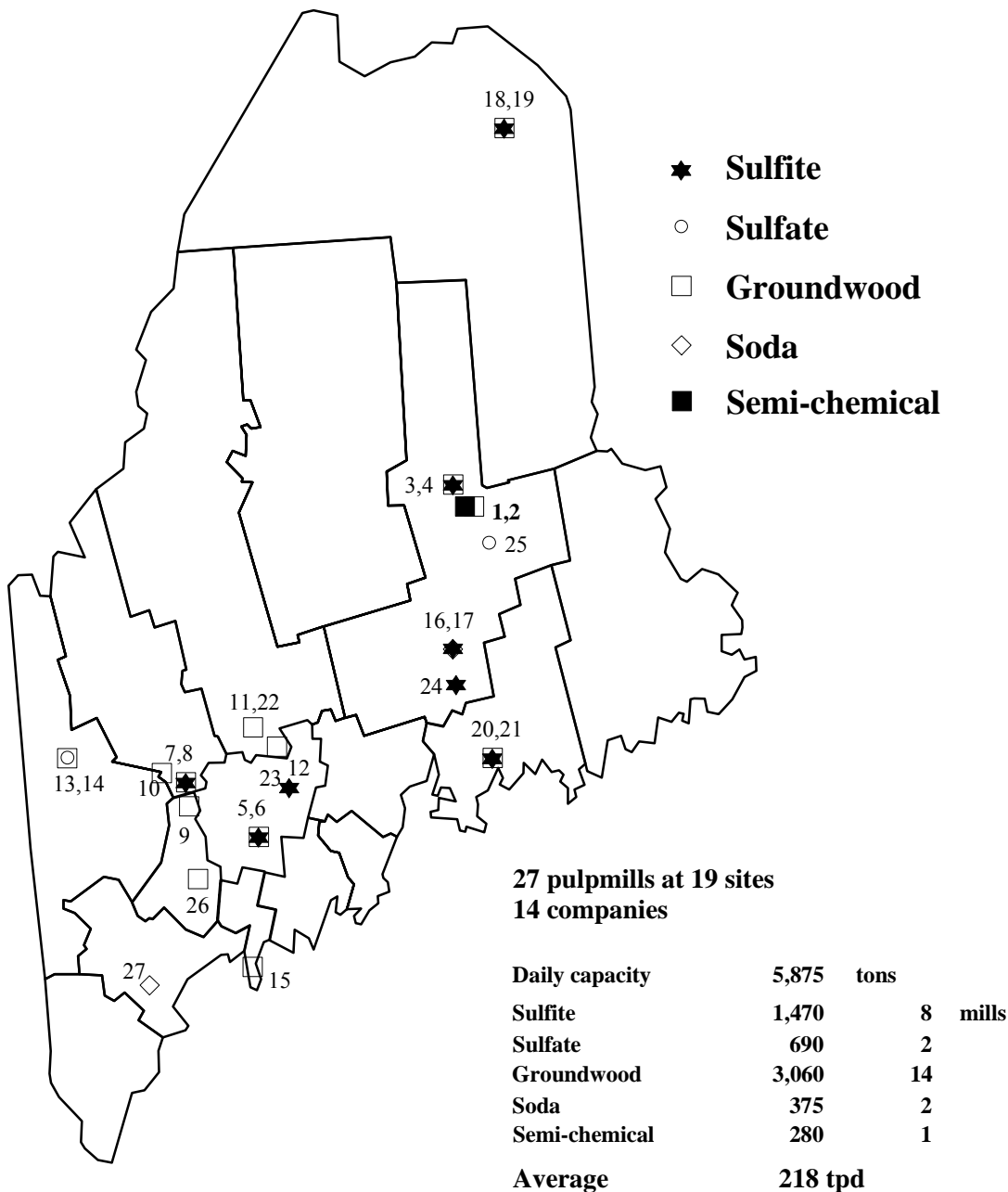
Pulp, Paper and Board Mills, 1931



See Backup Table 4 for details.

Figure 12

Maine Woodpulp Mills, 1961

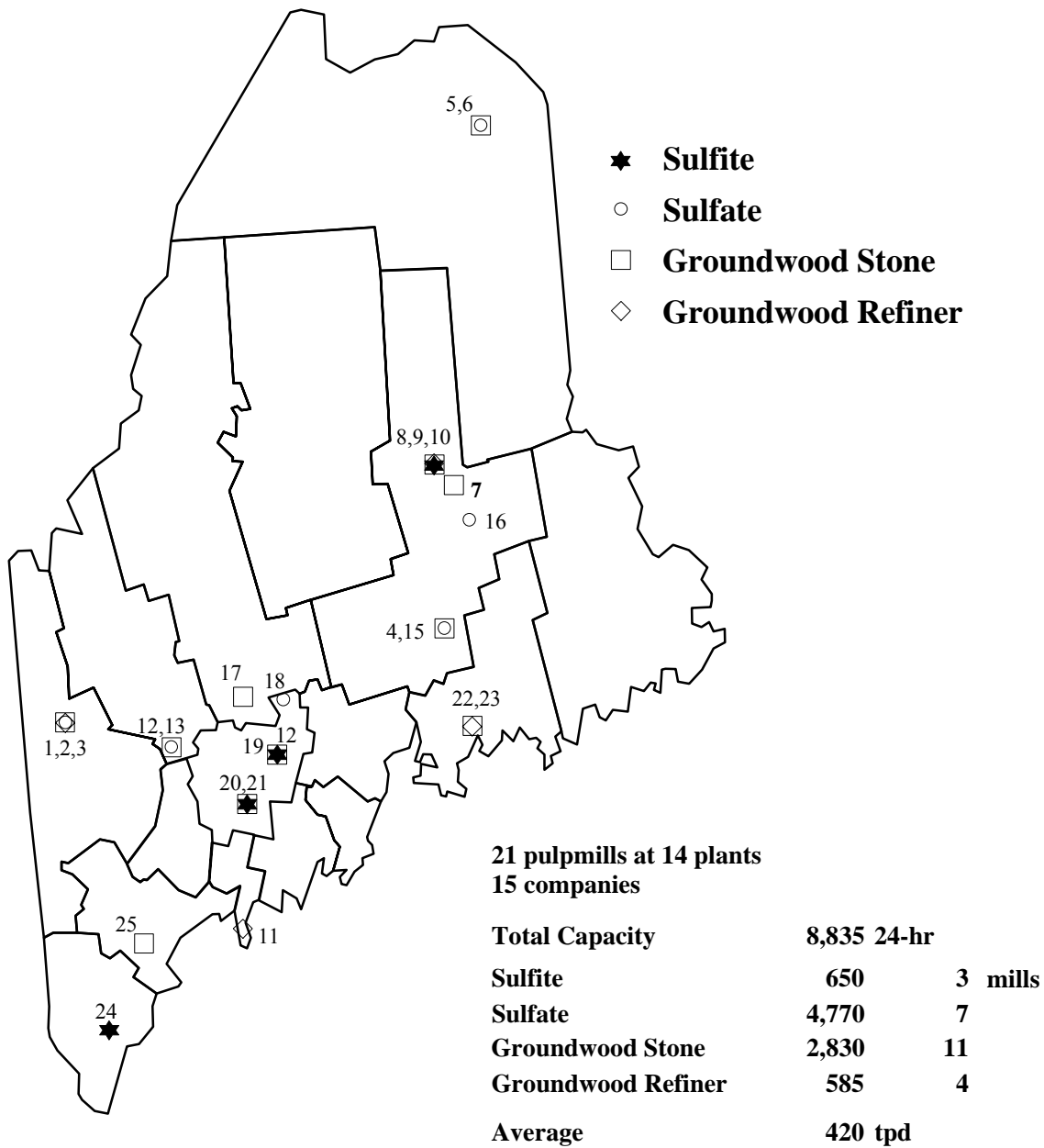


Source: USDA-FS, Div. of Forest Economics Research, 1961, pp. 8.

See Backup Table 5 for details.

Figure 13

Pulp and Paper Mills, 1983

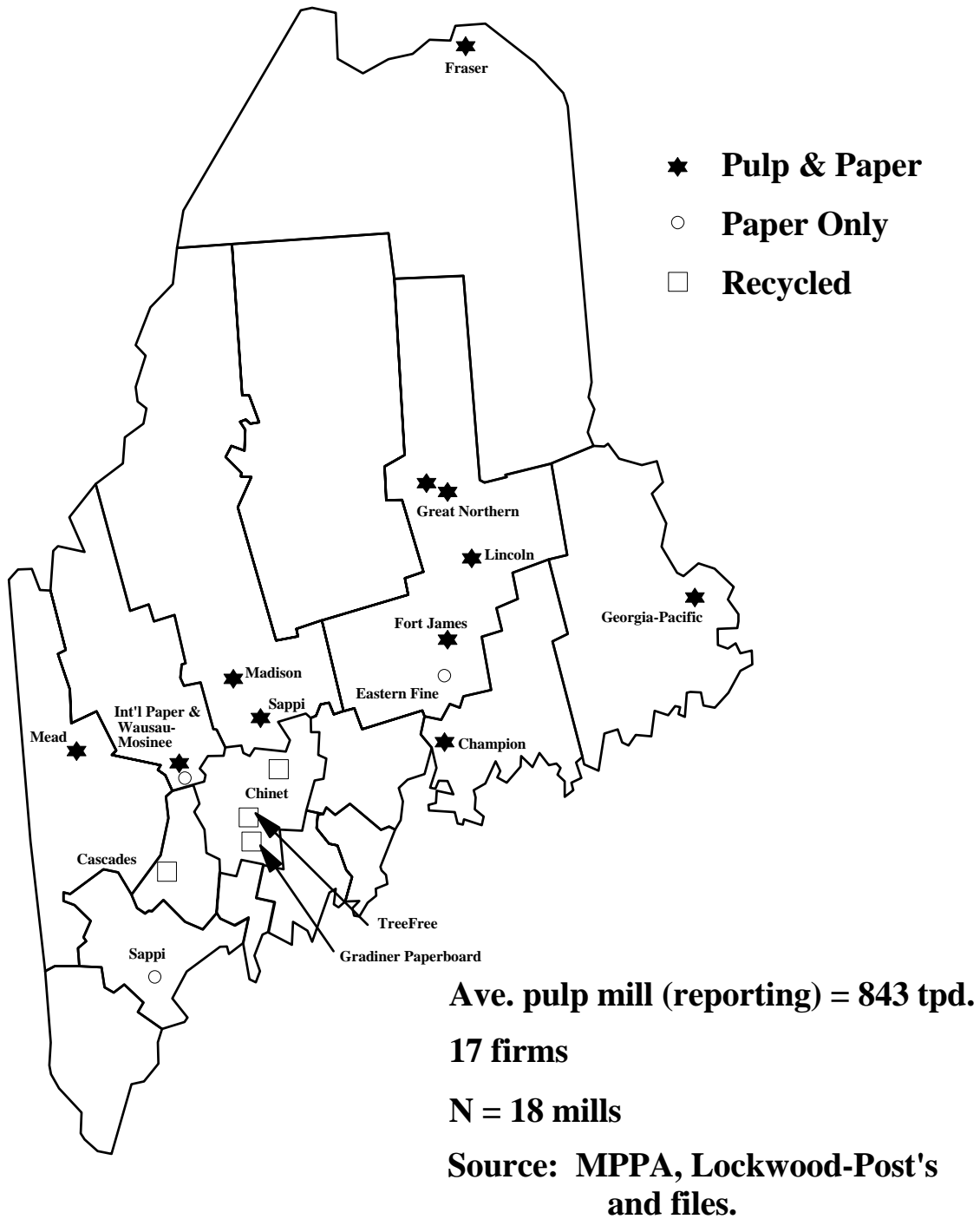


Source: McKeevor, 1987, pp. 8.

See Backup Table 6 for details.

Figure 14

Maine Paper Industry, 1999



See Backup Table 7 for details.

EQUIPMENT AND TECHNOLOGICAL CHANGE

Through the mid 19th century, paper mills were very small, no larger at times than a large house. In a basement, women and girls sorted rags, on the main floor, beaters and vats prepared stock and formed sheets, and in a second floor or attic, sheets were dried. Humid weather might delay shipment for days. Historians despair of keeping track of these “garage businesses” as they washed out in freshets and burned regularly. Not until the widespread introduction of the fourdrinier paper machine did mills grow significantly in size and begin to require large hydro dams and really substantial brick and stone buildings. As firms grew, they added lines or built additional mills nearby. Ownership across states was uncommon until the 1880’s and 1890’s.

Equipment had advanced in many respects. These advances are most strikingly evident in the newest machines, but existing machines are regularly upgraded for speed and quality. By 1860, handmade paper had virtually vanished – a near complete industry conversion in three or four decades. The history of machine speeds from 1860 is one indication.

Feet Per Minute

Late 1860’s	100	
1872	175	Fastest on record
1880	200	Glatfelter, PA
1897	500	4 mills
Early 1920’s	1,000	
Late 1950’s	2,500	
Mid 1980’s	3,500	
Late 1990’s	5,000 +	New newsprint machines

These estimates, culled from histories and company reports, show that speeds increased dramatically from 1870 to 1900, based largely on electrification and new equipment and metallurgy. Over the past century, speeds have increased by a factor of ten.

Paper machines widths increased, as metallurgy and control techniques advanced. The Richards mill at Gardiner in mid century had machines 58” wide. The widest machine noted in Maine’s 1899 BILS report was at International Paper’s Rumford mill, 162” newsprint machine. In that year, many machines of widths between 80” and 120” were in use, but new machines were in the 135-162” range. Machine widths rose significantly over the 20th century, but not nearly as much as speeds. Great Northern’s No. 11” in 1972, was 297” wide, and many new machines now exceed 300”.

Even by 1900, the principal way to build a large mill was to install more machines. In 1899, larger mills had 4 to 6 paper machines. Great Northern’s Millinocket mill started up with two machines. By mid century, some large specialty mills ran a dozen or more machines. Between them, by the early 1980’s, the 2 Great Northern mills ran 17 machines.

After the 1980’s, smaller, slower machines were being closed and mills slimmed down. About 1900, International Paper ran 4 mills in the Jay area, with 14 machines, making 235 tpd. By 1999, IP’s giant “Andro” mill at Livermore Falls produced 1,600 tpd on 5 machines. By 1999, Great Northern was down to 6 machines. The newest mill in Maine was Sappi’s at Hinckley, producing 500 tpd of printing paper on just 3 machines. In this slimming down process, some of the mills cut their tonnage significantly.

Newsprint mills had an advantage of uniform fiber mix and specialization. They rapidly began to outdistance other grades in annual tonnage. In 1894, the 6 newsprint mills were among the State’s largest. By 1931, the average Maine newsprint mill was 4 times the size of the average (non-news) paper mill.

Chemical processes evolved dramatically over the century as well. In a 1900 newsprint mill, the mix was often 80% groundwood and 20% soda pulp. The soda process fell out of favor

in time. The sulfite process was also important at that time, but became eclipsed by the kraft process. That process used byproduct waste for fuel and enabled mills to recover process chemicals. It produced a high-strength pulp. From 20% of U.S. production in 1929, kraft rose to 84% by 1999 (Backup Table 11). Reflecting weaker U.S. competitiveness in commodity groundwood grades, that form of pulp declined in total production from 1983 to 1999, even as total U.S. pulp output rose. From 1920 to 1983, 100 groundwood mills closed nationwide (McKeever, 1987).

Maine mills during the 1920's to the 1960's shifted production to the emerging printing and writing papers, which were growing rapidly in demand. Maine mills staked out leading positions supplying high-profile publications such as National Geographic and Sports Illustrated. The industry left commodity grades, newsprint, packaging, and market pulp, largely to other regions. Despite the age of its mills, the Maine industry compared favorably to mills in the same grades by machine widths and speeds in the mid 1980's (Maine, 1988, Appendix, p. 12). Investment had not been neglected – it occurred in the less dramatic form of machine upgrades and replacements.

From 1930 (Seaboard at Bucksport) to the early 1960's (Andro), not one new “Greenfield” mill was built in Maine. The last one was Scott's (now Sappi) mill at Hinckley (nr. Skowhegan), started up about 1980. By the mid 1990's, it was showing. A detailed analysis by leading consultants at Jaako Pöyry showed that most Maine mills were older than their competitors and that major investments were required to remain competitive. This strategy yielded impressive production growth for the state's industry from the late 1940's to the 1980's. Still, the Maine industry remained true to its groundwood roots, with about half of its pulp capacity in 1961 still in groundwood.

MAINE'S INDUSTRY OVERVIEW

Maine's paper industry accounted for a significant volume of economic activity in the 1997 Census of Manufactures. Maine's overall papermaking sector (NAICS 322) accounted for 13,800 jobs and about \$4.7 billion in product shipments in that year. The industry accounted for 32% of manufacturing shipments and 16.8% of the manufacturing employees. The industry's share of manufacturing jobs is less than 5% in all other New England states. Paper industry workers enjoy among the very highest wages and fringe benefits of any industry. In 1997, for example, industry payroll per employee in paper was far higher than other manufacturing industries (Table 6).

Employment in Maine's paper industry has been important to its economy since the turn of the century. In fact, until the late 1990's, the paper industry's share of all manufacturing remained fairly steady (Fig. 15). A closer look at recent years shows a slow decline in primary paper jobs after the late 1980's, while secondary paper jobs increased slightly over the period (Fig. 16).

Table 6
Average Annual Payroll Per Employee, 1997

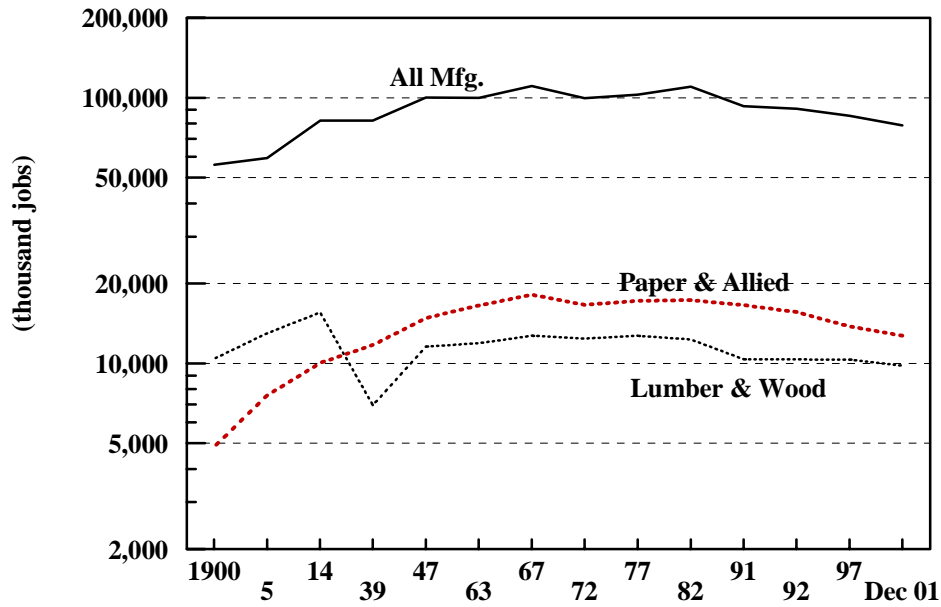
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Source: U.S. Census of Manufactures, 1997.

Maine stands by itself not only in the size and relative importance of its paper industry, but in the sustained role the industry has played. Since the 1930s, the state's lumber and paper based sector has accounted for just under 30% of its manufacturing employment.

Figure 15

Maine Forest Industry Employment, 1900-1997

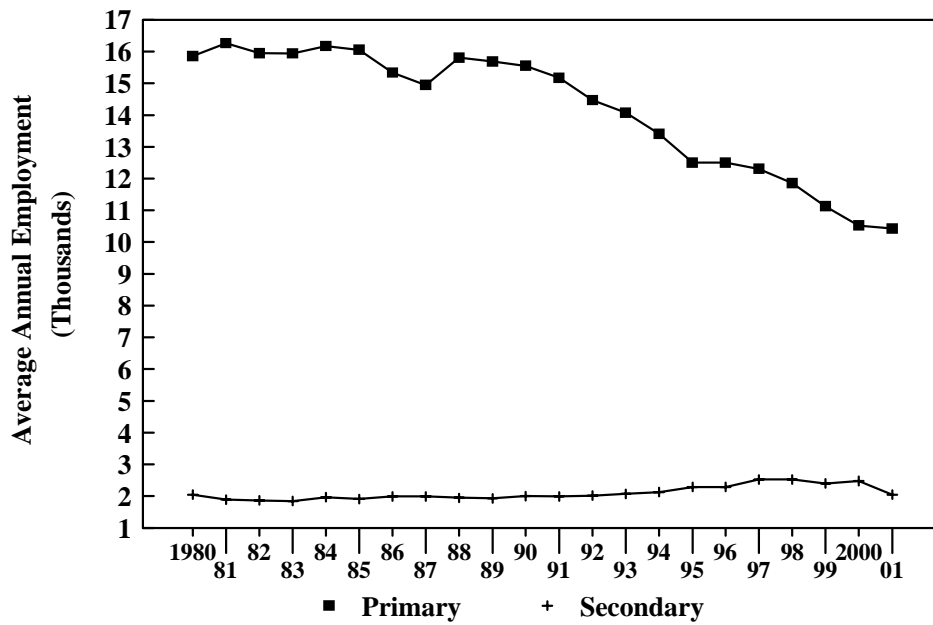


Sources: Census of Mfrs., U.S. Bureau of the Census with Census of Maine Mfrs. for 1982a and 1991 to 1997; and MDOL, March, 2002.

Note: Using different sources probably jolts the comparison from 1992 to 1993 a bit.

Figure 16

Maine Paper Employment, 1980-2001



Source: Maine Dept. of Labor.

FIBER SOURCES

The paper industry was already straining raw material sources before the Civil War. As demands rose and mill sizes increased, fiber supply went from a problem to a crisis. According to Munsell's "Chronology," the U.S. imported 8 million pounds of rags, mostly from Italy, in 1847. The imports rose to 21 million in 1850, 44 million by 1857, and 128 million pounds in 1872. By then, the United Kingdom was the leading source, and the U.S. produced one-third of the world's output (Munsell, 1871). Imports remained high until 1914 (Smith, 1971, p. 321). In 1880, the small Maine industry relied almost entirely on rags. In the Tenth Census of that year, wood was not tallied as a material source, despite the introduction of groundwood pulps in preceding years.

Bolstered by extensive controlled timberlands, available hydropower sites, and a growing timber resource, the Maine industry was in a favorable fiber supply position for decades after 1920. This began to change in the 1970's and 1980's. A complex series of changes took place. First, the 1972-1985 spruce budworm outbreak not only placed a limit on inventory increases, but dramatically turned them around (Irland, et al., 1979). The salvage efforts of that period briefly increased supplies, but when the dust settled it was evident that inventories would only recover after decades, and only if significant improvements in management occurred (Gadzik, Blanck, and Caldwell, 1998).

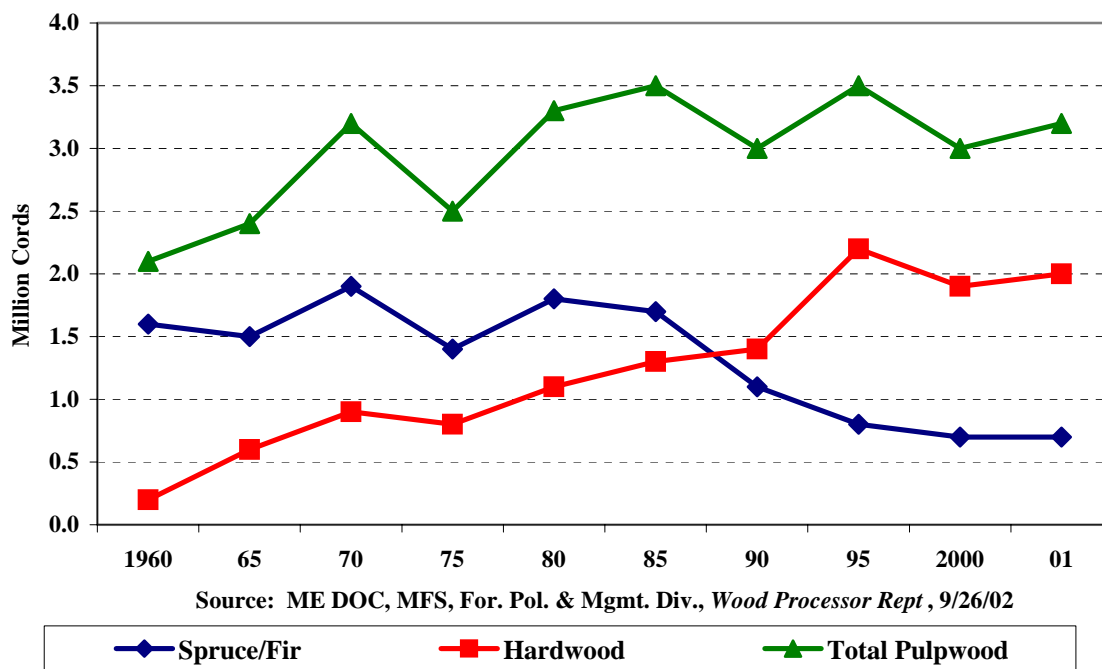
Another development was new sawmilling technology enabling lumber production from ever-smaller logs. By the early 1990's, over much of northern Maine, logs generally went straight to a sawmill, sold by the ton. Chips from the sawmills came back, often on long hauls in specially designed chip vans, to the paper mills. A new competitor now skimmed off a significant share of a declining resource. In the late 1950's, chips accounted for 30,000 cords of

pulpwood, and by 1977 they already amounted to 900,000 cords. This amount continued to increase. By the 1990's, recycled content was being required by buyers, and Maine mills moved to adapt. By 1999, recycled was a significant portion of the fiber mix.

As the spruce-fir supply peaked, the Maine mills turned to the abundant and low-cost hardwoods that formerly had not been needed. This represented a sea change in a state whose industry was built on spruce-fir. By the later 1980's, hardwood overtook spruce and fir in the mix, and by the close of the 1990's, hardwood was more than half of the wood fiber input (Fig. 17). In 2001, spruce-fir roundwood accounted for only 20% of Maine's pulpwood harvest. This situation suggests a significant challenge in reliance on hardwoods, when other parts of the World have absolute cost advantages in hardwood pulp costs.

Figure 17

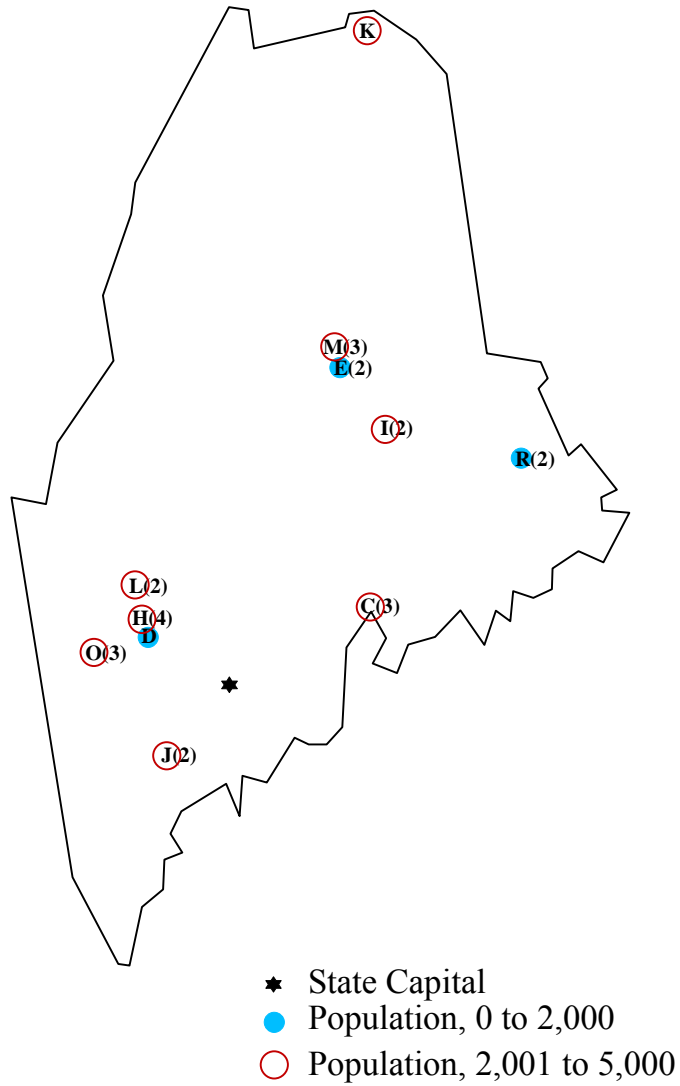
**Harvest Levels of Selected Species for Pulpwood in Maine,
1960-2001**



PAPER MILLTOWNS -- 1999

To identify current milltowns, we can turn to the authoritative Lockwood-Posts' directory. This source lists 18 primary pulp and paper mills in 1999 (Fig. 18). Of these, 11 can be considered "milltowns" by reason of their size and relative geographic position – away from or isolated from larger cities (Fig. 18). An additional seven cities (Backup Table 7) can be identified as larger towns with a significant primary paper industry influence. This listing of traits (Table 7) is based on personal familiarity with the paper industry and on several in depth, informal interviews (Irland, n.d.). Detailed studies of socioeconomic aspects of northeastern paper milltowns are few, though a number of historic treatments exist (Conforti, 2001 deals with social changes generally; see also Greene, 1939; Gutman and Bell, 1987; Hartford, 1983; Horwitz, 1978; Whitaker, 1994 treats rural areas within the region; and Luloff and Nord, 1993). The special socioeconomic traits of paper milltowns have not been adequately understood in the past. These traits have a lot to do with the prospects for various strategies that help town adjust to a changing employment base.

Figure 18
Maine Paper Milltowns, 1999



Source: Lockwood-Post's Directory, 1999 (see Backup Table 7 for names)

Table 7
Socioeconomic Traits of Milltowns

<u>Trait</u>	<u>Comment</u>
Ethnic Mix	Varied
Geographic isolation	Some are compact, others draw from a wide labor market
Outdoor culture	Strong in these communities
Employer influence	Not all are true "company towns"
Shift work	Sets "social schedule"
Residence/commuting patterns	Residence near mills still common
High worker incomes	High real estate values; high standard of living for "blue collar" community; often own "camps"
Longtime job tenure	Often multi-generational
Adapting to job reductions	Major source of social stress
Aging workforce	Job shrinkage means workforce gets older
Importance of Union	Key social institution
Worker roles in community leadership	Increasing over time

REFLECTIONS

As the 20th century opened, Maine's paper industry was not only in a burst of expansion, but was quickly assuming a leading place in the State's economy. Not for nothing did the Commissioner of Industrial and Labor Statistics term it "the imperial industry" of Maine in his 1899 report (p. 33). But today, many paper milltowns are enduring painful re-adjustments as mills downsize in the face of timber supply limits, international competition, and ongoing technological changes. Income levels remain high for workers still on the payroll, as skill needs continue to increase. But the stability expected by past generations is gone. The "true" milltowns -- remote towns with heavy paper industry dependence -- have in many cases endured dramatic population shrinkages since the 1960s. The many ways in which the social fabric of these towns is being torn need much more sympathetic attention from a range of social science disciplines. The implications need more careful consideration by policymakers.

It is striking that, despite the strains of the 1990's, the worst has not hit Maine. In a list of 47 "capacity reductions" nationwide in Pulp and Paper Magazine (Jan. 2001, p. 44), only four were in Maine, and they were small machines. As of yet, prior to the end of 2002, Maine had not lost a single large, integrated, wood-fiber based pulp and paper mill in many years. The January 2003 bankruptcy filing of Great Northern indicates how severe are current market conditions, and how fragile the position of single-unit companies in this intensely competitive, globalized industry.

FOOTNOTE

Note on Statistics

At the turn of the century, many compilations list machines and pulp lines separately. Thus, in 1899 the BILS compilation listed 38 pulp mills and 28 paper mills at 37 “plants” or establishments. The data usually do not show the paper net pulp balance of mills or the state. “Pulp for sale” could go to other Maine mills. Thus, adding up production totals is frustrating if not impossible. Individual mills are commonly cited with different capacities or outputs in different sources, untrained authors commonly omit precise dating when citing key data.

Also, in the early 19th century production data hardly exist. Mill volumes were tallied in reams, later in pounds, then tons. The 1906 BILS list still states output in pounds. It was common practice to list mills by daily capacity. Mills ran 15-hour days in late 19th century, falling to 10-12 by early 20th century. Six-day weeks were common until well into the 20th century, well after 24-hour operating using two shifts was well established.

Turning daily capacity or output into annual totals is problematic. Today, authors state outputs in annual terms for mills and machines just often enough to confuse later analysts. Late in the 20th century, especially for market pulp and news, it became more common to state capacities and production in metric tons (designated “Mtons” or “tonnes”).

For turn of the century “data” different authors use different numbers. Even in speaking of individual machines, authors may speak total (felt) width, or of “trim” width.

Invisible Industry Problem

By the 1950's, disclosure problems were already preventing details for Maine from appearing in Census and industry tabulations; helping to create this problem.

Analyzing local area economic impacts of the paper industry is complicated by the data disclosure rules of state and federal statistical agencies. Briefly, it is not possible to publish any economic data in the employment statistics or in the economic censuses if three or fewer firms are represented in the applicable area. In many counties where the paper industry is the leading single employer, the tables of employment, shipments, firms, wages, and other economic data display rows of “d’s” – the statistical agency code meaning, “cannot be published due to disclosure rules.” This renders the industry “invisible” in the local economic statistics unless analysts are able to directly obtain private data.

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**Backup Table 1
Maine Pulp Mills, 1894**

<u>Map No.</u>	<u>Company</u>	<u>Location</u>	<u>Product</u>	<u>Lbs/Day</u>	<u>Converted to Tons</u>
31 PULP COMPANIES					
State at Large					
1	Forest Paper Company	Yarmouthville	Soda fiber	72,000	36.00
2	S. D. Warren and Company	Westbrook	Soda	<u>50,000</u>	<u>25.00</u>
			Total	122,000	61.00
Androscoggin River					
3	Androscoggin Pulp Co.	Brunswick	Pulpboard	12,000	6.00
4	Pejepscot Paper Co.	Pejepscot	Ground	80,000	40.00
5	Lisbon Falls Fiber Co.	Lisbon Falls	Sulphite Pulp	40,000	20.00
6	Poland Paper Co.	Mechanic Falls	Soda	30,000	15.00
7	Bisco Falls Pulp Mill	Paris	Ground	3,000	1.50
8	Otis Falls Pulp Co.	Livermore Falls	Ground	109,000	54.50
9	Umbagog Pulp Co.	Livermore Falls	Pulpboard	30,000	15.00
10	Livermore Falls Pulp Co.	Livermore Falls	Ground	20,000	10.00
11	Jay Paper Mfg. Co.	Jay Bridge	Ground	50,000	25.00
12	Rumford Falls Paper Co.	Rumford Falls	Ground	100,000	50.00
13	Rumford Falls Paper Co.	Rumford Falls	Sulphite	50,000	25.00
14	Rumford Falls Sulphite Co.	Rumford Falls	Sulphite	<u>100,000</u>	<u>50.00</u>
			Total	624,000	312.00
Kennebec River					
15	Richards Paper Co.	South Gardiner	Sulphite	36,000	18.00
16	Cushnoc Fiber Co.	Augusta	Ground	12,000	6.00
17	Cushnoc Fiber Co.	Augusta	Sulphite	26,000	13.00
18	Hollingsworth & Whitney Co.	Winslow	Mechanical	100,000	50.00
19	Kennebec Fiber Co.	Benton	Pulpboard	20,000	10.00
20	Somerset Fiber Co.	Fairfield	Soda	22,000	11.00
21	Richards Paper Co.	Skowhegan	Ground	14,000	7.00
22	Skowhegan Pulp Co.	Skowhegan	Ground	36,000	18.00
23	Mfg. Investment Co.	Madison	Sulphite	60,000	30.00
24	Moosehead Pulp & Paper Co.	Emden	Mechanical	<u>100,000</u>	<u>50.00</u>
			Total	426,000	213.00
Penobscot River					
25	Penobscot Pulp & Paper Co.	Veazie	Ground	40,000	20.00
26	Bangor Pulp & Paper Co.	Orono	Sulphite	50,000	25.00
27	Eastern Mfg. Co.	South Brewer	Sulphite	50,000	25.00
28	Penobscot Chemical Fiber Co.	Old Town	Soda Pulp	52,000	26.00
29	Piscataquis Falls Pulp & Paper Co.	Montague (now Enfield)	Ground	80,000	40.00
30	Howland Falls Pulp Co.	Howland	Sulphite	60,000	30.00
31	Katahdin Pulp & Paper Co.	Lincoln	Sulphite	<u>40,000</u>	<u>20.00</u>
			Total	372,000	186.00
	TOTAL PULP			1,544,000	772.00
	Percent of capacity that is groundwood		35.2%		

Source: Maine Bureau of Industrial and Labor Statistics, 1894, pp. 121-122.

**Backup Table 1 (cont.)
Maine Paper Mills, 1894**

<u>Map No.</u>	<u>Company</u>	<u>Location</u>	<u>Product</u>	<u>Lbs/Day</u>	<u>Converted to Tons</u>
19 PAPER COMPANIES					
State at Large					
32	S. D. Warren Co.	Westbrook	Book	100,000	50.00
33	Maine Paper Co.	Westbrook	Tissue	4,000	2.00
34	Sebago Wood Board Co.	South Windham	Woodboard	24,000	12.00
35	National Fiber Board Co.	Kennebunk	Leatherboard	5,000	2.50
36	Sherman & Co.	Belfast	Leatherboard	<u>3,500</u>	<u>1.75</u>
			Total	136,500	68.25
Androscoggin					
37	Bowdoin Paper Mfg. Co.	Topsham	News & Book	60,000	30.00
38	Lisbon Falls Fiber Co.	Lisbon Falls	News & Book	50,000	25.00
39	Poland Paper Co.	Mechanic Falls	Book	50,000	25.00
40	National Fiber Board Co.	East Poland	Leatherboard	8,000	4.00
41	Otis Falls Pulp Co.	Livermore Falls	News	60,000	30.00
42	Jay Paper Mfg. Co.	Jay Bridge	News	40,000	20.00
43	A. Record	Livermore Falls	Leatherboard	4,000	2.00
44	Rumford Falls Paper Co.	Rumford Falls	News	<u>120,000</u>	<u>60.00</u>
			Total	392,000	196.00
Kennebec					
45	S. D. Warren & Co.	Gardiner	Book	24,000	12.00
46	Hollingsworth & Whitney Co.	Gardiner	Manilla	40,000	20.00
47	Hollingsworth & Whitney Co.	Winslow	Manilla	84,000	42.00
48	Cushnoc Fiber Co.	Augusta	Manilla	<u>18,000</u>	<u>9.00</u>
			Total	166,000	83.00
Penobscot					
49	Bangor Pulp & Paper Co.	Orono	Manilla	24,000	12.00
50	Webster Paper Co.	Orono	News	<u>46,000</u>	<u>23.00</u>
			Total	70,000	35.00
TOTAL PAPER				764,500	382.25
Averages:					
	31 pulpmills	25 tpd			
	19 paper mills	20 tpd			
	6 newsprint mills	49 tpd			

Source: Maine Bureau of Industrial and Labor Statistics, 1894, pp. 121-122.

**Backup Table 1a
Maine Paper Mills, 1894 Summary**

<u>Company</u>	<u>No. Mills Pulp</u>	<u>No. Mills Paper</u>
A. Record		1
Androscoggin Pulp Co.	1	
Bangor Pulp & Paper Co.	1	1
Bisco Falls Pulp Mill	1	
Bowdoin Paper Mfg. Co.		1
Cushnoc Fiber Co.	2	1
Eastern Mfg. Co.	1	
Forest Paper Company	1	
Hollingsworth & Whitney Co.	1	2
Howland Falls Pulp Co.	1	
Jay Paper Mfg. Co.	1	1
Katahdin Pulp & Paper Co.	1	
Kennebec Fiber Co.	1	
Lisbon Falls Fiber Co.	1	1
Livermore Falls Pulp Co.	1	
Maine Paper Co.		1
Mfg. Investment Co.	1	
Moosehead Pulp & Paper Co.	1	
National Fiber Board Co.		2
Otis Falls Pulp Co.	1	1
Pejepscot Paper Co.	1	
Penobscot Chemical Fiber Co.	1	
Penobscot Pulp & Paper Co.	1	
Piscataquis Falls Pulp & Paper Co.	1	
Poland Paper Co.	1	1
Richards Paper Co.	2	
Rumford Falls Paper Co.	1	1
Rumford Falls Sulphite Co.	1	
S. D. Warren & Co.	1	2
Sebago Wood Board Co.		1
Sherman & Co.		1
Skowhegan Pulp Co.	1	
Somerset Fiber Co.	1	
Umbagog Pulp Co.	1	
Webster Paper Co.		1
Total	30	19

Backup Table 2
Pulp, Paper & Leather Board Mills, 1899

Map No.	Name	Location	Product	Lbs/Day	Converted to Tons
1	Auburn Leather Board Supply Co.	Auburn	Leather Board *	2,000	1.00
2	Cushnoc Paper Co.	Augusta	Sulphite Fiber Pulp	24,000	12.00
	Cushnoc Paper Co.	Augusta	Wood Pulp	10,000	5.00
	Cushnoc Paper Co.	Augusta	Manila Paper	36,000	18.00
3	Sherman & Co.	Belfast	Leather Board	6,000	3.00
4	Kennebec Fiber Co.	Benton Falls	Wood Pulp	30,000	15.00
	Kennebec Fiber Co.	Benton Falls	Wood Pulp Board	24,000	12.00
5	Androscoggin Pulp Co.	Brunswick	Wood Pulp	16,000	8.00
	Androscoggin Pulp Co.	Brunswick	Wood Pulp Board	10,000	5.00
6	International Paper Co.	Chisholm	Wood Pulp, Dry	400,000	200.00
	International Paper Co.	Chisholm	Newspaper	320,000	160.00
7	S. D. Warren & Co.	Cumberland Mills	Soda Fiber Pulp	50,000	25.00
	S. D. Warren & Co.	Cumberland Mills	Book & Coated Paper	120,000	60.00
	S. D. Warren & Co.	Cumberland Mills	Wrapping Paper	15,000	7.50
8	National Fiber Board Co.	East Poland	Leather Board	14,000	7.00
9	International Paper Co.	Embden	Wood Pulp	100,000	50.00
10	International Paper Co.	Enfield	Wood Pulp, Dry	90,000	45.00
11	Somerset Fiber Co.	Fairfield	Soda Fiber Pulp	30,000	15.00
12	S. D. Warren & Co.	Gardiner	Book Paper	32,000	16.00
13	Hollingsworth & Whitney	Gardiner	Manila Paper	56,000	28.00
14	Penobscot Chemical Fiber Co.	Great Works	Soda Fiber Pulp	80,000	40.00
15	Howland Pulp Co.	Howland	Sulphite Fiber Pulp	80,000	40.00
16	International Paper Co.	Jay Bridge	Wood Pulp, Dry	50,000	25.00
	International Paper Co.	Jay Bridge	Newspaper	120,000	60.00
17	National Fiber Board Co.	Kennebunk	Leather Board	5,000	2.50
18	Katahdin Pulp & Paper Co.	Lincoln	Sulphite Fiber Pulp	60,000	30.00
19	Lisbon Falls Fiber Co.	Lisbon Falls	Sulphite Fiber Pulp	60,000	30.00
	Lisbon Falls Fiber Co.	Lisbon Falls	News & Manila Paper	50,000	25.00
20	International Paper Co.	Livermore Falls	Wood Pulp, Dry	40,000	20.00
	International Paper Co.	Livermore Falls	Wood Pulp Board	30,000	15.00
21	Great Northern Paper Co.	Madison	Wood Pulp	80,000	40.00
	Great Northern Paper Co.	Madison	Sulphite Fiber Pulp	80,000	40.00
22	Poland Paper Co.	Mechanic Falls	Book Paper	50,000	25.00
23	International Paper Co.	Orono	Wood Pulp	60,000	30.00
	International Paper Co.	Orono	Newspaper	60,000	30.00
24	Orono Pulp and Paper	Orono	Sulphite Fiber Pulp	50,000	25.00
	Orono Pulp and Paper	Orono	Hardware & Manila Paper	30,000	15.00
25	International Paper Co.	Riley	Wood Pulp	200,000	100.00
26	International Paper Co.	Rumford Falls	Wood Pulp	180,000	90.00
	International Paper Co.	Rumford Falls	Newspaper	225,000	112.50
27	Richards Paper Co.	Skowhegan	Wood Pulp	16,000	8.00
28	Skowhegan Pulp Co.	Skowhegan	Wood Pulp	40,000	20.00
29	Eastern Manufacturing Co.	South Brewer	Sulphite Fiber Pulp	50,000	25.00
	Eastern Manufacturing Co.	South Brewer	Fine Manila Paper	50,000	25.00
30	International Paper Co.	South Gardiner	Sulphite Fiber Pulp	50,000	25.00
31	Sebago Wood Board Co.	South Windham	Sulphite Fiber Pulp	50,000	25.00
	Sebago Wood Board Co.	South Windham	Wood Pulp Board	30,000	15.00
32	Pejepscot Paper Co.	Topsham	Wood Pulp	180,000	90.00
	Pejepscot Paper Co.	Topsham	Newspaper	130,000	65.00
33	Bowdoin Paper Manufacturing Co.	Topsham	Newspaper	70,000	35.00
34	Hollingsworth & Whitney Co.	Winslow	Wood Pulp	120,000	60.00
	Hollingsworth & Whitney Co.	Winslow	Manila Paper	170,000	85.00
35	Algonquin Sulphite Fiber Mill	Winslow	Sulphite Fiber Pulp	80,000	40.00
		Total Leatherboard		4 27,000	13.50
		Total Pulp		33 2,450,000	1,225.00
		Total Paper		16 1,534,000	767.00
		Average Leatherboard		6,750	3.38
		Average Pulp		74,242	37.12
		Average Paper		95,875	47.94

Source: Bureau of Industrial and Labor Statistics Rept, State of Maine, 1899, Augusta, pp. 33ff.

Backup Table 2A
Pulp, Paper & Leather Board Mills, 1899 Summary

<u>Name</u>	<u>No. Mills</u>
Algonquin Suphite Fiber Mill	1
Androscoggin Pulp Co.	2
Auburn Leather Board Supply Co.	1
Bowdoin Paper Manufacturing Co.	1
Cushnoc Paper Co.	3
Eastern Manufacturing Co.	2
Great Northern Paper Co.	2
Hollingsworth & Whitney	3
Howland Pulp Co.	1
International Paper Co.	14
Katahdin Pulp & Paper Co.	1
Kennebec Fiber Co.	2
Lisbon Falls Fiber Co.	2
National Fiber Board Co.	2
Orono Pulp and Paper	2
Pejepscot Paper Co.	2
Penobscot Chemical Fiber Co.	1
Poland Paper Co.	1
Richards Paper Co.	1
S. D. Warren & Co.	4
Sebago Wood Board Co.	2
Sherman & Co.	1
Skowhegan Pulp Co.	1
Somerset Fiber Co.	<u>1</u>
 TOTAL	 53

Backup Table 3
Pulp, Paper & Leather Board Mills, 1906

Map No.	Company	Location	Year Established	Product	Lbs/Day	Converted to Tons
1	Auburn Leather Board Supply Co.	Auburn	n.d.	Leather Board	2,000	1.00
2	Cushnoc Paper Co.	Augusta	1888	Ground Wood Pulp	12,000	6.00
3	Sherman & Co.	Belfast	n.d.	Leather Board	6,000	3.00
4	United Box Board & Paper	Benton Falls	n.d.	Ground Wood Pulp	24,000	12.00
5	Androscoggin Pulp Co.	Brunswick	n.d.	Pulp Board	20,000	10.00
6	International Paper Co.	Chisholm	1898	Ground Wood Pulp	120,000	60.00
7	S. D. Warren Co.	Cumberland Mills	1854	Soda Pulp	120,000	60.00
8	National Fiber Board Co.	East Poland	1879	Thick Paper	8,000	4.00
9	American Pulp, Paper & Lumber Co.	Anson	Under Constr.			0.00
10	Orono Pulp & Paper Co.	Bangor	1891	Sulphite Pulp	70,000	35.00
10	United Box Board & Paper	Fairfield	1881	Soda Pulp	30,000	15.00
12	S. D. Warren & Co.	Gardiner	1854	Book & Magazine Paper	50,000	25.00
13	Hollingsworth & Whitney Co.	Gardiner	1882	Ground Wood Pulp	12,000	6.00
14	Penobscot Chemical Fiber Co.	Great Works	1882	Soda Pulp	110,000	55.00
15	Howland Pulp & Paper Co.	Howland	1891	Sulphite Pulp	60,000	30.00
16	International Paper Co.	Jay	1898	Ground Wood Pulp	38,000	19.00
17	National Fiber Board Co.	Kennebunk	n.d.	Leather Board	5,000	2.50
18	Katahdin Pulp & Paper Co.	Lincoln	1894	Sulphite Pulp	70,000	35.00
19	Lisbon Falls Fiber Co.	Lisbon Falls	1889	Sulphite Pulp	70,000	35.00
20	International Paper Co.	Livermore Falls	1898	Ground Wood Pulp	24,000	12.00
21	Great Northern Paper Co.	Madison	1891	Ground Wood Pulp	80,000	40.00
22	Poland Paper Co.	Mechanic Falls	1887	Book & Writing Paper	80,000	40.00
23	International Paper Co.	Orono	1898	Ground Wood Pulp	40,000	20.00
24		Bar Mills	Under Constr.			0.00
25	International Paper Co.	Riley	1898	Ground Wood Pulp	128,000	64.00
26	International Paper Co.	Rumford Falls	1898	Ground Wood Pulp	136,000	68.00
27	Eastern Manufacturing Co.	Brewer	1889	Sulphite Pulp	70,000	35.00
28	Skowhegan Pulp Co.	Skowhegan	1888	Ground Wood Pulp	40,000	20.00
29		Chisholm	Under Constr.			0.00
30	International Paper Co.	South Gardiner	1898	Sulphite Pulp	52,000	26.00
31	Androscoggin Pulp Co.	South Windham	1875	Ground Wood Pulp	50,000	25.00
32	Bowdoin Paper Manufacturing Co.	Topsham	1868	Newspaper	60,000	30.00
33	Publisher's Paper Co.	Hollis	Under Constr.			0.00
34	Hollingsworth & Whitney Co.	Winslow	1893	Ground Wood Pulp	150,000	75.00
35	Pejepscot Paper Co.	Pejepscot	1893	Ground Wood Pulp	104,000	52.00
35		Howland	Under Constr.			0.00
36		Livermore Falls	Under Constr.			0.00
37	Great Northern Paper Co.	Millmocket	1899	Ground Wood Pulp	600,000	300.00
38	Shawmut Manufacturing Co.	Shawmut	1871	Ground Wood Pulp	50,000	25.00
39		Nobleboro	Under Constr.			0.00
40		North Anson	Under Constr.			0.00
41	Nekonegan Paper Co.	Old Town	1900	Ground Wood Pulp	70,000	35.00
42	Oxford Paper Co.	Rumford Falls	1991	Sulphite Pulp	160,000	80.00
43	International Paper Co.	Solon	1898	Ground Wood Pulp	54,000	27.00
44	Publisher's Paper Co.	Standish	Under Constr.			
45		Steep Falls	Under Constr.			
46	Great Northern Paper Co.	TA R7 WELS	Under Constr.	Paper	280,000	140.00
47	International Paper Co.	West Enfield	1898	Ground Wood Pulp	62,000	31.00
48		Windham	Under Constr.			
49	Saint Croix Paper Co.	Woodland	1905	Ground Wood Pulp	120,000	60.00
50	Forest Paper Co.	Yarmouthville	1874	Soda Pulp	140,000	70.00

	No. Mills		
Total Leatherboard	3	13,000	7
Total Pulp	32	2,886,000	813
Total Paper	5	478,000	245
Newsprint Only	1	60,000	30
Average Leatherboard		4,333	2.17
Average Pulp		90,188	25.41
Average Paper		95,600	49.00

Source: Bureau of Industrial and Labor Statistics Report, 1906.

Backup Table 3A
Pulp, Paper & Leather Board Mills, 1906 Summary

<u>Company</u>	<u>No. Mills</u>
American Pulp, Paper & Lumber Co.	1
Androscoggin Pulp Co.	2
Auburn Leather Board Supply Co.	1
Bowdoin Paper Manufacturing Co.	1
Cushnoc Paper Co.	1
Eastern Manufacturing Co.	1
Forest Paper Co.	1
Great Northern Paper Co.	3
Hollingsworth & Whitney Co.	2
Howland Pulp & Paper Co.	1
International Paper Co.	11
Katahdin Pulp & Paper Co.	1
Lisbon Falls Fiber Co.	1
National Fiber Board Co.	2
Nekonegan Paper Co.	1
Orono Pulp & Paper Co.	1
Oxford Paper Co.	1
Pejepscot Paper Co.	3
Penobscot Chemical Fiber Co.	1
Poland Paper Co.	1
Publisher's Paper Co.	3
S. D. Warren & Co.	2
Saint Croix Paper Co.	1
Shawmut Manufacturing Co.	3
Sherman & Co.	1
Skowhegan Pulp Co.	2
United Box Board & Paper	2
 Total	 51 Mills 27 Companies

Backup Table 4 Pulp, Paper & Board Mills, 1931

Map No.	Location	Company	Pulp	Pulp Comment	Paper Lbs/Day	Paper Converted to Tons	Remarks
1	Auburn	Androscoggin Co.	--		6,000	3	Idle
2	Augusta	Kennebec Co.	3	GW/Sulph.	280,000	140	Newsprint
3	Bangor	Eastern Mfg. Co.	1	Sulph.	150,000	75	Specialties
4	Bar Mills	Rogers Fiber	--		30,000	15	Fiber Board
5	Belfast	Sherman & Co.	--		8,000	4	Shank Board
6	Benton Falls	United Paperboard	--		50,000	25	Specialties
8	Bowdoin	Pejepscot Paper (2 mills)	--		240,000	120	Newsprint, etc.
7	Brunswick	Pejepscot Paper	2	GW	None		None
9	Bucksport	Maine Seaboard	2	GW/Sulph.	600,000	300	Newsprint
10	Chisholm	International Paper	2	GW/Sulph.	746,000	373	Newsprint, etc.
11	Cumberland Mills	S.D. Warren	2	Soda/Sulph.	540,000	270	Printing
12	E. Millinocket	Great Northern Paper	1	GW	560,000	280	Newsprint
13	E. Poland	Waterfalls Paper Mills	--		None		Idle?
14	Fairfield	United Paperboard	--				Dismantled
15	Gardiner	Hollingsworth & Whitney	--		70,000	35	Specialties
16	Gardiner	S. D. Warren	--		20,000	10	Specialties
17	Great Works	Penobscot Chemical Fibre	2	Soda/Sulph.	None		Sulph. & Soda
18	Howland	Advance Bag & Paper	1	Sulfate	150,000	75	Bag & Kraft
19	Lincoln	Eastern Mfg, Katahdin Div.	1	Sulph.	50,000	25	Printing & Writing
20	Lisbon Falls	Wood Fibre Board Corp.	--		n/a		Insul Bd. 90,000 ft.2
21	Lisbon Falls	Pejepscot	--		110,000	55	Newsprint
22	Livermore Falls	International Paper	1	GW	None		Pulp only
23	Madawaska	Fraser	--		800,000	400	Specialties
24	Madison	Great Northern Paper	2	GW/Sulph.	200,000	100	News & Specialties
25	Madison	Hollingsworth & Whitney	1	GW	None		Pulp only
26	Mechanic Falls	Waterfalls Papermill	--		120,000	60	Spec, Printing & Writing
27	Millinocket	Great Northern Paper	2	GW/Sulph.	1,290,000	645	Newsprint
28	Newhall	Dupont de Nemours, Co.	1	GW	None		GW for dynamite, linoleum
29	Old Town	Old Town Co.	1	GW	80,000	40	GW pulp; moulded plates
30	Orono	IP (Webster)	1	GW	76,000	38	Specialties
31	Orono	Orono P&P East.Div	1	Sulph.	100,000	50	Specialties
32	Richmond	Maine Fibre	--		10,000	5	Idle
33	Riley	International Paper	1	GW	None		Pulp pumped to Otis
34	Rumford	Oxford	2	Soda/Sulph.	700,000	350	Printing & Book
35	Rumford	Continental	2	GW/Sulph.	450,000	225	Bag, Specialties
36	S. Windham	Androscoggin Pulp Co.	1	GW	160,000	80	Specialties
37	Shawmut	Keyes Fibre	1	GW	None		Pulp
38	Steep Falls	Androscoggin Pulp Co.	1	GW	None		Specialties
39	Van Buren	International Paper	1	Sulph.	None		Idle
40	Winslow	Hollingsworth & Whitney	1	Sulph.	510,000	255	Specialties
41	Woodland	St. Croix Paper Co.	2	GW/Sulph.	400,000	200	Newsprint
42	Yarmouth	Forest Paper Co.	--	--	180,000	90	Idle
					<u>lb/day</u>	<u>Tpd</u>	
Total Board			3		38,000	19	
Total Pulp			8		n/a	n/a	
Total Paper			25		8,372,000	1973	
Total Newsprint Only			9		4,426,000	2213	
Average Board					12,667	6	
Average Pulp					n/a	n/a	
Average Paper					334,880	79	
Average Newsprint					491,778	246	

Backup Table 4
Pulp, Paper and Board Mills, 1931 Summary

<u>Company</u>	<u>Location</u>
Advance Bag & Paper	1
Androscoggin Co.	1
Androscoggin Pulp Co.	2
Continental	1
Dupont de Nemours, Co.	1
Eastern Mfg. Co.	2
Forest Paper Co.	1
Fraser	1
Great Northern Paper	3
Hollingsworth & Whitney	3
International Paper	5
Kennebec Co.	1
Keyes Fibre	1
Maine Fibre	1
Maine Seaboard	1
Old Town Co.	1
Orono P&P Div. Eastern	1
Oxford	1
Pejepscot	4
Penobscot Chemical Fibre	1
Rogers Fiber	1
S. D. Warren	2
Sherman & Co.	1
St. Croix Paper Co.	1
United Paperboard	2
Waterfalls Paper Mills	2
Wood Fibre Board Corp.	1
Total	43 Mills
Firms	24
Paper Mills	32
Pulp Mills	38
Groundwood	20
Sulphite	14
Soda	3
Sulphate	1

**Backup Table 5
Maine Woodpulp Mills, 1961**

<u>Map No.</u>	<u>Company</u>	<u>Location</u>	<u>Product</u>	<u>Tons/Day</u>
1	Great Northern Paper Co.	E. Millinocket	Groundwood	600
2	Great Northern Paper Co.	E. Millinocket	Semi-chemical	280
3	Great Northern Paper Co.	Millinocket	Sulfite	260
4	Great Northern Paper Co.	Millinocket	Groundwood	875
5	Hudson Pulp & Paper Co.	Augusta	Sulfite	215
6	Hudson Pulp & Paper Co.	Augusta	Groundwood	20
7	International Paper Co.	Chisholm	Sulfite	95
8	International Paper Co.	Chisholm	Groundwood	225
9	International Paper Co.	Livermore Falls	Groundwood	120
10	International Paper Co.	Riley	Groundwood	80
11	Kennebec Corp.	Madison	Groundwood	70
12	Keys Fibre Co.	Shawmut	Groundwood	90
13	Oxford Paper Co.	Rumford	Sulfate	515
14	Oxford Paper Co.	Rumford	Groundwood	75
15	Pejepscot Paper Co.	Brunswick	Groundwood	115
16	Penobscot Chemical Fibre Co.	Great Works	Sulfite	140
17	Penobscot Chemical Fibre Co.	Great Works	Soda	140
18	St. Croix Paper Co.	Woodland	Sulfite	120
19	St. Croix Paper Co.	Woodland	Groundwood	390
20	St. Regis Paper Co.	Bucksport	Sulfite	120
21	St. Regis Paper Co.	Bucksport	Groundwood	200
22	Scott Paper Co.	Madison	Groundwood	100
23	Scott Paper Co.	Winslow	Sulfite	350
24	Standard Packaging Corp.	Bangor	Sulfite	170
25	Standard Packaging Corp.	Lincoln	Sulfate	175
26	U.S. Gypsum Co.	Lisbon Falls	Groundwood	100
27	S. D. Warren Co.	Cumberland Mills	Soda	235
Total				5,875
Average				218

Source: USDA-FS, Div. of Economic Research 1961.

	<u>No. Mills</u>	<u>Ave Tons /Day</u>
Groundwood Mills	14	218.57
All Other Mills	13	216.54

**Backup Table 6
Maine Woodpulp Plants, 1983**

Map No.	Company	Location	Product	Tons/Day
1	Boise Cascade Corp.	Rumford	Sulfate	630
2	Boise Cascade Corp.	Rumford	Groundwood Stone	140
3	Boise Cascade Corp.	Rumford	Groundwood Refiner	165
4	James River Corp.	Old Town	Sulfate	600
5	Georgia-Pacific Corp.	Woodland	Sulfate	800
6	Georgia-Pacific Corp.	Woodland	Groundwood Stone	240
7	Great Northern Paper Co.	E. Millinocket	Groundwood Stone	725
8	Great Northern Paper Co.	Millinocket	Sulfite	650
9	Great Northern Paper Co.	Millinocket	Groundwood Stone	735
10	Great Northern Paper Co.	Millinocket	Groundwood Refiner	100
11	Hearst Corp.	Brunswick	Groundwood Refiner	170
12	International Paper Co.	Jay	Sulfate	1200
13	International Paper Co.	Jay	Groundwood Stone	190
14	Keyes Fibre Co.	Shawmut	Groundwood Stone	100
15	Lily-Tulip, Inc.	Old Town	Groundwood Stone	50
16	Lincoln Pulp & Paper	Lincoln	Sulfate	340
17	Madison Paper Industries, Inc.	Madison	Groundwood Stone	300
18	Scott Paper Co.	Hinckley	Sulfate	900
19	Scott Paper Co.	Winslow	Sulfite	485
20	Statler Tissue Corp.	Augusta	Sulfite	250
21	Statler Tissue Corp.	Augusta	Groundwood Stone	20
22	St. Regis Paper Co.	Bucksport	Groundwood Stone	300
23	St. Regis Paper Co.	Bucksport	Groundwood Refiner	150
24	S. D. Warren Co.	Westbrook	Sulfate	300
25	U.S. Gypsum Co.	Lisbon Falls	Groundwood Stone	10
Total				9,550
Average				382

* Includes defibrated/exploded pulp.

	<u>No. Mills</u>	<u>Ave Tons /Day</u>
Groundwood Mills	15	226.33
All Other Mills	10	615.50

Source: McKeever, 1987, pp. 10.

**Backup Table 6A
Maine Woodpulp Plants, 1983 Summary**

<u>Company</u>	<u>No. Mills</u>
Boise Cascade Corp.	3
James River Corp.	1
Georgia-Pacific Corp.	2
Great Northern Paper Co.	4
Hearst Corp.	1
International Paper Co.	2
Keyes Fibre Co.	1
Lily-Tulip, Inc.	1
Lincoln Pulp & Paper	1
Madison Paper Industries, Inc.	1
Scott Paper Co.	2
Statler Tissue Corp.	2
St. Regis Paper Co.	2
S. D. Warren Co.	1
U.S. Gypsum Co.	1
Total	25

**Backup Table 7
Paper Mill Towns, 1999**

<u>State</u>	<u>Legend</u>	<u>Location</u>	<u>Population</u>
ME	A	Auburn	23,203
	B	<i>Brewer</i>	8,987
	C	Bucksport	2,970
	D	Chisholm	1,399
	E	East Millinocket	1,828
	F	<i>Gardiner</i>	6,198
	G	Hinckley	Not listed
	H	Jay	4,985
	I	Lincoln	5,221
	J	Lisbon Falls	4,420
	K	Madawaska	4,534
	L	Madison	4,523
	M	Millinocket	5,203
	N	<i>Old Town</i>	8,130
	O	Rumford	6,472
	P	<i>Waterville</i>	15,605
	Q	<i>Westbrook</i>	16,142
	R	Woodland	1,403

Notes:

Milltowns in "bold."

Larger cities significantly influenced by paper mills in "italics."

(1) Ryegate mill (George-Pacific) closed in early 2001.

* 2000 Census

**Backup Table 8
Maine Paper Mill Capacity, 1999
(tons per day)**

	<u>Lockwood's</u>	<u>Maine Pulp & Paper Assn.</u>		
		<u>Pulp</u>	<u>Paper</u>	<u>No. Machines</u>
Champion Bucksport	1,340	600	1,370	4
Madison Paper Industries	630	275	576	1
GNP - Millinocket	720	610	736	4
GNP - E. Millinocket	820	1,010	788	2
Fort James, Old Town	450 pulp	725	240	2
I-P, Jay	1,500	1,400	1,600	5
Sappi, Westbrook	200 *			
Mead, Rumford	1,505	1,280	1,600	9
G-P, Woodland	905 pulp			
Fraser, Madawaska	540		1,200	8
Cascades, Auburn, DIP	225 pulp			
Tree Free Augusta	40			
Eastern Fine, Brewer	250 *			
Gardiner Paperboard, Gardiner	90 *			
Lincoln Pulp and Paper	320			
Wausau, Mosinee	190 *		200	2
Sappi, Hinckley	1,800			
Chinet, Waterville	n.a.			
Average tpd	640	843	923	4
Highest tpd	1800	1400	1600	9
Lowest tpd	40	275	200	1

* Paper only.

Source: Lockwood-Post's, 1999; and MPPA, 2000.

Backup Table 9
New England Manufacturing Employment, 1914-1997 (1000's)

	<u>1919</u>	Pct. of <u>All Mfg.</u>	<u>1939</u>	Pct. of <u>All Mfg.</u>	<u>1947</u>	Pct. of <u>All Mfg.</u>	<u>1997</u>	Pct. of <u>All Mfg.</u>
All Manufacturing	1,505.0	100.0%	1,120.8	100.0%	1,474.8	100.0%	968.8	100.0%
Lumber & Timber	22.6	1.5%	9.9	0.9%	15.5	1.1%	n/a	0.0%
Furniture & Fixtures	30.1	2.0%	29.2	2.6%	38.6	2.6%	n/a	0.0%
Textiles	439.6	29.2%	281.3	25.1%	283.1	19.2%	n/a	0.0%
Leather	155.4	10.3%	117.2	10.5%	109.1	7.4%	n/a	0.0%
Paper & Products	58.7	3.9%	54.9	4.9%	69.4	4.7%	46.7	4.8%

Source: Anon., 1951; 1997 Census of Manufacturers

Backup Table 10

State	Legend	Location	POPULATION					
			1900	1920	1940	1960	1980	2000
ME	A	Auburn	12,951	16,985	19,817	24,449	23,128	23,203
	B	Brewer	4,835	6,064	6,510	9,009	9,017	8,987
	C	Bucksport	2,339	1,906	2,927	3,466	4,345	4,908
	D	Chisholm	nl	nl	nl	nl	nl	1,399
	E	East Millinocket	nl	1,392	1,663	2,392	2,372	1,828
	F	Gardiner	5,501	5,475	6,044	6,897	6,485	6,198
	G	Hinckley	nl	nl	nl	nl	nl	nl
	H	Jay	2,758	3,152	2,858	3,247	5,080	4,985
	I	Lincoln	1,731	2,452	3,653	4,541	5,066	5,221
	J	Lisbon Falls	nl	nl	nl	nl	nl	4,420
	K	Madawaska	1,698	1,933	4,477	5,507	5,282	4,534
	L	Madison	2,764	3,700	3,836	3,935	4,367	4,523
	M	Millinocket	nl	4,528	6,223	7,453	7,567	5,203
	N	Old Town	5,763	6,956	7,688	8,626	8,422	8,130
	O	Rumford	3,770	8,576	10,230	10,005	8,240	6,472
	P	Waterville	9,477	13,351	16,688	18,695	17,779	15,605
	Q	Westbrook	7,283	9,453	11,087	13,820	14,976	16,142
	R	Woodland	1,096	1,120	1,298	1,372	1,369	1,403

Sources:

2000	Bureau of the Census, http://factfinder.census.gov
CT 1900-1980	Connecticut Secretary of the State, http://www.sots.state.ct.us/RegisterManual/SectionVII/Population1900.htm
ME 1900-1980	University of Maine, Fogler Library, http://www.library.umaine.edu/cens
NH 1900-1980	New Hampshire Office of State Planning, http://www.state.nh.us/osp/sdc
MA 1900-1920	Historical Atlas of Massachusetts, 1981. Amherst: Univ. of Massachusetts
MA 1940-1980	Miser Data Center, http://www.umass.edu/miser
VT 1900-1980	Vermont Genealogy Resources, http://freepages.genealogy.rootsweb.co/~vermontgenealogyresources

Backup Table 11
U.S. Changing Pulping Processes, 1914 to 1999
(1000 tons)

	<u>Total</u>	<u>Sulfite</u>	<u>Sulfate</u>	<u>Ground- wood</u>	<u>Semi- Chemical</u>
1914	3,556			1,511	
1929	6,690	2,805	1,358	1,911	97
1955	22,413	4,163	11,952	2,961	2,856
1960 *	35,154	2,579	14,156	3,247	3,294
1983 *	54,808	1,729	40,351	5,529	3,516
1999	57,075	996	48,404 **	3,643	3,643

* Soda omitted.

** est.

Note: TRR p. 437 has data 1869! – not broken down by type until 1914.

Sulfate > Groundwood by 1932! Exceeded Sulfite by 1939 and was half by 1952.

U.S. already a net importer of pulp in 1899 (p. 458).

Sources:

1914-29, TRR, p. 437

1960, Anon. 1961.

1983 – FPLRB-18; McKeever. 1987.

1999 – Pulp and Paper N. American Factbook, p. 134

Backup Table 12
Paper Industry of U.S., and Leading States, 1880

PAPER	ECONOMIC DATA										
	No. Estab.	Capital (\$)	AVG NO. HANDS EMPLOYED			Total Wages Paid During the Year (\$)					
			Males > 16 yrs old	Females > 16 yrs. old	Children & Youth						
Total U.S.	692	46,241,202	16,133	7,640	649	8,525,355					
Connecticut	65	3,168,931	1,173	478	51	656,000					
Maine	12	1,995,000	753	314		325,691					
Massachusetts	96	11,722,046	3,523	3,563	62	2,467,359					
New Hampshire	25	1,197,000	497	202	3	249,612					
New York	168	6,859,565	2,929	751	134	1,217,580					
Vermont	13	785,500	283	92	2	189,889					
Subtotal 6 States	379	25,728,042	9,158	5,400	252	5,106,131					
% of Total U.S.	54.8%	55.6%	56.8%	70.7%	38.8%	59.9%					
	MATERIALS (tons)										
	<u>Rags</u>	<u>Old Paper</u>	<u>Cotton Waste</u>	<u>Manilla Stock</u>	<u>Straw</u>	<u>Corn Stock</u>	<u>Esparto Grass</u>	<u>Value of all Chemicals</u>	<u>Value of all Other Materials</u>	<u>Value of Pulp Purchased</u>	<u>Total Value of All Materials</u>
Total U.S.	187,917	87,840	12,088	84,786	245,838	954	264	3,628,798	7,039,497	1,681,762	33,951,297
Connecticut	15,580	10,810	625	9,698	2,304	150		265,387	446,487	125,950	2,761,316
Maine	10,383	1,960	822	1,712	100			93,554	355,925	109,126	1,347,509
Massachusetts	62,922	14,910	2,686	13,861	5,312	72	23	640,280	1,970,334	316,881	9,213,221
New Hampshire	4,435	3,156	1,387	3,372	2,905			104,252	245,635	15,100	1,131,425
New York	19,083	15,709	1,402	15,400	76,191	200	240	726,483	1,115,926	266,219	5,579,525
Vermont	770	2,562	1,500	4,130	675			65,129	97,302	31,725	556,667
Subtotal 6 States	113,173	49,107	8,422	48,173	87,487	422	263	1,895,085	4,231,609	865,001	20,589,663
% of Total U.S.	60.2%	55.9%	69.7%	56.8%	35.6%	44.2%	99.6%	52.2%	60.1%	51.4%	60.6%

Backup Table 12
Paper Industry of U.S., and Leading States, 1880 (cont.)

PRODUCTS

	Printing Paper (tons)	Writing Paper (tons)	Wrapping Paper (tons)	Binders Board (tons)	Wall Paper (tons)	Colored Paper (pounds)	Bank-Note Paper (pounds)	Tissue Paper (pounds)	All Other Paper (pounds)	Total Value, All Products (dollars)
Total U.S.	149,177	32,937	134,294	20,014	14,737	14,756,268	296,000	8,125,957	178,719,831	55,109,914
Connecticut	8,213	2,218	6,491	2,562	450	2,838,040		1,459,148	10,163,137	4,337,550
Maine	10,619		1,166		100	420,000			1,170,000	2,170,321
Massachusetts	27,638	24,746	10,255	600	945	3,706,010	255,000	878,000	27,607,706	15,188,196
New Hampshire	5,480	450	2,680	200	480	1,180,000		470,000	7,604,000	1,731,170
New York	23,077	2,780	36,295	2,835	8,929	595,381		1,224,137	32,365,518	8,524,279
Vermont	2,620				1,688			1,850,000	6,922,000	1,237,484
Subtotal 6 States	77,647	30,194	56,887	6,197	12,592	8,739,431	255,000	5,881,285	85,832,361	33,189,000
% of Total U.S.	52.1%	91.7%	42.4%	31.0%	85.4%	59.2%	86.1%	72.4%	48.0%	60.2%