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Maine Lumber Production, 1839-1997: A Statistical Overview

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MAINE LUMBER PRODUCTION, 1839-1997
A STATISTICAL OVERVIEW

Complementing the qualitative account of forestry's impact provided by Geoffrey Carpenter, Lloyd Irland gives us a broad statistical overview of the industry, its changing economic fortunes, and its impact on the environment of the north woods. The data, while not always precise, reveal the terms upon which the state's decision-makers historically viewed the forest and its future. Mr. Irland is private forestry consultant in Winthrop, Maine, who has written widely on New England forestry topics, including WILDLANDS AND WOODLOTS: THE STORY OF NEW ENGLAND'S FORESTS (1982).

Lumbering has been an important social force in shaping Maine's landscape, its community life, and its sense of place. Lumber production began in the Province of Maine with a small water-powered mill built in the 1620s in Berwick – often cited as the first sawmill in North America – and the forest has been a foundation for Maine's economy ever since. The industry's history, then, is relevant to understanding the state's changing economic fortunes, as well as its environmental history. For these reasons, a short statistical history of the state's lumber production might be useful. This summary, covering the period 1839 to 1997, relies on a major compilation issued by the U.S. Forest Service in 1948, as updated by recent Census sources.[1] The survey reveals how the state's production has been affected by changing resource supplies, competition, and market trends.

The data shown here are limited, yet they are the basis on which observers at the time saw the state's industry and on which they based conclusions about its future, about the forest's

FIGURE 1

Maine Lumber Production Data, 1839-1992
(thousand board feet)

Year	U.S. Total Softwood	U.S. Total Hardwood	U.S. Total	Maine Softwood	Maine Hardwood	Maine Total	Maine Softwood % of U.S. Softwood	Maine Hardwood % of U.S. Hardwood
1839						224,100		
49						541,300		
59						567,400		
69	9,252,000	3,504,000	12,756,000	617,000	22,000	639,000	6.67%	0.63%
79	13,334,000	4,791,000	18,125,000	544,000	36,000	580,000	4.08%	0.75%
89	20,024,000	7,015,000	27,039,000	588,000	70,000	658,000	2.94%	1.00%
99	26,179,351	8,898,244	35,077,595	728,454	56,193	784,647	2.78%	0.63%
1904	27,345,338	6,781,827	34,127,165	833,158	30,702	863,860	3.05%	0.45%
5	24,914,618	5,588,343	30,502,961	703,879	41,826	745,705	2.83%	0.75%
6	30,235,245	7,315,491	37,550,736	1,015,591	73,156	1,088,747	3.36%	1.00%
7	31,001,225	9,254,929	40,256,154	1,031,188	72,620	1,103,808	3.33%	0.78%
8	25,546,006	7,678,363	33,224,369	836,176	93,174	929,350	3.27%	1.21%
9	33,896,959	10,612,802	44,509,761	993,954	117,611	1,111,565	2.93%	1.11%
10	31,160,856	8,857,426	40,018,282	778,000	82,273	860,273	2.50%	0.93%
11	28,902,388	8,100,819	37,003,207	741,795	86,622	828,417	2.57%	1.07%
12	30,526,416	8,631,998	39,158,414	790,582	91,546	882,128	2.59%	1.06%
13	30,302,549	8,084,460	38,387,009	759,754	74,919	834,673	2.51%	0.93%
14	29,406,839	7,939,184	37,346,023	942,919	49,675	992,594	3.21%	0.63%
15	25,440,685	5,801,049	31,241,734	756,098	49,883	805,981	2.97%	0.86%
16	28,576,292	6,215,093	34,791,385	817,590	49,159	866,749	2.86%	0.79%
17	27,130,008	6,062,903	33,192,911	671,141	33,873	705,014	2.47%	0.56%
18	24,099,554	5,262,466	29,362,020	542,208	28,638	570,846	2.25%	0.54%
19	27,407,130	7,144,946	34,552,076	556,164	39,952	596,116	2.03%	0.56%
20	24,253,918	5,624,442	29,878,360	422,595	27,601	450,196	1.74%	0.49%
21	22,185,504	4,775,360	26,960,864	386,764	34,772	421,536	1.74%	0.73%
22	26,644,334	4,924,554	31,568,888	340,553	21,671	362,224	1.28%	0.44%
23	30,903,981	6,261,524	37,165,505	346,440	29,238	375,678	1.12%	0.47%
24	29,405,685	6,525,301	35,930,986	330,205	39,410	369,615	1.12%	0.60%
25	31,710,478	6,628,163	38,338,641	301,832	28,271	330,103	0.95%	0.43%
26	30,469,344	6,466,586	36,935,930	307,819	33,074	340,893	1.01%	0.51%
27	28,442,522	6,089,898	34,532,420	231,223	32,595	263,818	0.81%	0.54%
28	28,345,095	5,797,028	34,142,123	240,569	25,954	266,523	0.85%	0.45%
29	29,813,345	7,072,687	36,886,032	233,297	24,613	257,910	0.78%	0.35%
30	21,322,786	4,728,687	26,051,473	201,963	20,141	222,104	0.95%	0.43%
31	13,851,951	2,670,692	16,522,643	132,335	19,495	151,830	0.96%	0.73%
32	8,745,636	1,405,596	10,151,232	89,664	12,329	101,993	1.03%	0.88%
33	11,898,873	2,062,261	13,961,134	99,111	5,793	104,904	0.83%	0.28%
34	12,735,358	2,758,281	15,493,639	158,623	19,874	178,497	1.25%	0.72%
35	16,247,981	3,290,750	19,538,731	194,618	22,843	217,461	1.20%	0.69%
36	20,241,731	4,113,153	24,354,884	213,042	19,164	232,206	1.05%	0.47%
37	21,589,123	4,407,734	25,996,857	212,762	23,827	236,589	0.99%	0.54%
38	18,292,823	3,353,448	21,646,271	188,323	29,209	217,532	1.03%	0.87%
39	21,407,699	3,740,685	25,148,384	185,652	28,802	214,454	0.87%	0.77%
40	24,902,933	4,031,194	28,934,127	195,237	34,935	230,172	0.78%	0.87%
41	28,031,551	5,581,492	33,613,043	306,921	34,254	341,175	1.09%	0.61%
42	29,510,184	6,822,064	36,332,248	358,030	37,623	395,653	1.21%	0.55%
43	26,917,342	7,371,415	34,288,757	259,043	29,041	288,084	0.96%	0.39%
44	25,159,695	7,777,854	32,937,549	380,994	21,511	402,505	1.51%	0.28%
45	21,139,872	6,982,472	28,122,344	365,696	7,912	373,608	1.73%	0.11%
46	26,547,861	9,384,689	35,932,550	666,465	24,837	691,302	2.51%	0.26%
47								
48								
49								
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51								
52								

Maine Lumber Production Data, 1839-1992 (cont.)

Year	U.S. Total Softwood	U.S. Total Hardwood	U.S. Total	Maine Softwood	Maine Hardwood	Maine Total	Maine Softwood % of U.S. Softwood	Maine Hardwood % of U.S. Hardwood
53								
54	29,281,611	7,073,901	36,355,512	359,141	35,401	394,542	1.23%	0.50%
55	29,815,000	7,565,000	37,380,000	371,000	44,000	415,000	1.24%	0.58%
56								
57	27,100,000	5,801,000	32,901,000	320,000	31,000	351,000	1.18%	0.53%
58	27,379,000	6,006,000	33,385,000	251,190	34,810	286,000	0.92%	0.58%
59	30,674,000	6,381,000	37,055,000	269,000	35,000	304,000	0.88%	0.55%
60	26,650,000	6,230,000	32,880,000	276,000	27,000	303,000	1.04%	0.43%
61	25,883,000	5,960,000	31.843,000	273,000	24,000	297,000	1.05%	0.40%
62								
63	27,552,000	7,194,000	34,746,000	197,000	74,000	271,000	0.72%	1.03%
64	29,284,000	7,275,000	36,559,000	279,000	29,000	308,000	0.95%	0.40%
65	29,159,000	7,467,000	36,626,000	259,000	33,000	292,000	0.89%	0.44%
66	28,847,000	7,737,000	36,584,000	256,000	49,000	305,000	0.89%	0.63%
67	27,874,000	7,401,000	35,275,000	238,000	40,000	278,000	0.85%	0.54%
68	30,223,000	7,227,000	37,450,000	263,000	48,000	311,000	0.87%	0.66%
69	28,281,000	7,316,000	35,597,000	271,000	46,000	317,000	0.96%	0.63%
70	27,297,000	7,120,000	34,417,000	288,000	45,000	333,000	1.06%	0.63%
71	30,039,000	6,949,000	36,988,000	302,000	37,000	339,000	1.01%	0.53%
72	30,975,000	6,770,000	37,745,000	303,000	40,000	343,000	0.98%	0.59%
73	31,586,000	7,009,000	38,595,000	320,000	42,000	362,000	1.01%	0.60%
74	27,704,000	6,904,000	34,608,000	334,000	37,000	371,000	1.21%	0.54%
75	26,742,000	5,872,000	32,614,000	326,000	39,000	365,000	1.22%	0.66%
76	29,878,000	6,417,000	36,295,000	401,000	41,000	442,000	1.34%	0.64%
77	31,160,000	6,597,000	37,757,000	421,000	39,000	460,000	1.35%	0.59%
78	31,273,000	7,267,000	38,540,000	482,000	40,000	522,000	1.54%	0.55%
79	30,411,000	6,997,000	37,408,000	446,000	40,000	486,000	1.47%	0.57%
80	25,264,000	7,058,000	32,322,000					
81	22,187,000	s	22,187,000					
82	24,949,000	5,061,000	30,010,000	561,000	144,000	705,000	2.25%	2.85%
83	31,415,000	5,456,000	36,871,000	757,000	146,000	903,000	2.41%	2.68%
84	31,185,000	6,216,000	37,401,000	782,000	136,000	918,000	2.51%	2.19%
85	30,282,000	6,032,000	36,314,000	636,000	107,000	743,000	2.10%	1.77%
86	34,202,000	7,400,000	41,602,000	650,000	75,000	725,000	1.90%	1.01%
87	37,422,000	7,471,000	44,893,000	694,000	75,000	769,000	1.85%	1.00%
88	37,003,000	7,727,000	44,730,000	699,000	70,000	769,000	1.89%	0.91%
89	36,040,000	7,536,000	43,576,000	638,000	76,000	714,000	1.77%	1.01%
90	36,602,000	7,340,000	43,942,000	754,000	60,000	814,000	2.06%	0.82%
91	33,250,000	6,781,000	40,031,000	776,000	66,000	842,000	2.35%	0.97%
92	33,783,000	7,049,000	40l,832,000	804,000	68,000	872,000	2.38%	0.96%

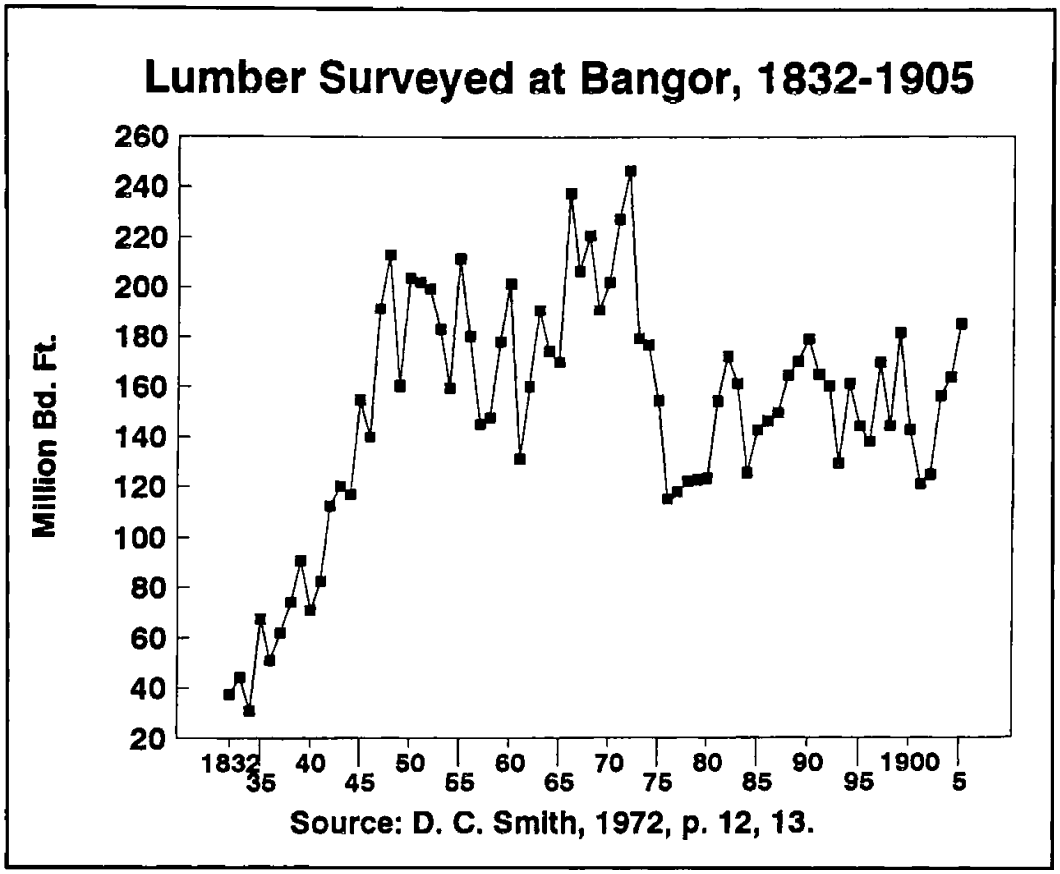
(Production in Thousands)

s = Suppressed

Source: 1869-1946 Steer's tables, 1954 to date, U. S Dept. of Commerce, Bureau of Census.

Lumber has traditionally been measured in thousands of board feet (Mbf). Ten thousand feet of lumber will build a house of respectable size.

FIGURE 2



sustainability, and about local communities. So while we might well hesitate to use these numbers in complex computer models, there are important reasons for studying them.

The Trend in Lumber Production

Maine's production grew irregularly from 1839 to the state's all-time production peak in 1909 (Fig. 1). The strong upswing from 1879 to 1905 and 1909 coincided with dramatic growth in industrial output, world trade, and railroad construction, and with a vast expansion of farms on the Great Plains. The state's peak coincided with the nation's production peak, hinting that strong nationwide demand drove production levels in Maine. The series reflects the sustained decline to the early 1930s, strong lumber demand during the war, and then a steady resurgence as markets for eastern lumber recovered and Maine cutover stands again reached sawlog sizes. Market forces – building trends and competition from western and southern

producers – affected Maine production. Still, the decline after 1909 was probably caused in part by supply, since a massive spruce budworm outbreak from 1912 to 1920 killed millions of cords of spruce and fir statewide.

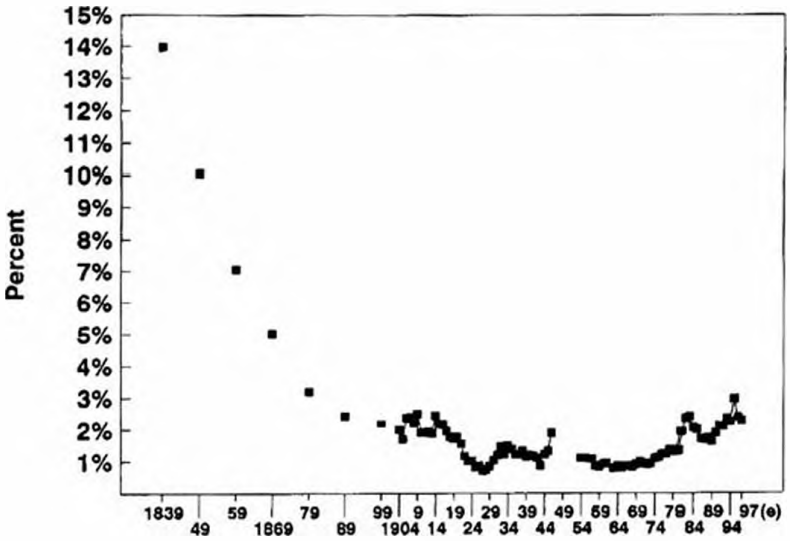
There are certain optical illusions embedded in historical statistics. For example, log-driving records were one of the only ways to track production in the early years. The volume of lumber surveyed at Bangor, for example, peaked in 1872 (Fig. 2) and the statistics end in 1905. Log drives on other rivers show similar trends. These figures, however, give no hint of the state's production recovery after 1879. Lumber milling dwindled at Bangor, not because the resource had disappeared, but because Great Northern Paper Company had purchased much of the upper Penobscot watershed in 1901 and turned the log drives aside at Millinocket to manufacture newsprint. Similar developments at Rumford, Winslow, and elsewhere had the same effect. Downstream lumber processing at traditional mill towns like Bangor, Machias, Topsham, Hallowell, Bucksport, and Saco withered not from the extinction of the forest but from the diversion of logs to competing users.

The opening of the Panama Canal brought immense quantities of West Coast lumber into northeastern markets. The collapse in national housing demand after the mid-1920s, followed by the Great Depression, caused Maine lumber production to plummet to about 10 percent of its 1909 peak by the early 1930s. After the depths of the Depression, lumber production recovered rapidly to a temporary postwar peak, before settling in again to a slow decline until the early 1960s. This reflected the onrush of western production, which grew rapidly in these years. Between the early 1960s and the late 1980s, Maine production more than doubled. This increase was fostered by strong national markets for lumber, by improved technology for sawing small logs, and by a variety of other factors.[2] Maine production also responded strongly to the high lumber prices of the 1990s.

In relative terms, in 1839 Maine was the leading state in lumber production, even though it supplied only a small portion of national lumber markets (Fig. 3). Its share fell by half, as the

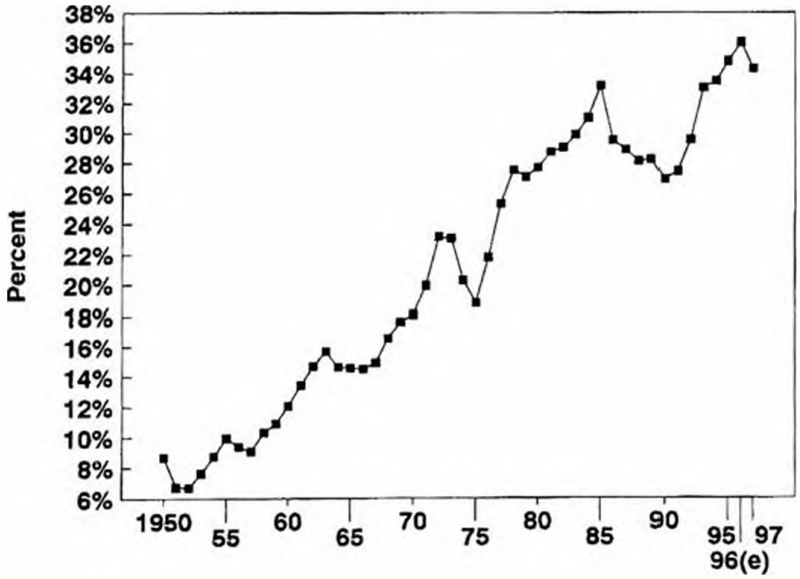
FIGURES 3 and 4

Maine as a Percent of U.S. Lumber Production, 1869-1997(e)



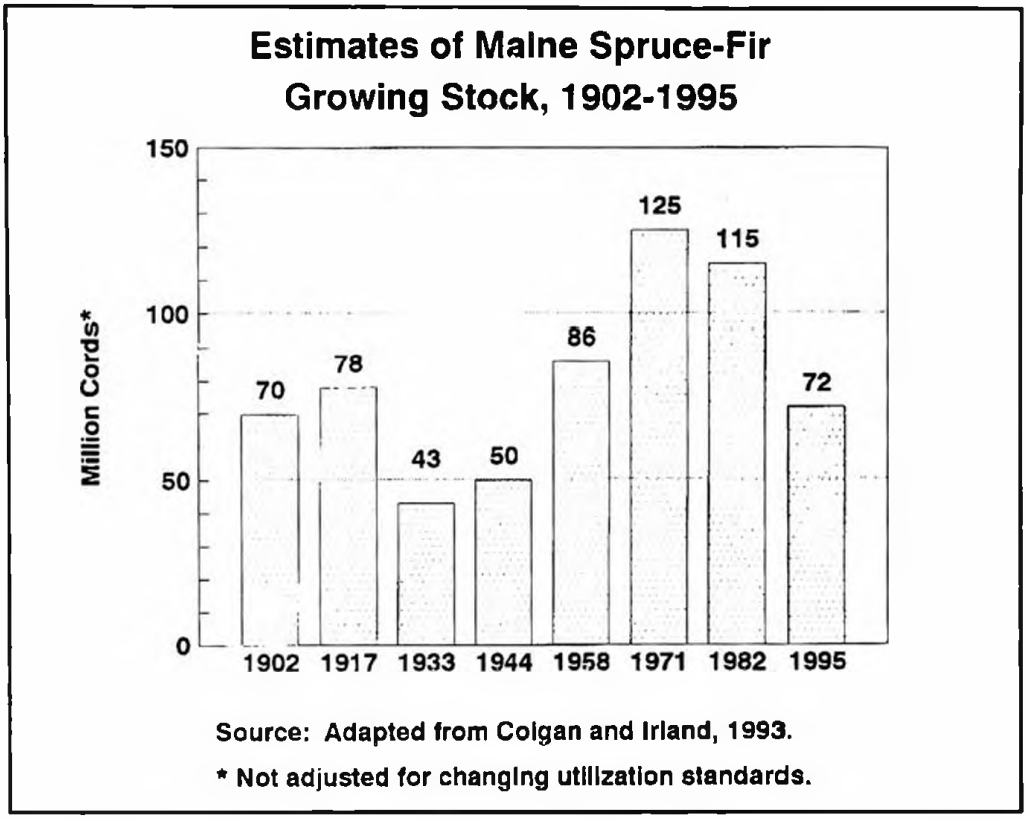
Source: 1839-1946, Steer's tables 1, 4, and 5 ff; "estimated" values where available. 1947 to date, U.S. Dept. of Commerce, as used in various USDA Forest Service sources, and in Current Industrial Reports, MA 24-T (annual).
Maine data for 1980-81, and Maine hardwood 1982-85 are author estimates.

Softwood Lumber: Canadian Shipments to U.S. as % of U.S. Consumption



Sources: USDA-FS PNW Res. Bull. 151; U.S. ITC, 1992; and AF&PA.

FIGURE 5



pineries of Pennsylvania, New York, the Midwest, and the South were opened up. During the 1920s, under the combined pressure of shrinking timber supply and stiff western competition, Maine's national production share fell to about 1 percent, where it remained for half a century. Since the early 1970s, it has restored its share of output to better than 2 percent. But this increased production share applied to a smaller market, since Canadian lumber after 1950 came to play a major role in U.S. consumption (Fig. 4).

Products Replaced by Substitutes

It is difficult to imagine today the extent to which the commerce of the nineteenth century depended on wood. Maine goods were packed in wooden barrels or boxes, moved by wooden schooners to Boston or New York, and loaded onto wooden boxcars to be shipped to final destinations. On arriving, they were unloaded across wooden loading docks into wooden wagons. Perishables would go into a hardwood icebox. David Demeritt has estimated the large volumes of Maine wood going

into just one field of this trade – the export of box shook and barrel staves to Cuba for transporting sugar.[3] But in the years between the Civil War and 1890, jute bags took over the sugar business, virtually ending what had been an important item of commerce for many coastal Maine towns.

In the early twentieth century, a "boxboard boom" swept across many Northeastern states. The boxboards were sawn from knotty second-growth pine that could not have been sold in national markets for clear boards. In 1900 around 100 million feet per year were being sawn from second-growth pine in the southern portion of Maine. By the 1940s the box market was dwindling. The growing production of cardboard cartons, made from second-growth southern pine, provided a new shipping container far more convenient and adaptable than the wooden box.

Another story of displacement involved the softwood plywood industry, which expanded in the 1950s, and the oriented strandboard (OSB) industry of the 1980s. These strong and durable engineered panels offered labor savings to builders in sheathing walls and decking roofs, among other things. Their development, however, eliminated markets for billions of feet of boards that had been sawn in the East. Except for one short-lived plywood mill, this was a product entirely imported from the West and the South until three waferboard plants were built in Maine in the early 1980s.

In each of these cases, a Maine product, fashioned from a local resource, was displaced by an outside manufacturer. The reasons for this were various. The result was, however, that even in this forest-rich, lumber-exporting state, Mainers used wood products from other places to meet their needs. The demand on the Maine forest was thereby reduced.

How Well Has Maine Sustained Lumber Output?

Trends in lumber production in Maine raise the question of sustainability, an ever-more important criterion in thinking about economic development. There are many ways to evaluate sustainability, but one simple view can be offered here. First,

because of the changes in product demand and western competition and the shrinkage of Maine agriculture, Maine today still has 94 percent of the forest acreage it had 300 years ago.[4]

While the first-growth forest was mostly exhausted by the time production peaked in 1909, the shrinking forest base did not bring about subsequent decline by itself. According to admittedly rough estimates, the spruce-fir growing stock, source of much of the softwood lumber production, fell by perhaps 40 percent from 1902 to 1933 (Fig. 5). More seriously, Maine suffered a dramatic reduction in average tree size. Yet even this collapse would not have caused lumber output to fall by 90 percent, had there not been low-cost alternative supplies in the South and West. Later, timber volume increased again until the 1970-1985 budworm outbreak, heavy cutting, and maturity of the fir component of the forest all caused the growing stock to decline yet again. Except for this latest downturn, spruce-fir is not a bad proxy for the entire forest.

Since 1902 Maine's production of spruce lumber has only briefly exceeded the level that foresters Edgar Ring and Ralph Hosmer believed sustainable under the forest acreages, growing conditions, and merchantability standards of the time. Yet the data in Fig. 6 should be taken only as a gross indication of trends, since utilization standards and tree sizes changed so much over the period. The effects of the 1912-1920 budworm outbreak are evident in the 1917 and 1933 columns, and the large volumes of "ingrowth" that occurred after 1960, as young trees reached sizes large enough to be counted in the inventory, boost the 1992 figure. While the pattern is plausible, it would be difficult to prove conclusively that growing-stock volume in 1982 was larger than in 1902.

We can also view sustainability in comparative terms. How has Maine sustained its production of lumber in comparison with other places? To answer this question, we can compare production with some other northern states that produced similar species of timber (Table 1). This comparison ignores shifts from forest to farmland and a whole host of contextual variables, but it shows that softwood lumber production has

Table 1
Peak and Current Softwood Lumber Production

	Peak Year	Softwood Peak Output	Softwood Output 1987*	Ratio %
Maine	1909	993	694	70%
New York	1869	1,099	53	5
Pennsylvania	1889	1,885	13	1
Michigan	1889	4,203	119	3
Wisconsin	1899	2,847	53	2
Minnesota	1899	2,279	63	3

* 1987 was also a cyclical peak.

Sources: Steer, 1948; U.S. Dept. of Commerce, 1988.

been sustained impressively well in Maine since the state's 1980 production peak. This is despite the fact that Maine exceeds all other northern states except Wisconsin in paper output and all of them in wood energy utilization. On the other hand, the initial volumes in the other states were extremely large and were harvested in a much shorter period than in Maine. Very likely, the surge of output from these other states between 1870 and 1900 helped render Maine's output marginal in the booming midwestern markets.

How Accurate are the Production Estimates?

This article relies on data prepared by Henry B. Steer, a U.S. Forest Service statistician who devoted much of his career to compiling production figures. Over the course of many years, Steer adjusted the data to allow for underreporting or other imperfections.

Weaknesses in the production data are significant, since they are derived from varying sources from period to period. In the years 1839-1859, Steer's estimates of dollar values were

converted to board feet using the unit values reported for national averages for softwood and hardwood. For this period, U.S. economic statistics are notoriously inaccurate. In addition to incentives for misreporting due to customs and tax regulations, there was such a complex maze of products similar to lumber (such as staves, heading, planks, deals, timbers, clapboarding, box shook, and laths) that obtaining consistent enumeration of products was nearly impossible. In addition, a good deal of lumber and millwork during that period was actually prepared, not in sawmills, but at the work site by house carpenters from planks and timbers. After the Civil War, there were periods during which logs cut in Maine on the St. John and Allagash rivers were milled in New Brunswick, but the lumber was readmitted duty-free. Even today, estimating the total production of lumber from Maine forests is hindered by the number of small mills and by underreporting of log exports. Also, no Maine lumber production estimates for the years 1947-1953 have been found.

For comparisons over time, we need to account for product specifications, grades, quality, and packaging, especially if unit values are being considered. For instance, the clear white pine boards of the 1830s could be sawn three feet in width and twenty feet or longer. After the Civil War, standardized grades and sizes emerged. This lumber, often rough and green or air-dried, was loaded onto schooners or boxcars a piece at a time and unloaded similarly. By the 1980s, much of the pine was sawn from sixteen-foot logs, and the lumber was often planed and kiln-dried. The wood was shipped in banded units covered with rainproof wrapping. The perfectly clear grades amounted to only 10 to 15 percent of the total yield. The definition of a board foot can also lead to ambiguities. A green, unplaned pine board of 1880 was sawn to a full inch and contained more lumber than does a 1998 one-inch nominal pine board, which after planing and drying measures 3/4 inches in thickness. Yet this board is considered to contain the same board footage as the 1880 version. Further, if the board is ripped at an angle to form a pair of clapboards, its board footage then doubles.

A considerable volume of lumber is sawn at mills and then converted to other products, such as pallets, furniture parts, or flooring. This material does not leave the processor's plant as lumber, so it is not included in census counts. Yet from the point of view of the industrial impact on the forest, this lumber, as the intermediate product, needs to be accounted for. Recently, Forest Service experts estimated hardwood lumber production for eastern states, finding a significant undercount in the census statistics.[5] No doubt a similar undercount occurs in softwoods.

It is rare to find alternative sources of lumber production data as a basis for evaluating the accuracy of census information. And indeed, we cannot be certain that these alternative enumerations are complete. Several comparisons for Maine, however, come readily to hand. First, in Charles Sprague Sargent's 1884 Census review of U.S. forests, he cited an estimate of spruce and pine lumber production prepared by State Land Agent Cyrus Packard.[6] Packard's figures were below the census count, but he omitted certain species:

	Million Board Feet (1884)
Packard (spruce and pine only)	439.8
U.S. Census (all species)	544.0

Also, David C. Smith cites estimates for 1893 and for the decadal average of the 1890s that are higher than the census would suggest.[7] The 1905 report of the Commissioner of Labor and Industrial Statistics offers additional figures that do not tally with Steer's census figures.[8]

	Million Board Feet (1905)		
Commissioner	31.0 (hardwood)	832.8 (softwood)	863.8 (total)
Steer	41.7 (hardwood)	745.7 (softwood)	787.4 (total)

In this instance, the state's report found less hardwood lumber production and far more softwood than did the U.S. census. There is no basis, however, for assuming that this single compari-

Maine Lumber Production Estimates
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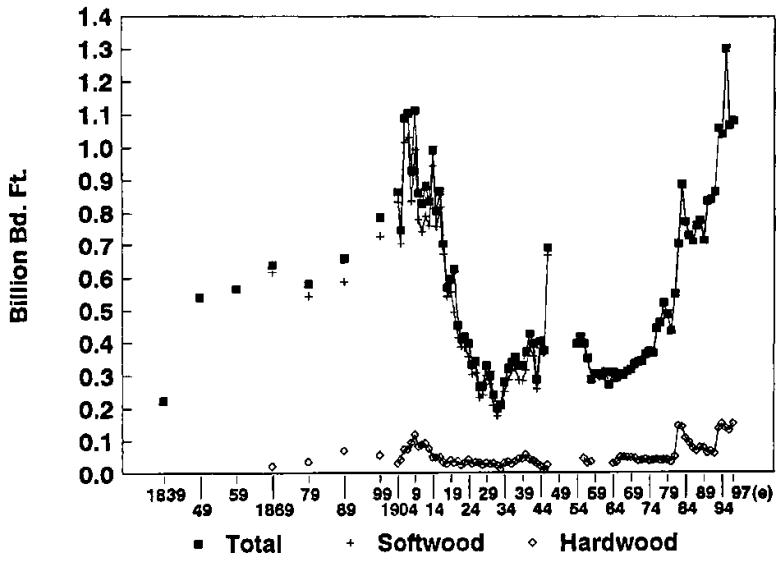

Source: 1839-1946, Steer's tables 1, 4, and 5 ff; "estimated" values where available. 1947 to date, U.S. Dept. of Commerce, as used in various USDA Forest Service sources, and in Current Industrial Reports, MA 24-T (annual).
Maine data for 1980-81, and Maine hardwood 1982-85 are author estimates.

son can provide an adjustment factor for census data from other years.

More recently, the Maine Forest Service conducted surveys of log consumption in Maine and in some years converted the data to represent mill production. In the late 1980s, the Service made an intensive effort to improve the detail and coverage of these statistics.[9] This led to the following comparisons for 1991:

	Million Board Feet (1991)
Maine Forest Service processed sawlogs	953.3
Census Maine lumber production	847.0

These estimates differ in the likely direction, that is, of an undercount in the Census figures.[10]

Considering the gaps in the official series, and the occasional nature of the alternative estimates, there is little hope of developing a realistically adjusted series. The data presented in

this paper need to be used with these limitations in mind, but they do appear to be suitable for broad descriptive purposes.

Conclusions

Steer's figures offer the longest time series on Maine lumber production available. Balanced against alternative estimates appearing at various times, this series appears to reflect at least some meaningful trends in industry conditions, even though it is not a precise estimate for any given year. Viewed as a useful proxy, these lumber production figures reflect, at different periods, the state's changing competitive position, along with national demand fluctuations and the depletion and resurgence of forest area and volume. Compared to competing northern states, Maine experienced a far longer period of exhaustion of the original forest, a greater recovery of the forest area, and a more complete rebound relative to the all-time production peak.

NOTES

[1]Henry B. Steer, *Lumber Production in the United States, 1799-1946* (USDA Forest Service Miscellaneous Publication 669, October 1948). For a brief national summary, 1630-1930, see R.V. Reynolds, "How Much Timber Has America Cut?" *Journal of Forestry* 33 (no. 1, 1935): 34-41.

[2]Charles S. Colgan and Lloyd C. Irland, "The Sustainability Dilemma: Observations from Maine History," in Richard E. Barringer, ed., *Toward a Sustainable Maine* (Portland: E.S. Muskie Institute of Public Affairs, University of Southern Maine, 1993), pp. 53-116.

[3]David Demeritt, "Boards, Barrels, and Boxshooks: The Economics of Downeast Lumber in Nineteenth-Century Cuba," *Forest and Conservation History* 35 (July 1991): 108-120.

[4]Lloyd C. Irland, *Maine's Forest Area, 1600-1995: Review of Available Estimates* (Orono: Maine Agricultural Experiemnt Station miscellaneous publication 736, 1998).

[5]William G. Luppold and Gilbert P. Dempsey, "New Estimates of Central and Eastern U.S. Hardwood Lumber Production," *Northern Journal of Applied Forestry* 6 (no. 3, 1989): 120-122.

[6]Charles Sprague Sargent. *The Forests of the United States*, in U.S. Census Office, *Tenth Census of the U.S. (1884).*

[7]David C. Smith. *History of Lumbering in Maine, 1861-1960* (Orono: University of Maine Studies, 1972), p. 40.

[8]Commissioner of Labor and Industrial Statistics, *Twentieth Annual Report (1906)* (Augusta: Kennebec Journal Print, 1907), pp. 112-113.

[9]Maine Forest Service, "Worksheets for 1991 Woodflow in Maine," Department of Conservation unpublished worksheets, Augusta, Maine, 1992.

[10]U.S. Bureau of Census, *Lumber Production and Mill Stocks*, MA24T (Washington, D.C.: Government Printing Office, annual).