



Maine's Forest Area, 1600-1995: Review of Available Estimates

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Notes on the Photos

Photos used in this bulletin are from the George W. French collection of the Maine State Archives. In 1936 French (1882–1970) was appointed a photographer for the Maine Development Commission. He developed an extensive archive of scenes from around the state during the late 1930s and the 1940s. Our thanks to the State Archives for the use of these photos.

Cover: From many hilltops in Maine, extensive vistas could be seen in the 1940s. By 1995, many of these hilltops were obscured by regrowing forest. Rangeley, 1946. Photo courtesy of the Maine State Archives.

INTRODUCTION

In any brief period, the acreage of forest in Maine changes extremely slowly. Yet over the time since settlement, its forest area has changed a great deal indeed. A summary of estimates of the state's forest area in the past may be of interest to naturalists and historians. This publication provides a brief summary of such estimates for years between 1600 and 1995, with cautions as to their limitations. Also it provides the numbers themselves for reader convenience; several other sources provide charts only (e.g., Harper 1918; Foster 1995:269, which omits Maine).

HOW MUCH LAND IS THERE IN MAINE?

Taking the various sources at face value, the land area of Maine has changed over time. While sea level rise, flooding by reservoirs or beaver dams, landfilling in coastal cities, and perhaps other forces do indeed change the area of land, such changes likely have a minor effect in Maine. When working with historical sources, the limited extent of surveying, changes in estimates, and improving accuracy of maps must be taken into account. When Moses Greenleaf (1829: 10) ventured an estimate of Maine's land area (Table 1), the state's final boundaries were not yet determined, and much of the wildlands had not been surveyed. In recent years, Census Bureau estimates of land area have been used. From time to time, the Bureau's definition changes based on the minimum size of water body consid-

ered to be "water" or some other factor. By the data in Table 1, Maine "lost" 53,000 acres of land from 1959 to 1995. Between the 1932 census (lowest) and the 1959 USFS report (highest), is a difference in land area of 700,000 acres. This is equivalent to 30 townships, more than three times the area of Baxter State Park. For this reason, in showing percentages of Maine in forest, the 1995 estimate was used for all years to provide a standard base for comparison. The percentages shown below, then, will differ slightly from those shown in the contemporary sources.

AREA OF LAND IN FARMS

A common method of estimating forest area has been simply to take an estimate of total land area and delete the area cleared for farming, and also delete some estimate of urbanized and developed lands (Harper 1918). Since farming has been the land use contributing most to change in Maine's forest area, it is worth some consideration here. The statistical measure "Land in Farms" is the most inclusive measure of farm property and includes woodland (Figure 1). Estimates of pasture, hayland, and cropland are also available in the agricultural censuses.

Since the 1880s, considerable acreage of pasture and cropland have "gone back" to woodland in Maine. The later estimates of forest acreage often lag behind the facts. Writers may lack accurate data, or they may not consider poorly stocked abandoned pastures or regenerating stands of poletimber to be forest.

Table 1. Estimates of all land and water area in Maine, 1824–1995.

	All Land	All Land & Water	Source
1829	n/s	21,263.0	Greenleaf, p. 10
1872	19,866.0	22,400.0	Whitman, 1873
1930*	19,132.0	21,145.0	Wilkins, 1932
1941	19,462.0	20,388.3	Coolidge: see disc. p. 760–763
1944	19,700.0	20,800.0	Sewall, 1944
1959	19,866.0	n/s	USFS Reports
1971	19,797.1	n/s	USFS Reports
1982	19,836.8	n/s	USFS Reports
1992	19,517.4	21,289.6	USDA-SCS-NRI, 1994
1995	19,753.3	n/s	USFS Reports

n/s = not shown.



Photo A. As tractors and pickups replaced horses on the farm and in town, large areas of pasture and hayland reverted to forest. Photo courtesy of Maine State Archives.



Photo B. Potato acreage in Maine declined by more than 150,000 acres after its late 1940s peak; much of this area reverted to forest. Presque Isle. Photo courtesy of Maine State Archives.

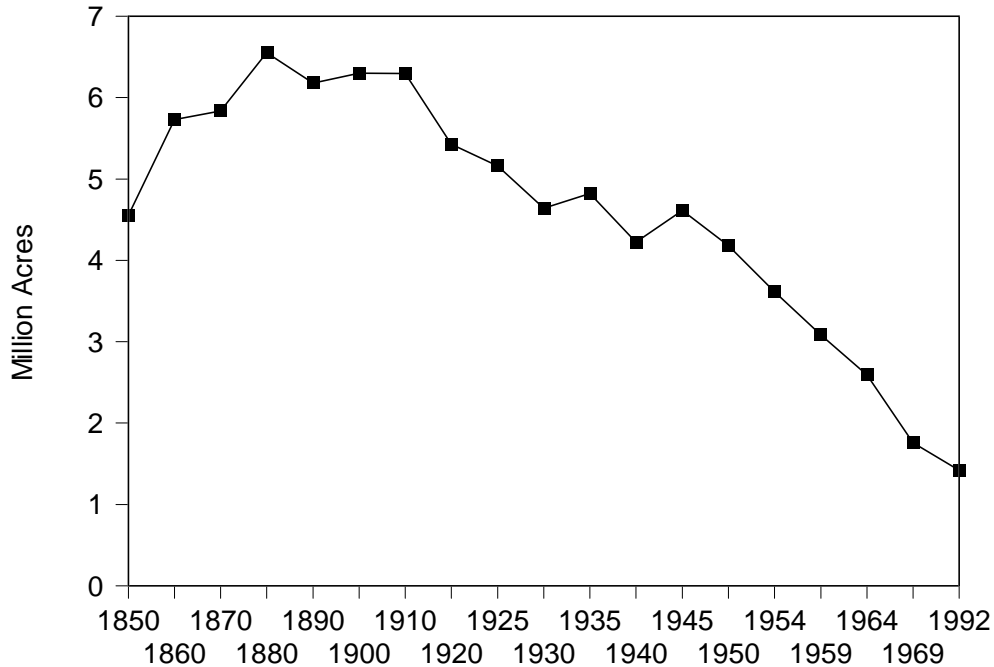


Figure 1. Maine land in farms, 1850 to 1995. Source: U.S. DOC, *Historical Stats of the U.S.*, and USDA *Agricultural Statistics*.

EARLY ESTIMATES OF FOREST AREA

One estimate of Maine's original forest area was made in 1909 by R.S. Kellogg, a USDA Forest Service analyst. His estimate of 18.2 million acres is used here, though a more detailed inquiry into expert views on this point would be of interest. Other sources have ventured larger numbers (see Wilkins 1932:20; Coolidge 1963:762). For 1760, Wood (1961) estimates cleared land at only about 10,000 to 12,000 acres, implying essentially no change in forest area. In 1820, Greenleaf (1829:203) estimated that there were 653,000 acres of improved land in Maine, rising to 753,000 acres by 1829. (Table 2, Figure 2).

By 1840, Wood (1961) estimated that land clearing was still nominal, about 1 million acres plus burns and rough pasture. This implies that forest still covered 17.2 million acres, or 87% of the state. By 1850, according to Census Surveys, 2 million acres had been cleared (Williams 1992:119).

A survey of the state's potential hydropower resources in 1869 produced an estimate of forest area of 13.44 million acres for that year, which seems to have been used for years. It was cited in a publication by Matthews (1900). In his survey of U.S. forests, Sargent (1884) did not venture numerical estimates, but he provided estimates of the

Table 2. Estimates of Maine forest land, 1600–1995, with sources.

Year	Acreage	% of All Land	Citation
1600	18,200.0	92.1%	Kellogg 1909:7
1760	18,190.0	91.6%	Wood 1961:32
1820	17,550.0	88.8%	Greenleaf 1829:203
1840	17,200.0	87.1%	Wood 1961:50
1869	13,440.0	68.0%	Matthews 1900:50
1872	10,505.7	53.2%	Whitman 1873:xxvii
1900	15,168.0	76.8%	Gannett 1902:833
1902	13,440.0	68.0%	Ring 1902:6
1909	14,900.0	75.4%	Kellogg 1909:7
1917	15,000.0	75.9%	Colby 1917:xxvii
1925	16,079.6	81.4%	Benson 1985, Table 1
1930	14,988.3	75.9%	Wilkins 1932:21
1932*	14,490.0	73.4%	USDA-FS 1933:827
1933	17,000.0	86.1%	Sewall Co. 1933:3
1941	16,269.5	82.4%	Coolidge 1963:761
1944	16,200.0	82.0%	Sewall Co. 1946
1953	17,088.0	86.5%	USDA-FS 1958:503.
1959**	17,425.0	88.2%	Ferguson & Longwood 1960:55
1971	17,748.6	89.9%	Ferguson & Kingsley 1972:47
1982	17,607.4	89.1%	Powell & Dickson 1984:9
1992	17,556.5	88.9%	SCS 1994:12
1995	17,689.1	89.6%	Griffith & Alerich 1996:10

Percentage is based on 1995 land area estimate of 19,253,300 acres and not on original source

* CFL.

** For 1959 to date, data are for all forest and not timberland.



Figure 2. Estimates of Maine forest land, 1600 to 1995. Note: For 1959 to date, data are for all forest land. Degree of precision varies.

percentage of forested land by county (see Table 4) that imply an estimate for the total. According to Sargent's numbers, Maine had 13.3 million acres of forest in 1880 (this estimate is not included in Table 2, since it is this author's inference from Sargent's estimates).

ESTIMATES 1900–1944

The Conservation Movement of the turn of the century produced a great increase in interest in forests and other natural resources, and led to the establishment of public forestry agencies and schools concerned with their management and protection. Reports by the Forest Commissioners and other agencies deal extensively with forest resource estimates and issues. No effort has been made to find every mention of this topic. The major reason is simply that the writers were often using old information. The citation of a 1869 estimate in a 1900 report has already been mentioned. In 1902 the Forest Commissioner used an estimate of forest area identical to the 1869 source.

The 1900 estimate by Henry Gannett would have been considered authoritative at the time in view of Gannett's stature as an expert on the nation's forest resources. Gannett criticized estimates by Sargent and others as being too low. Yet

later estimates by Maine analysts are lower than his figure. It could be that in writing his 1902 report, Ring was unaware of the Gannett estimate. Defebaugh (1909:19) finds 12 million acres in "forest growth" in Maine early in the century, but does not mention the Gannett estimate.

Certain estimates specifically mention acreage recently burned and deduct them from the area considered to be forested. For example, Sewall's 1933 estimate reckoned 12.6 million acres to be in forest, but noted an addition area of burned and immature second growth of 4 million acres, plus 400,000 acres of unproductive forest. In 1944, Sewall also identified 400,000 acres of recent burn. In 1959 and more recently, such areas are counted as forest, but considered "nonstocked."

The estimates all reflect a rising trend in forest land, which is consistent with the information on the retreat of agriculture. But because of the general nature of the estimates, inexplicit methods and sources, and likely differences in definitions, these estimates cannot be used to make strong statements about area change from one year to another. All estimates for this period are contemporaneous, except for the estimate by Benson (1985), which is notably higher than others of the period. Large differences between the estimates for 1930, 1932, and 1933 are notable.

Table 3. Total forest and timberland, 1959–1995.

Year	Timberland	All Forest	Timberland %
1953	16,601.0	17,080.0	97.2%
1959	17,169.0	17,425.0	98.5%
1971	16,894.3	17,748.6	95.2%
1982	17,060.2	17,607.4	96.9%
1995	16,937.7	17,689.1	95.8%

Sources: USDA-FS (1958:503); Ferguson and Longwood (1960:55); Ferguson and Kingsley (1972:47); Powell and Dickson (1984:9); and Griffith and Alerich (1996: table 1).

ESTIMATES BASED ON FIELD SURVEYS, 1953–1995

For its National Timber Resources Review, issued in 1958, the USDA Forest Service had not completed fieldwork for Maine. Instead it prepared estimates for 1953 from a light field survey (Table 3).

The first full Forest Survey of Maine by the USDA Forest Service was published in 1960, providing data for 1959. These surveys are based on aerial photographs, intensively measured ground plots, and statistical procedures. Methods and assumptions employed are documented in detail in the official publications, field manuals, and other administrative documents (Ferguson and Longwood 1960; Ferguson and Kingsley 1972; Powell and Dickson 1984; Griffith and Alerich 1996).

The Forest Service reports show measures of statistical accuracy. For example, in Maine from 1982 to 1995, total forest area declined, but the amount was not statistically significant. Timberland area, however, fell by 1.5%, which was statistically significant (a 95% CI on the 1995 estimate was 0.8%, or +/- 135,000 A. [Griffith and Alerich 1996:2]). Changes between successive surveys will be most accurate, but definitional differences over time reduce the precision of longer term comparisons. Because of their smaller size, counties display higher sampling errors than the state as a whole, limiting our ability to detect small changes over time for counties.

For years 1953 and later, it is possible to distinguish between total forest area and the area considered to be “commercial forest” or “timberland,” that is, capable of growing 20 cubic feet per acre per year of wood and not formally withdrawn from timber harvesting. Areas by counties and ownership are available on a consistent basis.

From 1959 to 1995, Maine’s estimated forest area rose by somewhat more than a quarter of a million acres (Table 3). Reservations of lands to nontimber uses, and recognition of increased

amounts of nonproductive forestland, reduced the proportion of forest considered timberland from 98.5% in 1959 to 95.8% in 1995.

FOREST ACREAGE BY COUNTY

Rough estimates made by Sargent (1884) as to the percentage of Maine counties forested show that York, Waldo, and Kennebec were the most fully deforested by that time (Table 4). By 1995, Androscoggin, Kennebec, and Knox were the least forested counties. By these estimates, Waldo, York, and Kennebec counties showed the greatest relative increase in forest cover over the period (Figure 3). Case studies of local changes in forest cover in Maine are few. They include a study of Arrowsic Island (Moore and Witham 1996) and of the Bangor area (Eves 1992).



Photo C. Despite a massive increase in pulp and paper production after 1900, Maine forest acreage increased. Madawaska, 1941. Photo courtesy of Maine State Archives.

Table 4. Maine forest acres by county, 1880 and 1995.

County	----- 1880 -----		----- 1995 -----		
	Percent Forest	Forested Acres	Forested Acres	All Land	Percent Forest
Androscoggin	50%	105.0	210.0	301.0	69.8%
Aroostook	90%	3,485.4	3,872.7	4,270.0	90.7%
Cumberland	50%	188.0	375.9	534.8	70.3%
Franklin	75%	773.0	1,030.7	1,086.7	94.8%
Hancock	82%	749.1	913.5	1,017.0	89.8%
Kennebec	40%	163.4	408.5	555.2	73.6%
Knox	50%	87.3	174.5	234.0	74.6%
Lincoln	50%	111.9	223.8	291.6	76.7%
Oxford	60%	728.8	1,214.6	1,330.0	91.3%
Penobscot	90%	1,733.0	1,925.6	2,173.5	88.6%
Piscataquis	85%	2,094.6	2,464.2	2,538.6	97.1%
Sagadahoc	50%	61.7	123.4	162.6	75.9%
Somerset	60%	1,433.3	2,388.9	2,513.2	95.1%
Waldo	35%	132.9	379.8	467.1	81.3%
Washington	85%	1,262.7	1,485.5	1,643.9	90.4%
York	40%	199.0	497.4	634.2	78.4%
Total		13,309.0	17,689.1	19,753.3	89.6%

* Percents for 1880 from Sargent:495-496. Averages of ranges used at times.
 Acres for 1995 from Griffith and Alerich:110; data are all forest, not "timberland."
 Total land areas from same page.

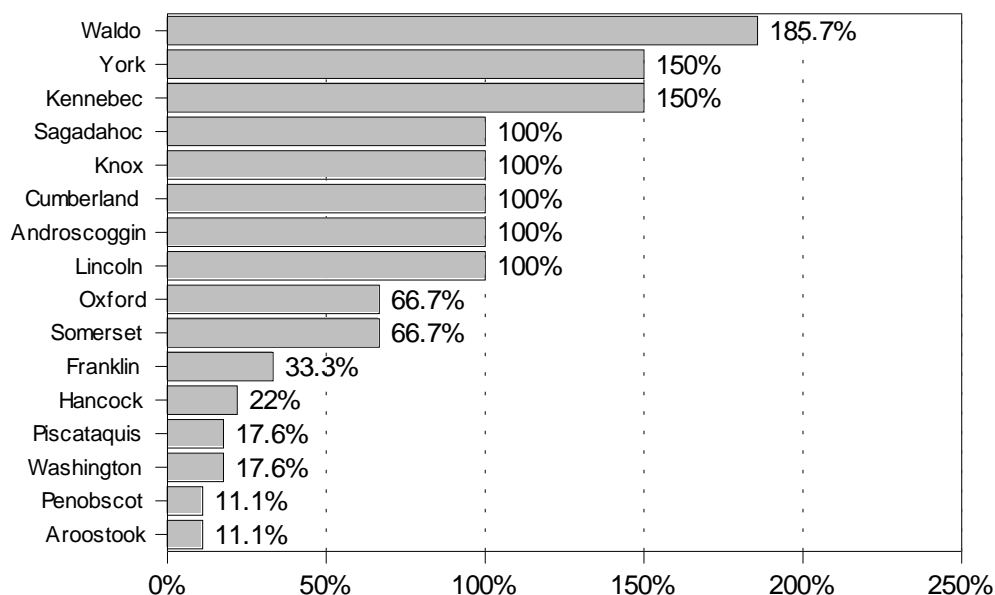


Figure 3. Percentage change in forest area by county, 1880–1995. Source: Table 4.

SOURCES TO USE WITH CARE

Occasionally the USDA Forest Service prepares nationwide estimates of forest area, timber volumes, and related statistics (e.g., Powell et al. [1993], which provides a full listing at p. 20ff). In these publications, computer models are used to bring estimates from various state field surveys to a common year so that they can be summed to provide national totals. The updates on forest land area are based on a variety of estimates that are subject to errors. Estimates by state are provided. For general purposes, these publications provide a convenient source for showing trends over time and comparisons between states and regions. At times, however, updates are developed from relatively old state surveys. These can turn out to be misleading when updates are compared with later full-fledged resurveys.

The Natural Resources Conservation Service (formerly Soil Conservation Service) has issued a periodic appraisal of the nation's farmland and related sources since 1982. For some purposes, this is a helpful source, especially as it provides state-by-state detail. Its numbers should not be compared with USFS results without determining if methods, definitions, or time differences exist.

Estimates of forest area may be reported in a variety of other publications and documents. At times these do not describe the estimate or its source with any precision. Such sources should naturally be used with care.

When seeking area data for portions of the forest, such as "reserved" lands or ownership categories such as farmers, forest industry, or Indian tribes, a variety of problems are encountered. For farmlands, forest land owned by farmers is tallied in the successive Censuses of Agriculture. The estimates often differ from those found in the Forest Surveys, due to different definitions. I am not aware of any general reconciliation between these sources, other than that in recent years, USDA agencies have made an effort to harmonize their data.

For industry lands, different sources may use different definitions and sources. For example, the USDA Forest Service Surveys include only lands owned by companies with mills. When such a company sells its lands to a firm without mills, even if the land remains in commercial timber production, "industrial" ownership declines.

For tribal lands, Forest Service sources use standard definitions nationwide because of the agency's mission to produce national summaries. Yet the definition used does not precisely fit the

specific tribal ownership conditions found in Maine. To obtain information on tribal ownership, other sources must be consulted.

For readers interested in land uses, a series of publications by the ERS (e.g., USDA-SCS 1994) of the USDA has shown estimates of land uses, including forest. Various river basin studies also show land use information.

ERRORS AND ABSENCES

For 1872, an estimate of land uses for Maine was published in the 1873 *Bulletin of Industrial and Labor Statistics*, the first issue of that important statistical source. Methods used are not described in any detail (Whitman 1873). This offers the very lowest estimate of remaining forest in Maine—only 10.5 million acres. It is problematic because it is far lower than the estimate for 1869 and than Gannett's 1900 estimate. Yet 1872 was well before the maximum extent of farmland area and farm clearing in Maine. In 1870 only 5.8 million acres were in farms, and not all of this was cleared. It could be that Whitman did not intend to include young and regenerating forest in his estimate. Considering the limited description of sources and methods, this estimate should be considered questionable unless it can be validated in some manner. This estimate was not cited by later workers, who used the earlier 1869 estimate instead. It is not used in Figure 2.

Occasional errors can crop up in reporting forest land area. They may not always be as obvious as the one in a Maine Forest Commissioner's report of 1912, which asserted that Maine's original forest covered only 12% of the state (Nellis 1912:85).

Sometimes knowing where not to look can be a time-saver. Estimates of Maine's forest area will not be found in Sargent's 1884 Census volume on U.S. forests, though Sargent does venture estimates of the proportion of each county that was forested in 1880, as noted above. Hough (1882), USFS (1920) or the USFS "Reappraisal" of 1946 also provide no state-level data.

CONCLUSIONS

Until 1953, we can place only a limited degree of confidence in estimates of forest area for individual years. It is necessary to be guarded about claims that the forest area changed by a specific amount based on comparisons of previous estimates. Yet viewing the longer trend, we can say a few things from this collection of estimates about Maine's forest.

- Maine was virtually entirely forested in 1600, though the composition and structure of that forest was very different from what we now see.
- Maine probably lost roughly 5 million acres of its year 1600 forest area by the 1870–1900 period.
- Due to land use changes since then, a large portion of this loss has been regained, so that the state's forest cover has risen from about 70% in 1900 to 90% today. This means that roughly 22% of Maine's present forest is secondary forest on lands at one time farmed or pastured.
- Without checking for consistency of definitions and sources, readers should not assume that a change in forest area between two time periods is real if the estimates come from different sources.

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