

OLD FIELD FORESTS OF SOUTHEASTERN NEW ENGLAND

HUGH M. RAUP

With one text-figure

Most of the original forests of Rhode Island, and of Massachusetts and Connecticut east of the Berkshires were removed prior to the middle of the 19th century. The process of removal was a progressive one, beginning with the early settlements in Massachusetts Bay and the Connecticut Valley. The upland of central and northern Massachusetts and the less desirable portions of upland Connecticut were probably the last to be cleared. The removal of the original forests of this district has since become well nigh complete, as Bromley ('35) has recently shown.

The relative areas of old field timber and that which has arisen as a result of the removal of original stands without complete eradication differ in various parts of the country, but during the middle 1800's the amount which was actually clear was far greater than that in woodland. The town of Petersham, though not as old as many other communities in southern New England, has been estimated to have had 60 to 70% of its land surface under cultivation or in pasture during this period. Recent studies of land use in the town of Petersham show these to be conservative figures. Consequently the importance of old field timber in our region is clear, if for no other reason than sheer volume.

The development of forests in old fields has been investigated with greatest intensity by students of the Harvard Forest School in Petersham and neighboring towns, and by those of Yale University in Connecticut. A number of papers have been published in recent years describing the situation in these two sections of southern New England, and since they show some notable contrasts, the general results will be briefly summarized here. (See Fisher, '18, '25, '33; Spaeth, '20; Griffith, Hartwell & Shaw, '30).

On the better upland soils of central Massachusetts the old fields, when abandoned, became seeded into nearly pure stands of white pine. This process went on progressively during the latter half of the last century, but the general decline in New England agriculture about the middle of the 1800's brought a concentration of abandonment during that period. As a result, vast areas of white pine forests reached commercial maturity

in the late 1800's and the first ten or fifteen years of the twentieth century. The prevalence of this type was so great that students of American forests during the latter half of the century regarded most of eastern Massachusetts and parts of northeastern Connecticut and Rhode Island as a "white pine region." That is, white pine was regarded as a widespread native type.

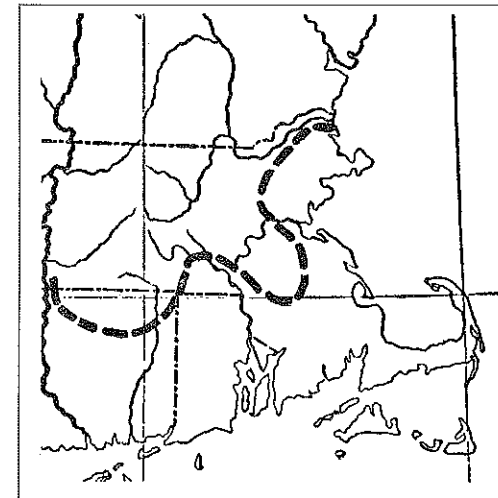
At the time these forests reached maturity they became a major source of wealth in New England, and were largely removed. Contrary to expectation, however, they generally did not reproduce themselves except on light sandy or gravelly soils. A common sight in remnants of these old field pine stands is a growth of young native hardwoods which seed in under the pines. They do not appear until the pine forest has reached the age of about 40 or 50 years. Presumably, if such stands were left to themselves, the hardwoods would eventually crowd out the pines. Cases where this has happened are rare, however, because the pine has been removed for lumber before the final stages have been reached.

The young hardwoods which appear in this manner in central New England are chiefly red oak, hard maple, red maple, white ash and black birch. There are a few white oaks, beeches, lindens, ironwoods, greater or less numbers of gray birch, and some white birch. The removal of the old field pine stands at commercial maturity has brought about young stands of hardwoods of approximately the above composition over large areas in central Massachusetts (McKinnon, Hyde & Cline, '35). This is the forest commonly seen as one travels through this section. It is broken here and there chiefly by remnant stands of old field pines, or by young stands of pine on newly abandoned land. Sand plains and gravel terraces are characterized by pitch and white pines, while lowlands have typical swamp forests. Ravines and some rich lowland soils, particularly on northern exposures, will have forests of the more northern hardwoods and hemlock. Southern exposures will show relatively more white oak and some hickory. Old field forest successions in this region, therefore, may be designated as of white pine and hardwoods.

Old field forests in Connecticut have been studied extensively by Dr. H. J. Lutz of the Yale School of Forestry ('28). He has outlined the succession which occurs on old field areas from which the former forest has been completely eradicated. The initial woodland association, not only on these sites, but also on the poorer sites which have been severely disturbed though not entirely cleared, is one of red cedar and gray birch. As this association approaches maturity it is gradually replaced by other hardwoods, notably white, black and red oak, hickory, red maple and black birch.

As one travels southward through southern Massachusetts and Connecticut, old field associations of red cedar and gray birch are common sights. Since neither of these trees has ever proved as commercially valuable as white pine, it is not unusual to see stands wherein a gradual change is taking place from the old field type to one of the hardwoods mentioned above. The cedars grow old, become decrepit, and finally disappear among the vigorous hardwoods without being able to perpetuate themselves.

A somewhat similar type of succession is to be seen in parts of southern New York state, particularly on soils derived from the Paleozoic rocks. At the northern base of the Hudson Highlands, in Orange Co., old fields first develop a red cedar association which is usually followed by white ash.



TEXT FIGURE 1

The dotted line shows the approximate boundary between the more southern, old field red cedar—gray birch association and the northern old field white pine.

Between northern Massachusetts and southern Connecticut there is also a notable transition in the types of sand plain timber. In most of Massachusetts the pitch pine is the commonest species on these habitats. On the sand plains of central and southern Connecticut, on the other hand, black, red and white oaks also become prominent (Olmsted '37).

Although the two types of old field succession described above have long been recognized, so far as the writer is aware no one has attempted to draw up a tangible boundary or transition zone between them. It has seemed that there should be no particular difficulty in doing this since the two types may be easily and quickly recognized in the field. The map accompanying this paper contains a tentative boundary between

these two old field types. Data for it have been acquired on various trips back and forth through the country around Boston and in the country to the southwest.

The approximate northeastern limit of the red cedar—gray birch association appears to be at the lower Merrimac between the city of Lowell and the coast. No occurrences of it have been found in southern Maine or southeastern New Hampshire although the cedar occurs sporadically in these areas. Southward from the vicinity of Lowell it passes west of Concord and through the town of Maynard. It is the characteristic old field association in the Boston basin. Old photographs taken in the Arnold Arboretum during the period of its construction in the 1880's show this complex very clearly. Southwest of the Boston basin the boundary takes a zigzag course to the northeastern corner of Connecticut. There appear to be northern extensions of the cedar—gray birch community between Milford and Uxbridge, and between Douglas and Webster. These probably extend northward to the latitude of Worcester, as the type appears along the Worcester turnpike west of Framingham. To the southwest and south of Boston there is a considerable area in which the transition is gradual. This is evident for instance in the country between Foxboro and Taunton and between Stoughton and Easton, where white pine and red cedar are freely mixed in old fields or occur alternately. There is much light soil here, however, with an abundance of pitch pine. The light soils favor the development of pine throughout the region, and probably account for the mixture here. Similar soils on most of Cape Cod have the same effect, and old field cedar is not highly developed there. At the northeastern corner of Connecticut the boundary winds southward at least as far as South Woodstock and Westford. It then turns westward, passing south of Stafford Springs and Somers to the Connecticut Valley.

It must be understood that this boundary cannot be designated as a line but rather as a transition, often many miles wide. Pine-hardwood types appear far south of it in suitable situations such as northern slopes, while the cedar-birch type may be found somewhat farther north, usually on southern slopes.

In western Massachusetts, northwestern Connecticut, and in the Connecticut Valley, the red cedar is commonly associated with the trap ridges and with limestone outcrops. It appears to be a pronounced calciphile in these parts. The absence of basic rocks in eastern Massachusetts, Connecticut and Rhode Island, however, necessitates looking for other factor complexes to account for its dispersal.

There seems to be no direct correlation with the boundaries commonly

drawn between the physiographic provinces of southern New England (Wright, '33). Although in eastern Massachusetts the cedar-gray birch association is largely confined to the coastal lowland and basin provinces, in Connecticut it is also well-developed on the eastern and parts of the western uplands. Likewise it is difficult to find a close relationship to such frost phenomena as are shown in a map of average growing seasons (Wright, '33), although it should be noted that the general configuration of the isopleth for 160 days bears some resemblance to our forest boundary. There are long northern extensions of it up the Connecticut valley and into Massachusetts east of Worcester, as well as in the Boston Basin and the lower Merrimac valley. In eastern Connecticut, however, the cedar—gray birch type covers an area where the average growing season drops to 130 days.

For many years there has been recognized a faunal region in southern New England, the northern limit of which also resembles our forest boundary in general configuration (cf. Forbush, '27). This region has been described as "Transition, with traces of Carolinian," following the system of Merriam. It has a long extension up the Connecticut River valley nearly to central Massachusetts, and another up the valley of the Blackstone River into southern Massachusetts. Along the coast it extends north to the mouth of the Merrimac, involving much of the Boston Basin. If the northern limit of this faunal region could be moved northward and northwestward, therefore, it would nearly coincide with the boundary between old field pine and cedar.

It has been noted above that all of eastern Massachusetts, a part of northeastern Connecticut, and northern Rhode Island have long been placed by foresters in the white pine region (Hawley & Hawes, '12; Sargent, '84; Fisher, '33; Bromley, '35). The current prevalence of hardwood forests over much of this region, and the recognition of white pine as a transient, old field type except on very light soils, raises the problem of forest classification among the hardwoods. The need for such a reclassification here has been dealt with briefly in a recent paper by Behre, Cline & Baker ('36). Are different types represented in this area, and if so how are they related to the primeval stands which occurred here in pre-colonial times? The nature of our original forests is of considerable importance in working out management plans for the rehabilitation of our woodlands. Whether the purposes involved are watershed protection, the development of recreational facilities, or the production of merchantable timber, the problems involved would be simplified if we knew what the natural production was under primitive conditions, both in the distribution of stand composition and of quality.

Foresters have classified the deciduous types of central Massachusetts and southern New Hampshire as "Transition Hardwoods" (Spaeth, '20). They consist principally of red oak, white ash, sugar maple, red maple and black birch, and form a broad transition from the "Northern Hardwoods," in which beech, sugar maple and yellow birch predominate, to the "Sprout" or "Central Hardwoods" of Connecticut. The latter are characterized by the abundance of white oak, black oak and hickory. It should be noted that the hardwoods following white pine and cedar in the old field successions are those of the "Transition" and "Central" groups, respectively, and it is suggested that the pine-cedar boundary may be used to divide the two in southeastern New England.

It is further suggested that the same boundary may be a reflection of fundamental differences in growing conditions which were effective in the primeval forests of this region. What the actual habitat differences were is difficult to determine, although the attempted correlations noted above suggest that they were climatic rather than edaphic. Pollen studies in Connecticut noted below, also indicate a climatic interpretation.

Recent studies of ancient vegetation in southern New England give reason to believe that much of Connecticut, Rhode Island, and southern Massachusetts east of the Berkshires had a rather open forest of oaks, hickories and chestnuts (Bromley, '35; Raup, '37). There is some evidence that in precolonial times the oak-hickory type extended somewhat farther northward in Massachusetts than the present stands would indicate although there are still present what may be regarded as modified descendants from it (Raup, '37). Recent investigations of pollen in southern Connecticut lake sediments tend to bear out the suggestion that a southern, oak-hickory forest has been in part replaced by an oak-chestnut type, and that farther inland the hemlock has shown an increase (Deevey, '39).

It seems fairly well established, therefore, that oak forests of "Central Hardwood" character, associated with hickory, were present in southern New England when the colonists arrived, that they were tending toward slightly greater mesophytism than had existed earlier, and that somewhere in Massachusetts or northern Connecticut was a transition to more northern hardwood types. It is not impossible that the present boundary between the old field pine and the cedar-gray birch associations reflects the ancient transition noted above. If, however, there was an element of persistence in the presence of oak-hickory forests in southern Massachusetts and northern Connecticut at the time of colonial clearing,

then it is reasonable to think that the present boundary is somewhat farther south than the ancient one. The present occurrence of considerable white oak, black oak and hickory in southern Massachusetts, and, the early description of oak-hickory types in southern and central Worcester County in the eighteenth century (cf. Whitney, 1793) lend weight to the latter view.

LITERATURE CITED

- BEHRE, C. EDWARD, CLINE, A. C. & W. L. BAKER. The Silvicultural Control of the Gypsy Moth. (Massachusetts Forest and Park Association, Bull. No. 157, 1936.)
- BROMLEY, STANLEY W. The Original Forest Types of Southern New England. (Ecol. Monog. 5: 61-89. 1935.)
- DEEVEY, EDWARD S. Studies on Connecticut Lake Sediments. (Am. Jour. Sci. 237: 691-724. 1939.)
- FISHER, R. T. The Yield of Volunteer Second Growth as Affected by Improvement Cutting and Early Weeding. (Jour. For. 16: 493-506. 1918.)
- Introduction to Cline and Lockhard's Mixed White Pine and Hardwood. (Harvard For. Bull. No. 8. 1925.)
- New England Forests: Biological Factors. In New England's Prospect; 1933. (Am. Geog. Soc. Spec. Publ. No. 16: 213-23. 1933.)
- Soil Changes and Silviculture on the Harvard Forest. (Ecology 9: 6-11. 1928.)
- FORBUSH, E. H. Birds of Massachusetts and other New England States. (Mass. Dept. of Agr. 1927. Map on p. xix, Introduction to Vol. 2.)
- GRIFFITH, B. G., HARTWELL, E. W. and T. E. SHAW. The Evolution of Soils as Affected by the Old Field White Pine — Mixed Hardwood Succession in Central New England. (Harvard For. Bull. No. 15. 1930.)
- HAWLEY, R. C. & A. F. HAWES. Forestry in New England. New York (1912).
- LUTZ, H. J. Trends and Silvicultural Significance of Upland Forest Successions in Southern New England. (Yale Univ. School For. Bull. No. 22. 1928.)
- MCKINNON, F. S., HYDE, G. R. & A. C. CLINE. Cut-over Old Field Pine Lands in Central New England. (Harvard For. Bull. No. 18. 1935.)
- OLMSTED, CHARLES E. Vegetation of certain Sand Plains of Connecticut. (Botanical Gazette 99: 209-300. 1937.)
- RAUP, HUGH M. Recent changes of Climate and Vegetation in Southern New England and Adjacent New York. (Jour. Arnold Arb. 18: 79-117. 1937.)
- SARGENT, C. S. Report on the Forest of North America, Exclusive of Mexico. (Tenth Census of the United States. 1884.)

SPAETH, J. NELSON. Growth Study and Normal Yield Tables for Second Growth Hardwood Stands in Central New England. (Harvard For. Bull. No. 2, 1920.)

WHITNEY, PETER. The History of the County of Worcester. Worcester (1793).

WRIGHT, JOHN K. Regions and landscapes of New England. In New England's Prospect, 1933. (Am. Geog. Soc. Spec. Publ. No. 16: 14-49, 1933.)

ARNOLD ARBORETUM,
HARVARD UNIVERSITY.