Forest Research Note

NE

FOREST SERVICE, U.S. DEPT. OF AGRICULTURE, 102 MOTORS AVENUE, UPPER DARBY, PA.

No. 125
1961

AGE-SIZE RELATIONSHIPS IN ALL-AGED NORTHERN HARDWOODS

During the summer of 1960, a series of clearcuttings in small patches were made in an old-growth stand of northern hardwoods on the Bartlett Experimental Forest, Bartlett, New Hampshire. This provided an opportunity to observe the variation in ages of a wide range of trees of different sizes and species. The annual rings of over 100 stumps were counted in this stand of typical all-aged, old-growth birch, beech, and maple—which has been untouched by loggers since some light cutting took place late in the 19th century.

Sampling the stumps was on a casual, "let's-take-a-look" basis and was not randomized; instead annual rings were counted as the loggers felled the tree. Many stumps—particularly those of yellow birch—had rings that were extremely difficult to count in the field, so they were by-passed. White ash, hemlock, and beech had the easiest rings to count. Almost 50 percent of the stumps counted were beech; fewer stump counts were obtained for sugar maple, red maple, and hemlock—in that order.[1]

The resulting data, biased though they were because of sampling inadequacies, brought to light a large variation in ages between trees of the same diameter. And if the stumps with rings too difficult to count had been included, this variation would conceivably have been greater.

The extent or magnitude of the variation in ages within d.b.h. classes is illustrated graphically in figure 1. The 14-inch d.b.h. class had the

[1] For some early work of this type on hemlock and sugar maple in Michigan see: Gates, F. C., and Nichols, G. E. Relation between age and diameter in trees of the primeval northern hardwood forest. Jour. Forestry 28: 395, 1930.

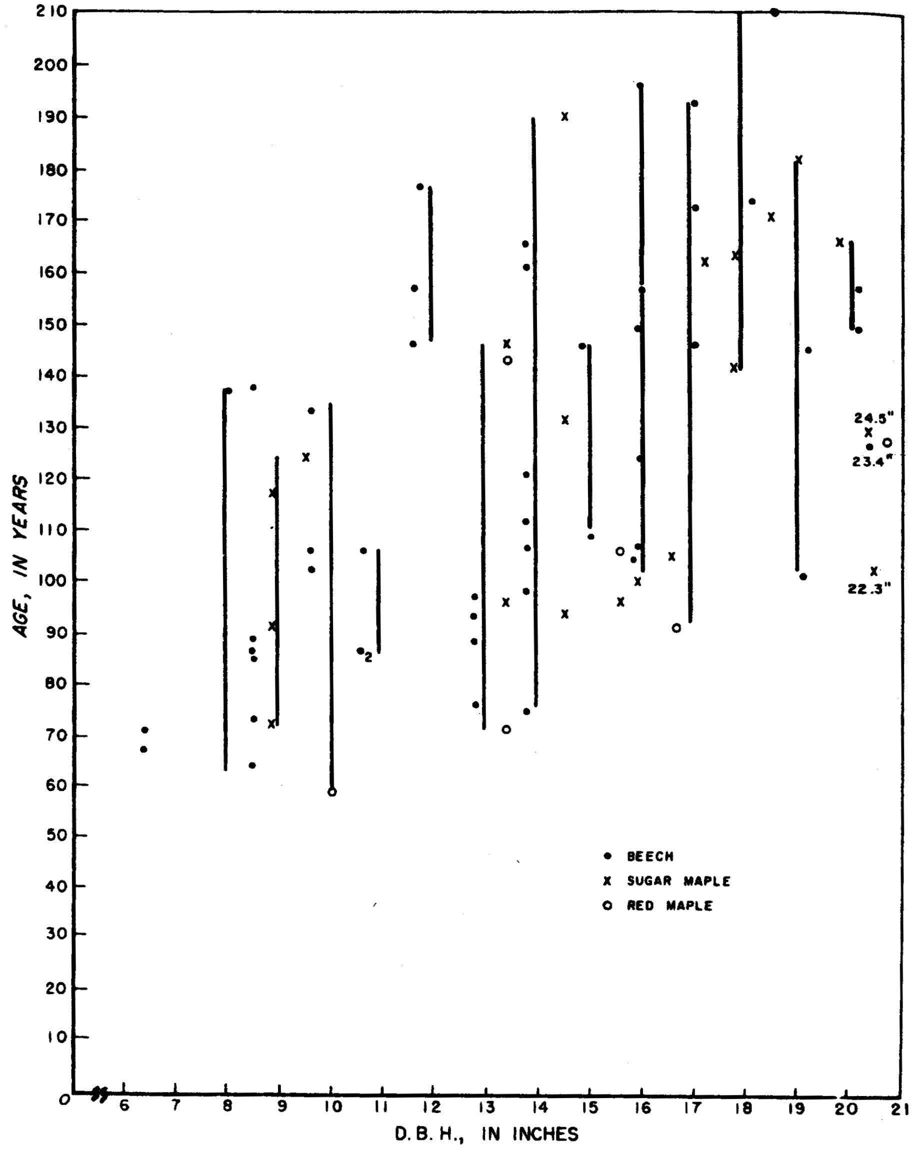

Figure 1. — Variation of ages by d.b.h. classes.

greatest variation in ages, with a range of 115 years between the oldest and the youngest tree; and the 16-inch class had a range of 100 years between extremes. Beech alone had a range in age of 74 years for the 8-inch class and 91 years for the 14-inch class. And the samples were fairly evenly distributed throughout the extremes. Vertical lines on the graph are merely to emphasize the extent of age variation within d.b.h. classes.

The hemlocks, a common associate of northern hardwoods, were the oldest trees recorded, with ages of 205, 214, and 305 years for three 17-inch trees alone. Hemlock was not included in the plotted data because the extreme age of the samples exaggerated the range of ages.

Intolerant species such as yellow birch, paper birch, and white ash did not vary so greatly in age as did the tolerants, the largest spread being 26 years for both the 17- and 18-inch d.b.h. classes. This smaller variation would be expected, considering the relatively short life-span of these species and their inability to withstand shade.

Of course, the age variation within size classes in these all-aged stands is due to differences in individual tree growth rates. These differences are in turn brought about mainly by suppression of the tolerant trees to various degrees, differences in site characteristics, and perhaps genetic differences. Early cuttings in the Bartlett stands played a part in increasing this variation by releasing trees from competition and creating openings favorable for the establishment of young, thrifty reproduction. To a much lesser extent, natural catastrophe such as windfall and normal stand mortality accomplished similar results. Thus these stands are a complex mixture of sizes and ages, with a wide range of ages for any particular size.

Aside from being somewhat interesting, the data collected at Bartlett emphasize several important questions pertaining to the single-tree selection system, which is widely used in the management of all-aged northern hardwoods. For example, can relative age be estimated from the external characteristics of a tree? How is age related to vigor? Will a 70-year-old 8-inch tree respond to release in the same manner as a 90-year-old 8-inch tree? Are there differences between the insect and disease resistance of such trees? What are the relative sprouting capabilities?

These are only a few of the many questions which need to be answered before we can competently manage northern hardwood stands that have age variations within size classes as great as shown in this study.

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