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NATURAL HYBRIDIZATION OF THE ASPENS

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The native aspens of Minnesota, usually referred to collectively as "popple", comprise two distinct species: quaking or trembling aspen (*Populus tremuloides* Michaux), and bigtooth or largetooth aspen (*P. grandidentata* Michaux). The former is the most widely distributed tree species in North America, whereas the range of bigtooth is much more restricted, being confined to essentially the same range as that occupied by the quaking aspen in the North Central and Northeastern United States and adjacent southern parts of Canada. In spite of a diversity in ecological preference, the native aspens frequently occur side by side throughout much of their common range, especially as components of the post-fire type in the Lake States and Northeast.

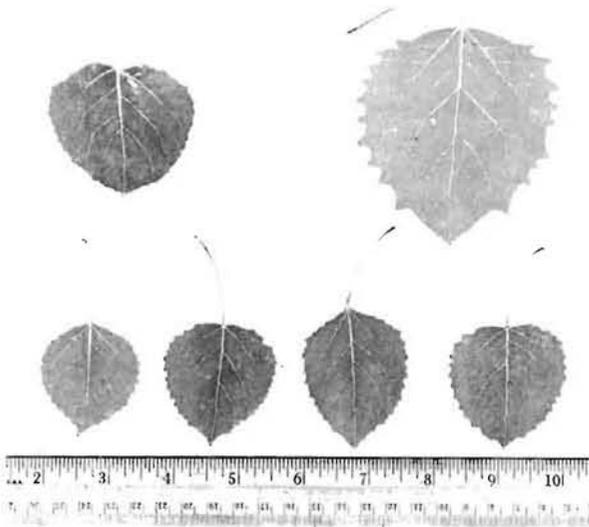


Fig. 1. (Above) Typical leaves of quaking (left) and bigtooth aspen (right). Trees from which the leaves were collected were artificially crossed in 1949. (Below) Typical leaves from 4 of the F_1 's from the above cross at the age of 5 years. Note intermediacy in shape and serration of the leaf blade.

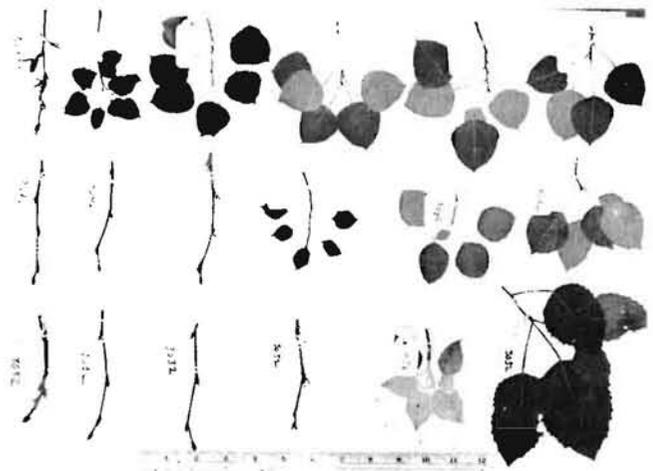


Fig. 2. Differences in leafing-out time of typical quaking aspen (above), a natural F_1 hybrid (center), and bigtooth aspen (below). Material was collected at weekly intervals (May 12 - June 17, 1954) from plants growing in an abandoned gravel pit near Petersham, Massachusetts.

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Genetic isolation of quaking and bigtooth aspen is apparently effected solely through a difference in flowering times, since artificial crosses are easily made. Under field conditions quaking aspen flowers 10 - 14 days in advance of bigtooth. Thus largetooth x trembling crosses in the field may be made simply by storing quaking aspen pollen until the female flowers of bigtooth are receptive. Most artificial crosses, however, are made on cut twigs forced in tap water in the greenhouse. Under such conditions reciprocal crosses may be effected at will.

F₁ hybrids of quaking and bigtooth aspen are intermediate in most morphological characteristics and may be easily identified when leaves are available (Fig. 1). Leafing-out and flowering time of the hybrids is intermediate as well (Fig. 2). Juvenile growth rate, to at least the 6th year, tends in general to approach the typically rapid growth characteristics of quaking aspen, but rarely exceeds it.

Although Victorin (Les variation laurentiennes du Populus tremuloides et du P. grandidentata. Contr. Lab. Bot. Univ. Montreal 16. 1930) reported natural hybrids of tremuloides x grandidentata within their common Canadian range, no report of their occurrence in the United States appears to have been made. The hybrids are not, however, infrequent in central and eastern Massachusetts where the author has observed several widely scattered individuals and hybrid swarms. Such populations also contain individuals that may be presumed to be products of crosses between F₁ hybrids (F₂'s), or backcrosses to quaking or bigtooth aspen, especially the later (Fig. 3). Fertility in the hybrids thus suggests that introgression of quaking aspen genes into bigtooth, or vice versa, has likely occurred to a considerable degree in certain localities. Since the recognizable members of natural F₂ or backcross progenies, especially those carrying a preponderance of bigtooth genes, are typically healthy, vigorous and well formed, promising genetic improvement possibilities exist. Such studies, supported by the Charles K. Blandin Foundation of Grand Rapids, Minnesota, are now in progress at the University of Minnesota's School of Forestry, in cooperation with the Maria Moors Cabot Foundation for Botanical Research of Harvard University, under the auspices of which the observations here briefly reported were made.

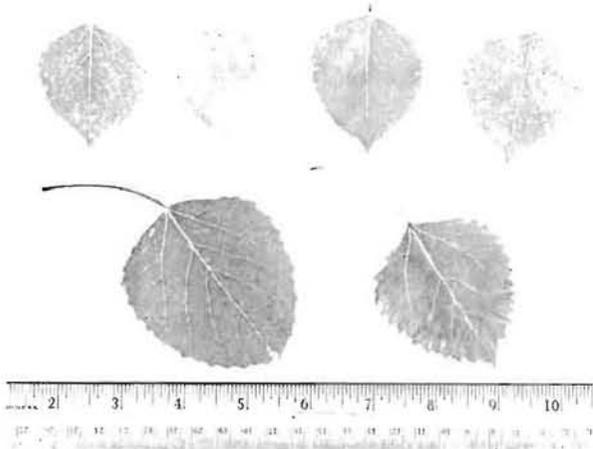


Fig. 3. (Above) Typical leaves of natural F₁ hybrids of quaking and bigtooth aspen, collected July, 1954, north-central Massachusetts. (Below) Typical leaves from presumed products of the natural crossing of F₁ hybrids or backcrosses to bigtooth aspen. Material collected from same locality and at same time as those above.

No systematic search for the hybrids has yet been made in Minnesota but there is every reason to believe that they do occur here as well as throughout the common range of the aspens. Most favorable localities for search are abandoned gravel pits, shoulders of woods roads, or similar sites providing a suitable seed bed of exposed mineral soil. Areas in which temperature inversions are common in spring seem to provide especially favorable conditions for the natural crossing to occur. For example, a valley through which cold air drains may retard the flowering of quaking aspen females in the valley bottom sufficiently so that bigtooth males on the warmer adjacent slopes may pollinate them. Reports of suspected hybrids involving these species or others will be welcomed by the School of Forestry, University of Minnesota.