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Distribution in Minnesota of *Acer Saccharum*, *Tilia Americana* and *Betula Lutea*¹

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ABSTRACT — The distribution in Minnesota of three tree species (*Acer saccharum*, *Betula lutea* and *Tilia americana*) of the northern hardwood type have been plotted, using data from the Third Forest Inventory of the Lake States' Forest Experiment Station, herbaria records and records of occurrence from personal and other's field work. Maps are presented that give more detailed distributions than have heretofore been available. All three species show concentration in a belt along the North Shore of Lake Superior. *Acer saccharum* and *Tilia americana* show the expected close correspondence of distribution in this belt and in a broad extension westward, almost to the prairie margin. *Betula lutea* thins out rapidly as one proceeds west.

From a study of old growth northern hardwood stands in northeastern Minnesota (Flaccus and Ohmann, 1964), the author became interested in the distribution in Minnesota of the three most important tree species in this type of forest: sugar maple (*Acer saccharum*), basswood (*Tilia americana*), and yellow birch (*Betula lutea*). Although general range maps showing limits of distribution are available in a number of sources, such as tree manuals, none gives intensity of distribution. The maps presented here (Figs. 1, 2, 3) provide such information with precision previously unavailable.

Explanation of Maps

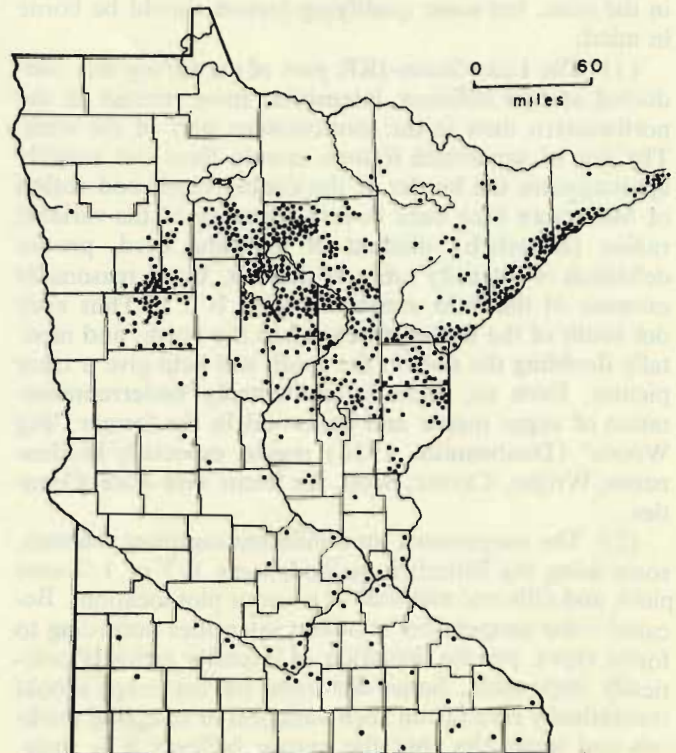
Each dot on the maps represents an occurrence of at least one individual of the species, as noted in ground check sampling or collection. Most dots derive from data of the Third Forest Inventory of the Lake States Forest Experiment Station and the Office of Iron Range Resources and Rehabilitation, and their cooperators. Part of a national survey, this inventory was made in the years 1959-63, and represents a sampling of commercial forest land throughout the state. The cooperators were, Superior National Forest, Chippewa National Forest, Bureau of Indian Affairs, Koochiching County, Wadena County, Minnesota and Ontario Paper Co., and Kimberly-Clark of Minnesota, Inc. The author recorded oc-

currences from either original field tally sheets or IBM plot tally summary sheets, furnished by these agencies. The legal description of each occurrence was determined and then its location was plotted on the maps.

Additional locations were mapped from the following sources: (1) herbaria of the University of Minnesota, Minneapolis and Duluth campuses, (2) personal communications from some foresters of national, state and county agencies, and private industry, (3) maps prepared by E. Bakuzis, (4) personal records, (5) any other private sources considered reliable.

The Lake States-IRR and cooperators' data are based on commercial forest land defined as stands greater than 1 acre or a two-chain strip stocked ten per cent or more with trees and not used for any other purpose or, if used for some other purpose (e.g., wooded pasture), stocked

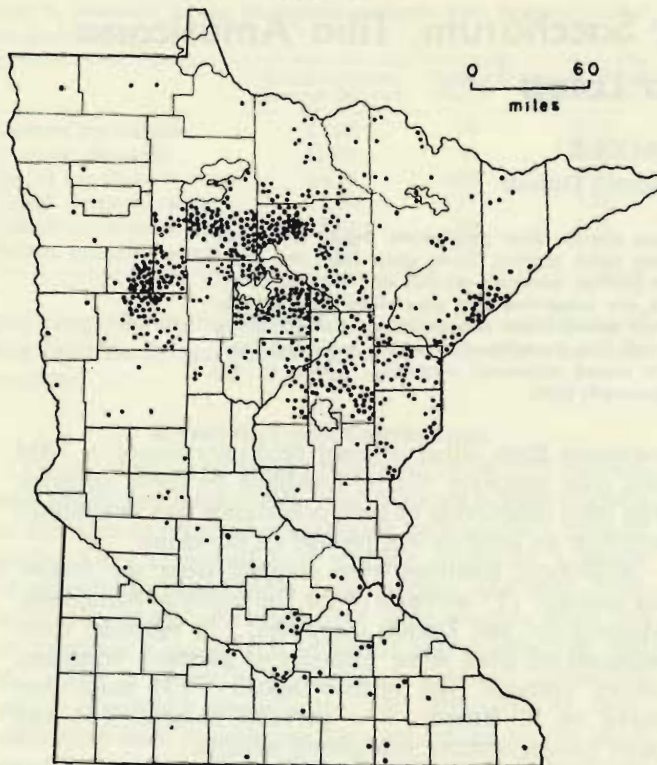
ACER SACCHARUM



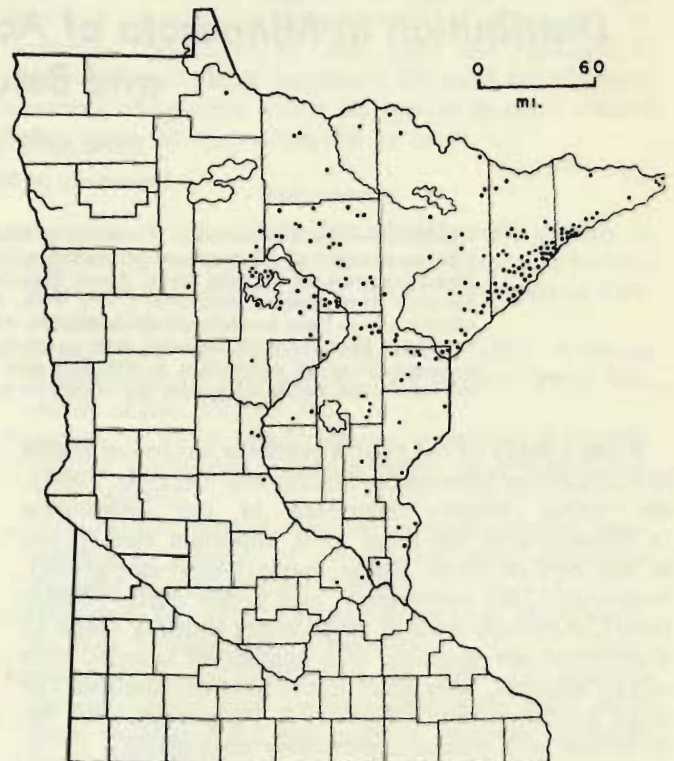
¹ The author wishes to acknowledge the cooperation of personnel, too numerous to mention individually, of the following: Lake States Forest Experiment Station; Office of Iron Range Resources and Rehabilitation; Superior National Forest; Chippewa National Forest; Minnesota State Forestry Division; Bureau of Indian Affairs; Botany Department, University of Minnesota, Minneapolis. In addition, the following foresters provided valuable information: A. R. Johnson (Koochiching County), J. C. Ryan (Cloquet Valley State Forest), J. W. Hubbard (M. and O. Paper Co.), S. K. Dickerson (Erie Mining Co.), C. E. Ahlgren (Basswood Research Center), E. Bakuzis (University of Minnesota), and E. J. Haselrud (Kimberly-Clark, Inc.). Special appreciation for their help is due R. N. Stone and A. Vasilevsky of the Lake States Forest Experiment Station.

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TILIA AMERICANA



BETULA LUTEA



25 per cent or more with commercial species. The Lake States-IRR data include all land in private ownership and land owned by public agencies not covered by one of the cooperators.

It is believed that the maps represent with reasonable accuracy the intensity of distribution of the three species in the state, but some qualifying factors should be borne in mind:

(1) The Lake States-IRR part of the survey was conducted at two different intensities, more intense in the northeastern than in the southwestern part of the state. The line of separation follows county lines but roughly approximates the border of the conifer-hardwood region of Minnesota (see back cover). Because of the variable radius (Bitterlich) method of sampling used, precise definition of intensity ratios is difficult, but a reasonable estimate of the ratio, north to south, is 2:1. Thus each dot south of the line represents 2 in the north, and mentally doubling the dots in the south will help give a truer picture. Even so, there is undoubtedly underrepresentation of sugar maple and basswood in the former "Big Woods" (Daubenmire, 1936) region, especially in Hennepin, Wright, Carver, Scott, Le Sueur and Rice Counties.

(2) The cooperators used different sampling schemes, some using the Bitterlich method, some 1/5 or 1/7 acre plots, and different methods of point or plot locations. Because some cooperators stratified intensities according to forest types, precise definition of intensity ratios is practically impossible. Some distortion on the maps should theoretically result from such variation in sampling methods and intensities, but the author believes it is insignificant

because of the checkered pattern of land ownership throughout most of the state.

(3) In Koochiching County and M. and O. Company data, all species of maple were lumped, and all species of birch; it was thus possible to map only basswood from these two sources. But the foresters involved assured me that sugar maple and yellow birch are extremely rare in Koochiching Co., so the maps are essentially unaffected.

(4) No data were available for that part of the Superior National Forest in the no-cut wilderness area. This lack is minor, since all three species are rare in this area.

(5) On state-owned land, no plots were taken in stands in the 0-5" dbh size class.

(6) For the most part (Forestry Inventory data), a dot represents one or more sampling points or plots on which the species occurred; it thus can represent one or a number of trees at one or several points. At the scale of mapping used, some lumping of plots was necessary. For instance, if several neighboring plots of occurrence had the same legal description (same section of same Township and Range), they were mapped by a single dot. Breakdown was hence not carried below sections, and, in many cases, two immediately contiguous sections were lumped. The net effect of this lumping is some underrepresentation in areas of high concentration.

Discussion

The distribution of tree species may be determined by a complex of many factors—climatic, edaphic and historical. Such factors as temperature extremes, rainfall, evapotranspiration, soils, topography, competition, dis-

ease, post-glacial events, natural or man-caused catastrophes, and agriculture may be involved. Analysis of the importance of these to the distributions reported is beyond the scope of this paper. A few general comments about the distributions are in order, however.

(1) The major occurrences of all three species lie in the conifer-hardwood region of the state. Within this region all three are almost absent in the northwestward area that was once practically covered by Glacial Lake Agassiz. They are infrequent in the region that is northwest of the belt along the North Shore of Lake Superior, (St. Louis, Lake and Cook Counties). There are smaller areas where sugar maple and basswood are absent or rare, such as just east of Lake Winnibigoshish and just west of Leech Lake.

(2) Sugar maple and basswood distributions are very similar, reinforcing the well established concept of maple-

basswood association in Minnesota. Basswood is somewhat more widespread, except in the northern half of the North Shore of Lake Superior (Cook County), where it is completely absent.

(3) The concentration of the three species in the North Shore belt is marked. Yellow birch is here regularly associated with the other two; westward the yellow birch drops out, although it can be found associated with the other two as far west as Leech Lake.

References

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