

ABSTRACT OF THE THESIS

Acer saccharum near and at the periphery of its range  
in New Jersey

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This study is an attempt to determine the status of sugar maple (Acer saccharum) in New Jersey with respect to its intraspecific variation, its reproduction, its distribution and the factors that control it, and its future importance in the State of New Jersey. The conclusions are based on results obtained for the trees, saplings, and seedlings of sugar maple in forty-two stands which have been studied during the period of 1965 to 1967.

The stands were divided into two portions: the northern stands located north of the terminal moraine and the southern stands located south of the moraine. The southern group of stands extends to the southern limit of sugar maple distribution in New Jersey.

No genetical variation within the New Jersey populations of sugar maple could be detected by the procedures used in the morphological analyses of the leaves. It was assumed that the same form or subspecies is present throughout the study area.

The seedling survey indicated prolific reproduction throughout the study area with heavy seed yields every 2 to 5 years.

The analyses of seedlings, saplings, and trees suggested, first, that the climatic factors were more important in the north while the edaphic factors were more important in the south suggesting that as one ap-

proaches the southern limit of sugar maple in New Jersey the edaphic conditions have a greater bearing even to the extent of being limiting. Secondly the statistical analyses of seedlings, saplings, and trees suggested that the causes for the present-day distribution of sugar maple in New Jersey resided in the restrictions imposed on the large individuals. The high correlation that existed between sugar maple and calcium in the B horizon suggested that the chemical properties of the soils near the limit of the range in New Jersey may be limiting to sugar maple. The importance of these two elements (calcium and magnesium) may reflect a favorable level of general soil fertility which presents favorable conditions for sugar maple. Another reason for stressing the importance of sugar maple trees is the seed production. To have self-perpetuation, seeds and seed producers are needed; thus large individuals are necessary. These seeds may germinate and produce seedlings but unless the limitations imposed on the trees are absent that is, adequate soil elements or soil fertility, their development into mature trees will not occur.

Regarding the successional trends, a distinction should be made between the northern and the southern stands.

In northern New Jersey the present oak-dominated forests will in time presumably proceed toward a sugar maple-dominated forest. However, climatic factors appeared to have imposed some restrictions as suggested by the statistical analyses of the data which indicated that exposure and elevation may limit the areal expansion of the species. In regard to the areas where there is a potential for the establishment of a sugar maple-dominated forest the past influence (fire and cutting) have undoubtedly played an important role in preventing the succession toward a sugar maple

forest.

In the southern stands, the succession toward a sugar maple-dominated forest is also taking place. Near the southern limit of sugar maple distribution in New Jersey the edaphic factors appeared to have restricted the succession toward the dominance of sugar maple as suggested by the regression analyses. The analyses suggested that some edaphic elements may limit the development of the species. The succession toward a sugar maple-dominated forest will proceed only if the essential elements or the level of fertility is sufficient. Geologically and ecologically speaking the suitable sites are the magnesium and calcium-bearing formations which produce soils with good internal and surficial drainage. The areas which have the potential for supporting a sugar maple-dominated forest but where oaks and hickories are still the dominant trees are the result of past influence (fire and cutting) which have probably prevented sugar maple from increasing in importance.