

ABSTRACT OF THE THESIS
Diversity in Vegetation
of New Jersey

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Diversity, a synonym for variety, can be an attribute of a single plant community or of a landscape that encompasses a number of different habitats. Many ecologists believe that fuller understanding of diversity may provide a needed interweaving thread for the development of ecological theory as well as an important guide for conservation practice. The purpose of this research was twofold: first, to explore the meaning of community diversity as reflected in the tree species component of New Jersey forests, and, second, to identify the degree of landscape diversity that now exists in the natural vegetation of New Jersey and the reasons for such diversity. The research results are summarized in two manuscripts, a presentation format designed to overcome current criticisms that ecologists should show more social responsiveness. The first manuscript, entitled "Tree Species Diversity in New Jersey Forests: Its Measurement and Ecological Meaning," is prepared for publication in a scientific journal, while the second, entitled "Vegetation of New Jersey: A Study of Landscape Diversity," is written as a semi-technical description and explanation of New Jersey vegetation.

For the study of community diversity, data about the tree species component of 175 forest and 9 woodland stands growing on a wide variety of geological substrata and topographic positions throughout New Jersey were used to evaluate alternative measures of diversity, to identify within-habitat diversity differences, and to relate the observed diversity results to ecological theories. It was concluded that the Shannon diversity function is preferable to Simpson's and McIntosh's indices because it does not exaggerate high contribution of a few species; also, it can be partitioned into its two components--"richness" and "evenness"--and its standard error and sensitivity to sample size can be estimated. The measure of community evenness (or its inverse--dominance) least sensitive to species counts is one derived from the Shannon function expressed as H/H_{Max} . Separate comparisons of community richness and evenness are needed for meaningful interpretations of observed diversity.

Tree species richness in New Jersey forests is related to substrate conditions--stands on mesic upland sites are richer than those on xeric sites or wetlands. Community evenness is associated with stand dominant. Many, but not all, conifers by allelopathic or other means appear to retard development of companion species.

Observed diversity richness appears best explained by the time-stability hypothesis which, however, does not account for differences in community evenness. It is

suggested that evenness can increase or decrease in evolutionary time dependent on selection for biochemical differentiation and on predation control. Attempts to relate observed diversity to community niche-width measures based on species substrate distribution appear meaningless; division of community resources is dependent on more complex biological interrelationships.

The natural landscape diversity that now exists in New Jersey is interpreted in terms of the particular factors that have influenced the vegetation--climate, geologic and soil features, man's actions, and other biological interrelationships. A broad classification of twelve terrestrial plant habitats in New Jersey is suggested; the primary criteria for differentiation are amount of substrate moisture, North-South and altitudinal temperature variations, and substrate salinity and acidity. The typical plant communities found in each type habitat are described and illustrations given of man's capacity to alter the composition of natural vegetation as well as to obliterate it completely. A dual classification of New Jersey upland forests within the Eastern Deciduous Forest Formation is outlined considering the vegetation as it is today and as it would be without man's interference. Finally, the conflicts and issues involved in retaining the present landscape diversity in New Jersey are examined.