

TRACT OF THE THESIS

Bird Species Diversity in Relation to Secondary Succession on the New Jersey Piedmont

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A study of bird species diversity on three seral stages characteristic of secondary succession on the New Jersey Piedmont was done during the summers of 1968 and 1969, the winters of 1968-1969 and 1969-1970, and the spring of 1969. The seral stages studied were a two- to three-year-old field (the herbaceous field), a thirty-year-old field (the cedar field), and a climax oak-hickory forest (the oak forest). Two study plots each with an area of two hectares were chosen within each seral stage. Diversity indices were calculated using the Shannon-Wiener information formula, $H' = -\sum p_i \log p_i$.

Bird species diversity (BSD) and age of the seral stage were positively correlated, and the greatest increase in the diversity index occurred between the herbaceous field and the cedar field. BSD in the climax oak forest was consistently higher than in the cedar field, although the mean values were not greatly different. BSD variability decreased with the age of the seral stage, particularly in summer. The highest variability estimates were found for the herbaceous field. Much of the variability in the herbaceous field was due to the importance of non-nesting

birds which fed in the habitat. The importance of non-nesting birds decreased with the age of the seral stage. The suggestion was made that variability is an important parameter and should be examined more closely in future species diversity studies. Although no cause-effect mechanism between species diversity and habitat stability was found, the trends observed suggest that low species diversity and high variability characterize unstable habitats. BSD was highest in all seral stages in summer and lowest in winter. In winter, the greatest decreases in BSD occurred in the herbaceous field and cedar field. Microclimatic differences between the seral stages were thought to account for differences in BSD observed in winter between the seral stages.

The species count (species richness) was found to account for most of the differences in BSD between the seral stages. Species richness was a highly accurate predictor of species diversity in the cedar field and oak forest. The evenness with which species were numerically distributed (equitability) was found to be lowest and to have its greatest influence on the diversity index in the herbaceous field, due to the presence of large flocks of a single species. Equitability was high in the cedar field and oak forest. Territoriality was thought to account for the high equitabilities observed in summer. No obvious reason existed for the relatively high equitabilities observed in winter, but the aggregations of birds into

mixed species flocks was suggested as a possible answer. Both species richness and equitability were concluded to be important parameters in ecological study.

A positive correlation was found between foliage height diversity (FHD) and BSD. The suggestion was made that FHD is a measure of vertical stratification and that habitat volume may be a better predictor of BSD.