Avifauna Habitat Utilization and Vegetation Structure

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Behavioral ecology studies of avifauna have centered on foraging methods, time budgets and correlation of avifauna with the presence or absence of species of plants. Few studies have considered the relation of vegetation structure and species of avifauna present. MacArthur and MacArthur (1961) found foliage height diversity functioned as a predictor of bird species diversity. Sturman (1969) showed the abundance of Chestnut-backed Chickadees to be correlated with the upper story canopy volume and the average height of the upper story conifers. Both canopy volume and canopy height are components of the foliage height diversity. Anderson (1970a) utilized stepwise multiple linear regression analysis to correlate 52 vegetation structure components with the presence or absence of avifauna species in the Oregon white oak and Douglas fir.

To characterize and compare the avifauna and vegetation of the area around Jackson Hole, Wyoming, sampling transects were established through nine study sites: three aspen groves, three lodgepole pine groves, and three spruce-fir groves. Each area was sampled once a week during the months of July and August 1971. Early morning censuses were made of avifauna present by means of a modification of the sample count method (Anderson, in preparation). An irregular transect was established through each stand at least 150 meters from the edge. Ten sample points were spaced 95 meters among this transect. As I walked along the transect, all birds seen within 18 meters on either side of the transect were counted.

To compare and contrast the vegetation of the area and relate the vegetation structure to the avifauna present, each study area was randomly sampled twice a week during July for structural features of the vegetation. These features include: canopy volume, trunk height, position of primary and secondary branches, amount of vegetative matter present, density of trees and shrubs per acre, area of inner core of trees, amount of dead vegetation per acre, percent of conifers and deciduous trees per acre, height class of trees, index of openness, height from ground to lower canopy, diameter at breast height and type of bark on trees. Each area was sampled by the point-centered quarter method (Cottam and Curtis, 1956). A sampling point was located by random numbers in each 125-pace interval (95 meters) along a wandering transect 951 meters in length through the center of each area. The area around the sample was divided into four quarters and data were taken on the nearest tree in each quarter.
Results and Discussion

The three vegetation types studied in the Jackson Hole area presented a contrast in overall avian abundance. Much of the lodgepole pine was in uniform aged stands with the shrub layer at a minimum. Of the three areas studied total number of individuals and total number of species of birds was minimal in the pine areas. Several factors could be responsible for this. The variety of foraging sites would be minimal thus reducing the number of species that such an area could support. Further, the actual food available might be less in such a uniform community. Further analysis of the structural features of the vegetation which influence the abundance of the different bird species might give insight into this problem.

Another factor that must be considered in a survey of the lodgepole pine avian community is the influence of the bark beetle. Many large trees are dead or dying from attacks by this beetle. Alteration of the entire vegetation structure is occurring in many places e.g. reduction in canopy volume, increase in number of seedlings, branch structure change, etc., will influence the abundance of avifauna present. This topic warrants further study.

Spruce-fir forests in the Jackson Hole area consisted of Engelmann spruce, Douglas fir with scattered patches of alpine fir. Such forests were common on the slopes surrounding the valley. Birds in these areas were numerous. Many foliage nesting birds were found here with several hole nesters. The areas often had dense understory which provided further habitat for birds to utilize.

Aspen stands were common on the valley floor in moist areas. They were frequently very small; however, a large number of birds nested in these areas. Hole nesters were particularly common. Many birds appeared to nest in these small stands and disperse later in the season into the many different forest types in the area. The maximum number of birds in the areas studied was found in these areas.

The data gathered in this study will be analyzed by means of multiple stepwise regression analysis and principle component analysis in which the key vegetative features affecting avian abundance will be calculated by the computer. This should provide information on why avian species are present in numbers in some areas and absent from others. Information on niche breadth will be calculated using the formula: \( B_i = 1/P_i^2 \) (Levins, 1969). Further analysis will be made by comparing the results of this study with work done by the investigator in the forests of western Oregon (Anderson, 1970b) and the tropical forests of Costa Rica (Willson, Anderson, and Murray, in preparation). Differences in species between areas will be related.

Further studies are to be undertaken on the birds of the forests of Ohio.
Literature Cited


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