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THE ECOLOGICAL RELATIONSHIP BETWEEN THE OCCURRENCE OF SQUIRREL LEAF-NESTS IN DIFFERENT TYPES OF OAK FOREST HABITATS

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In the extensive upland and floodplain, hardwood forests of Arkansas are found the fox squirrel (Sciurus niger Linnaeus) and the gray squirrel (Sciurus carolinensis Gmelin), probably two of the most sought after game animals in the state.

It was the opinion that there was a very noticeable relationship between the different types of upland mixed-oak forest and the numbers of fox and gray squirrel leaf-nests,[1] which may be used as an index to squirrel population(1), appearing therein. It was recognized that here was an unusual opportunity of study. In order to more closely correlate this theory, an attempt was made in the formulation of this paper: a comparative study between the woody vegetation of two mixed-oak forest plots, one being in xeric upland forest and the other in a mesic type situation, with the corresponding occurrence of squirrel leaf-nests in these areas.

LOCATION AND SIZE

The areas chosen for this study were two 50 acre plots located (Fig. 1) in the Lake Wedington area of Washington and southern Benton counties, Arkansas. These areas had been already established and mapped previously for a squirrel leaf-nest study(3) and were labeled Areas No. 1 and No. 4. For the

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[1]Nests constructed of leaves or sticks in limbs, not in cavities of trees.

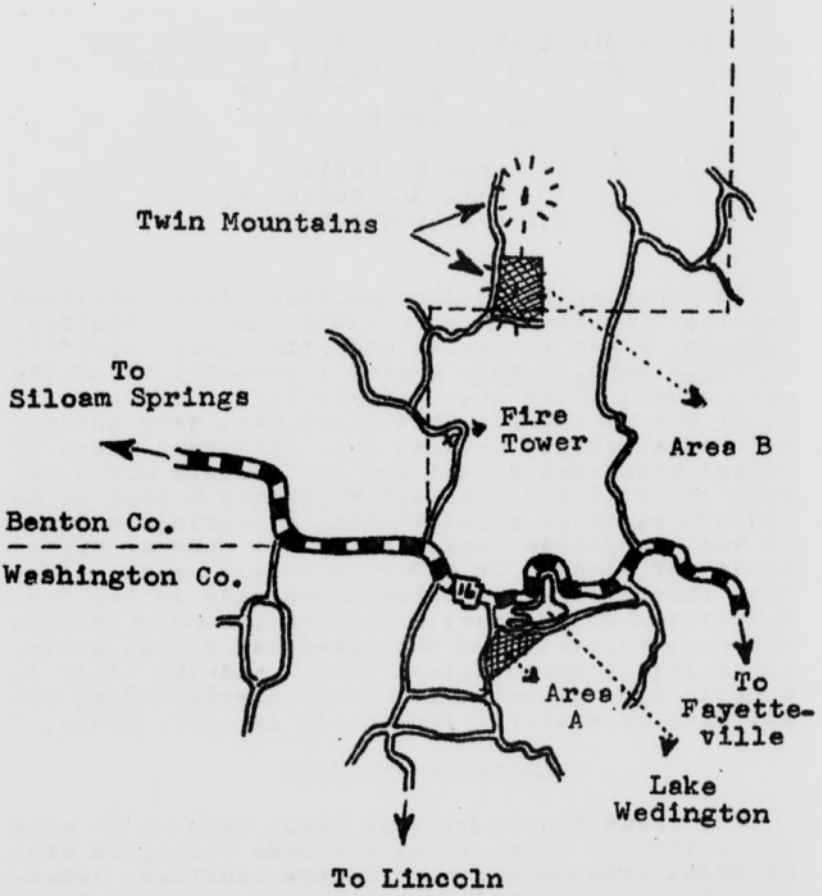

Figure 1. A map of the Wedington area in Washington and southern Benton Counties, Arkansas, showing the location of Areas A and B.

purpose of this paper, "A" has been substituted for No. 1 and "B" for No. 4, and all future mention to these areas will be Areas A and B.

METHODS

A systematic-random plan was used in sampling the trees in the areas by first mapping off the area into plots and then randomly selecting the transects from each plot. The method of sampling employed in this study was the "arm-length transect" method, a method which makes use of ones outstretched arms. All trees within reach while pacing off sixty feet are recorded; the result being one sample quadrat, 6 X 60 feet. This method was selected because of its ease and resulting efficiency. A total of sixty-one transects were sampled in each of the two areas.

All trees sampled were placed into size classes, thus obtaining a standardization of sampling. The size classes were designated 1, 2, 3, 4, and 5 as follows:

Size Classes	Diameter Breast High (DBH) in Inches
1	3.6 to 6.5
2	6.6 to 9.0
3	9.1 to 15.0
4	15.1 to 20.0
5	20.1 to 25.0

The data were compiled in a manner similar to methods used by Curtis and McIntosh(2). From this data the frequencies (number of sample plots in which a species occurs), densities (number of individuals of a given species over a given area), basal areas (amount of solid tree per acre), and importance percentage (I.P.) (average of the relative frequencies, densities, and basal areas--total 100%--giving an index on the importance of a species in a community) of all species were determined. All procedures on the censusing of squirrel leaf-nests are outlined in "Squirrel Investigations"(3).

RESULTS

It was established by the 1957 squirrel leaf-nest census that there were more leaf-nests in Area A, with 52 nests, than in Area B which had 25 nests. In the 1958 census, Area A had 60 nests as compared to 34 nests in Area B. When the two years were averaged, Area A had an average of 56 nests as compared with 29.5 nests in Area B.

It was found that Area A had a density of 548.5 trees per acre as compared to 435.6 trees per acre in Area B. There was also a noticeable difference in total basal area in that Area A had an average of 256.14 square feet per acre as compared to 169.10 square feet per acre in Area B.

One would normally assume by the above figures that Area A would have a greater basal area because of the higher density. This was found to be true, but when the B. A. factor (average basal area in square feet) was calculated, it was found that the B.A. in size classes 1 and 2 were the same in both areas, whereas the remaining size classes, 3, 4, and 5, in Area A had larger B. A. factors than the same classes in Area B, thus indicating that Area A had a greater number of large trees than did Area B.

An interesting and obvious factor evident when the figures of the two areas were compared, were the dominant trees (species that control and characterize the community(4)) of the areas (Table I). Although some of the white oak were larger, the obvious dominant of Area A, in both density and basal area, was the black oak. When the I.P. was calculated, it was found that the black oak had a high percentage of 33.4%. In Area B, black oak rated only a 10.4% as compared to a dominant 36.5% for post oak, which had the high density and basal area. It might also be noted here that both species had the highest relative frequencies in their respective areas.

Each area had several other species which rated high in dominance. In Area A, white oak had an I. P. of 22.2 and post oak 20.1. Blackjack oak had less than 10% with an I. P. of 9.6. This species, low in Area A, rated very high in Area B, closely following post oak with an I. P. of 29.3. Other species of importance, but of lesser degree in Area B, were white oak with an I. P. of 11.7 and black oak with an I. P. of 10.4. All other species of

TABLE I

THE SPECIES OF TREES, CENSUSED FROM THE SUBJECT AREAS, SHOWING THE RELATIVE FREQUENCIES, DENSITIES, BASAL AREAS, AND IMPORTANT PERCENTAGES IN ORDER OF MOST DOMINANT TO LEAST DOMINANT (Species Listed in Order of Dominance)

Species	Rel. Freq.	Rel. Dens.	Rel. B. A.	I. P.
AREA A				
Black Oak (Quercus velutina Lam.)	28.9	31.5	39.7	33.4
White Oak (Quercus alba L.)	21.8	18.0	26.9	22.2
Post Oak (Quercus stellata Wang.)	20.6	23.8	15.8	20.1
Blackjack Oak (Quercus marilandica Muench.)	9.5	11.6	7.6	9.6
Dogwood (Cornus florida L.)	7.1	6.9	1.2	5.1
Sycamore (Platanus occidentalis L.)	2.4	1.4	2.4	2.1
Red Maple (Acer rubrum L.)	2.4	1.4	0.7	1.5
Wild Black Cherry (Prunus serotina Ehrh.)	1.4	1.1	2.1	1.5
American Elm (Ulmus americana L.)	1.4	1.1	1.2	1.2
Chinquapin (Castanea ozarkensis Ashe.)	0.9	1.7	1.5	1.0
Persimmon (Diospyros virginiana L.)	0.9	1.8	0.2	1.0
Black Hickory (Carya texana (Sarge.))	1.4	0.7	0.5	0.9
Black Gum (Nyssa sylvatica Marsh.)	0.9	0.4	0.3	0.5

TABLE I (Continued)

Species	Rel. Freq.	Rel. Dens.	Rel. B. A.	I. P.
AREA B				
Post Oak (Quercus stellata Wang.)	32.7	38.6	38.1	36.5
Blackjack Oak (Quercus marilandica Muench.)	28.8	33.2	26.0	29.3
White Oak (Quercus alba L.)	12.2	10.9	12.0	11.7
Black Oak (Quercus velutina Lam.)	11.2	7.7	12.3	10.4
Northern Red Oak (Quercus borealis Michv. f.)	8.8	5.9	8.0	7.6
Black Hickory (Carya texana (Sarg.))	3.4	1.8	1.6	2.3
Southern Red Oak (Quercus falcata Michx.)	1.0	0.5	0.8	0.8
Winged Elm (Ulmus alata Michx.)	1.0	0.5	0.8	0.8
Bitternut Hickory (Carya cordiformis Wang.)	1.0	0.9	0.5	0.8

both areas were less than 10% in frequency, density, and basal area and so were not considered as important in dominance in these communities.

CONCLUSIONS

The difference in the size relationship and numbers of the trees in the two areas result primarily from the moisture factor, influenced by slope, elevation, light, insulation, and evaporation. The forest in Area A, with ravines dissecting the area several different ways, is in a very moist situa-

tion located immediately adjacent to the southern end of Lake Wedington, whereas Area B incloses the south peak of Twin Mountains which are located approximately north of the Wedington Fire Tower. Because of the similarity of soil composition, both being largely composed of a gray limestone, which is the Boone Formation (5), it is felt that this is of no importance.

The disturbance factor in connection with the trees of the two areas is considered of no importance. This factor includes lumbering and hunting. Lumbering is not considered too important since neither area has been known to have been logged for at least the last 25 years. Hunting may have some bearing although it is doubtful that any correlation can be made since Area A, with more leaf-nests, has a higher hunting pressure due to being more accessible (closer to the paved road) than is Area B which is far back in the forest.

In Area A, there is a larger percentage of white and black oak than in Area B. Besides providing large trees that make good habitats for dens for squirrels, the white oak, particularly, produces very good mast (nut crop) which squirrels relish.

With the larger trees, larger number of trees, larger variety of trees, and with an increased variety of food, Area A begins to show some meaning in correlation to number of squirrel leaf-nests present. Though we could hardly point to any one factor and infer that it is the important factor, one could state that because of all of the more favorable interacting conditions of the prevailing community in Area A, there would be a greater abundance of squirrels and hence more leaf-nests than in Area B.

SUMMARY

1. A comparison study was undertaken to see if there was a correlation between the number of squirrel leaf-nests and size and species of trees in two different types of mixed oak forests; one in a mesic situation and the other in a xeric type.

2. Factors such as moisture, soil, and disturbances were taken into consideration.

3. Factors such as densities, frequencies, basal areas, and importance percentages of the trees were compared and it was found that there were more species, they were closer together, and

they had a larger over-all basal area in Area A as opposed to Area B.

4. There are approximately twice as many leaf-nests in one area (Area A) as the other (Area B).

5. It was concluded that no one factor was responsible for the difference in comparative numbers of leaf-nests, but that the interaction of all the conditions observed were responsible for the differences in the two communities; the result--Area A has a more favorable habitat for squirrels than Area B.

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