

OBSERVATIONS ON THE AVIFAUNA OF AN
OZARK PLATEAU

BY PHILIP S. CALLAHAN AND HOWARD YOUNG

ORNITHOLOGICAL studies in Arkansas, aside from special investigations of single species, have been primarily of a survey nature. Thus, while works covering the state as a whole have been published by Howell (1911), Wheeler (1924), and Baerg (1951), there are only a few published studies of specific habitat regions in Arkansas. Baerg (1927) worked in Logan County, and Smith (1915) and Black (1935) have reported on the southern portion of Washington County. This paper on the birds in an Arkansas Ozarks region may help fill the gap in published information on that area.

This work represents a portion of a thesis submitted by the senior author in partial fulfillment of the requirements for the degree of Master of Science in Zoology at the University of Arkansas. Most of the material on which the discussion is based was gathered during a period extending from June 21, 1952, to May 20, 1953. Field observations were made about once a week (41 trips), each trip lasting about four hours.

The study area was two square miles (T 16 N, R 32 W, Secs. 3 and 4) of wooded, hilly terrain in the northwestern corner of Washington County, Arkansas, on the Ozark plateau. It contains an artificial impoundment, Lake Wedington, formed in 1937. The total surface area of the lake is 81.5 acres (Owen, 1951).

Figure 1 shows the main plant communities of the region. The uplands are covered with rather sterile stands of mixed oak; *Quercus stellata* and *Q. marilandica* lead in abundance, and *Q. rubra*, *Q. velutina*, and *Q. macrocarpa* are the most numerous of the other species represented. These stands are primarily scrubby and quite monotypic, with a scanty understory. This upland oak community occupies about 61 per cent of the study area. The second major community is composed of flood plain species occupying low areas near the lake and along the streams. Conspicuous species in this more varied area are sycamore (*Platanus occidentalis*), river birch (*Betula nigra*), black willow (*Salix nigra*), sweet gum (*Liquidambar styraciflua*), winged elm (*Ulmus alata*), water locust (*Gleditsia aquatica*), bodark (*Maclura pomifera*), persimmon (*Diospyros virginiana*), sassafras (*Sassafras albidum*), redbud (*Cercis canadensis*), buttonbush (*Cephalanthus occidentalis*), grape (*Vitis* spp.), and others. This community occupies about 10 per cent of the study area.

The bulk of the remainder of the land is covered by scattered

plantings of southern short-leaf pine (*Pinus echinata*) and open grassy areas in which "broom sedge" (*Andropogon virginicus*), ragweed (*Ambrosia* spp.), foxtail (*Alopecurus* spp.), and Queen Anne's lace (*Daucus* sp.) are typical plants.

Elevation on the study area varies from 1100 to 1250 feet.

Composition of the Wedington Avifauna.—One hundred and thirty-five species have been reported from the Wedington area, 69 of which are probable breeders (18 permanent residents), 11 of which can best be classified as winter residents, and 55 of which are mainly represented by transient individuals.

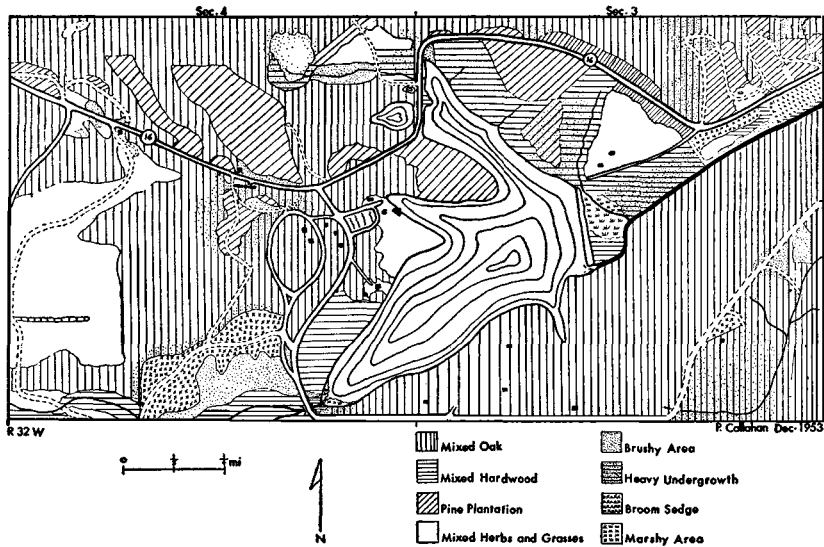


FIGURE 1. The Wedington Area, Washington County, Arkansas.

The techniques of the study did not include any searching for nests, and only a few species were definitely known to be breeding on the study area. Those generally considered as breeders for this region (Baerg, 1951) were so listed. Some difficulty arose in assigning species to any one of the categories listed above, since some forms (e.g., Blue Jay, *Cyanocitta cristata*) apparently include both migratory and sedentary individuals, and in other cases the behavior of a species was irregular. Thus Harris's Sparrow (*Zonotrichia querula*) at times appears to be a common winter resident in northwestern Arkansas, and at other times is not found. All species were eventually assigned to one of the categories; generally speaking Baerg (*op. cit.*) was followed in determining the status.

As in commonly found on such studies on inland areas (Anderson, *et al.*, 1941; Salt, 1953; etc.) the passeriform species were most numerous. Of the 135 species seen, 77 (57 per cent) were passerine. Within this group the Parulidae (18 species) and the Fringillidae (17 species) were the best represented. Among non-passeriform birds the Anatidae with 18 species, all transients or winter residents, making temporary use of the lake, and the Picidae (7 species) were most numerous. A total of 35 families was recorded, with an average of 3.9 species per family utilizing the Wedington area. This small list for a year's observation is typical for the region and is indicative of the generally impoverished fauna of this area. All species common enough to be of ecological significance were observed.

Frequency of Occurrence.—By means of a seasonal breakdown, the relative abundance of various species in the following groups was noted: permanent residents, winter residents, and summer residents. Owing to the rapid shifting of transient populations, a frequency analysis of these species did not seem practical.

The techniques used were similar to those of Linsdale (1928); however, the number seen per hour of observation was used as a basis for comparison. The recommendation of Dice (1930) was also followed, and the frequency comparisons were made on separate habitat lists. This restricted the analysis, since only the flood plain habitat had a varied enough avifauna to make analysis worthwhile. Inasmuch as this habitat was by far the richest in bird life, the inclusion of data from other habitats would not greatly alter the picture. These data are presented in tables 1, 2, and 3; permanent residents are included in all three tables.

The Carolina Chickadee (*Parus carolinensis*) and the Crow (*Corvus brachyrhynchos*) were the species most frequently recorded (table 1). The conspicuousness of these species is matched by other permanent residents, and we feel that the analysis quite accurately indicates their relative abundance. The low incidence of Bobwhite (*Colinus virginianus*) in this particular area had been previously noted by Baerg and Warren (1949).

Table 1 includes data from the entire period of observation. When only the winter period is considered (table 2), there is in some forms a decrease in the average number of individuals seen per hour (e.g., Carolina Chickadee, Crow); in others, such as the Bobwhite and the Robin (*Turdus migratorius*), there are indications of increase. Not all of this can be ascribed entirely to changes in population densities; loss of foliage from trees and bushes and changes in the

activities of the various species would cause unmeasurable variations in their conspicuousness, and therefore in the probability of their discovery during a census trip. Nevertheless, it seems logical to conclude on the basis of these data, that the Flicker (*Colaptes auratus*), for example, is more abundant during the winter in this region than the Red-bellied Woodpecker (*Centurus carolinus*), and in general that the table approximates the relative abundance of the various species. The four most common species here in winter are permanent residents; the most abundant of the species which are present only as winter residents, the Song Sparrow (*Melospiza melodia*), was seen on less than half the winter trips.

Only the summer records are considered in table 3. Here again the relative abundance of the permanent residents is apparent; five of the first six species falling in this category. The Green Heron (*Butorides virescens*), most common of those species present only during the breeding season, was seen only on slightly more than half the summer trips.

Census lists of this sort frequently follow Raunkiaer's Law of Frequency. The fact that tables 1, 2, and 3 do not conform to this distribution is probably a reflection of sample size. The distribution of course will also be influenced by any lack of randomness in the sampling. Preston (1948) gives a detailed discussion of the interpretation of data of this sort. Without going into extensive analysis, however, it is still possible to note certain clear points. All three tables show that those species seen most frequently were generally seen in the greatest numbers. Furthermore, as shown in table 3, where the data are most adequate, those species seldom seen and seen in small numbers greatly outnumber those frequently seen in large numbers. This is a commonly observed phenomenon (Linsdale, 1928; Preston, 1948).

Mallards (*Anas platyrhynchos*) and Lesser Scaup (*Aythya affinis*) were the waterfowl most frequently seen and were represented by the greatest number of individuals.

Habitat Preference.—On every census trip, one hour each was spent in the upland oak and flood plain communities, and one-half hour each was spent in the grassy areas and the pine plantations. These latter two areas were generally unproductive and easily covered, and it was felt that more time spent in them would not have resulted in significant additions to the species observed. Data gathered are presented in table 4 (waterfowl are omitted).

It can be seen that the greatest number of individuals and species

TABLE 1

FREQUENCY OF OCCURRENCE OF PERMANENT RESIDENTS OBSERVED ON WEEKLY TRIPS IN THE FLOOD PLAIN AREA (JULY 6, 1952, TO MAY 9, 1953).

<i>Species</i>	<i>Per cent frequency of occurrence</i>	<i>Average number per hour of observation</i>
Carolina Chickadee	93.40	3.60
Crow	93.40	2.77
Cardinal	90.00	4.90
Blue Jay	90.00	3.20
Flicker	56.60	.86
Carolina Wren	43.40	.76
Tufted Titmouse	43.40	.56
Downy Woodpecker	33.40	.33
Red-bellied Woodpecker	23.40	.40
Robin	13.30	.86
Hairy Woodpecker	6.60	.10
Belted Kingfisher	6.60	.06
Pileated Woodpecker	6.60	.06
Bob-white	3.30	.26

TABLE 2

FREQUENCY OF OCCURRENCE OF WINTER RESIDENTS OBSERVED ON WEEKLY TRIPS IN THE FLOOD PLAIN AREA (NOV. 1, 1952, TO FEB. 26, 1953).

<i>Species</i>	<i>Per cent frequency of occurrence</i>	<i>Average number seen per hour of observation</i>
Cardinal	77.00	3.46
Blue Jay	61.50	3.30
Carolina Chickadee	61.50	2.00
Belted Kingfisher	61.50	.69
Song Sparrow	46.10	1.54
Crow	38.40	.69
Slate-colored Junco	30.70	2.07
Flicker	30.70	.38
Downy Woodpecker	30.70	.23
Wilson's Snipe	23.00	.53
Tufted Titmouse	23.00	.23
Carolina Wren	23.00	.23
Robin	15.40	1.46
Bob-white	15.40	1.30
Fox Sparrow	15.40	.23
White-throated Sparrow	7.70	.23
Red-tailed Hawk	7.70	.23
Sharp-shinned Hawk	7.70	.07
Pileated Woodpecker	7.70	.07
Harris's Sparrow	7.70	.07
Red-bellied Woodpecker	7.70	.07

TABLE 3

FREQUENCY OF OCCURRENCE OF SUMMER RESIDENTS OBSERVED ON WEEKLY TRIPS
IN THE FLOOD PLAIN AREA, JULY 6, 1952, TO SEPTEMBER 28, 1952,
AND MARCH 26, 1953, TO MAY 9, 1953.

<i>Species</i>	<i>Per cent frequency of occurrence</i>	<i>Average number seen per hour of observation</i>
Carolina Chickadee	69.23	2.62
Cardinal	61.54	2.23
Blue Jay	61.54	2.31
Green Heron	53.85	.77
Red-bellied Woodpecker	53.85	.62
Crow	53.85	1.46
Belted Kingfisher	46.15	.69
Phoebe	46.15	.92
Catbird	46.15	1.31
Field Sparrow	46.15	2.77
Mourning Dove	38.46	.54
Chimney Swift	38.46	1.77
Red-winged Blackbird	38.46	1.92
Blue Grosbeak	38.46	1.00
Turkey Vulture	30.77	1.23
Blue-gray Gnatcatcher	30.77	1.15
White-eyed Vireo	30.77	.46
Yellow-breasted Chat	30.77	.54
Indigo Bunting	30.77	.54
Barn Swallow	23.08	.62
Brown Thrasher	23.08	.31
Blue-winged Warbler	23.08	.38
Prairie Warbler	23.08	.46
Great Blue Heron	15.38	.15
Spotted Sandpiper	15.38	.38
Yellow-billed Cuckoo	15.38	.38
Ruby-throated Hummingbird	15.38	.31
Pileated Woodpecker	15.38	.15
Wood Pewee	15.38	.62
Tufted Titmouse	15.38	.77
Carolina Wren	15.38	.23
Wood Thrush	15.38	.23
Red-eyed Towhee	15.38	.31
Cowbird	15.38	.77
Red-eyed Vireo	15.38	.15
Louisiana Water Thrush	15.38	.15
Kentucky Warbler	15.38	.31
Cooper's Hawk	7.69	.08
Broad-winged Hawk	7.69	.15
Whip-poor-will	7.69	.08
Nighthawk	7.69	.62
Flicker	7.69	.08
Red-headed Woodpecker	7.69	.08
Downy Woodpecker	7.69	.15
Kingbird	7.69	.69
Mockingbird	7.69	.08
Robin	7.69	.38
Bluebird	7.69	.23
Black and White Warbler	7.69	.08

occurred in the flood plain community. Although it comprised only 10 per cent of the study area, 57 per cent of the species found occurred in it. As compared to the other areas, the proximity to water and the greater diversity of vegetation, including a varied undergrowth, made this the most heavily utilized habitat in the study region. Field observations indicated that more potential nesting sites and a varied fruit and invertebrate food supply were available to species utilizing this area.

The sterility of the upland oak region (61 per cent of the total area) is shown by the fact that only 37 per cent of the species were found in this habitat. As previously noted, there is little variety in these stands as far as the life form of the plants is concerned, and the undergrowth is scanty. Arend (1948) found that only from 2.5 per cent to slightly more than 3 per cent of the oak forest floor

TABLE 4
SPECIES AND INDIVIDUALS OBSERVED IN FIVE WEDINGTON AREA HABITATS.

<i>Habitat</i>	<i>Number of</i>		<i>Per cent of Total</i>	
	<i>Individuals</i>	<i>Species</i>	<i>Individuals</i>	<i>Species</i>
Upland Oak	409	43	17.2	37
Flood Plain	1107	66	47.2	57
Grass Areas	254	23	10.7	20
Lake Edge and Marsh	522	25	21.5	22
Pine Plantations	81	24	3.4	21
Total	2373	115	100.0	100.0

in this general region was covered with herbaceous and/or shrubby plants.

There are certain variables present in any field census of this sort, which must be considered in interpreting the results. The data in table 4 are based on sight records, and this eliminates the variable of calls and songs of different volume or frequency. Obviously however, some birds are much more conspicuous than others. Howell's (1951) careful study gives us some measurement of the variability among species in this respect. The extent to which the visibility of any given species would vary from habitat to habitat is less well known; because of the denser brush, observation was most difficult in the flood plain region, so any error in these comparisons would probably tend to lessen the contrast between this and the other habitats.

The most sterile of the habitats censused was that formed by the pine plantations; only 81 individuals of 24 species were recorded there during the entire period of the study. Kendeigh (1945) men-

tions the accumulation of sterile needle-layers under evergreen forests, which are typically poor in food supply. This raw, persistent, and slowly decomposing accumulation of needles, commonly called "mor" by pedologists, was very abundant under the pine stands at Wedington. There was no cover for ground-nesting birds in these stands, and very few ground-utilizing species were observed there. The only birds seen feeding in these stands were woodpeckers.

In table 5 a "coefficient of community" (Jaccard, 1928) is derived by dividing the number of species common to any two habitats by the total number of species found in both habitats. Two areas having identical avifauna would result in a coefficient of 1.00. Reference to this table shows that the most homogeneous populations were those in the mixed oak and flood plain areas. The similarity in life form of the dominant plants in these habitats is possibly of some significance in this respect. The area of herbs and grasses

TABLE 5
COEFFICIENT OF COMMUNITY BETWEEN FOUR WEDINGTON HABITATS.

	<i>Flood plain</i>	<i>Upland oak</i>	<i>Grass areas</i>	<i>Pine plantations</i>
Flood plain	—	.36	.32	.25
Upland oak	.36	—	.21	.32
Grass areas	.32	.21	—	.27
Pine plantations	.25	.32	.27	—

shows in general the least correlation with the other regions and has the most distinctive avifauna. Actually there are only small coefficients between any two habitats, suggesting definite habitat selection by the various species. However, there was very little absolute restriction to specific habitat type.

The Geographic Origin of the Wedington Avifauna.—Mayr (1946) classified the bird fauna of North America into 5 elements, according to their place of evolutionary origin. With reference to the Wedington avifauna, his groups can be roughly summarized as follows:

a. Unanalyzed element—including shore birds, raptors, woodpeckers, and some of the fresh water birds.

b. Pan-American element—hummingbirds, flycatchers, tanagers, and blackbirds.

c. Old World element—including the cuckoos, owls, thrushes, crows, kingfishers, nuthatches, kinglets, and titmice.

d. North American element—including vultures, quail, wrens, mockingbirds, gnatcatchers, waxwings, wood warblers, and emberizine finches.

e. South American element—including the richmondene finches.

None of these groups is precise; in some cases Mayr was forced by lack of evidence (e.g.—*Icteridae*) to make a tentative assignment to a category; in other cases a group had species in more than one category (e.g.—*Phasianidae*). Nevertheless he was able to show interesting variations in the composition of bird populations from various North American regions, and the analysis is of obvious value.

In applying Mayr's classification to the Wedington area, the data were treated in several ways. Table 6 shows the basic breakdown; it includes all species observed in any Wedington habitat, and the records are drawn from every season. The unanalyzed group includes over a third of the species, and in the case of transients and winter residents, unanalyzed species make up more than half

TABLE 6
WEDINGTON SPECIES FROM VARIOUS GEOGRAPHIC ORIGINS.

	Unanalyzed		North American		South American		Old World		Total	
	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent	Num-ber	Per-cent
Transients	29	21.5	17	12.6	—	—	9	6.7	55	40.7
Summer Residents	10	7.4	26	19.3	9	6.7	6	4.4	51	37.8
Winter Residents	6	4.4	5	3.7	—	—	—	—	11	8.1
Permanent Residents	2	1.5	2	1.5	1	.7	13	9.6	18	13.3
Total	47	34.8	50	37.0	10	7.4	28	20.7	135	100.0

the total. The largest single component of the Wedington avifauna (21.5 per cent) was unanalyzed transients. Many of these unanalyzed species are among the waterfowl; to make these data comparable to those of Mayr (*op. cit.*), such species were deleted from further analyses.

Table 7 shows the geographic origin of breeding passerine species at Wedington, compared with some areas previously analyzed by Mayr (slightly re-arranged), plus an additional analysis of a Wisconsin avifauna. The table is arranged with the northernmost areas at the top. As Mayr has pointed out, there is a gradual decrease in Old World species as one proceeds from the north to the south. While the Wisconsin and Arkansas data do not fit perfectly in this sequence, neither do they indicate any strong departure from the pattern. The various areas are not completely comparable, since the relative abundance of certain habitat types may affect the composition of an avifauna, aside from latitudinal position. The North American

element is well represented; with the exception of Alaska and Oregon, it forms over 50 per cent of the breeding species, and in Oregon nearly half of the breeding passerines belong to this group. It would require the analysis of additional areas to determine if the decrease of this element to the north and south is real or apparent. A suggestion of a cline is best shown in the distribution of the South American element. The discrepancy of the Wisconsin data in this sequence is explained by the fact that fresh-water marsh areas, which are inhabited primarily by indigenous North American species, made up a large part of the area censused.

Mayr also analyzed various habitats by comparing the number of individuals (breeding pairs) of different species from the various

TABLE 7
GEOGRAPHIC ORIGIN OF THE BREEDING PASSERINE SPECIES OF SEVERAL
DISTRICTS OF NORTH AMERICA, IN PER CENT.

Locality	North American	South American	Old World	Reference
Alaska	39	3	58	Mayr (1946)
Oregon	47	14	39	Mayr (1946)
Ontario	57	13	30	Mayr (1946)
Wisconsin	65	17.5	17.5	Anderson <i>et al.</i> (1941)
New Jersey	63	14	23	Mayr (1946)
Arkansas	57	19	24	This paper
Florida	59	20	21	Mayr (1946)
Sonora	52	27	21	Mayr (1946)

groups. Since a breeding census was not carried on at Wedington, we have no data comparable to his. Differences in the conspicuousness of various breeding species (Howell, 1951) should be taken into consideration in interpreting data such as these.

Analyzing Cruickshank's (1942) data for the New York region, Mayr found that 82 percent of the permanent residents (28 species) were of Old World origin. At Wedington, 13 (81 per cent) of the 16 permanent residents (unanalyzable species excluded) were of Old World origin. In a group of 67 summer resident species (New York) only 8 (11.9 per cent) were of Old World origin. Here the data are again similar, 6 (14.6 per cent) of 41 analyzable summer residents in the Wedington area being of Old World origin. Of 12 species from the South American element in New York, only the Cardinal (*Richmondia cardinalis*) was considered a permanent resident. The same species was the only permanent resident among the 10 species of South American origin observed at Wedington. Similarly, Mayr's analysis showed 76 per cent of the Old World element was composed of permanent residents, while only 8.3 per

cent of the North American species were non-migratory. At Wedington, 72 per cent of the species of Old World origin were permanent residents, and 11 per cent of the North American species were permanent residents.

These differences probably reflect the greater resistance of the Old World types to winter conditions, as suggested by Mayr. It is perhaps significant to note that while only 5 winter residents (which bred farther north) were analyzable at Wedington, all were of the autochthonous North American group.

The Wedington data in general agree very well with those of Mayr and support his thesis that as far as birds are concerned, a "North American region" is a more accurate zoogeographical term than "holarctic" or "neotropical." However, while Mayr tends to minimize the error resulting from the elimination of unanalyzable species, the authors feel it is sufficiently great to recommend caution in considering these data. For example, of all Wedington species observed, 35 per cent were unanalyzable in reference to their geographic origin, including 9 species (about 13 per cent of all breeders) which could be called common breeders.

Summary.—Northwestern Arkansas, in the Ozarks region, has a rather impoverished avifauna. Though birds are present in considerable numbers during the height of the migration seasons, there are only 18 permanent residents and 69 breeding species recorded for the Wedington area. This reflects the fact that the greater portion of the region (61 per cent of the study area) is covered by a relatively sterile upland oak association. The birds are most concentrated in the flood plain communities of river bottoms and valleys. While habitat selection was apparent, there was scarcely any total restriction to specific habitat types. Permanent residents were the most abundant species, but the greatest percentage of species seen were migrants or uncommon residents. Most were of North American origin.

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Department of Entomology, Kansas State University, Manhattan, Kansas, and Biology Department, Wisconsin State College, LaCrosse, Wisconsin.