AN EVALUATION OF GROUND NESTING BY MOURNING DOVES IN NORTHWESTERN OKLAHOMA

By

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INTRODUCTION

Ground nesting by the mourning dove (Zenaidura macroura) is not an unusual occurrence. A number of investigators have reported ground nests, and there has been one study devoted particularly to a ground nesting population in North Carolina (Hon, 1956).

The extent to which mourning doves nest on the ground as compared with the extent of nesting in trees has nowhere been explored carefully. Neither has any particular study been made of the contribution of ground nesting to the mourning dove population. While rare or unusual phenomena in themselves may not interest the wildlife manager, a nesting habit involving a large percentage of the population can be expected to be of considerable significance. An effort is made here to determine the extent of ground nesting and how this compares in magnitude and productiveness with tree nesting in a prairie region in northwestern Oklahoma. In addition, a program of increasing preferred nesting habitat is suggested.

Field work was begun March 20, 1956, and was continued without interruption until September 8, 1956. Due to considerable year to year variation in the effect of weather

on the environment of the study region, the conclusions, since they are based on a study of one nesting season, should be regarded as tentative. The location of field headquarters for the study was the U. S. Southern Great Plains Field Station at Woodward, with several study areas each in Woodward, Ellis, Harper, and Beaver counties in northwestern Oklahoma.

METHODS OF INVESTIGATION

Ground Nesting Investigations

Two methods were used to locate ground nests for study. A very fruitful method was the solicitation of help from each 4-H Club and FFA boy in the four counties. After the goals of the project were explained fully to each boy, he was given a postcard bearing the investigator's name and address with instructions to report any dove nest found on the ground. In addition, farmers, county agents, Soil Conservation Service personnel, Southern Great Plains Field Station employees, and other Cooperative Wildlife Research Unit graduate students working in the area reported a number of nests.

The second method of locating ground nests for study was a census of areas of typical vegetation. In the beginning, searching for nests was done on foot. For the most part, a series of permanently marked transect lines parallel to tree areas was traversed on foot weekly in search of ground nests. The success of this method was dependent on the flushing distance of nesting doves being great enough so that the area covered would be large enough to yield a sufficient sample. By May 10, 1956, however,

only two ground nests had been found by walking these transects. Although approximately thirty miles of transects were being walked each week, the flushing distance was so short that the area covered was too small. (One dove did not flush as the investigator passed within three feet of the nest.)

Since traversing the transects on foot did not yield satisfactory results, a flushing bar was constructed and mounted on the front of a pickup truck. The flushing bar consisted of 36 feet of two inch pipe from which were suspended pieces of cable or chain at two foot intervals. This bar, although quite heavy, was made to operate satisfactorily by mounting it flexibly to the pickup and providing it with a spring-and-cable support which allowed it to "give" rather than break when going over rough terrain.

This flushing bar was put to extensive use beginning May 18, 1956, and was used to census 19 different areas throughout the summer. Some areas were censused weekly, some were censused bi-weekly, and some were covered only once. Censuses were made by driving the pickup with flushing bar along slightly overlapping strips. When a dove was flushed, its nest was located and permanently marked. In this way, 1,184 acres were censused, some as many as 11 times during the summer, and 44 nests were found.

A detailed description of each nest site was made. The direction and distance from a house, tree, road, fence, or high-line wire also were recorded for each nest. Data on the contents of each nest, including its fate and significant information about the nest site, were entered on Keysort cards for future analysis. The nests were revisited each week until they were no longer in use.

Tree Nesting Investigations

The history and success of a number of tree nests were obtained by weekly visits to two areas which were known to contain a large number of nests. The first of these areas was the Getz farmstead in Beaver County which was studied previously by Dodson (1953) and found to harbor a high nesting population of mourning doves. The second tree area was one in which the first nests of the season were found, and one which, judging from the number of doves using the area, promised to produce a large number of nests. This area was a wooded canyon on the Vickery ranch near the Woodward-Major county line.

Nesting densities for small tree areas were determined by devoting the week beginning July 29, 1956, to a count of active nests in twenty such areas. A tree nesting density based on approximately 67.5 acres thus was obtained for comparison with the ground nesting densities which had been obtained through the use of the flushing bar.

DESCRIPTION OF THE STUDY AREA

Climate

The climate of the four counties of northwestern Oklahoma, Beaver, Harper, Ellis, and Woodward, in which this study was carried out is of the continental type and is drier than that found in other parts of the state (U. S. Dept. of Agric., 1941).

During 1956, the Woodward weather station reported that, during the months of this study, March to September, low temperatures of 14 degrees F. were recorded on March 13, 25 degrees F. on April 11, and the last reading of 32 degrees F. on April 20. Throughout the area, the length of the frost-free season is about 190 days. Extreme high temperatures of 108 degrees F. were reported during August at most weather stations in the area. The Gage CAAP weather station reported a high of 108 degrees F. as early as June 30.

Rainfall at Woodward was above average during the months of June, July, and August, but was considerably below average during the months of March, April, and May. Summer rains generally are in the form of scattered showers. Records from a single station are not likely to be

descriptive of the entire area. Beaver City, for instance, recorded above average rainfall for only one month, July.

Physiography

The physiography of the region is varied. The physical types recognized in the region are the high plains, the eroded plains and the rolling sand hills found along the north sides of the principal streams. The prevailing southerly winds have been responsible for the deposit of extensive sand dunes in these areas (Finnell, 1939).

With the exception of the eroded plains, where hard lands prevail, the soils of the region are permeable and are not subject to severe run-off. Wind erosion, however, is severe and largely dictates land use. For the most part, the sandy soils are pastured. The eroded plains, and especially the high plains, are cultivated extensively. It is here that wheat is the principal crop.

Vegetation

As would be expected, the vegetation types follow the soil types very closely. The eroded plains and the high plains originally were mainly in grass but now are mostly cultivated. The mantle of rolling sand hills supports two principal vegetation types--shin oak and sandsage. Some of

the principal plant species to be found in each vegetation type are described by Duck and Fletcher (1944).

Since a comparison of ground nesting with tree nesting has been made, a brief description of the tree areas of northwestern Oklahoma is also in order. In presettlement days, trees were restricted largely to water courses. The early settlers, particularly of Woodward and Ellis counties, planted large numbers of black locust seedlings for wood and for fence post production. These locusts were planted in one to five-acre plots about houses or within the pastures. The use of ornamentals and fruit trees in farmyards and the planting of shelterbelts also have contributed to trees being found outside of the bottomlands. The acreage of all tree areas combined, however, is very small when compared with the expanses of treeless areas.

RESULTS OF INVESTIGATION

Distribution of Ground Nests

Ground nests of the mourning dove were found on flat areas and on gentle and precipitous slopes. No particular direction or degree of slope seemed to be preferred over any other.

Nests were found in cover which was dense, as in the case of sandsage and shin oak, and sparse, as in the case of grassland and wheat stubble. All nest sites were situated so that they were surrounded largely by some type of vegetation. Overhead cover or shade, however, did not appear to be essential. In general, every area studied seemed to offer an abundance of possible ground nest sites.

The distance from trees at which nests were placed (Table I) is pertinent to this comparison of ground nesting and tree nesting. Although the majority of the ground nests were found within one-fourth of a mile from a tree, it should be pointed out that in many cases it was not possible to get more than one-fourth of a mile from a tree, and only rarely was it possible to get more than one mile from a tree. For this reason, there is no real basis for saying that the distribution of trees had any effect on the distribution of ground nests.

TABLE I

DISTRIBUTION OF GROUND NESTS OF THE MOURNING DOVE BY TREE DISTANCE CLASSES, NORTHWESTERN OKLAHOMA, 1956

	Distance from nest to nearest tree				
	0 - 50 yds.	50 - 200 yds.	200 yds. - 1/4 mi.	1/4 mi. - 1 mi.	More than 1 mi.
Number nests	27	35	31	21	16

It had been thought that the distribution of ground nests might be affected by the distribution of water. However, the distribution of water apparently has no effect on the distribution of nests since a watering place usually is provided within each square mile for the use of livestock. Moreover, Merriam (1886) has reported that mourning doves will fly three to five miles to water, distances far greater than doves need to fly to obtain water in the region under study.

Comparative Densities of Ground Nests and Tree Nests

The fact that 130 ground nests were found during this study suggests that ground nesting by mourning doves is prevalent in northwestern Oklahoma. Table II and Table III summarize the densities of breeding pairs occupying the ground nesting and tree nesting areas, respectively, which were surveyed.

TABLE II

KNOWN DENSITIES OF GROUND NESTS AND APPARENT NUMBER OF BREEDING PAIRS OF MOURNING DOVES, NORTHWESTERN OKLAHOMA, 1956.

Landowner	Veg. Type	Acreage	No. of Censuses	Total No. of Nests	Apparent No. Breeding Pairs	Breeding Pairs per Acre
Jacks	Shin oak	40	11	4	2	.050
Jacks	Shin oak	40	3	1	1	.025
Jacks	Shin oak	40	10	7	3	.072
Berryman	Shin oak	160	1	2	2	.013
Knowles	Shin oak	65	1	4	4	.061
Getz	Short grass	205	1	1	1	.005
Bittman	Mixed grass	80	6	1	1	.013
Polin	Mixed grass	40	6	3	1	.025
Vickery	Mixed grass	40	6	1	1	.025
Wolf	Salt grass	40	5	3	2	.050
Wolf	Sandsage	40	5	1	1	.025
Laubhan	Sandsage	31	1	1	1	.032
Laubhan	Sandsage	55	1	5	5	.091
Randall	Sandsage	50	5	6	3	.060
Heglin	Wheat stub.	55	1	-	-	-
Woods	Wheat stub.	43	1	-	-	-
Drake	Wheat stub.	63	4	2	2	.032
Pierson	Wheat stub.	35	1	-	-	-
Cooper	Wheat stub.	62	1	-	-	-
		1,184		42	30	.025

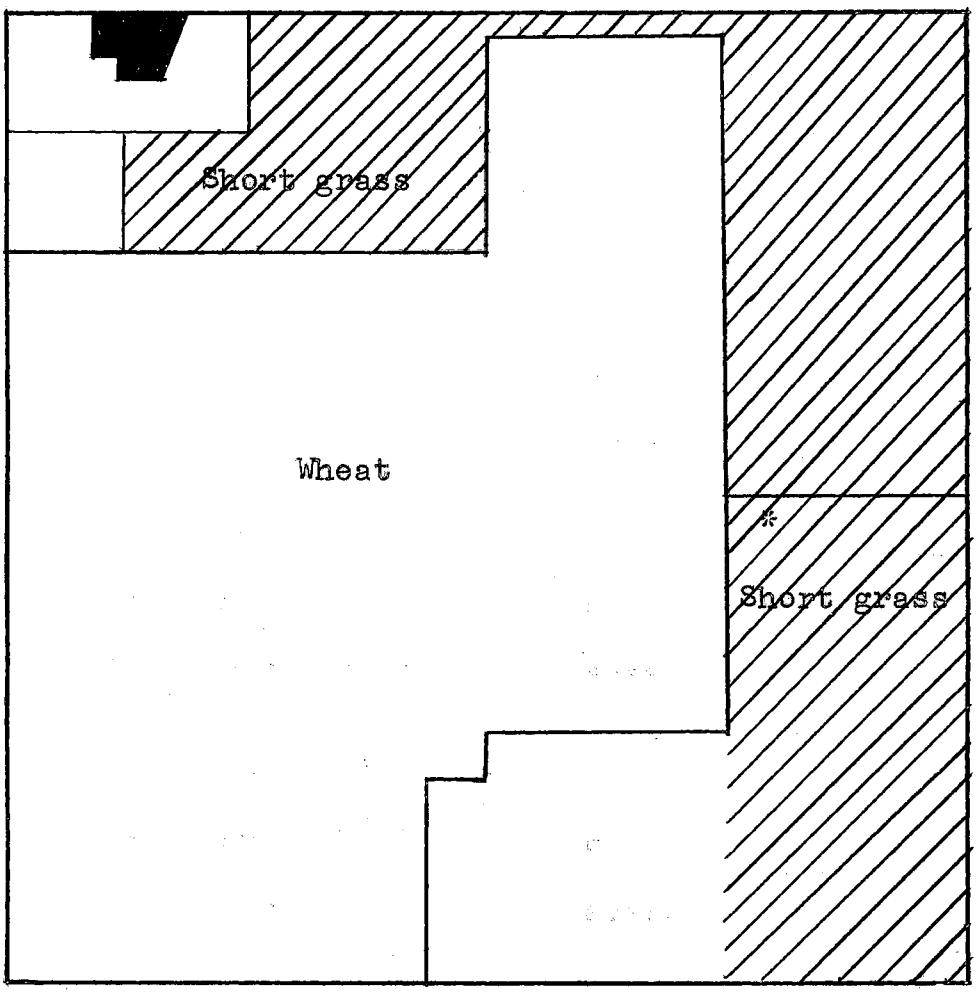
TABLE III

KNOWN DENSITIES OF TREE NESTS AND APPARENT NUMBER OF BREEDING PAIRS OF MOURNING DOVES, NORTHWESTERN OKLAHOMA, 1956.

Landowner	Type Area	Acreage	No. of Censuses	Total No. of Nests	Apparent No. Breeding Pairs	Breeding Pairs per Acre
Getz	Farmstead and orchard	3.0	20	88	38	12.67
Miller	Farmstead	1.0	1	2	2	2.00
Miller	Farmstead	1.0	1	5	5	5.00
Trimmell	Farmstead	1.0	1	-	-	-
Yauk	Farmstead	2.0	1	6	6	3.00
Lintner	Farmstead	2.0	1	1	1	.50
Eike	Farmstead	1.0	1	2	2	2.00
Randall	Locust grove	.5	1	-	-	-
Phillips	Locust grove	2.5	1	2	2	.80
Wolf	Locust grove and farmstead	6.0	1	16	16	2.67
Jacks	Locust grove and farmstead	2.5	1	9	9	4.50
Getz	Shelterbelt	2.0	1	-	-	-
Woods	Shelterbelt	3.0	1	3	3	1.00
Webb	Shelterbelt	6.0	1	4	4	.67
Heglin	Shelterbelt	3.0	1	2	2	.67
Vickery	Wooded canyon	10.0	20	41	22	2.20
Holloway	River flat	6.0	1	-	-	-
Berryman	Shin oak mott	2.5	1	9	9	3.60
Jacks, etc.	25 oak motts	12.5	1	-	-	-
U. S. Gov't.	Natural grove	.5	1	-	-	-
		67.5		190	122	1.80

The ground nesting density of .025 breeding pairs per acre noted in northwestern Oklahoma (Table II) is roughly comparable to the ground nesting density of .03 breeding pairs per acre noted in coastal North Carolina by Hon (1956).

Areas in which trees are available for nesting, on the other hand, are used to such an extent that an average density of 1.80 breeding pairs per acre was found (Table III). It should be pointed out that a tree area which harbors a dense nesting population of doves does not, in most cases, provide total support for that population. In other words, doves which nest in small tree areas, such as the Getz farmstead, may have to range far outside that tree area to obtain sufficient food, water, and nest material. The present knowledge of mourning dove movements does not permit the delineation of the bounds of the area utilized by individual doves, much less of the area on which a large and concentrated nesting colony makes its living. Figure 1 shows the Getz farm study area in Beaver County, Oklahoma. On June 4, 1956, this area contained 11 active nests in the three acres of trees about the farmstead, while the contiguous 205 acres of short grass prairie contained only one ground nest.



Getz farmstead and orchard
Scale: 5" = 1 mile
205 acres short grass censused with flushing bar
Location of ground nest

Figure 1. The Getz farm study area in Beaver County, Oklahoma, showing relative densities of tree nests and ground nests of the mourning dove. On June 4, 1956, the 205 acres of short grass contained one nest while the three-acre farmstead and orchard contained 11 nests.

Colonial nesting tendencies of this sort have been noted previously for tree areas in the southwest (Dodson, 1953; and Jackson, personal communication), but they are rare in the southeast. Hon (1956) found grouping of ground nests near the centers of several small coastal islands in North Carolina. However, no ground nest was found within 200 yards of any other ground nest in northwestern Oklahoma.

The most striking feature shown in Table III is the high density of breeding pairs that was noted for tree areas. The fact that a great difference was noted in nesting densities between individual tree areas indicates that doves probably have a decided preference for certain forms or patterns of trees. While concrete differences are not apparent between the types of tree areas in Table III, those areas having the greater densities of breeding pairs were those in which the trees generally were spaced openly.

A summary of the ground nesting densities (Table IV) shows that certain types are used more frequently for nesting than are others. Sandsage and shin oak had higher densities of breeding pairs than grasslands or wheat stubble.

TABLE IV

DENSITIES OF BREEDING PAIRS OF MOURNING DOVES BY VEGETATION TYPES, NORTHWESTERN OKLAHOMA, 1956

Vegetation Type	Acreage	Number Breeding Pairs	Breeding Pairs per Acre
Sandsage	176	10	.057
Shin oak	345	12	.035
Grasslands	405	6	.015
Wheat stubble	258	2	.008
	1,184	30	.025

Comparative Fecundity Rate

The fecundity rate of the mourning dove, since the species usually makes more than one nesting attempt per season, is the product of the average clutch size multiplied by the average number of nesting attempts.

Clutches of two eggs were the most frequent (Table V), and clutches of one and three eggs were comparatively uncommon. Several nests containing only one egg were not considered here because they were deserted or were destroyed before it was possible to determine if the single egg represented a complete clutch.

The averages of the numbers of eggs per clutch observed in ground nests and in tree nests are almost identical, as there was a difference of only .03 separating the extremes. It is evident, therefore, that no significant difference

exists in the number of eggs per clutch laid in ground nests and in tree nests.

TABLE V

FREQUENCY OF CLUTCH SIZES OF THE MOURNING DOVE IN OKLAHOMA, 1956

Nest Site	Number Eggs per Clutch 1	2	3	Average Clutch
Ground	4	117	1	1.98
Trees (Vickery Canyon)	1	41	1	2.00
Trees (Getz farmstead)	6	95	7	2.01

There is no reason to believe that ground nesting doves make fewer nesting attempts than do tree nesting doves. Table VI, for instance, shows rather clearly that a nesting season of short duration, as would be expected of a population of birds making only one nesting attempt per season, does not exist in northwestern Oklahoma for either ground nesting or tree nesting doves. In fact, the period of time covered by this distribution of nests (Table VI) gives no indication of any difference in the number of nesting attempts per pair of doves whether they nest on the ground or in trees.

TABLE VI

DATES OF NESTING STARTS OF THE MOURNING DOVE
IN NORTHWESTERN OKLAHOMA, 1956.

	Nests Begun During Week Beginning																											
	March		April					May				June				July					August			
	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26
Type of Nest																								
Ground nests	-	1	2	2	3	9	8	14	7	7	7	10	10	8	6	7	-	9	5	4	5	5	-	2
Tree nests	1	1	2	2	1	7	8	9	15	6	4	7	7	10	3	10	14	12	11	12	8	12	4	2

The reason for a dove using a ground nest only once is, on the other hand, unknown. A factor which certainly should not be overlooked is the comparative condition of ground nests and tree nests following the fledging of the young. Nestling doves raised in ground nests apparently defecate directly onto the nest, resulting occasionally in their being completely covered with droppings. In tree nests, however, nestlings usually defecate from the edge of the nest onto the ground below.

On the other hand, mourning doves do not seem prone to re-nest in an unsuccessful nest. Of the unsuccessful tree nests found during the study, only 12.1 per cent were re-used, whereas 40.2 per cent of those previously successful were re-used. This apparent tendency of mourning doves to build new nests after unsuccessful attempts, combined with the fact that some successful ground nests may not be in a condition to be re-used, may explain why many ground nests are used only once.

Comparative Nesting Success

Although ground nests and Vickery Canyon tree nests showed very nearly the same degree of success, 29 per cent and 30 per cent, respectively, trees about the Getz farmstead were almost twice as successful with an over-all success of 56 per cent (Table VII).

TABLE VII

MOURNING DOVE NESTING SUCCESS CUMULATIVELY BY WEEKS, NORTHWESTERN OKLAHOMA, 1956.

	Nests Begun Before																				
	April					May				June				July					August			
	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26
Getz farmstead																						
No. nests					4	5	10	13	14	20	26	35	38	47	60	72	82	94	102	113	118	120
% Success					0%	20%	40%	46%	50%	55%	62%	66%	66%	66%	67%	68%	68%	68%	65%	60%	57%	56%
Vickery canyon																						
No. nests	4	6	7	14	17	26	36	38	40	43	44	44	44	45	45	45	47	47	47	47	47	47
% Success	50%	50%	57%	43%	47%	38%	36%	34%	33%	30%	30%	30%	30%	29%	29%	29%	30%	30%	30%	30%	30%	30%
Ground nests																						
No. nests	1	3	5	8	17	25	39	46	53	60	70	80	88	94	101	101	110	115	120	125	130	131
% Success	100%	67%	40%	38%	24%	32%	25%	26%	28%	27%	27%	26%	25%	24%	27%	27%	26%	27%	27%	29%	29%	29%

It is not possible to say for certain why such a difference in success was experienced between the Vickery Canyon and the Getz farmstead. There is, however, one fact which may help to explain this phenomenon. It should be noted from Table VIII that, although nesting in the Vickery Canyon got underway six weeks in advance of nesting on the Getz farmstead and reached a high level of nesting intensity quite early, it had virtually ceased by June 10, 1956. This cessation of nesting in the Vickery Canyon was accompanied by the movement of practically all doves from the area.

The differences in nesting success between these two tree areas is believed to be caused by a difference in the effective length of the nesting season. There were 10 or more active nests in the Vickery Canyon for only four weeks while there were 10 or more nests in the Getz farmstead for 13 weeks. The higher success usually is experienced during the high "plateau" of nesting intensity (Lack, 1954). Since a high plateau was much shorter in comparison with the rest of the nesting season in the Vickery Canyon than at the Getz farmstead, it is not surprising that success in the Vickery Canyon was so much lower. No such comparison can be made between these two groups of tree nests with ground nests, however, because ground nest hunting intensity was not uniform. Similar comparisons of ground nesting and tree nesting in other years and other regions are needed to compare adequately ground nesting success with that of tree nesting.

TABLE VIII

ACTIVE NESTS OF THE MOURNING DOVE BY WEEKS,
NORTHWESTERN OKLAHOMA, 1956.

	Week Beginning																										
	March		April					May				June				July					August				Sept.
	18	25	1	8	15	22	29	6	13	20	27	3	10	17	24	1	8	15	22	29	5	12	19	26	2
Ground nests		1	3	5	5	13	16	25	21	19	17	21	22	19	18	17	7	14	11	10	11	11	9	9	1
Vickery canyon	1	2	4	5	4	9	10	14	22	13	8	8	2			1	1		2	1	1	1			
Getz farmstead							4	5	7	9	9	12	14	20	16	24	29	31	37	38	34	32	27	13	1

Only one other study (Hon, 1956) has produced any data on the success of ground nesting doves. Hon's success of 33 per cent is very nearly the same as that of 29 per cent observed in this study. Hon made no comparisons of ground nesting success with that of tree nesting, but he surmised that tree nesting success in the area of his study (coastal North Carolina) was probably higher than that of ground nesting since many losses of ground nests were due apparently to desertion, a factor of lesser importance in tree nesting.

The cause of nest loss is often indeterminable. In 75 per cent of the unsuccessful ground nests and in more than 80 per cent of the unsuccessful tree nests, it was not possible to determine the cause of loss. Human activities, weather, predation, and desertion all appeared to contribute to nest loss in this study.

Weather, reported by McClure (1943) and Dodson (1953) to have been responsible for the loss of tree nests, apparently did not cause the loss of any ground nests. The frequent high winds, which destroyed six tree nests about the Getz farmstead, had little or no noticeable effect on nests at ground level. Although ground nests are found frequently in flat areas, they usually are placed slightly above the level of the surrounding ground, either on natural mounds of soil or on accumulations of dead vegetation. Much of the soil was sandy, and the locally heavy rainfall seemed

to soak in before enough water accumulated to inundate the nests. In comparing the other causes of nest loss, no significant difference between their effects on ground nesting and tree nesting was detected.

The rate of nest loss was quite different between the nests containing eggs and the nests containing young. It should be noted also (Table IX) that the ratio of egg-loss to nestling-loss is lower for ground nests than for tree nests. This difference, though slight, could have been brought about by the rate of egg-loss being higher for tree nests than for ground nests and/or the rate of nestling-loss being higher for ground nests than tree nests. Whether the nest is in a tree or on the ground, however, it has a much better chance of successfully fledging young once the eggs hatch.

TABLE IX

LOSSES OF NESTS OF THE MOURNING DOVE AT DIFFERENT STAGES OF ADVANCEMENT, NORTHWESTERN OKLAHOMA, 1956

Study Area	Attempts	Successful	Lost W/eggs	Lost W/yg.	Ratio of Egg-loss to Nestling-loss
Ground nests	131	29.0%	57.3%	13.7%	4.2 - 1
Getz farmstead	120	55.8%	36.7%	7.5%	4.9 - 1
Vickery Canyon	47	30.0%	59.4%	10.6%	5.6 - 1

Comparative Production of Young

On the average, the 67.5 acres of trees censused in northwestern Oklahoma contained 1.80 breeding pairs of mourning doves per acre (Table III). The Agricultural Census (U. S. Department of Commerce, 1954) states that there are 10,808 acres of woodland in the four counties under study. In addition, there are 4,043 farmsteads, each of which is surrounded by approximately one acre of trees. If the resulting 14,850 acres of trees are multiplied by 1.80 breeding pairs per acre (Table III), the product, 26,730 is an estimation of the number of pairs of doves nesting in trees in the region.

The acreage given in the Agricultural Census of 1954 can be subdivided according to the proportions of the various vegetation types given by Duck and Fletcher (1944). In 1954, there were approximately 1,149,000 acres of grasslands, 672,640 acres of sandsage, and 273,280 acres of shin oak which were available for ground nesting. If each category, grassland, sandsage, and shin oak, is multiplied by the average density of breeding pairs per acre, .015, .057, and .035, respectively (Table II), the resultant sum, 64,760, is an estimation of the number of pairs of doves nesting on the ground.

The number of breeding pairs in trees and on the ground can be modified by nesting success to arrive at a comparison

of the number of young produced by the two population segments. The estimated number of ground nesting pairs, 64,760, multiplied by the per cent success experienced on the ground, 29 per cent, yields a figure 1.46 times as large as the product of the estimated number of tree nesting pairs, 26,730, multiplied by the per cent success in trees, 48 per cent. Ground nesting, therefore, produced an estimated 59 per cent of the young mourning doves in northwestern Oklahoma.

This comparison of production in trees and on the ground can be carried further to include subdivisions of both ground nesting types and tree nesting types on a unit area basis (Table X). It should be borne in mind that high or low indicated production in some categories may be the result of relationships with other categories. For instance, sandy lands are indicated here to have high ground nest production. This high indicated production on sandy lands may be related to the fact that the highest production according to vegetation types was in sandsage and shin oak, two high production types occurring on sandy lands.

TABLE X

PAIRS OF MOURNING DOVES NESTING SUCCESSFULLY ARRANGED ACCORDING TO HABITAT TYPES, NORTHWESTERN OKLAHOMA, 1956

Habitat type	Breeding Pairs per Acre	Nesting Success	No. Pairs Nesting Successfully per 100 acres
Trees - over-all	1.80	48%	86.40
Openly spaced	2.85	48%*	136.80
Closely spaced	.66	48%*	31.68
Within cultivated area	3.57	48%*	171.36
Within partly cultivated area	1.65	48%*	79.20
Within uncultivated area	1.23	48%*	59.04
Ground - over-all	.025	29%	.72
Sandsage type	.057	23%	1.31
Shin oak type	.035	33%	1.15
Grasslands	.015	31%	.46
Sandy lands	.042	28%	1.17
Hard lands	.012	28%	.33

*Estimate based on over-all average

DISCUSSION

A ground nesting density of .025 breeding pairs of mourning doves per acre was noted for the areas censused in northwestern Oklahoma in 1956 (Table II and Table IV). This density compares unfavorably with the tree nesting density of 1.80 breeding pairs per acre of trees censused in the same region at the same time (Table III). Since it can not be shown that factors such as the availability of ground nesting cover, the distribution of water, or the distribution of trees (Table I) limit the extent of ground nesting, it is assumed that this great difference in nesting densities is an expression of preference for tree nesting sites. In the majority of the cases, where trees are available, they are used much more heavily for nesting than are contiguous treeless areas.

A significant difference among tree and ground nesting success also was noted in this study. An average success of 29 per cent was observed for the ground nests as opposed to 48 per cent success for the tree nests (Table VII). Comparisons of nesting success on the ground with that in trees, however, must be made with reservation due to the variation which may occur between different regions and different years. The higher success in trees tends to make trees,

where present, even more important to mourning dove reproduction. Nesting success is almost twice as high in trees as on the ground.

On the northwestern Oklahoma prairies, however, the high number of pairs nesting successfully per unit of area (Table X) is more than offset by the extremely low availability of tree areas. There are estimated to be only 14,850 acres of trees in this region which comprises a total of more than three million acres. Due to the low availability of trees, an estimated 71 per cent of the doves nest on the ground. The reproductive effort of these birds, while less successful, accounts for an estimated 59 per cent of the total production of young in the region investigated.

The tree areas having the greatest number of pairs nesting successfully per unit of area are those which are spaced openly and located within cultivated area (Table X). On the basis of this study, a tree area possessing both of these attributes can be expected to contribute more to mourning dove production than any other type of area.

While other methods may be found for increasing either the total number of doves or nesting success, the duplication of types of tree areas known to be highly productive appears to hold the most promise. It is suggested that, by planting openly spaced stands of trees within cultivated areas, the wildlife manager could increase the production of mourning doves in the region. The most productive area

studied was the Getz farmstead which, in addition to having a border of ornamental trees about the yard and an evergreen windbreak, has a rather large number of fruit and ornamental trees arranged in an orchard type of planting. The area surrounding this is largely cultivated.

Ground nesting, while it produces the majority of the doves in northwestern Oklahoma, is not highly productive on a unit area basis. What ground nesting lacks in density of breeding pairs per unit area and nesting success it makes up in total volume of effort. Ground nesting in northwestern Oklahoma is important because of the low availability of trees in the area. It is suggested that the attraction of a large number of breeding pairs to a tree area of the preferred and more successful type, that is, openly spaced type of stand, might be expected to result in an increase in the production of mourning doves in the region.

SUMMARY

1. Studies of nesting density and nesting success both in trees and on the ground constituted the basic approach to this investigation of the extent and relative contribution of ground nesting to the mourning dove (Zenaidura macroura) population.
2. The study was carried out from March 20, 1956, to September 8, 1956, in Beaver, Harper, Ellis, and Woodward counties in northwestern Oklahoma.
3. The distribution of ground nests was not found to be affected greatly by the distribution of trees or water.
4. An over-all ground nesting density of .025 breeding pairs per acre was determined for 19 study areas aggregating 1,184 acres.
5. An over-all tree nesting density of 1.80 breeding pairs per acre was determined for 20 small tree areas aggregating 67.5 acres.
6. No significant difference between the fecundity rates of ground nesting doves and tree nesting doves was detected.
7. The ground nesting success of 29 per cent compared unfavorably with the over-all tree nesting success of 48 per cent.

8. While both density and success were much lower for ground nesting than for tree nesting, the availability of trees was so low that an estimated 59 per cent of the production of young mourning doves was from the ground.
9. Trees are much more productive of mourning doves on a unit area basis than is the ground.
10. The provision of more of the highly productive types of tree areas is suggested as a management technique.

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