A TECHNIQUE FOR EVALUATING THE BREEDING HABITAT OF MOURNING DOVES USING CALL–COUNT TRANSECTS[1]

by
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ABSTRACT

This paper describes a technique to evaluate the breeding habitat of the mourning dove (Zenaida macroura) *utilizing a "windshield approach" capable of identifying habitat parameters correlated with call counts. Habitat parameters accounted for up to 77.8 and 97.8 percent of the variation in call counts within transect intervals and transects, respectively, when regression analyses were conducted within ecological areas. Techniques presented can be used to evaluate the habitat of any game or non-game species for which transects are used to obtain population data, can be modified to include particular plants important to a given wildlife species, and may be useful in monitoring annual or long term changes in wildlife habitat.*

Field studies have demonstrated the feasibility of utilizing call-count surveys to detect annual changes in mourning dove breeding populations (Foote and Peters 1952). These surveys have been conducted throughout the United States on more than 800 established routes since 1953 (Ruos 1975). Each route consists of 20 listening points (3 minute stops) at 1.6 km intervals along roads. Population indices derived from these surveys are believed to be biologically and statistically sound for detecting annual changes in breeding dove densities (Ruos 1975). If the number of doves heard calling at a stop reflects the density of doves breeding within a radius of 0.8 km (Kerley 1952), it should be possible to determine the habitat parameters associated with different breeding densities. These habitat parameters can then be used as guidelines for managing breeding habitat for mourning doves. The purpose of this study was to develop a technique to evaluate the breeding habitat of the mourning dove by identifying those habitat parameters which could be readily evaluated from a vehicle ("windshield approach") and would be significantly correlated with call counts.

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METHODS

A method of classifying habitats from a vehicle was developed in which 583 habitat types were recognized (Fig. 1). Habitat type was defined as a description of the vegetation of an area consisting of a unique combination of ground cover height and composition, canopy composition, and physiognomic class. Physiognomic classes included:

Barren: Areas with less than 25 percent ground cover.

Marsh: Areas inundated by water containing sedges, rushes, cattails, and grasses with less than 10 percent woody canopy cover.

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[1] Texas Agricultural Experiment Station, Technical Article 12780.

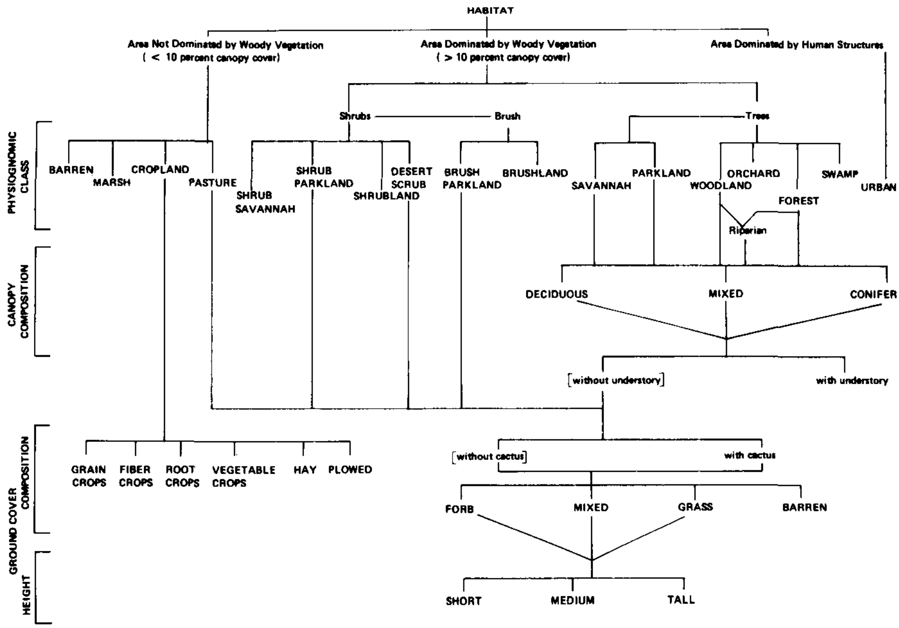

Figure 1. Schematic diagram showing habitat classification. Habitats are keyed to habitat type from top to bottom. Names of habitat types are assigned from bottom to top. Words in brackets are omitted when naming habitat types.

Cropland: Cultivated cover or row crops used for food and/or fiber for man or domestic animals.

Pasture or fields: Areas dominated by grasses and/or forbs with less than 10 percent canopy cover of trees (single or multi-stemmed woody plants greater than 3 m in height) and/or shrubs (single or multi-stemed woody plants less than 3 m in height).

Shrub savannah: Pastures or fields with widely scattered shrubs covering 10 to 25 percent of the ground.

Shrub parkland: Pastures or fields with 25 to 75 percent canopy cover of shrubs usually in clusters.

Shrubland: Open stand of evenly spaced shrubs covering at least 75 percent of the ground.

Desert scrub: Open stand of thorny deciduous shrubs and arborescent cacti usually with scattered deciduous trees covering at least 25 percent of the ground.

Brush parkland: Closed, impenetrable stands of shrubs covering 25 to 75 percent of the ground.

Brushland: Closed, impenetrable stand of shrubs covering at least 75 percent of the ground.

Savannah: Pastures or fields with widely scattered trees covering 10 to 25 percent of the ground.

Parkland: Pastures or fields with open or closed stands of trees covering 25 to 75 percent of the ground.

Woodland: Open stand of evenly spaced trees (excluding managed fruit and nut trees), less than 10 m in height, covering at least 75 percent of the ground and usually without understory.

Orchard: Managed, open stand of evenly spaced fruit or nut trees, usually less than 10 m in height, covering at least 75 percent of the ground and without understory.

Forest: Closed stand of trees, greater than 10 m in height, usually forming a continuous canopy over at least 75 percent of the ground and usually with an understory except in managed monocultures.

Swamp: Areas inundated by water with greater than 10 percent woody canopy cover consisting of trees usually with understory.

Urban: Cities or towns; areas dominated by human dwellings including the fences, shrubrows, windbreaks, powerlines, and roads associated with their presence.

Cropland was further divided into cultivated grains, vegetable crops, fiber crops, root crops, hay, and plowed ground. Woodland and forest were divided based on whether or not they were riparian. Savannah, parkland, woodland, and forest were also subdivided depending on whether the canopy layer was deciduous, coniferous, or mixed, and the presence or absence of understory. If at least 75 percent of the canopy or ground cover shared a particular vegetative characteristic (composition and/or height) it was considered homogeneous, and if the characteristic was shared by less than 75 percent it was considered mixed. Pasture, savannahs, parklands, desert scrub, woodland, and forest were further divided based on the composition and height of the ground cover. Ground cover composition was categorized as forb, grass, or mixed, and with or without cacti. Ground cover height was divided into three classes. Ground cover less than 0.16 m was considered short, between 0.16 and 0.50 m considered medium, and greater than 0.50 m considered tall.

Several structural features within habitat types were also considered. Structural features were defined as structures or characteristics other than height and composition of the ground cover, composition of the canopy, and physiognomic class. Included within this category were the number of intersecting fences, shrubrows, windbreaks, powerlines, roads, and railroad right-of-ways, and whether or not these structures paralleled the call-count transect. The number of edges (an abrubt change in the physiognomy of the vegetation excluding ecotones), permanent water sources, and human structures were also included. The type of road surface on the survey route (asphalt, gravel, sand, or dirt) and the width of the road shoulder were recorded at each stop. The presence of snags (dead, defoliated shrubs or trees), cattle feeders and feedlots, gravel pits, irrigation and oil pumps, and washes was also noted.

Through the cooperation of the Texas Parks and Wildlife Department, call-count data for 1975 were obtained for the first 15 stops within each of the 133 call-count transects in Texas. Each transect was surveyed four times between 20 May and 10 June by Texas Parks and Wildlife Department personnel (Dunks 1975). Based on these data, 50 call-count transects were selected for habitat analyses to determine the effectiveness of the habitat classification and techniques presented. The transects selected represented high, average, and low dove densities within each of the 10 ecological areas (Gould 1969) in Texas (Fig. 2). The number of transects selected within each ecological area was proportional to the number of transects present (Table 1).

The habitat on the 50 call-count transects was surveyed during July and August 1975, utilizing two vehicles each with a two-man team. To reduce error due to differences between the habitat classifications of the observers, trial surveys were conducted as a group along several call-count transects throughout most of Texas; each team worked within different ecological areas; and one member of each team was designated the driver and odometer reader, while the other person classified the habitat throughout the study. A team traveled and recorded habitat data on both sides of each 24.0 km call-count transect starting 0.8 km before and ending 0.8 km after each stop. Each of these 1.6 km units was defined as a transect interval. The linear distance of each observation of a habitat type intersecting the survey route was measured to the nearest 0.02 km, and the number of structural features were recorded simultaneously within each transect interval on the 50 call-count transects selected.

Habitat interspersion and diversity were included as habitat parameters. Within a transect interval, interspersion was defined as the number of times the established habitat

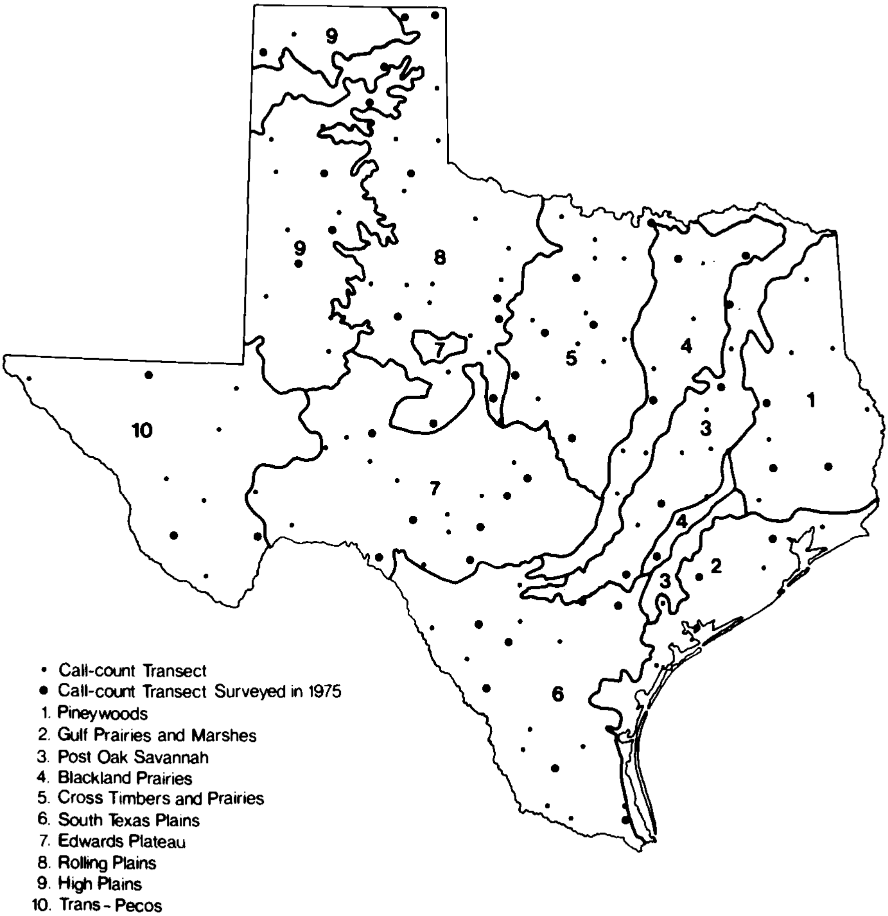

Figure 2. Locations of the 133 mourning dove call-count transects in Texas showing the 50 transects surveyed in 1975 and the ecological areas (after Gould 1969) within the state.

classification changed on both sides of a call-count transect. Values for the interspersion index were calculated by determining the sum of the frequencies of occurrence for each habitat type intersecting the survey route. Habitat diversity was calculated for each transect interval and transect using the Shannon-Wiener Index (Shannon, 1948). This index incorporated the number of different habitat types intersecting a survey route as well as their relative dominance.

Habitat parameters were analyzed for correlations with call counts statewide and within ecological areas by transect interval and by transect using the stepwise multiple regression procedures of the Statistical Analysis System (Barr and Goodnight 1972). Transect call counts were calculated by determining the sum of the call counts at each of the 15 stops. Transect habitat type values were defined as the sum of their linear distances within the 15 transect intervals. Shoulder width on a transect was defined as the mean of

Table 1. Selection of call-count transects surveyed during summer 1975.

Ecological area	*Transects present*		*Transects selected*		*Total surveys*	*Mean call-counts for transects selected*					
						High		*Medium*		*Low*	
	N	*%*	*N*	*%*		*N*	*Range*	*N*	*Range*	*N*	*Range*
Pineywoods	9	6.8	3	6.0	12	1	(21)	1	(11)	1	(1)
Gulf Prairies and Marshes	5	3.8	2	4.0	5	1	(15)			1	(2)
Post Oak Savannah	10	7.5	4	8.0	13	2	(24-42)			2	(2-7)
Blackland Prairies	10	7.5	4	8.0	14	2	(21-23)			2	(5)
Cross Timbers and Prairies	17	12.8	6	12.0	17	2	(47-53)	2	(20-22)	2	(3)
South Texas Plains	18	13.5	7	14.0	24	3	(36-44)	1	(17)	3	(3-8)
Edwards Plateau	18	13.5	7	14.0	23	3	(31-48)	1	(21)	3	(3-9)
Rolling Plains	24	18.0	9	18.0	31	3	(54-139)	3	(35-38)	3	(2-8)
High Plains	13	9.8	5	10.0	19	2	(14-15)	1	(7)	2	(0)
Trans-Pecos	9	6.8	3	6.0	11	1	(15)	1	(29)	1	(7)
Total	133	100.0	50	100.0	169	20	(14-139)	10	(7-38)	20	(0-9)

the shoulder widths at each stop. Interspersion on transects was calculated by summing the frequencies of each habitat type occurring within the 15 transect intervals. Call-count data for each of the four surveys conducted on the 50 transects were included in all analyses, because the variation in call counts between surveys was significant ($F = 4.62$; df = 3,2497; $P < 0.0036$). Independent variables (habitat parameters) entered and remained in the models if values for their partial F-statistic were significant ($P < 0.05$).

RESULTS AND DISCUSSION

Results (Table 2) indicate that the habitat classification and techniques we employed in evaluating the nesting habitat of the mourning dove will identify those habitat parameters significantly correlated with call counts. Habitat parameters accounted for between 18.1 and 97.8 percent of the variation in call counts depending on whether analyses were conducted by transect interval or by transect, and statewide or within ecological areas. Habitat parameters within transects accounted for a greater percentage of the variation (R^2) in call counts than those within transect intervals. These data suggest that habitat surveys may be conducted more efficiently by transect than by transect interval.

Table 2. Correlations between habitat parameters and call counts.

Ecological area	*Habitat variables present*	*Transect intervals*		*Transect*	
		Number of variables remaining in model	*R^2* [a]	*Number of variables remaining in model*	*R^2*
Pineywoods	66	10	67.0	1	80.3
Gulf Prairies and Marshes	57	8	77.8	1	97.7
Post Oak Savannah	80	11	66.8	1	97.8
Blackland Prairies	66	13	50.8	1	70.9
Cross Timbers and Prairies	65	8	44.6	2	81.3
South Texas Plains	77	23	55.2	4	93.0
Edwards Plateau	71	9	25.0	3	75.4
Rolling Plains	75	22	62.2	4	93.2
High Plains	31	7	18.2	1	47.5
Trans-Pecos	26	6	42.2	1	89.1
Texas	150	39	28.6	23	89.7

[a] Square of the multiple correlation coefficient expressed as a percent.

Analyses conducted by transect may have reduced error due to dove mobility, variations in odometer readings between vehicles, and excessive values of zero for the dependent variable (stop call count) and independent variables. Few studies have examined the daily movements of the mourning dove during the breeding season. Slade (1969) estimated that the distance doves would fly to water was at least 2.0 km, the maximum possible on his study area. Because doves feed and water early in the morning (McClure 1943), when call-count surveys are being conducted, movements to feeding and watering areas of greater than 0.8 km could reduce multiple correlation coefficients between stop call count and habitat parameters. We also observed differences of up to ± 0.16 km per 1.6 km between the odometers of different vehicles. Whether these differences did significantly affect multiple correlation coefficients would depend on the accuracy of the odometers relative to the tire sizes on the vehicles used by Texas Parks and Wildlife Department personnel to collect the call-count data. In addition, excessive values of zero for the dependent and independent variables may have reduced multiple correlation coefficients (Gates, personal communication).

Results also indicate that habitat surveys and regression analyses should be conducted within ecological areas. Analyses by transect interval and transect within ecological areas generally resulted in an increase in multiple correlation coefficients and/or a decrease in the number of independent variables in the models (Table 2). These trends may be explained by increased homogeneity in call counts (Foote et al. 1958) and/or habitat within ecological areas (Blankenship et al. 1971). Results from analyses conducted within ecological areas may also provide a more accurate interpretation of the data. Analyses by transect interval within Texas indicated a negative correlation between call count and the number of permanent water sources present. This may be expected as the number of water sources probably increases from west to east, whereas call counts generally decrease. However, the number of permanent water sources was positively correlated with stop call counts in the High Plains, one of the more arid regions of Texas.

Analyses by both transect interval and transect within physiographic divisions such as ecological area may identify those habitat parameters being selected by breeding mourning doves. However, higher multiple correlation coefficients and a reduction in the number of independent variables in the models suggest that analyses conducted by transect may not only identify those habitat parameters suitable as guidelines for the management of habitat essential to breeding mourning doves, but also those habitat parameters most adaptable to a windshield approach. These parameters should be selected after examining correlation matrices for interaction between the independent variables accounting for a significant percentage of the variation in transect call counts.

The time lag between call-count and habitat surveys, and difficulties in classifying non-discrete habitats should be considered in employing the technique. The 2-month delay between some call-count surveys and corresponding habitat surveys may have reduced the accuracy of analyses on both transect interval and transects. In this time period the habitat on the transects may have changed, particularly croplands. In most cases the classification of non-discrete habitats was subjective. Trial surveys prior to actual data collection should be conducted to acquaint the investigator with the habitat classification and familiarize him with the subjective decisions that must be made. This would enable him to evaluate habitats more consistently and efficiently.

The habitat classification and techniques employed in the present study are applicable to evaluating the habitat of any game or non-game species for which transects are used to obtain population data. These techniques are currently being used to evaluate the breeding habitat of the mourning dove, bobwhite (*Colinus virginianus*) and scaled quail (*Callipepla squamata*) on all 133 call-count transects in Texas. In addition, the habitat classification can be modified to include individual species of plants important to wildlife or characteristic of a particular geographical area such as mesquite (*Prosopis* spp.) in the southwestern United States. The use of continuous independent variables (i.e. linear distance) permits the monitoring of annual and long term changes in wildlife habitat and the prediction of corresponding fluctuations in wildlife populations.

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