

University of Nebraska - Lincoln

DigitalCommons@University of Nebraska - Lincoln

US Fish & Wildlife Publications

US Fish & Wildlife Service

December 1968

Mourning Dove Status Report, 1967

James L. Ruos

Migratory Bird Populations Station Division of Wildlife Research

Duncan McDonald

Migratory Bird Populations Station, Division of Wildlife Research

Follow this and additional works at: <https://digitalcommons.unl.edu/usfwspubs>



Part of the [Aquaculture and Fisheries Commons](#)

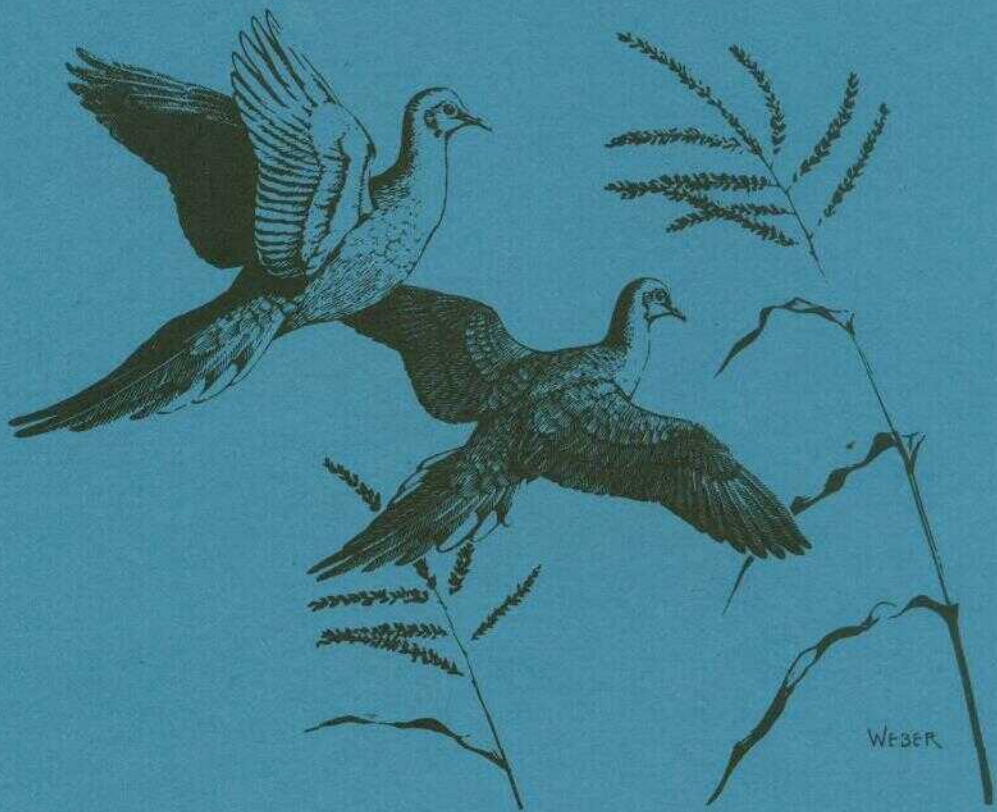
Ruos, James L. and McDonald, Duncan, "Mourning Dove Status Report, 1967" (1968). *US Fish & Wildlife Publications*. 7.

<https://digitalcommons.unl.edu/usfwspubs/7>

This Article is brought to you for free and open access by the US Fish & Wildlife Service at DigitalCommons@University of Nebraska - Lincoln. It has been accepted for inclusion in US Fish & Wildlife Publications by an authorized administrator of DigitalCommons@University of Nebraska - Lincoln.

Johnson *S. Hand*
MOURNING DOVE STATUS REPORT

1967



**UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
Special Scientific Report — Wildlife No. 121**

UNITED STATES DEPARTMENT OF THE INTERIOR
Fish and Wildlife Service
Bureau of Sport Fisheries and Wildlife

MOURNING DOVE STATUS REPORT, 1967

Compiled by

James L. Ruos and Duncan MacDonald
Migratory Bird Populations Station
Division of Wildlife Research



Bureau of Sport Fisheries and Wildlife
Special Scientific Report--Wildlife No. 121
Washington, D.C. • December 1968

CONTENTS

Abstract	iv
Introduction	1
Procedure	
The Call-Count Survey method	2
Quality checks of field data	3
Randomization of call-count routes	3
Physiographic stratification of call-count routes	3
Breeding Density Index	4
Determination of short-term population changes, 1966-1967	8
Determination of long-term population trends, 1957-67	8
Computer analysis of dove call-count data	9
Findings	
Status of the 1967 mourning dove breeding population.	9
United States	9
Eastern Management Unit	10
Central Management Unit	10
Western Management Unit	10
Long-term dove population fluctuations, 1957-67	10
Statistical significance of data	14
Quality of the 1967 call-count data	15
Quality by route, 1967	15
Comparability of 1966 and 1967 routes	15
Significance of quality data	15
References	17
Appendix	18

ABSTRACT

Nationwide dove population indexes in the 1967 Mourning Dove Status Report were obtained by essentially the same data gathering and analyzing procedures as in 1966. A refinement was made in the base year index, using the mean of the 1966 and 1967 readings as the base for all States. There was a slight adjustment in physiographic region boundaries.

Changes in mourning dove breeding density indexes, obtained from call-count surveys throughout the United States, are summarized by management unit as follows:

<u>Management Unit</u>	<u>Percent Change</u>	
	<u>1966:1967</u>	<u>10-yr. mean:1967</u>
Eastern	-3.6	- 5.0
Central	-4.5	-15.1
Western	-2.3	-12.8
United States	-3.8	-12.1

Data analyses suggest that 1967 dove populations declined to approximately the 1965 level in all units. Present population indexes in all units are below the 10-year (1957-1966) mean.

Long-term trends in population densities indicate that dove breeding populations in all units are considerably below the peak of 1960 and, with the exception of the Eastern Management Unit, are at their lowest level since 1957.

INTRODUCTION

Management of mourning doves in the United States is confined essentially to the regulation of hunting for proper harvest. The Call-Count Survey, conducted annually since 1953 by Federal, State, and independent observers on more than 800 prescribed routes, provides population data on which wildlife administrators rely heavily in setting annual regulations. This report describes the methods employed to obtain and analyze such data and presents the status of the 1967 mourning dove breeding population.

Two versions of the dove status report are prepared annually. In 1967, a preliminary version of this report was mailed to members of the Dove Regulations Committee 1 week before the regulations meeting, held in June of each year at Washington, D.C. This timely distribution was made possible by the promptness of cooperators who sent their data directly to the Migratory Bird Populations Station, Laurel, Md., immediately after completion of their surveys. This final report contains additional survey data received too late for use in the preliminary version. It is distributed to all cooperators and is available to interested organizations and individuals.

This report continues the more comprehensive analysis of mourning dove populations begun in 1966. Randomization of call-count routes, begun in 1957, was completed in 44 of the 48 contiguous States in 1966. Survey data were analyzed by physiographic regions. With the aid of automatic data processing equipment, an analysis of the Call-Count Survey was made which produced weighted means, the standard error of the mean difference, and levels of significance for changes in each State, each management unit, and each sub-unit (combined hunting States and combined nonhunting States). Studies of long-term population trends used a new base year index which was the mean of the 1966 and 1967 readings.

PROCEDURE

The Call-Count Survey method

Field studies have demonstrated the feasibility of the Call-Count Survey as a method for detecting annual changes in mourning dove breeding populations (Foote and Peters, 1952). Since 1953, these surveys have been conducted throughout the United States over a system of more than 800 established routes. Each call-count route has twenty 3-minute listening stations spaced at 1-mile intervals, usually on lightly traveled secondary roads.

Each route is checked once between May 20 and June 10. Intensive studies in the eastern United States (Foote and Peters, 1952) indicated that dove calling is relatively stable during this period. Call-count surveys are not made when wind velocities exceed 12 miles per hour or when it is raining.

Records are kept of all doves seen or heard calling along the routes. The numbers heard calling during the 3-minute listening periods are totaled for each route to provide the data for determining the population index. The numbers of calls per dove and of doves seen are not currently used in the index calculation, although they are recorded. A detailed analysis of these and other pertinent data from past call-counts is currently being undertaken by Lytle H. Blankenship of the Migratory Bird Populations Station.

The Call-Count Survey has limitations and possible biases which require further study. One important shortcoming is that the Survey does not measure the current year's production. This factor may be especially significant since a high percentage of the fall population is normally composed of young-of-the-year.

Recent studies (Frankel and Baskett, 1961; Jackson and Baskett, 1964) have shown that unmated males call at a greater rate than mated males. This suggests that the reliability of the annual call-count census is reduced by the variability in the ratios of mated to unmated males. However, Wight (1964) observed that variations in the ratio of mated to unmated males, where the adult sex ratio approached equality, did not significantly alter the reliability of the dove call-count for measuring annual trends of breeding mourning doves. Irby (1964) also found no evidence on his study area in Arizona that the numbers of unmated males materially affected call-count results.

Quality checks of field data

Survey reports received at the Migratory Bird Populations Station were examined to determine circumstances affecting the accuracy with which the routes were run and the data recorded. Records for routes run under unacceptable conditions were deleted from analysis. Reports on routes completed under the prescribed conditions but containing discrepancies, errors, or missing data were examined to ascertain whether parts were acceptable. If so, they were used in analyses for which they were applicable. Where there was a change in observers on a route from one year to the next, the data were examined to determine whether an unexpected population change was apparent. When such differences were detected, they were attributed to differences in observers, and the data were deleted from the current analysis.

Randomization of call-count routes

The original call-count routes (established between 1951 and 1956, and hereinafter designated "management routes") were in many instances selected in areas of high-density dove populations and were not representative of populations over the entire State or management unit.

Randomly located routes were first employed in seven southeastern States in 1957 (Foote, Peters, and Finkner, 1958). A comparative study of the random and management route data from these States confirmed earlier assumptions that a revision of the nationwide call-count survey routes should be undertaken if representative dove population indexes were to be obtained. This recommendation prompted the gradual selection and establishment of the 868 randomly located call-count routes now employed in 44 States. Selection of random routes in the remaining four States of Maine, New Hampshire, Rhode Island, and Vermont (now represented by a total of 12 management routes) will be made in the near future.

Both types of routes were run during the year of transition from management to random routes. This procedure permitted a direct comparison of data (Foote, Peters, and Finkner, 1958). Randomized data have now been obtained in the 44 States for 2 or more years.

Physiographic stratification of call-count routes

Biologists recognize the limitation of sampling wildlife populations by political units. Census data collected and analyzed by ecological

divisions represent better statistical design and could be expected to provide more precise information with the same effort.

An ecological sampling design for the collection of dove population data, using physiographic regions as the basis for stratification, was suggested by Foote, Peters, and Finkner, (1958). The 78 regions designated in this report (fig. 1) are based essentially on a map entitled "Physical Divisions of the United States" prepared by Fenneman (1931). The boundaries of these divisions were modified in several instances after examination of field data and more recent ecological studies. A change from the 1966 stratification was made for Minnesota to correct an inaccurately designated boundary between strata 010 and 122.

The combined use of physiographic stratification and randomization of call-count routes makes possible the detection of a true population change with 95 percent confidence when an observed change of 20 percent occurs for each management unit (fig. 2.). Additional physiographic and ecological studies, combined with an examination of regional dove data, are expected to improve the statistical precision of this analysis.

Breeding Density Index

The Breeding Density Index (BDI) is an indicator of the number of doves per unit of area and is derived from the average number of calling doves per route. To obtain as precise an average as possible for derivation of this index, the call-count data are weighted according to differences among land areas in each State and management unit.

Prior to 1966, the BDI for each State represented the average number of birds heard calling per route within that State, thus weighting all routes equally. The State averages were then weighted in proportion to the estimated area of dove habitat in each State of a management unit, to provide a Breeding Population Index for each unit (U.S. Bureau of Sport Fisheries and Wildlife, 1957). In the 1966 survey (Ruos and Tomlinson, 1968), 35 States had been "randomized" for 2 or more years, and these were weighted by physiographic region in calculating BDI values. The average number of birds heard calling per route from each region within a State was weighted by the percentage of the total land area occupied by that region in the State to obtain the State's BDI. A BDI value was similarly determined for each of the three management units. In the 1967 survey the same procedures were used, but 44 States had been "randomized" for 2 or more years. This weighting procedure recognizes differences in quality of dove habitat as manifested by physiographic

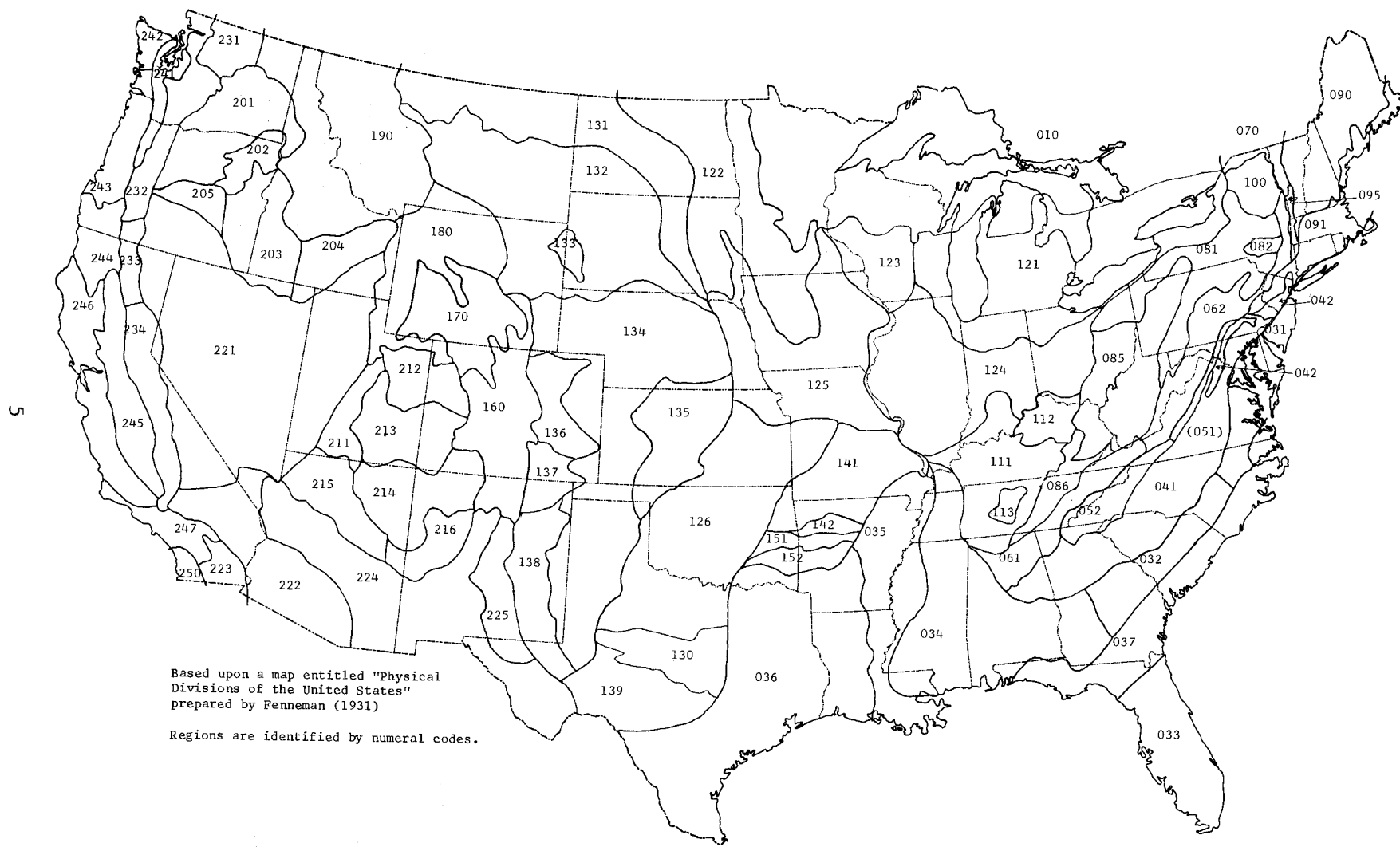


Figure 1.--Physiographic regions used in analysis of mourning dove population data, 1967.
See page 6 for strata codes.

Physiographic Regions Used in Analysis of Mourning Dove Population Data, 1967
[Modified after Fenneman (1931)]

<u>Description</u>	<u>Stratum Code</u>	<u>Description</u>	<u>Stratum Code</u>	<u>Description</u>	<u>Stratum Code</u>
Laurentian Upland Division		Interior Plains Division		Intermontane Plateaus Division	
Superior Upland Province	010	Interior Low Plateaus Province		Columbia Plateaus Province	
		Highland Rim section	111	Walla Walla Plateau	201
Atlantic Plain Division		Lexington Plain	112	Blue Mountain section	202
Coastal Plain Province		Nashville Basin	113	Payette section	203
Embayed section	031	Central Lowland Province		Snake River Plain	204
Upper Coastal Plain	032	Eastern lake section	121	Harney section	205
Floridian section	033	Western lake section	122	Colorado Plateaus Province	
East Gulf Coastal Plain	034	Wisconsin Driftless section	123	High Plateaus of Utah	211
Mississippi Alluvial Plain	035	Till Plains	124	Uinta Basin	212
West Gulf Coastal Plain	036	Dissected Till Plains	125	Canyon Lands	213
Lower Coastal Plain	037	Osage Plains	126	Navajo section	214
		Great Plains Province		Grand Canyon section	215
Appalachian Highlands Division		Central Texas section	130	Datil section	216
Piedmont Province		Missouri Plateau, glaciated	131	Basin and Range Province	
Piedmont Uplands	041	Missouri Plateau, unglaciated	132	Great Basin	221
Piedmont Lowlands	042	Black Hills	133	Sonoran Desert	222
Blue Ridge Province		High Plains	134	Salton Trough	223
Northern section	051	Plains Border	135	Mexican Highland	224
Southern section	052	Colorado Piedmont	136	Sacramento section	225
Valley and Ridge Province		Raton section	137		
Tennessee section	061	Pecos Valley	138	Pacific Mountain Division	
Middle and Hudson Valley section	062	Edwards Plateau	139	Cascade Sierra Mountains Province	
St. Lawrence Valley Province				Northern Cascade Mountains	231
Champlain and Northern section	070	Interior Highlands Division		Middle Cascade Mountains	232
Appalachian Plateaus Province		Ozark Plateaus Province		Southern Cascade Mountains	233
Mohawk and Allegheny section	081	Springfield-Salem plateaus	141	Sierra Nevada	234
Catskill section	082	Boston "Mountains"	142	Pacific Border Province	
Kanawha section	085	Ouachita Province		Puget Trough	241
Cumberland section	086	Arkansas Valley	151	Olympic Mountains	242
New England Province		Ouachita Mountains	152	Oregon Coast Range	243
Northern New England section	090			Klamath Mountains	244
Southern New England section	091	Rocky Mountain Division		California Trough	245
Taconic section	095	Southern Rocky Mountains Province	160	California Coast Ranges	246
Adirondack Province	100	Wyoming Basin Province	170	Los Angeles Ranges	247
		Middle Rocky Mountains Province	180	Lower Californian Province	250
		Northern Rocky Mountains Province	190		

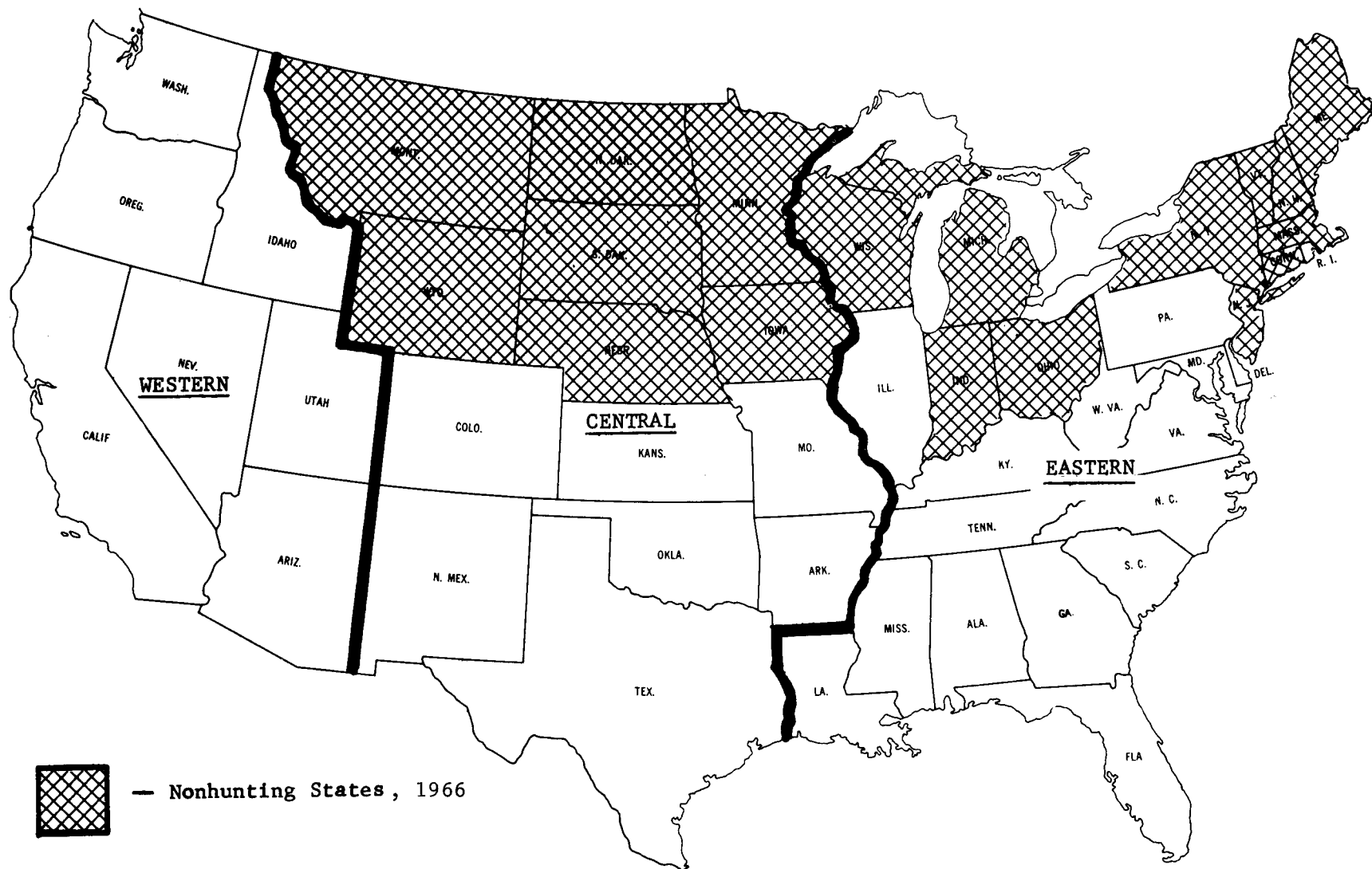


Figure 2.--Mourning dove management units.

regions in States and management units. Thus it represents an improvement in the analysis and interpretation of survey data.

Only four States (Maine, New Hampshire, Rhode Island, and Vermont) did not provide randomized data in both 1966 and 1967. Management route data from these States were not weighted and were not included in the management unit averages. Thus, comparable data for 1966 and 1967 BDI values are given for only 44 States.

Determination of short-term population changes, 1966-1967

Changes in the size of mourning dove breeding populations between 1966 and 1967 are indicated by data from 658 comparable routes run in both years. The average, appropriately weighted BDI values for each year are presented for each State and management unit (appendix table 1). Differences in these BDI values, expressed as percent change, determined the magnitude of changes in the breeding population index.

Determination of long-term population trends, 1957-67

Short-term (year-to-year) population changes are based, as indicated above, upon data from comparable routes only. Since the composition of these comparable routes changes with each 2-year comparison, it is not possible to use the uncorrected data to demonstrate long-term trends. For this purpose a Base Year Index (BYI) has been chosen for each State, and long-term trends have been shown by applying the percent change from year to year to this index. In previous reports the BYI has generally been the first year that the State's call-count routes were randomized. This method of selection had an advantage over the selection of a single year for all States.

The 1967 call-count data make available, for the first time, 2 years of randomized data for all but four States. In order to provide a more uniform basis for evaluation of long-term trends, the BYI for all States has been selected as the mean of the comparable 1966 and 1967 routes, as presented in appendix table 1. This BYI is thought to provide a meaningful refinement over the previous method. Not only are two "random-route" years averaged to reduce the influence of a possible atypical year, but the choice of a uniform BYI period for all States reduces possible bias in overweighting a State by the selection of a BYI in a peak year.

As in the past, the BYI value for each State for each year is weighted to provide management unit values. This weighting is based upon differences in land area among States. The land area values and the BDI values for States and management units by year are presented in appendix table 2.

Computer analysis of dove call-count data

Through the efforts of the North Carolina Institute of Statistics, University of North Carolina, and with the support of the Southeastern Association of Game and Fish Commissioners, a computer program was made available for the analysis of the 1967 call-count data. This program weights the State and management unit averages by physiographic region. It provides the mean difference, the standard error of the mean difference, and the level of significance of the change for each State and management unit. Since this program does not provide a summary of data by physiographic region irrespective of State boundaries, the analysis of population distribution by physiographic region, as presented in the 1966 Mourning Dove Status Report, was not done for this report. It is anticipated that an additional computer program, providing the data summarized by physiographic region, will be available for use in analyzing the 1968 call-count data.

FINDINGS

Status of the 1967 mourning dove breeding population

The adjusted average numbers of mourning doves heard calling on comparable call-count routes in 1966 and 1967 are tabulated by State and management unit (appendix table 1). These figures, adjusted to a base-year, appear in appendix table 2.

United States.--The mourning dove Breeding Density Index decreased 3.85 percent from 1966 to 1967. The adjusted mean number of doves heard calling per route was 19.96, 12.1 percent below the 10-year average for 1957-66.

The average adjusted BDI for the dove-hunting States decreased 1.84 percent from 20.08 in 1966 to 19.71 in 1967, while the BDI for all non-hunting States decreased 8.14 percent from 22.36 in 1966 to 20.54 in 1967. The BDI for all hunting States was 11.6 percent below the 10-year mean, and that for nonhunting States was 13.7 percent below this average.

Eastern Management Unit.--The BDI in the Eastern unit decreased 3.57 percent between 1966 (19.33 doves heard calling per route) and 1967 (18.64 doves). The 1967 BDI was calculated to be 5.0 percent below the 10-year mean. Dove densities in hunting States (66 percent of the unit's land area) declined 6.27 percent between 1966 and 1967, while in the non-hunting States, the BDI increased 3.59 percent.

Central Management Unit.--The Central unit has the highest mean BDI of all units. The BDI decreased 4.51 percent between 1966 (24.18) and 1967 (23.09). The 1967 BDI was 15.1 percent below the 10-year mean. Hunting States (56 percent of the unit's land area) experienced a slight population increase of 1.38 percent, while the nonhunting States declined 11.51 percent between 1966 and 1967.

Western Management Unit.--All States within the Western Management Unit provide dove hunting opportunities. BDI values in this unit decreased from 15.87 to 15.50 between 1966 and 1967, a decrease of 2.33 percent. The 1967 BDI was determined to be 12.8 percent below the 10-year mean.

Long-term dove population fluctuations, 1957-67

Mourning dove breeding density indexes for 1967 are compared with the previous 10-year indexes in appendix table 2 and figures 3-5. The 10-year (1957-66) averages are also shown.

Trends for each of the major management units and for the total contiguous United States are shown in figure 3. The 1967 indexes are at or near their lowest values for the designated 11-year period. Although there have been occasional increases in year-to-year comparisons since 1957 (notably 1960 and 1964), the general trend has been downward for all major units. This cannot be explained by the change to random routes during this period, since these calculations consider only percent changes in comparable routes from a base year index.

Trends in sub-unit breeding populations are shown in figure 4, and compare Eastern and Central hunting vs. nonhunting States. In general, the trends for hunting and nonhunting States appear similar. In 1966 and 1967, however, the nonhunting States in the Eastern unit showed increases while the hunting States decreased. The comparison of population trends between all hunting and nonhunting States is shown in figure 5. Since the trends are so similar, it might be inferred that hunting does not influence breeding populations. However, it is equally reasonable to

Figure 3.--Index of Relative Densities of Breeding Mourning Dove Populations
by Management Units, 1957-1967, based upon Call-Counts

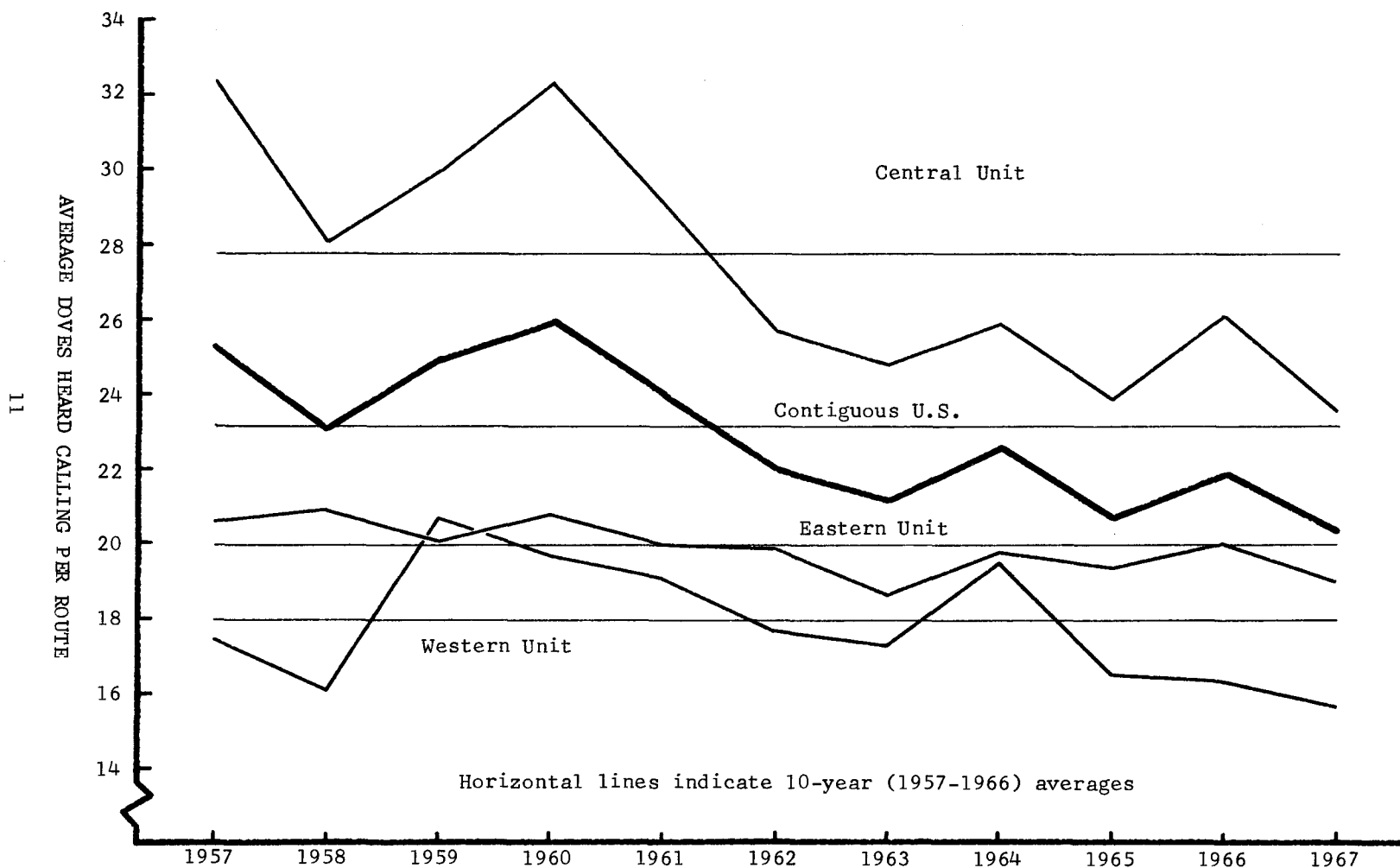


Figure 4.--Index of Relative Densities of Breeding Mourning Dove Populations
Based upon Call-Counts, Eastern and Central Unit Hunting and Nonhunting
States, 1957-1967

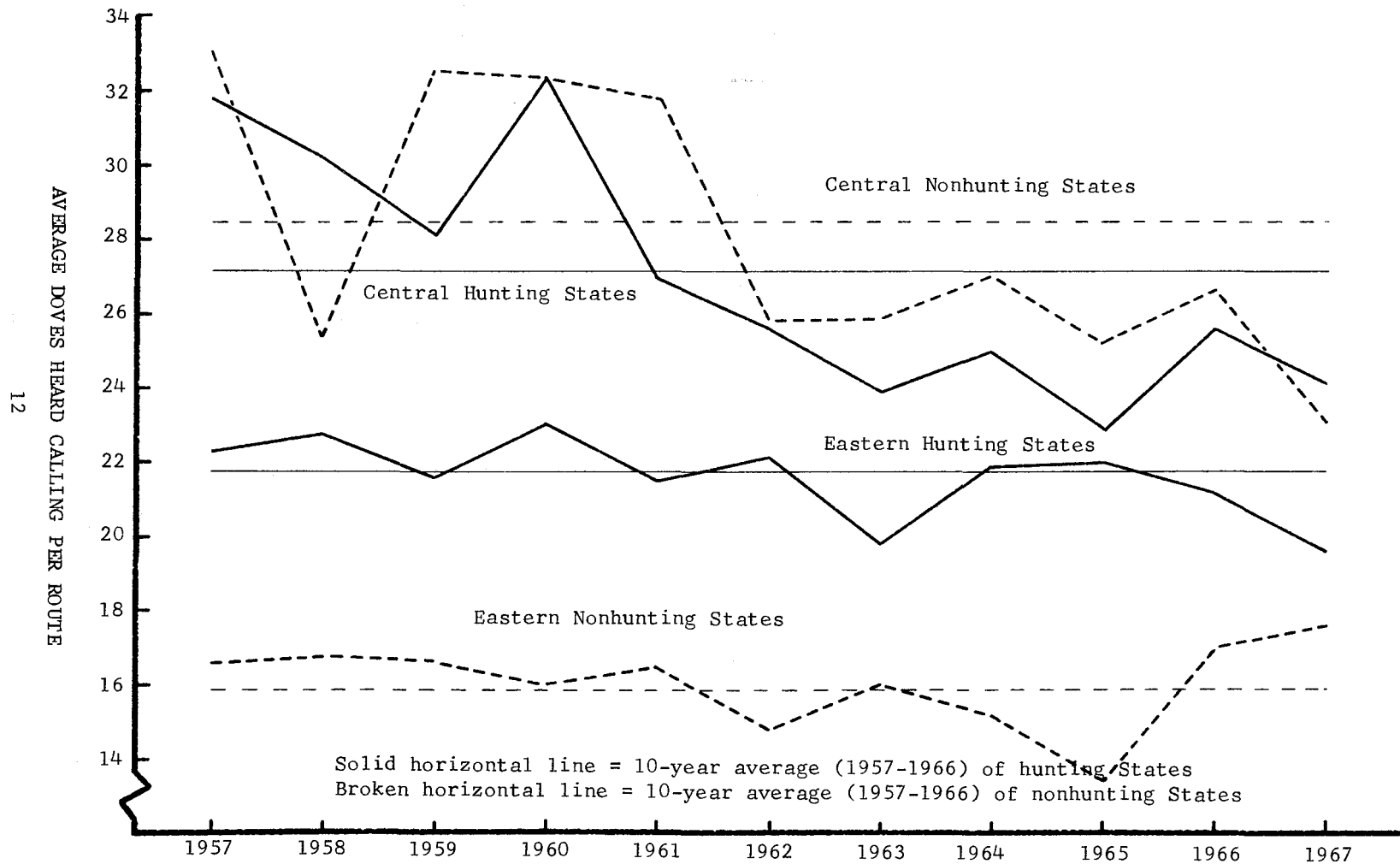
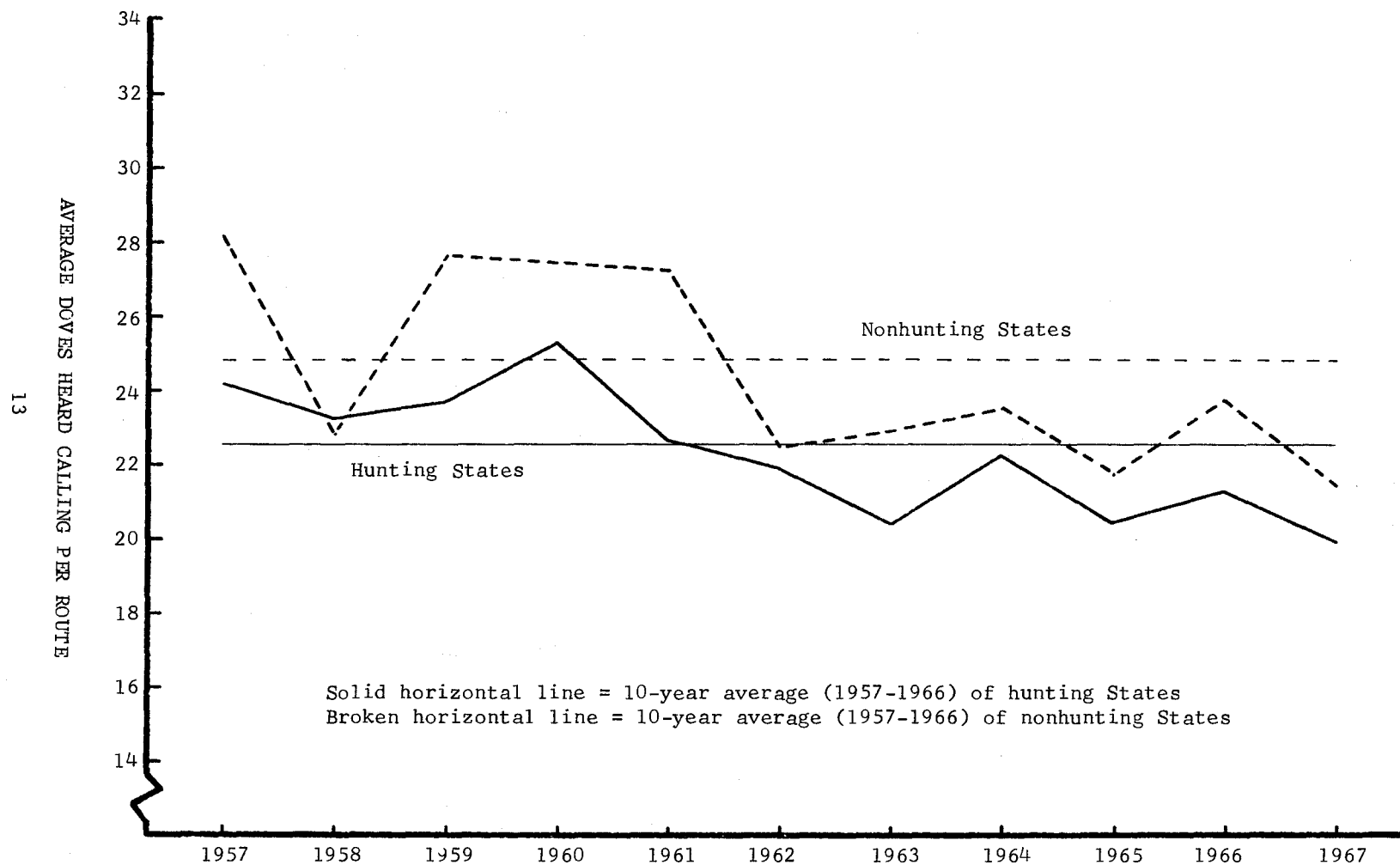


Figure 5.--Index of Relative Densities of Breeding Mourning Dove Populations
Based upon Call-Counts, Hunting States and Nonhunting States, 1957-1967



assume that harvest in the hunting States affects the populations in the hunting and nonhunting States to about the same degree. In fact, a number of States deliberately select late seasons in order to coincide with the presence of migrant doves from northern production areas. It should also be noted that, since the Central Management Unit has much higher dove densities than the Eastern Management Unit, particularly with respect to nonhunting States, the influence of the Central unit data in figure 5 is somewhat disproportionate.

A discussion in the 1966 Mourning Dove Status Report (Ruos and Tomlinson, 1968, p. 21) suggests that the populations in the three management units fluctuate in unison more often than could be explained by chance. The data for 1967 support this contention, with all three units showing a downward trend. In fact, annually since 1960 the three management units have fluctuated in perfect synchrony with the single exception of 1965-66, when the Western unit decreased by 0.1 while the other two units increased. It would appear that there may be some factor or factors influencing breeding mourning dove populations continent-wide. There is, as yet, no indication of what this influence may be. It should also be noted that this apparent synchrony, while occurring in the comparison between hunting and nonhunting States in the Central unit, does not exist at all in the same comparison in the Eastern unit. In fact, since 1959 the Eastern unit hunting and nonhunting State BDI's fluctuated together only once (fig. 4).

Statistical significance of data

The procedures employed on the annual call-count survey were designed so that a population change would be detected at the 95 percent significance level should the real population change 20 percent or more within a management unit (Foote, Peters, and Finkner, 1958). This means that should a 20 percent change be observed the chances are only 5 in 100 that no change actually occurred. In 1967 the call-count data were analyzed by the computer program which tests the significance of the observed changes from the previous year. In no case did a major management unit show a change significant at the 90 percent level. The Central nonhunting States decreased significantly at the 95 percent level. The U.S. nonhunting States decreased significantly at the 90 percent level. Nine States showed significant changes at the 90 percent level; four of these were also significant at the 95 percent level and two at the 99 percent level (appendix table 1). Three of the nine increased and six decreased. One would expect about five States to show a significant change at the 90 percent level due to chance alone.

Quality of the 1967 call-count data

Standardization of the call-count census method is essential if statistically precise data are to be collected. In 1966 and 1967, quality checks were made of all completed call-count route forms to determine the acceptability of data.

Quality by route, 1967.--This year, 885 routes were scheduled for completion to determine relative population densities between physiographic regions, States, and management units. Of this total, 87.6 percent were considered valid for the primary category "number of doves heard calling." The remaining 12.4 percent of the routes were considered invalid or no data were received. Data quality of routes varied within management units. In the Eastern unit 92.3 percent of the routes provided valid data, in the Central unit 81.0 percent were acceptable, and in the Western unit 87.8 percent were valid for "doves heard calling." It is hoped that the "quality" of the data will improve in the future, particularly in the Central Management Unit.

Comparability of 1966 and 1967 routes.--Annual dove population changes for States or management units are determined from a comparison of accurately obtained data collected on identical routes in successive years. In 1966 and 1967, 885 routes were potentially available for this study. Of these, 74.4 percent were accurate and comparable for "number of doves heard calling." This is almost identical to the 1965-66 comparison (74.2 percent). Again the Eastern Management Unit had the highest percent of comparable routes (80.7). The Central had the lowest (65.6), and the Western unit approximated the U.S. mean (74.7).

Significance of quality data.--The call-count census is the only standardized mourning dove breeding population count conducted annually throughout the United States. Wildlife administrators rely heavily upon the results of this survey when establishing hunting regulations. In addition, the call-count information becomes a valuable tool for researchers investigating more precise census techniques, as well as for those persons engaged in comprehensive studies requiring reliable population statistics. The result of any analysis is never better than the quality of the data that go into it.

Call-count cooperators and their agencies have done a very satisfactory job of collecting and reporting dove population data. The preceding

analysis indicates, however, that quality of data can be substantially improved in some instances. Improved quality will result in increased precision and in savings in manpower and cost.

This analysis has been prepared to indicate quality weaknesses within management units. Upon request to the Migratory Bird Populations Station, Laurel, Maryland 20810, State wildlife administrators or project leaders will be provided with a detailed analysis of their State routes run in 1967.

REFERENCES

- Fenneman, Nevin M.
1931. Physiography of western United States. McGraw-Hill Book Company, New York. 534 pp.
-
1938. Physiography of eastern United States. McGraw-Hill Book Company, New York. 714 pp.
- Foote, Leonard E., and Harold S. Peters.
1952. Introduction in Investigations of methods of appraising the abundance of mourning doves. U.S. Fish and Wildlife Service, Special Scientific Report--Wildlife No. 17.
-
- , Harold S. Peters, and Alva L. Finkner.
1958. Design tests for mourning dove call-count sampling in seven southeastern States. Journal of Wildlife Management, vol. 22, no. 4, p. 402-403.
- Frankel, Arthur I., and Thomas S. Baskett.
1961. The effect of pairing on cooing of penned mourning doves. Journal of Wildlife Management, vol. 25, no. 4, p. 372-384.
- Irby, Harold D.
1964. The relationship of calling behavior to mourning dove populations and production in southern Arizona. Unpublished Ph.D. dissertation. University of Arizona. 100 pp.
- Jackson, Gary L., and Thomas S. Baskett.
1964. Perch-cooing and other aspects of breeding behavior of mourning doves. Journal of Wildlife Management, vol. 28, no. 2, p. 293-307.
- Ruos, James L., and Roy E. Tomlinson.
1968. Mourning dove status report, 1966. U.S. Fish and Wildlife Service, Special Scientific Report--Wildlife No. 115.
- (U.S.) Bureau of Sport Fisheries and Wildlife.
1957. Mourning Dove Newsletter, no. 12. 30 pp.
- Wight, Howard M.
1964. Matedness in the mourning dove and its effect on the nationwide dove-call census. Trans. 29th North American Wildlife and Resources Conference, p. 270-281.

APPENDIX

Table 1.--Changes in population density indexes for breeding mourning doves, 1966-67

EASTERN MANAGEMENT UNIT - HUNTING STATES

State	Comparable routes	Average doves heard/route [weighted] ^{1/}		Percent change ^{3/}
		1966	1967	
Ala.	25	20.19	19.49	- 3.4 ^{4/}
Del.	1	5.00	10.00	+100.0
Fla.	21	9.27	8.96	- 3.4
Ga.	17	14.19	16.71	+ 17.7
Ill.	18	27.49	28.36	+ 3.2
Ky.	12	32.36	27.42	- 15.3*
La.	18	8.26	9.46	+ 14.5
Md.	9	17.30	22.91	+ 32.4*
Miss.	22	30.38	25.04	- 17.6*
N. C.	20	23.64	19.20	- 18.8
Pa.	15	10.03	13.76	+ 37.2
R. I. ^{2/}	3	4.67	6.00	+ 28.6
S. C.	17	34.27	34.10	- 0.5
Tenn.	22	25.70	18.88	- 26.6***
Va.	9	26.08	21.17	- 18.8
W. Va.	4	6.61	3.36	- 49.1
Sub- Total	233	20.24	18.97	- 6.27

EASTERN MANAGEMENT UNIT - NONHUNTING STATES

Conn.	2	3.50	5.50	+ 57.1
Ind.	7	37.88	39.29	+ 3.7
Me. ^{2/}	2	0.00	0.00	0.0
Mass.	2	12.50	16.50	+ 32.0
Mich.	14	12.09	11.78	- 2.6
N. H. ^{2/}	4	6.00	4.00	- 33.3
N. J.	2	21.95	18.24	- 16.9
N. Y.	13	7.85	7.73	- 1.5
Ohio	11	25.90	25.16	- 2.8
Vt. ^{2/}	2	5.00	5.00	0.0
Wisc.	14	12.15	14.81	+ 21.8
Sub- Total	73	17.26	17.88	+ 3.59
Eastern Unit Total	306	19.33	18.64	- 3.57

Table 1.--Changes in population density indexes for breeding mourning doves, 1966-67
[continued]

CENTRAL MANAGEMENT UNIT - HUNTING STATES

State	Comparable routes	Average doves heard/route [weighted] $\frac{1}{2}$		Percent change $\frac{3}{4}$
		1966	1967	
Ark.	13	18.32	23.02	+ 25.6*
Colo.	8	15.46	16.82	+ 8.8
Kans.	16	55.76	64.91	+ 16.4
Mo.	16	37.92	35.30	- 6.9
N. M.	11	13.13	3.93	- 70.0*
Okla.	9	33.06	42.79	+ 29.4
Tex.	26	17.32	16.34	- 5.6
Sub- Total	99	23.89	24.22	+ 1.38

CENTRAL MANAGEMENT UNIT - NONHUNTING STATES

Iowa	11	33.67	34.62	+ 2.8
Minn.	7	17.64	15.72	- 10.9
Mont.	7	17.87	19.57	+ 9.5
Nebr.	18	43.86	36.23	- 17.4**
N. Dak.	22	20.70	20.62	- 0.4
S. Dak.	10	34.74	21.59	- 37.8***
Wyo.	13	14.30	11.72	- 18.0
Sub- Total	88	24.50	21.68	- 11.51**
Central Unit Total	187	24.18	23.09	- 4.51

WESTERN MANAGEMENT UNIT - HUNTING STATES

Ariz.	34	28.93	26.20	- 9.4
Calif.	51	15.58	12.74	- 18.2
Idaho	14	18.21	17.37	- 4.6
Nev.	19	4.19	4.66	+ 11.3
Oreg.	19	13.41	12.34	- 8.0
Utah	10	17.72	26.62	+ 50.2**
Wash.	18	12.26	10.48	- 14.5
Western Unit Total	165	15.87	15.50	- 2.33

Table 1.--Changes in population density indexes for breeding mourning doves, 1966-67
[continued]

United States	Comparable routes	Average doves heard/route [weighted] ^{1/}		Percent change ^{3/}
		1966	1967	
Hunting States	497	20.08	19.71	- 1.84
Nonhunting States	161	22.36	20.54	- 8.14*
United States Total	658	20.76	19.96	- 3.85

^{1/} Except as noted, State and management unit indexes were obtained from comparable, randomized route data adjusted for variation in the land area of each physiographic region represented.

^{2/} State indexes obtained from comparable, non-randomized route data not weighted by physiographic region. State data not represented in the respective management unit means.

^{3/} Probability that observed change represents actual change:
* 90 percent ** 95 percent *** 99 percent

^{4/} Percent change calculated using data carried to 3 decimal places, hence the apparent rounding error.

Table 2. -- Trends in mourning dove breeding density indexes by State, 1957-1967

State	Weight factor*	ADJUSTED AVERAGE DOVES HEARD CALLING PER ROUTE**											10-Yr. Ave. 57-66
		1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	
EASTERN MANAGEMENT UNIT - HUNTING STATES													
Alabama	33.32	20.5	23.1	18.1	22.0	19.4	18.9	16.3	21.1	20.5	20.5	19.8	20.0
Delaware	1.29	3.9	3.8	6.8	6.2	4.6	5.6	5.1	4.4	5.1	3.8	7.5	4.9
Florida	35.82	10.8	8.6	8.6	10.1	9.4	11.4	9.8	11.2	10.5	9.4	9.1	10.0
Georgia	37.82	15.1	11.2	13.3	16.9	14.4	16.8	14.4	22.5	18.5	13.1	15.4	15.6
Illinois	35.09	27.1	29.4	29.8	28.3	32.3	26.3	26.9	24.3	23.5	27.0	27.9	27.5
Kentucky	26.08	23.4	29.2	28.8	29.8	28.2	28.6	27.0	30.4	32.5	35.3	29.9	29.3
Louisiana	31.14	22.2	20.7	17.9	19.3	17.8	14.2	16.6	13.6	11.6	7.7	8.9	16.2
Maryland	6.55	16.3	15.5	18.0	15.6	14.4	15.8	16.1	16.1	16.0	15.2	20.1	15.9
Mississippi	30.63	38.0	46.3	37.7	37.8	33.2	35.4	30.5	35.1	36.8	33.6	27.7	36.4
North Carolina	22.51	17.8	16.5	20.3	19.7	17.3	19.0	21.0	21.9	24.8	26.4	21.4	20.5
Pennsylvania	29.01	11.3	9.8	10.7	9.5	9.9	8.2	5.6	7.2	7.4	8.7	11.9	8.8
Rhode Island***	--	--	--	7.0	4.0	5.0	5.5	5.5	8.9	5.9	4.2	5.3	5.7
South Carolina	19.99	24.2	25.5	24.4	25.8	25.5	23.0	23.0	24.1	35.3	34.4	34.2	26.5
Tennessee	27.07	46.0	41.8	35.1	35.6	30.2	34.8	29.2	28.1	30.4	30.4	22.3	34.2
Virginia	26.05	22.8	28.8	30.6	30.6	28.7	24.8	25.2	29.0	24.0	29.1	23.6	27.4
West Virginia	15.41	14.0	6.2	7.7	20.1	21.0	44.0	18.5	23.4	22.6	9.8	5.0	18.7
SUB-TOT./AVERAGE	377.78	22.3	22.8	21.6	23.0	21.6	22.2	19.8	21.9	22.0	21.2	19.6	21.8
EASTERN MANAGEMENT UNIT - NONHUNTING STATES													
Connecticut	3.23	6.1	4.7	4.1	6.5	3.5	3.5	3.0	2.4	1.9	2.9	4.5	3.9
Indiana	23.36	30.7	31.9	33.2	25.1	28.3	23.4	26.8	27.7	20.2	37.2	38.6	28.4
Maine***	--	--	--	1.5	3.0	3.0	3.0	1.3	0.0	0.3	1.3	0.0	1.7
Massachusetts	5.31	11.6	5.2	7.4	10.6	6.9	9.0	5.2	6.7	7.7	11.0	14.5	8.1
Michigan	37.18	11.4	12.8	15.5	14.0	14.8	11.8	17.4	13.2	8.0	12.3	11.9	13.1
New Hampshire***	--	--	--	4.3	6.8	4.6	3.4	3.1	6.3	10.6	7.5	5.0	5.8
New Jersey	4.91	25.0	28.0	32.7	32.7	29.0	28.8	29.5	30.4	25.7	24.2	20.1	28.6
New York	30.49	9.3	7.7	5.8	8.8	7.2	8.3	7.8	7.0	7.1	7.9	7.8	7.7
Ohio	26.42	16.8	20.2	16.9	14.8	17.9	21.4	17.5	16.8	19.1	26.3	25.5	18.8
Vermont***	--	--	--	1.0	8.0	0.0	2.0	2.0	2.0	1.0	6.0	5.0	2.8
Wisconsin	36.07	19.3	17.4	16.1	18.3	18.1	12.7	14.1	15.2	16.1	11.1	13.5	15.8
SUB-TOT./AVERAGE	166.97	16.6	16.8	16.6	16.0	16.4	14.7	16.0	15.2	13.4	17.1	17.6	15.9
EAST. MGMT. UNIT													
TOTAL/AVERAGE	544.75	20.6	20.9	20.1	20.8	20.0	19.9	18.6	19.8	19.4	20.0	19.0	20.0

Table 2. -- Trends in mourning dove breeding density indexes by State, 1957-1967 (continued)

State	Weight factor*	ADJUSTED AVERAGE DOVES HEARD CALLING PER ROUTE**											10 Yr. Ave. 57-66
		1957	1958	1959	1960	1961	1962	1963	1964	1965	1966	1967	
WESTERN MANAGEMENT UNIT													
Arizona	72.65	24.1	22.6	24.4	19.1	34.3	23.8	22.7	27.6	26.6	30.4	27.6	25.6
California	101.71	22.3	25.0	33.5	36.2	26.0	29.2	29.2	32.0	21.6	17.3	14.2	27.2
Idaho	54.37	17.9	15.8	17.7	20.4	18.0	18.3	18.3	20.6	19.4	18.6	17.8	18.5
Nevada	71.27	2.2	1.4	2.6	1.9	2.3	1.2	1.8	2.9	2.7	4.0	4.4	2.3
Oregon	62.27	16.7	14.3	20.9	19.2	21.2	18.2	16.8	18.1	14.1	14.0	12.9	17.4
Utah	53.34	22.9	15.0	22.9	18.6	14.8	13.6	13.4	12.9	13.7	14.8	22.2	16.3
Washington	43.87	14.4	12.6	15.2	10.5	9.2	11.0	9.8	13.2	13.1	13.3	11.4	12.2
WESTERN MGMT. UNIT													
TOTAL/AVERAGE	459.48	17.5	16.1	20.7	19.5	19.1	17.7	17.3	19.5	16.4	16.3	15.7	18.0
TOTAL HUNT. STATES 1,328.75													
TOTAL NONHUNT STATES 558.44													
U.S. TOT./AVERAGE	1,887.19	25.4	23.1	24.9	25.9	24.0	22.1	21.2	22.6	20.8	21.9	20.3	23.2

* Assigned State land-area-value

** From a base year, average doves heard calling per route for each State has been adjusted annually according to the percent change from the preceding year in counts on comparable routes. Except as noted, percent changes between years have been based upon unweighted, randomized data for the period 1957 to 1965 inclusive. Annual percent changes since 1966 have been derived from randomized data weighted by physiographic regions within States. Base year index (mean of 1966 and 1967) is changed from previous reports.

*** Indexes for Maine, New Hampshire, Rhode Island, and Vermont represent unweighted and unrandomized data and have not been included in the "weighted means."

As the Nation's principal conservation agency, the Department of the Interior has basic responsibilities for water, fish, wildlife, mineral, land, park, and recreational resources. Indian and Territorial affairs are other major concerns of America's "Department of Natural Resources."

The Department works to assure the wisest choice in managing all our resources so each will make its full contribution to a better United States -- now and in the future.



UNITED STATES
DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
WASHINGTON, D. C. 20240

POSTAGE AND FEES PAID
U. S.
DEPARTMENT OF THE INTERIOR

MOORNING DOVE SECTION
U. S. FISH & WILDLIFE SERVICE
MIGRATORY BIRD POPULATION STATION
LAUREL, MARYLAND 20810

M O STEEN
NEB GAME COMMISSION
LINCOLN NB 68509