STATUS OF RED AND GRAY FOXES IN TENNESSEE

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This paper deals with the current status of the red fox (*Vulpes fulva fulva*, Desmarest) and gray fox (*Vulpes cinereoargenteus cinereoargenteus*, Schreber) in Tennessee, especially their distribution and density.

Current literature on the distribution of Tennessee mammals, primarily that of Hamilton (1943) and Burt and Grossenheider (1952), relies chiefly upon the reports of Rhoads (1896) and Kellogg (1939) for information on Tennessee mammals. Rhoads's report, which is based on limited field work in East Tennessee, contains the statement the gray fox is "found all over the State but said to be supplanted by the Red Fox in western portions, where it is less common than formerly." In regard to the red fox he states, "Always numerous in the mountains, the Red Fox has spread with the increasing population into West Tennessee, where it was unknown to early pioneers and that the same conditions are true of the Central Basin . . ." Kellogg's report contains the most complete information regarding the mammals of Tennessee to date. In regard to the red fox he states, "The red fox seems not to have been one of the native mammals of Tennessee, but it has been introduced into various sections of the State at different times by those interested in hunting with hounds. . . . Local residents informed him [Perrygo, in charge of Kellogg's field party] that red foxes were plentiful in the vicinity of Waynesboro, Wayne County, but that they were not common near Crossville, Cumberland County. Contrary to general belief, Rhoads (1896, p. 200) states that the red fox 'always numerous in the mountains' but 'has spread with increasing population into west Tennessee, where it was unknown to the early pioneers.' Benjamin C. Miles is authority for the statement that this fox was introduced or migrated into Haywood and Lauderdale Counties about 1845." Kellogg also states, "The gray fox in former times occurred in most sections of the State and is still common in many localities. . . . Local residents reported to Perrygo that gray foxes are occasionally caught in Fayette and Shelby Counties." It is interesting to note that Kellogg reports only three Tennessee specimens of the gray fox (one from Big Sandy, Benton County; two from near Soddy, Hamilton County) and none of the red fox in the collections of the National Museum and Biological Survey. Ganier (1928) believed red and gray foxes to be well distributed throughout the State and that the gray fox was more common than the red fox. Wing (1940), reporting on a

game survey encompassing an area roughly between the Holston River and the Tennessee-Kentucky state line, remarked that, "There are a few Red Foxes, but not so many as the Gray Foxes." Howell and Conaway (1952), in a report primarily on the small mammals of the Cumberland Plateau, believe that on the Plateau the red and gray fox are generally distributed and that the red fox is less common than the gray fox. In a similar study (Conaway and Howell, 1953) they make the same statement in regard to the distribution of the gray and red fox in Carter and Johnson counties which are located in upper East Tennessee. Apparently these writers obtained this information from residents of the two study regions. Goodpaster and Hoffmeister (1952) were told that the red fox was common in the bottomlands of Reelfoot Lake and that the gray fox occurred principally in the hills and bluffs in the vicinity of the Lake. The red fox was considered the commonest of the two species in the vicinity of Reelfoot Lake.

Lack of specific information concerning the distribution of the foxes and other fauna of Tennessee resulted in the Tennessee Game and Fish Commission conducting a statewide wildlife survey. Primary field work for this project was begun September, 1950, and was completed approximately thirteen months later. The survey procedure (Schultz, 1952; 1954) included a method of sampling known as "area sampling" which permitted computation of sampling errors. In brief, the sampling scheme consisted of a proportionate stratified random sample of 1,000 "sampling areas" in Tennessee which averaged five indicated dwellings per area. This was a sampling rate of 1 in 51. Heads of farm households dwelling upon these areas were interviewed concerning red and gray foxes utilizing their farms and the "sampling areas." Data collected on the foxes are presented in this paper and Schultz *et al.* (1954). The relative sampling errors (R.S.E.) indicated the adequacy of sampling for all interviewees and also all respondents reporting the two foxes on their farms. Ninety-five per cent confidence limits on an estimated total (obtained my multiplying the number of respondents by the sampling rate) of either all heads of farm households or all such persons with the foxes utilizing their farm in a farming-type are obtained as follows:

$$\pm \text{ (Estimated Total) (R.S.E.) (2).}$$

Farmer hunters were requested to furnish information on animals hunted, with the intent that such information would assist in delineation of the range of game species and possibly population densities. As it was illegal to trap foxes during the study period such information could not be utilized from trappers.

Data obtained by personal interview have been tabulated

TABLE 1. *Status of the gray fox in Tennessee as determined by personal interview of heads of farm households.*

	FARMING-TYPE															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
FARM:																
Number of Respondents	27	94	489	69	131	161	200	139	116	538	306	137	57	862	131	3560
Number reporting gray fox on farm	6	31	223	31	77	238	179	136	93	447	260	116	39	532	98	2606
Per cent reporting gray fox on farm	22	32	46	45	59	91	90	98	80	83	85	85	68	73	75	78
R.S.E.[1] for estimated total of:																
All heads of farm households	16.4	7.6	5.0	6.7	6.8	4.6	5.9	6.7	8.8	3.2	5.7	7.7	10.2	3.0	6.5	1.5
Heads of farm households with gray fox on farm	42.2	23.3	8.0	18.6	10.0	4.8	6.3	6.6	9.0	4.2	6.0	9.1	16.1	3.8	8.6	1.8
SAMPLING AREA:																
Number of Respondents[2]	16	78	341	58	94	184	158	120	95	417	239	116	45	724	122	2807
Number reporting gray fox on sampling area	7	27	190	29	64	180	152	119	84	382	228	112	34	653	116	2377
Per cent reporting gray fox on sampling area	44	35	56	50	68	98	96	99	88	92	95	97	76	90	95	85

[1]Relative sampling errors (R.S.E.) computed by use of analysis of variance, with computations by the Iowa State College Statistical Laboratory.

[2]Includes only respondents who have lived on area, or not over 2 miles from area, during the last five years.

on a farming-type basis (Tables 1 and 2; Figures 1 and 2). The farming-types (revised from Luebke *et al.*, 1947) or strata in Figures 1 and 2 represent physiographic regions as follows: Mississippi Bottoms, 1; Plateau Slope of West Tennessee, 2, 3, 4, 5, 6; Highland Rim, 7, 8, 9, 11; Central Basin, 10; Cumberland Plateau, 12; Valley of East Tennessee, 13, 14; Sequatchie Valley, 14A; Unaka Range, 15.

Gray Fox. The primary range of the gray fox in Tennessee apparently encompasses all of the State east of the western edge

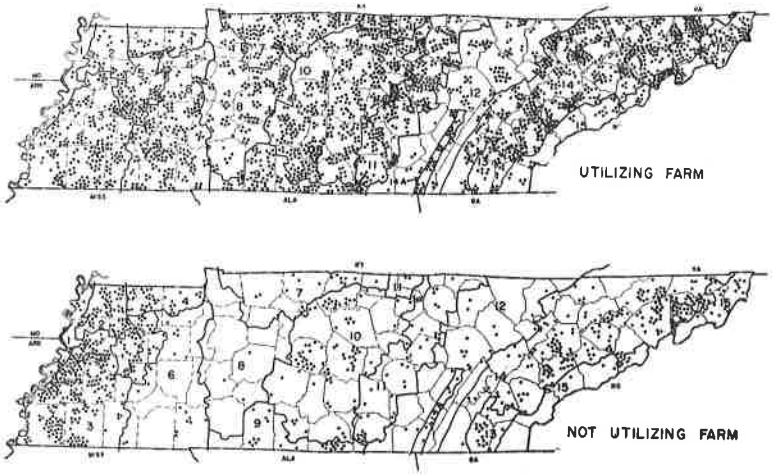

Fig. 1. Distribution of heads of farm households reporting the gray fox either utilizing or not utilizing their farms.

of farming-type 6. Apparently the denser populations lie between Walden Ridge and this western limit of the primary range (Table 1 and Figure 1). In general, these conclusions are substantiated by data collected on farms and sampling areas. The fairly large increase in percentages for sampling areas in farming-types east of the Cumberland Plateau might have resulted from a scarcity of gray foxes on farms in these regions and their presence in the forested ridges and mountains of the sampling areas.

The gray fox was reported as occurring on farms of 2,606 of the 3,560 respondents (Table 1). The distribution of the 3,560 respondents, 2,606 of whom reported the gray fox on their farms and 954 who reported the animal not on their farms, is presented in Figure 1.

Gray fox population trends on the sampling areas during the five year period to study were reported as: up, 60 per cent; down, 7 per cent; fluctuating, less than 0.5 per cent; no change,

Statistical Laboratory.
[1]Includes only respondents who have lived on area, or not over 2 miles from area, during the last five years.

TABLE 2. *Status of the red fox in Tennessee as determined by personal interview of heads of farm households.*

	FARMING-TYPE															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total
FARM:																
Number of Respondents	27	97	489	69	131	261	200	139	116	538	306	137	57	862	131	3560
Number reporting red fox on farm	20	93	405	68	115	250	171	132	94	452	226	84	35	534	62	2741
Per cent reporting red fox on farm	74	96	83	99	88	96	86	95	81	84	74	61	61	62	47	77
R.S.E.[1] for estimated total of:																
All heads of farm households	16.4	7.6	5.0	6.7	6.8	4.6	5.9	6.7	8.8	3.2	5.7	7.7	10.2	3.0	6.5	1.5
Heads of farm households with red fox on farm	21.9	8.2	5.5	6.9	7.7	4.7	7.1	6.7	10.5	4.2	7.0	11.1	17.4	4.4	13.2	1.8
SAMPLING AREA:																
Number of Respondents[2]	16	78	341	58	94	184	158	120	95	417	239	116	45	724	122	2807
Number reporting red fox on sampling area	15	77	307	58	90	182	144	118	85	389	212	86	35	586	91	2475
Per cent reporting red fox on sampling area	94	99	90	100	96	99	91	98	89	93	89	74	78	81	75	88

[1]Relative sampling errors (R.S.E.) computed by use of analysis of variance, with computations by the Iowa State College Statistical Laboratory.

[2]Includes only respondents who have lived on area, or not over 2 miles from area, during the last five years.

16 per cent; unknown, 16 per cent. In all farming-type the largest per cent of respondents reporting a change reported gray fox populations as up.

Red Fox. Although the red occurs throughout the State, its primary range appears to be west of the forested Cumberland Plateau, farming-type 12 (Table 2 and Figure 2). On the basis of the data collected it is impossible to ascertain the higher population regions within this primary range. Demands for closed seasons and restocking of the red fox from fox hunters in East Tennessee indicate that the red fox is not abundant in

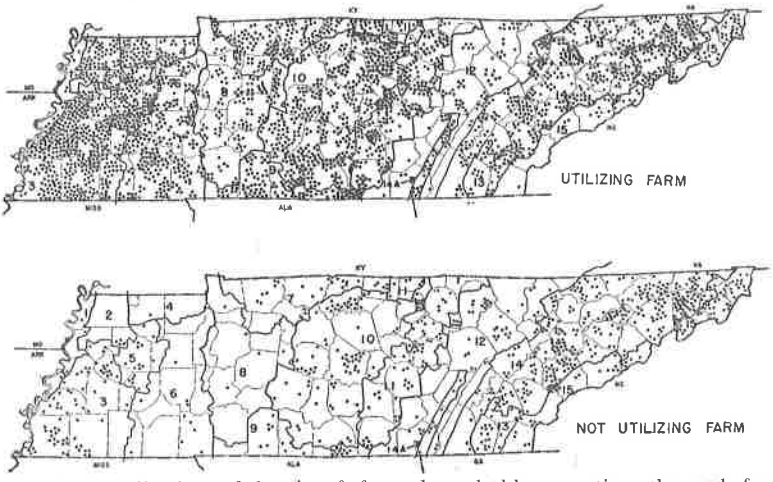

Fig. 2. Distribution of heads of farm households reporting the red fox either utilizing or not utilizing their farms.

this section. Such requests are relatively rare in other sections of the State.

The red fox was reported as occurring on farms of 2,741 of the 3,560 respondents (Table 2). The distribution of the 3,560 respondents, 2,741 of which reported the red fox on their farms and 819 who reported the animal not on their farms, is presented in Figure 2.

Red fox population trends on the sampling areas during the five year period prior to study were reported as: up, 61 per cent; down, 6 per cent; fluctuating, 1 per cent; no change, 15 per cent; unknown, 17 per cent. In all farming-types the largest per cent of respondents reporting a change reported the red fox population as up.

Fox Hunting. Of the 3,560 heads of farm households interviewed, 44.7 per cent hunt and an estimate of 11 per cent of

these hunters hunt the fox. The larger percentages of farmer fox hunters were in Central Tennessee. Of 117 fox hunters interviewed only 51 per cent possessed a hunting license. It was estimated that heads of farm households harvested 6,621 red and 5,093 gray foxes in Tennessee during the study period. These figures are not indicative of the sporting value of the foxes as fox hunters rarely attempt to kill the fox. This becomes evident when it is known that the estimated number of hunting trips required to harvest the 6,621 red foxes was 323,399. The above hunting data were obtained from Schultz *et al.* (1954).

Acknowledgments

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