

TRENDS IN NUMBERS OF LOGGERHEAD SHRIKES ON ROADSIDE CENSUSES IN PENINSU LAR FLORIDA, 1974-1992.

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ABSTRACT: *The Loggerhead Shrike (Lanius ludovicianus) has been declining in numbers for most of the 20th century and is currently diminishing at about 5% per year. We present data on trends in numbers of shrikes in southcentral Florida based on roadside counts conducted along 505 km of roads, twice a year in summer and winter, from 1974 to 1981, in January 1989, July 1991, and January and July 1992. The annual mean count method indicates that from 1976 to 1992 the winter population declined at the rate of 37%, and the summer counts by 41%. The magnitude of the decline documented by us is greater than that recorded by Breeding Bird Surveys for the species nationwide.*

LOGGERHEAD Shrikes (*Lanius ludovicianus*) are prominent birds of open habitats and are important as an indicator species of environmental degradation because they are predatory and closely associated with agricultural areas (Hands et al., 1989). Once relatively common throughout much of North America, the Loggerhead Shrike has been declining in numbers for most of the 20th century and is currently diminishing at about 5% per year (Hess, 1910; Graber et al., 1973; Bystrak and Robbins, 1977; Geissler and Noon, 1981; Morrison, 1981; Burnside and Sheperd, 1985; Hands et al., 1989). It is one of the few species to exhibit significant declines in Breeding Bird Surveys (BBS) in all continental regions (Robbins et al., 1986). During 1966 - 1989, 37 of 43 states and provinces of the U. S. and Canada showed negative trends, 25 of which were statistically significant (Droege and Sauer, 1990). Regions most affected appear to be those with breeding populations of the migratory subspecies (Bystrak, 1983). The Loggerhead Shrike has been included in the National Audubon Society's Blue List since 1972 (Tate, 1986) and is under consideration for listing as Threatened or Endangered by the FWS². The species is considered Extirpated in 4 states, Endangered in 5; Threatened in 2; and of Special Concern in 3 (Hands et al., 1989). In a recent Status Review of the southeastern states by the FWS, 71% of the respondents opposed Federal listing at present, 17% favored listing as Threatened, and 12% did not comment (Flemming, 1991).

Several factors have been suggested as causes for the decline of the Loggerhead Shrike (Porter et al., 1975; Busbee, 1977; Anderson and Duzan, 1978; Craig, 1978; Kridelbaugh, 1982; Bystrak, 1983; Cadman, 1985; Hands et al., 1989), while loss of foraging habitat and hunting perches to modern agricultural practices in the last

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²FWS: United States Fish and Wildlife Service

decade may be the most likely explanation (Cadman, 1985; Hands et al., 1989). Flemming (1991) cautioned that shrike population trends should be considered in a historical perspective. Much of the eastern U. S. was forested in pre-settlement times, so the species may have increased its range as the result of widespread clearing of forests for agriculture. Thus, the current decline may reflect loss of suitable agricultural and other open habitats due to changing agricultural practices (Novak, 1989).

Three major strongholds of Loggerhead Shrike populations are considered to be peninsular Florida, Oklahoma, and New Mexico (Robbins et al., 1986). Cox (1987) showed that BBS indicate a statewide decline of approximately 3.7% annually. Here, we present additional data on trends in numbers of shrikes in southcentral Florida based on roadside counts conducted twice a year in summer and winter from 1974 to 1981, in January 1989, July 1991, and January and July 1992.

METHODS—Censuses were conducted in January and July along 505 km (314 miles) of roads in Highlands, DeSoto, Charlotte, Glades, Hardee and Okeechobee counties. The total route was divided into four transects (Appendix 1) of 158 km (96 miles), 104 km (65 miles), 116 km (72 miles), and 127 km (79 miles) respectively, and surveyed on consecutive days. Maps of the census routes are on permanent file at the Archbold Biological Station.

The predominant habitat sampled by the census route was open, improved pasture with widely spaced trees. Other habitat types included bottomland and upland forests, citrus groves, marshes and wet prairies, pine flatwoods, scrub and urban areas. All roads were bordered by utility lines, grassy road shoulders and, for most portions of the route, roadside ditches.

Loggerhead Shrikes observed within a distance of a quarter (1/4) mile from the road were recorded from a vehicle travelling at 50-58 km/h (30-35 mph), and the odometer reading was recorded to allow plotting the location of each sighting on maps. Notes were taken on habitats, weather, perch selection and other details. Surveys started at 0800 hr and usually ended before 1200 hrs. All transects were driven in the same direction in all the surveys. Four observers participated in each survey.

Regression analysis was performed with a Statview program; all data presented are mean \pm SE, unless otherwise specified. We chose $P = 0.05$ as the minimum acceptable level of significance.

RESULTS—Numbers of shrikes on the 505 km census route from 1974 to 1992 varied from 111 to 336 (mean of 233.4 ± 77.0) in winter and from 95 to 234 (mean of 158.5 ± 41.3) in summer (Table 1). The difference between the January and July censuses, for all counts combined, was significant (Chi-square = 442.6, 7 DF, $P = 0.0001$), as was the difference for each year (Chi-square = 9.03 - 42.34, $P < 0.05$).

A pronounced increase in numbers occurred between 1974 and 1976, but populations in July and January steadily declined during the period 1976 to 1992 (Table 1). Each transect route was analyzed separately from 1974 to 1992 to determine if the trend was due to particular routes. Significant declines occurred on three of the four routes (route 1: $r^2 = 0.4$, F-test = 5.6, $P = 0.05$; route 2: $r^2 = 0.5$, F-test = 8.3, $P = 0.02$, route 3: $r^2 = 0.2$, F-test = 1.5, $P = 0.3$; route 4: $r^2 = 0.5$, F-test = 9.7, $P = 0.01$). From 1976 to 1992 the winter counts decreased by 37%, the summer counts by 41% (i.e., a decline of 1.4% and 1.6% per year, respectively, over 16 years). In January 1976, 0.67 individuals were observed per kilometer, but this number declined to 0.25 in 1992 (Table 1). Numbers on the July census decreased from 0.46 individual per mile in 1976 to 0.18 in 1981. The rates of decline in summer and winter were strongly correlated; r^2 value was 0.94 between each July and the following January.

TABLE 1. Number of Loggerhead Shrikes observed per km in southcentral Florida on a 505 km roadside census route, 1976-1989, and percentage change from one year to the next.

| Year | January | | July | |
|------|---------|----------|--------|----------|
| | Ind/km | % change | Ind/km | % change |
| 1974 | 0.36 | | 0.25 | |
| 1975 | 0.49 | +34 | 0.35 | +36 |
| 1976 | 0.66 | +37 | 0.46 | +34 |
| 1977 | 0.65 | -2 | 0.39 | -16 |
| 1978 | 0.54 | -18 | 0.34 | -14 |
| 1979 | 0.52 | -3 | 0.37 | +12 |
| 1980 | 0.51 | -2 | 0.26 | -31 |
| 1981 | 0.41 | -20 | 0.27 | -5 |
| 1989 | 0.22 | -6 | | |
| 1991 | | | 0.25 | |
| 1992 | 0.25 | | 0.18 | |

Difference between:

January and July censuses

Chi-square = 442.6, DF = 7; P = 0001

Each year

Chi-square = 9.03 - 42.34, P = 0.05

DISCUSSION—The results of our roadside censuses and those of Bohall-Wood (1987) indicate that shrike populations in Florida are larger in winter than in summer. The increased abundance in winter may be due to wintering migrants, residents and young of the year, or a combination of both. Burnside (1987) suggested that Loggerhead Shrike populations east of the Rocky Mountains migrate partly or wholly to the southeastern states for the winter, but presently there is no evidence to indicate that northern individuals winter in peninsular Florida. Banding data for Loggerhead Shrikes in the USFWS Office of Migratory Bird Management contain records of only 11 banded shrikes recovered in Florida, all of which were banded there. Additional evidence indicative of no significant movement of northern birds into southcentral Florida in winter was obtained in a study of Loggerhead Shrikes by the senior author on a 4,200 ha ranch located within the area of the roadside census routes. All resident adults and fledglings were color-banded during the summers of 1990 and 1991, and in neither year did any unmarked shrikes appear on the study area during winter. The boundary of the ranch study area is adjacent to the nearest segment of the roadside census route, so migrants might have settled along roads rather than in areas remote from roads. Further support for residents rather than migrants as the source of increased numbers of shrikes along roads in winter is the close similarity in the trends of summer and winter counts ($r^2 = 0.94$ between counts in July and the following January). Such a strong correlation would not be predicted if the winter increase was due largely to migrants because yearly differences in breeding success and winter temperatures in the north would be expected to result in year-to-year variation in the migrating population, independent of resident numbers.

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LITERATURE CITED

- ANDERSON, W. J. AND R. F. DUZAN. 1978. DDE residues and eggshell thinning in Loggerhead Shrikes. *Wilson Bull.* 90:215-220.
- BOHALL-WOOD, P. 1987. Abundance, habitat use, and perch use of Loggerhead Shrikes in north-central Florida. *Wilson Bull.* 99:82-86.
- BURNSIDE, F. L. AND W. M. SHEPHERD. 1965. Population trends of the Loggerhead Shrike in Arkansas. *Arkansas Acad. of Sci. Proc.* 39:25-28.
- BURNSIDE, F. L. 1987. Long distance movements by Loggerhead Shrikes. *J. Field Ornithol.* 58:62-65.
- BUSBEF, E. L. 1977. The effects of dieldrin on the behavior of young Loggerhead Shrikes. *Auk* 94:28-35.
- BYSTRAK, D. 1983. Loggerhead Shrike (*Lanius ludovicianus*). Pp. 301-310. In: ARMBUSTER, J. S. (ed.). Impacts of coal surface mining on 25 migratory bird species of high federal interest. U. S. Fish and Wildlife Service FWS/OBS-83/35.
- _____, AND C. S. ROBBINS. 1977. Bird population trends detected by the North American Breeding Bird Survey. *Pol. Ecol. Stud.* 3:131-143.
- CADMAN, M. D. 1955. Status report of the Loggerhead Shrike in Canada. Unpublished report to the Committee on the Status of Endangered Wildlife in Canada. 97 pp.
- CARLSON, A. 1985. Prey detection in the Red-backed Shrike: an experimental study. *Anim. Behav.* 33:1243-1249.
- COX, J. 1987. The Breeding Bird Survey in Florida: 1969-1983. *Fla. Field Nat.* 15:29-56.
- CRAIG, R. B. 1978. An analysis of the predatory behavior of the Loggerhead Shrike. *Auk* 95:221-234.
- DROEGE, S., AND J. R. SAUER. 1990. North American Breeding Bird Survey annual summary, 1989. US Fish Wildl. Serv. Biol. Rep. 90(8):1-22.
- DUNNING, J. B., Jr. 1989. Management of nongame migratory birds in farmland, suburban and urban habitats. Pp. 153-163. In: Proc. nongame migratory bird workshop. USFWS, Atlanta, Georgia.
- FLEMMING, D. P. 1991. Loggerhead Shrike status survey in the southeast region. USFWS, Atlanta, Georgia. Unpubl. ms.
- GEISSLER, P. H., AND B. R. NOON. 1981. Estimates of avian population trends from North American Breeding Bird Survey. *Stud. Avian Biol.* 6:42-51.
- GRABER, R. R., J. W. GRABER AND E. L. KIRK. 1973. Illinois birds. Laniidae. *Illinois Nat. Hist. Surv. Biol. Notes* 83. 18 pp.
- HANDS, H. M., R. D. DROBNEY, AND M. R. RYAN. 1989. Status of the Loggerhead Shrike in the northcentral United States. Unpublished report of the U.S. Fish and Wildlife Service. Missouri Cooperative Fish Wildl. Res. Unit, Univ. of Missouri, Columbia, Missouri.
- HESS, I. E. 1910. One hundred breeding birds of an Illinois ten-mile radius. *Auk* 27:19-32.
- HILL, H. R. 1976. Feeding habits of the Ring-necked Pheasant chick, and the evaluation of available foods. Ph.D. diss. Michigan State Univ., East Lansing, 84 pp.
- KRIEDELBAUGH, A. J. 1982. An ecological study of Loggerhead Shrikes in central Missouri. M.S. Thesis. Univ. of Missouri, Columbia, Missouri. 114 pp.
- MORRISON, M. L. 1981. Population trends of the Loggerhead Shrike in the United States. *Am. Birds* 55:754-757.
- NOVAK, P. G. 1989. Breeding ecology and status of the Loggerhead Shrike in New York state. M.S. Thesis. Cornell Univ., Ithaca, New York. 156 pp.
- PORTER, D. K., M. A. STRONG, J. B. GIEZENTANNER, AND R. A. RYDER. 1975. Nest ecology, productivity, and growth of the Loggerhead Shrike on the shortgrass prairie. *Southwest Nat.* 19:429-436.
- ROBBINS, C. S., D. BYSTRAK, AND P. H. GEISSLER. 1986. The Breeding Bird Survey: its first fifteen years, 1965-1979. US Fish Wildl. Serv. Resour. Publ. 157. 196 pp.
- TATE, J., Jr. 1986. The Blue List for 1986. *Am. Birds* 40:227-236.

APPENDIX 1. Census route along 505 km (314 miles) of roads through Highlands, DeSoto, Charlotte, Glades, Hardee and Okeechobee counties. The total route was divided into four transects.

1) Commence at junction US 27 and SR 70; W on SR 70 to SR 31; S on SR 31 to SR 74; E on SR 74 to SR 29; E on SR 29 to US 27; N on US 27 to SR 70. Included are portions of Highlands, DeSoto, Charlotte and Glades counties. 158 Km (98 miles).

2) Commence at junction US 27 and SR 70; N on US 27 to SR 66; W on SR 66 to SR 17; S on SR 17 to SR 70; E on SR 70 to SR 31. Included are parts of Highlands, Hardee and DeSoto counties. 104 km (65 miles).

3) Commence at junction US 27 and SR 70; E on SR 70 to CR 721 (at Brighton); S on SR 721 to SR 78; E on SR 78 to US 441; N on US 441 to SR 70; W on SR 70 to CR 721. Included are portions of Highlands, Glades and Okeechobee counties. 116 km (72 miles).

4) Commence 3 km east of US 27 on SR 70 at intersection with SR 29; N on SR 29 to CR 619; N on CR 619 to CR 621; E on CR 621 to US 98; E on US 98 to CR 68; CR 68 to US 441; S on US 441 to SR 70; W on SR 70 to US 98; N on US 98 to CR 68; (continue W on US 98 to CR 721 - this section is not counted); S on CR 721 to SR 70. Included are portions of Highlands and Okeechobee counties. 127 km (79 miles).

If the increase in roadside counts in winter largely or entirely reflects a change in the resident population, at least part of the build-up probably represents juveniles produced the previous breeding season. Adults whose territories are located along roads also might tend to shift their activity to roadsides in winter in response to higher prey abundance and/or vulnerability in the short grass of road shoulders (Hill, 1976; Carlson, 1985). In cool weather insects may be more active in short-grass areas than in habitats with taller ground cover because of greater insolation. The presence of utility poles and wires and fences for perching presumably is an additional factor contributing to the value of roadsides as winter shrike habitat.

The positive trend from 1974 to 1976 was not associated with any significant change in habitats of the census routes and thus may have reflected a period of favorable environmental conditions leading to higher reproduction and/or survival unless habitat changes in a wider peripheral geographic area influenced the population in our census area. The 1981 numbers approximate those of 1974, so one could argue that the curvilinear, downward trend from 1976 to 1981, may not reflect a long-term decline but rather is part of a "normal" fluctuation, perhaps resulting from years of low productivity and/or survival. However, the very low three groups of counts in 1989, 1991, and 1992 further support the contention of a long-term decline. If the positive relationship between winter and summer counts in 1974-1981 was real, the decline to the July 1992 level seems ominous. The annual mean counts method, which represents a species average density (Robbins et al., 1986), indicates that the population of Loggerhead Shrikes on our census routes in southcentral Florida declined 8.9% per year between 1976 and 1981, and a further 5.5% per year between 1981 and 1992. The magnitude of the decline is greater than that recorded by BBS nationwide (Robbins et al., 1986; Droege and Sauer, 1990), and for southcentral Florida in particular (1986-1989, -3.5%). If the current trend continues, southcentral Florida may lose Loggerhead Shrikes from its breeding fauna. The problem of distinguishing between population fluctuations of long periodicity and a true long-term decline clearly indicates the need for continuous, long-term monitoring of Florida's Loggerhead Shrike populations.

Peninsular Florida presently is experiencing significant land-use changes that affect shrikes negatively. The increasing human population is resulting in increasing urbanization and development, and in the southern one-third of the peninsula extensive conversion of pasture-lands to citrus groves and row crops is occurring. Southcentral Florida is one of the three major strongholds of Loggerhead Shrikes (Robbins et al., 1986), hence the present evidence of decline is of particular concern.

The Loggerhead Shrike is but one of a group of open-area/prairie birds that is declining. Northern Bobwhites (*Colinus virginianus*) have also undergone extensive declines (Brennan, 1991), as have Barn Owls (*Tyto alba*), and Henslow's Sparrows (*Ammodramus henslowii*) (Dunning, 1989). However, none of these other open-area species of special concern exhibits continent-wide declines to the extent recorded for the Loggerhead Shrikes.