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SPECIES AND ABUNDANCE OF DIURNAL RAPTORS IN THE PANHANDLE OF NEBRASKA

JOHN E. MATHISEN AND ANN MATHISEN

RECENT evidence of population declines for several species of raptors has been a subject of some concern both nationally and internationally. Although raptors are the most conspicuous birds in our environment, by virtue of their large size, flight habits, and food habits, little information is available to evaluate population densities and trends over large areas. Data are needed to provide yardsticks for judging population changes over time periods and among geographic areas.

This study was undertaken to provide information on the species and seasonal abundance of raptors in the panhandle of Nebraska for three years (1957 through 1959). Ten years have elapsed since the study was initiated and a replication at this time would be of considerable interest and value. We hope this report stimulates someone to repeat the study now and provide valuable information for helping to evaluate the population status of raptors.

Preliminary findings on our Nebraska study were reported by Mathisen and Mathisen (1957). Similar roadside raptor counts have been conducted by Nice (1934), Allan and Sime (1943) in Texas, Enderson (1965) in Colorado, and Rowan (1964) in South Africa.

METHODS

Most of the observations were made during official travel for the Nebraska Game, Forestation and Parks Commission. On days when observing conditions were good, all raptors seen on either side of the road were identified and recorded. Data included species, location, general habitat type where each bird was observed, time of day, and weather conditions. If positive identification could not be made, the bird was classed as unidentified. Observations were not made on rainy, foggy, or exceedingly windy days.

The number of miles traveled during each observation period was also recorded. Observations were made while traveling on both paved highways and secondary roads during all months of the year, except January 1958. The study period extended from 1 January 1957 through 31 December 1959.

An index of abundance was computed for each species for each month by calculating the number of raptors observed per 100 miles of travel. Future data can be compared on a monthly or annual basis, provided an adequate sample of mileage is obtained.

Information on habitat preferences of the various species appears in the preliminary report (Mathisen and Mathisen, 1957).

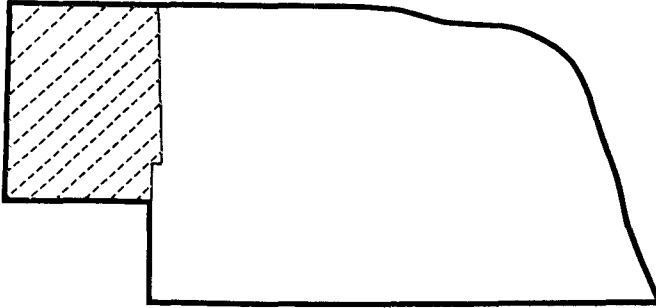


FIG. 1. Location of Nebraska panhandle study area.

STUDY AREA

This study was restricted to the eleven counties comprising the panhandle of Nebraska, an area of approximately 14,000 square miles (Fig. 1). This region may be roughly divided into three general habitat types: (1) cropland, largely winter wheat and other grains, (2) grassland, including the short-grass prairie of the extreme west and mixed-grass prairie of the sandhills, and (3) pine ridge, a rough escarpment with many buttes and canyons supporting open stands of ponderosa pine (*Pinus ponderosa*). Grassland is the most abundant habitat type in the panhandle, with cropland second and the pine ridge least.

FINDINGS

A total of 2,564 raptors were recorded in 53,347 miles of travel (Table 1). Seventeen species were recorded during the study period (Table 2). About six per cent of the raptors were classified as unidentified. Almost 90 per cent of the observations consisted of six species: Marsh Hawk, Sparrow Hawk, Rough-legged Hawk, Swainson's Hawk, Golden Eagle, and Red-tailed Hawk.

TABLE 1
SAMPLE SIZES AND INDEX OF ABUNDANCE OF RAPTORS IN THE PANHANDLE
OF NEBRASKA, 1957-59

Year	Miles Traveled	No. Observation Days	No. of Raptors	No. Raptors per 100 Miles
1957	17,807	100	623	3.5
1958	20,852	143	1,072	5.1
1959	14,688	100	869	5.9
Totals	53,347	343	2,564	4.8

TABLE 2
NUMBER OF DIURNAL RAPTORS RECORDED IN THE PANHANDLE OF NEBRASKA, 1957-59

Species	1957	1958	1959	Total
Sparrow Hawk (<i>Falco sparverius</i>)	113	283	369	765
Marsh Hawk (<i>Circus cyaneus</i>)	164	324	166	654
Rough-legged Hawk (<i>Buteo lagopus</i>)	149	213	137	499
Swainson's Hawk (<i>B. swainsoni</i>)	65	78	29	172
Golden Eagle (<i>Aquila chrysaetos</i>)	24	52	61	137
Red-tailed Hawk (<i>B. jamaicensis</i>)	20	20	30	70
Peregrine Falcon (<i>Falco peregrinus</i>)	24	11	8	43
Krider's Red-tailed Hawk (<i>B. j. kriderii</i>)	3	6	6	15
Turkey Vulture (<i>Cathartes aura</i>)	5	3	4	12
Bald Eagle (<i>Haliaeetus leucocephalus</i>)	1	4	6	11
Ferruginous Hawk (<i>B. regalis</i>)	4	2	3	9
Broad-winged Hawk (<i>B. platypterus</i>)		3	3	6
Prairie Falcon (<i>F. mexicanus</i>)			4	4
Cooper's Hawk (<i>Accipiter cooperii</i>)			3	3
Pigeon Hawk (<i>F. columbarius</i>)	1		2	3
Osprey (<i>Pandion haliaetus</i>)	1			1
Sharp-shinned Hawk (<i>A. striatus</i>)	1			1
Unidentified	48	73	38	159
Totals	623	1,072	869	2,564

TABLE 3
NUMBER OF RAPTORS OBSERVED PER 100 MILES, 1957-59
Values given are monthly averages

Month	Species*						All Raptors†
	1	2	3	4	5	6	
January	0.1	0.8	1.1	3.2			6.1
February	0.2	1.0	1.0	2.7			5.4
March	0.1	1.4	0.4	2.1	tr		4.9
April	3.3	2.0	0.2	0.4	0.3	0.4	7.1
May	1.4	1.0	0.1	tr	0.1	0.4	3.2
June	0.3	0.4	tr		tr	0.3	1.4
July	0.6	0.8	0.1		tr	0.5	2.2
August	1.7	1.0	tr		0.1	0.4	3.5
September	8.4	1.5	0.2	0.1	0.6	0.4	12.6
October	0.4	2.0	0.1	0.2	0.2	0.1	3.5
November	0.1	1.3	0.7	1.9	0.1		4.5
December	0.2	0.7	0.5	2.2			4.1

* 1 Sparrow Hawk; 2 Marsh Hawk; 3 Golden Eagle; 4 Rough-legged Hawk; 5 Red-tailed Hawk; 6 Swainson's Hawk.

† Includes all identified and unidentified raptors observed.

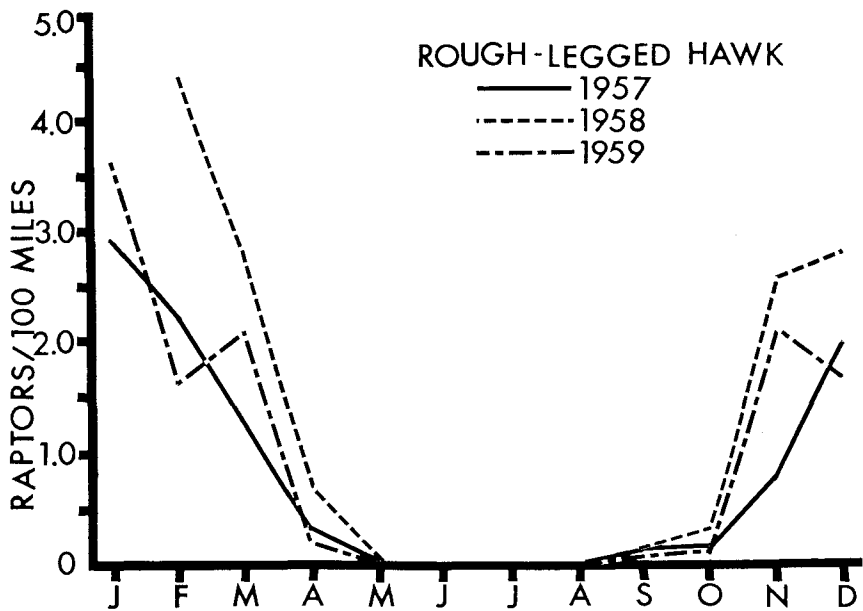


FIG. 2. Monthly abundance of the Rough-legged Hawk in the panhandle of Nebraska, 1957-59.

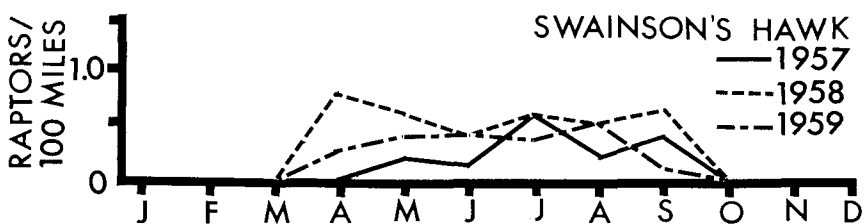


FIG. 3. Monthly abundance of the Swainson's Hawk in the panhandle of Nebraska, 1957-59.

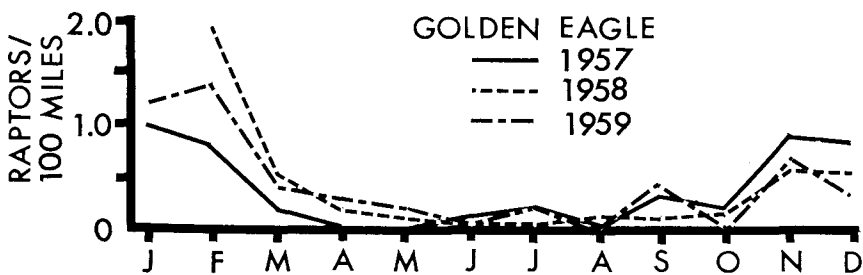


FIG. 4. Monthly abundance of the Golden Eagle in the panhandle of Nebraska, 1957-59.

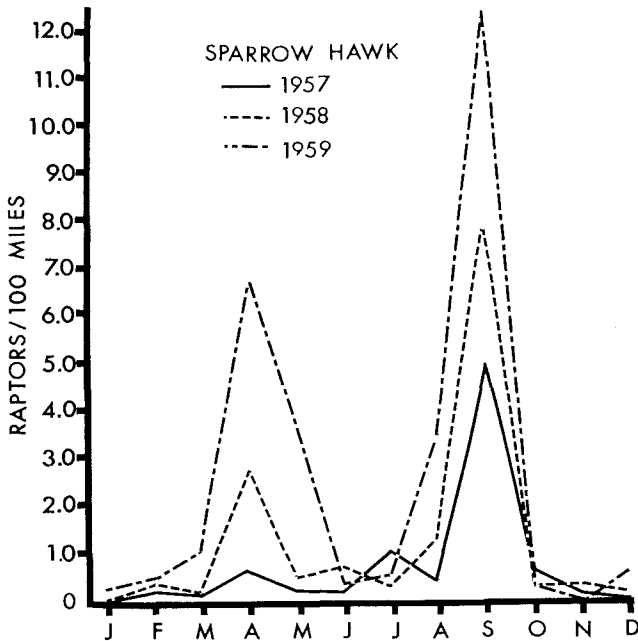


FIG. 5. Monthly abundance of the Sparrow Hawk in the panhandle of Nebraska, 1957-59.

Annual patterns of population abundance for the six major species are presented in Figures 2 through 7. These graphs show the periods of migration and relative abundance of each species for the three-year period.

Average monthly indices of abundance for the six most numerous species and for all raptors observed are given in Table 3. The pattern of seasonal abundance of raptors was similar from year to year with but few deviations. But the magnitude of abundance for specific months varied from year to year. April and September were months of major migrations. More raptors were observed in September than in April each year. The population reached a low point yearly in June or July. In 1957 and 1959 an increase in July was recorded for species breeding in the area, possibly reflecting the increment of young birds. This premigration increase was detected in August 1958.

The Rough-legged Hawk was the major raptor in midwinter in the study area. Its population changes were very similar for the three-year period (Fig. 2). Highest densities occurred in January with a consistent decline through May, after which the birds were not seen for the summer. They reappeared in September and gradually built up to their wintering peak.

TABLE 4
SEASONAL SPECIES COMPOSITION OF RAPTORS OBSERVED IN THE PANHANDLE
OF NEBRASKA, 1957-59

	Summer		Fall		Winter		Spring	
	No.	Per Cent	No.	Per Cent	No.	Per Cent	No.	Per Cent
Rough-legged Hawk	—	—	90	10.4	289	52.4	120	14.8
Red-tailed Hawk	11	3.4	34	3.9	—	—	25	3.1
Marsh Hawk	104	32.1	233	26.9	90	16.4	227	27.9
Sparrow Hawk	105	32.4	357	41.3	19	3.4	285	35.1
Golden Eagle	11	3.4	41	4.7	93	16.9	33	4.1
Swainson's Hawk	61	18.8	21	2.4	—	—	49	6.0
Others	32	9.9	89	10.3	60	10.9	73	9.0
Total	324	100.0	865	100.0	551	100.0	812	100.0

Summer: June, July, August; Fall: September, October, November; Winter: December, January, February; Spring: March, April, May.

When the number of Rough-legged Hawks per 100 miles is expressed for comparable groups of months, there were 11.1 in Colorado (Enderson, 1965), 2.1 in Nebraska (our data), and 1.2 in Texas (Allan and Sime, 1943). Rough-legged Hawks were recorded almost five times more frequently in Colorado than Nebraska from September to February.

The Swainson's Hawk was recorded from March through October or November at relatively low population levels (Fig. 3).

The curves for the Golden Eagle population were almost identical for the three years. Peak numbers occurred during the winter months, with highest densities in January and February. Low populations occurred during the summer period, with a slight peak in July and September. A slight peak was also evident in November of all three years. For the same period, there were 1.9 Golden Eagles observed per 100 miles in Colorado (Enderson, 1965), compared to 0.5 seen in Nebraska.

The Sparrow Hawk population followed a similar annual pattern of abundance for the three years, although the magnitude of the peak populations varied (Fig. 5). Large numbers of Sparrow Hawks migrated through the area in April and September. In Colorado, Enderson (1965) recorded 1.9 Sparrow Hawks per 100 miles, compared to 1.3 for this Nebraska study.

The Marsh Hawk was present throughout the year, with peak numbers occurring in April and October in all years except October 1959 (Fig. 6). No peak was recorded in the fall of 1959, even though 1,000 miles were logged for the month on eight different days. For the same months, 5.0

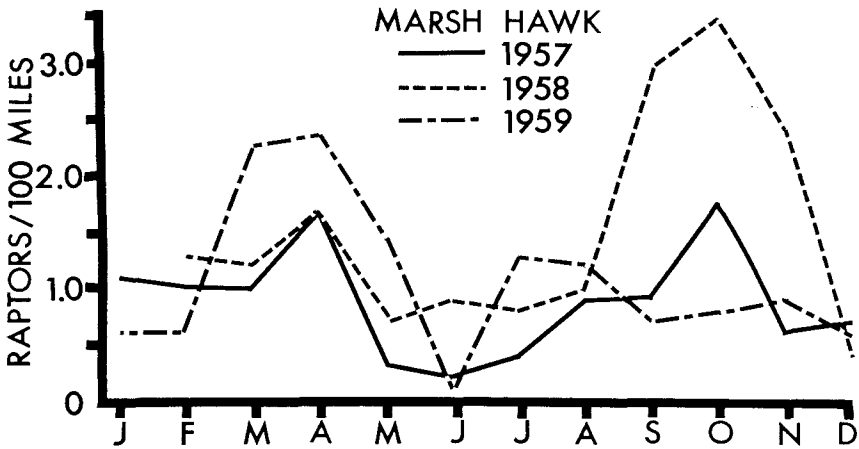


FIG. 6. Monthly abundance of the Marsh Hawk in the panhandle of Nebraska, 1957-59.

Marsh Hawks per 100 miles were found in Texas (Allan and Sime, 1943), 4.5 in Colorado (Enderson, 1965), and 1.2 in Nebraska (our study).

The Red-tailed Hawk was present in all months except December, January, and February (Fig. 7). Migration apparently took place in April and September. The breeding population was at a relatively low level in all years, with greatest numbers present in 1959.

Relative abundance of the six major species of raptors was obtained by combining data for the three-year period and summarizing by seasons of the year (Table 4). A direct comparison implies that each species is equally observable. This, of course, is not the case. The small size of Sparrow Hawks, for instance, and the ground roosting habits of Marsh Hawks makes these raptors less observable from the roadside. Craighead and Craighead (1956) suggest applying correction factors to field data so these two species are more properly represented. Their studies in southern Michigan indicated that doubling the Marsh Hawk observations and tripling the Sparrow Hawk observations would correct for their being less observable.

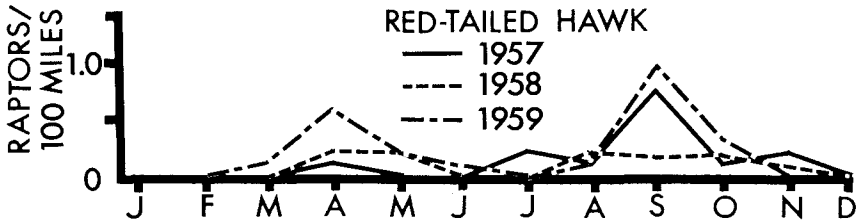


FIG. 7. Monthly abundance of the Red-tailed Hawk in the panhandle of Nebraska, 1957-59.

Data given in Table 4, therefore, probably do not properly reflect the true species composition of the raptor population. Species composition from future roadside counts, however, can be compared with data in Table 4.

The winter population of raptors consisted primarily of Rough-legged Hawks, Marsh Hawks, and Golden Eagles. By spring the Rough-legged Hawks were replaced in dominance by Sparrow Hawks. Other buteos and eagles became relatively scarce.

The summer breeding population consisted largely of Sparrow Hawks and Marsh Hawks. The Swainson's Hawk was the major summer buteo. Species composition in fall was almost identical to the spring period.

SUMMARY

Diurnal raptors were recorded from 1957 through 1959 while traveling by automobile in the panhandle of Nebraska. A total of 2,564 raptors of 17 species were observed while traveling 53,347 miles. The number of raptors per 100 miles was 3.5 in 1957, 5.1 in 1958, 5.9 in 1959 and averaged 4.8 for the three years.

Annual patterns of raptor abundance were, with but few deviations, similar among years. But the magnitude of abundance for certain months varied among years. April and September were months of major migrations.

Major winter raptors were the Rough-legged Hawk, Marsh Hawk, and Golden Eagle. Abundant species in summer included the Sparrow Hawk, Marsh Hawk, and Swainson's Hawk. In spring and fall the raptor population was dominated by the Sparrow Hawk, Marsh Hawk, and Rough-legged Hawk.

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