LOCAL WINTER MOVEMENTS OF FOUR RAPTOR SPECIES IN CENTRAL COLORADO

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Although most North American raptors are migratory (Bent 1937, 1938), considerably less emphasis has been placed on studying wintering habitat than breeding habitat. Newton (1979) noted that relatively few raptor studies have been conducted in winter. Wilkinson and Debban (1980) stated that little is known about wintering habitat preferences for any raptor species (but, see Southern 1963, Weller 1964, Schnell 1968, Edwards 1969, Koplin 1973, Page and Whitacre 1975, Parker and Campbell 1984, Fisher et al. 1984). Consequently, it is difficult to predict the effects of wintering habitat alterations on raptor populations. One of the most detailed winter studies of raptors (Craighead and Craighead 1956) based its movement estimates on observations of unmarked birds in southern Michigan. The study by Enderson (1964) of Prairie Falcon (*Falco mexicanus*) movements in the central Rocky Mountain region was based on observations of marked birds. However, without telemetry equipment, the locations of unobserved birds could not be determined.

While field testing methods of attaching radio transmitters to raptors, we collected movement data for three Red-tailed Hawks (*Buteo jamaicensis*), one Rough-legged Hawk (*Buteo lagopus*), one Prairie Falcon and three Great Horned Owls (*Bubo virginianus*) for various periods of time (1 day to 4 months) between 1 December 1974 and 10 April 1975 in central Colorado.

STUDY AREA AND METHODS

The study was conducted in a 186 km^2 area of south Sedalia, Douglas County, in central Colorado. The study area was on private land adjacent to the Rampart range foothills east of Pike National Forest. West Plum Creek and its major tributaries are the primary drainage courses, and the habitat within 0.4 km of these drainages constitutes 29% of the study area. The elevation ranges from 1739 m in the drainage bottoms to 2280 m on the buttes.

Habitat in the area, primarily used for cattle production, comprises short grass pasture and alfalfa with scattered stands of natural and planted tree groves. Dominant native trees include Ponderosa Pine (*Pinus ponderosa*) and oak (*Quercus* spp.) on the uplands and Plains Cottonwood (*Populus sargentii*) and willow (*Salix* spp.) in the drainages.

We trapped all raptors near roads which paralleled major drainages in the area. The Prairie Falcon, Red-tailed Hawks and Rough-legged Hawk were

captured by means of bal-chatri traps (Berger and Hammerstrom 1962, Berger and Mueller 1959); the Great Horned Owls were captured in Swedish goshawk traps (Meng 1971) and with bal-chatri traps. The raptors were held overnight and blood samples were taken from the hawks and falcon. We used 164 MHz, 15 to 25 g transmitters which were attached with nylon cord "back-pack" harnesses to two Red-tailed Hawks and to two Great Horned Owls. The remaining birds were radio-equipped with experimental tail mounts on the two central rectices. Radio tracking was done primarily from vehicles equipped with roof-mounted dual yagi antennas (Hegdal and Gatz 1979). Yagi antennas were used for aerial tracking. Hand-held loop and yagi antennas were used for "walking-out" radio-equipped birds. Model LA 12 receivers (built by AVM Instrument Co., Champaign, IL)[1] were used for all radio-tracking.

Raptor locations were determined about twice each week by triangulation. Each bird was located visually approximately once each week to observe the radio attachment. Since the main objective of this study was to field test radio attachment techniques, primary consideration was not given to continuous or daily monitoring of raptor movements. The tracking of radio-equipped birds was fairly regular from 4 December 1974 to 19 February 1975. Tracking was discontinued in March and April except for the periods of 6 to 10 March and 5 to 12 April when additional movement data were collected. No active radio transmitters were located in the study area on 13 August 1975. We plotted raptor locations on 1:24000 scale USGS quadrangle maps. The convex polygon method (Southwood 1966, Jennrich and Turner 1969) was used to calculate the area used by the raptors. Although this method often includes areas of non-use and gives no weight to relative densities of locations in the polygon, it is a consistent method and it provides information comparable to other movement data often calculated with this technique (Jennrich and Turner 1969). We follow Craighead and Craighead (1956) in defining a winter raptor range as "a rather limited area of land over which a raptor moves or hunts during a given period." It is generally undefended, thus it differs from a territory.

RESULTS AND DISCUSSION

Red-tailed Hawks

Of the three Red-tailed Hawks radioed, number 3 flew west and was not located again after it was released on 23 December 1974 (Table 1). Red-tailed Hawk number 1 was monitored from 4 to 18 December 1974, and had moved 6.3 km south of its capture site when last located. Red-tailed Hawk number 2 was monitored from 5 December until 11 December 1974 when no signal was received in the study area. An aerial search in late February 1975 over the study area and 290 km south to near the Colorado-New Mexico border failed to locate the bird. However, it was located again 20 March 1975 in the study area 0.4 km from its last December location. It was building

[1]Use of brand names does not imply endorsement by the Federal Government.

Table 1. Raptor movement data summary, Douglas Co., Colorado, 12 December 1974 to 10 April 1975.

SPECIES	NUMBER	RANGE (km²)	MAX. DISTANCE MOVED (km)	% LOCATIONS 0.4 km OF CREEK	NUMBER OF LOCATIONS	NUMBER DAYS MONITORED	DATES MONITORED
Red-tailed Hawk	1	18.0[1]	7.1	100%	9	15	4-18 Dec 1974
Red-tailed Hawk	2	2.2	2.6	100%	10	22	5-11 Dec 1974 20 Mar to 10 April 1975
Red-tailed Hawk	3	—	—	100%	1	1	23 Dec 1974
Rough-legged Hawk	—	8.0	8.8	95%	20	65	17 Dec 1974 to 19 Feb 1975
Prairie Falcon	—	27.6	10.0	100%	35	114	12 Dec 1974 to 4 April 1975
Great Horned Owl	1	0.4	1.1	86%	14	46	27 Dec 1974 to 10 Feb 1975
Great Horned Owl	2	0.9	1.1	97%	29	108	24 Dec 1974 to 10 April 1975
Great Horned Owl	3	0.2	0.8	100%	9	57	13 Feb-10 April 1975

[1]Probably not a true winter range. This Red-tailed Hawk appeared to be a transient bird moving through the study area.

a nest with another Red-tailed Hawk in a large cottonwood 1.2 km south of its capture location on 10 April 1975, when monitoring was discontinued.

Bailey and Niedrach (1965) stated that, in contrast to 20 to 30 years ago, when prairie dogs (*Cynomys* spp.) and other small mammals were abundant, most breeding Red-tailed Hawks in Colorado now leave for the winter. They show egg laying dates for this species in early May in Colorado. This is consistent with our data. Two of our radio-equipped birds were apparently transient in the study area in December. Red-tailed Hawk number 2, a breeding bird in the study area, left the area in mid-December for 3 months, returned by mid-March, and initiated nest-building in April.

Based on our limited data, the winter range of the resident Red-tailed Hawk was 2.2 km^2. In comparison, Craighead and Craighead (1956) estimated Red-tailed Hawk winter ranges of 0.75 to 2.98 km^2 for individual birds and 3.80 to 10.0 km^2 for pairs in southern Michigan. The mean size of winter home ranges for Red-tailed Hawks of both sexes in a southwestern Wisconsin study was 1.65 km^2 (Peterson 1979). Fitch et al. (1946) found that Red-tailed Hawks have circular or oval home ranges which varied spatially according to the number and distribution of perch trees, food supply, territorial pressures and physiographic features of the terrain. Peterson (1979) showed that winter home range boundaries of radio-equipped Red-tailed Hawks in Wisconsin frequently appeared to follow public roads (which are modified by physiographic features) and woodlot edges containing selected trees used as hunting perches. Similar selection for a physiographic feature may have been occurring in our study area. All of the Red-tailed Hawks locations were within 0.4 km of drainage courses, most of which were paralleled by roads, but habitat within 0.4 km of drainages constituted only 29% of our study area.

Rough-legged Hawk

We radio-tracked a dark-phase Rough-legged Hawk from 17 December 1974 to 21 January 1975, and located it visually from 6 to 19 February 1975 after the radio transmitter came off. We identified it by its missing tail feathers which came off with the transmitter. Our last sighting of this bird in February is consistent with Bailey and Niedrach's (1965) observation that the northward migration of Rough-legged Hawks out of Colorado starts in late February.

The total range of this bird (8.0 km^2) may be exaggerated by including two locations that could represent wandering from its usual range. Eighty-nine percent of its locations were within a 1.0 km^2 area. This small range is in contrast to the 10 to 15 km^2 winter range estimated to be used by this species in southern Michigan (Craighead and Craighead 1956). Two of the Rough-legged Hawks observed in the Michigan study did have winter ranges more comparable to our data (1.8 to 4.4 km^2). Except for these two individuals, accurate range data were not obtained in the Michigan study for other individuals because of the difficulty in distinguishing individual birds (Craighead and Craighead 1956). Citing increases in daily ranges of hawks from fall to spring as rodent populations decreased, Craighead and Craighead (1956)

concluded that small ranges of raptors were always correlated with either very high or unusually vulnerable local rodent populations.

The majority (95%) of our Rough-legged Hawk radio-locations were within 0.4 km of a drainage course.

Prairie Falcon

A male Prairie Falcon had the largest total winter range of any raptor monitored in this study (27.6 km²). However, the range may be exaggerated by including large areas of probable non-use between its diurnal range and its roosting sites up to 10 km to the south. Ninety percent of its locations were within a 9.3 km² area and all locations were within 0.4 km of major drainages. Most (91%) of the locations were taken between 1000 and 1600. Two locations in the late afternoon were 3.8 km south of the usual diurnal range and two locations after dark were 10 km south of the diurnal range.

From 11 December 1974 to 14 February 1975 most (83%) of its daytime locations were within a 0.5 km² area where it frequently was observed perched in dead trees or on haystacks. From 18 February to 20 March it expanded its diurnal range 2.5 km to the south, increasing its range to 1.9 km². Including diurnal movements away from this 1.9 km², a total of 9.3 km² were used by the falcon during the daytime. Only by including the distant roost sites does the total winter range expand to 27.6 km². On 4 April 1975 the falcon's radio transmitter and feathers were found near a dirt road, indicating that the bird was dead. This last location was 6.5 km south of its capture site. Enderson (1964) used the length of a line between the two most distant points of observation to measure marked Prairie Falcon winter ranges in Colorado and Wyoming. Using this method he found the average "range" to be 5.5 km, with a maximum of 19.4 km. Female birds had greater average ranges (11.5 km) compared to males (6.1 km). The male bird in our study had a maximum range of 10 km between its two most distant locations.

Great Horned Owls

The three Great Horned Owls we monitored frequently changed roost locations within their respective ranges of 0.4 km², 0.9 km² and 0.2 km² (mean area of 0.5 km²). The actual areas used by these owls are probably under-estimated because most (96%) of the locations were taken during daytime roosting periods and do not adequately reflect the owls' nocturnal movements. Great Horned Owl number 1 removed its radio harness on 10 February 1975. Great Horned Owl number 2 was last located on a nest in a conifer in a ranch yard on 20 March 1975.

These data are in agreement with Craighead and Craighead's (1956) conclusions (based on observations of unmarked birds in Michigan) that Great Horned Owls maintain relatively small home ranges where they nest as well as winter and that winter ranges seldom exceed 1.3 km². Similarly, Peterson (1979) found a mean January home range of 1.48 km² for Great Horned Owls of both sexes in southeastern Wisconsin. He also noted that owls unsuccessful in breeding had a similar sized home range from January through

March, while successful males increased their home ranges between 26 and 64% during the same period.

Ninety-four percent of the Great Horned Owl locations in our study were within 0.4 km of a drainage course.

SUMMARY

We collected movement data for eight raptors of four species with the use of radio telemetry in Douglas County, Colorado. We monitored three Red-tailed Hawks, one Rough-legged Hawk, one Prairie Falcon and three Great Horned Owls for various periods of time (1 day to 4 months) from 1 December 1974 to 10 April 1975. Two of the three Red-tailed Hawks were apparently transient birds. One remained in the study area only 15 days and a second bird was never located in the area after its release on 23 December. The third Red-tailed Hawk left the study area 11 December 1974 and returned to the area by 20 March 1975 where it remained to nest. It confined its local movements to a 2.2 km^2 area. Eighty-nine percent of the Rough-legged Hawk locations were confined to a 1.0 km^2 area. The Prairie Falcon moved up to 10 km between its day use area of 9.3 km^2 and its roost sites. The daytime roost locations of the three Great Horned Owls were each limited to a mean area of 0.5 km^2.

Our data, based on radio-equipped raptors, tend to support Craighead and Craighead's (1956) conclusions, based on observations of unmarked birds, that "definite and limited winter ranges are established by raptors and that these populations are spatially fixed and do not wander indiscriminately." The relatively small main-use areas of the Rough-legged Hawk and the Prairie Falcon may indicate that high prey populations were available to these species in the winter of 1974-75 in this area (Craighead and Craighead 1956, Newton 1979). The majority (97%) of all raptor locations in this study were within 0.4 km of drainage courses though this habitat made up only 29% of the study area. This observation suggests that the habitat associated with these riparian areas is important to wintering raptors. Glinski and Ohmart (unpublished data) surmise that in Arizona riparian areas may be essential to raptors as wintering refuges. Anderson and Ohmart (1977) have reported that wintering passerines exhibit a higher degree of habitat specialization than permanent residents. This factor also may be operating in riparian habitats for some wintering raptor species. Although no investigations were undertaken to test this hypothesis in our study area, perhaps the greater number of suitable perch sites and the greater or more vulnerable prey base available in the drainage bottoms account for almost all of the raptor use occurring in this habitat.

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