

## Habitat Use by Wintering Golden Eagles and Rough-Legged Hawks In Southeastern Idaho

E.H. CRAIG, T.H. CRAIG AND LEON R. POWERS

Little information is available on winter habitat preferences of raptors, even though they spend nearly as much time in wintering areas as nesting areas. Wilkinson and Debban (1980) identified a need for determining habitat preferences for wintering raptors so that effects of habitat alterations on raptor populations might be predicted. This may be especially important where native habitat is being altered to increase grazing, or for agricultural lands in the intermountain west. The purpose of this study was

to identify wintering habitats used by the Golden Eagle (*Aquila chrysaetos*) and Rough-legged Hawk (*Buteo lagopus*) on and around the Idaho National Engineering Laboratory (INEL) in southeastern Idaho.

During 1981-1982, we conducted a daytime winter inventory (30 November - 23 February) of raptors on INEL. During the recent inventory (7 surveys), we plotted the specific location of 626 Rough-legged Hawks and 283 Golden Eagles on vegetation maps of the INEL (McBride

Table 1. Habitat comparisons for wintering Golden Eagles and Rough-legged Hawks observed in various habitat types on a 1981-1982 car survey in southeastern Idaho. Chi-square values are indicated in parentheses.

HABITAT <sup>a</sup>	GOLDEN EAGLE OBSERVED <sup>b</sup>	EXPECTED <sup>b</sup>	ROUGH-LEGGED HAWK OBSERVED <sup>b</sup>
<i>Artemesia tridentata</i> - grass	32.1 (1.048) <sup>h</sup>	29.1	10.9 (71.67) <sup>e</sup>
<i>A. tridentata</i> - grass (no power poles)	9.9 (21.03) <sup>e</sup>	22.9	4.2 (96.07) <sup>e</sup>
<i>A. tridentata</i> - <i>Certoides lanata</i>	29.0 (49.28) <sup>e</sup>	13.6	11.3 (2.59) <sup>g</sup>
<i>Juniperus osteosperma</i> - <i>A. tridentata</i> - grass	5.3 (53.29) <sup>e</sup>	1.0	1.6 (2.59) <sup>g</sup>
Agricultural Land	4.2 (8.14) <sup>f</sup>	9.4	63.1 (1924.90) <sup>e</sup>
<i>Chrysothamnus viscidiflorus</i> - grass - <i>Opuntia polycantha</i>	3.5 (0.82) <sup>i</sup>	3.1	1.9 (2.59) <sup>g</sup>
<i>Tetradymia canescens</i> - <i>C. viscidiflorus</i> - <i>A. tridentata</i> (no power poles)	2.5 (9.19) <sup>f</sup>	7.3	3.8 (12.89) <sup>e</sup>
<i>Agropyron cristatum</i> (no power poles)	2.1 (5.28) <sup>c</sup>	5.2	0.5 (29.46) <sup>e</sup>
<i>Atriplex nuttali</i> - <i>C. lanata</i> - grass	1.8 (0.82) <sup>i</sup>	2.1	2.0 (2.59) <sup>g</sup>
<i>Artemesia arbuscula</i> - <i>Atriplex confertifolia</i> - grass	1.4 (0.82) <sup>i</sup>	1.0	0.2 (7.05) <sup>d</sup>
<i>A. tridentata</i> - <i>A. arbuscula</i> - <i>Atriplex confertifolia</i>	8.1 (23.04) <sup>e</sup>	3.1	0.5 (16.45) <sup>e</sup>

<sup>a</sup>Power poles were present in all sections unless noted otherwise.

<sup>b</sup>Percent of total birds seen rounded to nearest tenth of a percent.

<sup>c</sup>P < 0.025; <sup>d</sup>P < 0.001; <sup>e</sup>P < 0.001; <sup>f</sup>P < 0.005; <sup>g</sup>P > 0.05; <sup>h</sup>>P 0.25; <sup>i</sup>>P 0.75.

et al. 1978). The frequency of raptor occurrences per habitat was compared to expected frequencies of both species in each habitat type (Chi-square ( $\chi^2$ ) test). The expected frequencies were determined by multiplying the total number of each species observed per survey by percent occurrence of each habitat along the 187 km survey route. The percent habitat coverage was determined by selecting 95 random points on a map of the survey route and calculating the percent of points which fell in each habitat type (after Marcum and Loftsgaarden 1980). All agricultural lands, usually alfalfa (*Medicago sativa*) and grain fields, were considered one habitat. Areas where few or no power poles were available for perches were listed separately, since Craig (1978) reported that both Golden Eagles and Rough-legged Hawks showed a preference for power poles as perch sites on INEL.

Golden Eagles occurred in agricultural areas significantly less often than expected ( $P < 0.005$ ;  $\chi^2 = 8.1422$ ; Table 1) and were found most frequently in certain habitats dominated by native vegetation (Table 1). However, 3 areas covered with native vegetation or *Agropyron cristatum*, but containing few or no powerlines were used significantly less often ( $P < 0.01$ ,  $\chi^2 = 1.0482$ ;  $P < 0.005$ ,  $\chi^2 = 9.194$ ;  $P < 0.025$ ,  $\chi^2 = 5.2776$ ; Table 1) than expected by Golden Eagles. Birds either selected preferred habitats where perches were available, or birds were more visible when perched. These findings are similar to those of Fischer et al. (1984) in Utah. Golden Eagles occurred most often in areas where winterfat (*Ceratoides lanata*), grass and shrub species such as Utah juniper (*Juniperus osteosperma*) and big sagebrush (*Artemisia tridentata*) predominated. Johnson (1982) observed that shrubby habitats are used for cover during the daytime by Black-tailed Jackrabbit (*Lepus californicus*) and that winterfat and some species of grass comprised most of the hares' diet. Gross et al. (1974) found higher densities of jackrabbits in sagebrush habitats than in croplands, and Johnson (1982) seldom found them in open areas of native habitat during the day. Therefore, the areas where eagles were most frequently observed may have contained higher numbers of jackrabbits, an important prey of Golden Eagles (Smith and Murphy 1979; Thompson et al. 1982).

Rough-legged Hawks were observed in farmland areas significantly more often ( $P < 0.001$ ;  $\chi^2 = 1924.9$ ; Table 1) than expected in most other areas (see also Fischer et al. 1984). Since these hawks feed largely on small mammals (Craighead and Craighead 1956), they would likely occur in areas where such animals are abundant. Watson (1983) found that the major prey of Rough-legged Hawks in the agricultural land of our study areas was *Microtus montanus*. In southwestern Idaho, *Microtus* spp. are more numerous near agricultural lands than in desert areas (Marks and Yensen 1980). This is probably also true on our study area and would thus account for the distribution of these hawks. As with Golden Eagles, significantly fewer ( $P < 0.001$ ;  $\chi^2 = 96.0174$ ;  $P < 0.001$ ,  $\chi^2 = 12.8900$ ;  $P < 0.001$ ;

$\chi^2 = 29.4622$ ; Table 1) Rough-legged Hawks were observed in areas lacking power poles; however, other native habitats also hosted fewer hawks than expected.

In conclusion, Golden Eagles were observed most frequently in certain parts of the INEL study area covered with native shrub-steppe vegetation and significantly less often ( $P < 0.005$ ;  $\chi^2 = 8.1422$ ; Table 1) in farmland. In contrast, Rough-legged Hawks were sighted more often in agricultural areas. The distribution of these raptors may have resulted because of the prey species associated with the 2 different habitats. Fleming (1981) also noted that Rough-legged Hawks occurred primarily in agricultural areas and Golden Eagles in areas of native vegetation in southeastern Washington. Our results suggest that the native shrub-steppe habitats in Idaho are important as wintering habitat for Golden Eagles. Alterations of this habitat may adversely affect the wintering Golden Eagle population but may favor wintering Rough-legged Hawks, if the habitat alterations benefit small mammal populations.

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#### LITERATURE CITED

- CRAIG, T.H. 1978. A car survey of raptors in southeastern Idaho, 1974-1976. *Raptor Res.* 12:40-45.
- CRAIGHEAD, J.J. AND F.C. CRAIGHEAD. 1956. Hawks, owls and wildlife. Stackpole Co., Harrisburg, PA.
- FISCHER, D.L., K.L. ELLIS AND R.J. MEESE. 1984. Winter habitat selection of diurnal raptors in central Utah. *Raptor Res.* 18:98-102.
- FLEMING, T. 1981. A three-winter raptor survey of the Columbia Basin; 19 December 1978 through 27 February 1981. Unpubl. report to U.S. Army Corps of Engineers. Portland District, Portland, OR.
- GROSS, J.E., L.C. STODDART AND F.H. WAGNER. 1974. Demographic analysis of a northern Utah jackrabbit population. *Wildl. Monog. No.* 40.
- JOHNSON, R.D. 1982. Relationships of black-tailed jackrabbit diets to population density and vegetal components of habitat. M.S. thesis, Idaho State Univ., Pocatello, ID.
- MARCUM, C.L. AND D.O. LOFTSGAARDEN. 1980. A non-mapping technique for studying habitat preferences. *J. Wildl. Manag.* 44:463-468.
- MARKS, J.S. AND E. YENSEN. 1980. Nest sites and food habits of Long-eared Owls in southwestern Idaho. *Murrelet* 61:86-91.

- MCBRIDE, R., N.R. FRENCH, A.H. DAHL AND J.E. DETMER. 1978. Vegetation types and surface soils of the Idaho National Engineering Laboratory Site. DOE/IDO-12084. Natl. Tech. Inf. Serv., Springfield, VA.
- SMITH, D.G. AND J.R. MURPHY. 1979. Breeding responses of raptors to jackrabbit density in the eastern Great Basin desert of Utah. *Raptor Res.* 13:1-14.
- THOMPSON, S.P., R.S. JOHNSTONE AND C.D. LITTLEFIELD. 1982. Nesting history of Golden Eagles in Malheur-Harney Lakes Basin, southeastern Oregon. *Raptor Res.* 16:116-122.
- WATSON, J.W. 1983. An ecological study of the American Rough-legged Hawk on the Idaho National Engineering Laboratory. In: O.D. Markham, Ed., 1983 progress report, Idaho National Engineering Laboratory Radioecology and Ecology Programs, DOE/IDO-12098. Natl. Tech. Inf. Serv., Springfield, VA.
- WILKINSON, G.S. AND K.R. DEBBAN. 1980. Habitat preferences of wintering diurnal raptors in the Sacramento Valley. *Western Birds* 11:25-34.

**Department of Biology, Northwest Nazarene College, Nampa, ID 83651. Present address of first and second authors: Box 1, Lee Creek Road, Leadore, ID 83464.**

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### Distribution and Density of Prairie Falcons Nesting in California During the 1970s

DOUGLAS A. BOYCE, JR., RONALD L. GARRETT AND BRIAN J. WALTON

The Prairie Falcon (*Falco mexicanus*) is endemic to western North America, and although extensively studied, questions still remain regarding distribution of nesting territories and density throughout its range. Information on Prairie Falcon nest site distribution and densities in California was limited prior to 1970. Grinnell and Miller (1944:108) stated that Prairie Falcons were "extensive throughout the state save in northwest humid coast belt. Metropolis appears to lie in southeastern desert and thence northwest along inner coast ranges." Miller (1951) used 3 methods to analyze California avifaunal distribution — life zone, biome, and biotic province — but did not specifically examine the distribution of Prairie Falcons statewide based on vegetational schemes. In 1971 the California Department of Fish and Game began a two-year statewide survey of Prairie Falcon nesting sites (Garrett and Mitchell 1972) that yielded comprehensive distribution data and provided impetus for more surveys. Here we report on Prairie Falcon nesting distribution and densities in California, and on the unusually low nesting density in northwestern California that *may be* the result of (1) interspecific competition with increasing numbers of Peregrine Falcons (*Falco peregrinus*), and/or (2) the presence of unsuitable foraging habitat.

Garrett and Mitchell (1973) provided us with 256 nesting territory locations that were originally obtained from ornithologists, egg collectors, museums, falconers, state and federal biologists and personal records. A territory was defined as an area 1 km in diameter that may have one or more alternate nest sites located within it. The existence of a territory was confirmed when (1) a pair of adults was found defending a specific location during the nesting season, (2) adults were observed incubating or brooding young in or on a ledge-pothole-cavity-or stick nest, (3)

when young were observed at a nesting site or (4) when recently fledged young in family groups were located. A territory was "active" when any of the aforementioned criteria were observed in subsequent years and inactive if falcons were not found. Visits to territories in following years revealed that alternate nest locations were sometimes used. When Prairie Falcons shifted nest site locations within the original 1 km diameter area of the territory we treated the nest as being within the same territory if no other Prairie Falcons were present within 1 km of the nest. Infrequently, two or more pairs of Prairie Falcons nested simultaneously within 1 km of each other and 1 km territories overlapped.

We added to Garrett and Mitchell's data base during the 1970s by conducting surveys, during the nesting season, of potential nesting areas using helicopters (after 1976), automobiles, motorcycles and by searching on foot. Additional records of Prairie Falcon nesting territories were obtained from the California Department of Fish and Game and other biologists working for state and federal agencies. Territories were plotted on U.S.G.S. topographical maps (1:64,000) and deposited with the Western Foundation of Vertebrate Zoology, Los Angeles, California.

The entire state was examined during the 1970s (1970-1979) for nesting Prairie Falcons. Our original intent was never to locate every single territory in the state. However, as we worked during the 1970s we were able to cover the entire state in great depth. We were not able to examine (in depth) the entire state in any single year and we did not have the manpower to visit all known territories in a single year. Furthermore, even with the use of helicopters, we could not be certain that we located all territories within every habitat type visited as Prairie Fal-