

Home Range and Foraging Habitat of American Crows, *Corvus brachyrhynchos*, in a Waterfowl Breeding Area in Manitoba

BRIAN D. SULLIVAN^{1,2} and JAMES J. DINSMORE¹

¹Department of Animal Ecology, 124 Science II, Iowa State University, Ames, Iowa 50011

²Present Address: Texas Parks and Wildlife Department, 4200 Smith School Road, Austin, Texas 78744

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American Crows were studied from April to July in 1986 and 1987 in southwestern Manitoba. Home ranges averaged 2.6 km². Foraging flights from the nest averaged 382 m; flights longer than 700 m were infrequent. American Crows used habitats for foraging in proportion to their occurrence within home ranges, but large individual variation existed. American Crows avoided tall vegetation while foraging, and seldom encountered duck nests.

Key Words: American Crow, *Corvus brachyrhynchos*, foraging, habitat use, home range, Manitoba, waterfowl.

Egg predation by American Crows (herein referred to as crows) long has been a concern of waterfowl managers (Kalmbach 1937; Johnson et al. 1989). An understanding of the home range size, flight distances, and foraging habitat of crows is fundamental to evaluating their importance as waterfowl nest predators. Current knowledge of crow foraging is limited to studies of food habits (Kalmbach 1937; Young 1989) and factors affecting egg predation (Sugden and Beyersbergen 1986, 1987; Sullivan and Dinsmore 1990). Only two authors have investigated the daily movements of crows during the breeding season (Schaefer 1983; Kilham 1989), and none has described crow use of foraging habitats quantitatively.

Our study was designed to (1) estimate the home range size of breeding crows, (2) measure flight distances from the nest, (3) assess foraging habitat use by crows, and (4) relate these parameters to potential interactions of crows with nesting waterfowl.

Study Area

The study was conducted from mid-April through mid-July in 1986 and 1987 on a 62 km² study area near Minnedosa in southwestern Manitoba (50°06'N; 99°50'W). Lying within the aspen (*Populus* spp.) parklands of the prairie pothole region, this area is characterized by uplands that are intensively cultivated and interspersed with numerous wetland basins that support a high density of breeding waterfowl (Smith et al. 1964; Stoudt 1982). Gravel roads bound most sections (2.59 km²) of land. Ducks nested primarily in narrow strips of vegetation along wetland basins or roadsides, whereas crows nested in farm shelterbelts, willow (*Salix* spp.) shrubs near wetlands, or in small, aspen-dominated woodlots. Stoudt (1982) provided a detailed description of the natural history of the Minnedosa area.

Methods

Crow nests were located by searching woody vegetation in areas where crows were observed. In 1987, two adult male crows were captured and fitted with radio transmitters.

Radio-marked crows were monitored from a vehicle; line-of-sight accuracy of the receiving system was tested daily. When locating individual crows, bearings were taken from three different positions in rapid succession and plotted on maps. Radio locations often were confirmed visually. We located each radio-marked crow two or three times per day at intervals of at least several hours. Telemetry also was conducted periodically on two nights to determine if movement occurred during darkness.

Home range and flight distance information was collected by tracking crows visually in 1986 and by a combination of visual tracking and radiotelemetry in 1987. Because of the fine interspersion of habitat types on the study area and the observation that crows often foraged along habitat edges, we believed that even small errors in determining locations of radio-marked crows would be unacceptable for assessing habitat use. Therefore, we relied solely on visual observations for collecting foraging habitat data.

Foraging observations were conducted from vehicles because crows become accustomed quickly to their presence and continued foraging undisturbed. Each day was divided into three equal periods (morning, midday, and evening) based on available daylight hours, and observations of each pair were balanced among these periods. We followed foraging crows continuously during 1-h observation sessions using binoculars or a telescope. Crows usually foraged singly, but if the pair foraged together we used data for only one bird to ensure independence. Pairs usually were observed two times per day for a

total of two hours. The amount of time spent foraging in each habitat type (cropland, wetland [including narrow upland perimeters], or miscellaneous [roadsides (including ditches), pastures, farmyards, farm lanes, fencerows, railroad rights-of-way, and woodland]) was recorded with a stopwatch. All flight paths and foraging locations were plotted on maps. The maximum straight-line distance from the nest attained on each flight was measured from aerial photographs (scale = 1:16 000). We ceased observing pairs after the young crows began to accompany the adults on extended flights, because at that time the crows gradually began to abandon their breeding home ranges.

All known locations (determined from foraging observations, radiotelemetry, chance sightings, or during nest inspections) were combined for each pair. Home range boundaries were determined by the minimum convex polygon method (Mohr 1947) and plotted on aerial photographs. Home range areas were measured with a planimeter. We used Pearson's correlation coefficient to determine if our estimates of home range areas were influenced by the amount of time that we observed the birds.

Habitat composition of each home range was estimated by overlaying the aerial photographs with a fine dot grid (3-mm dot spacing) and classifying the habitat beneath each point into categories as described previously. We sampled an average of 1372 points per home range. At this sampling intensity, the occurrence of all habitats in each home range could be estimated to within 3% of the true proportions with 95% confidence (Thompson 1987).

For each pair of crows, the proportion of the total foraging time spent in each habitat was compared to the proportional occurrence of the habitats within the pair's home range (Design 3 of Thomas and Taylor 1990). We used Friedman's nonparametric test (Friedman 1937, as described in Conover 1980) to test the null hypothesis that the ranks of the differences in use and occurrence were the same for all habitats (Allredge and Ratti 1986, 1992). Based on study design, sample sizes, hypothesis tests, assumptions, and methods of calculation, we felt that Friedman's test was more appropriate than other statistical tests of resource selection (Allredge and Ratti 1986, 1992; Thomas and Taylor 1990). Statistical significance was established at $P \leq 0.05$ for all tests.

Results

Flight distances, complete breeding season home ranges, and foraging habitat information were collected on 22, 10, and nine pairs of crows, respectively. Home ranges were estimated from visual observations for eight pairs (mean number of 1-h observation sessions = 37, range = 20–64), by radiotelemetry for one pair (59 telemetry relocations), and by a

TABLE 1. Flight distances from the nest ($n = 404$) for breeding American Crows in southwestern Manitoba, Canada, 1986–1987.

Distance category	Proportion of flights in each category (cumulative proportion in parentheses)
0–350 m	0.57 (0.57)
351–700 m	0.30 (0.87)
701–1000 m	0.08 (0.95)
> 1000 m	0.05 (1.00)

combination of the two methods for one pair (43 1-h observation sessions, 63 telemetry relocations).

Crows occupied non-overlapping home ranges that averaged 2.6 km² (SD = 1.4, range 0.8–6.0 km², $n = 10$). There was no significant correlation between home range area and the number of 1-h observation sessions ($r = 0.53$, $P = 0.14$, $n = 9$). Although our sample size was small, this may suggest that our observation effort was sufficient to estimate home range areas adequately.

The mean foraging flight distance was 382 m (SD = 318, range = 16–2078 m, $n = 404$). Crows seldom made extended flights from their nests; flights longer than 700 m were infrequent, and they rarely exceeded 1000 m (Table 1). Crows did not leave their evening roost site (always near the nest) during night telemetry surveillance.

Crows foraged most often in cropland, but cropland was the only habitat used in lower proportion than it occurred within home ranges (Table 2). Miscellaneous habitats were used by foraging crows twice as much as these habitats occurred; wetland habitat was used slightly more than its occurrence (Table 2). The Friedman test was not significant ($T_2 = 1.53$, $0.10 < P < 0.25$, DF = 2, 16), indicating overall proportional use of foraging habitats by the crow pairs under study. However, individual crow pairs showed highly variable use of foraging habitats. Some pairs used a particular habitat extensively, while other pairs made little use of the same habitat.

We did not observe crows foraging in wooded areas, so we recomputed the proportional occurrence

TABLE 2. Mean proportion of use and occurrence within home ranges of foraging habitats for nine pairs of American Crows in southwestern Manitoba, Canada, 1986–1987.

Habitat type ^a	Mean Use (SD)	Mean Occurrence (SD)
Cropland	0.57 (0.18)	0.70 (0.04)
Wetland	0.29 (0.19)	0.23 (0.04)
Miscellaneous	0.14 (0.15)	0.07 (0.01)

^a See text for definition.

of the three habitat categories excluding woodland. Habitat rankings were not affected for any crow pair, thus precluding any effect on the statistical procedure.

Although it was not studied directly, our observations indicated that vegetation height had a major influence on where crows foraged. Crows ceased foraging in seeded cropland when the vegetation height exceeded their own, at which time they made greater use of barren fallow fields. Crows made greatest use of roadsides late in the nesting season when vegetation in other habitats was tall and dense. Low, heavily grazed pastures were present in the home ranges of two crow pairs, and both pairs foraged extensively in this habitat. Three pairs that made greatest use of wetland habitats most often foraged in one or two wetlands where the perimeter vegetation remained low due to haying or cultivation.

During > 400 h of observation, we saw only one instance where a crow flushed a female duck (a Northern Shoveler, *Anas clypeata*) from a nest and consumed the eggs. Crows were observed at only three other duck nests, all of which had been abandoned or previously depredated by another predator. In no other instances were crows seen transporting or feeding on duck eggs.

Discussion

The mean breeding season home range area of crows in our study was 70% larger than for seven crow pairs in Iowa (Schaefer 1983) and nearly 300% larger than the largest territories of several groups of cooperatively breeding crows in Florida (Kilham 1989: 40).

The analysis of flight distances complements our findings in a related study (Sullivan and Dinsmore 1990) in which rates of crow predation on artificial duck nests decreased markedly at distances greater than 700 m from crow nests. The longest flight from a nest reported by Schaefer (1983) was 4.8 km, compared to only 2.1 km in our study.

There was no indication that crows used foraging habitats that would lead them to frequent contact with nesting waterfowl. Crows spent 57% of their foraging time in cropland; this habitat supports low densities of duck nests (Cowardin et al. 1985; Klett et al. 1988). In wetland and miscellaneous habitats, crows were attracted to areas disturbed by farm machinery or livestock; these areas would not have been conducive to successful hatching of duck nests regardless of the presence of crows. The apparent avoidance of taller vegetation by crows may reduce encounters with duck nests. Kilham (1989: 115) noted that crows stopped foraging in hayfields when the vegetation grew tall, but returned after it had been cut. Sugden and Beyersbergen (1987) found that crow predation on concealed artificial nests in

tall vegetation was less frequent than in short vegetation for crows foraging on foot. They postulated that tall, dense cover served as a behavioral deterrent and physical barrier to crows hunting on foot, and we concur. However, we found previously that when crows had located a nest through aerial searching, increased vegetation height above 20–50 cm did not reduce predation on the eggs (Sullivan and Dinsmore 1990).

Although we specifically watched for crow predation on duck nests, we observed few such encounters. In previous waterfowl nesting studies, crows may have been blamed for nests initially depredated by other predator species. Investigator disturbance of nests also can bias rates of crow predation upward (Salathé 1987). Although crows depredate some duck nests, their relative importance as a duck nest predator may be less than previously suggested.

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