J. Field Ornithol., 56(2):153–157

HUMAN DISTURBANCE AND NEST SITE PLACEMENT IN BLACK-BILLED MAGPIES

By Richard L. Knight and Richard E. Fitzner

It has been suggested that some birds build nests higher above the ground if they have been disturbed by human intruders in the past (Stoner 1937, Hickey 1942, Preston and Norris 1947, Ratcliffe 1962), but see Savard and Falls (1981). Brown (1957) noted an increase in nest heights of Black-billed Magpies (*Pica pica*) in the second year of a 2-year study and suggested that this was due to a "disturbance by the investigator." We examined the subsequent placement of nests by Black-billed Magpies that had been disturbed at their nests and the role of available nest sites in constraining their responses. We hypothesized that magpies should respond to human disturbance at their nests with changes in nest placement during the following nesting season. If they responded in subsequent seasons, then we predicted nests would be placed in less accessible positions and that the amount of change would be limited by the availability of alternative nest sites and nest plants.

STUDY AREA AND METHODS

We made initial observations in 1978 on 3 groups of nesting magpies in eastern Washington. One group of 8 pairs nested in a 4-ha clump of big sagebrush (*Artemisia tridentata*) on a 56-ha island in the Columbia River between McNary and Priest Rapids dams. A second group of 6 pairs nested in a 1-ha stand of Russian olive (*Elaeagnus angustifolia*) trees in Franklin County, 54 km northwest of the island. A third group of 9 pairs nested in a 0.5-ha stand of willow (*Salix* sp.) trees 7 km northeast of the Russian olive grove. Surrounding habitat was a mixture of dry and irrigated cropland and shrub- and grass-steppe rangeland.

We disturbed nests experimentally by visiting and looking into each active nest 3 times during April and May 1979 and 1980 (1 visit during the incubation period and 2 visits during the nestling period). Each area was posted and patrolled by land-owners who prevented additional human disturbance. Nest accessibility determined the duration of each visit such that our visits to nests in willow and Russian olive trees lasted longer than visits to nests in sagebrush.

Responses to this disturbance were measured by recording and comparing nest heights (to the nearest cm from ground to nest rim) during the initial nesting season and the two subsequent years, i.e., 1979–1981. Controls were 15 nests [7 in Russian olives, 2 in willows, 3 in black cottonwoods (*Populus trichocarpa*), and 3 in giant sagebrush] near the 3 experimental areas that were observed from a distance and not visited until after the nesting season, then rechecked the following year. Birds in the 3 experimental groups of nesting magpies were unmarked; thus,

we compared the mean nest height for each group each year rather than the responses of individuals. We found no evidence of adult magpies being killed by their main predators, i.e., hawks and owls, that nested in the area during the 4-year period (Fitzner 1980, Knight and Smith 1982) and we assumed most of the individuals survived and returned to the same areas but not necessarily the same territories, in each year of the study.

Within each group, we examined 4 possible responses of magpies in 1980 and 1981 following our nest visits. These were: (1) nests in the same sites in the same trees or shrubs (no response), (2) nests in different sites in the same trees or shrubs, (3) nests in different trees or shrubs, and (4) fewer nests (magpies either remaining and not nesting or moving to a new area).

Two factors, among others, that might have affected the expected response were the number of alternative nest sites in the same nest tree or shrub and the number of alternative nest plants available. The number of nest sites was determined by visually inspecting the location of each active nest and estimating the number of similar sites in the same plant. An index to the number of alternative nest trees or shrubs available was determined by counting the number of similar-sized (trunk diameter below branching and plant height) plants within a 5-m radius of the active nest.

RESULTS

Mean nest height, relative to tree height, was significantly higher for magpies in Russian olive trees each year following disturbance, but was unchanged in willows and sagebrush (Table 1). Heights of nest plants used did not differ among years within each site (Kruskal-Wallis, $P > 0.10$). Control nests were placed neither higher nor lower the following year (Wilcoxon paired-sample test, $P > 0.10$).

Rearranging the data into the 4 possible responses following disturbance produced sample sizes inadequate for statistical analysis; nevertheless, our observations suggest that nest placement following our visits is in agreement with at least 2 factors: (1) number of alternative nest sites in the nest plant, and (2) number of alternative nest plants. Of 6 Russian olive tree nests that were in the same tree the year following disturbance, 3 were in different sites (always higher sites than the previous year); whereas all willow tree nests that were in the same tree the year following disturbance were in the same sites (Table 2). Only 1 sagebrush bush nest was in the same plant following disturbance, and it was in the same site. There were more (Mann-Whitney U test, $P < 0.001$) alternative nest sites in Russian olive trees ($\bar{x} = 11.4$, $n = 12$, $SE = 1.21$) than in willows ($\bar{x} = 2.4$, $n = 19$, $SE = 0.91$). Sagebrush bushes containing nests had no alternative nest sites in the same bush ($n = 16$), due to the large size of magpie nests (Johnson 1972) and the small size of sagebrush bushes ($\bar{x}$ height of 16 bushes containing nests was 1.4

TABLE 1. Heights of magpie nests in Russian olive and willow trees, and sagebrush bushes, 1979–1981.

Nest plant	Mean relative nest height in indicated year[a]			Significance of differences among years, H-statistic
	1979	1980	1981	
Russian olive	0.31 (6)	0.57 (6)	0.69 (6)	10.8 (6, 6, 6 df)*
Willow	0.48 (9)	0.41 (9)	0.48 (9)	3.9 (9, 9, 9 df)
Sagebrush	0.81 (8)	0.81 (6)	0.74 (3)	2.3 (8, 6, 3 df)

[a] Mean of ratios of nest height over nest tree or shrub height. Number of nests in parentheses. Mean ± SE of nest heights, 1979–1981, was 3.1 ± 0.4 m for nests in Russian olives, 2.9 ± 0.6 m for nests in willows, and 1.1 ± 0.04 m for nests in sagebrush bushes.
*$P < 0.05$ (Kruskal-Wallis).

m). Thirteen of 15 control nests were in the same sites in the same plants the following year.

Approximately one-half of the nesting attempts in Russian olives and willows were in different trees the years following our visits (Table 2). Of the 6 Russian olive tree nests in different plants following our disturbance, 5 were higher than the nearest active nest of the preceding year; whereas, only 3 of 10 willow nests in different trees were higher. Eight of 9 magpie nests in sagebrush were placed in different bushes following disturbance, and the number of nesting attempts declined from 8 in 1979 to 6 in 1980 and to 3 in 1981. Only 2 of 15 control nests were in different plants the following year, a significant difference from the nests we disturbed ($\chi^2 = 10.2$, df = 1, $P < 0.005$). More (Kruskal-Wallis, $P < 0.01$) alternative nest plants were available within a 5-m radius of Russian olive trees with nests ($\bar{x} = 23.6$, n = 12, SE = 5.4) than at either willow ($\bar{x} = 5.3$, n = 19, SE = 1.4) or sagebrush nest plants ($\bar{x} = 8.4$, n = 16, SE = 1.9).

DISCUSSION

Magpie nests in Russian olives were higher in trees following human disturbance—both in trees used the previous years and in trees used for the first time. Russian olive trees are multiple branched with numerous forks providing suitable nest sites. Nests in willows were in either the same site the year following disturbance or in a different tree at approximately the same height. Magpies nesting in willows were either unable or unwilling to build higher nests because of a scarcity of higher alternative or suitable nest sites. We attribute this to the shape of willows: willows had many slender erect stems arising from a single clump and provided few suitable nest sites. Two factors that may affect nest site placement are predation and wind (Lawton and Lawton 1980). Nests placed high in willows are more subject to wind damage because of structural instability (Erpino 1968, Johnson 1972).

Only on the sagebrush island study area did the number of nests

TABLE 2. Responses of 3 nesting groups of magpies following human disturbances at the nest.

Response in year following disturbance	Frequency of responses in nesting area[a]		
	Russian olive	Willow	Sagebrush
Nests in same sites as previous year	25.0 (3/12)	44.4 (8/18)	7.1 (1/14)
Nests in different sites in same plants as previous year	25.0 (3/12)	0 (0/18)	0 (0/14)
Nests in different plants from previous year	50.0 (6/12)	55.6 (10/18)	57.2 (8/14)
Fewer nests	0 (0/12)	0 (0/18)	35.7 (5/14)

[a] Numbers in parentheses indicate the ratio of number showing the response over the number of potential nesting attempts in 1980 and 1981.

decline during our study. Unable to nest higher the year following disturbance, magpies may either nest in the same site, select a new bush, forego nesting, or abandon the area altogether. Because number of adults was consistent with number of nests each year (i.e., 2 adults/active nest), we believe that nesting declined because of abandonment.

An alternative, nonmutually exclusive, explanation for the presumed abandonment other than human disturbance may be related to food shortage (Newton 1981). We are unable to evaluate the importance of this factor due to the lack of information on magpie food abundance during our study. There was no difference, however, in the proportion of nestlings starving among years, nor did we notice a decline of magpies nesting nearby.

The relationships alluded to in our paper are tenuous because they are based on unmarked populations with small sample sizes. An alternative method to examine the effects of human disturbance on nest placement by unmarked birds would be to observe renesting in areas where timed destruction of first nesting attempts occurred (M. J. Erpino, pers. comm.). Our findings, nonetheless, suggest how nest site availability may influence nest placement, and indicate a potentially fruitful area of research.

SUMMARY

Between 1979–1981, we experimentally disturbed active magpie nests in 3 different plant species and observed the location of nests the following years. Magpie nests in Russian olive trees tended to be at the same or a higher site in the same plant, or in higher sites in different plants the years following our disturbance. Magpie nests in willow trees tended to be either in the same site or in a different plant, but usually no higher, the year following disturbance. Nests in sagebrush bushes were almost always in different bushes, and we had fewer active nests each year. The number of alternative nest sites and number of alter-

native nest plants varied for each of the plant species: Russian olive nest trees had the greatest number of both alternative nest sites and nearby nest plants while sagebrush bushes had the least. Our results support the hypothesis that magpies attempt to minimize the risk of human disturbance by placing nests higher above the ground, and that the number of alternative nest sites and alternative nest plants influences nest placement following disturbance.

ACKNOWLEDGMENTS

For thoughtful criticisms on the manuscript we thank: C. E. Braun, W. H. Buskirk, D. Buitron, M. J. Erpino, D. J. Gabaldon, J. P. Hailman, S. K. Knight, B. A. Loiselle, R. A. McCabe, I. Newton, S. A. Temple, C. H. Trost, and an anonymous reviewer. We thank the H. Camp family who allowed use of their ranch as a study area. L. Steiner, P. Randolph, L. Anderson, S. K. Knight, C. A. Rieck, and others provided field assistance.

LITERATURE CITED

BROWN, R. L. 1957. The population ecology of the magpie in western Montana. M.S. thesis, Univ. Montana, Missoula.

ERPINO, M. J. 1968. Nest-related activities of Black-billed Magpies. Condor 70:154–165.

FITZNER, R. E. 1980. Impacts of a nuclear energy facility on raptorial birds. Pp. 9–33, *in* A workshop on raptors and energy developments, R. P. Howard and J. F. Gore, eds. U.S. Dept. Inter., Fish Wildl. Serv., Boise, Idaho.

HICKEY, J. J. 1942. Eastern population of the Duck Hawk. Auk 59:176–204.

JOHNSON, R. L. 1972. Ecology of the Black-billed Magpie in southeastern Washington. M.S. thesis, Washington State Univ., Pullman.

KNIGHT, R. L., AND D. G. SMITH. 1982. Summer raptor populations of a Washington coulee. Northwest Sci. 56:303–309.

LAWTON, M. F., AND R. O. LAWTON. 1980. Nest-site selection in the Brown Jay. Auk 97: 631–633.

NEWTON, I. 1981. The role of food in limiting bird numbers. Pp. 11–130, *in* The integrated study of bird populations, H. Klomp and J. W. Woldendorp, eds. North-Holland Publ. Co., Amsterdam, Netherlands.

PRESTON, F. W., AND R. T. NORRIS. 1947. Nesting heights of breeding birds. Ecology 28:241–273.

RATCLIFFE, D. A. 1962. Breeding density in the Peregrine *Falco peregrinus* and Raven *Corvus corax*. Ibis 104:13–39.

SAVARD, J. P. L., AND J. B. FALLS. 1981. Influence of habitat structure on the nesting height of birds in urban areas. Can. J. Zool. 59:924–932.

STONER, E. A. 1937. Elevation of nests of the Western Crow. Auk 54:394.

Department of Wildlife Ecology, University of Wisconsin, Madison, Wisconsin 53706. Address of REF: *Ecosystems Department, Battelle-Northwest, P.O. Box 999, Richland, Washington 99352.* Received 2 Nov. 1983; accepted 28 Jan. 1985.