

## EFFECT OF RESEARCH ACTIVITY ON THE SUCCESS OF AMERICAN ROBIN NESTS

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**Abstract:** We investigated researcher effects on the success of American robin (*Turdus migratorius*) nests from 1993 through 1995 in La Plata County, southwest Colorado. We handled the contents of 56 nests in 1993, 33 nests in 1994, and 20 nests in 1995. In these nests, which we refer to as "touched nests," each egg was handled one time, and each chick was handled for about 3 minutes every 1–3 days. We made no attempt to mask our scent, such as with use of rubber gloves. With the use of a mirror on an extension pole, we monitored an additional 14 nests in 1993, 12 nests in 1994, and 21 nests in 1995 that we did not touch. Although we monitored nests that we could not reach, in the analyses we included only nests that we could have touched,  $\leq 3.7$  m high. In 1993, a significantly greater proportion of touched nests was successful in fledging at least one robin (57.1%) than untouched nests (21.4%,  $P < 0.05$ ). Similarly, in 1994, 60.6% of touched nests were successful whereas 8.3% of untouched nests were successful ( $P < 0.01$ ). In 1995, when we controlled for nest height by touching every other nest that was  $\leq 3.7$  m, success between touched and untouched nests was similar (35.0% for touched nests and 23.8% for untouched nests). Our results strongly suggest that monitoring nests and handling eggs and chicks did not affect negatively the success of American robin nests at our study site.

*J. WILDL. MANAGE.* 61(3):948–952

**Key words:** American robin, Colorado, eggs, nestlings, nests, nest success, observer effects, predation, predators, reproduction, research activity, *Turdus migratorius*.

Predation is the major cause of reproductive failure among most open-cup nesting birds (Ricklefs 1969, Martin and Li 1992, Martin 1993), and many investigators who study avian breeding biology estimate rates of nest success and failure. For scientific and ethical reasons, some investigators have expressed concern over whether research activities have a detrimental effect on the success of nesting birds (Hammond and Forward 1956, Johnson and Sloan 1975, Lenington 1979, Major 1990). Research activities may promote predation (or other reproductive failures) on nests in several ways: (1) researchers may leave a visual or olfactory trail that predators can follow (MacIvor et al. 1990); (2) nest markers may reveal the location of a nest to visually oriented predators, such as corvids (Picozzi 1975); (3) predators may follow researchers (Strang 1980); (4) researchers may leave a scent on the eggs and/or nest (MacIvor et al. 1990); (5) adult birds may defecate on

their eggs when disturbed, and this scent may attract predators (Hammond and Forward 1956); and (6) nesting birds may desert their nests after disturbance by humans (Safina and Burger 1983). Determining effects of researcher activities is complex, and various methods have been employed: (1) comparison of nests visited daily and nests visited less frequently (Safina and Burger 1983, Nichols et al. 1984, Major 1990) or comparisons between different numbers of visits (Cairn 1980, DesGranges and Reed 1981); (2) comparison of visited and unvisited (experimentally placed or observed from a distance) nests (Willis 1973, Gottfried and Thompson 1978); (3) comparison of nests observed from different distances (MacIvor et al. 1990); (4) comparison of nests in which eggs were handled with and without rubber gloves (MacIvor et al. 1990); (5) direct observation of predators (Johnson and Sloan 1975, Strang 1980); (6) comparison of marked and unmarked nests (Picozzi 1975, Galbraith 1987); and (7) direct observation of nesting birds' reactions to researchers (Kury and Gochfeld 1975, Conover and Miller 1978, Burger 1981).

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Most investigations, promoted by concerns over human effects, have been conducted on ground-nesting birds, most notably waterfowl and sea birds (Robert and Ralph 1975, MacInnes 1980, MacIvor et al. 1990). However, this concern should extend to tree-nesting birds as well (Bart 1977, Westmoreland and Best 1985). In this study, we investigated whether research activities on American robin nests promoted subsequent predation and/or abandonment of nests using a method that, to our knowledge, has not been employed specifically to determine differences in failure rates between touched and untouched arboreal nests. American robins were an appropriate subject for this investigation because they are common, their nests are fairly conspicuous and may be detected easily by predators, and our chances of finding most nests in the study area were high. Due to the numerous ways predators may use cues of researchers, we expected that more touched nests would be preyed upon than nests we did not touch.

We thank D. Schafer and A. Denham for access to the Colorado State University San Juan Basin Research Center. This research was funded by a Howard Hughes Medical Institute Grant to the Departments of Chemistry and Biology, Fort Lewis College, and by a Ford Foundation Fellowship (administered by the Natl. Res. Council) to J. C. Ortega. We appreciate field assistance from S. Allerton and T. Kreykes. Two anonymous reviewers commented on the manuscript.

## STUDY AREA

Our study was conducted at the Colorado State University San Juan Basin Research Center, 8 km south of Hesperus, in La Plata County, Colorado. The Research Center, located along the La Plata River was dominated by narrow-leaf cottonwoods (*Populus angustifolia*) and to a lesser degree by river birch (*Betula fontinalis*) and Gambel oak (*Quercus gambelii*). The site was grazed by cattle at a moderate intensity (0.4 head/ha) and was mostly open at ground level; that is, shrubs and other heavy understory were scarce.

## METHODS

During the breeding season (May–Jul) from 1993 through 1995, we searched for American robin nests. We handled eggs and/or chicks in 56 nests in 1993 and 33 nests in 1994 by reach-

ing from the ground, climbing the tree, or using a ladder. In these nests, which we refer to as "touched nests," each egg was handled one time, and each chick was handled for about 3 minutes (to take measurements as part of another study) every 1–3 days. We made no attempt to mask our scent, such as using rubber gloves. We monitored an additional 27 nests in 1993 and 22 nests in 1994 with a mirror on an extension pole. We refer to these nests as "untouched nests." In 1993 and 1994, a significantly greater proportion of touched nests were successful (57.1% in 1993 and 62.9% in 1994) than untouched nests (22.2% in 1993 and 9.1% in 1994). However, nest height was a confounding variable; that is, many nests that were too high for us to touch were unsuccessful. Therefore, in the analyses, we included only those nests that we could have reached—those  $\leq 3.7$  m (56 touched nests and 14 untouched nests in 1993; 33 touched and 12 untouched nests in 1994). In addition, within the category of nests  $\leq 3.7$  m, the mean height of touched nests was significantly lower than untouched nests in 1993 (touched:  $2.3 \pm 0.6$  m; untouched  $3.0 \pm 0.7$  m,  $P < 0.01$ , 2-tailed Mann-Whitney  $U$ -test, corrected for ties) and 1994 (touched:  $1.9 \pm 0.6$  m; untouched  $3.0 \pm 0.6$  m,  $P < 0.01$ , 2-tailed Mann-Whitney  $U$ -test, corrected for ties). In 1995, to control for nest height, we touched every other nest  $\leq 3.7$  m as we found them, and we monitored all nests we did not touch with a mirror and pole. In 1995, the mean height of touched nests ( $2.3 \pm 0.5$  m) did not differ from untouched nests ( $2.3 \pm 0.8$  m,  $P = 0.58$ , 2-tailed Mann-Whitney  $U$ -test, corrected for ties).

We marked the site of each nest by attaching uniquely coded orange flagging tape to the nest tree at a height of about 1.5–2 m. We visited nests every 1–3 days and recorded the contents of the nest until all birds had fledged or until the nest failed through predation, abandonment, or natural disaster. Although most nests were found during the egg stage, a few nests were found during the nestling phase; however, for this study we included only those that were found with chicks younger than 7 days—the midway point from hatching to fledging.

*Statistical Analyses.*—To test for differences in means, we used a 2-tailed Mann-Whitney  $U$ -test, corrected for ties (Zar 1984). To test for significance in the success of nests we touched and did not touch, we employed a Chi-square goodness-of-fit test with Yates correction (Zar

Table 1. Success of American robin nests  $\leq 3.7$  m touched and untouched by researchers, Hesperus, Colorado, 1993–95.

	Touched	Untouched	P	$\chi^2_c$
1993				
Successful	32 (57.1%)	3 (21.4%)	<0.05	4.4
Unsuccessful	24 (42.9%)	11 (78.6%)		
1994				
Successful	20 (60.6%)	1 (8.3%)	<0.01	7.7
Unsuccessful	13 (39.4%)	11 (91.7%)		
1995				
Successful	7 (35.0%)	5 (23.8%)	0.66	0.2
Unsuccessful	13 (65.0%)	16 (76.2%)		

1984). We considered a  $P$  value of  $\leq 0.05$  to be significant for all tests.

## RESULTS

Contrary to our predictions, in both 1993 and 1994, a significantly greater proportion of touched nests succeeded in fledging at least one robin than untouched nests; in 1995, success was similar between touched and untouched nests (Table 1). Touching nests had no apparent effect on nest abandonment. In 1993, 2 nests were abandoned (1 touched and 1 untouched); in 1994, 3 nests were abandoned (1 touched and 2 untouched); and in 1995, 2 nests were abandoned (1 touched and 1 untouched). A wind storm blew one touched nest down in 1995, killing the 9-day-old nestling. All other unsuccessful nests failed through predation.

Our research efforts also did not appear to lower hatching and fledging success in any year; in 1993 and 1994, significantly more robins hatched and fledged per nest among touched nests than untouched nests (Table 2). In addition to our research activity not increasing chances of predation, among successful nests only, the mean number of robins hatched and fledged did not differ between touched and untouched nests (Table 2). In a few cases, we discovered a nest that was in the early nestling stage and were not able to determine the number of hatched eggs; therefore, the sample sizes of number hatched and number fledged differs.

## DISCUSSION

Our research activities on American robin nests had no apparent detrimental effect on their nesting success. Nest abandonment was not due to our handling nest contents because only 7 nests were abandoned during the 3 years of our study (3 touched and 4 untouched). Nests were marked by the same method regardless of whether they were touched or not. Nest markers, therefore, were probably not used as a visual cue by predators. Olfactory trails to nesting trees were the same between the touched and untouched nests, but we left additional olfactory trails within the touched nests and on the nest trees.

Contrary to what we expected, a significantly

Table 2. Mean number ( $\pm$  SD) of American robins hatched and fledged in touched and untouched nests  $\leq 3.7$  m, Hesperus, Colorado, 1993–95.

	Touched	Untouched	$P^a$
All nests			
1993			
Hatched	2.2 $\pm$ 1.7 ( $n = 56$ )	1.1 $\pm$ 1.6 ( $n = 12$ )	0.042
Fledged	1.5 $\pm$ 1.5 ( $n = 56$ )	0.6 $\pm$ 1.2 ( $n = 14$ )	0.030
1994			
Hatched	2.3 $\pm$ 1.5 ( $n = 32$ )	0.5 $\pm$ 1.2 ( $n = 12$ )	0.002
Fledged	1.6 $\pm$ 1.5 ( $n = 33$ )	0.3 $\pm$ 0.9 ( $n = 12$ )	0.004
1995			
Hatched	1.7 $\pm$ 1.8 ( $n = 20$ )	1.5 $\pm$ 1.7 ( $n = 20$ )	NS
Fledged	0.9 $\pm$ 1.4 ( $n = 20$ )	0.9 $\pm$ 1.6 ( $n = 21$ )	NS
Successful nests			
1993			
Hatched	3.2 $\pm$ 1.1 ( $n = 32$ )	3.5 $\pm$ 0.7 ( $n = 2$ )	
Fledged	2.6 $\pm$ 1.0 ( $n = 32$ )	2.7 $\pm$ 0.6 ( $n = 3$ )	
1994			
Hatched	2.9 $\pm$ 0.7 ( $n = 19$ )	3.0 ( $n = 1$ )	
Fledged	2.7 $\pm$ 0.8 ( $n = 20$ )	3.0 ( $n = 1$ )	
1995			
Hatched	3.4 $\pm$ 0.8 ( $n = 7$ )	3.5 $\pm$ 0.6 ( $n = 4$ )	
Fledged	2.6 $\pm$ 1.1 ( $n = 7$ )	3.6 $\pm$ 0.6 ( $n = 5$ )	

<sup>a</sup> Two-tailed Mann Whitney  $U$ -test, corrected for ties.

higher proportion of untouched than touched nests failed in 1993 and 1994. Nest height may have been a confounding variable because the mean nest height of untouched nests was significantly higher within the  $\leq 3.7$ -m category; therefore, the results of higher success among touched nests in 1993 and 1994 need to be interpreted cautiously. Indeed, in 1995, when we controlled for nest height and assigned every other nest ( $\leq 3.7$  m) as a control, we found no differences in either mean height of nests  $\leq 3.7$  m or in success between touched and untouched nests  $\leq 3.7$  m. Nest height, as a factor contributing to nest predation, has been investigated numerous times for other species with varying results (Holcomb 1972, Yahner and Scott 1988, Martin 1993). For example, Holcomb and Twiest (1968) reported increased nesting success with increased nest height in red-winged blackbirds (*Agelaius phoeniceus*), but Holcomb (1972) found predation to be higher among nests that were higher than the mean nest height in Traill's flycatchers (*Empidonax traillii*). Varying results of studies may be partially due to different habitats and to different predators in particular study sites. The potential primary avian predators in our study site included black-billed magpies (*Pica pica*), scrub jays (*Aphelocoma coerulescens*), and Steller's jays (*Cyanocitta stelleri*). The main potential mammalian predators were rock squirrels (*Spermophilus variegatus*), long-tailed weasels (*Mustela frenata*), striped skunks (*Mephitis mephitis*), raccoons (*Procyon lotor*), chipmunks (*Tamias* spp.), and deer mice (*Peromyscus maniculatus*). Garter snakes (*Thamnophis* sp.) were abundant at the study site and may have preyed upon robin eggs. We have observed rock squirrels, black-billed magpies, and raccoons preying upon bird nests at our study site, and we believe rock squirrels were one of the most important predators on American robin nests.

While there was no difference in success between touched and untouched nests in 1995, and nest height may have confounded the results in 1993 and 1994, possible positive effects of human manipulation noted in 1993 and 1994 may be worth considering. Possibly, we left an unpleasant scent on nests that we touched, such as our own natural scent or traces of insect repellent. Red foxes (*Vulpes vulpes*) were less likely to prey upon eggs that had been handled, which suggested that they may be reluctant to approach nests with human scent (MacIvor et

al. 1990). Possibly, the behavior of robins whose nests we touched was altered by our handling the contents of their nests. Robins whose nests were disturbed for longer periods of time and whose young were handled may have become more vigilant in general than robins who were disturbed only briefly by a mirror and pole. Herring gulls (*Larus argentatus*) in colonies disturbed for 30 minutes every other day by researchers were more aggressive towards humans and conspecifics than gulls in adjacent undisturbed colonies (Burger 1981).

## MANAGEMENT IMPLICATIONS

For effective management, particularly for sensitive species, it is essential to understand researcher effects and to take appropriate precautionary measures when researchers appear to cause lowered nesting success. The importance of understanding researcher effects on the success of nesting birds should not be underestimated, in terms of ethical principles, evaluating biases in data, and population stability of some species. Many studies clearly have shown a negative effect of research activity (Johnson and Sloan 1975, Kury and Gochfeld 1975, Robert and Ralph 1975, Ollason and Dunnet 1980, Fetterolf 1981), while others have shown minimal or no effect (Nichols et al. 1984, Galbraith 1987; this study); therefore, researcher effects need to be evaluated on a species-by-species basis. In this study, we have reported unexpected results and presented a new method for investigating the effects of human researchers on the nesting success of arboreal-nesting species. American robins may respond differently to human activity than other more sensitive birds, particularly since they are common in urban areas and often associate with humans.

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Received 11 September 1995.

Accepted 21 February 1997.

Associate Editor: O'Connor.