SITE-RELATED NESTING SUCCESS OF MOURNING DOVES AND AMERICAN ROBINS IN SHELTERBELTS

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Farmstead shelterbelts are often the only source of wooded habitat amid extensive croplands and pastures in the intensively-farmed regions of the Midwest (Griffith 1976), thereby representing an important habitat for many species of birds (Martin 1980; Yahner 1982a, 1983a). Mourning Doves (*Zenaida macroura*) and American Robins (*Turdus migratorius*) are among the most abundant nesting species of birds in Minnesota farmstead shelterbelts (Harris et al. 1963, Yahner 1982b). In a previous study of nest-site selection by five avian species in shelterbelts based on total nests constructed (active and inactive nests pooled), I found considerable overlap between doves and robins in both choice of nesting substratum and microhabitat features surrounding nest-sites (Yahner 1982b).

Selection should ensure that individuals that construct nests in optimal microhabitat locations are more successful in fledging young than individuals that choose less suitable locations (Caccamise 1977). In shelterbelts, nesting success has been reported for doves (e.g., Boldt and Hendrickson 1952, Randall 1955, Harris et al. 1963) but not for robins. Further, nesting success of both species in relation to microhabitat features or nesting substrata has seldom been examined (but see Howell 1942, Coon et al. 1981). Because of pronounced similarities in nest-site selection between doves and robins in shelterbelts (Yahner 1982b), herein I specifically examine whether or not success of active nests is associated with microhabitat features or other site-related factors either within a species or between the two species. Two hypotheses are tested: (1) microhabitat features of active nest-sites do not vary among successful and unsuccessful nests of doves and robins; and (2) relative densities of potential predators among shelterbelts do not affect nesting success in these two avian species.

STUDY AREA AND METHODS

The study was conducted at the Rosemount Agricultural Experiment Station, Dakota Co., Minnesota, from June 1978–July 1981. Topography at the Station is flat to gently rolling; agricultural practices and land uses are characteristic of intensively-farmed regions of southern Minnesota (Yahner 1982a). Seven representative farmstead shelterbelts were selected for study (details of each are presented in Yahner 1980a, 1982b).

Nest searches were made every 2–3 days when possible from March to late September in each shelterbelt by systematically searching the ground level and all trees and shrubs for active nests of Mourning Doves and American Robins. Active nests were defined as containing one or more eggs or nestlings (Harris et al. 1963) in newly-constructed nests, in

abandoned nests of conspecifics, or in abandoned nests constructed by another species. Inactive nests (see Yahner 1982b) were not included in this study. An effort was made to monitor the status of each active nest every 1–3 days. Successful active nests were those in which one young was fledged or known to be present in the nest within 1 day of the expected date of fledging, in cases where individual active nests could not be inspected on the exact day of fledging (see Coon et al. 1981).

Six microhabitat features were measured for each active nest: (1) compass direction of the nest relative to the position of the main stem of the tree or shrub containing the nest; (2) height (m) of the tree or shrub in which the active nest was located; (3) height (m) of the nest above ground; (4) diameter (m) of the largest woody stem touching and/or supporting the nest; (5) lateral distance (m) of the nest from the main trunk of the tree or shrub containing the nest; and (6) species of tree or shrub used as nesting substratum.

Active nests of doves and robins were divided into successful and unsuccessful nests, giving four groups of active nests for statistical analysis. Rates of nesting success were compared between bird species using tests of equality between two percentages based on arcsine transformations (statistical tests throughout are from Sokal and Rohlf 1969). Compass direction among the groups of nests was analyzed by categorizing an active nest as being north (315–45°), east (45–135°), south (135–225°), or west (225–315°) of the main stem of the nesting substratum; the resultant 4×4 data matrix was analyzed by a row $(R) \times$ column (C) test of independence. Differences in means of nesting substratum height, nest height, nesting substratum diameter, and nest distance to main trunk of nesting substratum among the four groups of active nests were examined by single-classification analyses of variance and Student-Newman-Keuls tests. If necessary, data were transformed with square roots prior to analysis. To determine relationships between nesting success of both avian species and nesting substrata used, active nests occurring in major genera of trees and shrubs (genera containing at least 10% of the total nests) were analyzed via a $R \times C$ test of independence. Rows of the data matrix were spruce (*Picea* spp.), maple (*Acer* spp.), and ash (*Fraxinus* spp.), and columns were the four groups of active nests.

The potential effect of mammalian predators on nesting success was determined by first dividing shelterbelts into those containing resident populations of predators vs those with no or transient populations of predators. Two potential mammalian predators regularly observed and/or live-trapped at the Station and known to prey on the contents of bird nests (Nelson 1976, Gates and Gysel 1978) were red squirrels (*Tamiasciurus hudsonicus*) and house cats (*Felis domesticus*) (Yahner 1980b, 1983b). Active nests in the four groups (rows) of active nests were analyzed between the two categories of shelterbelts (columns) using a $R \times C$ test of independence for each predator separately. Potential avian predators, such as Blue Jays (*Cyanocitta cristata*) or Common Grackles (*Quiscalus quiscula*) (McClure 1943, Harris et al. 1963, Best 1978), were not considered because both species nested and/or regularly visited all seven shelterbelts during the study (Yahner 1983a).

RESULTS AND DISCUSSION

Reuse of nests.—Ninety-four and 54 active nests of Mourning Doves and American Robins, respectively, were monitored during the study. Robins nested only in newly-constructed nests and never in abandoned nests. Robins seldom reuse nests of either conspecifics or other species (Howell 1942). However, only 70 (75%) active nests of doves were newly-constructed dove nests; 13 (14%) were in abandoned dove nests, 7 (7%) in abandoned grackle nests, and 4 (4%) in abandoned robin nests. Other studies

Nest group	Total active nests	Compass direction			
		North (315–45°)	East (45–135°)	South (135–225°)	West (225–315°)
Successful dove nest	30	3	9	12	6
Unsuccessful dove nest	64	7	17	31	9
Successful robin nest	30	4	10	10	6
Unsuccessful robin nest	24	4	8	10	2

have shown that doves are very opportunistic in using abandoned nests (e.g., McClure 1946, Boldt and Hendrickson 1952, Harris et al. 1963) and artificial nests (Nelson 1976). Greater use by doves of abandoned grackle nests vs abandoned robin nests in my study was not unexpected due to the greater number of available grackle nests in the seven shelterbelts. Total (active and inactive) grackle nests (N = 335) during a 2-year period (1978–1979) were nearly four times as abundant as total robin nests (N = 87); however, total dove nests (N = 136) also were less frequent than grackle nests (Yahner 1982b). This suggests that doves prefer abandoned nests of conspecifics rather than those of coexisting species. McClure (1946) observed the same dove nest being used on five different occasions during the same nesting season; I noted one dove nest to be used four times during a single season by one or more pairs of doves. I had no evidence that doves reused nests constructed in a previous year as has been noted in other studies (Coon et al. 1981).

Nesting success between species and in relation to wind damage.—Thirty active nests each of both doves (32%) and robins (56%) successfully fledged one or more young (Table 1); these rates varied between species (t = 2.8, df = 146, P < 0.01). Nesting success of doves in various habitats has ranged from about 35% in Michigan woodlots (Caldwell 1964) to 77% in a North Dakota shelterbelt devoid of predators (Randall 1955). Differential success of doves vs robins may be attributed partially to structure of nests. Doves construct "flimsy" nests compared to those of robins (Howell 1942, McClure 1943, Coon et al. 1981). But nests of both species apparently were affected equally by wind damage; seven nests (7%) of doves and two nests (4%) of robins were destroyed by high winds that accompanied severe storms (t = −1.0, df = 146, P > 0.05). Other investigators report

TABLE 2

MEAN (±SD) OF FOUR MICROHABITAT FEATURES OF SUCCESSFUL AND UNSUCCESSFUL
ACTIVE NESTS OF MOURNING DOVES AND AMERICAN ROBINS IN MINNESOTA FARMSTEAD
SHELTERBELTS

| | Nest group | | | |
| | Doves | | Robins | |
Microhabitat feature	Successful	Unsuccessful	Successful	Unsuccessful
Height of nesting substratum (m)	8.0 ± 4.0^a	6.9 ± 2.7	5.5 ± 3.0	6.6 ± 3.3
Height of nest (m)	2.1 ± 1.3	2.0 ± 0.8	1.9 ± 1.3	1.9 ± 1.1
Diameter of nesting substratum (m)	0.05 ± 0.06	0.05 ± 0.05	0.07 ± 0.07	0.06 ± 0.05
Nest distance to main trunk (m)	0.61 ± 0.69^a	0.65 ± 0.62	0.29 ± 0.55	0.48 ± 0.46

[a] Significant difference ($P < 0.05$) in means among four nest groups, based on single-classification analysis of variance; nonsignificant ranges are underlined, based on Student-Newman-Keuls tests.

low dove nest loss (less than 5%) due to inclement weather (Boldt and Hendrickson 1952, Randall 1955) even though wind velocities are often excessive near shelterbelts (Lyles 1976). Summer storms in southern Minnesota usually have northerly or westerly winds, and most nests (76%) of doves in this region are located on southwest, south, east, or southeast sides of nesting substrata (Harris et al. 1963). In my study, 73% (N = 69) and 70% (N = 38) of active nests of doves and robins, respectively, were positioned east or south of the main stems of nesting substrata (Table 1). Compass direction of nest was independent of nesting success in both species ($G = 4.0$, df = 9, $P > 0.50$).

Nesting success in relation to other microhabitat characteristics.—In a previous study (Yahner 1982b), height of both nesting substratum and nest did not vary ($P > 0.05$) between total nests (active and inactive combined) of doves and robins during a 2-year period; whereas nesting substratum diameter was significantly less ($P < 0.05$) and nest distance to main trunk was significantly greater ($P < 0.05$) in total nests of doves compared to robins. When I compared these four microhabitat characteristics in relation to nesting success using active nests only in the present study, nest height ($\bar{x} = 1.9–2.1$ m) and nesting substratum diameter ($\bar{x} = 0.05–0.07$ m) did not differ among successful and unsuccessful nests of doves and robins (F's < 1.4; df = 3, 144; P's > 0.05) (Table 2). Best (1978) also noted that nest height above ground did not affect nesting success in Field Sparrows (*Spizella pusilla*).

Nest distance to main trunk and nesting substratum height varied among the four groups of nests (F's > 3.2; df = 3, 144; P's < 0.05). *A posteriori* comparisons of group means showed no differences ($P > 0.05$) between

successful and unsuccessful nests of robins with respect to nest distances to main trunk ($\bar{x} = 0.29$ vs 0.43 m) or nesting substratum height ($\bar{x} = 5.5$ vs 6.6 m). Likewise, successful and unsuccessful nests of doves did not vary ($P > 0.05$) with regard to nest distance to main trunk ($\bar{x} = 0.61$ vs 0.65 m) or nesting substratum height ($\bar{x} = 8.0$ vs 6.9 m). However, both of these characteristics were lower for successful nests of robins ($P < 0.05$) than those of either successful and unsuccessful nests of doves. Perhaps robin nests are near the main stem of a nesting substratum because their nests are bulkier than nests of doves, requiring sturdier locations to support their weight. A by-product of this selection for nest placement in robins may be greater protection from inclement weather and certain types of predators (e.g., Blue Jay), contributing to greater nesting success (56%) compared to that of doves (32%) observed in this study.

Caccamise (1977) found reduced nesting success in Red-winged Blackbirds (*Agelaius phoenicus*) nesting in taller shrubs and concluded that nests in tall shrubs were more susceptible to predators than nests located nearer to ground level. Although nesting success of doves and robins in my study was not dependent on use of spruce, maple, or ash as nesting substrata ($G = 5.0$, df $= 6$, $P > 0.50$), both species nested in *Picea* more often than in most other plant genera in shelterbelts due to branching characteristics and regardless of tree height (Yahner 1982b). However, resident red squirrels were found in shelterbelts containing mature spruce that produced large quantities of cone seeds as a food source (Yahner 1980b). I suggest that possibly small *Picea* were used less often by foraging squirrels (Sciuridae), accounting in part for the relationship between successful robin nests and low height of nesting substrata.

Nesting success in relation to predators.—Of 64 and 24 unsuccessful nests of doves and robins (Table 1), respectively, similar ($t = -0.05$, df $= 86$, $P > 0.05$) proportions of these unsuccessful dove (80%) and robin nests (79%) were lost to predation. Relative densities of house cats in farmsteads adjacent to shelterbelts were independent of nesting success of both avian species ($G = 1.4$, df $= 3$, $P > 0.05$). Several studies in rural areas have found little predation by house cats on birds (e.g., Parmalee 1953). In contrast, relative densities of red squirrels in shelterbelts were dependent on nesting success ($G = 9.2$, df $= 3$, $P < 0.05$). Proportions of successful dove nests did not differ between shelterbelts inhabited by resident red squirrels (38%) and shelterbelts lacking resident squirrels (37%). However, only 40% of total active robin nests were successful in shelterbelts occupied by red squirrels compared to 67% success rate for nests in shelterbelts infrequently used by this mammal. These differential success rates may imply a greater nest predation on

robins than on doves by *Tamiasciurus*. I propose that behavior associated with parental defense of nests by robins (e.g., attack; see Howell 1942) may increase the conspicuousness of a concealed robin nest (e.g., a nest close to the tree trunk) to arboreal red squirrels rather than acting as an effective deterrent against predation.

Nesting success in relation to season.—Nests were initiated from April–August by doves and from April–June by robins. Percentages of successful nests per month in doves ranged from 30% in June (N = 23 active nests) to 50% in August (N = 2). Success rates of 32% in April (N = 19), 33% in May (N = 39), and 36% in July (N = 11) were similar in doves giving no consistent trend in monthly success rates. LaPointe (1958) observed no seasonal trend in nesting success of doves, whereas Harris et al. (1963) and Caldwell (1964) noted greater success in latter months of the breeding season. I found that success rate of robins increased as the breeding season progressed with 50% in April (N = 26 active nests), 56% in May (N = 18), and 70% in June (N = 10). Howell (1942) also reported increased nesting success in robins with seasonal progression.

Use of coniferous vs deciduous nesting substrata by robins in my study was dependent on season ($G = 32.2$, df = 2, $P < 0.001$); 73%, 50%, and 30% of active robin nests constructed during April, May, and June, respectively, were in conifers (principally *Picea*). Of the total individual trees and shrubs present in the seven shelterbelts (N = 3589), 34% were coniferous (Yahner 1982b). As in the present study, Howell (1942) noted that robins more often nested in deciduous trees compared to coniferous trees later in the season. Nest parasitism by Brown-headed Cowbirds (*Molothrus ater*) and predation have been identified as potential factors accounting for differential nesting success in passerines over season (Best 1978), but I had no evidence that either affected nesting success.

In conclusion, two characteristics of nest-sites considered in this study were related to nesting success of robins, but none was associated with success of doves. Perhaps other characteristics of shelterbelts not measured in my study (e.g., food resources, proximal land-use features; Yahner 1983a) had important influences on nesting success. Alternatively, shelterbelts are evolutionarily-recent, man-made habitats compared to natural Midwest habitats (e.g., riparian habitats [Stauffer and Best 1980]). Although doves and robins are common nesting species in shelterbelts, they may not be adapted to these recent habitats relative to other habitats that have been in existence for longer time periods (after Gates and Gysel 1978).

SUMMARY

Nesting success of Mourning Doves (*Zenaida macroura*) and American Robins (*Turdus migratorius*) was studied for 3 years in Minnesota farmstead shelterbelts. Of 94 dove nests

and 54 robin nests, 32% and 56%, respectively, fledged at least one young. Doves frequently nested in abandoned nests, whereas robins never nested in abandoned nests. No nest-site characteristics measured in the study were related to nesting success of doves; height of tree or shrub used for nesting and distance of nest from the main stem of the nesting substratum were associated with success of robin nests when compared to those of doves. Relative to nests of doves, nests of robins may be more susceptible to predation by red squirrels. Nesting success rates of doves did not show a seasonal trend, but rates of robins increased as breeding season progressed. Farmstead shelterbelts are relatively recent, man-made habitats in the Midwest. Thus, relationships between nest-site selection and nesting success may be different than those found in habitats that have been in existence for longer time periods.

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