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Mourning dove (*Zenaidura macroura*) nesting success in artificial and natural nests was investigated in 1974 on seven study areas in central Minnesota. Nesting success in artificial nests was significantly greater ($P<0.05$) than that in natural nests. Of 69 nesting attempts in artificial nests, 60.9% (42) were successful. Of 224 nesting attempts in natural nests, 44.2% (99) were successful. Sixty-nine nesting attempts were made in 59 of the 203 artificial nests installed. This represents a 34.0% rate of utilization.

INDEX DESCRIPTORS: Mourning Dove, *Zenaidura macroura*, Nesting success.

The game bird status of the mourning dove and its aesthetic value as a songbird make it a species held in high esteem. The mourning dove is the most important game bird in the United States in terms of numbers of birds harvested. Over 49 million doves were harvested for the 1972-73 season (Sorensen 1975).

Bent (1932) has described the nest of the mourning dove as a flimsy platform of twigs. This frail construction often leads to egg and nestling mortality as a result of storms or crowded conditions within the nest (Nice 1923). Cowan (1959) indicated that artificial nests can reduce nest mortality by providing a stable, cone-shaped depression for nesting doves. However, little information is available on dove production in artificial nests. This study compares dove nesting success in artificial nests to that in natural nests.

MATERIALS AND METHODS

The study was conducted in 1974 on seven study areas in central Minnesota, all located within three miles of St. Cloud, Minnesota. The trees on these study areas were planted to control wind erosion of topsoil or for ornamental purposes (Table 1).

Artificial nests were constructed from 6.5 mm wire mesh hardware cloth. The nests were constructed by making a cut with a tin snips from the corners to the center of a 25.0 cm square piece of hardware cloth. The cut edges were overlapped and fastened with wire to form a cone-shaped nest with an 8.0 cm depression.

Two hundred and three artificial nests were placed in trees in five study areas between 19 March and 18 May. Eighty-six percent (175)

Table 1. *Study Area Characteristics.*

Study Area	Type of Planting	Hectares	Number of Trees	Type of Trees
I	Shelterbelt	0.40	258	Coniferous
II	Shelterbelt	0.28	93	Coniferous
III	Woodlot	0.04	101	Coniferous
IV	Shelterbelt	0.45	617	Coniferous
V	Shelterbelt and Farmyard	0.81	336	Coniferous and Deciduous
VI	Shelterbelt	0.24	486	Coniferous
VII	Landscape (cemeteries)	2.63	195	Coniferous and Deciduous

Table 2. *Nesting Success in Artificial and Natural Nests.*

	Artificial Nests			Natural Nests		
Study Area	Nesting Attempts	Number Successful	Percent Successful	Nesting Attempts	Number Successful	Percent Successful
I	16	10	62.5	28	10	35.7
II	9	7	77.8	24	10	41.7
III	13	10	76.9	24	10	41.7
IV	16	8	50.0	24	15	62.5
V	15	7	46.7	53	29	54.7
VI	—	—	—	23	9	39.1
VII	—	—	—	48	16	33.3
TOTAL OR AVG.	**69**	**42**	**60.9**	**224**	**99**	**44.2**

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Table 3. *Nesting Success in Minnesota and Adjacent States.*

State	Nesting Attempts	Number Successful	Percent Successful	Investigator
IL	940	600	63.8	Hanson and Kossack (1963)
IA	3878	1855	47.9	McClure (1946)
MI	164	58	35.4	Caldwell (1964)
MN	704	459	65.2	Harris et al. (1963)
MN	69	42	60.9	This Study
MN[1]	224	99	44.2	This Study
NE	385	181	47.0	McClure (1946)
ND	187	133	71.1	Randall (1955)
SD	320	123	38.4	Drewien and Sparrowe (1966)
WI	110	71	64.6	Mathiak (1953)

[1]Nesting success in artificial nests.

Table 4. *Eggs and Nestlings Lost to Various Causes in Artificial and Natural Nests.*

	Artificial Nests		Natural Nests	
Cause	Eggs and Nestlings Lost	Percent of Total Lost	Eggs and Nestlings Lost	Percent of Total Lost
Unknown	38	64.4	185	70.1
Predation	13	22.0	42	15.9
Wind	3	5.1	23	8.7
Infertile	5	8.5	3	1.1
Human	0	0.0	11	4.2
TOTAL	**59**	**100.0**	**264**	**100.0**

of the nests were placed in conifers and 14% (28) in deciduous trees. The nests were fastened to the limbs with wire and lined with grasses or pine needles.

Study areas were searched weekly for nesting attempts from 10 April to 24 September. Inaccessible nests were observed with binoculars or with a mirror attached to an extension pole.

RESULTS AND DISCUSSION

Nesting Success

A nest was considered successful if at least one young fledged. Of 69 nesting attempts in artificial nests, 60.9% (42) were successful (Table 2). Of 224 nesting attempts in natural nests in all study areas, 44.2% (99) were successful. Chi-square analysis indicated a significant difference ($P<0.05$) in nesting success between artificial and natural nests in all study areas.

Greater nesting success in artificial nests may be attributed to: (a) resistance of artificial nests to wind destruction and (b) provision of a large cone-shaped depression which prevents eggs and nestlings from falling out of the nest.

Nesting success in artificial nests in study areas IV and V was less than that in natural nests in the same areas. Feral cats (*Felis domesticus*) were regularly observed in study area IV. Placement of some artificial nests in exposed locations may have increased nest predation. No reason could be found for the low nesting success in artificial nests in study area V.

Investigators in Minnesota and adjacent states have reported nesting successes in natural nests ranging from 35 to 71% (Table 3). LaPointe (1958) concluded that nesting success even in similar habitats is extremely variable. Several of the investigators listed in Table 3 reported a higher nesting success in natural nests than I found in artificial nests. In spite of this, artificial nests should be viewed as a practical means of increasing nesting success. Nesting success in artificial nests was 16.7% greater than in natural nests.

Few comparable studies of nesting success in artificial nests have been conducted. Calhoun (1948) reported a high degree of mourning dove utilization of artificial nests constructed from roofing paper. However, only 12 of 31 (38.7%) nesting attempts were successful. Cowan (1959) also reported mourning dove use of artificial nests, but did not present data on nesting success.

Only one other species attempted to nest in artificial nests. Two nesting attempts were made by American robins (*Turdus migratorius*) in artificial nests. One attempt was successful in fledging four young.

Egg and Nestling Mortality

Egg and nestling mortality in artificial nests was less than [that] in natural nests. Causes of egg and nestling mortality were difficult to determine. Over 60% of the causes of mortality were unknown (Table 4). However, predation and strong winds were thought to be the major factors involved.

Predation accounted for 22.0% (13) and 15.9% (42) of the losses in artificial and natural nests respectively. Feral cats were the most destructive nest predators. Cats were seen frequently in five study areas. Predation by cats was evident from scattered feathers of adults and nestlings at the nest site.

The second most important nest predators were red squirrels, (*Tamiasciurus hudsonicus*), which were regularly observed in the

Table 5. *Utilization of Artificial Nests in Each Study Area.*

Study Area	Nests Installed	Nesting Attempts	Percent Utilization
I	40	16	40.0
II	33	9	27.3
III	23	13	56.5
IV	71	16	22.5
V	36	15	41.7
TOTAL OR AVERAGE	**203**	**69**	**34.0**

Table 6. *Nesting Attempts in Artificial and Natural Nests in Each Study Area.*

	All Nests	Artificial Nests		Natural Nests	
Study Area	Total Nesting Attempts	Nesting Attempts	Percent of Total Attempts in Area	Nesting Attempts	Percent of Total Attempts in Area
I	44	16	36.4	28	63.6
II	33	9	27.3	24	72.7
III	37	13	35.1	24	64.9
IV	40	16	40.0	24	60.0
V	68	15	22.1	53	77.9
TOTAL OR AVERAGE	**222**	**69**	**31.1**	**153**	**68.9**

Table 7. *Nests Initiated and Young Fledged During Each Month of the Nesting Season.*

Month	Nests Initiated	Percent of Total Initiated	Cumulative Percent Initiated	Young Fledged	Percent of Total Fledged	Cumulative Percent Fledged
April	12	4.3	4.3	0	0.0	0.0
May	115	40.8	45.1	22	9.3	9.3
June	73	25.9	71.0	93	39.2	48.5
July	52	18.4	89.4	60	25.3	73.8
August	30	10.6	100.0	43	18.1	91.9
September	0	0.0	100.0	19	8.0	99.9
TOTAL	**282**	**100.0**	**100.0**	**237**	**99.9**	**99.9**

conifer shelterbelts. Smashed eggs with jagged edges were evidence of red squirrel predation. Occasionally red squirrel hairs were found sticking to wet, broken egg shells.

McClure (1943) identified blue jay (*Cyanocitta cristata*) predation by the presence of large puncture holes in eggs. Blue jays nested in several study areas, however, few signs of predation were recorded. Other possible predators included eastern gray squirrels (*Sciurus carolinensis*) and eastern chipmunks (*Tamias striatus*).

Harris, et al. (1963) and Drewien and Sparrowe (1966) found common grackle (*Quiscalus quiscula*) predation to be an important factor in nest mortality. McClure (1943) found grackle predation to be insignificant. In this study, nesting grackles were present on all areas, but seemed to have no detrimental effect on nesting doves. Actually, doves benefited by utilizing abandoned sturdy nest structures of grackles.

Of all dove nesting attempts in natural nests in this study, 14.7% (33) were made in common grackle nests. Nesting success in grackle nests averaged 57.6%, 15.1% greater than the average nesting success in dove nests. A grackle nest is similar to an artificial nest in that the cone-shaped depression of the nest prevents eggs and nestlings from falling out.

Strong winds were responsible for 5.1% (3) and 8.7% (23) of the losses in artificial and natural nests, respectively. Three nestlings in artificial nests died as a result of winds breaking the limbs to which the nests were fastened. Winds caused mortality in natural nests by blowing the nest contents or entire nest out of the tree. In Iowa, McClure (1943) reported that 22% of all nesting attempts were destroyed by wind and severe weather.

Utilization of Artificial Nests

Mourning doves attempted 69 nestings in 59 (10 nesting attempts occurred in nests previously used) of the 203 artificial nests installed (Table 5). This represents a 34.0% rate of utilization. The high degree of utilization of artificial nests (56.5%) in study area III was probably due to the high density of nesting on this area. Fifteen nesting pairs were estimated to be using this small study area. Only 22.5% (16) of the artificial nests in study area IV (shelterbelt) were

utilized. However, 40.0% (16) of the nesting attempts in this study area were made in artificial nests.

Of the 222 nesting attempts in study areas I through V, 31.1% (69) were in artificial nests and 68.9% (153) were in natural nests (Table 6). This represents a ratio of approximately one nesting attempt in an artificial nest for every two nesting attempts in natural nests. Considering the abundance of natural nest sites offered by the conifers in these study areas, this represents a high degree of utilization of artificial nests.

Nest Site Selection

Twelve species of trees were present on the study areas. White spruce (*Picea glauca*), blue spruce (*Picea pungens*), red cedar (*Juniperus virginiana*) and box elder (*Acer negundo*) comprised 79.6% (1660) of the total number of trees present. Of 213 nesting attempts in natural nests, 85.0% (181) were made in these four species of trees. Eleven nest sites were found in locations other than living trees. Four were found on leaning dead tree trunks, three in lilac bushes, two on building roofs, and two on farm machinery.

Of 203 artificial nests installed, 78.3% (159) were installed in the same four tree species. Fifty-one or 73.9% of the nesting attempts in artificial nests were made in nests installed in these tree species.

The growth form and the high availability of white spruce, blue spruce, and red cedar were considered to be the most important factors influencing mourning dove nest site selection. The high density of cover and availability of spreading horizontal branches in these trees provided excellent nest site locations for artificial and natural nests.

The Nesting Season

Nesting began 16 April and ended 20 September. Nest initiation was greatest in May (Table 7). The peak period of production occurred in June.

Of 282 nesting attempts, 89.4% (252) were established by 31 July. No nests were initiated after 1 September. Of 237 young, 91.9% (218) were fledged by 31 August.

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