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BROOD PARASITISM BY BROWN-HEADED COWBIRDS IN A SIMPLE HOST COMMUNITY IN EASTERN KANSAS

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Many factors may affect the frequency of brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) in local communities of birds. For example, increased density of host nests, which likely allows for increased host defense, may result in a decrease in the level of parasitism (Robertson and Norman 1977, Facemire 1980). On the other hand, increased density of cowbirds usually results in a greater frequency of parasitism, and may cause the use of hosts that are not normally parasitized (Elliott 1978). Factors such as host nesting phenology (Klaas 1975, Middleton 1977), habitat (Zimmerman 1983), host female age (Smith 1981), or nest placement (Dappen 1967, Newman 1980, Buech 1982) may play a role in determining local rates of parasitism. Selection by the parasite of one species of host over another may also be important, but evidence of such selection has not been adequately provided (Friedmann 1963, Friedmann et al. 1977, Payne 1977).

Very few studies have assessed such factors on a community-wide level. Most previous studies of parasitism on entire avian communities have reported merely the proportion of nests parasitized and/or the effect of parasitism on host nest success (Norris 1947, Berger 1951, Hergenrader 1962, Wiens 1963, Hill 1976, Elliot 1978, Southern and Southern 1980). In this paper I present data on the frequency of brood parasitism on a study site near Lawrence, Kansas. I then assess relationships among the frequency of parasitism, host nest density, host laying phenology, and nest or nest-site characteristics. I correlate geographic variation in percent parasitism to geographic variation in cowbird density and determine if the distribution of cowbird eggs over host nests fits that predicted by recent models using a Poisson expansion (Preston 1948, Mayfield 1965a, Lowther 1984b).

Methods

The study area was located just south of the intersection of US 40 and Clinton Road, about 10 km west of Lawrence, Douglas County, Kansas. The 25 ha site consisted of intermittently grazed pasture, and included areas of grassland, stands of shrubby dogwood (*Cornus* sp.), and cattail marshes in two small, adjacent ponds (Fig. 1). Some large mulberries (*Morus rubra*) and cottonwoods (*Populus deltoides*) were dispersed along the fencelines (solid lines in Fig. 1), and osage orange (*Maclura pomifera*) and red cedar (*Juniperus virginianus*) dotted the pasture. The site was divided into six sectors (A-F, Fig. 1) on the basis of fencelines and natural habitat breaks.

I made 28 visits to the site between 25 April and 27 June 1981, and 17 visits between 2 May and 12 June 1982. Visits averaged 3-4 h and were made at various times of the day. During each visit I primarily searched for nests. My searches were unsystematic; I walked throughout the site in a zig-zag pattern, checking trees, bushes and grass clumps, and sometimes I flushed incubating females. I also sat on high spots and scanned for nest-building activity by birds or occasionally dragged a 30 m rope through the grass. Nests were marked and monitored on subsequent visits. Nest height was measured and its supporting plant species was identified. Cowbird eggs were removed for electrophoresis (Fleischer 1985) and about half of these were randomly replaced with a surrogate egg. Surrogate eggs were plaster models (Rothstein 1970) or actual, dead eggs of House Sparrows (*Passer domesticus*).

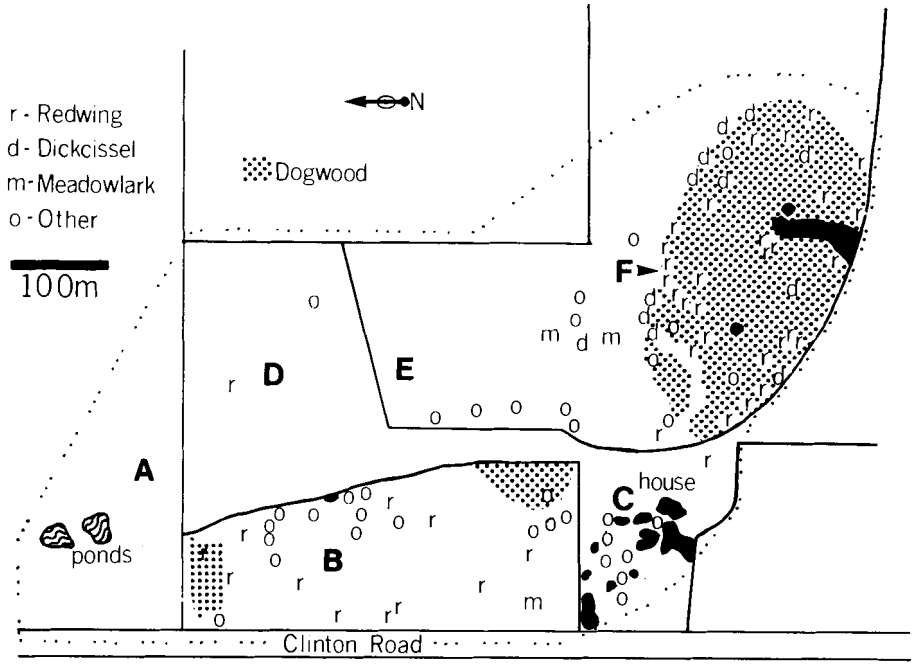

Figure 1. Map of the study area near Lawrence, Douglas Co., KS. Stippled areas are dogwood patches, dark areas are thickets of trees. Solid lines are fencelines, and the dotted line is the site boundary. Nests for the 1982 season are shown on the map (see Table 1). Site is divided into six sectors (A-F) on the basis of fencelines and habitat breaks.

Nesting Phenology and Parasitism Rates

I found 112 and 106 nests on the study site during 1981 and 1982, respectively (Table 1). Nests of 14 and 13 species were found in 1981 and 1982, respectively. In 1981, 32 cowbird eggs were removed from 24 nests of three species (Table 2). In 1982, 26 cowbird eggs were removed from 19 nests of four species (Table 2). Overall and within-species there was no significant difference in parasitism rates between years. Nor was there a between-year difference in the number of acceptor species' nests found with 0, 1, 2, or 3 cowbird eggs per nest.

The phenology of clutch initiation for the five commonest, upland nesting species is shown in Fig. 2. The laying phenologies did not differ between years for any of the species except the Common Grackle (*Quiscalus quiscula*) ($X^2 = 5.00, p = 0.025$), which had two renests very late in 1981. In general, the laying periods of these five species did not overlap very much. The laying periods of Red-winged Blackbirds (*Aqelaius phoeniceus*) and Eastern Meadowlarks (*Sturnella magna*) were not significantly different ($X^2 = 0.02, p > 0.975$), but both laid significantly earlier than Dickcissels (*Spiza americana*) ($G = 17.54, p < 0.005$, and $G = 7.44, p < 0.025$, respectively). Common Grackles laid significantly earlier than all the other species. Most laying activity had ceased by the end of the study period (Fig. 2), at least for first clutches. Only Dickcissels were likely to still be initiating first clutches. Dickcissels are normally single-brooded, and tend to lay their clutches later than other, local species (Zimmerman, 1983).

During 1981, the location of Red-winged Blackbird nests changed as the season progressed; the proportion of the total number of Red-winged Blackbird nests that was found in sector F (see Fig. 1) increased from 19% prior to 20 May to 53% after 20 May ($X^2 = 4.63, p < 0.05$). In 1982 there was no significant within-season temporal shift, but there was a significant difference overall from the 1981 season: nesting in sector F

TABLE 1. Summary of nests found in 1981 and 1982 on the study site in Douglas County, Kansas. The acceptor/rejector status was obtained from Rothstein (1970) or by personal observation of acceptance (designated by an asterisk). Hole nesters are designated by an "H". In 1981, seven female Red-winged Blackbirds also nested in the cattails of the pond and two upland nests were built and abandoned. In 1982 no females nested there, but seven upland nests were built and abandoned. Only upland and active nests are included in subsequent analyses.

Species	Accepts or Rejects	1981 # of Found Nests	1982 # of Found Nests
Red-winged Blackbird (*Agelaius phoeniceus*)	A	37(46)	36(43)
Eastern Meadowlark (*Sturnella magna*)	A	7	3
Dickcissel (*Spiza americana*)	A*	11	12
Common Grackle (*Quiscalus quiscula*)	A	7	16
American Robin (*Turdus migratorius*)	R	1	4
Mourning Dove (*Zenaidura macroura*)	A	5	9
Brown Thrasher (*Toxostoma rufum*)	R	10	6
Loggerhead Shrike (*Lanius ludovicianus*)	?	1	1
American Crow (*Corvus brachyrhynchos*)	—	1	1
Eastern Kingbird (*Tyrannus tyrannus*)	R	5	6
Cardinal (*Cardinalis cardinalis*)	A	0	2
Great-tailed Grackle (*Quiscalus mexicanus*)	?	15	5
Common Yellowthroat (*Geothlypis trichas*)	A	1	0
House Sparrow (*Passer domesticus*)	H	1	0
Upland Sandpiper (*Bartramia longicauda*)	—	1	0
Grasshopper Sparrow (*Ammodramus savannarum*)	A*	0	1
House Wren (*Troglodytes aedon*)	H	0	0
TOTALS		**112**	**106**

TABLE 2. Rates of parasitism on those species that were parasitized in 1981 and 1982.

Species	No. of nests	No. parasitized	% parasitized	No. of cowbird eggs/nest
	1981			
Red-winged Blackbird	37	12	32%	0.38
Eastern Meadowlark	7	4	57%	0.86
Dickcissel	11	8	73%	1.09
	1982			
Red-winged Blackbird	36	10	28%	0.39
Eastern Meadowlark	3	1	33%	0.67
Dickcissel	12	7	58%	0.75
Common Grackle	16	1	6%	0.06

increased from 33% of the total in 1981 to 73% in 1982 ($X^2 = 10.7$, $p < 0.001$). The shift may have occurred because of predation by Great-tailed Grackles (*Quiscalus mexicanus*) in sectors closer to the ponds, or because of herbicide spraying for musk thistle in sector B late in the 1981 season.

Dickcissels nested almost exclusively in sector F (87% over the two seasons). This differed significantly from that of red-wings (52% in sector F over two seasons; $X^2 = 8.91$, $p < 0.005$), and was particularly marked in 1981 (82% versus 33%; $X^2 = 8.91$, $p < 0.005$). In both years cowbirds appeared to switch from parasitizing Red-winged Blackbird nests earlier in the season, to using Dickcissel nests when they became available: in 1981, 39% of 26 red-wing nests were parasitized prior to 24 May, 20% of 10 nests

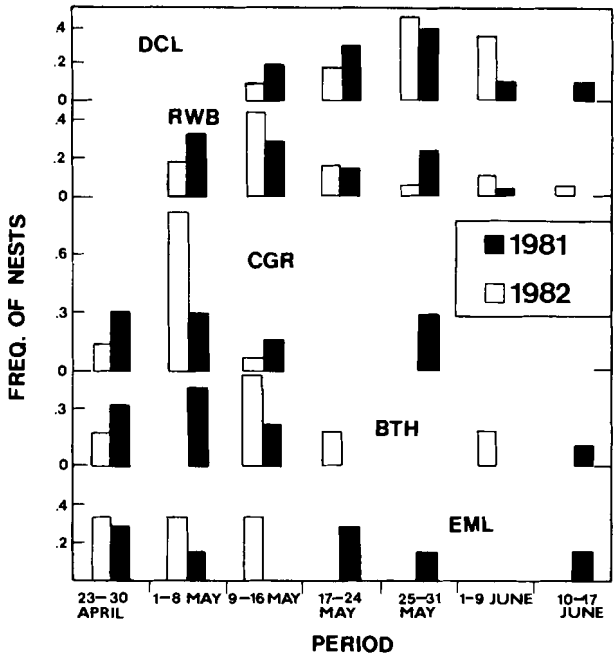

Figure 2. Phenology of clutch initiation for the five commonest species of passerines on the site. Blackened bars are for 1981, white ones are for 1982. Acronyms are as follows: DCL, Dickcissel; RWB, Red-winged Blackbird; CGR, Common Grackle; BTH, Brown Thrasher; and EML, Eastern Meadowlark.

after 25 May ($X^2 = 1.11, p > 0.10$); in 1982, 37% of 27 nests were parasitized before 25 May, versus none of 9 nests after ($X^2 = 4.61, p < 0.05$). Combined over both years, the difference is significant (with 38% before, 10% after; $X^2 = 4.88, p < 0.05$). Dickcissels show trends in the opposite direction (50% parasitism of 6 nests prior to 25 May; 69% of 16 nests after 25 May), but the differences were not significant. Comparing the two species prior to 25 May yields no significant differences in parasitism rate ($X^2 = 0.34$, $p > 0.50$), but a highly significant difference after 25 May (10% of Red-wing Blackbird nests parasitized, 69% of Dickcissel nests parasitized; $X^2 = 12.61, p < 0.001$). Thus, it appears that the parasitism rate on Red-winged Blackbird nests drops as Dickcissel nests become available.

Nest Features, Nest Density, and Parasitism

I examined the data to see how parasitized nests differed from unparasitized ones. These differences may reflect intrinsic factors which affect the rate of parasitism, or the differences may be caused by the parasitism of the nest. Because of the limited sample sizes of nests for Eastern Meadowlarks and Common Grackles, these analyses involve only Red-winged Blackbirds and Dickcissels.

The density of Red-winged Blackbird nests was assessed by nearest neighbor analyses and by estimates of local nest density. For nearest neighbor analysis I measured the distance on a map between a nest and the four nests to which it was closest. Within each year there were no significant differences in mean nearest neighbor distance or mean of four nearest neighbor distances between parasitized and unparasitized nests (no t greater than 0.81, or p less than 0.40). Sectors B and F are of nearly equal area (see Fig. 1). Densities of Red-winged Blackbird nests were greater in sector F in 1982 (29 vs. 11). Within 1982 the two sectors did not differ in the percent of nests parasitized. In 1981 sector F had only two-thirds the nests of sector B, but again there were no significant differences in parasitism rate. Thus, at least minor differences in nest density do not appear to affect the level of parasitism on Red-winged Blackbirds. The type of

vegetation in which a nest was placed did not affect parasitism rates, but parasitized nests of both species were at a significantly greater height than unparasitized nests (Table 3). Cowbirds might be choosing higher nests over lower ones, or may just find them more easily. If higher nests were more successful than ones placed lower, this would suggest the former. Nest success was determined by whether or not at least one host nestling survived to six days of age. This could not be determined for all Red-winged Blackbird nests (33 of 36 for 1981; 26 of 37 for 1982). Successful, unparasitized nests were not significantly higher than unsuccessful ones ($t = 0.03, p > 0.90$).

TABLE 3. Parasitism rates in Red-winged Blackbird and Dickcissel nests as a function of the height of the nest within the vegetation. Parasitized nests were significantly higher than unparasitized ones.

Species	Average Nest Height (m) †Parasitized	n	Unparasitized	n	t
Red-winged Blackbird	0.94	(28)	0.73	(51)	2.84*
Dickcissel	0.65	(21)	0.34	(8)	2.74*

* $p < 0.05$.
†Based on the number of independent parasitisms (i.e., if parasitized twice, the nest was included twice).

Parasitism apparently affected reproductive success in spite of my removing all cowbird eggs from the nests. Clutch size of parasitized red-wing nests was 2.96 (s.d. = 1.37) eggs, and of unparasitized nests was 3.70 (s.d. = 0.74) eggs ($t = 2.47, p < 0.02$). This 0.74 egg difference was almost certainly due to host egg removal by female cowbirds prior to laying rather than by female cowbirds selecting nests with fewer eggs. Nest success of parasitized nests (21%) was significantly lower than the success of unparasitized nests (55%; $X^2 = 6.02, p < 0.025$). This reduced success is at least due in part to desertion by hosts in response to reduction in clutch size (partial clutch reduction, Rothstein 1982), but may have also been due to abandonment because of the presence of cowbird eggs, or to factors coincident with nest failure and nest selection by cowbirds.

Discussion

Community-wide Rates of Parasitism

Parasitism rates on my study site were high, and were typical of Kansas (Hill 1976, Elliot 1978) and prairie communities in general (Hergenrader 1962, Wiens 1963, Lowther 1984a). The overall percent parasitism for nests of acceptor species was 32.3%. This rate is much lower than the rate of 72.8% for a similar host community about 130 km to the west (Riley Co., KS, Elliot 1978). The rates of parasitism of acceptor species in western Kansas (22.0%, Hill 1976), southern Oklahoma (36.9%, Wiens 1963), southern Nebraska (43.0%, Hergenrader 1962) and southern Michigan (22.4%, Berger 1951) are more usual rates for the prairie or midwest regions, and are generally higher than rates from other regions (e.g. for Colorado/Wyoming, 9.7%, Hanka 1979; Louisiana, 3.5%, Goertz 1977; but for northern Michigan, 27.8%, Southern and Southern 1980). Greater rates of parasitism from the central U.S. may result from two factors: first, cowbirds are more abundant there than elsewhere (Van Velzen 1972, Dolbeer and Stehn 1979), and second, cowbirds likely originated in prairie habitats, and perhaps have had more time to coevolve with the host community (Mayfield 1965b).

Geographic Variation in Parasitism in Red-winged Blackbirds and Diskcissels.

There are many studies which provide comparative data on parasitism levels for the primary hosts of this study. These data are interesting in that they may show geographic or ecotypic variation in the level of parasitism. Such variation in host use may be genetically based or may merely be a proximate response by cowbirds to varying host communities or differing cowbird densities.

Parasitism of Red-winged Blackbirds, for example, varies from mostly 0-10% in the east, mid-west (Berger 1951, Nickell 1955, Robertson and Norman 1976, Goertz 1977) and west (King 1954, Payne 1973, Kundert 1977, Friedmann et al. 1977) to about 30%

in Kansas (present study; 21.9%, Hill 1976; 31.0%, Facemire 1980) and even higher in Nebraska and the Dakotas (52.8%, Blankespoor et al. 1982; 54.2%, Hergenrader 1962; 42.2%, Linz and Bolin 1982; 76.4%, Houston 1973). Parasitism frequencies from 38 studies in 24 states or provinces correlate significantly with cowbird densities for the states or provinces (from Van Velzen 1972; $r = 0.69, p < 0.001$; Fleischer, in prep.). The correlation is independent of whether the study involved only marsh-nesting ($r = 0.60, n = 17, p = 0.01$) or upland-nesting birds ($r = 0.73$, n = 13, $p < 0.01$), although marsh-nesting red-wings had lower overall rates ($\bar{x} = 7.3 \pm 14.9\%$ vs. $26.7 \pm 32.0\%$, $t = 2.01, p = 0.05$).

Parasitism of Red-winged Blackbirds, however, undoubtedly relates to factors other than cowbird density and habitat. Many studies of upland-nesting red-wings in areas of high cowbird abundance show little or no parasitism, despite being acceptors of cowbird eggs (S. I. Rothstein, personal comm.). Whether aggressive responses to cowbirds are greater in these areas (Robertson and Norman 1977) or cowbirds just do not select Red-winged Blackbird nests (perhaps because densities of better hosts are higher) cannot be determined at present. Host communities do appear to become increasingly depaupered as one goes from the east to the prairies, and from south to north within the prairies, and this may partly explain the observed trends. Cowbird egg success in Red-winged Blackbird nests, however, is equal to that observed for most other hosts (13.5% of 141 cowbird eggs, based on studies of Hill 1976, Berger 1951, Young 1963, Smith 1949, Houston 1973, Facemire 1980, and Lowther 1984a; vs. 13.0% of 1143 cowbird eggs from nests of 7+ other species summarized in Table 4 of Scott and Ankney 1980; $X^2 = 0.02, p > 0.90$).

The frequency of parasitism of Dickcissel nests is higher than that of Red-winged Blackbird nests, and data presented here suggest that cowbirds may switch from parasitizing red-wing nests early in the season to parasitizing Dickcissel nests later, despite the continued availability of Red-winged Blackbird nests. This may be because Dickcissel nests are easier to find, because Dickcissels offer less resistance to cowbirds (as smaller hosts often do; Robertson and Norman 1977), or because they are superior hosts. However, in three studies of cowbird fledging success in Dickcissel nests in Kansas (Zimmerman 1966, 1983; Elliot 1978), 153 of 848 cowbird eggs (18.0%) fledged. This does not differ significantly from the fledging success of cowbird eggs laid in Red-winged Blackbird nests ($X^2 = 1.75, p > 0.10$). Thus, cowbirds should have no reason to actively select Dickcissel nests over nests of Red-winged Blackbirds. Parasitism rates on Dickcissel nests also vary geographically, with highest levels of parasitism in Kansas (from 50-95%) and a positive correlation between cowbird density (Van Velzen 1972) and frequency of parasitism ($r = 0.83$, n = 11, $p < 0.01$).

Chance Distribution of Cowbird Eggs.

Several workers have examined the distribution of cowbird eggs over host eggs within host communities to see if eggs are placed non-randomly among available nests (Preston 1948, Mayfield 1965a, Elliot 1977, Lowther 1977, 1984b). Preston used a simple Poisson series to calculate the expected number of nests with 0, 1, 2, 3 or more cowbird eggs per nest, and compared these to actual values. Mayfield (1965a) modified this technique to correct a potential bias due to hosts abandoning nests in response to parasitism (thus resulting in fewer 1-egg nests than predicted). Lowther (1984b) also modified the method, but so that nests that were not found by cowbirds (i.e., not parasitized) were accounted for.

The number of cowbird eggs per acceptor host nest in this study was distributed as follows: 0 eggs, 103 nests; 1 egg, 29 nests; 2 eggs, 10 nests; 3 eggs, 3 nests. A Poisson prediction was calculated, and was significantly different from the observed ($X^2 = 7.49$, $p > 0.025$). However, using the method of Lowther (1984b) there was no significant difference between observed and expected values ($X^2 = 0.61, p > 0.50$). Thus, given only the host nests that are parasitized, there appears to be a random placement of eggs among them.

Nest Features and Parasitism.

I examined parasitism rates in relation to a number of nest variables. I found no

relationship between Red-winged Blackbird nest density and parasitism rate; this is counter to findings by Dappen (1967), Robertson and Norman (1977), and Facemire (1980) for red-wings, and by Zimmerman (1983) for Dickcissels. I did find, however, that of seven Red-winged Blackbird nests in the pond cattails in 1981, none were parasitized in spite of finding parasitized upland red-wing nests withim 100 m of the pond (see Fig. 1). Whether this was because of the high density (and thus defensibility) of these clumped nests (average inter-nest distances were less than 2 m), because of an avoidance by cowbirds to nests over water, or because of Great-tailed Grackle aggression against cowbirds cannot be determined.

Higher nests of both Red-winged Blackbirds and Dickcissels were parasitized more frequently than lower nests. Dappen (1967) also found that parasitized nests were higher in the vegetation than unparasitized ones. No differences in nest height or concealment between parasitized and unparasitized nests were found for Song Sparrows (*Melospiza melodia*; Smith 1981), Field Sparrows (*Spizella pusilla*; Best 1978, Buech 1982), Chipping Sparrows (*Spizella passerina*) or Clay-colored Sparrows (*Spizella pallida*; Buech 1982), but Newman (1970) found greater parasitism of ground nests of Lark Sparrows (*Chondestes grammicus*) than of nests higher in the vegetation. I did not find that nest success of Red-winged Blackbirds was related to nest height. However, in at least four previous studies (Holcomb and Twiest 1968, Meanley 1971, Holm 1973, and Brown and Goertz 1978) higher Red-winged Blackbird nests were more successful. One study by Goddard and Board (1967), however, revealed the opposite trend and Harmeson (1974) found no difference in height of successful and unsuccessful Dickcissel nests. If success if generally greater in higher nests, this might explain why parasitized nests are higher in this study, despite the lack for my sample of an apparent relationship between height and success. Alternatively, taller nests may just be more easy to locate than those lower in the vegetation.

Conclusions

This study revealed that several factors relate to the frequency of cowbird parasitism in a local host community. Host nest density was not related to whether a nest was parasitized, but as relative host nest numbers changed, so did parasitism rates for Red-winged Blackbirds and Dickcissels. Although there was no way to assess the effects of local cowbird densities, geographic comparisons strongly suggest that the greater the cowbird density, the higher the level of parasitism on both Red-winged Blackbirds and Dickcissels. Nest height was also related to parasitism rate. Finally, egg placement into nests appears to fit a modified, Poisson distribution (Lowther 1984b).

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Museum of Natural History, University of Kansas, Lawrence, Kansas 66045. Present address: *Hawaiian Evolutionary Biology Program, Pacific Biomedical Research Center, 1993 East-West Road, University of Hawaii, Honolulu, HI 96822.*

Trumpeter Swans Wintering in Kansas. Four Trumpeter Swans (*Cygnus buccinator*) from a restoration flock at Lake Rebecca Park Reserve, Minneapolis, Minnesota, arrived at South Lake, Garnett (Anderson Co.) Kansas on 23 January 1985. These swans were led by a banded, adult female (No. 619-01452). The other three were unmarked, but were believed to be one of her cygnets of the year and two yearling offspring. She apparently lost her nine year old mate and two cygnets on this, their first exploratory migration south.

These swans were 4 of 29 that migrated from a population of 86 birds, the first known migration from a restoration flock of swans. Eighteen of the 29 migrants returned safely to the breeding grounds in Minnesota. The remaining 11 are assumed to have died during this first migration. Other swans from this flock wintered on the Cimarron River west of Tulsa, Oklahoma, near Waynoka, Oklahoma, at Lake of the Ozarks in Missouri, and Duck Creek Wildlife Management Area, Missouri. The four swans that wintered at Garnett left during the night of 22 February, and all arrived back at their Minnesota nesting ground on 26 February. An immature Trumpeter Swan was reported on Perry Lake on 28 February; this may also have been a bird from the Rebecca Lake flock.

Eleven Trumpeter Swans had migrated again from Rebecca Lake by early January 1986. There are two records from Kansas, but neither is definitely known to be from the Rebecca Lake flock. One stayed on Cedar Bluff Reservoir (Trego Co.) for more than a week in mid-November. The other was a sick juvenile picked up by a deer hunter 3 miles northwest of Emporia (Lyon Co.). The bird was thin and too weak to fly. It died the next day and is now in the collection at the University of Kansas, Lawrence. This is the only preserved specimen of the Trumpeter Swan from Kansas.

Goss (1891. History of Birds of Kansas, G. W. Crane Co., Topeka) lists the Trumpeter Swan as migratory, nesting from Iowa north to the arctic, and wintering in Kansas.

This species was quickly eliminated from Kansas and the entire Great Plains soon after settlement by people from the eastern United States. It now appears, however, that man's restoration efforts have now resulted in its again establishing itself as a winter resident in Kansas.

William R. and Eva M. Brecheisen, Rt. 1, Box 110, Welda, KS 66091.

IN MEMORIAM: IVAN L. BOYD

Ivan Louis Boyd was born near Creston, Iowa, 4 August 1904 and died on the Baker University Wetland Research Area 18 March 1982. Ivan was involved in many different organizations in addition to the Kansas Ornithological Society, of which he was a founding as well as Life member, and its first president. Later on he served as Bulletin editor for a number of years.

He graduated from Creston High School, Iowa, received a B.A. from Simpson College, and his M.A. and Ph.D. from Iowa State College of Ames. He taught in the public schools of Atlantic, Iowa from 1927-1938, Shelby High School in 1939, and from 1941-1972 was Head of the Biology Department at Baker University in Baldwin City, Kansas. Although retired, he was Professor Emeritus and Director of the University's 573 acre Wetland Prairie until a tractor accident claimed his life during the annual prairie burning.

Ivan was a member of National Audubon Society for 45 years and was an active bird bander for 30 years. He and his wife, Margaret, helped organize the Baldwin Bird Club in 1942 and planned the Baldwin Christmas Bird Count that year. He was an active beekeeper and was a member of several beekeepers' organizations. He was also a charter member of Kansas Wildflower Society. He was a weather observer for the U.S. Weather Bureau and operated an official weather station for 39 years. He was a member of Kansas Academy of Science for 41 years and judged at the Greater Kansas City Science Fair for 25 years. He often presented scientific papers at KOS, KAS and North America Prairie Conferences. Locally, he originated Baldwin's annual Maple Leaf Festival in 1959, and was awarded the Distinguished Citizen Award, as well as the Freedom Guard Award, both from the Jaycees. He gave a tremendous amount of his time to scouting.

Ivan started working with scouts while in Atlantic, Iowa, and was Baldwin's scoutmaster from 1941 until his death. He received all of the major awards given in scouting, including Silver Beaver, Wood Badge, and Award of Merit, but none of these awards were as precious as the feeling he got from working with boys and helping them mature in thought, word, and deed. He helped over 40 young men earn their Eagle Scout Badge.

Dr. Boyd earned his Ph.D. in the field of botany studying the reestablishment of prairie grasses on eroded soil. He continued his interest in the prairie through the Baker Wetlands, helping organize the Save the Tallgrass Prairie, and in many hours of consultation with local landowners and Douglas County Commissioners in regard to the Black Jack Prairie, an 18-acre native prairie renamed the Ivan L. Boyd Prairie Preserve after his death.

Ralph Tanner, President of Baker University, said in his eulogy to Ivan, "Somewhere . . . sometime . . . I read that planting trees is an ultimate manifestation of faith. Ivan Boyd planted trees. Unless you knew Dr. Boyd, that news may seem to be no 'big deal'. But planting trees was special to this gentle scholar, who planted trees and sowed the seeds of knowledge in the minds of many generations of students on the campus of Baker University. Who among us can look upon the splendor of a maple tree in all of its glory without seeing this man?" The trees on the Baker University campus were designated the Ivan L. Boyd Arboretum in 1978 in honor of his many years of hard work and love.

Ivan had patience and concern for students and other acquaintances. He helped generate an interest and love for birds in many people across the state, young and old. One of his former students, who is now an environmental consultant in Arizona, wrote "Dr. Boyd was not just a teacher I had many years ago, he was someone who still has an influence on my daily life."

It was indeed an honor for me a year ago, to receive my father's Life Member pin of the Kansas Ornithological Society at the same time that I was elected president of this organization. I am saddened when I think of his death, but comforted to know that the end came while he was doing something he enjoyed and believed in, at a place where he loved to be.

Roger L. Boyd, Biology Department, Baker University, Baldwin City, Kansas 66006.

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