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NEST MONITORING, POINT COUNTS, AND HABITAT OF TALLGRASS PRAIRIE BREEDING BIRDS OF NORTHEASTERN OKLAHOMA, 1992-1996

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ABSTRACT.—Grassland birds have undergone significant declines in North America in recent decades. Loss of native grassland habitat is almost total in many areas. Understanding the breeding ecology of grassland birds in remaining habitat is important for maintaining bird populations. We conducted avian nest monitoring, point counts, and habitat sampling in tallgrass prairie of northeastern Oklahoma from 1992 to 1996. We provide a number of the raw metrics from our research to serve as a comparison to other or future studies of tallgrass prairie birds.

As a group, birds inhabiting North American grasslands have been undergoing a widespread decline in recent decades (Askins 1993, Knopf 1994, Peterjohn et al. 1994, Peterjohn and Sauer 1999). In addition to potential persecution and habitat loss on wintering grounds, these species are also affected by a variety of land use changes on the breeding grounds, including habitat loss or fragmentation, intensifying agricultural practices, loss or suppression of natural habitat disturbances, and changes in ranching practices (Herkert 1994a, Vickery et al. 1994, Warner 1994, Boren et al. 1999). Each of these factors can influence grassland bird population sizes by manifesting changes in survivorship and/or fecundity, or can alter distribution patterns of species. A better understanding of these demographics and how they may have changed or will change over time can be important for evaluating the reasons for changing population trends.

At one time, grasslands covered 17 % of the North American landscape (Knopf 1988). The areal extent of tallgrass prairie in North America has been reduced by 96% since European settlement, more than the other major grassland provinces due largely to conversion of native prairie for agricultural crop production. In some states (e.g., Iowa, Illinois, Indiana) losses are well over 99%, and remnants are mostly in small, isolated patches, while other states (e.g., Kansas, Oklahoma) retain significant areas of native tallgrass prairie (Steinauer and Collins 1996). Because of these dramatic reductions in tallgrass prairie habitat, documenting and understanding breeding season demographics and relative abundances of tallgrass prairie birds can provide important insights into understanding population trends and evaluating needed conservation actions. In this study, we report on the results of monitoring a large sample of nests found in tallgrass prairie of northeastern Oklahoma from 1992 to 1996, and we include various metrics such as clutch size, number of young fledged, observed nest parasitism rates by the Brown-headed Cowbird *(Molothrus ater)*, dates of nest initiation, and nest heights above ground. We also report on the results of fixed radius point counts and vegetation density sampling that were conducted concurrently with our nest monitoring efforts. Several analyses of these data have been previously published (see Rohrbaugh et al. 1999, Reinking et al. 2000, Herkert et al. 2003, Shochat et al. 2005, and Patten et al. 2006). Our intent here is to provide basic natural history information including detailed summaries of the "raw" data from our nest monitoring and point counts to allow for comparisons to data from other areas, or for comparisons to other or future breeding bird investigations conducted in this region and habitat.

STUDY AREA

We conducted our study on 18 plots of tallgrass prairie, five in Washington County and 13 in Osage County, northeastern Oklahoma (Fig.1). Each plot was 16.2 ha in size and was situated within a much larger expanse of native prairie. Nine plots were located on The Nature Conservancy's Tallgrass Prairie Preserve (TPP) in northern Osage County, and nine plots were located on four private ranches. This area forms the southern terminus of the Flint Hills region, most of which lies in east-central Kansas along a 70 km wide and 322 km long north-south band extending from northern Oklahoma to Nebraska. The Flint Hills are characterized by large amounts of surface limestone, rendering cultivation largely impossible or impractical. As a result, much of the Flint Hills region, including the Tallgrass Prairie Preserve and the ranches on which we worked, remains as native tallgrass prairie which

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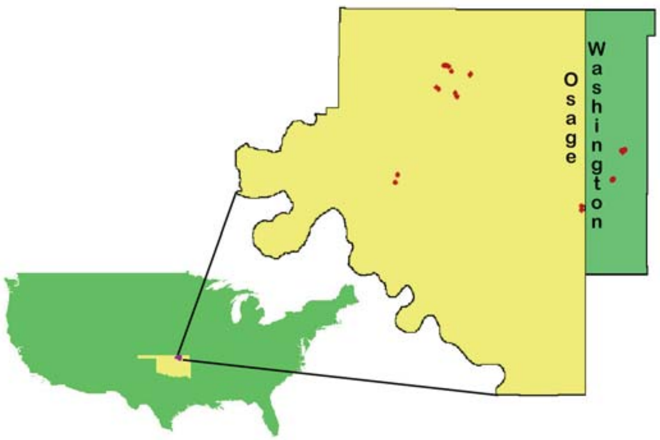

Figure 1. Dots represent the locations of 16.2-ha tallgrass prairie study plots in Osage and Washington Counties, northeastern Oklahoma, USA. Osage County is located at approximately 36.63° N latitude and 96.4° W longitude, while Washington County is located at approximately 36.75° N latitude and 95.98° W longitude.

has been used for cattle grazing but has never been plowed. In 1993, two additional plots were studied on the Tallgrass Prairie Preserve that were not studied in other years.

Major vegetation species were similar on all plots, and included big bluestem *(Andropogon gerardi)*, little bluestem *(Schizachyrium scoparium)*, Indian grass *(Sorghastrum nutans)*, switchgrass *(Panicum virgatum)*, common broomweed *(Gutierrezia dracunculoides)*, dogbane *(Apocynum cannabinum)*, ironweed *(Vernonia baldwinii)*, aster *(Aster* spp.*)*, goldenrod *(Solidago* spp.*)*, and Lespedeza *(Lespedeza* spp.*)*. Woody species on or near many of our study plots included Osage orange *(Maclura pomifera)*, buckbrush *(Symphoricarpos orbiculatus)*, buttonbush *(Cephalanthus occidentalis)*, blackberry *(Rubus* spp.*)*, Rough-leaved dogwood *(Cornus drummondii)*, plums *(Prunus* spp.*)*, and Honey Locust *(Glenditsia triacanthos*; names in accordance with Great Plains Flora Association 1986*)*.

Management varied across study plots and years, and we lacked control over treatments (Table 1). One common grazing regime used in the Flint Hills region of Oklahoma and Kansas is intensive early stocking (IES) (Smith and Owensby 1978, Vermeire and Bidwell 1998). Under this system, grasslands are burned in the spring annually or biennially, usually in March or April, to encourage the growth of grasses and discourage the growth of woody plants and undesirable forbs. Shortly after the burning, relatively high densities of yearling cattle are grazed in these areas for a limited time interval of 75-100 d, typically into July. Approximately double the number of cattle are grazed in a given area under IES as would be used in a season-long, cow-calf continuous grazing regime. This form of management is used in part because it takes advantage of high forage production and quality during the first half of the growing season, more evenly distributes grazing pressure over the rangeland, and increases the herbage remaining after the growing season because there is no grazing pressure after mid-July. Plots on ranches were cattle-grazed and usually but not always burned each year, while the TPP had a mixture of plots which were unburned and cattle-grazed, burned and cattle-grazed, unburned and bison-grazed, and unburned/ungrazed in a given year. No plots were burned without subsequent grazing. With the exception of a portion of one plot being burned in December of 1995, all burns took place in the spring, prior to May. We were unable to obtain stocking densities for all grazed plots, but on those plots for which we have data, densities were about 2.5 to 3.5 acres per head (yearlings), a level considered moderate for this habitat type and management regime.

Table 1. Number of 16.2-ha tallgrass prairie study plots per treatment per year.

	1992	1993	1994	1995	1996
Unburned/ungrazed	9	8	3	3	3
Unburned/ cattle grazed	2	4	0	2	11
Unburned/bison grazed	0	0	3	3	3
Burned/cattle grazed	7	8	12	10	1

METHODS

Data were collected for five consecutive nesting seasons starting in 1992. All study plots were established in the early spring of 1992, and were used throughout the five years of our study. Study plots were randomly located within management units, which were located within larger areas of contiguous prairie (i.e., plots were not merely isolated patches of habitat), and were kept a minimum of 50 m from public roads or fences. Plots were laid out in squares, each measuring 16.2 ha in area. An interior grid within each plot was marked every 33.5 m with 41-cm long, alphanumerically-labeled wooden survey stakes driven into the ground. This grid system was used to select repeatable locations for point counts and vegetation sampling, as well as to facilitate nest relocation.

Point counts were conducted twice on each plot during each year of the study, once in late May and once in mid June. Five symmetrically-placed, non-overlapping point count stations on each plot were used to conduct 67-m, fixed-radius point counts (Ralph et al. 1993, 1995). Birds were counted for a duration of 10 minutes at each station, and counts were started between 15 minutes post sunrise and 8 a.m. Different observers conducted the first and second replicate of each count on a given plot to minimize observer bias. Counts were not conducted if moderate or greater amounts of either wind or precipitation were occurring.

Given the dynamic nature of tallgrass prairie vegetation, height and density sampling was conducted four times on each plot during each nesting season, during late April, May, June, and July. Twenty sampling points were randomly selected on each plot from among the 169 marked grid points. The points selected for each individual plot were then used throughout the five years of study on that plot. Vegetation density was measured using an index based on the number of vegetation contacts with a 0.63-cm diameter rod held vertically against the ground (Wiens 1969). Contacts were counted within each of three height strata, <10 cm, 10-50 cm, and >50 cm. This density index was measured at a distance of 1 m in each of the four cardinal compass directions from the selected grid points, yielding a total of eighty measurements per plot per sampling period. The height of the tallest piece of vegetation within a 1-m radius of each grid point was also measured, a value we refer to as maximum height. Sampling was not conducted following rain, which temporarily compacted vegetation, or during wind, which made counting contacts difficult.

The majority of time spent on study plots was devoted to nest finding and monitoring (Martin and Geupel 1993, Ralph et al. 1993). Three field crews of three people each conducted most nest finding and monitoring, with each crew being responsible for six study plots. Nests were found through observation of adults and by flushing incubating females. Nest locations were recorded with respect to the nearest plot grid point, and discreetly marked with a small piece of colored flagging placed 10 m from the nest. Nests were revisited every 2-4 d until fledging or failure. Disturbances to the nests and vegetation surrounding the nests were kept to a minimum, and nests were not checked during inclement weather. The contents of each nest were recorded on each visit, along with the presence or absence of an incubating adult. Notes were also made on any observed parasitism by Brown-headed Cowbirds.

RESULTS AND DISCUSSION

During five years of field work, 2,748 nests of 40 species were found and monitored on or adjacent to study plots (Table 2). Dickcissels *(Spiza americana)* made up the largest proportion, with 1,107 nests (Table 3). Eastern Meadowlark *(Sturnella magna)* was next, with 582 nests (Table 4), followed by Grasshopper Sparrow *(Ammodramus savannarum)* with 273 nests (Table 5). These and other ground and shrub nesting species made up the majority of our sample, given the open prairie areas selected for our study plots. Scattered trees near study plots or along nearby fencelines resulted in nests of a number of tree-nesting species being found and monitored, and these off-plot nest records are included here as well. For Dickcissels, mean clutch size for unparasitized nests was 3.9 and ranged from one to six (Table 3). Four-egg clutches were by far the most common (Figure 2), and the majority of clutches were initiated in late May and early June (Figure 3). Nest heights ranged from ground level to an unusually high 550 cm, with a mean of about 25 cm. For Eastern Meadowlarks, mean clutch size was 4.3 and ranged from one to eight (Table 4). Four-and five-egg clutches were by far the most common (Figure 4), and the majority of clutches were initiated in May (Figure 5). For Grasshopper Sparrows, mean clutch size was 4.1 and ranged from one to six (Table 5). Four- and five-egg clutches were by far the most common (Figure 6), and the majority of clutches were initiated from May to early June (Figure 7).

The total number of individuals of each species recorded within all count circles (excluding high flyovers) on replicate 1 plus replicate 2 is shown in Table 6. The top three species recorded in point counts mirrored the nest monitoring results, with Dickcissels, Eastern Meadowlarks, and Grasshopper Sparrows being most commonly recorded for 2967, 1982, and 980 records, respectively. While Henslow's Sparrow *(Ammodramus henslowii)* was fourth in abundance on the point counts, only 24 nests of this species were recorded, an indication of the effective concealment of nests by this species and the difficulty of locating them. Thirty-two species were recorded overall during point counts on our study plots.

With regard to vegetation sampling, a trend for increasing seasonal vegetation density and increasing maximum height from April to July was apparent on burned and grazed plots, which is not surprising given that these plots started each season with little or no vegetation present following spring burning. Regrowth in the months following a burn tended to diminish the structural differences among treatments later in the nesting season, although the pattern of spring-burned and grazed plots as well as unburned but grazed plots having lower vegetation densities than unburned and ungrazed plots was still evident even in July.

Animal populations face changing habitat, land use, and even climate. By documenting our findings from the early to mid 1990s in terms of the breeding bird community and the relative abundance of species present at the time of our study, as well as nesting variables such as clutch size, observed nest parasitism rates, and nesting phenology, we provide a basis for comparison to future studies. These data may be useful in evaluating and understanding changes in the range or abundance of tallgrass prairie birds in Oklahoma.

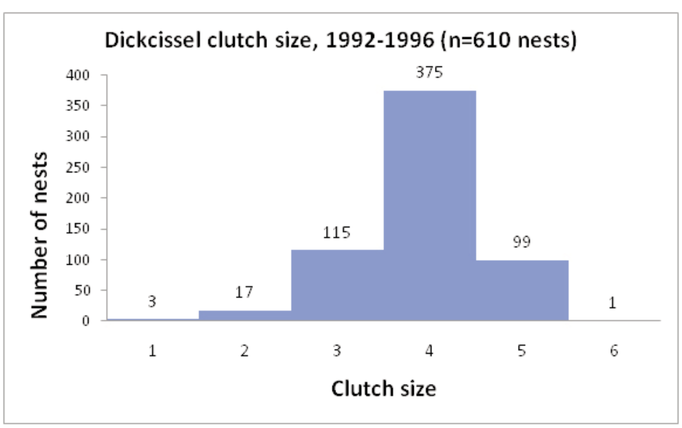

Figure 2. Histogram of Dickcissel clutch sizes from northeastern Oklahoma tallgrass prairie.

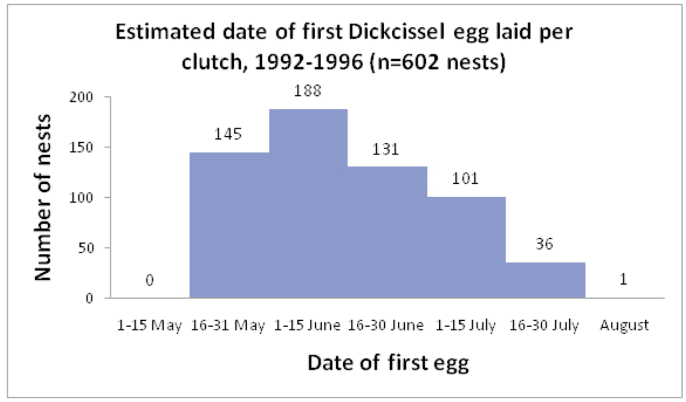

Figure 3. Histogram of clutch initiation dates for Dickcissels in Oklahoma tallgrass prairie.

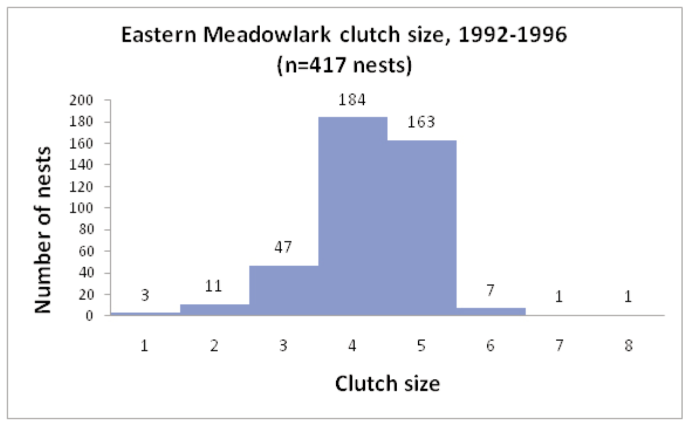

Figure 4. Histogram of Eastern Meadowlark clutch sizes from northeastern Oklahoma tallgrass prairie.

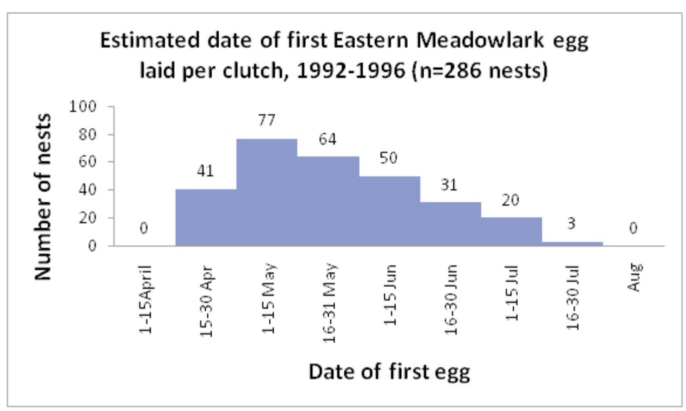

Figure 5. Histogram of clutch initiation dates for Eastern Meadowlarks in Oklahoma tallgrass prairie.

Table 2. Nesting metrics for species found on or near study plots of tallgrass prairie in northeastern Oklahoma 1992–1996.

Species	Total nests	No./percent successful (observed)	Mean clutch size[a]	Min./max. clutch size	No./% of nests parasitized (observed)	Mean no. host young fledged per nest	Mean no. host young fledged per successful nest	Mean no. host young fledged per successful unparasitized nests	Nest height mean and range (cm)
Mallard (*Anas platyrhynchos*)	2	0/0 (n=2)	11 (n=1)	11/11 (n=1)	N/A	0 (n=2)	N/A	N/A	0
Greater Prairie-Chicken (*Tympanuchus cupido*)	22	6/28.6 (n=20)	13.5 (n=13)	9/16 (n=13)	N/A	1.9 (n=21)	13 (n=3)	N/A	0
Northern Bobwhite (*Colinus virginianus*)	13	3/25 (n=12)	11 (n=7)	1/17 (n=7)	N/A	1.9 (n=13)	8.3 (n=3)	N/A	0
Green Heron (*Butorides virescens*)	2	1/50 (n=2)	4 (n=2)	4/4 (n=2)	N/A	1 (n=2)	2 (n=1)	N/A	513 425–600 (n=2)
Northern Harrier (*Circus cyaneus*)	2	0/0 (n=1)	5.5 (n=2)	5/6 (n=2)	N/A	0 (n=1)	N/A	N/A	0
American Kestrel (*Falco sparverius*)	1	0/0 (n=1)	4 (n=1)	4/4 (n=1)	N/A	0 (n=1)	N/A	N/A	265 (n=1)
Killdeer (*Charadrius vociferous*)	20	6/42.9 (n=14)	3.9 (n=14)	2/4 (n=14)	N/A	1.6 (n=14)	3.7 (n=6)	N/A	0
Upland Sandpiper (*Bartramia longicauda*)	16	6/37.5 (n=16)	4.1 (n=14)	4/5 (n=14)	N/A	1.4 (n=16)	3.8 (n=6)	N/A	0
Mourning Dove (*Zenaida macroura*)	49	11/22.5 (n=49)	1.9 (n=40)	1/2 (n=40)	0/0 (n=49)	0.36 (n=39)	1.9 (n=11)	1.9 (n=11)	199 0–600 (n=41)
Yellow-billed Cuckoo (*Coccyzus americanus*)	19	6/42.9 (n=14)	3.1 (n=11)	2/5 (n=11)	0/0 (n=19)	0.9 (n=16)	2.3 (n=6)	2.3 (n=6)	253 75–450 (n=16)
Short-eared Owl (*Asio flammeus*)	1	0/0 (n=1)	N/A	N/A	N/A	0 (n=1)	N/A	N/A	0
Common Nighthawk (*Chordeiles minor*)	55	23/49 (n=47)	1.9 (n=52)	1/2 (n=52)	N/A	0.9 (n=46)	1.8 (n=22)	N/A	0
Common Poorwill (*Phalaenoptilus nuttalii*)	1	0/0 (n=1)	2 (n=1)	2/2 (n=1)	N/A	0 (n=1)	N/A	N/A	0
Belted Kingfisher (*Megaceryle alcyon*)	1	1/100	N/A	N/A	N/A	4 (n=1)	4 (n=1)	N/A	N/A

Table 2. Continued

Species	Total nests	No./percent successful (observed)	Mean clutch size[a]	Min./max. clutch size	No./% of nests parasitized (observed)	Mean no. host young fledged per nest	Mean no. host young fledged per successful nest	Mean no. host young fledged per successful unparasitized nests	Nest height mean and range (cm)
Eastern Kingbird *(Tyrannus tyrannus)*	69	24/36.4	3.4 (n=46)	1/5 (n=46)	1/1.5 (n=69)	1.0 (n=65)	2.6 (n=24)	2.6 (n=24)	231 38–900 (n=61)
Scissor-tailed Flycatcher *(Tyrannus forficatus)*	35	12/34.3 (n=35)	4.1 (n=22)	3/5 (n=22)	2/5.7 (n=35)	1.1 (n=35)	3.2 (n=12)	3.2 (n=12)	230 140–400 (n=22)
Loggerhead Shrike *(Lanius ludovicianus)*	5	4/80 (n=5)	4.75 (n=4)	4/5 (n=4)	0/0 (n=5)	3 (n=5)	3.75 (n=4)	3.75 (n=4)	190 135–240 (n=5)
Bell's Vireo *(Vireo bellii)*	13	2/15.4	2 (n=1)	2/2 (n=1)	7/53.8	0.3 (n=12)	4 (n=1)	4 (n=1)	126 66–286 (n=12)
Carolina Chickadee *(Poecile carolinensis)*	1	1/100	8 (n=1)	8/8 (n=1)	N/A	3 (n=1)	3 (n=1)	3 (n=1)	200 (n=1)
Blue-gray Gnatcatcher *(Polioptila caerulea)*	2	0/0 (n=2)	N/A	N/A	0/0 (n=2)	0	N/A	N/A	500 (n=1)
Eastern Bluebird *(Sialia sialis)*	4	2/50 (n=4)	4 (n=2)	3/5 (n=2)	0/0 (n=4)	1.25 (n=4)	2.5 (n=4)	2.5 (n=4)	93 70–120 (n=3)
American Robin *(Turdus migratorius)*	7	0/0	3 (n=4)	2/4 (n=4)	N/A	0 (n=7)	N/A	N/A	198 73–300 (n=7)
Gray Catbird *(Dumetella carolinensis)*	3	2/66.7 (n=3)	3 (n=3)	2/4 (n=3)	0/0 (n=3)	2 (n=3)	3 (n=2)	3 (n=2)	125 106–142 (n=3)
Northern Mockingbird *(Mimus polyglottos)*	25	11/45.8 (n=24)	3.5 (n=19)	1/4 (n=19)	2/8 (n=25)	1.4 (n=24)	3 (n=11)	3 n=11)	127 40–215 (n=25)
Brown Thrasher *(Toxostoma rufum)*	102	54/52.9 (n=102)	3.6 (n=73)	2/5 (n=73)	3/2.9 (n=102)	1.5 (n=101)	2.9 (n=54)	2.9 (n=51)	155 20–470 (n=98)
Common Yellowthroat *(Geothlypis trichas)*	2	0/0 (n=2)	3.5 (n=2)	2/5 (n=2)	0/0 (n=2)	0 (n=2)	N/A	N/A	22 20–24 (n=2)

Table 2. Continued

Species	Total nests	No./percent successful (observed)	Mean clutch size[a]	Min./max. clutch size	No./% of nests parasitized (observed)	Mean no. host young fledged per nest	Mean no. host young fledged per successful nest	Mean no. host young fledged per successful unparasitized nests	Nest height mean and range (cm)
Summer Tanager (*Piranga rubra*)	2	1/50 (n=2)	3 (n=1)	3/3 (n=1)	1/50 (n=2)	1.5 (n=2)	3 (n=1)	3 (n=1)	231 230–232 (n=2)
Field Sparrow (*Spizella pusilla*)	9	4/50 (n=4)	3 (n=2)	2/4 (n=2)	3/33.3 (n=9)	1.1 (n=8)	2.3 (n=4)	2.3 (n=4)	29 10–75 (n=7)
Lark Sparrow (*Chondestes grammacus*)	22	8/36.4 (n=22)	3.7 (n=10)	3/8 (n=10)	5/22.7 (n=22)	1.0 (n=22)	2.6 (n=8)	2.4 (n=7)	14 0–210 (n=14)
Grasshopper Sparrow (see Table 5)									
Henslow's Sparrow	24	9/45 (n=20)	3.9 (n=14)	3/4 (n=14)	2/8.3 (n=24)	1.5 (n=22)	3.3 (n=9)	3.3 (n=9)	11.8 0–23 (n=23)
Northern Cardinal (*Cardinalis cardinalis*)	2	1/50 (n=2)	3 (n=1)	3/3 (n=1)	1/50 (n=2)	1.5 (n=2)	3 (n=1)	3 (n=1)	92 84–100 (n=2)
Blue Grosbeak (*Passerina caerulea*)	2	0/0 (n=2)	4 (n=1)	4/4 (n=1)	1/50 (n=2)	0 (n=2)	N/A	N/A	85.5 68–103 (n=2)
Dickcissel (see Table 3)									
Red-winged Blackbird (*Agelaius phoeniceous*)	226	53/25.1 (n=211)	3.5 (n=109)	2/5 (n=109)	18/8.0 (n=226)	0.7 (n=210)	4.4 (n=53)	4.5 (n=51)	77 0–350 (n=200)
Eastern Meadowlark (see Table 4)									
Common Grackle (*Quiscalus quiscula*)	9	3/43 (n=7)	5.1 (n=8)	5/6 (n=8)	0/0	1.9 (n=7)	4.3 (n=3)	4.3 (n=3)	206 140–372 (n=6)
Great-tailed Grackle (*Quiscalus mexicanus*)	3	2/66.7 (n=3)	3.7 (n=3)	3/4 (n=3)	0/0 (n=3)	1.7 (n=3)	2.5 (n=2)	2.5 (n=3)	66 47–87 (n=3)

Table 2. Continued

Species	Total nests	No./percent successful (observed)	Mean clutch size[a]	Min./max. clutch size	No./% of nests parasitized (observed)	Mean no. host young fledged per nest	Mean no. host young fledged per successful nest	Mean no. host young fledged per successful unparasitized nests	Nest height mean and range (cm)
Orchard Oriole (*Icterus spurius*)	9	5/71.4 (n=7)	4 (n=2)	4/4 (n=2)	0/0 (n=9)	1.0 (n=6)	2 (n=3)	2 (n=3)	441 245–550 (n=6)
American Goldfinch (*Spinus tristis*)	2	2/100	5 (n=1)	5/5 (n=1)	0/0	2 (n=2)	2 (n=2)	2 (n=2)	382.5 215–550 (n=2)

[a]For non-parasitized nests from which a valid clutch size could be determined.

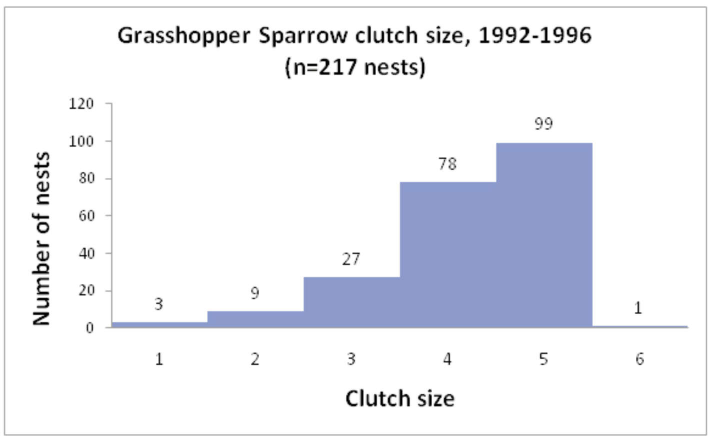

Figure 6. Histogram of Grasshopper Sparrow clutch sizes from northeastern Oklahoma tallgrass prairie.

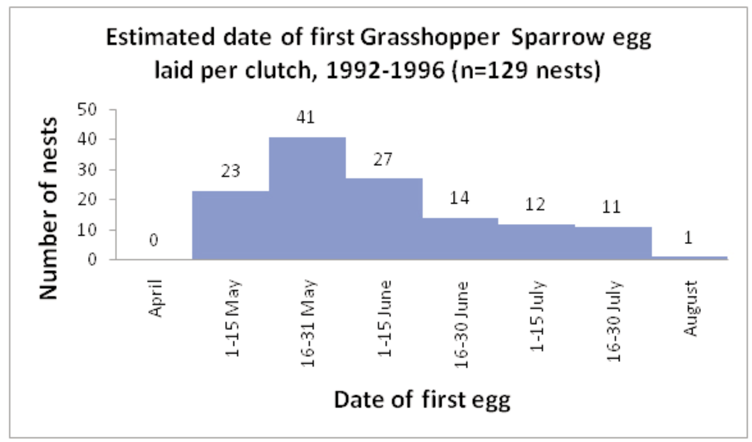

Figure 7. Histogram of clutch initiation dates for Grasshopper Sparrows in Oklahoma tallgrass prairie.

Table 3. Nesting metrics for Dickcissels nesting on or near tallgrass prairie study plots in northeastern Oklahoma from 1992–1996.

	1992–1996	1992	1993	1994	1995	1996
Total nests	1,107	136	190	286	188	307
Mean clutch size[a]	3.9 (n=610)	4.0 (n=77)	3.7 (n=98)	3.8 (n=165)	3.9 (n=97)	4.0 (n=173)
Min./max. clutch size	1/6	1/5	2/5	1/5	2/6	2/5
No./% of nests parasitized (observed)	195/17.6	21/15.4	44/23.2	38/13.3	39/20.7	53/17.3
Mean no. host young fledged per nest	0.9 (n=1,060)	1.6 (n=133)	1.0 (n=187)	0.9 (n=270)	0.9 (n=179)	0.6 (n=291)
Mean no. host young fledged per successful nest	3.0 (n=316)	3.2 (n=66)	3.1 (n=57)	3.0 (n=77)	2.9 (n=54)	2.7 (n=62)
Mean no. host young fledged per successful unparasitized nest	3.1 (n=275)	3.3 (n=55)	3.2 (n=49)	3.1 (n=71)	3.0 (n=44)	2.8 (n=56)
Nest height mean/range (cm)	24.9/0–550 (n=887)	22.5/0–60 (n=124)	36.3/0–500 (n=70)	30.8/0–540 (n=257)	17.9/0–330 (n=161)	21.9/0–550 (n=275)

[a]For non-parasitized nests from which a valid clutch size could be determined.

Table 4. Nesting metrics for Eastern Meadowlarks nesting on or near tallgrass prairie study plots in northeastern Oklahoma from 1992–1996.

	1992–1996	1992	1993	1994	1995	1996
Total nests	582	89	198	102	122	71
Mean clutch size[a]	4.3 (n=417)	4.3 (n=74)	4.3 (n=138)	4.1 (n=65)	4.1 (n=86)	4.5 (n=54)
Min./max. clutch size	1/8	1/6	2/7	1/8	2/6	3/5
No./% of nests parasitized (observed)	31/5.3	2/2.2	12/6.0	7/6.9	8/6.6	2/2.8
Mean no. host young fledged per nest	0.7 (n=570)	0.9 (n=88)	0.7 (n=198)	0.8 (n=99)	0.5 (n=116)	1.0 (n=69)
Mean no. host young fledged per successful nest	3.2 (n=130)	3.3 (n=23)	3.2 (n=40)	3.4 (n=22)	2.7 (n=22)	3.2 (n=21)
Mean no. host young fledged per successful unparasitized nest	3.2 (n=130)	3.3 (n=23)	3.2 (n=40)	3.5 (n=24)	2.7 (n=22)	3.2 (n=21)

[a]For non-parasitized nests from which a valid clutch size could be determined.

Table 5. Nesting metrics for Grasshopper Sparrows nesting on or near tallgrass prairie study plots in northeastern Oklahoma from 1992–1996.

	1992–1996	**1992**	**1993**	**1994**	**1995**	**1996**
Total nests	273	36	83	49	57	48
Mean clutch size[a]	4.1 (n=190)	4.4 (n=28)	3.7 (n=51)	4.3 (n=35)	4.2 (n=46)	4.2 (n=30)
Min./max. clutch size	1/6	2/6	1/5	1/5	3/5	2/5
No./% of nests parasitized (observed)	17/6.2	2/5.6	6/7.2	3/6.1	5/8.8	1/2.1
Mean no. host young fledged per nest	1.0 (n=256)	1.7 (n=34)	0.7 (n=79)	0.8 (n=43)	0.9 (n=55)	1.2 (n=45)
Mean no. host young fledged per successful nest	3.4 (n=74)	3.5 (n=17)	2.9 (n=20)	3.3 (n=11)	3.9 (n=12)	3.9 (n=14)
Mean no. host young fledged per successful unparasitized nest	3.5 (n=73)	3.5 (n=17)	3.0 (n=19)	3.3 (n=11)	3.9 (n=12)	3.9 (n=14)

[a]For non-parasitized nests from which a valid clutch size could be determined.

Table 6. Total number of individuals counted on 67-m radius, 10-minute point counts conducted in May and June for five years on 18 tallgrass prairie study plots in Osage and Washington Counties, Oklahoma. The numbers represent the five-year totals from five point count circles per plot, counted for two replicates per year per plot. The numbers therefore include some of the same individuals from the first replicate to the second in each year, but are provided in this format to give an indication of the relative abundance of the species present in the study areas.

SPECIES	**TOTAL COUNTED**	**SPECIES**	**TOTAL COUNTED**
Dickcissel	2967	Lark Sparrow	7
Eastern Meadowlark	1982	Cliff Swallow *(Petrochelidon pyrrhonota)*	6
Grasshopper Sparrow	980	Common Grackle	6
Henslow's Sparrow	323	Barn Swallow *(Hirundo rustica)*	5
Red-winged Blackbird	231	Horned Lark *(Eremophila alpestris)*	5
Northern Bobwhite	78	Savannah Sparrow *(Passerculus sandwichensis)*	5
Brown-headed Cowbird	58	American Goldfinch	3
Upland Sandpiper	51	Greater Prairie-Chicken	3
Eastern Kingbird	41	Field Sparrow	2
Killdeer	31	Loggerhead Shrike	2
Brown Thrasher	20	Yellow-billed Cuckoo	2
Scissor-tailed Flycatcher	20	Bell's Vireo	1
Common Yellowthroat	12	Blue Jay *(Cyanocitta cristata)*	1
Mourning Dove	12	Great Blue Heron *(Ardea herodias)*	1
Northern Mockingbird	12	Northern Cardinal	1
Common Nighthawk	7	Orchard Oriole	1

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