

Final Report

UPLAND BIRD SURVEY AT NACHUSA GRASSLANDS

Submitted to The Nature Conservancy

By
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PROJECT BACKGROUND: In 1986, recognizing that the area offered one of the best opportunities in the state to restore a large and diverse grassland, The Nature Conservancy initiated a large-scale prairie restoration project at Nachusa. So far, nearly 3,000 acres have been protected within the Nachusa Grasslands project area. Many uncommon or rare species occur at the site including Blanding's turtles and one of the state's largest populations of the federally-threatened prairie bush clover. The site also contains abundant habitat for breeding grassland and savanna birds. In all, Nachusa is home to 600 native plant species and 180 species of breeding and migrating birds.

Nachusa Grasslands also is an important outreach and training site for other public and private land managers. These restorations serve as a model for a variety of land management techniques, including controlled burns, seed collecting, weed management and natural areas restoration.

Between 1995-1997 bird population studies were conducted at the Nachusa Grasslands project area. Those studies included breeding bird abundance surveys and nest searching and monitoring. During the 1995-1997 survey, 79 species of birds were recorded and 373 nests from 30 species were found and monitored.

Since that time Nachusa has expanded and now contains savanna areas as well as another 1,000 acres that has been recently acquired and will be restored to grasslands and savanna. In an effort to monitor how breeding bird populations at the site are doing as restoration proceeds, a second round of bird censusing and nest monitoring was conducted between 2007 and 2009.

PROJECT OBJECTIVES:

- (1) Conduct point counts within savanna areas of Nachusa Grasslands to estimate breeding abundance and compare with other savanna areas in Illinois.
- (2) Estimate grassland and savanna bird nest productivity at Nachusa Grasslands.

PROJECT METHODOLOGY:

Bird Censusing

Bird populations in savanna habitats at Nachusa Grasslands were censused using the point-count method (unlimited distance). Points were distributed among savanna areas so as to sample representative savanna habitats at the site. Points were visited twice per season in 2007.

Grassland Bird Productivity

Grassland and savanna bird productivity efforts were primarily focused on obtaining data on predation and nest parasitism rates for representative species in Nachusa's grassland and savanna habitats. Nests were located by intensive surveys using rope-dragging, walking searches and behavioral observations. Nest searching began in early May and continued until late July or

early August. Once nests were located, the contents were checked every 2-4 days until the nest fledged, was depredated, or was abandoned. Comparisons of nesting success between study areas and within the three years of this study 2007-2009 were made with the program CONTRAST (Sauer and Hines 1989). Comparisons of nesting success between study areas and among years were limited to the five species with the largest samples of nests – dickcissel, field sparrow, red-winged blackbird, grasshopper sparrow, and lark sparrow.

PROJECT RESULTS

Table 1 shows the results of the 2007 savanna habitat surveys. House wrens were the most commonly detected species in the savannas at Nachusa Grasslands. Other commonly detected species included blue jay, eastern towhee, mourning dove, red-bellied woodpecker, common yellowthroat, eastern wood pewee and northern cardinal. Compared with the reported relative abundance of savanna bird species from restored savanna sites elsewhere in west-central, northeastern and east-central Illinois (Brawn 2006), house wren, eastern towhee, common yellowthroat, mourning dove, gray catbird, and red-bellied woodpecker were somewhat more common at Nachusa Grasslands than in other Illinois savannas and American robin, blue jay, indigo bunting, and tufted titmouse appear to be less common than savannas in other areas of the state (Table 1).

Between 2007 and 2009 a total of 512 nests were found including 24 species (Table 2). Field sparrow was the most common nest found with 124 nests. Other commonly found nests included dickcissel (95 total nests), red-winged blackbird (82 nests), grasshopper sparrow (38 nests) and lark sparrow (31 nests). Estimates of daily nest survival varied among species and ranged from a high of 0.968 for American goldfinch to a low of 0.901 for common yellowthroat (Table 2). Based on the estimates of daily nest survival shown in Table 2 and known incubation and nestling stages (Ehrlich et al. 1988) estimates of overall nest success for the 15 species in Table 2 that had at least 3 nests ranged from 44.7% to 10.0%. American goldfinch had the highest estimated nest success at 44.7% and common yellowthroat had the lowest estimated nest success at 10.0%. Estimates of overall nest success for the other species with a minimum of three nests were brown thrasher (39.1%), mourning dove (27.4%), field sparrow (26.4%), lark sparrow (24.7%), eastern meadowlark (23.3%), grasshopper sparrow (20.9%), sedge wren (18.2%), song sparrow (17.5%), red-winged blackbird (17.4%), indigo bunting (17.2%), vesper sparrow (16.7%), dickcissel (15.7%), and bobolink (11.4%).

The five species with the largest samples of nests – dickcissel, field sparrow, red-winged blackbird, grasshopper sparrow, and lark sparrow – were included in more detailed analyses investigating potential differences among sub-sites within Nachusa Grasslands and also looking at potential year effects. Nests were located and monitored at seven sub-areas within the Nachusa Grasslands project, with a majority coming from four areas – the Clear Creek Knolls unit (223 nests), the Hamill-Winter Prairie (123 nests), the Hook Larson Prairie (65 nests), and the Sand Farm (60 nests) which were the areas included in the analyses. For each species, an initial overall analysis was conducted investigating differences in site by year estimates of daily nest survival. Following the initial analysis, follow-up tests were run investigating sub-area and year effects separately.

Among the five species, three species showed signs of significant differences in estimates of daily nest survival among the site by year combinations; dickcissel ($X^2 = 75.3$, $df = 8$, $P < 0.001$), field sparrow ($X^2 = 74.7$, $df = 11$, $P < 0.001$), and lark sparrow ($X^2 = 20.5$, $df = 8$, $P < 0.001$).

0.009). No overall differences in estimates of daily nest survival were detected for grasshopper sparrows ($X^2 = 9.2$, $df = 6$, $P = 0.16$) and red-winged blackbird ($X^2 = 4.7$, $df = 9$, $P = 0.86$). Follow-up tests indicated that the differences were due primarily to differences among sub-areas. For dickcissels, estimated daily nest survival was highest on the Hamill-Winter Prairie unit (Figure 1). Field sparrow daily nest survival was highest on the Sand Farm unit and lowest on the Hook Larson Prairie unit (Figure 1). Lark sparrow daily nest survival was high on the Sand Farm and Clear Creek Knolls units and lower on the Hook Larson Prairie and Hamill-Winter Prairie units (Figure 1). Despite the fact that grassland bird nest success is often considered to be variable from year to year, no significant differences were detected in the follow-up tests for year effects for any species (Figure 2).

The final nesting comparison involved comparisons of estimated daily nest survival rates between the current study (2007-2009) and previous nesting studies conducted at the site between 1995-1997 (J. Herkert and S. Robinson, unpublished data). Due to the observed differences in estimated nest survival rates among areas, the comparison of nest success between periods was restricted to nests from the Hamill-Winter Prairie unit since that was the only area included in the 1995-1997 study. Additionally since no year effects were detected, nests from different years within the two study periods (1995-1997 and 2007-2009) were combined so that the analysis consisted of a single comparison of overall nest success for the 1995-1997 period compared to overall nest success for the 2007-2009 period. The analysis was restricted to species, which had at least five nests from the Hamill-Winter Prairie unit in each period, which included six species (brown thrasher, dickcissel, eastern meadowlark, field sparrow, grasshopper sparrow, and red-winged blackbird).

The comparison of estimated daily nest survival rates among periods suggests that nest survival was generally higher during the recent period (2007-2009) than it was in the earlier (1995-1997) study (Figure 3). Two species, dickcissels ($X^2 = 6.5$, $df = 1$, $P = 0.01$) and red-winged blackbirds ($X^2 = 3.9$, $df = 1$, $P = 0.04$) had nest success that was significantly higher in 2007-2009 than it was in 1995-1997 (Figure 3). Three additional species brown thrasher ($X^2 = 2.0$, $df = 1$, $P = 0.15$), eastern meadowlark ($X^2 = 1.9$, $df = 1$, $P = 0.16$), and field sparrow ($X^2 = 0.01$, $df = 1$, $P = 0.90$) had estimated nest success that tended to be higher during the recent period (Figure 3), but no significant differences could be detected. Relatively small sample sizes may have limited the ability to detect differences among periods, however, as both brown thrashers and eastern meadowlarks showed sizeable differences in nest survival rates between periods but high variances associated with these estimates yielded no statistical differences. Grasshopper sparrow was the only species among the six examined for which estimated nest success was lower during the recent period than it was during the earlier study (Figure 3), a difference that was not significant ($X^2 = 0.54$, $df = 1$, $P = 0.46$).

SUMMARY AND CONCLUSIONS

The savanna habitats at Nachusa Grasslands support a diverse community of at least 40 bird species that is relatively similar to other savanna areas in Illinois.

Overall daily nest survival at Nachusa Grasslands averaged 0.93, which resulted in an estimated overall nest success rate of 22% for breeding birds at Nachusa Grasslands. Nesting success, however, was variable among species and ranged from 44% (American goldfinch) to

10% (common yellowthroat). Bird species nesting success was also found to be variable among sub-units at Nachusa Grasslands but relatively consistent among years. Although individual bird species nesting success was variable among sub-units, few consistent patterns emerged. Some sub-units had high estimates of nest success for some species but low estimates for others. The factors responsible for the variability of nesting success among sub-units is unclear.

The comparison of current nest success at Nachusa Grasslands with previous estimates is encouraging in that estimates for most species have improved – with estimates for two species (dickcissel and red-winged blackbird) significantly improving between periods. The general increase in nesting success is consistent with expectations due to recent management activities focused on removing internal woody vegetation and enlarging the size of the preserve, but other potential factors were not investigated.

REFERENCES

- Brawn, J. D. 2006. Effects of restoring oak savannas on bird communities and populations. *Conservation Biology* 20:460–469
- Ehrlich, P.R., D.S. Dobkin, and D. Wheye. 1988. *The birder's handbook*. Simon and Schuster Inc. New York. 785 p.
- Sauer, J.R. and J.E. Hines. 1989. Testing for Differences among Survival or Recovery Rates Using Program CONTRAST. *Wildlife Society Bulletin* 17:549-550.

Table 1. Relative abundance of twenty most common breeding birds¹ in Nachusa Grasslands savanna habitat in 2007. Counts are based on two visits using the point-count method (unlimited distance). For comparison, the relative abundance of savanna bird species from 12 restored savanna sites in west-central, northeastern and east-central Illinois is also shown.

Species	Number Detected / 10 Points Nachusa Grasslands	Number Detected / 10 Points Restored Oak Savannas ²
House Wren	16.7	4.3
Blue Jay	10.0	14.7
Eastern Towhee	10.0	3.7
Mourning Dove	8.0	2.4
Red-bellied Woodpecker	7.3	3.1
Common Yellowthroat	6.0	--
Eastern Wood-Pewee	6.0	6.9
Northern Cardinal	6.0	3.1
White-breasted Nuthatch	6.0	4.1
Gray Catbird	5.3	0.7
Baltimore Oriole	4.7	2.7
American Robin	4.0	12.8
Brown-headed Cowbird	4.0	5.5
Eastern Bluebird	4.0	--
Tufted Titmouse	4.0	7.0
Field Sparrow	4.0	--
Northern Flicker	3.3	3.4
Rose-breasted Grosbeak	3.3	2.3
Indigo Bunting	2.7	6.7
Wood Thrush	2.7	1.4

¹ Other species of interest observed (40 species detected overall); Red-headed Woodpecker, Brown Thrasher, Veery, Great Crested Flycatcher, Yellow-throated Vireo, Northern Bobwhite.

² Relative abundance data are from Brawn (2006).

TABLE 2. Numbers of nests found by year and overall estimates of daily nest survival and nest parasitism rates for bird nests found at Nachusa Grasslands 2007-2009.

Species	Number of Nests Found				Daily Survival Rate	Standard Error	Nest Parasitism Rate
	2007	2008	2009	TOTAL			
Field Sparrow	47	49	28	124	0.934	0.007	20%
Dickcissel	36	31	28	95	0.919	0.009	36%
Red-winged Blackbird	43	26	13	82	0.928	0.009	5%
Grasshopper Sparrow	10	25	3	38	0.928	0.015	13%
Lark Sparrow	3	22	6	31	0.936	0.015	23%
Song Sparrow	7	21	2	30	0.931	0.015	17%
American Goldfinch	19	9	0	28	0.968	0.008	4%
Mourning Dove	8	14	0	22	0.952	0.013	0%
Common Yellowthroat	1	4	6	11	0.901	0.031	45%
Eastern Meadowlark	5	1	4	10	0.944	0.024	10%
Indigo Bunting	5	3	2	10	0.923	0.026	40%
Brown Thrasher	1	5	1	7	0.961	0.022	14%
Bobolink	2	1	2	5	0.912	0.049	0%
Sedge Wren	2	1	2	5	0.937	0.031	0%
Vesper Sparrow	0	2	1	3	0.918	0.055	33%
Killdeer	1	0	1	2			
Chipping Sparrow	1	1	0	2			
Black-billed Cuckoo	1	0	0	1			
Ring-necked Pheasant	1	0	0	1			
Eastern Kingbird	0	1	0	1			
Eastern Towhee	1	0	0	1			
American Woodcock	1	0	0	1			
Willow Flycatcher	1	0	0	1			
Yellow Warbler	1	0	0	1			

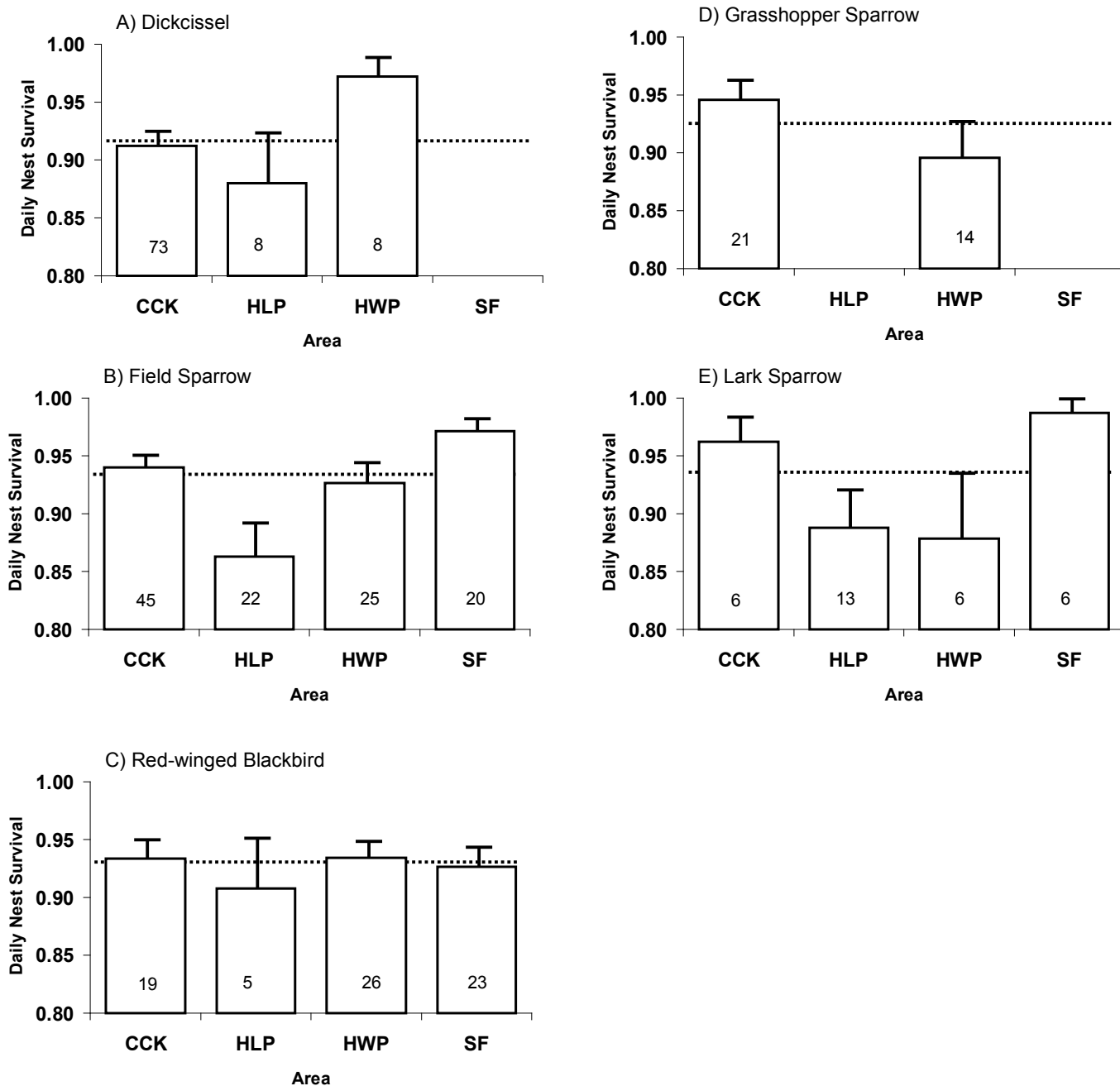


Figure 1. Estimates of daily nest survival among sub-units at Nachusa Grasslands, 2007-2009. Numbers are the estimated daily nest survival rates for nests located on the Clear Creek Knolls unit (CCK), the Hamill-Winter Prairie (HWP), the Hook Larson Prairie (HLP), and the Sand Farm (SF). Numbers within individual bars are the number of nests for that species within each sub-unit. Bars indicate one standard error and the dashed line indicates the overall daily nest survival rate for all nests of the species across all sub-units.

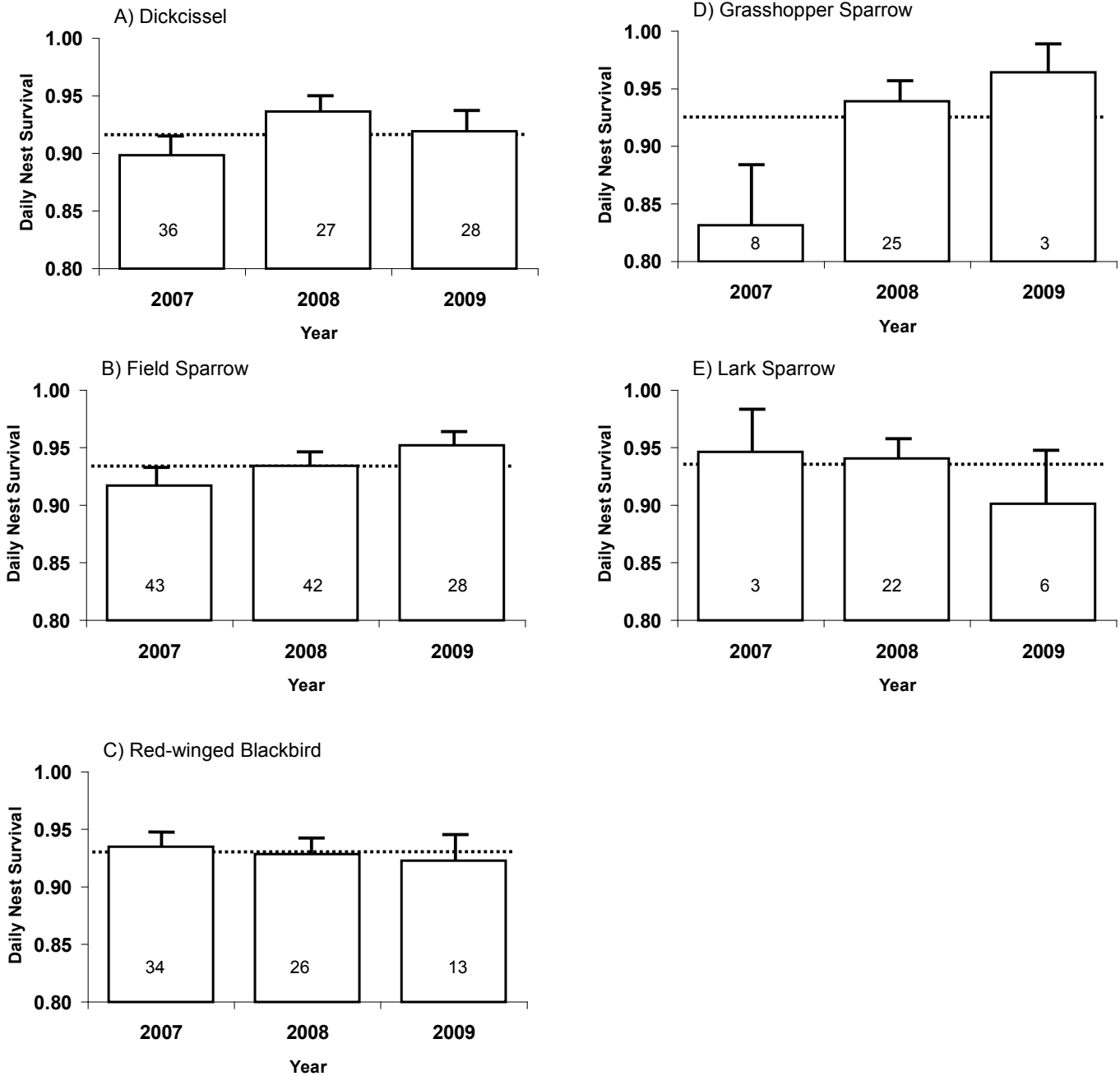


Figure 2. Estimates of daily nest survival among years at Nachusa Grasslands, 2007-2009. Numbers are the estimated daily nest survival rates for nests in each year of the study. Numbers within individual bars are the number of nests for that species within each year. Bars indicate one standard error and the dashed line indicates the overall daily nest survival rate for all nests of the species across all years.

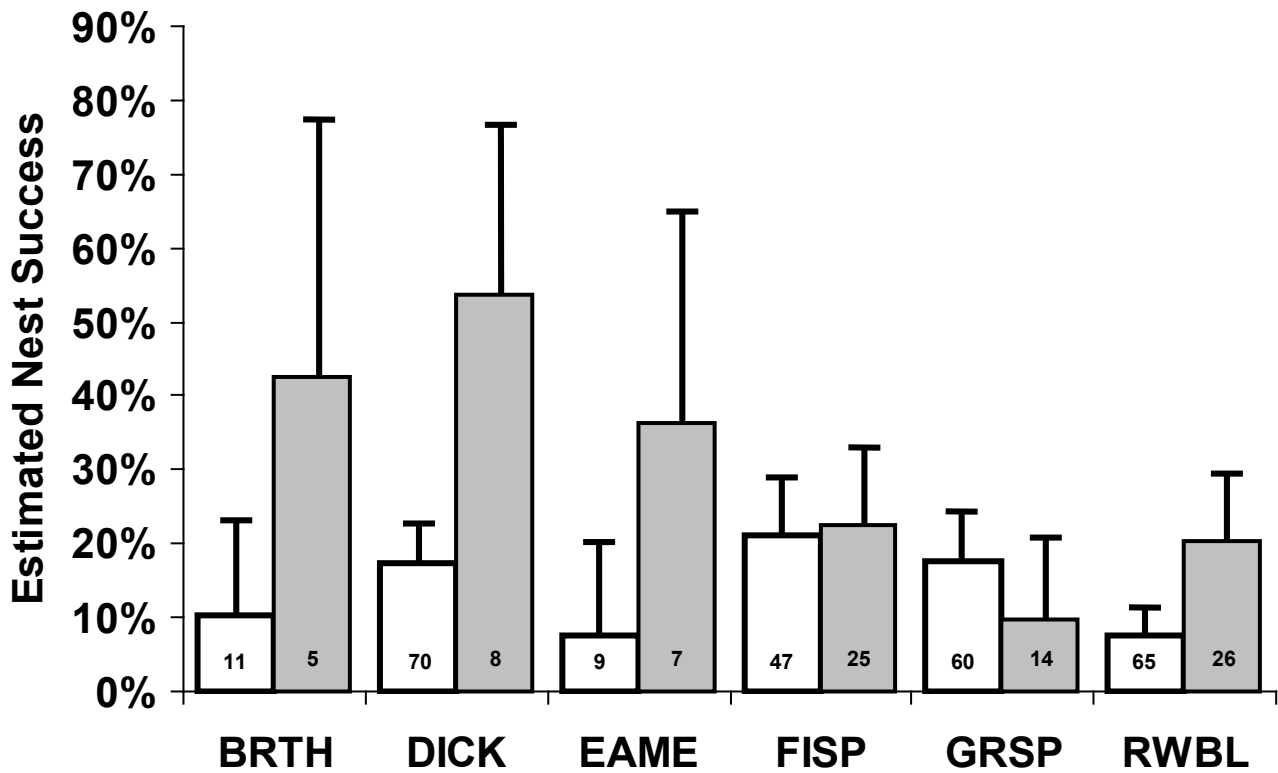


Figure 3. Estimates of overall nest success for breeding birds at Nachusa Grasslands in 1995-1997 (clear bars) versus 2007-2009 (shaded bars). Numbers within individual bars are the number of nests for that species within each period. Bars indicate one standard error. BRTH = brown thrasher, DICK = dickcissel, EAME = eastern meadowlark, FISP = field sparrow, GRSP = grasshopper sparrow, and RWBL = red-winged blackbird.