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Site Fidelity of Wintering Le Conte's Sparrows in Northeast Texas

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ABSTRACT

Information on the winter ecology of many grassland sparrows (Emberizidae) in North America is limited. I examined the degree of site fidelity within years and between years for Le Conte's Sparrows (*Ammodramus leconteii*) wintering in northeast Texas. During the winter of 2004 - 2005, I banded 163 individuals, of which 34 were recaptured a total of 48 times. During the winter of 2005 - 2006, I banded 70 individuals, of which seven were recaptured a total of eight times. All recaptures occurred within the original banding site and no movement between sites was detected. No birds banded in 2004 - 2005 were recaptured in 2005 - 2006. Parameter estimates had reduced precision due to small numbers of recaptures. In 2004 - 2005 survival rates (ϕ) ranged from 0.40 - 0.98 in four sites. Probability of recapture was low in all four sites ($p = 0.18 - 0.46$). These data suggest that wintering Le Conte's Sparrows show site fidelity within years, but do not show site fidelity between years.

INTRODUCTION

Winter site fidelity has been recorded in many species of migrant passerines. Several Neotropical migrants, especially parulid warblers, are known not only to be site faithful within years, but also to return to the same wintering quarters in consecutive years (Snow and Snow 1960, Thurber and Villeda 1980, McNeil 1982, Faaborg 1984, Kricher and Davis 1986, Sherry and Holmes 1996). Among Oct. - Dec. 2007

short-distance migrants, White-throated Sparrows (*Zonotrichia albicollis*) show winter site fidelity within and between seasons (Piper 1990, Piper and Wiley 1990). Site fidelity and winter territoriality offer advantages to individuals where resources are plentiful (Sherry and Holmes 1996).

Knowledge of winter site fidelity for the majority of North American grassland sparrows is limited and little information is available for the Le Conte's Sparrow (*Ammodramus leconteii*). Widespread declines in grassland birds make research pertinent to further elucidate the winter ecology of the species (Askins 1993, Peterjohn and Sauer 1999).

The Le Conte' Sparrow is a small elusive sparrow of interior North America, breeding in wet grasslands and marshes of central and southern Canada and extreme north-central United States (Murray 1969, Lowther 1996). It is a short-distance migrant wintering throughout the southern Midwest and Gulf states. According to Christmas Bird Count data, the largest number of wintering birds occur in east Texas (Lowther 1996). On their wintering grounds, Le Conte's Sparrows occupy old fields and prairies with dense cover of grasses and sedges and occasionally overgrown shortgrass prairie (Lowther 1996, Rising and Beadle 1996). So far, no studies have examined the degree of intra- and inter-year site fidelity for the species on their wintering grounds.

METHODS

The study site was located at Camp Maxey, a Texas Army National Guard training facility located in north-central Lamar County, TX. Camp Maxey encompasses 2600 ha of habitat associated with Post Oak Savanna and Blackland Prairie vegetation communities. The terrain is flat to rolling hills with an average elevation of 130 m. The dominant habitat type includes a mixture of prairie openings and open deciduous woodland composed mainly of post oak (*Quercus stellata*), blackjack oak (*Q. marilandica*), and other drought-tolerant plant species. The majority of prairie openings

within Camp Maxey are old fields that have reverted to grasslands dominated by little bluestem (*Schizachyrium scoparium*), indiagrass (*Sorghastrum avenaceum*), and a profusion of composites, legumes, and other forbs. The prairie openings are maintained through prescribed burns and accidental fires. In unburned areas, woody vegetation – mostly smooth sumac (*Rhus glabra*) and yaupon (*Ilex vomitoria*) – has become established.

Banding was conducted within five prairie openings which were bordered by deciduous woodland edge and gravel roads. Specific study sites were chosen based on suitable habitats known to contain high concentrations of Le Conte's Sparrows. All five sites were of similar habitat and size (mean 21.2 ha, range 15 - 30 ha) and were an average of 2.8 km (range 0.98 - 6.2 km) apart. I captured Le Conte's Sparrows using mist nets (12 x 2.8m, 36 mm mesh) and banded each individual with a U.S. Fish and Wildlife aluminum band. In 2005 - 2006, I also collected basic morphometric measurements of exposed culmen, wing chord, diagonal tarsus, and weight before birds were released. Mist nets, varying in number from seven to ten, were placed perpendicular to habitat edges to facilitate the capture of birds which were reluctant to cross roads or fly into woodlands. I maintained the original mist-netting protocol at each site during each consecutive visit. Birds were driven into nets by a varying number of people methodically walking towards the nets, disturbing the grass with rope drags and sticks. All other species captured incidentally also were banded.

During the winter of 2004 - 2005, I captured birds at four sites between 13 Nov 2004 and 26 Feb 2005. Three sites used in the previous season were again used during the winter of 2005 - 2006. One site, which had recently been burned, was replaced with a new site within the study area that was known to contain high numbers of Le Conte's Sparrows. During the winter of 2005 - 2006, birds were banded between 30 Oct 2005 and 12 Feb 2006. Total hours spent trapping amounted to 118 hr during the first season and 59.75 hr during the second. Each of the four sites during each season received roughly equal amount of banding effort. Due to the low capture and recapture rates during the winter of 2005 - 2006, I limited my survival and

recapture probabilities analysis to the first study season and used the second season only as a test of between-year site fidelity.

I used Cormack-Jolly-Seber (CJS) models to estimate the within-year survival (ϕ) and recapture rates (p) of Le Conte's Sparrows in each of the four plots for 2004 - 2005. Analyses were conducted in Program Mark™ (version 5.1) using Parameter Index Models (PIMs) and the sine link function. For each site analyzed, I fitted three models to the encounter histories. I considered a model with constant survival and constant recapture probabilities (ϕ_c, p_c). In addition, I tested two time-dependent models. One in which survival and recapture probability varied over time (ϕ_t, p_t) and one time-since-marking model (TSM) in which survival was constant, but the interval after first capture was estimated separately from recapture probability during all subsequent intervals (ϕ_c, p_{tsm} ; Pradel et al. 1997, Parker et al. 2006). For each site, I estimated the variance inflation factor, \hat{c} , by dividing the deviance estimate from the original data by the mean of the simulated deviances from 100 parametric bootstraps (White et al. 2001).

I report the quasi-Akaike's Information Criterion (QAICc) adjusted for \hat{c} , Akaike weights (w_i) and estimates of ϕ and p for the most supported model in each site. I assessed precision of ϕ and p by examining standard errors (SE) and 95% confidence intervals (CI).

RESULTS

During the first season, I banded 163 Le Conte's Sparrows of which 34 individuals were recaptured a total of 48 times. During the second season, I banded 70 Le Conte's Sparrows of which seven individuals were recaptured a total of eight times. Mean mass of birds in 2005 - 2006 was 13.16 ± 1.03 g (range 10.9 - 15.8 g, $n = 74$). No birds banded during 2004 - 2005 were recaptured in 2005 - 2006. All within season recaptures occurred within the original site of capture and no movement between sites was detected. The mean recapture interval was 40 d (range 1 - 105 d) in 2004 - 2005 and 31 d (range 1 - 54 d) in 2005 - 2006. In 2004 - 2005 at least seven birds remained at the same site for >60 d, 10 birds >30 d, and 17 birds <30 d. In 2005 - 2006, no birds were detected at the same

site for >60 d, but at least three birds remained at the same site for >30 d, and four birds <30 d.

For three of the four sites in 2004 - 2005, the constant model (ϕ_c, p_c) had the highest support based on QAICc and w_i and in only one site did the TSM model (ϕ_c, p_{tsm}) have the highest support (Table 1). In each site the time dependent model

(ϕ, p) had the lowest support of all three competing models. Estimates of ϕ and p varied among three study sites (ϕ range 0.40 - 0.98; p range 0.18 - 0.46; Table 2). The recapture history at the New Location site was best supported by the TSM model (ϕ_c, p_{tsm}) with a high estimate of survival ($\phi = 0.98$) and low estimate of recapture rate ($p^1 = 0.08$; $p^{2+} = 0.24$; Table 3).

Table 1. Number of captures and recaptures of LeConte's Sparrows within four sites during the winter of 2004-2005 and the mark-recapture models of the probability of survival and recapture ranked according to quasi-Akaike's Information Criterion ($\Delta QAICc$) and Akaike weight (w_i).

Site	Individuals Captured	Number of Recaptures	Individuals Recaptured	Model	$\Delta QAICc$	w_i
New Location	36	15	9	Φ_c, P_{tsm}	0.0	0.767
				Φ_c, P_c	2.4	0.233
Main Road	48	11	8	Φ_c, P_c	0.0	0.706
				Φ_c, P_{tsm}	2.3	0.227
Pistol Range	52	18	14	Φ_c, P_c	0.0	0.717
				Φ_c, P_{tsm}	2.2	0.238
Side Road	25	4	3	Φ_c, P_c	0.0	0.687
				Φ_c, P_{tsm}	1.6	0.313

Table 2. Estimates of the probability of survival and recapture of LeConte's Sparrows in three sites during the winter of 2004-2005 from the constant-survival and constant-recapture probability model (Φ_c, P_c).

Site	Φ_c			P_c		
	Estimated	SE	95% CI	Estimated	SE	95% CI
Main Road	0.40	0.15	0.16-0.69	0.46	0.24	0.11-0.85
Pistol Range	0.98	0.01	0.94-0.99	0.31	0.15	0.11-0.64
Side Road	0.96	0.8	0.20-0.99	0.18	0.20	0.02-0.75

Table 3. Estimates of survival and recapture of LeConte's Sparrows in one site during the winter of 2004-2005 from the constant-survival and TSM model for recapture probability (f_c, P_{tsm}).

Site	Φ_c			$P_{tsm} (P^1, P^{2+})$		
	Estimated	SE	95% CI	Estimated	SE	95% CI
New Location	0.98	0.01	0.96-0.99	0.08	0.05	0.03-0.23
				0.24	0.07	0.14-0.40

DISCUSSION

These findings suggest that wintering Le Conte's Sparrows exhibit site fidelity within the same season, but are not site faithful between years. This concurs with findings on the species' breeding grounds. Philopatry for breeding territories in Le Conte's Sparrow appears to be limited at best. Murray (1969) had one color-banded male return out of seven males and six females marked during the previous breeding season. In northwestern Minnesota and North Dakota, out of a total of 93 breeding birds banded only one was recovered in subsequent years (Winter et al. 2005).

In this study, Le Conte's Sparrows had moderate-to-high within year survival rates, but low recapture probabilities in four study sites. Due to low sample sizes and resulting large confidence intervals, these numbers should be examined cautiously, but it appears that Le Conte's Sparrows are site faithful within years and tend to overwinter within the same habitat patch with no or limited movement between sites. This supports studies by Grzybowski (1980, 1982, 1983) who found Le Conte's Sparrows apparently maintain winter territories and individual spacing patterns.

The closely related Henslow's Sparrow (*Ammodramus henslowii*) also exhibited site fidelity within years, but no site fidelity between years on wintering grounds in Alabama and Mississippi (Plentovich et al. 1998, Thatcher et al. 2005). Henslow's Sparrows appear to have adapted to ephemeral habitats on their wintering grounds and thus lack site fidelity between years (Plentovich et al. 1998). In southeast Louisiana, Bechtoldt and Stouffer (2005) found that Henslow's Sparrows did exhibit limited site fidelity between years in areas where suitable habitat persisted for more than one year.

Breeding and wintering Le Conte's Sparrows also take advantage of changing habitat conditions and densities appear to be dependent on disturbance and rainfall. Le Conte's Sparrows were more abundant during two wet years in southeast Saskatchewan (Knapton 1979) and during the wettest year in southern Texas (Grzybowski 1980). Populations of wintering Le Conte's Sparrows may follow habitat as it becomes suitable and thus do

not show strong site fidelity between years. Species that tend to be highly irruptive in occurrence on their wintering ground exhibit no between-year site fidelity (Yunick 1983).

There are two possibilities explaining the low probabilities of recapture within years. One is that birds became net shy and learned to avoid mist nets and observers after initial capture. The second is that rates of survival and site fidelity were overestimated due to low sample sizes. In at least one site, the time-since-marking model had the strongest support, and the possible effects of transient individual on estimates of survival and site fidelity remains to be investigated.

Additional research is needed to elucidate at what scale numbers of wintering Le Conte's Sparrows fluctuate and what drives site fidelity or lack thereof in grassland sparrows, especially *Ammodramus*. Long-term studies are needed to estimate wintering populations at local scales and compare those to estimates obtained from larger surveys like Christmas Bird Count data. This baseline study demonstrates that mist-netting is a feasible method to survey for and estimate site fidelity of Le Conte's Sparrows and possibly other grassland sparrows during winter.

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