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STATUS AND HABITAT SELECTION OF THE HENSLOW'S SPARROW IN ILLINOIS

JAMES R. HERKERT[1,2]

ABSTRACT.—Henslow's Sparrows (*Ammodramus henslowii*), formerly abundant throughout Illinois, now are rare and local in occurrence there. Analyses of distribution and abundance patterns within a representative sample of grassland fragments showed that habitat area is the most important factor influencing Henslow's Sparrows in Illinois. Henslow's Sparrows rarely were encountered on grassland fragments less than 100 ha. However, in large fragments habitat structure also significantly influenced distribution and abundance patterns. Henslow's Sparrows preferred areas having tall, dense vegetation with a high proportion of residual standing dead plant material. Prescribed burning and mowing removed the tall, dense vegetation this species prefers and significantly reduced bird densities within parts of grasslands that had been recently managed. *Received 9 March 1993, accepted 20 July 1993.*

Henslow's Sparrows (*Ammodramus henslowii*) breed locally in southern Ontario and northeastern and east-central United States (Hands et al. 1989). Concern over the status of this grassland sparrow was first expressed when the National Audubon Society (NAS) included it in their 1974 Blue List on the basis of population declines in the northeastern United States and western Great Lakes region (Arbib 1973). It remained on the NAS Blue List from 1974–1981, and was changed to Special Concern from 1982–1986 (Tate 1986). In 1987, the Henslow's Sparrow was identified as a migratory nongame species of management concern by the United States Fish and Wildlife Service (USFWS), as a result of widespread population declines and its specific association with restricted/vulnerable habitats (USFWS 1987). More recently it has been designated an endangered or threatened species listing candidate (USFWS 1991). Recent analyses of data from the North American Breeding Bird Survey by the USFWS's Office of Migratory Bird Management suggests that the United States population of Henslow's Sparrows has decreased by over 68% between 1966 and 1991 (USFWS, unpubl. data).

Historically, Henslow's Sparrows in the midwestern states bred in native prairie habitat (Nelson 1876, Ridgway 1889, Cory 1909). However, they also inhabit a variety of other grassland habitats including hayfields, pastures, wet meadows, and old fields (Graber 1968, Skinner et al. 1984, Sample 1989). Litter density and depth (Wiens 1969, Robbins 1971, Kahl et al. 1985), standing dead residual vegetation (Zimmerman 1988, Sample

[1] Dept. of Ecology, Ethology, & Evolution, Univ. of Illinois, Champaign, Illinois 61820.
[2] Present address: Illinois Endangered Species Protection Board, 524 South Second Street, Springfield, Illinois 62701.

1989), forb and woody stem densities (Wiens 1969, Kahl et al. 1985, Sample 1989), vegetation height and density (Skinner 1975, Skinner et al. 1984, Kahl et al. 1985, Sample 1989), and field size (Peterson 1983, Smith and Smith 1990) previously have been recognized as important components of Henslow's Sparrow habitat.

Loss of habitat has been implicated as the most likely factor causing declines in Henslow's Sparrow populations in the midwestern United States and elsewhere (USFWS 1987, Hands et al. 1989, Smith 1992). However, the relative importance of factors such as predation, competition, weather, and human disturbance remains poorly understood (Hands et al. 1989).

The objective of this paper is to identify habitat features that significantly influence distribution and abundance patterns for the Henslow's Sparrow in a highly fragmented midwestern landscape.

METHODS

I collected data from 86, 4.5-ha (300 m × 150 m), strip transects (Conner and Dickson 1980) within 24 grassland fragments in northeastern and north-central Illinois (1987–1990). Strip transects were dispersed so as to provide representative samples of the available habitat within fragments and were distant enough from one another to eliminate the possibility of counting the same bird on two different transects. I located transects in a manner designed to minimize within-transect habitat variability and to maximize distance from major habitat edges (to the extent possible as constrained by fragment size).

Study areas included native and restored prairies and non-native, cool-season grass and fallow fields ranging in size from 0.5 to 650 ha (see Herkert 1991a for a complete listing of study areas and fragment sizes). Dominant grass species from the native and restored prairie study areas included big bluestem (*Andropogon gerardii*), Indian grass (*Sorghastrum nutans*), panic grass (*Panicum* spp.), cord grass (*Spartina pectinata*), prairie dropseed (*Sporobolus heterolepis*), and upland sedges (*Carex* spp.). Dominant grass species from the non-native grassland areas included Kentucky bluegrass (*Poa pratensis*), meadow fescue (*Festuca pratensis*), smooth brome grass (*Bromus inermis*), timothy (*Phleum pratense*), orchard grass (*Dactylis glomerata*), and red-top (*Agrostis alba*). Plant species nomenclature follows that of Mohlenbrock (1986).

I censused each transect 3–4 times between 15 May and 30 June, between sunrise and 10:00 h CST, and recorded the locations of all territorial (singing) male Henslow's Sparrows. I conducted censuses at a rate of about 0.9 km/h (20 min/transect). I classified bird census transects as occupied or unoccupied. In order to eliminate the inclusion of transient individuals, only transects in which Henslow's Sparrows were encountered on two or more visits were classified as occupied.

Each year I chose 40 randomly located sites within each bird census transect for vegetation sampling. I sampled vegetation structure by passing a metal rod (0.6 cm diameter) through the vegetation and counted the number of contacts by live grasses, live forbs, and dead plant material in successive 25-cm intervals of height (cf Rotenberry and Wiens 1980). I measured nine vegetation variables from each bird census transect, including mean litter depth, mean grass height, mean vegetation height, mean number of total (live grass, live forb, dead plant material) vegetation contacts, mean number of total vegetation contacts between 0–25 cm,

percentage of live grass contacts, percentage of live forb contacts, percentage of standing dead residual plant contacts, and woody stem density. Measurements of vegetation structure were made between 10–25 May each year, with sampling beginning in the southernmost study areas and progressing northward.

I compared vegetative features of occupied and unoccupied transects using the Kruskal-Wallis test (nonparameteric equivalent of single classification ANOVA), and analyzed the effect of burning on Henslow's Sparrow abundance by comparing densities from three management categories for census transects at the largest prairie site (Goose Lake Prairie). The management categories included first growing season (1–3 months) immediately following burning (burn-I); second growing season (13–15 months) since last burned (burn-II); and three or more growing seasons (>25 months) since last burned (burn-III). Burns were conducted on April 13 of each year (1988–1990). Henslow's Sparrow densities were compared between mowed and unmowed transects within a 238-ha non-prairie study site. Management categories consisted of mowed and unmowed areas. Mowed sites were cut either in the late fall or early spring prior to the start of the breeding season (May 1), and unmowed sites were not cut for at least 12 months prior to the start of the breeding season. The effect of burning on the large prairie area was analyzed using repeated measures analysis of variance (Neter et al. 1985), because all six census transects on the large prairie site received all three burn management treatments in one of the three years of study (1988–1990) included in the burning analysis. On the non-prairie study site, however, all transects did not receive both mowed and unmowed treatments; therefore the effect of mowing at this site was analyzed using traditional analysis of variance (Sokal and Rohlf 1981). All analyses were performed using SAS version 5 (SAS 1985).

RESULTS

Henslow's Sparrows were recorded from 13 (15%) of the 86 census transects. There was no apparent preference for native or restored prairie or non-native grasslands ($\chi^2 = 0.16$, df = 1, $P > 0.69$) with Henslow's Sparrows being recorded from a nearly equal number of native or restored prairies and non-native grasslands (6 out of 44 prairie transects and 7 out of 42 non-native transects). Occupied prairie transects were dominated by sedges, prairie dropseed, and cord grass and occupied non-native transects were dominated by meadow fescue and bluegrass. The initial comparison of vegetation features of occupied and unoccupied transects for all grassland areas revealed few significant differences (Table 1). Occupied transects tended ($0.05 < P < 0.10$) to have a greater vegetation density at heights between 0 and 25 cm and a higher percentage of standing dead residual vegetation than unoccupied transects (Table 1). The greatest difference between occupied and unoccupied transects, however, was the size of the grassland in which the transect was located. Henslow's Sparrows were far more likely ($P < 0.0001$) to occupy transects that were located in large grasslands, suggesting that grassland size may be the most important feature influencing Henslow's Sparrow habitat occupancy over the range of grassland sizes included in the study.

In order to eliminate the influence of grassland area on Henslow's

TABLE 1

MEAN VALUES AND STANDARD ERRORS (SE) FOR HABITAT ATTRIBUTES IN OCCUPIED AND UNOCCUPIED HENSLOW'S SPARROW CENSUS TRANSECTS LOCATED IN 24 GRASSLAND FRAGMENTS IN ILLINOIS

	Unoccupied		Occupied	
	Mean	SE	Mean	SE
All grassland areas (0.5–650 ha)				
Litter depth (cm)	2.75	0.23	3.08	0.36
Grass height (cm)	29.92	1.40	29.45	2.92
Vegetation height (cm)	57.41	3.30	49.27	4.92
No. contacts—total	4.95	0.28	5.92	0.58
No. contacts <25 cm	3.59*	0.19	4.81*	0.57
Woody stem density (stems/m^2)	1.23	0.31	1.72	0.83
Contacts—live grass (%)	21.02	3.19	20.31	7.38
Contacts—live forbs (%)	6.33	1.48	2.58	1.14
Contacts—standing residual dead (%)	27.76*	3.12	45.69*	8.75
Grassland area (ha)	87.20***	17.94	420.56***	62.71
Large grassland areas (150–650 ha)				
Litter depth (cm)	1.97	0.34	2.96	0.36
Grass height (cm)	19.77**	1.99	27.47**	2.33
Vegetation height (cm)	30.09**	7.23	47.23**	4.88
No. contacts—total	2.63***	0.57	5.75***	0.60
No. contacts <25 cm	2.15***	0.47	4.95***	0.60
Woody stem density (stems/m^2)	3.30	1.69	1.68	0.90
Contacts—live grass (%)	30.77	14.35	21.96	7.82
Contacts—live forbs (%)	7.68	4.00	2.80	1.21
Contacts—standing residual dead (%)	13.61**	4.79	45.00**	6.48
Grassland area (ha)	534.40	76.53	445.50	62.56

* $P < 0.10$, ** $P < 0.05$, *** $P < 0.01$, Kruskal-Wallis test.

Sparrow habitat selection, habitat features of occupied and unoccupied transects were compared only for grasslands greater than 150 ha in size. This comparison revealed several significant vegetative differences between occupied and unoccupied transects. On large grasslands, Henslow's Sparrows occupied transects that had vegetation that was significantly taller (both mean grass and total vegetation heights), more dense (especially within 25 cm of the ground), and with a higher proportion of residual standing dead plant material than unoccupied transects (Table 1).

Burning had a significant effect on Henslow's Sparrow distribution and abundance on the large prairie study area ($F = 12.90$, $P < 0.002$). Henslow's Sparrows were never encountered on transects located in recently burned areas (Fig. 1). Moreover, average Henslow's Sparrow densities on

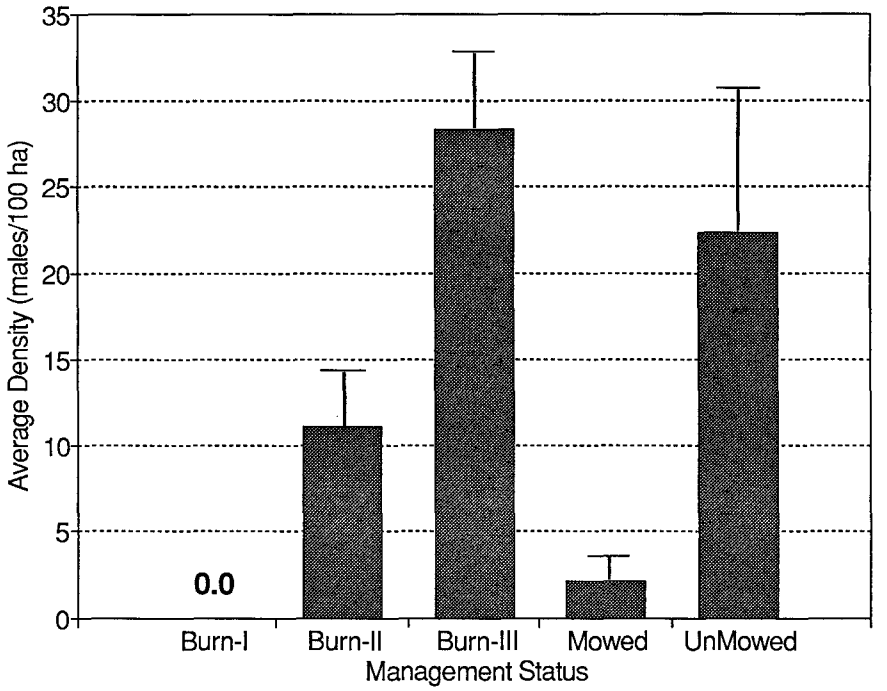

FIG. 1. Average densities of Henslow's Sparrows in census transects located in large managed grassland areas in Illinois. Bars indicate one standard error.

areas in their second growing season post-fire (burn-II) were less than half their densities on transects in their third or greater growing season post-fire (burn-III) (Fig. 1). Mowing also had a significant influence on Henslow's Sparrow abundance within the non-prairie grassland area ($F = 7.26$, $P < 0.025$). Although Henslow's Sparrows did not completely avoid mowed areas, average densities on mowed areas were nearly 90% less than they were on unmowed areas (Fig. 1).

DISCUSSION

Prior to 1900, the Henslow's Sparrow was considered to be abundant in Illinois (Herkert 1991b) and was among the most numerous prairie bird species in some parts of the state (Ridgway 1873). Ridgway described the Henslow's Sparrow as "much more common" than the Grasshopper Sparrow (*Ammodramus savannarum*) with only the Eastern Meadowlark (*Sturnella magna*) and Dickcissel (*Spiza americana*) being more abundant than it in 1871 at Fox Prairie, Richland County, Illinois. Nelson (1876) also considered the Henslow's Sparrow to be a common summer resident

in the prairies of northeastern Illinois, and more recently, Ford (1956) considered it a common summer resident in the northeastern part of the state. Between the late 1950s and the late 1970s, however, populations of the Henslow's Sparrow and several other grassland birds are believed to have declined substantially in Illinois (Illinois Natural History Survey 1983). Periodic surveys conducted by R. R. and J. W. Graber between 1957 and 1979 suggested that the Henslow's Sparrow population in Illinois may have declined as much as 94% during this period. The Graber's attributed the decline to a 65–75% decrease in grassland habitat and a concurrent 75% decline in average density within remaining grassland areas in Illinois (Graber and Graber, unpubl. data). The Henslow's Sparrow is presently a very local summer resident in Illinois (Bohlen 1989) and is listed as a state-threatened species (Herkert 1992). Henslow's Sparrows have recently (since 1980) been reported as summer residents in 14 of Illinois' 102 counties (Herkert 1992).

In many parts of their range, Henslow's Sparrow populations have often been described as somewhat unstable with numbers fluctuating from year to year (e.g., Hyde 1939, Wiens 1969, Robbins 1971). In Illinois, their appearance is also somewhat sporadic, especially in the southern part of the state (T. Fink, pers. commun.). In a few protected grassland areas in northern Illinois, Henslow's Sparrows are fairly common and are regular breeders. In the southern part of the state, however, Henslow's Sparrows occur sporadically in fescue and orchard grass fields in some years and are completely absent from this part of the state in other years despite the continued presence of similar habitat (T. Fink, pers. commun.). The largest known population in the state occurs on Illinois' largest native prairie remnant (Goose Lake Prairie, 650+ ha) where 15 to 55 pairs have bred consistently since at least the early 1970s (Birkenholz 1972, 1975, 1983, Birkenholz pers. commun., Herkert unpub. data). No other sites in Illinois are known to have more than 15 pairs of Henslow's Sparrows (Illinois Dept. of Conservation, unpubl. data).

In Illinois, Henslow's Sparrows choose habitats of specific vegetation structure and grassland size. Henslow's Sparrows were almost completely restricted to large grassland areas, occurring on only one grassland less than 100 ha. The general lack of significant structural differences between occupied and unoccupied transects when the full size range of grassland areas was compared (Table 1) further suggests that grassland size is the major factor influencing Henslow's Sparrow habitat selection in Illinois and possibly other highly fragmented Midwestern states. In other parts of their range, Henslow's Sparrows have also been shown to require relatively large grassland areas. In New York, Smith and Smith (1990) showed that this species requires pastures at least 30 ha in size. In Missouri,

Samson (1980) estimated that between 10 and 100 ha of prairie habitat were required to maintain viable populations of Henslow's Sparrows, although the methods used to derive this estimate are not clear.

The comparison of habitat attributes from occupied and unoccupied transects for large grassland areas (Table 1), however, shows that vegetation structure is also important in determining Henslow's Sparrow distribution and abundance patterns within tracts. Henslow's Sparrows inhabit large grassland areas that have tall, dense vegetation and a high percentage of standing dead residual plant cover.

Henslow's Sparrows have often been described to breed in "loose colonies" (Hyde 1939, Graber 1968, Wiens 1969, Johnsgard 1979); therefore, this species may avoid small grassland areas large enough for a single pair but not large enough for a "colony." In Illinois, this species is sometimes found in loose colonies but also occurs as single pairs. Sample (1989) described a similar pattern in Wisconsin, where Henslow's Sparrows also occur both in loose colonies and individually. Moreover, Smith (1992) has suggested that Henslow's Sparrows are not more colonial than other sparrows but only appear colonial as a result of clumping of suitable habitat. In any case, coloniality is unlikely to be a major reason for Henslow's Sparrow avoidance of small grassland areas, because many of the small grasslands that were unoccupied by this species appear to be large enough for several pairs. Henslow's Sparrow territory sizes have generally been estimated to be less than 1 ha (e.g., 0.6 ha, Wiens 1969; 0.3 ha, Robbins 1971). With a territory requirement of this size, grassland areas (with suitable habitat) as small as 10 ha should be large enough for several pairs, and yet Henslow's Sparrows are regularly absent from grassland areas much larger than this in Illinois.

Grassland management also significantly influences Henslow's Sparrow distribution and abundance patterns within grassland areas. Henslow's Sparrows are strongly influenced by prescribed burning of managed grasslands. In large native grasslands, burning prevents the establishment of Henslow's Sparrows in the summer immediately following spring (and probably fall) burning and significantly lowers densities in the ensuing year as well (Fig. 1). In Illinois, densities of Henslow's Sparrows in grasslands in their second growing season (13–16 months) following spring burning were roughly half of comparable densities in grasslands areas that have at least three growing seasons following burning (Fig. 1). This avoidance of recently burned areas is consistent with other research that has shown this species prefers relatively undisturbed, tall, dense vegetation (Skinner et al. 1984; Kahl et al. 1985; Zimmerman 1988, 1992; Sample 1989).

Regular mowing of the large non-prairie study area also significantly

reduced Henslow's Sparrow densities (Fig. 1), despite the fact that this mowing occurred outside of the breeding season. Studies in other regions and habitats, however, suggest that Henslow's Sparrows may use annually mowed or hayed areas (e.g., Hyde 1939, Smith and Smith 1990, DeNeal 1991). In New York pastures, Smith and Smith (1990) found no relationship between mowing and the occurrence of Henslow's Sparrows as long as mowing was undertaken after the nesting season. Additionally, reports of Henslow's Sparrows from midwestern hayfields (e.g., Hyde 1939, Graber and Graber 1963, DeNeal 1991) imply that this species can use annually mowed areas as long as the vegetation has had a chance to grow to an acceptable height and density prior to the breeding season. However, despite the presence of Henslow's Sparrows in some midwestern hayfields, the frequency of disturbance in these areas very likely severely reduces, if not precludes, successful nesting in these habitats (e.g., Warner and Etter 1989, Bollinger et al. 1990, Frawley and Best 1991).

Because of the large area requirement and avoidance of recently burned or mowed areas, grassland management for Henslow's Sparrows must be directed toward providing large unburned and/or unmowed areas. However, since grassland maintenance (Anderson 1970, Bragg 1982) and several other grassland bird species (Skinner 1975, Skinner et al. 1984, Herkert 1991a) are dependent on periodic fire or mowing for habitat maintenance, the optimal grassland management system would be a rotational system of burning or mowing in which subsections of large grasslands are managed on a regular rotating schedule as has been suggested for Henslow's Sparrows in Kansas (Zimmerman 1988). A rotational management system would ensure the availability of suitable habitat for Henslow's Sparrows as well as provide habitat for bird species that prefer short grass areas (Herkert 1991a). Just how large these units should be, however, is not clear. Based on incidental observations in Kansas, Zimmerman (1988) suggested that management units be at least 30 ha. My own incidental observations in Illinois show that Henslow's Sparrows may occasionally be found in small patches ($\sim$1 ha) of unburned prairie that occur within a much larger ($\sim$120 ha) matrix of burned prairie. However, whether these birds were mated or successfully reproduced in these small patches is not known. Nevertheless, given the sensitivity of this species to reduced habitat area and specific habitat requirements, management units should be at least 20–30 ha to be most effective. On large grassland areas (>100 ha) 20–30% of the area should be burned (or mowed) each year in a rotating series.

Finally, although the mechanisms causing Henslow's Sparrow declines remain poorly understood, conservation and management efforts directed toward protecting and/or establishing large grassland areas, with the spe-

cific habitat requirements this species prefers, offers the most promising approach to conserving and managing populations of this species.

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TO: Members of the Wilson Ornithological Society

This past year the Council of the Wilson Ornithological Society has considered revision of the Wilson Ornithological Society's Bylaws and Constitution. By unanimous vote the Council has approved the consideration of two changes in our Bylaws and one Amendment to the Constitution. Final decision on these changes will be accomplished by a vote of our Membership during the annual meeting of the Wilson Ornithological Society in Missoula, Montana, 22–26 June 1994. The proposed changes will, (1) make changes in the Bylaws that permit the Council to set the fiscal year to a time period more in accord with receipts and expenditures that occur during the year, and (2) make changes in the Bylaws and Constitution relative to how new members may join the Society to reflect more closely what is actually practiced by the Society for the past two decades.

Suggested changes in the Wilson Ornithological Society Bylaws and Constitution:

1. **Repeal** of Bylaw 7 which reads: "The fiscal year of the Society shall be the calendar year." This will permit the Council to set the fiscal year.

2. **Repeal** item 5 of Bylaw 8, which establishes agenda items for the annual meeting. Item 5 reads: "Election of members."

3. **Amend** Article II, Section 2, by replacing the italicized wording with the boldfaced sentence. Replace "Any person who is in sympathy with the objectives of the Society *may be nominated for membership. Nominations and applications for membership shall be made through the Treasurer. Applications for membership shall be endorsed by at least one member.*" with "Any person who is in sympathy with the objectives of the Society **may become a member by submitting an application and appropriate dues to the Treasurer.**"

Items 2 and 3 reflect past practices that are no longer followed, and should be removed from the Constitution and Bylaws, or followed. Item 1 will allow the Council to set the fiscal year to 1 July–30 June which better fits the Society's annual financial cycle.

Please be prepared to vote on these three changes at our annual meeting in Montana.

Sincerely,
Richard N. Conner
President, The Wilson Ornithological Society