

# Fire Management Species Profile

## Henslow's Sparrow (*Ammodramus henslowii*)

**Federal Status (27): Not Listed**

**State Ranking (27): Imperiled** - AL, AR, GA, IL, MA, MD, MI, MN, NC, NE, NJ, OK, SD, TN, TX, VA, VT;

**Vulnerable** - IA, IN, KS, KY, LA, MO, MS, NY, WI, WV;

**Historical** - CT, DE, RI; **Not Ranked** - FL, SC



Photo - Eric C. Soehren

### Bio Facts (19):

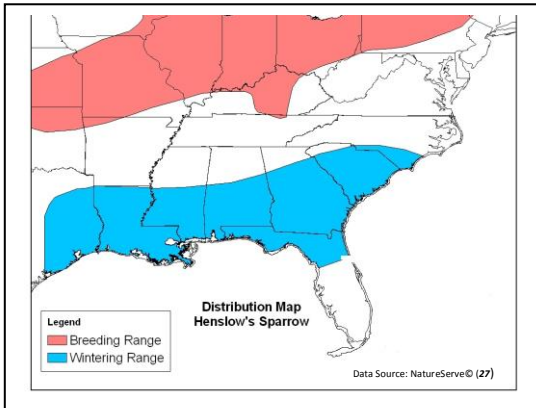
**Size:** 5 inches

**Nesting:** May-September with 2 clutches per season often

**Feeding:** Insects, seeds

**Eggs:** 4-5

**Incubation:** 9-10 days



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**Landscape Conservation Cooperatives: Breeding:** Appalachian, Gulf Coast Plains and Ozarks, Eastern Tallgrass Prairie and Big Rivers, Great Plains, Upper Midwest and Great Lakes, North Atlantic; **Winter:** Gulf Coast Plains and Ozarks, Gulf Coast Prairies Peninsular Florida, South Atlantic, Appalachian

**Landfire Zones: Breeding** - 32, 38, 42, 43, 44, 47, 49, 50, 52, 53, 61, 62, 63, 64; **Winter** - 36, 37, 45, 46, 48, 54, 55, 56, 58, 98, 99

### Desired Vegetation Structure and Fire Components

Criteria	Monitoring Variables
Canopy/Sub-canopy	Breeding and wintering: Open appearance with little to no pine canopy; canopy cover <5% or BA < 50 sq ft per acre.
Mid-story	Breeding and wintering: Open condition with little to no mid-story >3 ft; allow 2-5 trees (>40 ft) per 250 acres for perching.
Understory	Breeding and wintering: Dense understory less than 3ft with grass cover >60%; forb cover >30%; and woody understory cover <30%.
Ground Cover	Breeding: Dense ground cover >80%; dominated by tall grasses with patches of exposed mineral soil; litter cover >75% ; mean litter depth to > 1 inch; Wintering: Dense ground cover > 80% dominated by grasses used as food sources; little to no litter; ground cover can get to be too dense as soon as 1.5 years following fire in some wintering areas.
Fire Regime	Natural fire regime (breeding): 3-5 years, low departure 5-7 years; moderate departure 7-10, high departure >10 years; Natural Fire Regime(wintering): 2-3 years, low departure 3-4 years, moderate departure 4-5 years, high departure >5 years; this species is most common on areas burned < 1 yr and become rare on sites burned > 1.5 years.
Fire Regime Condition Class	Most desired FRCC1 (low departure from natural); FRCC2 (moderate departure); no suitable habitat in FRCC3.
Seasonality	Early growing season burns favors wintering habitat structure and promotes native grass seed production for food (Mar-April); winter burning limits availability of resources for sparrows.
Fuel Models	In well maintained habitat, fuel models include grass (GR3, GR5, GR6, and GR9); grass-shrub (GS3, GS4); possibly shrub (SH4); possibly timber-understory (TU3).
Burn Severity	During nesting season, low burn severity is favored to allow unburned patches to develop for escape (CBI<1.5); outside nesting season moderate burn severity acceptable; CBI<2.0.
Fire Behavior	Low to moderate fireline intensity; flame heights <10 ft; <75% burn cover is acceptable in May and June.
Landscape Considerations	Matrix of suitable habitat patches of good quality patches (>50 acres) in proximity to one another or connected by corridors to allow movement between patches. Fire management should consider timing and spatial arrangement of treatments in matrix.

The objective of the Fire Management Species Profile project is to identify habitat management objectives that are specific, measurable, achievable, and clearly communicate among habitat management professionals and are firmly based in the best available science. Their use is intended to guide habitat managers in setting local objectives for habitat management in fire-adapted ecological systems. Fire management objectives are specific to habitat conditions in which maintenance and improvement, rather than restoration, of habitat condition is the goal.

## Desired Habitat Conditions

Henslow's sparrow is a secretive grassland bird that breeds in tall, dense herbaceous vegetation dominated by grasses of the north and eastern United States and winters in similar dense groundcover habitat of open pine savannas and grasslands of the southeastern United States from North Carolina south to Florida west to Texas. Breeding habitat includes tall dense grassland vegetation with few canopy, sub-canopy and mid-story trees that is burned on a three to five year fire return interval. Understory and ground cover less than 3 feet tall should be greater than 80% with some standing dead vegetation for perching. Litter depth should be greater than one inch with >80% cover. Wintering habitat is similar to breeding habitat but with less litter depth and dead standing vegetation. Sites with few canopy, sub-canopy and mid-story trees are desired. These sites are maintained through burning in the growing season (when birds are away) on a 2-4 year fire return interval.

**Distribution:** Historically, Henslow's sparrow occurred in native prairie habitats but now is also found in secondary grasslands, fields and pastures extending its native breeding range (32). Henslow's sparrow breeds locally from South Dakota east across the Great Lakes to eastern US and southern Canada and south to Kansas, Oklahoma, Missouri, Illinois, Kentucky, West Virginia, Virginia and North Carolina. Wintering range is from North Carolina south to central Florida and west to east Texas along the Gulf Coast. Breeding and wintering ranges overlap in southern North Carolina (32). There is some evidence that site fidelity may vary considerably from year to year depending on conditions (J. Cox, *Tall Timbers, pers. comm., 2012*).

**Breeding Habitat:** The breeding season is defined as a period of May through September. Breeding habitat for Henslow's sparrow includes prairies, hayfields, pastures, wet meadows, and old fields, sphagnum bogs of Wisconsin (32), and salt marshes in eastern edge of breeding range (8, 19, 32). There is evidence for a preference for wet or moderately wet sites over dry sites (12, 15, 16, 19, 22, 27, 29, 32, 36, 40, 47, 50).

**Wintering Habitat:** The nonbreeding season is defined as a period of October through April when the birds have migrated to their winter range. Henslow's sparrow prefers areas with tall dense groundcover dominated by grasses with little litter layer and high grass seed productivity. In winter, the bird is more secretive and requires openings at the ground level to move around to locate forage or escape predators (44). The bird is difficult to flush and rarely uses perches during the winter. Winter habitat is similar in structure to breeding habitat comprised of tall dense ground cover (dominated by grasses) in longleaf pine savannas or longleaf pine (*Pinus palustris*) and slash pine (*P. elliotii*) woodlands and forests (14, 44). Wet meadows dominated by broom sedge and wiregrass within longleaf pine woodlands as well as utility line corridors are used by the bird (18). In Florida, upland pine forests with a low density of trees and dense ground cover as well as open prairies, wet prairies, and edges of freshwater marshes, grassy swales below powerlines, along roadsides and in moist grassy unmowed fields are used by sparrows (32). In Alabama, birds in winter occur in thick wiregrass or broomsedge bogs with pitcher plants, or areas along salt marshes (26, 31). In North Carolina, birds have been reported to winter in longleaf pine stands with wiregrass (*Aristida spp.*) that have been burned in the previous year (32). Recently, birds have been reported to winter in saline soil barrens in southern Arkansas (17).

**Canopy, Sub-canopy and Midstory:** Sparrows occur in open grassland habitats in both breeding and wintering sites with little to no midstory or canopy trees (19, 32). As a result, few studies have been published from areas with significant tree canopies (6, 31). In a study of wintering sparrows in Louisiana, sparrows occupied sites with lower basal areas than unoccupied sites (30 vs 50 sq ft BA per acre, respectively) and in areas with fewer trees greater than 10 inches in diameter (2.7 trees in occupied sites and 4.2 trees in unoccupied sites) (6).

**Understory/ Ground Cover:** Tall, dense ground cover, dominated by grass, is an important component of both breeding and wintering Henslow's sparrow habitat (6, 32, 48). In breeding habitat, tall (> 3ft), dense herbaceous ground cover (>50% cover) with a well-developed litter layer (>1 inch) has been reported in many studies (15, 16, 23, 29, 32, 34, 36, 40, 47, 51) with some height exceptions (22). Ground cover of Henslow's sparrow breeding habitat in prairie grasslands is dominated by native grasses such as big bluestems (*Andropogon spp.*), little bluestems

(*Schizacharium spp.*), panic grasses (*Panicum spp.*), bromes (*Bromus spp.*), indiagrasses (*Sorghastrum spp.*), cordgrasses (*Spartina spp.*), and upland sedges (*Carex spp.*) intermixed with a diversity of forbs and low growing woody shrubs (**16, 36, 48**). The species is also known to breed in more disturbed habitat such as hayfields, pastures, wet meadows, and old fields dominated by bluestems (*Poa spp.*), fescues (*Festuca spp.*), bromes, Timothy (*Phleum spp.*), orchard grasses (*Dactylis spp.*), and red-top grasses (*Agrostis spp.*) (**16**). The amount of dead vegetation in the understory is also important (**19, 22, 32, 36, 47, 48**). In breeding habitats, birds occupy a greater number of sites with dead standing stems less than 3 ft tall that are made up of dead forb stems from the previous growing season or low growing shrubs (**15, 27, 36**). The presence of woody understory is a minor component of the ground cover and should not exceed 5% cover (**29**). The height of dead standing vegetation is important to sparrows (**47**). Males avoided areas where vegetation was more than 3 ft tall (**22, 50**) and many studies suggest ground cover should be no greater than 18 inches (**15, 16, 22, 36, 40, 47, 50**).

In wintering habitat, Henslow's sparrow abundance correlates with ground cover dominated by tall grasses with low vegetation density near the ground (**2, 3, 6, 17**). In Louisiana, sites with the greatest number of sparrows had tall grass heights (> 3 ft) and low vegetation density (<5%) near the ground (<1 ft) (**3**). This vegetation structure allows birds to run along the ground for foraging and precludes detection by predators (**3**). Herbaceous cover and low vegetation density near the ground were also important factors in occupied compared to unoccupied sites of longleaf pine forests in Louisiana (**6**). Grass cover makes up more than 50% of the ground cover in most wintering habitats (**3, 6, 17, 44**). Grass and grass-like species in the ground cover include toothache grass (*Ctenium aromaticum*), muhly (*Muhlenbergia expansa*), little bluestem (*Schizachrium scoparium*), panic grasses, dicantheiums (*Dichantheium spp.*), three awn grasses (*Aristida spp.*), beakrushes (*Rhynchospora spp.*) and others. Muhly and toothache grass have been shown to be important seed species for winter diets in Louisiana (**3, 9**) and are both fire dependent species (**4**). Forbs make up a smaller portion of ground cover and include pitcher plants (*Sarracenia spp.*), Eupatoriums (*Eupatorium spp.*), Asters (*Aster spp.*), sundews (*Drosera spp.*), pipeworts (*Eriocaulon spp.*), meadowbeauty (*Rhexia spp.*) (**3,44**). In general, woody species in the understory include small saplings of slash pine and longleaf pine, and shrub species such as gallberry (*Ilex spp.*), titi (*Cyrilla spp.*), wax myrtle (*Myrica spp.*), and vines such as greenbrier (*Smilax spp.*) (**44**).

**Litter:** In breeding grassland habitat for Henslow's sparrow, a greater litter depth (>1 inch) and cover (> 75%) has been associated with nesting success (**15, 16, 22, 32, 36, 47, 48, 51**). Sparrows use the litter layer for nesting, escaping from predators, and foraging (**32, 48**). Conversely, in winter habitats, greater sparrow abundance occurs in areas with none or sparse developed litter layer where seeds on the ground are readily accessible and movement along the ground is easier (**3, 6, 9**).

**Breeding Information:** Spring migration begins from wintering grounds in the mid-Atlantic and Gulf coast states in early March (**19**). By the second or third week of April, sparrows have reached breeding grounds in Oklahoma, Kansas, Missouri, West Virginia and New Jersey (**13, 19, 35, 36**). In mid-May birds reach their northern limits of the breeding range in New England, southern Canada and South Dakota (**19, 20**). Birds initiate nesting in early May (**32**). Territory size has been reported from 0.75 acres in Michigan (**36**) to 1.5 acres in Wisconsin (**47**) to 2.5 acres in Oklahoma (**45**) with 8 to 23 pairs of birds per 100 acres (**16, 36**). Territories may be more clumped than uniform in distribution (**32**). Birds develop open or dome-shaped nests on the ground usually attached to grass or forb stems and are made of dead grass and lined with finer grasses (**19, 36, 48**). Sparrows lay 4-5 eggs that are incubated for 10-11 days (**19, 32**). Young birds will leave the nest 9-10 days after hatching (**19, 32, 36**) and adults can have two broods per year (**19, 36**).

Nest predation is the major factor for nest failure in Henslow's sparrow in Missouri (**48**). Brown-headed cowbird nest parasitism has been extensively reported (**1, 19, 34, 36, 48, 51**). Rates of nest predation and parasitism maybe higher in small grassland patches (<80 acres) compared to larger patches (>320 acres) (**21**). Nest predators include ground squirrel (*Spermophilus spp.*) (**36**), snakes (**19**), weasel (*Mustela spp.*), canids (*Canis spp.*), Virginia opossum (*Didelphus virginiana*), raccoon (*Procyon lotor*) (**12**), and feral cat (*Felus catus*) (**25**). Trampling of nests by cattle has been reported (**19**). In winter habitats, other predators reported are predatory birds such as loggerhead shrike (*Lanius ludovicianus*), sharp-shinned hawk (*Accipiter striatus*), Cooper's hawk (*A. cooperii*), northern harrier (*Circus cyaneus*), and American kestrel (*Falco sparverius*) (**19, 33, 44**). In addition, increased predation with proximity of grassland habitats to woody cover has been reported (**5, 11, 21**).

**Role of Fire: Breeding** - Cyclic disturbances are needed to maintain open grassland habitats used by Henslow's sparrow for breeding and nesting (32). Timing of prescribed burns is an important factor to consider. Sparrows avoid areas immediately following a burn and will not utilize grasslands the summer immediately after a spring burn (16, 35, 38, 51). Recolonization by sparrows after burning is quite variable. In Illinois, birds occupied grasslands the second growing season after a burn, and reached maximum bird densities the third growing season following burning (16). Other studies have also shown birds to occupy an area in the second to third growing season following burning (16, 43). In breeding habitat in Oklahoma, no birds were found to occur in 0- and 1-year post fire plots, suggesting that annual burning may be too aggressive and does not allow litter build up or ground cover density to recover fully for adequate nesting habitat for sparrows. Therefore, a 3 to 5 year fire return interval is suggested to maintain breeding habitat (16, 50).

**Winter** - Henslow's sparrows arrive in late September to wintering grounds and stay until late March or early April (32). Prescribed burns conducted at this time of year could eliminate ground cover needed for foraging and escaping prey (7, 24). Winter burning may lead to increased mortality by forcing sparrows to disperse from home ranges (30, 44). To avoid significant impact from prescribed burns during wintering period, growing season burns are recommended when the birds have migrated to the breeding range. Growing season burns are more effective in controlling woody succession (10) and encourages flowering of native grasses that are preferred food species of Henslow's sparrows during winter months (9). Further, burning habitat on a minimum of a 2-year burn interval to reduce litter and woody vegetation accumulations will promote seed production of native grasses (44). In addition, evidence of higher winter survival and higher winter abundances in sites burned during the previous growing season has been reported (44). These results may stem from increased food resources or improved vegetation structure at ground level (7, 44). The highest number of Henslow's sparrow occurred in areas burned the previous growing season with decreasing abundance of over 90% in areas that were fire suppressed for more than three years (3).

**Mowing/Grazing Treatments:** Henslow's sparrow habitat characteristics can also be managed with grazing, and/or mowing (35). Grazing may be favored over mowing since there is a higher loss of nest, egg and young destruction associated with mowing (41). Important considerations include the timing and intensity of these treatments and their consequences on habitat structure. In terms of intensity, the amount of grasslands available for Henslow's sparrow habitat will be severely limited under aggressive and intensive management (i.e., heavy grazing and frequent annual burning) (35). Sparrows breed in lightly grazed, and in infrequently mowed hayfields (32, 40, 42, 43). In Oklahoma, in addition to a 3-year fire return interval, a low to moderate level of grazing has been recommended (35). On grazed lands with 8-12 inch vegetation the densities of sparrows was very few; this suggests a period of time is needed to allow the vegetation to grow tall (39). In addition, sparrows did not breed in areas that were moderately grazed the summer before due to the loss of standing dead vegetation (50). Seasonality may also play a role in that earlier season grazing or mowing in the breeding season may allow the birds a chance to establish a second nest or brood (32). Mowing may be a viable management tool in breeding habitat as long as it is implemented outside of nesting season or restricted in area (42). Mowing in mid-August has been reported to produce favorable Henslow's sparrow habitat in New York and allows enough time to fledge first broods (42). Haying may also be a viable management tool if applied mid to late summer (43). Sites with haying on a 1 to 3 year rotation in late summer (July) had twice as many Henslow's sparrows compared to as burned only prairies (spring burns, 2.5-yr fire return interval) or burned and hayed prairie sites (3-year fire return interval; hayed every 2.5 to 3.0 years) (43). However, mid-winter haying on winter populations may have a negative effect on sparrows (3).

### **Landscape/ Spatiality-Temporality (Mobility, Area Sensitivity, Insularity-Connectivity Consideration)**

Habitat area is one of the most important factors to consider in landscape level design for managing Henslow's sparrow (16, 32). The species has been shown to require large continuous tracts (from 165 to 250 acres and greater) of good quality habitat throughout its breeding range (16, 29, 37, 42, 43, 51). In winter habitat, 25 acres of good quality savanna have been estimated to support 25 sparrows the first winter following a spring burn (3). However, abundance declines as time since burn increases (10 sparrows 1-year post-burn, down to 1 sparrow 2-year post-burn) (3).

Efforts should be made to reduce fragmentation of existing larger grasslands, especially in the breeding range (32). Although populations of sparrows have been reported to breed in small habitat patches, it is less likely that these populations will be able to sustain themselves as birds return year after year (15, 27, 32, 46, 47). A matrix of small good quality grassland patches may provide suitable habitat if patches occur in relatively close proximity (32), or are connected by corridors (49). Habitat areas should be at least 50 to 75 acres of good quality habitat with cyclic disturbance such as burning, mowing or haying to promote grasses and preclude woody vegetation (16, 51).

#### Literature Cited

1. **Austen, M., R. Pratt, M. Cadman, D. Cuddy, and R. Knaption. 1995.** National recovery plan for Henslow's sparrow. Final report for the Canadian Wildlife Service, Ontario Region and the Endangered Species Recovery Fund. 48pp.
2. **Bechtoldt, C. L. 2002.** Habitat use by wintering Henslow's sparrows (*Ammodramus henslowii*) in relation to fire management. Master's Thesis. Southeastern Louisiana University, Hammond, LA. 133pp.
3. **Bechtoldt, C. L. and P. C. Stouffer. 2005.** Home-range size, response to fire, and habitat preferences of wintering Henslow's sparrows. *Wilson Bulletin* 117:211-225.
4. **Brewer, J. S., A. L. Cunningham, T. P. Moore, R. M. Brooks, and J. L. Waldrup. 2009.** A six-year study of fire-related flowering cues and coexistence of two perennial grasses in a wet longleaf pine (*Pinus palustris*) savanna. *Plant Ecology* 200:141-154.
5. **Burger, L. D., L. W. Burger, Jr., and J. Faaborg. 1994.** Effects of prairie fragmentation on predation on artificial nests. *Journal of Wildlife Management* 58:249-254.
6. **Carrie, N. R., R. O. Wagner, K. R. Moore, J. C. Sparks, E. L. Keith, and C. A. Melder. 2002.** Winter abundance of and habitat use by Henslow's sparrows in Louisiana. *Wilson Bulletin*. 114:221-226.
7. **Cox, J. A. and B. Widner. 2008.** Lightning season burning; friend or foe of breeding birds? Miscellaneous Publication 17. Tall Timbers Research Station, Tallahassee, FL. 16pp.
8. **Craig, R. J. 1979.** The rare vertebrates of Connecticut. U.S. Soil Conservation Service. Storrs, CT. 169pp.
9. **DiMiceli, J. K., P. C. Stouffer, E. I. Johnson, C. Leonardi, and E. B. Moser. 2007.** Seed preferences of wintering Henslow's sparrows. *The Condor* 109:595-604.
10. **Drewa, P. B., W. J. Platt, and E. B. Moser. 2002.** Fire effects on resprouting of shrubs in headwaters of southeastern longleaf pine savannas. *Ecology* 83:755-767.
11. **Gates, J. E. and L. W. Gysel 1978.** Avian nest dispersion and fledging success in field-forest ecotones. *Ecology* 59:871-883.
12. **Graber, J. W. 1968.** *Passerherbulus henslowii henslowii* (Audubon): Western Henslow's sparrow. Pages 779-788 *In*. A. C. Bent (ed.). Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. Part 2. Smithsonian Institution, U.S. National Museum Bulletin 237:603-1248.
13. **Hall, G. A. 1983.** West Virginia birds: distribution and ecology. Special Publication, Carnegie Museum of Natural History. No. 7. Pittsburgh, PA. 180pp.
14. **Hamel, P. B. 1992.** Henslow's sparrow (*Ammodramus henslowii*). Page 314 *In*. Land manager's guide to birds of the South. The Nature Conservancy, Chapel Hill. NC.
15. **Hanson, L. G. 1994.** The Henslow's sparrow (*Ammodramus henslowii*) of Minnesota: population status and breeding habitat analysis. Master's Thesis. Central Missouri University, Mount Pleasant, MI. 39pp.
16. **Herkert, J. R. 1994.** Status and habitat selection of the Henslow's sparrow in Illinois. *Wilson Bulletin* 106:35-45.
17. **Holiman, W. C, C. T. Witsell, W. H. Baltosser, and C. W. Rideout. 2008.** Density and habitat associations of Henslow's sparrows wintering in saline soil barrens in southern Arkansas. *Journal of Field Ornithology* 79:364-370.
18. **Hunter, W. C. 1990.** Henslow's sparrow (*Ammodramus henslowii*). Pages 60-61. *In*. Handbook for nongame bird management and monitoring in the southeast region. USFWS, Atlanta, GA. 198pp.
19. **Hyde, A. S. 1939.** The life history of Henslow's sparrow, *Passerherbulus henslowii* (Audubon). University of Michigan, Museum of Zoology Miscellaneous Publication No. 41. 72pp.

20. **Johnsgard, P. A. 1979.** Henslow's sparrow *Ammodramus henslowii* (*Passerherbulus henslowii*). Pages 469-470 *In.* Birds of the Great Plains: breeding species and their distribution. University of Nebraska Press, Lincoln NE.
21. **Johnson, R. G. and S. A. Temple. 1990.** Nest predation and brood parasitism of tallgrass prairie birds. *Journal of Wildlife Management* 54:106-111.
22. **Kahl, R. B., T. S. Baskett, J. A. Ellis, and J. N. Burroughs. 1985.** Characteristics of summer habitats of selected nongame birds in Missouri. Research Bulletin 1056. University of Missouri, Columbia, MI. 155pp.
23. **Mazur, R. 1996.** Implications of field management for Henslow's sparrow habitat at Saratoga National Historical Park, New York. Master's Thesis. State University of New York, Syracuse, NY.
24. **McNair, D. B. 1998.** Henslow's sparrow and sedge wren response to dormant-season prescribed burn in a pine savanna. *Florida Field Naturalist* 26:46-47.
25. **McPeck, G. A. 1994.** Henslow's sparrow (*Ammodramus henslowii*). Pages 306-307 *In.* G. A. McPeck (ed.). *The Birds of Michigan*. Indiana University Press, IN.
26. **Mirarchi, R. W. 1986.** Henslow's sparrow: *Ammodramus henslowii* Audubon. Pages 100-102 *In.* R. H. Mount (ed.). *Vertebrate animals of Alabama in need of special attention*. Alabama Agricultural Experiment Station, Auburn University, AL. 124pp.
27. **NatureServe: Ridgely, R.S., T.F. Allnutt, T. Brooks, D.K. McNicol, D.W. Mehlman, B.E. Young, and J.R. Zook. 2003.** Digital Distribution Maps of the Birds of the Western Hemisphere, version 1.0. NatureServe, Arlington, VA.
28. **Nolin, D and J. Ritzenthaler. 1987.** Meadow size requirements for selected non-game birds in southwest Ohio. Unpublished report, Dayton, OH. 26pp.
29. **Peterson, A. 1983.** Observations on habitat selection by Henslow's sparrow in Broome County, New York. *Kingbird* 33:155-163.
30. **Plentovich, S. M., N. R. Holler, and G. W. Hill. 1998.** Site fidelity of wintering Henslow's sparrows. *Journal of Field Ornithology* 69:486-490.
31. **Plentovich, S. M., N. R. Holler, and G. W. Hill. 1999.** Habitat requirements of Henslow's sparrow wintering in silvicultural lands of the Gulf Coastal Plain. *The Auk* 116:109-115.
32. **Pruitt, L. 1996.** Henslow's sparrow. Status assessment 1996. U.S. Fish and Wildlife Service, Minneapolis, MN. 104pp.
33. **Pulliam, H. R. and G. S. Mills. 1977.** The use of space by wintering sparrows. *Ecology* 58:1393-1399.
34. **Reinking, D. L. and D. P. Hendricks. 1993.** Occurrences and nesting of Henslow's sparrows in Oklahoma. *Bulletin of the Oklahoma Ornithological Society* 26:33-36.
35. **Reinking, D. L., D. A. Wiedenfeld, D. H. Wolfe, and R. W. Rohrbaugh, Jr. 2000.** Distribution, habitat use, and nesting success of Henslow's sparrow in Oklahoma. *The Prairie Naturalist* 32:219-232.
36. **Robins, J. D. 1971.** A study of Henslow's sparrow in Michigan. *Wilson Bulletin* 83:38-48.
37. **Samson, R. B. 1980.** Island biogeography and the conservation of prairie birds. Pages 293-305 *In.* C. L. Kucera, (ed.). *Proceedings of the 7<sup>th</sup> North American Prairie Conference*. Southwest Missouri State University, Springfield, MI.
38. **Schulenberg, J. H., G. L. Horak, M. D. Schwillig, and E. J. Finck. 1994.** Nesting of Henslow's sparrow on Osage County, Kansas. *Kansas Ornithological Society Bulletin*. 44:25-28.
39. **Skinner, R. M. 1975.** Grassland use patterns and prairie bird populations in Missouri. Pages 171-180 *In.* M. K. Wali (ed.). *Prairie: a multiple view*. University of North Dakota Press, Grand Forks, ND.
40. **Skinner, R. M., T. S. Baskett, and M. D. Blenden. 1984.** Bird habitat on Missouri prairies. *Terrestrial Series # 14*, Missouri Department of Conservation, Jefferson City, MI. 37pp.
41. **Smith, C. R. 1992.** Henslow's sparrow (*Ammodramus henslowii*). Pages 315-330 *In.* K. S. Schneider and D. M. Pence (eds.). *Migratory nongame birds of management concern in the Northeast*. U.S. Fish and Wildlife, Newton Corner, MA.
42. **Smith, D. J. and C. R. Smith. 1992.** Henslow's sparrow and grasshopper sparrow: a comparison of habitat use in Finger Lakes National Forest, New York. *Bird Observer* 20:187-194.
43. **Swengel, S. R. 1996.** Management responses of three species of declining sparrows in tallgrass prairie. *Bird Conservation International* 6:241-253.
44. **Thatcher, B. S., D. G. Kremetz, and M. S. Woodrey. 2006.** Henslow's sparrow winter-survival estimates and responses to prescribed burning. *Journal of Wildlife Management* 70:198-206.

45. **Verser, D. W. 1990.** Henslow's sparrow in northeast Oklahoma. *Bulletin of the Oklahoma Ornithological Society* 23:9-12.
46. **Whitmore, R. C. 1979.** Short-term changes in vegetation structure and its effect on grasshopper sparrows in West Virginia. *Auk* 96:621-625.
47. **Wiens, J. A. 1969.** An approach to the study of ecological relationships among grassland birds. *Ornithological Monographs* No. 8.
48. **Winter, M. 1999.** Nesting biology of dickcissels and Henslow's sparrows in southwestern Missouri prairie fragments. *Wilson Bulletin* 111:515-527.
49. **Wood, D. R., L. W. Burger, Jr., J. L. Bowman, and C. L. Hardy. 2004.** Avian community response to pine-grassland restoration. *Wildlife Society Bulletin*. 32:819-829.
50. **Zimmerman, J. L. 1988.** Breeding season habitat selection by the Henslow's sparrow (*Ammodramus henslowii*) in Kansas. *Wilson Bulletin*. 100:85-94.
51. **Zimmerman, J. L. 1993.** *The birds of Konza: the avian ecology of the tallgrass prairie.* University Press of Kansas, Lawrence, KS. 186pp.

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