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Effects of Management Practices on Grassland Birds: Field Sparrow

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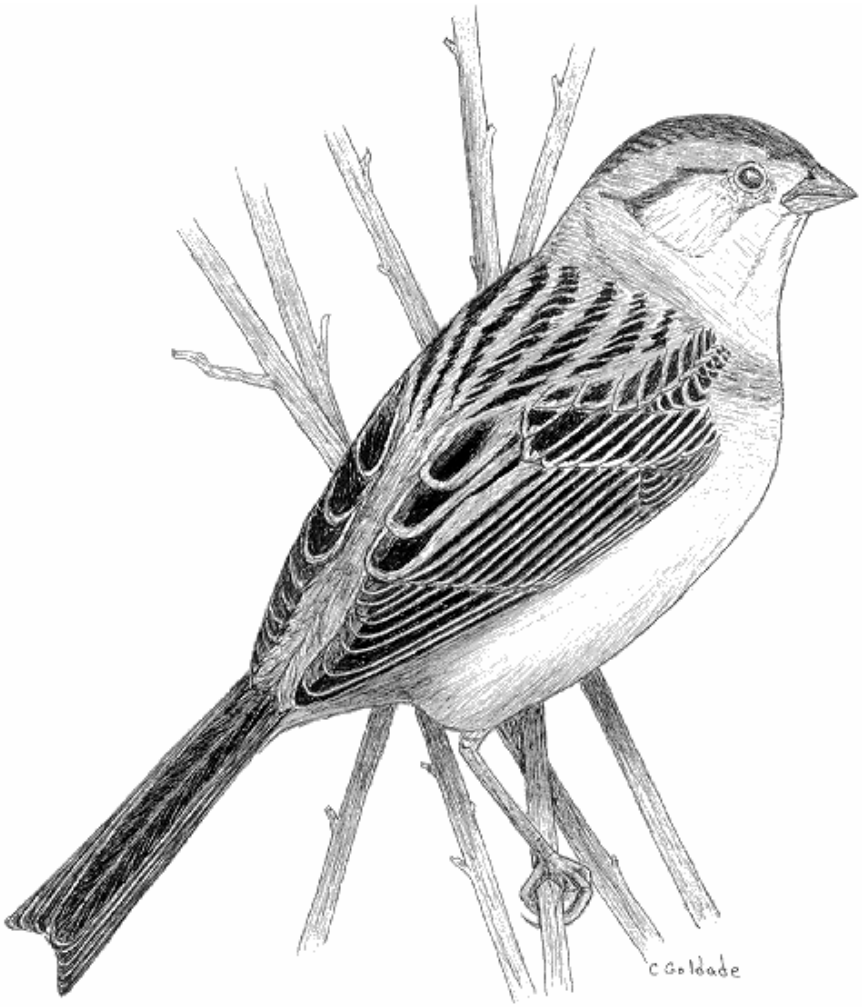
EFFECTS OF MANAGEMENT PRACTICES ON GRASSLAND BIRDS:

FIELD SPARROW



Grasslands Ecosystem Initiative
Northern Prairie Wildlife Research Center
U.S. Geological Survey
Jamestown, North Dakota 58401

This report is one in a series of literature syntheses on North American grassland birds. The need for these reports was identified by the Prairie Pothole Joint Venture (PPJV), a part of the North American Waterfowl Management Plan. The PPJV recently adopted a new goal, to stabilize or increase populations of declining grassland- and wetland-associated wildlife species in the Prairie Pothole Region. To further that objective, it is essential to understand the habitat needs of birds other than waterfowl, and how management practices affect their habitats. The focus of these reports is on management of breeding habitat, particularly in the northern Great Plains.

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Species for which syntheses are available or are in preparation:

American Bittern
Mountain Plover
Marbled Godwit
Long-billed Curlew
Willet
Wilson's Phalarope
Upland Sandpiper
Greater Prairie-Chicken
Lesser Prairie-Chicken
Northern Harrier
Swainson's Hawk
Ferruginous Hawk
Short-eared Owl
Burrowing Owl
Horned Lark
Sedge Wren
Loggerhead Shrike
Sprague's Pipit
Grasshopper Sparrow
Baird's Sparrow
Henslow's Sparrow
Le Conte's Sparrow
Nelson's Sharp-tailed Sparrow
Vesper Sparrow
Savannah Sparrow
Lark Sparrow
Field Sparrow
Clay-colored Sparrow
Chestnut-collared Longspur
McCown's Longspur
Dickcissel
Lark Bunting
Bobolink
Eastern Meadowlark
Western Meadowlark
Brown-headed Cowbird

EFFECTS OF MANAGEMENT PRACTICES ON GRASSLAND BIRDS:

FIELD SPARROW

Jill A. Dechant, Marriah L. Sondreal, Douglas H. Johnson, Lawrence D. Igl,
Christopher M. Goldade, Barry D. Parkin, and Betty R. Euliss

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May 1999
(revised January 2002)

ORGANIZATION AND FEATURES OF THIS SPECIES ACCOUNT

Information on the habitat requirements and effects of habitat management on grassland birds were summarized from information in more than 4,000 published and unpublished papers. A ***range map*** is provided to indicate the relative densities of the species in North America, based on Breeding Bird Survey (BBS) data. Although birds frequently are observed outside the breeding range indicated, the maps are intended to show areas where managers might concentrate their attention. It may be ineffectual to manage habitat at a site for a species that rarely occurs in an area. The species account begins with a brief ***capsule statement***, which provides the fundamental components or keys to management for the species. A section on ***breeding range*** outlines the current breeding distribution of the species in North America, including areas that could not be mapped using BBS data. The ***suitable habitat*** section describes the breeding habitat and occasionally microhabitat characteristics of the species, especially those habitats that occur in the Great Plains. Details on habitat and microhabitat requirements often provide clues to how a species will respond to a particular management practice. A ***table*** near the end of the account complements the section on suitable habitat, and lists the specific habitat characteristics for the species by individual studies. A special section on ***prey habitat*** is included for those predatory species that have more specific prey requirements. The ***area requirements*** section provides details on territory and home range sizes, minimum area requirements, and the effects of patch size, edges, and other landscape and habitat features on abundance and productivity. It may be futile to manage a small block of suitable habitat for a species that has minimum area requirements that are larger than the area being managed. The Brown-headed Cowbird (*Molothrus ater*) is an obligate brood parasite of many grassland birds. The section on ***cowbird brood parasitism*** summarizes rates of cowbird parasitism, host responses to parasitism, and factors that influence parasitism, such as nest concealment and host density. The impact of management depends, in part, upon a species' nesting phenology and biology. The section on ***breeding-season phenology and site fidelity*** includes details on spring arrival and fall departure for migratory populations in the Great Plains, peak breeding periods, the tendency to renest after nest failure or success, and the propensity to return to a previous breeding site. The duration and timing of breeding varies among regions and years. ***Species' response to management*** summarizes the current knowledge and major findings in the literature on the effects of different management practices on the species. The section on ***management recommendations*** complements the previous section and summarizes specific recommendations for habitat management provided in the literature. If management recommendations differ in different portions of the species' breeding range, recommendations are given separately by region. The ***literature cited*** contains references to published and unpublished literature on the management effects and habitat requirements of the species. This section is not meant to be a complete bibliography; a searchable, annotated bibliography of published and unpublished papers dealing with habitat needs of grassland birds and their responses to habitat management is posted at the Web site mentioned below.

This report has been downloaded from the Northern Prairie Wildlife Research Center World-Wide Web site, www.npwrc.usgs.gov/resource/literatr/grasbird/grasbird.htm. Please direct comments and suggestions to Douglas H. Johnson, Northern Prairie Wildlife Research Center, U.S. Geological Survey, 8711 37th Street SE, Jamestown, North Dakota 58401; telephone: 701-253-5539; fax: 701-253-5553; e-mail: Douglas_H_Johnson@usgs.gov.

FIELD SPARROW
(*Spizella pusilla*)

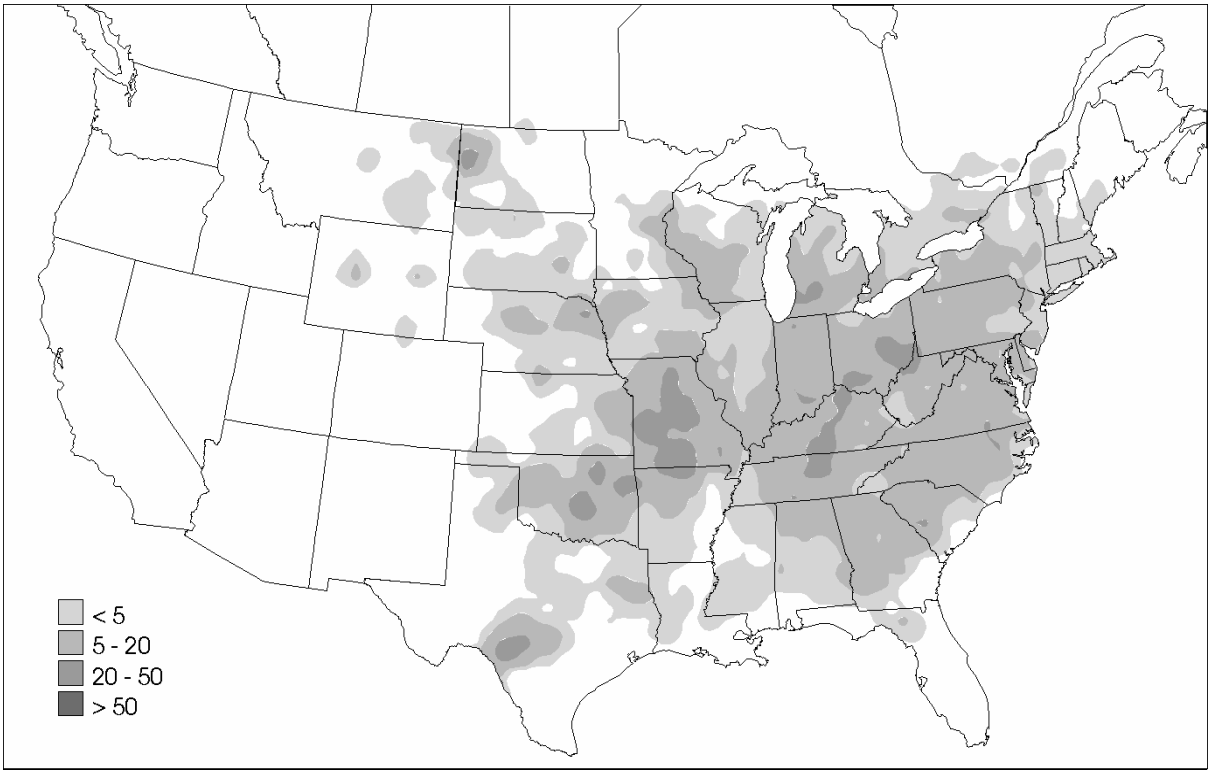

Figure. Breeding distribution of the Field Sparrow in the United States and southern Canada, based on Breeding Bird Survey data, 1985-1991. Scale represents average number of individuals detected per route per year. Map from Price, J., S. Droege, and A. Price. 1995. The summer atlas of North American birds. Academic Press, London, England. 364 pages.

Keys to management include providing shrub-dominated edge habitat adjacent to grassland or providing grassland with a shrub component (both of which must include dense grass and moderately high litter cover), and avoiding disturbances that completely eliminate woody vegetation.

Breeding range:

Field Sparrows breed from central Montana and Wyoming to eastern North Dakota, south through southcentral Texas to northern Florida, and north to central Minnesota, northern Wisconsin, Michigan, southern Quebec, and Maine (National Geographic Society 1987). (See figure for the relative densities of Field Sparrows in the United States and southern Canada, based on Breeding Bird Survey data.)

Suitable habitat:

Field Sparrows prefer woody edges and dry to slightly mesic, moderately tall grasslands with moderately abundant litter and a shrub component (Best 1977, 1978; Sousa 1983; Sample 1989; Herkert 1991*a*). Suitable habitat includes oldfields, sage (*Artemisia*) flats, weedy pastures, untilled and idle cropland, Conservation Reserve Program fields, grassed waterways, hedgerows,

shelterbelts, orchards, woodland edges, brushy woodlands, wooded draws, pine (*Pinus*) plantations, attenuated gallery and gallery forest, and reclaimed strip mines (Gabrielson 1914; Ely 1957; Graber and Graber 1963; Walkinshaw 1968, 1978; Stewart 1975; Best 1977, 1978; Evans 1978; Johnsgard 1980; Stauffer and Best 1980; Whitmore 1980; Best et al. 1981, 1997; Faanes 1981, 1983; Buech 1982; Hopkins 1983; Sousa 1983; Dinsmore et al. 1984; Kahl et al. 1985; Basore et al. 1986; Sample 1989; Bryan and Best 1991; Herkert 1991*a*; Cable et al. 1992; Zimmerman 1993; Carey et al. 1994; Vickery et al. 1994; Faanes and Lingle 1995).

Woody vegetation and dense grass appear to be critical components for habitat suitability (Johnston 1947, Kupsky 1970, Lanyon 1981, Sousa 1983, Laubach 1984, Herkert 1991*a*). Percent shrub crown cover, percent of total shrubs <1.5 m tall, percent grass canopy cover, and average height of herbaceous canopy were identified as important features of breeding habitat in Sousa's (1983) habitat suitability model. Optimal habitat was described as areas >2 ha containing dense, moderately tall grass, low to moderate shrub density with 50-75% of shrubs <1.5 m tall, and shrub cover between 15-35%. Areas where most shrubs were <1.5 m in height were considered too sparse in providing adequate numbers of perch sites, whereas areas where most shrubs were >1.5 m were considered too sparse in providing adequate numbers of possible nest sites. Areas with >75% shrub cover were too dense to be suitable breeding habitat (Sousa 1983). The key to determining suitability of an area for nesting Field Sparrows in Illinois was the availability of shrubs, trees, or other substrates that could be used as song perches; Field Sparrows stayed within or near the forest edge, not venturing deeper than a few meters into the forest, nor farther than 12-15 m into surrounding fields (Johnston 1947). In Illinois, Field Sparrows preferred shrub-grassland, where shrubs and trees were <8 m tall, over adjacent grassland or woodland edge; shrub-grassland offered an assemblage of grasses, forbs, trees, and shrubs to accommodate temporal shifts in the nesting and foraging preferences of Field Sparrows (Best 1974*a*,1977). All available shrub-grassland habitat was encompassed within territories, whereas not all grassland or woodland edge habitat was encompassed within territories. Within riparian habitats ranging from hayfields to closed canopy woodlands in Iowa, Field Sparrow density was positively correlated to species richness of shrubs; 67% of nine nests were built in shrubs, 22% in evergreen trees, and 11% in forbs (Stauffer and Best 1980, Best et al. 1981). Also in Iowa, Field Sparrows preferred grassy areas with shrubs or low trees (Laubach 1984). In Wisconsin, Field Sparrow density was positively correlated with percent woody cover and total number of dead stems (Sample 1989). In North Dakota, Field Sparrows were attracted to wooded draws with a high shrub density (Faanes 1983). In Missouri, grasslands and idle areas occupied by Field Sparrows were characterized by low to intermediate canopy height (2-8 m, never >8 m), few woody stems <2.5 cm diameter at breast height (dbh) (approximately 350-700/ha), and moderate numbers of woody stems $\geq$2.5 cm dbh (approximately 25-50/ha) (Kahl et al. 1985).

Moderate amounts of dense grass also are important (Sousa 1983). Optimal grass density is 50-90% canopy cover, which provides adequate nesting cover, abundant food sources, and ease of movement through vegetation (Sousa 1983). Optimal height of herbaceous vegetation during May and June is 16-32 cm; vegetation with an average height >40 cm provides suboptimal habitat and vegetation with an average height <5 cm provides inadequate concealment (Sousa 1983). In Wisconsin, Field Sparrows preferred habitats that were relatively undisturbed, that were uncultivated, and that contained an average of 75% herbaceous cover (Sample 1989). In an Ohio oldfield, Field Sparrows foraged in grasses in higher frequencies

than expected based on their availability (Kupsky 1970). In Michigan, Field Sparrows preferred to nest in residual stands of Indiangrass (*Sorghastrum nutans*) over residual stands of big bluestem (*Andropogon gerardii*) because most of the big bluestem was prostrate whereas most of the Indiangrass was upright (Best 1974*a*).

Nest height ranges from 0 to 4.4 m above ground (Walkinshaw 1936, 1945, 1978; Crooks 1948; George 1952; Ely 1957; Nolan 1963; Kupsky 1970; Best 1978; Evans 1978; Lanyon 1981; Buech 1982; Laubach 1984; Carey et al. 1994; D. E. Burhans, North Central Forest Experiment Station, Columbia, Missouri, pers. comm.), but height is dependent upon time of season and substrate type. Field Sparrows nest on or near the ground in weed clumps, grass tufts, or litter early in the breeding season (May-June), but nest in small shrubs and saplings later in the breeding season as vegetative cover increases in height (Walkinshaw 1936, 1945, 1978; Crooks 1948; Crooks and Hendrickson 1953; Nolan 1963; Best 1974*a*, 1978; Evans 1978; Sousa 1983; Carey et al. 1994). Based on the observations of one male that returned to the same Michigan site for 6 yr, May nests were on the ground, and June and July nests averaged 26.0 cm and 40.5 cm above the ground, respectively (Walkinshaw 1945). In Iowa, six of 11 nests built in May were above ground with an average height of 16 cm; by June, six of 10 nests were above ground with an average height of 40 cm, and by July, all of the 11 nests found were above ground with an average of 51 cm (Crooks 1948). It has been surmised that Field Sparrows nest in woody vegetation after foliage becomes dense enough to conceal nests (Crooks 1948, Nolan 1963, Walkinshaw 1978). However, Best (1978) found that Field Sparrows preferred to use residual grasses as a nesting substrate over live grasses or woody vegetation that had leafed out. As long as isolated clumps of residual grass remained exposed from new growth, Field Sparrows nested in residual grass; once residual grass was covered by live grasses, Field Sparrows nested in woody vegetation.

Other habitat features that appear important to Field Sparrows are vegetation patchiness, species richness of herbaceous and woody vegetation, and slope (Stauffer and Best 1980, Best et al.1981, Sample 1989, Vickery et al. 1994). In riparian habitats in Iowa, Field Sparrow densities were positively correlated to horizontal patchiness of shrubs, vertical patchiness of trees, slope, and species richness of grass-like vegetation, shrubs, and evergreen trees; densities were negatively correlated to tree density and tree size, species richness of vines, and vertical stratification of vegetation (Stauffer and Best 1980, Best et al. 1981). In Maine grassland barrens, abundance was positively correlated to habitat patchiness, litter, shrub cover, and short grass, and negatively correlated to bare ground (Vickery 1993, Vickery et al. 1994). Field Sparrow density in Wisconsin was positively correlated to plant species richness (Sample 1989). In Iowa, all 15 breeding territories in an idle pasture were located on semi-wooded hillsides or lowlands (Crooks and Hendrickson 1953). A male Field Sparrow occupied a steep hillside for 6 consecutive years (Walkinshaw 1945). A table near the end of the account lists the specific habitat characteristics for Field Sparrows by study.

<u>Area requirements</u>:

The habitat suitability model for Field Sparrows posited that breeding habitat should be >2 ha (Sousa 1983). However, Kupsky (1970) and Petter et al. (1990) found that Field Sparrows were breeding on fields <2 ha. In Illinois, Field Sparrows were encountered on small (<10 ha) sites but were classified as moderately tolerant to habitat fragmentation because they were more frequently encountered on large than on small grassland fragments (Herkert 1991*a*,*b*). Field

Sparrows in this study, however, were more strongly influenced by habitat structure than grassland area, and their absence from some small grassland areas may have been due to a lack of suitable habitat rather than an avoidance of small areas per se (Herkert 1991*a*; J. R. Herkert, Illinois Endangered Species Protection Board, Springfield, Illinois, pers. comm.). In Maine, Field Sparrow occurrence was not affected by field size (Vickery et al. 1994). Territory sizes range from 0.3 to 2.4 ha (Walkinshaw 1945, 1968, 1978; Crooks 1948; Best 1977; Evans 1978; Laubach 1984). In Illinois, territories that included suboptimal habitats, such as grasslands devoid of woody vegetation and woodlands, were found to be larger in area than those habitats that included only optimal habitat, such as shrubby grassland (Best 1977).

Brown-headed Cowbird brood parasitism:

Brood parasitism of Field Sparrow nests by Brown-headed Cowbirds (*Molothrus ater*) is common (Friedmann 1963, Friedmann et al. 1977). Parasitism rates vary from <1% of 371 nests (M. Carey in Carey et al. 1994) to 80% of 20 nests (Crooks 1948, Crooks and Henderson 1953). Refer to Table 1 in Shaffer et al. (2003) for rates of cowbird brood parasitism. Field Sparrows may be multiply parasitized (Burhans et al. 2000). Because adult Field Sparrows commonly desert nests due to brood parasitism, they may be poor hosts (Walkinshaw 1949, 1968, 1978; George 1952; Crooks and Hendrickson 1953; Ely 1957; Best 1978; Carey et al. 1994; Burhans 2000; Burhans et al. 2000). Of 182 parasitized nests in Michigan, 100 were deserted and only 27 of 234 cowbird eggs hatched (Walkinshaw 1968). In Illinois, 5 of 25 nests were parasitized and 3 of 5 deserted nests also were parasitized (Best 1979). In another Illinois study, 14 of 29 parasitized nests were deserted, compared to none of 21 unparasitized nests (Strausberger and Burhans 2001). In Michigan, only eight of 29 cowbird eggs hatched and, of these, only one cowbird fledgling survived the first week (Crooks 1948). In Missouri, 21 of 47 parasitized nests were deserted; of 54 cowbird eggs in 50 nests, only 4 cowbird chicks fledged from 4 nests (Burhans et al. 2000, Strausberger and Burhans 2001).

For Field Sparrows, no studies have investigated a relationship between patch size and nest success or patch size and rates of brood parasitism by Brown-headed Cowbirds. In an Illinois oldfield surrounded by woodland, six Field Sparrow nests parasitized by Brown-headed Cowbirds were an average of 13.4 m from the woodland (Best 1978).

Breeding-season phenology and site fidelity:

Field Sparrows arrive on the breeding grounds from about mid-March to early May, and depart late August to early November (Walkinshaw 1936, 1945, 1968, 1978; George 1952; Crooks and Hendrickson 1953; Easterla 1962; Stewart 1975; Best 1977; Evans 1978; Johnsgard 1980; Faanes 1981; Dinsmore et al. 1984; Laubach 1984; Carey et al. 1994). In Michigan, females arrive from late April to early May, about 3 wk later than males arrived (Walkinshaw 1978). Multiple (as many as ten) nest attempts per pair have been reported following failure of previous nesting attempts (Walkinshaw 1945, 1978; George 1952; Best 1974*b*; Evans 1978; Carey et al. 1994). There are known cases of Field Sparrows double- and triple-brooding (Walkinshaw 1945, George 1952, Evans 1978, Carey et al. 1994). In Pennsylvania, 30% of 160 females successfully fledged two broods, and 1% successfully fledged three broods (Carey et al. 1994). Fidelity to breeding sites does occur; in only one documented case has a banded fledgling returned and bred at the natal site (Walkinshaw 1945, 1978; George 1952; Best 1977, 1979; Carey et al. 1994). In Michigan, Walkinshaw (1978) reported instances of pairs mating

for two successive years. Walkinshaw (1945) also documented that one male returned to the same breeding territory for six consecutive summers.

Species' response to management:

Complete removal of woody vegetation from an area may make it unattractive to Field Sparrows (Stauffer and Best 1980, Sousa 1983). In Illinois, Field Sparrows appeared tolerant to burning in shrub-grassland if woody vegetation remained and burning occurred after territories had been established (Best 1979). Field Sparrows moved from the adjacent burned tallgrass and woodland edge into the shrub-grassland. Burning also caused a decrease in parasitism rates and nest desertion resulting from parasitism. Also in Illinois, Field Sparrows preferred burned areas 3-4 yr postburn but were not present ≥5 yr postburn (Westemeier and Buhnerkempe 1983; Herkert 1991*a*, 1994*a*). In Iowa, one nest was found just 27 d after the area was burned (Laubach 1984). In Wisconsin, Field Sparrow density was positively correlated with the proportion of plots that was burned (Sample 1989). In Kansas tallgrass prairie, Field Sparrows did not occur in annually burned watersheds, probably because they lacked woody vegetation (Zimmerman 1993). In the same study area, Field Sparrows occurred in prairie that was neither burned or grazed, but were absent from ungrazed prairie that was annually burned (Zimmerman 1997). In Nebraska, Field Sparrow abundance did not differ between pastures grazed by cattle and a pasture grazed by American bison (*Bison bison*), or between burned and unburned areas in the pasture grazed by American bison (Griebel et al. 1998). In Maine, Field Sparrows avoided grassland barrens ≥3 yr postburn (Vickery 1993). In Michigan, following a burn in early spring, only males that had bred on the burned area the previous year bred on the burned area (Walkinshaw 1945). Some males whose territories were severely burned did not acquire a mate until the vegetation had recovered. One male did not acquire a mate until July but still was able to successfully nest.

In Illinois, Field Sparrows selected idle areas over areas that were high-mowed (stubble >30 cm remains on the field), and were absent in hayed areas (Westemeier and Buhnerkempe 1983). However, in another Illinois study, Field Sparrows were absent from both tame hayfields and idle fields (Herkert 1991*a*). In Iowa, Field Sparrows nested only in grassed waterways that were mowed the previous year (Bryan and Best 1994). Also in Iowa, they nested in low densities in strip cover, such as grassed waterways, terraces, fencerows, and road rights-of-way (Basore et al. 1986). They also nested in soybean fields that were not tilled in fall and spring and that contained year-round crop residue; they did not nest in spring-tilled fields. In Illinois, Field Sparrows were observed more frequently in a corn field under no-tillage treatment than in a conventionally tilled corn field, possibly because there was greater availability of invertebrates in the former corn field (Warburton and Klimstra 1984). In a study of avian use of cropland in Ohio, Field Sparrows used fallow cropland, pasture, and small grains grown in strips between idle cropland (Good and Dambach 1943). In Wisconsin, Field Sparrows were absent from hayfields and cropland (Sample 1989). In New York, Field Sparrows avoided fields mowed annually and nested in oldfields 2-16 yr following the cessation of cultivation; after that time the fields were no longer attractive, probably due to lack of suitable nesting cover such as weeds and saplings (Lanyon 1981). McCoy et al. (1999) reported that fecundity of Field Sparrows over 3 yr in Missouri CRP fields was high enough to maintain a stable population.

Little information exists concerning the effects of pesticides on Field Sparrows. In New York, carbaryl was sprayed on shrubs at normal levels and at levels six times the normal dose

(Bart 1979). Field Sparrows were not affected by the spraying; the number of singing male Field Sparrows did not significantly differ between the treated areas and the control areas. In New York, Field Sparrows did not breed for 18 yr in a field where vegetation was removed by a one-time application of 2,4,5-T and kerosene (Lanyon 1981). In Texas, in a study examining the effects on avian density of discing, spraying of 2,4,5-T approximately 14 yr earlier, and construction of brush shelters, grassland sparrows, as a group, were more abundant in the treated than untreated areas; effects on particular species, such as Field Sparrow, composing the group of grassland sparrows, were not examined (Gruver and Guthery 1986). In a study examining the effects of DDT dust for tick (*Amblyomma americanum*) control in Texas, numbers of nesting Field Sparrows decreased in the treated area (George and Stickel 1949).

Management Recommendations:

Avoid management practices that completely remove woody vegetation (Best 1979, Stauffer and Best 1980).

Protect existing prairie remnants (Herkert 1994*b*). Collaborate with private landowners to maintain habitat suitable for breeding Field Sparrows (Herkert 1994*b*).

Manipulations of forested riparian habitats that benefit Field Sparrows include reducing woody vegetation to narrow strips, partially removing woody canopy, and thinning shrubs and saplings (Stauffer and Best 1980).

Disturbance, such as burning, should be avoided before territories have been established, approximately March to early April (Best 1979, Carey et al. 1994, Herkert 1994*b*). Burning after territories already have been established does not appear to cause Field Sparrows to abandon their territories (Best 1979, Carey et al. 1994).

Burning should be used to prevent encroachment of woody vegetation, but some woody vegetation should be allowed to remain (Best 1979, Carey et al. 1994, Herkert 1994*b*).

On prairie fragments >80 ha, burning should be conducted on a rotating schedule with 20-30% of area treated annually (Herkert 1994*a*). Small, isolated prairie fragments should not have more than 50-60% of total area burned at a time, and where several small prairie fragments are present, a rotating schedule also can be implemented to provide adjacent burned and unburned areas (Herkert 1994*a*).

In Iowa, mowing should be delayed until late August or early September to prevent destruction of nests and young; however, mowing should not occur later than mid-September, as vegetation will not have time to recover before the winter and following spring (Bryan and Best 1991).

Minimize tillage, because conventional tillage leaves little or no crop residue on the soil surface. Reduced tillage allows 15-30% of crop residue to remain, whereas conservation tillage allows $\geq$30% of crop residue to remain (Basore et al. 1986, Koford and Best 1996).

Table. Field Sparrow habitat characteristics.

Author(s)	**Location(s)**	**Habitat(s) Studied***	**Species-specific Habitat Characteristics**
Bart 1979	New York	Idle	Abundance did not significantly differ among control areas, areas treated with normal doses of carbaryl (1-naphthyl methylcarbamate), and areas treated with doses six times above normal
Basore et al. 1986	Iowa	Cropland, idle	Nested in strip cover (fencerows, road rights-of-way, terraces, and waterways) and untilled fields where soybeans were planted into corn residue; did not nest in tilled fields or untilled fields where corn was planted into sod or corn was planted into corn residue
Best 1974*a*, 1977, 1978	Illinois	Idle, idle seeded-native, woodland, woodland edge	Preferred to nest in standing litter in shrub-grassland early in the season and in trees and shrubs later in the season; average nest heights ranged from 30 cm above ground for nests in grasses, 36 cm for those in forbs, and 45 cm for those in trees and shrubs; territories were never confined solely to grassland or shrub-woodland; preferred to nest in upright, residual Indiangrass (*Sorghastrum nutans*) over prostrate, residual big bluestem (*Andropogon gerardii*)
Best 1979	Illinois	Burned idle, burned seeded-native, burned woodland edge, idle, idle seeded-native, woodland, woodland edge	Appeared to tolerate burning in shrub-grassland if woody vegetation remains and burning occurs after territories have been established; nest parasitism and nest desertion caused largely by parasitism both declined after burning

Bryan and Best 1994	Iowa	Cropland, idle tame, tame hayland	Nested only in waterways that were hayed the previous year
Buech 1982	Minnesota	Conifer plantation	Nested in Scotch pine (*Pinus sylvestris*) plantation; average height of nest tree was 142 cm and average nest height was 44 cm
Carey et al. 1994	Rangewide	Idle, woodland, woodland edge	Used areas with scattered woody vegetation such as oldfields, road rights-of-way, railroad rights-of-way, and woodland edges; early nests were on the ground in grass clumps or at the base of shrubs, and later nests were in shrubs and small trees
Crooks 1948, Crooks and Hendrickson 1953	Iowa	Idle tame pasture, tame pasture	Nested in weed clumps or small shrubs on partially wooded hillsides but never on ridgetops; number of nests built on the ground decreased as the height of vegetative cover increased; in May, six of 11 nests were built above ground in hawthorn (*Crataegus*) shrubs, and average height was 16 cm; in June, six of 10 nests were built above ground in hawthorn shrubs, and average height was 40 cm; in July, all of 11 nests were in shrubs (mostly hawthorn), and average nest height was 51 cm above ground; May nests that were on the ground were in forb clumps such as gromwell (*Lithospermum latifolium*), European gromwell (*Lithospermum officinale*), and rigid goldenrod (*Solidago rigida*); three of the June nests were in gromwell clumps and one was in a dense tangle of Kentucky bluegrass (*Poa pratensis*) and wild buckwheat (*Polygonum convolvulus*)
Dinsmore et al. 1984	Iowa	Idle, pasture, woodland edge	Nested in idle fields, pastures containing shrubs, and woodland edges
Ely 1957	Oklahoma	Idle, tame pasture,	Used edges of willow (*Salix*) groves and oldfields; nested in

		woodland, woodland edge	juniper (*Juniperus)*, persimmon (*Diospyros virginiana*), winged elm (*Ulmus alata*), and greenbrier (*Smilax bona-nox*); nest heights ranged from about 60 to 90 cm; the only successful nest was in juniper
Evans 1978	Michigan	Idle	Nested on the ground, in herbaceous cover (5-25 cm above ground), in small trees (5-90 cm), and in dwarf juniper (*Juniperus communis*) (7-90 cm); preferred nesting in juniper; nest success in junipers was significantly higher than in other substrates, but nests in junipers were parasitized by Brown-headed Cowbirds (*Molothrus ater*) at a slightly higher rate
Faanes 1981	Minnesota, Wisconsin	Conifer plantation, cropland, idle, idle tallgrass/tame, tame hayland, wetland, wet meadow, woodland	Nested in oldfields, idle fields, young pine (*Pinus*) plantations, and brushy forest openings
Faanes 1983	North Dakota	Idle mixed-grass, mixed-grass pasture	Occurred in wooded draws with high shrub density and low percent canopy cover
Faanes and Lingle 1995	Nebraska	Cropland, idle mixed-grass, idle shortgrass, idle tallgrass, pasture, sand-sage grassland, tame hayland, wetland, wet meadow, woodland	Nested in upland prairie, lowland forest, and river channel islands; found most often on the edge of native grassland that was being invaded by Rocky Mountain juniper (*Juniperus scopulorum*) and that contained an abundance of soapweed yucca (*Yucca glauca*); also used shrubby thickets, field edges, and extensive growths of willow saplings on river channel islands
George 1952	Michigan	Cropland, hayland, pasture, woodland edge	Placed territories along forest edge; usually nested on the ground or within 75 cm of the ground
Good and Dambach	Ohio	Cropland, idle, pasture	Were observed in idle cropland, pasture, and small grain grown

1943			in strips between strips of idle cropland
Graber and Graber 1963	Illinois	Cropland, hayland, idle, idle grassland, tame pasture, wetland, woodland	Used shrubs, hedgerows, orchards, and pastures
Herkert 1991*a*	Illinois	Burned seeded-native, burned tallgrass, cropland, idle seeded-native, idle tallgrass, idle tame, tame hayland	Were most abundant on large and small prairie fragments three growing seasons (>25 months) postburn, and were absent from tame grass areas, both hayed and idle; were moderately tolerant to fragmentation. Univariate analysis: density was significantly and positively correlated with average number of live grass contacts, average number of live forb contacts, and woody stem density/m^2; density was significantly and negatively correlated with average grass height, total number of contacts of grass, forb, and dead vegetation, and area. Multivariate analysis: density was significantly and positively correlated with shrub and forb abundance, and significantly and negatively correlated with total vegetation richness and live plant richness
Herkert 1991*b*	Illinois	Idle seeded-native, idle tallgrass, idle tame	Were present on tallgrass prairie fragments <10 ha
Herkert 1994*a*	Illinois	Burned seeded-native, burned tallgrass	Were most abundant three growing seasons (>25 months) postburn; abundance was negatively associated with area
Herkert 1994*b*	Illinois	Idle seeded-native, idle tallgrass, idle tame	Positive predictor of occurrence was mean vegetation height; negative predictor of occurrence was mean grass height; occurrence was unaffected by field size
Johnsgard 1980	Nebraska	Idle, idle hayland, idle mixed-grass, idle shortgrass, idle tallgrass, mixed-grass pasture,	Were found in brushy woodlands, forest edges, brushy ravines, idle hayfields, forest clearings, and similar open habitats having scattered shrubs or low trees

		tallgrass pasture, woodland, woodland edge	
Johnston 1947	Illinois	Hayland, woodland, woodland edge	Used woodland edge; were not found deep in woodland or >12-15 m into surrounding hayfields; important factor in habitat suitability was availability of shrubs, trees, or fences used as song perches
Kahl et al. 1985	Missouri	Burned tallgrass, cropland, idle, idle tallgrass, tallgrass hayland, tallgrass pasture, woodland, woodland edge	Used oldfields and grassland areas with low to moderate canopy height (2-8 m), dense ground vegetation, few woody stems <2.5 cm diameter at breast height (dbh), and a moderate number of woody stems ≥2.5 cm dbh
Kupsky 1970	Ohio	Idle	Nested in hawthorn, saplings, berry (*Rubus* spp.) clumps, and on the ground; nests were <25 cm from the ground and were partially concealed by dead vegetation
Lanyon 1981	New York	Hayland, idle	Nested in shrubs at an average height of 20 cm, and in herbaceous vegetation at an average height of 18 cm tall; also nested on the ground; used oldfields 2-16 yr after cultivation ceased; avoided areas mowed annually
Laubach 1984	Iowa	Burned tallgrass, idle tallgrass	Preferred a combination of grassy areas with shrubs or low trees; nested in tall forbs such as rosin-weed (*Silphium integrifolium*) and in wild plum (*Prunus americana*); nest heights were as high as 1 m; one nest was found in a recently burned area
McCoy et al. 1999	Missouri	CRP (idle seeded-native, idle tame)	Fecundity over 3 yr within CRP fields was high enough to support a stable population

Nolan 1963	Indiana	Idle, woodland, woodland edge	Of 21 nests initiated in May, 17 were placed on the ground; on 23 May, the first elevated nest was built; by 3 June, all nests were elevated; 48 plant species were used as nesting substrates, and the three most commonly used plant species for nesting were American elm (*Ulmus americanus*), blackberry (*Rubus*), and hawthorn; elevated nests heights ranged from 0.15 to 3 m, with an average of 1 m
Sample 1989	Wisconsin	Burned tallgrass, cropland, DNC (idle seeded-native, idle tame), idle, idle seeded-native, idle tallgrass, idle tallgrass/tame, idle tame, tame hayland, tame pasture, tame savanna pasture, wet meadow, wet-meadow pasture	Preferred dry to slightly mesic, brushy areas that were undisturbed or uncultivated; used areas characterized by an average of 75% herbaceous cover, 18% litter cover, 7% bare ground, 72 cm maximum vegetation height, and 20 cm vegetation height/density; density was positively correlated with percent woody cover, total number of dead stems, proportion of burned plots, and number of plant species
Sousa 1983	Rangewide	Idle, woodland, woodland edge	Habitat suitability model posited that Field Sparrows used areas >2 ha that contained dense (50-90% of canopy cover), moderately tall grass, low to moderate shrub density with 50-75% of shrubs <1.5 m tall, and shrub cover between 15-35%; areas where all shrubs were <1.5 m were considered sparse in numbers of perch sites, whereas areas with all shrubs >1.5 m were considered sparse in numbers of possible nest sites; areas with >75% shrub cover were too dense; optimal height of herbaceous vegetation during May and June was 16-32 cm; average herbaceous vegetation heights >40 cm provided suboptimal habitat and heights <5 cm provided inadequate concealment
Stauffer and Best		Hayland, idle, pasture,	Nested in shrubs, coniferous trees, and forbs; density was

1980, Best et al. 1981	Iowa	woodland, woodland edge	positively associated with horizontally patchy shrubs, vertically patchy trees, slope, and species richness of grass-like vegetation, shrubs, and evergreen trees; density was negatively associated with tree density and tree size
Stewart 1975	North Dakota	Idle mixed-grass, woodland	Nested in mixed-grass prairie containing silver sagebrush (*Artemisia cana*), brushy draws, woodlands, and thickets
Vickery 1993, Vickery et al. 1994	Maine	Eastern grassland barren: burned, mowed, and/or sprayed with herbicides	Avoided grasslands ≥3 yr postburn; density was positively correlated with litter, shrub cover, short grass, area, and habitat patchiness; density was negatively correlated with area and bare ground
Walkinshaw 1936, 1968	Michigan	Idle	Built early nests on the ground; later nests were built in small shrubs and tree saplings and ranged from 5 to 120 cm above the ground; most nests were 15 to 30 cm above ground
Walkinshaw 1945	Michigan	Idle	Based on one male that returned to the same area for six summers, 15 nests were found; May nests were built on the ground underneath tufts of dead grass; June nests averaged 26 cm above ground, and July nests averaged 40.5 cm; eight of the above-ground nests were in New Jersey tea bushes (*Ceanothus americanus*) ranging in height from 24 to 48 cm and two nests were in small bitternut hickory (*Carya cordiformis*) trees 11 and 23 cm above ground
Walkinshaw 1978	Michigan	Idle	In May, nests were built on the ground under clumps of Carolina crabgrass (*Digitaria cognata* var. *cognata*); from June to August, nests were found in New Jersey tea bushes, hawthorn (*Crataegus* sp.), blackberry (*Rubus* spp.), and small oaks (*Quercus* spp.); mean height of nests in June was 21 cm; mean height of nests in both July and August was 31 cm
Westemeier and		Burned tallgrass, idle	Preferred burned areas 3-4 yr postburn, were absent ≥5 yr

Buhnerkempe 1983	Illinois	seeded-native, tallgrass hayland	postburn; selected idle areas over high-mowed (leaves stubble 30-50 cm high) areas; did not occur in hayed areas

*In an effort to standardize terminology among studies, various descriptors were used to denote the management or type of habitat. "Idle" used as a modifier (e.g., idle tallgrass) denotes undisturbed or unmanaged (e.g., not burned, mowed, or grazed) areas. "Idle" by itself denotes unmanaged areas in which the plant species were not mentioned. Examples of "idle" habitats include weedy or fallow areas (e.g., oldfields), fencerows, grassed waterways, terraces, ditches, and road rights-of-way. "Tame" denotes introduced plant species (e.g., smooth brome [*Bromus inermis*]) that are not native to North American prairies. "Hayland" refers to any habitat that was mowed, regardless of whether the resulting cut vegetation was removed. "Burned" includes habitats that were burned intentionally or accidentally or those burned by natural forces (e.g., lightning). In situations where there are two or more descriptors (e.g., idle tame hayland), the first descriptor modifies the following descriptors. For example, idle tame hayland is habitat that is usually mowed annually but happened to be undisturbed during the year of the study.

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