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Effects of Management Practices on Grassland Birds: Sedge Wren

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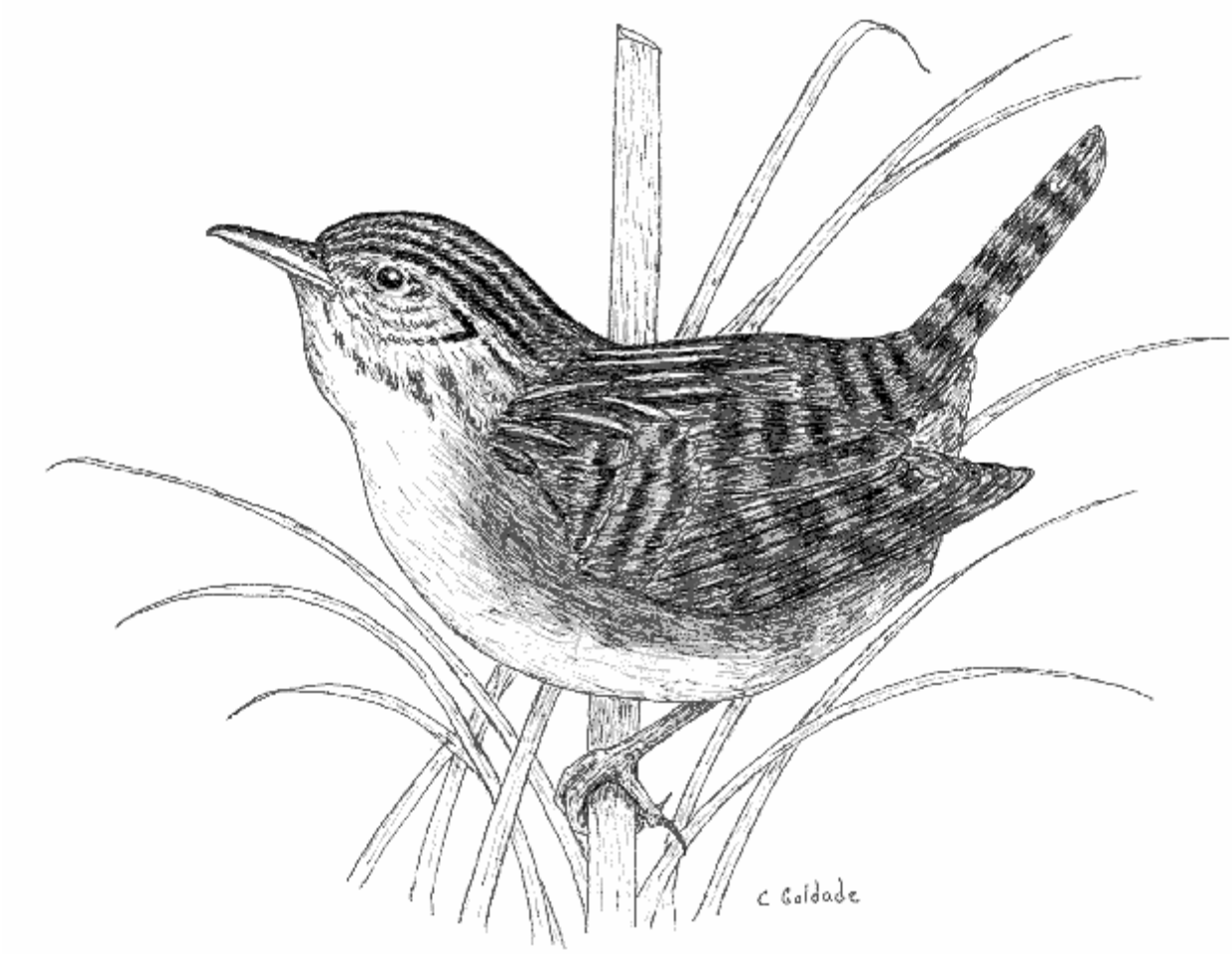

Grasslands Ecosystem Initiative
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Jamestown, North Dakota 58401

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

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SEDGE WREN

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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and effects of habitat management on grassland birds were summarized from information in more than 4,000 published and unpublished papers.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.

 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.

SEDGE WREN
(*Cistothorus platensis*)

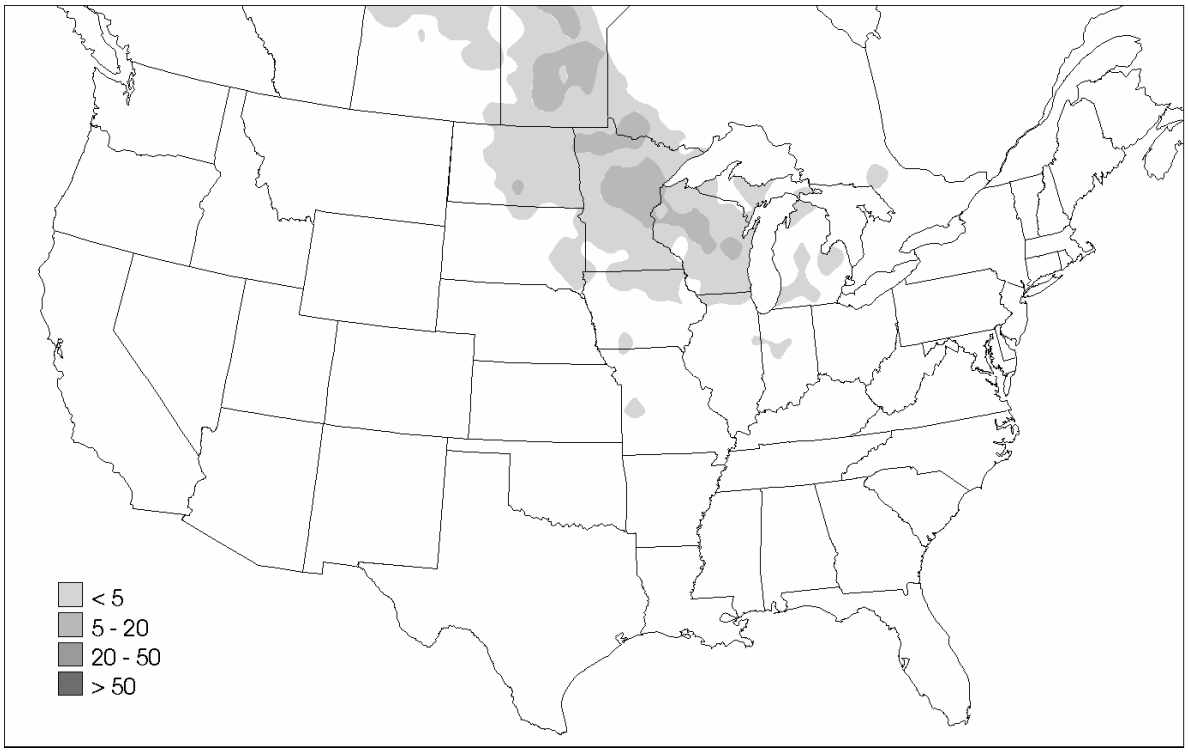

Figure. Breeding distribution of the Sedge Wren in the United States and southern Canada, based on Breeding Bird Survey data, 1985-1991. Scale represents average number of individuals detected per route per year. Map from Price, J., S. Droege, and A. Price. 1995. The summer atlas of North American birds. Academic Press, London, England. 364 pages. (Note: The Breeding Bird Survey may be conducted too early in the southern Great Plains to detect late-season nesting of Sedge Wrens [see Bedell 1996].)

Keys to management include providing tall, dense grassland with moderate forb cover and minimizing disturbances during the breeding season.

Breeding range:

Sedge Wrens breed from eastern Saskatchewan through southern Manitoba and southern Ontario to southern Maine and New Brunswick, south from northeastern Montana and central North Dakota, through eastern South Dakota, to eastern Kansas and eastern Oklahoma, and east to New Jersey, Rhode Island, and New Hampshire (National Geographic Society 1987). (See figure for the relative densities of Sedge Wrens in the United States and southern Canada, based on Breeding Bird Survey data.)

Suitable habitat:

Although Sedge Wrens generally prefer mesic or upland habitats with tall, dense vegetation and moderate forb cover (Bent 1964, Stewart 1975, Renken 1983, Skinner et al. 1984, Clausen 1989, Sample 1989, Johnson and Schwartz 1993*a*), they also have been reported in both upland and mesic areas of short- (30 cm) and mid- (1.2 m) grass prairies in Nebraska and Kansas (Tordoff and Young 1951, Bedell 1987). Sedge Wrens use native and tame vegetation in wet or dry grasslands, sedge (*Carex*) meadows, planted cover (e.g., Conservation Reserve Program

[CRP] fields and dense nesting cover [DNC]), hayfields, lightly grazed pastures, grassed waterways, flooded rice fields, and oldfields (Mousley 1934, Meanley 1952, Birkenholz 1973, Cink 1973, Crawford 1977, Knapton 1979, Johnsgard 1980, Faanes 1981, Burns 1982, Higgins et al. 1984, Skinner et al. 1984, Renken and Dinsmore 1987, Manci and Rusch 1988, Frawley 1989, Sample 1989, Bryan and Best 1991, Frawley and Best 1991, Volkert 1992, Johnson and Schwartz 1993*a*, Dhol et al. 1994, Hartley 1994, Johnson and Igl 1995, King and Savidge 1995, Helzer 1996, Patterson and Best 1996, Best et al. 1997, Delisle and Savidge 1997, Helzer and Jelinski 1999, Horn and Koford 2000). In Wisconsin, Sedge Wrens preferred habitats with a high density of standing and prostrate residual vegetation (Sample 1989). In Iowa, occurrence was positively related to the percent of wetland area composed of wet-meadow vegetation, to the percent of wetland area within a wetland complex composed of wet-meadow vegetation, and to the area of temporary wetlands within a 3-km buffer around each wetland complex; complexes were defined as tracts of land containing from 4 to 15 wetlands ranging from 44 to 144 ha (Fairbairn and Dinsmore 2001*a*,*b*).

Annual precipitation may affect the occurrence of Sedge Wrens and their habitat use. Sedge Wrens typically were found in sedge meadows in Wisconsin and Minnesota, but during dry years they used hayfields, grasslands, and oldfields (Faanes 1981). In North Dakota during wet years, Sedge Wrens used upland grasslands (Johnson 1997). Presence of breeding Sedge Wrens in Nebraska and Kansas may be related to years of high precipitation (Tordoff and Young 1951, Cink 1973, Bedell 1987). During such years, Sedge Wren nests have been located in short (30 cm) grass with standing water (2 cm), in wetlands, shortgrass prairie, and along dry hillsides. In southeastern Saskatchewan and southwestern Manitoba, Sedge Wrens were less common in dry years than in wet years, and used wet meadows during the latter (Knapton 1979). In Kansas, Sedge Wrens were not present during drought years (Zimmerman 1993). A table near the end of the account lists the specific habitat characteristics for Sedge Wrens by study.

Area requirements:

In Illinois native and restored prairies and tame grasslands, area was not as important as vegetation structure in predicting Sedge Wren occurrence; Sedge Wrens were present on tallgrass prairie <10 ha (Herkert 1991*b*, 1994*a*). When restricting analyses to Sedge Wren density within just tallgrass prairie fragments, density was positively correlated to area (Herkert 1994*b*). In the northern Great Plains (North Dakota, South Dakota, and Minnesota), Sedge Wrens favored large areas of contiguous grassland habitat over small grassland patches (D. H. Johnson, *unpublished data*). In a Minnesota sedge meadow, average territory size was 0.2 ha (Burns 1982). In an Illinois burned prairie, Sedge Wren pairs required 3.4 ha of burned prairie to establish territories (Schramm et al. 1986).

Brown-headed Cowbird brood parasitism:

No known records of brood parasitism by Brown-headed Cowbirds (*Molothrus ater*) exist.

Breeding-season phenology and site fidelity:

In the northern Great Plains (North Dakota, Minnesota, and Manitoba), the breeding season of the Sedge Wren extends from late April to early October (Mousley 1934, Walkinshaw 1935, Bent 1964, Stewart 1975, Knapton 1979, Faanes 1981), making it one of the latest-nesting grassland birds. In North Dakota, the peak breeding season is mid-June to early

August (Stewart 1975). In the central and southern Great Plains (Illinois, Iowa, Kansas, Missouri, and Nebraska), Sedge Wrens may not initiate breeding until July or August (Schwilling 1982, Skinner et al. 1984, Schramm et al. 1986, Bedell 1987, Lingle and Bedell 1989, Zimmerman 1993, Kent and Dinsmore 1996). One possible explanation for late breeding attempts is that Sedge Wrens from northern areas may move to southern areas and raise a second brood because of the longer nesting season (Bedell 1996). Sedge Wrens migrate through Kansas during late April and early May, only to return in July to breed during years of normal precipitation levels (Zimmerman 1993). In Minnesota, Sedge Wrens were double-brooded (Burns 1982).

Species' response to management:

Spring burning in tallgrass prairie can improve habitat by increasing vegetation height and density and decreasing litter (Eddleman 1974, Schramm et al. 1986). In westcentral Illinois, Sedge Wrens preferred nesting and foraging in spring-burned areas, yet relied on unburned areas as a source of litter for nest building (Schramm et al. 1986). In northeastern and eastcentral Illinois, Sedge Wrens showed no significant response to prescribed burning, although they did not use a spring-burned prairie fragment of 650 ha 1 yr postburn and were absent in small (1.4-32 ha) prairie fragments 1-3 yr postburn (Herkert 1991*a*, 1994*b*). However, these results probably were influenced by climatic factors; the first two years of the study were excessively dry and the third year was abnormally wet. In Illinois Greater Prairie-Chicken (*Tympanuchus cupido*) sanctuaries, Sedge Wrens preferred burned areas 3 yr postburn over hayed and idle areas (Westemeier and Buhnerkempe 1983). In North Dakota, Sedge Wren occurrence appeared to be unrelated to number of years since last burn, other than a reduction 1 yr postburn (Johnson 1997). In Nebraska, Sedge Wrens avoided recently burned CRP fields (Delisle and Savidge 1997). During years of normal precipitation in Kansas, Sedge Wrens breed in unburned prairie, as well as prairie burned earlier in the breeding season; during drought years, they may not breed regardless of burn treatment (Zimmerman 1993). In Missouri, Nebraska, and Wisconsin, Sedge Wrens were present by July or August on tallgrass prairies burned in the spring of the same year (Skinner et al. 1984, King 1991, Volkert 1992). Likewise in North Dakota, Sedge Wrens were present in July on a mixed-grass prairie burned in the spring of the same year (Higgins et al. 1984). In a Kansas study of spring-burned and unburned native CRP fields, abundance of Sedge Wrens was nonsignificantly higher on unburned than spring-burned CRP fields (Robel et al. 1998).

In the Midwest (Wisconsin, Iowa, Missouri), Sedge Wrens preferred hayfields that were dense, lush, and unmown (Skinner 1975, Sample 1989, Frawley and Best 1991). Sedge Wrens did not use hayfields after the hayfields were mowed (Skinner 1975, Frawley and Best 1991, Herkert 1991*a*, Delisle and Savidge 1997). In Iowa, Sedge Wrens nested in grassed waterways that were not mowed the previous year (Bryan and Best 1994). In North Dakota, Sedge Wrens were significantly more abundant in the year after mowing in idled portions of CRP fields than in mowed portions (Horn and Koford 2000). During one year of the two-year study, they were present only in idled portions of CRP fields and not in mowed portions.

Throughout their breeding range, Sedge Wrens avoid areas where vegetation is <10 cm in height, or where vegetation density has been reduced by moderate to heavy grazing (Skinner 1974, 1975; Kantrud 1981; Messmer 1985; Lingle and Bedell 1989). In Missouri, Sedge Wrens preferred lightly grazed areas where vegetation height was >30.4 cm, followed by idle grasslands and moderately grazed fields where vegetation height was 20.3-30.4 cm (Skinner 1975). In

North Dakota, Sedge Wrens were more abundant in idle areas than in pastures under season-long or twice-over grazing systems (Messmer 1990). In southwestern Wisconsin, Sedge Wrens were more abundant in rotationally grazed pastures than in continuously grazed pastures or in ungrazed pastures (Temple et al. 1999). Ungrazed grasslands were neither mowed or grazed from 15 May to 1 July. Continuously grazed sites were grazed throughout the summer at levels of 2.5-4 animals/ha. Rotationally grazed pastures, stocked with 40-60 animals/ha, were grazed for 1-2 d and then left undisturbed for 10-15 d before being grazed again; pastures averaged 5 ha. All sites were composed of 50-75% cool-season grasses, 7-27% legumes, and 8-23% forbs.

In North Dakota, Sedge Wren density was significantly higher in DNC than in either idle or grazed native prairie (Renken and Dinsmore 1987). DNC habitat was characterized by high grass and litter cover, moderate forb cover, low shrub cover, and low amounts of bare ground. In Saskatchewan, Sedge Wrens preferred DNC (tame or native not specified) to idle native grasslands or wheat fields (Hartley 1994). In Manitoba, Sedge Wren abundance was higher in native DNC and tame DNC than in idle native grasslands; productivity was higher in native DNC than in idle grasslands, but not significantly higher than in tame DNC (Dhol et al. 1994, Jones 1994). In Alberta, Sedge Wrens were found in 3-4 yr old tame DNC fields, but their numbers were very low (Prescott and Murphy 1999).

In eastcentral Wisconsin, Sedge Wrens gradually increased in subsequent years following the restoration of a tallgrass prairie (Volkert 1992). Sedge Wrens also were found on restored tallgrass prairies in Illinois and Kansas (Westemeier and Buhnerkempe 1983, Schramm et al. 1986, Cink and Lowther 1989). In North Dakota, Sedge Wrens were the most common species within fields seeded to native grasses (Higgins et al. 1984). In South Dakota, Sedge Wrens were attracted to rank, dense growth of green needlegrass (*Stipa viridula*) in restored fields, which had formerly been cornfields and soybean fields, 2-4 yr after being seeded to prairie grasses (Blankespoor 1980).

In studies of bird use of cropland in the Great Plains (Illinois, Iowa, Kansas, Manitoba, Minnesota, Missouri, Montana, Nebraska, North Dakota, Saskatchewan, and South Dakota), Sedge Wrens were not found in cropland (Patterson and Best 1991, Johnson and Schwartz 1993*b*, Hartley 1994, Jones 1994, Johnson and Igl 1995, Best et al. 1997). In a Saskatchewan study comparing bird use of uplands and wetlands in conventional, minimum-tillage, and organic farmland and DNC, Sedge Wrens were present only in organic farmland and DNC in uplands (Shutler et al. 2000). They were more abundant in organic farmland than in DNC. In Arkansas, Sedge Wrens nested in flooded rice fields when plant height reached 50 cm (Meanley 1952).

Wetlands that have been modified for waterfowl production are commonly used by Sedge Wrens (Brady 1983). In eastern South Dakota, Sedge Wrens were found on dug-brood complexes (a system of channels, ponds, and created islands constructed in wetlands to provide deep, open water and upland nesting areas for waterfowl). Sedge Wren densities were higher in the dug-brood complexes than in unmodified wetlands.

Management Recommendations:

Provide areas of tall, dense planted cover, such as CRP or DNC (Renken and Dinsmore 1987, Johnson and Schwartz 1993*a*, Johnson and Igl 1995, Patterson and Best 1996). In tallgrass prairie, big bluestem (*Andropogon gerardii*) or Indiangrass (*Sorghastrum nutans*) provide tall cover (Skinner et al. 1984). Suitable habitat also may be provided by areas dominated by reed

canary grass (*Phalaris arundinacea*) and switchgrass (*Panicum virgatum*) if wet-prairie or sedge-meadow habitats are not available (Sample 1989).

Minimize disturbance, such as mowing or herbicide spraying, during the breeding season (Sample 1989, Frawley and Best 1991, Herkert 1994*a*, Patterson and Best 1996, Delisle and Savidge 1997). Because Sedge Wrens have such a long nesting season, delay mowing even longer than the date generally recommended for other passerines of 15 July. Spray noxious weeds on a spot-by-spot basis, rather than on an entire-field basis (Delisle and Savidge 1997).

In tallgrass prairie, create a mosaic of burned and unburned areas to provide for both nesting and foraging needs of the Sedge Wren (Schramm et al. 1986, Volkert 1992).

Prevent encroachment by woody species in idle grassland by periodic disturbance (burning, mowing, or grazing) (Sample 1989, Herkert 1994*a*).

In Missouri, a rotational system of two or more grazing units may be most beneficial in providing distinct stands of grasses of various heights, but warm-season grasses should not be grazed <25 cm (Skinner 1975).

Table. Sedge Wren habitat characteristics.

Author(s)	Location(s)	Habitat(s) Studied*	Species-specific Habitat Characteristics
Bedell 1987	Nebraska	Idle, idle tallgrass, wetland, wet meadow	Used tall (1.2-1.5 m) wetland vegetation in a complex of dry wetlands and short grasses; used short grass (≤30 cm) in standing water (2 cm); also were found in bluestem (*Andropogon*) prairie adjacent to wetlands
Bedell 1996	Nebraska	Conservation Reserve Program (CRP; idle seeded-native), idle mixed-grass, mixed-grass pasture, wet meadow	Used partly flooded to dry areas, such as sub-irrigated native meadows, CRP, upland prairie, and sedge (*Carex*) meadows, where vegetative growth was ≥0.5 m
Bent 1964	Rangewide	Cropland, hayland, idle, pasture, wet meadow	Preferred wet meadow dominated by sedges and tall grasses, but also nested in cattails (*Typha*)
Birkenholz 1973	Illinois	Idle, idle tallgrass, idle tame, wetland, wet meadow	Used wet meadows dominated by sedges and bluejoint (*Calamagrostis canadensis*)
Blankespoor 1980	South Dakota	Idle seeded-native, seeded-native pasture	Were attracted to rank, dense growth of green needlegrass (*Stipa viridula*) in a cropland field that was restored to native prairie
Cink 1973	Nebraska	Idle, wetland, wet meadow	Used wetlands with cattails, prairie cordgrass (*Spartina pectinata*), reed canary grass (*Phalaris arundinacea*), and wet-meadow areas
Clausen 1989	Nebraska	Idle seeded-native, wetland	Used areas around wetlands that have been seeded to dense, native grasses, such as big bluestem (*Andropogon gerardii*), switchgrass (*Panicum virgatum*), tall mannagrass (*Glyceria*), and/or Indiangrass (*Sorghastrum nutans*)

Crawford 1977	Iowa	Wetland, wet meadow	Nested in drier parts of wetlands in reed canary grass and river bulrush (*Schoenoplectus fluviatilis*)
Delisle and Savidge 1997	Nebraska	CRP (burned seeded-native, idle seeded-native, idle tame, seeded-native hayland, tame hayland)	Preferred native grasses to cool-season grass/legume fields; abundance significantly and positively correlated to vertical density, percent grass cover, and litter depth; abundance was significantly and negatively correlated to percent litter cover and percent bare ground
Dhol et al. 1994	Manitoba	Dense nesting cover (DNC; idle seeded-native, idle tame), idle mixed-grass	Were more abundant in native DNC (western wheatgrass [*Pascopyrum smithii*], thick-spike wheatgrass [*Agropyron dasystachyum*], streambank wheatgrass [*Agropyron riparian*], slender wheatgrass [*Agropyron caninum*], green needlegrass, big bluestem, switchgrass, and purple prairie clover [*Dalea purpurea*]) than in mixed-grass prairie or tame DNC (tall wheatgrass [*Agropyron elongatum*], intermediate wheatgrass [*Agropyron intermedium*], slender wheatgrass, and alfalfa [*Medicago sativa*]); were more productive in native DNC than mixed-grass prairie
Eddleman 1974	Kansas	Burned tallgrass, burned tallgrass pasture, idle tallgrass, tallgrass pasture, wet meadow	Used low areas with dense sedges and grasses
Fairbairn and Dinsmore 2001*a*,*b*	Iowa	Wetland complex	Occurrence was positively related to the percent of wetland area composed of wet-meadow vegetation, to the percent of wetland area within a wetland complex composed of wet-meadow vegetation, and to the area of temporary wetlands within a 3-km buffer around each wetland complex; complexes were defined as tracts of land containing from 4 to 15 wetlands ranging from 44 to 144 ha
Frawley 1989,	Iowa	Tame hayland	Established territories in grassy, weedy edges between

Frawley and Best 1991			waterways and hayland; average vegetation characteristics of territories were 8% bare ground, 15% grass cover, 78% forb cover, and 48 cm vegetation height
Hartley 1994	Saskatchewan	Cropland, DNC (idle seeded-native, idle seeded-native/tame, idle tame, idle tame hayland), idle mixed-grass	Were found in DNC (tame or native not specified) but not in wheat fields and idle native grasslands
Herkert 1991*a*	Illinois	Burned seeded-native, burned tallgrass, cropland, idle seeded-native, idle tallgrass, idle tame, tame hayland	Were most abundant on large prairie fragments 2 yr postburn, and absent from large prairies 1 yr postburn, small burned prairies, and tame hayland; were moderately tolerant to fragmentation. Univariate analysis: density was significantly and positively correlated to average grass height, average number of live grass contacts, and total number of contacts of live grasses, forbs, and residual vegetation; density was significantly and negatively correlated to percent live contacts. Multivariate analysis: density was significantly and positively correlated to total vegetation richness and vegetation heterogeneity
Herkert 1991*b*	Illinois	Idle seeded-native, idle tallgrass, idle tame	Were present on areas <10 ha
Herkert 1994*a*	Illinois	Idle seeded-native, idle tallgrass, idle tame	Positive predictors of occurrence were high average number of contacts of grass, forb, and dead plant material, and high variability in litter depth, vegetation height and vegetation density; negative predictor was average vegetation height; were unaffected by field size
Higgins et al. 1984	North Dakota	Idle seeded-native	Were found in restored native prairie consisting of western wheatgrass and green needlegrass
Horn and Koford 2000	North Dakota	CRP (idle tame, tame	Were significantly more abundant in the year after mowing

		hayland)	in idled portions of CRP fields than in mowed portions
Johnson and Igl 1995	North Dakota	Cropland, CRP (idle seeded-native, idle tame)	Were found in CRP but not in cropland
Johnson and Schwartz 1993*a*,*b*	Minnesota, Montana, North Dakota, South Dakota	Cropland, CRP (idle seeded-native, idle tame)	Density was positively associated with percent grass cover; were not found in cropland
Kantrud 1981	North Dakota	Mixed-grass hayland, mixed-grass pasture	Avoided areas with heavy grazing
Lingle and Bedell 1989	Nebraska	Wet meadow, wet-meadow pasture	Preferred ungrazed areas with dense cover; nested near wetland borders; predominant wetland vegetation consisted of water sedge (*Carex aquatilis*), common ragweed (*Ambrosia artemisiifolia*), and river bulrush
Meanley 1952	Arkansas	Flooded rice field	Nests were found in flooded rice fields associated with weedy areas and earliest-maturing varieties of rice; were not present until rice was >50 cm tall
Messmer 1985	North Dakota	Idle mixed-grass/tame, mixed-grass/tame pasture	Were found only on idle mixed-grass/tame pastures
Messmer 1990	North Dakota	Idle mixed-grass/tame, mixed-grass/tame hayland, mixed-grass/tame pasture, wet-meadow pasture	In grazed areas, were found only in wet meadow habitats; used idle areas more than grazed; were absent from an idle area after it was mowed
Mousley 1934	Quebec	Wet meadow	Used tall wetland vegetation consisting of tall grasses, rushes (*Juncus*), sedges, and cattails
Patterson and Best 1996	Iowa	Cropland, CRP (idle tame, tame hayland)	Used CRP fields and avoided cropland

Renken 1983, Renken and Dinsmore 1987	North Dakota	DNC (idle tame), idle mixed-grass, mixed-grass pasture	Density was significantly higher in alfalfa-wheatgrass (*Agropyron*) DNC than in either idle or grazed native prairie; occupied areas with high grass and litter cover, moderate forb cover, and low shrub and bare ground cover; used areas were characterized by 74% grass cover, 34% forb cover, 99% litter cover, 3% shrub cover, 23 cm effective height, and 3.5 cm litter depth
Robel et al. 1998	Kansas	CRP (burned seeded-native, idle seeded-native)	Abundance was nonsignificantly higher on unburned than spring-burned CRP fields
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	Were most common in wet areas with tall, dense vegetation but also found in uplands with tall, dense vegetation; occupied areas with an average of 2% woody cover, 82% herbaceous cover, 17% litter cover, 0.2% bare ground, 7% standing residual cover (median value), 1% water cover, maximum vegetation height of 102 cm, and vegetation height/density of 54 cm; density of Sedge Wrens was positively correlated to maximum vegetation height, vegetation height/density, herbaceous cover, standing residual cover, and water cover; abundance was negatively correlated with exposed soil
Schramm et al. 1986	Illinois	Burned seeded-native, idle seeded-native	Foraged and nested in burned areas with dense, tall vegetation and sparse litter; used unburned areas as a source of litter for nest building; breeding pairs required 3.4 ha of burned prairie to establish territory
Shutler et al. 2000	Saskatchewan	Cropland, DNC (idle seeded-native, idle seeded-tame), wetland	Were present in organic farmland and DNC in uplands; were more abundant in organic farmland than in DNC; were not present in wetlands or in minimum-tillage or conventional farmland

Skinner 1974, 1975	Missouri	Idle tallgrass, idle tame, tallgrass hayland, tallgrass pasture, tame hayland, tame pasture	Preferred light grazing (vegetation height >30.4 cm), followed by idle areas and moderate grazing (vegetation height 20.3-30.4 cm); avoided hayland, heavily grazed fields (vegetation height <20.3 cm), fields harvested for seed, and vegetation <10 cm in height
Skinner et al. 1984	Missouri	Burned tallgrass, idle tallgrass, tallgrass hayland, tallgrass pasture, tame pasture	Preferred tall, dense vegetation on lightly grazed or idle land; used prairie 1 yr postburn; approximate combined mean values for percent grass and forb cover at heights of 1, 25, 50, and 100 cm were 25%, 65%, 20%, and <1%, respectively
Stewart 1975	North Dakota	Idle, idle mixed-grass, idle tame, tame hayland, wetland	Used fens and other wetland habitat; also were found in idle cropland and hayfields containing heavy cover
Volkert 1992	Wisconsin	Burned tallgrass (restored), idle tallgrass (restored)	Numbers of Sedge Wrens increased 4 of 5 yr following establishment of tallgrass prairie; number of observed wrens was higher 1 yr postburn than before the burn
Walkinshaw 1935	Michigan	Idle, wet meadow	Preferred nesting in dense, thick wet meadow, where water was not always present; dominant vegetation consisted of sedges, small grasses, ferns (sensitive fern [*Onoclea sensibilis*] and marsh fern [*Thelypteris palustris*]), and willows (*Salix*)

*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.

LITERATURE CITED

Bedell, P. A. 1987. Early fall migration of Sedge Wrens. Nebraska Bird Review 55:86-88.

Bedell, P. A. 1996. Evidence of dual breeding ranges for the Sedge Wren in the central Great Plains. Wilson Bulletin 108:115-122.

Bent, A. C. 1964. Life histories of North American nuthatches, wrens, thrashers, and their allies. Dover Publications, Inc., New York, New York. 475 pages.

Best, L. B., H. Campa, III, K. E. Kemp, R. J. Robel, M. R. Ryan, J. A. Savidge, H. P. Weeks, Jr., and S. R. Winterstein. 1997. Bird abundance and nesting in CRP fields and cropland in the Midwest: a regional approach. Wildlife Society Bulletin 25:864-877.

Birkenholz, D. E. 1973. Habitat relationships of grassland birds at Goose Lake Prairie Nature Preserve. Pages 63-66 *in* L. C. Hulbert, editor. Third Midwest Prairie Conference Proceedings. Kansas State University, Manhattan, Kansas.

Blankespoor, G. W. 1980. Prairie restoration: effects on nongame birds. Journal of Wildlife Management 44:667-672.

Brady, E. N. 1983. Birds on modified wetlands in eastern South Dakota. M.S. thesis. South Dakota State University, Brookings, South Dakota. 39 pages.

Bryan, G. G., and L. B. Best. 1991. Bird abundance and species richness in grassed waterways in Iowa rowcrop fields. American Midland Naturalist 126:90-102.

Bryan, G. G., and L. B. Best. 1994. Avian nest density and success in grassed waterways in Iowa rowcrop fields. Wildlife Society Bulletin 22:583-592.

Burns, J. T. 1982. Nests, territories, and reproduction of Sedge Wrens (*Cistothorus platensis*). Wilson Bulletin 94:338-349.

Cink, C. 1973. Summer records of the Short-billed Marsh Wrens in Nebraska. Nebraska Bird Review 41:17-19.

Clausen, M. K. 1989. Recent Sedge Wren observations in Nebraska. Nebraska Bird Review 57:92-93.

Crawford, R. D. 1977. Polygynous breeding of Short-billed Marsh Wrens. Auk 94:359-362.

Delisle, J. M., and J. A. Savidge. 1997. Avian use and vegetation characteristics of Conservation Reserve Program fields. Journal of Wildlife Management 61:318-325.

Dhol, S., J. Horton, and R. E. Jones. 1994. 1994 non-waterfowl evaluation on Manitoba's North American Waterfowl Management Plan. Unpublished report. Wildlife Branch, Manitoba Department of Natural Resources, Winnipeg, Manitoba. 12 pages.

Eddleman, W. R. 1974. The effects of burning and grazing on bird populations in native prairie in the Kansas Flint Hills. Unpublished report, National Science Foundation-

Undergraduate Research Program. Kansas State University, Manhattan, Kansas. 33 pages.

Faanes, C. A. 1981. Birds of the St. Croix River Valley: Minnesota and Wisconsin. U.S. Fish and Wildlife Service, Washington, D.C. North American Fauna 73. 196 pages.

Fairbairn, S. E, and J. J. Dinsmore. 2001*a*. Factors associated with occurrence and density of wetland birds in the Prairie Pothole Region of Iowa. Journal of the Iowa Academy of Science 108:8-14.

Fairbairn, S. E., and J. J. Dinsmore. 2001*b*. Local and landscape-level influences on wetland bird communities of the prairie pothole region of Iowa, USA. Wetlands 21:41-47.

Frawley, B. J. 1989. The dynamics of nongame bird breeding ecology in Iowa alfalfa fields. M.S. thesis. Iowa State University, Ames, Iowa. 94 pages.

Frawley, B. J., and L. B. Best. 1991. Effects of mowing on breeding bird abundance and species composition in alfalfa fields. Wildlife Society Bulletin 19:135-142.

Hartley, M. J. 1994. Passerine abundance and productivity indices in grasslands managed for waterfowl nesting cover. Transactions of the North American Wildlife and Natural Resources Conference 59:322-327.

Helzer, C. J. 1996. The effects of wet meadow fragmentation on grassland birds. M.S. thesis. University of Nebraska, Lincoln, Nebraska. 65 pages.

Helzer, C. J., and D. E. Jelinski. 1999. The relative importance of patch area and perimeter-area ratio to grassland breeding birds. Ecological Applications 9:1448-1458.

Herkert, J. R. 1991*a*. An ecological study of the breeding birds of grassland habitats within Illinois. Ph.D. dissertation. University of Illinois, Urbana, Illinois. 112 pages.

Herkert, J. R. 1991*b*. Study suggests increases in restored prairie fragments to conserve breeding bird communities. Restoration and Management Notes 9:107.

Herkert, J. R. 1994*a*. The effects of habitat fragmentation on midwestern grassland bird communities. Ecological Applications 4:461-471.

Herkert, J. R. 1994*b*. Breeding bird communities of midwestern prairie fragments: the effects of prescribed burning and habitat-area. Natural Areas Journal 14:128-135.

Higgins, K. F., T. W. Arnold, and R. M. Barta. 1984. Breeding bird community colonization of sown stands of native grasses in North Dakota. Prairie Naturalist 16:177-182.

Horn, D. J., and R. R. Koford. 2000. Relation of grassland bird abundance to mowing of Conservation Reserve Program fields in North Dakota. Wildlife Society Bulletin 28:653-659.

Johnsgard, P. A. 1980. A preliminary list of the birds of Nebraska and adjacent Plains states. University of Nebraska, Lincoln, Nebraska. 156 pages.

Johnson, D. H. 1997. Effects of fire on bird populations in mixed-grass prairie. Pages 181-206 *in* F. L. Knopf and F. B. Samson, editors. Ecology and conservation of Great Plains vertebrates. Springer-Verlag, New York, New York.

Johnson, D. H., and L. D. Igl. 1995. Contributions of the Conservation Reserve Program to populations of breeding birds in North Dakota. Wilson Bulletin 107:709-718.

Johnson, D. H., and M. D. Schwartz. 1993*a*. The Conservation Reserve Program: habitat for grassland birds. Great Plains Research 3:273-295.

Johnson, D. H., and M. D. Schwartz. 1993*b*. The Conservation Reserve Program and grassland birds. Conservation Biology 7:934-937.

Jones, R. E. 1994. Non-waterfowl evaluation of Manitoba's North American Waterfowl Management Program. Unpublished report. Wildlife Branch, Manitoba Department of Natural Resources, Winnipeg, Manitoba. 15 pages.

Kantrud, H. A. 1981. Grazing intensity effects on the breeding avifauna of North Dakota native grasslands. Canadian Field-Naturalist 95:404-417.

Kent, T. H., and J. J. Dinsmore. 1996. Birds in Iowa. Published by the authors, Iowa City and Ames, Iowa. 391 pages.

King, J. W. 1991. Effects of the Conservation Reserve Program on selected wildlife populations in Southeast Nebraska. M.S. thesis. University of Nebraska, Lincoln, Nebraska. 39 pages.

King, J. W., and J. A. Savidge. 1995. Effects of the Conservation Reserve Program on wildlife in southeast Nebraska. Wildlife Society Bulletin 23:377-385.

Knapton, R. W. 1979. Birds of the Gainsborough-Lyleton region. Saskatchewan Natural History Society Special Publication 10. 72 pages.

Lingle, G. R., and P. A. Bedell. 1989. Nesting ecology of Sedge Wrens in Hall County, Nebraska. Nebraska Bird Review 57:47-49.

Manci, K. M., and D. H. Rusch. 1988. Indices to distribution and abundance of some inconspicuous waterbirds on Horicon Marsh. Journal of Field Ornithology 59:67-75.

Meanley, B. 1952. Notes on the ecology of the Short-billed Marsh Wren in the lower Arkansas rice fields. Wilson Bulletin 64:22-25.

Messmer, T. A. 1985. Effects of specialized grazing systems on upland nesting birds in southcentral North Dakota. M.S. thesis. North Dakota State University, Fargo, North Dakota. 112 pages.

Messmer, T. A. 1990. Influence of grazing treatments on nongame birds and vegetation structure in south central North Dakota. Ph.D. dissertation. North Dakota State University, Fargo, North Dakota. 164 pages.

Mousley, H. 1934. A study of the home life of the Short-billed Marsh Wren (*Cistothorus stellaris*). Auk 51:439-445.

National Geographic Society. 1987. Field guide to the birds of North America, second edition. National Geographic Society, Washington, D.C. 464 pages.

Patterson, M. P., and L. B. Best. 1996. Bird abundance and nesting success in Iowa CRP fields: the importance of vegetation structure and composition. American Midland Naturalist 135:153-167.

Prescott, D. R. C., and A. Murphy. 1999. Bird populations in seeded nesting cover on North American Waterfowl Management Plan properties in the aspen parkland of Alberta. Pages 203-210 *in* P. D. Vickery and J. R. Herkert, editors. Ecology and conservation of grassland birds of the Western Hemisphere. Studies in Avian Biology 19.

Renken, R. B. 1983. Breeding bird communities and bird-habitat associations on North Dakota waterfowl production areas of three habitat types. M.S. thesis. Iowa State University, Ames, Iowa. 90 pages.

Renken, R. B., and J. J. Dinsmore. 1987. Nongame bird communities on managed grasslands in North Dakota. Canadian Field-Naturalist 101:551-557.

Robel, R. J., J. P. Hughes, S. D. Hull, K. E. Kemp, and D. S. Klute. 1998. Spring burning: resulting avian abundance and nesting in Kansas CRP. Journal of Range Management 51:132-138.

Sample, D. W. 1989. Grassland birds in southern Wisconsin: habitat preference, population trends, and response to land use changes. M.S. thesis. University of Wisconsin, Madison, Wisconsin. 588 pages.

Schramm, P., D. S. Schramm, and S. G. Johnson. 1986. Seasonal phenology and habitat selection of the Sedge Wren *Cistothorus platensis* in a restored tallgrass prairie. Pages 95-99 *in* G. K. Clambey and R. H. Pemble, editors. Proceedings of the Ninth North American Prairie Conference. Tri-College University Center for Environmental Studies, Fargo, North Dakota.

Schwilling, M. D. 1982. Sedge Wrens nesting into September. Kansas Ornithological Society Bulletin 33:22-23.

Shutler, D., A. Mullie, and R. G. Clark. 2000. Bird communities of prairie uplands and wetlands in relation to farming practices in Saskatchewan. Conservation Biology 14:1441-1451.

Skinner, R. M. 1974. Grassland use patterns and prairie bird populations in Missouri. M.A. thesis. University of Missouri, Columbia, Missouri. 53 pages.

Skinner, R. M. 1975. Grassland use patterns and prairie bird populations in Missouri. Pages 171-180 *in* M. K. Wali, editor. Prairie: a multiple view. University of North Dakota Press, Grand Forks, North Dakota.

Skinner, R. M., T. S. Baskett, and M. D. Blendon. 1984. Bird habitat on Missouri prairies. Terrestrial Series 14. Missouri Department of Conservation, Jefferson City, Missouri. 37 pages.

Stewart, R. E. 1975. Breeding birds of North Dakota. Tri-College Center for Environmental Studies, Fargo, North Dakota. 295 pages.

Temple, S. A., B. M. Fevold, L. K. Paine, D. J. Undersander, and D. W. Sample. 1999. Nesting birds and grazing cattle: accommodating both on midwestern pastures. Pages 196-202 *in* P. D. Vickery and J. R. Herkert, editors. Ecology and conservation of grassland birds of the Western Hemisphere. Studies in Avian Biology 19.

Tordoff, H. B., and G. P. Young. 1951. Short-billed Marsh Wren breeding in Kansas. Wilson Bulletin 63:44-45.

Volkert, W. K. 1992. Response of grassland birds to a large-scale prairie planting project. Passenger Pigeon 54:190-196.

Walkinshaw, L. H. 1935. Studies of the Short-billed Marsh Wren (*Cistothorus stellaris*) in Michigan. Auk 52:362-369.

Westemeier, R. L., and J. E. Buhnerkempe. 1983. Responses of nesting wildlife to prairie grass management in prairie chicken sanctuaries in Illinois. Pages 36-46 *in* R. Brewer, editor. Proceedings of the Eighth North American Prairie Conference. Western Michigan University, Kalamazoo, Michigan.

Zimmerman, J. L. 1993. Birds of Konza: the avian ecology of the tallgrass prairie. University of Kansas Press, Lawrence, Kansas. 186 pages.