

The Effects of Management Practices on Grassland Birds— Willet (*Tringa semipalmata inornata*)

Chapter I of

The Effects of Management Practices on Grassland Birds



Professional Paper 1842—I

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Background photograph: Northern mixed-grass prairie in North Dakota, by Rick Bohn, used with permission.

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Chapter I of

The Effects of Management Practices on Grassland Birds

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Conversion Factors

International System of Units to U.S. customary units

Multiply	By	To obtain
Length		
centimeter (cm)	0.3937	inch (in.)
meter (m)	3.281	foot (ft)
kilometer (km)	0.6214	mile (mi)
Area		
hectare (ha)	2.471	acre
hectare (ha)	0.003861	square mile (mi ²)

Abbreviations

DNC dense nesting cover

PPR Prairie Pothole Region

spp. species (applies to two or more species within the genus)

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Capsule Statement

Keys to Willet (*Tringa semipalmata inornata*) management include providing large expanses of native grasslands and wetland complexes. Wetland complexes should contain a diversity of wetland sizes and classes, such as ephemeral, temporary, seasonal, semipermanent, and permanent wetlands (wetland classifications based on Stewart and Kantrud, 1971), as well as intermittent streams. Willets use wetlands of various salinities. Willets require short, sparse upland grasslands for nesting and foraging and wetland complexes for foraging. Broods use taller, denser grass cover than do nesting adults. Willets have been reported to use habitats with less than or equal to 70 centimeters (cm) average vegetation height, 4–23 cm visual obstruction reading, 15 percent bare ground, 38 percent litter cover, and 1–9 cm litter depth. The descriptions of key vegetation characteristics are provided in table II (after the “References” section). Vernacular and scientific names of plants and animals follow the Integrated Taxonomic Information System (<https://www.itis.gov>).



Willet. Illustration by Christopher M. Goldade, U.S. Geological Survey.

Breeding Range

Two subspecies of Willets breed in North America: the Eastern Willet (*Tringa semipalmata semipalmata*) and the Western Willet (*Tringa semipalmata inornata*). This account deals only with the Western Willet, which breeds on the Great Plains, and not with the Eastern Willet, which breeds on the Atlantic and Gulf coasts of North America. Western Willets breed from central Alberta and Montana through southern Manitoba, North Dakota, western Minnesota, and South Dakota; south to south-central Oregon and central California; and east to northern Nevada, Idaho, northern Utah, Wyoming, northern Colorado, and western Nebraska (National Geographic Society, 2011). The relative densities of

both subspecies of Willets in the United States and southern Canada, based on North American Breeding Bird Survey data (Sauer and others, 2014), are shown in figure II (not all geographic places mentioned in report are shown on figure).

Suitable Habitat

During the breeding season, Willets require large expanses of short, sparse grasslands for nesting and foraging, and wetland complexes for foraging (Stewart, 1975; Weber, 1978; Higgins and others, 1979; Kantrud and Stewart, 1984; Ryan and Renken, 1987; Colwell and Oring, 1988a, 1990; Eldridge, 1992; Kantrud and Higgins, 1992; Prescott and others, 1995; Lowther and others, 2001). In upland and wetland habitats, adults with broods use somewhat taller, denser

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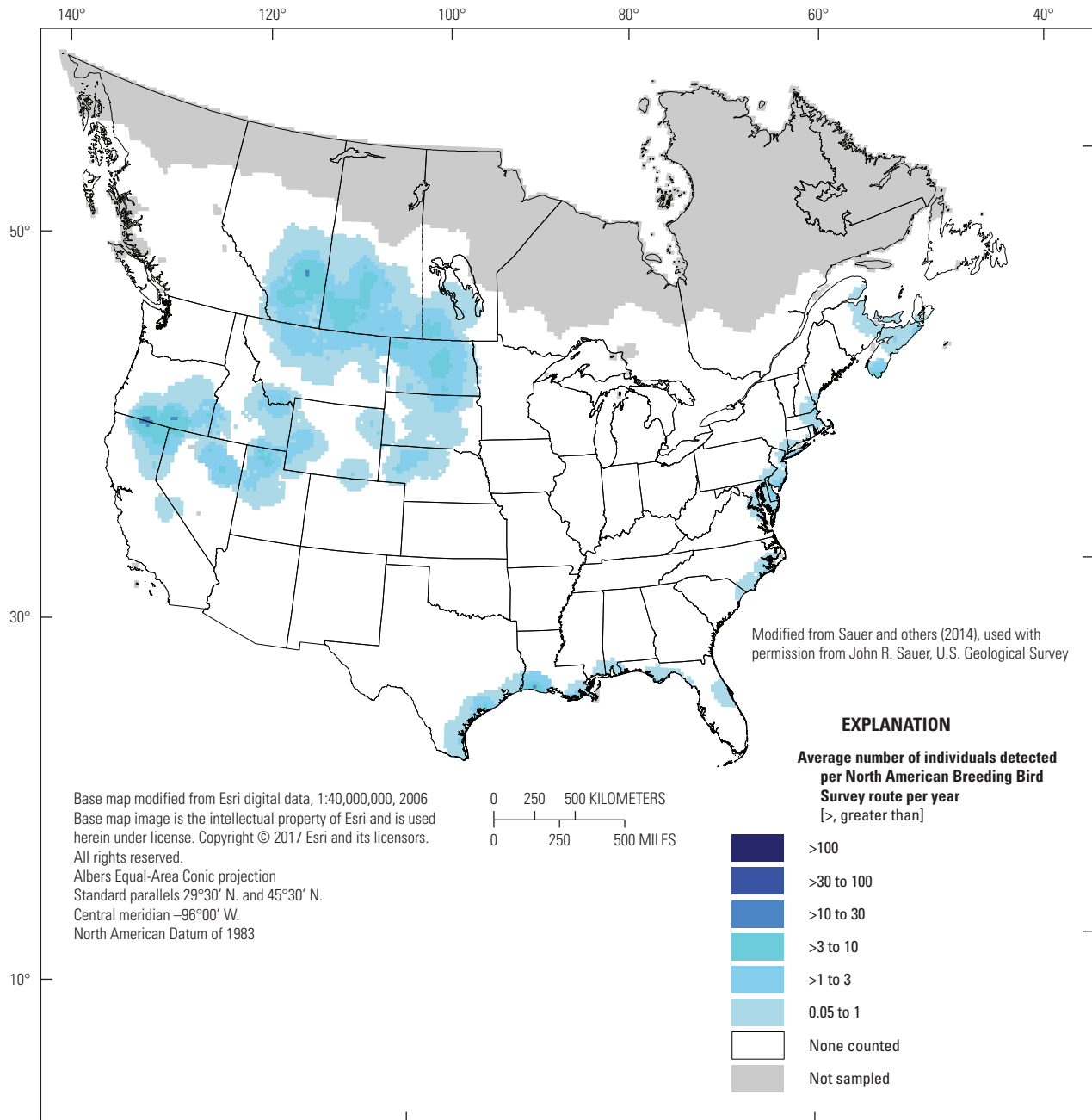


Figure 11. Breeding distribution of the Willet (*Tringa semipalmata*) in the United States and southern Canada, based on North American Breeding Bird Survey (BBS) data, 2008–12. The BBS abundance map provides only an approximation of breeding range edges.

grass cover than do breeding pairs during nesting (Ryan and Renken, 1987). In North Dakota, uplands used by Willets had a thinner litter layer than surrounding areas (Renken, 1983). Willets often nest near a conspicuous object, such as a piece of wood, dried cattle dung, or a stone (Higgins and others, 1979; Kantrud and Higgins, 1992).

Willets prefer native grass to tame vegetation (Stewart, 1975; Ryan and Renken, 1987; Eldridge, 1992; Kantrud and Higgins, 1992). In the prairie and aspen parkland regions of Alberta, mean number of birds per site was compared among several habitats (Prescott and others, 1995; Prescott, 1997). In the prairie region, Willets were most abundant in native

mixed-grass prairies, followed by coulees (that is, a valley containing an ephemeral creek or seepage that may contain other undescribed habitat types), upland shrublands, planted croplands, and haylands (planted to grasses [species not given] or alfalfa [*Medicago sativa*]) (Prescott, 1997). In the uplands of aspen parkland, Willets were most abundant in deferred native pastures grazed after July 15, followed by idle native grasslands, continuously grazed native parklands, and tame dense nesting cover (DNC) (Prescott and others, 1995). The species was not found in tame pastures, deferred tame pastures, idle tame uplands, idle tame grasslands, continuously grazed native grasslands, idle parklands, or native DNC. In North Dakota, the species was absent from tame DNC (Renken, 1983).

In Manitoba, Montana, North Dakota, and South Dakota, Willets nested in native and tame grasslands, pastures, hayland, and idle or burned areas (Kantrud and Higgins, 1992). Dominant vegetation at nest sites included green needlegrass (*Nassella viridula*), short sedges (*Carex* species [spp.]), and Kentucky bluegrass (*Poa pratensis*). In North Dakota, nesting pairs used upland sites characterized by short (less than 15 cm) vegetation (Ryan and Renken, 1987). The mean cover percentages at 15 nests were 77.7 percent for vegetation less than (<) 15 cm tall, 7.8 percent for vegetation 15–60 cm tall, and 0.7 percent for vegetation greater than (>) 60 cm tall. In another North Dakota study, the species nested in dry uplands in vegetation with low height-density (<6 cm) (Sedivec, 1994). Although tilled lands usually are avoided (Weber, 1978; Eldridge, 1992), nests have been reported in hayland and cropland, including small-grain, common flax (*Linum usitatissimum*), and stubble fields (Higgins and others, 1979; Kantrud and Higgins, 1992). In a North Dakota study, pairs nesting in native vegetation had higher apparent hatching success than pairs nesting in cultivated fields (Higgins and others, 1979).

In wetlands, Willets avoid dense, emergent vegetation, preferring shallow-water areas with short, sparse shoreline vegetation (Weber, 1978; Ryan and Renken, 1987; Colwell and Oring, 1988a; Eldridge, 1992; Lowther and others, 2001). In Alberta, Willets were present in areas with shallow water, a condition that was provided by created wetlands but not natural wetlands, which were dry during the study (Gratto-Trevor, 1999). In another Alberta study, Willet abundance increased by 25 percent within 0.94 kilometer (km) of wetland edges (Sliwinski and Koper, 2012). In Saskatchewan, Willets waded in shallow water within 10 meters (m) of the wetland edge (Colwell and Oring, 1988a).

Suitable wetlands range from fresh to saline and vary widely in size and permanence (Stewart and Kantrud, 1965; Stewart, 1975; Kantrud and Stewart, 1984; Ryan and Renken, 1987; Eldridge, 1992; Prescott and others, 1995; Lowther and others, 2001). In Alberta, Willets were most abundant in large saline wetlands and rare in small freshwater wetlands; the species also was found in large and medium freshwater and medium saline wetlands (Prescott and others, 1995). In North Dakota, the highest densities of Willets were found in brackish and saline semipermanent potholes with closed stands of

emergent cover, with clumps of emergent cover interspersed with open water, or with peripheral bands of emergent cover encircling expanses of open water (Stewart and Kantrud, 1965). In another North Dakota study, the highest densities of Willets were found in brackish and subsaline semipermanent ponds and lakes (Stewart, 1975). In that same study, 47 percent of 219 breeding pairs of Willets were recorded using semipermanent wetlands, 43 percent seasonal wetlands, 4 percent permanent wetlands, 3 percent alkali wetlands, and 3 percent intermittent streams (Stewart, 1975). In a third North Dakota study, semipermanent wetlands were used most often by Willets in North Dakota, but seasonal, temporary, ephemeral, and alkali ponds were preferred relative to their availability (Ryan and Renken, 1987). In a study of 1,190 wetlands throughout the Prairie Pothole Region (PPR) of North Dakota and South Dakota, Willets were observed in natural and restored wetlands, and were observed in a higher proportion of the alkali or permanent wetlands than in the semipermanent, seasonal, or temporary wetlands (Igl and others, 2017). Willets were observed in 78 wetlands characterized by an average of 52 percent open water, 22 percent wet-meadow vegetation, 20 percent emergent vegetation, and 6 percent shore/mudflat (Igl and others, 2017). In South Dakota, Willets occurred in many types of wetlands, including permanent, semipermanent, seasonal, temporary, and ephemeral ponds; stock ponds; dugouts; and intermittent streams. Willets were absent from permanent streams, ponds in tilled fields, drainage and road ditches, oxbows, and gravel pits (Weber, 1978; Weber and others, 1982).

The use by spring-migrating Willets of temporary and seasonal wetlands within agricultural fields in the Drift Prairie of eastern North Dakota was evaluated by Niemuth and others (2006). Willets were more likely to use temporary than seasonal wetlands and to use wetlands with sparse amounts of tall, emergent vegetation than wetlands with dense stands of tall, emergent vegetation; presence of Willets was positively related to the number of times a wetland basin contained water during 9 or 10 visits. The species was less likely to use wetlands showing evidence of a drainage history. In the PPR of eastern Montana, North Dakota, and South Dakota, Niemuth and others (2012) evaluated wetland characteristics that influenced the detection and number of Willets. Detections of Willets were negatively related to excavated, ditched wetlands and positively related to brackish wetlands. Detections increased as the proportion of wetlands surrounded by a grass buffer increased. Moreover, detections were positively related to characteristics indicative of wetlands with low amounts of emergent vegetation: the amount of open water or bare soil covering >95 percent of the wetland area, the proportion of wetland inundated by water, and the width of mudflats. Detections were negatively related to wetlands characterized by scattered-to-closed stands of tall (>25 cm) emergent and with open water or bare soil covering less than or equal to 95 percent of the wetland area. However, in a study in North Dakota and South Dakota, Willet detections were positively associated with wetlands characterized by scattered-to-open water and

with open water or bare soil covering from 5 to >95 percent of the wetland area (Niemuth and others, 2013).

Seasonal shifts in habitat use between wetlands and uplands may occur, as Niemuth and others (2012) reported that the detections of Willets over a 7-week survey period spanning mid-May to late June were initially high in upland habitats but decreased with concomitant increases in wetland habitats. Shifts in wetland use occur seasonally and during climatic extremes (Ryan and Renken, 1987; Gratto-Trevor, 1999, 2006). In North Dakota, semipermanent wetlands were used more often later in the summer than other wetland types, and semipermanent and permanent wetlands were used during drought years (Ryan and Renken, 1987).

Area Requirements and Landscape Associations

Willet territories are large and include feeding and nesting areas. Areas must be large enough to provide upland habitat and a diversity of wetland types (Kantrud and Stewart, 1984; Ryan and Renken, 1987; Colwell and Oring, 1988a). In North Dakota, mean territory size was 44.3 hectares (ha) (Ryan and Renken, 1987). Of 78 wetlands in the PPR of North Dakota and South Dakota in which Willets were observed, average wetland size was 15 ha (Igl and others, 2017). In South Dakota, the presence of the species was positively associated with area of surface water (Weber, 1978). In the PPR of Montana, North Dakota, and South Dakota, Niemuth and others (2012) reported that the detections of Willets exhibited a curvilinear relationship with area of wetland surveyed; in North Dakota and South Dakota, detections increased curvilinearly with wet area of basin (Niemuth and others, 2013).

At a landscape level, detections of Willets in the PPR of Montana, North Dakota, and South Dakota were positively related to the percentage of grassland within 800 m of a survey point consisting of native grassland, forb, and scattered low shrubs; and to percentage of area within 800 m consisting of temporary, seasonal, semipermanent, and permanent wetlands (Niemuth and others, 2012). The number of Willets was positively related to the number of different water regimes for wetlands (that is, number of wetland types) in the landscape. In North Dakota's Drift Prairie, presence of spring-migrating Willets was positively related to the percentage of the landscape within 800 m of sampled wetlands that was occupied by semipermanent and permanent wetlands (Niemuth and others, 2006). In a survey of 1,190 wetlands in the PPR of North Dakota and South Dakota, Igl and others (2017) recorded Willets in 78 wetlands, where landscape composition within 800 m of the wetlands in which Willets were observed was 58 percent grassland, 21 percent agricultural, 17 percent wetland, and 4 percent other; average number of wetlands within 800 m was 22 (Igl and others, 2017). In South Dakota, the presence of the species was negatively associated with area of land under cultivation (Weber, 1978).

Brood Parasitism by Cowbirds and Other Species

The Willet is an unsuitable host of the Brown-headed Cowbird (*Molothrus ater*), and there are no known records of cowbird brood parasitism (Shaffer and others, 2019). Willet nests have been parasitized by Long-billed Curlews (*Numenius americanus*) (Sugden, 1947).

Breeding-Season Phenology and Site Fidelity

Willetts arrive on Saskatchewan breeding grounds from late April to mid-May and depart from mid-August to early September (Maher, 1974). In South Dakota, peak spring migration occurs from April 21 to May 10, and peak fall migration occurs from August 1 to August 15 (Gardner and others, 2008). In the northern Great Plains, Willets breed from early May through late July, with broods present from about early June until late July (Stewart, 1975; Kantrud and Higgins, 1992; Sedivec, 1994; Gardner and others, 2008). Ryan and others (1981) reported two cases of renesting after initial nests were destroyed. In Saskatchewan, adults of both sexes and yearling females exhibited breeding-site fidelity (Colwell and Oring, 1988b).

Species' Response to Management

Little information is available on the effects of prescribed burning or haying on Willets. Ryan and Renken (1987) recommended burning, mowing, or grazing of upland and wetland habitat to maintain the short, sparse vegetation and thin litter layer preferred by Willets. Ryan and others (1984) indicated that fall burning can provide dense, taller regrowth (15–60 cm) later in the summer, which may benefit broods because they use vegetation >15 cm in height (Ryan and Renken, 1987). In a North Dakota grassland study, Willet densities were unrelated to time since burning (Johnson, 1997). In another North Dakota study, Willets did not use idle areas even after they were hayed the previous year (Messmer, 1990).

Grazed uplands appear to be more attractive to breeding Willets than idle grasslands (Messmer, 1985, 1990; Renken and Dinsmore, 1987; Sedivec, 1994; Lowther and others, 2001; Gardner and others, 2008), although Kantrud and Higgins (1992) indicated that the species prefers pastures that are idle during the nesting season and, to a lesser extent, actively grazed pastures than other land-use types. In Alberta, Willet densities were higher (not statistically tested) on deferred-grazed native pastures than on native pastures grazed in early summer, but the species was not present on continuously grazed native pastures (Prescott and Wagner, 1996). However,

Willetts were present on tame pastures of crested wheatgrass (*Agropyron cristatum*) grazed in spring from late April to mid-June. In Saskatchewan, Willetts were observed on grazed and ungrazed areas (Dale, 1984). In North Dakota, Willetts were more common in grazed areas than in ungrazed areas (Sedivec, 1994). In North Dakota, densities of breeding Willetts were significantly higher on twice-over deferred (grazing a number of pastures twice per season, with about a 2-month rest between grazing) grazing systems than on season-long (leaving cattle on the same pasture for the entire growing season) or short-duration (pastures rotated through a grazing schedule of about 1 week grazed and 1 month ungrazed, repeated throughout the growing season [usually late May or early June until October]) grazing systems or on idle pastures (Messmer, 1990). The density of Willetts decreased as vegetative cover increased on a managed pasture. The twice-over deferred pastures consisted of silty range, thin upland range, and shallow-to-gravel range sites (Messmer, 1990; Sedivec, 1994). Silty range and thin upland range sites were characterized by thin topsoil, loamy soil, 1–25 percent slope, grassy cover, low shrub cover, and moderate-to-high litter cover. Shallow-to-gravel range sites were characterized by sparse cover and reduced litter. In south-central North Dakota mixed-grass prairies, Willetts only occurred in heavily and extremely grazed pastures (20–35 percent of forage produced in an average year remained, equating to an average grazing rate of 4.2–6.8 animal unit months per ha) and were not recorded in lightly or moderately grazed pastures (50–65 percent, 1.1–2.4 animal unit months per ha) (Salo and others, 2004).

Willetts appear to be fairly tolerant of anthropogenic activity associated with energy development, roads, and agriculture. Niemuth and others (2013) examined the influence of two wind facilities in North Dakota and South Dakota on Willetts for 3 years. The species did not appear to avoid wetland basins <805 m from wind turbines at either facility, although occurrence was slightly and consistently lower at one facility, possibly because that facility was located primarily in cropland and the other facility in grassland. In Alberta, Sliwinski and Koper (2012) detected no effect of cropland or road edges on Willet abundance.

Management Recommendations from the Literature

Protection of wetland complexes is important because Willetts use a variety of wetland sizes and types with various salinity levels (Kantrud and Stewart, 1984; Ryan and others, 1984; Ryan and Renken, 1987; Colwell and Oring, 1988a; Lowther and others, 2001; Niemuth and others, 2006, 2012). During migration, numerous small wetlands may be of equal

or greater importance to Willetts than a few large wetlands (Niemuth and others, 2006), but larger, more permanent wetlands provide vital habitat during droughts or in late summer (Ryan and Renken, 1987; Prescott and others, 1995; Niemuth and others, 2006).

Willetts will benefit from protecting wetlands from drainage (Ryan and others, 1984; Ryan and Renken, 1987; Lowther and others, 2001; Niemuth and others, 2006) and from restoring drained wetlands (Berkey and others, 1993; Johnson, 1996). Construction of wetlands may be especially beneficial to Willetts in locations where natural wetlands tend to go dry in the summer; Willetts in Alberta were more abundant in managed wetland basins than in natural wetland basins because natural basins usually lacked water by late summer (Gratto-Trevor, 1999, 2006).

Ryan and Renken (1987) emphasized the importance of providing wetland and grassland habitats that are large enough to support Willet territories, which averaged 44.3 ha in North Dakota. Willetts were not found in small (<100 ha) blocks of wetland and grassland habitat (Ryan and Renken, 1987). Areas also must be large enough to provide grassland habitat and a diverse range of wetland types and sizes (Stewart, 1975; Kantrud and Stewart, 1984; Ryan and Renken, 1987; Colwell and Oring, 1988a; Kantrud and Higgins, 1992). Native grassland habitat for upland nesting and foraging should be provided (Ryan and Renken, 1987; Eldridge, 1992; Kantrud and Higgins, 1992).

Burning, mowing, and grazing can be used to provide areas of shorter, sparser vegetation in uplands and wetlands (Kantrud and Stewart, 1984; Messmer, 1985; Ryan and Renken, 1987; Eldridge, 1992; Berkey and others, 1993). Fall burning or mowing of upland sites and wetland edges can produce suitable cover during the following spring (Ryan and others, 1984). Moderate-to-dense regrowth in burned areas may be too dense for nesting but may provide the denser, taller cover used by broods (Ryan and others, 1984).

Twice-over deferred grazing is preferable to season-long grazing (Messmer, 1985, 1990; Sedivec, 1994). Berkey and others (1993) indicated that short-term grazing (2–4 weeks in May) may be beneficial to Willetts in North Dakota. Willetts prefer previously grazed areas that are idle during the current breeding season (Kantrud and Higgins, 1992). To benefit Willetts and other nesting grassland birds, the timing of grazing in spring may depend on the grazing regime; Sedivec (1994) recommended delaying grazing until late May to early June when implementing a rotational grazing system, and until mid-June when implementing season-long grazing.

Agriculture and mechanical disturbances on cropland may negatively affect Willetts during the breeding season. Willetts will benefit from the protection of grasslands from conversion to agriculture (Ryan and others, 1984; Ryan and Renken, 1987) and the adoption of no-tillage and minimum-tillage practices on cropland (Kantrud and Higgins, 1992).

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Table 11. Measured values of vegetation structure and composition in Willet (*Tringa semipalmata inornata*) breeding habitat by study. The parenthetical descriptors following authorship and year in the “Study” column indicate that the vegetation measurements were taken in locations or under conditions specified in the descriptor; no descriptor implies that measurements were taken within the general study area.

[cm, centimeter; %, percent; <, less than; > greater than; --, no data; DNC, dense nesting cover]

Study	State or province	Habitat	Management practice or treatment	Vegetation height (cm)	Vegetation height-density (cm)	Grass cover (%)	Forb cover (%)	Shrub cover (%)	Bare ground cover (%)	Litter cover (%)	Litter depth (cm)
Higgins and others, 1979 (nests)	North Dakota	Mixed-grass prairie	Multiple	<15	--	--	--	--	--	--	--
Kantrud and Higgins, 1992 (nests)	Manitoba, Montana, North Dakota, South Dakota	Multiple	Multiple	--	4 ^a , 11 ^b	--	--	--	--	38 ^c	--
Messmer, 1990	North Dakota	Mixed-grass prairie	Multiple	50–70	--	--	--	--	--	--	3.8–9.1
Renken, 1983 ^d	North Dakota	Tame grassland (DNC)	Idle, grazed	--	8 ^a	55.1	20.5	3.9	0.6	98.7	1.8
Ryan and Renken, 1987 (nests)	North Dakota	Mixed-grass prairie	--	<15	--	--	--	--	14.5	--	--
Ryan and Renken, 1987 (broods)	North Dakota	Mixed-grass prairie	--	>15	--	--	--	--	--	--	--
Salo and others, 2004	North Dakota	Mixed-grass prairie	Heavy grazing intensity	27.1 ^e	22.9 ^a	--	--	--	--	--	2
Salo and others, 2004	North Dakota	Mixed-grass prairie	Extreme grazing intensity	17.5 ^e	7.9 ^a	--	--	--	--	--	0.9
Sedivec, 1994 (nests)	North Dakota	Mixed-grass prairie	Multiple	--	5.8 ^a	--	--	--	--	--	--

^aVisual obstruction reading (Robel and others, 1970).

^bEffective vegetation height.

^cStanding dead vegetation.

^dThe sum of percentages is >100%, based on the modified point-quadrat technique of Wiens (1969).

^eMean grass height.

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