The Effects of Management Practices on Grassland Birds—Nelson's Sparrow (*Ammospiza nelsoni nelsoni*)

Chapter KK of

The Effects of Management Practices on Grassland Birds

Professional Paper 1842–KK

U.S. Department of the Interior
U.S. Geological Survey

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By Jill A. Shaffer,[1] Lawrence D. Igl,[1] Douglas H. Johnson,[1]
Marriah L. Sondreal,[1] Christopher M. Goldade,[1,2] Paul A. Rabie,[1,3] and
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The Effects of Management Practices on Grassland Birds

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U.S. Department of the Interior
U.S. Geological Survey

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Table

KK1. Measured values of vegetation structure and composition in Nelson's Sparrow (*Ammospiza nelsoni nelsoni*) breeding habitat by study 10

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)
	Area	
square meter (m^2)	0.0002471	acre
hectare (ha)	2.471	acre
square meter (m^2)	10.76	square foot (ft^2)
hectare (ha)	0.003861	square mile (mi^2)
	Mass	
gram (g)	0.03527	ounce (oz)

Temperature in degrees Celsius (°C) may be converted to degrees Fahrenheit (°F) as

$$°F = (1.8 \times °C) + 32.$$

Abbreviations

BBS	Breeding Bird Survey
DNC	dense nesting cover
n.d.	no date
PPR	Prairie Pothole Region
spp.	species (applies to two or more species within the genus)

Acknowledgments

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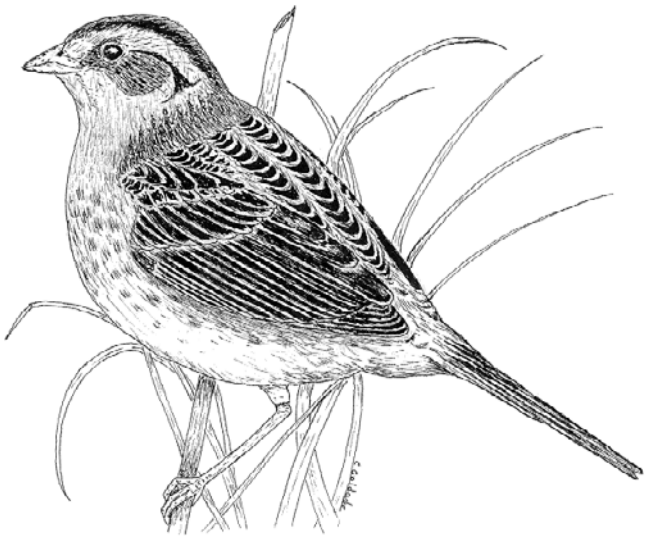
Capsule Statement

The key to Nelson's Sparrow (*Ammospiza nelsoni nelsoni*) management is providing dense grasses or emergent vegetation near damp areas or freshwater wetlands. Nelson's Sparrows have been reported to use habitats with 20–122 centimeters (cm) average vegetation height, 41 cm visual obstruction reading, 40–58 percent grass cover, 24 percent forb cover, 5 percent shrub cover, 13 percent bare ground, and 2–7 cm litter depth. The descriptions of key vegetation characteristics are provided in table KK1 (after the "References" section). Vernacular and scientific names of plants and animals follow the Integrated Taxonomic Information System (https://www.itis.gov), except for the *Ammospiza* genus, which follows the 59th Supplement to the American Ornithological Society's Check-list of North American Birds (Chesser and others, 2018).



Nelson's Sparrow. Illustration by Christopher M. Goldade, used with permission.

Breeding Range

In 1995, the Sharp-tailed Sparrow (*Ammodramus caudacutus*) was split into two separate species, Saltmarsh Sharp-tailed Sparrow (*Ammodramus caudacutus*) and Nelson's Sharp-tailed Sparrow (*Ammodramus nelsoni*) (American Ornithologists' Union, 1995). Vernacular names of the two species were later shortened to Saltmarsh and Nelson's sparrows, respectively (Chesser and others, 2009), and the genus was later changed to *Ammospiza* (Chesser and others, 2018). This account deals only with the subspecies of Nelson's Sparrow (*Ammospiza nelsoni nelsoni*), which breeds in freshwater wetlands, wet meadows, and upland areas in north-central North America (Shriver and others, 2020). The subspecies *A. n. alter* and *A. n. subvirgatus* occur outside of the region of focus (that is, the Great Plains).

Nelson's Sparrows breed from the southern Northwest Territories and northeastern British Columbia through Alberta, northwestern and south-central Saskatchewan, and southern Manitoba; south to northeastern Montana, North Dakota, and northeastern South Dakota; and east to northwestern Minnesota (National Geographic Society, 2011). The relative densities of Nelson's Sparrows in the United States and southern Canada, based on North American Breeding Bird Survey (BBS) data (Sauer and others, 2014), are shown in figure KK1 (not all geographic places mentioned in report are shown on figure).

Suitable Habitat

The Nelson's Sparrow is a secretive species known to sing at night and unpredictably during the day (Breckenridge, 1930; Shriver and others, 2020; D.R.C. Prescott, Alberta Sustainable Resource Development, Fish and Wildlife Management Division, Red Deer, Alberta, written commun.

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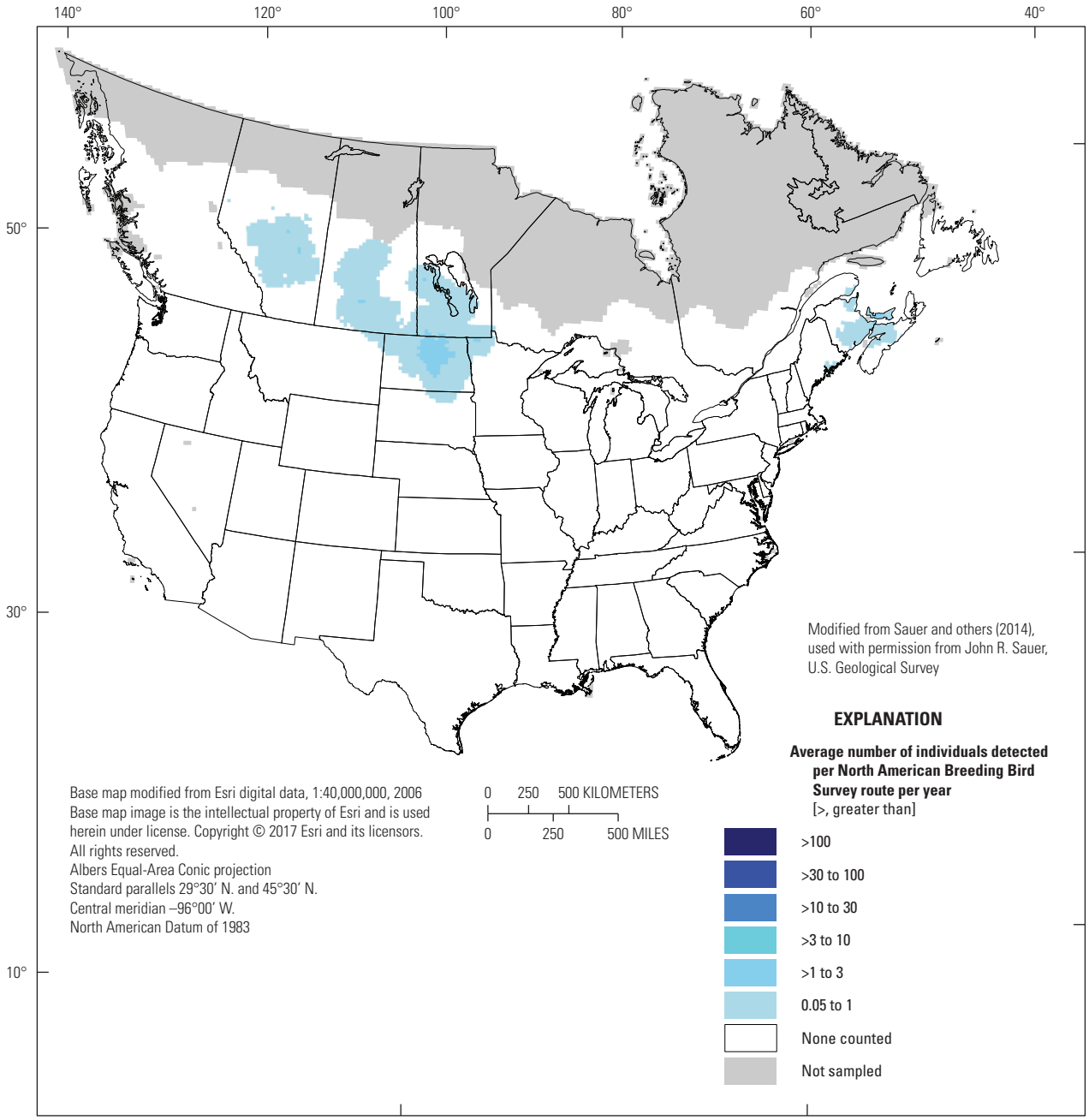

Figure KK1. The breeding distribution of the Nelson's Sparrow (*Ammospiza nelsoni*) in the United States and southern Canada, based on North American Breeding Bird Survey (BBS) data, 2008–12. The BBS abundance map provides only an approximation of breeding range edges.

[n.d.]). Consequently, individual birds are difficult to survey or detect, and knowledge of the species' habitat preferences is limited mostly to notes or short communications of incidental observations. In Alberta, Nelson's Sparrows were not detected during daytime fixed-radius point counts on study plots or during surveys that used BBS methodology (Prescott and others, 1993). Moderate numbers, however, were detected during surveys of wetlands conducted 0.5 hour after sunset. In northeastern North Dakota and northwestern Minnesota, human observers that started to survey 1 hour after sunset were more adept at detecting singing Nelson's Sparrows than autonomous recording units programmed to record nightly from 2000 to 0800 hours Central Daylight Time (Sidie-Slettedahl and others, 2015).

Nelson's Sparrows prefer freshwater wetlands with dense, emergent vegetation or damp areas with dense grasses (Bownan, 1904; Murray, 1969; Stewart, 1975; Krapu and Green, 1978; Knapton, 1979; Williams and Zimmer, 1992; Berkey and others, 1993). Suitable habitat includes fens, wet meadows, peatlands, riparian areas, and lake margins with

emergent cattails (*Typha* species [spp.]) (Bownan, 1904; Breckenridge and Kilgore, 1929; Roberts, 1932; Hill, 1968; Stewart, 1975; Salt and Salt, 1976; Knapton, 1979; Hillman and others, 2016; Taylor, 2018). The range of these mesic habitats includes the wetlands within the Boreal Taiga Plains of Canada (Erskine, 1968; Siddle, 1992; Morissette and others, 2013); the wetland basins, riparian zones, and wet prairies within the Prairie Pothole Region (PPR) of the northern United States and southern Canada (Breckenridge and Kilgore, 1929; Stewart, 1975; Knapton, 1979; Hanowski and Niemi, 1988; Svedarsky, 1992; Williams and Zimmer, 1992; Nordhagen and others, 2005; Hillman and others, 2016); the wet prairies and peatlands within the Boreal Hardwood Transition Region of northern Minnesota (Roberts, 1932; Hanowski and Niemi, 1988; Hanowski and others, 1999); and the wet meadows of the river valleys in the Prairie Hardwood Transition Region of Minnesota and Wisconsin (Faanes, 1981). Nelson's Sparrows inhabit mixed-grass and tallgrass prairies, preferring grasslands that are not burned, hayed, or grazed (Stewart, 1975; Dhol and others, 1994; Prescott and others, 1995; Ahlering and Merkord, 2016). Planted cover, such as dense nesting cover (DNC) grasslands and fields enrolled in the Conservation Reserve Program, also provide suitable habitat (Renken and Dinsmore, 1987; Johnson and Schwartz, 1993; Hartley, 1994a; Prescott and others, 1995; Igl, 2009; Davis and others, 2017).

In Saskatchewan, Nelson's Sparrows occurred in both natural and restored wetlands (Begley and others, 2012). In Alberta, Nelson's Sparrows were more abundant around large saline wetlands and small freshwater wetlands than small saline wetlands and large freshwater wetlands (Prescott and others, 1995). In a survey of breeding birds in 1,190 wetlands throughout the PPR of North Dakota and South Dakota, Nelson's Sparrows occurred in both natural and restored wetlands (Igl and others, 2017). Nelson's Sparrows were detected in a higher proportion of alkali or permanent wetlands than in temporary, seasonal, or semipermanent wetlands. The 47 wetlands in which Nelson's Sparrows were present were characterized as having an average of 40 percent open water, 20 percent emergent vegetation, 31 percent wet meadow, and 6 percent shore/mudflat (Igl and others, 2017).

In North Dakota, Stewart (1975) reported that Nelson's Sparrows may be more abundant in dry years than in wet years. During dry years, the species nests in the shallow- and deep-marsh zones of wetlands; in wet years, Nelson's Sparrows nest in prairie cordgrass (*Spartina pectinata*) within wet-meadow zones. Plant species that provide nesting cover within shallow-marsh and deep-marsh zones include cattail, hardstem bulrush (*Schoenoplectus acutus*), river bulrush (*Bolboschoenus fluviatilis*), cosmopolitan bulrush (*Bolboschoenus maritimus*), sprangletop (*Scolochloa* spp.), sloughgrass (*Beckmannia* spp.), slough sedge (*Carex atherodes*), and water knotweed (*Persicaria amphibia*); breeding populations in fens are restricted to areas dominated by cattail, common reed (*Phragmites australis*), and softstem bulrush (*Schoenoplectus tabernaemontani*). Murray (1969) reported that Nelson's Sparrows in North Dakota were common in stands of prairie cordgrass, occurred at the edges of stands of common reed, and nested in stands of sprangletop. In northeastern North Dakota, Nelson's Sparrows have been reported nesting in thin, sparse grass on a wet alkali flat (Rolfe, 1899; Hill, 1968). In South Dakota, they were found nesting in bulrushes (*Scirpus* spp.) and dense grass (Williams and Zimmer, 1992).

In northern Minnesota, Hanowski and Niemi (1988) found that graminoid density within Nelson's Sparrow breeding territories was high (greater than 180 stems per square meter [m^2]). Stem density of phanerophytes (graminoids, forbs, or shrubs greater than 40 cm tall that are present each year) was low (mean of 0.06 stems per m^2) in habitats used by Nelson's Sparrows. The most common forbs near nests were mints (Lamiaceae) (forb coverage was 76 percent mint, 10 percent bur-reed [*Sparganium* spp.], 5 percent parsley [Apiaceae], 5 percent thistle [*Cirsium* spp.], 1 percent harlequin blueflag [*Iris versicolor*], 1 percent purple marshlocks [*Comarum palustre*], 1 percent clover [*Trifolium* spp.], and 1 percent bedstraw [*Galium* spp.]). The composition of phanerophytes was 79 percent willow (*Salix* spp.), 15 percent quaking aspen (*Populus tremuloides*), and 6 percent common reed. Nelson's Sparrows in the St. Croix River Valley of Minnesota and Wisconsin used northern sedge (*Carex* spp.) meadows containing mannagrass (*Glyceria* spp.), bluejoint (*Calamagrostis canadensis*), and water sedge (*Carex aquatilis*) (Faanes, 1981). In northwestern Minnesota, Svedarsky (1992) reported breeding pairs using upland areas dominated by wheatgrasses (*Thinopyrum intermedium*, *Pascopyrum smithii*, and *Elymus repens*), timothy (*Phleum pratense*), bluegrass (*Poa* spp.), and sweetclover (*Melilotus* spp.), and seep areas dominated by reed canary grass (*Phalaris arundinacea*), bulrush, and sedges.

The Nelson's Sparrow tolerates some shrubby vegetation, such as scattered willows (*Salix* spp.) (Morissette and others, 2013; Hillman and others, 2016). In boreal wetlands in Manitoba, Morissette and others (2013) observed the Nelson's Sparrow in marsh and shrubby fen communities. Composition of shrubby fens included willows, alders (*Alnus* spp.), and sweetgale (*Myrica gale*). Along an intermittent prairie stream in southern Alberta, Hillman and others (2016) reported that Nelson's Sparrows occurred in true willow communities (that is, riparian zones inhabited primarily by Bebb's willow [*Salix bebbiana*] and sandbar willow [*Salix exigua*]).

The future distribution of Nelson's Sparrow breeding habitat may be affected by climate-induced changes to temperature and precipitation (Langham and others, 2015; Winker and Gibson, 2018; Cadieux and others, 2020). Wilsey and others (2019) compiled avian occurrence data from 40 datasets to project climate vulnerability scores under scenarios in which global mean temperature increases 1.5, 2, or 3 degrees Celsius (ºC). Nelson's Sparrows ranked low in vulnerability during the breeding season at a 1.5 ºC increase, moderate at a 2 ºC increase, and high at a 3 ºC increase. Under projected greenhouse gas emission scenarios described by the

Intergovernmental Panel on Climate Change (2000), Langham and others (2015) categorized the Nelson's Sparrow as a climate-endangered species, indicating that the species would lose more than 50 percent of its current distribution by 2050 across all scenarios, with no net gain from potential range expansion. Winker and Gibson (2018) estimated that climate changes would shift the range of Nelson's Sparrows into Beringia. Within the Canadian boreal forest, Cadieux and others (2020) forecast that climate-related increases in fire activity from the year 2000 to 2100 would decrease tree cover and increase grass- and shrub-dominated vegetation communities, which was projected to be a key driver of increased abundance of Nelson's Sparrows.

Area Requirements and Landscape Associations

Little information is available regarding the area requirements of Nelson's 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 (*Molothrus ater*). Nelson's Sparrows may be semicolonial nesters, and they may be nonterritorial (Murray, 1969; Shriver and others, 2020). The daily activities of breeding males are concentrated in large overlapping home ranges (Shriver and others, 2020). However, males do respond to recorded playbacks of songs, which suggests some level of territoriality (D.R.C. Prescott, Alberta Sustainable Resource Development, Fish and Wildlife Management Division, Red Deer, Alberta, written commun. [n.d.]). They are interspecifically territorial with LeConte's Sparrows (*Ammospiza leconteii*) (Murray, 1969; D.R.C. Prescott, Alberta Sustainable Resource Development, Fish and Wildlife Management Division, Red Deer, Alberta, written commun. [n.d.]).

In Alberta, Prescott and others (1995) found Nelson's Sparrows only on saline wetlands larger than 8 hectares (ha) and freshwater wetlands smaller than 1 ha. In a study of wetlands throughout the PPR of North Dakota and South Dakota, Nelson's Sparrows occurred in 47 wetlands with an average size of 8 ha (Igl and others, 2017). Landscape composition within 800 meters (m) of the 47 wetlands was 54 percent grassland, 25 percent agricultural, 15 percent wetland, and 6 percent other; average number of wetlands within 800 m was 20. In south-central North Dakota, Nelson's Sparrows occurred on wetlands ranging in size from 5.0 to 6.4 ha (Krapu and Green, 1978). In northern Minnesota, the average wetland size used by Nelson's Sparrows was 130 ha (range 15–250 ha) (Hanowski and Niemi, 1986). Nelson's Sparrows also were found in a 500-ha wetland in Minnesota (Breckenridge and Kilgore, 1929).

Brood Parasitism by Cowbirds and Other Species

There are two published records of brood parasitism by Brown-headed Cowbirds in Nelson's Sparrow nests (Shaffer and others, 2019). Hill (1968) reported a single cowbird egg discovered in a Nelson's Sparrow nest in Manitoba. In northeastern Montana, a Brown-headed Cowbird nestling was found in a Nelson's Sparrow nest, and a punctured Nelson's Sparrow egg was discovered on the ground below the nest (Nordhagen and others, 2005). Adult Nelson's Sparrows were observed feeding the cowbird nestling.

Breeding-Season Phenology and Site Fidelity

Nelson's Sparrows arrive on the breeding grounds from early to mid-May in Minnesota, from mid- to late May in North Dakota and the aspen parkland of Alberta, and not before June in southeastern Saskatchewan and southwestern Manitoba (Roberts, 1932; Murray, 1969; Salt and Salt, 1976; Knapton, 1979; D.R.C. Prescott, Alberta Sustainable Resource Development, Fish and Wildlife Management Division, Red Deer, Alberta, written commun. [n.d.]). In North Dakota, the peak breeding season is mid-June to early August (Murray, 1969; Stewart, 1975). Nelson's Sparrows leave the breeding grounds from late August to mid-October (Roberts, 1932; Murray, 1969; Salt and Salt, 1976; Shriver and others, 2020). Saltmarsh Sparrows on the East Coast raise second broods and renest following failed nesting attempts (Greenlaw and others, 2020), but double broodedness and renesting have not been reported for Nelson's Sparrows. Limited evidence exists in North Dakota for breeding-site fidelity (Murray, 1969). One of three banded males and the only banded female returned to a study site in the year after they were banded.

Species' Response to Management

Few studies have examined the effects of burning, mowing, or grazing on Nelson's Sparrows. Shriver and others (2020) have suggested that removal of vegetation by burning or mowing may cause local extirpation of Nelson's Sparrow populations. In northeastern Minnesota, Hanowski and others (1999) found that Nelson's Sparrows markedly declined in scrub/shrub wetlands within the decades following suppression of wildfires. Efforts at suppressing woody vegetation within wetlands by prescribed burning and shearing failed

to provide suitable habitat to attract Nelson's Sparrows. In Saskatchewan and Manitoba, Davis and others (2017) studied the effect on grassland birds of fields converted from cropland to native and tame grass-forb mixtures and managed with burning and haying. Davis and others (2017) reported that Nelson's Sparrows occurrence was unaffected by burning or mowing, as occurrence was similar in seeded-native burned fields, seeded-native hayed fields, and seeded-tame hayed fields. In Saskatchewan, no relationship was detected between Nelson's Sparrow occurrence and years postmanagement. In Manitoba, however, Nelson's Sparrow occurrence gradually declined throughout the entirety of the 8 years that management was assessed; occurrence declined by 50 percent over the 8 years, regardless of whether the seeded fields were burned or hayed. Vegetation structure was a better predictor of bird occurrence than management regime or years postmanagement; Nelson's Sparrow occurrence was positively associated with the number of contacts of narrow-leaved (less than 0.5 cm) grasses and had a quadratic relationship with vegetation height (Davis and others, 2017).

Grazing is generally detrimental to Nelson's Sparrows. In Alberta aspen parkland, Nelson's Sparrows were absent from mixed-grass pastures and uncommon in tame pastures (Prescott and Murphy, 1996). Tame pastures were characterized by lower percentages of grass and shrub cover, higher percentages of forb cover and bare ground, fewer shrub clumps, and taller grasses and forbs than mixed-grass pastures. Prescott and others (1995) reported that the species was most abundant in idled native and tame grasslands and absent from continuously grazed mixed-grass prairies, continuously grazed native parkland, deferred-grazed (grazed only after July 15) mixed-grass prairies, deferred-grazed tame grasslands, conventionally mowed hayfields, and deferred-mowed hayfields. The effects of three intensities of late-season (dates were not provided) grazing were examined in another Alberta study (Prescott, 1996). The only Nelson's Sparrow recorded was on a site subjected to the highest intensity of grazing (biomass loss because of grazing was 71 percent, but vegetation height was not reduced significantly).

Nelson's Sparrows readily occupy seeded grasslands. In Alberta, Nelson's Sparrows were more abundant in seeded-native than in tame DNC fields (Prescott and others, 1995). The species was rare or absent in tame DNC fields that were less than 2 years old; abundance increased with age of DNC fields until the fifth and final year of the study, after which abundance decreased (Prescott and Murphy, 1999). In Saskatchewan, Nelson's Sparrows were present in seeded-native and tame DNC fields and in native mixed-grass prairies but were absent from wheat (*Triticum* spp.) fields (Hartley, 1994a, 1994b). In Manitoba, Nelson's Sparrows were detected in idle native grasslands but not in seeded-native or tame DNC fields (Dhol and others, 1994). In another Manitoba study, Nelson's Sparrows were recorded only in hayland planted to tame grasses and legumes (single occurrence) and not in seeded-native DNC fields, DNC fields planted to tame grasses and legumes, or idle native grassland (Jones, 1994). In Saskatchewan and Manitoba, Nelson's Sparrows were found in seeded-native burned fields, seeded-native hayed fields, and seeded-tame hayed fields (Davis and others, 2017). In North Dakota, Nelson's Sparrows were present in DNC fields planted to tame species and absent in idle and grazed mixed-grass prairie (Renken, 1983; Renken and Dinsmore, 1987). DNC fields were characterized by taller and denser vegetation cover and a deeper litter layer than idle mixed-grass prairies (Renken, 1983). In North Dakota, South Dakota, Montana, and Minnesota, Nelson's Sparrows were present at low densities in grasslands enrolled in the Conservation Reserve Program (Johnson and Schwartz, 1993; Igl, 1996, 2009).

Environmental contaminants may have deleterious effects on Nelson's Sparrows. Localized and potentially harmful concentrations of mercury were reported in a Nelson's Sparrow breeding population in northeastern North Dakota (Winder and Emslie, 2011, 2012; Winder and others, 2020). Elevated blood mercury concentrations in Nelson's Sparrows tested near Grand Forks, North Dakota, averaged 1.16 micrograms (µg) per gram (g) wet weight, an amount which was in excess of levels corresponding to greater than or equal to 50 percent reduction in nest success in another songbird species (Winder and Emslie, 2011, 2012). Lower blood mercury concentrations (average 0.38 µg per g wet weight) were reported at J. Clark Salyer National Wildlife Refuge in northern North Dakota (Winder and Emslie, 2012). Winder and others (2020) examined the role of wetland water management on mercury bioaccumulation at the same Grand Forks sites as those examined 6 years earlier (Winder and Emslie, 2012). Blood mercury concentrations remained high for Nelson's Sparrows, averaging 0.89 µg per g wet weight for 14 individuals. Songbirds, including Nelson's Sparrows, that occupied areas that were impounded with water flow or partially drawn-down conditions had blood mercury concentrations 26–28 percent lower than individuals in isolated wetlands with no outflow (Winder and others, 2020).

Although little information exists on the effects of human-made structures on Nelson's Sparrows during the breeding season, Arnold and Zink (2011) ranked the Nelson's Sparrow as a "super collider" during migration; Nelson's Sparrow experienced 26 times greater risk of colliding with buildings than the average bird species and was ranked among the top five species that collide most frequently with buildings in North America.

Energy development may negatively affect Nelson's Sparrow distribution and abundance. Beston and others (2016) developed a prioritization system for 428 avian species to identify those species most likely to experience population declines in the United States from wind facilities based on the species' current conservation status and the species' expected risk from wind turbines. The Nelson's Sparrow scored a 4.50 out of nine; 7.84 percent of the Nelson's Sparrow breeding population in the United States were estimated to be exposed to wind facilities.

Management Recommendations from the Literature

Protection of mesic habitats throughout the Nelson's Sparrow's breeding range will benefit this species (Shriver and others, 2020). In the semiforested boreal and parkland zones of North America, the protection of the various wetland classes collectively termed peatlands is necessary to maintain breeding habitat for the Nelson's Sparrow (Hanowski and others, 1999; Morissette and others, 2013). Within the PPR, grassland landscapes that include wetland complexes with a gradient of water permanencies, wetland sizes, and alkalinities will provide suitable Nelson's Sparrow breeding habitat during both wet and dry years (Igl and others, 2017). Restored wetlands within grassland landscapes also support Nelson's Sparrows during the breeding season (Begley and others, 2012; Igl and others, 2017).

Nelson's Sparrows may benefit from preventing removal of vegetation through burning or harvesting, or by increasing vegetative cover in areas where short grasses prevail (Prescott and Murphy, 1996; Shriver and others, 2020). Davis and others (2017) recommended that some form of management of planted grasslands should occur every 4–6 years to maintain habitat for generalist grassland bird species, but in their study, Nelson's Sparrow densities continued to decline after burning and haying treatments had been applied to seeded fields, indicating that for this species, management was detrimental.

To prevent collisions with human-made structures, Arnold and Zink (2011) recommended simple design alterations. These included the use of flashing lights on shorter communication towers and turning off lights on towers during peak migratory periods. To minimize collisions with buildings, Arnold and Zink (2011) recommend eliminating or minimizing vegetation near glass building faces.

Winder and Emslie (2012) and Winder and others (2020) recommended that conservation management plans should consider the potential negative effects of mercury exposure in Nelson's Sparrows, which may be exasperated by other environmental threats, such as habitat degradation and water-management regimes. Winder and others (2020) suggested that wetland water management has important consequences for the levels of mercury bioaccumulation in Nelson's Sparrows and other birds and indicated that water flow and drawn-down water level could play an important role in reducing mercury bioaccumulation in wetlands. Winder and others (2020) reported that birds occupying partially or fully drawn-down wetlands had lower mercury concentrations than those within impounded wetlands, suggesting that drawing down wetland water levels and introducing water flow has the potential to reduce mercury bioaccumulation.

References

Ahlering, M.A., and Merkord, C.L., 2016, Cattle grazing and grassland birds in the northern tallgrass prairie: The Journal of Wildlife Management, v. 80, no. 4, p. 643–654. [Also available at https://doi.org/10.1002/jwmg.1049.]

American Ornithologists' Union, 1995, Fortieth supplement to the American Ornithologists' Union Check-list of North American Birds: The Auk, v. 112, no. 3, p. 819–830.

Arnold, T.W., and Zink, R.M., 2011, Collision mortality has no discernible effect on population trends of North American birds: PLoS One, v. 6, no. 9, p. e24708. [Also available at https://doi.org/10.1371/journal.pone.0024708.]

Begley, A.J.P., Gray, B.T., and Paszkowski, C.A., 2012, A comparison of restored and natural wetlands as habitat for birds in the Prairie Pothole Region of Saskatchewan, Canada: The Raffles Bulletin of Zoology, suppl. no. 25, p. 173–187.

Berkey, G., Crawford, R., Galipeau, S., Johnson, D., Lambeth, D., and Kreil, R., 1993, A review of wildlife management practices in North Dakota—Effects on nongame bird populations and habitats: Denver, Colo., U.S. Fish and Wildlife Service, Report submitted to Region 6, 51 p.

Beston, J.A., Diffendorfer, J.E., Loss, S.R., and Johnson, D.H., 2016, Prioritizing avian species for their risk of population-level consequences from wind energy development: PLoS One, v. 11, no. 3, p. e0150813. [Also available at https://doi.org/10.1371/journal.pone.0150813.]

Bownan, C.W., 1904, Nelson's Sharp-tailed Sparrow in North Dakota: The Auk, v. 21, no. 3, p. 385–386. [Also available at https://doi.org/10.2307/4070206.]

Breckenridge, W.J., 1930, Breeding of Nelson's Sparrow (*Ammospiza nelsoni*) with special reference to Minnesota: Minneapolis, Minn., University of Minnesota, Occasional Paper of the Museum of Natural History, no. 3, p. 29–38.

Breckenridge, W.J., and Kilgore, W., 1929, Nelson's Sparrow nesting in Minnesota: The Auk, v. 46, no. 4, p. 548. [Also available at https://doi.org/10.2307/4076212.]

Cadieux, P., Boulanger, Y., Cyr, D., Taylor, A.R., Price, D.T., Sólymos, P., Stralberg, D., Chen, H.Y.H., Brecka, A., and Tremblay, J.A., 2020, Projected effects of climate change on boreal bird community accentuated by anthropogenic disturbances in western boreal forest, Canada: Diversity and Distributions, v. 26, no. 6, p. 668–682. [Also available at https://doi.org/10.1111/ddi.13057.]

Chesser, R.T., Banks, R.C., Barker, F.K., Cicero, C., Dunn, J.L., Kratter, A.W., Lovette, I.J., Rasmussen, P.C., Remsen, J.V., Jr., Rising, J.D., Stotz, D.F., and Winker, K., 2009, Fiftieth supplement to the American Ornithological Society's Check-list of North American Birds: The Auk, v. 126, no. 3, p. 705–714. [Also available at https://doi.org/10.1525/auk.2009.8709.]

Chesser, R.T., Burns, K.J., Cicero, C., Dunn, J.L., Kratter, A.W., Lovette, I.J., Rasmussen, P.C., Remsen, J.V., Jr., Stotz, D.F., Winger, B.M., and Winker, K., 2018, Fifty-ninth supplement to the American Ornithological Society's Check-list of North American Birds: The Auk, v. 135, no. 3, p. 798–813. [Also available at https://doi.org/10.1642/AUK-18-62.1.]

Davis, S.K., Devries, J.H., and Armstrong, L.M., 2017, Variation in passerine use of burned and hayed planted grasslands: The Journal of Wildlife Management, v. 81, no. 8, p. 1494–1504. [Also available at https://doi.org/10.1002/jwmg.21316.]

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

Erskine, A.J., 1968, Birds observed in north-central Alberta, summer 1964: Blue Jay, v. 26, no. 1, p. 24–31. [Also available at https://dx.doi.org/10.29173/bluejay3286.]

Faanes, C.A., 1981. Birds of the St. Croix River Valley—Minnesota and Wisconsin: Washington, D.C., U.S. Fish and Wildlife Service, North American Fauna, no. 73, 196 p. [Also available at https://dx.doi.org/10.3996/nafa.73.0001.]

Greenlaw, J.S., Elphick, C.S., Post, W., and Rising, J.D., 2020, Saltmarsh Sparrow (*Ammospiza caudacutus*) (ver. 1.0), *in* Rodewald, P.G., ed., Birds of the world: Ithaca, N.Y., Cornell Lab of Ornithology, accessed July 2020 at https://birdsoftheworld.org/bow/species/sstspa/cur/introduction. [Also available at https://doi.org/10.2173/bow.sstspa.01.]

Hanowski, J.M., Christian, D.P., and Nelson, M.C., 1999, Response of breeding birds to shearing and burning in wetland brush ecosystems: Wetlands, v. 19, no. 3, p. 584–593. [Also available at https://dx.doi.org/10.1007/BF03161696.]

Hanowski, J.M., and Niemi, G.J., 1986, Habitat characteristics for bird species of special concern: St. Paul, Minn., Report prepared for Minnesota Department of Natural Resources, 50 p.

Hanowski, J.M., and Niemi, G.J., 1988, An approach for quantifying habitat characteristics for rare wetland birds, *in* Mitchell, R.S., and Sheviak, C.J., eds., Proceedings of the fifteenth Annual Natural Areas Conference: Albany, N.Y., State University of New York, p. 51–56.

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

Hartley, M.J., 1994b, Passerine abundance and productivity indices in grasslands managed for waterfowl nesting cover in Saskatchewan, Canada: Baton Rouge, La., Louisiana State University, Master's Thesis, 42 p.

Hill, N.P., 1968, Nelson's Sharp-tailed Sparrow (*Ammospiza caudacuta nelsoni*), *in* Austin, O.L., Jr., ed., Life histories of North American cardinals, grosbeaks, buntings, towhees, finches, sparrows, and allies. Order Passeriformes—Family Fringillidae. Part two—Genera *Pipilo* (part) through *Spizella*: New York, N.Y., Dover Publications, Inc., p. 815–819. [Also available at https://doi.org/10.5479/si.03629236.237.1.]

Hillman, E.J., Bigelow, S.G., Samuelson, G.M., Herzog, P.W., Hurly, T.A., and Rood, S.B., 2016, Increasing river flow expands riparian habitat—Influences of flow augmentation on channel form, riparian vegetation and birds along the Little Bow River, Alberta: River Research and Applications, v. 32, p. 1687–1697. [Also available at https://dx.doi.org/10.1002/rra.3018.]

Igl, L.D., 1996, Le Conte's, Sharp-tailed, and Henslow's sparrows in Grant County: Loon, v. 68, no. 2, p. 127–128.

Igl, L.D., 2009, Breeding bird use of grasslands enrolled in the Conservation Reserve Program in the northern Great Plains: Fargo, N. Dak., North Dakota State University, Ph.D. Dissertation, 199 p.

Igl, L.D., Shaffer, J.A., Johnson, D.H., and Buhl, D.A., 2017, The influence of local- and landscape-level factors on wetland breeding birds in the Prairie Pothole Region of North and South Dakota: U.S. Geological Survey Open-File Report 2017–1096, 65 p. [Also available at https://dx.doi.org/10.3133/ofr20171096.]

Johnson, D.H., and Schwartz, M.D., 1993, The Conservation Reserve Program—Habitat for grassland birds: Great Plains Research, v. 3, no. 2, p. 273–295.

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

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

Krapu, G.L., and Green, R.K., 1978, Breeding bird populations of selected semipermanent wetlands in south-central North Dakota—1977: American Birds, v. 32, no. 1, p. 110–112.

Langham, G.M., Schuetz, J.G., Distler, T., Soykan, C.U., and Wilsey, C., 2015, Conservation status of North American birds in the face of future climate change: PLoS One, v. 10, no. 9, p. e0135350. [Also available at https://dx.doi.org/10.1371/journal.pone.0135350.]

Morissette, J.L., Kardynal, K.J., Bayne, E.M., and Hobson, K.A., 2013, Comparing bird community composition among boreal wetlands—Is wetland classification a missing piece of the habitat puzzle?: Wetlands, v. 33, p. 653–665. [Also available at https://doi.org/10.1007/s13157-013-0421-1.]

Murray, B.G., Jr., 1969, A comparative study of Le Conte's and Sharp-tailed sparrows: The Auk, v. 86, no. 2, p. 199–231. [Also available at https://doi.org/10.2307/4083496.]

National Geographic Society, 2011, Field guide to the birds of North America (6th ed.): Washington, D.C., National Geographic Society, 576 p.

Nordhagen, T.J., Nordhagen, M.P., and Hendricks, P., 2005, Nelson's Sharp-tailed Sparrow nest parasitized by Brown-headed Cowbird: The Wilson Bulletin, v. 117, no. 4, p. 403–404. [Also available at https://doi.org/10.1676/05-005.1.]

Prescott, D.R.C., 1996, Impacts of grazing management on bird communities of dense nesting cover: the Alberta Agricultural Development Corporation (AADC) property: Edmonton, Alberta, Alberta NAWMP Centre, and Land Stewardship Centre of Canada, NAWMP-027, 15 p.

Prescott, D.R.C., Arbuckle, R., Goddard, B., and Murphy, A., 1993, Methods for the monitoring and assessment of avian communities on NAWMP landscapes in Alberta, and 1993 results: Edmonton, Alberta, Alberta NAWMP Centre, NAWMP-007, 48 p.

Prescott, D.R.C., and Murphy, A.J., 1996, Habitat associations of grassland birds on native and tame pastures of the aspen parkland in Alberta: Edmonton, Alberta, Alberta NAWMP Centre, NAWMP-021, 36 p.

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

Prescott, D.R.C., Murphy, A.J., and Ewaschuk, E., 1995, An avian community approach to determining biodiversity values of NAWMP habitats in the aspen parkland of Alberta: Edmonton, Alberta, Alberta NAWMP Centre, NAWMP-012, 58 p.

Renken, R.B., 1983, Breeding bird communities and bird-habitat associations on North Dakota waterfowl production areas of three habitat types: Ames, Iowa, Iowa State University, Master's Thesis, 90 p.

Renken, R.B., and Dinsmore, J.J., 1987, Nongame bird communities on managed grasslands in North Dakota: Canadian Field-Naturalist, v. 101, no. 4, p. 551–557.

Robel, R.J., Briggs, J.N., Dayton, A.D., and Hulbert, L.C., 1970, Relationships between visual obstruction measurements and weight of grassland vegetation: Journal of Range Management, v. 23, no. 4, p. 295–297. [Also available at https://dx.doi.org/10.2307/3896225.]

Roberts, T.S., 1932, The birds of Minnesota, volume 2: Minneapolis, Minn., University of Minnesota Press, 821 p.

Rolfe, E.S., 1899, Nesting of Nelson's Sparrow (*Ammodramus nelsoni*) in North Dakota: The Auk, v. 16, no. 4, p. 356–357. [Also available at https://dx.doi.org/10.2307/4069369.]

Salt, W.R., and Salt, J.R., 1976, The birds of Alberta: Edmonton, Alberta, Hurtig Publishers, 498 p.

Sauer, J.R., Hines, J.E., Fallon, J.E., Pardieck, K.L., Ziolkowski, D.J., Jr., and Link, W.A., 2014, The North American Breeding Bird Survey, results and analysis 1966–2012 (ver. 02.19.2014): Laurel, Md., U.S. Geological Survey, Patuxent Wildlife Research Center, accessed May 2020 at https://www.mbr-pwrc.usgs.gov/bbs/bbs2012.shtml.

Shaffer, J.A., Igl, L.D., Goldade, C.M., Dinkins, M.F., Johnson, D.H., and Euliss, B.R., 2019, The effects of management practices on grassland birds—Rates of Brown-headed Cowbird (*Molothrus ater*) parasitism in nests of North American grassland birds, chap. PP *of* Johnson, D.H., Igl, L.D., Shaffer, J.A., and DeLong, J.P., eds., The effects of management practices on grassland birds: U.S. Geological Survey Professional Paper 1842, 24 p., accessed May 2020 at https://doi.org/10.3133/pp1842PP.

Shriver, W.G., Hodgman, T.P., and Hanson, A.R., 2020, Nelson's Sparrow (*Ammospiza nelsoni*) (ver. 1.0), *in* Rodewald, P.G., ed., The birds of the world: Ithaca, N.Y., Cornell Lab of Ornithology, accessed July 2020 at https://birdsoftheworld.org/bow/species/nstspa/cur/introduction. [Also available at https://doi.org/10.2173/bow.nstspa.01.]

Siddle, C., 1992, The summer season–British Columbia/Yukon region: American Birds, v. 46, no. 5, p. 1167–1170.

Sidie-Slettedahl, A.M., Jensen, K.C., Johnson, R.R., Arnold, T.W., Austin, J.E., and Stafford, J.D., 2015, Evaluation of autonomous recording units for detecting 3 species of secretive marsh birds: Wildlife Society Bulletin, v. 39, no. 3, p. 626–634. [Also available at https://doi.org/10.1002/wsb.569.]

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

Svedarsky, W.D., 1992, Biological inventory of a multi-purpose flood control impoundment in northwest Minnesota and potentials for nongame and game bird management: Crookston, Minn., University of Minnesota, Northwest Research and Outreach Center, Miscellaneous Publication, 114 p.

Taylor, P., 2018, Nelson's Sparrow *in* Artuso, C., Couturier, A.R., De Smet, K.D., Koes, R.F., Lepage, D., McCracken, J., Mooi, R.D., and Taylor, P., eds., The atlas of the breeding birds of Manitoba, 2010–2014: Winnipeg, Manitoba, Bird Studies Canada, accessed June 2020 at http://www.birdatlas.mb.ca/accounts/speciesaccount.jsp?sp=NSTS&lang=en.

Wiens, J.A., 1969, An approach to the study of ecological relationships among grassland birds: Ornithological Monographs, no. 8, p. 1–93. [Also available at https://dx.doi.org/10.2307/40166677.]

Williams, J.D., and Zimmer, M., 1992, First Sharp-tailed Sparrow South Dakota nesting record: South Dakota Bird Notes, v. 44, no. 4, p. 84–85.

Wilsey, C., Taylor, L., Bateman, B., Jensen, C., Michel, N., Panjabi, A., and Langham, G., 2019, Climate policy action needed to reduce vulnerability of conservation-reliant grassland birds in North America: Conservation Science and Practice, v. 1, no. 4, p. e21. [Also available at https://doi.org/10.1111/csp2.21.]

Winder, V.L., Anteau, M.J., Fisher, M.R., Wilcox, M.K., Igl, L.D., and Ackerman, J.T., 2020, Wetland water-management may influence mercury bioaccumulation in songbirds and ducks at a mercury hotspot: Ecotoxicology. [Also available at https://doi.org/10.1007/s10646-019-02143-w.]

Winder, V.L., and Emslie, S.D., 2011, Mercury in breeding and wintering Nelson's Sparrows (*Ammodramus nelsoni*): Ecotoxicology, v. 20, no. 1, p. 218–225. [Also available at https://dx.doi.org/10.1007/s10646-010-0573-1.]

Winder, V.L., and Emslie, S.D., 2012, Mercury in Nelson's Sparrow subspecies at breeding sites: PLoS One, v. 7, no. 2, p. e32257. [Also available at https://dx.doi.org/10.1371/journal.pone.0032257.]

Winker, K., and Gibson, D.D., 2018, Some broad-scale effects of recent and future climate change among migratory birds in Beringia, *in* Shuford, W.D., Gill, R., and Handel, C., eds., Trends and traditions—Avifaunal change in western North America: Studies of Western Birds, no. 3, p. 432–440. [Also available at http://dx.doi.org/10.21199/SWB3.23.]

Table KK1. Measured values of vegetation structure and composition in Nelson's Sparrow (*Ammospiza nelsoni nelsoni*) 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; --, no data; DNC, dense nesting cover; WMA, Wildlife Management Area; >, greater than]

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)
Dhol and others, 1994	Manitoba	Mixed-grass prairie	Idle	27.5	--	40.4	--	--	--	--	6.8
Hanowski and Niemi, 1986 (territories)	Minnesota	Tallgrass prairie	--	121.9	--	--	--	--	--	--	--
Prescott and Murphy, 1996	Alberta	Tame grassland	Grazed	20	--	58	24	4.5	13	--	--
Renken, 1983[a]	North Dakota	Tame grassland (DNC)	Idle, grazed	--	41[b]	89	35	0	0.3	99	2.4
Svedarsky, 1992 (nests)	Minnesota	Tame grassland (WMA)	--	>100	--	--	--	--	--	--	--

[a]The sum of the percentages is >100%, based on the modified point-quadrat technique of Wiens (1969).

[b]Visual obstruction reading (Robel and others, 1970).

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