ARE SUNFLOWER FIELDS FOR THE BIRDS?

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***Abstract*:** The northern Great Plains are home to a variety of birds throughout the year, particularly during migration. Migratory species use native and restored grasslands, shelterbelts, and agricultural fields for food and shelter in North Dakota. Blackbirds (*Xanthocephalus xanthocephalus*) have been documented to cause economically important damage to some crops and thus, are sometimes the target of concerted harassment efforts. Few studies have assembled an inventory of nonblackbirds using small grain fields during the fall and spring in North Dakota that may be inadvertently affected by blackbird management. At least 94 nonblackbird species use crop fields in the spring and fall in North Dakota. Sunflower fields appear to be a particularly important stopover habitat for a variety of migratory birds, with 78 species and 29 species using sunflower in the fall and spring, respectively. We encourage a joint blackbird management / wildlife habitat system including Wildlife Conservation Sunflower Plots (lure plots) as part of an integrated pest management plan to reduce blackbird damage to sunflower and provide habitat for nonblackbirds.

***Key words*:** blackbirds, decoy plots, lure plots, nonblackbirds, stopover habitat, WCSP

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INTRODUCTION

The northern Great Plains (hereafter NGP) of North America provide stopover habitat for a wide variety of migratory birds. Forest species, grassland species, and habitat generalists migrate across a patchwork of agriculture that fragments the once continuous grasslands of the NGP into a mosaic of commercial grain crops, hay lands, grazing pastures, and shelterbelts. Presently, patches of Conservation Reserve Program (CRP) grasslands, grazing pastures, and wildlife-managed lands represent the majority of the prairie remnants within the cultivated landscape of NGP. With reduced grassland habitats available, migratory birds use crop fields and shelterbelts in the NGP. These areas have become important habitats for some migratory species, especially as some North American birds have experienced population declines (Robbins et al. 1989, Askins et al. 1990, Askins 1993, 1999, 2000, Murphy 2003).

Population and habitat selection studies of farmland birds are heavily biased towards the breeding grounds, with little information available about the wintering ground habitat and even less regarding stopover site selection. Though site selection is likely hierarchical, studies quantifying habitat variables in stopover locations are lacking (Wiens 1973, Johnson 1980).

Peterjohn (2003) describes understanding of the habitat requirements of many farmland birds during non-breeding seasons as "rudimentary." Quality stopover habitat is vital for migrants, especially when they are bound for breeding grounds as lean birds may not be as attractive to females nor be able to defend a territory until they feed and increase their fat stores (Moore and Simons 1989). Fat depleted birds must also remain longer at stopover sites increasing the risk of predation. Stopover sites which provide cover and large amounts of accessible forage spread over a large area may lead to reduced stopover time.

Many migratory bird species inhabit the Prairie Pothole Region of the NGP, using small, isolated wetlands, prairie patches, emergent wetland vegetation, and agricultural crops for food, nesting habitat, and cover. Though the NGP is highly fragmented, grassland birds and other species inhabit row-crop fields, roadsides, grass patches, and other areas (Best et al. 1998, Herkert 1998, McCoy et al. 1999, Schaaf 2003, Galle 2006, Hagy 2006). Best et al. (1998) found more wintering species in row-crop fields than in CRP fields in six Midwestern states. Martin (1980) observed more than 65 avian species using shelterbelts as stopover habitat during spring migration in eastern South Dakota. Shelterbelts provide forest islands that have contributed to the westward expansion of some forest birds (Sprunt 1975, Johnson and Beck 1988). Clearly, the NGP provide habitat for a large number of migratory birds.

Though crop fields may provide adequate habitat for birds, not all of these migrants are welcomed visitors, especially by sunflower producers. An estimated 75 million blackbirds migrate through the NGP in the fall to feed on waste grain and standing crops, the latter including corn and sunflower (Linz et al. 2003). Blackbirds, including red-winged blackbirds (*Agelaius phoeniceus*), common grackles (*Quiscalus quiscula*), and yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), congregate in large mixed-species foraging flocks and may do substantial damage to commercial crops. The close proximity of commercial agriculture and abundant roosting habitat, cattail-emergent wetlands, make this region attractive to blackbirds. As North Dakota and South Dakota sunflower production supports a regional economy worth over $906 million, significant crop losses could reduce future sunflower plantings and negatively affect rural economies in the region (Bangsund and Leistritz 1995).

Many methods have been researched and implemented in the last 50 years to reduce blackbird damage to corn and sunflower in the NGP (Avery 2003, Cummings and Avery 2003, Linz et al. 2003). Producers and researchers have tried hazing birds with airplanes, frightening devices, propane cannons, and firearms, and have implemented roost habitat management with mixed success (Linz et al. 1992, 2003). In the early 1980s, Cummings et al. (1987) showed that "decoy" plantings of sunflower might reduce bird damage to commercial sunflower fields, though strategic placement of the plots was critical for their success. Researchers have documented bird use of agriculture in North Dakota comparing both blackbird and nonblackbird use across common row-crops. In this paper, we will focus on three studies which examined a variety of row-crops in central and eastern North Dakota in order to demonstrate the importance of agricultural habitat to migratory nonblackbirds, especially sunflower.

STUDY AREA

These studies were conducted within central and eastern North Dakota. Schaaf (2003) conducted observations in Barnes and Stutsman counties in the Southern Drift

Plains physiographic subregion. Galle (2006) conducted observations across 18 counties within the Southern Drift Plains of east–central part of the state. Hagy (2006) worked in the Southern Drift Plains, the Northern Drift Plains, and the Missouri Coteau subregions of east and central North Dakota within a 14-county area. Although this area was once dominated by tall- and mixed-grass prairies, it is now heavily cultivated (Barbour et al. 1999). Agriculture is a valuable industry in North Dakota, as it contributes to 25% of the state's economic base and over 8% of its gross state product (Leistritz et al. 2002).

Sunflower is an important crop, both ecologically and economically, in North Dakota, as well over 1 billion pounds of sunflower seed is produced annually on 0.44 million ha (USDA 2005). In 2005, North Dakota produced 45% of all oilseed, 39% of all confectionary, and 42% of the total sunflower grown in the United States (USDA 2005).

METHODS

In fall of 2000 and 2001, Schaaf (2003) identified and quantified nonblackbirds in 12 ripening sunflower fields in Barnes and Stutsman counties, North Dakota. This study also measured habitat parameters in and around the fields, in order to examine possible correlation between these factors and nonblackbird abundance using Pearson product-moment correlations. The aim of this study was to develop information to evaluate the importance of sunflower as habitat for post-breeding birds.

In the spring of 2003 and 2004, Galle (2006) examined avian activity on 114 sunflower, soybean, corn, and other small grain fields throughout the Southern Drift Plains of North Dakota. Additionally, habitat variables surrounding study fields were quantified using GIS and principal component analysis to determine if there were significant relationships between bird abundance and surrounding habitats.

Hagy (2006) examined bird use throughout east–central North Dakota in 35 locations, each site including 1 commercial sunflower field, One Wildlife Conservation Sunflower Plot (hereafter WCSP), and one non-sunflower commercial agricultural row-crop field (corn, wheat, soybeans, field pea, canola, or flaxseed) in the fall of 2004 and 2005. Additionally, his study examined habitat variables within and surrounding each field type using model selection to elucidate relationships between avian abundance and habitat variables.

These authors used different methodologies, but all gathered valuable information regarding avian use of crop fields. Schaaf (2003) and Hagy (2006) conducted 50 m fixed radius circular point counts with supplemental mist-netting to thoroughly evaluate species richness in sunflower (Reynolds et al. 1980, Poulin et al. 2000). They conducted 8 min point counts beginning shortly after sunrise until all fields were surveyed (~2-5 hr). Hagy (2006) and Schaaf (2003) used mist nets in WCSP and commercial sunflower fields, respectively. Hagy (2006) conducted point counts only in commercial sunflower and non-sunflower crop fields. Galle (2006) used a line-transect method to count birds, which is more efficient than other methods for migration monitoring, especially in open habitats (Wilson et al. 2000).

RESULTS

Across studies, 94 species were documented (Schaaf 2003, Galle 2006, Hagy 2006) to use crop fields in the spring and fall in North Dakota (Table 1). Within all crop fields, abundance, density, and species richness were highest in sunflower (Galle 2006, Hagy 2006).

Table 1. Bird species observed in North Dakota with associated crop type (S - sunflower or C - other crop) and migration period (S - spring or F - fall).

AOU Code	Common Name	Species Name	Crop	Migration Period
AMCR	American Crow	*Corvus brachyrhynchos*	S	S, F
AMGO	American Goldfinch	*Carduelis tristis*	S, C	F
AMKE	American Kestrel	*Falco sparverius*	S	F
AMPI	American Pipit	*Anthus rubescens*	S	F
AMRO	American Robin	*Turdus migratorius*	S, C	S, F
ATSP	American Tree Sparrow	*Spizella arborea*	S, C	S, F
BAIS	Baird's Sparrow	*Ammodramus bairdii*	S	F
BAOR	Baltimore Oriole	*Icterus galbula*	S	F
BASW	Bank Swallow	*Riparia riparia*	S	F
BARS	Barn Swallow	*Hirundo rustica*	S	F
BCCH	Black-capped Chickadee	*Poecile atricapillus*	S	F
BLJA	Blue Jay	*Cyanocitta cristata*	S	F
BOBO	Bobolink	*Dolichonyx oryzivorus*	S	F
BRBL	Brewer's Blackbird	*Euphagus cyanocephalus*	S, C	S
BRTH	Brown Thrasher	*Toxostoma rufrum*	S	F
BHCO	Brown-headed cowbird	*Molothros ater*	S, C	S, F
CANG	Canada Goose	*Branta canadensis*	S, C	S
CEDW	Cedar Waxwing	*Bombycilla cedrorum*	S	F
CHSW	Chimney Swift	*Chaetura pelagica*	S	F
CHSP	Chipping Sparrow	*Spizella passerina*	S, C	F
CCSP	Clay-colored Sparrow	*Spizella pallida*	S, C	F
COGR	Common Grackle	*Quiscula quiscalus*	S, C	S, F
COSN	Common Snipe	*Gallinage gallinago*	S, C	S, F
COYE	Common Yellowthroat	*Geothlypis trichas*	S	F
COHA	Cooper's Hawk	*Accipiter cooperii*	S	F
DEJU	Dark-eyed Junco	*Junco hyemalis*	S, C	S
DICK	Dickcissel	*Spiza americana*	S	F

Table 1. Continued

AOU Code	Common Name	Species Name	Crop	Migration Period
DOWO	Downy Woodpecker	*Picoides pubescens*	S	F
EAKI	Eastern Kingbird	*Tyrannus tyrannus*	S, C	F
EVGR	Evening Grosbeak	*Coccothraustes vespertinus*	S	F
FISP	Field Sparrow	*Spizella pusilla*	S, C	S, F
FOSP	Fox Sparrow	*Passerella iliaca*	S	F
FRGU	Franklin's Gull	*Larus pipixcan*	C	F
GRSP	Grasshopper Sparrow	*Ammodramus savannarum*	S	F
GRAP	Gray Partridge	*Perdix perdix*	S, C	S, F
HAWO	Hairy Woodpecker	*Picoides villosus*	S	F
HASP	Harris's Sparrow	*Zonotrichia querula*	S	F
HOLA	Horned Lark	*Eremophila alpestris*	S, C	S, F
HOFI	House Finch	*Carpodacus mexicanus*	S	F
HOSP	House Sparrow	*Passer domesticus*	S, C	S, F
HOWR	House Wren	*Troglodytes aedon*	S	F
KILL	Killdeer	*Charadrius vociferus*	S, C	S, F
LALO	Lapland Longspur	*Calcarius lapponicus*	S, C	S, F
LASP	Lark Sparrow	*Chondestes grammacus*	C	F
LCSP	Le Conte's Sparrow	*Ammodramus leconteii*	S	F
LISP	Lincoln's Sparrow	*Melospiza lincolnii*	S	F
LSGO	Lesser Snow Goose	*Chen caerulescens caerulescens*	C	S
MALL	Mallard	*Anas platyrhynchos*	S,C	S
MAWR	Marsh Wren	*Cistothorus palustris*	S	F
MODO	Mourning Dove	*Zenaida macroura*	S, C	S, F
MOWA	Mourning Warbler	*Oporornis philadelphia*	S	F
NAWA	Nashville Warbler	*Vermivora ruficapilla*	S	F
NSTS	Nelson's Sharp-tailed Sparrow	*Ammodramus nelsoni*	S	F
NOFL	Northern Flicker	*Colaptes auratus*	S, C	S, F
NOHA	Northern Harrier	*Circus cyaneus*	S, C	S, F

Table 1. Continued

AOU Code	Common Name	Species Name	Crop	Migration Period
NOPI	Northern Pintail	*Anas acuta*	C	S
NRWS	Northern Rough-winged Swallow	*Stelgidopteryx serripennis*	S	F
NOWA	Northern Waterthrush	*Seiurus noveboracensis*	S	F
OCWA	Orange-crowned Warbler	*Vermivora celata*	S	F
OROR	Orchard Oriole	*Icterus spurius*	S	F
PAWA	Palm Warbler	*Dendroica palmarum*	S	F
PUFI	Purple Finch	*Carpodacus purpureus*	S	F
RWBL	Red-winged Blackbird	*Agelius phoenecius*	S, C	S, F
RNEP	Ring-necked Pheasant	*Phasianus colchicus*	S, C	S, F
RODO	Rock Dove	*Columba livia*	S	S, F
RBGR	Rose-breasted Grosbeak	*Pheycticus ludovicianus*	S	F
RCKI	Ruby-crowned Kinglet	*Regulus calendula*	S	F
RTHA	Red-tailed Hawk	*Buteo jamaicensis*	C	S, F
RTHU	Ruby-throated Hummingbird	*Archilochus colubris*	S, C	F
SACR	Sandhill Crane	*Grus canadensis*	C	S
SAVS	Savannah Sparrow	*Passerculus sandwichensis*	S, C	S, F
SEWR	Sedge Wren	*Cistothorus platensis*	S	F
SSHA	Sharp-shinned Hawk	*Accipiter striatus*	S	F
STGR	Sharp-tailed Grouse	*Tympanuchus phasianellus*	S, C	S, F
STSP	Sharp-tailed Sparrow	*Ammodramus nelsoni*	S	F
SMLO	Smith's Longspur	*Calcarius pictus*	S	F
SNBU	Snow Bunting	*Plectrophenax nivalis*	C	F
SOSP	Song Sparrow	*Melospiza melodia*	S, C	S, F
SORA	Sora	*Porzana carolina*	S	F
SPPI	Sprague's Pipit	*Anthus spragueii*	S	F
SWHA	Swainson's Hawk	*Buteo swainsoni*	S	F
SWSP	Swamp Sparrow	*Melospiza geogiana*	S	F
TEWA	Tennessee Warbler	*Vermivora peregrina*	S	F

Table 1. Continued

AOU Code	Common Name	Species Name	Crop	Migration Period
TRES	Tree Swallow	*Tachycineta bicolor*	S, C	F
VESP	Vesper Sparrow	*Pooecetes gramineus*	S, C	S, F
VIRA	Virginia Rail	*Rallus limicola*	S	F
WEKI	Western Kingbird	*Tyrannus verticalis*	S	F
WEME	Western Meadowlark	*Sturnella neglecta*	S, C	S, F
WCSP	White-crowned Sparrow	*Zonotrichia leucophrys*	S	F
WTSP	White-throated Sparrow	*Zonotrichia albicollis*	S, C	F
WIFL	Willow Flycatcher	*Empidonax traillii*	S	F
YWAR	Yellow Warbler	*Dendroica petechia*	S	F
YBFL	Yellow-bellied Flycatcher	*Empidonax flaviventris*	S, C	F
YHBL	Yellow-headed Blackbird	*Xanthocephalus xanthocephalus*	S, C	S, F
YRWA	Yellow-rumped Warbler	*Dendroica coronata*	S	F

Seventy-eight species exceeding 22 nonblackbirds/ha were observed in sunflower in the fall (Schaaf 2003, Hagy 2006) and 29 species at 2.6 nonblackbirds/ha were observed in the spring (Galle 2006). Galle (2006) found that blackbirds, passerines, Horned lark (*Eremophila alpestris*), Lapland longspur (*Calcarius lapponicus*), and all bird guilds had higher abundances in sunflower than other crop fields. Hagy (2006) omitted non-sunflower crop fields from habitat analysis reasoning that non-sunflower provide poor habitat for birds when compared to sunflower and bird observation numbers were insufficient in non-sunflower crops to conduct a reliable analysis. Galle (2006) detected horned larks, Lapland longspurs, and red-winged blackbirds most commonly in cropped fields; whereas, Hagy (2006) observed red-winged blackbird, yellow-headed blackbird, and white-throated sparrow (*Zonotrichia albicollis*) most commonly in crop fields.

In sunflower, Schaaf (2003) identified 49 species foraging in field interiors and 61 species on interiors and field edges combined. Avian density averaged 22.3 birds/ha in 2001 in commercial sunflower. Hagy (2006) observed 58 different species, 38 in WCSP, 42 in commercial sunflower, and 28 in all other crop fields. Nonblackbird densities averaged 4.3 birds/ha in commercial sunflower, 6.2 birds/ha in WCSP, and 1.8 birds/ha in non-sunflower crop fields. Collectively, avian density differed significantly for all birds combined (P = 0.05) across all field types in 2004 and 2005 (Hagy 2006). Hagy (2006) showed that average nonblackbird densities were higher in ripening sunflower (4.3 birds/ha) compared with wheat (2.9 birds/ha), corn (2.3 birds/ha), soybean (2.1 birds/ha), flaxseed (1.7 birds/ha), and canola (<1 birds/ha). Galle (2006) observed similar trends in the spring.

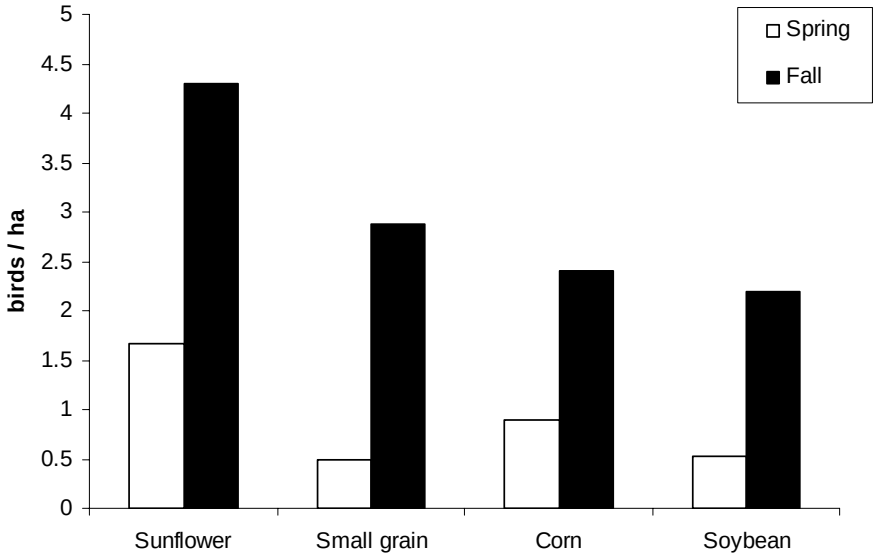

Figure 1. Nonblackbird use of crop fields in the spring (March and April) and fall (August - October) in North Dakota.

DISCUSSION

Schaaf (2003), Galle (2006), and Hagy (2006) showed that agricultural fields are important foraging habitats for birds during fall and spring migration in North Dakota. Moreover, of those crop habitats available to migratory birds, sunflower may have a disproportional importance to birds compared to percent coverage in the state. For example, in 2005, wheat (42%), soybeans (19%), corn (9.3%), barley (8.3%), and sunflower (4.5%) were the five major row-crops in North Dakota (NASS 2005). Nutritional value (Diaz 1990) and energy potential (Hagen 2006) are likely the primary reasons for the birds' selection of sunflower. Sunflower fields often have a higher density of weeds compared to herbicide resistant row crops such as soybean and corn (Krapu et al. 2004). Common "weeds" in sunflower may be attractive to granivorous birds, providing increased incentive to visit sunflower fields (Cummings and Avery 2003). Other studies have suggested that complex vegetation structure and diversity within fields can improve wildlife habitat in agricultural landscapes, especially to neotropical migratory birds (Otis and Kilburn 1988, Koford and Best 1996).

Sunflower is a valuable agricultural commodity for both migratory birds and producers which can sometimes lead to significant conflict and costs for both groups. Ironically, 82 million Americans fed wild birds using at least $1 billion in bird seed in 1985. Today, estimates have been as high as $10 billion in bird seed purchases, a major constituent of which is oilseed sunflower (O'Brien et al. 2001). Thus, sunflower producers and researchers are faced with the dilemma of keeping bird food away from birds.

As blackbirds can become an economical burden to producers, we suggest using lure plots of oilseed sunflower (WCSP) to minimize blackbird damage and harassment costs in commercial sunflower fields. Lure crops, for reducing wildlife damage to commercial agriculture, have been shown to be effective when carefully planned and manageed (Gustad 1979, Cummings et al. 1987). Harassing migratory birds increases grain wasting and may have negative effects on the birds themselves (Gustad 1979). Reduced hazing and other repulsion methods could save farmers time and money while improving sunflower habitat quality for migratory birds.

MANAGEMENT IMPLICATIONS

We conclude that WCSP aimed at reducing wildlife damage to commercial agriculture can be an important part of an overall integrated pest management plan. Limited traditional control methods in commercial sunflower to avoid blackbird "establishment" combined with well placed lure plots and initiatives such as the cattail management program may help reduce blackbird damage in areas that are predisposed to depredation (Linz et al. 1992). WCSP can potentially help meet blackbird nutrition needs, act as migratory bird stopover havens, and reduce damage to commercial sunflower acreages in North Dakota. Additionally, WCSP that are not tilled until spring might provide an important habitat for resident and migrating birds during winter and spring migration.

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