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DECOY CROPPING METHODS FOR LURING BLACKBIRDS AWAY FROM COMMERCIAL SUNFLOWER: USDA WILDLIFE CONSERVATION SUNFLOWER PLOTS

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Abstract: In an effort to reduce blackbird damage to commercial sunflower, which can range from $4-11 million annually in North Dakota and South Dakota, we evaluated Wildlife Conservation Sunflower Plots (WCSP) for efficacy and wildlife benefits. Blackbird depredation has caused some producers to reduce sunflower acreages and seek alternative crops in this optimal sunflower growing region. USDA's Wildlife Services funded 8-ha units of oil sunflower (WCSP) to lure migrating blackbirds away from commercial sunflower fields. Vegetative data, habitat variables, GIS-analyzed land-use data, weekly blackbird surveys, sunflower damage surveys, and avian point counts will be used to evaluate the effectiveness of the WCSP. Preliminary analysis of the 2004 field data showed that blackbird and nonblackbird density is significantly greater in WCSP than in commercial sunflower. Habitat variables and spatial landscape features are currently being reviewed in order to account for the difference. Under some conditions, trees and wetlands are significantly correlated with blackbird damage and abundance in sunflower. We further hypothesize that proximity to shelter belts, wetlands, cattail stands, other grain crops, and/or large commercial sunflower acreages influences avian use of WCSP.

Key words: avian damage, blackbird, migratory bird stop-over habitat, sunflower, wildlife depredation

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INTRODUCTION

North Dakota's former grasslands, temperate growing season, and semi-arid climate make this region well-suited for small grains and drought-hardy plants such as sunflower. Glaciations during the late Pleistocene era left a large region in North Dakota dotted with numerous small, isolated wetlands, which is known as the Prairie Pothole Region (PPR). This area is well-known as a migratory pathway for many wetland-dependent birds. Cattails (*Typha* spp) have spread into many of these wetlands providing preferred nesting and roosting habitat for blackbirds, including red-winged blackbirds (*Agelaius phoeniceus*), yellow-headed blackbirds (*Xanthocephalus xanthocephalus*), and

common grackles (*Quiscalus quiscula*). During late-summer, cattail-choked wetlands harbor large foraging blackbird flocks that feed on nearby commercial sunflower, leading to heavy economic losses (Linz and Hanzel 1997). Blackbird damage is estimated to account for 2% of total sunflower crop in this region, but bird damage can result in high loss for individual fields due to typical blackbird foraging behavior (Kleingartner 2002). Lamey et al. (1993) reported that 26% of producers lost >10% of their sunflower crops to blackbird depredation in North Dakota. Profit margins are considered negligible when damage exceeds 10% percent and fields are considered total losses when damage reaches 70% (National Sunflower Association, unpublished data). Thus, blackbird depredation of sunflower in the PPR is a major problem for some producers.

A host of blackbird deterrent measures have been tried with varying success, though no single treatment has sufficiently decreased damage to sunflower. Common measures include harassment with pyrotechnics, shotguns, propane cannons, scarecrows, vehicles, and airplanes. Sensory repellents, including olfaction, gustation, and chemical irritation, have been used with limited success (Werner and Clark 2002). Lethal control methods have not been widely accepted due to effects on nontarget species and negative political implications (Sawin et al. 1999, Linz et al. 2002, Conover 1984). Preliminary evaluations of decoy plantings of sunflower have been shown to be effective at luring blackbirds away from adjacent commercial sunflower fields (Cummings et al. 1987). However, lure crops have not been employed on a large scale due to a lack of funds and a comprehensive evaluation (Linz et al. 2004). Avery (2003) suggested that birds with limited food resources are much more difficult to deter by traditional harassment techniques than those with viable alternate foraging sites. Lure crops planted in strategic locations could lessen the burden on farmers who deal with avian crop depredation. Additionally, lure crops could provide foraging and stopover areas for nonblackbird migrants.

In 2004, the USDA, in collaboration with North Dakota State University, initiated a study to evaluate the use of Wildlife Conservation Sunflower Plots (Linz et al. 2004). Our objectives are to (1) evaluate the efficacy of small (8 ha) sunflower plots (WCSP) to attract blackbirds and thus, reduce damage to nearby ripening commercial sunflower, (2) identify and quantify bird-use of sunflower, soybean, and small grain fields by fall-migrating birds in the Southern Drift Plains of North Dakota, (3) identify and quantify factors that might influence bird-use of crop fields, including seed availability and type of habitats surrounding the sampled fields, and (4) estimate the economic costs and benefits of using WCSP.

METHODS

In May 2004, growers planted 17 WCSP in damage–prone sites within the Southern Drift Plains of North Dakota. They were compensated US $370.50/ha for seed, herbicide and tillage costs. The growers were instructed not to harass blackbirds in the WCSP, not to apply insecticides, and not to plow the field until 1 April 2005. Of the 17 fields planted, 4 failed to mature because of an unusually cool and wet summer. The remaining 13 sites were surveyed for bird activity, damage, and habitat features.

From late August to mid-October 2004, we evaluated the WCSP and surrounding fields for bird activity. At each study site, we conducted point counts in the WCSP, one randomly selected commercial sunflower field, and one grain crop field

located within 2.4 km of the WCSP. Blackbird and nonblackbird species incidence and abundance were tallied using point count methods (Ralph et al. 1995, Reynolds et al. 1980). We divided each field into 1-ha cells and point counts were conducted in 15% of these cells, with no fields having less than two census points per visit. We conducted the counts from the center point of each cell. Counts were conducted from 15 minutes after sunrise until all three field types had been surveyed.

From 20 August to 18 October 2004, weekly blackbird surveys were conducted in WCSP and all commercial sunflower fields in each site. Surveys were conducted within 2-hour windows, starting ½-hour after sunrise and 2½-hours before sunset. Each field was scanned for 5-15 minutes. We estimated total blackbird number and foraging flock composition.

Vegetative surveys were assessed in two 1-m^2 plots within each hectare selected for point counts evaluating crop density, percent canopy cover, crop plant count, weed density, surface seed availability, tallest plant height, and identification to family of all non-crop plant species. We used geospatial software to analyze aerial photos of the study sites for land-use classification. These data were used to compare avian usage of the WCSP to determine what outlying vegetation characteristics and immediate landscape variables best attract blackbirds.

Blackbird damage was assessed in WCSP and nearby commercial fields during the growing season. From 20 August to 18 October 2004, weekly damage assessment surveys were conducted in the WCSP. These surveys were conducted by randomly choosing four transect locations within the WCSP. We selected 24 damage assessment points that were evenly distributed along the transects. Each damage assessment site included all sunflower heads in the row contained within a 1.5 meter linear locale. Each damage assessment point was marked using GPS and individual heads were labeled with colored flagging for subsequent identification. Over the 9-week study, the same damage assessment points were surveyed on each visit. We recorded developed head area (cm^2) and damage amount (cm^2) for each individual head on a weekly basis. Percent damage was calculated by dividing the area damage amount (cm^2) by recorded developed head area (cm^2). Additionally, we conducted damage assessments in all commercial sunflower fields located within each study site prior to harvest. Damage was recorded along four randomly chosen transects using 24, 1.5 meter assessment locales within the same guidelines as the WCSP surveys.

RESULTS

Point Counts

We counted 551 (26%) nonblackbirds within the WCSP (n=13) compared to 851 (40%) in commercial sunflower (n=12) and 717 (34%) in other grains fields (n=13). Wheat and field pea harbored the majority of nonblackbird species in small grain crops showing 25% and 8%, respectively. Over 20,000 blackbirds were observed during the point counts. Of those, 10,473 (50%) were counted in WCSP, 10,424 (50%) in commercial sunflower and 73 (<1%) in all other grain crops. Red-winged blackbirds accounted for the majority of blackbird flock composition (69%), followed by common grackles (25%), and yellow-headed blackbirds (6%). Avian feeding group percentages were relatively similar within each field type – at least in terms of feeding guild. The nonblackbird group consisted largely of granivores (65%) followed by insectivores (21%). Granivores were the dominate guild in the WCSP and

commercial fields, averaging 73% and 67%, respectively. Of the 43 different species observed during the study, 26 were seen in WCSP, 31 in commercial sunflower, and 21 in all other grain. Nonblackbird density in commercial sunflower was 0.74 birds/ha whereas WCSP harbored 1.56 birds/ha (Figure 1). Blackbird density was 10.4 birds/ha in commercial sunflower and 90.8 birds/ha in WCSP (Figure 2). Overall grain crop density was 0.47 birds/ha for blackbirds and 0.58 birds/ha for nonblackbirds.

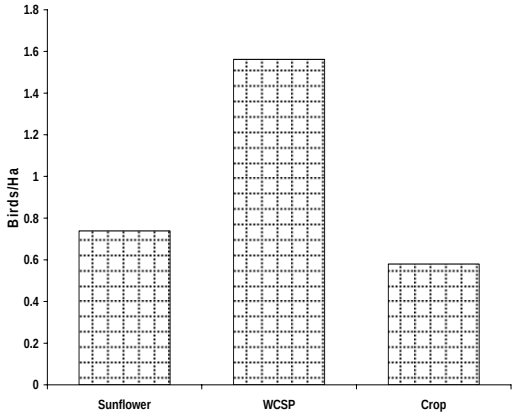

Figure 1. Nonblackbird densities from point counts - Wildlife Conservation Sunflower Plots compared to commercial sunflower and combined small grain crops.

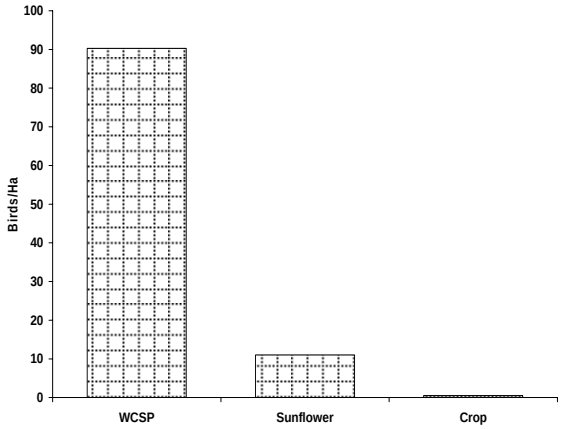

Figure 2. Blackbird densities from point counts - Wildlife Conservation Sunflower Plots compared to commercial sunflower and combined small grain crops.

Vegetation Surveys

Preliminary analysis of the vegetative data shows that sunflower stem densities were similar in both commercial sunflower ($\bar{x}$ = 3.3 plants/m^2, 95% C.I. = 2.39-4.20) and WCSP ($\bar{x}$ = 3.30 plants/m^2, 95% C.I. = 2.62-3.62). Tallest plant height in these meter-plots also varied little between commercial sunflower ($\bar{x}$ = 1.35 m, 95% C.I. = 1.28-1.42) and WCSP ($\bar{x}$ = 1.26 m, 95% C.I. = 1.10-1.42). Vegetative cover shows negligible differences with commercial sunflower and WCSP averaging 60.1% (95% C.I. = 55.4%-65.6%) and 67.4% (95% C.I. = 56.1%-78.5%), respectively.

Geospatial Analysis

Land use data were collected and then analyzed with GIS Arc Map to determine the effect of spatial habitat variables on bird use and damage to WCSP (ESRI 2002). Using multiple linear regressions, no significant correlation was shown between damage, bird use, or land use within a 2.4 km buffer of the WCSP. However, at a 0.5 km buffer radius shelterbelt acreage ($p=0.02$), wetland acreage ($p<0.001$), and presence/absence of adjacent wetlands ($p=0.001$) were significantly correlated ($p<0.05$) to damage. Nonblackbirds were correlated to shelterbelt acreages ($p<0.001$) and wetland acreages ($p<0.001$). Blackbird numbers within the WCSP were correlated to shelterbelt acreages ($p<0.001$) and damage ($p<0.001$) but not to wetlands ($p<0.05$).

Weekly Blackbird Surveys

During our weekly surveys, commercial sunflower averaged 1,813 blackbirds/field, while WCSP averaged 2,374 blackbirds/field. Densities were recorded at 294.6 blackbirds/ha in WCSP compared to 44.5 blackbirds/ha in commercial sunflower fields (Figure 3).

Over the complete 2004 field season, WCSP contained a total of approximately 33,000 blackbirds and commercial sunflower fields contained over 42,000 blackbirds. Blackbird flock compositions were similar in the WCSP and commercial sunflower fields, averaging 82% red-winged blackbird, 9% common grackle, and 9% yellow-headed blackbird in the WCSP and 83% red-winged blackbird, 8% common grackle, and 9% yellow-headed blackbird in the commercial sunflower fields.

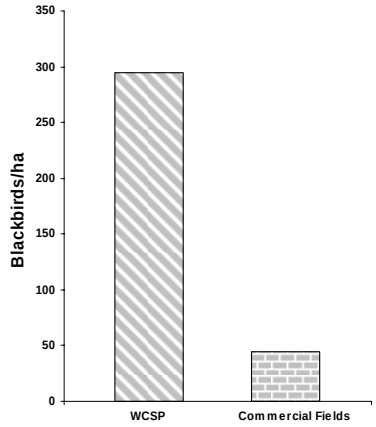

Figure 3. Weekly bird survey densities comparing blackbird use of wildlife conservation sunflower plots to commercial sunflower.

Damage Surveys

The 13 WCSP had a final mean damage of 38.6% (95% C.I. =20.3%-57.2%; Figure 4). We conducted weekly damage surveys on 11 of the 13 WCSP due to late development of two plots. Damage among individual fields varied, but the overall damage increased noticeably around 4 September and then again near 25 September (Figure 5). This is most likely due to influxes of migrating blackbirds which also surged near this time. There were a total of 23 commercial sunflower fields within a 2.4 km radius of the WCSP. We surveyed for damage just prior to harvest in each commercial sunflower field and found that mean damage was 4.68% (95% C.I. =1.66-7.70%; Figure 4).

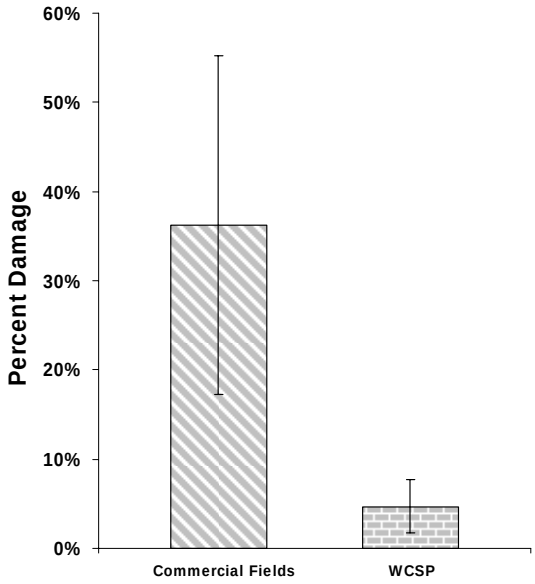

Figure 4. Mean sunflower damage comparing commercial sunflower fields to Wildlife Conservation Sunflower Plots.

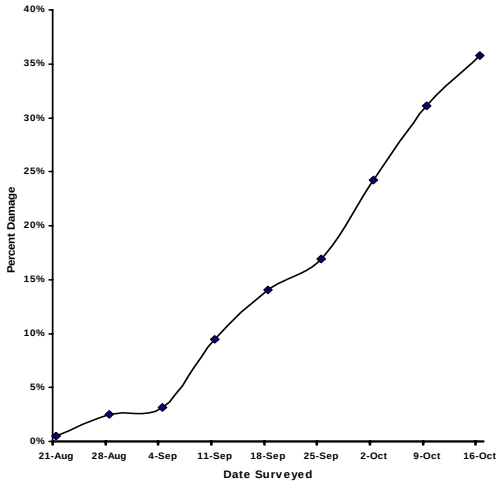

Figure 5. Mean sunflower damage to Wildlife Conservation Sunflower Plots.

DISCUSSION

The WCSP harbored a higher density of both blackbirds and nonblackbird species. Damage and both avian–count methods showed higher numbers of birds/ha in the WCSP compared to commercial sunflower. Though WCSP accounted for a much smaller area than did commercial sunflower or grain fields, nonblackbird and blackbird densities were much greater. The proportion of area to bird numbers is much lower in the WCSP, suggesting that the birds are more attracted to the WCSP than commercial sunflower and grain crops. Using the 10% damage threshold, all of the WCSP would be considered total losses negating harvest (National Sunflower Association, unpublished data). However, the associated commercial fields did not receive significant damage. Initially, decoy plantings may have some viability as a blackbird management tool and could be part of an integrated pest management / wildlife habitat system. Measured vegetation parameters within each field type appear to have little correlation to bird numbers or damage. However, further data manipulation and multivariate statistical testing may uncover some trends not yet discernable

To this point, only descriptive statistics and information theoretic model construction (ITMC) approaches have been completed on the data. Eventually we will use Pearson product-moment correlations, stepwise multiple regressions, indicator species analysis (ISA), and further model selection techniques to look for correlating variables. Data from the first year does suggest that on a small scale, <0.5 km, land use variables become significant with bird use and damage in sunflower. In the original 2.4 km buffer area around the conservation plots, no land use or habitat variables are significantly correlated with either damage or bird usage. However, as the buffer size around the WCSP is decreased, both wetlands and shelterbelts acreages become significant according to multiple regression analysis. We recognize the small sample size within our study due to environmental conditions and monetary restraints and seek to improve on this situation in the fall of 2005.

In the second year of the study, WCSP locations will be previewed before planting and suggestions made as to the probability of that area's potential for attracting blackbirds based on the first year's data. In this way, placement of WCSP in outlying areas that may not be conducive to attracting blackbirds can be avoided. These data from 2004 and 2005 will help Wildlife Services to optimize the location of WCSP to reduce sunflower damage and benefit migrating birds. At the conclusion of our study, we will provide guidelines for WCSP placement and index of the total WCSP value to all wildlife.

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