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Decoy plantings for reducing blackbird damage to nearby commercial sunflower fields

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ABSTRACT. Field tests were conducted in North Dakota in August, September and October 1981 to 1983 inclusive, to determine if decoy plantings of nine sunflower fields and one interplanted corn/sunflower field would reduce blackbird (Icterinae) damage to nearby commercial sunflower fields. Total seed consumption by blackbirds of sunflower (90 ha) and corn (7 ha) was 87 860 kg, worth US$26 533·72 based on the average 3-year market price of $0·302/kg. The average cost of planting a decoy field was $74/ha for a total cost of $7178. The yearly cost–benefit ratio varied from 1:2·1 to 1:4·7 with an overall study average of 1:3·7. From 1981 to 1983, the annual median seed consumption in decoy fields was 917, 1210, and 1121 kg/ha compared with surrounding commercial fields within 11 km of the decoy fields which had losses of 4, 99 and 115 kg/ha, respectively. In 1981, a comparison of losses between sunflower fields in Bottineau County and commercial sunflower fields within 11 km of decoy fields provided statistical evidence ($P=0·0651$) that there was less damage to commercial fields surrounding the decoy crops; this difference in losses was attributed to the presence of the decoy fields. Average blackbird numbers observed entering decoy fields per minute per hectare were 69 (1981), 49 (1982) and 91 (1983). Peak roost populations associated with decoy fields ranged from 72 000 to 215 000 blackbirds. Overall, redwings constituted about 83% of all blackbirds observed in decoy fields.

Introduction

Blackbird damage to sunflower seed has become a major economic problem for some growers in North and South Dakota and Minnesota. Blackbirds, specifically the red-winged blackbird (*Agelaius phoeniceus*), the yellow-headed blackbird (*Xanthocephalus xanthocephalus*), and the common grackle (*Quiscalus quiscula*) caused approximately US$2·7 million in sunflower damage in North Dakota in 1978 (Henne, Pfeifer and Besser, 1979). In state-wide surveys conducted in 1979 and 1980 in North Dakota, sunflower seed losses to blackbirds were calculated at $3·6 and $6·5 million (Hothem, personal communication) respectively. The increased monetary loss was attributed to an expansion in the area of sunflower grown and higher market values of the crop. The oil varieties of sunflower seeds seem to be highly preferred to confectionery seed by redwings and bear the brunt of the bird damage (Besser, 1978). Food habit studies conducted during August and September 1979 and 1980, coincidental with the sunflower bird-damage season, demonstrated that sunflower represented 86% of the total oesophageal contents of male redwings (Linz et al., 1984). Calculations by Besser, Berg and Knittle (1979) suggested that a male redwing would be capable of damaging about 25 cents worth of sunflower seed if it obtained half its diet from ripening sunflower fields during an average maturation season of 60 days (based on a sunflower seed price of $0·22/kg; at 1986 prices of $0·30/kg, this is equivalent to a male redwing damaging 30·4 cents worth).

Several techniques are available to sunflower growers for lessening blackbird damage but most have practical limitations due to expense, maintenance, weather and logistics. Devices such as mechanical scarecrows and propane exploders require considerable expense and constant maintenance to protect limited areas, with success ranging from 0 to 85% (Potvin and Bergeron, 1981). The fright-producing chemical, 4-aminopyridine, has shown variable success in various crops (DeGrazio *et al.*, 1972; Besser, 1976; Dolbeer *et al.*, 1976; Jaeger *et al.*, 1983).

An alternative to these techniques is to divert feeding blackbird flocks from the commercial crop to alternative crops on idle lands (decoy crops) where little direct economic loss is sustained. Decoy crops of wheat are reported to have reduced duck damage, as well as farmers' complaints, in historical damage areas

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in North Dakota (Fairaizl, unpublished data). Similarly, we believe that if decoy crops were planted in strategic locations near large blackbird roosts in commercial sunflower areas, they might bear the brunt of blackbird damage. In addition, plantings of sunflower and/or corn on National Wildlife Refuges (NWR) or Federal Waterfowl Production Areas (WPA) would not only serve the same purpose, but should also provide much-needed alternative wildlife food and cover, especially if the plantings were left standing in winter.

There are about 6070 ha of federal lands 'owned in fee' that are used for agricultural purposes in North Dakota (D. Henry, personal communication); 'owned in fee' means that the federal government actually owns the land. Some of these farmed hectares are located adjacent to historically large blackbird roosts which are responsible for high bird damage to surrounding commercial fields. Our purpose was to determine the effectiveness of decoy crops (primarily sunflower) on these lands to reduce blackbird damage to surrounding commercial sunflower crops. This paper presents results from this 3-year study conducted during 1981, 1982 and 1983.

Methods

From 1981 to 1983, during May and June, farmers and NWR personnel planted nine oil variety sunflower fields and one interplanted corn/sunflower field (7 ha of each) at ten locations in North Dakota (Table 1). Planting dates of decoy fields were staggered, and some fields were split into halves. Halves were planted 14–20 days apart in an attempt to compensate for anticipated variations in bird pressure and weather conditions, as well as to provide available seed for a longer period. Fields were located near blackbird roosts, shelterbelts or under known blackbird flightlines in areas of historically high blackbird damage. Plantings were on set-aside or other idle fields on NWR, WPA and private lands. All plantings were within 3·21 km of commercial sunflower crops. Farmers were paid $74/ha to cover planting costs.

Damage assessments

Decoy fields and associated commercial sunflower fields were surveyed for bird damage just before harvest. During each year, a random sample of 10% of the commercial fields within 11 km (an area with the greatest concentration of birds) of the decoy fields were assessed for damage to determine the relationship between damage in these fields and the decoy fields. Also in 1981, a survey was made in 50 randomly chosen sunflower fields in Bottineau County for comparing damage with the 1981 decoy fields. Losses between the Bottineau County fields and commercial fields within 11 km of the decoy fields were compared using a Wilcoxon non-parametric test to determine the influence of the decoy fields on damage to surrounding commercial fields.

During 1981 and 1983, head damage was measured in each field on 100 and 75 linear (1·52 m along rows) stratified random plots, respectively. In 1982, 80 linear (0·91 m) plots were used to determine bird damage. Sample size in the latter 2 years was adjusted to increase efficiency for estimating damage based on an analysis of the previous year's data.

During the 1981 survey, damage was measured on 50 sub-samples in each commercial field using a systematic random design. Each field was divided into four sections, containing an equal number of rows. One row was selected at random from the first section; one row was then selected in the same relative position within each of the other three field sections. The total length of these four rows was then divided by 50 to derive the sub-sample interval (distance in paces between the first sub-sample and consecutive sub-samples). The location of the first sub-sample was always selected from the first sample row, a random distance in paces within the sub-sample interval. The remaining 49 sub-samples were then located at regular intervals. Each sub-sample comprised five consecutive harvestable heads along the row for a total of 250 heads per field.

The total surface area of developed and undeveloped seeds and area of bird damage was measured (cm^2) on each head using the template method described by

TABLE 1. Sunflower fields and an interplanted corn/sunflower field used for decoy-crop study in North Dakota, 1981–83

Field	County	Area (ha)	Date planted	Amount consumed (Kilograms lost/ hectare)	Amount consumed (%)	Distance from major roost (km)
1	McHenry	7	18 May 81	883	100	0·32
2	Bottineau	14	21 May 81	294	32	6·43
3*	McHenry	4	3 June 81	918	100	4·82
4†	McHenry	4	17 June 81	914	100	4·82
5	McHenry	14	25 May 82	1309/1110†	24/100	0·32
6	McHenry	22	13 June 83	1084	100	1·12
7	McHenry	8	11 June 83	1183	100	2·41
8	McHenry	10	10 June 83	431	35	2·25
9	McHenry	8	11 June 83	1120	100	1·12
10	McHenry	6	13 June 83	1120	100	1·12

* Staggered planting
† Corn/sunflower alternated every four rows

Dolbeer (1975). The diameters of sunflower heads and their undeveloped centres were measured with a flexible steel tape (cm) and data from each head were converted to total available seed area (cm^2). The amount of sunflower (cm^2) damage was converted to km lost per field for comparative purposes. To prevent disturbance that might be caused by observer presence, damage assessments were conducted after 1100 h, when birds were loafing or had returned to the roost.

Estimates of the number of blackbirds (by species) utilizing decoy fields were made from August to October, at 1- to 5-day intervals, between sunrise and 1100 h and for 10- to 30-minute periods using the counting technique described by Meanley (1965). The starting point for bird observations was alternated daily among fields to reduce potential bias due to time. Bird numbers were converted to bird use per minute per hectare for comparison among fields. Dawn counts of roosting blackbirds on flightlines were conducted at 14-day intervals from August to October at roosts that were associated with decoy fields.

Results

Seed consumption in decoy fields

During this study, blackbirds consumed a total of 87 860 kg of seed in 90 ha of sunflower and 7 ha of corn in decoy fields (Table 1). The value of the seed consumed was $26 533·72 based on an average price (over the three years) of $0·302/kg. We assume that if birds had not fed in the decoy plantings, they would have caused about this amount of damage to surrounding commercial sunflower fields. The 10 decoy fields (nine sunflower and one interplanted sunflower and corn) were planted at an average cost of $74/ha for a total cost of $7178. The yearly cost–benefit ratio (CBR) ranged from 1:2·1 to 1:4·7 with an overall study average of 1:3·7. The yearly variation of the CBR was related to distribution of roosts, decoy field location, flightline direction and number of blackbirds.

In 1982, the amount of corn consumed from the interplanted decoy field was extrapolated to a sunflower cost per kilogram on the assumption that birds would have damaged this amount of sunflower if corn was not present. Blackbirds consumed 9014 kg of corn or 23·6% of the corn portion of the interplanted field. They also consumed 7642 kg of sunflower seed or 100% of the sunflower portion of the field. As corn has about four times more biomass of seed per hectare than sunflower (Watt and Merrill, 1975), the actual weight loss of sunflower and corn was about equal. Thus, corn might be an alternative to sunflower when large bird numbers are involved and when limited acres are available for decoy crops (four times the biomass of seed could be produced on the same area). In addition, corn generally ripens earlier and could be used as an initial attractant to the decoy field.

Damage to commercial fields influenced by the decoy fields

In 1981, 1982 and 1983, 26 commercial sunflower fields that were randomly chosen within an 11 km radius of the decoy fields showed a median loss of 4, 99 and 115 kg/ha, respectively. Median seed consumption in decoy fields at the same time was 917, 1210 and 1121 kg/ha, respectively. In 1981, a comparison of losses between sunflower fields (50) in Bottineau County and commercial sunflower fields within 11 km of the decoy fields provided statistical evidence (Wilcoxon non-parametric test, $P=0·0651$) that there was less damage to commercial fields surrounding the decoy crops. These differences were attributed to the observation that birds were attracted to, and spent most of their feeding time in, the decoy fields. As these commercial fields were located within 11 km of a major roost, they would be expected to receive greater bird damage (Guarino and Cummings, 1984).

During the study, red-winged blackbirds were the primary bird species causing damage in most test fields. Overall, redwings constituted an average of 80% of all birds observed in test fields, grackles 11%, and yellowheads 9%. Peak numbers of blackbirds feeding in test fields varied from 800 to 45 000 during the test period. In 1982, redwings constituted about 87% of the total birds observed during the peak damage period (29 August to 5 September). Bird observations of decoy fields showed that the average number of blackbirds entering per minute per hectare in decoy fields was 69, 49 and 91 for 1981, 1982 and 1983, respectively. About 81% of the birds observed were seen 9–18 days after anthesis. For the years 1981 and 1983, bird numbers were closely correlated with the amount of sunflower consumed. Lack of sufficient numbers of fields preclude a comparison in 1982.

In 1981, 1982 and 1983, counts at roosts that influenced the decoy fields and surrounding commercial fields showed that blackbird populations peaked in the early part of September (Table 2). Increases in blackbird populations due to the presence of decoy plantings during this study were not noticed. Redwings comprised 83% of the roosting populations, grackles 11% and yellowheads 6%, which was similar to bird compositions found in decoy fields.

Discussion and recommendations

Attempts to initiate this study in 1979 and 1980 largely failed because co-operators planted fields in non-strategic locations, and through lack of bird pressure. Thus, the limited data collected during those two years are excluded from this analysis. The experience gathered during that time, however, emphasized the importance of field location in relation to major blackbird roosts. Consequently, during 1981 to 1983, decoy fields were always located either adjacent to active roosts, under flightlines of blackbirds emanating from these roosts, or between the roosts and commercial sunflower fields: these locations appeared to enhance

TABLE 2. Roosting populations (species composition) of blackbirds contributing to the damage of sunflower decoy crops in North Dakota, 1981–83

	Salyer				Westhope			
	August	September		October	August	September		October
	15–30	1–15	15–30	1–15	15–30	1–15	15–30	1–15
1981	28900 (55/35/10)*	93000 (83/10/7)	184000 (90/10/0)	—	16500 (80/20/0)	72000 (85/10/5)	—	—
1982	60000 (75/10/15)	150000 (80/10/10)	—	52000 (85/12/3)	—	—	—	—
1983	80500 (80/15/5)	215000 (85/13/2)	57000 (85/14/1)	—	63000 (80/10/10)			
Mean	56467 (70/20/10)*	152666 (83/11/6)	120500 (88/11/1)	52000 (85/12/3)	39750 (80/15/5)	72000 (85/10/5)		

* Species composition (redwing/yellowhead/grackle)

the effectiveness of decoy fields.

One problem with using either corn or sunflower is that blackbirds prefer to feed on these crops mostly during the early stages of seed development. About 90% of the bird damage to corn occurs in a 6- to 14-day period (Bridgeland, 1979) and about 66% of the damage to sunflower occurs within the first 15 days after anthesis (J. L. Cummings, unpublished data): hence, to prolong the availability of the preferred seed stage of either sunflower or corn, fields would have to be planted at 7- to 14-day intervals. A comparison of staggered and normal-planted sunflower fields showed that bird populations utilized staggered fields for 18 additional days.

One male red-winged blackbird is capable of consuming an average of 19 g of sunflower a day if it spends 50% of its time in sunflower and 50% in other feeding areas (Besser, 1978). Thus, the approximate area needed for a decoy crop can be calculated by estimating the number of blackbirds in an area: for example, the average number of blackbirds over the last 3 years using the roosts in our study area near J. Clark Salyer NWR was 88400 birds (82% redwings, 13% grackles and 5% yellowheads). This means that this population was capable of consuming a minimum of 1·5 ha of sunflower seed a day (88400 × 19 g) based on an average yield of 1121 kg/ha. As most damage occurs over a 30-day period, at least 45 ha of sunflower would be needed for best results.

Most wildlife refuges in North Dakota generally rotate fallow to wheat. Rotating sunflower with the existing crops on refuges that harbour large numbers of blackbirds would provide a great potential for reducing blackbird depredations surrounding these roosting areas. It has been suggested that, by using decoy crops, more birds might be attracted to an area, thus compounding the problem; however, the results of a study by Jaeger *et al.* (1983) indicate that this is doubtful, because most blackbird roosts in sunflower areas are traditional by location and population size.

Because much of the success of decoy plantings is based on field location, size and planting time, the following recommendations are made regarding their effective use:

1. Location: plant idle lands (private, federal, or state) so that they are the first ones encountered by birds on a flightline from a roost or loafing cover;
2. Planting time: fields should be the first ones planted in an area. Stagger plantings at 7- to 14-day intervals, to lengthen the period of bird use;
3. Size: fields should be variable, depending on the number of birds and how long they stay in an area, but 12 ha fields in prime locations would help to alleviate bird pressure during susceptible stages of commercial fields;
4. Agricultural practices: they should ensure a productive decoy crop and thus improve its attractiveness to birds.

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