ESTIMATES OF SUNFLOWER DAMAGE AND SIZE OF BLACKBIRD POPULATION IN A 308 Mi² AREA IN BENSON AND RAMSEY COUNTIES, NORTH DAKOTA

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In the 1980s oilseed sunflower acreage in Minnesota, North Dakota, and South Dakota varied between 1.0 and 4.0 million acres. In 1979 and 1980 blackbirds consumed 0.8% to 2.0% of the sunflower crop before migrating to the southern United States and Mexico (Hothem et al., in press). Red-winged blackbirds (**Agelaius phoeniceus**) are the most numerous of the icterinaes in the Dakotas and Minnesota and probably cause more damage to sunflower than the other species (Besser 1978). Although yellow-headed blackbirds (**Xanthocephalus xanthocephalus**) are less numerous than redwings in North Dakota (1,500,000 redwing breeding "pairs" vs 950,000 yellowhead breeding "pairs"), their population appears to be increasing (Besser 1985) and they may consume considerable amounts of sunflower. Data on the distribution, movements, timing, and magnitude of the migrating blackbird populations and on the sunflower damage caused by these birds is necessary before designing cost-effective management programs for reducing these populations.

A multi-year study was initiated in 1986 to determine blackbird damage patterns to sunflower in a 308 mi² area in Benson and Ramsey Counties, North Dakota (Linz et al. 1987a). This survey, when conducted over a number of years, will provide estimates of blackbird damage to ripening sunflower over a range of sunflower production levels and growing conditions. These baseline data will be used to evaluate methods of reducing sunflower losses to blackbirds.

In the same area, we used an aerially applied fluorescent particle marker to estimate population size and turnover rates of red-winged and yellow-headed blackbirds migrating through four roosts (Linz et al. 1987b).

Study Area and Methods

Sunflower Damage Survey

The study area (Benson-Ramsey Block) is centered on Churches Ferry in northeastern North Dakota. Sunflower fields within the study area were stratified into 4 quadrants (NE, SE, NW, SW) and 67 oilseed fields were randomly selected and surveyed for bird damage. The number of fields surveyed in each quadrant was proportional to the total number of fields in the quadrant. Each field was divided into four strata of equal number of rows and one row within each stratum was surveyed. Within those four rows, 24 5-ft linear plots were established by dividing the total length of the four rows by 24. The location of the first plot was a random distance in paces (approx. one yd/pace) between the field edge and the plot interval. The remaining 23 plots were located at uniform intervals. The diameter and undeveloped center of each head were measured with a steel tape by averaging two perpendicular measurements. A template was used to measure total area of damage. The total amount and percentage of seed loss were calculated for each field. An average seed weight of 0.05 oz/in² was used for calculations.

Population Study

There were four major (>8000 birds) blackbird roosts in the Benson-Ramsey Block. The amount of roosting habitat varied among roosts: Lake Ibsen (125 a), Blegen's Roost (12 a), Mike's Lake (25 a), and Pelican Lake (125 a). The number and percentage of each blackbird species using these roosts were estimated the morning before or after the birds were marked. The marking formulation consisted of an acrylic adhesive, an antifreeze (propylene glycol), a wetting agent, a defoamer, a fluorescent particle-marker (organic resin), and water (Otis et al. 1986). This formulation was sprayed from a fixed-winged aircraft, flying 45-60 ft above the roosting concentrations of blackbirds, during 20-30 minutes after sunset.

We marked birds at roosts at intervals of 8 to 14 days. Lake Ibsen and Blegen's were sprayed on 29 Aug. and 6, 18, and 30 Sept.; Mike's Lake on 29 Aug. and 6 and 18 Sept.; and Pelican Lake on 6 Sept. Two aircraft sprayed 152 gals of flesh-pink marker formulation on 29 Aug., 200 gals of fire-orange formulation on 6 Sept., and 250 gals of Saturn yellow formulation on 18 Sept.; one aircraft sprayed 180 gals of arc-yellow formulation on 30 Sept.

Within two days after the roosts were sprayed, blackbirds were collected with shotguns and mist nets at the roosts or were followed from the roost and collected opportunistically. Within two days after collection, we examined all birds for fluorescent marker. The species, sex, and age (when known) and location where collected were recorded along with the color(s) of the marks on the bird.

Birds marked in the spring lose about 29% of the marker in 6 weeks through normal wear (Knittle and Johns 1986). However, because blackbirds undergo an annual molt during Aug. and Sept., an unknown, but presumably small percentage of birds marked in the early stages of molt may have lost all marks before the conclusion of this study.

Methods of estimating population size (total numbers) and turnover rates were obtained from Otis et al. (1986). Birds collected 1 or 2 days following the spray were pooled and treated as one instantaneous sample. Otis et al. (1986) defined "total numbers" as the number of different individuals and "turnover rates" as 1 minus the probability that a bird remained a member of the roosting population from the first sampling occasion to the second sampling occasion. Daily turnover rates were obtained by calculating 1 - N^{th} root of the total turnover rate, where N equaled the number of days between collections.

Results and Discussion

Sunflower Damage Survey

Surveyed fields (N = 67) averaged 55 acres (SE = 4) and had an estimated potential yield of 73,500 lbs/field (SE = 844) of sunflower seed. Eighteen (27%) of the fields received < 1% damage and 18 fields received >10% damage. Of the 18 heavily damaged fields, 5 received >30% damage. The sampled fields sustained an average of 107 lbs/a (SE = 18) damage. At $0.065/lb, this represents a loss of $4.68 to $9.23/a.

This was the first comprehensive damage survey conducted in the Benson-Ramsey Block (308 mi²). Hothem et al. (in press), however, surveyed 50 fields in Benson County in 1981. They reported that birds damaged an average of 32 lb/a of the sunflower crop. However, in 1981 there were 1.35 million more acres planted to sunflower in North Dakota than in 1986. Thus, future bird damage surveys in the Benson-Ramsey Block are needed before relationships among acres of sunflower planted, numbers of blackbirds, and the amount of sunflower losses can be determined.

Population Study

We estimated that 250,700 redwings used the four roosts during the study period; 142,100 used Lake Ibsen, 46,300 used Blegen's Roost, 36,200 used Mike's Lake, and 26,100 used Pelican Lake (Table 1). Average daily turnover rates were 0.12 in Lake Ibsen, 0.08 in Blegen's Roost, 0.07 in Mike's Lake, and 0.07 in Pelican Lake. Although turnover rates varied among roosts, they appeared to be highest in late Aug.-early Sept. and late Sept.-early Oct. For example, Lake Ibsen had the highest daily turnover rates (DTR) from 29 Aug.-6 Sept. and 30 Sept.-6 Oct. and Mike's Lake had the highest DTR from 29 Aug.-6 Sept. On the other hand, Blegen's had the highest DTR from 18-30 Sept.

From 29 Aug.-6 Sept., the total number of yellow-headed blackbirds using Lake Ibsen, Blegen's Roost, and Mike's Lake was 71,200 (SE = 10,700). Because the population of yellowheads decreased rapidly after mid-Sept., we were unable to collect a sufficient number to estimate population size after 6 Sept. To obtain better estimates of total number and also turnover rates of yellowheads migrating through North Dakota, it will be necessary to begin the study in late July or early Aug.

Because redwings moved through these roosts fastest in late Aug.-early Sept. and also early Oct., a management scheme implemented to reduce the population at these times may result in only a temporary reduction in the local population. However, Cummings et al. (in press) showed that most sunflower damage occurs within 9 days after the ray flowers begin to wilt in mid- to late Aug. Hence, a reduction of the blackbird population at that time may be effective in reducing early damage to sunflower. On the other hand, reducing the population during a period of low turnover (mid-Sept.) may result in lower crop losses until harvest can be completed. Additional data on population dynamics and bird damage in sunflower growing areas are needed before recommendations on optimal population management strategies are made.

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Table 1. Estimated population size and daily turnover rates of red-winged blackbirds using four roosts in Benson and Ramsey Counties, North Dakota.

Period	Lake Ibsen	Blegen's	Mike's Lake	Pelican Lake
	Daily (SE)	Daily (SE)	Daily (SE)	Daily (SE)
29 Aug-6 Sept	0.23 (0.03)	0.03 (0.02)	0.15 (0.01)	
6 Aug-18 Sept	0.04 (0.02)	0.05 (0.01)	0.03 (0.02)	0.07 (0.02)
18-30 Sept	0.02 (0.02)	0.16 (0.01)		-0.01 (0.04)
30 Sept-6 Oct	0.28 (0.01)	0.07 (0.02)	0.06 (0.04)	0.18 (0.05)
Weighted mean daily Turnover rate	0.12 (0.04)	0.08 (0.02)	0.07 (0.03)	0.07 (0.07)
Total population	142,100 (13,600)	46,300 (3,200)	36,200 (1,800)	26,100 (2,600)