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METHODS OF CONTROLLING BLACKBIRD DAMAGE
TO FIELD CORN IN SOUTH DAKOTA

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INTRODUCTION

One of the most widespread bird problems in the Western United States is damage to ripening cereal grain crops. Crops such as corn, rice, and sorghum, when grown close to favored roosting areas are often subject to serious damage from large flocks of feeding blackbirds. The redwinged blackbird is the most numerous species and causes most of the damage, but other blackbird species, including the yellow-headed blackbird, the common grackle, the brown-headed cowbird, and Brewer's blackbird, also contribute to damage problems.

The Denver Wildlife Research Center is actively investigating methods to combat blackbird depredations to field corn in the vicinity of Sand Lake National Wildlife Refuge in northeastern South Dakota. This report will deal with this particular project since it is the Denver Center's most active study involving blackbird depredations.

The Sand Lake project was initiated in 1960 and was planned for five years. Field work usually begins in April and ends in October. The major work period is August and September, the time of peak populations of birds and of the most acute damage.

STUDY AREA

The 94-section study area is rectangular, 13 miles long and 4 to 8 miles wide. Sand Lake Refuge bisects the study area on its long axis. The Refuge totals about 22,000 acres and is an important link in a chain of federal refuges in the Central Flyway. The Refuge is situated in the flat James River Valley and includes two impoundments which create water and marsh areas. Open water area covers 8,000 acres and the bordering marsh covers 4,000 acres. Marsh vegetation consists primarily of cattail (*Typha latifolia*) and reeds (*Phragmites* sp.). The remaining 10,000 acres is composed of prairie grasslands, cultivated fields, and shelterbelt plantings.

Agriculture is the principal industry in the Sand Lake area. About 70% of the land is under cultivation; the remainder is mainly in pasture and hay land. Field corn makes up about 30% of the crop land. Strip cropping is used extensively as a soil conservation measure. Shelterbelts planted to control wind erosion are numerous and often border corn fields. Farming operations are on a large scale and consequently the farmer disperses his corn fields widely. This type of farming pattern presents major difficulties in the use of bird management techniques.

BIOLOGICAL ASPECTS

Blackbird Populations: Numbers, Trends, and Habits

Blackbird populations in the area are neither stable nor constant, but change with the season, weather conditions, and corn maturity. The peak population period occurs between August 25 and September 10, closely coinciding with the ripening of corn.

In 1961 the blackbird population was estimated to be over 2 million; in 1962, $1\frac{1}{4}$ million; and in 1963, $1\frac{1}{2}$ million. Estimating bird populations on such a large area has proven to be difficult; however, a basic flyway-count method has been developed which has proven useful for estimating large populations. The method entails counting early morning flights of birds moving out of the roost in tight, narrow bands. As the birds proceed out of the roost, estimates are made on segments of the bands per time interval. An average of 33 flyways along the 35 miles of marsh shoreline have been censused each year.

The birds leave the roost shortly after sunrise and head toward their feeding grounds. Heaviest feeding is in the early morning and late afternoon. Shelterbelt plantings serve as important daytime resting and loafing sites. Loafing in shelterbelts is regularly interrupted by periods of foraging in corn fields, pastures, stubble, and weed fields, and visiting water areas. Blackbirds feed on all stages of ripening corn, but do most damage in the milk and dough stages. Corn is the major item in the diet of the redwing from mid-August to mid-September.

In following the phenology of the redwing at Sand Lake, it has been noted that adult males are first to appear in late March and females follow in late April and early May. Nesting starts in May and continues through July. Local birds, those birds raised within 100 miles from Sand Lake, appear in late July. Northerly migrants from North Dakota and possibly from Canada make up the majority of the peak population. A steady influx and exodus of northern birds probably extends throughout the entire month of September. As frost occurs there is a noticeable decline in blackbird numbers.

A food habits analysis has been conducted on redwing stomachs collected during the months of August and September. Seed material constituted 95% of the birds' diet during this period, and insect material, 5%. Wild millet (*Setaria sp.*) and corn, the two most frequently taken foods, comprised 48 and 28% of the total, respectively.

Corn Damage Appraisals

When a study is to be made involving widespread bird depredations, as at Sand Lake, it is desirable first to have information on crop losses in order to evaluate the over-all effect of control measures. Appraisals of the corn losses caused by blackbirds have been conducted annually by means of statistically derived sampling methods. An average of 325 corn fields, totalling about 9,000 acres have been planted in the 94-section study area during the last three years.

The appraisal is conducted in late September after the corn has dented or hardened. The average corn loss in the study area for 1961 was 4.81 (+3.03) bushels per acre; the 1962 loss, 2.38 (+1.37) bushels; and the 1963 loss, 2.48 (+1.31) bushels. Using a figure of \$1.00 per bushel of corn, the 1961 monetary loss was about \$41,000; in 1962 about \$20,000; and in 1963 about \$25,000.

Losses during the three years were roughly proportional to the August-September peak population for each of the years. More water in northern South Dakota in 1962 and 1963 tended to scatter rather than concentrate the birds, whereas in a dry year such as in 1961, only Sand Lake marshes had abundant water.

The greatest damage occurs in fields located on or near a flyway and those fields nearest to a roost. Refuge corn fields have been more severely damaged than private fields, as no protection is given to Refuge fields. (Nearby landowners protected their fields adjacent to the Refuge boundary with frightening devices which increased blackbird feeding on unprotected Refuge fields.)

Banding

It has become increasingly apparent that complete control of blackbird damage to corn in the Sand Lake area will be very difficult to accomplish during the heavy damage period in August and September. Birds at this time are feeding heavily on ripening corn and utilizing thousands of acres of marsh for roosting. An intensive banding program may point out other places, seasons, and situations where these birds are more vulnerable to control methods.

Much has been learned about distribution and dispersal of Sand Lake blackbird flocks through banding and color marking. Nearly 27,000 birds have been banded at Sand Lake and at areas in North Dakota over the past three years. Of this total, approximately 15,000 birds have been tagged with 1x 4-inch colored nylon impregnated plastic (Facilon) strips which were attached to the regular Service band. Possibly the per cent of band returns will be increased through color tagging.

From the results of the banding program at Sand Lake, it appears that the nesting grounds of the damaging redwings are in North Dakota and in the provinces of Saskatchewan and Alberta, Canada. The data also show, from the limited number of band returns, that their wintering grounds are in the northeastern and southeastern regions of Texas.

Trapping

Numerous types of traps and trapping techniques have been tested. Trapping of blackbirds has not developed to the point where it can be considered a method of population control, but it does constitute a means of successfully capturing large numbers of birds for banding.

The Miller-type cannon net trap and the modified Australian crow trap have been the two most successful traps used. The cannon net trap has been

more productive for capturing large numbers of redwings in single catches. In one instance, 1,550 birds were taken by firing two nets simultaneously. The modified crow trap is more productive for capturing large numbers of birds steadily over an extended period. In one instance, 500 birds were taken in 15 traps in one day. When operated properly, one crow trap is capable of catching 50 to 75 birds per day.

Small numbers of redwings for banding have been captured at Sand Lake using the experimental chemical soporific DRC-736 applied to grain baits as an immobilizing agent. This particular chemical has not been entirely successful since the margin between death and paralysis is not as large as desired and the intake of bait is difficult to regulate. It is, however, a new technique that has potential.

BIOLOGICAL CONTROL

Bird-resistant Varieties of Crops

Three blackbird-resistant varieties of grain sorghum were evaluated as possible crop substitutes for corn. The three varieties, Northrup King 120, Northrup King 125, and Adkins-Phelps 614, were planted alongside heavily damaged corn fields where they were subjected to severe bird pressure. The two Northrup King varieties had less than one per cent damage and there was no damage on AKS 614. All were healthy plantings and yielded well.

It has been stated that resistance to blackbird damage is associated with the brown seed color of the sorghum. The brown coloring is believed to be an astringent chemical causing poor acceptance. (It has also been stated that the silage from these sorghums should be stored for a period of time before being fed to make them more palatable to livestock.)

A tight-husked hybrid variety of corn was also evaluated as a bird-resistant crop. Early in the damage season the hybrid appeared as though it might fare well against feeding blackbirds, but it was slow in maturing. When corn in the surrounding fields began to harden, the hybrid was only in the more vulnerable dough stage. Under these conditions the hybrid sustained heavier damage than did corn in the surrounding fields.

The use of effective bird-resistant varieties of crops, while not at present a reality, may yet prove to be one of the more promising means of combatting bird depredations in the future.

Habitat Improvement Measures

Experiments have been conducted at Sand Lake Refuge to reduce cattail and Phragmites stands in an attempt to provide a better habitat for waterfowl and other wildlife on the Refuge. These same cane and cattail stands are utilized by blackbirds for roosting habitat.

Experimental methods for control of marsh vegetation have consisted of discing, burning, and applying herbicides. Of the three methods, herbicides, particularly Amitrol-T, are capable of complete control of marsh vegetation when applied aerially at the rate of two gallons per acre. Cost is prohibitive, however, amounting to about \$18.00 per acre.

MECHANICAL CONTROL

Frightening Devices

Frightening devices, particularly the automatic carbide exploder, have been used extensively in the Sand Lake area and have effectively minimized bird damage. In one test where carbide exploders were employed, a 98% damage reduction was attained. In this field, corn lost to feeding blackbirds amounted to 1% compared to 43% on an unprotected field. Frightening devices, such as the carbide and acetylene exploders, exploding shotgun shell, rope firecrackers, shotgun, and the .22 rifle, when used to supplement one another, have been effective in preventing bird damage. Farmers in the Sand Lake area have demonstrated the utility of these devices when properly applied. If used improperly, however, scaring devices are a waste of time and money.

A variety of amplified bird distress calls and equipment have been used at Sand Lake to determine their effectiveness in moving birds and protecting fields. To test the calls, three types of units were employed. They included the use of stationary ground field units, a portable unit in a low-flying aircraft, and a mobile truck-mounted unit.

Frightening tests with the stationary ground amplified units using taped distress calls of the immature male yellow-headed blackbird, the immature male redwinged blackbird, and the adult female redwing, were conducted on three Refuge corn fields having a history of heavy bird damage. Damage was reduced by 85, 23, and 15% on the three fields. These represented the most severely damaged fields in the entire study area due to their proximity to roosting vegetation and their location on major flightlines. Initially all fields were protected, but once a small flock overcame their fear of the calls, it attracted other flocks. Dense vegetation bordered those fields sustaining the most damage. Frightened birds using this cover were within hearing range of the calls and presumably became accustomed to them. The field receiving 85% protection was located one-fourth mile from dense roosting vegetation and here the feeding habit was more quickly broken and the flight-line changed.

Tests with distress calls broadcasted from a low-flying aircraft were initially effective in moving birds. However, once birds established feeding habits in a field, almost constant harassment was necessary for protection. Limited tests with distress calls broadcasted from the mobile sound unit revealed that the sound must be directional for maximum success. In these tests the maximum effective distance varied from 100 to 350 yards. We also observed that distress calls were more effective than alarm calls. While this method of bird control has potential, at the present time it does not appear to be a practical and economical way of protecting low-profit crops such as corn in the Sand Lake area.

CHEMICAL CONTROL

Population Reduction in Roosts

The testing of contact toxicants in roosts at Sand Lake has been limited to the organophosphate, DRC-632, which is highly toxic to birds but has a low

toxicity to mammals. Two types of tests were conducted; ground spray applications on roosting vegetation and aerial applications sprayed directly on roosting birds.

Numerous small roosting plots were sprayed at various rates with DRC-632 prior to the birds roosting. The highest calculated kill on any one plot in 1962 was projected to 7,000 redwings per acre. The plot was treated with a 12% ORC-632-methocel spray at the rate of 20 pounds of toxicant in 20 gallons of solution per acre. The cost of the toxicant in this application was 1.3 cents per bird. Success of a ground spray test was dependent on proper selection of application site. Roosting birds concentrate closely in certain spots and leave large areas of the roost totally unoccupied. The best indicator for locating heavily used roosting areas during the day was numerous molted feathers and droppings on the vegetation and water surface. A chemical spray may be a practical method of controlling redwings under ideal conditions; these are concentrations of roosting birds in excess of 10,000 per acre, knowledge of exact roosting spots in large roosting areas, and development of special equipment, as yet unknown, to make the operation economically feasible.

Aerial applications by a Super-Piper Cub airplane with DRC-632 as a direct contact spray on the birds have not been promising. Attempts were made to raise the roosting birds into the swath of falling spray from the plane 15 to 30 minutes before dark by use of shell-crackers or by buzzing the plot with the spray plane. Only a few birds were affected. The few birds that did not flush from the approaching plane were shielded by the dense canopy of vegetation. The majority of birds that flushed flew out of the spray swath apparently untouched and alighted in other vegetation several hundred yards away. Aerial spraying does not appear to be feasible in large marshes where there is a wide choice of roosting areas, and where the vegetation serves as a shield from the spray deposit.

Baiting Studies

Field trials with chemically treated grain baits and standing crops have been undertaken during all seasons and in a variety of situations as a means of controlling Sand Lake birds. The two most important factors in poisoning birds are proper timing and bait placement. In many instances, the bait site rather than the lethal agent used was the deciding factor. From these studies it appears that only spring migrants and early summer birds are vulnerable to poison baits. Birds controlled would probably amount to only a fraction of the peak population which occurs in August and September. There appears to be no bait or technique that will compete with birds feeding on extensive stands of dough-stage corn during the damage season.

Tests with DRC-1327, a fright-producing chemical agent applied to standing husked ears of corn, has proven its utility in alleviating damage to ripening corn. Protection is gained when only a few birds are affected. The action of the chemical causes affected birds, before death, to fly erratically in towering circles while emitting distress calls. This action lasts for a period of 5 to 15 minutes. This visual and auditory stimulus causes a flock of feeding birds to flush and leave a field. The method of treatment is to partially husk ears in a field that is receiving, or is about to receive damage, and then to apply the chemical with a hand sprayer to the exposed

ear. Results of field trials show that adequate protection can be obtained by treating a five-ear plot every two acres about once a week during the period that damage is expected. One man can treat 30 acres per hour in this manner at a negligible cost for chemical.

SUMMARY

A project to find methods of curbing blackbird damage to corn has been underway since 1960 in the vicinity of Sand Lake National Wildlife Refuge, South Dakota.

The peak blackbird population occurs between August 25 and September 10. In 1961, the estimated population was 2 million birds; in 1962, $1\frac{1}{4}$ million; and in 1963, $1\frac{1}{2}$ million. An annual average of 33 flyways have been located along 35 miles of marsh shoreline. A statistically valid method was used to determine annual corn losses in the area. In 1961, the monetary loss was about \$41,000; in 1962, about \$20,000; and in 1963, about \$25,000. Nearly 27,000 blackbirds have been banded in the last three years; of these, approximately 15,000 have been color tagged with the expectation that this will increase the per cent of band returns. The banding data show that the nesting grounds of birds causing damage at Sand Lake are in North Dakota and possibly Canada, and the wintering grounds in eastern Texas. Trapping of birds with the Miller-type cannon net and the modified Australian crow trap has been a successful means of capturing birds for banding. Three blackbird-resistant sorghums indicated usefulness as a possible alternate crop for corn. Refuge experimentation with marsh vegetation control shows that Amitrol-T is completely effective in killing roosting vegetation, but the cost of application is at present prohibitive.

Frightening devices, primarily carbide exploders, are widely used in the Sand Lake area and have greatly helped local farmers in protecting their fields. Tests with the various amplified distress calls and equipment show promise in protecting crops but will require improvement in calls, equipment, and techniques.

Spray applications with DRC-632 as a contact toxicant on roosting vegetation and as a direct contact toxicant on roosting birds show that ground sprays have limited utility and that aerial sprays are not feasible under Sand Lake conditions. Baiting studies show that bait placement and timing are two important factors to consider in attempting to poison birds. A fright-producing chemical, DRC-1327, proved its utility in alleviating damage to ripening corn.