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BIRDS IN PEST MANAGEMENT

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INTRODUCTION

As human activity encroaches on wildlife habitats and natural food sources become increasingly scarce, it is no wonder that birds turn to habitats such as crop fields and aquaculture ponds. Where else can large flocks of birds find sufficient, nutritious, readily available food? Agricultural crops create ideal foraging sites for gregarious bird species, and virtually everything that humans grow or raise for food is subject to some level of bird damage. For most farmers, bird damage is a fact of life, but not a major concern. The unlucky few producers for whom depredations are severe, however, do incur substantial financial losses.

ESTIMATING BIRD DAMAGE

There is little research on the economic thresholds of bird damage. The point at which the grower can no longer tolerate such loss varies according to numerous factors, and might be as much psychological as it is economical. Reliable, practical methods of measuring bird damage are not well developed for many crops. Damage measurement techniques that are available are time-consuming and often produce very large confidence intervals (1, 2).

Rather than measure damage directly, an alternative is to calculate crop loss from food habits and dietary information, bird population size, and residency period. Such calculations generally yield estimated losses that are small compared to the overall size or value of the crop. Overlooked by indirect estimates of damage, however, is the fact that bird damage is distributed unevenly (Fig. 1). The percentage of the crop damaged by birds might be less that 5% overall, but this means little to an individual producer who loses 20–25% of the crop.

CONSTRAINTS TO CONTROLLING BIRD DAMAGE

There are a number of constraints to the successful management of bird damage problems.

1. Private companies have few financial incentives to invest in the development of bird control chemicals because available markets are small (4). The potential demand for a chemical bird repellent is insufficient to entice most companies to spend the money to meet the data requirements imposed by regulatory agencies.
2. Production cost are crucial in agricultural, so many effective bird control methods that are available are unsuitable because they are too costly.
3. Avian behavior and population dynamics make controlling bird damage particularly challenging. Almost uniformly, depredating species are group foragers. Feeding flocks can number in the hundreds of thousands, and birds can travel great distances to exploit food resources that become available. Birds' ability to exploit crops is further enhanced by their social habit of roosting in large numbers at night. Members of the roost that foraged successfully that day recruit other roost members to the site on subsequent days, thereby increasing pressure on the crop.
4. Public sentiment places constraints on the types of damage management methods that can be imposed. As a result, lethal control methods usually are more difficult to implement than nonlethal methods.

REDUCING THE IMPACT OF BIRDS IN CROPS

A vineyard, orchard, or field of corn represents the best possible return for a bird's foraging effort because food items are readily available and superabundant. To reduce bird damage to crops, it is necessary to increase the cost or reduce the benefit to the birds, thereby reducing profitability of feeding on the crop (5). Only when the costs of finding, handling, eating, and digesting the food items increase sufficiently to exceed the nutritional benefits, will birds shift to other food sources.

In bird damage control, the ultimate reduction in benefit is to exclude birds from the crop with a net or other

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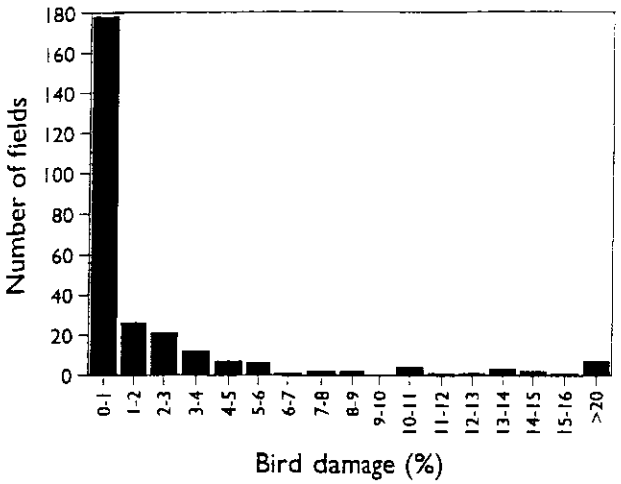

Fig. 1 Bird damage measured in sunflower fields in North and South Dakota, 1996–1998. (Redrawn from data in Ref. 3.)

physical barrier. This also is one of the costlier methods for a producer to employ. Nevertheless for high-value commodities, including tropical fish, early-ripening blueberries, and wine grapes, netting is a cost-effective approach. Netting is impractical for field crops such as corn and rice where hundreds or thousands of acres must be protected. In such cases, the cost per unit area of netting far exceeds the value of the crop.

When exclusion is not feasible, alternate means of increasing costs to birds must be sought. These methods include making the crop unpalatable or more difficult to eat, or making the food items harder to handle. Approaches that address this concept include genetic alteration to produce bird-resistant varieties (6) or the application of chemical feeding deterrents to the crop (7).

Increasing the birds' perceived risk of predation through the use of visual and auditory scare devices will also increase the cost of feeding on the crop. Such scare tactics are usually only effective in the short term, however, as birds readily perceive the emptiness of the implied danger. The effectiveness of nonlethal scare devices might be improved by augmenting these tactics with lethal control but no data are available to confirm this.

BIRDS AND INSECT PESTS

Whereas some species of birds are detrimental to agriculture, there are other situations in which birds' feeding activity is beneficial. Birds are opportunistic feeders, and they can respond facultatively to sudden increases in prey. Individual birds respond by taking greater numbers of the prey species as prey density increases (functional response). Furthermore, the number of avian predators can increase, through immigration or reproduction, with the expanded prey population (numerical response).

Outbreaks of some forest insect pests can be devastating. During the peak of a large-scale population surge of an insect such as the Eastern spruce budworm *Choristoneura fumiferana*, avian predators have relatively little impact. The impact of bird predation may be crucial, however, at the beginning or declining phase of an outbreak and would serve to limit the severity and extent of the damage (8). Predation by birds is also likely to be critical in maintaining insect populations at low levels and in extending the period between population irruptions. Managing forests to increase habitat favorable for insectivorous birds would be likely to increase further the positive effects of bird predation on forest pest species (9).

The abundance of insects in a crop can affect the level of bird damage. Red-winged blackbirds are attracted in greater numbers to plots of corn with high infestations of European corn borer (*Ostrinia nubialis*) than to similar plots with lower infestations (10). As a result, high infestation plots suffer greater bird damage than do the other plots. Similarly, when insect populations in cornfields are reduced with carbamate pesticides, blackbird numbers and bird damage to corn are also reduced. These results suggest that one effective means to lessen the impact of blackbirds, at least in corn, is to reduce the availability of insect prey that might attract birds to the field. Additional studies of this concept in other crops are warranted.

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