

Direct economic losses caused by birds amounted to between \$3.60 and \$8.40 per day, or between \$564 and \$1,296 for the five winter months of this study involving a 20-acre desert feedlot occupied daily by between 10,000 and 12,000 head of cattle. The total ecological and environmental impact of the birds—including beneficial habits elsewhere at other times of the year—must be considered before control methods are undertaken.

BIRDS

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Bird flocks rising above the Rummonds Brothers Feedlot, Indio. Photographs of this type were used to obtain minimal counts of the number of birds in the feedlot. These counts were then compared with estimates made while the birds were on the ground. Magnification of the images reveals that there are 5,321 birds in this photograph.



of a cattle feedlot in the Southern California desert

IT IS WELL KNOWN that enormous numbers of birds often congregate at cattle feedlots to consume the abundant food which is there for the taking. Surprisingly little information has been published, however, about the economic impact of birds on feedlots. Are the birds merely nuisances to be tolerated, or do they cause so much financial loss by stealing excessive amounts of grain that expensive control measures are warranted? The University of California at Riverside through its Boyd-Deep Canyon Desert Research Center undertook the study reported here of birds of the Rummonds Brothers Feedlot near Indio, Riverside County.

Study goals included finding out what species of birds were attracted to the feedlot, the numbers of each species, and the amount and kind of food they consumed. The Rummonds Brothers Feedlot covers about 20 acres located near the center of the Coachella Valley, and is surrounded by rich agricultural lands interspersed with occasional patches of uncultivated desert. The arid climate of the region is ideal for feedlots.

Winter months

During the five winter months—the only season when birds assemble at the Rummonds Brothers Feedlot in significant numbers—the pens are occupied daily by between 10,000 and 12,000 head of cattle. Among the birds which flock to the feedlot in winter are the domestic pigeon, yellow-headed blackbird, Mexican ground dove, California sea gull, house finch, and white-crowned sparrow. These species are relatively few in numbers and do not consume much grain. The five important species which make up the bulk of the population and which, accordingly, were the ones given intensive study, are the house sparrow (*Passer domesticus*), Brewer blackbird (*Euphagus cyanocephalus*), red-wing blackbird (*Agelaius phoeniceus*), starling (*Sturnus*

vulgaris), and cowbird (*Molothrus ater*).

A precise count of the total number of birds in the feedlot at any time during the day was difficult to get because of the large numbers involved and the tendency of individuals and flocks to be constantly on the move. But by checking estimates of flock sizes against numbers of birds shown in photographs of the same flocks, it was possible to refine the counting technique and to come up with a reasonably accurate idea of how many individuals of each species were present at any given time.

The total number of birds in the feedlot ranged between 10,000 and 20,000 of all species. The most abundant species was the house sparrow, varying in daily numbers from 6,000 to 8,000 birds; while the least numerous of the five important species was the red-wing blackbird, accounting for 500 to 2,000 individuals per day.

To determine the kind and amount of food that was being eaten by the different species, birds were shot in the feedlot and the surrounding fields. Then their crops and gizzards were examined for food. Not unexpectedly, the preponderate item found in all species was feedlot grain, consisting of milo, wheat, barley, and corn. The only other kind of food present in significant amounts were insects in Brewer blackbirds (15% of contents) and wild seeds in red-wing blackbirds (35% of contents).

Brewer blackbirds and red-wing blackbirds shot in the fields had twice as much wild seed and insects in their crops and gizzards as did individuals of the same species taken in the feedlot. Presumably this wild diet, craved to some degree by certain species, was beneficial to farmers. But because the fields were barren of vegetation during the cold middle of winter (the only time when collecting was undertaken) it was relatively difficult for so many birds to maintain themselves on such a diet alone. For example, al-

though the redwing blackbird spent 40% of its day in the fields, it got 60% of its food from the feedlot; and the cowbird, making little effort to subsist on wild offerings, spent 90% of its day in the feedlot and took 94% of its food there. House sparrows fed entirely in feedlots.

Obviously, the feedlot which always contained an excess of food, was a major source of nourishment for the multitudes of birds which congregated in or around it during winter. Very likely, too, it was responsible for building up and maintaining far larger flocks of birds than could have survived the winter on natural food alone.

Although all grain found in the crops and gizzards had been garnered by birds in the feedlot, not all of it had been picked out of the cattle troughs. Observations of feeding birds revealed that a considerable amount (approximately 40%) of the grain which they ate was waste grain of no economic value. Feeding on grain lost from spillage (estimated by the operator at from 200 to 400 lbs per day), and on undigested kernels in cow dung was as easy as stealing grain from the troughs.

To assess the extent of the economic damage inflicted on the feedlot operation by the birds, the amount of food eaten each day by each species had to be calculated. This could not be done by depending on field observations, which of necessity were always too brief for any one bird, or by weighing the contents of crops and gizzards, which represented an unknown period of feeding time. Instead, it was necessary to study caged birds and check the amount of food they ate in captivity against their known metabolic requirements.

Because data on the metabolic requirements of different species of birds are available in the scientific literature, estimates can be made of how much food is required per day for each of the important species in the feedlot. When these

figures were compared with measurements of the amount of food eaten by captives, the two sets of figures were in close agreement.

The daily food requirements of the various species ranged from 8.3 grams for the house sparrow to 17 grams for the Brewer blackbird. The total amount consumed by all birds at the feedlot was arrived at by multiplying the daily food consumption of each species by the average daily number of birds of that species present in the feedlot. It was learned that during the five months when birds were attracted to the feedlot, they consumed between 200 and 500 lbs of food per day, which adds up to between 32,500 and 74,000 lbs for the winter season.

Because approximately 40% of the food was spillage or was extracted from manure and could not have been utilized as cattle food, that amount had to be subtracted from the total to arrive at a correct dollar and cent figure of the extent of economic damage done by birds.

By subtracting that part of the diet of the birds which was waste grain, it was found that the direct economic loss caused by birds at the Rummonds Brothers Feedlot amounted to between \$3.60 and \$8.40 per day—or between \$564 and \$1,296 for the five winter months. These figures closely match estimates made in studies at a Denver, Colorado feedlot by the U.S. Fish and Wildlife Service.

It should be emphasized that the economic loss which birds cause feedlot operators by stealing grain directly from the troughs may be offset by beneficial habits elsewhere at other times of the year. It is particularly important to know the feeding habits of the birds during the greater part of the year when they do not congregate at the feedlot. Therefore, before control methods are undertaken, the total ecological and environmental impact of the birds should be given consideration.

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SOIL RECYC OF CANNERY

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IN 1969, CONCERN FOR THE ENVIRONMENT and problems with existing methods of disposal of solid wastes from canneries led the Santa Clara County canning industry to investigate new approaches to waste disposal. In 1970 the local industry formed the Cooperative for Environmental Improvement (CEI) and, in conjunction with local government officials and farm advisors of Santa Clara and San Benito counties, developed the program now in use. The program utilizes the process of soil incorporation to achieve aerobic degradation of the cannery wastes. Plant nutrients released in the process become available for "recycling" by subsequent plant growth.

Soil incorporation

Screened tomato and fruit waste solids formerly disposed of as sanitary land fill or in livestock feeding operations are now hauled to a 2,300-acre leased site and are systematically spread onto prepared land. Following additional field spreading by a tractor-drawn double pipe

drag-float, the wastes are allowed to air dry for two days prior to discing. The process of dragging and discing is alternated several times at appropriate levels to complete drying and soil incorporation of the wastes. The primary management procedures are directed toward the prevention of fly problems and excessive odors.

This method results in the soil incorporation of about 15 tons of dry matter derived from 150 tons of wet waste per acre per application. Currently, only one application is made during the season to each acre of land used.

Site

The 2,300-acre waste disposal site in these tests is located in northern San Benito County approximately six miles southeast of Gilroy. The area largely consists of flat, westerly sloping, poorly drained, basin land clay soil of marginal agricultural value. Mainly used for pasture and occasionally for grain, the land is annually subject to localized winter

Beginning of a delivery "run" by a 30 cu. yd. capacity "end-dump" semi. Evenness of spread of cannery waste material along the "run" is influenced by trucking equipment, driver skill and consistency of waste material.

