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ABSTRACT: The cattle feedlot affords an ideal habitat for large concentrations of birds. Several species are primarily involved in feed depredations and contamination. The development of an integrated systems approach to control involves the interaction of - human attitude, cultural control practices and application of bird damage control techniques, each of which is a dynamic system in itself.

INTRODUCTION

Cattle feedlots are prime locations for the concentration of bird species, especially during the fall and winter months of October to the middle of March. Considered primarily as holding areas for the economic custom-feeding of large numbers of cattle, these feedlots appear to be a monoculture. However, the monoculture of the feedlot is environmentally a complex ecosystem. For birds this complex environment supplies an ever abundant and diverse supply of food, warmth during the winter, and many feedlots also supply adequate shelter.

Feedlots became the focal point of attention regarding winter bird damage control efforts during the early 1960's. In 1961-62 studies were initiated by several governmental agencies to evaluate the starling problem in California, and interest in this problem has continued to the present time. Those interested in these early phases of pest-bird damage control programs in California should see the five issues of the "Progress Report on Starling Control" printed from 1964 to 1967 and published jointly by the California Department of Food and Agriculture and the University of California at Davis.

A great deal of effort was also expended in banding starling populations (Royall, et al., 1972) during the early 1960's, so as to delineate the movement patterns of this species.

Nearly all the early efforts directed toward solving the pest-bird problem in cattle feedlots were confined to either the starling or blackbird complex. Control efforts were primarily directed toward evaluating the use of toxicants, sound and traps. Field studies involving the use of toxicants (Besser, Royall, DeGrazio, 1967; Levingston, 1967; Marsh, Brock, 1964; West, Besser, DeGrazio, 1967) were conducted at a number of cattle feedlots. Studies on the effectiveness of acoustics were reported by Frings (1964) and Sprock, Palmer and Zajanc (1966). Investigations involving the use of traps to control birds were reported by several authors (Bogatich, 1967; Palmer, 1970; Zajanc and Cummings, 1962).

The greatest limitation seemingly imposed on "scientific" field evaluations is that only one technique and/or device is the subject of investigation or evaluation at any given time. At least the literature appears to support this premise. Researchers have generally confined their investigations to a specific product or technique (i.e. DRC 1339) and not the integrated use of that device with other devices or products to achieve, perhaps, a higher degree of "control". It is the purpose of this report to examine the integrated use of several techniques to achieve a reliably high degree of pest-bird damage control at cattle feedlots.

PROBLEM SPECIES

The pest-bird species which are most frequently involved with depredations at cattle feedlots are the starling (Sturnus vulgaris), Brewer's blackbird (Euphagus cyanocephalus), red-winged blackbird (Agelaius phoeniceus), tricolored blackbird (Agelaius tricolor), brown-headed cowbird (Molothrus ater) , house sparrow (Passer domesticus), and the domestic pigeon (Columba livia). A number of other bird species are frequently found in California feedlots but they are seldom considered severe pests. These other species are yellow-headed blackbird (Xanthocephalus xanthocephalus), mourning dove (Zenaidura macroura), Western meadow lark (Sturnella neglecta), killdeer (Charadrius vociferus), and water pipit (Anthus spinoletta). There are other bird species, such as gulls, sparrows and miscellaneous shore birds that also find their way into feedlots depending upon where in California the lot is located.

One of the keys to successful bird control in feedlots is knowing the seasonal cycle of each species. Once the cycle is known, it is possible to anticipate the problem and thus prevent pest-bird populations from becoming established. This might be too simplistic; however, where knowledge of pest-bird behavior, their food habits and the interaction between bird species is known, it is a great deal easier to reduce or prevent damage from occurring. The primary season for bird damage in California feedlots is from October through the middle of March. There are some resident starlings, blackbirds, pigeons and house sparrow that inhabit the lots all year around.

One of the most difficult tasks is that of assessing the true economic loss that occurs from bird depredation and contamination at feedlots. One of the most under-investigated aspects of the bird problem is the benefit derived from these species at other times in their season cycles.

Kalmach and Gabrielson (1921) indicated that a "reasonable number of starlings" should be allowed at farming operations, and if this occurred the farmer would be well rewarded. Little has been done by the current generation of research biologists to either refute or support this thought.

As to the feedlot environs proper, there are several factors which lead to errors in estimating economic losses. The size of cattle feedlots within the State varies considerably. Some cattle feeding operations have pen areas encompassing less than one acre, while the largest units cover an area nearly one mile square. The bird populations also can vary considerably in their size and species composition. The feed ration used by each cattle feeder is different. (Feed ration variability depends upon local economics and availability of certain types of grains.) I doubt that there are two feedlots in the State with the same ration components.

Several authors have attempted to estimate feedlot losses caused by birds, (Besser, DeGrazio and Guarino, 1968; Clevenger and Grassel, 1972; Lynch, Tevis and Ruibal, 1973; Wright, 1973). The statements of Besser, DeGrazio and Guarino (1968) probably reflect the most accurate methods of measuring direct economic losses at the feedlot. Their 1968 cost estimate was $84.38 per 1,000 starlings and $1.98 per 1,000 red-winged blackbirds for the six month period (October through March). The inflationary trend in recent years has probably doubled the basic feed grain costs since this study was conducted.

THE INTEGRATED SYSTEM

The integrated systems approach to control deals with the problems that exist when man attempts to influence the variables in his artificial environment. The feedlot is a human contrivance in the ecosystem; its existence has altered avian behavior and this altered behavior has impacted in a negative manner on human goals. The production of quality beef cattle for slaughter and the resultant economic gain from the sale of these animals is the goal of the feedlot operator. Excessive numbers of birds in the lot are contrary to good feedlot management. The logical integrated application of three separate and dynamic systems within the feedlot will greatly reduce the potential for the existence of sustained bird depredations.

SYSTEM I - THE HUMAN ATTITUDE

Regardless of who does the control work - grower, ag-pest control operator or governmental biologist - a positive mental attitude is necessary. If anyone in the systems doubts that control can be achieved, the whole program will suffer or fail. If there are any restrictions or stipulations on which control technique(s) will be used, this will certainly hamper the results. Many individuals, growers, PCO's and government biologists alike, believe that toxicants or killing the birds is the only solution to the problem. This myopic attitude limits the decision-making process and will undoubtedly lead to failure of the program.

The key in the human attitude system is to keep positive thoughts (be enthusiastic), anticipate the normal cycle of events (be prepared to start early), be persistent in the application of the selected control techniques, and be observant. Keen observations are critical to making adjustments in the control operation as it progresses.

SYSTEM II - CULTURAL CONTROL PRACTICES

The responsibility for this sytem is almost entirely that of the feedlot manager and/or his pest control person. This system involves the feedlot environs; items such as feed spillage in alleyways affords additional food for birds. This spillage causes birds to congregate in difficult to manage areas. Water management is extremely important in that the moist areas are sites for flies to breed in. Fly adults and larvae are attractive food for birds. Fly control programs are necessary not only to reduce the irritation to cattle but to reduce the availability of food to the birds. Flies can be effectively controlled by water management, biological control techniques (the release of fly parasites and predators) and integrated use of selective chemical agents. Uncontrolled fly populations at feedlots in the San Joaquin Valley of California often remain high until January, supplying pest birds with abundant food in addition to the feed ration.

SYSTEM III - BIRD DAMAGE CONTROL TECHNIQUES

This system addresses itself to the "tools" which are generally available for solving bird depredation problems in California feedlots.

There are more exhaustive lists of management techniques (Fitzwater, 1971; Palmer, 1973) but these tools represent those which have been most effective in recent years.

Repellents - are products designed to repel birds, generally from a very limited environmental area. The principles advocated by Piper and Neff (1937) and supported by California Department of Food and Agriculture encourage the use of repellents where possible to alleviate crop depredation.

Shell Crackers - two-shot 12 gauge shotgun ammunition, available in California at: B.M. Lawrence and Company, 351 California Street, San Francisco, California 94104, Tel: (415) 981-3650. This projectile has a range of approximately 100 yards.

Bird Bomb and Pistol - a small hand gun designed to fire a special two-shot shell 40-50 yards. Ideal for when it is not practical to carry a shotgun. It has a shorter range than the 12 gauge shell cracker. Available from: W.V. Clow Seed Company, 1107 Abbott Street, Salinas, California 93901, Tel: (408) 422-9693.

Rockets (SCRAM) - these rockets are now very difficult to purchase in California. They have an extremely long range approximately 300 yards. They are useful at large feedlots. Only governmental agencies can obtain these devices because of restrictions imposed by the Hazardous Substances Act.

Propane Cannons - the new Zon Mark II cannon has proved to be very field reliable. When equipped with the automatic timer, it becomes a very effective tool in bird control. These cannons and the Av-Alarm (mentioned below) are an aid to persistence. Where it is difficult to get a "person" up in the morning, these units start up automatically. The "booming" noise of these cannons is effective in repelling birds. These devices are available from: B.M. Lawrence and Company at the above address.

Recorded alarm or distress calls - available from: "Wildlife Technology," Hollister, California. These calls are very effective but the user needs to have custom-built equipment upon which to play them.

Av-Alarm - these units are very effective in repelling birds from feedlots. The Av-Alarm Corporation has an excellent publication available titled "Repelling Birds and Other Pests," available from: Av-Alarm Corporation, P.O. Box 2488, Santa Maria, California 93454, Tel: (805) 922-5765. Av-Alarm has been very reliable in the field, resistant to the elements, and require a minimum of care. They also function automatically, being equipped with an adjusting photo-cell to trigger the off-on cycle.

Avitrol - is available from: Avitrol Corporation, P.O. Box 45141, Tulsa, Oklahoma 74145, Tel: (1) 800-331-4215. Avitrol is an excellent bird management agent with a wide number of variations in California registrations for its use. U.S. Fish and Wildlife Service Biologists (Schafer, Brunton and Cunningham, 1973; Schafer, Brunton and Lockyer, 1974; Schafer and Marking, 1975) have expended considerable effort in evaluating this product and its impact on the environment. The National Pest Control Association (1972) has two helpful technical releases on the use of Avitrol available.

Terminators - products designed and used primarily to cause the death of pest animals. Use of these products should be restricted to the site of depredations(localized use only).

Traps - In California, 20 foot cotton trailers are being converted into traps for capturing house finches, house sparrows, starlings and blackbirds. These trailers are converted into enlarged versions of the Modified Australian Crow Trap (MAC). The obvious advantage of these units is their increased entrance area, larger capacity and greater degree of maneuverability. Trap designs are available in the new edition of the Vertebrate Pest Control Handbook, available from: California Department of Food and Agriculture, Production Services, 1220 N Street, Sacramento, California 95814. Traps have an advantage over toxicants in that nontarget species can be released unharmed. The target species is removed and killed, generally by fumigation.

Toxicants - poisonous products generally applied to grain baits attractive to birds.

Strychnine - a widely used material applied to a number of grain baits. California registrations for use in bird control are limited to Agricultural Commissioners. The registered label include a wide variety of avian species, sparrows, blackbirds, larks, pigeons, etc. This product is used very little for starling control.

Starlicide (DRC-1339) - a widely researched products (Besser, Royall and DeGrazio, 1967; DeCino, Cunningham and Schafer, 1966) during the 1960's. It is an excellent toxicant with a broad range of potential uses, but these have not been exploited by the Ralston Purina Co. Currently, it is registered in California for starling control in a pelletized form, that has poor weather resistant characteristics.

CONCLUSION - INTEGRATING THE SYSTEMS

As stated previously each of these systems can be considered as a separate entity but when integrated they function much more effectively. Units within a given system also have a great deal of interplay. An example would be the use of cannons and Av-Alarm. When used in combination, they give a higher degree of control than when used separately. Shell crackers and bird bombs can be used to augment the Av-Alarm or cannon. These latter devices can also be used to restrict the area where Avitrol, Starlicide, or strychnine treated baits are to be applied. Birds can and do become accustomed to acoustic repellents. Where this occurs, Avitrol is very effective in reducing the threat; however, the acoustic devices greatly reduce the amount of expensive chemical bait needed. Chemical baits are limited in durability and repeated treatments may be necessary. The new cannons and Av-Alarm are extremely durable and each has very low operating costs.

In reality, how well these systems are to be employed is determined by how effectively the human components of the problem can communicate with each other. The integrated systems approach has provided efficient cost savings to the grower. In a three-year study conducted at a feedlot near Five-Points, California, the following data was collected:

Feedlot - Average 10,000 cattle per day and a pen area covering 80 acres.

Bird Population. Pre-control estimates October to December 15, 1973. Mid-day average 25,000 starlings, 10,000 blackbirds, 8,000 house sparrows. This is an average of 4.3 birds per cow.

Pest control service charges were $400.00 per month. This included fly control, bird control, rodent control. This comes to a cost of $0.04 a cow per month.

Cost of feeding birds modified from the formula of Besser, DeGrazio and Guarino (1968) to indicate present costs and based on feeds priced at $120.00 per ton as compared to $60.00 per ton in 1968.

Daily consumption rate of feed: Starling - 28.3g; Blackbird - 11.1g; Sparrow - 8.3g.

Cost:

Starlings	- cost per 1000 = 84.38 x 2 = 168.76 x 25 =	$4219.00
Blackbirds	- cost per 1000 = 1.98 x 2 = 1.98 x 10 =	39.60
Sparrows	- cost per 1000 = 24.30 x 2 = 48.60 x 8 =	388.80

Projected loss for the 6 month Fall-Winter period $4647.40
or $774.56 per month or $0,077 per cow.

NET SAVINGS difference: $2247.40 per season or $374.56 per month or $0.037 per cow.

Control efforts reduced the bird population in the lot to an average of less than one bird for every ten cows. This method of measuring control effectiveness may prove useful in the future. The intangible benefits of bird control, the positive impact on clients for an efficient cattle feeding operation free of birds, and the removal of the potential for spreading diseases to cattle, is impossible to price out. As can be seen from this data, the integrated pest management systems of bird damage control can be an effective cost benefit tool in feedlot management, when based simply on the economics of feed consumption.

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