October 1981

Pyrotechnics For Bird Control

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It is a little disputed fact that each year birds cause damage through crop depredation, roosting activities, and bird/aircraft strike damage with occasionally associated loss of life. Stephen (1961) cites an article by Elkins (1957) which said ducks cause millions of dollars of loss to barley, oats, and wheat crops in Canadian prairies. Damage to ripening cereal grain crops in the western United States is one of the most widespread bird problems (DeGrazio 1964). Zajanc (1962) reports these losses are estimated at $15 million annually in three western states alone where blackbirds feed in fields of rice, corn, small grains, truck crops, nuts, and fruits located near roosting areas.

Roosts containing over one million birds are not uncommon with their presence objectionable due to economic, health, and nuisance problems (Mott 1980). Due to economic and health hazards, some military installations have taken steps to eliminate birds from nesting and perching in aircraft hangars. McGuire AFB, New Jersey, is currently involved with installation of a plastic webbing material to prevent bird habitation of a 20,000 square foot hangar at a cost of some $179,000 in response to a health hazard created by pigeons. An Army Air Guard helicopter hangar at Lakefront Airport, New Orleans, Louisiana, has likewise installed the same material to reduce cleanup costs estimated at $5,000 annually. Roosts located in close proximity to runway environments also cause problems for aircraft flight operations. A 5,000 hectare savannah northeast of Moody AFB, Georgia, had, by 1964, contained three individual bird roosts for over 70 years. In 1965 a study was conducted and the population was estimated at between two and three million blackbirds. Because of the requirement of continuous aircraft flight operations at Moody AFB (an Air Training Command base training new Air Force pilots) and because of the conflict of the feeding/roosting flight pattern of the blackbirds twice daily, 45 minutes in the early morning and 55 minutes in the late afternoon, Moody requested a study be undertaken to determine possible methods to reduce the roosting activity. No technique used, from defoliation to use of pyrotechnics and TNT, was successful in bird dispersal.

During the two year period, April 1978 - April 1980, there were 3,258 birdstrikes to USAF aircraft reported worldwide (USAF 1980). Damage cost from these strikes amounted to $5,775,273. No aircraft were destroyed nor was there major injury or death to aircrew members attributed to birds during this period. The Air Force did, however, lose a pilot and aircraft in November 1980 due to a birdstrike. Likewise, a copilot of a civilian aircraft was killed in April 1981 by the penetration of a Common Loon (Gavia immer) through the windshield of a Learjet on takeoff from Cincinnati Airport, Ohio. The same Air Force study shows that 46.93% of all reported birdstrikes occur within 10 miles of the airfield (during takeoff, final approach, go-around, traffic pattern, and landing phases of flight). A previous Air Force study indicated 51% of all reported birdstrikes were experienced in the near vicinity of the airfield. This four percent reduction is perhaps due to an increased awareness in airfield management which appears to have produced favorable results. One management technique used in both the civilian and military environment for bird control at airfields and cropland areas, is that of producing frightening noise. Noise with a gradual increase in intensity such as a siren is

ineffective (Boudreau 1975). To satisfactorily affect the bird's neural system during bird dispersal activities, the noise must be sudden, short, and have a sharp onset as in the use of pyrotechnics.

Pyrotechnics which are recommended and used by United States Fish and Wildlife Service (FWS) Animal Damage Control personnel, Air Force personnel, and others include rope firecrackers, bird bombs, gas cannons (carbide, acetylene), and firearms (.22 caliber rifle, 15 mm pistol, 12-gauge shotgun).

ROPE FIRECRACKERS

The United States Fish and Wildlife Service has been suggesting the use of rope firecrackers for reducing the damage of Red-winged Blackbirds (Algelaius phoeniceus), Brown-headed Cowbirds (Molothrus ater), and Boat-tailed Grackles (Cassidix mexicanus) to various grain crops since 1949 (Zajanc 1962). Zajanc further states, "one properly located firecracker rope can protect a block of approximately two hectares of standing corn. However, if the assembly is suspended so that the explosion occurs above the corn tassels, about twice as much area can be protected." This protection is not without danger, however, as fireworks of this type can seriously maim or kill and should be used with caution.

GAS EXPLODERS

In 1959, Canadian and United States agencies began a cooperative effort of testing known and new methods of reducing crop damage by ducks (Stephen 1961). Automatic acetylene exploders were found to be the most promising and practical means of damage control. The success of the exploders was measured by the number of claims made on Wildlife Insurance in the adjacent control area and the study area.

DeGrazio (1964) reported the automatic carbide exploder was used extensively in the Sand Lake National Wildlife Refuge in northeastern South Dakota to minimize bird damage. In one cornfield, loss to blackbirds was reduced from 43% on unprotected fields to one percent on protected ones. One exploder for each four hectares is generally recommended to protect corn from blackbirds and two exploders for each 34 hectares for protection of croplands from waterfowl (Stone and Hood 1979). Hunting or shooting is thought to expand the control effect of the gas-powered exploders.

FIREARMS

Boudreau (1975) suggests the use of a .22 caliber rifle with long-rifle, high-speed, hollow-point ammunition as one of the best weapons for clearing bird roosts. Zajanc (1962) likewise suggests a .22 caliber rifle for blackbird control in open fields. He cites Neff and Meanley (1957) to say one man could successfully control blackbirds in a 73 hectare field using a .22 caliber rifle. However, Stone and Hood (1979) report one man can protect little more than half that amount (41 hectares).

SCARE CARTRIDGES

Mott (1980) reduced the roosting population of up to one million blackbirds in five study roost sites by 96 to 100% with the use of 12-gauge scare cartridges and noise bombs. With the exception of one site, birds were

reluctant to disperse during the first couple nights. Their routine was to gather in large flocks near the roost about 30 minutes before sunset, fly around until sunset, and then enter the shelter of the roost site. Use of pyrotechnics after dark was generally ineffective. Because roosts which were accessible by shellcrackers were more easily disrupted, it appears dense roost vegetation was more important to bird protection than was the size of the roost bird population. The cost of bird dispersal averaged $28.26 per hectare based on $2.30 per hour labor, $110 per 500 rounds of scare cartridges, and $50 for 500 rounds of noise bombs (actual ranged from $4.93 to $103.33 per hectare). End results of roost dispersal were greatly influenced by the availability of alternate roost sites. Before undertaking a roost dispersal program, Mott suggests surveying other potential roost sites surrounding the roost to help judge the potential benefit or harm of the dispersal effort. Some of the roost site birds during his test relocated near houses or other locations which were as undesirable as the previous location.

deCalesta and Hayes (unpublished data) tested scare cartridges using a modified 12-gauge shotgun and a firecracker propelled by a modified .22 caliber starter pistol. These devices were used to protect ripening blueberry fields in Benton, Oregon, from dawn to dusk, seven days a week until harvest. Starlings (Sturnus vulgaris) exhibited the greatest response to pyrotechnic use leaving the fields 99.2% of the time, with Cedar Waxwings (Bombycilla cedrorum) and Brewer's Blackbirds (Euphagus cyanocephalus) leaving 83.4% of the time, respectively. Other than Brewer's Blackbird there was no significant ($P < .05$) waning of bird response to pyrotechnic use.

Some cartridges, a commercially available pyrotechnic fired from a 12-gauge break-open shotgun, are authorized for Air Force use on a temporary basis, pending testing and evaluation for permanent use. Pyrotechnics for airdrome environments can be used to flush and direct flocks of birds in a desired direction. For example, if a flock of gulls is feeding near an active runway, a scare cartridge is exploded between the birds and the runway. Doing so, the birds will usually depart away from the source of the noise and not pass over the runway. Close coordination with the control tower is essential to prevent scaring birds into the path of arriving or departing aircraft.

FACTORS RELATING TO ALARM STIMULI IN BIRD CONTROL

Boudreau (1972) reports there are many stimuli which affect bird control effectiveness. These include the environment, clocktime, physiological requirements, and others.

Environment

Environmental conditions are important influences in a bird's response to alarm stimuli. For example, birds of the open prairie, such as Horned Larks (Eremophila alpestris) rely almost entirely on visual information for warning. On the other hand, gregarious bird species which live in the forest or open brusn depend largely on acoustic warnings. Even many of these species will not react until they confirm the acoustical warning by visual information. Environmental cues may be fully understood when attempting to disperse birds from an established roost. Because birds choose a roost site that provides the ultimate in safety and comfort, they are oftentimes not easily dispersed. Hence, their sensitivity to alarm stimuli drops to low levels. The same birds which will readily respond to visual and acoustic stimuli during the day may be totally unresponsive during hours of darkness.

Clock Time

Boudreau found birds have cyclic patterns to their susceptibility to alarm stimuli which are related to the time of day. Their sensitivity is highest during early morning hours and gradually decreases toward evening. For example, Red-winged Blackbirds were found to ignore the same alarm stimuli in the early evening hours to which they responded positively during morning hours.

Physiological Requirements

Factors of hunger and thirst are described by Boudreau to induce a drive in birds which they would not ordinarily display at other times of the day. For example, Band-tailed Pigeons (Columba fasciata) were successfully repelled during the day, using visual and noise stimuli, from fields of boysenberry-blackberry hybrid which are relished by this species of bird. However, about 30 minutes before their normal roosting time the pigeons were not dissuaded from their feeding activity regardless of stimuli used, including shotgun fire at close range. Boudreau interprets this to mean "birds must enter their roosts with full crops or stomachs, otherwise they may not survive the night in inclement weather."

CONCLUSION

The use of pyrotechnics has been in existence for many years. Currently, however, it appears that scare cartridges, even though more costly in terms of money and manpower, are the most effective product for bird control in both agronomic and airfield environments. The Bird/Aircraft Strike Hazard (BASH) Team, HQ AFESC/DEVN, Tyndall AFB, Florida, 32403, is the office of primary responsibility for bird control for the Air Force. This Team is investigating the use of other techniques for bird control as well as improved pyrotechnics.

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