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A REVIEW OF DEER CONTROL DEVICES INTENDED FOR USE ON AIRPORTS

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ABSTRACT

Deer living on airport habitats pose a direct threat to aircraft operations and to public safety. From 1990–2000, about 520 collisions between civil aircraft and deer were reported in the USA with damage occurring in 86% of the collisions. Removal of individual deer by lethal or non-lethal means can reduce the potential for deer-aircraft collisions; however, such action is often controversial. Various items are marketed to keep deer away from airports, crops or residential areas. Some items have been tested while others have unsubstantiated claims of efficacy. This paper reviews the use of various fence designs, propane cannons, cattle guards, sonic and ultrasonic devices, shooting and predator urines as deer control measures. Deer density and the attractiveness of the area being protected may influence the efficacy of the device or technique being implemented. Well-maintained 3-3.7 m (10-12 foot) high fences are the primary defense against deer on airports. However, costs may prohibit the installation of such fencing at many airports. In addition, fences may be damaged or have practical design restrictions that reduce their effectiveness; thus, other devices or strategies must be employed. Most chemical and noise repellents have had limited effectiveness after about 3 days of use. A combination of devices or techniques may be more effective for reducing the deer problem at an airport.

INTRODUCTION

White-tailed deer populations (*Odocoileus virginianus*) in the United States have increased from about 350,000 in 1900 to >26 million individuals in the 1990's (Jacobson and Kroll 1994). Deer residing near airports pose a direct threat to operational and public safety. Deer are often attracted to airports to forage and have become a concern as the number of reported deer-aircraft collisions increase (Bashore and Bellis 1982, Wright 1996, Dolbeer et al. 2000). From 1990 to 2000, there were 518 reported civil aircraft collisions with deer in the United States with damage occurring in 86% of the collisions (Wright 2001).

Due to the proportion of strikes resulting in damage when deer-aircraft collisions occur, it is imperative that airports be kept free of deer (Wright 1996, Wright et al. 1998, Dolbeer et al. 2000). Lethal control of deer on airports is often controversial but due to the nature of the risk to public safety posed by deer on airports it is often justifiable. However, killing deer alone will not solve the problem if nothing else is done to make the airport either less attractive or less accessible to deer. Exclusion, frightening or harassment, and habitat manipulation are management practices that should be used in conjunction with lethal control to keep deer off of airports.

EXCLUSION

The most effective means of reducing the number of deer on an airport is to make it difficult for deer to access the airport. Fences of various styles have proven to be effective at reducing deer intrusions (McAninch et al. 1983). Deer are able to jump 2.4-m (8 foot) fences (Saur 1984). Therefore most airport fences should be at least 3-m tall. Woven wire and chain-link fences with barbed wire outriggers, although the most expensive ($6 - $40/m), provide an outstanding deer barrier (Craven and Hyngstrom 1994) and serve as a perimeter fence to reduce accidental entry onto the airport by unauthorized people. Electrified high-tensile wire fence designs offer a possible, less expensive (costs range from $2 - $6/m), alternative to woven wire fences (Brenneman 1983, McAninch et al. 1983, Craven and Hyngstrom 1994). Some of the various designs include slanted, offset, and vertical. Deer still penetrate these fences but the number of deer within the protected area has been reduced (Brenneman 1983, Palmer et al. 1983). Electric fences do require vegetation maintenance both under and adjacent to the fence to reduce shorting of the fence from vegetation. Current fence designs and usage of low-impedance, high voltage chargers has reduced shorting problems (McAninch et al. 1983, Palmer et al. 1983).

Every fence needs a gate to allow authorized human entry into an area. Gates that are left open allow deer passage into protected areas. Keeping gates closed all the time is not always feasible. One solution to this dilemma is the placement of cattle guards at gate openings. Cattle guards are widely used to stop hoofed livestock from moving out of fenced areas through permanent openings maintained for vehicular traffic (Hoy 1982). Belant et al. (1998a) monitored deer crossings of 2 – 3 cattle guards (4.6[L] x 3[W] x 0.5 or 1.0[D] m) and found up to a 98% reduction in deer crossings. Deer only rarely attempted to cross the barrier. More often it was reported that deer appeared to have approached the barrier but did not cross. No difference was noted in deer crossings when the depth of the pit under the pipes was increased from 0.5 – 1.0 m. However, snow depth may influence the required pit depth because if the pit fills with hard packed snow then deer would be able to cross the guard. The cost of a cattle guard will vary due to labor, size and needed specifications of the cattle guard that will allow safe passage of emergency or heavy equipment through the gate. Cost estimates based on the size used in the Belant et al. (1998a) test range from $1,000 - $2,000 per cattle guard.

Reflecting tape (mylar) has been effective in reducing some bird species from using specific areas (Bruggers et al. 1986, Dolbeer et al. 1986). Mylar flags have been used to deter Canada geese from agricultural fields (Heinrich and Craven 1990, Summers and Hillman 1990, Mason and Clark 1994). However, when mylar ribbons or flags were placed adjacent to a desired food source, deer were not deterred from feeding on the food (Dolbeer et al. 1986, Belant et al. 1997). Flashing mylar ribbons do not create effective deer barriers and would not be useful at airports.

SONIC DEVICES

Sound waves have been used in an attempt to keep deer away from specified areas. Propane cannons or gas exploders are often applied in areas to scare deer (Craven and Hyngstrom 1994). Exploders have generally been designed to fire at set time intervals (Stickley et al. 1972, Cummings et al. 1986). Belant et al. (1996) compared efficacy of systematically firing exploders to motion-activated exploders to keep deer from a desired food source. Systematic exploders were ineffective at keeping deer away while efficacy of motion-activated exploders varied from 0-6 weeks. Neither motion-activated nor systematic exploders were effective from mid-August to late October, while motion-activated exploders were effective from late April to mid-July. Reproductive and social behavior, density of the deer population, and availability of food may have influenced the variability in repellency noted in the study. In general, motion-activated exploders were thought to have short-term (a few days) utility on airports to keep deer from penetrating temporary gaps in perimeter fencing.

In a review of sonic and ultrasonic deterrent devices, Bomford and O'Brien (1990) concluded that sounds other than alarm or distress calls had no persistent effect for dispersing animals. Curtis et al. (1995) found the Super Yard Guard ultrasonic device, working at regular intervals, to be ineffective as a deer repellent. Belant et al. (1998b) tested motion-activated ultrasonic devices both with and without strobe lights and a timed sonic device that also had a strobe light. Results from field trials showed that the mean daily number of deer intrusions at feeding stations during treatment both in darkness and daylight was similar to, or greater than the number of intrusions during pre- or posttreatment periods. In general, it has been concluded that sonic and ultrasonic devices are not effective in deterring white-tailed deer from specific areas and are not applicable to airport deer control.

SCENT

Odor-based repellents have generally been ineffective in protecting desired foods from deer (Conover 1984, Belant et al. 1998c, Brown et al. 2000). Palatability of food or desirability of a site influences the efficacy of repellents (Conover and Kania 1987). For example, bags of human hair have not been effective at protecting yews (*Taxus* spp.) from deer (Conover 1984) but did provide some protection for apple trees (Conover and Kania 1987). Repellents that elicit fear have been found to be more effective area repellents than taste aversion repellents (Wagner and Nolte 2001).

Predator urines have been proposed as having the potential to create a “chemical fence” that is not offensive to people. When predator urine was applied directly to, or immediately adjacent to food, suppressed deer feeding activity was noted (Sullivan et al. 1985, Swihart et al. 1991, Wagner and Nolte 2001). However, when Belant et al. (1998c) tested predator urines as a chemical barrier away from a food source, they noted only a slight (15-24%) decline in deer use of feeding stations. Additionally, when predator urines were placed along established deer trails, there was no effect on deer use of the trails. Due to the limited effectiveness of predator urines and other area repellents as chemical barriers, they are not appropriate for use on airports to keep deer from runways or from entering an airport through temporary holes in perimeter fencing.

DOGS

Biological control would include the use of dogs to scare deer from an airport. Dogs have been used successfully in orchards and Christmas tree plantations to reduce deer damage (Beringer et al. 1994, Craven and Hyngstrom 1994). However, at airports dogs would need to be under the control of a handler or have their movement restricted by fences. Fences used could be similar to perimeter fences or an invisible electronic fence. Care and feeding of the dog would have to be considered from both an economic and time management point of view. A dog would only be effective when present but might reinforce the use of canine predator odors set at temporary fence openings to reduce deer intrusions through the openings.

HABITAT MANAGEMENT

Deer may be attracted to airports due to the airport property providing food, water or shelter. Manipulation of this habitat to make the area less appealing should reduce deer intrusions onto an airport. Removal of trees and brush takes away both food and shelter. Planting less palatable grasses or tall fescue infected with a symbiotic fungus (Aldrich et al. 1993) may also reduce the attractiveness of an airport. Lure crops planted off airport property and in such a location that deer are not encouraged to cross runways to reach the crop may also reduce the attractiveness of the airport. However, any lure crop planting would have to be done in conjunction with habitat manipulation on the airport such that deer are not encouraged to remain on the airport after feeding on the lure crop. Also, lure crops may increase local carrying capacity or attract deer to the general area, which would increase the number of deer near the airport and at risk for incursions onto the airfield.

RELOCATION

Live capture of deer on airports followed by relocation off airport property is not generally recommended. Despite improvements in capture techniques that may reduce capture stress (DeNicola and Swihart 1997) there are still concerns over suitable release sites, survival of released deer (e.g., 15 – 75% survival), and costs (e.g., $412 – $431/deer) associated with capture and release programs (Ishmael and

Rongstad 1984, O'Bryan and McCullough 1985, Jones and Witham 1990, Coffey and Johnston 1997, Jones et al. 1997). In addition, any capture techniques require trained personnel and equipment that airports do not normally employ.

HAZING

Deer can be harassed using techniques such as pyrotechnics, sirens, human drives, vehicles or any loud, startling sound that deer are not accustomed to. Deer usually habituate to new sounds or tactics in a few days, therefore frequent changes in harassment tactics are required to continually scare deer (Matschke et al. 1984, Craven and Hyngstrom 1994). Selective use of harassment techniques can help reduce the need for frequent change, but deer will habituate to techniques that do not result in a perceived threat (e.g., Belant et al. 1996, 1998b,c).

LETHAL CONTROL

The presence of deer on an airport is incompatible with airport safety (Wright 1996, Wright et al. 1998, Cleary et al., 2000, Dolbeer et al. 2000). When deer cannot be hazed off and kept off the airport, lethal control should be implemented as part of an integrated program that includes fencing and habitat management. Lethal control needs to be done in close cooperation with local and state or provincial authorities so that proper permits for killing deer under approved methods may be attained. Trained, experienced sharpshooters provide the most humane and efficient means of killing deer on an airport without jeopardizing safety concerns (Ishmael and Rongstad 1984, Montoney 1994, Butfiloski et al. 1997, DeNicola et al. 1997, Glass 2000). Costs vary depending on time spent to kill each deer, but have ranged from $74 - $207/deer (Ishmael and Rongstad 1984, Peck and Stahl 1997). Rates of kill have ranged from 0.3 – 6.6 hr/deer due to the method of locating deer and deer population density (Butfiloski et al. 1997, DeNicola et al. 1997).

SUMMARY

Deer on airports represent a threat to flight safety that must not be ignored. Deer populations are dynamic and adaptable to many management practices intended to dissuade deer from specific areas. An integrated management approach that includes physical barriers, scare tactics, habitat management and lethal control provides a sound approach to keeping deer off of an airport. The most critical element in any deer management program is a team of dedicated personnel who are committed to keeping deer off of an airport. The tools to keep deer off airports are available but the tools must be used correctly and diligently by trained personnel whose job is to reduce wildlife hazards at airports.

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