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AN EVALUATION OF VISUAL AND AUDITORY ELECTRONIC DEVICES TO REPEL DEER

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Abstract: An electronic device[4] that emitted auditory and visual stimuli was evaluated for repelling deer from hardwood plantations and soybean fields in Southwest Alabama from February 1976 through March 1978. Repellent effectiveness in hardwood plantations and in soybean fields was determined by comparing browsing damage on areas treated with the repellent stimuli against damage on control areas.

No difference ($P < 0.05$) was detected in browsing damage between treated and control areas in either hardwood plantations or soybean fields. Browsing damage on soybeans continued when electronic stimuli were combined with electric fences, human scent rags, and periodic shooting, demonstrating the high degree of adaptability of the white-tailed deer as they attempt to utilize an available food supply.

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[4] Mention of specific products does not constitute a recommendation

INTRODUCTION

The lack of natural predators and inadequate hunter harvest, coupled with the reproductive and adaptive capabilities of the white-tailed deer (Odocoileus virginianus) have led to high population densities of this species in many parts of its range. In some areas, densities have persisted at such high levels that negative impacts such as (1) decreases in the quality of deer (reductions in body size, reproductive performance, and antler development); (2) deer die-offs; (3) destruction of habitat; and (4) damage to forest regeneration and agricultural crops have resulted (Severinghaus and Cheatum 1956, Newsom 1969).

Many methods have been proposed for alleviating the problem of deer damage to forests and crops. These methods have included removal of deer by means of live trapping or year-round shooting under special permits, protection of crops and trees by means of fences or individual protective coverings, and repulsion of deer by means of chemical repellents, so called "natural" repellents, or scare devices (Hill et al. 1977; Matschke et al. 1984).

The AV-ALARM is an electronic scare device which, according to its manufacturer, (AV-ALARM Corp., Santa Monica, CA) "produces sounds that interfere with an animal's ability to hear sounds of danger and social sounds on which its security and well-being depend and, therefore, acts as a repellent." The manufacturer claimed success in repelling deer from fruit orchards using the AV-ALARM, thus the

device provided a possible solution to the problem of deer damage to forests and crops. The objective of this study was to evaluate the effectiveness of AV-ALARM auditory and visual repellent devices for protection of newly planted hardwood seedlings and row crops from browsing deer.

Study Area: For almost two decades many white-tailed deer herds in southwest Alabama, have existed at such high population densities that reports of deer damage to tree seedlings and row crops have become common (Allen 1965). Two hardwood plantations and a soybean plantation were selected in that part of the state to evaluate the AV-ALARM.

One of the hardwood plantations was owned by Buchanan Hardwood Company and was located in Marengo County, Alabmam, on the flood plain of the Tombigbee River approximately 13 km west of Putnam, Alabama (Figure 1). The site had been planted to cotton in the past and allowed to lie fallow prior to planting with hardwood seedlings. In the spring of 1975, the site was double disked and hand planted using a 3x3 m spacing. Approximately 60 ha were planted with water oak (Quercus nigra), cherrybark oak (Quercus falcata var. pagodaefolia), Nutall oak (Quercus nuttallii), sycamore (Platanus occidentalis) and loblolly pine (Pinus taeda). The owners disked or mowed two to three times a year between rows to control competing vegetation.

The second hardwood plantation, owned by Scott Paper Company, was located in Clarke County, Alabama near the Alabama River and approximately 16 km south of Carlton, Alabama. The site was a mixed stand of bottomland hardwoods prior to establishment of the plantation. The area was clearcut and extensively site-prepared before being planted in July 1976 with sweetgum (Liquidambar styracflua) and sycamore. Seedlings were planted with a towed mechanical planter using a 3x3 m spacing. Most of the plantation, including those sites used in the AV-ALARM evaluation, were replanted in June 1977 because of poor seedling survival. Spaces between rows of seedlings were disked to control competing vegetation.

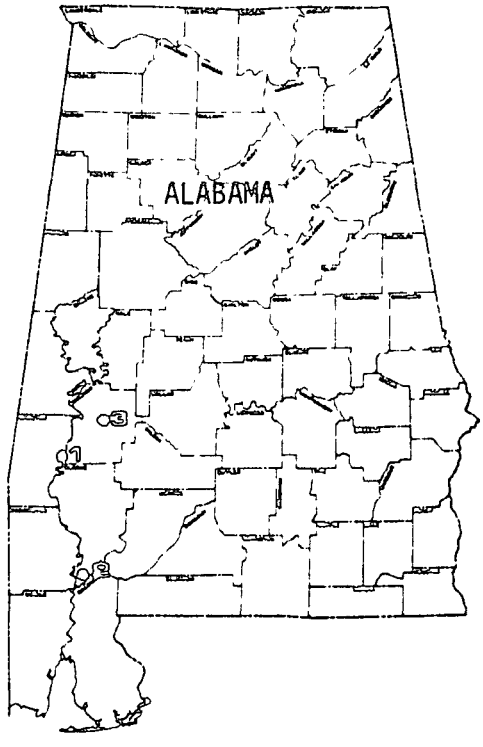

Figure 1. Locations of study areas; (1) Buchanan Hardwood Company plantation, (2) Scott Paper Company plantation, and (3) Owensby farm.

Both of these sites were believed to be in areas where deer densities would be at high enough levels that browsing damage to hardwood seedlings hardwood seedlings would be observed. This contention was supported by (1) the number of deer observed and the frequency with which they were sighted on visits to the area, (2) the appearance of a "browse line" in the forest surrounding the areas, and (3) requests from nearby landowners for special permits from the Alabama

Department of Conservation and Natural Resources for removal of deer outside the legal hunting seasons and hours.

The soybean fields used in the study were owned by Paul Owensby and located just outside of Linden, Alabama in Marengo County. The Owensby plantation consisted of approximately 1,215 ha of soybean fields surrounded by forest. The farmer's reports of deer damage and evidence of the extent to which he had gone to alleviate the problem (eg. propane cannons, electric fences and special shooting permits) made this site a likely candidate for study.

METHODS

The AV-ALARM is an electronic scare device which employs sound or sound and light as a means of repelling animals from an area. The Model ST-3 battery-powered units (Figure 2) with optional strobe light were used in this evaluation. Units were equipped with three speakers which were mounted horizontally and aimed in a circular pattern to provide maximum area coverage, with each speaker covering a 90° to 120° sector. According to manufacturer specifications, the sound level at one meter from the speaker mouth was 117 db and at 230 meters away was about 70 db, a drop of 0.2 db per meter. A 70 db sound level is roughly equivalent to the noise of a freight train heard at 100 ft (Peterson and Gross 1972). The sound produced by the unit was a sharp staccato which was intended by its manufacturers to resemble an amplified blackbird distress call. The light used was a Britestar Anti-collision Light, a very intense aircraft strobe. The sound system was equipped with a control box which allowed the operator to select continuous or intermittent sounds with numerous combinations of duration, pitch and volume. A photocell switch on the side of the control box allowed

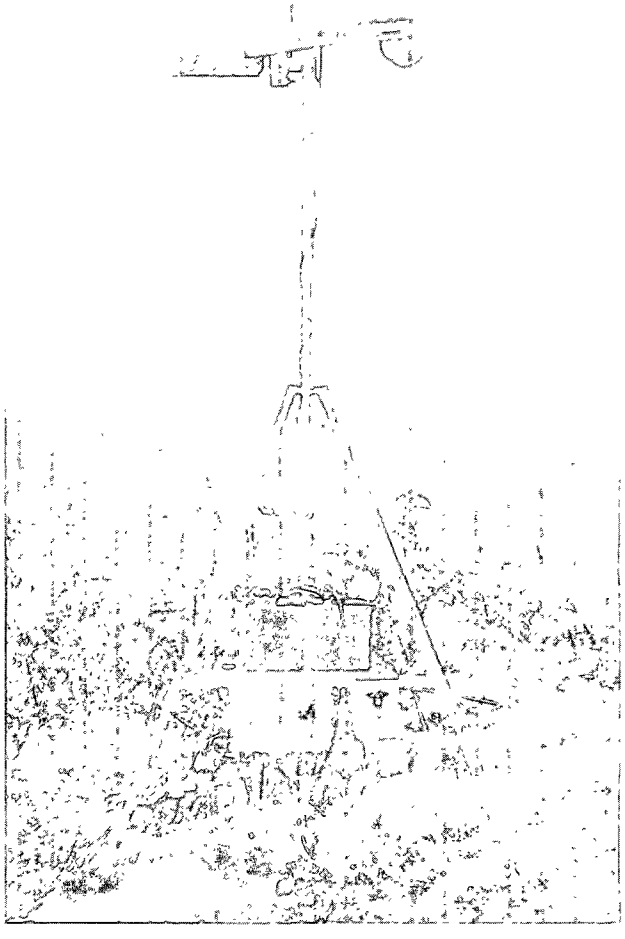

Figure 2. A Model ST-3 battery-powered AV-ALARM with strobe light.

operation of the system day and/or night. The strobe light was equipped with a separate control box which was also fitted with a photocell switch permitting operation day and/or night. The sound controls could be set to operate for up to five minutes with up to four minute lapses between sound blasts, whereas the light controls could be set to operate for up to five minutes with up to 3 1/3 minute lapses between lighted intervals.

The AV-ALARM was supported on a 1.4 m tripod with the speakers and strobe light mounted above on a 1.5 m pole. With the pole inserted in the tripod, the speakers and strobe were approximately 2.5 m above ground level.

Control boxes and batteries were placed on a platform about 1/2 m above the ground in the center of the tripod.

During field evaluations, the sound system was set to operate both day and night, and the strobe light was set to operate only at night. The sound "on-time" was varied between 1/2 and 1 minute, and "off-time" was set at 5 minutes. Volume was maintained at peak levels for maximum area coverage. The pitch and other sound qualities were altered each time an alarm was visited for a battery change or service (eg. every two to three weeks except in cases where flooding prevented access to study areas). It was believed that if the sound was altered frequently, the deer would be less likely to become acclimated to it. The strobe light was set to operate for 1/2 minute every 6 minutes.

The AV-ALARM with strobe light was evaluated for effectiveness as a deer repellent on similar 8 ha plots of newly planted hardwoods. Treatments on the two areas were as follows: (1) centrally located, continuously operated AV-ALARM with strobe light; and (2) a comparable area without an alarm.

Effectiveness was determined by comparing browsing damage observed on areas treated with the alarm against that observed on control areas, and by comparing damage on seedlings at various distances from the alarm. Evaluations of the alarm were made on the Buchanan Hardwoods Company oak plantation through the 1976-77 and 1977-78 growing seasons. The Scott Paper Company sweet-gum plantation was evaluated through the 1977-78 growing season.

Browsing damage on the treated area was determined within a series of 6 concentric bands radiating out from a centrally positioned alarm. Ten seedlings were monitored in the 0-15 m band, 30 in the 15-30 m band, and 60 seedlings each in the 30-46, 46-61, 61-122, 122-183 m bands. Where field dimensions allowed full utilization of this system of sampling, a total of 280 seedlings were examined. Sample seedlings were systematically located by means of a coordinate numbering system with the position of the alarm being the point (0, 0). Control areas were sampled using 20x5 row rectangular plots containing 95 to 100 seedlings.

Browsing of the apical shoot or leader of each monitored seedling was recorded monthly except when flooding prevented access to study areas. When the leader was observed to have been browsed, the next shoot down the stem was considered to be the leader. Once a seedling was browsed, it was counted as browsed on subsequent examinations until growth began the following spring.

Percentages of browsing damage were computed by dividing the number of seedlings browsed by the number of seedlings examined. Changes in damage were calculated by subtracting the percentage browsing damage for the previous browse check from that of the most recent check.

An analysis of variance was performed to compare change in damage figures on alarm treated areas with those on control areas. A linear regression analysis was performed on the correlation between browsing damage (%) and distance from the alarm (m). Combined data from Buchanan and Scott plantations for 1977 were used in the corrlation.

The alarm was evaluated as a means of repelling deer from soybean fields on the Owensby plantation during the 1976 growing season. Three fields ranging from 8 ha to 10.5 ha were used in the evaluation. These fields were located around the edges of the farm and were surrounded by forest or

tree-lined fence rows which provided access routes from the forest to the fields. One field was treated with an AV-ALARM with strobe light, another with an alarm without the strobe, and a third was used as a control. The farmer used gas cannons on some fields near the alarm treated fields and a single strand electric fence encircled most of the farm. Pie plates and urine soaked rags were also placed at edges of some fields in an attempt to repel deer, and occasionally, deer were shot at night.

Effectiveness of the alarm was determined by comparing deer usage of the three fields. Deer usage was determined by a series of 6 deer counts made at 10 minute intervals during each of 4 observation periods. Observation periods were as follows: Predawn - beginning at least one hour before sunrise; Dawn - beginning within one hour after sunrise; Dusk - beginning at least one hour before sunset; night- beginning within one hour after sunset. Counts were made from tree stands placed at field edges. Binoculars were used during daylight hours and a spotlight was used after dark. This series of counts was performed 6 times on each field.

Analysis of variance procedures were used to determine differences in deer usage. Comparisons were made between fields using counts from all observation periods and again using counts from each of the four observation periods independently.

RESULTS

The browsing damage levels recorded on the treated areas on both the Buchanan and Scott Paper plantations were higher than those recorded on the control areas. Browsing damage recorded on the alarm areas of the Buchanan plantation for the 1976-77 and 1977-78 growing seasons were 70.5% and 79.5% respectively, while those on the control areas for the same periods were 34.0% and 66.0%. The browsing damage level on Scott Paper plantation was 42.7% on the treated area during the 1977-78 growing season while the control area had a 28.7% level (Table 1). Analysis of variance of the change in damage figures on alarm versus control areas computed for the three evaluations, revealed no significant difference ($P < 0.05$) between the alarm and control areas.

In the comparison of browsing damage and distance from the AV-ALARM, a linear correlation coefficient of .86 was computed. This indicates that distance from the alarm was strongly correlated with browsing damage. Unfortunately, from a damage control point of view, the slope of the line was negative, therefore, browsing damage decreased as distance from the alarm increased (Figure 3).

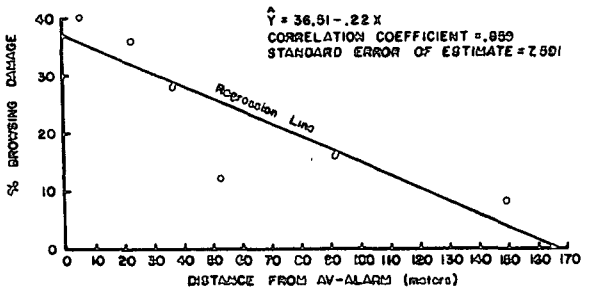

Figure 3. Correlation between browsing damage (%) and distance from the AV-ALARM (m) using combined data from Buchanan and Scott plantations for 1977.

Analysis of variance revealed no significant difference ($P < 0.05$) between deer usage on treated and untreated soybean fields both when all observation periods were treated collectively or when each observation period was treated independently. During the course of these counts, deer were observed in the vicinity of operating alarms on at least 35

different occasions. In only two instances did deer leave the field and when an alarm sounded, it was rare to witness more than a momentary pause in the deer's feeding activities. Other measures such as single strand electrically charged wire, urine soaked rags, and shooting employed by the farmer to repel appeared to be similarly ineffective.

CONCLUSIONS

The AV-ALARM did not decrease browsing damage on hardwood seedlings nor did it decrease deer usage of soybean fields. Browsing damage was heavier on treated fields. The reasons for this relationship are speculative and could not be determined from the data collected in this study. However, it is evident that the AV-ALARM did not function as a deer repellent.

Remaining is a need for an effective means of controlling deer browsing damage on hardwood plantations and row crops. The belief commonly held by the wildlife professional is that if the size of the herd is reduced to about one deer per 16 ha, the surrounding habitat will be adequate to support the herd, and the browsing damage will be reduced to tolerable levels. In view of the level of browsing damage observed in this study, the herds in these areas were not being maintained at an appropriate level. Since completion of the study, the hunting regulations have been liberalized to allow either-sex harvest for at least two weeks during the regular season.

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