November 1995

EVALUATION OF THE YARD GARD ULTRASONIC YARD PROTECTOR FOR REPELLING WHITE-TAILED DEER

Paul D. Curtis
Cornell Cooperative Extension, Department of Natural Resources, Cornell University, Ithaca, NY

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PAUL D. CURTIS, Cornell Cooperative Extension, Department of Natural Resources, Cornell University, Ithaca, NY, 14853

CHRISTOPHER FITZGERALD' and MILO E. RICHMOND, New York Cooperative Fish and Wildlife Research Unit, Department of Natural Resources, Cornell University, Ithaca, NY, 14853

ABSTRACT: Ultrasonic devices are marketed for pest control because some manufacturers believe they possess properties aversive to animals. However, there is little evidence that ultrasound is more aversive to animals than is audible sound. In this study, we examined the efficacy of the Yard Gard ultrasonic device for deterring deer *(Odocoileus virginianus) from* feeding on apples. Four deer feeding stations were established at private residential properties with a history of deer damage to ornamental plants, so that control (A I and B 1) and experimental (A2 and 132) stations existed at each site. Apples were placed at each feeding station and restocked daily from mid-February to mid-March 1995. Yard Gard devices were set up at one station at each site, and we monitored daily deer activity by counting: (1) apples remaining, (2) deer tracks, and (3) deer fecal pellet groups at all feeding stations. Of the 360 total apples offered at site A while the devices were on, 175.0 (97.2%) and 179.5 (99.7%) apples were consumed at control (Al) and experimental (A2) stations, respectively. Of the 400 total apples offered at site B while the devices were on, 188 (94.0%) and 196.5 (98.3%) apples were consumed at control (B 1) and experimental (B2) stations, respectively. Apple consumption at feeding stations proved to be the only quantitative data which provided a consistent measure of deer activity. Behavioral observations made at each site revealed that several deer visited the control and experimental feeding stations while Yard Gard devices were on, Apparently, the deer were alerted by the ultrasonic emissions but were not deterred from consuming apples. In conclusion, this study produced no evidence that the Yard Gard ultrasonic device protected the area from deer activity, or preferred foods from deer damage.

Proc. East. Wildl. Damage Manage. Conf. 7:172-176. 1997.

Ultrasonic devices, from deer whistles to bird repellers, have been used by property owners and pest control operators in attempts to reduce damage caused by wildlife. These devices are supposed to emit sounds which are aversive to animals, yet ' cannot be detected by people. The range of detection of audible sound in humans is approximately 20 Hz to 20,000 Hz (Bomford and O'Brien 1990). Frequencies below 20 Hz (infrasound) and above 20,000 Hz (ultrasound) cannot detected by the human ear, but these sounds are detected by other vertebrate species. However, there are few indications that ultrasound is meaningful to animals, and will result in a direct avoidance response.

There is also no evidence that ultrasound will more likely repel animals than audible sound (Bomford and O'Brien 1990). The increased frequency of ultrasound means that the sound dissipates more rapidly, requires greater energy to produce, and increases the chance of sound shadows (Bomford and O'Brien 1990). These characteristics may explain the lack of observed repellency reported in most studies. Ultrasound has not been successful for insect control (Mix 1984). There is no evidence that ultrasound can be detected by or is aversive to birds (Wright 1982, Beuter and Weiss 1986). Mammalian species, including rodents (Rodentia), bats (Chiroptera), and dogs (Cams familiaris), are known to detect ultrasound, but similarly exhibit no clear-cut aversive response (Hurley and Fenton 1980, Blackshaw et al. 1990, Bomford and O'Brien 1990). Many investigators have reported that ultrasound was ineffective, or was only partially effective due to transient effects

1Present address:
University of Arizona, Tucson, AZ 85721

(Sprocket al. 1967; Kent and Grossman 1968; Meehan 1976; Lavoie and Glahn 1977; Beck and Stein 1979; Lund and Lodal 1980, 1982, 1983, 1984, 1985; Shumake et al. 1982; Lund 1984; Monro and Meehan 1987). During this study, we examined the efficacy of the Yard Gard ultrasonic device for deferring deer from feeding on a preferred food (apples), to determine if additional experimentation was warranted.

METHODS

Four feeding stations for deer were established on private residential properties with a history of deer damage to ornamental plants. Two stations were located adjacent to Ellis Hollow Road (A1 and A2) in a yard bordered by abandoned agricultural fields and a brushy woodlot. Two additional stations were located approximately 4 km away near Ellis Hollow Creek Road (B 1 and B2) in similar habitat. Control (A1 and B1) and experimental (A2 and B2) stations existed at each site. Twenty apples were placed at each feeding station, and were restocked daily from mid-February to mid-March 1995. After 3 days of baiting, Yard Gard (Weitech, Inc., Sisters, Oregon) devices were set up at one station at each site. Speakers were set on posts 0.91.2 m above the ground (manufacturerrecommended height for repelling deer), 10 m from the apples, so that the sound ellipse emitted would encompass the feeding station. After another 4 days, the devices were activated at the medium frequency (manufacturer-recommended frequency for repelling deer).

We monitored deer activity by counting: (1) apples remaining, (2) deer tracks, and (3) deer fecal pellet groups at all feeding stations once daily. On days with a fresh snowfall, tracks were counted by walking a circular transect around the station at a radius of approximately 10 m. Landowners made behavioral observations of deer while the devices were turned "on" to supplement our measures of deer activity.

RESULTS

During trials near Ellis Hollow Road (Site A), a total of 140 apples were offered at each feeding station (A 1 and A2) when devices were "off," and 180 apples were offered at each station when devices were "on" (Table 1). Before the ultrasonic device was activated, 91.4% (128 of 140), and 97.9% (137 of 140) of the apples were consumed at control (A1) and experimental (A2) stations, respectively. While the device was "on," 97.2% (175 of 180) and 99.7% (179:5 of 180) of the apples offered were consumed at control (A1) and experimental (A2) stations, respectively.

At Ellis Hollow Creek Road (Site B), 100 apples were offered at each feeding station (B 1 and B2) *when* devices were "off," and 200 were offered at each station when devices were "on" (Table 1). Before the device was activated, 68% (68 of 100) and 72% (72 of 100) apples offered were consumed at control (B1) and experimental (B2) stations, respectively. At site B while the ultrasonic device was "on," 94% (188 of 200) and 98.3% (196.5 of 200) of the apples *offered were* consumed at control (B1) and experimental (B2) stations, respectively.

DISCUSSION

Apple consumption at feeding stations proved to be the only quantitative data which provided a consistent measure of deer activity. Track and pellet counts, and direct observations of deer, were useful in confirming that deer were the primary source of apple removal.

At site A, there was very little difference in apple consumption between control and experimental stations during the prebaiting or treatment phases of the study. More than 90% of the apples were consumed at both feeding stations whether the device was "on" or "off." At site B, apple consumption during the prebaiting phase was considerably less (68-72°/a) than during the treatment phase (94-98.3%), illustrating both the effect of supplemental feeding in attracting deer and the lack of effect of the Yard Gard device for repelling deer.

During experimentation, the number of different deer tracks observed at each feeding station fluctuated from 1 to 18 depending on the snow conditions and the amount of time since the previous snowfall. It was often difficult to distinguish "old" from "new" tracks because of the number of overlapping tracks, "melted-out" or "snowed-in" tracks, and the infrequency of fresh snowfalls. Similarly, it was difficult to distinguish "new" from "old" fecal-pellet groups because of frequent changes in snow depth and melting. However, deer tracks and pellet groups were important for confirming that deer were using the feeding stations. Additionally, no decrease in the number of tracks counted was observed after the ultrasonic devices were turned "on." When devices were "off," track counts ranged from 1 to 15 per station, and when devices were "on," counts ranged from 3 to 18.

Behavioral observations made by both the landowners and investigators confirmed that deer visited the control and experimental feeding stations while the Yard Gards were "on." For example at Site A on two separate occasions, 3 deer (one doe and two yearlings) were observed at the experimental feeding station (A2) while the device was active. The deer were alerted by the ultrasonic emissions, however, were not deterred from consuming apples. The adult doe was noticeably more alert and/or agitated (determined by frequent head-lifting, ear-twitching, and hoof-stomping) than the yearlings, and was the last to approach the apples. The doe fed for a few minutes at the apple pile and then grabbed an apple in her mouth and moved away approximately 30 m before stopping to eat it. The yearlings continued to consume apples at the feeding station while the doe remained at a distance. When the doe had finished her apple, she again approached the feeding station, took another apple and returned to the same spot several meters away.

Similar observations were made at Site B while the devices were "on." On one occasion, 8 deer were observed feeding at the experimental station (B2) with the device active, while 6 deer fed at the control station (B1). The deer were reportedly "alert" and "nervous" but not deterred from consuming the apples at the feeding stations. Dear alternated back and forth between the two feeding stations during this one observation period.

Other wildlife species visited the deer feeding stations at Sites A and B during experimentation. Eastern gray squirrels *(Sciurus carolinensis), red* squirrels *(Tamiasciurus hudsonicus),* American *crows (Corvus brachyrhynchos) and* eastern wild turkeys *(Meleagris gallopavo)* were infrequently observed at or near the apple piles. Furthermore, tracks of these species were visible around the bait stations, and partially-eaten apples occasionally provided evidence of feeding by animals other than deer. Small mammals, i.e., mice *(Peromyscus spp.),* voles *(Microtus pennsylvanicus)* and shrews *(Blarina brevicauda),* inhabited areas near the feeding stations, but we observed no direct evidence that these species actually consumed apples. Although many nontarget wildlife species visited the bait stations and may have removed a few apples, our observations, track and fecal pellet counts, and evidence from partially-eaten apples, confirmed that deer were responsible for nearly all apple consumption.

The Yard Gard devices exhibited no persistent or transient effects in repelling deer from treated yards, or in reducing apple consumption. These ultrasonic devices did not deter deer from consuming a highly-desirable food (apples), and therefore, would not likely deter herbivory of other highly-preferred ornamentals (i.e., yews, arborvitae, azaleas, etc.). Ultrasonic devices may be more effective if they are installed before a deer feeding pattern is developed. However this may be unrealistic, as most homeowners react only after an intolerable level of deer damage is observed. In conclusion, this study produced no evidence that the Yard Gard ultrasonic device protected the experimental yards from deer activity, or preferred foods from deer damage.

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Table 1. Number of apples offered and consumed at control (A 1 and B 1) and experimental (A2 and 132) feeding stations during the pre-treatment and treatment phases of experimentation with the Yard Gard Ultrasonic Yard Protector, Ithaca, New York, 16 February-13 March 1995.

		Pre-treatment No. Apples			Treatment No. Apples		
Site	Station	Offered	Eaten	% Eaten	Offered	Eaten	% Eaten
A	1	140	128	91.4	180	175	97.2
	2	140	137	97.9	180	179.5	99.7
B	1	100	68	68.0	200	188.0	94.0
	2	100	72	72.0	200	196.5	98.3