EFFICACY OF SHOOTING PERMITS FOR DEER DAMAGE ABATEMENT IN WISCONSIN

RICK R. HORTON, Florida Game and Freshwater Fish Commission, 443 Needles Dr., Ormond Beach, FL 32174

SCOTT R. CRAVEN, Department of Wildlife Ecology, University of Wisconsin, Madison, WI 53706

ABSTRACT: The efficacy of out-of-season shooting permits for deer damage abatement in Wisconsin has not been critically evaluated. We used deer damage shooting permits to remove 21 antlerless deer (Odocoileus virginianus) from 7 heavily damaged alfalfa fields to evaluate subsequent impact on crop damage. Volunteer shooters, using permits issued to the landowners, hunted a minimum of 3 nights/week throughout the growth of the third alfalfa crop (Aug. 1 - late Sept.). We calculated the difference between the assessed damage to the second crop (untreated) and the third crop (treated) on treatment and control farms. We found no significant difference between treatment and control. There was no evidence that deer adjusted their feeding times to avoid shooting pressure. There were no detectable relationships between the change in crop damage and field size or number of deer killed. This suggests that shooting permits do little to reduce crop damage when used during the growing season. These results should assist managers involved with, or contemplating, out-of-season deer damage abatement programs.

Proc. East. Wildl. Damage Mgmt. Conf. 7:162-171. 1997.

Wisconsin's white-tailed deer population reached record high levels in the early 1990's. Record deer harvests during the same period helped reduce the herd to manageable levels, but landownership and hunting patterns in some areas made it difficult to control deer numbers with normal hunting seasons. Thus locally high deer numbers (>38/km^2) caused pockets of crop damage problems, referred to as "hotspots".

Michigan and Missouri used shooting permits during normal hunting seasons to reduce out-of-season permit use and encourage antlerless deer kill on private lands with a history of crop damage. Missouri wildlife managers determined that damage continued even when doe harvest was maximized with shooting permits. Thus they concluded that farm-by-farm management scale was too small to be effective (Erickson and Giessman 1989) and the Missouri Crop Damage Permit program was terminated after 9 years. However, the Michigan Deer Crop Damage Block Permit program was successful in reducing the use of out-of-season shooting permits, which had increased from 42 farms with permits in 1976 to 1406 farms in 1989 in response to a 4-fold increase in deer numbers, by controlling the deer population during normal hunting seasons (Nelson and Reis 1992).

The Wisconsin Department of Natural Resources (WDNR) Wildlife Damage Abatement and Claims Program (WDACP), in conjunction with county Land Conservation Committees (LCC) and the United States Department of Agriculture Animal Damage Control (USDA-APHIS-ADC) offices, provides farmers with crop damage abatement services and compensates them for 80% of their damage up to a $5000 maximum (Gerlman and Harris 1987). One provision of the WDACP allows the assigned damage program technician to recommend issuance of a crop damage, or "Hotspot", shooting permit to the farmer if deer damage exceeds $1000 and other abatement strategies are judged to be impractical. The farmer then applies to the WDNR for the permit and, if granted, a designated number of shooting authorization tags are issued to the farmer. The farmer may then shoot all the deer allowed by the permit, keeping one for personal use and turning the rest over to WDNR wardens for distribution to the public, or tags may be issued to prospective hunters. Each hunter may shoot and keep one deer from each farm in the program. Most farmers issue the tags to hunters. The permits are usually for antlerless deer only, however the wildlife manager may authorize taking of antlered bucks if the damage technician finds rubbing damage to fruit or ornamental trees. These permits are intended to reduce deer numbers outside the normal hunting seasons, although they may be used during the archery or firearms seasons. Most states (86%) offer out-of-season shooting permits to farmers to help control wildlife crop damage (Conover and Decker 1991). Use of these permits is often controversial (Erickson and Giessman 1989, Nelson and Reis 1992, Siemer and Decker 1991).

In theory, reducing deer numbers, or frightening deer away by shooting at them, should result in reduced crop damage, but the efficacy of shooting permits has not been rigorously tested. Surveys suggest that 64% of farmers, 87% of past permit holders (permittees), and 46% of hunters in Wisconsin think shooting permits are effective in reducing crop damage (Horton and Craven unpubl. data). Forty five percent of Michigan farmers think shooting permits are highly effective (Nelson and Reis 1992). However, some vocal opponents of shooting permit use in Wisconsin have questioned their efficacy. We examined the hypothesis that the use of shooting permits to kill antlerless deer during the growing season has an impact on subsequent crop loss as part of a larger research project on shooting permit efficacy. Using volunteer hunters, we experimentally duplicated the level of shooting pressure we believed permittees could realistically maintain during the summer. Thus we were able to test for a measurable damage change within a growing season under the existing shooting permit program regulations.

Damage reductions could result from any combination of local deer population reduction, alteration in feeding behavior, or field avoidance by surviving deer. However, we did not expect deer to leave the hunted area or change home range size or location. They do not exhibit such behavior in response to shooting pressure during normal hunting seasons (Kufeld et al 1988, Marshall and Wittington 1968, Swenson 1982), and this pressure is both more extensive and more intensive than shooting permits use. Deer also may not change home ranges to utilize different food sources when they are excluded from food sources within their home ranges (Hygnstrom et al 1988). However, they may spend more time on adjoining farms, if within their existing home range. Root et al (1988) found that does with a refuge in part of their home ranges will spend daylight hours in the refuge during hunting season, and leave them at night to feed.

Herein we use the term permittee for farmers who used shooting permits, and the term farmer for farmers in general, unless otherwise noted.

United States Department of Agriculture Animal and Plant Health Inspection Service Animal Damage Control (ADC) employees R. Beck, B. Benson, D. Hilchert and P. Peterson performed alfalfa damage assessments and J. Heinrich provided useful advice and guidance. The many volunteer shooters included C. Balzer, G. Basili, J. Cary, B. Dhuey, L. Gohlke, L. Stowell, R. Stowell, S. Walter, and J. Wilkins. L. Stowell, G. Bartelt, and J. Heinrich helped with experimental design. This work would have been impossible without the generosity and cooperation of the landowners who granted us access to their land. Thanks to R. Beck, D. Berndt, K. Borzick, G. Cardo, K. Coddington, R. Dukelow, C. Heinz, J. Knock, A. Kregel, P. Loberg, H. Schultz, and P. Steuk. This research was funded by the Wisconsin Department of Natural Resources and the USDA Hatch Grant program.

STUDY AREA

We conducted this study on private farms in Adams, Columbia, Green Lake, and Marquette counties in south-central Wisconsin. This area encompassed Deer Management Units 53, 67A, 68A, and 70G. Over-winter deer population goals for these units ranged from 10-14/km^2 but local densities were often 2-3 times higher. This area is representative of southern Wisconsin agricultural land, with cropland interspersed with river valleys, large marshes and upland hardwoods dominated by oak (*Quercus* spp.) and hickory (*Carya* spp.). Ninety-eight percent of the midwest agricultural region is in private ownership (Gladfelter 1984). Landowners control access to private lands and thus control and limit hunting pressure. What little public land is available receives intensive hunting pressure.

METHODS

In 1993 and 1994 we sent introductory letters and self-addressed stamped envelopes to all permittees within the study area who used shooting permits to control deer damage to alfalfa the previous year. These letters explained the nature of the research and asked for their cooperation in allowing us to shoot deer with their permits under the provisions with which the permits were granted. We stressed the importance of landowners calling for damage assessments before they harvest each alfalfa crop, as currently stipulated by ADC. Names of respondents who did not wish to participate were removed from the list, and those that did were sent additional information. We personally approached non-respondents, accompanied by the local ADC technician, to enlist their cooperation. Area farmers who filed crop damage claims in 1993 and 1994 were used as spatial controls.

We selected alfalfa because it is harvested 3 or more times per year. Thus we could compare damage levels between cuts without the problems of year-to-year variation in deer numbers, stand productivity, and land use patterns. We enlisted APHIS-ADC technicians, who perform assessments for claimants under the WDACP, to do the assessments for this project because they had the expertise, experience and techniques to overcome the difficulties of assessing forage crop losses. Such losses are difficult to detect unless damage is localized and extreme, and the level of damage is always difficult to appraise (Palmer et al. 1982). It is also difficult to estimate the extent of damage and the number of samples necessary to determine yield (Mullen and Rongstad 1979).

First crop alfalfa in Wisconsin greens up very early in the spring and sustains disproportionatly intensive deer browsing. Mullen and Rongstad (1979) also found that deer use of crop fields is more variable in spring than summer. Thus we chose to work with the second and third crops. This delay also allowed us to avoid the period when fawns were most likely to be adversely affected by orphaning. The peak of fawning in central Wisconsin is May 27-June 2 (Moore and White 1971) White-tailed deer fawns are functional ruminants at 8 weeks (Short 1964). Thus we did not begin doe removals until August 1, when fawn survival was likely. Fortunately, this date coincides with the normal harvest of second crop alfalfa.

Deer were free to feed throughout the growth of the first and second alfalfa crops without hunting pressure, although other abatement measures may have been used. ADC technicians assessed alfalfa damage to the second crop of both treatment and control fields prior to harvest using the disk height method developed at the Waupun, WI office (Wis. Dept. Nat. Res. WDACP Tech. Manual, D30-D32, 1992). Deer were then shot in the treatment fields using the landowner's shooting permits throughout the growth of the third crop. Volunteer shooters were assigned one week to hunt at a specific farm and asked to hunt a minimum of 3 days that week. Our primary objective was to duplicate what we believed farmers could realistically accomplish during the summer by shooting 1 deer/week. We did not attempt to maximize deer kill. Shooters could each keep 1 deer. Unretained deer were sold to the Winnebago Indian Nation for a nominal fee. Shooters were required to keep a field log of the dates they hunted, arrival and departure times, and a record of all deer sightings. Thus we could quantify changes in deer feeding behavior in response to shooting. Crop damage was assessed again before the harvest of the third alfalfa crop.

ADC technicians sometimes combined yield and damage estimates from several fields to reduce paperwork. When that occurred, we extrapolated treatment field data from the pooled data. We subtracted the second crop deer damage estimate from the third crop deer damage estimate to get the difference (D). We controlled for temporal change in feeding behavior resulting from fawn growth, deer social behavior, and crop maturity by comparing the mean difference between treatment fields (hunting) to the mean difference between control fields (no hunting). We used the Student's T-test for these comparisons, and regression analysis for testing relationships between the change in crop damage and other factors.

We conducted a telephone survey of wildlife crop damage specialists in 8 midwestern states; IA, IL, IN, MI, MN, MO, OH, and WI, and asked them 14 questions regarding shooting permit use in their states. We examined the history and parameters of shooting permit use in each state, and asked each damage specialist for an opinion on shooting permit effectiveness.

RESULTS

Fourteen landowners initially agreed to participate in this research. A total of 7 eventually withdrew or were disqualified for personal reasons, failure to request timely damage assessments, or administrative problems with permit issuance. There was no detectable reduction ($\underline{P}$ = 0.70) in crop damage in treated ($\underline{n}$ = 7, $\bar{x}$ = -18.2 kg, SD = 151.3) vs. control fields ($\underline{n}$ = 87, $\bar{x}$ = -73.0 kg, SD = 1225.0) (Table 1). Similarly, we found no relationships between the change in damage and the number of deer killed ($\underline{F}_{1,5}$ = 0.165, $\underline{P}$ = 0.702), the total number of deer present at the time of the kill ($\underline{F}_{1,3}$ = 1.15, $\underline{P}$ = 0.363), or field size ($\underline{F}_{1,5}$ = 0.033, $\underline{P}$ = 0.864).

Both hunters and landowners stated in discussions with us that they felt deer were coming out to feed later at night in response to the shooting pressure, however, we could not support these observations with statistical analysis of the shooters' field notes. Shooters usually shot the first deer that presented itself, then left the field, so their observations gave us no indication when the main body of the local herd came to feed. We did get reports on the reactions of individual deer to shooting from the shooters' field notes. Most surviving deer rapidly fled the field at the sound of a shot, but 5 shooters reported deer unalarmed at the killing of another deer. They either remained in the field after the shot, or returned to the field within minutes of a kill. One shooter returned to his vehicle to drop off equipment, and came back to find 2 deer feeding next to the carcass of the deer he had killed minutes before. Another observed 3 deer feeding very close to a kill site 1 hour after the kill.

Telephone surveys of 8 midwestern wildlife crop damage specialists showed that all states utilized shooting permits, but suggested that in all cases but 1, they were considered ineffective at reducing crop damage. Although state shooting permits vary widely in administration and regulatory flexibility, most state damage specialists consider shooting permits to be primarily a public relations tool used to increase landowners' tolerance of deer damage (Table 2).

DISCUSSION

Shooting permit use within the growing season did not significantly reduce alfalfa crop damage levels. Three of 7 treatment fields did show reductions, but these were within the range of reductions seen in the control fields. The change in alfalfa damage from the second to the third crop was highly variable in both treatment (coefficient of variation = 8.3) and control (coefficient of variation = 16.8) fields. Deer experience several social, biological, and environmental changes from July to September that could cause variations in local densities and feeding pressure levels exerted on crop fields. Matriarchal social groups, which split up in May for fawn birth and rearing, reform in late summer (Hawkins and Klimstra 1970, Hirth 1977), with the weaning fawns adding to the herd sizes observed feeding in fields. Deer also move around to take advantage of ripening crops and native vegetation as they become available.

There is a certain amount of error inherent in the ADC disk height assessment method, specifically in the subjective determination of the area damaged. This is the most difficult aspect of forage damage assessment (Mullen and Rongstad (1979) and could have affected our ability to detect changes in crop damage levels. However, ADC technicians are well trained and the disk height method is the most accurate assessment method available short of cutting, drying, and weighing an entire crop. Any damage change not detected would have been too slight to be biologically meaningful.

Although we believed landowners would have been eager for assistance in reducing their crop damage, we were unable to enlist the cooperation of as many as we planned in the experimental design. Siemer and Decker (1991) found that landowners often will not take all steps available to control damage, even when they have the skills and inclination, because of perceived or actual opposition from family, friends, or community. We believe our sample size was adequate because the observed change in damage is normally distributed and the variation is less than that of the control group.

We imitated the level of shooting pressure we believed a farmer could realistically muster during the summer by requiring volunteer shooters to hunt a minimum of 3 days/week. Discussions with farmers suggested that it is difficult to find hunters willing to shoot in the summer months due to the heat, insects, alternative summer activities, and they dislike shooting when does are pregnant or with spotted fawns. We did not require our shooters to hunt more than 3 days/week because we were testing the efficacy of shooting permits as currently used, not the effect of maximized hunting pressure. Some farms did receive more shooting pressure than others, but the level of hunting pressure was not related to the resultant change in crop damage.

We were unable to meet our objective of removing 1 deer/week to test whether surviving deer would avoid the hunted fields. Hunting hours for shooting permit holders are restricted to 0.5 hours before sunrise to 0.25 hours after sunset. The nocturnal behavior of deer made it difficult to shoot them in the damaged fields under these restrictions. Surveys suggested that 36.6% of Wisconsin permittees would like to see the shooting hours lengthened (Horton and Craven unpubl. data), probably because they encountered the same difficulties in shooting deer under the current constraints that we did. Montgomery (1963) found that in Pennsylvania deer begin to move into open fields during the hour of sunset, then feed for 7-8 hours before returning to the woods before dawn. Summer maximum nightly counts of mule deer in fields in Utah occurred in the first 4 hours after sunset, but the number counted at sunset was only 45%of the mean maximum nightly count (Austin and Urness 1993). Similar patterns are seen in Wisconsin (Larson et al 1978).

Hunter field notes suggested that it was also difficult to shoot 1 deer/week because deer use of fields was highly variable. Deer were not always present when people were hunting, and they entered the fields from different directions on different nights, making it difficult to predict deer movements. Mullen and Rongstad (1979) also found considerable variation in nightly deer use of crop fields in Wisconsin. We also observed this variation in 1993, when we attempted to study the efficacy of shooting permits in reducing deer damage to field corn. We wanted to use deer track counts in raked strips along field edges as an index to deer use of the fields, but the coefficient of variation for 2 weeks of daily track counts in 4 control fields was 75.5%, which was unacceptably high for creation of a useful index.

We could not detect a difference in crop damage between treated and untreated fields. There are several possible explanations for this, but primarily we did not kill enough deer to change damage by simply reducing the number of deer feeding in the fields. Deer Management Units in the study area had over-winter deer population goals of 10-14/km^2, but local populations were often twice as high around heavily damaged farms. Thus, the average permittee's farm, which covers 1.92 km^2 (Horton and Craven unpubl. data), has 38-54 deer on it in the spring. The mean annual rate of increase for deer is 1.7 in the study area (WDNR unpubl. data), so 27-38 fawns are added to the population in May. By August these fawns contribute to the crop damage burden. Shooting 5-10 adult deer in late summer represents only approximately 10% of the deer present.

We delayed shooting until after August 1 to minimize adverse effects of orphaning on fawns. However, some of the second alfalfa crops were harvested in mid-July, allowing the third crop to grow for 2 weeks with no treatment to the deer feeding on them. This early damage affects the subsequent yield, even if no further damage is done, by weakening alfalfa plants and giving the grass components of the hay a competitive advantage (Mullen and Rongstad 1979, Palmer et al. 1982). This could have masked subsequent damage changes resulting from shooting permit use. We could have begun removals earlier and reduced the impact of maturing fawns on subsequent damage, but interviews and surveys suggested that landowners are opposed to shooting deer before August 1. Only 2% of the deer taken with shooting permits in Wisconsin from 1989 - 1993 were killed between April 1 and August 1 (Horton and Craven unpubl. data).

We did not detect any direct evidence of deer avoiding the treatment fields. We captured and radio-equipped 5 adult does on one farm intending to document their home ranges and feeding times before and after we treated them by shooting other deer. This would have allowed us to quantify any behavioral changes resulting from shooting permit use. However, radio failure, mortality, and especially the difficulty in detecting an experimental deer in the proper time, place, and social setting for treatment prevented us from proceeding with that portion of the study. It does serve to highlight the need for large sample sizes should anyone attempt this type of research in the future.

Hunter field logs revealed that some deer were not alarmed at the sound of gunfire or the presence of dead deer, but 90% of surviving deer ran off at the sound of a shot. Since subsequent damage did not change we can infer that surviving deer did not avoid the treatment fields altogether, but they may have avoided them during shooting hours. Deer adjust their active periods to avoid dangerous or annoying situations (Marchinton and Hirth 1984), including moving to feeding areas later at night. However, we could not detect a shift in deer feeding times from the hunter's field logs because they tended to shoot the first deer that entered the field and leave. This did not provide us with information on when the main body of the herd came to feed, which is more crucial to us than the time of the first deer entering the field. If deer become more nocturnal in response to shooting permit use, which is the common perception of permittees, the difficulty of shooting them while they are doing damage would increase as the growing season progresses.

Spotlighting and shooting deer at night is not allowed in Wisconsin because of safety concerns. It seems intuitive that spotlighting would address the nocturnal nature of deer, allowing removal of the deer responsible for the crop damage, but 5 of the states we surveyed allowed spotlighting when using shooting permits and only 1 of the state wildlife crop damage specialists considered shooting permit use to be effective in reducing crop damage.

MANAGEMENT IMPLICATIONS

We found that summer shooting permit use under existing restrictions is ineffective at reducing crop damage to alfalfa. However, shooting permits may be more effective under other conditions, or they may help control local populations when used for several consecutive years.

Shooting permit use has been controversial in Wisconsin among a small, but vocal, group of hunters who feel that it is unfair that farmers get to shoot "public" deer and that shooting permits are ineffective at reducing crop damage (Horton and Craven unpubl. data). However, shooting permits may still have validity as an abatement tool as long as expectations are in line with reality. Most midwestern wildlife damage specialists we interviewed suggested that shooting permits increased landowners' tolerance of deer damage. Kube (1983) found that when landowners with excessive crop damage get individualized attention, they feel the agency is actively trying to help solve their damage problems. Increased tolerance reduces landowner conflicts, and allows maintenance of higher deer herds, thus increasing viewing and hunting opportunities.

LITERATURE CITED

Austin, D. D. and P. J. Urness. 1993. Evaluating production losses from mule deer depredation in alfalfa fields. Wildl. Soc. Bull. 21:397-401.

Conover, M. R. and D. J. Decker. 1991. Wildlife damage to crops: perceptions of agricultural and wildlife professionals in 1957 and 1987. Wildl. Soc. Bull. 19:46-52.

Erickson, D. W. and N. F. Giessman. 1989. Review of a program to alleviate localized deer damage. Wildl. Soc. Bull. 17:544-548.

Gerleman, T. G. and P. E. Harris. 1987. Wildlife damage compensation law. Publ. No. G3408. University of Wisconsin-Extension, Madison, WI. 2pp.

Gladfelter, H. L. 1984. Midwest agricultural region. Pages 427-440 in L. Halls ed., White-tailed deer: ecology and management. Stackpole books, Harrisburg, PA.

Hawkins, R. E. and W. D. Klimstra. 1970. A preliminary study of the social organization of white-tailed deer. J. Wildl. Manage. 34(2):407-419.

Hirth, D. H. 1977. Social behavior of white-tailed deer in relation to habitat. Wildl. Monogr. 53. The Wildlife Society, Washington, D.C. 55pp.

Hygnstrom, S. E., S. R. Craven and J. R. Cary. 1988. Home range and habitat use responses of white-tailed deer to electric fences. Ph. D. Thesis, Univ. of Wisconsin, Madison. 25pp.

Kube, J. H. 1983. Assessment of deer management by Illinois landowners. Ill. Dep. Conserv., Div. Fish and Wildl. ?, Ill. 11pp + app.

Kufeld, R. C., D. C. Bowden, and D. L. Schrupp. 1988. Influence of hunting on movements of female mule deer. J. Range Manage. 41:70-72.

Larson, T. J., O. J. Rongstad, and F. W. Terbilcox. 1978. Movement and habitat use of white-tailed deer in south central Wisconsin. J. Wildl. Manage. 42:113-117.

Marchinton, R. L. and D. H. Hirth. 1984. Behavior. Pages 129-168 in L. Halls ed., White-tailed deer: ecology and management. Stackpole books, Harrisburg, PA.

Marshall, A. D. and R. W. Whittington. 1968. A telemetric study of deer home ranges and behavior of deer during managed hunts. Proc. Ann. Conf. SE Ass. Game and Fish Comms. 22:30-46.

Montgomery, G. G. 1963. Nocturnal movements and activity rhythms of white-tailed deer. J. Wildl. Manage. 27(3):422-427.

Moore, S. A. and C. M. White. 1971. Intrauterine distribution of fetuses and productivity of white-tailed deer in central Wisconsin. Reports on the fauna and flora of Wisconsin, No. 4. Mus. Nat. Hist., Univ. of Wis., Stevens Point, WI. 17pp.

Mullen, C. A. and O. J. Rongstad. 1979. Evaluation of deer damage to hay in southern Wisconsin. Pages 143-153 in Am. Soc. for Testing and Materials Spec. Tech. Publ. 680. Philadelphia, Pa.

Nelson, C. M. and T. F. Reis. 1992. Michigan deer crop damage block permit study. Trans. 57th N. A. Wildl. & Nat. Res. Conf. 57:89-95.

Siemer, W. F. and D. J. Decker. 1991. Human tolerance of wildlife damage: synthesis of research and management implications. Human Dimensions Res. Unit Series 91-7. Dep. Nat. Resour., Cornell Univ., Ithaca, N.Y. 24pp.

Short, H. L. 1964. Postnatal stomach development of white-tailed deer. J. Wildl. Manage. 28(3):445-458.

Swenson, J. E. 1982. Effects of hunting on habitat use by mule deer on mixed grass prairie in Montana. Wildl. Soc. Bull. 10:115-120.

Table 1. Deer damage change resulting from shooting permit use in Wisconsin.

Field	Second crop loss (kg)	Third crop loss (kg)	Difference (kg)[a]	No. deer killed
T1	408.79	545.06	136.26	4
T2	2089.39	2180.23	90.84	3
T3	1308.14	1090.12	54.51	1
T4	1208.21	1144.62	-63.59	3
T5	3833.58	3897.17	63.59	2
T6	926.60	817.59	-109.01	4
T7	1853.20	1553.42	-299.78	4
Control[b]			-73.0	0

[a] Mean = -18.2 kg, SD = 151.3.

[b] Mean given, N = 87, SD = 1225.0.

Table 2. Deer shooting permit use in the midwestern U.S.[a]

	WI	MN	MI	MO	IL	IA	IN	OH
Min. damage value	$1000	Biol.	Biol.	Biol.	Biol.	$1500	$500	Biol.
Sex of deer killed	Biol.	Either	Biol.	Biol.	Biol.	Biol.	Either	Biol.
Deer disposition[b]	1	2	Biol.	2	1	3	1	1
Shooting hour limits[c]	1	Biol.	Biol.	None	Biol.	2	2	None
Used in growing season?	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Intended purpose[d]	A	R	P	RP	A	RP	P	P
Controversiality[e]	2FHN	3H	1FHN	2HN	2FHN	None	2H	3N
Are they effective?[f]	?	Yes	No	No	No	?	Yes	No

[a] Biol. = biologist's discretion.
[b] 1 = shooters keep deer, 2 = deer are turned over to wardens, 3 = farmer keeps 2 and turns rest in.
[c] 1 = .5hr before sunrise to .25hr after sunset, 2 = .5hr before sunrise to .5hr after sunset.
[d] R = reduce population, S = scare survivors, P = pacify farmers, A = all of the above.
[e] 1 = very, 2 = moderately, 3 = mildly, 4 = not controversial among F = farmers, H = hunters, N = neighbors.
[f] State wildlife crop damage specialist's opinion.