

CROP DAMAGE CAUSED BY MARYLAND DEER *

By VAGN FLYGER and THEODORE THOERIG

*Natural Resources Institute,
University of Maryland*

At the turn of the century White-tailed Deer (*Odocoileus virginianus*) could be found only in small numbers in the mountains of western Maryland. Deer had been extirpated from the remainder of the state. Following World War I the Conservation Department and enthusiastic sportsmen introduced deer onto the Eastern Shore and the Aberdeen Proving Ground. Good protection by law enforcement officers, a sympathetic public and abandonment of agricultural lands which became young forests caused the deer to prosper and increase their numbers. The Aberdeen herd grew especially rapidly and immediately following World War II deer were trapped here and released in those parts of the state with few or no deer. Today deer are abundant in all portions of Maryland and deer hunting is permitted in all but one county.

In 1927 when deer hunting again became legal in Maryland, five deer were killed in one of the western counties. Over the years since that date the annual harvest has grown steadily until last year a total of 6507 legal deer were killed.

This population explosion among Maryland deer has been a contribution to public recreation and the state's economy. The number of hunters who bought deer stamps in 1961 was 68,723, representing considerable expenditure within the state. However, this large number of deer is not entirely a blessing. As the deer increased farmers in the regions with large deer herds began to complain of damage to their crops. The complaints became stronger and more frequent every year. In some localities the deer damage became so severe that certain crops, such as buckwheat, became impossible to grow.

In order to better assess the extent of the damage claimed by farmers, a portion of the Maryland P-R Deer Research Project was allocated to investigating this problem. The project was conducted jointly by the Maryland Game and Inland Fish Commission and the Natural Resources Institute of the University of Maryland.

From then on all complaints made by farmers to game wardens were investigated by project personnel. The damaged crops were inspected and a questionnaire was completed for each investigation. Soon it became evident that an accurate appraisal of the actual damage caused by deer was extremely difficult except in rare cases. The farmer himself had difficulty estimating the actual damage on a dollars and cents basis, but exorbitant claims by some farmers were quickly brought to within reason.

An immediate benefit of this project was improvement of farmer and Game Commission relations. Many farmers had felt that the Game Commission had only the sportsmen's interests at heart and was not concerned with the farmer. This action of visiting the farmers and discussing the deer problem with them made these men realize that they were not being ignored by the Game Commission. In the four years between 1957 and 1961 approximately 800 interviews were made.

The type of crops injured and the nature of the injury vary depending on season and locality.

One of the most important crops on the lower Eastern Shore is soybeans. The beans are planted in early May and later that month or in June the sprouts appear above ground. When these sprouts are two to five inches high they are very tasty to white-tails which browse on them early in the evenings or early mornings. Ordinarily soy beans grow rapidly and discourage weed growth by their dense shade. However, when young

* Contr. No. 280 Md. Natural Resources Institute.

This study was financed in part by Maryland P-R project W-34-R. It was conducted jointly by the Maryland Game and Inland Fish Commission and the Maryland Natural Resources Institute. The authors wish to acknowledge the efforts of James Bowers and Carson Bozman who worked on this project.

soybean plants are repeatedly grazed they grow slowly permitting weeds to develop luxuriantly in the rich soil. Upon maturation the heavy weed growth makes harvesting by combine impossible and sometimes the heavy grazing will prevent the beans from maturing.

In larger fields of ten acres or more, usually only the outer edges of the fields are affected and the farmer can harvest all but these edges. Smaller fields of five acres or less, especially when surrounded by woods, suffer heavily. Often such fields are overgrown with weeds to the extent that the crop is a total loss. The farmer loses not only the potential income from the crop but also his time and effort in planting the field and the cost of seeds and fertilizer. The owners of large fields can absorb the loss of a few outer rows but owners of small fields are often poor to begin with and to them the total loss of a crop is serious. One such farmer who was interviewed had planted two small soybean fields to pay for taxes on his land but because of weeds he was unable to harvest the crop. This loss was a severe hardship on the man.

After the soybean plants reach the height of about a foot they are able to withstand grazing by deer without untoward effects. However, in October and November when ready for harvest, the beans are easily shaken out of the pods and of course are lost when they fall to the ground. Deer also trample the vines into the ground, before the beans are dry, making them difficult to harvest successfully with a combine. At this season farmers report what they consider to be severe losses caused by deer walking and gamboling through soybean fields.

Sweet corn on the Eastern Shore also suffers greatly from deer. Most of this damage is done just before harvest when the deer enter the fields at night and nibble at the ears of corn. Usually only the terminal end of the ear is consumed but this makes the ear worthless. At this time of year raccoons and squirrels also eat corn. Damage to corn, reported by farmers as caused by deer, frequently upon investigation, turns out to be caused by squirrels or raccoons. Recognition of the animal species causing the damage is simple. Deer tend to nip off the ends of the ears or rake the kernels from the terminal part of the cob often dropping the damaged ear onto the ground. Squirrels and raccoons strip off the husk and consume the kernels from the cob consuming most of the kernels. At times deer will walk along a row of corn stalks nipping off the ends of unripe ears resulting in deformed ears at maturity. Opening the ends of ears of corn makes the remainder of the ear more vulnerable to blackbird damage. Some farmers assert that much of their blackbird damage is due indirectly to deer exposing the corn kernels.

Deer are reluctant to stray far from the protection of woodlands but high corn seems to give deer a sense of security and they will wander about in a cornfield not confining their activities to the border near the trees. Deer damage is therefore more diffuse in high corn than in the case of other crops except orchards.

Corn is raised in the western portion of the state mostly as livestock feed. In this region deer rarely eat young seedlings but rather confine their damage to ripe or almost ripe ears. Farmers in this region raising small grains such as wheat, oats, barely or rye tell of seeing deer grazing on these crops. Few complaints are made of losses to these crops and only rarely is damage excessive. Estimating the amount consumed by deer varies and is difficult to evaluate because of the recuperation of the crop. Grain standing in shocks, however, is extremely vulnerable to deer which will tear the shocks apart, consume the heads of the grains and trample the torn up shocks into the ground. Fortunately most farmers now use the combine to harvest small grains and deer have little opportunity to tear shocks to pieces. Here again, the man who suffers is the one with small fields, next to or surrounded by woods and who often harvests his grain by shocking it.

Buckwheat is a tasty item to the deer palate and was grown much more extensively in Western Maryland twenty years ago than it is today. The increase in deer numbers has forced farmers to cease growing this

crop. Today it is virtually impossible to grow buckwheat profitably and only the rare farmer is foolish enough to make the attempt.

Truck crops are very vulnerable because they are usually grown in small fields adjacent to forests and the product grown is usually succulent and tasty, being grown on rich fertilized and well-watered sites. Tomatoes are grown on the lower Eastern Shore and the farmers in this region suffer heavily in late June and early July. Deer walking between the rows of tomato plants bite pieces from the green tomatoes. They take only one bite from a tomato and drop it. Many tomatoes on the ground bear only the impressions of deer incisors. An estimate of the loss in one field based on the percent of stalks without tomatoes, revealed that 75% of the crop was destroyed by deer. The farmer had not even been aware of more than slight damage to his tomato crop.

Other truck crops which deer enjoy are snap beans, peas, strawberries, cabbage, lettuce and sweet potatoes. The latter are grown extensively on the lower Eastern Shore and are hit hardest when the plants are young and just appearing above ground. Repeated browsing by deer in a sweet potato field frequently leaves a border of bare ground next to the woods where the sweet potato plants have been consumed. Inside this border the sweet potato plants become progressively more luxuriant as the distance from the woods increases.

Probably the most seriously affected area is the orchard district of western Washington County, eastern Allegany County and the north-west corner of Frederick County. The orchardists in these areas have almost a constant year round battle with deer. In late summer the bucks polish their antlers on young trees and during winter and early spring the young trees are heavily browsed but some browsing occurs throughout the year. Damage to large trees is negligible but repeated browsing of young trees finally results in their death. The loss to the orchardist is not so much the cost of the tree and the replanting as is the loss of several years productivity. The orchardists regularly remove older trees and plant new ones so that they can maintain a constant yearly production of apples, peaches or cherries. Young trees may, for example, die one to three years following planting. The replanted trees may also be killed by deer after several years of browsing or antler rubbing. Therefore, a particular tree site can easily be non-productive for six or more years. Where deer damage is severe enough to destroy twenty per cent of the trees in a block every year, the losses can be staggering to the orchardist. One fruit grower estimated losses caused by deer on his orchards in 1960 at approximately \$15,000.

Growing Christmas trees for the markets in and around Washington and Baltimore is a potential source of income to western Maryland farmers. However, because of the predilection of deer for evergreens, growing Christmas trees is just about as practical as raising buckwheat; the farmer only provides deer food. Here again it is difficult to determine how much potential income is lost by the inability to grow this particular crop. The palatability of pine seedlings to deer is also reflected by the losses among reforestation plantings established by the Maryland Department of Forests and Parks. Deer prefer white pine to other species, red pine is also relished and Scotch pine least of all. Spruce is also well liked. White pine, a desirable timber species, can be successfully grown only in places distant from forests.

It is apparent (Table I) that most farmers are fortunate in suffering little or no deer damage. Nevertheless, one cannot ignore the serious state of affairs on other farms. Below are a few sample quotations from the questionnaires reflecting the gravity of the situation:

1. "Mr. _____ reported that employees have killed about 30 deer so far this year (Oct. 1959), on the farm. He also told me that they have killed an average of 50 deer annually for the past six years on this farm."
2. "Mr. _____ sees from 100 to 150 deer in his fields in the spring when the most damage is done to the new growth of alfalfa and clover. He estimates that he has 1,200 deer on his 4,000 acres."

3. "Mr. _____ told me that if something is not done to reduce his loss (estimated to be \$3,000) he will protect his livelihood by his own methods."

4. "Mr. _____ said he had to stop growing buckwheat because of heavy deer damage".

5. "Mr. _____ had to stop planting buckwheat and soybeans because of the heavy deer damage. He also complained about the damage to his pine trees".

6. "This farmer had to stop planting buckwheat because of the deer and the spotlight hunting damaging his crop."

7. "Mr. _____ says he has been driven out of the buckwheat business because of the heavy damage caused by deer."

Much of the grazing and browsing of crops by deer does not raise much comment. For example, deer are frequently seen grazing in clover, winter wheat or rye or in pastures. Because of no obvious indication of the amount consumed by deer the farmers rarely complain.

Placing monetary values on the losses incurred by farmers because of deer is difficult. A very rough estimate based on average losses on representative farms for certain crops places the total loss for Maryland at slightly over one million dollars.

Some farmers exaggerated their losses to ridiculous proportions either because they wish to make an issue of the event or because they hope to be reimbursed for damage by the Game and Inland Fish Commission. On the other hand, just as many farmers underestimated the amount of deer damage. The majority of farmers enjoyed the presence of deer and were tolerant of their feeding on crops as long as the amount consumed was not in their opinion excessive. Of course these men varied considerably in their interpretation of what was excessive.

On the whole, farmers were found to be tolerant and realistic. They appreciated our efforts to investigate deer damage and were cooperative in answering questions. Only a small, but possibly growing, minority felt bitter about the situation.

The contrast between the reactions of farmers in western Maryland and those on the Eastern Shore was pronounced. In the western portion of the state where deer have always been present or at last had been present for many years, farmers more readily accepted deer damage as a natural event. Even great amounts of damage and complete losses of buckwheat were often accepted philosophically without complaint in western Maryland. In contrast, on the Eastern Shore where deer are new animals and deer damage is a new hazard, the farmers were much more vociferous and active about damage to their crops by deer. Most of these farmers remember the time when they had neither deer damage nor deer and the contrast with present day extensive damage is clear. Perhaps in years to come, if the deer damage continues, the number of complaints will decrease as farmers become used to the condition.

CONTROL MEASURES

Few farmers experiencing crop damage from deer have accepted it lying down. Most of them make some kind of effort to prevent its occurrence even if only to call the local game warden. Some of the men have tried their own methods of control, some of which have been successful. The following description of these methods also discusses their effectiveness.

The most commonly used means of preventing intrusion by deer is the use of firecracker rope which is used so extensively because it is distributed by game wardens who also instruct the farmers in its use. Firecracker rope is simply a soft rope impregnated with potassium nitrate or some other salt so that when a lighted match is applied to one end the rope burns slowly at a rate of about six to ten inches an hour. Firecrackers are placed at intervals along the rope by inserting the fuses between the rope strands and the rope is then suspended from a branch or pole. As the burning end of the rope reaches the firecracker fuses, the fuses ignite and

the firecrackers fall off to explode either while falling or on the ground. The firecrackers are usually spaced to explode every twenty to thirty minutes.

The automatic carbide exploder is used by only a few farmers but the principle of its effect is similar to that of firecracker rope. The exploder is a device which is filled with water and carbide and then adjusted so that water drips onto the carbide. The rate of dripping determines the amount of acetylene gas produced and the interval between explosions. The initial cost of the exploder is high but the overall cost of its operation is less than the cost of firecrackers. Exploders have the advantages of being able to operate several days without attention, operating even in heavy rainfall, and do not create the fire hazard which is inherent in firecrackers.

The regular repeated explosions in one spot produced either by firecrackers or carbide exploders soon loses effectiveness on deer (Flyger and Thorig, 1961). Firecracker rope is most effective when the size of firecrackers and their spacing is varied in a random manner. Such an arrangement reduces the monotony of the explosions and deer do not become as readily accustomed to the noise as they do when the same magnitude of noise is repeated at uniform intervals.

Some farmers were issued shotgun shells which fired an explosive projectile. Such shells were fired at deer but their effectiveness was limited. If the deer were frightened they often learned to be more wary of the farmer who fired the shells. Shooting deer with fine shot (size 8 or 9) had the same effect.

Repellants have been used by few farmers and on the whole have been disappointing. One man, however, has a system which he thinks is effective in preventing deer from grazing on young soybeans. After planting the beans he covers the field with an inch of chicken manure and according to this farmer deer have not eaten young soy bean plants for the four years that he has been using this technique. Previous to this he suffered much damage. Since chicken raising is a large industry in this region there is plenty of manure available for other farmers to try the method. Another man bothered by deer claimed that he had successfully kept deer out of his orchard by applying an insecticide to the ground at fifty times the recommended dosage.

One farmer had two small noisy mongrel dogs which he encouraged to chase deer and he felt that these dogs were effective. This idea merits further consideration and although it was suggested to many farmers, none of them, to our knowledge, tried it. Keeping a few small dogs either chained or loose in fields might be an effective deterrent to deer. Some farmers tried flashing lights, kerosene lanterns, tinsel, pie plates and tin cans that rattled and glittered and small bags with moth balls sometimes combined with asafetida. Others hung rags soaked in tar or asphalt around the fields. None of these latter methods seemed effective. Two farmers claimed that they successfully discouraged deer from their land by keeping a radio playing in the middle of the field. One of these men stated that deer were not frightened by music but human voices frightened them. This method is also worth further consideration.

No one in Maryland, to our knowledge, has tried the use of electric fences of the type suggested by Seamans (1951) and this method offers some possibility especially around orchards.

The most effective deer deterrent has been booby traps (Op. Cit.). This is also the least expensive method but these devices cannot be used in places where children may tamper with them.

A few farmers have been forced out of desperation to take matters into their own hands. This has been true especially for orchardists. Some of them shoot deer on sight or hire hunters to kill deer. One orchardist, for example, stated that during the year he counted in excess of 75 dead deer, which he had shot, lying in his orchard. Since he shot the deer with .22 long rifle bullets, one can safely assume that many more deer were wounded which went off to die in the woods and were not found.

Feelings run high between orchardists and hunters in this region. The orchardist wants deer numbers reduced and together with the Game and Inland Fish Commission have tried to establish antlerless seasons. The more vociferous hunters in this area have been able to prevent all but one small ineffectual antlerless season. On one occasion the Game Commission, wishing to control the killing of deer and keep it out of the hands of the public, assigned wardens to shoot deer in the orchards. This did not please the hunters and within a week a large old storage building in one of the orchards mysteriously caught fire and burned to the ground, just as one of the hunters earlier had predicted would happen.

Farmers, when interviewed, were asked whether or not they favored a doe season. Out of 357 farmers questioned 72 percent favored shooting does and 23% were opposed. In order to learn the opinions of hunters 301 questionnaires were mailed to a sample of hunters selected from licenses issued in 1959 in the four westernmost counties. Two followup questionnaires were mailed to those who failed to respond and those who did not answer were personally interviewed. Surprisingly enough 48 per cent of the hunters favored a doe season, 42 per cent were opposed, and the remainder had no opinion. From this survey it seems obvious that more farmers and hunters favor an antlerless season than oppose it. A vociferous minority among the hunters are able to prevent the establishment of antlerless seasons in western Maryland.

In sharp contrast to the conflicts over antlerless seasons in western Maryland has been the smooth operation of antlerless seasons for five years on the Eastern Shore. The almost total absence of opposition to shooting antlerless deer on the Shore can probably be attributed to the fact that deer hunting is something relatively recent to the sportsmen of the area. They have not had time to become "experts" on deer and to develop strong opinions on deer management. In western Maryland, however, deer hunting has been going on since 1927 and one of the early protective measures for conserving these deer was to shoot only males. In effect the aspect of protecting females had been oversold in western Maryland.

During the annual buck seasons a large number of deer have been examined throughout the State and their weights and ages determined. These data (Table II) show that the areas of overcrowding in Maryland are the lower Eastern Shore and western Maryland, the same areas, with one exception, which report excessive crop damage. The area of exception is Dorchester County which has some of the largest deer in the state. This county also has a spreading herd of sika deer and a more intensive investigation of this county is under way.

Deer damage to crops, therefore, is linked with overcrowding of deer. Naturally, if deer reduce their woodland browse to low levels they will turn to other foods. It has been our belief that once deer begin feeding on crops it becomes a firmly established habit for generations, which develops in the following manner. Female deer come onto the farm to feed and finding the food to their liking return. When they have fawns these follow the mother into these fields and establish a pattern of feeding on farm crops. These young develop a liking for crops early in life and the farm becomes part of their specific home range. As they become older these deer in turn "train" their own offspring to feeding on crops and the habit is passed on from generation to generation.

The deer situation in western Maryland is not only unpleasant and wasteful but needless. Effective management of the herd is obstructed by a small but influential portion of local hunters. The Game and Inland Fish Commission is caught in the middle of this situation with its hands tied by legislation and public opinion. On the one hand farmers demand action threatening to take matters into their own hands. If the Commission permits such action, open lawlessness is encouraged with loss of respect for hunting laws. However, if a farmer is prosecuted for shooting deer in defense of his property the court is likely to favor the

farmer, thereby setting a precedent for other landowners and farmers to follow. On the other hand, hunters want more deer hunting but refuse to permit an antlerless season believing that they can build up their herd. Therefore the situation has become a dilemma created by the misinformed hunter.

Deer poaching in western Maryland has reached large and commercial status, most of the wardens in the area admitting that the annual illegal kill exceeds the legal kill. These poachers have become highly efficient and operate with only a small chance of apprehension. On the rare occasions when they are caught the fine is only a small portion of their operating expenses. There is a feeling among some Game Commission personnel that the illegal hunters actively support the opposition to antlerless season.

SUMMARY

Damage to crops by deer affects mostly the farmer with small fields having a high proportion of forest edge to crop area. Crop damage occurs almost entirely within two regions of the state, the lower Eastern Shore and the mountainous western counties. On the lower Shore the damage problem may begin to decrease as more deer are harvested during the annual antlerless seasons but in western Maryland no respite is forthcoming.

The solution to the problem of crop damage is several fold. Deer have learned to eat and relish farm crops because they have consumed much of their natural food due to over-population. Some deer have become habitual consumers of farm crops and pass this bad habit on to their offspring. Therefore, to reduce damage it is necessary not only to reduce the deer herd by increasing the harvest but also to kill the specific deer feeding on farm crops.

Much crop damage can be prevented by discouraging farmers from planting crops palatable to deer especially in small fields surrounded by woodland. Such small fields should be planted with crops less tasty to deer or the fields should be enlarged to reduce the amount of deer cover. Much crop damage can be reduced by proper advice to the farmer. Often by discouraging deer for a period of a week or two when the crop is especially vulnerable, the damage can be greatly minimized. Proper use at this time *only* of any of several devices may temporarily repel deer and by the time deer have become tolerant of the device the danger to the crops will have passed until next year. In places, such as orchards, where crop damage is a year round danger, one must resort to booby traps or shooting the guilty individuals.



Figure 1. Map of Maryland showing areas where deer are considered overabundant. In these areas the average dressed weight of 1½ year old male deer is 105 pounds or less.

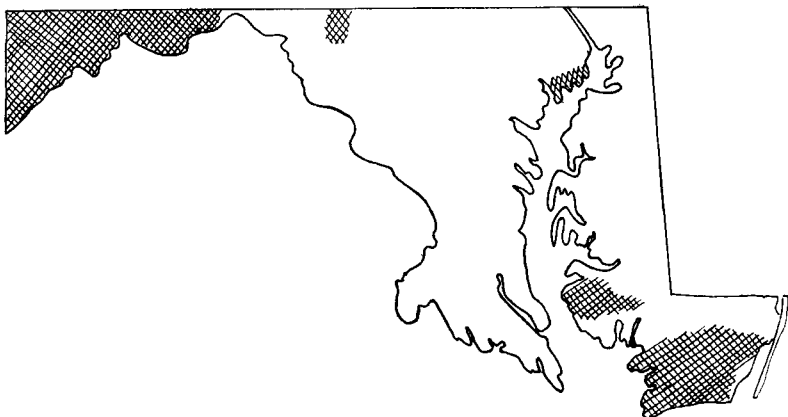


Figure 2. Map of Maryland showing areas where deer cause an excess of damage to crops.

In western Maryland proper management of the deer herd is prevented by an influential hunter minority. Therefore, the problem here is not one of conducting further studies to supply supporting information but to make use of existing knowledge in an educational campaign. Management of public owned game is based upon a democratic system but such a system is weakened when the controlling group is misinformed. An educational program should not be labelled propaganda because we are not dealing with a two-sided problem, just misinformation. Once the facts and the situation are understood the problem becomes more simple and the next steps can be taken toward the solution.

LITERATURE CITED

- Flyger, V. and T. Thorig. 1961. Preliminary report on a new principle for prevention of crop damage by deer. Proc. 15th Ann. Conf. SE. Assoc. Game and Fish Commissioners. 119-122.
- Seamans, R. 1951. Electric fences for the control of deer damage. Vermont Fish and Game Service. 77 pp.