

MICHIGAN DEPARTMENT OF CONSERVATION
Game Division

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Controlled Deer Hunting in a Square-Mile Enclosure*

We are presenting this paper to demonstrate quantitatively the portion of a deer herd a hunter may actually see or bag under various hunting conditions and concentrations of deer. It reports the behavior of hunters and deer under experimental conditions and does not attempt to present results of management of a deer herd.

The sportsman is apt to measure deer populations in terms of the deer he sees and shoots during the hunting season. Fortunately, most game managers realize that animals seen and shot by hunters represent only a fraction of the population, but this concept is exceedingly difficult to get across to many individuals. Deer drives throughout the country on small isolated tracts very often produce fantastic numbers of deer. It is almost axiomatic that when an area is carefully censused for deer, the population usually turns out to be higher than generally supposed. Our controlled hunts present another facet of this complex picture.

The Enclosure: A nearly ideal situation was at hand for this study, a herd of deer in a 647-acre fenced area at the Cusino Wildlife Experiment Station near Shingleton, Michigan. This large enclosure, surrounded by an 11-foot deer-proof fence, contains a fairly representative sample of Upper Peninsula deer range: hardwoods 68 per cent, mixed conifer swamp 9 per cent, and open pine barrens 23 per cent. The conifer swamp forms the nucleus of the yarding area, although the deer also use much of the upland hardwoods during milder winters.

After the completion of the fence in early 1952, we knew a few deer were still in the area. In order to start with a clean slate we attempted to remove these animals and introduce a new herd of known age and sex composition. This we accomplished except for three bucks which we were unable to drive from the area. To this residue we added 2 adult bucks, 11 adult does, and 11 fawns, making a herd of 27 deer. This, we believe, was close to the population this particular combination of habitats could support. Apparently our estimates of carrying capacity were not far from correct since the introduced herd not only thrived but reproduced at a rate considerably higher than that for the Upper Peninsula as a whole. While availability and production of browse has deteriorated somewhat through changes in plant succession and overbrowsing of some highly preferred woody species, the carrying capacity of the area has remained relatively high.

Census Techniques: A number of census techniques enabled us to follow changes in the deer population in the enclosure. First, we ear-tagged all animals originally placed in the area. Then each spring we captured and marked as many newborn fawns as possible. In later years hunting removed a portion of the herd. In winter we live-trapped and removed as many deer as possible to a holding pen and shot the rest. This whole process has permitted calculation of an accurate population figure for each year, as well as tagging of the remaining spring fawns. Finally, in mid-winter we returned a predetermined number of deer to the enclosure for the next year.

A series of deer drives each spring and fall has measured overwintering losses and populations available for hunting, respectively. Spring searches for dead deer uncover most previously unrecorded hunting season and other winter mortalities. The greatest unknown within the population has been the early postnatal mortality. Although we know the number of adult deer, drive censuses have been the principal means

year. The hunters, generally game biologists or conservation officers, were at least as experienced woodsmen as average deer hunters, and many also had an intimate knowledge of the enclosure. The three years of controlled hunting from 1954 to 1956 are the basis of this report.

Instructions to Hunters: Before the hunters entered the enclosure, we briefed them thoroughly, requesting them to hunt as they normally would on the outside under the pertaining laws, and to be sure of their targets to prevent undue crippling losses. Each hunter recorded each day: (1) deer killed or wounded, (2) deer seen, and sex and age where possible, (3) type of hunting and length of hunt to the nearest half hour, and (4) hunting conditions. We classified hunting into four main classes: still hunting or stalking, sitting along a good runway or crossing, trailing by tracks, and organized drives.

Special Conditions: We attempted to simulate normal hunting conditions outside, but due to the nature of the area and certain other limitations it was inevitable that some differences would occur. The enclosure confined the deer and assured the hunter that the deer would not leave the area. Hunters sometimes tracked bucks most of a day in hope they would drive them past other hunters. Deer hunters normally are out early in the morning, but in the enclosure most participants were unable to be on hand until about 9:00 A.M. Hunting had to stop in the late afternoon to permit autopsy of deer the same day. Several times hunters had opportunities to shoot but withheld their fire to avoid shooting a doe during the buck hunt or wounding an animal. We are sure deer hunters in general are not so careful to avoid crippling shots. During the first two hunts, in 1954 and 1955, hunters shot several deer from groups running together to speed up the harvest, resulting in increased removal of does and fawns. To lower the fawn take, in 1956 each hunter could shoot only one deer from each group he encountered.

Types of Seasons: Michigan laws allow two general types of hunting seasons, "bucks only" and "any deer". The buck season, in force since 1921, permits the taking of a male deer having at least three-inch antlers. The present deer law allows the Conservation Commission to authorize the taking of a deer of either sex and any age in special areas. In the enclosure in 1954 a further type of harvest after the first day permitted the shooting of adult deer only. Multiple kills on opening day had so depleted the fawn population that further removal would have jeopardized other phases of the experiment.

Hunting Pressure and Deer Population: Over the three-year period 7 hunters averaged a total of 37 man-hours per day or 5 hours per hunter each day in this square mile of deer range. This was exactly the hunter density calculated for the remainder of the Upper Peninsula, but was only one-third the average for the northern Lower Peninsula. Actual hours of hunting per day may have been higher in the enclosure than outside since the average hunter probably does not spend a five-hour day in the field. The fenced deer herd varied between 26 and 39 animals, averaging 34 deer per square mile at the beginning of each year's hunt. This closely approaches the best population estimates for the Upper Peninsula deer range. Generally, about 20 per cent of these deer were antlered bucks $1\frac{1}{2}$ years old or older.

Uniform Procedure: While we necessarily modified hunting procedures somewhat each year, other factors remained essentially the same. All harvests were in late November or early December. Many of the participating employees hunted all three years. We observed the same precautions each year concerning wounded animals, and maintained relatively constant hunting pressure and gun hours. Each year there was tracking snow but differences in ground conditions and visibility occurred as a result of snowfall, high winds, and low temperatures, which would be true of outside areas as well.

Description of Hunts

The 1954 Hunt: At the time of the first hunt in 1954, most of the enclosed deer had never been subjected to the gun, since the majority were either fawns at introduction

or had been born in the area. The hunters shot 8 deer and wounded 2 during four days of any-deer hunting (Table 1). They shot 6 of these deer, 4 fawns and 2 does, the first morning during organized deer drives. There was no evident selection by the hunters. Kills from groups of deer accounted for the high success. As pointed out previously, fawns seemed extremely vulnerable and therefore were excluded from hunting during the remainder of the season. On the second day the hunters made an increased effort to locate antlered bucks but still shot the first adult deer they saw. It was not until the fourth day of the hunt that they even saw an antlered buck. Actually, it took $15\frac{1}{2}$ man-days of hunting to locate and shoot this buck, the only one of seven in the enclosure taken during the hunt. Weather for hunting was ideal during the entire season.

The 1955 Hunt: In 1955 hunters spent the first 7 days hunting the 10 antlered bucks in the enclosure, followed by one day of any-deer shooting (Table 2). The 1954 any-deer hunt and live-trapping in previous years failed to crop bucks adequately, making it necessary to hunt them exclusively. Hunters shot 7 bucks during the 7 days and took 3 antlerless deer during the one-day any-deer hunt. These 3 deer bagged on the last day resulted from organized drives during which hunters saw more than 20 deer. Weather and ground conditions generally were favorable, but deep snows and a blizzard hampered hunters to some extent.

The 1956 Hunt: In 1956 a two-day buck hunt preceded four days of any-deer harvest (Table 3). The pre hunting population was lower by 28 per cent than in 1955, and the number of bucks decreased to one-half. At this writing the status of two carcasses found during the spring of 1957 is not known since we did not find the heads. We believe these animals were untagged fawns mortally wounded during the 1956 hunt and expect to establish their identity from the winter trap-out in early 1958. I do not include them in the present analysis since there is a possibility they were tagged and died of other causes after being handled during the 1957 trap-out. This was the first year that we prohibited multiple kills from groups of deer. Wet deep snow and blizzards produced the worst hunting conditions of the three-year period.

Discussion

Sight Records: Preliminary examination of the results of these three hunts (Table 4) shows that it is not possible to make general statements applicable to all three. The number of deer and bucks seen per unit of time varied considerably between any-deer and buck seasons, making it undesirable to group these data, as discussed later. I have summarized reports of deer seen in two ways: hunter-hours per deer or buck seen, and the per cent of the available deer or bucks seen during an eight-hour day. The latter considers daily hunting mortality and permits comparison of different seasons and herd densities on an equal basis.

During buck hunting, hunters saw one deer of any kind for each 0.9 hour in the field, while taking 10.2 gun-hours to see a buck. On the average, they saw 26.5 per cent of the available deer and 10.1 per cent of the available bucks during an eight-hour day of this type of hunting. The chances of seeing any deer decreased about half (to 17.2 per cent of the available deer) and of seeing a buck at least two-thirds (to 3.1 per cent) when the type of hunting changed to any-deer.

Several factors probably influenced this variation. By nature, the bucks seemed more secretive and elusive, and therefore more difficult to find. Hunters did not exert the increased effort needed to locate bucks unless bucks only were legal. When hunting effort increased to find these bucks, it generally produced increased sight records of bucks. We can attribute a further increase in sighting bucks to special hunting techniques hunters sometimes employ when pursuing bucks only.

Hunting Success: The same general pattern was found for the kill as for sight records. Hunters required 14.1 hours to shoot a deer during any-deer harvest and 50.8

The percentage of available deer seen during buck hunts dropped from an average of 28.5 in 1955 in good weather to 19.6 in 1956 in poor weather, or about 1/3, discounting the sixth day of hunting in 1956. I omit the sixth day of 1956 since the total hunting amounted to only 3 man-hours of driving with 7 men to shoot one more deer, and is not comparable with the other full days of hunting. In 1955 on the seventh day, hunters saw 45 per cent of all deer during an eight-hour day, the largest percentage of deer seen in a complete day's hunt. The day was calm and clear with good tracking snow. Organized deer drives on the eighth day's hunt in 1955 were responsible for the high percentage of sight records on that day. The best deer sighting success in 1956 was the second day immediately after a blizzard, a generally calm day with good tracking. This best day for 1956 was still below the average for the entire 1955 season.

Hunting Methods: Driving was the most effective means of hunting in the enclosure. Hunters drove several small isolated blocks of hardwood on different occasions with good results, but generally as the season progressed these drives became less effective. During the three-year period no bucks were seen on deer drives. In 1954 hunters shot four antlerless deer the first morning on a drive, but other drives during the season failed to produce a deer. The other four deer were shot that year by still hunting and sitting. On the last day of the 1955 season, an any-deer hunt, hunters killed 1 doe and 2 fawns on several organized drives from 20 deer seen. In 1956, driving made up 25 per cent of the total effort and resulted in 50 per cent of the kill.

In 1955 and 1956 still hunting or stalking was the most popular method of hunting, making up 47 and 36 per cent of the total effort, respectively (Tables 2 and 3). In 1955, due to extreme cold, few hunters chose to sit. The data do not permit us to analyze the effectiveness of hunting methods other than driving, although each method proved effective at times.

Crippling Loss: Crippling losses during these hunts were far less than one would expect during normal hunting seasons. First, we asked enclosure hunters to shoot only at reasonable targets. Also, during buck hunts they were careful not to shoot antlerless deer. When a hunter wounded an animal, he made a concentrated effort to retrieve it, since its loss would affect the population data. Even with such precautions hunters did wound deer and not recover them. In 1954 two does known to be seriously wounded were not found until after the hunt. Neither would have survived. In 1955 hunters mortally wounded a fawn, but we did not find it until the following spring. Two deer found during the spring of 1957 probably were lost during the previous hunting season. Crippling losses equaled 18 per cent of the legal kill during the three years. This figure suggests that even the most careful hunters cannot avoid crippling some deer.

Conclusions and Summary

Granting that methods of hunting in the deer enclosure differed somewhat from those on the outside, the controlled hunts nevertheless have demonstrated some highly significant findings of value to the game manager and of interest to the sportsman. We had generally supposed that it would be easier to shoot a deer, or a buck, inside a fence than out! If this is true, the enclosure hunter should have been more successful than his counterpart outside. When one considers the small number of deer seen and shot in this confined herd and the time it took to harvest the deer, he must revamp his ideas on the number of deer that must be present to produce comparable hunting outside.

A primary concept resulting from these hunts, but one that has also become evident from other studies, is that deer are usually more plentiful than seems evident to the casual observer. Game managers have had to endure the incessant claims of many hunters, resort operators, and others that our deer herd is fast disappearing, or has already disappeared, and that the only way we can bring it back is to restrict the harvest to

bucks only. By demonstrating that in 1954, for instance, a party of six hunters required $15\frac{1}{2}$ days to even see a buck when seven were known to be on the same square mile, we have a very convincing piece of evidence that the number of animals encountered afield may be a very unreliable indicator of deer populations. Better understanding of the elusiveness of deer and especially the extreme wariness of bucks, as shown in other ways in succeeding hunts, should remove much of the public concern that a deer herd is on the verge of extermination just because few animals are seen.

The following summarizes three controlled hunts on a square mile of enclosed Upper Peninsula deer range, supporting an average pre-hunting population of 34 deer, including 7 bucks:

1. Hunters saw twice as many deer and at least three times as many bucks when hunting bucks only as under any-deer regulations.
2. During buck hunts gunners saw one deer for every 0.9 hour and a buck for 10.2 hours of hunting.
3. This amounted to seeing 27 per cent of the available deer and 10 per cent of the available bucks for each 8 hours of buck hunting.
4. Hunters saw 17 per cent of the available deer, but only 3 per cent of the available bucks, during 8 hours of hunting under any-deer regulations.
5. They required 14 hours to shoot a deer during any-deer harvests, and 51 gun-hours for each buck during buck hunts.
6. They saw and therefore killed more deer during good weather.
7. Driving was the most effective means of seeing and killing deer, although 20 per cent of the hunting effort spent on drives failed to produce a single buck.
8. The crippling loss even with extreme care was at least 18 per cent.

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Table 1
Controlled Deer Harvest, 647-Acre Cusino Deer Enclosure
December 8-13, 1954
(Number of deer at beginning of hunt: 7 bucks, 14 does, 18 fawns=39 deer)

e t	Hunting conditions	Deer Shot				Number of times deer were seen						Type of hunting by hours	
		Buck	Do	Fawn	Tot.	Wounded Do	Buck	Do	Fawn	Unk.	Tot.	Hours	Main type
	Tracking snow, clear calm	0	2	4	6	0	0	3	7	2	12	31	Driving all day
	Cloudy, calm, tracking snow	0	1	0	1	1	0	4	9	0	13	38	Driving and still
	Same but warmer	0	0	0	0	0	0	5	10	6	21	30	Still and trailing
	Same but warmer	1	0	0	1	1	2	3	2	5	12	25	Driving and still
		1	3	4	8	2**	2	15	28	13	58	124	
							3.4	25.8	48.3	22.4	99.9		

not permitted after first day.
ter hunt.

Table 2
Controlled Deer Harvest, 647-Acre Cusino Deer Enclosure
November 28 - December 7, 1955

Day of hunt	Number of hunters	Type of hunt	Hunting conditions	Deer shot					Number of times deer were seen					Type of hunting		
				Killed			Wounded Fawn	Tot.	Buck	Doe	Fawn	Unk.	Tot.	Sitting	Still	Tree
				Buck	Doe	Fawn										
1	8	Bucks only	Cold, calm, good tracking	1	0	0	1	1	8	8	5	23	44	2.5	26	1
2	7	Bucks only	Blizzard, good tracking	2	0	0	2	0	8	11	11	25	55	5	24	1
3	9	Bucks only	Calm, good tracking	0	0	0	0	0	0	18	14	16	48	7	17.5	
4	5	Bucks only	Calm, good tracking	1	0	0	1	0	3	11	13	12	39	3.5	25	
5	10	Bucks only	Calm, deep snow	1	0	0	1	0	6	10	8	17	41	6.5	27.5	
6	7	Bucks only	Calm, deep snow	0	0	0	0	0	0	18	14	9	41	5.5	2.5	1
7	8	Bucks only	Calm, good tracking	2	0	0	2	0	5	14	28	24	71	4	22	1
8	7	Any deer	Calm, good tracking	0	1	2	3	0	0	3	2	29	34	1.5	7	
Totals	61			7	1	2	10	1*	30	93	95	155	373	35.5	151.5	7
Per cent									8.0	24.9	25.5	41.6	100	11.1	47.1	2

*Fawn found dead in April, 1956; probably wounded during hunt.

Table 3
Controlled Deer Harvest 647-Acre Cusino Deer Enclosure
November 26 - December 4, 1956

e t t y k y r r r	Hunting conditions	Deer shot				Number of times deer were seen					Type of hunting by hours					
		Killed			Wounded Fawn?	Buck	Doe	Fawn	Unk.	Tot.	Sitting	Still		Trailing	Driving	Tot.
Buck	Doe	Fawn	Tot.	Buck								Doe	Fawn			
	Wind, snow	1	0	0	1		4	4	2	11	21	9.25	27.5	12.75	4	53.5
	Poor visiblilty, good track- ing	0	0	0	0		1	16	13	17	47	15	23	5	12	55
	High wind, snow	1	1	0	2	2	2	12	6	8	28	10	15	13	14	52
	Light wind, good tracking	0	1	1	2		0	7	1	13	21	12.5	7	4.5	12	36
	Light wind, snow furies	0	2	2	4		1	5	7	6	19	7	14.5	7	14.5	43
	Light wind, snow furies	0	1	0	1			2	4	2	8	0	0	0	3	3
		2	5	3	10	2*	8	46	33	57	144	53.75	87	42.25	59.50	242.5
							5.6	31.9	22.9	39.6	100	22.2	35.9	17.4	24.5	100

s found in spring; possibly wounded during harvest; not included here.

Table 4
Summary of Three Years of Controlled Deer Harvests
647-Acre Cusino Deer Enclosure, 1954-56

	1954	1955	1956	Ave.
<u>BASIC DATA:</u>				
Number of days of each type of hunting	4 any	7 Buck 1 any	2 Buck 4 any	
Average number of hunters per day	6	7	7	7
Number of hours of hunting	124	321	243	229
Pre-hunting population:				
Bucks	7	10	5	7
Does	14	12	13	13
Fawns	18	14	8	13
Total	39	36	26	34
Deer killed:				
Bucks	1	7	2	3
Does	3	1	5	3
Fawns	4	2	3	3
Total	8	10	10	9
Per cent of herd removed	26%	28%	38%	31%
<u>DEER SEEN:</u>				
Hunter-hours per <u>deer</u> seen:				
Any-deer hunts	2.1	0.8	1.8	1.7
Buck hunts	---	0.9	0.9	0.9
Hunter-hours per <u>buck</u> seen:				
Any-deer hunts	62.0	---	44.7	56.2
Buck hunts	---	9.9	11.8	10.2
Per cent of available <u>deer</u> seen during an 8-hour day:				
Any-deer hunts	11.5%	38.9%	18.1%	17.2%
Buck hunts	---	28.5%	19.6%	26.5%
Per cent of available <u>bucks</u> seen during an 8-hour day:				
Any-deer hunts	2.3%	0.0%	5.1%	3.1%
Buck hunts	---	10.6%	8.0%	10.1%
<u>HUNTING SUCCESS:</u>				
Hunter-hours per <u>deer</u> shot:				
Any-deer hunts	15.5	8.0	14.9	14.1
Hunter-hours per <u>buck</u> shot:				
Any-deer hunts	124.0	---	134.0	140.5
Buck hunts	---	42.4	59.0	50.8
Per cent of available <u>deer</u> shot during an 8-hour day:				
Any-deer hunts	1.7%	3.4%	2.2%	2.1%
Per cent of available <u>bucks</u> shot during an 8-hour day:				
Any-deer hunts	1.2%	0.0%	1.3%	1.5%
Buck hunts	---	2.9%	1.4%	2.5%

