Potential Economic Returns from Deer as Compared with Livestock in the Edwards Plateau Region of Texas[1]

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Highlight
Potential economic return from deer was greater than that from livestock under conditions of average prevailing prices and adequate deer harvest. Data computed from rancher surveys indicated that the deer herd was maintained as a liability to the ranchers collectively, primarily because of inadequate harvest.

The economic potential of white-tailed deer *(Odocoileus virginianus)* to the rancher in the Edwards Plateau is a consideration that has rapidly gained importance with the increasing public demand for hunting. As early as 1947 it was estimated that the cash income from big game hunting leases to the average rancher in the Edwards Plateau was about $160.00 (Hahn, 1951).

Since the introduction of livestock into this region in the 1800's range vegetation has changed markedly. Under heavy domestic stocking rates the vegetation has changed from a predominately grassland to a predominately woodland or brush. This change increased the carrying capacity for deer until by the 1940's the region was supporting high den-

sities of deer (Hahn, 1945). Today, population densities of a deer to three acres are not uncommon. Simultaneous with the vegetative change brought about by livestock grazing was a decrease in carrying capacity for livestock. Under heavy domestic stocking rates, ranges have deteriorated until "the number of livestock which can be grazed on most Texas range lands today is less than half the number carried in 1900" (Merrill, 1959).

Combined classes of cows, sheep, goats, and deer are presently occupying the same range and the resulting competition between classes of animals is acute, particularly between sheep, goats and deer (McMahan, 1964).

Since sheep and goats are a principal product of the region, any reduction in forage for these animals by deer is an expense to the rancher. Thus economic competition exists between livestock and deer. The deer are the property of the people of the State and cannot be sold outright. However, a fee for ingress may be charged by the rancher to those wishing to hunt on his land. A means is therefore available for offsetting the cost of pasturage for the deer herd and

for realizing a profit from their management.

The Texas Parks and Wildlife Commission has the responsibility of setting game laws. However, game laws can only be protective. They can not force the harvest of any deer. Since all the land within the Plateau is under private ownership, the laws of trespass give the landholder control over the access to the deer herds. He controls the number of deer killed by his decision on whether or not to allow hunters on his land.

The game law provides that each license holder can kill no more than three deer, of which only two can be males with hardened antlers. It further provides that each antlerless deer killed must be matched with a tag from the individual license holder and a permit to kill antlerless deer furnished to the landholders by the Parks and Wildlife Department. Thus, the game law only governs the maximum number of antlerless deer which can be taken from any given acreage. It does not govern the maximum number of males with antlers which may be taken. The landholder through his control of hunter access, has complete control of the total number of antlered males taken and control of the number of females taken up to the maximum number specified by the Department.

Deer in the Edwards Plateau have a limited home range of approximately 1.5 mile radius (Thomas et al., 1964). Therefore, many decisions affecting deer welfare and numbers must be

made by individual ranchers.

The dominant conditions in the Plateau are very limited harvest brought about by the reluctance of the ranchers to let in enough hunters. This reluctance stems from two separate reasons. First, the majority of the people do not realize how many deer are present on the range and how many can be harvested without detriment to the herd. Second, the rancher prefers to avoid dealing with the large numbers of hunters necessary for adequate harvest and the problems involved.

It is true that the rancher does not have a choice of whether to stock his ranch with deer or not. The deer are already on the range in large numbers. The ranchers' choice is whether or not to allow the animals to be harvested from his land. This decision determines whether the deer herd is a liability or asset.

The Texas Parks and Wildlife Department in 1954 began a study of the relationships of deer and livestock sharing a mutual habitat under ranching conditions on the Kerr Wildlife Management Area. One phase of this study was directed toward a comparison of the economic compatibility of producing deer and livestock on the Edwards Plateau range land.

Experimental Area and Methods

The Kerr Wildlife Management Area is located at Hunt, Kerr County. It is basically representative of the surrounding region of the Edwards Plateau. Mean annual precipitation on the study area is 29 inches with most of the moisture being received as rainfall in the late spring and summer months. Rainfall fluctuates between years and droughts are common.

Approximately 5,500 acres were involved in the study. One-third of the acreage was an oak woodland in which the ashe juniper (*Juniperus ashei*) had been removed. The remaining acreage was a dense "cedar brake". Typically the oak woodland was rather open with liveoak (*Quercus virginiana*) and shinoak (*Quercus durandi*) comprising 8 and 3 percent canopy, respectively. Texas wintergrass (*Stipa leucotricha*), curlymesquite (*Hilaria belangeri*) and various threeawn species (*Aristida* spp.) comprised the more common grasses with numerous others present in considerably lesser quantity. The ashe juniper in the "cedar brake" was approximately 27 per cent of the canopy. Grasses were predominately tall dropseed (*Sporobolus asper*) in the shade, and curly mesquite in the openings. Because of a past history of very heavy use, range condition throughout the experimental area was only poor to fair, but with an improving trend.

An economic comparison of the net return from deer and from livestock occupying the same habitat was made from data collected on the Kerr Wildlife Management Area.

In 1957 the experimental area was stocked moderately with Hereford cows, Angora goats, and Rambouillet-type sheep in approximately equal proportions at a rate of 30 acres per animal unit. The grazing program was an informal deferred-rotation system in which two herds were rotated within seven pastures. Time of rotation was determined by an ocular estimate of 50 percent use on forage plants.

The livestock was furnished and managed by a lessee, an independent rancher who was granted the grazing rights on competitive bid. Records of the costs and returns of the livestock operation were maintained by the lessee. Net return per animal unit of livestock was computed from these records. Total expenses included three catagories: grazing lease, livestock maintenance and production, and interest on investment.

A population estimate of the deer herd on the experimental area was made annually, utilizing a walking-cruise census technique (Hahn, 1949). A total pasturage cost for the deer herd was computed by using the livestock grazing lease price per animal unit and the deer population estimate expressed in animal units. Six deer were considered an animal unit (Merrill *et al.*, 1957).

Deer were harvested from the herd annually by a public hunt during the regular fall season. Hunter numbers and the resultant number of deer killed were controlled by Department personnel and the numbers and sex of animals killed were recorded. A $2.00 per head harvest cost was assessed each deer killed to cover such expenses of the rancher as bait, advertising expense, blinds, and other conveniences necessary for the hunter to harvest the deer. Income figures were simulated at prices of from $50.00 to $60.00 per forked-antlered buck and from $15.00 to $18.00 per antlerless deer. The average price per deer was based on survey information from representative ranches within the region.

Survey information relative to the income received from deer hunting was obtained from questionnaires submitted to ranchers who maintained sufficient records.

Results and Discussion

Hahn (1951) reported that in 1947, 44 percent of the ranchers in a sample of 4 counties leased their land for deer hunting. Average size of the ranches for hunting was 785 acres, stocked with cattle, sheep, and goats at a rate of 1 animal unit per 10 acres. Average gross return from deer hunting leases was $361.00, or approximately $36.00 gross return per forked-antlered buck killed.

As the demand for hunting grew so did the economic value of the deer herd to the rancher. During the years 1955-59 a survey of representative ranches was conducted to determine the prevailing economic value of the deer hunting to the ranchers (Table 1). The average gross return per deer killed was approximately $42.00 over the 5-year period. A contributing factor to the fluctuation between years in the gross return per deer killed was the variation introduced by sampling different ranches each year. Methods of charging for deer hunting varied in form as well as price. The cost of hunting varied from $5.00 per day of hunting to $150.00 per individual for a lease for the first two weeks of the season. Lease price paid to the rancher on the

Table 1. Economic returns from deer on selected ranches in the Edwards Plateau.

Item	1955	1956	1957	1958	1959
Ranches surveyed, *no.*	8	12	24	20	17
Total area in ranches, *acres*	15,434	13,239	75,711	40,525	33,154
Animal units in livestock on ranches, *no.*	1,049	617	4,636	3,376	2,404
Estimated deer on ranches, *no.*	2,051	1,725	10,164	7,079	8,266
Antlered deer harvested, *no.*	128	154	521	487	615
Antlerless deer harvested, *no.*	50	75	343	124	495
Proportion of total deer population harvested, *%*	9	13	9	9	13
Total gross income from deer, *dollars*[1]	8,280.00	10,475.00	47,250.00	23,705.00	30,635.00
Average net return per animal unit in deer based on total population, $	16.78	18.50	25.02	15.52	9.19
Average gross return per deer killed, $	46.51	45.74	54.63	38.79	27.59
Average net return per deer killed, $	22.65	23.27	31.93	17.95	8.65

[1] A total of $18.00 per animal unit of deer was figured as pasture expenses; a total of $2.00 per deer killed was figured for harvesting expenses.

basis of animals killed varied from $10.00 to kill a doe to $150.00 to kill a buck with 8 or more points. Other variables influencing the lease price were: inclusion of turkey hunting, availability of permits to kill does, availability of fishing facilities, inclusion of a cabin, presence of hunting blinds, agreement for the rancher to bait around the blinds, presence of oat fields to draw the deer, agreement for the rancher to furnish the bait, *ad infinitum.*

Two costs to the rancher were associated with the production and harvest of deer. The first and usually smallest is associated with harvesting the deer. Numerous items were included within this category: of which advertising for hunters, baited blinds, maintenance of cabins, truck costs, and additional labor hired to assist hunters are but a few. It has been estimated from experience on the Kerr Wildlife Management Area that a cost of approximately $2.00 per deer killed is sufficient to adequately harvest a herd. This is a minimum figure based on 1 man with a pickup supervising 40 hunters per day on 5,500 acres during a 3 to 4 week season.

The second, and largest, is the pasturage cost of carrying the deer herd. This cost is a variable dependent upon the number of deer. The grazing lease price

paid per animal unit livestock varied from a low of approximately $10.00 per animal unit to a high of $30.00 per animal unit. A pasturage cost of $18.00 per animal unit of deer was used in computing Table 1.

The difference in gross and net returns shown in Table 1 is due primarily to the pasturage cost of a large deer herd. A means was available for reducing the size of this difference by increasing the gross return without higher charges to the hunters for the hunting lease. The average annual harvest of the deer herd as reported in the survey was only 11 percent. Numerous studies have shown that between 20 and 30 percent of a herd can be harvested annually without reduction of the basic herd. Thus, the kill could have been doubled. The total gross return would not necessarily have been doubled because a large portion of the additional kill would have been the lower-priced antlerless deer. However, a 25 percent harvest at $15.00 gross per deer killed would have paid the pasturage on the entire herd.

In order to have a comparison of the returns from livestock and deer sharing a mutual habitat, ranching conditions were established on the Kerr Wildlife Management Area and records of the operation maintained.

A summary of the period 1957

through 1962 is given in Table 2. The net return from livestock fluctuated between years. The lowest returns in 1961 were attributed to a calf crop of less than 50 percent and the fact that the lambs sold for only 11 cents per pound. The second lowest returns in 1957 were attributed to a kid crop of less than 20 percent and low mohair production of approximately 5 pounds per head. Production per animal could have been increased through better management practices. The lack of sufficient culling of low producing individuals was a major weakness in the livestock management.

The highest net return from deer occurred when the largest percent of the deer herd was harvested, but this could not be maintained without a resultant reduction in the size of the herd. The years from 1959 through 1961 represent what is probably the optimum harvest from a biological standpoint. The net return per animal unit of deer under optimum harvest conditions compares favorably with the returns from livestock The highest net return per animal unit from livestock is below the net returns per animal unit from deer when adequately harvested. During the year of least harvest the deer herd was maintained as a liability to the ranching opera-

tion. Only 24 bucks and 10 antlerless deer were harvested from a population of 463 deer. This was not sufficient to even pay for the pasturage expense of the herd.

The apparent discrepancy between the net returns per animal unit of deer reported in Table 1 and in Table 2 is due primarily to the difference in the composition of the kill. In the rancher survey information of Table 1 the kill was composed primarily of antlered deer while in Table 2 the larger percentage was composed of antlerless deer.

Deer harvest information gathered by the Kerr County 4-H Club Junior Wildlife Association gives a basis for computing a net return per animal unit of deer in Kerr County, which is 1,101 square miles in area. Considering Kerr County as a representative county, Table 3 illustrates three points: 1) the generally low percent of harvest over the Edwards Plateau, 2) the loss of potential hunting for the sportsman, and 3) the resulting cost of the deer herd to the ranchers. Over the 3-year period 29,838 deer were harvested as compared with 113,581 deer that could have been taken. The difference represents a loss in hunting for the sportsman. It also represents the difference between the deer herd being an asset or a liability to the rancher. The simulated monetary return to ranchers from deer in Kerr County shows an over-all loss. This loss is not money that the rancher has ever had in his pocket and must give up, but rather it is a hidden expense extracted from the range in the form of forage.

Summary and Conclusion

Records from the Kerr Wildlife Management Area indicate that the net return per animal unit of deer can exceed that from livestock in the Edwards Plateau region of Texas, if the deer herd is adequately harvested. The best yearly return of $28.82 per animal unit of livestock was not as great as the 1958-1963 average return of $38.60 from the deer herd. Surveys of ranches within the plateau region indicate that the deer herds are grossly underharvested with a resulting loss in potential income to the rancher.

Deer as a product of the range occupy a unique economic position. Deer products in the form of hunting have a demand which is increasing above that of the demand for any domestic livestock product. Its market is directed toward a portion of the public's income which is increasing more rapidly than any other, money available for recreation. The deer herd represents an economic asset if adequately harvested, but a liability if inadequately harvested.

At a time when efficiency of resource management is becoming increasingly important, it follows that recognition of the need for efficiency in deer production will become recognized.

Table 2. Comparative net returns from deer and livestock on a 5,500-Acre ranching operation, Kerr Wildlife Management Area.

Year	Deer Population no.	Deer Harvested[1] Antlered no.	Antlerless no.	Deer harvested %	Return per A.U. deer[2] $	Return per A.U. livestock $
1957	463	24	10	7	-1.94	1.87
1958	731	37	87	17	20.54	12.86
1959	713	60	112	24	40.96	28.82
1960	625	63	115	24	41.72	11.58
1961	927	69	166	25	44.03	-3.50
1962	452	64	132	43	79.25	5.35

[1] Antlered — male deer with forked antlers; antlerless — female deer and male deer without forked antlers.

[2] Six deer equivalent to one animal unit.

Table 3. Landowner survey concerning deer harvest in Kerr County, Texas.[1]

Item	1961	1962	1963
Buck Deer Harvested	6,745	4,612	5,454
Antlerless Deer Harvested	2,095	4,399	6,533
Total Deer Harvested	8,840	9,011	11,987
Adequate Deer Harvest (25% of herd)	43,413	28,913	41,255
Percent of Deer Harvested	5	8	7
Net Return per Animal Unit dollars[2]	-7.87	-5.54	-7.39

[1] Compiled by the Kerr County 4-H Club Junior Wildlife Association.

[2] Net Return figured on a basis of $50.00 per buck, $15.00 per antlerless deer, $20.00 per animal unit pasturage cost, and $2.00 per deer killed harvest cost.

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