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### THE ECONOMIC VALUE OF WILDLIFE RESOURCES IN TEXAS

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**THE ECONOMIC VALUE OF  
WILDLIFE RESOURCES IN TEXAS**

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## ABSTRACT

The economic value of wildlife is partly reflected in the Texas hunt lease and rural land markets. The results of an extensive survey of Texas hunters, and a land valuation model are utilized to develop estimates of the value of wildlife in Texas. Although the value of wildlife cannot be precisely calculated, these estimates clearly indicate that wildlife is an enormously valuable natural resource.

## THE ECONOMIC VALUE OF WILDLIFE RESOURCES IN TEXAS

Properly managing lands with wildlife is difficult unless some understanding of the relative value of wildlife to society is obtained. The value of wildlife resources to society is difficult to measure because these resources are publicly held with little or no market transactions available to reveal their relative value. Past attempts to determine the value of such resources have largely concentrated on demand. Meyer points out that "willingness/ability to pay, revealed by direct questioning, indirect observation, or expenditure-participation relationships (travel/transfer cost), have formed the basis for the valuation of public fish and wildlife recreation for at least two decades" [1979, p. 224]. Although these attempts provide useful information [Schulze, d'Arge and Brookshire 1981], accurate data on what individuals actually do pay for access to these resources (within a reasonably developed market, and where free public access to wildlife resources is not readily available) would be a more reliable indicator of the value of these resources. Because almost all of the land in Texas is privately owned, and because a market for buying and selling the rights to access wildlife on private land has developed, this can be done with some success in Texas.

There are basically only four ways to get access to wildlife in Texas. One way is to use public land. In Texas there is very little public land; much of it has poor hunting; and it is often over crowded. The second way is to be invited onto private land by family, friends, or associates. A third way is to purchase a hunting or recreational lease directly from the landlord or to belong to a sportsman club, a company, or some other organization that has purchased these rights. The fourth way is to obtain title to the land itself.

The value of wildlife is reflected in the Texas hunt lease system and rural land market. This paper will explore the Texas hunt lease system and rural land market as it relates to the actual buying and selling of the rights to access wildlife. First the lease system in Texas will be briefly described. Next the results of an extensive survey of hunters and how much they have paid for hunting leases will be reported. Finally, the effects that wildlife has on land values will be discussed.

### Texas Hunt Lease System

When Texas entered the Union in 1845 it retained title to all public land. However, the state government quickly proceeded to give away most of its real estate. By 1898 it had divested itself of all unappropriated land [Fugua 1980, p. 13]. Today, Texas has eight general types of habitat and fifteen unique ecosystems that cover over 262,840 square miles including approximately 3 million white-tailed deer on approximately 77 million acres of deer range [Texas Parks and Wildlife Department 1971 and Texas Sportsman 1982]. Almost all of this is on privately held land.

Texas wildlife is regarded as being held in trust by the state for the use of the public, but access to this wildlife, for the most part, is controlled by private landowners. As Teer and Forrest pointed out, "control of access has, for all practical purposes, transferred the custody of game animals from the State to the landowners" [1968, p. 194]. Because the value of this wildlife, particularly for hunting, has been recognized by landowners and hunters, a market or leasing system for trespass rights to access wildlife on private property has developed. Four general types of leasing arrangements can be identified.

The first and most common type of leasing arrangement is the annual or

seasonal lease. Under this arrangement the landowner provides a hunter or group of hunters the privilege of hunting on the land for a particular hunting season or for a full year. Annual leases often allow the hunters to hunt multiple species within their respective seasons throughout the year. Seasonal leases generally allow hunting limited species during their hunting season. The hunters and the landowner will agree on the services provided by the landowner, and harvest quotas for the hunter (within the established State and County game regulations). In addition, this arrangement may also include privileges to engage in other non-hunting activities such as wildlife and nature photography, camping, horseback riding, etc.

The second type of leasing arrangement is day-hunts. Under this arrangement the landowner allows hunter access to wildlife on the land on a per-day basis similar to arrangements made with trailer parks, or other such recreation facilities. Again services provided by the landlord and hunter quotas must be agreed upon.

A third type of leasing arrangement is where the landlord charges hunters directly for the animals bagged. Charges may differ by sex, size, antler development, or other such characteristics. Often there will be a base per-day or per-season charge for access to the property and an additional fee depending on the animals taken.

The fourth type of leasing arrangement is where the landowner sells the rights to access his land for hunting or other recreational activities to an outfitter, a recreational or sportsman club, or some other such organization and allows them to manage access to the land for hunting or other outdoor recreation for a predetermined period of time and within an agreed upon set of conditions.

Under all leasing arrangements, the price of the lease depends on the services offered, the game species that can be hunted, the quality and quantity of wildlife, the aesthetic appeal of the land, the number of acres of land involved, the distance from metropolitan areas, and other such factors. Some services that can be provided by the landowner are lodging, meals, guiding, tree stands, maps of the ranch, target ranges, campsites, etc. Landowners can build deer-proof fences around their property, provide supplemental feed to the wildlife, do population counts and try to maintain a given sex ratio or age distribution, establish populations of exotic game, or other such practices that help provide a marketable wildlife resource to outdoor recreationists interested in accessing wildlife.

This leasing market in Texas is generally not centralized or formal. Landlords sometimes advertize in newspapers or magazines and lists of landowners willing to give leases can often be obtained locally. However, a large share of the leasing arrangements are made through friends, relatives, and associates and are often informal. In addition, because wildlife is viewed not only as being aesthetically desirable but also as a source of economic returns to the land, most landowners zealously protect these resources by enforcing trespass laws. Although both hunters and landowners are expected to comply with State and County game regulations, Texas wildlife is primarily controlled by private landowners, and, for the most part, must be accessed through them.

### Hunter Survey

A telephone survey of 3,081 hunters was conducted from February to May, 1982. Participants were randomly selected from a list of individuals that purchased hunting licenses during the 1980-1981 hunting season. This list



was compiled by the Texas Parks and Wildlife Department (TPWD) and used to identify hunters participating in the 1981-1982 hunting season. The sample was selected by proportionally selecting licensed hunters from each of the four administrative regions of the TPWD. The study was not solely an attempt to examine the prices paid for hunting leases, but was also an attempt to assess hunters' attitudes and preferences concerning Texas wildlife and wildlife regulatory policies [Thomas and Adams 1982].

Information on hunter characteristics such as age, sex, race, education, income, and residence was obtained. The average age of the sample was with ages ranging from 9 to 89 years. Ninety-four percent of the sample hunters were male. Also, 94 percent were white with approximately four percent being Hispanic and two percent being Black. Slightly over 50 percent had at least some college education. Another 30 percent had finished high school. The average family income of the sample was between \$25,000 and \$30,000. Almost 30 percent had total family incomes of over \$40,000. Sixty-two percent reported living in urban areas.

Of those sampled, only 75 percent actually hunted during the 1981-1982 season. White-tailed deer was the most hunted game species (hunted by 75% of the hunters) followed by dove (54%), quail (43%), squirrel (36%), rabbit (35%), turkey (25%), duck (21%), Javalina (13%), geese (10%), and mule deer (5%). Antelope, pheasant, raccoon, and fox were also hunted by a relatively small number of hunters. White-tailed deer, mule deer, and turkey were most commonly accessed through hunting leases. Approximately 40 percent of those surveyed that hunted these species purchased a lease to do so. This compared with 35, 24, 21, 19, and 15 percent for javalina, geese, duck, quail, and dove respectively. Those that hunted without a lease generally hunted on

their own land, or had free access to private land by invitation from friends and relatives. Less than 10 percent of those surveyed that hunted white-tailed deer, javalina, turkey, dove, or quail did so on public land. Waterfowl was most commonly hunted on public land; however, only 27 percent of the geese hunters and 19 percent of the duck hunters surveyed hunted on public land.

The cost of the hunt leases ranged from one to over 5,000 dollars. The average cost of a white-tailed deer lease, as reported by those surveyed, was 393 dollars. The average cost of a mule deer lease was 902 dollars. The average cost of leases to hunt duck and geese was 626 and 758 dollars respectively. The cost-of-lease data for dove, quail, squirrel, rabbit, turkey, and javalina was confounded by the fact that the leases commonly included the rights to hunt multiple species. However, the costs of these leases were notably high. The average cost of leases that included the rights to hunt these species ranged from 293 dollars for squirrels to 647 dollars for quail.

It is clear that hunters are willing, able, and do pay significantly to obtain access to wildlife in Texas. In the 1981-1982 season, it was estimated that over 300,000 white-tailed deer were harvested by 533,130 hunters [Texas Sportsman 1982]. Assuming that 40 percent of these hunters purchased leases at an average cost of 393 dollars per lease, the total amount spent on hunting leases to access white-tailed deer during the 1981-1982 hunting season was approximately 84 million dollars. When the amount spent on leases to hunt dove, quail, mule-deer, water-fowl, javalina, and other game species is included, the total amount spent on leases to hunt is conservatively estimated as being over 100 million dollars.

### Wildlife's Effect on Land Prices

The value of wildlife is also partly reflected in the rural land market in Texas. Wildlife contributes to the value of land as a result of its natural aesthetic value; the value of owning the rights of ingress to the land for hunting by the landowner, friends and relatives; and the potential of providing income from hunting leases. The effect that white-tailed deer have on rural land prices can be approximated by using a land valuation model estimated by Pope [1983] to evaluate the agricultural productive and consumptive use components of rural land values in Texas. This model is briefly presented in Appendix A. In this model, factors relating to population density, proximity to the three major metropolitan areas of Texas, and differences in non-quantifiable aesthetic qualities collectively explain the largest portion of the variance in land values.

Net returns to land from agricultural production and hunt leases significantly effects rural land values. Based on the capitalization rate estimated by the land valuation model, the contribution to land values from average annual net returns can be approximated by capitalizing these returns by a rate of  $(1/11.84)$  or 8.45 percent. In areas where deer leasing is common, net income from hunting leases, as an average, ranges between one to three dollars per acre [State Property Tax Board 1981]. Based on a capitalization rate of 8.45 percent, this income from deer leases contributes 12 to 35 dollars per acre to the average price of deer range. If it is assumed that income from deer range averages 1.5 dollars per acre, the total income from these leases equals approximately 115 million dollars -- an amount roughly comparable with the total amount previously estimated using survey data.

Because the natural aesthetic value of wildlife and the value of owning

the rights of ingress to the land for hunting by the landowner, friends, and relatives is not captured by the income received from hunting leases, the total number of white-tailed deer harvested per square mile (DRH) is included as a variable in the model. This variable indicates not only the abundance of deer, but also the degree of hunter appeal. Based on the model, an increase of one deer harvested per square mile correlates with an additional 18.31 dollars per acre in the value of rural land in Texas. This is in addition to the value of the land from capitalized hunt lease income. For example, in the 1981-1982 season, there were approximately 10 deer harvested per square mile in several counties in the Texas Hill Country. This good wildlife potential is estimated to contribute, on the average, approximately 183 dollars per acre to rural land values in these counties. In comparison, the average contribution to land values from traditional agriculture in these counties is less than 70 dollars per acre.

The total contribution of white-tailed deer to rural land values in Texas is estimated as follows:

$$CD = \sum_{i=1}^N (18.31) (DRH_i) (TRA_i) + HLI/0.0845$$

where CD equals the total contribution of white-tailed deer to land values,  $DRH_i$  equals the number of deer harvested per square mile in county  $i$  (when less than 93 deer were harvested in the county  $DRH_i=0$ ),  $TRA_i$  equals the total number of rural acres in county  $i$ , HLI equals total annual income from white-tailed deer leases, and  $N$  equals the number of counties in Texas.

If it is assumed that HLI equals 100 million dollars, the estimated total contribution of white-tailed deer to rural land values equals approximately 4.4 billion dollars. This equals approximately 29 dollars per acre of

rural land in Texas and 57 dollars per acre of deer range. If this 4.4 billion dollars is annualized by multiplying it by the capitalization rate of 8.45 percent, the total annualized value is estimated as approximately 383 million dollars. This is roughly comparable with the results obtained from previous survey data. If, based on survey data, it is assumed that the average value of the rights to access deer for all white-tailed deer hunters in Texas equals the average amount paid for a white-tailed deer leases (\$393), the total value of white-tailed deer for hunting purposes alone equals approximately 210 million dollars. The annualized value of white-tailed deer, as reflected in land values, is expected to be somewhat larger than that based primarily on hunt lease data. It includes not only the value of white-tailed deer for hunting purposes, but also their aesthetic value.

### Conclusions

In Texas, the value of wildlife is at least partly reflected in its hunt lease and rural land markets. By studying these markets, rough estimates of the value of wildlife in Texas can be made. Because required data relating to other species is either not available or confounded with various problems, most of the estimates in this paper are based on data relating primarily to white-tailed deer. However, these estimates serve to illustrate the value of wildlife in general.

It is estimated that over 100 million dollars is spent annually on leases to access wildlife for hunting purposes. Estimates of the total annual value of wildlife in Texas range from 100 to over 380 million dollars. This equals one to over 3.5 percent of the total cash receipts from agricultural production in Texas in 1981, and rivals the value of some more traditional agricultural commodities. For example, in 1981, the total cash

receipts for sheep, lamb, mohair, and wool equaled 114 million dollars. It is also estimated that, in terms of its contribution to land values, wildlife is valued at over 4 billion dollars and contributes over 50 dollars per acre to the average value of deer range. In some areas of Texas the contribution to land values from wildlife is greater than the contribution from traditional livestock production. In conclusion, although the value of wildlife in Texas cannot be precisely calculated, by exploring the hunt lease system and rural land market in Texas, it is clear that wildlife is an enormously valuable natural resource.

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## Appendix A. Land Valuation Model

Data pertaining to the average market value of rural agricultural land and average net returns to the land were obtained for all school districts in Texas from the State Property Tax Board. Data pertaining to quality of hunting, population density, and proximity to major metropolitan areas were also collected. The school districts that were within one of the 26 metropolitan statistical areas of Texas and other school districts that were primarily urban or urban fringe districts were deleted. Also, 15 regions of aesthetic appeal were identified based on differences in topography, vegetation cover, access to the ocean, type of dominant agricultural activity and other factors. Using least-squares regression, the following land valuation model was estimated:

$$\begin{aligned}
 \text{AMV} = & 11.84 \text{ ANR} + 18.31 \text{ DRH} + 295.47 \text{ APP}^{-0.5} + 18.02 \text{ PD}^{0.5} \\
 & (14.54^{***}) \quad (3.96^{***}) \quad (3.35^{***}) \quad (4.05^{***}) \\
 & - 0.426 [(\text{APP})(\text{.PD})]^{0.5} + 16893 (1/\text{DD}) + 24026 (1/\text{DH}) \\
 & (2.78^{***}) \quad (9.17^{***}) \quad (7.42^{***}) \\
 & + 9263 (1/\text{DSA}) + 33.53 (D1) - 5.17 (D2) + 6.54 (D3) \\
 & (6.50^{***}) \quad (1.02) \quad (0.17) \quad (0.26) \\
 & + 271.13 (D4) + 137.64 (D5) + 154.05 (D6) + 85.17 (D7) \\
 & (4.96^{***}) \quad (2.28^{**}) \quad (4.78^{***}) \quad (2.07^{**}) \\
 & + 41.63 (D8) + 21.87 (D9) + 67.42 (D10) + 293.58 (D11) \\
 & (1.14) \quad (0.97) \quad (1.63^*) \quad (4.62^{***}) \\
 & - 62.17 (D12) + 239.50 (D13) - 23.49 (D14) + 139.78 (D15) \\
 & (2.61^{***}) \quad (6.61^{***}) \quad (1.14) \quad (4.79^{***})
 \end{aligned}$$

$$R^2 = .977 \quad R^2(\text{ADJ}) = .858^1 \quad \text{MSE} = 9366 \quad N = 592$$

where:

AMV = average market value of rural land devoted to agriculture in 1981,

ANR = estimated average annual net returns to land from agriculture in



1981 dollars including government payments and income received from hunting leases,

DRH = number of white-tailed deer harvested per square mile in the county in 1981 when total deer harvest for the county was more than 92, otherwise DRH = 0,

APP = estimated acres devoted to agriculture per person in 1980 based on the number of students in the school districts,

PD = total population per square mile in the county in 1980,

DD, DH, DSA = the highway mileage from Dallas, Houston, and San Antonio respectively,

D1, D2, ... D15 = dummy variables that identify the regions of aesthetic appeal. The variables equal 1 when the school district is within the region identified with the dummy variable, otherwise they equal 0.

The absolute t- values are given in parenthesis beneath the estimated regression coefficients and \*\*\*, \*\* and \* refer to statistical significance at 1, 5, and 15 percent respectively. In the model there is no intercept. The  $R^2$  for this model equals one minus the sum of squared errors divided by the sum of squared deviations from zero.  $R^2(\text{ADJ})$  equals one minus the sum of squared errors divided by the sum of squared deviations from the mean.

