RURAL ECONOMY

PROJECT REPORT

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An Economic Assessment of the Value of Wildlife Resources in Alberta

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Executive Summary

The objectives of this study are to: (i) explore the nature and extent of consumptive and nonconsumptive activities associated with wildlife in Alberta, (ii) provide an empirical estimate of hunting and preservation values associated with wildlife resources in Alberta and, (iii) examine the effects of supply uncertainty on nonmarket value estimates.

The data for the research were obtained by means of a mail survey of a random sample of 2,590 resident hunters and 2,400 households in Alberta. The response rates were approximately 51% for the hunters and 30% for the households.

It was estimated that of 140,579 resident license holders, 134,956 hunted actively during the 1987/88 season, with 112,463 hunting mainly for sport. The main reasons given for hunting were (in order of importance): for outdoor enjoyment, for meat, for trophy, for companionship and for exercise. On average, each hunter made 2.73 trips during the hunting season, lasting an average of 13.71 days. Each hunter travelled an average of 564.96 kilometres (one-way) to the hunting site and harvested an average of 5.82 animals (including big game and birds) during the season.

The total variable hunting costs incurred per person for the season was $657.66. Each hunter spent an average of $29.00 on hunting licenses and $158.94 on capital items. Total hunting costs (the sum of total variable costs, license fees, and capital costs) were $845.60 per person for the season. Total hunting costs per day amounted to $61.68, of which total variable costs were $47.97 per day per person; license fees, $2.12 per day per person; and capital costs, $11.59 per day per person. It was estimated that over $113 million was spent on hunting related activities in the 1987/88 season.

Approximately one-third of Albertans including one-half of the hunter subpopulation took trips specifically for nonconsumptive purposes in 1987/88. The most popular form of nonconsumptive activity was watching and feeding wildlife. Other forms of nonconsumptive activity were photographing wildlife, studying and identifying wildlife. On average, members of each household spent 5.2 days per household watching/ feeding wildlife, 1.9 days photographing wildlife, 2.7 days studying/identifying wildlife and 1.7 days hunting wildlife. On average, the active hunter subpopulation spent 5.7 days watching/ feeding wildlife, 2.2 days photographing wildlife, 4.7 days studying/identifying wildlife and 13.12 days hunting.

The typical Albertan household spent an average of $323.47 on nonconsumptive trips in 1987. Expenditures on nonconsumptive activities around the home or cottage was $47.97 per person. Total expenditures on nonconsumptive activities (the sum of expenditures on nonconsumptive trips and nonconsumptive activities around the home/cottage) was $371.44 per person. The aggregate expenditure on nonconsumptive activities in the province was estimated at $310 million in 1987.

The economic benefits derived from hunting big game were over $15 million and the benefits derived from wildlife preservation were over $67 million per annum. The total benefits of big game wildlife resources were estimated to be in excess of $83 million per annum. The actual value of wildlife resources would be higher due to the benefits of nonconsumptive use which were not ascertained directly in the study.

In an analysis of the effects of supply uncertainty on nonmarket value estimates, option price was shown to be an increasing function of the probability of supply. Also, for a given level of probability of supply, option price was shown to decline as the level of demand uncertainty increased. It was argued that in cases where there is likely to be significant supply and/or demand uncertainty, option price should be used as a measure of the benefits of future programs. Use of consumer's surplus (actual willingness-to-pay), which assumes perfect certainty, could lead to an overestimation of the stream of future benefits.

The results of this study provide evidence for the high level of concern that Albertans have for wildlife resources. Such evidence is consistent with the increasing national awareness about environmental issues. The study results indicate extensive use of wildlife resources for both consumptive and nonconsumptive purposes. Approximately two-thirds of the total benefits of wildlife resources was attributed to preservation value. This suggests that the preservation value of wildlife in Alberta is significant and therefore the omission of such values in resource allocation or benefit cost analysis could lead to a gross underestimate of total benefits. This, in turn, could lead to decisions which may pose adverse repercussions for social welfare.

Acknowledgements

This research could not have been completed without assistance from various sources. We gratefully acknowledge financial support provided by the Alberta Recreation, Parks and Wildlife Foundation. The protection of environmental resources, including wildlife, is becoming an urgent concern in national debate. There is therefore a need for increased financial support for research in this area. We are thankful to the foundation for putting funds at our disposal to initiate this research.

We are indebted to Alison Coyne who provided full-time assistance in administering the survey and collating the returns. We would also like to thank other staff of Alberta Wildlife Division and Alberta Bureau of Statistics who provided valuable input in the questionnaire design phase of the project. Sincere thanks go to Judy Boucher, for data entry assistance; to Clare Shier for help in the computer analysis of the data; and to Barb Johnson for editorial assistance.

Finally, we would like to express sincere appreciation to Alberta Forestry, Lands and Wildlife (Fish and Wildlife Division), for the considerable material and human resources placed at our disposal. We hope this effort will mark the beginning of many future joint research endeavors.

I. INTRODUCTION

The need to provide reliable estimates of the value of natural resource commodities such as wildlife is becoming increasingly important in view of encroachments on the natural environment from modern day economic and technological developments. The recreational value of wildlife is often ignored or assigned a low value and thus tends to be underrepresented in the public decision-making calculus. The proper valuation of nonmarket natural environmental commodities has policy relevance insofar as its omission could result in decisions which pose long run detrimental implications for the environment and social welfare. For example, a proposed resource extraction activity (say, open-pit mining of coal) might adversely modify the environment in the form of changes in the ecosystem or elimination of a given species' habitat[1]. A proposed hydro-electric project might affect recreational fishing or a unique natural environment such as a pristine mountain stream; and a proposed expansion of the agricultural land base might lead to a decline in the quality of wildlife habitat, causing a decline in the benefits derived from recreational hunting. Ethical arguments pertaining to our obligations to unborn generations have been made for including the value of such commodities in public choice decisions. Ciriacy-Wantrup (1952) has advocated the idea of a "safe-minimum standard for conservation" as essential for natural resource policy. Page (1977) has argued that preserving opportunities for future generations is a "common sense minimal notion of intergenerational justice".

The objectives of this study are to: (i) explore the nature and extent of consumptive and nonconsumptive activities associated with wildlife in Alberta, (ii) to provide an empirical estimate of hunting and preservation values associated with wildlife resources in Alberta and, (iii) to examine the effects of supply uncertainty on nonmarket value estimates.

Previous efforts at wildlife valuation in Alberta (eg., see Phillips et al. 1978, Adamowicz 1983, Wilson 1983) and elsewhere have focused almost exclusively on values derived from actual use of the given resource (eg., for hunting). However, use value notwithstanding, individuals may have nonuse values which exist outside of any intentions pertaining to current and/or future use. We refer to this as *preservation value*. Preservation value has three major components - *existence value, bequest*

[1] Artificial restoration has often been presented as a solution to the effects of this kind of resource extraction. However, as Krutilla and Fisher (1985) point out, the demand for authenticity of a natural environment rules out this option in certain situations.

value and *option value*. Option value arises when some individuals who, although not current users, nevertheless place a significant value on the option of consuming the resource. Existence value arises from a desire to have natural resources in continued existence regardless of use or option value. Bequest value arises from the desire of people to pass on a relatively unspoiled environment to future generations.

It has been suggested (Krutilla 1967; Krutilla et al. 1972) that in cases involving natural resource commodities, these values are likely to be significant. While empirical studies of preservation values are limited, those that have been reported show varying degrees of significance depending on the type of commodity. Meyer (1974) estimated preservation values for salmon in the Fraser River in British Columbia to be $223 per household per year. Mitchell and Carson (1981) estimated intrinsic (preservation) values for U.S freshwater rivers, lakes and streams to be $111 per household per year. Greenley et al. (1981) found existence values for preserving water quality in the South Platte River in Colorado to be about 53% of use value. Other empirical estimates include Brookshire et al. (1983) who found preservation values of grizzly bear and bighorn sheep habitat in Wyoming to be $24.00 and $7.40, respectively, for a given five-year time horizon. When appropriately aggregated over all households in the relevant populations, these values amount to millions of dollars for a given resource/environmental commodity.

The issue of supply uncertainty, as far as the grizzly bear resource is concerned, is an important one in Alberta. The grizzly bear population in the province has been declining due to deteriorating habitat quality and increased contact with humans. This decline has also been exacerbated by the increasing use of natural wildlife habitat for nonhunting purposes such as agriculture and mining. While the grizzly bear is relatively scarce compared to most other big game species (eg., moose, deer), there is a high demand for grizzly bear hunting licenses[2]. The measure of value used to analyze the effects of supply uncertainty is *option price*. Option price is defined as the maximum amount of money an individual is willing to pay for a good regardless of what the state of the world would be in the future (eg., see Bishop 1986). Take the example of grizzly bear hunting in

[2] According to Gunson (1988), there are about 809 grizzly bears in Alberta. Over the period 1986 to 1987, a total of 3709 applications were made for grizzly bear hunting licenses of which only 359 were awarded (Alberta Forests, Lands and Wildlife 1987).

Alberta, for which the current probability of obtaining a license is very low (about 5%): an individual's option price bid would be the maximum he or she is willing to pay for a hunting license, given a 5% chance of being supplied (or a 95% chance of not being supplied).

This report is structured as follows. Section II outlines the methodology employed in the research. This includes a brief discussion of procedures used in nonmarket value estimation and an outline of the survey design. Section III presents the empirical results and discussion. This includes a profile of the socioeconomic characteristics of the sample and an analysis of activities pertaining to the consumptive and nonconsumptive use of wildlife. Section III concludes with an analysis of the economic benefits derived from wildlife resources in the province. The report concludes with a summary of the main findings, the limitations of the research, directions for future research and implications for policy makers.

II. METHODOLOGY

A. Introduction

Natural resource commodities such as air quality, water quality, recreational use of fish and wildlife and certain unique natural environments present a valuation problem in that they are not traded in competitive markets, and as such their values are not reflected by market prices. This difficulty is a contributory factor to the tendency of public decision-makers to implicitly assign zero or low values to nonmarket environmental resources in the analysis of public projects. Much progress has been made in recent years in the valuation of nonmarket commodities since the pioneering work of Hotelling (1947), Ciriacy-Wantrup (1952), Clawson (1959) and Davis (1963). Previous efforts at valuation, especially with regard to outdoor recreation, were based on market prices. Some examples of this approach are the Gross Expenditures Method, the Cost Method, and the Market Value Method (Knetsch and Davis 1966). The Gross Expenditures Method attempts to measure value in terms of total expenditures (eg., travel, equipment etc.) incurred in the recreation area. While such measures may be useful in giving some indication of the amount of money spent on a particular kind of recreation, it is of little use in determining recreation benefits. For example, expenditures merely reflect transfers of expenditures from one

area of the economy to another and thus cannot necessarily be tied to the recreational commodity. The Cost Method assumes that the value of a good is equal to or is some multiple of the cost of producing it.

The Cost Method has the effect of justifying any proposed project but offers little guidance in the case of valuing contemplated loss or gain of recreation opportunities. It also allows little or no discrimination between the relative value of alternative additions to the proposed project. The Market Value Method draws up a schedule of charges judged to reflect the private market value of the services the resource provides. These charges are then multiplied by the actual or expected attendance figures to arrive at a recreation value. This method appears attractive due to the emphasis on the willingness of users to incur costs to make choices. However, the market for most types of environmental commodities is, to a large extent, a public one. It therefore appears unreasonable to use charges from a private area to estimate the recreational value from a public area. In general, these methods have been found to be unsatisfactory because they rely on market prices as indicators of value for nonmarket goods.

Three methods which aim at simulating a market have been recently developed to rectify the weaknesses of the above nonsimulation methods. Two of these - the travel cost method (TCM) and the hedonic price method (HPM) are termed "related-market approaches" or "inferential approaches" because they are based on the linkages between unpriced natural resources and markets for related goods and services[3] TCM uses recreational trip expenditures as a proxy for market prices (see Knetsch 1963; Burt and Brewer 1971 and Cicchetti et al. 1976). The HPM, formalized by Rosen (1974), takes data on recreation expenditure and expresses it as a function of a variable such as recreation days and success rates. By then evaluating expenditure changes with respect to an additional recreation day or additional animal bagged, one is able to estimate a value for that additional recreation day or animal bagged (Adamowicz 1983; Freeman 1979; McConnell 1979; and Bockstael and McConnell 1983).

[3] These two methods are also referred to as weak complementarity approaches because they assume weak complementarity between the market good and the nonmarket good (see Maler 1974).

The third approach - contingent valuation method (CVM) - utilizes interviews or mail surveys to ask people about the values they would place on the commodity in question contingent on the existence of a market or other means of payment. Usually, respondents are asked to indicate the dollar amount they are willing to pay to engage in the activity to reveal "willingness-to-pay" (WTP). They may also be asked to indicate the dollar amount they must receive in order not to engage in the activity to reveal "willingness-to-accept-compensation" (WTAC)[4]. Various techniques are employed to elicit these responses. Examples are (i) direct question methods, variants of which are open-ended (Hammack and Brown 1974), close-ended (Phillips et al. 1978) and dichotomous choice questions (Bishop and Herberlein 1979); (ii) bidding game methods (Brookshire et al. 1981); (iii) payment-card method (Mitchell and Carson 1981) and, (iv) contingent ranking (Desvousges et al. 1983). Contingent ranking is a relatively new approach in which respondents are merely asked to rank the alternatives from most preferred to least preferred. Values are then inferred through statistical analysis of the rankings.

The contingent valuation method is adopted as a measurement technique for this study. This choice is based on the fact that the CVM is the only approach which can be used to estimate the nonuse component of wildlife, given the present state-of-the-art in nonmarket valuation research.

B. Survey Design and Procedures

Two target populations were utilized for this study. The first was a random sample of 2,590 Alberta resident hunters who purchased hunting licenses during the 1987/88 season, and the second was a random sample of 2,400 Alberta households drawn from the general population. The sampling frame for the hunters was obtained from the computer files of Alberta Forestry, Lands and Wildlife (Fish and Wildlife Division). The sampling frame for the households was obtained from the current telephone directories of Alberta Government Telephones (AGT) and

[4] Various CV studies (eg. Bishop and Heberlein 1979; Knetsch and Sinden 1984; Adamowicz and Phillips 1983) have found WTAC to be substantially greater than WTP when theory suggests they are equivalent measures, give or take small differences due to income effects. Tversky and Kahneman (1987) have rationalized these observations in terms of loss aversion, i.e. the response to losses is more extreme than the response to gains.

Edmonton Telephones (Ed Tel)[5]. Prior to taking the sample for the latter group, the telephone directories were arranged in random order. Areas with multiple listings were clipped to avoid multiple selections from these areas. The sample was then taken using a sampling interval of 1/300, after a random start. Both sampling frames were cross-checked to prevent duplicate entries. The questionnaire design followed, insofar as possible, Dillman's (1978) "total design concepts". The questionnaires were put through several drafts, with input from the personnel of the Fish and Wildlife Division (Alberta Forestry, Lands and Wildlife) and Alberta Bureau of Statistics. They were also put through a number of pretests. The cover letters were not personalized due to the large numbers involved. However, each respondent received a professionally duplicated copy co-signed by the Assistant Deputy Minister of Alberta Forestry, Lands and Wildlife, and the Chairman of the Department of Rural Economy, University of Alberta.

Two mailings of the questionnaires were carried out for the hunter component of the sample. Budgetary considerations constrained the number of mailings for the household component to just one. The response rates, adjusted for undelivered questionnaires, were approximately 51% and 30% for the hunter and household components, respectively. Hunting benefits were obtained by asking respondents who hunted in the 1987/88 season how much they were willing to pay annually (over and above their hunting expenses) to engage in that activity. Separate values for big game and grizzly bear hunting were elicited. Preservation value was elicited by asking respondents how much they were willing to donate annually to a hypothetical public trust fund set up to preserve wildlife in Alberta. For the households, two different approaches to eliciting values were employed. Half of the group was asked about how much they were willing to donate annually to the wildlife trust fund for wildlife preservation. The other half was asked for similar donations but in the form of increased taxes. The former is referred to below as a "donation payment vehicle", while the latter is referred to as a "tax payment vehicle".

[5] In the U.S., more than 90% of households have telephones. One would expect a similar situation to prevail in Canada, although there is concern that households with unlisted numbers may have different characteristics.

For those hunters who indicated an intention to hunt grizzly bear in the future, option price bids were elicited as follows:

> **"What is the MAXIMUM amount of money you are willing to pay each year to the grizzly bear fund if there are high chances, 9 in 10, of you getting a grizzly bear hunting license after 5 years? $ _____."**

Bids were also elicited at two additional levels of probability - 50% and 10%. The respondents were also questioned about their chances of hunting grizzly bear if they obtained a hunting license. These demand probability measures were obtained at four levels - certain, even odds, low odds and zero odds. The survey concluded with questions on the usual socioeconomic characteristics - place of residence, sex, age, education, family size, and income.

III. EMPIRICAL RESULTS AND DISCUSSION

A. Socioeconomic Characteristics

Table 1 compares the socioeconomic characteristics of the sample of hunters with the sample of households. Approximately 53% of hunters reside in rural areas while approximately 47% reside in urban areas. This trend is reversed for the general population, of which the predominant proportion (73%) reside in urban areas. Edmonton and Calgary account for approximately 31% of all hunters. Smaller cities such as Grande Prairie, Fort McMurray, Medicine Hat, Lethbridge, St. Albert and Red Deer account for 16.4% of hunters. Sixty-three of the general population reside in Edmonton and Calgary, while 7% reside in Grande Prairie, Fort McMurray, Medicine Hat, Lethbridge, St. Albert and Red Deer. The remaining 30% are from the rural areas (see Appendix 1).

Surveyed hunters range in age from 13 to 82 years, with an average of approximately 38 years. On the other hand, the average age for the general population is 43 years, with a range of 16 to 94 years.

The average family size of hunters is 3.1 persons, with a range of 1 to 9 persons. The family size of the general population also ranges from 1 to 9 persons with an average of 2.8

Table 1 Socioeconomic Characteristics of the Samples of Hunters and Households

Variable	Hunters		Households	
Population Size	140,579[a]		2,365,825[b]	
Sample Size (% Population)	1303	(1.0%)	603	(.02%)
Residence:				
% Urban[c]	46.7		73.0	
% Rural	53.3		27.0	
Average Age (Years)	37.6		43.2	
Sex:				
% Male	96.4		74.8[d]	
% Female	3.5		25.3	
Average Family Size (Persons)	3.1		2.8	
Average Years Schooling	12.9		13.9	
Average Household Income ($)	39,259		39,119	
Median Household Income ($)	37,500		37,500	

[a] Alberta Forestry, Lands and Wildlife. Fish and Wildlife Draw Statistics, 1988.

[b] Statistics Canada 1988.

[c] An urban area is defined as a settlement with a population of 10,000 or more.

[d] There is a higher than normal proportion of males because questionnaires were completed by heads of households who tended to be male.

persons (see Appendix 2).

The average number of years of formal education is 12.9 for hunters and 13.9 for the general population. Approximatley 67% of the general population have some form of post-secondary (i.e., university, college, technical or trade school) education, while 51% of hunters have similar educational background (see Appendix 3).

Approximately 96% of hunters have annual household incomes of between $10,000 and $70,000^{+}, with an average of $39,259. Approximately 95% of the general population have annual incomes of between $10,000 and $70,000^{+}, with an average of $39,119 per annum. Median incomes for hunters and households are identical at $37,500 per annum (see Appendix 4).

In summary, the typical hunter in 1988 tends to be a rural male, about 38 years of age, has about 13 years of formal education, is a member of a family of three and receives a household income of $39,259. The typical head of the household in 1988 is an urban male, 43 years of age, has about 14 years of formal education, is a member of a family of about three, and receives a household income of $39,119.

B. Attitudes towards Wildlife

A summary of the survey respondents' attitudes towards wildlife is presented in Table 2. Approximately 82% of hunters and 61% of households reported a high value for wildlife. Approximately sixteen percent of hunters and 31% of households had a very high value for wildlife, while 1.8% of the hunter population and 6.8% of households had a moderate value for wildlife. On the other hand, 0.1% of hunters either had a low or zero value, while at most 0.2% of households had a low or zero value for wildlife. In general, these results indicate there is a high degree of concern among Albertans for wildlife. This could be a result of the re-emergence of environmental issues among the pressing topics of the day.

Table 2 Respondents' Attitudes Towards Wildlife

Hunters Variable	No.	(%)	Households No.	(%)
Value very highly	1072	(82.3%)	369	(61.4%)
Value highly	203	(15.6%)	188	(31.3%)
Value moderately	23	(1.8%)	41	(6.8%)
Low value	1	(0.1%)	2	(0.3%)
No value	1	(0.1%)	1	(0.2%)
No value	1	(0.1%)	1	(0.2%)
No response	3	(0.1%)		
Total	1303		601	

C. Analysis of Consumptive Use

1. Hunting Experience and Motivation

Table 3 displays results pertaining to hunting experience and motivation. It shows that 1228 or 96% of the hunters surveyed hunted prior to the 1987/88 season. Nine hundred and ninety-four or 80% of the hunters hunted for sport during the 1987/88 season. On average, each hunter has had 16.24 years of hunting experience in Alberta. Also, each hunter has had 17.31 and 16.62 years of big game and bird game hunting experience, respectively. One hundred and forty thousand, five hundred and seventy nine resident hunters were registered in Alberta in the 1987/88 season. By inference, approximately 134,956 persons hunted actively in 1987/88, with 112,463 hunting mainly for sport.

Respondents to the hunting survey were required to rank from 1 to 6, their reasons for hunting. Table 4 gives a breakdown of respondents' motivations for hunting. The main reasons given for hunting are for outdoor enjoyment, for meat, for trophy, for companionship and for exercise. Of these reasons, outdoor enjoyment ranks as the most important motivating factor, accounting for 26.7% of the total score (see last two columns of Table 4). The second most important reason given is hunting as a source of meat (23.8% of the total score). Hunting for trophy, companionship and exercise are equally ranked with approximately 15% of the total score. Approximately 6% of the score is due to reasons other than the above. Examples of such reasons are: for challenge, stalking, relaxation, taking pictures, exploring, making a living, etc. (see Appendix 5).

2. Hunting Activities

Persons who hunted for sport in 1987/88 were required to provide general information on their hunting trips. This information is summarized in Table 5. Of the 1,303 hunters in the sample, 924 (71%) hunted big game, 356 (27%) hunted upland bird game and 142 (11%) hunted migratory bird game (waterfowl). These numbers represent 1%, 0.9% and 0.4%, respectively, of the populations of big game, upland bird game and migratory bird

Table 3 Hunting Experience of Survey Respondents

Number Hunting in Alberta prior to 1987/88 season (%)	1228	(95.7%)
Number Hunting for Sport in Alberta in 1987/88 season (%)	994	(79.8%)
Average Number of Years of Alberta Hunting	16.24	
Average Number of Years Big Game Hunting	17.31	
Average Number of Years Bird Game Hunting	16.62	

Table 4 Reasons given for Hunting[a]

Reason for Hunting	Rank of Choice								
	1st	2nd	3rd	4th	5th	6th	No Rank	Score[b]	% Total Score
Outdoor Enjoyment	761	360	97	14	5	0	66	8109	26.7
Meat	500	306	236	122	54	2	83	7253	23.8
Trophy	98	149	234	146	264	10	412	4558	15.0
Companionship	34	202	246	232	139	12	438	4487	14.4
Exercise	28	112	279	280	198	11	395	4394	14.4
Other Reasons	16	18	14	17	11	39	1187	1656	5.4
Total Score								30457	100.0

[a] Numbers refer to the frequency of responses in each category. N=1303.

[b] Scores are weighted sums of the rankings in which "1st" is weighted 7, "2nd" 6, "3rd" 5, "4th" 4, "5th" 3, "6th" 2, and "No Rank" 1.

Table 5 Hunting Activities by Type of Game, 1987/88 Season

Variable	All Hunting Combined	Big Game Hunting	Upland Bird Game Hunting	Migratory Bird Game Hunting
Population Size	140,579[a]	77,717[a]	38,408[b]	33,545[c]
Sample Size	1303	924[d]	356[d]	142[d]
No. of Trips/Person	2.73	2.98	2.07	1.72
No. of Days/Person	13.71	13.14	7.95	6.84
Days Hunted/Trip/Person	5.02	4.41	3.84	3.98
Kilometres (One Way)/Person	564.96	528.62	331.14	259.13
Kilometres/Trip/Person	206.94	177.39	159.98	150.66
Party Size/Trip/Person	2.58	2.57	2.51	2.66
Animals Taken/Trip/Person	5.82	1.19	12.11	15.02

[a] Source: Alberta Forestry, Lands and Wildlife (1988).

[b] Estimate based on proportion of sample hunting given species multiplied by the total number of hunters (140,579).

[c] Source: Hunting Permit Sales, Canada Post Corporation, 1988.

[d] These totals cannot be summed to equal the sample total because a hunter could be in one or more of the three hunting categories.

game hunters in the province. It is usual for a hunter to hold more than one type of license. Thus, it must be borne in mind that the above three categories are not mutually exclusive.

On average, the typical hunter made 2.73 trips, lasting a total of 13.71 days and an average of 5.02 days per trip. Table 5 also shows that on average, each hunter travelled a distance of 564.96 kilometres (one way) to the hunting site per season. Each trip was approximately 207 kilometres long and each hunter travelled in a party of about 2-3 persons. Each hunter harvested an average of 5.82 animals per season (both big game and birds).

Each big game hunter took an average of 2.98 trips lasting an average of 13.14 days (4.41 days per trip). Each big game hunter travelled an average one-way distance of 528.62 kilometres (one way) to a hunting site (177.39 kilometres per trip) in a party of 2-3 persons. On average, each big game hunter harvested 1.19 animals during the 1987/88 hunting season.

Each upland bird game hunter took an average of 2.07 trips during the 1987/88 season and hunted for 7.95 days (3.84 days per trip). Upland bird game hunters travelled an average distance of 331.14 kilometres (one way) to a hunting site (159.98 kilometres per trip) in a party of 2-3 persons. Each upland bird game hunter harvested an average of 12.11 birds during the season.

Migratory bird game hunters took an average of 1.72 trips per person during the 1987/88 season, lasting for 6.84 days per person per season. Each migratory bird game hunter spent an average of 3.98 days on each trip, travelling a distance of 259.13 kilometres (one way) to the hunting site. Each trip covered an average distance of 150.66 kilometres and the hunter travelled in a party of 2-3 persons. Finally, each upland bird game hunter harvested an average of 15.02 birds during the season.

3. *Hunting Expenditures*

During the 1987/88 season, Alberta hunters spent an average of $657.66 in total variable costs (see Table 6). These expenditures comprised of the following items: travel costs (gasoline, oil, air fare, etc.), $334.51 per person; lodging costs (hotels, motels, camping fees, etc.), $54.22 per person; food (including restaurant meals, purchased food, beverages,

Table 6 Hunting Expenditures Per Person, 1987/88 Season

Item	All Hunting Combined	Big Game	Migratory Bird Game	Upland Bird Game
Travel Costs	$ 334.51	$ 339.62	$ 383.41	$ 347.17
Lodging Costs	54.22	47.02	54.42	47.74
Food Costs	163.04	154.58	155.36	150.43
Guiding Costs	25.26	21.09	28.42	8.98
Ammunition	68.96	59.23	104.49	65.85
Rentals	11.67	3.94	2.23	1.44
Total Variable Costs	657.66	625.48	728.33	621.61
License Fees	29.00[a]	23.00[b]	23.00[c]	19.00[d]
Capital Costs[e]	158.94	176.18	152.91	163.36
Total Hunting Costs	845.60	824.66	904.24	803.97

[a] Includes the cost of a Wildlife Certificate ($7.00) and Resource Development Stamp ($6.00) and an estimate of $16.00 for licenses.
[b] Includes $13.00 for the cost of a Wildlife Certificate and Resource Development Stamp and $10.00 for a big game license.
[c] Includes $13.00 for the cost of a Wildlife Certificate and Resource Development Stamp and $10.00 for a migratory bird license.
[d] Includes $13.00 for the cost of a Wildlife Certificate and Resource Development Stamp and $6.00 for a bird game license.
[e] Excludes capital items such as 4-wheel drive trucks, campers, etc.

etc.), $163.09 per person; guides (including guiding and outfitting fees, etc.), $25.26 per person; ammunition, $68.96 per person; and rentals, $11.67 per person. 71% of the sample hunted big game and incurred total variable costs of $625.48 per person per season, 27% hunted upland bird game and incurred total variable costs of $621.61 per person per season, and 11% hunted waterfowl and incurred total variable costs of $728.33 per person per season. As reported above, the weighted average of total variable costs for all hunting activities was $657.66 per person per season.

Other expenditures incurred for hunting purposes were in respect of hunting licenses and capital items. In the 1987/88 hunting season, Alberta hunters spent approximately $29.00 per person on hunting licenses[6]. In computing capital costs, consideration was given only to items (eg., rifle, binoculars, decoys, etc.) which are used exclusively for hunting. Excluded from the calculations are items such as, 4-wheel drive vehicles and campers. Such items are also used for other purposes and their hunting components would be difficult to assess. Capital hunting expenditures incurred for the 1987/88 season averaged $158.94 per person. Total hunting costs (the sum of total variable costs, license fees and capital costs) for the 1987/88 season amounted to $845.60 per person. The breakdown of total hunting costs by type of game hunted is as follows: big game hunters incurred total expenditures of $824.66 per person, including $23.00 for licenses and $176.18 for capital costs. Migratory bird game hunters spent a total of $904.24 per person for the season, including $23.00 per person on license fees and $152.91 per person on capital costs. Finally, upland bird game hunters spent a total of $803.97 per person, including $19.00 per person on license fees and $163.36 per person on capital costs.

Given that each person hunted an average of 13.71 days per season, total hunting costs per day amounted to $61.68 per person, of which total variable costs were $47.97 per day per person. License fees accounted for approximately $2.12 per day per person while

[6] The amount spent on licenses varies in accordance with the particular combination of licenses held. The minimum cost of a license would be $20.00. This includes the cost of a Wildlife Certificate ($7.00), Resource Development Stamp ($6.00), and the lowest priced license ($7.00).

capital costs accounted for $11.59 per day per person. Aggregating the total hunting costs per person over our estimate of 134,815 active hunters, we estimate that over $113m was spent on hunting related activities in the 1987/88 season.

D. Analysis of Nonconsumptive Wildlife Use

1. Nonconsumptive Activities

Table 7 presents information on the nonconsumptive use of wildlife resources in the province. It can be seen here that more than one-half (53.9%) of hunting license holders and more than a third (37%) of households engaged in some form of nonconsumptive wildlife-related activity during 1987. The most popular form of nonconsumptive activity was watching and/or feeding wildlife. One hundred and eighty-six (31%) households watched and/or fed wildlife while on a nonconsumptive trip, while among the hunter population, 516 (40%) watched and/or fed wildlife on nonconsumptive trips. The second most popular form of nonconsumptive activity was photographing wildlife which engaged the attention of 361 (28%) hunters and 124 (21%) households. 426 (33%) hunters and 92 (15%) households used wildlife for study or identification purposes. 994 (80%) licensed hunters actually hunted in 1987/88, while a smaller number (80 or 13%) of the households engaged in hunting activities in 1987/88.

The frequency of the various kinds of nonconsumptive activities are summarized in Table 8. On average, each hunter spent 5.7 days watching or feeding wildlife, 2.2 days photographing wildlife, 4.7 days studying/identifying wildlife and 13.12 days hunting. In contrast, households spent relatively less time on these activities. A typical Alberta household spent an average of 5.2 days watching/feeding wildlife, 1.9 days photographing wildlife, 2.7 days studying/identifying wildlife and 1.7 days hunting.

The most popular types of wildlife watched, fed, photographed and studied or identified (see Table 9) were ungulates (eg., deer, elk, moose and sheep), which attracted the attention of 670 (52.7%) hunters and 209 (34.8%) households (see Table 9). The second

Table 7 Nonconsumptive Wildlife-related Activities, 1987/88

	Hunters		Households	
Type	No.	%	No.	%
Took nonconsumptive trips	702	53.9	224	37.3
Watched, fed wildlife	516	39.6	186	30.9
Photographed wildlife	361	27.7	124	20.6
Studied, identified wildlife	426	32.7	92	15.3
Hunted wildlife	994	79.8	80	13.3

Table 8 Frequency of Nonconsumptive Wildlife-related Activities, 1987/88

Activity	Hunters	Households
Average Number of Days Watching/Feeding Wildlife	5.7	5.2
Average Number of Days Photographing Wildlife	2.2	1.9
Average Number of Days Studying/Identifying Wildlife	4.7	2.7
Average Number of Days Hunting Wildlife	13.12	1.7

Table 9 Species of Wildlife Used for Nonconsumptive Activities, 1987/88

	Hunters		Households	
Species	No.	%	No.	%
Ungulates (Deer, Elk, Moose, Sheep, etc.)	670	52.7	209	34.8
Large Carnivores (Bears, Wolves, etc.)	273	21.0	61	10.1
Upland Birds (Grouse, Ptarmigan, etc.)	301	23.7	92	15.3
Waterfowl (Ducks, Geese, etc.)	384	30.2	173	28.8
Other Birds (Songbirds, Eagles, etc.)	248	19.5	143	23.8
Small Mammals (Rabbits, Squirrels, etc)	259	20.4	145	24.1

most popular species were waterfowl (eg., ducks and geese), which attracted approximately one-third of hunters (384 or 30%) and households (92 or 29%). Each of large carnivores (eg., bears, wolves), small mammals (eg., rabbits), bird game (eg., grouse, ptarmigan) and other birds (eg., eagles, songbirds) attracted approximately one-fifth of hunters. In general, households showed less preference for large carnivores and upland bird game, tending to favor less dangerous species such as small mammals (eg., rabbits, squirrels) and birds (eg., songbirds).

2. *Expenditures on Nonconsumptive Activities*

The survey instrument also requested households who had undertaken wildlife-related trips in 1987 to indicate how much they spent on such trips. Table 10 reports the results for expenditures on nonconsumptive trips. On average, a typical Alberta household spent $98.85 on travel costs (including gasoline, oil, air fare, etc.) and $46.23 on lodging (including hotels, motels, camping fees, etc.). $60.65 per household was spent on food (including restaurant meals, purchased food, etc.); $11.59 per household was spent on equipment and $18.37 per household was spent on other items. The average total cost per household incurred on nonconsumptive trips was $323.47.

In addition to taking trips for which the primary purpose was to watch, feed, photograph or study wildlife, a significant proportion (65%) of the households engaged in nonconsumptive activities around their homes and cottages. Such activities consisted of watching, feeding attracting and photographing wildlife around the home or cottage. The cost of such activities was $47.97 per household (see Table 10). These expenditures include costs for feeders, food for wildlife, bird houses, cameras, film, etc., used primarily for wildlife. The annual aggregate costs of these activities was over $40 million in 1987. The total cost of nonconsumptive activities (the sum of the cost of nonconsumptive trips and the cost of nonconsumptive activities undertaken around the home or cottage) was $371.44 per households. Multiplying this amount by the 836,125 households in Alberta, we obtain a total expenditure of $310 million per annum incurred in the province in respect of trips related to

Table 10 Expenditures on Nonconsumptive Activities, 1987 (Households)

Item	Total Expenditures Per Household	Annual Aggregate Expenditures
Travel Costs	$ 98.85	$ 82,650,956
Lodging Costs	46.23	38,654,058
Food Costs	60.65	50,710,981
Beverage Costs	11.59	9,690,689
Equipment Costs	87.78	73,395,052
Other Costs	18.37	15,359,616
Sub-Total	323.47	270,461,350
Costs at Home, Cottage	47.97	40,108,916
Total Costs	371.44	310,570,266

the nonconsumptive use of wildlife.

E. Economic Benefits of Wildlife Resources

1. Hunting Benefits

Table 11 provides estimates for the economic benefits derived from hunting big game and grizzly bear during the 1987/88 season. Two different approaches to aggregation were adopted for computing aggregate benefits. The first involved the usual method of aggregating over the relevant population using the mean, while the second involved aggregating via the median. The median was included because it is consistent with the process of providing public goods using a majority voting rule[7]. On average, Alberta hunters derived benefits of $204.06 per person per season from big game hunting. Aggregating over the big game hunter population, these benefits amount to over $15 million per annum. The median value for big game hunting was $100 per person per season, resulting in aggregate benefits of over $7 million. Benefits derived from grizzly bear hunting were $151.12 per person per season, resulting in aggregate benefits of over $160,000 annually. Aggregating via the median, the benefits of grizzly bear hunting were $42,720 in 1987/88.

2. Preservation Benefits

Preservation values for hunters and the general population are presented in Table 12. It can be seen from the first row that the average preservation value of hunters was $70.78 per person per annum, while that of the general population was slightly higher at $80.92 per person per annum although this difference was not statistically significant. The remainder of Table 12 displays the factors which may influence the magnitude of preservation values. Among hunters, average preservation value for urban residents was relatively higher than that of rural residents, however, the difference was not statistically significant. A similar trend was observed for the general population: the average preservation value for urban

[7] See, for example, Denzau and Parks 1983 for a discussion of voting criteria in political markets.

Table 11 Economic Benefits of Hunting[a]

Species	Benefits/Person/Year[b] Mean	Median	Annual Aggregate Value Based on Mean	Based on Median
Big Game	$204.06 (379.82)	$100.00	$15,858,931[c]	$7,771,700[c]
Grizzly Bear	$151.12 (392.05)	$40.00	$161,396[d]	$42,720[d]

[a] Excludes license fees.
[b] Standard deviations are in parentheses.
[c] Aggregated over the big game hunter population, N=77,717.
[d] Aggregated over the grizzly bear hunter population, N=1,068.

Table 12 Preservation Values per Person by Strata (Dollars)[a]

Stratum	Hunters Pres. Value	n_1	Gen. Pop. Pres. Value	n_2
Overall Mean Pres. Value	70.78 (121.34)	1169	80.92 (154.43)	267
By Residence:				
Urban	72.08 (133.65)	5526	88.24 (161.70)	199
Rural	69.62 (109.26)	617	59.49 (129.62)	68
F-statistic[b]	0.12 (N.S.)		1.76*	
By Sex:				
Male	71.43 (119.55)	1122	74.75 (124.08)	59
Female	71.43 (167.78)	42	89.49 (201.4)	204
F-statistic[b]	0.0004 (N.S.)		0.30 (N.S.)	
By Income:				
< $ 4999	72.86 (128.25)	3	50.00 (50.00)	4
5000-9999	76.46 (200.30)	14	57.73 (64.40)	11
10000-14999	38.57 (44.76)	24	22.50 (31.47)	10
15000-19999	41.43 (75.42)	49	51.15 (44.02)	13
20000-24999	54.87 (108.86)	56	77.38 (192.19)	21
25000-29999	59.10 (86.89)	76	88.86 (212.51)	22
30000-34999	60.55 (76.20)	100	87.75 (122.48)	20
35000-39999	60.28 (75.65)	118	91.67 (144.38)	21
40000-49999	75.22 (91.13)	127	74.55 (152.34)	33
50000-59999	88.63 (142.01)	132	69.57 (69.07)	35
60000-69999	71.22 (93.19)	74	38.82 (37.23)	17
70000+	111.72 (210.29)	154	128.26 (206.62)	
F-statistic[b]	2.67***		0.75 (N.S.)	
By Attitude:				
Value very highly	75.74	963	109.02 (186.52)	169
Value highly	47.07	184	40.152 (38.95)	69
Value moderately	49.95	19	15.77 (26.93)	26
Low value	100.00	1	0.00 (0.00)	2
No value	0.00	1	0.00 (0.00)	1
F-statistic[b]	1.94**		4.15***	

[a] Standard deviations are in parentheses.
[b] F-statistic tests for differences between the means of the above strata.
*** Significant at the .01 level using a two-tailed test.
** Significant at the .05 level using a two-tailed test.
* Significant at the .10 level using a two-tailed test.
NS Not significant.

residents was higher than that of rural residents. However, in this case the difference was statistically significant.

There was a significantly positive relationship between income and preservation value for the hunter population. However, such a relationship was not observed for the general population. As could be expected, attitude towards wildlife was a strong determinant of preservation value. For both the hunter and the general population, a statistically significant, positive relationship between attitude and preservation value was observed[5].

Table 13 presents estimates for hunters' preservation values for wildlife in general, and grizzly bear in particular. Aggregate benefits derived from preservation values amounted to over $9 million per annum. The grizzly bear resource provided preservation benefits of $45.25 per person per annum, resulting in aggregate benefits of over $6 million annually. The median value of preservation benefits for both wildlife and grizzly bear was $50.00, resulting in aggregate benefits of over $7 million, for wildlife and grizzly bear, respectively.

Table 14 presents results for households' preservation values obtained using the donation payment and the tax payment vehicles (see section II). It can be seen that, using the contribution payment vehicle, an average preservation value of $80.92 per person per annum was obtained. This amounts to aggregate benefits of over $67 million. On the other hand, the average preservation value using the tax payment vehicle was $68.73 per person per annum, resulting in aggregate benefits of over $57 million. The difference of $12.19 in the preservation values using the two methods was not statistically significant. It may be argued that the relatively lower value for the tax payment vehicle was due to a general aversion towards increased taxes. However, it has also been argued elsewhere that the tax approach may be more accurate since people are more familiar with this method of paying for public services.

The results reported in Table 15 represent an attempt to arrive at an estimate of the total value of wildlife resources in the province. The rationale behind this attempt is that,

[5] In the lower section of Table 10, one amount of $100 is reported. This may be an inaccurate estimate given that the person had earlier indicated a low value for wildlife.

Table 13 Preservation Benefits of Wildlife to Hunters

Fund	Benefits/Person/Year[a] Mean	Median	Annual Aggregate Value[b] Based on Mean	Based on Median
Big Game	$70.78 (121.03)	$50.00	$9,950,182	$7,028,950
Grizzly Bear	$45.25 (90.13)	$50.00	$6,361,200	$7,028,950

[a] Standard deviations are in parentheses.
[b] Aggregated over the hunter population, N=140,579.

Table 14 Preservation Benefits of Wildlife to the General Population

Payment Vehicle[a]	Benefits/Person/Year[b] Mean	Median	Annual Aggregate Value[c] Based on Mean	Based on Median
Donations	$80.92 (154.44)	$25.00	$67,659,235	$20,903,125
Tax increase	$68.73 (105.80)	$40.00	$57,466,871	$33,445,000

[a] Payment vehicle refers to method of eliciting hypothetical bids: (i) 'Donations' is donation to a trust fund to preserve wildlife; (ii) 'Tax increase' is a tax increase to fund wildlife preservation.
[b] Standard deviations are in parentheses.
[c] Aggregated over the total number of households, N=836,125.

traditionally, efforts to measure the nonmarket value of wildlife have focused exclusively on benefits derived from actual use of the resource. However, results already presented in this study suggest that benefits derived from wildlife preservation are also significant. Thus, failure to include such benefits could lead to a gross understatement of total benefits. In Table 15, total benefits, defined as the sum of hunting and preservation benefits, were computed using information from Tables 11 and 14. In calculating total benefits, it was assumed that hunting benefits accrue only to the hunter population[9], while preservation benefits accrue to both hunters and nonhunters.

Table 15 shows that total value of big game wildlife resources were in excess of $83 million annually. The present values of these benefits, discounted at 5% and 8% discount factors in perpetuity, are over $1.6 billion and $1 billion, respectively The above results are remarkable in that they suggest that only about one-third of the total value of wildlife resources in the province may be attributed to direct consumptive use.

3. *The Effects of Supply Uncertainty*

Table 16 presents results for the frequency distribution, means, standard deviations and 95% confidence intervals for the option price associated with a 90%, 50% and 10% chance of obtaining a grizzly bear hunting license. Mean option price for a hunting license is $45.67, $31.47 and $19.55 for 90%, 50% and 10% supply probability, respectively. The calculated 95% confidence intervals fall within a range of ±18% to ±26% of the respective means, indicating a reasonable degree of accuracy in the measurements. It is important to note from Table 16, that as supply uncertainty increases, the frequency of cases in the lower dollar categories ($0 and $1-10) increases. Thus, people are unwilling to pay more as their chances of obtaining a license declines, which is to be expected under rational behavior.

To further investigate the effects of supply uncertainty, a graph was plotted to show the relationship between option price and probability of supply using a disaggregated sample

[9] This is not entirely correct since a small proportion of households actually hunted. Unfortunately we do not have hunting values for these people.

Table 15 Total Benefits of Big Game in Alberta

Category	Annual Value	Present Value (5% d.f.)[a]	(8% d.f.)[a]
Hunting Benefits	$15,858,931	$317,178,620	$198,236,630
Preservation Benefits	$67,659,235	$1,353,184,700	$845,740,437
Total Benefits[b]	$83,518,166	$1,670,363,320	$1,043,977,067

[a] d.f. is discount factor.

[b] Excludes nonconsumptive wildlife benefits. According to the the 1981 National Survey on the Importance of Wildlife to Canadians (Jacquemot et al. 1987), nonconsumptive benefits for Alberta would be over $53 million per annum.

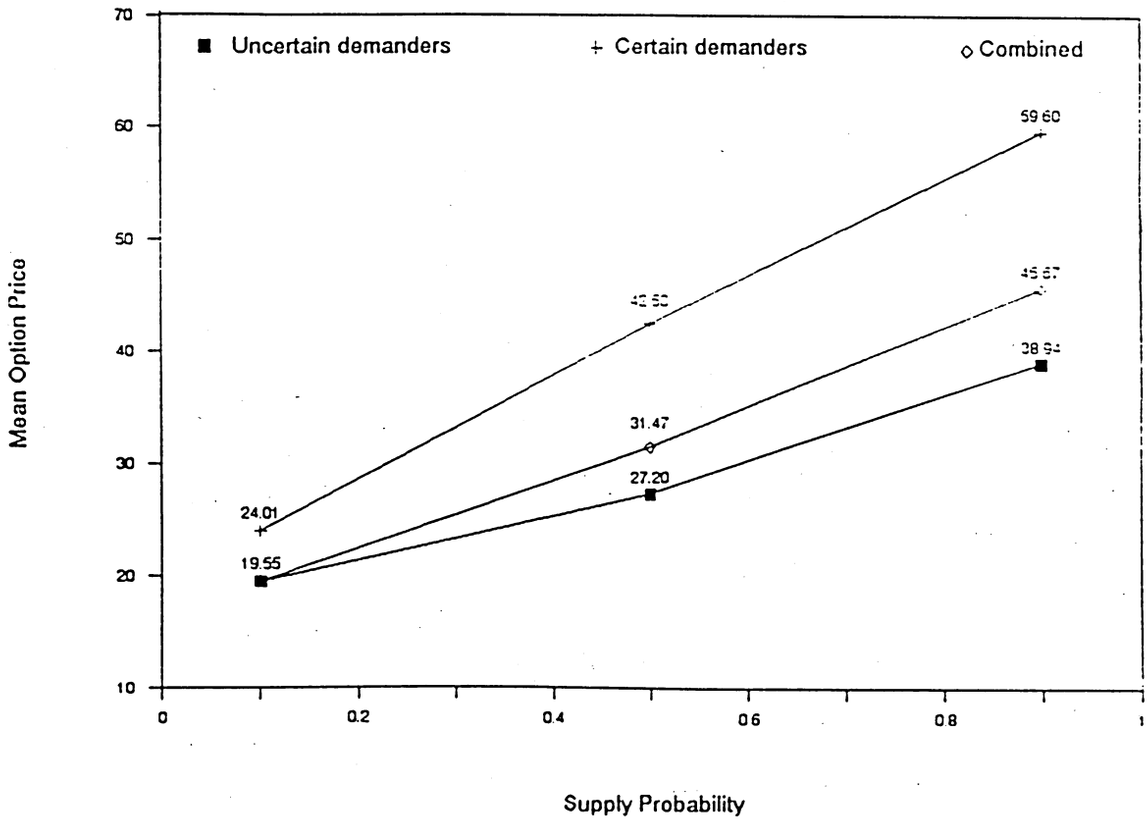
Table 16 Frequency Distribution of Bids (Supply Uncertainty)

$ Value	Option Price (90%)	Option Price (50%)	Option Price (10%)
0	41	45	72
1-10	26	40	58
11-20	30	32	20
21-40	20	30	19
41-80	45	31	20
81-100	32	19	8
101-200	6	3	1
201-300	1	1	2
301-400	1	0	0
401-500	1	1	0
Mean	$45.67	$31.47	$19.55
Std. Dev.	60.86	48.19	37.89
95% C.I.	$8.37	$6.66	$5.25
N	203	201	200

(certain and uncertain demanders) and the combined sample. Figure 1 presents a graph of the results. Examining in more detail the plot for the complete sample (see middle graph), it can be seen that the mean option price for 90% supply probability, $45.67, is significantly greater than that for 50% supply probability, $31.47 (t=2.60). Furthermore, mean option price for 50% supply probability is significantly greater than for 10% supply probability, $19.55 (t=2.75). Thus, option price is an increasing function of the probability of supply. Looking at the disaggregated sample, it is observed that at 90% supply probability, mean option price for certain demanders ($59.60) is significantly greater than for uncertain demanders ($38.94), t=2.43. At 50% supply probability, the mean option price for certain demanders ($42.50) is also significantly greater than for uncertain demanders ($32.80), t=2.09. Finally, at 10% supply probability, mean option price for certain demanders ($24.01) is greater than that of uncertain demanders ($19.51), however, this difference is not significant (t=0.75). Nevertheless, the overall results show that at a given level of probability of supply, option price declines as the level of demand uncertainty increases.

The foregoing results have important implications for resource managers and planners. Traditionally, the valuation of the impacts of proposed public programs or projects has been based on scenarios in which benefits are assumed to accrue in the future with certainty. As illustrated in figure 1, option price is sensitive to changes in the probabilities of supply and demand. Thus, in cases where there is likely to be significant supply and/or demand uncertainty, option price should be used as a measure of future benefits. Use of consumer's surplus (actual willingness-to-pay), which assumes perfect certainty, could to lead to an overestimation of the stream of future benefits.

Figure I The Relationship Between Option Price and Supply Uncertainty



IV. SUMMARY AND CONCLUSIONS

A. Summary

The objectives of this study were to analyze the nature and extent of consumptive and nonconsumptive activities associated with wildlife recreation in Alberta, to provide an empirical estimate of the total value of wildlife resources in the province, and to examine the effects of supply uncertainty on nonmarket value estimates.

A mail contingent valuation survey, utilizing independent random samples of 2,590 hunters and 2,400 households from the general population were used to obtain relevant information pertaining to the study objectives. Two mailings of the survey questionnaire were carried out for hunters while there was only one mailing for the households. The response rates were 51% and 30%, respectively, for the hunters and households.

An analysis of the socioeconomic characteristics of the two samples showed that the typical hunter tends to be a rural male, about 38 years of age, has about 13 years of formal education, is a member of a family of three and receives a household income of $39,259. On the other hand, the typical head of a household is an urban male, 43 years of age, has about 14 years of formal education, is a member of a family of about three, and receives a household income of $39,119.

It was estimated that of 140,579 resident hunters, 134,956 hunted actively during the 1987/88 season, with 112,463 hunting mainly for sport. The main reasons given for hunting were (in order of importance) for outdoor enjoyment, for meat, for trophy, for companionship and for exercise. 71% of hunters sought big game, 27% sought upland bird and 11% sought waterfowl. On average, each hunter made 2.73 trips during the 1987/88 hunting season, lasting an average of 13.71 days (5.02 days per trip). Each hunter travelled an average of 564.96 kilometres (one-way) to the hunting site and harvested an average of 5.82 animals (including big game and birds) during the season.

The total variable hunting costs incurred per person for the season was $657.66. Each hunter spent an average of $29.00 on hunting licenses and $158.94 on capital items. Total hunting

cost (the sum of total variable costs, license fees, and capital items) was $845.60 per person for the season. Total hunting costs per day amounted to $61.68, of which total variable costs were $47.97 per day per person; license fees, $2.12 per day per person; and capital costs, $11.59 per day per person. It was estimated that over $113 million was spent on hunting related activities in the 1987/88 season.

Approximately one-third of Albertans including one-half of the hunter subpopulation took trips specifically for nonconsumptive purposes in 1987/88. The most popular form of nonconsumptive activity was watching and feeding wildlife. Other forms of nonconsumptive activity were photographing wildlife, studying and identifying wildlife. On average, members of each household spent 5.2 days per household watching/ feeding wildlife, 1.9 days photographing wildlife, 2.7 days studying/identifying wildlife and 1.7 days hunting wildlife. On average, the active hunter subpopulation spent 5.7 days watching/ feeding wildlife, 2.2 days photographing wildlife, 4.7 days studying/identifying wildlife and 13.12 days hunting.

The typical Albertan household spent an average of $323.47 on nonconsumptive trips in 1987. Expenditures on nonconsumptive activities around the home or cottage was $47.97 per person. Total expenditures on nonconsumptive activities (the sum of expenditures on nonconsumptive trips and nonconsumptive activities around the home/cottage) was $371.44 per person. The aggregate expenditure on nonconsumptive activities in the province was estimated at $310 million in 1987.

The economic benefits derived from hunting big game, in general, and grizzly bear, in particular, were over $15 million and $160,000 annually, respectively. Preservation benefits were $70.78 per person per annum for hunters and $80.92 per person for households. The total benefits of big game wildlife resources (the sum of hunting and preservation benefits) were estimated at over $83 million per annum, of which approximately two-thirds could be attributed to the benefits derived from preserving wildlife. The actual benefits of wildlife resources are higher since the benefits of nonconsumptive wildlife use are excluded from this estimate.

In an analysis of the effects of supply uncertainty on nonmarket value estimates, option price was shown to be an increasing function of the probability of supply. Also, for a given level of probability of supply, option price was shown to decline as the level of demand uncertainty increased. It was argued that in cases where there is likely to be significant supply and/or demand uncertainty, option price should be used as a measure of the benefits of future programs. Use of consumer's surplus (actual willingness-to-pay), which assumes perfect certainty, could lead to an overestimation of the stream of future benefits.

B. Limitations of the Study

Another limitation of this study is the use of Contingent Valuation Methodology (CVM). Unlike the other approaches (eg., Travel Cost Method and Hedonic Price Method), CVM does not make any assumption about individual preferences, but rather relies on the individual to provide a personal valuation of the resource in question[10]. It is clear that the respondent's ability to do this would depend, *inter alia*, on his or her familiarity with the resource in question. It has been argued elsewhere that the CVM induces *strategic behavior*. That is, if individuals believed that their responses would influence policy, they would make conscious attempts to misrepresent their true preferences by giving incorrect answers. However, empirical investigation of strategic behavior in CVM (eg., see Bishop et al. 1988) suggests that the extent of the problem has been overstated.

One major limitation of the study is that it implicitly assumes that wildlife values will remain constant over time. Such an assumption is implicit in the use of a discount rate of, say, 5%. This is, of course, a simplified view of the world. As certain types of wildlife or recreational opportunities decline, their value will increase. It is also important to note that, due to study limitations, wildlife use values were reported for only big game and grizzly bear. Thus, the value of all hunting combined would be much higher. Also excluded were nonconsumptive use values and commercial values of wildlife. The foregoing suggests that the values presented in this report

[10] This, in itself, could be seen as a strength since the other methods make certain assumptions about preferences which may not hold, in practice.

must be viewed as lower bound estimates.

C. Directions for Future Research

In order to increase the current state of knowledge about wildlife resource use, more work needs to be done on nonconsumptive use. In particular, greater attention must be paid to nonhunters since, traditionally, studies in this area have focused on hunters. Much remains to be accomplished on the role of sociopsychological and noneconomic factors in value formation. To make the set of data more useful to resource managers, efforts must be made to update the baseline information on a continuous basis. This is necessary because values, attitudes and use patterns are dynamic and not static. Finally, future research must aim for closer cooperation from the physical sciences. Such cooperation would enable us to obtain a better idea about the linkages between biological (eg., population dynamics, weather, predators) and other factors on recreational values. This kind of information could provide useful information on the consequences of alternative management policies.

D. Implications

The results of this study provide evidence for the high level of concern that Albertans have for wildlife resources. Such evidence is consistent with the increasing national awareness about environmental/resource issues. The study results show extensive use of wildlife resources for both consumptive and nonconsumptive purposes. The 1981 National Survey on the Importance of Wildlife to Canadians (Jacquemot et al. 1987) indicated that Alberta residents derived net benefits of about $114 million from wildlife in 1981, of which 47% was attributable to nonconsumptive trips. However, no estimates of preservation values were obtained. The results of the present study, in combination with the revised and updated national survey conducted in 1987, could provide the first estimate of the total economic value of wildlife resources in Alberta. In general, our study results reinforce those of similar studies carried out in the United States and Canada in that they show preservation values of wildlife to be significant. It may thus be argued that the omission of such values in resource allocation or in benefit-cost analysis could lead to a

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One major limitation of the study is that it implicitly assumes that wildlife values will remain constant over time. Such an assumption is implicit in the use of a discount rate of, say, 5%. This is, of course, a simplified view of the world. As certain types of wildlife or recreational opportunities decline, their value will increase. It is also important to note that, due to study limitations, wildlife use values were reported for only big game and grizzly bear. Thus, the value of all hunting combined would be much higher. Also excluded were nonconsumptive use values and commercial values of wildlife. The foregoing suggests that the values presented in this report

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must be viewed as lower bound estimates.

C. Directions for Future Research

In order to increase the current state of knowledge about wildlife resource use, more work needs to be done on nonconsumptive use. In particular, greater attention must be paid to nonhunters since, traditionally, studies in this area have focused on hunters. Much remains to be accomplished on the role of sociopsychological and noneconomic factors in value formation. To make the set of data more useful to resource managers, efforts must be made to update the baseline information on a continuous basis. This is necessary because values, attitudes and use patterns are dynamic and not static. Finally, future research must aim for closer cooperation from the physical sciences. Such cooperation would enable us to obtain a better idea about the linkages between biological (eg., population dynamics, weather, predators) and other factors on recreational values. This kind of information could provide useful information on the consequences of alternative management policies.

D. Implications

The results of this study provide evidence for the high level of concern that Albertans have for wildlife resources. Such evidence is consistent with the increasing national awareness about environmental/resource issues. The study results show extensive use of wildlife resources for both consumptive and nonconsumptive purposes. The 1981 National Survey on the Importance of Wildlife to Canadians (Jacquemot et al. 1987) indicated that Alberta residents derived net benefits of about $114 million from wildlife in 1981, of which 47% was attributable to nonconsumptive trips. However, no estimates of preservation values were obtained. The results of the present study, in combination with the revised and updated national survey conducted in 1987, could provide the first estimate of the total economic value of wildlife resources in Alberta. In general, our study results reinforce those of similar studies carried out in the United States and Canada in that they show preservation values of wildlife to be significant. It may thus be argued that the omission of such values in resource allocation or in benefit-cost analysis could lead to a

gross underestimate of total benefits. This, in turn, could lead to decisions which may pose adverse implications for social welfare.

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Appendices

Appendix 1 Place of Residence of Survey Respondents

Residence[a]	Hunters	(%)	Households	(%)
Big City	397	(31)	380	(63)
Small City	214	(16)	42	(7)
Rural	692	(53)	181	(30)
Total	1303		603	(100)

[a] Definitions:

Big city: population of over 100,000.

Small city: population greater than 10,000 but less than 100,000.

Rural: population under 10,000.

Appendix 2 Family Size of Survey Respondents

No. of Persons	Hunters	(%)	Households	(%)
1	235	(18.3)	137	(23.5)
2	244	(19.0)	161	(27.7)
3	247	(19.3)	96	(16.5)
4	344	(26.9)	117	(20.1)
5	134	(10.5)	52	(8.9)
6	52	(4.1)	12	(2.1)
7	8	(.6)	22	(.3)
8	2	(.2)	1	(.2)
9	15	(1.2)	4	(.7)
No response	22	(1.7)	21	(3.5)
Mean	3.1		2.8	
Standard Dev.	1.6		1.5	
Median	3.0		2.0	
N	1303		603	

Appendix 3 Years of Formal Education of Survey Respondents

	High School				Post - Secondary			
Years	Hunters		Households		Hunters		Households	
	No.	(%)	No.	(%)	No.	(%)	No.	(%)
0	-	-	-	-	610	(46.8)	202	(33.5)
1	2	(.2)	5	(.9)	100	(15.1)	52	(8.6)
2	-	-	1	(.2)	142	(21.5)	69	(11.7)
3	3	(.1)	1	(.2)	97	(14.7)	51	(8.7)
4	-	-	3	(.5)	197	(29.8)	97	(16.5)
5	2	(.2)	1	(.2)	47	(7.1)	44	(7.5)
6	8	(.6)	1	(.2)	31	(4.7)	30	(5.1)
7	16	(1.3)	2	(.3)	17	(2.6)	18	(3.1)
8	50	(3.9)	24	(4.1)	12	(1.8)	11	(1.9)
9	97	(7.6)	15	(2.6)	5	(.8)	2	(.3)
10	153	(12.0)	41	(7.0)	2	(.3)	4	(.7)
11	137	(10.8)	37	(6.3)	1	(.2)	3	(.5)
12	800	(62.8)	449	(76.4)	10	(1.5)	5	(.9)
13	7	(.5)	8	(1.4)	1	(.2)	-	
No response	30	(2.3)	15	(2.5)	31	(2.4)	15	(2.5)

Appendix 4 Household Incomes of Survey Respondents

Category	Hunters (%)	Households (%)
Less than $4,999	20 (1.7)	9 (1.7)
5,000-9,999	26 (2.2)	19 (3.5)
10,000-14,999	58 (4.9)	23 (4.2)
15,000-19,999	69 (5.8)	33 (6.0)
20,000-24,999	81 (6.8)	47 (8.6)
25,000-29,999	106 (8.9)	48 (8.8)
30,000-34,999	124 (10.5)	50 (9.1)
35,000-39,999	135 (11.4)	54 (9.9)
40,000-49,999	172 (14.5)	73 (13.3)
50,000-59,999	143 (12.1)	67 (12.2)
60,000-69,999	77 (6.5)	39 (7.1)
70,000+	174 (14.7)	85 (15.5)
No response	118 (9.0)	56 (9.3)
Mean	$39,259	$30,119
Standard Dev.	$12,565	$12,005
Median	$37,500	$37,500
N	1303	603

Appendix 5 Other Reasons for Hunting

Reason	No.	(%)
Relaxation	17	(18.9)
Sport	29	(32.2)
Photographs	7	(6.8)
Exercise	1	(1.1)
Companionship	1	(1.1)
See country	6	(6.7)
Teach children	3	(3.3)
Enjoy shooting	4	(4.4)
Conservation	1	(1.1)
Get away from wife	2	(2.2)
Make living	6	(6.7)
Like wilderness	1	(1.1)
Spiritual rebuilding	1	(1.1)
Enjoy nature	5	(5.6)
For solitude	4	(4.4)
Specimens	1	(1.1)
No response	1	(1.1)
Total	1303	(100)

Appendix 6 Preservation Value of Wildlife (Households)

$ Value	Donation[a]	(%)	Tax[a]	(%)
0	37	(13.9)	25	(9.8)
2	-	-	1	(.4)
5	9	(3.4)	7	(2.7)
10	22	(8.2)	23	(9.0)
15	3	(1.1)	5	(2.0)
20	25	(9.4)	27	(10.6)
25	41	(15.4)	28	(11.0)
30	2	(.7)	7	(2.7)
35	1	(.4)	1	(.4)
40	2	(.7)	4	(1.6)
50	30	(11.2)	45	(17.6)
60	3	(1.1)	1	(.4)
70	-	-	1	(.4)
100	60	(22.5)	45	(17.6)
120	2	(.7)	7	(2.7)
125	1	(.4)	2	(.8)
150	4	(1.5)	7	(2.7)
170	-	-	1	(.4)
200	10	(3.7)	8	(3.1)
250	3	(1.1)	1	(.4)
300	3	(1.1)	4	(1.6)
500	3	(1.1)	3	(1.2)

Appendix 6, Cont'd

900	2	(.7)	2	(.8)
1000	4	(1.5)	-	
No response	336	(55.8)	339	(57.7)
Mean[b]	$80.92		$68.73	
Standard Dev.	$154.44		$105.80	
Median[b]	$25.00		$40.00	
N	603		603	

[a] (i) 'Donations' is donation to a trust fund to preserve wildlife;

(ii) 'Tax' is a tax increase to fund wildlife preservation.

[b] Excludes those who did not provide dollar values.

Appendix 7 Preservation Values of Wildlife and Grizzly Bear (Hunters)

$ Value	Wildlife		Grizzly Bear	
	No.	(%)	No.	(%)
0	140	(11.9)	303	(26.7)
4	1	(.1)	3	(.3)
5	38	(3.2)	57	(.3)
10	104	(8.8)	112	(9.9)
15	9	(.8)	6	(.5)
20	142	(12.1)	151	(13.3)
25	117	(9.9)	89	(7.8)
30	18	(1.5)	21	(1.9)
35	1	(.1)	-	
40	16	(1.4)	21	(1.9)
45	-	-	3	(.2)
50	218	(18.5)	180	(15.9)
60	5	(.4)	1	(.1)
65	1	(.1)	1	(.1)
70	1	(.1)	1	(.1)
80	-	-	1	(.1)
90	1	(.1)	-	
100	233	(19.8)	108	(9.5)
120	12	(1.0)	4	(4)
125	1	(.1)	-	
150	15	(1.3)	10	(.9)

Appendix 7, Cont'd

200	41	(3.5)	26	(2.3)
250	13	(1.1)	10	(.9)
300	7	(.6)	7	(.6)
400	7	(.6)	2	(.2)
500	24	(2.0)	13	(1.1)
650	1	(.1)	-	
900	1	(.1)	-	
1000	4	(.3)	3	(.2)
Priceless	2	(.2)	2	(.2)
No response	125	(9.6)	166	(12.7)
Mean[a]	$70.70		$45.25	
Standard Dev.	$121.02		$90.13	
Median[a]	$50.00		$20.00	
N	1303		1303	

[a] Excludes those who did not provide dollar values.

Appendix 8 Economic Value of Big Game and Grizzly Bear Hunting

$ Value	Big Game	(%)	Grizzly Bear	(%)
0	241	(25)	380	(40.8)
10	24	(2)	20	(2.1)
20	36	(4)	42	(4.5)
30	21	(2)	14	(1.5)
40	14	(1)	28	(3.0)
50	95	(10)	85	(9.1)
60	7	(1)	3	(.3)
70	3	(0)	1	(.1)
80	7	(1)	1	(.1)
90	1	(0)	-	
100	166	(17)	102	(11)
125	4	(0)	2	(.2)
150	22	(2)	12	(1.3)
175	5	(1)	1	(.1)
200	63	(7)	67	(7.2)
225	2	(0)	-	
250	30	(3)	30	(3.2)
275	1	(0)	1	(.1)
300	46	(5)	27	(2.9)
325	-	-	1	(.1)
375	1	(0)	-	
375	1	(0)	-	
400	15	(2)	19	(2.0)

450	3	(0)	-	
500	3	(0)	-	
550	75	(8)	51	(5.5)
600	8	(1)	2	(.2)
650	2	(2)	2	(.2)
700	5	(1)	5	(.4)
750	3	(8)	2	(.2)
800	9	(1)	6	(.6)
900	14	(1)	3	(.3)
1000	21	(2)	13	(1.4)
1200	21	(2)	-	-
1500	4	(0)	2	(.2)
2000	3	(0)	1	(.1)
2500	2	(0)	1	(.1)
3000	-	-	1	(.1)
3500	1	(0)	-	-
4000	-	-	1	(.1)
5000	2	(0)	3	(.2)
Priceless	15	(1)	10	(.8)
Not applicable	204	(16)	204	(15.7)
No response	123	(9)	158	(12.1)
Mean[a]	$204.06		$151.12	
Standard Dev.	$379.82		$392.05	
Median[a]	$100.00		$40.00	
N	1303		1303	

[a] Excludes those who did not provide dollar values.

Appendix 9 Cover Letters

Fish and Wildlife Division
Alberta Forestry, Lands and Wildlife
Edmonton, Alberta T5K 2G6

Department of Rural Economy
University of Alberta
Edmonton, Alberta T6G 2H1

Dear Sir/Madam,

As you know, wildlife resources play a very important role in the social and economic development of the province of Alberta. However, in order to protect and manage these resources in a manner which provides the most benefit to all Albertans, there is a need to collect information to facilitate this process.

This survey is being conducted by the Department of Rural Economy (University of Alberta), in cooperation with Fish and Wildlife Division (Alberta Forestry, Lands and Wildlife). Our objective is to determine the extent and value of recreational activities related to wildlife.

We request your cooperation in completing, and returning, the enclosed questionnaire. To ensure that your individual responses are held in strict confidence, they will be combined with those of other respondents. It is not necessary to reveal your identity.

We hope you share our objective of making wildlife management programs more responsive to the needs of present and future generations. Please take a few minutes to fill out the questionnaire, and tell us your concerns, if any, about Alberta's wildlife resources. Your anticipated cooperation and assistance are greatly appreciated.

Sincerely,

Les Cooke, Assistant Deputy Minister
Forestry, Lands and Wildlife

Bill Phillips, Chairman
Rural Economy, University of Alberta

A Research Project Co-funded by the Alberta Recreation, Parks and Wildlife Foundation

Fish and Wildlife Division
Alberta Forestry, Lands and Wildlife
Edmonton, Alberta T5K 2G6

Department of Rural Economy
University of Alberta
Edmonton, Alberta T6G 2H1

Dear Sir/Madam,

Several weeks ago, you were mailed a copy of the enclosed questionnaire and covering letter. If you have completed and returned the original questionnaire, please disregard this note. If for some reason you have not responded to our survey, we would be grateful if you would take a few minutes and complete the enclosed questionnaire. We are anxious to receive as many returns as possible in order to ensure the success of this project.

Thanking you in advance.

Sincerely,

Les Cooke, Assistant Deputy Minister
Forestry, Lands and Wildlife

Bill Phillips, Chairman
Rural Economy, University of Alberta

A Research Project Co-funded by the Alberta Recreation, Parks and Wildlife Foundation

Appendix 10 Household Survey CONFIDENTIAL (FORM D1.2)

University of Alberta
Department of Rural Economy
Edmonton, T6H 2H1

1988 ALBERTA WILDLIFE RECREATIONAL STUDY

The purpose of this study is to determine the extent and value of recreational activities related to wildlife in the province of Alberta.

A. QUESTIONS ABOUT WILDLIFE IN GENERAL

FOR OFFICE USE ONLY

1. Which of the following best describes your attitude towards wildlife, in general? (check the appropriate box).

   ☐ I value wildlife very highly
   ☐ I value wildlife highly
   ☐ I value wildlife moderately
   ☐ I have a low value for wildlife
   ☐ I have no value for wildlife

   _

2. During 1987, did you take any trips for which the **primary** purpose was to watch, feed, photograph or study wildlife?

   ☐ Yes ☐ No (**Go to Question 7**).

   _

3. Which of the following activities did you participate in? (check one or more of these categories).

   ☐ Watching and/or feeding wildlife (in the natural state) _
   ☐ Photographing wildlife (in the natural state) _
   ☐ Studying and identifying wildlife (in the natural state) _
   ☐ Hunting wildlife _

4. Approximately how many days in 1987 did you spend in each activity? (Note: 1 FULL day is 4 or more hours spent in the activity).

   Watching and/or feeding ____ days. _ _ _
   Photographing ____ days. _ _ _
   Studying and identifying ____ days. _ _ _
   Hunting wildlife ____ days. _ _ _

CONTINUED ON REVERSE →

5. Which of the following types of wildlife did you watch, feed, photograph or study?

___ Ungulates (Deer, Elk, Moose, Sheep, etc.)
___ Large Carnivores (Bears, Wolves, etc.)
___ Upland Bird (Grouse, Ptarmigan, etc.)
___ Waterfowl (Ducks, Geese, etc.)
___ Other Birds (Songbirds, Eagles, etc.)
___ Small Mammals (Rabbits, Squirrels, etc.)

6. How much did you spend on wildlife related trips in 1987? (put estimate beside the appropriate category).

Travel (includes gasoline, oil, air fare,etc.) $_____

Lodging (includes hotels, motels, camping fees, etc.) $_____

Food (includes restaurant meals, purchased food, etc.) $_____

Beverages $_____

Equipment $_____

Other (please specify below) $_____

_____

7. During 1987, did you watch, feed, attract or photograph wildlife around your home or cottage?

☐ Yes ☐ No

8. What did it cost you to participate in these wildlife activities around your home? (Include costs for feeders, food for wildlife, bird houses, cameras, film, etc., used primarily for wildlife). $_____

B. QUESTIONS ABOUT THE PRESERVATION OF WILDLIFE

* This section of the questionnaire is part of an experiment designed to provide an indication of how you value the preservation of wildlife in Alberta. The details which follow relate to a hypothetical situation to give you a reference point for your answers, and DO NOT reflect any specific management plans on behalf of the Government.

The population levels of several species of wildlife in the province are declining due to deteriorating habitat quality, and increasing contact with humans. This situation has developed mainly as a result of the increasing use of natural wildlife habitat for various purposes such as timber harvesting, mining, farming, etc.

Suppose a public trust fund were set up to pay for a 5-year wildlife management program to preserve wildlife in the province. This program would include restricting access to selected areas and improving wildlife habitat.

1. Regardless of whether or not you plan to hunt, watch, feed, photograph or study wildlife, what is the MAXIMUM amount of money you would be willing to donate annually to the fund for the preservation of wildlife?

$ 0	5	10	15	20	25	30	35	40	45	50	60	70	80	90
100	105	115	120	125	130	135	140	145	150	155	160	170	180	190
200	250	300	350	400	450	500	550	600	650	700	750	800	850	900

If higher or other dollar value, please specify: $_____

PLEASE PROCEED TO SECTION C →

C. PERSONAL INFORMATION

We know that people with different characteristics and backgrounds have different wildlife recreational values. For that reason, we would appreciate your answering the following, more personal questions. Your answers will be held confidential, and you personally will not be identified in the results of the study.

1. In which town or city do you live? _____ ___

2. What is your age? _____ years. ___

3. Sex (please check one). _

☐ Male
☐ Female

4. What is your highest year of schooling completed? Please circle one.

Grade/High School 0 1 2 3 4 5 6 7 8 9 10 11 12

Post Secondary Education:
University/College/Technical
or Trade School (years) 1 2 3 4 5 6 7 8 9 10 11 12 or more

___

5. Including yourself, how many of your immediate family are living at your residence? Please circle. _

1 2 3 4 5 6 7 8 9 or more

6. To the best of your knowledge, what was the total amount of money earned (before taxes) by you and your family in 1987? Please estimate and check the appropriate category:

___ $4,999 or less	___ $30,000 - 34,999
___ $5,000 - 9,999	___ $35,000 - 39,999
___ $10,000 - 14,999	___ $40,000 - 49,999
___ $15,000 - 19,999	___ $50,000 - 59,999
___ $20,000 - 24,999	___ $60,000 - 69,999
___ $25,000 - 29,999	___ $70,000 or over

___

7. If you have any additional comments on wildlife management in Alberta, please provide them on the back of this survey.

Thank you for co-operation. Please return your questionnaire today using the stamped, self-addressed envelope that has been provided.

Household Survey

CONFIDENTIAL (FORM D2.2)

University of Alberta
Department of Rural Economy
Edmonton, T6H 2H1

1988 ALBERTA WILDLIFE RECREATIONAL STUDY

The purpose of this study is to determine the extent and value of recreational activities related to wildlife in the province of Alberta.

A. QUESTIONS ABOUT WILDLIFE IN GENERAL

FOR OFFICE USE ONLY

1. Which of the following best describes your attitude towards wildlife, in general? (check the appropriate box).

   ☐ I value wildlife very highly
   ☐ I value wildlife highly
   ☐ I value wildlife moderately
   ☐ I have a low value for wildlife
   ☐ I have no value for wildlife

   —

2. During 1987, did you take any trips for which the **primary** purpose was to watch, feed, photograph or study wildlife?

   ☐ Yes ☐ No (**Go to Question 7**).

   —

3. Which of the following activities did you participate in? (check one or more of these categories).

   ☐ Watching and/or feeding wildlife (in the natural state)
   ☐ Photographing wildlife (in the natural state)
   ☐ Studying and identifying wildlife (in the natural state)
   ☐ Hunting wildlife

   —
   —
   —
   —

4. Approximately how many days in 1987 did you spend in each activity? (Note: 1 FULL day is 4 or more hours spent in the activity).

   Watching and/or feeding ____ days. — — —
   Photographing ____ days. — — —
   Studying and identifying ____ days. — — —
   Hunting wildlife ____ days. — — —

CONTINUED ON REVERSE →

5. Which of the following types of wildlife did you watch, feed, photograph or study?

___ Ungulates (Deer, Elk, Moose, Sheep, etc.)
___ Large Carnivores (Bears, Wolves, etc.)
___ Upland Bird (Grouse, Ptarmigan, etc.)
___ Waterfowl (Ducks, Geese, etc.)
___ Other Birds (Songbirds, Eagles, etc.)
___ Small Mammals (Rabbits, Squirrels, etc.)

6. How much did you spend on wildlife related trips in 1987? (put estimate beside the appropriate category).

Travel (includes gasoline, oil, air fare,etc.) $_____

Lodging (includes hotels, motels, camping fees, etc.) $_____

Food (includes restaurant meals, purchased food, etc.) $_____

Beverages $_____

Equipment $_____

Other (please specify below) $_____

_____

7. During 1987, did you watch, feed, attract or photograph wildlife around your home or cottage?

☐ Yes ☐ No

8. What did it cost you to participate in these wildlife activities around your home? (Include costs for feeders, food for wildlife, bird houses, cameras, film, etc., used primarily for wildlife). $_____

B. QUESTIONS ABOUT THE PRESERVATION OF WILDLIFE

* This section of the questionnaire is part of an experiment designed to provide an indication of how you value the preservation of wildlife in Alberta. The details which follow relate to a hypothetical situation to give you a reference point for your answers, and DO NOT reflect any specific management plans on behalf of the Government.

The population levels of several species of wildlife in the province are declining due to deteriorating habitat quality, and increasing contact with humans. This situation has developed mainly as a result of the increasing use of natural wildlife habitat for various purposes such as timber harvesting, mining, farming, etc.

Suppose a public trust fund were set up to pay for a 5-year wildlife management program to preserve wildlife in the province. This program would include restricting access to selected areas and improving wildlife habitat.

1. Regardless of whether or not you plan to hunt, watch, feed, photograph or study wildlife, what is the MAXIMUM amount of money you would be willing to donate annually to the fund for the <u>preservation</u> of wildlife, if the amount you indicate would be represented by an increase in your income tax?

$ 0	5	10	15	20	25	30	35	40	45	50	60	70	80	90
100	105	115	120	125	130	135	140	145	150	155	160	170	180	190
200	250	300	350	400	450	500	550	600	650	700	750	800	850	900

If higher or other dollar value, please specify: $_____

PLEASE PROCEED TO SECTION C →

C. PERSONAL INFORMATION

We know that people with different characteristics and backgrounds have different wildlife recreational values. For that reason, we would appreciate your answering the following, more personal questions. Your answers will be held confidential, and you personally will not be identified in the results of the study.

1. In which town or city do you live? _____ ___

2. What is your age? _____ years. ___

3. Sex (please check one). _

☐ Male
☐ Female

4. What is your highest year of schooling completed? Please circle one.

Grade/High School 0 1 2 3 4 5 6 7 8 9 10 11 12

Post Secondary Education:
University/College/Technical
or Trade School (years) 1 2 3 4 5 6 7 8 9 10 11 12 or more

___

5. Including yourself, how many of your immediate family are living at your residence? Please circle. _

1 2 3 4 5 6 7 8 9 or more

6. To the best of your knowledge, what was the total amount of money earned (before taxes) by you and your family in 1987? Please estimate and check the appropriate category:

___ $4,999 or less	___ $30,000 - 34,999
___ $5,000 - 9,999	___ $35,000 - 39,999
___ $10,000 - 14,999	___ $40,000 - 49,999
___ $15,000 - 19,999	___ $50,000 - 59,999
___ $20,000 - 24,999	___ $60,000 - 69,999
___ $25,000 - 29,999	___ $70,000 or over

___

7. If you have any additional comments on wildlife management in Alberta, please provide them on the back of this survey.

Thank you for co-operation. Please return your questionnaire today using the stamped, self-addressed envelope that has been provided.

Hunter Survey

CONFIDENTIAL

University of Alberta
Department of Rural Economy
Edmonton, T6H 2H1

ALBERTA WILDLIFE RECREATIONAL STUDY

The purpose of this study is to determine the extent and value of recreational activities related to wildlife in Alberta.

A. QUESTIONS ABOUT HUNTING WILDLIFE

FOR OFFICE USE ONLY

1. Which of the following best describes your attitude towards wildlife, in general? (check the appropriate box).

   ☐ I value wildlife very highly
   ☐ I value wildlife highly
   ☐ I value wildlife moderately
   ☐ I have a low value for wildlife
   ☐ I have no value for wildlife

   —

2. How many years hunting experience have you had?

   Big Game ___ years
   Bird Game ___ years

   — —
   — —

3. What are the main reasons that you go hunting? Rank the following in order of importance, eg., 1st, 2nd, 3rd choices, etc.

   ___ For meat
   ___ For trophy
   ___ For outdoor enjoyment
   ___ For companionship
   ___ For exercise
   ___ Other (please specify)_____

   —
   —
   —
   —
   —
   —
   —

4. Have you ever hunted in Alberta before the 1987/88 season?

   ☐ Yes If "Yes", how many years? ___
   ☐ No

   — — —

5. Please respond to the questions below by checking the appropriate box.

   a. In the 1987/88 season, did you hunt for sport at least once?

      ☐ Yes (PLEASE PROCEED TO SECTION B)
      ☐ No (GO TO THE NEXT QUESTION)

      —

      ↓

   b. Would you like to hunt grizzly bear sometime in the future?

      ☐ Yes (PLEASE PROCEED TO SECTION C)
      ☐ No (GO TO SECTION D)

      —

CONTINUED ON REVERSE →

B. GENERAL INFORMATION ON HUNTING TRIPS

This section is only to be completed if you hunted for sport in the 1987/88 season.

1. Please complete the following information for each Alberta hunting trip undertaken. Consider 1 FULL day of hunting to be 4 or more hours spent in the activity.

   Also, rate each Alberta hunting trip by providing a value on a scale of 1 to 5 for each of two categories below. The rating scale for each category is :

   a. Hunting quality (includes sightings or observations of animals, access, remoteness): 1=Very poor quality; 2=Poor quality; 3=Moderate quality; 4=High quality; 5=Extremely high quality.

   b. Crowding (were there too many people at the site?):
   1=Extremely high crowding; 2=High crowding; 3=Moderate crowding; 4=Low crowding 5=Extremely low crowding.

TRIP No.	Area(s) hunted: WMU, nearest town or landmark	Days Hunted	Miles to Area	No. in Hunting Party	Type of Game Hunted	Game bagged by yourself only (type & number)	HUNTING QUALITY Very Poor				Very Good	CROWDING Crowded				Not Crowded
Eg.	Vermilion	3	100	2	Deer & Grouse	0 deer 3 grouse	1	2	3	[4]	5	1	[2]	3	4	5
1.							1	2	3	4	5	1	2	3	4	5
2.							1	2	3	4	5	1	2	3	4	5
3.							1	2	3	4	5	1	2	3	4	5
4.							1	2	3	4	5	1	2	3	4	5
5.							1	2	3	4	5	1	2	3	4	5
6.							1	2	3	4	5	1	2	3	4	5
7.							1	2	3	4	5	1	2	3	4	5
8.							1	2	3	4	5	1	2	3	4	5
9.							1	2	3	4	5	1	2	3	4	5
10.							1	2	3	4	5	1	2	3	4	5

CONTINUED ON NEXT PAGE→

2. Please estimate, as best as you can, the amount of money you personally spent for hunting purposes in Alberta during the 1987/88 season. Indicate the amount beside the appropriate category.

ITEM

Travel cost $_____ _ _ _ _
(includes gasoline, oil, air fare, etc.)

Lodging $_____ _ _ _ _
(includes hotels, motels, camping fees, etc.)

Food $_____ _ _ _ _
(includes restaurant meals, purchased food, beverages, etc.)

Guides $_____ _ _ _ _
(includes guiding and outfitting fees, etc.)

Ammunition $_____ _ _ _ _

Rentals $_____ _ _ _ _

Other (please specify below) $_____ _ _ _ _

_____ _ _
_ _

3. How much would you have been willing to pay (above what you spent on travel and other expenses) to hunt big game in Alberta in 1987/88? (Please circle the appropriate dollar value).

$ 0	10	20	30	40	50	60	70	80	90	100
125	150	175	200	225	250	275	300	325	350	375
400	450	500	550	600	650	700	750	800	850	900

If higher or other dollar value, please specify: $_____ _ _ _ _

4. Now, we would like to ask you specifically about grizzly bear hunting:
How much would you have been willing to pay (above what you spent on travel and other expenses) to hunt grizzly bears in Alberta in 1987/88? (Please circle the appropriate dollar value).

$ 0	10	20	30	40	50	60	70	80	90	100
125	150	175	200	225	250	275	300	325	350	375
400	450	500	550	600	650	700	750	800	850	900

If higher or other dollar value, please specify: $_____ _ _ _ _

PLEASE PROCEED TO SECTION C →

C. QUESTIONS ABOUT THE RECREATIONAL VALUE OF GRIZZLY BEAR HUNTING

* This section of the questionnaire is part of an experiment designed to provide an indication of the recreational value of grizzly bear hunting. The details which follow relate to a hypothetical situation to give you a reference point for your answers, and DO NOT reflect any specific management plans on behalf of the Government.

The grizzly bear population in Alberta is declining due to deteriorating habitat quality, and increasing contact with humans. This situation has been created by the increasing use of natural wildlife habitat for non-hunting purposes such as agriculture and mining. At present the darkened area on the attached map (see last page) is closed to hunting.

Suppose a public trust fund were set up to pay for a 5-year management program to increase the grizzly bear population in the above area, to allow hunting. It is expected that such a program would increase the grizzly bear population by as much as 20%. This would more than double your chances of getting a grizzly bear hunting license. If you decide to hunt grizzly bear, your chances of shooting a bear could also be more than doubled.

To participate in this program, you would be required to make annual payments into the fund for the next five years to be considered for access at the end of the period, and continuing into the future.

Given this background information, please answer the following questions as accurately as you can:

1. How many more years do you expect to hunt grizzly bear? ____ years.

2. What is the MAXIMUM amount of money you would be willing to pay each year to the grizzly bear fund if there are high chances, 9 in 10, of you getting a grizzly bear license after 5 years? $_____

3. What is the MAXIMUM amount of money you would be willing to pay each year to the grizzly bear fund if there are even chances, 5 in 10, of you getting a grizzly bear license after 5 years? $_____

4. What is the MAXIMUM amount of money you would be willing to pay each year to the grizzly bear fund if there are low chances, 1 in 10, of you getting a grizzly bear license after 5 years? $_____

5. If you obtained a license, what are your chances of wanting to hunt grizzly bear? (please check one).

   ☐ I will definitely want to hunt grizzly bear
   ☐ There's an even chance I might want to hunt grizzly bear
   ☐ There's a small chance I might want to hunt grizzly bear
   ☐ There's no chance I might want to hunt grizzly bear

PLEASE PROCEED TO SECTION D →

D. QUESTIONS ABOUT THE USE OF WILDLIFE FOR NON-HUNTING PURPOSES

1. During 1987, did you take any trips for which the **primary** purpose was to watch, feed, photograph or study wildlife?

   ☐ Yes ☐ No (Go to Question 5). _

2. Which of the following activities did you participate in? (check one or more of these categories).

   ☐ Watching and/or feeding wildlife (in the natural state) _
   ☐ Photographing wildlife (in the natural state) _
   ☐ Studying and identifying wildlife (in the natural state) _

3. Approximately how many days in 1987 did you spend in each activity? (Note: 1 FULL day is 4 or more hours spent in the actvity. For those who answered SECTION C, don't include hunting time.)

   Watching and/or feeding ____ days. _ _ _
   Photographing ____ days. _ _ _
   Studying and identifying ____ days. _ _ _

4. Which of the following types of wildlife did you watch, feed, photograph or study? (check one or more of these categories).

   ___ Ungulates (Deer, Elk, Moose, Sheep, etc.) _
   ___ Large Carnivores (Bears, Wolves, etc.) _
   ___ Upland Bird (Grouse, Ptarmigan, etc.) _
   ___ Waterfowl (Ducks, Geese, etc.) _
   ___ Other Birds (Songbirds, Eagles, etc.) _
   ___ Small Mammals (Rabbits, Squirrels, etc.) _

5. The following questions are intended to give an indication of how you value the preservation of wildlife in Alberta. Suppose a public trust fund were set up to preserve wildlife in Alberta.

   a. What is the MAXIMUM amount of money you would be willing to donate annually to the fund for the preservation of wildlife? (Please circle the appropriate dollar value).

$ 0	5	10	15	20	25	30	35	40	45	50	60	70	80	90
100	105	115	120	125	130	135	140	145	150	155	160	170	180	190
200	250	300	350	400	450	500	550	600	650	700	750	800	850	900

   If higher or other dollar value, please specify: $_____ _ _ _ _

   8. What is the MAXIMUM amount of money you would be willing to donate annually to the fund, if it were specifically for the preservation of grizzly bear? (Please circle the appropriate dollar value).

$ 0	5	10	15	20	25	30	35	40	45	50	60	70	80	90
100	105	115	120	125	130	135	140	145	150	155	160	170	180	190
200	250	300	350	400	450	500	550	600	650	700	750	800	850	900

   If higher or other dollar value, please specify: $_____ _ _ _ _

PLEASE PROCEED TO SECTION E →

E. PERSONAL INFORMATION

We know that hunters with different characteristics and backgrounds have different wildlife recreational values. For that reason, we would appreciate your answering the following, more personal questions. Your answers will be held confidential, and you personally will not be identified in the results of the study.

1. In which town or city do you live? _____

2. What is your age? _____ years.

3. Sex (please check one).

☐ Male
☐ Female

4. What is your highest year of schooling completed? Please circle one.

Grade/High School 0 1 2 3 4 5 6 7 8 9 10 11 12

Post Secondary Education:
University/College/Technical
or Trade School (years) 1 2 3 4 5 6 7 8 9 10 11 12 or more

5. Including yourself, how many of your immediate family are living at your residence? Please circle.

1 2 3 4 5 6 7 8 9 or more

6. To the best of your knowledge, what was the total amount of money earned (before taxes) by you and your family in 1987? Please estimate and check the appropriate category:

___ $4,999 or less	___ $30,000 - 34,999
___ $5,000 - 9,999	___ $35,000 - 39,999
___ $10,000 - 14,999	___ $40,000 - 49,999
___ $15,000 - 19,999	___ $50,000 - 59,999
___ $20,000 - 24,999	___ $60,000 - 69,999
___ $25,000 - 29,999	___ $70,000 or over

7. If you have any additional comments on wildlife management in Alberta, please provide them on the back of the attached map.

Thank you for co-operation. Please return your questionnaire today using the stamped, self-addressed envelope that has been provided.

(FORM B)

Map of Alberta