

The Value of the Whooping Crane: An Application of
Valuation Techniques for Nonmarket Resources

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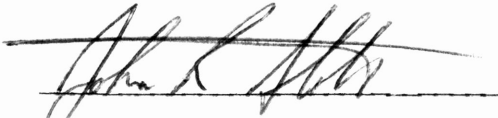
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ABSTRACT

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Increasing nonconsumptive use of wildlife resources and a concern with the threats of extinction have resulted in development of techniques to value nonmarket natural resources. One such technique is contingent valuation, in which values are estimated for a nonmarket good based on individuals' willingness-to-pay as expressed in a hypothetical situation.

The value of the whooping crane, an endangered species, was estimated using contingent valuation in a mail survey of Texas and selected out-of-state metropolitan residents and a survey of visitors to the Aransas National Wildlife Refuge. Results showed a mean use value of \$4.47 and a combined option price and existence value of \$16.33 for visitors to the refuge. The mail surveys produced responses of \$7.84 for Texas residents and \$7.13 for out-of-state residents. Estimates on the value of the whooping crane in the United States had upper and lower bounds of \$573 million and \$1.58 billion.

Background characteristics indicated that most people visit the

refuge to observe wildlife or the whooping cranes. Users of the refuge show a greater participation in conservation and outdoor activities than do nonusers.

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INTRODUCTION

The benefits associated with wildlife as a resource have been proclaimed since before the conception of the natural resources profession itself, and attempts to attach economic values to wildlife have been the natural result. In recent years, however, increasing attention has been upon the importance of wildlife as a non-consumptive commodity. Although such an outlook is timely indeed, it incurs additional dilemmas in the attempts to economically assess natural resources. The outgrowth has been experimentation and application of a new array of tools for estimating nonmarket values. Among the several methods, contingent valuation has emerged as a promising technique in the field of wildlife economics.

As in the science of wildlife biology and management, the science of natural resource economics has devoted special attention to the study of endangered species. Considerations of scarcity, uniqueness, and irreversibility compound the assessment of values associated with these species. The whooping crane (Grus americana) represents a case in point. An international campaign to gain public awareness and expenditure of considerable public and private funds to aid its recovery have made it one of the most well-recognized endangered species; however, nothing to this point is known of the actual magnitude of the economic value which people attach to it. This attempt to value the whooping crane is a prototypical effort to assess how public perceptions can be expressed as economic values for an individual species.

Nonconsumptive Resource Use

Growth in levels of participation in and expenditures for wildlife-related activities has been a primary impetus for the recent work in wildlife valuation, most notably in the area of nonconsumptive valuation. Shaw outlines the historic shift in value emphases from commercial uses to consumptive recreation to aesthetics and preservation. Indeed, several researchers have noted a shift in the predominant use of wildlife resources from consumptive to nonconsumptive (Shaw, Fazio and Belli, Hay and McConnell). This change in preference can be seen in activities, memberships, and expenditures. Hay and McConnell found that in 1977 85 million people participated in nonconsumptive wildlife-related activities, while membership in the National Audubon Society jumped from 41,000 in 1963 to 300,000 in 1978. There has also been an apparent increase in time and space devoted to nature topics by the media (Shaw). Expenditures on related activities have increased even more dramatically. DeGraaf and Payne estimated that \$500 million was spent on nonconsumptive wildlife goods in 1974, while the 1980 National Survey of Fishing, Hunting and Wildlife-Associated Recreation revealed that 83.2 million nonconsumptive users spent \$14.8 billion on their activities in that year alone.

Such preferences and growth in demand are the result of several factors, including personal characteristics such as age, education, and place of residence (Davis and Seneca, Kellert). External factors such as loss of hunting land, urbanization, and declines in hunting quality may have also contributed to the increases in nonconsumptive wildlife activities (Fazio and Belli). Furthermore, probability of

participation is proposed to increase if diversity of wildlife and amounts of natural environments increase (Hay and McConnell). Finally, changing public interests have been reflected in increased funding for non-game wildlife programs on both the state and federal level (Brown et al.)

Endangered Species

The development of the Endangered Species Program likewise reflects an increasing public concern with wildlife benefits. Among those benefits described are preservation of the species as a part of our heritage for cultural and spiritual benefits (Krutilla, Randall p.349). Krutilla, Randall (p.349), and Holden have also noted the importance of maintaining a diverse natural genetic pool. Environmental monitoring, the use of the status of a species to indicate the overall well-being of the environment, has also been argued to be a reason for species preservation (Bishop, 1978). Finally, preservation may be justified on the basis of providing for the possibility of unrealized future usefulness of the species (Krutilla, Bishop, Randall p.349, Holden). Action taken by the endangered species legislation of 1966, 1969, and 1973 sought to address the threats, most notable loss of habitat, to species survival and the described benefits.

The whooping crane has been one of the beneficiaries of these actions. In fact, the recovery of the whooping crane from a worldwide population low of 14 birds in 1940's to the present level of 109 birds has been identified as a symbol of the potential effectiveness of concerted preservation efforts. A myriad of public programs and

private efforts have aided the comeback. The Aransas National Wildlife Refuge in Texas and Wood Buffalo National Park in northwest Canada have been set aside as wintering and nesting grounds, respectively, for the only wild breeding flock (including 71 of the 109 birds). In 1979, an out-of-court settlement involving the Missouri Basin Power Project resulted in a \$7.5 million trust fund being set up to protect land used by whoopers along the migration route in Nebraska (Bowen). Other research and management activities include attempts to establish a second flock of whooping cranes under sandhill crane foster parents in Idaho, a tracking project by the Fish and Wildlife Service, and captive breeding programs in both private and public zoos and research centers.

Public demand and support for this species has been evidenced in a variety of ways, to the extent that a conservation organization, the Whooping Crane Conservation Association, has formed. In addition, from 60,000 to 100,000 people visit the Aransas National Wildlife Refuge each year, the great majority in the winter months when the whooping cranes are present (Figure 1). To some extent, the market reflects demand as well. Several books and motion pictures have been written or made on the crane, boat and bus tours of Aransas attract thousands of people annually, magazines devote time and space to feature articles on the species, and Continental Oil Company has funded research, television commercials, and publications on the whooping crane. All these expenditures by private individuals and companies indicate a recognition of value beyond the interest reflected by government programs.

Valuing Natural Resources

Recognizing a general public interest in nonconsumptive use of wildlife and in endangered species and the whooping crane in particular, questions finally arise concerning how to best estimate the magnitude and significance of this interest. Public policy makers face a dilemma, as the costs of preservation of wildlife resources are often concentrated in a few, localized areas (Harrington and Fisher, Holden, Bowen). To a great extent, cost-benefit analysis involving endangered species and natural resources in general is complicated by the nonexclusive and non-rival nature of the goods. That is, the value of the existence of a species cannot be excluded from those who do not bear its cost (nonexclusiveness) and, in nonconsumptive use, the quantity of a good is not decreased for others by the use by one individual (non-rival goods) (Randall, in press). Economic valuation, therefore, involves assessing both the market and nonmarket benefits accruing to each individual which can be attributed to a resource. The need for such measures has long been recognized (King); however, historic attempts at estimation using market-generated data have pointed to the gross underestimations obtained in this manner (Bart et al., DeGraaf and Payne) and the need for a new approach to describing benefits of natural resource amenities and their value.

Recent research efforts have attempted to more fully measure the benefits associated with unique natural resources through isolation and evaluation of nonmarket values. The proposals have included a use value defined in terms of consumer surplus, a probabilistic measure of value derived from the expected consumer surplus, an option value

related to a risk premium on future supply or demand, a quasi-option value dependent upon receipt of information in the future (Arrow and Fisher, Conrad), and an existence value resulting from altruistic actions by consumers (Krutilla, Randall and Stoll). These value estimates are overlapping to a certain extent (Randall and Stoll). Traditionally, use values have received the most treatment in the literature.

Option value has been defined as "the amount an individual would be willing to pay to preserve the option to consume some good in the future" (Brookshire et al. 1978). It has also been called simply a risk premium (Bishop 1978), for it represents a value, either negative or positive (Schmalensee), which a potential consumer would be willing to give up in order to insure a future availability of a good. Combined with expected consumers surplus, it is represented by option price (Randall, in print).

Existence value, as defined by Randall and Stoll (1982), is distinct from the other value types in that it requires altruistic activities. It is the willingness of the individual or household to assume a cost in order to insure that the resource continues to exist. The three types of altruism proposed by Randall and Stoll offer the rationale for such behavior by individuals. They include interpersonal altruism designed to provide the resource for other individuals or households, intertemporal altruism designed to provide the resource for future generations, and Q-altruism which implies an intrinsic right of the resource to exist.

Recognition of the values presented above has required the development of methods for their estimation which are distinct from the valuation of market goods or the inferential estimation techniques which are applicable to use values. A contingent valuation approach, one which "relies upon individual responses to contingent circumstances posited in an artificially structure market" (Stoll), has been most often used. A survey instrument is designed to present an individual with an often hypothetical situation in which he must value a nonmarket good. The bidding approaches which are described have three essential parts: (1) a vehicle to place the bid in a realistic payment context, (2) a starting point for the bidding process, and (3) a set of information describing the hypothetical situation (Brookshire et al. 1978). A variant is the substitution approach, which attempts to estimate (again through a survey) the expenditure by an individual which would yield him the same level of utility without the resource as he would have with the resource (Brookshire et al. 1978).

Scope Of Study

Such studies and background work point the way for future applications to valuation of nonmarket resources. The whooping crane provides an excellent study for an estimation of total value incorporating those economic values, such as option and existence, which have only recently been empirically entered into the valuation framework. Several objectives are offered to which this research addresses itself:

1. To examine sources of satisfaction associated with the whooping crane.

2. To review methods for valuing nonmarket natural resources.
3. To estimate use, option, and existence values for the whooping crane through application of contingent valuation methods.

Results will provide a clearer understanding of the factors influencing demand for a species, an analysis of the potential for estimation of this demand, and an actual estimation for the value of a species-- information which can hopefully serve in guiding decision making and as a building block for the perfection of estimation techniques.

The remainder of this paper discusses a review of the literature on contingent valuation, describes its application to valuing the whooping crane through a refuge and mail survey, and analyzes the estimates obtained and their implications.

LITERATURE REVIEW

The majority of the literature on nonmarket valuation, especially contingent valuation, is fairly recent. It reveals a progression from the formulative ideas and applications in the 1960's and early 1970's to a large amount of work during the past five years on assessing and perfecting the technique. This review will begin by reviewing the history of the technique, and then go on to discuss some of the current issues, with a special look at work on option and existence values.

History

Clawson initiated much of the thought on valuing natural resources, specifically outdoor recreation. He noted several advantages to estimating economic values for resources; however, he also recognized the lack of techniques for doing so at that time. He reviewed four concepts proposed as measures of value, including gross volume of business generated by outdoor recreation, an estimate of value based on local business volume attributable to recreation, demand for recreation as measured by willingness-to-pay (WTP), and the consumer's surplus associated with recreation benefits. Clawson showed derivation of a demand curve for four national parks based on travel cost, but concluded that the usefulness of consumer's surplus measures was very limited because such values are individual-specific.

The first actual application of bidding in a contingent situation was performed by Davis. He interviewed outdoor recreators in the Maine backwoods to obtain their willingness to pay for their recreation

experience. His work is significant not only in being the earliest study of this type (1963), but also because he recognized and attempted to control for factors which might have contributed to what were later labelled as hypothetical, strategic, information, and vehicle biases. He foresaw the usefulness of contingent valuation for benefit-cost analysis and its role as a criteria in public policy decisions.

Following Davis' work, little use of contingent valuation took place until the mid-1970's. In 1974, however, the field of study was brought to the fore again, as Randall, Ives, and Eastman estimated the amount of the aesthetic damages associated with the development of the Four Corners Power Plant in New Mexico. Using a much-refined survey method, Randall et al. found a significant willingness-to-pay (\$19-25 million/year) for the abatement of aesthetic damages. Although the benefits associated with abatement were found to be significantly less than its cost, this study did much to confirm the fact that contingent valuation has the potential to reveal previously unmeasured economic values of aesthetics.

Use of contingent valuation increased greatly during the late 1970's. The early work had confirmed the ability of the method to reveal nonmarket values, so the later studies increasingly concentrated on analyzing its shortcomings and perfecting the technique. Through this development and refinement several issues of concern have received specific attention, including alternative measures of welfare change, potential biases, aggregation problems, accuracy of the hypothetical situation, effects of household characteristics and consumption technologies, and comparability of results across studies. Most of the

literature on applications of contingent valuation can be discussed in the context of its relationship to these issues.

Contingent Valuation Issues

Resource economics is a policy oriented discipline which, therefore is concerned with the measurement of welfare change associated policies affecting the availability of goods or resources. In contingent valuation the appropriate measure of these welfare changes is argued to be consumer's surplus, "the residual difference between the value of a consumption bundle to the individual and the amount which he actually pays for it in the marketplace" (Marshall in Stoll and Mills). Contingent valuation actually measures one of two versions of consumer's surplus described by Hicks (in Randall and Stoll). Equivalent measures measure "the amount of compensation, paid or received, which would bring the consumer to his subsequent welfare level if the change did not take place," while compensating measures describe the compensation "which would keep the consumer at his initial welfare level after the consumer at his initial welfare level after the change had taken place" (Stoll and Mills). Several studies address the differences between the equivalent and compensating surpluses.

Brookshire et al. (1976) examined the aesthetic damages associated with the building of the Kaiparowits power plant on Lake Powell in the Glen Canyon National Recreation Area. By both estimating willingness to pay to prevent damage and deriving willingness to accept compensation for damage, they were able to obtain both equivalent and compensating measures of surplus. The results showed negligible differences between

the two measures; however, Brookshire et al. noted that income distribution might have a significant effect on differences in other situations.

Rowe et al. found that income did have a significant effect on equivalent measures in their assessment of the value of visibility in the Four Corners region. They attributed statistically different equivalent and compensating surpluses to the differential effects of liability and strategic bias. As a result, they recommended that both measures be obtained in future studies.

One of the issues in contingent valuation receiving the most treatment in the literature and one of the primary concerns is the question of various forms of bias inherent in the method. The major forms identified include strategic bias, which argues that individuals may purposefully mistate their preferences in order to influence the mean result; informational bias, which proposes that bids are highly dependent on the type of information included in the description of the contingent situation; several types of survey instrument bias, such as variability caused by the type of bidding used, the starting point used for iterative bidding, and the type of vehicle used for payment; and hypothetical bias, a question of validity which argues that the hypothetical nature of the method produces results which are inaccurate (Schulze, d'Arge, and Brookshire; Rowe et al.). Results of tests to detect bias are variable. They are discussed below, with hypothetical bias being discussed in a later section on validity.

Critics of contingent valuation often cite strategic bias as one of its fundamental weaknesses; however, little evidence, other than theoretical, is found on its existence. As Bohm (1979), indicated,

the existence of incentives for strategic bidding does not imply that it actually takes place. In fact, in his examination of willingness-to-pay for television service, he found that strategic bias was not a problem (Bohm 1972). Brookshire et al. (1976) reported that the dispersal of bids from the mean did not evidence the occurrence of strategic bias in the Kaiparowits power plant study. Rowe et al. noted that no significant strategic bias occurred in their visibility study, especially when protest bids were removed. Brookshire et al. (1982) also examined strategic bias in a comparison of contingent and hedonic method valuations of air quality in Los Angeles. They argued that a nonzero willingness-to-pay indicated lack of free-riding and a minimal strategic bias. However, as Randall et al. (in press) notes, if contingent valuation becomes widespread in use to actually determine fees, then the incentives for strategic bias will be greatly increased.

Results of attempts to identify information bias are more variable. Brookshire et al. (1982) reported that information did not bias the results of their air quality estimates, and Thayer found no evidence of information bias in his study to estimate aesthetic damages resulting from geothermal energy development in the Jemez Mountain region of the Santa Fe National Forest. Rowe et al., however, found that there were significant information effects. Others have argued that it is logical for information bias to exist, as one would expect new information to affect a person's bid (Randall in press). Information bias may therefore be minimal in instances such as the Brookshire et al. (1982) study where information levels are already high.

Outcomes of contingent valuation are also proposed to be linked to

the characteristics of the contingent situation. One variable is the form of contingent valuation bidding used. Stoll describes several forms. Iterative bidding offers the survey respondent a dollar amount to which he can respond yes or no. The amount is then adjusted accordingly, and the question repeated until finally a maximum bid is obtained. Non-iterative bidding, on the other hand, does not involve such a "honing in" on the final bid. Instead, the respondent is simply asked to state his maximum WTP (open-ended), or he is offered a single value and allowed to respond yes or no (close-ended). These close-ended responses may then be analyzed by a logit model or several other less sophisticated approaches. Other forms of bidding include checklists, payment cards, and comparison payment cards (Randall et al. in press).

Randall et al. (in press) examined the influence of various bidding methods on WTP for air quality in Chicago, the Eastern United States, and the Grand Canyon among Chicago residents. They compared six different bidding methods, including open-ended, close-ended, iterative bidding, checklist, payment cards (Mitchell and Carson), and comparison payment card. They found that the close-ended and checklist forms produced lower mean values than the overall, but these disparities disappeared when socioeconomic characteristics were controlled for. The comparison payment card produced higher bids, but the other results were all comparable in amount. In a later study of recreational boaters in Texas Sellar et al. (in press) found that open-ended responses were lower than close-ended.

Another form of bias has been proposed to be linked with the iterative bidding method. The contention is that the starting point from

which bidding is initiated affects the outcome. Rowe et al. found that starting point did have a significant effect on outcome; however, Thayer found no effect at a 10% significance level, and Brookshire et al. (1982) also concluded that starting point bias was not represented in their results.

Some questions also exist concerning the effects of the choice of payment vehicle. Greenley et al. examined option and existence values among Denver and Fort Collins, Colorado, residents for water quality on the South Platte. They found that bids were lower when sewer fees were proposed as a method of payment than when a sales tax was proposed as the payment method. Rowe et al. found vehicle effects on measures of equivalent surplus as well.

Studies such as Randall et al.'s (in press) assessment of values for visibility on a local and regional scale and at a distant locality have raised a fairly new issue in contingent valuation--aggregation of values. The issue is concerned with valuing a portion of an overall good. Schulze, Brookshire, and Thayer found that Chicago residents were willing to pay \$86 per household per year for a visibility improvement in the Grand Canyon. Randall et al. (1981) found that when Chicago residents were asked to bid on a package including air quality in Chicago the Eastern United State, and the Grand Canyon, and then on the package without the Grand Canyon, the average WTP for the same visibility improvement at the Grand Canyon was only \$18 per household per year. Aggregation of the value of individual characteristics of a site as compared to the value of the whole is also a topic under much current discussion (Majid, Sinden, and Randall; Stoll)

Perhaps the area of most concern in the literature on contingent valuation is that of the validity of results. Consequently, much of the work has concentrated on comparisons between contingent valuation studies themselves and between CV work and other methods of estimating values. Comparisons between studies is relatively difficult, as values vary with site, population surveyed, and contingent situation; however, studies which are similar in these characteristics have been shown to have very similar value estimates. Brookshire et al. 1976 found their aesthetics value estimates for Lake Powell to be amazingly similar to the results obtained by Randall et al. (1974) for the Four Corners region. Later, Rowe, et al. found their estimates for the Four Corners region to be very comparable to the other studies. It appears that there is at least some consistency in the results produced by contingent valuation.

Other researchers have attempted to compare contingent valuation (hypothetical markets) estimates and other methods of value measurement. Results have indicated a variability in the amount of agreement. Thayer used a site substitution measure in examining aesthetic damages in the Jemez Mountains. This site substitution approach was based on trip characteristics similar to travel cost. Results showed that value estimates obtained by these two valuation approaches had little variation.

Bishop and Heberlein were able to set up a simulated market for goose hunting permits in the Horicon Zone, Wisconsin, in which money was actually offered to license recipients to buy back their licenses. In addition, the researchers estimated hunting values through travel

cost and traditional hypothetical markets. They found that equivalent measures of consumer's surplus (WTP) obtained in the contingent situation were significantly lower than those produced in the simulated market, while compensating measures (willingness-to-sell) were significantly higher. Travel costs were also found to underestimate values. Bishop and Heberlein suggest WTP and WTS as upper and lower bounds when contingent valuation is used.

Brookshire et al. (1982) used another type of market measure to estimate values for air quality in Los Angeles. Hedonic measures are estimates of the value of characteristics, such as air quality, as they are reflected in the total price of a commodity, such as a house. Using the housing market and different levels of air quality in Los Angeles, the researchers found close agreement in values obtained by hedonic and contingent approaches.

Sellar et al. (in press) compared the two most commonly used forms of nonmarket valuation when assessing boating recreational values for four East Texas lakes through travel cost and contingent valuation. Three lakes produced useable data, and values from the two methods were not significantly different from each other for all three at a 5% level of confidence.

While much of the work in contingent valuation has concentrated on the improvement of the technique, efforts have also been made to understand the factors affecting values. Several models have postulated that socioeconomic characteristics and backgrounds of sample populations may significantly affect the values obtained. In part, these charac-

teristics may indicate the household's consumption technology, an experience level which affects a household's ability to derive utility from a resource (Lancaster in Randall in press, Baker in Randall in press).

Conclusions concerning the effects of personal characteristics upon values have not been consistent. Eastman et al. found no definite relationships between amount of bid for pollution abatement in the Four Corners region and socioeconomic characteristics, while Rowe et al. found that income and other characteristics significantly impacted aesthetic damage values for this same area. Thayer's analysis of bids to prevent aesthetic damage in the Jemez Mountains region revealed no links with income, age, party size, or miles per gallon. However, age and income, affected option and existence values for grizzly and bighorn in a study by Brookshire et al. (1983), and standard of living, age, education, and environmental awareness impacted bids for air quality in Randall et al.'s (in press) study of Chicago residents. Schulze, Brookshire, and Thayer found that neither past visitation nor distance from the area affected the willingness of residents of Denver, Los Angeles, Albuquerque, and Chicago to pay for air quality at the Grand Canyon. Not surprisingly, however, Cocheba and Langford revealed in a mail survey of Canada residents that hunters were willing to pay a higher amount than nonhunters for increases in the goose population.

Option and Existence Values

While contingent valuation is one of many methods available to measure use values for a resource, it is one of few with the capability

to estimate option and existence values. Realizing that these values contribute significantly to the total value of natural resources, especially familiar endangered species, discussion of the issues associated with contingent valuation as a method of measuring option and existence values is merited.

Krutilla initiated much of the thought on the economics of preservation in 1967. As a central issue, he recognized the lack of a market to provide for the present and future the benefit associated with unspoiled natural environments. As a result, he noted that option demand and preservation values may be unrealized.

Applications of contingent valuation have revealed that such demands are significant. Brookshire et al. 1978 found significant willingness-to pay for future option to use and existence of grizzly and bighorn sheep in Wyoming. Greenley et al. revealed significant existence values for water quality on the South Platte Rivier. Both Randall et al.(in press) and Schulze, Brookshire, and Thayer found that metropolitan residents attached values to air quality in the Grand Canyon. Schulze, Brookshire, and Thayer found that existence values greatly exceeded use values.

Clearly, values are attached to the existence of and option to use certain resources; however, the discussion of requirements for such values reveals some theoretical differences. Initially economists proposed that uncertainty of demand was a requirement for option value (Weisbrod in Fisher and Krutilla); however, Cicchetti and Freeman (in Fisher and Krutilla) argued that option value exists in the presence of uncertainty in demand or supply. In fact, Brookshire et al. (1983)

found that uncertainty in demand did not affect option bids for grizzly and bighorn, while uncertainty in supply had significant effects. Uncertainty is the basis for description of option value as a risk premium. From this, option price is determined to the sum of option value and the expected consumer's surplus (Bishop 1982; Brookshire et al. 1983).

Irreversibility of resource loss and uniqueness of the resource are also argued to be prerequisite for option and existence values. Weisbrod (in Randall and Stoll 1983) called for irreversibility, while Krutilla maintained that both conditions were necessary. However, Fisher and Krutilla and Randall (in press) recognized that the issue of irreversibility is complicated by the cost of reversal (prohibitive irreversibility) and the treatment of time horizons in assessing costs. Rnadall and Stall argue that neither irreversibility nor uniqueness are required for option and existence values. Empirically, Greenley et al. found significant existence values for a non-unique resource.

Several researchers have also devoted attention to the special problems of species preservation. It has been described as a threshold problem, dependent on maintenance of a minimal population level (Randall in press; Bishop 1978). Based on these complexities and the uncertainties of species-related benefits, Bishop (1978) has proposed adoption of a Safe Minimum Standard (SMS approach), which calls for avoidance of extinction except when costs are exceptionally high. SMS places the burden of proof on the threat to a species.

McConnell proposed a two-step process for preservation issues. Following the statement of a budget for existence goods, consumers

would rank those goods in priority for protection. Randall (in press) however, has noted problems associated with vertebrate chauvinism and called for increased consideration of the questions of life forms versus life processes and species versus habitats, as well as actual priorities among species.

This study will contribute to earlier findings in several areas. First, use, option, and existence values will be determined for a single species and their interrelationships noted. Secondly, comparisons of values between users and non-users and residents of different geographic regions can provide some indication of the motivations for attaching value to a resource. Thirdly, examination of the personal background of respondents will provide increased information on who the market really is. Finally, by examining the value of the whooper in its native environment, an assessment of species versus habitat values can begin.

METHODS

A comprehensive literature review was undertaken to determine issues of concern based on the results of past work. Specifically, work on endangered species and studies which provided recommendations on application of contingent valuation techniques were sought. Results of this search were summarized in the literature review previously presented.

Three population subsamples to be surveyed were selected. They were (1) users of the Aransas National Wildlife Refuge (NWR), (2) the general resident population of Texas, and (3) residents of four major metropolitan areas outside Texas. The survey was designed to reveal personal characteristics, trip characteristics, and use, option, and existence values for the Aransas NWR users, and personal characteristics and option and existence values of the remaining two subsamples.

A questionnaire was designed to obtain the desired information. In addition to the questions on personal backgrounds, hypothetical markets were constructed using close-ended bids, for use of the Aransas NWR with and without whooping cranes (Q9 and Q9a) and for preservation of the whooping crane through a private foundation (Appendix 1). The preservation question (Q18) was differentiated into option and existence values by requiring the respondent to indicate if he planned to visit the refuge in the future (Q17).

Questionnaires were pretested on the Aransas NWR and at a Conference for the Advancement of Science Teaching. From these results, modifications were made, including adjustment of the ranges for the dollar

amounts used in the bidding questions. (See Appendix 1 for ranges in amounts.)

The modified questionnaire was administered to visitors at the visitors' center of the Aransas National Wildlife Refuge on 11 different dates in December, 1982, and January and February, 1983. The dates included seven weekdays and four weekend days. In each case, one member of each household was handed the questionnaire and asked to return it while on the site.

The sampling frames for the Texas and out-of-state residents were obtained from Survey Sampling, Incorporated, which draws its random samples from a list compiled from telephone directories, drivers license registrations, and various other sources. A total of 1200 questionnaires were mailed to Texas residents, and 600 questionnaires were mailed to four cities (150 to each): Atlanta, Los Angeles, Chicago, and New York City in January, 1983. A reminder post card was mailed to each individual one week later, then another letter and questionnaire were sent to nonrespondents two weeks following the post card.

Results were analyzed using the Statistical Analysis Systems (SAS) computer package. Use, option, and existence values were constructed as weighted means from the yes/no responses to the close-ended questions. Preliminary total values were then estimated based on the population of Texas and the United States. Frequency and means procedures provided the remaining information concerning respondents familiarity with whooping cranes and the refuge, conservation and outdoor activities, personal backgrounds, and attitudes toward preservation.

RESULTS

Five hundred thirty-four responses were obtained from users of the refuge, for an overall response rate of 66.75%. The overall response rate, after subtracting for bad addresses, for the mail survey was 36.45%. A total of 321 Texas and 176 out-of-state mail survey questionnaires were returned.

Household Characteristics

Several questions revealed respondents' familiarity with whooping cranes. Approximately one-half of all visitors to the refuge had seen live whooping cranes at some time in the past. Twenty-nine percent of the Texas residents surveyed by mail indicated that they had seen the whooping cranes, while an additional 21% were uncertain. For out-of-state residents surveyed by mail the figures were 19% and 20%, respectively. Visitors who had seen cranes were asked to indicate where they had seen them. The Aransas NWR and an associated tour boat were the most commonly given answers for refuge users. Texas respondents to the mail survey was cranes most often at zoos or research centers and then on the refuge, while out-of-state respondents indicated that the site where whooping cranes were seen were almost exclusively zoos and research centers (Figure 1). The most common source of information on whooping cranes for all three groups was television programs. Newspapers and magazines were the next most frequent sources. Only the out-of-state responses indicated that a significant number of these respondents had never encountered any information on whooping cranes (Figure 3).

Figure 1. Locations of sightings of whooping cranes.

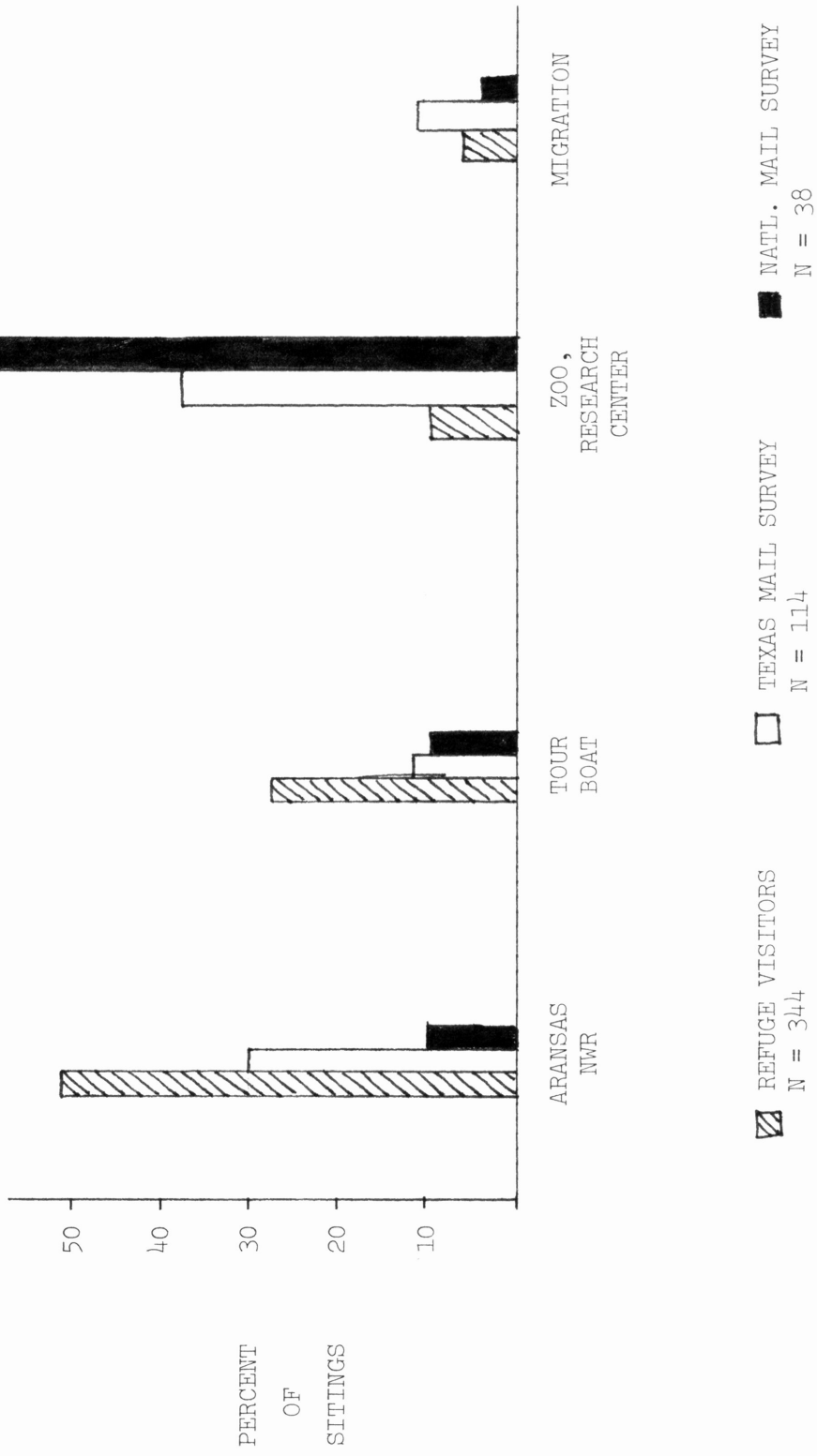
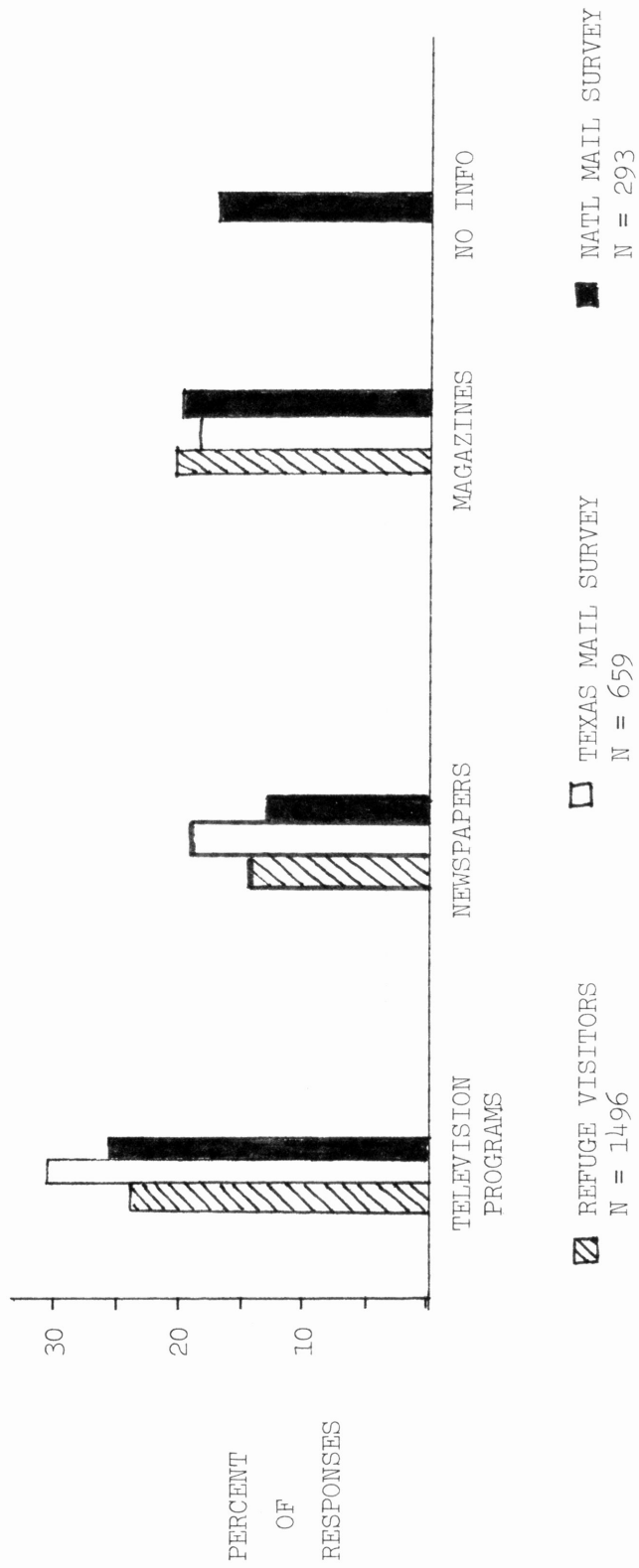


Figure 2. Sources of information on whooping cranes.



All respondents were also asked whether or not they had ever visited the Aransas National Wildlife Refuge in the past (Q13). As expected, those who received the questionnaire while visiting the refuge were most likely to have visited in the past (44% of respondents). In the mail survey, only 16.3% of the Texas respondents and 3.7% of the out-of-state respondents had visited the refuge in the past.

Refuge visitors were also more active in conservation and outdoor activities (Q12-Q16, Q22-Q26). Thirty-one percent of the visitors belonged to conservation organizations, while, of the mail survey respondents, only 11.3% of the Texas residents and 15.7% of the out-of-state residents reported such memberships. Percentages of those subscribing to natural history publications were 52% of the refuge visitors, 29% of the Texas mail survey respondents, and 22% of the out-of-state mail survey respondents. Refuge visitors took an average of 11.7 hunting and fishing trips and 12.4 wildlife observation trips in 1982, while the corresponding figures for the mail survey were 5.8 and 2.0 for Texas respondents and 5.8 and 2.5 for out-of-state respondents, respectively.

The average age of respondents was 46.5, 45.3 and 43.7 years for refuge visitors, Texas mail survey respondents, and out-of-state mail survey respondents, respectively. Most respondents were male (59% of the refuge visitors, 73% of the Texas mail survey respondents, and 72% of the out-of-state mail survey respondents). Breakdowns for size of town of residence, education level, and income level are indicated in Figures 3, 4, and 5. In general, refuge visitors tend to be more highly educated and are more likely to be from rural areas than the two mail survey subsamples.

Figure 3. Population of town of residence.

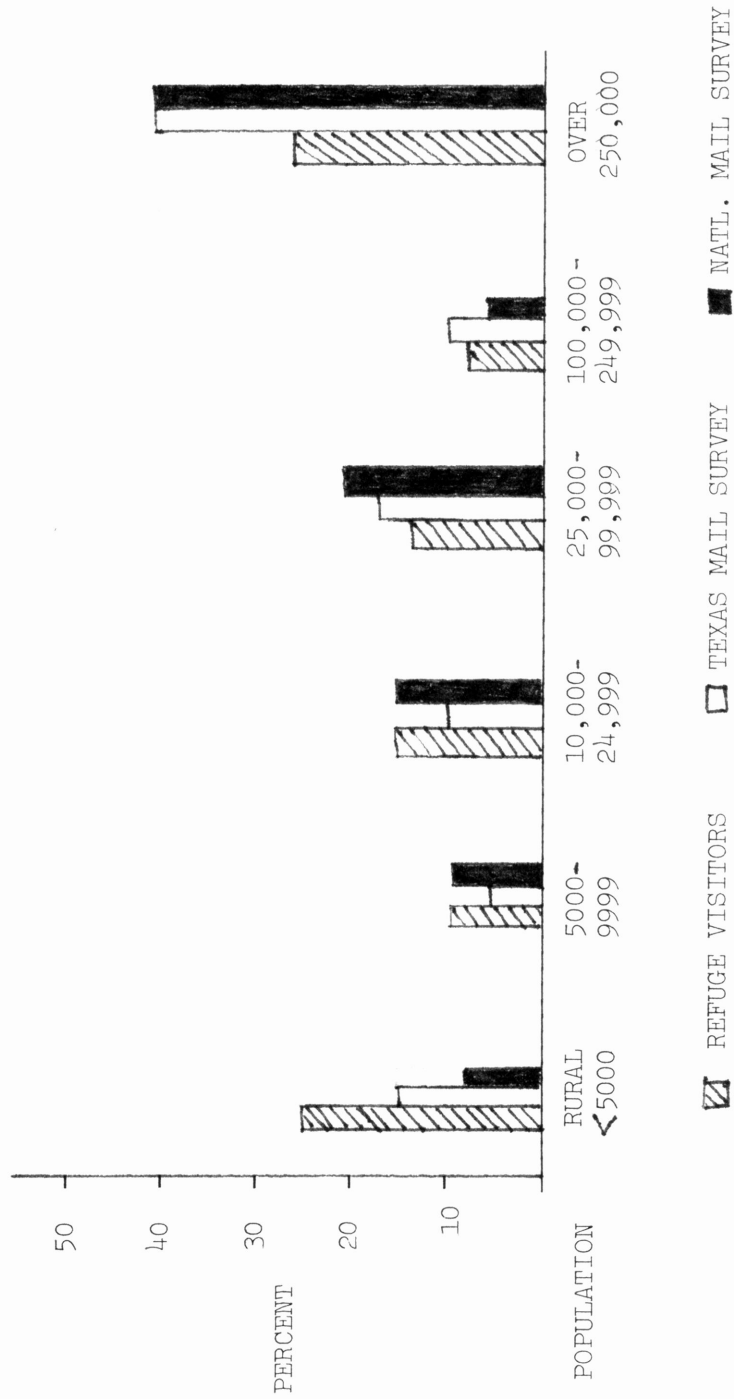


Figure 4. Education level of respondents.

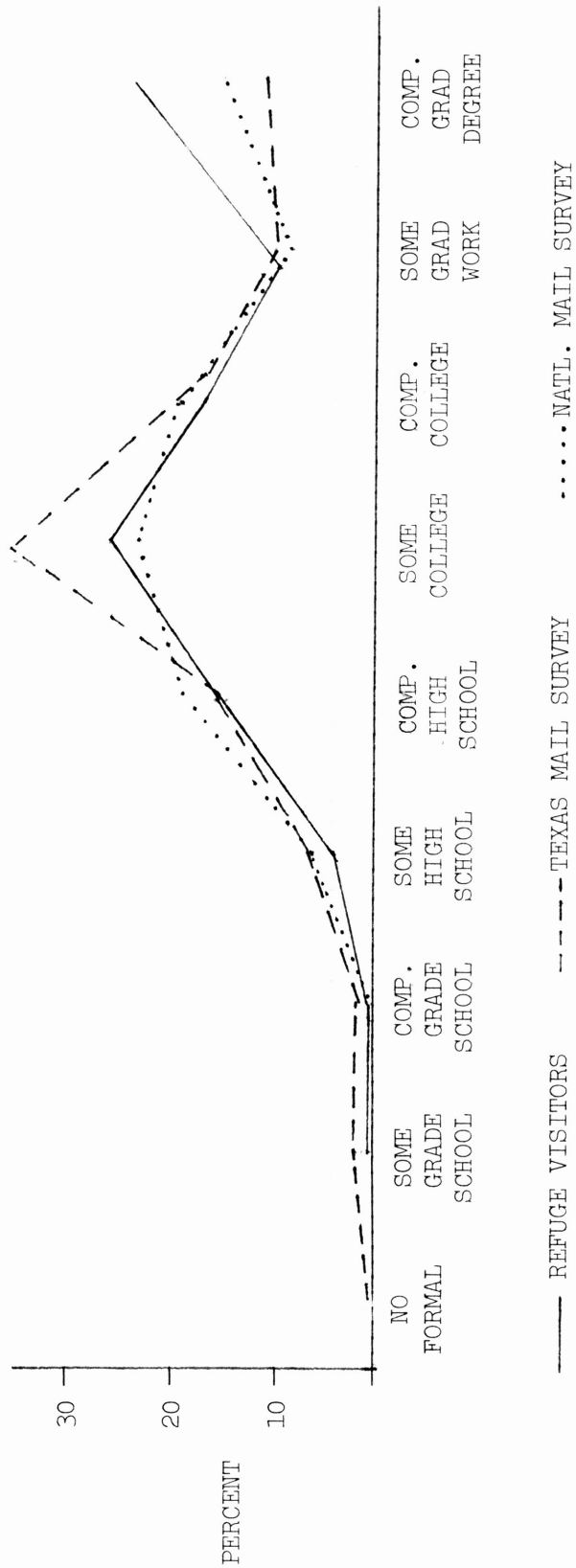
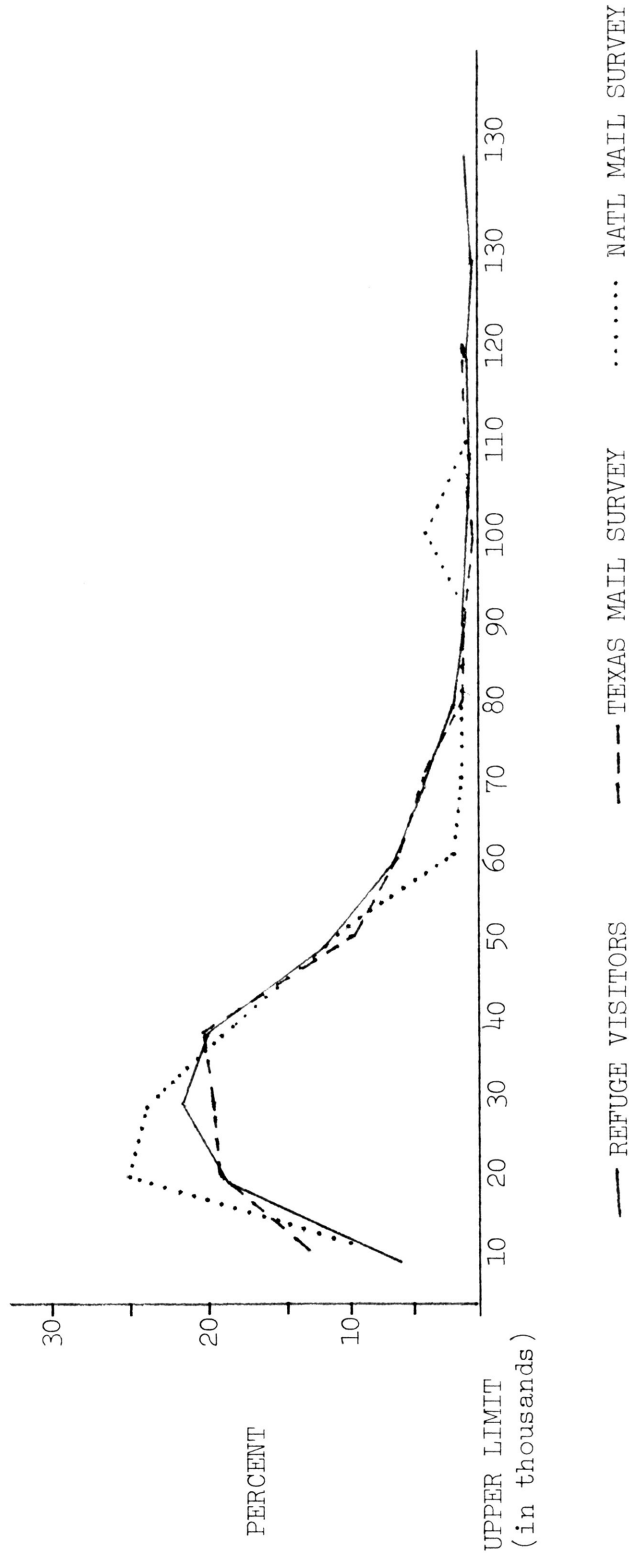


Figure 5. Income of respondents.



Visit Characteristics

Refuge visitors were also asked to provide information on their trip to the Aransas National Wildlife Refuge. Most reported that their main purpose was to observe wildlife (42.3%) or to observe the whooping cranes (21.8%). (See Figure 6). Average length of stay was 1.3 days per trip (Q7). Sixty-seven percent of the respondents visited in family groups, with an average of 2.7 family members in the group (Q4 and Q5). The mean number of visits per year was 1.32. Fifty seven percent of the respondents completing the survey instrument after touring the refuge saw whooping cranes during their visit (Q12a).

Although 55% of the visitors to the refuge were from Texas, residents of 37 states and three foreign countries were represented in the sample.

Values

Mean values for users of the refuge are presented in Table 1. Mean willingness-to-pay for an annual permit to visit the refuge was found to be \$4.47/person. The mean bid for an annual permit to visit the refuge with no whooping cranes present was \$3.07/person. A combined annual option price and existence value was estimated to be \$16.33/person annually. When option price and existence value were estimated independently by separating those respondents who did not anticipate future visitation (30 respondents), option price was estimated to be \$16.87/person annually, while existence value was estimated at \$9.33/person annually.

Adjustment of these values for multiple visits per year allows estimation of a total use value of \$213,000/year (47,700 x \$4.47), based

on a 1982 visitation of 63,000 visits (63,000 visits / 1.32 visits per person = 47,700 visitors). Combined option price and existence value for the same visitation rate is \$780,000/year (47,700 x \$16.33), yielding an estimate of total annual value by users of the refuge of \$990,000.

All estimates are derived after the elimination of "protest" bids, which are "no" bids based on reasons other than value (see Q11, Q19). Twenty-eight percent of the "no" bids to the use value question were protests based on a resistance to the payment of fees for use of natural resources. Thirty percent of the "no" responses to the option/existence bid indicated a lack of faith among these respondents in the contingent situation described. Respondents were also asked to indicate the accuracy of their responses to the bidding questions. Given choices of certainty, some uncertainty, and uncertainty, 54.8%, 38.1%, and 7.1% of the responses fell in these respective categories.

Analyzing the responses from the mail survey indicated that the mean combined option price and existence value for Texas residents is \$7.84/year/person. Controlling for anticipated future visitation, mean option price is estimated to be \$10.67 annually per person, while mean existence value is estimated at \$1.03 annually. Controlling for past visitation to the refuge resulted in an estimate of existence value which was not significantly different from that presented above.

When individual bidding is assumed, then the total combined option price/existence value for the whooping crane among the 13.9 million Texas residents (U.S. Dept. Commerce) is \$109.9 million (13.9 million x \$7.84). If one supposes that bidding took place by household rather than

individual, then the mean combined value is \$36.7 million, based on 4.93 million Texas households.

Of the "no" bids entered by Texas respondents, only 19% were judged to be protest bids. Accuracy breakdown of the bids is 67.2% certain, 23.4% some uncertainty, and 9.4% uncertain.

Out-of-state residents surveyed by mail indicated a mean combined option price and existence value of \$7.13/person annually. Approximately one-half of the respondents indicated that it was an option price, for which the mean value was \$13.24/person. Existence value for the remaining respondents averaged \$1.24. Once again, controlling for past visitation had no significant effect upon existence value.

Based on the 1980 U. S. population of 221 million people (U.S. Dept. Commerce), total combined option price and existence value of the whooping crane in the United States is \$1.58 billion (221 million x \$7.13). Supposing that bids represent household estimates for 80.4 million households, then total value is \$573 million.

Protest bids occurred for 30% of the "no" respondents. Relative to the refuge visitor survey and the Texas mail survey, a greater number of respondents (8.9% of the "no" responses) indicated an aversion to species management. Accuracy of responses was 64.6% certain, 28.6% some uncertainty, and 6.8% uncertain.

Table 1. Weighted mean values for visitors to Aransas National Wildlife Refuge.

VALUE (\$)	\bar{X}	s	α	δ	n
USE					
-WITH WHOOPERS	4.47	12.31	.05	2.44	508
-WITHOUT WHOOPERS	3.07	10.54	.05	2.09	510
OPTION/EXISTENCE					
-OPTION	16.87	29.58	.05	7.06	351
-EXISTENCE	9.33	25.37	.05	20.71	30

Table 2. Weighted mean values for a mail survey of Texas and out-of-state residents.

VALUE (\$)	\bar{X}	s	α	δ	n
TEXAS					
-OPTION/EXIST	7.84	21.78	.10	4.39	249
-OPTION	10.67	25.28	.10	6.03	176
-EXISTENCE	1.03	3.72	.10	1.40	73
OUT-OF-STATE					
-OPTION/EXIST	7.13	18.19	.10	5.12	126
-OPTION	13.24	24.13	.10	9.69	62
-EXIST	1.24	4.55	.10	1.81	63

\bar{X} - weighted mean bid

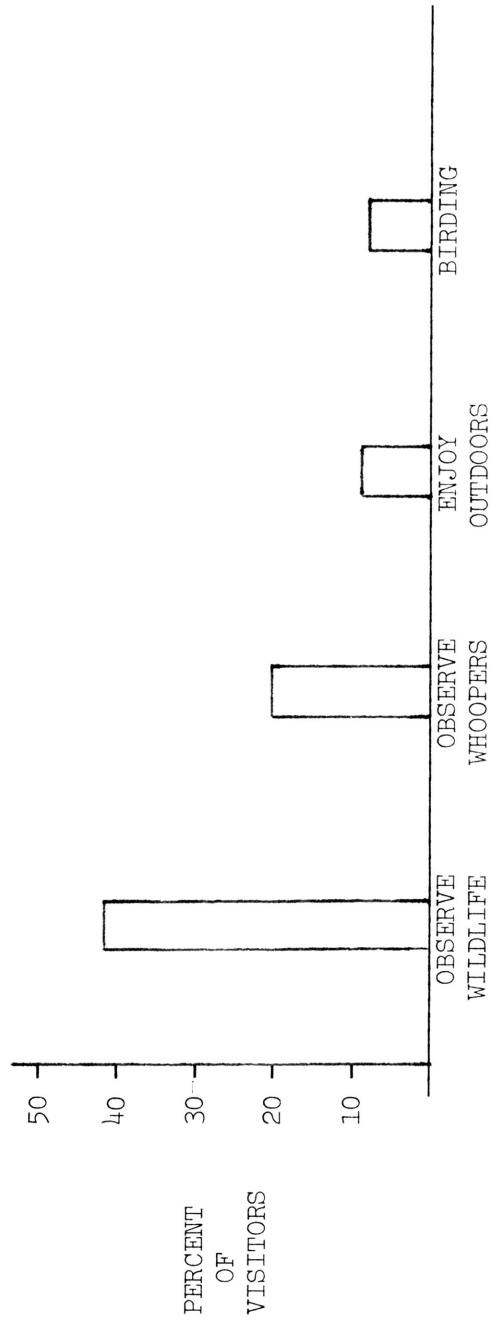
s - standard deviation

α - confidence level

δ - interval of confidence

$$\delta^2 = \frac{s^2}{\alpha n}$$

Figure 6. Reasons for visitation to Arkansas National Wildlife Refuge.



CONCLUSION

The results of this study offer some encouraging results for the continued improvement of the contingent valuation technique, and specifically for its application to aid in assessing the values of wildlife species. In addition, characteristics of users and nonusers of wildlife resources are revealed which may help resource managers to better understand the public's perception of natural resources. Finally, some persistent questions are raised such as aggregation of values.

Several comments may be made concerning the characteristics of users and nonusers of the whooping crane resource and their associated bids. In addition to expressing a mean use value of \$4.47 per person per year, the option price and existence values were consistently higher for users of the resource. In addition, users participated in hunting, fishing, and wildlife-related recreation more often than non-users of the whooping cranes. These characteristics, in addition to increased membership in conservation organizations and subscription to natural history publications, point to an enhanced consumption technology among visitors of the Aransas National Wildlife Refuge which is expressed not only in use of the species, but also in increased personal benefits derived from anticipated future use or even simply existence.

Visitors to the Aransas National Wildlife Refuge also demonstrated a perception of resource value which is rarely attributed to the public. While a bid of \$4.47 per year for use indicated a value attachment to the whooping crane, it is interesting to note that the mean willingness-to-pay was still \$3.07/year for use of the refuge without the whooping

crane. The argument of species versus habitat management has received much attention in the natural resources profession. It has long been assumed that the public attaches its values to individual species, especially endangered species, and managers have felt the pressure to serve this public demand. This study reveals, however, that the species value is significant, but it is only a part of the value of the resource as perceived by the public users. Such findings offer hope of an increased perception of ecological relationships and new thoughts for the resource manager to consider in deciding how to best manage nature and man.

The mail survey of Texas and out-of-state metropolitan residents revealed significant values for the whooping crane, even among those who may have never come into contact with it. Considering the large amount of public exposure which this species has had, these results are not unexpected. However, examination of the preservation values to learn more about their characteristics uncovers an interesting disproportion in the values between option and existence values. Existence values are significantly less than the option values. Among nonusers who have never encountered whooping cranes (from the probability of the responses), one would expect the majority of the value to be associated with the status quo--the existence of the resource without use by the individual. The large amount of the combined preservation value which is attributable to option price, however, indicates that an important factor in determining values may be the anticipated, though perhaps unfulfilled, use of the species. Values for the whooping crane appear to be strongly associated with possible use, however uncertain.

Results of this study may serve to further aid in the refinement of the contingent valuation technique. Use of the protest and uncertainty questions allowed a check on the validity of the responses which were obtained. Extremely low levels of uncertainty as perceived by the respondent indicated that the instrument was successful in setting up a contingent situation in which the individual felt that he could respond with some degree of familiarity. One may foresee the greatly increased potential of hypothetical markets, especially as private organizations such as the Nature Conservancy help the public to perceive natural resources in more of a private market context. However, fairly high occurrences of protest bids may indicate that, although the market which the contingent situation set up was believable, many individuals are resistant to valuing public goods such as natural resources in that context. Such feelings have to be dealt with not only by the economist, but also by the policy maker.

Perhaps most encouraging to both resource managers and economists from this study is the magnitude of the responses which were obtained. Economic theory states that there are significant benefits associated with wildlife which is not expressed in the marketplace. Following this same belief, resource managers seek to maximize production of those benefits. Revelation by this study that the order of magnitude of those benefits for a single species is conservatively in the millions of dollars, and quite possibly in the billions of dollars, annually develops a strong case for consideration of nonmarket resource benefits in decision making, especially where irreversible action is proposed.

Finally, one of the major products of this study, as with most others, is the raising of new questions which provide the impetus for the next step in the science of nonmarket valuation. Consideration of species versus habitat value for the whooping crane has again raised the question of how to deal with aggregation of the benefits of the many components of an ecosystem. Given that many other endangered and popular species use the Aransas National Wildlife Refuge, one may see the problems involved in analyzing individual components in this type of system or in any like it. The answer to this problem involves more than the economist or resource manager individually. Aggregation of values calls for an intricate understanding of the many interrelationships in a system. The challenge for the future is for the ecologist, the sociologist, the economist, and others to enhance the understanding of natural resources and their benefits as a whole.

LITERATURE CITED

- Anonymous. "1980 Fishing, Hunting Survey Results Told." Fish and Wildlife News Apr-May 1982:1-2,7.
- Arrow, K. J., and A. C. Fisher. "Environmental Preservation, Uncertainty and Irreversibility." Quart. J. Econ. 55(1974):313-319.
- Bart, J., D. Allee, and M. Richmond. "Using Economics in Defense of Wildlife." Wildl. Soc. Bull. 7(1979):139-144.
- Bishop, R. C. "Endangered Species and Uncertainty: The Economics of a Safe Minimum Standard." Am. J. Agri. Econ. 60(1978):10-18.
- Bishop, R. C. "Option Value: An Exposition and Extension." Land Econ. 58(1982):1-15.
- Bishop, R. C., and T. A. Heberlein. "Simulated Markets, Hypothetical Markets, and Travel Cost Analysis: Alternative Methods of Estimating Outdoor Recreation Demand." University of Wisconsin Agricultural Economics Staff Paper No. 187 (1980).
- Bohm, P. "Estimating Demand for Public Goods: An Experiment." Europ. Econ. Rev. 3(1972):111-130.
- Bohm, P. "Estimating Willingness to Pay: Why and How?" Scand. J. Econ. (1979):142-153.
- Bowen, C. M. "Grayrocks: A New Approach to Mitigation." U.S. For. Serv. Gen. Tech. Rep. RM 65(1979):434-438.
- Brookshire, D. S., L. S. Eubanks, and A. Randall. "Valuing Wildlife Resources: An Experiment." Trans. N. Am. Wildl. Conf. 43(1978):302-310.
- _____. "Estimating Option Prices and Existence Values for Wildlife Resources." Land Econ. 59(1983):1-15.
- _____, B. C. Ives, and W. D. Schulze. "The Valuation of Aesthetic Preferences." J. Environ. Econ. Manage. 3(1976):325-346.
- _____, M. A. Thayer, W. D. Schulze, and R. C. d'Arge. "Valuing Public Goods: A Comparison of Survey and Hedonic Approaches." Am Econ. Rev. 72(1982):165-177.
- Brown, T. L., C. P. Dawson, and R. L. Miller. "Interests and Attitudes of Metropolitan New York Residents about Wildlife." Trans. N. Am. Wildl. Conf. 44(1979):289-297.
- Clawson, J. "Methods of Measuring the Demand for and Value of Outdoor Recreation." Resources for the Future reprint (1970).

- Cocheba, D. J., and W. A. Langford. "Direct Willingness-to-Pay Questions: An Analysis of Their Use for Quantitatively Valuing Wildlife." J. Leisure Res. 13(1981):311-322.
- Conrad, J. M. "Quasi-option Value and the Expected Value of Information." Quart. J. Econ. 95(1980):812-820.
- Davis, R. K. "Recreation Planning as an Economic Problem." Nat. Resources J. 3(1963):239-249.
- Davis, R. K., and J. J. Seneca. "Models for Supply and Demand Analysis in State Fish and Game Planning." Trans. N. Am. Wildl. Conf. 37(1972): 234-246.
- DeGraaf, R. M., and B. R. Payne. "Economic Values of Non-Game Birds and Some Urban Wildlife Research Needs." Trans. N. Am. Wildl. Conf. 40(1975):281-287.
- Eastman, C., P. Hoffer, and A. Randall. A Socioeconomic Analysis of Environmental Concern: Case of the Four Corners Electric Power Complex. Las Cruces, N.M.: New Mexico State University, 1974.
- Fazio, J. R., and L. A. Belli. "Characteristics of Nonconsumptive Wildlife Users in Idaho." Trans. N. Am. Wildl. Conf. 42(1977):110-128.
- Fisher, A. C., and J. V. Krutilla. "Valuing Long Run Ecological Consequences and Irreversibilities." J. Environ. Econ. Manage. 1(1974): 96-108.
- Greenley, D. A., R. G. Walsh, and R. A. Young. "Option Value: Empirical Evidence from a Case Study of Recreation and Water Quality." Quart. J. Econ. 97(1981):657-673.
- Harrington, W., and A.C. Fisher. "Endangered Species." In Current Issues in Natural Resource Policy. ed. P.R. Portney. John Hopkins Univ. Press: Baltimore, MD.
- Hay, M.J., and K.E. McConnell. "An Analysis of Participation in Non-consumptive Wildlife Recreation." Land Econ. 55(1979):460-471.
- Holden, C. "Endangered Species Net in Jeopardy." Science 215(1982): 1212-1213.
- Kellert, S.R. "Public Attitudes Toward Critical Wildlife and Natural Habitat Issues - Phase I." Progress report prepared for U.S. Fish and Wildl. Service. 1979. Contract 14-16-0009-77-056.
- King, R.T. "The Future of Wildlife in Forest Land Use." Trans. N. Am. Wildl. Conf. 12(1937):454-467.

- Krutilla, J.V. "Conservation Reconsidered." Am. Econ. Rev. 57(1967): 777-786.
- McConnell, K.E. "Existence and Bequest Value." In Managing Air Quality and Scenic Resources at National Parks and Wilderness Areas, eds. R.D. Rowe and G. Chestnut. Boulder, Colorado: Westview Press.
- Majid, L., J. Sinden, and A. Randall. (in review). "The Benefits of Increments to Existing Park Systems." Land Econ.
- Randall, A. Resource Economics: An Economic Approach to Natural Resource and Environmental Policy. Grid Publishing, Inc.: Columbus, Ohio. 1981.
- Randall, A. (in press). "Human Preferences, Economics, and Decisions about Preservation of Species."
- Randall, A., J. Hoehn, and G.S. Tolley. 1981. "The Structure of Contingent Markets: Some Results of a Recent Experiment." Presented at the American Economic Association Annual Meeting, Washington, D.C.
- Rowe, R.D., R.C. d'Arge, and D.S. Brookshire. "An Experiment on the Economic Value of Visibility." J. Environ. Econ. Manage. 7(1980):1-19.
- Sellar, C., J.R. Stoll, and Jean-Pual Chavas. "Validation of Empirical Measures of Welfare Change: A Comparison of Nonmarket Techniques." Dept. of Agricultural Economics, Texas A&M University, Resources Group Working Paper, 1983.
- Schmalensee, R. "Option Demand and Consumer's Surplus: Valuing Price Changes Under Uncertainty." Am. Econ. Rev. 62(1972):813-824.
- Schulze, W.D., D.S. Brookshire, and M.A. Thayer. "National Parks and Beauty: A Test of Existence Values." Environmental Protection Agency project report, Washington, D.C.
- Schulze, W.D., R.C. d'Arge, and D.S. Brookshire. "Valuing Environmental Commodities: Some Recent Experiments." Land Econ. 57(1981): 151-172.
- Shaw, W.W. "Meanings of Wildlife for Americans: Contemporary Attitudes and Social Trends." Trans. N. Am. Wildl. Cont. 39(1974):151-155.
- Stoll, J.R. "Recreational Activities and Nonmarket Valuation: The Conceptualization Issue." Resources group working paper, Dept. Agri. Econ., Texas A&M University, College Station.
- Stoll, J.R., and A.S. Mills. "Contingent Valuation: Origin, Procedures and Methodology." Resources group working paper, Dept. Agri. Econ., Texas A&M University, College Station.

Thayer, M.A. "Contingent Valuation Techniques for Assessing Environmental Impacts: Further Evidence." J. Environ. Econ. Manage. 8(1981): 27-44.

APPENDIX 1

TEXAS A&M UNIVERSITY

45

DEPARTMENT OF AGRICULTURAL ECONOMICS
COLLEGE STATION, TEXAS 77843



Dear Citizen:

Understanding the use of wildlife and related natural resources is an important aspect of managing resources for you and other citizens. As competition for natural resources increases, difficult questions concerning the priorities of management programs are often raised. Surveys such as this one provide useful information for assisting managers of these resources.

The enclosed questionnaire is an important part of a study at Texas A&M University which focuses on understanding people's familiarity with the whooping crane, an endangered species. Several questions also seek data on use of the Aransas National Wildlife Refuge, a Texas coastal sanctuary for many wildlife species and the wintering grounds for the only wild, breeding flock of whooping cranes.

Your responses will provide information about your experiences and background -- information which can serve as a valuable insight in guiding resource managers in the future. Special or previous knowledge about whooping cranes is not required for you to respond to this questionnaire. Any information you provide will be kept in strictest confidence. The number written on the back of the questionnaire is only to enable us to eliminate your name from our mailing list when you respond; otherwise, you would receive a reminder and an additional questionnaire in the mail. Please respond soon and help us to provide a useful research product.

If you have any questions regarding this study, please feel free to contact us at the above address or at (713) 845-2333. If you would like to receive a summary document upon completion of this study, please indicate so on the back of your questionnaire or in a separate note with your name and address, and we will be happy to mail you a copy of the results.

Thank you for your cooperation.

Sincerely,

Lee Ann Johnson
Undergraduate Fellow

John R. Stoll
Assistant Professor

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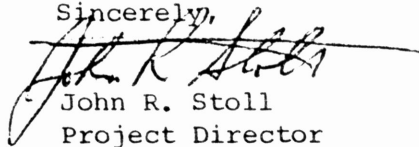
Enclosure

Last week a questionnaire concerning the whooping crane and its habitat was mailed to you. Your name was selected as part of a sample of U.S. citizens.

If you have already completed and returned it to us, please accept our sincere thanks. If not, please do so today. Because this questionnaire has been sent to only a small sample of individuals, it is extremely important that yours also be included in the study. Your participation is necessary, if the results are to provide meaningful information.

If by some chance you did not receive the questionnaire, or it got misplaced, please call me now, 713-845-2333, and I will arrange to get another one in the mail to you today.

Sincerely,

A handwritten signature in cursive script, appearing to read "John R. Stoll", written over a horizontal line.

John R. Stoll
Project Director

TEXAS A&M UNIVERSITY

DEPARTMENT OF AGRICULTURAL ECONOMICS
COLLEGE STATION, TEXAS 77843

47



Dear Citizen,

About three weeks ago we sent you a questionnaire in an effort to learn more about your familiarity with the whooping crane. As of today, we have not received your completed questionnaire.

We are conducting this study to learn how natural resource managers can better meet the needs of the public. Feedback from the users of natural resources is often unavailable to these managers. Therefore, results from surveys such as this one are important for providing useful information to set priorities for wildlife programs in the future.

We want the results of our study to accurately reflect the opinions of citizens such as yourself. For this reason, we are again requesting you to help us. Your response will enable us to provide more significant and useful results. In the event that your questionnaire has been misplaced, a replacement is enclosed.

If you would like a copy of the summary report of this study when it is completed, then please indicate so on the back of your questionnaire or in a separate note mailed to the above address. Confidentiality of all responses is guaranteed in any case.

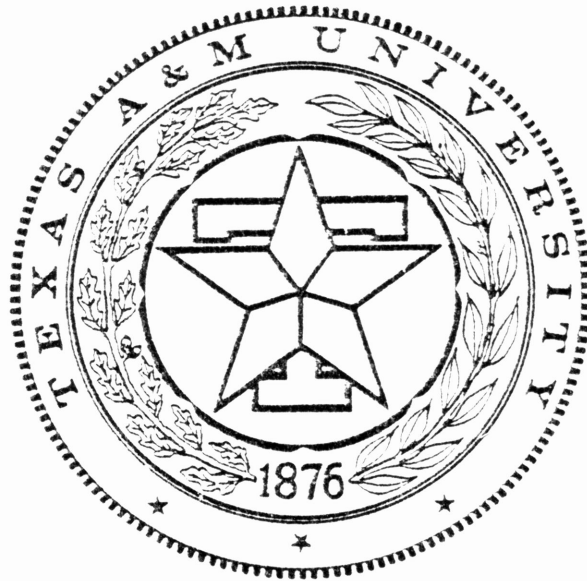
Your cooperation is greatly appreciated.

Sincerely,

Lee Ann Johnson
Undergraduate Fellow

John R. Stoll
Assistant Professor

WHOOPING CRANE SURVEY



CONDUCTED BY

Texas A&M University
Department of Agricultural Economics

You have been randomly selected to receive this questionnaire as part of a university research study. All information is confidential. The questionnaire has an identification number for mailing purposes only. This is so that we may check your name off our mailing list when your questionnaire is returned. Your name will never be placed on the questionnaire.

In order to help us determine how familiar people are with whooping cranes, we will first ask you a few general questions.

1. To the best of your knowledge, have you ever seen a live whooping crane?
(Circle number)

	1 YES 2 NOT SURE 3 NO	Please skip to Question 2
--	-----------------------------	---------------------------

- 1a. Where were you when you saw the whooping crane(s)? (Circle all numbers that apply)

- 1 ON A TOUR BOAT
- 2 AT A ZOO OR RESEARCH CENTER (Please specify where) _____
- 3 AT WOOD BUFFALO NATIONAL PARK, CANADA
- 4 ON THE ARANSAS NATIONAL WILDLIFE REFUGE, TEXAS
- 5 AT GRAY'S LAKE, IDAHO
- 6 AT BOSQUE DEL APACHE, NEW MEXICO
- 7 IN MIGRATION (Please specify where) _____

2. Have you ever encountered information on whooping cranes from any of the following sources? (Circle all numbers that apply)

- 1 TELEVISION PROGRAMS
- 2 TELEVISION COMMERCIALS
- 3 NEWSPAPER ARTICLES
- 4 MAGAZINE/JOURNAL ARTICLES
- 5 BOOKS
- 6 PAMPHLETS OR BROCHURES
- 7 MUSEUMS
- 8 NEVER ENCOUNTERED INFORMATION ABOUT WHOOPING CRANES
- 9 OTHER (Please specify) _____

The following questions ask you about previous visits to the Aransas National Wildlife Refuge in Texas.

3. Have you ever visited the Aransas National Wildlife Refuge before? (Circle number)

1 YES
2 NO → Skip to Question 7

- 3a. Please indicate the number of visits you made to the Aransas National Wildlife Refuge during each of the time intervals listed below:
(Please specify number)

1982: _____ TIMES
1981: _____ TIMES
1976-80: _____ TIMES
1971-75: _____ TIMES
1961-70: _____ TIMES
1960 or
earlier: _____ TIMES

4. What has usually been your main purpose for visiting the Aransas National Wildlife Refuge? (Circle only one number)

- 1 OBSERVE THE WHOOPING CRANES
2 OBSERVE WILDLIFE
3 CURIOSITY
4 ENJOY THE OUTDOORS
5 BIRDING
6 OUT FOR A DRIVE
7 PHOTOGRAPH WILDLIFE
8 OTHER (Please specify) _____

5. Have you ever seen a whooping crane at the Aransas National Wildlife Refuge on previous visits? (Circle number)

1 YES
2 NO → Skip to Question 6

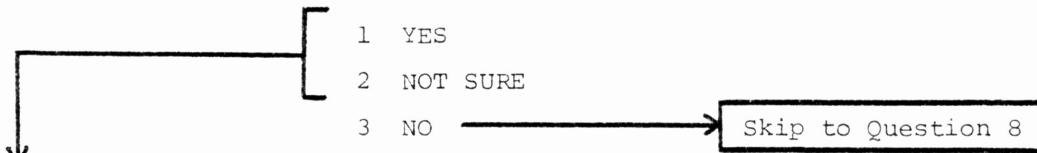
- 5a. On how many visits? (Please specify number)

_____ VISITS

6. Did you participate in any of the following activities while at the refuge on previous visits? (Circle all numbers that apply)

- 1 HIKING TRAILS
- 2 VISITING THE VISITORS' CENTER
- 3 DRIVING THE TOUR LOOP
- 4 USING THE OBSERVATION TOWER
- 5 PICNICKING
- 6 PHOTOGRAPHY
- 7 BICYCLING

7. Do you think that you might visit the Aransas National Wildlife Refuge in the future? (Circle number)



7a. How often do you think that you will visit the Aransas National Wildlife Refuge in the future? (Circle one number)

- 1 5 OR MORE VISITS PER YEAR
- 2 4 VISITS PER YEAR
- 3 3 VISITS PER YEAR
- 4 2 VISITS PER YEAR
- 5 1 VISIT PER YEAR
- 6 1 VISIT EVERY 2 YEARS
- 7 1 VISIT EVERY 3-4 YEARS
- 8 1 VISIT EVERY 5-6 YEARS
- 9 FEWER THAN 1 VISIT EVERY 6 YEARS

Resource managers are interested in predicting the amount of future interest which people will have in wildlife. The next question presents a situation which asks for your best estimate of how you would react in the given circumstances. This situation does not represent any actual policy proposals under consideration.

8. Suppose that economic pressures and policy changes resulted in a decision to no longer fund programs to maintain the whooping crane population -- a decision which would virtually insure the extinction of the whooping crane.

Suppose that an independent foundation was set up for the purchase and maintenance of refuge land so that the species might be preserved in the future. Supporting membership in the foundation would be available for \$_____ per year for each person. Future access would be set up so that only those individuals who desire to visit and who contribute to the foundation each year would have the option to use the refuge areas. These people would pay no additional fees for visitation at these refuges. Other individuals who contributed, but did not intend to visit the refuges, would still have the satisfaction that they helped preserve the whooping crane.

If a supporting membership cost \$_____ per year, would you become a member and help ensure the continued existence of the whooping cranes? (Circle number)

1 YES

Skip to Question 10

2 NO

9. Why did you answer "NO" to Question 8? (Circle one number)

1 I CAN'T AFFORD TO DONATE \$_____/YEAR

2 I DON'T THINK THAT THE WHOOPING CRANE IS WORTH \$_____/YEAR

3 I DON'T THINK THAT A PRIVATE FOUNDATION COULD EFFECTIVELY PRESERVE THE WHOOPING CRANE

4 I DISAGREE WITH THE CONCEPT OF "SPECIES MANAGEMENT"

10. Do you believe that it is important that whooping cranes continue to exist? (Circle number)

1 YES, VERY IMPORTANT

2 YES, SOME IMPORTANCE

3 NO, NOT IMPORTANT

11. If no whooping cranes were present, do you believe that it would still be important for the Aransas National Wildlife Refuge in Texas to continue to exist? (Circle number)

1 YES, VERY IMPORTANT

2 YES, SOME IMPORTANCE

3 NO, NOT IMPORTANT

Finally, a few questions about your background.

12. Do you belong to any wildlife-related or conservation organizations?
(Circle number)

1 YES
2 NO → Skip to Question 13

- 12a. Please indicate the organizations in which you maintain membership and the number of years which you have been a member.

ORGANIZATION	YEARS
_____	_____
_____	_____
_____	_____
_____	_____

13. Do you subscribe to any wildlife or natural history publications? (Circle number)

1 YES
2 NO

14. During the past year, how many times have you gone hunting and/or fishing?
(Please specify number)

_____ TIMES

15. During the past year, how many trips have you made to specifically observe or photograph wildlife? (Please specify number)

_____ TRIPS

16. Do you feed or devote time to observing wildlife at your home? (Circle number)

1 YES
2 NO

17. How many people live in your household, including yourself? (Please specify)

_____ PEOPLE

18. Please indicate your city, county and state of residence:

CITY: _____

COUNTY: _____

STATE: _____

19. In what size town do you reside? (Circle one number)

1 RURAL OR LESS THAN 5000

2 5000 TO 9999

3 10,000 TO 24,999

4 25,000 TO 99,999

5 100,000 TO 249,999

6 250,000 OR MORE

20. What is your present age? (Please specify)

_____ YEARS

21. I am: (Circle number)

1 MALE

2 FEMALE

22. What is the highest level of education you have completed? (Circle only one number)

1 NO FORMAL EDUCATION

2 SOME GRADE SCHOOL

3 COMPLETED GRADE SCHOOL

4 SOME HIGH SCHOOL

5 COMPLETED HIGH SCHOOL

6 SOME COLLEGE

7 COMPLETED COLLEGE

8 SOME GRADUATE WORK

9 A GRADUATE DEGREE

23. Which range describes your total household income for 1981? (Circle one number)

- 1 LESS THAN \$10,000
- 2 \$10,000 TO \$19,999
- 3 \$20,000 TO \$29,999
- 4 \$30,000 TO \$39,999
- 5 \$40,000 TO \$49,999
- 6 \$50,000 TO \$59,999
- 7 \$60,000 TO \$69,999
- 8 \$70,000 TO \$79,999
- 9 \$80,000 TO \$89,999
- 10 \$90,000 TO \$99,999
- 11 \$100,000 TO \$109,999
- 12 \$110,000 TO \$119,999
- 13 \$120,000 TO \$129,999
- 14 \$130,000 OR MORE

To help us in the design of future questionnaires and in assessing the accuracy of our data for this study, could you please take a minute to complete the following:

24. Were the questions worded in such a way that you were able to respond accurately? (Circle number)

- 1 THERE WAS SOME UNCERTAINTY
- 2 I WAS CERTAIN OF MY ANSWERS
- 3 I WAS UNCERTAIN OF MY ANSWERS

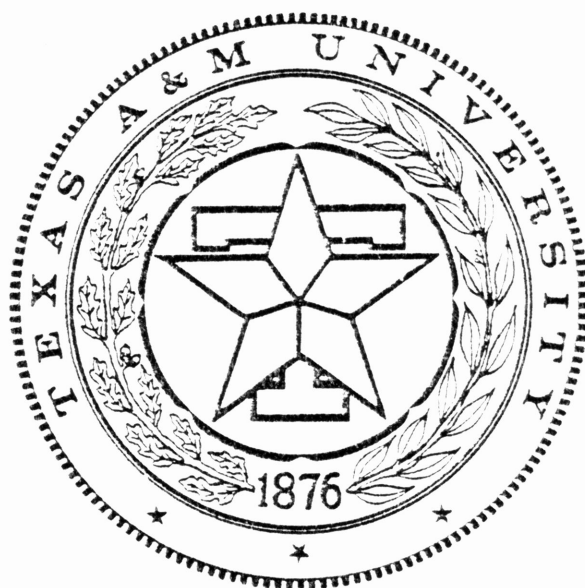
25. Do you think that question 8 presented a situation for which you could provide an accurate answer? (Circle number)

- 1 THERE WAS SOME UNCERTAINTY
- 2 I WAS CERTAIN OF MY ANSWER
- 3 I WAS UNCERTAIN OF MY ANSWER

We welcome your comments concerning endangered species, the refuge, or this questionnaire. Feel free to write us a short note about these subjects.

Thank you for your time and effort.

WHOOPING CRANE SURVEY



CONDUCTED BY

Texas A&M University
Department of Agricultural Economics

You have been randomly selected to receive this questionnaire as part of a university research study. All information is confidential. The questionnaire has an identification number for mailing purposes only. This is so that we may check your name off our mailing list when your questionnaire is returned. Your name will never be placed on the questionnaire.

In order to help us determine how familiar people are with whooping cranes, we will first ask you a few general questions.

1. To the best of your knowledge, have you ever seen a live whooping crane?
(Circle number)

1 YES

2 NOT SURE

Please skip to Question 2

3 NO

- 1a. Where were you when you saw the whooping crane(s)?
(Circle all numbers that apply)

1 ON A TOUR BOAT

2 AT A ZOO OR RESEARCH CENTER

(Please specify where) _____

3 AT WOOD BUFFALO NATIONAL PARK, CANADA

4 ON THE ARANSAS NATIONAL WILDLIFE REFUGE, TEXAS

5 AT GRAY'S LAKE, IDAHO

6 AT BOSQUE DEL APACHE, NEW MEXICO

7 IN MIGRATION

(Please specify where) _____

2. Have you ever encountered information on whooping cranes from any of the following sources? (Circle all numbers that apply)

1 TELEVISION PROGRAMS

2 TELEVISION COMMERCIALS

3 NEWSPAPER ARTICLES

4 MAGAZINE/JOURNAL ARTICLES

5 BOOKS

6 PAMPHLETS OR BROCHURES

7 MUSEUMS

8 NEVER ENCOUNTERED INFORMATION ABOUT WHOOPING CRANES

9 OTHER

(Please specify) _____

The next set of questions asks you to provide information concerning this visit to the Aransas National Wildlife Refuge.

3. What is your main purpose for this visit to the Aransas National Wildlife Refuge? (Circle only one number)

- 1 OBSERVE THE WHOOPING CRANES
- 2 OBSERVE WILDLIFE
- 3 CURIOSITY
- 4 ENJOY THE OUTDOORS
- 5 BIRDING
- 6 OUT FOR A DRIVE
- 7 PHOTOGRAPH WILDLIFE
- 8 OTHER
(Please specify) _____

4. Which term best describes the group with whom you are visiting the Aransas National Wildlife Refuge? (Circle number)

- 1 ALONE
- 2 ORGANIZED BUS TOUR OR SCHOOL GROUP
- 3 FAMILY
- 4 FRIENDS
- 5 FAMILY/FRIENDS MIXTURE
- 6 OTHER
(Please specify) _____

5. How many members of your household, including yourself, are on this visit to the refuge? (Please specify number)

_____ PEOPLE

6. What is the cost to your household of this visit to the refuge? If you are visiting more than one day during this trip, please indicate the total costs. If this visit to the refuge is part of an extended trip to other destinations, please estimate only those costs associated with visiting the refuge. (Respond for each category)

\$ _____ TOUR PACKAGE - BUS FEES, ETC.
 \$ _____ TRAVEL - INCLUDING GAS, CAR WEAR, ETC.
 \$ _____ FOOD
 \$ _____ OVERNIGHT LODGING
 \$ _____ EQUIPMENT AND SUPPLIES - INCLUDING FILM, BOOKS,
 BINOCULARS, ETC. BOUGHT SPECIFICALLY FOR THIS TRIP
 \$ _____ OTHER EXPENDITURES (Specify) _____

 \$ _____ TOTAL COST

7. How many days will you be visiting the Aransas National Wildlife Refuge on this trip? (Please specify number)

_____ DAYS

8. How much time did you spend traveling to and from the refuge? If this visit is part of an extended trip, then please give only the time required to travel to and from the refuge. (Please specify hours)

_____ HOURS

An important aspect of wildlife management is understanding the importance people attach to wildlife. The next question presents a situation which asks for your best estimate of how you would act in the given circumstances. This situation does not reflect any actual policy proposals under consideration.

9. Currently, there is no direct charge for use of the Aransas National Wildlife Refuge. Suppose that increasing costs necessitated a system of annual permits for use of the refuge. One permit would be needed for each individual visitor. If an annual permit allowing you an unlimited number of visits during a one-year period had cost \$_____, would you have purchased the permit and made this trip to the refuge? (Circle number)

1 YES

2 NO

Skip to Question 11

- 9a. Suppose that whooping cranes did not use the refuge. Would you still purchase an annual permit for \$_____ per year? (Circle number)

1 YES

2 NO

10. If no whooping cranes were present, what is the highest amount an annual permit for the Aransas National Wildlife Refuge could cost before you would stop visiting the refuge? (Please specify amount)

\$ _____ PER YEAR

Skip to Question 12

11. Why did you answer "NO" to Question 9? (Circle one number)

- 1 I CAN'T AFFORD TO PAY \$ ____/YEAR TO VISIT THE REFUGE
- 2 I DON'T THINK THAT FEES SHOULD BE CHARGED TO USE NATURAL RESOURCES
- 3 I DON'T THINK THAT VISITING THE REFUGE IS WORTH \$ ____/YEAR
- 4 I DON'T THINK USE PERMITS SHOULD EVER BE SOLD

12. When did you complete this portion of the questionnaire? (Circle number)

- 1 BEFORE TOURING THE REFUGE Skip to Question 13
- 2 AFTER TOURING THE REFUGE

- 12a. Did you see a whooping crane while touring the refuge? (Circle number)

- 1 YES
- 2 NO

- 12b. Did you participate in any of the following activities while touring the refuge? (Circle all numbers that apply)

- 1 HIKING TRAILS
- 2 VISITING THE VISITORS' CENTER
- 3 DRIVING THE TOUR LOOP
- 4 USING THE OBSERVATION TOWER
- 5 PICNICKING
- 6 PHOTOGRAPHY
- 7 BICYCLING

The following questions ask you about previous visits to the Aransas National Wildlife Refuge in Texas.

13. Have you ever visited the Aransas National Wildlife Refuge before?
(Circle number)

1 YES

2 NO

Skip to Question 17

- 13a. Please indicate the number of visits you made to the Aransas National Wildlife Refuge during each of the time intervals listed below: (Please specify number)

1982: _____ TIMES

1981: _____ TIMES

1976-80: _____ TIMES

1971-75: _____ TIMES

1961-70: _____ TIMES

1960 or
earlier: _____ TIMES

14. What has usually been your main purpose for visiting the Aransas National Wildlife Refuge? (Circle only one number)

1 OBSERVE THE WHOOPING CRANES

2 OBSERVE WILDLIFE

3 CURIOSITY

4 ENJOY THE OUTDOORS

5 BIRDING

6 OUT FOR A DRIVE

7 PHOTOGRAPH WILDLIFE

8 OTHER

(Please specify) _____

15. Have you ever seen a whooping crane at the Aransas National Wildlife Refuge on previous visits? (Circle number)

1 YES

2 NO

Skip to Question 16

- 15a. On how many visits? (Please specify number)

_____ VISITS

16. Did you participate in any of the following activities while at the refuge on previous visits? (Circle all numbers that apply)

- 1 HIKING TRAILS
- 2 VISITING THE VISITORS' CENTER
- 3 DRIVING THE TOUR LOOP
- 4 USING THE OBSERVATION TOWER
- 5 PICNICKING
- 6 PHOTOGRAPHY
- 7 BICYCLING

17. Do you think that you might visit the Aransas National Wildlife Refuge in the future? (Circle number)

- 1 YES
- 2 NOT SURE
- 3 NO

Skip to Question 18

17a. How often do you think that you will visit the Aransas National Wildlife Refuge in the future? (Circle one number)

- 1 5 OR MORE VISITS PER YEAR
- 2 4 VISITS PER YEAR
- 3 3 VISITS PER YEAR
- 4 2 VISITS PER YEAR
- 5 1 VISIT PER YEAR
- 6 1 VISIT EVERY 2 YEARS
- 7 1 VISIT EVERY 3-4 YEARS
- 8 1 VISIT EVERY 5-6 YEARS
- 9 FEWER THAN 1 VISIT EVERY 6 YEARS

Resource managers are interested in predicting the amount of future interest which people will have in wildlife. The next question presents a situation which asks for your best estimate of how you would react in the given circumstances. This situation does not represent any actual policy proposals under consideration.

18. Suppose that economic pressures and policy changes resulted in a decision to no longer fund programs to maintain the whooping crane population -- a decision which would virtually insure the extinction of the whooping crane.

Suppose that an independent foundation was set up for the purchase and maintenance of refuge land so that the species might be preserved in the future. Supporting membership in the foundation would be available for \$ _____ per year for each person. Future access would be set up so that only those individuals who desire to visit and who contribute to the foundation each year would have the option to use the refuge areas. These people would pay no additional fees for visitation at these refuges. Other individuals who contributed, but did not intend to visit the refuges, would still have the satisfaction that they helped preserve the whooping crane.

If a supporting membership cost \$ _____ per year, would you become a member and help ensure the continued existence of the whooping cranes? (Circle number)

- | | |
|-------|---------------------|
| 1 YES | Skip to Question 20 |
| 2 NO | |

19. Why did you answer "NO" to Question 18? (Circle one number)

- 1 I CAN'T AFFORD TO DONATE \$ _____ /YEAR
- 2 I DON'T THINK THAT THE WHOOPING CRANE IS WORTH \$ _____ /YEAR
- 3 I DON'T THINK THAT A PRIVATE FOUNDATION COULD EFFECTIVELY PRESERVE THE WHOOPING CRANE
- 4 I DISAGREE WITH THE CONCEPT OF "SPECIES MANAGEMENT"

20. Do you believe that it is important that whooping cranes continue to exist? (Circle number)

- 1 YES, VERY IMPORTANT
- 2 YES, SOME IMPORTANCE
- 3 NO, NOT IMPORTANT

21. If no whooping cranes were present, do you believe that it would still be important for the Aransas National Wildlife Refuge in Texas to continue to exist? (Circle number)

- 1 YES, VERY IMPORTANT
- 2 YES, SOME IMPORTANCE
- 3 NO, NOT IMPORTANT

Finally, a few questions about your background.

22. Do you belong to any wildlife-related or conservation organizations?
(Circle number)

1 YES

2 NO

Skip to Question 23

- 22a. Please indicate the organizations in which you maintain membership and the number of years which you have been a member.

ORGANIZATION	# OF YEARS
_____	_____
_____	_____
_____	_____
_____	_____

23. Do you subscribe to any wildlife or natural history publications?
(Circle number)

1 YES

2 NO

24. During the past year, how many times have you gone hunting and/or fishing?
(Please specify number)

_____ TIMES

25. During the past year, how many trips have you made to specifically observe or photograph wildlife? (Please specify number)

_____ TRIPS

26. Do you feed or devote time to observing wildlife at your home? (Circle number)

1 YES

2 NO

27. How many people live in your household, including yourself? (Please specify)

_____ PEOPLE

28. Please indicate your city, county and state of residence:

CITY: _____

COUNTY: _____

STATE: _____

29. In what size town do you reside? (Circle one number)

1 RURAL OR LESS THAN 5000

2 5000 TO 9999

3 10,000 TO 24,999

4 25,000 TO 99,999

5 100,000 TO 249,999

6 250,000 OR MORE

30. What is your present age? (Please specify)

_____ YEARS

31. I am:

1 MALE

2 FEMALE

32. What is the highest level of education you have completed? (Circle only one number)

1 NO FORMAL EDUCATION

2 SOME GRADE SCHOOL

3 COMPLETED GRADE SCHOOL

4 SOME HIGH SCHOOL

5 COMPLETED HIGH SCHOOL

6 SOME COLLEGE

7 COMPLETED COLLEGE

8 SOME GRADUATE WORK

9 A GRADUATE DEGREE

33. Which range describes your total household income for 1981? (Circle one number)

- 1 LESS THAN \$10,000
- 2 \$10,000 TO \$19,999
- 3 \$20,000 TO \$29,999
- 4 \$30,000 TO \$39,999
- 5 \$40,000 TO \$49,999
- 6 \$50,000 TO \$59,999
- 7 \$60,000 TO \$69,999
- 8 \$70,000 TO \$79,999
- 9 \$80,000 TO \$89,999
- 10 \$90,000 TO \$99,999
- 11 \$100,000 TO \$109,999
- 12 \$110,000 TO \$119,999
- 13 \$120,000 TO \$129,999
- 14 \$130,000 OR MORE

To help us in the design of future questionnaires and in assessing the accuracy of our data for this study, could you please take a minute to complete the following:

34. Were the questions worded in such a way that you were able to respond accurately? (Circle number)

- 1 THERE WAS SOME UNCERTAINTY
- 2 I WAS CERTAIN OF MY ANSWERS
- 3 I WAS UNCERTAIN OF MY ANSWERS

35. Do you think that questions 9 and 18 presented situations for which you could provide accurate answers? (Circle number)

- 1 THERE WAS SOME UNCERTAINTY
- 2 I WAS CERTAIN OF MY ANSWERS
- 3 I WAS UNCERTAIN OF MY ANSWERS

We welcome your comments concerning endangered species, the refuge, or this questionnaire. Feel free to write on the back of this questionnaire booklet.

Thank you for your time and effort.

Range of Bid Values

Use (Q9, refuge)

\$ 1
5
10
15
20
25
30
35
40
45
50
55
60
65
70

Option/Existence (Q18, refuge)
(Q8, mail)

\$ 1
5
10
15
20
25
30
35
40
50
60
70
80
90
100
115
130