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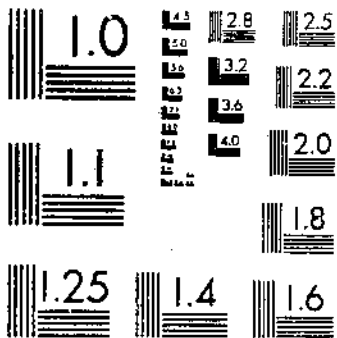
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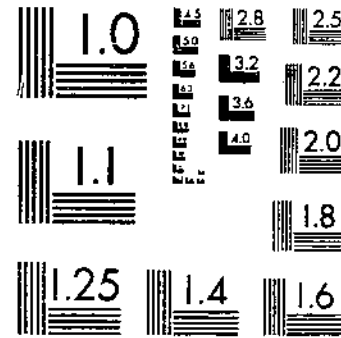
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MEASURING PUBLIC ATTITUDES TOWARD NATURAL RESOURCE ISSUES COYOTE CONTROL  
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A



MICROCOPY RESOLUTION TEST CHART  
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MEASURING PUBLIC ATTITUDES TOWARD NATURAL RESOURCE ISSUES:  
COYOTE CONTROL, Louise M. Arthur. Natural Research Economics  
Division, Economic Research Service, U. S. Department of  
Agriculture. Technical Bulletin No. 1657.

#### ABSTRACT

A method to obtain quantitative information on public attitudes toward natural resource issues is described. The quantification depends on the structure of the entire survey instrument as well as on individual items in the survey. Items are designed and organized to facilitate (1) the summarizing of measured attitudes toward very complex resource issues, and (2) meaningful comparisons of the summary attitudinal measures to other quantified impacts -- economic and physical -- for policy analysis. A U.S. Department of Agriculture and U.S. Fish and Wildlife Service study of the costs and benefits of coyote control illustrates the quantification process.

Key words: Public opinion surveys, questionnaire design, coyotes, environmental evaluation, predator control.

#### ACKNOWLEDGMENTS

The author appreciates the data and consultation from the U.S. Fish and Wildlife Service, U.S. Department of Interior; the efforts of E. Carpenter and W. Shaw (University of Arizona), and R. Gum and R. Stuby (ERS/USDA) in designing the coyote control survey instrument; and the helpful comments of L. Anderson, L. Llewellyn, W. Wilson, and other reviewers of this manuscript.

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STATISTICAL NOTE

Differences in means were all statistically significant at the 95-percent confidence level, unless otherwise noted.

# Measuring Public Attitudes Toward Natural Resource Issues: Coyote Control

Louise M. Arthur\*

## INTRODUCTION

The concept of public involvement in decisions affecting the public is inherent in the democratic process. Yet, only recently have Government officials begun to seek more reliable and informative public inputs concerning natural resource policy issues. Opinion polls are now being conducted on a broader range of politically sensitive resource topics, such as timber harvesting (14), fish and game management (2), water pollution (19), and coyote control (5). 1/

This paper describes and illustrates a process to obtain quantitative measures of public attitudes toward resource issues. The first step is to create a method to obtain public inputs, a survey in this case. The process then involves organizing and summarizing measures of attitudes toward the many aspects of complex issues and comparing the summary attitudinal measure(s) to other quantified impacts in a meaningful way. A U.S. Department of Agriculture and U.S. Fish and Wildlife Service study of the costs and benefits of coyote control (18) illustrates the quantification process.

## Peculiarities of Resource Related Surveys

Many public opinion polls, such as those dealing with preferences for political candidates, provide only cursory evaluations of given issues; a few direct questions are asked of very limited samples. The complexities of most natural resource issues require more detailed analyses, especially if the information obtained is to be useful in the decision-making process. The information must also be reliable (that is, similar results should appear when the survey is repeated), valid (what is really being measured?), relevant to the issue, and communicated to decisionmakers in an efficient and effective manner.

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1/ Underscored numbers in parentheses refer to items listed in References section.

Careful sampling and questionnaire design is vital in maintaining reliability and validity. <sup>2/</sup> Basic survey design is the subject of a vast social psychology and political science literature, so it will not be discussed here (see (35) and bibliography therein). This paper focuses on other data needs more directly related to natural resource policy decisionmaking.

Quantitative information is emphasized here because resource planning is often based on economic models. Such information (desirable in other problem areas as well) becomes crucial when decisions are based on benefit-cost ratios or similar measures of economic feasibility.

Information that cannot be quantified cannot easily be included in quantitative decision frameworks and, thus, may not be properly considered in the decisionmaking process. Most major impacts of resource plans can be quantified and even expressed in tangible dollar terms. Knowing the reliability of these physical and economic measures, decisionmakers may be unwilling to give presently unquantified measures of impact as much weight in their decisions. Thus, it may be more practical to quantify the "intangible" and currently unquantified impacts than to redesign the entire decisionmaking framework to make the tangible and intangible impacts more comparable. The quantification of intangibles might, in fact, increase the reliability and accuracy of the estimates of intangible or nonmonetary impacts.

#### Attitudinal Information Needs

Information needs of decisionmakers must be determined before a method of measuring public attitudes on natural resource issues is selected. Information needs usually include: (1) identification of the relevant public, (2) range and distribution of relevant attitudes within the population, (3) types of active interest groups that exist or might emerge, (4) a general measure of majority preference toward various aspects of an issue, (5) a single measure of general public response to a whole policy package, and (6) comparisons of the relative magnitudes and importance of economic, physical, and attitudinal impacts.

The first three information categories can be obtained from any well-designed attitudinal study, though quantitative measures facilitate compilation and efficient communication of the results. The latter three categories, on the other hand, require quantitative results--or at least quantitative

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<sup>2/</sup> Questionnaires can be designed to solicit public attitudes on even the most complex of issues, although some disagree (9).

evaluation or scaling of the results--and a means of aggregating responses to many aspects of an issue. The aggregation scheme selected will dictate the level of scaling needed. In most cases, at least interval measures are desirable so that averaging and weighting techniques can be utilized. Methods are available for transforming categorical and ordinal data into interval scales (9, 10), but interval and even ratio measures of attitudes also can be obtained directly from the public (14, 19, 31). The directness and efficiency of the latter approach justified its use in this study.

The classical view is that individual welfare functions cannot be aggregated. But, some researchers have found that aggregation is meaningful if intransitive preferences are prevented from occurring (9, 12) and ratio scales are used. Ratio-scaled data answer questions regarding order as well as strength of preference. The survey described here was designed to yield ratio measures so that aggregate preferences could be measured. 3/

In the coyote control study, all respondents were considered equally important in determining an overall public preference value for a given policy alternative, but all aspects of given policy were not treated as equally important. 4/ Rather, respondents judged the relative importance of various aspects of the problem and their individual ratings were aggregated into an overall measure of preference (number 5 in the list of information needs above) which, in turn, could be compared to nonattitudinal impacts of that policy (number 6 above). SQPI--the System for a Quantified Planning Inquiry (4)--provided the framework for measuring and aggregating attitudes toward coyote control. Other measurement and aggregation systems are also attractive and feasible, but SQPI will be used for this exposition because many of the critical components contained in the other systems are also found in SQPI.

SYSTEM FOR A  
QUANTIFIED PLANNING  
INQUIRY

SQPI evolved directly from the work of the Technical Committee of the Water Resource Center of the Thirteen Western States (32). Its "TECHOM" System attempts to quantify an extremely comprehensive set of attitudes toward social problems, but SQPI focuses on attitudes toward natural resource or environmental quality issues.

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3/ Whether or not preferences do in fact have ratio characteristics has been addressed and supported by the developers of the scaling technique; see (15, 16, 20, 22, 30, 33).

4/ Other weighting schemes are possible if general public perceptions are not requested. For instance, people who are more likely to become actively involved in an interest group could be given more weight.



The first step of SQPI (or any measurement-aggregation system) is to identify the perceptual or attitudinal impacts related to the issue. Some of the identifications will be dictated by law or convention or by the interests of the sponsors of the study, but others may be based on public definitions of conceptually related issues. Thus, the first stage of SQPI requires public input. This input can be formal (such as a public hearing or survey) or informal, depending on the amounts of prior research in the area and the type of information desired by policymakers. Important perceptual impacts of coyote control policies were easily identified due to the extensive media coverage and special interest group involvement in the issue. The more obvious impacts included: (1) unintentional killing of animals other than coyotes, (2) animal suffering (sheep or coyote, inflicted by man or animal), (3) possible extinction or proliferation of the coyote, (4) economic impacts (public perceptions thereof) on producers and consumers of sheep products, (5) ecological disruption or enhancement, and (6) tax changes.

Some of these impacts (and others in the survey, see app. A) are only tangentially related to the coyote control issue, but public responses to them could provide information for explaining the bases of varying attitudes toward more directly related impacts of control.

The second step of SQPI is to select impacts directly related to coyote control and organize them into a hierarchy in which abstract impacts are disaggregated into more specific impacts. <sup>5/</sup> This disaggregation further ensures the identification and consideration of all relevant impacts, but its primary purpose is to organize the impacts so that measures of the more easily quantifiable impacts can be aggregated into more abstract, summary measures of impact. The most general impact will be termed socioenvironmental impact, as it concerns both social impacts and social perceptions of environmental impacts. A hierarchy of socioenvironmental impacts for coyote control is presented in figure 1.

The only step needed to complete the hierarchy is to link the lowest level, perceived impacts to quantitative physical changes which underlie the perceived changes (the social indicators in fig. 1). The necessary indicator-impact linkages are mathematical functions describing the perceived change when actual changes in a social indicator occur. For

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<sup>5/</sup> The hierarchy consists only of a conceptual organization of goals and is not meant to signify their importance. Importance will be measured in later steps of SQPI. Rules for establishing the hierarchy can be found in (4) and (32).

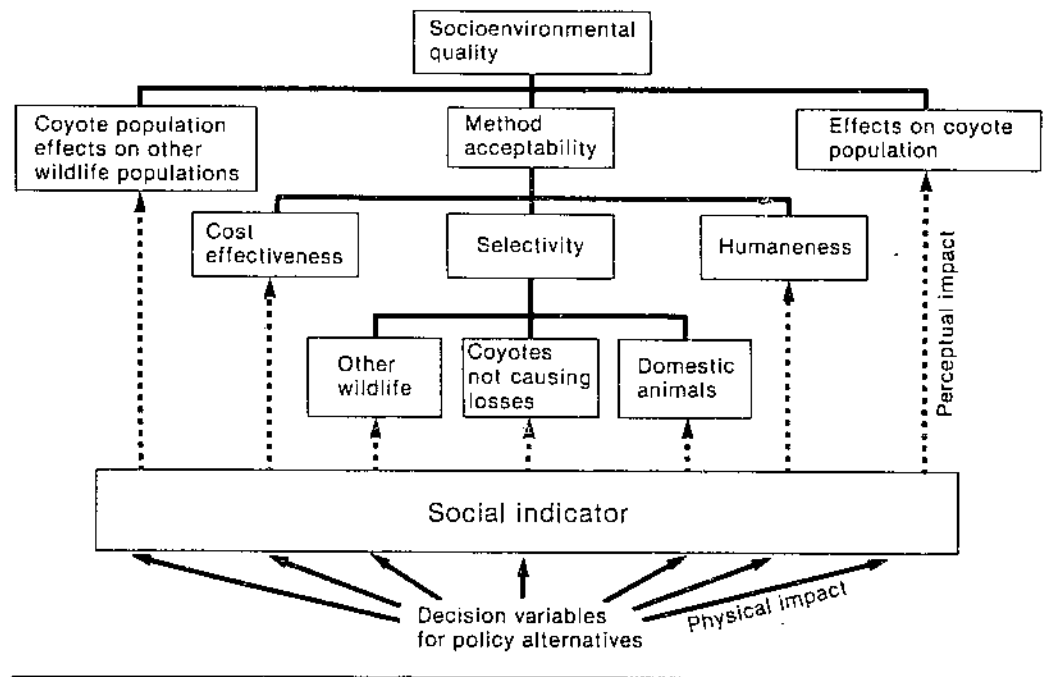
example, the social indicator for the cost component of method acceptability (fig. 1) might be dollar expenditures for control; the indicator-impact link, then, could be linear (that is, cost is perceived to increase linearly with dollars spent), logarithmic, exponential, or any number of other functional forms. The function can be derived from empirical studies (1) or, when empirical studies are lacking, may have to be based on the consensus of a panel of experts (6, 13).

Public Involvement

The stage is now set for direct public involvement in the evaluation process. As natural resource policies are often extremely complex and the alternatives myriad, public respondents in the coyote control study were not asked to judge the worth of every policy alternative, nor were they expected to understand the specific impacts of each. Rather, they were asked to express the importance to themselves personally of various environmental and economic changes that could take place given an unspecified change in control policy. For instance, respondents were not expected to know the costs, success rates, or hazards to other wildlife of aerial gunning, but were asked only to indicate which costs, success rates,

Figure 1

**Hierarchy of socioenvironmental impacts, social indicators, and decision variables**



or hazards to other wildlife concerned them most and by how much. Then, based on estimates of the actual physical or economic impacts of a given control strategy, the relationship of actual changes to perceived change, and public preferences for various combinations of changes, the socioenvironmental impacts are estimated.

The nature of SQPI's hierarchical aggregation placed constraints on the methodology that could be used to measure the relative importance of the various impact categories. The function selected to aggregate lower level impacts into more general impacts was the Cobb-Douglas or power function:

$$P = cX_n^{e_n}$$

where  $P$  is a measure of impact in the level of the hierarchy just above  $X$ , that is,  $P = f(X_1, X_2, \dots, X_n)$ ;  $X_n$  is a measure of impact on the  $n^{\text{th}}$  component of  $P$ ;  $c$  is an arbitrary constant; and  $e_n$  is a weight reflecting the public's perceptions of importance of  $X_n$  in determining  $P$ . The sum of the  $e_n$  components must equal 1.

The so-called power law, "equal stimulus ratios produce equal subjective ratios," has been supported numerous times for physical stimuli (16, 24, 29, 34), but Stevens (30) and others have extended the application to value judgments (15, 16, 20). Linear, factor analytic, and root-mean square aggregation schemes have been shown to be insensitive to the weights; results have not been significantly different from additive, unweighted functions (21, 28, 36). Because SQPI defines measures of impact as perceived measures, they must be sensitive to the varying perceptions of different populations (that is, conflicting interest groups, professionals, public). Given this required sensitivity to perceptual differences, the wealth of support for the power function as a means of aggregating preferential judgments into more general measures of preference (see also 19, 23), and the lack of support for other functional forms, the power function has become an important component of SQPI.

The sum of the exponents in the Cobb-Douglas function must equal 1, reflecting the reliance of SQPI on ratio measures of preference. Several ratio scaling techniques are adaptable for SQPI application; for example, Thurstone Paired Comparisons with Rational Origin Assumption (33), Comrey Paired Allocation Test (11), and Metfessel's General Allocation Test (25). Because earlier tests have indicated that all techniques yield similar results (22), Metfessel's test was selected for its straightforward approach and ease of use. The method can be

used for even the most extensive and general of public surveys (see 5), for it requires little time and is easily understood (if specific instructional aids are provided), yet it yields direct ratio measures of the importance of environmental impacts.

In Metfessel's General Allocation Test, respondents were asked to distribute or allocate 100 points among the various environmental impacts. For instance, 100 points could be distributed among the three components of control method acceptability (fig. 1) in a manner that represents respondents' perceptions of the importance of each component relative to other components. Hypothetical responses for four subjects might be:

	Subjects			
	1	2	3	4
	Number of points out of 100			
Cost	0	50	60	33.3
Selectivity	0	50	20	33.3
Humaneness	100	0	20	33.3

Subject 4 believes all the aspects are equally important in determining the acceptability of a control method, while subject 1 believes only humaneness is important and subject 2 feels humaneness is not important at all. These point allocations provide the weights or exponents for the aggregation (Cobb-Douglas) equations.

Distributing points among two or three stimuli is quite simple for most respondents, especially if they are first asked to rank the stimuli for importance. Lists of more than four stimuli usually can be avoided by breaking the list into subsets with common elements and then mathematically adjusting the separate allocations to obtain a single distribution of 100 points. Some examples are discussed below.

#### The Coyote Control Survey Design

Data for the coyote control survey were obtained in May and June 1976 from telephone interviews with persons selected in a stratified probability sample of households in the 48 contiguous States and the District of Columbia (see 31 for more details on the sampling techniques). To avoid biased responses on more general issues, specific interest in issues pertaining to coyotes and sheep was mentioned following a battery of questions about treatment, use, and affinity toward

other domestic and wild animals. The questions directly relating to the SQPI hierarchy (fig. 1) and, using Metfessel's allocation method, were interspersed with questions designed to measure the stability of respondents' judgments (for instance, their knowledge base), reasons for varying attitudes (are, for example, place of residence, attitude towards hunting, and vegetarianism related to attitudes toward control?), and respondents' attitudes toward other control related issues. These questions and their results are presented later in this paper.

The first Metfessel item did not contribute to the SQPI hierarchy and thus the ratio nature of the scaling was not important. But, it was designed as a tradeoff to serve as a warmup on the Metfessel procedure. In addition, it provided information on the public enjoyment of various aspects of wildlife.

The precise wording of the question is given in Appendix A (questions 3 to 8) and the mean points distributed are listed in table 1. Because this was the first point allocation question in the survey, instructions were quite extensive and carefully designed. Respondents quickly adapted to the procedure, however, and needed little guidance on the questions that followed (although guidance was written into the survey and used when needed).

The mean point allocations show that respondents tended to enjoy viewing animals in person or in pictures more than hunting them or knowing they exist. This general trend

Table 1--Relative enjoyment of three aspects of wildlife <sup>1/</sup>

Aspect <sup>1/</sup>	Mean points
	<u>Points</u>
Viewing wildlife	52.22
Knowing wildlife exists	36.65
Hunting wildlife	9.58
Total	99.45 <sup>2/</sup>

<sup>1/</sup> See figure 1.

<sup>2/</sup> Does not add to 100 because of rounding error.

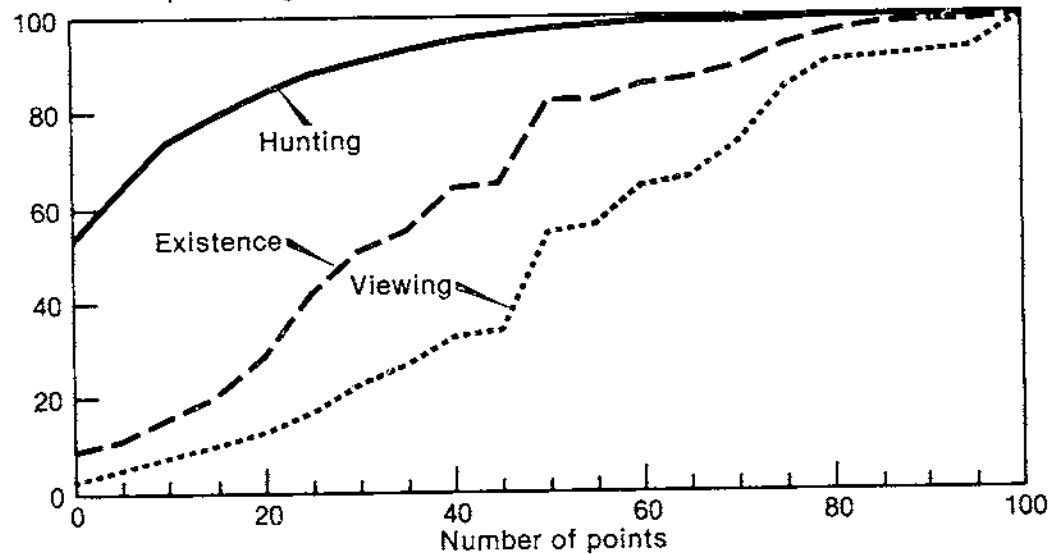
provides no information concerning the range of preferences, however; did everyone prefer viewing to hunting wildlife? The distribution of point allocations to enjoyment of hunting animals, viewing them, and knowing they exist is presented in figure 2.

Over half the respondents allocated no points to hunting and over 90 percent allocated less than a third of the 100 points to hunting (fig. 2). <sup>6/</sup> Only 2 to 3 percent gave hunting more than 50 points. The distribution of responses to enjoyment of viewing animals provides a contrasting picture. Over 75 percent of the respondents gave viewing more than a third of the points, and nearly half allocated 50 or more points to viewing. These results reflect not only the large proportion of respondents who disapprove of hunting (45 percent, see 27), but corroborate other findings that suggest hunters are as interested (or more interested) in aesthetic and ecological values of wildlife as in the actual hunting experience (2, 3).

Figure 2

### Distribution of point allocations to enjoyment of three aspects of wildlife

Cumulative percentage of respondents



<sup>6/</sup> Refusals to respond and responses of "don't know" are not included in the percentages, but usually comprised much less than 1 percent of all cases.

A second point distribution item further reinforced the Metfessel procedure and introduced the issue of killing coyotes and sheep. This item and all the attitudinal questions that followed treated the coyote-sheep issue in particular and were presented only to respondents who had heard of the rancher-environmentalist controversy over control (question 17, app. A) and/or thought it to be an important issue (questions 18-20, app. A). <sup>7/</sup>

Respondents who expressed no knowledge of the issue and said it was not an important one were not expected to have any stable attitudes toward specific aspects of control (see 8). Nearly two-thirds of the sample had heard of this regional issue (most sheep and lamb predation occurs in the West) or judged it to be important (see below and 18). These 1,321 people comprised the sample for the SQPI related items discussed below.

#### Results of SQPI Items

The most concrete impacts of the SQPI hierarchy (fig. 1), those dealing with the accidental deaths of nontarget animals, were treated first in the survey. Point allocations reflecting relative concerns for the accidental deaths of domestic animals such as dogs and other pets, coyotes that have not killed sheep and lambs, and other wild animals of various kinds are presented in figure 3 and table 2. Control killing of nontarget coyotes caused the least concern, with over 50 percent of the respondents allocating less than 20 points to this concern, and less than 3 percent allocating more than 50 points. There was little differentiation between the two greater concerns--killing of wildlife and domestic animals.

Accidental killing of nontarget animals is one of three impacts of control strategies that determine the acceptability of the strategies. Figure 4 and table 2 show people's judgments of the importance of this selectivity factor relative to two other concerns, humaneness (that is, how much animal suffering is incurred) and costs of control. Seventy-five percent of the respondents assigned 20 or fewer points to the cost factor, while 75 percent assigned 70 or more points to humaneness. Concern for the selectivity factor fell between that for cost and for humaneness.

The method acceptability factor is, in turn, only one of several factors contributing to the environmental quality of a control strategy. Other factors identified in this study include the extent of the control effort--for instance, how many coyotes are killed or lambs saved--and the impacts of

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<sup>7/</sup> Sociodemographic items comprised the final section of the survey and were presented to all respondents.

Figure 3

### Distribution of responses to relative concern over accidental killing of three classes of animals

Cumulative percentage of respondents

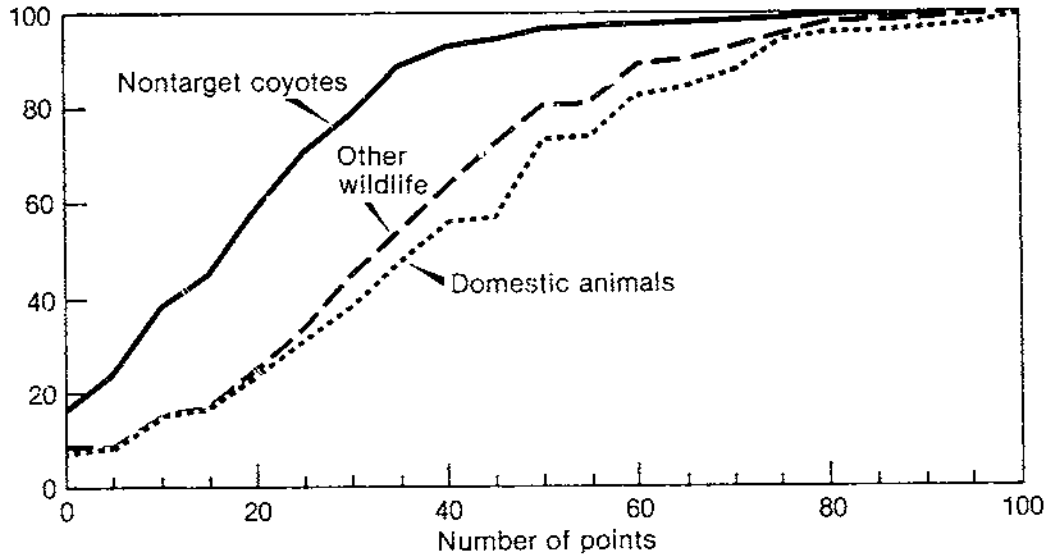
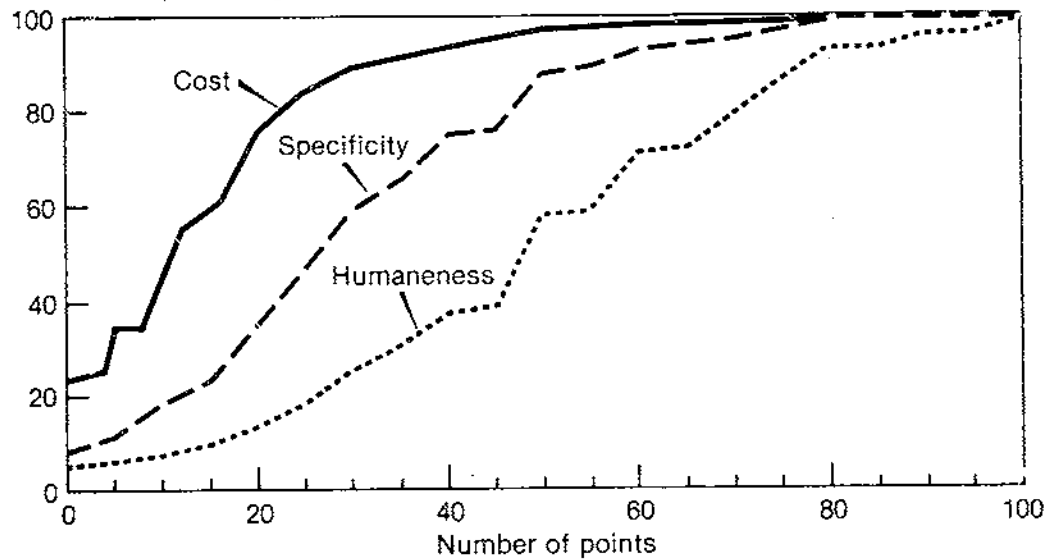


Figure 4

### Distribution of point allocations reflecting relative importance of cost, humaneness, and specificity of control methods

Cumulative percentage of respondents





coyote populations on other wildlife populations (such as competition for food and territory, any predation of other species). Because these more abstract concepts are more difficult for people to comprehend and compare, preferences for these components of environmental quality were solicited in two tradeoff items. One item required relative concerns for the number of coyotes killed (extent of control) and the methods used to kill them (method acceptability). The second requested relative concerns for coyote (extent of control) and deer populations (chosen to represent secondary impacts on other wildlife populations). Distributions of responses to these two items are shown in figure 5, while table 2 presents the mean responses, adjusted to show tradeoffs among the three components of environmental quality (extent of control was used as the common factor). Both means and distributions

Table 2--Relative importance of socioenvironmental impacts, as viewed by respondents to the national survey

Impacts <sup>1/</sup>	Mean points allocated
	<u>Points</u>
Primary impacts:	
Coyote population impacts on other wildlife populations	46
Method acceptability	30
Extent of control	24
Total	100
Acceptability subimpacts:	
Cost	16
Specificity	32
Humaneness	52
Total	100
Specificity subimpacts:	
On domestic animals	42
On coyotes not causing losses	20
On other wildlife	38
Total	100

<sup>1/</sup> See figure 1 for structure.

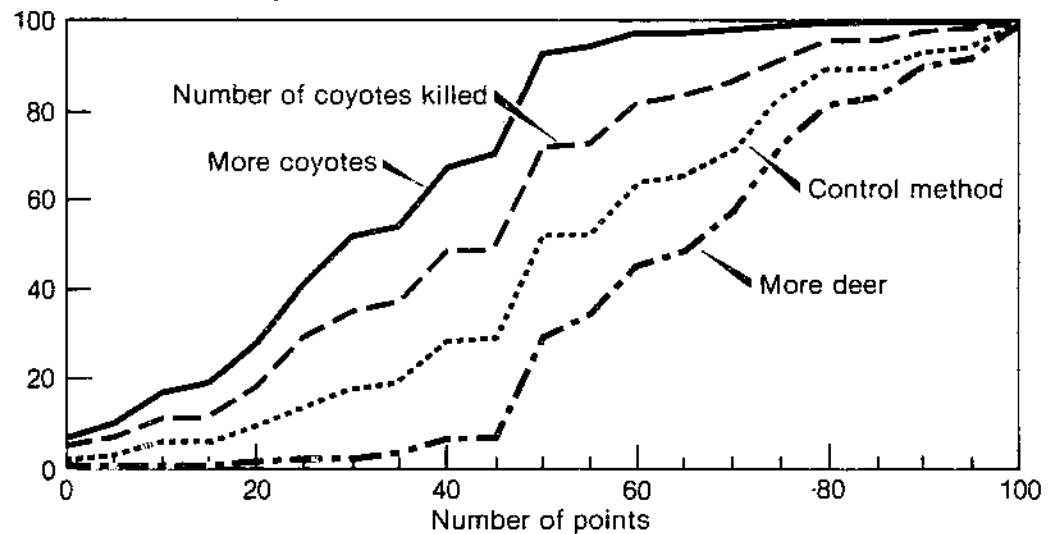
reveal that coyote populations were judged more important than even the methods used to kill coyotes. 8/

These three question sets, then, address all of the control impacts listed in the SQPI hierarchy in figure 1. From responses to these questions and measures of the actual impacts of use of certain levels and methods of control, public responses to proposed control strategies can be anticipated. In general, examination of figures 3, 4, and 5 reveals that a control policy consisting of humane and selective methods and having minimal impacts on nontarget wildlife populations would likely be preferred to one that kills many coyotes at a low cost but is hazardous to other species and is inhumane. 9/

Figure 5

**Distribution of point allocations reflecting relative concern for coyote populations, deer populations, and methods of control used<sup>1</sup>**

Cumulative percentage of respondents



<sup>1</sup>See appendix A, questions 40 and 41, for exact wording.

8/ Responses to question 11, discussed below, reveal that the deer was liked more than most other wild animals and considerably more than coyotes. Thus, this particular measure of concern for "other wildlife populations" may have involved some upward bias.

9/ Impacts were defined in terms of changes in coyote populations. Extremely large or small populations were assumed to cause the most ecological disruption and, thus, indirect impacts on other species (18).

Many control questions remain unanswered, however. For example, which methods cause the most suffering of the target animal? Why are people generally less concerned about coyote than other animals? What are the characteristics of people with conflicting stances on control issues? These and many other questions were addressed in the remainder of the survey.

BACKGROUND  
ATTITUDINAL  
INFORMATION

Although the necessity of quantifying information on respondents' characteristics and attitudes other than those needed for the SQPI analysis is not as binding, quantitative outputs again provide distinct advantages. Quantitative outputs facilitate the coding and retrieval of results; in this study, the interviewer typed numerical responses into a computer storage facility where they remain instantly available on tape. Quantitative outputs also provide potential for more sophisticated data analysis and efficient and effective communication of results. Means, standard deviations, and distributions can be easily calculated and interpreted. Tests of reliability, validity, intercorrelation, and statistical significance can be performed, as well as procedures that group respondents with similar response profiles or predict responses to changing or emerging issues. Therefore, quantitative measures were used wherever possible in the coyote control study. Some items are, of course, categorical by nature--sex and place of residence, for example--but even these can be used as "dummy variables" (26) in analyses designed to take advantage of the sociodemographic responses.

The first attitudinal questions in the survey treated respondents' attitudes toward wild and domestic animals. These more general questions were asked first so that responses to them would not be biased by their association with control issues. These questions were included to facilitate measurement and/or prediction of the attitudes toward control of the following groups: (1) respondents indicating prior knowledge of the rancher-environmentalist controversy over control, (2) those indicating no prior knowledge, but expressing concerns over the issue, and (3) those with no prior knowledge nor interest in the issue (questions 17-20, app. A). The first group, anticipated to be quite small due to the regional importance of the issue, would be expected to display the most stable attitudes toward control, while the second group would be expressing opinions on a topic which they had not considered previously. These newly formed opinions should, however, be consistent with the respondents' basic value systems and attitudes toward related issues. Measurement of both general wildlife attitudes and control attitudes for informed and uninformed/concerned respondents enhances the ability to test confidence in the reliability of the measures of control attitudes.

As noted earlier, the third group of respondents--those who had not heard about the controversy and did not believe it to be important--were not asked the control questions. The general attitudinal questions were used to provide information concerning the reasons for this group's lack of interest in the issue (that is, how do wildlife attitudes of this group differ from those of the other two groups?) and predictions of possible stances on the issue should it increase in notoriety and importance. The increasing political sensitivity of environmental issues has made anticipation of public responses a highly desirable objective.

Question 1:  
Capturing Interest

The first question, designed to be easily understood, quickly answered, and interest-generating, asked respondents which TV shows about wild animals they had watched in the past few months. The information retrieved was not particularly important or useful, but responses to initial survey items tend to be less reliable than desired.

A possible use of this question would be to examine the programming interests of respondents with conflicting attitudes toward control or wildlife management. In this instance, people who disliked animals or placed relatively little value on their nonconsumptive uses tended to watch fewer wildlife shows (app. B). 10/

Question 2:  
Introducing Rating  
Scales

The second question, dealing with the respondents' sense of importance of wild animals, was more closely related to the theme of the survey, coyote control. However, it was still general enough to be of interest to most people. This item introduced respondents to the 0 to 10 rating scales used throughout the survey. To minimize explanations and misunderstandings, all 0 to 10 scales were defined as indicating low to high ratings. Almost all respondents quickly adapted to the use of such scales with little guidance and virtually no practice (14).

The rating scale approach was selected for its provision of interval rather than ordinal data. The interval nature allows for the calculation of representative means and standard deviations and the use of parametric techniques, such as correlation, for more indepth analysis. Ordinal scales typically restrict the analysis to descriptions of distribution and nonparametric analysis. Several types of rating scales could have been utilized: 0 to 10, 0 to 7, 1 to 5, or

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10/ This and other findings that follow resulted from a cluster analysis of responses to the survey's general questions. A few selected findings will be cited to provide insight into possible uses of the results.

a myriad of others. Scales larger than 0 to 10 have been shown to provide no significant additional discrimination (17). Scales smaller than 0 to 10, on the other hand, can be advantageous in specific situations, such as when individual points along the scale are defined (that is, 1 = agree very much, 2 = agree somewhat, 3 = agree slightly, 4 = no opinion, 5 = disagree slightly...). The endpoint definition method was selected for use in this study as it is more conducive to telephone description and use and provides no less discrimination than scales with all points defined (14). The endpoints of 0 and 10 were chosen to represent low and high ratings, respectively, due to the strong association of 0 with the absence of a quality (that is, importance or concern) and people's frequent contacts with 0 to 10 or 1 to 10 type scales in other aspects of life.

Question 2 treated the relative importance of several values of wild animals, three nonconsumptive (viewing pleasure, enjoyment from knowing the animals exist, and maintaining nature's balance) and three consumptive (source of food, furs, and hunting opportunity). Respondents clearly distinguished between consumptive and nonconsumptive values, even though they could have given all values equal ratings (that is, no tradeoffs were required as in the SQPI items (table 3)). 11/

Table 3--Relative importance of six values of wildlife

Value	Mean points <u>1/</u>
	<u>Points</u>
Balance in nature	8.95
Knowing they exist	8.56
Viewing pleasure	8.25
Source of food	4.76
Opportunity for hunting	3.75
Source of furs	2.46

1/ 0 to 10 rating scale (low to high importance).

11/ Even in SQPI items, however, equal numbers of points could have been distributed. But, clearly, use of any 100 rating would require 0 ratings for other categories.

All nonconsumptive values were judged to be much more important than any consumptive value. The range of responses illustrated in figure 6 shows there were few exceptions to these relative preferences.

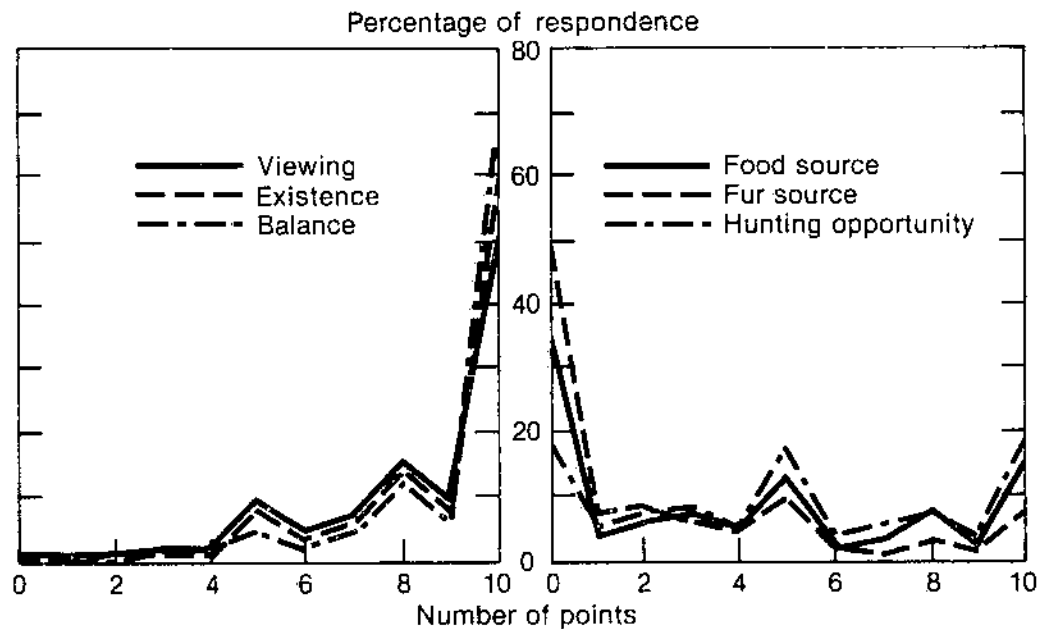
The distribution in figure 6 also reveals that a smaller rating scale could have been used for this item, as most scores tended to cluster around the end and midpoints of the scale. Points 0, 5, and 10 alone show that nonconsumptive values were rated much higher in importance. In the 0 to 5 point range consumptive uses predominate in the figure, while higher ratings (7 to 10 points) were assigned to nonconsumptive uses. If a scale with a less well-defined midpoint had been used (for example, a 0 to 7 scale), respondents may have been induced to use the scale more fully, rather than acquiescing to the noncommittal "5" response.

Response Bias

Response bias is often evident when open rating scales such as that described above are used. Because each point on the scale is not defined, respondents are free to use any series of points to express relative preferences. Some respondents, for instance, may use only the bottom half of the scale (0 to 5), others the top, and still others the entire scale. If

Figure 6

**Ratings of importance of six values of wildlife**



a respondent uses only the scale points 0 to 5, the rating of 5 could actually be considered the equivalent of the 10 rating of a respondent who uses the whole scale. Without additional information one finds it difficult to determine whether the first respondent's rating of 5 really expresses the strength of conviction of a second respondent's 10 rating. Nevertheless, when relative rather than absolute preferences are at issue, and tradeoffs must be evaluated, the 5 on a 0 to 5 scale should be treated as the 10 on a 0 to 10 scale.

Response bias cannot, of course, be identified from one or even a few scaled items. The respondent may, in fact, believe none of the five items in question 2 is worthy of a rating above (or below) 5. But, if an exclusive list of scaled items is available, patterns can be more readily detected and mathematical adjustments for response bias made, usually in the form of standardizations such as Z scores. Twenty-eight such scales were used in this survey, so standardization was possible. The standard scores did not attenuate differences shown in figure 6. If anything, they intensified the apparent distinction among categories (see app. B).

#### Response Dependent Items

Following question 2, an advantage of computerized survey administration was utilized; response dependent questions were included. Persons responding to question 2 with all zeros or "don't know's" were not asked questions 3 to 13 (app. A), which further probed the attitudes introduced in question 2. Persons answering only the first three items in question 2 with zeros or "no opinions," on the other hand, would skip only questions 3 to 8 (app. A). In this way, more detailed information can be solicited from people with well-formed attitudes on the matter, while people with no opinions or interest are not badgered with irrelevant questions. The facility to skip respondents in and out of a series of items is particularly valuable if the survey theme is suspected to be of limited interest, but some related components are of widespread interest. Response dependent questioning prevents both the alienation of marginally interested respondents and the inclusion of instable, invalid opinions in attitudinal measures.

#### Questions 2 and 3 Compared: Confoundings

Note that the pattern of preferences in response to question 2 (table 3) differs from that in response to question 3 regarding the manner in which respondents enjoyed wildlife (table 1). If the items in question 3 were a subset of those in question 2, consistency would require that respondents allocate more points to the existence category than to viewing; they did not. Closer examination reveals that the conflict cannot be blamed on the differences in scaling approaches or numbers of items rated. Unlike question 2, questions 3 to 8

ask for ratings of relative "enjoyment," not "importance." Knowing animals exist is apparently more important than viewing animals, but not as enjoyable.

Question 9:  
Categorical Items

Question 9 presents a simple categorical choice--approval or disapproval of hunting--which was included to answer several questions. Anticipating a large, vociferous proportion of antihunters, we hoped to be able to isolate the contribution of antihunting sentiment to: (1) low point allocations to hunting (questions 3 to 8), (2) low ratings of the importance of hunting (question 2), and (3) opposition to other means of killing animals, especially control killing. Table 4 results clearly show that antihunting sentiment only partially explains the low ratings for hunting. Although antihunters assign proportionally more points to nonconsumptive values and somewhat less to consumptive values than those who approve of hunting, the distinction between consumptive and nonconsumptive values is dramatic for both groups. The only trend that differs between groups is that prohunters rate the importance of hunting higher than food and furs, while antihunters rate hunting lowest.

A shortcoming of categorical measures is that they often do not provide sufficient information to be useful in measuring complex attitudes. In the case of the hunting item, for instance, vehement antihunters may hold very different control attitudes than mild antihunters. Therefore, a measure of strength of approval or disapproval was added, again on a 0

Table 4--Relative enjoyment of three values of wildlife for respondents who approve and disapprove of hunting

Value of wildlife	Approve of hunting	Disapprove of hunting	Overall
	(1,330) <u>1/</u>	(1,019) <u>1/</u>	(2,358) <u>1/</u>
	<u>Mean points allocated</u>		
Viewing	50	55	52
Knowing animals exist	33	41	37
Hunting	16	3	10
Total	<u>2/</u> 99	<u>2/</u> 99	<u>2/</u> 99

1/ Number of respondents.

2/ Total does not add to 100 due to rounding error.



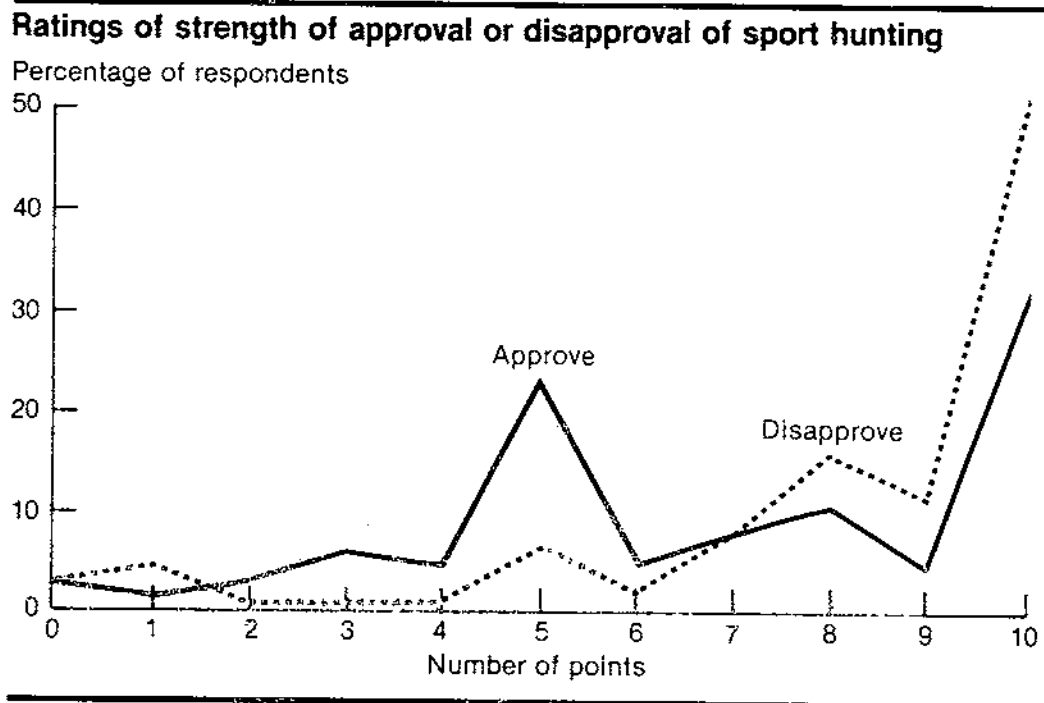
to 10 rating scale. More antihunters judged their strength of disapproval extreme than did prohunters (fig. 7, 27).

Question 11:  
Magnitude Estimation  
and Order Effects

Because perceptions of control problems could depend on concern for the animals involved, particularly sheep and coyotes, information was solicited regarding people's liking of these two animals relative to other domestic and wild animals. The objective of measuring affinities toward a wide array of animals precluded use of the Metfessel procedure, as it is only useful when four or fewer tradeoffs or comparisons are desired. A 0 to 10 rating scale could have been employed, but more direct comparisons among animals were desired. The 0 to 10 scale can imply comparisons among items, but actually requests an independent judgment of each item. The assumption of a stable or common criterion for all ratings of items is used to justify inter-item comparisons, but the criterion is likely to shift or change if a long list of items is presented. Techniques are available which specify the criteria, however. The method used in question 11 was one of these, magnitude estimation (20).

The specified criterion for question 9 was that a deer was equal to 50 points; any number of points from 0 to 100 could be allocated to the other 16 animals to represent how much

Figure 7



the person liked each relative to the deer (table 5). The deer was selected as a criterion because it has been demonstrated to be a well-known and well-liked animal.

The relationship of affinity toward animals to control attitudes is not a simple one and is discussed in detail in (31) and appendix B. However, the low affinity for the coyote may itself partially explain some of the attitudes expressed, such as the greater concern for other animal populations than for coyote populations (table 2), the priority of acceptable control methods over limiting the number of coyotes killed, the low ratings of concern over the killing of nontarget coyotes, and other indicators of tolerance of coyote control discussed below.

Table 5--Respondents' affinities for 16 animals relative to a deer

Animal	Mean points	Standard deviation
Dog	67.35	28.92
Horse	63.99	25.77
Bald eagle	61.74	30.50
Cow	57.93	27.68
Robin	56.09	27.18
Mallard duck	50.47	24.44
Antelope	50.39	22.41
Deer	50.00	<u>1/</u>
Cottontail rabbit	48.16	25.89
Sheep	47.80	26.28
Black bear	45.84	25.78
Chicken	40.65	28.29
Bobcat	40.36	26.85
Fox	39.58	23.80
Wolf	35.82	25.86
Coyote	32.19	23.32
Skunk	23.16	22.55

1/ Defined criterion of deer = 50 (see app. A).

Question 11 was the first item which required comparisons among many items. Order of presentation of long lists of items must be randomized (as should the order of shorter lists) because even when the criterion is repeatedly defined, order effects are likely to occur. Respondents might, for instance, assign precisely the same number of points to two different animals even though they do not like them equally; by the time they are asked how much they like chickens, they may have forgotten they already assigned 42 points to rabbits. This is a particularly critical problem with telephone interviews. Long lists are probably best avoided, but, if used, order effects must be either randomized, balanced out, or accounted for (see 7, 8).

The order in which questions are asked can also confound entire surveys. Later items in a survey must be interpreted in light of the bias produced by earlier items. As long as such "order effects" and other sources of bias can be identified, adjustments or explanations can be made, however. In some cases, the bias may be deliberately introduced, for example, to define rather nebulous concepts. In any case, question order should be recognized as a crucial variable in survey design. (In the coyote study, order effects were attenuated by random orderings of shorter lists and random ordered starting points in longer lists.)

Questions 12 to 14:  
Killing and  
Treatment of  
Animals

Several earlier items indirectly addressed the animal killing issue by asking people to rate the importance of wildlife as a source of food, fur, and hunting opportunity. The expressed low importance of these consumptive uses of wildlife may not, however, depend wholly on opposition to killing animals. The low importance rating for fur, for instance, may derive from perceptions of the slow suffering of leg-trapped animals, not of their actual deaths. Attitudes toward killing are directly probed in questions 12 to 14. (Question 15 treats perceptions of the animal suffering aspect of killing.)

Question 12, dealing with feelings toward the killing of livestock for food, sheds further light on question 2 (app. A), but also could be used to explain various stances on control issues. Those people who respond that they "don't want [livestock] killed even for food," might be hypothesized to have little interest in the sheep industry and thus might oppose control on those grounds, despite their expressed like or dislike of the animals involved. Meat-eaters, on the other hand, might oppose control, or only certain methods of control, for very different reasons, perhaps because of its inhumanity, high accident rate, or high cost. These other motivations are explored elsewhere in the survey.

Responses to question 12 are paradoxical in light of market indications that most Americans eat large quantities of meat. Most people indicated they are bothered by the killing of domestic animals for food; while 39 percent said they were not bothered by it, 57 percent responded that they do not like it, but recognize domestic animals as important food sources. Four percent reacted negatively to killing domestic animals even for food. If such attitudes reflect general opposition to killing, people with this attitude will likely oppose control killing of coyotes as well.

Question 13 revealed, however, that 73 percent of the respondents favored control killing in response to a predation incident. This procontrol attitude, then, may be more an affirmation of farmers' rights than an endorsement of killing coyotes. This hypothesis is supported by responses to question 14; 57 percent of those favoring incident-specific control did not favor more general control to prevent further losses.

The relationship between responses to questions 12 to 14 and to other animal killing issues are displayed in table 6. Some of these issues will be discussed later in the paper. Of interest at this point is the greater tendency for people who disapproved of killing animals for meat or sport to disapprove of control killing. An antikilling sentiment may underlie all these attitudes.

Question 15:  
Humaneness, A Social  
Indicator for SQPI

As illustrated in figure 1, to employ the SQPI method of quantifying perceived impacts, one must link the lowest level impacts in the hierarchy to measurable physical impacts. Unfortunately, one impact in figure 1, humaneness, currently has no physical correlate. Animal suffering is a subjective or perceptual concept based on projections of our own experiences with pain and facilitated by human empathy or sympathy for animals. Thus, the "social indicator" for humaneness was based on people's judgments of the amount of animal suffering caused by human actions toward animals. A 0 to 10 scale was used to obtain the internal measures usually required of social indicators.

Mean ratings of the suffering caused by six human actions toward animals are: steel leghold traps, 9.01; slow-acting poisons, 8.68; fast-acting poisons, 4.97; killing in packing plants, 4.5; high quality zoos, 4.18; and killing instantly with guns, 3.14 (0 to 10 scale, little to extreme suffering). Because coyote control was the theme of the study, four of these actions are common methods of control. The others were included for comparative purposes.

Table 6--Relationship of approval of control to other control and killing attitudes

Question <u>1/</u>	Incident-specific control		General control	
	Approve	Dis-approve	Approve	Dis-approve
<u>Number of respondents <u>2/</u></u>				
12--Killing for food:				
Doesn't bother me	630	129	277	322
Don't like it, but important	761	346	278	450
Don't approve	22	49	11	10
9--Hunting wildlife:				
Approve	845	188	384	421
Disapprove	522	325	172	329
42--Recommended control with 5% lamb losses:				
Strict	178	29	113	61
Moderate	613	264	193	397
None	67	96	14	51
45--Recommended control with 40% lamb losses:				
Strict	600	168	249	332
Moderate	246	198	69	168
None	6	20	2	4

1/ See corresponding item number, Appendix A.

2/ Includes only respondents who answered entire questionnaire. "Don't know" also excluded.

The faster the perceived death, the lower the rating of suffering. The only nonkilling treatment, "high quality zoos," was judged to cause more suffering than instant death by guns. These humaneness ratings were extremely robust across the population sample; differences in general liking of animals (possible empathy component) and attitudes toward killing had no impact on the rankings of these treatments.

Question 16:  
Knowledge Base

In addition to measuring the direction, intensity, importance, and consistency of various attitudes toward control, account should be taken of the knowledge base and stability. The knowledge base is particularly important when attitudes are still being formed; as information is accumulated, people may shift their attitudes to maintain consistency with their respective value system and the information base. Because coyote control issues have only recently reached the public arena, it is highly probable that most public attitudes toward control are still forming. Indeed, some attitudes will be formed or altered during the course of the survey. Yet, because many people's control attitudes are probably only now beginning to develop, measures of these attitudes and predictions of future attitudinal trends are especially desirable. Control attitudes are likely not yet so imbedded in respondents' value systems that change is not probable. Attitudes based on little or inaccurate information, for example, could be influenced by increased information dissemination. If, on the other hand, most people were already well informed and their attitudes consistent with their other wildlife values, changes in control policy would be necessary to appease any expressed or anticipated public discontent with proposed control measures.

Question 16 solicited information on respondents' current knowledge of coyotes. Most people seemed to know that coyotes are predators, but relatively few understood the range and adaptability of the coyote (table 7). Coyotes probably live in all States but Hawaii and Florida and easily adapt to urban and suburban living. Underestimates of coyote population size, range, and adaptability as expressed in this survey might have biased attitudes toward protection of the species.

Data from this survey show, however, that despite their misinformation, most people endorse some form of humane and coyote specific control (see discussion of items that follow). The proportion favoring control might be expected to increase as people become more informed about the current status of coyote populations.

Questions 17 to 21:  
Stability of  
Attitudes

A second aspect of attitudes not yet adequately addressed in the survey is stability (is the attitude firmly held or only a whim?). Stability depends on the intensity, integration into a value system (measured above in terms of consistency with other attitudes), and factual base of an attitude. It is also determined by how important the attitude is to the person and how long that attitude has been held.

Just formed opinions that are of little importance or consequence to the respondents should not be included in a general measure of public attitude since they would likely lead to inaccurate conclusions. Short-lived, previously unanticipated opinions will be poor predictors of future attitudes or behavior and often are inconsistent with the respondents' value systems. Thus, those respondents who had not heard of the coyote-sheep issue until this survey and, even after hearing about it, did not think the issue was important were not asked any questions about specific aspects of coyote control. They were skipped to the sociodemographic items at the end of the survey as a result of the screening questions, 17-21. Results of screening questions appear in table 8.

Table 7--Respondents' current knowledge about coyotes

	Percentage of correct answers
	<u>Percent</u>
Are numerous in North America	50
Are found only west of Mississippi	53
Control rodents	<u>1/</u> 89
Easily adapt to populated areas	25
Sometimes kill sheep	92
Sometimes kill pets in suburbs	52

1/ Coyotes probably do not "control" rodent populations, but they do prey on rodents. The ecological impact of this predation should not have been alluded to, but the overwhelming number of affirmative responses seems to indicate that people were responding to the predatory aspect, not "control" per se.

Questions 17 to 21 could be used to estimate the stability and centrality of expressed attitudes toward control as well as to screen respondents. People who had not heard of the controversy, but judged it to be important, probably have less stable attitudes than those who had heard of the issue before the survey. Similarly, previously uninformed respondents who rated the importance of the issue low (question 19) might tend to have less stable and less well-defined attitudes than those who rated it high. The latter respondents are more likely to seek factual support for their expressed opinions and incorporate the opinions into their respective value systems. If those persons who assigned low importance ratings to the coyote control controversy on this survey were to become more interested in the issue, shifts in attitudes toward control and related issues would likely be manifest.

The levels of prior knowledge of and interest in the controversy displayed in table 8 indicate that the issue is of more than regional importance. Proportionally, more informed, interested respondents would be expected in the western sheep raising States. A regional analysis (see fig. 8 and table 9) shows exactly that. Seventy-two percent of the respondents in the western Mountain States (region 8, fig. 8), a primary

Table 8--Respondents' awareness and perceived importance of coyote-sheep issue

Importance	Number and percentage distribution of respondents who--				Total	
	Heard about issue		Haven't heard about issue			
	No.	Pct.	No.	Pct.	No.	Pct.
Issue important	474	23.2	418	20.5	892	43.8
Issue not important	429	21.0	718	35.2	1147	56.2
Total	903	44.2	1136	55.7	1/2039	100.0

$$\chi^2 = 50.37 \text{ p} < .001$$

1/ Two cases of missing data.



sheep growing region, had heard of the issue, while only 20 percent of respondents in the South (region 6) and 37 to 40 percent of those in the East (regions 1, 2, and 5) had heard of the issue. Similarly, nearly 60 percent of region 8 residents thought the rancher-environmentalist controversy was important while none of three Eastern regions had more than 44 percent expressing personal concern and less than half of these expressed any substantial concern (that is, a rating greater than 5 on questions 19 or 21).

**ATTITUDES TOWARD  
COYOTE CONTROL**

While the information in items 1 through 21 is necessary to establish the characteristics of people's wildlife attitudes and familiarize the respondents with the quantitative scaling procedure, the direct purpose of the survey is to measure attitudes toward coyote control in particular. Items 22 through 48 are designed to this end. These items on coyote control were presented only to screened respondents, the approximately 67 percent who had heard of the control issue and thought it to be important.

Questions 22 to 24:  
Coyotes Versus  
Sheep

The first control related question requested the screened respondents to rate their concern for the killing of sheep and lambs by coyotes and the killing of coyotes to protect sheep and lambs. Based on a 0 to 10 scale the respective means

Figure 8

**U.S. regions as defined in coyote control study**

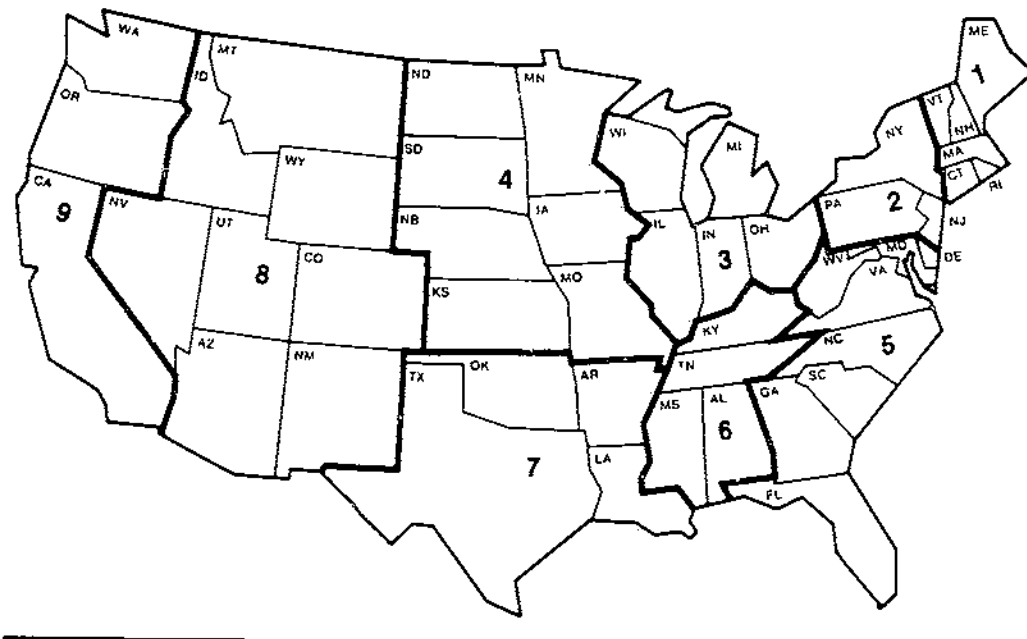


Table 9--Regional differences in awareness and perceived importance of the rancher-environmentalist controversy

Awareness/importance <u>1/</u>	Percentage of respondents in region <u>2/--</u>								
	1	2	3	4	5	6	7	8	9
	<u>Percent</u>								
Heard:									
High importance	9.8	12.0	7.7	10.5	10.4	7.7	11.3	27.5	17.4
Low importance	10.7	10.0	12.3	16.0	8.2	6.9	13.4	20.9	13.1
No importance	16.4	17.8	21.2	29.0	21.2	5.4	21.6	24.2	23.2
Subtotal	36.9	39.8	41.2	55.5	39.8	20.0	46.3	72.6	53.7
Haven't heard:									
High importance	9.8	7.8	9.5	4.3	8.2	13.8	11.9	6.6	8.9
Low importance	13.1	14.2	12.5	10.5	11.4	15.4	10.3	4.4	13.1
No importance	40.2	38.2	36.8	29.6	40.5	50.8	31.4	16.5	24.3
Subtotal	63.1	60.2	58.8	44.4	60.1	80.0	53.6	27.5	46.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
High importance subtotal	19.6	19.8	17.2	14.8	18.6	21.5	23.1	34.1	26.3
Low importance subtotal	23.8	24.2	24.8	26.6	19.7	22.3	23.9	25.2	26.2
No importance subtotal	56.6	56.0	58.0	58.6	61.7	56.2	53.0	40.7	47.5
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

1/ High = rating  $\geq$  5 on questions 19 and 21 (app. A); low is  $\leq$  5 on questions 19 and 21.

2/ See fig. 8.

were 5.9 and 5.8, indicating that most people were about equally concerned about coyotes and sheep being killed. The more informative distribution of responses in figure 9 supports the lack of differentiation between coyotes and sheep. Certain individuals could, of course, have differentiated strongly between the two types of killing, but the general trend was toward equal concern.

Questions 22 and 23 permitted respondents to "have their cake and eat it too;" that is, the points they chose to assign to concern for coyotes had no effect on the number of points they could assign to sheep. When forced to choose between killing coyotes and coyotes killing sheep, however, respondents remained recalcitrant. The distribution of responses in figure 10 again shows no significant distinction.

Although the greater affinity for sheep than for coyotes which was expressed in response to question 11 (app. A) might lead one to predict that people would express greater concern for the killing of sheep than coyotes, the killing aspect introduced a new aspect. Despite their low affinities for coyotes, people are generally opposed to humans killing animals.

Figure 9

### Ratings of concern over the killing of coyotes and sheep



Question 25:  
Economic Impacts  
of Predation

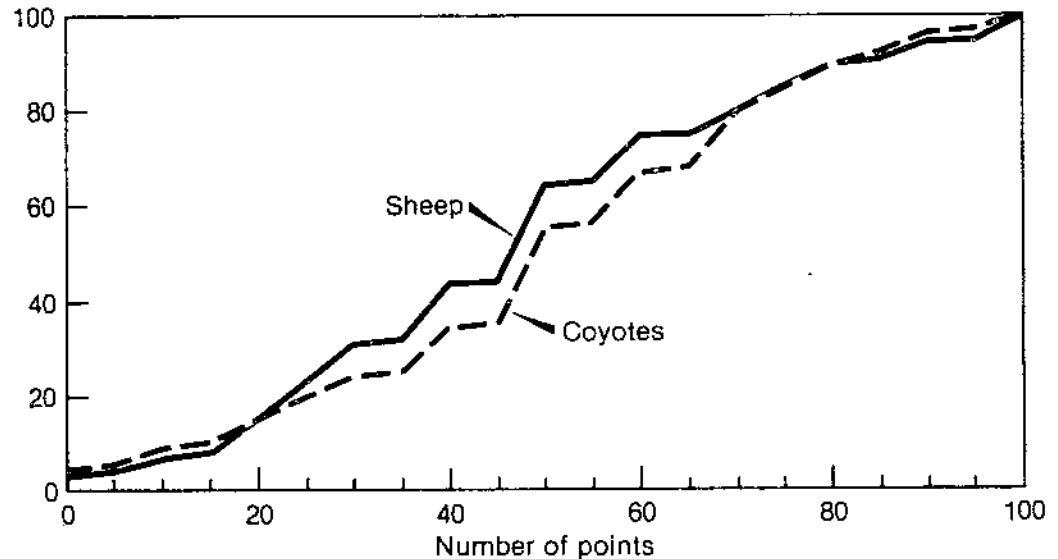
Question 25 sought to measure people's empathy for the economic hardships of the sheep rancher, as these hardships reputedly are the impetus of extensive control efforts and have led ranchers to seek funding assistance and new methods for control. It is difficult to determine what level of concern the mean ratings (table 10) reflect, but they do show that there was very little differentiation among the importance of various economic impacts. Impacts on consumer goods were judged least important (perhaps reflecting the small U.S. market for lamb and wool) and ecologically related impacts were rated higher, again in line with the high concern for maintaining nature's balance (question 2). But, even this variation is not dramatic. <sup>12/</sup> The lack of differentiation may be based on general trends toward little concern for economic impacts of control, as expressed in response to questions 34 to 39 (table 2).

Conversely, there was some variation in the ratings of importance of these economic factors among people with varying concerns for control killing. People who rated their concern over control killing of coyotes lowest (question 24) were most likely to rate these impacts as extremely important and vice

Figure 10

**Distribution of points allocated to concern for the killing of coyotes and sheep**

Cumulative percentage of respondents



<sup>12/</sup> The inter-item variation may, however, be statistically significant, for the sample was large and the intra-item variation small.

versa. From this trend alone, however, one cannot determine whether concern for economic factors led to greater tendencies to endorse control killing of coyotes or whether people who already favor control for other reasons (dislike of coyotes, for instance) used economic arguments to justify their positions. The general opposition to humans killing animals expressed throughout the survey suggests the former hypothesis may more likely be correct.

Questions 26 to 27:  
Acceptability of  
Control Methods

Numerous cross-checks, or items which are repeated from slightly varying viewpoints, are always advisable in surveys, especially cross-sectional surveys that address new topics. Internal consistency is often the only reasonable basis for estimating validity and reliability. Questions 26 and 27 provided a cross-check of SQPI measures of method acceptability based on the hierarchy in figure 1. Although only current methods were evaluated in SQPI (measures of actual physical impact were needed), question 26 also included ratings of the acceptability of the development of some experimental methods (table 11).

Three of the experimental methods were judged more acceptable than any of the current methods, all which require killing of the predator. Endorsement of coyote specific, nonkilling methods is consistent with other findings that humaneness and specificity are extremely important concerns in evaluating control alternatives (table 2). Conversely, two of the experimental methods that would have the least impact on coyotes, rancher subsidies and indemnity payments, were judged less acceptable than some killing methods. This is somewhat surprising due to the low priority of cost factors

Table 10--Respondents' concern for economic impacts of predation

Impact	Rating <sup>1/</sup>
Sheep growers out of business	6.34
Lamb and wool prices up	5.88
Range produces less food	6.46
Fewer jobs in sheep growing areas	6.13

<sup>1/</sup> 0 to 10 scale, low to high concern.

in determining acceptability (table 2). Perhaps, then, the preference equation (page 6) takes a different form when a certain cost threshold is reached. Alternatively, subsidy and indemnity payments may call forth another dimension of acceptability independent of cost, humaneness, and specificity. That is, such payments may be unacceptable despite cost, humaneness, and specificity considerations.

The ratings of acceptability of current methods were directly related to the ratings of humaneness in question 15, confirming the previous result indicating humaneness as the predominant determinant of control method acceptability (see table 2). The least humane methods--trapping and slow-acting poisons--were also judged least acceptable, and the most humane--fast-acting poisons and guns--were judged most acceptable. However, guns were not as acceptable if used from the air. Perhaps respondents viewed this aerial gunning method as providing man an unfair advantage over the coyote.

Denning was rated more acceptable than slow-acting poisons or steel leghold traps, but the details of how the pups were killed were not elaborated upon. Obviously, emotional issues are best left untreated or, at least, more objectively and

Table 11--Respondents' acceptability of experimental and current methods of control

Method <u>1/</u>	Mean rating <u>2/</u>
Experimental:	
Guard dogs	7.15
Repellent chemicals	6.97
Birth control	5.75
Indemnity payments	3.08
Subsidy payments	1.85
Current:	
Ground shooting	4.29
Fast-acting poisons	4.27
Aerial gunning	2.55
Denning	2.27
Trapping	1.56
Slow-acting poisons	1.29

1/ See appendix A for exact wording.

2/ 0 to 10 scale, low to high acceptability.

less crudely presented to public respondents, lest responses to all the questions that follow be biased or respondents terminate the survey. <sup>13/</sup> Furthermore, emotional tainting of an issue biases responses in a very predictable direction; an actual survey of such responses is hardly necessary.

Questions 42 to 45:  
Acceptability of  
Control Under  
Varying Conditions  
of Lamb Losses

Responses to all of the previous control related items were based on personal conjecture or beliefs regarding the current levels of lamb losses to coyotes and the current status of the sheep industry and coyote populations. The latter two conditions have been addressed--if somewhat cursorily--in some previous items. The question of the effect of perception of risks to lambs on attitudes toward control is treated in questions 42 to 45.

Rather than measuring each respondent's perception of current lamb loss rates and then looking across respondents for trends in covariations of lamb loss perceptions and endorsement of control, each respondent was presented several scenarios with varying lamb losses and asked for a personal control endorsement under that condition (table 12).

Table 12--Respondents' endorsements of various control strategies under hypothetical levels of lamb losses

Control strategy	Portion of respondents reacting to lamb loss percentages of---			
	5	10	20	40
	<u>Percent</u>			
Strictest control	16	28	47	61
Moderate	71	66	50	37
No control	13	6	3	2
Total	100	100	100	100

<sup>13/</sup> There are also ethical considerations regarding treatment of human subjects.

The trend toward greater endorsement of stricter control methods under higher loss conditions is not surprising, especially given the order of presentation of the scenarios. As in earlier items, order should have been randomized to prevent people from responding to the increasing loss trend with an increasing control trend rather than responding to each scenario individually. Under this possible bias, the 2 percent that remained recalcitrant in their opposition to control probably hold very stable and salient, as well as very intense, attitudes toward the issue. The 11 percent that shifted from no control at 5-percent losses to some control at 40 percent were probably less adamantly anticontrol. Clearly, the majority of people had some concern for lambs and coyotes and other animals that could be accidentally killed and, therefore, preferred not to take extreme measures until losses reached much higher levels (not necessarily those specified in the scenarios).

Questions 46 and 47:  
Open Ended Items

Occasionally, there may be items requiring more detailed analysis than can be covered adequately in a closed format survey such as that outlined above. If very little is known about attitudes toward a particular issue, more individualized responses may be desired and open-ended formats such as that in question 47 can be used. These survey type items are usually more appropriate for smaller samples or pilot surveys which are used to determine how a larger survey should be structured. Nevertheless, some items not warranting an entire survey or even pilot effort, but still of particular interest to the researchers, may be included in a structured survey as open ended items. These items also give the respondent a chance to "let off a little steam" after being confined to categorical responses for so long.

When large samples are used, open ended responses are usually extremely tedious to analyze, especially if quantitative interpretations such as those available from content analysis (10) are required. Open ended items are also more tedious to record initially. Because most incentives are focused toward use of fixed response items, open ended items are only justified when the benefits of detailed responses supercede the additional costs of coding and analysis. Responses to question 47, for example, were only cursorily examined and not coded for more extensive analysis. The low proportion of affirmative responses to question 46 (29 percent) indicated that the issue of differential control strategies on private and public lands was not as important as had been anticipated.



Question 48: The  
Final Control Item  
-- Government  
Spending

Until this point in the survey, no mention has been made of Government sponsorship of control efforts, as such information might have biased responses against control. The survey was designed to solicit attitudes toward actual control procedures, not toward Government-supported control efforts or, more generally, governmental assistance to ranchers. <sup>14/</sup> Items such as this, which are suspected of introducing bias no matter how carefully worded, are best placed at the end of the questionnaire (or not included). Question 48 is, in fact, the last control-related item. It requests information on respondents' desires to spend more or less than the currently budgeted \$5 million on coyote control.

Responses to question 48 show a fairly normal distribution of a few adamant procontrol and anticontrol people and a majority of middle of the road responses. The question, based on an arbitrarily defined current control level, found that 3 percent of the respondents would have the Government spend much more than that; 17 percent indicated "more;" 51 percent, "about the same;" 20 percent, "less;" and 9 percent elected the "much less than present" option. This trend may reflect the general tendency of most people to "acquiesce" or it may indicate people had no idea what \$5 million means in terms of control. (A response of "don't know" was always available, however.) Alternatively, the overwhelming endorsement of current governmental control expenditures may suggest that the unknowing public feel they must trust the judgment of Government officials in this regard. Given the previously expressed ignorance of control issues, it is highly unlikely that responses to question 48 show that people believe that \$5 million is a proper control expenditure or even that they believe the Government control program is adequate. At most, it shows that most people favor some governmental involvement in control. The 9 percent that said Government control expenditures should be "much less than present" probably include the 2 percent that oppose control under all circumstances, another small percentage that oppose Government spending under all circumstances, and some others who do not perceive the current loss situation as warranting such expenditures, feel the ranchers should bear the costs, or fear any further tax increases.

Survey items which require more detailed knowledge of an issue than can reasonably be expected of most respondents should be omitted or the necessary information should be provided. Question 48 probably was too difficult for most respondents, so they might have been forced simply to acquiesce. This item

<sup>14/</sup> The strong disapproval of subsidy and indemnity payments (question 26) may reveal the probable trends of such attitudes.

also illustrates the need for carefully defining all issues. As it stands, it is impossible to sort responses to Government spending from responses to Government control efforts from responses to the specified level of control spending. If there is no available survey time to clarify complex issues, it is probably better to leave them untreated.

#### SOCIODEMOGRAPHICS

Like most surveys, this one contains sociodemographic items, but unlike most, they are positioned last. There are several justifications for use of sociodemographic items--including such things as verification of representation of population constituency, and measurement of attitude differences among different subpopulations--yet they are known to alienate respondents. Placing them last seems the best solution, as the alienation occurs after attitudes have been measured; non-response and response bias are thereby attenuated. Even so, sociodemographic items are personal and should be minimized.

The results for these final items are listed in appendix A, but are not of particular interest here. The sample's representation of U.S. census data was satisfactory. Relationships of sociodemographics to attitudes are somewhat more interesting, but are relegated to the appendix B. The data for the regional analysis in table 4 were not obtained from the survey, but from the sampling frame. It is not necessary to ask respondents for information which can be more reliably obtained elsewhere.

#### CONCLUSIONS

The total coyote control questionnaire ran an average of 24 minutes, but the length evidently did not deter most respondents. The response rate of 78 percent can be attributed to sampling and administration factors, as well as a survey instrument designed to hold the interest of respondents. Telephone interviews and repeated callbacks greatly facilitated the achievement of a high response rate. In some cases, the costs of a telephone survey may outweigh these benefits (see 35).

The coyote control survey produced extremely satisfactory results in that people were able to handle the scaled items easily, found the survey interesting and informative, and displayed consistent attitudes. The consistency of attitudinal trends is encouraging in light of the recent development of the issue and the innovative scaling techniques employed, and increased confidence in the validity and reliability of the findings. The quantitative nature of the data greatly facilitated analysis, particularly by enhancing inter-item comparisons, which can reveal the consensus underlying face value contradictions. The data were also easily incorporated into a simulation evaluation of coyote control, which

emphasized economic and physical as well as socioenvironmental factors (18).

Survey findings generally indicated that people seem to dislike coyotes and favor humane and specific control methods. That the uninformed-uninterested one-third had even greater tendencies to favor the killing of animals for predator control and other reasons suggests that these people may endorse increasing levels of control as they are drawn into the issue by increased media coverage. Furthermore, increased information regarding current levels of lamb losses and hardness of coyote populations might effect increased endorsement. Despite general trends toward environmental sensitivity, the public does not appear to endorse blind protection of any species at any cost.

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APPENDIX A --  
WILDLIFE STUDY  
QUESTIONNAIRE

WILDLIFE STUDY Time Int. Began \_\_\_\_\_ AM \_\_\_\_\_ PM

SCREENING FORM Time Int. Ended \_\_\_\_\_ AM \_\_\_\_\_ PM

I'm \_\_\_\_\_. I'm calling long distance for the U.S. Department of Agriculture. We are conducting a nationwide survey to find out how people feel about wild animals. Your household was randomly selected as part of our sample.

INTERVIEW: Male 49%  
Female 51%

A. So that I may know the right person to talk with, please tell me how many (SEX AS INDICATED ABOVE), age 18 and over are living in your household.

Number 18 and over 1.16

IF "0", TERMINATE

B. Please tell me what the ages are for the (Number in A, Sex) 18 and over. Just tell me from oldest to youngest. (LIST AGES IN COL. 1.)

BE SURE TO RECORD  
AGE AND SEX OF  
RESPONDENT.

Line #	Ages									
1		1								
2		1	2							
3		1	2	3						
4		1	2	3	4					
5		1	2	3	4	5				
6		1	2	3	4	5	6			
7		1	2	3	4	5	6	7		
8		1	2	3	4	5	6	7	8	

(USE GRID TO SELECT RESPONDENT. CIRCLE THE LINE # FOR THE DESIGNATED RESPONDENT. IF DESIGNATED RESPONDENT NOT AT HOME, FIND OUT BEST TIME TO REACH HIM AND RECORD ON RANDOM NUMBER SLIP. ATTACH RANDOM NUMBER SHEET TO THIS SCREENING FORM.)

(IF CALLBACK:) DESIGNATED RESPONDENT'S NAME \_\_\_\_\_

(RE-READ INTRODUCTION IF RESPONDENT SELECTED HAD NOT ANSWERED THE TELEPHONE, VERIFY, AND RECORD THE AGE AND GO TO Q.1.)



1. I'd like you to tell me which of the following television programs about wild animals you have seen during the past few months or so? (READ LIST ONE AT A TIME.)

	<u>% Yes</u>	<u>% No</u>	<u>% DK</u>
Animal World with Bill Burrud	37	63	
Last of the Wild with Lorne Green	44	56	
Wild Kingdom with Marlin Perkins	80	20	
Undersea World of Jacques Cousteau	66	34	

2. People feel differently about the importance of wild animals. As I read a list of ways in which wild animals might be considered important, please tell me how important each way is to you personally on a scale from "0" to "10", where "0" means not important at all and "10" means extremely important. Of course, you can give nay number between "0" and "10". Now, on a scale from "0" to "10", how important is it to you that wild animals: (START WITH "X'd" STATEMENT)

	$\bar{X}$
Provide an opportunity for hunting	3.753
Provide viewing pleasure in person or pictures	8.250
Provide enjoyment from knowing they exist	8.560
Help maintain a balance in nature	8.949
Are a source of food	4.759
Are a source of furs	2.457

(IF RESPONSES ARE ALL "0" OR "DON'T KNOW/NO OPINION", SKIP TO Q.13.)

(IF RESPONSES TO A,B, AND C WERE ALL "0" OR "DON'T KNOW/NO OPINION, SKIP TO Q. 9.)

3. There are three general ways people can enjoy wild animals: they can enjoy viewing them either in person or in pictures, they can enjoy just knowing they exist, and they can enjoy hunting them. Which of these three ways best describes how you enjoy wild animals? Again, they are: (RECORD BELOW IN Q.3) (START WITH "X'd" STATEMENT)

4. Of the two remaining ways, which best describes how you enjoy wild animals? They are (INSERT) and (INSERT). (RECORD BELOW IN Q.4 COL.)
5. Now, we would like you to distribute a total of 100 points among the three ways to show how you enjoy wild animals. You give the most points to the way you enjoy wild animals most and so on. But remember, you only have 100 points to distribute among the three ways. You said (FIRST CHOICE) is the way you enjoy wild animals most. How many of the 100 points would you give to (FIRST CHOICE)? (RECORD BELOW IN Q.5 COL.)
6. You said (SECOND CHOICE) was your second choice. How many of the remaining \_\_\_\_\_ points would you give to (SECOND CHOICE)? (RECORD BELOW IN Q.6 COL.) That leaves \_\_\_\_\_ points for (THIRD CHOICE). (RECORD BELOW IN Q.6 COL.)

(NOW SKIP TO Q.9)

	Q.3 First Choice %	Q.4 Second Choice %	Q.'s 5 and 6 Distribution of Points X
Viewing them	64	31	52.22
Knowing they exist	28	62	36.65
Hunting them	6	6	9.58
DO All the same	1	SKIP TO Q.7	
NOT Can't decide			
READ Indifferent/Don't care		SKIP TO Q.9	

7. Well, if you were to distribute a total of 100 points, among the three ways to show how you enjoy wild animals, how many of the 100 points would you give to \_\_\_\_\_? (RECORD BELOW.) (PRESENT IN ORDER LISTED IN Q.3)
8. How many of the remaining \_\_\_\_\_ points would you give to \_\_\_\_\_? (RECORD BELOW.) (SECOND CHECK.)

That leaves \_\_\_\_\_ points for \_\_\_\_\_? (RECORD BELOW.)

Q.'s 7 and 8  
Distribution  
of Points

Viewing them	
Knowing they exist	
Hunting them	
Total	100

9. In general, do you tend to approve or disapprove of legal hunting?

CONTINUE	Approve	55
	Disapprove	45
SKIP TO Q. 11	Don't know/No opinion	

10. Please tell me how much you (approve)(disapprove) of hunting on a scale of "0" to "10", where "0" means that your (approval/disapproval) is not strong at all and "10" means that your (approval/disapproval) is extremely strong. Remember, you can use any number between "0" and "10".

$\bar{X}$   
RECORD NUMBER 7.528

11. We would like to know how much you like different kinds of wild animals. We are going to assume that a deer is worth 50 points. As I read a list of animals, please tell me how many points from 0-100 you would give each animal to show how much you like it compared to a deer. For example, if you like an animal I name less than a deer, be sure to give that animal less than 50 points and if you like the animal more than a deer, be sure to give it more than 50 points. Remember, a deer is worth 50 points, but you can give each animal any number of points between 0 and 100. Let's start with a \_\_\_\_\_. (START WITH CHECKED ANIMAL.)

	$\bar{X}$ Points		$\bar{X}$ Points
Cottontail rabbit	48.162	Mallard duck	50.466
Skunk	23.543	Fox	39.580
Bald eagle	61.744	Black bear	45.844
Bobcat	40.358	Cow	57.934
Antelope	50.391	Sheep	47.796
Wolf	35.82	Dog	67.353
Robin	56.09	Chicken	40.649
Coyote	32.193	Horse	63.990

12. Please tell me which one of the following three statements best describes how you feel about cattle, hogs, and sheep being killed for food. (READ LIST.)

	%
One - It doesn't bother me	39
Two - I don't like it, but they are an important source of food.	57
Three - I don't want them killed, even for food.	4

DON'T READ Don't know

13. If a wild animal kills a farmer's cows, sheep, or chickens on his property, do you think the farmer should have the right to kill that animal?

		%
CONTINUE	Yes	73
SKIP TO Q.15	No	27
	Don't Know	

14. Do you think the farmer should have the right to kill other animals of the same type to help prevent future losses?

	%
Yes	43
No	57

Don't know

15. Let's change the subject a little bit. Please tell me how much you think an animal suffers as a result of each of the following practices. On a scale of "0" to "10", where "0" is no suffering and "10" is a lot of suffering. How much suffering do you think is involved in: (START WITH CHECK)

	X̄
Trapping wild animals in steel leghold traps.	9.014
Killing animals instantly with guns.	3.137
Keeping animals in high quality zoos.*	4.180
Using poisons that kill in less than a minute.	4.973
Using poisons that kill in a few hours.	8.679
Killing animals in meat packing plants.	4.505

\* Make sure respondent is not reversing scale.

16. Now we would like your opinion about a specific animal that you might or might not be familiar with - the coyote. Concerning coyotes, would you say that:  
(START WITH CHECK.)

	% Yes	% No
Coyotes are numerous in North America?	50	50
Coyotes are found only West of the Mississippi?	47	53
Coyotes help keep rodent populations under control?	89	11
Coyotes adapt easily to living in populated areas?	25	75
Coyotes sometimes kill sheep?	92	8
Coyotes sometimes kill pets in suburban areas?	58	42

17. Because coyotes sometimes kill livestock, some ranchers are demanding a reduction in the number of coyotes. On the other hand, some environmental groups feel that the coyote is a valuable part of nature and should be protected. Have you heard about this issue?

	%
CONTINUE Yes (I have heard about it)	44
SKIP TO No (I have not heard about it)	56
Q.20 Don't know/Not sure	

18. Is this issue important to you personally?

	%
CONTINUE Yes (issue is important)	53
READ STATEMENT A No (issue is not important)	47
A Don't know/Not sure	

STATEMENT A: We would still like to know your opinion even though you may not feel the issue is important. (NOW GO TO Q 22.)

19. On a scale from "0" to "10", where "0" means not very important and "10" means extremely important, how important is this issue to you personally?

	$\bar{X}$
SKIP TO Q.22 RECORD NUMBER	7.271

20. Even though you haven't heard much about it, is the issue important to you personally?

	%
Yes (issue is important)	38
GO TO No (issue is not important)	62
Q. 49 Don't know/Not sure	

21. On a scale from "0" to "10", where "0" means not very important and "10" means extremely important, how important is this issue to you personally?

$\bar{X}$   
READ STATEMENT B RECORD NUMBER 7.029

STATEMENT B: Then we would still like to know some of your opinions even though you may not have heard much about the issue. (NOW GO TO Q.22.)

22. Let's look at this issue more carefully. On one hand, coyotes sometimes kill sheep and lambs. On a scale from "0" to "10", please tell me how concerned you are that sheep and lambs are killed by selecting any number from "0" to "10", where "0" means no concern and "10" means extreme concern. Of course, you can choose any number between "0" and "10".

$\bar{X}$   
RECORD NUMBER 5.915

23. On the other hand, because coyotes sometimes kill sheep and lambs, coyotes are often killed. Please tell me how concerned you are that coyotes are killed by selecting any number from "0" to "10", where "0" means no concern and "10" means extreme concern.

$\bar{X}$   
RECORD NUMBER 5.773

24. Now, we would like to know which you are most concerned about - the killing of sheep and lambs by coyotes or the killing of coyotes by people. Please divide 100 points between the two to show your concern. Give the most points to the one you are most concerned about. How many of the 100 points would you give to \_\_\_\_\_? (RECORD BELOW Q. 24) (START WITH CHECK.)

That leaves \_\_\_\_\_ points for (SECOND CHOICE). (RECORD BELOW UNDER Q.24 COL.)

	Distribution of points
	$\bar{X}$
Killing of sheep	48.175
Killing of coyotes	51.825
	100.000

25. I'm going to read a list of consequences that may result from coyotes killing sheep and lambs. On a scale of "0" through "10", where "0" means no importance and "10" means extreme importance, tell me how important each consequence is to you personally. Remember, that you can give it any number for "0" through "10". The first consequence is: (START WITH CHECK.)

	$\bar{x}$
Some sheep growers may go out of business.	6.336
Prices to consumers of lamb and wool may go higher.	5.877
Some of the nation's pasture and range resources may produce less food.	6.456
Fewer jobs may exist for people living in sheep growing areas.	6.127

26. In addition to killing coyotes to protect sheep, there are other control alternatives being developed that would not kill coyotes. As I read each alternative, please tell me on a scale from "0" to "10", how acceptable it would be to you if it were developed. Remember, "0" means not acceptable at all and "10" means extremely acceptable and you can give any number between "0" and "10". Let's start with: (START WITH CHECK.)

	$\bar{x}$
Using repellent chemicals that keep coyotes away from sheep.	6.965
Allowing coyotes to kill the sheep and lambs and then pay ranchers for their losses.	3.080
Using guard dogs that keep coyotes away.	7.147
Using birth control measures to keep coyote populations smaller.	5.754
Paying ranchers to not raise sheep.	1.846

27. The control alternatives I just mentioned are still in the experimental stage. The only practical alternatives currently available to protect sheep and lambs involve the killing of coyotes by one means or another.

Now, I'm going to read a list of methods currently used to kill coyotes. On a scale of "0" to "10", tell me how acceptable each method is to you where "0" means not acceptable at all and "10" means extremely acceptable. Of course, you can choose any number between "0" and "10". How acceptable to you is:  
(START WITH CHECK.)

	$\bar{X}$
Using poisons that kill coyotes in less than a minute.	4.27
Using poisons that kill coyotes in a few hours.	1.285
Shooting coyotes from airplanes and helicopters.	2.549
Locating coyote dens and killing pups.	2.272
Shooting coyotes from the ground.	4.287
Trapping coyotes with steel leghold traps.	1.556

(IF ALL RESPONSES ARE "DON'T KNOW/NO OPINION, SKIP TO Q.49.)

28. Three classes of animals might be unintentionally killed by the methods used to kill coyotes. Which one of the three are you most concerned about? They are (1) domestic animals, like dogs and other pets, (2) coyotes that have not killed sheep, or (3) other wild animals of various kinds. (RECORD BELOW UNDER Q.28).
29. Of the two remaining classes of animals, which are you most concerned about? They are (INSERT) and (INSERT). (RECORD BELOW UNDER Q.29 COL.)
30. Again, we would like you to distribute a total of 100 points among the three to show your concern. You give the most points to the one you are most concerned about and so on. But remember, you only have 100 points to distribute among the three. How many of the 100 points would you give to (MOST IMPORTANT)? (RECORD BELOW UNDER Q.30 COL.)
31. How many of the remaining \_\_\_\_\_ points for (SECOND MOST IMPORTANT) (RECORD BELOW UNDER Q.31 COL.)

That leaves \_\_\_\_\_ points for (THIRD MOST IMPORTANT). (RECORD BELOW.)

(NOW SKIP TO Q.34.)



	Q. 28	Q. 29	Q.'s 30 and 31
	Most Important	2nd Most Important	Distribution of Points
	%	%	$\bar{X}$
Domestic animals like dogs and other pets	50	28	42.430
Coyotes that have not killed sheep and lambs	7	23	19.832
Other wild animals of various kinds	37	47	37.781
All the same	5	SKIP TO QUESTION 32	
Can't decide	1	SKIP TO QUESTION 32	
Indifferent/Don't care		SKIP TO QUESTION 34	

32. Well, if you were to distribute a total of 100 points among the three to indicate your concern, how many of the 100 points would you give to \_\_\_\_\_? (RECORD BELOW IN Q. 32 COL.) (START WITH CHECK.)

33. How many of the remaining \_\_\_\_\_ points would you give to \_\_\_\_\_? (RECORD BELOW IN Q. 33 COL.)

That leaves \_\_\_\_\_ points for \_\_\_\_\_. (RECORD BELOW.)

	Q.'s 32 and 33
	Distribution of points
	$\bar{X}$
Domestic animals like dogs and other pets	36.882
Coyotes that have not killed sheep and lambs	25.975
Other wild animals of various kinds	37.143
TOTAL	100.000

34. Three important questions in evaluating coyote control methods are: (START WITH "X'd" STATEMENT)

- (1) How much they cost.
- (2) How specific they are; that is, do they kill only coyotes that have killed sheep and lambs?
- (3) How humane they are; that is, how little pain and suffering is caused the coyotes killed?

Which of the three do you feel is most important? (IF NECESSARY, READ AGAIN.)  
(RECORD BELOW UNDER Q.34 COL.)

35. Which of the two remaining are most important - they are (INSERT) and (INSERT)?  
(RECORD BELOW UNDER Q. 35 COL.)

36. Now, we would like you to distribute a total of 100 points among the three to show the importance of each. You give the most points to the one that is most important and so on. But remember, you only have 100 points to distribute among the three. How many of the 100 points would you give to (MOST IMPORTANT)?  
(RECORD BELOW UNDER Q.36 COL.)

37. How many of the \_\_\_\_\_ remaining points for (SECOND MOST IMPORTANT)? (RECORD BELOW UNDER Q. 37 COL.)

That leaves \_\_\_\_\_ points for (THIRD MOST IMPORTANT). (RECORD BELOW.)

(NOW SKIP TO Q. 40.)

	Q. 34 Most Important	Q. 35 2nd Most Important	Q.'s 36 and 37 Distribution of points
	%	%	$\bar{X}$
1. How much they cost	7	13	16.435
2. How specific they are	26	60	33.452
3. How humane they are	65	26	51.218
All the same	0	SKIP TO QUESTION 38.	
Can't decide	1	SKIP TO QUESTION 38.	
Indifferent/Don't care	9	SKIP TO QUESTION 40.	

38. Well, if you were to distribute a total of 100 points among the three, how many of the 100 points would you give to \_\_\_\_\_? (RECORD BELOW.) (START WITH CHECK.)

39. How many of the remaining \_\_\_\_\_ points would you give to \_\_\_\_\_? (RECORD BELOW.) (SECOND CHECK.)

That leaves \_\_\_\_\_ points for \_\_\_\_\_. (RECORD BELOW.)

	Distribution of Points $\bar{X}$
How much they cost	21.500
How specific	37.583
How humane	40.920
TOTAL	100.000

40. Remember that the coyote control methods currently used involve killing coyotes. Now, we would like to know which is of more concern to you: (1) the number of coyotes killed or (2) the method used to kill them.

Distribute a total of 100 points between the two to show your concern. Give the most points to the one you are most concerned about. How many of the 100 points would you give to (CHECKED STATEMENT)? (RECORD BELOW.)

That leaves \_\_\_\_\_ points for (SECOND STATEMENT). (RECORD BELOW.)

	Q. 40 Distribution of points X
The number of coyotes killed	43.906
or	
The method used to kill them	56.094
	100.000

41. Due to the dependence of wild animals on each other, changing the number of coyotes may affect other wild animal numbers. While this is a very complex issue, let's look at an example - coyotes and deer. In general, which are you most concerned with: (1) having more coyotes or (2) having more deer? Please divide 100 points between the two to reflect your concern. Give the most points to the one you are most concerned about. How many of the 100 points would you give to (CHECKED STATEMENT)? (RECORD BELOW.)

That leaves \_\_\_\_\_ points for \_\_\_\_\_. (RECORD BELOW.)

	Q. 41 Distribution of points X
Having more coyotes	33.271
Having more deer	66.729
	100.000

42. Now, we would like to know what you think should be done in situations where coyotes are killing sheep and lambs. Keep in mind that at present the only practical way to keep coyotes from killing sheep is to kill coyotes and generally speaking, the more coyotes killed, the fewer sheep and lambs killed.

First, let's take a situation where coyotes are killing 5 percent of the lambs. In this situation, which of the following actions would you favor:

	%
(1) Kill coyotes with methods that kill the <u>most</u> coyotes and save the most lambs, but which sometimes kill other wild animals.	16
(2) Kill coyotes with methods that kill <u>fewer</u> coyotes and save <u>fewer</u> lambs, but which are safe to all other wild animals.	71
(3) Kill no coyotes and let them go on killing 5 percent of the lambs.	13
43. Now, suppose coyotes are killing 10 percent of the lambs. In this situation, which of the following actions would you favor:	
(1) Kill coyotes with methods that kill the <u>most</u> coyotes and <u>save</u> the most lambs, but which sometimes kill other wild animals.	28
(2) Kill coyotes with methods that kill <u>fewer</u> coyotes and save <u>fewer</u> lambs, but which are safe to all other wild animals.	66
(3) Kill no coyotes and let them go on killing 10 percent of the lambs.	6
44. Now, suppose coyotes are killing 20 percent of the lambs. In this situation, which of the following actions would you favor:	
(1) Kill coyotes with methods that kill the <u>most</u> coyotes and <u>save</u> the most lambs, but which sometimes kill other wild animals.	47
(2) Kill coyotes with methods that kill <u>fewer</u> coyotes and save <u>fewer</u> lambs, but which are safe to all other wild animals.	50
(3) Kill no coyotes and let them go on killing 20 percent of the lambs.	3
45. Finally, suppose coyotes are killing 40 percent of the lambs. In this situation, which of the following control actions would you favor:	
(1) Kill coyotes with methods that kill the <u>most</u> coyotes and <u>save</u> the most lambs, but which sometimes kill other wild animals.	61
(2) Kill coyotes with methods that kill <u>fewer</u> coyotes and save <u>fewer</u> lambs, but which are safe to all other wild animals.	37
(3) Kill no coyotes and let them go on killing 40 percent of the lambs.	2

46. Many sheep ranchers lease grazing areas for their sheep from the federal government. Do you feel that coyote control should be different on these public lands than on a rancher's private land?

		<u>%</u>
CONTINUE	Yes	29
SKIP TO	No	71
Q. 49	Don't Know	

47. (IF "YES") How should it be different? Anything else?

48. At the present time, the Federal Government is spending about 5 million dollars a year on coyote control to reduce livestock losses. (RANDOM SELECTION OF 48A or 48B)

- A. Do you think the Federal Government should spend much more than present, more, about the same, less, or much less than present on coyote control?
- B. Do you think the Federal Government should spend much less, less, about the same, more, or much more than present on coyote control?

	<u>%</u>
Much more than present	3
More	17
About the same	51
Less	20
Much less than present	9

49. Finally, a few quick questions about yourself. Is your present residence:  
(READ LIST.)

	<u>%</u>
In the city	33
A suburb	27
A town	19
On a farm or ranch	7
In the country, but not on a farm or ranch	14

50. Have you ever lived: (READ LIST.)	<u>Yes</u> <u>%</u>	<u>No</u> <u>%</u>
In a city	75	25
A suburb	61	39
A town	71	29
On a farm or ranch	48	52
In the country, but not on a farm or ranch	44	56

51. Do you have any of the following pets at your house?	<u>Yes</u> <u>%</u>	<u>No</u> <u>%</u>
Dog	54	46
Cat	29	71
Pet birds	8	92

52. And what was the highest grade or year of school you completed?	<u>%</u>
Eighth grade or less	8
Some high school	11
Completed high school	37
Technical/Business school	4
Some college	19
Completed college	14
Graduate school	8
Refusal	

53. And which of these categories best describes your total household income last year before taxes? Was it: (READ LIST)

	<u>%</u>
Under \$5,000	12
\$5,000 - 10,000	20
\$10,000 - 15,000	27
\$15,000 - 25,000	27
Over \$25,000	14

Thank you very much for your help. Have a pleasant day.

Interviewer \_\_\_\_\_

Date \_\_\_\_\_

Area Code \_\_\_\_\_

Exchange \_\_\_\_\_

Census Division \_\_\_\_\_

State \_\_\_\_\_

County \_\_\_\_\_

Metro \_\_\_\_\_

Length of Interview ( $\bar{X}$ ) 24.255 min.

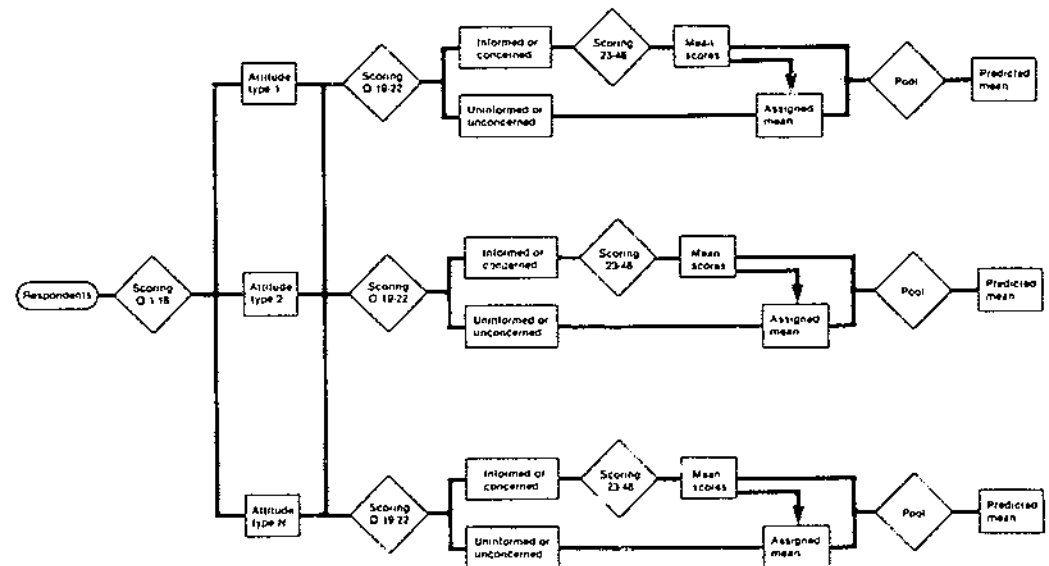
APPENDIX B--  
 CHARACTERIZING  
 ATTITUDINAL TYPES  
 AND PREDICTING  
 CHANGE

This analysis of responses to the questionnaire in appendix A has been included to illustrate possible uses of quantitative attitudinal data and skip-out procedures. Sophisticated analyses such as cluster analysis can be used to characterize rather complex attitudinal types and attempt to predict future attitudinal trends. The structure of a model used to characterize and predict wildlife attitudes is illustrated in appendix figure 1.

First, each respondent receives scores on the first 18 questions (app. A) and is placed into a general wildlife attitudinal type with all other respondents with similar attitudes. Then, questions 19 to 22 are used to separate respondents with well-informed attitudes toward control ("informed or concerned" respondents) from those with lesser formed attitudes (uninformed and unconcerned). The informed or concerned respondents who answered items 23 to 48 are scored on these items while uninformed-unconcerned respondents are simply assigned the mean scores of the informed-concerned respondents in their respective attitudinal type. Finally, the calculated

Appendix Figure 1

Prediction model





and assigned means are pooled to yield mean control attitudes under hypothetical conditions of 100 percent informed respondents. The analyst hopes these predicted means will provide an indication of possible responses to control issues if the issue were to become of more widespread interest.

In some cases, the needs of decisionmakers may fall short of prediction. Policymakers may simply desire information on the perceptions and attitudes of various subsets of a population. These subsets are often defined by the issue -- for example, relevant select interest groups or political constituencies -- in which cases the defined audiences can be separately polled and their attitudes determined. In other cases, however, relevant audiences may have to be identified from a larger, more general sample. This postsampling grouping of respondents might be necessary in new policy areas where impacted or interested populations have not been identified or when policy impacts are so widespread or diffuse that impacted groups cannot be easily identified. In both cases, policymakers may desire information on general public perceptions as well as perceptions of subsets of the public with divergent (especially extreme) attitudes. Identification of the scope of attitudes in a general sample and the grouping and characterizing of persons with conflicting attitudes can be accomplished by cluster analysis.

The cluster analysis technique is particularly useful when attitudes are defined by a vast array of items. The items are combined into homogeneous clusters which describe more succinctly the various aspects of an issue. Although several computing algorithms are available, the procedure described below is that developed by Tryon and Bailey and known as BCTRY. <sup>1/</sup>

### Cluster Analysis

First, people's attitudes toward an issue must be measured in quantitative terms. In this case, only the general wildlife attitudes were used as all respondents answered these items. <sup>2/</sup> Scaling procedures were used where applicable, but categorical responses were treated as dummy variables, that is, coded 0 for not applicable and 1 for applicable. All responses to the first 18 questions (app. A) were coded and entered into

<sup>1/</sup> Robert C. Tryon and Daniel E. Bailey. 1970. Cluster analysis. New York: McGraw-Hill. Unlike factor analysis, these clusters need not be linear combinations of the original variables. See also Michael R. Anderberg, 1973. Cluster analysis for applications. New York: Academic Press.

<sup>2/</sup> We had anticipated a lower level of knowledge and concern over coyote control and thus designed the questionnaire to predict control attitudes from general attitudes (see app. fig. 1).

the cluster analysis program. In the first stage, composites or "clusters" of items were identified that were mathematically interrelated (correlated) and that accounted for as much of the variability of all the items as possible. In other words, variables with high common variances were used to form a lesser number of clusters of variables which contain the basic structural information of all the variables. The clusters generated using the items from the coyote control survey are listed in appendix table 1.

Once formed, each cluster was examined for its homogeneity (or the colinearity of the variables, app. table 2), independence from the clusters (based on the correlations in app. table 3), and statistical validity or reliability (app. table 1). Because cluster analysis is a hypothesis generating rather than hypothesis testing technique, the researcher should feel free to refine the original clusters into ones that meet the conceptual as well as statistical needs of the researcher's problem; that is, the clusters should be both statistically and conceptually homogeneous, independent, and valid. Items within a cluster that hamper precise definition of the cluster or that are unrelated to any attitudinal construct relevant to the issue can be deleted and the analysis repeated. In areas in which there is little previous research, however, the researchers may have no basis for refining the clusters and may wish to retain the original set. Examination of the reliabilities and validities of the new clusters will determine whether the costs of clear definitions are too high. The judgment of what constitutes a reasonable level of statistical validity will be based, among other things, on the amount of previous research in the area (little research would suggest more tolerance of low validities) and the reliability of the original data base (attitudinal measures, for instance, are notoriously unreliable.) A cluster with an extremely low reliability may be eliminated if conceptually unimportant, combined with a related cluster to retain the attitudinal measure, or retained. Conceptually redundant clusters may be combined or a high reliability representative selected to simplify further analysis. Appendix table 1 represents a refined set of clusters. Although cluster 5 is statistically redundant of cluster 2 (see app. table 3), it is conceptually independent, statistically independent of 3 and 4, and sufficiently reliable to warrant retention.

After a final set of clusters has been defined, the respondents to the survey can be grouped into attitudinal types based on individual scores on the clusters. Each individual's response to each item is standardized to a mean of 50 and standard deviation of 10, thereby equalizing the importance of each variable in defining a cluster. To obtain a score for

Appendix table 1--Five clusters developed from first 17 questions 1/

Cluster description	Defining variables <u>2/</u>	Domain validity coefficient	Reliability coefficient
Affinity for wild pradatory mammals	Like of: (11) Wolf Coyote Fox Bobcat Bear	0.95	0.90
Affinity for farm animals	Like of: (11) Sheep Cow Chicken Duck	.91	.83
Attitude toward hunting	Hunting importance (2) Hunting enjoyment (3-8) Approval of hunting (9) Disapproval of hunting (9)	.85	.72
Nonconsumptive importance of wildlife	Enjoy knowing they exist (3-8) Enjoy viewing (3-8) Balance in nature (2) Number of TV wildlife programs viewed (1)	.78	.61
Affinity for pets	Like of: (11) Horse Rabbit Dog	.86	.74

1/ See appendix A.

2/ Question number in parentheses.

Appendix table 2--Correlations of cluster variables with rotated oblique factor coefficients

Cluster variables	Clusters				
	1	2	3	4	5
	Affinity for wild predatory mammals	Affinity for farm animals	Attitude toward hunting	Nonconsumptive importance of wildlife	Affinity for pets
Like of:					
Wolf	0.88	0.13	0.03	0.35	0.28
Coyote	.83	.20	.09	.31	.32
Fox	.80	.26	-.09	.27	.39
Bobcat	.80	.11	-.02	.37	.31
Bear	.71	.22	.01	.28	.34
Sheep	.16	.84	-.09	-.09	.57
Cow	.06	.80	.05	-.10	.47
Chicken	.01	.74	-.07	-.14	.50
Duck	.43	.50	-.01	.10	.49
Hunting:					
Importance	-.06	-.01	.81	-.03	-.18
Enjoyment	-.04	-.08	.69	-.16	-.16
Approval	.05	-.02	.54	-.07	-.10
Disapproval	.09	.00	-.41	.04	.11
Enjoy knowing wildlife exists	.26	-.07	-.12	.80	.05
Enjoy viewing wildlife	.15	-.06	-.01	.55	.01
Balance in nature	.25	-.05	-.08	.48	.03
Number of TV wildlife programs viewed	.15	.02	-.03	.26	.07
Like of:					
Horse	.25	.50	-.19	.02	.79
Dog	.24	.43	-.14	.08	.66
Rabbit	.36	.53	-.14	.06	.61

each respondent on each cluster the scores for all items comprising a cluster are summed. To facilitate intercluster comparisons, all cluster scores are restandardized to a mean of 50 and standard deviation of 10.

Cluster scores are then plotted in N-dimensional space, where N = the number of clusters, in this case five. The analytical program examines the space for concentrations of scores and classifies the people within a concentration as an attitudinal type. If the variance of scores within a concentration is small, the type has a high homogeneity coefficient. Respondents not included in any concentration are considered unique and are not classified.

Appendix table 4 shows nine types of people with varying attitudes toward wildlife issues. The names assigned to each type are based on scores on each cluster. For example, persons within type 4 are labeled as disliking animals, for they show the largest deviations from the mean (50) on clusters 1, 2, and 5. The other types are given designations in a similar manner.

The final step of the cluster analysis is to describe the attitudinal types in terms of other sociodemographic and attitudinal characteristics. Sometimes policymakers will have no desire to identify the sociodemographics of a type, for instance, when the total population surveyed is extremely homogeneous in this regard or all regions, social strata, or income classes are expected to be impacted equally by a project. Even in such cases, however, more detailed information on the responses of each type to individual attitudinal items, whether or not they were included in a cluster, may be desirable. Cluster analysis provides information on the

Appendix table 3--Intercorrelations between cluster scores

Cluster	Cluster				
	1	2	3	4	5
1	1.00				
2	.23	1.00			
3	-.05	-.04	1.00		
4	.39	-.08	-.12	1.00	
5	.41	.71	-.22	.02	1.00

Appendix table 4--Types of individuals defined by mean cluster scores 1/

Type characterization	Clusters					Overall homogene- ity	Number in type
	Affinity for wild predatory mammals	Affinity for farm animals	Approve of hunting	Nonconsump- tive importance of wildlife	Affinity for pets		
	----- Mean -----						No.
1. Dislike predators, disapprove of hunting	42.6	46.0	44.4	52.6	51.5	0.85	247
2. Dislike pets and farm animals, disapprove of hunting	53.4	45.4	44.0	47.5	45.9	.87	204
3. Low nonconsumptive im- portance of wildlife	45.4	51.9	48.3	34.1	50.4	.76	178
4. Dislike animals	40.1	39.3	50.8	48.5	36.2	.78	224
5. Like predators and pets, disapprove of hunting	59.4	54.6	43.2	54.8	60.7	.80	242
6. High nonconsumptive importance of wildlife	56.7	45.2	45.9	61.6	46.9	.83	216
7. Approve of hunting	51.2	45.6	66.8	51.0	47.0	.76	224
8. Like farm animals	49.1	58.9	54.1	55.3	48.8	.82	154
9. Like pets and farm animals	45.9	63.7	49.1	47.1	62.1	.78	190
Unclassified							155

1/ Values are standardized to a mean of 50 and standard deviation of 10.

unstandardized mean response of every type to all cluster items and any other requested items. Tests of significance of the differences between each type's mean response to an item and the overall mean are performed. <sup>3/</sup> Homogeneity coefficients provide measures of variability among respondents in a type:

$$H = \sqrt{1 - \frac{\text{SD of item for a type}^2}{\text{SD of item for total sample}^2}}$$

Some example results are presented in appendix table 5.

## CONCLUSIONS

The information on responses of each type to each item can be used in SQPI to generate environmental quality estimates for various audiences. The constituencies of these audiences can then be described in terms of attitudes toward the issue, toward a related issue, or in sociodemographic characteristics. Further, if the control attitudes of the uninformed-unconcerned subset of an attitudinal type are predicted from the expressed attitudes toward control of the informed or concerned subset (as in app. fig. 1), the sociodemographic and attitudinal differences between the two subsets can be measured in an attempt to determine the precision of the prediction. Such information will aid policymakers in anticipating the direction and degree of potential responses to various decisions.

<sup>3/</sup> Significance tests are based on 300 random samples from the full supply of responses to each item, thereby providing an estimate of the probability of obtaining mean values above or below those actually observed. This method precludes assumption of a normal distribution of responses.

Appendix table 5--Mean characteristics and attitudes by type 1/

Variable <u>2/</u>	Units	Type									Total
		1	2	3	4	5	6	7	8	9	
		Mean									
Percentage female (screen)	Pct.	67*	53	56	55	57	45	21*	46	57	51
Education (52)	Rank	3.8	4.2	3.8	3.3*	4.2	4.7*	4.0	4.0	3.4*	3.9
Income (53)	Rank	3.1	3.1	3.0	2.8*	3.1	3.4*	3.3*	3.4	3.0	3.1
Age (screen)	Years	41	34*	45*	48	34	35*	37*	46*	44*	40
Currently residing in: (49)											
City	Pct.	36	35	41	37	33	31	23*	30	36	33
Suburb	Pct.	30	29	23	17*	36	37*	26	25	22	27
Town	Pct.	19	19	15	22	14	15	23	20	21	19
Farm	Pct.	3*	4	8	9	5	4	14*	10	7	7
Country nonfarm	Pct.	13	13	13	14	12	12	13	14	15	14
Regional residence <u>3/</u>											
1. New England	Pct.	8	8	6	7	7	5	5	6	6	6
2. Middle Atlantic	Pct.	22	16	22	15	23	16	13	11	21	18
3. East North Central	Pct.	20	18	23	18	20	23	16	21	16	19
4. West North Central	Pct.	7	10	8	7	5	7	11	13	7	8
5. South Atlantic	Pct.	13	17	14	18	14	13	17	11	22*	16
6. East South Central	Pct.	3	5	7	12	5	2*	9	5	7	6
7. West South Central	Pct.	10	7	10	10	10	4*	13	10	11	10
8. Mountain	Pct.	5	4	2	4	4	6	5	7	2	5
9. Pacific	Pct.	13	15	8	8	12	24	13	15	6*	13
Percentage agree:											
Farmer has right to kill predators (13)	Pct.	73	68	80	83	56*	59*	87*	79	78	73
Concern over killing animals for food (12)	Pct.	1.7	1.8*	1.7	1.8*	1.9*	1.6	1.3*	1.5*	1.7	1.6

\* Significantly different from overall mean at  $p < .05$ .

1/ For more variables and further detail see Edwin H. Carpenter and Richard G. Stuby. 1979. A descriptive look at Americans' affinity for wild and domesticated animals, their treatment and utilization. Southwestern Social Sci. Assoc. Meetings, Fort Worth, Tex., Mar. 1, 1979.

2/ See question number in parenthesis for coding (app. A).

3/ See figure 8.



**END**